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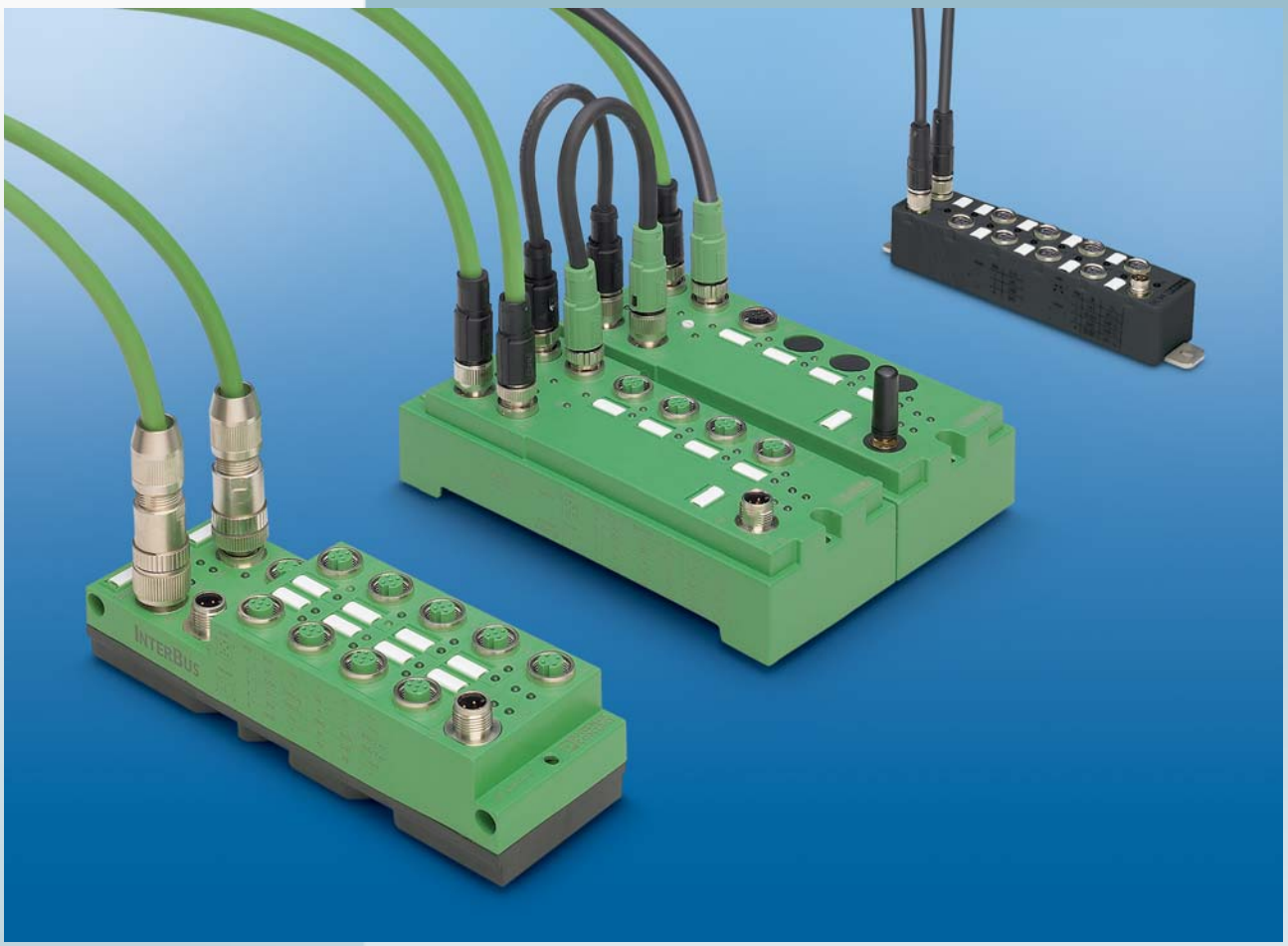

User Manual

FLS FLM SYS INST UM E

Order No.: 2698973

Installation of Devices in the Fieldline Product Range

PHOENIX CONTACT
INSPIRING INNOVATIONS

AUTOMATIONWORX

User Manual
Installation of Devices in the Fieldline Product Range

09/2007

Designation: FLS FLM SYS INST UM E

Revision: 04

Order No.: 2698973

This user manual is valid for:

Devices of the Fieldline product range connected to different bus systems

Please Observe the Following Notes

In order to ensure the safe use of the product described, we recommend that you read this manual carefully. The following notes provide information on how to use this manual.

User Group of This Manual

The use of products described in this manual is oriented exclusively to qualified electricians or persons instructed by them, who are familiar with applicable standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.

Phoenix Contact accepts no liability for erroneous handling or damage to products from Phoenix Contact or third-party products resulting from disregard of information contained in this manual.

Explanation of Symbols Used

The *attention* symbol refers to an operating procedure which, if not carefully followed, could result in damage to hardware and software or personal injury.

The *note* symbol informs you of conditions that must be strictly observed to achieve error-free operation. It also gives you tips and advice on the efficient use of hardware and on software optimization to save you extra work.

The *text* symbol refers to detailed sources of information (manuals, data sheets, literature, etc.) on the subject matter, product, etc. This text also provides helpful information for the orientation in the manual.

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– WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.
– WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
– ALL WIRING OF THESE DEVICES MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE ARTICLE 501.4(B) FOR CLASS I, DIVISION 2.

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Should you have any suggestions or recommendations for improvement of the contents and layout of our manuals, please send us your comments.

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1 Fieldline

1.1 The Fieldline Product Range

The input and output devices in the Fieldline product range are designed for distributed automation tasks in harsh environmental conditions. The devices meet the requirements for IP65/IP67 protection. They enable direct connection of sensors and actuators in an environment close to the station.

The Fieldline product range includes the Fieldline Stand-Alone (FLS) and Fieldline Modular (FLM) product groups. FLS devices are available in M12 connection method. With FLM devices you can choose between M12 and M8 connection method. If not mentioned explicitly, the M12 connection method is used in this manual.

Fieldline Stand-Alone devices cannot be extended and have a directly integrated fieldbus connection and I/O level. They are used for distribution in the field when only a few digital I/O points are required.

Fieldline Modular systems consist of a bus coupler (gateway) and I/O devices that can be connected. They are used for special functions, primarily for applications with a high I/O node density and complex functions.

Directly on the field level the Fieldline Modular M8 devices complement the Fieldline product range to form a sophisticated system. The Fieldline Modular M8 devices are perfectly designed for acquisition and output of signals in the direct proximity to the process when only limited space is available.

Bus systems

The Fieldline devices are available for the following bus systems:

INTERBUS

PROFIBUS-DP

PROFINET

DeviceNet™

CANopen

Ethernet

The following tables provide an overview of the meaning of the product designations used within the Fieldline product range.

Table 1-1 Structure of the product designation

Type	Basic Devices	Fieldbus	Bus Connection	I/O Type	I/O Connection	Exten-sion
FLS		IB	M12	DI x	M8	-2A
FLM	BK	PB	M8	DO y	M12	DIAG
		DN		DIO x/y		RTD
		CO		AI		2TX
		ETH		AO		SF
		EIP		IOL		NPN
		PN		TEMP		

Examples:

FLS		PB	M12	DIO 4/4	M12	-2A
FLM	BK	IB	M12	DI 8	M12	
FLM				AI 4 SF	M12	
FLM				DIO8/4	M8	

Table 1-2 Structure of the product designation for Bluetooth devices

Type	Bus Connection	Basic Device	Type	I/O Type	I/O Connection
FLM	BT	BS	3		
FLM	BT		P2P	DIO x/y	M12

Examples:

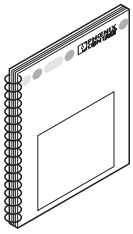
FLM	BT	BS	3		
FLM	BT			DIO 8/8	M12

Table 1-3 Meaning of the product designation

Abbrev.	Meaning
FLS	Fieldline Stand-Alone
FLM	Fieldline Modular
BK	Bus coupler
BS	Base station
IB	INTERBUS
PB	PROFIBUS-DP
DN	DeviceNet™
CO	CANopen
ETH	Ethernet
BT	Bluetooth
EIP	Ethernet IP
PN	PROFINET
P2P	Point-to-point
M8	M8 connector
M12	M12 connector
DI x	x digital inputs
DO y	y digital outputs
DIO x/y	x digital inputs; y digital outputs
AI x SF	x analog inputs, (standard function)
AO y SF	y analog outputs, (standard function)
-2A	Nominal current of an output is 2 A
DIAG	Extended diagnostics
RTD	Shunt
2TX	2 ports, twisted pair
NPN	Negative input/output
IOL	IO link
TEMP	Temperature

1.2 Documentation for Fieldline Devices

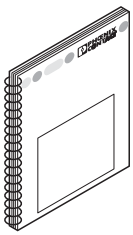
The documentation for Fieldline devices is modular, providing you with the optimum information for your specific bus system.



Installation of Devices in the Fieldline Product Range

This user manual describes the Fieldline Stand-Alone and Fieldline Modular devices for all bus systems. This includes:

– The device properties, which are the same for all bus systems
– Mounting
– The power supply concept
– Station structure examples



Configuring a ... System Using Devices in the Fieldline Product Range

User manuals for the bus systems

INTERBUS

PROFIBUS-DP

PROFINET

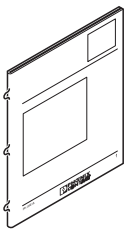
DeviceNet™

CANopen

Ethernet

A separate user manual is available for each bus system.

Each user manual describes the special features of the Fieldline Stand-Alone and Fieldline Modular devices when used in the relevant bus system.



Device-Specific Data Sheet

The data sheet describes the specific properties of a device. This includes:

– Function
– Local diagnostic and status indicators
– Connector pin assignment and connection example
– Programming data/configuration data
– Technical data

This user manual only describes the Fieldline Stand-Alone and Fieldline Modular devices without reference to the specific bus system. For complete information, please refer to the Fieldline user manual for your bus system and the data sheets for the devices used.

1.3 Product Description of the Fieldline Stand-Alone Devices

Versions

The Fieldline Stand-Alone product group includes digital devices with the following functions:

- DI

Digital input devices acquire digital control signals from the process level. These signals are transferred to the higher-level automation equipment via the bus. The signal status is indicated on the Fieldline Stand-Alone device using LEDs. Sensors are connected via screw-cage M12 connectors. The sensors are supplied from the sensor voltage U_S.

- DO

Digital output devices transfer the digital control signals from the automation equipment to the process level on to the actuators. The specified load currents for the outputs of various devices can be found in the data sheet. The signal status is indicated on the Fieldline Stand-Alone device using LEDs. Actuators are connected via screw-cage M12 connectors. The outputs are protected against short circuits and overloads. The actuators are supplied from the actuator voltage U_A.

- DIO

Digital I/O devices have digital inputs and digital outputs with the same properties as on the input and output devices.

- IOL

These devices are provided with I/O link ports for sensors capable of communications in order to dynamically modify the sensor parameters directly using the PLC.

Connections

The bus, I/O devices, and supply are connected via screw-cage M12 connectors. Every Fieldline Stand-Alone device is connected directly to the bus system.

Degree of protection

The devices have IP65/67 protection.

1.4 Product Description of the Fieldline Modular M12 Devices

Versions

The Fieldline Modular M12 product group includes bus couplers as well as digital and analog devices with the following functions:

BK

The bus coupler provides the transition from the higher-level network to the local bus. It provides the power supply for the local bus devices within a Fieldline Modular station. Local bus devices are the Fieldline Modular I/O devices used to implement a local bus station.

The bus coupler can be connected with up to eight digital sensors using M12 connectors. The slots are double-assigned. The bus coupler supplies the supply voltage for the sensors and reads in the provided signals.

BT BS

The base station receives the I/O data of the Bluetooth I/O devices and integrates them in the process data of the Fieldline Modular local bus.

- DI

Digital input devices acquire digital control signals from the process level. These signals are transferred to the higher-level automation equipment via the bus. The signal status is indicated on the Fieldline Modular device using LEDs. Sensors are connected using screw-cage connectors. The sensors are supplied from the sensor voltage U_S.

- DO

Digital output devices transfer the digital control signals from the automation equipment to the process level on to the actuators. The specified load currents for the outputs of various devices can be found in the data sheet. The signal status is indicated on the Fieldline Modular device using LEDs. Actuators are connected using screw-cage connectors. The outputs are protected against short circuits and overloads. The actuators are supplied from the actuator voltage U_A.

- DIO

Digital I/O devices have digital inputs and digital outputs with the same properties as on the input and output devices.

- AI

Analog input devices acquire analog control signals from the process level. These signals are transferred to the higher-level automation equipment via the bus. Sensors are connected via screw-cage M12 connectors. The sensors are supplied from the sensor voltage U_S.

- AO

Analog output devices transfer the control signals from the automation equipment to the process level on to the actuators. For the specified signal forms of the outputs of various devices, please refer to the device-specific data sheet. Actuators are connected via screw-cage M12 connectors. The outputs are protected against short circuits and overloads. The actuators are supplied from the supply voltage U_S (U_{ANA}).

- RTD

The analog input devices have four inputs for resistive temperature sensors. The measured values are represented by standardized 16-bit values.

Connection to Inline

The IB IL 24 FLM-PAC branch terminal can be used to connect the Fieldline M12 local bus to the end of an Inline station. The IB IL 24 FLM MULTI-PAC terminal can be used to connect the FLM local bus several times to an Inline station at any point. This allows for integrating sensors and actuators, which are connected near the station to the Fieldline Modular M12 devices with IP65/67 protection, in an Inline system. Conversion of the physical transmission method of the Inline local bus to the physical transmission method of the Fieldline Modular M21 local bus is performed using the Inline branch terminal. The U_{LS} supply voltage should be supplied separately.

Connections

The bus, I/O devices, and supply are connected using M12 connectors with quick connection method or using radio (local bus only).

Degree of protection

The devices have IP65/67 protection.

1.5 Product Description of the Fieldline Modular M8 Devices

Versions

The Fieldline Modular M8 product range includes digital devices with the following functions:

- DI

Digital input devices acquire digital control signals from the process level. These signals are transferred to the higher-level automation equipment via the bus. The signal status is indicated on the Fieldline Modular device using LEDs. Sensors are connected via screw-cage M8 connectors. The sensors are supplied from the sensor voltage U_S.

- DO

Digital output devices transfer the digital control signals from the automation equipment to the process level on to the actuators. The specified load currents for the outputs of various devices can be found in the data sheet. The signal status is indicated on the Fieldline Modular device using LEDs. Actuators are connected via screw-cage M8 connectors. The outputs are protected against short circuits and overloads. When mounting the device onto a metallic surface, derating does not need to be taken into account. The actuators are supplied from the actuator voltage U_A.

- DIO

Digital I/O devices have digital inputs and digital outputs with the same properties as on the input and output devices. The sensors and actuators are supplied from the actuator voltage U_A. The DIO 8/4 devices allow for using either four inputs or four outputs.

Connection to Inline

The IB IL 24 FLM-PAC branch terminal can be used to connect the Fieldline M8 local bus to the end of an Inline station. The IB IL 24 FLM MULTI-PAC terminal can be used to connect the FLM local bus several times to an Inline station at any point. This allows for integrating sensors and actuators, which are connected near the station to the Fieldline Modular M8 devices with IP65/67 protection, in an Inline system. Conversion of the physical transmission method of the Inline local bus to the physical transmission method of the Fieldline Modular M8 local bus is performed using the Inline branch terminal.

An segment terminal with fuse (IB IL 24 SEG/F-D) must be used directly before the Inline branch terminal because the M8 system cable also provides the communications and sensor power.

Connection to a Fieldline Modular M12 Station

The FLM APAP M12/M8 adapter can be used to connect the Fieldline M8 local bus to a Fieldline Modular M12 station. The adapter is used to connect the Fieldline Modular M8 devices to a bus coupler or an I/O devices of the Fieldline Modular M12 system. The adapter is provided with the local bus and the communications and sensor power via M12 connectors. For the M8 system cable the local bus, communications and sensor power are converted to 4-pos. M8 female and male connectors for the incoming and outgoing M8 local bus including the power supply.

Connections

The bus, I/O devices, and supply are connected via M8 connectors.

Degree of protection

The devices have IP65/67 protection.

1.6 For Your Safety

1.6.1 Correct Usage

Fieldline devices are designed for use as specified in this user manual and in the device-specific data sheets.

Always observe the data specified in the user manual and in the data sheets. If the operating instructions and safety notes for configuration, installation, and operation given in the documentation are followed, the devices should not normally present a risk to people or property.

1.6.2 Regulations

During device configuration, installation, startup, and maintenance, the valid safety and accident prevention regulations for the specific application must be observed.

1.6.3 Safety Notes

Avoid polarity reversal of the power supplies, as this may damage the device (see Section "Connecting the Power Supply" on page 4-22).

To ensure IP65/67 protection, cover unused connections with protective caps.

Ground devices to provide immunity to interference (see page 4-6).

Only operate Fieldline devices with a safety extra-low voltage of 30 V, maximum, according to IEC 60950/EN 60950/VDE 0805.

1.7 Using Fieldline Devices in Potentially Explosive Areas

When additionally using fuse clips for the M12 connectors Fieldline Stand-Alone devices and Fieldline Modular M12 devices with EG-RL 94/9 (ATEX) approval can be used in potentially explosive areas.

M12 connectors must not be disconnected or connected unless power has been switched off or the area is known to be non-hazardous.

For Fieldline devices approved for use in potentially explosive areas and additional information, please refer to the AH EN FLS FLM EX ZONE 22 application note.

1.8 Using Fieldline Devices in Safety Applications

Fieldline devices with an actuator supply that can be disconnected separately can be used in safety applications.

The supply voltage for the output modules is switched off in a safety-related procedure using a safety switching devices (e.g., PSR safety relay from Phoenix Contact). In this way, the outputs are set to the deenergized state independent of the communications and sensor power.

For Fieldline devices approved for use in safety applications (FLS...M12 DO 8 M12-2A) and additional information, please refer to the AH EN FLS FLM SAFE application note.

2 Description of the Fieldline Stand-Alone Devices

2.1 Housing Versions for Fieldline Stand-Alone Devices

Independent of the bus system two different housing versions are available for the Fieldline Stand-Alone devices.

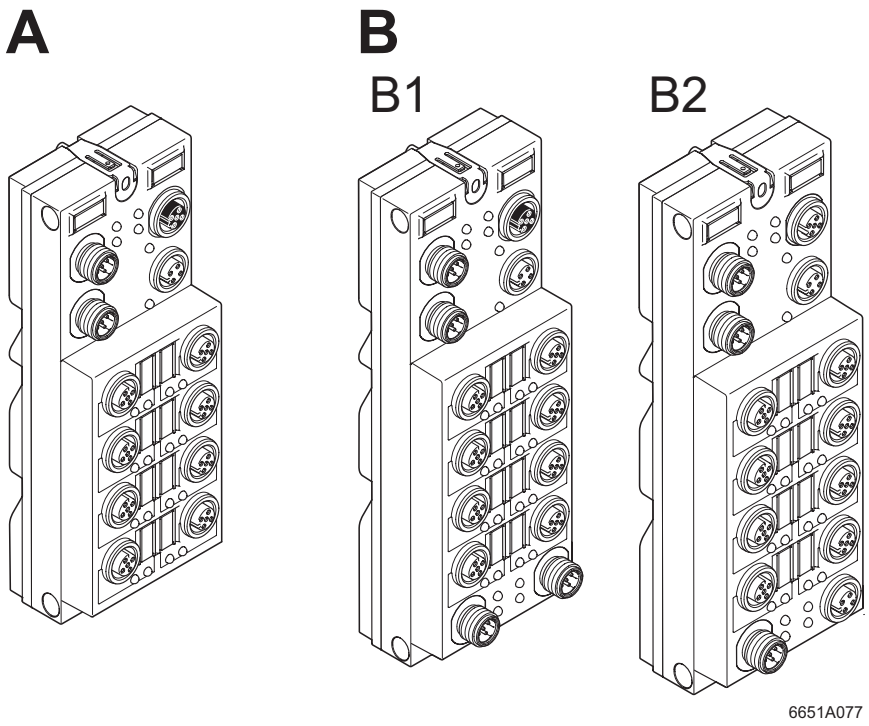


Figure 2-1 Housing versions for the Fieldline Stand-Alone devices

A Devices without actuator supply (e.g., digital input device)

B1 Devices with two connections for the actuator supply (e.g., digital output device)

B2 Devices with one connection for the incoming supply and one connection to forward the actuator supply (e.g., digital I/O device)

2.2 Housing Dimensions for Fieldline Stand-Alone Devices

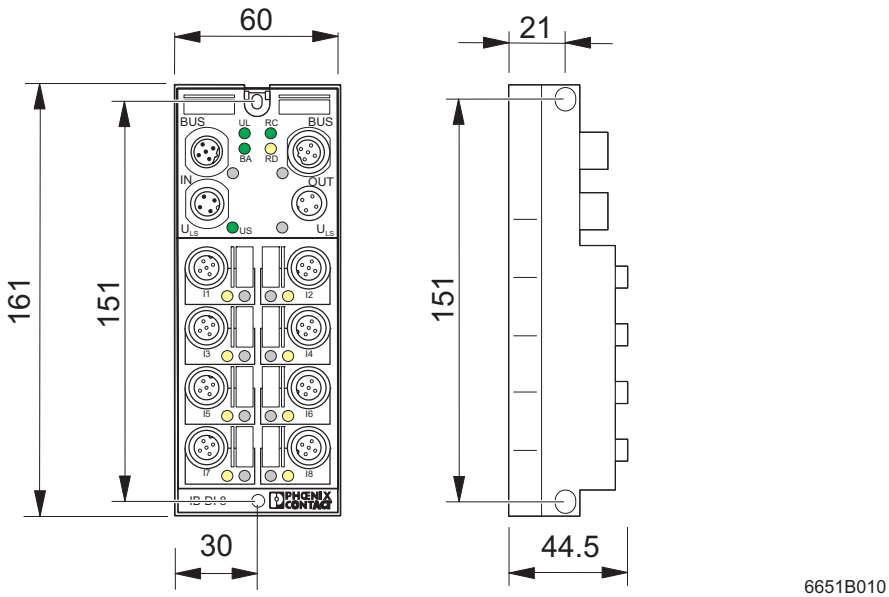


Figure 2-2 Housing dimensions in mm for FLS devices without actuator supply

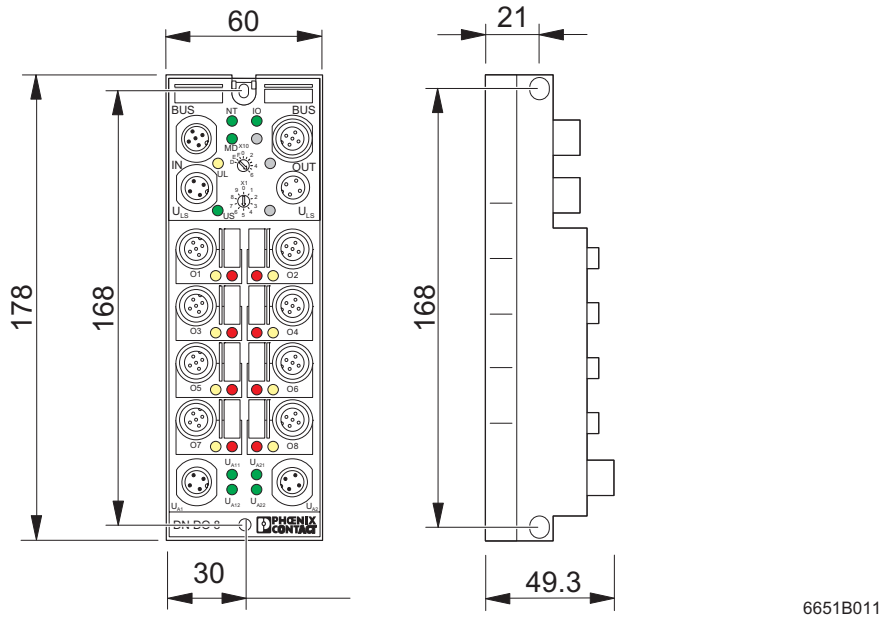


Figure 2-3 Housing dimensions in mm for FLS devices with actuator supply

2.3 Basic Structure of the Fieldline Stand-Alone Devices

Figure 2-4 shows the basic structure of the Fieldline Stand-Alone devices. Depending on the bus system and the device function, the device may **not** have all of the elements shown. These elements are marked with an asterisk.

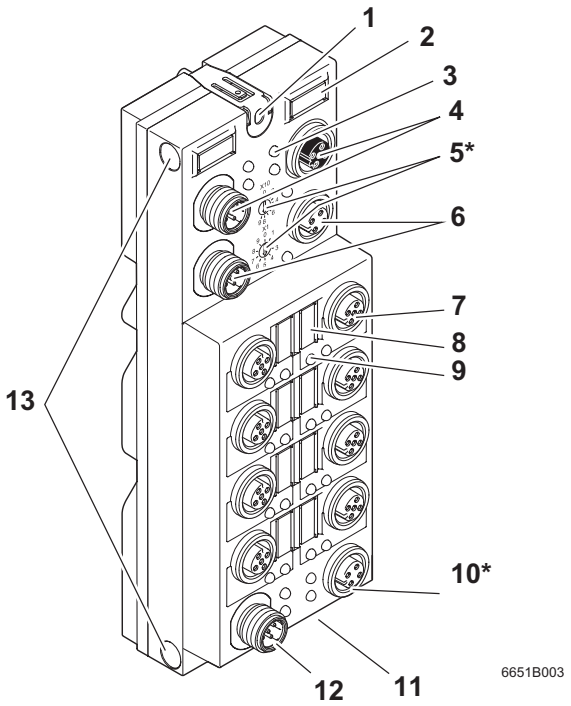


Figure 2-4 Basic structure of the Fieldline Stand-Alone devices

1 Upper mounting hole (FE connection)
2 Slot for labeling field
3 Diagnostic and status indicators for bus and supply voltages (U_L and U_S)
4 Bus connection (IN and OUT)
5 Rotary encoding switch (not for INTERBUS)
6 Connection for the supply voltages for communications power (U_L) and sensors (U_S) (IN and OUT)
7 Connections for inputs or outputs
8 Slot for labeling field
9 Status indicator for the inputs/outputs
10 Forwarding of actuator supply voltage for DIO devices or connection of actuator supply voltage for DO devices
11 Lower mounting hole
12 Connection for actuator supply voltage (not for DI devices)
13 Side mounting holes

2.4 Labeling for Fieldline Stand-Alone Devices

The devices can be labeled above the bus connections (2 in Figure 2-4) and at every I/O connection (8 in Figure 2-4).

Ten labeling fields without color print are supplied as standard with the devices.

When labeling, proceed as follows:

- Complete a labeling field and snap it into the relevant slot.
- If you want to change a labeling field, it can be removed using a small screwdriver.

For professional labeling, Phoenix Contact offers the CMS-MARK-WIN software (see Phoenix Contact CLIPLINE catalog).

2.5 Diagnostic and Status Indicators of the Fieldline Stand-Alone Devices

Diagnostics

Diagnostic indicators (green/red) indicate whether an error is present or not. In the event of an error, they indicate the error type and location. The Fieldline Stand-Alone device is functioning correctly if all the green LEDs are on.

Status

Status indicators (yellow) indicate the signal status of the corresponding input/output. If the yellow status indicators are on, this indicates the signal state "1" of the input/output signal.

Fieldline Stand-Alone devices have three main areas for diagnostic and status indicators. These areas are illustrated in Figure 2-5.

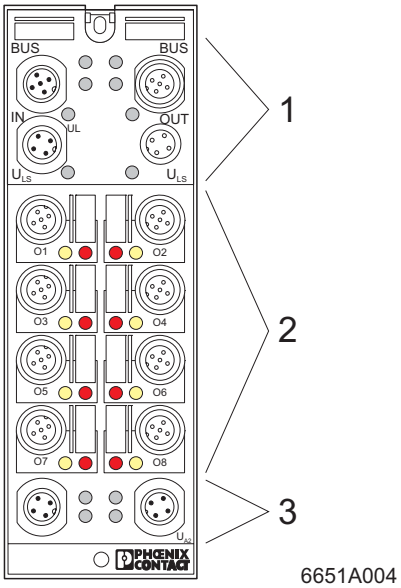


Figure 2-5 Main diagnostic and status indicators for the Fieldline Stand-Alone devices

1 Bus-specific indicators
2 Inputs and outputs (device-specific)
3 Actuator supply (device-specific)

For additional information on the diagnostic and status indicators, please refer to the data sheet for the relevant device.

3 Description of Fieldline Modular Devices

3.1 Housing Versions for Fieldline Modular Devices

Independent of the bus system five different housing versions are available for the Fieldline Modular devices.

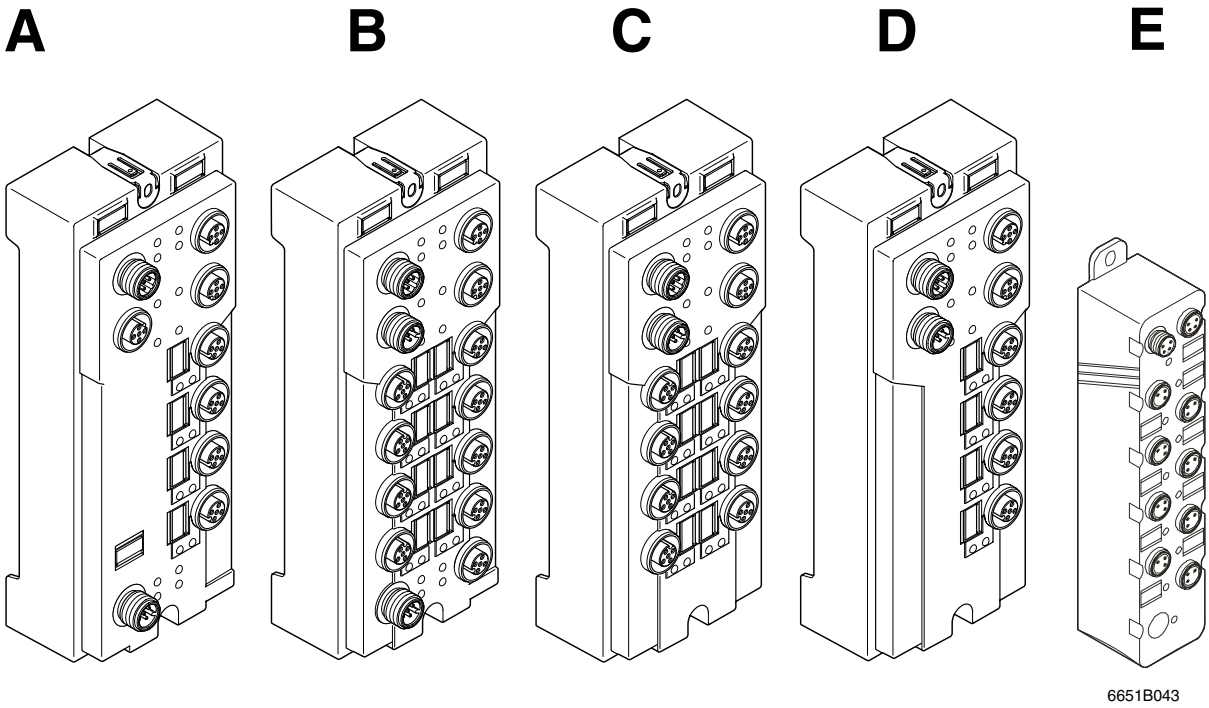


Figure 3-1 Housing versions for the Fieldline Modular devices

A Bus coupler/base station (BK/BT)
B Digital devices (DO/DIO)
C Digital devices (DI)
D Analog devices (AI/AO)
E Digital M8 devices (DI/DO/DIO)

If not mentioned explicitly, the M12 connection method is used in this manual.

3.2 Housing Dimensions for Fieldline Modular Devices

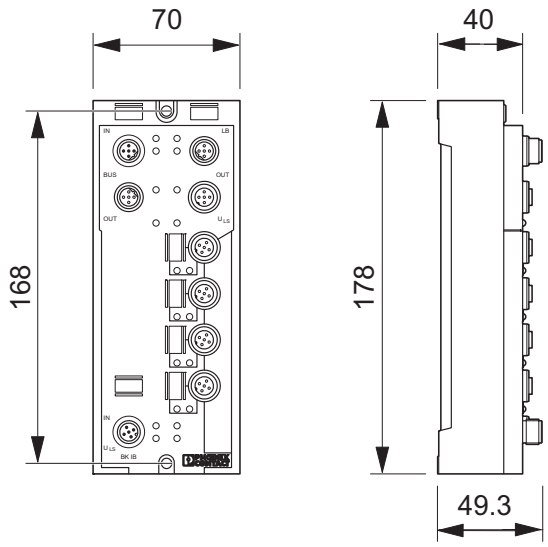


Figure 3-2 Housing dimensions in mm for Fieldline Modular devices (M12)

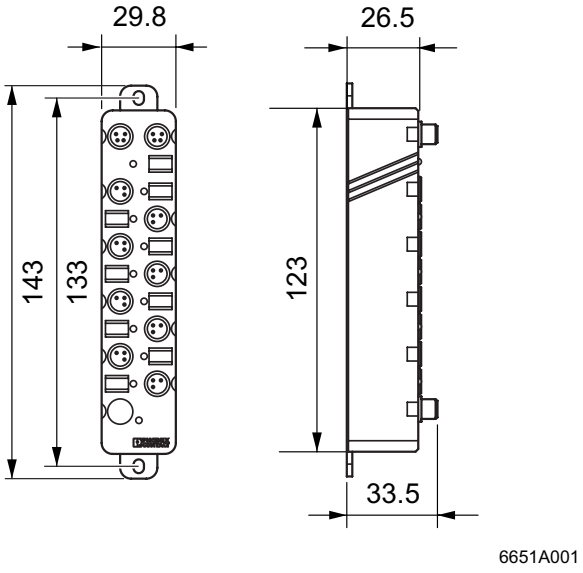


Figure 3-3 Housing dimensions in mm for Fieldline Modular devices (M8)

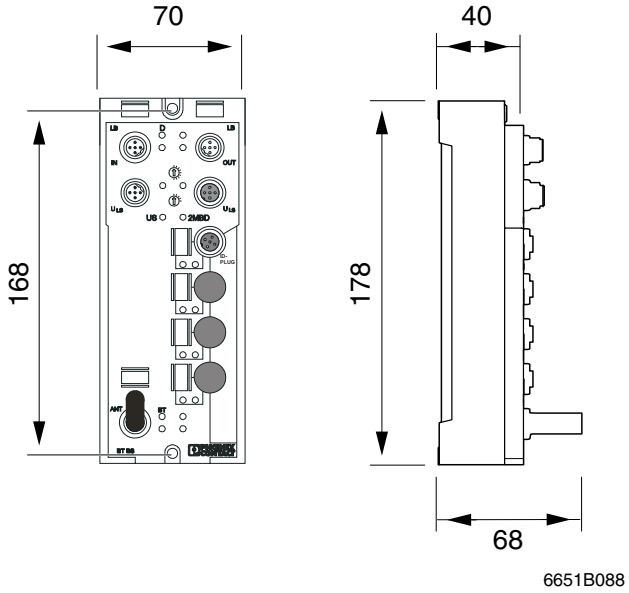


Figure 3-4 Housing dimensions in mm for Fieldline Modular Bluetooth devices

3.3 Basic Structure of the Fieldline Modular Devices

Figure 3-5 to Figure 3-7 show the basic structure of the devices. Depending on the network and the device function, the device may **not** have all of the elements shown. These elements are marked with an asterisk.

3.3.1 Structure of Fieldline Modular Bus Couplers

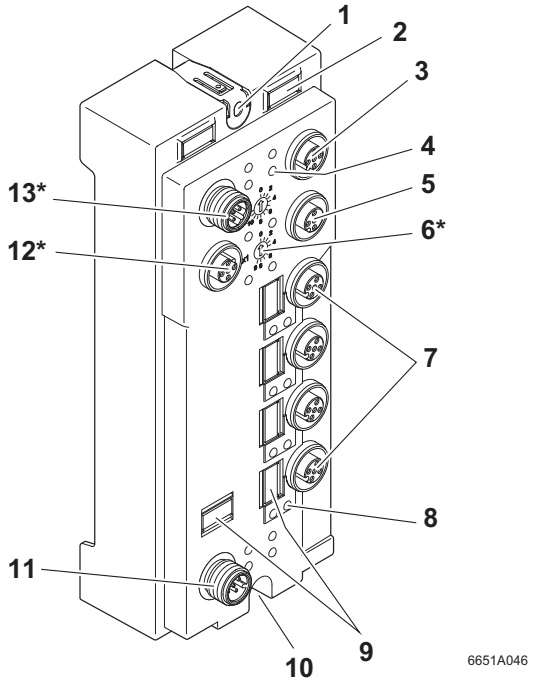


Figure 3-5 Basic structure of Fieldline Modular bus couplers

1 Upper mounting hole (FE connection)
2 Slot for labeling field
3 Connection for local bus (LB OUT)
4 Diagnostic and status indicators for bus and supply voltages (U_L and U_S)
5 Connection for the supply voltages for communications power and sensors (U_{LS} OUT)
6 Rotary encoding switch (not for INTERBUS and Ethernet)
7 Connections for the inputs
8 Status indicator for the inputs
9 Slot for labeling fields
10 Lower mounting hole
11 Connection for the supply voltage (U_{LS} IN)
12 Connection for the bus (OUT), port 2 for Ethernet
13 Connection for the bus (IN), port 1 for Ethernet

3.3.2 Structure of the Digital Fieldline Modular Input and Output Devices (M12)

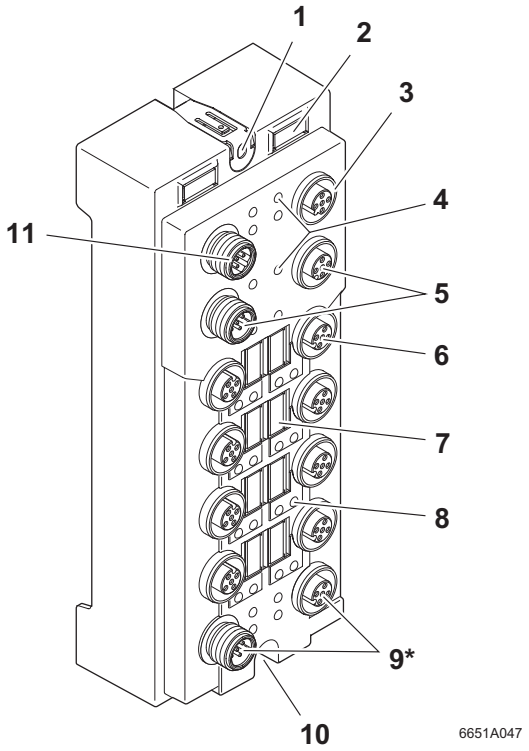


Figure 3-6 Basic structure of the digital Fieldline Modular input and output devices
* see page 3-4

1 Upper mounting hole (FE connection)
2 Slot for labeling field
3 Connection for local bus (LB OUT)
4 Diagnostic and status indicators for bus and supply voltages (U_L and U_S)
5 Connection for the supply voltages for communications power and sensors (U_{LS})
6 Connections for inputs or outputs
7 Slot for labeling field
8 Status indicator for the inputs or outputs
9 Connection for the actuator supply voltages (U_A IN and U_A OUT), not for DI devices
10 Lower mounting hole
11 Connection for local bus (LB IN)

3.3.3 Structure of the Analog Fieldline Modular Input and Output Devices (M12)

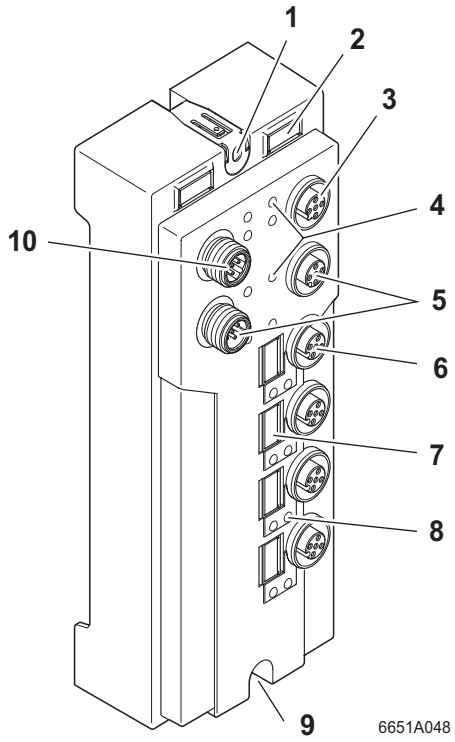


Figure 3-7 Basic structure of the analog Fieldline Modular input and output devices

1 Upper mounting hole (FE connection)
2 Slot for labeling field
3 Local bus (LB OUT)
4 Diagnostic and status indicators for bus and supply voltages (U_L and U_S)
5 Connection for the supply voltages for communications power and sensors (U_{LS}) and actuators
6 Connections for inputs or outputs
7 Slot for labeling field
8 Status indicator for the inputs or outputs
9 Lower mounting hole
10 Local bus (LB IN)

3.3.4 Structure of the Fieldline Modular Bluetooth Base Station

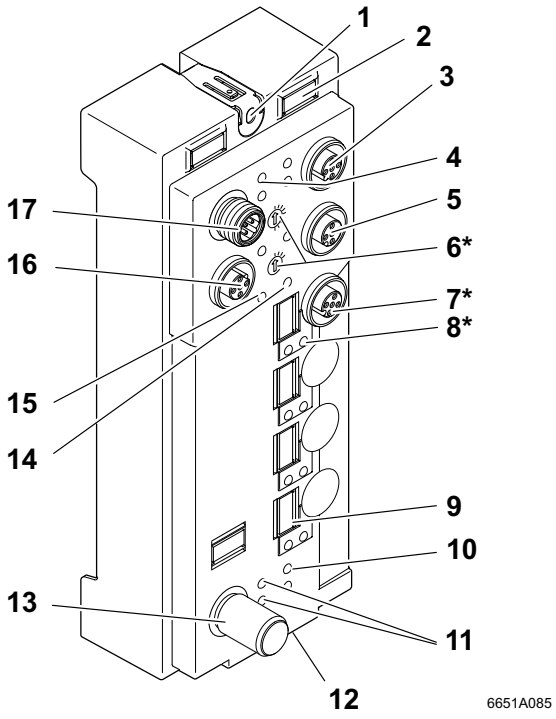


Figure 3-8 Basic structure of the Fieldline Modular Bluetooth base station
* see page 3-4

1 Upper mounting hole (FE connection)
2 Slot for labeling field
3 Connection for local bus (LB OUT)
4 Diagnostic and status indicators for bus and supply voltages (D)
5 Connections for the supply voltages for communications power and sensors (U_{LS} OUT)
6 Rotary encoding switch (not for FLM BT BS P2P)
7 Programming interface for ID PLUG (not for FLM BT BS P2P)
8 Indicator for ID PLUG programming (not for FLM BT BS P2P)
9 Slot for labeling field
10 Indicator for wireless connection
11 Indicator for quality of Bluetooth connection (BT), (not for FLM BT BS P2P)
12 Lower mounting hole
13 Antenna
14 Indicator for transmission speed (2MBD)
15 Indicator for supply voltage (US)
16 Connection for the supply voltages for communications power and sensors (U_{LS} IN)
17 Connection for local bus (LB IN)

3.3.5 Structure of a Digital Fieldline Modular Bluetooth Device

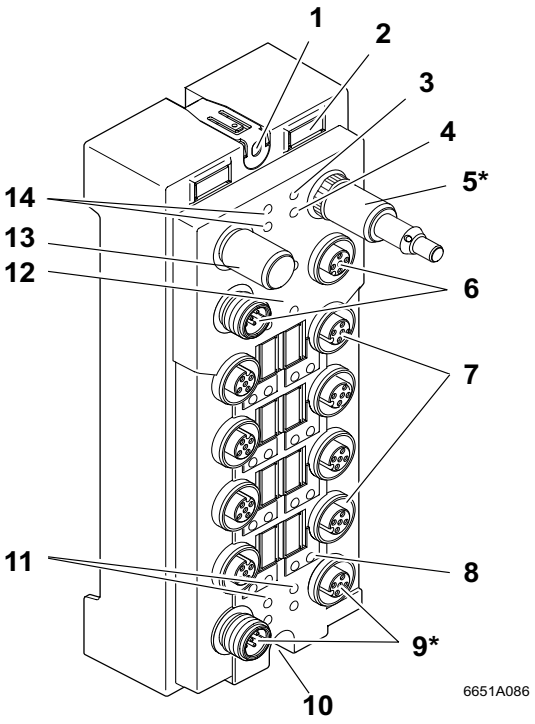
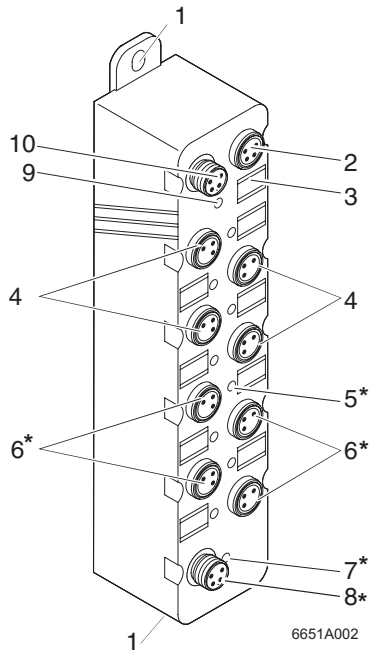


Figure 3-9 Basic structure of a digital Fieldline Modular Bluetooth device
* see page 3-4

1 Upper mounting hole (FE connection)
2 Slot for labeling field
3 Indicator for failsafe status (FS)
4 Indicator for ID-PLUG status
5 ID-PLUG
6 Connections for the supply voltages for communications power and sensors (U_{LS} IN/OUT)
7 Connections for inputs or outputs
8 Status indicator for the inputs or outputs
9 Connections for the actuator supply voltage (U_A IN/OUT)
10 Lower mounting hole
11 Indicator for actuator supply (U_A, E_A)
12 Diagnostic and status indicators for bus and supply voltages (UL, US, E)
13 Antenna
14 Indicator for link quality

3.3.6 Structure of the Digital Fieldline Modular Input and Output Devices (M8)



15 Basic structure of the digital Fieldline Modular input and output devices (M8),
***** see page 3-4

1 Upper and lower mounting latch (FE connection)

2 Connection for the local bus (LB OUT) and connection for the supply voltage (U_{LS} OUT)

3 Slot for labeling field

4 Connections for inputs or outputs

5 Status indicator for the inputs/outputs

6 Connections for inputs and/or outputs

7 Indicator for the sensor/actuator supply voltage (not for DI devices)

8 Connection for the sensor/actuator supply voltage (not for DI modules)

9 Indicator for bus diagnostics (D)

10 Connection for the local bus (LB IN) and for the supply voltage (U_{LS} IN)

3.4 Labeling of the Fieldline Modular Devices

When labeling the Fieldline Modular devices, please proceed as for labeling the Fieldline Stand-Alone devices (see page 2-4).

3.5 Diagnostic and Status Indicators of the Fieldline Modular Devices

Diagnostics

The diagnostic indicators (green/yellow/red) indicate whether an error is present or not. In the event of an error, they indicate the error type and location. The Fieldline Modular device is functioning correctly if all the green LEDs are on.

Status indicators

Status indicators (yellow) indicate the signal status of the corresponding input/output. If the yellow status indicators are on, this indicates the signal state "1" of the input/output signal.

Fieldline Modular bus coupler

Fieldline Modular bus couplers have three main areas for diagnostic and status indicators. These areas are illustrated in Figure 3-10.

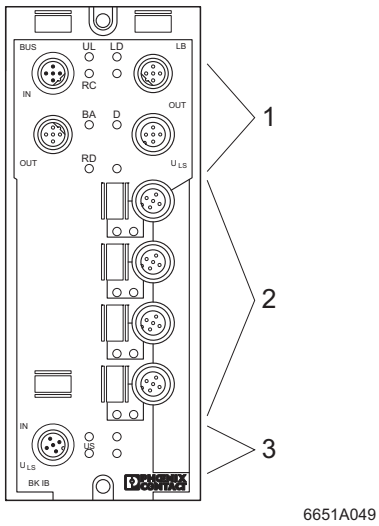


Figure 3-10 Main diagnostic and status indicators for the Fieldline Modular bus couplers

1 Bus-specific indicators and power supply indicators for additional devices

2 Inputs (device-specific)

3 Power supply IN (device-specific)

For additional information on the diagnostic and status indicators, please refer to the data sheet for the relevant device.

Digital Fieldline Modular input and output devices, M12 and M8

Digital Fieldline Modular input and output devices have three main areas for diagnostic and status indicators. These areas are illustrated in Figure 3-11.

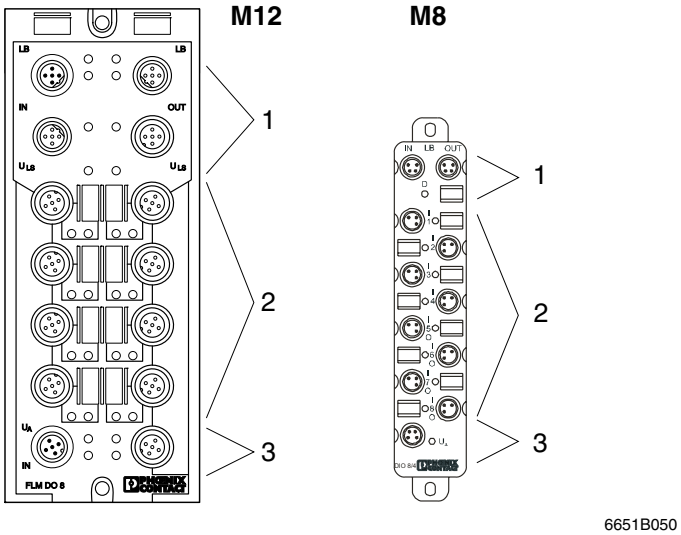


Figure 3-11 Main diagnostic and status indicators for the digital Fieldline Modular input and output devices

1 Bus-specific indicators and power supply indicators

2 Inputs and outputs (device-specific)

3 Sensor/actuator supply voltage and error indicator (device-specific)

For additional information on the diagnostic and status indicators, please refer to the data sheet for the relevant device.

Fieldline Modular analog devices

Analog Fieldline Modular devices have two main areas for diagnostic and status indicators. These areas are illustrated in Figure 3-12.

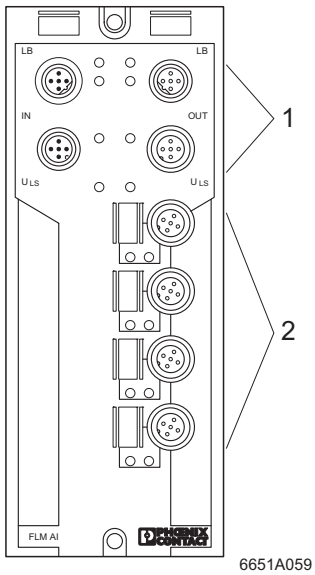


Figure 3-12 Main diagnostic and status indicators for the Fieldline Modular analog devices

1 Bus-specific indicators and power supply indicators

2 Inputs and outputs (device-specific)

For additional information on the diagnostic and status indicators, please refer to the data sheet for the relevant device.

Fieldline Modular Bluetooth base station

The Fieldline Modular Bluetooth base station has three main areas for diagnostic and status indicators. These areas are illustrated in Figure 3-13.

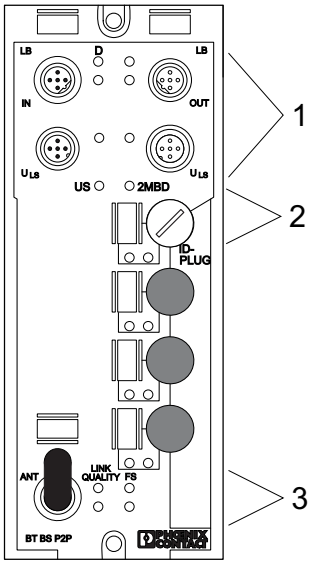


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Figure 3-13 Main diagnostic and status indicators for the Fieldline Modular Bluetooth base station

1 Bus-specific indicators and power supply indicators

2 ID PLUG indicators

3 Indicator for Bluetooth communication

For additional information on the diagnostic and status indicators, please refer to the data sheet for the relevant device.

Digital Fieldline Modular Bluetooth input and output devices

Digital Fieldline Modular Bluetooth input and output devices have four main areas for diagnostic and status indicators. These areas are illustrated in Figure 3-14.

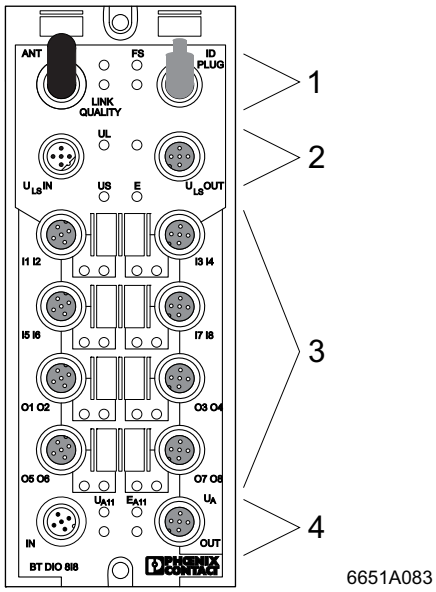

Figure 3-14 Main diagnostic and status indicators for the digital Fieldline Modular Bluetooth input and output devices

1 Indicators for Bluetooth communication and ID PLUG
2 Power supply indicators
3 Inputs and outputs (device-specific)
4 Actuator supply and error indicator (device-specific)

For additional information on the diagnostic and status indicators, please refer to the data sheet for the relevant device.

3.6 Structure of a Fieldline Modular Station

The bus coupler opens a powerful local bus, which can be used to connect up to 16 additional devices. The devices used are Fieldline Modular local bus devices for implementing a local bus station. The communications power and sensor voltage supply are also provided via the bus coupler.

The total length of a local bus is 20 m, maximum. The transmission speed can be switched from 500 kbaud to 2 Mbaud.

Using four double-assigned slots the bus coupler can also be connected to up to eight digital sensors via M12 connectors. The bus coupler supplies the sensors with the required voltage and reads the available signals.

Fieldline Modular M12 station

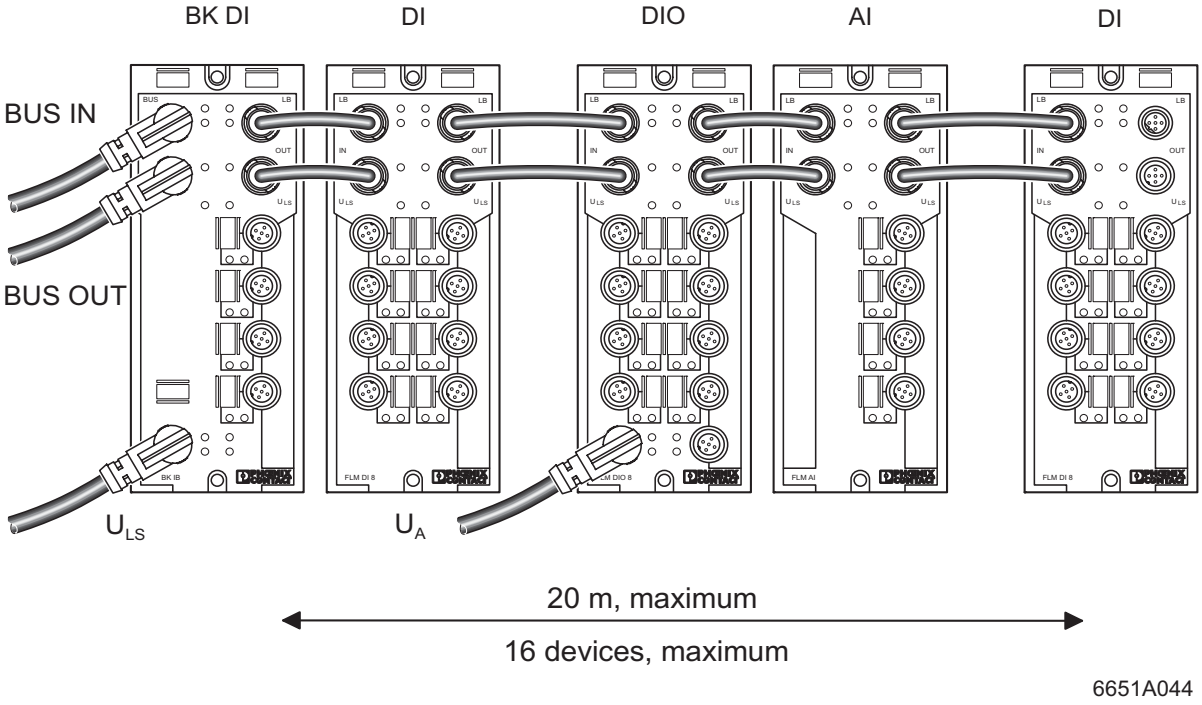

Figure 3-15 Example structure of a Fieldline Modular M12 station

The maximum length of the local bus for Fieldline Modular M12 devices is 20 m. A maximum of 16 devices can be connected.

Fieldline Modular M8 station

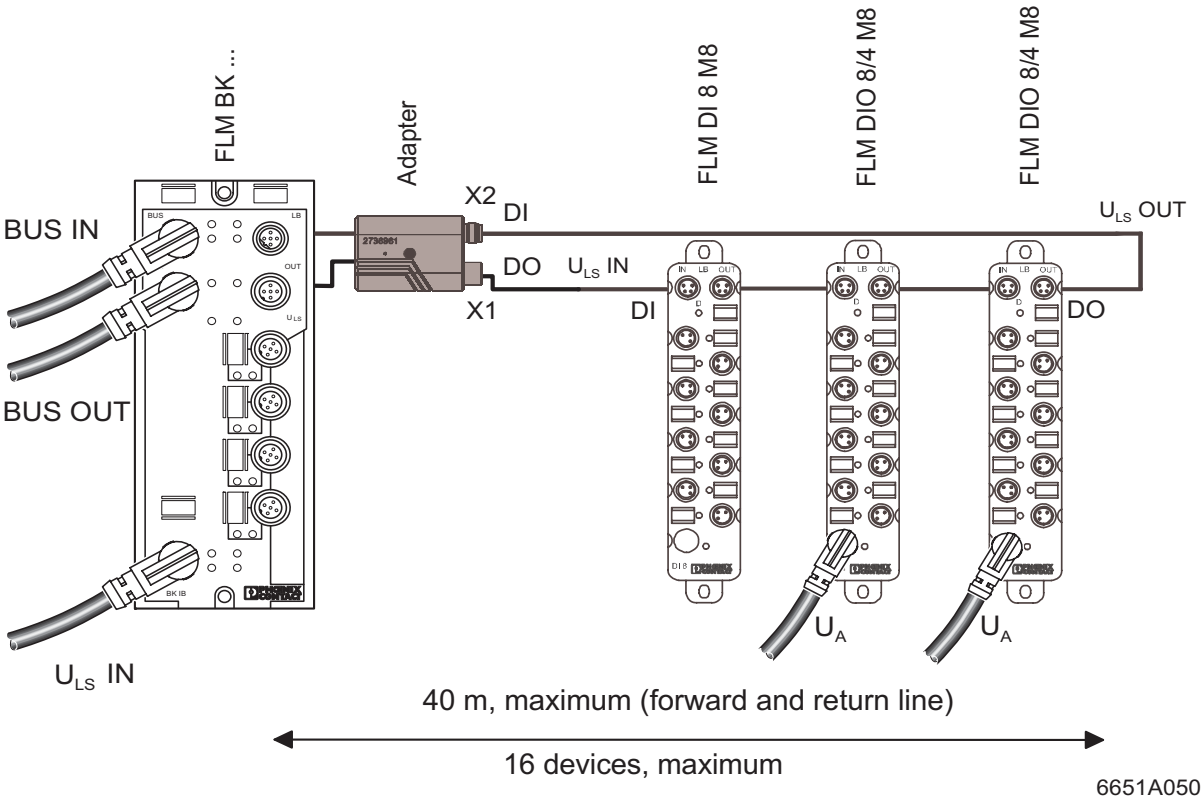

Figure 3-16 Example structure of a Fieldline Modular M8 station

The maximum length of the local bus for Fieldline Modular M8 devices is 40 m. A maximum of 16 devices can be connected. The maximum distance between two M8 devices is 20 m.

Always connect DI to DO.

If U_{LS} is directly supplied to the adapter from the bus coupler, the maximum current load is 2 A. If power is supplied again at an M12 bus device before the adapter, the maximum current load for the M8 bus devices on the local bus is 4 A.

If U_A is supplied in 4-pos. method at an M8 bus device, the maximum current load is 2 x 3 A.

Fieldline Modular station (M12/M8, mixed)

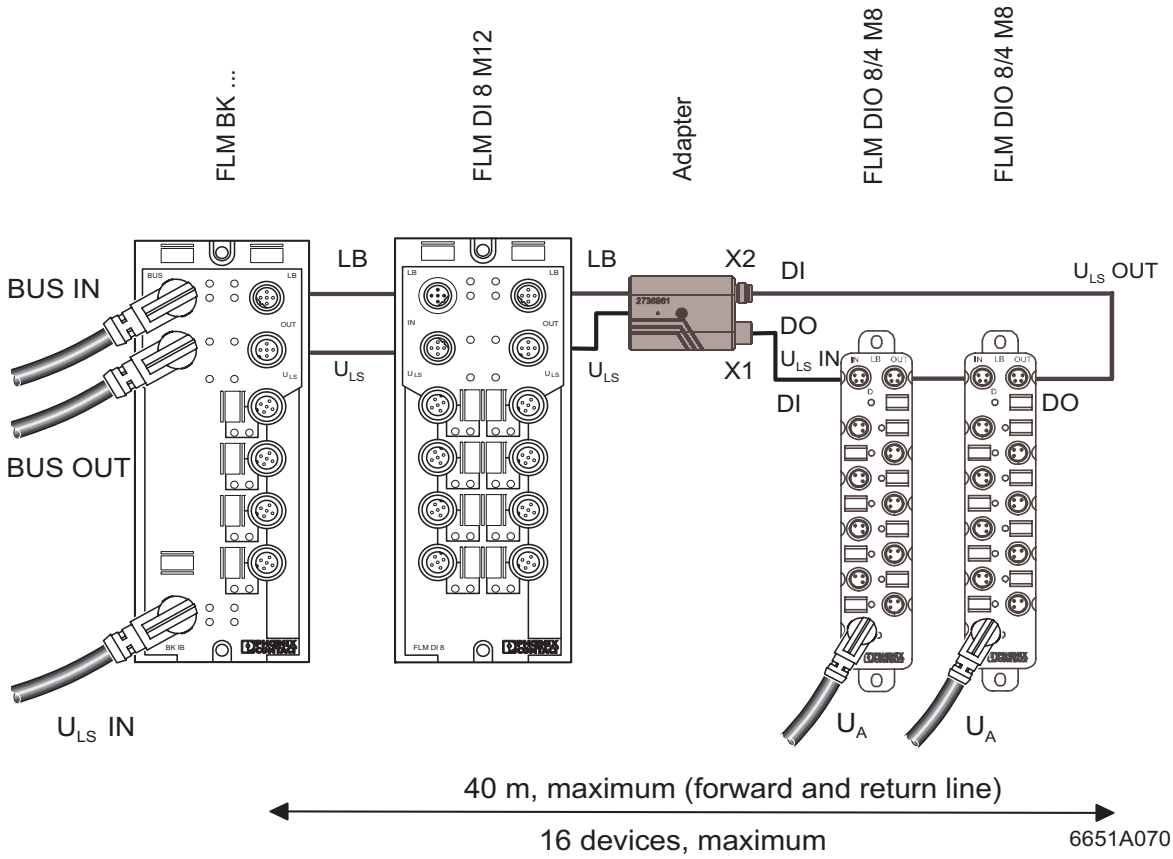

Figure 3-17 Example structure of a Fieldline Modular station (M12/M8, mixed)

The maximum length of the local bus for a station consisting of Fieldline Modular M12 and M8 devices is 40 m. A maximum of 16 devices can be connected. The maximum distance between two M8 devices is 20 m.

Always connect DI to DO.

If U_{LS} is directly supplied to the adapter from the bus coupler, the maximum current load is 2 A. If power is supplied again at an M12 bus device before the adapter, the maximum current load for the M8 bus devices on the local bus is 4 A.

If U_A is supplied in 4-pos. method at an M8 bus device, the maximum current load is 2 x 3 A.

FLM M8 station connected to Inline using the IB IL 24 FLM MULTI-PAC branch terminal

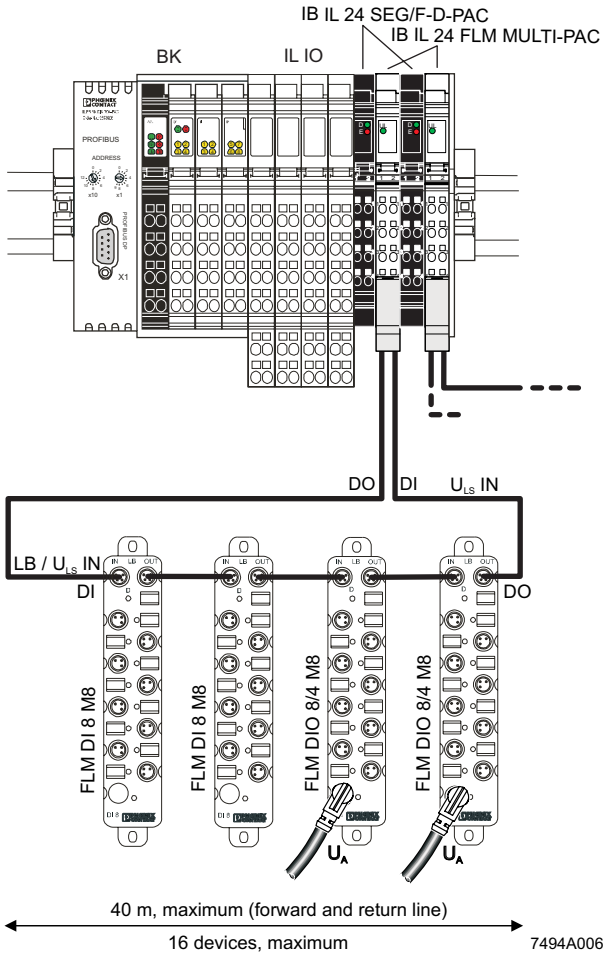

Figure 3-18 Example structure of a Fieldline Modular M8 station connected to Inline

Using the IB IL 24 FLM MULTI-PAC branch terminal it is possible to integrate a Fieldline Modular M8 local bus in the Inline system. When using **one** branch terminal in an Inline station it can be installed at any position. When using **more than one** branch terminals in an Inline station they should be installed at the end of the Inline station.

The **maximum cable length of the Fieldline Modular M8 local bus** is 40 m. The **maximum number of devices of a Fieldline Modular M8 local bus** is 16.

The **maximum number of devices of an Inline station** including the connected Fieldline Modular M8 devices is 63. This number only includes the bus devices (the branch terminal, for example, is not a bus device).

To supply the Fieldline Modular M8 system with power, install a segment terminal with fuse and diagnostics directly before the branch terminal. In this way, the supply voltage for the Fieldline Modular M8 system is guaranteed and diagnostics of the supply voltage is possible. When using this terminal the current consumption at U_S is limited to 4 A.

Always connect DI to DO.

Always supply the U_{LS} supply voltage backwards via U_{LS} OUT or, in the event of higher current loads, via U_{LS} IN and U_{LS} OUT from both sides in order for the devices to indicate the error location in the event of a defective local bus cable.

In the event of supplying the U_{LS} power supply from both sides the maximum current load is 2 x 2 A.

FLM M12 station connected to Inline using the IB IL 24 FLM-PAC branch terminal

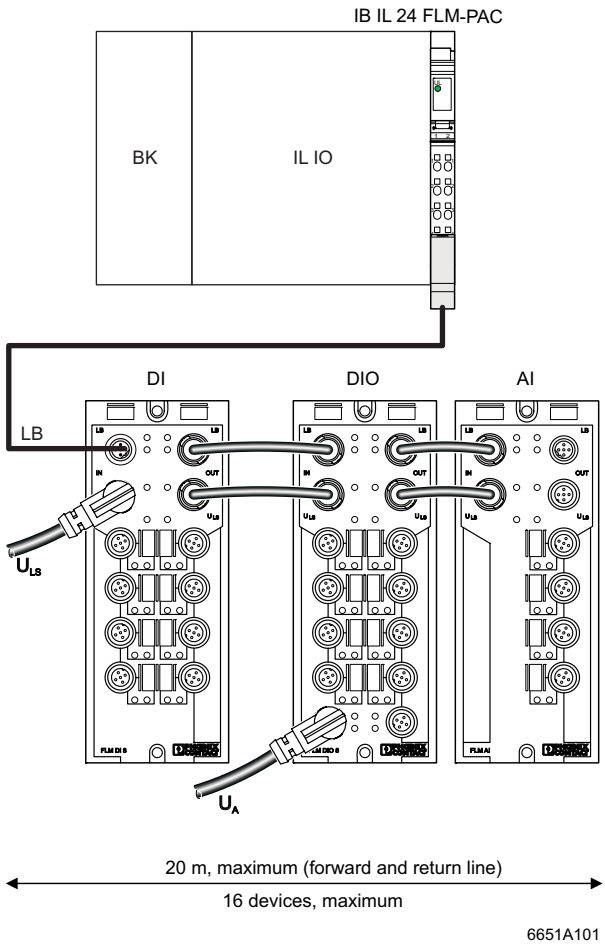

Figure 3-19 Example structure of a Fieldline Modular M12 station connected to Inline

Key

BK	Bus coupler
IL IO	Any Inline terminals

Using the IB IL 24 FLM-PAC branch terminal it is possible to integrate a Fieldline Modular M12 or M8 local bus in the Inline system.

Only install the branch terminal as the last terminal in an Inline station.

The data jumpers for the local bus are **not** available in the position behind the branch terminal. If you snap on terminals in the position behind the branch terminal, the first INTERBUS device behind the branch terminal indicates an interface error (D LED D flashes at 4 Hz). In this case, the Inline station has to be changed in order for the branch terminal to be the last terminal in the station.

The **maximum cable length of the Fieldline Modular M12 local bus** is 20 m. The **maximum cable length of the Fieldline Modular M8 local bus** is 40 m.

The **maximum number of devices of a Fieldline Modular M12 or M8 local bus** is 16.

The **maximum number of devices of an Inline station** including the connected Fieldline Modular devices is 63. This number only includes the bus devices (the branch terminal, for example, is not a bus device).

When installing a Fieldline Modular M8 system, install a segment terminal with fuse and diagnostics directly before the IB IL 24 FLM-PAC branch terminal. In this way, the supply voltage for the Fieldline Modular system is guaranteed and diagnostics of the supply voltage is possible.

When installing a Fieldline Modular M12 system, supply the U_{LS} supply voltage separately at the first FLM device, if possible, in order to use the logic and sensor current of 4 A, maximum, each for the FLM station.

Always connect DI to DO.

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

Fieldline Modular
Bluetooth station (M12)

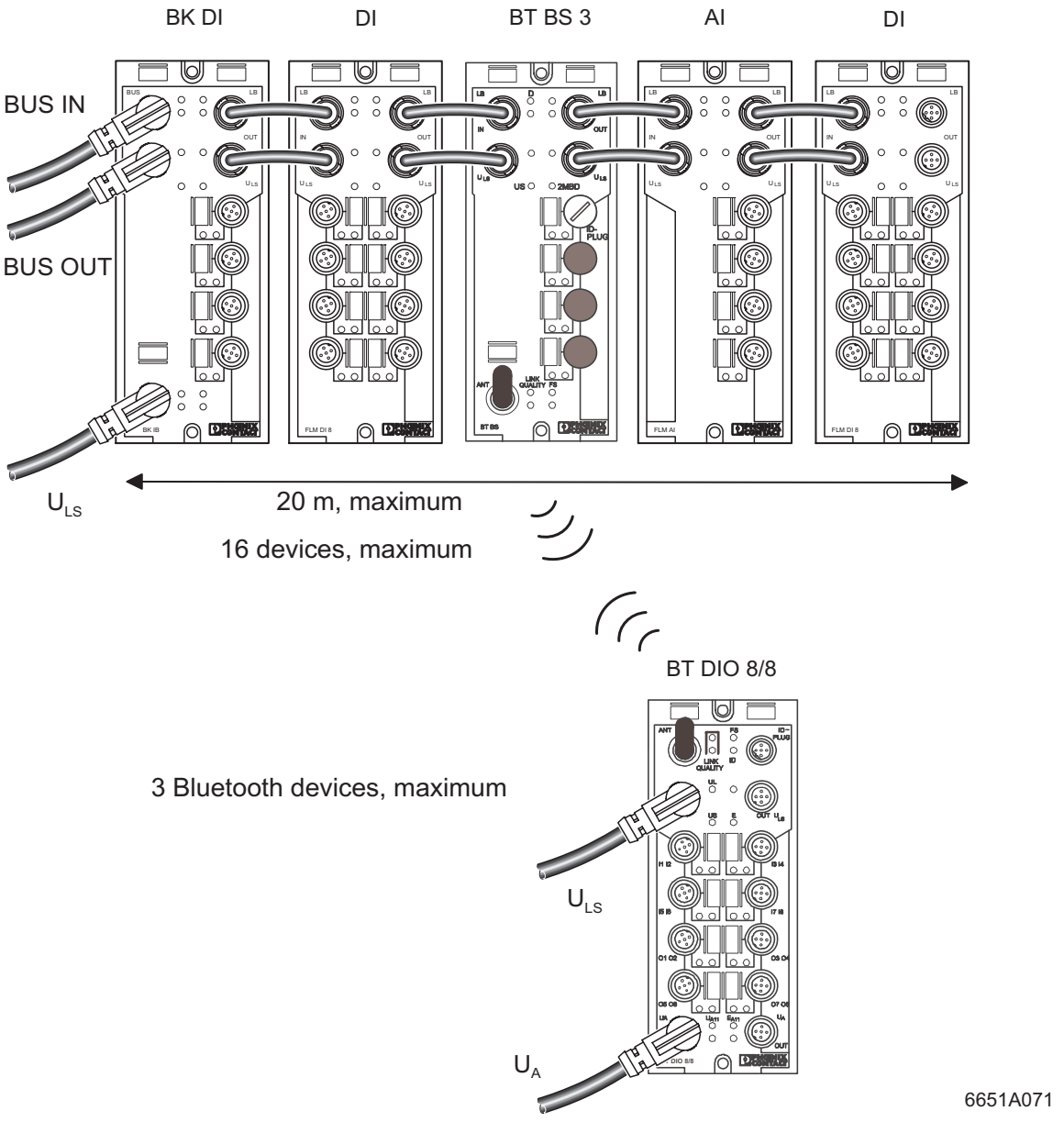

Figure 3-20 Example structure of a Fieldline Modular Bluetooth station (M12)

The FLM BT BS 3 M12 device including the Bluetooth I/O devices counts as **one** device on the local bus.

Fieldline Modular Bluetooth station (M12) connected to Inline

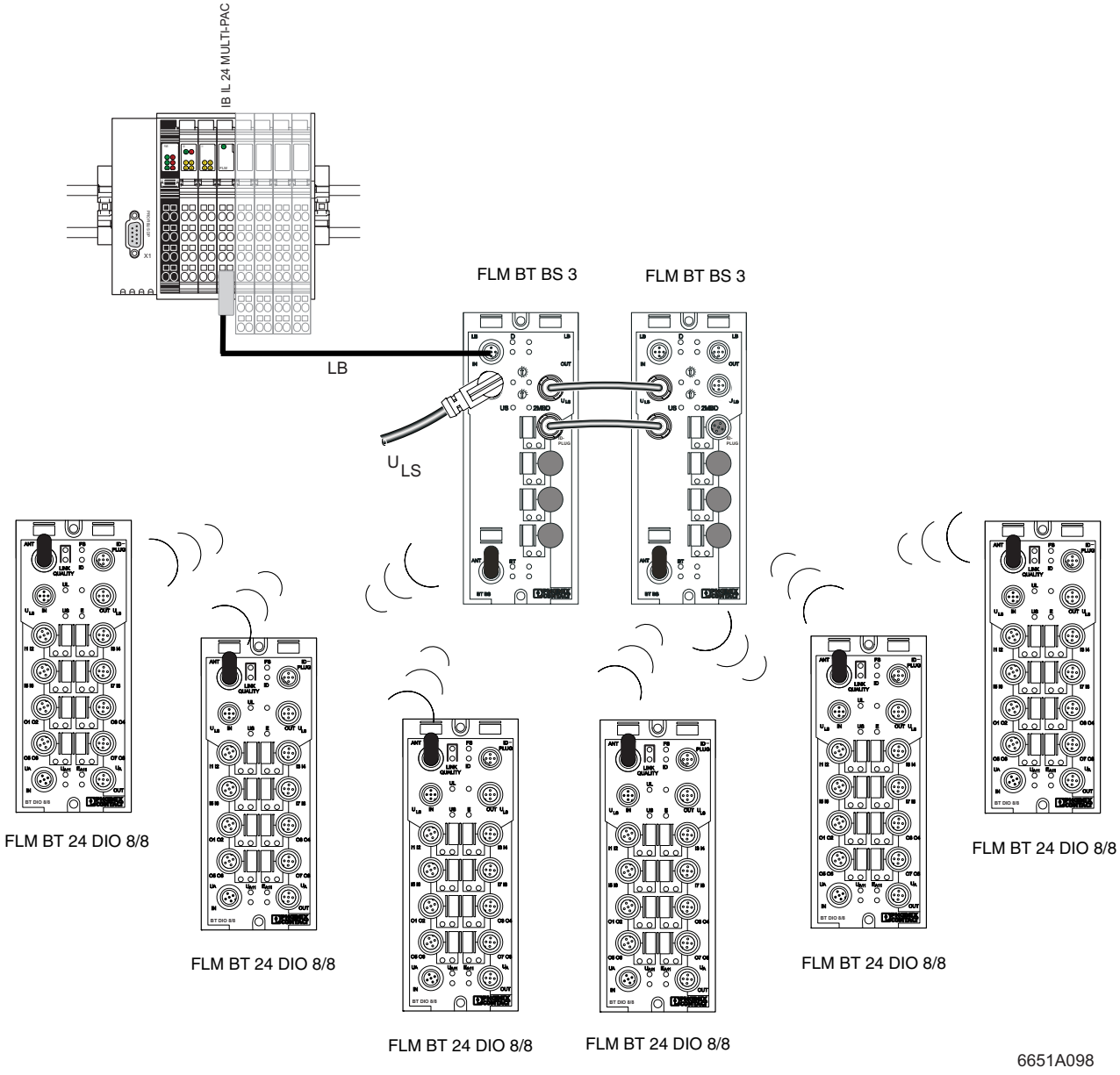

Figure 3-21 Example structure of a Fieldline Modular Bluetooth station (M12) connected to Inline

4 Mounting Fieldline Devices and Connecting Cables

4.1 General Information on Installation

When preparing for cable installation, the local conditions and the corresponding mounting regulations are of major importance. Cables can be installed, for example, in cable ducts or on cable jumpers.

A minimum distance between the cabling and possible sources of interference (e.g., machines, welding equipment, power cables) is defined in the relevant regulations and standards. During system planning and installation, these regulations and standards must be taken into account and observed.

Protect the bus lines from sources of electric/magnetic interference and mechanical strain.

Observe the following regulations for "Electromagnetic Compatibility" (EMC) to keep mechanical risks and interference to a minimum:

Mechanical strain

- Select the correct cable type for each application (e.g., indoor or outdoor installation, flexible drag chains).
- Observe the minimum bending radius.
- Cables must not enter the shear area of moving machine parts.
- Do not install bus lines at right angles to driving paths and machine movements.
- Use cable ducts or cable jumpers.

Observe the specifications for the cable used.

Interference

- Signal and power supply lines should not be installed in parallel. If necessary, metal isolating segments should be placed between the power supply and signal lines.
- Only use connectors with metal housings and connect as much of the shielding as possible to the housing.
- Refer to "Installing Bus Lines Between Buildings" on page 4-3 when grounding outdoor cables running between buildings.
- During installation, all connector interlocks (screws, cap nuts) must be firmly tightened to ensure the best possible contact between shielding and ground. Before initial startup, the connection for the cable ground or shielding must be checked for low-resistance continuity.

Routing of buses in control cabinets

- Install bus lines in separate cable ducts or separate cable bundles.
- Avoid the installation of bus lines parallel to power supply lines.
- Install bus lines with a minimum distance of 10 cm to power cables.

Routing of buses in buildings

- If possible, use metal cable hangers.
- Do not install bus lines together with or parallel to power supply lines.
- Separate bus lines on cable jumpers or in cable ducts from the power supply lines using isolating segments.
- Install bus lines as far away as possible from sources of interference, for example, motors and welding equipment.
- For long line connections, install an additional equipotential bonding line between the connection points.

Routing of buses outside buildings

- Install the bus lines in metal pipes that are grounded on both sides or in concrete cable ducts with continuous reinforcement.
- For long line connections, install an additional equipotential bonding line between the connection points.

Transmission via Bluetooth

- The Bluetooth devices transmit the I/O data via radio.

4.1.1 Installing Bus Lines Between Buildings

Surge voltages

Surge voltages result from switching operations, electrostatic discharges, and lightning discharges. Surge voltages can be coupled inductively, capacitively or galvanically to the electrical lines for power supply, measured value transmission, and data transmission. In this way, surge voltages reach power supply units and the interfaces of systems and termination devices.

Grounding cable shielding

Ground the cable shielding (2 in Figure 4-1) directly after it has been installed in the building to avoid surge voltages. The cable shielding must have a diameter that meets all applicable standards.

Equipotential bonding line

Install an additional equipotential bonding line between the grounding points of buildings (3 in Figure 4-1) that preferably is designed as

– a metal reinforced concrete channel
– an additional grounding cable
– a metal pipe

Surge voltage protection devices

Phoenix Contact recommends that all cable wires are connected to surge voltage protection devices (1 in Figure 4-1) to protect the modules against surge voltages.

For information on the surge voltage protection devices, please refer to the TRABTECH catalog. Observe all national and international regulations when installing surge voltage protection devices.

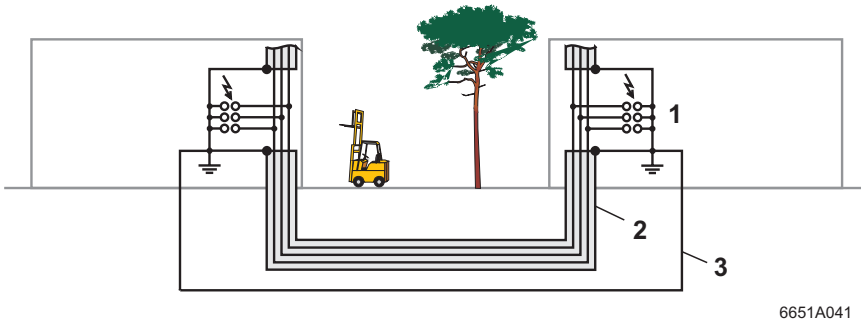

Figure 4-1 Surge voltage protection measures

1 Surge voltage protection devices
2 Cable shielding
3 Equipotential bonding line

4.1.2 Interference Suppression Measures

Phoenix Contact recommends connecting relay coils or motor coils with an RC element to protect the devices against interference. Depending on the application, the delay time of the relay can be increased by approximately 1 ms.

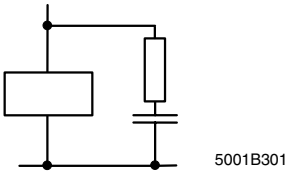

Figure 4-2 Relay coil with RC element

When sizing the RC element, the following values are recommended: R = 100 Ω to 200 Ω; C = 220 nF to 470 nF.

4.1.3 Grounding Concept

Grounding protects people and machines against hazardous voltages. To avoid these hazards, correct grounding, taking the local conditions into account, is vital.
Ensure that the devices you are using are properly grounded before startup.

Fieldline devices operate in the low-level signal voltage range. In low-level signal devices, interference is discharged via functional earth ground (FE).

Functional Earth Ground Connection for Fieldline Devices

Fieldline devices are designed for screw-mounting on a flat mounting surface (direct mounting). FE connection for the housing can be achieved using a mounting screw on a grounded mounting surface or an external grounding connection (latch) (see Section "Mounting Fieldline Stand-Alone Devices" on page 4-6 and Section "Mounting Fieldline Modular Devices" on page 4-10).

4.2 Installation Instructions

Electrostatic Discharge!

The module contains components that can be damaged or destroyed by electrostatic discharge. When handling the module, observe the necessary safety precautions against electrostatic discharge (ESD), in accordance with EN 61340-5-1 and EN 61340-5-2, as well as IEC 61340-5-1 and IEC 61340-5-2.

Only qualified personnel should mount and remove a device while observing the ESD regulations.

Meet noise immunity requirements

Connect functional earth ground as described in "Mounting Fieldline Stand-Alone Devices" on page 4-6 and "Mounting Fieldline Modular Devices" on page 4-10.

Ensure IP65/67 protection

To ensure IP65/67 protection, cover unused connections with protective caps.

Avoid damage to the electronics

Only supply the sensors with the voltage U_S provided at the connection points.

Avoid polarity reversal

Avoid polarity reversal of the supply voltages U_L, U_S, and U_A.

4.3 Mounting Distances

No specific distances are required between devices or from a device to a cabinet door or cover. Mounting distances are determined solely by the connectors used and the bending radii of the cables.

4.4 Mounting Fieldline Stand-Alone Devices

There are two options for mounting Fieldline Stand-Alone devices:

– Direct mounting on the front on a flat mounting surface
– Direct mounting on the side on a flat mounting surface

The mounting surface must be flat to avoid strain in the housing when tightening the screws.

Functional earth grounding

Functional earth grounding is absolutely essential for error-free bus operation.

For direct mounting on the front on a grounded mounting surface, the devices are grounded using the upper mounting screw (see Figure 4-4).

For side mounting and for front mounting on an ungrounded mounting surface, the devices are grounded using cable lugs (2.8 mm) via the external grounding connection (connection latch), see page 4-8 and page 4-9.

Mounting

You can directly mount the devices on the mounting surface or on mounting profiles using two mounting holes (∅ 4 mm, cylindrical sinking 8 mm). Please refer to the dimensional drawings in Section "Housing Dimensions for Fieldline Stand-Alone Devices" on page 2-2 for the drill hole distance.

The mounting materials required are two screws with a diameter of 4 mm (M4) and a maximum head diameter of 7 mm and two retaining washers. The length of the screws depends on the mounting method used (at least 30 mm for front mounting, at least 40 mm for side mounting).

The tightening torque is 0.8 Nm.

4.4.1 Front Mounting for Fieldline Stand-Alone Devices

- Screw the device directly onto the flat mounting surface using two mounting screws (1 and 2 in Figure 4-3).

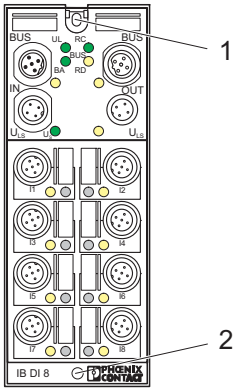

Figure 4-3 Front mounting (FLS)

Grounded mounting surface

If the mounting surface is grounded, the device is connected to functional earth ground via the upper mounting screw (Figure 4-4).

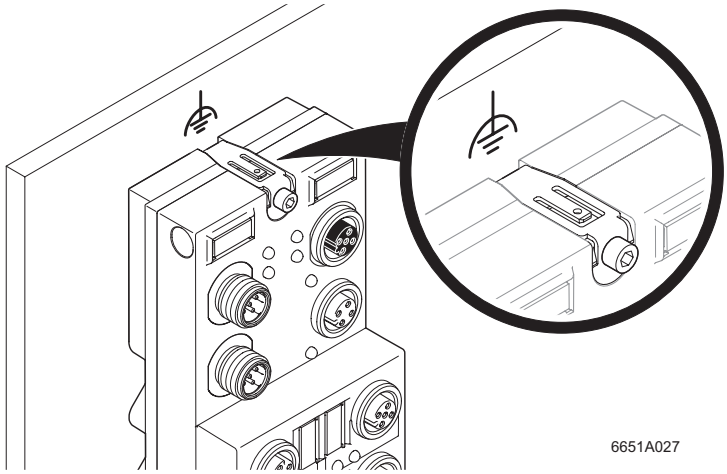

Figure 4-4 Functional earth grounding with grounded mounting surface (FLS)

Ungrounded mounting surface

If the mounting surface is not grounded, the device must be grounded via the external FE connection.

To connect functional earth ground, proceed as shown in Figure 4-5:

- Bend the connection latch back (1).
- Insert a cable lug (2.8 mm), which is connected to FE, in this connection (2).

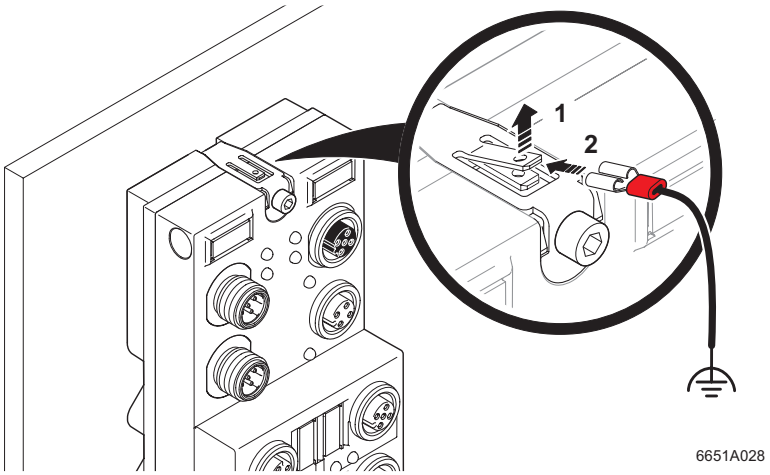

Figure 4-5 Functional earth grounding via external FE connection for front mounting (FLS)

4.4.2 Side Mounting for Fieldline Stand-Alone Devices

- Screw the device onto the mounting surface using two mounting screws in the side mounting holes (1 and 2 in Figure 4-6).

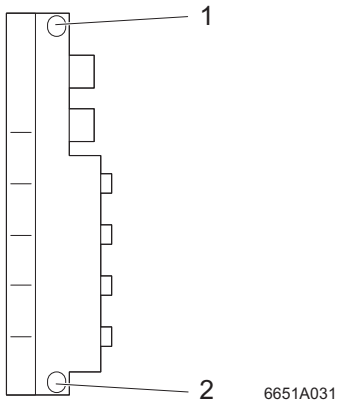

Figure 4-6 Side mounting (FLS)

As in this case the mounting screws have no contact with FE, the device must be grounded via the external FE connection.

To connect functional earth ground, proceed as shown in Figure 4-7:

- Bend the connection latch back (1).
- Insert a cable lug (2.8 mm), which is connected to FE, in this connection (2).

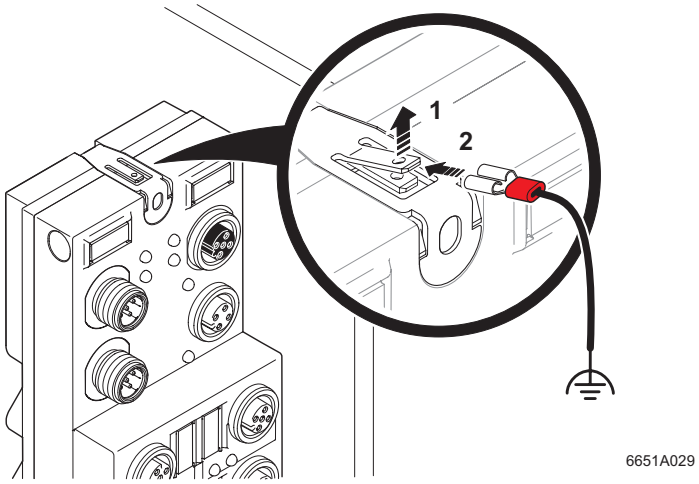

Figure 4-7 Functional earth grounding via external FE connection for side mounting (FLS)

4.5 Mounting Fieldline Modular Devices

There are two options for mounting Fieldline Modular devices:

– Direct mounting on the front on a flat mounting surface (M8 or M12)
– Mounting the devices side by side on a mounting plate (M12 only)

4.5.1 Direct Mounting on a Flat Mounting Surface

The mounting surface must be flat to avoid strain in the housing when tightening the screws. Do not use this device to bridge gaps in order to prevent forces to be transmitted onto the device.

Functional earth grounding

Functional earth grounding is absolutely essential for error-free bus operation.

For direct mounting on the front on a grounded mounting surface, the devices are grounded using the upper mounting screw (see Figure 4-8).

For front mounting on an ungrounded mounting surface, the devices are grounded using cable lugs (2.8 mm) via the external grounding connection (connection latch), see Figure 4-10.

Mounting

You can directly mount the devices on the mounting surface, using two mounting holes (∅ 4 mm, cylindrical sinking 8 mm). Please refer to the dimensional drawings in Section "Housing Dimensions for Fieldline Modular Devices" on page 3-2 for the drill hole distance.

For Fieldline Modular M8 devices tighten the fixing screws at the girder metal sheet with a maximum of 2.8 Nm.

Screw the device directly onto the mounting surface using two mounting screws (1 and 2 in Figure 4-8).

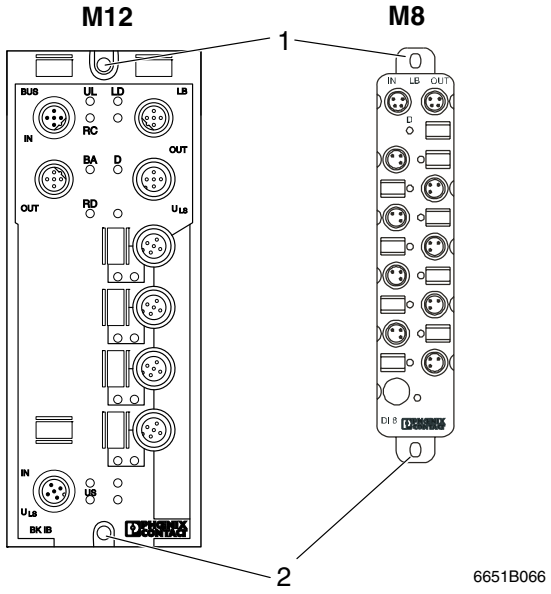

Figure 4-8 Front mounting (FLM)

Grounded mounting surface, FLM M12

If the mounting surface is grounded, the device is connected to functional earth ground via the upper mounting screw (Figure 4-9).

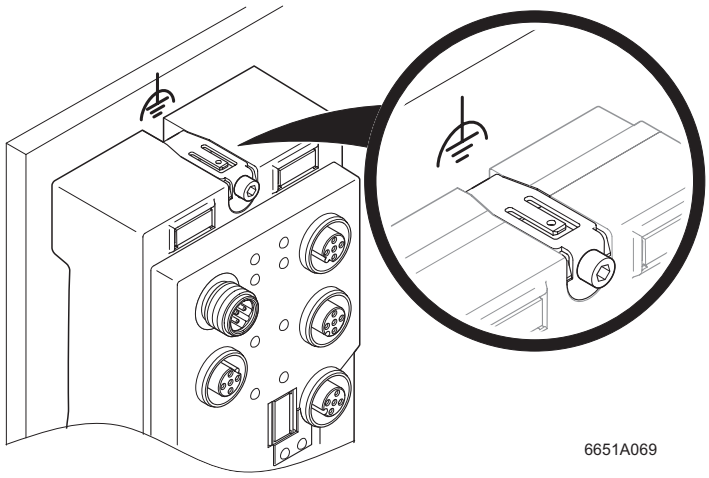

Figure 4-9 Functional earth grounding with grounded mounting surface (FLM M12)

Ungrounded mounting surface, FLM M12

If the mounting surface is not grounded, the device must be grounded via the external FE connection.

To connect functional earth ground, proceed as shown in Figure 4-10:

- Bend the connection latch back (1).
- Insert a cable lug (2.8 mm), which is connected to FE, in this connection (2).

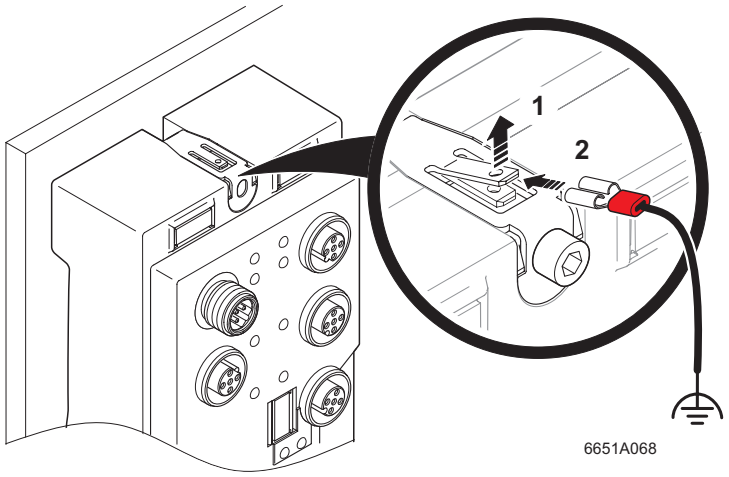

Figure 4-10 Functional earth grounding via external FE connection (FLM M12)

Grounded mounting surface, FLM M8

When mounting the devices bottom on a conductive surface, the device is connected to functional earth ground via the mounting screw.

Ungrounded mounting surface, FLM M8

When mounting the devices bottom on a non-conductive surface, the device is connected to functional earth ground using the mounting screw via a cable lug.

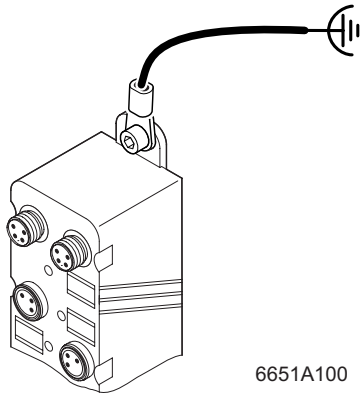

Figure 4-11 Functional earth grounding using a mounting screw via a cable lug (FLM M8)

4.5.2 Mounting on a Mounting Plate

For mounting Fieldline Modular M12 devices Phoenix Contact recommends using a mounting plate. The FLM MP5 mounting plate (Order No. 2736660) can be used to mount up to five devices. The FLM MP7 mounting plate (Order No. 2736673) supports up to seven devices.

Mounting

You can directly mount the devices on the mounting plate using two mounting holes (∅ 4 mm, cylindrical sinking 8 mm). The device is connected to functional earth ground via the upper mounting screw, see Figure 4-9 on page 4-11.

Use standard M4 x 40 mm screws.

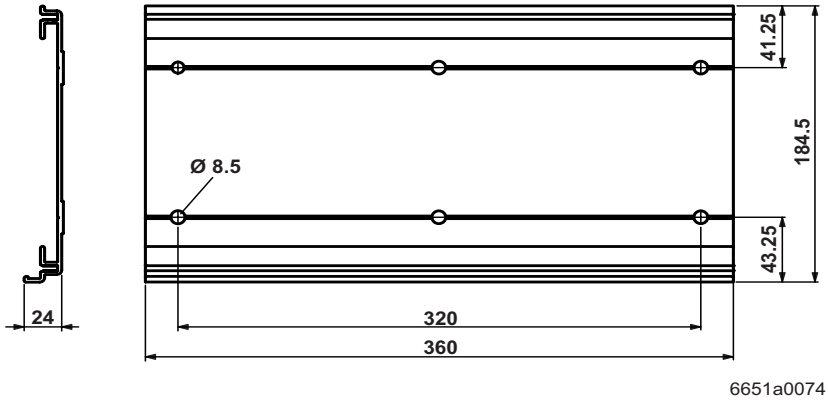

Figure 4-12 Dimensional drawing for FLM MP5 mounting plate (mm)

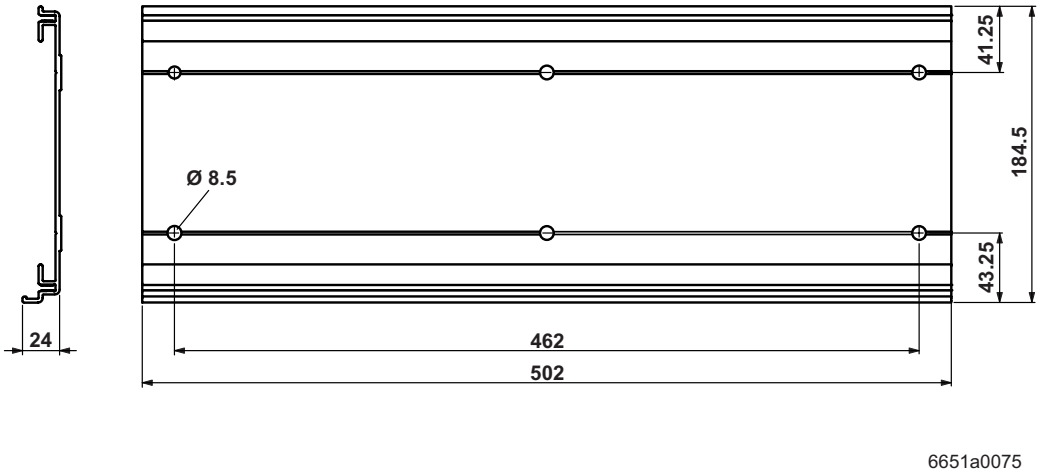

Figure 4-13 Dimensional drawing for FLM MP7 mounting plate (mm)

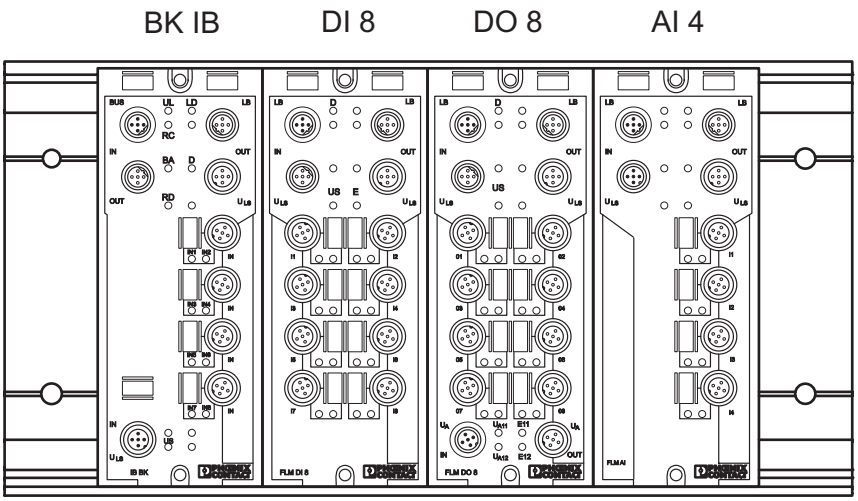

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Figure 4-14 Fieldline Modular M12 devices on an FLM MP5 mounting plate

4.6 Setting the Address and Transmission Speed for Fieldline Devices

PROFIBUS-DP, DeviceNet™, CANopen

Fieldline devices for **PROFIBUS-DP**, **DeviceNet™**, and **CANopen** bus systems have rotary encoding switches for setting the address and, if necessary, the transmission speed (see user manual for the relevant bus system). Rotary encoding switch X10 is used to specify the tens and switch X1 is used to specify the units of the device ID (module ID).

Example:

Setting address 46 (e.g., PROFIBUS-DP):

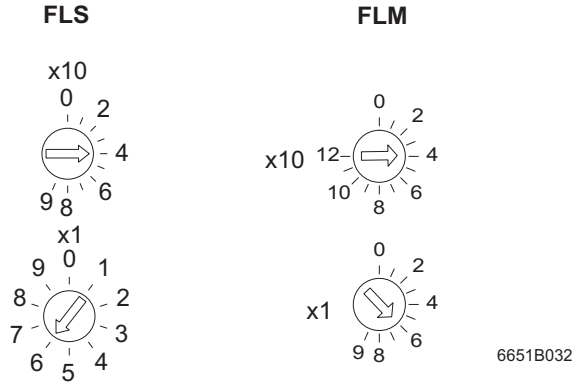

Figure 4-15 Example: address 46 (FLS and FLM)

Adjust the rotary encoding switches using a suitable screwdriver (according to DIN 5264: blade width 3.0 mm or 2.5 mm). Use of an unsuitable tool may damage the rotary encoding switches.

For additional information on addresses and transmission speeds, please refer to the Fieldline user manual for your bus system and the device-specific data sheet.

Bluetooth

The device address is set using rotary encoding switches on the base station. The ID-PLUG is programmed using the base station. If the ID-PLUG is plugged on the base station, the device address is read by the rotary encoding switch and, together with the connection parameters, written to the ID-PLUG. The ID-PLUG stores the connection parameters (Bluetooth address of the base station and pass key) and the device address. During programming the ID-PLUG LED is yellow. After successful programming the ID-PLUG is green.

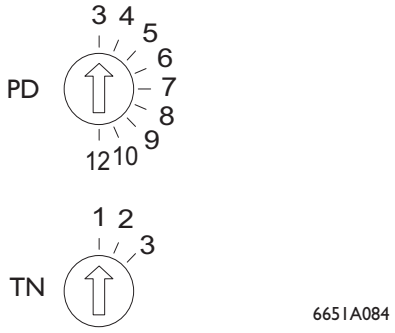

Figure 4-16 Rotary encoding switch on the FLM BT BS 3 device

For further information on setting up an FLM BT BS 3 local bus device, please refer to the device-specific data sheet.

4.7 Assembling Bus Cables for M12 Connectors

Phoenix Contact recommends the use of pre-assembled bus cables (see Phoenix Contact AUTOMATION catalog).

If you assemble the cables yourself, use one of the recommended shielded M12 connector types. If the cables are assembled correctly, they provide IP65/67 protection when connected.

Phoenix Contact recommends the use of shielded M12 connectors (see Phoenix Contact AUTOMATION catalog). Please note the bus-specific encoding.

The following assembly example uses the SACC-M12MSB-5CON-PG9 SH AU connector (Order No. 1507764). For other connectors, please follow the description provided with the connector.

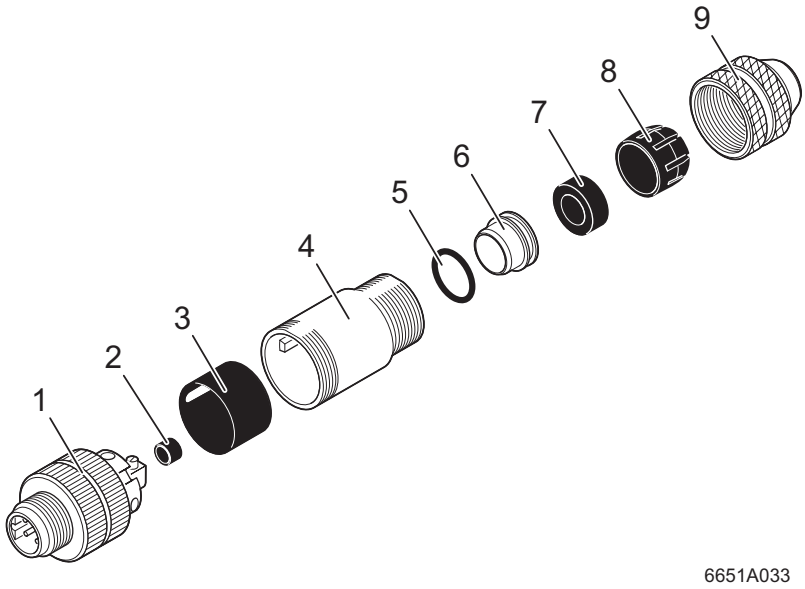

Figure 4-17 Structure of an M12 connector (e.g., SACC-M12MSB-5CON-PG9-SH AU)

1 Contact insert
2 Shrink sleeve
3 Insulation insert
4 Protective cap
5 Grommet
6 Shield insert
7 Grommet
8 Compression ring
9 Cap nut

To assemble the cables, proceed as shown in Figure 4-18.

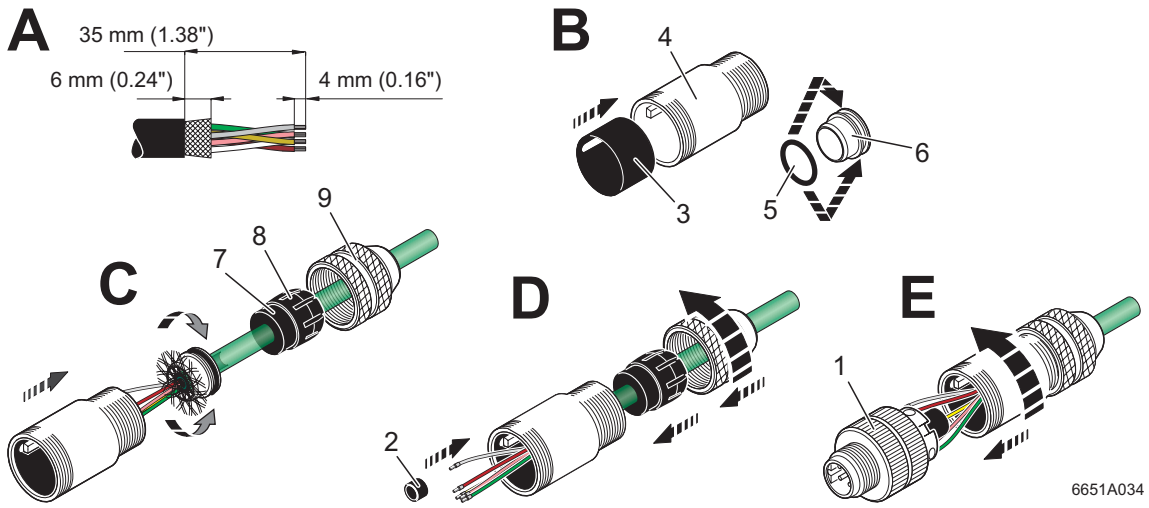

Figure 4-18 Cable assembly using the example of a shielded INTERBUS cable

Assembly steps

- Strip approximately 35 mm off the outer cable sheath (A).
- Shorten the shield to 6 mm (A).
- Strip 4 mm off the wires (A). For INTERBUS: cut off white wire.
- Fit ferrules at the ends.
- Push insulation insert (3) into the protective cap (4) (B).
- Push grommet (5) into the groove in the shield insert (6) (B).
- Push cap nut (9), compression ring (8), grommet (7), and shield insert with grommet onto the prepared cable (C).
- Push grommet into the compression ring (C).
- Place braided shield around the shield insert (C).
- Push protective cap over the shielding (C).
- Push compression ring with the grommet into the protective cap and screw the cap nut onto the protective cap (D).
- Push shrink sleeve (2) for functional earth ground over the relevant wire (D).
- Push the wires into the ferrules of the contact insert (1) and screw into place. The shrink sleeve is thus pushed over the central contact (E).
- Screw contact insert (1) onto the protective cap (E).

Connect as much of the shield as possible, to prevent interference.
Ensure the connections are secure.

Select the cable diameter according to the cable input to ensure a good seal and thus provide IP65/67 protection.

For the connector pin assignment, please refer to the Fieldline user manual for your bus system and the device-specific data sheet.

4.8 Assembling System Cables for M8 Connectors

Phoenix Contact recommends the use of pre-assembled bus cables.

If you assemble the cables yourself, use one of the recommended shielded M8 connector types. If the cables are assembled correctly, they provide IP65/67 protection when connected.

Phoenix Contact recommends the use of shielded M8 connectors.

The following assembly example uses the SACC-M8MS-4CON-M-0,34-SH connector (Order No. 1542897). For other connectors, please follow the description provided with the connector.

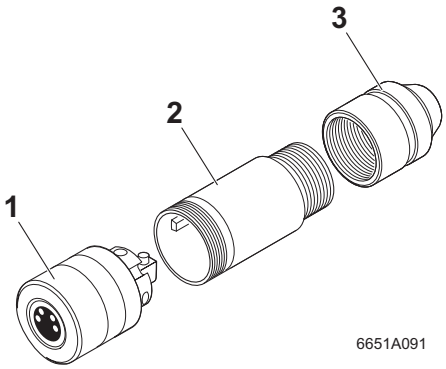

Figure 4-19 Structure of an M8 connector (e.g., SACC-M8MS-4CON-M-0,34-SH)

1 Contact insert
2 Protective cap/housing
3 Pressure screw

To assemble the cables, proceed as shown in Figure 4-20.

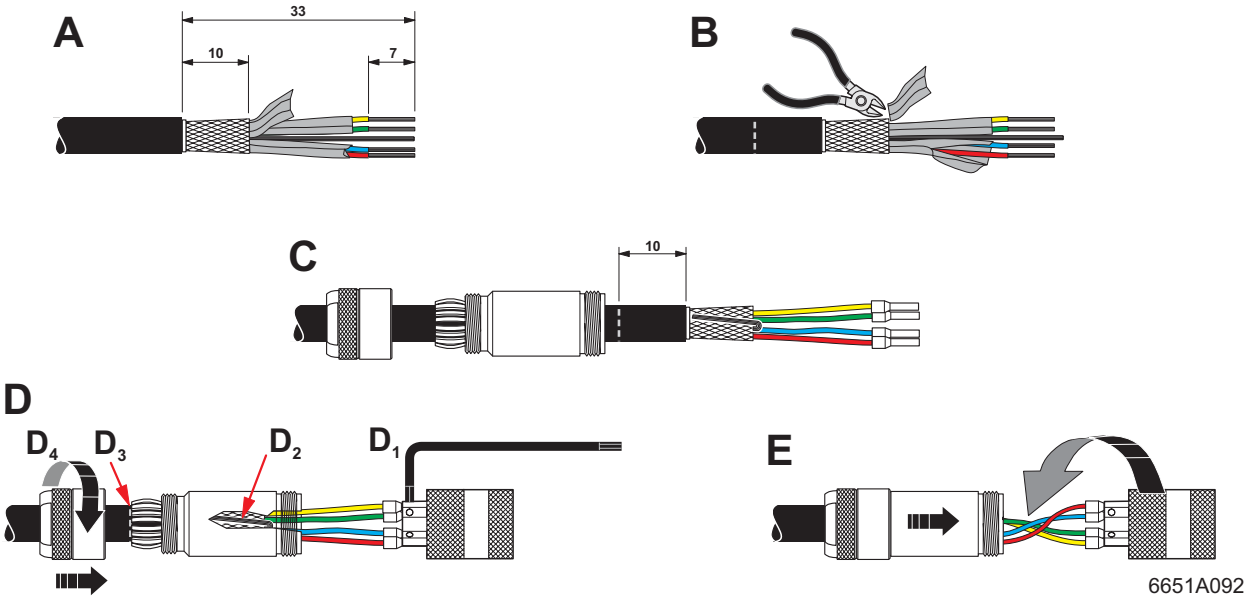

Figure 4-20 Cable assembly using the example of a shielded cable

Assembly steps

- Strip approximately 33 mm off the outer cable sheath and remove the Teflon shield up to the outer cable sheath (A).
- Shorten the braided shield to approximately 10 mm (A).
- Remove the conductive fleece (B).
- Remove the two internal shields (for each wire pair); (B).
- Bend the filler litz back and shorten it until it is flush with the outer cable sheath (C).
- Mark the sheath approximately 10 mm behind the sheath end (C).
- Wire the pressure screw and the hosing on the cable (C).
- Strip approximately 7 mm of the wires and connect the ferrules (C).
- Establish contact between connector insert and ferrules. Use the provided Allen wrench to tighten the screws (D_1 in illustration D). For the pin assignment, please refer to the data sheet.
- Check the filler litz (D_2 in illustration D). It must be positioned flat on the braided shield (D).
- Position the housing at the mark (D_3 in illustration D).
- Tighten the pressure screw (D_4 n illustration D).
- Twist the contact insert for easier assembly (E).
- Screw the contact insert onto the protective cap (E).

Connect as much of the shield as possible, to prevent interference. Ensure the connections are secure. Make sure that the filler litz, together with the braided shield, is directly connected to functional earth ground at both cable ends.

For the connector pin assignment, please refer to the Fieldline user manual for your bus system and the device-specific data sheet.

4.9 Connecting Bus Cables, Sensors, Actuators, and Power Supply Using the SPEEDCON Quick Connection Technology

For information on "Connecting Bus Cables", please refer to the Fieldline user manual for your bus system and the device-specific data sheet.

With Fieldline M12 devices it is possible to use the SPEEDCON quick connection technology. Bus cables, sensors, actuators, and the power supply are connected most quickly using this connection technology. The electrical connections are installed by means of half turning the connector.

SPEEDCON is upward and backward-compatible with standard M12 systems and meets all the standards and requirements of the former M12 connector systems.

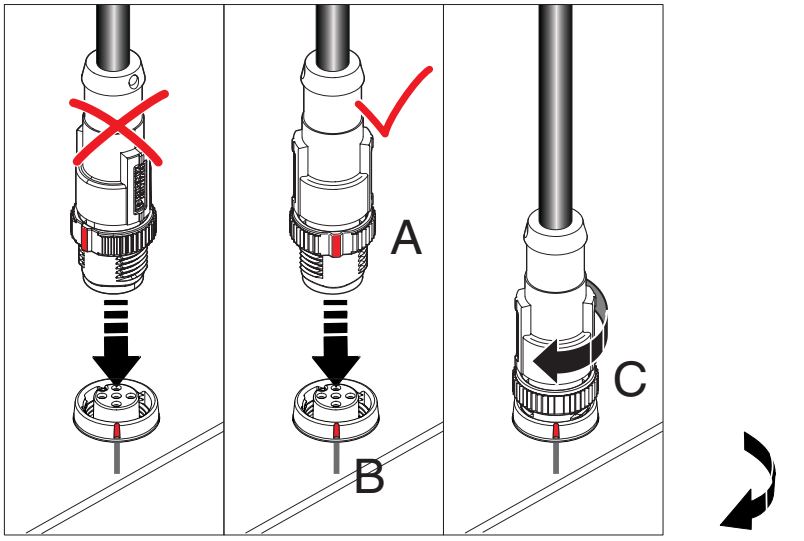

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Figure 4-21 SPEEDCON quick connection technology

For using the SPEEDCON quick connection technology, proceed as follows:

- Position the connector mark (A) directly above the marked line (B) on the housing.
- Vertically insert the connector as far as possible.
- Turn the knurled nut of the connector (C) clockwise until it is tight.

4.10 Connecting the Power Supply

For Fieldline devices, a distinction is made between three different voltages:

– U_L to supply the communications power for the device electronics (always required)
– U_S to supply the sensors (only required for devices with inputs)
– U_A to supply the actuators (only required for devices with outputs)

With Fieldline Modular M8 DIO devices U_A also supplies the sensors.

Connection

All supply voltages are connected via M8 or M12 connectors.

Current carrying capacity

Connect each of the supply voltages completely (to +24 V and GND). Do not connect several supply voltages via one GND, as this exceeds the current carrying capacity of the contacts.

Also connect a large part of the filler litz to the connector when assembling the M8 system cables with braided shield.

4.10.1 Power Supplies U_L and U_S

The voltages U_L and U_S are supplied via the U_{LS} IN connection.

The power supply U_L is required to supply the communications power for the device electronics. It must be connected to every device. If this supply voltage is disconnected, the device does not function.

Install the power supply for the device electronics independently of the power supply for the actuators. Protect the power supplies independently. In this way the bus continues to run even if some I/O devices are switched off.

The power supply U_S supplies the sensors. It is only connected to devices with inputs and is supplied at the U_{LS} connection.

For **INTERBUS**, **PROFIBUS-DP** and **Ethernet**, the voltages U_L and U_S are supplied via the U_{LS} IN connection and, if other devices are also to be supplied, forwarded via U_{LS} OUT.

For **DeviceNet™**, the voltage U_L is always transferred via the bus cable and supplied at the BUS IN connection via V+/V- and then forwarded via BUS OUT.

For **CANopen**, the voltage CAN U_L is transferred via the bus cable and supplied at the BUS IN connection via V+/V- and then forwarded via BUS OUT.

For Fieldline Modular devices, the voltage U_L for the local bus is supplied at the U_{LS} connection.

For information on using the communications power for other bus systems, please refer to the device-specific data sheets

Power supply U_{LS} for Fieldline Stand-Alone devices

Connect the power supplies for the communications power and the sensors U_{LS} to female connector U_{LS} IN. To supply other devices, connect the cable for the outgoing supply voltage to female connector U_{LS} OUT.

The current carrying capacity of the M12 connectors is 4 A per contact. Ensure that this value is not exceeded. Please note that the connection for the outgoing supply voltage is not monitored for overload. Exceeding the permissible current carrying capacity may lead to connector damage.

Phoenix Contact recommends the use of pre-assembled cables.

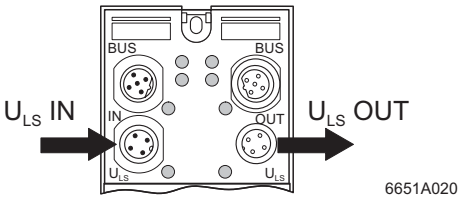

Figure 4-22 Connections for the power supply U_{LS} (FLS)

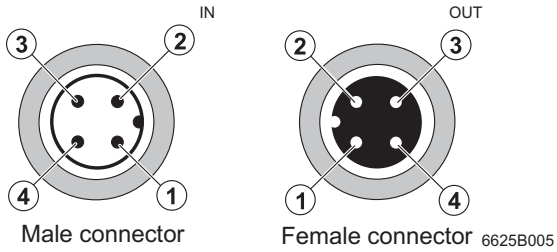

Figure 4-23 Pin assignment of the power supply U_{LS} (connections on the Fieldline Stand-Alone device)

Table 4-1 Pin assignment of the power supply U_{LS} (FLS)

Pin	IN	OUT	Wire Color
1	U_L +24 V	U_L +24 V	Brown
2	U_S GND	U_S GND	White
3	U_L GND	U_L GND	Blue
4	U_S +24 V	U_S +24 V	Black

The power supplies U_L and U_S should only be supplied with SELV (Safety Extra-Low Voltage).

Power supply U_{LS} for Fieldline Modular M12 Devices

Connect the power supplies for the communications power and the sensors U_{LS} to female connector U_{LS} IN. To supply other devices, connect the cable for the outgoing supply voltage to female connector U_{LS} OUT.

The current carrying capacity of the M12 connectors is 4 A per contact. Ensure that this value is not exceeded. Please note that the connection for the outgoing supply voltage is not monitored for overload. Exceeding the permissible current carrying capacity may lead to connector damage.

Phoenix Contact recommends the use of pre-assembled cables.

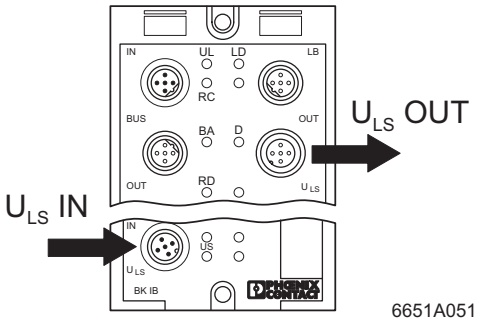

Figure 4-24 Connections for the power supply U_{LS} of the bus couplers (FLM)

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

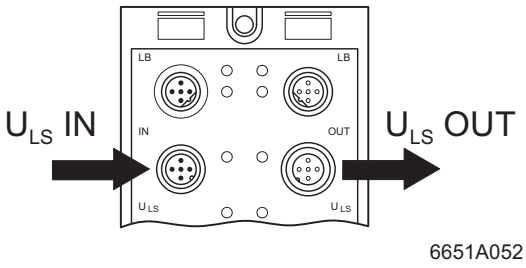

Figure 4-25 Connections for the power supply U_{LS} on the digital and analog M12 input and output devices (FLM)

Voltages U_L and U_S at female connector U_{LS} OUT can each only carry a maximum current of 4 A.

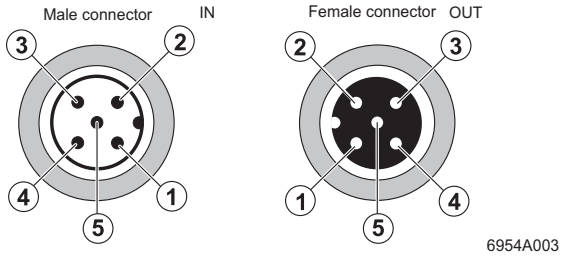

Figure 4-26 Pin assignment of the power supply U_{LS} (connections on the Fieldline Modular M12 device)

Table 4-2 Pin assignment of the power supply U_{LS} for Fieldline Modular M12 devices (FLM)

Pin	IN	OUT	Wire Color
1	U_L +24 V	U_L +24 V	Brown
2	U_S GND	U_S GND	White
3	U_L GND	U_L GND	Blue
4	U_S +24 V	U_S +24 V	Black
5	500 kbaud / 2 Mbaud	500 kbaud / 2 Mbaud	**Green/yellow** or gray

The transmission speed is switched to 2 Mbaud by jumpering +24 V (U_L, pin 1) to pin 5 on the bus coupler. For safety reasons, the pins should be jumpered on the last device of the local bus station.
For Ethernet and PROFINET IO, please refer to the relevant data sheet.

Power supply U_{LS} for Fieldline Modular M8 devices

The current carrying capacity of the M8 connectors is 3 A per contact. Ensure that this value is not exceeded. Please note that the connection for the outgoing supply voltage is not monitored for overload. Exceeding the permissible current carrying capacity may lead to connector damage.

Phoenix Contact recommends the use of pre-assembled cables.

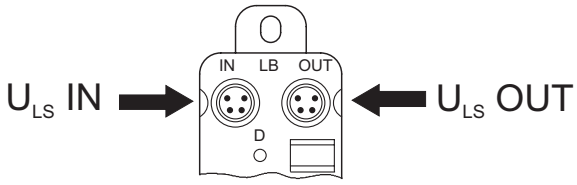

Figure 4-27 Connections for the power supply on the digital FLM M8 input and output devices

In the event of power supply from one side, U_{LS} OUT must be supplied back.

With FLM M8 DI devices, voltage U_{LS} supplies the sensors and logic.
With FLM M8 DIO devices, voltage U_{LS} supplies the logic and voltage U_A the sensors and actuators.

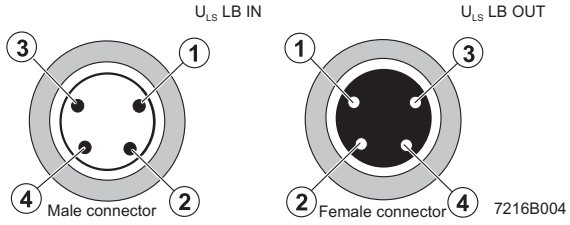

Figure 4-28 Pin assignment of the power supply U_{LS} and the local bus (FLM M8)

Pin assignment of the power supply U_{LS} and the local bus (FLM M8)

Pin	IN	OUT	Wire Color
1	U_{LS} +24 V	U_{LS} +24 V	Red
2	DI	DO	Yellow
3	U_{LS} GND	U_{LS} GND	Blue
4	$\overline{DI}$	$\overline{DO}$	Green

Voltage $_{LS}$ at female connector OUT can only carry a maximum current of 3 A.
The thread is used for shielding.

4.10.2 Power Supply U_A

Power supply U_A for FLS and FLM M12 devices

The power supply U_A is required to supply the actuators. It is only connected to devices with outputs.

The connections for U_A have different functions for output devices (DO devices) and I/O devices (DIO devices). Figure 4-29 provides examples for the different device types.

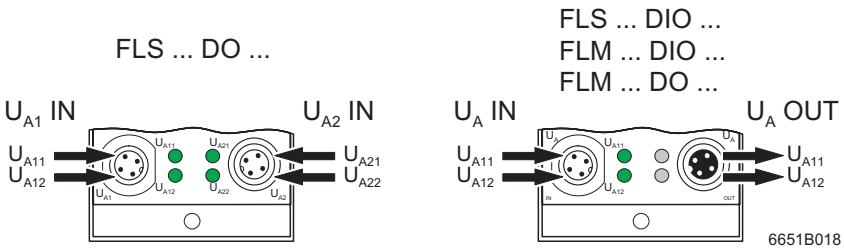

Figure 4-29 U_A connections for DO and DIO devices (FLS and FLM M12)

The different functions of the connections - supply for DO devices and supply and forwarding for DIO devices - are due to the different number of outputs and their nominal current. Two voltages are connected to each connection for supplying U_A, e.g., the voltages U_{A11} and U_{A12} at U_{A1}. Each of these supply voltages supplies a group of outputs. The advantage of this structure is that the outputs can be switched off in groups.

For information about which outputs are supplied from which voltage, see the examples in Section "Power Supply for Sensors and Actuators in Individual Fieldline Stand-Alone Devices" on page 4-30 and Section "Power Supply for Sensors and Actuators in Individual Fieldline Modular M12 Devices" on page 4-32.

Connect each of the supply voltages completely (to +24 V and GND). Do not connect several supply voltages via one GND, as this would exceed the current carrying capacity of the contacts.

When determining the load for a supply voltage, take into account the number of outputs, the nominal current, and the simultaneity.

Power supply U_{LS} for M8 devices

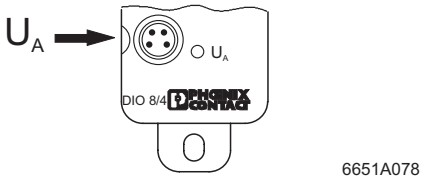

Figure 4-30 U_A connection for Fieldline Modular DIO/DO M8 devices

With Fieldline Modular M8 devices, voltage U_A is led twice through the supply line. This allows for a total current carrying capacity of 6 A.

For information about which outputs are supplied from which voltage, see the examples in Section "Power Supply for Sensors and Actuators in Individual Fieldline Modular M8 Devices" on page 4-35.

Pin assignment of the power supply U_A for Fieldline Stand-Alone devices

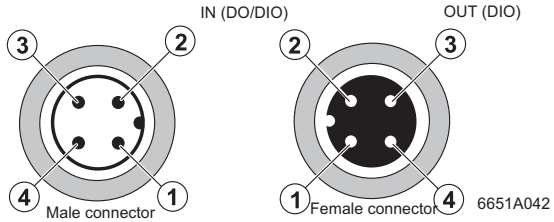

Figure 4-31 Pin assignment of the power supply U_A of the outputs (connections on the Fieldline Stand-Alone device)

Table 4-3 Pin assignment of the power supply U_A (FLS)

Pin	IN (DIO/DO)	OUT (DIO)	IN (DO-2A)	Wire Color
1	U_{A11} +24 V	U_{A11} +24 V	U_{A21} +24 V	Brown
2	U_{A12} GND	U_{A12} GND	U_{A22} GND	White
3	U_{A11} GND	U_{A11} GND	U_{A21} GND	Blue
4	U_{A12} +24 V	U_{A12} +24 V	U_{A22} +24 V	Black

The power supply U_A should only be supplied with SELV (Safety Extra-Low Voltage).

Pin assignment of the power supply U_A for Fieldline Modular M12 devices

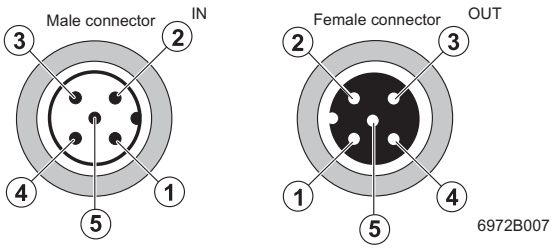

Figure 4-32 Pin assignment of the power supply U_A of the outputs (connections on the Fieldline Modular device)

Table 4-4 Pin assignment of the power supply U_A of the outputs (connections on the Fieldline Modular M12 device)

Pin	IN	OUT	Wire Color
1	U_{A11} +24 V	U_{A11} +24 V	Brown
2	U_{A12} GND	U_{A12} GND	White
3	U_{A11} GND	U_{A11} GND	Blue
4	U_{A12} +24 V	U_{A12} +24 V	Black
5	Not used	Not used	**Green/yellow** or gray

The power supply U_A should only be supplied with SELV (Safety Extra-Low Voltage).

Pin assignment of the power supply U_A for Fieldline Modular M8 devices

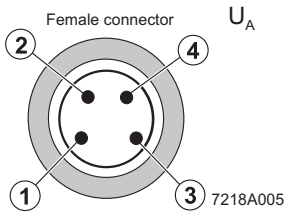

Figure 4-33 Pin assignment of the power supply U_A of the outputs (connections on the Fieldline Modular M8 device)

Table 4-5 Pin assignment of the power supply U_A of the outputs (connections on the Fieldline Modular M8 device)

Pin	Assignment	Wire Color
1	24 V U_A	Brown
2	GND U_A	White
3	GND U_A	Blue
4	24 V U_A	Black

The power supply U_A should only be supplied with SELV (Safety Extra-Low Voltage). With the FLM DIO 8/4 M8, U_A is also used to supply the sensors.

4.10.3 Power Supply for Sensors and Actuators in Individual Fieldline Stand-Alone Devices

The following figures provide **examples** of which inputs and outputs are supplied by which supply voltage.

For the actual assignment of your device, please refer to the device-specific data sheet.

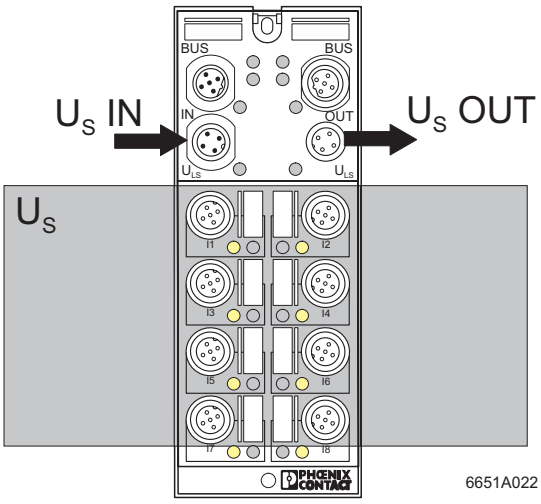

Figure 4-34 Input supply
(digital input device, e.g., FLS IB M12 DI 8 M12)

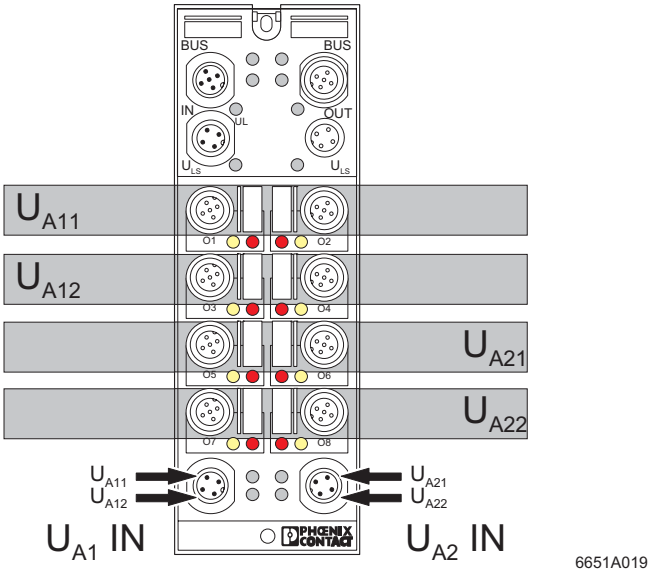

Figure 4-35 Output supply
(digital output device, e.g., FLS IB M12 DO 8 M12-2A)

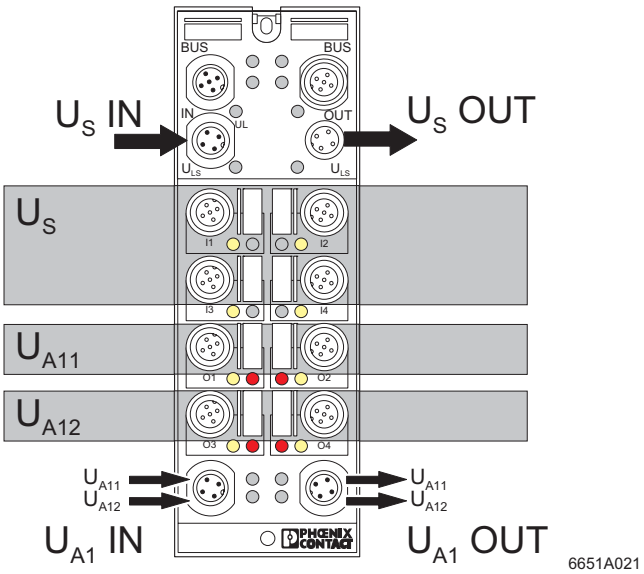

Figure 4-36 Input and output supply (digital I/O device, e.g., FLS IB M12 DIO 4/4 M12-2A)

4.10.4 Power Supply for Sensors and Actuators in Individual Fieldline Modular M12 Devices

The following figures provide **examples** of which inputs and outputs are supplied by which supply voltage.

For the actual assignment of your device, please refer to the device-specific data sheet.

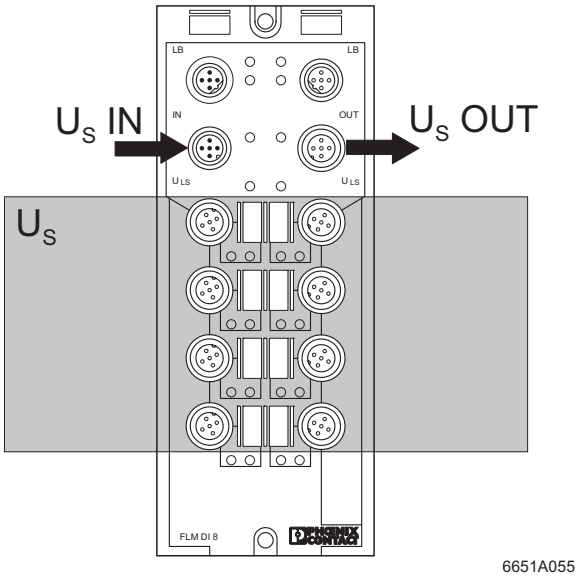

Figure 4-37 Input supply
(digital input device, e.g., FLM DI 8 M12)

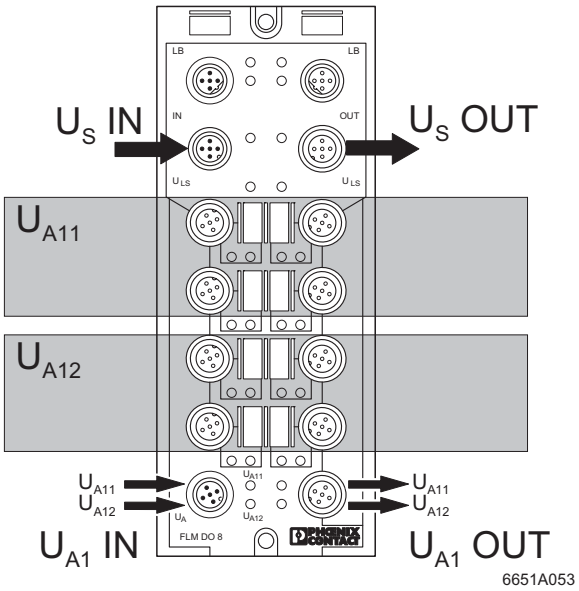

Figure 4-38 Output supply
(digital output device, e.g., FLM DO 8 M12)

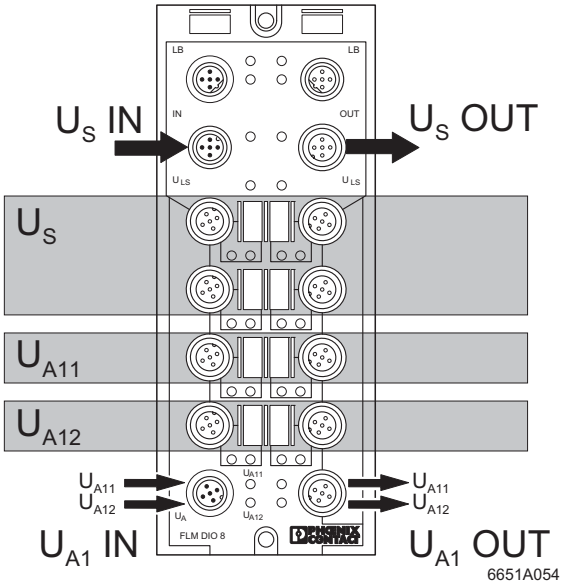

Figure 4-39 Input and output supply
(digital I/O device, e.g., FLM DIO 4/4 M12-2A)

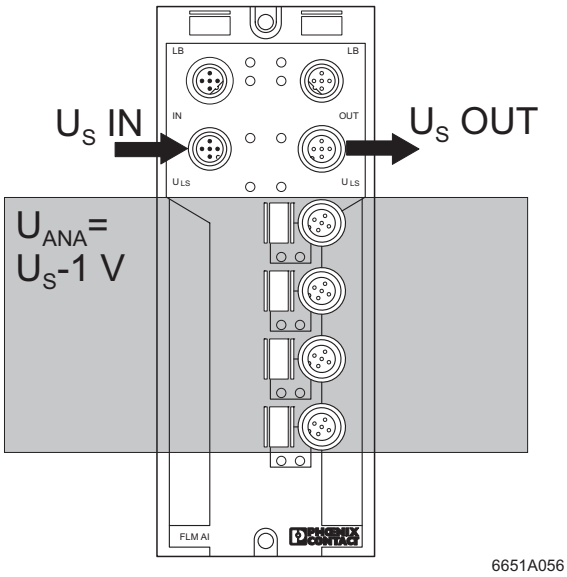

Figure 4-40 Input and output supply
(analog device, e.g., FLM AI 4 SF M12)

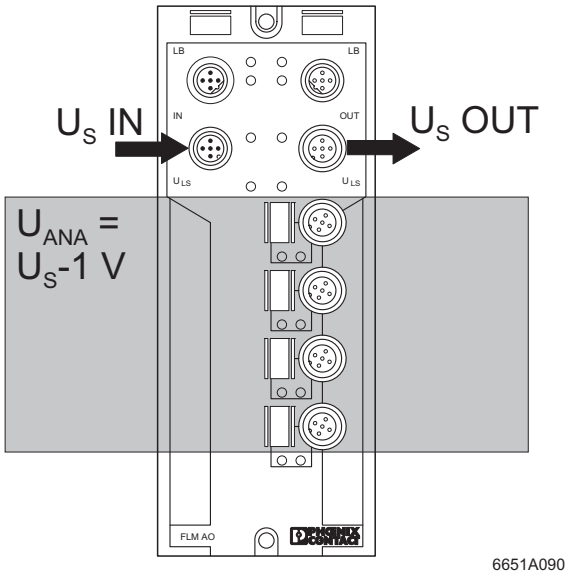

Figure 4-41 Output supply
(analog device, e.g., FLM AO 4 SF M12)

4.10.5 Power Supply for Sensors and Actuators in Individual Fieldline Modular M8 Devices

The following figures provide **examples** of which inputs and outputs are supplied by which supply voltage.

For the actual assignment of your device, please refer to the device-specific data sheet.

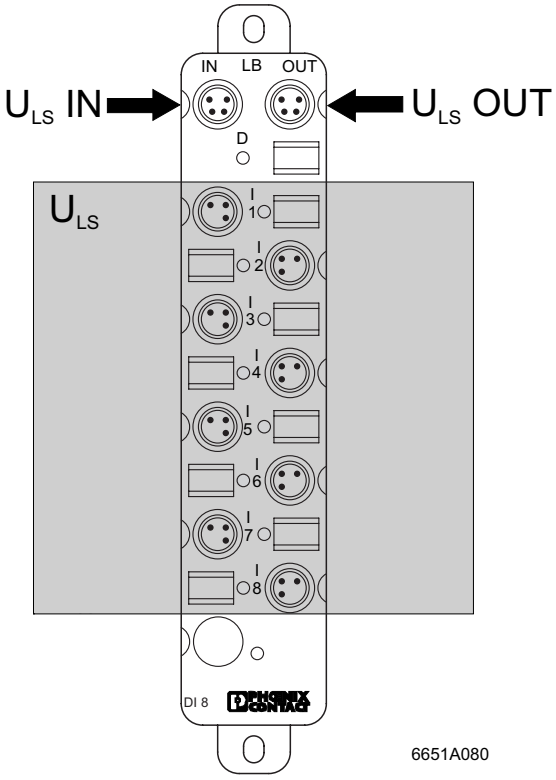

Figure 4-42 Input supply
(digital input device, e.g., FLM DI 8 M8)

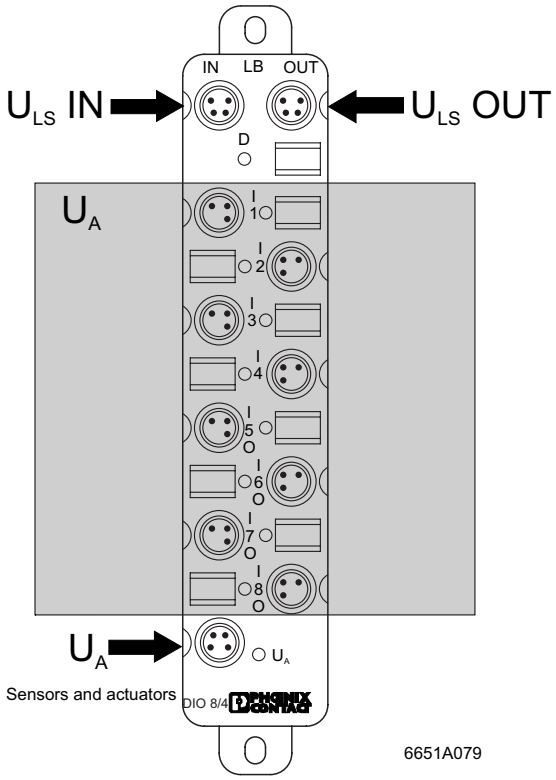

Figure 4-43 Input and output supply
(digital I/O device, e.g., FLM DIO 8/4 M8)

Combined input and output devices only use the communications power from the M8 system cable.

4.10.6 Voltage Supply Examples

FLS

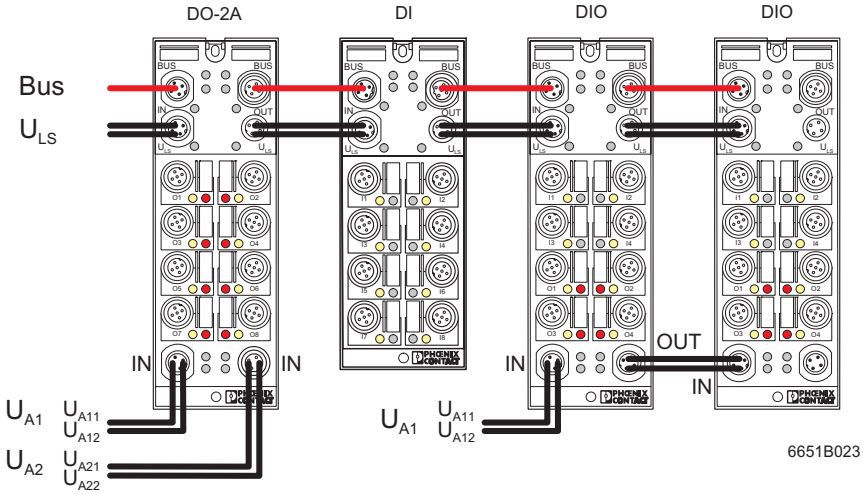

Figure 4-44 Example for the supply and forwarding of supply voltages (FLS)

FLM M12

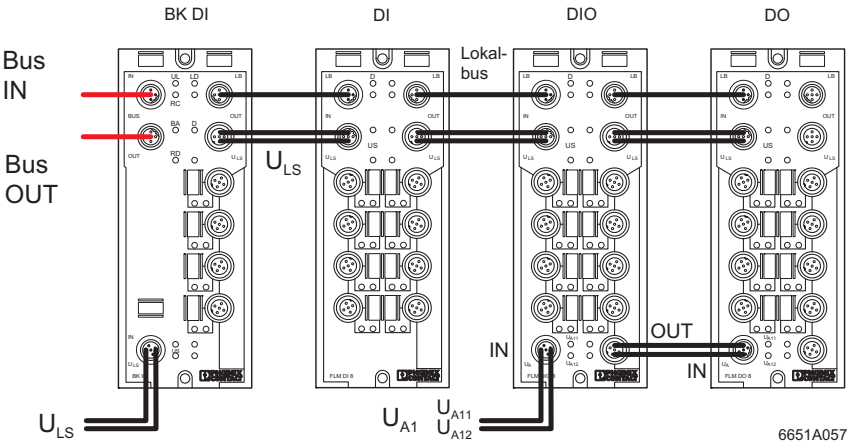

Figure 4-45 Example for the supply and forwarding of supply voltages (FLM M12)

The current carrying capacity of the M12 connectors is 4 A per contact. Ensure that this value is not exceeded. Please note that the connection for the outgoing supply voltage is not monitored for overload. Exceeding the permissible current carrying capacity may lead to connector damage.

FLM M8

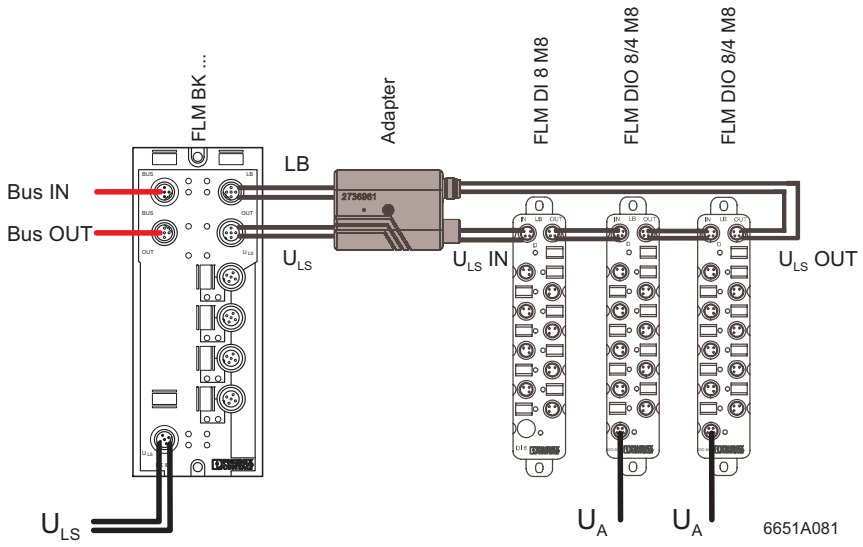

Figure 4-46 Example for the supply and forwarding of supply voltages (FLM M8)

The current carrying capacity of the M8 connectors is 3 A per contact. Ensure that this value is not exceeded. Please note that the connection for the outgoing supply voltage is not monitored for overload. Exceeding the permissible current carrying capacity may lead to connector damage.

If U_{LS} is directly supplied to the adapter from the bus coupler, the maximum current load is 2 A. If power is supplied again at an M12 bus device before the adapter, the maximum current load for the M8 bus devices on the local bus is 4 A.

If U_A is supplied in 4-pos. method at an M8 bus device, the maximum current load is 2 x 3 A.

Example for Optional Supply Via a Y Cable With Reduced Current (for Fieldline Stand-Alone Devices Only)

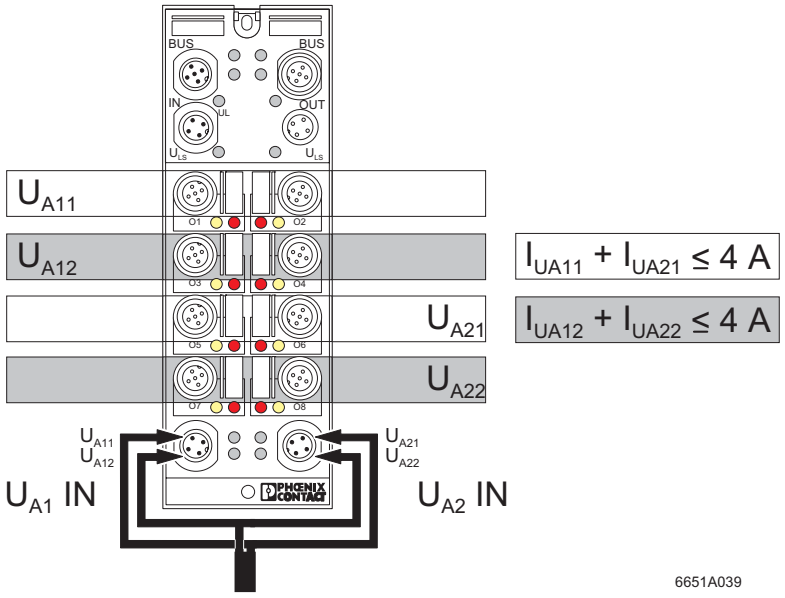

Figure 4-47 Supply via a Y cable (FLS)

If you are working with reduced current, you can use a Y cable to supply the supply voltages U_A. In this case, the following conditions must be met for the currents:

The total current at U_{A11} and U_{A21} must not exceed 4 A.
The total current at U_{A12} and U_{A22} must not exceed 4 A.

Example of Switching Off Specific Outputs on a Fieldline Stand-Alone M12 Device

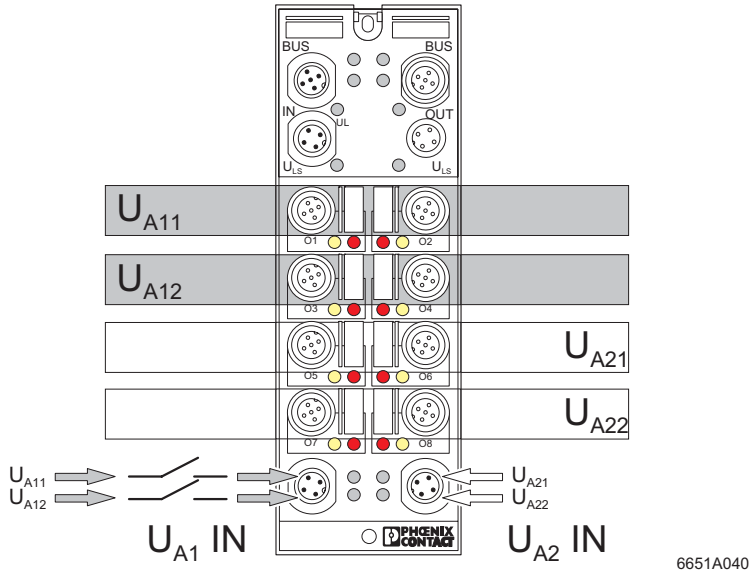

Figure 4-48 Switching off specific outputs (FLS)

If you switch off the voltage U_{A11}/U_{A12} in the example, outputs O1 to O4 are switched off. Outputs O5 to O8 can still be operated independently.

4.10.7 Calculation Examples for Sensor and Actuator Currents

Calculation example for an FLM bus coupler

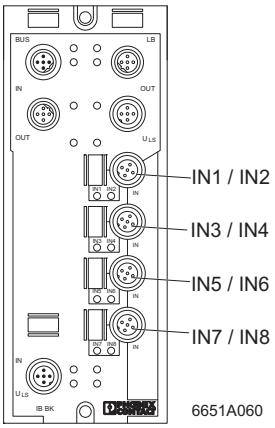

Figure 4-49 FLM BK IB M12 DI 8 M12

Sensor type:	**Current consumption:**
2 x reflex optical data link with 2 output signals	30 mA each
2 x inductive sensors	15 mA each

Calculation example for a bus coupler

IN1, IN2	Reflex optical data link		30 mA
IN3, IN4	Reflex optical data link	+	30 mA
IN5	Inductive sensor	+	15 mA
IN7	Inductive sensor	+	15 mA
Sensor supply		=	**90 mA**
Current consumption of inputs (5 mA for each input used)		+	**30 mA**
I_{US} total		=	**120 mA**

With this configuration, the FLM BK loads U_S with approximately 120 mA. U_L is loaded with approximately 70 mA (see data sheet).

Voltages U_L and U_S each have a maximum load of 2 A at the bus coupler.

Calculation example for an FLM DI 8 M12 device

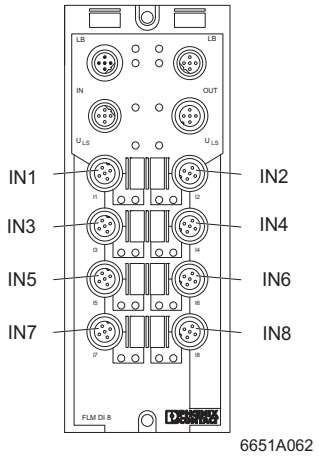

Figure 4-50 FLM DI 8 M12

Sensor type:	**Current consumption:**
1 x reflex optical data link with 2 output signals	30 mA each
2 x inductive sensors	15 mA each
3 x proximity switches	10 mA each

Calculation example for an FLM DI 8 M12 device

IN1, IN2	Reflex optical data link		30 mA
IN3	Inductive sensor	+	15 mA
IN4	Inductive sensor	+	15 mA
IN5	Proximity switch	+	10 mA
IN6	Proximity switch	+	10 mA
IN7	Proximity switch	+	10 mA
Sensor supply		=	**90 mA**
Current consumption of inputs (5 mA for each input used)		+	**35 mA**
I_{US} total		=	**125 mA**

With this configuration, the FLM DI 8 M12 device loads U_S with approximately 125 mA. U_L is loaded with approximately 40 mA (see data sheet).

Calculation example for an FLS DIO 4/4 device

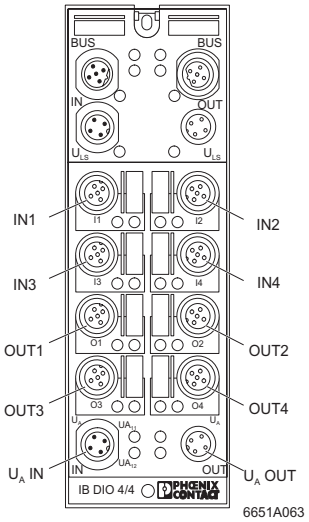

Figure 4-51 FLS M12 DIO 4/4 M12-2A

Sensor type:			**Current consumption:**
1 x reflex optical data link with 2 output signals			30 mA
2 x proximity switches			15 mA
Actuator type:			
2 x solenoid valves (hydraulic)			1.3 A
2 x solenoid valves (pneumatic)			67 mA
Calculation example for an FLS DIO 4/4 device			
IN1, IN2	Reflex optical data link		30 mA
IN3	Proximity switch	+	15 mA
IN4	Proximity switch	+	15 mA
Sensor supply		=	**60 mA**
Current consumption of inputs (5 mA for each input used)		+	**20 mA**
I_{US} total		=	**80 mA**
Current consumption of actuators U_{A11}			
OUT1	Solenoid valve (hydraulic)	+	1.3 A
OUT2	Solenoid valve (pneumatic)	+	67 mA
I_{UA11} total		=	**1.367 A**
Current consumption of actuators U_{A12}			
OUT3	Solenoid valve (hydraulic)		1.3 A
OUT4	Solenoid valve (pneumatic)	+	67 mA
I_{UA12} total		=	**1.367 A**

With this configuration, the FLS DIO 4/4 device loads U_S with approximately 80 mA. U_L is loaded with approximately 40 mA (see data sheet). U_{A11} is loaded with approximately 1.367 A. U_{A12} is loaded with approximately 1.367 A.

Calculation example for an FLM DO 8 M12 device

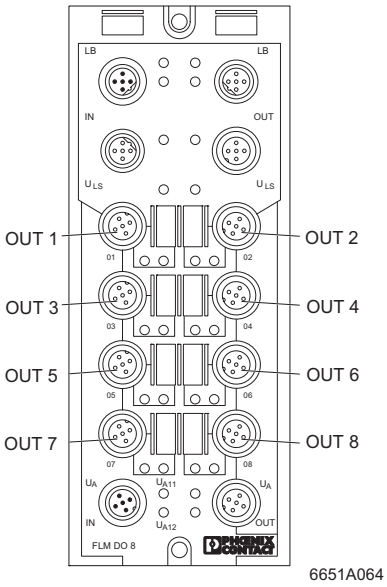

Figure 4-52 FLM DO 8 M12

Actuator type:	**Current consumption:**
4 x solenoid valves (pneumatic)	67 mA

Calculation example for an FLM DO 8 M12 device

Current consumption of actuators U_{A11}			
OUT1	Solenoid valve (pneumatic)		67 mA
OUT2	Solenoid valve (pneumatic)	+	67 mA
I_{UA11} total			**134 mA**
Current consumption of actuators U_{A12}			
OUT5	Solenoid valve (pneumatic)		67 mA
OUT6	Solenoid valve (pneumatic)	+	67 mA
I_{UA12} total			**134 mA**

With this configuration, the FLM DO 8 M12 device never loads U_S.
U_L is loaded with approximately 40 mA (see data sheet).
U_{A11} is loaded with approximately 134 mA. U_{A12} is loaded with approximately 134 mA.

Calculation example for an FLM DI 8 M8 device

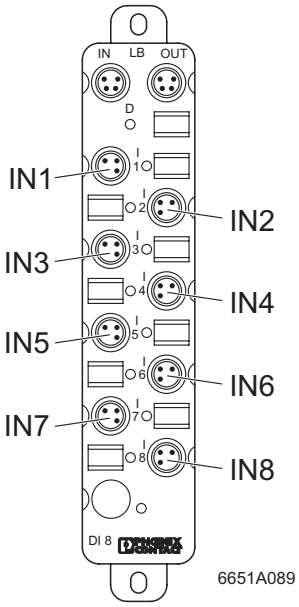

Figure 4-53 FLM DI 8 M8

Sensor type:	**Current consumption:**
1 x reflex optical data link with 2 output signals	30 mA each
2 x inductive sensors	15 mA each
3 x proximity switches	10 mA each

Calculation example for an FLM DI 8 M8 device

IN1, IN2	Reflex optical data link		30 mA
IN3	Inductive sensor	+	15 mA
IN4	Inductive sensor	+	15 mA
IN5	Proximity switch	+	10 mA
IN6	Proximity switch	+	10 mA
IN7	Proximity switch	+	10 mA
Sensor supply		=	**90 mA**
Current consumption of inputs (5 mA for each input used)		+	**35 mA**
I_{US} total		=	**125 mA**

With this configuration, the FLM DI 8 M8 device loads U_S with approximately 125 mA. U_L is loaded with approximately 40 mA (see data sheet). U_{LS} is thus loaded with approximately 165 mA.

Calculation example for an FLM DIO 8/4 M8 device

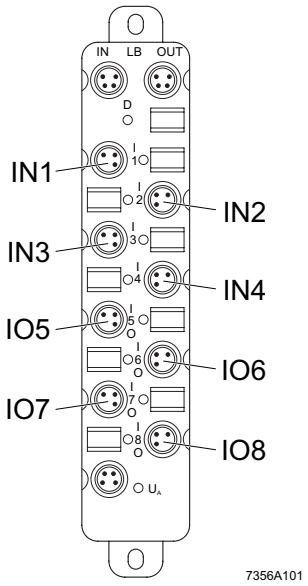

Figure 4-54 FLM DIO 8/4 M8

Sensor type:	**Current consumption:**
1 x reflex optical data link with 2 output signals	30 mA
2 x proximity switches	15 mA
Actuator type:	
1 x solenoid valve (hydraulic)	0.5 A
1 x solenoid valve (hydraulic)	0.3 A
2 x solenoid valves (pneumatic)	67 mA

Calculation example for an FLM DIO 8/4 M8 device

IN1, IN2	Reflex optical data link		30 mA
IN3	Proximity switch	+	15 mA
IN4	Proximity switch	+	15 mA
Sensor supply		=	**60 mA**
Current consumption of inputs (5 mA for each input used)		+	**20 mA**
I_{US} total		=	**80 mA**
Current consumption of actuators U_A			
OUT1	Solenoid valve (hydraulic)	+	0.5 A
OUT2	Solenoid valve (pneumatic)	+	67 mA
OUT3	Solenoid valve (hydraulic)		0.3 A
OUT4	Solenoid valve (pneumatic)	+	67 mA
I_{UA} total		=	**0.934 A**

With this configuration, the FLM DIO 8/4 M8 device loads U_S with approximately 80 mA. U_L is loaded with approximately 55 mA (see data sheet). Due to the outputs U_A is loaded with approximately 0.934 A. The total load U_a and U_S is 1.114 A.

Calculation example for an FLM DO4 M8-2A device

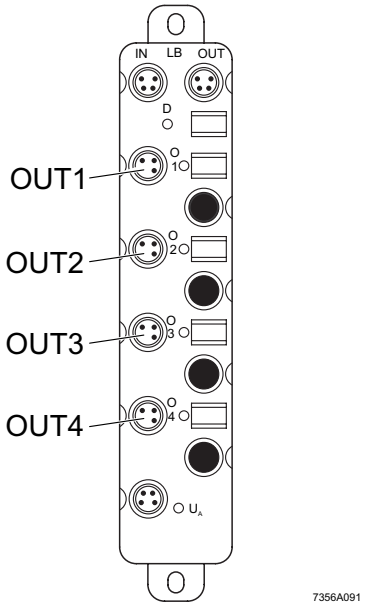

Figure 4-55 FLM DO 4 M8-2A

Calculation example for an FLM DO 4 M8-2A device

Current consumption of actuators U_A

OUT1	Solenoid valve (hydraulic)		0.8 A
OUT2	Solenoid valve (pneumatic)	+	67 mA
OUT3	Solenoid valve (hydraulic)		0.8 A
OUT4	Solenoid valve (pneumatic)	+	67 mA
I_{UA} total			**1.734 A**

With this configuration, the FLM DO 4 M8-2A device loads U_L with approximately 55 mA (see data sheet). Due to the outputs U_A is loaded with approximately 1.734 A.
The total load U_A and U_L is 1.789 A.

Calculation example for an FLM M12 station

The following example combines the individual devices from the previous examples to form a station.

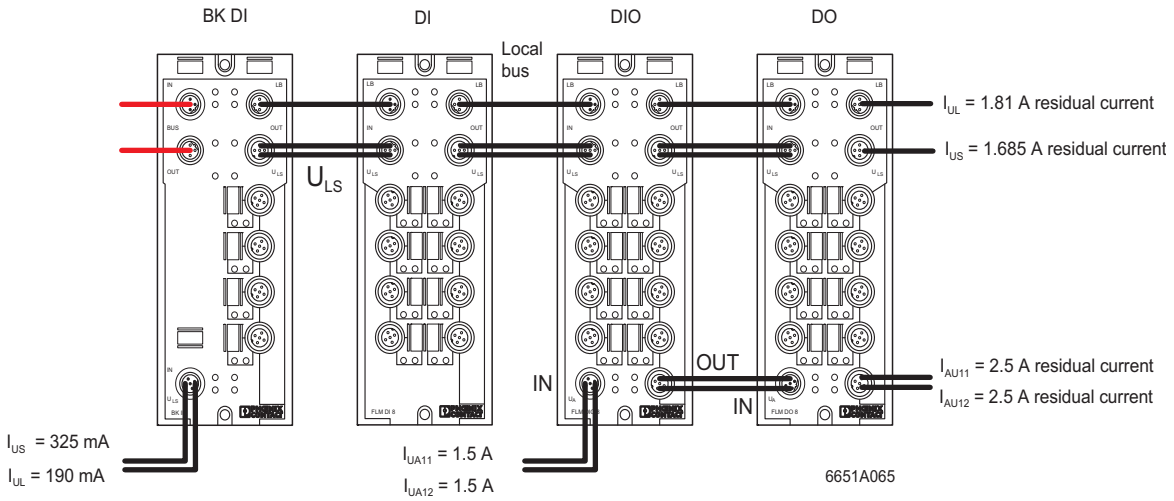

Figure 4-56 FLM M12 station

	Bus Coupler	DI 8 Device	DIO 4/4 Device	DO 8 Device	Station	Maximum Current
I_{UL}	+ 70 mA	+ 40 mA	+ 40 mA	+ 40 mA	= 190 mA	2 A
I_{US}	+ 120 mA	+ 125 mA	+ 80 mA	-	**= 325 mA**	2 A
I_{UA11}	-	-	1.367 A	+ 134 mA	= 1.5 A	4 A
I_{UA12}	-	-	1.367 A	+ 134 mA	= 1.5 A	4 A

Voltages U_{A11} and U_{A12} should be loaded equally.

Calculation example for an FLM M12/M8 station

The following example combines the individual devices from the previous examples to form a station.

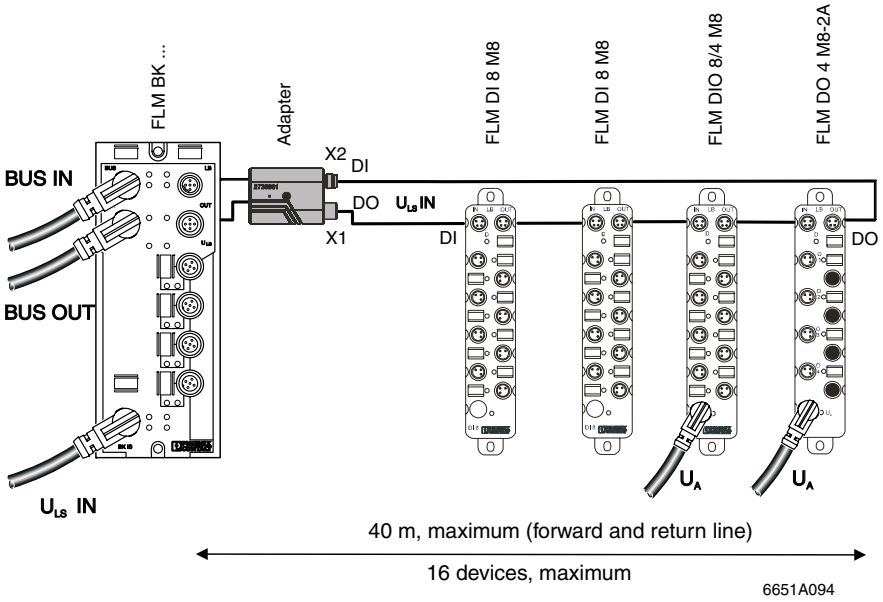

Figure 4-57 FLM M12/M8 station

	Bus Coupler	DI 8 Device	DI 8 Device	DIO 8/4 Device	DO 4 Device	Station	Maximum Current
I_{UL}	+ 70 mA	+ 40 mA	+ 40 mA	+ 55 mA	+ 55 mA	**= 260 mA**	2 A
I_{US}	+ 120 mA	+ 125 mA	+ 125 mA	+ 80 mA	-	**= 450 mA**	2 A
I_{UA}	-	-	-	1.114 A	1.734 A	**= 2.848 A**	2 x 3 A

Voltage U_A should be loaded equally.

Calculation example for an FLM M8 station connected to Inline

The following example combines the individual devices from the previous examples to form a station.

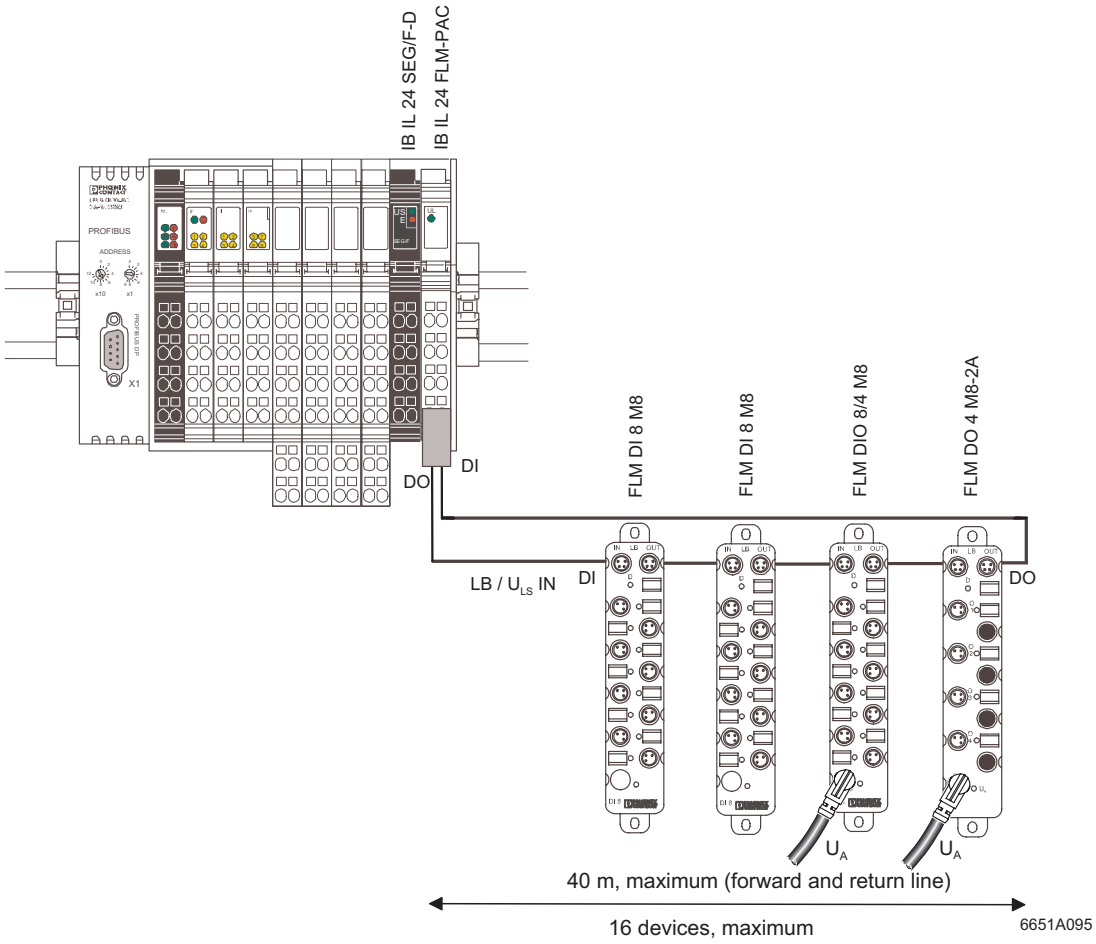

Figure 4-58 FLM M12/M8 station

	DI 8 Device	DI 8 Device	DIO 8/4 Device	DO 4 Device	Station	Maximum Current
I_{UL}	+ 40 mA	+ 40 mA	+ 55 mA	+ 55 mA	**= 190 mA**	3 A
I_{US}	+ 125 mA	+ 125 mA	+ 80 mA	-	**= 330 mA**	3 A
I_{UA}	-	-	1.114 A	1.734 A	**= 2.848 A**	2 x 3 A

4.10.8 Supply Line and Current Supply (M12)

For M12 connectors in Fieldline devices, **a maximum of 4 A per contact** is permitted.

To ensure this condition is met, the following factors should be considered:

1. Current consumption of the Fieldline devices (see data sheets)
2. Current consumption of the connected sensors
3. Current consumption of the connected actuators
4. Length of the cables and losses on these cables

It is particularly important to observe these factors when forwarding the supply voltage.

Examples

Detail A in Figure 4-59: On an FLS IB DIO 4/4 M12-2A Fieldline device, if both outputs of a group are loaded with 2 A simultaneously, the supply voltage for these outputs cannot be forwarded.

Detail B in Figure 4-59: On the same Fieldline device, if both outputs of a group are loaded with 0.5 A simultaneously, the supply voltage for these outputs can be forwarded. Forwarding would also be permitted, for example, if the outputs were each loaded with 2 A but simultaneity was not permitted.

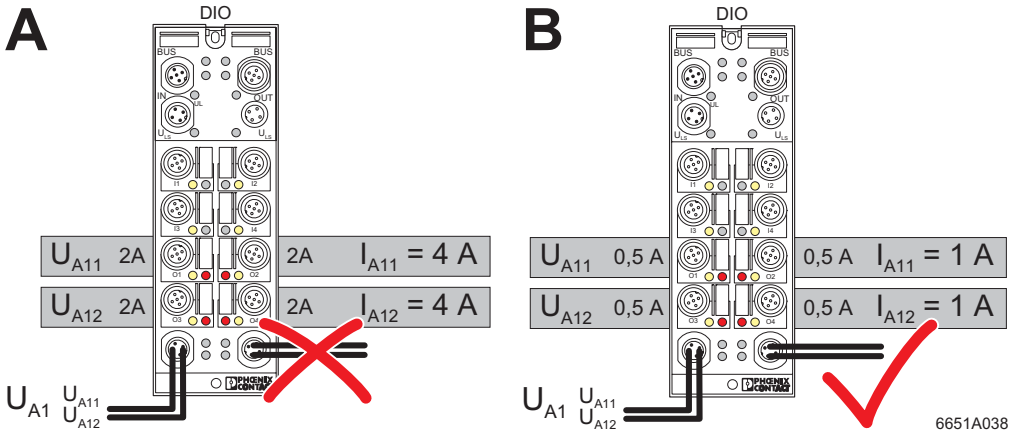

Figure 4-59 Forwarding the supply voltage

Losses on the Cables

The voltage drop on the cables can be calculated using the formula

$U_A = I \times R \times 2$

Where:

U_A	Voltage drop
I	Current strength
R	Conductor resistance
2	Calculation for forward and return path

For a power supply cable 4 x 0.75 mm² cable type 186 (e.g., SAC-4P-M12MS/...-186/M12FS), the conductor resistance is 26 Ω/km.

With 4 A:

$U_A = 4\ A \times 26\ \Omega/km \times 2 = 208\ V/km$ which corresponds to 2.08 V on 10 m

With 2 A:

$U_A = 2\ A \times 26\ \Omega/km \times 2 = 104\ V/km$ which corresponds to 1.04 V on 10 m

Other cables have other specific resistance values, which can be used to calculate the voltage drop according to the above formula.

4.10.9 Supply Line and Current Supply (M8)

For M8 connectors in Fieldline devices, **a maximum of 3 A per contact** is permitted.

To ensure this condition is met, the following factors should be considered:

5. Current consumption of the Fieldline devices (see data sheets)
6. Current consumption of the connected sensors
7. Current consumption of the connected actuators
8. Length of the cables and losses on these cables

With Fieldline Modular M8 devices, voltage U_{LS} is usually supplied from two sides. This means that a total current of 6 A is permitted for the entire local bus. In the event of supply from one side (backward), a current of only 3 A is permitted.

4.11 Connecting Sensors and Actuators

Connect the sensors and actuators using M12 or M8 connectors.

Phoenix Contact recommends the use of pre-assembled cables.

For the pin assignment of the inputs and outputs, please refer to the device-specific data sheet.

The maximum cable length for connecting sensors and actuators is 30 m.

A Appendix

The Phoenix Contact AUTOMATION and PLUSCON catalogs contain the ordering data for all Fieldline products.

This includes:

– Fieldline devices
– Bus cables
– Shielded bus connectors
– Unshielded connectors
– Assembly systems
– Termination resistors
– Other accessories

For additional information about Fieldline devices and accessories, visit the Phoenix Contact e-shop at www.eshop.phoenixcontact.com.

Complete documentation for the Fieldline devices can be found on the Internet at www.download.phoenixcontact.com.

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