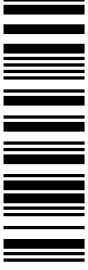


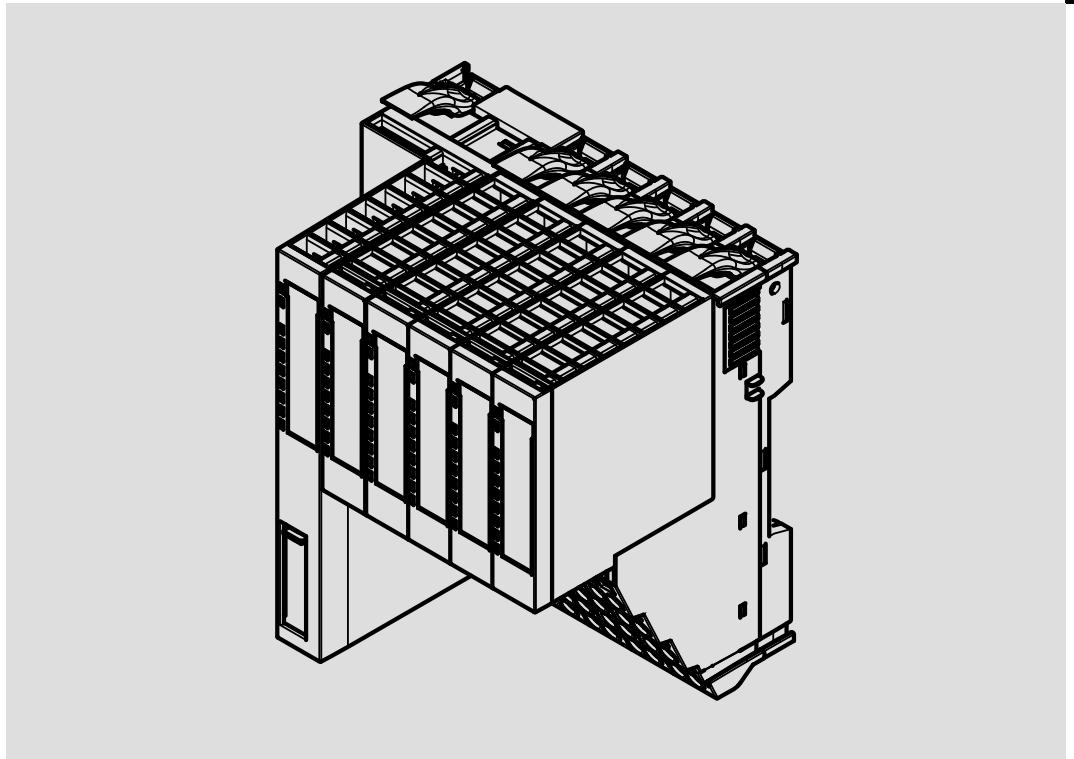
EDSIO1000
13525977

L-force *Controls*



System Manual

I/O System 1000



EPM-Sxxx

Modular I/O system

Lenze

1	About this documentation	13
1.1	Document history	15
1.2	Conventions used	16
1.3	Notes used	16
1.4	Terminology used	17
2	Safety instructions	19
2.1	General safety information	19
3	Product description	22
3.1	Device features	22
3.2	Application as directed	23
3.3	System overview	24
3.3.1	System design	24
3.4	Module design	26
3.4.1	Bus coupler modules	26
3.4.2	I/O compound modules	26
3.4.3	Supply modules	27
3.4.4	Power distributor module	27
3.4.5	Accessories	28
3.4.6	Function elements	29
3.5	Bus coupler modules	30
3.5.1	CANopen - EPM-S110	30
3.5.2	PROFIBUS - EPM-S120	37
3.5.3	EtherCAT - EPM-S130	44
3.5.4	PROFINET - EPM-S140	49
3.5.5	DeviceNet - EPM-S150	54
3.5.6	Modbus TCP- EPM-S160	62
3.6	I/O compound modules - digital I/O	66
3.6.1	Two digital inputs - EPM-S200 and EPM-S204 (NPN)	66
3.6.2	Four digital inputs - EPM-S201 and EPM-S205 (NPN)	69
3.6.3	Eight digital inputs - EPM-S202 and EPM-S206 (NPN)	72
3.6.4	Four digital inputs (three-wire conductor connection) - EPM-S203	75
3.6.5	2 digital inputs with time stamp function - EPM-S207	78
3.6.6	Two digital outputs 0.5 A - EPM-S300 and EPM-S303 (NPN)	88
3.6.7	Four digital outputs 0.5 A - EPM-S301 and EPM-S304 (NPN)	92
3.6.8	Eight digital outputs 0.5 A - EPM-S302 and EPM-S305 (NPN)	96
3.6.9	Two digital outputs 2 A - EPM-S306	100
3.6.10	Four digital outputs 2 A - EPM-S309	104
3.6.11	2 digital outputs with time stamp function - EPM-S310	108
3.6.12	Two relay outputs - EPM-S308	119

3.7	I/O compound modules - analog I/O	123
3.7.1	Representation of analog values	123
3.7.2	2 analog inputs 0 ... 10 V (12 bits) - EPM-S400	124
3.7.3	4 analog inputs 0 ... 10 V (12 bits) - EPM-S401	128
3.7.4	2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402	132
3.7.5	4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403	136
3.7.6	2 analog inputs -10 ... +10 V (16 bits) - EPM-S406	140
3.7.7	2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408	143
3.7.8	2 analog outputs 0 ... 10 V (12 bits) - EPM-S500	146
3.7.9	4 analog outputs 0 ... 10 V (12 bits) - EPM-S501	150
3.7.10	2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502	154
3.7.11	4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503	158
3.8	I/O compound modules - temperature measurement	162
3.8.1	Representation of analog values	162
3.8.2	Four (two) analog inputs for resistance tests - EPM-S404	163
3.8.3	Two analog inputs for thermocouple measurement - EPM-S405	168
3.9	I/O compound modules - counter	173
3.9.1	One counter 32 bits, 24 V DC - EPM-S600	173
3.9.2	Two counters 32 bits, 24 V DC - EPM-S601	191
3.9.3	One counter 32 bits, 5 V DC - EPM-S602	207
3.9.4	Two counters 32 bits, 24 V DC - EPM-S603	223
3.9.5	Control and status word	229
3.10	I/O compound modules - encoder evaluation	233
3.10.1	SSI - EPM-S604	233
3.11	I/O compound modules - pulse width modulation (PWM)	238
3.11.1	2 digital outputs with PWM functionality - EPM-S620	238
3.11.2	Control and status word	242
3.12	I/O compound modules - communication	243
3.12.1	RS232 interface - EPM-S640	243
3.12.2	RS422/RS485 interface - EPM-S650	248
3.13	Power supply modules	254
3.13.1	I/O supply - EPM-S701	254
3.13.2	I/O supply and electronic supply - EPM-S702	256
3.14	Terminal modules	259
3.14.1	8 terminals 24 V - EPM-S910	259
3.14.2	8 terminals 0 V - EPM-S911	260
3.14.3	4/4 terminals 24 V/0 V - EPM-S912	261
4	Technical data	262

5	Mechanical installation	264
5.1	Important notes	264
5.2	Dimensions	265
5.3	Mounting	266
5.3.1	Standard mounting	266
5.3.2	Block mounting	267
5.3.3	Mounting the busbar for the shield connection	268
5.4	Dismounting	269
5.4.1	Dismounting the bus coupler module, the I/O compound module, and the power supply module	269
5.4.2	Removing the bus coupler module	269
6	Electrical installation	270
6.1	EMC-compliant wiring	270
6.2	Supply voltage connection	271
6.3	Wiring of the control connections	273
6.4	Connecting the shield	273
7	Troubleshooting and fault elimination	274
7.1	Troubleshooting via RUN- and MF-LED	274
8	CANopen communication	275
8.1	About CANopen	275
8.1.1	Structure of the CAN data telegram	275
8.1.2	Identifier	275
8.1.3	Saving settings	276
8.2	Network management (NMT)	277
8.3	Transmitting process data	279
8.3.1	Process data telegram	279
8.3.2	Identifier of the process data objects (PDO)	280
8.3.3	Assigning individual identifiers	281
8.3.4	Process data transmission mode	281
8.3.5	PDO mapping	283
8.3.6	PDO mapping for I/O compound modules with a serial interface	285
8.3.7	PDO mapping for I/O compound modules with time stamp function ..	286
8.3.8	PDO mapping for I/O compound modules with PWM function	289
8.3.9	PDO mapping for counters and encoder evaluation	290
8.3.10	Data transfer between I/O system and controller	292
8.3.11	Indices for setting the process data transfer	293

8.4	Transmitting parameter data	296
8.4.1	Telegram structure	296
8.4.2	Writing a parameter (example)	298
8.4.3	Reading a parameter (example)	299
8.5	Response of the station after switch-on	301
8.6	Baud rate and node address (node ID) setting	302
8.7	General function of the parameter setting	303
8.7.1	Parameterising digital I/Os	303
8.7.2	Parameterising analog I/Os, counter, SSI, time stamp and PWM	304
8.8	Setting the parameters of analog I/O	305
8.8.1	2 analog inputs 0 ... 10 V (12 bits) - EPM-S400	305
8.8.2	4 analog inputs 0 ... 10 V (12 bits) - EPM-S401	306
8.8.3	2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402	307
8.8.4	4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403	308
8.8.5	2 analog inputs -10 ... +10 V (16 bits) - EPM-S406	309
8.8.6	2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408	311
8.8.7	2 analog outputs 0 ... 10 V (12 bits) - EPM-S500	313
8.8.8	4 analog outputs 0 ... 10 V (12 bits) - EPM-S501	314
8.8.9	2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502	315
8.8.10	4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503	316
8.8.11	Error behaviour	317
8.9	Parameterising the temperature measurement	318
8.9.1	Four (two) analog inputs for resistance tests - EPM-S404	318
8.9.2	Two analog inputs for thermocouple measurement - EPM-S405	324
8.9.3	Error behaviour	327
8.10	Parameterising the counter	328
8.10.1	Commissioning examples	328
8.10.2	Rotary transducer signal evaluation	329
8.10.3	One counter 32 bits, 24 V DC - EPM-S600	329
8.10.4	Two counters 32 bits, 24 V DC - EPM-S601	333
8.10.5	One counter 32 bits, 5 V DC - EPM-S602	337
8.10.6	Two counters 32 bits, 24 V DC - EPM-S603	341
8.11	Parameterising the encoder evaluation	343
8.11.1	SSI - EPM-S604	343
8.12	Time stamp parameterising	346
8.12.1	2 digital inputs with time stamp function - EPM-S207	346
8.12.2	2 digital outputs with time stamp function - EPM-S310	346
8.13	Parameterising technology modules	347
8.13.1	2 digital outputs with PWM functionality - EPM-S620	347
8.13.2	RS232 interface - EPM-S640	348
8.13.3	RS422/RS485 interface - EPM-S650	354

8.14	"Store" function	363
8.15	Loading the default setting	364
8.16	Node Guarding	365
8.17	Heartbeat	367
8.18	Monitoring	369
8.18.1	Time monitoring for PDO1-Rx ... PDO10-Rx	369
8.18.2	Digital output monitoring	370
8.18.3	Monitoring of the analog outputs	371
8.19	Diagnostics	372
8.19.1	Emergency telegram	372
8.19.2	Reading out the module identifiers	379
8.19.3	Status of the digital inputs	380
8.19.4	Status of the digital outputs	380
8.19.5	Status of the analog inputs	380
8.19.6	Status of the analog outputs	380
8.19.7	Status of the counters	381
8.19.8	Status of digital inputs with time stamp function	381
8.19.9	Status of digital outputs with time stamp function	382
8.19.10	Status of digital outputs with PWM function	383
8.20	Index table	384
9	PROFIBUS communication	410
9.1	Via Profibus-DP	410
9.2	System configuration	411
9.2.1	Types	411
9.2.2	Mono-master system	411
9.2.3	Multi-master system	412
9.3	Communication	413
9.3.1	Bus access	413
9.3.2	Cyclic data transfer	414
9.3.3	Acyclic data transfer	415
9.3.4	Communication medium	416
9.4	Project planning	417

9.5	Setting the parameters of analog I/O	418
9.5.1	2 analog inputs 0 ... 10 V (12 bits) - EPM-S400	418
9.5.2	4 analog inputs 0 ... 10 V (12 bits) - EPM-S401	420
9.5.3	2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402	422
9.5.4	4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403	424
9.5.5	2 analog inputs -10 ... +10 V (16 bits) - EPM-S406	426
9.5.6	2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408	429
9.5.7	2 analog outputs 0 ... 10 V (12 bits) - EPM-S500	432
9.5.8	4 analog outputs 0 ... 10 V (12 bits) - EPM-S501	434
9.5.9	2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502	436
9.5.10	4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503	438
9.6	Parameterising the temperature measurement	440
9.6.1	Four (two) analog inputs for resistance tests - EPM-S404	440
9.6.2	Two analog inputs for thermocouple measurement - EPM-S405	447
9.7	Parameterising the counter	452
9.7.1	Rotary transducer signal evaluation	452
9.7.2	One counter 32 bits, 24 V DC - EPM-S600	452
9.7.3	Two counters 32 bits, 24 V DC - EPM-S601	461
9.7.4	One counter 32 bits, 5 V DC - EPM-S602	469
9.7.5	Two counters 32 bits, 24 V DC - EPM-S603	477
9.8	Parameterising the encoder evaluation	481
9.8.1	SSI - EPM-S604	481
9.9	Time stamp parameterising	486
9.9.1	2 digital inputs with time stamp function - EPM-S207	486
9.9.2	2 digital outputs with time stamp function - EPM-S310	488
9.10	Parameterising technology modules	491
9.10.1	2 digital outputs with PWM functionality - EPM-S620	491
9.10.2	RS232 interface - EPM-S640	494
9.10.3	RS422/RS485 interface - EPM-S650	501
9.11	Diagnostics	511
9.11.1	Slave standard diagnostic data	511
9.11.2	Identifier-related diagnostics	512
9.11.3	Module status	513
9.11.4	Channel-related diagnostics	515
9.11.5	Alarms	516
10	EtherCAT communication	518
10.1	About EtherCAT	518
10.1.1	EtherCAT frame	519
10.1.2	EtherCAT datagrams	520
10.1.3	EtherCAT state machine	520

10.2	Transmitting process data	521
10.2.1	PDO mapping	522
10.2.2	PDO mapping for I/O compound modules with a serial interface	524
10.2.3	PDO mapping for I/O compound modules with time stamp function ..	525
10.2.4	PDO mapping for I/O compound modules with PWM function	528
10.2.5	PDO mapping for counters and encoder evaluation	529
10.2.6	Access to the I/O area	531
10.3	Transmitting parameter data	532
10.4	General function of the parameter setting	533
10.5	Setting the parameters of analog I/O	534
10.5.1	2 analog inputs 0 ... 10 V (12 bits) - EPM-S400	534
10.5.2	4 analog inputs 0 ... 10 V (12 bits) - EPM-S401	535
10.5.3	2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402	536
10.5.4	4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403	537
10.5.5	2 analog inputs -10 ... +10 V (16 bits) - EPM-S406	538
10.5.6	2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408	540
10.5.7	2 analog outputs 0 ... 10 V (12 bits) - EPM-S500	542
10.5.8	4 analog outputs 0 ... 10 V (12 bits) - EPM-S501	543
10.5.9	2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502	544
10.5.10	4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503	545
10.6	Parameterising the temperature measurement	546
10.6.1	Four (two) analog inputs for resistance tests - EPM-S404	546
10.6.2	Two analog inputs for thermocouple measurement - EPM-S405	552
10.7	Parameterising the counter	555
10.7.1	Rotary transducer signal evaluation	555
10.7.2	One counter 32 bits, 24 V DC - EPM-S600	555
10.7.3	Two counters 32 bits, 24 V DC - EPM-S601	559
10.7.4	One counter 32 bits, 5 V DC - EPM-S602	563
10.7.5	Two counters 32 bits, 24 V DC - EPM-S603	566
10.8	Parameterising the encoder evaluation	568
10.8.1	SSI - EPM-S604	568
10.9	Time stamp parameterising	571
10.9.1	2 digital inputs with time stamp function - EPM-S207	571
10.9.2	2 digital outputs with time stamp function - EPM-S310	571
10.10	Parameterising technology modules	572
10.10.1	2 digital outputs with PWM functionality - EPM-S620	572
10.10.2	RS232 interface - EPM-S640	573
10.10.3	RS422/RS485 interface - EPM-S650	579
10.11	Monitoring	588

10.12	Diagnostics	588
10.12.1	Access to diagnostic data	588
10.12.2	Standard objects	600
10.12.3	Storage of the PDOs	605
10.12.4	Emergency telegram	606
10.12.5	EtherCAT-specific error codes	607
10.12.6	Manufacturer-specific error codes	608
10.12.7	SDO error codes	609
11	DeviceNet communication	610
11.1	About DeviceNet	610
11.2	Access to the I/O system 1000	612
11.2.1	Access to the I/O area	613
11.2.2	Access to parameter data	614
11.2.3	Access to diagnostic data	615
11.3	Setting the parameters of analog I/O	616
11.3.1	2 analog inputs 0 ... 10 V (12 bits) - EPM-S400	616
11.3.2	4 analog inputs 0 ... 10 V (12 bits) - EPM-S401	617
11.3.3	2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402	618
11.3.4	4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403	619
11.3.5	2 analog inputs -10 ... +10 V (16 bits) - EPM-S406	620
11.3.6	2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408	622
11.3.7	2 analog outputs 0 ... 10 V (12 bits) - EPM-S500	624
11.3.8	4 analog outputs 0 ... 10 V (12 bits) - EPM-S501	625
11.3.9	2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502	626
11.3.10	4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503	627
11.4	Parameterising the temperature measurement	628
11.4.1	Four (two) analog inputs for resistance tests - EPM-S404	628
11.4.2	Two analog inputs for thermocouple measurement - EPM-S405	634
11.5	Parameterising the counter	637
11.5.1	Rotary transducer signal evaluation	637
11.5.2	One counter 32 bits, 24 V DC - EPM-S600	637
11.5.3	Two counters 32 bits, 24 V DC - EPM-S601	641
11.5.4	One counter 32 bits, 5 V DC - EPM-S602	645
11.5.5	Two counters 32 bits, 24 V DC - EPM-S603	648
11.6	Parameterising the encoder evaluation	650
11.6.1	SSI - EPM-S604	650
11.7	Time stamp parameterising	653
11.7.1	2 digital inputs with time stamp function - EPM-S207	653
11.7.2	2 digital outputs with time stamp function - EPM-S310	653

11.8	Parameterising technology modules	654
11.8.1	2 digital outputs with PWM functionality - EPM-S620	654
11.8.2	RS232 interface - EPM-S640	655
11.8.3	RS422/RS485 interface - EPM-S650	661
12	PROFINET communication	670
12.1	About PROFINET	670
12.2	Access to the I/O system 1000	673
12.2.1	Access to the I/O area	675
12.2.2	Access to parameter data	675
12.2.3	Access to diagnostic data	676
12.3	Project planning	678
12.4	I&M data	680
12.5	Index table	682
12.6	Setting the parameters of analog I/O	683
12.6.1	2 analog inputs 0 ... 10 V (12 bits) - EPM-S400	683
12.6.2	4 analog inputs 0 ... 10 V (12 bits) - EPM-S401	685
12.6.3	2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402	687
12.6.4	4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403	689
12.6.5	2 analog inputs -10 ... +10 V (16 bits) - EPM-S406	691
12.6.6	2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408	694
12.6.7	2 analog outputs 0 ... 10 V (12 bits) - EPM-S500	697
12.6.8	4 analog outputs 0 ... 10 V (12 bits) - EPM-S501	699
12.6.9	2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502	701
12.6.10	4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503	703
12.7	Parameterising the temperature measurement	705
12.7.1	Four (two) analog inputs for resistance tests - EPM-S404	705
12.7.2	Two analog inputs for thermocouple measurement - EPM-S405	712
12.8	Parameterising the counter	717
12.8.1	Rotary transducer signal evaluation	717
12.8.2	One counter 32 bits, 24 V DC - EPM-S600	717
12.8.3	Two counters 32 bits, 24 V DC - EPM-S601	725
12.8.4	One counter 32 bits, 5 V DC - EPM-S602	733
12.8.5	Two counters 32 bits, 24 V DC - EPM-S603	741
12.9	Parameterising the encoder evaluation	745
12.9.1	SSI - EPM-S604	745
12.10	Time stamp parameterising	750
12.10.1	2 digital inputs with time stamp function - EPM-S207	750
12.10.2	2 digital outputs with time stamp function - EPM-S310	752

12.11	Parameterising technology modules	755
12.11.1	2 digital outputs with PWM functionality - EPM-S620	755
12.11.2	RS232 interface - EPM-S640	758
12.11.3	RS422/RS485 interface - EPM-S650	765
13	Maintenance	775
13.1	Regular checks	775
13.2	Cleaning	775
13.3	Repair	776
13.3.1	Replacing the electronic module/main supply	776
14	Appendix	777
14.1	Serial process interfacing	777
14.1.1	Protocols	779
14.1.2	I/O area	782
14.1.3	Principle of backplane bus communication	782
15	Index	791

1 About this documentation

Contents

This documentation informs you about the intended use of the components of the I/O system 1000.

Target group

This documentation is intended for all persons who design, install, set up, and adjust the I/O system 1000.



Tip!

Information and tools concerning the Lenze products can be found in the download area at www.lenze.com

Validity

The information given in this documentation applies to the components of the I/O system 1000 according to the following module labelling:

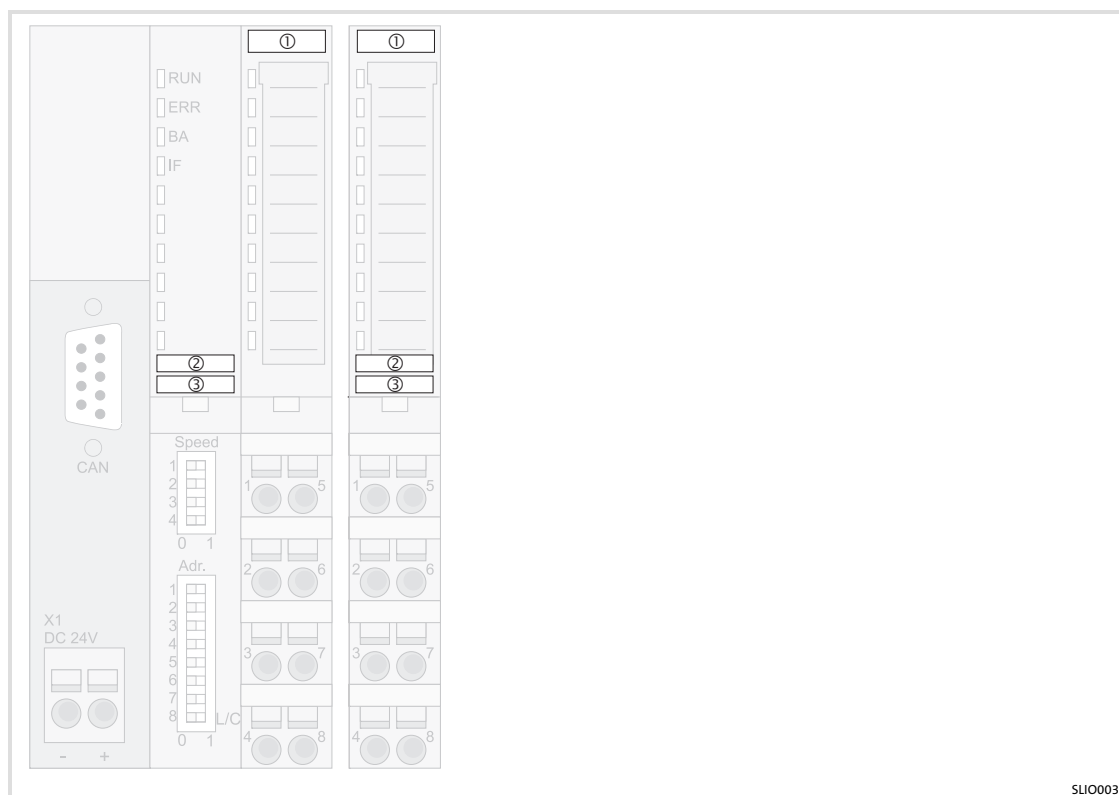


Fig. 1-1 Labelling of the modules

- ① Module designation according to the following table (e.g. AI 2, 12 bits, DC 0 ...10 V)
- ② Type designation according to the following table (e.g. EPM-S400)
- ③ Hardware version/software version according to the following table (e.g. 1A.10)

Module function	Module designation	Type designation	From hardware version	From software version
	①	②	③	
Bus coupler module				
CANopen	CANopen	EPM-S110	1D	30
PROFIBUS	PROFIBUS-DP	EPM-S120	1D	30
EtherCAT	EtherCAT	EPM-S130	1D	30
PROFINET	PROFINET	EPM-S140	1D	10
DeviceNet	DeviceNet	EPM-S150	1D	10
Modbus TCP	Modbus TCP	EPM-S160	1D	10
I/O compound module				
Digital I/O				
2 digital inputs	DI 2, DC 24 V	EPM-S200	1B	-
4 digital inputs	DI 4, DC 24 V	EPM-S201	1B	-
8 digital inputs	DI 8, DC 24 V	EPM-S202	1B	-
4 digital inputs three-wire conductor	DI 4, DC 24 V	EPM-S203	1B	-
2 digital inputs NPN	DI 2, NPN, DC 24 V	EPM-S204	1B	-
4 digital inputs NPN	DI 4, NPN, DC 24 V	EPM-S205	1B	-
8 digital inputs NPN	DI 8, NPN, DC 24 V	EPM-S206	1B	-
2 digital inputs, time stamp	DI 2, 2 µs, DC 24 V	EPM-S207	1B	10
2 digital outputs 0.5 A	DO 2, DC 24 V, 0.5 A	EPM-S300	1B	-
4 digital outputs 0.5 A	DO 4, DC 24 V, 0.5 A	EPM-S301	1B	-
8 digital outputs 0.5 A	DO 8, DC 24 V, 0.5 A	EPM-S302	1B	-
2 digital outputs 0.5 A NPN	DO 2, NPN, DC 24 V, 0.5 A	EPM-S303	1B	-
4 digital outputs 0.5 A NPN	DO 4, NPN, DC 24 V, 0.5 A	EPM-S304	1B	-
8 digital outputs 0.5 A NPN	DO 8, NPN, DC 24 V, 0.5 A	EPM-S305	1B	-
2 digital outputs 2 A	DO 2, DC 24 V, 2 A	EPM-S306	1B	-
4 digital outputs 2 A	DO 4, DC 24 V, 2 A	EPM-S309	1B	-
2 digital outputs, time stamp	DO 2, 1 µs, DC 24 V, 0.5 A	EPM-S310	1B	10
2 relay outputs	Relay 2, AC 230 V, 3 A	EPM-S308	1B	-
Analog I/O				
2 analog inputs, 12 bits, 0 ... 10 V	AI 2, 12 bits, DC 0...10 V	EPM-S400	1B	10
4 analog inputs, 12 bits, 0 ... 10 V	AI 4, 12 bits, DC 0...10 V	EPM-S401	1B	10
2 analog inputs, 12 bits, 0/4 ... 20 mA	AI 2, 12 bits, DC 0/4...20 mA	EPM-S402	1B	10
4 analog inputs, 12 bits, 0/4 ... 20 mA	AI 4, 12 bits, DC 0/4...20 mA	EPM-S403	1B	10
2 analog inputs, 16 bits, -10 ... +10 V	AI 2, 16 bits, DC -10...+10 V	EPM-S406	1B	10
2 analog inputs, 16 bits, 0/4 ... 20 mA	AI 2, 16 bits, DC 0/4...20 mA	EPM-S408	1B	10
2 analog outputs, 12 bits, 0 ... 10 V	AO 2, 12 bits, DC 0...10 V	EPM-S500	1B	10
4 analog outputs, 12 bits, 0 ... 10 V	AO 4, 12 bits, DC 0...10 V	EPM-S501	1B	10
2 analog outputs, 12 bits, 0/4 ... 20 mA	AO 2, 12 bits, DC 0/4...20 mA	EPM-S502	1B	10
4 analog outputs, 12 bits, 0/4 ... 20 mA	AO 4, 12 bits, DC 0/4...20 mA	EPM-S503	1B	10
Temperature measurement				
4(2) analog inputs resistor	AI 4, 16 bits, resistor	EPM-S404	1B	10
2 analog inputs thermocouple	AI 2, 16 bits, thermo	EPM-S405	1B	10

Module function	Module designation	Type designation	From hardware version	From software version
	①	②	③	
Meters				
1 counter 32 bits, 24 V DC (reading, setting, comparing, time stamp)	Counter 1, DC 24 V	EPM-S600	1B	10
2 counters, 32 bits, 24 V DC (reading, setting)	Counter 2, DC 24 V	EPM-S601	1B	10
1 counter, 32 bits, 5 V DC (reading, setting, time stamp)	Counter 1, DC 5 V	EPM-S602	1B	10
2 counters, 32 bits, 24 V DC (reading)	Counter 2, DC 24 V	EPM-S603	1B	10
Encoder evaluation				
SSI interface	SSI	EPM-S604	1B	10
Technology modules				
2 digital outputs PWM (output of pulse width modulated signals)	PWM	EPM-S620	1B	10
RS232 interface	RS232	EPM-S640	1B	10
RS422/RS485 interface	RS422/RS485	EPM-S650	1B	10
Power supply modules				
I/O supply	Power, DC 24 V	EPM-S701	1B	-
I/O supply and electronic supply	Power, DC 24 V/24 V	EPM-S702	1B	-
Potential distributor module				
8 terminals DC 24 V	Supply DC 24 V	EPM-S910	1A	-
8 terminals DC 0 V	Supply DC 0 V	EPM-S911	1A	-
4/4 terminals DC 24 V/0 V	Supply DC 24 V/0 V	EPM-S912	1A	-

1.1

Document history

Material number	Version			Description
13525977	8.0	01/2017	TD29	General revision and error recovery
13409968	7.1	01/2015	TD29	Technical data for EPM-S310 amended
13409968	7.0	06/2012	TD29	Description of the I/O compound modules EPM-S406, EPM-S408 and EPM-S650 supplemented; error correction
13392311	6.1	02/2012	TD29	General revision and error recovery
13376655	6.0	04/2011	TD29	Descriptions added: Bus coupler EPM-S140, EPM-S150, EPM-S160 I/O compound module EPM-S640 Power distributor module EPM-S910, EPM-S911, EPM-S912
13358613	5.0	11/2010	TD29	Descriptions of I/O compound modules EPM-S207, EPM-S310, EPM-S620 and bus coupler EPM-S130 supplemented; troubleshooting
13339410	4.0	05/2010	TD29	Troubleshooting
13321837	3.0	04/2010	TD29	Descriptions of the I/O compound modules EPM-S306, EPM-S308, EPM-S309, EPM-S600, EPM-S601, EPM-S602, EPM-S603, EPM-S604 supplemented; technical data for all modules revised
13313389	2.1	08/2009	TD29	Technical data for EPM-S120 amended
13313389	2.0	08/2009	TD29	First edition
13297999	1.0	06/2009	TD29	Validation

1 About this documentation

Conventions used

1.2 Conventions used

This documentation uses the following conventions to distinguish between different types of information:

Spelling of numbers

Decimal separator	Point	In general, the decimal point is used. For instance: 1234.56
-------------------	-------	---





Warnings

UL warnings		Given in English and French
UR warnings		

Text

Program name	» «	PC software For example: »Engineer«, »Global Drive Control« (GDC)
--------------	-----	--

Icons

Page reference		Reference to another page with additional information For instance:  16 = see page 16
Documentation reference		Reference to another documentation with additional information For example:  EDKxxx = see documentation EDKxxx

1.3 Notes used

The following pictographs and signal words are used in this documentation to indicate dangers and important information:

Safety instructions

Structure of safety instructions:






Danger!




(characterises the type and severity of danger)

Note

(describes the danger and gives information about how to prevent dangerous situations)

Pictograph and signal word	Meaning
 Danger!	Danger of personal injury through dangerous electrical voltage. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Danger!	Danger of personal injury through a general source of danger. Reference to an imminent danger that may result in death or serious personal injury if the corresponding measures are not taken.
 Stop!	Danger of property damage. Reference to a possible danger that may result in property damage if the corresponding measures are not taken.

Application notes

Pictograph and signal word	Meaning
 Note!	Important note to ensure troublefree operation
 Tip!	Useful tip for simple handling
	Reference to another documentation

1.4

Terminology used

Term	Meaning
I/O compound module	EPM-S2xx, EPM-S3xx, EPM-S4xx, EPM-S5xx, EPM-S6xx; module of the I/O system 1000 (DI, DO, AI, AO, counter, etc.)
Bus coupler, bus coupler module	EPM-S1xx; for connection of the I/O system 1000 to a fieldbus system (CANopen, PROFIBUS, etc.). With an integrated DC power supply unit (main supply) for supply of the bus coupler module and the connected I/O compound modules via backplane bus.
Power supply module	EPM-S7xx; additional DC power supply unit that is used in extensive systems if the main supply of the bus coupler is not sufficient to supply the I/O level and/or the electronics.
Power distributor module	EPM-S9xx; power distributor for the supply of external consumers via the I/O system 1000 (24 V and/or 0 V)
Backplane bus	The control signals on the process level are transferred by the I/O compound modules via the internal backplane bus.
Ohmic load	In the technical data, the load capacity at a constant ohmic load is often characterised by specifying a maximum output current at signal "1".
Lamp load	When the lamp load is specified, the fact is taken into account that an incandescent lamp has the n-fold starting current compared to the rated current. Only when the glow wire is heated, the resistance strongly increases. In the data sheets, the lamp load is characterised by specification of a power in watts which is considerably lower than the product of the rated voltage and the permissible output current. The high starting current of an incandescent lamp is also the reason for the fact that the maximum switching frequency is lower by a factor of approximately ten than it would be at a constant ohmic load. Therefore only incandescent lamps which, in total, do not feature a higher rated power than specified in the specification of the lamp load must be connected to a digital output. This does not concern LED lamps; they are treated as an ohmic load.
Inductive load	In the case of an inductive load, the impedance of the consumer (relay coil, contactor) depends on the operating frequency of the digital output. In this case, as well, the permissible switching frequency is strongly reduced compared to that for a constant ohmic load, in order to ensure reliable switching of the relay. The cause of this is the discharge of inductance by the interrupting current via the suppressor circuit. If the switching frequency is too high, the interrupting current can no longer decay sufficiently, so that for instance the relay at the output cannot be disconnected anymore. Without a suppressor circuit, an overvoltage at the power transistors of the digital output may occur, causing damage or destruction of the module.
AI/AO	Analog input/output
DI/DO	Digital input/output

Term	Meaning
µs ticker	Some I/O compound modules are provided with an integrated µs-ticker for the logging of states. The µs-ticker works with a resolution of 1 µs, counts from 0 ... 65535 µs after power-on and then starts with 0 again.
Time stamp	By means of the time stamp function, initial states, together with a time value (see µs-ticker) and a consecutive number, can be transferred to the FIFO memory as a time stamp entry.
PWM	Pulse width modulation
SSI interface	For direct connection of the I/O system to an SSI encoder (EPM-S604)
Basic error limit	Accuracy of analog I/Os at 25 °C relating to the upper limit of effective range (according to EN61131); example: measuring range = 0 ... 10 V or -10 V ... +10 V; basic error limit = ±0.2 % → 10 V * 0.2/100 = 20 mV; this means that at 25 °C a maximum measuring error of ±20 mV can occur.
Operational error limit	Accuracy of analog I/Os across the entire admissible temperature range for the module relating to the upper limit of effective range (according to EN61131).
Basic conversion time	Time required by an A/D converter to record the measured value.
PLC	Programmable Logic Controller
»Global Drive Control« (GDC)	Lenze Engineering tools supporting you during the whole life cycle of a machine - from planning to maintenance.
»Engineer«	
»PLC Designer«	

2 Safety instructions

2.1 General safety information

Scope

The following general safety instructions apply to all Lenze drive and automation components.

The product-specific safety and application notes given in this documentation must be observed!

For your own safety



Danger!

Disregarding the following basic safety measures may lead to severe personal injury and damage to material assets!

- ▶ Lenze drive and automation components ...
 - ... must only be used for the intended purpose.
 - ... must never be operated if damaged.
 - ... must never be subjected to technical modifications.
 - ... must never be operated unless completely assembled.
 - ... must never be operated without the covers/guards.
 - ... can - depending on their degree of protection - have live, movable or rotating parts during or after operation. Surfaces can be hot.
- ▶ All specifications of the corresponding enclosed documentation must be observed. This is vital for safe and trouble-free operation and for achieving the specified product features.

The procedural notes and circuit details provided in this document are proposals which the user must check for suitability for his application. The manufacturer does not accept any liability for the suitability of the specified procedures and circuit proposals.
- ▶ Only qualified skilled personnel are permitted to work with or on Lenze drive and automation components.

According to IEC 60364 or CENELEC HD 384, these are persons ...

 - ... who are familiar with the installation, assembly, commissioning and operation of the product,
 - ... possess the appropriate qualifications for their work,
 - ... and are acquainted with and can apply all the accident prevent regulations, directives and laws applicable at the place of use.

Transport, storage

- ▶ Transport and storage in a dry, low-vibration environment without aggressive atmosphere; preferably in the packaging provided by the manufacturer.
 - Protect against dust and impacts.
 - Observe climatic conditions according to the technical data.
- ▶ Use load carrying equipment for transport! (📖 264)

Mechanical installation

- ▶ Install the product according to the regulations of the corresponding documentation. In particular observe the section "Operating conditions" in the chapter "Technical data".
- ▶ Provide for careful handling and avoid mechanical overload. During handling neither bend components, nor change the insulation distances.
- ▶ The product contains electrostatic sensitive devices which can easily be damaged by short circuit or static discharge (ESD). Thus, electronic components and contacts must not be touched unless ESD measures are taken beforehand.

Electrical installation

- ▶ Carry out the electrical installation according to the relevant regulations (e. g. cable cross-sections, fusing, connection to the PE conductor). Additional notes are included in the documentation.
- ▶ When working on live products, observe the applicable national regulations for the prevention of accidents (e.g. BGV 3).
- ▶ The Instructions contain notes concerning wiring according to EMC regulations (shielding, earthing, filters and cable routing). The compliance with limit values required by the EMC legislation is the responsibility of the manufacturer of the machine or system.

Warning: The inverters are automation components which can be used in industrial environment according to EN 61000-6-4. These products may cause radio interference in residential areas. If this happens, the operator may need to take appropriate action.
- ▶ For compliance with the limit values for radio interference emission at the site of installation, the components - if specified in the technical data - have to be mounted in housings (e. g. control cabinets). The housings have to enable an EMC-compliant installation. In particular observe that for example control cabinet doors preferably have a circumferential metallic connection to the housing. Reduce openings or cutouts through the housing to a minimum.
- ▶ Only plug in or remove pluggable terminals in the deenergised state!

Commissioning

- ▶ If required, you have to equip the system with additional monitoring and protective devices in accordance with the respective valid safety regulations (e. g. law on technical equipment, regulations for the prevention of accidents).

Operation

- ▶ Keep all protective covers and doors closed during operation.

Safety functions

- ▶ Without a higher-level safety system, the described product must neither be used for the protection of machines nor persons.

Maintenance and servicing

- ▶ The components are maintenance-free if the required operating conditions are observed.
- ▶ If the cooling air is polluted, the cooling surfaces may be contaminated or the air vents may be blocked. Under these operating conditions, the cooling surfaces and air vents must be cleaned at regular intervals. Never use sharp objects for this purpose!
- ▶ After the system has been disconnected from the supply voltage, live components and power connections must not be touched immediately because capacitors may be charged. Please observe the corresponding notes on the device.

Disposal

- ▶ Recycle or dispose of the product according to the applicable regulations.

3 Product description

Device features

3 Product description

3.1 Device features

The I/O system 1000 can be used to implement complex automation applications. It includes a bus coupler module and several I/O compound modules which use an internal backplane bus to communicate with each other within the station and exchange process data, parameter data, and diagnostic information.

- ▶ Modular system
- ▶ Mounting on standard DIN rail (35 mm)
- ▶ The two-piece structure (separation of electronics and process integration) enables a quick exchange of modules in the event of service
- ▶ Supply voltage of electronics and process level is separated.
- ▶ Wiring level via spring terminal
- ▶ Shield connection to standard busbar
- ▶ Individual labelling by insertable labels (item designation)
- ▶ Creation of electrical isolations by power supply modules

3.2 Application as directed

The I/O system 1000 is applied as directed if it is only used for implementing automation tasks in common industrial and commercial areas. Any other use is not permissible.

A **use contrary to the intended purposes** is also the case if it bears severe risks or dangers which can cause death, injuries, or damage to material assets if an extremely high level of safety measures is not provided.

The I/O system 1000 may especially **not** be used ...

- ▶ in private areas
- ▶ in potentially explosive atmospheres
- ▶ in areas with harmful gases, oils, acids, radiation, etc.
- ▶ in applications where vibration and impact loads occur which exceed the requirements of the EN 60068-2-6 / EN 60068-2-27
- ▶ to execute safety functions, as for example
 - in the air-traffic control / in flight control systems
 - for monitoring/controlling nuclear reactions
 - for monitoring/controlling mass transportation
 - for monitoring/controlling medical systems
 - for monitoring/controlling weapons systems

In order to ensure the protection of persons and material assets, higher-level safety systems must be used!

3 Product description

System overview
System design

3.3 System overview

3.3.1 System design

An I/O system 1000 consists of the following modules:

- ▶ An EPM-S1xx bus coupler module
 - Connection of the aystem to a fieldbus system (CANopen, PROFIBUS, etc.)
 - Integrated DC power supply unit for the supply of the bus coupler module and the connected I/O compound modules via the backplane bus.
- ▶ Up to 64 EPM-S2xx ... EPM-S6xx I/O compound modules (DI, DO, AI, AO, counter, etc.)

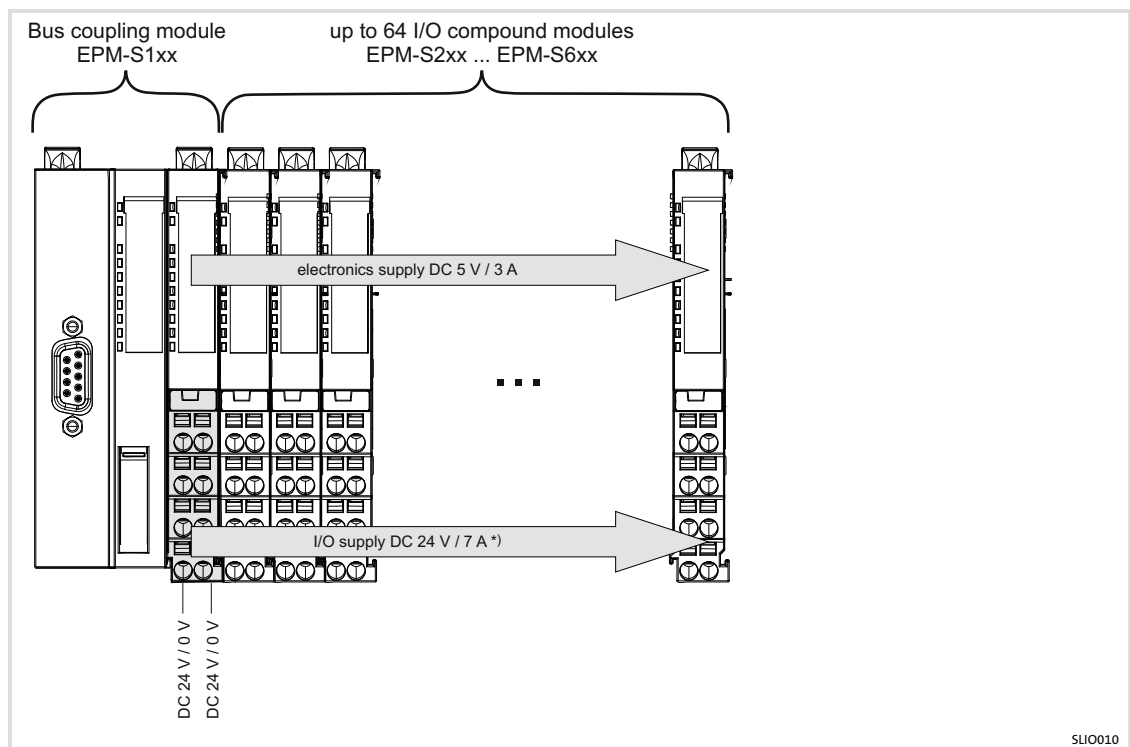


Fig. 3-1 Standard design

*) If no UL conformity is required, the maximum permissible load for the I/O supply is 10 A.

Electronic supply: 5 V voltage for the supply of the bus coupler module electronics and the I/O-compound modules connected.

I/O supply: 24 V voltage for the power supply of the I/O-compound modules.

If, in the case of great station designs, the power of the main bus coupler supply does not suffice to supply the I/O level and/or the electronics, power supply modules can be used. Each supply provides an individual separate potential area.

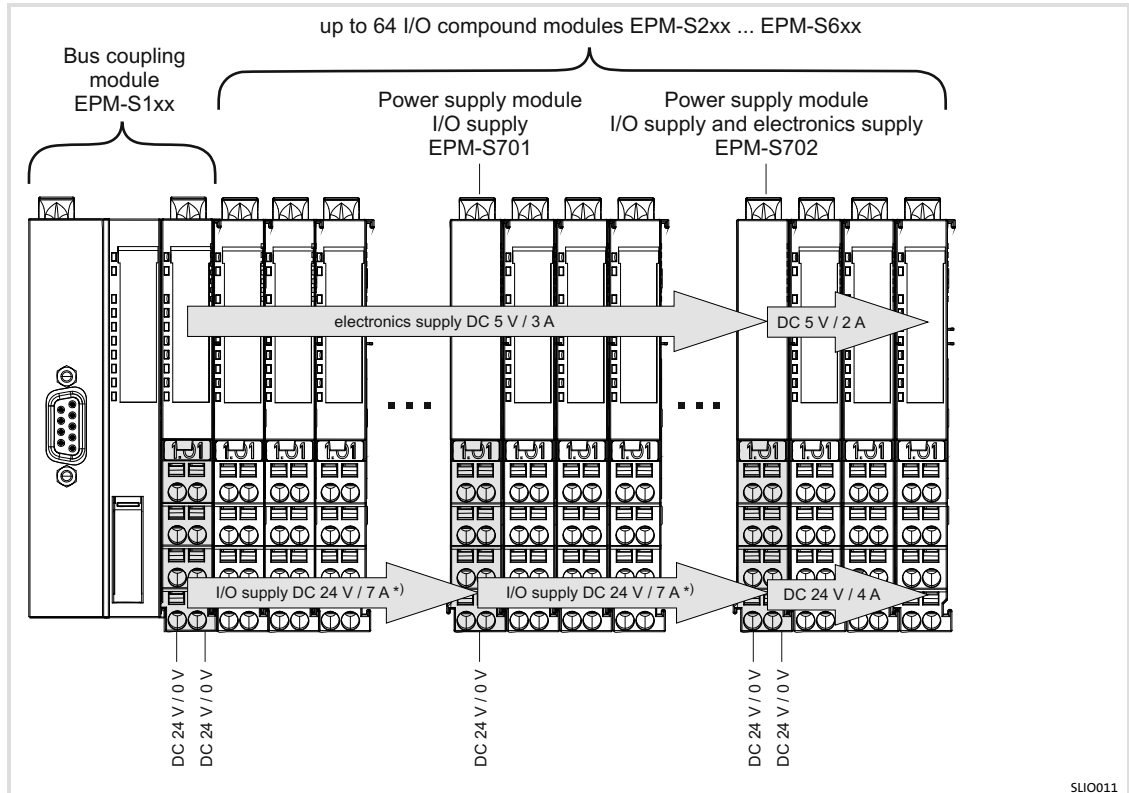


Fig. 3-2 Grouping through power supply modules

*) If no UL conformity is required, the maximum permissible load for the I/O supply is 10 A.

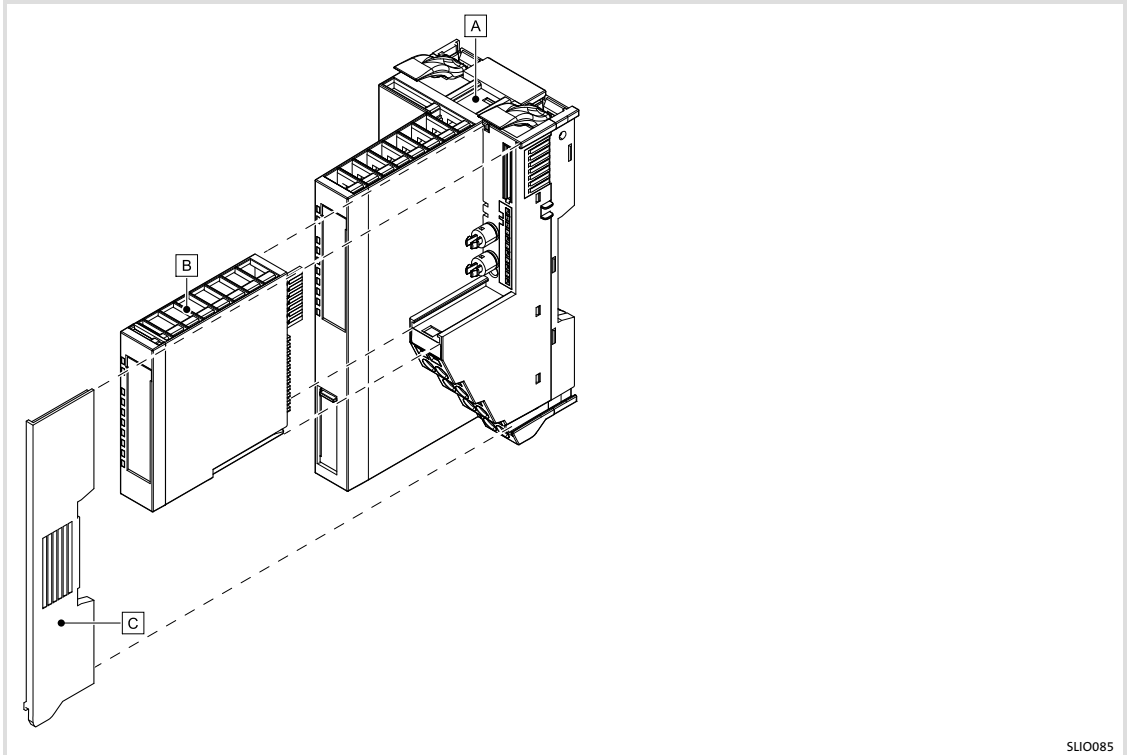
For the supply of external consumers via the I/O system 1000 you can use power distributor modules (EPM-S9xx) which provide the 24 V and/or 0 V voltage of the I/O supply via their terminals.

3 Product description

Module design
Bus coupler modules

3.4 Module design

3.4.1 Bus coupler modules

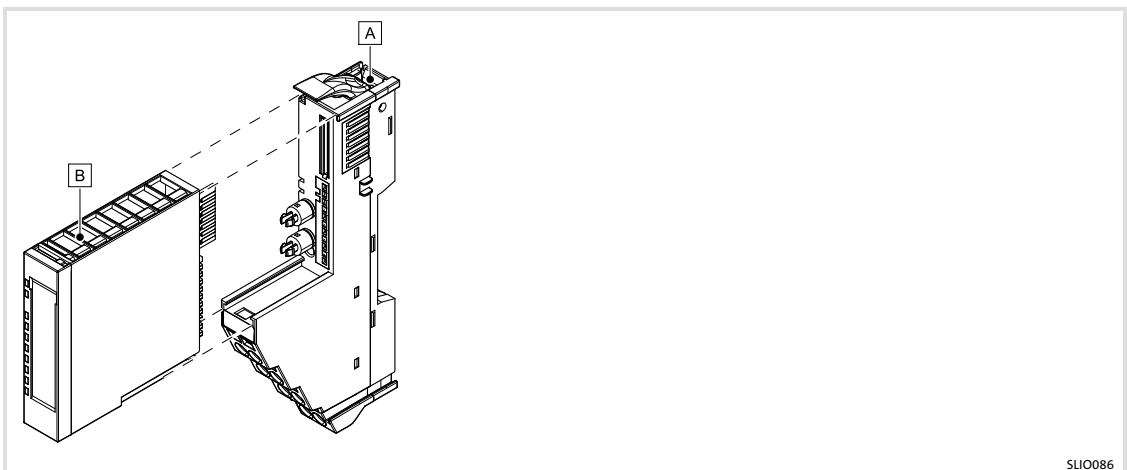


SLIO085

Fig. 3-3 Components of an EPM-S1xx bus coupler module

- Ⓐ Bus coupler with firmly attached base module (inseparable)
- Ⓑ Electronic module (main supply with fuse; spare part order designation: EPM-S700)
- Ⓒ Contact cover for the last module of an I/O system

3.4.2 I/O compound modules



SLIO086

Fig. 3-4 Components of an EPM-S2xx ... EPM-S6xx I/O compound module

- Ⓐ Base module
- Ⓑ Electronic module

3.4.3 Supply modules

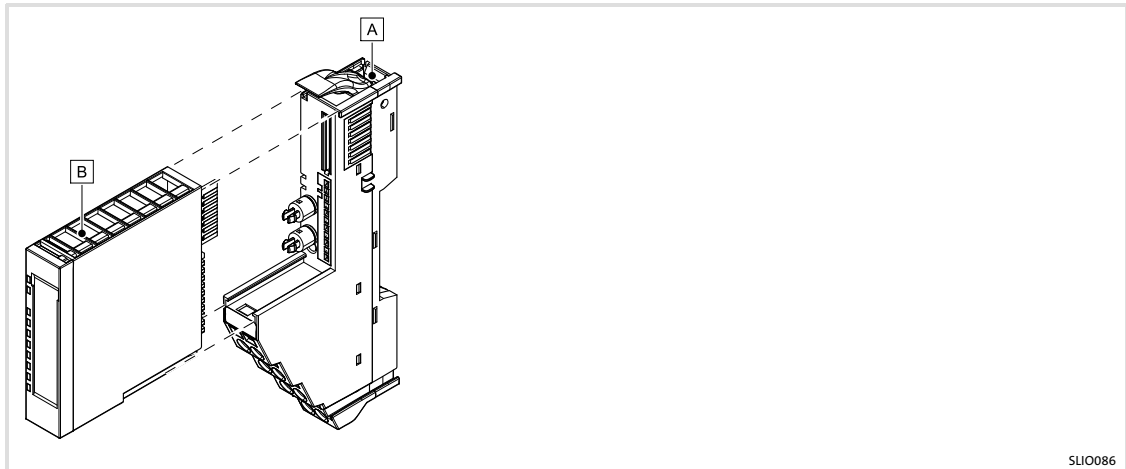


Fig. 3-5 Components of an EPM-S7xx power supply module

- A** Base module
- B** Electronic module

3.4.4 Power distributor module

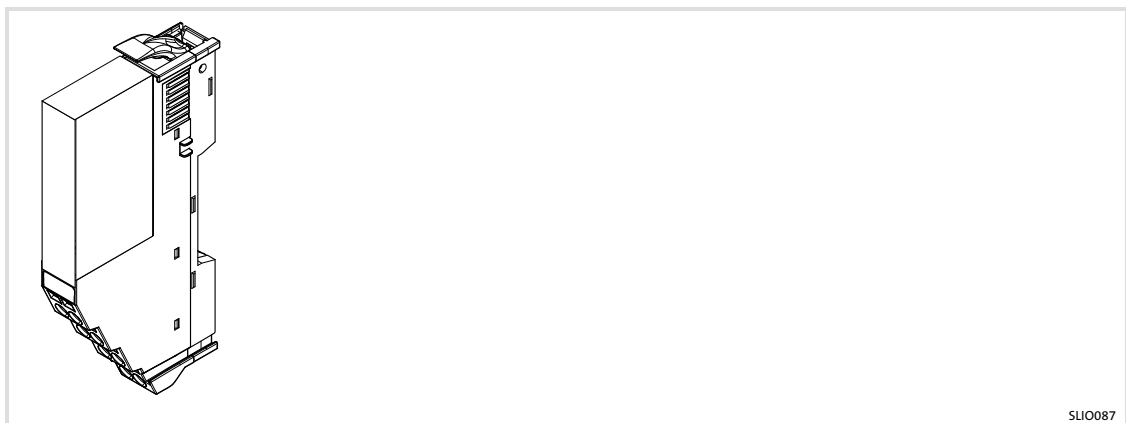
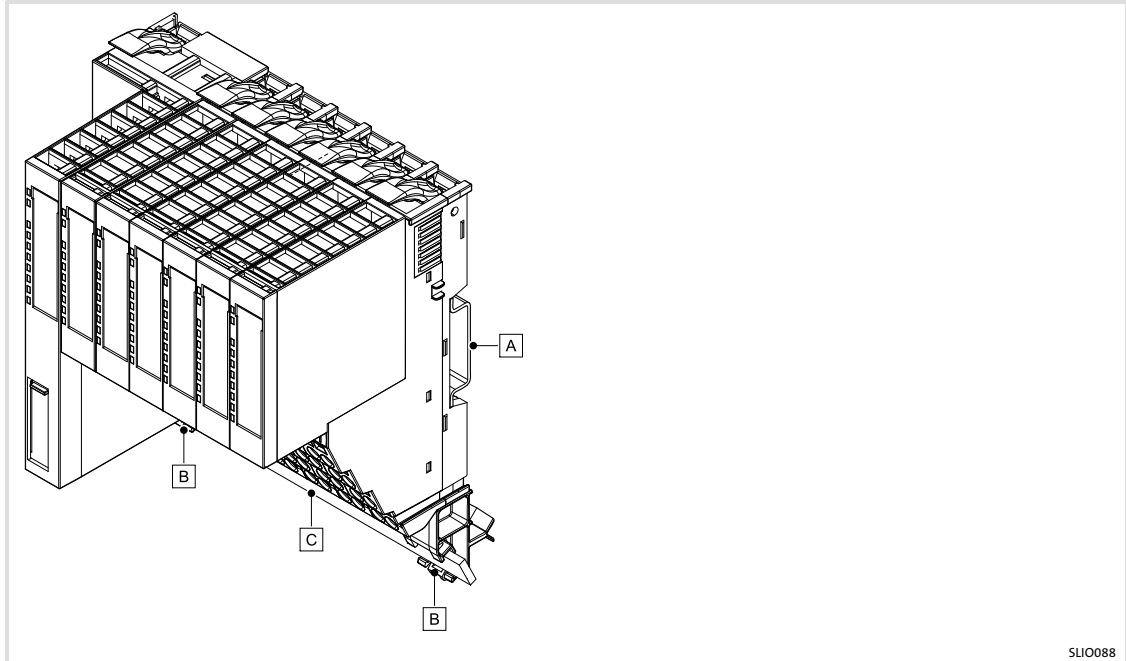


Fig. 3-6 EPM-S9xx Power distributor module

3.4.5

Accessories



5LIO088

Fig. 3-7 I/O system 1000 accessories

- Ⓐ 35 mm DIN rail (available in specialist shops)
- Ⓑ EPM-S900 busbar support
- Ⓒ 10 x 3 mm busbar for shield connection via shield terminals (available in specialist shops)

3.4.6 Function elements

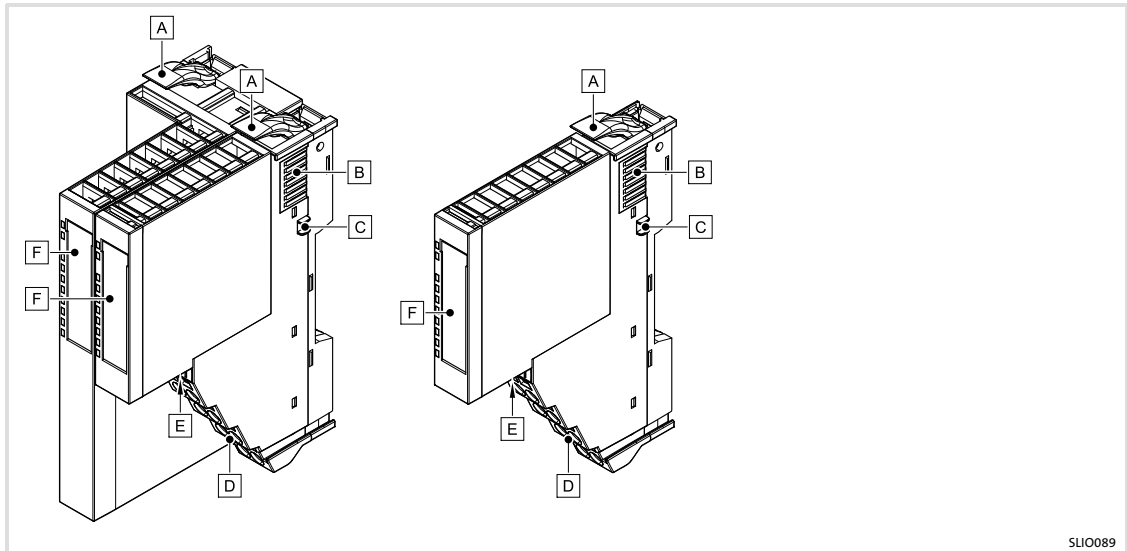


Fig. 3-8 Standard function elements (on the left bus coupler module, on the right I/O compound module)

- Ⓐ Base module ↔ DIN rail locking lever
- Ⓑ Contacts - backplane bus
- Ⓒ Contacts, I/O supply
- Ⓓ Terminals
- Ⓔ Electronic module ↔ base module locking button
- Ⓕ Status displays (LEDs) with labelling strips



Note!

The description of the module-specific function elements can be found in the following module descriptions.

3 Product description

Bus coupler modules
CANopen - EPM-S110

3.5 Bus coupler modules

3.5.1 CANopen - EPM-S110

The bus coupler module represents the interface between the process level (I/O level) and the higher-level fieldbus. The control signals on the process level are transmitted by the I/O compound modules via the internal backplane bus.

Features

- ▶ Up to 64 I/O compound modules can be connected to a CANopen bus coupler module
- ▶ Integrated power supply unit for the internal voltage supply and the voltage supply of the connected I/O compound modules
 - Power supply unit is fed via an external DC voltage source
- ▶ Connected to the CAN bus via a 9-pole Sub-D plug
- ▶ Setting of the CAN address and baud rate via coding switch
- ▶ LEDs for status display

Overview

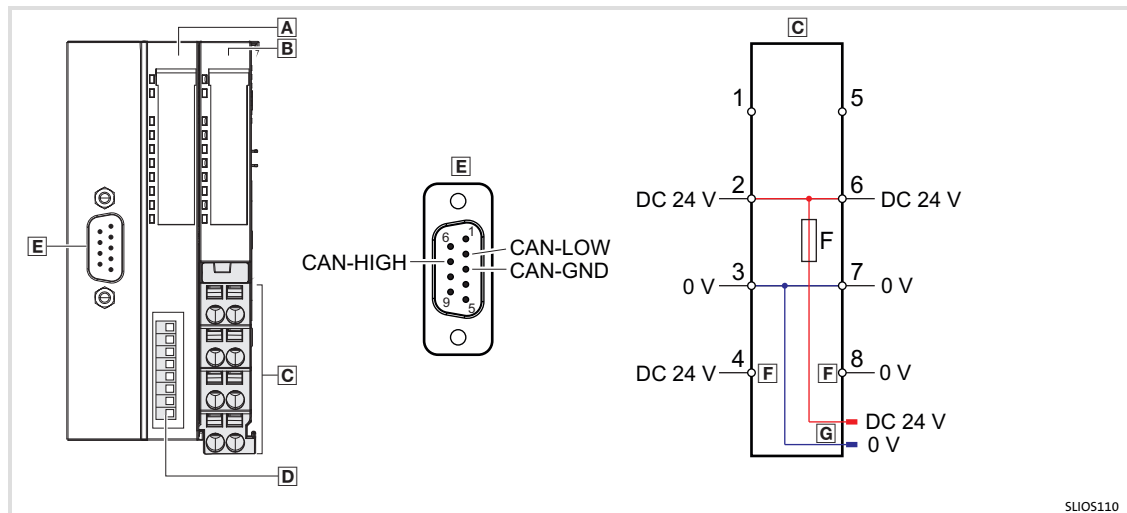


Fig. 3-9 Elements and circuit diagram of voltage supply

- A** Displays for station and fieldbus status
- B** Displays for electronics and I/O supply status
- C** Terminals for the voltage supply
- D** Coding switch for setting the CAN address and baud rate
- E** Sub-D plug for connection to the fieldbus
- F** Electronic supply
- G** I/O supply




Note!


The 24V terminal is an integral part of the bus coupler module and cannot be separated from it.

Status displays

Fieldbus status LEDs

View	Pos.	Designation	Colour	Explanation
 <p>S110001</p>	1	PWR	Green	On: Bus coupler is supplied with voltage
	2	SF	Red	On: Station error, station structure does not comply with configuration.
	3	BA	Green	On: Operating mode "Operational" (ready for data exchange) Blinking: Operating mode "Pre-operational" (waiting for parameters)
	4	IF	Red	On: Internal error is pending
	5			
	6			
	7	-	-	Not assigned
	8			
	9			
	10			


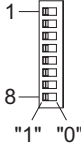
Module status LEDs

View	Pos.	Designation	Colour	Explanation
 <p>S110001</p>	1	PWR IO	Green	On: I/O supply okay
	2	PF IO	Red	On: Fuse for I/O supply is defective
	3	PWR	Green	On: Electronic supply okay
	4	PF	Red	On: Fuse for electronic supply defective
	5			
	6			
	7			
	8	-	-	Not assigned
	9			
	10			

Control elements


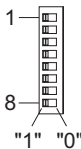
The CAN node address and the baud rate are set via the coding switch.

Setting the baud rate:

Coding switch - CAN address and baud rate (addr.) 					
View	Pos.	Valency	Baud rate [kbps]	Example	
				Switching status	Baud rate
 <small>SLIO004</small>	1	not assigned	-	-	1 + 2 = 3 → baud rate 125 kbps
	2	1	0 = 1000	1	
	3	2	1 = 500	1	
	4	4	2 = 250	0	
	5	8	3 = 125	0	
	6	16	4 = 100	0	
	7	32	5 = 50	0	
	8	64	6 = 20	0	
			7 = 10		
			8 = 800		

1. Switch off the voltage supply for the I/O system.
2. Set all switches at the coding switch to "0".
3. Switch on the voltage supply for the I/O system.
The LEDs SF, IF and CAN-RUN are blinking with a frequency of 1 Hz.
4. Set the desired baud rate with the coding switch. You have 10 seconds to do this.
The IF LED goes off after 10 seconds, and the set baud rate is saved.
You have a further 10 seconds time to set the node address.

Setting the node address:


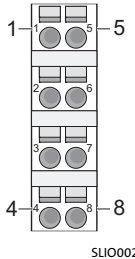
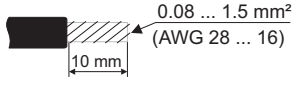
Coding switch - CAN address and baud rate (addr.) 				
View	Pos.	Valency	Switching status	Example
				Node address
 <small>SLIO004</small>	1	not assigned	-	1 + 2 + 16 = 19 → address 19
	2	1	1	
	3	2	1	
	4	4	0	
	5	8	0	
	6	16	1	
	7	32	0	
	8	64	0	

5. Set the node address for the module with the coding switch.
 - Device addresses permitted are 1 ... 127.
 - Each node address must be assigned only once.


**Note!**


The node address can be changed any time by means of the coding switch. The setting is accepted once the supply voltage is switched on.

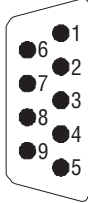
Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 S110002	1	Not assigned	
	2	I/O supply +24 V DC	
	3	I/O supply 0 V	
	4	Electronic supply +24 V DC	
	5	Not assigned	
	6	I/O supply +24 V DC	
	7	I/O supply 0 V	
	8	Electronic supply 0 V	

**Note!**

- ▶ Terminals 2 and 6 as well as 3 and 7 are bridged internally. Please note that the **max. permissible bridge current is 5 A**.
- ▶ Both the I/O supply and the electronic supply are protected against overload internally by a fuse. When the fuses have been tripped, the main supply of the bus coupler (EPM-S700) must be replaced ( 776).

System bus (CAN) / CANopen ("CAN"), 9-pole Sub-D plug 

View	Pin	Assignment	Explanation
 epm-t023	1	-	Not assigned
	2	CAN-LOW	Data line
	3	CAN-GND	Data ground
	4	-	Not assigned
	5	-	Not assigned
	6	-	Not assigned
	7	CAN-HIGH	Data line
	8	-	Not assigned
	9	-	Not assigned

**Stop!****Housing breakage in the case of a too high tightening torque of the securing screws**

If the connector securing screws are tightened too firmly, the housing may break.

Possible consequences:

- ▶ The plug connection is no longer secured against tension.
- ▶ Enclosure IP20 of the module which is warranted can no longer be guaranteed.

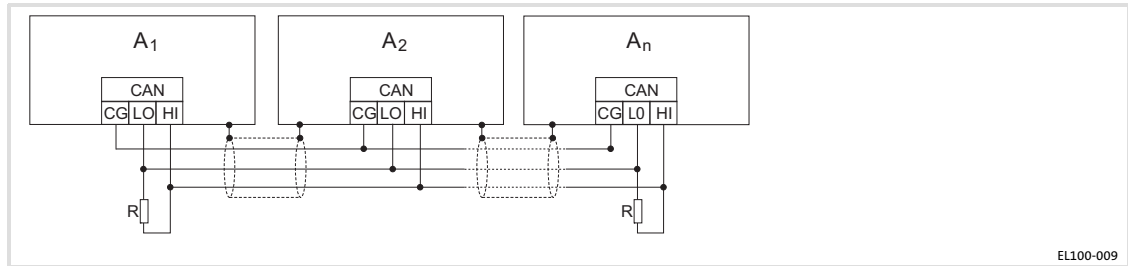
Protective measures:

- ▶ Tighten securing screws without using force (max. 40 Nm).

Product description

Bus coupler modules
CANopen - EPM-S110

Wiring



A1 Node 1
A2 Node 2
An Node n
CG CAN-GND
LO CAN-LOW
HI CAN-HIGH
R 120 Ω -bus terminating resistor

We recommend the use of CAN cables in accordance with ISO 11898-2:

CAN cable in accordance with ISO 11898-2	
Cable type	Paired with shielding
Impedance	120 Ω (95 ... 140 Ω)
Cable resistance/cross-section	
	Cable length \leq 300 m \leq 70 m Ω /m / 0.25 ... 0.34 mm ² (AWG22)
	Cable length 301 ... 1000 m \leq 40 m Ω /m / 0.5 mm ² (AWG20)
Signal propagation delay	\leq 5 ns/m



More information on the system bus (CAN) / CANopen can be found in the chapter "CANopen communication" (📖 275).

Accessories

- ▶ CAN bus plug "Node" - EPM-T950
 - SUB-D, 90°
 - Screw terminals
- ▶ CAN bus plug "Termination" - EPM-T951
 - SUB-D, 90°
 - Screw terminals
 - Integrated terminating resistor
- ▶ CAN bus plug "Even" - EPM-T952
 - SUB-D, 180°
 - Screw terminals
 - Switched terminating resistor
- ▶ CAN bus plug "Switch" - EWZ0046
 - SUB-D, 90°
 - Spring-type terminals
 - Switched terminating resistor

Technical data**EPM-S110: Rated data****Electrical data**

Supply voltage

Nominal value	DC 24 V
Permissible range	DC 20.4 ... 28.8 V

Current consumption

Nominal value	0.95 A
In idle state	0.09 A

Starting current

	3.9 A
--	-------

I²t

	0.14 A ² s
--	-----------------------

Current output, max.

At the backplane bus	3 A
Load supply	7 A (if no UL conformity is required: max. 10 A)

Polarity reversal protection

	Yes
--	-----

Power loss

	3 W
--	-----

Status, alarm, diagnostics

Status display	Yes
Alarms	Yes, parameterisable
Process alarm	No
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes, parameterisable
Diagnostic information can be read out	Possible
Supply voltage display	Green LED
Group error display	Red LED
Channel error display	None

System limits

Mounting racks, max.	1
Modules per mounting rack	64
Number, max.	
I/O compound modules	64 (depends on current consumption)
Inputs/outputs	128 bytes /128 bytes (128 bytes = 16 PDOs of 8 bytes each)
Digital inputs/outputs	512
Analog inputs/outputs	36
Meters	4
SSI	8
Digital inputs, time stamp	4
Digital outputs, time stamp	4
Digital outputs, PWM	4

EPM-S110: Rated data**communication**

Fieldbus	CANopen
Physics	CAN
Connection	9-pole Sub-D plug
Topology	Linear bus with bus termination at both ends
Electrical isolation	Yes
Station	
Number, max.	127
Address	1 ... 127
Transmission speed	
Min.	10 kbps
Max.	1 Mbps
Address range	
Inputs, max.	128 bytes
Outputs, max.	128 bytes
Number of TxPDOs/RxPDO, max.	
for controller-based automation	16/16
for drive-based automation	10/10

Calculation example for determining the maximum number of modules**Note!**

If the CANopen bus coupler is used in conjunction with Lenze drives as part of Drive-based Automation (i.e. as a "terminal extension" to the drive), the PDO configuration of the factory adjustment is used (see examples below):

- ▶ PDO1 only purely digital I/O compound modules
- ▶ PDO2 only purely analog I/O compound modules
- ▶ as of PDO3 counter, rapid I/Os with time stamp function etc.

With Controller-based Automation however all 16 PDOs are available in any distribution.

Example 1: Maximum configuration with digital inputs/outputs

In the default setting, 9 Rx-/Tx-PDOs are provided for digital inputs/outputs (DI/DO).

$$9 \times 8 \text{ bytes} = 72 \text{ bytes} = 576 \text{ bits}$$

Since only 64 I/O compound modules are permissible, max. $64 \times 8 \text{ bits (DI8/DO8)} = 512$ channels can be used.

Example 2: Maximum configuration with analog inputs/outputs

In the default setting, 9 Rx-/Tx-PDOs are provided for analog inputs/outputs (AI/AO).


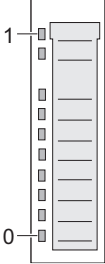
$$9 \times 8 \text{ bytes} = 72 \text{ bytes} = 576 \text{ bits}$$


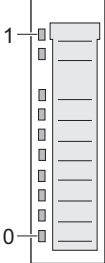
Since 2 bytes are always occupied by an analog channel, max. $72 : 2 = 36$ AI/AO channels can be used.

Product description


Bus coupler modules
PROFIBUS - EPM-S120


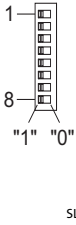


Status displays

Fieldbus status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 SUI0001	1	PWR	Green	On: Bus coupler is supplied with voltage	
	2	SF	Red	On: Station error, station structure does not comply with configuration.	
	3	DE	Green	On: "Data Exchange" state Blinking: Bus coupler waiting for parameters	
	4	IF	Red	On: Internal error is pending	
	5				
	6				
	7				
	8	-	-		Not assigned
	9				
	10				


Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 SUI0001	1	PWR IO	Green	On: I/O supply okay	
	2	PF IO	Red	On: Fuse for I/O supply is defective	
	3	PWR	Green	On: Electronic supply okay	
	4	PF	Red	On: Fuse for electronic supply defective	
	5				
	6				
	7				
	8	-	-		Not assigned
	9				
	10				

Control elements

Via coding switch  the PROFIBUS node address is set. The setting is permanently stored in EEPROM.

Coding switch - PROFIBUS address (addr.) 				
View	Pos.	Valency	Example	
			Switching status	Node address
	1	Not assigned	-	19_{dec}  11_{dec}  address: 19
	2	1	1	
	3	2	1	
	4	4	0	
	5	8	0	
	6	16	1	
	7	32	0	
	8	64	0	


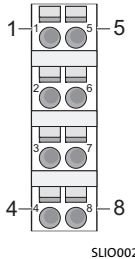
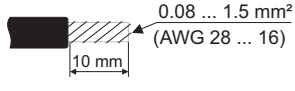
How to proceed:

1. Switch off the voltage supply for the I/O system.
2. Set the node address with the coding switch .
 - Permitted addresses: 1 ... 125
 - Each node address within a fieldbus system must be non-ambiguous.
3. Switch on the voltage supply for the I/O system.

Product description


Bus coupler modules
PROFIBUS - EPM-S120


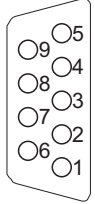
Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	Not assigned	
	2	I/O supply +24 V DC	
	3	I/O supply 0 V	
	4	Electronic supply +24 V DC	
	5	Not assigned	
	6	I/O supply +24 V DC	
	7	I/O supply 0 V	
	8	Electronic supply 0 V	



Note!

- ▶ Terminals 2 and 6 as well as 3 and 7 are bridged internally. Please note that the **max. permissible bridge current is 5 A**.
- ▶ Both the I/O supply and the electronic supply are protected against overload internally by a fuse. When the fuses have been tripped, the main supply of the bus coupler (EPM-S700) must be replaced ( 776).

Profibus, 9-pole Sub-D socket 			
View	Pin	Assignment	Explanation
	1	-	Not assigned
	2	-	Not assigned
	3	RxD/TxD-P	Data line B (received / transmitted data plus)
	4	RTS	Request To Send (received / transmitted data, no differential signal)
	5	M5V2	Data ground (ground at 5 V)
	6	P5V2	DC 5 V / 30 mA (bus termination)
	7	-	Not assigned
	8	RxD/TxD-N	Data line A (received / transmitted data minus)
	9	-	Not assigned



Stop!

Housing breakage in the case of a too high tightening torque of the securing screws

If the connector securing screws are tightened too firmly, the housing may break.

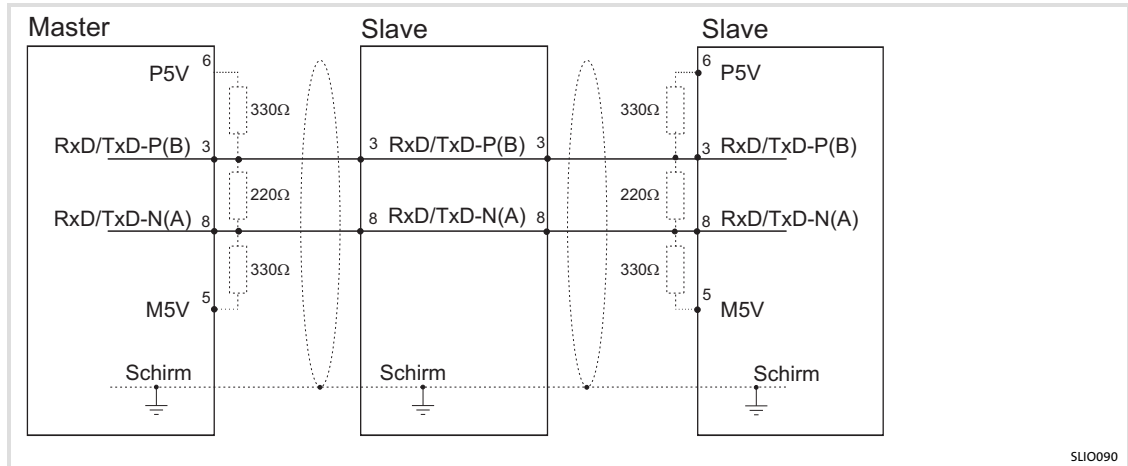
Possible consequences:

- ▶ The plug connection is no longer secured against tension.
- ▶ Enclosure IP20 of the module which is warranted can no longer be guaranteed.

Protective measures:

- ▶ Tighten securing screws without using force (max. 40 Nm).

Wiring



Note!

The PROFIBUS cable must be terminated with its surge impedance.



More information on the PROFIBUS can be found in the chapter "PROFIBUS communication" (410).

Technical data

EPM-S120: Rated data**Electrical data**

Supply voltage

Nominal value	DC 24 V
Permissible range	DC 20.4 ... 28.8 V

Current consumption

Nominal value	0.95 A
In idle state	0.09 A

Starting current

	3.9 A
--	-------

I²t

	0.14 A ² s
--	-----------------------

Current output, max.

At the backplane bus	3 A
Load supply	7 A (if no UL conformity is required: max. 10 A)

Polarity reversal protection

	Yes
--	-----

Power loss

	3 W
--	-----

Status, alarm, diagnostics

Status display	Yes
Alarms	Yes, parameterisable
Process alarm	Yes, parameterisable
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes, parameterisable
Diagnostic information can be read out	Possible
Supply voltage display	Green LED
Group error display	Red LED
Channel error display	None

System limits

Mounting racks, max.	1
Modules per mounting rack	64

EPM-S120: Rated data

communication

Fieldbus	PROFIBUS-DP in accordance with EN 50170
Physics	RS485 insulated
Connection	9-pole Sub-D socket
Topology	Linear bus with bus termination at both ends
Electrical isolation	Yes
Station	
Number, max.	125
Address	1 ... 125
Transmission speed	9.6 kbps ... 12 Mbps
Process data for PROFIBUS-DP-V0	
Input data, max.	244 bytes
Output data, max.	244 bytes
Process data for PROFIBUS-DP-V1	
Input data, max.	240 bytes
Output data, max.	240 bytes
Parameter data, max. length *	224 bytes
the amount required by an I/O module with ...	
digital inputs or outputs (EPM-S200 ... EPM-S305)	0 bytes
2 analog inputs (EPM-S400/-S402)	6 bytes
4 analog inputs (EPM-S401/-S403)	8 bytes
2 analog outputs (EPM-S500/-S502)	8 bytes
4 analog outputs (EPM-S501/-S503)	10 bytes
4 analog inputs res. (EPM-S404)	34 bytes
2 analog inputs TE (EPM-S405)	22 bytes
1 counter 32 bits, 24 V DC (EPM-S600)	21 bytes
2 counters 32 bits, 24 V DC (EPM-S601)	42 bytes
1 counter 32 bits, 5 V DC (EPM-S602)	22 bytes
2 counters 32 bits, 24 V DC (EPM-S603)	8 bytes
SSI (EPM-S604)	33 bytes
2 dig. inputs, time stamp (EPM-S207)	6 bytes
2 dig. outputs, time stamp (EPM-S310)	2 bytes
2 dig. outputs, PWM (EPM-S620)	8 bytes
RS232 interface (EPM-S640)	8/20/60 bytes (parameterisable)

* Calculation example: 5 x EPM-S400 and 5 x EPM-S501 → (5 x 6 bytes) + (5 x 10 bytes) = 80 bytes; i.e. a reserve of 144 bytes

3.5.3 EtherCAT - EPM-S130**Note!**

In conjunction with the EPM-S130 bus coupler module (EtherCAT), only I/O compound modules EPM-Sxxx from hardware version 1B on are supported.

The bus coupler module represents the interface between the process level (I/O level) and the higher-level fieldbus. The control signals on the process level are transmitted by the I/O compound modules via the internal backplane bus.

Features

- ▶ EtherCAT bus coupler module for up to 64 peripheral modules
- ▶ Ethernet-based fieldbus system with high real-time capability
- ▶ Online project planning using Mater system
- ▶ Extensive diagnostic functions
- ▶ Integrated power supply unit for the internal voltage supply and the voltage supply of the connected I/O compound modules
 - Power supply unit supplied via an external DC voltage source
- ▶ Connected to fieldbus via RJ45 socket 100BaseTX, 10BaseT
- ▶ LEDs for status display
- ▶ "Distributed Clock" and "Station Alias" are not supported

Overview

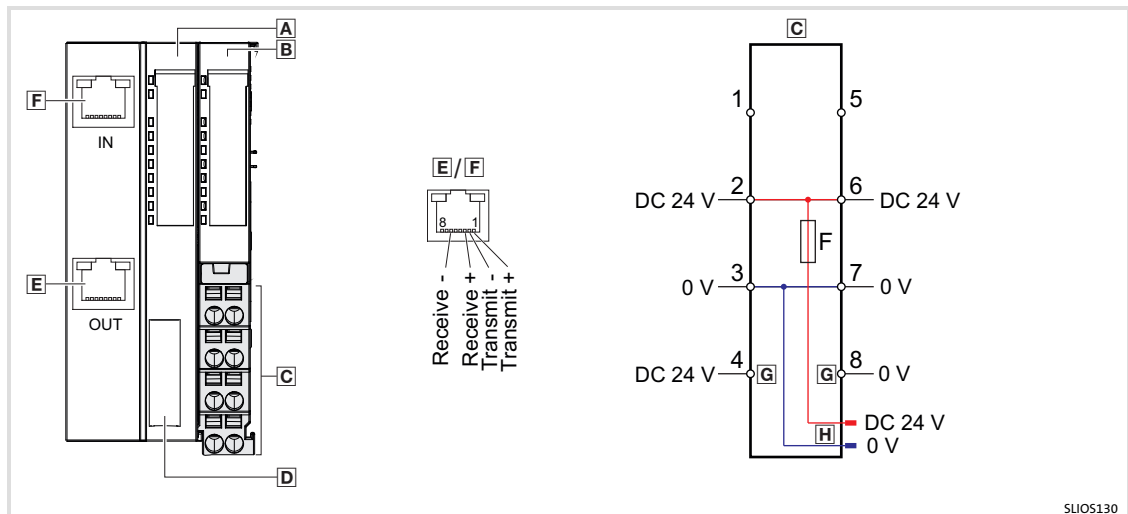


Fig. 3-11 Elements and circuit diagram of voltage supply

- A** Displays for station and fieldbus status
- B** Displays for electronics and I/O supply status
- C** Terminals for the voltage supply
- D** Bus interface
- E** RJ45 socket OUT
- F** RJ45 socket IN
- G** Electronic supply
- H** I/O supply

**Note!**



EtherCAT uses the Ethernet as its transmission medium. Only EtherCAT components may be used in an EtherCAT network. To produce topologies deviating from the line topology, you will need the corresponding EtherCAT components which support such deviations. Hubs cannot be used.

An EtherCAT network always consists of a master and any number of EtherCAT slaves (bus couplers). Each EtherCAT slave has an "IN" and "OUT" RJ45 socket. The EtherCAT cable from the master should be plugged into the socket marked as "IN". The socket marked as "OUT" should be connected to the following node. The "OUT" socket on the last node is free.


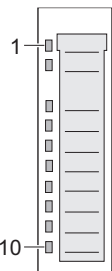
Product description

Bus coupler modules
EtherCAT - EPM-S130

Status displays


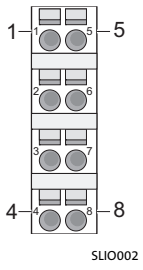
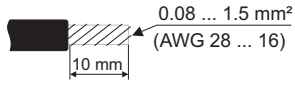
Fieldbus status LEDs 				
View	Pos.	Designation	Colour	Explanation
	1	PWR	Green	On: bus coupler is supplied with voltage
	2	SF	Red	Flashes at 0.5 Hz: EtherCAT timeout (watchdog) Flashes at 1 Hz: status change due to error Flashes at 2 Hz: configuration error
	3	RUN	Green	On: bus coupler in operational status Flashes at 1 Hz: bus coupler in pre-operational status Flashes at 2 Hz: bus coupler in safe operational status Off: bus coupler in initialisation status
	4	L/A1	Green	Off: no communication with preceding EtherCAT node On: preceding EtherCAT node is connected
	5	IF1	Red	On: internal error in communication with preceding EtherCAT node
	6	L/A2	Green	Off: no communication with following EtherCAT node On: following EtherCAT node is connected
	7	IF2	Red	On: internal error in communication with following EtherCAT node
	8			
	9	-	-	Not assigned
	10			

SUI0001

Module status LEDs 				
View	Pos.	Designation	Colour	Explanation
	1	PWR IO	Green	On: I/O supply okay
	2	PF IO	Red	On: Fuse for I/O supply is defective
	3	PWR	Green	On: Electronic supply okay
	4	PF	Red	On: Fuse for electronic supply defective
	5			
	6			
	7			
	8	-	-	Not assigned
	9			
	10			


SUI0001

Terminals

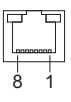
Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	Not assigned	
	2	I/O supply +24 V DC	
	3	I/O supply 0 V	
	4	Electronic supply +24 V DC	
	5	Not assigned	
	6	I/O supply +24 V DC	
	7	I/O supply 0 V	
	8	Electronic supply 0 V	



Note!

- Terminals 2 and 6 as well as 3 and 7 are bridged internally. Please note that the **max. permissible bridge current is 5 A**.
- Both the I/O supply and the electronic supply are protected against overload internally by a fuse. When the fuses have been tripped, the main supply of the bus coupler (EPM-S700) must be replaced ( 776).

EtherCAT, RJ45 socket

View	Pin	Assignment	Explanation
	1	Transmit +	Transmitted data plus
	2	Transmit -	Transmitted data minus
	3	Receive +	Received data plus
	4	-	Not assigned
	5	-	Not assigned
	6	Receive -	Received data minus
	7	-	Not assigned
	8	-	Not assigned
	9	-	Not assigned

Technical data

EPM-S130: rated data

Electrical data

Supply voltage	
Nominal value	DC 24 V
Permissible range	DC 20.4 ... 28.8 V
Current consumption	
Nominal value	0.95 A
In idle state	0.095 A
Starting current	3.9 A
I ² t	0.14 A ² s
Current output, max.	
At the backplane bus	3 A
Load supply	7 A (if no UL conformity is required: max. 10 A)
Polarity reversal protection	No
Power loss	3 W

Product description

Bus coupler modules
EtherCAT - EPM-S130

EPM-S130: rated data

Status, alarm, diagnostics

Status display	Yes
Alarms	Yes, parameterisable
Process alarm	Yes, parameterisable
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes, parameterisable
Diagnostic information can be read out	Possible
Supply voltage display	Green LED
Group error display	Red SF-LED
Channel error display	None

System limits

Mounting racks, max.	1
Modules per mounting rack	64

communication

Fieldbus	EtherCAT
Physics	Ethernet 100 Mbits
Connection	RJ45
Topology	Line topology with branches and spur lines
Electrical isolation	No

Station

Number, max.	65535
Address	None
Transmission speed	100 Mbps
Address range	
Inputs, max.	4 kB
Outputs, max.	4 kB

Process data

Input data, max.	1024 bytes
Output data, max.	1024 bytes

3.5.4 PROFINET - EPM-S140

The bus coupler module represents the interface between the process level (I/O level) and the higher-level fieldbus. The control signals on the process level are transmitted by the I/O compound modules via the internal backplane bus.

Features

- ▶ PROFINET I/O-Device according to IEC 61158
- ▶ Up to 64 I/O compound modules can be connected to a PROFINET bus coupler module
- ▶ Integrated power supply unit for the internal voltage supply and the voltage supply of the connected I/O compound modules
 - Power supply unit supplied via an external DC voltage source
- ▶ Integrated 2-port switch
 - Ethernet connection via 2 RJ45 sockets (P1, P2)
 - Auto negotiation (negotiating the transmission parameters)
 - Auto crossover (transmit and receive path are automatically crossed if required)
- ▶ Setting of the PROFINET address via coding switch
- ▶ LEDs for status display

Overview

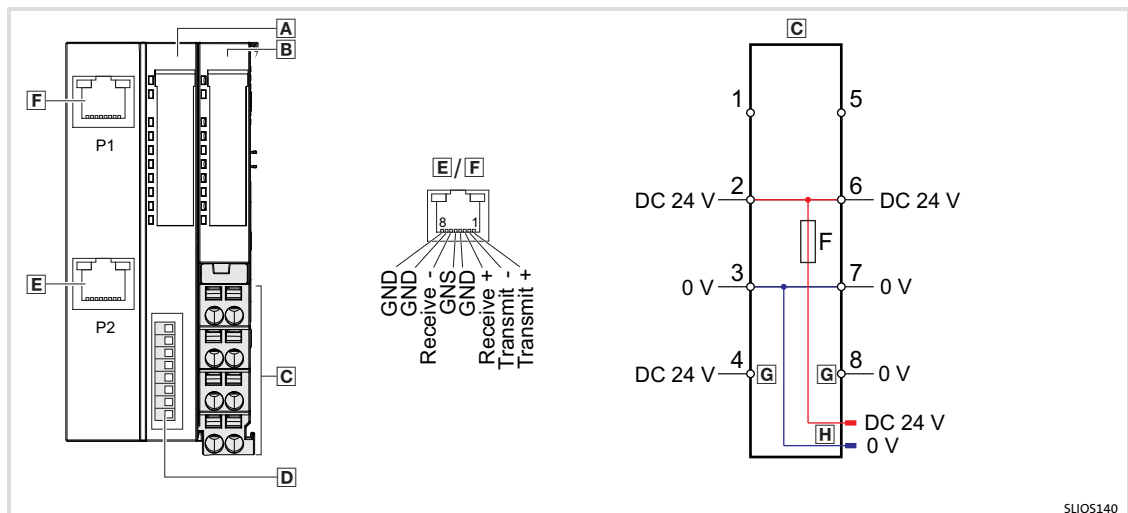

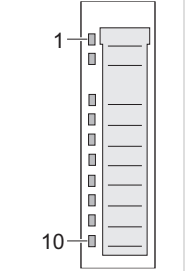


Fig. 3-12 Elements and circuit diagram of voltage supply

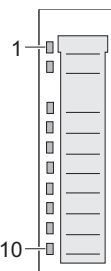
- A** Displays for station and fieldbus status
- B** Displays for electronics and I/O supply status
- C** Terminals for the voltage supply
- D** Coding switch for setting the PROFINET address
- E** RJ45 socket for connection to the fieldbus (P1)
- F** RJ45 socket for connection to the fieldbus (P2)
- G** Electronic supply
- H** I/O supply

Status displays

Fieldbus status LEDs 								
View	Pos.	Designation	Colour	Explanation				
	1	PWR	Green	On: bus coupler is supplied with voltage				
	2	SF	Red	On: System error; error at PROFINET or at backplane bus				
	3	BS	Green	Bus error; error in PROFINET communication				
	4	MT	Yellow	Maintenance: PROFINET maintenance request				
	5	LINK1	Green	Physical connection to PROFINET (P1)				
	6	ACT1	Green	Communication via PROFINET (P1)				
	7	LINK2	Green	Physical connection to PROFINET (P2)				
	8	ACT2	Green	Communication via PROFINET (P2)				
	9	-	-	Not assigned				
	10	-	-	Not assigned				
PWR	SF	BS	MT	LINK1	ACT1	LINK2	ACT2	Status
Green	Red	Green	Yellow	Green	Green	Green	Green	
On	-	-	-	-	-	-	-	The PROFINET bus coupler is supplied with voltage.
On	Off	0.5 Hz	-	[On]	-	[On]	-	It is not possible to establish a connection with the PROFINET I/O controller. A connection to the switch, however, exists (no AR is active) LNK1 or LNK2 is on.
On	Off	On	-	Off	Off	Off	Off	There is no physical connection to the Ethernet. LNK1 and LNK2 are off.
On	-	Off	-	[On]	Pulse	[On]	Pulse	A connection to a PROFINET I/O controller has been established (at least one AR is active) LNK1 or LNK2 is on.
On	On	-	-	-	-	-	-	<ul style="list-style-type: none"> A diagnostic message not yet acknowledged is available. Error at the backplane bus (e.g. module defective, bus disturbed). Error at firmware update (only visible for a short time, afterwards restart).
On	2 Hz	On	-	On	-	On	-	IP address error <ul style="list-style-type: none"> No valid IP address has been assigned. The assigned IP address already exists in the system.
On	-	1 Hz	1 Hz	-	-	-	-	A firmware update is currently being executed. Here, BS and MT are blinking alternately.
On	-	-	-	2 Hz	-	2 Hz	-	Identification via DCP. Depending on the connection, LINK1 or LINK2 is blinking for 3 seconds with 2 Hz.
On	On	-	On	-	-	-	-	Maintenance request (Maintenance demanded/requested) <ul style="list-style-type: none"> After the coupler has been parameterised, no sync frame has been received. Jitter is outside the limits (renewed synchronisation). Switch has rejected 10 frames (network overloaded). Error at the system SLIO bus (version error).

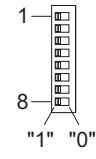
"-": Not relevant; "x Hz": Blinking with x Hz; "[an]": Option; "Puls": Pulsating

Module status LEDs A

View	Pos.	Designation	Colour	Explanation
 <p>1</p> <p>10</p> <p>SLIO001</p>	1	PWR IO	Green	On: I/O supply okay
	2	PF IO	Red	On: Fuse for I/O supply is defective
	3	PWR	Green	On: Electronic supply okay
	4	PF	Red	On: Fuse for electronic supply defective
	5			
	6			
	7			
	8	-	-	Not assigned
	9			
	10			

Control elements

Coding switch PROFINET address B

View	Pos.	Valency	Example	
			Switching status	Node address
 <p>1</p> <p>8</p> <p>"1" "0"</p> <p>SLIO004</p>	1	-	-	No function
	2	1	1	Profinet name: "EPM-S140-xxx" with xxx = decimal value of position 2 ... 8; for example: 19 _{dec} → xxx = 19
	3	2	1	
	4	4	0	
	5	8	0	
	6	16	1	
	7	32	0	
	8	64	0	


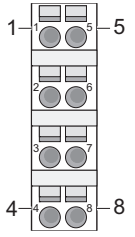
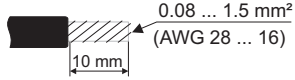
Important switch positions

Pos.	Status	Behaviour at restart
2 ... 8	0	Profinet-compliant (IEC 61158-6-10, IEC 61784-2) <ul style="list-style-type: none"> IP address./subnet mask comes from flash memory. Profinet name comes from flash memory.
2 ... 8	[1 ... 127]	<ul style="list-style-type: none"> IP address./subnet mask comes from flash memory. Profinet name: EPM-S140-xxx (with xxx = decimal value of position 2...8): Profinet name with I/O controller cannot be changed.

Product description


Bus coupler modules
PROFINET - EPM-S140



Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 SUI0002	1	Not assigned	
	2	I/O supply +24 V DC	
	3	I/O supply 0 V	
	4	Electronic supply +24 V DC	
	5	Not assigned	
	6	I/O supply +24 V DC	
	7	I/O supply 0 V	
	8	Electronic supply 0 V	



Note!

- ▶ Terminals 2 and 6 as well as 3 and 7 are bridged internally. Please note that the **max. permissible bridge current is 5 A**.
- ▶ Both the I/O supply and the electronic supply are protected against overload internally by a fuse. When the fuses have been tripped, the main supply of the bus coupler (EPM-S700) must be replaced ( 776).

PROFINET, RJ45 socket 			
View	Pin	Assignment	Explanation
 SUI0065	1	Transmit +	Transmitted data plus
	2	Transmit -	Transmitted data minus
	3	Receive +	Received data plus
	4	GND	Ground
	5	GND	Ground
	6	Receive -	Received data minus
	7	GND	Ground
	8	GND	Ground

Technical data

Rated data EPM-S140	
Electrical data	
Supply voltage	
Nominal value	DC 24 V
Permissible range	DC 20.4 ... 28.8 V
Current consumption	
Nominal value	0.95 A
In idle state	0.095 A
Starting current	3.9 A
I ² t	0.14 A ² s
Current output, max.	
At the backplane bus	3 A
Load supply	7 A (if no UL conformity is required: max. 10 A)
Polarity reversal protection	Yes
Power loss	3 W

Rated data EPM-S140**Status, alarm, diagnostics**

Status display	Yes
Alarms	Yes, parameterisable
Process alarm	Yes, parameterisable
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes, parameterisable
Diagnostic information can be read out	Possible
Supply voltage display	Green LED
Maintenance display	Yellow LED
Group error display	Red LED
Channel error display	None

System limits

Mounting racks, max.	
Modules per mounting rack	64

communication

Fieldbus	PROFINET-IO
Physics	Ethernet 100 Mbits
Connection	2 x RJ45
Electrical isolation	Yes
Transmission speed	100 Mbps

Address range

Inputs, max.	512 bytes
Outputs, max.	512 bytes

3.5.5 DeviceNet - EPM-S150

The bus coupler module represents the interface between the process level (I/O level) and the higher-level fieldbus. The control signals on the process level are transmitted by the I/O compound modules via the internal backplane bus.

Features

- ▶ DeviceNet coupler
- ▶ Up to 64 I/O compound modules can be connected to a DeviceNet bus coupler module
- ▶ Group 2 only Device uses Predefined Connection Set
- ▶ Poll only Device
 - No operating mode BIT STROBE
 - NO operating mode CHANGE OF STATE
 - Profile Generic Device
- ▶ Support of all baud rates: 125, 250 und 500 kbps
- ▶ Max. 255 bytes input/output data
- ▶ Integrated power supply unit for the internal voltage supply and the voltage supply of the connected I/O compound modules
 - Power supply unit supplied via an external DC voltage source
- ▶ Connection to the DeviceNet via "Open Style Connector"
- ▶ Setting of the DeviceNet address and the baud rate via coding switch
- ▶ LEDs for status display

Overview

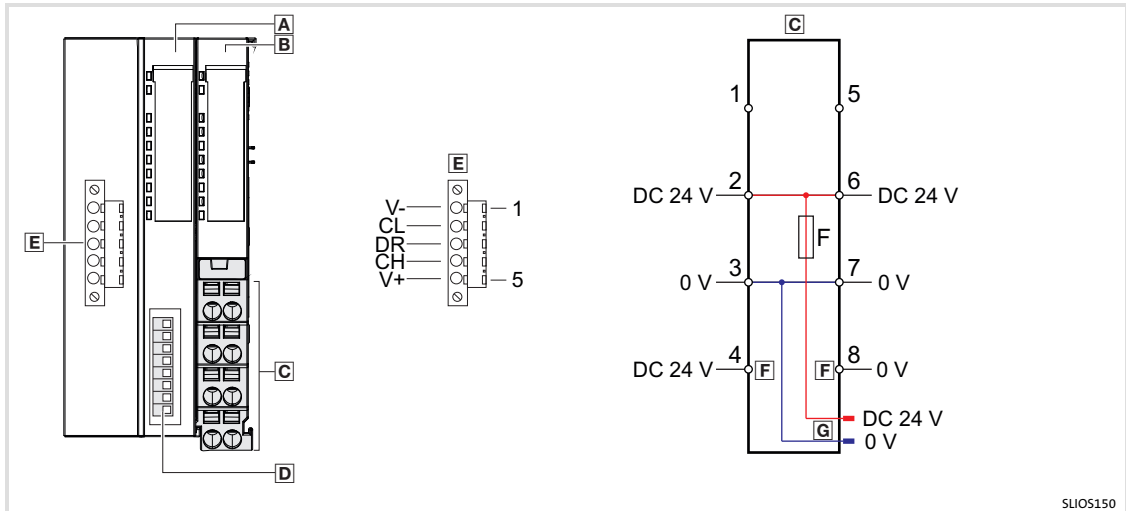


Fig. 3-13 Elements and circuit diagram of voltage supply

- A** Displays for station and fieldbus status
- B** Displays for electronics and I/O supply status
- C** Terminals for the voltage supply
- D** Coding switch for setting the DeviceNet address
- E** Fieldbus connection
- F** Electronic supply
- G** I/O supply

Status displays

Fieldbus status LEDs A					
View	Pos.	Designation	Colour	Explanation	
	1	PW	Green	On: Bus coupler is supplied with voltage	
	2	SF	Red	On: Error at DeviceNet or at backplane bus	
	3	RD	Green	On: Backplane bus okay	
	4	BA	Yellow	On: DeviceNet okay	
	5				
	6				
	7				
	8	-	-	-	Not assigned
	9				
	10				



S1IO001

Product description

Bus coupler modules
DeviceNet - EPM-S150

SF	RD	BA	State
Red	Green	Yellow	
On	Off	Off	Invalid switch position at the address switch
Off	On	Off	Baud rate has been accepted successfully
1 Hz	1 Hz	1 Hz	Firmware update is running
On	On	On	Firmware update completed successfully
2 Hz	On	On	Firmware update completed with errors <ul style="list-style-type: none"> • EDS file defective • Transmission error • Flash error
-	-	Off	Fieldbus is offline <ul style="list-style-type: none"> • No DC 24V at the fieldbus plug • No further node at the fieldbus
-	-	1 Hz	Fieldbus is ready <ul style="list-style-type: none"> • No connection established
-	-	On	Fieldbus connected
On	-	Off	Fieldbus error <ul style="list-style-type: none"> • Fieldbus address already exists • Communication error at the fieldbus
On	-	1 Hz	Inactivity monitoring - Connection has been terminated due to inactivity
-	1 Hz	-	System SLIO Bus ready, outputs inactive
-	On	-	System SLIO bus active
On	2 Hz	-	Access error to system SLIO bus
2 Hz	2 Hz	-	Configuration error of system SLIO bus <ul style="list-style-type: none"> • The numbers of plugged and projected modules are different. • The module type of at least one plugged module differs from the parameterised module type.
1 Hz	2 Hz	2 Hz	Device error / internal error Please contact the Lenze service!

"-": Not relevant; "x Hz": Blinking with x Hz

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
	1	PWR IO	Green	On: I/O supply okay	
	2	PF IO	Red	On: Fuse for I/O supply is defective	
	3	PWR	Green	On: Electronic supply okay	
	4	PF	Red	On: Fuse for electronic supply defective	
	5				Not assigned
	6				
	7				
	8	-	-	-	
	9				
	10				

Control elements

The coding switch serves for the following settings:

- ▶ Baud rate
- ▶ DeviceNet address
- ▶ Update mode for firmware update



Note!

Changes at the coding switch get only effective after PowerON or automatic reset. Changes during operation will not be recognised!

Setting the baud rate:

Every station on the DeviceNet communicates with the same transfer rate. Proceed as follows to define the baud rate:

1. Switch off the voltage supply.
2. Set the switch 1 to "1" (= baud rate).
3. Set the baud rate via switches 2 ... 4 according to the following table.

Baud rate

View	Pos.	Description	Example	
			Switching status	Result
 <small>SLIO004</small>	1	Configuration	1	1: Setting of baud rate/update mode
	2	Baud rate 125 kbps	0	Baud rate: 250 kbps
	3	Baud rate 250 kbps	1	
	4	Baud rate 500 kbps	0	
	5	Not assigned	-	
	6	Not assigned	-	
	7	Update mode	0	
	8	Not assigned	-	

4. Switch on the voltage supply.
 The set baud rate is stored in the EEPROM.


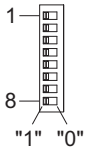


Setting the DeviceNet address:

All stations on the bus must be uniquely identified by means of a DeviceNet address which is between 0 and 63. Proceed as follows to define the baud rate:

1. Switch off the voltage supply.
2. Set the switch 1 to "0" (address).
3. Set the address via switches 2 ... 4 according to the following table.

Product description

Bus coupler modules
DeviceNet - EPM-S150

DeviceNet address 				
View	Pos.	Valency	Example	
			Switching status	Result
 <small>SLIO004</small>	1	Configuration	0	0: Address setting
	2	1	1	$1 + 2 + 16 = 19$   address: 19
	3	2	1	
	4	4	0	
	5	8	0	
	6	16	1	
	7	32	0	
	8	Not assigned	-	

4. Switch on the voltage supply.


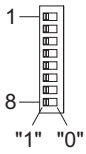
The set node address is saved in the EEPROM. In case of a wrong or already available address the SF-LED (red) is lit after PowerON.

Setting the update mode:

Set the update mode to transmit a firmware to the bus coupler.

How to proceed:


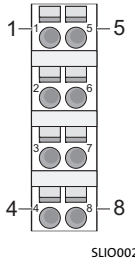
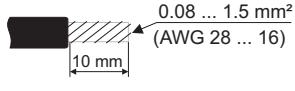
1. Switch off the voltage supply.
2. Set the switch 1 to "1" (= baud rate/update mode).
3. Set the update mode via switches 2 ... 4 according to the following table.

Baud rate 				
View	Pos.	Description	Example	
			Switching status	Result
 <small>SLIO004</small>	1	Configuration	1	1: Setting of baud rate/update mode
	2	Baud rate 125 kbps	0	Update mode active
	3	Baud rate 250 kbps	0	
	4	Baud rate 500 kbps	0	
	5	Not assigned	-	
	6	Not assigned	-	
	7	Update mode	1	
	8	Not assigned	-	

4. Switch on the voltage supply.


The firmware is copied to the bus coupler.

Terminals


Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	Not assigned	
	2	I/O supply +24 V DC	
	3	I/O supply 0 V	
	4	Electronic supply +24 V DC	
	5	Not assigned	
	6	I/O supply +24 V DC	
	7	I/O supply 0 V	
	8	Electronic supply 0 V	



Note!

- ▶ Terminals 2 and 6 as well as 3 and 7 are bridged internally. Please note that the **max. permissible bridge current is 5 A**.
- ▶ Both the I/O supply and the electronic supply are protected against overload internally by a fuse. When the fuses have been tripped, the main supply of the bus coupler (EPM-S700) must be replaced ( 776).

DeviceNet, 5-pole socket

View	Pin	Assignment	Explanation
	1	V-	GND, voltage supply
	2	CL	CAN Low
	3	DR	DRAIN / shield
	4	CH	CAN High
	9	V+	DC 24 V, voltage supply



Stop!

Housing breakage in the case of a too high tightening torque of the securing screws

If the connector securing screws are tightened too firmly, the housing may break.

Possible consequences:

- ▶ The plug connection is no longer secured against tension.
- ▶ Enclosure IP20 of the module which is warranted can no longer be guaranteed.

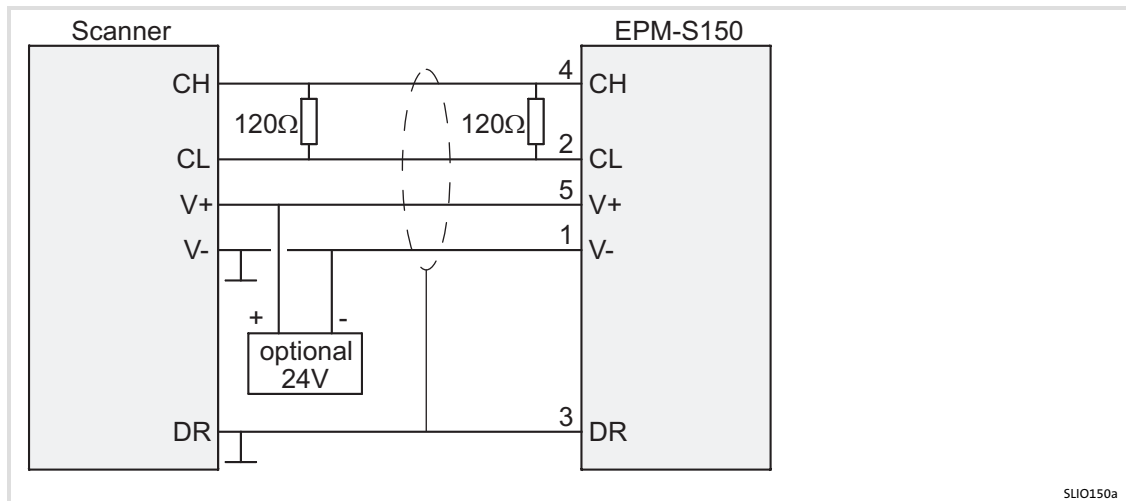
Protective measures:

- ▶ Tighten securing screws without using force (max. 40 Nm).

Product description

Bus coupler modules
DeviceNet - EPM-S150

Wiring



More information on the DeviceNet can be found in the chapter "DeviceNet communication" (610).

Technical data

EPM-S150: Rated data

Electrical data

Supply voltage

Nominal value	DC 24 V
Permissible range	DC 20.4 ... 28.8 V

Current consumption

Nominal value	0.95 A
In idle state	0.09 A

Starting current

Starting current	3.9 A
------------------	-------

I²t

I ² t	0.14 A ² s
------------------	-----------------------

Current output, max.

At the backplane bus	3 A
Load supply	7 A (if no UL conformity is required: max. 10 A)

Polarity reversal protection

Polarity reversal protection	Yes
------------------------------	-----

Power loss

Power loss	3 W
------------	-----

Status, alarm, diagnostics

Status display	Yes
Alarms	None
Process alarm	None
Diagnostic alarm	None
Diagnostic function	None
Diagnostic information can be read out	Possible
Supply voltage display	Green LED
Group error display	Red SF-LED
Channel error display	None

EPM-S150: Rated data

System limits

Mounting racks, max.	1
Modules per mounting rack	64

communication

Fieldbus	DeviceNet
Physics	CAN
Connection	5-pole open-style connector
Topology	Line with bus termination at both ends
Electrical isolation	Yes

Station

Number, max.	64
Address	0 ... 63
Transmission speed	125 ... 500 kbps

Process data

Address range input data, max.	256 bytes
Address range output data, max.	256 bytes

3.5.6 Modbus TCP- EPM-S160

The bus coupler module represents the interface between the process level (I/O level) and the higher-level fieldbus. The control signals on the process level are transmitted by the I/O compound modules via the internal backplane bus.

Features

- ▶ Ethernet slave with Modbus TCP protocol
- ▶ Up to 64 I/O compound modules connectable to a bus coupler module
- ▶ Integrated power supply unit for the internal voltage supply and the voltage supply of the connected I/O compound modules
 - Power supply unit supplied via an external DC voltage source
- ▶ I/O access of up to 8 stations
- ▶ Online parameter setting via integrated web server
- ▶ RJ45 socket 100BaseTX, 10BaseTX
- ▶ Automatic polarity and speed detection (auto negotiation)
- ▶ Automatic detection of parallel or crossed cables (auto crossover)
- ▶ LEDs for status display

Overview

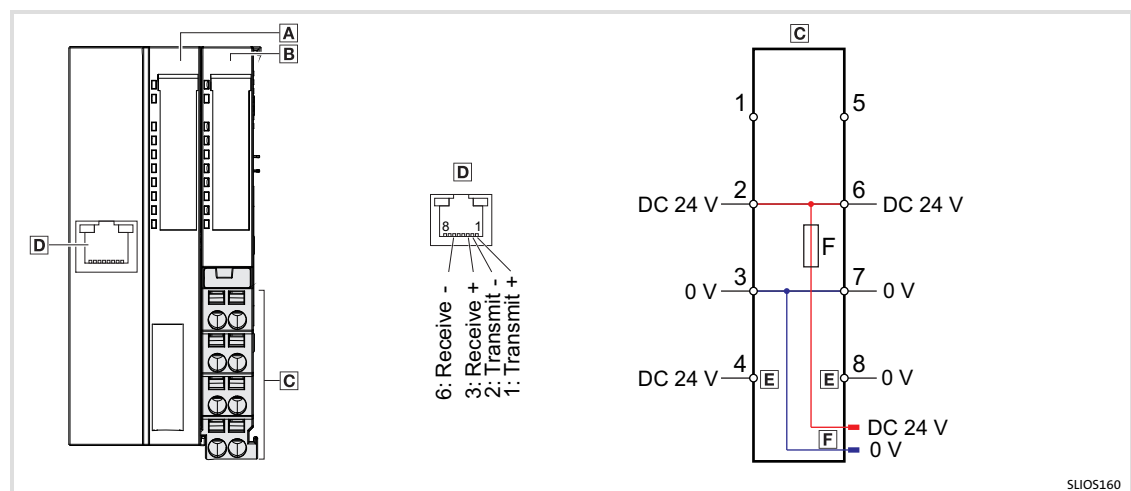




Fig. 3-14 Elements and circuit diagram of voltage supply

- A** Displays for station and fieldbus status
- B** Displays for electronics and I/O supply status
- C** Terminals for the voltage supply
- D** Fieldbus connection
- E** Electronic supply
- F** I/O supply

Status displays

Fieldbus status LEDs 				
View	Pos.	Designation	Colour	Explanation
	1	PWR	Green	On: Bus coupler is supplied with voltage
	2	SF	Red	On: System error; error at Ethernet or at backplane bus
	3	RUN	Green	Bus coupler status
	4	MT	Yellow	Bus coupler is localised
	5	L/A	Green	On: Ethernet is connected physically Blinking: Bus activity
	6	SPD	Green	On: Speed 100 Mbps Off: Speed 10 Mbps
	7			
	8			
	9			
	10			

SLIO001



PWR	SF	RUN	MT	L/A	SPD	State
Green	Red	Green	Yellow	Green	Green	
On	-	-	-	-	-	Bus coupler is supplied with voltage.
On	Off	On	-	On	-	Bus coupler is communicating via Ethernet; no errors are pending.
On	-	-	-	Off	Off	There is no physical connection to the Ethernet.
On	On	Off	-	-	-	Error of Ethernet communication <ul style="list-style-type: none"> ● IP address error ● Error in DHCP setting ● Defective module connected
On	B2	Off	-	-	-	Backplane bus error; module is not supported
On	B3	Off	-	-	-	Backplane bus error; parameterisation error
On	-	-	B1	-	-	Bus coupler is localised; identification. Blinking lasts for 10 s.

"-":not relevant

"B1": Blinking code with a period of 1 s "off-off-on-on"

"B2": Blinking code with a period of 1 s "on-on-on-on-off"

"B3": Blinking code with a period of 1 s "off-off-off-off-on"


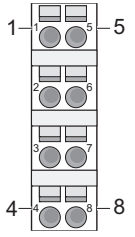
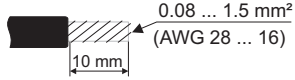
Module status LEDs 				
View	Pos.	Designation	Colour	Explanation
	1	PWR IO	Green	On: I/O supply okay
	2	PF IO	Red	On: Fuse for I/O supply is defective
	3	PWR	Green	On: Electronic supply okay
	4	PF	Red	On: Fuse for electronic supply defective
	5			
	6			
	7			
	8			
	9			
	10			

SLIO001

Product description


Bus coupler modules
Modbus TCP- EPM-S160



Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 SUI0002	1	Not assigned	
	2	I/O supply +24 V DC	
	3	I/O supply 0 V	
	4	Electronic supply +24 V DC	
	5	Not assigned	
	6	I/O supply +24 V DC	
	7	I/O supply 0 V	
	8	Electronic supply 0 V	



Note!

- ▶ Terminals 2 and 6 as well as 3 and 7 are bridged internally. Please note that the **max. permissible bridge current is 5 A**.
- ▶ Both the I/O supply and the electronic supply are protected against overload internally by a fuse. When the fuses have been tripped, the main supply of the bus coupler (EPM-S700) must be replaced ( 776).

Modbus TCP, 5-pole socket 			
View	Pin	Assignment	Explanation
 SUI0065	1	Transmit +	Transmitted data plus
	2	Transmit -	Transmitted data minus
	3	Receive +	Received data plus
	4	-	Not assigned
	5	-	Not assigned
	6	Receive -	Received data minus
	7	-	Not assigned
	8		

Technical data

EPM-S160: Rated data	
Electrical data	
Supply voltage	
Nominal value	DC 24 V
Permissible range	DC 20.4 ... 28.8 V
Current consumption	
Nominal value	0.95 A
In idle state	0.095 A
Starting current	3.9 A
I ² t	0.14 A ² s
Current output, max.	
At the backplane bus	3 A
Load supply	7 A (if no UL conformity is required: max. 10 A)
Polarity reversal protection	Yes
Power loss	3 W

EPM-S160: Rated data**Status, alarm, diagnostics**

Status display	Yes
Alarms	Yes, parameterisable
Process alarm	Yes, parameterisable
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes, parameterisable
Diagnostic information can be read out	Possible
Supply voltage display	Green LED
Maintenance display	Yellow LED
Group error display	Red LED
Channel error display	None

System limits

Mounting racks, max.	
Modules per mounting rack	64

communication

Fieldbus	Modbus / TCP/IP
Physics	Ethernet 10/100 Mbps
Connection	RJ45
Electrical isolation	Yes
Transmission speed	10 ... 100 Mbps

Address range

Inputs, max.	1 kB
Outputs, max.	1 kB

3

Product description

I/O compound modules - digital I/O

Two digital inputs - EPM-S200 and EPM-S204 (NPN)

3.6 I/O compound modules - digital I/O

3.6.1 Two digital inputs - EPM-S200 and EPM-S204 (NPN)

This module detects up to two binary control signals from the process level and transmits them to the higher-level bus system.

Features

- ▶ 2 digital inputs (EPM-S204: N-switching)
- ▶ Suitable for switches and proximity switches
- ▶ LEDs display the switching states of the digital inputs

Overview

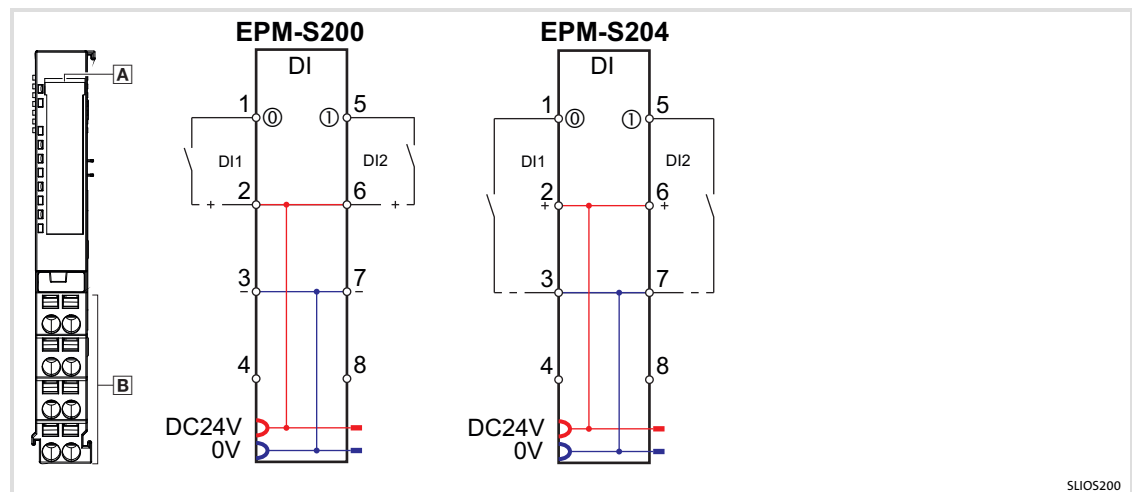





Fig. 3-15 Elements and circuit diagram


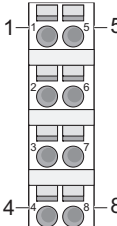
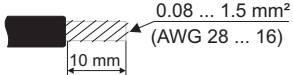
- ▣ A Displays for module status
- ▣ B Terminals
- 1 ... 8 Connection number
- ① ... ⑧ Bit number in bit presentation

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 <p style="text-align: center;">SUI0001</p>	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	DI1	Green	On: Digital input triggered	
	4	DI2			
	5				
	6				
	7				
	8	-	-		Not assigned
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <p style="text-align: center;">SUI0002</p>	1	Digital input DI1	
	2	24 V DC	
	3	GND	
	4	Not assigned	
	5	Digital input DI2	
	6	24 V DC	
	7	GND	
	8	Not assigned	

Product description

I/O compound modules - digital I/O

Two digital inputs - EPM-S200 and EPM-S204 (NPN)

Technical data

EPM-S200 / EPM-S204 (NPN): Rated data	
Module identifier	EPM-S200: 1 _{dec} ; EPM-S204: 2 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	EPM-S200: 55 mA; EPM-S204: 60 mA
Power loss	0.5 W
Digital inputs	
Number of inputs	2
Cable length	
shielded	1000 m
unshielded	600 m
Input voltage	
Nominal value	DC 24 (DC 20.4 ... 28.8 V)
for signal "0"	EPM-S200: DC 0 ... 5 V; EPM-S204: DC 15 ... 28.8 V
for signal "1"	EPM-S200: DC 15 ... 28.8 V; EPM-S204: DC 0 ... 5 V
Input current	
for signal "1"	3 mA
2-wire BERO	
Connection possible	Yes
Max. permissible closed-circuit current	0.5 mA
Input delay	
from "0" to "1"	3 ms
from "1" to "0"	3 ms
Number of inputs which can be used simultaneously	
horizontal structure	2
vertical structure	2
Input characteristic	EPM-S200: IEC 61131, type 1; EPM-S204: none
Input data size	8 bits (with EPM-S110: 2 bits)
Status, alarm, diagnostics	
Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	None
Module status	Green LED
Module error display	Red LED
Channel error display	None
Electrical isolation	
Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

3.6.2 Four digital inputs - EPM-S201 and EPM-S205 (NPN)

This module detects up to four binary control signals from the process level and transmits them to the higher-level bus system.

Features

- ▶ 4 digital inputs (EPM-S205: N-switching)
- ▶ Suitable for switches and proximity switches
- ▶ LEDs display the switching states of the digital inputs

Overview

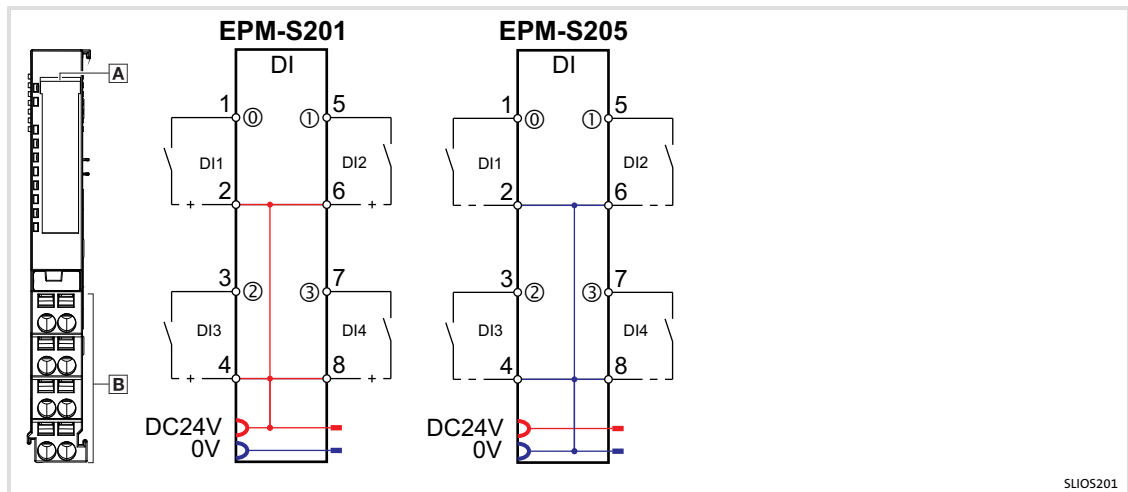



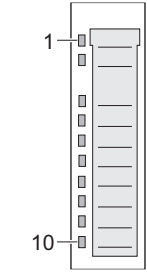
Fig. 3-16 Elements and circuit diagram
 A Displays for module status
 B Terminals
 1 ... 8 Connection number
 ① ... ⑦ Bit number in bit presentation

Product description


I/O compound modules - digital I/O

Four digital inputs - EPM-S201 and EPM-S205 (NPN)


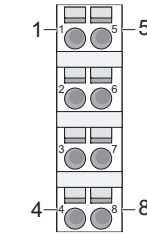
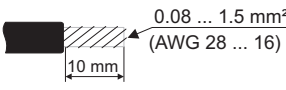
Status displays

Module status LEDs 				
View	Pos.	Designation	Colour	Explanation
 SUI0001	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error (see table below)
	3	DI1	Green	On: Digital input triggered
	4	DI2		
	5	DI3		
	6	DI4		
	7			
	8	-	-	Not assigned
	9			
	10			

Messages of the status LEDs RUN and MF

RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 SUI0002	1	Digital input DI1	
	2	24 V DC	
	3	Digital input DI3	
	4	24 V DC	
	5	Digital input DI2	
	6	24 V DC	
	7	Digital input DI4	
	8	24 V DC	

Technical data

EPM-S201 / EPM-S205 (NPN): rated data	
Module identifier	EPM-S201: 3 _{dec} ; EPM-S205: 4 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	EPM-S201: 55 mA; EPM-S205: 65 mA;
Power loss	0.6 W
Digital inputs	
Number of inputs	4
Cable length	
shielded	1000 m
unshielded	600 m
Input voltage	
Nominal value	DC 24 (DC 20.4 ... 28.8 V)
for signal "0"	EPM-S201: DC 0 ... 5 V; EPM-S205: DC 15 ... 28.8 V
for signal "1"	EPM-S201: DC 15 ... 28.8 V; EPM-S205: DC 0 ... 5 V
Input current	
for signal "1"	3 mA
2-wire BERO	
Connection possible	Yes
Max. permissible closed-circuit current	0.5 mA
Input delay	
from "0" to "1"	3 ms
from "1" to "0"	3 ms
Number of inputs which can be used simultaneously	
horizontal structure	4
vertical structure	4
Input characteristic	EPM-S201: IEC 61131, type 1; EPM-S205: none
Input data size	8 bits (with EPM-S110: 4 bits)
Status, alarm, diagnostics	
Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	None
Module status	Green LED
Module error display	Red LED
Channel error display	None
Electrical isolation	
Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

Product description

I/O compound modules - digital I/O

Eight digital inputs - EPM-S202 and EPM-S206 (NPN)

3.6.3 Eight digital inputs - EPM-S202 and EPM-S206 (NPN)

This module detects up to eight binary control signals from the process level and transmits them to the higher-level bus system.

Features

- ▶ 8 digital inputs (EPM-S206: N-switching)
- ▶ Suitable for switches and proximity switches
- ▶ LEDs display the switching states of the digital inputs

Overview

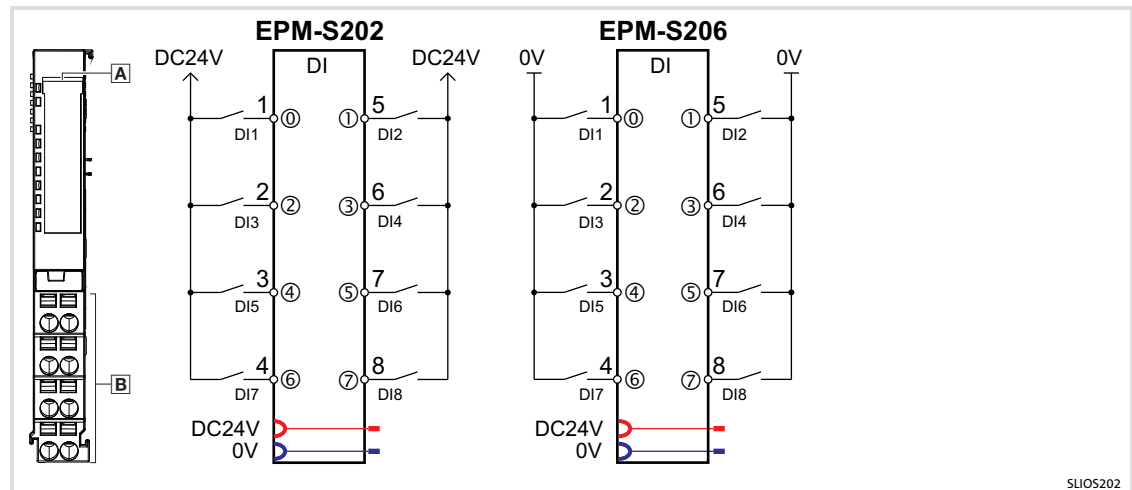





Fig. 3-17 Elements and circuit diagram


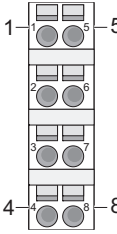
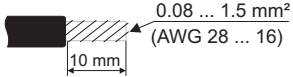
- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number
- ① ... ⑧ Bit number in bit presentation

Status displays

Module status LEDs 				
View	Pos.	Designation	Colour	Explanation
 <p style="text-align: center;">SUI0001</p>	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error (see table below)
	3	DI1	Green	On: Digital input triggered
	4	DI2		
	5	DI3		
	6	DI4		
	7	DI5		
	8	DI6		
	9	DI7		
	10	DI8		

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <p style="text-align: center;">SUI0002</p>	1	Digital input DI1	
	2	Digital input DI3	
	3	Digital input DI5	
	4	Digital input DI7	
	5	Digital input DI2	
	6	Digital input DI4	
	7	Digital input DI6	
	8	Digital input DI8	

Product description

I/O compound modules - digital I/O

Eight digital inputs - EPM-S202 and EPM-S206 (NPN)

Technical data

EPM-S202 / EPM-S206 (NPN): rated data	
Module identifier	EPM-S202: 5 _{dec} ; EPM-S206: 7 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	EPM-S202: 60 mA; EPM-S206: 65 mA;
Power loss	0.9 W
Digital inputs	
Number of inputs	8
Cable length	
shielded	1000 m
unshielded	600 m
Input voltage	
Nominal value	DC 24 (DC 20.4 ... 28.8 V)
for signal "0"	EPM-S202: DC 0 ... 5 V; EPM-S206: DC 15 ... 28.8 V
for signal "1"	EPM-S202: DC 15 ... 28.8 V; EPM-S206: DC 0 ... 5 V
Input current	
for signal "1"	3 mA
2-wire BERO	
Connection possible	Yes
Max. permissible closed-circuit current	0.5 mA
Input delay	
from "0" to "1"	3 ms
from "1" to "0"	3 ms
Number of inputs which can be used simultaneously	
horizontal structure	8
vertical structure	8
Input characteristic	EPM-S202: IEC 61131, type 1; EPM-S206: none
Input data size	8 bits
Status, alarm, diagnostics	
Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	None
Module status	Green LED
Module error display	Red LED
Channel error display	None
Electrical isolation	
Between channels and the backplane bus	Yes
Insulation checked with	DC 500 V

3.6.4 Four digital inputs (three-wire conductor connection) - EPM-S203

This module detects up to four binary control signals from the process level and transmits them to the higher-level bus system.

Features

- ▶ 4 digital inputs in three-wire conductor technique
- ▶ Suitable for switches and proximity switches
- ▶ LEDs display the switching states of the digital inputs

Overview

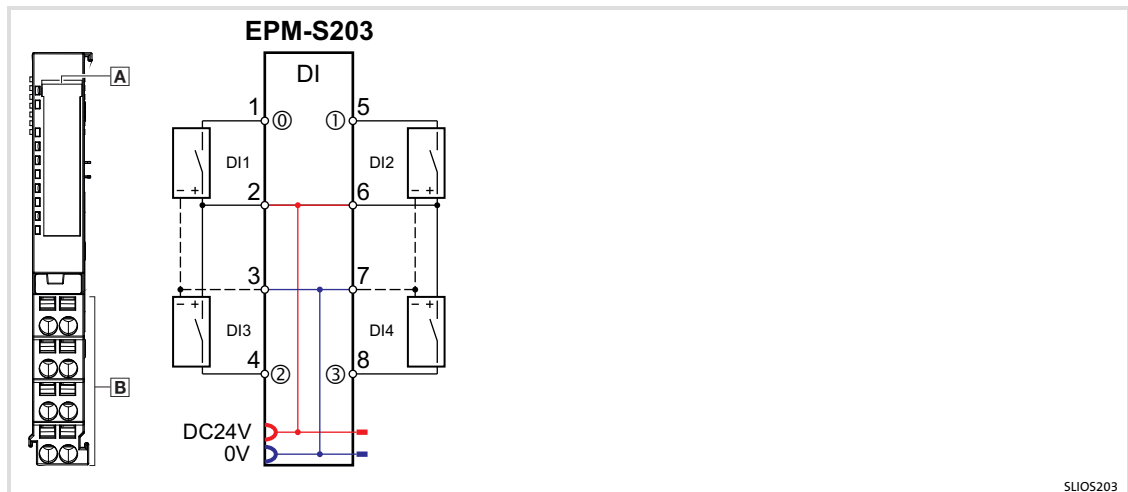


Fig. 3-18 Elements and circuit diagram



- Ⓐ Displays for module status
- Ⓑ Terminals
- 1 ... 8 Connection number
- ⓪ ... ⑦ Bit number in bit presentation

Product description


I/O compound modules - digital I/O

Four digital inputs (three-wire conductor connection) - EPM-S203


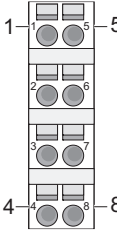
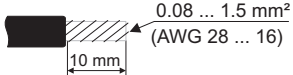
Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 SUI0001	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	DI1	Green	On: Digital input triggered	
	4	DI2			
	5	DI3			
	6	DI4			
	7				
	8	-	-		Not assigned
	9				
	10				

Messages of the status LEDs RUN and MF

RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 SUI0002	1	Digital input DI1	
	2	24 V DC	
	3	GND	
	4	Digital input DI3	
	5	Digital input DI2	
	6	24 V DC	
	7	GND	
	8	Digital input DI4	

Technical data

EPM-S203: Rated data	
Module identifier	8 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	55 mA
Power loss	0.6 W
Digital inputs	
Number of inputs	4
Cable length	
shielded	1000 m
unshielded	600 m
Input voltage	
Nominal value	DC 24 (DC 20.4 ... 28.8 V)
for signal "0"	DC 0 ... 5 V
for signal "1"	DC 15 ... 28.8 V
Input current	
for signal "1"	3 mA
2-wire BERO	
Connection possible	Yes
Max. permissible closed-circuit current	0.5 mA
Input delay	
from "0" to "1"	3 ms
from "1" to "0"	3 ms
Number of inputs which can be used simultaneously	
horizontal structure	4
vertical structure	4
Input characteristic	IEC 61131
Input data size	8 bits (with EPM-S110: 4 bits)
Status, alarm, diagnostics	
Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	None
Module status	Green LED
Module error display	Red LED
Channel error display	None
Electrical isolation	
Between channels and the backplane bus	Yes
Insulation checked with	DC 500 V

3.6.5 2 digital inputs with time stamp function - EPM-S207

This module detects up to two binary control signals from the process level and transmits them to the higher-level bus system.

If the time stamp function is parameterised, in the case of a specified edge (rising or falling), the current time of the system-internal μ s-ticker is stored as a time stamp entry in the process image along with the status of the inputs and a consecutive number.

Depending on the configuration, up to 15 time successive stamp entries can be recorded in the process image.

Features

- ▶ 2 digital inputs
- ▶ up to 15 time stamp entries can be recorded
- ▶ Suitable for switches and proximity switches
- ▶ LEDs display the switching states of the digital inputs (even when electronic supply is switched off)

Overview

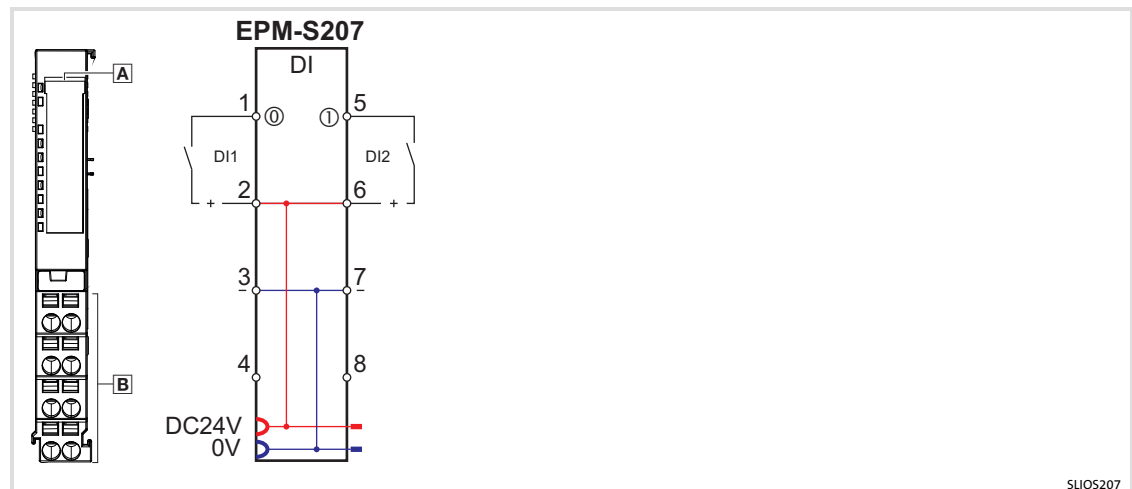

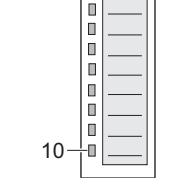



Fig. 3-19 Elements and circuit diagram


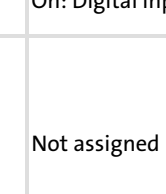

- Ⓐ Displays for module status
- Ⓑ Terminals
- 1 ... 8 Connection number
- ① ... ② Bit number in bit presentation

Status displays

Module status LEDs 				
View	Pos.	Designation	Colour	Explanation
 <p style="text-align: center;">SUI0001</p>	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error (see table below)
	3	DI1	Green	On: Digital input triggered
	4	DI2		
	5			
	6			
	7			
	8	-	-	Not assigned
	9			
	10			

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <p style="text-align: center;">SUI0002</p>	1	Digital input DI1	
	2	24 V DC	
	3	GND	
	4	Not assigned	
	5	Digital input DI2	
	6	24 V DC	
	7	GND	
	8	Not assigned	

Product description

I/O compound modules - digital I/O

2 digital inputs with time stamp function - EPM-S207

Technical data

EPM-S207: rated data	
Module identifier	3841 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	85 mA
Power loss	0.9 W
Digital inputs	
Number of inputs	2
Cable length	
shielded	1000 m
unshielded	600 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	10 mA (without load)
Input voltage	
Nominal value	DC 20.4 ... 28.8 V
for signal "0"	DC 0 ... 5 V
for signal "1"	DC 15 ... 28.8 V
Input current	
for signal "1"	3 mA
2-wire BERO	
Connection possible	Yes
Max. permissible closed-circuit current	0.5 mA
Input delay	
from "0" to "1"	Parameterisable
from "1" to "0"	Parameterisable
Number of inputs which can be used simultaneously	
horizontal structure	2
vertical structure	2
Input characteristic	IEC 61131, type 1
Input data size	60 bytes
Status, alarm, diagnostics	
Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	None
Electrical isolation	
zwischen Kanälen in Gruppen zu	2
Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

Functional principle taking the example of the system bus CAN

Long cycle times or fieldbus cycle times which fluctuate depending on bus load inevitably result in unacceptable inaccuracy when precise switching times are needed. The time stamp function can be used to calculate switching times for outputs accurate to 1 μ s.

An I/O compound module with time stamp function is fitted with an internal ticker. The tickers within a station are all synchronised via the backplane bus to ensure the same time base.

- ▶ The ticker has a resolution of 1 μ s. After power-on, it counts from 0 ... 65535 μ s and then goes back to 0.
- ▶ If using I/O compound modules with the time stamp function, when the signal undergoes a edge change, the ticker value is saved to the process image along with the channel status.
- ▶ Up to 15 DI switching orders (sub-index entries) can be transmitted with the time stamp function.

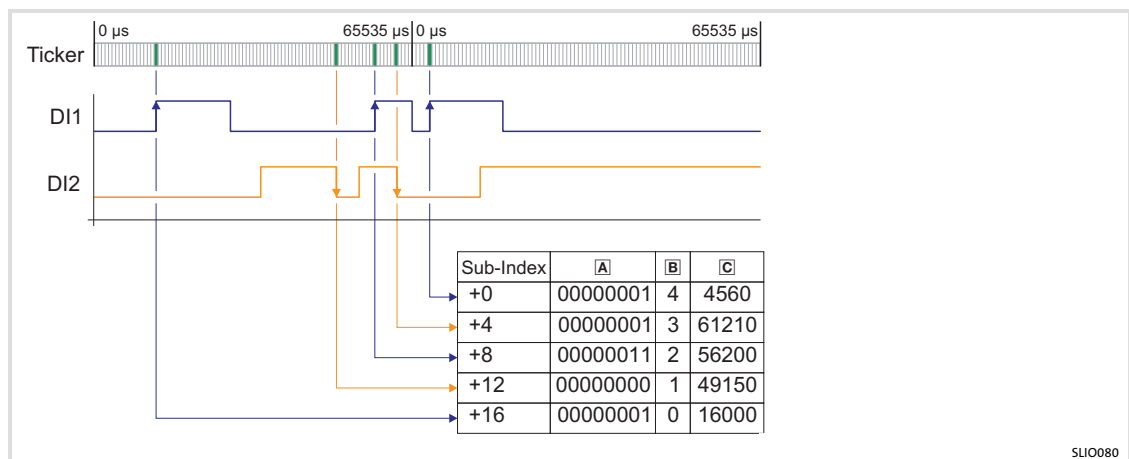


Fig. 3-20 Saving the time stamp entries

- DI1 Digital input 1
The time stamp entry for the edge evaluation is generated with a rising edge.
- DI2 Digital input 2
The time stamp entry for the edge evaluation is generated with a falling edge.
- A** Channel status
- B** Running number (RN)
A consecutive number from 0 ... 63 which always starts afresh. The "running number" serves to determine the chronological sequence of the entries. It must be incremented with each time stamp entry. During the first run, the "running number" must start with 1.
- C** Ticker value

Example of the operating principle of the time stamp function



Note!

The time stamp modules EPM-S207 and EPM-S310 can only be operated usefully on bus coupler modules in which a μ s ticker is integrated.

The example shows in which order the time stamp entries are stored and processed.

A module is projected here which has 20 bytes assigned for 5 time stamp entries in the output area. The outputs are supposed to adopt the following states at the indicated ticker times:

Running number (RN)	Ticker value [μ s]	State DO 0 (bit 7)	State DO 1 (bit 6)	Release DO 0 (bit 5)	Release DO 1 (bit 4)
0x01	6000	0	0	1	1
0x02	12506	1	0	1	1
0x03	34518	1	1	1	1
0x04	49526	0	0	1	1
0x05	54529	0	1	1	1
0x06	3500	1	1	1	1
0x07	12443	1	0	1	1
0x08	20185	0	0	1	1
0x09	30140	1	0	1	1
0x0A	37330	0	0	1	1
0x0B	40000	0	0	0	0

The values of the table result in the following time diagram:

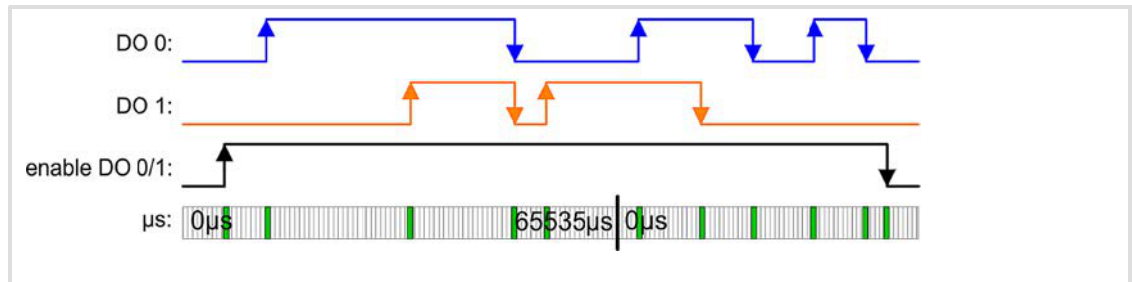


Fig. 3-21 Time diagram: example of time stamp function

Writing the time stamp entries 1 ... 5

After writing the first 5 time stamp entries (RN = 0x01 ... 0x05) in the process output data, they are directly transferred to the FIFO memory of the module.

The respective status bytes are listed below the input data.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b00110000	0x01	6000	RN_LAST: 0x45 RN_NEXT: 0xC1 STS_FIFO: 0x00 NUM_ETS: 0x05
2	0b10110000	0x02	12506	
3	0b11110000	0x03	34518	
4	0b00110000	0x04	49526	
5	0b01110000	0x05	54529	
6	0b00000000	0x00	0	
...	0b00000000	0x00	0	
31	0b00000000	0x00	0	

The values of the table result in the following time diagram:

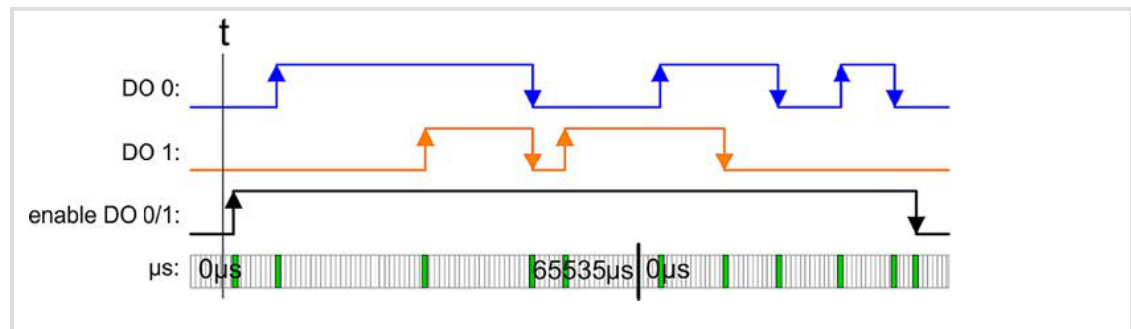


Fig. 3-22 Time diagram: writing the time stamp entries 1 ... 5

Product description

I/O compound modules - digital I/O

2 digital inputs with time stamp function - EPM-S207

Executing the time stamp function for the first entry

In order to be able to trigger the outputs accordingly, they must previously be enabled. In this example you enable the two outputs with the first "running number" (RN). The first time stamp entry (RN = 0x01) is executed and deleted from the FIFO memory.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b10110000	0x02	12506	RN_LAST: 0x45
2	0b11110000	0x03	34518	RN_NEXT: 0xC2
3	0b00110000	0x04	49526	STS_FIFO: 0x00/0x02
4	0b01110000	0x05	54529	NUM_ETS: 0x04
5	0b00000000	0x00	0	
...	0b00000000	0x00	0	
31	0b00000000	0x00	0	

The values of the table result in the following time diagram:

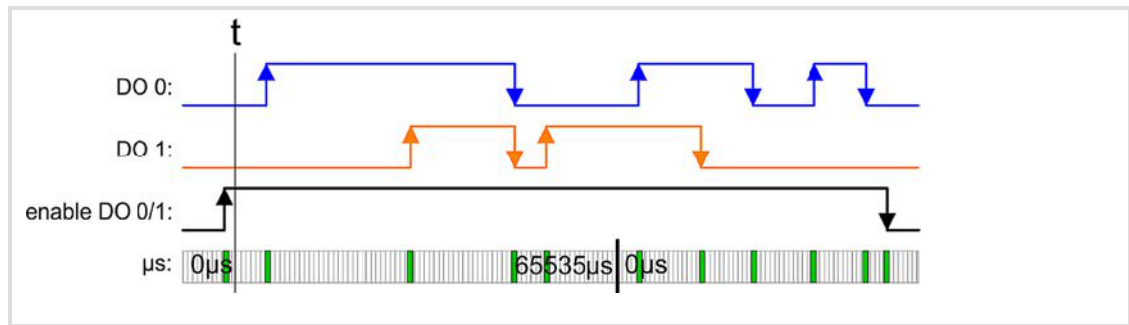


Fig. 3-23 Time diagram: executing the time stamp function for the first entry

Executing the time stamp function for the entries 2 ... 4

The states of the time stamp entries 2 ... 4 (RN = 0x02 ... 0x04) are output consecutively and deleted from the FIFO memory.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b01110000	0x05	54529	RN_LAST: 0x45
2	0b00000000	0x05	0	RN_NEXT: 0xC5
...	0b00000000	0x00	0	STS_FIFO: 0x00/0x02
31	0b00000000	0x00	0	NUM_ETS: 0x01

The values of the table result in the following time diagram:

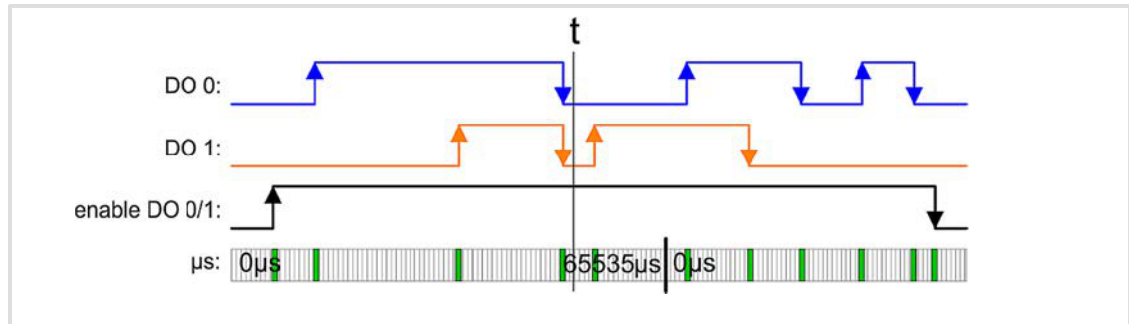


Fig. 3-24 Time diagram: executing the time stamp function for the entries 2 ... 4

Writing the time stamp entries 6 ... 10

After writing the time stamp entries 6 ... 10 (RN = 0x06 ... 0x0A) in the process output data, they are directly transferred to the FIFO memory of the module.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b01110000	0x05	54529	RN_LAST: 0x4A
2	0b11110000	0x06	3500	RN_NEXT: 0xC5
3	0b10110000	0x07	12443	STS_FIFO: 0x00/0x02
4	0b00110000	0x08	20185	NUM_ETS: 0x06
5	0b10110000	0x09	30140	
6	0b00110000	0x0A	37330	
7	0b00000000	0x00	0	
...	0b00000000	0x00	0	
31	0b00000000	0x00	0	

The values of the table result in the following time diagram:

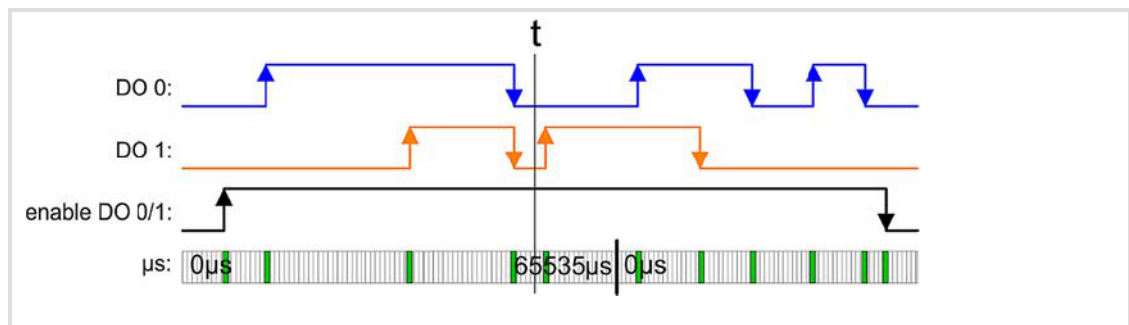


Fig. 3-25 Time diagram: writing the time stamp entries 6 ... 10

Executing the time stamp entries 6 ... 8

The states of the time stamp entries 6 ... 8 (RN = 0x06 ... 0x08) are output consecutively and deleted from the FIFO memory.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b10110000	0x09	30140	RN_LAST: 0x4A
2	0b00110000	0x0A	37330	RN_NEXT: 0xC5
3	0b00000000	0x00	0	STS_FIFO: 0x00/0x02
...	0b00000000	0x00	0	NUM_ETS: 0x02
31	0b00000000	0x00	0	

The values of the table result in the following time diagram:

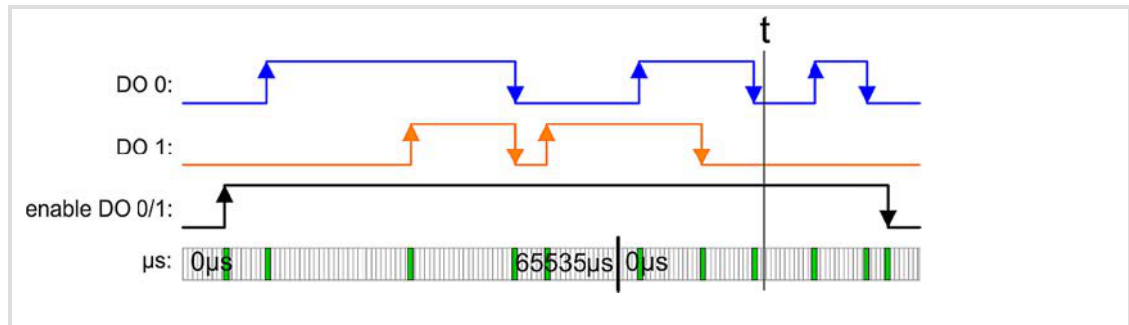


Fig. 3-26 Time diagram: writing the time stamp entries 6 ... 10

Writing the last time stamp entry

As less than five time stamp entries are written, bit 6 of the "running number" (RN) must always be set at the last time stamp entry: RN = 0x0B becomes 0x4B.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b10110000	0x09	30140	RN_LAST: 0x4B
2	0b00110000	0x0A	37330	RN_NEXT: 0xC9
3	0b00000000	0x0B	40000	STS_FIFO: 0x80/0x82
4	0b00000000	0x00	0	NUM_ETS: 0x03
...	0b00000000	0x00	0	
31	0b00000000	0x00	0	

The values of the table result in the following time diagram:

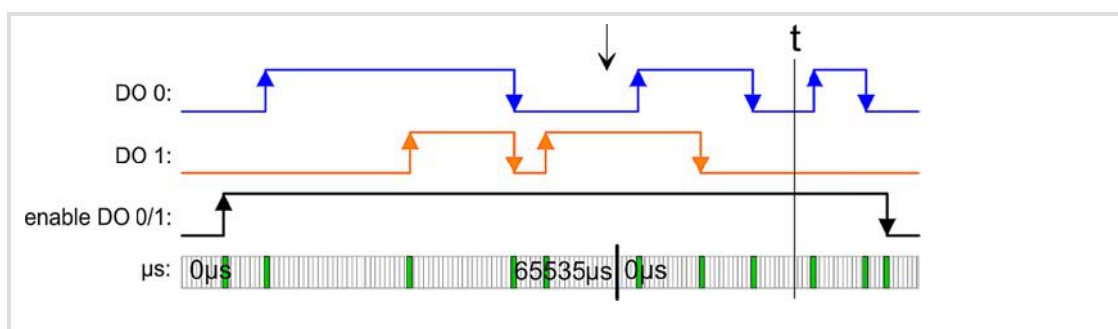


Fig. 3-27 Time diagram: writing the last time stamp entry

Executing the time stamp function for the last entries

The states of the last time stamp entries (RN = 0x09 ... 0x4B) are output consecutively and deleted from the FIFO memory.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b00000000	0x00	0	RN_LAST: 0x4B
2	0b00000000	0x00	0	RN_NEXT: 0xCC
...	0b00000000	0x00	0	STS_FIFO: 0x80/0x82
31	0b00000000	0x00	0	NUM_ETS: 0x00

The values of the table result in the following time diagram:

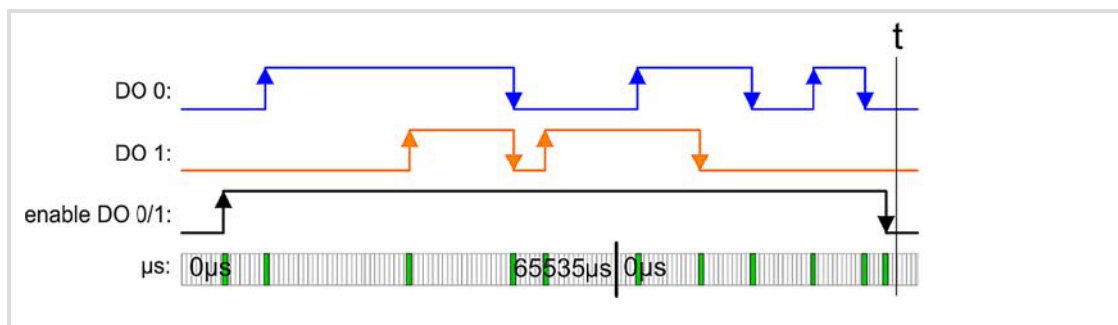


Fig. 3-28 Time diagram: executing the time stamp function for the last entries

Product description

I/O compound modules - digital I/O

Two digital outputs 0.5 A - EPM-S300 and EPM-S303 (NPN)

3.6.6 Two digital outputs 0.5 A - EPM-S300 and EPM-S303 (NPN)

This module detects up to two binary control signals from the higher-level bus system and transmits them to the process level.

Features

- ▶ 2 digital outputs (EPM-S303 N-switching)
- ▶ LEDs display the switching states of the digital outputs

Overview

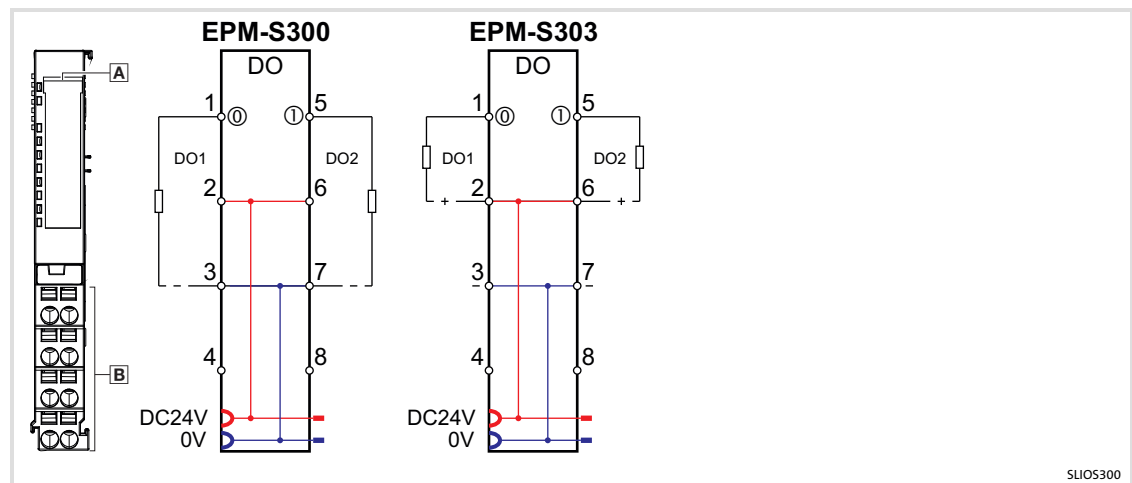

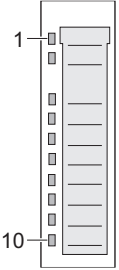



Fig. 3-29 Elements and circuit diagram


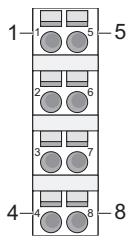
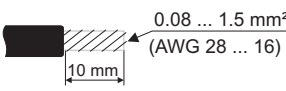
- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number
- ① ... ⑦ Bit number in bit presentation

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 SLIO001	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error and error at overload, short circuit, overtemperature (see table below)	
	3	DO1	Green	On: Digital output triggered	
	4	DO2			
	5	-	-	-	Not assigned
	6				
	7				
	8				
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 SLIO002	1	Digital output DO1	
	2	24 V DC	
	3	GND	
	4	Not assigned	
	5	Digital output DO2	
	6	24 V DC	
	7	GND	
	8	Not assigned	

Product description

I/O compound modules - digital I/O

Two digital outputs 0.5 A - EPM-S300 and EPM-S303 (NPN)

Technical data

EPM-S300 / EPM-S303 (NPN): rated data	
Module identifier	EPM-S300: 257 _{dec} ; EPM-S303: 259 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	EPM-S300: 55 mA; EPM-S303: 60 mA
Power loss	0.4 W
Digital outputs	
Number of outputs	2
Cable length	
shielded	1000 m
unshielded	600 m
Load voltage	
Nominal value	DC 24 (DC 20.4 ... 28.8 V)
Current consumption from load voltage L+	EPM-S300: 5 mA (without load); EPM-S303: 2.5 mA (without load)
Total current	
for each group, horizontal structure, 40°C	1 A
for each group, horizontal structure, 60°C	1 A
for each group, vertical structure	1 A
Output voltage	
for "1" signal, max. current	Only for EPM-S303: M (+250 mV)
for "1" signal, min. current	Only for EPM-S303: M (+0 V)
Output current	
for "1" signal, nominal value	0.5 A
Output delay	
from "0" to "1"	30 µs
from "1" to "0"	EPM-S300: 175 µs; EPM-S303: 100 µs
Lamp load	10 W
Parallel switching of outputs	
for redundant control	Not possible
for power increase	Not possible
Control of a digital input	Possible
Switching frequencies	
for ohmic loads	Max. 1000 Hz
for inductive loads	Max. 0.5 Hz
for lamp loads	Max. 10 Hz
Limitation (internal) of the inductive breaking voltage	EPM-S300: L+ (-52 V); EPM-S303: +45 V
Short circuit protection of the output	Electronically
Operating threshold of the protection system	EPM-S300: 1 A; EPM-S303: 1.7 A
Output data size	8 bits (with EPM-S110: 2 bits)

EPM-S300 / EPM-S303 (NPN): rated data

Status, alarm, diagnostics

Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	None
Module status	Green LED
Module error display	Red LED
Channel error display	None

Electrical isolation

Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

Product description

I/O compound modules - digital I/O

Four digital outputs 0.5 A - EPM-S301 and EPM-S304 (NPN)

3.6.7 Four digital outputs 0.5 A - EPM-S301 and EPM-S304 (NPN)

This module detects up to four binary control signals from the higher-level bus system and transmits them to the process level.

Features

- ▶ 4 digital outputs (EPM-S304 N-switching)
- ▶ LEDs display the switching states of the digital outputs

Overview

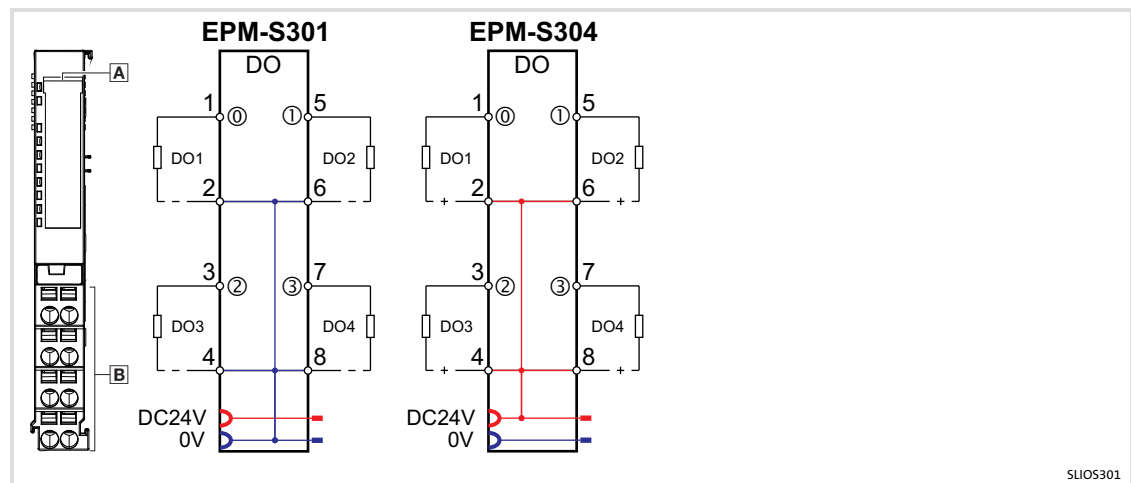





Fig. 3-30 Elements and circuit diagram


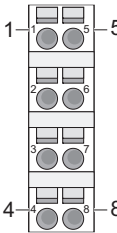
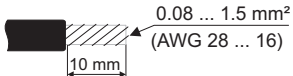
- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number
- ① ... ⑦ Bit number in bit presentation

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 <p>S1IO001</p>	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Digital output triggered	
	3	DO1	Green		
	4	DO2			
	5	DO3			
	6	DO4	-	-	Not assigned
	7				
	8				
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <p>S1IO002</p>	1	Digital output DO1	
	2	EPM-S301: GND EPM-S304: 24 V DC	
	3	Digital output DO3	
	4	EPM-S301: GND EPM-S304: 24 V DC	
	5	Digital output DO2	
	6	EPM-S301: GND EPM-S304: 24 V DC	
	7	Digital output DO4	
	8	EPM-S301: GND EPM-S304: 24 V DC	

Product description

I/O compound modules - digital I/O

Four digital outputs 0.5 A - EPM-S301 and EPM-S304 (NPN)

Technical data

EPM-S301 / EPM-S304 (NPN): rated data	
Module identifier	EPM-S301: 260 _{dec} ; EPM-S304: 261 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	EPM-S301: 55 mA; EPM-S304: 65 mA
Power loss	0.5 W
Digital outputs	
Number of outputs	4
Cable length	
shielded	1000 m
unshielded	600 m
Load voltage	
Nominal value	DC 24 (DC 20.4 ... 28.8 V)
Current consumption from load voltage L+	EPM-S301: 10 mA (without load); EPM-S304: 5 mA (without load)
Total current	
for each group, horizontal structure, 40°C	2 A
for each group, horizontal structure, 60°C	2 A
for each group, vertical structure	2 A
Output voltage	
for "1" signal, max. current	Only for EPM-S304: M (+250 mV)
for "1" signal, min. current	Only for EPM-S304: M (+0 V)
Output current	
for "1" signal, nominal value	0.5 A
Output delay	
from "0" to "1"	30 µs
from "1" to "0"	EPM-S301: 175 µs; EPM-S304: 100 µs
Lamp load	10 W
Parallel switching of outputs	
for redundant control	Not possible
for power increase	Not possible
Control of a digital input	Possible
Switching frequencies	
for ohmic loads	Max. 1000 Hz
for inductive loads	Max. 0.5 Hz
for lamp loads	Max. 10 Hz
Limitation (internal) of the inductive breaking voltage	EPM-S301: L+ (-52 V); EPM-S304: +45 V
Short circuit protection of the output	Electronically
Operating threshold of the protection system	EPM-S301: 1 A; EPM-S304: 1.7 A
Output data size	8 bits (with EPM-S110: 4 bits)

EPM-S301 / EPM-S304 (NPN): rated data

Status, alarm, diagnostics

Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	None
Module status	Green LED
Module error display	Red SF-LED
Channel error display	None

Electrical isolation

Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

Product description

I/O compound modules - digital I/O

Eight digital outputs 0.5 A - EPM-S302 and EPM-S305 (NPN)

3.6.8 Eight digital outputs 0.5 A - EPM-S302 and EPM-S305 (NPN)

This module detects up to eight binary control signals from the higher-level bus system and transmits them to the process level.

Features

- ▶ 8 digital outputs (EPM-S305 N-switching)
- ▶ LEDs show the switching states of the digital outputs

Overview

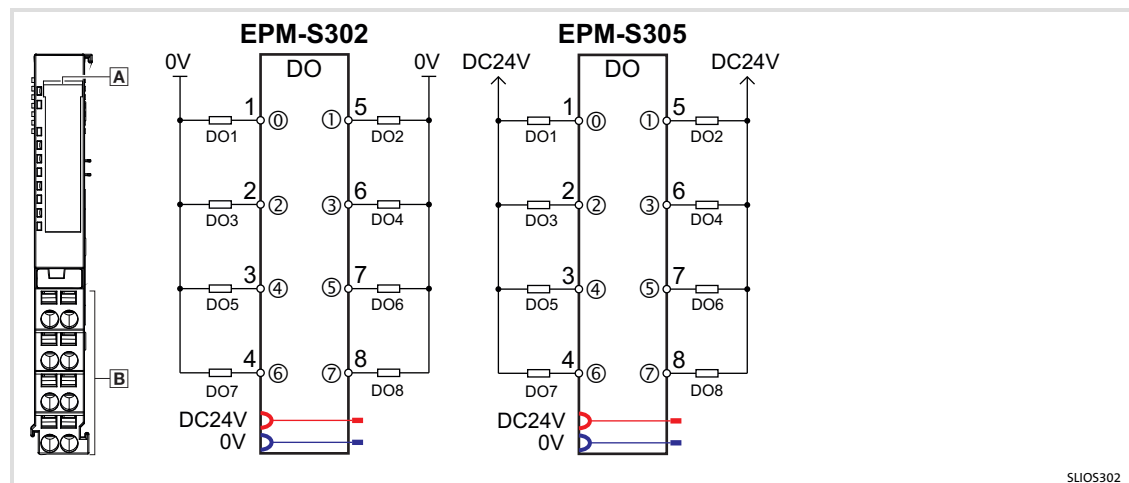

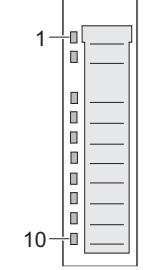



Fig. 3-31 Elements and circuit diagram


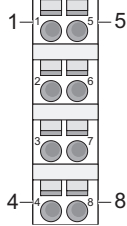
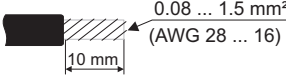
- Ⓐ Displays for module status
- Ⓑ Terminals
- 1 ... 8 Connection number
- ⓪ ... ⓷ Bit number in bit presentation

Status displays

Module status LEDs 				
View	Pos.	Designation	Colour	Explanation
 <p style="text-align: center;">SUIO001</p>	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error and error at overload, short circuit, overtemperature (see table below)
	3	DO1	Green	On: Digital output triggered
	4	DO2		
	5	DO3		
	6	DO4		
	7	DO5		
	8	DO6		
	9	DO7		
	10	DO8		

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <p style="text-align: center;">SUIO002</p>	1	Digital output DO1	
	2	Digital output DO3	
	3	Digital output DO5	
	4	Digital output DO7	
	5	Digital output DO2	
	6	Digital output DO4	
	7	Digital output DO6	
	8	Digital output DO8	

Product description

I/O compound modules - digital I/O

Eight digital outputs 0.5 A - EPM-S302 and EPM-S305 (NPN)

Technical data

EPM-S302 / EPM-S305 (NPN): rated data	
Module identifier	EPM-S302: 262 _{dec} ; EPM-S305: 263 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	EPM-S302: 65 mA; EPM-S305: 70 mA
Power loss	EPM-S302: 0.7 W; EPM-S305: 0.6 W
Digital outputs	
Number of outputs	8
Cable length	
shielded	1000 m
unshielded	600 m
Load voltage	
Nominal value	DC 24 (DC 20.4 ... 28.8 V)
Current consumption from load voltage L+	EPM-S302: 15 mA (without load); EPM-S305: 10 mA (without load)
Total current	
for each group, horizontal structure, 40°C	EPM-S302: 4 A; EPM-S305: 2.5 A
for each group, horizontal structure, 60°C	EPM-S302: 4 A; EPM-S305: 2.5 A
for each group, vertical structure	EPM-S302: 4 A; EPM-S305: 2.5 A
Output voltage	
for "1" signal, max. current	Only for EPM-S305: M (+250 mV)
for "1" signal, min. current	Only for EPM-S305: M (+0 V)
Output current	
for "1" signal, nominal value	0.5 A
Output delay	
from "0" to "1"	30 µs
from "1" to "0"	EPM-S302: 175 µs; EPM-S305: 100 µs
Lamp load	10 W
Parallel switching of outputs	
for redundant control	Not possible
for power increase	Not possible
Control of a digital input	Possible
Switching frequencies	
for ohmic loads	Max. 1000 Hz
for inductive loads	Max. 0.5 Hz
for lamp loads	Max. 10 Hz
Limitation (internal) of the inductive breaking voltage	EPM-S302: L+ (-52 V); EPM-S305: +45 V
Short circuit protection of the output	Electronically
Operating threshold of the protection system	EPM-S302: 1 A; EPM-S305: 1.7 A
Output data size	8 bits

EPM-S302 / EPM-S305 (NPN): rated data

Status, alarm, diagnostics

Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	None
Module status	Green LED
Module error display	Red LED
Channel error display	None

Electrical isolation

Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

3.6.9 Two digital outputs 2 A - EPM-S306

This module detects up to two binary control signals from the higher-level bus system and transmits them to the process level.

Features

- ▶ 2 digital outputs which each can be loaded with 2 A
- ▶ LEDs show the switching states of the digital outputs
- ▶ Overload protection (outputs switch off at overload)

Overview

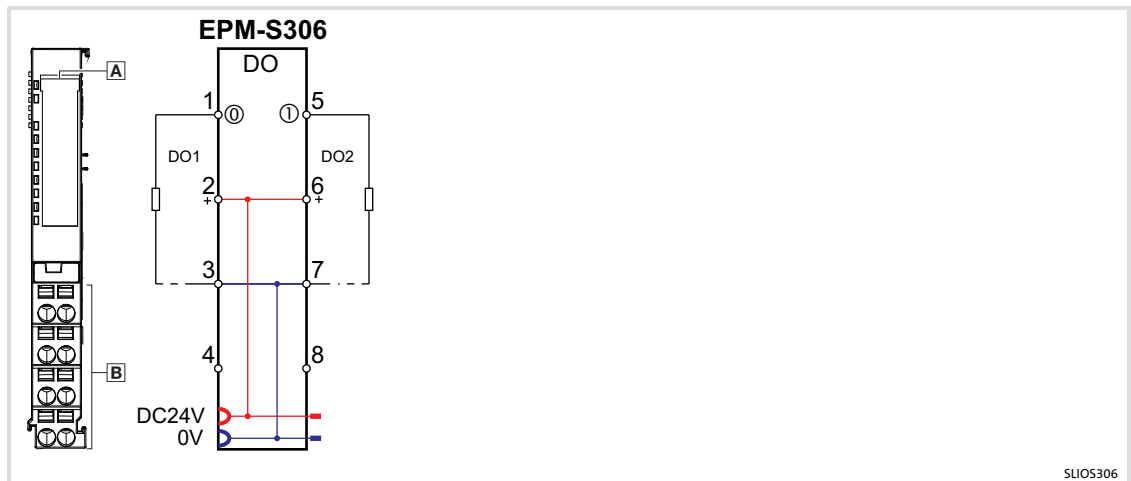

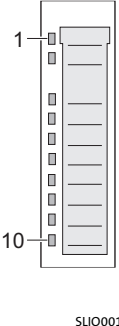



Fig. 3-32 Elements and circuit diagram


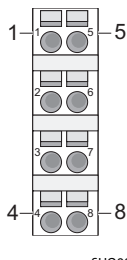
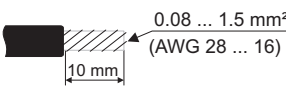
- Ⓐ Displays for module status
- Ⓑ Terminals
- 1 ... 8 Connection number
- ① ... ⑦ Bit number in bit presentation

Status displays

Module status LEDs 				
View	Pos.	Designation	Colour	Explanation
	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error and error at overload, short circuit, overtemperature (see table below)
	3	DO1	Green	On: Digital output triggered
	4	DO2		
	5			Not assigned
	6			
	7			
	8	-	-	
	9			
		10		

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	Digital output DO1	
	2	24 V DC	
	3	GND	
	4	Not assigned	
	5	Digital output DO2	
	6	24 V DC	
	7	GND	
	8	Not assigned	

Product description

I/O compound modules - digital I/O
Two digital outputs 2 A - EPM-S306

Technical data

EPM-S306: rated data	
Module identifier	258 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	60 mA
Power loss	0.55 W
Digital outputs	
Number of outputs	2
Cable length	
shielded	1000 m
unshielded	600 m
Load voltage	
Nominal value	DC 24 (DC 20.4 ... 28.8 V)
Current consumption from load voltage L+	10 mA (without load)
Total current	
for each group, horizontal structure, 40°C	4 A
for each group, horizontal structure, 60°C	4 A
for each group, vertical structure	4 A
Output current	
for "1" signal, nominal value	2 A
Output delay	
from "0" to "1"	100 µs
from "1" to "0"	250 µs
Lamp load	10 W
Parallel switching of outputs	
for redundant control	Not possible
for power increase	Not possible
Control of a digital input	Possible
Switching frequencies	
for ohmic loads	Max. 1000 Hz
for inductive loads	Max. 0.5 Hz
for lamp loads	Max. 10 Hz
Limitation (internal) of the inductive breaking voltage	L+ (-52 V)
Short circuit protection of the output	Electronically
Operating threshold of the protection system	2.7 A
Output data size	8 bits (with EPM-S110: 2 bits)

EPM-S306: rated data

Status, alarm, diagnostics

Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	None
Module status	Green LED
Module error display	Red LED
Channel error display	None

Electrical isolation

Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

3.6.10 Four digital outputs 2 A - EPM-S309

This module detects up to four binary control signals from the higher-level bus system and transmits them to the process level.

Features

- ▶ 4 digital outputs, each can be loaded with 2 A (permanent total current max. 4 A)
- ▶ LEDs show the switching states of the digital outputs
- ▶ Overload protection (outputs switch off at overload)

Overview

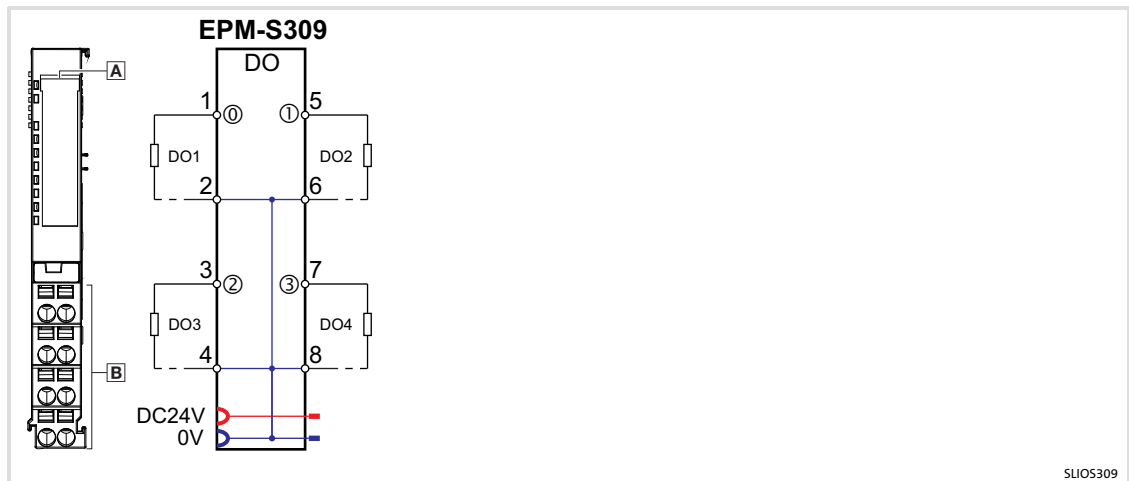





Fig. 3-33 Elements and circuit diagram


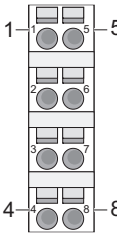
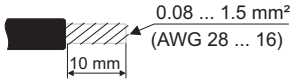
- Ⓐ Displays for module status
- Ⓑ Terminals
- 1 ... 8 Connection number
- ① ... ④ Bit number in bit presentation

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 <p style="text-align: center;">SUI0001</p>	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error and error at overload, short circuit, overtemperature (see table below)	
	3	DO1	Green	On: Digital output triggered	
	4	DO2			
	5	DO3			
	6	DO4			
	7				
	8	-	-		Not assigned
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <p style="text-align: center;">SUI0002</p>	1	Digital output DO1	
	2	GND	
	3	Digital output DO3	
	4	GND	
	5	Digital output DO2	
	6	GND	
	7	Digital output DO4	
	8	GND	

Technical data

EPM-S309: rated data	
Module identifier	264 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	65 mA
Power loss	0.8 W
Digital outputs	
Number of outputs	4
Cable length	
shielded	1000 m
unshielded	600 m
Load voltage	
Nominal value	DC 24 (DC 20.4 ... 28.8 V)
Current consumption from load voltage L+	20 mA (without load)
Total current	
for each group, horizontal structure, 40°C	4 A
for each group, horizontal structure, 60°C	4 A
for each group, vertical structure	4 A
Output current	
for "1" signal, nominal value	2 A
Output delay	
from "0" to "1"	100 µs
from "1" to "0"	250 µs
Lamp load	10 W
Parallel switching of outputs	
for redundant control	Not possible
for power increase	Not possible
Control of a digital input	Not possible
Switching frequencies	
for ohmic loads	Max. 1000 Hz
for inductive loads	Max. 0.5 Hz
for lamp loads	Max. 10 Hz
Limitation (internal) of the inductive breaking voltage	L+ (-52 V)
Short circuit protection of the output	Electronically
Operating threshold of the protection system	2.7 A
Output data size	8 bits (with EPM-S110: 4 bits)

EPM-S309: rated data

Status, alarm, diagnostics

Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	None
Module status	Green LED
Module error display	Red SF-LED
Channel error display	None

Electrical isolation

Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

3.6.11 2 digital outputs with time stamp function - EPM-S310

This module detects up to two binary control signals from the higher-level bus system and transmits them to the process level with time control using the time stamp function.

If the time stamp function has been parameterised, 15 initial states can be transferred to the FIFO memory as time stamp entry together with a time value of the μ s ticker and a consecutive number. The FIFO memory offers space for max. 31 time stamp entries.

Features

- ▶ Two digital outputs
- ▶ FIFO memory for up to 15 time stamp entries
- ▶ Activation via process image
- ▶ LEDs show the switching states of the digital outputs

Overview

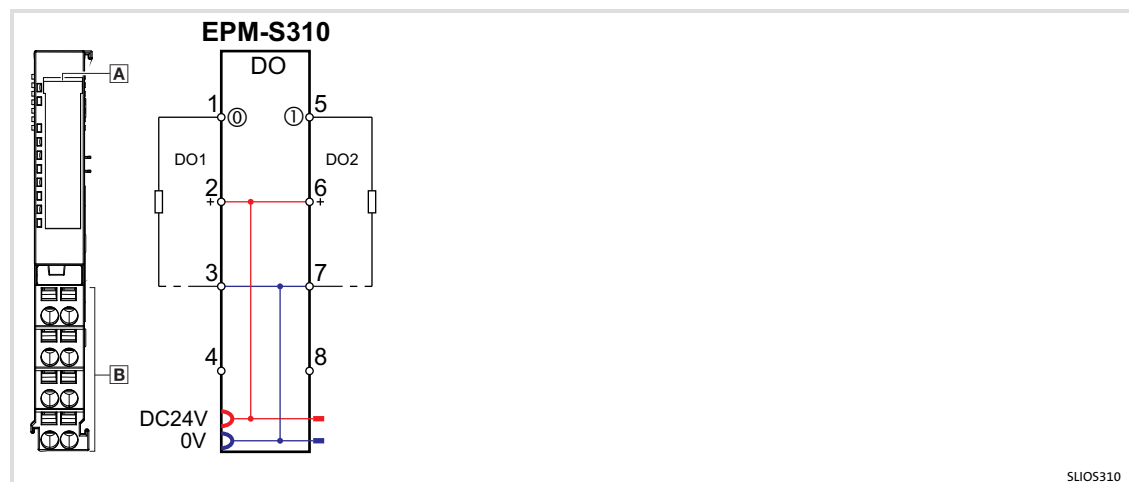

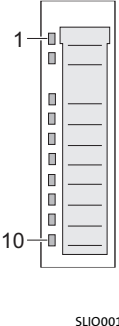



Fig. 3-34 Elements and circuit diagram


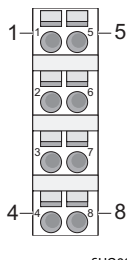
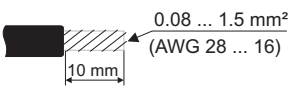
- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number
- ① ... ⑧ Bit number in bit presentation

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error and error at overload, short circuit, overtemperature (see table below)	
	3	DO1	Green	On: Digital output triggered	
	4	DO2			
	5	-	-	-	Not assigned
	6				
	7				
	8				
	9	-	-	-	-
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	Digital output DO1	
	2	24 V DC	
	3	GND	
	4	Not assigned	
	5	Digital output DO2	
	6	24 V DC	
	7	GND	
	8	Not assigned	

Product description

I/O compound modules - digital I/O

2 digital outputs with time stamp function - EPM-S310

Technical data

EPM-S310: rated data	
Module identifier	3905 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	85 mA
Power loss	0.95 W
Digital outputs	
Number of outputs	2
Cable length	
shielded	1000 m
unshielded	600 m
Load voltage	
Nominal value	DC 24 (DC 20.4 ... 28.8 V)
Current consumption from load voltage L+	15 mA (without load)
Total current	
for each group, horizontal structure, 40°C	1 A
for each group, horizontal structure, 60°C	1 A
for each group, vertical structure	1 A
Output current	
for "1" signal, nominal value	0.5 A
Output delay	
from "0" to "1"	Max. 100 ns
from "1" to "0"	Max. 100 ns
Lamp load	10 W
Parallel switching of outputs	
for redundant control	Not possible
for power increase	Not possible
Control of a digital input	Possible
Switching frequencies	
for ohmic loads	Max. 40 kHz
for inductive loads	Max. 40 kHz
for lamp loads	Max. 40 kHz
Limitation (internal) of the inductive breaking voltage	L+ (-52 V)
Short circuit protection of the output	Electronically; only highside
Operating threshold of the protection system	2.5 A
Output data size	60 bits

EPM-S310: rated data**Status, alarm, diagnostics**

Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	None

Electrical isolation

Between the channels in groups of	2
Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

Product description

I/O compound modules - digital I/O

2 digital outputs with time stamp function - EPM-S310

Functional principle taking the example of the system bus CAN

Long cycle times or fieldbus cycle times which fluctuate depending on bus load inevitably result in unacceptable inaccuracy when precise switching times are needed. The time stamp function can be used to calculate switching times for outputs accurate to 1 μs .

An I/O compound module with time stamp function is fitted with an internal ticker. The tickers within a station are all synchronised via the backplane bus to ensure the same time base.

- ▶ The ticker has a resolution of 1 μs . After power-on, it counts from 0 ... 65535 μs and then goes back to 0.
- ▶ If using I/O compound modules with the time stamp function, when the signal undergoes a edge change, the ticker value is saved to the process image along with the channel status.
- ▶ Up to 15 DO switching orders can be received with the time stamp function which allows an output to be activated several times within a cycle.

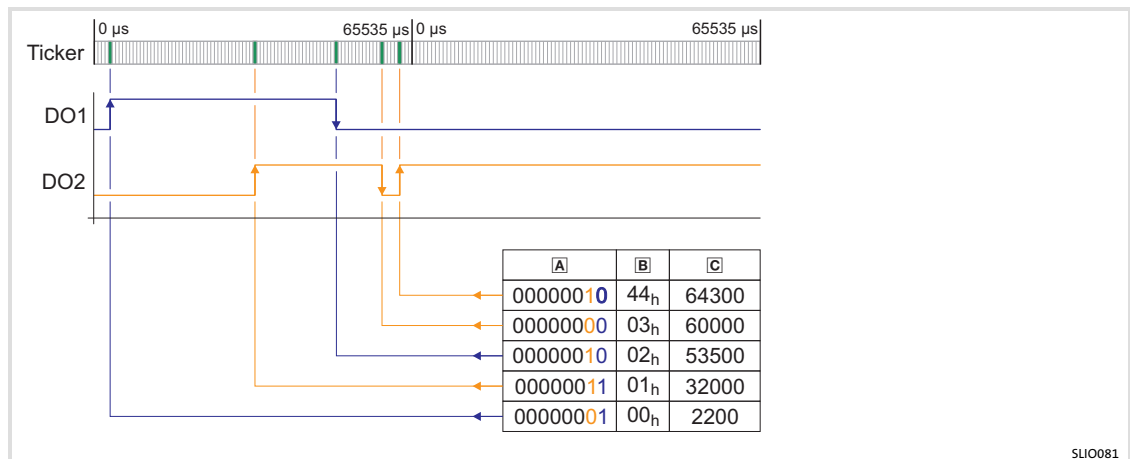


Fig. 3-35 Output of time stamp entries

DO1 Digital output 1

The output signal is switched according to the time stamp entry.

DO2 Digital output 2

The output signal is switched according to the time stamp entry.

A Status of digital outputs

B Running number (RN)

A consecutive number from 0 ... 63 which always starts afresh. The "running number" serves to determine the chronological sequence of the entries. It must be incremented with each time stamp entry. During the first run, the "running number" must start with 1.

C Ticker value

Example of the operating principle of the time stamp function



Note!

The time stamp modules EPM-S207 and EPM-S310 can only be operated usefully on bus coupler modules in which a μ s ticker is integrated.

The example shows in which order the time stamp entries are stored and processed.

A module is projected here which has 20 bytes assigned for 5 time stamp entries in the output area. The outputs are supposed to adopt the following states at the indicated ticker times:

Running number (RN)	Ticker value [μ s]	State DO 0 (bit 7)	State DO 1 (bit 6)	Release DO 0 (bit 5)	Release DO 1 (bit 4)
0x01	6000	0	0	1	1
0x02	12506	1	0	1	1
0x03	34518	1	1	1	1
0x04	49526	0	0	1	1
0x05	54529	0	1	1	1
0x06	3500	1	1	1	1
0x07	12443	1	0	1	1
0x08	20185	0	0	1	1
0x09	30140	1	0	1	1
0x0A	37330	0	0	1	1
0x0B	40000	0	0	0	0

The values of the table result in the following time diagram:

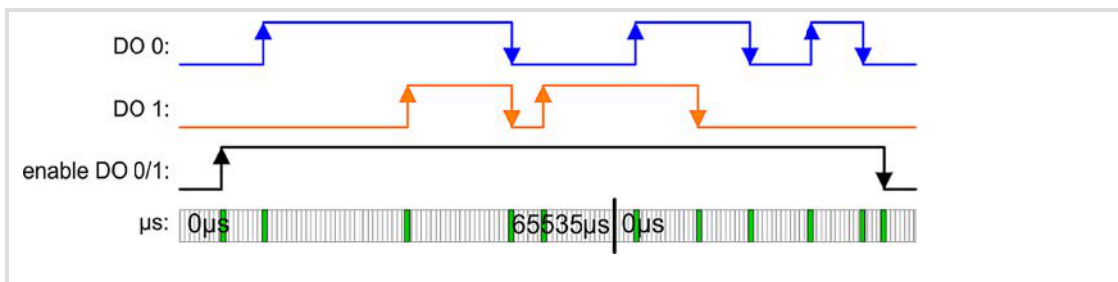


Fig. 3-36 Time diagram: example of time stamp function

Product description

I/O compound modules - digital I/O

2 digital outputs with time stamp function - EPM-S310

Writing the time stamp entries 1 ... 5

After writing the first 5 time stamp entries (RN = 0x01 ... 0x05) in the process output data, they are directly transferred to the FIFO memory of the module.

The respective status bytes are listed below the input data.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b00110000	0x01	6000	RN_LAST: 0x45
2	0b10110000	0x02	12506	RN_NEXT: 0xC1
3	0b11110000	0x03	34518	STS_FIFO: 0x00
4	0b00110000	0x04	49526	NUM_ETS: 0x05
5	0b01110000	0x05	54529	
6	0b00000000	0x00	0	
...	0b00000000	0x00	0	
31	0b00000000	0x00	0	

The values of the table result in the following time diagram:

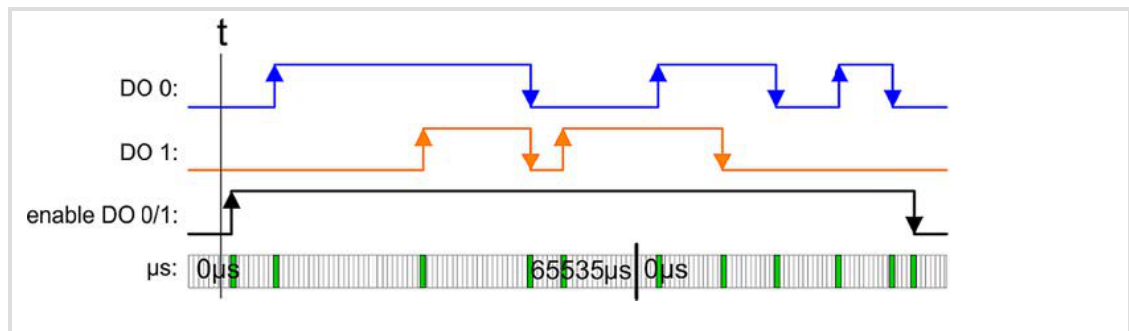


Fig. 3-37 Time diagram: writing the time stamp entries 1 ... 5

Executing the time stamp function for the first entry

In order to be able to trigger the outputs accordingly, they must previously be enabled. In this example you enable the two outputs with the first "running number" (RN). The first time stamp entry (RN = 0x01) is executed and deleted from the FIFO memory.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b10110000	0x02	12506	RN_LAST: 0x45
2	0b11110000	0x03	34518	RN_NEXT: 0xC2
3	0b00110000	0x04	49526	STS_FIFO: 0x00/0x02
4	0b01110000	0x05	54529	NUM_ETS: 0x04
5	0b00000000	0x00	0	
...	0b00000000	0x00	0	
31	0b00000000	0x00	0	

The values of the table result in the following time diagram:

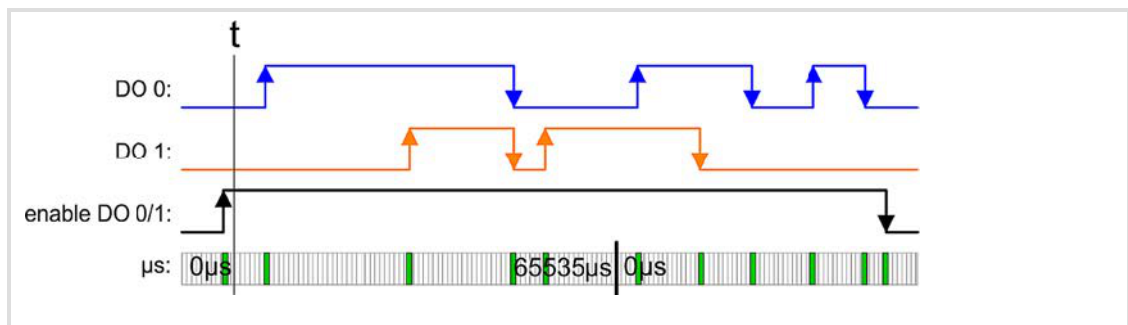


Fig. 3-38 Time diagram: executing the time stamp function for the first entry

Product description

I/O compound modules - digital I/O

2 digital outputs with time stamp function - EPM-S310

Executing the time stamp function for the entries 2 ... 4

The states of the time stamp entries 2 ... 4 (RN = 0x02 ... 0x04) are output consecutively and deleted from the FIFO memory.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b01110000	0x05	54529	RN_LAST: 0x45
2	0b00000000	0x05	0	RN_NEXT: 0xC5
...	0b00000000	0x00	0	STS_FIFO: 0x00/0x02
31	0b00000000	0x00	0	NUM_ETS: 0x01

The values of the table result in the following time diagram:

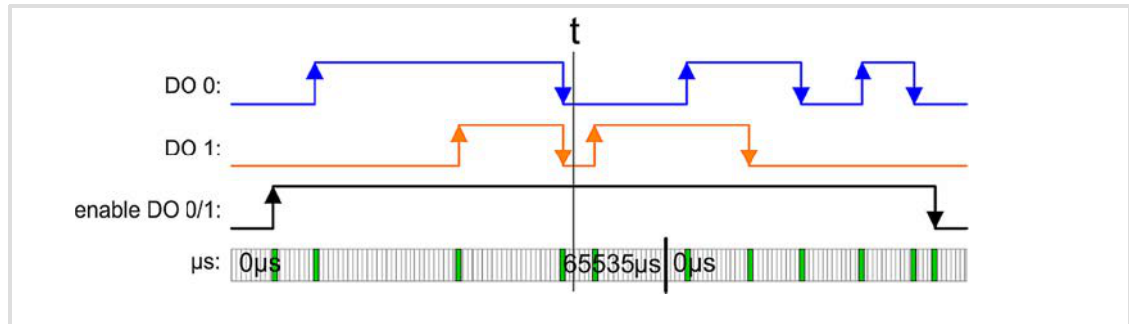


Fig. 3-39 Time diagram: executing the time stamp function for the entries 2 ... 4

Writing the time stamp entries 6 ... 10

After writing the time stamp entries 6 ... 10 (RN = 0x06 ... 0x0A) in the process output data, they are directly transferred to the FIFO memory of the module.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b01110000	0x05	54529	RN_LAST: 0x4A
2	0b11110000	0x06	3500	RN_NEXT: 0xC5
3	0b10110000	0x07	12443	STS_FIFO: 0x00/0x02
4	0b00110000	0x08	20185	NUM_ETS: 0x06
5	0b10110000	0x09	30140	
6	0b00110000	0x0A	37330	
7	0b00000000	0x00	0	
...	0b00000000	0x00	0	
31	0b00000000	0x00	0	

The values of the table result in the following time diagram:

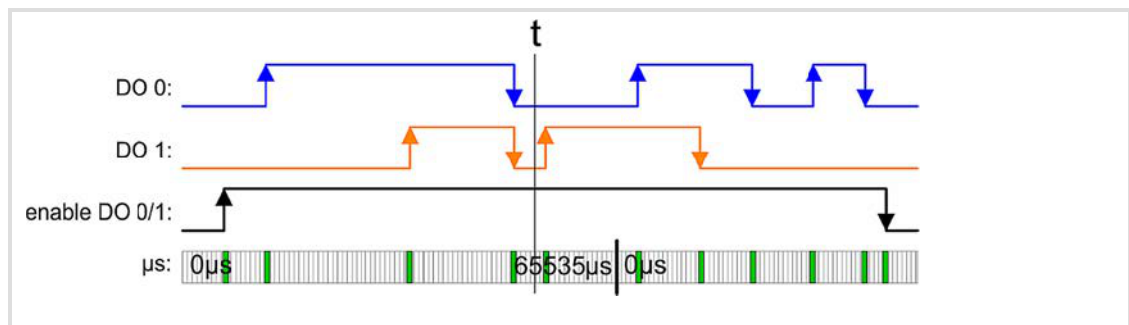


Fig. 3-40 Time diagram: writing the time stamp entries 6 ... 10

Executing the time stamp entries 6 ... 8

The states of the time stamp entries 6 ... 8 (RN = 0x06 ... 0x08) are output consecutively and deleted from the FIFO memory.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b10110000	0x09	30140	RN_LAST: 0x4A
2	0b00110000	0x0A	37330	RN_NEXT: 0xC5
3	0b00000000	0x00	0	STS_FIFO: 0x00/0x02
...	0b00000000	0x00	0	NUM_ETS: 0x02
31	0b00000000	0x00	0	

The values of the table result in the following time diagram:

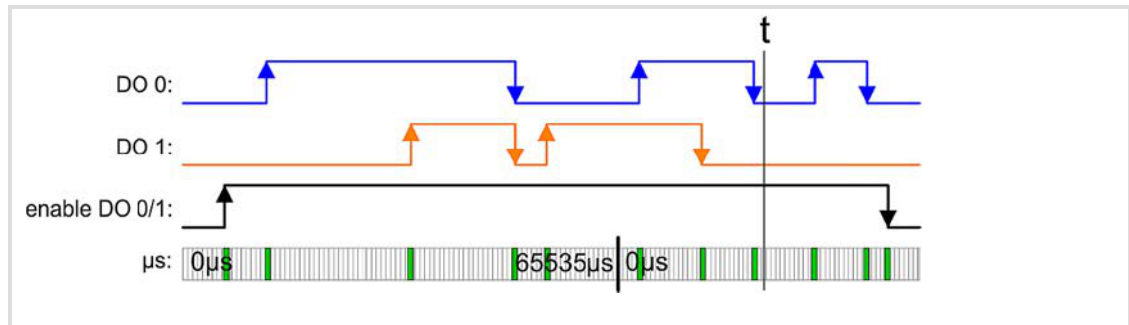


Fig. 3-41 Time diagram: writing the time stamp entries 6 ... 10

Product description

I/O compound modules - digital I/O

2 digital outputs with time stamp function - EPM-S310

Writing the last time stamp entry

As less than five time stamp entries are written, bit 6 of the "running number" (RN) must always be set at the last time stamp entry: RN = 0x0B becomes 0x4B.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b10110000	0x09	30140	RN_LAST: 0x4B
2	0b00110000	0x0A	37330	RN_NEXT: 0xC9
3	0b00000000	0x0B	40000	STS_FIFO: 0x80/0x82
4	0b00000000	0x00	0	NUM_ETS: 0x03
...	0b00000000	0x00	0	
31	0b00000000	0x00	0	

The values of the table result in the following time diagram:

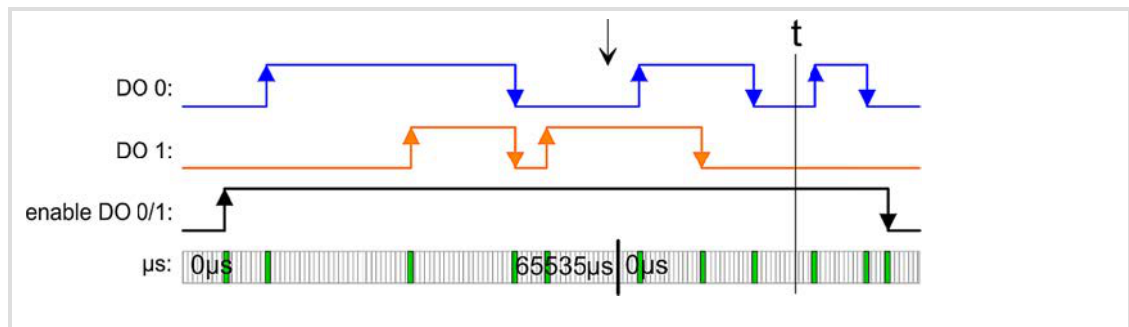


Fig. 3-42 Time diagram: writing the last time stamp entry

Executing the time stamp function for the last entries

The states of the last time stamp entries (RN = 0x09 ... 0x4B) are output consecutively and deleted from the FIFO memory.

FIFO	Output data	Running number (RN)	Ticker value [μ s]	Input data
1	0b00000000	0x00	0	RN_LAST: 0x4B
2	0b00000000	0x00	0	RN_NEXT: 0xCC
...	0b00000000	0x00	0	STS_FIFO: 0x80/0x82
31	0b00000000	0x00	0	NUM_ETS: 0x00

The values of the table result in the following time diagram:

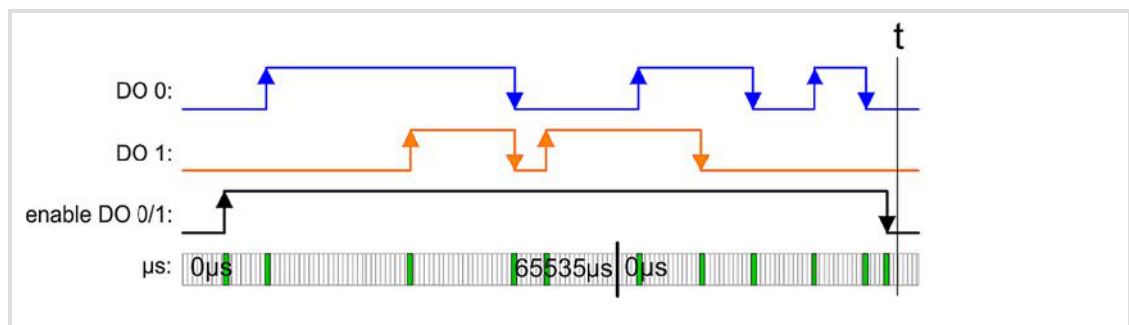


Fig. 3-43 Time diagram: executing the time stamp function for the last entries

3.6.12 Two relay outputs - EPM-S308

This module detects up to two binary control signals from the higher-level bus system and transmits them to the process level via relay outputs (switches).

Features

- ▶ 2 relay outputs (switches), potential-free
- ▶ LEDs show the switching states of the outputs

Overview



Fig. 3-44 Elements and circuit diagram



- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number
- ① ... ② Bit number in bit presentation

Product description


I/O compound modules - digital I/O

Two relay outputs - EPM-S308

Status displays

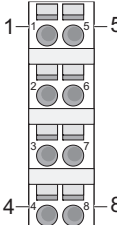
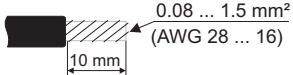
Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 SUI0001	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	DO1	Green	On: Relay output triggered	
	4	DO2			
	5				
	6				
	7				
	8	-	-		Not assigned
	9				
	10				

Messages of the status LEDs RUN and MF

RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals

View	Designation	Explanation	Terminal data
 SUI0002	1	Relay output DO1	
	2	Not assigned	
	3	Relay output DO2	
	4	Not assigned	
	5	Relay output DO1	
	6	Not assigned	
	7	Relay output DO2	
	8	Not assigned	

Technical data

EPM-S308: rated data

Module identifier 265_{dec}

Current consumption/power loss

Current consumption from backplane bus 130 mA

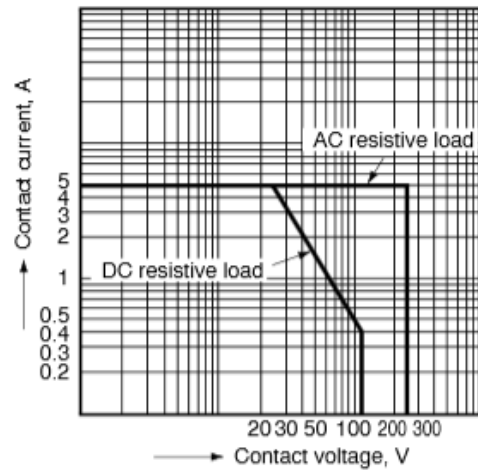
Power loss 0.7 W

EPM-S308: rated data

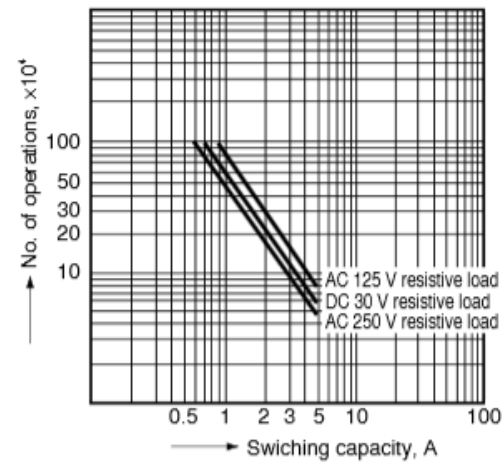
Relay outputs

Number of outputs	2
Load voltage	
Nominal value	DC 30 V / AC 230 V
Total current	
for each group, horizontal structure, 40°C	3 A
for each group, horizontal structure, 60°C	3 A
for each group, vertical structure	3 A
Output current	
for "1" signal, nominal value	3 A

Maximum switching capacity



Service life



Parallel switching of outputs

for redundant control	Not possible
for power increase	Not possible
Control of a digital input	Not possible

Switching frequencies

for ohmic loads	Max. 100 Hz
Output data size	8 bits (with EPM-S110: 2 bits)

Product description

I/O compound modules - digital I/O

Two relay outputs - EPM-S308

EPM-S308: rated data

Status, alarm, diagnostics

Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	None
Module status	Green LED
Module error display	Red LED
Channel error display	None

Electrical isolation

between the channels	Yes
Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

3.7 I/O compound modules - analog I/O

3.7.1 Representation of analog values

Analog values can only be processed in a binary form. For this, the analog module converts each process signal into a digital form and passes it on as a word.

Resolution	Analog value															
	HIGH byte (byte 0)								LOW byte (byte 1)							
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Valency	Sign bit	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
12 bits + sign bit	Sign bit	Measured value											0	0	0	
15 bits + sign bit	Sign bit	Measured value														

Resolution: In the case of a resolution of 12 bits plus sign bit, the lower-order digits that are not used (3 bits) are written to with "0".

Sign bit: Bit 15 = "0" → positive value; bit 15 = "1" → negative value.

Response in the event of an error: If a measured value exceeds the overrange or falls below the lower range, the following value is output:

Measured value > overrange → 32767 (7FFF_h)

Measured value < lower range → -32768 (8000_h)

If a parameterisation error occurs, the measured value 32767 (7FFF_h) is output.

Product description

I/O compound modules - analog I/O
2 analog inputs 0 ... 10 V (12 bits) - EPM-S400

3.7.2 2 analog inputs 0 ... 10 V (12 bits) - EPM-S400

This module detects up to two analog control signals from the process level and transmits them to the higher-level bus system.

Features

- ▶ 2 analog inputs
- ▶ Voltage range 0 ... 10 V
- ▶ 12-bit resolution
- ▶ Signal function is parameterisable
- ▶ An LED indicates if an input signal is outside the permissible measuring range



Stop!

Overvoltage at the inputs

The electronics of the electronic module are not protected against too high input signals.

Possible consequences:

- ▶ The module is destroyed

Protective measures:

- ▶ Make sure that the signals and encoders connected match the measuring range parameterised.

Overview

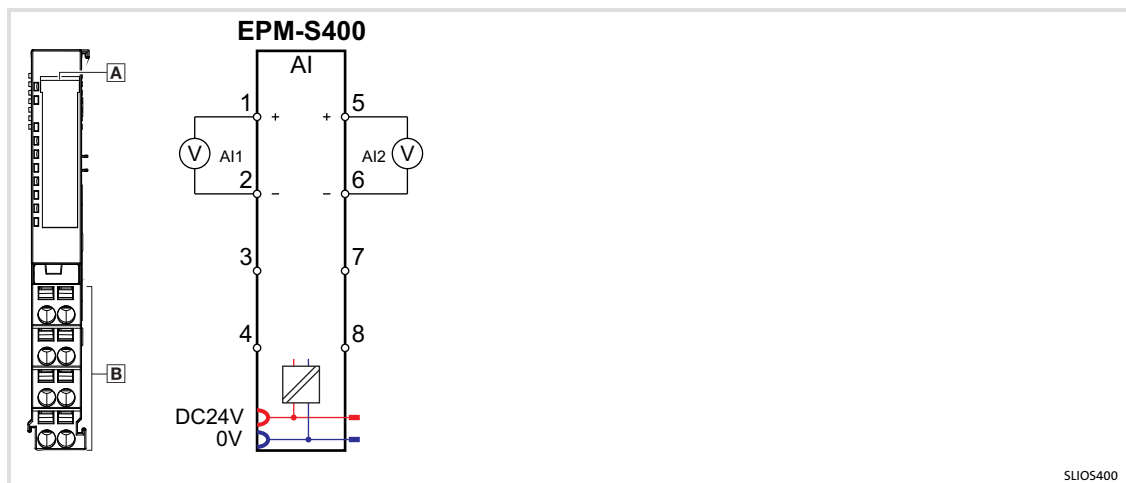

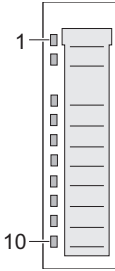



Fig. 3-45 Elements and circuit diagram


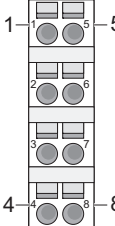
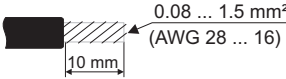
- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 <p>1 10</p> <p>SLIO001</p>	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	AI1	Red	On: Channel 1, signal outside the measuring range, error in parameter setting	
	4	AI2	Red	On: Channel 2, signal outside the measuring range, error in parameter setting	
	5	-	-	-	Not assigned
	6				
	7				
	8	-	-	-	-
	9	-	-	-	-
	10	-	-	-	-

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <p>1-5 2-6 3-7 4-8</p> <p>SLIO002</p>	1	Analog input AI1 (+)	
	2	Analog input AI1 (GND)	
	3	Not assigned	
	4	Not assigned	
	5	Analog input AI2 (+)	
	6	Analog input AI2 (GND)	
	7	Not assigned	
	8	Not assigned	



Note!

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ The module does not provide any auxiliary supply for sensors.

Product description

I/O compound modules - analog I/O
2 analog inputs 0 ... 10 V (12 bits) - EPM-S400

Technical data

EPM-S400: Rated data	
Module identifier	1025 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	70 mA
Power loss	0.7 W
Analog inputs	
Number of inputs	2
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	15 mA (without load)
Voltage inputs	
Input voltage ranges	0 V ... +10 V
Destruction limit (input voltage)	30 V
Min. input resistance	100 kΩ
Operational error limit	+/- 0.3 %
Basic error limit	+/- 0.2 %
Measuring principle	Gradual approximation
Resolution	12 bits
Basic conversion time	2 ms all channels
Interference voltage suppression for a frequency of	> 50 dB bei 50 Hz (UCM < 2 V)
Temperature error (relating to input range)	± 0.005 %/K
Linearity distortion (relating to input range)	± 0.02 %
Repeat accuracy (in steady-state vibration at 25°C, relating to the input range)	± 0.05 %
Input data size	4 bytes
Status, alarm, diagnostics	
Status display	Yes
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel

EPM-S400: Rated data

Electrical isolation

Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between inputs (U_{cm})	DC 2 V
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

Product description

I/O compound modules - analog I/O
4 analog inputs 0 ... 10 V (12 bits) - EPM-S401

3.7.3 4 analog inputs 0 ... 10 V (12 bits) - EPM-S401

This module detects up to four analog control signals from the process level and transmits them to the higher-level bus system.

Features

- ▶ 4 analog inputs
- ▶ Voltage range 0 ... 10 V
- ▶ 12-bit resolution
- ▶ Signal function is parameterisable
- ▶ An LED indicates if an input signal is outside the permissible measuring range



Stop!

Overvoltage at the inputs

The electronics of the electronic module are not protected against too high input signals.

Possible consequences:

- ▶ The module is destroyed

Protective measures:

- ▶ Make sure that the signals and encoders connected match the measuring range parameterised.

Overview

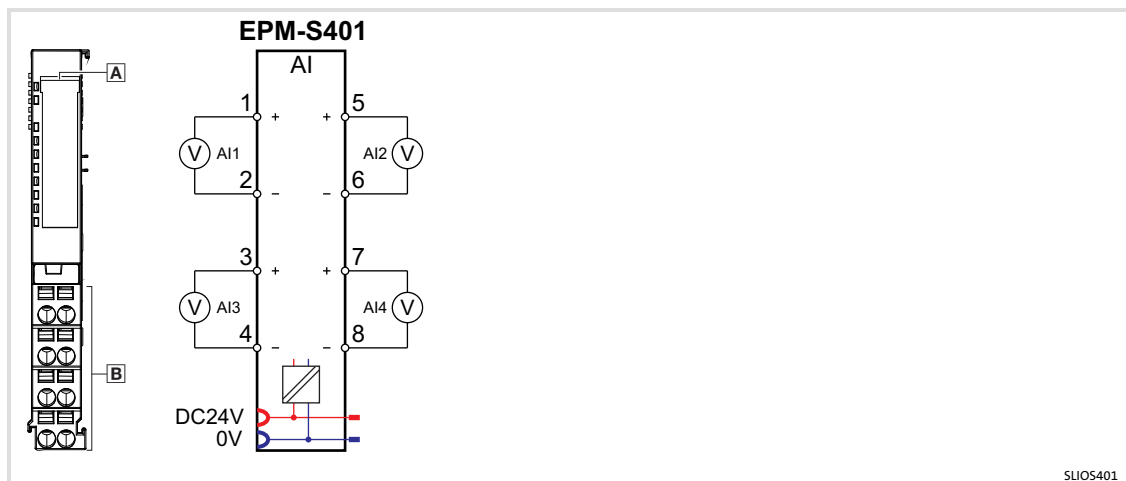

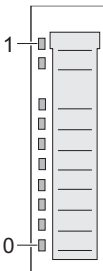



Fig. 3-46 Elements and circuit diagram


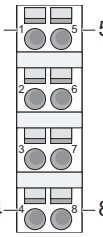
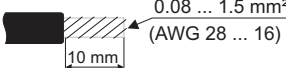
- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	AI1	Red	On: Channel 1, signal outside the measuring range, error in parameter setting	
	4	AI2	Red	On: Channel 2, signal outside the measuring range, error in parameter setting	
	5	AI3	Red	On: Channel 3, signal outside the measuring range, error in parameter setting	
	6	AI4	Red	On: Channel 4, signal outside the measuring range, error in parameter setting	
	7				Not assigned
	8				
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	Analog input AI1 (+)	
	2	Analog input AI1 (GND)	
	3	Analog input AI3 (+)	
	4	Analog input AI3 (GND)	
	5	Analog input AI2 (+)	
	6	Analog input AI2 (GND)	
	7	Analog input AI4 (+)	
	8	Analog input AI4 (GND)	



Note!

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ The module does not provide any auxiliary supply for sensors.

Product description

I/O compound modules - analog I/O
4 analog inputs 0 ... 10 V (12 bits) - EPM-S401

Technical data

EPM-S401: Rated data	
Module identifier	1028 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	70 mA
Power loss	0.7 W
Analog inputs	
Number of inputs	4
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	15 mA (without load)
Voltage inputs	
Input voltage ranges	0 V ... +10 V
Destruction limit (input voltage)	30 V
Min. input resistance	100 kΩ
Operational error limit	+/- 0.3 %
Basic error limit	+/- 0.2 %
Measuring principle	Gradual approximation
Resolution	12 bits
Basic conversion time	4 ms all channels
Interference voltage suppression for a frequency of	> 50 dB bei 50 Hz (UCM < 2 V)
Temperature error (relating to input range)	±□0.005 %/K
Linearity distortion (relating to input range)	±□0.02 %
Repeat accuracy (in steady-state vibration at 25°C, relating to the input range)	±□0.05 %
Input data size	8 bytes
Status, alarm, diagnostics	
Status display	Yes
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel

EPM-S401: Rated data**Electrical isolation**

Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between inputs (U_{cm})	DC 2 V
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

Product description

I/O compound modules - analog I/O
2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402

3.7.4 2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402

This module detects up to four analog control signals from the process level and transmits them to the higher-level bus system.

Features

- ▶ 2 analog inputs
- ▶ Current range 0/4 ... 20 mA
- ▶ 12-bit resolution
- ▶ Signal function is parameterisable
- ▶ An LED indicates if an input signal is outside the permissible measuring range



Stop!

Overvoltage at the inputs

The electronics of the electronic module are not protected against too high input signals.

Possible consequences:

- ▶ The module is destroyed

Protective measures:

- ▶ Make sure that the signals and encoders connected match the measuring range parameterised.

Overview

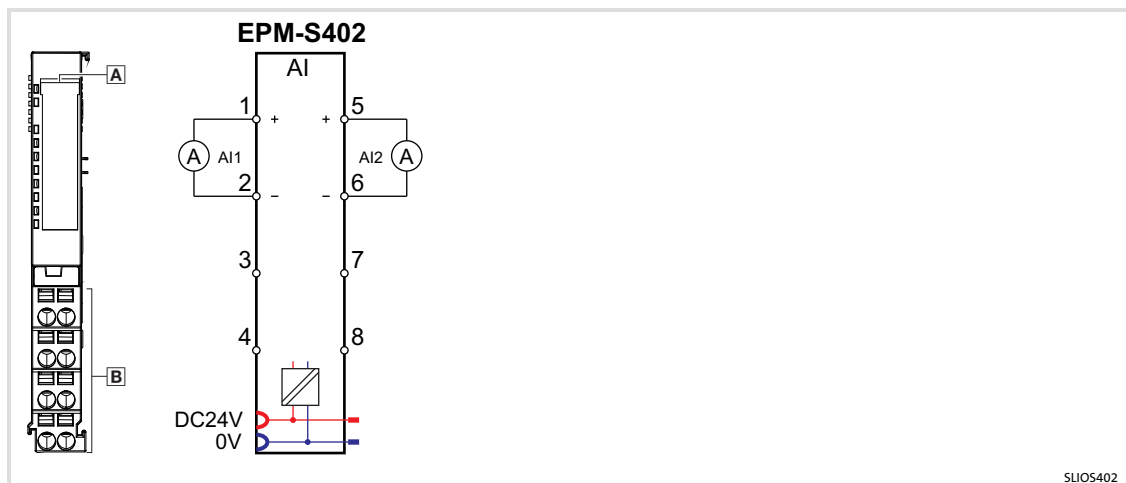





Fig. 3-47 Elements and circuit diagram


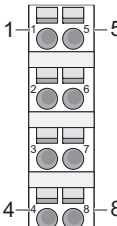
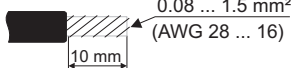
- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 <p>1 10</p> <p>SLIO001</p>	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	AI1	Red	On: Channel 1, signal outside the measuring range, error in parameter setting	
	4	AI2	Red	On: Channel 2, signal outside the measuring range, error in parameter setting	
	5	-	-	-	Not assigned
	6				
	7				
	8				
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <p>1-5 2-6 3-7 4-8</p> <p>SLIO002</p>	1	Analog input AI1 (+)	
	2	Analog input AI1 (GND)	
	3	Not assigned	
	4	Not assigned	
	5	Analog input AI2 (+)	
	6	Analog input AI2 (GND)	
	7	Not assigned	
	8	Not assigned	



Note!

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ The module does not provide any auxiliary supply for sensors.

Product description

I/O compound modules - analog I/O

2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402

Technical data

EPM-S402: Rated data	
Module identifier	1026 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	70 mA
Power loss	0.7 W
Analog inputs	
Number of inputs	2
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	15 mA (without load)
Current inputs	
Input current ranges	0 mA ... +20 mA +4 mA ... +20 mA
Destruction limit (input current)	40 mA
Max. input resistance	110 Ω
Operational error limit	+/- 0.3 % ... +/- 0.5 %
Basic error limit	+/- 0.2 % ... +/- 0.3 %
Measuring principle	Gradual approximation
Resolution	12 bits
Basic conversion time	2 ms all channels
Interference voltage suppression for a frequency of	> 50 dB bei 50 Hz (UCM < 2 V)
Temperature error (relating to input range)	±□0.005 %/K
Linearity distortion (relating to input range)	±□0.02 %
Repeat accuracy (in steady-state vibration at 25°C, relating to the input range)	±□0.05 %
Input data size	4 bytes
Status, alarm, diagnostics	
Status display	Yes
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel

EPM-S402: Rated data**Electrical isolation**

Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between inputs (U_{cm})	DC 2 V
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

Product description

I/O compound modules - analog I/O
4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403

3.7.5 4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403

This module detects up to four analog control signals from the process level and transmits them to the higher-level bus system.

Features

- ▶ 4 analog inputs
- ▶ Current range 0/4 ... 20 mA
- ▶ 12-bit resolution
- ▶ Signal function is parameterisable
- ▶ An LED indicates if an input signal is outside the permissible measuring range



Stop!

Overvoltage at the inputs

The electronics of the electronic module are not protected against too high input signals.

Possible consequences:

- ▶ The module is destroyed

Protective measures:

- ▶ Make sure that the signals and encoders connected match the measuring range parameterised.

Overview

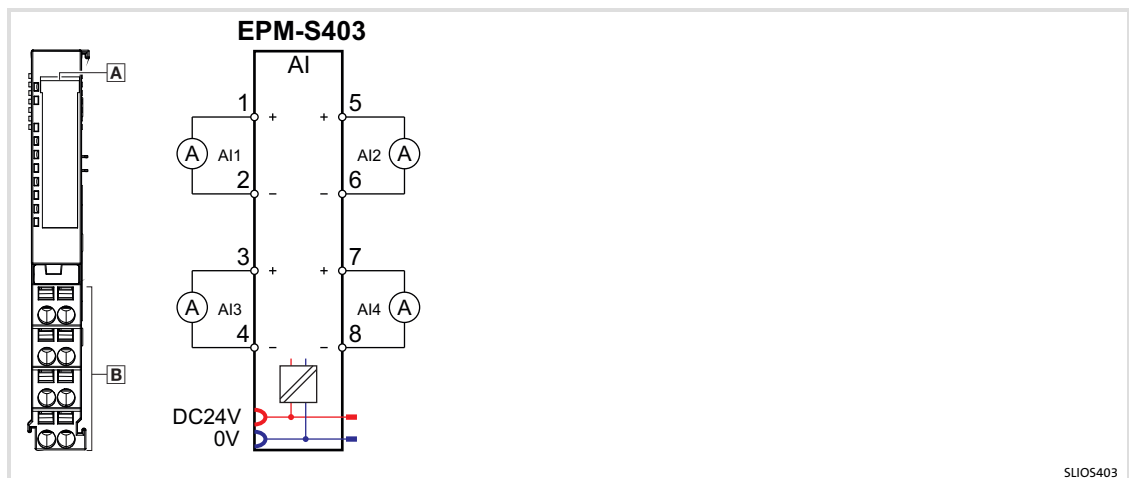





Fig. 3-48 Elements and circuit diagram


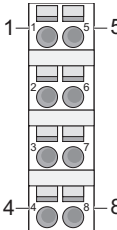
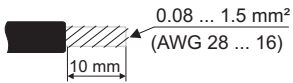
- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	AI1	Red	On: Channel 1, signal outside the measuring range, error in parameter setting	
	4	AI2	Red	On: Channel 2, signal outside the measuring range, error in parameter setting	
	5	AI3	Red	On: Channel 3, signal outside the measuring range, error in parameter setting	
	6	AI4	Red	On: Channel 4, signal outside the measuring range, error in parameter setting	
	7				Not assigned
	8				
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	Analog input AI1 (+)	
	2	Analog input AI1 (GND)	
	3	Analog input AI3 (+)	
	4	Analog input AI3 (GND)	
	5	Analog input AI2 (+)	
	6	Analog input AI2 (GND)	
	7	Analog input AI4 (+)	
	8	Analog input AI4 (GND)	



Note!

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ The module does not provide any auxiliary supply for sensors.

Product description

I/O compound modules - analog I/O

4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403

Technical data

EPM-S403: Rated data	
Module identifier	1029 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	70 mA
Power loss	0.7 W
Analog inputs	
Number of inputs	4
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	15 mA (without load)
Current inputs	
Input current ranges	0 mA ... +20 mA +4 mA ... +20 mA
Destruction limit (input current)	40 mA
Max. input resistance	110 Ω
Operational error limit	+/- 0.3 % ... +/- 0.5 %
Basic error limit	+/- 0.2 % ... +/- 0.3 %
Measuring principle	Gradual approximation
Resolution	12 bits
Basic conversion time	4 ms all channels
Interference voltage suppression for a frequency of	> 50 dB bei 50 Hz (UCM < 2 V)
Temperature error (relating to input range)	±□0.005 %/K
Linearity distortion (relating to input range)	±□0.02 %
Repeat accuracy (in steady-state vibration at 25°C, relating to the input range)	±□0.05 %
Input data size	8 bytes
Status, alarm, diagnostics	
Status display	Yes
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel

EPM-S403: Rated data**Electrical isolation**

Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between inputs (U_{cm})	DC 2 V
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

Product description

I/O compound modules - analog I/O
2 analog inputs -10 ... +10 V (16 bits) - EPM-S406

3.7.6 2 analog inputs -10 ... +10 V (16 bits) - EPM-S406

This module detects up to two analog control signals from the process level and transmits them to the higher-level bus system.



Note!

The UL approval for this module is in preparation.

Features

- ▶ 2 analog inputs
- ▶ Voltage range -10 ... +10 V
- ▶ 16-bit resolution
- ▶ Signal function is parameterisable
- ▶ An LED indicates if an input signal is outside the permissible measuring range



Stop!

Overvoltage at the inputs

The electronics of the electronic module are not protected against too high input signals.

Possible consequences:

- ▶ The module is destroyed

Protective measures:

- ▶ Make sure that the signals and encoders connected match the measuring range parameterised.

Overview

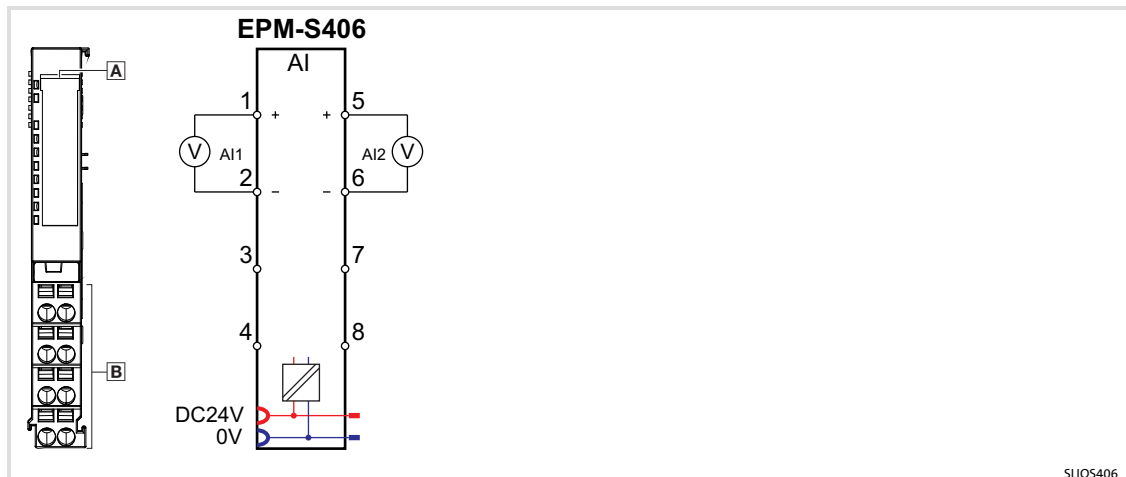





Fig. 3-49 Elements and circuit diagram


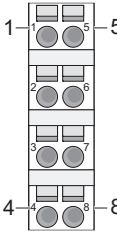
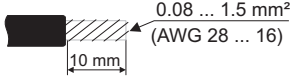
- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 <p style="text-align: center;">SLIO001</p>	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	AI1	Red	On: Channel 1, signal outside the measuring range, error in parameter setting	
	4	AI2	Red	On: Channel 2, signal outside the measuring range, error in parameter setting	
	5	-	-	-	Not assigned
	6				
	7				
	8				
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <p style="text-align: center;">SLIO002</p>	1	Analog input AI1 (+)	
	2	Analog input AI1 (GND)	
	3	Not assigned	
	4	Not assigned	
	5	Analog input AI2 (+)	
	6	Analog input AI2 (GND)	
	7	Not assigned	
	8	Not assigned	



Note!

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ The module does not provide any auxiliary supply for sensors.

Product description

I/O compound modules - analog I/O
2 analog inputs -10 ... +10 V (16 bits) - EPM-S406

Technical data

EPM-S406: Rated data	
Module identifier	1036 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	60 mA
Power loss	0.8 W
Analog inputs	
Number of inputs	2
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	20 mA (without load)
Voltage inputs	
Input voltage ranges	-10 V ... +10 V
Min. input resistance	200 kΩ
Operational error limit	+/- 0.2 %
Basic error limit	+/- 0.1 %
Measuring principle	Gradual approximation
Resolution	16 bits
Basic conversion time	240 μs all channels
Interference voltage suppression for a frequency of	> 80 dB at 50 Hz (UCM < 9 V)
Input data size	4 bytes
Status, alarm, diagnostics	
Status display	Yes
Alarms	Yes, parameterisable
Process alarm	Yes, parameterisable
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel
Electrical isolation	
Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between inputs (U _{cm})	DC 9 V
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

3.7.7 2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408

This module detects up to four analog control signals from the process level and transmits them to the higher-level bus system.



Note!

The UL approval for this module is in preparation.

Features

- ▶ 2 analog inputs
- ▶ Current range 0/4 ... 20 mA
- ▶ 16-bit resolution
- ▶ Signal function is parameterisable
- ▶ An LED indicates if an input signal is outside the permissible measuring range



Stop!

Overvoltage at the inputs

The electronics of the electronic module are not protected against too high input signals.

Possible consequences:

- ▶ The module is destroyed

Protective measures:

- ▶ Make sure that the signals and encoders connected match the measuring range parameterised.

Overview

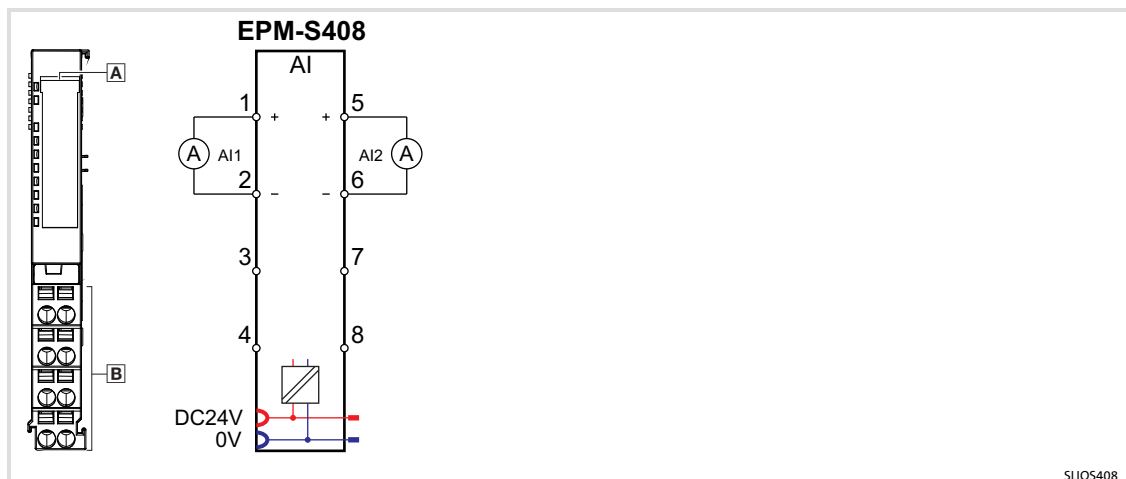


Fig. 3-50 Elements and circuit diagram



- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number


Product description

I/O compound modules - analog I/O


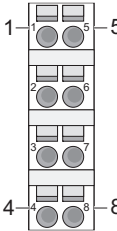
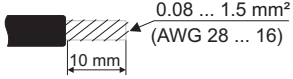
2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 SLIO001	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	AI1	Red	On: Channel 1, signal outside the measuring range, error in parameter setting	
	4	AI2	Red	On: Channel 2, signal outside the measuring range, error in parameter setting	
	5				
	6				
	7				
	8	-	-		Not assigned
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 SLIO002	1	Analog input AI1 (+)	
	2	Analog input AI1 (GND)	
	3	Not assigned	
	4	Not assigned	
	5	Analog input AI2 (+)	
	6	Analog input AI2 (GND)	
	7	Not assigned	
	8	Not assigned	



Note!

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ The module does not provide any auxiliary supply for sensors.

Technical data

EPM-S408: Rated data	
Module identifier	1035 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	60 mA
Power loss	0.7 W
Analog inputs	
Number of inputs	2
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	15 mA (without load)
Current inputs	
Input current ranges	0 mA ... +20 mA +4 mA ... +20 mA
Max. input resistance	60 Ω
Operational error limit	+/- 0.2 %
Basic error limit	+/- 0.1 %
Measuring principle	Gradual approximation
Resolution	16 bits
Basic conversion time	240 μs all channels
Interference voltage suppression for a frequency of	> 80 dB (UCM < 4 V)
Input data size	4 bytes
Status, alarm, diagnostics	
Status display	Yes
Alarms	Yes, parameterisable
Process alarm	Yes, parameterisable
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel
Electrical isolation	
Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between inputs (U _{cm})	DC 4 V
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

3.7.8 2 analog outputs 0 ... 10 V (12 bits) - EPM-S500

This module detects up to two analog control signals from the higher-level bus system and transmits them to the process level.

Features

- ▶ 2 analog outputs
- ▶ Voltage output 0 ... +10 V
- ▶ 12-bit resolution
- ▶ Signal function parameterisable
- ▶ 24 V DC supply voltage
- ▶ A reference potential for all outputs
- ▶ Short circuit protection
- ▶ An LED indicates if an output signal is outside the permissible measuring range

Overview

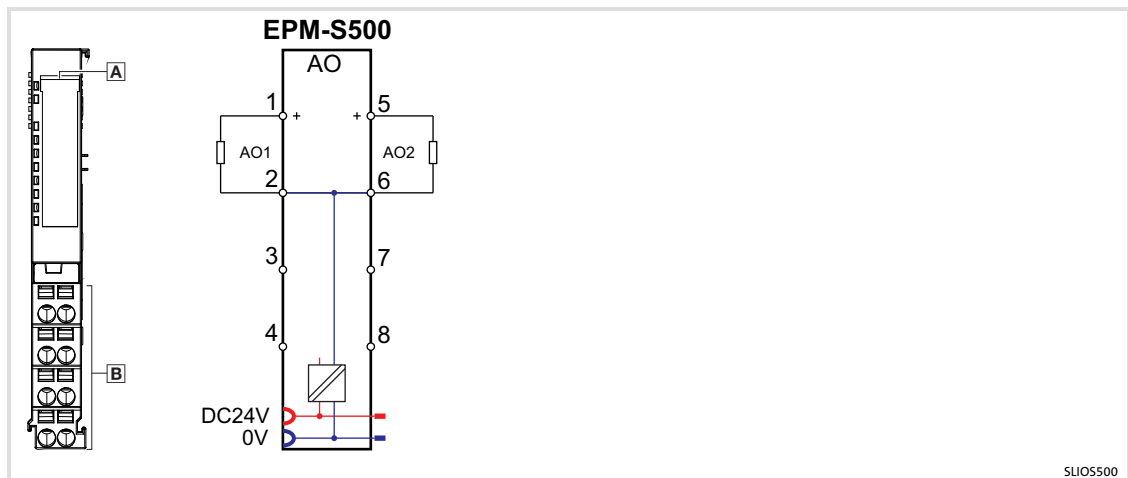





Fig. 3-51 Elements and circuit diagram


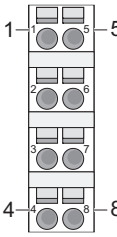
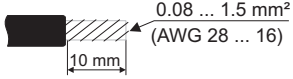
- ▣ A Displays for module status
- ▣ B Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 SII0001	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	AO1	Red	On: Channel 1, overload, short circuit, error in parameter setting	
	4	AO2	Red	On: Channel 2, overload, short-circuit, error in parameter setting	
	5				
	6				
	7				
	8	-	-		Not assigned
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 SII0002	1	Analog output AO1 (+)	
	2	Analog output AO1 (GND)	
	3	Not assigned	
	4	Not assigned	
	5	Analog output AO2 (+)	
	6	Analog output AO2 (GND)	
	7	Not assigned	
	8	Not assigned	



Note!

- ▶ When connecting the actuators, make sure that the polarity is correct.
- ▶ Outputs that are not used are not connected.
- ▶ The module does not provide any auxiliary supply for actuators.

Product description

I/O compound modules - analog I/O
2 analog outputs 0 ... 10 V (12 bits) - EPM-S500

Technical data

EPM-S500: Rated data	
Module identifier	1281 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	80 mA
Power loss	1.2 W
Analog outputs	
Number of outputs	2
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	35 mA (without load)
Voltage outputs	
Output voltage ranges	0 V ... +10 V
Min. load impedance	5 kΩ
Max. capacitive load	1 μF
Operational error limit	+/- 0.3 %
Basic error limit	+/- 0.2 %
Short circuit protection	Yes
Wire-break protection	No
Voltage at the outputs	15 V
Current	30 mA
Interference suppression (cross-talk between the outputs)	> 40 dB
Resolution	12 bits
Basic conversion time	2 ms all channels
Substitute values can be applied	Yes
Temperature error (relating to the output range)	±□0.01 %/K
Linearity distortion (relating to the output range)	±□0.1 %
Output ripple; bandwidth 0 to 50 kHz (relating to the output range)	±□0.05 %
Repeat accuracy (in steady-state vibration at 25°C, relating to the output range)	±□0.05 %
Dwell time	
for ohmic loads	1.5 ms
for capacitive loads	2 ms
Output data size	4 bytes

EPM-S500: Rated data

Status, alarm, diagnostics

Status display	Yes
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel

Electrical isolation

Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

3.7.9 4 analog outputs 0 ... 10 V (12 bits) - EPM-S501

This module detects up to four analog control signals from the higher-level bus system and transmits them to the process level.

Features

- ▶ 4 analog outputs
- ▶ Voltage output 0 ... +10 V
- ▶ 12-bit resolution
- ▶ Signal function parameterisable
- ▶ 24 V DC supply voltage
- ▶ A reference potential for all outputs
- ▶ Short circuit protection
- ▶ An LED indicates if an output signal is outside the permissible measuring range

Overview

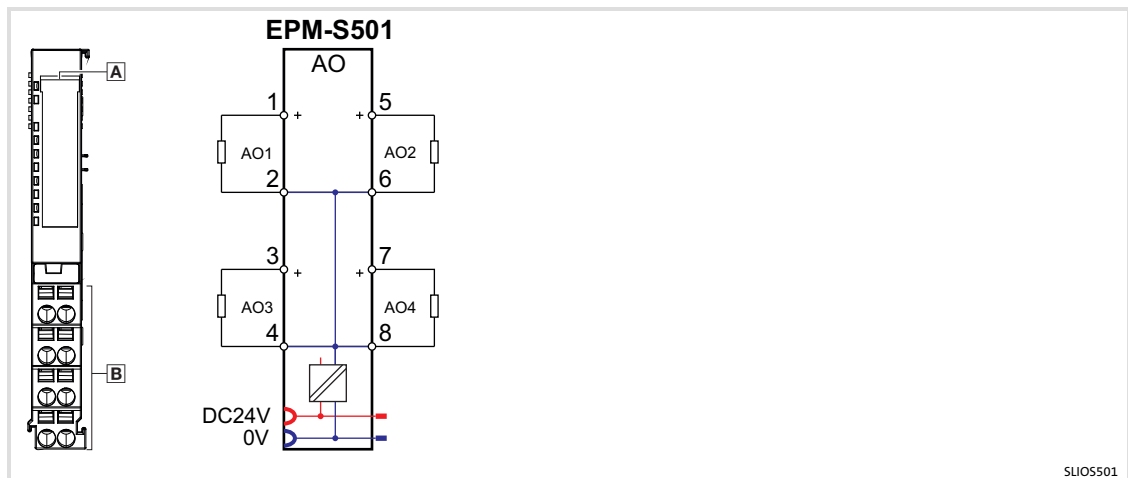

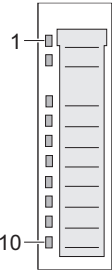



Fig. 3-52 Elements and circuit diagram


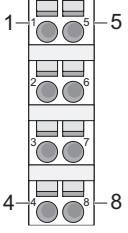
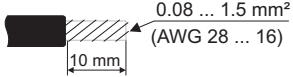
- ▣ A Displays for module status
- ▣ B Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs 				
View	Pos.	Designation	Colour	Explanation
	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error (see table below)
	3	AO1	Red	Channel 1, overload, short-circuit, error in parameter setting
	4	AO2	Red	Channel 2, overload, short-circuit, error in parameter setting
	5	AO3	Red	Channel 3, overload, short-circuit, error in parameter setting
	6	AO4	Red	Channel 4, overload, short-circuit, error in parameter setting
	7			
	8	-	-	
	9	-	-	
	10	-	-	Not assigned

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	Analog output AO1 (+)	
	2	Analog output AO1 (GND)	
	3	Analog output AO3 (+)	
	4	Analog output AO3 (GND)	
	5	Analog output AO2 (+)	
	6	Analog output AO2 (GND)	
	7	Analog output AO4 (+)	
	8	Analog output AO4 (GND)	



Note!

- ▶ When connecting the actuators, make sure that the polarity is correct.
- ▶ Outputs that are not used are not connected.
- ▶ The module does not provide any auxiliary supply for actuators.

Product description

I/O compound modules - analog I/O

4 analog outputs 0 ... 10 V (12 bits) - EPM-S501

Technical data

EPM-S501: Rated data	
Module identifier	1283 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	80 mA
Power loss	1.2 W
Analog outputs	
Number of outputs	4
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	35 mA (without load)
Voltage outputs	
Output voltage ranges	0 V ... +10 V
Min. load impedance	5 kΩ
Max. capacitive load	1 μF
Operational error limit	+/- 0.3 %
Basic error limit	+/- 0.2 %
Short circuit protection	Yes
Wire-break protection	No
Voltage at the outputs	15 V
Current	30 mA
Interference suppression (cross-talk between the outputs)	> 40 dB
Resolution	12 bits
Basic conversion time	2 ms all channels
Substitute values can be applied	Yes
Temperature error (relating to the output range)	±□0.01 %/K
Linearity distortion (relating to the output range)	±□0.1 %
Output ripple; bandwidth 0 to 50 kHz (relating to the output range)	±□0.05 %
Repeat accuracy (in steady-state vibration at 25°C, relating to the output range)	±□0.05 %
Dwell time	
for ohmic loads	1.5 ms
for capacitive loads	2 ms
Output data size	8 bytes

EPM-S501: Rated data**Status, alarm, diagnostics**

Status display	Yes
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel

Electrical isolation

Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

3.7.10 2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502

This module detects up to two analog control signals from the higher-level bus system and transmits them to the process level.

Features

- ▶ 2 analog outputs
- ▶ Current output 0/4 ... 20 mA
- ▶ 12-bit resolution
- ▶ Signal function parameterisable
- ▶ 24 V DC supply voltage
- ▶ A reference potential for all outputs
- ▶ Wire-break protection
- ▶ An LED indicates if an output signal is outside the permissible measuring range

Overview

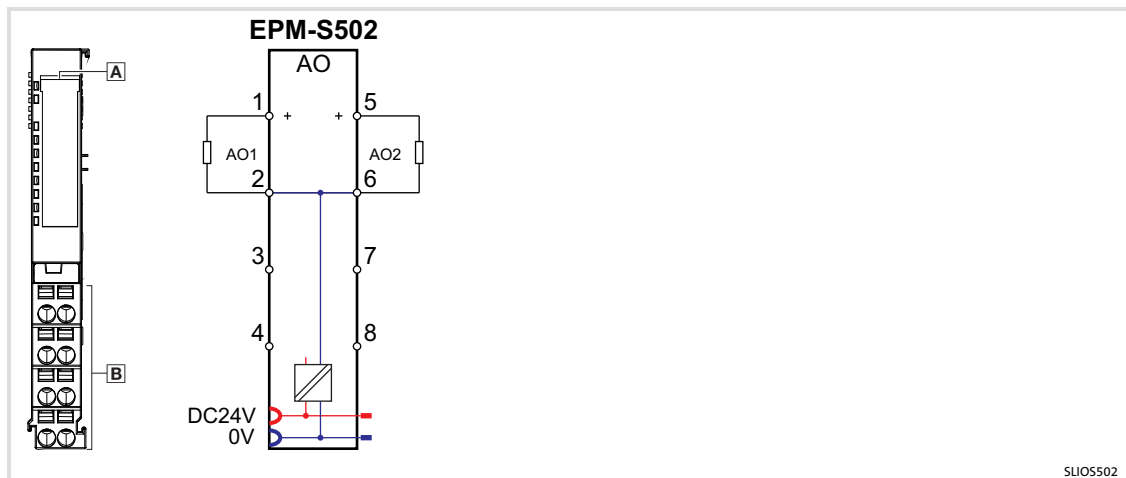





Fig. 3-53 Elements and circuit diagram


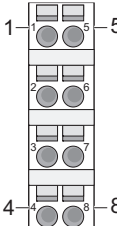
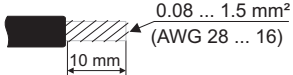
- ▣ A Displays for module status
- ▣ B Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 <p style="text-align: center;">SUI0001</p>	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	AO1	Red	On: Channel 1, open circuit, parameterisation error	
	4	AO2	Red	On: Channel 2, open circuit, parameterisation error	
	5				Not assigned
	6				
	7				
	8				
	9				
		10			

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <p style="text-align: center;">SUI0002</p>	1	Analog output AO1 (+)	
	2	Analog output AO1 (GND)	
	3	Not assigned	
	4	Not assigned	
	5	Analog output AO2 (+)	
	6	Analog output AO2 (GND)	
	7	Not assigned	
	8	Not assigned	



Note!

- ▶ When connecting the actuators, make sure that the polarity is correct.
- ▶ Outputs that are not used are not connected.
- ▶ The module does not provide any auxiliary supply for actuators.

Product description

I/O compound modules - analog I/O

2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502

Technical data

EPM-S502: Rated data	
Module identifier	1282 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	80 mA
Power loss	0.8 W
Analog outputs	
Number of outputs	2
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	15 mA (without load)
Current outputs	
Output current ranges	0 mA ... +20 mA +4 mA ... +20 mA
Max. load impedance	350 Ω
Max. inductive load	10 mH
Operational error limit	+/- 0.4 % ... +/- 0.5 %
Basic error limit	+/- 0.2 % ... +/- 0.3 %
Short circuit protection	No
Wire-break protection	Yes
Voltage at the outputs	12 V
Interference suppression (cross-talk between the outputs)	> 40 dB
Resolution	12 bits
Basic conversion time	2 ms all channels
Substitute values can be applied	Yes
Temperature error (relating to the output range)	±□0.01 %/K
Linearity distortion (relating to the output range)	±□0.1 %
Output ripple; bandwidth 0 to 50 kHz (relating to the output range)	±□0.05 %
Repeat accuracy (in steady-state vibration at 25°C, relating to the output range)	±□0.05 %
Dwell time	
for ohmic loads	0.25 ms
for inductive load	1.5 ms
Output data size	4 bytes

EPM-S502: Rated data

Status, alarm, diagnostics

Status display	Yes
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel

Electrical isolation

Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

3.7.11 4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503

This module detects up to four analog control signals from the higher-level bus system and transmits them to the process level.

Features

- ▶ 4 analog outputs
- ▶ Current output 0/4 ... 20 mA
- ▶ 12-bit resolution
- ▶ Signal function parameterisable
- ▶ 24 V DC supply voltage
- ▶ A reference potential for all outputs
- ▶ Wire-break protection
- ▶ An LED indicates if an output signal is outside the permissible measuring range

Overview

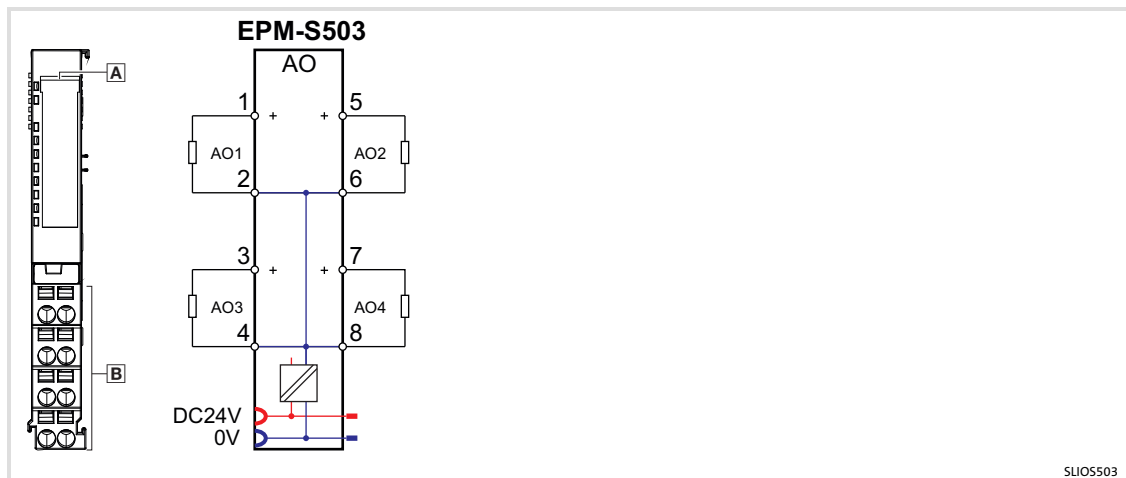





Fig. 3-54 Elements and circuit diagram


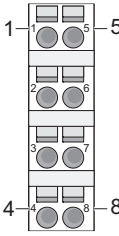
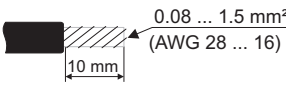
- ▣ A Displays for module status
- ▣ B Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 <p style="text-align: center;">SUI0001</p>	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	AO1	Red	On: Channel 1, open circuit, parameterisation error	
	4	AO2	Red	On: Channel 2, open circuit, parameterisation error	
	5	AO3	Red	On: Channel 3, open circuit, parameterisation error	
	6	AO4	Red	On: Channel 4, open circuit, parameterisation error	
	7				
	8	-	-		Not assigned
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <p style="text-align: center;">SUI0002</p>	1	Analog output AO1 (+)	
	2	Analog output AO1 (GND)	
	3	Analog output AO3 (+)	
	4	Analog output AO3 (GND)	
	5	Analog output AO2 (+)	
	6	Analog output AO2 (GND)	
	7	Analog output AO4 (+)	
	8	Analog output AO4 (GND)	



Note!

- ▶ When connecting the actuators, make sure that the polarity is correct.
- ▶ Outputs that are not used are not connected.
- ▶ The module does not provide any auxiliary supply for actuators.

Product description

I/O compound modules - analog I/O

4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503

Technical data

EPM-S503: Rated data	
Module identifier	1284 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	80 mA
Power loss	0.8 W
Analog outputs	
Number of outputs	4
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	15 mA (without load)
Current outputs	
Output current ranges	0 mA ... +20 mA +4 mA ... +20 mA
Max. load impedance	350 Ω
Max. inductive load	10 mH
Operational error limit	+/- 0.4 % ... +/- 0.5 %
Basic error limit	+/- 0.2 % ... +/- 0.3 %
Short circuit protection	No
Wire-break protection	Yes
Voltage at the outputs	12 V
Interference suppression (cross-talk between the outputs)	> 40 dB
Resolution	12 bits
Basic conversion time	2 ms all channels
Substitute values can be applied	Yes
Temperature error (relating to the output range)	±□0.01 %/K
Linearity distortion (relating to the output range)	±□0.1 %
Output ripple; bandwidth 0 to 50 kHz (relating to the output range)	±□0.05 %
Repeat accuracy (in steady-state vibration at 25°C, relating to the output range)	±□0.05 %
Dwell time	
for ohmic loads	0.25 ms
for inductive load	1.5 ms
Output data size	8 bytes

EPM-S503: Rated data**Status, alarm, diagnostics**

Status display	Yes
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel

Electrical isolation

Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

3

Product description

I/O compound modules - temperature measurement
Representation of analog values

3.8 I/O compound modules - temperature measurement

3.8.1 Representation of analog values

Analog values can only be processed in a binary form. For this, the analog module converts each process signal into a digital form and passes it on as a word.

Resolution	Analog value															
	HIGH byte (byte 0)								LOW byte (byte 1)							
Bit number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Valency	Sign bit	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
12 bits + sign bit	Sign bit	Measured value											0	0	0	
15 bits + sign bit	Sign bit	Measured value														

Resolution: In the case of a resolution of 12 bits plus sign bit, the lower-order digits that are not used (3 bits) are written to with "0".

Sign bit: Bit 15 = "0" → positive value; bit 15 = "1" → negative value.

Response in the event of an error: If a measured value exceeds the overrange or falls below the lower range, the following value is output:

Measured value > overrange → 32767 (7FFF_h)

Measured value < lower range → -32768 (8000_h)

If a parameterisation error occurs, the measured value 32767 (7FFF_h) is output.

3.8.2 Four (two) analog inputs for resistance tests - EPM-S404

This module detects up to four analog control signals from the process level and transmits them to the higher-level bus system.

Features

- ▶ 4 analog inputs (for 2-wire technology) or 2 analog inputs (for 3- and 4-wire technology)
- ▶ For resistance-type sensors 0 ... 3000 and resistance temperature sensors Pt100, Pt1000, Ni100 or Ni1000
- ▶ 16-bit resolution
- ▶ Signal function is parameterisable
- ▶ An LED indicates if an input voltage is outside the permitted measuring range



Stop!

Overvoltage at the inputs

The electronics of the electronic module are not protected against too high input signals.

Possible consequences:

- ▶ The module is destroyed

Protective measures:

- ▶ Make sure that the signals and encoders connected match the measuring range parameterised.

Overview

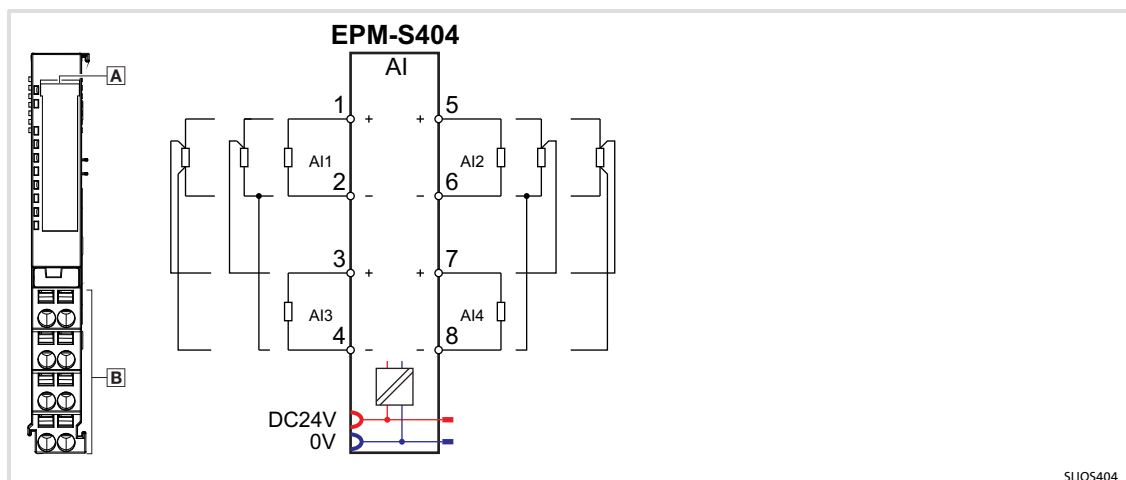


Fig. 3-55 Elements and circuit diagram



- Ⓐ Displays for module status
- Ⓑ Terminals
- 1 ... 8 Connection number

Product description


I/O compound modules - temperature measurement

Four (two) analog inputs for resistance tests - EPM-S404

Status displays

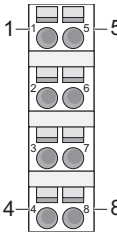
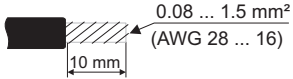
Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 <small>SLIO001</small>	1	RUN	Green	On: Module is ready for operation (see following table)	
	2	MF	Red	On: Module error (see table below)	
	3	AI1	Red	On: Channel 1, signal outside the measuring range, parameterisation error, open circuit	
	4	AI2	Red	On: Channel 2, signal outside the measuring range, parameterisation error, open circuit	
	5	AI3	Red	On: Channel 3, signal outside the measuring range, parameterisation error, open circuit	
	6	AI4	Red	On: Channel 4, signal outside the measuring range, parameterisation error, open circuit	
	7				
	8				
	9	-	-	-	Not assigned
	10				

Messages of the status LEDs RUN and MF

RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error ( 274)

Terminals

Module terminals, spring terminals

View	Designation	Explanation	Terminal data
 <small>SLIO002</small>	1	Analog input AI1 (+)	
	2	Analog input AI1 (GND)	
	3	Analog input AI3 (+)	
	4	Analog input AI3 (GND)	
	5	Analog input AI2 (+)	
	6	Analog input AI2 (GND)	
	7	Analog input AI4 (+)	
	8	Analog input AI4 (GND)	



Note!

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ If thermal detectors are connected in a 3-wire or 4-wire setup, channels 3 and/or 4 must be deactivated.
- ▶ The module does not provide any auxiliary supply for sensors.

2-wire, 3-wire, 4-wire measurement

From the above terminal assignment you can see how to connect your sensors for 2-wire, 3-wire or 4-wire measurement.

- ▶ All channels are suitable for 2-wire measurement.
- ▶ A 3-wire measurement is only possible on channels 1 and 2.
 - Please note that in the event of 3-wire measurement you always have to deactivate the corresponding channel by parameterisation. The corresponding channel of channel 1 is channel 3 and the one of channel 2 is channel 4.
 - Deactivate any unused channels by parameterisation.
- ▶ A 4-wire measurement is only possible on channels 1 and 2.
 - The measuring current for channel 1 is output at pins 1 and 2. The measurement for channel 1 takes place at pins 3 and 4. The analog value for channel 1 is represented in the input word 0.
 - The measuring current for channel 2 is output at pins 5 and 6. The measurement for channel 2 takes place at pins 7 and 8. The analog value for channel 2 is represented in the input word 1.
 - Please note that in the event of 4-wire measurement you always have to deactivate the corresponding channel by parameterisation. The corresponding channel of channel 1 is channel 3 and the one of channel 2 is channel 4.
- ▶ Use parameter setting to deactivate unused inputs.

Product description

I/O compound modules - temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Technical data

EPM-S404: Rated data	
Module identifier	1030 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	75 mA
Power loss	1 W
Analog inputs	
Number of inputs	4
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	30 mA (without load)
Resistor inputs	
Resistance ranges	0 ... 60 Ω 0 ... 600 Ω 0 ... 3000 Ω
Operational error limit	±□ 0.4 %
Basic error limit	±□ 0.2 %
Resistance thermometer inputs	
Resistance thermometer ranges	Pt100 Pt1000 Ni100 Ni1000
Operational error limit	±□ 0.4 %
Basic error limit	±□ 0.2 %
Measuring principle	Sigma-delta
Resolution	16 bits
Basic conversion time	4.2 ... 324.1 ms (50 Hz) per channel 3.8 ... 270.5 ms (60 Hz) per channel
Interference voltage suppression for a frequency of	> 80 dB at 50 Hz (UCM < 60 V)
Destruction limit (input voltage)	9 V
Temperature error (relating to input range)	±□ 0.005 %/K
Linearity distortion (relating to input range)	±□ 0.005 %
Repeat accuracy (in steady-state vibration at 25°C, relating to the input range)	±□ 0.05 %
Input data size	8 bytes

I/O compound modules - temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

EPM-S404: Rated data**Status, alarm, diagnostics**

Status display	Yes
Alarms	Yes, parameterisable
Process alarm	Yes, parameterisable
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel

Electrical isolation

Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between inputs (U_{cm})	DC 6 V
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

Product description

I/O compound modules - temperature measurement

Two analog inputs for thermocouple measurement - EPM-S405

3.8.3 Two analog inputs for thermocouple measurement - EPM-S405

This module detects up to two analog control signals from the process level and transmits them to the higher-level bus system.

Features

- ▶ 2 analog inputs
- ▶ For thermocouple type B, C, E, J, K, L, N, R, S or T
- ▶ 16-bit resolution
- ▶ Internal temperature compensation
- ▶ Signal function is parameterisable
- ▶ An LED indicates if an input voltage is outside the permitted measuring range



Stop!

Overvoltage at the inputs

The electronics of the electronic module are not protected against too high input signals.

Possible consequences:

- ▶ The module is destroyed

Protective measures:

- ▶ Make sure that the signals and encoders connected match the measuring range parameterised.

Mounting instructions

Variations in temperature within the module may affect the measuring accuracy. Therefore please observe the following recommendations:

- ▶ Do **not** place the module...
 - directly next to the bus coupler module
 - directly next to a power supply module
 - in a position as the last module within an I/O system
- ▶ If possible, the ambient temperature should be constant. After a change in the ambient temperature, the module requires approx. 30 minutes until obtaining its ensured measuring accuracy.

Overview

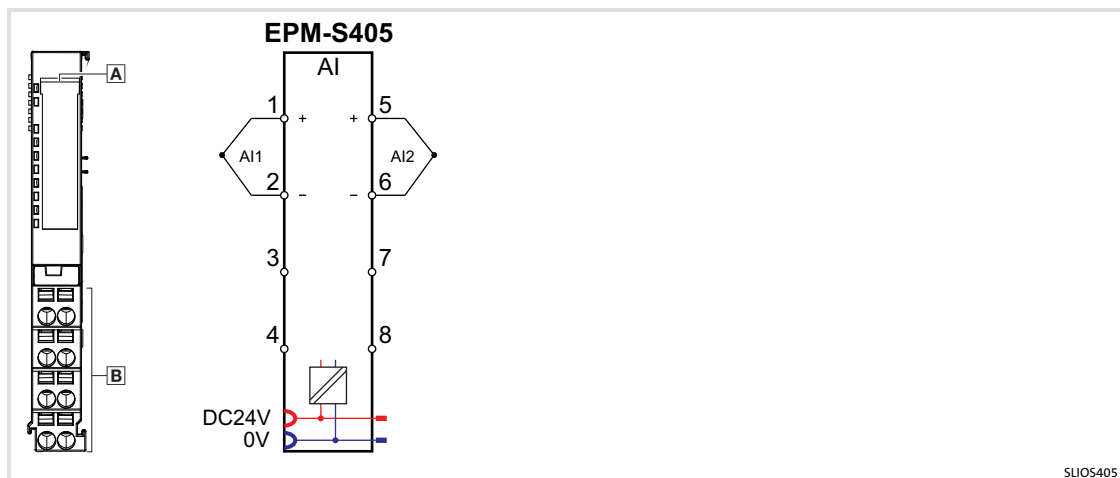


Fig. 3-56 Elements and circuit diagram
A Displays for module status
B Terminals
 1 ... 8 Connection number

Status displays

Module status LEDs A				
View	Pos.	Designation	Colour	Explanation
	1	RUN	Green	On: Module is ready for operation (see following table)
	2	MF	Red	On: Module error (see table below)
	3	AI1	Red	On: Channel 1, signal outside the measuring range, parameterisation error, open circuit
	4	AI2	Red	On: Channel 2, signal outside the measuring range, parameterisation error, open circuit
	5			Not assigned
	6			
	7			
	8			
	9			
	10			


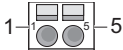
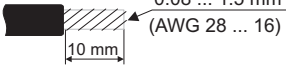
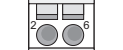

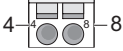
Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error (see 274)

Product description

I/O compound modules - temperature measurement

Two analog inputs for thermocouple measurement - EPM-S405

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	Analog input AI1 (+)	
	2	Analog input AI1 (GND)	
	3	Not assigned	
	4	Not assigned	
	5	Analog input AI2 (+)	
	6	Analog input AI2 (GND)	
	7	Not assigned	
	8	Not assigned	

SU0002



Note!

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ The module does not provide any auxiliary supply for sensors.

I/O compound modules - temperature measurement
Two analog inputs for thermocouple measurement - EPM-S405

Technical data

EPM-S405: Rated data	
Module identifier	1027 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	75 mA
Power loss	1 W
Analog inputs	
Number of inputs	2
Cable length	
shielded	200 m
Load voltage	
Nominal value	DC 24 V
Current consumption from load voltage L+	30 mA (without load)
Voltage inputs	
Input voltage ranges	-80 mV ... +80 mV
Destruction limit (input voltage)	30 V
Operational error limit	With interference frequency suppression: ± 0.1 % Without interference frequency suppression: ± 0.3 %
Basic error limit	With interference frequency suppression: ± 0.05 % Without interference frequency suppression: ± 0.25 %
Thermocouple inputs	
Thermocouple ranges	Types B, C, E, J, K, L, N, R, S, T
Operational error limit	With interference frequency suppression: Types E, L, T, J, K, N: ± 1.5 K Types B, C, R, S: ± 4.0 K Without interference frequency suppression: Types E, L, T, J, K, N: ± 2.5 K Types B, C, R, S: ± 8.0 K
Basic error limit	With interference frequency suppression: Types E, L, T, J, K, N: ± 1.0 K Types B, C, R, S: ± 3.0 K Without interference frequency suppression: Types E, L, T, J, K, N: ± 2.0 K Types B, C, R, S: ± 7.0 K
Measuring principle	Sigma-delta
Resolution	16 bits
Basic conversion time	4.2 ... 324.1 ms (50 Hz) per channel 3.8 ... 270.5 ms (60 Hz) per channel
Interference voltage suppression for a frequency of	> 90 dB bei 50 Hz (UCM < 10 V)
Temperature error (relating to input range)	± 0.001 %/K
Linearity distortion (relating to input range)	± 0.005 %
Repeat accuracy (in steady-state vibration at 25°C, relating to the input range)	± 0.05 %
Temperature error of the internal compensation	± 0.2 %
Temperature compensation	
parameterisable	Yes
external	Yes
internal	Yes
Input data size	4 bytes

Product description

I/O compound modules - temperature measurement

Two analog inputs for thermocouple measurement - EPM-S405

EPM-S405: Rated data

Status, alarm, diagnostics

Status display	Yes
Alarms	Yes
Process alarm	Yes, parameterisable
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LEDs per channel

Electrical isolation

Between the channels and the backplane bus	Yes
Between the channels and the voltage supply	Yes
Max. potential difference between inputs (U_{cm})	DC 140 V / AC 60 V
Max. potential difference between the analog channel (e.g. input) and the I/O supply	DC 75 V / AC 60 V
Insulation checked with	DC 500 V

3.9 I/O compound modules - counter

3.9.1 One counter 32 bits, 24 V DC - EPM-S600

This module measures the pulses of one connected encoder and processes them according to the mode selected.

Features

- ▶ 1 counter 32 bits (AB), invertible, DC 24 V
- ▶ Counting frequency max. 400 kHz
- ▶ Latch value, comparison value, set value, input filter
- ▶ Hardware gate, digital output
- ▶ Alarm and diagnostic function

Overview

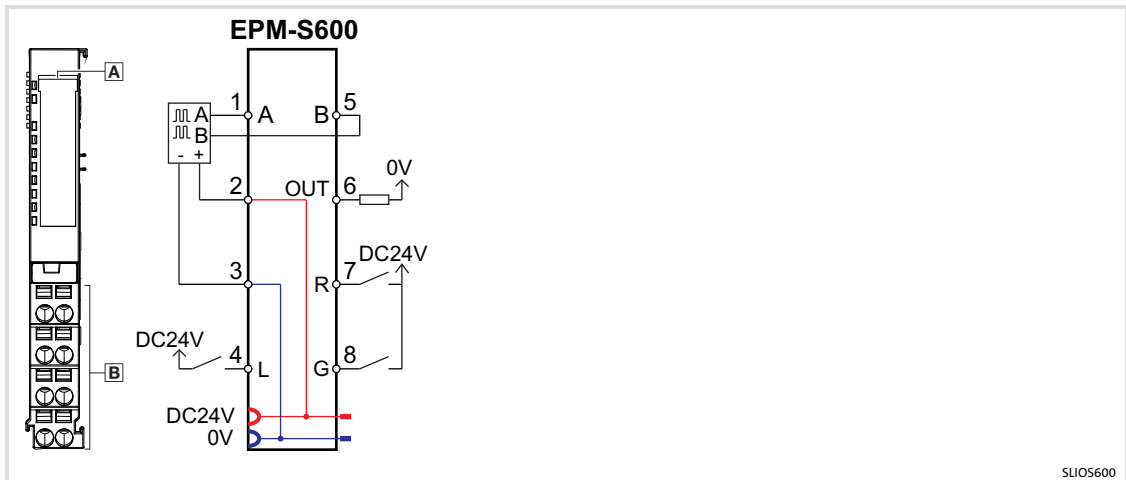


Fig. 3-57 Elements and circuit diagram

- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs A					
View	Pos.	Designation	Colour	Explanation	
	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error (see table below)	
	3	A	Green	On: Digital input 1 "A"/"pulse" triggered	
	4	B		On: Digital input 5 "B"/"direction" triggered	
	5	Latch		On: Digital input 4 "Latch" triggered	
	6	Gate		On: Digital input 8 "Hardware gate" triggered	
	7	Reset		On: Digital input 7 "Reset" triggered	
	8	OUT		On: Digital output "OUT" triggered	
	9	-			
	10	-			Not assigned

Product description

I/O compound modules - counter

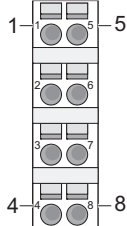
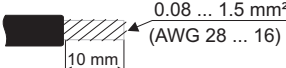
One counter 32 bits, 24 V DC - EPM-S600

Messages of the status LEDs RUN and MF

RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error (📖 274)

Terminals

Module terminals, spring terminals

View	Designation	Explanation	Terminal data
 <p>SUI0002</p>	1	Digital input "A"/"pulse" Pulse input for counting signal or track A of an encoder for single, double, or quadruple evaluation	
	2	DC 24 V for encoder supply	
	3	GND	
	4	Digital input "Latch" With a positive edge or a level-triggered signal at "Latch", the current counter content is stored as latch value in the input area.	
	5	Digital input "B"/"direction" Direction signal or track B of an encoder (can be inverted via parameterisation)	
	6	Digital output "OUT" (parameterisable)	
	7	Digital input "Reset" With a positive edge at this input the counter is reset.	
	8	Digital input "Hardware gate" With a HIGH level at this input the hardware gate is opened and the counting process is started (parameterisable).	

Technical data

EPM-S600: rated data	
Module identifier	2241 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	75 mA
Power loss	1 W
Digital inputs	
Number of inputs	5
Cable length	
shielded	100 m
Load voltage	
Nominal value	DC 20.4 ... 28.8 V
Current consumption from load voltage L+	20 mA (without load)
Input voltage	
Nominal value	DC 20.4 ... 28.8 V
for signal "0"	DC 0 ... 5 V
for signal "1"	DC 15 ... 28.8 V
Input current	
for signal "1"	3 mA
2-wire BERO	
Connection possible	Yes
Max. permissible closed-circuit current	0.5 mA
Input delay	
from "0" to "1"	0.8 μs
from "1" to "0"	0.8 μs
Number of inputs which can be used simultaneously	
horizontal structure	5
vertical structure	5
Input characteristic	IEC 61131, type 1
Input data size	12 bytes

Product description

I/O compound modules - counter

One counter 32 bits, 24 V DC - EPM-S600

EPM-S600: rated data

Digital outputs

Number of outputs	1
Cable length	
shielded	100 m
unshielded	100 m
Load voltage	
Nominal value	DC 20.4 ... 28.8 V
Output delay	
from "0" to "1"	30 µs
from "1" to "0"	30 µs
Lamp load	10 W
Parallel switching of outputs	
for redundant control	Not possible
for power increase	Not possible
Control of a digital input	Possible
Switching frequencies	
for ohmic loads, max.	10 kHz
for inductive loads, max.	0.5 Hz
for lamp loads, max.	10 kHz
Limitation (internal) of the inductive breaking voltage	L+ (-52 V)
Short circuit protection	
Type	Electronically
Operating threshold	1 A
Output data size	10 bytes

Meters

Number of counters	1
Counter width	32 bits
Frequency	
Input frequency, max	500 kHz
Counting frequency, max	400 kHz
Operating mode	
Incremental encoder	Possible
Pulse/direction	Possible
Pulse	Not possible
Frequency measurement	Not possible
Period duration measurement	Not possible
Connection	
Gate connection	Possible
Latch connection	Possible
Reset connection	Possible
Counter output	Possible

EPM-S600: rated data

Status, alarm, diagnostics

Status display	Yes
Alarms	Yes, parameterisable
Process alarm	Yes, parameterisable
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes, parameterisable
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	None

Electrical isolation

Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

Parameterisable functions

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	

Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter a differentiation between the internal gate (I-gate), hardware gate (HW gate), and software gate (SW gate) is made.</p> <ul style="list-style-type: none"> ● The I-gate is the AND logic operation of the software gate (SW gate) and the hardware gate (HW gate). ● The SW gate is controlled via your user program (status word in the output area). ● The HW gate is controlled via the digital gate input. <p>The following response can be parameterised:</p> <p>Cancelling gate function:After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function:After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Latch function	<p>If a positive edge occurs at the latch input, the current count value is stored in the latch register. The latch register is accessed via the input area. After a STOP-RUN transition, latch is always 0.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>

Counting continuously

Limits	Counting range
Lower counting limit	-2 147 483 648 (-2^{31})
Upper counting limit	+2 147 483 647 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts from the loading value in the counting range.
 - If the counter reaches the upper counting limit when counting forwards, and if a further count pulse in positive direction occurs, the counter skips to the lower counting limit and continues to count from there.
 - If the counter reaches the lower counting limit when counting backwards, and if a further negative count pulse occurs, the counter skips to the upper counting limit and continues to count from there.
 - If maximum values are exceeded or minimum values are not reached, the status bits *STS_OFLW* or *STS_UFLW* are set. These bits remain set until they are reset with *RES_SET* in the control word. If enabled, additionally a process alarm is triggered.
- ▶ For stopping the counting process the internal gate has to be closed.

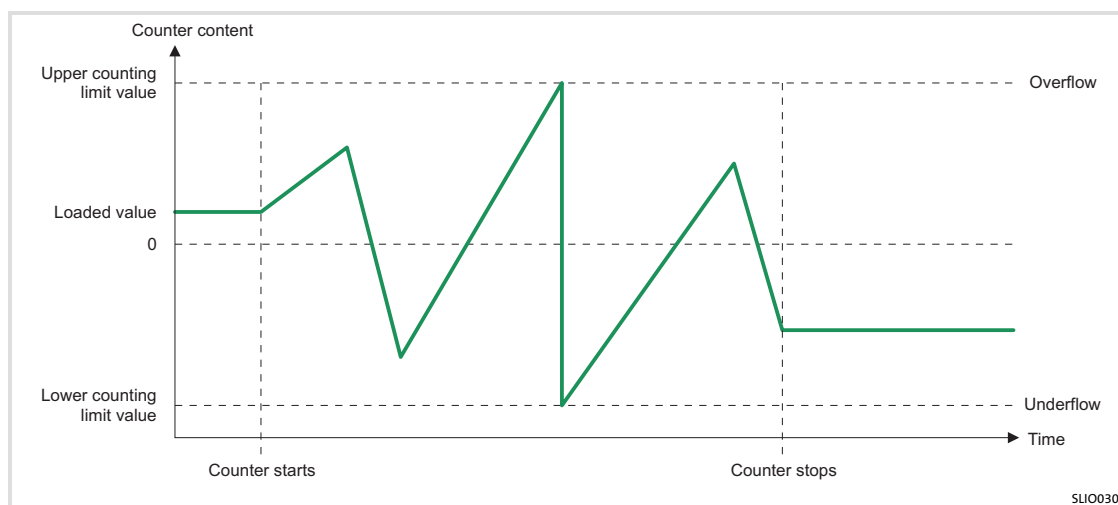


Fig. 3-58 Example of "Counting continuously"

SLI0030

Counting once

A) No main counting direction:

Limits	Counting range
Lower counting limit	-2 147 483 648 (-2^{31})
Upper counting limit	+2 147 483 647 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards once from the loading value or backwards in the preset counting range.
 - If the counting limits are not reached or exceeded, the counter skips to the other counting limit, respectively, the internal gate is closed automatically and the status bits *STS_OFLW* or *STS_UFLW* are set. If enabled, a process alarm is effected.
- ▶ For stopping the counting process the internal gate has to be closed.
- ▶ For starting the counting process again, the internal gate has to be opened.
 - If the gate control is interrupted, the counting process continues at the current counter content.
 - If the gate control is cancelled, the counter starts from the loading value.

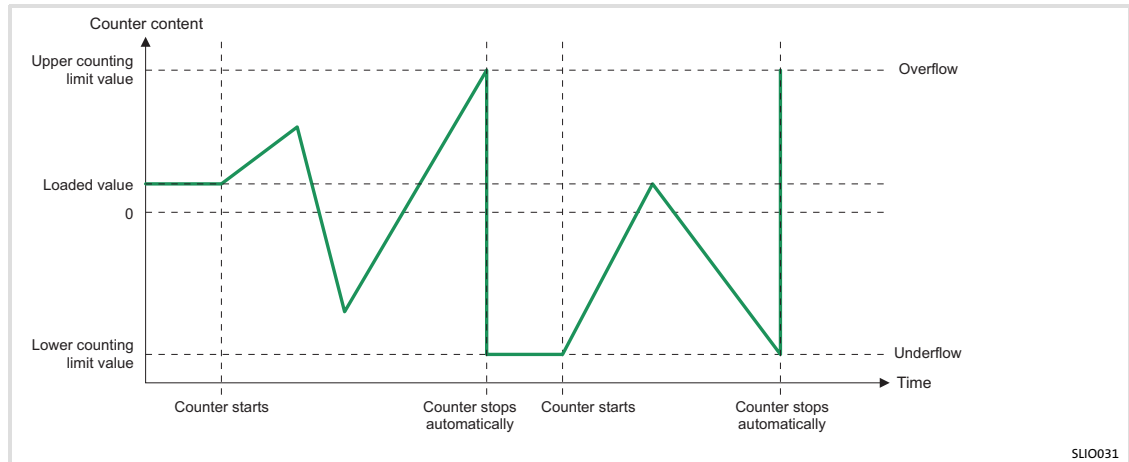


Fig. 3-59 Example of "Counting once", no main counting direction and with interrupting gate control

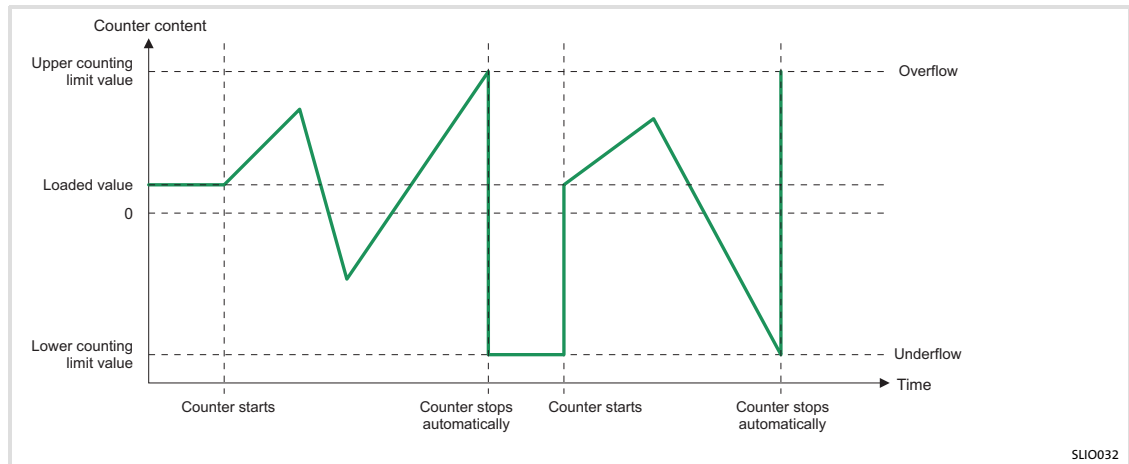


Fig. 3-60 Example of "Counting once", no main counting direction and with cancelling gate control

B) Main counting direction forwards:

Limits	Counting range
Final value	-2 147 483 646 ($-2^{31}+1$) to +2 147 483 646 ($2^{31}-1$)
Lower counting limit	-2 147 483 648 (-2^{31})

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards from the loading value.
 - If the counter reaches the final value -1 in the positive direction, it skips to the loading value at the next count pulse and the internal gate is closed automatically.
- ▶ For starting the counting process again, the internal gate has to be opened.
 - The counter counts from the loading value.
 - You can also count above the lower counting limit.

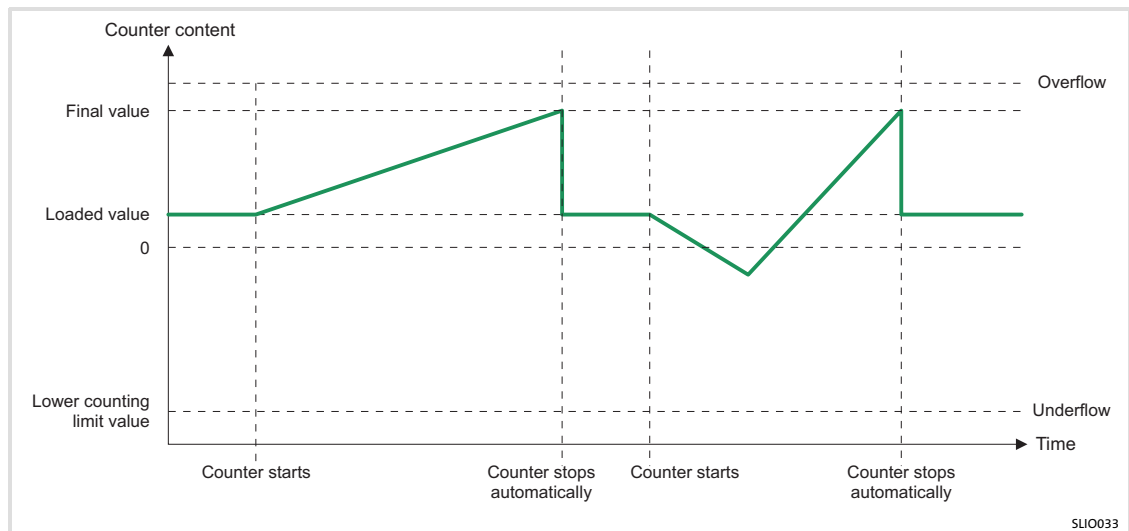


Fig. 3-61 Example of "Counting once" with main counting direction forwards

Product description

I/O compound modules - counter

One counter 32 bits, 24 V DC - EPM-S600

C) Main counting direction backwards:

Limits	Counting range
Final value	-2 147 483 646 ($-2^{31}+1$) to +2 147 483 646 ($2^{31}-1$)
Upper counting limit	+2 147 483 646 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts backwards from the loading value.
 - If the counter reaches the final value +1 in the negative direction, it skips to the loading value at the next count pulse and the internal gate is closed automatically.
- ▶ For starting the counting process again, the internal gate has to be opened again.
 - The counter starts from the loading value.
 - You can also count above the upper counting limit.

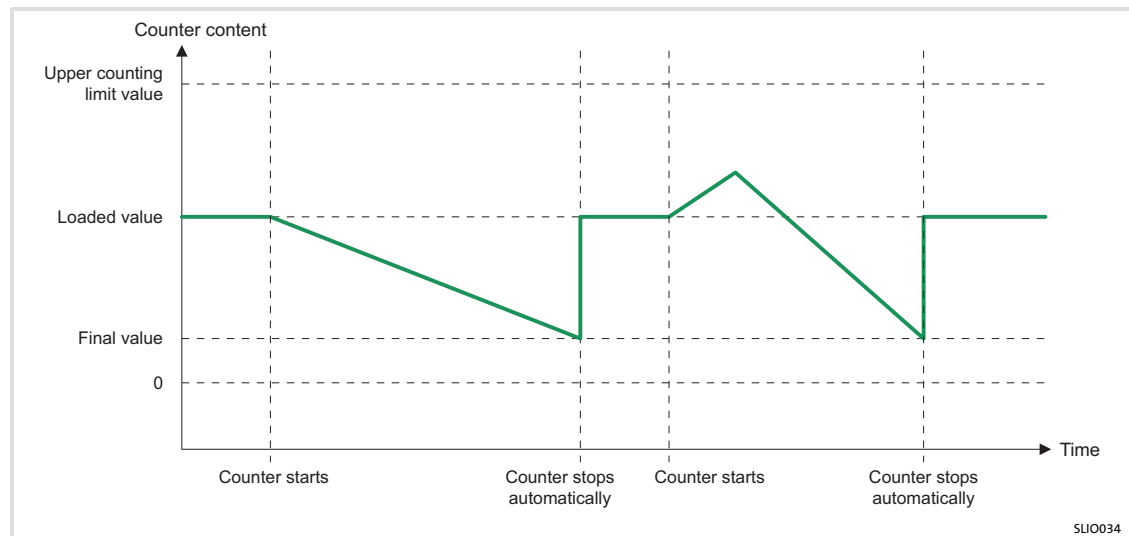


Fig. 3-62 Example of "Counting once" with main counting direction backwards

Counting periodically

A) No main counting direction:

Limits	Counting range
Lower counting limit	-2 147 483 648 (-2^{31})
Upper counting limit	+2 147 483 647 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards from the loading value or backwards in the counting range.
 - If there is an overflow or underflow at the respective counting limit, the counter skips to the loading value and continues to count from there.
- ▶ For stopping the counting process the internal gate has to be closed.

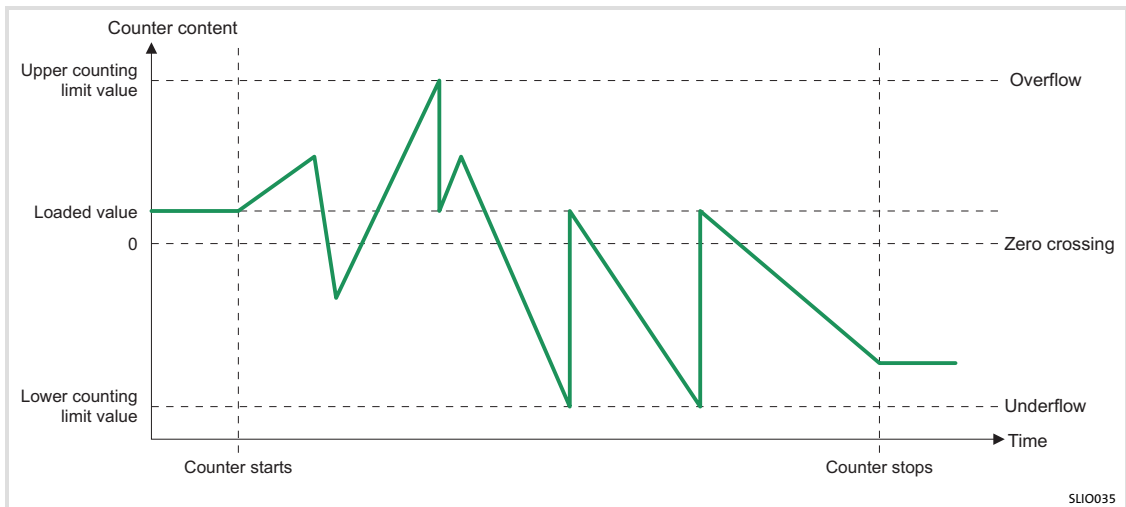


Fig. 3-63 Example of "Counting periodically" and no main counting direction

Product description

I/O compound modules - counter

One counter 32 bits, 24 V DC - EPM-S600

B) Main counting direction forwards:

Limits	Counting range
Final value	-2 147 483 646 ($-2^{31}+1$) to +2 147 483 646 ($2^{31}-1$)
Lower counting limit	-2 147 483 648 (-2^{31})

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards from the loading value.
 - If the counter reaches the final value -1 in the positive direction, it skips to the loading value at the next positive count pulse and continues to count from there.
 - You can also count above the lower counting limit.
- ▶ For stopping the counting process the internal gate has to be closed.

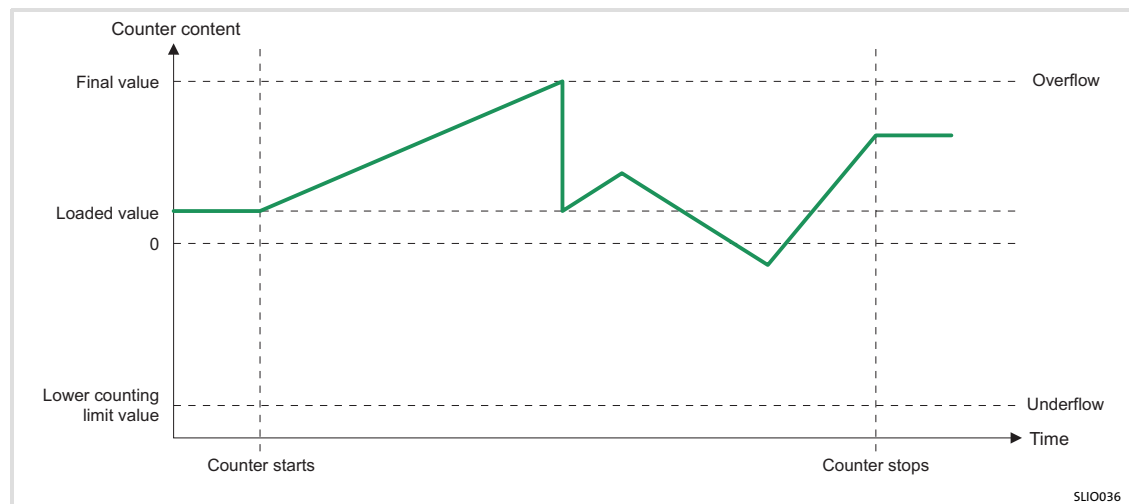


Fig. 3-64 Example of "Counting periodically" and main counting direction forwards

C) Main counting direction backwards:

Limits	Counting range
Final value	-2 147 483 646 ($-2^{31}+1$) to +2 147 483 646 ($2^{31}-1$)
Upper counting limit	+2 147 483 646 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts backwards from the loading value.
 - If the counter reaches the final value +1 in the negative direction, it skips to the loading value at the next negative count pulse and continues to count from there.
 - You can also count above the upper counting limit.
- ▶ For stopping the counting process the internal gate has to be closed.

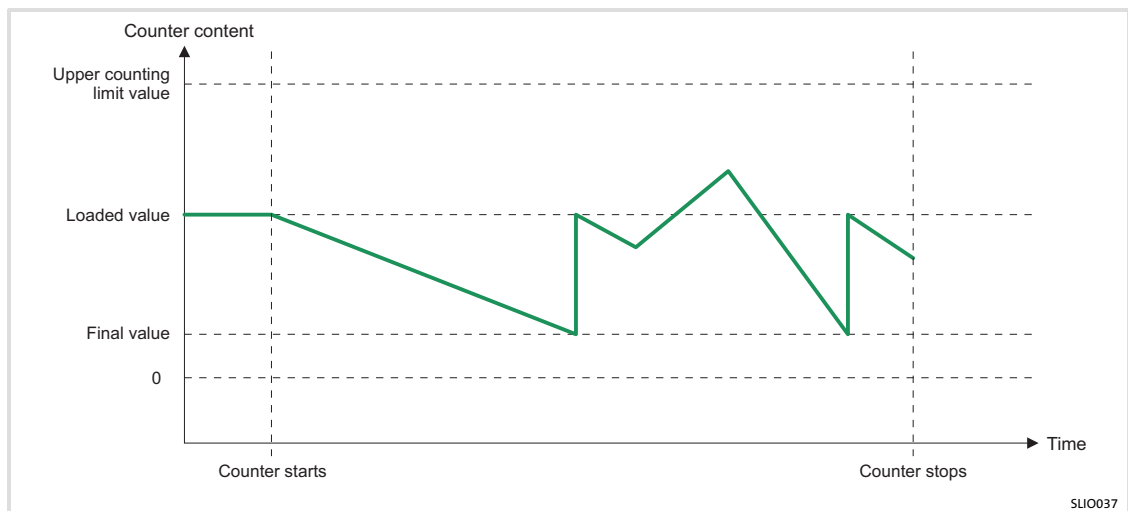


Fig. 3-65 Example of "Counting periodically" and main counting direction backwards

Product description

I/O compound modules - counter

One counter 32 bits, 24 V DC - EPM-S600

Gate function

The counter is controlled via the "internal gate" (I-gate) which is the AND logic operation of the software gate (SW gate) and the hardware gate (HW gate).

- ▶ The SW gate is opened and closed via the user program (control word).
 - With an edge change 0-1 at control word bit *SW_GATE_SET*, the SW gate opens (counter starts).
 - With an edge change 0-1 at control word bit *SW_GATE_RESET*, the SW gate closes (counter stops).
- ▶ The HW gate is opened and closed via the digital gate input.

In the parameter setting the HW gate can be deactivated, so that it is only possible to activate the counter via the SW gate.

The following states have an impact on the I-gate:

SW gate	HW gate	Has an impact on the I-gate
0	Edge change 0-1	0
1	Edge change 0-1	1
Edge change 0-1	1	1
Edge change 0-1	0	0
Edge change 0-1	deactivated	1

Via the parameter setting you define whether the gate is to cancel or interrupt the counting process.

- ▶ In the case of a cancelling gate function, the counting process starts after a restart from the loading value.
- ▶ In the case of an interrupting gate function, the counting process is continued at the current count value after a restart.

Action and response of the gate control:

Function	SW gate	HW gate	Counter response
Gate control via SW gate, cancelling	Edge change 0-1	deactivated	Restart with loading value
Gate control via SW gate, interrupting	Edge change 0-1	Deactivated	Continuation
Gate control via SW/HW gate, cancelling	Edge change 0-1	1	Continuation
	1	Edge change 0-1	Restart with loading value
Gate control via SW/HW gate, interrupting	Edge change 0-1	1	Continuation
	1	Edge change 0-1	Continuation

In particular in the case of the gate control via SW/HW gate in the "Counting once" operating mode: If the internal gate has been closed automatically, it can only be opened when the following conditions are met:

SW gate	HW gate	Response of I-gate
1	Edge change 0-1	1
Edge change 0-1 (after edge change 0-1 at HW gate)	1	1

Comparator

The comparison value is specified via the output area. If a comparison condition is met, bit *STS_DO* is set in the status word.



Note!

Please note that bit *STS_DO* can only be triggered if bit *STS_CTRL_DO* is set in the status word.

By parameterisation you can define the response of the counter output:

- ▶ Output never switches
- ▶ Output switches if count value \geq comparison value
As long as the count value is greater than or equals the comparison value, the output remains set
- ▶ Output switches if count value \leq comparison value
As long as the count value is smaller than or equals the comparison value, the output remains set.
- ▶ Output switches at comparison value

Pulse at comparison value: If the counter reaches the comparison value, the output is set for the parameterised pulse duration. If the pulse duration is = 0, the output is set until the comparison condition is no longer met. If you have set a main counting direction, the output is only switched from the main counting direction when the comparison value is reached.

Pulse duration: The pulse duration indicates for how long the output is to be set. It can be preselected in steps of 2.048 ms between 0 and 522.24 ms. The pulse duration starts with the setting of the respective digital output. The inaccuracy of the pulse duration is smaller than 2.048 ms. The pulse duration is not re-triggered if the comparison value has been exited and reached again during one pulse output.



Note!

Together with bit *STS_DO*, bit *STS_CMP* is set in the status word. In contrast to bit *STS_DO*, however, it remains set until it is reset with *RES_SET* in the control word.

Hysteresis

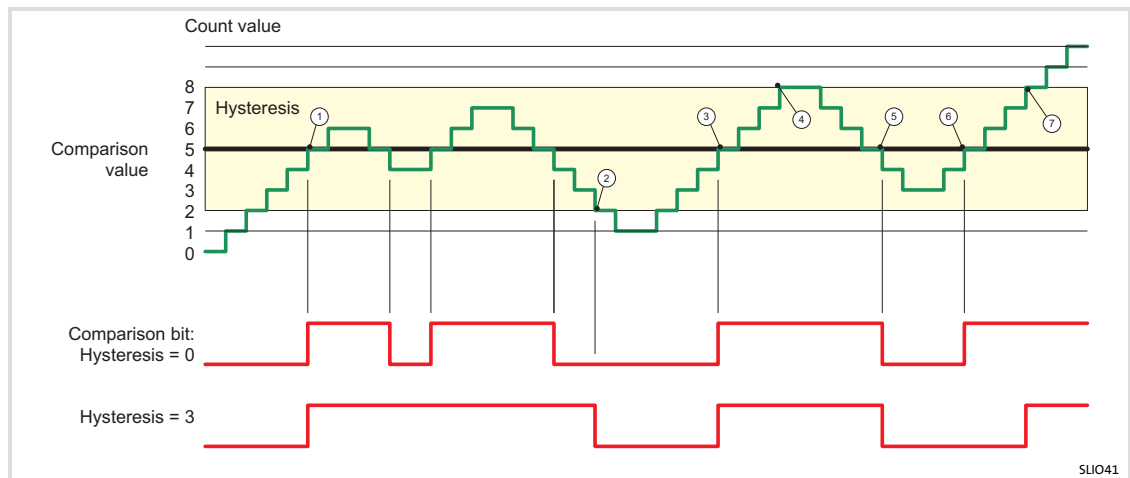
The hysteresis for instance serves to avoid frequent switching operations of the output and triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off. The hysteresis has an effect on the zero crossing, overflow/underflow, and on the comparison value.

An active hysteresis remains active after the change. The new hysteresis range becomes active at the next hysteresis event.

In the following illustrations the response of the output at hysteresis 0 and hysteresis 3 for the corresponding conditions is represented:

A) Function mode in the case of count value \geq comparison value

When the comparison condition is met, hysteresis becomes active. When hysteresis is active, the comparison result remains unchanged until the count value exits the hysteresis range set. After the hysteresis range is exited, hysteresis is only activated again when the comparison conditions are met.

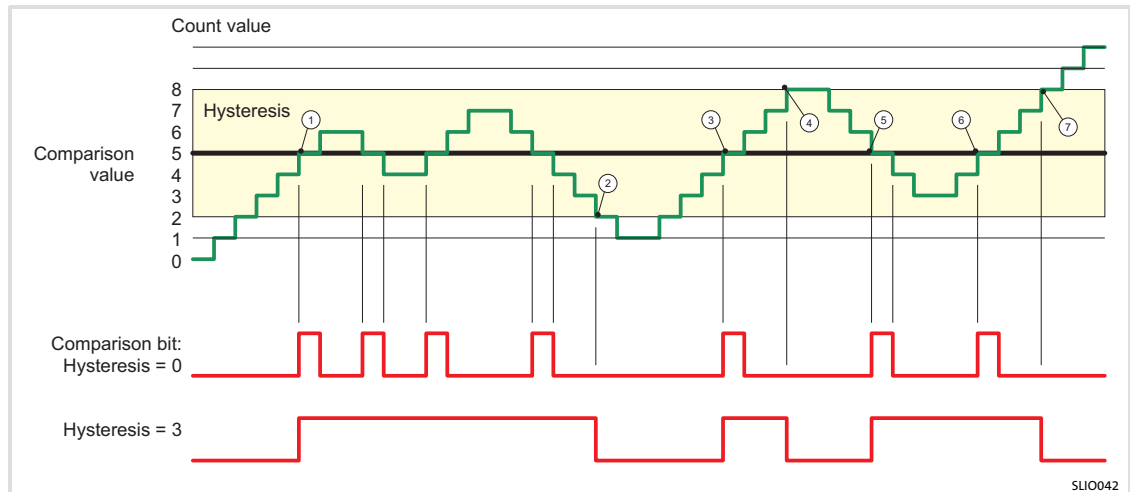


- ① Count value \geq comparison value \rightarrow Output is set and hysteresis is activated
- ② Exiting of the hysteresis range \rightarrow Output is reset
- ③ Count value \geq comparison value \rightarrow Output is set and hysteresis is activated
- ④ Exiting of the hysteresis range, output remains set, since count value \geq comparison value
- ⑤ Count value $<$ comparison value and hysteresis active \rightarrow Output is reset
- ⑥ Count value \geq comparison value \rightarrow Output is not set since hysteresis is activated
- ⑦ Exiting of the hysteresis range, output is set, since count value \geq comparison value

SIO41

B) Function mode in the case of comparison value with zero pulse duration

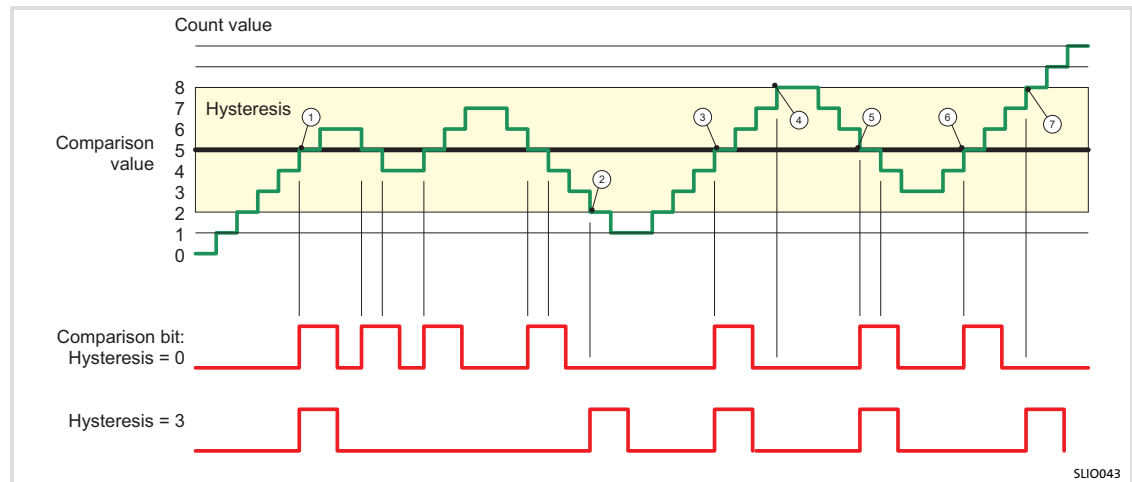
When the comparison condition is met, hysteresis becomes active. When hysteresis is active, the comparison result remains unchanged until the count value exits the hysteresis range set. After the hysteresis range is exited, hysteresis is only activated again when the comparison conditions are met.



- ① Count value = comparison value → Output is set and hysteresis is activated
- ② Exiting of the hysteresis range → Output is reset and count value < comparison value
- ③ Count value = comparison value → Output is set and hysteresis is activated
- ④ Output is reset due to exiting of the hysteresis range and count value > comparison value
- ⑤ Count value = comparison value → Output is set and hysteresis is activated
- ⑥ Count value = comparison value and hysteresis active → Output remains set
- ⑦ Exiting of the hysteresis range and count value > comparison value → Output is reset

C) Function mode for comparison value with non-zero pulse duration

When the comparison condition is met, hysteresis becomes active and a pulse of the parameterised duration is released. As long as the count value is within the hysteresis range, no further pulse is released. With activation of the hysteresis, the counting direction is stored within the module. If the count value exits the hysteresis range in opposition to the counting direction stored, a pulse of the parameterised duration is released. When the hysteresis range is exited without a change in direction, no pulse is released.



- ① Count value = comparison value → Pulse of the parameterised period is output, hysteresis is activated, and the counting direction is stored
- ② Exiting of the hysteresis range against the counting direction stored → Pulse of the parameterised pulse duration is output and hysteresis is deactivated
- ③ Count value = comparison value → Pulse of the parameterised pulse duration is output, hysteresis is activated, and the counting direction is stored
- ④ Hysteresis range is exited without change of the counting direction → Hysteresis is deactivated
- ⑤ Count value = comparison value → Pulse of the parameterised pulse duration is output, hysteresis is activated, and the counting direction is stored
- ⑥ Count value = comparison value and hysteresis active → No pulse
- ⑦ Exiting of the hysteresis range against the counting direction stored → Pulse of the parameterised pulse duration is output and hysteresis is deactivated

3.9.2 Two counters 32 bits, 24 V DC - EPM-S601

This module measures the pulses of up to two connected encoders and processes them according to the mode selected.

Features

- ▶ 2 counters 32 bits (AB), invertible, DC 24 V
- ▶ Counting frequency max. 400 kHz
- ▶ Comparison value, set value, input filter
- ▶ Alarm and diagnostic function

Overview

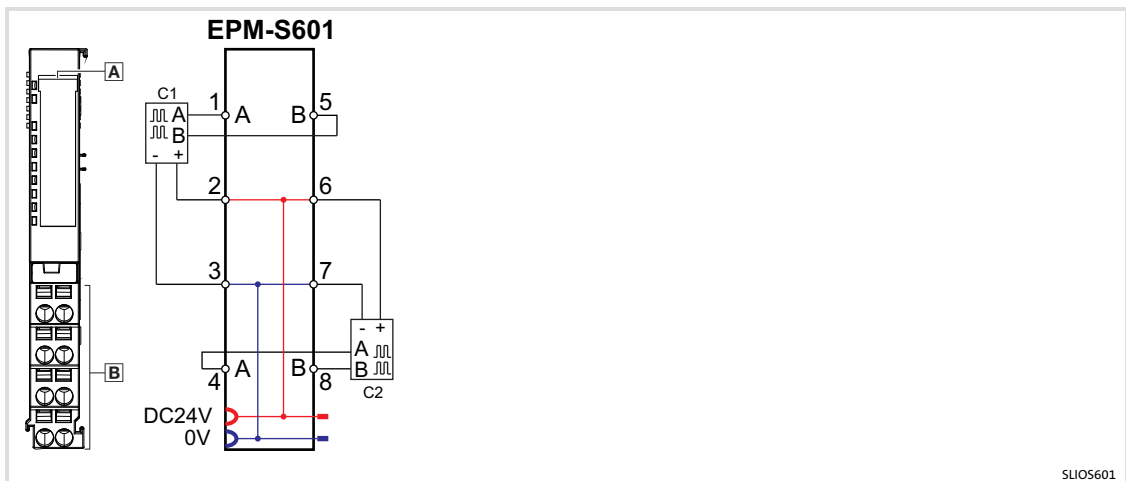


Fig. 3-66 Elements and circuit diagram

- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs A				
View	Pos.	Designation	Colour	Explanation
	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error (see table below)
	3	A1	Green	On: Digital input 1, counter 1, "A1"/"pulse" triggered
	4	B1		On: Digital input 5, counter 1, "B1"/"direction" triggered
	5	A2		On: Digital input 4, counter 2, "A2"/"pulse" triggered
	6	B2		On: Digital input 8, counter 2, "B2"/"direction" triggered
	7	-	-	Not assigned
	8	-	-	
	9	-	-	
	10	-	-	

Product description

I/O compound modules - counter

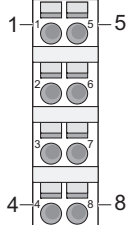
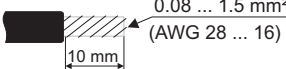
Two counters 32 bits, 24 V DC - EPM-S601

Messages of the status LEDs RUN and MF

RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error (📖 274)

Terminals

Module terminals, spring terminals

View	Designation	Explanation	Terminal data
 <p>SUI0002</p>	1	Digital input, counter 1, "A"/"pulse" Pulse input for counting signal or track A of an encoder for single, double, or quadruple evaluation	
	2	DC 24 V for encoder supply	
	3	GND	
	4	Digital input, counter 2, "A"/"pulse" Pulse input for counting signal or track A of an encoder for single, double, or quadruple evaluation	
	5	Digital input, counter 1, "B"/"direction" Direction signal or track B of an encoder (can be inverted via parameterisation)	
	6	DC 24 V for encoder	
	7	GND	
	8	Digital input, counter 2, "B"/"direction" Direction signal or track B of an encoder (can be inverted via parameterisation)	

Technical data

EPM-S601: rated data

Module identifier 2243_{dec}

Current consumption/power loss

Current consumption from backplane bus 75 mA

Power loss 0.9 W

EPM-S601: rated data

Digital inputs

Number of inputs	4
Cable length	
shielded	100 m
Load voltage	
Nominal value	DC 20.4 ... 28.8 V
Current consumption from load voltage L+	15 mA (without load)
Input voltage	
Nominal value	DC 20.4 ... 28.8 V
for signal "0"	DC 0 ... 5 V
for signal "1"	DC 15 ... 28.8 V
Input current	
for signal "1"	3 mA
2-wire BERO	
Connection possible	Yes
Max. permissible closed-circuit current	0.5 mA
Input delay	
from "0" to "1"	0.8 µs
from "1" to "0"	0.8 µs
Number of inputs which can be used simultaneously	
horizontal structure	4
vertical structure	4
Input characteristic	IEC 61131, type 1
Input data size	12 bytes

Digital outputs

Output data size	12 bytes
------------------	----------

Meters

Number of counters	2
Counter width	32 bits
Frequency	
Input frequency, max	500 kHz
Counting frequency, max	400 kHz
Operating mode	
Incremental encoder	Possible
Pulse/direction	Possible
Pulse	Not possible
Frequency measurement	Not possible
Period duration measurement	Not possible
Connection	
Gate connection	Not possible
Latch connection	Not possible
Reset connection	Not possible
Counter output	Not possible

Product description

I/O compound modules - counter

Two counters 32 bits, 24 V DC - EPM-S601

EPM-S601: rated data

Status, alarm, diagnostics

Status display	Yes
Alarms	Yes, parameterisable
Process alarm	Yes, parameterisable
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes, parameterisable
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	None

Electrical isolation

Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

Parameterisable functions

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"
Additional functions	Description
Main counting direction	The main counting direction can be parameterised: None: The whole counting range is available. Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following. Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area). The following response can be parameterised: Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again. Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.
Comparator	You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.
Hysteresis	By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.
Process alarm	The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events: <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.
Diagnostic function	Diagnostic functions are provided in the modules.
Diagnostic information	The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.

Counting continuously

Limits	Counting range
Lower counting limit	-2 147 483 648 (-2^{31})
Upper counting limit	+2 147 483 647 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts from the loading value in the counting range.
 - If the counter reaches the upper counting limit when counting forwards, and if a further count pulse in positive direction occurs, the counter skips to the lower counting limit and continues to count from there.
 - If the counter reaches the lower counting limit when counting backwards, and if a further negative count pulse occurs, the counter skips to the upper counting limit and continues to count from there.
 - If maximum values are exceeded or minimum values are not reached, the status bits *STS_OFLW* or *STS_UFLW* are set. These bits remain set until they are reset with *RES_SET* in the control word. If enabled, additionally a process alarm is triggered.
- ▶ For stopping the counting process the internal gate has to be closed.

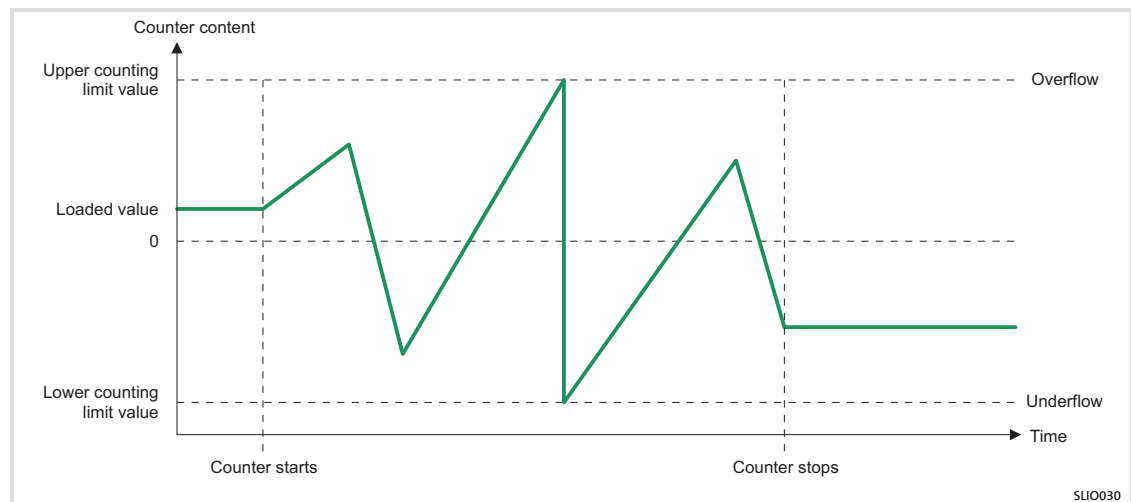


Fig. 3-67 Example of "Counting continuously"

Counting once

A) No main counting direction:

Limits	Counting range
Lower counting limit	-2 147 483 648 (-2^{31})
Upper counting limit	+2 147 483 647 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards once from the loading value or backwards in the preset counting range.
 - If the counting limits are not reached or exceeded, the counter skips to the other counting limit, respectively, the internal gate is closed automatically and the status bits *STS_OFLW* or *STS_UFLW* are set. If enabled, a process alarm is effected.
- ▶ For stopping the counting process the internal gate has to be closed.
- ▶ For starting the counting process again, the internal gate has to be opened.
 - If the gate control is interrupted, the counting process continues at the current counter content.
 - If the gate control is cancelled, the counter starts from the loading value.

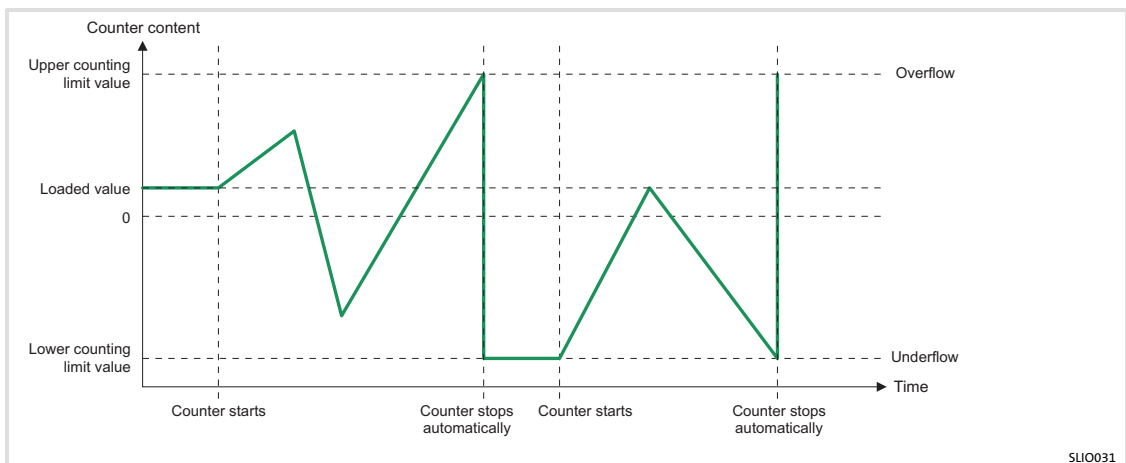


Fig. 3-68 Example of "Counting once", no main counting direction and with interrupting gate control

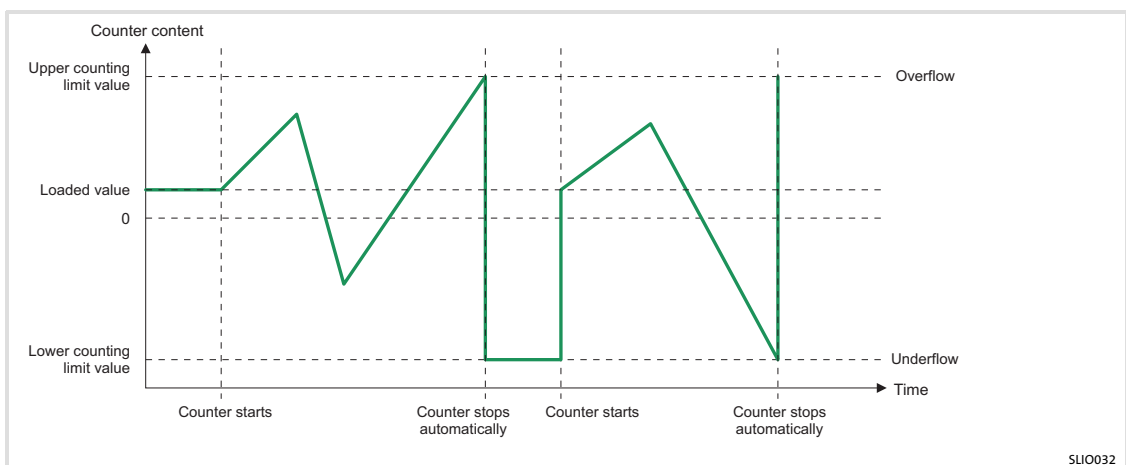


Fig. 3-69 Example of "Counting once", no main counting direction and with cancelling gate control

Product description

I/O compound modules - counter

Two counters 32 bits, 24 V DC - EPM-S601

B) Main counting direction forwards:

Limits	Counting range
Final value	-2 147 483 646 ($-2^{31}+1$) to +2 147 483 646 ($2^{31}-1$)
Lower counting limit	-2 147 483 648 (-2^{31})

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards from the loading value.
 - If the counter reaches the final value -1 in the positive direction, it skips to the loading value at the next count pulse and the internal gate is closed automatically.
- ▶ For starting the counting process again, the internal gate has to be opened.
 - The counter counts from the loading value.
 - You can also count above the lower counting limit.

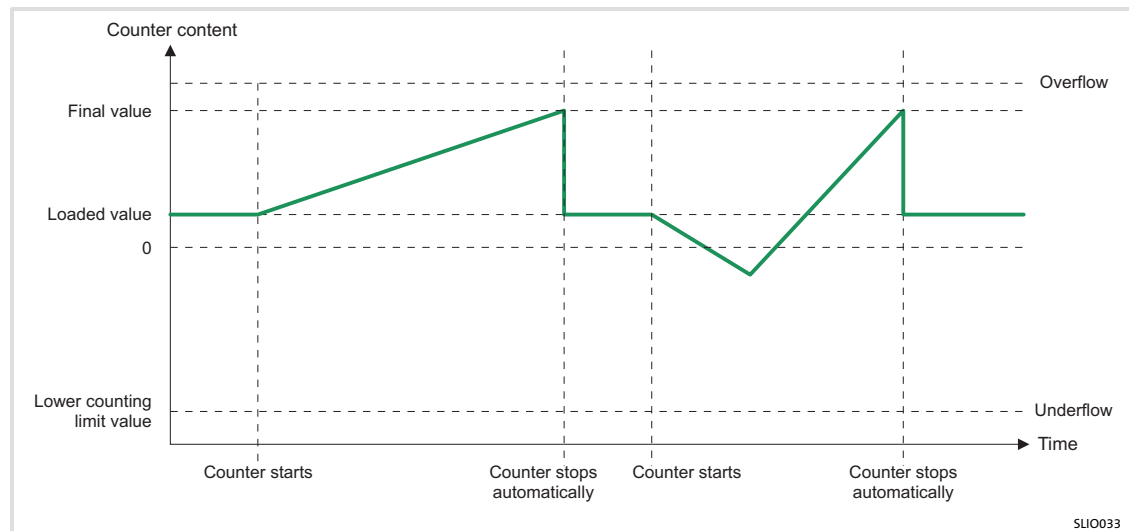


Fig. 3-70 Example of "Counting once" with main counting direction forwards

C) Main counting direction backwards:

Limits	Counting range
Final value	-2 147 483 646 ($-2^{31}+1$) to +2 147 483 646 ($2^{31}-1$)
Upper counting limit	+2 147 483 646 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts backwards from the loading value.
 - If the counter reaches the final value +1 in the negative direction, it skips to the loading value at the next count pulse and the internal gate is closed automatically.
- ▶ For starting the counting process again, the internal gate has to be opened again.
 - The counter starts from the loading value.
 - You can also count above the upper counting limit.

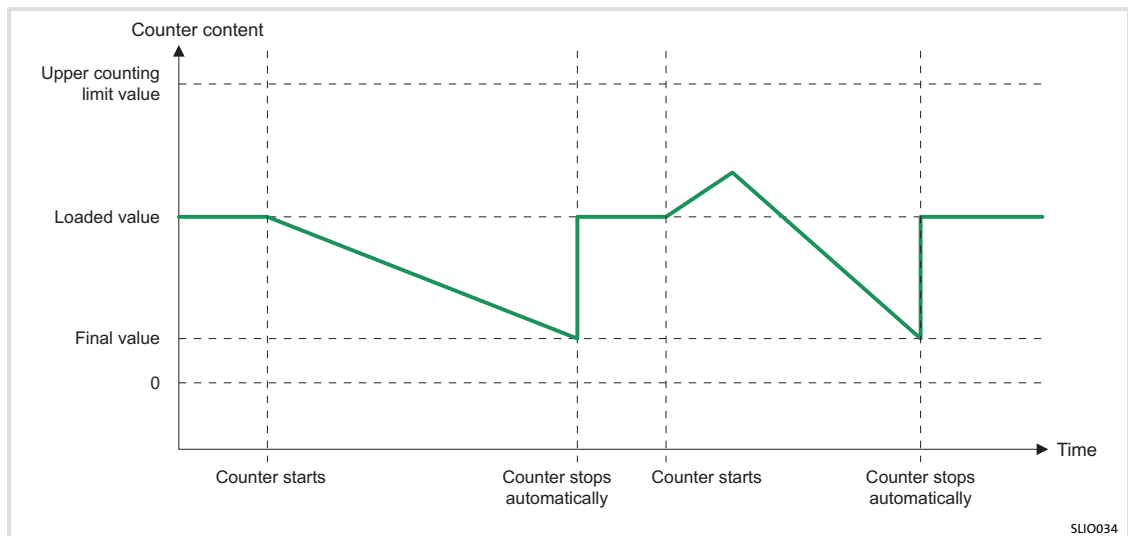


Fig. 3-71 Example of "Counting once" with main counting direction backwards

Product description

I/O compound modules - counter

Two counters 32 bits, 24 V DC - EPM-5601

Counting periodically

A) No main counting direction:

Limits	Counting range
Lower counting limit	-2 147 483 648 (-2^{31})
Upper counting limit	+2 147 483 647 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards from the loading value or backwards in the counting range.
 - If there is an overflow or underflow at the respective counting limit, the counter skips to the loading value and continues to count from there.
- ▶ For stopping the counting process the internal gate has to be closed.

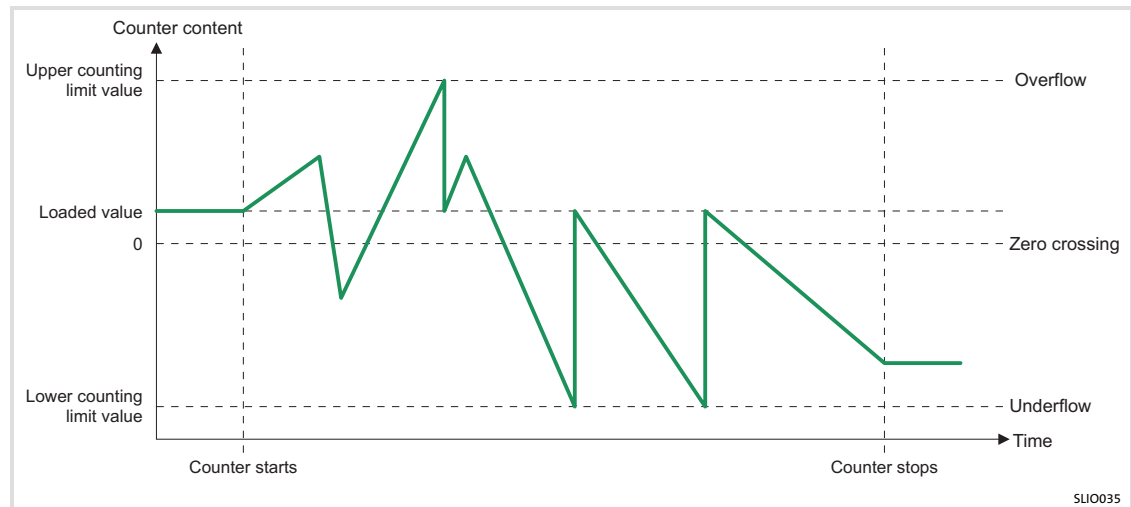


Fig. 3-72 Example of "Counting periodically" and no main counting direction

B) Main counting direction forwards:

Limits	Counting range
Final value	-2 147 483 646 ($-2^{31}+1$) to +2 147 483 646 ($2^{31}-1$)
Lower counting limit	-2 147 483 648 (-2^{31})

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards from the loading value.
 - If the counter reaches the final value -1 in the positive direction, it skips to the loading value at the next positive count pulse and continues to count from there.
 - You can also count above the lower counting limit.
- ▶ For stopping the counting process the internal gate has to be closed.

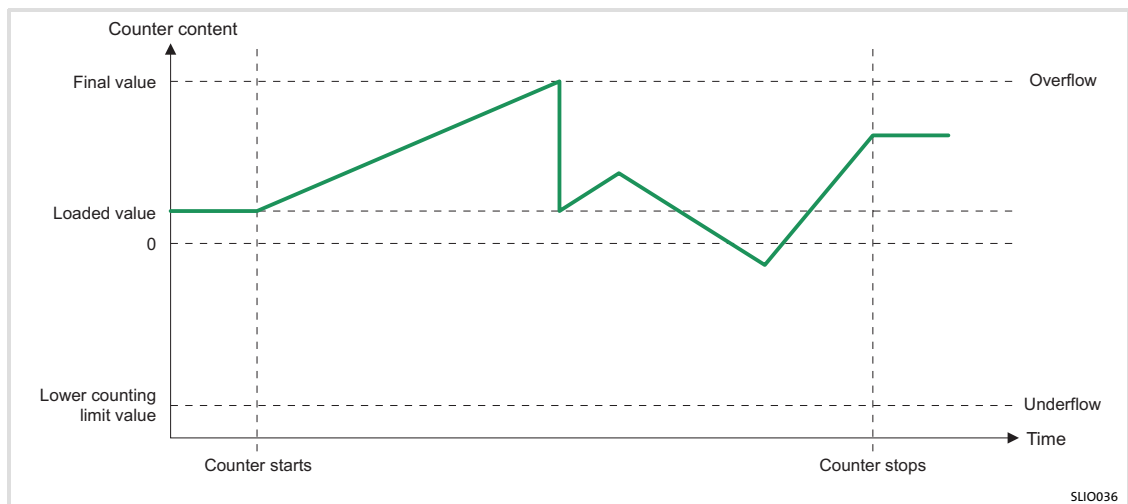


Fig. 3-73 Example of "Counting periodically" and main counting direction forwards

Product description

I/O compound modules - counter

Two counters 32 bits, 24 V DC - EPM-S601

C) Main counting direction backwards:

Limits	Counting range
Final value	-2 147 483 646 ($-2^{31}+1$) to +2 147 483 646 ($2^{31}-1$)
Upper counting limit	+2 147 483 646 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts backwards from the loading value.
 - If the counter reaches the final value +1 in the negative direction, it skips to the loading value at the next negative count pulse and continues to count from there.
 - You can also count above the upper counting limit.
- ▶ For stopping the counting process the internal gate has to be closed.

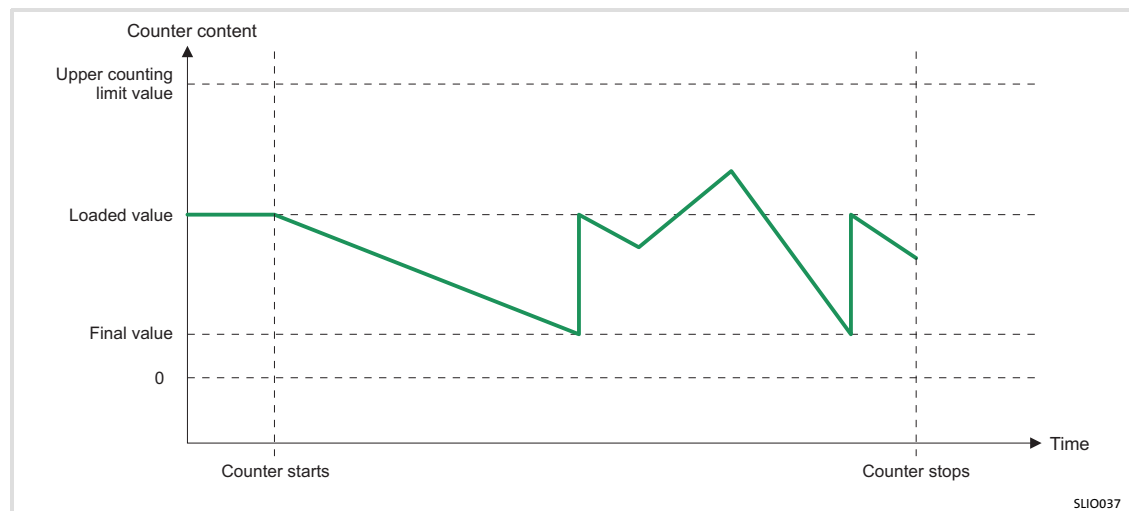


Fig. 3-74 Example of "Counting periodically" and main counting direction backwards

Gate function

The counter is controlled via the "internal gate" (I-gate). For this counter, the I-gate is conform to the software gate (SW gate).

The SW gate is opened and closed via the user program (control word).

- ▶ With an edge change 0-1 at the control word bit *SW_GATE_SET*, the SW gate opens (counter starts).
- ▶ With an edge change 0-1 at the control word bit *SW_GATE_RESET*, the SW gate closes (counter stops).

The following states have an impact on the I-gate:

SW gate	Response of I-gate
0	0
1	1
Edge change 0-1	1

Via the parameter setting you define whether the gate is to cancel or interrupt the counting process.

- ▶ In the case of a cancelling gate function, the counting process starts after a restart from the loading value.
- ▶ In the case of an interrupting gate function, the counting process is continued at the current count value after a restart.

Characteristic for the gate control via SW/HW gate in the "Counting once" operating mode: If the I-gate was closed automatically, it can only be opened by means of an edge change 0-1 at *SW_GATE_SET*.

Product description

I/O compound modules - counter

Two counters 32 bits, 24 V DC - EPM-5601

Comparator

The comparison value is specified via the output area. The comparison bit can be found in the status word under *STS_COMP*.



Note!

Please note that bit *STS_COMP* can only be triggered if bit *STS_CTRL_COMP* is set in the status word.

Via the parameter setting you can define the response of the comparison bit:

- ▶ Comparison bit never switches
- ▶ Comparison bit is set if count value \geq comparison value
As long as the count value is greater than or equals the comparison value, the comparison bit remains set
- ▶ Comparison bit is set if count value \leq comparison value
As long as the count value is smaller than or equals the comparison value, the comparison bit remains set.
- ▶ Comparison bit is set if count value = comparison value
If the count value = comparison value, the comparison bit is set. The bit remains set until the comparison condition is no longer met. If you have set a main counting direction, the comparison bit is only set when the comparison value from the main counting direction is reached.



Note!

Together with bit *STS_COMP*, bit *STS_CMP* is set in the status word. In contrast to bit *STS_COMP*, however, it remains set until it is reset with *RES_SET* in the control word.

Hysteresis

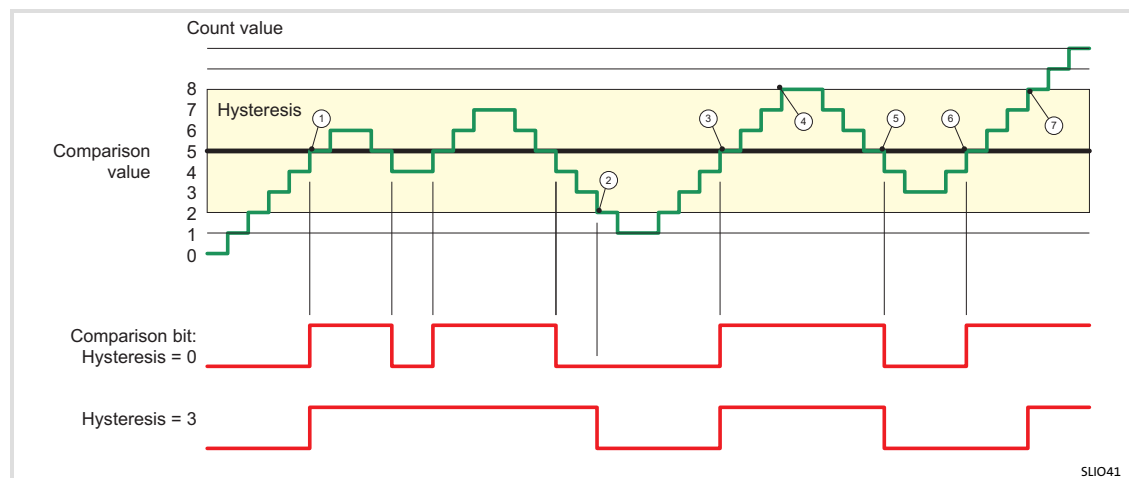
The hysteresis for instance serves to avoid frequent switching operations of the output and triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off. The hysteresis has an effect on the zero crossing, overflow/underflow, and on the comparison value.

An active hysteresis remains active after the change. The new hysteresis range becomes active at the next hysteresis event.

In the following illustrations the response of the output at hysteresis 0 and hysteresis 3 for the corresponding conditions is represented:

A) Function mode in the case of count value \geq comparison value

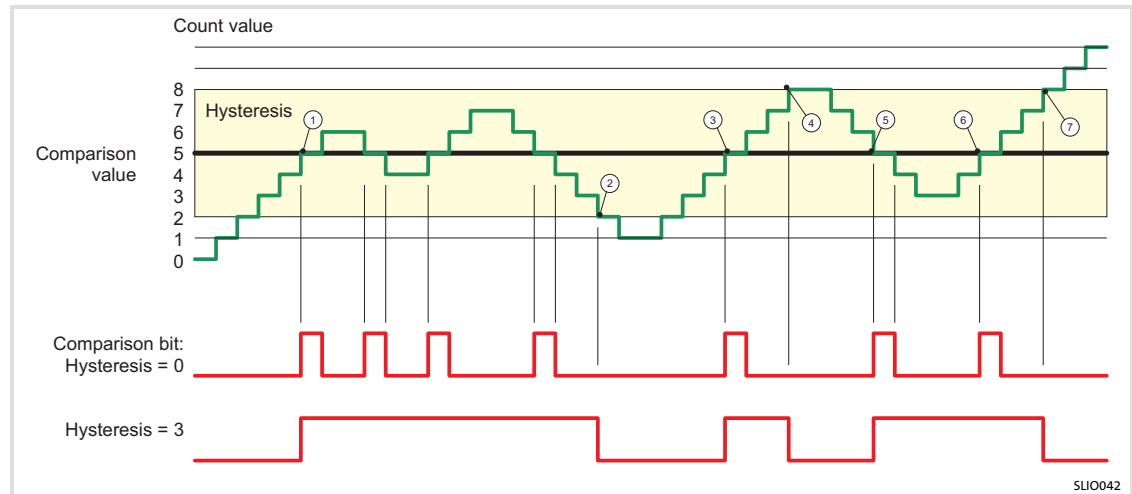
When the comparison condition is met, hysteresis becomes active. When hysteresis is active, the comparison result remains unchanged until the count value exits the hysteresis range set. After the hysteresis range is exited, hysteresis is only activated again when the comparison conditions are met.



- ① Count value \geq comparison value \rightarrow Comparison bit is set and hysteresis is activated
- ② Exiting of the hysteresis range \rightarrow Comparison bit is reset
- ③ Count value \geq comparison value \rightarrow Comparison bit is set and hysteresis is activated
- ④ Exiting of the hysteresis range, comparison bit remains set, since count value \geq comparison value
- ⑤ Count value $<$ comparison value and hysteresis active \rightarrow Comparison bit is reset
- ⑥ Count value \geq comparison value \rightarrow Comparison bit is not set since hysteresis is activated
- ⑦ Exiting of the hysteresis range, comparison bit is set, since count value \geq comparison value

B) Function mode for count value = comparison value

When the comparison condition is met, hysteresis becomes active. When hysteresis is active, the comparison result remains unchanged until the count value exits the hysteresis range set. After the hysteresis range is exited, hysteresis is only activated again when the comparison conditions are met.



- ① Count value = comparison value → Comparison bit is set and hysteresis is activated
- ② Exiting of the hysteresis range → Comparison bit is reset and count value < comparison value
- ③ Count value = comparison value → Comparison bit is set and hysteresis is activated
- ④ Comparison bit is reset due to exiting of the hysteresis range and count value > comparison value
- ⑤ Count value = comparison value → Comparison bit is set and hysteresis is activated
- ⑥ Count value = comparison value and hysteresis active → Comparison bit remains set
- ⑦ Exiting of the hysteresis range and count value > comparison value → Comparison bit is reset

3.9.3 One counter 32 bits, 5 V DC - EPM-S602

This module measures the pulses of one connected encoder and processes them according to the mode selected.

Features

- ▶ 1 counter 32 bits (AB), invertible, DC 5 V (differential signal)
- ▶ Counting frequency max. 2 MHz
- ▶ Comparison value, set value, input filter
- ▶ Alarm and diagnostic function

Overview



Fig. 3-75 Elements and circuit diagram
 A Displays for module status
 B Terminals
 1 ... 8 Connection number

Status displays

Module status LEDs A				
View	Pos.	Designation	Colour	Explanation
	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error (see table below)
	3	A	Green	On: Digital input 1 and 5, "A"/"pulse" triggered
	4	B		On: Digital input 4 and 8, "B"/"direction" triggered
	5	Reset		On: Digital input 6 and 7, "Reset" triggered
	6			
	7			
	8	-	-	Not assigned
	9			
	10			

Product description

I/O compound modules - counter

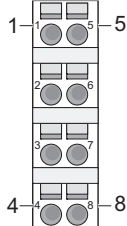
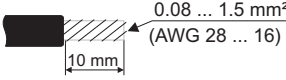
One counter 32 bits, 5 V DC - EPM-S602

Messages of the status LEDs RUN and MF

RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error (📖 274)

Terminals

Module terminals, spring terminals

View	Name	Explanation	Terminal data
 <p>SUI0002</p>	1	Digital input "A+"/"pulse" Differential input for counting signal or track A of an encoder for single, double, or quadruple evaluation	
	2	DC 5 V for encoder supply Load capacity: max. 500 mA	
	3	GND	
	4	Digital input "B+"/"direction" Differential input for direction signal or track B of an encoder (can be inverted via parameterisation)	
	5	Digital input "A-"/"pulse" See 1	
	6	Differential input for reset "Z+"	
	7	Differential input for reset "Z-"	
	8	Digital input "B-"/"direction" See 4	

Technical data

EPM-S602: rated data

Module identifier 2242_{dec}

Current consumption/power loss

Current consumption from backplane bus	70 mA
Power loss	0.85 W

EPM-S602: rated data	
Digital inputs	
Number of inputs	0
Cable length	
shielded	100 m
Load voltage	
Nominal value	DC 20.4 ... 28.8 V
Current consumption from load voltage L+	20 mA (without load)
Input voltage	
for signal "0"	Differential signal RS422
for signal "1"	Differential signal RS422
Input resistance	120 Ω
Input delay	
from "0" to "1"	0.8 μs
from "1" to "0"	0.8 μs
Input data size	8 bytes
Digital outputs	
Output data size	10 bytes
Counter	
Number of counters	1
Counter width	32 bits
Frequency	
Input frequency, max	500 kHz
Counting frequency, max	2 MHz
Operating mode	
Incremental encoder	Possible
Pulse/direction	Possible
Pulse	Not possible
Frequency measurement	Not possible
Period duration measurement	Not possible
Connection	
Gate connection	Not possible
Latch connection	Not possible
Reset connection	Possible
Counter output	Not possible
Status, alarm, diagnostics	
Status display	Yes
Alarms	Yes, parameterisable
Process alarm	Yes, parameterisable
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes, parameterisable
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	None

Product description

I/O compound modules - counter

One counter 32 bits, 5 V DC - EPM-S602

EPM-S602: rated data

Electrical isolation

Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

Parameterisable functions

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).</p> <p>The following response can be parameterised:</p> <p>Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>

Product description

I/O compound modules - counter

One counter 32 bits, 5 V DC - EPM-S602

Counting continuously

Limits	Counting range
Lower counting limit	-2 147 483 648 (-2^{31})
Upper counting limit	+2 147 483 647 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts from the loading value in the counting range.
 - If the counter reaches the upper counting limit when counting forwards, and if a further count pulse in positive direction occurs, the counter skips to the lower counting limit and continues to count from there.
 - If the counter reaches the lower counting limit when counting backwards, and if a further negative count pulse occurs, the counter skips to the upper counting limit and continues to count from there.
 - If maximum values are exceeded or minimum values are not reached, the status bits *STS_OFLW* or *STS_UFLW* are set. These bits remain set until they are reset with *RES_SET* in the control word. If enabled, additionally a process alarm is triggered.
- ▶ For stopping the counting process the internal gate has to be closed.

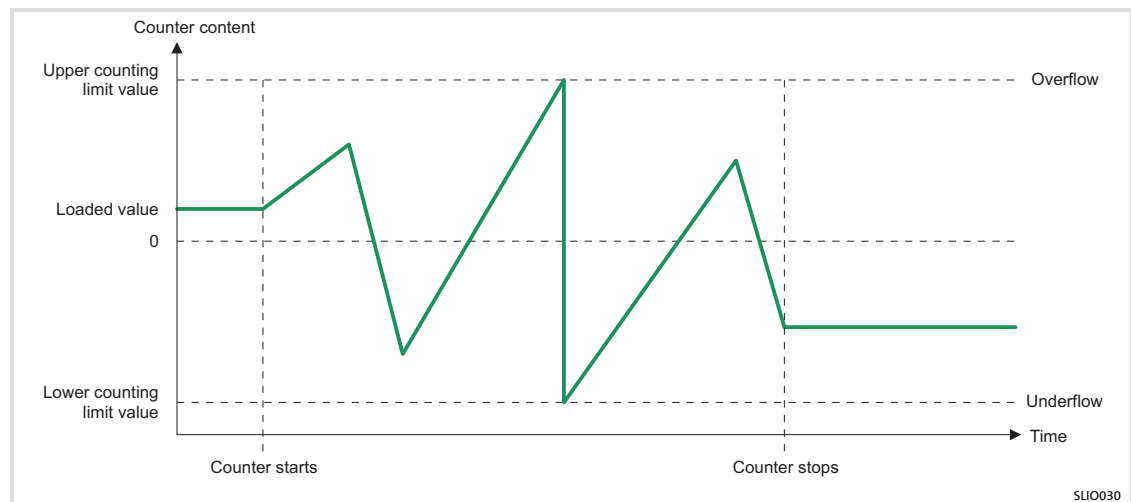


Fig. 3-76 Example of "Counting continuously"

Counting once

A) No main counting direction:

Limits	Counting range
Lower counting limit	-2 147 483 648 (-2^{31})
Upper counting limit	+2 147 483 647 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards once from the loading value or backwards in the preset counting range.
 - If the counting limits are not reached or exceeded, the counter skips to the other counting limit, respectively, the internal gate is closed automatically and the status bits *STS_OFLW* or *STS_UFLW* are set. If enabled, a process alarm is effected.
- ▶ For stopping the counting process the internal gate has to be closed.
- ▶ For starting the counting process again, the internal gate has to be opened.
 - If the gate control is interrupted, the counting process continues at the current counter content.
 - If the gate control is cancelled, the counter starts from the loading value.

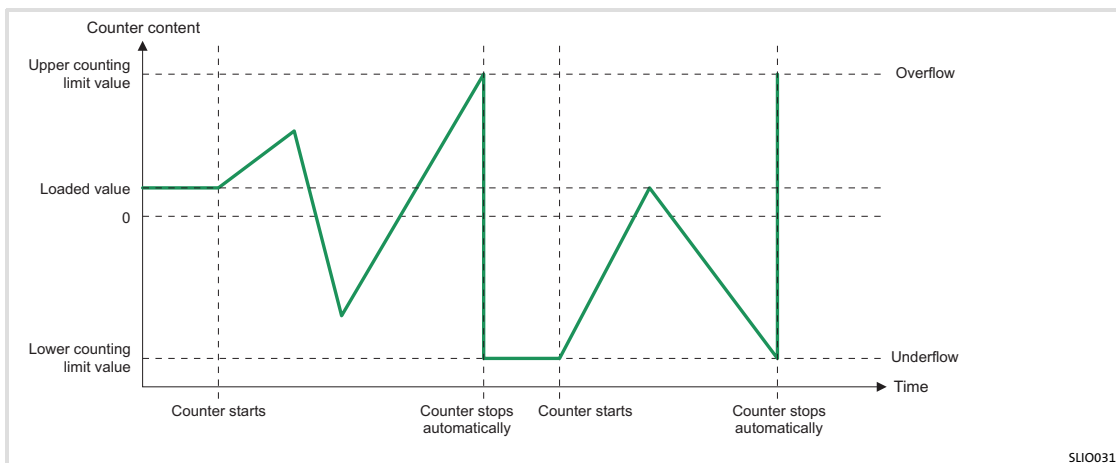


Fig. 3-77 Example of "Counting once", no main counting direction and with interrupting gate control

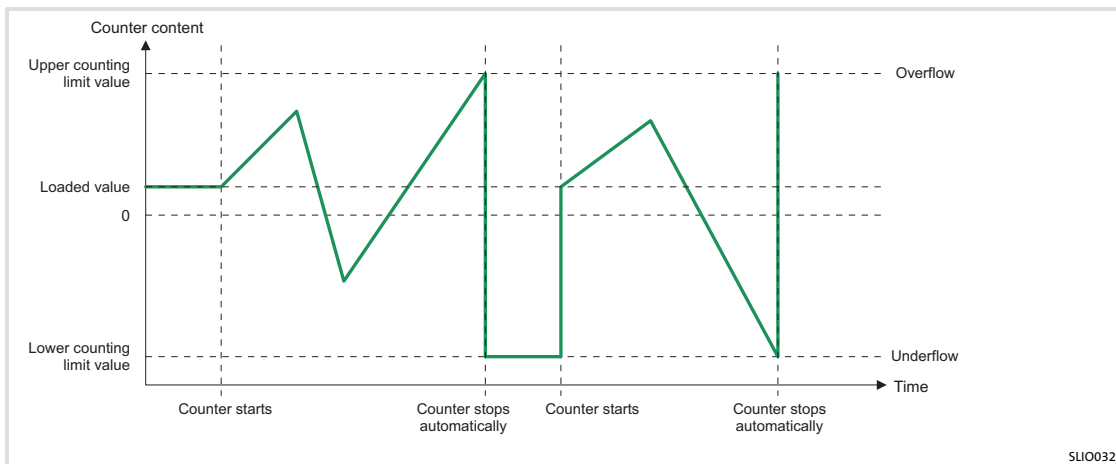


Fig. 3-78 Example of "Counting once", no main counting direction and with cancelling gate control

Product description

I/O compound modules - counter

One counter 32 bits, 5 V DC - EPM-S602

B) Main counting direction forwards:

Limits	Counting range
Final value	-2 147 483 646 ($-2^{31}+1$) to +2 147 483 646 ($2^{31}-1$)
Lower counting limit	-2 147 483 648 (-2^{31})

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards from the loading value.
 - If the counter reaches the final value -1 in the positive direction, it skips to the loading value at the next count pulse and the internal gate is closed automatically.
- ▶ For starting the counting process again, the internal gate has to be opened.
 - The counter counts from the loading value.
 - You can also count above the lower counting limit.

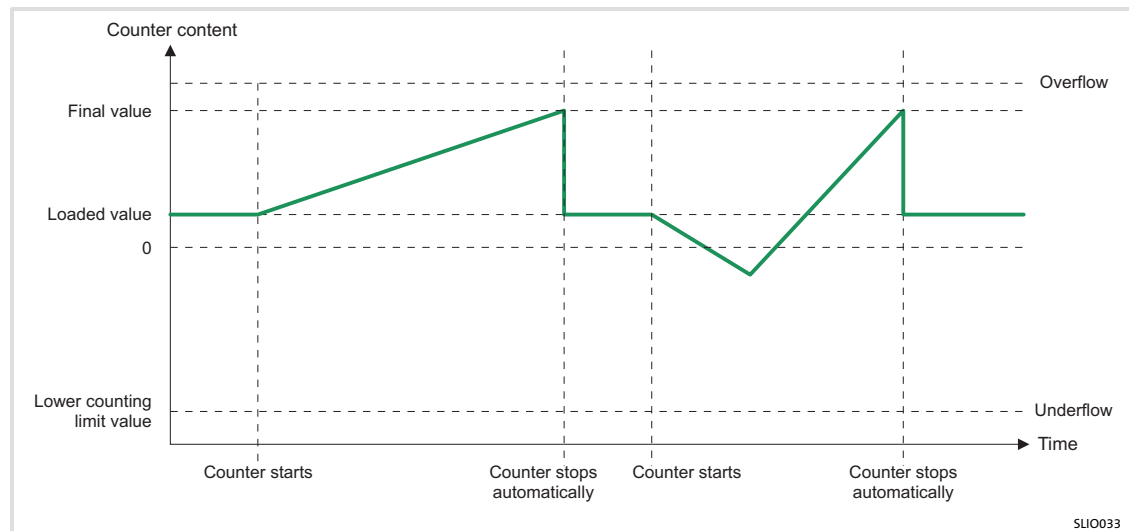


Fig. 3-79 Example of "Counting once" with main counting direction forwards

C) Main counting direction backwards:

Limits	Counting range
Final value	-2 147 483 646 (-2 ³¹ +1) to +2 147 483 646 (2 ³¹ -1)
Upper counting limit	+2 147 483 646 (2 ³¹ -1)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts backwards from the loading value.
 - If the counter reaches the final value +1 in the negative direction, it skips to the loading value at the next count pulse and the internal gate is closed automatically.
- ▶ For starting the counting process again, the internal gate has to be opened again.
 - The counter starts from the loading value.
 - You can also count above the upper counting limit.

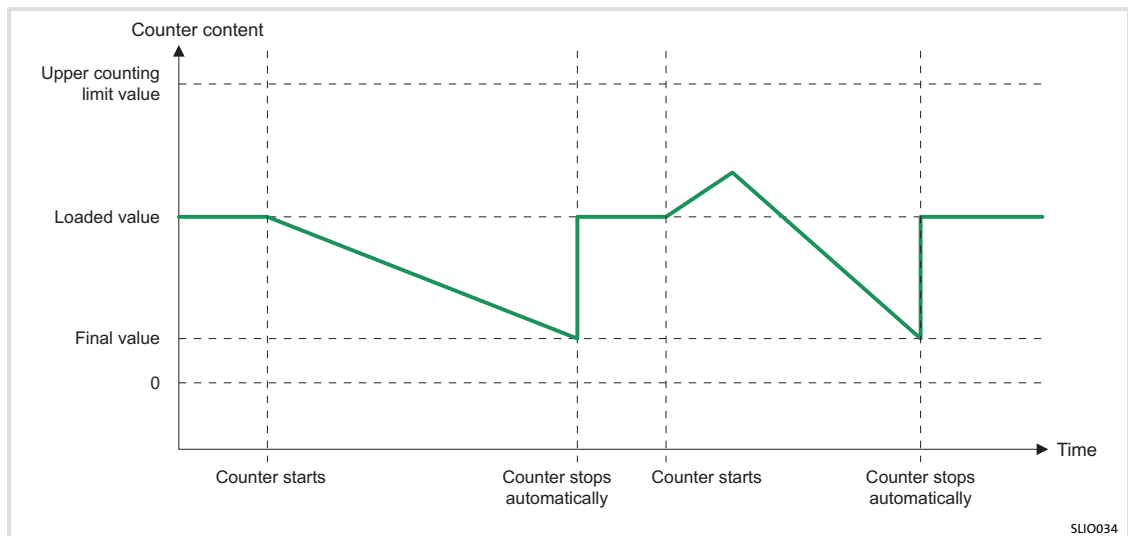


Fig. 3-80 Example of "Counting once" with main counting direction backwards

Product description

I/O compound modules - counter

One counter 32 bits, 5 V DC - EPM-S602

Counting periodically

A) No main counting direction:

Limits	Counting range
Lower counting limit	-2 147 483 648 (-2^{31})
Upper counting limit	+2 147 483 647 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards from the loading value or backwards in the counting range.
 - If there is an overflow or underflow at the respective counting limit, the counter skips to the loading value and continues to count from there.
- ▶ For stopping the counting process the internal gate has to be closed.

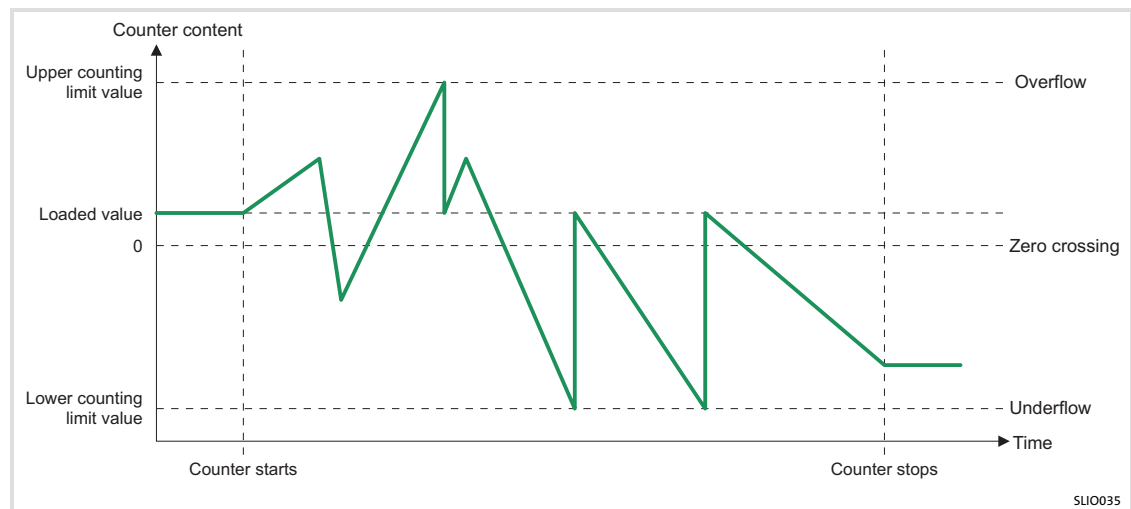


Fig. 3-81 Example of "Counting periodically" and no main counting direction

B) Main counting direction forwards:

Limits	Counting range
Final value	-2 147 483 646 ($-2^{31}+1$) to +2 147 483 646 ($2^{31}-1$)
Lower counting limit	-2 147 483 648 (-2^{31})

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts forwards from the loading value.
 - If the counter reaches the final value -1 in the positive direction, it skips to the loading value at the next positive count pulse and continues to count from there.
 - You can also count above the lower counting limit.
- ▶ For stopping the counting process the internal gate has to be closed.

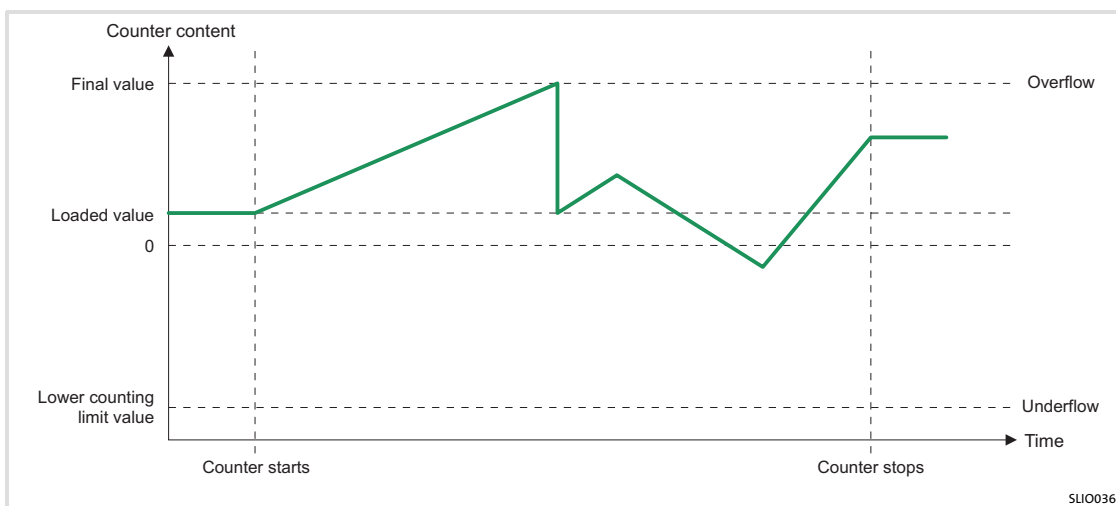


Fig. 3-82 Example of "Counting periodically" and main counting direction forwards

Product description

I/O compound modules - counter

One counter 32 bits, 5 V DC - EPM-S602

C) Main counting direction backwards:

Limits	Counting range
Final value	-2 147 483 646 ($-2^{31}+1$) to +2 147 483 646 ($2^{31}-1$)
Upper counting limit	+2 147 483 646 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter counts backwards from the loading value.
 - If the counter reaches the final value +1 in the negative direction, it skips to the loading value at the next negative count pulse and continues to count from there.
 - You can also count above the upper counting limit.
- ▶ For stopping the counting process the internal gate has to be closed.

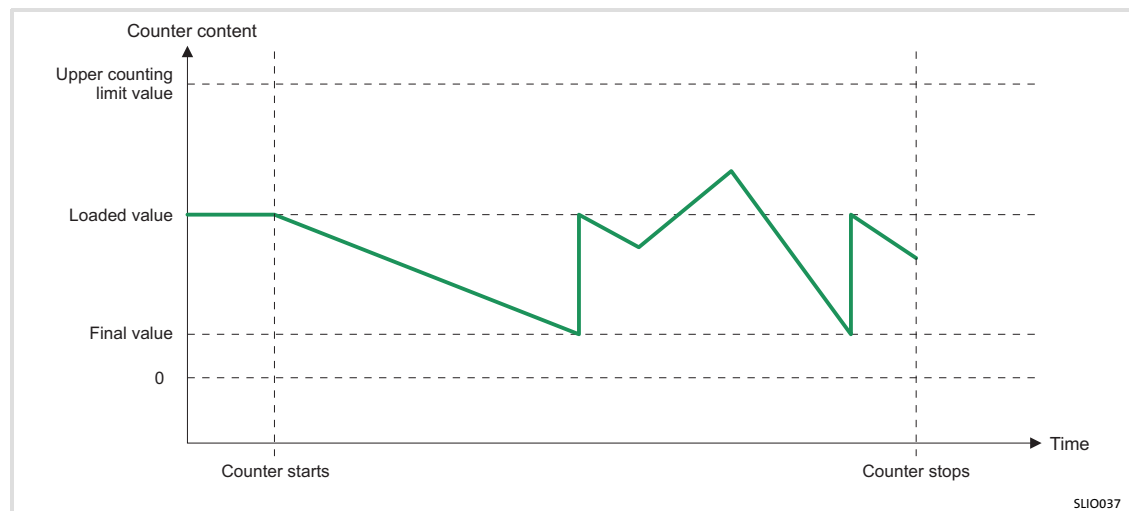


Fig. 3-83 Example of "Counting periodically" and main counting direction backwards

Gate function

The counter is controlled via the "internal gate" (I-gate). For this counter, the I-gate is conform to the software gate (SW gate).

The SW gate is opened and closed via the user program (control word).

- ▶ With an edge change 0-1 at the control word bit *SW_GATE_SET*, the SW gate opens (counter starts).
- ▶ With an edge change 0-1 at the control word bit *SW_GATE_RESET*, the SW gate closes (counter stops).

The following states have an impact on the I-gate:

SW gate	Response of I-gate
0	0
1	1
Edge change 0-1	1

Via the parameter setting you define whether the gate is to cancel or interrupt the counting process.

- ▶ In the case of a cancelling gate function, the counting process starts after a restart from the loading value.
- ▶ In the case of an interrupting gate function, the counting process is continued at the current count value after a restart.

Characteristic for the gate control via SW/HW gate in the "Counting once" operating mode: If the I-gate was closed automatically, it can only be opened by means of an edge change 0-1 at *SW_GATE_SET*.

Product description

I/O compound modules - counter

One counter 32 bits, 5 V DC - EPM-S602

Comparator

The comparison value is specified via the output area. The comparison bit can be found in the status word under *STS_COMP*.



Note!

Please note that bit *STS_COMP* can only be triggered if bit *STS_CTRL_COMP* is set in the status word.

Via the parameter setting you can define the response of the comparison bit:

- ▶ Comparison bit never switches
- ▶ Comparison bit is set if count value \geq comparison value
As long as the count value is greater than or equals the comparison value, the comparison bit remains set
- ▶ Comparison bit is set if count value \leq comparison value
As long as the count value is smaller than or equals the comparison value, the comparison bit remains set.
- ▶ Comparison bit is set if count value = comparison value
If the count value = comparison value, the comparison bit is set. The bit remains set until the comparison condition is no longer met. If you have set a main counting direction, the comparison bit is only set when the comparison value from the main counting direction is reached.



Note!

Together with bit *STS_COMP*, bit *STS_CMP* is set in the status word. In contrast to bit *STS_COMP*, however, it remains set until it is reset with *RES_SET* in the control word.

Hysteresis

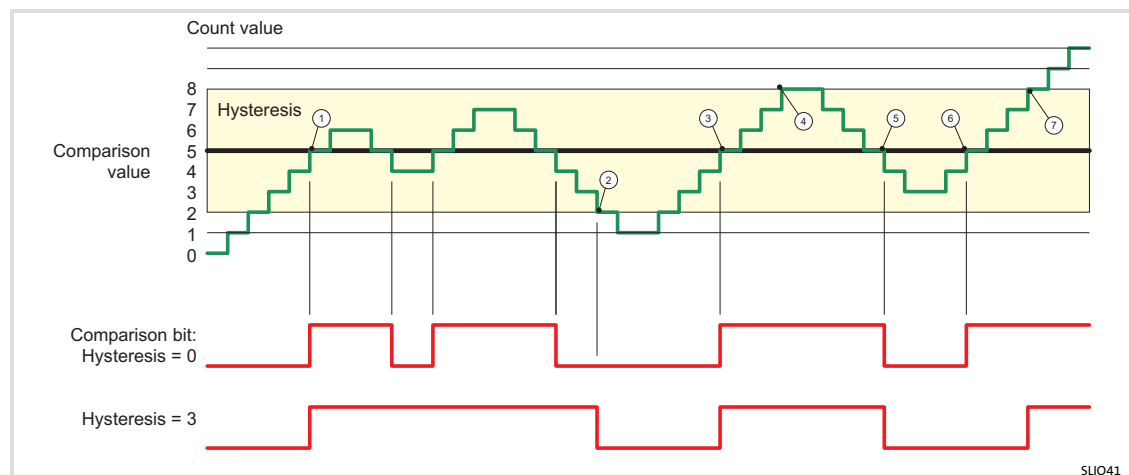
The hysteresis for instance serves to avoid frequent switching operations of the output and triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off. The hysteresis has an effect on the zero crossing, overflow/underflow, and on the comparison value.

An active hysteresis remains active after the change. The new hysteresis range becomes active at the next hysteresis event.

In the following illustrations the response of the output at hysteresis 0 and hysteresis 3 for the corresponding conditions is represented:

A) Function mode in the case of count value \geq comparison value

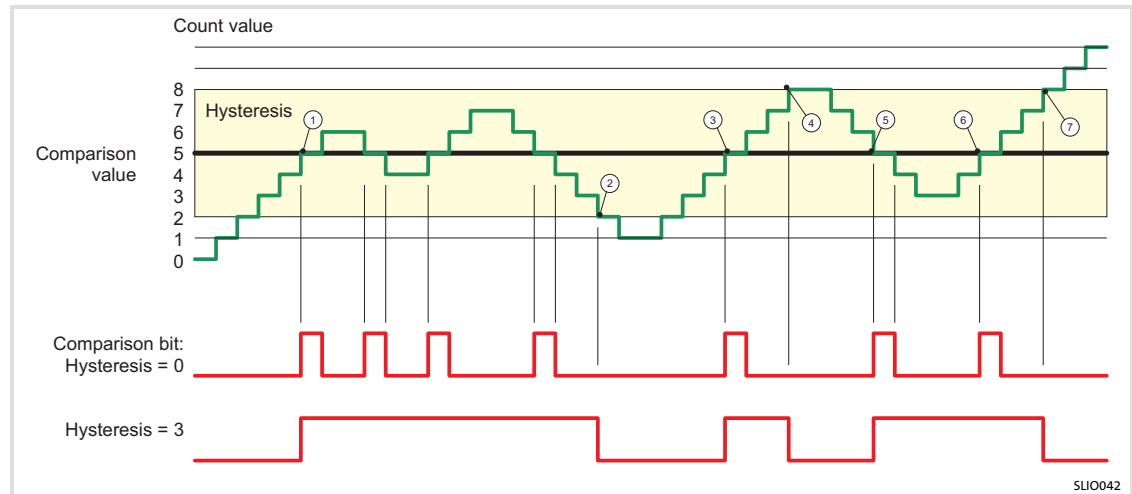
When the comparison condition is met, hysteresis becomes active. When hysteresis is active, the comparison result remains unchanged until the count value exits the hysteresis range set. After the hysteresis range is exited, hysteresis is only activated again when the comparison conditions are met.



- ① Count value \geq comparison value \rightarrow Comparison bit is set and hysteresis is activated
- ② Exiting of the hysteresis range \rightarrow Comparison bit is reset
- ③ Count value \geq comparison value \rightarrow Comparison bit is set and hysteresis is activated
- ④ Exiting of the hysteresis range, comparison bit remains set, since count value \geq comparison value
- ⑤ Count value $<$ comparison value and hysteresis active \rightarrow Comparison bit is reset
- ⑥ Count value \geq comparison value \rightarrow Comparison bit is not set since hysteresis is activated
- ⑦ Exiting of the hysteresis range, comparison bit is set, since count value \geq comparison value

B) Function mode for count value = comparison value

When the comparison condition is met, hysteresis becomes active. When hysteresis is active, the comparison result remains unchanged until the count value exits the hysteresis range set. After the hysteresis range is exited, hysteresis is only activated again when the comparison conditions are met.



- ① Count value = comparison value → Comparison bit is set and hysteresis is activated
- ② Exiting of the hysteresis range → Comparison bit is reset and count value < comparison value
- ③ Count value = comparison value → Comparison bit is set and hysteresis is activated
- ④ Comparison bit is reset due to exiting of the hysteresis range and count value > comparison value
- ⑤ Count value = comparison value → Comparison bit is set and hysteresis is activated
- ⑥ Count value = comparison value and hysteresis active → Comparison bit remains set
- ⑦ Exiting of the hysteresis range and count value > comparison value → Comparison bit is reset

3.9.4 Two counters 32 bits, 24 V DC - EPM-S603

This module measures the pulses of up to two connected encoders and processes them according to the mode selected.

Features

- ▶ 2 counters 32 bits, DC 24 V
- ▶ Counting frequency max. 400 kHz
- ▶ Input filter
- ▶ Diagnostic function

Overview

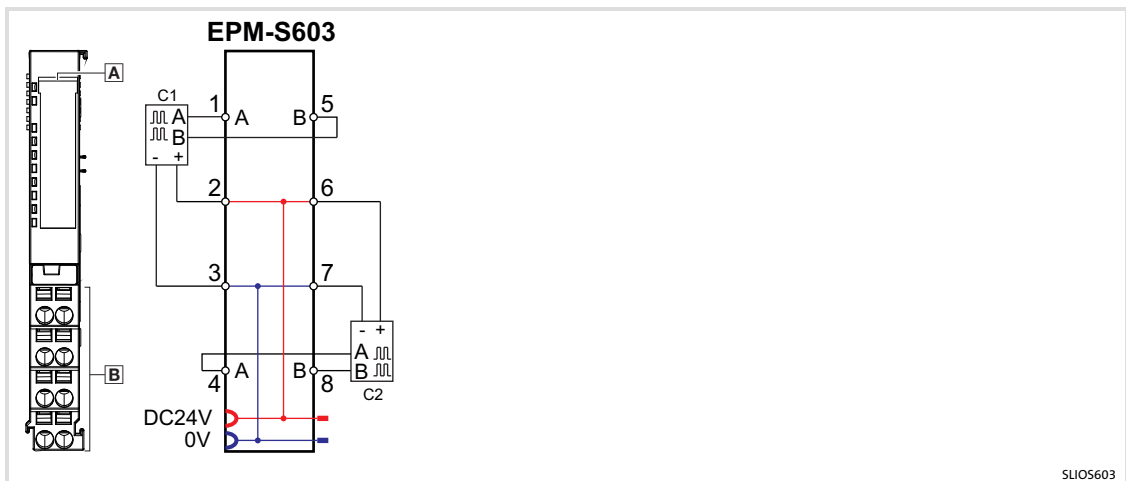


Fig. 3-84 Elements and circuit diagram
A Displays for module status
B Terminals
 1 ... 8 Connection number

Status displays

Module status LEDs A				
View	Pos.	Designation	Colour	Explanation
	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error (see table below)
	3	A1	Green	On: Digital input 1, counter 1, "A1"/"pulse" triggered
	4	B1		On: Digital input 5, counter 1, "B1"/"direction" triggered
	5	A2		On: Digital input 4, counter 2, "A2"/"pulse" triggered
	6	B2		On: Digital input 8, counter 2, "B2"/"direction" triggered
	7	-	-	Not assigned
	8	-	-	
	9	-	-	
	10	-	-	

Product description

I/O compound modules - counter

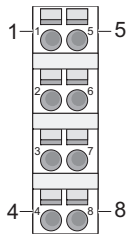
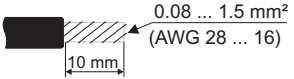
Two counters 32 bits, 24 V DC - EPM-S603

Messages of the status LEDs RUN and MF

RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error (📄 274)
BLINKING (2 Hz)	BLINKING (2 Hz)	Module reports parameterisation error Bus communication is OK

Terminals

Module terminals, spring terminals

View	Designation	Explanation	Terminal data
 <p>SIO002</p>	1	Digital input, counter 1, "A"/"pulse" Pulse input for counting signal or track A of an encoder for single, double, or quadruple evaluation	
	2	DC 24 V for encoder supply	
	3	GND	
	4	Digital input, counter 2, "A"/"pulse" Pulse input for counting signal or track A of an encoder for single, double, or quadruple evaluation	
	5	Digital input, counter 1, "B"/"direction" Direction signal or track B of an encoder (can be inverted via parameterisation)	
	6	DC 24 V for encoder	
	7	GND	
	8	Digital input, counter 2, "B"/"direction" Direction signal or track B of an encoder (can be inverted via parameterisation)	

Technical data

EPM-S603: rated data

Module identifier 2244_{dec}

Current consumption/power loss

Current consumption from backplane bus	75 mA
Power loss	0.9 W

EPM-S603: rated data

Digital inputs

Number of inputs	4
Cable length	
shielded	100 m
Load voltage	
Nominal value	DC 20.4 ... 28.8 V
Current consumption from load voltage L+	15 mA (without load)
Input voltage	
Nominal value	DC 20.4 ... 28.8 V
for signal "0"	DC 0 ... 5 V
for signal "1"	DC 15 ... 28.8 V
Input current	
for signal "1"	3 mA
2-wire BERO	
Connection possible	Yes
Max. permissible closed-circuit current	0.5 mA
Input delay	
from "0" to "1"	0.8 µs
from "1" to "0"	0.8 µs
Number of inputs which can be used simultaneously	
horizontal structure	4
vertical structure	4
Input characteristic	IEC 61131, type 1
Input data size	12 bytes

Digital outputs

Output data size	4 bytes
------------------	---------

Meters

Number of counters	2
Counter width	32 bits
Frequency	
Input frequency, max	500 kHz
Counting frequency, max	400 kHz
Operating mode	
Incremental encoder	Possible
Pulse / direction	Possible
Pulse	Not possible
Frequency measurement	Not possible
Period duration measurement	Not possible
Connection	
Gate connection	Not possible
Latch connection	Not possible
Reset connection	Not possible
Counter output	Not possible

Product description

I/O compound modules - counter

Two counters 32 bits, 24 V DC - EPM-S603

EPM-S603: rated data

Status, alarm, diagnostics

Status display	Yes
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	None

Electrical isolation

Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

Parameterisable functions

Counting functions	Description
Counting continuously	The counter counts from 0 to the counting limit, then skips to the opposite counting limit and continues to count from there.

Signal evaluation	Description
Single rotary transducer	Connection to input "A/pulse" and "B/direction"
Double rotary transducer	
Quadruple rotary transducer	
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).

Counting continuously

Limits	Counting range
Lower counting limit	-2 147 483 648 (-2^{31})
Upper counting limit	+2 147 483 647 ($2^{31}-1$)

Function:

- ▶ For starting the counting process the internal gate has to be opened.
 - The counter always counts from 0.
 - If the counter reaches the upper counting limit when counting forwards, and if a further count pulse in positive direction occurs, the counter skips to the lower counting limit and continues to count from there.
 - If the counter reaches the lower counting limit when counting backwards, and if a further negative count pulse occurs, the counter skips to the upper counting limit and continues to count from there.
 - If values are exceeded or not reached, the status bits *STS_OFLW* or *STS_UFLW* are set. These bits remain set until they are reset with *RES_SET* in the control word.
- ▶ For stopping the counting process the internal gate has to be closed.

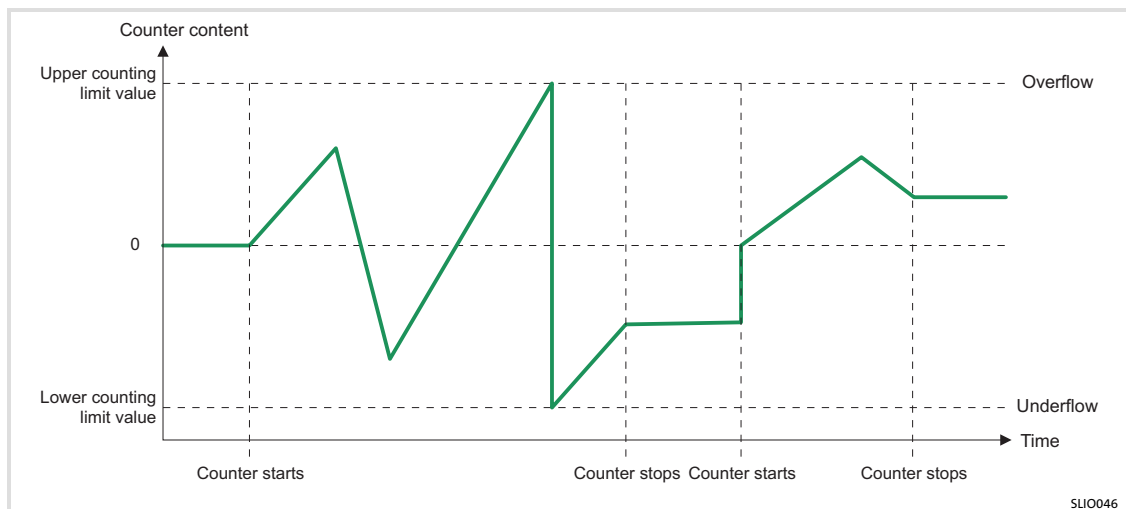


Fig. 3-85 Example of "Counting continuously"

Product description

I/O compound modules - counter

Two counters 32 bits, 24 V DC - EPM-S603

Gate function

The counter is controlled via the "internal gate" (I-gate). For this counter, the I-gate is conform to the software gate (SW gate).

The SW gate is opened and closed via the user program (control word).

- ▶ With an edge change 0-1 at the control word bit *SW_GATE_SET*, the SW gate opens (counter starts from count value).
- ▶ With an edge change 0-1 at the control word bit *SW_GATE_RESET*, the SW gate closes (counter stops).

The following states have an impact on the I-gate:

SW gate	Response of I-gate
0	0
1	1
Edge change 0-1	1

3.9.5 Control and status word

EPM-S600 status word		
Bit	Designation	Function
0	STS_SYNC	Reset was active
1	STS_CTRL_DO	Is set if the digital output is enabled
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	STS_RST	Status of reset input
4	STS_STRT	Hardware gate status (set if HW gate active)
5	STS_GATE	Status of internal gate (set if internal gate active)
6	STS_DO	Status of digital counter output (DO)
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	STS_CMP*	Comparator status is set if the comparison condition is met. If the comparison is deactivated (counter mode byte 1 = 000 _b), the bit has no function.
10	STS_END*	Status set if final value was reached
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	STS_LTCH	Status of latch input
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

EPM-S600 control word		
Bit	Name	Function
0	CTRL_SYNC_SET	Activation/deactivation of the counting signal: 0 (FALSE): The input for the counting signal is deactivated and the current counter content is reset to 0. 1 (TRUE): The input for the counting signal is activated.
1	CTRL_DO_SET	Enables the digital output
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	COUNTERVAL_SET	Sets the counter temporarily to the value in the set value
6	RES_SET	Resets bits STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP with a rising edge
7	-	Reserved
8	CTRL_SYNC_RESET	Activation/deactivation of the zero track evaluation: 0 (FALSE): The zero track evaluation is activated. 1 (TRUE): The zero track evaluation is stopped. The counter keeps counting irrespective of the zero pulse. Bit 0 (CTRL_SYNC_SET) must be set to TRUE for this purpose.
9	CTRL_DO_RESET	Inhibits the digital output
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12	-	
13	-	
14	-	
15	-	

Product description

I/O compound modules - counter

Control and status word

EPM-S601 status word		
Bit	Designation	Function
0	-	Reserved
1	STS_CTRL_COMP	Is set if the comparison bit is enabled
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	-	Reserved
4	-	Reserved
5	STS_GATE	Status of internal gate (set if internal gate active)
6	STS_COMP	Status of comparison bit
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	STS_CMP*	Comparator status is set if the comparison condition is met. If the comparison is deactivated (counter mode byte 1 = 000 _b), the bit has no function.
10	STS_END*	Status set if final value was reached
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	-	Reserved
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

EPM-S601 control word		
Bit	Designation	Function
0	-	Reserved
1	CTRL_COMP_SET	Enables the comparison bit
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	COUNTERVAL_SET	Sets the counter temporarily to the value in the set value
6	RES_SET	Resets bits STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP with a rising edge
7	-	Reserved
8	-	Reserved
9	CTRL_COMP_RESET	Inhibits comparison bit
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12		
13		
14		
15		

EPM-S602 status word		
Bit	Designation	Function
0	STS_SYNC	Reset was active
1	STS_CTRL_COMP	Is set if the comparison bit is enabled
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	STS_RST	Status of reset input
4	-	Reserved
5	STS_GATE	Status of internal gate (set if internal gate active)
6	STS_COMP	Status of comparison bit
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	STS_CMP*	Comparator status is set if the comparison condition is met. If the comparison is deactivated (counter mode byte 1 = 000 _b), the bit has no function.
10	STS_END*	Status set if final value was reached
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	-	Reserved
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

EPM-S602 control word		
Bit	Name	Function
0	CTRL_SYNC_SET	Activation/deactivation of the counting signal: TRUE=>FALSE edge: The input for the counting signal is deactivated and the current counter content is reset to 0. FALSE=>TRUE edge: The input for the counting signal is activated.
1	CTRL_COMP_SET	Enables the comparison bit
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	COUNTERVAL_SET	Sets the counter temporarily to the value in the set value
6	RES_SET	Resets bits STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP with a rising edge
7	-	Reserved
8	CTRL_SYNC_RESET	Activation/deactivation of the zero track evaluation: TRUE=>FALSE edge: The zero track evaluation is activated. FALSE=>TRUE edge: The zero track evaluation is stopped. The counter keeps counting irrespective of the zero pulse. Bit 0 (CTRL_SYNC_SET) must be set to TRUE for this purpose.
9	CTRL_COMP_RESET	Inhibits the comparison bit
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12	-	
13	-	
14	-	
15	-	

Product description

I/O compound modules - counter

Control and status word

EPM-S603 status word		
Bit	Designation	Function
0	-	Reserved
1	-	Reserved
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	-	Reserved
4	-	Reserved
5	STS_GATE	Status of internal gate (set if internal gate active)
6	-	Reserved
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	-	Reserved
10	-	Reserved
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	-	Reserved
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

EPM-S603 control word		
Bit	Designation	Function
0	-	Reserved
1	-	Reserved
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	-	Reserved
6	RES_SET	Resets bits STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP with a rising edge
7	-	Reserved
8	-	Reserved
9	-	Reserved
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12	-	
13	-	
14	-	
15	-	

3.10 I/O compound modules - encoder evaluation

3.10.1 SSI - EPM-S604

The module is an SSI interface for direct connection to an SSI encoder.

During the parameterisation you can adapt the module to the corresponding SSI encoder.

Features

- ▶ 1xSSI for absolute value encoders with 8 ... 32 bits
- ▶ Connection via differential signal (RS422)
- ▶ Clock output for master operating mode
- ▶ Clock input for monitoring operation
- ▶ Integrated converter for Gray/Dual
- ▶ Cyclic encoder value measurement
- ▶ Scaling of the encoder value, i. e. subsequent bits are removed

Overview

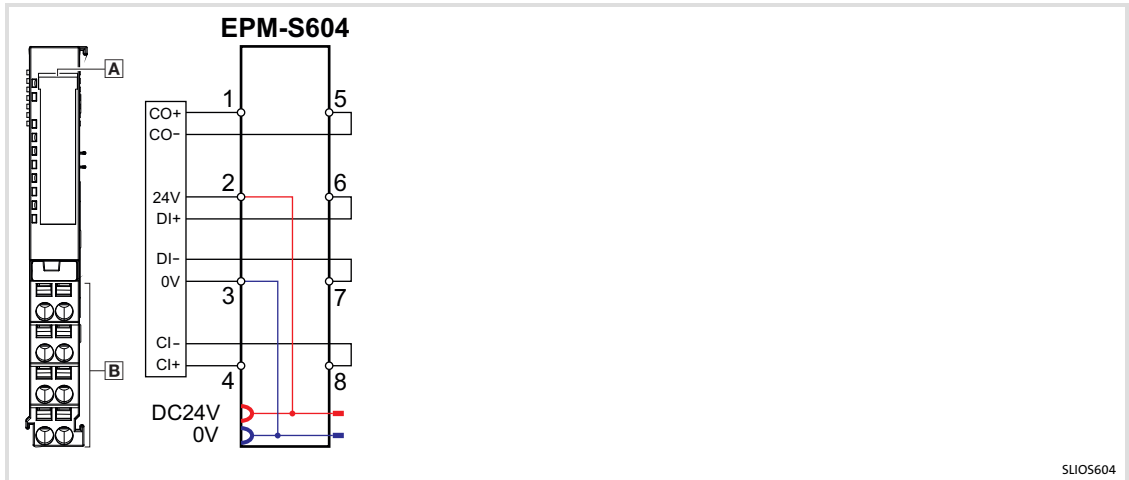


Fig. 3-86 Elements and circuit diagram

- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number

Status displays

Module status LEDs A				
View	Pos.	Designation	Colour	Explanation
	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error (see table below)
	3	CO	Green	Clock OUT activity
	4	DI		Data IN activity
	5	CI		Clock IN activity
	6			
	7			
	8	-	-	Not assigned
	9			
	10			

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error (📖 274)

Terminals

Module terminals, spring terminals			
View	Designation	Explanation	Terminal data
<p style="text-align: center; margin-top: 10px;">SU0002</p>	1	Digital output "Clock OUT+" Differential output for Clock OUT	
	2	DC 24 V for encoder	
	3	GND	
	4	Digital input "Clock IN+" Differential input for Clock IN	
	5	Digital output "Clock OUT-" Differential output for Clock OUT	
	6	Digital input "Data IN+" Differential input for Data IN	
	7	Digital input "Data IN-" Differential input for Data IN	
	8	Digital input "Clock IN-" Differential input for Clock IN	

Technical data

EPM-S604: rated data	
Module identifier	2497 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	70 mA
Power loss	1 W
SSI	
Number of terminals for SSI encoders	1
Physics	RS422
Encoder	
Supply voltage	DC 24 V
Bit length	8 ... 32 bits
Cycle	125 kHz ... 2 MHz
Operating modes	Master mode, monitoring operation
Coding	Binary, gray
Scaling	Yes, parameterisable
Output data size	6 bytes
Status, alarm, diagnostics	
Status display	Yes
Alarms	Yes, parameterisable
Process alarm	No
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes, parameterisable
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	None
Electrical isolation	
Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

Operating modes

In the **"Master mode"** the module is directly connected to an SSI encoder and also supplies it. For reading out the encoder, the module provides a cycle to the encoder and presents the received data current in the process image.

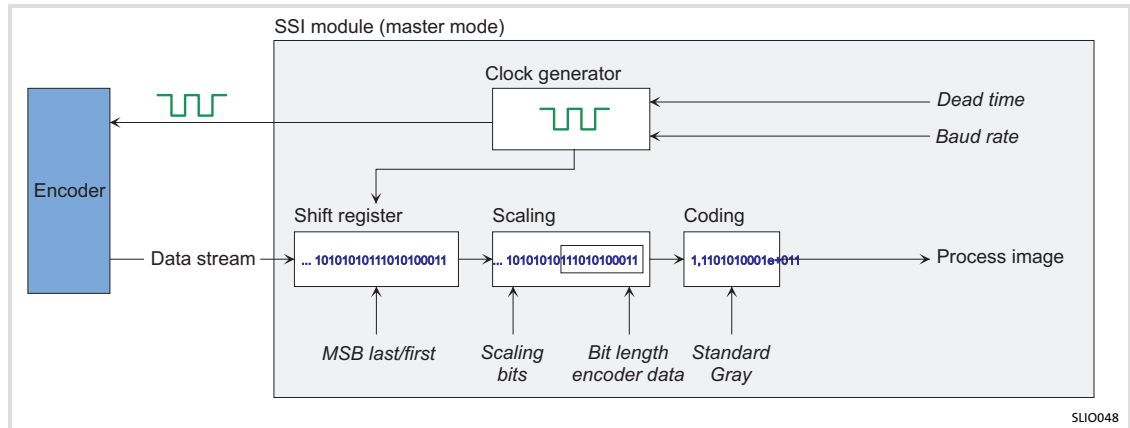


Fig. 3-87 "Master mode" block diagram

In **"Monitoring operation"** the monitoring module is operated on an SSI encoder passively to the master module. During this operating mode the SSI encoder has to be supplied via the master module. During operation, the module monitors the signals of the SSI telegram and provides the data flow in the process image. In this case again, the module has to be adapted to the corresponding encoder via parameterisation. The "Baud rate" parameter is irrelevant.

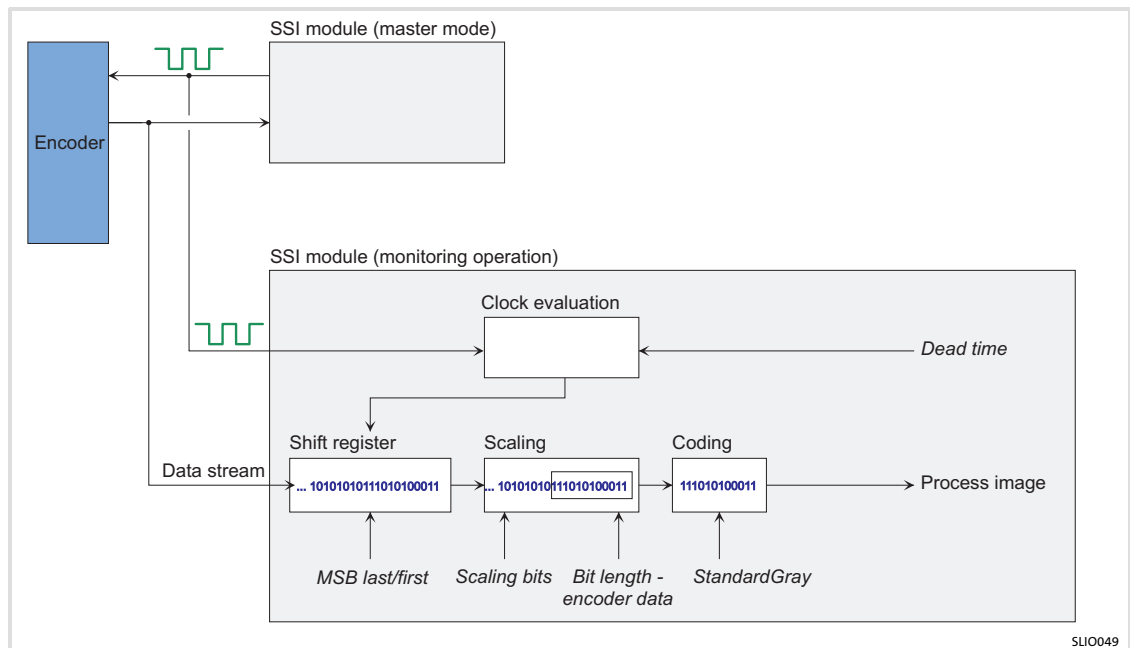


Fig. 3-88 "Monitoring operation" block diagram

3

Product description

I/O compound modules - pulse width modulation (PWM)

2 digital outputs with PWM functionality - EPM-S620

3.11 I/O compound modules - pulse width modulation (PWM)

3.11.1 2 digital outputs with PWM functionality - EPM-S620

This module has two output channels with PWM functionality (**P**ulse**W**idth**M**odulation).

By specifying time parameters, you can forward a pulse train to the desired output with the mark-to-space ratio you want.

Features

- ▶ 2 PWM outputs, can be switched between "push/pull" and "highside"
 - Push/pull mode should be used if you need defined high/low levels for a rapid change. This is used with a low load especially if "highside" mode cannot move the output to low fast enough during a low status. With push/pull, the output is switched to ground with low active and to voltage with high active.
 - In highside mode, the output switched to low remains in a state of uncertainty between ground and voltage. The load has to "pull" itself to ground. In highside mode, the switch is only made to high level active.
- ▶ Variable period and scanning ratio
- ▶ LEDs show the switching states of the digital outputs

Overview

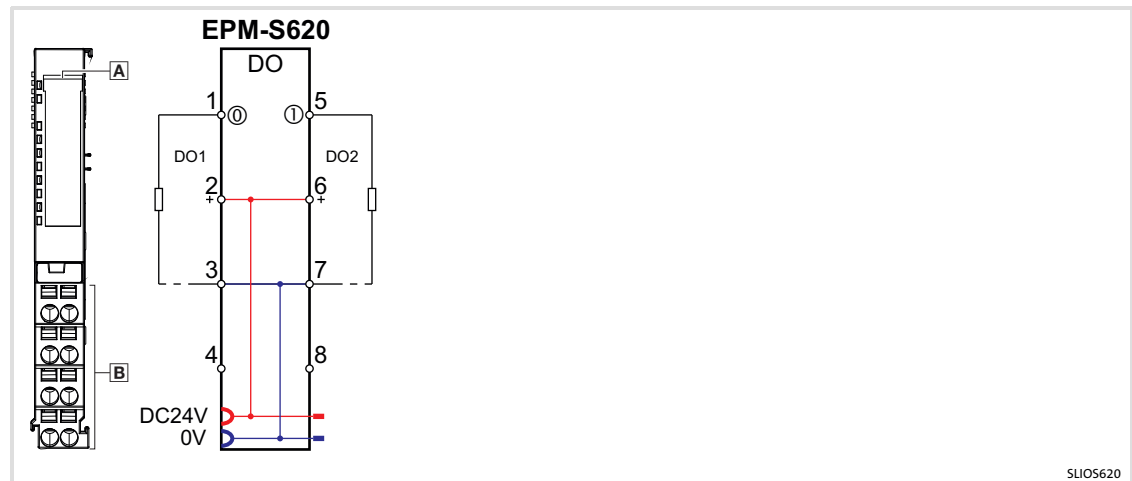

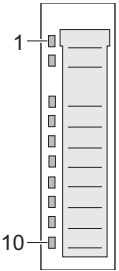



Fig. 3-89 Elements and circuit diagram


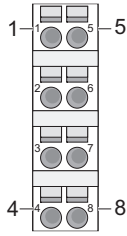
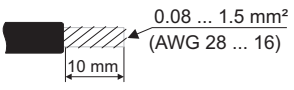
- Ⓐ Displays for module status
- Ⓑ Terminals
- 1 ... 8 Connection number
- ① ... ⑦ Bit number in bit presentation

Status displays

Module status LEDs 					
View	Pos.	Designation	Colour	Explanation	
 SLIO001	1	RUN	Green	On: Module is ready for operation	
	2	MF	Red	On: Module error and error at overload, short circuit, overtemperature (see table below)	
	3	DO1	Green	On: Digital output triggered	
	4	DO2			
	5	-	-	-	Not assigned
	6				
	7				
	8				
	9				
	10				

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error  274

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 SLIO002	1	Digital output DO1	
	2	24 V DC	
	3	GND	
	4	Not assigned	
	5	Digital output DO2	
	6	24 V DC	
	7	GND	
	8	Not assigned	

Technical data

EPM-S620: Rated data	
Module identifier	2305 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	85 mA
Power loss	0.95 W
Digital outputs	
Number of outputs	2
Cable length	
shielded	1000 m
unshielded	600 m

Product description

I/O compound modules - pulse width modulation (PWM)
2 digital outputs with PWM functionality - EPM-S620

EPM-S620: Rated data	
Load voltage	
Nominal value	DC 24 (DC 20.4 ... 28.8 V)
Current consumption from load voltage L+	15 mA (without load)
Total current	
for each group, horizontal structure, 40°C	1 A
for each group, horizontal structure, 60°C	1 A
for each group, vertical structure	1 A
Output current	
for "1" signal, nominal value	0.5 A
Output delay	
from "0" to "1"	Max. 100 ns
from "1" to "0"	Max. 100 ns
Lamp load	10 W
Parallel switching of outputs	
for redundant control	Not possible
for power increase	Not possible
Control of a digital input	Possible
Switching frequencies	
for ohmic loads	max. 40 kHz
for inductive loads	max. 40 kHz
for lamp loads	max. 40 kHz
Limitation (internal) of the inductive breaking voltage	L+ (-52 V)
Short circuit protection of the output	Electronically; only highside
Operating threshold of the protection system	2.5 A
Input data size	4 bytes
Output data size	12 bytes
Status, alarm, diagnostics	
Status display	Green LEDs per channel
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	None
Electrical isolation	
Between the channels and the backplane bus	Yes
Insulation checked with	DC 500 V

Functional principle

Both electronic module outputs are supported by the PWM function (pulse width modulation). Specifying the time parameters produces a pulse train with the desired pulse/pause ratio.

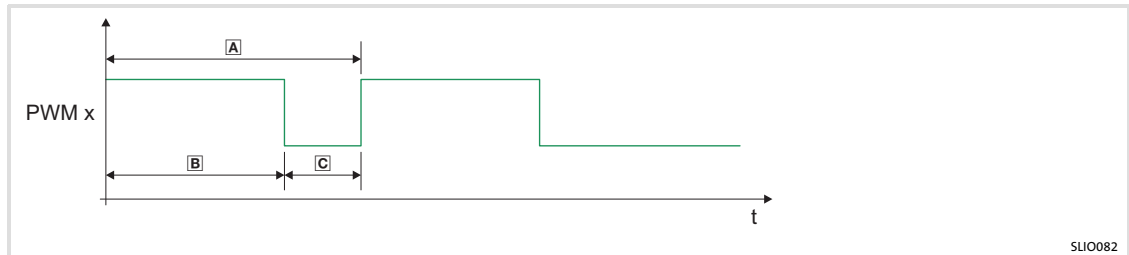


Fig. 3-90 Pulse/pause ratio for output signal

PWM x Signal level of digital output, PWM 1 or PWM 2

- A** Period
- B** Pulse duration
- C** Break duration

The pulse pause is obtained by setting parameters for period and pulse duration. The settings determine the pulse/pause ratio.

3.11.2 Control and status word

EPM-S620 status word		
Bit	Designation	Function
0	–	Reserved
1	Status of PWM	0: PWM output stopped 1: PWM output active
2	Output status	0: push/pull output 1: highside output
3 ... 15	–	Reserved

EPM-S620 control word		
Bit	Designation	Function
0 ... 1	–	Reserved
2	PWM response	<ul style="list-style-type: none"> ● 0: push/pull output Push/pull mode should be used if you need defined high/low levels for a rapid change. This is used with a low load especially if "highside" mode cannot move the output to low fast enough during a low status. With push/pull, the output is switched to ground with low active and to voltage with high active. ● 1: highside output In highside mode, the output switched to low remains in a state of uncertainty between ground and voltage. The load has to "pull" itself to ground. In highside mode, the switch is only made to high level active.
3 ... 7	Output status	Reserved
8	Start PWM output	0-1 edge: PWM output starts
9	Stop PWM output	0-1 edge: PWM output stops
10 ... 15	–	Reserved

3.12 I/O compound modules - communication

3.12.1 RS232 interface - EPM-S640

**Note!**

This module can only be actuated on a bus coupler module with HW version 1D or higher.

This module features an RS232 interface for access to field devices with an RS232 interface. For access to devices with an RS232 interface, the protocol of the field device must be implemented in the control in each case.

The following function blocks are provided for this purpose:

IPC / control	Programming via	Bus system	Function block
Lenze Industrial PC • EL 1800-9800 • CS 5800-9800 • CPC 2800	PLC Designer V2	<ul style="list-style-type: none"> • CAN • EtherCAT • PROFIBUS 	Data reception: L_IO1000_EPMS640_RS232Write Data transmission: L_IO1000_EPMS640_RS232Read
L-force Controller 3200 C	PLC Designer V3		

**Further information on the subject ...**

- ▶ "Serial process interfacing with I/O compound modules", see appendix.
- ▶ "Parameterisation", see in the corresponding chapter for the fieldbuses.
- ▶ "Handling blocks", see documentation for the PLC Designer.

Features

- ▶ Serial RS232 interface (isolated towards the backplane bus)
- ▶ Logic states as voltage level
- ▶ Transmission speed 150 bps ... 115.2 kbps
- ▶ Data transfer up to a distance of 15 m
- ▶ Hardware handshake (RTS/CTS)
- ▶ Protocols
 - ASCII
 - STX/ETX
 - 3964(R)
- ▶ Up to 250 frames (1024 bytes of receive or transmit buffer)
- ▶ Character delay time can be parameterised in ms grid
- ▶ Parameter setting via 17 bytes of parameter data
- ▶ Modem Signals Management DTR-DSR-DCD

Overview

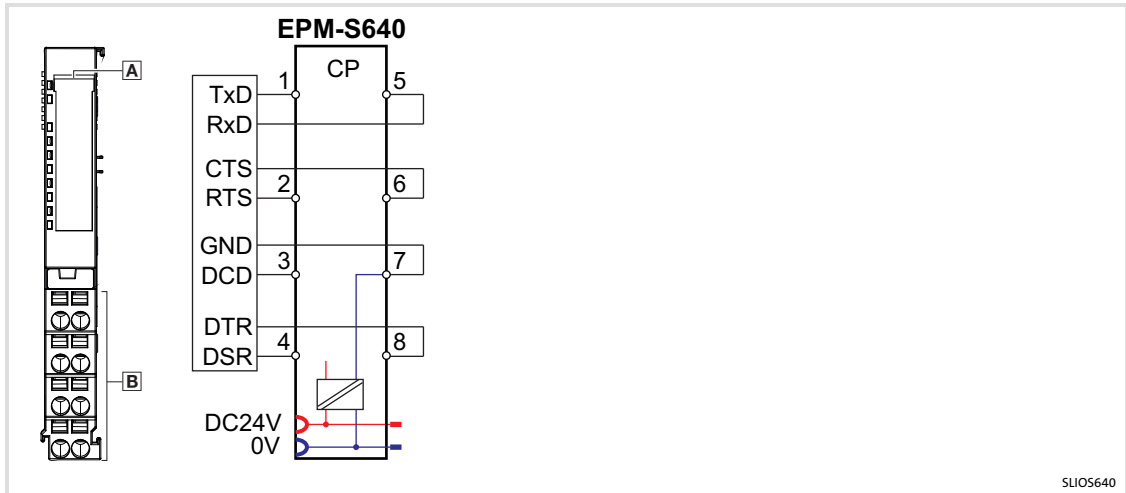


Fig. 3-91 Elements and circuit diagram


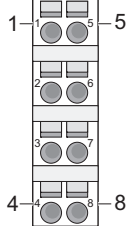
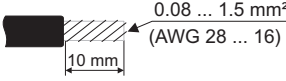
- A** Displays for module status
- B** Terminals
- 1...8 Connection number

Status displays

Module status LEDs A				
View	Pos.	Designation	Colour	Explanation
	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error (see table below)
	3	TxD	Green	On: Transmit data
	4	RxD		On: Receive data
	5	IF	Red	Blinking: Line interruption, overflow, parity error, or character frame error
	6			
	7			
	8	-	-	Not assigned
	9			
	10			

Messages of the status LEDs RUN and MF		
RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error (see 274)

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
 <small>SLIO002</small>	1	TxD output (transmit data); transmitted data	
	2	RTS output (request to send) RTS = "1": module ready to transmit RTS = "0": module is not transmitting	
	3	DCD input (Data Carrier Detect); data can be received	
	4	DSR input (Data Set Ready); modem signals ready for operation	
	5	RxD input (receive data); received data	
	6	CTS input (clear to send); module is allowed to send data	
	7	GND_ISO (Signal Ground); zero reference point signal (isolated)	
	8	DTR output (Data Terminal Ready); module ready for operation	



Note!

RI (Ring indicator) - modem ring is not used!

Wiring



Fig. 3-92 Without hardware handshake



Fig. 3-93 With hardware handshake

Product description

I/O compound modules - communication
RS232 interface - EPM-S640

Technical data

Rated data EPM-S640	
Module identifier	3585 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	100 mA
Current consumption from load voltage L+	10 mA (without load)
Power loss	1 W
Status, alarm, diagnostics	
Status display	Yes
Alarms	Yes, parameterisable
Process alarm	No
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes, parameterisable
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LED
Communication	
Interface	RS232
Electrical isolation	To the backplane bus
PtP communication	Yes
Transmission speed	150 bps ... 115.2 kbps
Cable length, max.	15 m
Input data for bus coupler module	
EPM-S110	8 bytes
EPM-S120	8/20/60 bytes (selectable)
EPM-S140	20/60 bytes (selectable)
EPM-S130, EPM-S150, EPM-S160	60 bytes
Output data for bus coupler module	
EPM-S110	8 bytes
EPM-S120	8/20/60 bytes (selectable)
EPM-S140	20/60 bytes (selectable)
EPM-S130, EPM-S150, EPM-S160	60 bytes

Rated data EPM-S640

Point-to-point protocols

ASCII

Telegram length, max.	1024 bytes
Character delay time	0 ... 65535 in ms steps (0 = 3-fold character time)
Flow control	None, hardware, XON/XOFF
Number of frames to be buffered, max.	250
Recognition of the end of a frame	after the character delay time has elapsed

STX/ETX

Telegram length, max.	1024 bytes
Character delay time TMO	0 ... 65535 in ms steps (0 = 3-fold character time)
Flow control	None, hardware, XON/XOFF
Number of frames to be buffered, max.	250
Recognition of the end of a frame	by parameterised final character
Number of initial characters	0 ... 2 (characters can be parameterised)
Number of final characters	0 ... 2 (characters can be parameterised)

3964, 3964R

Telegram length, max.	1024 bytes
Block check times	Only 3964R
Priority	LOW/HIGH
Character delay time	0 ... 255 in 20 ms steps (0 = 3-fold character time)
Character delay time acknowledgement time	0 ... 255 in 20 ms steps (0 = 3-fold character time)
Number of establishment tests	0 ... 255
Number of transmission tests	1 ... 255

Product description

I/O compound modules - communication
RS422/RS485 interface - EPM-S650

3.12.2 RS422/RS485 interface - EPM-S650

This module can be used to communicate with field devices via an RS422 or RS485 interface. For access to devices with an RS422/RS485 interface, the protocol of the field device must be implemented in the control system in each case.

The following function blocks are provided for this purpose:

IPC / control	Programming via	Bus system	Function block
Lenze Industrial PC <ul style="list-style-type: none"> ● EL 1800-9800 ● CS 5800-9800 ● CPC 2800 	PLC Designer V2	<ul style="list-style-type: none"> ● CAN ● EtherCAT ● PROFIBUS 	Data reception: L_IO1000_EPMS640_RS232Write Data transmission: L_IO1000_EPMS640_RS232Read
L-force Controller 3200 C	PLC Designer V3		



Further information on the subject ...

- ▶ "Serial process interfacing with I/O compound modules", see appendix.
- ▶ "Parameterisation", see in the corresponding chapter for the fieldbuses.
- ▶ "Handling blocks", see documentation for the PLC Designer.

Features

- ▶ Serial RS422/RS485 interface (isolated from the backplane bus)
- ▶ Transmission speed 150 bps ... 115.2 kbps
- ▶ Protocols
 - ASCII
 - STX/ETX
 - 3964(R)
- ▶ Up to 250 frames (1024 bytes of receive or transmit buffer)
- ▶ Character delay time can be parameterised in ms grid
- ▶ Parameter setting via 19 bytes of parameter data



Note!

More information can be found in the "Communication" chapter.

Overview

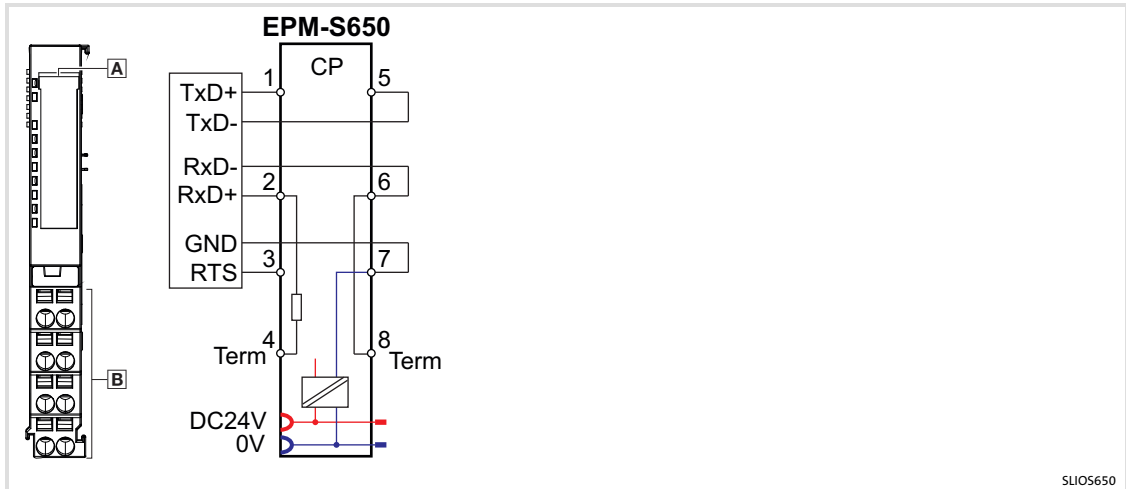


Fig. 3-94 Elements and circuit diagram

- A** Displays for module status
- B** Terminals
- 1...8 Connection number

Status displays

Module status LEDs **A**

View	Pos.	Designation	Colour	Explanation
	1	RUN	Green	On: Module is ready for operation
	2	MF	Red	On: Module error (see table below)
	3	TxD	Green	On: Transmit data
	4	RxD		On: Receive data
	5	IF	Red	Blinking: Line interruption, overflow, parity error, or character frame error
	6			
	7			
	8	-	-	Not assigned
	9			
	10			


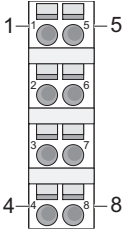
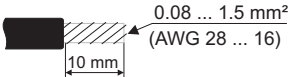
Messages of the status LEDs RUN and MF

RUN	MF	Meaning
On	Off	Module status OK Bus communication is OK
On	On	Module reports error Bus communication is OK
Off	On	Module reports error Bus communication not possible
Off	Off	Error in the bus supply voltage
Blinking	Blinking	Configuration error (274)

Product description

I/O compound modules - communication
RS422/RS485 interface - EPM-S650

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	TxD-P (B) output (transmit data); transmitted data RS422	
	2	RxD-P (B) input; received data RS422 TxD/RxD-P (B) output/input; transmitted/received data RS485	
	3	RTS output (request to send) RS485 RTS = "1": module ready to transmit RTS = "0": module is not transmitting	
	4	TERM; terminating resistor A bridge between the two TERM connections activates a terminating resistor of 120 Ω between terminal 2 and 6 on the receiver side.	
	5	TxD-N (A) output (transmit data); transmitted data RS422	
	6	RxD-N (A) input; received data RS422 TxD/RxD-N (A) output/input; transmitted/received data RS485	
	7	GND_ISO Signal Ground; Signal zero reference point (isolated)	
	8	TERM; terminating resistor	

SUI0002

Wiring

- ▶ Logic states as a voltage difference between 2 twisted cores
- ▶ Serial bus connection
 - Full duplex (RS422 four-wire operation)
 - Half duplex (RS485 two-wire operation)
- ▶ Cable length: 250 m for 115.2 kbps ... 1200 m for 19.2 kbps
- ▶ Data transfer rate: Max. 115.2 kbps

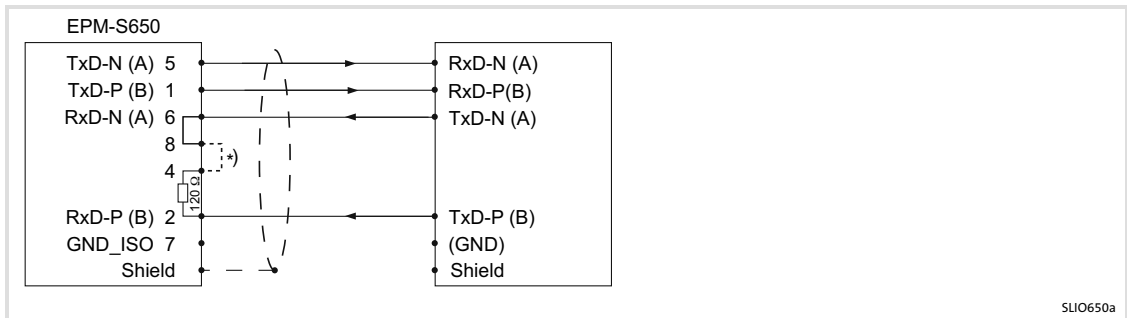


Fig. 3-95 RS422 wiring

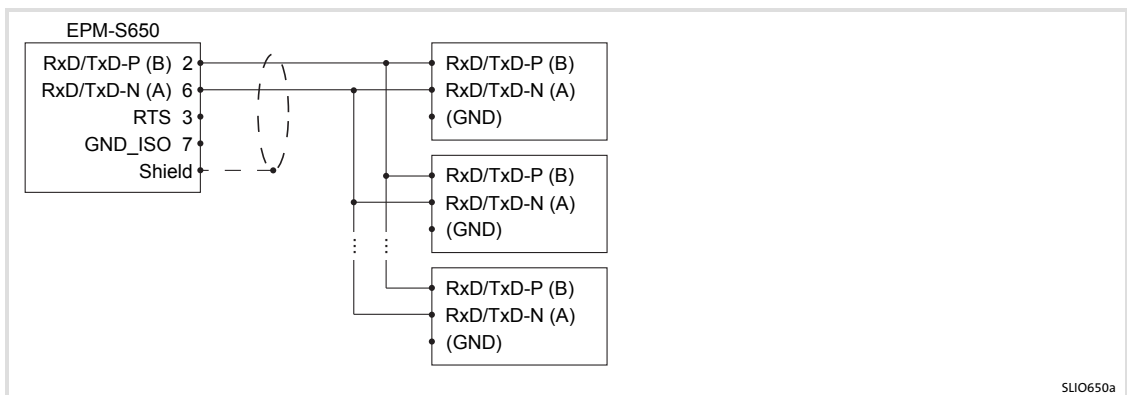


Fig. 3-96 RS485 wiring

*) A bridge between pin 8 and 4 in the EPM-S650 activates a 120 Ω terminating resistor between RxD-P (pin 2) and RxD-N (pin 6).

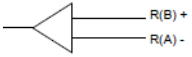
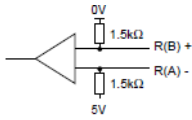
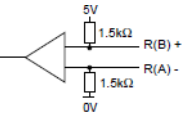
Product description

I/O compound modules - communication
RS422/RS485 interface - EPM-S650

Parameterisable idle level:

For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level.

The receiver is connected as follows:

Parameter	Description	Receiver connection
None	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
Signal R(A) 5 V (open circuit detection) Signal R(B) 0 V	If this pre-assignment is set, open circuit detection is possible in full duplex operation (RS422).	
Signal R(A) 0 V Signal R(B) 5 V	This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open circuit detection is not possible.	

Technical data

EPM-S650: Rated data	
Module identifier	2625 _{dec}
Current consumption/power loss	
Current consumption from backplane bus	100 mA
Current consumption from load voltage L+	10 mA (without load)
Power loss	1 W
Status, alarm, diagnostics	
Status display	Yes
Alarms	Yes, parameterisable
Process alarm	No
Diagnostic alarm	Yes, parameterisable
Diagnostic function	Yes, parameterisable
Diagnostic information can be read out	Possible
Module status	Green LED
Module error display	Red LED
Channel error display	Red LED
Communication	
Interface	RS422 and RS485
Electrical isolation	To the backplane bus
PtP communication	Yes
20 mA / TTY	No
Transmission speed	150 bps ... 115.2 kbps
Cable length, max.	1200 m

EPM-S650: Rated data

Point-to-point protocols

ASCII

Telegram length, max.	1024 bytes
Character delay time	0 ... 65535 in ms steps (0 = 3-fold character time)
Flow control	None, hardware, XON/XOFF
Number of frames to be buffered, max.	250
Recognition of the end of a frame	after the character delay time has elapsed

STX/ETX

Telegram length, max.	1024 bytes
Character delay time TMO	0 ... 65535 in ms steps (0 = 3-fold character time)
Flow control	None, hardware, XON/XOFF
Number of frames to be buffered, max.	250
Recognition of the end of a frame	by parameterised final character
Number of initial characters	0 ... 2 (characters can be parameterised)
Number of final characters	0 ... 2 (characters can be parameterised)

3964, 3964R

Telegram length, max.	1024 bytes
Block check times	Only 3964R
Priority	LOW/HIGH
Character delay time	0 ... 255 in 20 ms steps (0 = 3-fold character time)
Character delay time acknowledgement time	0 ... 255 in 20 ms steps (0 = 3-fold character time)
Number of establishment tests	0 ... 255
Number of transmission attempts	1 ... 255

3 Product description

Power supply modules
I/O supply - EPM-S701

3.13 Power supply modules

3.13.1 I/O supply - EPM-S701

If the bus coupler main supply does not have sufficient power to feed the I/O level, this module can be used.

Features

- ▶ Incoming supply for I/O supply
- ▶ Cable protection by monitored internal fuse

Overview

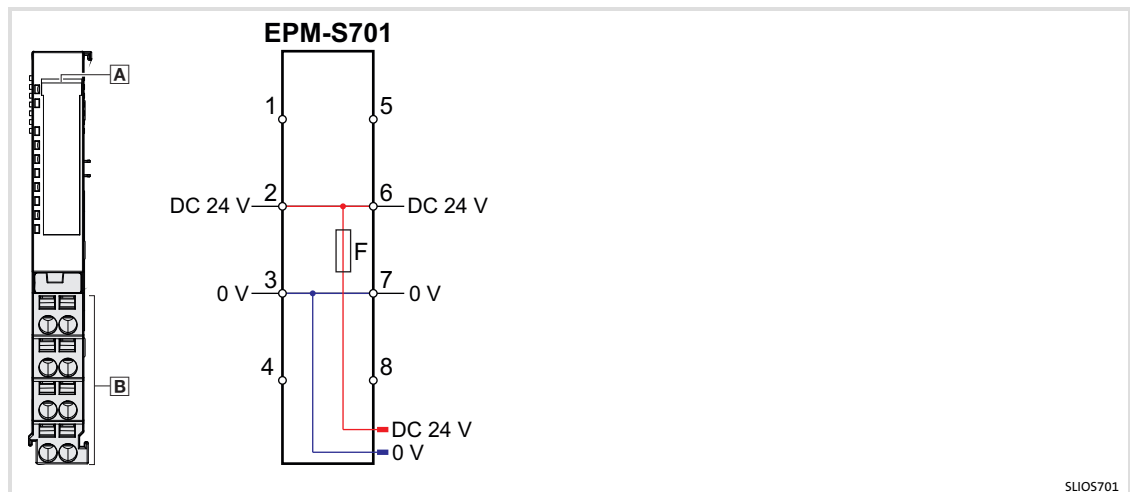



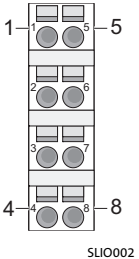
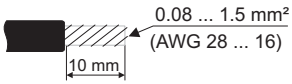
Fig. 3-97 Elements and circuit diagram

- A** Displays for module status
- B** Terminals
- 1 ... 8 Connection number


Status displays

Module status LEDs A				
View	Pos.	Designation	Colour	Explanation
	1		Green	On: 24 V for I/O supply has been applied
	2		Red	On: Fuse for I/O supply is defective
	3			Not assigned
	4			
	5			
	6			
	7			
	8			
	9			
	10			

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	Not assigned	
	2	I/O supply +24 V DC	
	3	I/O supply 0 V	
	4	Not assigned	
	5	Not assigned	
	6	I/O supply +24 V DC	
	7	I/O supply 0 V	
	8	Not assigned	

**Note!**

- ▶ Terminals 2 and 6 as well as 3 and 7 are bridged internally. Please note that the **max. permissible bridge current is 5 A**.
- ▶ Both the I/O supply and the electronic supply are protected against overload internally by a fuse. When the fuses have been tripped, the main supply of the bus coupler (EPM-S700) must be replaced ( 776).

Technical data

EPM-S701: Rated data	
Module identifier	-
Electrical data	
Input (supply)	
Rated voltage	DC 24 V
Voltage range	DC 20.4 ... 28.8 V
Output	
I/O supply	DC 24 V, max. 7 A (if UL conformity is required, max. 10 A)
Status, alarm, diagnostics	
Status display	Yes
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	No
Module status display	Green LED
Module error display	Red LED

3.13.2 I/O supply and electronic supply - EPM-S702

If the bus coupler main supply does not have sufficient power to feed the I/O level and/or the electronic components, this module can be used.

Features

- ▶ Incoming supply for I/O and electronic supply
- ▶ Cable protection by monitored internal fuses

Overview

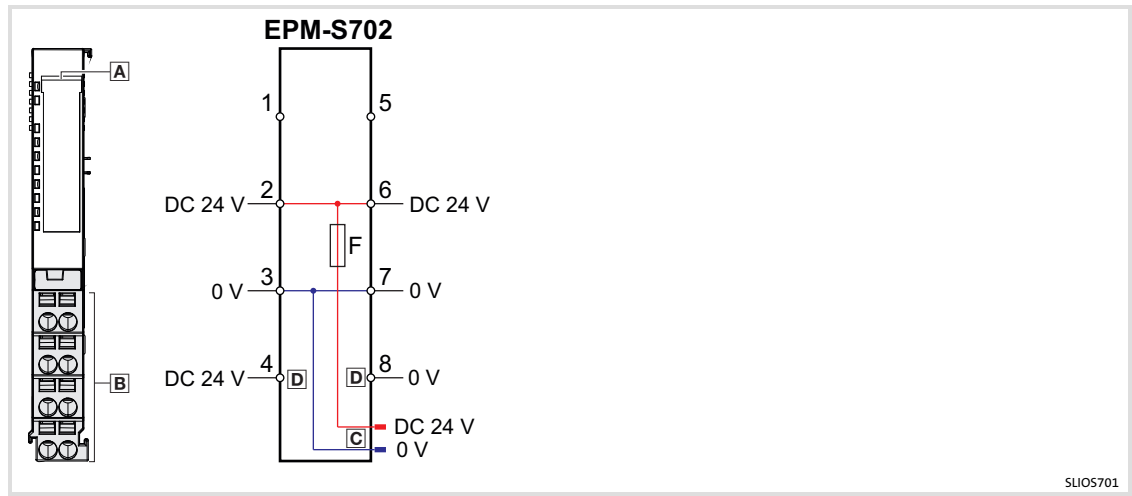



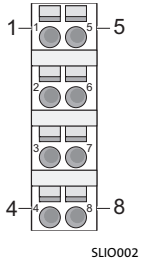
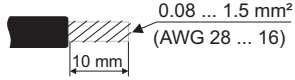
Fig. 3-98 Elements and circuit diagram

- A** Displays for module status
- B** Terminals
- C** Power supply of the I/O level
- D** Electronic supply
- 1...8 Connection number

Status displays


Module status LEDs A					
View	Pos.	Designation	Colour	Explanation	
	1		Green	On: 24 V for I/O supply has been applied	
	2		Red	On: Fuse for I/O supply is defective	
	3		Green	On: 24 V for electronic supply is applied	
	4		Red	On: Fuse for electronic supply defective	
	5				
	6				
	7				
	8	-	-	-	Not assigned
	9				
	10				

Terminals

Module terminals, spring terminals 			
View	Designation	Explanation	Terminal data
	1	Not assigned	
	2	I/O supply +24 V DC	
	3	I/O supply 0 V	
	4	Electronic supply +24 V DC	
	5	Not assigned	
	6	I/O supply +24 V DC	
	7	I/O supply 0 V	
	8	Electronic supply 0 V	



Note!

- ▶ Terminals 2 and 6 as well as 3 and 7 are bridged internally. Please note that the **max. permissible bridge current is 5 A**.
- ▶ Both the I/O supply and the electronic supply are protected against overload internally by a fuse. When the fuses have been tripped, the main supply of the bus coupler (EPM-S700) must be replaced ( 776).

Product description

Power supply modules

I/O supply and electronic supply - EPM-S702

Technical data

EPM-S702: Rated data	
Module identifier	-
Electrical data	
Input (supply)	
Rated voltage	DC 24 V
Voltage range	DC 20.4 ... 28.8 V
Output	
I/O supply	DC 24 V, max. 4 A
Electronic supply	DC 5 V, max. 2 A
Derating of electronic supply	
Convection	
Air circulation 0.5 m/s	
Power loss	1.4 W
Efficiency	89 %
Oversvoltage protection	Up to 36 V
Polarity reversal protection	Yes
Status, alarm, diagnostics	
Status display	Yes
Alarms	No
Process alarm	No
Diagnostic alarm	No
Diagnostic function	No
Diagnostic information can be read out	None
Module status display	Green LED
Module error display	Red LED

3.14 Terminal modules

3.14.1 8 terminals 24 V - EPM-S910

The terminals of this module provide the 24 Volts of the I/O supply. The backplane bus is looped through.

Features

- ▶ 8 terminals 24 V (I/O supply)

Overview



Fig. 3-99 Elements and circuit diagram

- A** Terminals
- 1...8 Connection number

Terminals

Module terminals, spring terminals A			
View	Designation	Explanation	Terminal data
	1	I/O supply +24 V DC	
	2		
	3		
	4		
	5		
	6		
	7		
	8		

Technical data

EPM-S910: Rated data	
Module identifier	-
Terminal parameters	
Terminal voltage, max.	DC 30 V
Terminal current, max.	10 A

3.14.2 8 terminals 0 V - EPM-S911

The terminals of this module provide the GND of the I/O supply. The backplane bus is looped through.

Features

- ▶ 8 terminals mass GND (I/O supply)

Overview

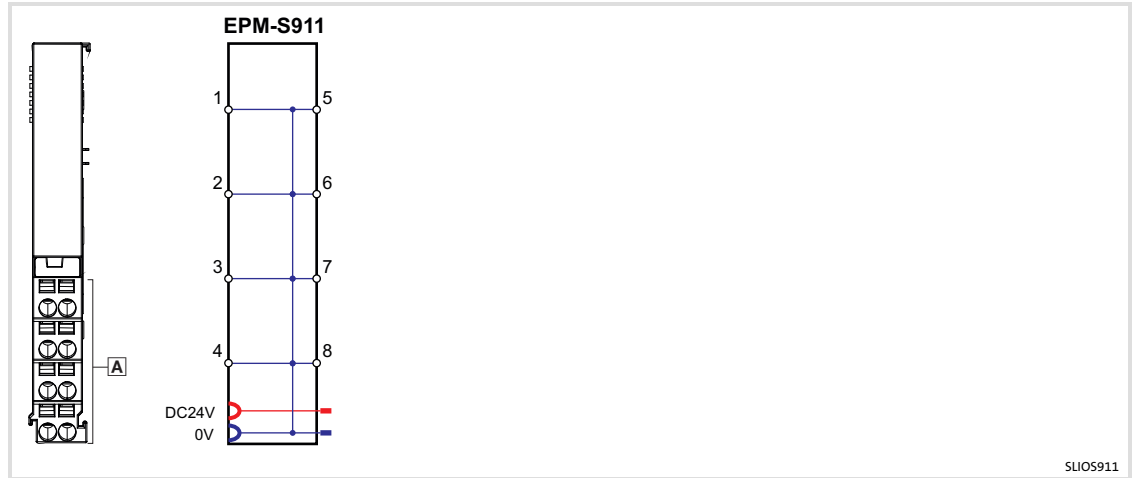


Fig. 3-100 Elements and circuit diagram

- A Terminals
- 1...8 Connection number

Terminals

Module terminals, spring terminals A			
View	Designation	Explanation	Terminal data
	1	I/O supply 0 V	
	2		
	3		
	4		
	5		
	6		
	7		
	8		

Technical data

EPM-S911: Rated data	
Module identifier	-
Terminal parameters	
Terminal voltage, max.	0 V
Terminal current, max.	10 A

3.14.3 4/4 terminals 24 V/0 V - EPM-S912

The terminals of this module provide the 24 Volts and the GND of the I/O supply. The backplane bus is looped through.

Features

- ▶ 4 terminals 24 V (I/O supply)
- ▶ 4 terminals mass GND (I/O supply)

Overview



Fig. 3-101 Elements and circuit diagram

- ▣ Terminals
- 1...8 Connection number

Terminals

Module terminals, spring terminals ▣			
View	Designation	Explanation	Terminal data
	1	I/O supply +24 V DC	
	2		
	3		
	4		
	5	I/O supply 0 V	
	6		
	7		
	8		

Technical data

EPM-S912: Rated data	
Module identifier	-
Terminal parameters	
Terminal voltage, max.	DC 30 V
Terminal current, max.	10 A

4 Technical data



Note!

The technical data of the I/O system modules can be found in the individual module descriptions which are provided in the "Product description" chapter.

General data

Conformity and approval

Conformity		
CE	2006/95/EG	Low-Voltage Directive
Approval		
UL	UL 508	File No. E343358
Other		
RoHS	-	Products lead-free in accordance with EC Directive 2002/95/EC

Protection of persons and device protection

Degree of protection		IP20
Electrical isolation		
To the fieldbus		Electrically isolated
To the process level		Electrically isolated
Insulation resistance	IEC 61131-2	
Insulation voltage against reference earth of the inputs/outputs		AC / DC 50V, for test voltage AC 500V
Protective measures		Against short circuit

EMC

Noise emission	EN 61000-6-4	Class A (industrial premises)	
Noise immunity Zone B	EN 61000-6-2	Industrial premises	
		EN 61000-4-2	ESD; severity: 3, i.e. 8 kV in the case of air discharge, 4 kV in the case of contact discharge
		EN 61000-4-3	RF interference (housing) 80 MHz ... 1000 MHz, 10 V/m 80 % AM (1 kHz)
		EN 61000-4-4	Burst, severity: 3
		EN 61000-4-5	Surge, severity 3 *
		EN 61000-4-6	RF conducted 150 kHz ... 80 MHz, 10 V/m 80 % AM (1 kHz)

* Due to the high-energy single current pulses, a surge requires a suitable external connection with lightning protection elements like for instance lightning conductors and overvoltage arresters.

Operating conditions

Ambient conditions		
Climatic		
Storage	EN 60068-2-14	-25 ... +70 °C
Operation		
Horizontal installation	EN 61131-2	0 ... +60 °C
Vertical installation	EN 61131-2	0 ... +60 °C
Air humidity	EN 60068-2-30	RH1 (without condensation, relative humidity 10 ... 95 %)
Pollution	EN 61131-2	Degree of pollution: 2
Mechanical		
Vibration	EN 60068-2-6	1 G
Shock	EN 60068-2-27	15 G
Mounting conditions		
Mounting place		In the control cabinet
Mounting position		Horizontal and vertical

5 Mechanical installation

Important notes

5 Mechanical installation

5.1 Important notes

- ▶ The mounting location must always ensure the operating conditions mentioned in the technical data. Take additional measures if necessary.
- ▶ Always ensure permanent mechanical connections.
- ▶ The fixing rail and the mounting plate in the control cabinet must be electrically conductive and free of lacquer.
- ▶ Plug and unplug the modules only if the supply voltage has been switched off to prevent the modules of the I/O system from being damaged by short circuit.
- ▶ Always arrange the modules from the left to the right and start with the bus coupler.
- ▶ The modules must always be plugged directly next to each other. Free slots are not permissible since this would interrupt the backplane bus.
- ▶ Always use the contact cover - which is included in the scope of supply of the bus coupler module - to protect the last module's contacts to the sides. Otherwise, the modules of the I/O system may become damaged by short circuit or static discharge.

5.2 Dimensions

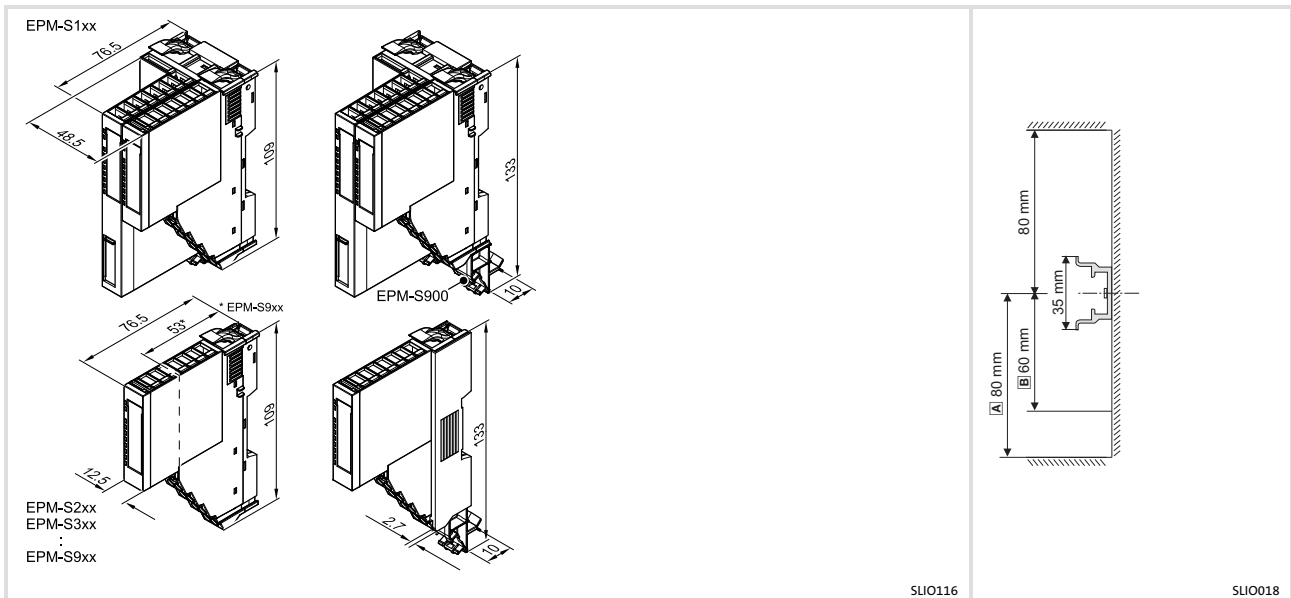


Fig. 5-1 Dimensions and mounting clearances

▣ Mounting clearance without shield bus

▣ Mounting clearance with shield bus

All dimensions in millimetres.

5 Mechanical installation

Mounting

Standard mounting

5.3 Mounting

5.3.1 Standard mounting

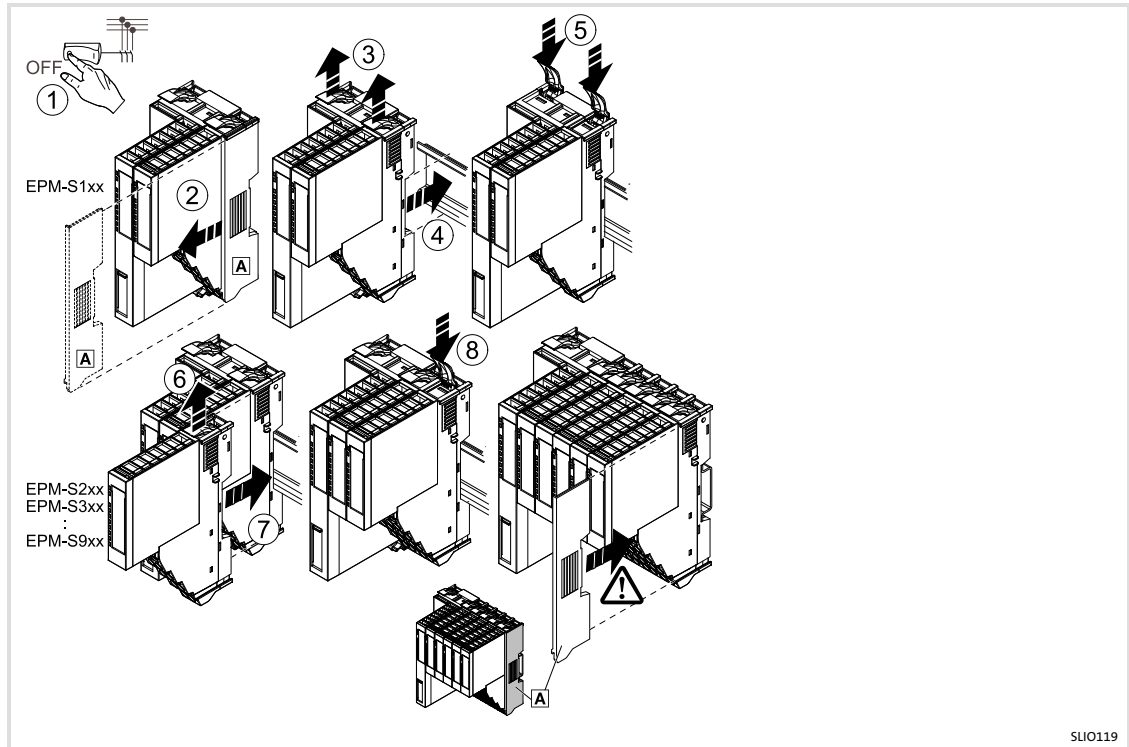
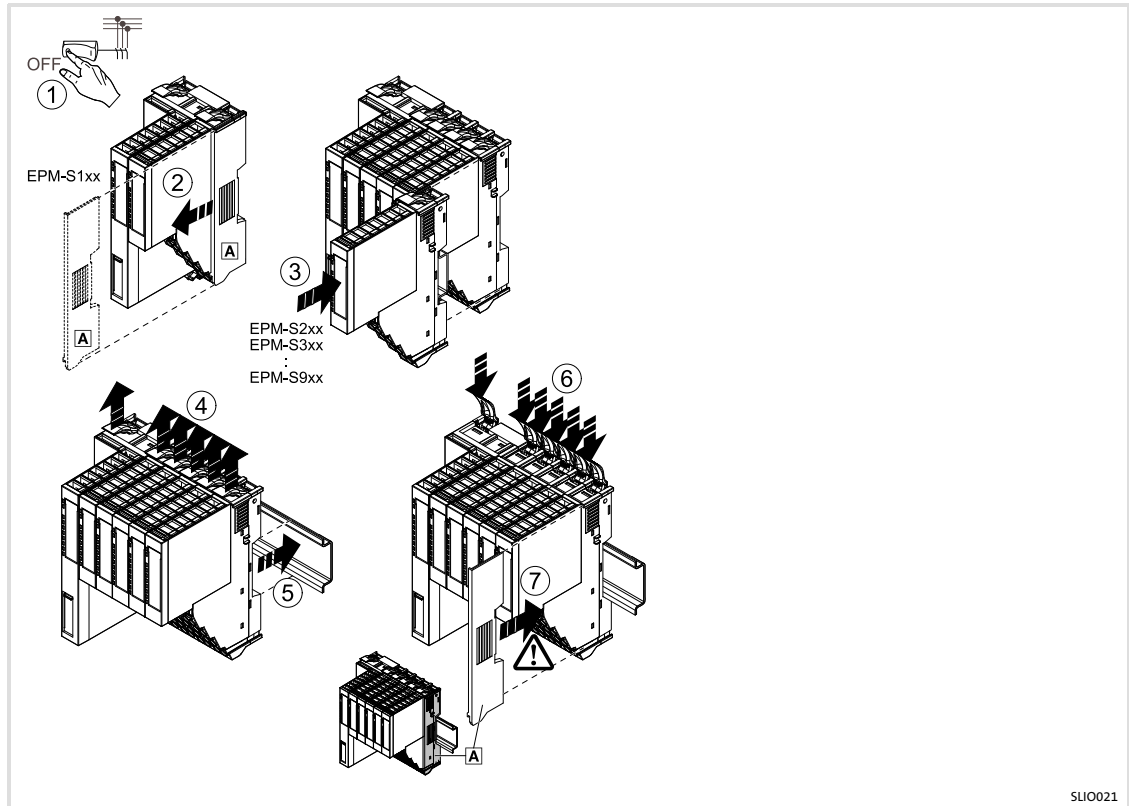


Fig. 5-2 Mounting modules

- | | |
|-----------------------|---|
| EPM-S1xx | Bus coupler module |
| EPM-S2xx ... EPM-S6xx | I/O compound module |
| EPM-S7xx | Power supply module |
| EPM-S9xx | Power distributor module |
| | Contact cover (included in the scope of supply of the bus coupler module) |

5.3.2 Block mounting



SLIO021

Fig. 5-3 Mounting modules in blocks

- | | |
|-----------------------|---|
| EPM-S1xx | Bus coupler module |
| EPM-S2xx ... EPM-S6xx | I/O compound module |
| EPM-S7xx | Power supply module |
| EPM-S9xx | Power distributor module module |
| A | Contact cover (included in the scope of supply of the bus coupler module) |

5.3.3

Mounting the busbar for the shield connection

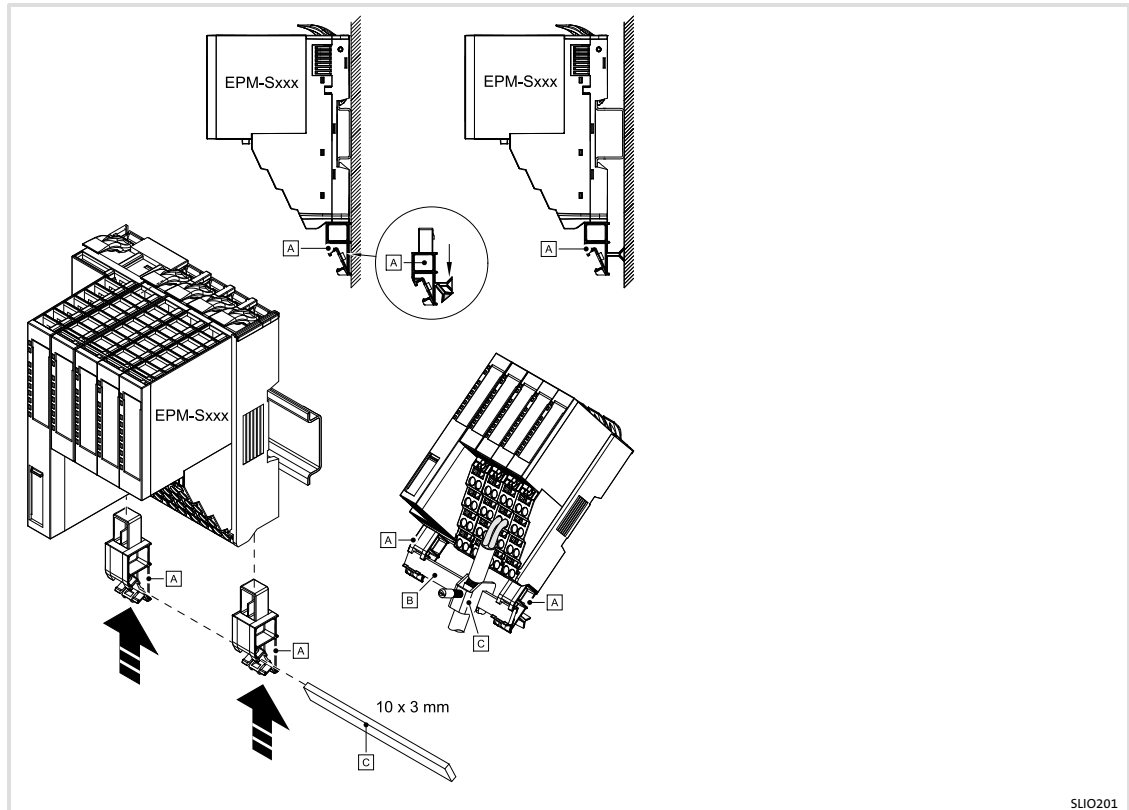


Fig. 5-4 Mounting the busbar for the shield connection

EPM-Sxxx	Bus coupler module, I/O compound module, power supply module
A	Busbar support for EPM-S900 shield connection (accessories)
B	Busbar 10 x 3 mm (available in selected stores)
C	Shield connection terminal (available in selected stores)

Insert the EPM-S900 **A** busbar support into the base module as shown in the illustration. Mount more supports for assistance in case of longer busbars.

5.4 Dismounting

5.4.1 Dismounting the bus coupler module, the I/O compound module, and the power supply module

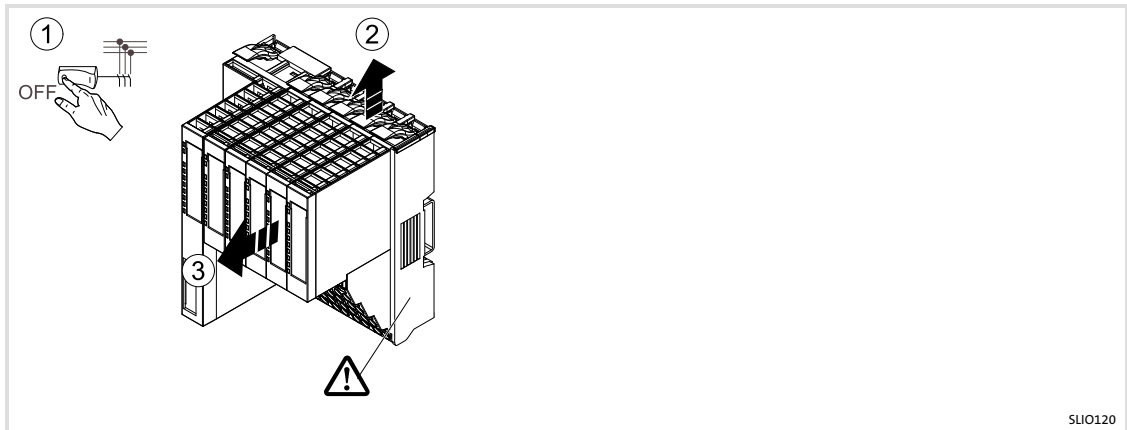


Fig. 5-5 Dismounting modules

5.4.2 Removing the bus coupler module



Note!

Before removing the bus coupler module EPM-Sxxx, the adjacent electronic module **A** must be pulled from its base module **B**.

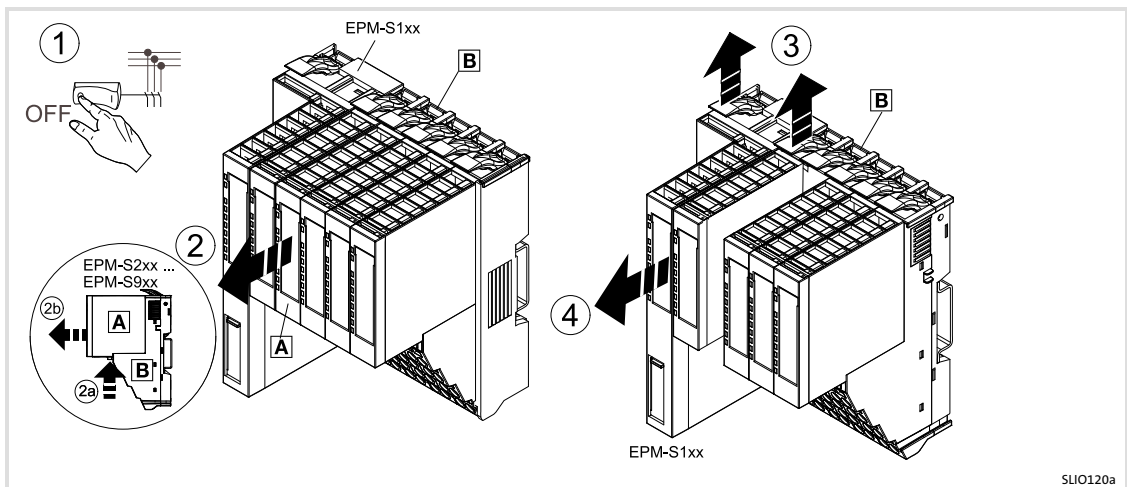


Fig. 5-6 Disassembly of bus coupler modules

6 Electrical installation

6.1 EMC-compliant wiring

General notes	<ul style="list-style-type: none"> ● The electromagnetic compatibility of the system depends on the type of installation and care taken. Especially consider the following: <ul style="list-style-type: none"> – Assembly – Shielding – Earthing ● For installations differing from the one described, the evaluation of the conformity with the EMC Directive requires a check of the system regarding the EMC limit values. This for instance applies to: <ul style="list-style-type: none"> – Use of unshielded cables ● The compliance with the EMC Directive is in the responsibility of the user. <ul style="list-style-type: none"> – If you observe the following measures, you can assume that no EMC problems will occur during operation and that compliance with the EMC Directive and the EMC law is achieved. – If devices which do not comply with the CE requirement concerning noise immunity (EN 6100042) are operated close to the system, these devices may be electromagnetically affected by the system.
Assembly	<ul style="list-style-type: none"> ● Provide electrical contact between the DIN rail and the earthed mounting plate: <ul style="list-style-type: none"> – Mounting plates with electrically conductive surfaces (zinc-coated or stainless steel) allow permanent contact. – Painted plates are not suitable for an EMC-compliant installation. ● If you use several mounting plates: <ul style="list-style-type: none"> – Connect as much surface of the mounting plates as possible (e.g. with copper strips). ● When laying the cables, pay attention to the separation of signal cables and mains cables. ● Lay the cables as close as possible to the reference potential. Freely suspended cables act like aerials.
Shielding	<ul style="list-style-type: none"> ● Only use cables with braided shield if possible. ● The overlap rate of the shield should be higher than 80%. ● For data cables for serial connection, always use metal or metallised connectors. Connect the shield of the data cable to the connector shell.
Earthing	<ul style="list-style-type: none"> ● Earth all metallically conductive components using suitable cables connected to a central earthing point (PE bar). ● Keep to the minimum cross-sections defined in the safety instructions: <ul style="list-style-type: none"> – For EMC not the cable cross-section is important, but the surface of the cable and the contact with a cross-section as large as possible, i.e. large surface.

6.2 Supply voltage connection



Note!

The supply inputs of the bus coupler modules (main supply) and the power supply modules are provided with internal fuses which protect them against overvoltages.

The fuse is located in the main supply of the bus coupler module and in the electronic module of the power supply module. If this fuse has tripped, the main supply or the electronic module, respectively, needs to be replaced (776).

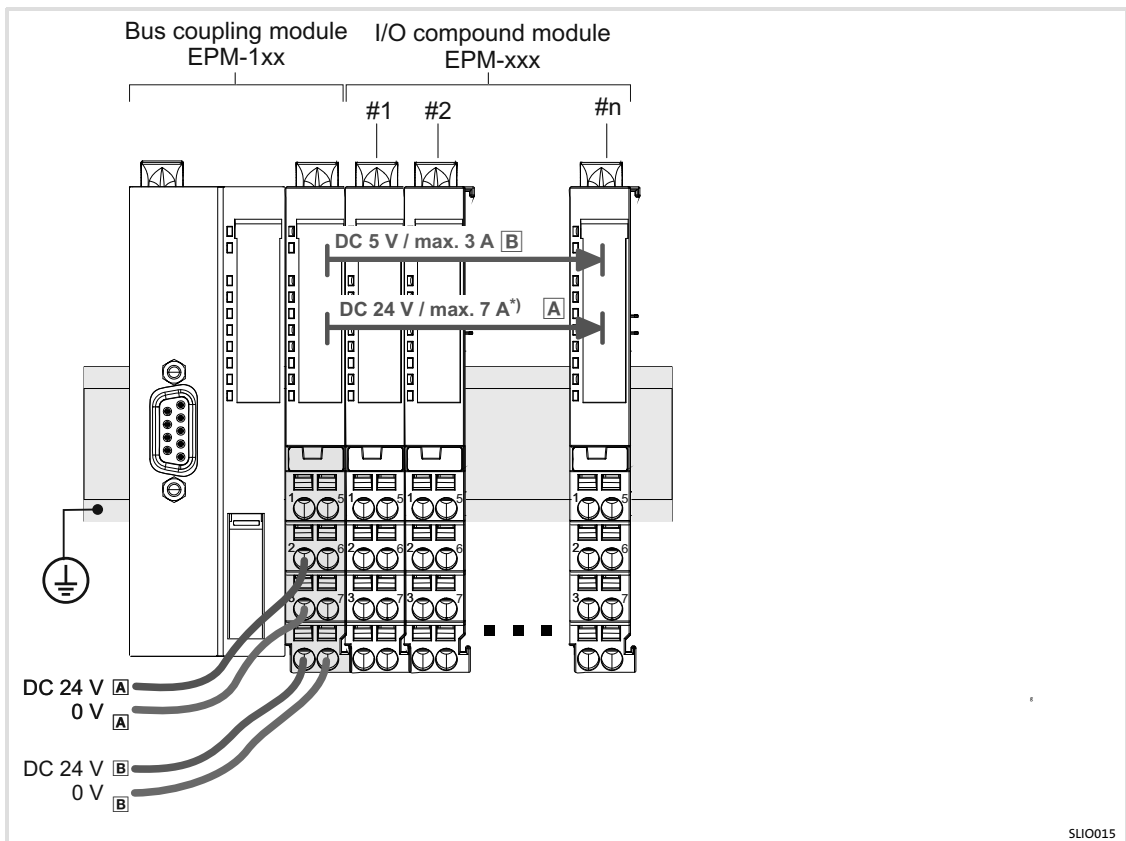


Fig. 6-1 Supply via bus coupler module (main supply)

*) If no UL conformity is required, the maximum permissible load for the I/O supply is 10 A.

A I/O supply

The I/O supply must be secured externally using a fuse that corresponds to the maximum current: fast fuse, or circuit breaker with a Z characteristic

B Electronic supply

We recommend securing the electronic supply externally according to the maximum current: fast fuse, or circuit breaker with a Z characteristic

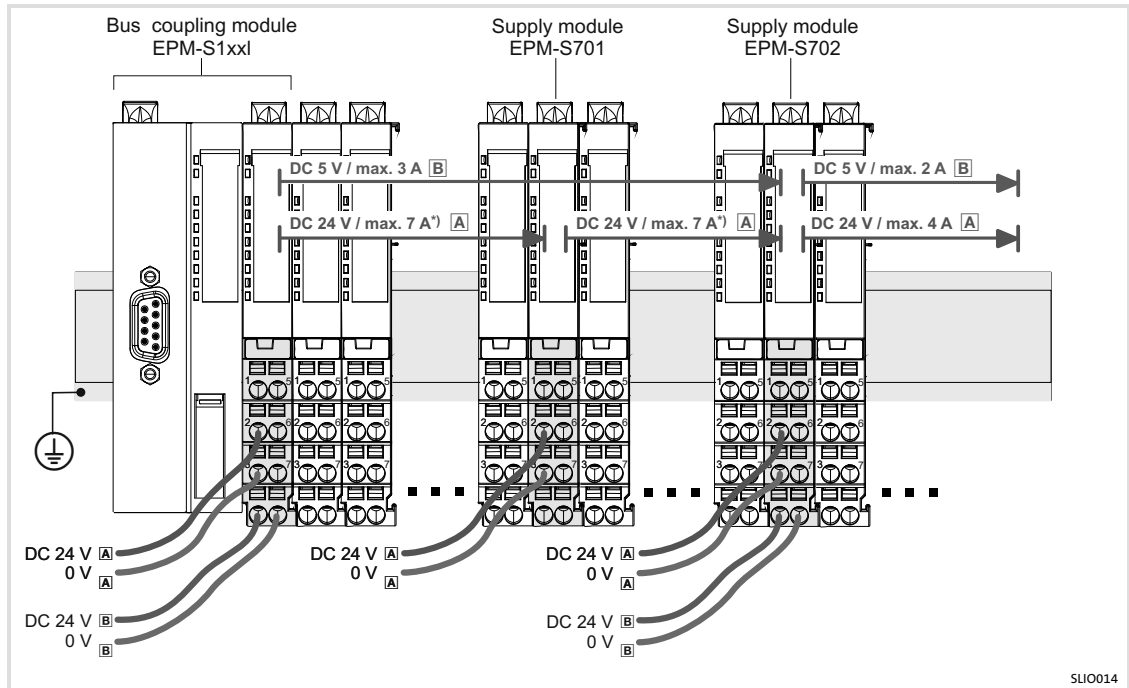


Fig. 6-2 Supply via Bus coupler module (main supply) and power supply modules

*) If no UL conformity is required, the maximum permissible load for the I/O supply is 10 A.

(A) I/O supply

The I/O supply must be secured externally using a fuse that corresponds to the maximum current: fast fuse, or circuit breaker with a Z characteristic

(B) Electronic supply

We recommend securing the electronic supply externally according to the maximum current: fast fuse, or circuit breaker with a Z characteristic

6.3 Wiring of the control connections



Note!

Information on wiring the connections of I/O compound modules can be found in the individual descriptions of the modules that are provided in the "Product description" chapter.

6.4 Connecting the shield



Information on mounting the busbar for the shield connection can be found in the "Mechanical installation" chapter (268).

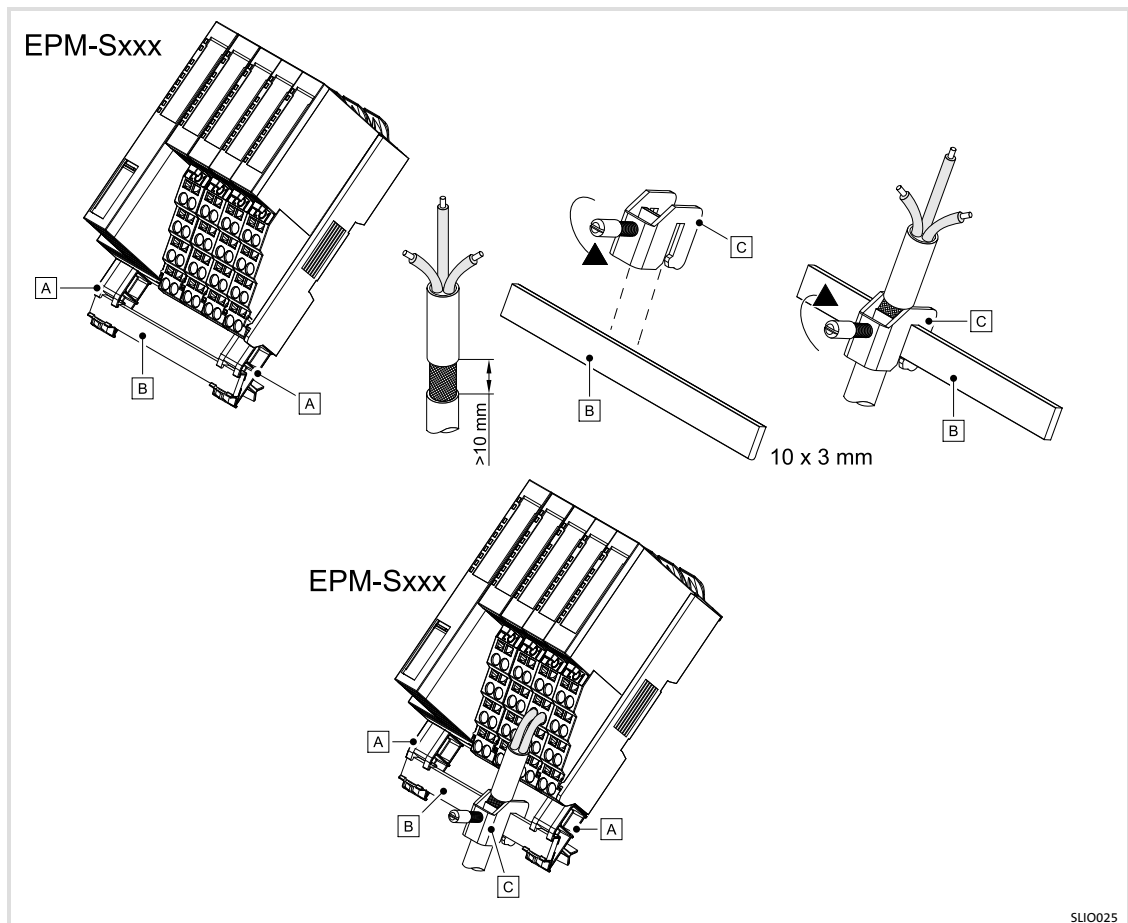


Fig. 6-3 Attaching the cable shield to the shield bus

- | | |
|----------|--|
| EPM-Sxxx | Bus coupler module, I/O compound module, power supply module |
| A | Busbar support for EPM-S900 shield connection (accessories) |
| B | Busbar 10 x 3 mm (available in selected stores) |
| C | Shield connection terminal (available in selected stores) |

7 Troubleshooting and fault elimination

Troubleshooting via RUN- and MF-LED

7 Troubleshooting and fault elimination

7.1 Troubleshooting via RUN- and MF-LED

On the front, each module is equipped with the RUN and MF LEDs. You can use these LEDs to determine errors in your system or defective modules.

Response	Cause	Remedy
After switch-on, the RUN-LED stays off on each module, and the MF-LED is lit sporadically.	The maximum current for the electronic supply is exceeded.	Place an EPM-S702 power supply module in the position in which the total current for the electronic supply exceeds the maximum current
After switch-on, the MF-LED is blinking on one module or on several modules. The RUN-LED remains switched off.	In this position a module is plugged in, which does not comply with the module currently configured.	Coordinate the configuration and the hardware setup.
After switch-on, all RUN-LEDs up to the defective module are blinking. At all following modules, the MF LED is lit and the RUN-LED is off.	The module on the right to the blinking modules is defective.	Replace the defective module.



Note!

Further fault messages of the I/O system modules can be found in the individual module descriptions which are provided in the "Product description" chapter.

8 CANopen communication

8.1 About CANopen

The I/O system supports the communication module CANopen.

The CANopen protocol is a standardised layer-7 protocol for the CAN bus. This layer is based on the CAN Application Layer (CAL) which was developed as a universal protocol.

However, as the practice shows, applications with CAL were too complex for the users. CANopen provides a uniform and simple structure for connecting the CAN devices of the various manufacturers.

8.1.1 Structure of the CAN data telegram

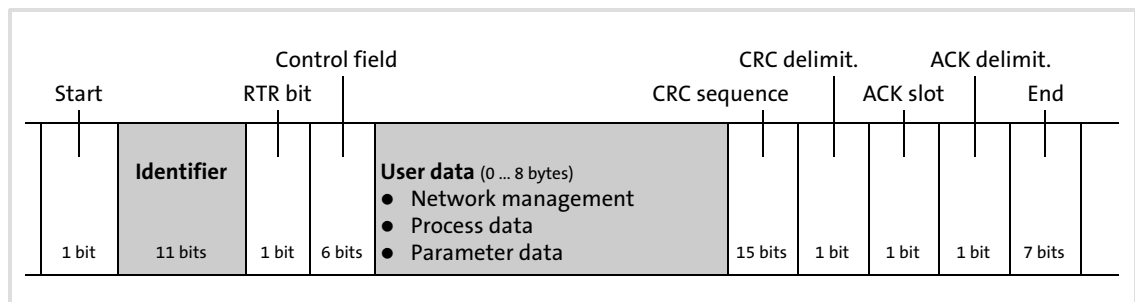


Fig. 8-1 Basic structure of the CAN telegram



Note!

Only the identifier and the user data are relevant to the user. All other data of the CAN telegram are automatically processed by the system.

8.1.2 Identifier

The principle of CAN communication is based on a message-oriented data exchange between a transmitter and many receivers. Therefore, all nodes can transmit and receive more or less at the same time.

The so-called *identifier* in the CAN telegram, also called *COB-ID* (*Communication Object Identifier*), controls which node is to receive a transmitted message. In addition to the addressing, the identifier contains information on the priority of the message and the type of user data.

The identifier consists of a 'basic identifier' and the node address of the device to be approached:

Identifier = Basic identifier + node address

- ▶ This node address is set with the coding switch at the module(📖 32).
- ▶ Network management and sync telegram only require the basic identifier.
- ▶ The identifiers can also be set individually(📖 281).

8 CANopen communication

About CANopen
Saving settings

8.1.3 Saving settings

The settings are permanently stored via I1010_h (communication protocol DS301/DS401).

8.2 Network management (NMT)

Via the network management, the master can change a communication status for the whole CAN network.

Communication phases

Status	Explanation
"Initialisation"	Initialisation starts when the I/O system is switched on. In this phase, the I/O system does not take part in the bus data transfer. Furthermore it is in each NMT status possible to restart the entire initialisation or parts of it by transferring different telegrams (see "Status transitions"). All parameters already set are overwritten with their standard values. After initialisation has been completed, the I/O system is automatically set to the status "Pre-operational".
"Pre-Operational" (before ready for operation)	The I/O system can receive parameter data. The process data are ignored.
"Operational" (Ready for operation)	The I/O system can receive parameter and process data.
"Stopped"	Parameter and process data cannot be received. Network management telegrams can be received. The module outputs switch to the configured status (see chapter "Monitoring").

Telegram structure

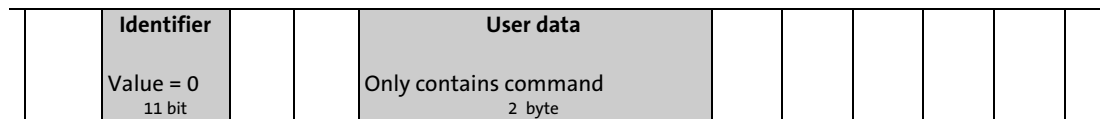


Fig. 8-2 Telegram for changing the communication phase

The telegram used for network management contains an identifier and the command which is part of the user data and consists of command byte and node address.

Telegrams with the identifier 0 and two bytes user data are used to change between the communication phases.

Only the network master (e.g. controller) can change a communication status for the whole network.



Note!

Only a change to "Operational" status enables communication via the process data!

Example:

If all nodes connected to the bus are to be switched from the "Pre-Operational" communication status to the "Operational" communication status via the CAN master, the identifier and the user data must have the following values in the transmission telegram:

- ▶ Identifier: 0x00 (broadcast telegram)
- ▶ User data: 0x0100

State transitions

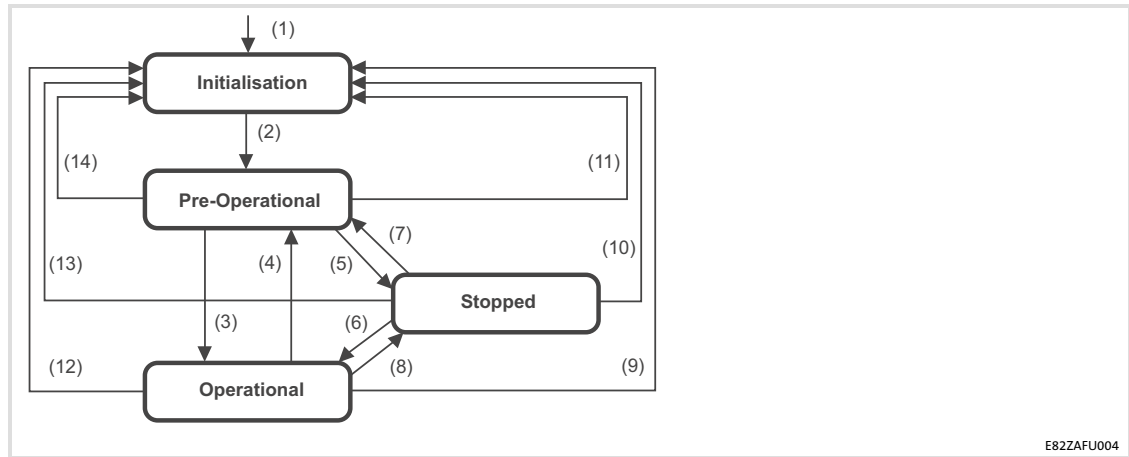


Fig. 8-3 Network management status transitions

State transition	Command (hex)	Network state after the change	Impact on process / parameter data after the state change
(1)	-	Initialisation	If the mains is switched on, initialisation is automatically started. During the initialisation phase, the I/O system is not involved in the data transfer. After the initialisation is complete, a boot-up message with its own identifier is sent to the master and the node changes automatically to the Pre-Operational state.
(2)	-	Pre-operational	In this phase, the master decides in which way the I/O system partakes in the communication.
From here, the change-over of the states is carried out by the master for the entire network. A target address contained in the command gives details about the recipient(s).			
(3), (6)	01 xx	Operational	Network management telegrams, sync, emergency, process data (PDO) and parameter data (SDO) are active. Optional: When the status is changed, event and time-controlled process data (PDO) will be sent once.
(4), (7)	80 xx	Pre-operational	Network management telegrams, sync, emergency and parameter data (SDO) are active (like "Enter pre-operational state")
(5), (8)	02 xx	Stopped	Network management telegrams can only be received.
(9)	81 xx	Initialisation	The parameters saved last via I1010 _h are loaded for all indices. If no values have been saved yet, the Lenze setting is loaded.
(10)			
(11)			
(12)			
(13), (14)	82 xx		The parameters saved last via I1010 _h are loaded for all communication parameters (index 0-1FFF _h). If no values have been saved yet, the Lenze setting will be loaded.

xx = 00_h With this assignment, all controllers connected are addressed by the telegram. All controllers can change their status at the same time.
 xx = node ID If a node address is indicated, the status will only be changed for the controller addressed.

8.3 Transmitting process data

Process data are used for control-specific purposes, such as setpoint and actual values, for example.

- ▶ Process data or the input / output data of the I/O system are transmitted as so-called PDOs (*Process Data Objects*).

8.3.1 Process data telegram

Structure of the process data telegram:

11 bits	8 bytes of user data							
Identifier	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8

Identifier

Information on the identifier can be found in the "Structure of the CAN data telegram" chapter.



Note!

In the Lenze setting, the identifiers are defined according to CANopen (assignment in accordance with DS301). Via I2101_h the identifier calculation according to the system bus (assignment according to the Lenze system bus) can be specified.

User data

The eight bytes of user data transmit the input signals (sent user data) and the output signals (received user data) of the modules.



Note!

Lenze controllers expect a PDO length of eight bytes even though not all of them may have assigned I/O values. The PDO length can be set via I2100_h:

- 0: PDO length of eight bytes (Lenze setting)
- 1: PDO length according to process image

8.3.2 Identifier of the process data objects (PDO)

The identifiers of process data objects PDO1 ... PDO10 consist of the so-called basic identifiers and the set node address:

Identifier = Basic identifier + node address

Basic identifiers of the process data objects

		Basic identifier		
		dec	hex	
PDOs	Process data object 1	PDO1-Rx	512	200
		PDO1-Tx	384	180
	Process data object 2	PDO2-Rx	768	300
		PDO2-Tx	640	280
	Process data object 3	PDO3-Rx	1024	400
		PDO3-Tx	896	380
	Process data object 4	PDO4-Rx	1280	500
		PDO4-Tx	1152	480
	Process data object 5	PDO5-Rx	1920	780
		PDO5-Tx	1664	680
	Process data object 6	PDO6-Rx	576	240
		PDO6-Tx	448	1C0
	Process data object 7	PDO7-Rx	832	340
		PDO7-Tx	704	2C0
	Process data object 8	PDO8-Rx	1088	440
		PDO8-Tx	960	3C0
	Process data object 9	PDO9-Rx	1344	540
		PDO9-Tx	1216	4C0
	Process data object 10	PDO10-Rx	1984	7C0
		PDO10-Tx	1728	6C0

8.3.3 Assigning individual identifiers

For larger networks with many nodes, it may be useful to set individual identifiers for process data objects PDO1 ... PDO10, that are independent of the set node address.

Process data objects for input data

Individual identifiers for input data can be set via the indices I1400_h, subindex 1 ... I1409_h, subindex 1.

Process data objects for output data

Individual identifiers for output data can be set via the indices I1800_h, subindex 1 ... I1809_h, subindex 1.



Note!

- ▶ Set the value which makes the required identifier (x = corresponding process data object) in index I140x_h, subindex 1 or I180x_h, subindex 1.
- ▶ Make a reset node so that the changes are accepted.

8.3.4 Process data transmission mode

Transmission mode for process input data

The transmission mode is configured via the index I1400_h, subindex 2 (PDO1-Rx) ... I1409_h, subindex 2 (PDO10-Rx):

- ▶ Sync-controlled reception
- ▶ n-sync-controlled reception
 - First, a certain number (n) of sync telegrams must be transmitted (I140x_h, subindex 2 = 1 ... 240). Then the PDO telegram must be received from the master. Finally, the process input data are accepted.
- ▶ Event-controlled reception (Lenze setting)

Transmission mode for process output data

The transmission mode is configured via the index I1800_h, subindex 2 (PDO1-Tx) ... I1809_h, subindex 2 (PDO10-Tx):

- ▶ Sync-controlled transmission
- ▶ n-sync-controlled transmission
 - First, a certain number (n) of sync telegrams must be transmitted (I180x_h, subindex 2 = 2 ... 240). Then, the PDO telegram is transmitted to the master.
- ▶ Event-controlled transmission (Lenze setting)



Note!

After changing to the CAN state "Operational", the current process image is transmitted from the I/O system.

Sync telegram for cyclic process data

A special telegram, the Sync telegram, is required for synchronisation when cyclic process data are transmitted.

The sync telegram must be generated by **another** node. It initiates the transmission for the cyclic process data of the I/O system and at the same time triggers data acceptance of cyclic process data received in the I/O system.

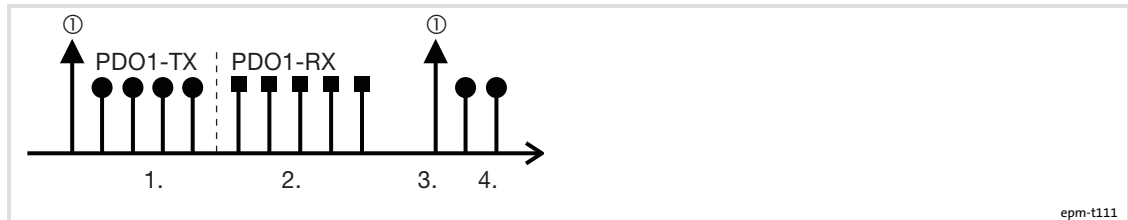


Fig. 8-4 Synchronisation of cyclical process data with the help of a sync telegram (asynchronous data not considered)

① Sync telegram

Transmission sequence

1. After receiving a sync telegram, the I/O system transmits the cyclic process output data (PDO1-Tx) if "sync-controlled transmission" is active.
2. Once the transmission is completed, the I/O system receives the cyclic process input data (PDO1-Rx).
3. The data is accepted by the I/O system with the next sync telegram if "sync-controlled reception" is active.
4. All other telegrams (e.g. for parameter or event-controlled process data) are accepted asynchronously by the I/O system after transmission.

8.3.5 PDO mapping

The PDO mapping differs depending on the motion control to be configured:

Drive-based automation (decentralised, with intelligent controllers)	Controller-based automation (with a central control)
<ul style="list-style-type: none"> Direct data exchange between the IO system and the controller without a master control. Configuration with L-force Engineer 	<ul style="list-style-type: none"> Direct data exchange between the IO system and the control (IPC). Configuration via L-force PLC Designer
<ul style="list-style-type: none"> Static PDO mapping (default setting) 	<ul style="list-style-type: none"> Free mapping by means of a bus configurator (e.g. PLC Designer)
<ul style="list-style-type: none"> Up to 10 RPDOs and TPDOs can be used 	<ul style="list-style-type: none"> Up to 16 RPDOs and TPDOs can be used

The following representation describes the static PDO mapping (Drive-based automation) by means of an example station structure:

Installation																
Module																
No.	M0	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15

n x DI I/O compound module with n digital inputs
n x DO I/O compound module with n digital outputs
n x AI I/O compound module with n analog inputs
n x AO I/O compound module with n analog outputs

Process image			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
PDO1	Permanent for the first DI or DO	RPDO1	M13	M14	–	–	–	–	–	–
		TPDO1	M1	M2	M3M4	M5	M6	M7	M8	M9
PDO2	Permanent for the first AI or AO	RPDO2	–	–	–	–	–	–	–	–
		TPDO2	M11	M11	M11	M11	M12	M12	M12	M12
PDO3	DI/DO, DI/DO TimeStamp, DO PWM, AI/AO, counter, SSI, RS232, RS422/RS485	RPDO3	–	–	–	–	–	–	–	–
		TPDO3	M12	M12	M12	M12	–	–	–	–
PDO4	DI/DO, DI/DO TimeStamp, DO PWM, AI/AO, counter, SSI, RS232, RS422/RS485	RPDO4	–	–	–	–	–	–	–	–
		TPDO4	M10	–	–	–	–	–	–	–
...								
PDO10	DI/DO, DI/DO TimeStamp, DO PWM, AI/AO, counter, SSI, RS232, RS422/RS485	RPDO10	–	–	–	–	–	–	–	–
		TPDO10	–	–	–	–	–	–	–	–

The following rules for assigning the PDO apply in accordance with the CANopen communication profile DS401:

- ▶ RPDO1 is reserved for the first I/O compound modules with digital inputs.
- ▶ TPDO1 is reserved for the first I/O compound modules with digital outputs.
- ▶ RPDO2 is reserved for the first I/O compound modules with analog inputs.
- ▶ TPDO2 is reserved for the first I/O compound modules with analog outputs.
- ▶ As of PDO3: a PDO can only be occupied by electronic modules of one module class. Free bytes are reserved for modules of the same module class.

Sorting sequence for module classes:

- Digital inputs and outputs (EPM-S200 to EPM-S206, EPM-S300 to EPM-S309)
- Analog inputs and outputs (EPM-S400 to EPM-S503)
- Counter (EPM-S600 to EPM-S603)
- SSI encoder (EPM-S604)
- Digital outputs with pulse width modulation (EPM-S620)
- Interfaces RS232 and RS422/RS485 (EPM-S640/EPM-S650)
- Digital outputs with time stamp functionality (EPM-S310)
- Digital inputs with time stamp functionality (EPM-S207)



Note!

In order to ensure data consistency, the data in the PDO are mapped as follows:

▶ Digital I/O:

With digital values, an I/O compound module is always mapped in one byte. If a byte in a PDO does not have enough free bits, the I/O compound module is mapped in the next byte.

▶ Analog I/O:

In the case of analog values the data lengths of which exceed one byte, the data consistency is extended. Since one channel assigns two bytes, each channel of an I/O compound module is mapped in two successive PDOs.

8.3.6 PDO mapping for I/O compound modules with a serial interface

Mapping for I/O compound modules with a serial interface (EPM-S640, EPM-S650) starts at PDO 3.

Default mapping

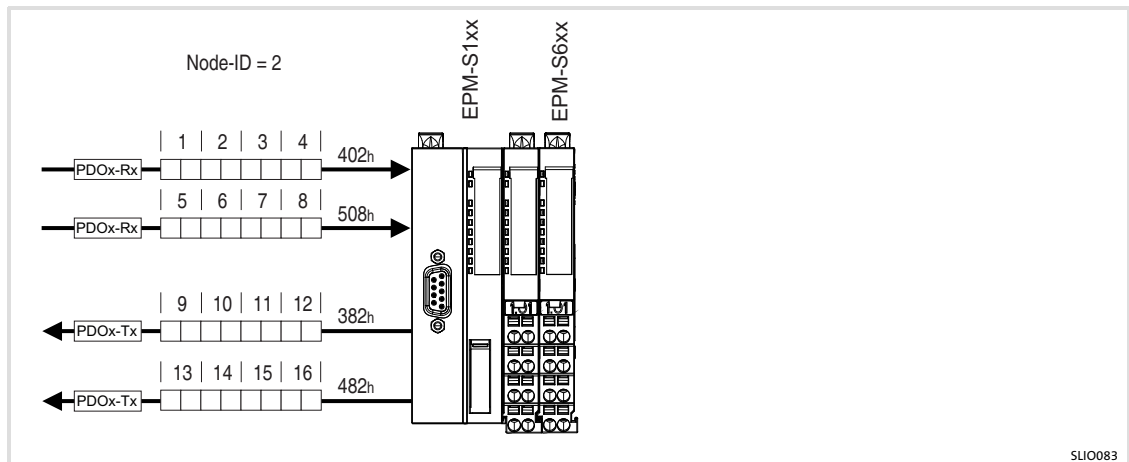


Fig. 8-5 Mapping contents

Word	EPM-S640, EPM-S650
1	Rx byte 0 ... 1
2	Rx byte 2 ... 3
3	Rx byte 4 ... 5
4	Rx byte 6 ... 7
5	–
6	–
7	–
8	–
9	Tx byte 0 ... 1
10	Tx byte 2 ... 3
11	Tx byte 4 ... 5
12	Tx byte 6 ... 7
13	–
14	–
15	–
16	–

8.3.7 PDO mapping for I/O compound modules with time stamp function

Mapping for I/O compound modules with a time stamp function begins at PDO 3.

Default mapping

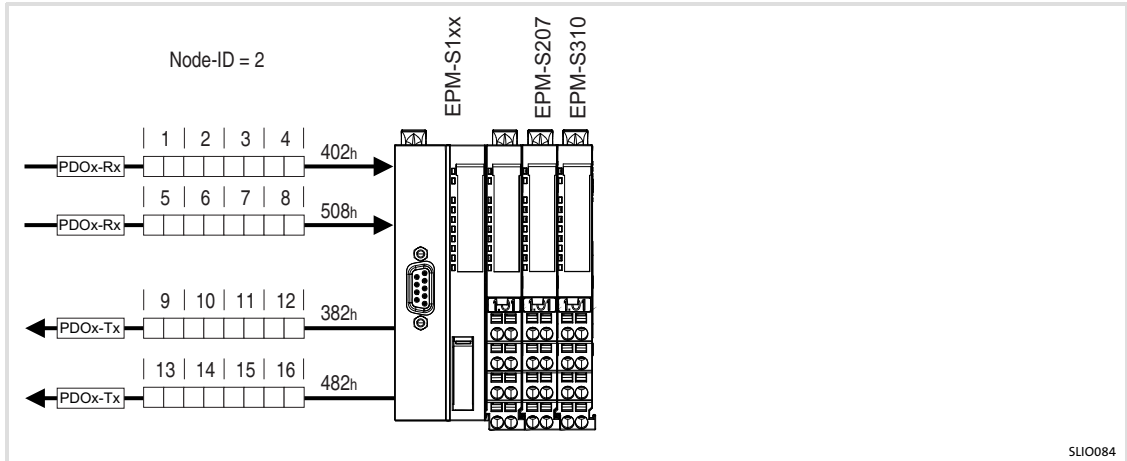


Fig. 8-6 Mapping contents

Word	EPM-S207	EPM-S310
1	–	Ticker value DO1
2	–	Running number Channel status DO1
3	–	Ticker value DO2
4	–	Running number Channel status DO2
5	–	–
6	–	–
7	–	–
8	–	–
9	Ticker value DI1	Status of FIFO memory
10	Running number Channel status DI1	
11	Ticker value DI2	–
12	Running number Channel status DI2	–
13	–	–
14	–	–
15	–	–
16	–	–

Ticker value EPM-S207 and EPM-S310		
Bit	Designation	Function
0 ... 15	Ticker value	After mains connection, a timer (μ s ticker) is started, which after 65535 μ s starts with 0 again.

PDO mapping for I/O compound modules with time stamp function

Running number, channel status EPM-S207		
Bit	Name	Function
0 ... 7	Running number (RN)	Counter which counts from 0 ... 63 and then goes back to 0. During the first run, the running number must start with 1.
8	Channel status DI1	0: FALSE 1: TRUE
9	Channel status DI2	0: FALSE 1: TRUE
10 ... 15	–	Reserved (fix 0)

Running number, channel status EPM-S310		
Bit	Name	Function
0 ... 7	Running number (RN)	Counter which counts from 0 ... 63 and then goes back to 0. During the first run, the running number must start with 1.
8 ... 11	–	Reserved (fix 0)
12	Enable DO1	0: inhibit 1: enable
13	Enable DO2	0: inhibit 1: enable
14	Channel status DO1	0: FALSE 1: TRUE
15	Channel status DO2	0: FALSE 1: TRUE

Status of FIFO memory for EPM-S310		
Bit	Designation	Function
0 ... 5	RN-LAST	Running number of the time stamp entry last detected as valid by the module and written into the FIFO memory.
6		1 (fix); is used for identification in the process image
7		0 (fix); is used for identification in the process image
8 ... 13	RN_NEXT	Running number of the time stamp entry to be processed next in the FIFO memory.
14		1 (fix); is used for identification in the process image
15		1 (fix); is used for identification in the process image
16 ... 23	STS_FIFO	<p>Status information of FIFO memory</p> <ul style="list-style-type: none"> ● 00_h or 80_h: Everything is OK; you will receive this message directly after the acceptance into the FIFO memory of the module. ● 01_h or 81_h: No follow-up entry available; the running number does not correspond to the expected running number. Check the running number in the output area. ● 02_h or 82_h: No new entries available in the FIFO memory. ● 03_h or 83_h: FIFO memory full. No new entries possible. A full memory will not accept any more time stamp entries. Perform a status query to establish the FIFO memory's status before transferring more time stamp entries. <p>Note: If less than possible time stamp entries are written, bit 6 must be set in the running number (RN) of the last time stamp entry. This is required in order to not write the follow-up entries as "invalid" since the module ignores all time stamp entries after an entry with a set RN bit 6. If a time stamp entry with a running number and a set bit 6 is in the FIFO memory, STS_FIFO with 80_h is returned in an OR-ed manner.</p>
24 ... 31	–	Current number of time stamp entries in FIFO memory.

8.3.8 PDO mapping for I/O compound modules with PWM function

Mapping for I/O compound modules with a PWM function begins at PDO 3.

Default mapping

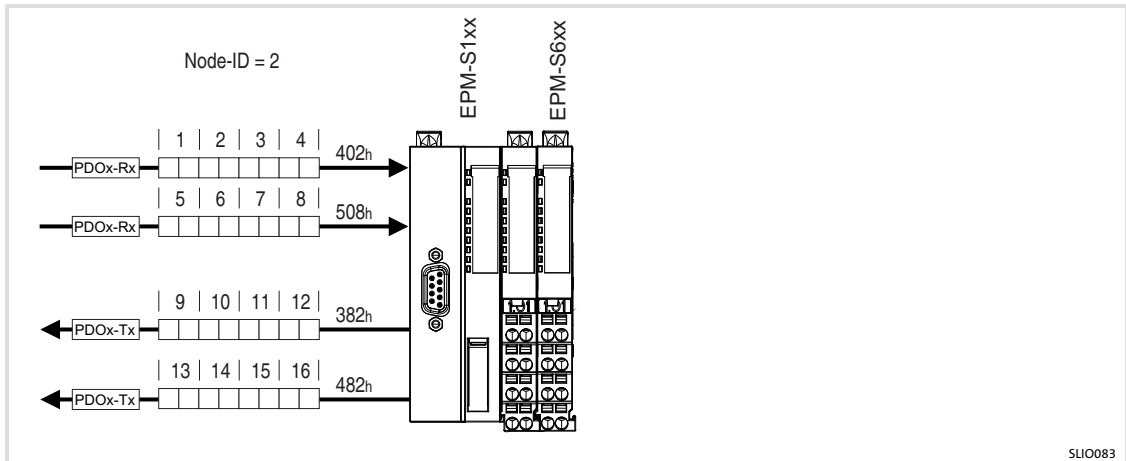


Fig. 8-7 Mapping contents








Word	EPM-S620
1	Pulse duration DO1
2	
3	Pulse duration DO2
4	
5	Control word DO1
6	Control word DO2
7	–
8	–
9	Status word DO1
10	Status word DO2
11	–
12	–
13	–
14	–
15	–
16	–

Information on the structure of the control word and the status word [242](#).

8.3.9 PDO mapping for counters and encoder evaluation

The mapping for counters starts at PDO 3, since the first two PDOs are reserved for digital and analog modules.

The following table describes the indices for the PDO mapping for counters.

Index	Name	Possible settings			Important
		Lenze	Selection		
15400 _h	Counter Value		00000000 _h {1 _h }	FFFFFFF _h	Count value  290
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: Subindex is increased by 2 for each counter
	2 DWord 2				
				
	64 DWord 64				
15401 _h	Latch value		00000000 _h {1}	FFFFFFF _h	Latch value  290
	1 DWord 1				EPM-S600: Subindex is increased by 1 for each counter EPM-S601/-S602/-S603: without function
	2 DWord 2				
				
	64 DWord 64				
15402 _h	Status word		0000 _h {1}	FFFF _h	Status word  290
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: Subindex is increased by 2 for each counter
	2 DWord 2				
				
	64 DWord 64				
15403 _h	Counter ticker value		0000 _h {1}	FFFF _h	Ticker value  290
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: without function
	2 DWord 2				
				
	64 DWord 64				
15600 _h	Counter Compare Value		00000000 _h {1}	FFFFFFF _h	Comparison value  290
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601: Subindex is increased by 2 for each counter EPM-S603: without function
	2 DWord 2				
				
	64 DWord 64				
15601 _h	Counter Set Value		00000000 _h {1}	FFFFFFF _h	Set value  290
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: without function
	2 DWord 2				
				
	64 DWord 64				
15602 _h	Counter Control Word		0000 _h {1}	FFFF _h	Control word  290
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: Subindex is increased by 2 for each counter
	2 DWord 2				
				
	64 DWord 64				

Default mapping

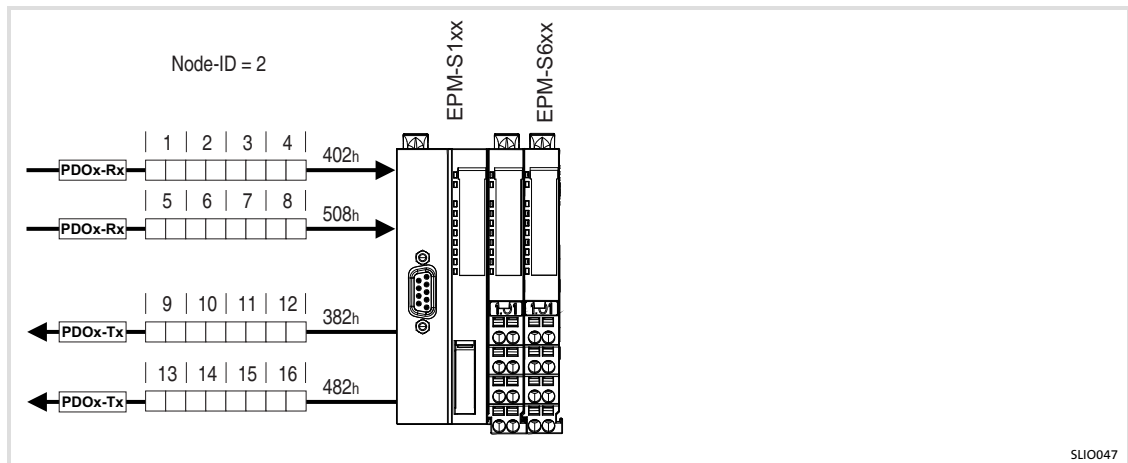


Fig. 8-8 Mapping contents

Word	EPM-S600	EPM-S601	EPM-S602	EPM-S603	EPM-S604
1	Comparison value	Comparison value C1	Comparison value	Control word C1	
2				Control word C2	
3	Set value	Comparison value C2	Set value		
4					
5	Control word	Control word C1	Control word	-	
6		Control word C2			
7	-		-		
8		-			
9	Count value	Count value C1	Count value	Count value C1	Encoder value
10					
11	Latch value	Count value C2	Status word	Count value C2	Ticker value
12			Ticker value		
13	Status word	Status word C1		Status word C1	
14	Ticker value	Status word C2		Status word C2	
15			-		-
16	-	-		-	

Comparison value: Here you can select a value which, by comparison with the current counter content, can impact the counter output or trigger a process alarm. The response of the output or the process alarm can be parameterised.

Set value: With an edge change 0-1 of *COUNTERVAL_SET* in the control word, the set value is accepted in the counter.

Count value: Current counter content

Latch value: If there is a positive edge at the latch input, the count value is stored here.

Ticker value: After mains connection a timer (μ s ticker) is started, which after 65535 μ s starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μ s value together with the count value in the input area.

Information on the structure of the control word and the status word 229.

8.3.10 Data transfer between I/O system and controller

In the Lenze setting of the I/O system 1000, the basic identifiers of the PDOs are set according to CANopen.

For communicating with Lenze controllers the basic identifiers for the process data object 1 must be adapted.

1. Set RPDO1 via index 1400_h , subindex 1 to 770.
2. Set TPDO1 via index 1800_h , subindex 1 to 769.

The input data are accepted on sync telegram transmission.

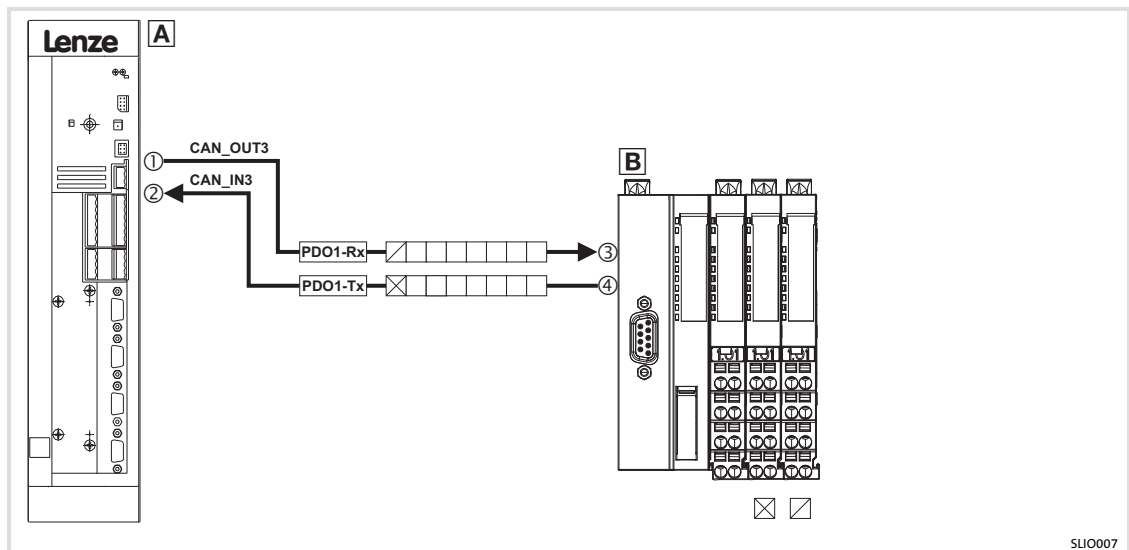


Fig. 8-9 Data transfer between I/O system and controller

PDO-Rx The I/O system receives the status information from the controller

PDO-Tx The I/O system transmits the status information to the controller

- A** Controller with node address 1 (C0350 = 1)
- ① 768_d (basic identifier) + 1 (node address) = 769_d (identifier)
 - ② 769_d (basic identifier) + 1 (node address) = 770_d (identifier)
- B** CAN bus coupler module with node address 2
- ③ 767_d (basic identifier) + 2 (node address) = 769_d (identifier)
 - ④ 768_d (basic identifier) + 2 (node address) = 770_d (identifier)

8.3.11 Indices for setting the process data transfer**Process data objects for input data**

COB-IDs can be changed as follows:

The COB-ID is set via a 32 bit value.

Bit 0 ... 11	Bit 12 ... 29	Bit 30	Bit 31
COB-ID	Reserved	RTR allowed	PDO not valid: 1 PDO valid: 0

Example: Changing the COB-ID from 201 to 202

1. Enter the COB-ID value and bit 31 = 1.

0xC0000202

2. Bit 31 = 0

0x40000202

The PDO is activated with a new identifier. The changes will be accepted in the Pre-Operational or Operational status.

Index	Name	Possible settings		Important
		Lenze	Selection	
11400 _h				281
1	COB-ID used by RxPDO 1	513 + NID	385 {1} 2047	Definition of specific identifiers for process data object 1 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
			0 ... 24 Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
			0 ... 241 ... 254 Reserved	
			255 Process data update on every occurrence of an event	Every received value is accepted
...	...			
11409 _h				281
1	COB-ID used by RxPDO 10	1984 + NID	385 {1} 2047	Definition of specific identifiers for process data object 10 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
			0 ... 24 Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
			0 ... 241 ... 254 Reserved	
			255 Process data update on every occurrence of an event	Every received value is accepted

Process data objects for output data

COB-IDs can be changed as follows:

The COB-ID is set via a 32 bit value.

Bit 0 ... 11	Bit 12 ... 29	Bit 30	Bit 31
COB-ID	Reserved	RTR allowed	PDO not valid: 1 PDO valid: 0

Example: A COB-ID value of 182 is to be set

1. Enter the COB-ID value and bit 31 = 1.

0x80000182

2. Bit 31 = 0

0x00000182

The PDO is activated with a new identifier. The changes will be accepted in the Pre-Operational or Operational status.

Index	Name	Possible settings		Important
		Lenze	Selection	
l1800 _h				281
1	COB-ID used by TxPDO 1	384+ NID	385 {1} 2047	Definition of specific identifiers for process data object 1 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
			0 Function deactivated	The output data are accepted on sync telegram transmission.
			1 ... 240 Process data transfer after sync no. 1 ... Process data transfer after sync no. 240	The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.
			254 Time-controlled process data transfer	Only if a cycle time is set in l180x _h , subindex 5
			255 Event-controlled process data transfer	
			255 Event-controlled process data transfer with cyclic overlay	Only if a cycle time is set in l180x _h , subindex 5
3	Inhibit time	0	0 {1 ms} 65535	Blocking time
5	Event time	100	0 {1 ms} 65535	Cycle time
...	...			

Transmitting process data
 Indices for setting the process data transfer

Index	Name	Possible settings		Important
		Lenze	Selection	
11809 _h ┌				
1	COB-ID used by TxPDO 10	1728 + NID	385 {1} 2047	Definition of specific identifiers for process data object 10 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
			0 Function deactivated	The output data are accepted on sync telegram transmission.
			1 ... 240 ... Process data transfer after sync no. 1 ... Process data transfer after sync no. 240	The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.
			254 Time-controlled process data transfer	Only if a cycle time is set in 1180x _h , subindex 5
			255 Event-controlled process data transfer	
			255 Event-controlled process data transfer with cyclic overlay	Only if a cycle time is set in 1180x _h , subindex 5
3	Inhibit time	0	0 {1 ms} 65535	Blocking time
5	Event time	0	0 {1 ms} 65535	Cycle time

 281

8 CANopen communication

Transmitting parameter data
Telegram structure

8.4 Transmitting parameter data

Parameter data are the so-called indices.

Parameters are usually set only once during commissioning.

Parameter data are transmitted as so-called SDOs (*Service Data Objects*) via the system bus and acknowledged by the receiver, i.e. the transmitter gets a feedback if the transmission was successful.

8.4.1 Telegram structure

Structure of the telegram for parameter data:

11 bits		8 bytes of user data						
Identifier	Instruction code	Index		Subindex	Data 1	Data 2	Data 3	Data 4
		Low byte	High byte					

- ▶ The subchapters below explain the individual telegram components in detail.
- ▶ The chapter 8.4.2 contains an example of how to write a parameter. (📖 298)
- ▶ The chapter 8.4.3 contains an example of how to read a parameter. (📖 299)

Identifier

Identifier	Instruction code	Index		Subindex	Data 1	Data 2	Data 3	Data 4
		Low byte	High byte					

One parameter channel is available for parameter data transmission, which is addressed via the identifier.

Identifier =		Basic identifier		+ node address of the device
		dec	hex	
SDO	Parameter channel 1			+ value set with coding switch
	Output (transmit)	1408	580	
	Input (receive)	1536	600	

Instruction code

Identifier	Instruction code	Index		Subindex	Data 1	Data 2	Data 3	Data 4
		Low byte	High byte					

The instruction code contains the command to be executed and information about the parameter data length. It is structured as follows:

	Bit 7 (MSB)	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Command	Command Specifier (cs)				Length		E	s
Write Request	0	0	1	0	00 = 4 bytes		1	1
Write Response	0	1	1	0	01 = 3 bytes		0	0
Read Request	0	1	0	0	10 = 2 bytes		0	0
Read Response	0	1	0	0	11 = 1 byte		1	1
Error Response	1	0	0	0	0	0	0	0

Instruction code for parameters with 4 bytes of data length:

Command	4 bytes of data		Information
	hex	dec	
Write Request	23	35	Transmitting parameters to a node
Write Response	60	96	Node response to the Write Request (acknowledgement)
Read Request	40	64	Request to read a parameter from a node
Read Response	43	67	Response to the read request with the actual value
Error Response	80	128	Node reports a communication error

Instruction “Error Response”

If an error occurs, the addressed node generates an “Error Response”.

In data 4, this telegram always contains the value “6”, in data 3 it contains an error code:

Command code Error Response	Data 3	Data 4	Error message
80 _h	3	6	Access denied
	5		Wrong subindex
	6		Wrong index

Parameter addressing (Index/subindex)

Identifier	Instruction code	Index		Subindex	Data 1	Data 2	Data 3	Data 4
		Low byte	High byte					

The index of the telegram is used to address the index to be read or written:

- ▶ The index value must be entered in flush-left Intel format and divided into Low byte and High byte (see example).
- ▶ For subindices, the number of the associated subindex must be entered into the telegram’s subindex.
- ▶ For indices without subindex, the subindex always has the value “0”.

Example

The subindex 1 of index I2400_h (monitoring time for PDO1) is to be addressed:

11 bits		8 bytes of user data						
Identifier	Instruction code	Index		Subindex	Data 1	Data 2	Data 3	Data 4
		Low byte	High byte					
		00 _h	24 _h	1				

Parameter data (data 1 ... data 4)

Identifier	Instruction code	Index		Subindex	Data 1	Data 2	Data 3	Data 4
		Low byte	High byte					

Up to 4 bytes (data 1 ... data 4) are available for parameter data.

Data are entered in left-justified Intel format with data 1 as LSB and data 4 as MSB (see example).

Example

The value "1 s" is to be transmitted for the index 2400_h (monitoring time).

$$\text{Data}_{1...4} = 1 \times 1000 = 1000 = 00\ 00\ 03\ \text{E8}_h$$

11 bits		8 bytes of user data							
Identifier	Instruction code	Index		Subindex	Data 1	Data 2	Data 3	Data 4	
		Low byte	High byte						
					E8 _h	03 _h	00 _h	00 _h	
					(LSB)				(MSB)

8.4.2 Writing a parameter (example)

Task

An I/O system 1000 has been assigned node address 2. The function of the first channel (voltage signal 0 ... +10 V, 0 ... 27648_{dec}) is to be output at the first analog I/O compound module (EPM-S500, 2 analog outputs 0 ... 10 V).

Telegram to the I/O system

	Formula	Information
Identifier	= Basic identifier + node address = 1536 + 2 = 1538 = 602 _h	<ul style="list-style-type: none"> Basic identifier for parameter channel 1 (output) = 1536 Node address of the I/O system = 2
Instruction code	= 23 _h	<ul style="list-style-type: none"> Write Request command (transmitting parameters to the I/O system)
Index	= I3100 _h	<ul style="list-style-type: none"> First channel of the analog module
Subindex	= 1	<ul style="list-style-type: none"> First analog module
Data 1	= 0F _h	<ul style="list-style-type: none"> 0 ... 10 V, 0 ... 07648_{dec}
Data 2 ... 4	= 00 _h	<ul style="list-style-type: none"> No function

11 bits		Eight bytes of user data							
Identifier	Instruction code	Index		Subindex	Data 1	Data 2	Data 3	Data 4	
		LOW byte	HIGH byte						
602 _h	23 _h	00 _h	31 _h	0F _h	00 _h	00 _h	00 _h	00 _h	
					(LSB)				(MSB)

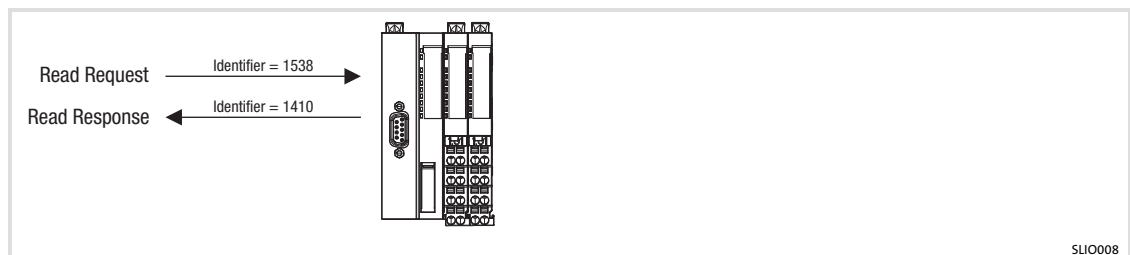


Fig. 8-10 Writing a parameter

SLIO008

Telegram from the I/O system (acknowledgement when being executed faultlessly)

	Formula	Information
Identifier	= Basic identifier + node address = 1408 + 2 = 1410	<ul style="list-style-type: none"> Basic identifier for parameter channel 1 (input) = 1408 Node address of the I/O system = 2
Instruction code	= 60_h	<ul style="list-style-type: none"> Command "Write Response" (acknowledgement from the I/O system)
Index	= Index of the read request	
Subindex	= Subindex of the read request	
Data 1 ... 4	= 0	<ul style="list-style-type: none"> Acknowledgement only

11 bits	Eight bytes of user data							
Identifier	Instruction code	Index		Subindex	Data 1	Data 2	Data 3	Data 4
		LOW byte	HIGH byte					
1410	60 _h	01 _h	30 _h	0	0	0	0	3

8.4.3 Reading a parameter (example)

Task

An I/O system 1000 has been assigned node address 2. The function of the first channel is to be read at the first analog I/O compound module (EPM-S500, 2 analog outputs 0 ... 10 V).

Telegram to the I/O system

	Formula	Information
Identifier	= Basic identifier + node address = 1536 + 2 = 1538 = 602_h	<ul style="list-style-type: none"> Basic identifier for parameter channel 1 (output) = 1536 Node address of the I/O system = 2
Instruction code	= 40_h	<ul style="list-style-type: none"> Read Request command (request for reading a parameter of the I/O system)
Index	= 13100_h	<ul style="list-style-type: none"> First channel of the analog module
Subindex	= 1	<ul style="list-style-type: none"> First analog module
Data 1	= 00 _h	<ul style="list-style-type: none"> Read request only
Data 2	= 00 _h	
Data 3	= 00 _h	
Data 4	= 00 _h	
Data 1 ... 4	= 00 00 00 00_h	

11 bits	Eight bytes of user data							
Identifier	Instruction code	Index		Subindex	Data 1	Data 2	Data 3	Data 4
		LOW byte	HIGH byte					
602 _h	40 _h	00 _h	31 _h	1	0F _h	00 _h	00 _h	00 _h
					(LSB)			(MSB)

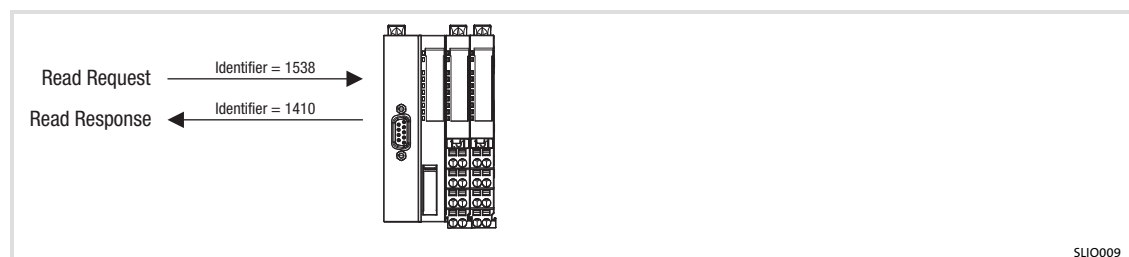


Fig. 8-11 Reading a parameter

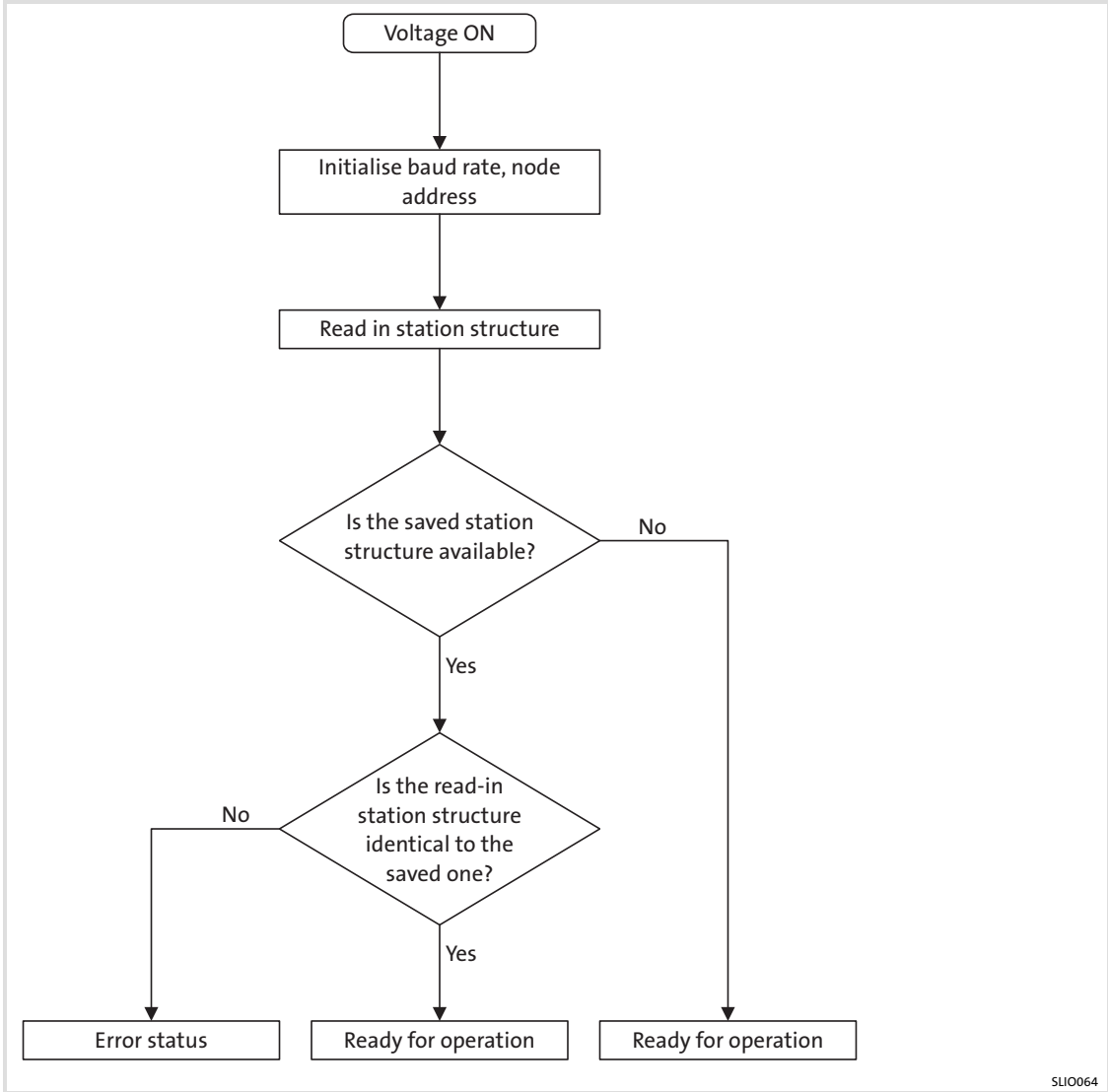
Telegram from the I/O system (value of the requested parameter)

	Formula	Information
Identifier	= Basic identifier + node address = 1408 + 2 = 1410	<ul style="list-style-type: none"> Basic identifier for parameter channel 1 (input) = 1408 Node address of the I/O system = 2
Instruction code	= 43_h	<ul style="list-style-type: none"> Read Response command (response to the read request with the current value)
Index	= Index of the read request	
Subindex	= Subindex of the read request	
Data 1	= 00 _h	<ul style="list-style-type: none"> Assumption: The first channel of the first analog module outputs a voltage signal 0 ... +10 V with a resolution of 0 ... 07648_{dec}.
Data 2	= 00 _h	
Data 3	= 05 _h	
Data 4	= 3B _h	
Data 1 ... 4	= 00 00 05 3B_h	

11 bits	Eight bytes of user data							
Identifier	Instruction code	Index		Subindex	Data 1	Data 2	Data 3	Data 4
		LOW byte	HIGH byte					
1410	43 _h	00 _h	31 _h	0	00 _h	00 _h	05 _h	3B _h

8.5 Response of the station after switch-on

The sequence diagram shows the test routine of the I/O system after every switch-on of the supply voltage.



8.6 Baud rate and node address (node ID) setting**Baud rate**

For establishing a communication, all devices must use the same baud rate for the data transfer.

- ▶ Use the coding switch to set the baud rate at the CANopen bus coupler module (📖 32).

Node address

Each node of the network must be assigned to a node address, also called *node ID* within a range of 1 ... 127 for clear identification.

- ▶ A node address in a network may be used only once.
- ▶ Use the coding switch to set the node address of the I/O system at the CANopen bus coupler module (📖 32).
- ▶ The set node address can be read in index I100B_h.

8.7 General function of the parameter setting

8.7.1 Parameterising digital I/Os

The parameter data of the digital I/O define if the control signals are to be transmitted with original or inverted polarity.

For parameter data, 1 byte is available which is assigned via SDO.

- ▶ Digital inputs are parameterised via index I6002h.
- ▶ Digital outputs are parameterised via index I6202h.

The subindex depends on the slot.

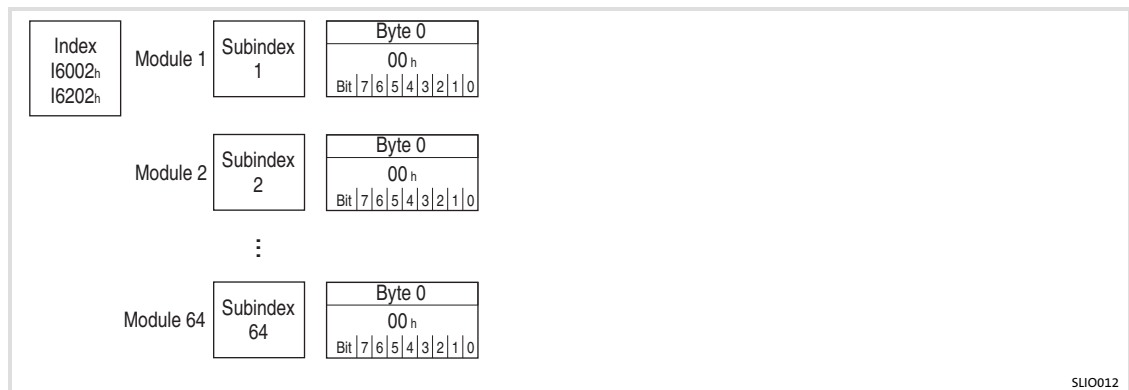


Fig. 8-12 Display of the digital I/O parameter data

Byte	Assignment	Bit	Value	Description	Lenze setting
0	Polarity of the transmitted signals	Bit0	0	Signal is transmitted in original form	00h
			1	Signal is transmitted in inverse form	
		Bit 1...7		Reserve	



Note!

Store changed parameters in the EEPROM via index I1010h. The settings are maintained after the supply voltage is switched off.

8.7.2 Parameterising analog I/Os, counter, SSI, time stamp and PWM

The parameter data of each parameterisable I/O compound module (e.g. analog I/O, counter, SSI, digital I/O time stamp or PWM) are values in the index range 0x3100 ... 0x3129.

The parameter data of the 1st parameterisable I/O compound module are in subindex 1 of this range, the parameter data of the 2nd parameterisable I/O compound module in subindex 2, etc.

Index range for	#1 (analog I/O)	#2 (analog I/O)	#3 (counter)	...
Signal functions	0x3100/1	0x3100/2	0x3100/3	...
	:	:	:	...
	0x3129/1	0x3129/2	0x3129/3	...

8.8 Setting the parameters of analog I/O

8.8.1 2 analog inputs 0 ... 10 V (12 bits) - EPM-S400

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec}	20 _h
0x3101/x	Function channel 2	255 (FF _h): channel deactivated	20 _h
0x3102/x	Reserved	0	
...	
0x311D/x	Reserved	0	

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I - 4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I - 4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

8.8.2 4 analog inputs 0 ... 10 V (12 bits) - EPM-S401

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
0x3101/x	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec}	20 _h
0x3102/x	Function channel 3	255 (FF _h): channel deactivated	20 _h
0x3103/x	Function channel 4		20 _h
0x3104/x	Reserved	0	
...	
0x311D/x	Reserved	0	

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I - 4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I - 4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

8.8.3 2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
0x3101/x	Function channel 2	49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	31 _h
0x3102/x	Reserved	0	
...	
0x311D/x	Reserved	0	

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

8.8.4 4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511	31 _h
0x3101/x	Function channel 2	64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
0x3102/x	Function channel 3	49 (31 _h): 0 ... 20 mA / -4864 ... 32511	31 _h
0x3103/x	Function channel 4	65 (41 _h): 0 ... 20 mA / -3277 ... 20480	31 _h
0x3104/x	Reserved	255 (FF _h): channel deactivated	31 _h
...	
0x311D/x	Reserved	0	

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

8.8.5 2 analog inputs -10 ... +10 V (16 bits) - EPM-S406

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Diagnostics	Bits 0 ... 5: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
0x3101/x	Reserved	0	
0x3102/x	Limit value monitoring	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) Bit 1: Channel 2 (0 = inhibited; 1 = enabled) Bits 7 ... 2: Reserved	00 _h
0x3103/x	Interference frequency suppression	Bit 1, 0: Channel 1 00: Deactivated 01: 60 Hz 10: 50 Hz Bit 3, 2: Channel 2 00: Deactivated 01: 60 Hz 10: 50 Hz Bits 7 ... 4: Reserved	00 _h
0x3104/x	Function channel 1	12 (12 _h): -10 ... 10 V / -27648 ... 27648 _{dec} 34 (22 _h): -10 ... 10 V / -16384 ... 16384 _{dec} 16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
0x3105/x	Reserved	0	
0x3106/x 0x3107/x	Upper limit value channel 1	Value from the rated range; if this value is exceeded and the limit value monitoring function is enabled, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
0x3108/x 0x3109/x	Lower limit value channel 1	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is enabled, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h
0x310A/x	Function channel 2	12 (12 _h): -10 ... 10 V / -27648 ... 27648 _{dec} 34 (22 _h): -10 ... 10 V / -16384 ... 16384 _{dec} 16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
0x310B/x	Reserved	0	
0x310C/x 0x310D/x	Upper limit value channel 2	Value from the rated range; if this value is exceeded and the limit value monitoring function is enabled, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
0x310E/x 0x310F/x	Lower limit value channel 2	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is enabled, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h

CANopen communication

Setting the parameters of analog I/O
2 analog inputs -10 ... +10 V (16 bits) - EPM-S406

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
-10 ... +10 V (12 _h)	11.76	32511	7EFF	Overflow	U = D * 10 / 27648 D = 27648 * U / 10
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	-5	-13824	CA00		
	-10	-27648	9400		
	-11.76	-32512	8100	Underflow	
-10 ... +10 V (22 _h)	12.5	20480	5000	Overflow	U = D * 10 / 16384 D = 16384 * U / 10
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	-5	-8192	E000		
	-10	-16384	C000		
	-12.5	-20480	B000	Underflow	
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	U = D * 10 / 27648 D = 27648 * U / 10
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	-1.76	-4864	ED00	Underflow	
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	U = D * 10 / 16384 D = 16384 * U / 10
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	-2	-3277	F333	Underflow	

8.8.6 2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Diagnostics	Bits 0 ... 5: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
0x3101/x	Reserved	0	
0x3102/x	Limit value monitoring	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 (0 = deactivated; 1 = activated) Bits 7 ... 2: Reserved	00 _h
0x3103/x	Interference frequency suppression	Bit 1, 0: Channel 1 00: Deactivated 01: 60 Hz 10: 50 Hz Bit 3, 2: Channel 2 00: Deactivated 01: 60 Hz 10: 50 Hz Bits 7 ... 4: Reserved	00 _h
0x3104/x	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480 49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	41 _h
0x3105/x	Reserved	0	
0x3106/x 0x3107/x	Upper limit value channel 1	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
0x3108/x 0x3109/x	Lower limit value channel 1	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h
0x310A/x	Function channel 2	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480 49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	41 _h
0x310B/x	Reserved	0	
0x310C/x 0x310D/x	Upper limit value channel 2	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
0x310E/x 0x310F/x	Lower limit value channel 2	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h

CANopen communication

Setting the parameters of analog I/O
2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

8.8.7 2 analog outputs 0 ... 10 V (12 bits) - EPM-S500

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Reserved	0	
0x3101/x	Short-circuit detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
0x3102/x	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
0x3103/x	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
0x3104/x	Reserved		
...	
0x311D/x	Reserved	0	

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Output area (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

8.8.8 4 analog outputs 0 ... 10 V (12 bits) - EPM-S501

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Reserved	0	
0x3101/x	Short-circuit detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bit 2: Channel 3 Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
0x3102/x	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
0x3103/x	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec}	20 _h
0x3104/x	Function channel 3	255 (FF _h): channel deactivated	20 _h
0x3105/x	Function channel 4		20 _h
0x3106/x	Reserved	0	
...	
0x311D/x	Reserved	0	

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Output area (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

8.8.9 2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Reserved	0	
0x3101/x	Wire-breakage detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
0x3102/x	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
0x3103/x	Function channel 2	49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480	31 _h
0x3104/x	Reserved	255 (FF _h): channel deactivated	
...	
0x311D/x	Reserved	0	

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

8.8.10 4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503



Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Reserved	0	
0x3101/x	Wire-breakage detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bit 2: Channel 3 Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
0x3102/x	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511	31 _h
0x3103/x	Function channel 2	64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
0x3104/x	Function channel 3	49 (31 _h): 0 ... 20 mA / -4864 ... 32511	31 _h
0x3105/x	Function channel 4	65 (41 _h): 0 ... 20 mA / -3277 ... 20480	31 _h
0x3106/x	Reserved	0	
...	
0x311D/x	Reserved	0	

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

8.8.11 Error behaviour

Index	Name	Possible settings		Important	
		Lenze	Selection		
I6443 _h └┘	Error mode analog output		0 {1} 255	Configures analog output monitoring  371	
			0 All analog outputs retain the last value output		
			255 Response from I6444 _h		In I6444 _h the response can be configured individually for each analog output
		1 Channel 1	0		
	2 Channel 2	0			
			
	36 Channel 36	0			
I6444 _h └┘	Error value analog output		-32768 {1} 32767	Configures the individual analog output responses  371 The analog outputs provide the set value	
			1 Channel 1		0
			2 Channel 2		0
		
			36 Channel 36		0

8.9 Parameterising the temperature measurement**8.9.1 Four (two) analog inputs for resistance tests - EPM-S404****Note!**

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ If thermal detectors are connected in a 3-wire or 4-wire setup, channels 3 and/or 4 must be deactivated.
- ▶ The module does not provide any auxiliary supply for sensors.

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 0 ... 5: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
0x3101/x	Wire-breakage detection	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) : Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
0x3102/x	Limit value monitoring	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) : Bit 3: Channel 4 Bit 4 ... 7: Reserved	00 _h
0x3103/x	Reserved		
0x3104/x	Temperature system	Bit 0, 1: 00 _b = °C; 01 _b = °F; 10 _b = K Bits 2 ... 7: Reserved	00 _h
0x3105/x	Interference frequency suppression	Bit 0, 1: 01 _b = 60 Hz; 10 _b = 50 Hz Bits 2 ... 7: Reserved	02 _h

Parameterising the temperature measurement
 Four (two) analog inputs for resistance tests - EPM-S404

Index/sub index	Name	Description/value	Lenze
Channel 1			
0x3106/x	Function channel 1	Thermal detector: 80 (50 _h): PT100 2-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 81 (51 _h): PT1000 2-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 82 (52 _h): Ni100 2-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} 83 (53 _h): Ni1000 2-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} 88 (58 _h): PT100 3-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 89 (59 _h): PT1000 3-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 90 (5A _h): Ni100 3-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} 91 (5B _h): Ni1000 3-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} 96 (60 _h): PT100 4-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 97 (61 _h): PT1000 4-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 98 (62 _h): Ni100 4-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} 99 (63 _h): Ni1000 4-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} Resistor: 112 (70 _h): R 60-Ω2-wire conductor 0.00 ... +60.00 / 0 ... +32767 _{dec} 113 (71 _h): R 600-Ω2-wire conductor 0.00 ... +600.00 / 0 ... +32767 _{dec} 114 (72 _h): R 3000-Ω2-wire conductor 0.00 ... +3000.00 / 0 ... +32767 _{dec} 115 (73 _h): R 6000-Ω2-wire conductor 0.00 ... +6000.00 / 0 ... +32767 _{dec} 128 (80 _h): R 60-Ω4-wire conductor 0.00 ... +60.00 / 0 ... +32767 _{dec} 129 (81 _h): R 600-Ω4-wire conductor 0.00 ... +600.00 / 0 ... +32767 _{dec} 130 (82 _h): R 3000-Ω4-wire conductor 0.00 ... +3000.00 / 0 ... +32767 _{dec} 144 (90 _h): R 60-Ω2-wire conductor 0.00 ... +60.00 / 0 ... +6000 _{dec} 145 (91 _h): R 600-Ω2-wire conductor 0.00 ... +600.00 / 0 ... +6000 _{dec} 146 (92 _h): R 3000-Ω2-wire conductor 0.00 ... +3000.00 / 0 ... +30000 _{dec} 160 (A0 _h): R 60-Ω2-wire conductor 0.00 ... +60.00 / 0 ... +6000 _{dec} 161 (A1 _h): R 600-Ω2-wire conductor 0.00 ... +600.00 / 0 ... +6000 _{dec} 162 (A2 _h): R 3000-Ω2-wire conductor 0.00 ... +3000.00 / 0 ... +30000 _{dec} 255 (FF _h): channel deactivated	50 _h

CANopen communication

Parameterising the temperature measurement

Four (two) analog inputs for resistance tests - EPM-S404

Index/sub index	Name	Description/value	Lenze
0x3107/x	Conversion time channel 1	You can set the transformer speed as a function of the interference frequency suppression (see 0x3105/x) for each channel. 0 (00 _h): At 50 Hz: 324.1 ms/channel 16 bits; at 60 Hz: 270.5 ms/channel 16 bits 1 (01 _h): At 50 Hz: 164.2 ms/channel 16 bits; at 60 Hz: 137.2 ms/channel 16 bits 2 (02 _h): At 50 Hz: 84.2 ms/channel 16 bits; at 60 Hz: 70.5 ms/channel 16 bits 3 (03 _h): at 50 Hz: 44.1 ms/channel 16 bits; at 60 Hz: 37.2 ms/channel 16 bits 4 (04 _h): At 50 Hz: 24.2 ms/channel 16 bits; at 60 Hz: 20.5 ms/channel 16 bits 5 (05 _h): At 50 Hz: 14.2 ms/channel 16 bits; at 60 Hz: 12.2 ms/channel 16 bits 6 (06 _h): At 50 Hz: 9.2 ms/channel 16 bits; at 60 Hz: 8.0 ms/channel 16 bits 7 (07 _h): At 50 Hz: 6.6 ms/channel 15 bits; at 60 Hz: 5.9 ms/channel 15 bits 8 (08 _h): At 50 Hz: 4.2 ms/channel 13 bits; at 60 Hz: 3.8 ms/channel 13 bits	00 _h
0x3108/x	Upper limit value (HIGH byte) channel 1	You can define an upper or lower limit value for each channel. For this you can only specify values from the nominal range, otherwise you'll receive a parameterisation error. By specification of 7FFF _h for the upper or 8000 _h for the lower limit value, the corresponding limit value is deactivated. If your measured value is outside a limit value and you have activated the limit value monitoring, a process alarm is triggered.	7F _h
0x3109/x	Upper limit value channel 1 (LOW byte)		FF _h
0x310A/x	Lower limit value (HIGH byte) channel 1		80 _h
0x310B/x	Lower limit value channel 1 (LOW byte)		00 _h
Channel 2			
0x310C/x	Function channel 2	See channel 1	50 _h
0x310D/x	Conversion time channel 2	See channel 1	00 _h
0x310E/x	Upper limit value channel 2 (HIGH byte)	See channel 1	7F _h
0x310F/x	Upper limit value (LOW byte) channel 2		FF _h
0x3110/x	Lower limit value channel 2 (HIGH byte)		80 _h
0x3111/x	Lower limit value (LOW byte) channel 2		00 _h
Channel 3 (for two-wire conductor connections only)			
0x3112/x	Function channel 3	See channel 1	50 _h
0x3113/x	Conversion time channel 3	See channel 1	00 _h
0x3114/x	Upper limit value channel 3 (HIGH byte)	See channel 1	7F _h
0x3115/x	Upper limit value channel 3 (LOW byte)		FF _h
0x3116/x	Lower limit value channel 3 (HIGH byte)		80 _h
0x3117/x	Lower limit value channel 3 (LOW byte)		00 _h

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Index/sub index	Name	Description/value	Lenze
Channel 4 (for two-wire conductor connections only)			
0x3118/x	Function channel 4	See channel 1	50 _h
0x3119/x	Conversion time channel 4	See channel 1	00 _h
0x311A/x	Upper limit value channel 4 (HIGH byte)	See channel 1	7F _h
0x311B/x	Upper limit value channel 4 (LOW byte)		FF _h
0x311C/x	Lower limit value channel 4 (HIGH byte)		80 _h
0x311D/x	Lower limit value channel 4 (LOW byte)		00 _h

Measuring range

Measuring range (Fct. no.)	Measured value	Signal range	Range
2-wire: PT100 (50 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
2-wire: PT1000 (51 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
2-wire: NI100 (52 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
2-wire: NI1000 (53 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
3-wire: PT100 (58 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
3-wire: PT1000 (59 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
3-wire: NI100 (5A _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
3-wire: NI1000 (5B _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
4-wire: PT100 (60 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
4-wire: PT1000 (61 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow

CANopen communication

Parameterising the temperature measurement

Four (two) analog inputs for resistance tests - EPM-S404

Measuring range (Fct. no.)	Measured value	Signal range	Range
4-wire: NI100 (62 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
4-wire: NI1000 (63 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
2-wire: 0 ... 60 Ω (70 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (71 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (72 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (78 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (79 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (7A _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (80 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (81 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (82 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767	Nominal range
	-	-	Underflow
2-wire: 0 ... 60 Ω (90 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (91 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (92 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (98 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow

Parameterising the temperature measurement
 Four (two) analog inputs for resistance tests - EPM-S404

Measuring range (Fct. no.)	Measured value	Signal range	Range
3-wire: 0 ... 600 Ω (99 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (9A _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (A0 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (A1 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (A2 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 60 Ω (D0 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (D1 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (D2 _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (D8 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (D9 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (DA _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (E0 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (E1 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (E2 _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow

8.9.2

Two analog inputs for thermocouple measurement - EPM-S405

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 0 ... 5: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
0x3101/x	Wire-breakage detection	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
0x3102/x	Limit value monitoring	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
0x3103/x	Reserved	0	
0x3104/x	Temperature system	Bit 0, 1: 00 _b = °C; 10 _b = °F; 11 _b = K Bits 2 ... 7: Reserved	00 _h
0x3105/x	Interference frequency suppression	Bit 0, 1: 01 _b = 60 Hz; 10 _b = 50 Hz Bits 2 ... 7: Reserved	02 _h
Channel 1			
0x3106/x	Function channel 1	External temperature compensation: 176 (60 _h): type J, -210.0 ... +1200.0 °C / -2100 ... +12000 _{dec} 177 (61 _h): type K, -270.0 ... +1372.0 °C / -2700 ... +13720 _{dec} 178 (62 _h): type N -270.0 ... +1300.0 °C / -2700 ... +13000 _{dec} 179 (63 _h): type R, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 180 (64 _h): type S, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 181 (65 _h): type T, -270.0 ... +400.0 °C / -2700 ... +4000 _{dec} 182 (66 _h): type B, 0.0 ... +1820.0 °C / 0 ... +18200 _{dec} 183 (67 _h): type C, 0.0 ... +2315.0 °C / 0 ... +23150 _{dec} 184 (68 _h): type E, -270.0 ... +1000.0 °C / -2700 ... +10000 _{dec} 185 (69 _h): type L, -200.0 ... +900.0 °C / -2000 ... +9000 _{dec} Internal temperature compensation: 192 (C0 _h): type J, -210.0 ... +1200.0 °C / -2100 ... +12000 _{dec} 193 (C1 _h): type K, -270.0 ... +1372.0 °C / -2700 ... +13720 _{dec} 194 (C2 _h): type N -270.0 ... +1300.0 °C / -2700 ... +13000 _{dec} 195 (C3 _h): type R, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 196 (C4 _h): type S, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 197 (C5 _h): type T, -270.0 ... +400.0 °C / -2700 ... +4000 _{dec} 198 (C6 _h): type B, 0.0 ... +1820.0 °C / 0 ... +18200 _{dec} 199 (C7 _h): type C, 0.0 ... +2315.0 °C / 0 ... +23150 _{dec} 200 (C8 _h): type E, -270.0 ... +1000.0 °C / -2700 ... +10000 _{dec} 201 (C9 _h): type L, -200.0 ... +900.0 °C / -2000 ... +9000 _{dec} 255 (FF _h): channel deactivated	C1 _h

Parameterising the temperature measurement
 Two analog inputs for thermocouple measurement - EPM-S405

Index/sub index	Name	Description/value	Lenze
0x3107/x	Conversion time channel 1	You can set the transformer speed as a function of the interference frequency suppression (see 0x3105/x) for each channel. 0 (00 _h): At 50 Hz: 324.1 ms/channel 16 bits; at 60 Hz: 270.5 ms/channel 16 bits 1 (01 _h): at 50 Hz: 164.2 ms/channel 16 bits; at 60 Hz: 137.2 ms/channel 16 bits 2 (02 _h): At 50 Hz: 84.2 ms/channel 16 bits; at 60 Hz: 70.5 ms/channel 16 bits 3 (03 _h): at 50 Hz: 44.1 ms/channel 16 bits; at 60 Hz: 37.2 ms/channel 16 bits 4 (04 _h): At 50 Hz: 24.2 ms/channel 16 bits; at 60 Hz: 20.5 ms/channel 16 bits 5 (05 _h): at 50 Hz: 14.2 ms/channel 16 bits; at 60 Hz: 12.2 ms/channel 16 bits 6 (06 _h): at 50 Hz: 9.2 ms/channel 16 bits; at 60 Hz: 8.0 ms/channel 16 bits 7 (07 _h): at 50 Hz: 6.6 ms/channel 15 bits; at 60 Hz: 5.9 ms/channel 15 bits 8 (08 _h): at 50 Hz: 4.2 ms/channel 13 bits; at 60 Hz: 3.8 ms/channel 13 bits	02 _h
0x3108/x	Upper limit value (HIGH byte) channel 1	You can define an upper or lower limit value for each channel. For this you can only specify values from the nominal range, otherwise you'll receive a parameterisation error. By specification of 7FFF _h for the upper or 8000 _h for the lower limit value, the corresponding limit value is deactivated. If your measured value is outside a limit value and you have activated the limit value monitoring, a process alarm is triggered.	7F _h
0x3109/x	Upper limit value channel 1 (LOW byte)		FF _h
0x310A/x	Lower limit value (HIGH byte) channel 1		80 _h
0x310B/x	Lower limit value channel 1 (LOW byte)		00 _h
Channel 2			
0x310C/x	Function channel 2	See channel 1	C1 _h
0x310D/x	Conversion time channel 2	See channel 1	02 _h
0x310E/x	Upper limit value channel 2 (HIGH byte)		7F _h
0x310F/x	Upper limit value (LOW byte) channel 2		FF _h
0x3110/x	Lower limit value channel 2 (HIGH byte)		80 _h
0x3111/x	Lower limit value (LOW byte) channel 2		00 _h
0x3112/x	Reserved	0	
...	
0x311D/x	Reserved	0	

Measuring range

Measuring range (Fct. no.)	Measured value			Range
	[°C]	[°F]	[K]	
Type J: -210 ... +1200 °C -346 ... 2192 °F 63.2 ... 1473.2 K (B0 _h : ext. comp. 0 °C) (C0 _h : int. comp. 0 °C)	+14500	26420	17232	Overflow
	-2100 ... +12000	-3460 ... +21920	632 ... 14732	Nominal range
	-	-	-	Underflow



CANopen communication

Parameterising the temperature measurement

Two analog inputs for thermocouple measurement - EPM-S405

Measuring range (Fct. no.)	Measured value			Range
	[°C]	[°F]	[K]	
Type K: -210 ... +1372 °C -454 ... 2501.6 °F 0 ... 1645.2 K (B1 _h : ext. comp. 0 °C) (C1 _h : int. comp. 0 °C)	+16220	29516	18952	Overflow
	-2700 ... +13720	-4540 ... 25016	0 ... 16452	Nominal range
	-	-	-	Underflow
Type N: -270 ... +1300 °C -454 ... 2372 °F 0 ... 1573.2 K (B2 _h : ext. comp. 0 °C) (C2 _h : int. comp. 0 °C)	+15500	28220	18232	Overflow
	-2700 ... +13000	-4540 ... 23720	0 ... 15732	Nominal range
	-	-	-	Underflow
Type R: -50 ... +1769 °C -58 ... 3216.2 °F 223.2 ... 2042.2 K (B3 _h : ext. comp. 0 °C) (C3 _h : int. comp. 0 °C)	+20190	32766	22922	Overflow
	-500 ... +17690	-580 ... 32162	2232 ... 20422	Nominal range
	-1700	-2740	1032	Underflow
Type S: -50 ... +1769 °C -58 ... 3216.2 °F 223.2 ... 2042.2 K (B4 _h : ext. comp. 0 °C) (C4 _h : int. comp. 0 °C)	+20190	32766	22922	Overflow
	-500 ... +17690	-580 ... 32162	2232 ... 20422	Nominal range
	-1700	-2740	1032	Underflow
Type T: -270 ... +440 °C -454 ... 752 °F 3.2 ... 673.2 K (B2 _h : ext. comp. 0 °C) (C2 _h : int. comp. 0 °C)	+5400	10040	8132	Overflow
	-2700 ... +4000	-4540 ... 7520	32 ... 6732	Nominal range
	-	-	-	Underflow
Type B: 0 ... +1820 °C 32 ... 2786.5 °F 273.2 ... 2093.2 K (B6 _h : ext. comp. 0 °C) (C6 _h : int. comp. 0 °C)	+20700	32766	23432	Overflow
	0 ... +18200	320 ... 27865	2732 ... 20932	Nominal range
	-1200	-1840	1532	Underflow
Type C: 0 ... +2315 °C 32 ... 2786.5 °F 273.2 ... 2093.2 K (B7 _h : ext. comp. 0 °C) (C7 _h : int. comp. 0 °C)	+25000	32766	23432	Overflow
	0 ... +23150	320 ... 27865	2732 ... 20932	Nominal range
	-1200	-1840	1532	Underflow
Type E: -270 ... +1000 °C -454 ... 1832 °F 0 ... 1273.2 K (B8 _h : ext. comp. 0 °C) (C8 _h : int. comp. 0 °C)	+12000	21920	14732	Overflow
	-2700 ... +10000	-4540 ... 18320	0 ... 12732	Nominal range
	-	-	-	Underflow
Type L: -200 ... +900 °C -328 ... 1652 °F 73.2 ... 1173.2 K (B9 _h : ext. comp. 0 °C) (C9 _h : int. comp. 0 °C)	+11500	21020	14232	Overflow
	-2000 ... +9000	-3280 ... 16520	732 ... 11732	Nominal range
	-	-	-	Underflow

8.9.3 Error behaviour

Index	Name	Possible settings		Important	
		Lenze	Selection		
I6443 _h ↓	Error mode analog output		0 {1} 255	Configures analog output monitoring  371	
			0 All analog outputs retain the last value output		
			255 Response from I6444 _h		In I6444 _h the response can be configured individually for each analog output
		1 Channel 1	0		
	2 Channel 2	0			
			
	36 Channel 36	0			
I6444 _h ↓	Error value analog output		-32768 {1} 32767	Configures the individual analog output responses  371 The analog outputs provide the set value	
		1 Channel 1	0		
		2 Channel 2	0		
			
		36 Channel 36	0		

8 CANopen communication

Parameterising the counter
Commissioning examples

8.10 Parameterising the counter

8.10.1 Commissioning examples

The indexes for the signal setting in the following examples refer to the EPM-S600. In the case of different counters the function selection can be placed on a different index (📖 Parameter data of the counter).

Example 1: Counting upwards

Step	Setting	Comment
1	Set signal evaluation: Index 0x310A/x, bit 2 ... 0 = 100 _b (direction)	A signal evaluation has to be specified, otherwise the counting process is not started.
2	Accept parameter setting: 0x31FF = 255 _{dec}	No storage into the EEPROM of the bus coupler.
3	Enable of the software gates via control word 📖 290: Bit 2 (SW_GATE_SET) = HIGH	Transfer control word to the counter via PDO.

Example 2: Accept set value

Step	Setting	Comment
1	Set signal evaluation: Index 0x310A/x, bit 2 ... 0 = 100 _b (direction)	A signal evaluation has to be specified, otherwise the counting process is not started.
2	Accept parameter setting: 0x31FF = 255 _{dec}	No storage into the EEPROM of the bus coupler.
3	Transfer set value to the counter via PDO: e.g. 2147483583 _{dec} → Tx-PDO= □□□□ 7F FF FF BF	
4	Activation of the set value via control word 📖 290: Bit 5 (COUNTERval_SET) = HIGH	Transfer control word via PDO to the counter.

Example 3: Set comparison bit

If the count value is 255 (= comparison value), the digital output is set.

Step	Setting	Comment
1	Set signal evaluation: Index 0x310A/x, bit 2 ... 0 = 100 _b (direction)	A signal evaluation has to be specified, otherwise the counting process is not started.
2	Set comparator: Index 0x3109/x, bit 2 ... 0 = 010 _b (count value ≤ comparison value)	
3	Accept parameter setting: 0x31FF = 255 _{dec}	No storage into the EEPROM of the bus coupler.
4	Transfer comparison value to the counter via PDO: e.g. 255 _{dec} → Tx-PDO= FF 00 00 00 00	
5	Enable digital output via control word 📖 290: Bit 1 (CTRL_DO_SET) = HIGH	Transfer control word to the counter via PDO.





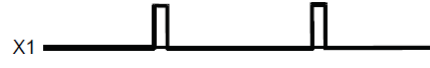


Further information ...

Default mapping 📖 291

Control and status words 📖 229

8.10.2 Rotary transducer signal evaluation

Depending on which edge of a channel is evaluated, the following pulse trains and the associated pulse multiplication can be realised.

Pulse trains	Description	
Channel A		
Channel B		
Single evaluation		There is a response to the falling edges of channel A. The number of pulses has not increased.
Double evaluation		There is a response to the rising and the falling edges of channel A. The number of pulses has doubled and is symmetrical.
Four-fold evaluation		The rising and the falling edges of channels A and B are evaluated. The number of pulses is quadrupled and is symmetrical.

8.10.3 One counter 32 bits, 24 V DC - EPM-S600

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	

Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	The main counting direction can be parameterised: None: The whole counting range is available. Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following. Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter a differentiation between the internal gate (I-gate), hardware gate (HW gate), and software gate (SW gate) is made. <ul style="list-style-type: none"> • The I-gate is the AND logic operation of the software gate (SW gate) and the hardware gate (HW gate). • The SW gate is controlled via your user program (status word in the output area). • The HW gate is controlled via the digital gate input. The following response can be parameterised: Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again. Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.
Latch function	If a positive edge occurs at the latch input, the current count value is stored in the latch register. The latch register is accessed via the input area. After a STOP-RUN transition, latch is always 0.
Comparator	You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.
Hysteresis	By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.
Process alarm	The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events: <ul style="list-style-type: none"> • Hardware gate open • Hardware gate closed • Counting limit - overflow • Counting limit - underflow • Comparison value reached • Final value reached • Latch value reached
Diagnostic alarm	If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.
Diagnostic function	Diagnostic functions are provided in the modules.
Diagnostic information	The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.



Further information can be found in the chapter "Product description".

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
0x3101/x	Input frequency track A	Filters for instance serve to filter signal peaks in the case of an unclean input signal. 0 (00 _h): 500 kHz	02 _h
0x3102/x	Input frequency track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz 4 (04 _h): 30 kHz	02 _h
0x3103/x	Input frequency latch	6 (06 _h): 10 kHz 7 (07 _h): 5 kHz 8 (08 _h): 2 kHz	02 _h
0x3104/x	Input frequency gate	9 (09 _h): 1 kHz Other values are not permissible!	02 _h
0x3105/x	Input frequency reset		00 _h
0x3106/x	Reserved		
0x3107/x	Alarm response	Setting activates process alarm Bit 0: Proc. alarm HW gate open Bit 1: Proc. alarm HW gate closed Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bit 6: Proc. alarm latch value Bit 7: Reserved	80 _h
0x3108/x	Counter function	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = counting once, main counting direction forwards 000010 _b = counting once, main counting direction backwards 000100 _b = counting once, no main counting direction 001000 _b = counting periodically, main counting direction forwards 010000 _b = counting periodically, main counting direction backwards 100000 _b = counting periodically, no main counting direction Bits 7 ... 6: Reserved	40 _h
0x3109/x	Comparator	Bit 2 ... 0: output switches (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 6 ... 4: Reset 000 _b = deactivated 001 _b = HIGH level 011 _b = rising edge 101 _b = rising edge, once Bit 7: Reserved	00 _h

Index/sub index	Name	Description/value	Lenze
0x310A/x	Signal evaluation	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (to A/pulse) 010 _b = double rotary transducer (to A/pulse) 011 _b = four-fold rotary transducer (to A/pulse and B/direction) 100 _b = direction (pulse to A/pulse and direction to B/direction) Bit 6 ... 3: hardware gate (HW gate) 000 _b = deactivated (counter starts by setting SW gate) 001 _b = activated (HIGH level at gate activates the HW gate. Counter starts if HW and SW gate are set.) Bit 7: Gate function (internal gate) 0 = abort (counting process starts again from loading value) 1 = interrupt (counting process is continued with counter content)	00 _h
0x310B/x ... 0x310E/x	Final value	Upper limit of the counting range; counting method: 0x310B: byte 3 (high byte) 0x310C: byte 2 0x310D: byte 1 0x310E: byte 0 (low byte)	00 _h
0x310F/x ... 0x3112/x	Start value	Lower limit of the counting range; counting method: 0x310B: byte 3 (high byte) 0x3110: byte 2 0x3111: byte 1 0x3112: byte 0 (low byte)	00 _h
0x3113/x	Hysteresis	The hysteresis for instance serves to avoid frequent switching operations of the output and/or triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off. The hysteresis has an effect on the zero crossing, comparison, overflow/underflow.	00 _h
0x3114/x	Pulse	The pulse duration indicates for how long the output is to be set if the parameterised comparison criterion is reached or exceeded. The pulse duration can be specified in steps of 2.048 ms between 0 and 522.24 ms. If the pulse duration is = 0, the output is set until the comparison condition is no longer met.	00 _h
0x3115/x ... 0x3129/x	Reserved		

8.10.4 Two counters 32 bits, 24 V DC - EPM-S601

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).</p> <p>The following response can be parameterised:</p> <p>Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>



Further information can be found in the chapter "Product description".

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
0x3101/x	Input frequency counter 1, track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz	02 _h
0x3102/x	Input frequency counter 1, track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz	02 _h
0x3103/x	Input frequency counter 2, track A	4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
0x3104/x	Input frequency counter 2, track B	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
0x3105/x	Alarm response counter 1	Setting activates process alarm Bits 1 ... 0: reserved Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bits 7 ... 6: Reserved	00 _h
0x3106/x	Counter function counter 1	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = once: forwards 000010 _b = once: backwards 000100 _b = once: no main counting direction 001000 _b = periodically: forwards 010000 _b = periodically: backwards 100000 _b = periodically: no main counting direction Bits 7 ... 6: Reserved	00 _h
0x3107/x	Comparator counter 1	Bits 2 ... 0: Comparison bit is set (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
0x3108/x	Signal evaluation counter 1	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (to A/pulse) 010 _b = double rotary transducer (to A/pulse) 011 _b = four-fold rotary transducer (to A/pulse and B/direction) 100 _b = direction (pulse to A/pulse and direction to B/direction) Bits 6 ... 3: Reserved Bit 7: Gate function (internal gate) 0 = abort (counting process starts again from loading value) 1 = interrupt (counting process is continued with counter content)	00 _h

Index/sub index	Name	Description/value	Lenze
0x3109/x ... 0x310C/x	Set value counter 1	By specifying a set value, the counter can be loaded with the set value. With an edge 0-1 to COUNTERVAL_SET in the control word, the set value is adopted by the counter. Counting method: 0x3109: byte 3 (high byte) 0x310A: byte 2 0x310B: byte 1 0x310C: byte 0 (low byte)	00 _h
0x310D/x ... 0x3110/x	Final value counter 1	Upper limit of the counting range Counting method: 0x310D: byte 3 (high byte) 0x310E: byte 2 0x310F: byte 1 0x3110: byte 0 (low byte)	00 _h
0x3111/x ... 0x3114/x	Loading value counter 1	Lower limit of the counting range Counting method: 0x3111: byte 3 (high byte) 0x3112: byte 2 0x3113: byte 1 0x3114: byte 0 (low byte)	00 _h
0x3115/x	Hysteresis counter 1	The hysteresis for instance serves to avoid frequent switching operations of the output and/or triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off. The hysteresis has an effect on the zero crossing, comparison, overflow/underflow.	00 _h
0x3116/x	Reserved		
0x3117/x	Alarm response counter 2	See counter 1	00 _h
0x3118/x	Counter function counter 2	See counter 1	00 _h
0x3119/x	Comparator counter 2	See counter 1	00 _h
0x311A/x	Signal evaluation counter 2	See counter 1	00 _h
0x311B/x ... 0x311E/x	Set value counter 2	See counter 1	00 _h
0x311F/x ... 0x3122/x	Final value counter 2	See counter 1	00 _h
0x3123/x ... 0x3126/x	Loading value counter 2	See counter 1	00 _h
0x3127/x	Hysteresis counter 2	See counter 1	00 _h
0x3128/x 0x3129/x	Reserved		

8.10.5 One counter 32 bits, 5 V DC - EPM-S602

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).</p> <p>The following response can be parameterised:</p> <p>Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>



Further information can be found in the chapter "Product description".

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
0x3101/x	Input frequency track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz 1 (01 _h): 300 kHz 2 (02 _h): 100 kHz	02 _h
0x3102/x	Input frequency track B	3 (03 _h): 60 kHz 4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
0x3103/x	Input frequency reset	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
0x3104/x	Reserved		
0x3105/x	Alarm response	Setting activates process alarm Bits 1 ... 0: reserved Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bits 7 ... 6: Reserved	00 _h
0x3106/x	Counter function	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = once: forwards 000010 _b = once: backwards 000100 _b = once: no main counting direction 001000 _b = periodically: forwards 010000 _b = periodically: backwards 100000 _b = periodically: no main counting direction Bits 7 ... 6: Reserved	00 _h
0x3107/x	Comparator	Bits 2 ... 0: Comparison bit is set (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 6 ... 4: Reset 000 _b = deactivated 001 _b = HIGH level 011 _b = rising edge 101 _b = rising edge, once Bit 7: Reserved	00 _h

Index/sub index	Name	Description/value	Lenze
0x3108/x	Signal evaluation	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (to A/pulse) 010 _b = double rotary transducer (to A/pulse) 011 _b = four-fold rotary transducer (to A/pulse and B/direction) 100 _b = direction (pulse to A/pulse and direction to B/direction) Bits 6 ... 3: Reserved Bit 7: Gate function (internal gate) 0 = abort (counting process starts again from loading value) 1 = interrupt (counting process is continued with counter content)	00 _h
0x3109/x ... 0x310C/x	Final value	Upper limit of the counting range; counting method: 0x3109: byte 3 (high byte) 0x310A: byte 2 0x310B: byte 1 0x310C: byte 0 (low byte)	00 _h
0x310D/x ... 0x3110/x	Start value	Lower limit of the counting range; counting method: 0x310D: byte 3 (high byte) 0x310E: byte 2 0x311F: byte 1 0x3110: byte 0 (low byte)	00 _h
0x3111/x	Hysteresis		00 _h
0x3112/x ... 0x3129/x	Reserved		00 _h

8.10.6 Two counters 32 bits, 24 V DC - EPM-S603

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from 0 to the counting limit, then skips to the opposite counting limit and continues to count from there.

Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).



Further information can be found in the chapter "Product description".

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Input frequency counter 1, track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz	02 _h
0x3101/x	Input frequency counter 1, track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz	02 _h
0x3102/x	Input frequency counter 2, track A	4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
0x3103/x	Input frequency counter 2, track B	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
0x3104/x	Counting direction counter 1, track B	Bits 2 ... 0: Reserved Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
0x3105/x	Signal evaluation counter 1	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (to A/pulse) 010 _b = double rotary transducer (to A/pulse) 011 _b = four-fold rotary transducer (to A/pulse and B/direction) 100 _b = direction (pulse to A/pulse and direction to B/direction) Bits 7 ... 3: Reserved	00 _h
0x3106/x	Counting direction counter 2, track B	Bits 2 ... 0: Reserved Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
0x3107/x	Signal evaluation counter 2	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (to A/pulse) 010 _b = double rotary transducer (to A/pulse) 011 _b = four-fold rotary transducer (to A/pulse and B/direction) 100 _b = direction (pulse to A/pulse and direction to B/direction) Bits 7 ... 3: Reserved	00 _h
0x3108/x 0x3129/x	Reserved		

8.11 Parameterising the encoder evaluation

8.11.1 SSI - EPM-S604



Further information can be found in the chapter "Product description".

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
0x3101/x	Dead time HIGH byte	The dead time, also called tbs (time between sends), defines the waiting time between two encoder values to be observed by the module so that the encoder is able to process its value. This data can be found in the data sheet for your encoder. HIGH LOW 00 _h 30 _h : 1 μs 00 _h 60 _h : 2 μs	0C _h
0x3102/x	Dead time LOW byte	00 _h C0 _h : 4 μs 01 _h 80 _h : 8 μs 03 _h 00 _h : 16 μs 06 _h 00 _h : 32 μs 09 _h 00 _h : 48 μs 0C _h 00 _h : 64 μs	00 _h
0x3103/x	Baud rate HIGH byte	In the "Monitoring operation" mode, the baud rate is irrelevant. Enter the baud rate here. This corresponds to the clock frequency via which the connected encoder communicates. More information on this can be found in the data sheet for your encoder. HIGH LOW	01 _h
0x3104/x	Baud rate LOW byte	00 _h 18 _h : 2 MHz 00 _h 20 _h : 1.5 MHz 00 _h 30 _h : 1 MHz 00 _h 60 _h : 500 kHz 00 _h C0 _h : 250 kHz 01 _h 80 _h : 125 kHz	80 _h
0x3105/x	Reserved		
0x3106/x	Scaling	Depending on the encoder, further bits are transmitted in addition to the encoder value. Scaling serves to determine how many bits postpositioned to the encoder value will be removed by shifting the encoder value to the right. The encoder value is scaled by the module only after a gray-binary conversion. More information can be found in the data sheet for your encoder. Value range: 00 _h ... 0F _h = 0 bits ... 15 bits	00 _h

Index/sub index	Name	Description/value	Lenze
0x3107/x	Bit length of encoder data	<p>Enter the bit length of the encoder data here. Depending on the encoder, the encoder data consist of the current encoder value with subsequent bits. The total length has to be specified here. More information on this can be found in the data sheet for your encoder.</p> <p>7 (07_h) = "8 bits" 8 (08_h) = "9 bits" 9 (09_h) = "10 bits" 10 (0A_h) = "11 bits" 11 (0B_h) = "12 bits" 12 (0C_h) = "13 bits" 13 (0D_h) = "14 bits" 14 (0E_h) = "15 bits" 15 (0F_h) = "16 bits" 16 (10_h) = "17 bits" 17 (11_h) = "18 bits" 18 (12_h) = "19 bits" 19 (13_h) = "20 bits" 20 (14_h) = "21 bits" 21 (15_h) = "22 bits" 22 (16_h) = "23 bits" 23 (17_h) = "24 bits" 24 (18_h) = "25 bits" 25 (19_h) = "26 bits" 26 (1A_h) = "27 bits" 27 (1B_h) = "28 bits" 28 (1C_h) = "29 bits" 29 (1D_h) = "30 bits" 30 (1E_h) = "31 bits" 31 (1F_h) = "32 bits"</p>	18 _h

Index/sub index	Name	Description/value	Lenze
0x3108/x		<p>Bit 1 ... 0: ready for operation During "Monitoring operation" the module serves to monitor the data exchange between an SSI master and an SSI encoder. It receives the cycle by the master and the data flow by the SSI encoder. In the "Master mode" operating mode the module provides a cycle to the encoder and receives data by the encoder. 01_b = monitoring operation 10_b = master mode</p> <p>Bit 2: shifting direction Specify the orientation of the encoder data here. More information can be found in the data sheet for your encoder. Usually, the SSI encoder uses "MSB first". 0 = LSB first (LSB is transmitted first) 1 = MSB first (MSB is transmitted first)</p> <p>Bit 3: edge clock signal Here you can specify the edge type of the clock signal, in the case of which the encoder supplies data. Information on this can be found in the data sheet for your encoder. Usually the SSI encoders respond to rising edges. 0 = falling edge 1 = rising edge</p> <p>Bit 4: coding In the "Binary code" setting, the provided encoder value remains unchanged. In the "Gray code" setting, the gray-coded value provided by the encoder is converted into a binary value. Only after this conversion, the received encoder value is scaled, if required. The Gray code is another form of representation of the binary code. It is based on the fact that two adjacent Gray numbers differ from each other in exactly one bit. If the Gray code is used, transmission errors can be easily detected, since adjacent characters must only differ from each other in one digit. Information on this can be found in the data sheet for your encoder. 0 = standard code 1 = Gray code</p> <p>Bits 7 ... 5: reserved</p>	1E _h
0x3109/x ... 0x310B/x	Reserved		
0x310C/x	SSI function	<p>By enabling the SSI function the module starts with the cycle output and the evaluation of the encoder data. In the "monitor operation" mode, the module starts with the encoder evaluation. 0 (00_h) = inhibited 1 (01_h) = enabled</p>	00 _h
0x310D/x ... 0x3129/x	Reserved		

8.12 Time stamp parameterising

8.12.1 2 digital inputs with time stamp function - EPM-S207

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	14 _h or 3C _h (fix)
0x3101/x	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	00 _h (fix)
0x3102/x	Input delay DI1	00 _h = 1 μs 02 _h = 3 μs 04 _h = 10 μs	02 _h
0x3103/x	Input delay DI2	07 _h = 86 μs 09 _h = 342 μs 0C _h = 273 μs Other values are not permissible.	02 _h
0x3104/x	Edge 0-1 at DIx	Time stamp entry on rising edge Bit 0: DI1 (0: inhibit, 1 = enable) Bit 1: DI2 (0: inhibit, 1 = enable) Bits 7 ... 2: Reserved	00 _h
0x3105/x	Edge 1-0 at DIx	Time stamp entry on falling edge Bit 0: DI1 (0: inhibit, 1 = enable) Bit 1: DI2 (0: inhibit, 1 = enable) Bits 7 ... 2: Reserved	00 _h
0x3106/x	Reserved		
...			
0x3129/x			

8.12.2 2 digital outputs with time stamp function - EPM-S310

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	14 _h or 3C _h (fix)
0x3101/x	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	00 _h (fix)
0x3102/x	Reserved		
...			
0x3129/x			

8.13 Parameterising technology modules

8.13.1 2 digital outputs with PWM functionality - EPM-S620

Parameter data

Index/sub index	Name	Description/value	Lenze
0x3100/x	PWM 1: Period byte 3	Set parameters here for the total time for pulse duration and pulse pause. The time should be selected as a factor for the 20.83 ns basis. Values below 25 µs are ignored. If the pulse duration is higher or equal to the period, the DO output is set permanently. Value range: 1200 ... 8388607 (25 µs ... approx. 175 ms)	1F40 _h
0x3101/x	PWM 1: Period byte 2		
0x3102/x	PWM 1: Period byte 1		
0x3103/x	PWM 1: Period byte 0		
0x3104/x	PWM 2: Period byte 3		1F40 _h
0x3105/x	PWM 2: Period byte 2		
0x3106/x	PWM 2: Period byte 1		
0x3107/x	PWM 2: Period byte 0		
0x3108/x	Reserved		
...			
0x3129/x			
0x5620/x	PWM pulse duration	Selection of pulse duration Permissible values. 48 ... 8388607 (corresponds to 1 ... 175000 µs)	



Note!

The pulse/pause ratio is determined by specifying the period (0x3100 ... 0x3107) and pulse duration (0x5620).

8.13.2 RS232 interface - EPM-S640

Parameter data

Parameter data - ASCII protocol			
Index/ Subindex	Name	Description/value	Lenze
0x3100/x	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3101/x	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3102/x	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
0x3103/x	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
0x3104/x	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame			
0x3105/x	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
0x3106/x	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed.	00 _h
0x3107/x	ZNA (LOW byte)	0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h

Parameter data - ASCII protocol			
Index/ Subindex	Name	Description/value	Lenze
Option 4 ... 5, ZVZ			
0x3108/x	Character delay time (HIGH byte)	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram.	00 _h
0x3109/x	Character delay time (LOW byte)	If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	FA _h
Option 6, number of receive buffers			
0x310A/x	Number of receive buffers	Defines the number of receive buffers. As long as only one receive buffer is used and is assigned, no more data can be received. If up to 250 receive buffers are connected, the received data can be redirected to a still free receive buffer. 1 ... 255 (01 _h ... FF _h)	01 _h
Option 7 ... 12, reserved			
0x310B/x ... 0x3110/x	Reserved		00 _h

CANopen communication

Parameterising technology modules
RS232 interface - EPM-S640

Parameter data STX/ETX protocol			
Index/ Subindex	Name	Description/value	Lenze
0x3100/x	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3101/x	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3102/x	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
0x3103/x	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
0x3104/x	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 02 _h : STX/ETX	02 _h
Option 1, character frame			
0x3105/x	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
0x3106/x	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed.	00 _h
0x3107/x	ZNA (LOW byte)	0 ... 65535 [ms] (0000 _h ... FFFF _h)	00 _h

Parameter data STX/ETX protocol			
Index/ Subindex	Name	Description/value	Lenze
Option 4 ... 5, TMO			
0x3108/x	TMO (HIGH byte)	TMO serves to define the maximally permissible interval between two frames.	00 _h
0x3109/x	TMO (LOW byte)	0 ... 65535 [ms] (0000 _h ..: FFFF _h)	FA _h
Option 6, number of start identifiers			
0x310A/x	No. of start identifiers	00 _h : 1 start identifier (2. start identifier is ignored) 01 _h : 2 start identifiers	01 _h
Option 7, start identifier 1			
0x310B/x	Start identifier 1	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 8, start identifier 2			
0x310C/x	Start identifier 2	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 9, number of end identifiers			
0x310D/x	No. of end identifier	00 _h : 1 end identifier (2nd end identifier is ignored) 01 _h : 2 end identifiers	00 _h
Option 10, end identifier 1			
0x310E/x	End identifier 1	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 11, end identifier 2			
0x310F/x	End identifier 2	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 12, reserved			
0x3110/x	Reserved		00 _h

CANopen communication

Parameterising technology modules
RS232 interface - EPM-S640

Parameter data 3964(R) protocol			
Index/ Subindex	Name	Description/value	Lenze
0x3100/x	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3101/x	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3102/x	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
0x3103/x	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
0x3104/x	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 03 _h : 3964 04 _h : 3964R	03 _h
Option 1, character frame			
0x3105/x	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2, ZNA (x 20 ms)			
0x3106/x	ZNA	Time after request (ZNA) Waiting time observed until the next transmit request is processed. The ZNA is indicated as a factor in steps of 20 ms. 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h

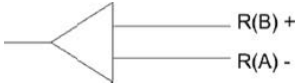
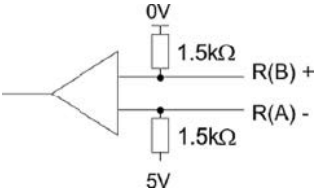
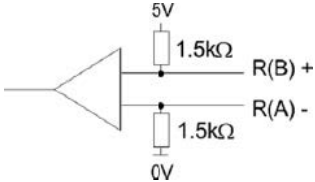
Parameter data 3964(R) protocol			
Index/ Subindex	Name	Description/value	Lenze
Option 3, ZVZ (x 20 ms)			
0x3107/x	Character delay time	Character delay time (ZVZ) The ZVZ defines the maximum permissible time interval between two characters received within a telegram. The ZVZ is indicated as a factor in steps of 20 ms. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 255 [ms] (00 _h ... FF _h)	00 _h
Option 4, QVZ (x 20 ms)			
0x3108/x	Acknowledgement time	Acknowledgement time (QVZ) The QVZ defines the max. permissible time interval until the partner is acknowledged while establishing/terminating a connection. The QVZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 5, BWZ (x 20 ms)			
0x3109/x	Block wait time	Block wait time (BWZ) The BWZ is the maximum time period between the confirmation of a request frame (DLE) and STX of the response frame. The BWZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	FA _h
Option 6, STX repetitions			
0x310A/x	STX repetitions	Maximum number of times the module attempts to establish a connection. 1 ... 255 [ms] (01 _h ... FF _h)	01 _h
Option 7, DBL			
0x310B/x	DBL	When exceeding the block wait time (BWZ) you can specify the maximum number of repetitions for the request frame using the DBL parameter. If these attempts fail, transmission is cancelled. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 8, priority			
0x310C/x	Priority	A communication partner has high priority if its sending attempt has precedence over the partner's transmit request. In the event of low priority, it must take second place behind the partner's transmit request. With 3964(R) the priorities of both partners must be different. The following settings are possible: 00 _h : LOW 01 _h : HIGH	00 _h
Option 9 ... 12, reserved			
0x310D/x ... 0x3110/x	Reserved		00 _h

8.13.3 RS422/RS485 interface - EPM-S650

Parameter data


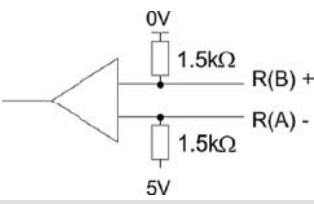
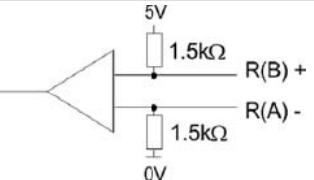
Parameter data - ASCII protocol			
Index/ Subindex	Name	Description/value	Lenze
0x3100/x	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3101/x	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3102/x	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
0x3103/x	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
0x3104/x	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame			
0x3105/x	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
0x3106/x	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed.	00 _h
0x3107/x	ZNA (LOW byte)	0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h

Parameter data - ASCII protocol			
Index/ Subindex	Name	Description/value	Lenze
Option 4 ... 5, ZVZ			
0x3108/x	Character delay time (HIGH byte)	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h
0x3109/x	Character delay time (LOW byte)		FA _h
Option 6, number of receive buffers			
0x310A/x	Number of receive buffers	Defines the number of receive buffers. As long as only one receive buffer is used and is assigned, no more data can be received. If up to 250 receive buffers are connected, the received data can be redirected to a still free receive buffer. 1 ... 255 (01 _h ... FF _h)	01 _h
Option 7 ... 12, reserved			
0x310B/x ... 0x3110/x	Reserved		00 _h
Option 13, operating mode			
0x3111/x	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> ● 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. ● 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment			
0x3112/x	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

Parameter data STX/ETX protocol			
Index/ Subindex	Name	Description/value	Lenze
0x3100/x	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3101/x	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3102/x	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
0x3103/x	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
0x3104/x	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 02 _h : STX/ETX	02 _h
Option 1, character frame			
0x3105/x	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
0x3106/x	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed.	00 _h
0x3107/x	ZNA (LOW byte)	0 ... 65535 [ms] (0000 _h ... FFFF _h)	00 _h

Parameter data STX/ETX protocol			
Index/ Subindex	Name	Description/value	Lenze
Option 4 ... 5, TMO			
0x3108/x	TMO (HIGH byte)	TMO serves to define the maximally permissible interval between two frames.	00 _h
0x3109/x	TMO (LOW byte)	0 ... 65535 [ms] (0000 _h ..: FFFF _h)	FA _h
Option 6, number of start identifiers			
0x310A/x	No. of start identifiers	00 _h : 1 start identifier (2. start identifier is ignored) 01 _h : 2 start identifiers	01 _h
Option 7, start identifier 1			
0x310B/x	Start identifier 1	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 8, start identifier 2			
0x310C/x	Start identifier 2	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 9, number of end identifiers			
0x310D/x	No. of end identifier	00 _h : 1 end identifier (2nd end identifier is ignored) 01 _h : 2 end identifiers	00 _h
Option 10, end identifier 1			
0x310E/x	End identifier 1	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 11, end identifier 2			
0x310F/x	End identifier 2	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 12, reserved			
0x3110/x	Reserved		00 _h
Option 13, operating mode			
0x3111/x	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment			
0x3112/x	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

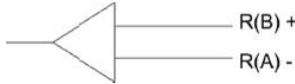
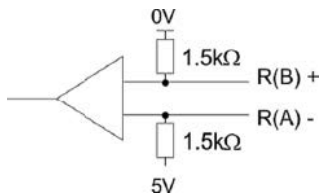
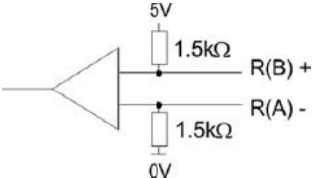
CANopen communication

Parameterising technology modules
RS422/RS485 interface - EPM-S650

Parameter data 3964(R) protocol			
Index/ Subindex	Name	Description/value	Lenze
0x3100/x	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3101/x	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
0x3102/x	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
0x3103/x	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
0x3104/x	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 03 _h : 3964 04 _h : 3964R	03 _h
Option 1, character frame			
0x3105/x	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2, ZNA (x 20 ms)			
0x3106/x	ZNA	Time after request (ZNA) Waiting time observed until the next transmit request is processed. The ZNA is indicated as a factor in steps of 20 ms. 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h

Parameter data 3964(R) protocol			
Index/ Subindex	Name	Description/value	Lenze
Option 3, ZVZ (x 20 ms)			
0x3107/x	Character delay time	Character delay time (ZVZ) The ZVZ defines the maximum permissible time interval between two characters received within a telegram. The ZVZ is indicated as a factor in steps of 20 ms. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 255 [ms] (00 _h ... FF _h)	00 _h
Option 4, QVZ (x 20 ms)			
0x3108/x	Acknowledgement time	Acknowledgement time (QVZ) The QVZ defines the max. permissible time interval until the partner is acknowledged while establishing/terminating a connection. The QVZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 5, BWZ (x 20 ms)			
0x3109/x	Block wait time	Block wait time (BWZ) The BWZ is the maximum time period between the confirmation of a request frame (DLE) and STX of the response frame. The BWZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	FA _h
Option 6, STX repetitions			
0x310A/x	STX repetitions	Maximum number of times the module attempts to establish a connection. 1 ... 255 [ms] (01 _h ... FF _h)	01 _h
Option 7, DBL			
0x310B/x	DBL	When exceeding the block wait time (BWZ) you can specify the maximum number of repetitions for the request frame using the DBL parameter. If these attempts fail, transmission is cancelled. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 8, priority			
0x310C/x	Priority	A communication partner has high priority if its sending attempt has precedence over the partner's transmit request. In the event of low priority, it must take second place behind the partner's transmit request. With 3964(R) the priorities of both partners must be different. The following settings are possible: 00 _h : LOW 01 _h : HIGH	00 _h
Option 9 ... 12, reserved			
0x310D/x ... 0x3110/x	Reserved		00 _h
Option 13, operating mode			

Parameter data 3964(R) protocol			
Index/ Subindex	Name	Description/value	Lenze
0x3111/x	Operating mode	<p>The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422).</p> <ul style="list-style-type: none"> 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment			
0x3112/x	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

8.14 "Store" function

All parameter changes and the structure of the station are permanently stored via index I1010_{hex} (Store parameter).



Note!

If the real structure of the station does not correspond with its stored structure anymore after a restart, the bus coupler module reports an error.

- ▶ The (red) SF LED is permanently ON.
- ▶ The (green) PWR LED is permanently ON.
- ▶ The (green) CAN-RUN LED is blinking.


The stored structure of the station is deleted via index I1011_{hex} (Restore parameter).

Index	Name	Possible settings		Important
		Lenze	Selection	
I1010 _h ┘	Save All Parameters	0		Saving the parameter settings and the station structure in the EEPROM of the bus coupler. Function in accordance with CANopen (DS301/DS401 communication protocol). 363
	0		Number of subindexes assigned	Read only Number of the subindexes used by the index 1010 _h
	1 Save		0 = no function 1702257011 _d = save parameters	The numerical value is ASCII-coded and complies with: 65 76 61 73 _h = "E" "V" "A" "S"

8.15 Loading the default setting

All parameter changes are reset to the default setting via index 11011_{hex}.

The default setting is accepted by switching the supply off and on again. Changes that you may have carried out before will be deleted from the EEPROM of the I/O system.

Index	Name	Possible settings		Important
		Lenze	Selection	
11011 _h └┘	Restore All Parameters	0		Resetting the parameter setting in the EEPROM of the bus coupler to the Lenze setting. Function in accordance with CANopen (DS301/DS401 communication protocol).  363
0			Number of subindexes assigned	Read only Number of the subindexes used by the index 1011 _h
1	Load		0 = no function 1684107116 _d = load Lenze setting	The numerical value is ASCII-coded and complies with: 64 61 6F 6C _h = "D" "A" "O" "L" After executing "Load", acceptance is effected by <ul style="list-style-type: none"> • Voltage off/on, or • Transmission of a reset node telegram (00 82 xx, mit xx = node address)

8.16 Node Guarding

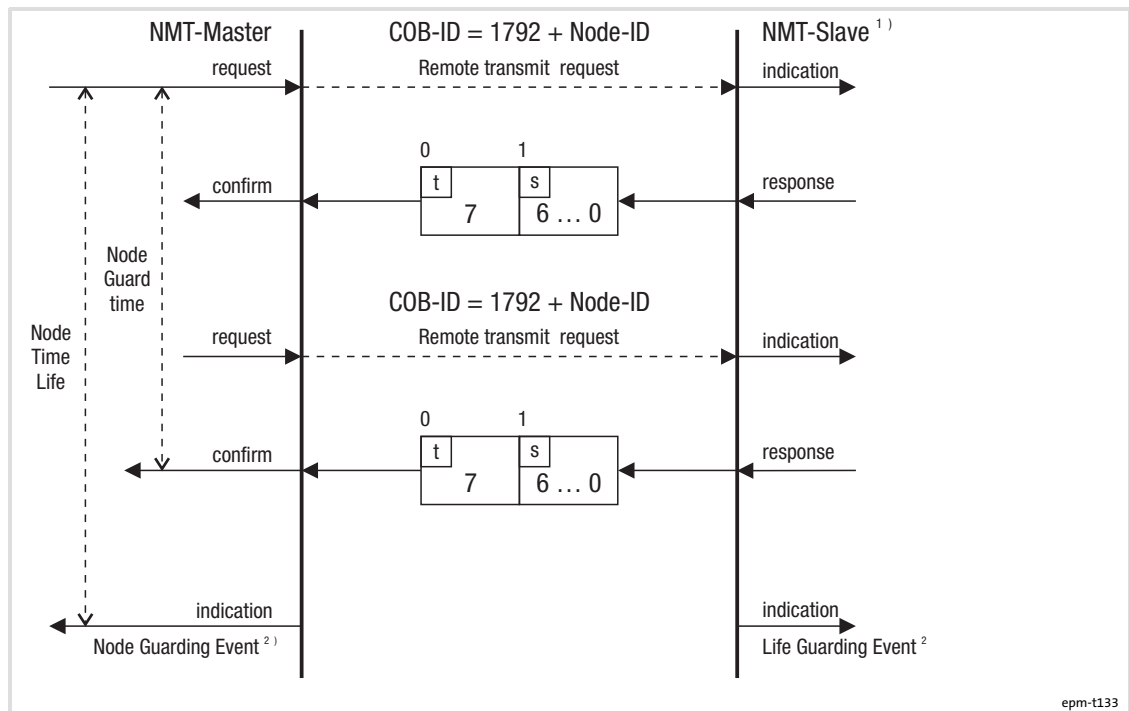


Fig. 8-13 Node Guarding Protocol

- 1) I/O system
- s Status of the I/O system
- t Toggle bit

Description

The Node Guarding Protocol monitors the connection between master and slave.

Via index I100C_h, Guard time, a time [ms] can be set and in index I100D_h, Life Time Factor, a factor can be set. If both indexes are multiplied by each other, you get a monitoring time in which the master must send a Node Guarding telegram to the slave. If one of the two indexes is set to zero, the monitoring time is also zero and hence deactivated. The slave sends a telegram with its current status to the master.

With event-controlled process data transmission, Node Guarding ensures cyclical node monitoring.

- ▶ The master starts the Node Guarding by sending the Node Guarding telegram.
- ▶ If the slave (I/O system) does not receive a telegram within the monitoring time, a Node Guarding event will be triggered. The I/O system switches to the status set in I1029_h. The outputs switch to defined states (380).
- ▶ A change to the Operational status triggers a reset.

Status telegram

11 bits Identifier	1 byte of user data	
1792 _d (700 _h)	Device status (bits 0 ... 6)	Toggle bit

Identifier:

Identifier	Formula	Information
Identifier	= Basic identifier + node address = 1792 _d + xx	The basic identifier for Node Guarding is firmly adjusted to 1792 _d (700 _h) xx = Node address of the I/O system

Device status (bit 0 ... 6) of the slave (I/O system):

Command (hex)	Device status
04	Stopped
05	Operational
7F	Pre-Operational

Indices for setting

Index	Name	Possible settings			Important
		Lenze	Selection		
l100C _h	Guard time	0	0	{1 ms}	65535 Node Guarding Monitoring time 0 = monitoring not active
l100D _h	Life time factor	0	0	{1}	255 Node Guarding Response time computation factor 0 = monitoring not active The response time is computed as: Monitoring period x factor
l100E _h	Node Guarding identifier				Display only Identifier = Basic identifier + node address (basic identifier cannot be modified)



Note!

The Lenze PLC's 9300 servo PLC and Drive PLC in connection with the function library LenzeCanDSxDrv.lib support the "Node Guarding" function.

8.17 Heartbeat

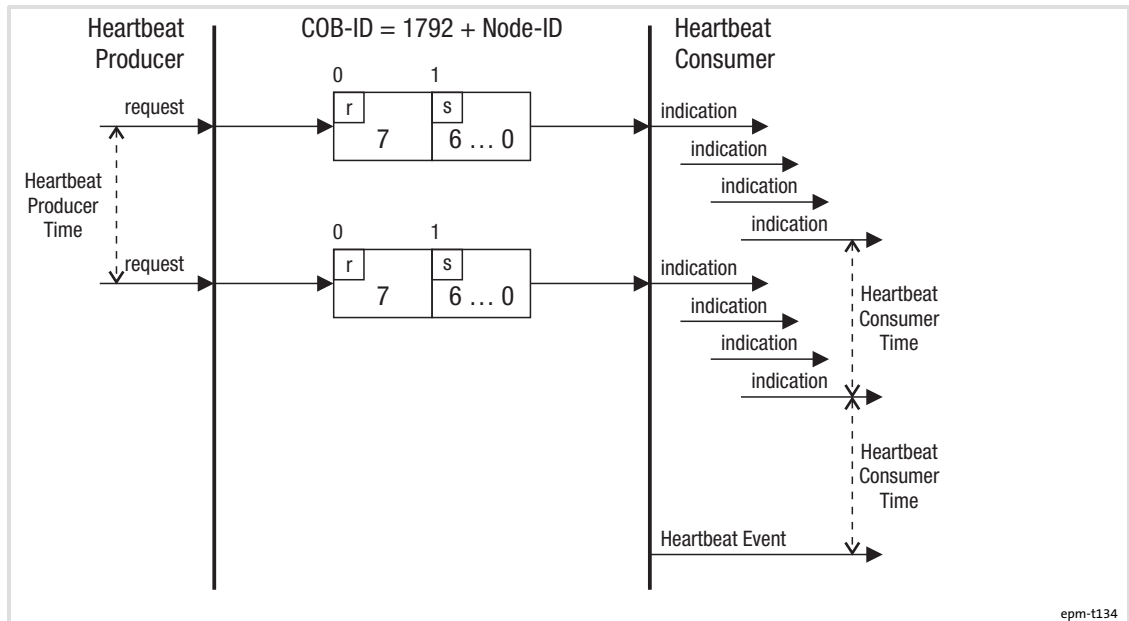


Fig. 8-14 Heartbeat Protocol

r Reserved
s State of the Heartbeat Producer

Heartbeat Producer

The I/O system transmits a status telegram to the fieldbus and can thus be monitored by other nodes.

Settings are made in index 11017_h.

- ▶ Producer heartbeat is automatically started if a time > 0 is entered in the index 1017_h and the I/O system changes to the status "Operational".
- ▶ After the cycle time has elapsed, the status telegram is transferred from the I/O system to the fieldbus.
- ▶ A change into the Operational status triggers a reset.

Status telegram

11 bits	1 byte of user data	
Identifier	Device status (bits 0 ... 6)	Bit 7
1792 _d (700 _h)		Reserved

Identifier:

Identifier	Formula	Information
Identifier	= Basic identifier + node address = 1792 _d + xx	The basic identifiers for heartbeat is firmly adjusted to 1792 _d (700 _h) xx = Node address of the I/O system

Device status (bit 1 ... 6) of the heartbeat producer:

Command (hex)	Status
00	Boot-up
05	Operational
04	Stopped
7F	Pre-Operational



Note!


The Lenze 9300 servo PLC and Drive PLC in connection with the function library LenzeCanDSxDrv.lib support the "heartbeat" function.

8.18 Monitoring

8.18.1 Time monitoring for PDO1-Rx ... PDO10-Rx


A time monitoring can be configured for the inputs of the process data objects PDO1-Rx ... PDO10-Rx via index I2400_h.

If no PDO is received within the time set in I2400_h, the outputs will switch to their defined error status (see following sections).

Index	Name	Possible settings		Important
		Lenze	Selection	
I2400 _h	Timer value		0 {1 ms} 65535	Monitoring time for process data input objects  369
1	Lenze PDO control 1	0		
2	Lenze PDO control 2	0		
3	Lenze PDO control 3	0		
4	Lenze PDO control 4	0		
5	Lenze PDO control 5	0		
6	Lenze PDO control 6	0		
7	Lenze PDO control 7	0		
8	Lenze PDO control 8	0		
9	Lenze PDO control 9	0		
10	Lenze PDO control 10	0		


8.18.2 Digital output monitoring

Via the index I6206_h you can configure the reactions of the digital outputs which are to take place when no telegrams, Node Guarding Events or Heartbeat, have been received in the adjusted monitoring time.

Index	Name	Possible settings		Important	
		Lenze	Selection		
I6206 _h └┘	Error mode - digital output		0 {1} 255	Configures digital output monitoring  370	
			0 All digital outputs retain the last status output.		
			255 Response from I6207 _h	In I6207 _h , the response can be configured individually for each digital output	
			1 Byte 1	0	
			2 Byte 2	0	
...			
80	Byte 80	0			

Individual response setting


Via index I6207_h the response can be configured individually for each digital output.

Index	Name	Possible settings		Important
		Lenze	Selection	
I6207 _h └┘	Error value - digital output	0	0 {1} 255	Configures the individual digital output responses  370
			8 bits of information	
			Bit value 0 Output switches to LOW	
			Bit value 1 Output retains last status output	
			1 Byte 1	0
2 Byte 2	0			
...		
64	Byte 80	0		

8.18.3 Monitoring of the analog outputs


Via the index I6443_h you can configure the reactions of the analog outputs which are to take place when no telegrams, Node Guarding Events or Heartbeat, have been received in the adjusted monitoring time.

- ▶ Monitoring is started on receipt of the next PDO telegram after the settings.
- ▶ If a telegram is not transmitted within the adjusted time, the module switches to the "Pre-Operational" state. No further process data are transmitted.
- ▶ A change into the "Operational" state triggers a reset.

Index	Name	Possible settings		Important
		Lenze	Selection	
I6443 _h └┘	Error mode analog output		0 {1} 255	Configures analog output monitoring  371
			0 All analog outputs retain the last value output	
			255 Response from I6444 _h	In I6444 _h the response can be configured individually for each analog output
		1 Channel 1	0	
2 Channel 2	0			
...		
36 Channel 36	0			

Individual response setting

Via index I6444_h the response can be configured individually for each analog output.

Index	Name	Possible settings		Important
		Lenze	Selection	
I6444 _h └┘	Error value analog output		-32768 {1} 32767	Configures the individual analog output responses The analog outputs provide the set value  371
		1 Channel 1	0	
		2 Channel 2	0	
		
		36 Channel 36	0	

8 CANopen communication

Diagnostics
Emergency telegram

8.19 Diagnostics



Note!

The diagnostic function is only supported by I/O compound modules from HW version 1B and by bus coupler modules from HW version 1A.

If a module in the system complies with an earlier HW version, the diagnostic function is deactivated for all modules.

The following indexes can be used for purposes of diagnostics. They show operating states. Settings cannot be made.

Index	Information displayed	Description
I1014 _h	Emergency telegram	372
I1027 _h	Reading out the module IDs	379
I6000 _h	Status of digital inputs	380
I6200 _h	Status of digital outputs	380
I6401 _h	Status of analog inputs	380
I6411 _h	Status of analog outputs	380
I5400 _h ... I5403 _h	Counter status	381
I1003 _h	Current errors	

8.19.1 Emergency telegram

By means of the emergency telegram, the I/O system communicates internal device errors to other system bus nodes with high priority. 8 bytes of user data are available.

Index	Name	Possible settings		Important
		Lenze	Selection	
I1003 _h				Display only Fault memory
1	Actual errors			
I1014 _h	COB ID emergency			Emergency telegram Identifier 80h + node address is displayed after boot-up. 372

Emergency telegram structure

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
LOW byte	HIGH byte	Error register I1001 _h	Error information				
Error code	Error code	The error code 81 _h (= device error) is displayed in index I1001 _h (error register).	1	2	3	4	5

Error codes

Error code	Meaning	Error information				
		1	2	3	4	5
0x0000	Reset Emergency	0x00	0x00	0x00	0x00	0x00
0x8100	Heartbeat consumer	Node ID	LOW byte timer value	HIGH byte timer value	0x00	0x00
0x8130	Node guarding error	LOW byte guard time	HIGH byte guard time	LifeTime	0x00	0x00
0x8157	Module removed from slot [n]; no communication	0x05	0x[n]	0x00	0x00	0x00
0x8210	PDO not executed due to length error	PDO number	Wrong length	PDO length	0x00	0x00
0x8220	PDO length exceeded	PDO number	0x1000	PDO number	0x00	0x00
0x1000	Module configuration was changed	0x01	0x00	0x00	0x00	0x00
0x1000	Error during initialisation of the backplane modules	0x02	Module number	LOW byte Error register	HIGH byte Error register	0x00
0x1000	Diagnostic alarm	0x40 + module number	Diagnostic byte 1	Diagnostic byte 2	Diagnostic byte 3	Diagnostic byte 4
0x0000	Process alarm	0x80 + module number	Diagnostic byte 1	Diagnostic byte 2	Diagnostic byte 3	Diagnostic byte 4
0x1000	Backplane bus: Initialisation error	E0	Module number	LOW byte Error bitfield	HIGH byte Error bitfield	0x00
0x1000	Backplane bus: Initialisation error pre-operational → operational	E0	0x00	0x00	0x00	0x00
0x1000	Backplane bus: Bus error	E1	0x00	0x00	0x00	0x00
0x1001	Lenze PDO control, monitoring time exceeded	FF	0x10	PDO number	Monitoring time that has been set in [ms]	
0x2000	Description of the process data width not permissible for modules with a time stamp functionality or a serial interface (index 3100/x, 3101/x)	E2	0x00	0x00	0x00	0x00

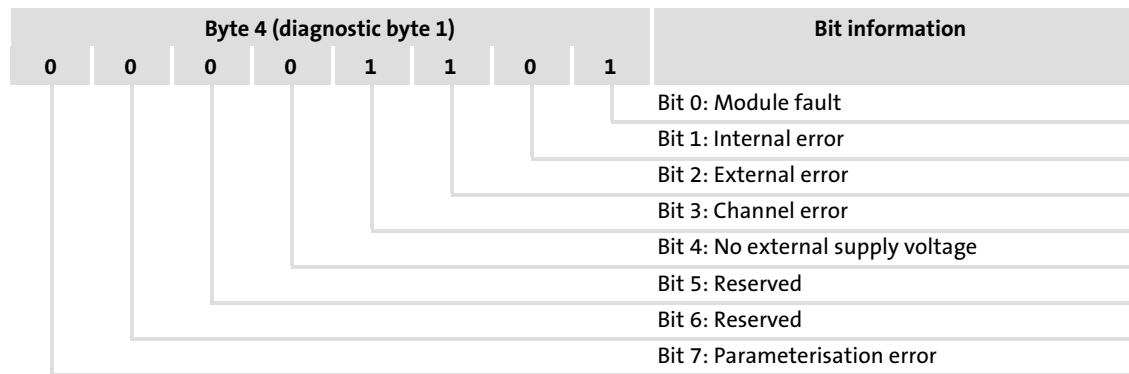
Example: error information "46 0D 15 00 00"

The error information "46 0D 15 00 00" is contained in the emergency telegram in the bytes 3 ... 7.

Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
Error information				
1	2 (Diagnostic byte 1)	3 (Diagnostic byte 2)	4 (Diagnostic byte 3)	5 (Diagnostic byte 4)
0x46 (0x40 + slot no. 6)	0x0D	0x15	0x00	0x00

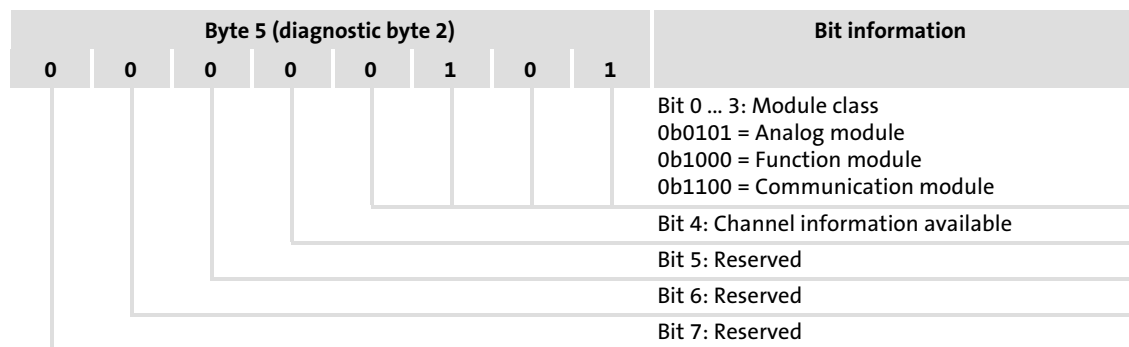
- Byte 4: 0x0D = 0b00001101

Meaning: module fault, external error, channel error available.



- Byte 5: 0x15 = 0b00010101

Meaning: Module class "analog module", channel information (channel error) available.



The module-specific bit information of the "diagnostic bytes 1 ... 4" (process/diagnostic alarms) are described in the following sections.

Process alarm

EPM-S404 - process alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: Limit value exceeded channel 1 Bit 1: Limit value exceeded channel 2 Bit 7 ... 2: 0 (fixed)
2	Bit 0: Limit value not reached, channel 1 Bit 1: Limit value not reached, channel 2 Bit 7 ... 2: 0 (fixed)
3/4	Ticker value at the time of the alarm

EPM-S405 - process alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: Limit exceedance channel 1 Bit 1: Limit exceedance channel 2 Bit 2: Limit exceedance channel 3 Bit 3: Limit exceedance channel 4 Bit 7 ... 4: 0 (fix)
2	Bit 0: Limit value underflow channel 1 Bit 1: Limit value underflow channel 2 Bit 2: Limit value underflow channel 3 Bit 3: Limit value underflow channel 4 Bit 7 ... 4: 0 (fix)
3/4	Ticker value at the time of the alarm

EPM-S406, EPM-S408 - process alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: Limit value exceeded channel 1 Bit 1: Limit value exceeded channel 2 Bit 7 ... 2: 0 (fixed)
2	Bit 0: Limit value not reached, channel 1 Bit 1: Limit value not reached, channel 2 Bit 7 ... 2: 0 (fixed)
3/4	μ s-ticker value at the time of the alarm The I/O compound module features an integrated 32-bit timer (μ s-ticker) which is started at switch-on and starts at 0 again after $2^{32} - 1 \mu$ s. These two bytes represent the lower 2 bytes of the μ s-ticker ($0 \dots 2^{16} - 1$)

EPM-S600 - process alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: Hardware gate open Bit 1: Hardware gate closed Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 4: Latch value Bit 7 ... 5: 0 (fixed)
2	State of the inputs at the time of the alarm Bit 0: A/pulse Bit 1: B/direction Bit 2: Latch Bit 3: Hardware gate Bit 4: Reset Bit 7 ... 5: 0 (fixed)
3/4	Ticker value at the time of the alarm

EPM-S601, EPM-S602 - process alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: 0 Bit 1: 0 Bit 2: Counter 1, overflow/underflow/final value Bit 3: Counter 1, comparison value reached Bit 4: 0 Bit 5: 0 Bit 6: Counter 2, overflow/underflow/final value Bit 7: Counter 2, comparison value reached
2	State of the inputs at the time of the alarm Bit 0: Counter 1, A/pulse Bit 1: Counter 1, B/direction Bit 2: Counter 2, A/pulse Bit 3: Counter 2, B/direction Bit 7 ... 4: 0 (fix)
3/4	16 bit μ s value at the time of the alarm

Diagnostic alarm

EPM-S600 - diagnostic alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)

EPM-S601 - diagnostic alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)

EPM-S603 - diagnostic alarm

Diagnostic byte	Bit 7 ... 0
1	0 (fixed)
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	0 (fixed)

EPM-S604 - diagnostic alarm

Diagnostic byte	Bit 7 ... 0
1	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of missing external supply voltage Bit 6 ... 5: 0 (fixed) Bit 7: Parameterisation error
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)

EPM-S640 - diagnostic alarm

Diagnostic byte	Bit 7 ... 0
1	Bit 0: set in the case of module fault Bit 1: set in the case of internal error Bit 2: set in the case of external error (cable break only for RS422) Bit 3: 0 (fixed) Bit 4: set in the case of missing external supply voltage Bit 5, 6: 0 (fixed) Bit 7: set in the case of parameterisation error
2	Bits 3 ... 0: module class, 1100 _b : communication module Bit 4: set if channel information available Bits 7 ... 5: 0 (fixed)
3	Bits 3 ... 0: 0 (fixed) Bit 4: set in the case of internal communication error Bits 7 ... 5: 0 (fixed)
4	Bits 6 ... 0: channel type, 60 _h : communication processor Bit 7: 0 (fixed)

EPM-S650 - diagnostic alarm

Diagnostic byte	Bit 7 ... 0
1	Bit 0: set in the case of module fault Bit 1: set in the case of internal error Bit 2: set in the case of external error (cable break only for RS422) Bit 3: 0 (fixed) Bit 4: set in the case of missing external supply voltage Bit 5, 6: 0 (fixed) Bit 7: set in the case of parameterisation error
2	Bits 3 ... 0: module class, 1100 _b : communication module Bit 4: set if channel information available Bits 7 ... 5: 0 (fixed)
3	Bits 3 ... 0: 0 (fixed) Bit 4: set in the case of internal communication error Bits 7 ... 5: 0 (fixed)
4	Bits 6 ... 0: channel type, 60 _h : communication processor Bit 7: 0 (fixed)

8.19.2 Reading out the module identifiers

The number of I/O compound modules connected and the module types used can be read out via index I1027_h. Each module type can be identified unambiguously via a hex value.

Index	Subindex	Read out...	Module type	Module identifier	
I1027 _h	0	... the number of plugged modules (0 ... 64)	–	23 _{dec}	017 _h
	1 ... 64	... the module type in slots 1 ... 64	EPM-S200	1 _{dec}	001 _h
			EPM-S201	3 _{dec}	003 _h
			EPM-S202	5 _{dec}	005 _h
			EPM-S203	8 _{dec}	008 _h
			EPM-S204	2 _{dec}	002 _h
			EPM-S205	4 _{dec}	004 _h
			EPM-S206	7 _{dec}	007 _h
			EPM-S207	3841 _{dec}	F01 _h
			EPM-S300	257 _{dec}	101 _h
			EPM-S301	260 _{dec}	104 _h
			EPM-S302	262 _{dec}	106 _h
			EPM-S303	259 _{dec}	103 _h
			EPM-S304	261 _{dec}	105 _h
			EPM-S305	263 _{dec}	107 _h
			EPM-S306	258 _{dec}	102 _h
			EPM-S308	265 _{dec}	109 _h
			EPM-S309	264 _{dec}	108 _h
			EPM-S310	3905 _{dec}	F41 _h
			EPM-S400	1025 _{dec}	401 _h
			EPM-S401	1028 _{dec}	404 _h
			EPM-S402	1026 _{dec}	402 _h
			EPM-S403	1029 _{dec}	405 _h
			EPM-S404	1030 _{dec}	406 _h
			EPM-S405	1027 _{dec}	403 _h
			EPM-S406	1036 _{dec}	40C _h
			EPM-S408	1035 _{dec}	40B _h
			EPM-S500	1281 _{dec}	501 _h
			EPM-S501	1283 _{dec}	503 _h
			EPM-S502	1282 _{dec}	502 _h
			EPM-S503	1284 _{dec}	504 _h
			EPM-S600	2241 _{dec}	8C1 _h
			EPM-S601	2243 _{dec}	8C3 _h
			EPM-S602	2242 _{dec}	8C2 _h
			EPM-S603	2244 _{dec}	8C4 _h
			EPM-S604	2497 _{dec}	9C1 _h
			EPM-S620	2305 _{dec}	901 _h
			EPM-S640	3585 _{dec}	E01 _h
			EPM-S650	2625 _{dec}	A41 _h


8 CANopen communication

Diagnostics
Status of the digital inputs

8.19.3 Status of the digital inputs

Via the index I6000_h the status of the digital inputs can be displayed.

Index	Name	Possible settings		Important
		Lenze	Selection	
I6000 _h	Digital input		0 {1}	255
1	Byte 1			
2	Byte 2			
...	...			
80	Byte 80			


Read only
Digital input status  380

8.19.4 Status of the digital outputs

Via the index I6200_h the status of the digital outputs can be displayed:

Index	Name	Possible settings		Important
		Lenze	Selection	
I6200 _h	Digital output		0 {1}	255
1	Byte 1			
2	Byte 2			
...	...			
80	Byte 80			


- Digital output status
- The outputs can be set manually (forcing):
 - Depends on CAN status and I2360_h

 380

8.19.5 Status of the analog inputs

Via the index I6401_h the status of the analog inputs can be displayed.

Index	Name	Possible settings		Important
		Lenze	Selection	
I6401 _h	Analog input		-32768 {1}	32767
1	Channel 1			
2	Channel 2			
...	...			
36	Channel 36			


Display only
Analog input status  380

8.19.6 Status of the analog outputs

Via the index I6411_h the status of the analog outputs can be displayed:





Index	Name	Possible settings		Important
		Lenze	Selection	
I6411 _h	Analog output		-32768 {1}	32767
1	Channel 1			
2	Channel 2			
...	...			
36	Channel 36			

- Analog output status
- The outputs can be set manually (forcing):
 - Depends on CAN status and I2360_h

 380


8.19.7 Status of the counters

Via the following indexes you can have the status of the counters displayed:

Index	Name	Possible settings		Important
		Lenze	Selection	
I5400 _h └┘	Counter Value		00000000 _h {1 _h } FFFFFFFF _h	Count value  290
	1 DWord 1			EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: Subindex is increased by 2 for each counter
	2 DWord 2			
			
	64 DWord 64			
I5401 _h └┘	Latch value		00000000 _h {1} FFFFFFFF _h	Latch value  290
	1 DWord 1			EPM-S600: Subindex is increased by 1 for each counter EPM-S601/-S602/-S603: without function
	2 DWord 2			
			
	64 DWord 64			
I5402 _h └┘	Status word		0000 _h {1} FFFF _h	Status word  290
	1 DWord 1			EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: Subindex is increased by 2 for each counter
	2 DWord 2			
			
	64 DWord 64			
I5403 _h └┘	Counter ticker value		0000 _h {1} FFFF _h	Ticker value  290
	1 DWord 1			EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: without function
	2 DWord 2			
			
	64 DWord 64			

8.19.8 Status of digital inputs with time stamp function

Index I5430_h can be used to display the status of the digital inputs with time stamp function.

Index	Name	Possible settings		Important
		Lenze	Selection	
I5430 _h	DI time stamp state		0000 _h {1} FFFF _h	Read only  285 Status of time stamp 15 entries per module
	1 DWORD 1			Bit 0: channel status DI1 (0: FALSE; 1: TRUE) Bit 1: channel status DI2 (0: FALSE; 1: TRUE) Bits 2 ... 7: reserved Bits 8 ... 15: counter which counts from 0 ... 127 and then goes back to 0. Bits 16 ... 32: ticker value
	2 DWORD 2			
			
	80 DWORD 64			

8.19.9 Status of digital outputs with time stamp function

The following index can be used to display the status of the digital outputs with time stamp function.

Index	Name	Possible settings		Important
		Lenze	Selection	
15440 _h	DO time stamp state		0000 _h {1} FFFF _h	Read only Status of FIFO memory 1 entry per module Bits 0 ... 5: running number of time stamp entry last written to the FIFO memory. Bits 6 ... 7: reserved Bits 8 ... 13: running number of time stamp entry to be processed next. Bits 14 ... 15: reserved Bits 16 ... 23: <ul style="list-style-type: none"> ● 00h or 80h: everything ok ● 01h or 81h: no following entry ● 02h or 82h: no new entries ● 03h or 83h: FIFO memory full. No new entries possible. A full memory will not accept any more time stamp entries. Perform a status query to establish the FIFO memory's status before transferring more time stamp entries. Bits 24 ... 31: number of time stamp entries in FIFO memory.
1	DWORD 1			
2	DWORD 2			
...	...			
80	DWORD 64			

You can specify values using the following index.

Index	Name	Possible settings		Important
		Lenze	Selection	
15640 _h	DO time stamp control		0000 _h {1} FFFF _h	15 entries per module Bits 0 ... 5: reserved Bit 6: channel status D01 (0: FALSE; 1: TRUE) Bit 7: channel status D02 (0: FALSE; 1: TRUE) Bits 8 ... 15: counter which counts from 0 ... 127 and then goes back to 0. Bits 16 ... 32: ticker value
1	DWORD 1			
2	DWORD 2			
...	...			
80	DWORD 64			

8.19.10 Status of digital outputs with PWM function

You can use the following indexes to display the status of the digital outputs with PWM function.

Index	Name	Possible settings		Important
		Lenze	Selection	
I5420 _h	PWM state		0000 _h {1} FFFF _h	Read only Status of PWM 2 entries per module Bit 0: reserved Bit 1: PWM status (0: PWM output stopped; 1: PWM output active) Bit 2: output status (0: push/pull output; 1: highside output) Bits 3 ... 15: reserved
1	WORD 1			289
2	WORD 2			
...	...			
80	WORD 64			
I5620 _h	PWM pulse duration		0000 _h {1} FFFF _h	Status of PWM 2 entries per module Specification of pulse duration in [μs].
1	DWORD 1			289
2	DWORD 2			
...	...			
80	DWORD 64			
I5621 _h	PMW control		0000 _h {1} FFFF _h	Control word PWM 2 entries per module Bits 0 ... 1: reserved Bit 2: <ul style="list-style-type: none"> ● 0: push/pull output The output signal is switched to HIGH level active and LOW level active. ● 1: highside output The output signal is only switched to HIGH level active. Bits 3 ... 7: reserved Bit 8: 0-1 edge: PWM output starts Bit 9: 1-0 edge: PWM output stops Bits 10 ... 15: reserved
1	WORD 1			380
2	WORD 2			
...	...			
80	WORD 64			







8.20 Index table

- ▶ The indices are numbered in ascending order for reference purposes.
- ▶ How to read the index table:

Column	Abbreviation	Meaning
Index	Ixxxx _h	Index Ixxxx _h
	1	Subindex 1 of Ixxxx _h
	2	Subindex 2 of Ixxxx _h
	Ixxxx _h ↓	After entry, the index parameter value is stored in the EEPROM
	Ixxxx _h *	Index parameter value is stored in the EEPROM with I2003 _h = 1
Name		Index name
Lenze		Lenze setting, setting on delivery
Selection	1 {%}	99 Min. value (unit) max. value
Important	–	Brief, important explanations
	Page x	Reference to detailed explanations

Index	Name	Possible settings		Important
		Lenze	Selection	
I1000 _h	Device type			Display only Type
I1001 _h	Error register			Display only
		Bit 0	Generic An unspecified error has occurred (flag set on each error message)	
		Bit 1	Reserved	
		Bit 2	Reserved	
		Bit 3	Reserved	
		Bit 4	Comm. Communication error (Overrun CAN)	
		Bit 5	Reserved	
		Bit 6	Reserved	
	Bit 7	ManSpe Manufacturer-specific error c.	Shown in detail in I1003 _h	
I1003 _h				Display only Fault memory
I1004 _h	Number of supported PDOs			Display only
	1 Number of synchronous PDOs supported			
	2 Number of synchronous PDOs supported			
I1005 _h	Sync COB-ID	128	128 {1} 2047	

Index	Name	Possible settings		Important	
		Lenze	Selection		
I1006 _h *	Sync interval (μs)	0	0 {1 μs} 4294967295	<ul style="list-style-type: none"> The I/O system acts as sync consumer: <ul style="list-style-type: none"> Set bit 30 = 0 under I1005_h After the time set under I1006_h, I/O system switches to the communication status set under I1029_h A reset will be carried out with the next sync telegram With I1006_h = 0, the monitoring is deactivated 	
I1007 _h	Synchronous window length	0	0 {1 μs} 4294967295	Die Lange des Zeitfensters für synchrone PDOs in μs.	
I1008 _h	DIS: Device name			Display only Device name	
I1009 _h	DIS: Hardware version			Display only Hardware version	
I100A _h	DIS: Software version			Display only Software version	
I100B _h	Node ID		1 {1} 127	Read only CANopen node address	
I100C _h *	Guard time	0	0 {1 ms} 65535	Node Guarding Monitoring time 0 = monitoring not active	365
I100D _h *	Life time factor	0	0 {1} 255	Node Guarding Response time computation factor 0 = monitoring not active The response time is computed as: Monitoring period x factor	365
I100E _h	Node Guarding identifier			Display only Identifier = Basic identifier + node address (basic identifier cannot be modified)	365
I1010 _h ┘	Save All Parameters	0		Saving the parameter settings and the station structure in the EEPROM of the bus coupler. Function in accordance with CANopen (DS301/DS401 communication protocol).	363
	0		Number of subindexes assigned	Read only Number of the subindexes used by the index 1010 _h	
	1 Save		0 = no function 1702257011 _d = save parameters	The numerical value is ASCII-coded and complies with: 65 76 61 73 _h = "E" "V" "A" "S"	

Index	Name	Possible settings		Important
		Lenze	Selection	
11011 _h ┘	Restore All Parameters	0		Resetting the parameter setting in the EEPROM of the bus coupler to the Lenze setting. Function in accordance with CANopen (DS301/DS401 communication protocol).  363
			Number of subindexes assigned	Read only Number of the subindexes used by the index 1011 _h
	1 Load		0 = no function 1684107116 _d = load Lenze setting	The numerical value is ASCII-coded and complies with: 64 61 6F 6C _h = "D" "A" "O" "L" After executing "Load", acceptance is effected by <ul style="list-style-type: none"> • Voltage off/on, or • Transmission of a reset node telegram (00 82 xx, mit xx = node address)
11014 _h	COB ID emergency			Emergency telegram Identifier 80h + node address is displayed after boot-up.  372
11017 _h ┘	Heartbeat producer time	0	0 {1 ms} 65535 0 Function is not active	I/O system can be monitored by other nodes. Within this time the device status of I/O system is transmitted to the fieldbus.  367
11018 _h				Display only Device identification
	1 Vendor ID			
	2 Product code			
	3 Revision number			
11027 _h	Type of			Read only  379
	0			Number of plugged-in modules  379
	1 Module no. 1			Module list  379
	2 Module no. 2			Subindexes 1 ... 64 Module identifiers of the plugged-in modules
			
	64 Module no. 64			
11029 _h *	Error behaviour		0 Pre-Operational 1 No state changed 2 Stopped 3 Reset	Error behaviour
	1 Communication error	0		I/O system switches to the status set if the communication with the master fails or "node guarding", "heartbeat", or the output monitoring have been activated.
	2 Manufacturer-specific error	0		No function
11200 _h	Server SDO parameter 1			Read only Current identifiers for SDO communication
	1 SDO1-Rx		1536 (basic identifier) + node address	
	2 SDO1-Tx		1408 (basic identifier) + node address	
11201 _h	Server SDO parameter 2			Current identifiers for SDO communication SDO channel deactivated: bit 31 = 1 SDO channel activated: bit 31 = 0 + identifier from the SDO area
	1 SDO2-Rx	0	COB-ID client -> server (Rx)	
	2 SDO2-Tx	0	COB-ID server -> client (Tx)	

Index	Name	Possible settings		Important		
		Lenze	Selection			
I1400 _h ┌						
	1	COB-ID used by RxPDO 1	513 + NID	385 {1} 2047	Definition of specific identifiers for process data object 1 (NID= Node ID / node address)	
	2	Transmission type	255	0 {1} 255	Defining the transmission mode	
				0 ... 24 0	Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
				241 ... 254	Reserved	
255				Process data update on every occurrence of an event	Every received value is accepted	
I1401 _h ┌						
	1	COB-ID used by RxPDO 2	768 + NID	385 {1} 2047	Definition of specific identifiers for process data object 2 (NID= Node ID / node address)	
	2	Transmission type	255	0 {1} 255	Defining the transmission mode	
				0 ... 24 0	Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
				241 ... 254	Reserved	
255				Process data update on every occurrence of an event	Every received value is accepted	
I1402 _h ┌						
	1	COB-ID used by RxPDO 3	1024 + NID	385 {1} 2047	Definition of specific identifiers for process data object 3 (NID= Node ID / node address)	
	2	Transmission type	255	0 {1} 255	Defining the transmission mode	
				0 ... 24 0	Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
				241 ... 254	Reserved	
255				Process data update on every occurrence of an event	Every received value is accepted	
I1403 _h ┌						
	1	COB-ID used by RxPDO 4	1280 + NID	385 {1} 2047	Definition of specific identifiers for process data object 4 (NID= Node ID / node address)	
	2	Transmission type	255	0 {1} 255	Defining the transmission mode	
				0 ... 24 0	Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
				241 ... 254	Reserved	
255				Process data update on every occurrence of an event	Every received value is accepted	

Index	Name	Possible settings		Important
		Lenze	Selection	
I1404 _h				281
1	COB-ID used by RxPDO 5	1920 + NID	385 {1} 2047	Definition of specific identifiers for process data object 5 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
0 ... 24			Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
241 ... 254			Reserved	
255			Process data update on every occurrence of an event	Every received value is accepted
I1405 _h				281
1	COB-ID used by RxPDO 6	576 + NID	385 {1} 2047	Definition of specific identifiers for process data object 6 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
0 ... 24			Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
241 ... 254			Reserved	
255			Process data update on every occurrence of an event	Every received value is accepted
I1406 _h				281
1	COB-ID used by RxPDO 7	832 + NID	385 {1} 2047	Definition of specific identifiers for process data object 7 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
0 ... 24			Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
241 ... 254			Reserved	
255			Process data update on every occurrence of an event	Every received value is accepted
I1407 _h				281
1	COB-ID used by RxPDO 8	1088 + NID	385 {1} 2047	Definition of specific identifiers for process data object 8 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
0 ... 24			Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
241 ... 254			Reserved	
255			Process data update on every occurrence of an event	Every received value is accepted


Index	Name	Possible settings		Important
		Lenze	Selection	
I1408 _h └┘				281
1	COB-ID used by RxPDO 9	1344 + NID	385 {1} 2047	Definition of specific identifiers for process data object 9 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
0 ... 24			Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
241 ... 254			Reserved	
255			Process data update on every occurrence of an event	Every received value is accepted
I1409 _h └┘				281
1	COB-ID used by RxPDO 10	1984 + NID	385 {1} 2047	Definition of specific identifiers for process data object 10 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
0 ... 24			Process data update on every sync telegram transmission	The input data are accepted on sync telegram transmission.
241 ... 254			Reserved	
255			Process data update on every occurrence of an event	Every received value is accepted
I1600 _h └┘				Mapping parameters for receive PDOs
0	Number of mapped RxPDO1		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value

Index	Name	Possible settings		Important
		Lenze	Selection	
11601 _h └┘				Mapping parameters for receive PDOs
0	Number of mapped RxPDO2		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
11602 _h └┘				Mapping parameters for receive PDOs
0	Number of mapped RxPDO3		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value

Index	Name	Possible settings		Important
		Lenze	Selection	
11603 _h └┘				Mapping parameters for receive PDOs
0	Number of mapped RxPDO4		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
11604 _h └┘				Mapping parameters for receive PDOs
0	Number of mapped RxPDO5		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value

Index	Name	Possible settings		Important
		Lenze	Selection	
11605 _h └┘				Mapping parameters for receive PDOs
0	Number of mapped RxPDO6		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
11606 _h └┘				Mapping parameters for receive PDOs
0	Number of mapped RxPDO7		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value

Index	Name	Possible settings		Important
		Lenze	Selection	
11607 _h └┘				Mapping parameters for receive PDOs
0	Number of mapped RxPDO8		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
11608 _h └┘				Mapping parameters for receive PDOs
0	Number of mapped RxPDO9		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value

Index	Name	Possible settings			Important
		Lenze	Selection		
I1609 _h └┘					Mapping parameters for receive PDOs
0	Number of mapped RxPDO10		0	{1} 255	8 bit value
1	1st mapped object		00000000 _h	{1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h	{1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h	{1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h	{1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h	{1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h	{1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h	{1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h	{1} FFFFFFFF _h	32 bit value
I1800 _h └┘					 281
1	COB-ID used by TxPDO 1	384+ NID	385	{1} 2047	Definition of specific identifiers for process data object 1 (NID= Node ID / node address)
2	Transmission type	255	0	{1} 255	Defining the transmission mode
			0	Function deactivated	The output data are accepted on sync telegram transmission.
			1 ... 240	Process data transfer after sync no. 1 ... Process data transfer after sync no. 240	The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.
			254	Time-controlled process data transfer	Only if a cycle time is set in I180x _h , subindex 5
			255	Event-controlled process data transfer	
			255	Event-controlled process data transfer with cyclic overlay	Only if a cycle time is set in I180x _h , subindex 5
3	Inhibit time	0	0	{1 ms} 65535	Blocking time
5	Event time	100	0	{1 ms} 65535	Cycle time

Index	Name	Possible settings			Important
		Lenze	Selection		
I1801 _h └┘					281
1	COB-ID used by TxPDO 2	640 + NID	385 {1} 2047	Definition of specific identifiers for process data object 2 (NID= Node ID / node address)	
2	Transmission type	255	0 {1} 255	Defining the transmission mode	
			0 Function deactivated	The output data are accepted on sync telegram transmission.	
			1 ... 240 Process data transfer after sync no. 1 ... Process data transfer after sync no. 240	The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.	
			254 Time-controlled process data transfer	Only if a cycle time is set in I180x _h , subindex 5	
			255 Event-controlled process data transfer		
			255 Event-controlled process data transfer with cyclic overlay	Only if a cycle time is set in I180x _h , subindex 5	
3	Inhibit time	0	0 {1 ms} 65535	Blocking time	
5	Event time	0	0 {1 ms} 65535	Cycle time	
I1802 _h └┘					281
1	COB-ID used by TxPDO 3	896 + NID	385 {1} 2047	Definition of specific identifiers for process data object 3 (NID= Node ID / node address)	
2	Transmission type	255	0 {1} 255	Defining the transmission mode	
			0 Function deactivated	The output data are accepted on sync telegram transmission.	
			1 ... 240 Process data transfer after sync no. 1 ... Process data transfer after sync no. 240	The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.	
			254 Time-controlled process data transfer	Only if a cycle time is set in I180x _h , subindex 5	
			255 Event-controlled process data transfer		
			255 Event-controlled process data transfer with cyclic overlay	Only if a cycle time is set in I180x _h , subindex 5	
3	Inhibit time	0	0 {1 ms} 65535	Blocking time	
5	Event time	0	0 {1 ms} 65535	Cycle time	

Index	Name	Possible settings			Important	
		Lenze	Selection			
I1803 _h					281	
1	COB-ID used by TxPDO 4	1152 + NID	385	{1}	2047	Definition of specific identifiers for process data object 4 (NID= Node ID / node address)
2	Transmission type	255	0	{1}	255	Defining the transmission mode
			0	Function deactivated		The output data are accepted on sync telegram transmission.
			1 ... 240	Process data transfer after sync no. 1 ... Process data transfer after sync no. 240		The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.
			254	Time-controlled process data transfer		Only if a cycle time is set in I180x _h , subindex 5
			255	Event-controlled process data transfer		
			255	Event-controlled process data transfer with cyclic overlay		Only if a cycle time is set in I180x _h , subindex 5
3	Inhibit time	0	0	{1 ms}	65535	Blocking time
5	Event time	0	0	{1 ms}	65535	Cycle time
I1804 _h						281
1	COB-ID used by TxPDO 5	1664 + NID	385	{1}	2047	Definition of specific identifiers for process data object 5 (NID= Node ID / node address)
2	Transmission type	255	0	{1}	255	Defining the transmission mode
			0	Function deactivated		The output data are accepted on sync telegram transmission.
			1 ... 240	Process data transfer after sync no. 1 ... Process data transfer after sync no. 240		The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.
			254	Time-controlled process data transfer		Only if a cycle time is set in I180x _h , subindex 5
			255	Event-controlled process data transfer		
			255	Event-controlled process data transfer with cyclic overlay		Only if a cycle time is set in I180x _h , subindex 5
3	Inhibit time	0	0	{1 ms}	65535	Blocking time
5	Event time	0	0	{1 ms}	65535	Cycle time

Index	Name	Possible settings		Important
		Lenze	Selection	
I1805 _h └┘				
1	COB-ID used by TxPDO 6	448 + NID	385 {1} 2047	Definition of specific identifiers for process data object 6 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
			0 Function deactivated	The output data are accepted on sync telegram transmission.
			1 ... 240 Process data transfer after sync no. 1 ... Process data transfer after sync no. 240	The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.
			254 Time-controlled process data transfer	Only if a cycle time is set in I180x _h , subindex 5
			255 Event-controlled process data transfer	
			255 Event-controlled process data transfer with cyclic overlay	Only if a cycle time is set in I180x _h , subindex 5
3	Inhibit time	0	0 {1 ms} 65535	Blocking time
5	Event time	0	0 {1 ms} 65535	Cycle time
I1806 _h └┘				
1	COB-ID used by TxPDO 7	704 + NID	385 {1} 2047	Definition of specific identifiers for process data object 7 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
			0 Function deactivated	The output data are accepted on sync telegram transmission.
			1 ... 240 Process data transfer after sync no. 1 ... Process data transfer after sync no. 240	The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.
			254 Time-controlled process data transfer	Only if a cycle time is set in I180x _h , subindex 5
			255 Event-controlled process data transfer	
			255 Event-controlled process data transfer with cyclic overlay	Only if a cycle time is set in I180x _h , subindex 5
3	Inhibit time	0	0 {1 ms} 65535	Blocking time
5	Event time	0	0 {1 ms} 65535	Cycle time

Index	Name	Possible settings			Important	
		Lenze	Selection			
I1807 _h ┌┐					281	
1	COB-ID used by TxPDO 8	960 + NID	385	{1}	2047	Definition of specific identifiers for process data object 8 (NID= Node ID / node address)
2	Transmission type	255	0	{1}	255	Defining the transmission mode
			0	Function deactivated		The output data are accepted on sync telegram transmission.
			1 ... 240	Process data transfer after sync no. 1 ... Process data transfer after sync no. 240		The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.
			254	Time-controlled process data transfer		Only if a cycle time is set in I180x _h , subindex 5
			255	Event-controlled process data transfer		
			255	Event-controlled process data transfer with cyclic overlay		Only if a cycle time is set in I180x _h , subindex 5
3	Inhibit time	0	0	{1 ms}	65535	Blocking time
5	Event time	0	0	{1 ms}	65535	Cycle time
I1808 _h ┌┐						281
1	COB-ID used by TxPDO 9	1216 + NID	385	{1}	2047	Definition of specific identifiers for process data object 9 (NID= Node ID / node address)
2	Transmission type	255	0	{1}	255	Defining the transmission mode
			0	Function deactivated		The output data are accepted on sync telegram transmission.
			1 ... 240	Process data transfer after sync no. 1 ... Process data transfer after sync no. 240		The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.
			254	Time-controlled process data transfer		Only if a cycle time is set in I180x _h , subindex 5
			255	Event-controlled process data transfer		
			255	Event-controlled process data transfer with cyclic overlay		Only if a cycle time is set in I180x _h , subindex 5
3	Inhibit time	0	0	{1 ms}	65535	Blocking time
5	Event time	0	0	{1 ms}	65535	Cycle time

Index	Name	Possible settings		Important
		Lenze	Selection	
I1809 _h └┘				
1	COB-ID used by TxPDO 10	1728 + NID	385 {1} 2047	Definition of specific identifiers for process data object 10 (NID= Node ID / node address)
2	Transmission type	255	0 {1} 255	Defining the transmission mode
			0 Function deactivated	The output data are accepted on sync telegram transmission.
			1 ... 240 Process data transfer after sync no. 1 ... Process data transfer after sync no. 240	The output data are accepted after transmission of the set number (1 ... 240) of sync telegrams.
			254 Time-controlled process data transfer	Only if a cycle time is set in I180x _h , subindex 5
			255 Event-controlled process data transfer	
			255 Event-controlled process data transfer with cyclic overlay	Only if a cycle time is set in I180x _h , subindex 5
3	Inhibit time	0	0 {1 ms} 65535	Blocking time
5	Event time	0	0 {1 ms} 65535	Cycle time
I1A00 _h └┘				Mapping parameters for transmit PDOs
0	Number of mapped TxPDO1		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value

Index	Name	Possible settings		Important
		Lenze	Selection	
11A01 _h └┘				Mapping parameters for transmit PDOs
0	Number of mapped TxPDO2		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
11A02 _h └┘				Mapping parameters for transmit PDOs
0	Number of mapped TxPDO3		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value

Index	Name	Possible settings		Important
		Lenze	Selection	
11A03 _h └┘				Mapping parameters for transmit PDOs
0	Number of mapped TxPDO4		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
11A04 _h └┘				Mapping parameters for transmit PDOs
0	Number of mapped TxPDO5		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value

Index	Name	Possible settings		Important
		Lenze	Selection	
11A05 _h └┘				Mapping parameters for transmit PDOs
0	Number of mapped TxPDO6		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
11A06 _h └┘				Mapping parameters for transmit PDOs
0	Number of mapped TxPDO7		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value

Index	Name	Possible settings		Important
		Lenze	Selection	
11A07 _h └┘				Mapping parameters for transmit PDOs
0	Number of mapped TxPDO8		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
11A08 _h └┘				Mapping parameters for transmit PDOs
0	Number of mapped TxPDO9		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value

Index	Name	Possible settings		Important
		Lenze	Selection	
11A09 _h				Mapping parameters for transmit PDOs
└┘				
0	Number of mapped TxPDO10		0 {1} 255	8 bit value
1	1st mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
2	2nd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
3	3rd mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
4	4th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
5	5th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
6	6th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
7	7th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
8	8th mapped object		00000000 _h {1} FFFFFFFF _h	32 bit value
12100 _h	PDO length	0	0 {1} 255	Setting of the user data width
			0 PDO length 8 bytes	Note: Lenze controllers expect a PDO length of eight bytes even though not all of them may have assigned I/O values.
			1 PDO length according to process image	
12101 _h	Identifizierung	0	CANopen (Belegung nach DS301)	
		1	Belegung nach Lenze-Systembus	
12359 _h	Bus State	0	Operational	Aktueller Busstatus
		1	Pre-Operational	
12361 _h	Mode	0	CANopen	
		1	Lenze Systembus	
12400 _h	Timer value		0 {1 ms} 65535	Monitoring time for process data input objects
└┘				
1	Lenze PDO control 1	0		
2	Lenze PDO control 2	0		
3	Lenze PDO control 3	0		
4	Lenze PDO control 4	0		
5	Lenze PDO control 5	0		
6	Lenze PDO control 6	0		
7	Lenze PDO control 7	0		
8	Lenze PDO control 8	0		
9	Lenze PDO control 9	0		
10	Lenze PDO control 10	0		






Index	Name	Possible settings		Important
		Lenze	Selection	
I3100 _h I311D _h	Parameter data byte 1 Module 1 2 Module 2 64 Module 64		0 {1 _h } 255	Contents are written by the parameterisable module 303 318 328 343 346 347
I31FE _h ┘	Accept module parameter (single) 1 DWord 1 2 DWord 2 64 DWord 64	0	0 {1} 255 255 Accept module parameters	Index for accepting parameter settings one module at a time. Used e.g. in the PLC Designer Each subindex corresponds to a parameterisable module (sequence according to the slot, from left to right). The value changes are only accepted after writing the corresponding subindex with 255
I31FF _h	Accept module parameter	0	0 {1} 255 0 255 Accept module parameters	After describing the index with 255, the parameter changes are transferred by all modules
I5400 _h ┘	Counter Value 1 DWord 1 2 DWord 2 64 DWord 64		00000000 _h {1 _h } FFFFFFFF _h	Count value 290
I5401 _h ┘	Latch value 1 DWord 1 2 DWord 2 64 DWord 64		00000000 _h {1} FFFFFFFF _h	Latch value 290
I5402 _h ┘	Status word 1 DWord 1 2 DWord 2 64 DWord 64		0000 _h {1} FFFF _h	Status word 290
I5403 _h ┘	Counter ticker value 1 DWord 1 2 DWord 2 64 DWord 64		0000 _h {1} FFFF _h	Ticker value 290
I5420 _h	PWM state 1 WORD 1 2 WORD 2 80 WORD 64		0000 _h {1} FFFF _h	Read only Status of PWM 2 entries per module Bit 0: reserved Bit 1: PWM status (0: PWM output stopped; 1: PWM output active) Bit 2: output status (0: push/pull output; 1: highside output) Bits 3 ... 15: reserved 289



8 CANopen communication

Index table

Index	Name	Possible settings			Important
		Lenze	Selection		
I5430 _h	DI time stamp state		0000 _h {1}	FFFF _h	Read only Status of time stamp 15 entries per module Bit 0: channel status DI1 (0: FALSE; 1: TRUE) Bit 1: channel status DI2 (0: FALSE; 1: TRUE) Bits 2 ... 7: reserved Bits 8 ... 15: counter which counts from 0 ... 127 and then goes back to 0. Bits 16 ... 32: ticker value
1	DWORD 1				
2	DWORD 2				
...	...				
80	DWORD 64				
I5440 _h	DO time stamp state		0000 _h {1}	FFFF _h	Read only Status of FIFO memory 1 entry per module Bits 0 ... 5: running number of time stamp entry last written to the FIFO memory. Bits 6 ... 7: reserved Bits 8 ... 13: running number of time stamp entry to be processed next. Bits 14 ... 15: reserved Bits 16 ... 23: <ul style="list-style-type: none"> ● 00h or 80h: everything ok ● 01h or 81h: no following entry ● 02h or 82h: no new entries ● 03h or 83h: FIFO memory full. No new entries possible. A full memory will not accept any more time stamp entries. Perform a status query to establish the FIFO memory's status before transferring more time stamp entries. Bits 24 ... 31: number of time stamp entries in FIFO memory.
1	DWORD 1				
2	DWORD 2				
...	...				
80	DWORD 64				
I5600 _h	Counter Compare Value		00000000 _h {1}	FFFFFFF _h	Comparison value
1	DWord 1				
2	DWord 2				
...	...				
64	DWord 64				
I5601 _h	Counter Set Value		00000000 _h {1}	FFFFFFF _h	Set value
1	DWord 1				
2	DWord 2				
...	...				
64	DWord 64				
I5602 _h	Counter Control Word		0000 _h {1}	FFFF _h	Control word
1	DWord 1				
2	DWord 2				
...	...				
64	DWord 64				

Index	Name	Possible settings			Important		
		Lenze	Selection				
I5620 _h	PWM pulse duration		0000 _h	{1}	FFFF _h	Status of PWM 2 entries per module Specification of pulse duration in [μs].	📖 289
	1	DWORD 1					
	2	DWORD 2					
					
	80	DWORD 64					
I5621 _h	PMW control		0000 _h	{1}	FFFF _h	Control word PWM 2 entries per module Bits 0 ... 1: reserved Bit 2: <ul style="list-style-type: none"> 0: push/pull output The output signal is switched to HIGH level active and LOW level active. 1: highside output The output signal is only switched to HIGH level active. Bits 3 ... 7: reserved Bit 8: 0-1 edge: PWM output starts Bit 9: 1-0 edge: PWM output stops Bits 10 ... 15: reserved	📖 380
	1	WORD 1					
	2	WORD 2					
					
	80	WORD 64					
I5640 _h	DO time stamp control		0000 _h	{1}	FFFF _h	15 entries per module Bits 0 ... 5: reserved Bit 6: channel status D01 (0: FALSE; 1: TRUE) Bit 7: channel status D02 (0: FALSE; 1: TRUE) Bits 8 ... 15: counter which counts from 0 ... 127 and then goes back to 0. Bits 16 ... 32: ticker value	📖 285
	1	DWORD 1					
	2	DWORD 2					
					
	80	DWORD 64					
I6000 _h	Digital input		0	{1}	255	Read only Digital input status	📖 380
	1	Byte 1					
	2	Byte 2					
					
	80	Byte 80					
I6002 _h	Change polarity - digital input		0	{1}	255	Inverts digital input signals	📖 303
	1	Byte 1	0				
	2	Byte 2	0				
				
	80	Byte 80	0				
I6200 _h	Digital output		0	{1}	255	<ul style="list-style-type: none"> Digital output status The outputs can be set manually (forcing): <ul style="list-style-type: none"> – Depends on CAN status and I2360_h 	📖 380
	1	Byte 1					
	2	Byte 2					
					
	80	Byte 80					

Index	Name	Possible settings		Important	
		Lenze	Selection		
I6202 _h ┘	Change polarity - digital output		0 {1} 255	Inverts digital output signals  303	
	1 Byte 1	0			
	2 Byte 2	0			
			
	80 Byte 80	0			
I6206 _h ┘	Error mode - digital output		0 {1} 255	Configures digital output monitoring  370	
			0 All digital outputs retain the last status output.		
			255 Response from I6207 _h		In I6207 _h , the response can be configured individually for each digital output
	1 Byte 1	0			
	2 Byte 2	0			
...	...				
80 Byte 80	0				
I6207 _h ┘	Error value - digital output		0 {1} 255	Configures the individual digital output responses  370	
			8 bits of information		
			Bit value 0 Output switches to LOW		
			Bit value 1 Output retains last status output		
	1 Byte 1	0			
2 Byte 2	0				
...	...				
64 Byte 80	0				
I6401 _h	Analog input		-32768 {1} 32767	Display only Analog input status  380	
	1 Channel 1				
	2 Channel 2				
	...				
	36 Channel 36				
I6411 _h *	Analog output		-32768 {1} 32767	<ul style="list-style-type: none"> Analog output status The outputs can be set manually (forcing): <ul style="list-style-type: none"> – Depends on CAN status and I2360_h  380	
	1 Channel 1				
	2 Channel 2				
	...				
	36 Channel 36				
I6421 _h ┘	Trigger selection		0 {1} 255	Enables interrupt for analog inputs/outputs	
	1 Channel 1	0			
	2 Channel 2	0			
			
	36 Channel 36	0			

Index	Name	Possible settings		Important
		Lenze	Selection	
I6423 _h ┘	Global interrupt enable		0 {1} 255	Global activation/deactivation of the event-controlled process data transfer of the analog input signals. The setting in I6423 _h has a higher priority than the settings in the TxPDOs. • Lenze setting: – System bus (CAN): I6423 _h = 255 – CANopen: I6423 _h = 0
			0 Event-controlled process data transfer deactivated	
			255 Event-controlled process data transfer activated	
I6424 _h ┘	Upper limit analog input		00000000 _h {1} FFFFFFFF _h	
	1 Channel 1	0		
	2 Channel 2	0		
		
	36 Channel 36	0		
I6425 _h ┘	Lower limit analog input		00000000 _h {1} FFFFFFFF _h	
	1 Channel 1	0		
	2 Channel 2	0		
		
	36 Channel 36	0		
I6426 _h ┘	Delta limit analog input		00000000 _h {1} FFFFFFFF _h	
	1 Channel 1	0		
	2 Channel 2	0		
		
	36 Channel 36	0		
I6443 _h ┘	Error mode analog output		0 {1} 255	Configures analog output monitoring  371
			0 All analog outputs retain the last value output	
			255 Response from I6444 _h	
	1 Channel 1	0		
	2 Channel 2	0		
		
	36 Channel 36	0		
I6444 _h ┘	Error value analog output		-32768 {1} 32767	Configures the individual analog output responses  371 The analog outputs provide the set value
	1 Channel 1	0		
	2 Channel 2	0		
		
	36 Channel 36	0		

9 PROFIBUS communication

Via Profibus-DP

9 PROFIBUS communication

9.1 Via Profibus-DP

PROFIBUS is an integrated, open, digital communication system with a wide application range mainly in manufacturing and process automation. PROFIBUS is suitable for fast, time-critical and complex communication tasks.

PROFIBUS-DP can be used for manufacturing automation. It provides for an easy, fast, cyclic and deterministic process data exchange between a master and the assigned slaves. Power section DP-V0 is provided with these basic functions. Power section DP-V1 was enhanced by an acyclic data exchange between master and slave.

Power section DP-V0

Profibus-DP-V0 (Decentralised Peripherals) provides the basic functions of DP.

Power section DP-V1

The power section DP-V1 contains supplements for DP-V0 with the focus on process automation: Simultaneously to the cyclic process data transfer, an acyclic data link to the slaves is built up in order to parameterise the slaves.



Note!

Power section DP-V1 can only be used if it is supported by the master and the slaves.

9.2 System configuration

9.2.1 Types

PROFIBUS differentiates between active nodes (master) and passive nodes (slave).

Class 1 master (DPM 1)

A class 1 master (DPM 1) is a central control which exchanges data with the slaves in a fixed cycle. Typical DPM 1 are, for example, PLC or PC. Via an active bus access, measured data is read cyclically from the input modules of the slaves and setpoints are written to the output modules of the slaves.

Class 2 master (DPM 2)

Class 2 masters (DPM 2) are used for engineering, configuration or operation. During commissioning, maintenance and diagnostics, for example, DPM 2 can be used to configure the connected slaves, evaluate measured values and parameters and query the status of the slaves. The data is transmitted acyclically. DPM 2 do not have to be permanently connected to the bus. DPM 2 are provided with active bus access.

Slave

Slaves are peripherals (PROFIBUS bus couplers) making process information (input data and output data) available. Slaves only respond to direct requests by the master.

9.2.2 Mono-master system

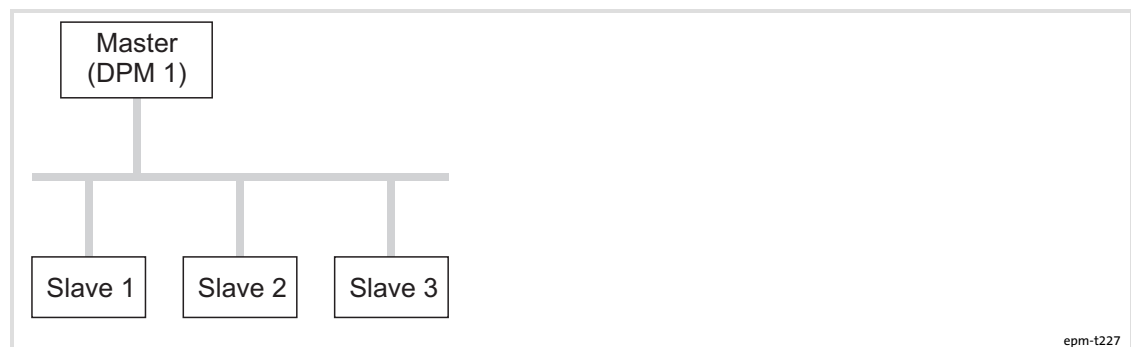


Fig. 9-1 PROFIBUS-DP mono-master system

In the case of mono-master systems, only one master on the bus is active during operation. The slaves are coupled to the master via the transmission medium in a decentralised manner. This system configuration achieves the shortest bus cycle time.

9.2.3 Multi-master system

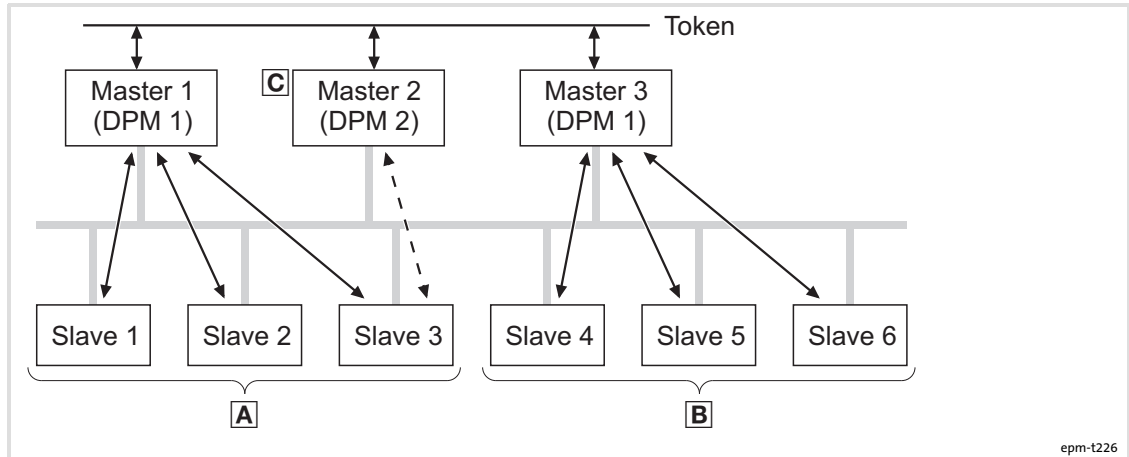


Fig. 9-2 PROFIBUS-DP multi-master system

- A** Subsystem consisting of master 1 and slaves 1 ... 3 with cyclic data transfer.
- B** Subsystem consisting of master 3 and slaves 4 ... 6 with cyclic data transfer.
- C** For configuration and diagnostics, master 2 can communicate with slave 1 ... 6. The data transfer is acyclic.

In multi-master operation, several masters are connected to one bus. They either form independent subsystems consisting of one class 1 master (DPM 1) each and the corresponding slaves, or additional class 2 masters (DPM 2) for configuration and diagnostics. The input and output images of the slaves can be read by all masters. Only the respective class 1 master (DPM 1) can write the outputs.

9.3 Communication

9.3.1 Bus access

The transmission protocol offers two bus access procedures.

Master ↔ Master

The master communication is also referred to as token passing procedure. The token passing procedure makes sure that the bus access authorisation is assigned. The bus access authorisation is given by means of a "token". The token is a special telegram transmitted via the bus.

If a master has a token, it can communicate with all of the other bus nodes. The token hold time is defined during system configuration. Once the token hold time has elapsed, the token is passed on to the next master which is then in possession of the bus access authorisation and can communicate with all of the other nodes.

The data transfer between the master and the slaves assigned to it is automatically controlled by the master and takes place in a fixed and recurring sequence. The slaves are assigned to a master during configuration. In addition, it can be defined which slaves participate in the cyclic process data transfer.

Master ↔ Slave

Before master and slave can communicate, the configuration and the parameter setting are checked for errors after startup.

The following are checked: type, format information, length information and the number of inputs and outputs.

If the parameters are valid, the slave changes over to the DataExchange (DE) state. The master can now transmit output data to the slave and receive the current input data from the slave.

While the process data transfer is in progress, the master can transmit new parameter data to the slave.

9.3.2 Cyclic data transfer

The data communication with PROFIBUS-DP-V0 includes cyclic diagnostics as well as cyclic process data and parameter data transfer.

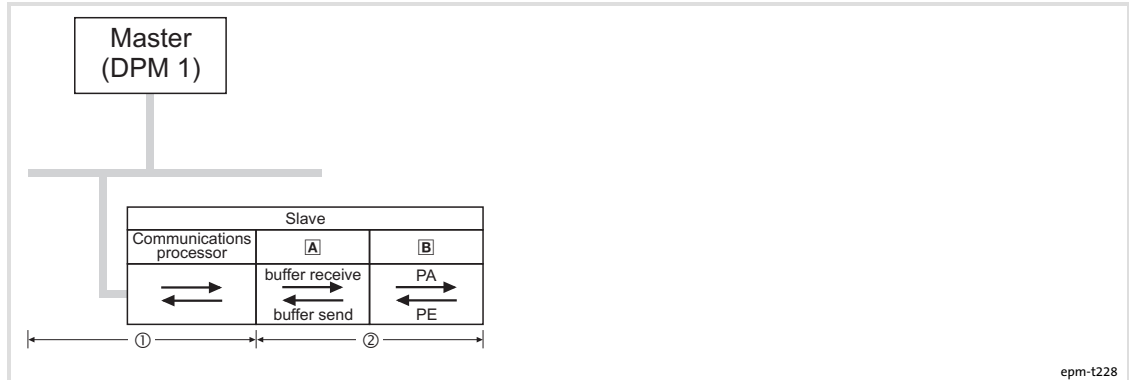


Fig. 9-3 DP cycle and cycle of backplane bus

- Ⓐ Backplane bus with transmit and receive buffer
- Ⓑ Input / output modules
 - PO: process image of outputs
 - PI: process image of inputs
- ① PROFIBUS cycle
- ② Backplane bus cycle

Backplane bus cycle

During a backplane bus cycle

- ▶ the input data (PI) on the inputs is collected and transmitted to the transmit buffer (buffer send),
- ▶ the output data (PO) of the receive buffer (buffer receive) is written to the outputs.

PROFIBUS cycle

During a PROFIBUS cycle, the master successively addresses all its assigned slaves with a DataExchange. During a DataExchange, the memory areas assigned to the PROFIBUS are transmitted.

- ▶ The data of the PROFIBUS input area is transmitted to the receive buffer (buffer receive).
- ▶ The data of the transmit buffer (buffer send) is transmitted to the PROFIBUS output area.

9.3.3 Acyclic data transfer

The PROFIBUS-DP-V1 service can be used as an optional extension to enable an acyclic parameter data transfer. PROFIBUS-DP-V0 and PROFIBUS-DP-V1 may be operated simultaneously in one network.

The integration of the acyclic service in a fixed bus cycle depends on the correct configuration of DPM 1:

- ▶ If configured, a time slot is reserved.
- ▶ If not configured, the acyclic service is added when a DP-V1 slave is accessed acyclically with a DPM 2.
- ▶ The acyclic service always has lower priority.

Parameter data transfer between DPM 1 and slaves

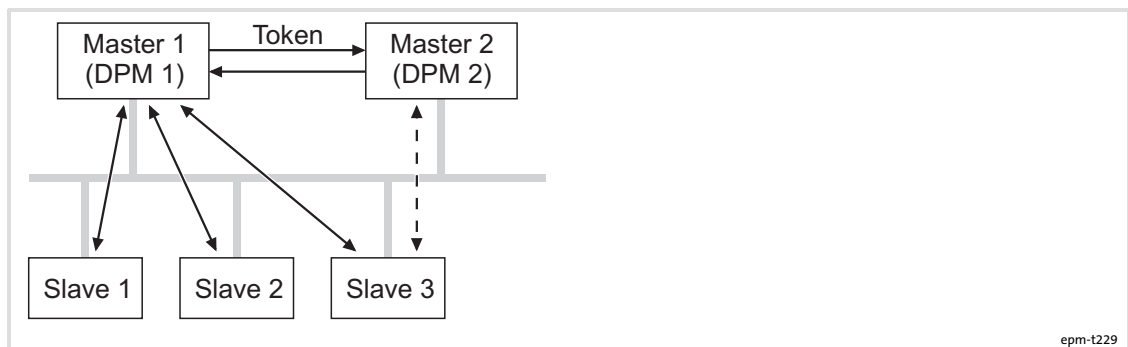


Fig. 9-4 Acyclic data transfer

- ◄ — — — — — ► Cyclic process data transfer between DPM 1 and slave 1 ... 3
- ◄ - - - - - ► Acyclic parameter data transfer between DPM 1 and slave 3

1. DPM 1 has the send authorisation (token) and communicates in a fixed sequence with slave 1, then with slave 2 etc. up to the last slave of the current list via the MS0 channel by means of request and response.
2. DPM 1 transfers the token to DPM 2.
3. During the remaining cycle time (time slot), DPM 2 establishes an acyclical connection to one of the slaves in order to transmit parameter data via the MS2 channel.
4. At the end of the running cycle time, DPM 2 returns the token to DPM 1.
 - Depending on the remaining cycle time, several time slots may be required for the acyclical data record transfer.
5. Once all of the data records have been transferred, DPM 2 establishes the connection within one time slot.



Note!

DPM 1 can perform the acyclical parameter data exchange via the MS1 channel.

Services for the acyclic parameter data transfer**Data transfer between DPM 1 and slaves**

The connection is established by DPM 1 via the MS1 channel. The connection to the slave can only be established by the master that has parameterised and configured the slave.

Service	Description
Read	The master reads a data block from the slave.
Write	The master writes a data block to the slave.
Alarm	The slave transmits an alarm message to the master. The master acknowledges receipt. To prevent alarm messages from being overwritten, the slave can only transmit a new alarm message if it has received the acknowledgement.
Alarm_Acknowledge	The master transmits an acknowledgement to the slave, confirming that it has received an alarm message.
Status	The slave transmits a status message to the master. The master does not acknowledge receipt.

Data transfer between DPM 2 and slaves

The connection is established by DPM 2 via the MS1 channel using the "Initiate" service. One slave can maintain several active connections at the same time. The number of connections is limited depending on the resources available in the slave.

Service	Description
Initiate / Abort	Establishing or terminating a connection for the acyclic data transfer between DPM 2 and a slave.
Read	The master reads a data block from the slave.
Write	The master writes a data block to the slave.
Data_Transport	The master writes user-specific data (defined in profiles) to the slave and, if required, it reads data from the slave in the same cycle.

**Note!**

For further information on the services and communication with DP-V0 and DP-V1, refer to standard IEC 61158.

9.3.4**Communication medium**

- ▶ The communication medium is an RS485 interface.
- ▶ The bus can be configured as line or tree topology.
- ▶ The bus structure under RS485 enables the reactionless connection and disconnection of stations as well as the gradual commissioning of the system. Subsequent enhancements do not affect the stations already in operation. It is automatically detected whether a node has failed or just been connected to the mains.
- ▶ The PROFIBUS bus coupler is provided with a 9-pole Sub-D socket for connecting them to the bus.

9.4 Project planning

The I/O system is configured via the master. The following work steps must be carried out:

- ▶ Import the GSE file (device description) of the I/O system into the project planning tool.
 - PROFIBUS bus coupler: LENZ0C3A.gse
 - The description or linkage of the GSE file can be found in the project planning tool.
- ▶ Address nodes
 - Every node at the PROFIBUS is identified by an address.
 - Each address may only be assigned once in a bus system.
 - Addresses between 1 ... 125 can be assigned.
 - At the PROFIBUS bus coupler (slave), the address with the front DIP switch is set (📖 39).
 - At the master, the address is set during the configuration.
- ▶ Set the baud rate
 - The baud rate is set in the configuration tool.
 - The baud rate must correspond to the length of the bus cable.
- ▶ Parameterise slaves



Note!

The diagnostic function is only supported by I/O compound modules from HW version 1B and by bus coupler modules from HW version 1A. If a module in the system complies with an earlier HW version, the diagnostic function is deactivated for all modules.

9.5 Setting the parameters of analog I/O

9.5.1 2 analog inputs 0 ... 10 V (12 bits) - EPM-S400

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
128	0	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
129	0	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 02 _h)
6	Number of channels of a module (here 02 _h ·)
7	Bit 0: Channel error, channel 1 Bit 1: Channel error, channel 2 Bit 7 ... 2: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10 ... 15	0 (fixed)

9.5.2 4 analog inputs 0 ... 10 V (12 bits) - EPM-S401

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
128	0	Function channel 1		20 _h
129	0	Function channel 2	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
130	0	Function channel 3	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec}	20 _h
131	0	Function channel 4	255 (FF _h): channel deactivated	20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000	Underflow	
Not possible, is limited to 0 V				Underflow	
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000	Underflow	
Not possible, is limited to 0 V				Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
12 ... 15	0 (fixed)

9.5.3 2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
128	0	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
129	0	Function channel 2	49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	I = D * 20 / 27648 D = 27648 * I / 20
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	I = D * 20 / 16384 D = 16384 * I / 20
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	I = D * 16 / 27648 + 4 D = 27648 * (I-4) / 16
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	I = D * 16 / 16384 + 4 D = 16384 * (I-4) / 16
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 02 _h)
6	Number of channels of a module (here 02 _h ·)
7	Bit 0: Channel error, channel 1 Bit 1: Channel error, channel 2 Bit 7 ... 2: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10 ... 15	0 (fixed)

9.5.4 4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
128	0	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511	31 _h
129	0	Function channel 2	64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
130	0	Function channel 3	49 (31 _h): 0 ... 20 mA / -4864 ... 32511	31 _h
131	0	Function channel 4	65 (41 _h): 0 ... 20 mA / -3277 ... 20480	31 _h
			255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
12 ... 15	0 (fixed)

9.5.5 2 analog inputs -10 ... +10 V (16 bits) - EPM-S406

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	1	Reserved	0	
	2	Limit value monitoring	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 (0 = deactivated; 1 = activated) Bits 7 ... 2: Reserved	00 _h
1	0	Interference frequency suppression	Bit 1, 0: Channel 1 00: Deactivated 01: 60 Hz 10: 50 Hz Bit 3, 2: Channel 2 00: Deactivated 01: 60 Hz 10: 50 Hz Bits 7 ... 4: Reserved	00 _h
128	0	Function channel 1	12 (12 _h): -10 ... 10 V / -27648 ... 27648 _{dec} 34 (22 _h): -10 ... 10 V / -16384 ... 16384 _{dec} 16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
	1	Reserved	0	
	2	Upper limit value channel 1	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
	3	Lower limit value channel 1	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h
129	0	Function channel 2	12 (12 _h): -10 ... 10 V / -27648 ... 27648 _{dec} 34 (22 _h): -10 ... 10 V / -16384 ... 16384 _{dec} 16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
	1	Reserved	0	
	2	Upper limit value channel 2	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
	3	Lower limit value channel 2	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Setting the parameters of analog I/O
2 analog inputs -10 ... +10 V (16 bits) - EPM-S406

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
-10 ... +10 V (12 _h)	11.76	32511	7EFF	Overflow	U = D * 10 / 27648 D = 27648 * U / 10
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	-5	-13824	CA00		
	-10	-27648	9400		
-11.76	-32512	8100	Underflow		
-10 ... +10 V (22 _h)	12.5	20480	5000	Overflow	U = D * 10 / 16384 D = 16384 * U / 10
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	-5	-8192	E000		
	-10	-16384	C000		
-12.5	-20480	B000	Underflow		
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	U = D * 10 / 27648 D = 27648 * U / 10
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
-1.76	-4864	ED00	Underflow		
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	U = D * 10 / 16384 D = 16384 * U / 10
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
-2	-3277	F333	Underflow		

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
12 ... 15	0 (fixed)

9.5.6 2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0		Diagnostics	Bits 0 ... 5: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
		Reserved	0	
		Limit value monitoring	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 (0 = deactivated; 1 = activated) Bits 7 ... 2: Reserved	00 _h
1		Interference frequency suppression	Bit 1, 0: Channel 1 00: Deactivated 01: 60 Hz 10: 50 Hz Bit 3, 2: Channel 2 00: Deactivated 01: 60 Hz 10: 50 Hz Bits 7 ... 4: Reserved	00 _h
128		Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480 49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	41 _h
		Reserved	0	
		Upper limit value channel 1	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
		Lower limit value channel 1	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h
129		Function channel 2	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480 49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	41 _h
		Reserved	0	
		Upper limit value channel 2	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
		Lower limit value channel 2	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
12 ... 15	0 (fixed)

9.5.7 2 analog outputs 0 ... 10 V (12 bits) - EPM-S500

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	1	Short-circuit detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
128	0	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
129	0	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Output area (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000	Underflow	
Not possible, is limited to 0 V				Underflow	
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000	Underflow	
Not possible, is limited to 0 V				Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Short circuit/overload (if parameterised)

Using SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 73 _h : analog output Bit 7: 0 (fixed)
5	Number of diagnostic bits output by the module per channel (here 02 _h)
6	Number of channels of a module (here 02 _h .)
7	Bit 0: Channel error, channel 1 Bit 1: Channel error, channel 2 Bit 7 ... 2: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
10 ... 15	0 (fixed)

9.5.8 4 analog outputs 0 ... 10 V (12 bits) - EPM-S501

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	1	Short-circuit detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bit 2: Channel 3 Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
128	0	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
129	0	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec}	20 _h
130	0	Function channel 3	255 (FF _h): channel deactivated	20 _h
131	0	Function channel 4		20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Output area (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Short circuit/overload (if parameterised)

Using SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 73 _h : analog output Bit 7: 0 (fixed)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
12 ... 15	0 (fixed)

9.5.9 2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	1	Wire-breakage detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
128	0	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
129	0	Function channel 2	49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
0 ... 20 mA (41 _h)	-3.52	-4864	ED00	Underflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	25	20480	5000	Overflow	
	20	16384	4000	Nominal range	
	10	8192	2000		
0	0	0000	Underflow		
4 ... 20 mA (30 _h)	-4	-3277	F333	Underflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	22.81	32511	7EFF	Overflow	
	20	27648	6C00	Nominal range	
	12	13824	3600		
4	0	0000	Underflow		
4 ... 20 mA (40 _h)	1.19	-4864	ED00	Underflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	24	20480	5000	Overflow	
	20	16384	4000	Nominal range	
	12	8192	2000		
4	0	0000	Underflow		
0.8	-3277	F333	Underflow		

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Open circuit (if parameterised)

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 73 _h : analog output Bit 7: 0 (fixed)
5	Number of diagnostic bits output by the module per channel (here 02 _h)
6	Number of channels of a module (here 02 _h .)
7	Bit 0: Channel error, channel 1 Bit 1: Channel error, channel 2 Bit 7 ... 2: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
10 ... 15	0 (fixed)

9.5.10 4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	1	Wire-breakage detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bit 2: Channel 3 Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
128	0	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511	31 _h
129	0	Function channel 2	64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
130	0	Function channel 3	49 (31 _h): 0 ... 20 mA / -4864 ... 32511	31 _h
131	0	Function channel 4	65 (41 _h): 0 ... 20 mA / -3277 ... 20480	31 _h
			255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Open circuit (if parameterised)

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 73 _h : analog output Bit 7: 0 (fixed)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
12 ... 15	0 (fixed)

9.6 Parameterising the temperature measurement

9.6.1 Four (two) analog inputs for resistance tests - EPM-S404

**Note!**

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ If thermal detectors are connected in a 3-wire or 4-wire setup, channels 3 and/or 4 must be deactivated.
- ▶ The module does not provide any auxiliary supply for sensors.

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 0 ... 5: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
	1	Wire-breakage detection	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) : Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
	2	Limit value monitoring	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) : Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
	3	Reserved		
1	0	Temperature system	Bit 0, 1: 00 _b = °C; 01 _b = °F; 10 _b = K Bits 2 ... 7: Reserved	00 _h
	1	Interference frequency suppression	Bit 0, 1: 01 _b = 60 Hz; 10 _b = 50 Hz Bits 2 ... 7: Reserved	02 _h
Channel 1				
128	0	Function channel 1	80 (50 _h) ... 162 (A2 _h): see "measuring range" 255 (FF _h): channel deactivated	50 _h
	1	Conversion time channel 1	You can set the transformer speed as a function of the interference frequency suppression (see 0x3105/x) for each channel. 0 (00 _h): At 50 Hz: 324.1 ms/channel 16 bits; at 60 Hz: 270.5 ms/channel 16 bits 1 (01 _h): At 50 Hz: 164.2 ms/channel 16 bits; at 60 Hz: 137.2 ms/channel 16 bits 2 (02 _h): At 50 Hz: 84.2 ms/channel 16 bits; at 60 Hz: 70.5 ms/channel 16 bits 3 (03 _h): at 50 Hz: 44.1 ms/channel 16 bits; at 60 Hz: 37.2 ms/channel 16 bits 4 (04 _h): At 50 Hz: 24.2 ms/channel 16 bits; at 60 Hz: 20.5 ms/channel 16 bits 5 (05 _h): At 50 Hz: 14.2 ms/channel 16 bits; at 60 Hz: 12.2 ms/channel 16 bits 6 (06 _h): At 50 Hz: 9.2 ms/channel 16 bits; at 60 Hz: 8.0 ms/channel 16 bits 7 (07 _h): At 50 Hz: 6.6 ms/channel 15 bits; at 60 Hz: 5.9 ms/channel 15 bits 8 (08 _h): At 50 Hz: 4.2 ms/channel 13 bits; at 60 Hz: 3.8 ms/channel 13 bits	00 _h

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Data set		Name	Description/value	Lenze
No.	Byte			
	2, 3	Upper limit value channel 1	You can define an upper or lower limit value for each channel. For this you can only specify values from the nominal range, otherwise you'll receive a parameterisation error. By specification of 7FFF _h for the upper or 8000 _h for the lower limit value, the corresponding limit value is deactivated. As soon as the measured value is outside a limit value and limit value monitoring is activated, a process alarm is triggered.	7FFF _h
	4,5	Lower limit value channel 1		8000 _h
Channel 2				
129	0	Function channel 2	See channel 1	50 _h
	1	Conversion time channel 2	See channel 1	00 _h
	2, 3	Upper limit value channel 2	See channel 1	7FFF _h
	4, 5	Lower limit value channel 2 (HIGH byte)		8000 _h
Channel 3 (for two-wire conductor connections only)				
130	0	Function channel 3	See channel 1	50 _h
	1	Conversion time channel 3	See channel 1	00 _h
	2, 3	Upper limit value channel 3	See channel 1	7FFF _h
	4, 5	Lower limit value channel 3		8000 _h
Channel 4 (for two-wire conductor connections only)				
131	0	Function channel 4	See channel 1	50 _h
	1	Conversion time channel 4	See channel 1	00 _h
	2, 3	Upper limit value channel 4	See channel 1	7FFF _h
	4, 5	Lower limit value channel 4		8000 _h

Measuring range

Measuring range (Fct. no.)	Measured value	Signal range	Range
2-wire: PT100 (50 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
2-wire: PT1000 (51 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
2-wire: NI100 (52 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
2-wire: NI1000 (53 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
3-wire: PT100 (58 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow

Measuring range (Fct. no.)	Measured value	Signal range	Range
3-wire: PT1000 (59 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
3-wire: NI100 (5A _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
3-wire: NI1000 (5B _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
4-wire: PT100 (60 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
4-wire: PT1000 (61 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
4-wire: NI100 (62 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
4-wire: NI1000 (63 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
2-wire: 0 ... 60 Ω (70 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (71 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (72 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (78 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (79 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (7A _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (80 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (81 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Measuring range (Fct. no.)	Measured value	Signal range	Range
4-wire: 0 ... 3000 Ω (82 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767	Nominal range
	-	-	Underflow
2-wire: 0 ... 60 Ω (90 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (91 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (92 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (98 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (99 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (9A _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (A0 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (A1 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (A2 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 60 Ω (D0 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (D1 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (D2 _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (D8 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (D9 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow

Measuring range (Fct. no.)	Measured value	Signal range	Range
3-wire: 0 ... 3000 Ω (DA _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (E0 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (E1 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (E2 _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow

Diagnostics and alarm

Trigger	Process alarm	Diagnostic alarm	Parameterisable
Configuration/parameterisation error	-	X	-
Open circuit detected	-	X	X
Measuring range exceeded	-	X	-
Measuring range not reached	-	X	-
Limit value exceeded	X	-	X
Limit value not reached	X	-	X
Process alarm lost	-	X	-

Process alarm

A process alarm causes a call of the OB 40. Within the OB 40 you have the possibility of determining the logic basic address of the module that has triggered the process alarm via the local word 6. Further information on the triggering event can be found in the "Local double word 8".

Local double word 8 of OB 40:

Local byte	Bit 7 ... 0
1	Bit 0: Limit value exceeded channel 1 Bit 1: Limit value exceeded channel 2 Bit 2: Limit value exceeded channel 3 Bit 3: Limit value exceeded channel 4 Bit 7 ... 4: 0 (fixed)
2	Bit 0: Limit value not reached channel 1 Bit 1: Limit value not reached channel 2 Bit 2: Limit value not reached, channel 3 Bit 3: Limit value not reached, channel 4 Bit 7 ... 4: 0 (fixed)
3/4	Ticker value at the time of the alarm After mains connection, a timer (μs ticker) is started which after 65535 μs starts with 0 again.

Diagnostic alarm

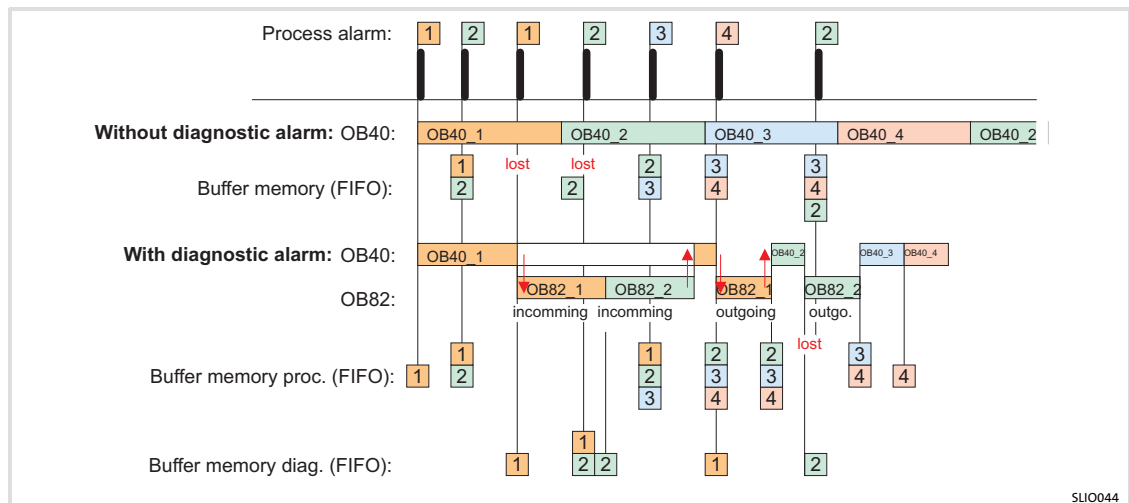
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



SLI0044

Diagnostic alarm processing:

Using SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.

Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bit 6 ... 0: Channel type, 76h: counter module Bit 7: Further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 01 _h)
7	Bit 0: Error in channel group 0 (counter) Bit 7 ... 1: 0 (fixed)
8	Diagnostic alarm due to process alarm lost to ... Bit 0: Hardware gate open Bit 1: Hardware gate closed Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 4: Latch value Bit 7 ... 5: 0 (fixed)
9 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

9.6.2 Two analog inputs for thermocouple measurement - EPM-S405

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 0 ... 5: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
	1	Wire-breakage detection	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
	2	Limit value monitoring	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
	3	Reserved	0	
1	0	Temperature system	Bit 0, 1: 00 _b = °C; 10 _b = °F; 11 _b = K Bits 2 ... 7: Reserved	00 _h
	1	Interference frequency suppression	Bit 0, 1: 01 _b = 60 Hz; 10 _b = 50 Hz Bits 2 ... 7: Reserved	02 _h
Channel 1				
128	0	Function channel 1	176 (60 _h) ... 201 (C9 _h): see "measuring range" External temperature compensation: 176 (60 _h) ... 185 (69 _h) Internal temperature compensation: 192 (C0 _h): ... 201 (C9 _h) 255 (FF _h): channel deactivated	C1 _h
	1	Conversion time channel 1	You can set the transformer speed as a function of the interference frequency suppression (see 0x3105/x) for each channel. 0 (00 _h): At 50 Hz: 324.1 ms/channel 16 bits; at 60 Hz: 270.5 ms/channel 16 bits 1 (01 _h): at 50 Hz: 164.2 ms/channel 16 bits; at 60 Hz: 137.2 ms/channel 16 bits 2 (02 _h): At 50 Hz: 84.2 ms/channel 16 bits; at 60 Hz: 70.5 ms/channel 16 bits 3 (03 _h): at 50 Hz: 44.1 ms/channel 16 bits; at 60 Hz: 37.2 ms/channel 16 bits 4 (04 _h): At 50 Hz: 24.2 ms/channel 16 bits; at 60 Hz: 20.5 ms/channel 16 bits 5 (05 _h): at 50 Hz: 14.2 ms/channel 16 bits; at 60 Hz: 12.2 ms/channel 16 bits 6 (06 _h): at 50 Hz: 9.2 ms/channel 16 bits; at 60 Hz: 8.0 ms/channel 16 bits 7 (07 _h): at 50 Hz: 6.6 ms/channel 15 bits; at 60 Hz: 5.9 ms/channel 15 bits 8 (08 _h): at 50 Hz: 4.2 ms/channel 13 bits; at 60 Hz: 3.8 ms/channel 13 bits	02 _h
	2, 3	Upper limit value channel 1	You can define an upper or lower limit value for each channel. For this you can only specify values from the nominal range, otherwise you'll receive a parameterisation error. By specification of 7FFF _h for the upper or 8000 _h for the lower limit value, the corresponding limit value is deactivated.	7FFF _h
	4, 5	Lower limit value channel 1	If the measured value is outside a limit value and the limit value monitoring is activated, a process alarm is triggered.	8000 _h

Data set		Name	Description/value	Lenze
No.	Byte			
Channel 2				
129	0	Function channel 2	See channel 1	C1 _h
	1	Conversion time channel 2	See channel 1	02 _h
	2, 3	Upper limit value channel 2	See channel 1	7FFF _h
	3, 4	Lower limit value channel 2		8000 _h

Measuring range

Measuring range (Fct. no.)	Measured value			Range
	[°C]	[°F]	[K]	
Type J: -210 ... +1200 °C -346 ... 2192 °F 63.2 ... 1473.2 K (B0 _h : ext. comp. 0 °C) (C0 _h : int. comp. 0 °C)	+14500	26420	17232	Overflow
	-2100 ... +12000	-3460 ... +21920	632 ... 14732	Nominal range
	-	-	-	Underflow
Type K: -210 ... +1372 °C -454 ... 2501.6 °F 0 ... 1645.2 K (B1 _h : ext. comp. 0 °C) (C1 _h : int. comp. 0 °C)	+16220	29516	18952	Overflow
	-2700 ... +13720	-4540 ... 25016	0 ... 16452	Nominal range
	-	-	-	Underflow
Type N: -270 ... +1300 °C -454 ... 2372 °F 0 ... 1573.2 K (B2 _h : ext. comp. 0 °C) (C2 _h : int. comp. 0 °C)	+15500	28220	18232	Overflow
	-2700 ... +13000	-4540 ... 23720	0 ... 15732	Nominal range
	-	-	-	Underflow
Type R: -50 ... +1769 °C -58 ... 3216.2 °F 223.2 ... 2042.2 K (B3 _h : ext. comp. 0 °C) (C3 _h : int. comp. 0 °C)	+20190	32766	22922	Overflow
	-500 ... +17690	-580 ... 32162	2232 ... 20422	Nominal range
	-1700	-2740	1032	Underflow
Type S: -50 ... +1769 °C -58 ... 3216.2 °F 223.2 ... 2042.2 K (B4 _h : ext. comp. 0 °C) (C4 _h : int. comp. 0 °C)	+20190	32766	22922	Overflow
	-500 ... +17690	-580 ... 32162	2232 ... 20422	Nominal range
	-1700	-2740	1032	Underflow
Type T: -270 ... +440 °C -454 ... 752 °F 3.2 ... 673.2 K (B2 _h : ext. comp. 0 °C) (C2 _h : int. comp. 0 °C)	+5400	10040	8132	Overflow
	-2700 ... +4000	-4540 ... 7520	32 ... 6732	Nominal range
	-	-	-	Underflow
Type B: 0 ... +1820 °C 32 ... 2786.5 °F 273.2 ... 2093.2 K (B6 _h : ext. comp. 0 °C) (C6 _h : int. comp. 0 °C)	+20700	32766	23432	Overflow
	0 ... +18200	320 ... 27865	2732 ... 20932	Nominal range
	-1200	-1840	1532	Underflow

Parameterising the temperature measurement
Two analog inputs for thermocouple measurement - EPM-S405

Measuring range (Fct. no.)	Measured value			Range
	[°C]	[°F]	[K]	
Type C: 0 ... +2315 °C 32 ... 2786.5 °F 273.2 ... 2093.2 K (B7 _h : ext. comp. 0 °C) (C7 _h : int. comp. 0 °C)	+25000	32766	23432	Overflow
	0 ... +23150	320 ... 27865	2732 ... 20932	Nominal range
	-1200	-1840	1532	Underflow
Type E: -270 ... +1000 °C -454 ... 1832 °F 0 ... 1273.2 K (B8 _h : ext. comp. 0 °C) (C8 _h : int. comp. 0 °C)	+12000	21920	14732	Overflow
	-2700 ... +10000	-4540 ... 18320	0 ... 12732	Nominal range
	-	-	-	Underflow
Type L: -200 ... +900 °C -328 ... 1652 °F 73.2 ... 1173.2 K (B9 _h : ext. comp. 0 °C) (C9 _h : int. comp. 0 °C)	+11500	21020	14232	Overflow
	-2000 ... +9000	-3280 ... 16520	732 ... 11732	Nominal range
	-	-	-	Underflow

Diagnostics and alarm

Trigger	Process alarm	Diagnostic alarm	Parameterisable
Configuration/parameterisation error	-	X	-
Open circuit detected	-	X	X
Measuring range exceeded	-	X	-
Measuring range not reached	-	X	-
Limit value exceeded	X	-	X
Limit value not reached	X	-	X
Process alarm lost	-	X	-

Process alarm

A process alarm causes a call of the OB 40. Within the OB 40 you have the possibility of determining the logic basic address of the module that has triggered the process alarm via the local word 6. Further information on the triggering event can be found in the "Local double word 8".

Local double word 8 of OB 40:

Local byte	Bit 7 ... 0
1	Bit 0: Limit value exceeded channel 1 Bit 1: Limit value exceeded channel 2 Bit 7 ... 2: 0 (fixed)
2	Bit 0: Limit value not reached, channel 1 Bit 1: Limit value not reached, channel 2 Bit 7 ... 2: 0 (fixed)
3/4	Ticker value at the time of the alarm After mains connection, a timer (µs ticker) is started which after 65535 µs starts with 0 again.

Diagnostic alarm

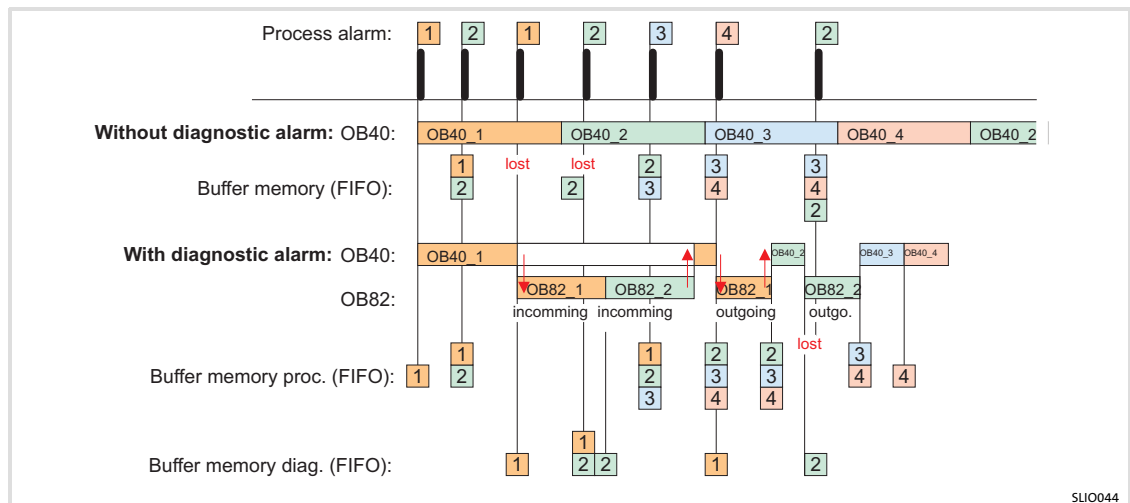
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



SLI0044

Diagnostic alarm processing:

Using SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.

Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bit 6 ... 0: Channel type, 76h: counter module Bit 7: Further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 01 _h)
7	Bit 0: Error in channel group 0 (counter) Bit 7 ... 1: 0 (fixed)
8	Diagnostic alarm due to process alarm lost to ... Bit 0: Hardware gate open Bit 1: Hardware gate closed Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 4: Latch value Bit 7 ... 5: 0 (fixed)
9 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

9 PROFIBUS communication






Parameterising the counter

Rotary transducer signal evaluation

9.7 Parameterising the counter

9.7.1 Rotary transducer signal evaluation

Depending on which edge of a channel is evaluated, the following pulse trains and the associated pulse multiplication can be realised.

Pulse trains	Description	
Channel A		
Channel B		
Single evaluation		There is a response to the falling edges of channel A. The number of pulses has not increased.
Double evaluation		There is a response to the rising and the falling edges of channel A. The number of pulses has doubled and is symmetrical.
Four-fold evaluation		The rising and the falling edges of channels A and B are evaluated. The number of pulses is quadrupled and is symmetrical.

9.7.2 One counter 32 bits, 24 V DC - EPM-S600

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	

Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter a differentiation between the internal gate (I-gate), hardware gate (HW gate), and software gate (SW gate) is made.</p> <ul style="list-style-type: none"> ● The I-gate is the AND logic operation of the software gate (SW gate) and the hardware gate (HW gate). ● The SW gate is controlled via your user program (status word in the output area). ● The HW gate is controlled via the digital gate input. <p>The following response can be parameterised:</p> <p>Cancelling gate function:After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function:After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Latch function	<p>If a positive edge occurs at the latch input, the current count value is stored in the latch register. The latch register is accessed via the input area. After a STOP-RUN transition, latch is always 0.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>

Read data: 12 bytes

Input area		
Addr.	Access	Assignment
+0	Double word	Count value
+4	Double word	Latch value
+8	Word	Status word (see the following table)
+10	Word	Ticker value

Count value: Current counter content

Latch value: If there is a positive edge at the latch input, the count value is stored here.

Ticker value: After mains connection a timer (μs ticker) is started, which after 65535 μs starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μs value together with the count value in the input area.

EPM-S600 status word		
Bit	Designation	Function
0	STS_SYNC	Reset was active
1	STS_CTRL_DO	Is set if the digital output is enabled
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	STS_RST	Status of reset input
4	STS_STRT	Hardware gate status (set if HW gate active)
5	STS_GATE	Status of internal gate (set if internal gate active)
6	STS_DO	Status of digital counter output (DO)
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	STS_CMP*	Comparator status is set if the comparison condition is met. If the comparison is deactivated (counter mode byte 1 = 000 _b), the bit has no function.
10	STS_END*	Status set if final value was reached
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	STS_LTCH	Status of latch input
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

Write data: 10 bytes

Output area		
Addr.	Access	Assignment
+0	Double word	Comparison value
+4	Double word	Set value
+8	Word	Control word (see the following table)

Comparison value: Here you can select a value which, by comparison with the current counter content, can impact the counter output or trigger a process alarm. The response of the output or the process alarm can be parameterised.

Set value: With an edge change 0-1 of *COUNTERVAL_SET* in the control word, the set value is accepted in the counter.

EPM-S600 control word		
Bit	Name	Function
0	CTRL_SYNC_SET	Activation/deactivation of the counting signal: 0 (FALSE): The input for the counting signal is deactivated and the current counter content is reset to 0. 1 (TRUE): The input for the counting signal is activated.
1	CTRL_DO_SET	Enables the digital output
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	COUNTERVAL_SET	Sets the counter temporarily to the value in the set value
6	RES_SET	Resets bits STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP with a rising edge
7	-	Reserved
8	CTRL_SYNC_RESET	Activation/deactivation of the zero track evaluation: 0 (FALSE): The zero track evaluation is activated. 1 (TRUE): The zero track evaluation is stopped. The counter keeps counting irrespective of the zero pulse. Bit 0 (CTRL_SYNC_SET) must be set to TRUE for this purpose.
9	CTRL_DO_RESET	Inhibits the digital output
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12		
13		
14		
15		

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
01 _h	0	Input frequency track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz 1 (01 _h): 300 kHz	02 _h
	1	Input frequency track B	2 (02 _h): 100 kHz 3 (03 _h): 60 kHz 4 (04 _h): 30 kHz	02 _h
	2	Input frequency latch	6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
	3	Input frequency gate	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
	4	Input frequency reset		00 _h
	5	Reserved		
80 _h	0	Alarm response	Setting activates process alarm Bit 0: Proc. alarm HW gate open Bit 1: Proc. alarm HW gate closed Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bit 6: Proc. alarm latch value Bit 7: Reserved	80 _h
	1	Counter function	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = counting once, main counting direction forwards 000010 _b = counting once, main counting direction backwards 000100 _b = counting once, no main counting direction 001000 _b = counting periodically, main counting direction forwards 010000 _b = counting periodically, main counting direction backwards 100000 _b = counting periodically, no main counting direction Bits 7 ... 6: Reserved	40 _h
	2	Comparator	Bit 2 ... 0: output switches (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 6 ... 4: Reset 000 _b = deactivated 001 _b = HIGH level 011 _b = rising edge 101 _b = rising edge, once Bit 7: Reserved	00 _h

Data set		Name	Description/value	Lenze
No.	Byte			
	3	Signal evaluation	<p>Bits 2 ... 0: Signal evaluation</p> <p>000_b = counter deactivated (the other parameter details for the counter are ignored)</p> <p>001_b = single rotary transducer (connection to input "A/pulse")</p> <p>010_b = double rotary transducer (connection to input "A/pulse")</p> <p>011_b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction")</p> <p>100_b = direction (pulse to "A/pulse" and direction to "B/direction")</p> <p>Bit 6 ... 3: Hardware gate (HW gate)</p> <p>000_b = deactivated (counter starts by setting SW gate)</p> <p>001_b = activated (HIGH level at gate activates the HW gate. Counter starts if HW and SW gate are set.)</p> <p>Bit 7: Gate function (internal gate)</p> <p>0 = abort (counting process starts again from loading value)</p> <p>1 = interrupt (counting process is continued with counter content)</p>	00 _h
81 _h	0	Final value	Upper limit of the counting range	00 _h
	1	Start value	Lower limit of the counting range	00 _h
	2	Hysteresis	<p>The hysteresis for instance serves to avoid frequent switching operations of the output and/or triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off.</p> <p>The hysteresis has an effect on the zero crossing, comparison, overflow/underflow.</p>	00 _h
	3	Pulse	The pulse duration indicates for how long the output is to be set if the parameterised comparison criterion is reached or exceeded. The pulse duration can be specified in steps of 2.048 ms between 0 and 522.24 ms. If the pulse duration is = 0, the output is set until the comparison condition is no longer met.	00 _h

Process alarm

A process alarm causes a call of the OB 40. Within the OB 40 you have the possibility of determining the logic basic address of the module that has triggered the process alarm via the local word 6. Further information on the triggering event can be found in the "Local double word 8".

Local double word 8 of OB 40:

Local byte	Bit 7 ... 0
1	Bit 0: Hardware gate open Bit 1: Hardware gate closed Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 4: Latch value Bit 7 ... 5: 0 (fixed)
2	State of the inputs at the time of the alarm Bit 0: A/pulse Bit 1: B/direction Bit 2: Latch Bit 3: Hardware gate Bit 4: Reset Bit 7 ... 5: 0 (fixed)
3/4	Ticker value at the time of the alarm

Gate counter open/closed: Bit 0 is set if the HW gate is activated while the SW gate is active. Bit 1 is set if the HW gate is deactivated while the SW gate is active.

Ticker value: After mains connection a timer (μs ticker) is started, which after 65535 μs starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μs value together with the count value in the input area.

Diagnostic alarm

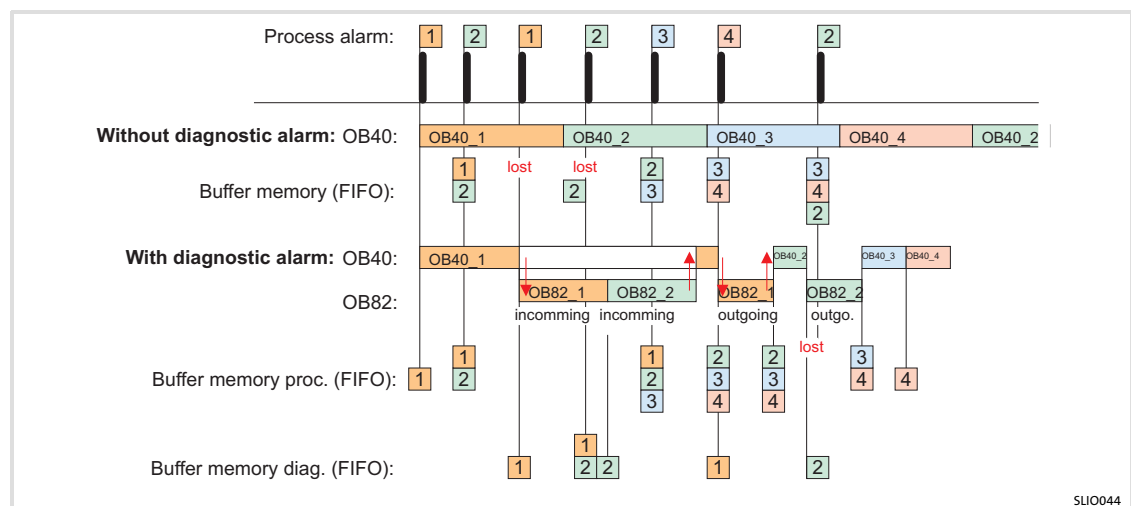
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



SLI0044

Diagnostic alarm processing:

Using SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.

Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bit 6 ... 0: Channel type, 76h: counter module Bit 7: Further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 01 _h)
7	Bit 0: Error in channel group 0 (counter) Bit 7 ... 1: 0 (fixed)
8	Diagnostic alarm due to process alarm lost to ... Bit 0: Hardware gate open Bit 1: Hardware gate closed Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 4: Latch value Bit 7 ... 5: 0 (fixed)
9 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

9.7.3 Two counters 32 bits, 24 V DC - EPM-S601

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).</p> <p>The following response can be parameterised:</p> <p>Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>

Read data: 12 bytes

Input area in the process image		
Addr.	Access	Assignment
+0	Double word	Counter 1: count value
+4	Double word	Counter 2: count value
+8	Word	Counter 1: status word (see following table)
+10	Word	Counter 2: status word (see following table)

Count value: Current counter content

EPM-S601 status word		
Bit	Designation	Function
0	-	Reserved
1	STS_CTRL_COMP	Is set if the comparison bit is enabled
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	-	Reserved
4	-	Reserved
5	STS_GATE	Status of internal gate (set if internal gate active)
6	STS_COMP	Status of comparison bit
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	STS_CMP*	Comparator status is set if the comparison condition is met. If the comparison is deactivated (counter mode byte 1 = 000 _b), the bit has no function.
10	STS_END*	Status set if final value was reached
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	-	Reserved
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

Write data: 12 bytes

Output area in the process image		
Addr.	Access	Assignment
+0	Double word	Counter 1: Comparison value
+4	Double word	Counter 2: Comparison value
+8	Word	Counter 1: Control word (see following table)
+10	Word	Counter 2: Control word (see following table)

Comparison value: With the comparison value you can specify a value which, by comparison with the current counter content, can impact the counter output or trigger a process alarm. The response of the comparison bit *STS_COMP* in the counter status or the process alarm is to be specified via data set 80_h for counter 1 and 82_h for counter 2.

EPM-S601 control word		
Bit	Designation	Function
0	-	Reserved
1	CTRL_COMP_SET	Enables the comparison bit
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	COUNTERVAL_SET	Sets the counter temporarily to the value in the set value
6	RES_SET	Resets bits <i>STS_CMP</i> , <i>STS_END</i> , <i>STS_OFLW</i> , <i>STS_UFLW</i> and <i>STS_ZP</i> with a rising edge
7	-	Reserved
8	-	Reserved
9	CTRL_COMP_RESET	Inhibits comparison bit
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12		
13		
14		
15		

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
01 _h	0	Input frequency counter 1, track A	Filters for instance serve to filter signal peaks in the case of an unclean input signal. 0 (00 _h): 500 kHz	02 _h
	1	Input frequency counter 1, track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz	02 _h
	2	Input frequency counter 2, track A	4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h

Data set		Name	Description/value	Lenze
No.	Byte			
	3	Input frequency counter 2, track B	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
80 _h	0	Alarm response counter 1	Setting activates process alarm Bits 1 ... 0: reserved Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bits 7 ... 6: Reserved	00 _h
	1	Counter function counter 1	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = once: forwards 000010 _b = once: backwards 000100 _b = once: no main counting direction 001000 _b = periodically: forwards 010000 _b = periodically: backwards 100000 _b = periodically: no main counting direction Bits 7 ... 6: Reserved	00 _h
	2	Comparator counter 1	Bits 2 ... 0: Comparison bit is set (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
	3	Signal evaluation counter 1	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 6 ... 3: Reserved Bit 7: Gate function (internal gate) 0 = abort (counting process starts again from loading value) 1 = interrupt (counting process is continued with counter content)	00 _h
81 _h	0...3	Set value counter 1	By specifying a set value, the counter can be loaded with the set value. With an edge 0-1 to COUNTERVAL_SET in the control word, the set value is adopted by the counter.	00 _h
	4...7	Final value counter 1	Upper limit of the counting range	00 _h
	8...11	Loading value counter 1	Lower limit of the counting range	00 _h
	12	Hysteresis counter 1	The hysteresis for instance serves to avoid frequent switching operations of the output and/or triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off. The hysteresis has an effect on the zero crossing, comparison, overflow/underflow.	00 _h
	13	Reserved		

Data set		Name	Description/value	Lenze
No.	Byte			
82 _h	0	Alarm response counter 2	See counter 1	00 _h
	1	Counter function counter 2	See counter 1	00 _h
	2	Comparator counter 2	See counter 1	00 _h
	3	Signal evaluation counter 2	See counter 1	00 _h
83 _h	0...3	Set value counter 2	See counter 1	00 _h
	4...7	Final value counter 2	See counter 1	00 _h
	8...11	Loading value counter 2	See counter 1	00 _h
	12	Hysteresis counter 2	See counter 1	00 _h

Process alarm

A process alarm causes a call of the OB 40. Within the OB 40 you have the possibility of determining the logic basic address of the module that has triggered the process alarm via the local word 6. Further information on the triggering event can be found in the "Local double word 8".

Local double word 8 of OB 40:

Local byte	Bit 7 ... 0
1	Bit 0: 0 Bit 1: 0 Bit 2: Counter 1, overflow/underflow/final value Bit 3: Counter 1, comparison value reached Bit 4: 0 Bit 5: 0 Bit 6: Counter 2, overflow/underflow/final value Bit 7: Counter 2, comparison value reached
2	State of the inputs at the time of the alarm Bit 0: Counter 1, A/pulse Bit 1: Counter 1, B/direction Bit 2: Counter 2, A/pulse Bit 3: Counter 2, B/direction Bit 7 ... 4: 0 (fix)
3/4	16 bit μ s value at the time of the alarm

Ticker value: After mains connection a timer (μ s ticker) is started, which after 65535 μ s starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μ s value together with the count value in the input area.

Diagnostic alarm

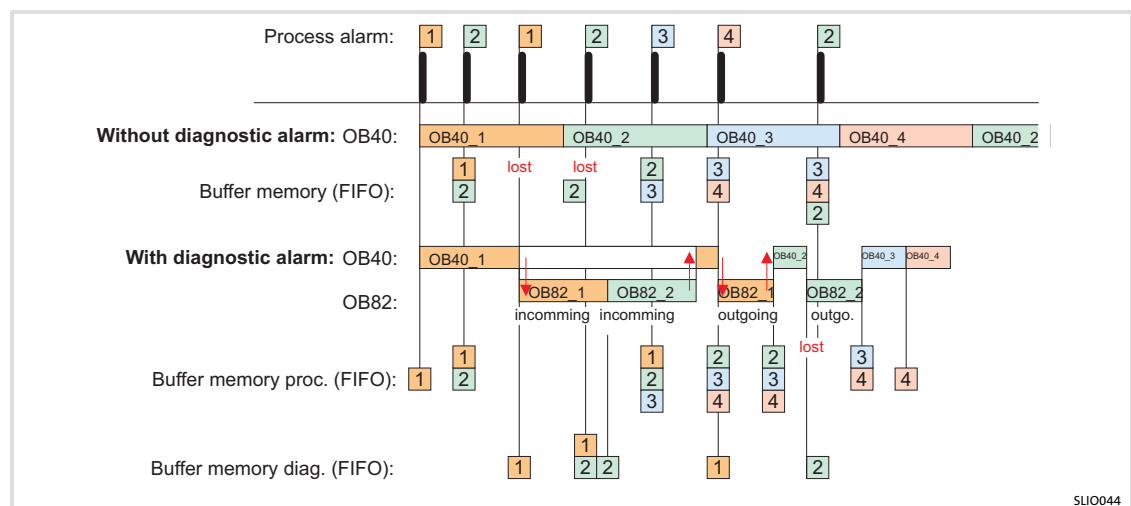
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



SLI0044

Diagnostic alarm processing:

Using the SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.

Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bits 6 ... 0: channel type, 76h: counter module Bit 7: further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 02 _h)
7	Bit 0: Error in channel group 0 (counter 1) Bit 1: Error in channel group 1 (counter 2) Bit 7 ... 2: 0 (fix)
8	Channel group 0: diagnostic alarm due to lost process alarm to ... Bits 1 ... 0: 0 (fixed) Bit 2: overflow/underflow/final value Bit 3: comparison value reached Bits 7 ... 4: 0 (fixed)
9	Channel group 1: diagnostic alarm due to lost process alarm to ... Bits 1 ... 0: 0 (fixed) Bit 2: overflow/underflow/final value Bit 3: comparison value reached Bits 7 ... 4: 0 (fixed)
10 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

9.7.4 One counter 32 bits, 5 V DC - EPM-S602

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).</p> <p>The following response can be parameterised:</p> <p>Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>

Read data: 8 bytes

Input area		
Addr.	Access	Assignment
+0	Double word	Count value
+4	Word	Status word (see the following table)
+6	Word	Ticker value

Count value: Current counter content

Ticker value: After mains connection a timer (μs ticker) is started, which after 65535 μs starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μs value together with the count value in the input area.

EPM-S602 status word		
Bit	Designation	Function
0	STS_SYNC	Reset was active
1	STS_CTRL_COMP	Is set if the comparison bit is enabled
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	STS_RST	Status of reset input
4	-	Reserved
5	STS_GATE	Status of internal gate (set if internal gate active)
6	STS_COMP	Status of comparison bit
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	STS_CMP*	Comparator status is set if the comparison condition is met. If the comparison is deactivated (counter mode byte 1 = 000 _b), the bit has no function.
10	STS_END*	Status set if final value was reached
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	-	Reserved
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

Write data: 10 bytes

Output area		
Addr.	Access	Assignment
+0	Double word	Comparison value
+4	Double word	Set value
+8	Word	Control word (see the following table)

Comparison value: Here you can select a value which, by comparison with the current counter content, can impact the counter output or trigger a process alarm. The response of the output or the process alarm can be parameterised.

Set value: With an edge change 0-1 of *COUNTERVAL_SET* in the control word, the set value is accepted in the counter.

EPM-S602 control word		
Bit	Name	Function
0	CTRL_SYNC_SET	Activation/deactivation of the counting signal: TRUE=>FALSE edge: The input for the counting signal is deactivated and the current counter content is reset to 0. FALSE=>TRUE edge: The input for the counting signal is activated.
1	CTRL_COMP_SET	Enables the comparison bit
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	COUNTERVAL_SET	Sets the counter temporarily to the value in the set value
6	RES_SET	Resets bits STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP with a rising edge
7	-	Reserved
8	CTRL_SYNC_RESET	Activation/deactivation of the zero track evaluation: TRUE=>FALSE edge: The zero track evaluation is activated. FALSE=>TRUE edge: The zero track evaluation is stopped. The counter keeps counting irrespective of the zero pulse. Bit 0 (CTRL_SYNC_SET) must be set to TRUE for this purpose.
9	CTRL_COMP_RESET	Inhibits the comparison bit
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12		
13		
14		
15		

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
01 _h	0	Input frequency track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz 1 (01 _h): 300 kHz 2 (02 _h): 100 kHz	02 _h
	1	Input frequency track B	3 (03 _h): 60 kHz 4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
	2	Input frequency reset	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
	3	Reserved		
80 _h	0	Alarm response	Setting activates process alarm Bits 1 ... 0: reserved Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bits 7 ... 6: Reserved	00 _h
	1	Counter function	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = once: forwards 000010 _b = once: backwards 000100 _b = once: no main counting direction 001000 _b = periodically: forwards 010000 _b = periodically: backwards 100000 _b = periodically: no main counting direction Bits 7 ... 6: Reserved	00 _h
	2	Comparator	Bits 2 ... 0: Comparison bit is set (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 6 ... 4: Reset 000 _b = deactivated 001 _b = HIGH level 011 _b = rising edge 101 _b = rising edge, once Bit 7: Reserved	00 _h

Data set		Name	Description/value	Lenze
No.	Byte			
	3	Signal evaluation	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 6 ... 3: Reserved Bit 7: Gate function (internal gate) 0 = abort (counting process starts again from loading value) 1 = interrupt (counting process is continued with counter content)	00 _h
81 _h	4...7	Final value	Upper limit of the counting range	00 _h
	8...11	Start value	Lower limit of the counting range; counting method:	00 _h
	12	Hysteresis		00 _h

Process alarm

A process alarm causes a call of the OB 40. Within the OB 40 you have the possibility of determining the logic basic address of the module that has triggered the process alarm via the local word 6. Further information on the triggering event can be found in the "Local double word 8".

Local double word 8 of OB 40:

Local byte	Bit 7 ... 0
1	Bit 0: 0 Bit 1: 0 Bit 2: Counter 1, overflow/underflow/final value Bit 3: Counter 1, comparison value reached Bit 4: 0 Bit 5: 0 Bit 6: Counter 2, overflow/underflow/final value Bit 7: Counter 2, comparison value reached
2	State of the inputs at the time of the alarm Bit 0: Counter 1, A/pulse Bit 1: Counter 1, B/direction Bit 2: Counter 2, A/pulse Bit 3: Counter 2, B/direction Bit 7 ... 4: 0 (fix)
3/4	16 bit μ s value at the time of the alarm

Ticker value: After mains connection a timer (μ s ticker) is started, which after 65535 μ s starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μ s value together with the count value in the input area.

Diagnostic alarm

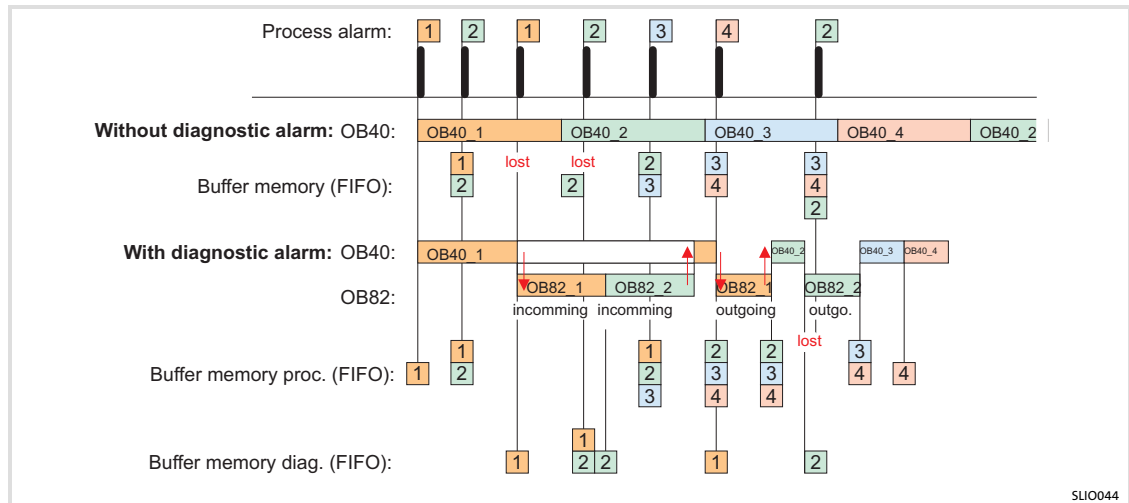
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



Diagnostic alarm processing:

Using the SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.

Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bits 6 ... 0: channel type, 76h: counter module Bit 7: further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 02 _h)
7	Bit 0: Error in channel group 0 (counter 1) Bit 1: Error in channel group 1 (counter 2) Bit 7 ... 2: 0 (fix)
8	Channel group 0: diagnostic alarm due to lost process alarm to ... Bits 1 ... 0: 0 (fixed) Bit 2: overflow/underflow/final value Bit 3: comparison value reached Bits 7 ... 4: 0 (fixed)
9	Channel group 1: diagnostic alarm due to lost process alarm to ... Bits 1 ... 0: 0 (fixed) Bit 2: overflow/underflow/final value Bit 3: comparison value reached Bits 7 ... 4: 0 (fixed)
10 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

9.7.5 Two counters 32 bits, 24 V DC - EPM-S603

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from 0 to the counting limit, then skips to the opposite counting limit and continues to count from there.

Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).

Read data: 12 bytes

Input area in the process image		
Addr.	Access	Assignment
+0	Double word	Counter 1: count value
+4	Double word	Counter 2: count value
+8	Word	Counter 1: status word (see following table)
+10	Word	Counter 2: status word (see following table)

EPM-S603 status word		
Bit	Designation	Function
0	-	Reserved
1	-	Reserved
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	-	Reserved
4	-	Reserved
5	STS_GATE	Status of internal gate (set if internal gate active)
6	-	Reserved
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	-	Reserved
10	-	Reserved
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	-	Reserved
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

Write data: 4 bytes

Output area in the process image		
Addr.	Access	Assignment
+0	Word	Counter 1: Control word (see following table)
+2	Word	Counter 2: Control word (see following table)

EPM-S603 control word		
Bit	Designation	Function
0	-	Reserved
1	-	Reserved
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	-	Reserved
6	RES_SET	Resets bits STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP with a rising edge
7	-	Reserved
8	-	Reserved
9	-	Reserved
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12		
13		
14		
15		

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
01 _h	0	Input frequency counter 1, track A	Filters for instance serve to filter signal peaks in the case of an unclean input signal. 0 (00 _h): 500 kHz	02 _h
	1	Input frequency counter 1, track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz	02 _h
	2	Input frequency counter 2, track A	4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
	3	Input frequency counter 2, track B	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
80 _h	0	Counting direction counter 1, track B	Bits 2 ... 0: Reserved Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
	1	Signal evaluation counter 1	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 7 ... 3: Reserved	00 _h
82 _h	0	Counting direction counter 2, track B	Bits 2 ... 0: Reserved Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
	1	Signal evaluation counter 2	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 7 ... 3: Reserved	00 _h

Diagnostic data

Using the SFB 52 you can access the diagnostic data of the module anytime. Since this module does not support a process alarm, the diagnostic data serve to provide information on this module.

Data set 1 is structured as follows:

Byte	Bit 7 ... 0
0	0 (fixed)
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 76h: counter module Bit 7: Further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 00 _h)
6	Number of channels of a module (here 02 _h)
7 ... 15	0 (fixed)

9.8 Parameterising the encoder evaluation

9.8.1 SSI - EPM-S604

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Functions	Description
SSI encoder parameters	According to encoder data sheet
Operating mode	Master mode or monitoring operation
Alarm response	With definition of the comparison and limit values

Read data: 6 bytes

Input area		
Addr.	Access	Assignment
+0	Double word	Encoder value
+4	Word	Ticker value

Encoder value: Current encoder value

Ticker value: After mains connection a timer (μs ticker) is started, which after 65535 μs starts with 0 again. With every change of the encoder value the time value of the timer is stored as 16-bit μs value together with the encoder value in the input area.

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
80 _h	0	Dead time	The dead time, also called tbs (time between sends), defines the waiting time between two encoder values to be observed by the module so that the encoder is able to process its value. This data can be found in the data sheet for your encoder. HIGH LOW 00 _h 30 _h : 1 μs 00 _h 60 _h : 2 μs 00 _h C0 _h : 4 μs 01 _h 80 _h : 8 μs 03 _h 00 _h : 16 μs 06 _h 00 _h : 32 μs 09 _h 00 _h : 48 μs 0C _h 00 _h : 64 μs	0C00 _h

Data set		Name	Description/value	Lenze
No.	Byte			
	1	Baud rate	In the "Monitoring operation" mode, the baud rate is irrelevant. Enter the baud rate here. This corresponds to the clock frequency via which the connected encoder communicates. More information on this can be found in the data sheet for your encoder. HIGH LOW 00 _h 18 _h : 2 MHz 00 _h 20 _h : 1.5 MHz 00 _h 30 _h : 1 MHz 00 _h 60 _h : 500 kHz 00 _h C0 _h : 250 kHz 01 _h 80 _h : 125 kHz	0180 _h
	2	Reserved		
	3	Scaling	Depending on the encoder, further bits are transmitted in addition to the encoder value. Scaling serves to determine how many bits postponed to the encoder value will be removed by shifting the encoder value to the right. The encoder value is scaled by the module only after a gray-binary conversion. More information can be found in the data sheet for your encoder. Value range: 00 _h ... 0F _h = 0 bits ... 15 bits	00 _h
	4	Bit length of encoder data	Enter the bit length of the encoder data here. Depending on the encoder, the encoder data consist of the current encoder value with subsequent bits. The total length has to be specified here. More information on this can be found in the data sheet for your encoder. 7 (07 _h) = "8 bits" 8 (08 _h) = "9 bits" ... 24 (18 _h) = "25 bits" ... 31 (1F _h) = "32 bits"	18 _h

Data set		Name	Description/value	Lenze
No.	Byte			
	5		<p>Bit 1 ... 0: Ready for operation During "Monitoring operation" the module serves to monitor the data exchange between an SSI master and an SSI encoder. It receives the cycle by the master and the data flow by the SSI encoder. In the "Master mode" operating mode the module provides a cycle to the encoder and receives data by the encoder. 01_b = monitoring operation 10_b = master mode</p> <p>Bit 2: Shifting direction Specify the orientation of the encoder data here. More information can be found in the data sheet for your encoder. Usually, the SSI encoder uses "MSB first". 0 = LSB first (LSB is transmitted first) 1 = MSB first (MSB is transmitted first)</p> <p>Bit 3: edge clock signal Here you can specify the edge type of the clock signal, in the case of which the encoder supplies data. Information on this can be found in the data sheet for your encoder. Usually the SSI encoders respond to rising edges. 0 = falling edge 1 = rising edge</p> <p>Bit 4: Coding In the "Binary code" setting, the provided encoder value remains unchanged. In the "Gray code" setting, the gray-coded value provided by the encoder is converted into a binary value. Only after this conversion, the received encoder value is scaled, if required. The Gray code is another form of representation of the binary code. It is based on the fact that two adjacent Gray numbers differ from each other in exactly one bit. If the Gray code is used, transmission errors can be easily detected, since adjacent characters must only differ from each other in one digit. Information on this can be found in the data sheet for your encoder. 0 = standard code 1 = Gray code</p> <p>Bits 7 ... 5: reserved</p>	1E _h
6		Reserved		
7		SSI function	<p>By enabling the SSI function the module starts with the cycle output and the evaluation of the encoder data. In the "monitor operation" mode, the module starts with the encoder evaluation. 0 (00_h) = inhibited 1 (01_h) = enabled</p>	00 _h

Diagnostic alarm

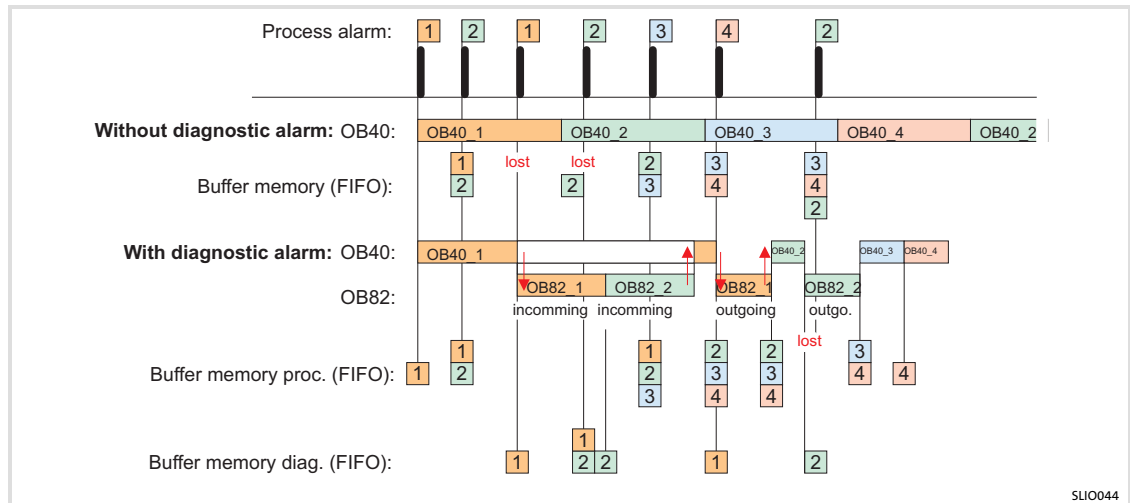
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



SLI0044

Diagnostic alarm processing:

Using SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.

Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of missing external supply voltage Bit 6 ... 5: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bit 6 ... 0: Channel type, 76h: counter module Bit 7: 0 (fixed)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 01 _h)
7	Bit 0: Error in channel group 0
8 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

9 PROFIBUS communication

Time stamp parameterising
2 digital inputs with time stamp function - EPM-S207

9.9 Time stamp parameterising

9.9.1 2 digital inputs with time stamp function - EPM-S207

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Functions	Description
Input delay	For example, signal peaks can be filtered in the event of an unclear input signal.
Edge selection	Specification of signal edge for input signal to produce a time stamp entry.

Read data: 6 bytes

Input area		
Addr.	Access	Assignment
+0	Byte	Status of inputs (PAE)
+1	Byte	Running number (RN)
+2	Word	Ticker value

Status of inputs: the status of the inputs after the edge change is saved here. Parameters can be set for the following variants by incorporating the GSD file LE010C3A.gsd:

20 bytes, 5 time stamp entries:

Addr.	+0	+1	+2	+3
+0	PAE	RN	16-bit μ s value	
+4	PAE	RN-1	16-bit μ s value	
+8	PAE	RN-2	16-bit μ s value	
+12	PAE	RN-3	16-bit μ s value	
+16	PAE	RN-4	16-bit μ s value	

60 bytes, 15 time stamp entries:

Addr.	+0	+1	+2	+3
+0	PAE	RN	16-bit μ s value	
+4	PAE	RN-1	16-bit μ s value	
+8	PAE	RN-2	16-bit μ s value	
+12	PAE	RN-3	16-bit μ s value	
...	
+56	PAE	RN-14	16-bit μ s value	

Running number (RN): The "running number" is a consecutive number between 0 ... 63, which always starts afresh from 0. You use the "running number" to determine the time sequence of entries. It should be incremented with every time stamp entry. During the first run, the "running number" must start with 1.

Ticker value: After mains connection, a timer (μ s ticker) is started, which after 65535 μ s starts with 0 again. With every change in the encoder value the time value of the timer is stored as a 16-bit μ s value together with the encoder value in the input area.

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	14 _h or 3C _h (fix)
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	00 _h (fix)
01 _h	0	Input delay DI 1	00 _h = 1 μs 02 _h = 3 μs 04 _h = 10 μs 07 _h = 86 μs 09 _h = 342 μs 0C _h = 273 μs Other values are not permissible.	02 _h
	1	Input delay DI 2	07 _h = 86 μs 09 _h = 342 μs 0C _h = 273 μs Other values are not permissible.	02 _h
80 _h	0	Edge 0-1 an DI x	Time stamp entry on rising edge Bit 0: DI 1 (0: inhibit, 1 = enable) Bit 1: DI 2 (0: inhibit, 1 = enable) Bits 7 ... 2: Reserved	00 _h
	1	Edge 1-0 at DI x	Time stamp entry on falling edge Bit 0: DI 1 (0: inhibit, 1 = enable) Bit 1: DI 2 (0: inhibit, 1 = enable) Bits 7 ... 2: Reserved	00 _h

Diagnostic data

Using SFB 52, you can read out the diagnostic bytes which provide information about the module. With SFB 52 you can also read out data set 1 which contains further information.

Data set 1 is structured as follows:

Data set 1, diagnostics	
Byte	Bit 7 ... 0
0	0 (fixed)
1	Bits 3 ... 0: module class, 1111 _b : digital module Bit 4: channel information available Bits 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bits 6 ... 0: channel type, 70 _h : digital module Bit 7: more channel types available (0: yes; 1: no)
5	Number of diagnostic bits output by the module per channel (here 00 _h)
6	Number of channels of a module (here 02 _h)
7 ... 15	0 (fixed)

9.9.2 2 digital outputs with time stamp function - EPM-S310

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The module has an FIFO (first-in-first-out) memory for 15 time stamp entries. Depending on parameter setting, you can use the output area to transfer up to 15 time stamp entries to the FIFO memory. The input process image provides information on the status of the FIFO memory and the status of processing.

Read data: 4 bytes

Input area		
Addr.	Access	Assignment
+0	Byte	Bits 5 ... 0: running number (RN = Running Number) of the last FIFO entry Bit 6: 1 (fixed) Bit 7: 0 (fixed)
+1	Byte	Bits 5 ... 0: running number of the next FIFO entry Bit 6: 1 (fixed) Bit 7: 1 (fixed)
+2	Byte	Status
+3	Byte	Number of time stamp entries in FIFO memory.

Running number: here you will find the running number of the time stamp entry last/next written to the FIFO.

Status: The status informs you of the status of the FIFO memory:

Code 00_h/80_h: everything OK

Code 01_h/81_h: no following time stamp entry

Code 02_h/82_h: no new time stamp entries.

Code 03_h/83_h: FIFO memory is full. No new time stamp entries can be accepted.

If bit 6 of the last processed running number (RN) was set, the code is returned at 80_h OR-ed.



Note!

Note that no more time stamp entries can be accepted once the FIFO memory is full. You should always establish the status of the FIFO memory before the transfer to ensure that your entries are accepted.

Write data: 20 bytes/60 bytes

Depending on project planning, the output area can be used to write up to 15 time stamp entries. 4 bytes in the process image are intended for each time stamp entry:

Output area		
Addr.	Access	Assignment
+0	Byte	Bits 3 ... 0: 0 (fixed) Bit 4: Release of DO 1 (0: inhibit, 1: enable) Bit 5: Release of DO 0 (0: inhibit, 1: enable) Bit 6: State DO 1 Bit 7: State DO 0
+1	Byte	Running number (RN)
+2	Word	Ticker value

Status of outputs:the status of the outputs for the time required is stated here. You can project plan the following variants by incorporating the GSD file LE010C3A.gsd.gsd:

20 bytes, 5 time stamp entries:

Addr.	+0	+1	+2	+3
+0	PAA	RN	16-bit μ s value	
+4	PAA	RN-1	16-bit μ s value	
+8	PAA	RN-2	16-bit μ s value	
+12	PAA	RN-3	16-bit μ s value	
+16	PAA	RN-4	16-bit μ s value	

60 bytes, 15 time stamp entries:

Addr.	+0	+1	+2	+3
+0	PAA	RN	16-bit μ s value	
+4	PAA	RN-1	16-bit μ s value	
+8	PAA	RN-2	16-bit μ s value	
+12	PAA	RN-3	16-bit μ s value	
...	
+56	PAA	RN-14	16-bit μ s value	

Running number (RN): The "running number" is a consecutive number between 0 ... 63, which always starts afresh from 0. You use the "running number" to determine the time sequence of entries. It should be incremented with every time stamp entry. During the first run, the "running number" must start with 1.



Note!

If using SFC 15 to write consistent user data, up to 15 time stamp entries can be written. If less than 15 time stamp entries are written, bit 6 must also be set for the last RN. This has to be done to ensure that the following entries don't have to be written in an "invalid" way. The module ignores all time stamp entries after an entry with a set bit 6.

Ticker value: Specify a time here in μ s at which the status of the outputs is to be accepted (value range: 0 ... 65535).

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	14 _h or 3C _h (fix)
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	00 _h (fix)

Diagnostic data

Using SFB 52, you can read out the diagnostic bytes which provide information about the module. With SFB 52 you can also read out data set 1 which contains further information.

Data set 1 is structured as follows:

Data set 1, diagnostics	
Byte	Bit 7 ... 0
0	0 (fixed)
1	Bits 3 ... 0: module class, 1111 _b : digital module Bit 4: channel information available Bits 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bits 6 ... 0: channel type, 70 _h : digital module Bit 7: more channel types available (0: yes; 1: no)
5	Number of diagnostic bits output by the module per channel (here 00 _h)
6	Number of channels of a module (here 02 _h)
7 ... 15	0 (fixed)

9.10 Parameterising technology modules

9.10.1 2 digital outputs with PWM functionality - EPM-S620

The following functions can be parameterised:

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

Read data: 4 bytes

Input area			
Addr.	Name	Byte	Function
+0	PWMSTS_I	2	PWM 1: status
+2	PWMSTS_II	2	PWM 2: status

Status PVMx		
Bit	Name	Function
0	-	Reserved
1	STS_PVM	Status PWM 0: PWM output stopped 1: PWM output active
2	STS_OUTBV	Output status 0: push/pull output 1: highside output
3 ... 15	-	Reserved

Write data: 12 bytes

Output area			
Addr.	Name	Byte	Function
+0	PWMPD_I	4	PWM 1: pulse duration
+4	PWMSTS_II	4	PWM 2: pulse duration
+8	PWMCTRL_I	2	PWM 1: control word
+10	PWMSTS_II	2	PWM 2: control word

PWMPD_I, PWMPD_II pulse duration:Determine the scanning ratio for the parameterised period here by stating the duration of the HIGH level for the corresponding PWM channel. The pulse duration should be chosen as a factor for the 20.83 ns basis.

Value range: 48 ... 8388607 (1µs ... approx. 175ms)

PWMPD_I, PWMPD_II control word:here you can specify the PWM output response for the corresponding channel and start or stop PWM output.

Control word PWMPDx		
Bit	Name	Function
0	-	Reserved
1	CTRL_OUTBV	PWM output response 0: push/pull output Push/pull mode should be used if you need defined high/low levels for a rapid change. This is used with a low load especially if "highside" mode cannot move the output to low fast enough during a low status. With push/pull, the output is switched to ground with low active and to voltage with high active. 1: highside output In highside mode, the output switched to low remains in a state of uncertainty between ground and voltage. The load has to "pull" itself to ground. In highside mode, the switch is only made to high level active.
3 ... 7	-	Reserved
8	CTRL_STRT	Edge 0-1 starts PWM output on channel x
9	CTRL_STP	Edge 0-1 stops PWM output on channel x
10 ... 15	-	Reserved

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
80h	0	PWM 1: period	Set parameters here for the total time for pulse duration and pulse pause. The time should be selected as a factor for the 20.83 ns basis.	1F40h
81h	0	PWM 2: Period	Values below 25 µs are ignored. If the pulse duration is higher or equal to the period, the DO output is set permanently. Value range: 1200 ... 8388607 (25 µs ... approx. 175 ms)	1F40h

Diagnostic data

Since this module does not support alarms, the diagnostic data provides information about this module.

Diagnostic data set - data set 01h			
Name	Byte	Function	Default
ERR_A	1	Reserved	00 _h
MODTYP	1	Module information Byte 0: Bit 3 ... 0: module class (1111b: digital module) Bit 4: channel information available Bits 7 ... 4: 0 reserved	15 _h
ERR_C	1	Reserved	00 _h
ERR_D	1	Reserved	00 _h
CHTYP	1	Channel type Byte 0: Bits 6 ... 0: channel type (72h: digital output) Bit 7: reserved	72 _h
NUMBIT	1	Number of diagnostic bits per channel Byte 0: here 00 _h	00 _h
NUMCH	1	Number of channels in module Byte 0: here 02 _h	02 _h
CHERR	1	Reserved	00 _h
CH0ERR ... CH7ERR	6	Reserved	00 _h
DIAG_US	4	Value of μ s ticker when diagnostics occur Bytes 0 ...3	0

9.10.2 RS232 interface - EPM-S640



Information on the transmission principles can be found in the appendix (777).

Parameter data

Parameter data - ASCII protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
			Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
			Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
			Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b

Parameter data - ASCII protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 2/3, ZNA				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
	4	ZNA (LOW byte)		00 _h
Option 4/5, ZVZ				
80 _h	5	Character delay time	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
80 _h	6			FA _h
Option 6, number of receive buffers				
80 _h	7	Number of receive buffers	Defines the number of receive buffers. As long as only one receive buffer is used and is assigned, no more data can be received. If up to 250 receive buffers are connected, the received data can be redirected to a still free receive buffer. 1 ... 255 (01 _h ... FF _h)	01 _h
Option 7 ... 12, reserved				
80 _h	8 ... 13	Reserved		00 _h

Parameter data STX/ETX protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h

Parameter data STX/ETX protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
			Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
			Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
			Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2/3, ZNA				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
	4	ZNA (LOW byte)		00 _h

Parameter data STX/ETX protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 4/5, TMO				
80 _h	5	TMO (HIGH byte)	TMO serves to define the maximally permissible interval between two frames. 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h
	6	TMO (LOW byte)		FA _h
Option 6, number of start identifiers				
80 _h	7	Number of start identifiers	00 _h : 1 start identifier (2nd start identifier is ignored) 01 _h : 2 start identifiers	01 _h
Option 7, start identifier 1				
80 _h	8	Start identifier 1	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 8, start identifier 2				
80 _h	9	Start identifier 2	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 9, number of end identifiers				
80 _h	10	No. of end identifier	00 _h : 1 end identifier (2. end identifier (0x310D/x) is ignored) 01 _h : 2 end identifiers	00 _h
Option 10, end identifier 1				
80 _h	11	End identifier 1	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 11, end identifier 2				
80 _h	12	End identifier 2	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 12, reserved				
80 _h	13	Reserved		00 _h

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
			Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
			Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
			Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2, ZNA (x 20 ms)				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. The ZNA is indicated as a factor in steps of 20ms. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 3, ZVZ (x 20 ms)				
80 _h	4	Character delay time	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram. The ZVS is indicated as a factor in steps of 20ms. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
Option 4, QVZ (x 20 ms)				
80 _h	5	Acknowledgement time	Acknowledgement time (QVZ) The QVZ defines the max. permissible time interval until the partner is acknowledged while establishing/terminating a connection. The QVZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 5, BWZ (x 20 ms)				
80 _h	6	Block wait time	Block wait time (BWZ) The BWZ is the maximum time period between the confirmation of a request frame (DLE) and STX of the response frame. The BWZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	FA _h
Option 6, STX (x 20 ms)				
80 _h	7	STX repetitions	Maximum number of times the module attempts to establish a connection. 1 ... 255 [ms] (01 _h ... FF _h)	01 _h
Option 7, DBL (x 20 ms)				
80 _h	8	DBL	When exceeding the block wait time (BWZ) you can specify the maximum number of repetitions for the request frame using the DBL parameter. If these attempts fail, transmission is cancelled. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 8, priority (x 20 ms)				
80 _h	9	Priority	A communication partner has high priority if its sending attempt has precedence over the partner's transmit request. In the event of low priority, it must take second place behind the partner's transmit request. With 3964(R) the priorities of both partners must be different. The following settings are possible: 00 _h : LOW 01 _h : HIGH	00 _h
Option 9 ... 12, reserved				
80 _h	10 ... 13	Reserved		00 _h

Diagnostic data

Since this module does not support alarms, the diagnostic data provides information about this module.

In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

Diagnostic data - data set 01h			
Name	Byte	Function	Default
ERR_A	1	ERR_A-diagnostics Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error (cable break) Bit 3: Reserved Bit 4: Set in the case of a missing external supply voltage Bit 5, 6: Reserved Bit 7: Set in the case of parameterisation error	00 _h
MODTYP	1	Module information Byte 0: Bit 3 ... 0: Module class (0111b: Gateway module) Bit 4: channel information available Bits 7 ... 4: 0 reserved	17 _h
ERR_C	1	ERR_A-diagnostics Bit 7 ... 0: Reserved	00 _h
ERR_D	1	ERR_D diagnostics Bit 3 ... 0: Reserved Bit 4: Set in the case of internal communication error Bit 7 ... 5: Reserved	00 _h
CHTYP	1	Channel type Bit 7 ... 0: Reserved	00 _h
NUMBIT	1	Number of diagnostic bits of the module per channel (here 08 _h)	08 _h
NUMCH	1	Number of channels in module Bit 7 ... 0: Reserved	00 _h
CHERR	1	Bit 7 ... 0: Reserved	00 _h
CH0ERR ... CH7ERR	8	Bit 7 ... 0: Reserved	00 _h
DIAG_US	4	Value of μ s ticker when diagnostics occur Bytes 0 ...3	00 _h

9.10.3 RS422/RS485 interface - EPM-S650


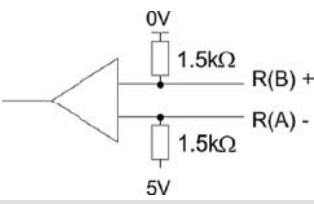
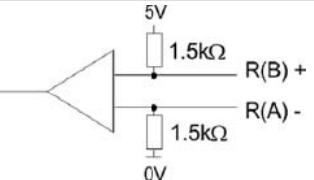


Information on the transmission principles can be found in the appendix (777).

Parameter data

Parameter data - ASCII protocol				
Data set No.	Byte	Name	Description/value	Lenze
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
			Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
			Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
			Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b

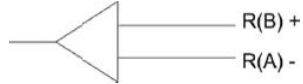
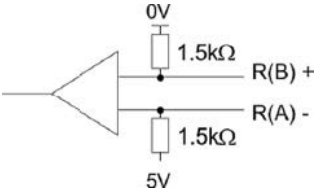
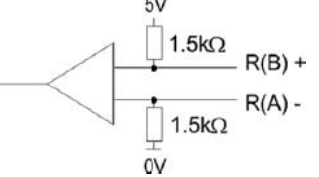
Parameter data - ASCII protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 2/3, ZNA				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA)	00 _h
	4	ZNA (LOW byte)	Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
Option 4/5, ZVZ				
80 _h	5	Character delay time	Character delay time (ZVZ)	00 _h
	6		The character delay time defines the maximum permissible time interval between two characters received within a telegram. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h .. FFFF _h)	FA _h
Option 6, number of receive buffers				
80 _h	7	Number of receive buffers	Defines the number of receive buffers. As long as only one receive buffer is used and is assigned, no more data can be received. If up to 250 receive buffers are connected, the received data can be redirected to a still free receive buffer. 1 ... 255 (01 _h ... FF _h)	01 _h
Option 7 ... 12, reserved				
80 _h	8 ... 13	Reserved		00 _h
Option 13, operating mode				
80 _h	14	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment				
80 _h	15	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

Parameter data STX/ETX protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits	11 _b
			00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	
			Bit 3/2 parity	00 _b
			00 _b : none 01 _b : odd 10 _b : even 11 _b : even	
			Bit 5/4 number of stop bits	01 _b
			01 _b : 1 10 _b : 1.5 11 _b : 2	
			Bit 7/6 flow control	00 _b
			00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	
Option 2/3, ZNA				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
	4	ZNA (LOW byte)		00 _h

Parameter data STX/ETX protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 4/5, TMO				
80 _h	5	TMO (HIGH byte)	TMO serves to define the maximally permissible interval between two frames. 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h
	6	TMO (LOW byte)		FA _h
Option 6, number of start identifiers				
80 _h	7	Number of start identifiers	00 _h : 1 start identifier (2nd start identifier is ignored) 01 _h : 2 start identifiers	01 _h
Option 7, start identifier 1				
80 _h	8	Start identifier 1	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 8, start identifier 2				
80 _h	9	Start identifier 2	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 9, number of end identifiers				
80 _h	10	No. of end identifier	00 _h : 1 end identifier (2. end identifier (0x310D/x) is ignored) 01 _h : 2 end identifiers	00 _h
Option 10, end identifier 1				
80 _h	11	End identifier 1	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 11, end identifier 2				
80 _h	12	End identifier 2	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 12, reserved				
80 _h	13	Reserved		00 _h
Option 13, operating mode				
80 _h	14	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> ● 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. ● 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h

Parameter data STX/ETX protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 14, cable assignment				
80 _h	15	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

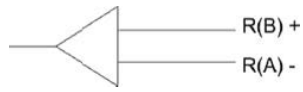
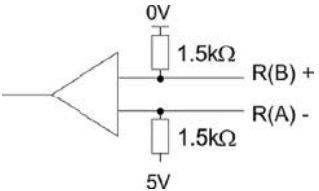
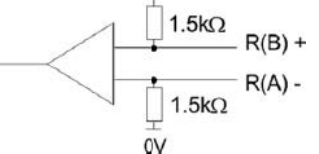
Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
			Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
			Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
			Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2, ZNA (x 20 ms)				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. The ZNA is indicated as a factor in steps of 20ms. 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 3, ZVZ (x 20 ms)				
80 _h	4	Character delay time	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram. The ZVZ is indicated as a factor in steps of 20ms. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
Option 4, QVZ (x 20 ms)				
80 _h	5	Acknowledgement time	Acknowledgement time (QVZ) The QVZ defines the max. permissible time interval until the partner is acknowledged while establishing/terminating a connection. The QVZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 5, BWZ (x 20 ms)				
80 _h	6	Block wait time	Block wait time (BWZ) The BWZ is the maximum time period between the confirmation of a request frame (DLE) and STX of the response frame. The BWZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	FA _h
Option 6, STX (x 20 ms)				
80 _h	7	STX repetitions	Maximum number of times the module attempts to establish a connection. 1 ... 255 [ms] (01 _h ... FF _h)	01 _h
Option 7, DBL (x 20 ms)				
80 _h	8	DBL	When exceeding the block wait time (BWZ) you can specify the maximum number of repetitions for the request frame using the DBL parameter. If these attempts fail, transmission is cancelled. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 8, priority (x 20 ms)				
80 _h	9	Priority	A communication partner has high priority if its sending attempt has precedence over the partner's transmit request. In the event of low priority, it must take second place behind the partner's transmit request. With 3964(R) the priorities of both partners must be different. The following settings are possible: 00 _h : LOW 01 _h : HIGH	00 _h
Option 9 ... 12, reserved				
80 _h	10 ... 13	Reserved		00 _h

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 13, operating mode				
80 _h	14	Operating mode	<p>The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422).</p> <ul style="list-style-type: none"> 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment				
80 _h	15	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

Diagnostic data

In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

Diagnostic data - data set 01h			
Name	Byte	Function	Default
ERR_A	1	ERR_A-diagnostics Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error (cable break) Bit 3: Reserved Bit 4: Set in the case of a missing external supply voltage Bit 5, 6: Reserved Bit 7: Set in the case of parameterisation error	00h
MODTYP	1	Module information Byte 0: Bit 3 ... 0: Module class (0111b: Gateway module) Bit 4: channel information available Bits 7 ... 4: 0 reserved	17h
ERR_C	1	ERR_A-diagnostics Bit 7 ... 0: Reserved	00h
ERR_D	1	ERR_D diagnostics Bit 3 ... 0: Reserved Bit 4: Set in the case of internal communication error Bit 7 ... 5: Reserved	00h
CHTYP	1	Channel type Bit 7 ... 0: Reserved	00h
NUMBIT	1	Number of diagnostic bits of the module per channel (here 08h)	08h
NUMCH	1	Number of channels in module Bit 7 ... 0: Reserved	00h
CHERR	1	Bit 0: set in the event of an error of channel group 1 Bits 7 ... 1 0 (fixed)	00h
CH0ERR	8	Channel-specific error: channel x: Bits 3 ... 0: 0 (fixed) Bit 4 : set in the case of open circuit (only possible for RS422) Bits 7 ... 5: 0 (fixed)	00h
CH1ERR ... CH7ERR	8	Bit 7 ... 0: Reserved	00h
DIAG_US	4	Value of μ s ticker when diagnostics occur Bytes 0 ...3	00h

9.11 Diagnostics

The comprehensive diagnostic functions of PROFIBUS-DP allow for fast fault localisation. The diagnostic data are transferred by the bus and summarised by the master. There you can access the diagnostic data e.g. with your projecting tool. The diagnostic messages created by the PROFIBUS slave have a maximum length of 122 bytes, depending on the parameterisation. As soon as the slave sends a diagnostic message to the master, 6 bytes of slave standard diagnostic data are put in front of the max. 122 bytes of diagnostic data.

Structure of diagnostic data	
Byte	Function
0 ... 5	Standard diagnostic data Are only put in front in the event of transfer to the master via PROFIBUS.
x ... x + 8	Identifier-related diagnostics (can be inhibited/enabled by parameterisation)
x ... x + 19	Module status (can be inhibited/enabled by parameterisation)
max. 21 × (x ... x + 2)	Channel-related diagnostics (can be inhibited/enabled by parameterisation)
x ... x + 20	Alarm (can be inhibited/enabled by parameterisation)

9.11.1 Slave standard diagnostic data

When transferring a diagnostic message to the master, the standard diagnostic data is put in front of the diagnostic bytes.

Standard diagnostic data	
Byte	Function
0	Bit 0: 0 (fix) Bit 1: Slave is not ready for data exchange Bit 2: Configuration data do not match Bit 3: Slave has external diagnostic data Bit 4: Slave does not support requested function Bit 5: 0 (fix) Bit 6: Wrong parameterisation Bit 7: 0 (fix)
1	Bit 0: Slave must be re-parameterised Bit 1: Statistic diagnostics Bit 2: 1 (fix) Bit 3: Response monitoring active Bit 4: "FREEZE" command received Bit 5: "SYNC" command received Bit 6: Reserved Bit 7: 0 (fix)
2	Bit 6 ... 0: Reserved Bit 7: Diagnostic data overflow
3	Master address after parameterisation 0xFF: Slave is without parameterisation
4	ID number of high byte
5	ID number of low byte

You can find more detailed information on the structure of standard diagnostic data in the publications of standards of the PROFIBUS user organisation.

9.11.2 Identifier-related diagnostics

The identifier-related diagnostics serve to provide you with the information at which PROFIBUS slot (module) an error has occurred. You will receive more detailed information on the error with the module status and the channel-related diagnostics. The identifier-related diagnostics can be activated by parameterisation.

Diagnostic data	
Byte	Function
x	Bit 5 ... 0: 0b001001 (fix): Length of the identifier-related diagnostics Bit 7 ... 6: 0b01 (fix): Code for the identifier-related diagnostics
x + 1	The bits of the modules per PROFIBUS slot are set if: <ul style="list-style-type: none"> ● the module is removed; ● a non-projected module is plugged; ● a module cannot be accessed; ● a module signals a diagnostic alarm. Bit 0: Input of module in PROFIBUS slot 1 ... Bit 7: Input of module in PROFIBUS slot 8
x + 2	Bit 0: Input of module in PROFIBUS slot 9 ... Bit 7: Input of module in PROFIBUS slot 16
x + 3	Bit 0: Input of module in PROFIBUS slot 17 ... Bit 7: Input of module in PROFIBUS slot 24
x + 4	Bit 0: Input of module in PROFIBUS slot 25 ... Bit 7: Input of module in PROFIBUS slot 32
x + 5	Bit 0: Input of module in PROFIBUS slot 33 ... Bit 7: Input of module in PROFIBUS slot 40
x + 6	Bit 0: Input of module in PROFIBUS slot 41 ... Bit 7: Input of module in PROFIBUS slot 48
x + 7	Bit 0: Input of module in PROFIBUS slot 49 ... Bit 7: Input of module in PROFIBUS slot 56
x + 8	Bit 0: Input of module in PROFIBUS slot 57 ... Bit 7: Input of module in PROFIBUS slot 64

9.11.3 Module status

The module status serves to give you more detailed information on the error which has occurred in a module. The module status can be activated by parameterisation.

Diagnostic data	
Byte	Function
x	Bit 5 ... 0: 0b001001 (fix): Length of the module status Bit 7 ... 6: 0b01 (fix): Code for the module status
x + 1	0x82 (fix): Status type of the module status
x + 2	0x00 (fix)
x + 3	0x00 (fix)
x + 4	The following errors are specified for PROFIBUS slot 1 ... 64: <ul style="list-style-type: none"> ● 0b00: Module has valid data ● 0b01: Module error - invalid data (module defective) ● 0b10: Wrong module - invalid data ● 0b11: No module plugged - invalid data Bit 1, 0: Module status module in PROFIBUS slot 1 Bit 3, 2: Module status module in PROFIBUS slot 2 Bit 5, 4: Module status module in PROFIBUS slot 3 Bit 7, 6: Module status module in PROFIBUS slot 4
x + 5	Bit 1, 0: Module status module in PROFIBUS slot 5 Bit 3, 2: Module status module in PROFIBUS slot 6 Bit 5, 4: Module status module in PROFIBUS slot 7 Bit 7, 6: Module status module in PROFIBUS slot 8
x + 6	Bit 1, 0: Module status module in PROFIBUS slot 9 Bit 3, 2: Module status module in PROFIBUS slot 10 Bit 5, 4: Module status module in PROFIBUS slot 11 Bit 7, 6: Module status module in PROFIBUS slot 12
x + 7	Bit 1, 0: Module status module in PROFIBUS slot 13 Bit 3, 2: Module status module in PROFIBUS slot 14 Bit 5, 4: Module status module in PROFIBUS slot 15 Bit 7, 6: Module status module in PROFIBUS slot 16
x + 8	Bit 1, 0: Module status module in PROFIBUS slot 17 Bit 3, 2: Module status module in PROFIBUS slot 18 Bit 5, 4: Module status module in PROFIBUS slot 19 Bit 7, 6: Module status module in PROFIBUS slot 20
x + 9	Bit 1, 0: Module status module in PROFIBUS slot 21 Bit 3, 2: Module status module in PROFIBUS slot 22 Bit 5, 4: Module status module in PROFIBUS slot 23 Bit 7, 6: Module status module in PROFIBUS slot 24
x + 10	Bit 1, 0: Module status module in PROFIBUS slot 25 Bit 3, 2: Module status module in PROFIBUS slot 26 Bit 5, 4: Module status module in PROFIBUS slot 27 Bit 7, 6: Module status module in PROFIBUS slot 28
x + 11	Bit 1, 0: Module status module in PROFIBUS slot 29 Bit 3, 2: Module status module in PROFIBUS slot 30 Bit 5, 4: Module status module in PROFIBUS slot 31 Bit 7, 6: Module status module in PROFIBUS slot 32
x + 12	Bit 1, 0: Module status module in PROFIBUS slot 33 Bit 3, 2: Module status module in PROFIBUS slot 34 Bit 5, 4: Module status module in PROFIBUS slot 35 Bit 7, 6: Module status module in PROFIBUS slot 36
x + 13	Bit 1, 0: Module status module in PROFIBUS slot 37 Bit 3, 2: Module status module in PROFIBUS slot 38 Bit 5, 4: Module status module in PROFIBUS slot 39 Bit 7, 6: Module status module in PROFIBUS slot 40

Diagnostic data	
Byte	Function
x + 14	Bit 1, 0: Module status module in PROFIBUS slot 41 Bit 3, 2: Module status module in PROFIBUS slot 42 Bit 5, 4: Module status module in PROFIBUS slot 43 Bit 7, 6: Module status module in PROFIBUS slot 44
x + 15	Bit 1, 0: Module status module in PROFIBUS slot 45 Bit 3, 2: Module status module in PROFIBUS slot 46 Bit 5, 4: Module status module in PROFIBUS slot 47 Bit 7, 6: Module status module in PROFIBUS slot 48
x + 16	Bit 1, 0: Module status module in PROFIBUS slot 49 Bit 3, 2: Module status module in PROFIBUS slot 50 Bit 5, 4: Module status module in PROFIBUS slot 51 Bit 7, 6: Module status module in PROFIBUS slot 52
x + 17	Bit 1, 0: Module status module in PROFIBUS slot 53 Bit 3, 2: Module status module in PROFIBUS slot 54 Bit 5, 4: Module status module in PROFIBUS slot 55 Bit 7, 6: Module status module in PROFIBUS slot 56
x + 18	Bit 1, 0: Module status module in PROFIBUS slot 57 Bit 3, 2: Module status module in PROFIBUS slot 58 Bit 5, 4: Module status module in PROFIBUS slot 59 Bit 7, 6: Module status module in PROFIBUS slot 60
x + 19	Bit 1, 0: Module status module in PROFIBUS slot 61 Bit 3, 2: Module status module in PROFIBUS slot 62 Bit 5, 4: Module status module in PROFIBUS slot 63 Bit 7, 6: Module status module in PROFIBUS slot 64

9.11.4 Channel-related diagnostics

The channel-related diagnostics serve to provide you with detailed information on channel errors within a module. The diagnostic alarm of each module must be enabled by parameterisation in order to use the channel-related diagnostics. The channel-related diagnostics can be activated by parameterisation.



Note!

The maximum number of channel-related diagnostic messages is limited by the max. overall length of 122 bytes. By deactivating other diagnostic areas, you can release these areas for further channel-related diagnostic messages. 3 bytes each are used per channel.

Diagnostic data for a channel

Byte	Function
x	Bit 5 ... 0: 0b001001 (fix): <ul style="list-style-type: none"> ● 0b000000 ... 0b111111: ID number of the module which provides the channel-related diagnostics ● PROFIBUS slot 1 has the ID number "0" ... ● PROFIBUS slot 64 has the ID number "63" Bit 7 ... 6: 0b01 (fix): <ul style="list-style-type: none"> ● 0b10 (fix): Code for the channel-related diagnostics
x + 1	Bits 5 ... 0: <ul style="list-style-type: none"> ● 0b000000 ... 0b111111: Number of the channel or channel group which provides the diagnostics Bit 7, 6: Module type <ul style="list-style-type: none"> ● 0b01: Input module ● 0b10: Output module ● 0b11: Input/output module
x + 2	Bit 4 ... 0: Error type according to PROFIBUS standard <ul style="list-style-type: none"> ● 0b00001: Short circuit ● 0b00010: Undervoltage (supply voltage) ● 0b00011: Overvoltage (supply voltage) ● 0b00100: Output module is overloaded ● 0b00101: Output module overtemperature ● 0b00110: Cable break of sensor or actuator ● 0b00111: Upper limit value exceeded ● 0b01000: Lower limit value exceeded ● 0b01001: Error (load voltage at output, encoder supply, hardware error of the module) Bit 4 ... 0: Manufacturer-specific error type <ul style="list-style-type: none"> ● 0b10000: Parameterisation error ● 0b10001: Module-specific error ● 0b10010: Fuse defective ● 0b10100: Grounding error ● 0b10101: Reference channel error ● 0b10110: Process alarm lost ● 0b11001: Safety-oriented switch-off ● 0b11010: External error ● 0b11010: Unclear error (not specifiable) Bit 7 ... 5: Channel type <ul style="list-style-type: none"> ● 0b001: Bit ● 0b010: 2 bits ● 0b011: 4 bits ● 0b100: Byte ● 0b101: Word ● 0b110: 2 words

9.11.5 Alarms

The alarm part of the slave diagnostic message provides information on the alarm type and the cause which has tripped an alarm. The alarm part consists of a maximum of 24 bytes. Per slave diagnostic message, a maximum of 1 alarm can be reported. If activated in the parameterisation, the alarm part is always added to the diagnostic message as the last part.

Structure of the alarm part, depending on the alarm type	
Byte	Function
x ... x + 3	Alarm status Contains information on the alarm type.
x + 4 ... x + 20	Diagnostic alarm The 20 bytes correspond to data set 1 of the CPU diagnostics.
x + 4 ... x + 7	Process alarm The 4 bytes are module-specific and described with the respective module.

Alarm status

If there is a diagnostic result for channel/channel group 0 of a module, there may also be a module error in addition to a channel error. In this case an entry is made even if you have not enabled the diagnostics for channel/channel group 0 of the module.

Structure of the alarm status – byte x ... x + 3	
Byte	Function
x	Bits 5 ... 0: <ul style="list-style-type: none"> 0b010100: Length of the alarm part incl. byte x Bit 7 ... 6: <ul style="list-style-type: none"> 0b00 (fix): Code for device-related diagnostics
x + 1	Bit 6 ... 0: Alarm type <ul style="list-style-type: none"> 0b0000001: Diagnostic alarm 0b0000010: Process alarm Bit 7: Code for alarm
x + 2	Bit 7 ... 0: <ul style="list-style-type: none"> 0b00000000 ... 0b00111111: ID number of the module which provides the alarm PROFIBUS slot 1 has the ID number "0" ... PROFIBUS slot 64 has the ID number "63"
x + 3	Bit 1, 0: Alarm type <ul style="list-style-type: none"> 0b00: Process alarm 0b01: Diagnostic alarm coming 0b10: Diagnostic alarm going 0b11: reserved Bit 2: <ul style="list-style-type: none"> 0 (fixed) Bit 7 ... 3: Alarm sequence number 0 ... 31 <ul style="list-style-type: none"> 0b00000 ... 0b11111

Diagnostic alarm

Structure of the diagnostic alarm – byte x + 4 ... x + 20	
Byte	Function
x + 4	<ul style="list-style-type: none"> ● Bit 0: Module fault, i.e. an error has been detected ● Bit 1: Internal error in the module ● Bit 2: External error (module no longer addressable) ● Bit 3: Channell error in the module ● Bit 4: External supply voltage missing ● Bit 5, 6: reserved ● Bit 7: Parameterisation error
x + 5	Bit 3 ... 0: Module class <ul style="list-style-type: none"> ● 0b1111: Digital module ● 0b0101: Analog module ● 0b1000: FM ● 0b0111: ETS, CP Bit 4: Channel information available Bit 7 ... 5: <ul style="list-style-type: none"> ● 0 (fixed)
x + 6	see module description
x + 7	Bit 5 ... 0: Reserved <ul style="list-style-type: none"> ● Bit 6: Process alarm lost ● Bit 7: reserved
x + 8	Channel type <ul style="list-style-type: none"> ● 0x70: Module with digital inputs ● 0x71: Module with analog inputs ● 0x72: Module with digital outputs ● 0x73: Module with analog outputs ● 0x74: Module with analog inputs and outputs ● 0x76: Counter
x + 9	Number of diagnostic bits per channel
x + 10	Number of channels per module
x + 11	Position (channel) of the diagnostic event
x + 12	Diagnostic result for channel/channel group 0 Assignment see module description
...	...
x + 19	Diagnostic result for channel/channel group 7 Assignment see module description
x + 20	μs ticker (4 bytes) Value of μs ticker when diagnostic alarm occurs

Process alarm

You can find more detailed information on the diagnostic data of a process alarm (bytes x + 4 to x + 7) in the corresponding module description.

10 EtherCAT communication



Note!

In conjunction with the EPM-S130 bus coupler module (EtherCAT), only I/O compound modules EPM-Sxxx from hardware version 1B on are supported.

10.1 About EtherCAT

EtherCAT (**E**thernet for **C**ontroller and **A**utomation **T**echnology) is an Ethernet-based fieldbus system which complies with the application profile for the field of industrial real-time systems. In contrast to the classic Ethernet communication, the I/O data in full duplex operation are exchanged with 100 MBit/s. By this, the telegrams are delayed in the μ s-range.

The EtherCAT protocol optimised for process data is transported directly in the Ethernet telegram, which, in turn, can consist of several subtelegrams, each operating a memory area of the process image.

As each EtherCAT gateway is provided with a clear address (MAC address), the data-related order is irrespective of the physical order of the EtherCAT gateway in the network.

10.1.1 EtherCAT frame

EtherCAT frames have the following structure:

Ethernet header			Ethernet data				FCS
48 bits	48 bits	16 bits	11 bits	1 bit	4 bits	48 ... 1498 bytes	32 bits
Destination	Source	EtherType	Header			Datagrams	
			Length	Reserved	Type		

Ethernet header

The Ethernet header contains the following information:

- ▶ Target address of the EtherCAT frame (destination)
- ▶ Source address of the EtherCAT frame (source)
- ▶ Type of the EtherCAT frame (EtherType)

Ethernet data

The Ethernet data contain the following information:

- ▶ Length of the datagrams within the EtherCAT frame (length)
- ▶ One reserved bit
- ▶ Type of the datagrams within the Ether-CAT frame (type)
- ▶ Datagrams

FCS

- ▶ Checksum of the EtherCAT frame

10 EtherCAT Kommunikation

About EtherCAT
EtherCAT datagrams

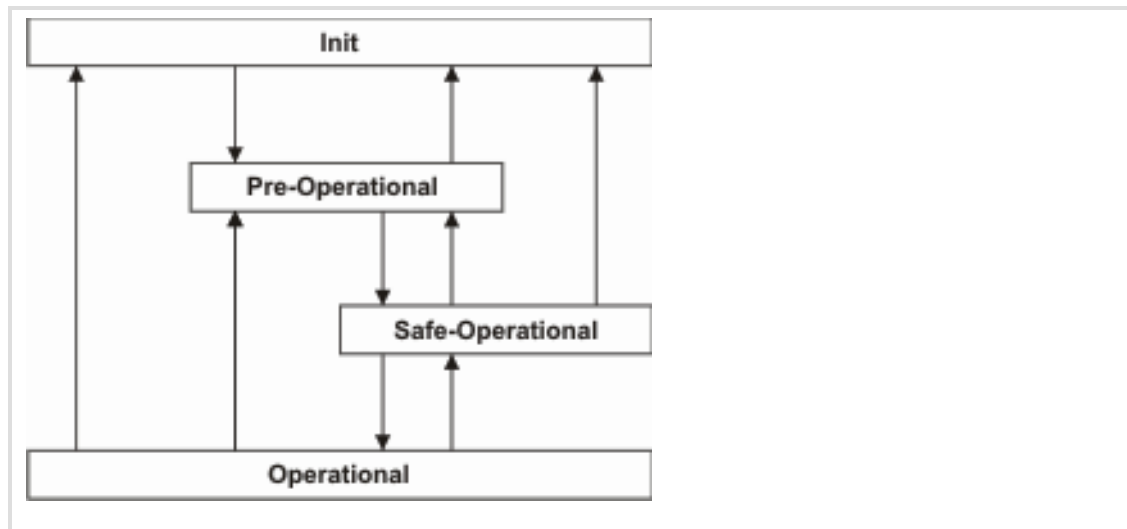
10.1.2 EtherCAT datagrams

EtherCAT datagrams have the following structure:

Header	Data	WKC
10 bits	Max. 1486 bytes	2 bytes WKC = Working Counter

10.1.3 EtherCAT state machine

Each fieldbus node is led through a state machine by the master. The state changes of the bus are shown in the following illustration.



Status	Description
Init	<ul style="list-style-type: none">• No communication on the "Application layer"• The master has access to the "DL information register".
Pre-operational	<ul style="list-style-type: none">• Mailbox communication on the "Application layer"• No process data communication
Safe-operational	<ul style="list-style-type: none">• Mailbox communication on the "Application layer"• Process data communication (Only the inputs are evaluated; the outputs are in the "Safe" status.)
Operational	<ul style="list-style-type: none">• Inputs and outputs are evaluated.

10.2 Transmitting process data

EtherCAT transfers parameter data and process data between master and slaves, which, depending on their time-critical behaviour, are divided into corresponding communication channels.

The process data are transferred via the process data channel using so-called "datagrams".

- ▶ The process data serve to control the I/O channels.
- ▶ The transmission of process data is time-critical.
- ▶ Process data is cyclically transferred between the host system and the I/O system (permanent exchange of current input data and output data).
- ▶ The master can directly access the process data. In the PLC, for instance, the data are directly stored in the I/O area.
- ▶ Process data are not saved in the I/O system.
- ▶ Process data are input data and output data, for instance, of the I/O system.



Note!

With regard to their direction, process data telegrams between the master and the EtherCAT bus coupler modules that are part of the bus are differentiated into:

- ▶ process data telegrams from EtherCAT bus coupler module (Tx data)
- ▶ process data telegrams to EtherCAT bus coupler module (Rx data)



Note!

The process data size of the I/O area is described by XML device description files.

Import the following two files via an EtherCAT configurator for this purpose:

EtherCAT bus coupler module: Lenze_IOSystem1000_EPM_S130.xml

I/O compound module: Lenze_IOSystem1000_EPM_S130_Modules.xml

10 EtherCAT Kommunikation

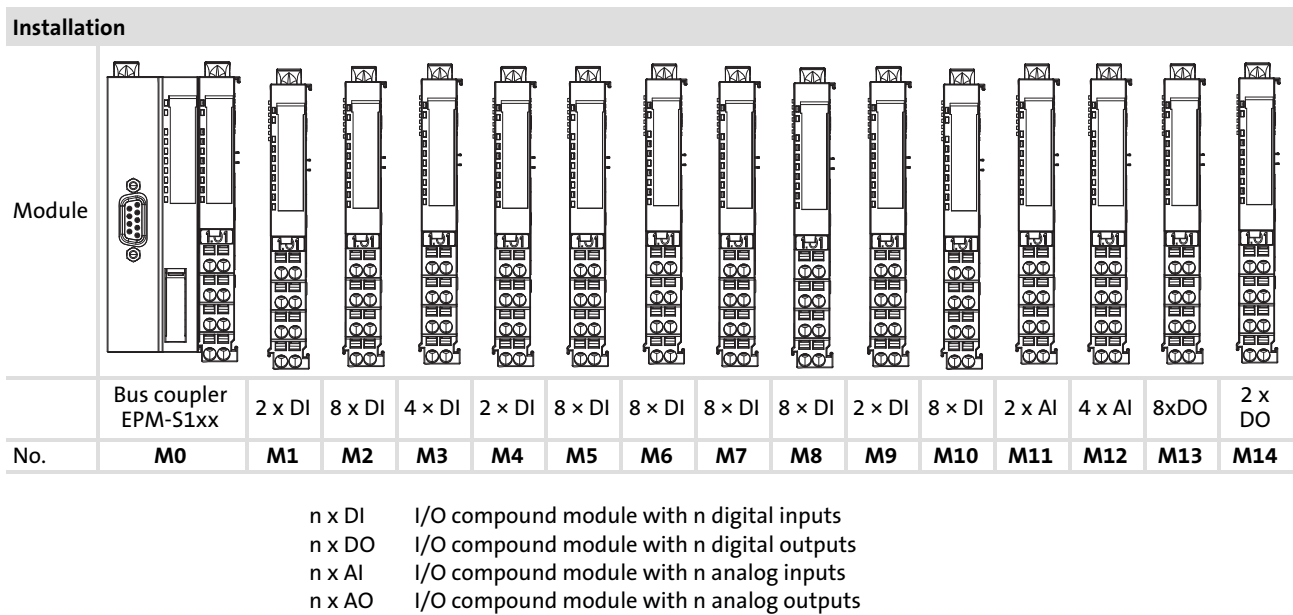
Transmitting process data
PDO mapping

10.2.1 PDO mapping

The PDO mapping differs depending on the motion control to be configured:

Drive-based automation (decentralised, with intelligent controllers)	Controller-based automation (with a central control)
<ul style="list-style-type: none"> Direct data exchange between the IO system and the controller without a master control. Configuration with L-force Engineer 	<ul style="list-style-type: none"> Direct data exchange between the IO system and the control (IPC). Configuration via L-force PLC Designer
<ul style="list-style-type: none"> Static PDO mapping (default setting) 	<ul style="list-style-type: none"> Free mapping by means of a bus configurator (e.g. PLC Designer)
<ul style="list-style-type: none"> Up to 10 RPDOs and TPDOs can be used 	<ul style="list-style-type: none"> Up to 16 RPDOs and TPDOs can be used

The following representation describes the static PDO mapping (Drive-based automation) by means of an example station structure:



Process image			Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
PDO1	Permanent for the first DI or DO	RPDO1	M13	M14	–	–	–	–	–	–
		TPDO1	M1	M2	M3M4	M5	M6	M7	M8	M9
PDO2	Permanent for the first AI or AO	RPDO2	–	–	–	–	–	–	–	–
		TPDO2	M11	M11	M11	M11	M12	M12	M12	M12
PDO3	DI/DO, DI/DO TimeStamp, DO PWM, AI/AO, counter, SSI, RS232, RS422/RS485	RPDO3	–	–	–	–	–	–	–	–
		TPDO3	M12	M12	M12	M12	–	–	–	–
PDO4	DI/DO, DI/DO TimeStamp, DO PWM, AI/AO, counter, SSI, RS232, RS422/RS485	RPDO4	–	–	–	–	–	–	–	–
		TPDO4	M10	–	–	–	–	–	–	–
...								
PDO10	DI/DO, DI/DO TimeStamp, DO PWM, AI/AO, counter, SSI, RS232, RS422/RS485	RPDO10	–	–	–	–	–	–	–	–
		TPDO10	–	–	–	–	–	–	–	–

The following rules for assigning the PDO apply in accordance with the CANopen communication profile DS401:

- ▶ RPDO1 is reserved for the first I/O compound modules with digital inputs.
- ▶ TPDO1 is reserved for the first I/O compound modules with digital outputs.
- ▶ RPDO2 is reserved for the first I/O compound modules with analog inputs.
- ▶ TPDO2 is reserved for the first I/O compound modules with analog outputs.
- ▶ As of PDO3: a PDO can only be occupied by electronic modules of one module class. Free bytes are reserved for modules of the same module class.

Sorting sequence for module classes:

- Digital inputs and outputs (EPM-S200 to EPM-S206, EPM-S300 to EPM-S309)
- Analog inputs and outputs (EPM-S400 to EPM-S503)
- Counter (EPM-S600 to EPM-S603)
- SSI encoder (EPM-S604)
- Digital outputs with pulse width modulation (EPM-S620)
- Interfaces RS232 and RS422/RS485 (EPM-S640/EPM-S650)
- Digital outputs with time stamp functionality (EPM-S310)
- Digital inputs with time stamp functionality (EPM-S207)



Note!

In order to ensure data consistency, the data in the PDO are mapped as follows:

▶ Digital I/O:

With digital values, an I/O compound module is always mapped in one byte. If a byte in a PDO does not have enough free bits, the I/O compound module is mapped in the next byte.

▶ Analog I/O:

In the case of analog values the data lengths of which exceed one byte, the data consistency is extended. Since one channel assigns two bytes, each channel of an I/O compound module is mapped in two successive PDOs.

10.2.2 PDO mapping for I/O compound modules with a serial interface

Mapping for I/O compound modules with a serial interface (EPM-S640, EPM-S650) starts at PDO 3.

Default mapping

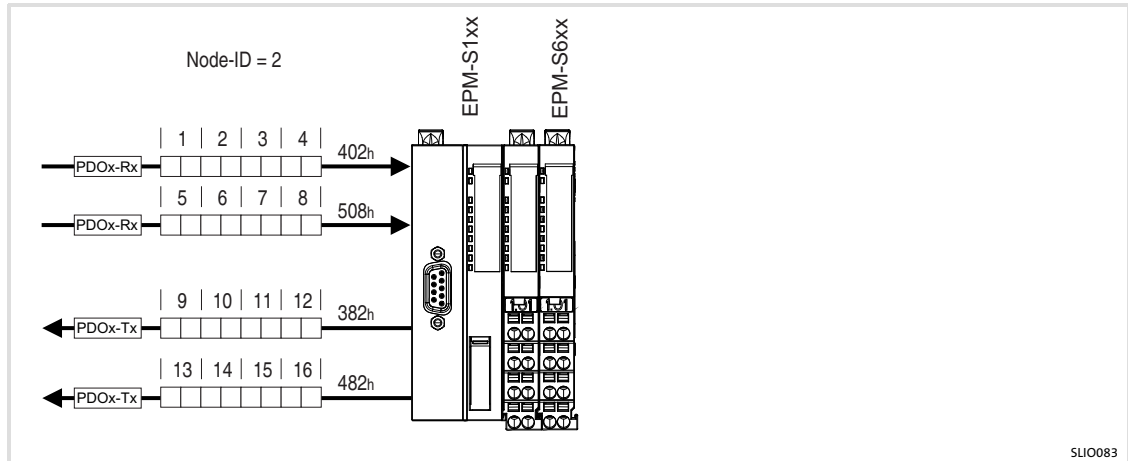


Fig. 10-1 Mapping contents

Word	EPM-S640, EPM-S650
1	Rx byte 0 ... 1
2	Rx byte 2 ... 3
3	Rx byte 4 ... 5
4	Rx byte 6 ... 7
5	—
6	—
7	—
8	—
9	Tx byte 0 ... 1
10	Tx byte 2 ... 3
11	Tx byte 4 ... 5
12	Tx byte 6 ... 7
13	—
14	—
15	—
16	—

10.2.3 PDO mapping for I/O compound modules with time stamp function

Mapping for I/O compound modules with a time stamp function begins at PDO 3.

Default mapping

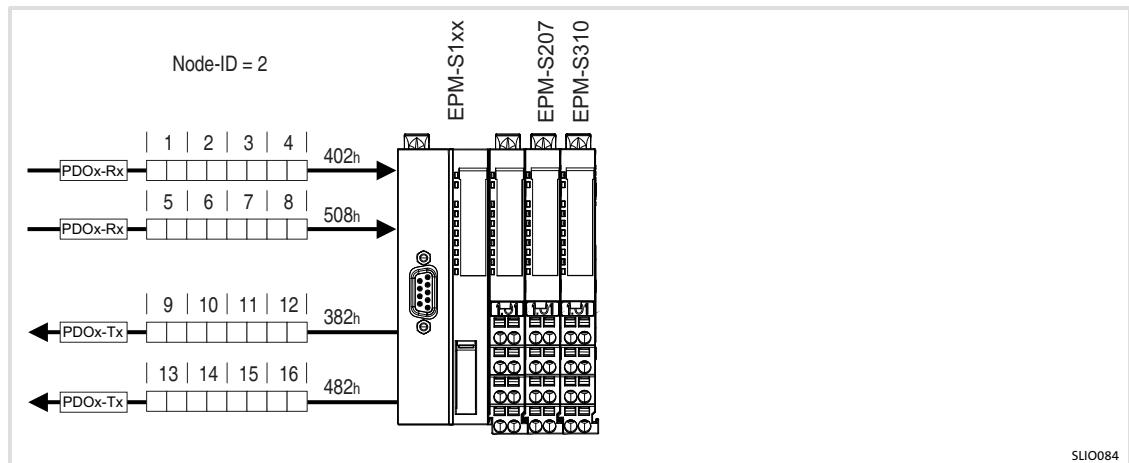


Fig. 10-2 Mapping contents

Word	EPM-S207	EPM-S310
1	–	Ticker value DO1
2	–	Running number Channel status DO1
3	–	Ticker value DO2
4	–	Running number Channel status DO2
5	–	–
6	–	–
7	–	–
8	–	–
9	Ticker value DI1	Status of FIFO memory
10	Running number Channel status DI1	
11	Ticker value DI2	–
12	Running number Channel status DI2	–
13	–	–
14	–	–
15	–	–
16	–	–

Ticker value EPM-S207 and EPM-S310		
Bit	Designation	Function
0 ... 15	Ticker value	After mains connection, a timer (μ s ticker) is started, which after 65535 μ s starts with 0 again.

Running number, channel status EPM-S207		
Bit	Name	Function
0 ... 7	Running number (RN)	Counter which counts from 0 ... 63 and then goes back to 0. During the first run, the running number must start with 1.
8	Channel status DI1	0: FALSE 1: TRUE
9	Channel status DI2	0: FALSE 1: TRUE
10 ... 15	–	Reserved (fix 0)

Running number, channel status EPM-S310		
Bit	Name	Function
0 ... 7	Running number (RN)	Counter which counts from 0 ... 63 and then goes back to 0. During the first run, the running number must start with 1.
8 ... 11	–	Reserved (fix 0)
12	Enable DO1	0: inhibit 1: enable
13	Enable DO2	0: inhibit 1: enable
14	Channel status DO1	0: FALSE 1: TRUE
15	Channel status DO2	0: FALSE 1: TRUE

Status of FIFO memory for EPM-S310		
Bit	Designation	Function
0 ... 5	RN-LAST	Running number of the time stamp entry last detected as valid by the module and written into the FIFO memory.
6		1 (fix); is used for identification in the process image
7		0 (fix); is used for identification in the process image
8 ... 13	RN_NEXT	Running number of the time stamp entry to be processed next in the FIFO memory.
14		1 (fix); is used for identification in the process image
15		1 (fix); is used for identification in the process image
16 ... 23	STS_FIFO	<p>Status information of FIFO memory</p> <ul style="list-style-type: none"> • 00_h or 80_h: Everything is OK; you will receive this message directly after the acceptance into the FIFO memory of the module. • 01_h or 81_h: No follow-up entry available; the running number does not correspond to the expected running number. Check the running number in the output area. • 02_h or 82_h: No new entries available in the FIFO memory. • 03_h or 83_h: FIFO memory full. No new entries possible. A full memory will not accept any more time stamp entries. Perform a status query to establish the FIFO memory's status before transferring more time stamp entries. <p>Note: If less than possible time stamp entries are written, bit 6 must be set in the running number (RN) of the last time stamp entry. This is required in order to not write the follow-up entries as "invalid" since the module ignores all time stamp entries after an entry with a set RN bit 6. If a time stamp entry with a running number and a set bit 6 is in the FIFO memory, STS_FIFO with 80_h is returned in an OR-ed manner.</p>
24 ... 31	–	Current number of time stamp entries in FIFO memory.

10.2.4 PDO mapping for I/O compound modules with PWM function

Mapping for I/O compound modules with a PWM function begins at PDO 3.

Default mapping

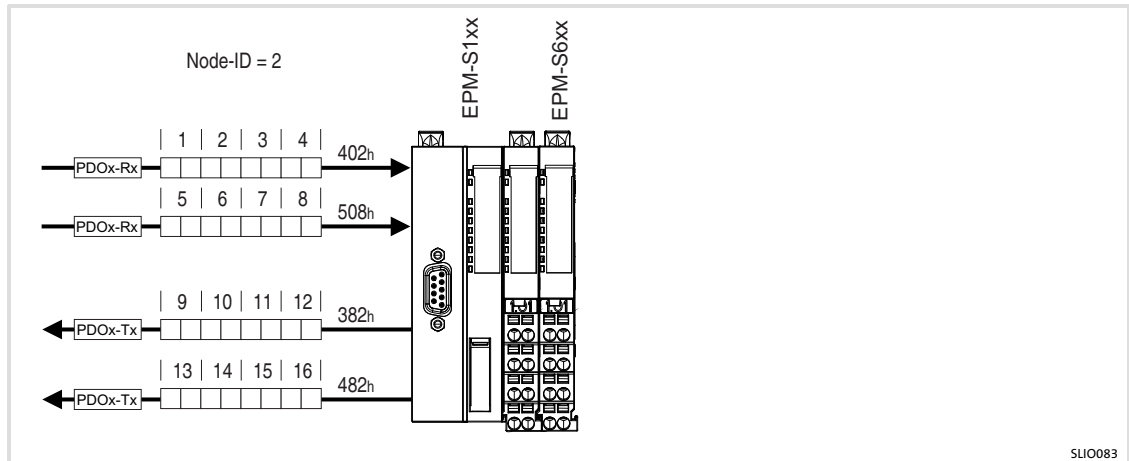


Fig. 10-3 Mapping contents








Word	EPM-S620
1	
2	Pulse duration DO1
3	
4	Pulse duration DO2
5	Control word DO1
6	Control word DO2
7	–
8	–
9	Status word DO1
10	Status word DO2
11	–
12	–
13	–
14	–
15	–
16	–

Information on the structure of the control word and the status word [242](#).

10.2.5 PDO mapping for counters and encoder evaluation

The mapping for counters starts at PDO 3, since the first two PDOs are reserved for digital and analog modules.

The following table describes the indices for the PDO mapping for counters.

Index	Name	Possible settings			Important
		Lenze	Selection		
I5400 _h └┘	Counter Value		00000000 _h {1 _h }	FFFFFFF _h	Count value  529
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: Subindex is increased by 2 for each counter
	2 DWord 2				
				
	64 DWord 64				
I5401 _h └┘	Latch value		00000000 _h {1}	FFFFFFF _h	Latch value  529
	1 DWord 1				EPM-S600: Subindex is increased by 1 for each counter EPM-S601/-S602/-S603: without function
	2 DWord 2				
				
	64 DWord 64				
I5402 _h └┘	Status word		0000 _h {1}	FFFF _h	Status word  529
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: Subindex is increased by 2 for each counter
	2 DWord 2				
				
	64 DWord 64				
I5403 _h └┘	Counter ticker value		0000 _h {1}	FFFF _h	Ticker value  529
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: without function
	2 DWord 2				
				
	64 DWord 64				
I5600 _h └┘	Counter Compare Value		00000000 _h {1}	FFFFFFF _h	Comparison value  529
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601: Subindex is increased by 2 for each counter EPM-S603: without function
	2 DWord 2				
				
	64 DWord 64				
I5601 _h └┘	Counter Set Value		00000000 _h {1}	FFFFFFF _h	Set value  529
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: without function
	2 DWord 2				
				
	64 DWord 64				
I5602 _h └┘	Counter Control Word		0000 _h {1}	FFFF _h	Control word
	1 DWord 1				EPM-S600/-S602: Subindex is increased by 1 for each counter EPM-S601/-S603: Subindex is increased by 2 for each counter  529
	2 DWord 2				
				
	64 DWord 64				

Default mapping

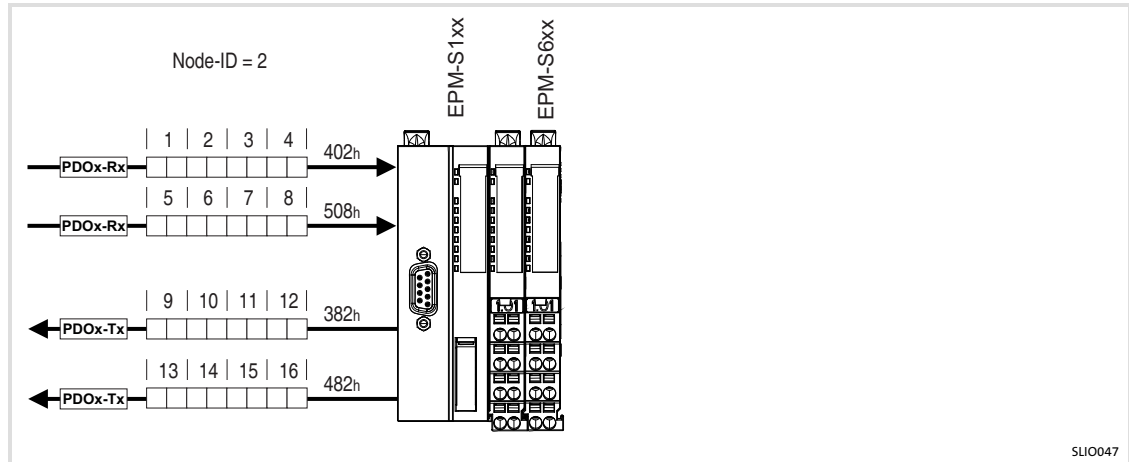


Fig. 10-4 Mapping contents

Word	EPM-S600	EPM-S601	EPM-S602	EPM-S603	EPM-S604
1	Comparison value	Comparison value C1	Comparison value	Control word C1	
2				Control word C2	
3	Set value	Comparison value C2	Set value		
4					
5	Control word	Control word C1	Control word	-	
6		Control word C2			
7	-		-		
8		-			
9	Count value	Count value C1	Count value	Count value C1	Encoder value
10					
11	Latch value	Count value C2	Status word	Count value C2	Ticker value
12			Ticker value		
13	Status word	Status word C1		Status word C1	
14	Ticker value	Status word C2		Status word C2	
15			-		-
16	-	-		-	

Comparison value: Here you can select a value which, by comparison with the current counter content, can impact the counter output or trigger a process alarm. The response of the output or the process alarm can be parameterised.

Set value: With an edge change 0-1 of *COUNTERVAL_SET* in the control word, the set value is accepted in the counter.

Count value: Current counter content

Latch value: If there is a positive edge at the latch input, the count value is stored here.

Ticker value: After mains connection a timer (μ s ticker) is started, which after 65535 μ s starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μ s value together with the count value in the input area.

Information on the structure of the control word and the status word 229.

10.2.6 Access to the I/O area

SDO access can be used for read-only access to the object directory's input and output data.

Input data

When accessing the input area of an I/O compound module, addressing takes place via index 0x6000 + EtherCAT slot no. Subindexes give you access to the corresponding input data. The relevant module description contains the subindex assignment.

Index	Subindex	Name	Type	Attr.	Default	Meaning
0x6000 ... 0x603F	0x00	Input data	Unsigned8	ro		Number of input data subindexes for the corresponding EtherCAT slot no.
	0x01 0x02 ...			ro ro		Input data (see module description)

Output data

During read-only access to the output area of an I/O compound module, addressing takes place via index 0x7000 + EtherCAT slot no. Subindexes give you read-only access to the corresponding output data. The relevant module description contains the subindex assignment.

Index	Subindex	Name	Type	Attr.	Default	Meaning
0x7000 ... 0x703F	0x00	Output data	Unsigned8	ro		Number of output data subindexes for the corresponding EtherCAT slot no.
	0x01 0x02 ...			ro ro		Output data (see module description)

**Note!**

Parameter data can be transferred from the EtherCAT master to the EtherCAT bus coupler module EPM-S130 (slave). Once the EtherCAT master has been started, the data is transferred to the bus coupler module where the settings are accepted after the change from "Pre-operational" operating mode to "Operational".

EtherCAT transfers parameter data and process data between the master and the bus coupler modules, which, depending on their time-critical behaviour, are divided into corresponding communication channels.

Parameter data (SDOs, service data objects) are transmitted via the SDO channel.

- ▶ Access to all indexes with CoE (CAN over EtherCAT) is enabled via the SDO channel.
- ▶ The transfer of parameter data is not normally time-critical.
- ▶ Parameter data corresponds to the indexes of the index list for the EtherCAT bus coupler module

Establishment of connection between the master and slave

Basically a master can always request parameter tasks from a slave if the slave is at least in the "Pre-operational" state.

Acyclic data transmission

Parameters ...

- ▶ are values which are stored under an index in the Lenze I/O system.
- ▶ for instance are used if the system is set once or if material is changed within a machine.
- ▶ are transmitted with a low priority.

10.4 General function of the parameter setting

Parameterise I/O compound modules using SDO transfer.

Addressing takes place via index 0x3100 + EtherCAT slot no. Subindexes give you access to the corresponding parameters. The relevant module description contains the subindex assignment.

Index	Subindex	Name	Type	Attr.	Meaning
0x3100 ... 0x313F	0x00	Parameter	Unsigned8	ro	Number of input data subindexes for the corresponding EtherCAT slot no.
	0x01	Param1		ro/rw	Parameter data (see module description)
	0x02	Param2		ro/rw	
	...				

If the module is parameterisable, the following applies:

Index 0x3100: access to EtherCAT slot no. 1

Index 0x3101: access to EtherCAT slot no. 2

...

Index 0x313F: access to EtherCAT slot no. 64

The following example shows access to the parameters of the module in slot 4 via index 0x3103.

Phy. slot	1	2	3	4
Module	DI	DI	DO	AI
Index	0x3100*	03101*	0x3102*	0x3103
EtherCAT slot no.	1	-	2	3

* This entry is not executed because the module is not parameterisable.

10

EtherCAT Kommunikation

Setting the parameters of analog I/O
2 analog inputs 0 ... 10 V (12 bits) - EPM-S400

10.5 Setting the parameters of analog I/O

10.5.1 2 analog inputs 0 ... 10 V (12 bits) - EPM-S400

Parameter data

Subindex	Name	Description/value	Lenze
01	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
02	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
Not possible, is limited to 0 V				Underflow	
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
Not possible, is limited to 0 V				Underflow	

10.5.2 4 analog inputs 0 ... 10 V (12 bits) - EPM-S401

Parameter data

Subindex	Name	Description/value	Lenze
01	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
02	Function channel 2		20 _h
03	Function channel 3		20 _h
04	Function channel 4		20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

10.5.3 2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402

Parameter data

Subindex	Name	Description/value	Lenze
01	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
02	Function channel 2	49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I - 4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I - 4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

10.5.4 4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403

Parameter data

Subindex	Name	Description/value	Lenze
01	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511	31 _h
02	Function channel 2	64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
03	Function channel 3	49 (31 _h): 0 ... 20 mA / -4864 ... 32511	31 _h
04	Function channel 4	65 (41 _h): 0 ... 20 mA / -3277 ... 20480	31 _h
		255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	I = D * 20 / 27648 D = 27648 * I / 20
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	I = D * 20 / 16384 D = 16384 * I / 20
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	I = D * 16 / 27648 + 4 D = 27648 * (I-4) / 16
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	I = D * 16 / 16384 + 4 D = 16384 * (I-4) / 16
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

10.5.5 2 analog inputs -10 ... +10 V (16 bits) - EPM-S406

Parameter data

Subindex	Name	Description/value	Lenze
01	Diagnostics	Bits 0 ... 5: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
02	Reserved	0	
03	Limit value monitoring	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 (0 = deactivated; 1 = activated) Bits 7 ... 2: Reserved	00 _h
04	Interference frequency suppression	Bit 1, 0: Channel 1 00: Deactivated 01: 60 Hz 10: 50 Hz Bit 3, 2: Channel 2 00: Deactivated 01: 60 Hz 10: 50 Hz Bits 7 ... 4: Reserved	00 _h
05	Function channel 1	12 (12 _h): -10 ... 10 V / -27648 ... 27648 _{dec} 34 (22 _h): -10 ... 10 V / -16384 ... 16384 _{dec} 16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
06	Reserved	0	
07	Upper limit value channel 1	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
08	Lower limit value channel 1	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h
09	Function channel 2	12 (12 _h): -10 ... 10 V / -27648 ... 27648 _{dec} 34 (22 _h): -10 ... 10 V / -16384 ... 16384 _{dec} 16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
0A	Reserved	0	
0B	Upper limit value channel 2	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
0C	Lower limit value channel 2	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
-10 ... +10 V (12 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	-5	-13824	CA00		
	-10	-27648	9400		
-11.76	-32512	8100	Underflow		
-10 ... +10 V (22 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	-5	-8192	E000		
	-10	-16384	C000		
-12.5	-20480	B000	Underflow		
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
-1.76	-4864	ED00	Underflow		
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	-2	-3277	F333	Underflow	

10.5.6 2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408

Parameter data

Subindex	Name	Description/value	Lenze
01	Diagnostics	Bits 0 ... 5: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
02	Reserved	0	
03	Limit value monitoring	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 (0 = deactivated; 1 = activated) Bits 7 ... 2: Reserved	00 _h
04	Interference frequency suppression	Bit 1, 0: Channel 1 00: Deactivated 01: 60 Hz 10: 50 Hz Bit 3, 2: Channel 2 00: Deactivated 01: 60 Hz 10: 50 Hz Bits 7 ... 4: Reserved	00 _h
05	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480 49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	41 _h
06	Reserved	0	
07	Upper limit value channel 1	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
08	Lower limit value channel 1	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h
09	Function channel 2	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480 49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	41 _h
0A	Reserved	0	
0B	Upper limit value channel 2	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
0C	Lower limit value channel 2	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
0 ... 20 mA (41 _h)	-3.52	-4864	ED00	Underflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	25	20480	5000	Overflow	
	20	16384	4000	Nominal range	
	10	8192	2000		
4 ... 20 mA (30 _h)	0	0	0000	Nominal range	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	4	0	0000		
	12	13824	3600		
	20	27648	6C00		
4 ... 20 mA (40 _h)	1.19	-4864	ED00	Underflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	24	20480	5000	Overflow	
	20	16384	4000	Nominal range	
	12	8192	2000		
4 ... 20 mA (40 _h)	0.8	-3277	F333	Underflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	4	0	0000	Nominal range	
	12	8192	2000		
	20	16384	4000		

10.5.7 2 analog outputs 0 ... 10 V (12 bits) - EPM-S500

Parameter data

Subindex	Name	Description/value	Lenze
01	Reserved	0	
02	Short-circuit detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
03	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec}	20 _h
04	Function channel 2	255 (FF _h): channel deactivated	20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Output area (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

10.5.8 4 analog outputs 0 ... 10 V (12 bits) - EPM-S501

Parameter data

Subindex	Name	Description/value	Lenze
01	Reserved	0	
02	Short-circuit detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bit 2: Channel 3 Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
03	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
04	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec}	20 _h
05	Function channel 3	255 (FF _h): channel deactivated	20 _h
06	Function channel 4		20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Output area (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

10.5.9 2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502

Parameter data

Subindex	Name	Description/value	Lenze
01	Reserved	0	
02	Wire-breakage detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
03	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480 49 (31 _h): 0 ... 20 mA / -4864 ... 32511	31 _h
04	Function channel 2	65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I - 4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I - 4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

10.5.10 4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503

Parameter data

Subindex	Name	Description/value	Lenze
01	Reserved	0	
02	Wire-breakage detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bit 2: Channel 3 Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
03	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511	31 _h
04	Function channel 2	64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
05	Function channel 3	49 (31 _h): 0 ... 20 mA / -4864 ... 32511	31 _h
06	Function channel 4	65 (41 _h): 0 ... 20 mA / -3277 ... 20480	31 _h
		255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
0 ... 20 mA (41 _h)	-3.52	-4864	ED00	Underflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	25	20480	5000	Overflow	
	20	16384	4000	Nominal range	
	10	8192	2000		
0	0	0000	Underflow		
4 ... 20 mA (30 _h)	-4	-3277	F333	Underflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	22.81	32511	7EFF	Overflow	
	20	27648	6C00	Nominal range	
	12	13824	3600		
4	0	0000	Underflow		
4 ... 20 mA (40 _h)	1.19	-4864	ED00	Underflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	24	20480	5000	Overflow	
	20	16384	4000	Nominal range	
	12	8192	2000		
4	0	0000	Underflow		
	0.8	-3277	F333	Underflow	

10.6 Parameterising the temperature measurement

10.6.1 Four (two) analog inputs for resistance tests - EPM-S404

**Note!**

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ If thermal detectors are connected in a 3-wire or 4-wire setup, channels 3 and/or 4 must be deactivated.
- ▶ The module does not provide any auxiliary supply for sensors.

Parameter data

Subindex	Name	Description/value	Lenze
01	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 0 ... 5: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
02	Wire-breakage detection	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) : Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
03	Limit value monitoring	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) : Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
04	Reserved		
05	Temperature system	Bit 0, 1: 00 _b = °C; 01 _b = °F; 10 _b = K Bits 2 ... 7: Reserved	00 _h
06	Interference frequency suppression	Bit 0, 1: 01 _b = 60 Hz; 10 _b = 50 Hz Bits 2 ... 7: Reserved	02 _h

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Subindex	Name	Description/value	Lenze
Channel 1			
07	Function channel 1	<p>Thermal detector:</p> <p>80 (50_h): PT100 2-wire conductor -200°C ... +850°C / -2000 ... +8500_{dec}</p> <p>81 (51_h): PT1000 2-wire conductor -200°C ... +850°C / -2000 ... +8500_{dec}</p> <p>82 (52_h): Ni100 2-wire conductor -60°C ... +250°C / -600 ... +2500_{dec}</p> <p>83 (53_h): Ni1000 2-wire conductor -60°C ... +250°C / -600 ... +2500_{dec}</p> <p>88 (58_h): PT100 3-wire conductor -200°C ... +850°C / -2000 ... +8500_{dec}</p> <p>89 (59_h): PT1000 3-wire conductor -200°C ... +850°C / -2000 ... +8500_{dec}</p> <p>90 (5A_h): Ni100 3-wire conductor -60°C ... +250°C / -600 ... +2500_{dec}</p> <p>91 (5B_h): Ni1000 3-wire conductor -60°C ... +250°C / -600 ... +2500_{dec}</p> <p>96 (60_h): PT100 4-wire conductor -200°C ... +850°C / -2000 ... +8500_{dec}</p> <p>97 (61_h): PT1000 4-wire conductor -200°C ... +850°C / -2000 ... +8500_{dec}</p> <p>98 (62_h): Ni100 4-wire conductor -60°C ... +250°C / -600 ... +2500_{dec}</p> <p>99 (63_h): Ni1000 4-wire conductor -60°C ... +250°C / -600 ... +2500_{dec}</p> <p>Resistor:</p> <p>112 (70_h): R 60-Ω2-wire conductor 0.00 ... +60.00 / 0 ... +32767_{dec}</p> <p>113 (71_h): R 600-Ω2-wire conductor 0.00 ... +600.00 / 0 ... +32767_{dec}</p> <p>114 (72_h): R 3000-Ω2-wire conductor 0.00 ... +3000.00 / 0 ... +32767_{dec}</p> <p>115 (73_h): R 6000-Ω2-wire conductor 0.00 ... +6000.00 / 0 ... +32767_{dec}</p> <p>128 (80_h): R 60-Ω4-wire conductor 0.00 ... +60.00 / 0 ... +32767_{dec}</p> <p>129 (81_h): R 600-Ω4-wire conductor 0.00 ... +600.00 / 0 ... +32767_{dec}</p> <p>130 (82_h): R 3000-Ω4-wire conductor 0.00 ... +3000.00 / 0 ... +32767_{dec}</p> <p>144 (90_h): R 60-Ω2-wire conductor 0.00 ... +60.00 / 0 ... +6000_{dec}</p> <p>145 (91_h): R 600-Ω2-wire conductor 0.00 ... +600.00 / 0 ... +6000_{dec}</p> <p>146 (92_h): R 3000-Ω2-wire conductor 0.00 ... +3000.00 / 0 ... +30000_{dec}</p> <p>160 (A0_h): R 60-Ω2-wire conductor 0.00 ... +60.00 / 0 ... +6000_{dec}</p> <p>161 (A1_h): R 600-Ω2-wire conductor 0.00 ... +600.00 / 0 ... +6000_{dec}</p> <p>162 (A2_h): R 3000-Ω2-wire conductor 0.00 ... +3000.00 / 0 ... +30000_{dec}</p> <p>255 (FF_h): channel deactivated</p>	50 _h

Subindex	Name	Description/value	Lenze
08	Conversion time channel 1	You can set the transformer speed as a function of the interference frequency suppression (see 0x3105/x) for each channel. 0 (00 _h): At 50 Hz: 324.1 ms/channel 16 bits; at 60 Hz: 270.5 ms/channel 16 bits 1 (01 _h): At 50 Hz: 164.2 ms/channel 16 bits; at 60 Hz: 137.2 ms/channel 16 bits 2 (02 _h): At 50 Hz: 84.2 ms/channel 16 bits; at 60 Hz: 70.5 ms/channel 16 bits 3 (03 _h): at 50 Hz: 44.1 ms/channel 16 bits; at 60 Hz: 37.2 ms/channel 16 bits 4 (04 _h): At 50 Hz: 24.2 ms/channel 16 bits; at 60 Hz: 20.5 ms/channel 16 bits 5 (05 _h): At 50 Hz: 14.2 ms/channel 16 bits; at 60 Hz: 12.2 ms/channel 16 bits 6 (06 _h): At 50 Hz: 9.2 ms/channel 16 bits; at 60 Hz: 8.0 ms/channel 16 bits 7 (07 _h): At 50 Hz: 6.6 ms/channel 15 bits; at 60 Hz: 5.9 ms/channel 15 bits 8 (08 _h): At 50 Hz: 4.2 ms/channel 13 bits; at 60 Hz: 3.8 ms/channel 13 bits	00 _h
09	Upper limit value channel 1	You can define an upper or lower limit value for each channel. For this you can only specify values from the nominal range, otherwise you'll receive a parameterisation error. By specification of 7FFF _h for the upper or 8000 _h for the lower limit value, the corresponding limit value is deactivated. If your measured value is outside a limit value and you have activated the limit value monitoring, a process alarm is triggered.	7FFF _h
0A	Lower limit value channel 1		8000 _h
Channel 2			
0B	Function channel 2	See channel 1	50 _h
0C	Conversion time channel 2	See channel 1	00 _h
0D	Upper limit value channel 2	See channel 1	7FFF _h
0E	Lower limit value channel 2		8000 _h
Channel 3 (for two-wire conductor connections only)			
0F	Function channel 3	See channel 1	50 _h
10	Conversion time channel 3	See channel 1	00 _h
11	Upper limit value channel 3	See channel 1	7FFF _h
12	Lower limit value channel 3		8000 _h
Channel 4 (for two-wire conductor connections only)			
13	Function channel 4	See channel 1	50 _h
14	Conversion time channel 4	See channel 1	00 _h
15	Upper limit value channel 4	See channel 1	7FFF _h
16	Lower limit value channel 4		8000 _h

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Measuring range

Measuring range (Fct. no.)	Measured value	Signal range	Range
2-wire: PT100 (50 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
2-wire: PT1000 (51 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
2-wire: NI100 (52 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
2-wire: NI1000 (53 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
3-wire: PT100 (58 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
3-wire: PT1000 (59 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
3-wire: NI100 (5A _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
3-wire: NI1000 (5B _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
4-wire: PT100 (60 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
4-wire: PT1000 (61 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
4-wire: NI100 (62 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
4-wire: NI1000 (63 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
2-wire: 0 ... 60 Ω (70 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (71 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (72 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow

Measuring range (Fct. no.)	Measured value	Signal range	Range
3-wire: 0 ... 60 Ω (78 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (79 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (7A _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (80 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (81 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (82 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767	Nominal range
	-	-	Underflow
2-wire: 0 ... 60 Ω (90 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (91 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (92 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (98 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (99 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (9A _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (A0 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (A1 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (A2 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Measuring range (Fct. no.)	Measured value	Signal range	Range
2-wire: 0 ... 60 Ω (D0 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (D1 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (D2 _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (D8 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (D9 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (DA _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (E0 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (E1 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (E2 _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow

10.6.2 Two analog inputs for thermocouple measurement - EPM-S405

Parameter data

Subindex	Name	Description/value	Lenze
01	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 0 ... 5: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
02	Wire-breakage detection	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
03	Limit value monitoring	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
04	Reserved	0	
05	Temperature system	Bit 0, 1: 00 _b = °C; 10 _b = °F; 11 _b = K Bits 2 ... 7: Reserved	00 _h
06	Interference frequency suppression	Bit 0, 1: 01 _b = 60 Hz; 10 _b = 50 Hz Bits 2 ... 7: Reserved	02 _h
Channel 1			
07	Function channel 1	External temperature compensation: 176 (60 _h): type J, -210.0 ... +1200.0 °C / -2100 ... +12000 _{dec} 177 (61 _h): type K, -270.0 ... +1372.0 °C / -2700 ... +13720 _{dec} 178 (62 _h): type N -270.0 ... +1300.0 °C / -2700 ... +13000 _{dec} 179 (63 _h): type R, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 180 (64 _h): type S, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 181 (65 _h): type T, -270.0 ... +400.0 °C / -2700 ... +4000 _{dec} 182 (66 _h): type B, 0.0 ... +1820.0 °C / 0 ... +18200 _{dec} 183 (67 _h): type C, 0.0 ... +2315.0 °C / 0 ... +23150 _{dec} 184 (68 _h): type E, -270.0 ... +1000.0 °C / -2700 ... +10000 _{dec} 185 (69 _h): type L, -200.0 ... +900.0 °C / -2000 ... +9000 _{dec} Internal temperature compensation: 192 (C0 _h): type J, -210.0 ... +1200.0 °C / -2100 ... +12000 _{dec} 193 (C1 _h): type K, -270.0 ... +1372.0 °C / -2700 ... +13720 _{dec} 194 (C2 _h): type N -270.0 ... +1300.0 °C / -2700 ... +13000 _{dec} 195 (C3 _h): type R, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 196 (C4 _h): type S, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 197 (C5 _h): type T, -270.0 ... +400.0 °C / -2700 ... +4000 _{dec} 198 (C6 _h): type B, 0.0 ... +1820.0 °C / 0 ... +18200 _{dec} 199 (C7 _h): type C, 0.0 ... +2315.0 °C / 0 ... +23150 _{dec} 200 (C8 _h): type E, -270.0 ... +1000.0 °C / -2700 ... +10000 _{dec} 201 (C9 _h): type L, -200.0 ... +900.0 °C / -2000 ... +9000 _{dec} 255 (FF _h): channel deactivated	C1 _h

Parameterising the temperature measurement Two analog inputs for thermocouple measurement - EPM-S405

Subindex	Name	Description/value	Lenze
08	Conversion time channel 1	You can set the transformer speed as a function of the interference frequency suppression (see 0x3105/x) for each channel. 0 (00 _h): At 50 Hz: 324.1 ms/channel 16 bits; at 60 Hz: 270.5 ms/channel 16 bits 1 (01 _h): at 50 Hz: 164.2 ms/channel 16 bits; at 60 Hz: 137.2 ms/channel 16 bits 2 (02 _h): At 50 Hz: 84.2 ms/channel 16 bits; at 60 Hz: 70.5 ms/channel 16 bits 3 (03 _h): at 50 Hz: 44.1 ms/channel 16 bits; at 60 Hz: 37.2 ms/channel 16 bits 4 (04 _h): At 50 Hz: 24.2 ms/channel 16 bits; at 60 Hz: 20.5 ms/channel 16 bits 5 (05 _h): at 50 Hz: 14.2 ms/channel 16 bits; at 60 Hz: 12.2 ms/channel 16 bits 6 (06 _h): at 50 Hz: 9.2 ms/channel 16 bits; at 60 Hz: 8.0 ms/channel 16 bits 7 (07 _h): at 50 Hz: 6.6 ms/channel 15 bits; at 60 Hz: 5.9 ms/channel 15 bits 8 (08 _h): at 50 Hz: 4.2 ms/channel 13 bits; at 60 Hz: 3.8 ms/channel 13 bits	02 _h
09	Upper limit value channel 1	You can define an upper or lower limit value for each channel. For this you can only specify values from the nominal range, otherwise you'll receive a parameterisation error. By specification of 7FFF _h for the upper or 8000 _h for the lower limit value, the corresponding limit value is deactivated. If your measured value is outside a limit value and you have activated the limit value monitoring, a process alarm is triggered.	7FFF _h
0A	Lower limit value channel 1		8000 _h
Channel 2			
0B	Function channel 2	See channel 1	C1 _h
0C	Conversion time channel 2	See channel 1	02 _h
0D	Upper limit value channel 2	See channel 1	7FFF _h
0E	Lower limit value channel 2		8000 _h

Measuring range






Measuring range (Fct. no.)	Measured value			Range
	[°C]	[°F]	[K]	
Type J: -210 ... +1200 °C -346 ... 2192 °F 63.2 ... 1473.2 K (B0 _h : ext. comp. 0 °C) (C0 _h : int. comp. 0 °C)	+14500	26420	17232	Overflow
	-2100 ... +12000	-3460 ... +21920	632 ... 14732	Nominal range
	-	-	-	Underflow
Type K: -210 ... +1372 °C -454 ... 2501.6 °F 0 ... 1645.2 K (B1 _h : ext. comp. 0 °C) (C1 _h : int. comp. 0 °C)	+16220	29516	18952	Overflow
	-2700 ... +13720	-4540 ... 25016	0 ... 16452	Nominal range
	-	-	-	Underflow
Type N: -270 ... +1300 °C -454 ... 2372 °F 0 ... 1573.2 K (B2 _h : ext. comp. 0 °C) (C2 _h : int. comp. 0 °C)	+15500	28220	18232	Overflow
	-2700 ... +13000	-4540 ... 23720	0 ... 15732	Nominal range
	-	-	-	Underflow

Measuring range (Fct. no.)	Measured value			Range
	[°C]	[°F]	[K]	
Type R: -50 ... +1769 °C -58 ... 3216.2 °F 223.2 ... 2042.2 K (B3 _h : ext. comp. 0 °C) (C3 _h : int. comp. 0 °C)	+20190	32766	22922	Overflow
	-500 ... +17690	-580 ... 32162	2232 ... 20422	Nominal range
	-1700	-2740	1032	Underflow
Type S: -50 ... +1769 °C -58 ... 3216.2 °F 223.2 ... 2042.2 K (B4 _h : ext. comp. 0 °C) (C4 _h : int. comp. 0 °C)	+20190	32766	22922	Overflow
	-500 ... +17690	-580 ... 32162	2232 ... 20422	Nominal range
	-1700	-2740	1032	Underflow
Type T: -270 ... +440 °C -454 ... 752 °F 3.2 ... 673.2 K (B2 _h : ext. comp. 0 °C) (C2 _h : int. comp. 0 °C)	+5400	10040	8132	Overflow
	-2700 ... +4000	-4540 ... 7520	32 ... 6732	Nominal range
	-	-	-	Underflow
Type B: 0 ... +1820 °C 32 ... 2786.5 °F 273.2 ... 2093.2 K (B6 _h : ext. comp. 0 °C) (C6 _h : int. comp. 0 °C)	+20700	32766	23432	Overflow
	0 ... +18200	320 ... 27865	2732 ... 20932	Nominal range
	-1200	-1840	1532	Underflow
Type C: 0 ... +2315 °C 32 ... 2786.5 °F 273.2 ... 2093.2 K (B7 _h : ext. comp. 0 °C) (C7 _h : int. comp. 0 °C)	+25000	32766	23432	Overflow
	0 ... +23150	320 ... 27865	2732 ... 20932	Nominal range
	-1200	-1840	1532	Underflow
Type E: -270 ... +1000 °C -454 ... 1832 °F 0 ... 1273.2 K (B8 _h : ext. comp. 0 °C) (C8 _h : int. comp. 0 °C)	+12000	21920	14732	Overflow
	-2700 ... +10000	-4540 ... 18320	0 ... 12732	Nominal range
	-	-	-	Underflow
Type L: -200 ... +900 °C -328 ... 1652 °F 73.2 ... 1173.2 K (B9 _h : ext. comp. 0 °C) (C9 _h : int. comp. 0 °C)	+11500	21020	14232	Overflow
	-2000 ... +9000	-3280 ... 16520	732 ... 11732	Nominal range
	-	-	-	Underflow

10.7 Parameterising the counter

10.7.1 Rotary transducer signal evaluation

Depending on which edge of a channel is evaluated, the following pulse trains and the associated pulse multiplication can be realised.

Pulse trains	Description
Channel A	
Channel B	
Single evaluation	 There is a response to the falling edges of channel A. The number of pulses has not increased.
Double evaluation	 There is a response to the rising and the falling edges of channel A. The number of pulses has doubled and is symmetrical.
Four-fold evaluation	 The rising and the falling edges of channels A and B are evaluated. The number of pulses is quadrupled and is symmetrical.

10.7.2 One counter 32 bits, 24 V DC - EPM-S600

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter a differentiation between the internal gate (I-gate), hardware gate (HW gate), and software gate (SW gate) is made.</p> <ul style="list-style-type: none"> ● The I-gate is the AND logic operation of the software gate (SW gate) and the hardware gate (HW gate). ● The SW gate is controlled via your user program (status word in the output area). ● The HW gate is controlled via the digital gate input. <p>The following response can be parameterised:</p> <p>Cancelling gate function:After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function:After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Latch function	<p>If a positive edge occurs at the latch input, the current count value is stored in the latch register. The latch register is accessed via the input area. After a STOP-RUN transition, latch is always 0.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>



Further information can be found in the chapter "Product description".

Parameter data

Subindex	Name	Description/value	Lenze
01	Diagnostics *	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
02	Input frequency track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz	02 _h
03	Input frequency track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz 4 (04 _h): 30 kHz	02 _h
04	Input frequency latch	6 (06 _h): 10 kHz 7 (07 _h): 5 kHz 8 (08 _h): 2 kHz	02 _h
05	Input frequency gate	9 (09 _h): 1 kHz Other values are not permissible!	02 _h
06	Input frequency reset		00 _h
07	Reserved		
08	Alarm response *	Setting activates process alarm Bit 0: Proc. alarm HW gate open Bit 1: Proc. alarm HW gate closed Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bit 6: Proc. alarm latch value Bit 7: Reserved	80 _h
09	Counter function *	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = counting once, main counting direction forwards 000010 _b = counting once, main counting direction backwards 000100 _b = counting once, no main counting direction 001000 _b = counting periodically, main counting direction forwards 010000 _b = counting periodically, main counting direction backwards 100000 _b = counting periodically, no main counting direction Bits 7 ... 6: Reserved	40 _h
0A	Comparator *	Bit 2 ... 0: output switches (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 6 ... 4: Reset 000 _b = deactivated 001 _b = HIGH level 011 _b = rising edge 101 _b = rising edge, once Bit 7: Reserved	00 _h
0B	Signal evaluation *	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input	00 _h

Subindex	Name	Description/value	Lenze
		<p>"A/pulse")</p> <p>011_b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction")</p> <p>100_b = direction (pulse to "A/pulse" and direction to "B/direction")</p> <p>Bit 6 ... 3: hardware gate (HW gate)</p> <p>000_b = deactivated (counter starts by setting SW gate)</p> <p>001_b = activated (HIGH level at gate activates the HW gate. Counter starts if HW and SW gate are set.)</p> <p>Bit 7: Gate function (internal gate)</p> <p>0= abort (counting process starts again from loading value)</p> <p>1 = interrupt (counting process is continued with counter content)</p>	
0C	Final value	Upper limit of the counting range	00 _h
0D	Start value	Lower limit of the counting range	00 _h
0E	Hysteresis	<p>The hysteresis for instance serves to avoid frequent switching operations of the output and/or triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off.</p> <p>The hysteresis has an effect on the zero crossing, comparison, overflow/underflow.</p>	00 _h
0F	Pulse	<p>The pulse duration indicates for how long the output is to be set if the parameterised comparison criterion is reached or exceeded. The pulse duration can be specified in steps of 2.048 ms between 0 and 522.24 ms. If the pulse duration is = 0, the output is set until the comparison condition is no longer met.</p>	00 _h

* The values are adopted only after a state change from "pre-operational" to "operational"

10.7.3 Two counters 32 bits, 24 V DC - EPM-S601

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).</p> <p>The following response can be parameterised:</p> <p>Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>



Further information can be found in the chapter "Product description".

Parameter data

Subindex	Name	Description/value	Lenze
01	Diagnostics *	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02	Input frequency counter 1, track A	Filters for instance serve to filter signal peaks in the case of an unclean input signal. 0 (00 _h): 500 kHz	02 _h
03	Input frequency counter 1, track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz	02 _h
04	Input frequency counter 2, track A	4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
05	Input frequency counter 2, track B	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
06	Alarm response counter 1 *	Setting activates process alarm Bits 1 ... 0: reserved Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bits 7 ... 6: Reserved	00 _h
07	Counter function counter 1 *	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = once: forwards 000010 _b = once: backwards 000100 _b = once: no main counting direction 001000 _b = periodically: forwards 010000 _b = periodically: backwards 100000 _b = periodically: no main counting direction Bits 7 ... 6: Reserved	00 _h
08	Comparator counter 1 *	Bits 2 ... 0: Comparison bit is set (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
09	Signal evaluation counter 1 *	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 6 ... 3: Reserved Bit 7: Gate function (internal gate) 0 = abort (counting process starts again from loading value) 1 = interrupt (counting process is continued with counter content)	00 _h

Subindex	Name	Description/value	Lenze
0A	Set value counter 1	By specifying a set value, the counter can be loaded with the set value. With an edge 0-1 to COUNTERVAL_SET in the control word, the set value is adopted by the counter.	00 _h
0B	Final value counter 1	Upper limit of the counting range	00 _h
0C	Loading value counter 1	Lower limit of the counting range	00 _h
0D	Hysteresis counter 1	The hysteresis for instance serves to avoid frequent switching operations of the output and/or triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off. The hysteresis has an effect on the zero crossing, comparison, overflow/underflow.	00 _h
0E	Reserved		
0F	Alarm response counter 2 *	See counter 1	00 _h
10	Counter function counter 2 *	See counter 1	00 _h
11	Comparator counter 2 *	See counter 1	00 _h
12	Signal evaluation counter 2 *	See counter 1	00 _h
13	Set value counter 2	See counter 1	00 _h
14	Final value counter 2	See counter 1	00 _h
15	Loading value counter 2	See counter 1	00 _h
16	Hysteresis counter 2	See counter 1	00 _h

* The values are adopted only after a state change from "pre-operational" to "operational"

10.7.4 One counter 32 bits, 5 V DC - EPM-S602

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).</p> <p>The following response can be parameterised:</p> <p>Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>



Further information can be found in the chapter "Product description".

Parameter data

Subindex	Name	Description/value	Lenze
01	Diagnostics *	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02	Input frequency track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz 1 (01 _h): 300 kHz	02 _h
03	Input frequency track B	2 (02 _h): 100 kHz 3 (03 _h): 60 kHz 4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
04	Input frequency reset	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
05	Reserved		
06	Alarm response *	Setting activates process alarm Bits 1 ... 0: reserved Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bits 7 ... 6: Reserved	00 _h
07	Counter function *	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = once: forwards 000010 _b = once: backwards 000100 _b = once: no main counting direction 001000 _b = periodically: forwards 010000 _b = periodically: backwards 100000 _b = periodically: no main counting direction Bits 7 ... 6: Reserved	00 _h
08	Comparator *	Bits 2 ... 0: Comparison bit is set (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 6 ... 4: Reset 000 _b = deactivated 001 _b = HIGH level 011 _b = rising edge 101 _b = rising edge, once Bit 7: Reserved	00 _h

Subindex	Name	Description/value	Lenze
09	Signal evaluation *	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 6 ... 3: Reserved Bit 7: Gate function (internal gate) 0 = abort (counting process starts again from loading value) 1 = interrupt (counting process is continued with counter content)	00 _h
0A	Final value	Upper limit of the counting range	00 _h
0B	Start value	Lower limit of the counting range	00 _h
0C	Hysteresis		00 _h

* The values are adopted only after a state change from "pre-operational" to "operational"

10.7.5 Two counters 32 bits, 24 V DC - EPM-S603

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from 0 to the counting limit, then skips to the opposite counting limit and continues to count from there.

Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).



Further information can be found in the chapter "Product description".

Parameter data

Subindex	Name	Description/value	Lenze
01	Input frequency counter 1, track A	Filters for instance serve to filter signal peaks in the case of an unclean input signal. 0 (00 _h): 500 kHz	02 _h
02	Input frequency counter 1, track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz	02 _h
03	Input frequency counter 2, track A	4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
04	Input frequency counter 2, track B	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
05	Counting direction counter 1, track B *	Bits 2 ... 0: Reserved Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
06	Signal evaluation counter 1 *	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 7 ... 3: Reserved	00 _h
07	Counting direction counter 2, track B *	Bits 2 ... 0: Reserved Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
08	Signal evaluation counter 2 *	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 7 ... 3: Reserved	00 _h

* The values are adopted only after a state change from "pre-operational" to "operational"

10.8 Parameterising the encoder evaluation

10.8.1 SSI - EPM-S604



Further information can be found in the chapter "Product description".

Parameter data

Subindex	Name	Description/value	Lenze
01	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02	Dead time	The dead time, also called tbs (time between sends), defines the waiting time between two encoder values to be observed by the module so that the encoder is able to process its value. This data can be found in the data sheet for your encoder. HIGH LOW 00 _h 30 _h : 1 µs 00 _h 60 _h : 2 µs 00 _h C0 _h : 4 µs 01 _h 80 _h : 8 µs 03 _h 00 _h : 16 µs 06 _h 00 _h : 32 µs 09 _h 00 _h : 48 µs 0C _h 00 _h : 64 µs	0C00 _h
03	Baud rate	In the "Monitoring operation" mode, the baud rate is irrelevant. Enter the baud rate here. This corresponds to the clock frequency via which the connected encoder communicates. More information on this can be found in the data sheet for your encoder. HIGH LOW 00 _h 18 _h : 2 MHz 00 _h 20 _h : 1.5 MHz 00 _h 30 _h : 1 MHz 00 _h 60 _h : 500 kHz 00 _h C0 _h : 250 kHz 01 _h 80 _h : 125 kHz	0180 _h
04	Reserved		
05	Scaling	Depending on the encoder, further bits are transmitted in addition to the encoder value. Scaling serves to determine how many bits postponed to the encoder value will be removed by shifting the encoder value to the right. The encoder value is scaled by the module only after a gray-binary conversion. More information can be found in the data sheet for your encoder. Value range: 00 _h ... 0F _h = 0 bits ... 15 bits	00 _h

Subindex	Name	Description/value	Lenze
06	Bit length of encoder data	Enter the bit length of the encoder data here. Depending on the encoder, the encoder data consist of the current encoder value with subsequent bits. The total length has to be specified here. More information on this can be found in the data sheet for your encoder. 7 (07 _h) = "8 bits" 8 (08 _h) = "9 bits" 9 (09 _h) = "10 bits" 10 (0A _h) = "11 bits" 11 (0B _h) = "12 bits" 12 (0C _h) = "13 bits" 13 (0D _h) = "14 bits" 14 (0E _h) = "15 bits" 15 (0F _h) = "16 bits" 16 (10 _h) = "17 bits" 17 (11 _h) = "18 bits" 18 (12 _h) = "19 bits" 19 (13 _h) = "20 bits" 20 (14 _h) = "21 bits" 21 (15 _h) = "22 bits" 22 (16 _h) = "23 bits" 23 (17 _h) = "24 bits" 24 (18 _h) = "25 bits" 25 (19 _h) = "26 bits" 26 (1A _h) = "27 bits" 27 (1B _h) = "28 bits" 28 (1C _h) = "29 bits" 29 (1D _h) = "30 bits" 30 (1E _h) = "31 bits" 31 (1F _h) = "32 bits"	18 _h

Subindex	Name	Description/value	Lenze
07		<p>Bit 1 ... 0: Ready for operation During "Monitoring operation" the module serves to monitor the data exchange between an SSI master and an SSI encoder. It receives the cycle by the master and the data flow by the SSI encoder. In the "Master mode" operating mode the module provides a cycle to the encoder and receives data by the encoder. 01_b = monitoring operation 10_b = master mode</p> <p>Bit 2: Shifting direction Specify the orientation of the encoder data here. More information can be found in the data sheet for your encoder. Usually, the SSI encoder uses "MSB first". 0 = LSB first (LSB is transmitted first) 1 = MSB first (MSB is transmitted first)</p> <p>Bit 3: edge clock signal Here you can specify the edge type of the clock signal, in the case of which the encoder supplies data. Information on this can be found in the data sheet for your encoder. Usually the SSI encoders respond to rising edges. 0 = falling edge 1 = rising edge</p> <p>Bit 4: Coding In the "Binary code" setting, the provided encoder value remains unchanged. In the "Gray code" setting, the gray-coded value provided by the encoder is converted into a binary value. Only after this conversion, the received encoder value is scaled, if required. The Gray code is another form of representation of the binary code. It is based on the fact that two adjacent Gray numbers differ from each other in exactly one bit. If the Gray code is used, transmission errors can be easily detected, since adjacent characters must only differ from each other in one digit. Information on this can be found in the data sheet for your encoder. 0 = standard code 1 = Gray code</p> <p>Bits 7 ... 5: reserved</p>	1E _h
08	Reserved		
09	SSI function	<p>By enabling the SSI function the module starts with the cycle output and the evaluation of the encoder data. In the "monitor operation" mode, the module starts with the encoder evaluation. 0 (00_h) = inhibited 1 (01_h) = enabled</p>	00 _h

10.9 Time stamp parameterising**10.9.1 2 digital inputs with time stamp function - EPM-S207****Parameter data**

Subindex	Name	Description/value	Lenze
01	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	14 _h or 3C _h (fix)
02	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	00 _h (fix)
03	Input delay DI 0	00 _h = 1 μs 02 _h = 3 μs 04 _h = 10 μs 07 _h = 86 μs	02 _h
04	Input delay DI 1	09 _h = 342 μs 0C _h = 273 μs Other values are not permissible.	02 _h
05	Edge 0-1 an DI x	Time stamp entry on rising edge Bit 0: DI 0 (0: inhibit, 1 = enable) Bit 1: DI 1 (0: inhibit, 1 = enable) Bits 7 ... 2: Reserved	00 _h
06	Edge 1-0 at DI x	Time stamp entry on falling edge Bit 0: DI 0 (0: inhibit, 1 = enable) Bit 1: DI 1 (0: inhibit, 1 = enable) Bits 7 ... 2: Reserved	00 _h

10.9.2 2 digital outputs with time stamp function - EPM-S310**Parameter data**

Subindex	Name	Description/value	Lenze
01	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	14 _h or 3C _h (fix)
02	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	00 _h (fix)

10.10 Parameterising technology modules**10.10.1 2 digital outputs with PWM functionality - EPM-S620****Parameter data**

Subindex	Name	Description/value	Lenze
01	PWM 0: period	Set parameters here for the total time for pulse duration and pulse pause. The time should be selected as a factor for the 20.83 ns basis.	1F40 _h
02	PWM 1: period	Values below 25 µs are ignored. If the pulse duration is higher or equal to the period, the DO output is set permanently. Value range: 1200 ... 8388607 (25 µs ... approx. 175 ms)	1F40 _h

10.10.2 RS232 interface - EPM-S640

Parameter data

Parameter data - ASCII protocol			
Subindex	Name	Description/value	Lenze
01	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
02	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
03	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
04	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
05	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame			
06	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
07	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed.	00 _h
08	ZNA (LOW byte)	0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h

Parameter data - ASCII protocol			
Subindex	Name	Description/value	Lenze
Option 4 ... 5, ZVZ			
09	Character delay time (HIGH byte)	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram.	00 _h
0A	Character delay time (LOW byte)	If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	FA _h
Option 6, number of receive buffers			
0B	Number of receive buffers	Defines the number of receive buffers. As long as only one receive buffer is used and is assigned, no more data can be received. If up to 250 receive buffers are connected, the received data can be redirected to a still free receive buffer. 1 ... 255 (01 _h ... FF _h)	01 _h
Option 7 ... 12, reserved			
0C ... 11	Reserved		00 _h

Parameter data STX/ETX protocol			
Subindex	Name	Description/value	Lenze
01	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
02	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
03	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
04	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
05	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 02 _h : STX/ETX	02 _h
Option 1, character frame			
06	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
07	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed.	00 _h
08	ZNA (LOW byte)	0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h

Parameter data STX/ETX protocol			
Subindex	Name	Description/value	Lenze
Option 4 ... 5, TMO			
09	TMO (HIGH byte)	TMO serves to define the maximally permissible interval between two frames.	00 _h
0A	TMO (LOW byte)	0 ... 65535 [ms] (0000 _h ... FFFF _h)	FA _h
Option 6, number of start identifiers			
0B	No. of start identifiers	00 _h : 1 start identifier (2nd start identifier is ignored) 01 _h : 2 start identifiers	01 _h
Option 7, start identifier 1			
0C	Start identifier 1	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 8, start identifier 2			
0D	Start identifier 2	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 9, number of end identifiers			
0E	No. of end identifier	00 _h : 1 end identifier (2nd end identifier is ignored) 01 _h : 2 end identifiers	00 _h
Option 10, end identifier 1			
0F	End identifier 1	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 11, end identifier 2			
10	End identifier 2	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 12, reserved			
11	Reserved		00 _h

Parameter data 3964(R) protocol			
Subindex	Name	Description/value	Lenze
01	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
02	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
03	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
04	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
05	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 03 _h : 3964 04 _h : 3964R	03 _h
Option 1, character frame			
06	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2, ZNA (x 20 ms)			
07	ZNA	Time after request (ZNA) Waiting time observed until the next transmit request is processed. The ZNA is indicated as a factor in steps of 20 ms. 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h

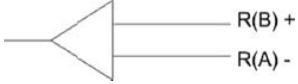
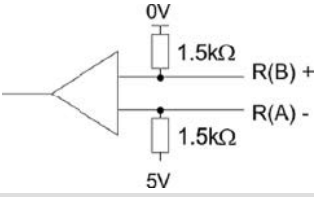
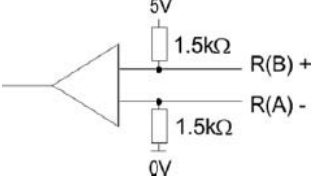
Parameter data 3964(R) protocol			
Subindex	Name	Description/value	Lenze
Option 3, ZVZ (x 20 ms)			
08	Character delay time	Character delay time (ZVZ) The ZVZ defines the maximum permissible time interval between two characters received within a telegram. The ZVZ is indicated as a factor in steps of 20 ms. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 255 [ms] (00 _h ... FF _h)	00 _h
Option 4, QVZ (x 20 ms)			
09	Acknowledgement time	Acknowledgement time (QVZ) The QVZ defines the max. permissible time interval until the partner is acknowledged while establishing/terminating a connection. The QVZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 5, BWZ (x 20 ms)			
0A	Block wait time	Block wait time (BWZ) The BWZ is the maximum time period between the confirmation of a request frame (DLE) and STX of the response frame. The BWZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	FA _h
Option 6, STX repetitions			
0B	STX repetitions	Maximum number of times the module attempts to establish a connection. 1 ... 255 [ms] (01 _h ... FF _h)	01 _h
Option 7, DBL			
0C	DBL	When exceeding the block wait time (BWZ) you can specify the maximum number of repetitions for the request frame using the DBL parameter. If these attempts fail, transmission is cancelled. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 8, priority			
0D	Priority	A communication partner has high priority if its sending attempt has precedence over the partner's transmit request. In the event of low priority, it must take second place behind the partner's transmit request. With 3964(R) the priorities of both partners must be different. The following settings are possible: 00 _h : LOW 01 _h : HIGH	00 _h
Option 9 ... 12, reserved			
0E ... 11	Reserved		00 _h

10.10.3 RS422/RS485 interface - EPM-S650

Parameter data

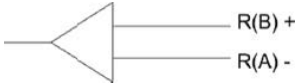
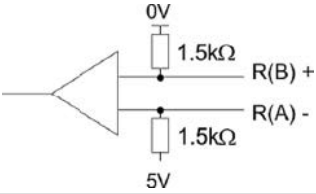
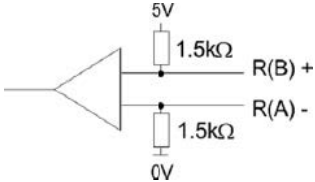
Parameter data - ASCII protocol			
Subindex	Name	Description/value	Lenze
01	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
02	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
03	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
04	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
05	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame			
06	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
07	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed.	00 _h
08	ZNA (LOW byte)	0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h

Parameter data - ASCII protocol			
Subindex	Name	Description/value	Lenze
Option 4 ... 5, ZVZ			
09	Character delay time (HIGH byte)	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram.	00 _h
0A	Character delay time (LOW byte)	If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h .. FFFF _h)	FA _h
Option 6, number of receive buffers			
0B	Number of receive buffers	Defines the number of receive buffers. As long as only one receive buffer is used and is assigned, no more data can be received. If up to 250 receive buffers are connected, the received data can be redirected to a still free receive buffer. 1 ... 255 (01 _h ... FF _h)	01 _h
Option 7 ... 12, reserved			
0C ... 11	Reserved		00 _h
Option 13, operating mode			
12	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment			
13	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	


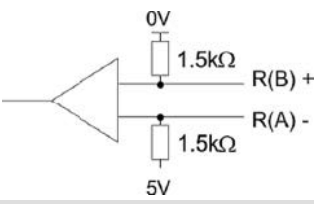
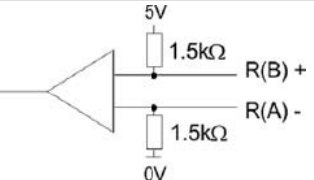
Parameter data STX/ETX protocol			
Subindex	Name	Description/value	Lenze
01	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
02	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
03	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
04	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
05	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 02 _h : STX/ETX	02 _h
Option 1, character frame			
06	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
07	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed.	00 _h
08	ZNA (LOW byte)	0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h

Parameter data STX/ETX protocol			
Subindex	Name	Description/value	Lenze
Option 4 ... 5, TMO			
09	TMO (HIGH byte)	TMO serves to define the maximally permissible interval between two frames.	00 _h
0A	TMO (LOW byte)	0 ... 65535 [ms] (0000 _h ... FFFF _h)	FA _h
Option 6, number of start identifiers			
0B	No. of start identifiers	00 _h : 1 start identifier (2nd start identifier is ignored) 01 _h : 2 start identifiers	01 _h
Option 7, start identifier 1			
0C	Start identifier 1	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 8, start identifier 2			
0D	Start identifier 2	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 9, number of end identifiers			
0E	No. of end identifier	00 _h : 1 end identifier (2nd end identifier is ignored) 01 _h : 2 end identifiers	00 _h
Option 10, end identifier 1			
0F	End identifier 1	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 11, end identifier 2			
10	End identifier 2	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 12, reserved			
11	Reserved		00 _h
Option 13, operating mode			
12	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment			
13	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

Parameter data STX/ETX protocol			
Subindex	Name	Description/value	Lenze
01	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
02	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
03	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
04	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
05	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 02 _h : STX/ETX	02 _h
Option 1, character frame			
06	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
07	ZNA (HIGH byte)	Time after request (ZNA)	00 _h
08	ZNA (LOW byte)	Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h

Parameter data STX/ETX protocol			
Subindex	Name	Description/value	Lenze
Option 4 ... 5, TMO			
09	TMO (HIGH byte)	TMO serves to define the maximally permissible interval between two frames.	00 _h
0A	TMO (LOW byte)	0 ... 65535 [ms] (0000 _h ... FFFF _h)	FA _h
Option 6, number of start identifiers			
0B	No. of start identifiers	00 _h : 1 start identifier (2nd start identifier is ignored) 01 _h : 2 start identifiers	01 _h
Option 7, start identifier 1			
0C	Start identifier 1	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 8, start identifier 2			
0D	Start identifier 2	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 9, number of end identifiers			
0E	No. of end identifier	00 _h : 1 end identifier (2nd end identifier is ignored) 01 _h : 2 end identifiers	00 _h
Option 10, end identifier 1			
0F	End identifier 1	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 11, end identifier 2			
10	End identifier 2	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 12, reserved			
11	Reserved		00 _h
Option 13, operating mode			
12	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment			
13	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

10 EtherCAT Kommunikation

Monitoring
Access to diagnostic data

10.11 Monitoring

In case of error, the digital and analog outputs are switched to the state FALSE or 0 V.
Exception: digital outputs with time stamp functionality retain the last set value.

10.12 Diagnostics

10.12.1 Access to diagnostic data

I/O compound modules capable of alarms automatically transmit process alarm and/or diagnostic alarm data via the emergency telegram, provided that the alarm is activated by the parameter setting. You can however also request diagnostic data via SDO.

Alarm status

The alarm status contains a counter for the process alarm and a counter for the diagnostic alarm for alarm signalling. These counters are input data for the EtherCAT slave and are transferred along with the process data.

Index	Subindex	Name	Type	Attr.	Default	Meaning
0xF100	0x00	Interrupt status	Unsigned8	ro	2	
	0x01	Hardware interrupt counter	Unsigned32	ro	0x00000000	Counter for process alarm
	0x02	Diagnostic interrupt counter	Unsigned32	ro	0x00000000	Counter for diagnostic alarm

When auto-acknowledge is deactivated for the EtherCAT bus coupler module, the corresponding counter is set to 1 until you acknowledge it. To do this, write any value to subindex 0x06 using the index assigned.

When auto-acknowledge is activated for the EtherCAT bus coupler module, here you will find the number of process and/or diagnostic alarms which have been triggered since the last alarm reset. To reset the corresponding counter, write any value to subindex 0x06 using the index assigned.

The following index assignment applies:

- ▶ Writing to subindex 0x06 of index 0x5000: resets counter for process alarms
- ▶ Writing to subindex 0x06 of index 0x5002: resets counter for diagnostic alarms

Process alarm data

If the alarm status indicates a process alarm, you have access to the current process alarm data via index 0x5000.

Index	Subindex	Name	Type	Attr.	Default	Meaning
0x5000	0x00	Hardware interrupt data	Unsigned8	ro	0x00	Current process alarm data
	0x01	Slot number	Unsigned8	ro	0x00	EtherCAT slot no. of module on which the alarm has occurred
	0x02	Diagnostic byte 1	Unsigned8	ro	0x00	Process alarm data (see tables below)
	0x03	Diagnostic byte 2	Unsigned8	ro	0x00	
	0x04	Diagnostic byte 3	Unsigned8	ro	0x00	
	0x05	Diagnostic byte 4	Unsigned8	ro	0x00	
	0x06	Acknowledge	Unsigned8	rw	0x00	Writing any value resets the diagnostic alarm counter and if necessary acknowledges the alarm

EPM-S404 - process alarm

Diagnostic byte	Bit 7 ... 0
1	Bit 0: Limit value exceeded channel 1 Bit 1: Limit value exceeded channel 2 Bit 7 ... 2: 0 (fixed)
2	Bit 0: Limit value not reached, channel 1 Bit 1: Limit value not reached, channel 2 Bit 7 ... 2: 0 (fixed)
3/4	Ticker value at the time of the alarm

EPM-S405 - process alarm

Diagnostic byte	Bit 7 ... 0
1	Bit 0: Limit exceedance channel 1 Bit 1: Limit exceedance channel 2 Bit 2: Limit exceedance channel 3 Bit 3: Limit exceedance channel 4 Bit 7 ... 4: 0 (fix)
2	Bit 0: Limit value underflow channel 1 Bit 1: Limit value underflow channel 2 Bit 2: Limit value underflow channel 3 Bit 3: Limit value underflow channel 4 Bit 7 ... 4: 0 (fix)
3/4	Ticker value at the time of the alarm

EPM-S406, EPM-S408 - process alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: Limit value exceeded channel 1 Bit 1: Limit value exceeded channel 2 Bit 7 ... 2: 0 (fixed)
2	Bit 0: Limit value not reached, channel 1 Bit 1: Limit value not reached, channel 2 Bit 7 ... 2: 0 (fixed)
3/4	μ s-ticker value at the time of the alarm The I/O compound module features an integrated 32-bit timer (μ s-ticker) which is started at switch-on and starts at 0 again after $23^2 - 1 \mu$ s. These two bytes represent the lower 2 bytes of the μ s-ticker ($0 \dots 2^{16} - 1$)

EPM-S600 - process alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: Hardware gate open Bit 1: Hardware gate closed Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 4: Latch value Bit 7 ... 5: 0 (fixed)
2	State of the inputs at the time of the alarm Bit 0: A/pulse Bit 1: B/direction Bit 2: Latch Bit 3: Hardware gate Bit 4: Reset Bit 7 ... 5: 0 (fixed)
3/4	Ticker value at the time of the alarm

EPM-S601, EPM-S602 - process alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: 0 Bit 1: 0 Bit 2: Counter 1, overflow/underflow/final value Bit 3: Counter 1, comparison value reached Bit 4: 0 Bit 5: 0 Bit 6: Counter 2, overflow/underflow/final value Bit 7: Counter 2, comparison value reached
2	State of the inputs at the time of the alarm Bit 0: Counter 1, A/pulse Bit 1: Counter 1, B/direction Bit 2: Counter 2, A/pulse Bit 3: Counter 2, B/direction Bit 7 ... 4: 0 (fix)
3/4	16 bit μ s value at the time of the alarm

Diagnostic data (bytes 1 ... 4)

If the alarm status indicates a diagnostic alarm, index 0x5002 provides access to the current diagnostic alarm data.

Index	Subindex	Name	Type	Attr.	Default	Meaning
0x5002	0x00	Diagnostic data	Unsigned8	ro	6	Current diagnostic data
	0x01	Slot number	Unsigned8	ro	0x00	EtherCAT slot no. of module on which the alarm has occurred
	0x02	Diagnostic byte 1	Unsigned8	ro	0x00	Diagnostic data (see tables below)
	0x03	Diagnostic byte 2	Unsigned8	ro	0x00	
	0x04	Diagnostic byte 3	Unsigned8	ro	0x00	
	0x05	Diagnostic byte 4	Unsigned8	ro	0x00	
	0x06	Acknowledge	Unsigned8	rw	0x00	Writing any value resets the diagnostic alarm counter and if necessary acknowledges the alarm

EPM-S404, EMP-S405 - diagnostic alarm

Diagnostic byte	Bits 7 ... 0
1	Bit 0: set if module fault Bit 1: set if internal error Bit 2: set if external error Bit 3: set if channel error available Bit 4: set if there is no external supply voltage Bit 6: 0 (fixed) Bit 7: set if parameterisation error
2	Bits 3 ... 0: module class, 0101 ₂ : analog module Bit 4: set if channel information available Bits 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bits 3 ... 0: 0 (fixed) Bit 4: set if internal communication error Bit 5: reserved Bit 6: set if process alarm lost Bit 7: 0 (fixed)

EPM-S600 - diagnostic alarm

Diagnostic byte	Bit 7 ... 0
1	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)

EPM-S601 - diagnostic alarm

Diagnostic byte	Bit 7 ... 0
1	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)

EPM-S602 diagnostic alarm

Diagnostic byte	Bits 7 ... 0
1	Bit 0: set if module fault Bit 1: set if internal error Bit 2: set if external error Bit 3: set if channel error exists Bit 4: set if there is no external voltage supply Bits 7 ... 5: 0 (fixed)
2	Bits 3 ... 0: module class, 1000 _b : function module Bit 4: set if channel information available Bits 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bits 5 ... 0: 0 (fixed) Bit 6: set if process alarm lost Bit 7: 0 (fixed)

EPM-S603 - diagnostic alarm

Diagnostic byte	Bit 7 ... 0
1	0 (fixed)
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	0 (fixed)

EPM-S604 - diagnostic alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of missing external supply voltage Bit 6 ... 5: 0 (fixed) Bit 7: Parameterisation error
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)

Diagnostic data (bytes 1 ... n)

This object gives you access to all a module's diagnostic data. You can either call up the current diagnostic data or a module's diagnostic data on any EtherCAT slot number.

Index	Subindex	Name	Type	Attr.	Default	Meaning
0x5005	0x00	Diagnostic data	Unsigned8	ro	18	
	0x01	Slot number	Unsigned8	rw	0	During read access, here you will find the EtherCAT slot no. of the module from which the following diagnostic data originates. By writing an EtherCAT slot no., you can query the diagnostic data of any module.
	0x02		Unsigned8	ro	0	Diagnostic alarm data (see module description)
	0x03		Unsigned8	ro	0	
	0x04		Unsigned8	ro	0	
	0x05		Unsigned8	ro	0	
	0x06		Unsigned8	ro	0	
	0x07		Unsigned8	ro	0	
	0x08		Unsigned8	ro	0	
	0x09		Unsigned8	ro	0	
	0x0A		Unsigned8	ro	0	
	0x0B		Unsigned8	ro	0	
	0x0C		Unsigned8	ro	0	
	0x0D		Unsigned8	ro	0	
	0x0E		Unsigned8	ro	0	
	0x0F		Unsigned8	ro	0	
	0x10		Unsigned8	ro	0	
	0x11		Unsigned8	ro	0	
	0x12		Unsigned32	ro	0	

EPM-S404, EMP-S405 - diagnostic alarm	
Diagnostic byte	Bits 7 ... 0
1	Bit 0: set if module fault Bit 1: set if internal error Bit 2: set if external error Bit 3: set if channel error available Bit 4: set if there is no external supply voltage Bit 6: 0 (fixed) Bit 7: set if parameterisation error
2	Bits 3 ... 0: module class, 0101 _b : analog module Bit 4: set if channel information available Bits 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bits 3 ... 0: 0 (fixed) Bit 4: set if internal communication error Bit 5: reserved Bit 6: set if process alarm lost Bit 7: 0 (fixed)
5	Bits 6 ... 0: channel type, 71 _h : analog input Bit 7: 0 (fixed)
6	Number of diagnostic bits output by the module per channel (here 08 _h)
7	Number of channels of a module (here 04 _h .)
8	Bit 0: channel error, channel group 0 Bit 1: channel error, group 1 Bits 7 ... 2: 0 (fixed)
9	Channel-specific error: channel 0: Bit 0: set if project planning/parameterising error Bits 3 ... 1: 0 (fixed) Bit 4: set if open circuit Bit 5: set if process alarm lost Bit 6: set if measuring range not reached Bit 7: set if measuring range exceeded
10	Channel-specific error: channel 1: Bit 0: set if project planning/parameterising error Bits 3 ... 1: 0 (fixed) Bit 4: set if open circuit Bit 5: set if process alarm lost Bit 6: set if measuring range not reached Bit 7: set if measuring range exceeded
11 ... 16	0 (fixed)

EPM-S600 - diagnostic alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
5	Bits 6 ... 0: channel type, 76h: counter module Bit 7: further channel types available, 0: no, 1: yes
6	Number of diagnostic bits output by the module per channel (here 08 _h)
7	Number of channels of a module (here 01 _h)
8	Bit 0: error in channel group 0 (counter) Bits 7 ... 1: 0 (fixed)
9	Diagnostic alarm due to process alarm lost to ... Bit 0: hardware gate open Bit 1: hardware gate closed Bit 2: overflow/underflow/final value Bit 3: comparison value reached Bit 4: latch value Bits 7 ... 5: 0 (fixed)
10 ... 16	0 (fixed)

EPM-S601 - diagnostic alarm	
Diagnostic byte	Bit 7 ... 0
1	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
5	Bit 6 ... 0: Channel type, 76 _h : Counter module Bit 7: Further channel types available, 0: no, 1: yes
6	Number of diagnostic bits output by the module per channel (here 08 _h)
7	Number of channels of a module (here 02 _h)
8	Bit 0: Error in channel group 0 (counter 1) Bit 1: Error in channel group 1 (counter 2) Bit 7 ... 2: 0 (fix)
9	Channel group 0: diagnostic alarm due to lost process alarm to ... Bits 1 ... 0: 0 (fixed) Bit 2: overflow/underflow/final value Bit 3: comparison value reached Bits 7 ... 4: 0 (fixed)
10	Channel group 1: diagnostic alarm due to lost process alarm to ... Bits 1 ... 0: 0 (fixed) Bit 2: overflow/underflow/final value Bit 3: comparison value reached Bits 7 ... 4: 0 (fixed)
11 ... 16	0 (fixed)

EPM-S602 diagnostic alarm	
Diagnostic byte	Bits 7 ... 0
1	Bit 0: set if module fault Bit 1: set if internal error Bit 2: set if external error Bit 3: set if channel error exists Bit 4: set if there is no external voltage supply Bits 7 ... 5: 0 (fixed)
2	Bits 3 ... 0: module class, 1000 _b : function module Bit 4: set if channel information available Bits 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bits 5 ... 0: 0 (fixed) Bit 6: set if process alarm lost Bit 7: 0 (fixed)
5	Bit 6 ... 0: Channel type, 76 _h : Counter module Bit 7: Further channel types available, 0: no, 1: yes
6	Number of diagnostic bits output by the module per channel (here 08 _h)
7	Number of channels of a module (here 02 _h)
8	Bit 0: Error in channel group 0 (counter 1) Bit 1: Error in channel group 1 (counter 2) Bit 7 ... 2: 0 (fix)
9	Channel group 0: diagnostic alarm due to lost process alarm to ... Bits 1 ... 0: 0 (fixed) Bit 2: overflow/underflow/final value Bit 3: comparison value reached Bits 7 ... 4: 0 (fixed)
10	Channel group 1: diagnostic alarm due to lost process alarm to ... Bits 1 ... 0: 0 (fixed) Bit 2: overflow/underflow/final value Bit 3: comparison value reached Bits 7 ... 4: 0 (fixed)
11 ... 16	0 (fixed)

EPM-S603 - diagnostic alarm	
Diagnostic byte	Bit 7 ... 0
1	0 (fixed)
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	0 (fixed)
5	Bits 6 ... 0: channel type, 76 _h : counter module Bit 7: further channel types available, 0: no, 1: yes
6	Number of diagnostic bits output by the module per channel (here 00 _h)
7	Number of channels of a module (here 02 _h)
8 ... 16	0 (fixed)

EPM-S604 - diagnostic alarm

Diagnostic byte	Bit 7 ... 0
1	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of missing external supply voltage Bit 6 ... 5: 0 (fixed) Bit 7: Parameterisation error
2	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
3	0 (fixed)
4	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
5	Bits 6 ... 0: channel type, 76h: counter module Bits 7: 0 (fixed)
6	Number of diagnostic bits output by the module per channel (here 08 _h)
7	Number of channels of a module (here 01 _h)
8	Bit 0: error in channel group 0
9 ... 16	0 (fixed)

10.12.2 Standard objects

The following indexes can be used for diagnostic purposes. They show operating states. Settings cannot be made.

Index	Designation	Possible settings		IMPORTANT
		Lenze	Selection	
0x1000 _h	Device type			Device type of the module Read only
0x1003 _h	Last error			Current error, the fault memory is cleared by a reset or power cycle. Read only
0	Last error			
1	Error code			Bus status
2	Module number			Module slot
3	Error description			Error code
0x1008 _h	Device name			Device name of the module Read only
0x1009 _h	Hardware Version			Hardware version of the module Read only
0x100A _h	Software version			Software version of the module Read only
0x100B _h	System version			Delivery status, depending on FPGA versions of bus coupler and modules, at least system version 2 Read only
0x1018 _h	Identity			General data of the EtherCAT bus coupler module Read only
0	Identity object			
1	Vendor ID			
2	Product code			
3	Revision number			
4	Serial number			
0x1600 _h ... 0x163F	Output mapping modules			
0	RxPDO Map			Number of outputs at this slot Entry only exists for slots with parameterisable modules
1	Output mapping			E.g.: 0x7000:01, 1 > the first output on slot 0 is 1 bit long
2	Output mapping			
...	...			

Index	Designation	Possible settings		IMPORTANT
		Lenze	Selection	
0x1A00 _h ... 0x1A3F	Input mapping modules			
0	TxPDO map			Number of inputs at this slot Entry only exists for slots with parameterisable modules
1	Input mapping			E.g.: 0x6000:01, 8 > the first output on slot 0 is 8 bits long
2	Input mapping			
...	...			
0x1AFF _h ... 0x1A3F	Input mapping coupler			Due to the system design, the mapping in the project planning tool must not be changed otherwise errors may arise in the process image!
0	Status PDO			Mapping for coupler's alarm counter
1	Input mapping			Mapping for process alarm counter
2	Input mapping			
...	...			Mapping for the diagnostic alarm counter
0x1C00 _h	Sync manager type			Use of the sync manager channels Read only
0	Sync manager type			
1	Subindex 01			Write mailbox from view of master
2	Subindex 02			Read mailbox from view of master
3	Subindex 03			Process input data from view of master
4	Subindex 04			Process output data from view of master
0x1C12 _h	RxPDO assign			Mapping of the digital output modules Read only
0	RxPDO assign			
1	Subindex 001			Output module at slot 1
...
32	Subindex 032			Output module at slot 32
0x1C13 _h	TxPDO assign			Mapping of the digital input modules Read only
0	TxPDO assign			
1	Subindex 001			Input module at slot 1
...
32	Subindex 032			Input module at slot 32

Index	Designation	Possible settings		IMPORTANT
		Lenze	Selection	
0x1C32 _h	SM output parameter			Read only
0	SM output parameter			
1	Sync mode			
2	Cycle time			
3	Shift time			
4	Sync modes supported			
5	Minimum cycle time			
6	Maximum shift time			
0x1C33 _h	SM input parameter			Read only
0	SM input parameter			
1	Sync mode			
2	Cycle time			
3	Shift time			
4	Sync modes supported			
5	Minimum cycle time			
6	Maximum shift time			
0x3000 _h	Parameter EtherCAT coupler			
0	Coupler parameter			
1	Auto-acknowledge			<p>States how the EtherCAT coupler is to respond to alarms.</p> <ul style="list-style-type: none"> • When auto-acknowledge = 0, you are responsible for acknowledgement. You are therefore informed of every alarm. If an alarm is not acknowledged, other alarms are inhibited. • When auto-acknowledge = 1, each alarm is automatically acknowledged by the EtherCAT coupler. In this mode, diagnostic data is overwritten by new alarms. Auto-acknowledge = 1 by default. Auto-acknowledge should be activated for continuous use.

Index	Designation	Possible settings		IMPORTANT	
		Lenze	Selection		
0x3100 _h ... 0x313F _h	Parameter EtherCAT coupler			<p>This object provides access to the parameters of an I/O compound module. The EtherCAT slot is addressed via the index. Subindexes provide access to the corresponding parameter. The respective module description contains the subindex assignment.</p> <p>Again here, power and terminal modules are not detected by the EtherCAT coupler and are therefore not taken into account when listing and/or assigning slots.</p>	
0	Parameter				Number of parameters
1	Param				Module parameter data
2	Param				
...	...				
0x4000 _h	Clear IO counter			Writing any value to the corresponding subindex clears the counter	
0	Clear master counter				
1	Clear module counter				
0x4001 _h					
0	Master counter				
1	Expected length error				
2	Timeout error				
3	Stop bit error				
4	FCS error				
5	Telegram length error				
6	Telegram type error				
7	Alarm retry error				
8	Bus idle time error				
9	Wrong node address				
A	Telegram valid				
B	Master load				
0x4002 _h					
0	Module MDL counter				
1	Slot 1				
2	Slot 2				
...	...				
40	Slot 64				
0x4003 _h					
0	Module NDL counter				
1	Slot 1				

Index	Designation	Possible settings		IMPORTANT
		Lenze	Selection	
2	Slot 2			
...	...			
40	Slot 64			
0x4100 _h				
0	System version			Version details of coupler components
1	Master FPGA			FPGA version
2	I/O bus			Backplane bus version
3	Firmware package			Version package
4	Mx file			Name and version of coupler's Mx file
0x4101 _h				
0	Module FPGA version			FPGA versions of modules
1	Slot 1			EtherCAT slot
2	Slot 1			
...	...			
64	Slot 64			
0x4102 _h				
0	Module firmware version			Firmware versions of modules
1	Slot 1			EtherCAT slot
2	Slot 1			
...	...			
64	Slot 64			
0x4103 _h				
0	Module serial number			Serial numbers of modules
1	Slot 1			EtherCAT slot
2	Slot 1			
...	...			
64	Slot 64			
0x5000 _h				
				If object 0xF100 indicates that a process alarm has occurred, you can access the current process alarm data here. The corresponding module description contains the process alarm data assignment.
0	Hardware interrupt data			Current process alarm data
1	Slot number			EtherCAT slot no. of module on which the alarm has occurred
2	Hardware interrupt data 00			Process alarm data
3	Hardware interrupt data 01			
4	Hardware interrupt data 02			

Index	Designation	Possible settings		IMPORTANT
		Lenze	Selection	
5	Hardware interrupt data 03			
6	Acknowledge			<p>Writing any value resets the process alarm counter and if necessary acknowledges the alarm</p> <p>If auto-acknowledge is deactivated for the EtherCAT coupler, you can reset the hardware interrupt counter of object 0xF100 and acknowledge the process alarm by writing any value to subindex 0x06 of index 0x5000.</p>

10.12.3 Storage of the PDOs

Index	Description
0x6000	Input PDO (1. slot)
0x6001	Input PDO (2. slot)
...	...
0x601F	Input PDO (32. slot)
0x7000	Output PDO (1. slot)
0x7001	Output PDO (1. slot)
...	...
0x701F	Output PDO (32. slot)

10.12.4 Emergency telegram

Emergency telegrams can only be sent by modules which support alarm functions such as "process alarm" or "diagnostic alarm". These are EPM-S404, EPM-S405, EPM-S406, EPM-S408 and the counter modules EPM-S6xx.

Emergency messages are triggered in the context of device-internal mechanisms and are reported to the master via the mailbox service of EtherCAT.

If a state change of an EtherCAT gateway cannot be carried out, this fact is reported by the corresponding emergency message.

For a more detailed error description the EtherCAT master reads out the AL status code (AL = application layer). It is in the EtherCAT coupler in register '0x0134'.

An emergency message has the following structure:

Byte							
0	1	2	3	4	5	6	7
Emergency Error		State	Slot	Type	Code		Reserved
Emergency Error State		Lenze = 0xFF00 1: Init 2: Pre-Operational 3: Save-Operational 4: Operational					
Slot Type		Slot of the module which has reported the error. 1: Process alarm 2: Diagnostic alarm					
Code		Error code which is described with the corresponding module.					

In the »PLC Designer« the emergency messages are displayed as raw data and entered into the logbook. Within this telegram, the reported error is entered as a 5-digit hex value from the information "data:" on. The structure of the hex value corresponds to bytes 3 ... 7 in the above table.

Example of an error message

07174 2013-06-04 10:12:04 _02M6D601 (1008): CoE emergency request.
id=0x0, len=8, ErrCode=0x0, ErrReg=0x8, data: 0x5 0x2 0x0 0x15 0x0.

Error information "data":

- ▶ Slot: 5
- ▶ Type: diagnostic alarm
- ▶ Code: error message '0x0015' (Invalid mailbox configuration)

10.12.5 EtherCAT-specific error codes

Code	Description	Current State	Resulting State
0x0000	No error	Any	Current state
0x0001	Unspecified error	Any	Any + E
0x0002	No Memory	Any	Any + E
0x0011	Invalid requested state change	I → S, I → O, P → O, O → B, S → B, P → B	Current state + E
0x0012	Unknown requested state	Any	Current state + E
0x0013	Bootstrap not supported	I → B	I + E
0x0014	No valid firmware	I → P	I + E
0x0015	Invalid mailbox configuration	I → B	I + E
0x0016	Invalid mailbox configuration	I → P	I + E
0x0017	Invalid SyncManager configuration	P → S, S → O	Current state + E
0x0018	No valid inputs available	O, S → O	S + E
0x0019	No valid outputs	O, S → O	S + E
0x001A	Synchronization error	O, S → O	S + E
0x001B	SyncManager watchdog	O, S	S + E
0x001C	Invalid SyncManager Types	O, S, P → S	S + E
0x001D	Invalid Output Configuration	O, S, P → S	S + E
0x001E	Invalid Input Configuration	O, S, P → S	P + E
0x001F	Invalid Watchdog Configuration	O, S, P → S	P + E
0x0020	Coupler needs cold start	Any	Current state + E
0x0021	Coupler needs INIT	B, P, S, O	Current state + E
0x0022	Coupler needs PREOP	S, O	S + E, O + E
0x0023	Coupler needs SAFEOP	O	O + E
0x0024	Invalid Input Mapping	P → S	0x0019
0x0025	Invalid Output Mapping	P → S	P + E
0x0026	Inconsistent Settings	P → S	P + E
0x0027	Free-run not supported	P → S	P + E
0x0028	Synchronization not supported	P → S	P + E
0x0029	Free-run needs 3 Buffer Mode	P → S	P + E
0x002A	Background Watchdog	S, O	P + E
0x002B	No Valid Inputs and Outputs	O, S → O	S + E
0x002C	Fatal Sync Error	O	S + E
0x002D	No Sync Error	S → O	S + E
0x0030	Invalid DC SYNC Configuration	O, S → O, P → S	P + E, S + E
0x0031	Invalid DC Latch Configuration	O, S → O, P → S	P + E, S + E
0x0032	PLL Error	O, S → O	S + E
0x0033	DC Sync IO Error	O, S → O	S + E

Code	Description	Current State	Resulting State
0x0034	DC Sync Timeout Error	O, S → O	S + E
0x0035	DC Invalid Sync Cycle Time	P → S	P + E
0x0036	DC Sync0 Cycle Time	P → S	P + E
0x0037	DC Sync1 Cycle Time	P → S	P + E
0x0041	MBX_AOE	B, P, S, O	Current state + E
0x0042	MBX_EOE	B, P, S, O	Current state + E
0x0043	MBX_COE	B, P, S, O	Current state + E
0x0044	MBX_FOE	B, P, S, O	Current state + E
0x0045	MBX_SOE	B, P, S, O	Current state + E
0x004F	MBX_VOE	B, P, S, O	Current state + E
0x0050	EEPROM No Access	Any	Any + E
0x0051	EEPROM Error	Any	Any + E
0x0060	Coupler Restarted Locally	Any	I
< x8000	Reserved		

10.12.6

Manufacturer-specific error codes

Code	Description	Current State	Resulting State
0x8000	no module recognized or present	I	I + E
0x8001	Module at system bus needs update	P > S	P + E
0x8002	Init error	P > S	PO + E
0x8003	unexpected restart (Watchdog)	P > S	PO + E

I: Init
 P: Pre-Operational
 S: Safe-Operational
 O: Operational
 B: Bootstrap
 E: Error

10.12.7 SDO error codes

Using the SDO service and the object index you can access all parameters of the EtherCATSlave.

If an SDO request receives a negative evaluation, the corresponding error code is output in the Abort SDO Transfer Protocol. The following table shows the possible error codes:

Code	Description
0x05030000	Toggle bit not alternated
0x05040000	SDO protocol timed out
0x05040001	Client/server command specifier not valid or unknown
0x05040002	Invalid block size (block mode only)
0x05040003	Invalid sequence number (block mode only)
0x05040004	CRC error (block mode only)
0x05040005	Out of memory
0x06010000	Unsupported access to an object
0x06010001	Attempt to read a write only object
0x06010002	Attempt to write a read only object
0x06020000	Object does not exist in the object dictionary
0x06040041	Object cannot be mapped to the PDO
0x06040042	The number and length of the objects to be mapped would exceed PDO length
0x06040043	General parameter incompatibility reason
0x06040047	General internal incompatibility in the device
0x06060000	Access failed due to a hardware error
0x06070010	Data type does not match, length of service parameter does not match
0x06070012	Data type does not match, length of service parameter too high
0x06070013	Data type does not match, length of service parameter too low
0x06090011	Sub-index does not exist
0x06090030	Value range of parameter exceeded (only for write access)
0x06090031	Value of parameter written too high
0x06090032	Value of parameter written too low
0x06090036	Maximum value is less than minimum value
0x08000000	General error
0x08000020	Data cannot be transferred or stored to the application
0x08000021	Data cannot be transferred or stored to the application because of local control
0x08000022	Data cannot be transferred or stored to the application because of the present device state
0x08000023	Object directory dynamic generation fails or no object directory is present (e.g. object directory is generated from file and generation fails because of a file error)

11 DeviceNet communication

About DeviceNet

11 DeviceNet communication

11.1 About DeviceNet

DeviceNet is an open device net standard that satisfies the user profile for industrial real-time system applications. The DeviceNet protocol has an open specification that is the property of and administered by the independent vendor organization "Open DeviceNet Vendor Association" ODVA. This is where standardised device profiles are created to provide compatibility and exchangeability on logical level for simple devices of the same type.

In contrast to the classical source–destination model, DeviceNet uses a modern producer/consumer model that requires data packets with identifier fields for the identification of the data. This approach caters for multiple priority levels, efficient transfers of I/O data and multiple consumers for the data.

A device that has data to send produces the data on the network together with an identifier. All devices requiring data listen for messages. When devices recognize a suitable identifier, they act and consume the respective data.

DeviceNet carries two types of messages:

► I/O messages

Messages that are subject to critical timing constraints and contain data for control purposes that can be exchanged by means of single or multiple connections and that employ identifiers with a high priority.

► Explicit messages

These are used to establish multi-purpose point-to-point communication paths between two devices, which are used for the configuration of network couplers and for diagnostic purposes. These functions usually employ identifiers of a low priority.

Messages that are longer than 8 bytes are subject to the fragmentation service. A set of rules for master/slave, peer-to-peer- and multi-master connections is also available.

Transmission medium

DeviceNet employs a screened five-core cable as data communication medium. DeviceNet uses voltage differences and for this reason it exhibits less sensitivity to interference than a voltage or current based interface.

Signals and power supply conductors are included in the same network cable. It is therefore possible to connect devices that obtain the operating voltage via the network as well as devices with an integrated power supply. Furthermore it is possible to connect redundant power supplies to the network that guarantees the power supply when required.

DeviceNet employs a master line/tap line topology with up to 64 network nodes. The maximum distance is either 500m at a rate of 125kbit/s, 250m at a rate of 250kbit/s or 100m at a rate of 500kbit/s.

The length of the tap lines can be up to 6m while the total length of all tap lines depends on the baud rate.

Network nodes can be removed from or inserted into the network without interruption of the network operation. New and failed stations are detected automatically.

Bus access method

DeviceNet operates according to the Carrier-Sense Multiple Access (CSMA) principle, i.e. every station on the network may access the bus when it is not occupied (random access).

The exchange of messages is message orientated and not station orientated.

Each message is provided with a unique and prioritising identifier. At any time only one station is able to occupy the bus with its messages.

The DeviceNet bus access control is subject to non-destructive, bit-wise arbitration. In this case non-destructive means that the successful station participating in the arbitration does not need to re-send its message. The most important station is selected automatically when multiple stations access the bus simultaneously. If a station that is ready to send recognises that the bus is occupied, its send request is delayed until the current transfer has been completed.

Addressing

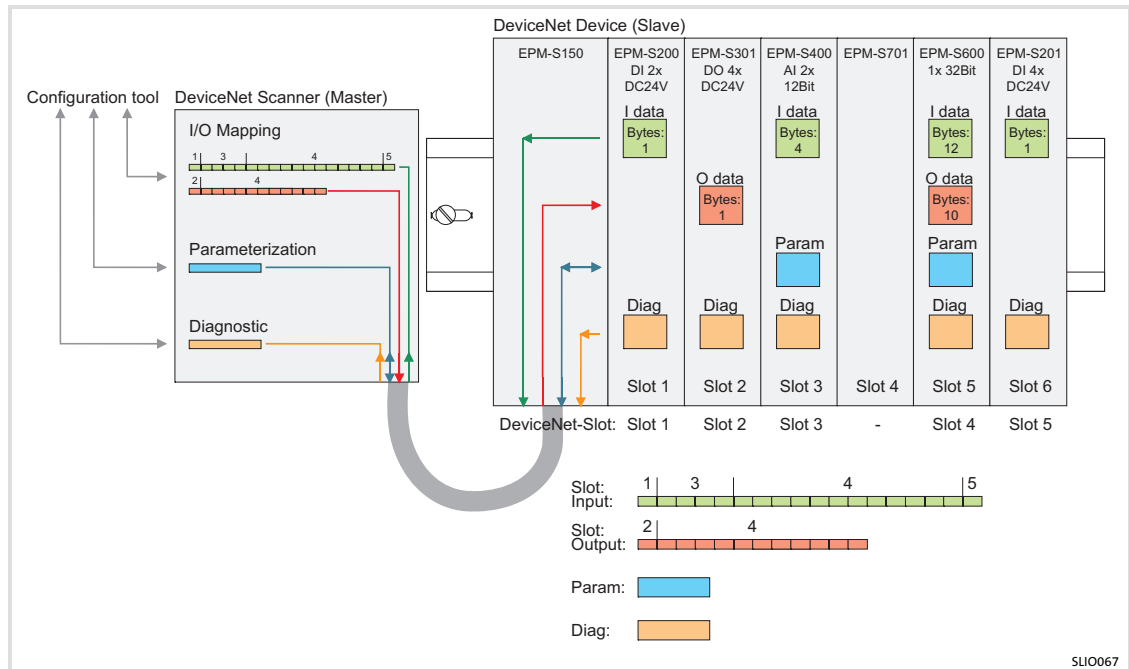
All stations on the bus must be uniquely identified by means of an ID address. Every DeviceNet device has addressing facilities.

11 DeviceNet communication

Access to the I/O system 1000

11.2 Access to the I/O system 1000

The following figure shows the access to the areas "I/O", "Parameters" and "Diagnostics" under DeviceNet.



Note!

Please note that the supply and terminal modules do not have any type identification and thus cannot be recognised by the DeviceNet bus coupler. In the following, slots within the DeviceNet are called DeviceNet slots. Counting always starts at 1.

EDS file (Electronic Data Sheet)

For the DeviceNet bus coupler module EPM-S150, the EDS file "Lenze-EPM-S150_64_10.eds" is available in the download area of www.Lenze.de. Install this EDS file in your project planning tool. More information on how to install the EDS file can be found in the manual of your project planning tool.

11.2.1 Access to the I/O area

The DeviceNet bus coupler automatically detects the I/O compound modules plugged at the backplane bus and generates the number of the input and output bytes. (Supply and potential distributor modules are not considered.)

When the DeviceNet scanner is configured, the respective total length of the input or output data must be indicated. Information on I/O assignment of a module can be found in the "Product description" chapter in the prevailing descriptions of the I/O compound modules.

The position (offset) of the input and output bytes within the input and output data results from the sequence of the modules (DeviceNet slot 1 ... 64). Use the basic address set for the bus coupler in the DeviceNet scanner to access the input or output data via the corresponding offset.

During operation, the DeviceNet bus coupler cyclically reads the input data of the peripheral modules and always provides the current state for the DeviceNet scanner. Output data, the DeviceNet bus coupler has directly received by the DeviceNet scanner will be directly forwarded to the modules as soon as they have been received via DeviceNet.

Configure DeviceNet scanner (master)

- ▶ Switch off the voltage supply of the DeviceNet bus coupler and set the baud rate and the DeviceNet address (📖 54).
- ▶ Start your configuration tool for the DeviceNet scanner.
- ▶ Set the "POLL IO" connection type in the DeviceNet scanner.
- ▶ Enter the number of input and output data:
 - Number of input data: Produced connection size
 - Number of output data: Consumed connection size
- ▶ Enter a basic address for the input and output data (mapping).
- ▶ Activate the DeviceNet bus coupler EPM-S150 in the scan list.
- ▶ Start the DeviceNet scanner.

After the DeviceNet scanner has been configured, the input and output modules can be triggered under the configured addresses.

11 DeviceNet communication

Access to the I/O system 1000

Access to parameter data

11.2.2 Access to parameter data

Your configuration tool also enables you to parameterise your I/O compound modules. For this purpose, the DeviceNet bus coupler must be located actively at the bus.

Your configuration tool serves to parameterise your modules in string form via the corresponding DeviceNet slot. you can also transfer the current parameters from the modules to the configuration tool, adapt and rewrite them.

Rules for parameter setting

- ▶ Each DeviceNet must be parameterised with a string.
- ▶ Within the string, each parameter consists of a type with attached value.
- ▶ The parameters must be separated by a space.
- ▶ Only parameters written in small letters are supported.

Depending on the type, you can indicate hexadecimal, decimal or binary values as parameters:

Type	Meaning	Value as	Example string
x	1 byte	Hexadecimal	xhh
2x	2 bytes	Hexadecimal	2xhhhh
4x	4 bytes	Hexadecimal	4xhhhhhhh
+	1 byte	decimal positive	+ddd
2+	2 bytes	decimal positive	2+dddd
4+	4 bytes	decimal positive	4+ddddddddd
-	1 byte	decimal negative	-ddd
2-	2 bytes	decimal negative	2-ddddd
4-	4 bytes	decimal negative	4-ddddddd
b	1 byte	Binary	xbbbbbbb

Example: The I/O compound module EPM-S405 has 18 bytes of parameter data. For parameterisation with the default values, the following string occurs:

x00 x00 x00 x00 x00 x02 xC1 x02 2x7FFF 2x8000 xC1 x02 2x7FFF 2x8000



Note!

If the parameter data does not match the hardware structure, the DeviceNet bus coupler changes to an error status and signals it via its status LEDs (📖 54).

Modules that have not yet been parameterised will be automatically supplied with their default values as soon as a read access from the configuration tool is executed.

11.2.3 Access to diagnostic data

The DeviceNet bus coupler exclusively supports passive diagnostics, i.e. no alarm activation on the module side is required for diagnostics. You have to request the diagnostics by yourself.

For this purpose, go to your configuration tool and select the diagnostic data of the corresponding DeviceNet slot. All diagnostic data of the module will be displayed as byte sequence.

DeviceNet bus coupler

Class code: 100 (64_h)

No.	Name	Information	Format	Example
1	DeviceName	Device name	String	EPM-S150
2	HwVersion	HW output version	String	02
3	SwVersion	SW output version	String	V101
4	SerialNumber	Serial number	Unsigned16, String	00000205
5	FpgaVersion	FPGA version	Unsigned16, String	V208
6	MxFile	Mx file	String	MX000053.101
7	ProductVersion	Product version	String	01V01.00
8	OrderCode	Order no.	String	(8-digit Lenze material number)

I/O compound module

Class code:

Slot 1: 101 (65_h)

Slot 2: 102 (66_h)

...

Slot 64: 164 (A4_h)

No.	Name	Information	Format	Example
1	DeviceName	Device name	String	EPM-S403
2	HwVersion	HW output version	String	21
3	SwVersion	SW output version	String	V202
4	SerialNumber	Serial number	Unsigned32, String	00001143
5	FpgaVersion	FPGA version	Unsigned16, String	V208
6	MxFile	Mx file	String	MX000028.130
7	ProductVersion	Product version	String	01V31.001
8	OrderCode	Order no.	String	(8-digit Lenze material number)
20	Parameter	Parameter data	String	x00 x00 x31 x31 x31 x31
21	Diagnostics	Diagnostic data	String	x00 x15 x00 x00 x73 x08 x04 x00 x00 x00 x00 x00 x00 x00 x00 x00 4x000020EB

11 DeviceNet communication

Setting the parameters of analog I/O
2 analog inputs 0 ... 10 V (12 bits) - EPM-S400

11.3 Setting the parameters of analog I/O

11.3.1 2 analog inputs 0 ... 10 V (12 bits) - EPM-S400

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
2	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
Not possible, is limited to 0 V				Underflow	
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
Not possible, is limited to 0 V				Underflow	

11.3.2 4 analog inputs 0 ... 10 V (12 bits) - EPM-S401

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
2	Function channel 2		20 _h
3	Function channel 3		20 _h
4	Function channel 4		20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	U = D * 10 / 27648 D = 27648 * U / 10
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	U = D * 10 / 16384 D = 16384 * U / 10
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

11.3.3 2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
2	Function channel 2	49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	I = D * 20 / 27648 D = 27648 * I / 20
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
0 ... 20 mA (41 _h)	-3.52	-4864	ED00	Underflow	I = D * 20 / 16384 D = 16384 * I / 20
	25	20480	5000	Overflow	
	20	16384	4000	Nominal range	
	10	8192	2000		
4 ... 20 mA (30 _h)	0	0	0000	Underflow	I = D * 16 / 27648 + 4 D = 27648 * (I-4) / 16
	-4	-3277	F333	Underflow	
	22.81	32511	7EFF	Overflow	
	20	27648	6C00	Nominal range	
12	13824	3600			
4 ... 20 mA (40 _h)	4	0	0000	Nominal range	I = D * 16 / 16384 + 4 D = 16384 * (I-4) / 16
	1.19	-4864	ED00		
	24	20480	5000	Overflow	
	20	16384	4000	Nominal range	
12	8192	2000			
4 ... 20 mA (40 _h)	4	0	0000	Nominal range	I = D * 16 / 16384 + 4 D = 16384 * (I-4) / 16
	0.8	-3277	F333		

11.3.4 4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511	31 _h
2	Function channel 2	64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
3	Function channel 3	49 (31 _h): 0 ... 20 mA / -4864 ... 32511	31 _h
4	Function channel 4	65 (41 _h): 0 ... 20 mA / -3277 ... 20480	31 _h
		255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	I = D * 20 / 27648 D = 27648 * I / 20
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
0 ... 20 mA (41 _h)	-3.52	-4864	ED00	Underflow	I = D * 20 / 16384 D = 16384 * I / 20
	25	20480	5000	Overflow	
	20	16384	4000	Nominal range	
	10	8192	2000		
4 ... 20 mA (30 _h)	0	0	0000	Underflow	I = D * 16 / 27648 + 4 D = 27648 * (I-4) / 16
	-4	-3277	F333		
	22.81	32511	7EFF	Overflow	
	20	27648	6C00	Nominal range	
12	13824	3600			
4 ... 20 mA (40 _h)	4	0	0000	Underflow	I = D * 16 / 16384 + 4 D = 16384 * (I-4) / 16
	1.19	-4864	ED00		
	24	20480	5000	Overflow	
	20	16384	4000	Nominal range	
12	8192	2000			
4 ... 20 mA (40 _h)	4	0	0000	Underflow	I = D * 16 / 16384 + 4 D = 16384 * (I-4) / 16
	0.8	-3277	F333		

11.3.5 2 analog inputs -10 ... +10 V (16 bits) - EPM-S406

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Diagnostics	Bits 0 ... 5: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
2	Reserved	0	
3	Limit value monitoring	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 (0 = deactivated; 1 = activated) Bits 7 ... 2: Reserved	00 _h
4	Interference frequency suppression	Bit 1, 0: Channel 1 00: Deactivated 01: 60 Hz 10: 50 Hz Bit 3, 2: Channel 2 00: Deactivated 01: 60 Hz 10: 50 Hz Bits 7 ... 4: Reserved	00 _h
5	Function channel 1	12 (12 _h): -10 ... 10 V / -27648 ... 27648 _{dec} 34 (22 _h): -10 ... 10 V / -16384 ... 16384 _{dec} 16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
6	Reserved	0	
7	Upper limit value channel 1	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
8	Lower limit value channel 1	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h
9	Function channel 2	12 (12 _h): -10 ... 10 V / -27648 ... 27648 _{dec} 34 (22 _h): -10 ... 10 V / -16384 ... 16384 _{dec} 16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
10	Reserved	0	
11	Upper limit value channel 2	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
12	Lower limit value channel 2	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
-10 ... +10 V (12 _h)	11.76	32511	7EFF	Overflow	U = D * 10 / 27648 D = 27648 * U / 10
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	-5	-13824	CA00		
	-10	-27648	9400		
	-11.76	-32512	8100	Underflow	
-10 ... +10 V (22 _h)	12.5	20480	5000	Overflow	U = D * 10 / 16384 D = 16384 * U / 10
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	-5	-8192	E000		
	-10	-16384	C000		
	-12.5	-20480	B000	Underflow	
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	U = D * 10 / 27648 D = 27648 * U / 10
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	-1.76	-4864	ED00	Underflow	
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	U = D * 10 / 16384 D = 16384 * U / 10
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
		-2	-3277	F333	

11.3.6 2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Diagnostics	Bits 0 ... 5: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
2	Reserved	0	
3	Limit value monitoring	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 (0 = deactivated; 1 = activated) Bits 7 ... 2: Reserved	00 _h
4	Interference frequency suppression	Bit 1, 0: Channel 1 00: Deactivated 01: 60 Hz 10: 50 Hz Bit 3, 2: Channel 2 00: Deactivated 01: 60 Hz 10: 50 Hz Bits 7 ... 4: Reserved	00 _h
5	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480 49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	41 _h
6	Reserved	0	
7	Upper limit value channel 1	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
8	Lower limit value channel 1	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h
9	Function channel 2	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480 49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	41 _h
10	Reserved	0	
11	Upper limit value channel 2	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
12	Lower limit value channel 2	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

11.3.7 2 analog outputs 0 ... 10 V (12 bits) - EPM-S500

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Reserved	0	
2	Short-circuit detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
3	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
4	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Output area (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000	Underflow	
Not possible, is limited to 0 V				Underflow	
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000	Underflow	
Not possible, is limited to 0 V				Underflow	

11.3.8 4 analog outputs 0 ... 10 V (12 bits) - EPM-S501

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Reserved	0	
2	Short-circuit detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bit 2: Channel 3 Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
3	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
4	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec}	20 _h
5	Function channel 3	255 (FF _h): channel deactivated	20 _h
6	Function channel 4		20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Output area (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

11.3.9 2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Reserved	0	
2	Wire-breakage detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
3	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
4	Function channel 2	49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

11.3.10 4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Reserved	0	
2	Wire-breakage detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bit 2: Channel 3 Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
3	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511	31 _h
4	Function channel 2	64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
5	Function channel 3	49 (31 _h): 0 ... 20 mA / -4864 ... 32511	31 _h
6	Function channel 4	65 (41 _h): 0 ... 20 mA / -3277 ... 20480	31 _h
		255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

11 DeviceNet communication

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

11.4 Parameterising the temperature measurement

11.4.1 Four (two) analog inputs for resistance tests - EPM-S404



Note!

- ▶ Use parameter setting to deactivate unused inputs.
- ▶ If thermal detectors are connected in a 3-wire or 4-wire setup, channels 3 and/or 4 must be deactivated.
- ▶ The module does not provide any auxiliary supply for sensors.

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 0 ... 5: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
2	Wire-breakage detection	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) : Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
3	Limit value monitoring	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) : Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
4	Reserved		
5	Temperature system	Bit 0, 1: 00 _b = °C; 01 _b = °F; 10 _b = K Bits 2 ... 7: Reserved	00 _h
6	Interference frequency suppression	Bit 0, 1: 01 _b = 60 Hz; 10 _b = 50 Hz Bits 2 ... 7: Reserved	02 _h

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Pos. in string of digits	Name	Description/value	Lenze
Channel 1			
7	Function channel 1	Thermal detector: 80 (50 _h): PT100 2-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 81 (51 _h): PT1000 2-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 82 (52 _h): Ni100 2-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} 83 (53 _h): Ni1000 2-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} 88 (58 _h): PT100 3-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 89 (59 _h): PT1000 3-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 90 (5A _h): Ni100 3-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} 91 (5B _h): Ni1000 3-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} 96 (60 _h): PT100 4-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 97 (61 _h): PT1000 4-wire conductor -200°C ... +850°C / -2000 ... +8500 _{dec} 98 (62 _h): Ni100 4-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} 99 (63 _h): Ni1000 4-wire conductor -60°C ... +250°C / -600 ... +2500 _{dec} Resistor: 112 (70 _h): R 60-Ω2-wire conductor 0.00 ... +60.00 / 0 ... +32767 _{dec} 113 (71 _h): R 600-Ω2-wire conductor 0.00 ... +600.00 / 0 ... +32767 _{dec} 114 (72 _h): R 3000-Ω2-wire conductor 0.00 ... +3000.00 / 0 ... +32767 _{dec} 115 (73 _h): R 6000-Ω2-wire conductor 0.00 ... +6000.00 / 0 ... +32767 _{dec} 128 (80 _h): R 60-Ω4-wire conductor 0.00 ... +60.00 / 0 ... +32767 _{dec} 129 (81 _h): R 600-Ω4-wire conductor 0.00 ... +600.00 / 0 ... +32767 _{dec} 130 (82 _h): R 3000-Ω4-wire conductor 0.00 ... +3000.00 / 0 ... +32767 _{dec} 144 (90 _h): R 60-Ω2-wire conductor 0.00 ... +60.00 / 0 ... +6000 _{dec} 145 (91 _h): R 600-Ω2-wire conductor 0.00 ... +600.00 / 0 ... +6000 _{dec} 146 (92 _h): R 3000-Ω2-wire conductor 0.00 ... +3000.00 / 0 ... +30000 _{dec} 160 (A0 _h): R 60-Ω2-wire conductor 0.00 ... +60.00 / 0 ... +6000 _{dec} 161 (A1 _h): R 600-Ω2-wire conductor 0.00 ... +600.00 / 0 ... +6000 _{dec} 162 (A2 _h): R 3000-Ω2-wire conductor 0.00 ... +3000.00 / 0 ... +30000 _{dec} 255 (FF _h): channel deactivated	50 _h

Pos. in string of digits	Name	Description/value	Lenze
8	Conversion time channel 1	You can set the transformer speed as a function of the interference frequency suppression (see 0x3105/x) for each channel. 0 (00 _h): At 50 Hz: 324.1 ms/channel 16 bits; at 60 Hz: 270.5 ms/channel 16 bits 1 (01 _h): At 50 Hz: 164.2 ms/channel 16 bits; at 60 Hz: 137.2 ms/channel 16 bits 2 (02 _h): At 50 Hz: 84.2 ms/channel 16 bits; at 60 Hz: 70.5 ms/channel 16 bits 3 (03 _h): at 50 Hz: 44.1 ms/channel 16 bits; at 60 Hz: 37.2 ms/channel 16 bits 4 (04 _h): At 50 Hz: 24.2 ms/channel 16 bits; at 60 Hz: 20.5 ms/channel 16 bits 5 (05 _h): At 50 Hz: 14.2 ms/channel 16 bits; at 60 Hz: 12.2 ms/channel 16 bits 6 (06 _h): At 50 Hz: 9.2 ms/channel 16 bits; at 60 Hz: 8.0 ms/channel 16 bits 7 (07 _h): At 50 Hz: 6.6 ms/channel 15 bits; at 60 Hz: 5.9 ms/channel 15 bits 8 (08 _h): At 50 Hz: 4.2 ms/channel 13 bits; at 60 Hz: 3.8 ms/channel 13 bits	00 _h
9	Upper limit value channel 1	You can define an upper or lower limit value for each channel. For this you can only specify values from the nominal range, otherwise you'll receive a parameterisation error. By specification of 7FFF _h for the upper or 8000 _h for the lower limit value, the corresponding limit value is deactivated. If your measured value is outside a limit value and you have activated the limit value monitoring, a process alarm is triggered.	7FFF _h
10	Lower limit value channel 1		8000 _h
Channel 2			
11	Function channel 2	See channel 1	50 _h
12	Conversion time channel 2	See channel 1	00 _h
13	Upper limit value channel 2	See channel 1	7FFF _h
14	Lower limit value channel 2		8000 _h
Channel 3 (for two-wire conductor connections only)			
15	Function channel 3	See channel 1	50 _h
16	Conversion time channel 3	See channel 1	00 _h
17	Upper limit value channel 3	See channel 1	7FFF _h
18	Lower limit value channel 3		8000 _h

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Pos. in string of digits	Name	Description/value	Lenze
Channel 4 (for two-wire conductor connections only)			
19	Function channel 4	See channel 1	50 _h
20	Conversion time channel 4	See channel 1	00 _h
21	Upper limit value channel 4	See channel 1	7FFF _h
22	Lower limit value channel 4		8000 _h

Measuring range

Measuring range (Fct. no.)	Measured value	Signal range	Range
2-wire: PT100 (50 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
2-wire: PT1000 (51 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
2-wire: NI100 (52 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
2-wire: NI1000 (53 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
3-wire: PT100 (58 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
3-wire: PT1000 (59 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
3-wire: NI100 (5A _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
3-wire: NI1000 (5B _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
4-wire: PT100 (60 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
4-wire: PT1000 (61 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
4-wire: NI100 (62 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow

Measuring range (Fct. no.)	Measured value	Signal range	Range
4-wire: NI1000 (63 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
2-wire: 0 ... 60 Ω (70 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (71 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (72 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (78 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (79 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (7A _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (80 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (81 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (82 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767	Nominal range
	-	-	Underflow
2-wire: 0 ... 60 Ω (90 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (91 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (92 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (98 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (99 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Measuring range (Fct. no.)	Measured value	Signal range	Range
3-wire: 0 ... 3000 Ω (9A _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (A0 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (A1 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (A2 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 60 Ω (D0 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (D1 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (D2 _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (D8 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (D9 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (DA _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (E0 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (E1 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (E2 _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow

11.4.2 Two analog inputs for thermocouple measurement - EPM-S405

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
01	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 0 ... 5: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
02	Wire-breakage detection	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
03	Limit value monitoring	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
04	Reserved	0	
05	Temperature system	Bit 0, 1: 00 _b = °C; 10 _b = °F; 11 _b = K Bits 2 ... 7: Reserved	00 _h
06	Interference frequency suppression	Bit 0, 1: 01 _b = 60 Hz; 10 _b = 50 Hz Bits 2 ... 7: Reserved	02 _h
Channel 1			
07	Function channel 1	External temperature compensation: 176 (60 _h): type J, -210.0 ... +1200.0 °C / -2100 ... +12000 _{dec} 177 (61 _h): type K, -270.0 ... +1372.0 °C / -2700 ... +13720 _{dec} 178 (62 _h): type N -270.0 ... +1300.0 °C / -2700 ... +13000 _{dec} 179 (63 _h): type R, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 180 (64 _h): type S, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 181 (65 _h): type T, -270.0 ... +400.0 °C / -2700 ... +4000 _{dec} 182 (66 _h): type B, 0.0 ... +1820.0 °C / 0 ... +18200 _{dec} 183 (67 _h): type C, 0.0 ... +2315.0 °C / 0 ... +23150 _{dec} 184 (68 _h): type E, -270.0 ... +1000.0 °C / -2700 ... +10000 _{dec} 185 (69 _h): type L, -200.0 ... +900.0 °C / -2000 ... +9000 _{dec} Internal temperature compensation: 192 (C0 _h): type J, -210.0 ... +1200.0 °C / -2100 ... +12000 _{dec} 193 (C1 _h): type K, -270.0 ... +1372.0 °C / -2700 ... +13720 _{dec} 194 (C2 _h): type N -270.0 ... +1300.0 °C / -2700 ... +13000 _{dec} 195 (C3 _h): type R, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 196 (C4 _h): type S, -50.0 ... +1769.0 °C / -500 ... +17690 _{dec} 197 (C5 _h): type T, -270.0 ... +400.0 °C / -2700 ... +4000 _{dec} 198 (C6 _h): type B, 0.0 ... +1820.0 °C / 0 ... +18200 _{dec} 199 (C7 _h): type C, 0.0 ... +2315.0 °C / 0 ... +23150 _{dec} 200 (C8 _h): type E, -270.0 ... +1000.0 °C / -2700 ... +10000 _{dec} 201 (C9 _h): type L, -200.0 ... +900.0 °C / -2000 ... +9000 _{dec} 255 (FF _h): channel deactivated	C1 _h

Parameterising the temperature measurement Two analog inputs for thermocouple measurement - EPM-S405

Pos. in string of digits	Name	Description/value	Lenze
08	Conversion time channel 1	You can set the transformer speed as a function of the interference frequency suppression (see 0x3105/x) for each channel. 0 (00 _h): At 50 Hz: 324.1 ms/channel 16 bits; at 60 Hz: 270.5 ms/channel 16 bits 1 (01 _h): at 50 Hz: 164.2 ms/channel 16 bits; at 60 Hz: 137.2 ms/channel 16 bits 2 (02 _h): At 50 Hz: 84.2 ms/channel 16 bits; at 60 Hz: 70.5 ms/channel 16 bits 3 (03 _h): at 50 Hz: 44.1 ms/channel 16 bits; at 60 Hz: 37.2 ms/channel 16 bits 4 (04 _h): At 50 Hz: 24.2 ms/channel 16 bits; at 60 Hz: 20.5 ms/channel 16 bits 5 (05 _h): at 50 Hz: 14.2 ms/channel 16 bits; at 60 Hz: 12.2 ms/channel 16 bits 6 (06 _h): at 50 Hz: 9.2 ms/channel 16 bits; at 60 Hz: 8.0 ms/channel 16 bits 7 (07 _h): at 50 Hz: 6.6 ms/channel 15 bits; at 60 Hz: 5.9 ms/channel 15 bits 8 (08 _h): at 50 Hz: 4.2 ms/channel 13 bits; at 60 Hz: 3.8 ms/channel 13 bits	02 _h
09	Upper limit value channel 1	You can define an upper or lower limit value for each channel. For this you can only specify values from the nominal range, otherwise you'll receive a parameterisation error. By specification of 7FFF _h for the upper or 8000 _h for the lower limit value, the corresponding limit value is deactivated. If your measured value is outside a limit value and you have activated the limit value monitoring, a process alarm is triggered.	7FFF _h
0A	Lower limit value channel 1		8000 _h
Channel 2			
0B	Function channel 2	See channel 1	C1 _h
0C	Conversion time channel 2	See channel 1	02 _h
0D	Upper limit value channel 2	See channel 1	7FFF _h
0E	Lower limit value channel 2		8000 _h

Measuring range






Measuring range (Fct. no.)	Measured value			Range
	[°C]	[°F]	[K]	
Type J: -210 ... +1200 °C -346 ... 2192 °F 63.2 ... 1473.2 K (B0 _h : ext. comp. 0 °C) (C0 _h : int. comp. 0 °C)	+14500	26420	17232	Overflow
	-2100 ... +12000	-3460 ... +21920	632 ... 14732	Nominal range
	-	-	-	Underflow
Type K: -210 ... +1372 °C -454 ... 2501.6 °F 0 ... 1645.2 K (B1 _h : ext. comp. 0 °C) (C1 _h : int. comp. 0 °C)	+16220	29516	18952	Overflow
	-2700 ... +13720	-4540 ... 25016	0 ... 16452	Nominal range
	-	-	-	Underflow

Measuring range (Fct. no.)	Measured value			Range
	[°C]	[°F]	[K]	
Type N: -270 ... +1300 °C -454 ... 2372 °F 0 ... 1573.2 K (B2 _h : ext. comp. 0 °C) (C2 _h : int. comp. 0 °C)	+15500	28220	18232	Overflow
	-2700 ... +13000	-4540 ... 23720	0 ... 15732	Nominal range
	-	-	-	Underflow
Type R: -50 ... +1769 °C -58 ... 3216.2 °F 223.2 ... 2042.2 K (B3 _h : ext. comp. 0 °C) (C3 _h : int. comp. 0 °C)	+20190	32766	22922	Overflow
	-500 ... +17690	-580 ... 32162	2232 ... 20422	Nominal range
	-1700	-2740	1032	Underflow
Type S: -50 ... +1769 °C -58 ... 3216.2 °F 223.2 ... 2042.2 K (B4 _h : ext. comp. 0 °C) (C4 _h : int. comp. 0 °C)	+20190	32766	22922	Overflow
	-500 ... +17690	-580 ... 32162	2232 ... 20422	Nominal range
	-1700	-2740	1032	Underflow
Type T: -270 ... +440 °C -454 ... 752 °F 3.2 ... 673.2 K (B2 _h : ext. comp. 0 °C) (C2 _h : int. comp. 0 °C)	+5400	10040	8132	Overflow
	-2700 ... +4000	-4540 ... 7520	32 ... 6732	Nominal range
	-	-	-	Underflow
Type B: 0 ... +1820 °C 32 ... 2786.5 °F 273.2 ... 2093.2 K (B6 _h : ext. comp. 0 °C) (C6 _h : int. comp. 0 °C)	+20700	32766	23432	Overflow
	0 ... +18200	320 ... 27865	2732 ... 20932	Nominal range
	-1200	-1840	1532	Underflow
Type C: 0 ... +2315 °C 32 ... 2786.5 °F 273.2 ... 2093.2 K (B7 _h : ext. comp. 0 °C) (C7 _h : int. comp. 0 °C)	+25000	32766	23432	Overflow
	0 ... +23150	320 ... 27865	2732 ... 20932	Nominal range
	-1200	-1840	1532	Underflow
Type E: -270 ... +1000 °C -454 ... 1832 °F 0 ... 1273.2 K (B8 _h : ext. comp. 0 °C) (C8 _h : int. comp. 0 °C)	+12000	21920	14732	Overflow
	-2700 ... +10000	-4540 ... 18320	0 ... 12732	Nominal range
	-	-	-	Underflow
Type L: -200 ... +900 °C -328 ... 1652 °F 73.2 ... 1173.2 K (B9 _h : ext. comp. 0 °C) (C9 _h : int. comp. 0 °C)	+11500	21020	14232	Overflow
	-2000 ... +9000	-3280 ... 16520	732 ... 11732	Nominal range
	-	-	-	Underflow

11.5 Parameterising the counter

11.5.1 Rotary transducer signal evaluation

Depending on which edge of a channel is evaluated, the following pulse trains and the associated pulse multiplication can be realised.

Pulse trains	Description	
Channel A		
Channel B		
Single evaluation		There is a response to the falling edges of channel A. The number of pulses has not increased.
Double evaluation		There is a response to the rising and the falling edges of channel A. The number of pulses has doubled and is symmetrical.
Four-fold evaluation		The rising and the falling edges of channels A and B are evaluated. The number of pulses is quadrupled and is symmetrical.

11.5.2 One counter 32 bits, 24 V DC - EPM-S600

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	The main counting direction can be parameterised: None: The whole counting range is available. Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following. Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter a differentiation between the internal gate (I-gate), hardware gate (HW gate), and software gate (SW gate) is made. <ul style="list-style-type: none"> • The I-gate is the AND logic operation of the software gate (SW gate) and the hardware gate (HW gate). • The SW gate is controlled via your user program (status word in the output area). • The HW gate is controlled via the digital gate input. The following response can be parameterised: Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again. Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.
Latch function	If a positive edge occurs at the latch input, the current count value is stored in the latch register. The latch register is accessed via the input area. After a STOP-RUN transition, latch is always 0.
Comparator	You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.
Hysteresis	By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.
Process alarm	The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events: <ul style="list-style-type: none"> • Hardware gate open • Hardware gate closed • Counting limit - overflow • Counting limit - underflow • Comparison value reached • Final value reached • Latch value reached
Diagnostic alarm	If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.
Diagnostic function	Diagnostic functions are provided in the modules.
Diagnostic information	The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.



Further information can be found in the chapter "Product description".

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
2	Input frequency track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz	02 _h
3	Input frequency track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz 4 (04 _h): 30 kHz	02 _h
4	Input frequency latch	6 (06 _h): 10 kHz 7 (07 _h): 5 kHz 8 (08 _h): 2 kHz	02 _h
5	Input frequency gate	9 (09 _h): 1 kHz Other values are not permissible!	02 _h
6	Input frequency reset		00 _h
7	Reserved		
8	Alarm response	Setting activates process alarm Bit 0: Proc. alarm HW gate open Bit 1: Proc. alarm HW gate closed Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bit 6: Proc. alarm latch value Bit 7: Reserved	80 _h
9	Counter function	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = counting once, main counting direction forwards 000010 _b = counting once, main counting direction backwards 000100 _b = counting once, no main counting direction 001000 _b = counting periodically, main counting direction forwards 010000 _b = counting periodically, main counting direction backwards 100000 _b = counting periodically, no main counting direction Bits 7 ... 6: Reserved	40 _h
10	Comparator	Bit 2 ... 0: output switches (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 6 ... 4: Reset 000 _b = deactivated 001 _b = HIGH level 011 _b = rising edge 101 _b = rising edge, once Bit 7: Reserved	00 _h

Pos. in string of digits	Name	Description/value	Lenze
11	Signal evaluation	<p>Bits 2 ... 0: Signal evaluation</p> <p>000_b = counter deactivated (the other parameter details for the counter are ignored)</p> <p>001_b = single rotary transducer (connection to input "A/pulse")</p> <p>010_b = double rotary transducer (connection to input "A/pulse")</p> <p>011_b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction")</p> <p>100_b = direction (pulse to "A/pulse" and direction to "B/direction")</p> <p>Bit 6 ... 3: Hardware gate (HW gate)</p> <p>000_b = deactivated (counter starts by setting SW gate)</p> <p>001_b = activated (HIGH level at gate activates the HW gate. Counter starts if HW and SW gate are set.)</p> <p>Bit 7: Gate function (internal gate)</p> <p>0 = abort (counting process starts again from loading value)</p> <p>1 = interrupt (counting process is continued with counter content)</p>	00 _h
12	Final value	Upper limit of the counting range	00 _h
13	Start value	Lower limit of the counting range	00 _h
14	Hysteresis	<p>The hysteresis for instance serves to avoid frequent switching operations of the output and/or triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off.</p> <p>The hysteresis has an effect on the zero crossing, comparison, overflow/underflow.</p>	00 _h
15	Pulse	<p>The pulse duration indicates for how long the output is to be set if the parameterised comparison criterion is reached or exceeded. The pulse duration can be specified in steps of 2.048 ms between 0 and 522.24 ms. If the pulse duration is = 0, the output is set until the comparison condition is no longer met.</p>	00 _h

11.5.3 Two counters 32 bits, 24 V DC - EPM-S601

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).</p> <p>The following response can be parameterised:</p> <p>Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>



Further information can be found in the chapter "Product description".

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
2	Input frequency counter 1, track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz	02 _h
3	Input frequency counter 1, track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz	02 _h
4	Input frequency counter 2, track A	4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
5	Input frequency counter 2, track B	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
6	Alarm response counter 1	Setting activates process alarm Bits 1 ... 0: reserved Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bits 7 ... 6: Reserved	00 _h
7	Counter function counter 1	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = once: forwards 000010 _b = once: backwards 000100 _b = once: no main counting direction 001000 _b = periodically: forwards 010000 _b = periodically: backwards 100000 _b = periodically: no main counting direction Bits 7 ... 6: Reserved	00 _h
8	Comparator counter 1	Bits 2 ... 0: Comparison bit is set (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h

Pos. in string of digits	Name	Description/value	Lenze
9	Signal evaluation counter 1	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 6 ... 3: Reserved Bit 7: Gate function (internal gate) 0 = abort (counting process starts again from loading value) 1 = interrupt (counting process is continued with counter content)	00 _h
10	Set value counter 1	By specifying a set value, the counter can be loaded with the set value. With an edge 0-1 to COUNTERVAL_SET in the control word, the set value is adopted by the counter.	00 _h
11	Final value counter 1	Upper limit of the counting range	00 _h
12	Loading value counter 1	Lower limit of the counting range	00 _h
13	Hysteresis counter 1	The hysteresis for instance serves to avoid frequent switching operations of the output and/or triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off. The hysteresis has an effect on the zero crossing, comparison, overflow/underflow.	00 _h
14	Reserved		
15	Alarm response counter 2	See counter 1	00 _h
16	Counter function counter 2	See counter 1	00 _h
17	Comparator counter 2	See counter 1	00 _h
18	Signal evaluation counter 2	See counter 1	00 _h
19	Set value counter 2	See counter 1	00 _h
20	Final value counter 2	See counter 1	00 _h
21	Loading value counter 2	See counter 1	00 _h
22	Hysteresis counter 2	See counter 1	00 _h

11.5.4 One counter 32 bits, 5 V DC - EPM-S602

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	

Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	The main counting direction can be parameterised: None: The whole counting range is available. Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following. Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area). The following response can be parameterised: Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again. Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.
Comparator	You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.
Hysteresis	By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.
Process alarm	The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events: <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.
Diagnostic function	Diagnostic functions are provided in the modules.
Diagnostic information	The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.



Further information can be found in the chapter "Product description".

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
2	Input frequency track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz 1 (01 _h): 300 kHz 2 (02 _h): 100 kHz	02 _h
3	Input frequency track B	3 (03 _h): 60 kHz 4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
4	Input frequency reset	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
5	Reserved		
6	Alarm response	Setting activates process alarm Bits 1 ... 0: reserved Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bits 7 ... 6: Reserved	00 _h
7	Counter function	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = once: forwards 000010 _b = once: backwards 000100 _b = once: no main counting direction 001000 _b = periodically: forwards 010000 _b = periodically: backwards 100000 _b = periodically: no main counting direction Bits 7 ... 6: Reserved	00 _h
8	Comparator	Bits 2 ... 0: Comparison bit is set (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 6 ... 4: Reset 000 _b = deactivated 001 _b = HIGH level 011 _b = rising edge 101 _b = rising edge, once Bit 7: Reserved	00 _h

Pos. in string of digits	Name	Description/value	Lenze
9	Signal evaluation	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 6 ... 3: Reserved Bit 7: Gate function (internal gate) 0 = abort (counting process starts again from loading value) 1 = interrupt (counting process is continued with counter content)	00 _h
10	Final value	Upper limit of the counting range	00 _h
11	Start value	Lower limit of the counting range	00 _h
12	Hysteresis		00 _h

11.5.5 Two counters 32 bits, 24 V DC - EPM-S603

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from 0 to the counting limit, then skips to the opposite counting limit and continues to count from there.

Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).



Further information can be found in the chapter "Product description".

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Input frequency counter 1, track A	Filters for instance serve to filter signal peaks in the case of an unclean input signal. 0 (00 _h): 500 kHz	02 _h
2	Input frequency counter 1, track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz	02 _h
3	Input frequency counter 2, track A	4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
4	Input frequency counter 2, track B	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
5	Counting direction counter 1, track B	Bits 2 ... 0: Reserved Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
6	Signal evaluation counter 1	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 7 ... 3: Reserved	00 _h
7	Counting direction counter 2, track B	Bits 2 ... 0: Reserved Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
8	Signal evaluation counter 2	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 7 ... 3: Reserved	00 _h

11 DeviceNet communication

Parameterising the encoder evaluation

SSI - EPM-S604

11.6 Parameterising the encoder evaluation

11.6.1 SSI - EPM-S604



Further information can be found in the chapter "Product description".

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
2	Dead time	The dead time, also called tbs (time between sends), defines the waiting time between two encoder values to be observed by the module so that the encoder is able to process its value. This data can be found in the data sheet for your encoder. HIGH LOW 00 _h 30 _h : 1 μs 00 _h 60 _h : 2 μs 00 _h C0 _h : 4 μs 01 _h 80 _h : 8 μs 03 _h 00 _h : 16 μs 06 _h 00 _h : 32 μs 09 _h 00 _h : 48 μs 0C _h 00 _h : 64 μs	0C00 _h
3	Baud rate	In the "Monitoring operation" mode, the baud rate is irrelevant. Enter the baud rate here. This corresponds to the clock frequency via which the connected encoder communicates. More information on this can be found in the data sheet for your encoder. HIGH LOW 00 _h 18 _h : 2 MHz 00 _h 20 _h : 1.5 MHz 00 _h 30 _h : 1 MHz 00 _h 60 _h : 500 kHz 00 _h C0 _h : 250 kHz 01 _h 80 _h : 125 kHz	0180 _h
4	Reserved		
5	Scaling	Depending on the encoder, further bits are transmitted in addition to the encoder value. Scaling serves to determine how many bits postponed to the encoder value will be removed by shifting the encoder value to the right. The encoder value is scaled by the module only after a gray-binary conversion. More information can be found in the data sheet for your encoder. Value range: 00 _h ... 0F _h = 0 bits ... 15 bits	00 _h

Pos. in string of digits	Name	Description/value	Lenze
6	Bit length of encoder data	<p>Enter the bit length of the encoder data here. Depending on the encoder, the encoder data consist of the current encoder value with subsequent bits. The total length has to be specified here. More information on this can be found in the data sheet for your encoder.</p> <p>7 (07_h) = "8 bits" 8 (08_h) = "9 bits" 9 (09_h) = "10 bits" 10 (0A_h) = "11 bits" 11 (0B_h) = "12 bits" 12 (0C_h) = "13 bits" 13 (0D_h) = "14 bits" 14 (0E_h) = "15 bits" 15 (0F_h) = "16 bits" 16 (10_h) = "17 bits" 17 (11_h) = "18 bits" 18 (12_h) = "19 bits" 19 (13_h) = "20 bits" 20 (14_h) = "21 bits" 21 (15_h) = "22 bits" 22 (16_h) = "23 bits" 23 (17_h) = "24 bits" 24 (18_h) = "25 bits" 25 (19_h) = "26 bits" 26 (1A_h) = "27 bits" 27 (1B_h) = "28 bits" 28 (1C_h) = "29 bits" 29 (1D_h) = "30 bits" 30 (1E_h) = "31 bits" 31 (1F_h) = "32 bits"</p>	18 _h

Pos. in string of digits	Name	Description/value	Lenze
7		<p>Bit 1 ... 0: ready for operation During "Monitoring operation" the module serves to monitor the data exchange between an SSI master and an SSI encoder. It receives the cycle by the master and the data flow by the SSI encoder. In the "Master mode" operating mode the module provides a cycle to the encoder and receives data by the encoder. 01_b = monitoring operation 10_b = master mode</p> <p>Bit 2: shifting direction Specify the orientation of the encoder data here. More information can be found in the data sheet for your encoder. Usually, the SSI encoder uses "MSB first". 0 = LSB first (LSB is transmitted first) 1 = MSB first (MSB is transmitted first)</p> <p>Bit 3: edge clock signal Here you can specify the edge type of the clock signal, in the case of which the encoder supplies data. Information on this can be found in the data sheet for your encoder. Usually the SSI encoders respond to rising edges. 0 = falling edge 1 = rising edge</p> <p>Bit 4: coding In the "Binary code" setting, the provided encoder value remains unchanged. In the "Gray code" setting, the gray-coded value provided by the encoder is converted into a binary value. Only after this conversion, the received encoder value is scaled, if required. The Gray code is another form of representation of the binary code. It is based on the fact that two adjacent Gray numbers differ from each other in exactly one bit. If the Gray code is used, transmission errors can be easily detected, since adjacent characters must only differ from each other in one digit. Information on this can be found in the data sheet for your encoder. 0 = standard code 1 = Gray code</p> <p>Bits 7 ... 5: reserved</p>	1E _h
8	Reserved		
9	SSI function	<p>By enabling the SSI function the module starts with the cycle output and the evaluation of the encoder data. In the "monitor operation" mode, the module starts with the encoder evaluation. 0 (00_h) = inhibited 1 (01_h) = enabled</p>	00 _h

11.7 Time stamp parameterising**11.7.1 2 digital inputs with time stamp function - EPM-S207****Parameter data**

Pos. in string of digits	Name	Description/value	Lenze
1	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	14 _h or 3C _h (fix)
2	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	00 _h (fix)
3	Input delay DI1	00 _h = 1 µs 02 _h = 3 µs 04 _h = 10 µs 07 _h = 86 µs	02 _h
4	Input delay DI2	09 _h = 342 µs 0C _h = 273 µs Other values are not permissible.	02 _h
5	Edge 0-1 an DI x	Time stamp entry on rising edge Bit 0: DI1 (0: inhibit, 1 = enable) Bit 1: DI2 (0: inhibit, 1 = enable) Bits 7 ... 2: Reserved	00 _h
6	Edge 1-0 at DI x	Time stamp entry on falling edge Bit 0: DI1 (0: inhibit, 1 = enable) Bit 1: DI2 (0: inhibit, 1 = enable) Bits 7 ... 2: Reserved	00 _h

11.7.2 2 digital outputs with time stamp function - EPM-S310**Parameter data**

Pos. in string of digits	Name	Description/value	Lenze
1	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	14 _h or 3C _h (fix)
2	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	00 _h (fix)

11

DeviceNet communication

Parameterising technology modules

2 digital outputs with PWM functionality - EPM-S620

11.8

Parameterising technology modules

11.8.1

2 digital outputs with PWM functionality - EPM-S620

Parameter data

Pos. in string of digits	Name	Description/value	Lenze
1	PWM 1: period	Set parameters here for the total time for pulse duration and pulse pause. The time should be selected as a factor for the 20.83 ns basis.	1F40 _h
2	PWM 2: Period	Values below 25 µs are ignored. If the pulse duration is higher or equal to the period, the DO output is set permanently. Value range: 1200 ... 8388607 (25 µs ... approx. 175 ms)	1F40 _h

11.8.2 RS232 interface - EPM-S640

Parameter data

Parameter data - ASCII protocol			
Pos. in string of digits	Name	Description/value	Lenze
1	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
2	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
3	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
4	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
5	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame			
6	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
7	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed.	00 _h
8	ZNA (LOW byte)	0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h

Parameter data - ASCII protocol			
Pos. in string of digits	Name	Description/value	Lenze
Option 4 ... 5, ZVZ			
9	Character delay time (HIGH byte)	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram.	00 _h
10	Character delay time (LOW byte)	If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h .. FFFF _h)	FA _h
Option 6, number of receive buffers			
11	Number of receive buffers	Defines the number of receive buffers. As long as only one receive buffer is used and is assigned, no more data can be received. If up to 250 receive buffers are connected, the received data can be redirected to a still free receive buffer. 1 ... 255 (01 _h ... FF _h)	01 _h
Option 7 ... 12, reserved			
12 ... 17	Reserved		00 _h

Parameter data STX/ETX protocol			
Pos. in string of digits	Name	Description/value	Lenze
1	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
2	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
3	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
4	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
5	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 02 _h : STX/ETX	02 _h
Option 1, character frame			
6	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
7	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
8	ZNA (LOW byte)		00 _h

Parameter data STX/ETX protocol			
Pos. in string of digits	Name	Description/value	Lenze
Option 4 ... 5, TMO			
9	TMO (HIGH byte)	TMO serves to define the maximally permissible interval between two frames. 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h
10	TMO (LOW byte)		FA _h
Option 6, number of start identifiers			
11	No. of start identifiers	00 _h : 1 start identifier (2nd start identifier is ignored) 01 _h : 2 start identifiers	01 _h
Option 7, start identifier 1			
12	Start identifier 1	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 8, start identifier 2			
13	Start identifier 2	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 9, number of end identifiers			
14	No. of end identifier	00 _h : 1 end identifier (2nd end identifier is ignored) 01 _h : 2 end identifiers	00 _h
Option 10, end identifier 1			
15	End identifier 1	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 11, end identifier 2			
16	End identifier 2	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 12, reserved			
17	Reserved		00 _h

Parameter data 3964(R) protocol			
Pos. in string of digits	Name	Description/value	Lenze
1	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
2	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
3	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
4	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
5	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 03 _h : 3964 04 _h : 3964R	03 _h
Option 1, character frame			
6	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2, ZNA (x 20 ms)			
7	ZNA	Time after request (ZNA) Waiting time observed until the next transmit request is processed. The ZNA is indicated as a factor in steps of 20 ms. 0 ... 65535 [ms] (0000 _h ... FFFF _h)	00 _h


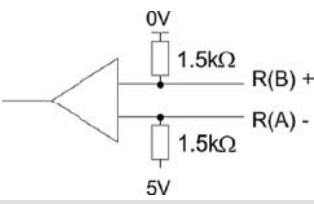
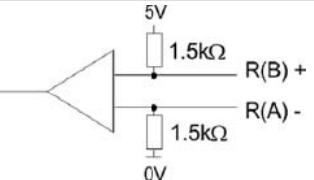
Parameter data 3964(R) protocol			
Pos. in string of digits	Name	Description/value	Lenze
Option 3, ZVZ (x 20 ms)			
8	Character delay time	Character delay time (ZVZ) The ZVZ defines the maximum permissible time interval between two characters received within a telegram. The ZVZ is indicated as a factor in steps of 20 ms. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 255 [ms] (00 _h ... FF _h)	00 _h
Option 4, QVZ (x 20 ms)			
9	Acknowledgement time	Acknowledgement time (QVZ) The QVZ defines the max. permissible time interval until the partner is acknowledged while establishing/terminating a connection. The QVZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 5, BWZ (x 20 ms)			
10	Block wait time	Block wait time (BWZ) The BWZ is the maximum time period between the confirmation of a request frame (DLE) and STX of the response frame. The BWZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	FA _h
Option 6, STX repetitions			
11	STX repetitions	Maximum number of times the module attempts to establish a connection. 1 ... 255 [ms] (01 _h ... FF _h)	01 _h
Option 7, DBL			
12	DBL	When exceeding the block wait time (BWZ) you can specify the maximum number of repetitions for the request frame using the DBL parameter. If these attempts fail, transmission is cancelled. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 8, priority			
13	Priority	A communication partner has high priority if its sending attempt has precedence over the partner's transmit request. In the event of low priority, it must take second place behind the partner's transmit request. With 3964(R) the priorities of both partners must be different. The following settings are possible: 00 _h : LOW 01 _h : HIGH	00 _h
Option 9 ... 12, reserved			
14 ... 17	Reserved		00 _h

11.8.3 RS422/RS485 interface - EPM-S650

Parameter data


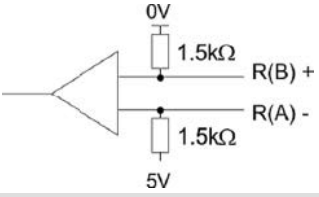
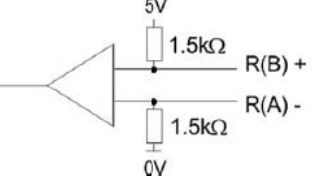
Parameter data - ASCII protocol			
Pos. in string of digits	Name	Description/value	Lenze
1	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
2	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
3	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
4	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
5	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame			
6	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
7	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
8	ZNA (LOW byte)		00 _h

Parameter data - ASCII protocol			
Pos. in string of digits	Name	Description/value	Lenze
Option 4 ... 5, ZVZ			
9	Character delay time (HIGH byte)	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram.	00 _h
10	Character delay time (LOW byte)	If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h .. FFFF _h)	FA _h
Option 6, number of receive buffers			
11	Number of receive buffers	Defines the number of receive buffers. As long as only one receive buffer is used and is assigned, no more data can be received. If up to 250 receive buffers are connected, the received data can be redirected to a still free receive buffer. 1 ... 255 (01 _h ... FF _h)	01 _h
Option 7 ... 12, reserved			
12 ... 17	Reserved		00 _h
Option 13, operating mode			
18	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> • 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. • 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment			
19	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

Parameter data STX/ETX protocol			
Pos. in string of digits	Name	Description/value	Lenze
1	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
2	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
3	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
4	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
5	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 02 _h : STX/ETX	02 _h
Option 1, character frame			
6	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2 ... 3, ZNA			
7	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
8	ZNA (LOW byte)		00 _h

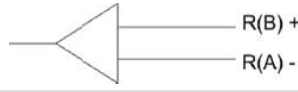
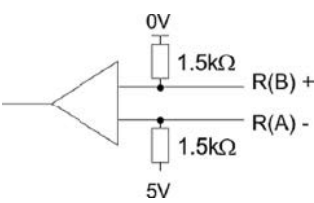
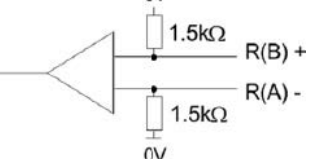
Parameter data STX/ETX protocol			
Pos. in string of digits	Name	Description/value	Lenze
Option 4 ... 5, TMO			
9	TMO (HIGH byte)	TMO serves to define the maximally permissible interval between two frames. 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h
10	TMO (LOW byte)		FA _h
Option 6, number of start identifiers			
11	No. of start identifiers	00 _h : 1 start identifier (2nd start identifier is ignored) 01 _h : 2 start identifiers	01 _h
Option 7, start identifier 1			
12	Start identifier 1	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 8, start identifier 2			
13	Start identifier 2	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 9, number of end identifiers			
14	No. of end identifier	00 _h : 1 end identifier (2nd end identifier is ignored) 01 _h : 2 end identifiers	00 _h
Option 10, end identifier 1			
15	End identifier 1	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 11, end identifier 2			
16	End identifier 2	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 12, reserved			
17	Reserved		00 _h
Option 13, operating mode			
18	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> ● 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. ● 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment			
19	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

Parameter data 3964(R) protocol			
Pos. in string of digits	Name	Description/value	Lenze
1	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
2	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
3	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
4	Baud rate	00 _h : 9600 Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
5	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 03 _h : 3964 04 _h : 3964R	03 _h
Option 1, character frame			
6	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
		Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
		Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
		Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2, ZNA (x 20 ms)			
7	ZNA	Time after request (ZNA) Waiting time observed until the next transmit request is processed. The ZNA is indicated as a factor in steps of 20 ms. 0 ... 65535 [ms] (0000 _h ... FFFF _h)	00 _h

Parameter data 3964(R) protocol			
Pos. in string of digits	Name	Description/value	Lenze
Option 3, ZVZ (x 20 ms)			
8	Character delay time	Character delay time (ZVZ) The ZVZ defines the maximum permissible time interval between two characters received within a telegram. The ZVZ is indicated as a factor in steps of 20 ms. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 255 [ms] (00 _h ... FF _h)	00 _h
Option 4, QVZ (x 20 ms)			
9	Acknowledgement time	Acknowledgement time (QVZ) The QVZ defines the max. permissible time interval until the partner is acknowledged while establishing/terminating a connection. The QVZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 5, BWZ (x 20 ms)			
10	Block wait time	Block wait time (BWZ) The BWZ is the maximum time period between the confirmation of a request frame (DLE) and STX of the response frame. The BWZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	FA _h
Option 6, STX repetitions			
11	STX repetitions	Maximum number of times the module attempts to establish a connection. 1 ... 255 [ms] (01 _h ... FF _h)	01 _h
Option 7, DBL			
12	DBL	When exceeding the block wait time (BWZ) you can specify the maximum number of repetitions for the request frame using the DBL parameter. If these attempts fail, transmission is cancelled. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 8, priority			
13	Priority	A communication partner has high priority if its sending attempt has precedence over the partner's transmit request. In the event of low priority, it must take second place behind the partner's transmit request. With 3964(R) the priorities of both partners must be different. The following settings are possible: 00 _h : LOW 01 _h : HIGH	00 _h
Option 9 ... 12, reserved			
14 ... 17	Reserved		00 _h

Parameter data 3964(R) protocol			
Pos. in string of digits	Name	Description/value	Lenze
Option 13, operating mode			
18	Operating mode	<p>The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422).</p> <ul style="list-style-type: none"> 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment			
19	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

12 PROFINET communication

About PROFINET

12 PROFINET communication

12.1 About PROFINET

PROFINET is an open industrial Ethernet standard by PROFIBUS & PROFINET International (PI) for automation technology. PROFINET is standardised in IEC 61158.

PROFINET uses TCP/IP and IT standards and complements the PROFIBUS technology for applications where fast data communication in combination with industrial IT functions is required.

There are two PROFINET command classes which can be implemented in three performance steps:

- ▶ PROFINET IO
 - RT communication
 - IRT communication
- ▶ PROFINET CBA (is not supported by the EPM-S140 bus coupler)
 - TCP/IP communication

PROFINET IO

PROFINET IO describes an I/O data view on decentralised peripherals. PROFINET IO describes the entire data exchange between the I/O controller and the I/O device. In the configuration, PROFINET IO is based on PROFIBUS.

PROFINET IO always features the real time concept. PROFINET IO uses a Provider/Consumer model in contrast to the master/slave method under PROFIBUS. This supports the communication relations (AR = Application Relation) between the equal nodes at the Ethernet. Here, the provider transmits its data without a request of the communication partner. In addition to the user data exchange, functions for parameterisation and diagnostics are supported as well.

RT communication

RT stands for Real Time. RT communication is the basis for data exchange with PROFINET IO. Here, RT data is treated with higher priority.

IRT communication

IRT stands for Isochronous Real Time. With IRT communication, the bus cycle starts in a true-to-cycle mode, i.e. with a max. permissible deviation and is consistently synchronised. This ensures the time-controlled and cycle-synchronous transfer of data. Here, sync frames of a sync master in the network provide for synchronisation.

PROFINET performance features

PROFINET according to IEC 61158 has the following performance features:

- ▶ Full duplex transmission with 100Mbit/s via copper cables or optical fibre
- ▶ Switched Ethernet
- ▶ Auto negotiation (negotiating the transmission parameters)
- ▶ Auto crossover (transmit and receive path are automatically crossed if required)
- ▶ Wireless communication via Bluetooth or WLAN
- ▶ UDP/IP is used as higher-level protocol. UDP stands for User Datagram Protocol and comprises the unsecured connectionless broadcast communication in combination with IP.

PROFINET devices

As with PROFIBUS-DP, the following devices are classified according to their tasks with PROFINET IO as well:

- ▶ IO-Controller
- ▶ IO-Device
- ▶ IO-Supervisor

The IO-Controller is equivalent to the master under PROFIBUS. Here, it is the PLC with PROFINET connection in which the automation program is executed.

An IO-Device is a decentralised I/O field device which is connected via PROFINET. The IO-Device is equivalent to the slave under PROFIBUS.

An IO-Supervisor is an engineering station as for example a programming device, a PC or a control panel for commissioning and diagnostics.

Industrial Ethernet

Due to the openness of PROFINET standard, you can use standard Ethernet components. For industrial environments and due to the high baud rate of 100 Mbps, the PROFINET system should consist of industrial Ethernet components. All devices connected via switches are located in one network and can communicate directly with each other. A network is physically limited by a router. For communication via network limits, you must program your routers in such a way that they permit this communication.

Topology

Line: For the line structure, all nodes are connected in series. The line structure is achieved via switches which have already been implemented in the PROFINET devices. If a node fails, communication over the failed node is not possible.

Star: When nodes are connected to a switch with more than 2 PROFINET interfaces, a star-shaped network topology is automatically formed. If a single PROFINET device fails, this does not cause a complete network failure as in case of the other structures. The switch failure only causes a failure of the sub-network.

Ring: In order to increase the availability, you can connect both open ends of a line structure via a switch. When you parameterise the switch as redundancy manager, it will make the data be transmitted via an intact network connection in the case of power failure.

Tree: When several star-shaped structures are interconnected, a tree-shaped network topology is formed.

GSDML file

Lenze provides you with a GSDML file for your IO-Device. This file is either located on the enclosed data medium or in the download area of www.lenze.de.

Install the GSDML file in your project planning tool. More information on how to install the GSDML file can be found in the manual of your project planning tool. For configuration in your project planning tool, the GSDML file contains all system modules as XML data.

Addressing

In contrast to the PROFIBUS address, each device in PROFINET can be identified non-ambiguously via its PROFINET interface:

- ▶ IP address or MAC address
- ▶ Device name

Transmission medium

PROFINET is Ethernet-compatible according to the IEEE standards. The PROFINET IO field devices are exclusively connected via switches as network components. It is either carried out as a star-shaped structure via multiple port switches or line-shaped by means of switched implemented in the field device.

12.2 Access to the I/O system 1000

In the following, the access under PROFINET to the following ranges of the I/O system 1000 are displayed:

- ▶ I/O area
- ▶ Parameter data
- ▶ Diagnostic data



Note!

Please note that the supply and terminal modules do not have any type identification. They cannot be identified by the PROFINET coupler and are thus not considered in the listing or assignment of the slots.

In the following, slots within PROFINET are called PROFINET slots. Counting always starts at 0.

GSDML file

For configuring a Device-I/O interface connection in your own project planning tool, you get the performance features of the PROFINET components in the form of a GSDML file.

This file is either located on the enclosed data medium or in the download area of www.lenze.de. Install this GSDML file in your project planning tool.

More information on how to install the GSDML file can be found in the manual for your project planning tool. Structure and contents of the GSDML file are defined by the IEC 61158 standard.

Handling blocks

For accepting or changing data records during runtime, two corresponding handling blocks for reading/writing data records are required. For CPUs to be programmed with STEP7 by Siemens, the following handling blocks are available:

- ▶ SFB 52 Read data record
- ▶ SFB 53 Write data record
- ▶ SFB 54 Read diagnostic data

With "slot" you address the module and via "index" you address the data area related to a module.

Acyclic access to the I/O system

For an acyclic write and read access, PROFINET uses appropriate frames. Here, the PROFINET coupler or the module is addressed via slot (0 ... 64) and the corresponding data area within the module via index. Subslot is always 1.

Read access

Request frame (ReadRequest)							
0009 _h +0	...	API +24	Slot +28	Subslot +30	Index +34	Length +36 +64

Response with data (ReadResponse)							
0009 _h +0	...	API +24	Slot +28	Subslot +30	Index +34	Length +36 +64

Write access

Request frame (WriteRequest)								
8008 _h +0	...	API +24	Slot +28	Subslot +30	Index +34	Length +36 +63	Data +64 ...

Response with length (WriteResponse)							
0008 _h +0	...	API +24	Slot +28	Subslot +30	Index +34	Length +36 +64

12.2.1 Access to the I/O area

With PROFINET, the input/output area is automatically shown in the corresponding address range of the master system. The following index no. also provides access to the I/O areas:

- ▶ Index = 8028h: Reading of the input data (slot 1 ... 64)
- ▶ Index = 8029h: Reading of the output data (slot 1 ... 64)

12.2.2 Access to parameter data

The GSDML file serves to set parameter data for the corresponding modules via the hardware configuration. When the I/O device starts, the parameter data is given once to the modules via the I/O controller. After writing, the parameter data in the module is active.

Access to	Slot	Index
All parameters of the PROFINET coupler incl. header (4 bytes)	0	007D _h
All parameters of the PROFINET coupler	0	007E _h
All module parameters incl. header (4 bytes)	1 ... 64	007D _h
Data record DS 00 _h of the module parameters	1 ... 64	007E _h
Data record DS 01 _h of the module parameters	1 ... 64	007F _h
Data record DS 80 _h ... 90 _h of the module parameters	1 ... 64	0080 _h ... 0090 _h

12.2.3 Access to diagnostic data

Alarm-capable I/O compound modules automatically send process alarm data or diagnostic data via the diagnostics frame if the alarm has been activated via parameterisation.

Another option is to request the diagnostic data. In this case, address the PROFINET bus coupler or the module via slot (0 ... 64) and the corresponding data area via the index.

Diagnostic data of PROFINET bus coupler

Slot = 0 / Subslot = 1 serves to access the PROFINET coupler. Depending on the index, you receive the following data:

Index = 0000_h: 4Byte: Byte 0: Diagnostic byte, byte 1 ... 3: 0 (fix)
 Index = 0001_h: 20Byte: Byte 0: Diagnostic byte, byte 1 ... 19: 0 (fix)

Structure of diagnostic data of PROFINET bus coupler		
Byte	Bit 7 ... 0	Lenze
0	Diagnostic byte Bit 0: Error at backplane bus Bit 1: Parameters have been rejected by the addressed module or coupler (error in data consistency) Bit 2: General bus coupler parameter error (data could not be saved) Bit 3: Version error at the backplane bus (at least one module at the backplane bus is not supported) Bit 5, 4: 0 (fix) Bit 6: Port error with activated port monitoring Bit 7: Configuration error backplane bus (actual configuration unequal to setpoint configuration)	00 _h
2 ... 3 (19)	00 _h (fix)	00 _h

Diagnostic data of I/O compound module

Slot = 1 ... 64 / Subslot = 1 serves to access the corresponding I/O compound module. Depending on the index, you receive the following data:

- ▶ Index = 0000_h: Data record DS 00_h of the diagnostic data
- ▶ Index = 0001_h: Data record DS 01_h of the diagnostic data



Note!

Information on how to assign the ranges can be found in the descriptions of the corresponding I/O compound module.

Structure of diagnostic data of I/O compound module

Byte	Bit 7 ... 0
0	Bit 0: Module fault, i.e. an error has been detected Bit 1: Internal error in the module Bit 2: External error - module cannot be addressed anymore Bit 3: Channel error in module Bit 4: External supply voltage is missing Bit 5, 6: Reserved Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class 1111: Digital module 0101: Analog module 1000: Counter module, SSI module 0111: Time stamp module, gateway module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	see module description
3	Bit 5 ... 0: Reserved Bit 6: Process alarm lost Bit 7: Reserved
4	Channel type 70h: Module with digital inputs 71h: Module with analog inputs 72h: Module with digital outputs 73h: Module with analog outputs 74h: Module with analog inputs/outputs 76h: Counter
5	Number of diagnostic bits per channel
6	Number of channels per module
7	Position (channel) of the diagnostic event
8	Diagnostic event for channel/channel group 0 For assignment see module description
9	Diagnostic event for channel/channel group 1 For assignment see module description
...	
15	Diagnostic event for channel/channel group 7 For assignment see module description
16 ... 19	Value of the μs ticker when diagnostic data is generated (The I/O compound module features a timer that is started with mains ON and restarts with 0 after 232-1 μs .)

12.3 Project planning

Project planning is carried out as hardware configuration in your PROFINET configuring tool as for example the Siemens SIMATIC Manager. Here, you assign your I/O controller to the appropriate I/O device. A direct assignment is made via the PROFINET address that can be set at the I/O device via the address switch and the in I/O device properties.

By implementing the corresponding GSDML file, the PROFINET I/O bus coupler EPM-S140 is specified under:

PROFINET IO -> More field devices -> I/O > I/O system 1000

GSDML file

Lenze provides you with a GSDML file for the I/O device. This file is either located on the enclosed data medium or in the download area of www.lenze.de. Install the GSDML file in your configuring tool. More information on how to install the GSDML file can be found in the manual of your configuring tool.

For operating with your configuring tool, the GSDML file contains all I/O compound modules as XML files.

After installing the GSDML file, you can find the I/O system 1000 in the hardware catalogue of Siemens under:

PROFINET IO > More field devices > I/O > I/O system 1000

Commissioning

- ▶ Set up your PROFINET system.
- ▶ Start your configuring tool with a new project.
- ▶ Configure a master system and create a new PROFINET subnetwork.
- ▶ For configuring the bus coupler, select the "EPM-S140" from the hardware catalogue and drag it to the PROFINET subnetwork.
- ▶ As soon as all switches of the address switch have the 0 status, the "DeviceName" can be assigned freely via the properties of the PROFINET bus coupler. Otherwise assign a PROFINET name via the switch position of the address switch.
- ▶ If required, parameterise the I/O device.
- ▶ Transfer your project into the PLC.

Parameter data of PROFINET bus coupler

Parameter data of PROFINET bus coupler		
Byte	Bit 7 ... 0	Lenze
0	Bit 0: Process alarm 0 = inhibit 1 = enable Bit 1: Diagnostic alarm 0 = inhibit 1 = enable Bit 2: #Diagnostic alarm type 0 = manufacturer-specific data 1 = channel-specific data Bit 3 ... 6: Reserved Bit 7: Data format 0 = Data format Motorola 1 = Data format Intel	00 _h
2 ... 6	00 _h (fix)	00 _h

Diagnostic alarm type Here you can determine the structure of the diagnostic alarm data that are sent via the diagnostic frame in the event of an error or be used to access standard PROFINET index numbers.

Manufacturer-specific data: You always obtain the data record DS 01h of the diagnostic data of a module.

Channel-specific data: You always obtain the data record DS 00h of the diagnostic data of a module.

Data format Motorola/Intel: This parameter refers to how a value is stored in the CPU address range.

In the Motorola format (default), the bytes are stored in descending order, i.e. the first byte contains the High byte and the second byte contains the Low byte.

In the Intel format, the bytes are stored in ascending order, i.e. the first byte contains the Low byte and the second byte contains the High byte.

12.4 I&M data

Identification and maintenance data (I&M) are information stored in a module which supports you in:

- ▶ Checking the system configuration
- ▶ Locating hardware changes in a system
- ▶ Eliminating errors in a system

Identification data (I data) are information on the module, as for instance order number and serial number, which are partly printed on the module housing. I data is manufacturer information on the module and can only be read.

Maintenance data (M data) are system-dependent information, as for instance mounting place and date of installation. M data is created during the project planning phase and written onto the module.

The I&M data serves to unambiguously identify modules online.

Via "read data record" you can access certain identification data. Here, you address parts of the identification data via the corresponding index.

The data records have the following structure:

Contents	Length (byte)	Coding (hex.)
Head information		
- BlockType	2	I&M0: 0020 _h I&M1: 0021 _h I&M2: 0022 _h I&M3: 0023 _h
- BlockLength	2	I&M0: 0038 _h I&M1: 0038 _h I&M2: 0012 _h I&M3: 0038 _h
- BlockVersionHigh	1	01 _h
- BlockVersionLow	4	00 _h
Identification data (see the following table)	I&M0 / Index AFF0 _h : 54 _h I&M1 / Index AFF1 _h : 54 _h I&M2 / Index AFF2 _h : 16 _h I&M3 / Index AFF3 _h : 54 _h	

I&M data for PROFINET-IO

Identification data	Access	Lenze	Description
Identification data 0: (Index AFF0h)			
VendorIDHigh	Read (1 byte)	02h	Name of the manufacturer
VendorIDLow	Read (1 byte)	2Bh	
Order_ID	Read (20 bytes)		Order number
IM_SERIAL_NUMBER	Read (16 bytes)	-	Serial number
IM_HARDWARE_REVISION	Read (2 bytes)	1	HW output version
IM_SOFTWARE_REVISION	Read (1 byte)	V, R, P, U, T 00h ... FFh 00h ... FFh 00h ... FFh	Firmware version
● SWRevisionPrefix	(1 byte)		
● IM_SWRevision_Functional_Enhancement	(1 byte)		
● IM_SWRevision_Bug_Fix	(1 byte)		
● IM_SWRevision_Internal_Change	(1 byte)		
IM_REVISION_COUNTER	Read (2 bytes)	0000h	for internal use
IM_PROFILE_ID	Read (2 bytes)	0000h	for internal use
IM_PROFILE_SPECIFIC_TYPE	Read (2 bytes)	0005h	for internal use
IM_VERSION	Read (1 byte)	0101h	Version of the I&M data (e.g. 0101h = version 1.1)
● IM_Version_Major	(1 byte)		
● IM_Version_Minor	(1 byte)		
IM_SUPPORTED	Read (2 bytes)	000Eh	I&M1 ... I&M3 are available
Maintenance data 1: (Index AFF1h)			
IM_TAG_FUNCTION	Read/write (32 bytes)	-	Selection of a clear identification throughout the system
IM_TAG_LOCATION	Read/write (22 bytes)	-	Selection of the mounting place
Maintenance data 2: (Index AFF2h)			
IM_DATE	Read/write (16 bytes)	YYYY-MMDD HH:MM	Selection of an date
Maintenance data 3: (Index AFF3h)			
IM_DESCRIPTOR	Read/write (54 bytes)	-	Selection of a comment

12.5 Index table

Within a module you can access the I/O data, parameter data and diagnostic data via index numbers. Under PROFINET the index numbers are summarised in the following areas:

0000_h ... 7FFF_h: Manufacturer-specific index numbers

8000_h ... F7FF_h: Standard index numbers of PROFINET.

Information on this can be found in the PROFINET specification. There, the "index" is also called "data record". In the following, all supported index numbers are listed.

Index	Description
Readable index numbers	
0000 _h	Read DS 00 _h diagnostic data
0001 _h	Read DS 01 _h diagnostic data
007D _h	Read all parameter data
007E _h	Read DS 00 _h of the parameter data
007F _h (only I/O compound modules)	Read DS 01 _h of the parameter data
0080 _h . 0090 _h (only I/O compound modules)	Read DS 80 _h . DS 90 _h of the parameter data
8000 _h / 8001 _h / 800A _h / 800B _h / 800C _h / 8010 _h / 8011 _h / 8012 _h / 8013 _h / 801E _h / 802A _h / 802B _h / 802C _h / 802D _h / 802F _h / 8030 _h / 8031 _h / 8050 _h / 8051 _h / 8052 _h / 8053 _h / 8054 _h / 8060 _h / 8061 _h / 8062 _h / 8070 _h / 8080 _h / 8090 _h	See PROFINET specification
8028 _h (only I/O compound modules)	Read input data of a sub-slot
8029 _h (only I/O compound modules)	Read output data of a sub-slot
AFF0 _h	Read I&M 0 (serial no., name, SW/HW version)
AFF1 _h (only PROFINET bus coupler9)	Read I&M 1 (designation and mounting place)
AFF2 _h (only PROFINET bus coupler9)	Read I&M 2 (date of installation)
AFF3 _h (only PROFINET bus coupler9)	Read I&M 3 (comment)
C000 _h / C001 _h / C00A _h / C00B _h / C00C _h / C010 _h / C011 _h / C012 _h / C013 _h / E000 _h / E001 _h / E002 _h / E00A _h / E00B _h / E00C _h / E010 _h / E011 _h / E012 _h / E013 _h / E030 _h / E040 _h / E050 _h / F000 _h / F001 _h / F00A _h / F00B _h / F00C _h / F010 _h / F011 _h / F012 _h / F013 _h / F020 _h / F80C _h / F820 _h / F821 _h / F830 _h / F831 _h / F840 _h / 8041 _h / F842 _h	See PROFINET specification
Writable index numbers	
007D _h	Write all parameter data
007E _h	Write DS 00 _h of the parameter data
007F _h (only I/O compound modules)	Write DS 01 _h of the parameter data
0080 _h . 0090 _h (only I/O compound modules)	Write DS 80 _h . DS 90 _h of the parameter data
AFF1 _h (only PROFINET bus coupler9)	Write I&M 1 (designation and mounting place)
AFF2 _h (only PROFINET bus coupler9)	Write I&M 2 (date of installation)
AFF3 _h (only PROFINET bus coupler9)	Write I&M 3 (comment)

12.6 Setting the parameters of analog I/O

12.6.1 2 analog inputs 0 ... 10 V (12 bits) - EPM-S400

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
128	0	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
129	0	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 02 _h)
6	Number of channels of a module (here 02 _h ·)
7	Bit 0: Channel error, channel 1 Bit 1: Channel error, channel 2 Bit 7 ... 2: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10 ... 15	0 (fixed)

12.6.2 4 analog inputs 0 ... 10 V (12 bits) - EPM-S401

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
128	0	Function channel 1		20 _h
129	0	Function channel 2	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
130	0	Function channel 3	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec}	20 _h
131	0	Function channel 4	255 (FF _h): channel deactivated	20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
12 ... 15	0 (fixed)

12.6.3 2 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S402

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
128	0	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
129	0	Function channel 2	49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	I = D * 20 / 27648 D = 27648 * I / 20
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	I = D * 20 / 16384 D = 16384 * I / 20
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	I = D * 16 / 27648 + 4 D = 27648 * (I-4) / 16
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	I = D * 16 / 16384 + 4 D = 16384 * (I-4) / 16
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 02 _h)
6	Number of channels of a module (here 02 _h ·)
7	Bit 0: Channel error, channel 1 Bit 1: Channel error, channel 2 Bit 7 ... 2: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10 ... 15	0 (fixed)

12.6.4 4 analog inputs 0/4 ... 20 mA (12 bits) - EPM-S403

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
128	0	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511	31 _h
129	0	Function channel 2	64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
130	0	Function channel 3	49 (31 _h): 0 ... 20 mA / -4864 ... 32511	31 _h
131	0	Function channel 4	65 (41 _h): 0 ... 20 mA / -3277 ... 20480	31 _h
			255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
12 ... 15	0 (fixed)

12.6.5 2 analog inputs -10 ... +10 V (16 bits) - EPM-S406

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	1	Reserved	0	
	2	Limit value monitoring	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 (0 = deactivated; 1 = activated) Bits 7 ... 2: Reserved	00 _h
1	0	Interference frequency suppression	Bit 1, 0: Channel 1 00: Deactivated 01: 60 Hz 10: 50 Hz Bit 3, 2: Channel 2 00: Deactivated 01: 60 Hz 10: 50 Hz Bits 7 ... 4: Reserved	00 _h
128	0	Function channel 1	12 (12 _h): -10 ... 10 V / -27648 ... 27648 _{dec} 34 (22 _h): -10 ... 10 V / -16384 ... 16384 _{dec} 16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
	1	Reserved	0	
	2	Upper limit value channel 1	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
	3	Lower limit value channel 1	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h
129	0	Function channel 2	12 (12 _h): -10 ... 10 V / -27648 ... 27648 _{dec} 34 (22 _h): -10 ... 10 V / -16384 ... 16384 _{dec} 16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec} 32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h
	1	Reserved	0	
	2	Upper limit value channel 2	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
	3	Lower limit value channel 2	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
-10 ... +10 V (12 _h)	11.76	32511	7EFF	Overflow	U = D * 10 / 27648 D = 27648 * U / 10
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	-5	-13824	CA00		
	-10	-27648	9400		
	-11.76	-32512	8100	Underflow	
-10 ... +10 V (22 _h)	12.5	20480	5000	Overflow	U = D * 10 / 16384 D = 16384 * U / 10
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	-5	-8192	E000		
	-10	-16384	C000		
	-12.5	-20480	B000	Underflow	
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	U = D * 10 / 27648 D = 27648 * U / 10
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	-1.76	-4864	ED00	Underflow	
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	U = D * 10 / 16384 D = 16384 * U / 10
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	-2	-3277	F333	Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
12 ... 15	0 (fixed)

12.6.6 2 analog inputs 0/4 ... 20 mA (16 bits) - EPM-S408

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0		Diagnostics	Bits 0 ... 5: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
		Reserved	0	
		Limit value monitoring	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 (0 = deactivated; 1 = activated) Bits 7 ... 2: Reserved	00 _h
1		Interference frequency suppression	Bit 1, 0: Channel 1 00: Deactivated 01: 60 Hz 10: 50 Hz Bit 3, 2: Channel 2 00: Deactivated 01: 60 Hz 10: 50 Hz Bits 7 ... 4: Reserved	00 _h
128		Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480 49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	41 _h
		Reserved	0	
		Upper limit value channel 1	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
		Lower limit value channel 1	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h
129		Function channel 2	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480 49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	41 _h
		Reserved	0	
		Upper limit value channel 2	Value from the rated range; if this value is exceeded and the limit value monitoring function is active, a process alarm is triggered. 7FFF _h : Limit value alarm deactivated	7FFF _h
		Lower limit value channel 2	Value from the rated range; if the actual value falls below this value and the limit value monitoring function is active, a process alarm is triggered. 8000 _h : Limit value alarm deactivated	8000 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	$I = D * 20 / 27648$ $D = 27648 * I / 20$
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	$I = D * 20 / 16384$ $D = 16384 * I / 20$
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	$I = D * 16 / 27648 + 4$ $D = 27648 * (I-4) / 16$
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	$I = D * 16 / 16384 + 4$ $D = 16384 * (I-4) / 16$
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Measuring range exceeded
- ▶ Measuring range not reached

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 71 _h : Analog input Bit 7: 0 (fix)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 5 ... 1: 0 (fixed) Bit 6: Measuring range not reached Bit 7: Measuring range exceeded
12 ... 15	0 (fixed)

12.6.7 2 analog outputs 0 ... 10 V (12 bits) - EPM-S500

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	1	Short-circuit detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
128	0	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
129	0	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec} 255 (FF _h): channel deactivated	20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Output area (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000	Underflow	
Not possible, is limited to 0 V				Underflow	
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000	Underflow	
Not possible, is limited to 0 V				Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Short circuit/overload (if parameterised)

Using SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 73 _h : analog output Bit 7: 0 (fixed)
5	Number of diagnostic bits output by the module per channel (here 02 _h)
6	Number of channels of a module (here 02 _h .)
7	Bit 0: Channel error, channel 1 Bit 1: Channel error, channel 2 Bit 7 ... 2: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
10 ... 15	0 (fixed)

12.6.8 4 analog outputs 0 ... 10 V (12 bits) - EPM-S501

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	1	Short-circuit detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bit 2: Channel 3 Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
128	0	Function channel 1	16 (10 _h): 0 ... 10 V / 0 ... 27648 _{dec}	20 _h
129	0	Function channel 2	32 (20 _h): 0 ... 10 V / 0 ... 16384 _{dec}	20 _h
130	0	Function channel 3	255 (FF _h): channel deactivated	20 _h
131	0	Function channel 4		20 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Output area (Fct. no.)	Voltage (U) [V]	Decimal (D)	Hex	Range	Conversion
0 ... 10 V (10 _h)	11.76	32511	7EFF	Overflow	$U = D * 10 / 27648$ $D = 27648 * U / 10$
	10	27648	6C00	Nominal range	
	5	13824	3600		
	0	0	0000		
	Not possible, is limited to 0 V				
0 ... 10 V (20 _h)	12.5	20480	5000	Overflow	$U = D * 10 / 16384$ $D = 16384 * U / 10$
	10	16384	4000	Nominal range	
	5	8192	2000		
	0	0	0000		
	Not possible, is limited to 0 V				

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Short circuit/overload (if parameterised)

Using SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 73 _h : analog output Bit 7: 0 (fixed)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Short circuit after M Bit 7 ... 4: 0 (fixed)
12 ... 15	0 (fixed)

12.6.9 2 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S502

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	1	Wire-breakage detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
128	0	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511 64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
129	0	Function channel 2	49 (31 _h): 0 ... 20 mA / -4864 ... 32511 65 (41 _h): 0 ... 20 mA / -3277 ... 20480 255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	I = D * 20 / 27648 D = 27648 * I / 20
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
0 ... 20 mA (41 _h)	-3.52	-4864	ED00	Underflow	I = D * 20 / 16384 D = 16384 * I / 20
	25	20480	5000	Overflow	
	20	16384	4000	Nominal range	
	10	8192	2000		
4 ... 20 mA (30 _h)	0	0	0000	Underflow	I = D * 16 / 27648 + 4 D = 27648 * (I-4) / 16
	1.19	-4864	ED00		
	22.81	32511	7EFF	Overflow	
	20	27648	6C00	Nominal range	
12	13824	3600			
4 ... 20 mA (40 _h)	4	0	0000	Underflow	I = D * 16 / 16384 + 4 D = 16384 * (I-4) / 16
	0.8	-3277	F333		
	24	20480	5000	Overflow	
	20	16384	4000	Nominal range	
12	8192	2000			

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Open circuit (if parameterised)

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 73 _h : analog output Bit 7: 0 (fixed)
5	Number of diagnostic bits output by the module per channel (here 02 _h)
6	Number of channels of a module (here 02 _h .)
7	Bit 0: Channel error, channel 1 Bit 1: Channel error, channel 2 Bit 7 ... 2: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
10 ... 15	0 (fixed)

12.6.10 4 analog outputs 0/4 ... 20 mA (12 bits) - EPM-S503

Parameter data

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	1	Wire-breakage detection	Bit 0: Channel 1 (0 = deactivated; 1 = activated) Bit 1: Channel 2 Bit 2: Channel 3 Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
128	0	Function channel 1	48 (30 _h): 4 ... 20 mA / -4864 ... 32511	31 _h
129	0	Function channel 2	64 (40 _h): 4 ... 20 mA / -3277 ... 20480	31 _h
130	0	Function channel 3	49 (31 _h): 0 ... 20 mA / -4864 ... 32511	31 _h
131	0	Function channel 4	65 (41 _h): 0 ... 20 mA / -3277 ... 20480	31 _h
			255 (FF _h): channel deactivated	31 _h

With the formulas listed in the following you can convert a digital value into an analog output value and vice versa.

Measuring range (Fct. no.)	Current (I) [mA]	Decimal (D)	Hex	Range	Conversion
0 ... 20 mA (31 _h)	23.52	32511	7EFF	Overflow	I = D * 20 / 27648 D = 27648 * I / 20
	20	27648	6C00	Nominal range	
	10	13824	3600		
	0	0	0000		
	-3.52	-4864	ED00	Underflow	
0 ... 20 mA (41 _h)	25	20480	5000	Overflow	I = D * 20 / 16384 D = 16384 * I / 20
	20	16384	4000	Nominal range	
	10	8192	2000		
	0	0	0000		
	-4	-3277	F333	Underflow	
4 ... 20 mA (30 _h)	22.81	32511	7EFF	Overflow	I = D * 16 / 27648 + 4 D = 27648 * (I-4) / 16
	20	27648	6C00	Nominal range	
	12	13824	3600		
	4	0	0000		
	1.19	-4864	ED00	Underflow	
4 ... 20 mA (40 _h)	24	20480	5000	Overflow	I = D * 16 / 16384 + 4 D = 16384 * (I-4) / 16
	20	16384	4000	Nominal range	
	12	8192	2000		
	4	0	0000		
	0.8	-3277	F333	Underflow	

Diagnostic data

Since this module does not support an alarm, the diagnostic data serve to provide information on this module. In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

The following errors are registered in the diagnostic data:

- ▶ Configuration/parameterisation errors
- ▶ Open circuit (if parameterised)

By the use of the SFB 52 you can access the diagnostic data of the module anytime. Data set 1 has the following structure:

Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of a missing external supply voltage Bit 6: 0 (fixed) Bit 7: Parameterisation error
1	Bits 3 ... 0: Module class, 0101 _b : Analog module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 73 _h : analog output Bit 7: 0 (fixed)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 04 _h .)
7	Bit 0: Channel error channel 1 Bit 1: Channel error channel 2 Bit 2: Channel error channel 3 Bit 3: Channel error channel 4 Bit 7 ... 4: 0 (fixed)
8	Channel-specific errors: channel 1: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
9	Channel-specific errors: channel 2: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
10	Channel-specific errors: channel 3: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
11	Channel-specific errors: channel 4: Bit 0: Configuration/parameterisation error Bit 2 ... 1: 0 (fixed) Bit 3: Open circuit Bit 7 ... 4: 0 (fixed)
12 ... 15	0 (fixed)

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

12.7 Parameterising the temperature measurement

12.7.1 Four (two) analog inputs for resistance tests - EPM-S404

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 0 ... 5: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
	1	Wire-breakage detection	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) : Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
	2	Limit value monitoring	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) : Bit 3: Channel 4 Bits 4 ... 7: Reserved	00 _h
	3	Reserved		
1	0	Temperature system	Bit 0, 1: 00 _b = °C; 01 _b = °F; 10 _b = K Bits 2 ... 7: Reserved	00 _h
	1	Interference frequency suppression	Bit 0, 1: 01 _b = 60 Hz; 10 _b = 50 Hz Bits 2 ... 7: Reserved	02 _h
Channel 1				
128	0	Function channel 1	80 (50 _h) ... 162 (A2 _h): see "measuring range" 255 (FF _h): channel deactivated	50 _h
	1	Conversion time channel 1	You can set the transformer speed as a function of the interference frequency suppression (see 0x3105/x) for each channel. 0 (00 _h): At 50 Hz: 324.1 ms/channel 16 bits; at 60 Hz: 270.5 ms/channel 16 bits 1 (01 _h): At 50 Hz: 164.2 ms/channel 16 bits; at 60 Hz: 137.2 ms/channel 16 bits 2 (02 _h): At 50 Hz: 84.2 ms/channel 16 bits; at 60 Hz: 70.5 ms/channel 16 bits 3 (03 _h): at 50 Hz: 44.1 ms/channel 16 bits; at 60 Hz: 37.2 ms/channel 16 bits 4 (04 _h): At 50 Hz: 24.2 ms/channel 16 bits; at 60 Hz: 20.5 ms/channel 16 bits 5 (05 _h): At 50 Hz: 14.2 ms/channel 16 bits; at 60 Hz: 12.2 ms/channel 16 bits 6 (06 _h): At 50 Hz: 9.2 ms/channel 16 bits; at 60 Hz: 8.0 ms/channel 16 bits 7 (07 _h): At 50 Hz: 6.6 ms/channel 15 bits; at 60 Hz: 5.9 ms/channel 15 bits 8 (08 _h): At 50 Hz: 4.2 ms/channel 13 bits; at 60 Hz: 3.8 ms/channel 13 bits	00 _h
	2, 3	Upper limit value channel 1	You can define an upper or lower limit value for each channel. For this you can only specify values from the nominal range, otherwise you'll receive a parameterisation error. By specification of 7FFF _h for the upper or 8000 _h for the lower limit value, the corresponding limit value is deactivated. As soon as the measured value is outside a limit value and limit value monitoring is activated, a process alarm is triggered.	7FFF _h
	4,5	Lower limit value channel 1		8000 _h
Channel 2				
129	0	Function channel 2	See channel 1	50 _h

Data set		Name	Description/value	Lenze
No.	Byte			
	1	Conversion time channel 2	See channel 1	00 _h
	2, 3	Upper limit value channel 2	See channel 1	7FFF _h
	4, 5	Lower limit value channel 2 (HIGH byte)		8000 _h
Channel 3 (for two-wire conductor connections only)				
130	0	Function channel 3	See channel 1	50 _h
	1	Conversion time channel 3	See channel 1	00 _h
	2, 3	Upper limit value channel 3	See channel 1	7FFF _h
	4, 5	Lower limit value channel 3		8000 _h
Channel 4 (for two-wire conductor connections only)				
131	0	Function channel 4	See channel 1	50 _h
	1	Conversion time channel 4	See channel 1	00 _h
	2, 3	Upper limit value channel 4	See channel 1	7FFF _h
	4, 5	Lower limit value channel 4		8000 _h

Measuring range

Measuring range (Fct. no.)	Measured value	Signal range	Range
2-wire: PT100 (50 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
2-wire: PT1000 (51 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
2-wire: NI100 (52 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
2-wire: NI1000 (53 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
3-wire: PT100 (58 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
3-wire: PT1000 (59 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
3-wire: NI100 (5A _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Measuring range (Fct. no.)	Measured value	Signal range	Range
3-wire: NI1000 (5B _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
4-wire: PT100 (60 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
4-wire: PT1000 (61 _h)	+1000 °C	+10000 _{dec}	Overflow
	-200 ... +850 °C	-2000 ... +8500 _{dec}	Nominal range
	-243 °C	-2430 _{dec}	Underflow
4-wire: NI100 (62 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
4-wire: NI1000 (63 _h)	+295 °C	+2950 _{dec}	Overflow
	-60 ... +250 °C	-600 ... +2500 _{dec}	Nominal range
	-105 °C	-1050 _{dec}	Underflow
2-wire: 0 ... 60 Ω (70 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (71 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (72 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (78 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (79 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (7A _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (80 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (81 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 32767 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (82 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 32767	Nominal range
	-	-	Underflow
2-wire: 0 ... 60 Ω (90 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow

Measuring range (Fct. no.)	Measured value	Signal range	Range
2-wire: 0 ... 600 Ω (91 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (92 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (98 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (99 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (9A _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (A0 _h)	-	-	Overflow
	0 ... 60 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 600 Ω (A1 _h)	-	-	Overflow
	0 ... 600 Ω	0 ... 6000 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (A2 _h)	-	-	Overflow
	0 ... 3000 Ω	0 ... 30000 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 60 Ω (D0 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 600 Ω (D1 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
2-wire: 0 ... 3000 Ω (D2 _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 60 Ω (D8 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 600 Ω (D9 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
3-wire: 0 ... 3000 Ω (DA _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 60 Ω (E0 _h)	70.55 Ω	32511 _{dec}	Overflow
	0 ... 60 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Measuring range (Fct. no.)	Measured value	Signal range	Range
4-wire: 0 ... 600 Ω (E1 _h)	705.5 Ω	32511 _{dec}	Overflow
	0 ... 600 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow
4-wire: 0 ... 3000 Ω (E2 _h)	3528 Ω	32511 _{dec}	Overflow
	0 ... 3000 Ω	0 ... 27648 _{dec}	Nominal range
	-	-	Underflow

Diagnostics and alarm

Trigger	Process alarm	Diagnostic alarm	Parameterisable
Configuration/parameterisation error	-	X	-
Open circuit detected	-	X	X
Measuring range exceeded	-	X	-
Measuring range not reached	-	X	-
Limit value exceeded	X	-	X
Limit value not reached	X	-	X
Process alarm lost	-	X	-

Process alarm

A process alarm causes a call of the OB 40. Within the OB 40 you have the possibility of determining the logic basic address of the module that has triggered the process alarm via the local word 6. Further information on the triggering event can be found in the "Local double word 8".

Local double word 8 of OB 40:

Local byte	Bit 7 ... 0
1	Bit 0: Limit value exceeded channel 1 Bit 1: Limit value exceeded channel 2 Bit 2: Limit value exceeded channel 3 Bit 3: Limit value exceeded channel 4 Bit 7 ... 4: 0 (fixed)
2	Bit 0: Limit value not reached channel 1 Bit 1: Limit value not reached channel 2 Bit 2: Limit value not reached, channel 3 Bit 3: Limit value not reached, channel 4 Bit 7 ... 4: 0 (fixed)
3/4	Ticker value at the time of the alarm After mains connection, a timer (µs ticker) is started which after 65535 µs starts with 0 again.

Diagnostic alarm

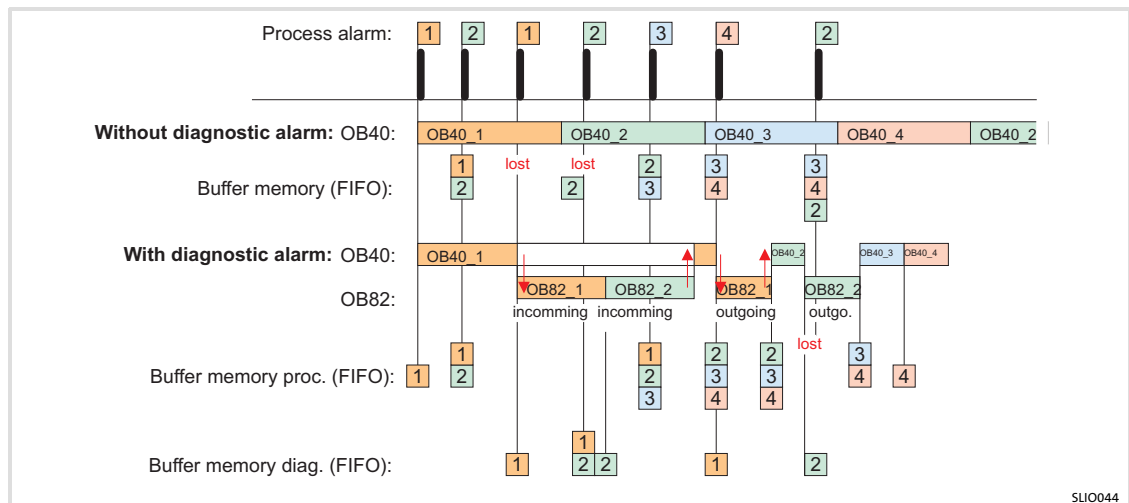
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



SLI0044

Parameterising the temperature measurement
Four (two) analog inputs for resistance tests - EPM-S404

Diagnostic alarm processing:

Using SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.

Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bit 6 ... 0: Channel type, 76h: counter module Bit 7: Further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 01 _h)
7	Bit 0: Error in channel group 0 (counter) Bit 7 ... 1: 0 (fixed)
8	Diagnostic alarm due to process alarm lost to ... Bit 0: Hardware gate open Bit 1: Hardware gate closed Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 4: Latch value Bit 7 ... 5: 0 (fixed)
9 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

12.7.2 Two analog inputs for thermocouple measurement - EPM-S405

During the execution time you can access the parameter data via the following data sets:

Data set		Name	Description/value	Lenze
No.	Byte			
0	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 0 ... 5: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
	1	Wire-breakage detection	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
	2	Limit value monitoring	Bit 0: Channel 1 (0 = inhibited; 1 = enabled) Bit 1: Channel 2 Bits 2 ... 7: Reserved	00 _h
	3	Reserved	0	
1	0	Temperature system	Bit 0, 1: 00 _b = °C; 10 _b = °F; 11 _b = K Bits 2 ... 7: Reserved	00 _h
	1	Interference frequency suppression	Bit 0, 1: 01 _b = 60 Hz; 10 _b = 50 Hz Bits 2 ... 7: Reserved	02 _h
Channel 1				
128	0	Function channel 1	176 (60 _h) ... 201 (C9 _h): see "measuring range" External temperature compensation: 176 (60 _h) ... 185 (69 _h) Internal temperature compensation: 192 (C0 _h): ... 201 (C9 _h) 255 (FF _h): channel deactivated	C1 _h
	1	Conversion time channel 1	You can set the transformer speed as a function of the interference frequency suppression (see 0x3105/x) for each channel. 0 (00 _h): At 50 Hz: 324.1 ms/channel 16 bits; at 60 Hz: 270.5 ms/channel 16 bits 1 (01 _h): at 50 Hz: 164.2 ms/channel 16 bits; at 60 Hz: 137.2 ms/channel 16 bits 2 (02 _h): At 50 Hz: 84.2 ms/channel 16 bits; at 60 Hz: 70.5 ms/channel 16 bits 3 (03 _h): at 50 Hz: 44.1 ms/channel 16 bits; at 60 Hz: 37.2 ms/channel 16 bits 4 (04 _h): At 50 Hz: 24.2 ms/channel 16 bits; at 60 Hz: 20.5 ms/channel 16 bits 5 (05 _h): at 50 Hz: 14.2 ms/channel 16 bits; at 60 Hz: 12.2 ms/channel 16 bits 6 (06 _h): at 50 Hz: 9.2 ms/channel 16 bits; at 60 Hz: 8.0 ms/channel 16 bits 7 (07 _h): at 50 Hz: 6.6 ms/channel 15 bits; at 60 Hz: 5.9 ms/channel 15 bits 8 (08 _h): at 50 Hz: 4.2 ms/channel 13 bits; at 60 Hz: 3.8 ms/channel 13 bits	02 _h
	2, 3	Upper limit value channel 1	You can define an upper or lower limit value for each channel. For this you can only specify values from the nominal range, otherwise you'll receive a parameterisation error. By specification of 7FFF _h for the upper or 8000 _h for the lower limit value, the corresponding limit value is deactivated.	7FFF _h
	4, 5	Lower limit value channel 1	If the measured value is outside a limit value and the limit value monitoring is activated, a process alarm is triggered.	8000 _h
Channel 2				
129	0	Function channel 2	See channel 1	C1 _h

Parameterising the temperature measurement
Two analog inputs for thermocouple measurement - EPM-S405

Data set		Name	Description/value	Lenze
No.	Byte			
	1	Conversion time channel 2	See channel 1	02 _h
	2, 3	Upper limit value channel 2	See channel 1	7FFF _h
	3, 4	Lower limit value channel 2		8000 _h

Measuring range

Measuring range (Fct. no.)	Measured value			Range
	[°C]	[°F]	[K]	
Type J: -210 ... +1200 °C -346 ... 2192 °F 63.2 ... 1473.2 K (B0 _h : ext. comp. 0 °C) (C0 _h : int. comp. 0 °C)	+14500	26420	17232	Overflow
	-2100 ... +12000	-3460 ... +21920	632 ... 14732	Nominal range
	-	-	-	Underflow
Type K: -210 ... +1372 °C -454 ... 2501.6 °F 0 ... 1645.2 K (B1 _h : ext. comp. 0 °C) (C1 _h : int. comp. 0 °C)	+16220	29516	18952	Overflow
	-2700 ... +13720	-4540 ... 25016	0 ... 16452	Nominal range
	-	-	-	Underflow
Type N: -270 ... +1300 °C -454 ... 2372 °F 0 ... 1573.2 K (B2 _h : ext. comp. 0 °C) (C2 _h : int. comp. 0 °C)	+15500	28220	18232	Overflow
	-2700 ... +13000	-4540 ... 23720	0 ... 15732	Nominal range
	-	-	-	Underflow
Type R: -50 ... +1769 °C -58 ... 3216.2 °F 223.2 ... 2042.2 K (B3 _h : ext. comp. 0 °C) (C3 _h : int. comp. 0 °C)	+20190	32766	22922	Overflow
	-500 ... +17690	-580 ... 32162	2232 ... 20422	Nominal range
	-1700	-2740	1032	Underflow
Type S: -50 ... +1769 °C -58 ... 3216.2 °F 223.2 ... 2042.2 K (B4 _h : ext. comp. 0 °C) (C4 _h : int. comp. 0 °C)	+20190	32766	22922	Overflow
	-500 ... +17690	-580 ... 32162	2232 ... 20422	Nominal range
	-1700	-2740	1032	Underflow
Type T: -270 ... +440 °C -454 ... 752 °F 3.2 ... 673.2 K (B2 _h : ext. comp. 0 °C) (C2 _h : int. comp. 0 °C)	+5400	10040	8132	Overflow
	-2700 ... +4000	-4540 ... 7520	32 ... 6732	Nominal range
	-	-	-	Underflow
Type B: 0 ... +1820 °C 32 ... 2786.5 °F 273.2 ... 2093.2 K (B6 _h : ext. comp. 0 °C) (C6 _h : int. comp. 0 °C)	+20700	32766	23432	Overflow
	0 ... +18200	320 ... 27865	2732 ... 20932	Nominal range
	-1200	-1840	1532	Underflow
Type C: 0 ... +2315 °C 32 ... 2786.5 °F 273.2 ... 2093.2 K (B7 _h : ext. comp. 0 °C) (C7 _h : int. comp. 0 °C)	+25000	32766	23432	Overflow
	0 ... +23150	320 ... 27865	2732 ... 20932	Nominal range
	-1200	-1840	1532	Underflow

Measuring range (Fct. no.)	Measured value			Range
	[°C]	[°F]	[K]	
Type E: -270 ... +1000 °C -454 ... 1832 °F 0 ... 1273.2 K (B8 _h : ext. comp. 0 °C) (C8 _h : int. comp. 0 °C)	+12000	21920	14732	Overflow
	-2700 ... +10000	-4540 ... 18320	0 ... 12732	Nominal range
	-	-	-	Underflow
Type L: -200 ... +900 °C -328 ... 1652 °F 73.2 ... 1173.2 K (B9 _h : ext. comp. 0 °C) (C9 _h : int. comp. 0 °C)	+11500	21020	14232	Overflow
	-2000 ... +9000	-3280 ... 16520	732 ... 11732	Nominal range
	-	-	-	Underflow

Diagnosics and alarm

Trigger	Process alarm	Diagnostic alarm	Parameterisable
Configuration/parameterisation error	-	X	-
Open circuit detected	-	X	X
Measuring range exceeded	-	X	-
Measuring range not reached	-	X	-
Limit value exceeded	X	-	X
Limit value not reached	X	-	X
Process alarm lost	-	X	-

Process alarm

A process alarm causes a call of the OB 40. Within the OB 40 you have the possibility of determining the logic basic address of the module that has triggered the process alarm via the local word 6. Further information on the triggering event can be found in the "Local double word 8".

Local double word 8 of OB 40:

Local byte	Bit 7 ... 0
1	Bit 0: Limit value exceeded channel 1 Bit 1: Limit value exceeded channel 2 Bit 7 ... 2: 0 (fixed)
2	Bit 0: Limit value not reached, channel 1 Bit 1: Limit value not reached, channel 2 Bit 7 ... 2: 0 (fixed)
3/4	Ticker value at the time of the alarm After mains connection, a timer (µs ticker) is started which after 65535 µs starts with 0 again.

Diagnostic alarm

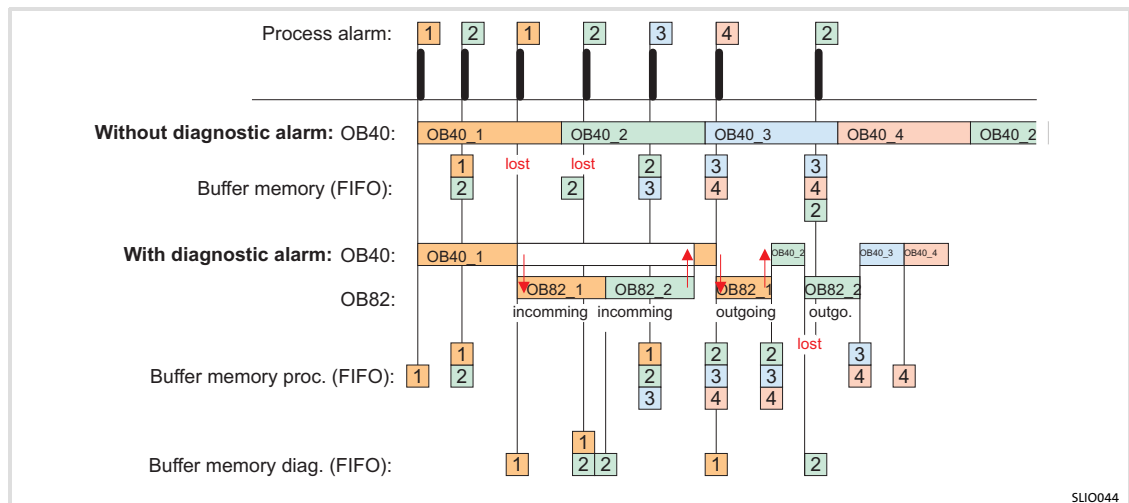
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



SLI0044

Diagnostic alarm processing:

Using SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.






Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bit 6 ... 0: Channel type, 76h: counter module Bit 7: Further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 01 _h)
7	Bit 0: Error in channel group 0 (counter) Bit 7 ... 1: 0 (fixed)
8	Diagnostic alarm due to process alarm lost to ... Bit 0: Hardware gate open Bit 1: Hardware gate closed Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 4: Latch value Bit 7 ... 5: 0 (fixed)
9 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

12.8 Parameterising the counter

12.8.1 Rotary transducer signal evaluation

Depending on which edge of a channel is evaluated, the following pulse trains and the associated pulse multiplication can be realised.

Pulse trains	Description	
Channel A		
Channel B		
Single evaluation		There is a response to the falling edges of channel A. The number of pulses has not increased.
Double evaluation		There is a response to the rising and the falling edges of channel A. The number of pulses has doubled and is symmetrical.
Four-fold evaluation		The rising and the falling edges of channels A and B are evaluated. The number of pulses is quadrupled and is symmetrical.

12.8.2 One counter 32 bits, 24 V DC - EPM-S600

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	

Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	<p>The main counting direction can be parameterised:</p> <p>None: The whole counting range is available.</p> <p>Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following.</p> <p>Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.</p>
Gate function	<p>The gate function serves to start, stop, and interrupt a counting function. In the case of this counter a differentiation between the internal gate (I-gate), hardware gate (HW gate), and software gate (SW gate) is made.</p> <ul style="list-style-type: none"> ● The I-gate is the AND logic operation of the software gate (SW gate) and the hardware gate (HW gate). ● The SW gate is controlled via your user program (status word in the output area). ● The HW gate is controlled via the digital gate input. <p>The following response can be parameterised:</p> <p>Cancelling gate function:After closing the gate and opening it again, the counting process continues from the loading value again.</p> <p>Interrupting gate function:After closing the gate and opening it again, the counting process continues with the last current counter content.</p>
Latch function	<p>If a positive edge occurs at the latch input, the current count value is stored in the latch register. The latch register is accessed via the input area. After a STOP-RUN transition, latch is always 0.</p>
Comparator	<p>You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.</p>
Hysteresis	<p>By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.</p>
Process alarm	<p>The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events:</p> <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	<p>If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.</p>
Diagnostic function	<p>Diagnostic functions are provided in the modules.</p>
Diagnostic information	<p>The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.</p>

Read data: 12 bytes

Input area		
Addr.	Access	Assignment
+0	Double word	Count value
+4	Double word	Latch value
+8	Word	Status word (see the following table)
+10	Word	Ticker value

Count value: Current counter content

Latch value: If there is a positive edge at the latch input, the count value is stored here.

Ticker value: After mains connection a timer (μs ticker) is started, which after 65535 μs starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μs value together with the count value in the input area.

EPM-S600 status word		
Bit	Designation	Function
0	STS_SYNC	Reset was active
1	STS_CTRL_DO	Is set if the digital output is enabled
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	STS_RST	Status of reset input
4	STS_STRT	Hardware gate status (set if HW gate active)
5	STS_GATE	Status of internal gate (set if internal gate active)
6	STS_DO	Status of digital counter output (DO)
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	STS_CMP*	Comparator status is set if the comparison condition is met. If the comparison is deactivated (counter mode byte 1 = 000 _b), the bit has no function.
10	STS_END*	Status set if final value was reached
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	STS_LTCH	Status of latch input
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

Write data: 10 bytes

Output area		
Addr.	Access	Assignment
+0	Double word	Comparison value
+4	Double word	Set value
+8	Word	Control word (see the following table)

Comparison value: Here you can select a value which, by comparison with the current counter content, can impact the counter output or trigger a process alarm. The response of the output or the process alarm can be parameterised.

Set value: With an edge change 0-1 of *COUNTERVAL_SET* in the control word, the set value is accepted in the counter.

EPM-S600 control word		
Bit	Name	Function
0	CTRL_SYNC_SET	Activation/deactivation of the counting signal: 0 (FALSE): The input for the counting signal is deactivated and the current counter content is reset to 0. 1 (TRUE): The input for the counting signal is activated.
1	CTRL_DO_SET	Enables the digital output
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	COUNTERVAL_SET	Sets the counter temporarily to the value in the set value
6	RES_SET	Resets bits STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP with a rising edge
7	-	Reserved
8	CTRL_SYNC_RESET	Activation/deactivation of the zero track evaluation: 0 (FALSE): The zero track evaluation is activated. 1 (TRUE): The zero track evaluation is stopped. The counter keeps counting irrespective of the zero pulse. Bit 0 (CTRL_SYNC_SET) must be set to TRUE for this purpose.
9	CTRL_DO_RESET	Inhibits the digital output
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12		
13		
14		
15		

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved	00 _h
01 _h	0	Input frequency track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz 1 (01 _h): 300 kHz	02 _h
	1	Input frequency track B	2 (02 _h): 100 kHz 3 (03 _h): 60 kHz 4 (04 _h): 30 kHz	02 _h
	2	Input frequency latch	6 (06 _h): 10 kHz 7 (07 _h): 5 kHz 8 (08 _h): 2 kHz	02 _h
	3	Input frequency gate	9 (09 _h): 1 kHz Other values are not permissible!	02 _h
	4	Input frequency reset		00 _h
	5	Reserved		

Data set		Name	Description/value	Lenze
No.	Byte			
80 _h	0	Alarm response	Setting activates process alarm Bit 0: Proc. alarm HW gate open Bit 1: Proc. alarm HW gate closed Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bit 6: Proc. alarm latch value Bit 7: Reserved	80 _h
	1	Counter function	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = counting once, main counting direction forwards 000010 _b = counting once, main counting direction backwards 000100 _b = counting once, no main counting direction 001000 _b = counting periodically, main counting direction forwards 010000 _b = counting periodically, main counting direction backwards 100000 _b = counting periodically, no main counting direction Bits 7 ... 6: Reserved	40 _h
	2	Comparator	Bit 2 ... 0: output switches (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 6 ... 4: Reset 000 _b = deactivated 001 _b = HIGH level 011 _b = rising edge 101 _b = rising edge, once Bit 7: Reserved	00 _h
81 _h	0	Final value	Upper limit of the counting range	00 _h
	1	Start value	Lower limit of the counting range	00 _h

Data set		Name	Description/value	Lenze
No.	Byte			
	2	Hysteresis	The hysteresis for instance serves to avoid frequent switching operations of the output and/or triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off. The hysteresis has an effect on the zero crossing, comparison, overflow/underflow.	00 _h
	3	Pulse	The pulse duration indicates for how long the output is to be set if the parameterised comparison criterion is reached or exceeded. The pulse duration can be specified in steps of 2.048 ms between 0 and 522.24 ms. If the pulse duration is = 0, the output is set until the comparison condition is no longer met.	00 _h

Process alarm

A process alarm causes a call of the OB 40. Within the OB 40 you have the possibility of determining the logic basic address of the module that has triggered the process alarm via the local word 6. Further information on the triggering event can be found in the "Local double word 8".

Local double word 8 of OB 40:

Local byte	Bit 7 ... 0
1	Bit 0: Hardware gate open Bit 1: Hardware gate closed Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 4: Latch value Bit 7 ... 5: 0 (fixed)
2	State of the inputs at the time of the alarm Bit 0: A/pulse Bit 1: B/direction Bit 2: Latch Bit 3: Hardware gate Bit 4: Reset Bit 7 ... 5: 0 (fixed)
3/4	Ticker value at the time of the alarm

Gate counter open/closed: Bit 0 is set if the HW gate is activated while the SW gate is active. Bit 1 is set if the HW gate is deactivated while the SW gate is active.

Ticker value: After mains connection a timer (μ s ticker) is started, which after 65535 μ s starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μ s value together with the count value in the input area.

Diagnostic alarm

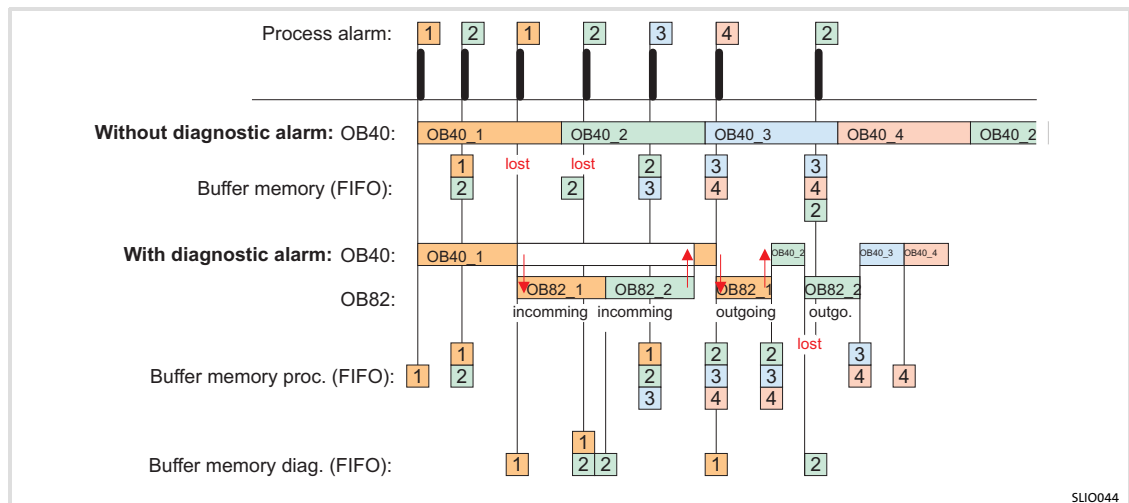
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



SLI0044

Diagnostic alarm processing:

Using SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.

Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bit 6 ... 0: Channel type, 76h: counter module Bit 7: Further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 01 _h)
7	Bit 0: Error in channel group 0 (counter) Bit 7 ... 1: 0 (fixed)
8	Diagnostic alarm due to process alarm lost to ... Bit 0: Hardware gate open Bit 1: Hardware gate closed Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 4: Latch value Bit 7 ... 5: 0 (fixed)
9 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

12.8.3 Two counters 32 bits, 24 V DC - EPM-S601

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	The main counting direction can be parameterised: None: The whole counting range is available. Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following. Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area). The following response can be parameterised: Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again. Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.
Comparator	You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.
Hysteresis	By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.
Process alarm	The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events: <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.
Diagnostic function	Diagnostic functions are provided in the modules.
Diagnostic information	The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.

Read data: 12 bytes

Input area in the process image		
Addr.	Access	Assignment
+0	Double word	Counter 1: count value
+4	Double word	Counter 2: count value
+8	Word	Counter 1: status word (see following table)
+10	Word	Counter 2: status word (see following table)

Count value: Current counter content

EPM-S601 status word		
Bit	Designation	Function
0	-	Reserved
1	STS_CTRL_COMP	Is set if the comparison bit is enabled
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	-	Reserved
4	-	Reserved
5	STS_GATE	Status of internal gate (set if internal gate active)
6	STS_COMP	Status of comparison bit
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	STS_CMP*	Comparator status is set if the comparison condition is met. If the comparison is deactivated (counter mode byte 1 = 000 _b), the bit has no function.
10	STS_END*	Status set if final value was reached
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	-	Reserved
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

Write data: 12 bytes

Output area in the process image		
Addr.	Access	Assignment
+0	Double word	Counter 1: Comparison value
+4	Double word	Counter 2: Comparison value
+8	Word	Counter 1: Control word (see following table)
+10	Word	Counter 2: Control word (see following table)

Comparison value: With the comparison value you can specify a value which, by comparison with the current counter content, can impact the counter output or trigger a process alarm. The response of the comparison bit *STS_COMP* in the counter status or the process alarm is to be specified via data set 80_h for counter 1 and 82_h for counter 2.

EPM-S601 control word		
Bit	Designation	Function
0	-	Reserved
1	CTRL_COMP_SET	Enables the comparison bit
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	COUNTERVAL_SET	Sets the counter temporarily to the value in the set value
6	RES_SET	Resets bits STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP with a rising edge
7	-	Reserved
8	-	Reserved
9	CTRL_COMP_RESET	Inhibits comparison bit
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12		
13		
14		
15		

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
01 _h	0	Input frequency counter 1, track A	Filters for instance serve to filter signal peaks in the case of an unclear input signal. 0 (00 _h): 500 kHz	02 _h
	1	Input frequency counter 1, track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz	02 _h
	2	Input frequency counter 2, track A	4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
	3	Input frequency counter 2, track B	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
80 _h	0	Alarm response counter 1	Setting activates process alarm Bits 1 ... 0: reserved Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bits 7 ... 6: Reserved	00 _h

Parameterising the counter
 Two counters 32 bits, 24 V DC - EPM-S601

Data set		Name	Description/value	Lenze
No.	Byte			
	1	Counter function counter 1	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = once: forwards 000010 _b = once: backwards 000100 _b = once: no main counting direction 001000 _b = periodically: forwards 010000 _b = periodically: backwards 100000 _b = periodically: no main counting direction Bits 7 ... 6: Reserved	00 _h
	2	Comparator counter 1	Bits 2 ... 0: Comparison bit is set (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
	3	Signal evaluation counter 1	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 6 ... 3: Reserved Bit 7: Gate function (internal gate) 0 = abort (counting process starts again from loading value) 1 = interrupt (counting process is continued with counter content)	00 _h
81 _h	0...3	Set value counter 1	By specifying a set value, the counter can be loaded with the set value. With an edge 0-1 to COUNTERVAL_SET in the control word, the set value is adopted by the counter.	00 _h
	4...7	Final value counter 1	Upper limit of the counting range	00 _h
	8...11	Loading value counter 1	Lower limit of the counting range	00 _h
	12	Hysteresis counter 1	The hysteresis for instance serves to avoid frequent switching operations of the output and/or triggering of the alarm when the count value is within the range of the comparison value. For the hysteresis you can select a range between 0 and 255. With the settings 0 and 1 the hysteresis is switched off. The hysteresis has an effect on the zero crossing, comparison, overflow/underflow.	00 _h
	13	Reserved		
82 _h	0	Alarm response counter 2	See counter 1	00 _h
	1	Counter function counter 2	See counter 1	00 _h
	2	Comparator counter 2	See counter 1	00 _h
	3	Signal evaluation counter 2	See counter 1	00 _h
83 _h	0...3	Set value counter 2	See counter 1	00 _h

Data set		Name	Description/value	Lenze
No.,	Byte			
	4...7	Final value counter 2	See counter 1	00 _h
	8...11	Loading value counter 2	See counter 1	00 _h
	12	Hysteresis counter 2	See counter 1	00 _h

Process alarm

A process alarm causes a call of the OB 40. Within the OB 40 you have the possibility of determining the logic basic address of the module that has triggered the process alarm via the local word 6. Further information on the triggering event can be found in the "Local double word 8".

Local double word 8 of OB 40:

Local byte	Bit 7 ... 0
1	Bit 0: 0 Bit 1: 0 Bit 2: Counter 1, overflow/underflow/final value Bit 3: Counter 1, comparison value reached Bit 4: 0 Bit 5: 0 Bit 6: Counter 2, overflow/underflow/final value Bit 7: Counter 2, comparison value reached
2	State of the inputs at the time of the alarm Bit 0: Counter 1, A/pulse Bit 1: Counter 1, B/direction Bit 2: Counter 2, A/pulse Bit 3: Counter 2, B/direction Bit 7 ... 4: 0 (fix)
3/4	16 bit μ s value at the time of the alarm

Ticker value: After mains connection a timer (μ s ticker) is started, which after 65535 μ s starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μ s value together with the count value in the input area.

Diagnostic alarm

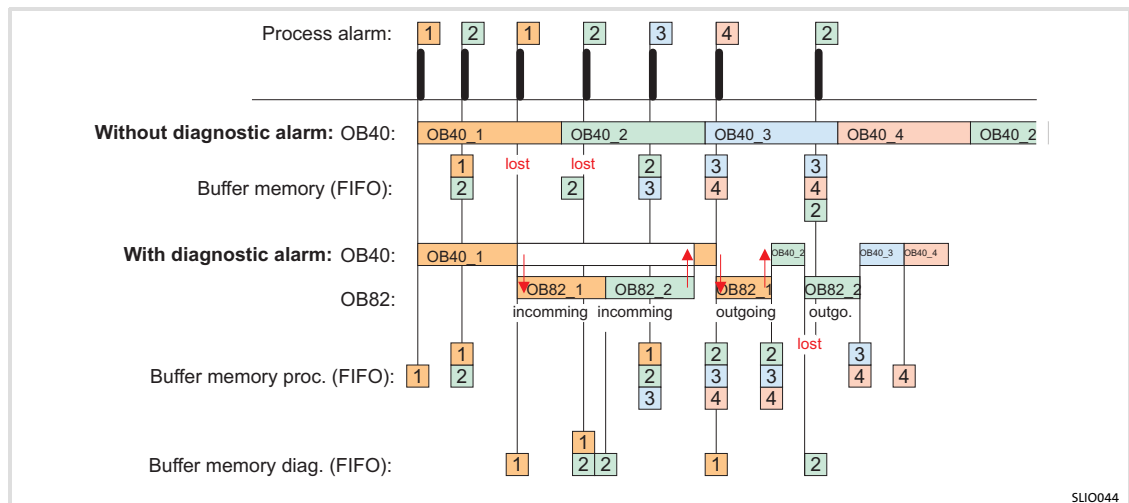
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



SLI0044

Diagnostic alarm processing:

Using the SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.

Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bits 6 ... 0: channel type, 76h: counter module Bit 7: further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 02 _h)
7	Bit 0: Error in channel group 0 (counter 1) Bit 1: Error in channel group 1 (counter 2) Bit 7 ... 2: 0 (fix)
8	Channel group 0: diagnostic alarm due to lost process alarm to ... Bits 1 ... 0: 0 (fixed) Bit 2: overflow/underflow/final value Bit 3: comparison value reached Bits 7 ... 4: 0 (fixed)
9	Channel group 1: diagnostic alarm due to lost process alarm to ... Bits 1 ... 0: 0 (fixed) Bit 2: overflow/underflow/final value Bit 3: comparison value reached Bits 7 ... 4: 0 (fixed)
10 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

12.8.4 One counter 32 bits, 5 V DC - EPM-S602

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from the loading value to the counting limit, then skips to the opposite counting limit and continues to count from there.
Counting once	The counter counts once/periodically from the loading value in the specified counting range.
Counting periodically	
Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Main counting direction	The main counting direction can be parameterised: None: The whole counting range is available. Forwards: Limitation of the counting range upwards. The counter counts from the parameterised loading value in the positive direction to the parameterised final value -1 and then skips to the loading value again with the encoder pulse that is following. Backwards: Limitation of the counting range downwards. The counter counts from the parameterised loading value in the negative direction to the parameterised final value +1 and then skips to the loading value again with the encoder pulse that is following.
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area). The following response can be parameterised: Cancelling gate function: After closing the gate and opening it again, the counting process continues from the loading value again. Interrupting gate function: After closing the gate and opening it again, the counting process continues with the last current counter content.
Comparator	You can specify a comparison value which, depending on the count value, activates the digital output or triggers a process alarm.
Hysteresis	By specification of a hysteresis you can for instance prevent the output from being permanently switched if the value of an encoder signal fluctuates around the comparison value.
Process alarm	The activation of a process alarm can be parameterised. A process alarm can be triggered in the case of the following events: <ul style="list-style-type: none"> ● Hardware gate open ● Hardware gate closed ● Counting limit - overflow ● Counting limit - underflow ● Comparison value reached ● Final value reached ● Latch value reached
Diagnostic alarm	If the diagnostic alarm is enabled in the parameter setting, it occurs as soon as another process alarm is triggered for the same event during process alarm processing.
Diagnostic function	Diagnostic functions are provided in the modules.
Diagnostic information	The diagnostic information describes the diagnostic contents which can be read out from a module. The diagnostic formation is not automatically sent by the module but must actively be read out by SDO access.

Read data: 8 bytes

Input area		
Addr.	Access	Assignment
+0	Double word	Count value
+4	Word	Status word (see the following table)
+6	Word	Ticker value

Count value: Current counter content

Ticker value: After mains connection a timer (μs ticker) is started, which after 65535 μs starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μs value together with the count value in the input area.

EPM-S602 status word		
Bit	Designation	Function
0	STS_SYNC	Reset was active
1	STS_CTRL_COMP	Is set if the comparison bit is enabled
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	STS_RST	Status of reset input
4	-	Reserved
5	STS_GATE	Status of internal gate (set if internal gate active)
6	STS_COMP	Status of comparison bit
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	STS_CMP*	Comparator status is set if the comparison condition is met. If the comparison is deactivated (counter mode byte 1 = 000 _b), the bit has no function.
10	STS_END*	Status set if final value was reached
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	-	Reserved
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

Write data: 10 bytes

Output area		
Addr.	Access	Assignment
+0	Double word	Comparison value
+4	Double word	Set value
+8	Word	Control word (see the following table)

Comparison value: Here you can select a value which, by comparison with the current counter content, can impact the counter output or trigger a process alarm. The response of the output or the process alarm can be parameterised.

Set value: With an edge change 0-1 of *COUNTERVAL_SET* in the control word, the set value is accepted in the counter.

EPM-S602 control word		
Bit	Name	Function
0	CTRL_SYNC_SET	Activation/deactivation of the counting signal: TRUE=>FALSE edge: The input for the counting signal is deactivated and the current counter content is reset to 0. FALSE=>TRUE edge: The input for the counting signal is activated.
1	CTRL_COMP_SET	Enables the comparison bit
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	COUNTERVAL_SET	Sets the counter temporarily to the value in the set value
6	RES_SET	Resets bits STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP with a rising edge
7	-	Reserved
8	CTRL_SYNC_RESET	Activation/deactivation of the zero track evaluation: TRUE=>FALSE edge: The zero track evaluation is activated. FALSE=>TRUE edge: The zero track evaluation is stopped. The counter keeps counting irrespective of the zero pulse. Bit 0 (CTRL_SYNC_SET) must be set to TRUE for this purpose.
9	CTRL_COMP_RESET	Inhibits the comparison bit
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12		
13		
14		
15		

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
01 _h	0	Input frequency track A	Filters for instance serve to filter signal peaks in the case of an unclean input signal. 0 (00 _h): 500 kHz 1 (01 _h): 300 kHz 2 (02 _h): 100 kHz	02 _h
	1	Input frequency track B	3 (03 _h): 60 kHz 4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
	2	Input frequency reset	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
	3	Reserved		
80 _h	0	Alarm response	Setting activates process alarm Bits 1 ... 0: reserved Bit 2: Proc. alarm overflow Bit 3: Proc. alarm underflow Bit 4: Proc. alarm comparison value Bit 5: Proc. alarm final value Bits 7 ... 6: Reserved	00 _h

Data set		Name	Description/value	Lenze
No.	Byte			
81 _h	1	Counter function	Bits 5 ... 0: 000000 _b = counting continuously 000001 _b = once: forwards 000010 _b = once: backwards 000100 _b = once: no main counting direction 001000 _b = periodically: forwards 010000 _b = periodically: backwards 100000 _b = periodically: no main counting direction Bits 7 ... 6: Reserved	00 _h
	2	Comparator	Bits 2 ... 0: Comparison bit is set (... if condition is met) 000 _b = never 001 _b = count value ≥ comparison value 010 _b = count value ≤ comparison value 100 _b = count value = comparison value Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 6 ... 4: Reset 000 _b = deactivated 001 _b = HIGH level 011 _b = rising edge 101 _b = rising edge, once Bit 7: Reserved	00 _h
	3	Signal evaluation	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 6 ... 3: Reserved Bit 7: Gate function (internal gate) 0 = abort (counting process starts again from loading value) 1 = interrupt (counting process is continued with counter content)	00 _h
	4...7	Final value	Upper limit of the counting range	00 _h
	8...11	Start value	Lower limit of the counting range; counting method:	00 _h
	12	Hysteresis		00 _h

Process alarm

A process alarm causes a call of the OB 40. Within the OB 40 you have the possibility of determining the logic basic address of the module that has triggered the process alarm via the local word 6. Further information on the triggering event can be found in the "Local double word 8".

Local double word 8 of OB 40:

Local byte	Bit 7 ... 0
1	Bit 0: 0 Bit 1: 0 Bit 2: Counter 1, overflow/underflow/final value Bit 3: Counter 1, comparison value reached Bit 4: 0 Bit 5: 0 Bit 6: Counter 2, overflow/underflow/final value Bit 7: Counter 2, comparison value reached
2	State of the inputs at the time of the alarm Bit 0: Counter 1, A/pulse Bit 1: Counter 1, B/direction Bit 2: Counter 2, A/pulse Bit 3: Counter 2, B/direction Bit 7 ... 4: 0 (fix)
3/4	16 bit μ s value at the time of the alarm

Ticker value: After mains connection a timer (μ s ticker) is started, which after 65535 μ s starts with 0 again. With every change of the count value the time value of the timer is stored as 16-bit μ s value together with the count value in the input area.

Diagnostic alarm

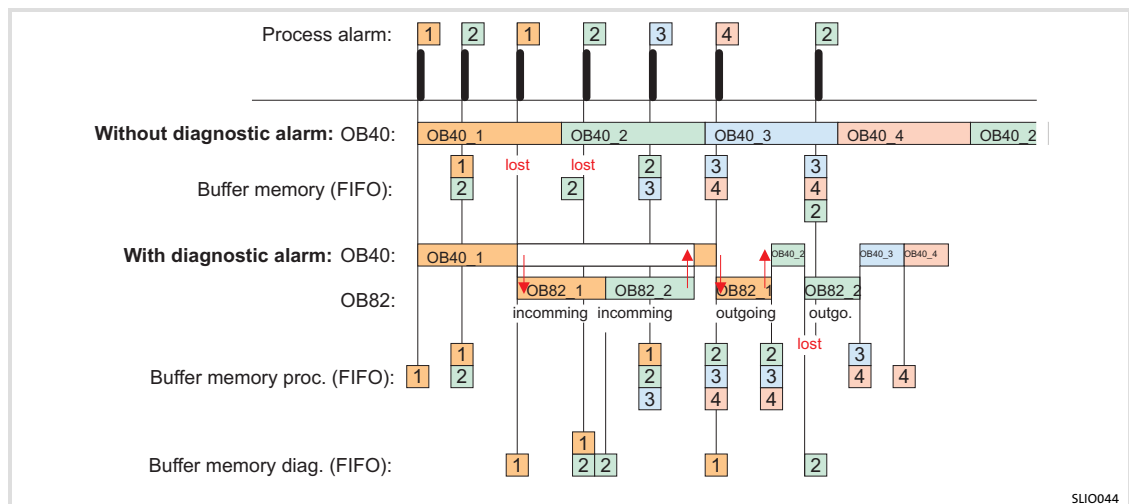
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



SLI0044

Diagnostic alarm processing:

Using the SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.

Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set if module fault Bit 1: 0 (fixed) Bit 2: Set in the case of an external error Bit 3: Set in the case of a channel error Bit 6 ... 4: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bit 6 ... 0: Channel type, 76h: counter module Bit 7: Further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 02 _h)
7	Bit 0: Error in channel group 0 (counter 0) Bit 1: Error in channel group 1 (counter 1) Bit 7 ... 2: 0 (fixed)
8	Channel group 0: Diagnostic alarm ldue to lost process alarm to ... Bit 1 ... 0: 0 (fixed) Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 7 ... 4: 0 (fixed)
9	Channel group 1: Diagnostic alarm ldue to lost process alarm to ... Bit 1 ... 0: 0 (fixed) Bit 2: Overflow/underflow/final value Bit 3: Comparison value reached Bit 7 ... 4: 0 (fixed)
10 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

12.8.5 Two counters 32 bits, 24 V DC - EPM-S603

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Counting functions	Description
Counting continuously	The counter counts from 0 to the counting limit, then skips to the opposite counting limit and continues to count from there.

Signal evaluation	Description
Rotary transducer, single	Connection to input "A/pulse"
Rotary transducer, double	
Rotary transducer, fourfold	Connection to input "A/pulse" and "B/direction"
Direction	Pulse at input "A/pulse" and direction at "B/direction"

Additional functions	Description
Gate function	The gate function serves to start, stop, and interrupt a counting function. In the case of this counter the internal gate (I-gate) is conform to the software gate (SW gate) which you control via your user program (status word in the output area).

Read data: 12 bytes

Input area in the process image		
Addr.	Access	Assignment
+0	Double word	Counter 1: count value
+4	Double word	Counter 2: count value
+8	Word	Counter 1: status word (see following table)
+10	Word	Counter 2: status word (see following table)

EPM-S603 status word		
Bit	Designation	Function
0	-	Reserved
1	-	Reserved
2	STS_SW-GATE	Software gate status (set if SW gate active)
3	-	Reserved
4	-	Reserved
5	STS_GATE	Status of internal gate (set if internal gate active)
6	-	Reserved
7	STS_C_DN	Status set for counter direction backwards
8	STS_C_UP	Status set for counter direction forwards
9	-	Reserved
10	-	Reserved
11	STS_OFLW*	Status set in the case of overflow
12	STS_UFLW*	Status set in the case of underflow
13	STS_ZP*	Status set in the case of zero crossing
14	-	Reserved
15	-	Reserved

* The bits are set until reset with RES_SET (bit 6 control word)

Write data: 4 bytes

Output area in the process image		
Addr.	Access	Assignment
+0	Word	Counter 1: Control word (see following table)
+2	Word	Counter 2: Control word (see following table)

EPM-S603 control word		
Bit	Designation	Function
0	-	Reserved
1	-	Reserved
2	SW_GATE_SET	Sets the software gate
3	-	Reserved
4	-	Reserved
5	-	Reserved
6	RES_SET	Resets bits STS_CMP, STS_END, STS_OFLW, STS_UFLW and STS_ZP with a rising edge
7	-	Reserved
8	-	Reserved
9	-	Reserved
10	SW_GATE_RESET	Resets the software gate
11	-	Reserved
12		
13		
14		
15		

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
01 _h	0	Input frequency counter 1, track A	Filters for instance serve to filter signal peaks in the case of an unclean input signal. 0 (00 _h): 500 kHz	02 _h
	1	Input frequency counter 1, track B	1 (01 _h): 300 kHz 2 (02 _h): 100 kHz 3 (03 _h): 60 kHz	02 _h
	2	Input frequency counter 2, track A	4 (04 _h): 30 kHz 6 (06 _h): 10 kHz 7 (07 _h): 5 kHz	02 _h
	3	Input frequency counter 2, track B	8 (08 _h): 2 kHz 9 (09 _h): 1 kHz Other values are not permissible!	02 _h
80 _h	0	Counting direction counter 1, track B	Bits 2 ... 0: Reserved Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
	1	Signal evaluation counter 1	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 7 ... 3: Reserved	00 _h
82 _h	0	Counting direction counter 2, track B	Bits 2 ... 0: Reserved Bit 3: Invert counting direction track B 0 = no (do not invert) 1 = yes (invert) Bits 7 ... 4: Reserved	00 _h
	1	Signal evaluation counter 2	Bits 2 ... 0: Signal evaluation 000 _b = counter deactivated (the other parameter details for the counter are ignored) 001 _b = single rotary transducer (connection to input "A/pulse") 010 _b = double rotary transducer (connection to input "A/pulse") 011 _b = four-fold rotary transducer (connection to input "A/pulse" and "B/direction") 100 _b = direction (pulse to "A/pulse" and direction to "B/direction") Bits 7 ... 3: Reserved	00 _h

Diagnostic data

Using the SFB 52 you can access the diagnostic data of the module anytime. Since this module does not support a process alarm, the diagnostic data serve to provide information on this module.

Data set 1 is structured as follows:

Byte	Bit 7 ... 0
0	0 (fixed)
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bit 6 ... 0: Channel type, 76h: counter module Bit 7: Further channel types available, 0: no, 1: yes
5	Number of diagnostic bits output by the module per channel (here 00 _h)
6	Number of channels of a module (here 02 _h)
7 ... 15	0 (fixed)

12.9 Parameterising the encoder evaluation

12.9.1 SSI - EPM-S604

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Functions	Description
SSI encoder parameters	According to encoder data sheet
Operating mode	Master mode or monitoring operation
Alarm response	With definition of the comparison and limit values

Read data: 6 bytes

Input area		
Addr.	Access	Assignment
+0	Double word	Encoder value
+4	Word	Ticker value

Encoder value: Current encoder value

Ticker value: After mains connection a timer (μs ticker) is started, which after 65535 μs starts with 0 again. With every change of the encoder value the time value of the timer is stored as 16-bit μs value together with the encoder value in the input area.

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	A diagnostic alarm occurs if the same event triggers a further process alarm during a process alarm processing. Bits 5 ... 0: reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
80 _h	0	Dead time	The dead time, also called tbs (time between sends), defines the waiting time between two encoder values to be observed by the module so that the encoder is able to process its value. This data can be found in the data sheet for your encoder. HIGH LOW 00 _h 30 _h : 1 μs 00 _h 60 _h : 2 μs 00 _h C0 _h : 4 μs 01 _h 80 _h : 8 μs 03 _h 00 _h : 16 μs 06 _h 00 _h : 32 μs 09 _h 00 _h : 48 μs 0C _h 00 _h : 64 μs	0C00 _h

Data set		Name	Description/value	Lenze
No.	Byte			
	1	Baud rate	In the "Monitoring operation" mode, the baud rate is irrelevant. Enter the baud rate here. This corresponds to the clock frequency via which the connected encoder communicates. More information on this can be found in the data sheet for your encoder. HIGH LOW 00 _h 18 _h : 2 MHz 00 _h 20 _h : 1.5 MHz 00 _h 30 _h : 1 MHz 00 _h 60 _h : 500 kHz 00 _h C0 _h : 250 kHz 01 _h 80 _h : 125 kHz	0180 _h
	2	Reserved		
	3	Scaling	Depending on the encoder, further bits are transmitted in addition to the encoder value. Scaling serves to determine how many bits postponed to the encoder value will be removed by shifting the encoder value to the right. The encoder value is scaled by the module only after a gray-binary conversion. More information can be found in the data sheet for your encoder. Value range: 00 _h ... 0F _h = 0 bits ... 15 bits	00 _h
	4	Bit length of encoder data	Enter the bit length of the encoder data here. Depending on the encoder, the encoder data consist of the current encoder value with subsequent bits. The total length has to be specified here. More information on this can be found in the data sheet for your encoder. 7 (07 _h) = "8 bits" 8 (08 _h) = "9 bits" ... 24 (18 _h) = "25 bits" ... 31 (1F _h) = "32 bits"	18 _h

Data set		Name	Description/value	Lenze
No.	Byte			
	5		<p>Bit 1 ... 0: Ready for operation During "Monitoring operation" the module serves to monitor the data exchange between an SSI master and an SSI encoder. It receives the cycle by the master and the data flow by the SSI encoder. In the "Master mode" operating mode the module provides a cycle to the encoder and receives data by the encoder. 01_b = monitoring operation 10_b = master mode</p> <p>Bit 2: Shifting direction Specify the orientation of the encoder data here. More information can be found in the data sheet for your encoder. Usually, the SSI encoder uses "MSB first". 0 = LSB first (LSB is transmitted first) 1 = MSB first (MSB is transmitted first)</p> <p>Bit 3: edge clock signal Here you can specify the edge type of the clock signal, in the case of which the encoder supplies data. Information on this can be found in the data sheet for your encoder. Usually the SSI encoders respond to rising edges. 0 = falling edge 1 = rising edge</p> <p>Bit 4: Coding In the "Binary code" setting, the provided encoder value remains unchanged. In the "Gray code" setting, the gray-coded value provided by the encoder is converted into a binary value. Only after this conversion, the received encoder value is scaled, if required. The Gray code is another form of representation of the binary code. It is based on the fact that two adjacent Gray numbers differ from each other in exactly one bit. If the Gray code is used, transmission errors can be easily detected, since adjacent characters must only differ from each other in one digit. Information on this can be found in the data sheet for your encoder. 0 = standard code 1 = Gray code</p> <p>Bits 7 ... 5: reserved</p>	1E _h
6		Reserved		
7		SSI function	<p>By enabling the SSI function the module starts with the cycle output and the evaluation of the encoder data. In the "monitor operation" mode, the module starts with the encoder evaluation. 0 (00_h) = inhibited 1 (01_h) = enabled</p>	00 _h

Diagnostic alarm

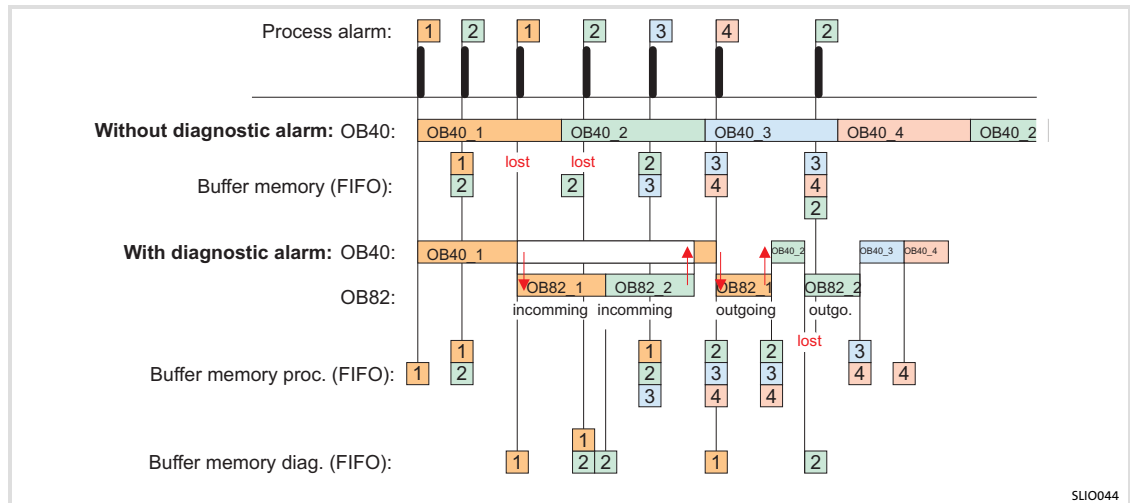
You have the possibility of globally activating a diagnostic alarm for the module via parameterisation (data set 00h). A diagnostic alarm occurs if a further process alarm is triggered for the same event during a process alarm processing in the OB 40.

By activation of a diagnostic alarm the current process alarm processing in the OB 40 is interrupted and branched to the diagnostic alarm processing_{incoming} in OB 82. If further events occur on other channels during the diagnostic alarm processing, which can trigger a process or diagnostic alarm, they are buffered. At the end of the diagnostic alarm processing, first all buffered diagnostic alarms are processed in order of their occurrence, and afterwards all process alarms.

If further process alarms occur on a channel for which a diagnostic alarm_{incoming} is currently processed or buffered, they are lost. If a process alarm for which a diagnostic alarm_{incoming} has been triggered is processed, the diagnostic alarm processing is called again as diagnostic alarm_{outgoing}.

All events of a channel between the diagnostic alarm_{incoming} and diagnostic alarm_{outgoing} are not buffered and are lost. During this time (first diagnostic alarm_{incoming} to the last diagnostic alarm_{outgoing}) the MF-LED of the module is lit. Additionally an entry in the diagnostic buffer of the CPU is made for every diagnostic alarm_{incoming/outgoing}.

Example:



Diagnostic alarm processing:

Using SFB 52 you can read out the diagnostic bytes. If the diagnostic alarm is deactivated, you can access the last diagnostic event in each case.

If you have activated the diagnostic function in your hardware configuration, OB 82 is called automatically. Here you can react on the diagnostics accordingly. With the SFB 52 you can additionally read out data set 1 which contains further information.

After exiting OB 82, the data can no longer be clearly assigned to the last diagnostic alarm.

Data set 1 is structured as follows:

Data set 1, diagnostics _{incoming}	
Byte	Bit 7 ... 0
0	Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error Bit 3: Set if channel error available Bit 4: Set in the case of missing external supply voltage Bit 6 ... 5: 0 (fixed) Bit 7: Parameterisation error
1	Bit 3 ... 0: Module class, 1000 _b : function module Bit 4: Channel information available Bit 7 ... 5: 0 (fixed)
2	0 (fixed)
3	Bit 5 ... 0: 0 (fixed) Bit 6: Process alarm lost Bit 7: 0 (fixed)
4	Bit 6 ... 0: Channel type, 76h: counter module Bit 7: 0 (fixed)
5	Number of diagnostic bits output by the module per channel (here 08 _h)
6	Number of channels of a module (here 01 _h)
7	Bit 0: Error in channel group 0
8 ... 15	0 (fixed)
Data set 1, diagnostics _{outgoing}	
After the error recovery a diagnostic message _{outgoing} is effected	

12 PROFINET communication

Time stamp parameterising
2 digital inputs with time stamp function - EPM-S207

12.10 Time stamp parameterising

12.10.1 2 digital inputs with time stamp function - EPM-S207

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The following functions can be parameterised:

Functions	Description
Input delay	For example, signal peaks can be filtered in the event of an unclear input signal.
Edge selection	Specification of signal edge for input signal to produce a time stamp entry.

Read data: 6 bytes

Input area		
Addr.	Access	Assignment
+0	Byte	Status of inputs (PAE)
+1	Byte	Running number (RN)
+2	Word	Ticker value

Status of inputs: the status of the inputs after the edge change is saved here. Parameters can be set for the following variants by incorporating the GSD file LE010C3A.gsd:

20 bytes, 5 time stamp entries:

Addr.	+0	+1	+2	+3
+0	PAE	RN	16-bit μ s value	
+4	PAE	RN-1	16-bit μ s value	
+8	PAE	RN-2	16-bit μ s value	
+12	PAE	RN-3	16-bit μ s value	
+16	PAE	RN-4	16-bit μ s value	

60 bytes, 15 time stamp entries:

Addr.	+0	+1	+2	+3
+0	PAE	RN	16-bit μ s value	
+4	PAE	RN-1	16-bit μ s value	
+8	PAE	RN-2	16-bit μ s value	
+12	PAE	RN-3	16-bit μ s value	
...	
+56	PAE	RN-14	16-bit μ s value	

Running number (RN): The "running number" is a consecutive number between 0 ... 63, which always starts afresh from 0. You use the "running number" to determine the time sequence of entries. It should be incremented with every time stamp entry. During the first run, the "running number" must start with 1.

Ticker value: After mains connection, a timer (μ s ticker) is started, which after 65535 μ s starts with 0 again. With every change in the encoder value the time value of the timer is stored as a 16-bit μ s value together with the encoder value in the input area.

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	14 _h or 3C _h (fix)
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	00 _h (fix)
01 _h	0	Input delay DI 1	00 _h = 1 μs 02 _h = 3 μs 04 _h = 10 μs 07 _h = 86 μs 09 _h = 342 μs 0C _h = 273 μs Other values are not permissible.	02 _h
	1	Input delay DI 2	07 _h = 86 μs 09 _h = 342 μs 0C _h = 273 μs Other values are not permissible.	02 _h
80 _h	0	Edge 0-1 an DI x	Time stamp entry on rising edge Bit 0: DI 1 (0: inhibit, 1 = enable) Bit 1: DI 2 (0: inhibit, 1 = enable) Bits 7 ... 2: Reserved	00 _h
	1	Edge 1-0 at DI x	Time stamp entry on falling edge Bit 0: DI 1 (0: inhibit, 1 = enable) Bit 1: DI 2 (0: inhibit, 1 = enable) Bits 7 ... 2: Reserved	00 _h

Diagnostic data

Using SFB 52, you can read out the diagnostic bytes which provide information about the module. With SFB 52 you can also read out data set 1 which contains further information.

Data set 1 is structured as follows:

Data set 1, diagnostics	
Byte	Bit 7 ... 0
0	0 (fixed)
1	Bits 3 ... 0: module class, 1111 _b : digital module Bit 4: channel information available Bits 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bits 6 ... 0: channel type, 70 _h : digital module Bit 7: more channel types available (0: yes; 1: no)
5	Number of diagnostic bits output by the module per channel (here 00 _h)
6	Number of channels of a module (here 02 _h)
7 ... 15	0 (fixed)

12.10.2 2 digital outputs with time stamp function - EPM-S310

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

The module has an FIFO (first-in-first-out) memory for 15 time stamp entries. Depending on parameter setting, you can use the output area to transfer up to 15 time stamp entries to the FIFO memory. The input process image provides information on the status of the FIFO memory and the status of processing.

Read data: 4 bytes

Input area		
Addr.	Access	Assignment
+0	Byte	Bits 5 ... 0: running number (RN = Running Number) of the last FIFO entry Bit 6: 1 (fixed) Bit 7: 0 (fixed)
+1	Byte	Bits 5 ... 0: running number of the next FIFO entry Bit 6: 1 (fixed) Bit 7: 1 (fixed)
+2	Byte	Status
+3	Byte	Number of time stamp entries in FIFO memory.

Running number: here you will find the running number of the time stamp entry last/next written to the FIFO.

Status: The status informs you of the status of the FIFO memory:

Code 00_h/80_h: everything OK

Code 01_h/81_h: no following time stamp entry

Code 02_h/82_h: no new time stamp entries.

Code 03_h/83_h: FIFO memory is full. No new time stamp entries can be accepted.

If bit 6 of the last processed running number (RN) was set, the code is returned at 80_h OR-ed.



Note!

Note that no more time stamp entries can be accepted once the FIFO memory is full. You should always establish the status of the FIFO memory before the transfer to ensure that your entries are accepted.

Write data: 20 bytes/60 bytes

Depending on project planning, the output area can be used to write up to 15 time stamp entries. 4 bytes in the process image are intended for each time stamp entry:

Output area		
Addr.	Access	Assignment
+0	Byte	Bits 3 ... 0: 0 (fixed) Bit 4: Release of DO 1 (0: inhibit, 1: enable) Bit 5: Release of DO 0 (0: inhibit, 1: enable) Bit 6: State DO 1 Bit 7: State DO 0
+1	Byte	Running number (RN)
+2	Word	Ticker value

Status of outputs: the status of the outputs for the time required is stated here. You can project plan the following variants by incorporating the GSD file LE010C3A.gsd.gsd:

20 bytes, 5 time stamp entries:

Addr.	+0	+1	+2	+3
+0	PAA	RN	16-bit μ s value	
+4	PAA	RN-1	16-bit μ s value	
+8	PAA	RN-2	16-bit μ s value	
+12	PAA	RN-3	16-bit μ s value	
+16	PAA	RN-4	16-bit μ s value	

60 bytes, 15 time stamp entries:

Addr.	+0	+1	+2	+3
+0	PAA	RN	16-bit μ s value	
+4	PAA	RN-1	16-bit μ s value	
+8	PAA	RN-2	16-bit μ s value	
+12	PAA	RN-3	16-bit μ s value	
...	
+56	PAA	RN-14	16-bit μ s value	

Running number (RN): The "running number" is a consecutive number between 0 ... 63, which always starts afresh from 0. You use the "running number" to determine the time sequence of entries. It should be incremented with every time stamp entry. During the first run, the "running number" must start with 1.

**Note!**

If using SFC 15 to write consistent user data, up to 15 time stamp entries can be written. If less than 15 time stamp entries are written, bit 6 must also be set for the last RN. This has to be done to ensure that the following entries don't have to be written in an "invalid" way. The module ignores all time stamp entries after an entry with a set bit 6.

Ticker value: Specify a time here in μ s at which the status of the outputs is to be accepted (value range: 0 ... 65535).

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	14 _h or 3C _h (fix)
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	00 _h (fix)

Diagnostic data

Using SFB 52, you can read out the diagnostic bytes which provide information about the module. With SFB 52 you can also read out data set 1 which contains further information.

Data set 1 is structured as follows:

Data set 1, diagnostics	
Byte	Bit 7 ... 0
0	0 (fixed)
1	Bits 3 ... 0: module class, 1111 _b : digital module Bit 4: channel information available Bits 7 ... 5: 0 (fixed)
2	0 (fixed)
3	0 (fixed)
4	Bits 6 ... 0: channel type, 70 _h : digital module Bit 7: more channel types available (0: yes; 1: no)
5	Number of diagnostic bits output by the module per channel (here 00 _h)
6	Number of channels of a module (here 02 _h)
7 ... 15	0 (fixed)

12.11 Parameterising technology modules**12.11.1** 2 digital outputs with PWM functionality - EPM-S620

The following functions can be parameterised:

By integration of the GSE file VI010C19.gse you can specify all counter parameters via a hardware configuration.

Read data: 4 bytes

Input area			
Addr.	Name	Byte	Function
+0	PWMSTS_I	2	PWM 1: status
+2	PWMSTS_II	2	PWM 2: status

Status PVMx		
Bit	Name	Function
0	-	Reserved
1	STS_PVM	Status PWM 0: PWM output stopped 1: PWM output active
2	STS_OUTBV	Output status 0: push/pull output 1: highside output
3 ... 15	-	Reserved

Write data: 12 bytes

Output area			
Addr.	Name	Byte	Function
+0	PWMPD_I	4	PWM 1: pulse duration
+4	PWMSTS_II	4	PWM 2: pulse duration
+8	PWMCTRL_I	2	PWM 1: control word
+10	PWMSTS_II	2	PWM 2: control word

PWMPD_I, PWMPD_II pulse duration:Determine the scanning ratio for the parameterised period here by stating the duration of the HIGH level for the corresponding PWM channel. The pulse duration should be chosen as a factor for the 20.83 ns basis.

Value range: 48 ... 8388607 (1 μ s ... approx. 175ms)

PWMPD_I, PWMPD_II control word:here you can specify the PWM output response for the corresponding channel and start or stop PWM output.

Control word PWMPDx		
Bit	Name	Function
0	-	Reserved
1	CTRL_OUTBV	PWM output response 0: push/pull output Push/pull mode should be used if you need defined high/low levels for a rapid change. This is used with a low load especially if "highside" mode cannot move the output to low fast enough during a low status. With push/pull, the output is switched to ground with low active and to voltage with high active. 1: highside output In highside mode, the output switched to low remains in a state of uncertainty between ground and voltage. The load has to "pull" itself to ground. In highside mode, the switch is only made to high level active.
3 ... 7	-	Reserved
8	CTRL_STRT	Edge 0-1 starts PWM output on channel x
9	CTRL_STP	Edge 0-1 stops PWM output on channel x
10 ... 15	-	Reserved

Parameter data

Data set		Name	Description/value	Lenze
No.	Byte			
80h	0	PWM 1: period	Set parameters here for the total time for pulse duration and pulse pause. The time should be selected as a factor for the 20.83 ns basis.	1F40h
81h	0	PWM 2: Period	Values below 25 µs are ignored. If the pulse duration is higher or equal to the period, the DO output is set permanently. Value range: 1200 ... 8388607 (25 µs ... approx. 175 ms)	1F40h

Diagnostic data

Since this module does not support alarms, the diagnostic data provides information about this module.

Diagnostic data set - data set 01h			
Name	Byte	Function	Default
ERR_A	1	Reserved	00 _h
MODTYP	1	Module information Byte 0: Bit 3 ... 0: module class (1111b: digital module) Bit 4: channel information available Bits 7 ... 4: 0 reserved	15 _h
ERR_C	1	Reserved	00 _h
ERR_D	1	Reserved	00 _h
CHTYP	1	Channel type Byte 0: Bits 6 ... 0: channel type (72h: digital output) Bit 7: reserved	72 _h
NUMBIT	1	Number of diagnostic bits per channel Byte 0: here 00 _h	00 _h
NUMCH	1	Number of channels in module Byte 0: here 02 _h	02 _h
CHERR	1	Reserved	00 _h
CH0ERR ... CH7ERR	6	Reserved	00 _h
DIAG_US	4	Value of μ s ticker when diagnostics occur Bytes 0 ...3	0

12.11.2

RS232 interface - EPM-S640



Information on the transmission principles can be found in the appendix (777).

Parameter data

Parameter data - ASCII protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
			Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
			Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
			Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b

Parameter data - ASCII protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 2/3, ZNA				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA)	00 _h
	4	ZNA (LOW byte)	Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
Option 4/5, ZVZ				
80 _h	5	Character delay time	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
	6			FA _h
Option 6, number of receive buffers				
80 _h	7	Number of receive buffers	Defines the number of receive buffers. As long as only one receive buffer is used and is assigned, no more data can be received. If up to 250 receive buffers are connected, the received data can be redirected to a still free receive buffer. 1 ... 255 (01 _h ... FF _h)	01 _h
Option 7 ... 12, reserved				
80 _h	8 ... 13	Reserved		00 _h

Parameter data STX/ETX protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhib.; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
			Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
			Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
			Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b
Option 2/3, ZNA				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
	4	ZNA (LOW byte)		00 _h

Parameter data STX/ETX protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 4/5, TMO				
80 _h	5	TMO (HIGH byte)	TMO serves to define the maximally permissible interval between two frames. 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h
	6	TMO (LOW byte)		FA _h
Option 6, number of start identifiers				
80 _h	7	Number of start identifiers	00 _h : 1 start identifier (2nd start identifier is ignored) 01 _h : 2 start identifiers	01 _h
Option 7, start identifier 1				
80 _h	8	Start identifier 1	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 8, start identifier 2				
80 _h	9	Start identifier 2	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 9, number of end identifiers				
80 _h	10	No. of end identifier	00 _h : 1 end identifier (2. end identifier (0x310D/x) is ignored) 01 _h : 2 end identifiers	00 _h
Option 10, end identifier 1				
80 _h	11	End identifier 1	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 11, end identifier 2				
80 _h	12	End identifier 2	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 12, reserved				
80 _h	13	Reserved		00 _h

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits	11 _b
			00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	
			Bit 3/2 parity	00 _b
			00 _b : none 01 _b : odd 10 _b : even 11 _b : even	
			Bit 5/4 number of stop bits	01 _b
			01 _b : 1 10 _b : 1.5 11 _b : 2	
			Bit 7/6 flow control	00 _b
			00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	
Option 2, ZNA (x 20 ms)				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. The ZNA is indicated as a factor in steps of 20ms. 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 3, ZVZ (x 20 ms)				
80 _h	4	Character delay time	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram. The ZVZ is indicated as a factor in steps of 20ms. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
Option 4, QVZ (x 20 ms)				
80 _h	5	Acknowledgement time	Acknowledgement time (QVZ) The QVZ defines the max. permissible time interval until the partner is acknowledged while establishing/terminating a connection. The QVZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 5, BWZ (x 20 ms)				
80 _h	6	Block wait time	Block wait time (BWZ) The BWZ is the maximum time period between the confirmation of a request frame (DLE) and STX of the response frame. The BWZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	FA _h
Option 6, STX (x 20 ms)				
80 _h	7	STX repetitions	Maximum number of times the module attempts to establish a connection. 1 ... 255 [ms] (01 _h ... FF _h)	01 _h
Option 7, DBL (x 20 ms)				
80 _h	8	DBL	When exceeding the block wait time (BWZ) you can specify the maximum number of repetitions for the request frame using the DBL parameter. If these attempts fail, transmission is cancelled. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 8, priority (x 20 ms)				
80 _h	9	Priority	A communication partner has high priority if its sending attempt has precedence over the partner's transmit request. In the event of low priority, it must take second place behind the partner's transmit request. With 3964(R) the priorities of both partners must be different. The following settings are possible: 00 _h : LOW 01 _h : HIGH	00 _h
Option 9 ... 12, reserved				
80 _h	10 ... 13	Reserved		00 _h

Diagnostic data

Since this module does not support alarms, the diagnostic data provides information about this module.

In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

Diagnostic data - data set 01h			
Name	Byte	Function	Default
ERR_A	1	ERR_A-diagnostics Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error (cable break) Bit 3: Reserved Bit 4: Set in the case of a missing external supply voltage Bit 5, 6: Reserved Bit 7: Set in the case of parameterisation error	00 _h
MODTYP	1	Module information Byte 0: Bit 3 ... 0: Module class (0111b: Gateway module) Bit 4: channel information available Bits 7 ... 4: 0 reserved	17 _h
ERR_C	1	ERR_A-diagnostics Bit 7 ... 0: Reserved	00 _h
ERR_D	1	ERR_D diagnostics Bit 3 ... 0: Reserved Bit 4: Set in the case of internal communication error Bit 7 ... 5: Reserved	00 _h
CHTYP	1	Channel type Bit 7 ... 0: Reserved	00 _h
NUMBIT	1	Number of diagnostic bits of the module per channel (here 08 _h)	08 _h
NUMCH	1	Number of channels in module Bit 7 ... 0: Reserved	00 _h
CHERR	1	Bit 7 ... 0: Reserved	00 _h
CH0ERR ... CH7ERR	8	Bit 7 ... 0: Reserved	00 _h
DIAG_US	4	Value of μ s ticker when diagnostics occur Bytes 0 ...3	00 _h

12.11.3 RS422/RS485 interface - EPM-S650


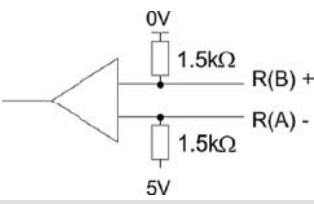
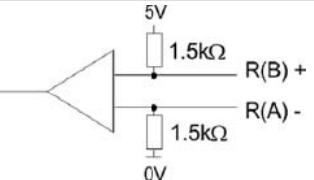


Information on the transmission principles can be found in the appendix (777).

Parameter data

Parameter data - ASCII protocol				
Data set No.	Byte	Name	Description/value	Lenze
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits 00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	11 _b
			Bit 3/2 parity 00 _b : none 01 _b : odd 10 _b : even 11 _b : even	00 _b
			Bit 5/4 number of stop bits 01 _b : 1 10 _b : 1.5 11 _b : 2	01 _b
			Bit 7/6 flow control 00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	00 _b

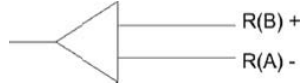
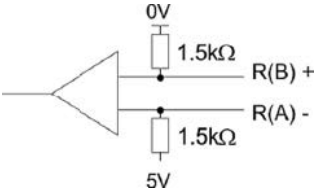
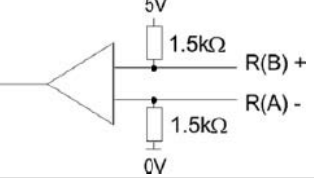
Parameter data - ASCII protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 2/3, ZNA				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA)	00 _h
	4	ZNA (LOW byte)	Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
Option 4/5, ZVZ				
80 _h	5	Character delay time	Character delay time (ZVZ)	00 _h
	6		The character delay time defines the maximum permissible time interval between two characters received within a telegram. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h .. FFFF _h)	FA _h
Option 6, number of receive buffers				
80 _h	7	Number of receive buffers	Defines the number of receive buffers. As long as only one receive buffer is used and is assigned, no more data can be received. If up to 250 receive buffers are connected, the received data can be redirected to a still free receive buffer. 1 ... 255 (01 _h ... FF _h)	01 _h
Option 7 ... 12, reserved				
80 _h	8 ... 13	Reserved		00 _h
Option 13, operating mode				
80 _h	14	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment				
80 _h	15	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

Parameter data STX/ETX protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits	11 _b
			00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	
			Bit 3/2 parity	00 _b
			00 _b : none 01 _b : odd 10 _b : even 11 _b : even	
			Bit 5/4 number of stop bits	01 _b
			01 _b : 1 10 _b : 1.5 11 _b : 2	
			Bit 7/6 flow control	00 _b
			00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	
Option 2/3, ZNA				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
	4	ZNA (LOW byte)		00 _h

Parameter data STX/ETX protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 4/5, TMO				
80 _h	5	TMO (HIGH byte)	TMO serves to define the maximally permissible interval between two frames. 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
	6	TMO (LOW byte)		FA _h
Option 6, number of start identifiers				
80 _h	7	Number of start identifiers	00 _h : 1 start identifier (2nd start identifier is ignored) 01 _h : 2 start identifiers	01 _h
Option 7, start identifier 1				
80 _h	8	Start identifier 1	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 8, start identifier 2				
80 _h	9	Start identifier 2	ASCII value of the initial character that is sent in advance of a frame and marks the start of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 9, number of end identifiers				
80 _h	10	No. of end identifier	00 _h : 1 end identifier (2. end identifier (0x310D/x) is ignored) 01 _h : 2 end identifiers	00 _h
Option 10, end identifier 1				
80 _h	11	End identifier 1	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 11, end identifier 2				
80 _h	12	End identifier 2	ASCII value of the end character that is sent after a frame and marks the end of a transmission. 0 ... 255 (00 _h ... FF _h)	00 _h
Option 12, reserved				
80 _h	13	Reserved		00 _h
Option 13, operating mode				
80 _h	14	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> • 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. • 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h

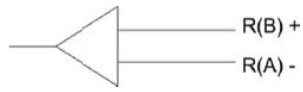
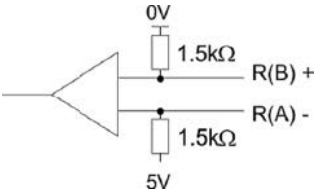
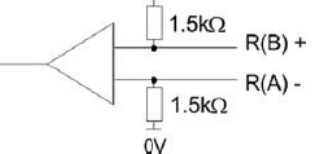
Parameter data STX/ETX protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 14, cable assignment				
80 _h	15	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
00 _h	0	Diagnostics	Bits 5 ... 0: Reserved Bit 6: Diagnostic alarm (0 = inhibited; 1 = enabled) Bit 7: Reserved Other values are not permissible!	00 _h
02 _h	0	Length - process image input data	Length of input data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
	1	Length - process image output data	Length of output data (backplane bus communication); the values are specified by the system. Other values are not permissible.	
80 _h	0	Baud rate	00 _h : 9600Baud 01 _h : 150 Baud 02 _h : 300 Baud 03 _h : 600 Baud 04 _h : 1200 Baud 05 _h : 1800 Baud 06 _h : 2400 Baud 07 _h : 4800 Baud 08 _h : 7200 Baud 09 _h : 9600 Baud 0A _h : 14400 Baud 0B _h : 19200 Baud 0C _h : 38400 Baud 0D _h : 57600 Baud 0E _h : 76800 Baud 0F _h : 115200 Baud 10 _h : 109700 Baud	00 _h
	1	Protocol	The protocol to be used. This setting influences the structure of the parameter data. 01 _h : ASCII	01 _h
Option 1, character frame				
80 _h	2	Data format	Bit 1/0 number of data bits	11 _b
			00 _b : 5 01 _b : 6 10 _b : 7 11 _b : 8	
			Bit 3/2 parity	00 _b
			00 _b : none 01 _b : odd 10 _b : even 11 _b : even	
			Bit 5/4 number of stop bits	01 _b
			01 _b : 1 10 _b : 1.5 11 _b : 2	
			Bit 7/6 flow control	00 _b
			00 _b : None 01 _b : Hardware 10 _b : XON/XOFF	
Option 2, ZNA (x 20 ms)				
80 _h	3	ZNA (HIGH byte)	Time after request (ZNA) Waiting time observed until the next transmit request is processed. The ZNA is indicated as a factor in steps of 20ms. 0 ... 65535 [ms] (0000 _h ..: FFFF _h)	00 _h

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 3, ZVZ (x 20 ms)				
80 _h	4	Character delay time	Character delay time (ZVZ) The character delay time defines the maximum permissible time interval between two characters received within a telegram. The ZVZ is indicated as a factor in steps of 20ms. If ZVZ = 0, the module calculates the ZVZ by means of the baud rate (approx. double character time). 0 ... 65535 [ms] (0000 _h .. FFFF _h)	00 _h
Option 4, QVZ (x 20 ms)				
80 _h	5	Acknowledgement time	Acknowledgement time (QVZ) The QVZ defines the max. permissible time interval until the partner is acknowledged while establishing/terminating a connection. The QVZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 5, BWZ (x 20 ms)				
80 _h	6	Block wait time	Block wait time (BWZ) The BWZ is the maximum time period between the confirmation of a request frame (DLE) and STX of the response frame. The BWZ is indicated as a factor in steps of 20 ms. 1 ... 255 [ms] (01 _h ... FF _h)	FA _h
Option 6, STX (x 20 ms)				
80 _h	7	STX repetitions	Maximum number of times the module attempts to establish a connection. 1 ... 255 [ms] (01 _h ... FF _h)	01 _h
Option 7, DBL (x 20 ms)				
80 _h	8	DBL	When exceeding the block wait time (BWZ) you can specify the maximum number of repetitions for the request frame using the DBL parameter. If these attempts fail, transmission is cancelled. 1 ... 255 [ms] (01 _h ... FF _h)	00 _h
Option 8, priority (x 20 ms)				
80 _h	9	Priority	A communication partner has high priority if its sending attempt has precedence over the partner's transmit request. In the event of low priority, it must take second place behind the partner's transmit request. With 3964(R) the priorities of both partners must be different. The following settings are possible: 00 _h : LOW 01 _h : HIGH	00 _h
Option 9 ... 12, reserved				
80 _h	10 ... 13	Reserved		00 _h

Parameter data 3964(R) protocol				
Data set		Name	Description/value	Lenze
No.	Byte			
Option 13, operating mode				
80 _h	14	Operating mode	The operating mode serves to determine if the interface is operated in half duplex mode (RS485) or full duplex mode (RS422). <ul style="list-style-type: none"> 0x00: Half duplex - two-wire operation (RS485) Half duplex operation means that at a point of time data are either sent or received. The data are transmitted between the communication partners in both directions in turns. If the parameterisation is half duplex under RS485, a software data flow control is not possible. 0x01: Full duplex - four-wire operation (RS422) The data are exchanged simultaneously between the communication partners; transmission and reception can take place at the same time. Each communication partner must simultaneously actuate a receive path. 	01 _h
Option 14, cable assignment				
80 _h	15	Cable assignment	For a connection with minimum reflections and the open circuit detection in RS422/485 operation, the cables can be pre-assigned via parameters with a defined idle level (see following table "Cable assignment parameters")	00 _h

Cable assignment parameter		
Values	Description	
00 _h	No pre-assignment of the receive path. This setting is only advisable for special drivers that are provided with a bus capability.	
01 _h	Signal R(A) 5 V (open-circuit detection), signal R(B) 0 V Open-circuit detection is possible in full duplex operation under RS422.	
02 _h	Signal R(A) 0 V, signal R(B) 5 V This pre-assignment corresponds to the idle state (no transmitter active) in half duplex operation under RS485. Open-circuit detection is not possible here.	

Diagnostic data

In the event of an error the corresponding channel LED of the module is lit and the error is entered in the diagnostic data.

Diagnostic data - data set 01h			
Name	Byte	Function	Default
ERR_A	1	ERR_A-diagnostics Bit 0: Set in the case of module fault Bit 1: Set in the case of internal error Bit 2: Set in the case of external error (cable break) Bit 3: Reserved Bit 4: Set in the case of a missing external supply voltage Bit 5, 6: Reserved Bit 7: Set in the case of parameterisation error	00h
MODTYP	1	Module information Byte 0: Bit 3 ... 0: Module class (0111b: Gateway module) Bit 4: channel information available Bits 7 ... 4: 0 reserved	17h
ERR_C	1	ERR_A-diagnostics Bit 7 ... 0: Reserved	00h
ERR_D	1	ERR_D diagnostics Bit 3 ... 0: Reserved Bit 4: Set in the case of internal communication error Bit 7 ... 5: Reserved	00h
CHTYP	1	Channel type Bit 7 ... 0: Reserved	00h
NUMBIT	1	Number of diagnostic bits of the module per channel (here 08h)	08h
NUMCH	1	Number of channels in module Bit 7 ... 0: Reserved	00h
CHERR	1	Bit 0: set in the event of an error of channel group 1 Bits 7 ... 1 0 (fixed)	00h
CH0ERR	8	Channel-specific error: channel x: Bits 3 ... 0: 0 (fixed) Bit 4 : set in the case of open circuit (only possible for RS422) Bits 7 ... 5: 0 (fixed)	00h
CH1ERR ... CH7ERR	8	Bit 7 ... 0: Reserved	00h
DIAG_US	4	Value of μ s ticker when diagnostics occur Bytes 0 ...3	00h

13 Maintenance

13.1 Regular checks

The system is maintenance-free. Nevertheless, visual inspections must be carried out at regular intervals which must not be too long, depending on the ambient conditions.

Please check the following:

- ▶ Does the environment of the system still meet the operating conditions specified in the Technical data?
- ▶ Is the heat dissipation impeded by dust or dirt?
- ▶ Are the mechanical and electrical connections still okay?

13.2 Cleaning



Stop!

Sensitive surfaces and components

The system can be damaged if it is not appropriately cleaned.

Possible consequences:

- ▶ Housings are scratched or get dull if you use alcohol-containing, solvent-containing or abrasive detergents.
- ▶ Electrical components may be damaged ...
 - by a short circuit due to humidity.
 - by static discharge.

Protective measures:

- ▶ Completely deenergise the system before cleaning.
- ▶ Clean the system as follows:
 - Use a clean, lint-free and soft cloth.
 - As cleaning agent only use water with a bit of standard liquid detergent.
 - Moisten the cloth with the detergent.
 - Make sure that no cleaning water enters the ventilation slots or the connections.

13.3

Repair

13.3.1

Replacing the electronic module/main supply

**Note!**

If an I/O compound module is defective, just replace its electronic module. Leave the base module and the wiring unchanged.

The input fuse of the power supply module is located in the electronic module. If this fuse has tripped, the electronic module needs to be replaced. The same applies to the main supply which is integrated in bus coupler modules.

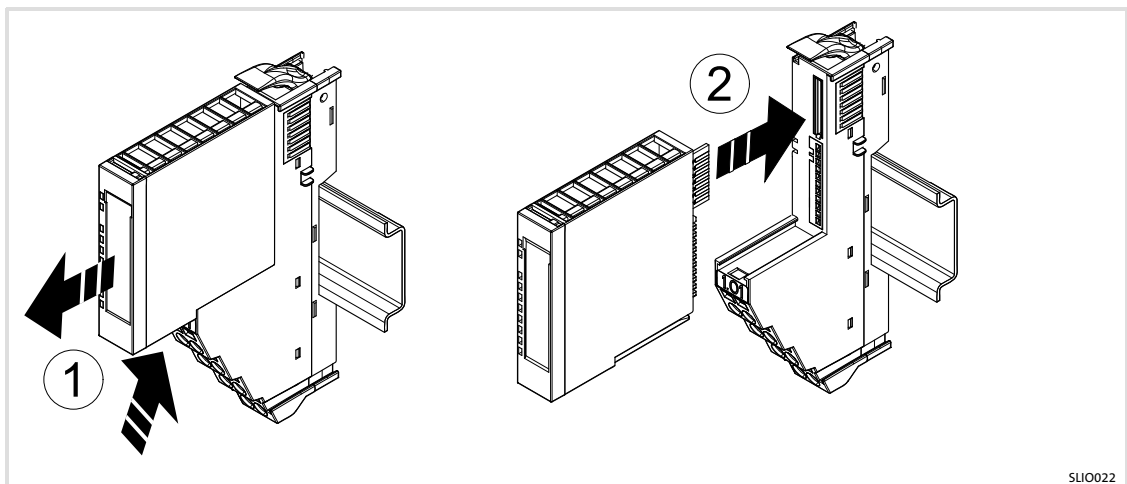


Fig. 13-1 Replacing the electronic module

How to proceed:

1. Press the locking button underneath the electronic module (or, in the case of bus coupler modules, the main supply, respectively) and remove the electronic module from the base module at the same time.
2. Slide a new electronic module of the same type on the base module until it locks into place.

14 Appendix

14.1 Serial process interfacing

With the EPM-S640 and EPM-S650 I/O compound modules a serial process interfacing to different target or source systems can be implemented.

EPM-S640: Serial process interfacing via RS232 interface

EPM-S650: Serial process interfacing via RS422 or RS485 interface

Serial transmission of a character

The point-to-point coupling between two communication partners is the simplest form of the exchange of information. The EPM-S640 I/O compound module provides the interface between a higher-level system (control) and a serially connected communication partner. In the case of serial data transmission, the individual bits of a byte of a piece of information to be transmitted are transferred successively in a defined sequence.

Character frame

The bidirectional data exchange makes a distinction between half duplex and full duplex operation. In half duplex operation, data are either sent or received at a certain time. A simultaneous data exchange can only be effected in full duplex operation.

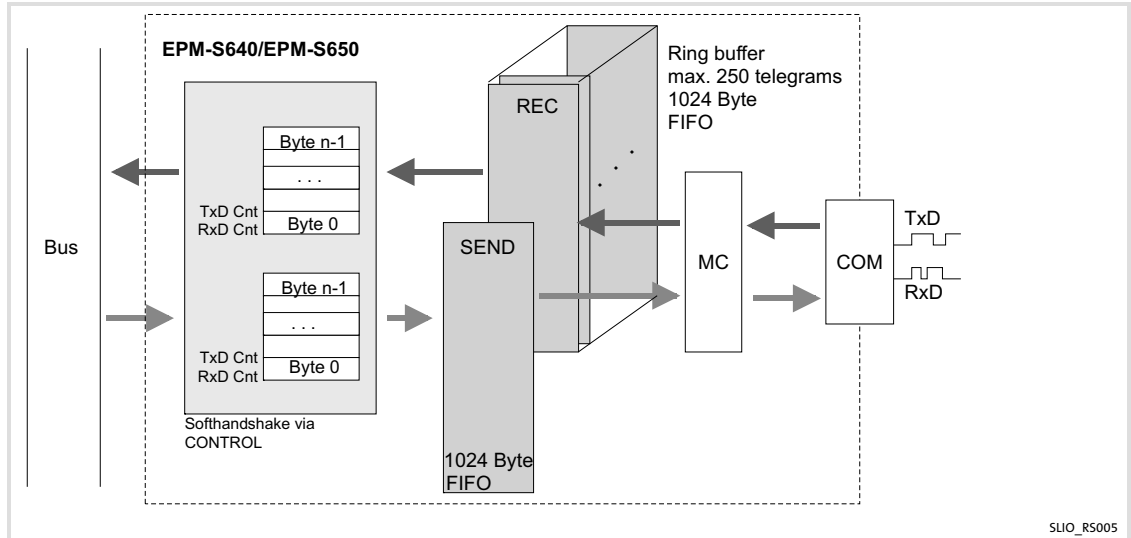
Each character to be transmitted is preceded by a synchronisation pulse as start bit. The end of the character transfer is set by the stop bit. In addition to the start and stop bit, further parameterisable agreements between the communication partners are required for a serial data transmission.

This character frame consists of the following elements:

- ▶ Transmission speed (baud rate)
- ▶ Character delay time and acknowledgement time
- ▶ Parity
- ▶ Number of data bits
- ▶ Number of stop bits

Communication

During the transmission, data which are written to the corresponding output area by a higher-level system via the backplane bus are written to the output buffer and are output via the interface from there. If the communication processor receives data via the interface, these data are stored in a ring buffer and are entered in the input area of the higher-level system via the backplane bus.



14.1.1 Protocols

The following protocols are supported:

- ▶ ASCII
- ▶ STX/ETX
- ▶ 3964(R)



Note!

Information on the parameterisation can be found in the corresponding chapters regarding the fieldbuses.

ASCII protocol: Data communication via ASCII is a simple form of data exchange and can be compared to a multicast/broadcast function.

The logical separation of the telegrams is effected via the character delay time. Within this time, the transmitter must have sent its telegram to the receiver. A telegram is only transferred to the higher-level system if it has been received completely. As long as the "Time after request" has not elapsed, no new transmit request is accepted.

These two time specifications serve to establish a simple serial communication.

Since, apart from the use of the parity bit, no further backup measures are implemented for ASCII transmissions, the data transfer may be very efficient, however, it is not secured. With the parity the inversion of one bit within a character is secured. If several bits of a character are inverted, this error can no longer be detected.

STX/ETX protocol: STX/ETX is a simple protocol with headers and trailers. It is used for transmitting ASCII characters (20_h ... 7F_h). This is done without block checks (BCC). If data are to be read in by the peripherals, STX (Start of Text) must be available as initial character, followed by the characters to be transmitted. An ETX (End of Text) must be inserted as the terminating character. The user data, i.e. all characters between STX and ETX, are transmitted to the control after the ETX terminating character has been received. When data are sent from the control to a peripheral device, the user data are transmitted to the EMP-S640 or EPM-S650 I/O compound module and are then transmitted to the communication partner with STX as initial character and ETX as final character.



Fig. 14-1 Telegram structure

Up to two initial characters and final characters can be freely defined. Here, a "time delay after command" can be selected for the transmitter as well.

3964(R) protocol: 3964(R) manages the data transfer of a point-to-point coupling between the EPM-S640 or EPM-S650 I/O compound module and a communication partner.

During the data transfer, control characters are added to the user data. These enable the communication partner to check whether the data has arrived completely and correctly.

The following control characters are evaluated:

- ▶ STX (Start of Text)
- ▶ DLE (Data Link Escape)
- ▶ ETX (End of Text)
- ▶ BCC (Block Check Character; only for 3964R)
- ▶ NAK (Negative Acknowledge)

**Note!**

When a DLE is transmitted as information character, it is distinguished from the DLE control character by being sent twice while establishing/terminating a connection (DLE duplication). The receiver undoes the DLE duplication.

With 3964(R), the communication partner must be assigned with a lower priority. When both communication partners place a transmit request at the same time, the partner with lower priority will delay its transmit request.

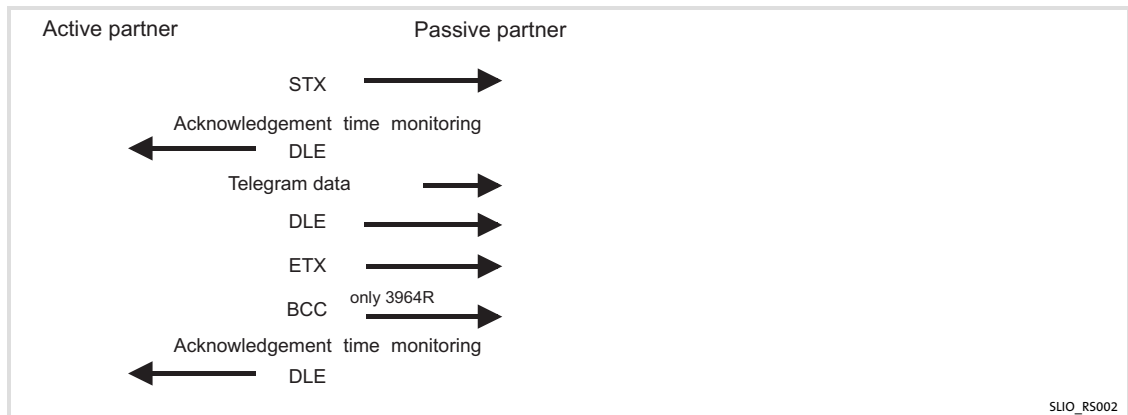


Fig. 14-2 Sequence

You can transfer a maximum of 250 bytes per frame.

Time-out times: Acknowledgement time is monitored between STX and DLE, as well as between BCC and DLE. Character delay time is monitored during the entire frame reception. After the acknowledgement time has elapsed after STX, STX is retransmitted and after 5 attempts a NAK is sent and the connection establishment is aborted. The same happens when after a STX a NAK or any character are received. After the acknowledgement time has elapsed after the frame (after BCC byte) or when a character unequal to DLE is received, the connection establishment and the frame will be repeated. Here, also 5 attempts are made, afterwards a NAK is sent and the transmission is aborted.

Passive operation: When the driver waits for the connection establishment and receives a character unequal to STS, a NAK is sent. When a NAK character is received, the driver does not send a respond. If the character delay time is exceeded while receiving a character, a NAK is sent and a renewed connection establishment is waited for. When the driver is not ready yet when the STX has received, a NAK is sent.

Block Check Character (BCC byte): For further backup, a block check character is added to the end of the frame of 3964R. The BCC byte is created by a XOR connection via the data of the entire frame including DLE/ETX. When a BCC byte is received that differs from the calculated one, a NAK is sent instead of the DLE.

Initialisation conflict: If two partners simultaneously attempt to establish a connection within the acknowledgement time, the partner with the lower priority sends the DLE and changes to receive mode.

Data Link Escape (DLE character): The DLE character in a frame is duplicated by the driver, i.e., DLE/DLE is sent. During the reception, duplicated DLEs are stored as a single DLE in the buffer. The frame always terminates with the combination DLE/ETX/BCC (only for 3964R).

Control codes:

- ▶ 02h = STX
- ▶ 03h = ETX
- ▶ 10h = DLE
- ▶ 15h = NAK

14.1.2 I/O area

Depending on the higher-level fieldbus system, the I/O compound module assigns the following number of bytes in the address range for the input and output, respectively.

- ▶ PROFIBUS: 8 bytes, 20 bytes or 60 bytes (selectable)
- ▶ PROFINET: 20 bytes or 60 bytes (selectable)
- ▶ CANopen: 8 bytes
- ▶ EtherCAT: 60 bytes
- ▶ DeviceNET: 60 bytes
- ▶ ModbusTCP: 60 bytes

14.1.3 Principle of backplane bus communication**Transmit data**

During transmission, the higher-level system enters the data to be output in the output area and transfers them to the I/O compound module together with the control byte. At every telegram, the I/O compound module responds with an acknowledgement by copying bits 3 ... 0 of byte 0 of the output area to bits 7 ... 4 of byte 0 of the input area, or by returning a corresponding status message via this byte. Depending on the length of the data to be transmitted, the telegram is to be transferred to the I/O compound module in one or several fragments. In the case of the fragmented transmission, each fragment is acknowledged by the I/O compound module.

Transmission without fragmentation:

Higher-level system		EPM-S640/EPM-S650		Description
Byte	Function	Byte	Function	
0	Control byte			Bits 3...0: 8 _h = idle state, no data available. A _h = start transmission without fragmentation. B _h = carry out a reset on the EPM-S6x0. Bits 7...4: Reserved for reception.
1	Telegram information byte			During the transmission process 00 _h (fixed).
2	High byte length			User data length in bytes.
3	Low byte length			
4 ... n-1	User data bytes 0 ... n-5			User data; n = number of the bytes assigned in the address range (IO size).
		→		
		←	0	Acknowledgement / status Bits 3...0: Reserved for reception. Bits 7...4: 8 _h : acknowledgement, idle state A _h : acknowledgement, data without fragmentation received. C _h : status, reset was carried out on EPM-S6x0. D _h : status, the length specified is invalid. E _h : status, EPM-S6x0 communication error, partner is not responding.

Example of transmission without fragmentation: IO size = 60 bytes, length = 40 bytes

Higher-level system		EPM-S640/EPM-S650		Description	
Byte	Value	Byte	Value		
0	0A _h			Command: start transmission without fragmentation.	
1	00 _h			Telegram information	
2	00 _h			User data length high byte	
3	28 _h			User data length low byte	
4 ... 43	x			User data byte 0 ... 39	
44 ... 59	-			Not used	
		→			
		←	0	A0 _h	Acknowledgement

Transmission with fragmentation:

In the case of the fragmented transmission, the number of user data and already part of the user data are transmitted with the 1. telegram (header). Then the fragment telegrams follow.

Procedure: Write 1. telegram → write fragment → write last fragment

Calculation of the number of fragments: $\text{number of fragments} = (\text{length} + 3) / (\text{IO_Size} - 1)$

Write 1. telegram (header)					
Higher-level system		EPM-S640/EPM-S650		Description	
Byte	Function	Byte	Function		
0	Control byte			Bits 3...0: 8 _h = idle state, no data available. 9 _h = start transmission with fragmentation. A _h = transmission of last fragment. B _h = carry out a reset on the EPM-S640. Bits 7...4: Reserved for reception.	
1	Telegram information byte			During the transmission process 00 _h (fixed).	
2	High byte length			User data length in bytes.	
3	Low byte length				
4 ... n-1	User data bytes 0 ... n-5			User data; n = number of the bytes assigned in the address range (IO size)	
		→			
		←	0	Acknowledgement / status	Bits 3...0: Reserved for reception. Bits 7...4: 8 _h : acknowledgement, idle state 9 _h : fragmented transmission started. A _h : acknowledgement, data without fragmentation received. C _h : status, reset was carried out on EPM-S6x0. D _h : status, the length specified is invalid. E _h : status, EPM-S6x0 communication error, partner is not responding.

Write fragment					
Higher-level system		EPM-S640/EPM-S650		Description	
Byte	Function	Byte	Function		
0	Control byte			Bits 3...0: 0 _h ... 7 _h = fragment number 8 _h = idle state, no data available. B _h = carry out a reset on the EPM-S6x0. Bits 7...4: Reserved for reception.	
1 ... n-1	User data			User data; n = number of the bytes assigned in the address range (IO size)	
		→			
		←	0	Acknowledgement / status	Bits 3...0: Reserved for reception. Bits 7...4: 0 _h ... 7 _h = acknowledgement fragment number 8 _h : acknowledgement, idle state 9 _h : fragmented transmission started. C _h : status, reset was carried out on EPM-S6x0. D _h : status, the length specified is invalid. E _h : status, EPM-S6x0 communication error, partner is not responding.

Write last fragment					
Higher-level system		EPM-S640/EPM-S650		Description	
Byte	Function	Byte	Function		
0	Control byte			Bits 3...0: 8 _h = idle state, no data available. A _h = transmission of last fragment. B _h = carry out a reset on the EPM-S6x0. Bits 7...4: Reserved for reception.	
1 ... n-1	User data			User data; n = number of the bytes assigned in the address range (IO size)	
		→			
		←	0	Acknowledgement / status	Bits 3...0: Reserved for reception. Bits 7...4: 8 _h : acknowledgement, idle state A _h : acknowledgement, last fragment received. C _h : status, reset was carried out on EPM-S6x0. D _h : status, the length specified is invalid. E _h : status, EPM-S6x0 communication error, partner is not responding.

Example of transmission with fragmentation: IO size = 16 bytes, length = 50 bytes

Header					
Higher-level system			EPM-S640/EPM-S650		Description
Byte	Value		Byte	Value	
0	09 _h				Command: start transmission with fragmentation.
1	00 _h				Telegram information
2	00 _h				User data length high byte
3	32 _h				User data length low byte
4 ... 15	x				User data byte 0 ... 11
		→			
		←	0	90 _h	Status: fragmented transmission started.

1. fragment					
Higher-level system			EPM-S640/EPM-S650		Description
Byte	Value		Byte	Value	
0	00 _h				Fragment number
1 ... 15	x				User data byte 12 ... 26
		→			
		←	0	00 _h	Acknowledgement 00 _h

2. fragment					
Higher-level system			EPM-S640/EPM-S650		Description
Byte	Value		Byte	Value	
0	01 _h				Fragment number
1 ... 15	x				User data byte 27 ... 41
		→			
		←	0	10 _h	Acknowledgement 01 _h Note: At the first fragment, the serial number 01 is transferred. In the acknowledgement, this information is returned in a mirrored manner.

Last fragment					
Higher-level system			EPM-S640/EPM-S650		Description
Byte	Value		Byte	Value	
0	0A _h				Fragment number
1 ... 8	x				User data byte 42 ... 49
11 ... 15	-				Not used
		→			
		←	0	A0 _h	Acknowledgement of last fragment

Receive data

During reception, the data received are entered automatically in the input area of the higher-level system by the I/O compound module. Depending on the length of the data received, the telegram is transmitted to the higher-level system in one or several fragments.

Reception without fragmentation:

Higher-level system		EPM-S640/EPM-S650		Description
Byte	Function	Byte	Function	
		0	Information byte	Bits 3...0: 8 _h = idle state, no data available. 9 _h = data are transmitted in a fragmented manner. A _h = data are transmitted without fragmentation. Bits 7...4: Reserved for transmission
		1	Telegram information byte	00 _h = the telegram does not contain any additional offset data. 04 _h = the telegram contains additional offset data, which are placed behind the length as word. Via the offset data, the position of the user data in the input area is determined.
		2	High byte length	Length of the user data in bytes plus 2 bytes for RetVal.
		3	Low byte length	
		[4]	High byte offset	If the telegram information byte has the value 04 _h , an offset is entered additionally. Otherwise there is no offset in the telegram.
		[5]	Low byte offset	
		6	RetVal high byte	0517 _h = invalid length (length = 0 or length > 1024) 080A _h = a free receive buffer is not available.
		7	RetVal low byte	080C _h = defective character received (character frame error or parity error).
		8 ... n-1	User data	User data received; n = number of the bytes assigned in the address range (IO size)
0	Acknowledgement	←	→	After having processed the data in your higher-level system, you have to acknowledge the reception to the I/O compound module. Only then you can provide these new received data. Bits 3...0: Reserved for transmission. Bits 7...4: 8 _h : acknowledgement, idle state A _h : acknowledgement, input area free for new data. B _h : command, execute a reset on the I/O compound module.

Example of reception without fragmentation: IO size = 60 bytes, length = 40 bytes

Higher-level system			EPM-S640/EPM-S650		Description
Byte	Value		Byte	Value	
			0	0A _h	Information: Data are transferred without fragmentation.
			1	00 _h	Information: The telegram does not contain any additional offset data.
			2	00 _h	High byte length
			3	2A _h	Length of low byte + 2 bytes for RetVal
			6	00 _h	RetVal high byte
			7	00 _h	RetVal low byte
			6 ... 45	x	User data bytes 0 ... 9
			46 ... 59	-	Not used
		←			
0	A0 _h	→	0		Acknowledgement, input area free for new data.

Received with fragmentation:

(Calculation of the number of frequencies: number of fragments = length + 7 / IO_Size - 1

Higher-level system		EPM-S640/EPM-S650		Description
Byte	Function	Byte	Function	
		0	Information byte	Bits 3...0: 8 _h = idle state, no data available. 9 _h = data are transmitted in a fragmented manner. A _h = data are transmitted without fragmentation. Bits 7...4: Reserved for transmission
		1	Telegram information byte	00 _h = the telegram does not contain any additional offset data. 04 _h = the telegram contains additional offset data, which are placed behind the length as word. Via the offset data, the position of the user data in the input area is determined.
		2	High byte length	Length of the user data in bytes plus 2 bytes for RetVal.
		3	Low byte length	
		[4]	High byte offset	If the telegram information byte has the value 04 _h , an offset is entered additionally. Otherwise RetVal is entered here. Calculation of the offset for fragmented transmission: $Data_offset = (fragment\ counter + 1) \times (IO_size - 1) - 7 + offset\ with$ Data_offset: Offset of the data in the input area Fragment counter: Absolute number of fragments IO_size: Number of bytes assigned in the address range Offset: Offset value in the telegram
		[5]	Low byte offset	
		6 ... n-1	User data	User data received; n = number of the bytes assigned in the address range (IO size)
←				
0	Acknowledgement	→	0	After having processed the data in your higher-level system, you have to acknowledge the reception to the I/O compound module. Only then you can provide these new received data. Bits 3...0: Reserved for transmission. Bits 7...4: 8 _h : acknowledgement, idle state A _h : acknowledgement, input area free for new data. B _h : command, execute a reset on the I/O compound module.

Example of reception with fragmentation: IO size = 16 bytes, length = 40 bytes

Higher-level system		EPM-S640/EPM-S650		Description
Byte	Value	Byte	Value	
		0	09 _h	Information: Data are transferred with fragmentation.
		1	00 _h	Information: The telegram does not contain any additional offset data.
		2	00 _h	High byte length
		3	2A _h	Length of low byte + 2 bytes for RetVal
		6	00 _h	RetVal high byte
		7	00 _h	RetVal low byte
		6 ... 15	x	User data bytes 0 ... 9
		←		
0	90 _h	→	0	Acknowledgement

Higher-level system		EPM-S640/EPM-S650		Description
Byte	Value	Byte	Value	
		0	00 _h	Fragment information
		1 ... 15	x	User data bytes 10 ... 24
		←		
0	00 _h	→	0	Acknowledgement

Higher-level system		EPM-S640/EPM-S650		Description
Byte	Value	Byte	Value	
		0	0A _h	Fragment information
		1 ... 15	x	User data bytes 25 ... 39
		←		
0	00 _h	→	0	Acknowledgement, input area free for new data.

15 Index

A

- Air humidity, 263
- Ambient conditions
 - Climatic, 263
 - Mechanical, 263
- Analog inputs, Status request, 380
- Analog outputs, #Status request, 380
- Application as directed, 23
- Approval, 262
- Attaching the shield, 273

B

- Baud rate, 32, 57
- Bus coupler module
 - CANopen, 30
 - Connecting the supply, 271, 272
 - DeviceNet, 54
 - Dismounting, 269
 - elements, 26
 - EtherCAT, 44
 - Modbus TCP, 62
 - Mounting, 266, 267
 - PROFIBUS, 37
 - PROFINET, 49
 - Replacing a fuse, 776
- Busbar, 268, 273
- Busbar support, 268, 273

C

- CAN data telegram, structure, 275
- CANopen
 - Baud rate, 32
 - Bus coupler module, 30
 - Communication, 275
 - Node address, 32
- Cleaning, 775
- COB-ID, 275
- CoDeSys, 417, 678
- Communication
 - CANopen, 275
 - DeviceNet, 610
 - EtherCAT, 518
 - PROFIBUS, 410
 - PROFINET, 670

- Communication Object Identifier, 275
- Communication phases, 277
- Conformity, CE, 262
- Connecting the supply, 271, 272
- Connection, EtherCAT, 47, 52, 64
- Contact cover, 266, 267
- Control word, 229, 242
- Counter, querying the status, 381
- Cover, 266, 267

D

- Data transfer, 292
- Definition of notes used, 16
- Definitions, 17
- Degree of protection, 262
- Device features, 22
- Device protection, 262
- Device status
 - of the heartbeat producer, 368
 - of the I/O system IP20, 366
 - of the slave, 366
- DeviceNet
 - baud rate, 57
 - bus coupler module, 54
 - communication, 610
 - node address, 57
- Digital inputs, Status request, 380
- Digital inputs with time stamp, Query status, 381
- Digital modules
 - Digital input, setting parameters, 303
 - Digital output, setting parameters, 303
- Digital outputs, Status request, 380
- Digital outputs with PWM, Status request, 383
- Digital outputs with time stamp, Query status, 382
- Dimensions, 265
- Dismounting, 269
- Disposal, 21

E

- Electrical installation, 270
 - Mounting steps, 271, 272, 273
 - Wiring according to EMC, 270
- Electrical isolation, 262
- Electronic supply, 271, 272
- EMC, 262
 - Assembly, 270
 - Earthing, 270
 - Shielding, 270
- EMC-compliant wiring, 270
- Emergency telegram, 372, 606
- EPM-S110, 30
- EPM-S120, 37
- EPM-S130, 44
- EPM-S140, 49
- EPM-S150, 54
- EPM-S160, 62
- EPM-S200, 66
- EPM-S201, 69
- EPM-S202, 72
- EPM-S203, 75
- EPM-S204, 66
- EPM-S205, 69
- EPM-S206, 72
- EPM-S207, 78, 346, 486, 571, 653, 750
- EPM-S300, 88
- EPM-S301, 92
- EPM-S302, 96
- EPM-S303, 88
- EPM-S304, 92
- EPM-S305, 96
- EPM-S306, 100
- EPM-S308, 119
- EPM-S309, 104
- EPM-S310, 108, 346, 488, 571, 653, 752
- EPM-S400, 124, 305, 418, 534, 616, 683

EPM-S401, 128, 306, 420, 535, 617, 685

EPM-S402, 132, 307, 422, 536, 618, 687

EPM-S403, 136, 308, 424, 537, 619, 689

EPM-S404, 163, 318, 440, 546, 628, 705

EPM-S405, 168, 324, 447, 552, 634, 712

EPM-S406, 140, 309, 426, 538, 620, 691

EPM-S408, 143, 311, 429, 540, 622, 694

EPM-S500, 146, 313, 432, 542, 624, 697

EPM-S501, 150, 314, 434, 543, 625, 699

EPM-S502, 154, 315, 436, 544, 626, 701

EPM-S503, 158, 316, 438, 545, 627, 703

EPM-S600, 173, 329, 452, 555, 637, 717

EPM-S601, 191, 333, 461, 559, 641, 725

EPM-S602, 207, 337, 469, 563, 645, 733

EPM-S603, 223, 341, 477, 566, 648, 741

EPM-S604, 233, 343, 481, 568, 650, 745

EPM-S620, 238, 347, 491, 572, 654, 755

EPM-S640, 243, 348, 494, 573, 655, 758

EPM-S650, 248, 354, 501, 579, 661, 765

EPM-S701, 254

EPM-S702, 256

EPM-S910, 259

EPM-S911, 260

EPM-S912, 261

Error Response, 297

EtherCAT

- Bus coupler module, 44
- Communication, 518

F

Fieldbus

- Baud rate, 32
- baud rate, 57
- Node address, 32
- node address, 39, 57

Fuses, 271, 272, 776

G

General data, 262

H

Heartbeat, 367

Heartbeat Producer, 367

I

I/O compound module

- Analog I/O, setting parameters, 305, 418, 534, 616, 683
- Analog I/Os, parameterising, 304
- Attaching the shield, 273
- counter, parameterising, 328, 452, 555, 637, 717
- digital I/Os, parameterising, 303
- Dismounting, 269
- elements, 26
- encoder evaluation, parameterising, 343, 481, 568, 650, 745
- Mounting, 266, 267
- Replacing the electronic module, 776
- technology module communication, parameterising, 347, 491, 572, 654, 755
- temperature measurement, parameterising, 318, 440, 546, 628, 705
- Time stamp, parameterising, 346, 486, 571, 653, 750

I/O supply, 271, 272

Identifier, 275

Index, 297

Installation, CE-typical drive system

- Assembly, 270
- Earthing, 270
- Shielding, 270

Installation, electrical, 270

- Mounting steps, 271, 272, 273

Installation, mechanical, 264

- Dimensions and mounting clearances, 265
- Mounting steps, 266, 267, 268

Instruction code, 296

Insulation resistance, 262

Insulation voltage, 262

L

Loading the default setting, 364

M

Maintenance, 775

- Cleaning, 775
- Regular checks, 775
- Repair, 776

Mechanical installation, 264

- Dimensions and mounting clearances, 265
- Mounting steps, 266, 267, 268

Modbus TCP, bus coupler module, 62

Module identifiers, reading out, 379

Monitoring, 369, 588

- Analog outputs, 371

Mounting, 266

Mounting clearances, 265

Mounting conditions, 263

Mounting place, 263

Mounting position, 263

Mounting steps

- Block mounting, 267
- Busbar, 268
- Dismounting, 269
- Standard, 266

N

Network management (NMT), 277

Network, CAN, Communication phases, 277

Node address, 32, 39, 57

Node Guarding, 365

Node ID, 32, 57

Node-ID, 39

Noise emission, 262

Noise immunity, 262

Notes, definition, 16

O

Operating conditions, 263

Operating temperature, 263

P

Parameter data, 297

- Meaning for digital modules, 303
- storing for digital modules, 303
- telegram structure, 296

Parameter setting

- Analog I/O, 305, 418, 534, 616, 683
- counter, 328, 452, 555, 637, 717
- Digital modules, 303
 - Display of the parameter data, 303
 - Meaning of the parameter data, 303
- encoder evaluation, 343, 481, 568, 650, 745
- temperature measurement, 318, 440, 546, 628, 705
- Time stamp, 346, 486, 571, 653, 750

Parameterisation

- digital I/Os, 303
- technology module communication, 347, 491, 572, 654, 755

PDO mapping, 283, 522

Pollution, 263

Power distributor module, 259, 260, 261

- elements, 27

Power supply module, 254, 256

- Connecting the supply, 272
- Dismounting, 269
- elements, 27
- Mounting, 266, 267
- Replacing a fuse, 776

Process data, transmission mode for, 281

Process data objects, Identifier, 280, 281

Process data telegram, 279

Product description, 22

- application as directed, 23
- CANopen bus coupler module, 30
- DeviceNet bus coupler module, 54
- EtherCAT bus coupler module, 44
- Modbus TCP bus coupler module, 62
- PROFIBUS bus coupler module, 37
- PROFINET bus coupler module, 49

PROFIBUS

- Bus coupler module, 37
- communication, 410
- node address, 39

PROFIBUS-DP-V0, 410

PROFIBUS-DP-V1, 410

PROFINET

- bus coupler module, 49
- communication, 670

Protection of persons, 262

Protective measures, 262

R

Read Request, 296

Read Response, 296

Reading a parameter, 299

Regular checks, 775

Repair, 776

Replacing the electronic module, 776

Replacing the main supply, 776

RJ45 socket, EtherCAT connection, 47, 52, 64

S

Safety instructions, 19

- application as directed, 23
- definition, 16
- layout, 16

Shield connection, 268, 273

Shield connection terminal, 268, 273

Shielding, EMC, 270

Shock resistance, 263

Status word, 229, 242

Storage temperature, 263

Store, 363

Subindex, 297

Sync telegram, for cyclic process data, 282

T

Technical data, 262

- General data, 262
- Operating conditions, 263

Time monitoring, 369

Transmitting parameter data, 296, 532

Transmitting PDO, 279, 521

Transmitting process data, 279, 521

Transmitting SDO, 296, 532

Troubleshooting and fault elimination, 274

- Monitoring, 369, 588

U

User data, 279

V

Validity, documentation, 13

Vibration resistance, 263

W

Wiring according to EMC, 270

Write Request, 296

Write Response, 296

Writing a parameter, 298



© 01/2017

Lenze Automation GmbH
Postfach 10 13 52, 31763 Hameln
Hans-Lenze-Str. 1, 31855 Aerzen
GERMANY
HR Hannover B 205381



+49 5154 82-0



+49 5154 82-2800



lenze@lenze.com



www.lenze.com

Service

Lenze Service GmbH
Breslauer Straße 3, 32699 Extertal

GERMANY



008000 2446877 (24 h helpline)



+49 5154 82-1112



service@lenze.com

EDSIO1000 ■ 13525977 ■ EN ■ 8.0 ■ TD29

10 9 8 7 6 5 4 3 2 1