

## FO Converter for V.24 (RS-232) Interfaces PSI-MOS-RS232/FO...

This data sheet applies to the following items:

PSI-MOS-RS232/FO 660 E Order No. 27 08 36 8  
PSI-MOS-RS232/FO 660 T Order No. 27 08 41 0  
PSI-MOS-RS232/FO 850 E Order No. 27 08 37 1  
PSI-MOS-RS232/FO 850 T Order No. 27 08 42 3

### 1. Description

The modular PSI-MOS-RS232/FO ... fiber optic transmission system can be used to convert V.24 (RS-232) interfaces to fiber optics. The main advantage of this system is the electrically isolated connection of devices, which prevents the negative effects of voltage equalization currents and electromagnetic interference on the data lines. This increases the overall availability of the system, and improves flexibility in terms of the design of the bus topology in a linear or star structure.

Up to 10 fiber optic modules can be connected side by side to form optical star couplers, which are tailored to the specific application. Cross wiring within a modular star coupler is created automatically via the backplane. Depending on the required transmission distance, modules using polymer/HCS fiber or glass fiber cables can be combined. Polymer and HCS fiber cables can be assembled locally very easily using quick connectors. The system supports transmission speeds of up to 115.2 kbps. Depending on the transmission medium used, the distance that can be covered is 100 m (328.08 ft.) for polymer fibers, up to 2800 m (9186.35 ft.) for HCS fibers, and up to 4800 m (15748.03 ft.) for multimode glass fibers.

The devices are also equipped with comprehensive diagnostic functions to improve system availability and to make startup easy. The integrated fiber optic diagnostics function permanently monitors the optical transmission quality and the system can switch to redundancy operation if required. The PSI-MOS system can be used with input voltages from 18 to 32 V DC and in a temperature range from -20 to +60°C (-4 to +140°F).



Should you have any technical questions, please contact us:  
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## 2. Supported Network Structures

The PSI-MOS-RS232/FO ... system can be used to create network topologies that are ideally adapted to the relevant application. The structures are described briefly below:

### 2.1 Point-to-Point Connections/Redundant Point-to-Point Connections (Figure 02)

Two **PSI-MOS-RS232/FO ... E fiber optic termination devices** can be used to convert a copper data path to fiber optics. If necessary, the point-to-point connection can be designed redundantly to increase availability using **PSI-MOS-RS232/FO ... T fiber optic T-couplers**.

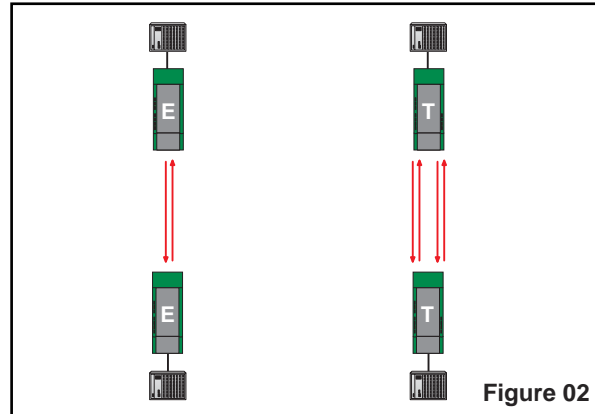


Figure 02

### 2.2 Linear Structures (Figure 03)

The fiber optic linear structure (Figure 02) can be used to network several V.24 (RS-232) devices to form a master/slave structure. In this case, it must be possible to address all V.24 (RS-232) devices via communication software. **PSI-MOS-RS232/FO ... E termination devices** are used at the beginning and end of the fiber optic line, while **PSI-MOS-RS232/FO ... T T-couplers** with 2 fiber optic channels are used along the line.

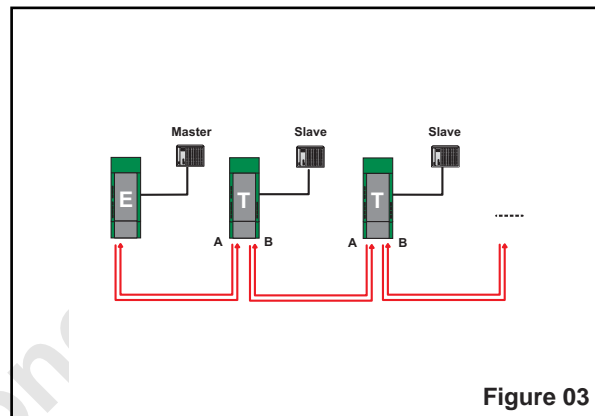


Figure 03

### 2.3 Star Structures (Figure 04)/Redundant Star Structures (Figure 05)

Addressable V.24 (RS-232) devices can be networked as a master/slave network within a star structure. Depending on the number of fiber optic lines required, several T-couplers or termination devices are connected to an active star coupler (Figure 04). Up to 20 fiber optic ports are available per star coupler. Cross wiring for the V.24 (RS-232) data and for the supply voltage is created automatically via the DIN rail bus connector (a special accessory, see Section 3. Technical Data). If increased availability is required, it is also possible to create redundant star distributors using **PSI-MOS-RS232/FO ... T T-couplers** (Figure 05).

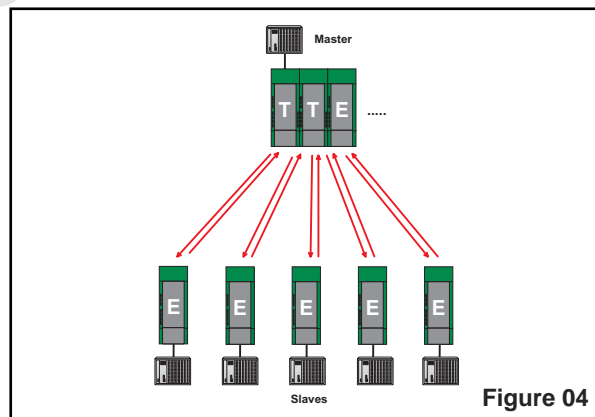


Figure 04

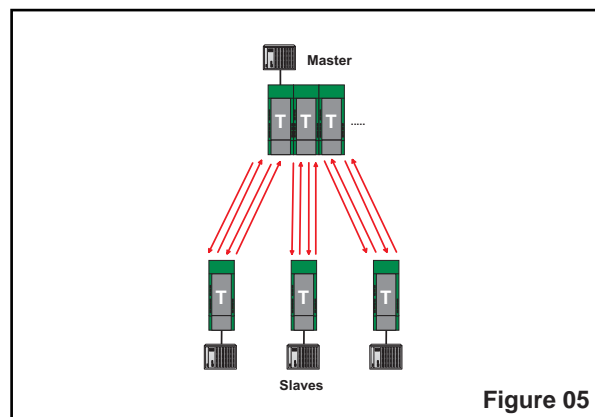


Figure 05

FO Converter for V.24 (RS-232) Interfaces – PSI-MOS-RS232/FO...

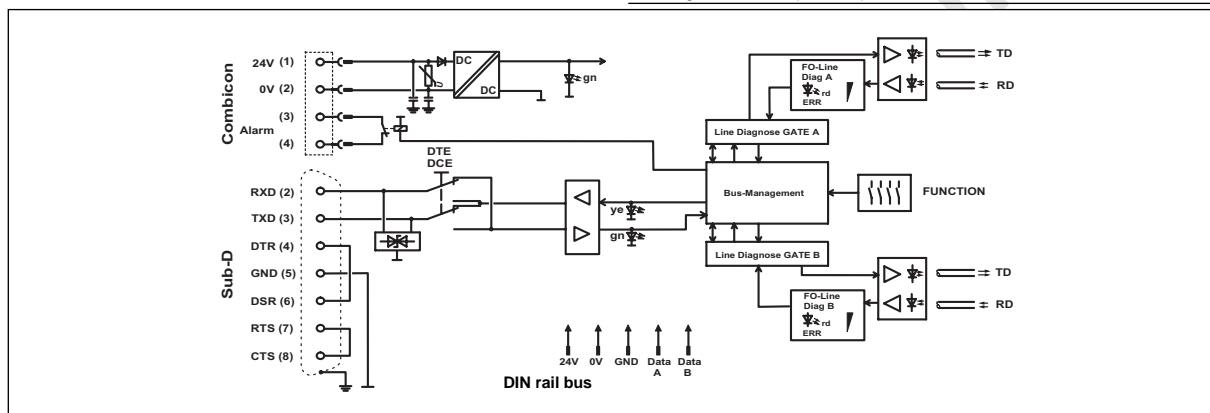
3. Technical Data



PSI-MOS-RS-232/FO...

FO converter for V.24 (RS-232) interfaces

Housing width 35 mm (1.378 in.)



Description	Connection Method	Type	Order No.	Pcs. Pkt.
T-coupler with integrated optical diagnostics for converting the V.24 (RS-232) interface to two fiber optic cables	660 nm F-SMA 850 nm B-FOC	PSI-MOS-RS232/FO 660 T PSI-MOS-RS232/FO 850 T	27 08 41 0 27 08 42 3	1 1
Termination device with integrated optical diagnostics for converting the V.24 (RS-232) interface to one fiber optic cable	660 nm F-SMA 850 nm B-FOC	PSI-MOS-RS232/FO 660 E PSI-MOS-RS232/FO 850 E	27 08 36 8 27 08 37 1	1 1
<b>Installation Accessories</b>				
<b>System power supply</b> for supplying a modular star coupler configuration		MINI-SYS-PS 100.240AC/24DC/1.5	28 66 98 3	1
<b>End clamp</b>		CLIPFIX 35	30 22 21 8	1
<b>DIN rail bus connector</b>		ME 17,5 T BUS1,5/5-ST-3,81GN	27 09 56 1	10
<b>Polymer fiber connectors</b> (4 connectors in the set)		PSM-SET-FSMA/4-KT	27 99 72 0	1
<b>Polishing set for polymer fiber connectors</b> (required for polymer fiber connector assembly)		PSM-SET-FSMA-POLISH	27 99 34 8	1
<b>Fiber optic polymer fiber cable for indoor installation</b>		PSM-LWL-KDHEAVY	27 44 31 9	1
<b>F-SMA HCS fiber connectors</b> (4 connectors in the set)		PSM-SET-FSMA/4-HCS	27 99 48 7	1
<b>B-FOC HCS fiber connectors</b> (4 connectors in the set)		PSM-SET-B-FOC/4-HCS	27 08 48 1	1
<b>Tool set for HCS connectors (F-SMA)</b> (required for HCS fiber connector assembly)		PSM-HCS-KONFTOOL	27 99 52 6	1
<b>Tool set for HCS connectors (B-FOC)</b> (required for HCS fiber connector assembly)		PSM-HCS-KONFTOOL/B-FOC	27 08 46 5	1
<b>Fiber optic HCS cable for indoor installation</b>		PSM-LWL-HCS-RUGGED-200/230	27 99 88 5	1
<b>Fiber optic HCS cable for outdoor installation</b>		PSM-LWL-HCSO-200/230	27 99 44 5	1
<b>Fiber optic glass fiber cable for indoor installation</b>		PSM-LWL-GDM-RUGGED-50/125	27 99 32 2	1
<b>Fiber optic glass fiber cable for outdoor installation</b>		PSM-LWL-GDO-50/125	27 99 43 2	1
<b>Measuring device for fiber optic power measurement</b>		PSM-FO-POWERMETER	27 99 53 9	1

**FO Converter for V.24 (RS-232) Interfaces – PSI-MOS-RS232/FO...**

**Technical Data**

Supply	24 V DC (±25%)	
Nominal current consumption	120 mA, maximum	
Ready-to-operate indicator	Green LED	
Maximum star coupler expansion	10	
<b>V.24 (RS-232) Interface</b>		
Data indicator	Green LED, (RD) receive data, dyn. Yellow LED, (TD) transmit data, dyn.	
Transmission speed	Up to 115.2 kbps, NRZ	
Transmission channels	2(1/1), RD, TD, full duplex	
Transmission length	15 m (49.21 ft.), maximum	
Connection	9-pos. D-SUB (male connector)	
<b>Fiber Optic Interface</b>		
Connection	F-SMA	(B-FOC) ST®
Wavelength	660 nm	850 nm
Transmission power (fiber type)	Minimum	- 4,6 dBm (980/1000 μm) - 16,6 dBm (200/230 μm)
Receiver sensitivity	Minimum	- 4,6 dBm (200/230 μm) - 17,6 dBm (50/125 μm) - 13,6 dBm (62,5/125 μm) - 33,2 dBm
Transmission length including 3 dB system reserve	Minimum	<ul style="list-style-type: none"> <li>• 100 m (328.08 ft.) with F-K 980/1000 230 dB/km</li> <li>• 2800 m (9186.35 ft.) with F-S 200/230 10 dB/km with quick mounting connector</li> <li>• 800 m (2624.67 ft.) with F-S 200/230 10 dB/km with quick mounting connector</li> <li>• 4200 m (13779.53 ft.) with F-G 50/125 2.5 dB/km</li> <li>• 4800 m (15748.03 ft.) with F-G 62.5/125 3.0 dB/km</li> </ul>
Transmission protocol	Transparent protocol to V.24 (RS-232) interface	
<b>General Data</b>		
Electrical isolation	V.24 (RS-232)//supply	
Test voltage	1.5 kV <sub>rms</sub> , 50 Hz, 1 minute	
Alarm output	60 V DC/42 V AC, maximum, 1 A, relay contact, opens on a supply voltage failure, when fiber optic power limit is reached, when fiber is broken	
Status and diagnostic indicators	Supply (V <sub>CC</sub> ), transmit/receive data V.24 (RS-232), fiber optic bar graph (FO-SIGNAL), fiber optic error (FO_ERR)	
Housing material/color	PA V0, green	
Connection data for screw terminal blocks	0.2 - 2.5 mm <sup>2</sup> (25 - 14 AWG)	
Operating temperature	-20°C to +60°C (-4°F to +140°F)	
Storage temperature	-40°C to +85°C (-40°F to +185°F)	
Dimensions (W x H x D)	35 mm x 99 mm x 105 mm (1.378 x 3.898 x 4.134 in.)	
Degree of protection	IP20	
Weight	190 g	
Humidity	30% - 95%, no condensation	

FO Converter for V.24 (RS-232) Interfaces – PSI-MOS-RS232/FO...

**Other Tests**

Ambient compatibility	Free from substances, which would hinder coating with paint or varnish (according to VW, Audi, and Seat specification)
Vibration resistance	5g according to IEC 60068-2-6, 2.5 h each in x, y, and z direction, criterion A
Shock resistance	15g according to IEC 60068-2-27 with 11 ms pulse length, criterion C
Free fall	1 m (3.281 ft.) without packaging according to IEC 60 950
Approvals	In preparation
Air and creepage distances	VDE 0110-1 DIN EN 50 178 DIN EN 60 950; 2000



**Conforms to the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC**

**EMC (Electromagnetic Compatibility)**

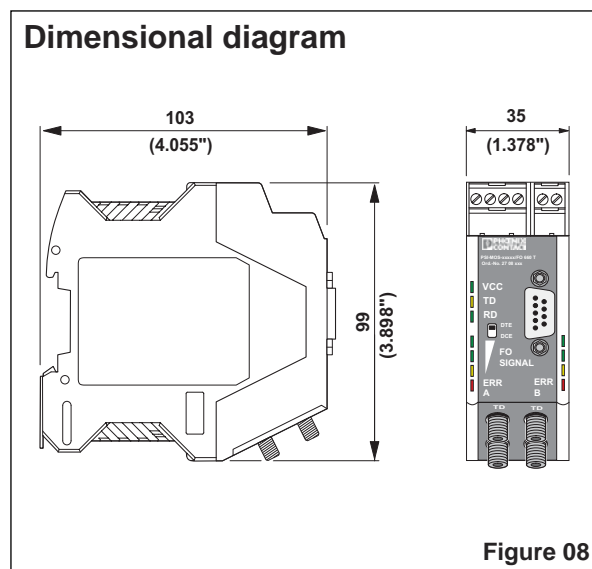
Noise immunity according to EN 61000-6-2

• Electrostatic discharge (ESD)	EN 61000-4-2	8 kV air discharge <sup>2)</sup> 6 kV contact discharge <sup>2)</sup>
• Electromagnetic HF field Amplitude modulation Pulse modulation	EN 61000-4-3	10 V/m <sup>1)</sup> 10 V/m <sup>1)</sup>
• Fast transients (burst) Signal: Supply:	EN 61000-4-4	2 kV/5 kHz <sup>2)</sup> 2 kV/5 kHz <sup>2)</sup>
• Surge current loads (surge) Signal: Supply:	EN 61000-4-5	1 kV/12 Ω <sup>2)</sup> 0.5 kV/2 Ω <sup>2)</sup>
• Conducted interference	EN 61000-4-6	10 V <sup>1)</sup>
Noise emission according to EN 50081-2	EN 55011	Class A

EN 61000 corresponds to IEC 1000/  
EN 55011 corresponds to CISPR11

- 1) Criterion A: Normal operating characteristics within the specified limits.
- 2) Criterion B: Temporary adverse effects on the operating characteristics that the device corrects independently.

Class A: Industrial application, without special installation measures



#### 4. Function Elements/Diagnostics

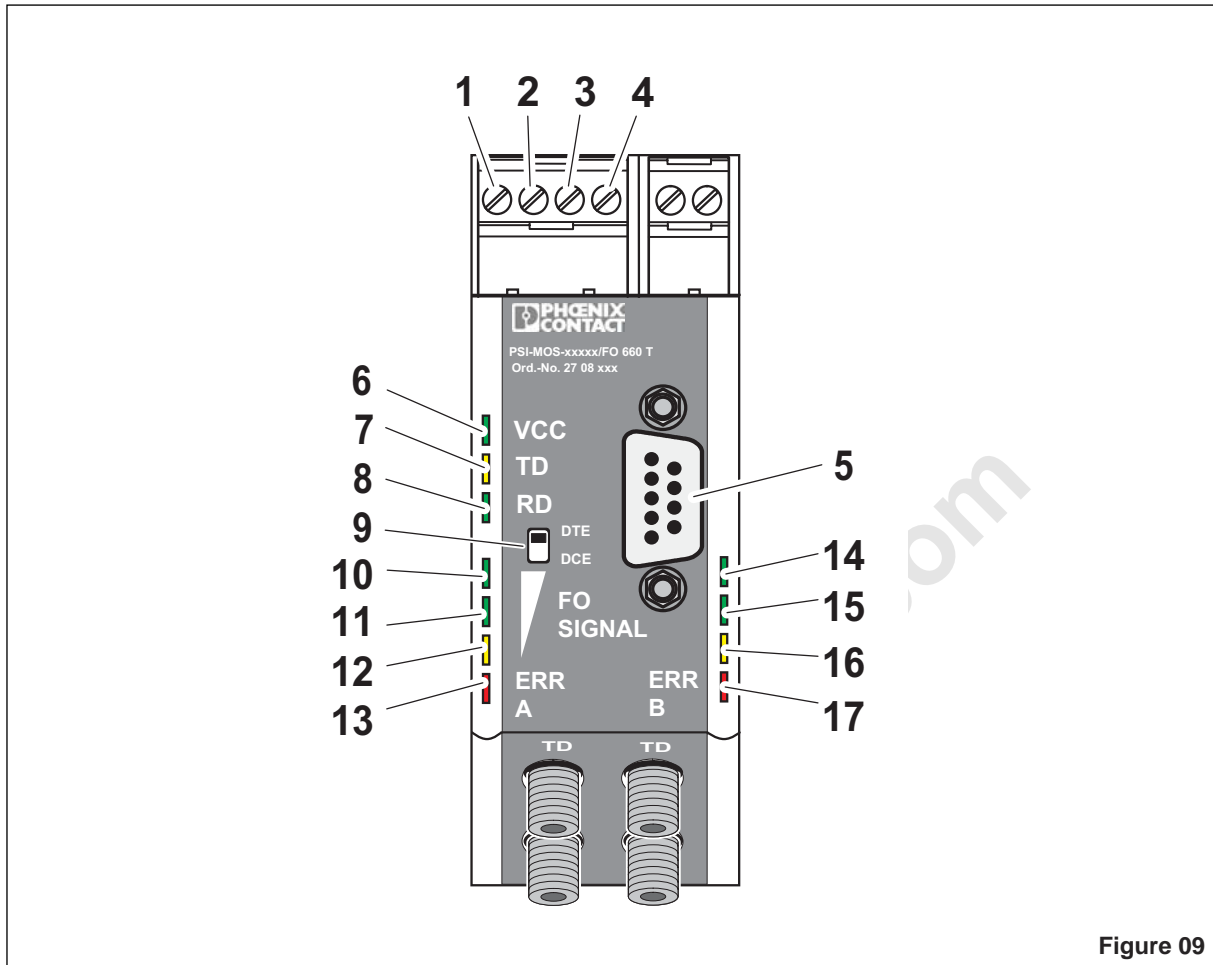


Figure 09

#### COMBICON

1. 24 V DC
2. 0 V
3. Switch contact connection 1
4. Switch contact connection 2

#### 9-pos. D-SUB

5. V.24 (RS-232) interface

#### LEDs

6. Supply voltage ( $V_{CC}$ )
7. Transmit data dyn. CU port (TD)
8. Receive data dyn. CU port (RD)
9. DTE/DCE adaptation

#### FO Signal Port A


10. Green -> Receiving power very good
11. Green -> Receiving power good
12. Yellow -> System reserve reached, receiving power critical
13. Red -> Receiving power insufficient/broken fiber

#### Fiber Optic Diagnostics Port B (Only for PSI-MOS RS232/FO ... -T)

14. Green -> Receiving power very good
15. Green -> Receiving power good
16. Yellow -> System reserve reached, receiving power critical
17. Red -> Receiving power insufficient/broken fiber

## 5. Module Configuration

To configure the modules, release the housing cover using a screwdriver (Figure 10). Then carefully pull the printed circuit board out of the housing as far as possible. DIP switches 1 - 4 are now freely accessible.



**Static discharge can damage electronic devices.**  
Remove electrostatic discharge from your body before opening and configuring the device. To do this, touch a grounded surface, e.g., the metal housing of the control cabinet.

Configure the DIP switches according to the planned network topology.

An overview of the various configuration options is provided in the table below.

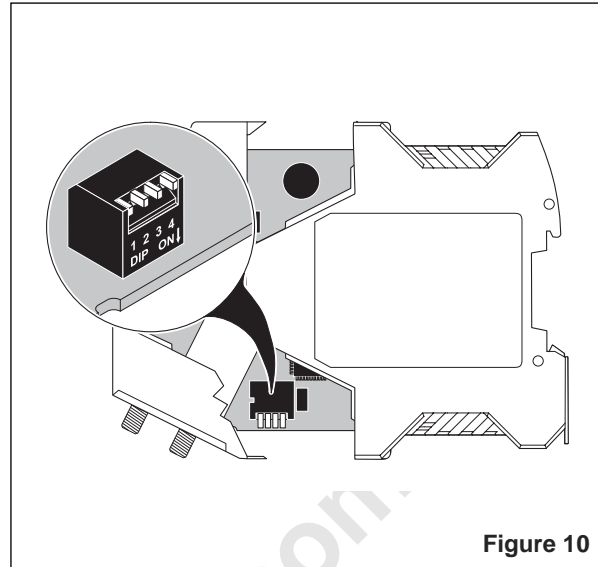


Figure 10

Switch	Position	Function	Designation	Remark	Factory Setting	P2P	P2P, Redundant	Linear	Star	Star, Redundant
1	OFF	Backplane switched off	LINE		X	X	X	X		
	ON	Backplane switched on	STAR						X	X
2	OFF	Optical rest position "Light on"	INVERS		X	X	X	X	X	X
	ON	Optical rest position "Light off"	NORM	No fiber optic						
3	OFF	T-coupler: No redundancy operation	–	T-coupler only	X	X		X	X	
	ON	T-coupler: Redundancy operation	REDUNDANCY							
4	OFF	T-coupler: Port B switched on	NEXT	T-coupler only	X		X	X	X	X
	ON	T-coupler: Port B switched off	END							

<sup>1)</sup> When a PSI-MOS-RS232/FO...T T-coupler is used at the end of a fiber optic line

Table 01: Configuration overview

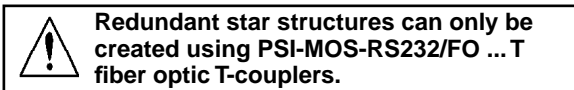
### Comment:

By default, PSI-MOS-RS232/FO...E termination devices are set to "Point-to-Point" mode and PSI-MOS-RS232/FO...T fiber optic T-couplers are set to "Linear" mode.

### 5.1 Operation in a Point-to-Point Connection (P2P):

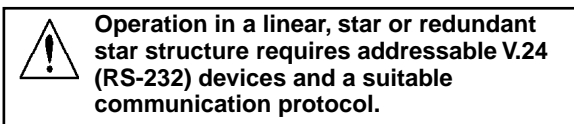
1. When two termination devices are used in the default setting, no other settings are required.
2. When T-couplers are used, fiber optic port B must be deactivated. Set DIP 4 to END (= "ON").

### 5.2 Operation in a Redundant Point-to-Point Connection:



1. Set DIP 3 to REDUNDANCY (= "ON").
2. Set DIP 4 to NEXT (= "OFF").

### 5.3 Operation in a Linear Structure



#### First and Last Device in the Line:

1. When two termination devices are used in the default setting, no other settings are required.
2. When T-couplers are used, fiber optic port B must be deactivated. Set DIP 4 to END (= "ON").

#### Devices Along the Line:

1. PSI-MOS-RS232/FO ... T fiber optic T-couplers must be used along the line.
2. If the default settings are used, no other settings are required.

### 5.4 Operation in a Star Structure:

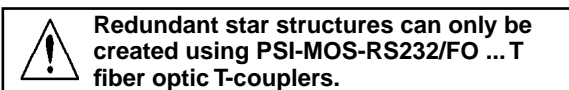
#### Devices in the Star Coupler Configuration:

1. For each device in the star coupler configuration, set DIP 1 to STAR (= "ON").
2. If the star coupler configuration includes PSI-MOS-RS232/FO ... T fiber optic T-couplers, where only fiber optic port A is to be used, deactivate fiber optic port B. Set DIP 4 to END (= "ON").

### Devices at the End of a Star Line:

1. When PSI-MOS-RS232/FO ... E termination devices are used in the default setting, no other settings are required.
2. When T-couplers are used, fiber optic port B must be deactivated. Set DIP 4 to END (= "ON").

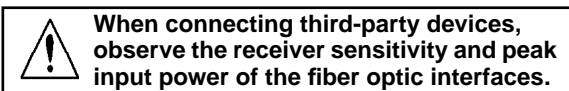
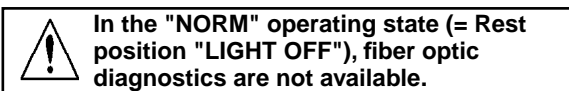
### 5.5 Operation in a Redundant Star Structure:




1. For each device in the redundant star coupler configuration, set DIP 1 to STAR (= "ON").
2. Activate the redundancy function in each device. Set DIP 3 to REDUNDANCY (= "ON").
3. Ensure that fiber optic port B is active for each device (DIP 4 = "ON").

### 5.6 Special Application: Direct Connection to Fiber Optic Interfaces From Other Manufacturers

1. Check the optical rest position used by the third-party interface (Logic 1 = "Light off" or Logic 1 = "Light on").
2. If necessary, adapt the optical rest position of the PSI-MOS device (default setting: Rest position = Logic 1 = "Light on"). Set DIP 2 to "NORM" (DIP 2 = "OFF") to change to "Logic 1 = Light off".

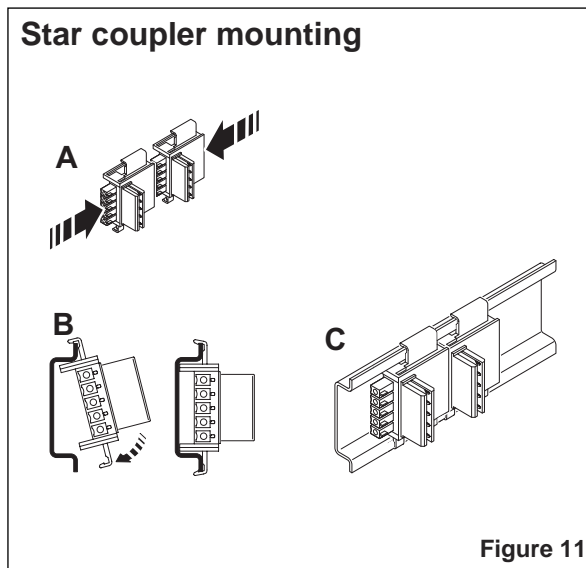


## 6. Connection Notes



**Only mount and remove modules when the power supply is disconnected. When connecting the supply voltage for operation in a PSI-MOS-... configuration, please refer to the notes.**


**Attention**  
Disregarding this warning may result in damage to equipment and/or serious personal injury. Only qualified personnel may start up and operate these devices. According to the safety instructions in this text, qualified personnel are persons who are authorized to start up, to ground, and to mark devices, systems, and equipment according to the standards of safety technology. In addition, these persons must be familiar with all warning instructions and maintenance measures in this text. PSI-MOS-... modules are designed exclusively for SELV operation according to IEC 60950/EN 60950/VDE 0805.



Install PSI-MOS- ... modules on a 35 mm (1.378 in.) DIN rail according to DIN EN 50 022.

To avoid contact resistance only use clean, corrosion-free DIN rails. End clamps should be mounted on both sides of the module to stop the modules from slipping on the DIN rail.

### 6.1. Mounting/Removal



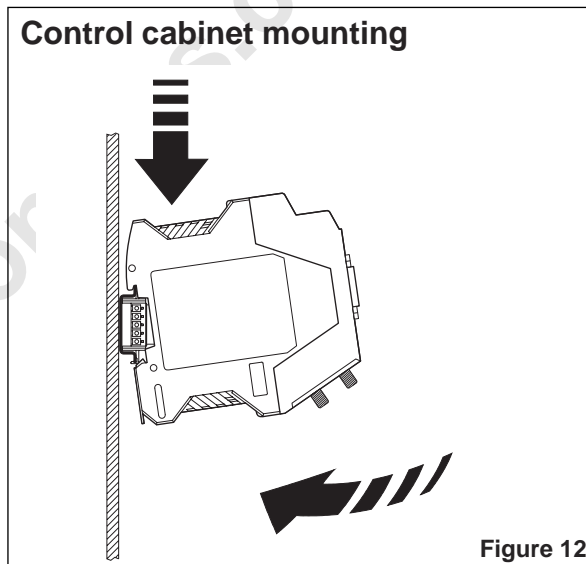
**Connect the DIN rail to protective earth ground using a grounding terminal block. The modules are grounded when they are snapped onto the DIN rail. This ensures that the shield is effective. Connect protective earth ground with low impedance.**

#### Mounting as an Individual Device (STAND-ALONE)

1. Place the module onto the DIN rail from above. The upper holding keyway must be hooked onto the top edge of the DIN rail.
2. Push the module from the front towards the mounting surface.
3. Once the module has been snapped on properly, check that it is fixed securely on the DIN rail.

#### 6.2 Mounting in a Configuration (Modular Star Coupler)

1. Connect together the required number of DIN rail bus connectors for the connection station. **Two** ME 17,5 TBUS 1,5/5-ST-3,81 connectors, Order No. 27 09 56 1, are required for **each device** (Figure 11).
2. Push the combined connectors on to the DIN rail.



3. Place the module onto the DIN rail from above. The upper holding keyway must be hooked onto the top edge of the DIN rail (Figure 12). Ensure that it is aligned correctly with the DIN rail bus connectors.
4. Once the module has been snapped on properly, check that it is fixed securely on the DIN rail.

#### 6.3 Removal:

1. Pull the locking latch down using a screwdriver, needle-nose pliers or similar.
2. Pull the bottom edge of the module away from the mounting surface.
3. Pull the module diagonally upwards away from the DIN rail.
4. To remove a complete star distributor, also remove the DIN rail bus connectors from the DIN rail.

## 7. Cabling Notes

### 7.1 Connecting the Supply Voltage

The module is operated using a +24 V DC SELV.

#### Operation as an Individual Device:

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

#### Operation in a Star Coupler Configuration

When the devices are operated in a star coupler configuration, the supply voltage must only be supplied to the first device. The remaining devices are supplied via the DIN rail bus. A redundant supply concept can be created by connecting a second power supply unit to another module in the configuration.

#### Using the MINI-SYS-PS ... System Power Supply

Alternatively, the star coupler configuration can be supplied using the MINI-SYS-PS ... system power supply. This is connected via two ME 17,5 TBUS 1,5/5-ST-3,81 DIN rail bus connectors, Order No. 27 09 56 1.

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

### 7.2 Connecting the Data Cables

Connect the V.24 (RS-232) connection via the 9-pos. D-SUB male connector on the top of the device. Refer to the wiring diagram in Figure 14.



**Use shielded data cables. The cable shield must be connected on both sides of the transmission path.**

#### Note for Star Structures:



**Always connect the master station to the V.24 (RS-232) interface of the first PSI-MOS device in the star coupler configuration. The other V.24 (RS-232) interfaces cannot be used.**



**Always connect only one V.24 (RS-232) slave device to each FO converter at the end of a star line.**

### Single supply/redundant supply

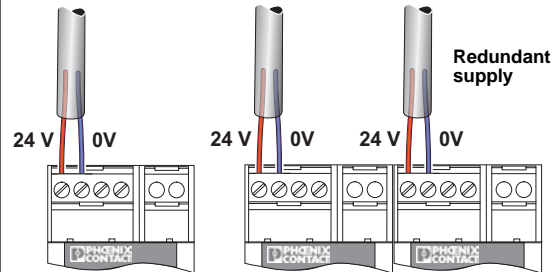


Figure 13

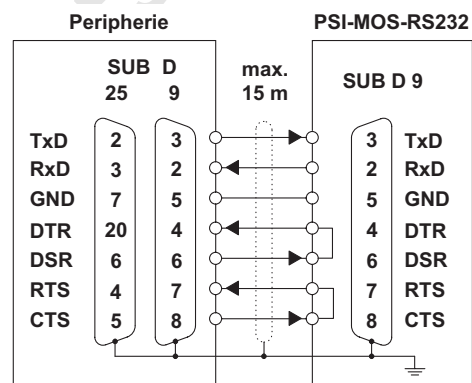


Figure 14

### Connecting the data cables

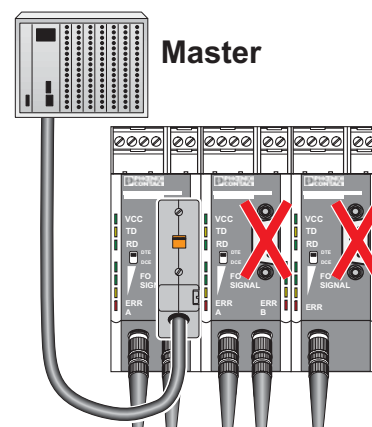


Figure 15

### 7.3 DTE/DCE Adaptation

The DTE/DCE slide switch can be used to internally cross the TxD and RxD cables, which enables the user to adapt easily to DTE or DCE interfaces.

For connection to:

- Data terminal equipment (DTE) => Set switch to DTE. (Default for most applications)
- Data communication equipment (DCE) => Set switch to DCE.

If you do not know which type of interface is connected, you can determine the correct configuration by testing (DTE/DCE switch).

### 7.4 Wiring the Switch Contact

PSI-MOS-RS232 ... converters are equipped with a floating switch contact for error diagnostics (connection terminal blocks 3 and 4). This contact opens on the relevant module if:

- The supply voltage fails
- An interrupt is detected on the fiber optic path
- The system reserve for the fiber optic path is not reached

The switch contact is a N/C contact and can be connected to a local digital input, e.g., on the PLC, to enable error detection.

When a device configuration is used (modular star coupler), the contacts can be connected individually to separate input points (Figure 16) or a group message can be generated by looping through the individual contacts (Figure 17).

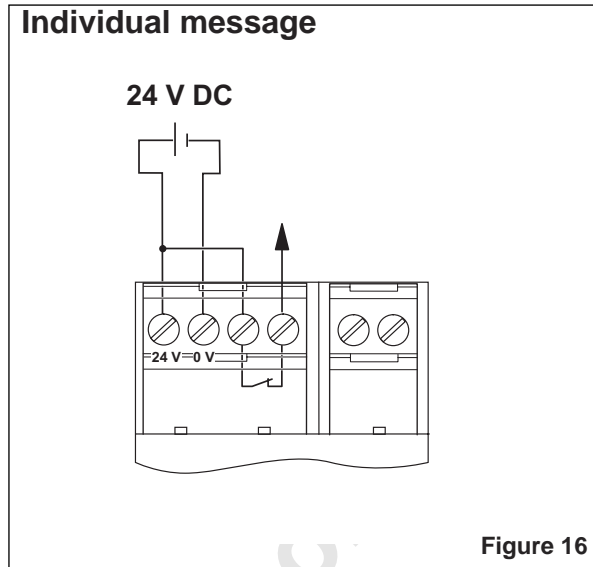


Figure 16

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

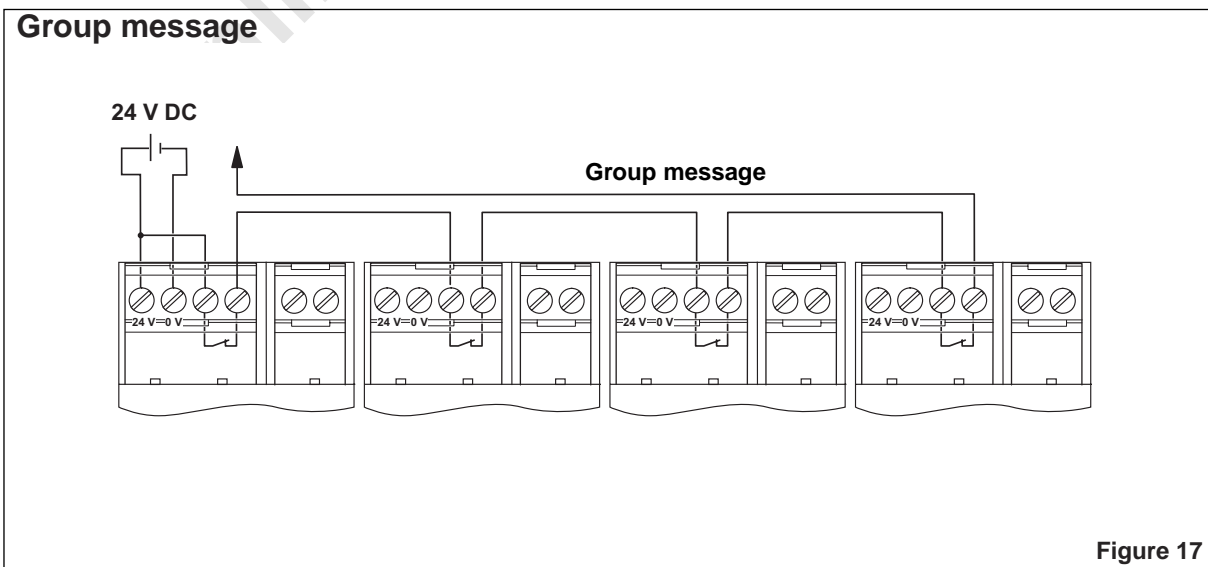




Figure 17

### 7.5 Connecting the Fiber Optic Cables

 Protective caps should only be removed just before the connectors are connected. These protect the transmit and receive elements. The same applies to the protective caps for the connectors.


 When fiber optic linear structures are created using T-couplers (see 5.3), fiber optic port A must always be connected in the direction of the master station

#### 7.6 F-SMA Connection (PSI-MOS-RS232/FO 660 ...)

PSI-MOS-RS232/FO 660 ... devices use F-SMA connectors for the fiber optic connection.

F-SMA is a standardized fiber optic connection. We recommend the use of user-friendly F-SMA connectors using the quick connection method. The connectors are screwed onto the device by manually tightening the screw collar.


#### 7.7 B-FOC (ST®) Connection (PSI-MOS-RS232/FO 850 ...)


 During operation, do not look directly into transmit diodes and do not look into the glass fibers using visual aids. The infrared light is not visible.

PSI-MOS-RS232/FO 850 ... devices use standardized B-FOC (ST®) connectors.

Connect the fiber optic cable to the B-FOC (ST) connector for the transmit and receive channel and push the connector clamp mechanism downwards. Secure the connection with a quarter turn to the right (Figure 18).

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

 Note the fiber optic cable signal direction when coupling two PSI-MOS modules: Module 1 fiber connection "TD" (transmitter) to module 2 fiber connection "RD" (receiver) (Figure 19).

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

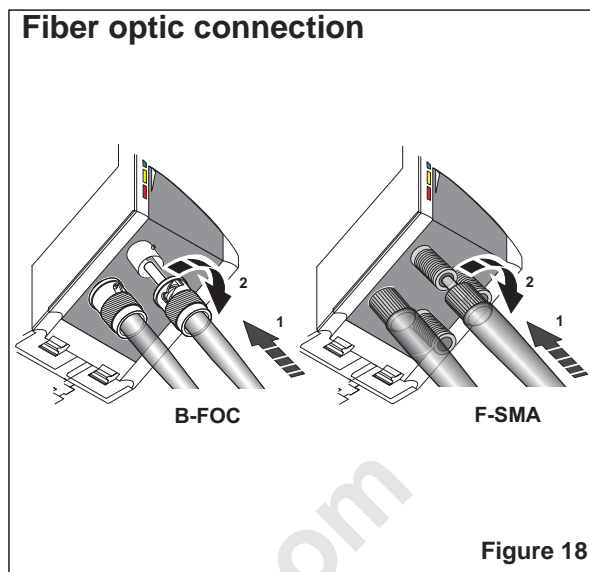


Figure 18

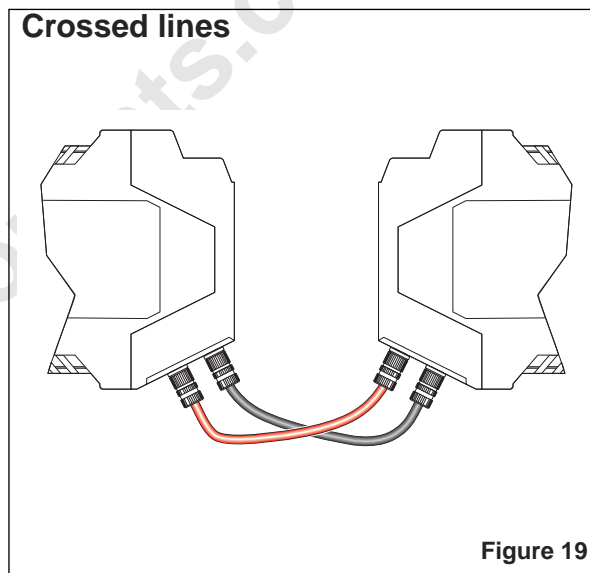


Figure 19