Indu-Sol
The IIT Network Equipment Supplier

Products
Diagnostics
Monitoring
Training
Consulting
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Ethernet-based real-time protocols are becoming the standard in industrial data communication. Classic fieldbus protocols hardly play a role anymore in new automation technology concepts. According to estimates, PROFINET achieved more market share than PROFIBUS for the first time in 2017. Advocates of this technology and its successors are already talking about a “triumphal march” of Ethernet in production control, because all of a sudden, communication paths from machine control to the ERP system are much easier to implement. Typical performance limits are disappearing, and responsibilities are merging in the course of this development. This adds to the importance of clarifying responsibilities again, because networks are no longer the sole responsibility of the IT department.
The tasks and responsibilities of the individual areas can be described as follows:

Information Technology (IT) area:
Umbrella term for all processes in the company related to electronic data processing. IT is responsible for the control, processing, storage and backup of data, including the hardware and software used for this purpose. IT management deals with the control of IT processes in a broader sense in order to guarantee the processes in the company and to achieve targets.

Industrial Information Technology (IIT) area:
Defines the link between the IT and OT areas. It is responsible for the acquisition and transfer from the OT area to IT of data that are not directly related to machine and system control, but are of decisive importance for process control and optimisation, e.g. quality monitoring/evaluation, logistics, and material flow.

Operational Technology (OT) area:
Operational Technology (OT) refers to hardware and software required for the control, regulation, monitoring and control of machines, systems and processes. In the past, operative technologies were only seen as industrial control systems, which communicate in closed systems with proprietary protocols. With the entry of Ethernet-based communication (real-time) into the OT area, an IT / OT convergence is developing which represents a new challenge.

While the protection and confidentiality of data are of paramount importance for information technology (IT), availability in production is the key factor for operational technology (OT). Ultimately, both areas must approach each other in order to work productively and efficiently in the age of the IoT – a challenge that must be faced together.

In order to face the changes with confidence and success, Indu-Sol has developed – in addition to the already existing diagnostic concept PROmanage® NT – the switch family PROmesh.
In combination, they stand for highest availability and operational reliability in OT networks.
The switch family PROmesh, the device development of the future, represents a new generation of its kind with its “High Performance onboard Diagnostic”. In addition to intelligent switch functionality, the PROmesh P9/P20 has an integrated EMC monitoring function that can be used at any time to make a statement about the relationship between network status and EMC stability. The clear and intuitively interpretable web interface in the typical traffic light colours enables everyone to react quickly and accurately to events in the network, and forms the basis for predictive, predictable maintenance.
Network planning

When we speak of network planning in automation technology, this is usually limited to a machine or system. More correctly, however, the planning should be set up on a larger scale and the machine/system understood as a component of the overall network within a hall network. This provides a complete overview of the communication relationships between OT or IIT and IT at a very early stage, allowing responsibilities and access rights to be defined in advance.

In order to achieve an optimal and secure network structure, it is necessary to draw up a list of questions in advance and to define key points:

- New setup or expansion
- Speed – bandwidth
- Network topology
- Network configuration / network load
- Access rights / Security
- Infrastructure components – Server
- Transfer medium – Copper, glass, wireless
- Power supply EPS / UPS
- Network diagnostics and monitoring
- Responsibilities / Maintenance / Service

Interactive preliminary planning – PROnetplan

PRONetplan is a software for the preliminary planning of industrial networks. The network can be assembled in an intuitive way on a graphic interface, and be tested interactively. Important parameters like the netload at the controller are calculated and displayed automatically based on the line depth and the preset update rate. With a simple simulation of the communication parameters and changes in the network structure, potential bottlenecks can be identified and eliminated during the planning stage. All devices and the predicted netload for each interface are listed in a clear overview.

Standards and guidelines

- PROFINET Planning Guidelines of PI
  Version 1.14 – December 2014
- PROFINET Commissioning Guideline of PI
  Version 1.36 – December 2014
- PROFINET Assembly Guideline of PI
  Version 1.0 – January 2009
- Functional Bonding and Shielding of PROFIBUS and PROFINET – Version 1.0 – March 18
- Cabling structure acc. to ISO/IEC 11801
Acceptance test and quality control

In the interest of a permanently high level of network availability, it is important to establish statements or requirements during the planning phase regarding qualitative evidence of the network function. In a technical delivery specification (user requirements specification), in addition to the infrastructure components, a measurement-based verification of the installation and the communication behaviour under load conditions must also be stipulated. The following tests and inspection steps are to be carried out.

**Offline analysis**

**Cable measurement**

After completed installation at the final installation location, the cables of all Ethernet and PROFINET data cables must be measured end-to-end (PROFINET 2pr E2E).

The following values must be evaluated and logged depending on length: min. insertion attenuation reserve – loss along the length of the line – min. NEXT reserve – attenuation of the cross talk between the individual pairs of wires.

**Inspection tools:** ETHERtest V5.2, Art. No. 112010012

**Online analysis**

**Online analysis** must be done while the system is functioning and the network is fully completed. It must be carried out by a company which is independent of the installer, and which has been approved by the client.

**Operational reliance analysis:**

The “Operational reliance analysis” should be carried out over a period of at least five working days with full/partial system functionality. The telegram traffic between the PLC and the first switch port is permanently logged in order to qualitatively evaluate the parameters listed here.

**Inspection tools:** PROFINET-INspektor® NT, Art. No. 124030100

**System-describing analysis:**

It is used to determine the topology of the network including all network and device information. These must be checked for compliance with the planning specifications and documented.

**Inspection tools:** PROscan Active® V2, Art. No. 117000053

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**RECOMMENDATION – Quality values**

Recommendations on the quality values in PROFINET by Indu-Sol

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Jitter (deviation from the planned update time)</td>
<td>≤ 50 %</td>
</tr>
<tr>
<td>Telegram gap (missing telegram)</td>
<td>0</td>
</tr>
<tr>
<td>Error telegram (defective telegrams)</td>
<td>0</td>
</tr>
<tr>
<td>Load ratio (How heavily the network is loaded?)</td>
<td>100 : 1</td>
</tr>
<tr>
<td>Netload (network load in 100 mbps)</td>
<td>&lt; 20 %</td>
</tr>
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</table>

Integration of the PROFINET-INspektor® NT into the PROFINET network
Network monitoring

Network monitoring is an important component of end-to-end asset management. Often the question arises from which number of devices or for which network characteristics network monitoring should be adopted. In automation, however, the associated networks are often still regarded as small units isolated towards the outside, although the connections between them and to the higher-level IT network are becoming more and more apparent. The question cannot be answered by looking at a single machine or system control, but can only be answered in the context of monitoring the entire OT network. A definite topology, traceable data transmission paths, and associated information such as netload, availability, speed, communication devices are basic prerequisites for assuming responsibility for a network.

Network monitoring is an automated maintenance and repair system that permanently determines the current network status and, in the event of quality-relevant events, issues a foresighted alarm with a specific time reference. To achieve this, the central monitoring software PROmanage® NT queries, analyzes, stores and graphically displays the device diagnoses, including port statistics, minute-by-minute via a standard SNMP protocol.

When using PROFINET, the passive PROFINET-INspektor® NT data loggers are additionally installed between the controller and the first switch port in order to obtain information about the communication behaviour within the network. This is necessary because the device diagnoses of the manufacturers allow very different or sometimes even no statements about the communication status of the network.
Event notification with time stamp

With the integrated threshold value management, limit values can be defined for every network parameter. When a limit is reached, an entry with a time stamp and event description is made automatically in the event list. Information about network errors can be retrieved from the event list with just one click.

Alarm management

Integrated alarm management enables automatic forwarding of event notifications. By selecting a suitable information medium (e mail, message services, OPC, SNMP), all messages can be transmitted to the responsible persons in a timely manner. This shortens notification paths and prevents undesired plant downtimes.
Network security within the trusted zone

With the increase in networking in the industrial production sector, monitoring systems for maintaining network availability are faced with completely new additional requirements. Availability and security must go hand in hand. Until now, communication within an externally secured network area, the so-called trusted zone, was classified as trustworthy and therefore not controlled any further. In most cases these were the OT networks, which were planned as isolated units, at least to a large extent. However, only a topology scan (e.g. with PROscan® Active V2) reveals without a doubt all devices belonging to the network, and their real connections to each other. The extent of interconnection of machines and systems in industrial production is often underestimated in practice!

For this reason, the PROFINET-Inspektor® NT, for example, functions not only as a measurement and diagnostic tool for determining data communication quality, but also as an intrusion detection system. It detects the presence of unknown devices in the network, and immediately alerts the operator – either by e mail, SNMP trap or, of course, via the tool’s web interface. By means of this function, and network load resolution with millisecond accuracy, targeted attacks on specific devices can be identified on the basis of increased network load and flooding with requests (denial of service attacks). In addition, programming access attempts on the PLC are detected in order to identify manipulation. The PROFINET-Inspektor® NT therefore serves both monitoring and security purposes.

The high number of access points to the network and the increasing level of networking of intelligent devices and components also make safety-relevant monitoring necessary within the automation network. In addition to the IT precautions, which are responsible for protection against external attacks, OT networks require independent monitoring: In these networks, no protective measures can be taken without at least partially sacrificing availability. Communication must, however, be permanently monitored in order to have at least the communication protocols available as a starting point for finding the cause in the event of safety-relevant incidents.
Walling-off is not an option

The reluctance of many operators to install security measures is often due to the great expense involved in IT-proven security solutions. In addition to the high costs, the immense configuration effort for firewalls, routers, user accounts, etc. is a deterrent. Moreover, these measures cannot be applied 1:1 to the protection of automation technology networks without compromising their availability. However, the isolationist approach of IT for the purpose of data protection runs counter to the idea of worldwide networking of production. Nevertheless, networks should be divided into segments and protected by firewalls.

However, despite the fact that there are no binding security standards for automation technology, trouble-free production will only be possible in the future if security and monitoring are equally guaranteed. Solutions that combine both requirements and are taking the first steps towards security are already available.

Observing security measures during planning

The PROnetplan software provides security information and shows where this has to be implemented in the network.

Security information

The user-friendly pop-ups with security information show immediately which devices have free ports that may need to be blocked, and where the use of a firewall might be advisable.
The **PROmesh P9** is an Ethernet/PROFINET switch which has been designed for use in the open field, especially due to its high robustness against EMC influences. It provides leakage current monitoring, millisecond display of network load, diagnostic functions and port statistics, and is certified to Conformance Class B and Netload Class III.

**Leakage current monitoring**

**Network load display with millisecond accuracy**

**Conformance Class B**

**Diagnostic function**

**Port statistics**

**Netload Class III**

9x10/100Base TX RJ45 ports

**Web view**

**Main overview**

**Leakage Current**

**Netload Class III**

In the context of Industry 4.0, more and more data has to be transferred from your network. For your network quality, the directly directed traffic is much more harmful than indirectly directed traffic. As the only switches with more than 4 ports, the **PROmesh P9** and the **PROmesh P20** are certified according to Netload Class III, and therefore particularly resistant to direct traffic.

**Clear web interface**

The proven traffic light system allows you to see at a glance which devices are experiencing problems. For more detailed analysis, the port statistics provide port-specific information on network load, errors and discards. Your maintenance personnel can thus quickly locate faulty devices, ensuring high availability of your network.

**Conformance Class B**

The Ethernet/PROFINET switches **PROmesh P9** and **PROmesh P20** are optimized for the Industrial Ethernet standard due to the increasing number of new PROFINET systems. Conformance Class B certification enables you to cover 99% of all PROFINET applications. This means that your PROFINET network is also optimally equipped for the future.
The **PROmesh P20** is an Ethernet/PROFINET switch that is designed to be used directly after the controller. With its four SFP modules, it offers a wide range of options for connecting fiberglass. It provides leakage current monitoring, a router function, millisecond display of network load, port statistics, diagnostic functions, and is certified to Conformance Class B and Netload Class III.

**Ethernet/PROFINET Switch PROmesh P20**

Discards and errors are usually caused by very short peaks. If the network load was only observed in the range of seconds or even minutes, then these load peaks could not be displayed, and a potential error might be overlooked. For diagnostic purposes, especially with regard to Industry 4.0, capturing the network limit in the millisecond range is therefore invaluable.

**Network load visualisation in ms**

Due to increasing networking, new demands are being made on data security and access rights. This is why the **PROmesh P20** has a router function. A Layer 3 port allows you to separate devices connected to the switch from the rest of the network. If required, individual connections to the higher-level network can be permitted.

**Diagnostic function**

The **PROmesh P9 and P20** can be adapted especially to your needs and individually to the network. In this way you are immediately informed about changes in your network if necessary:

- Number of error telegrams
- Number of discards
- Level of network load
- Correct port allocation
- Level of leakage current

**SFP slots**

SFP slots offer you an additional level of flexibility. The free slots can be occupied by the SFP modules. Such SFP modules are available in a wide variety of copper and optical fiber versions. This allows you to optimize your **PROmesh P20** for your system. 16 Cu ports + 4 SFP slots
**PROmesh P9**

Ethernet/PROFINET Switch

- Connection type: 9*10/100Base TX RJ45
- Technology: Store and Forward
- Applications: OT / IIT
- Port Mirroring: Yes
- PROFINET capable: Yes
- Leakage current monitoring: Yes
- Network load visualisation: Yes
- Discards visualisation: Yes
- Bandwidth control: Yes
- SD card storage medium: Yes
- Supported protocols: MRP; DCP; I&M; DCHP; IGMP; LLDP; PDEV; QoS; STP; SNMP; RSTP
- Diagnostics: LED, relay, SNMP, e mail
- Protection class: IP20
- Power supply: 24 V DC+/-20 % redundant
- Dimensions (H*W*D): 105*49*112 mm
- Weight: 490 g
- Housing: Aluminium, anodised

**PROmesh P20**

Ethernet/PROFINET Switch

- Connection type: 16*10/100Base TX RJ45, 4*1000Base SFP
- Technology: Store and Forward
- Applications: OT / IIT
- Port Mirroring: Yes
- NAT: Yes
- PROFINET capable: Yes
- Leakage current monitoring: Yes
- Network load visualisation: Yes
- Discards visualisation: Yes
- Bandwidth control: Yes
- SD card storage medium: Yes
- Supported protocols: MRP; DCP; I&M; DCHP; IGMP; LLDP; PDEV; QoS; STP; SNMP; RSTP; NAT
- Diagnostics: LED, relay, SNMP, e mail
- Protection class: IP30
- Power supply: 24 V DC+/-20 % redundant
- Dimensions (H*W*D): 138*68*130 mm
- Weight: 960 g
- Housing: Aluminium, anodised
Ethernet infrastructure components

**PROmesh P8-E**
Ethernet Switch
- Connection type: 8*10/100Base TX RJ45
- Technology: Store and Forward
- Applications: IIT
- Port Mirroring: Yes
- Web interface: Yes
- Network load visualisation: Yes
- Bandwidth control: Yes
- Supported protocols: LLDP; SNMP; RSTP; STP; IGMP; Telnet
- Diagnostics: LED, relay, SNMP, e mail
- Protection class: IP30
- Power supply: 12 V - 48 V DC redundant
- Dimensions (H*W*D): 138*53*110 mm
- Weight: 800 g
- Housing: Metal, powder-coated

**Ordering Details**

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**PROmesh P16-E**
Ethernet Switch
- Connection type: 16*10/100Base TX RJ45
- Technology: Store and Forward
- Applications: IIT
- Port Mirroring: Yes
- Web interface: Yes
- Network load visualisation: Yes
- Bandwidth control: Yes
- Supported protocols: LLDP; SNMP; RSTP; STP; IGMP; Telnet
- Diagnostics: LED, relay, SNMP, e mail
- Protection class: IP30
- Power supply: 12 V - 48 V DC redundant
- Dimensions (H*W*D): 160*70*130 mm
- Weight: 960 g
- Housing: Metal, powder-coated

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Ethernet / PROFINET infrastructure components

PROmesh P12-GE
Ethernet Switch
- Connection type: 8*10/100/1000Base TX RJ45, 4*1000Base SFP
- Technology: Store and Forward
- Applications: IIT
- Port Mirroring: Yes
- Web interface: Yes
- Network load visualisation: Yes
- Bandwidth control: Yes
- Supported protocols: ARP; ICMP; TCP; DHCP; DNS; HTTP; Telnet; Ring; RSTP; SNMP; LLDP; IGMP; GMRP
- Diagnostics: LED, relay, SNMP, e mail
- Protection class: IP30
- Power supply: 12 V - 48 V DC redundant
- Dimensions (H*W*D): 160*70*130 mm
- Weight: 960 g
- Housing: Metal, powder-coated

Ordering Details | Art. No.
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PROmesh P12-E | 114110070

PROmesh PoE
Ethernet Switch
- Connection type: 8*10/100/1000Base TX RJ45, 2x Combo 10/100/1000Base, TX RJ 45 or 1000Base SFP
- Technology: Store and Forward
- Applications: IIT
- Port Mirroring: Yes
- Web interface: Yes
- Network load visualisation: Yes
- Bandwidth control: Yes
- Supported protocols: ARP; ICMP; TCP; DHCP; DNS; HTTP; Telnet; Ring; RSTP; SNMP; LLDP; IGMP; GMRP
- Diagnostics: LED, relay, SNMP, e mail
- Protection class: IP30
- Power supply: 12 V - 48 V DC redundant
- Dimensions (H*W*D): 160*70*130 mm
- Weight: 1070 g
- Housing: Metal, powder-coated

Ordering Details | Art. No.
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PROmesh PoE | 114110090
# Ethernet infrastructure components

## PROmesh P28-R

**Ethernet Switch**

- Connection type: 16*10/100/1000Base TX RJ45, 8x Combo 10/100/1000Base, TX RJ 45 or 1000Base SFP, 4*1000Base SFP
- Technology: Store and Forward
- Applications: OT / IIT
- Port Mirroring: Yes
- Network load visualisation: Yes
- Bandwidth control: Yes
- Supported protocols: ARP; ICMP; TCP; UDP; DHCP; HTTP; HTTPS; Telnet; RSTP; DNS; MSTP; LLDP; LACP; IGMP; GMRP; SNMP
- Diagnostics: LED, relay, SNMP, e mail
- Protection class: IP30
- Power supply: 100 V - 240 V AC redundant
- Dimensions (H*W*D): 43*440*285 mm
- Fastening: 19 inch rack
- Weight: 3900 g
- Housing: Metal, powder-coated

### Ordering Details

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## PROmesh P28-RL

**Ethernet Switch**

- Connection type: 16*10/100/1000Base TX RJ45, 8x Combo 10/100/1000Base, TX RJ 45 or 1000Base SFP, 4*1000Base SFP
- Technology: Store and Forward
- Applications: OT / IIT / IT
- NAT: Yes
- Port Mirroring: Yes
- Network load visualisation: Yes
- Bandwidth control: Yes
- Supported protocols: IGMP; GMRP; SNMP; NAT; STP; RSTP; MSTP; DHCP; LLDP; SNTP; Telnet; HTTP/HTTPS; SSH; LACP
- Diagnostics: LED, relay, SNMP, e mail
- Protection class: IP30
- Power supply: 100 V - 240 V AC redundant
- Dimensions (H*W*D): 43*440*285 mm
- Fastening: 19 inch rack
- Weight: 3900 g
- Housing: Metal, powder-coated

### Ordering Details

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</table>
**PROmesh P7X**

Ethernet/PROFINET Switch

- Connection type: 7*7 10/100Base M12
- Technology: Store and Forward
- Application: OT
- Web interface: Yes
- Network load visualisation: Yes
- PROFINET capable: Yes
- Digital I/O ports: Yes
- Protection class: IP67
- Power supply: 18 V - 32 V redundant
- Dimensions (H*W*D): 244*84*35 mm
- Weight: 1265 g
- Housing aluminium, powder-coated

**PROFINET INspektor® NT**

Analysis and diagnostic tool

The **PROFINET-INspektor® NT** is an intelligent, passive measurement and diagnostic tool for temporary or permanent monitoring of PROFINET networks. Due to its passive and feedback-free behaviour, it is highly suitable for online analysis.

The **PROFINET-INspektor® NT** is both a full-featured measuring device for network acceptance and a monitoring tool for condition monitoring.

**Ordering Details**

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</table>
Analysis | diagnosis | measurement

**iPNMA**
Intelligent PROFINET measuring point

The intelligent PROFINET measuring point iPNMA combines the functions of a PROFINET measuring point with a simple PROFINET network analysis.

In this case, the evaluation of the recorded data does not take place on the device itself, but instead all data is queried and processed for evaluation by the PROmanage® NT software.

In addition to the integrated diagnostics function, an analysis tool (e.g. PROFINET-INspektor® NT or laptop) can be connected to the two monitor jacks (monitor M1 and M2) in a non-reactive way for a more thorough network analysis or troubleshooting.

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<td>iPNMA</td>
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**Infrastructure components**

**PNMA II / PNMX**
PROFINET measuring points

The PNMA II measuring point provides non-reactive access for telegram recording in the PROFINET and other Ethernet-based networks during running production. It is recommended to install the PNMA II measuring point permanently in the network connection between the automation device (controller) and the first switch, because the major part of the communication typically passes through here.

The measuring point in the PNMX version with IP67 protection class can be installed in rough production environments without any protective housing. Diagnostic tools are connected via M12 measurement jacks (M12 D-coded).

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<td>PNMX IP67 (for harsh environments)</td>
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**Network planning**

**PROnetplan**
Network planning software

PROnetplan is a software for the preliminary planning of industrial networks. The network can be assembled intuitively on a graphic interface.

With a simple simulation of the communication parameters and changes in the network structure, potential bottlenecks can be identified and eliminated during the planning stage.

The topology created with PROnetplan can be used both as a discussion platform with the client and as a document for a network installation, in addition to the objective of network optimization.

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**Acceptance test and validation**

**PROscan Active® V2**
Acceptance and validation software

With the PROscan Active V2 software, PROFINET networks can be described and displayed in detail at any time under running production conditions – i.e. online. Thanks to the LLDP protocol (detection of neighbourhood relationships) integrated in PROFINET devices, it is possible to generate a complete topology map, including all designations and relationships, in an extremely short time, and thereby simultaneously perform an initial simple diagnosis (line interruptions, device failures etc.) during running operation.

The software helps you to efficiently organise a complex network and, if required, perform necessary maintenance in a timely and direct manner. Its low resource requirements enable PROscan Active V2 to be installed on any commonly available touch panel.

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<td>Upgrade PROscan Active V1 to V2</td>
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Permanent Network Monitoring

**PROmanage® NT**

Network monitoring software

**PROmanage® NT** enables the assessment, analysis and long-term storage of condition data for fieldbus systems and other industrial networks. For this purpose, **PROmanage® NT** retrieves the port statistics of manageable switches and the events in the distributed data loggers (**INspektors**), evaluates them and displays them graphically.

To improve system availability, the following targets are set for a PNM system:
- Continuous monitoring of real communication
- Complete monitoring and detection of causes of weak spots in the network
- Automatic alarms in the case of negative developments
- Central overview of all networks

### Ordering Details

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<td>PROmanage® NT (320 ports*)</td>
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<td>117000036</td>
<td>PROmanage® NT (640 ports*)</td>
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### PROFINET connectors and cables

| Cat5 - Type A - massive +FE |
| Cat5 - Type B - Flexible +FE |
| Cat5 - Type C - drag-chain compatible |

### Ordering Details

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<th>Description</th>
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<tbody>
<tr>
<td>114030002</td>
<td>PROFINET connector M12</td>
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<tr>
<td>114030003</td>
<td>PROFINET connector RJ45 (180°)</td>
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<tr>
<td>114030004</td>
<td>PROFINET connector RJ45 (90°)</td>
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<tr>
<td>114030005</td>
<td>PROFINET connector RJ45/8A Cat 6a (180°/360°)</td>
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<td>PROFINET connector RJ45/8A Cat 6a (360°)</td>
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### Ordering Details

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<tr>
<td>114050010</td>
<td>PROFINET cable Cat5 (Type A – solid)</td>
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<tr>
<td>114060001</td>
<td>PROFINET cable Cat5 (Type B – flexible)</td>
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<tr>
<td>114070001</td>
<td>PROFINET cable Cat5 (Type C – drag-chain compat.)</td>
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<td>114050011</td>
<td>PROFINET cable *FE (Type A – solid)</td>
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<tr>
<td>114060003</td>
<td>PROFINET cable *FE (Type B – flexible)</td>
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*Further licenses upon request*
### Measurement / Troubleshooting
Network analysis / certification, troubleshooting

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<td>Troubleshooting</td>
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### Training
PROFINET seminars

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<tr>
<td>One-day seminar (1 day)*</td>
<td>220030012</td>
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<tr>
<td>User training PROFINET (2 days)*</td>
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PROFINET seminar **PI certified** incl. exam

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<tr>
<td>Certified PROFINET Installer (2,5 days)*</td>
<td>220030007</td>
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<tr>
<td>Certified PROFINET Engineer (2,5 days)*</td>
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### Training
Security seminar

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### Training
Wireless LAN seminar

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<td>Training Wireless LAN (2 days)*</td>
<td>220080001</td>
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