

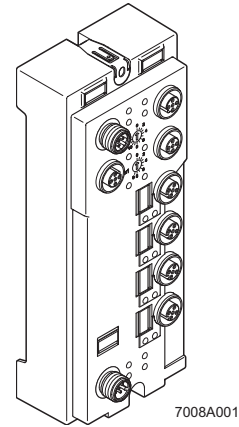
FLM BK PB M12 DI 8 M12-EF

Fieldline Modular Bus Coupler for PROFIBUS With 8 Digital Inputs

AUTOMATION

Data Sheet
8008_en_00

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1 Description

The device connects a Fieldline modular station to PROFIBUS-DP and is also used to acquire digital signals. 16 devices can be connected in any position to an existing PROFIBUS DP system using the bus coupler.

Features

- Connection to PROFIBUS-DP using M12 connectors (B-encoded)
- Opens the Fieldline modular local bus using M12 connectors (B-encoded)
- Length local bus max. 20 m
- Data transmission speed max. 12 Mbps (automatic detection)
- Device description using GSD file
- Dynamic configuration and empty spaces
- Supported PROFIBUS addresses 1 to 126
- Up to 16 PCP devices can be connected
- I & M functions
- Connection of digital sensors using M12 connectors

- Flexible voltage supply concept
- LED diagnostic and status indicators for bus operation and voltage supply
- Short-circuit and overload protection of the sensor supply
- Channel-specific diagnostics for different I/O devices
- IP65/IP67 protection

Additional features of EF versions

- IO-Link call (firmware 2.0 or later)



Make sure you always use the latest documentation. It can be downloaded at www.phoenixcontact.net/catalog. A conversion table is available on the Internet at www.download.phoenixcontact.com/general/7000_en_00.pdf.



This data sheet is only valid in association with the FLS FLM SYS INST UM E and FLS FLM PB SYS PRO UM E user manuals.

2 Ordering Data

2.1 Ordering Data Device and Accessories

Description	Order Designation	Order No.	Pcs./Pkt.
Fieldline Modular Bus Coupler for PROFIBUS With 8 Digital Inputs	FLM BK PB M12 DI 8 M12-EF	2773377	1
Protective caps (for unused sockets)	IBS IP PROT-12	1680539	5
Protective caps (for unused male connectors)	PROT-M12FS	1560251	5
5-pos. shielded metal socket, B-encoded, for the incoming local bus	SACC-M12FSB-5SC SH	1513596	1
Shielded metal connector, 5-pos., B-encoded, for the outgoing remote bus and local bus	SACC-M12MSB-5SC SH	1513570	1
Markers	ZBF 12:UNBEDRUCKT	0809735	10
Bridging cable for power supply, A-encoded, 5-pos., unshielded	SAC-5P-MS/ 0,13-186/FS SCO	1518481	1
Bridging cable for the local bus, B-encoded, 5-pos., shielded	SAC-5P-MSB/0,13-PUR/FSB SCO SH	1518478	1
Assembly system for 5 devices	FLM MP 5	2736660	1
Assembly system for 7 devices	FLM MP 7	2736673	1



Additional accessories for connecting the sensors and actuators can be found in the Phoenix Contact PLUSCON catalog.

2.2 Ordering Data for Documentation

Description	Order Designation
"Installing the Fieldline Product Range" user manual	FLS FLM SYS INST UM E
"Configuring a PROFIBUS DP System Using Devices in the Fieldline Product Range" user manual	FLS FLM PB SYS PRO UM E

3 Technical Data

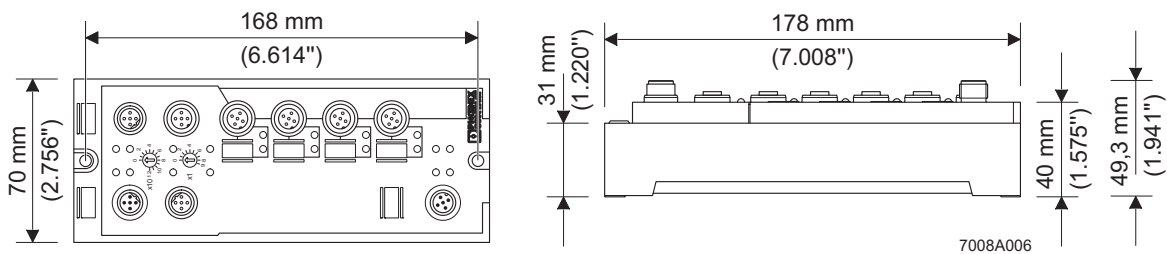


Figure 1 Device Dimensions

General Data	
Order Designation	FLM BK PB M12 DI 8 M12-EF
Order No.	2773377
Housing dimensions (width x height x depth)	70 mm x 178 mm x 49.3 mm
Weight	285 g, approximately
Type of sensor connection	2, 3 or 4-wire technology
Permissible temperature (operation)	-25°C to +60°C
Permissible temperature (storage/transport)	-25°C to +85°C
Permissible humidity (storage/transport)	95%

General Data



For a short period, slight condensation may appear on the housing.

Permissible air pressure (operation)	80 kPa to 106 kPa (up to 2,000 m above sea level)
Permissible air pressure (storage/transport)	70 kPa to 106 kPa (up to 3,000 m above sea level)
Degree of protection	IP65/IP67 according to IEC 60529
Class of protection	Class 3 according to VDE 0106, IEC 60536

Mechanical Requirements

Vibration test	5g load in each space direction
Sinusoidal vibrations according to EN 60068-2-6	
Shock test according to EN 60068-2-27	30g load, half sinusoidal wave positive and negative in each space direction



For additional information on mechanical requirements and ambient conditions, please contact Phoenix Contact.

Voltage Supply

Nominal value	24 V DC
Tolerable Range (EN 61131-2)	19 V DC to 30 V DC, ripple included
Current consumption at U_L at 24 V DC	
At 500 kbaud	35 mA, typical (100 mA, maximum)
At 2 Mbaud	40 mA, typical (100 mA, maximum)
Current consumption at U_S at 24 V DC	10 mA + sensor current, typical (600 mA, maximum)



Voltages U_L and U_S at female connector U_{LS} OUT can each only carry a maximum current of 2 A.

Digital Inputs

Number	8
Nominal input voltage	24 V DC
Range	-30 V DC < U_{IN} < + 30 V DC
Nominal input current	5 mA
Current flow	Linear in the range 1 V < U_{IN} < 30 V
Delay time	t_{ON} = 2.9 ms, typical t_{OFF} = 2.6 ms, typical
Permissible cable length to the sensor	< 30 m

Input Characteristic Curve

Input Voltage (V)	Typical Input Current (mA)
-30 < U_{IN} < 0.7	0
3	0.5
6	1.0
9	1.5
12	2.2
15	3.0
18	3.6
21	4.4
24	5.1
27	5.8
30	6.6

Sensor Supply

Minimum sensor voltage	U _S -1 V
Nominal current per channel	600 mA
Nominal current per device	600 mA
Overload protection	Electronic per device
Short-circuit protection	Electronic per device

Error Messages to the Higher-Level Control or Computer System

Sensor supply short-circuit	Yes
Sensor supply overload	Yes



If an error is triggered by an overload or short circuit of the sensor supply, the device switches off the sensor supply of the channels and updates the diagnostics. The corresponding error message can then be read out by the master. If the sensor supply U_S is not sufficiently high, the master can read out an appropriate error message also.

Interface

Bus system	PROFIBUS DP
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Incoming Bus

Coupling of shield connection	Directly to FE
Transmission Speed	12 Mbaud, maximum

Outgoing Bus

Coupling of shield connection	Directly to FE
Transmission Speed	12 Mbaud, maximum



For transmission rates of more than 3 Mbaud in PROFIBUS, series inductance is available in the device. Please observe the installation instructions of the PROFIBUS User Organization.

Electrical Isolation/Isolation of the Voltage Areas



For device connection, please note the instructions and regulations in the "Installing the Fieldline Product Range" user manual FLS FLM SYS INST UM E.

Separate Potentials in the FLM BK PB M12 DI 8 M12-EF

- Test Distance

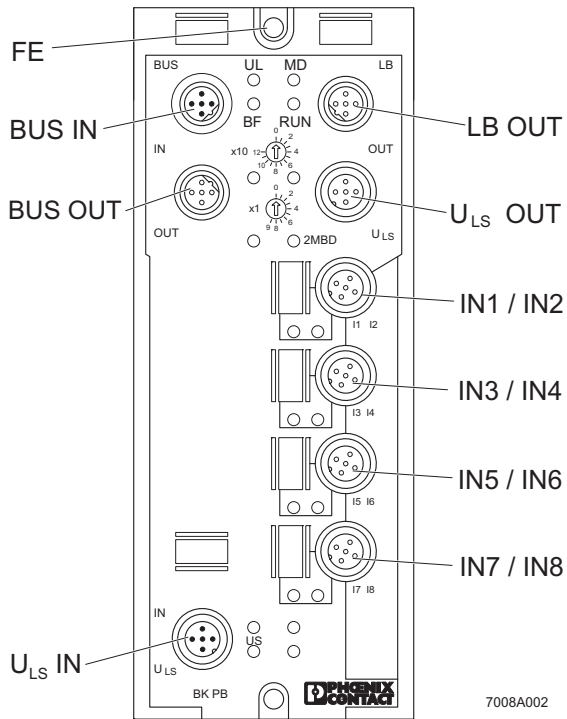
24 V supply (bus logic) / FE	500 V AC, 50 Hz, 1 min
24 V supply (bus logic) / digital inputs (sensor supply/I/O)	500 V AC, 50 Hz, 1 min
24 V supply (bus logic) / incoming remote bus	500 V AC, 50 Hz, 1 min
Digital inputs (sensor supply/I/O) / FE	500 V AC, 50 Hz, 1 min
Digital inputs (sensor supply / I/O) / incoming remote bus	500 V AC, 50 Hz, 1 min
Incoming remote bus / FE	500 V AC, 50 Hz, 1 min

- Test Voltage

Approvals

For the latest approvals, please visit www.phoenixcontact.net/download.

4 Pin Assignment



Designation	Meaning
FE	Functional earth ground
BUS IN	PROFIBUS IN
BUS OUT	PROFIBUS OUT
LB OUT	Local bus OUT (FLM local bus)
U_{LS} IN	Power supply IN (logic and sensor supply)
U_{LS} OUT	Voltage supply OUT (logic and sensor supply) for additional devices
IN1 to IN8	Inputs 1 to 8



ACHTUNG:

In general, the maximum current load of 4 A per contact must not be exceeded.

Figure 2 Connections of the FLM BK PB M12 DI 8 M12-EF

4.1 Pin Assignment PROFIBUS

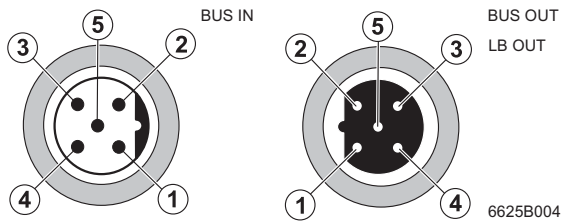


Figure 3 PROFIBUS pin assignment (M12 B-encoded)

4.2 Local Bus Pin Assignment (LB OUT)

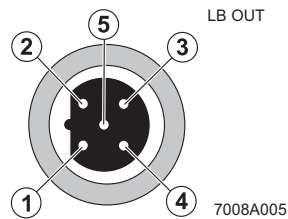


Figure 4 Local bus pin assignment (LB OUT)

Pin	BUS IN	BUS OUT
1	VP (Supply voltage + 5 V for terminal resistor)	VP (Supply voltage + 5 V for terminal resistor)
2	RxD/TxD-N (A)	RxD/TxD-N (A)
3	GND VP	GND VP
4	RxD/TxD-P (B)	RxD/TxD-P (B)
5	Shield	Shield

Pin	LB OUT
1	DO
2	\overline{DO}
3	DI
4	\overline{DI}
5	GND



The shield is connected to FE in the device.



The thread is used for shielding.

Mains termination resistors

Since PROFIBUS DP is a serial bus system in a linear or tree structure, the individual branches must be terminated with a termination resistor. The bus coupler does not have a resistor of this type. For additional information, please refer to the PROFIBUS documentation.

Phoenix Contact recommends using the PROFIBUS connector SAC-5P-M12MS PB TR (Orden No. 1507803). This connector has a termination resistor that can be connected.

4.3 Pin Assignment of the Voltage Supply U_{LS}

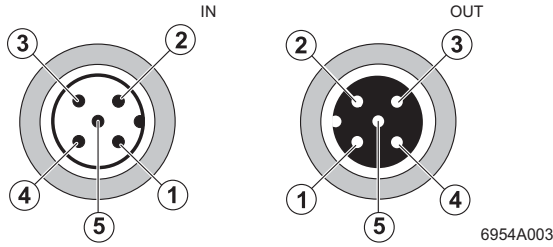


Figure 5 Pin assignment of the voltage supply U_{LS}

Pin	IN	OUT
1	$U_L +24\text{ V}$	$U_L +24\text{ V}$
2	$U_S\text{ GND}$	$U_S\text{ GND}$
3	$U_L\text{ GND}$	$U_L\text{ GND}$
4	$U_S +24\text{ V}$	$U_S +24\text{ V}$
5	500 kbaud / 2 Mbaud	500 kbaud / 2 Mbaud



ACHTUNG:

Voltages U_L and U_S at female connector U_{LS} OUT can each only carry a maximum current of 2 A.

4.4 Pin Assignment of the Inputs

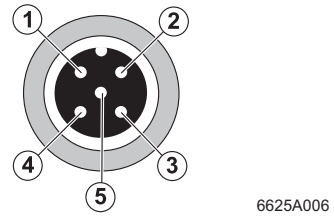


Figure 6 Pin assignment of the inputs

Pin	Input Socket (IN_x/IN_{x+1})
1	$U_S +24\text{ V}$
2	Input $x+1$
3	$\text{GND } U_S$
4	Input x
5	$\text{GND } U_S$

4.5 Assignment of the Input Sockets

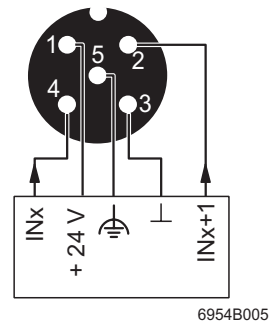


Figure 7 Assignment of the input sockets



Two input signals can be connected to each input socket.

5 Local Diagnostic and Status Indicators

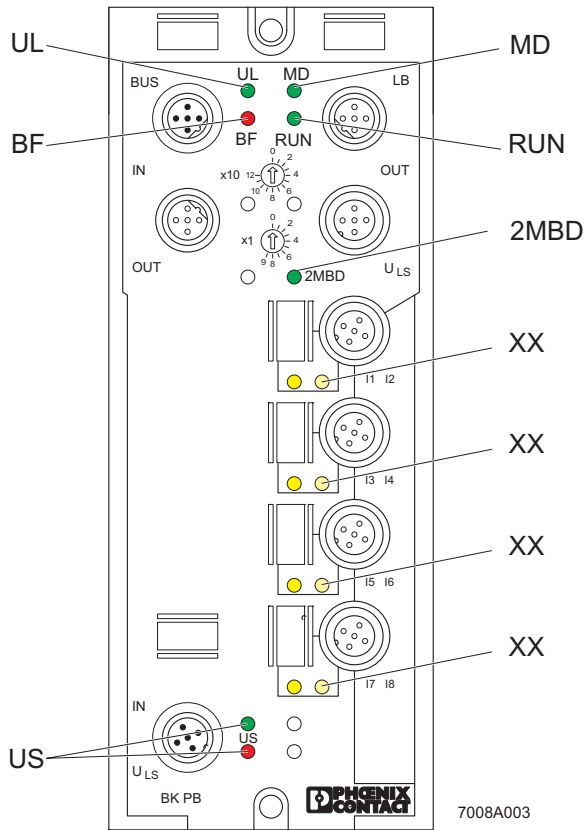


Figure 8 Diagnostic and status indicators of the FLM BK PB M12 DI 8 M12-EF

Rotary Encoding Switches

Set the station address using both rotary encoding switches X10 (for the first digit of a two-digit number) and X1 (for the second digit of a two-digit number). The PROFIBUS master addresses the device by means of this station address.



The valid value range is between 1 and 126.
A new address value is only accepted upon device power up.

6 Setting the transmission speed on the FLM local bus

You can set the transmission speed of the FLM local bus on pin 5 of connector U_{LS} IN by presetting the potential.

500 kbaud

The device baud rate (without jumper) is 500 kbaud.

2 Mbaud

If pin 5 and U_L are interconnected, 2 Mbaud is the transmission speed on the FLM local bus. Wiring can be performed by, for example, jumpering pin 1 and pin 5 on the input connector.

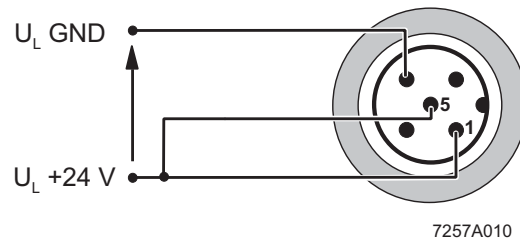
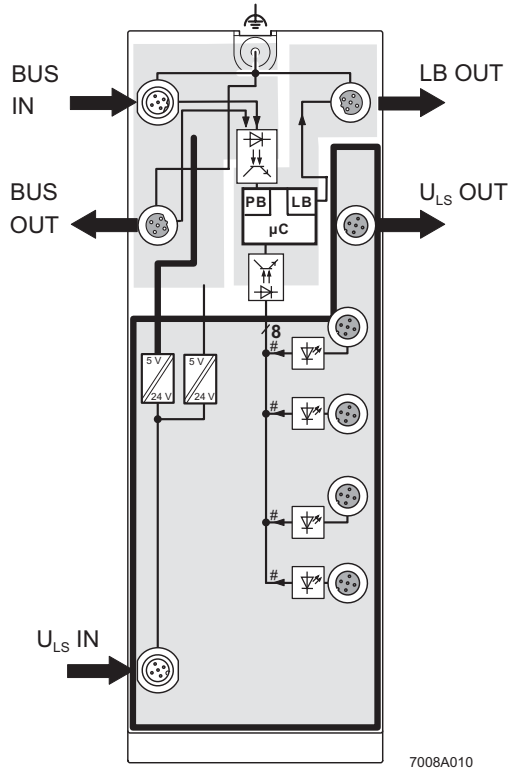


Figure 9 Setting 2 Mbaud

Des.	Color	Meaning
UL	Green LED:	Communications power
	ON:	Communications power present
	OFF:	Communications power too low
BF	Red LED:	No cyclic data transmission: <ul style="list-style-type: none"> – PROFIBUS not connected, master not active – Incorrect settings (configuration via master, station address) Timeout expired
	LED OFF:	Device addressed by PROFIBUS;a parameterization was received No power supply for the device (In this state the "UL" LED also is off because of the missing 24 V communications power.)
MD	LED green/red/ yellow:	Device status
	Green ON:	Device ready to operate.
	Green, flashing: 1 Hz	A recoverable error is present (local bus not complete). Station in process data mode.
	Green/red Flashing: (flicker)	Device in selftest state.
	Red ON:	An irrecoverable error is present.
	Red flashing: 1 Hz	Local bus is read, no process data transmission on local bus.
	Yellow flashing: 1 Hz	More than 16 devices configured or system restriction of 244 bytes of process data/ configuration data exceeded.
	OFF:	Voltage not present
RUN	LED green/red/ yellow:	Status of local bus communication
	Green ON:	Local bus is running data cycles.
	Green, flashing: 1 Hz	I/O error present
	Red ON:	Local bus stopped.
	Red/yellow Flashing: 1 Hz	There are differences between specified and current configuration.
	Green/yellow Flashing: 1 Hz	Preprogrammed error values are written to the outputs. PLC stopped or PROFIBUS connection interrupted (cable, connector).
	Yellow flashing: 1 Hz	PCP error on a local bus device
	OFF:	Voltage not present
US	Green/red LED:	Voltage supply for inputs IN1 to IN8
	Green ON:	Voltage supply present.
	Red ON:	Overload or voltage supply too low.
	OFF:	Voltage supply not present

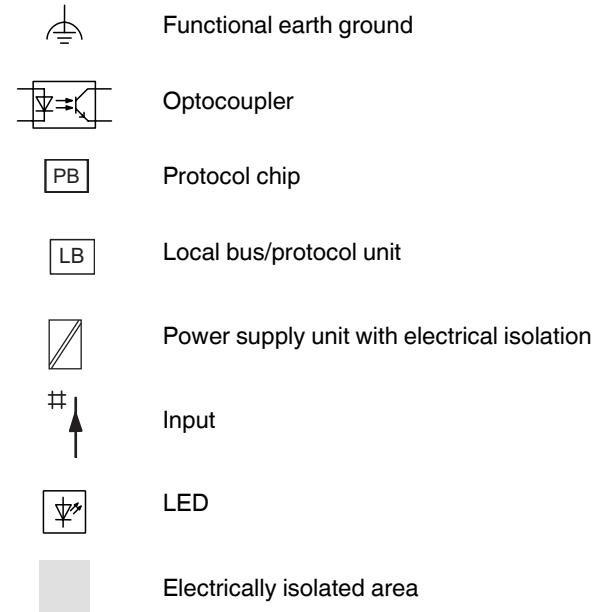
7 Internal Circuit Diagram



7008A010

Figure 10 Internal wiring of the connection points

Key:



For information on electrically isolated areas, please refer to page 4.

8 Connection Example

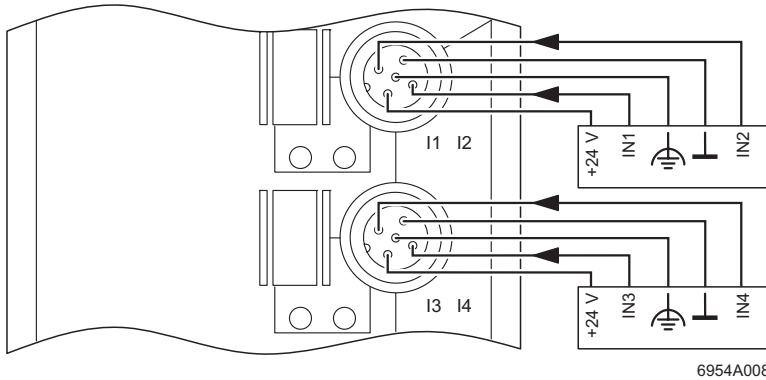


Figure 11 Typical sensor connections

9 Connection Notes



ACHTUNG: Ensure degree of protection

To ensure IP65/IP67 protection, cover unused sockets with protective caps.



ACHTUNG: Avoid damage to the electronics

Make sure you only supply the sensors with the voltage U_S provided at the connection points.



ACHTUNG: Avoid polarity reversal

Avoid polarity reversal of the supply voltages U_L and U_S in order to prevent damage to the device.



Meet noise immunity requirements

Connect FE using a mounting screw or a cable connection to the FE connection latch (when mounting on a non-conductive surface).



Observe connection point assignment

When connecting the sensors, observe the assignment of the connection points to the PROFIBUS IN process data (see "Process Data" on page 12).

10 Configuration Data

ID number	0C39
Input address area	8 bits

11 Process Data

11.1 Assignment of the Connection Points to the IN Process Data

(Byte.bit) view	Byte	Byte 0							
	Bit	7	6	5	4	3	2	1	0
Device	Input	8	7	6	5	4	3	2	1

12 Diagnostic Data

12.1 Mapping of the Diagnostic Data in PROFIBUS

Diagnostic Data	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Remark
Byte 0	X	X	X	X	X	X	X	X	Station status 1
Byte 1	X	X	X	X	X	X	X	X	Station status 2
Byte 2	X	X	X	X	X	X	X	X	Station status 3
Byte 3	X	X	X	X	X	X	X	X	Master address PROFIBUS
Byte 4	0	0	0	0	1	1	0	0	High ID number (0C _{hex})
Byte 5	0	0	1	1	1	0	0	1	Low ID number (39 _{hex})



Bytes 0 to 5 are PROFIBUS standard diagnostic. Bytes 6 to 78 are device-specific. For information on device-specific bytes, please refer to the FLS FLM PB SYS PRO UM E user manual.



If a diagnostic event occurs the diagnostic data is always sent to the master by means of a diagnostic telegram generated once by the device. The current status of the diagnostic data can be read by the device at any time.



For further information on the diagnostic data please refer to the FLS FLM PB SYS PRO UM E user manual.

13 IO-Link

In contrast to individual signal wiring, which was previously primarily used, IO-Link uses a 3-wire connection to sensors and actuators. This means that in addition to transmitting a simple switching signal, bidirectional serial communication is also possible. IO-Link is also suitable for mixed operation. If an interface does not support IO-Link, the device automatically switches to SIO mode (Standard Input/Output).

IO-Link call

IO-Link call refers to communication between the IO-Link client (PROFIBUS DP master) and the IO-Link server (FLM BK PB M12 DI 8 M12-EF).

Access to IO-Link objects is via PROFIBUS DP using read/write requests.