TC EXTENDER 4001 ETH-1S

Managed Ethernet extender



Data sheet
106942_en_04

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1 Description

The Ethernet extender makes broadband Ethernet applications on existing cables possible. The Ethernet extender can be used with company-owned 2-wire lines, but not in the public telephone network.

It is possible to establish point-to-point connections with a range of up to 20 km.

The managed Ethernet extender can be combined with the new unmanaged Ethernet extender (Item No. 2702409). However, it can also be used in a network with old generation devices (PSI-MODEM-SHDSL/ETH from firmware version 4.xx, Item No. 2313643). This enables the central diagnostics of all users and lines via IP.

In the event of a storm, high-energy transients can occur. Without protection, they are coupled into the 2-wire line. The integrated surge protection protects the device's SHDSL interface from these transients.

Functions in firmware version 5.xx or later

- Virtually separate critical IP networks with VLAN
- Increase availability through RSTP redundancy
- Greater transparency with SNMP diagnostic extension

Features

- Distances up to 20 km
- 1 port, can be configured via web server
- Integrated surge protection of the SHDSL interface
- Surge protection module available as replacement part (TC EXTENDER PT-IQ-1S, Item No. 2702257)
- Easy startup, plug and play
- Robust modulation method (SHDSL)
- Automatic topology and data rate detection
- Alarm and signal output
- Remote diagnostics via IP and automatic event messages via SNMP
- Protocol-transparent transmission of all standard Ethernet protocols, including EtherNet/IP™, Modbus/TCP, PROFINET, PROFIsafe, EtherCAT®, KNX, BACnet/IP
- Use in point-to-point connections with managed and unmanaged Ethernet extenders

WARNING: Explosion hazard when used in potentially explosive areas

The device is a category 3 item of electrical equipment. Observe the safety notes in the packing slip.

The additional information in the user manual must also be strictly observed.

Make sure you always use the latest documentation.

It can be downloaded at: phoenixcontact.net/product/2702253

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3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
Managed Ethernet extender, point-to-point connections, data rates up to 15.3 Mbps, distances of up to 20 km on in-house copper cables, replaceable surge protection, 1 SHDSL port, 1 LAN port, diagnostics via Ethernet	TC EXTENDER 4001 ETH-1S	2702253	1
Replaceable surge protection module, only for Ethernet extender TC EXTENDER 4001 ETH-1S (2702253), 1 SHDSL port, two-wire protection for floating SHDSL cables, two-level protective circuit	TC EXTENDER PT-IQ-1S	2702257	1

Accessories	Type	Item no.	Pcs./Pkt.
Surge protection in accordance with Class E_A ($CAT6_A$), for Gigabit Ethernet (up to 10 Gbps), token ring, FDDI/ CDDI, ISDN, and DS1. Suitable for Power over Ethernet (PoE++ / 4PPoE) “Mode A” and “Mode B”. RJ45 attachment plug with separate grounding cable and ground connection snap-on foot for NS 35 DIN rails.	DT-LAN-CAT.6+	2881007	1
Patch cable, CAT5, assembled, 0.5 m	FL CAT5 PATCH 0,5	2832263	1
Patch cable, CAT5, assembled, 5 m	FL CAT5 PATCH 5,0	2832580	1
CAT5-SF/UTP cable (J-02YS(ST)C HP 2 x 2 x 24 AWG), heavy-duty installation cable, 2 x 2 x 0.22 mm^2, solid conductor, shielded, outer sheath: 7.8 mm diameter, inner sheath: 5.75 mm ± 0.15 mm diameter, preassembled on both sides with RJ45 plug, crossover or line	FL CAT5 HEAVY CONF/	2744827	1
Primary-switched power supply unit, QUINT POWER, Screw connection, DIN rail mounting, input: 1-phase, output: 24 V DC / 2.5 A	QUINT4-SYS-PS/1AC/24DC/ 2.5/SC	2904614	1
Program and configuration memory, plug-in, 512 Mbyte.	SD FLASH 512MB	2988146	1
Second generation: Unmanaged Ethernet extender for point-to-point connections, line and ring structures, data rates up to 30 Mbps, distances of up to 20 km on in-house copper cables, diagnostics via USB and LEDs, 2 SHDSL ports, 1 LAN port	TC EXTENDER 2001 ETH-2S	2702409	1
RJ45 connector, degree of protection: IP20, number of positions: 8, 1 Gbps, CAT5 (IEC 11801:2002), material: Plastic, connection method: IDC fast connection, connection cross section: AWG 26- 23, cable outlet: straight, color: traffic grey A RAL 7042, Ethernet	VS-08-RJ45-5-Q/IP20	1656725	1

4 Technical data

Supply	
Connection method	Push-in spring connection
Supply voltage range	10 V DC ... 60 V DC
Nominal supply voltage	24 V DC ±5 %
Typical current consumption	200 mA (24 V DC) 80 mA (60 V DC) 380 mA (10 V DC)
Electrical isolation	VCC // Ethernet // DSL (A/B) // FE
Test voltage	500 V AC (in accordance with EN/IEC 60079-7, observe the limitations in the specific conditions of use.) 1.5 kV AC (50 Hz, 1 min.)

External protection of the suppressor diodes recommended in the supply voltage input: <6 AT per supply line, maximum terminal current 12 A

Available, internal device protection: 5 AT

Protection against polarity reversal via series diode

Ethernet interface, 10/100Base-T(X) in accordance with IEEE 802.3	
Number of ports	1
Connection method	RJ45 jack, shielded 1 port 10/100Base-T(X), auto negotiation
Serial transmission speed	10/100 Mbps, auto negotiation
Transmission length	< 100 m (shielded twisted pair)
Protocols supported	IPv4, IPv6, TCP/IP, HTTP, HTTPS
Auxiliary protocols	ARP, DHCP (Client), PING, SNMP

SHDSL interface according to ITU-T G.991.2.bis	
Connection method	Push-in spring connection
Serial transmission speed	2-wire operation: 32 kbps ... 15.3 Mbps
Transmission length	< 20 km (Depending on data rate and cable cross section)

Surge protection of the SHDSL interface	
IEC test classification	B1 C1 C2 C3 D1
Nominal pulse current I_{an} (10/1000) µs, Core-core/core-ground	100 A / 100 A (B1)
Nominal discharge current I_n (8/20) µs, Core-core/core-ground	1 kA / 1 kA (C1, 300 pulses)
	5 kA / 5 kA (C2, 10 pulses)
	100 A / 100 A (C3, 300 pulses)
Total surge current (8/20) µs, Core-ground	9 kA (C2)
Pulse discharge current I_{imp} (10/350) µs, Core-ground	500 A (D1)
Overvoltage category	II
Degree of pollution	2

Digital output	
Connection method	Push-in spring connection
Number of outputs	1
Voltage output signal	10 V DC ... 60 V DC (24 V DC, depending on the operating voltage)
Current output signal	≤ 500 mA (Short-circuit-proof)

Provide the digital switching output with a load between 200 Ω and 100 kΩ.

Push-in spring connection	
Stripping length	10 mm
Conductor cross section, flexible	0.2 mm² ... 2.5 mm²
Conductor cross section, rigid	0.2 mm² ... 1.5 mm²
Conductor cross section, solid [AWG]	24 ... 16

Ethernet extenders in accordance with ITU-T G.991.2	
Management	Web-based management (Access to all managed and unmanaged Ethernet extenders of the segment unit, role-based user management) SNMPv2/v3
Diagnostic functions	Web-based access to all managed and unmanaged Ethernet extenders of the segment unit SNMP traps Port mirroring
Filter functions	Extended Multicast Filtering VLAN
Redundancy	RSTP Proprietary SHDSL redundancy protocol (Managed and unmanaged Ethernet extenders)
IP parameterization	Static IP address DHCP client BootP (Delivery state: alternately BootP / DHCP)
Additional functions	FDCML support (for communication with the FL Network Manager)
Max. number of VLANs	64
Number of supported devices	≤ 50 (per SHDSL segment unit)

General data	
Status and diagnostic indicators	LEDs for warning, status, and device information
Degree of protection	IP20
Assembly instructions	The product can be snapped onto all 35 mm DIN rails in accordance with EN 60715.
Dimensions (W/H/D)	60 mm x 130 mm x 160 mm
Material	Aluminum / steel sheet DC01 (Housing)
Vibration resistance in acc. with EN 60068-2-6/ IEC 60068-2-6	5g, 10...150 Hz, 2.5 h, in XYZ direction
Shock in acc. with EN 60068-2-27/IEC 60068-2-27	15g
Electromagnetic compatibility	Conformance with EMC Directive 2014/30/EU

MTTF (mean time to failure)	
SN 29500 standard, temperature 25°C, operating cycle 21%	577 Years
SN 29500 standard, temperature 40°C, operating cycle 34.25%	300 Years
SN 29500 standard, temperature 40°C, operating cycle 100%	128 Years

Ambient conditions	
Ambient temperature	
Operation	-25 °C ... 60 °C
Storage/transport	-40 °C ... 85 °C
Humidity	
Operation	10 % ... 95 % (non-condensing)
Storage/transport	10 % ... 95 % (non-condensing)
Altitude	≤ 2500 m (for restrictions, see the manufacturer's declaration for altitude operation)

Conformance/Approvals	
CE	CE-compliant
ATEX	Ⓔx II 3 G Ex ec IIC T4 Gc PxCIF16ATEX2702253X Please follow the special installation instructions in the documentation!
UKEX	Ⓔx II 3 G Ex ec IIC T4 Gc PxCIMA22UKEX2702253X
UL, USA / Canada	508 Listed
Corrosive gas test	ISA-S71.04-1985 G3 Harsh Group A
Standards/regulations	EN 50121-4

Conformance with EMC Directive 2014/30/EU		
Immunity in accordance with EN 61000-6-2		
Electrostatic discharge	EN 61000-4-2	
	Contact discharge	± 6 kV
	Discharge in air	± 8 kV
	Indirect discharge	± 6 kV
	Comments	Criterion B
Electromagnetic HF field	EN 61000-4-3	
	Frequency range	80 MHz ... 3 GHz
	Field intensity	10 V/m
	Comments	Criterion A
Fast transients (burst)	EN 61000-4-4	
	Input	± 2 kV
	Signal	± 2 kV
	Comments	Criterion B
Surge current loads (surge)	EN 61000-4-5	
	Input	± 0.5 kV (Symmetrical, unshielded supply line) ± 1 kV (Asymmetrical, unshielded supply line)
	Output	± 1 kV (asymmetrical, unshielded)
	Signal	± 1 kV (asymmetrical, shielded Ethernet cable) ± 4 kV (asymmetrical: line to ground, unshielded SHDSL cable) ± 2 kV (symmetrical: line to line, unshielded SHDSL cable)
	Comments	Criterion B
Conducted interference	EN 61000-4-6	
	Frequency range	0.15 MHz ... 80 MHz
	Voltage	10 V
	Comments	Criterion A

Criterion A	Normal operating behavior within the specified limits.
Criterion B	Temporary impairment to operational behavior that is corrected by the device itself.

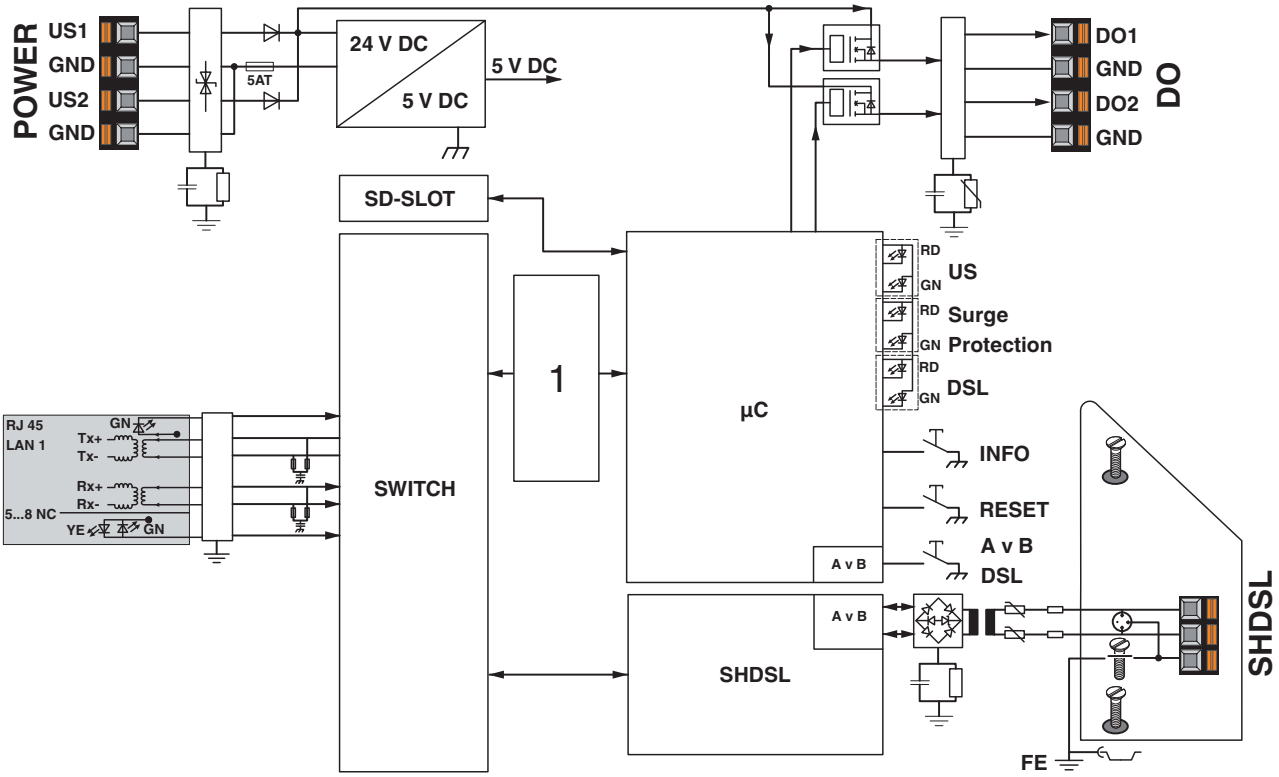
Emitted interference in acc. with EN 61000-6-4	
Interference emission	EN 55011 Class A, industrial applications

5 UL note

INDUSTRIAL CONTROL EQUIPMENT 11AE
Wire Range: 24-16 AWG
Cu Copper Wire, 60/75C
Terminal tightening torque value: 5-7 (Lbs-Ins)
Environmental designation: "Open Type Device"
"Pollution Degree 2 Installation Environment"

6 Basic circuit diagram

Figure 1 Basic circuit diagram



1 Transceiver

7 Range

7.1 DSL technology

In contrast to an analog permanent line modem, DSL (Digital Subscriber Line) uses a greater frequency range, which enables a data rate that is several times higher.

The modulation process is applied to different carrying frequencies for DSL. Modulation is therefore significantly less sensitive to external sources of electromagnetic interference.

SHDSL is a version of this DSL technology. In contrast to other DSL technologies, a greater range can be realized with SHDSL. In addition, the bandwidth for upstream and downstream is equally large (symmetrical data transmission). For this reason, SHDSL is well suited to industrial applications.

SHDSL is standardized in the ITU-T G-991-2. Further technical information can be found there.

Ethernet extenders with SHDSL technology are ideal for retrofitting a system, because the extenders can be used with the system's existing wiring.

7.2 Determining the data rate

A precise prediction of the maximum possible data rate is difficult in practice as many parameters play a role:

- Cable type (design, diameter, capacity, shielding)
- How it is laid (number of transitions, lines laid in parallel)
- EMC influences of neighboring devices on the communication line

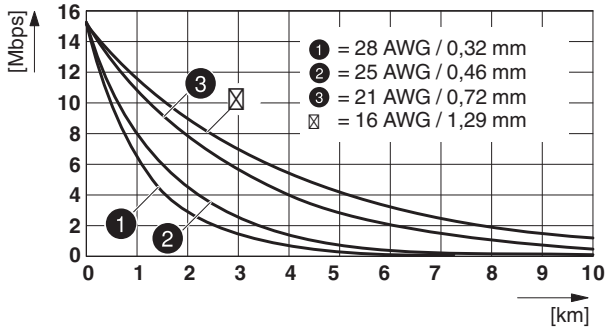
For a new installation, we recommend using shielded twisted pair cables.

To gain an initial estimation of the possible data rate, use the following diagram or the SHDSL calculator software. It can be downloaded free of charge at phoenixcontact.net/product/2702253.

The actual data rate can only be determined in a practical test. To this end, Phoenix Contact provides test kits with two Ethernet extenders. This enables you to test the paths under realistic conditions.

The maximum possible data rate is dependent on several parameters. Two important parameters are the cable length and cable cross section.

Figure 2 Data rate depending on the distance, 2-wire



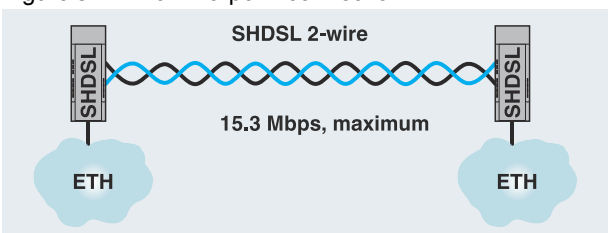
The diagram illustrates the dependency of the maximum data rate on the line length with 4 cable types. Longer distances can be achieved using high-quality cables with larger diameters.

The industrial Ethernet extenders support data rates of 32 kbps to 15.3 Mbps in 2-wire operation.

The Ethernet extenders are suitable for in-house cables, not for public telephone networks. Establishing the connection between the devices usually takes around one minute.

7.3 Application example

Figure 3 Point-to-point connection



There can be a maximum distance of 20 km between two devices.