Electric Drives and Controls | Hydraulics | Linear Motion and Assembly Technologies | Pneumatics | Service

Rexroth
Bosch Group

Installation of Devices from the Rexroth Fieldline Product Range

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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 with M12 connection method. With FLM devices you can choose between M12 and M8 connection method. If the connection method is not mentioned explicitly, the M12 connection method is used in this application description.

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

DeviceNet

Fieldline

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

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

Examples:

RF-FLS		PB	M12	DIO 4/4	M12	-2A
RF-FLM	BK	PB	M12	DI 8	M12	
RF-FLM				DIO 8/4	M8	

Fig. 1-1 Structure of the product designation

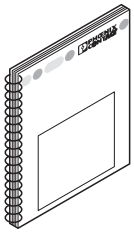
Abbrev.	**Meaning**
RF-FLS	Fieldline Stand-Alone
RF-FLM	Fieldline Modular
BK	Bus couplers
IB	INTERBUS
PB	PROFIBUS DP
DN	DeviceNet
CO	CANopen
ETH	Ethernet
EIP	Ethernet IP
PN	PROFINET
M8	M8 connector
M12	M12 connectors
DI x	x digital inputs
DO y	x digital outputs
DIO x/y	x digital inputs and y digital outputs

Fig. 1-2 Meaning of the product designation

Fieldline

1.2 Documentation for Fieldline Devices

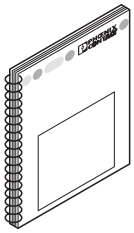
The documentation for Fieldline devices is modular, providing you with the optimum information for your specific bus system.



Installation of devices in the Fieldline product range

This application description 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



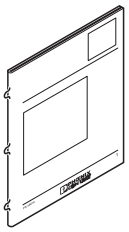
Configuring a ... system using devotes in the Fieldline product range

Application descriptions for the following bus systems:

- **INTERBUS**
- **PROFIBUS DP**
- **DeviceNet**

A separate application description is available for each bus system.

Each application description 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 description
- Technical data
- Local diagnostic and status indicators
- Pin assignment and connection example
- Programming data/configuration data

This application description describes only the Fieldline Stand-Alone and Fieldline Modular devices without reference to the specific bus system For additional information, please refer to the Fieldline application description 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. For the specified load currents for the outputs of the various devices, please refer to 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 for the input and output devices.

Connections

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

Degree of protection

The devices have IP65/67 protection.

Fieldline

1.4 Product Description of the Fieldline Modular M12 Devices

Versions The Fieldline Modular M12 product group includes bus couplers as well as digital 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 8 digital sensors via M12 connectors. The slots are double-occupied. The bus coupler supplies the supply voltage for the sensors and reads in the provided signals.

- 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 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. For the specified load currents for the outputs of the various devices, please refer to the data sheet. The signal status is indicated on the Fieldline Modular device using LEDs. Actuators are connected via 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.

Connection to Inline The R-IB IL 24 FLM-PAC branch terminal can be used to connect the Fieldline M12 local bus to the end of an Inline station. Therefore, sensors and actuators that are connected to the Fieldline Modular M12 devices with IP65/67 protection close to the station can be integrated in an Inline system. Conversion of the physical transmission method of the Inline local bus to the physical transmission method of the Fieldline Modular M12 local bus is performed using the Inline branch terminal. The ULS supply voltage should be supplied separately.

Connections The bus, I/O devices, and supply are connected using M12 connectors and the quick connection method.

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 M8 screw 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. For the specified load currents for the outputs of the various devices, please refer to the data sheet. The signal status is indicated on the Fieldline Modular device using LEDs. Actuators are connected via M8 screw 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 Fieldline M8 local bus can be connected to an Inline station via an R-IB IL 24 FLM-PAC branch terminal. Therefore, sensors and actuators that are connected to the Fieldline Modular M8 devices with IP65/67 protection close to the station can be integrated in an Inline system. The Inline branch terminal is used to convert the physical transmission method of the Inline local bus to the physical transmission method of the Fieldline Modular M8 local bus. An segment terminal with fuse (R-IBIL24SEG/F-PAC) 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 RF-FLM APAP M12/M8 adapter can be used to connect the Fieldline M8 local bus to a Fieldline Modular M12 station. The adapter connects Fieldline Modular M8 devices to a bus coupler or an I/O device in 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.

Fieldline

1.6 For Your Safety

1.6.1 Fields of Application

Fieldline devices are designed for use as specified in this application description and in the device-specific data sheets.
Always observe the data specified in the application description 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 Instructions

CAUTION

Damage to the device

Avoid polarity reversal of the power supplies, as this may damage the device (see Section "Connecting the Voltage Supplies" on page 51).

CAUTION

Deterioration of the protection class

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

CAUTION

Deterioration of the noise immunity

Ground devices to provide immunity to interference (see Page 44).

CAUTION

Damage to the device

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

1.7 Compatibility Test

All Rexroth controllers and drives are developed and tested in accordance with the latest state of the art.

However, as it is impossible to track the continuous further development of all materials with which our controllers and drives might come into contact (e.g., lubricants at machine tools), reactions with materials that we use cannot always be prevented.

Therefore, you should carry out a compatibility test of new lubricants, cleaning agents, etc. and our housings/housing materials, before they are used.

Fieldline

2 Important Directions for Use

2.1 Appropriate Use

2.1.1 Introduction

Rexroth products represent state-of-the-art developments and manufacturing. They are tested prior to delivery to ensure operating safety and reliability.

The products may only be used in the manner that is defined as appropriate. If they are used in an inappropriate manner, then situations can develop that may lead to property damage or injury to personnel.

Bosch Rexroth, as manufacturer, is not liable for any damages resulting from inappropriate use. In such cases, the guarantee and the right to payment of damages resulting from inappropriate use are forfeited. The user alone carries all responsibility of the risks.

Before using Rexroth products, make sure that all the pre-requisites for appropriate use of the products are satisfied:

- Personnel that in any way, shape or form uses our products must first read and understand the relevant safety instructions and be familiar with appropriate use.
- If the product takes the form of hardware, then they must remain in their original state, in other words, no structural changes are permitted. It is not permitted to decompile software products or alter source codes.
- Do not mount damaged or faulty products or use them in operation.
- Make sure that the products have been installed in the manner described in the relevant documentation.

2.1.2 Areas of Use and Application

The Fieldline system of Rexroth is an input/output system in the degree of protection IP 67. It allows the machine-oriented and highly reliable installation in harsh environmental conditions.

The Rexroth Fieldline system may only be used with the accessories and parts specified in this document. If a component has not been specifically named, then it may not be either mounted or connected. The same applies to cables and lines.

Operation is only permitted in the specified configurations and combinations of components using the software and firmware as specified in the relevant function descriptions.

Typical applications of the Rexroth Fieldline system are:

- Handling and assembly systems,
- Packaging and foodstuff machines,
- Printing and paper processing machines and
- Machine tools.

The Rexroth Fieldline system may only be operated under the assembly, installation and ambient conditions as described here (temperature, system of protection, humidity, EMC requirements, etc.) and in the position specified.

In residential areas as well as in business and commercial areas Class A devices may be used with the following note:

This is a Class A device. In a residential area, this device may cause radio interferences. In such a case, the user may be required to introduce suitable countermeasures at his own cost.

2.2 Inappropriate Use

Using the Rexroth Fieldline system outside of the above-referenced areas of application or under operating conditions other than described in the document and the technical data specified is defined as "inappropriate use".

The Rexroth Fieldline system may not be used if

- they are subject to operating conditions that do not meet the above specified ambient conditions. This includes, for example, operation under water, in the case of extreme temperature fluctuations or extremely high maximum temperatures or if
- Bosch Rexroth has not specifically released them for that intended purpose. Please note the specifications outlined in the general Safety Guidelines!

3 Safety Instructions for Electric Drives and Controls

3.1 Safety Instructions - General Information

3.1.1 Using the Safety Instructions and Passing them on to Others

Do not attempt to install or commission this device without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation prior to working with the device. If you do not have the user documentation for the device, contact your responsible Bosch Rexroth sales representative. Ask for these documents to be sent immediately to the person or persons responsible for the safe operation of the device.

If the device is resold, rented and/or passed on to others in any other form, these safety instructions must be delivered with the device in the official language of the user's country.

WARNING

Improper use of these devices, failure to follow the safety instructions in this document or tampering with the product, including disabling of safety devices, may result in material damage, bodily harm, electric shock or even death!

Observe the safety instructions!

3.1.2 How to Employ the Safety Instructions

Read these instructions before initial commissioning of the equipment in order to eliminate the risk of bodily harm and/or material damage. Follow these safety instructions at all times.

- Bosch Rexroth AG is not liable for damages resulting from failure to observe the warnings provided in this documentation.
- Read the operating, maintenance and safety instructions in your language before commissioning the machine. If you find that you cannot completely understand the documentation for your product, please ask your supplier to clarify.
- Proper and correct transport, storage, assembly and installation, as well as care in operation and maintenance, are prerequisites for optimal and safe operation of this device.
- Only assign trained and qualified persons to work with electrical installations:
  - Only persons who are trained and qualified for the use and operation of the device may work on this device or within its proximity. The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the product, as well as an understanding of all warnings and precautionary measures noted in these instructions.
  - Furthermore, they must be trained, instructed and qualified to switch electrical circuits and devices on and off in accordance with technical safety regulations, to ground them and to mark them according to the requirements of safe work practices. They must have adequate safety equipment and be trained in first aid.
- Only use spare parts and accessories approved by the manufacturer.

Safety Instructions for Electric Drives and Controls

- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The devices have been designed for installation in industrial machinery.
- The ambient conditions given in the product documentation must be observed.
- Only use safety-relevant applications that are clearly and explicitly approved in the Project Planning Manual. If this is not the case, they are excluded. Safety-relevant are all such applications which can cause danger to persons and material damage.
- The information given in the documentation of the product with regard to the use of the delivered components contains only examples of applications and suggestions.
- The machine and installation manufacturer must
  - make sure that the delivered components are suited for his individual application and check the information given in this documentation with regard to the use of the components,
  - make sure that his application complies with the applicable safety regulations and standards and carry out the required measures, modifications and complements.
- Commissioning of the delivered components is only permitted once it is sure that the machine or installation in which they are installed complies with the national regulations, safety specifications and standards of the application.
- Operation is only permitted if the national EMC regulations for the application are met.
- The instructions for installation in accordance with EMC requirements can be found in the section on EMC in the respective documentation (Project Planning Manuals of components and system).
  The machine or installation manufacturer is responsible for compliance with the limiting values as prescribed in the national regulations.
- Technical data, connection and installation conditions are specified in the product documentation and must be followed at all times.

National regulations which the user must take into account

- European countries: according to European EN standards
- United States of America (USA):
  - National Electrical Code (NEC)
  - National Electrical Manufacturers Association (NEMA), as well as local engineering regulations
  - regulations of the National Fire Protection Association (NFPA)
- Canada: Canadian Standards Association (CSA)
- Other countries:
  - International Organization for Standardization (ISO)
  - International Electrotechnical Commission (IEC)

3.1.3 Warning Symbols and Degrees of Hazard Seriousness

The safety instructions describe the following degrees of hazard seriousness. The degree of hazard seriousness informs about the consequences resulting from non-compliance with the safety instructions:

Warning symbol	Signal word	Degree of hazard seriousness acc. to ANSI Z 535.4-2002
	Danger	Death or severe bodily harm will occur.
	Warning	Death or severe bodily harm may occur.
	Caution	Minor or moderate bodily harm or material damage may occur.

Fig. 3-1 Hazard classification (according to ANSI Z 535)

3.1.4 Hazards by Improper Use

DANGER

High electric voltage and high working current! Risk of death or severe bodily injury by electric shock!

Observe the safety instructions!

DANGER

Dangerous movements! Danger to life, severe bodily harm or material damage by unintentional motor movements!

Observe the safety instructions!

WARNING

High electric voltage because of incorrect connection! Risk of death or bodily injury by electric shock!

Observe the safety instructions!

WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

Observe the safety instructions!

CAUTION

Hot surfaces on device housing! Danger of injury! Danger of burns!

Observe the safety instructions!

CAUTION

Risk of injury by improper handling! Risk of bodily injury by bruising, shearing, cutting, hitting or improper handling of pressurized lines!

Observe the safety instructions!

CAUTION

Risk of injury by improper handling of batteries!

Observe the safety instructions!

3.2 Instructions with Regard to Specific Dangers

3.2.1 Protection Against Contact with Electrical Parts and Housings

This section concerns devices and drive components with voltages of more than **50 volts**.

Contact with parts conducting voltages above 50 volts can cause personal danger and electric shock. When operating electrical equipment, it is unavoidable that some parts of the units conduct dangerous voltage.

DANGER

High electrical voltage! Danger to life, electric shock and severe bodily injury!

- Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain and repair this equipment.
- Follow general construction and safety regulations when working on electrical power installations.
- Before switching on the device, the equipment grounding conductor must have been permanently connected to all electrical equipment in accordance with the connection diagram.
- Do not operate electrical equipment at any time, even for brief measurements or tests, if the equipment grounding conductor is not permanently connected to the mounting points of the components provided for this purpose.
- Before working with electrical parts with voltage potentials higher than 50 V, the device must be disconnected from the mains voltage or power supply unit. Provide a safeguard to prevent reconnection.
- For electrical drive and filter components, observe the following:
  Wait **30 minutes** after switching off power to **allow capacitors to discharge** before beginning to work. Measure the electrical voltage on the capacitors before beginning to work to make sure that the equipment is safe to touch.
- Never touch the electrical connection points of a component while power is turned on.
- Install the covers and guards provided with the equipment properly before switching the device on. Before switching the equipment on, cover and safeguard live parts safely to prevent contact with those parts.
- A residual-current-operated circuit-breaker or r.c.d. cannot be used for electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device according to the relevant standards.
- Secure built-in devices from direct touching of electrical parts by providing an external housing, for example a control cabinet.

For electrical drive and filter components with voltages of **more than 50 volts**, observe the following additional safety instructions.

DANGER

High housing voltage and high leakage current! Risk of death or bodily injury by electric shock!

- Before switching on, the housings of all electrical equipment and motors must be connected or grounded with the equipment grounding conductor to the grounding points. This is also applicable before short tests.
- The equipment grounding conductor of the electrical equipment and the devices must be non-detachably and permanently connected to the power supply unit at all times. The leakage current is greater than 3.5 mA.
- Over the total length, use copper wire of a cross section of a minimum of 10 mm^2 for this equipment grounding connection!
- Before commissioning, also in trial runs, always attach the equipment grounding conductor or connect to the ground wire. Otherwise, high voltages may occur at the housing causing electric

3.2.2 Protection Against Electric Shock by Protective Extra-Low Voltage

Protective extra-low voltage is used to allow connecting devices with basic insulation to extra-low voltage circuits.

All connections and terminals with voltages between 5 and 50 volts at Rexroth products are PELV systems[1]. It is therefore allowed to connect devices equipped with basic insulation (such as programming devices, PCs, notebooks, display units) to these connections and terminals.

WARNING

High electric voltage by incorrect connection! Risk of death or bodily injury by electric shock!

If extra-low voltage circuits of devices containing voltages and circuits of more than 50 volts (e.g. the mains connection) are connected to Rexroth products, the connected extra-low voltage circuits must comply with the requirements for PELV[1].

3.2.3 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of connected motors. Some common examples are:

- improper or wrong wiring of cable connections
- incorrect operation of the equipment components
- wrong input of parameters before operation
- malfunction of sensors, encoders and monitoring devices
- defective components
- software or firmware errors

These errors can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.

The monitoring in the drive components will normally be sufficient to avoid faulty operation in the connected drives. Regarding personal safety, especially the danger of bodily harm and/or material damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.

1) "Protective Extra-Low Voltage"

DANGER

Dangerous movements! Danger to life, risk of injury, severe bodily harm or material damage!

- For the above reasons, ensure personal safety by means of qualified and tested higher-level monitoring devices or measures integrated in the installation.
  They have to be provided for by the user according to the specific conditions within the installation and a hazard and fault analysis. The safety regulations applicable for the installation have to be taken into consideration. Unintended machine motion or other malfunction is possible if safety devices are disabled, bypassed or not activated.

To avoid accidents, bodily harm and/or material damage

- Keep free and clear of the machine's range of motion and moving parts. Possible measures to prevent people from accidentally entering the machine's range of motion:
  - use safety fences
  - use safety guards
  - use protective coverings
  - install light curtains or light barriers
- Fences and coverings must be strong enough to resist maximum possible momentum.
- Mount the emergency stop switch in the immediate reach of the operator. Verify that the emergency stop works before commissioning. Do not operate the device if the emergency stop switch is not working.
- Isolate the drive power connection by means of an emergency stop circuit or use a safety related starting lockout to prevent unintentional start.
- Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone.
- Additionally secure vertical axes against falling or dropping after switching off the motor power by, for example:
  - mechanically securing the vertical axes,
  - adding an external braking/arrester/clamping mechanism or
  - ensuring sufficient equilibration of the vertical axes.
- The standard equipment motor brake or an external brake controlled by the drive controller are **not sufficient to guarantee personal safety**!
- Disconnect electrical power to the equipment using a master switch and secure the switch against reconnection for:
  - maintenance and repair work
  - cleaning of equipment
  - long periods of discontinued equipment use
- Prevent the operation of high-frequency, remote control and radio equipment near electronics circuits and supply leads. If the use of such devices cannot be avoided, verify the system and the installation for possible malfunctions in all possible positions of normal use before initial commissioning. If necessary, perform a special electromagnetic compatibility (EMC) test on the installation.

3.2.4 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated by current-carrying conductors and permanent magnets in motors represent a serious personal danger to those with heart pacemakers, metal implants and hearing aids.

WARNING

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

- Persons with heart pacemakers and metal implants are not permitted to enter following areas:
  - Areas in which electrical equipment and parts are mounted, being operated or commissioned.
  - Areas in which parts of motors with permanent magnets are being stored, repaired or mounted.
- If it is necessary for somebody with a pacemaker to enter such an area, a doctor must be consulted prior to doing so. The noise immunity of present or future implanted heart pacemakers differs greatly so that no general rules can be given.
- Those with metal implants or metal pieces, as well as with hearing aids, must consult a doctor before they enter the areas described above. Otherwise health hazards may occur.

3.2.5 Protection Against Contact with Hot Parts

CAUTION

Hot surfaces at motor housings, on drive controllers or chokes! Danger of injury! Danger of burns!

- Do not touch surfaces of device housings and chokes in the proximity of heat sources! Danger of burns!
- Do not touch housing surfaces of motors! Danger of burns!
- According to the operating conditions, temperatures can be **higher than 60 °C**, 140 °F during or after operation.
- Before accessing motors after having switched them off, let them cool down for a sufficiently long time. Cooling down can require **up to 140 minutes**! Roughly estimated, the time required for cooling down is five times the thermal time constant specified in the Technical Data.
- After switching drive controllers or chokes off, wait 15 minutes to allow them to cool down before touching them.
- Wear safety gloves or do not work at hot surfaces.
- For certain applications, the manufacturer of the end product, machine or installation, according to the respective safety regulations, has to take measures to avoid injuries caused by burns in the end application. These measures can be, for example: warnings, guards (shielding or barrier), technical documentation.

3.2.6 Protection During Handling and Mounting

In unfavorable conditions, handling and mounting certain parts and components in an improper way can cause injuries.

CAUTION

Risk of injury by improper handling! Bodily injury by bruising, shearing, cutting, hitting!

- Observe the general construction and safety regulations on handling and mounting.
- Use suitable devices for mounting and transport.
- Avoid jamming and bruising by appropriate measures.
- Always use suitable tools. Use special tools if specified.
- Use lifting equipment and tools in the correct manner.
- If necessary, use suitable protective equipment (for example safety goggles, safety shoes, safety gloves).
- Do not stand under hanging loads.
- Immediately clean up any spilled liquids because of the danger of skidding.

3.2.7 Battery Safety

Batteries consist of active chemicals enclosed in a solid housing. Therefore, improper handling can cause injury or material damage.

CAUTION

Risk of injury by improper handling!

- Do not attempt to reactivate low batteries by heating or other methods (risk of explosion and cauterization).
- Do not recharge the batteries as this may cause leakage or explosion.
- Do not throw batteries into open flames.
- Do not dismantle batteries.
- When replacing the battery/batteries do not damage electrical parts installed in the devices.
- Only use the battery types specified by the manufacturer.

Environmental protection and disposal! The batteries contained in the product are considered dangerous goods during land, air, and sea transport (risk of explosion) in the sense of the legal regulations. Dispose of used batteries separate from other waste. Observe the local regulations in the country of assembly.

3.2.8 Protection Against Pressurized Systems

According to the information given in the Project Planning Manuals, motors cooled with liquid and compressed air, as well as drive controllers, can be partially supplied with externally fed, pressurized media, such as compressed air, hydraulics oil, cooling liquids and cooling lubricating agents. Improper handling of the connected supply systems, supply lines or connections can cause injuries or material damage.

CAUTION

Risk of injury by improper handling of pressurized lines!

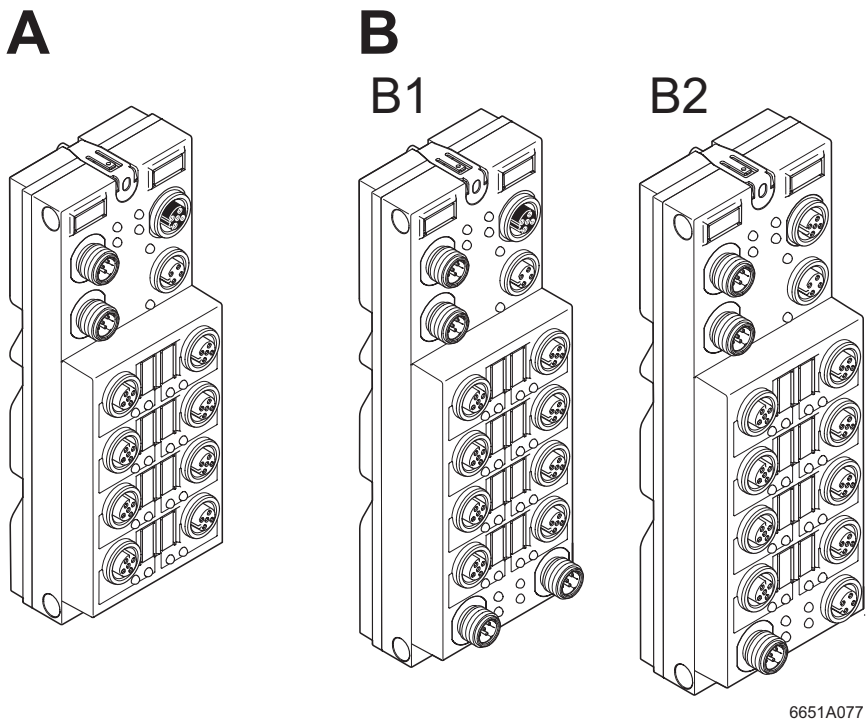
- Do not attempt to disconnect, open or cut pressurized lines (risk of explosion).
- Observe the respective manufacturer's operating instructions.
- Before dismounting lines, relieve pressure and empty medium.
- Use suitable protective equipment (for example safety goggles, safety shoes, safety gloves).
- Immediately clean up any spilled liquids from the floor.

Environmental protection and disposal! The agents used to operate the product might not be economically friendly. Dispose of ecologically harmful agents separately from other waste. Observe the local regulations in the country of assembly.

4 Description of the Fieldline Stand-Alone Devices

4.1 Housing Versions for Fieldline Stand-Alone Devices

Two different housing versions are available for Fieldline Stand-Alone devices for all bus systems.



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)

Fig. 4-1 Housing versions for Fieldline Stand-Alone devices

Description of the Fieldline Stand-Alone Devices

4.2 Housing Dimensions for Fieldline Stand-Alone Devices

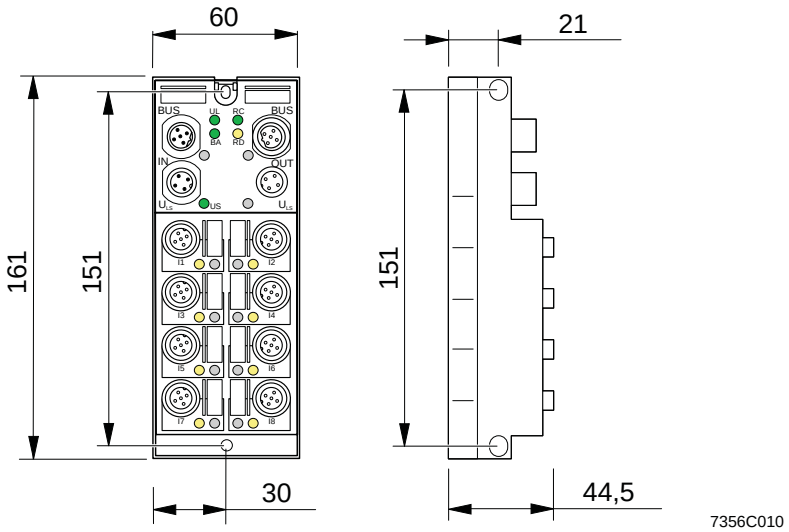


Fig. 4-2 *Housing dimensions in mm for Fieldline Stand-Alone devices without actuator supply*

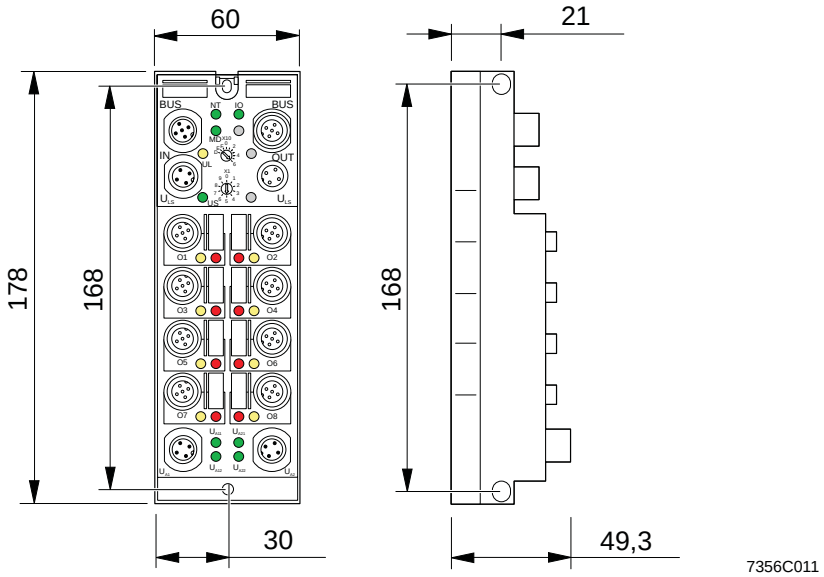
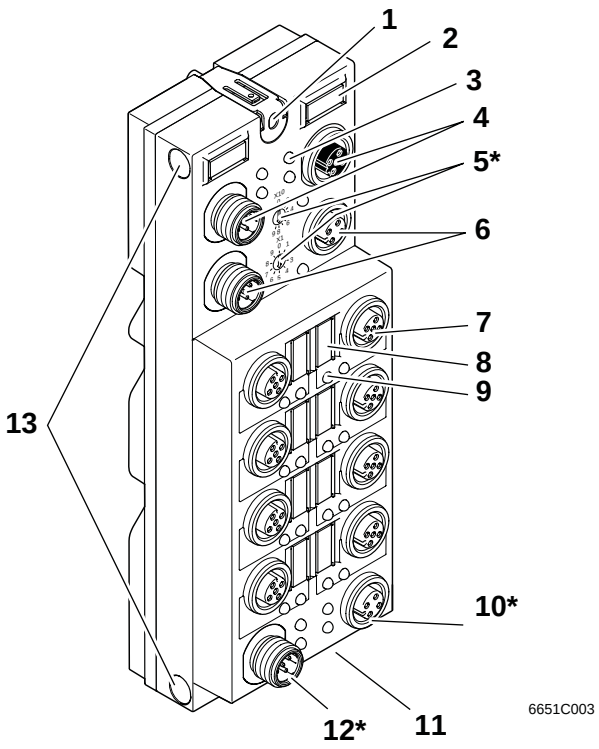


Fig. 4-3 *Housing dimensions in mm for Fieldline Stand-Alone devices with actuator supply*

4.3 Basic Structure of Fieldline Stand-Alone Devices

Fig. 4-4 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.



1 Upper mounting hole
2 Slot for labeling field
3 LED 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 LED 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

Fig. 4-4 Basic structure of the Fieldline Stand-Alone devices

4.4 Labeling for Fieldline Stand-Alone Devices

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

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

When labeling, proceed as follows:

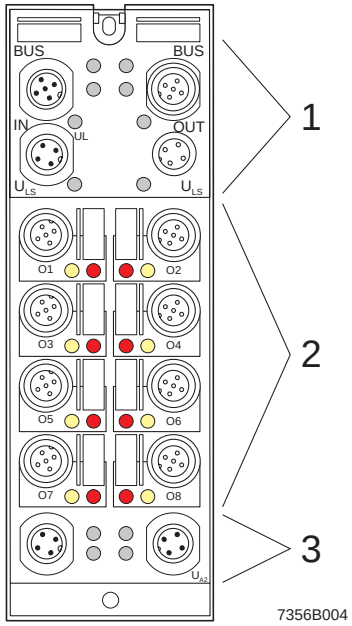
- Complete a labeling field and snap it into the relevant slot.
- If you want to replace a labeling field, it can be removed using a small screwdriver.

4.5 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 of 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 LED diagnostic and status indicators. These areas are illustrated in Fig. 4-5.



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

Fig. 4-5 *Main diagnostic and status indicators for the Fieldline Stand-Alone devices*

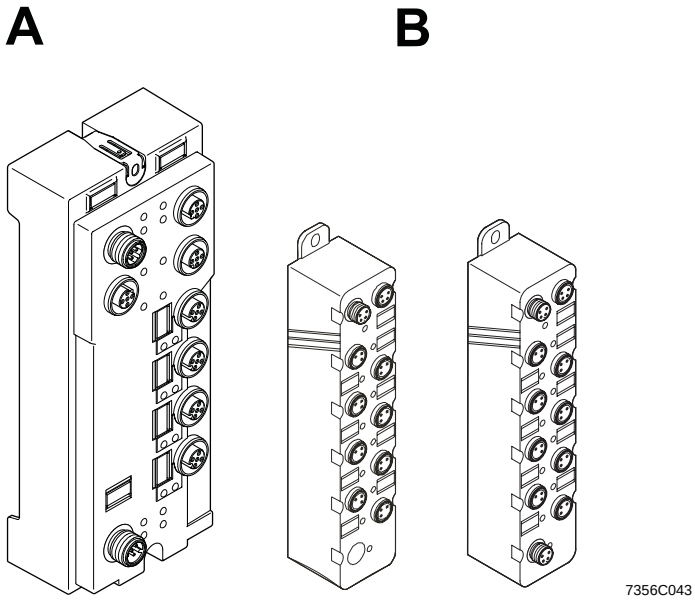
For additional information on the LED diagnostic and status indicators, please refer to the data sheet for the relevant device.

Description of the Fieldline Stand-Alone Devices

5 Description of Fieldline Modular Devices

5.1 Housing Versions for Fieldline Modular Devices

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



A Bus couplers

B Digital M8 devices (DI/DIO)

Fig. 5-1 Housing versions for Fieldline Modular devices

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

5.2 Housing Dimensions for Fieldline Modular Devices

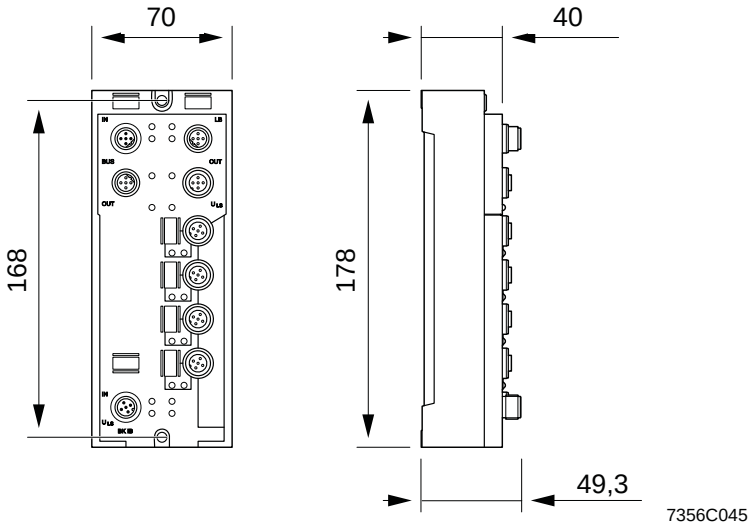


Fig. 5-2 Housing dimensions in mm for Fieldline Modular devices (M12)

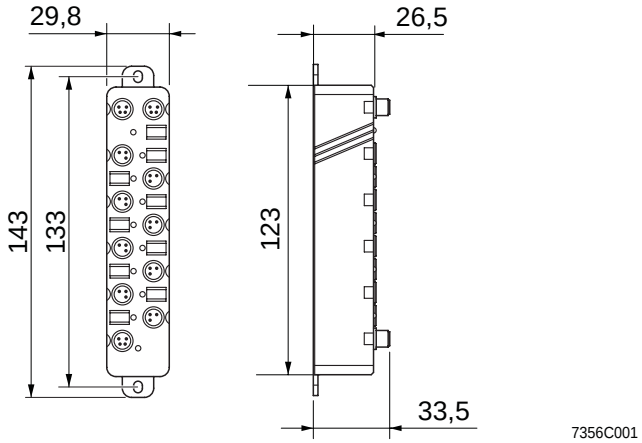
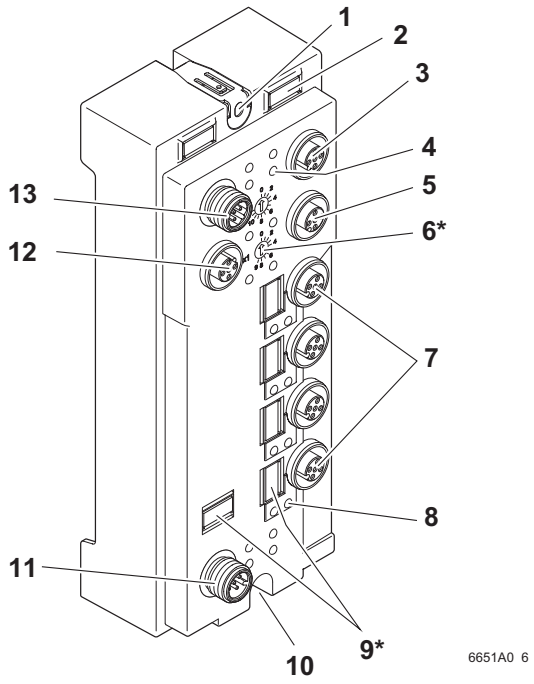


Fig. 5-3 Housing dimensions in mm for Fieldline Modular devices (M8)

5.3 Basic Structure of Fieldline Modular Devices

Fig. 5-4 to Fig. 5-5 show the basic structure of the devices. Depending on the device function, the device may **not** have all of the elements shown. These elements are marked with an asterisk.

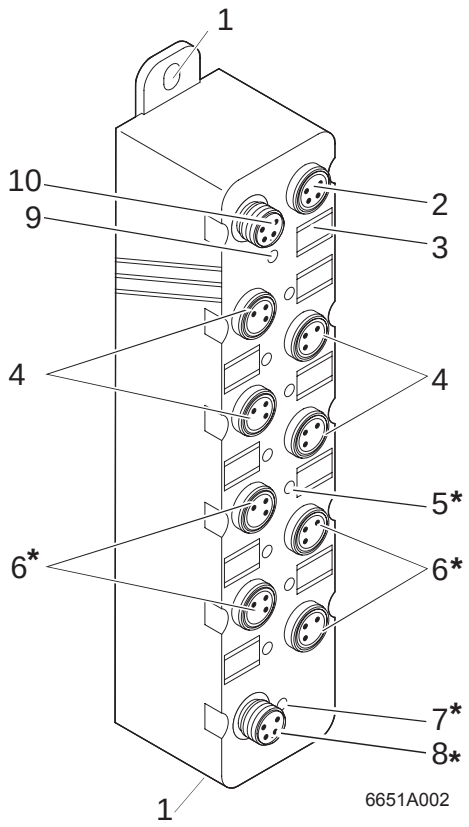
5.3.1 Structure of Fieldline Modular Bus Couplers



1 Upper mounting hole (FE connection)
2 Slot for labeling field
3 Connection for local bus (LB OUT)
4 LED 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)
7 Connections for the inputs
8 LED status indicator for the inputs
9 Slot for labeling field
10 Lower mounting hole
11 Connection for the supply voltage (U_{LS} IN)
12 Bus connection (OUT)
13 Bus connection (IN)

Fig. 5-4 Basic structure of Fieldline Modular bus couplers

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



1 Upper and lower fixing clip (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 the inputs
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)

Fig. 5-5 Basic structure of digital Fieldline Modular I/O devices (M8)

5.4 Labeling for Fieldline Modular Devices

When labeling the Fieldline Modular devices, please proceed as for labeling the Fieldline Stand-Alone devices (see Page 26).

5.5 Diagnostic and Status Indicators of the Fieldline Modular Devices

Diagnostics

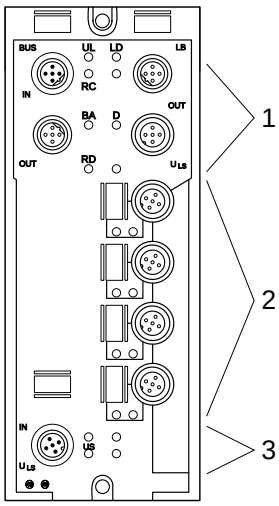
Diagnostic indicators (green/yellow/red) indicate whether an error is present. In the event of an error, they indicate the error type and location. The Fieldline Modular device is operating correctly if all the indicators are green.

LED 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 LED diagnostic and status indicators. These areas are illustrated in Fig. 5-6.



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

2 Inputs (device-specific)

3 Power supply IN (device-specific)

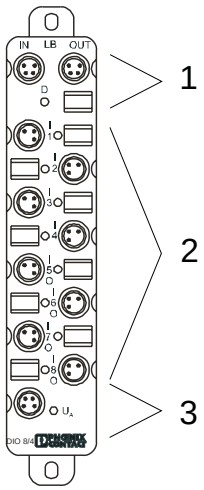
Fig. 5-6 *Main diagnostic and status indicators for the Fieldline Modular bus couplers*

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

Description of Fieldline Modular Devices

Digital Fieldline Modular input and output devices, M8

Digital Fieldline Modular input and output devices have three main areas for diagnostic and status indicators. These areas are illustrated in Fig. 5-7.



1 Bus-specific indicators and power supply indicators for additional devices
2 Inputs and outputs (device-specific)
3 Sensor/actuator supply voltage (device-specific)

Fig. 5-7 *Main diagnostic and status indicators for the Fieldline Modular input and output devices (M8)*

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

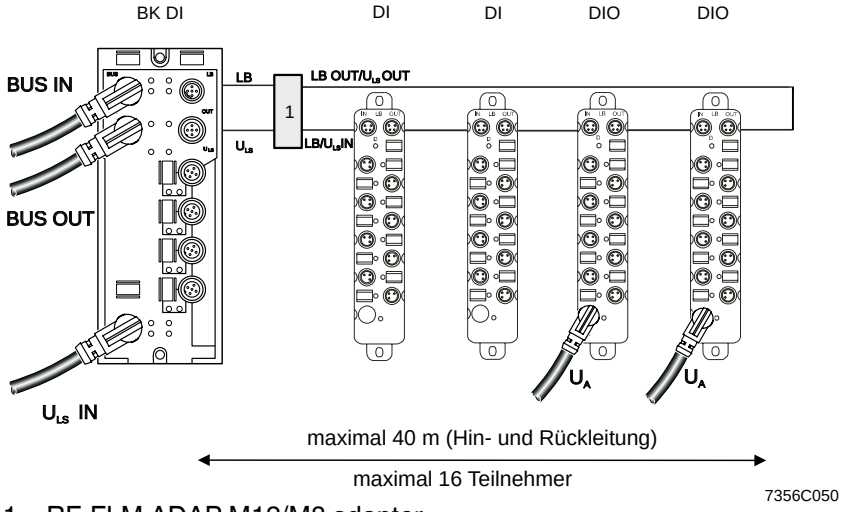
5.6 Structure of a Fieldline Modular Station

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

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 M8 station



1 = RF-FLM ADAP M12/M8 adapter

Fig. 5-8 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. There must be a maximum distance of 20 m between the devices.

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.

Description of Fieldline Modular Devices

Fieldline Modular M8 station at Inline

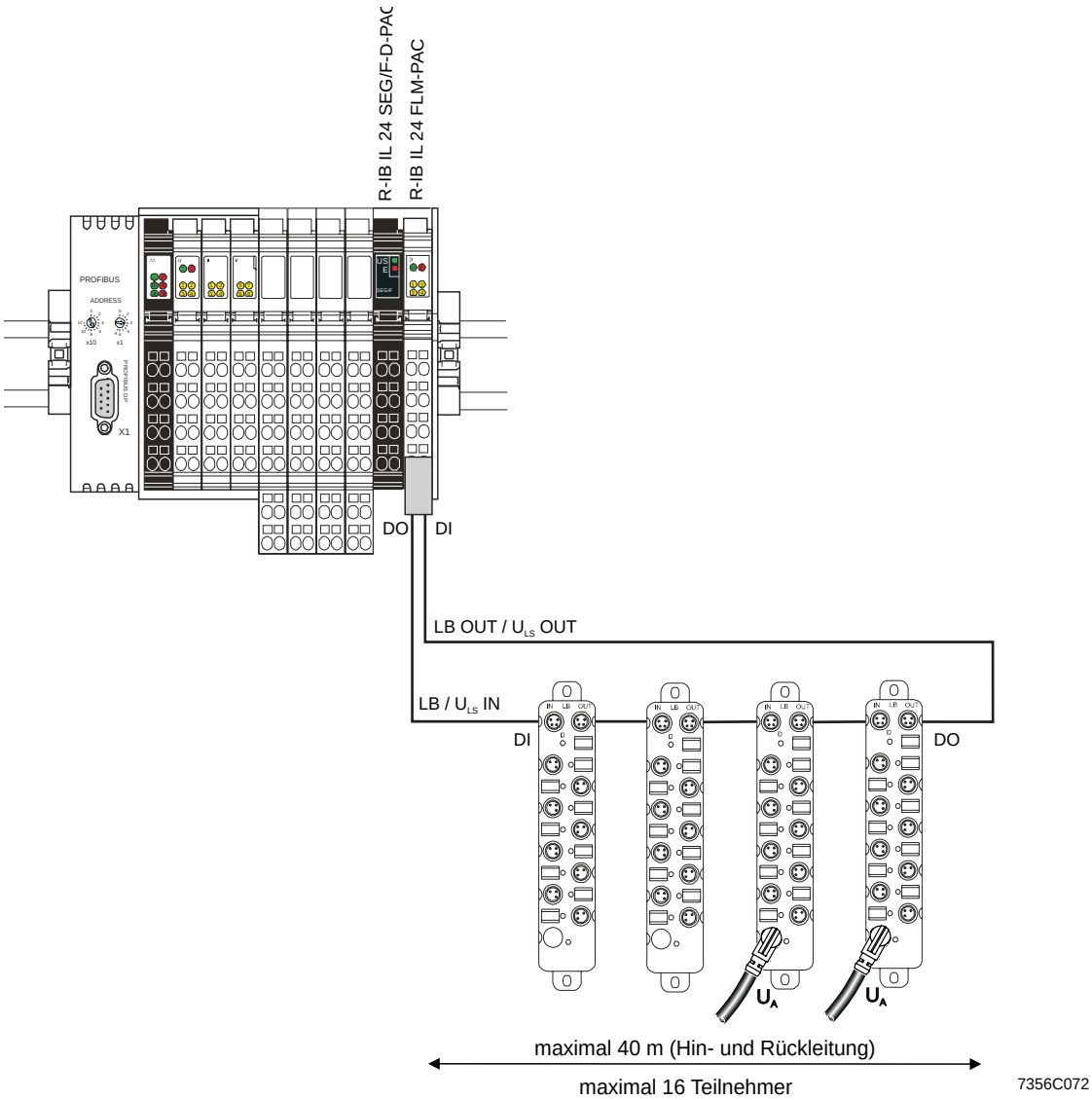


Fig. 5-9 Typical structure of a Fieldline Modular M8 station at Inline

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. The supply voltage for the Fieldline Modular M8 system is thus protected and diagnostics can be performed for the supply voltage. When using this terminal the current consumption at U_S is limited to 4 A.

Using the R-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 use the branch terminal as the last terminal in an Inline station.
The data jumpers for the local bus are not available after the branch terminal. If terminals are snapped on after the branch terminal, the first INTERBUS device after the branch terminal indicates an interface error (D LED flashes at 4 Hz). In this case, change the Inline station so that the branch terminal is the last terminal in the station.

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 R-IB IL 24 FLM-PAC branch terminal. The supply voltage for the Fieldline Modular system is thus protected and diagnostics can be performed for the supply voltage.

Always connect DI to DO.

Always supply the U_{LS} supply voltage 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. In general, the maximum current load of 4 A per contact must not be exceeded.

Description of Fieldline Modular Devices

6 Mounting Fieldline Devices and Connecting Cables

6.1 General Information on Installation

When preparing for cable installation, the local conditions and the corresponding mounting regulations are very important. 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 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 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.

Mounting Fieldline Devices and Connecting Cables

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 Cables Between Buildings" on page 41 when grounding cables run 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 cables 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

- Where possible, use metal cable hangers.
- Do not install bus lines together with or parallel to power supply lines.
- Separate bus lines on cable bridges or in cable ducts with isolating segments from the power supply lines.
- 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 cables 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.

6.1.1 Installing Bus Cables Between Buildings

Causes of 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 cables for mains 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 Fig. 6-1) 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

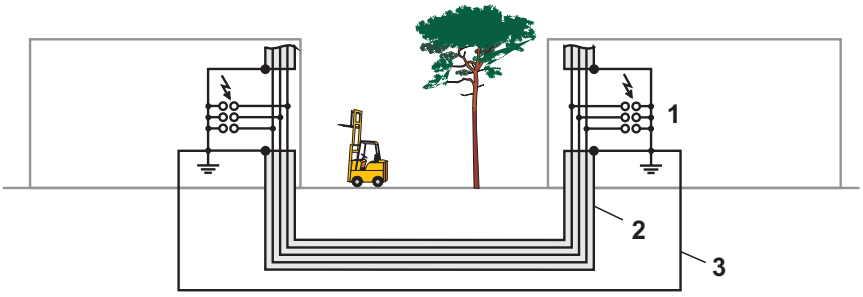
Install an additional equipotential bonding line between the grounding points of buildings (3 in Fig. 6-1), that preferably is designed as

- a metal reinforced concrete channel
- An additional grounding cable
- a metal pipe

Surge voltage protection devices

Bosch Rexroth recommends that all cable wires are connected with surge protection devices (1 in Fig. 6-1) to protect the modules against surge voltages.

Make sure you follow the national and international regulations when installing the surge protection devices.



1 Surge protection devices
2 Cable shielding
3 Equipotential bonding line

Fig. 6-1 Surge protection measures

6.1.2 Interference Suppression Measures

Bosch Rexroth 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.

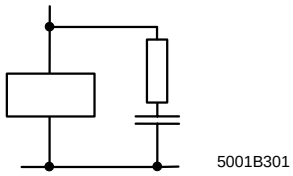


Fig. 6-2 Relay coil with RC element

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

6.1.3 Grounding Concept

DANGER

Dangerous contact voltage

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). The FE connection for the housing can be achieved using a mounting screw on a grounded mounting surface or an outside grounding connection (latch) (see Chapter "Mounting Fieldline Stand-Alone Devices" on page 44 and Chapter "Direct Mounting on a Fieldline Modular Flat Mounting Surface" on page 47).

6.2 Installation Instructions

Danger! Electrostatic discharge

The device contains components that can be damaged or destroyed by electrostatic discharge. When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) according to EN 61340-5-1 and EN 61340-5-2.

CAUTION

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 44 and "Direct Mounting on a Fieldline Modular Flat Mounting Surface" on page 47.

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.

6.3 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.

6.4 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 ground connection

CAUTION

Malfunction

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 Fig. 6-4).
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).

Assembly

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 Chapter "Housing Dimensions for Fieldline Stand-Alone Devices" on page 24 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.

6.4.1 Front Mounting for Fieldline Stand-Alone Devices

- Screw the device directly onto the flat mounting surface using two mounting screws (1 and 2 in Fig. 6-3).

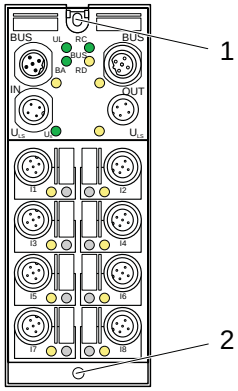


Fig. 6-3 Front mounting (FLS)

Grounded mounting surface

- If the mounting surface is grounded, the device is connected to functional earth ground via the upper mounting screw (Fig. 6-4).

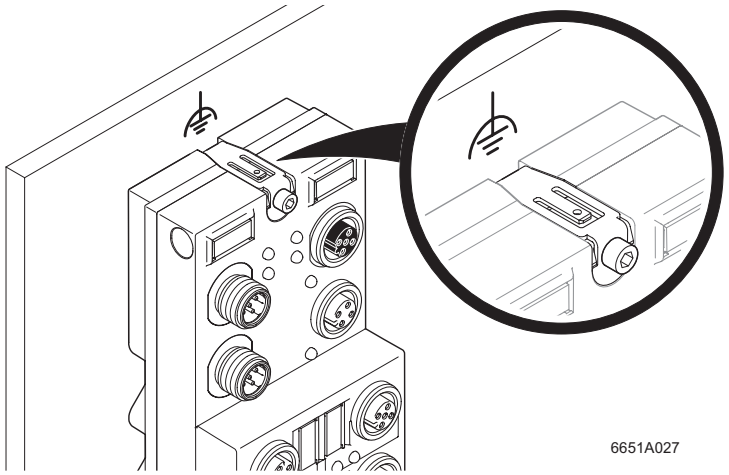


Fig. 6-4 Functional earth ground connection for a grounded mounting surface (FLS)

Mounting Fieldline Devices and Connecting Cables

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 Fig. 6-5:

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

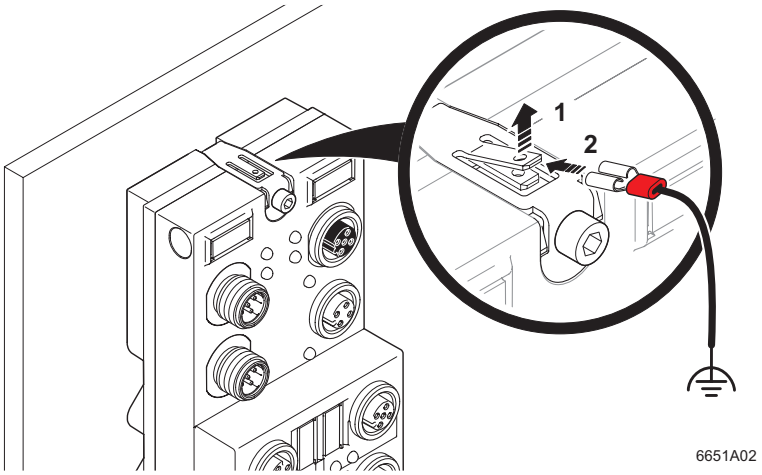


Fig. 6-5 Functional earth grounding via external FE connection for front mounting (FLS)

6.4.2 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 Fig. 6-6).

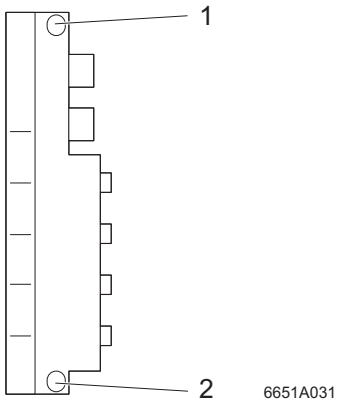


Fig. 6-6 Side mounting (FLS)

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 Fig. 6-7:

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

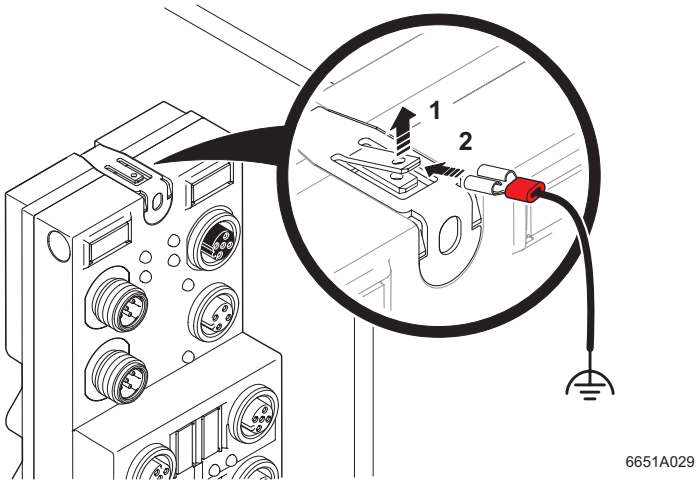


Fig. 6-7 *Functional earth grounding via external FE connection for side mounting (FLS)*

6.5 Direct Mounting on a Fieldline Modular 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 ground connection

CAUTION

Malfunction

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 Fig. 6-8).
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 Fig. 6-10.

Assembly

- 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 Chapter "Housing Dimensions for Fieldline Modular Devices" on page 30 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 Fig. 6-8).

Mounting Fieldline Devices and Connecting Cables

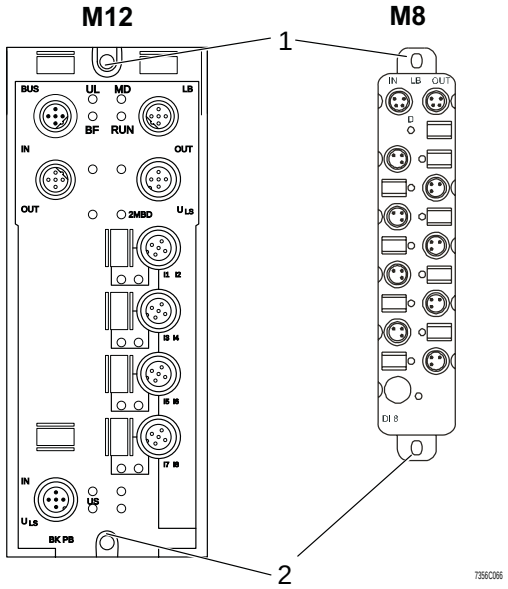


Fig. 6-8 Front mounting (FLM)

Grounded mounting surface, RF-FLM M12

If the mounting surface is grounded, the device is connected to functional earth ground via the upper mounting screw (Fig. 6-9).

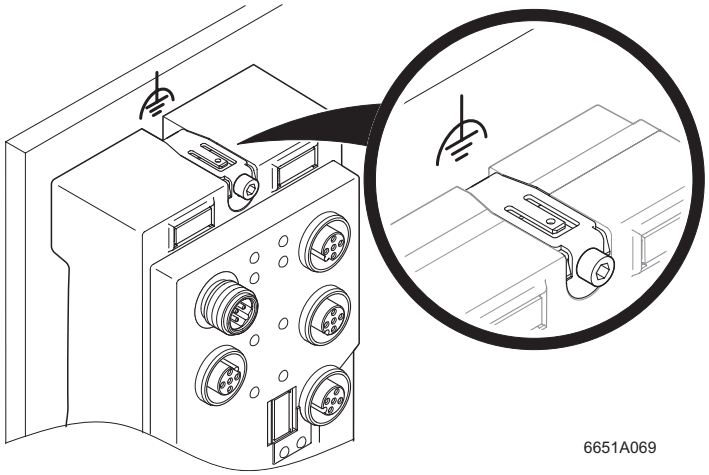


Fig. 6-9 Functional earth grounding with grounded mounting surface (RF-FLM M12)

Ungrounded mounting surface, RF-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 Fig. 6-10:

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

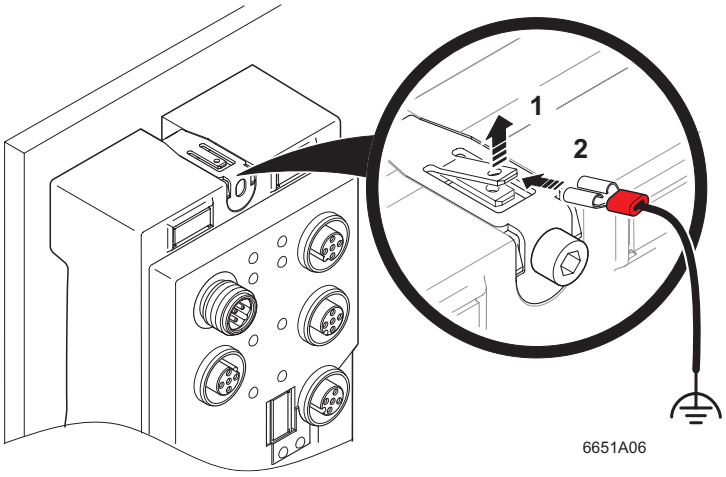


Fig. 6-10 Functional earth grounding via external FE connection (RF-FLM M12)

Grounded mounting surface, RF-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, RF-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.

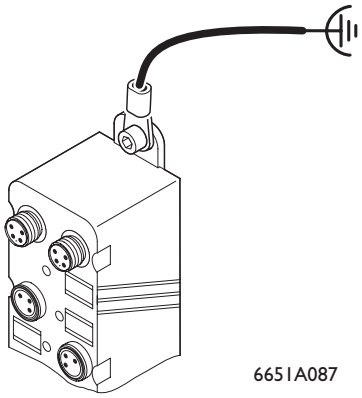


Fig. 6-11 Functional earth grounding using a mounting screw via a cable lug (RF-FLM M8)

6.6 Setting the Address and Transmission Speed for Fieldline Devices

PROFIBUS DP, DeviceNet

Fieldline devices for **PROFIBUS DP,** and **DeviceNet** bus systems have rotary encoding switches for setting the address and, if necessary, the transmission speed (see the application description for the relevant bus system). Rotary encoding switch x10 is used to specify the tens and switch x1 is used to specify the

Beispiel

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

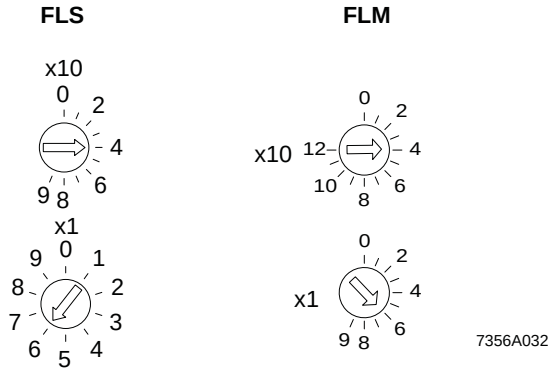


Fig. 6-12 Example: Address 46 (RF-FLS and RF-FLM)

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 application description for your bus system and the device-specific data sheet.

6.7 Connecting the Voltage Supplies

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

CAUTION

Overload

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.

For Fieldline Modular M8 devices, insert as much of the filler litz wire as possible in the connector for the local bus cables with braided shield.

6.7.1 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** and **PROFIBUS DP**, the voltages U_L and U_S are supplied via the U_{LS} IN connection and, if other devices are also 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 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 sheet.

Mounting Fieldline Devices and Connecting Cables

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.

CAUTION

Overload

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. If the permissible current carrying capacity is exceeded, this may lead to connector damage.

Bosch Rexroth recommends the use of pre-assembled bus cables.

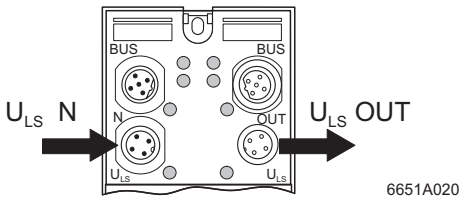


Fig. 6-13 Connections for the power supply U_{LS} (RF-FLS)

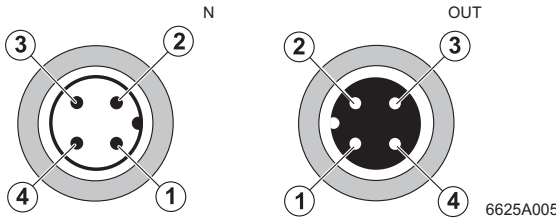


Fig. 6-14 Pin assignment of the power supply U_{LS} (connections on the Fieldline Stand-Alone device)

Pin	IN	OUT	Wire colors
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

Table 6-15 Pin assignment of the power supply U_{LS} (RF-FLS)

CAUTION

Surge voltages cause damage to the deivce

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.

CAUTION

Surge voltages cause damage to the deivce

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. If the permissible current carrying capacity is exceeded, this may lead to connector damage.

Bosch Rexroth recommends the use of pre-assembled bus cables.

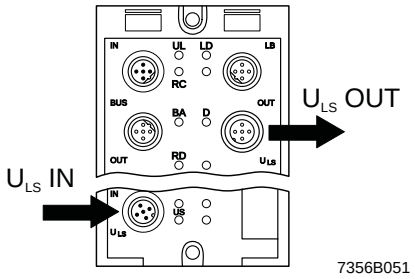


Fig. 6-16 *Connections for the power supply U_{LS} on the bus coupler (RF-FLM)*

CAUTION

Surge voltages cause damage to the deivce

The voltages U_L and U_S at female connector U_{LS} OUT may each only carry a maximum current of 2 A on the bus coupler.

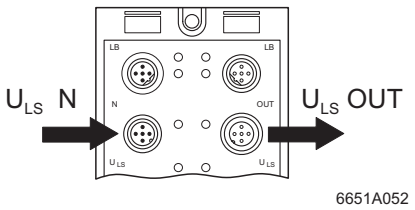


Fig. 6-17 *Connections for the power supply ULS on the digital and analog M12 I/O device*

Mounting Fieldline Devices and Connecting Cables

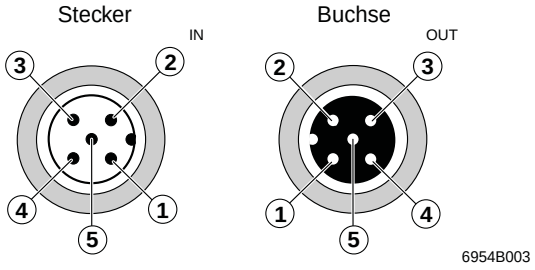


Fig. 6-18 Pin assignment of the power supply U_{LS} (connections on the Fieldline Modular M12 device)

Pin	IN	OUT	Wire colors
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 kbps/2 Mbps	500 kbps/2 Mbps	**Green/yellow** or gray

Table 6-19 Pin assignment of the power supply for Fieldline Modular M12 devices U_{LS} (RF-FLM)

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

Power supply U_{LS} for Fieldline Modular M8 devices

CAUTION

Surge voltages cause damage to the deivce

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. If the permissible current carrying capacity is exceeded, this may lead to connector damage.

Bosch Rexroth recommends the use of pre-assembled bus cables.

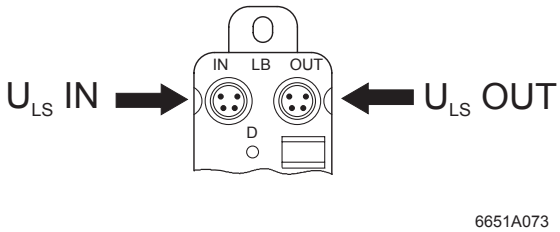


Fig. 6-20 Connections for the power supply on the digital RF-FLM M8 input and output devices

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

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

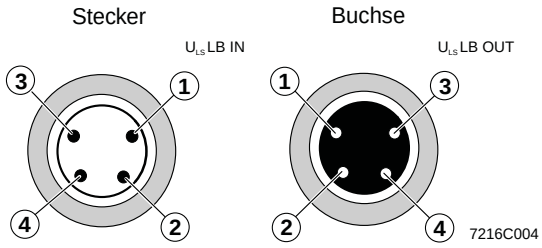


Fig. 6-21 Pin assignment of the power supply U_{LS} and the local bus (RF-FLM M8)

Pin	IN	OUT	Conductor Color
1	U_{LS} – +24 V	U_{LS} – +24 V	Red
2	DI	DO	Yellow
3	U_{LS} GND	U_{LS} GND	Blue
4	/DI	/DO	Green

Fig. 6-22 Pin assignment of the power supply U_{LS} and the local bus (RF-FLM M8)

CAUTION

Surge voltages cause damage to the deivce

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

6.7.2 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.

CAUTION

Device damage through polarity reversal

The connections for U_A have different functions for output devices (DO devices) and I/O devices (DIO devices). Fig. 6-23 provides examples for the different device types.

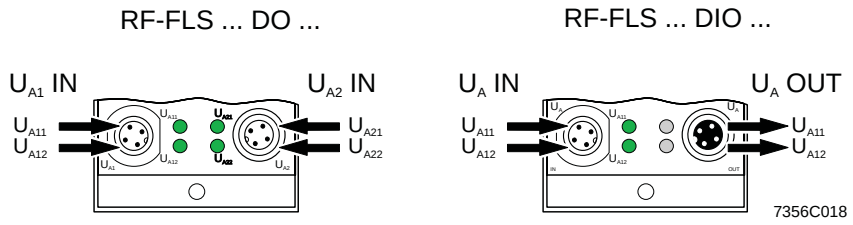


Fig. 6-23 U_A connections for DO and DIO devices (RF-FLs M12)

The different functions of the connections - supply for DO devices and supply and forwarding for DIO devices - is 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 Chapter "Power Supply for Sensors and Actuators in Individual Fieldline Stand-Alone Devices" on page 59.

CAUTION

Surge voltages cause damage to the deivce

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

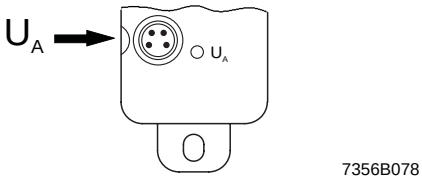


Fig. 6-24 U_A connection for Fieldline Modular DIO/DO M8 devices

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 Chapter "Power Supply for Sensors and Actuators in Individual Fieldline Modular M8 Devices" on page 60.

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

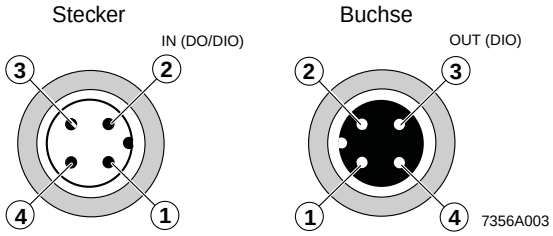


Fig. 6-25 Pin assignment of the power supply U_A of the outputs (connections on the Fieldline Stand-Alone device)

Pin	IN (DIO/DO)	OUT (DIO)	IN (DO-2A)	Wire colors
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

Fig. 6-26 Pin assignment of the power supply U_A (FLS)

CAUTION

Surge voltages cause damage to the deivce

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

Mounting Fieldline Devices and Connecting Cables

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

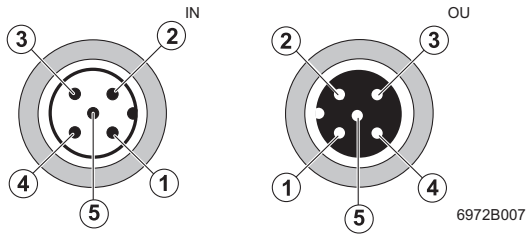


Fig. 6-27 Pin assignment of the power supply U_A of the outputs (connections on the Fieldline Modular device)

Pin	IN	OUT	Wire colors
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

Fig. 6-28 Pin assignment of the power supply U_A of the outputs (connections on the Fieldline Modular M12 device)

CAUTION

Surge voltages cause damage to the deivce

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

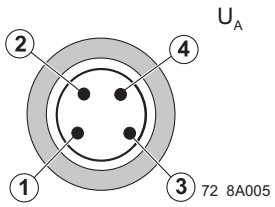


Fig. 6-29 Pin assignment of the power supply U_A of the outputs (connections on the Fieldline Modular M8 device)

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

Fig. 6-30 Pin assignment of the power supply U_A of the outputs (connections on the Fieldline Modular M8 device)

CAUTION

Surge voltages cause damage to the deivce

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

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

The following diagrams provide **examples** of which inputs and outputs are supplied by which supply voltage. For the actual assignment for your device, please refer to the device-specific data sheet.

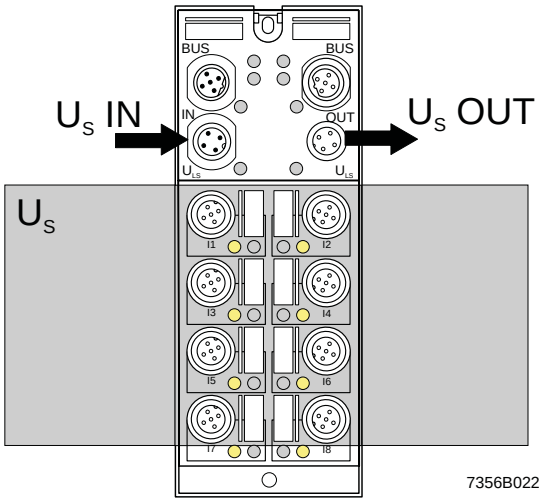


Fig. 6-31 *Input supply (digital input device, e.g., RF-FLS IB M12 DI 8 M12)*

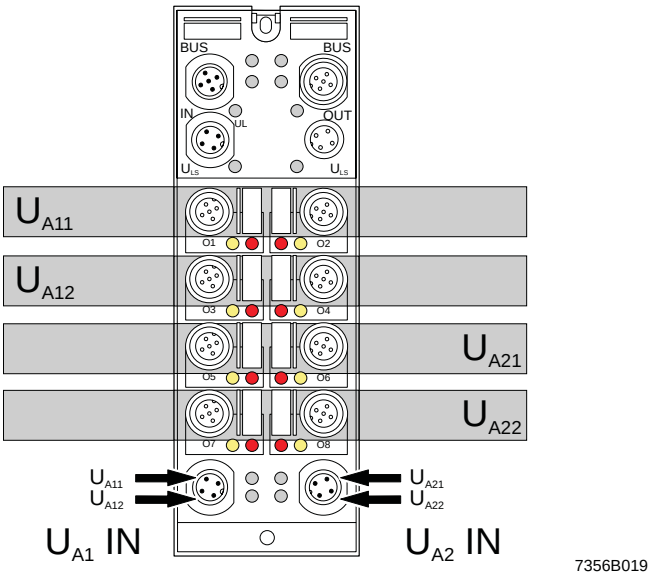


Fig. 6-32 *Output supply (digital output device, e.g., RF-FLS IB M12 DO 8 M12-2A)*

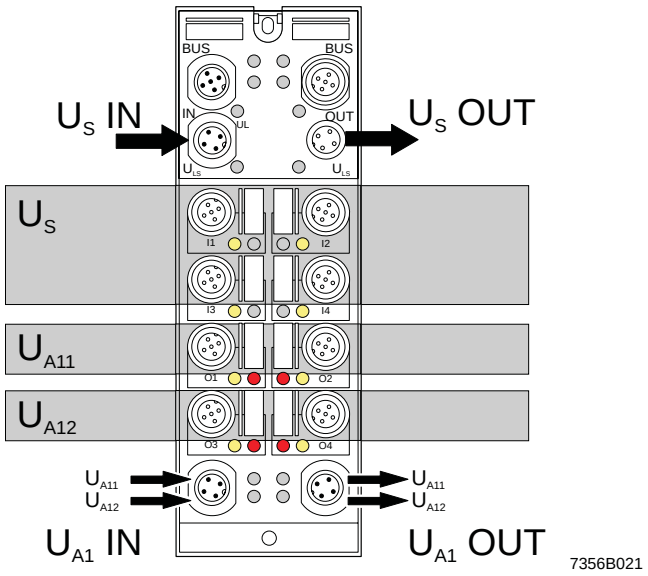


Fig. 6-33 *Input and output supply (digital I/O device, e.g., RF-FLS IB M12 DIO 4/4 M12-2A)*

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

The following diagrams provide **examples** of which inputs and outputs are supplied by which supply voltage. For the actual assignment for your device, please refer to the device-specific data sheet.

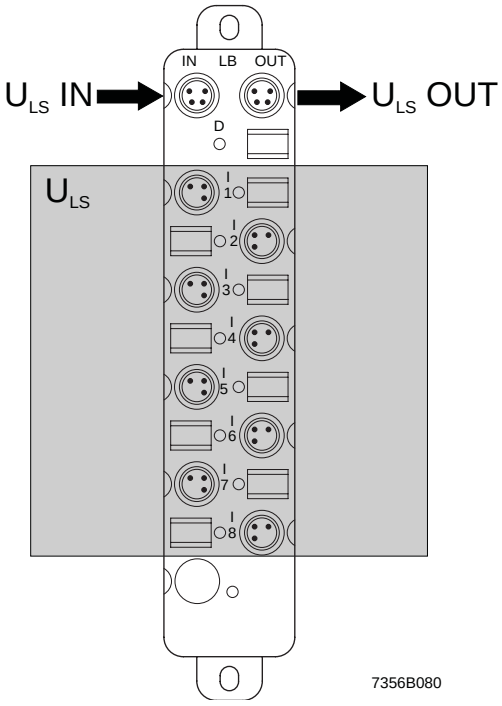


Fig. 6-34 *Input supply (digital input device, e.g., RF-FLM DI 8 M8)*

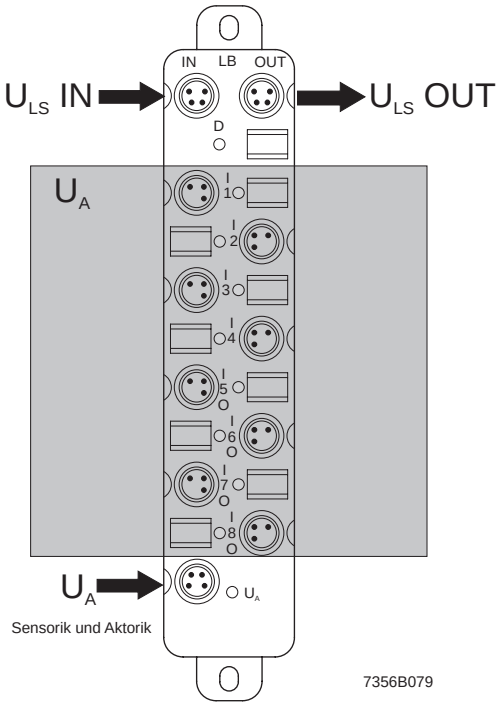


Fig. 6-35 *Input and output supply (digital I/O device, e.g., RF-FLM DIO 8/4 M8)*

Combined I/O devices are only supplied with communications power from the local bus cable.

6.7.5 Voltage Supply Examples

RF-FLS

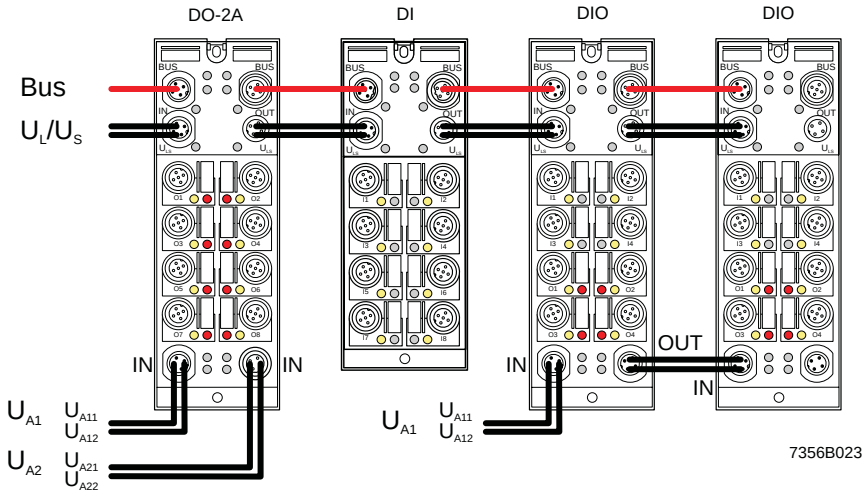


Fig. 6-36 *Example for the supply and forwarding of supply voltages (FLS)*

CAUTION

Surge voltages cause damage to the deivce

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. If the permissible current carrying capacity is exceeded, this may lead to connector damage.

Mounting Fieldline Devices and Connecting Cables

RF-FLM M8

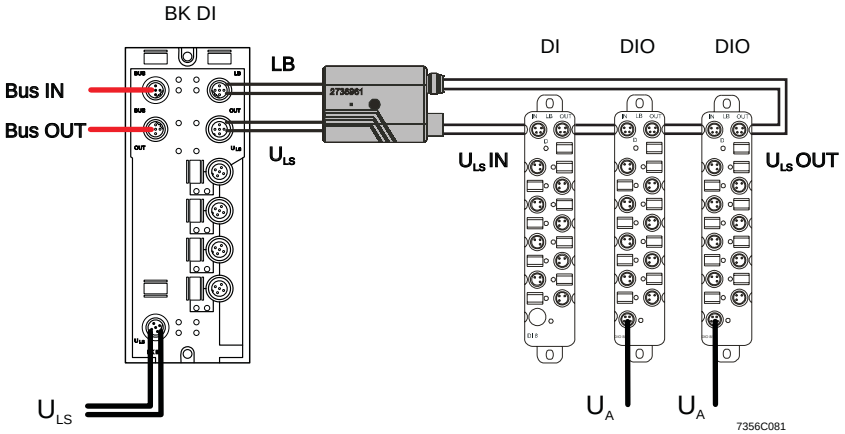


Fig. 6-37 Example for the supply and forwarding of supply voltages (RF-FLM M8)

CAUTION

Surge voltages cause damage to the deivce

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. If the permissible current carrying capacity is exceeded, this may lead to connector damage.

CAUTION

Surge voltages cause damage to the deivce

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)

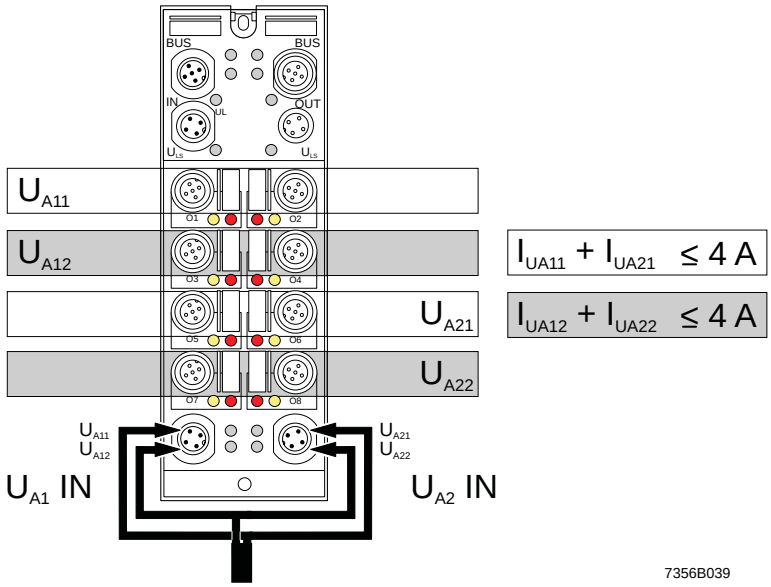


Fig. 6-38 Supply via a Y cable (RF-FLS)

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

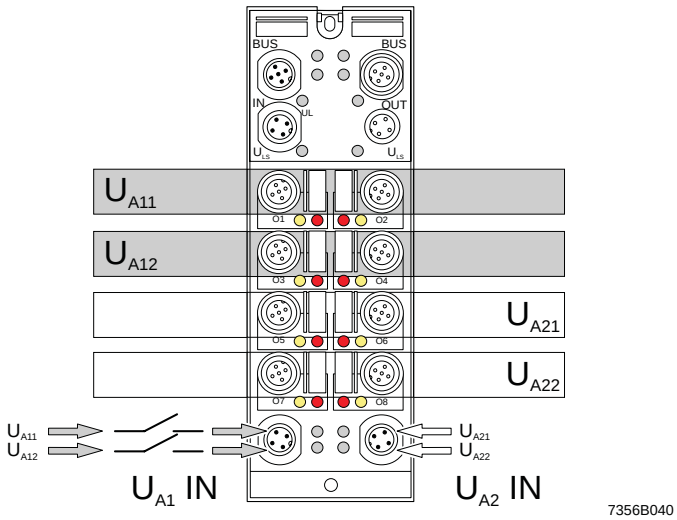


Fig. 6-39 Switching off specific outputs (RF-FLS)

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.

6.7.6 Calculation Examples for Sensor and Actuator Currents

Calculation example for an RF-FLM bus coupler

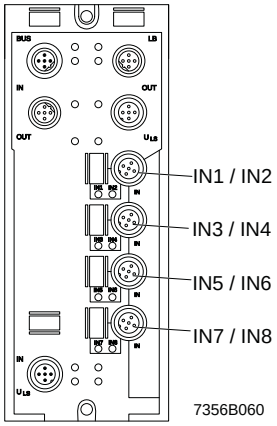


Fig. 6-40 RF-FLM BK PB M12 DI 8 M12

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 RF-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 RF-FLS DIO 4/4 device

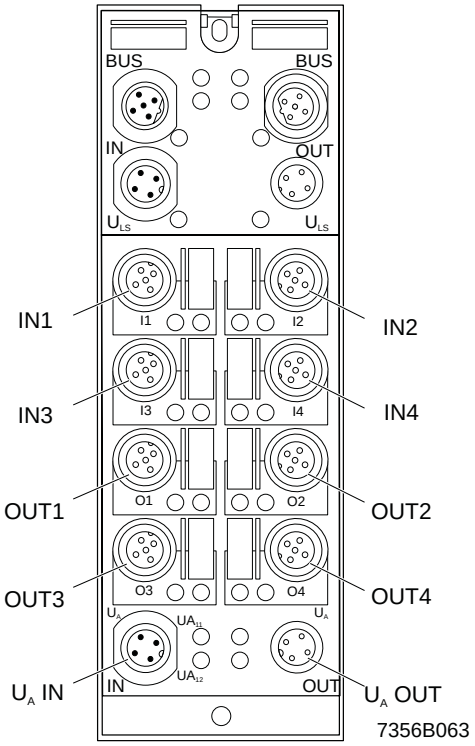


Fig. 6-41 RF-FLS M12 DIO 4/4 M12-2A

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

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Calculation example for an RF-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 mA**
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 RF-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 RF-FLM DI 8 M8 device

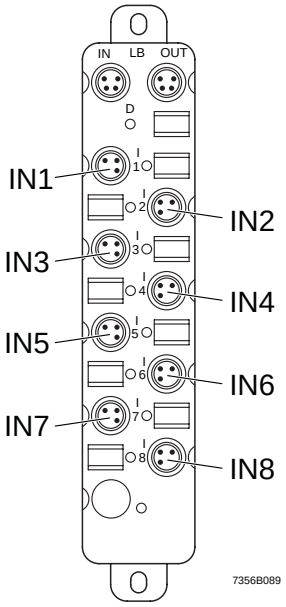

Fig. 6-42 RF-FLM DI 8 M8

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 RF-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 RF-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.

Mounting Fieldline Devices and Connecting Cables

Calculation example for an RF-FLM DIO 8/4 device

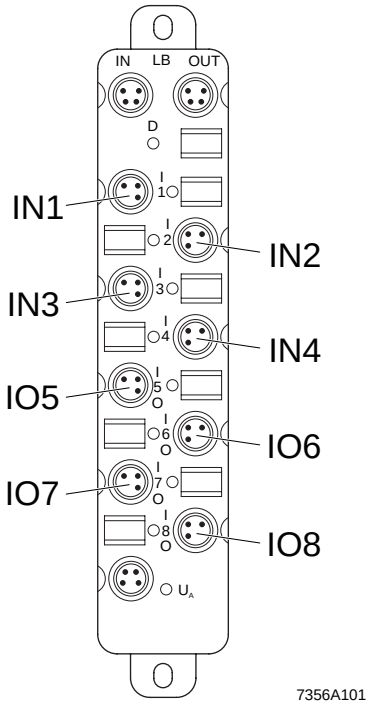

Fig. 6-43 RF-FLM DIO 8/4

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 valves (hydraulic)	0.5 A
1 x solenoid valves (hydraulic)	0.3 A
2 x solenoid valves (pneumatic)	67 mA

Calculation example for an RF-FLM DIO 8/4 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_A			
OUT1	Solenoid valve (hydraulic)	+	1.3 A
OUT2	Solenoid valve (pneumatic)	+	67 mA
OUT3	Solenoid valve (hydraulic)	+	1.3 A
OUT4	Solenoid valve (pneumatic)	+	67 mA
I_{UA} total		=	**2.734 A**

With this configuration, the RF-FLM DIO 8/4 device loads U_S with approximately 80 mA. U_L is loaded with approximately 55 mA (see data sheet). U_A is loaded with approximately 2.734 A. The total load is 2.869 A.

Calculation example for an RF-FLM DO 4 M8 device

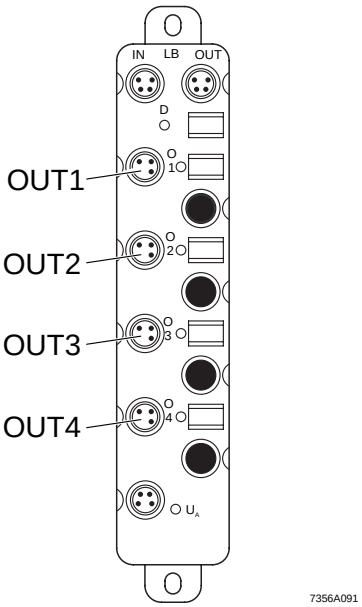

Fig. 6-44 RF-FLM DO 4 M8

Calculation example for an RF-FLM-DO 4 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**

The RF-FLM DO 4 device also supplies $U_{L\ from\ UA}$.
U_L loads U_A additionally with approximately 55 mA (see data sheet).
U_A is thus loaded with at total of 1.789 A.

Mounting Fieldline Devices and Connecting Cables

Calculation examples for an RF-FLM station

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

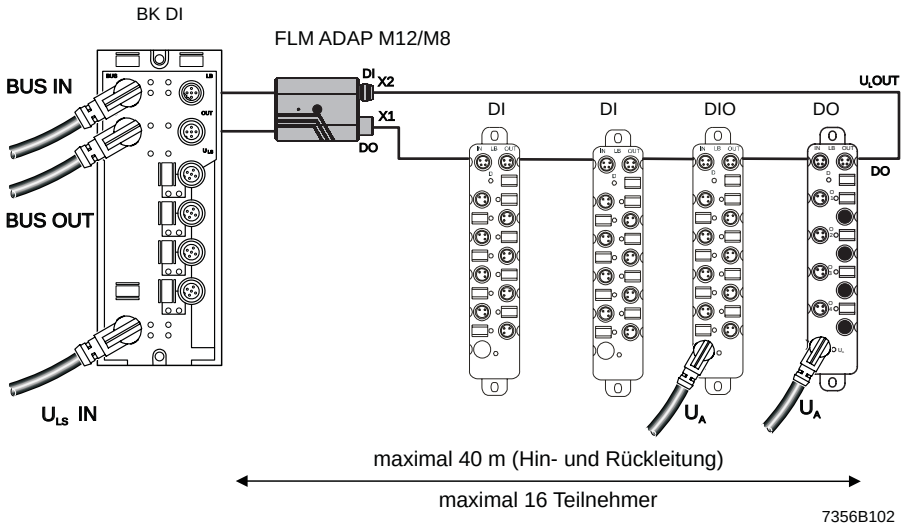

Fig. 6-45 FLM M12/M8 station

	Bus couplers	**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 mA	= 2.848 A	2 x 3 A

Voltage U_A should be loaded equally.

Calculation example for an Fieldline Modular M8 station connected to Inline

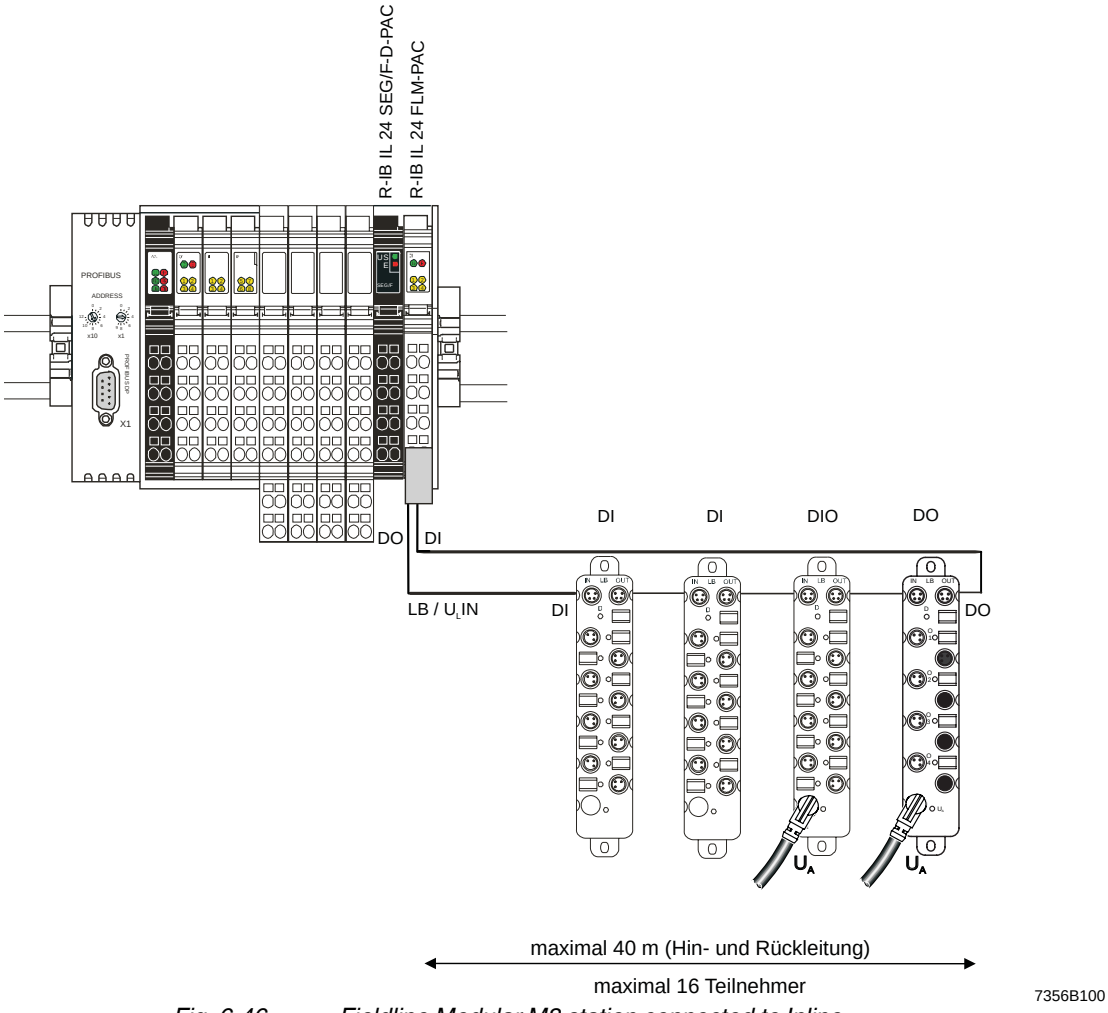

Fig. 6-46 Fieldline Modular M8 station connected to Inline

	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 mA	= 2.848 A	2 x 3 A

6.7.7 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.

Beispiel

Part A in Fig. 6-47: I both outputs of a group are loaded with 2 A simultaneously on an RF-FLS IB DIO 4/4 M12-2A Fieldline device, the supply voltage for these outputs cannot be forwarded.

Beispiel

Part B in Fig. 6-47: If both outputs of a group are loaded with 0.5 A simultaneously on the same Fieldline device, 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.

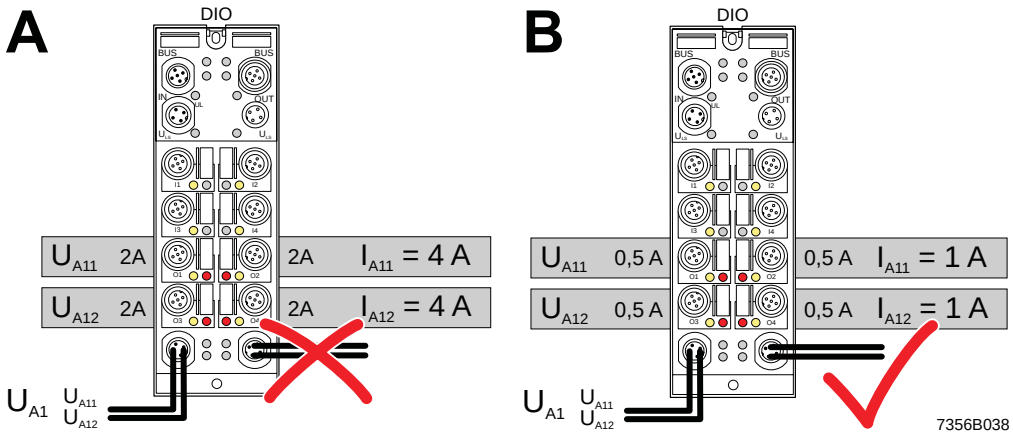

Fig. 6-47 Forwarding the supply voltage

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 mm^2 (18 AWG) cable type 186, for example, 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.

6.7.8 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:

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 better to supply the ULS supply voltage for Fieldline Modular M8 devices on both sides. When an Inline segment terminal (R-IB IL 24 SEG/F) is used and the M12/8 adapter, the sum current for an M8 station is limited to 4 A.

6.8 Connecting Sensors and Actuators

Connect the sensors and actuators using M12 or M8 connectors.

Bosch Rexroth recommends the use of pre-assembled cables.

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

The maximum cable length for connecting sensors and actuators is 100 m.

Mounting Fieldline Devices and Connecting Cables

7 Ordering Information

Further information on all Fieldline products, Fieldline devices and their accessories as well as the complete documentation on Fieldline devices can be found at www.boschrexroth.com.

These include:

- Fieldline devices
- Bus cables
- Shielded bus connectors
- Unshielded connectors
- Assembly systems
- Termination Resistors
- Other accessories

Ordering Information

8 Disposal and Environmental Protection

8.1 Disposal

8.1.1 Products

Our products can be returned to us free of charge for disposal. However, it is a precondition that the products are free of oil, grease or other dirt.

Furthermore, the products returned for disposal must not contain any undue foreign matter or foreign component.

Please send the products free domicile to the following address:

Bosch Rexroth AG

Electric Drives and Controls

Bürgermeister-Dr.-Nebel-Straße 2

D-97816 Lohr am Main

8.1.2 Packaging Materials

The packaging materials consist of cardboard, wood and polystyrene. These materials can be easily recycled in any municipal recycling system. For ecological reasons, please refrain from returning the empty packages to us.

8.2 Environmental Protection

8.2.1 No Release of Hazardous Substances

Our products do not contain any hazardous substances which may be released in the case of appropriate use. Accordingly, our products will normally not have any negative effect on the environment.

8.2.2 Materials Contained in the Products

Electronic devices

Electronic devices mainly contain:

- steel
- aluminium
- copper
- synthetic materials
- electronic components and modules

Motors

Motors mainly contain:

- steel
- aluminium
- copper
- brass
- magnetic materials
- electronic components and modules

Disposal and Environmental Protection

8.2.3 Recycling

Due to their high content of metal most of the product components can be recycled.In order to recycle the metal in the best possible way, the products must be disassembled into individual modules.

Metals contained in electric and electronic modules can also be recycled by means of special separation processes. The synthetic materials remaining after these processes can be thermally recycled.

If the products contain batteries or rechargeable batteries, these batteries are to be removed and disposed before they are recycled.

9 Service & Support

9.1 Helpdesk

Our service helpdesk at our headquarters in Lohr, Germany, will assist you with all kinds of enquiries.

Contact us:

- By phone through the Service Call Entry Center,
  Mo - Fr 7:00 am - 6:00 pm CET
  +49 (0) 9352 40 50 60
- By Fax
  +49 (0) 9352 40 49 41
- By email: service.svc@boschrexroth.de

9.2 Service Hotline

Out of helpdesk hours please contact our German service department directly:

+49 (0) 171 333 88 26

or

+49 (0) 172 660 04 06

Hotline numbers for other countries can be found in the addresses of each region (see below).

9.3 Internet

Additional notes regarding service, maintenance and training, as well as the current addresses of our sales and service offices can be found on

http://www.boschrexroth.com

Outwith Germany please contact our sales/service office in your area first.

9.4 Helpful Information

For quick and efficient help please have the following information ready:

- detailed description of the fault and the circumstances
- information on the type plate of the affected products, especially type codes and serial numbers
- your phone / fax numbers and e-mail address so we can contact you in case of questions

Service & Support

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