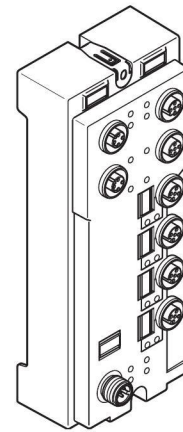


# FLM BK EIP M12 DI 8 M12-2TX

## Fieldline Modular Bus Coupler for Ethernet/IP With 8 Digital Inputs



### AUTOMATION

Data Sheet  
7563\_en\_00

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## 1 Description

The device connects a Fieldline modular station to an Ethernet network and is also used to acquire digital signals.

## Features

- 2 x Ethernet/IP Twisted Pair in accordance with 802.3 with auto negotiation and auto crossover
- Transmission rates of 10 Mbps and 100 Mbps
- IP parameter setting via BootP
- Software interface: Ethernet/IP CIP Interface
- Management via WEB Interface
- Connection to the Ethernet/IP network using M12 connectors (D-encoded)
- Opens the Fieldline Modular local bus using M12 connectors (B-encoded)
- Connection of digital sensors using M12 connectors (A-encoded)
- Flexible voltage supply concept
- Diagnostic and status indicators for network and local bus operation and voltage supply
- Overload and short circuit protection of the sensor supply
- IP65/IP67 protection



Make sure you always use the latest documentation. It can be downloaded at [www.download.phoenixcontact.com](http://www.download.phoenixcontact.com).

A conversion table is available on the Internet at [www.download.phoenixcontact.com/general/7000\\_en\\_00.pdf](http://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 (Order No. 2698973) and UM EN FLM EIP SYS PRO (Order No. 2910431) user manuals.

## 2 Ordering Data

### Products

Description	Type	Order No.	Pcs./Pkt.
Fieldline Modular bus coupler for Ethernet/IP with 8 digital inputs	FLM BK EIP M12 DI 8 M12-2TX	2773322	1

### Accessories

Description	Type	Order No.	Pcs./Pkt.
Protective caps for unused female connectors	IBS IP PROT-IO	2759919	10
Protective caps for unused male connectors	PROT-M12-M	2736194	10
Connector, metal, shielded, D-encoded 4-pos. for Ethernet	SACC-M12MSD-4CON-PG 9-SH	1521261	1
Connector, metal, shielded, B-encoded, 5-pos., for the local bus	SACC-M12MSB-5SC SH	0809735	1
Bridging cable for voltage supply, A-encoded, 5-pos., unshielded	SAC-5P-MS/ 0,13-186/FS SCO	1518481	1
Bridging cable for local bus, B-encoded, 5-pos., shielded	SAC-5P-MSB/0,13-PUR/FSB SCO SH	1518478	1
Assembly system for five devices	FLM MP 5	2736660	1
Assembly system for seven devices	FLM MP 7	2736673	1
Markers	ZBF 12:UNBEDRUCKT	0809735	10

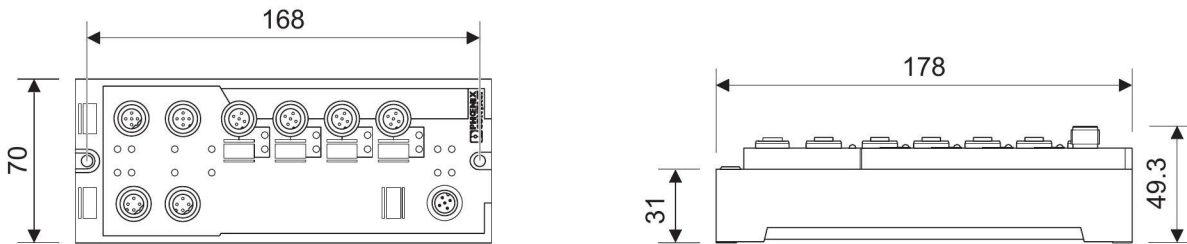


Additional accessories for connecting the sensors can be found in the Phoenix Contact PLUSCON catalog.

### Documentation

Description	Type	Order No.	Pcs./Pkt.
"Installing the Fieldline Product Range" user manual	FLS FLM SYS INST UM E	2698973	1
"Configuring an Ethernet/IP System Using Devices in the Fieldline Product Range" user manual	UM EN FLM EIP SYS PRO	2910431	1

### 3 Technical Data



7563A002

Figure 1 Dimensions of the Device (mm)

General Data	
Order designation	FLM BK EIP M12 DI 8 M12-2TX
Order no.	2773322
Housing dimensions (width x height x depth)	70 mm x 178 mm x 49.3 mm
Weight	290 g, approximately
Connection method for sensors	2, 3, or 4-wire technology
Permissible temperature (operation)	-25°C to +55°C
Permissible temperature (storage/transport)	-25°C to +85°C
Permissible humidity (storage/transport)	95%



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

Permissible air pressure (operation)	80 kPa to 106 kPa (up to 2000 m above sea level)
Permissible air pressure (storage/transport)	70 kPa to 106 kPa (up to 3000 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	
Sinusoidal vibrations according to EN 60068-2-6	5g load in each space direction
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.

**Power Supply**

Nominal value	24 V DC
Range	18 V DC to 30 V DC
Current consumption at $U_L$ at 24 V DC	
Without FLM local bus	60 mA, typical
With FLM local bus	118 mA, typical
Current consumption at $U_S$ at 24 V DC	5 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	1.6
12	2.3
15	3.0
18	3.8
21	4.5
24	5.2
27	6.0
30	6.7

**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 (I/O error information).  
If the sensor supply  $U_S$  is not sufficient anymore, diagnostic information is present. The device provides the diagnostic information via the corresponding services of the application protocols of the application.

**Network Interface**

Type	Ethernet/IP
	10 Base-T and 100 Base-TX
Speed	10 Mbps (10 Base-T), 100 Mbps (100 Base-TX) half duplex, full duplex, auto negotiation
Connection method	Twisted pair cable CAT 5, M12 female connector, D-encoded

**Local Bus Interface**

Speed	500 kbaud / 2 Mbaud
Connection method	INTERBUS cable, M12 female connector, B-encoded
Coupling of shield connection	Directly to FE
Electrical isolation	No, at U <sub>L</sub> potential

**Electrical Isolation/Isolation of the Voltage Areas**

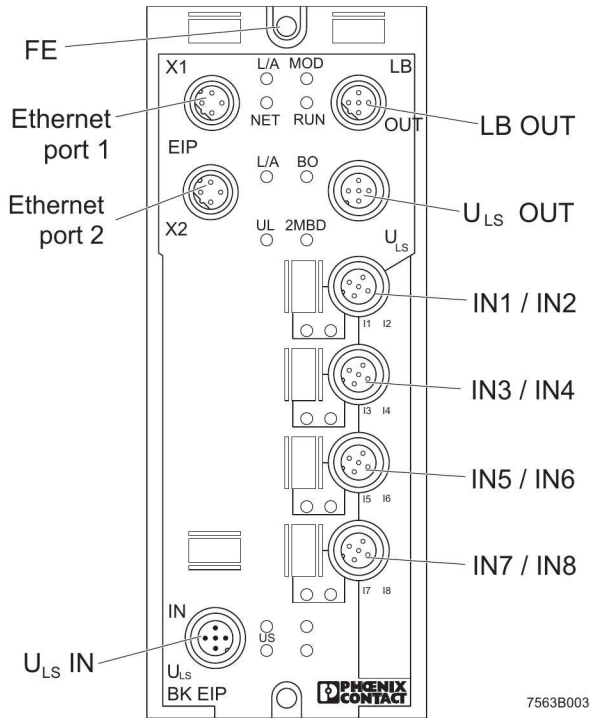


For device connection, please note instructions and regulations in the "Installing the Devices of the Fieldline Product Range" user manual FLS FLM SYS INST UM E (Order No. 2698973).

**Separate Potentials in the FLM BK EIP M12 DI 8 M12-2TX**

Test Distance	Test Voltage
24 V supply (logic) / FE	500 V AC, 50 Hz, 1 min
24 V supply (logic) / digital inputs (sensor supply / I/O)	500 V AC, 50 Hz, 1 min
24 V supply (logic) / Ethernet/IP	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) / Ethernet/IP	500 V AC, 50 Hz, 1 min
Ethernet/IP / FE	500 V AC, 50 Hz, 1 min

## 4 Connection Assignment



Desig.	Meaning
FE	Functional earth ground
X1	Ethernet port 1
X2	Ethernet port 2
LB OUT	Local bus OUT (FLM local bus)
UL <sub>S</sub> IN	Power supply IN (logic and sensors)
UL <sub>S</sub> OUT	Power supply OUT (logic and sensors) for additional devices
IN1 to IN8	Inputs 1 to 8



**NOTE:**

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

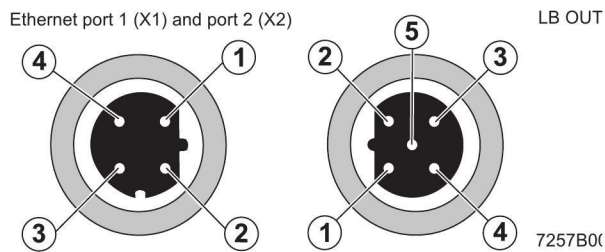


**NOTE:**

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

Figure 2 Connections of the FLM BK EIP M12 DI 8 M12-2TX device

### 4.1 Pin Assignment of Ethernet and Local Bus OUT



Pin	Ethernet port 1 (X1)	Ethernet port 2 (X2)	LB OUT
1	TX+	TX+	DO
2	RX+	RX+	DO
3	TX-	TX-	DI
4	RX-	RX-	DI
5			GND

Figure 3 Pin assignment of Ethernet (M12 D-encoded)  
Pin assignment of LB OUT (M12 B-encoded)



The thread is used for shielding.

#### 4.2 Pin Assignment of the Power Supply $U_{LS}$

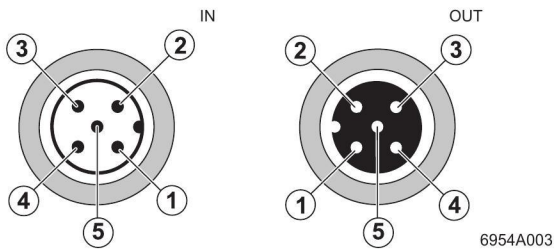


Figure 4 Pin assignment of the power supply  $U_{LS}$

Pin	IN	OUT
1	$U_L +24 V$	$U_L +24 V$
2	$U_S GND$	$U_S GND$
3	$U_L GND$	$U_L GND$
4	$U_S +24 V$	$U_S +24 V$
5	Default settings 500 kbaud / 2 Mbaud	



You can change the transmission speed on the local bus from 500 kbaud to 2 Mbaud. The transmission speed is switched to 2 Mbaud by jumpering +24 V ( $U_L$ , pin 1) to pin 5 see page 8.

#### 4.3 Pin Assignment of the Inputs

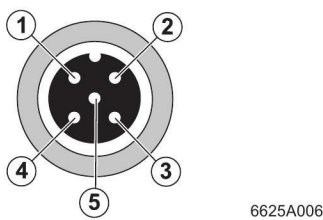


Figure 5 Pin assignment of the inputs (M12 A-encoded)

Pin	Female Input Connector (INx/INx+1)
1	$U_S +24 V$
2	Input x+1
3	GND
4	Input x
5	FE

#### 4.4 Assignment of the Female Input Connectors

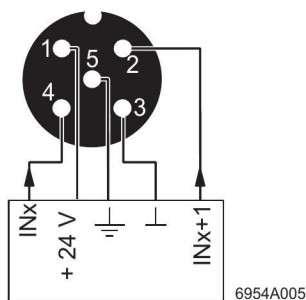


Figure 6 Assignment of the female input connectors



Two input signals can be connected to each female input connector.



## 5 Setting the Transmission Speed on the FLM Local Bus

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

### 500 kbaud

The baud rate for the device (without bridge) 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, bridging pin 1 and pin 5 on the input connector.

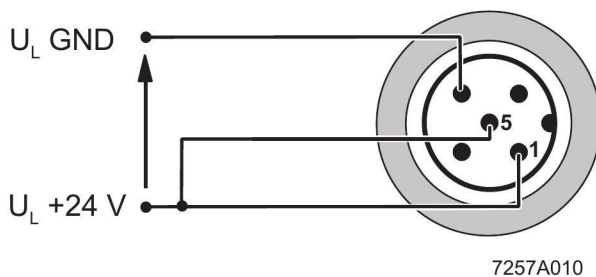


Figure 7 Setting 2 Mbaud

## 6 Resetting the Device to the Default Settings

Resetting the device to the default settings reactivates BootP and deletes the IP parameters stored.

You can reset the device to the default settings using pin 5 of connector  $U_{LS}$  IN. Proceed as follows:

- First, switch off the power supply of the bus coupler and then remove any bridges for setting the baud rate.
- Connect pin 5 using an external button (form A contact) to  $U_L$  (pin 1).
- Keep the button pressed.
- Then turn on the power supply.
- Release the button if the 2 MBD LED flashes.

The processor detects the signal change and the device is reset to the default settings. The bus coupler automatically boots using the default settings.

Booting is completed when the LED BO flashes. This process can take at least 30 seconds. When the LED BO flashes the bus coupler sends BootP requests and is reset to its factory settings.

After the bus coupler has received the IP parameters from the BootP server, these parameters are stored. The bus coupler boots again with these IP parameters. It is ready for operation again when after this process the LED MD flashes yellow, the LED RUN flashes green and the LED BO is off.

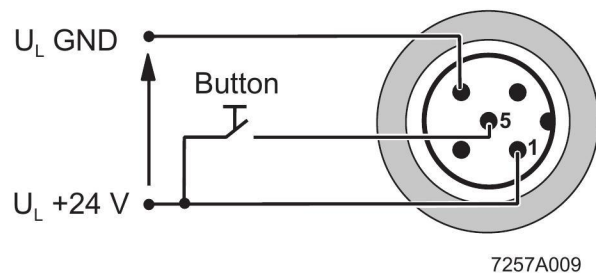


Figure 8 Circuit diagram for resetting the device to the default settings



7 Local Diagnostic and Status Indicators

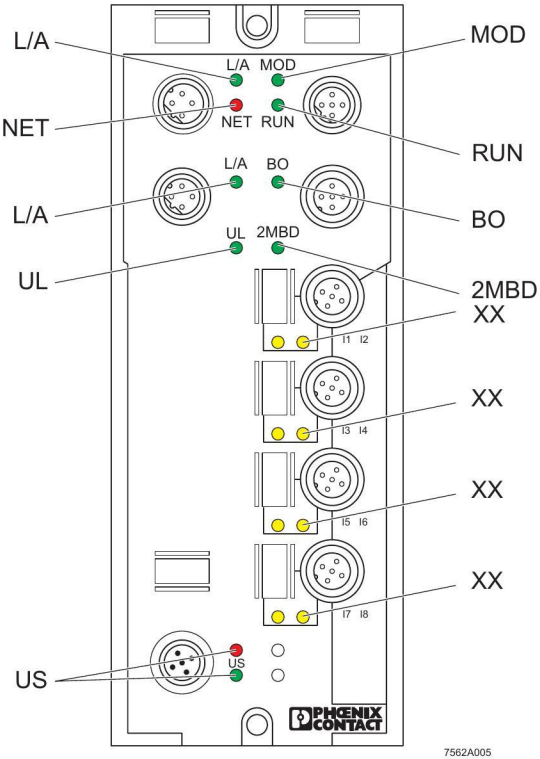
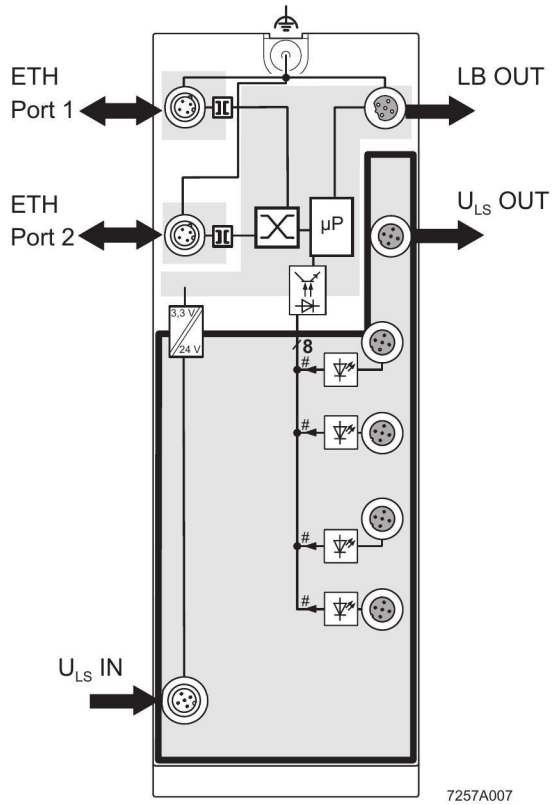


Figure 9 Diagnostic and status indicators of the FLM BK EIP M12 DI 8 M12-2TX device

Designation	Color	Meaning
L/A, Port 1	Green/yellow LED	Ethernet status
	Green on:	Link present at port 1, no activity
	Yellow on:	Activity at port 1, data traffic
	Off:	No link present at port 1
NET	Red/green LED	Network connection status
	Red on:	Duplicate IP Address Error
	Red flashing:	Connection Timeout
	Green on:	Connected, at least one established connection.
	Green flashing:	No Established Connection yet, IP address is present.
	Off:	No IP address or device not powered.
L/A, Port 2	Green/yellow LED	Ethernet/IP status
	Green on:	Link present at port 2, no activity
	Yellow on:	Activity at port 2, data traffic
	Off:	No link present at port 2

Designation	Color	Meaning
<b>UL</b>	Green LED	Communications power
	On:	Communications power present.
	Off:	Communications power too low.
<b>US</b>	Green LED	Voltage supply for inputs IN1 to IN8
	On:	Voltage supply present.
	Off:	Voltage supply not present.
	Red LED:	Overload or voltage supply too low.
<b>MOD</b>	Green/red/ LED	Device status indicator
	Green on:	Device is working properly.
	Green flashing:	Device needs to be configured (not an error).
	Red on:	Non-correctable error; Major Fault
	Red flashing:	Correctable error, local bus missing; Minor Fault
	Red/green flashing:	Self check running.
	Off:	Voltage supply not present.
<b>RUN</b>	Green/red/yellow LED	Status of local bus communication
	Green on:	Local bus configured and started.
	Green flashing:	I/O error present.
	Red on:	Local bus error / local bus in stop mode.
	Red flashing:	Differences between expected and actual configuration are present.
	Yellow on:	Local bus configuration is being determined, no data cycles yet, device is ready to operate.
	Off:	Voltage not present.
<b>BO</b>	Green LED	Status of the firmware
	Green on:	Firmware starting.
	Green flashing:	Firmware ready for operation, waiting for BootP reply.
	Off:	Boot loader inactive, firmware successfully started.
<b>2MBD</b>	Green LED	Indication of data transmission speed
	ON:	Local bus runs at 2 Mbaud.
	OFF:	Local bus runs at 500 kbaud.
	Flashing:	Resetting the device to the default settings
<b>XX</b>	Yellow LED	Status indicators of the inputs
	ON:	Input active.
	OFF:	Input inactive.





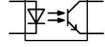




## 8 Internal Circuit Diagram



7257A007

Figure 10 Internal wiring of the connection points

Key:

-  Functional earth ground
-  Transmitter with electrical isolation
-  Switch
-  Microprocessor
-  Optocoupler
-  Power supply unit with electrical isolation
-  Input
-  LED
-  Electrically isolated area



For information on electrically isolated areas, please refer to page 5.

## 9 Connection Example

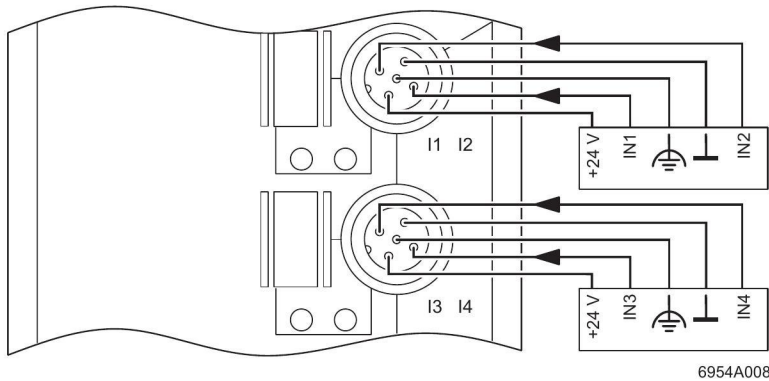


Figure 11 Typical sensor connections

## 10 Connection Notes



**NOTE:**

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



**NOTE:**

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



**NOTE:**

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 assignment**

When connecting the sensors, observe the assignment of the connection points to the Ethernet IN process data (see "Process Data" on page 13).

## 11 Process Data

### Assignment of the Connection Points of the Local Inputs to the IN Process Data

(Word.bit) view	Word	Word 0																
	Bit	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Device	Input	x	x	x	x	x	x	x	x	x	18	17	16	15	14	13	12	11



For further information on diagnostic data, please refer to the FLS FLM ETH SYS PRO UM E user manual (Order No. 2888615).