PROFIBUS DP with fiber optics (FO) in loop topology „C18“ (for FO coupler “d-Light”)

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1 Application

This supplement is valid for actuators with FO connection in loop topology.

Please observe the respective operation instructions for "Electric actuators ECOTRON / PROFITRON / HiMod“ and for "PROFIBUS DP interface“!

2 Technical data

2.1 FO connection board

FO connection board for loop topology	
FO cable connector type	ST = straight tip (BNC connector)
FO cable fiber type	MM = multi-mode
Fiber	Fiberglass 62.5 (50)/125 µm, multi-mode
Channels (optical)	2x RX (IN)/TX (OUT)
Data rate	Maximum 1.5 MBit/s Automatic recognition of the following baud rates: 9.6 kBit/s, 19.2 kBit/s, 45.45 kBit/s, 93.75 kBit/s, 187.5 kBit/s, 500 kBit/s, 1.5 MBit/s
Transmission type	Half-duplex
Signal delay	RS 485 <-> FO cable: < 3 T_{Bit} TX <-> RX: 11 T_{Bit}
Optical budget	13 dB
Network range max.	2,500 m (FO cable damping max. 2.0 dB/km, without additional damping)
Wave length	1310 nm
Operation temperature	-25 °C to +50 °C
Power supply	24 V DC/70 mA internally supplied via the power supply unit of the actuator.
Status indications (LEDs)	2 LEDs for general diagnostics: ● PWR = Device is ready for operation (power supply available) ● ERROR = Fault 2 LEDs for the RS 485 interface: ● RX = Byte received on RS 485 ● STATUS = Byte with incorrect bit(s) received on RS 3 LEDs for each channel: ● Link/Act = Good RX receive level. Data is received via the RS 485 channel ● Limit = Critical but still permissible receive level ● Fail = No or insufficient signal on RX
Required FO coupler for the master (DCS)	d-Light, DL485PBR-MM-ST SIPOS order no.: 2SX7100-4LP05 or EKS (www.eks-engel.de), EKS order no.: 01000 6371-FV

2.2 Cable types for FO connection

Cables and wires according to DIN VDE 088 part 3	
Fiber	Fiberglass 62.5 (50)/125 µm, multi-mode, max. 2,500 m
Damping coefficient	Recommendation: < 2.0 dB/km
FO cable connector type	ST = straight tip (BNC connector) 

⚠ **Never look directly into open cable ends or FO cable connections!**

3 FO connection

3.1 Connect FO cables

The FO connection is located in the FO round plug. When removing the cover (Fig. 1, [1]), the connection board is easily accessible:

1. Loosen screws [2] and remove cover [1].
2. Loosen Blanking plugs [5].
3. Insert cable glands [4] suitable for FO cables.

- Measure and record the damping of the FO cables before connection!
- Remove outer sheating of FO cable at a length of approx. 42 cm!

4. Insert the wires into the cable glands [4].

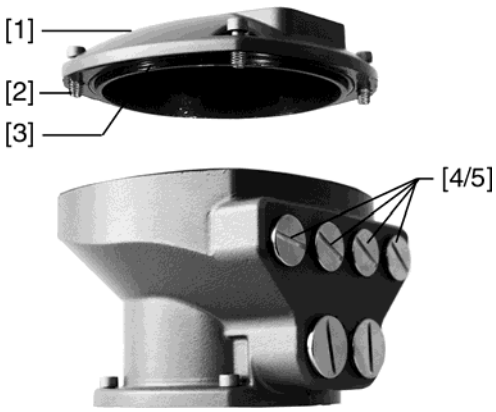


Fig. 1: FO round plug

5. Connect FO cables

- Install cables within the terminal compartment in a loop to achieve the highest possible bending radius!
- Link ST connectors crosswise; see chapter 3.2 „Structure for loop topology“
- Make sure, that the bayonet connection is properly engaged!

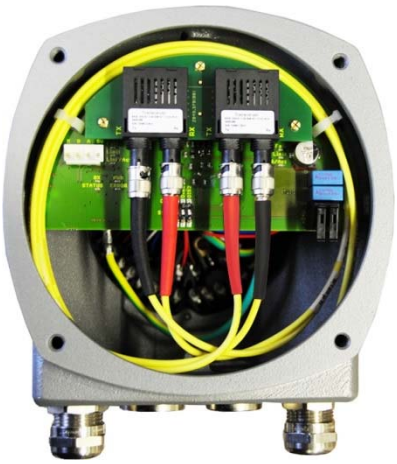
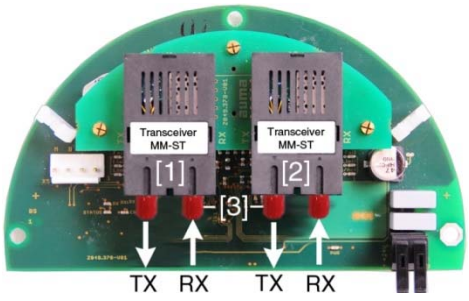


Fig. 2: Wiring within in the terminal compartment



[1] Channel 1
[2] Channel 2
[3] Dust protection
TX Optical output (OUT)
RX Optical input (IN)

Fig. 3: FO connection board

6. Clean sealing faces of cover (Fig. 1, [1]) and housing.
7. Check whether O-ring (Fig. 1, [3]) is in good condition, correctly insert O-ring.
8. Fit cover (Fig. 1, [1]) and fasten screws (Fig. 1, [2]) evenly crosswise.
9. Tighten cable glands (Fig. 1, [4]).

3.2 Structure for loop topology

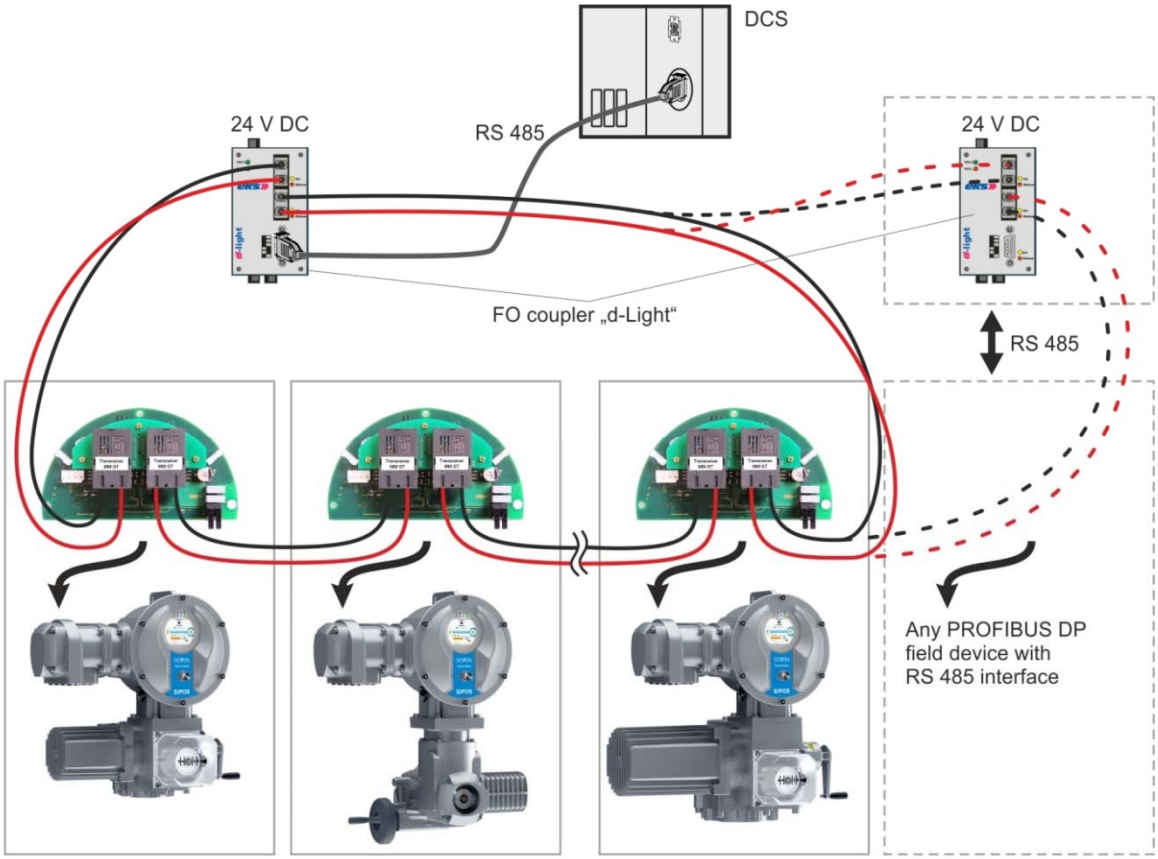


Fig.: Structure of a FO loop with FO coupler and SEVEN actuators

The connection to the FO interface board is made with F-ST bayonet type connectors as follows:

- Optical output **TX** (OUT 2) of actuator 1 ➔ Optical input **RX** (IN 1) of actuator 2
- Optical input **RX** (IN 2) of actuator 1 ➔ Optical output **TX** (OUT 1) of actuator 2

- Keep clean!
  Ingress of dust can render the optical components unusable.
- Remove dust protection only just before establishing the connection!
- Observe minimum bending radius of FO cables!

3.3 Electrical power supply

The electric actuator requires a mains voltage.

Should the power supply fail, the FO interface board is no longer supplied with power and the FO signal is not transmitted. The loop is thereby divided into two lines. If the power fails for only one of the actuators, all other actuators are still available via fiber optics.

To ensure that all actuators are still available via FO during a power failure, the actuator has to be operated with an external 24 V DC power supply!

4 Diagnosis

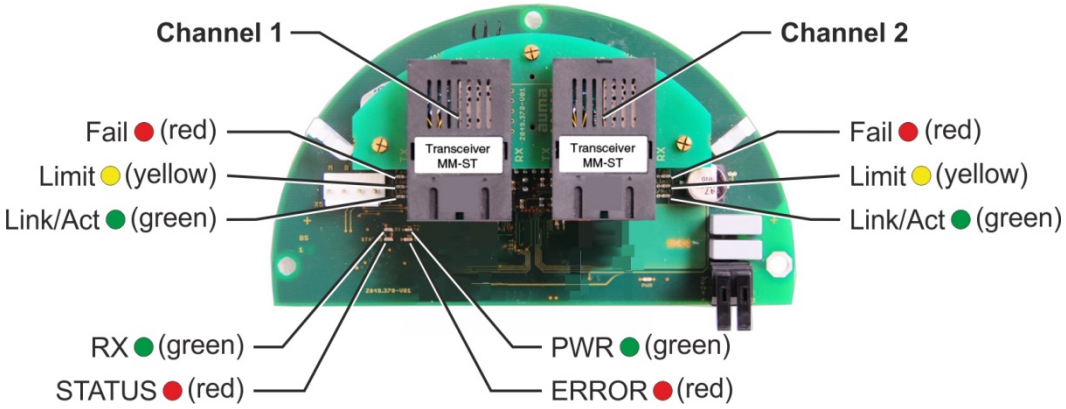
The FO input signal is monitored on the FO interface board.

In the fault-free state, signals from RX (channel 1) and RX (channel 2) are received, **even if no master (DCS) is connected**.

If no signal is received at the inputs RX (channel 1) or RX (channel 2), the fault "no signal fiber optics" is set and shown on the display of the actuator. This information can be read out via PROFIBUS resp. is indicated by LEDs on the FO connection board.

Therefore, an open circuit can be detected and the point of interruption can be determined.

4.1 Visual indication on FO connection board



LED indications			
Designation	***Color***		***Function***
PWR	●	green	Device is ready for operation (power supply available)
ERROR	●	red	FO collective fault: Will be activated if one of the LEDs "Fail" or "Limit" is illuminated or if the internal RS 485 connection is defective.
RX	●	green	Byte received on RS 485
STATUS	●	red	Byte with incorrect bit(s) received on RS 485
each for channel 1 and channel 2:			
Link/Act	●	green	Is illuminated and LED „Limit“ is not illuminated: Good RX receive level. Is blinking: Data is being received on RX.
Limit	●	yellow	Is illuminated with LED „Link/Act“: System reserve reached (critical or permissible receive level.
Fail	●	red	Optical receiving signal incorrect (no or insufficient RX receive level).

4.2 PROFIBUS telegram

The "No signal fiber optics" fault is signaled in fault signal 2 bit 8.

ParNo	Value	Name of parameters	Type	ECOTRON		PROFITRON	HiMod PROFITRON
				2S.70 2S.73	2S.75	2S.70 2S.73	2S.75 2S.78
71		fault signal 2	unsigned16	r	r	r	r
	bit 0	analog input AI2 I > 21 mA or I < 3.6 mA (live zero)					
	bit 1	analog input AI1 I > 21 mA or I < 3.6 mA (live zero)					
	bit 2	analog output AO1 defect					
	bit 4	no bus communication channel 1 and 2					
	bit 5	blocked in move					
	bit 6	run time error					
	bit 7	motor temperature too high					
	bit 8	**no signal fiber optics**					
	bit 9	fault Bluetooth					
	bit 10	fault electronic temperature					
	bit 11	no signal non-intrusive position encoder					
	bit 12	no communication non-intrusive position encoder					
	bit 14	no signal standstill sensor					

The information can be read to the Word PZD 5 in the cyclic telegram PPO2.
Fault signal 2 is assigned to PZD 5 as a standard.

By means of a DP-V1 connection, the fault signal can be read via slot 1 index 20.

Byte.Bit	Name of parameters	Type	ECOTRON		PROFITRON	HiMod PROFITRON
			2S.70 2S.73	2S.75	2S.70 2S.73	2S.75 2S.78
0.0	hand wheel/crank operated	bit	r	r	r	r
…						
24.0	**no signal fiber optics**					

Extract of the assignment of slot 1 index 20.