PSI-MOS-RS485W2/FO 1300 E

FO converters for RS-485 2-wire bus systems

Data sheet
103303_en_02

1 Description

The **PSI-MOS-RS485W2/FO 1300 E** device can be used to convert RS-485 2-wire bus systems to fiber optics.

All bus systems with 10/11-bit UART data format and NRZ data coding are supported:

- Modbus/ASCII, Modbus/RTU
- SUCONET K
- S-BUS
- DH-485
- Other company-specific bus systems

A transparent protocol is used to convert all common transmission speeds up to a maximum of 500 kbps. The integrated optical diagnostics enable fiber optic paths to be monitored continuously during installation and even during operation. The floating switch contact is activated when the signal output on the fiber optic paths drops to a critical level. This early alarm generation enables critical system states to be diagnosed before they result in failure.

The PSI-MOS-RS485W2/FO 1300 E termination device converts an RS-485 interface to a fiber optic cable. It is ideal for point-to-point connections.

You can create virtually any cascadable star and tree structures using integrated bit retiming. Devices are simply snapped onto DIN rail connectors. The DIN rail connectors route the supply voltage and the data signals.

Devices with different transmission technologies (polymer, HCS, and fiberglass) can be freely combined within a star coupler.

Possible distances:

- Up to 25 km with multimode fiberglass cable
- Up to 45 km with single mode fiberglass cable

WARNING: Explosion hazard when used in potentially explosive areas

The device is a category 3 item of electrical equipment. Follow the instructions provided here during installation and observe the safety notes.

Make sure you always use the latest documentation.
It can be downloaded at phoenixcontact.net/products.

This data sheet is valid for all products listed on the following page:

2 Table of contents

3 Ordering data

FO converter

Description	Type	Order No.	Pcs./Pkt.
Fiber optic converter with integrated optical diagnostics, alarm contact, for RS-485 2-wire bus systems (SUCONET K, Modbus, etc.) up to 500 kbps, NRZ coding, termination device with one fiber optic interface (SC duplex), 1300 nm, for fiberglass cable	PSI-MOS-RS485W2/ FO 1300 E	2708562	1

Accessories

Description	Type	Order No.	Pcs./Pkt.
System power supply unit for supplying a modular star coupler topology	MINI-SYS-PS 100-240AC/ 24DC/1.5	2866983	1
System power supply unit for supplying a modular star coupler topology, for potentially explosive areas	MINI-PS-100-240AC/24DC/ 1.5/EX	2866653	1
End clamp	CLIPFIX 35	3022218	50
DIN rail connector, power supply and data (2 per device)	ME 17.5 TBUS1.5/5-ST-3.81GN	2709561	10
DIN rail connector, power supply only (2 per device)	ME 17.5 TBUS1.5/PP000-3.81BK	2890014	10
Fiber optic fiberglass cable for indoor installation	PSM-LWL-GDM-RUGGED-50/125	2799322	1
Fiber optic fiberglass cable for outdoor installation	PSM-LWL-GDO-50/125	2799432	1

Other fiber optic converters in the PSI-MOS system

PSI-MOS-RS485W2/FO660... devices are networked using polymer fiber cable for distances up to 100 m and HCS fiber cable for up to 800 m. They are connected via FSMA quick mounting connectors, which can be assembled locally within a few minutes.

PSI-MOS-RS485W2/FO 850 ... devices are available for longer distances. They allow for distances up to 2800 m with HCS fiber cable and B-FOC(ST®) fast connection technology and up to 4200 m with multimode fiberglass cable.

Other FO converters

Description	Type	Order No.	Pcs./Pkt.
Termination device with one fiber optic interface			
FO converter with integrated optical diagnostics, alarm contact, for RS-485 2-wire bus systems (SUCONET K, Modbus, etc.) up to 500 kbps, NRZ coding			
660 nm, for polymer/HCS fiber cable, FSMA	PSI-MOS-RS485W2/ FO 660 E	2708313	1
850 nm, for HCS/fiberglass cable, B-FOC (ST®)	PSI-MOS-RS485W2/ FO 850 E	2708339	1
T-coupler with two fiber optic interfaces			
FO converter with integrated optical diagnostics, alarm contact, for RS-485 2-wire bus systems (SUCONET K, Modbus, etc.) up to 500 kbps, NRZ coding			
660 nm, for polymer/HCS fiber cable, FSMA	PSI-MOS-RS485W2/ FO 660 T	2708300	1
850 nm, for HCS/fiberglass cable, B-FOC (ST®)	PSI-MOS-RS485W2/ FO 850 T	2708326	1

4 Technical data

Interfaces	
Supply voltage range	18 V DC ... 32 V DC
Supply voltage, nominal	24 V DC (UL approved)
Nominal current consumption	55 mA (24 V DC)
	170 mA (UL Listed, 24 V DC)
	110 mA (UL Recognized, 24 V DC)
Standby indicator	LED VCC (green)
Maximum star coupler expansion	10
Serial RS-485 interface	RS-485, 2-wire, automatic
Operation mode	Half duplex
Bus termination resistors	220 Ω (can be connected to 390 Ω pull-up/pull-down)
Data format/coding	UART (10/11-bit switchable, NRZ)
Data direction changeover	Automatic
Transmission speed (set via DIP switches)	4.8/9.6/19.2/38.4/57.6/75/93.75/115.2/136/187.5/375/500 kbps
Transmission length	≤1200 m, maximum depending on the transmission speed, with shielded, twisted pair data cable
Connection	COMBICON plug-in screw terminal block
Optical interface	
Transmission protocol	Transparent protocol to RS-485 interface
Connection technology	SC duplex
Wavelength	1300 nm
Minimum transmission power (fiber type)	-3.4 dBm (50/125 µm), multi-mode fiberglass -4.7 dBm (62.5/125 µm), multi-mode fiberglass -5.5 dBm (9/125 µm), single mode fiberglass

Interfaces	
Minimum receiver responsiveness	-25.5 dBm (50/125 µm) -25.5 dBm (62.5/125 µm) -26.5 dBm (9/125 µm)
Overrange receiver	>0 dBm (9/125 µm)
Minimum transmission length including 3 dB system reserve	25 km with F-G 50/125; 0.7 dB/km 22 km with F-G 62.5/125; 0.8 dB/km 45 km with F-E 9/125; 0.4 dB/km
General data	
Bit distortion, input	±35%, maximum
Bit distortion, output	< 6.25 %
Bit delay	< 1 bits
Electrical isolation	VCC // RS-485
Test voltage	1.5 kV_{rms}, 50 Hz, 1 min.
Signaling output	Max. 60 V DC / 42 V AC, 1 A
Status and diagnostics indicators	Power supply (VCC), transmit/receive data RS-485, fiber optic bar graph (FO SIGNAL), fiber optic error (FO ERR)
Enclosure material	PA 6.6 FR, green
Ambient temperature	
Operation	-20°C ... +60°C
Storage/transport	-40°C ... +85°C
Humidity	30% ... 95%, non-condensing
Dimensions (W x H x D)	35 mm x 99 mm x 105 mm
Degree of protection	IP20
Weight	190 g, approximately
MTBF according to Telcordia standard	
Ambient temperature 25 °C	484 years
Ambient temperature 40 °C	102 years
Chloroform test	Free from substances that would hinder coating with paint or varnish (according to central standard P-VW 3.10.7 57 65 0 of VW, Audi, and Seat)
Vibration resistance	5g according to IEC 60068-2-6, 2.5 h each in XYZ direction, criterion A
Shock resistance	15g according to IEC 60068-2-27 with 11 ms pulse length, criterion C
Free fall	1 m without packaging according to IEC60950
Air clearances and creepage distances	DIN EN 60664-1/VDE 0110-1, DIN EN 50178, DIN EN 60950
Tests/approvals	
Conformity	CE-compliant, EAC
UL, USA/Canada	508 Listed, 508 Recognized
ATEX	Ⓔx II 3 G Ex nA nC IIC T4 Gc X

Conformity with EMC Directive 2014/30/EU			
Immunity test according to EN 61000-6-2[1]			
Electrostatic discharge (ESD)	EN 61000-4-2	Criterion B[2]	
Air discharge			8 kV
Contact discharge			6 kV
Electromagnetic HF field	EN 61000-4-3	Criterion A[3]	
Amplitude modulation			10 V/m
Fast transients (burst)	EN 61000-4-4	Criterion B[2]	
Signal			2 kV/5 kHz
Power supply			2 kV/5 kHz
Surge current loads (surge)	EN 61000-4-5	Criterion B[2]	
Signal			1 kV/42 Ω
Power supply			0.5 kV/2 Ω
Conducted disturbance variables	EN 61000-4-6	Criterion A[3]	10 V
Noise emission test according to EN 61000-6-4			
Noise emission of housing	EN 55011[4]	Class A[5]	

[1] EN 61000 corresponds to IEC 61000

[2] Criterion B: Temporary adverse effects on the operating behavior, which the device corrects automatically.

[3] Criterion A: Normal operating behavior within the specified limits.

[4] EN 55011 corresponds to CISPR11

[5] Class A: Industrial application, without special installation measures

Block diagram

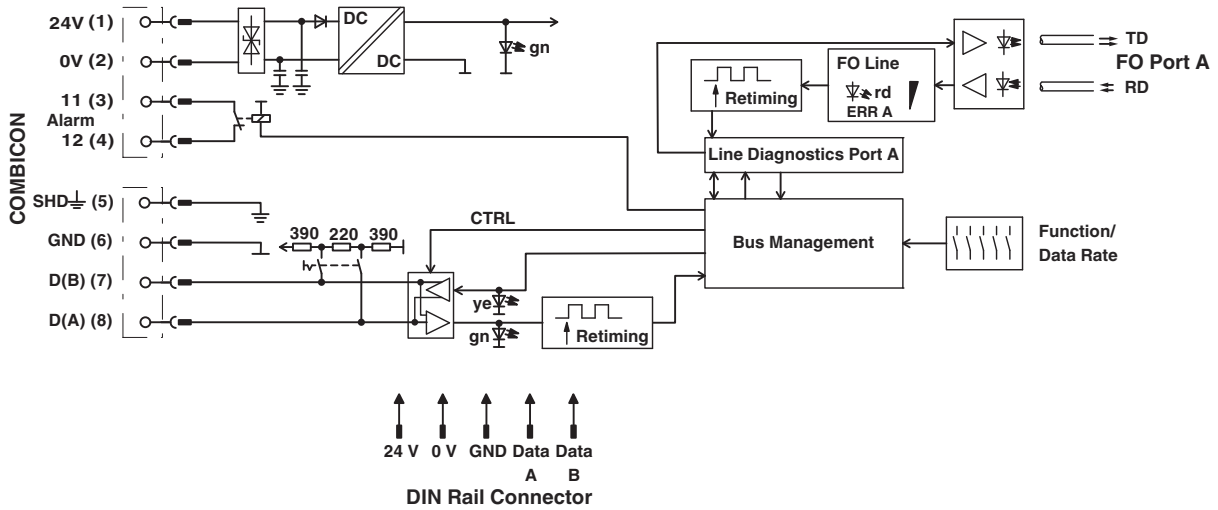

Figure 1 Block diagram

Housing dimensions

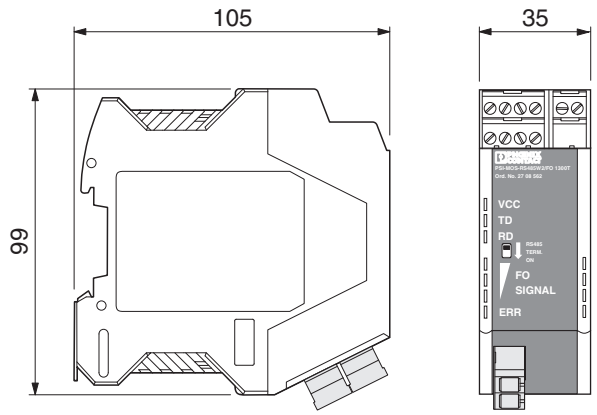

Figure 2 Housing dimensions (in mm)

5 Safety regulations and installation notes

5.1 Installation notes

WARNING:

Observe the following safety notes when using the FO converter.

- The category 3 device is designed for installation in Zone 2 potentially explosive areas. It meets the requirements of EN 60079-0:2012+A11:2013 and EN 60079-15:2010.
- Installation, operation, and maintenance may only be carried out by qualified electricians. Follow the installation instructions as described. When installing and operating the device, the applicable regulations and safety directives (including national safety directives), as well as the general codes of practice, must be observed. The safety data is provided in the packing slip and on the certificates (conformity assessment, additional approvals where applicable).
- The device must not be opened or modified apart from the configuration of the DIP switches.
- Do not repair the device yourself; replace it with an equivalent device instead. Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from noncompliance.
- The IP20 degree of protection (IEC 60529/EN 60529) of the device is intended for use in a clean and dry environment. Do not subject the device to mechanical and/or thermal loads that exceed the specified limits.
- This device is not designed for use in atmospheres with a risk of dust explosions.
- The switches of the device that can be accessed may only be actuated when power to the device is disconnected.
- The device is designed exclusively for operation with safety extra-low voltage (SELV) according to IEC 60950/EN 60950/VDE 0805. The device may only be connected to devices that meet the requirements of EN 60950.

5.2 Installation in zone 2

WARNING: Explosion hazard when used in potentially explosive areas

Make sure that the following notes and instructions are observed.

- Observe the specified conditions for use in potentially explosive areas!
- Install the device in a suitable, approved housing (with at least IP54 protection) that meets the requirements of EN 60079-15. For this purpose, observe the requirements of IEC 60079-14 / EN 60079-14.
- Only connect devices to the supply and signal circuits in zone 2 that are suitable for operation in Ex zone 2 and for the conditions at the installation location.
- In potentially explosive areas, only snap the device onto or off the DIN rail connector and connect/disconnect cables when the power is disconnected.
- The device must be stopped and immediately removed from the Ex area if it is damaged, was subjected to an impermissible load, stored incorrectly or if it malfunctions.

5.3 UL notes

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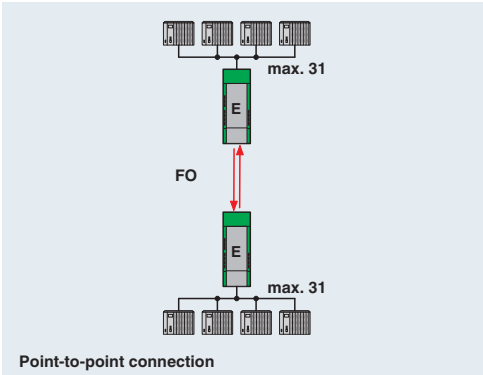
INDUSTRIAL CONTROL EQUIPMENT 11AE
Wire Range: 24-14 AWG
Cu Copper Wire, 60/75C
Terminal tightening torque value: 5-7 (Lbs-Ins)
Environmental designation: "Open Type Device"
"Pollution Degree 2 Installation Environment"

6 Supported network structures

The PSI-MOS-RS485W2/FO 1300 E can be used to create network topologies that are ideally adapted to the relevant application. The structures are described briefly below.

6.1 Point-to-point connections

You can use two PSI-MOS-RS485W2/FO 1300 E FO terminal devices to easily convert a data link from copper cable to fiber optics.

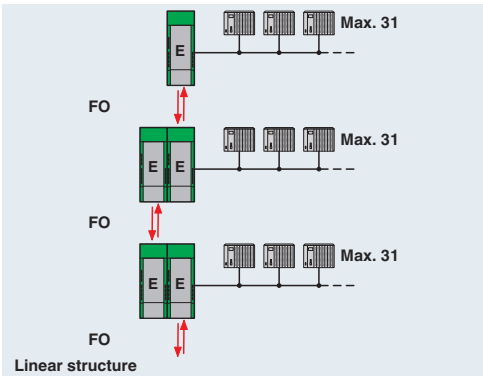


Point-to-point connection

6.2 Linear structures

The PSI-MOS-RS485W2/FO 1300 E device can be used to network several RS-485 devices to form a linear structure.

Devices are used in conjunction with DIN rail connectors along the line.



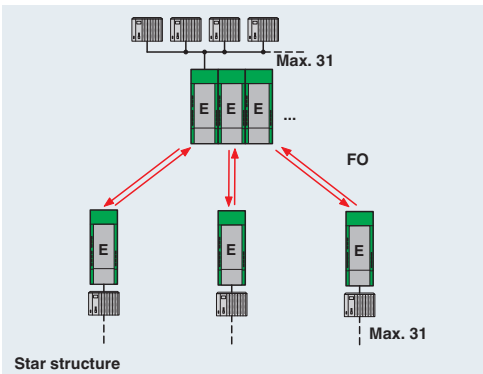
Linear structure

6.3 Star structures

You can also network RS-485 devices in a star structure. Depending on the number of star lines required, several termination devices are connected to an active star coupler.

You can connect up to ten PSI-MOS-RS485W2/FO 1300 E devices per star coupler. Cross-wiring for RS-485 data and for the supply voltage is provided automatically by the DIN rail connector (installation accessory, see Page 3).

If increased availability is required, redundant star distributors can be created on request.

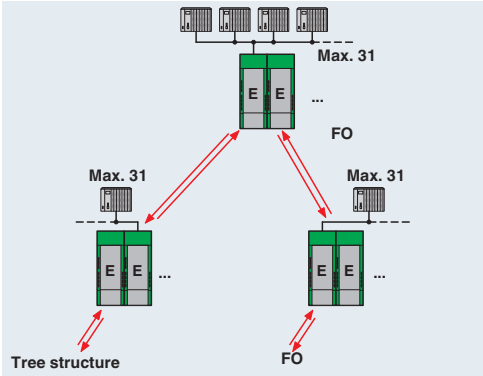


Star structure

6.4 Tree structures

Linear and star structures can be cascaded to create complex tree structures.

The number of devices that can be cascaded is only limited by the timing response (timeout) of the bus system used due to the bit retiming of the PSI-MOS-RS485W2/ FO 1300 E fiber optic converter.



7 Function elements

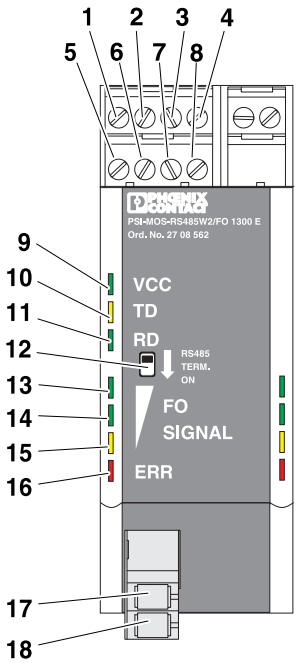


Figure 3 Function elements

1 24 V DC supply voltage connection
2 0 V DC supply voltage connection
3 Switch contact, connection 11
4 Switch contact, connection 12
5 SHD, shield
6 GND
7 D (B), transmit or receive positive
8 D (A), transmit or receive negative
9 "VCC" LED
10 TD "LED"
11 "RD" LED
12 Bus termination ON/OFF
13 "FO SIGNAL" LED
14 "FO SIGNAL" LED
15 "FO SIGNAL" LED
16 "ERR" LED
17 Fiber optic transmitter
18 Fiber optic receiver

Diagnostic and status indicators

Des.	Color	Meaning	
VCC	Green	Ready to operate	
TD	Yellow	Data is sent at the RS-485 copper interface	
RD	Green	Data is received at the RS-485 copper interface	
FO SIGNAL	Green	Power received at fiber optic port (see Page 11)	Very good
	Green		Good
	Yellow		Critical
ERR	Red		Insufficient, broken fiber

8 Definition of fiber optic diagnostics

The quality of the path is determined using the incoming optical power P_{opt} and displayed using the LED bar graph.

You use DIP 7 to switch idle senders (reset period between sending data) to continuous illumination (INVERS). This allows for continuous fiber optic diagnostics.

If you switch DIP 7 to "ON" (NORM), no fiber optic diagnostics are available.

LED bar graph	Receive status	Optical power P_{opt}
Green Green Yellow	Very good	P_{opt} is significantly greater than the system reserve
Green Yellow	Good	P_{opt} is still greater than the system reserve
Yellow	Critical	P_{opt} has reached the system reserve
Red	Error	P_{opt} has sapped the system reserve/broken fiber

As soon as the system reserve is reached, only the yellow LED remains lit. At the same time, the signaling relay drops and the switch contact opens. Data communication is still possible.

As soon as operation of the path is no longer possible (e.g., due to a broken fiber), the red "ERR" LED lights up.

If DIP 7 is set to "ON", fiber optic diagnostics are not available via the LED bar graph.

The LED bar graph can light up at high transmission speeds or flash at low transmission speeds. This display does **not** correspond to continuous evaluation of the optical power.

Basic method of operation

The device has three interfaces for the RS-485 signal:

– Electrical interface (COMBICON)
– Fiber optic port
– DIN rail connector

All interfaces communicate with one another with the same rights. A signal available at one of the interfaces is also available at all other interfaces.

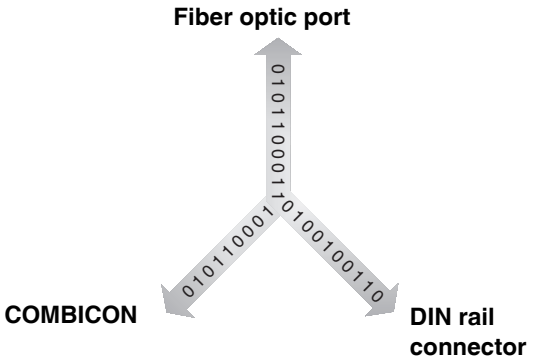


Figure 4 Communication between the interfaces

9 Configuration

NOTE: Electrostatic discharge

The device contains components that can be damaged or destroyed by electrostatic discharge. When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) according to EN 61340-5-1 and EN 61340-5-2.

- For configuration, release the housing cover using a screwdriver (A in Figure 5).
- Then carefully pull the PCB out of the housing as far as possible (B).

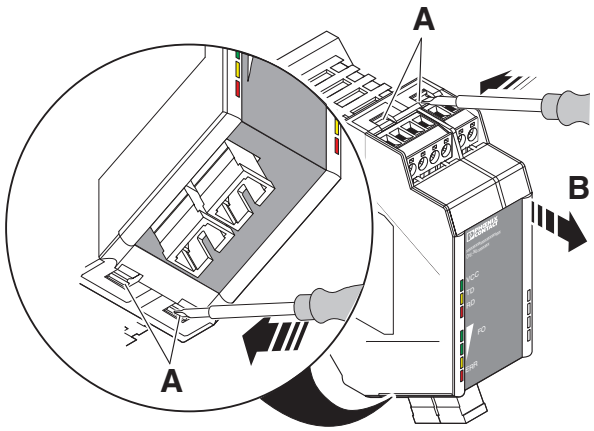


Figure 5 Opening the housing

DIP switches 1 to 10 are then freely accessible.

- Configure the DIP switches according to the planned application.

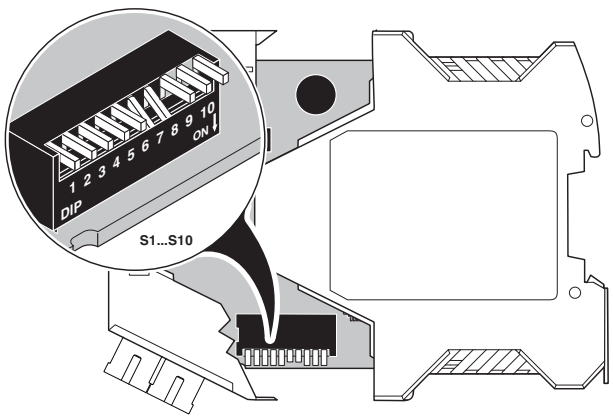


Figure 6 Setting the DIP switches

The following tables provide an overview of the DIP switch functions. By default upon delivery, all DIP switches are in the "OFF" position.

After changing the device settings, disconnect the power to the device so that the settings can be applied.

9.1 Setting the transmission speed

Set the transmission speed using DIP switches 1 ... 4.

NOTE: Malfunction

Set all fiber optic converters and all connected RS-485 devices to the same transmission speed.

Transmission speed (kbps) • = ON	DIP switch 1	2	3	4
500				
375				•
187.5			•	
136			•	•
115.2		•		
93.75		•		•
75		•	•	
57.6		•	•	•
38.4	•			
19.2	•			•
9.6	•		•	
4.8	•		•	•

DIP switch	ON	OFF
5	10 BIT	11 BIT
6	N.C.	
7	NORM	INVERSE
8	N.C.	
9	N.C.	
10	Multi mode	Single mode

9.2 10/11-bit selection (DIP 5)

Take the word length of a UART character into account. This is provided by the controller manufacturer.

The standard word length of a UART character is 11 bits. However, some bus systems, such as Modbus in ASCII mode transmit 10-bit word lengths.

- Set DIP switch 5 to "ON" ("10 BIT") (default setting: "OFF").

If operating Modbus in RTU mode, leave DIP switch 5 set to "OFF" ("11 bits").

If you are using the Inline multiplexer system, select a word length of 11 bits and 75 kbps.

9.3 Connection to fiber optic interfaces from third-party suppliers (DIP 7)

- Deactivate echo evaluation on the third-party device.
- Check the idle setting for the third-party interface:
  - Logic 1 = Light off or
  - Logic 1 = Light on
- If necessary, adjust the idle setting of the PSI-MOS device using DIP 7.

DIP 7	Idle setting	Meaning
OFF = INVERS	Light on[1]	Logic 1
ON = NORM	Light off	Logic 1

[1] Default setting

In the "NORM" operating state (= idle setting, "light off," DIP 7 set to "ON"), no fiber optic diagnostics are available. The bar graph is switched off.

The LED bar graph can light up at high transmission speeds or flash at low transmission speeds. This display does **not** correspond to continuous evaluation of the optical power.

When connecting third-party devices, observe the receiver sensitivity and overrange limits of the fiber optic interfaces.

9.4 Switches with no function (DIP 6, 8, and 9)

These switches are currently without function. They are reserved for later additional functions.

9.5 Adjusting the transmission power (DIP 10)

You can adjust the transmission power of the PSI-MOS-RS485W2/FO 1300 E via DIP switches for operation on multi-mode fiberglass cables.

- Set DIP 10 to "ON" (multi-mode) for operation on a multi-mode fiberglass (50/125 µm or 62.5/125 µm).
- Leave DIP 10 set to "OFF" (single mode) for operation on a single mode fiberglass (9/125 µm) (factory setting).

If you are not sure which type of fiberglass is used in your projects, contact your cable supplier.

10 Connection notes

CAUTION: Electrical voltage

The device is only intended for operation with SELV according to IEC 60950/EN 60950/ VDE 0805.

NOTE: Device damage

Only mount and remove devices when the power supply is disconnected.

NOTE: Malfunction

Use a grounding terminal block to connect the DIN rail to protective earth ground. The devices are grounded when they are snapped onto the DIN rail (installation according to PELV).
This ensures that the shielding is effective. Connect protective earth ground with low impedance.

- Install the device on a 35 mm DIN rail according to DIN EN 60715.

  To avoid contact resistance, only use clean, corrosion-free DIN rails.
- End brackets can be mounted on both sides of the device to stop the devices from slipping on the DIN rail (see Page 3 for ordering details).

10.1 Combined assembly with a system power supply unit (modular star coupler)

NOTE: Device damage

– The maximum current load in a connection station must not exceed 2 A.
– A connection station must not consist of more than ten devices.

- Connect together the required number of DIN rail connectors for the connection station. Two DIN rail connectors are required for each device (see A in Figure 7).
- Push the connected DIN rail connectors onto the DIN rail (B and C).
- Place the device onto the DIN rail from above. The upper holding keyway of the device must be hooked onto the top edge of the DIN rail. Make sure that it is aligned correctly with the DIN rail connectors.
- Once the device has been snapped on properly, check that it is fixed securely on the DIN rail.

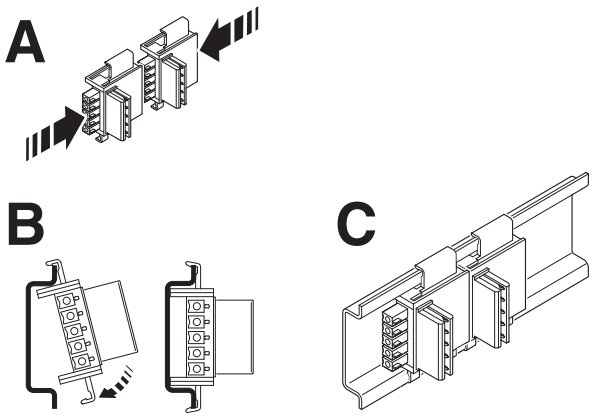


Figure 7 Combined assembly

10.2 Assembly as an individual device in the control cabinet (stand-alone)

- Place the device onto the DIN rail from above. The upper holding keyway of the device must be hooked onto the top edge of the DIN rail (see Figure 8).
- Push the device from the front towards the mounting surface.
- Once the device has been snapped on properly, check that it is fixed securely on the DIN rail.

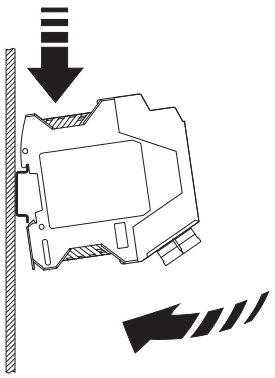


Figure 8 Assembly in the control cabinet

10.3 Assembly in potentially explosive areas

WARNING: Explosion hazard when used in potentially explosive areas

Observe the safety notes on Page 8.

– **Areas with a danger of gas explosions**

The devices are suitable for use in zone 2. Devices that are installed in zone 1 must **not** be connected to the fiber optic interface.

– **Area with a danger of dust explosions**

The device is **not** designed for installation in areas with a danger of dust explosions.

If dust is present, install the device in suitable, approved housing.

10.4 Dismantling

- Pull down the locking latch using a screwdriver, needle-nose pliers or similar.
- Pull the bottom edge of the module away from the mounting surface.
- Pull the module diagonally upwards away from the DIN rail.
- When you dismantle a star coupler, also remove the DIN rail connectors.

11 Cabling notes

11.1 Connecting the supply voltage

CAUTION: Electrical voltage

The device is only intended for operation with SELV according to IEC 60950/EN 60950/ VDE 0805.

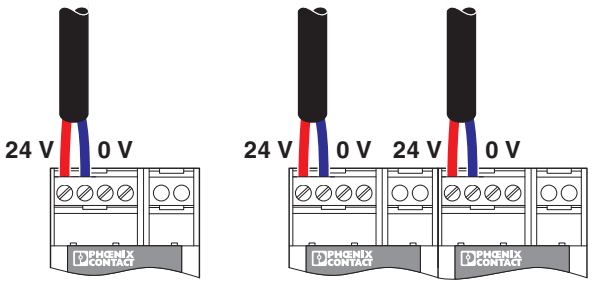


Figure 9 Individual or redundant supply

Operation as a single device

Supply the supply voltage to the module via terminal blocks 1 (24 V) and 2 (0 V).

Operation in a star coupler topology

When the devices are operated in a star coupler topology, the supply voltage must only be supplied to the first device in the station. The remaining devices are supplied via the DIN rail connector. You can create a redundant supply concept by connecting a second power supply unit to another device in the topology.

Supply via system power supply

Alternatively, you can supply the star coupler topology using the MINI-SYS-PS 100-240AC/24DC/1.5 (order no. 2866983) or MINI-PS-100-240AC/24DC/1.5/EX (Art.-Nr. 2866653) system power supply. It is connected via two DIN rail connectors.

Usually the system power supply is mounted as the first device in a topology. A second power supply unit can be used to create a redundant supply concept.

11.2 Connecting the data cables and bus termination

NOTE: Device damage

– Use shielded twisted pair data cables.
– Connect the cable shielding at both ends of the transmission path.

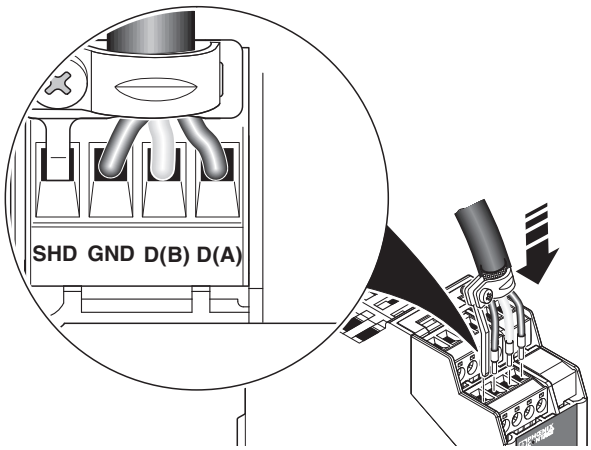


Figure 10 Connecting the data cables

- Connect the data cables as well as the shield of the data cable to the corresponding contacts on the COMBICON connector. For optimum shield connection, use the supplied terminal clamp.
- If the the FO converter is used at the start or end of an electrical RS-485 segment, activate the termination on the top of the device (12 in Figure 3 on page 10).

The maximum length of the RS-485 cables depends on the transmission speed. Do not exceed the following maximum values.

Transmission speed [kbps]	Maximum range [m]
≤ 93.75	1200
≤ 500	400

11.3 Wiring the switch contact

NOTE: Device damage

The maximum load capacity of the relay contact is 60 V DC/42 V AC, 1 A.

The PSI-MOS-RS485W2/FO 1300 E converters are equipped with a floating switch contact for error diagnostics (connection terminal blocks 3 and 4 in Figure 3 on page 10).

The switch contact opens on the relevant device in the event of the following:

– Supply voltage failure
– An interrupt is detected on the fiber optic path
– System reserve of the fiber optic path not reached

The switching output is an N/C contact. It can be connected to a local digital input, e.g. on a PLC, for error detection.

When a topology is used, the individual switching outputs can be connected to separate input points or the individual contacts can be looped through to generate a group message.

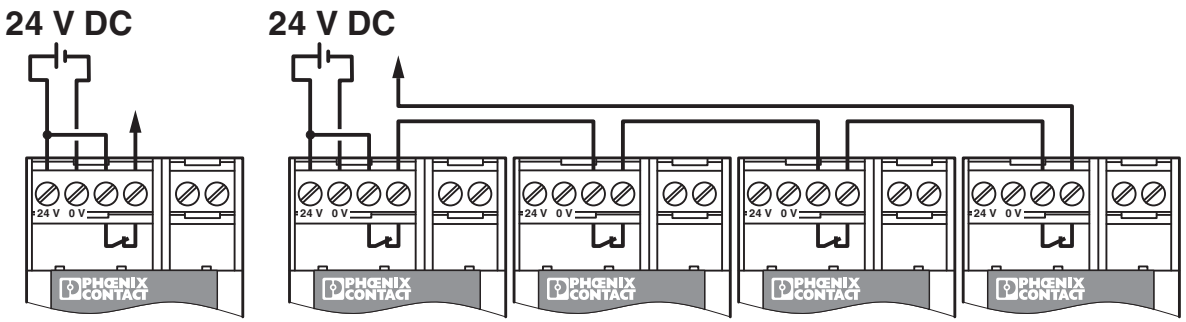


Figure 11 Individual and group message

11.4 Connecting the fiber optic cables (SC duplex)

WARNING: Risk of eye injury

During operation, do not look directly into transmitter diodes or use visual aids to look into the glass fibers. The infrared light is not visible.

Do not exceed the following maximum FO lengths:

– 25 km with F-G 50/125; 0.7 dB/km
– 22 km with F-G 62.5/125; 0.8 dB/km
– 45 km with F-E 9/125; 0.4 dB/km

Avoid contamination.

Do not remove the dust protection caps until just before the connectors are connected.

When using fiber optics, observe the fiber optic installation guidelines, DB GB IBS SYS FOC ASSEMBLY, Order No. 9423439.

Standardized SC duplex connectors are used with the PSI-MOS-RS485W2/FO 1300 E.

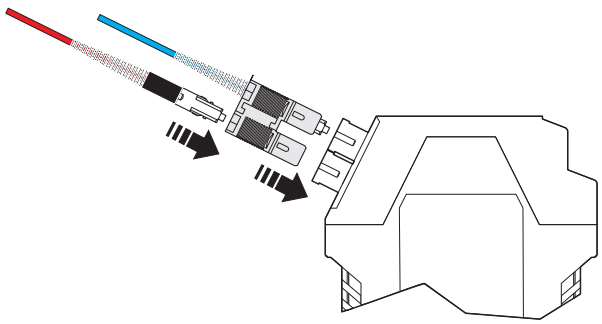


Figure 12 Fiber optic connection

- Connect the fiber optic cable to the SC duplex connector for the transmit and receive channel.
- Push the connector down until it you hear it snap into place.

Due to the integrated optical diagnostics, there is no need to measure the path.

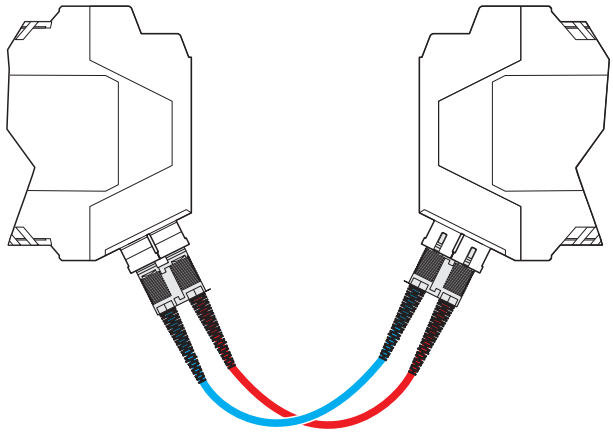


Figure 13 Crossed cables

When connecting two FO converters, note the signal direction of the fiber optics.

– Fiber connection “TD” (transmitter) at device 1
– Fiber connection “RD” (receiver) at device 2

Please note the transmit and receive channel crossover.

Due to different operating wavelengths, the device types, PSI-MOS-PROFIB/FO 660..., PSI-MOS-PROFIB/FO 850... and PSI-MOS-PROFIB/FO 1300... should not be connected directly via fiber optic cables.

12 Signal delay

Data transmission cables and network components lead to signal delays. You may need to consider these delays when setting timeout times for your bus system.

The signal delay **dT** can be calculated as follows:

dT = b x L + 2 x N

with

dT = Signal delay in bit periods for one complete signal cycle

b = Length parameter (see table)

L = Network expansion in km

N = Number of fiber optic converters

If necessary, adjust the timeout of your bus system to the signal delay.

Transmission speed [kbps]	Length parameter b
500	5.00
300	3.00
187.5	1.88
136	1.36
115.2	1.16
93.75	0.94
75	0.75
57.6	0.58
38.4	0.38
19.2	0.19
9.6	0.10
4.8	0.05