



Glass fiber cable (Multimode)

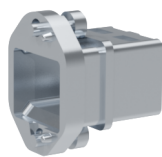
The Multimode glass fiber cable is used to connect the FM221, FM222, FS221/N and FS222/N FASTBUS modules. This enables the connection of remote SubDevices over distances of up to 2 km. Multimode fibers are also used for fiber optic Ethernet connections allowing the inexpensive combination of FASTBUS and Ethernet using multi-core cables.

Bachmann electronic GmbH **recommends the following multimode cables**, which have been tested accordingly. Cables of other manufacturers with the same or better specifications can naturally be used. These must be tested before use.



PushPull® connectors

The following recommended PushPull® connectors have been specially selected on account of their robust design and accuracy of fit. Other connector types should not be used. LC connectors of other manufacturers can be used once they have been functionally checked.



PushPull® adapter

This adapter is required for PushPull® connectors. With screwed adapter no LC patch cord should be plugged, as this covers the LC-release lever and thus can not be removed.

Cable recommendations ¹⁾

Part type designation	Part number	Manufacturer	Description
Glass fiber cable ²⁾ (Multimode)	8421801LG000	LEONI AG	AT-V(ZN)Y(ZN)Y 2G50/125 TB900L 2.2 Breakout cable up to 2,000 m long, Operating and storage temp. -40 to +85 °C, UL license
Glass fiber cable ²⁾ (Multimode)	84950785G222	LEONI AG	I-V(ZN)Y 2G50/125 TB900L 2.8 Mini breakout cable up to 2,000 m long, Operating and storage temp. -40 to +70 °C

Part type designation	Part number	Manufacturer	Length	[m]	Description/structure
Patch cable ¹⁾	JUDNAAUXXc77A00	LEONI AG	c = 0005	0.5	I-V(ZN)Y 2G50/125 TB900L 2.8 assembled Cable: 84950785G222 Side A: LC Side B: LC Operating and storage temperature -40 °C bis +70 °C
			c = 001	1	
			c = 003	3	
			c = 005	5	
			c = 010	10	
			c = 030	30	

¹⁾ Information without guarantee, order directly from the manufacturer

²⁾ When utilizing cable from other manufacturers be aware of possibly divergent specifications, e.g. attenuation or minimum bending radius. Fibers with a core diameter of 50 µm or 62.5 µm can be used. The outer diameter of the FO cable depends on the connectors used, see the data sheet provided with the connector.

Connector recommendations ³⁾ for glass fiber cables (Multimode)

Part type designation	Part number	Manufacturer	Description
HARTING PushPull® connector	09 57 402 0500 020	HARTING KGaA	Plastic connector, suitable for breakout cables
HARTING PushPull® connector	09 57 409 0500 020	HARTING KGaA	Metal connector, suitable for breakout cables
LC connector	SXLC-DK0-43-0010	LEONI AG	Plastic connector, suitable for mini breakout cables

³⁾ Information without guarantee, order directly from the manufacturer

Accessories

Part type designation	Part number	Description
PushPull® adapter ⁴⁾	00016682-00	Adapter for Harting PushPull LC connector

⁴⁾ Information without guarantee, order directly from the manufacturer

Mounting LWL connector/PushPull® adapter



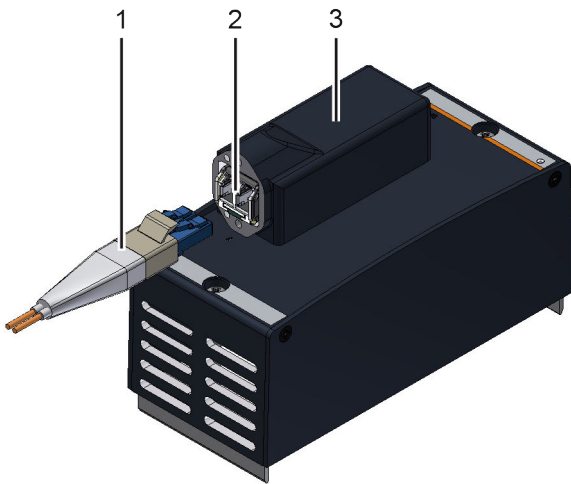
NOTICE

LC duplex connector (1) in interface (2) plugged in with PushPull® adapter (4).

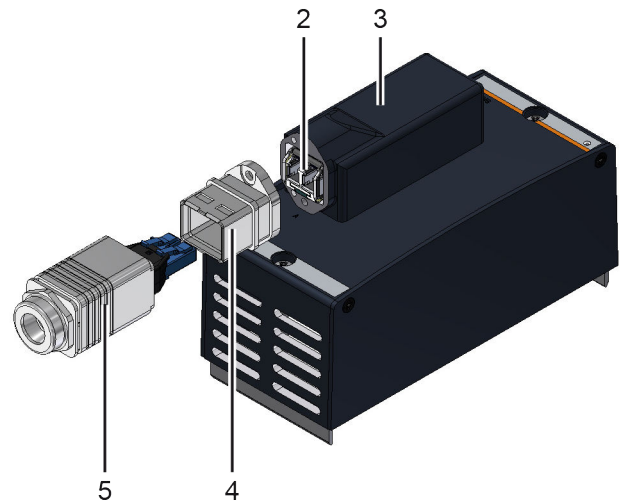
Catch unlocking no longer operable.

PushPull® adapter (4) must be dismantled for unlocking.

- Use interface (2) without PushPull® adapter (4)
- or -
- Remove the PushPull® adapter (4)



▼ FO connector mounting - LC duplex



▼ FO connector mounting - PushPull®

Mounting LC duplex connector

Procedure:

- ➔ Plug patch cable with LC duplex connector (1) into interface (2) without PushPull® adapter (4).
When mounting, ensure that the plug is securely locked at the transceiver interface.

Mounting the PushPull® system

Prerequisite:

- For a secure and robust plug connection with a PushPull® connector, the PushPull® adapter must be installed

Procedure:

1. ➔ Mounting PushPull® adapter (optional)
 - During mounting, ensure that the PushPull® connector is securely locked at the PushPull® adapter.
 - In case of independent mounting of the PushPull® adapter, care must be taken that the PushPull® adapter rests flush and without gaps on the transceiver housing.
 - ➔ Mount PushPull® adapter (4) on transceiver housing (1).
2. ➔ Fasten PushPull® adapter (4) with M3 screws. The permitted torque is 50 Ncm.
3. ➔ Mounting PushPull® connector
Push PullPull® connector (5) onto adapter (4).

Couplings

Couplings must only be used for transmission segments with plastic fiber cables (PMMA), or Multimode fiber optic cables. For transmissions with HCS/PCF cables there must always be a direct connection among the modules!

Couplings reduce the useable cable length. Bachmann electronic GmbH does not specify any couplings.

When selecting a coupling you should note the following requirements:

- The coupling must be specified in relation to the transmission attenuation (length losses).
- The coupling must be specified for the cable type used.
- Other tools are required for the assembly of the coupling.

Attenuation measurement Multimode

When using other measuring instrument sets, the procedure for measuring attenuation can vary. See the description of the respective measuring instrument set.

Prerequisites:

- Ready-made fiber optic cable with connectors
- Set of measuring instruments
For Bachmann electronic GmbH, for the attenuation measurement, the measuring instrument set NOY-MLP 4-2 from AFL Telecommunications GmbH is used, as are the FO types recommended by Bachmann electronic GmbH.
- LC duplex adapter FMA-LC-2x for measuring instrument set
- Accessories as specified in the tables below

Accessories - measurement with LC connector










Part type designation	Quantity (pc.)	Description
LC adapter cable	1	Multimode cable, 2-fiber with 2x LC Simplex connector ↔ LC duplex connector
LC coupling	1	LC-LC coupling for Multimode FO (duplex)

Accessories - measurement with PushPull® connector

Part type designation	Quantity (pc.)	Description
PushPull® adapter cable	2	Multimode cable, 2-fiber with 2x LC Simplex connector ↔ PushPull® LC connector
PushPull® coupling	2	PushPull® LC coupling for Multimode FO (duplex)










Measurement for FO cable with LC connector

Procedure:

1.  Connect the first connector of the LC adapter cable to the LED source OLS1 DUAL.
2.  Switch on LED source (operating mode without modulation).
 - Set the wavelength to 1300 nm.
3.  Adjust the OPM4 power meter (see power meter operation manual).
 - Set the wavelength to 1300 nm.
 - Set the measuring mode to dB.
4.  Connect the second connector of the adapter cable to the power meter.
5.  Set the reference level.
 - Press and hold the button "Ref/Set" until "[HELD]" is shown on the display.
6.  Remove the adapter cable from the power meter and connect it to an LC coupling.
7.  Connect the first connector of the FO cable to be tested, to the power meter.
8.  Connect the second connector of the FO cable to be tested, to the LC coupling.
9.  Compare the value displayed on the measuring instrument to the limit value.
 - ➔ Measurement completed.

Measurement for FO cable with PushPull connector

Procedure:

1.  Connect the LC connector of the first PushPull adapter cable to the LED source OLS1 DUAL.
2.  Switch on LED source (operating mode without modulation).
 - Set the wavelength to 1300 nm.
3.  Adjust the OPM4 power meter (see power meter operation manual).
 - Set the wavelength to 1300 nm.
 - Set the measuring mode to dB.
4.  Connect the LC connector of the second PushPull adapter cable to the power meter.
5.  Connect PushPull connectors of both adapter cables via a PushPull coupling.
6.  Set the reference level.
 - Press and hold the button "Ref/Set" until "[HELD]" is shown on the display.
7.  Remove one PushPull connector from the PushPull coupling.
8.  Connect the FO cable to both adapter cables via PushPull coupling.
9.  Compare the value displayed on the measuring instrument to the limit value.
 - ➔ Measurement completed.

Formulas for the link budget calculation:

$$LB \text{ (dB)} \geq M + V_L \text{ (dB/km)} * L + V_{C1} \text{ (dB)} + V_{C2} \text{ (dB)} + \dots + V_{Cn} \text{ (dB)}$$

LB – link budget (see Technical data of the respective module)

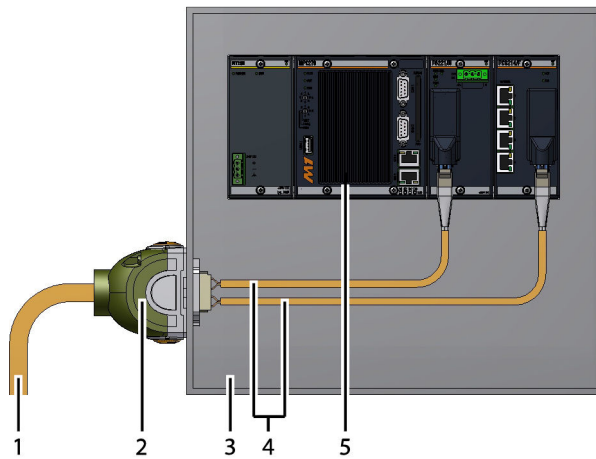
M – system margin (reserve, preferably 3 dB)

V_L – losses via the FO fiber (see data sheet for the FO fiber used)

L – length of the cable in [km]

V_{Cn} – losses via the couplings

Multi-fiber FO cable (Multimode)



- 1 Installation of multi-fiber FO cable (Multimode)
- 2 Switch cabinet leadthrough, e.g. system "Han-Yellock®" from HARTING KGaA
- 3 Switch cabinet
- 4 FO duplex cable, LC duplex connector M200-side
- 5 M200 controller

▼ *Example – installation of multi-fiber FO cable (Multimode)*