

Accessories



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 substations over distances of up to 2 kilometers. Multimode fibers are also used for fiber optic Ethernet connections allowing the inexpensive combination of Fastbus and Ethernet using multi-core cables.

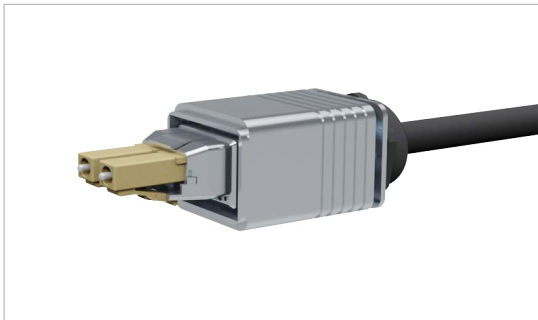
Bachmann electronic GmbH **recommends the following multimode cables**, which have been tested accordingly. Cables of other manufacturers with the same or better specifications can naturally be used. These must be tested before use.

Cable recommendations*

| Item | Item no. | Manufacturer | Description |
|------------------------------------|--------------|--------------|--|
| Glass fiber cable** (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** (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 |

* Information without guarantee, order directly from manufacturer

** When using the cables of other manufacturers, be aware of any different specifications, e.g. attenuation or minimum bend radius. Fibers with a core diameter of 50 µm or 62.5 µm can be used. The outer diameter of the fiber optic cable depends on the connector used, see connector data sheet.



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.

| Connector recommendations* for glass fiber cables (multimode) | | | |
|---|--------------------|--------------|--|
| Item | Item no. | 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 |

* Information without guarantee, order directly from manufacturer



PushPull® Adapter

This **adapter** is required **for PushPull® connectors**.

When an adapter is screwed on an LC patch cable must not be fitted as this covers the LC release lever so that it cannot be disconnected.

| Accessories | | |
|--------------------|-------------|---|
| Item | Item no. | Description |
| PushPull® adapter* | 00016682-00 | Adapter for Harting PushPull LC Connector |

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Mounting LWL connector/ PushPull® adapter

⚠ Caution

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).

Mounting LC duplex plug

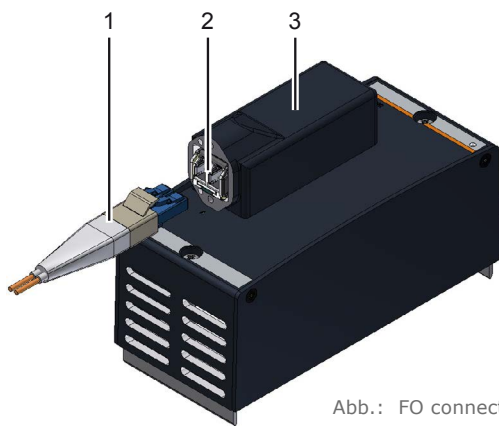


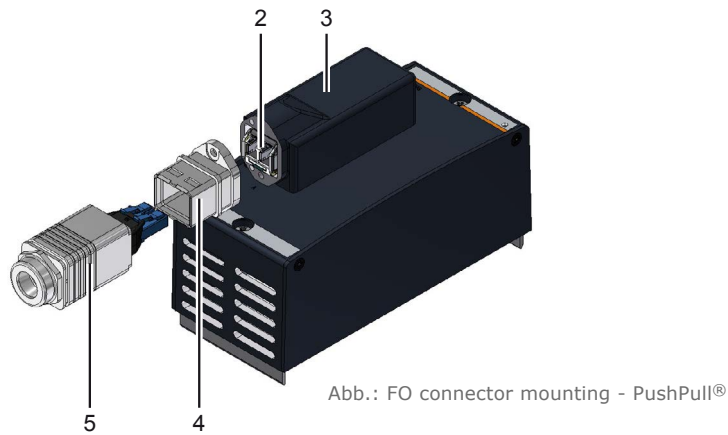
Abb.: FO connector mounting - LC duplex

Procedure:

CAUTION! When mounting, ensure that the plug is securely locked at the transceiver interface.

Plug patch cable with LC duplex plug (1) into interface (2) without PushPull® adapter (4).

Mounting the PushPull® system



Procedure:

Mounting PushPull® adapter (optional)

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.

1. Fasten PushPull® adapter (4) with M3 screws, permissible torque 50 Ncm.

Mount PushPull® connector

Requirements:

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

Caution! During installation, ensure that the PushPull® connector is securely locked at the PushPull® adapter.

Push PushPull® plug (5) onto adapter (4).

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Couplings

I Couplings must only be used for transmission segments with plastic fiber cables (PMMA), or multi-mode fiber optic cables.

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 completion of the coupling.

Attenuation measurement multi-mode

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

Requirements:

- Ready-made fiber optic cable with plugs
- 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

| Designation | Quantity [pc.] | Description |
|------------------|----------------|---|
| LC adapter cable | 1 | Multi-mode cable, 2-fiber with 2 x LC Simplex connector ↔ LC duplex connector |
| LC-coupling | 1 | LC-LC coupling for multi-mode FO (duplex) |

Accessories - measurement with PushPull® connector

| Designation | Quantity [pc.] | Description |
|-------------------------|----------------|---|
| PushPull®-adapter cable | 2 | Multi-mode cable, 2-fiber with 2 x LC Simplex connector ↔ PushPull®LC connector |
| PushPull®-coupling | 2 | PushPull® LC coupling for multi-mode 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 1,300 nm.
3. Adjust the OPM4 power meter (see power meter operation manual).
 - 3.1 Set the wavelength to 1,300 nm
 - 3.2 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 1,300 nm.
3. Adjust the OPM4 power meter (see power meter operation manual).
 - 3.1 Set the wavelength to 1,300 nm.
 - 3.2 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.
 - angezeigten Wert mit Grenzwert vergleichen.
 - Measurement completed.

Formulas for the link budget calculation

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

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]

VCX – losses via the couplings

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Multi-fiber FO cable (multi-mode)

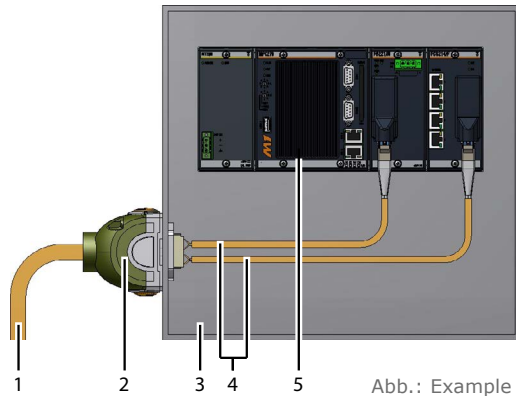


Abb.: Example – installation of multi-fiber FO cable (multi-mode)

- 1) Installation of multi-fiber FO cable (multi-mode)
- 2) Switch cabinet leadthrough z B. System "Han-Yellock®" from HARTING KGaA
- 3) Switch cabinet
- 4) FO duplex cable, LC duplex connector M1-side
- 5) M1 controller