

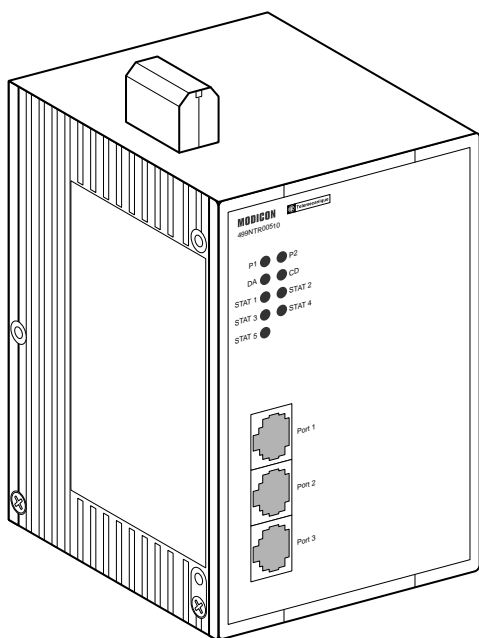
ETHERNET CABLING SYSTEM

Quick Reference Guide

ETHERNET HUB 10 Mbps 3TP/2FL
Ethernet Twisted Pair Industrial
Hub for ISO/DIN Rail

Order No.

499NOH10510



The Ethernet Hub 10 Mbps 3TP/2FL for ISO/DIN rail allows Ethernet networks to be flexibly constructed in accordance with IEEE standard 802.3 using fiber optic (F/O) and copper technology. The hubs for ISO/DIN rail provide several connection options in one device and are plugged onto the ISO/DIN rail.

The hub has three twisted pair (TP) interfaces and two BFOC optical interfaces. It is possible to connect up to three terminals or other TP segments using Shielded and Foiled Twisted Pair cords (SFTP) in industrial environments with electromagnetic interference.

The F/O parts can be used to connect up to two more terminals or optical network components: an optical ring architecture for example.

The module conforms to the specifications of ISO/IEC standard 8802-3.

You will find a detailed description for construction of a local area network on network design and network installation in the "Transparent Factory User and Planning Guide" (Order no. 490USE13300).

We have checked that the contents of the technical publication agree with the hardware and software described. However, it is not possible to rule out deviations completely, so we are unable to guarantee complete agreement. However, the details in the technical publication are checked regularly. Any corrections which prove necessary are contained in subsequent editions.

We are grateful for suggestions for improvement.

We reserve the right to make technical modifications.

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Note

We would point out that the content of these operating instructions is not part of, nor is it intended to amend an earlier or existing agreement, permit or legal relationship. All obligations on Schneider Automation arise from the respective purchasing agreement which also contains the full warranty conditions

which have sole applicability. These contractual warranty conditions are neither extended nor restricted by comments in these operating instructions.

We would furthermore point out that for reasons of simplicity, these operating instructions cannot

describe every conceivable problem associated with the use of this equipment. Should you require further information or should particular problems occur which are not treated in sufficient detail in the operating instructions, you can request the necessary information from your Schneider Electric regional sales office.

General

Electricity is used to operate this equipment. Comply in every detail with the safety requirements specified in the operating instructions regarding the voltages to apply!



Warning

If warning notes are ignored, severe injuries and/or material damage may occur.

Only appropriately qualified staff should work on or near this equipment. Such staff must be thoroughly acquainted with

all the warnings and maintenance measures contained in these operating instructions.

The proper and safe operation of this equipment assumes proper transport, appropriate storage and assembly and careful operation and maintenance.

Staff qualification requirements

Qualified staff within the meaning of these operating instructions or the warning notes are persons familiar with setting up, assembling, starting up and operating this product and who have appropriate qualifications to cover their

activities, such as:

- training or instruction/entitlement to switch circuits and equipment/systems on and off, ground them and identify them in accordance with current safety standards;

- training or instruction in accordance with current safety standards in looking after and using appropriate safety equipment;
- first aid training.

Safety guidelines



Warning

Ethernet Hub 10 Mbps 3TP/2FL units are designed for operation with safe extra-low voltage. Accordingly, only safe extra-low voltages (SELV) conforming to IEC950/EN60950/VDE0805 may be connected to the supply voltage connections.

1. Functional description

1.1 GENERAL FUNCTIONS

Signal regeneration

The Hub 10 Mbps 3TP/2FL processes the signal shape and amplitude of the data received.

Retiming

In order to prevent jitter increasing over several segments, the Hub 10 Mbps 3TP/2FL retimes the data to be transmitted.

Preamble regeneration

The Hub 10 Mbps 3TP/2FL supplements lost preamble bits from data received to 64 bits (incl. the start of frame delimiter (SFD)).

Fragment extension

Collisions can cause short fragments to occur. If the Hub 10 Mbps 3TP/2FL receives a fragment, this is supplemented to give the minimum length of 96 bits. This ensures reliable collision detection by all network participants.

Collision handling

If the Hub 10 Mbps 3TP/2FL detects a data collision, it interrupts the transmission. For the duration of the collision, the collided data package is replaced by a jam signal to ensure collision detection by the terminal equipment.

Auto partitioning

Network failures can be caused by permanent occupancy, ruptured lines, lack of terminating resistors, damaged cable insulation and frequent collisions due to electromagnetic interference. In order to protect the network from such failures, the Hub 10 Mbps 3TP/2FL in this case separates the segment in the receiving direction from the rest of the network.

The Hub 10 Mbps 3TP/2FL has this auto partitioning function individually at each port. The other ports can thus continue to be operated without interference if one of the ports has been auto partitioned. In the event of auto partitioning, transmission continues into the TP segment or the F/O line but reception at this port is blocked.

With twisted pair, auto partitioning is activated if

- a data collision lasts longer than 105 µs or
- there are more than 64 consecutive data collisions.

With F/O, auto partitioning becomes active when

- a data collision lasts longer than 1.5 ms (normal mode) or 0.2 ms (redundant mode) or
- there are more than 64 (normal mode) or 16 (redundant mode) consecutive data collisions.

Reconnection

The segment is reconnected to the network as soon as a package with the minimum length of 51 µs is received without collision at the relevant port, i. e. when the segment is working properly again.

When the redundant mode is active, packages >51 µs sent at a F/O port without collision also lead to reconnection.

Jabber control

Due to a defective transceiver or LAN controller, for example, the network can be continuously occupied with data. To protect against this, the Hub 10 Mbps 3TP/2FL interrupts reception

- at the affected TP or AUI port after 5.5 ms. 9.6 µs after the end of the error the auto partitioning will be cancelled.

- at the relevant F/O port after 3.9 ms. 420 ms after the end of the error the auto partitioning will be cancelled.

(Rx jabber)

1.2 SPECIFIC FUNCTIONS OF THE TP INTERFACE

Link control

The Hub 10 Mbps 3TP/2FL monitors the connected TP line segments for short-circuit or interrupt using idle signals during frame pauses in accordance with IEEE standard 802.3 10BASE-T. The Hub 10 Mbps 3TP/2FL does not transmit any data in a TP segment from which it does not receive an idle signals.

Note: A non-occupied interface is assessed as a line interrupt. The TP line to terminal equipment which is switched off is likewise assessed as a line interrupt as the de-energised transceiver cannot transmit idle signals.

Auto polarity exchange

If the reception line pair is incorrectly connected (RD+ and RD- switched) polarity is automatically reversed.

1.3 SPECIFIC FUNCTIONS OF THE F/O INTERFACE

Link control

The Hub 10 Mbps 3TP/2FL monitors the connected F/O lines for interrupts using idle signals during frame pauses in accordance with IEEE standard 802.3 10BASE-FL. The Hub 10 Mbps 3TP/2FL transmits no data to an F/O line from which it is receiving no idle signal.

Redundancy

In areas where data security has top priority, it is possible with the aid of the redundancy function to bridge any failure of an F/O line or Hub 10 Mbps 3TP/2FL. To do so, a replacement line is frequently routed in a different cable run. In the event of a fault, there is an automatic switch between the main line and the replacement. A cross-link within the bus structure creates a ring (see Fig. 5). If any Hub 10 Mbps 3TP/2FL link or Hub 10 Mbps 3TP/2FL fails, every other Hub 10 Mbps 3TP/2FL can still be reached with the aid of the redundant run.

1.4 DISPLAY ELEMENTS

Equipment status

The 4 LEDs on top provide information about the status which affects the function of the entire Hub 10 Mbps 3TP/2FL.

P1 - Power 1 (green LED)

- lit: supply voltage 1 present
- not lit: - supply voltage 1 not present,
- hardware fault in Hub 10 Mbps 3TP/2FL

P2 - Power 2 (green LED)

- lit: supply voltage 2 present
- not lit: - supply voltage 2 not present,
- hardware fault in Hub 10 Mbps 3TP/2FL

DA - Data (yellow LED)

- lit: Hub 10 Mbps 3TP/2FL receiving data at at least one interface
- not lit: - Hub 10 Mbps 3TP/2FL not receiving data at any interface,
- hardware fault in Hub 10 Mbps 3TP/2FL

Depending on network load, the illumination of the LED can vary between flickering to permanent illumination.

CD - Collision Detect (red LED)

- lit: data collision detected at Hub 10 Mbps 3TP/2FL level
- not lit: - no data collision at Hub 10 Mbps 3TP/2FL level

Port Status

These groups of LEDs display port-related information.

LS1 to LS3 - link status of the TP ports (3 x green LED)

- lit: Hub 10 Mbps 3TP/2FL receiving idle signals from TP segment,
- the TP segment connected is working properly
- not lit: Hub 10 Mbps 3TP/2FL is not receiving any idle signals from TP segment,
- the assigned TP port is not connected,
- the equipment connected is switched off,
- the TP line is interrupted or short-circuited

LS4 - link status of F/O port 4 (green LED)

- lit: Hub 10 Mbps 3TP/2FL receiving idle signals from F/O segment,
- the F/O segment connected is working properly
- flashes 2 times per period: port has auto partitioned
- not lit: Hub 10 Mbps 3TP/2FL not receiving any idle signals from F/O segment,
- the assigned F/O port is not connected,
- the equipment connected is switched off,
- the F/O receiving fibre is interrupted

LS5 - Link status of F/O port 5 (green LED) Normal mode switched on

- lit: Hub 10 Mbps 3TP/2FL receiving idle signals from F/O segment,
- the connected redundant F/O segment is working properly
- flashes 2 times per period: port has auto partitioned
- not lit: Hub 10 Mbps 3TP/2FL not receiving any idle signals from F/O segment,
- the assigned F/O port is not connected,
- the equipment connected is switched off,
- the F/O receiving fibre is interrupted

LS5 - Link status of F/O port 5 (green LED) Redundant mode switched on

- lit: Hub 10 Mbps 3TP/2FL receiving idle signals from F/O segment,
- the connected redundant F/O segment is working properly **and** is active,
- flashes 1 time per period: Hub 10 Mbps 3TP/2FL receiving idle signals from F/O segment,
- the connected redundant F/O segment is working properly **and** is in stand-by mode,
- not lit: Hub 10 Mbps 3TP/2FL not receiving any idle signals from F/O segment,
- the assigned F/O port is not connected,
- the equipment connected is switched off,
- the F/O receiving fibre is interrupted.

1.5 CONTROLS

6-pin DIP switch

Using the 6-pin DIP switch on the top of the Hub 10 Mbps 3TP/2FL housing

- the message about the link statuses can be suppressed by the indicator contact on a port-by-port basis. Using switches LA1 to LA5, the message about the link status of ports 1 to 5 is suppressed. State on delivery: switch position 1 (ON), i.e. message not suppressed.
- port 5 can be switched to redundant mode. State on delivery: switch position 0 (OFF), i.e. port 5 in normal mode.

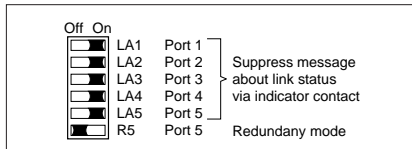


Fig. 1: 6-pin DIP switch

1.6 INTERFACES

TP connection

Three 8 pole RJ45 sockets enable three independent TP segments to be connected.

- Pin configuration of the RJ45 socket:

- TD+: Pin 3, TD-: Pin 6
- RD+: Pin 1, RD-: Pin 2
- remaining pins: not configured.

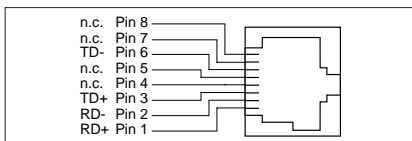


Fig. 2: Pin configuration TP interface

F/O connection

2 optical ports to 10BASE-FL (BFOC/2.5 (ST) sockets) enable Hub 10 Mbps 3TP/2FL equipment to be cascaded as well as redundant rings to be constructed using F/Os and terminal equipment to be connected.

5-pin terminal block

The supply voltage and the indicator contact are connected via a 5-pin terminal block with screw locking mechanism.

Warning

The Hub 10 Mbps 3TP/2FL equipment is designed for operation with SELV. Only safe extra-low voltages to IEC950/EN60950/VDE0805 may therefore be connected to the supply voltage connections and to the indicator contact.

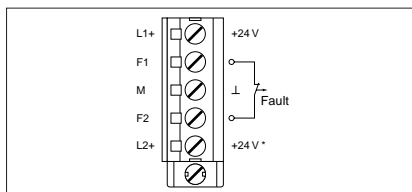


Fig. 3: Pin configuration of 5-pin terminal block

- **Voltage supply:** The voltage supply can be connected to be redundant. Both inputs are decoupled. There is no load distribution. With redundant supply, the power pack only supplies the Hub 10 Mbps 3TP/2FL with the higher output voltage. The supply voltage is electrically isolated from the housing.

- **Indicator contact:** Contact interrupt indicates the following by means of a volt-free indicator contact (relay contact, closed circuit):

- the failure of at least one of the two supply voltages.
 - a permanent fault in the hub (internal 5 V DC voltage, supply voltage 1 or 2 not in the permissible range).
 - the faulty link status of at least one F/O or TP port.
- The indication of the link state may be masked on a port-by-port basis using DIP switches.
- at least one port has auto partitioned. Port 5 in redundant mode doesn't indicate the state "auto partitioning", because this function characterizes the error free state of the optical ring.

Note: In the case of the voltage supply being routed without redundancy, the Hub 10 Mbps 3TP/2FL indicates the failure of a supply voltage. You can prevent this message by feeding in the supply voltage through both inputs.

2. Configuration

2.1 LINE STRUCTURE

The Hub 10 Mbps 3TP/2FL enables line structures to be built up. Cascading can be effected using both the TP and F/O ports.

2.2 REDUNDANT RING STRUCTURE

Redundant ring structures can be built up using the F/O ports of the Hub 10 Mbps 3TP/2FL. Figure 4 shows a redundant ring structure with Hub 10 Mbps 3TP/2FL equipment. To do so, the first device is connected to the last in the fiber optical line structure which includes Hub 10 Mbps 3TP/2FL equipment (see above) and the redundant fiber optical ring thus closed.

To do so, the redundant connection on just one of the two Hub 10 Mbps 3TP/2FL modules is to be connected to port 5, and port 5 switched to redundant mode. Switchover is effected at the 6-pin DIP switch on top of the equipment (see chapter entitled "Functional description - Controls").

The number of devices which can be cascaded depends on the overall network structure. Redundant ring structures can be implemented via the F/O ports.

Hints on calculating the maximum network expansion can be found in the "Ethernet Reference Manual".

A maximum of 11 Hub 10 Mbps 3TP/2FL modules can be cascaded in a fiber optical line. Here the total length of the line between the terminal devices at each end of the line may not exceed 1180 m.

The total length of the line is determined by the total sum of all F/O line sections and the two TP lines to the terminal devices.

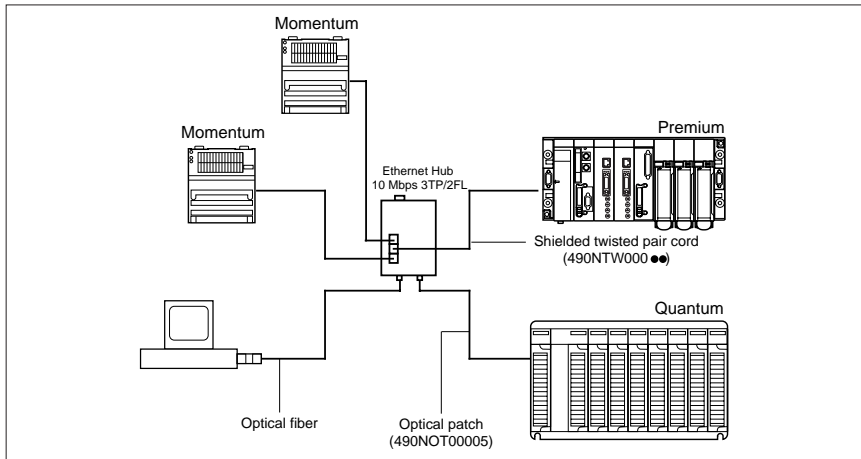


Fig. 4: Standalone configuration of the Hub 10 Mbps 3TP/2FL

When cascading via TP ports, use a cable which crosses the signal pairs, i.e. in each case connects output to input.

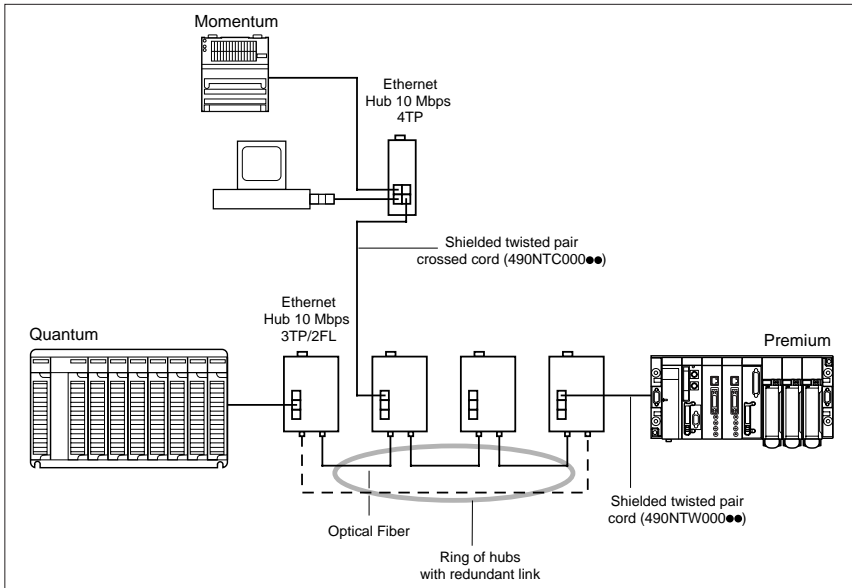


Fig. 5: Redundant ring structure via the F/O ports of the Hub 10 Mbps 3TP/2FL

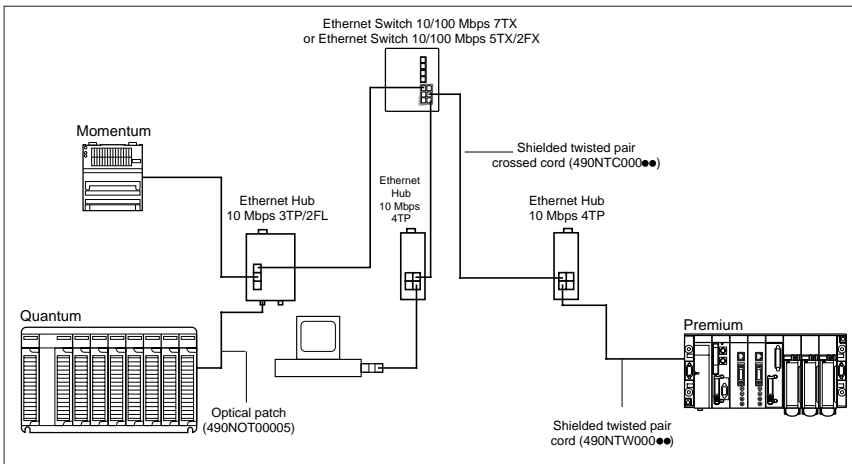


Fig. 6: Configuration with Ethernet switch

3. Assembly, startup procedure and dismantling

3.1 UNPACKING, CHECKING

- Check whether the package was delivered complete (see scope of delivery).
- Check the individual parts for transport damage.



Warning

Use only undamaged parts!

3.2 ASSEMBLY

The equipment is delivered in a ready-to-operate condition. The following procedure is appropriate for assembly:

- Check whether the switch factory-setting is suitable for your requirements.
- Pull the terminal block off the Hub 10 Mbps 3TP/2FL and wire up the supply voltage and indicator lines.
- Fit the Hub 10 Mbps 3TP/2FL on a 35 mm ISO/DIN rail to DIN EN 50 022.
- Suspend the upper snap-on slide bar of the Hub 10 Mbps 3TP/2FL in the standard bar and press it down towards the standard bar until it

- locks in position.
- Fit the signal lines.

Notes:

- The housing of the Hub 10 Mbps 3TP/2FL is grounded via the ISO/DIN rail. There is no separate ground connection.
- The screws in the lateral half-shells of the housing may not be undone under any circumstances.
- The shielding ground of the twisted pair lines which can be connected is electrically connected to the housing.

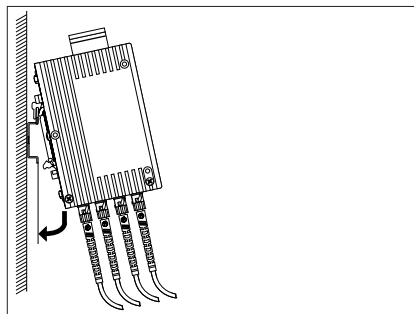


Fig. 7: Assembling the Hub 10 Mbps 3TP/2FL

3.3 STARTUP PROCEDURE

To start up the Hub 10 Mbps 3TP/2FL, connect the supply voltage via the 5-pin terminal block. Lock the terminal block with the locking screw at the side.

3.4 DISMANTLING

To dismantle the Hub 10 Mbps 3TP/2FL from the standard bar, pull the Hub 10 Mbps 3TP/2FL downwards and on the bottom lift the Hub 10 Mbps 3TP/2FL away from the standard bar.

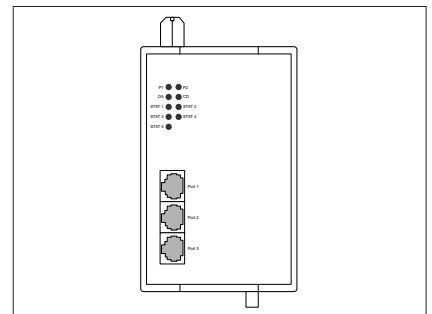


Fig. 8: Dismantling the Hub 10 Mbps 3TP/2FL

4. Technical data

General data

Operating voltage	DC 18 to 32 V safe extra-low voltage (SELV) (redundant inputs decoupled)	
Current consumption	typ. 160 mA at 24 VDC (without data) max. 350 mA at 24 VDC (with data)	
Overload current protection at input	non-changeable thermal fuse	
Dimensions W x H x D	80 mm x 140 mm x 85 mm	(3.15 in x 5.51 in x 3.35 in)
Mass	900 g	(1.982 lb)
Ambient temperature	0 °C to + 60 °C	(32 °F to + 140 °F)
Storage temperature	- 40 °C to + 80 °C	(-40 °F to + 176 °F)
Humidity	10% to 95% (non condensing)	
Protection class	IP 30	
Laser protection	Class 1 conform to EN 60825	
Radio interference level	EN 55022 Class B	
Interference immunity	EN 61000-6-2:1999	
Agency Approval	IEC 61131-2, Marine (Germanisher Lloyd)	

Network size

Transition	TP-Port ↔ TP-Port	F/O port ↔ F/O port
Propagation equivalent	190 m (623 ft)	260 m (853 ft)
Variability value	3 BT	3 BT
Transition	TP-Port ↔ F/O port	
Propagation equivalent	360 m (1.181 ft)	
Variability value	6 BT (1 BT = 100 ns)	

F/O port

Optical output power			
Graded-index fiber 50/125 µm (average)	min. -22,0 dBm	max. -16,2 dBm	
Graded-index fiber 62,5/125 µm (average)	min. -19,0 dBm	max. -12,4 dBm	
Optical input power	min. -33,0 dBm		

TP line length (TP-Port ↔ TP-Port)

Length of a twisted pair segment	max. 100 m (328 ft)
Number of cascaded hubs (electrical line)	max. 4
Number of hubs in an Optical ring	max. 11

F/O line length (example)

50/125 µm fiber	max. 2.600 m (8530 ft)
62.5/125 µm fiber	max. 3.100 m (10170 ft)

Scope of delivery

Ethernet Hub 10 Mbps 3TP/2FL incl. terminal block for supply voltage Quick Reference Guide	
Order number	
Ethernet Hub 10 Mbps 3TP/2FL	490NOH00510

Accessories

Ethernet SFTP cat5RJ45 cords	490NTW000●●
Ethernet SFTP cat5RJ45 crossed cords	490NTC000●●
Ethernet MTRJ/ST 5 m optical patch	490NOT00005

Note: The optical patch is made up of two 62.5/12.5 multi mode glass fiber, used in 1300 nano-meter wavelengths.

Transparent Factory User and Planning Guide	490USE13300
Transparent Factory Network Design and Cabling Guide	490USE13400



Notes on CE identification

The devices comply with the regulations of the following European directive:

89/336/EEC

Council Directive on the harmonisation of the legal regulations of member states on electromagnetic compatibility (amended by Directives 91/263/EEC,

Area used	Requirements for emitted interference	interference immunity
Industrial	EN 50081-2: 1993 EN 55022 Class A: 1998	EN 61000-6-2:1999

The product can be used in the residential sphere (residential sphere, business and trade sphere and small companies) and in the industrial sphere.

The precondition for compliance with EMC limit values is strict adherence to the construction guidelines specified in this description and operating instructions.



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