Schneider Electric

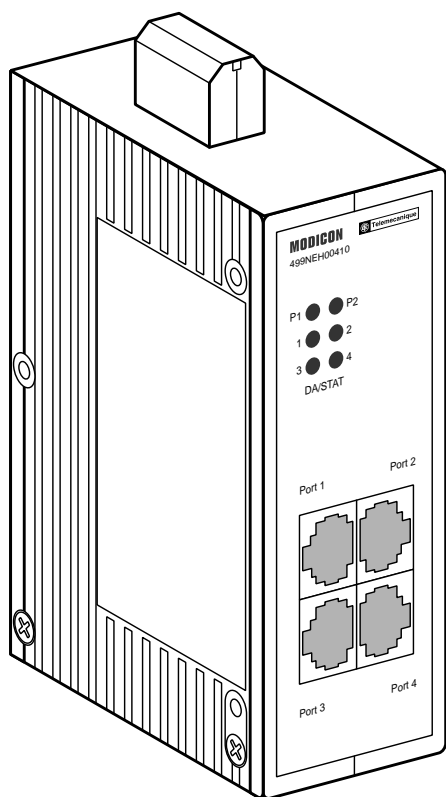# ETHERNET CABLING SYSTEM

Quick Reference Guide

ETHERNET HUB 10 Mbps 4TP
Ethernet Twisted Pair Industrial
Hub for ISO/DIN Rail

Order No.

499NEH10410

The Ethernet hub 10 Mbps 4TP supports fast network expansion. You can connect up to four data terminal devices or further twisted pair segments via shielded twisted pair cords.

To install, just fit the rail hub on an ISO/DIN rail. No other configuration is required. The 24V voltage is supplied via the terminal block and can be fed redundantly.

The terminal block contains an integrated indicator contact, receiving error and warning messages about the hub which are defined as digital signals. These signals can, for example, be utilized as process messages by a Quantum or Premium PLC. The indicator contact becomes active as soon as disturbances occur in the hubs, such as when a power supply fails or at least one TP port reports a faulty link status or has auto partitioned.

LEDs incdicating collisions, link status, segmentation, power and received data are available for diagnostic purposes.

The Ethernet Hub 10 Mbps has four twisted pair (TP) shielded interfaces. It is possible to connect up to four terminals or other TP segments using Shielded and Foiled Twisted Pair cords (SFTP) in industrial environments with electromagnetic interference.

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).

Merlin Gerin
Modicon
Square D
Telemecanique

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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expressly. Contravention renders the perpetrator liable for compensation for damages. All rights reserved, in particular in the case of patent grant or registration of a utility or design.

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 4TP 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 4TP processes the signal shape and amplitude of the data received.

Retiming
In order to prevent jitter increasing over several segments, the Hub 10 Mbps 4TP retimes the data to be transmitted.

Preamble regeneration
The Hub 10 Mbps 4TP 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 4TP 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 4TP 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 4TP in this case separates the segment in the receiving direction from the rest of the network.
The Hub 10 Mbps 4TP 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 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.

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.

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 4TP interrupts reception at the affected TP port after 5.5 ms for a duration of 9.6 µs. This cycle (transmission for 5.5 ms, interruption for 9.6 µs) is repeated until the end of the error (jabber lockup protection).

1.2 SPECIFIC FUNCTIONS OF THE TP INTERFACE
Link control
The Hub 10 Mbps 4TP monitors the connected TP line segments for short-circuits or interrupts, using idle signals during frame pauses, in accordance with IEEE standard 802.3 10BASE-T. The Hub 10 Mbps 4TP does not transmit any data in a TP segment from which it does not receive an idle signal.

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-energized 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 DISPLAY ELEMENTS
Equipment status
The two LEDs provide information about the status which affects the function of the entire Hub 10 Mbps 4TP.

P1 - Power 1 (green LED)
- lit: supply voltage 1 present
- not lit: - supply voltage 1 not present,
  - hardware fault in Hub 10 Mbps 4TP

P2 - Power 2 (green LED)
- lit: supply voltage 2 present
- not lit: - supply voltage 2 not present,
  - hardware fault in Hub 10 Mbps 4TP

Port Status
These groups of LEDs display port-related information.
DA/STAT 1 to DA/STAT 4 - link status of the TP ports (4 x green/yellow LED)
- lit yellow:
Hub 10 Mbps 4TP receiving data
- lit green:
Hub 10 Mbps 4TP receiving link test pulses from TP segment,
- the TP segment connected is working properly
- flashes
  green: port has auto partitioned
- not lit: Hub 10 Mbps 4TP 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

1.4 CONTROLS
6-pin DIP switch
Using the 6-pin DIP switch on the top of the Hub 10 Mbps 4TP housing
- the message about the link status can be suppressed by the indicator contact on a port-by-port basis. Using switches LA1 to LA4, the message about the link status of ports 1 to 4 is suppressed. Factory setting: switch position 1 (ON), i.e. message not suppressed.
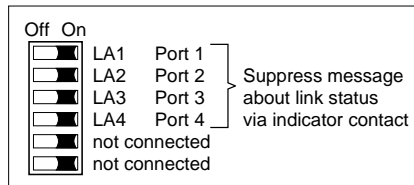

Fig. 1: 6-pin DIP switch

1.5 INTERFACES
TP connection
Four 8 pole RJ45 sockets enable four independent TP segments to be connected.

- Pin configuration of the RJ45 socket:
  - TD+: Pin 3,   TD-: Pin 6
  - RD+: Pin 1,   RD-: Pin 2
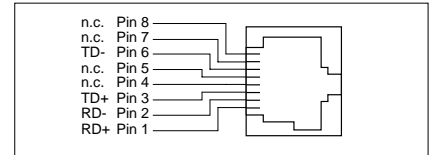 - remaining pins: not configured.

Fig. 2: Pin configuration TP interface

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 4TP 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.
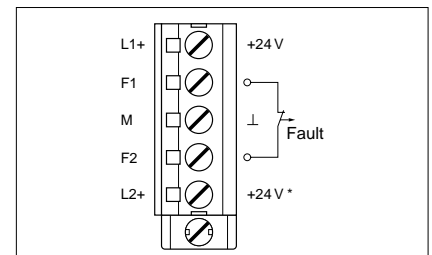

Fig. 3: Pin configuration of 5-pin terminal block

- **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 4TP 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 TP port. The indication of the link state can be masked on a port-by-port basis using DIP switches.
  - at least one port has auto partitioned.

Note: In the case of the voltage supply being wired without redundancy, the Hub 10 Mbps 4TP indicates the failure of a supply voltage. You can prevent this message by feeding the supply voltage through both inputs.

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2. Configuration

2.1 STANDALONE STRUCTURE
STAR SHAPED STRUCTURE
The Hub 10 Mbps 4TP enables connection of up to four data terminal devices or further twisted pair segments via twisted pair.

2.2 EXPANSION OF EXISTING NETWORKS
The Hub 10 Mbps 4TP offers the possibility of expanding your network quickly, for example by using an existing hub / switch link.
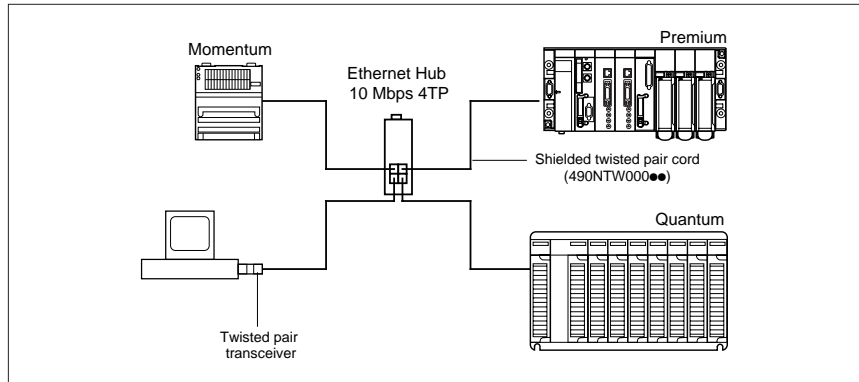

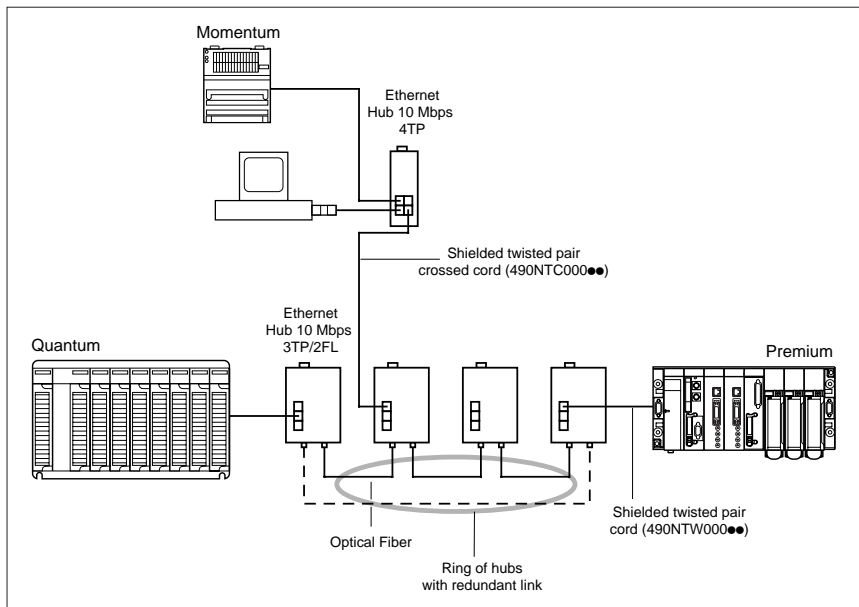Fig. 4: Standalone configuration of the Hub 10 Mbps 4TP
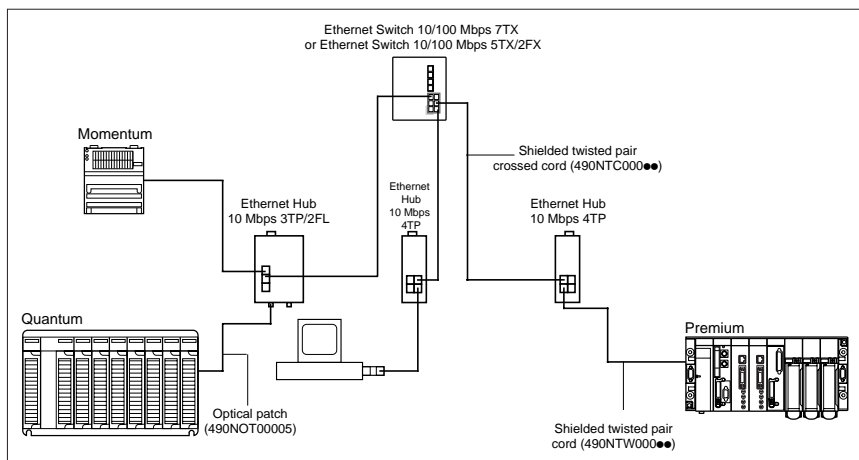

Fig. 5: Expansion of a hub link

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 4TP and wire up the supply voltage and indicator lines.
- Fit the Hub 10 Mbps 4TP on a 35 mm ISO/DIN rail to DIN EN 50 022.
- Suspend the upper snap-in hook of the Hub 10 Mbps 4TP on the ISO/DIN rail, insert a screwdriver horizontally under the housing into the locking slide pull this downwards (see Fig. 8, dismantling) and press the bottom of the module onto the ISO/ DIN rail until it locks in position (Fig. 7).
- Fit the signal lines.

Notes:
- The housing of the Hub 10 Mbps 4TP is grounded via the ISO/DIN rail. There is no separate ground connection.
- The screws in the lateral half-shells of the housing must not be undone under any circumstances.
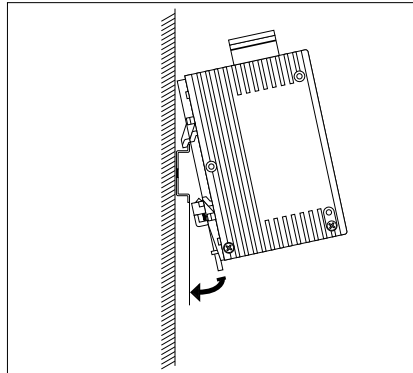- The shielding ground of the twisted pair lines which can be connected is electrically connected to the housing.

Fig. 7: Assembling the Hub 10 Mbps 4TP

3.3 STARTUP PROCEDURE
You start up the Hub 10 Mbps 4TP by connecting the supply voltage via the 5-pin terminal block. Lock the terminal block with the locking screw at the side.

3.4 DISMANTLING
To take the Hub 10 Mbps 4TP off the ISO/DIN rail, insert a screwdriver horizontally under the housing into the locking slide, pull it (without tipping the screwdriver) downwards and tilt the Hub 10 Mbps 4TP upwards.
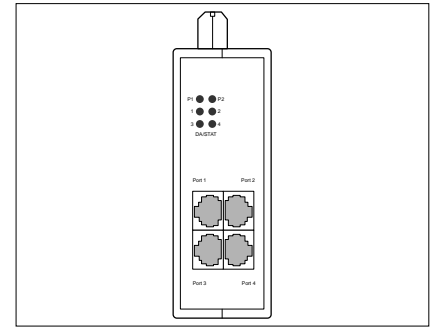

Fig. 8: Dismantling the Hub 10 Mbps 4TP

4. Technical data

General data

Operating voltage	DC 18 to 32 V safe extra-low voltage (SELV) (redundant inputs decoupled)
Current consumption	typ. 80 mA at 24 VDC (without data) max. 130 mA at 24 VDC (with data)
Overload current protection at input	non-replaceable thermal fuse
Dimensions W x H x D	40 mm x 125 mm x 80 mm (1.57 in x 4.92 in x 3.15 in)
Weight	530 g (1.167 lb)
Ambient temperature	0 ºC to + 60 ºC (32 ºF to + 140 ºF)
Storage temperature	- 40 ºC to + 80 ºC (-40 ºF to + 176 ºF)
Humidity	10% to 95% (non condensing)
Protection class	IP 30
Radio interference level Interference immunity	EN 55022 Class B EN 61000-6-2:1999
Interfaces	4 ports in compliance to 10BASE-T with RJ45 connectors (shielded) 1 x 5 pole mountable terminal block
Displays	P1, P2: power DA/STAT 1 to DA/STAT 4: data, collision, link status per port, segmentation
Agency Approval	IEC 61131-2, Marine (Germanisher Lloyd)

Network size

Transition	TP-Port ↔ TP-Port	
Propagation equivalent	190 m	(624 ft)
Variability value	4 BT	(1 BT = 100 ns)
TP line length (TP-Port ↔ TP-Port)		
Length of a twisted pair segment	max. 100 m	(328 ft)
Number of cascaded hubs	max.4	

Scope of delivery

Ethernet Hub 10 Mbps 4TP incl.
    terminal block for supply voltage
    Quick reference guide	

Order number Ethernet Hub 10 Mbps 4TP	499NEH10410

Accessories

Ethernet SFTP cat5RJ45 cords	490NTW000●●
Ethernet SFTP cat5RJ45 crossed cords	490NTC000●●
Transparent Factory User and Planning Guide	490USE13300
Transparent Factory Network Design and Cabling Guide	490USE13400

CE

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, 92/31/EEC and 93/68/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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