TC EXTENDER 2001 ETH-2S

Ethernet extender



Data sheet
106914_en_07

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1 Description

The Ethernet extender makes broadband Ethernet applications on existing cables possible. The Ethernet extender can be used for in-house 2 and 4-wire cables but not in the public telephone network.

Point-to-point, line or ring structures can be established, with ranges of up to 20 km.

The Ethernet extender can be used in a network with old generation devices (PSI-MODEM-SHDSL/ETH from firmware version 4.xx, Item No. 2313643).

Furthermore, the Ethernet extender can be combined with the managed Ethernet extenders (e.g., TC EXTENDER 6004 ETH-2S, Item No. 2702255). This enables the central diagnostics of all users and lines via IP.

Functions in firmware version 5.xx or later

- Virtually separate critical IP networks with VLAN
- Greater transparency with SNMP diagnostic extension

Features

- Distances up to 20 km
- Easy startup, plug and play
- Robust modulation method (SHDSL)
- Automatic topology and data rate detection
- Two alarm and signal outputs
- Network transparent, no IP configuration required
- Future proof (IPv4 and IPv6-compatible)
- Protocol-transparent transmission of all standard Ethernet protocols, including EtherNet/IP™, Modbus/TCP, PROFINET, PROFIsafe, EtherCAT®, KNX, BACnet/IP
- Use in point-to-point, line, and ring topologies with managed and unmanaged Ethernet extenders

Observe these notes

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.com/product/2702409

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3 Ordering data

Description	Type	Item no.	Pcs./Pkt.
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

Accessories	Type	Item no.	Pcs./Pkt.
Primary-switched power supply, QUINT POWER, screw connection, DIN rail mounting, supply of devices possible via the TBUS DIN rail connector, protective coating, input: single-phase, output: 24 V DC/2.5 A	QUINT4-SYS-PS/1AC/24DC/2.5/SC	2904614	1
DIN rail bus connector, color: light gray, nominal current: 8 A (parallel contacts), rated voltage (III/2): 125 V, number of positions: 5, product range: TBUS5-17,5.., pitch: 3.81 mm, mounting: DIN rail mounting, locking: without, mounting method: without, type of packaging: packed in cardboard, Item with gold-plated contacts, bus connectors for connecting with electronics housings, 5 parallel contacts	ME 17,5 TBUS 1,5/ 5-ST-3,81 KMGY	2713645	50
Attachment plug with surge protection for two SHDSL telecommunications interfaces (ports). Connection: RJ45 (RJ12/RJ11) and plug-in screw terminal block (COMBICON). Alternatively, can be snapped onto a DIN rail.	DT-TELE-SHDSL	2801593	1
USB connecting cable: USB plug type A to USB plug type Mini-B; length: 3 m	CABLE-USB/MINI-USB-3,0M	2986135	1
Security element for FL patch cable	FL PATCH SAFE CLIP	2891246	20
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 mm², 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
Shield connection terminal block, number of positions: 1, connection method: Spring-cage connection, mounting type: NS 35/7,5, NS 35/15, color: black	SCC 10-NS35	1019440	20

Accessories	Type	Item no.	Pcs./Pkt.
Managed Ethernet extender, point-to-point, line and ring structures, data rates up to 30 Mbps, distances of up to 20 km on in-house copper cables, replaceable surge protection, 2 SHDSL ports, 4-port switch, diagnostics via display and Ethernet	TC EXTENDER 6004 ETH-2S	2702255	1
RJ45 connector, design: RJ45, degree of protection: IP20, number of positions: 8, 1 Gbps, CAT5, material: Plastic, connection method: Insulation displacement connection, connection cross section: AWG 26- 23, cable outlet: straight, color: traffic gray A RAL 7042, Ethernet	VS-08-RJ45-5-Q/IP20	1656725	1
The FL DIN RA is installed in a standard, 19-inch rack (EIA-310-D, IEC 60297-3-100) to allow DIN rail mounted equipment to be rack mounted.	FL DIN RA	2891053	1

4 Technical data

Supply	
Connection method	COMBICON plug-in screw terminal block
Supply voltage range	18 V DC ... 30 V DC
Nominal supply voltage	24 V DC ±5 % (as an alternative or redundant, via backplane bus contact and system current supply) 5 V DC (configuration only, via mini-USB type B)
Typical current consumption	< 180 mA (24 V DC)
Max. current consumption	≤ 2 A (for operation in a joining station, via the DIN rail connector)
Electrical isolation	VCC // Ethernet // DSL (A) // DSL (B) // FE
Test voltage	500 V AC (In accordance with EN/IEC 60079-7) 1.5 kV AC (50 Hz, 1 min.)

Internal device protection: varistor (voltage limiting), series diode (protection against polarity reversal)

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	Protocol-transparent for TCP/IP, IPv4, and IPv6

SHDSL interface according to ITU-T G.991.2.bis	
Connection method	2 x 2-pos. COMBICON plug-in screw terminal blocks
Serial transmission speed	4-wire operation: 64 kbps ... 30 Mbps 2-wire operation: 32 kbps ... 15.3 Mbps
Transmission length	< 20 km (depending on data rate and cable cross section)

USB 2.0	
Connection method	Mini-USB type B, 5-pos.
Transmission length	< 100 m (shielded twisted pair)

Digital output	
Connection method	2 x 2-pos. COMBICON plug-in screw terminal blocks
Number of outputs	2
Voltage output signal	18 V DC ... 30 V DC (depending on the operating voltage)
Current output signal	≤ 150 mA (short-circuit-proof)
Behavior of outputs	Deactivated for device supply via DIN rail connector

NOTE: Malfunction

The digital switching outputs must be connected to a load between 220 Ω and 100 kΩ.

In the event of supply by means of DIN rail connectors, the digital switching outputs cannot be used. The function is selected by means of the configuration software.

2 x 2-pos. COMBICON plug-in screw terminal blocks	
Stripping length	7 mm
Tightening torque	0.56 Nm ... 0.79 Nm
Conductor cross-section, flexible	0.2 mm² ... 2.5 mm²
Conductor cross-section, flexible [AWG]	24 ... 14
Conductor cross-section, rigid	0.2 mm² ... 2.5 mm²
Conductor cross-section, rigid [AWG]	24 ... 14

Ethernet extenders in accordance with ITU-T G.991.2	
Management	Plug and Play, diagnostics via PSI-CONF software or web-based management (only with managed Ethernet extenders)
Diagnostic functions	Topological overview, event and path diagnostics Logbook
Filter functions	VLAN
Redundancy	Proprietary SHDSL redundancy protocol (Managed and unmanaged Ethernet extenders)
Max. number of VLANs	64
Number of supported devices	≤ 50 (Per SHDSL segment unit)

General data	
Status and diagnostic indicators	LEDs: US (supply voltage), ACT/LINK (Ethernet data traffic), ERR (errors) 2x LINK / 2x STAT (DSL data traffic port A and port B), DIAG (diagnostic messages)
Degree of protection	IP20
Mounting type	DIN rail mounting
Assembly note	The product can be snapped onto all 35 mm DIN rails in accordance with EN 60715.
Dimensions (W/H/D)	35 mm x 99 mm x 114.5 mm
Material	
Housing	PA 6.6-FR
Color	
Housing	gray (7042)
Vibration resistance in accordance with EN 60068-2-6/ IEC 60068-2-6	5g, 10...150 Hz, 2.5 h, in XYZ direction
Shock in accordance 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%	711 Years
SN 29500 standard, temperature 40°C, operating cycle 34.25%	308 Years
SN 29500 standard, temperature 40°C, operating cycle 100%	125 Years

Ambient conditions	
Ambient temperature	
Operation	-20 °C ... 60 °C (Freestanding, 40 mm spacing to the right and left, no supply of other modules via the device)
	-20 °C ... 55 °C (Mounted in rows with zero spacing and low power dissipation of aligned modules)
	-20 °C ... 50 °C (Mounted in rows with zero spacing)
	-20 °C ... 45 °C (aligned without spacing and supply of other modules via the device, 1.5 A)
Storage/transport	-40 °C ... 85 °C
Humidity	
Operation	10 % ... 95 % (non-condensing)
Storage/transport	10 % ... 95 % (non-condensing)
Altitude	≤ 5000 m (For restrictions, see the manufacturer's declaration for altitude operation)

Conformance/Approvals	
CE	CE-compliant
ATEX	II 3 G Ex ec IIC T4 Gc PxCIF11ATEX2313643X Please follow the special installation instructions in the documentation!
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 (sym./asym.)
	Output	± 1 kV (asymmetrical, unshielded)
	Signal	± 1 kV (asymmetrical, shielded Ethernet cable) ± 1 kV (asymmetrical: line to ground, unshielded SHDSL cable)
	Comments	Criterion A
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.

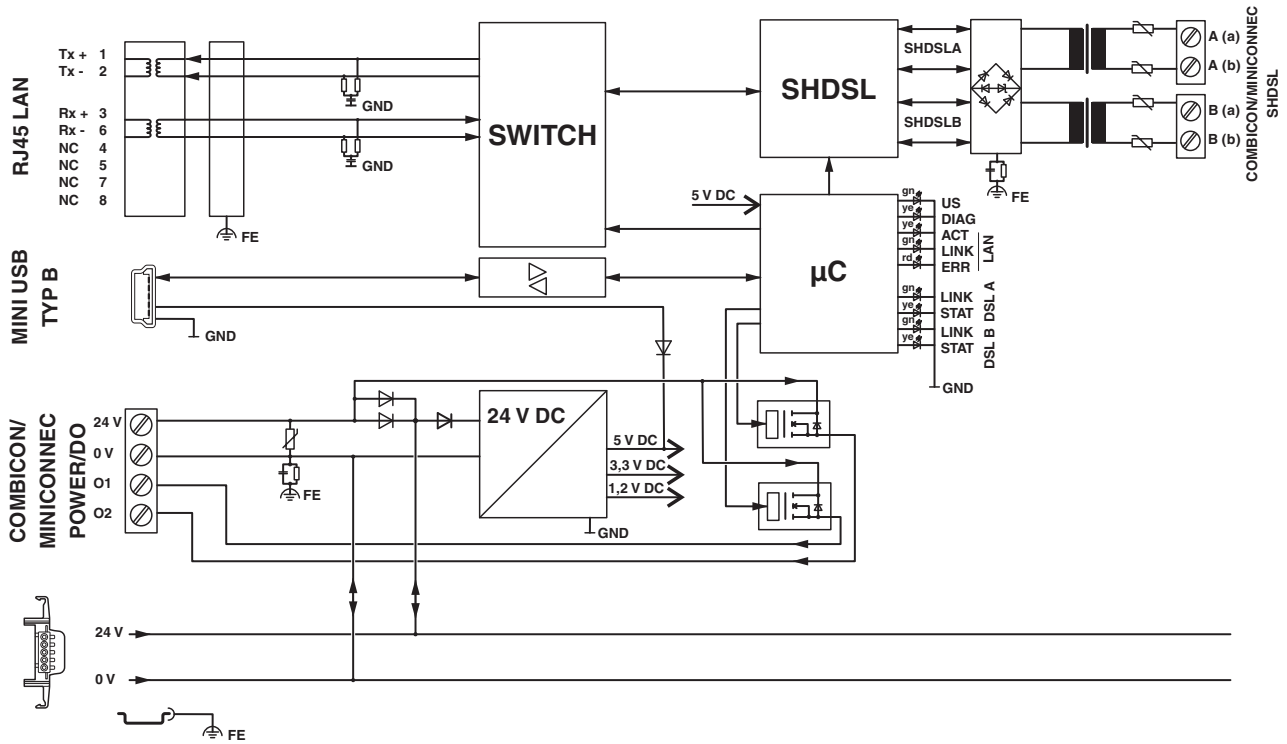
Emitted interference in acc. with EN 61000-6-4	
Interference emission	EN 55011 Class A, industrial applications

5 UL note

INDUSTRIAL CONTROL EQUIPMENT 11AE
Wire Range: 24-14 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



7 Application examples

7.1 Point-to-point connection

Figure 2 Point-to-point connection (2-wire)

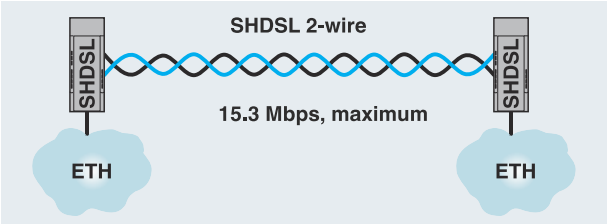
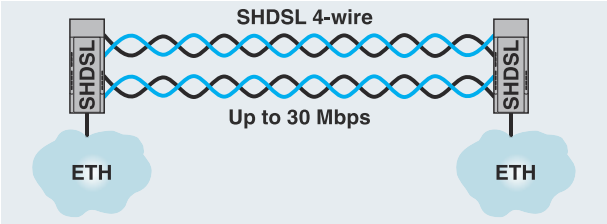


Figure 3 Point-to-point connection (4-wire)



There can be a maximum distance of 20 km between two devices. The Ethernet extender automatically recognizes if the path is constructed on a 2-wire or 4-wire path.

If the devices have detected a 4-wire line, the transmission rate is automatically increased depending on the line quality. It is usually doubled. If one of the connections fails, the data is transmitted via the remaining conductors at single transmission speed. In this way, a reliable redundancy operation is supported.

7.2 Line structure

Figure 4 Linear structure (2-wire)

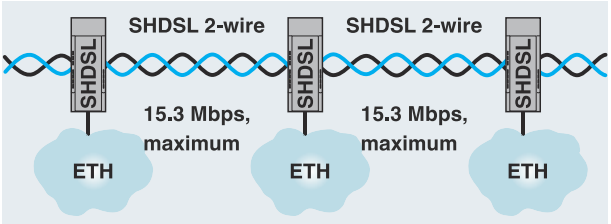
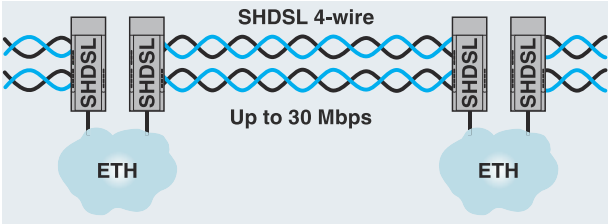


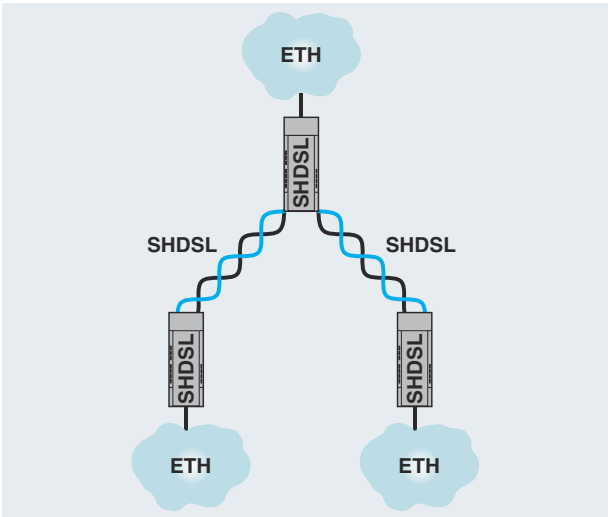
Figure 5 Linear structure (4-wire)



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

7.3 Star structure

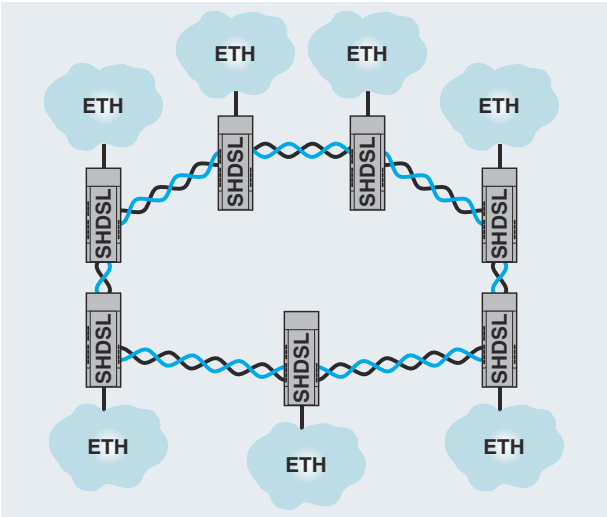
Figure 6 Star structure



Since each device features two SHDSL ports, you need only three devices.

7.4 Ring structure

Figure 7 Redundant ring structure



The overall availability of the system is significantly increased by a redundant ring.

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

If there is a ring interruption, Ethernet communication is possible again after the following response time:
$t_{Recovery}$ = 1500 ms + number of devices x 100 ms

The paths of the SHDSL ring should show a very high connection quality during normal operation. If that is not the case, the reaction time can deviate from the value calculated above.

8 Revision history

Document revision	Hardware revision	Firmware revision	Date	Description
00	10	400	2016-05-23	First publication
01	10	410	2016-07-29	“You can switch up to 255 devices in series.” removed
02	10	410	2017-03-28	ATEX and UL approval, section “Safety regulations and installation notes” revised, “Behavior of the outputs” added, table “Conformance with EMC Directive” revised, block diagram added, section “Configuration” revised
03	10	410	2020-06-29	Accessories updated, recommended switches updated, corrosive gas test added
04	10	410	2020-09-11	Note added: “The use in potentially explosive areas is not permitted in China.”
05	10	510	2021-06-28	New functions from firmware version 5.xx, accessories updated, new table “Ethernet extenders in accordance with ITU-T G.991.2”, note “SELV/PELV” updated
06	10	510	2022-12-15	Data sheet greatly shortened, reference to packing slip and user manual, accessories updated, UKEX added, ATEX re-evaluation, test voltage in accordance with EN/IEC 60079-7 added, stripping length and tightening torque added, nominal supply voltage updated
07	10	512	2026-02-20	UKEX removed, revision history added