

Indu-Sol GmbH – Specialist in fieldbus technologies

# PROFINET-INspektor®NT User Manual



# Diagnostic and service tools for PROFINET/ Ethernet

PEOFO





SafetyBUS p





# **Revision overview**

Date	Revision	Change(s)
10/09/2015	0	First version
04/07/2016	1	Firmware Update 1.4
22/12/2016	2	Firmware Update 1.5

© Copyright 2016 Indu-Sol GmbH

We reserve the right to amend this document without notice. We continuously work on further developing our products. We reserve the right to make changes to the scope of supply in terms of form, features and technology. No claims can be derived from the specifications, illustrations or descriptions in this documentation. Any kind of reproduction, subsequent editing or translation of this document, as well as excerpts from it, requires the written consent of Indu-Sol GmbH. All rights under copyright law are expressly reserved for Indu-Sol GmbH.

#### Caution!

This device may only be put into operation and operated by qualified personnel. Qualified personnel, as referred to in the safety-related information of this manual, are persons who are authorised to put into operation, to earth and to label devices, systems and electrical circuits in accordance with the standards of safety engineering.



# Contents

1	General information	6
1.1	Purpose of use	6
1.2	Scope of supply	7
1.3	Safety information	7
2	Device ports and status indicators	8
2.1	Device ports	8
3	Installation	9
3.1	Installation instructions	9
3.2	Voltage supply	10
3.3	Measurement location	10
3.4	Connection to the PROFINET network	10
3.4.1	Fixed installation within the master system	10
3.4.2	Connection via feedback-free measurement point	11
3.5	WEB INTERFACE	11
3.6	Signal inputs and outputs	12
3.7	Display screen	12
4	Web interface and selection functions	13
4.1	Homepage	14
4.1.1	Alarm overview	15
4.1.2	Timeline	15
4.1.3	Network overview	16
4.1.4	Node overview	16
4.1.5	Network statistics	18
4.2	Alarms	19
4.3	Evaluation	20
4.3.1	Netload chart	20
4.3.2	Reports	20
4.3.3	Jitter overview	21
4.3.4	Node statistic	21
4.3.5	Frame statistic	22
4.3.6	Tools	22
4.4	Configuration	23
4.4.1	System	23
4.4.1.1	General	24
4.4.1.2	Time and language settings	24



4.4.1.3	Network	25
4.4.1.4	Messages	25
4.4.1.5	Digital Input	26
4.4.1.6	Factory reset	27
4.4.1.7	Import/Export	27
4.4.1.8	Information	28
4.4.2	Monitoring	29
4.4.2.1	Node names and monitoring	29
4.4.2.2	Node condition	30
4.4.2.3	Triggers & alarms	32
4.4.2.4	Automated report	35
4.4.2.5	Control mode	35
4.4.3	Firmware update	36
5	Device parameters	37
5.1	Update rate	37
5.2	Alarm (high priority / low priority)	37
5.3	Bus node failures	37
5.4	Bus node restart	37
5.5	Jitter	37
5.6	Telegram gaps	38
5.7	Telegram overtakes	38
5.8	Error telegrams	38
5.9	Netload	38
5.10	Multicast telegrams	38
5.11	Broadcast telegrams	38
5.12	Sending cycle	38
6	Support and contact	39
7	Sample for controlling the PN-INspektor <sup>®</sup> NT	40
7.1	TiA-Portal Program example	41
8	Block diagram	42
9	Technical data	43
9.1	Technical drawing	43



# **1** General information

Please read this document thoroughly from start to finish before you begin installing the device and putting it into operation.

## 1.1 Purpose of use

The PROFINET-INspektor<sup>®</sup> NT permanently monitors all data traffic in a PROFINET master system. You will receive a maintenance requirement notification when critical changes that could lead to unplanned system downtimes are detected.

Based on the report analysis (purely passive behaviour), the following quality parameters are monitored:

- Update rate
- Error telegrams (sent/received)
- Alarms (low and high-priority)
- Telegram gaps
- Telegram overtakes
- Bus node failure
- Bus node restart
- Jitter
- Netload (sent/received)

One PN-INspektor<sup>®</sup> NT is required per PROFINET master system. This PN-INspektor is looped into the connection between the IO controller (PLC) and the first device (switch) for analysis, or integrated within the network through a feedback-free measurement point (e.g. PNMA II; art. no. 114090100).

No additional IP addresses or adjustments to the PLC program are required for using the PN-INspektor<sup>®</sup> NT. It works in an entirely manufacturer-independent way; i.e. the analysis works completely independently of the type of control system and IO devices.

For long-term analysis, the PN-INspektor<sup>®</sup> NT can remain in the bus system without any time restrictions. The relevant telegram traffic is continuously analysed and evaluated in order to detect deviations from normal conditions and trigger alarms.



## 1.2 Scope of supply

The scope of supply comprises the following individual parts:

- PROFINET-INspektor® NT
- 3-pole plug-in terminal block (power supply)
- 6-pole plug-in terminal block (alarm contacts)
- CD with software for the report analysis and device manual

Please check the contents are complete before putting into operation.

## 1.3 Safety information

- Never open the housing of the PROFINET-INspektor® NT
- Opening the housing immediately voids any warranty
- If you think the device is defective, send it back to the supplier



# 2 Device ports and status indicators

## 2.1 Device ports

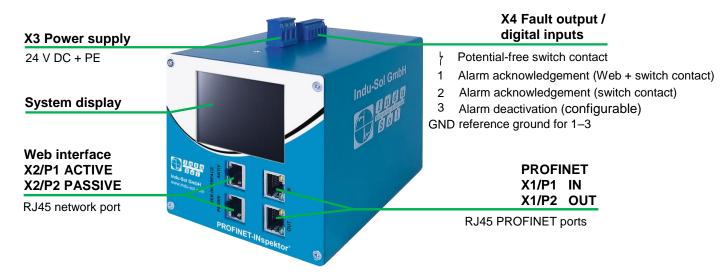


Figure 1: Device ports



# 3 Installation

## 3.1 Installation instructions

PROFINET-INspektor<sup>®</sup> NT is installed horizontally inside the cabinet on a 35 mm top-hat rail in accordance with DIN EN 60715.

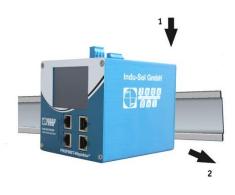


Figure 2: Device installation on top-hat rail

Caution: The following distances must be maintained from other modules for correct installation:

- From left and right: 20 mm
- From top and bottom: 50 mm

Removal for alternate use of the PN-INspektor® NT in different master systems is illustrated in Figure 3.

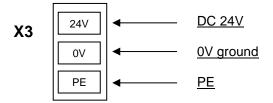


Figure 3: Removal



## 3.2 Voltage supply

Operation requires 24 V of external direct current, which is to be connected to the device via the 3-pole plug-in terminal block (X3) supplied in the package. The PE contact should be connected to the local PE system.





Caution: When connecting, make sure that the polarity is correct.

#### 3.3 Measurement location

Wherever possible, the PN-INspektor<sup>®</sup> NT should always be installed in the network connection between the PLC and the first I/O device or switch, since the majority of communication typically takes place via this connection.

## 3.4 Connection to the PROFINET network

You can connect to the PROFINET network in different ways. The various options are described below.

#### 3.4.1 Fixed installation within the master system

The PROFINET-INspektor<sup>®</sup> NT is firmly integrated into the network for continuous, permanent network analysis. To do this the device is integrated into the system via the IN and OUT sockets.

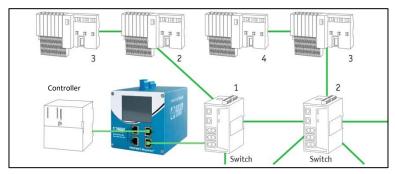


Figure 4: PROFINET-INspektor® NT fixed installation



**Caution:** Installing the device with this connection option causes a PROFINET network fault and should be performed during system standstill.



## 3.4.2 Connection via feedback-free measurement point

In conjunction with a feedback-free measurement point (e.g. PNMA II; art. no. 114090100), PROFINET-INspektor<sup>®</sup> NT can be connected to the PROFINET-system at any time without compromising ongoing system operation. This can also be performed on a temporary basis if required. To do this, the PN-INspektor<sup>®</sup> NT is hooked up to the M1 and M2 monitor sockets of the measurement point by means of two patch cables.

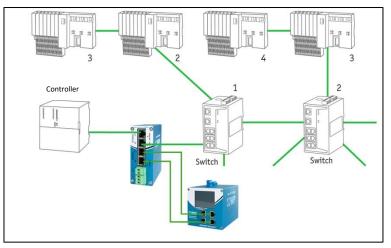


Figure 5: PN-INspektor® NT connection via PNMA II

## 3.5 WEB INTERFACE

The LAN connections X2/P1 and X2/P2 of the WEB INTERFACE constitute the link to the PN-INspektor® NT. This involves 10Base-T/1000Base-T RJ45 interfaces. A standard Ethernet cable is used as a connection cable to a PC/ laptop (not included in the scope of supply).

A Web-server function is integrated for access to the device and can be opened with an appropriate standard browser (e.g. Microsoft Internet Explorer from version 10 or Mozilla Firefox from version 11; JavaScript must be activated). You can reach the device's user interface by entering the IP address of the PN-INspektor® NT in the browser's command line.



**Caution:** To display the website correctly, the following ports must be enabled in firewalls, gateways and routers: TCP/80 and TCP/6325.

The PROFINET-INspektor® NT is supplied with the following factory-set network configuration:

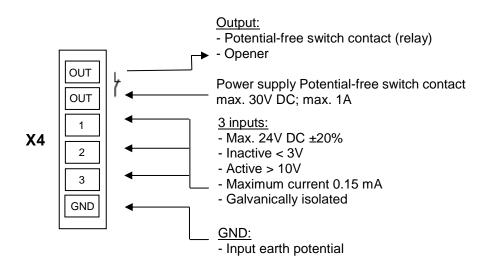
	PASSIVE – X2/P2	ACTIVE – X2/P1
IP address:	192.168.212.212	192.168.213.212
Subnet mask:	255.255.255.0	255.255.255.0



Both the evaluation of internally recorded data and the parametrisation of the device are possible through the **PASSIVE** and **ACTIVE** connection sockets. These are two independent network access. Additional to the web access the active Webinterface can send requests to the PROFINET Network. For this it is necessary to start a "Device scan" in the Device overview. This is used to retrieve and store information such as the name, IP address, etc. for the respective device.

## 3.6 Signal inputs and outputs

The 6-pole connector terminal block (X4) at the top of the device is assigned as follows:



Input 1: Alarm acknowledgement (Web interface + switch contact)

Input 2: Alarm acknowledgement (switch contact)

Input 3: Alarm deactivation

Additional functions can be configured via the Web interface (see point 4.4.1.5. Digital Input)

## 3.7 Display screen

After connecting the power supply, the display conveys the system start-up of the PN-INspektor® NT. After successful system start-up, the current state of the PROFINET network is always displayed on the Home screen. You can scroll between the menu items with the arrow keys on both sides. The Home key takes you directly to the Home screen.

Version information	Network settings	Current state	Alerts list	Contact
Serial number Firmware version 1.4.0.9999+13 Hardware version	Hostname profinet-inspektor-nt         Passive interface           Active interface         50:61:06:00:23:75           1p         12:26:62:1212           1p         12:26:23:1212           1k         10:24:04           1k         12:24:23:1212           1k         10:24:04           1k         10:24:04 <t< th=""><th></th><th></th><th>Blumenstraße 3 04626 Schmölln Germany +49 34491 5818-0 info@indu-sol.com</th></t<>			Blumenstraße 3 04626 Schmölln Germany +49 34491 5818-0 info@indu-sol.com

Figure 6: Touch-Screen menu



# 4 Web interface and selection functions

To access the Web interface, and thus the recorded data of the PROFINET-INspektor<sup>®</sup> NT, use an Internet browser and enter the IP address (passive: 192.168.212.212; active: 192.168.213.212) of the device to open the Web interface.

The following icons are used in the Web interface for a simple overview of the individual statuses of the network and devices:



No faults: PROFINET communication is working without any problems.

Warning: A communication fault or a diagnostic message has appeared in the network, or originated from a device, and this fault or message has not yet led to system failure. The sources of these events should be localised and resolved.



Fault: A critical fault has appeared in the network, or originated from a device, and this fault leads to system failure. It is urgently necessary to resolve the fault.



The bus communication in the network has failed or cannot be detected by the INspektor (serious fault in the network) or the device is no longer communicating or is not in the network.



## 4.1 Homepage

The homepage provides a complete overview of the status of the connected PROFINET master system since the start of the PN-INspektor<sup>®</sup> NT.

If there are no faulty entries here, the system is working stably and there are no urgent actions required.

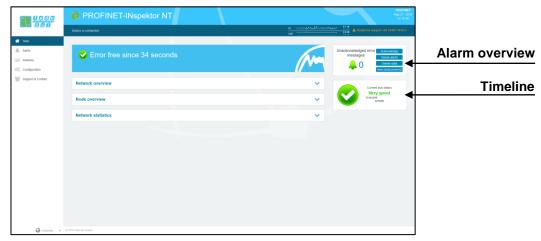


Figure 7: Complete overview

There are additional helpful functions for obtaining more detailed information on the state of the network. These can be accessed via drop-down menus or the Alarm Overview.

Specifying the time period, with a corresponding display of device information, is possible in the sub-menus of the homepage. The relevant period of evaluation can be selected by switching the time window between "current", "last minute" and "history". The "current" setting always displays the node condition (live list) at that particular moment, and the "last minute" option shows the device information over the course of the previous minute. With the "history" pre-selection, all data is displayed since the beginning of the recording or the last time the "Delete data" or "New measurement" function was commanded. You can use these different time references to determine whether PROFINET faults are occurring occasionally or permanently.



#### 4.1.1 Alarm overview

In the alarm overview the number of unacknowledged alarms are indicated to you. The entries in the alarm list are opened automatically with a mouse click on the alarm bell.

You can also perform the following functions in this window:

Acknowledge alarms: Unacknowledged alarms are acknowledged, but the entries stay in the alarm list. The switch contact for the alarm is reset.
 Delete alarms: All entries in the alarm list, including snapshots for this, are deleted.
 Delete data: All previously recorded data is reset and the network analysis is restarted. The device information (IP address, PN name) and configured settings are retained.
 New measurement: This item is to be applied in the event of alternating use in different PROFINET systems. By selecting this function, all previous entries including the node list are deleted, and the network analysis is restarted. Any configuration settings made are retained.

#### 4.1.2 Timeline

The timeline offers you a compact visual overview of the state of the network over the course of time. If different network statuses are analysed within the course of the monitoring period, the point in time when the respective status change started is presented as a new node (maximum 50 entries). Detailed information accumulated within this time frame can be accessed by selecting one such node. The minimum time period for a status change (new nodes) is one minute.

	Device is connected		in when the advector	
	Caution! Bus comm		m	Inacknowledged error messages 2 Celeto alerts Delete data
Configuration	Network overview		~	Current bus status Warning
	Node overview Network statistics	Start time: 05/27/2016 12/23/05 bis3583-L1 potient scatter 14:14 Jater	~ ~	27/86.3045 ¥22255 ¥22256
		neimindi-prevention 2456-402817, 10.15.817 Jitter -75.9%   -73.4% Ciose (2)		12/16.06

Figure 8: Timeline entry



The individual status changes can be adjusted for each node separately. (See point <u>4.4.2.2 Node condition</u>.)



#### 4.1.3 Network overview

You obtain a complete overview of all the important quality parameters of the PROFINET master system through the "Network overview" selection window. These form the basis for evaluating a network's stability. The individual parameters are explained in more detail in point <u>5. Device parameters</u>. To make it easier to evaluate the quality parameters, they can be coloured according to predefined acceptance values. (see point <u>4.4.2.5 Control mode</u>)

Enable controlling mode												
		Last minute					History					
Measurement start time		12/22/2016 10:32:21				12/22/2016 10:12:43						
Failures	0	0				0			0			
Restarts	0	<b>9</b> 0				0			0			
Alerts	0			0			<b>O</b> 0					
Update rate			0.	25ms - 128ms					0	).25ms - 128ms		
Controller transmit clock				0.25ms						0.25ms		
Jitter	0			14.1%			0			15.7%		
Frame gaps	0			0			0			0		
Concurent frame gaps	0			e 🔮 e								
Frame overtakes	0			0			0			0		
Load ratio	0			>500 : 1			0			>500 : 1		
Error frames	0			0			0			0		
		min 🛓		avg Ø		max T		min 🛓		avg Ø		max T
Netload (per second)	0	18.8 % 2.36 MB	0	19.0 % 2,37 MB	0	19.1 % 2.39 MB	0	17.8 % 2,23 MB	0	19.0 % 2,37 MB	0	19.6 % 2,45 MB
Payload (Bytes/ms)	0	1.55 kB	0	1.56 kB	0	1.57 kB	0	1.47 kB	0	1.56 kB	0	1.62 kB

Figure 9: "Network overview" selection window

#### 4.1.4 Node overview

This overview provides you with a complete outline of all devices communicating within the PROFINET network. The individual devices are marked in different colours based on node condition and communication protocol (PROFINET or acyclical communication). The meaning of the respective statuses is explained in the legend at the top.

For greater clarity, you can select the displaying of different types of protocol and individual evaluation criteria. To display all configured device Information (PN-Name, IP-Adresse), it is possible to start a device scan to retrieve the information (see section <u>3.5 WEB INTERFACE</u>).

Device overview	2							
Display		Sort	Resolve N			Active	Warning	Error
IP address	×	unsorted	Show acyclic devices Show PROFINET devices			Inactive	Deactivated	
			Show LLC	P devices	Ī	Controller	Acyclic	Inactiv
			Show dea	ctivated devices	U	Bus coupler	(	
Device scan (3)								
Current Last	minute	History	19					
	60	Siemons 1C:CA:44	Siemons_58:5E:A2	PhoenixC_38:5F:34	Siemens_D1:EC:8C	Murrelok	_FE:B8:DE	
Siemens_24:DA: int153-4pn-1 10.1.8.15		20.10 10.1.9.2	am151-3pn 10.1.9.9	ax3-pn-bit. 10.1.9:10	IE-PB-Link 10.1.9.16		e20e-1 1.9.11	
imt53-4pn-1	0	20.40				10. Wenglor wengi		

Figure 10: "Node overview" selection window



For a detailed view of device information, select the relevant device with a mouse click. The essential data for evaluating the communication quality of this node is then displayed

			Ger	ieral					
MAC address			Siemens	1C:CA:44					
IP address			10.1	.9.2					
Name			pr	-i0					
Alias									
Vendor		S7-300							
Vendor ID			SIEMEN	S AG (42)					
Device ID			2	57					
Device role			Cont	roller					
		Last minute	;		History				
Alert (low priority)	<b>v</b>	0		<b>v</b>	0				
Alert (high priority)	<b>O</b>			<b>O</b>					
Failures	<b>O</b>			<b>O</b>					
Restarts	<b>v</b>	0		<b>O</b>					
Frame gaps	<b>v</b>	0		<b>O</b>					
Concurent frame gaps	<b>v</b>	0		<b>O</b>					
Frame overtakes	<b>v</b>	0		<b>O</b>					
Error frames	<b>v</b>	0		<	0				
Jitter	<b>v</b>	4.8%		<	9.6%				
	min	avg	max	min	avg	max			
Update rate	0.25ms	-	2ms	0.25ms	-	128ms			
Transmit clock	0.25ms	-	0.25ms	0.25ms	-	0.25ms			
Measured update rate	0.24ms	19.66ms	128.00ms	0.23ms	19.65ms	128.01ms			
Payload (sent)	737,90 B	764,35 B	776,83 B	457,69 B	764,35 B	776,83 B			
Payload (received)	772,67 B	800,39 B	813,53 B	493,94 B	800,39 B	813,53 B			
Netload (sent per sec)	9.02% 1,13 MB	9.35% 1,17 MB	9.50% 1,19 MB	5.56% 694,41 kB	9.35% 1,17 MB	9.50% 1,19 MB			
Netload (received per sec)	✓9.30% 1,16 MB	✓9.63% 1,20 MB	✓9.79% 1,22 MB	✓5.84% 730,51 kB	✓9.63% 1,20 MB				

Figure 11: Detailed information window

As a sub-item to the detailed information, additional, more detailed **device-related** data is listed through the "Network statistic" page.

	Last minute	History
Load ratio	>500 : 1	>500 : 1
Broadcasts (of these PROFINET)	0 (0 0%)	0 (0 0%)
Multicasts	24	798
(of these PROFINET)	(0 0.00%)	(0 0.00%)
Frames (sent)	752.345	25.023.838
(of these PROFINET)	(752.343   100.00%)	( 25.023.836   100.00%)
Frames (received)	753.696	25.068.810
(of these PROFINET)	(753.696   100.00%)	( 25.068.810   100.00%)
Bytes (sent)	51,16 MB	1,70 GB
(of these PROFINET)	(51,16 MB   100.00%)	(1,70 GB   100.00%)
Bytes (received)	50,84 MB	1,69 GB
(of these PROFINET)	( 50,84 MB   100.00%)	( 1,69 GB   100.00%)
Error frames (sent)	0	0
(of these PROFINET)	(0 0%)	(0 0%)
Error frames (received) (of these PROFINET)	0 (0 0%)	0 (0 0%)
Payload (sent)	33,10 MB	1,10 GB
Payload (received)	32.75 MB	1,09 GB

Figure 12: Device-related network statistics



## 4.1.5 Network statistics

Further detailed information on the **whole** PROFINET network is displayed below the "Network statistics" selection window.

	Last minute	History
Broadcasts	0	1
(of these PROFINET)	(010%)	(0(0.00%)
Multicasts of these PROFINET)	98 (010.00%)	5.023 (010.00%)
Frames (sent)	1.506.054	77.201.967
of these PROFINET)	(1.506.044)100.00%)	(77.201.349) 100.00%)
Frames (received)	1.506.056	77.201.969
(of these PROFINET)	(1.508.045)100.00%)	(77.201.349)100.00%)
Bytes (sent)	102,01 MB	5,23 GB
of these PROFINET)	(101,99 MB (99,99%)	(5,23 GB (99.99%)
Bytes (received)	102,00 MB	5,23 GB
of these PROFINET)	(101,99 MB   100,00%)	(5,23 GB) 100.0%)
Payload (sent)	65,85 MB	3.38 GB
Payload (received)	65.85 MB	3.38 GB

Figure 13: Whole system network statistics



## 4.2 Alarms

This overview represents a list of all alarm entries since the restart or the resetting of alarms through the "Delete alarms", "Delete data" or "New measurement" commands. All unacknowledged entries are indicated with the 4 icon. The maximum quantity of saved alarms is 2,048. Any additional entries over that overwrite the oldest entries.

An entry is automatically made in the alarm list, including a telegram record (snapshot), when a triggering event occurs. Such an entry will contain all important information, such as the device address, fault event and time. In addition to an entry in the alarm overview, the value for unacknowledged alarms increases by one. The saved snapshots can be downloaded by pressing the disc icon and opened with the "Wireshark" software (this software is included in the scope of supply).

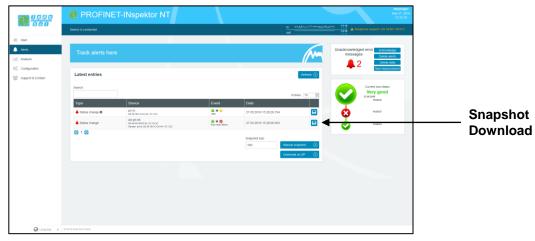


Figure 14: Alarms

The following functions are also available to you in this menu:

Update: Updates the entries in the alarm list

Manual snapshot: Records the current telegram traffic, which is also stored as an entry in the alarm list.

**Download as ZIP:** You can download all snapshots and a currently created log as a ZIP archive through this option.



## 4.3 Evaluation

The evaluation menu contains the "Netload chart" and the "Report function".

#### 4.3.1 Netload chart

In the chart function, this sub-menu provides a quick visual overview of the netload performance of the communication route. Here data is distinguished between incoming and outgoing netloads and presented in second and minute-cycles.



Figure 15: Netload charts

## 4.3.2 Reports

The report function allows for all information gathered since the beginning of the recording to be documented in a report in summary form. These reports are stored in the report directory and can be exported from here or printed out. The reports can be used for one's own documentation or as an acceptance report.

	PROFINET-INspektor NT	
	Device is connected	<u>в</u> Алдина-Каладоналара 100 ок. ————————————————————————————————————
6 Start		
Alerts Analysis	Analysis	Unacknowledged error Actinowedge messages Deete aters 2 Deete aters
Bupport & Contact  Report  27.05.20	Netload chart	
	Reports	Current bus status Very good 2780395
	27.05.2016 11:25:09 21%_45_7	Create report () 40.937
	Jitter overview	♥ 19422
	Node statistic	~
	Frame statistic	~
	Tools	~
	© 2014 Inde-Dat Cental	

Figure 16: Reports



For the complete topology to be shown in the log printout, the "Print Background" function must be activated in printer settings.

The report function can also be used for the automated creation of reports (see section 4.4.2.4Automated report).



#### 4.3.3 Jitter overview

For each update rate that was set in the PROFINET network, the jitter overview displays the corresponding jitter values that were detected, including global values and device-specific values. At a glance, you can see the update rates and devices that have increased jitter values.

To display the values, you can choose between table view and graphic view.

Jitter overview										~
Display Table	~									
Node	0.2	5ms	10	ns	27	15	4	ms	121	lms
	Current	History	Current	History	Current	History	Current	History	Current	History
Global	-3.6% 😋   😋 3.2%	-8.8% 😋   😋 8.8%	-55.4% 🔒   😂 33.9%	-72.7% 🔒   🔒 72.7%	-2.4% 😋   😋 2.2%	-8.5% 😋   😋 8.5%	-1.4% 🖸   🗳 2.0%	-6.9% 😋   😋 7.3%	-75.1% 😣 🖉 11.5%	-75.7% 🔒   🗳 13.5%
axl-pn-bk 00.4045/30.57/34, 10.1.9.10	-3.6% 😋   😋 3.2%	-8.4% 🖸   😋 8.0%								
pn-io 00101010:0044, 10.1.9.2	-0.4% 🖸   🗿 0.0%	-3.2% 🖸   😋 2.8%	-0.5% 😋   😋 0.7%	-1.2% 😋   😋 1.1%	-0.1% 😋   😋 0.0%	-0.6% 😋   😋 0.5%	0.0% 😋   😋 0.0%	-0.1% 😋   😋 0.0%	0.0% 😋   😋 0.0%	0.0% 😋   😋 0.0%
im153-4pn-1 001010240488, 10.1.3.15	-3.2% 🖸   🖸 3.2%	-8.8% 😋   😋 8.8%								
et200sp-1 2843.08/2C/F7/C0, 18.1.8.8					-0.5% 😋   😋 0.4%	-0.9% 😋   😋 0.7%				
cube20s-1 0687/95/75/98/05, 18.1.3.11			-0.7% 😋   😋 0.5%	-1.6% 😋   😋 1.5%						
bk9103-1-1 00/01/05/16/EE/07, 10.1.9.6			-55.4% 🔒   😂 33.9%	-72.7% 0   0 72.7%						
bnipnt502102z015 00:19:31:50:C3:45, 10:1.9:19					-2.4% 😋   😋 2.2%	-8.5% 😋   😋 8.5%				
IE-PB-Link 00:10:10:01:01:02:00, 10:10:11			-2.5% 😋   😋 3.1%	-8.9% 😋   😋 9.0%						
bnipnt502102z015-1 00:19:01:01:45:90, 10.1.9.10							-0.4% 🖸   💙 0.3%	-3.3% 🖸   😋 3.2%		
wago-750-370 00300E08A015, 10.1.9.7							-1.4% 🖸   😋 2.0%	-6.9% 😋   😋 7.3%		
fl-switch-smcs-8tx-p 004045582059, 10.1.0.4									3.0% 😋   😋 5.2%	2.8% 🖸   🗿 5.4%
scalance-x208 0018183AA18A, 181.93									-6.3% 😋   😋 1.6%	-6.5% 😋   😋 1.8%
heimholz-pn-switch 2424-40:2001:76, 10.1.3.17									-75.1% 🔒   😣 -74.2%	-75.7% 🔒   🔒 -73.51
wenglor-switch 5644.05122821, 10.1.9.20									-0.1% 😋   😋 0.0%	-0.1% 😋   😋 0.0%
fl-switch-ghs 00.40.45.85.87.26, 10.1.3.5									-6.2% 😋   😋 11.5%	-8.3%
										Reset 0

Figure 17: Jitter overview

#### 4.3.4 Node statistic

This sub-menu offers a statistics function for individual PROFINET quality parameters through all analysed network devices. Through this option you can see the device-related accumulation for the selected parameter at a glance.

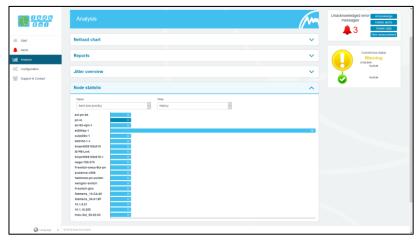


Figure 18: Node statistic



## 4.3.5 Frame statistic

Under the point Telegram Statistics, the number of telegrams is grouped according to the various log types, and is displayed graphically. With this graphic you can easily see which log type has a negative influence on the load ratio.



Figure 19: Frame statistic

#### 4.3.6 Tools

Under Tools, you can perform a ping and a traceroute to a specific IP address.

- Ping: Check for accessibility of IP address
- Traceroute: Determination of quantity and IP address of network transitions between the inspector and the specified IP address

	PROFINET-INspektor NT	
	Device is connected	81 542454444545454545454545454545454545454
ili Start Alerts M Ansiyos	Analysis	Unacknowledged error Antowledge messages
Configuration	Netload chart	
	Reports	Current bus status Warning 2023
	Jitter overview	5422 5422
	Node statistic	×
	Frame statistic	~
	Tools	~
	Host Fing (5) Trace (5)	
	© 2016 Indu-Sal Grabit	

Figure 20: Tools



## 4.4 Configuration

Within the configuration menu, you can make changes to the general device settings of the PN-INspektor<sup>®</sup> NT and adapt the monitoring function specifically to your PROFINET network.



All entries are saved in the device by pressing the "**Adopt**" button or reset to the default setting through "**Reset**" + "**Adopt**".

The functions are described individually below.

#### 4.4.1 System

Basic device settings, such as date / time, device name, IP address, etc., are displayed in the system settings and can be changed here. The entries are kept in the event of power failure or device modification.

	PROFINET-INspektor NT				
SCO	Device is connected			at manual and the	Accesson and a sector of the s
E Start L. Alerts 	Make configuration here			M	Unacknowledged error Astronomous messages Deete aeros Denter data
Configuration Support & Contact	Ø <mark>0</mark> System 🕐	Monitoring	o	Firmware update	New measurement
Support & Contact	General			~	Current bus status
	Time and language settings			~	Very good 2365.3946 1947.00
	Network			~	
	Messages			~	
	Digital input			~	
	Factory reset			~	
	Import / Export			~	
	Information			~	
	© 2015 Indu-Sul GmbH				

Figure 21: System settings - complete overview



#### 4.4.1.1 General

In this sub-menu, entries can be made for device name, installation location, network name and notes that provide a more detailed description of the device and the network to be monitored. In addition to these entries, this menu allows setting up a password for the INspektor<sup>®</sup>. This password will then be required for all changes made to device and monitoring settings.

Furthermore, deactivating and calibrating the display is possible in this window.

		pektor NT		
<b>S B B B B B B B B B B</b>	Device is connected		ii desterer deste	A Telephone support +49 54491 5810
E Start   . Alerts   . Analysis	Make configuration here		(M	Unacknowledged error messages Diete alerts Diete data
Configuration	O <sub>0</sub> System	Monitoring	C Firmware update	Now measurement
Support & Contact	General		^	Current bus status
	Device name	Installation place	Network name	Very good 27.85.20% 17.992.4
	PN-hispektorhiT	Home of PROFINET-Nspektor NT	PROFINET	1790:54
	Contact	Password	Password (repeat)	
	info@indu-soi.com			
	activate display	Start calibrate touchscreen ③		
	Notes			
			Apply ③	
	Time and language settings		~	
	Network		~	

Figure 22: System settings – general

#### 4.4.1.2 Time and language settings

In this menu, settings are made for the system time and for the default language of the PN-INspektor<sup>®</sup> NT. The system time can either be entered manually, be adopted automatically from local PC system time, or be retrieved from a time server.

	PROFINET-INspe		n a contratatore	1701.
	Device is connected		n naadaabababababababababababababababababa	A Telephone support +49 34491 5818-0
6 Start				
Alerts	Make configuration here			Unacknowledged error Acknowledge messages
Analysis				Delete alerts
Configuration	¢ <mark>0</mark> System	Monitoring	Firmware update	New measurement
Support & Contact				
	General		~	Current bus status
	Time and language settings		^	Very good 27.85.20% 17.00.54
			<u>^</u>	
	Time server (NTP)			
	ODate 27.05.2016	Time 17.0144 Add	t local time	
	Time zone	Q Note		
	Europe/Berin	The time zone setting of the device is used to show the correct time in the time on this website your system time zone is used. Changing this		
		reboot.	and some requires a denice	
	System language	Note		
	German (Deutsch)	<ul> <li>The system language sets the language for the display and reports the Changing this language requires a device reboot.</li> </ul>	at are created by the device.	
			Apply 🕥	
	Network		~	

Figure 23: Time and language settings



In order for the time to be displayed correctly in the log, you must always specify the time zone, both if the time is entered manually and if it is retrieved automatically.



#### 4.4.1.3 Network

Under this item the network address settings are defined for both the "ACTIVE" and "PASSIVE" network connections of the PN-INspektor<sup>®</sup> NT (e.g. address, subnet mask, gateway). In this process, you can decide whether you want to use a fixed address or if the IP address should be obtained automatically (DHCP).

In addition, the current status of the interfaces (connected / not connected) is displayed.

The configuration of a mirror port is also possible in this menu. The function allows telegrams that are recorded to the diagnostic ports (IN / OUT) to be forwarded to the active or passive web interface. This function is deactivated by default after each boot of the device.

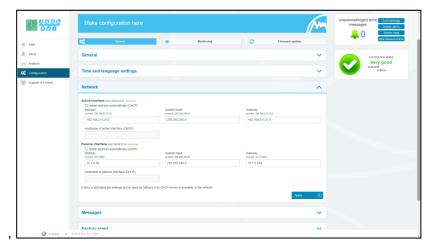


Figure 24: Network settings



To ensure error-free access to the Web interface, addresses from different address ranges or subnets must be assigned to both network connections

#### 4.4.1.4 Messages

With the message function, it is possible to arrange the sending of an email through the PN-INspektor<sup>®</sup>NT in the event of an alarm. To do this you require a valid recipient address, the IP address of the email server resp. SNMP trap host and an Ethernet connection between the device and the server.



	PROFINET-INspe	ktor NT			
	Device is connected			n webbulut.	AMAA-Jack AME A Temptrone support +49 34491 5818
# Start					
<ol> <li>Alerts</li> </ol>	Make configuration here				Unacknowledged error Acknowledge
iii Anaysis				/^	messages Delete alerts Delete alerts Delete alerts
Configuration	🔆 System	<b>•</b> •	onitoring C	Firmware update	New measurement
Support & Contact	General			×	Current bus status
	Time and language settings				Very good 23:65:395 95:47:11
	Network			×	
	Messages			1	×
	Sender name	Sender address	Receive	r address	
	PN-RepektorNT	pn-inspektor-nf@indu-sol.	com		
	Server IP	Server port		of format	
		25			
	Use authentification	Username	Passwo	rd.	
	SNMP trap host				
			Send test en	ual 🕥 Apply 🤅	
	Dialtal innut     0.2015 Indu Sul Cristi				

Figure 25: "Messages" selection window



For email alerts, it is imperative that the "Email" action has been activated for the desired trigger condition (see section <u>4.4.2.3 Triggers & Alarms</u>).

#### 4.4.1.5 Digital Input

For configuration of the digital inputs, you can choose between the following actions under this point. You can enter either a specific or an arbitrary slope change, and multiple actions per input.

- Disable alerts
- Delete data
- New measurement
- Creat report
- Acknowledge alerts
- Reset digital output
- Disable diagnosis

A delay of the recording start can be set via the item "Measurement start delay". This makes it possible to eliminate the start-up process from the monitoring function in the case of a slowly starting system.

Digital input							^
Measurement start delay	deactivated	Y					
Input		Level / Edg	•	Event			•
Input 1	Y	any	×	Acknowledge alerts (edge)	>		×
Input 2	Y	any	Y	Reset digital output (edge)	*		×
Input 3	Y	high / rising	Y	Disable alerts (level)	Y		×
Reset 🕥						Apply	$\odot$

Figure 26: Digital Input



#### 4.4.1.6 Factory reset

Here you can reset the PN-INspektor<sup>®</sup> NT to default settings. You have the option to retain the network settings, or to reset them as well. After the reset, the device is available again immediately.

	PROFINET-INspektor NT			PROFINET May 27, 2016 17:14:30
	Device is connected		n out	
-# Blat				
Alerts           Alerts           Analysis	Make configuration here		(Ma	Unacknowledged error Acknowledge messages Delete stens
O <sub>0</sub> <sup>®</sup> Configuration	Q0 System	Monitoring	Firmware update	Poly measurement
Support & Contact	General		~	Current bus status Very good
	Time and language settings		~	27.86.30% 17.96.32%
	Network		~	
	Messages		~	
	Factory reset		^	
	Here you can reset all satisfys to the factory defaults. This inclusion ad collector prevent Heffings, togger settings, status settings and settings for automated rep Reset reflexor settings			
	Import / Export		~	
	Information		~	
Q Language +	© 2015 Indu Sul Grabit			

Figure 27: Factory reset



In a reset to default settings, all previously made settings and records are lost.

#### 4.4.1.7 Import/Export

By means of the Import/Export function, all settings that have been made, e.g. general device settings and changes to PROFINET monitoring, can be saved, and loaded again into a PN-INspektor<sup>®</sup> NT whenever required.

	PROFINET-INspektor NT	
	Device is connected	<u>at</u>
Start     Alerts     Analysis	Make configuration here	Unacknowledged error Atsoundspr messages Owder aants
Configuration	🔆 System 💿 Monitoring	Firmware update
Support & Contact	General	Current bus status
	Time and language settings	Very good 27/8/2946 17/8/24
	Network	~
	Messages	~
	Factory reset	~
	Import / Export	^
	With the import and export function you are able to save and load the settings of the Republic. Wellow: It you import a settings file all collected data will be tool!	I Robert 💿
	Information	~

Figure 28: Import/Export



#### 4.4.1.8 Information

Current resource usage and the firmware and hardware versions of the PN-INspektor<sup>®</sup> NT are displayed in the information overview.

0000 880	Make configuration here				(/~	Unacknowledged error Acknowledge messages Delete alerts Delete data
art	Q <sub>0</sub> System	۲	Monitoring	ø	Firmware update	Taou measureme
erts valysis	General				~	Current bus status Very good
onfiguration	Time and language settings				~	27.86.3899 17280.34
upport & Contact	Network				~	
	Messages				~	
	Factory reset				~	
	Import / Export				~	
	Information				^	
	Processor load Used RAM Temperature				31.6 % 189,26 MB / 511,97 MB (37.0 %) 56 °C	
	Bytes sent (LAN) Bytes received (LAN)				2.23 G8 2.13 GB	
	Serial number MAC address (active) MAC address (passive)				00000198 50.61.D6.00.22.3C 50.61.D6.00.22.3D	
	Firmware version Framework version Hardware version				v1.4.0.56 0x453H3H60data23awad6x19079c734623 v1.0.0.33 80x27754131845awb296wd751489wd4175b v2.7.0 (2016-05-23 15.49.51)	

Figure 29: PN-INspektor® NT device information



## 4.4.2 Monitoring

You can specifically adjust the monitoring function of the PN-INspektor<sup>®</sup> NT to your network, define customised trigger and alarm thresholds and set up automated reporting with the specifications in these fields.

	PROFINET-INspek	tor NT					
	Device is connected				it has		418 A Jesture atbout +18 31151 (201
E Start   . Alerts   . Analyses	Make configuration here					M	Unacknowledged error Armowodge messages Deete airts Devite data
Configuration	Oo System	💿 Uor	itoring	ø	Firmware update		New measurement
Support & Contact	Node names					~	Current bus status Very good
	Node condition					~	38.85.29H 99:38.32
	Trigger & Alerts					~	
	Report					~	
	Control mode					~	

Figure 30: Monitoring - complete overview

#### 4.4.2.1 Node names and monitoring

The point "Node names and monitoring" allows to assign an alias name to each device. It is therefore possible, for example, to adopt and to save the device model, equipment identifier or installation location from the electrical diagrams. All entries will be visible throughout the entire system.

In addition, this menu allows to deactivate monitoring for individual or newly detected devices or limited the analysis to the device, which communicate exclusively with the corresponding station.

Count     Count     Adda torum     Count			Current bus status Very good			
Bit     Bit     Bit     Bit       March     Bit     Bit     Bit		Device	Alias name		stations that are logical connected to	22.12.2016
And a		<ul> <li>asi-ph-bk 90-49 45 30 57 54, 10 13 10</li> </ul>		•		
MMM     Image: Second Sec		O 0010 9910 9910 CA 44, 19192				
Adjunct of series of serie	ajus				•	
Option 1 & Constation     Option 1 & Constation     Option 2 & Constation       Option 2 & Constation     Option 2 & Constation     Option 2 & Constation       Option 2 & Constation     Option 2 & Constation     Option 2 & Constation       Option 2 & Constation     Option 2 & Constation     Option 2 & Constation       Option 2 & Constation     Option 2 & Constation     Option 2 & Constation       Option 2 & Constation     Option 2 & Constation     Option 2 & Constation       Option 2 & Constation     Option 2 & Constation     Option 2 & Constation       Option 2 & Constation     Option 2 & Constation     Option 2 & Constation       Option 2 & Constation     Option 2 & Constation     Option 2 & Constation       Option 2 & Constation     Option 2 & Constation     Option 2 & Constation       Option 2 & Constation     Option 2 & Constation     Option 2 & Constation	onfiguration					
Or Million     Image: Constraint of the	upport & Contact				•	
0     M00     •					•	
• Separation Statistics     • • • • • • • • • • • • • • • • • • •					•	
0         margin dom margin dom 0					•	
0         Improving the state of the s		bnipni5021022015 00103158 0346, 10 13 19			•	
0     Maintaining     -						
0 100 050 050 050 050 050 050 050 050 05		wengtor-switch 54 44 85 92 20 61, 10 1 9 20			•	
© 03.40.45.85.87.2#		<ul> <li>B-switch-ghs 00.42.45 88:97.28, 12.1.8.5</li> </ul>				
		8-05-5231 74/20182/E0132/E0131/E0131/E016/2018/66721/Bolids/Bedge			•	
		© 00 A0 45 8E:E7:2F				
Ø 00.18.18.10.04.46		© 00:18:18:10:0A:46				
50 51.06 00:28 04		50:61:D6:00:28:04				
		Automatically deactivate none PROFINET devices				
Automatically deachade none PROFPNET devices		Reset 🕥			Accely (5)	
New O		Device status			~	
Net O		Trigger & Alerts			~	

Figure 31: overview node names



#### 4.4.2.2 Node condition

It is possible to make adjustments to the display of node conditions over the entire master system (globally) and to specific nodes in this sub-menu. In this process, a node may adopt the following conditions, depending on the fault event and setting:

- 📀 🛛 No fault
- U Warning
- 😢 Fault

In the default setting, the PN-INspektor<sup>®</sup> NT is programmed so that alarms, error telegrams, increased jitter, telegram gaps, telegram overtakes and an increased netload of any node lead to "Warning" status; and failures lead to "Fault" status.



Figure 32: Node condition – default setting

By adding and editing additional event fields, the node conditions can be customised. In this process, nodespecific settings overwrite global values. This means it is possible to create node-specific settings to hide fault events which are justified in normal system operation.

**Example:** The system operator must enter a light barrier for a part change. This results in a device alarm (low) which is irrelevant to bus status evaluation. By deselecting the alarm (low) function of the nodes concerned in the PN-INspektor<sup>®</sup> NT, these stay "green" in the display.

As can be seen in the following illustration, in this example the "Telegram gap" event was deselected for the controller and the status change for the ET200SP was fully deactivated.



	PROFINET-INspektor NT	
	Device is connected	
Start Averts	Make configuration here	
Configuration	Q <sup>2</sup> System 🕐 Montolog 🖓 Fermana updata	
	Node names V Correct too status Verv good	
	Node condition	
	Citability         Controllative         Carteriality         Carteriality </td <td></td>	
	Enror bank         1         0         Diric frame         1         0         Diric frame         1         0           After         0.5% <td< td=""><td></td></td<>	
	France excision     1     0     France excision     1     0       Method     2.31486     0.5167     1     0     1     0       Method     2.31486     0.517     1     0     1     0       Rever     0     1     0     1     0     1     0	Delete fil
	Trigger & Alerts	Edit fil
	Report V	
🖓 Language 🔹	Report V	

Figure 33: Applying filters

The figure below shows the setting options in the editing window for the controller (telegram gap  $\rightarrow$  0) as an example.

Deactivate				
nodes	Controller			
nouce	Node	44 pn-io; 10.1.9.2	× ^	Select
			C C	nodes
	Bus node failure	0	1	
	Bus node restart	0	1	
	Alert (high)	1	0	
	Alert (low)	1	0	
	Error frame	1	0	
	Jitter	50	0	
	Frame gap	0	0	
	Concurrent frame gaps	1	0	
	Frame overtake	1	0	
	Netload	20 %	0 %	
		ок 🔊	Cancel	

Figure 34: Controller telegram gap deactivated



#### 4.4.2.3 Triggers & alarms

For the configuration of alarms and evaluation through switch contact, snapshot and email, the relevant parameters can be set under the item "Triggers & alarms".

In the device's default settings, all fault events of any PROFINET node automatically lead to an alarm entry in the status display and timeline, the creation of a fault record (snapshot), the connection of the switch contact and notification via email and SNMP-trap (if configured). The number of telegrams before and after an event can be freely selected between 0 and 2500. This means that the size of the snapshot can be freely selected as required

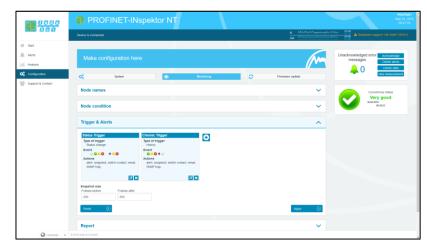


Figure 35: Triggers & alarms - default setting

Through a variable configuration of fault triggers in the form of different trigger types and special node addresses, it is possible to make the relevant adjustments here for a targeted fault search or targeted node monitoring.

The various options for editing individual filters are described in greater detail below.

By selecting the editing mode via the edit icon, the selection menu opens for adjusting the settings.

<b>1</b> 900	Device is connected	R
Start Alerts Analysis	Make configuration here	Uracknowledged error Administration
🕍 Anayon Of Conferentian Sequent & Context	Trigger & Alerts  Trigger & Al	Access value Access value Ac
	Capaginary solar Capaginary s	aan O

Figure 36: Selection menu for trigger type "status change"



The menu presented in Figure 37 is available for specifying the trigger type.

☑ Global trigger	
☑ Activate	
Designation	
Neuer Trigger	
Type of trigger	
Status change	~
Unknown	
Alert (low)	
Alert (high)	
Bus node failure	
Bus node restart	
Error frame	
Frame gap	
Concurrent frame gaps	
Frame overtake	
Jitter Netload	
Status change	
History	
Global netload	
Frame flood	
New node detected	
Double addressing	
Loop detection	

Figure 37: Trigger types

After choosing the individual trigger types (except "Timeline"), there is the option of global monitoring (all nodes) or an address-based selection.

By deselecting the item "Global trigger", you can select one or more devices from the existing device list via the node menu. The addresses presented are detected independently and system-specifically by the PN-INspektor<sup>®</sup> NT.

Cube20s-1; 10.1.9.11	
00:1B:1B:1C:CA:44 10.1.9.2	
O0:A0:45:38:5F:34 axl-pn-bi; 10.1.9.10	
O0:1B:1B:24:DA:80 im153-4pn-1; 10.1.9.15	
O0:1B:1B:D1:EC:8C IE-P8-Link; 10.1.9.16	
28:63:36:2C:F7:C0 et200sp-1; 10.1.9.8	
O0:30:DE:08:AD:15 wago-750-370; 10.1.9.7	
O0:19:31:98:C3:46 bnipnt502102z015; 10.1.9.19	
O0:19:31:31:A5:90 bnipnt502102z015-1; 10.1.9.18	
54:4A:05:04:00:E6 wenglor-cam; 10.1.9.21	
00:A0:45:BE:E7:26	_ ×

Figure 38: Address list example

The trigger types "Status change" and "Timeline event" each relate to changes in the entries which have been recorded under the item "Node condition" or in the timeline overview.

For threshold-related alarms, the number of **events per second** that should lead to a trigger is specified under this item.



☑ Global trigger ☑ Activate				
Designation				
Status Trigger				
Type of trigger				
Concurrent frame	gaps			~
Threshold				
2				
Actions				
✓ alert				
✓ snapshot				
switch contact				
🗹 email				
SNMP trap				
	ОК		Cancel	
	OK	$\bigcirc$	Cancer	

Figure 39: Telegram gap threshold setting

You can make practical use of these setting options to indicate the first signs of deterioration in communication before device failure occurs through an early warning.

The measures for when a trigger event occurs are defined in the options for individual "Actions".

**Example:** In PROFINET controllers the maximum number of concurrent frame gaps permitted in the default settings without a system malfunction occurring is 3. In order to receive an early warning promptly at this point and prior to failure, the threshold value is set to 2 concurrent frame gaps in the PN-INspektor<sup>®</sup> NT. If there are then occasional single gaps in normal operation for process-related reasons, that can be considered perfectly normal. If these frame gaps accumulate to 2 due to ageing, an alarm is triggered by the PN-INspektor<sup>®</sup> NT; even though the bus system continues to function without device failure. Thanks to this timely warning, you now have time to react before system failure to get to the bottom of the issue.

With the settings in the following example (Figure 39), only the failure of "Drive 0815" causes a trigger. This results in an alert including a snapshot record in PROFINET-INspektor<sup>®</sup> NT, as well as the activation of the switch contact and the sending of an email notification.

	PROFINET-INspektor NT	
	Device is connected	B: Annual Antonia State
N Blart Arens M Analysis	Make configuration here	Unacknowledged empr messages Cores and
Configuration	Q <sup>2</sup> <sub>6</sub> System ( Munikuring )	C Firmware update
Support & Contact	Node names	Current Dus status Very good
	Node condition	V SALINI 00222
	Trigger & Alerts	^
	Concentration The An color barbor Provent Methods and a concentrat, event solid Frage.	
	Snapshot size         Frames after           250         250	
	Reset	Acety 📀
	Report	~

Figure 40: "Drive 0815" failure trigger setting



#### 4.4.2.4 Automated report

The function "Automated report" provides you with the option of documenting the current system status at pre-set time intervals. These reports are then saved in the device regularly and are thus available to you for opening at any time (see item 4.3.2 Reports).

For the completion of the documentation, both the customer data and that of the system inspector can be added. Furthermore, the different sections for report creation can be selected or deselected, and an individual company logo can be used.

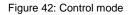


Figure 41: Selection window for automatic report creation

#### 4.4.2.5 Control mode

To allow rapid visual evaluation of the PROFINET network, individual quality parameters can be coloured by entering specific acceptance values. This setting is used both for the website (see point <u>4.1.3 Network</u> <u>overview</u>) and for the log.

	Make configur	adon nore							Converse avenus
	Q0 Sy	stern	۲	Nonitoring	0	Firmware update		- 0	New measurement
lart lerts	Node names						~		Current bus status
nalysis	Node condition						~		Very good 36.85-2019 08-39532
upport & Contact	Trigger & Alerts						~		
	Report						~		
	Control mode						^		
		Warning	Error						
	Breakdown	0	1						
	Restarts	0	1						
	Alerts	1	0						
	Jitter	50	0						
	Frame gaps	1	0						
	Concurrent frame gaps	1	0						
	Frame overhaul	1	0						
	Load ratio	100	0						
	Error frames	1	0						
	Netload (In %)	20	0						
	Payload (In Bytes/ms)	4500	0						
	Reset ()					Apply	۲		





#### 4.4.3 Firmware update

You can perform a firmware update for the PN-INspektor<sup>®</sup> NT using this function, if required. To do this, the new firmware file is selected and uploaded via the "Search" button. Following successful installation, triggering a restart is required in the device with the "Restart" button.



Figure 43: Firmware update



# **5** Device parameters

## 5.1 Update rate

The update rate is a fixed value (specific to each device) set in the controller (e.g. 1 ms) indicating the time between data updates in the controller and the I/O device. The decisive criterion for the actual update rate is the netload on the one hand, and the line depth, i.e. the installed network structure and the number of passing devices.

The increasing number of passing devices causes fluctuations in the transit time of telegrams, referred to as "jitter" (see point <u>5.5 Jitter</u>). By measuring the update rates, it has to be shown that telegram jitter does not exceed half the update rate upwards or downwards (max. 50% jitter).

## 5.2 Alarm (high priority / low priority)

Diagnostics messages that appear are sent to the PLC as high-priority or low-priority alarms in PROFINET. The event-based division of these alerts (e.g. the shorting of an ET200S module) is defined by each manufacturer themselves for their devices. Unfortunately, a more precise definition is therefore not possible, since the alarms are classified system and node-specifically.

## 5.3 Bus node failures

In PROFINET node failures are diagnosed by means of the watchdog time of the controller or the node itself. This is determined by the set update time between the controller and node, as well as the number of accepted update cycles with missing I/O data.

If the watchdog time is exceeded, the PN-INspektor® NT reports a failure.

## 5.4 Bus node restart

The parameter 'Bus device restart' counts all device restarts that occur. A restart of a bus device occurs after a failure or a system start when a bus device has its parameters set by the control system without any faults and then begins the cyclical data exchange.

## 5.5 Jitter

PROFINET communication is based on maintaining the set update rate of each device with the controller. Positive and negative deviations from this configured update time are referred to as "jitter" in PROFINET.

Jitter of up to 50% of the configured update time is in an acceptable range. Jitter values greater than 50% suggest network performance problems, device issues or an unfavourable layout of the network structure.



## 5.6 Telegram gaps

A telegram gap in PROFINET means the absence of an update time. Equally, a jitter of 100% may suggest a telegram gap. Telegram gaps are frequently caused by incorrect firmware versions of devices. In such cases the devices do not pass on a telegram or "forget" to send off their own telegram.

#### 5.7 Telegram overtakes

A telegram overtake may arise in PROFINET if peak loads occur in the switch or I/O device. When circumstances are particularly bad, a new telegram may be sent before an old one in the buffer of the switch. Telegram overtakes indicate excessive utilisation or device malfunctions.

#### 5.8 Error telegrams

This entry indicates the number of faulty telegrams detected in the PROFINET-INspektor<sup>®</sup> NT connection (checksum errors and packet fragments).

#### 5.9 Netload

This includes the netload produced by all reports. This is given as a percentage based on the maximum possible load of a cable at 100 MBit/s. For stable system operation the netload should not exceed 20% in new systems.

#### 5.10 Multicast telegrams

Multicast describes a message transmission from one point to a group and is therefore a form of multipoint connection. There should not be too many of these types of telegram, because they burden the entire network.

## 5.11 Broadcast telegrams

A broadcast telegram is a message in which data packets are transmitted to all nodes of a communication network from one point. The term "broadcast telegrams" refers to the number of telegrams that have to be received by all nodes.

## 5.12 Sending cycle

Period between two consecutive intervals for IRT or RT communication. The sending cycle is the shortest possible sending interval for data exchange. The calculated update times are multiples of the sending cycle. We recommend to set the sending cycle to 1 ms.



# 6 Support and contact

Should you wish to contact us for any reason, further information can be accessed from this page.

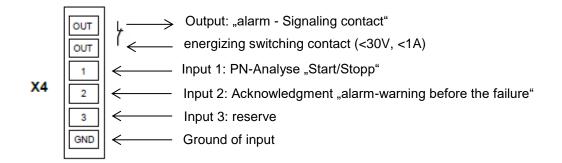
You can find the manual stored in the download area as a quick aid.



Figure 44: Support and contact



# 7 Sample for controlling the PN-INspektor<sup>®</sup> NT



#### Input 1: PN-Analyse "START / STOPP"

The input 1 is connected to an output of the PLC which outputs a signal from 0 to 1 (> 10V) as a continuous signal when the machine is enabled ("**automatic start-up**"). In the case of "**automatic operating stop**", wanted or unwanted, this enable (continuous signal) must be switched off and is thus set from 1 to 0.

#### Input 2: Acknowledgment "alarm-warning before the failure"

The input 2 is connected to an output of the PLC and serves to acknowledge the alarm message. This is to be executed as a switching pulse from 0 to 1 (> 10V).

#### Input 3: Reserve

#### Output: "alarm – Signaling contact"

The signaling contact is designed as a potential-free break contact. The confirmation is carried out as a function of the thresholds internally set in the PN-INspektor NT. Alarms are signaled from 1 to 0.

#### Explanation of the target function:

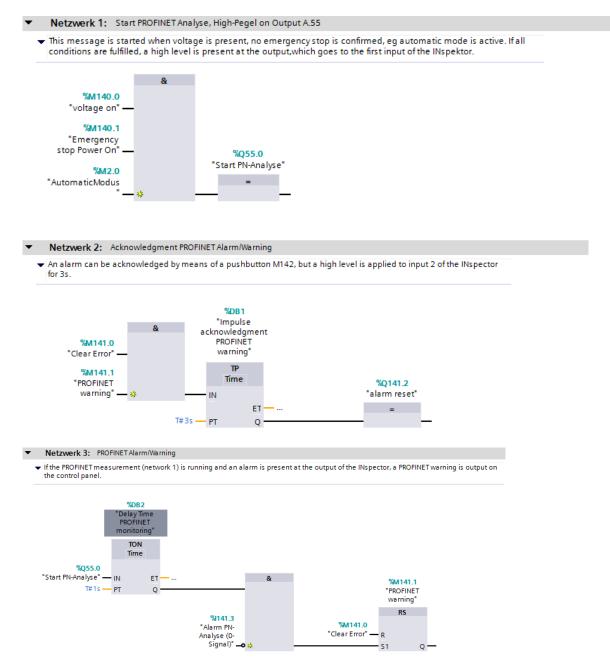
Scenario 1: Avoiding the alarm when the machine is booted: The PN-INspektor NT data are deleted when the signal change at input 1 (START / STOP) of the PN-INspector NT continuous signal from 0 to 1. At the same time, the alarm input for the switching contact OUT on the PN-INspector NT is to be enabled during this signal change in the PLC. This means that PROFINET alarms / warnings occurring only from this point in time are displayed on the visualization.
Scenario 2: PROFINET alarm/warning: For a PROFINET alarm / warning, the NC (Normally Close) contact "OUT" The input on the PLC is switched from 1 to 0 and thus an alarm / warning for the visualization is output.

If the PROFINET alarm is acknowledged at the visualization, the output at the PLC, which is connected to input 2 (acknowledgment) of the PN-INspector NT, is to be provided with a switching pulse from 0 to 1. The alarm is acknowledged and the alarm contact is reset to the PN-INspektor NT.



 Scenario 3: Automatic logging of the PN-INspektor NT: In order to obtain a trace of the network state, a protocol is automatically created each time the machine is switched off in the PN-INspector NT. This is achieved by the use of the signal AUTOMATIC START / STOP during the signal change of the duration signal 1 to 0 at input 1 (START / STOP) of the PN-INspector NT.

## 7.1 TiA-Portal Program example





# 8 Block diagram

The following image is a schematic diagram of the PN-INspektor® NT.

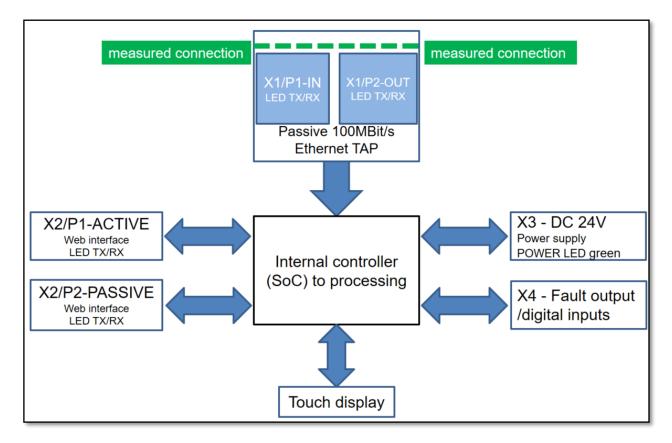


Figure 45: Block diagram



# 9 Technical data

Voltage supply:	+24V DC
Tolerance:	±10%
Power consumption:	Max. 200 mA
Starting current:	Max. 200 mA
• Dimensions (W x H x D):	105 x 125 x 132 (in mm)
Assembly:	TS35 DIN top-hat rail (EN 50022)
Weight:	0.840 kg
Protection class:	IP20
Operating temperature:	+5 °C to +55 °C
Storage temperature:	-20 °C to +70 °C
Relative air humidity:	10%90%

# 9.1 Technical drawing

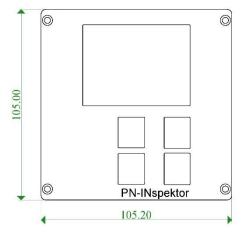


Figure 46: Front view

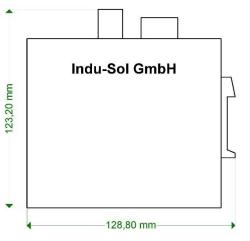


Figure 47: Side view with plugs and top-hat rail mounting

# Indu-Sol GmbH

Blumenstrasse 3 04626 Schmoelln

Telephone: +49 (0) 34491 5818-0 Telefax: +49 (0) 34491 5818-99

info@indu-sol.com www.indu-sol.com

We are certified according to DIN EN ISO 9001:2008