Rexroth
Bosch Group

Rexroth RECO Fieldline INTERBUS Devices

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Project Planning Manual

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This documentation describes the RECO Fieldline INTERBUS devices.

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Note
This document has been printed on chlorine-free bleached paper.

Contents

1 System Presentation

1.1 Product Family RECO Fieldline

The input and output devices of the product family RECO Fieldline are designed for distributed automation tasks in harsh environmental conditions. The devices meet the requirements for IP 65 / IP 67 protection. They enable the direct connection of sensors and actuators in the environment close to the station. This project planning manual describes the devices of the INTERBUS system.

1.2 Presentation of the Devices

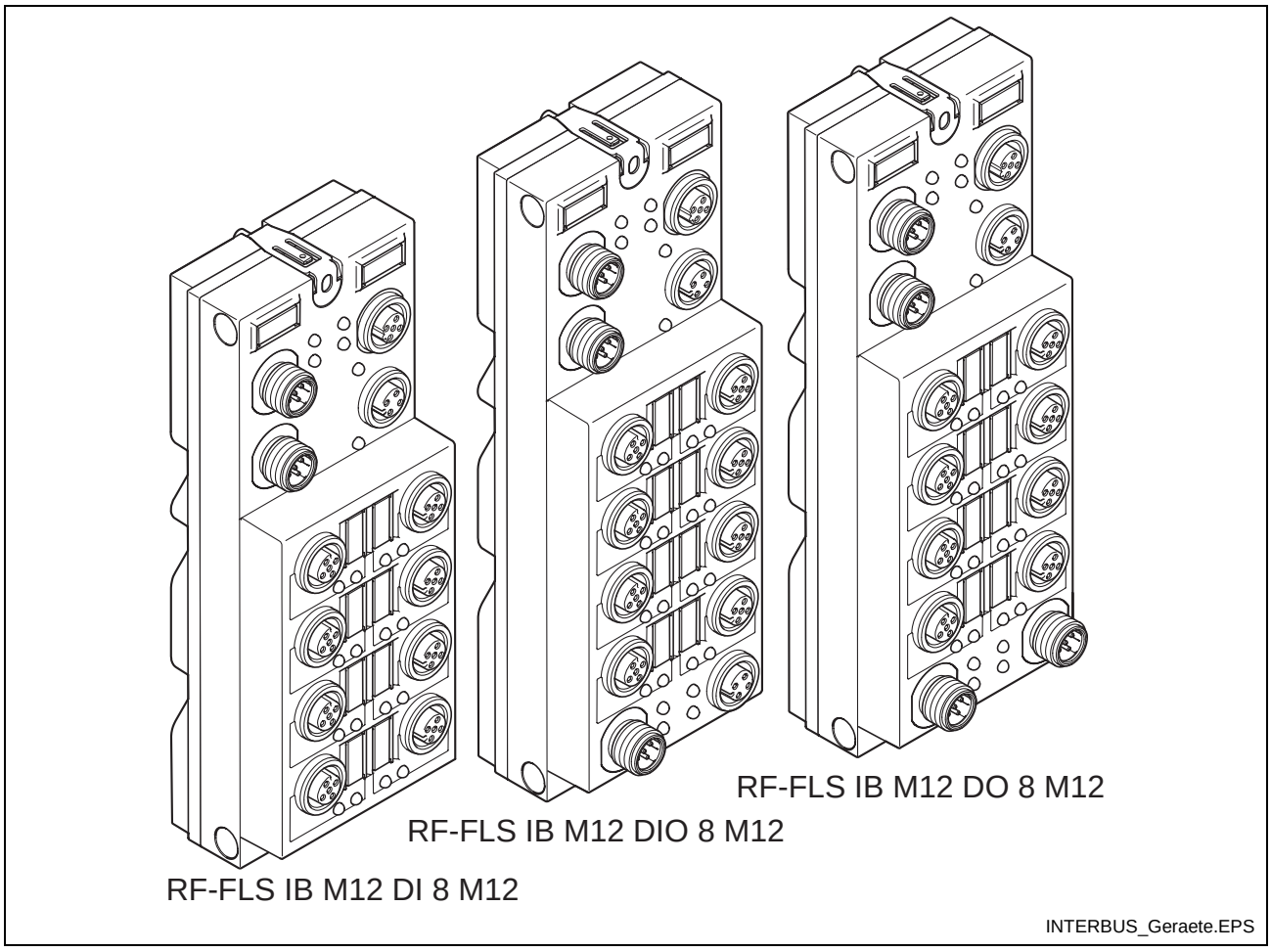


Fig. 1-1: INTERBUS devices

The following three devices are described in this project planning manual:

- Stand alone device for INTERBUS with 8 digital inputs

  RF-FLS IB M12 DI 8 M12

  The device is used for digital signal acquisition.
- Stand alone device for INTERBUS with 4 digital inputs and 4 digital outputs

  RF-FLS IB M12 DIO 4/4 M12-2A

  The device is used for digital signal acquisition and output.
- Stand alone device for INTERBUS with 8 digital outputs

  RF-FLS IB M12 DO 8 M12-2A

  The device is used for digital signal output.

Note: The project planning manual is only valid in conjunction with the application description DOK-CONTRL-RF-FLS-IB**-AW..-EN-P!

2 Important Directions for Use

2.1 Appropriate Use

Introduction

Bosch 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.

Note: 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 Bosch 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.

Areas of Use and Application

The RECO Fieldline system is a distributed modular fieldbus-coupled input and output system. The RECO Fieldline system of Bosch Rexroth is designed for the use in the following application cases:

- Machine tools
- Transfer systems
- General automation

Note: The RECO 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 areas of application of a RECO Fieldline device are:

- Lathes
- Milling machines
- Machining centers

The RECO 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.

2.2 Inappropriate Use

Using the RECO 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 RECO Fieldline system may not be used, if

- It is 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 extreme maximum temperatures

or if

- Bosch Rexroth has not specifically released them for that intended purpose. Please note the specifications outlined in the general Safety Instructions!

3 Safety Instructions for Electric Drives and Controls

3.1 Introduction

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

Do not attempt to install or start up this equipment without first reading all documentation provided with the product. Read and understand these safety instructions and all user documentation of the equipment prior to working with the equipment at any time. If you do not have the user documentation for your equipment, contact your local Bosch Rexroth representative to send this documentation immediately to the person or persons responsible for the safe operation of this equipment.

If the equipment is resold, rented or transferred or passed on to others, then these safety instructions must be delivered with the equipment.

WARNING

Improper use of this equipment, 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!

3.2 Explanations

The safety instructions describe the following degrees of hazard seriousness in compliance with ANSI Z535. The degree of hazard seriousness informs about the consequences resulting from non-compliance with the safety instructions.

Warning symbol with signal word	Degree of hazard seriousness according to ANSI
 **DANGER**	Death or severe bodily harm will occur.
 **WARNING**	Death or severe bodily harm may occur.
 **CAUTION**	Bodily harm or material damage may occur.

Fig. 3-1: Hazard classification (according to ANSI Z535)

3.3 Hazards by Improper Use

DANGER

High voltage and high discharge current! Danger to life or severe bodily harm by electric shock!

DANGER

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

WARNING

High electrical voltage due to wrong connections! Danger to life or bodily harm by electric shock!

WARNING

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

CAUTION

Surface of machine housing could be extremely hot! Danger of injury! Danger of burns!

CAUTION

Risk of injury due to improper handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock or incorrect handling of pressurized systems!

CAUTION

Risk of injury due to incorrect handling of batteries!

3.4 General Information

- The 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 starting up 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 equipment.
- Only persons who are trained and qualified for the use and operation of the equipment may work on this equipment or within its proximity.
  - The persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the equipment 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 equipment 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.
- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The equipment is designed for installation in industrial machinery.
- The ambient conditions given in the product documentation must be observed.
- Use only safety features and applications that are clearly and explicitly approved in the Project Planning Manual.
  For example, the following areas of use are not permitted: construction cranes, elevators used for people or freight, devices and vehicles to transport people, medical applications, refinery plants, transport of hazardous goods, nuclear applications, applications sensitive to high frequency, mining, food processing, control of protection equipment (also in a machine).
- 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.
- Startup 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.
- Technical data, connections and operational conditions are specified in the product documentation and must be followed at all times.

- 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 documentation "EMC in Drive and Control Systems".
  The machine or installation manufacturer is responsible for compliance with the limiting values as prescribed in the national regulations.

3.5 Protection Against Contact with Electrical Parts

Note: This section refers to equipment and drive components with voltages above 50 Volts.

Touching live parts with voltages of 50 Volts and more with bare hands or conductive tools or touching ungrounded housings can be dangerous and cause electric shock. In order to operate electrical equipment, certain parts must unavoidably have dangerous voltages applied to them.

DANGER

High electrical voltage! Danger to life, severe bodily harm by electric shock!

⇒ Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain or repair this equipment.

⇒ Follow general construction and safety regulations when working on high voltage installations.

⇒ Before switching on power the ground wire must be permanently connected to all electrical units according to the connection diagram.

⇒ Do not operate electrical equipment at any time, even for brief measurements or tests, if the ground wire is not permanently connected to the points of the components provided for this purpose.

⇒ Before working with electrical parts with voltage higher than 50 V, the equipment must be disconnected from the mains voltage or power supply. Make sure the equipment cannot be switched on again unintended.

⇒ The following should be observed with electrical drive and filter components:

⇒ Wait five (5) minutes after switching off power to allow capacitors to discharge before beginning to work. Measure the 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 equipment on. Prevent contact with live parts at any time.

⇒ A residual-current-operated protective device (RCD) must not be used on electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.

⇒ Electrical components with exposed live parts and uncovered high voltage terminals must be installed in a protective housing, for example, in a control cabinet.

To be observed with electrical drive and filter components:

DANGER

High electrical voltage on the housing!
High leakage current! Danger to life, danger of injury by electric shock!

⇒ Connect the electrical equipment, the housings of all electrical units and motors permanently with the safety conductor at the ground points before power is switched on. Look at the connection diagram. This is even necessary for brief tests.

⇒ Connect the safety conductor of the electrical equipment always permanently and firmly to the supply mains. Leakage current exceeds 3.5 mA in normal operation.

⇒ Use a copper conductor with at least 10 mm² cross section over its entire course for this safety conductor connection!

⇒ Prior to startups, even for brief tests, always connect the protective conductor or connect with ground wire. Otherwise, high voltages can occur on the housing that lead to electric shock.

3.6 Protection Against Electric Shock by Protective Low Voltage (PELV)

All connections and terminals with voltages between 0 and 50 Volts on Rexroth products are protective low voltages designed in accordance with international standards on electrical safety.

WARNING

High electrical voltage due to wrong connections! Danger to life, bodily harm by electric shock!

⇒ Only connect equipment, electrical components and cables of the protective low voltage type (PELV = Protective Extra Low Voltage) to all terminals and clamps with voltages of 0 to 50 Volts.

⇒ Only electrical circuits may be connected which are safely isolated against high voltage circuits. Safe isolation is achieved, for example, with an isolating transformer, an opto-electronic coupler or when battery-operated.

3.7 Protection Against Dangerous Movements

Dangerous movements can be caused by faulty control of the 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

Dangerous movements 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 injury and 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.

DANGER

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

⇒ Ensure personal safety by means of qualified and tested higher-level monitoring devices or measures integrated in the installation. Unintended machine motion is possible if monitoring devices are disabled, bypassed or not activated.

⇒ Pay attention to unintended machine motion or other malfunction in any mode of operation.

⇒ 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, especially if there is a possibility of loose parts flying off.

⇒ Mount the emergency stop switch in the immediate reach of the operator. Verify that the emergency stop works before startup. Don't operate the machine if the emergency stop is not working.

⇒ Isolate the drive power connection by means of an emergency stop circuit or use a starting lockout to prevent unintentional start.

Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone. Safe standstill can be achieved by switching off the power supply contactor or by safe mechanical locking of moving parts.

⇒ 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
- ensuring sufficient equilibration of the vertical axes

The standard equipment motor brake or an external brake controlled directly 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 equipment cannot be avoided, verify the system and the installation for possible malfunctions in all possible positions of normal use before initial startup. If necessary, perform a special electromagnetic compatibility (EMC) test on the installation.

3.8 Protection Against Magnetic and Electromagnetic Fields During Operation and Mounting

Magnetic and electromagnetic fields generated near current-carrying conductors and permanent magnets in motors represent a serious health hazard to persons 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, hearing aids and metal implants are not permitted to enter the following areas:
- Areas in which electrical equipment and parts are mounted, being operated or started up.
- Areas in which parts of motors with permanent magnets are being stored, operated, repaired or mounted.

⇒ If it is necessary for a person with a heart pacemaker to enter such an area, then a doctor must be consulted prior to doing so. Heart pacemakers that are already implanted or will be implanted in the future, have a considerable variation in their electrical noise immunity. Therefore there are no rules with general validity.

⇒ Persons with hearing aids, metal implants or metal pieces must consult a doctor before they enter the areas described above. Otherwise, health hazards will occur.

3.9 Protection Against Contact with Hot Parts

CAUTION

Housing surfaces could be extremely hot! Danger of injury! Danger of burns!

⇒ Do not touch housing surfaces near sources of heat! Danger of burns!

⇒ After switching the equipment off, wait at least ten (10) minutes to allow it to cool down before touching it.

⇒ Do not touch hot parts of the equipment, such as housings with integrated heat sinks and resistors. Danger of burns!

3.10 Protection During Handling and Mounting

Under certain conditions, incorrect handling and mounting of parts and components may cause injuries.

CAUTION

Risk of injury by incorrect handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock!

⇒ Observe general installation and safety instructions with regard to handling and mounting.

⇒ Use appropriate mounting and transport equipment.

⇒ Take precautions to avoid pinching and crushing.

⇒ Use only appropriate tools. If specified by the product documentation, special tools must be used.

⇒ Use lifting devices and tools correctly and safely.

⇒ For safe protection wear appropriate protective clothing, e.g. safety glasses, safety shoes and safety gloves.

⇒ Never stand under suspended loads.

⇒ Clean up liquids from the floor immediately to prevent slipping.

3.11 Battery Safety

Batteries contain reactive chemicals in a solid housing. Inappropriate handling may result in injuries or material damage.

CAUTION

Risk of injury by incorrect handling!

⇒ Do not attempt to reactivate discharged batteries by heating or other methods (danger of explosion and cauterization).

⇒ Never charge non-chargeable batteries (danger of leakage and explosion).

⇒ Never throw batteries into a fire.

⇒ Do not dismantle batteries.

⇒ Do not damage electrical components installed in the equipment.

Note: Be aware of environmental protection and disposal! The batteries contained in the product should be considered as hazardous material for land, air and sea transport in the sense of the legal requirements (danger of explosion). Dispose batteries separately from other waste. Observe the legal requirements in the country of installation.

3.12 Protection Against Pressurized Systems

Certain motors and drive controllers, corresponding to the information in the respective Project Planning Manual, must be provided with pressurized media, such as compressed air, hydraulic oil, cooling fluid and cooling lubricant supplied by external systems. Incorrect handling of the supply and connections of pressurized systems can lead to injuries or accidents. In these cases, improper handling of external supply systems, supply lines or connections can cause injuries or material damage.

CAUTION

Danger of injury by incorrect handling of pressurized systems !

⇒ Do not attempt to disassemble, to open or to cut a pressurized system (danger of explosion).

⇒ Observe the operation instructions of the respective manufacturer.

⇒ Before disassembling pressurized systems, release pressure and drain off the fluid or gas.

⇒ Use suitable protective clothing (for example safety glasses, safety shoes and safety gloves)

⇒ Remove any fluid that has leaked out onto the floor immediately.

Note: Environmental protection and disposal! The media used in the operation of the pressurized system equipment may not be environmentally compatible. Media that are damaging the environment must be disposed separately from normal waste. Observe the legal requirements in the country of installation.

Notes

4 Stand Alone Devices for INTERBUS with 8 Digital Inputs

4.1 Presentation and Intended Use

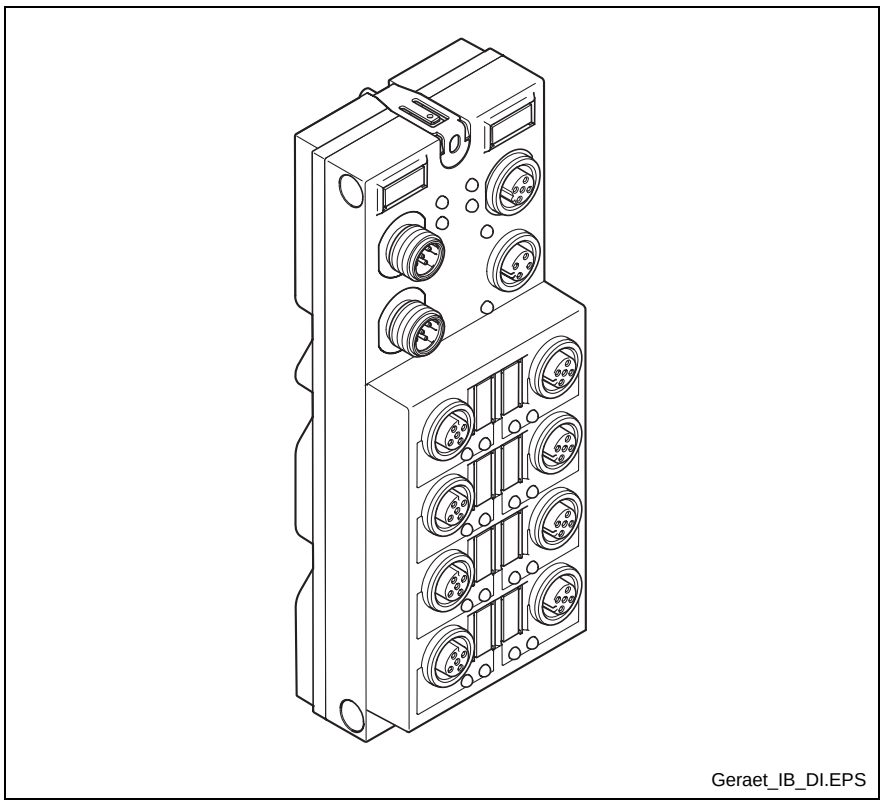


Fig. 4-1: RECO Fieldline devices RF-FLS IB M12 DI 8 M12

This device is used for digital signal acquisition.

Features

- Connection to the INTERBUS remote bus using M12 connectors (B-encoded)
- Connection of digital sensors using M12 connectors
- Flexible voltage supply concept
- Diagnostics and status indicators
- Short-circuit and overload protection of sensor supply
- IP 65 / IP 67 degrees of protection

Indicator Elements

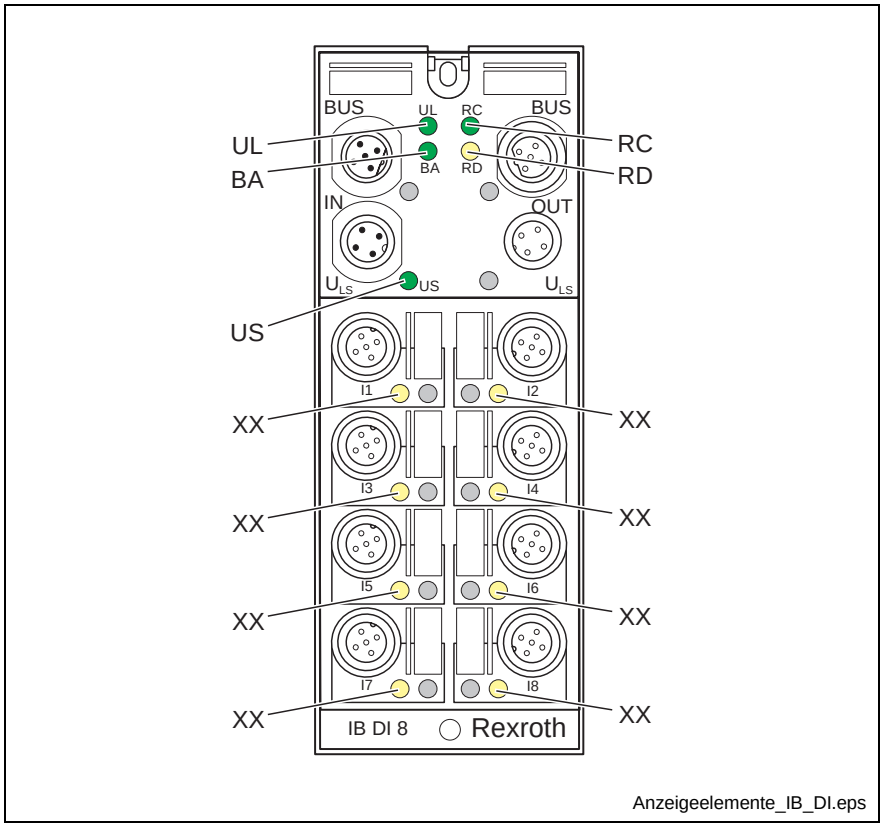


Fig. 4-2: Diagnostic and status indicators

Des.	Color	Meaning
UL	Green LED:	Communications power
	ON:	Communications power present
	OFF:	Communications power too low
BA	Green LED:	Remote bus active
	ON:	Data transmission on INTERBUS (INTERBUS state: Run)
	Flashing:	ID cycle; no data transmission (INTERBUS state: Active)
	OFF:	No data transmission
RC	Green LED:	Remote bus check
	ON:	Incoming remote bus connection established
	OFF:	Incoming remote bus connection faulty
RD	Yellow LED:	Remote bus disabled
	ON:	Outgoing remote bus connection switched off
	OFF:	Outgoing remote bus connection not switched off
US	Green LED:	Voltage supply for IN1 to IN8
	ON:	Voltage supply present
	OFF:	Voltage supply too low
XX	Yellow LED:	Status indicators of the inputs
	ON:	Input active
	OFF:	Input not active

Fig. 4-3: Local diagnostic and status indicators

4.2 Technical Data

Device Dimensions

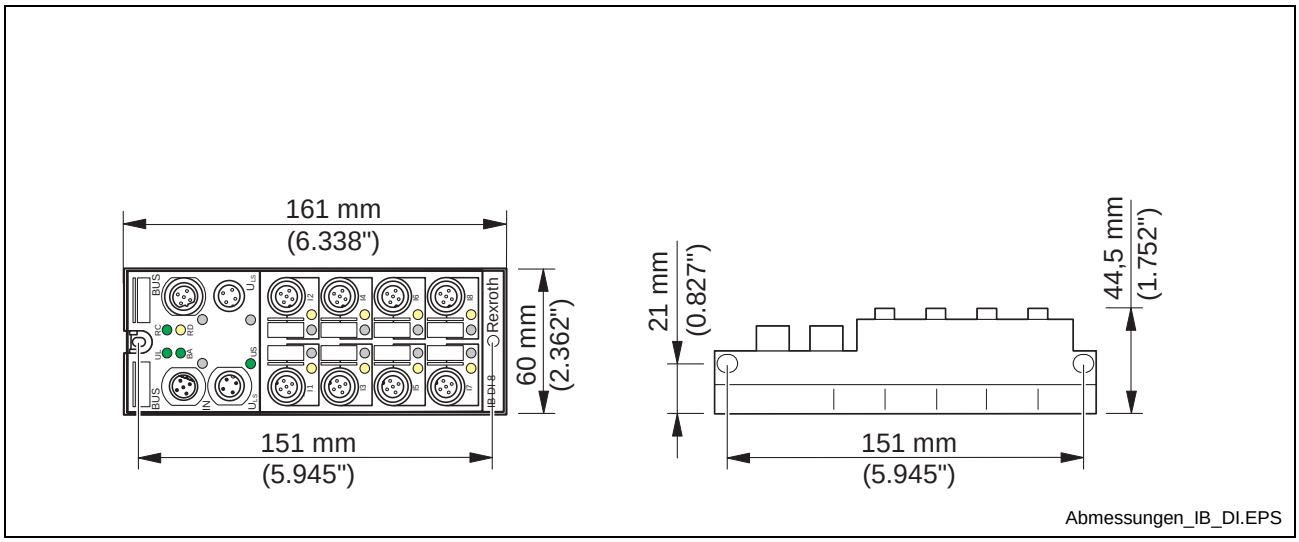


Fig. 4-4: Device dimensions

General Data

Housing dimensions (width x height x depth)	60 mm x 161 mm x 44.5 mm (2.362 in. x 6.388 in. x 1.752 in.)	
Weight	310 g, approx.	
Operating mode	Process data operation with 8 bits	
Type of sensor connection	2-, 3- or 4-wire technology	
Permissible temperature	Operation	-25 °C to +60 °C (-13 °F to +140 °F)
	Storage/transport	-25 °C to +85 °C (-13 °F to +185 °F)
Permissible humidity	Storage/transport	95 %

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

Permissible air pressure	Operation	80 kPa to 106 kPa (up to 2000 m [6562 ft.] above sea level)
	Storage/transport	70 kPa to 106 kPa (up to 3000 m [9843 ft.] above sea level)
Degree of protection	IP 65 / IP 67 according to IEC 60529	
Class of protection	Class 3 according to VDE 0106, IEC 60536	

Fig. 4-5: General data

Mechanical Demands

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

Fig. 4-6: Mechanical Demands

Voltage Supply

Nominal value	24 V DC
Range	18 V DC to 30 V DC
Current consumption U_L at 24 V DC	65 mA, typical (100 mA, maximum)
Current consumption U_S at 24 V DC	5 mA, typical + sensor current (700 mA, maximum)

Fig. 4-7: Power supply

Digital Inputs

Number	8
Input design	According to IEC 61131-2 Type 1
Definition of switching thresholds Maximum low level voltage Minimum high level voltage	 U_{Lmax} < 5 V U_{Hmin} > 11 V
Nominal input voltage	24 V DC
Range	-30 V DC < U_{IN} < +30 V DC
Nominal input current	5 mA
Characteristic curve of the current	Linear in the range 1 V < U_{IN} < 30 V
Delay time	t_{ON} = 3.1 ms, typical t_{OFF} = 4.1 ms, typical
Permissible cable length to the sensor	100 m (328 ft.)

Fig. 4-8: Digital inputs

Input Characteristic Curve

Input voltage (V)	Typical input current (mA)
-30 < U_{IN} < 0.7	0
3	0.5
6	1.0
9	1.6
12	2.3
15	3.0
18	3.8
21	4.5
24	5.2
27	6.0
30	6.7

Fig. 4-9: Input characteristic curve

Sensor Supply

Minimum sensor voltage	U_S -1V
Nominal current per channel	75 mA
Nominal current per device	600 mA
Overload protection	Electronic per device
Short-circuit protection	Electronic per device

Fig. 4-10: Sensor supply

Error Messages to the Higher-Level Control or Computer System

Sensor supply short-circuit	Yes
Sensor supply overload	Yes

Fig. 4-11: Error messages to the higher-level control or computer system

Note: If an error is triggered by an overload or short-circuit of the sensor supply, the device switches off the sensor supply of the channels and reports a peripheral fault PF to the master.

If the sensor supply U_S is not sufficiently high, the device reports a peripheral fault PF to the master.

Interfaces

Interface	
Bus system	INTERBUS remote bus

Fig. 4-12: Interface ’Bus system’

Incoming bus	
Coupling of shield connection	High resistance and capacitance to FE
Electrical isolation	Yes
Transmission rate	500 kbaud

Fig. 4-13: Interface ’Incoming bus’

Outgoing bus	
Coupling of shield connection	Directly to FE
Electrical isolation	Yes
Transmission rate	500 kbaud

Fig. 4-14: Interface ’Outgoing bus’

Electrical Isolation/Isolation of the Voltage Areas

Note: For device connection, please note the instructions and regulations in the application description DOK-CONTRL-RF-FLS-IB**-AW..-DE-P!

Separate potentials in the RF FLS IB M12 DI 8 M12 input device	
- Test distance	**- Test voltage**
24 V supply (bus logic) / FE	500 V AC, 50 Hz, 1 min.
24 V supply (bus logic) / digital inputs (sensor supply / I/O)	500 V AC, 50 Hz, 1 min.
24 V supply (bus logic) / incoming remote bus	500 V AC, 50 Hz, 1 min.
24 V supply (bus logic) / outgoing remote bus	500 V AC, 50 Hz, 1 min.
Digital inputs (sensor supply / I/O) / FE	500 V AC, 50 Hz, 1 min.
Digital inputs (sensor supply / I/O) / incoming remote bus	500 V AC, 50 Hz, 1 min.
Digital inputs (sensor supply / I/O) / outgoing remote bus	500 V AC, 50 Hz, 1 min.
Incoming remote bus / FE	500 V AC, 50 Hz, 1 min.
Incoming remote bus / outgoing remote bus	500 V AC, 50 Hz, 1 min.
Outgoing remote bus / FE	500 V AC, 50 Hz, 1 min.

Fig. 4-15: Electrical Isolation/Isolation of the voltage area

4.3 Connections

Device Connections

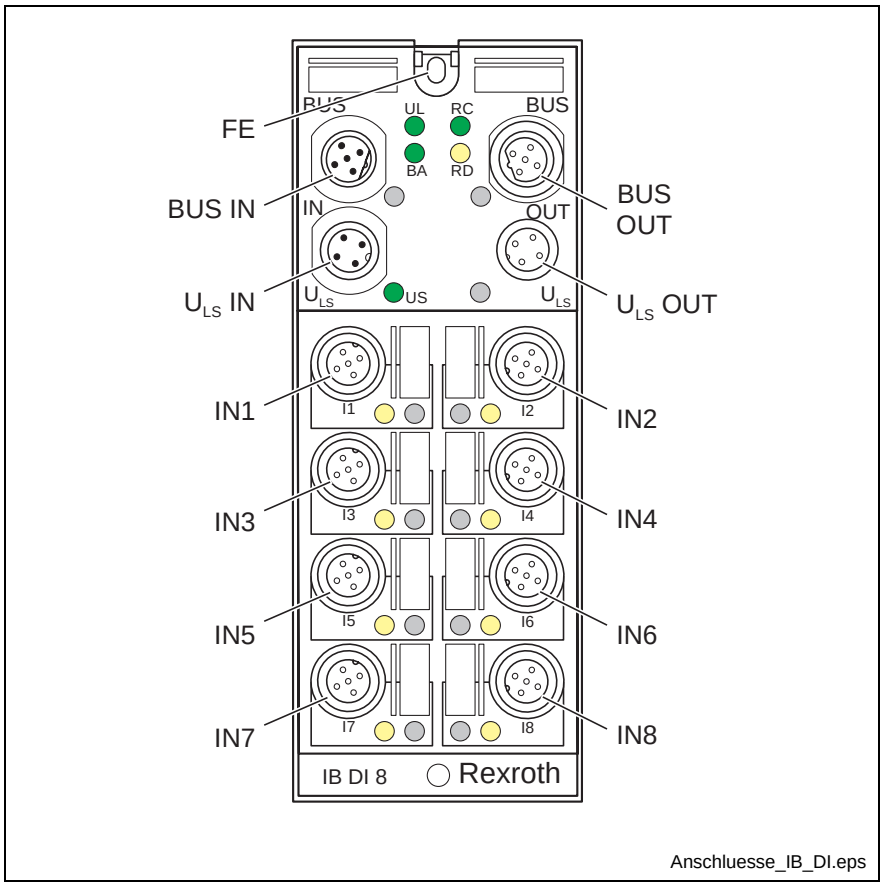


Fig. 4-16: Connections

Pin Assignment

Des.	Meaning
FE	Functional earth ground
BUS IN	INTERBUS IN (remote bus)
BUS OUT	INTERBUS OUT (remote bus)
U_{LS} IN	Voltage supply IN (logic and sensor supply)
U_{LS} OUT	Voltage supply OUT (logic and sensor supply) for additional devices
IN1 to IN8	Inputs 1 to 8

Fig. 4-17: Pin assignment

INTERBUS Pin Assignment

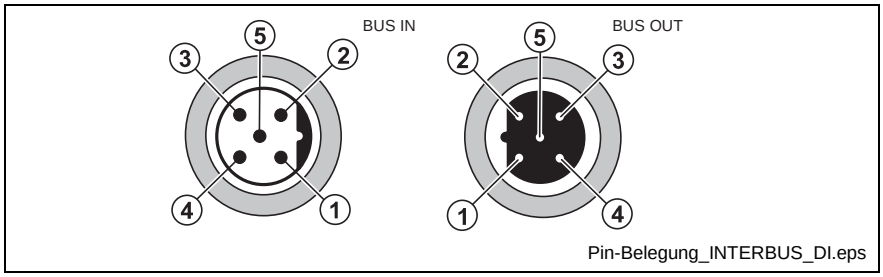


Fig. 4-18: INTERBUS pin assignment (encoded according to M12 B)

Pin	IN	OUT
1	DO	DO
2	/DO	/DO
3	DI	DI
4	/DI	/DI
5	GND	GND

Fig. 4-19: INTERBUS pin assignment

Note: The thread is used for shielding.

Pin Assignment of the Voltage Supply U_{LS}

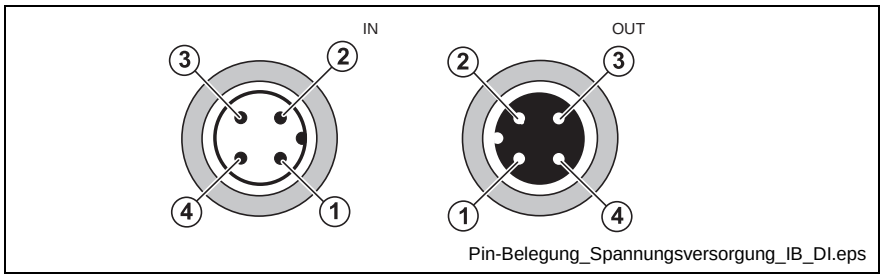


Fig. 4-20: Pin assignment of the voltage supply U_{LS}

Pin	IN	OUT
1	U_L +24 V	U_L +24 V
2	U_S GND	U_S GND
3	U_L GND	U_L GND
4	U_S +24 V	U_S +24 V

Fig. 4-21: Pin assignment of the voltage supply U_{LS}

Pin Assignment of the Inputs

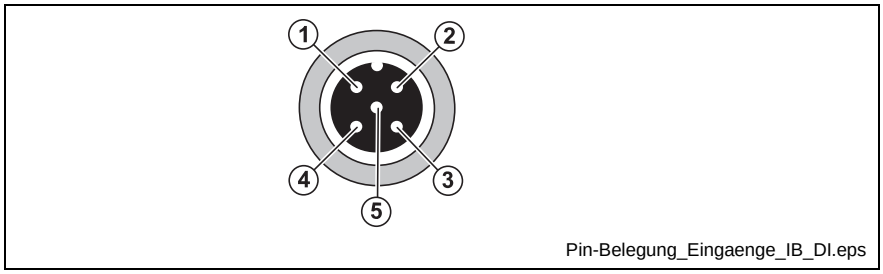


Fig. 4-22: Pin assignment of the inputs

Pin	Input socket
1	U_S +24 V
2	See Fig. 4-24
3	GND
4	Input
5	FE

Fig. 4-23: Pin assignment of the inputs

Assignment of the Input Sockets

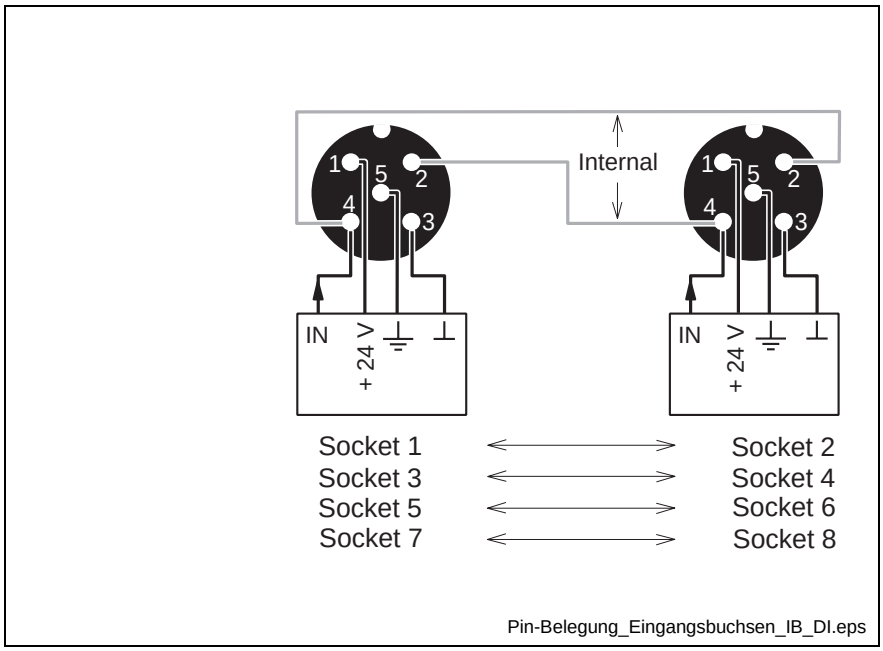


Fig. 4-24: Assignment of the input sockets

Note: Two input signals can be connected to each input socket. If both inputs of the same socket are used, the other socket must not be used (1 or 2, 3 or 4, 5 or 6 as well as 7 or 8).

Internal Circuit Diagram

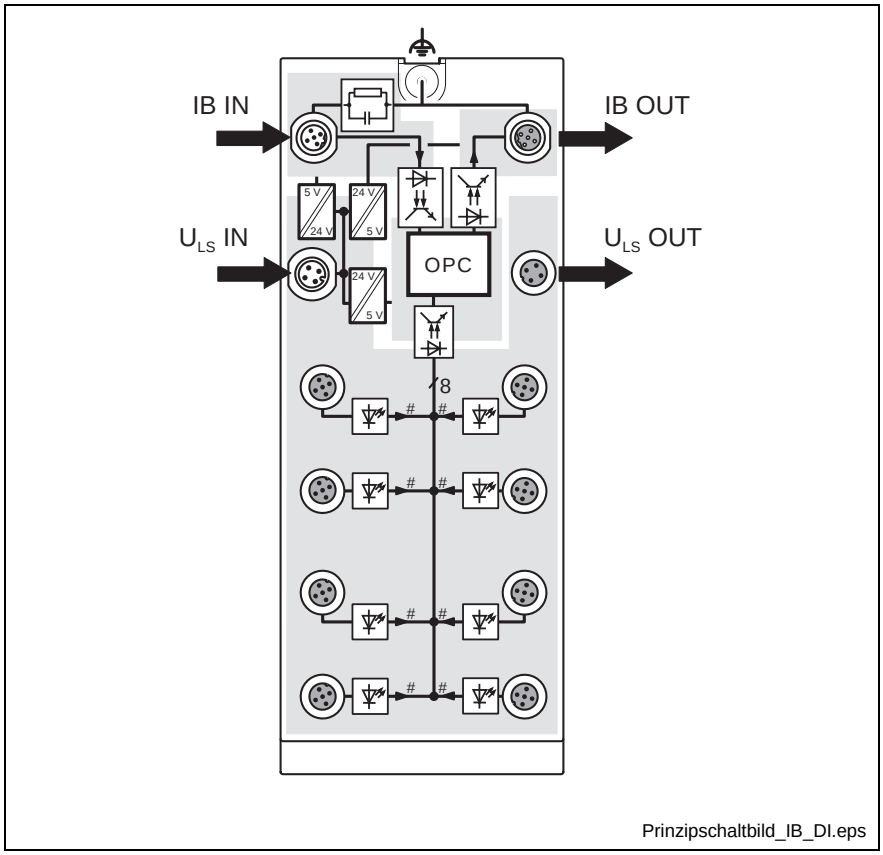


Fig. 4-25: Internal wiring of the connection points

Key:

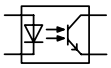
Symbol	Meaning
	Functional earth ground
	Internal coupling network
	Optocoupler
	Isolating transformer
	INTERBUS protocol chip (bus logic including voltage conditioning)
	LED
	Input
	Electrically isolated area (for this, see also section Electrical Isolation/Isolation of the Voltage Areas on page 4-6)

Fig. 4-26: Key

Connection Example

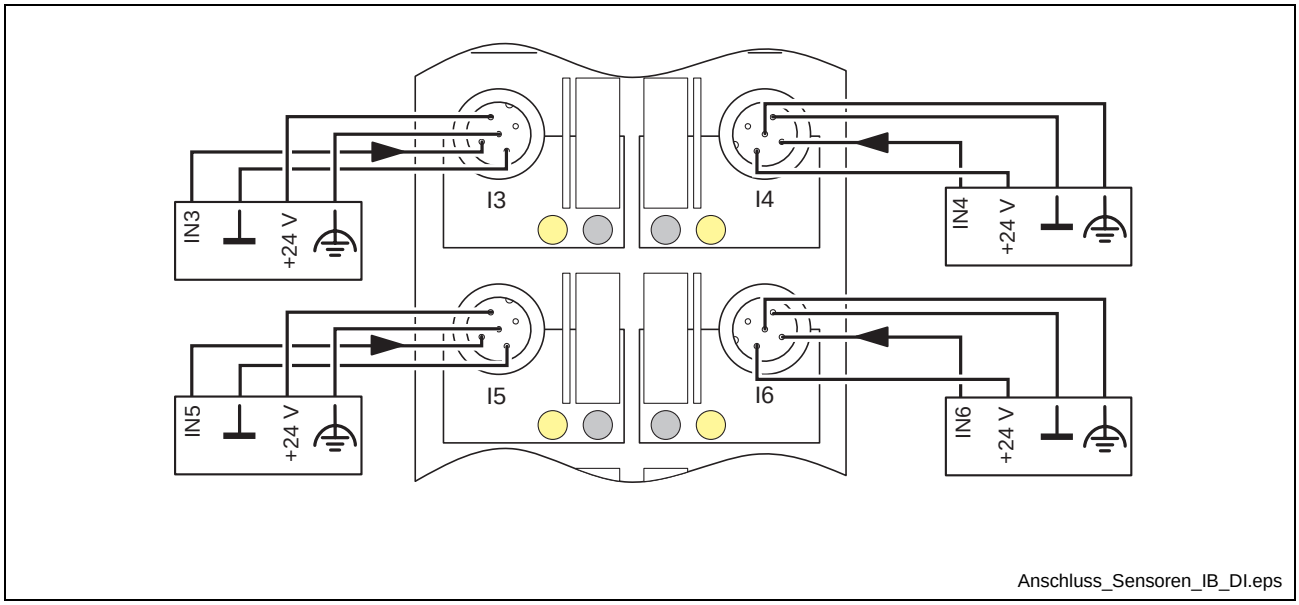


Fig. 4-27: Sensor connection example

Connection Notes

Note: **Meet noise immunity requirements**

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

Note: **Ensure degree of IP protection**

To ensure IP 65 / IP 67 protection, cover unused sockets with protective caps.

Note: **Avoid damage to the electronics**

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

Note: **Avoid polarity reversal**

Avoid polarity reversal of the supply voltages U_L, U_S to avoid damage to the device.

Note: **Observe connection point assignment**

When connecting the sensors, observe the assignment of the connection points to the INTERBUS input data (see Process Data on page 4-12).

Programming Data

ID code	02_{hex} (2_{dec})
Length code	81_{hex}
Process data channel	8 bits
Input address area	8 bits
Parameter channel (PCP)	0 bits
Register length (bus)	8 bits

Fig. 4-28: Programming data

Process Data

Assignment of the connection points to the IN process data

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

Fig. 4-29: IN process data

5 Stand Alone Device for INTERBUS with 4 Digital Inputs and Outputs

5.1 Presentation and Intended Use

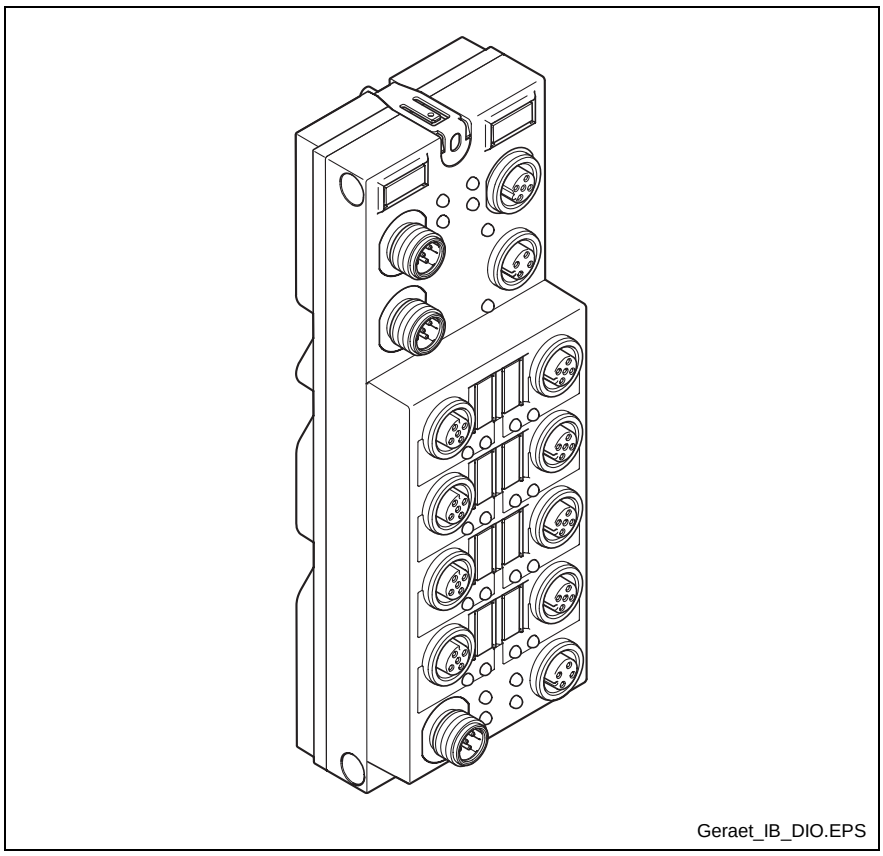


Fig. 5-1: RECO Fieldline device RF-FLS IB M12 DIO 4/4 M12-2A

This device is used for digital signal acquisition and output.

Features

- Connection to the INTERBUS remote bus using M12 connectors (B-encoded)
- Connection of digital sensors using M12 connectors
- Connection of digital actuators using M12 connectors, each with a load capacity of 2 A (nominal current)
- Flexible voltage supply concept
- Diagnostics and status indicators
- Short-circuit and overload protection of outputs and sensor supply
- IP 65 / IP 67 degrees of protection

Indicator Elements

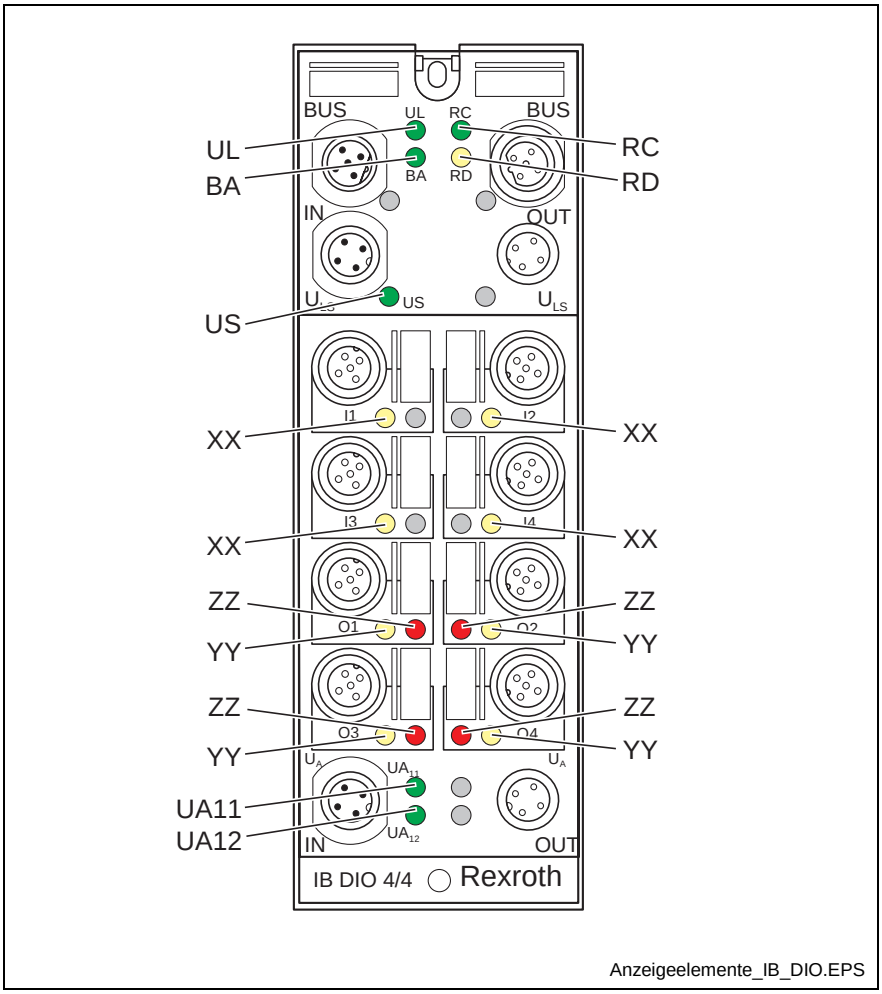


Fig. 5-2: Diagnostic and status indicators

Des.	Color	Meaning
UL	Green LED:	Communications power
	ON:	Communications power present
	OFF:	Communications power too low
BA	Green LED:	Remote bus active
	ON:	Data transmission on INTERBUS (INTERBUS state: Run)
	Flashing:	ID cycle; no data transmission (INTERBUS state: Active)
	OFF:	No data transmission
RC	Green LED:	Remote bus check
	ON:	Incoming remote bus connection established
	OFF:	Incoming remote bus connection faulty
RD	Yellow LED:	Remote bus disabled
	ON:	Outgoing remote bus interface switched off
	OFF:	Outgoing remote bus interface not switched off
US	Green LED:	Voltage supply for IN1 to IN4
	ON:	Voltage supply present
	OFF:	Voltage supply too low
XX	Yellow LED:	Status indicators of the inputs
	ON:	Input active
	OFF:	Input not active
YY	Yellow LED:	Status indicators of the outputs
	ON:	Output active
	OFF:	Output not active
ZZ	Red LED:	Overload of outputs
	ON:	Output overloaded
	OFF:	Output not overloaded
UA11	Green LED:	Voltage supply for OUT1 and OUT2
	ON:	Voltage supply for OUT1 and OUT2 present
	OFF:	Voltage supply for OUT1 and OUT2 too low
UA12	Green LED:	Voltage supply for OUT3 and OUT4
	ON:	Voltage supply for OUT3 and OUT4 present
	OFF:	Voltage supply for OUT3 and OUT4 too low

Fig. 5-3: Local diagnostic and status indicators

5.2 Technical Data

Device Dimensions

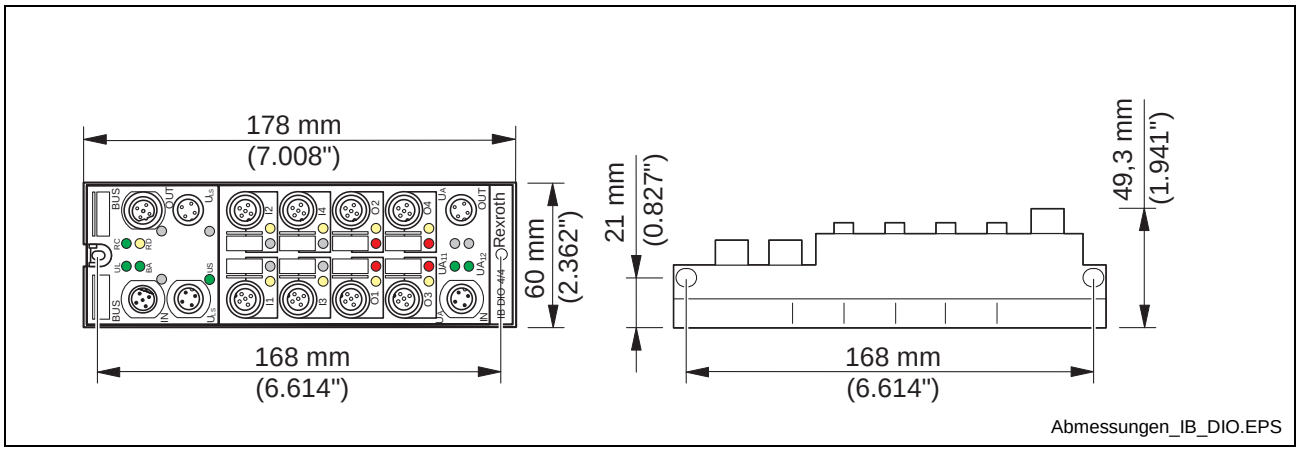


Fig. 5-4: Device Dimensions

General Data

Housing dimensions (width x height x depth)	60 mm x 178 mm x 49.3 mm (2.362 in. x 7.008 in. x 1.941 in.)	
Weight	340 g, approx.	
Operating mode	Process data operation with 4 bits	
Type of sensor connection	2-, 3- or 4-wire technology	
Type of actuator connection	2- or 3-wire technology	
Permissible temperature	Operation	-25 °C to +60 °C (-13 °F to +140 °F)
	Storage/transport	-25 °C to +85 °C (-13 °F to +185 °F)
Permissible humidity	Storage/transport	95 %

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

Permissible air pressure	Operation	80 kPa to 106 kPa (up to 2000 m [6562 ft.] above sea level)
	Storage/transport	70 kPa to 106 kPa (up to 3000 m [9843 ft.] above sea level)
Degree of protection	IP 65 / IP 67 according to IEC 60529	
Class of protection	Class 3 according to VDE 0106, IEC 60536	

Fig. 5-5: General data

Mechanical Demands

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

Fig. 5-6: Mechanical demands

Voltage Supply

Nominal value	24 V DC
Range	18 V DC to 30 V DC
Current consumption U_L at 24 V DC	60 mA, typical (100 mA, maximum)
Current consumption U_S at 24 V DC	5 mA, typical, + sensor current (700 mA, maximum)
Current consumption U_{AAX} at 24 V DC	3 mA, typical, + actuator current (4 A, maximum)

Fig. 5-7: Voltage supply

Digital Inputs

Number	4
Input design	According to IEC 61131-2 Type 1
Definition of switching thresholds Maximum low level voltage Minimum high level voltage	 U_{Lmax} < 5 V U_{Hmin} > 11 V
Nominal input voltage	24 V DC
Range	-30 V DC < U_{IN} < +30 V DC
Nominal input current	5 mA
Characteristic curve of the current	Linear in the range 1 V < U_{IN} < 30 V
Delay time	t_{ON} = 3.1 ms, typical t_{OFF} = 4.1 ms, typical
Permissible cable length to the sensor	100 m (328 ft.)

Fig. 5-8: Digital inputs

Input Characteristic Curve

Input voltage (V)	Typical input current (mA)
-30 < U_{IN} < 0.7	0
3	0.5
6	1.0
9	1.6
12	2.3
15	3.0
18	3.8
21	4.5
24	5.2
27	6.0
30	6.7

Fig. 5-9: Input characteristic curve

Sensor Supply

Minimum sensor supply	U_S -1 V
Nominal current per channel	75 mA
Nominal current per device	600 mA
Overload protection	Electronic per device
Sort-circuit protection	Electronic per device

Fig. 5-10: Sensor supply

Error Messages to the Higher-Level Control or Computer System

Short-circuit of the sensor supply	Yes
Overload of the sensor supply	Yes

Fig. 5-11: Error messages to the higher-level control or computer system

Note: If an error is triggered by an overload or short-circuit of the sensor supply, the device switches off the sensor supply of the channels and reports a peripheral fault PF to the master.

If the sensor supply U_S is not sufficiently high, the device reports a peripheral fault PF to the master.

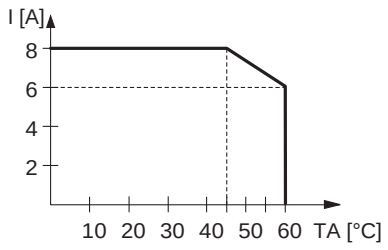
Digital Outputs

Number	4
Nominal output voltage U_{OUT}	U_{AXX} -1 V
Differential voltage for I_{nom}	≤ 1 V
Nominal current I_{nom} per channel	2 A
Total current	8 A (observe derating)
Possible output current during short-circuit	22 A, maximum for 300 µs

Note: Please take this value into account, when selecting the power supply unit.

Protection	Short-circuit; overload

Note: Single chip structure, i.e. all channels are thermally isolated.

Derating with 100 % simultaneity	

Digital outputs	
Nominal load per channel	
• Ohmic	48 W
• Inductive	48 VA (1.2 H, 12 Ω)
• Lamp	48 W
Signal delay upon power up of	
• Ohmic nominal load	Approximately 200 µs, typical
• Inductive nominal load	Depending on inductive time constant
• Lamp load	Approximately 200 µs, typical
Signal delay upon power down of	
• Ohmic nominal load	250 µs, approximately
• Inductive nominal load	Approximately 150 ms (1.2 H, 12 Ω), depending on inductive time constant
• Nominal lamp load	250 µs, approximately
Switching frequency with	
• Ohmic nominal load	500 Hz, maximum

Note: This switching frequency is limited by the number of bus devices, the bus structure, the software and the control or computer system used.

• Inductive nominal load	0.1 Hz, maximum (1.2 H, 12 Ω)
• Nominal lamp load	500 Hz, maximum
Overload response	Auto restart
Restart frequency with ohmic overload (2 Ω)	45 Hz, approximately
Inductive overload response	Output may be damaged
Reverse voltage endurance against short pulses	Protected against reverse voltages
Resistance to permanently applied reverse voltages	No
Response upon power down	The output follows the supply voltage without delay.
Validity of output data after connecting the voltage supply (power up)	5 ms, typical
Limitation of the voltage induced on circuit interruption	-11 V, approximately
Single maximum energy in free running	1500 W
Protective circuit type	Integrated free-wheeling diode for each channel
Overcurrent shutdown	At 2.6 A, minimum
Output current when switched off	20 µA, maximum
Output current with ground connection interrupt when switched off	5 mA, maximum

Fig. 5-12: Digital outputs

Error Messages

Overload of outputs	Yes

Fig. 5-13: Error messages

Note: If an error is triggered at the outputs due to a an overload, the device switches off the corresponding input and reports a peripheral fault PF to the master.

Output Characteristic Curve when Switched on (Typical)

Output current (A)	Differential output voltage (V)
0	0
0.20	0.01
0.40	0.03
0.75	0.05
1.00	0.07
1.50	0.12
1.75	0.13
2.00	0.17

Fig. 5-14: Output characteristic curve when switched on

Output Characteristic Curve when Switched off (U_{AXX} = 30 V DC; Typical)

Load resistance (kΩ)	Output voltage (V)
∞	1.5
1000	0.9
100	0.1
10	0.01
1	0.001

Fig. 5-15: Output characteristic curve when switched off

Output Characteristic Curve for Ground Connection Interrupt (U_{AXX} = 30 V DC; Typical)

Load resistance (kΩ)	Output voltage (V)
∞	29.9
1000	28.8
100	25.0
10	13.6
1	3.8

Fig. 5-16: Output characteristic curve for ground connection interrupt

Interfaces

Interface	
Bus system	INTERBUS remote bus

Fig. 5-17: Interface 'Bus system'

Incoming bus	
Coupling of the shield connection	High resistance and capacitance to FE
Electrical isolation	Yes
Transmission rate	500 kbaud

Fig. 5-18: Interface 'Incoming bus'

Outgoing bus	
Coupling of the shield connection	Directly to FE
Electrical isolation	Yes
Transmission rate	500 kbaud

Fig. 5-19: Interface 'Outgoing bus'

Electrical Isolation/Isolation of the Voltage Areas

Note: For device connection, please note the instructions and regulations in the application description DOK-CONTRL-RF-FLS-IB**-AW..-DE-P!

Separate potentials in the RF FLS IB M12 DIO 4/4 M12-2A input and output device	
- Test distance	**- Test voltage**
24 V supply (bus logic) / FE	500 V AC, 50 Hz, 1 min.
24 V supply (bus logic) / digital inputs (sensor supply / I/O)	500 V AC, 50 Hz, 1 min.
24 V supply (bus logic) / digital outputs (actuator supply)	500 V AC, 50 Hz, 1 min.
24 V supply (bus logic) / incoming remote bus	500 V AC, 50 Hz, 1 min.
24 V supply (bus logic) / outgoing remote bus	500 V AC, 50 Hz, 1 min.
Digital inputs (sensor supply / I/O) / FE	500 V AC, 50 Hz, 1 min.
Digital inputs (sensor supply / I/O) / digital outputs (actuator supply)	500 V AC, 50 Hz, 1 min.
Digital inputs (sensor supply / I/O) / incoming remote bus	500 V AC, 50 Hz, 1 min.
Digital inputs (sensor supply / I/O) / outgoing remote bus	500 V AC, 50 Hz, 1 min.
Digital outputs (actuator supply) / FE	500 V AC, 50 Hz, 1 min.
Digital outputs (actuator supply) / incoming remote bus	500 V AC, 50 Hz, 1 min.
Incoming remote bus / FE	500 V AC, 50 Hz, 1 min.
Incoming remote bus / outgoing remote bus	500 V AC, 50 Hz, 1 min.
Outgoing remote bus / FE	500 V AC, 50 Hz, 1 min.
Outgoing remote bus / digital outputs (actuator supply)	500 V AC, 50 Hz, 1 min.

Fig. 5-20: Electrical isolation/Isolation of the voltage areas

5.3 Connections

Device Connections

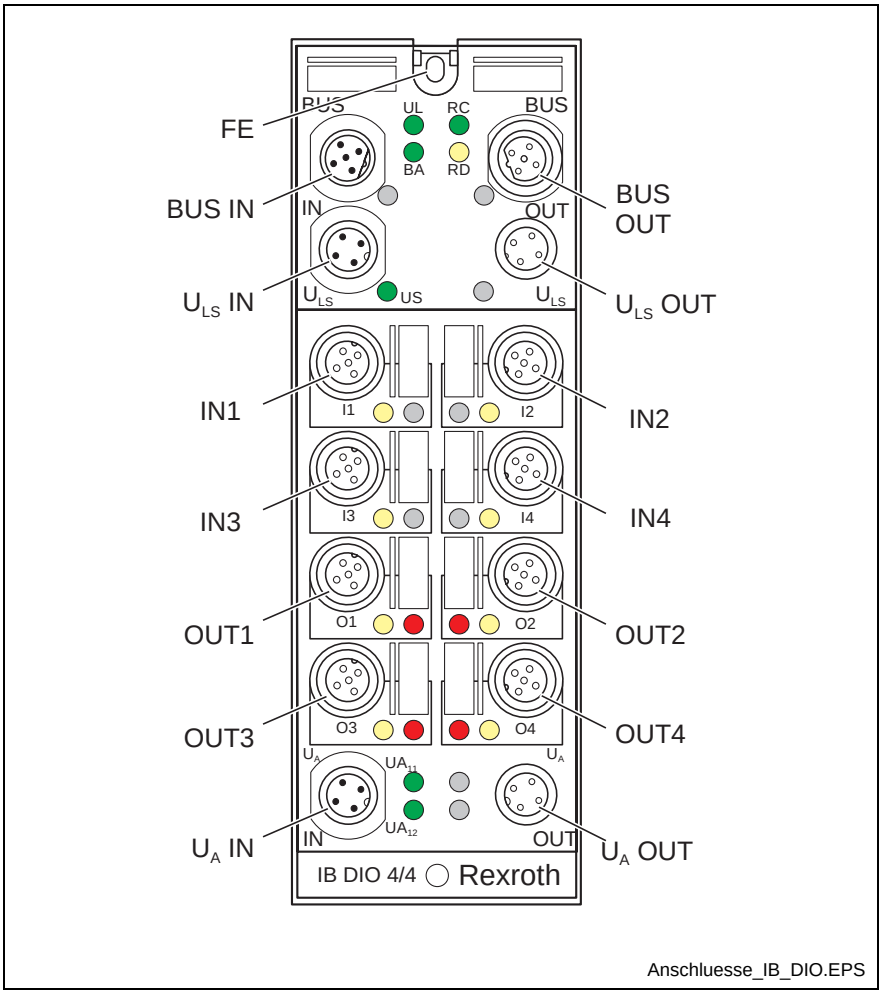


Fig. 5-21: Device connections

Pin Assignment

Des.	Meaning
FE	Functional earth ground
BUS IN	INTERBUS IN (remote bus)
BUS OUT	INTERBUS OUT (remote bus)
U_{LS} IN	Voltage supply IN (logic and sensor supply)
U_{LS} OUT	Voltage supply OUT (logic and sensor supply) for additional devices
IN1 to IN4	Inputs 1 to 4
OUT1 to OUT 4	Outputs 1 to 4
U_A IN	Voltage supply IN of the outputs (OUT1 to OUT4) with voltages U_{A11} and U_{A12}
U_A OUT	Voltage supply OUT of the outputs for additional devices

Fig. 5-22: Pin assignment

INTERBUS Pin Assignment

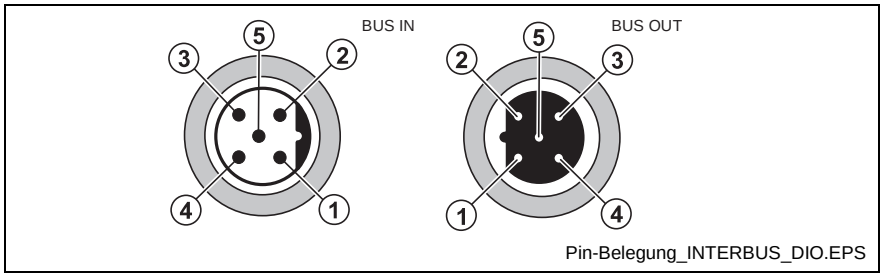


Fig. 5-23: INTERBUS pin assignment (encoded according to M12 B)

Pin	IN	OUT
1	DO	DO
2	/DO	/DO
3	DI	DI
4	/DI	/DI
5	GND	GND

Fig. 5-24: INTERBUS pin assignment

Note: The thread is used for shielding.

Pin Assignment of the Voltage Supply U_{LS}

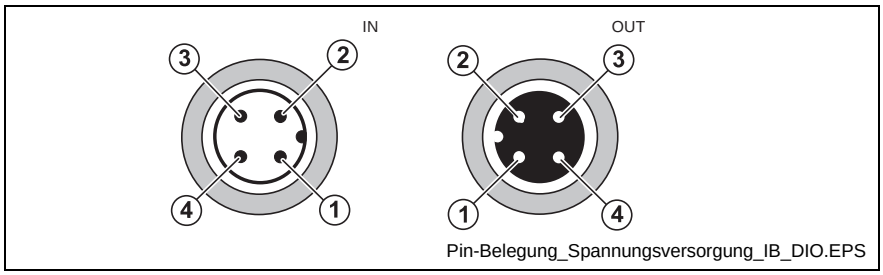


Fig. 5-25: Pin assignment of the voltage supply U_{LS}

Pin	IN	OUT
1	U_L +24 V	U_L +24 V
2	U_S GND	U_S GND
3	U_L GND	U_L GND
4	U_S +24 V	U_S +24 V

Fig. 5-26: Pin assignment of the voltage supply U_{LS}

Pin Assignment of the Voltage Supply U_A of the Outputs

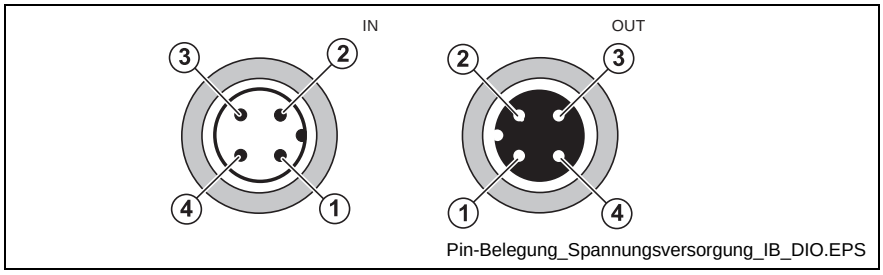


Fig. 5-27: Pin assignment of the voltage supply U_A of the outputs

Pin	IN	OUT
1	U_{A11} +24 V	U_{A11} +24 V
2	U_{A12} GND	U_{A12} GND
3	U_{A11} GND	U_{A11} GND
4	U_{A12} +24 V	U_{A12} +24 V

Fig. 5-28: Pin assignment of the voltage supply U_A of the outputs

Pin Assignment of the Inputs and Outputs

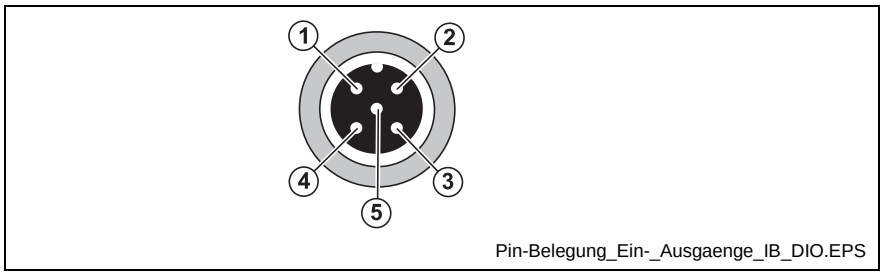


Fig. 5-29: Pin assignment of the inputs and outputs

Pin	Input socket	Output socket
1	U_S +24 V	Not used
2	See Fig. 5-31	Not used
3	GND	GND
4	Input	Output
5	FE	FE

Fig. 5-30: Pin assignment of the inputs and outputs

Assignment of the Input Sockets

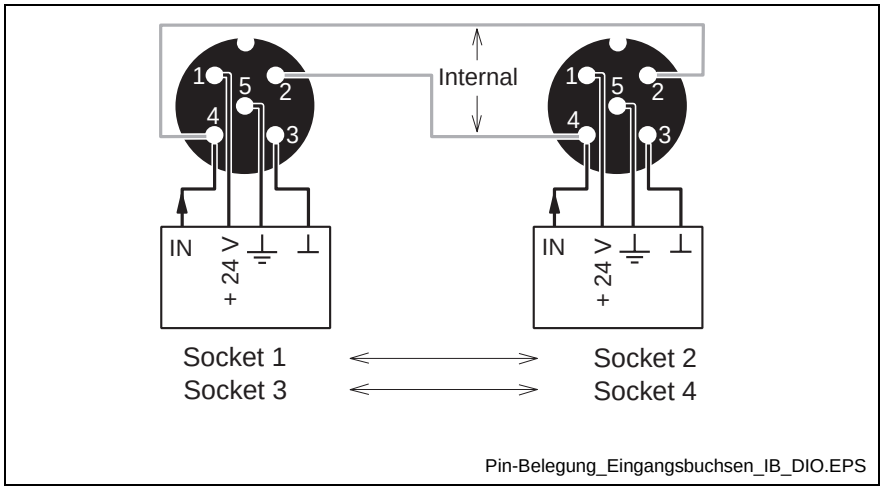


Fig. 5-31: Assignment of the input sockets

Note: Two input signals can be connected to each input socket. If both inputs of the same socket are used, the other socket must not be used (1 or 2 as well as 3 or 4).

Internal Circuit Diagram

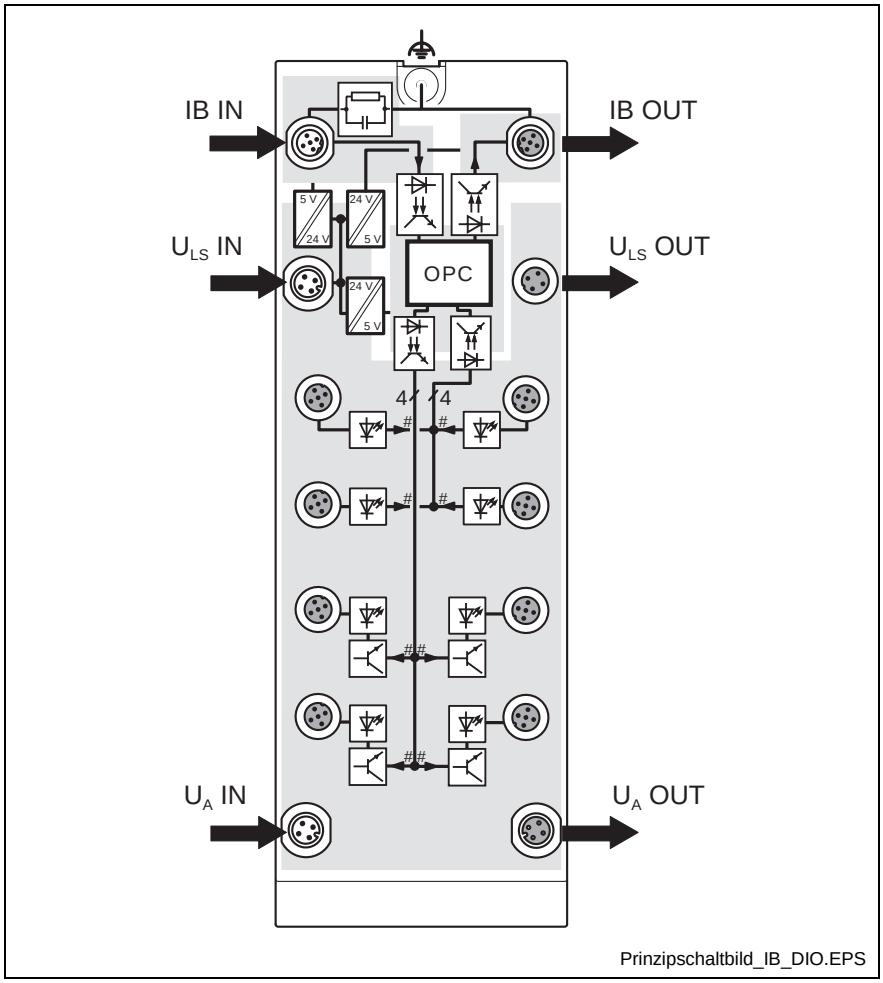


Fig. 5-32: Internal wiring of the connection points

Key:

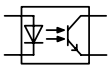
Symbol	Meaning
	Functional earth ground
	Internal coupling network
	Optocoupler
	Isolating transformer
	INTERBUS protocol chip (bus logic including voltage conditioning)
	LED
	Transistor
	Input
	Output
	Electrically isolated area (for this, see also section Electrical Isolation/Isolation of the Voltage Areas on page 5-9)

Fig. 5-33: Key

Connection Example

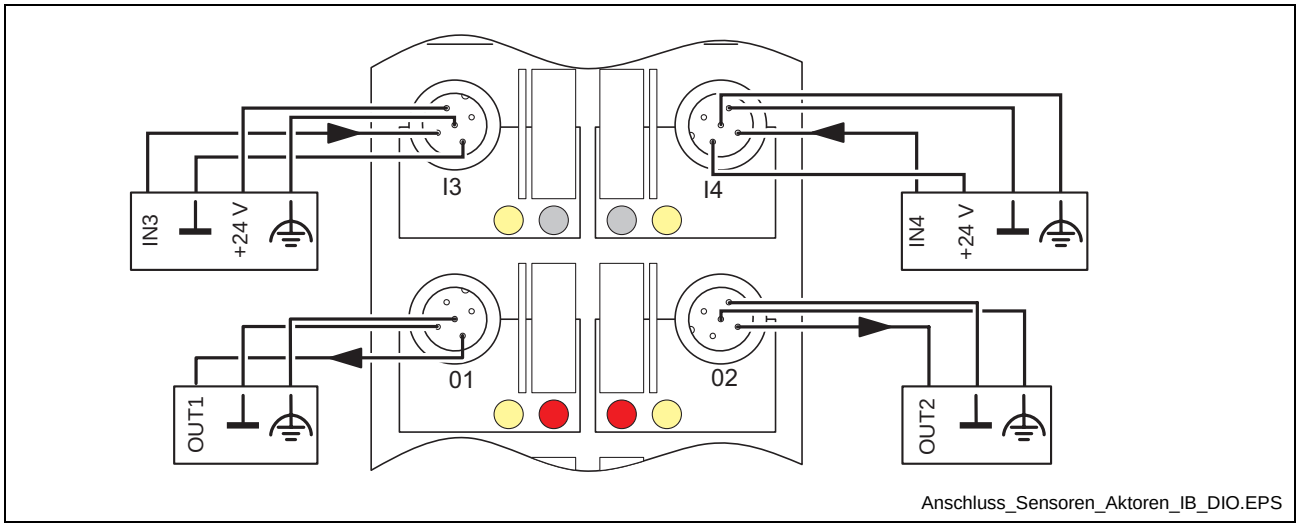


Fig. 5-34: Sensor and actuator connection example

Connection Notes

Note: **Meet noise immunity requirements**

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

Note: **Ensure degree of IP protection**

To ensure IP 65 / IP 67 protection, cover unused sockets with protective caps.

Note: **Avoid damage to the electronics**

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

Note: **Avoid polarity reversal**

Avoid polarity reversal of the supply voltages U_L, U_S and U_A to avoid damage to the device.

Note: **Observe connection point assignment**

When connecting the sensor and actuators, observe the assignment of the connection points to the INTERBUS input and output data (see Process Data on page 5-17).

Programming Data

ID code	03_{hex} (3_{dez})
Length code	41_{hex}
Process data channel	4 bits
Input address area	4 bits
Output address area	4 bits
Parameter channel (PCP)	0 bits
Register length (bus)	4 bits

Fig. 5-35: Programming data

Process Data

Assignment of connection points to the IN process data

(Byte.Bit) view	Bit	0.3	0.2	0.1	0.0
Device	Input	4	3	2	1

Fig. 5-36: IN process data

Assignment of the connection points to the OUT process data

(Byte.Bit) view	Bit	0.3	0.2	0.1	0.0
Device	Output	4	3	2	1

Fig. 5-37: OUT process data

6 Stand Alone Devices for INTERBUS with 8 Digital Outputs

6.1 Presentation and Intended Use

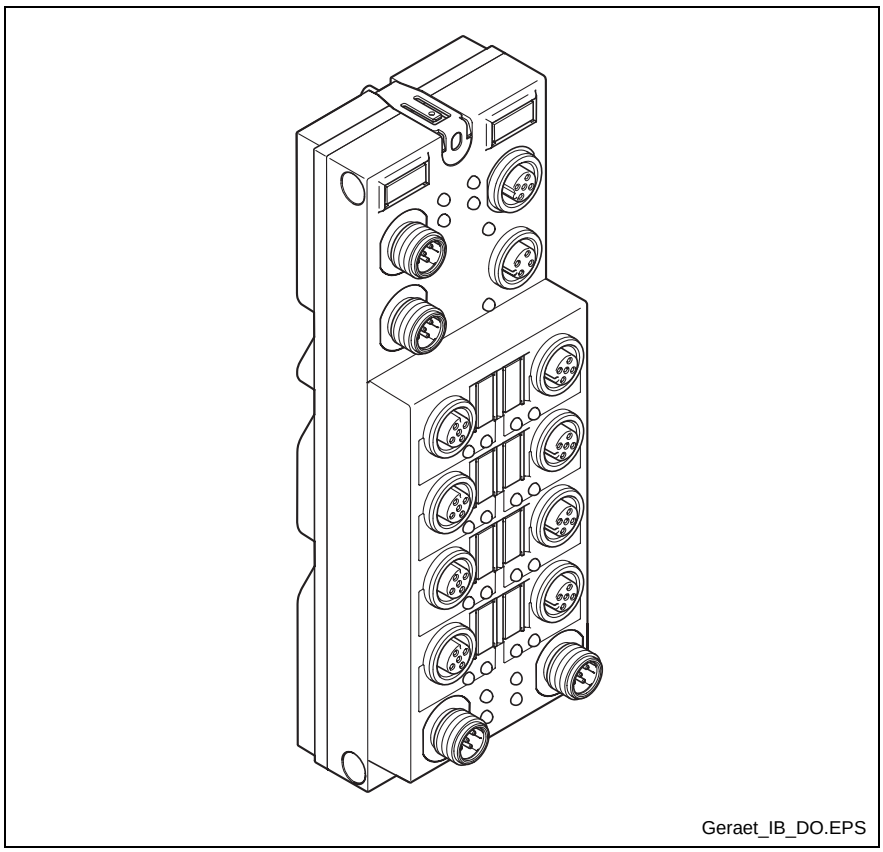


Fig. 6-1: RECO Fieldline device RF-FLS IB M12 DO 8 M12-2A

This device is used to output digital signals.

Features

- Connection to the INTERBUS remote bus using M12 connectors (B-encoded)
- Connection of digital actuators using M12 connectors, each with a load capacity of 2 A (nominal current)
- Flexible voltage supply concept
- Diagnostics and status indicators
- Short-circuit and overload protection of outputs
- IP 65 / IP 67 degrees of protection

Indicator Elements

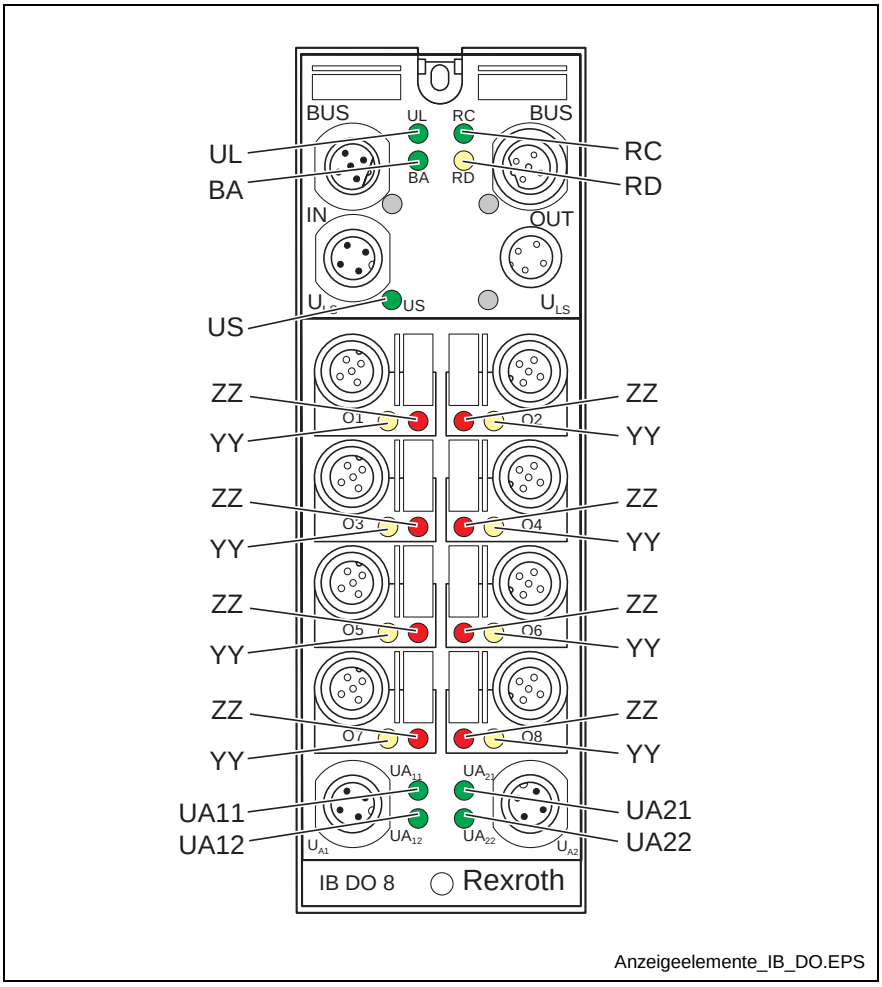


Fig. 6-2: Diagnostic and status indicators

Des.	Color	Meaning
UL	Green LED:	Communications power
	ON:	Communications power present
	OFF:	Communications power too low
BA	Green LED:	Remote bus active
	ON:	Data transmission on INTERBUS (INTERBUS state: Run)
	Flashing:	ID cycle; no data transmission (INTERBUS state: Active)
	OFF:	No data transmission
RC	Green LED	Remote bus check
	ON:	Incoming remote bus connection established
	OFF:	Incoming remote bus connection faulty
RD	Yellow LED:	Remote bus disabled
	ON:	Outgoing remote bus interface switched off
	OFF:	Outgoing remote bus interface not switched off
US	Green LED:	Voltage supply
	ON:	Voltage supply present
	OFF:	Voltage supply too low
YY	Yellow LED:	Status indicators of the outputs
	ON:	Output active
	OFF:	Output not active
ZZ	Red LED:	Overload of outputs
	ON:	Output overloaded
	OFF:	Output not overloaded
UA11	Green LED:	Voltage supply for OUT1 and OUT2
	ON:	Voltage supply for OUT1 and OUT2 present
	OFF:	Voltage supply for OUT1 and OUT2 too low
UA12	Green LED:	Voltage supply for OUT3 and OUT4
	ON:	Voltage supply for OUT3 and OUT4 present
	OFF:	Voltage supply for OUT3 and OUT4 too low
UA21	Green LED:	Voltage supply for OUT5 and OUT6
	ON:	Voltage supply for OUT5 and OUT6 present
	OFF:	Voltage supply for OUT5 and OUT6 too low
UA22	Green LED:	Voltage supply for OUT7 and OUT8
	ON:	Voltage supply for OUT7 and OUT8 present
	OFF:	Voltage supply for OUT7 and OUT8 too low

Fig. 6-3: Local diagnostic and status indicators

6.2 Technical Data

Device Dimensions

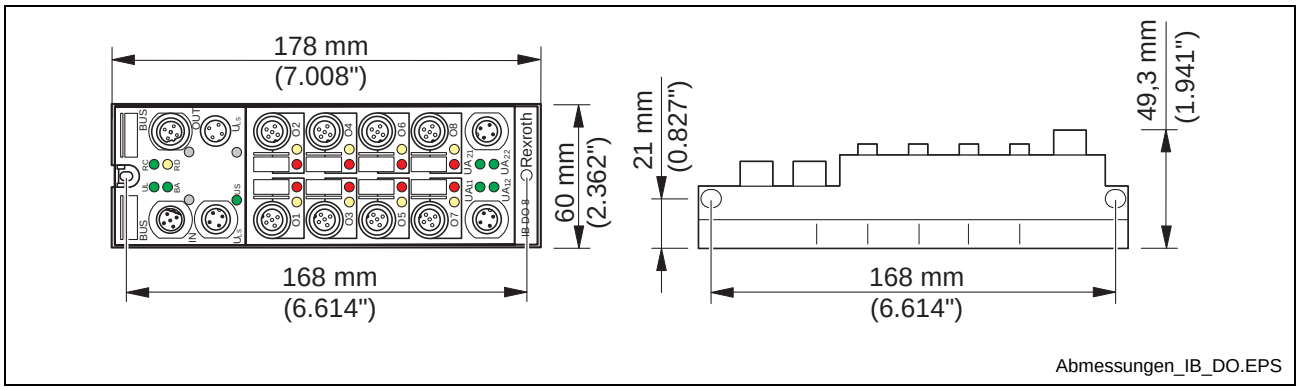


Fig. 6-4: Device dimensions

General Data

Housing dimensions (width x height x depth)	60 mm x 178 mm x 49.3 mm (2.362 in. x 7.008 in. x 1.941 in.)	
Weight	350 g, approx.	
Operating mode	Process data operation with 8 bits	
Type of actuator connection	2- or 3-wire technology	
Permissible temperature	Operation	-25 °C to +60 °C (-13 °F to +140 °F)
	Storage/transport	-25 °C to +85 °C (-13 °F to +185 °F)
Permissible humidity	Storage/transport	95 %

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

Permissible air pressure	Operation	80 kPa to 106 kPa (up to 2000 m [6562 ft.] above sea level)
	Storage/transport	70 kPa to 106 kPa (up to 3000 m [9843 ft.] above sea level)
Degree of protection	IP 65 / IP 67 according to IEC 60529	
Class of protection	Class 3 according to VDE 0106, IEC 60536	

Fig. 6-5: General data

Mechanical Demands

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

Fig. 6-6: Mechanical demands

Voltage Supply

Nominal value	24 V DC
Range	18 V DC to 30 V DC
Current consumption U_L at 24 V DC	80 mA, typical (100 mA, maximum)
Current consumption U_S at 24 V DC	3.5 mA, typical
Current consumption U_{AAX} at 24 V DC	12 mA, typical + actuator current (4 A, maximum)

Fig. 6-7: Voltage supply

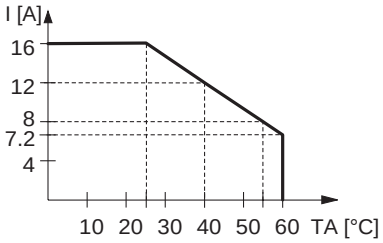
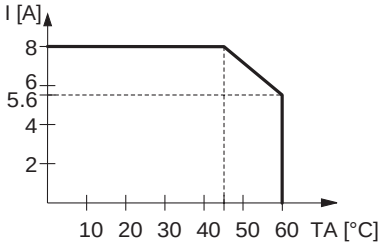
Digital Outputs

Number	8
Nominal output voltage U_{OUT}	U_{AXX} -1 V
Differential voltage for I_{nom}	≤ 1 V
Nominal current I_{nom} per channel	2 A
Total current	16 A (observe derating)
Possible output current during short-circuit	22 A, maximum for 300 µs

Note: Please take this value into account, when selecting the power supply unit.

Protection	Short-circuit; overload

Note: Single chip structure, i.e. all channels are thermally isolated.

Derating with 100 % simultaneity	
Derating with 50 % simultaneity	
Nominal load per channel	
• Ohmic	48 W
• Inductive	48 VA (1.2 H, 12 Ω)
• Lamp	48 W

Digital outputs	
Signal delay upon power up of	
• Ohmic nominal load	Approximately 200 µs, typical
• Inductive nominal load	Depending on inductive time constant
• Lamp load	Approximately 200 µs, typical
Signal delay upon power down of	
• Ohmic nominal load	250 µs, approximately
• Inductive nominal load	Approximately 150 ms (1.2 H, 12 Ω), depending on inductive time constant
• Nominal lamp load	250 µs, approximately
Switching frequency with	
• Ohmic nominal load	500 Hz, maximum

Note: This switching frequency is limited by the number of bus devices, the bus structure, the software and the control or computer system used.

• Inductive nominal load	0.1 Hz, maximum (1.2 H, 12 Ω)
• Nominal lamp load	500 Hz, maximum
Overload response	Auto restart
Restart frequency with ohmic overload (2 Ω)	45 Hz, approximately
Inductive overload response	Output may be damaged
Reverse voltage endurance against short pulses	Protected against reverse voltages
Resistance to permanently applied reverse voltages	No
Response upon power down	The output follows the supply voltage without delay.
Validity of output data after connecting the voltage supply (power up)	5 ms, typical
Limitation of the voltage induced on circuit interruption	-11 V, approximately
Single maximum energy in free running	1500 W
Protective circuit type	Integrated free-wheeling diode for each channel
Overcurrent shutdown	At 2.6 A, minimum
Output current when switched off	20 µA, maximum
Output current with ground connection interrupt when switched off	5 mA, maximum

Fig. 6-8: Digital outputs

Error Messages

Overload of outputs	Yes

Fig. 6-9: Error messages

Note: If an error is triggered at the outputs due to an overload, the device switches off the corresponding output and reports a peripheral fault PF to the master.

Output Characteristic Curve when Switched on (Typical)

Output current (A)	Differential output voltage (V)
0	0
0.20	0.01
0.40	0.03
0.75	0.05
1.00	0.07
1.50	0.12
1.75	0.13
2.00	0.17

Fig. 6-10: Output characteristic curve when switched on

Output Characteristic Curve when Switched off (U_{AXX} = 30 V DC; Typical)

Load resistance (kΩ)	Output voltage (V)
∞	1.5
1000	0.9
100	0.1
10	0.01
1	0.001

Fig. 6-11: Output characteristic curve when switched off

Output Characteristic Curve for Ground Connection Interrupt (U_{AXX} = 30 V DC; Typical)

Load resistance (kΩ)	Output voltage (V)
∞	29.9
1000	28.8
100	25.0
10	13.6
1	3.8

Fig. 6-12: Output characteristic curve for ground connection interrupt

Interfaces

Interface	
Bus system	INTERBUS remote bus

Fig. 6-13: Interface 'Bus system'

Incoming bus	
Coupling of shield connection	High resistance and capacitance to FE
Electrical isolation	Yes
Transmission rate	500 kbaud

Fig. 6-14: Interface 'Incoming bus'

Outgoing bus	
Coupling of shield connection	Directly to FE
Electrical isolation	Yes
Transmission rate	500 kbaud

Fig. 6-15: Interface 'Outgoing bus'

Electrical Isolation/Isolation of the Voltage Areas

Note: For device connection, please note the instructions and regulations in the application description DOK-CONTRL-RF-FLS-IB**-AW..-DE-P!

Separate potentials in the RF FLS IB M12 DO 8 M12 output device	
- Test distance	**- Test voltage**
24 V supply (bus logic) / FE	500 V AC, 50 Hz, 1 min.
24 V supply (bus logic) / 24 V supply (U_S)	500 V AC, 50 Hz, 1 min.
24 V supply (bus logic) / digital outputs (actuator supply)	500 V AC, 50 Hz, 1 min.
24 V supply (bus logic) / incoming remote bus	500 V AC, 50 Hz, 1 min.
24 V supply (bus logic) / outgoing remote bus	500 V AC, 50 Hz, 1 min.
24 V supply (U_S) / FE	500 V AC, 50 Hz, 1 min.
Digital outputs (actuator supply) / FE	500 V AC, 50 Hz, 1 min.
Digital outputs (actuator supply) / 24 V supply (U_S)	500 V AC, 50 Hz, 1 min.
Digital outputs (actuator supply) / incoming remote bus	500 V AC, 50 Hz, 1 min.
Incoming remote bus / FE	500 V AC, 50 Hz, 1 min.
Incoming remote bus / outgoing remote bus	500 V AC, 50 Hz, 1 min.
Outgoing remote bus / FE	500 V AC, 50 Hz, 1 min.
Outgoing remote bus / 24 V supply (U_S)	500 V AC, 50 Hz, 1 min.
Outgoing remote bus / digital outputs (actuator supply)	500 V AC, 50 Hz, 1 min.

Fig. 6-16: Electrical isolation/Isolation of the voltage areas

6.3 Connections

Device Connections

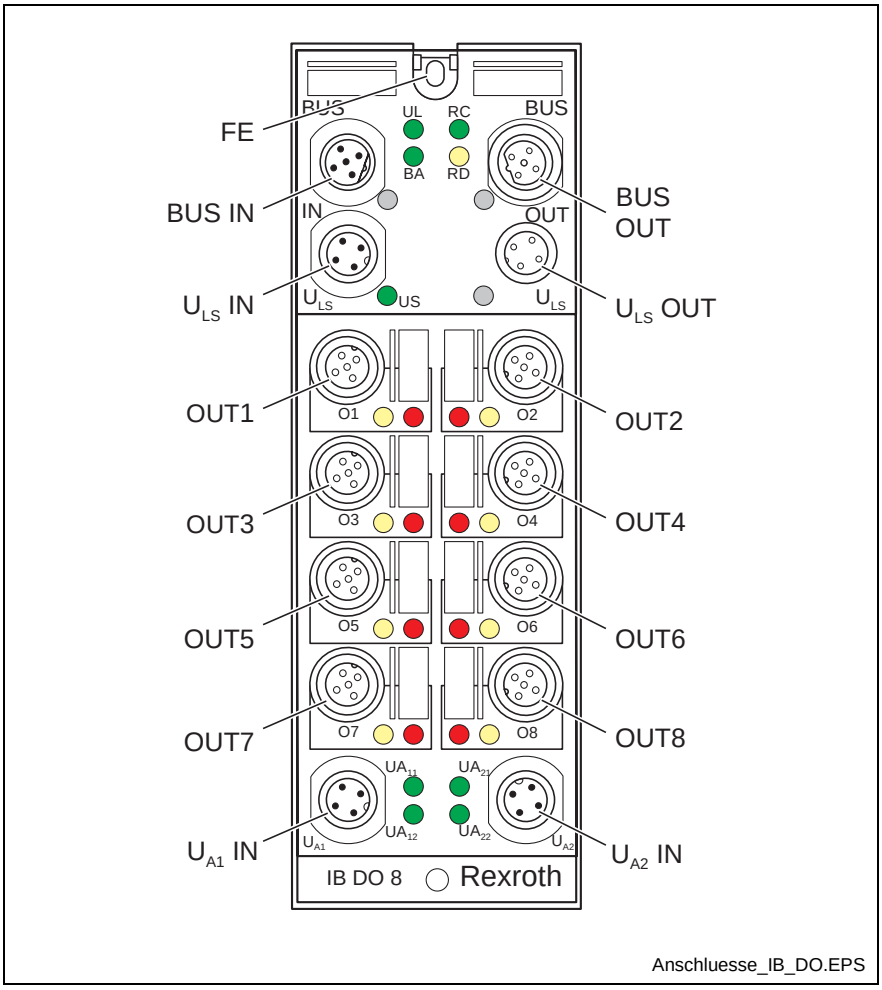


Fig. 6-17: Device connections

Pin Assignment

Des.	Meaning
FE	Functional earth ground
BUS IN	INTERBUS IN (remote bus)
BUS OUT	INTERBUS OUT (remote bus)
U_{LS} IN	Voltage supply IN (logic and sensor supply)
U_{LS} OUT	Voltage supply OUT (logic and sensor supply) for additional devices
OUT1 to OUT8	Outputs 1 to 8
U_{A1} IN	Voltage supply IN of the outputs (OUT1 to OUT4) with voltages U_{A11} and U_{A12}
U_{A2} IN	Voltage supply IN of the outputs (OUT5 to OUT8) with voltage U_{A21} and U_{A22}

Fig. 6-18: Pin assignment

INTERBUS Pin Assignment

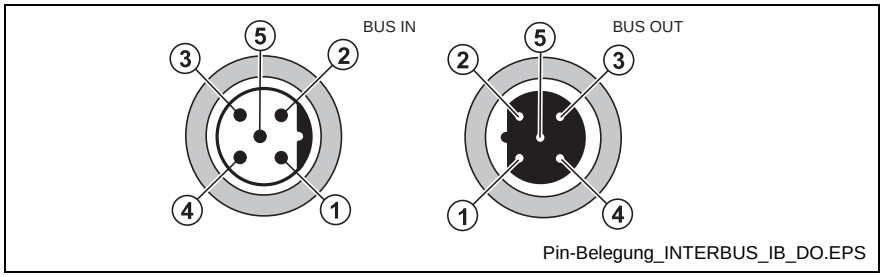


Fig. 6-19: INTERBUS pin assignment (encoded according to M12 B)

Pin	IN	OUT
1	DO	DO
2	/DO	/DO
3	DI	DI
4	/DI	/DI
5	GND	GND

Fig. 6-20: INTERBUS pin assignment

Note: The thread is used for shielding.

Pin Assignment of the Voltage Supply U_{LS}

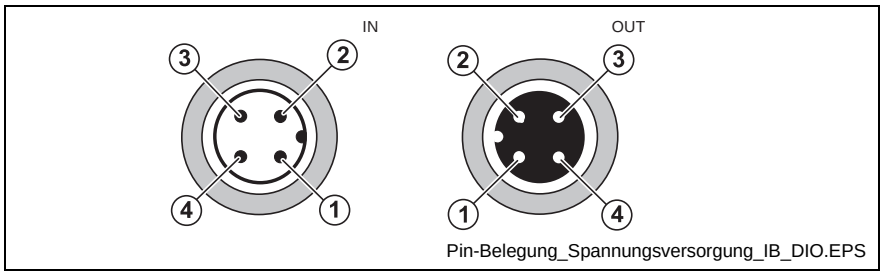


Fig. 6-21: Pin assignment of the voltage supply U_{LS}

Pin	IN	OUT
1	U_L +24 V	U_L +24 V
2	U_S GND	U_S GND
3	U_L GND	U_L GND
4	U_S +24 V	U_S +24 V

Fig. 6-22: Pin assignment of the voltage supply U_{LS}

Pin Assignment of the Voltage Supply U_A of the Outputs

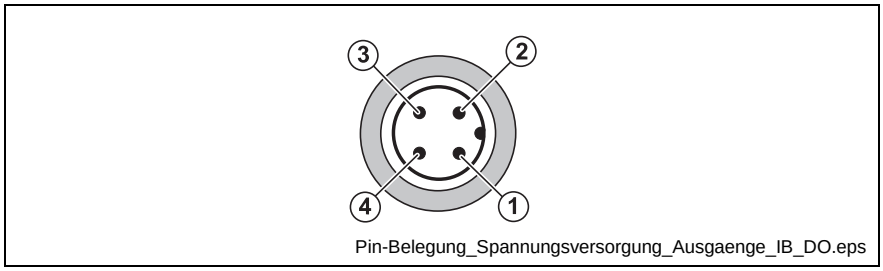


Fig. 6-23: Pin assignment of the voltage supply U_A of the outputs

Pin	U_{A1} IN	U_{A2} IN
1	U_{A11} +24 V	U_{A21} +24 V
2	U_{A12} GND	U_{A22} GND
3	U_{A11} GND	U_{A21} GND
4	U_{A12} +24 V	U_{A22} +24 V

Fig. 6-24: Pin assignment of the voltage supply U_A of the outputs

Pin Assignment of the Outputs

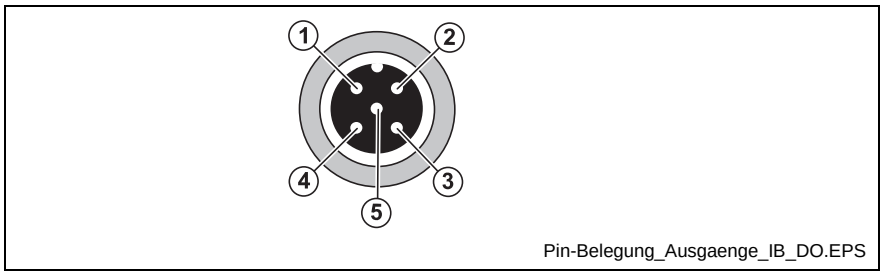


Fig. 6-25: Pin assignment of the outputs

Pin	Output socket
1	Not used
2	Not used
3	GND
4	Output
5	FE

Fig. 6-26: Pin assignment of the outputs

Internal Circuit Diagram

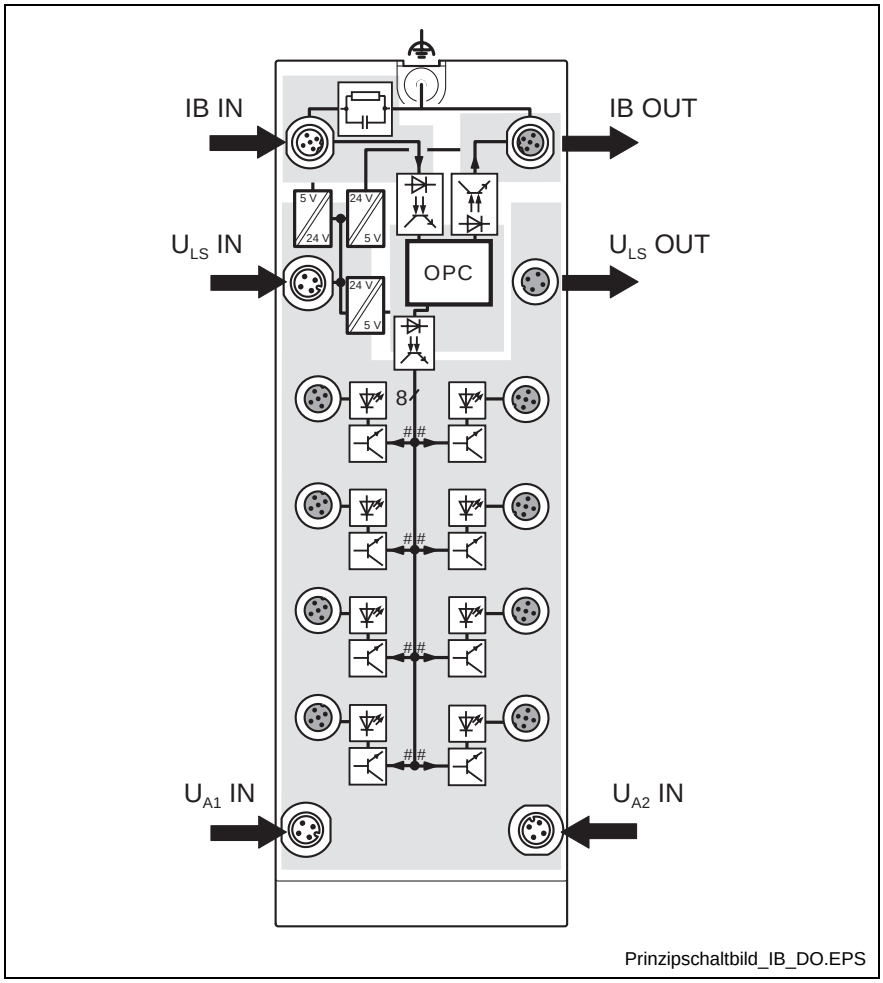


Fig. 6-27: Internal wiring of the connection points

Key:

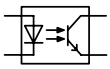
Symbol	Meaning
	Functional earth ground
	Internal coupling network
	Optocoupler
	Isolating transformer
	INTERBUS protocol chip (bus logic including voltage conditioning)
	LED
	Transistor
	Output
	Electrically isolated area

Fig. 6-28: Key

Connection Example

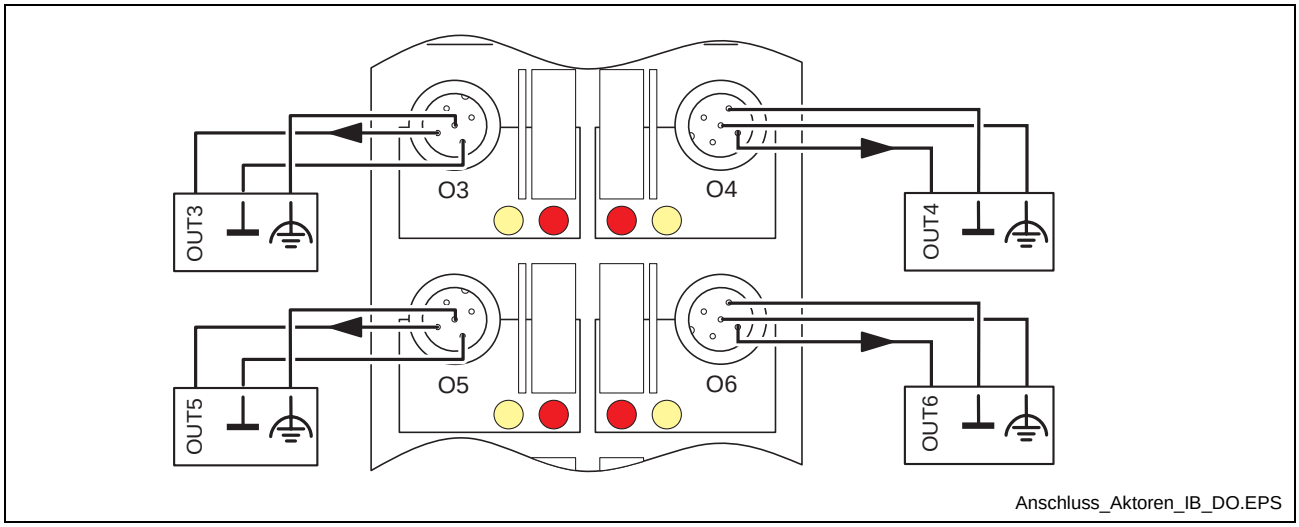


Fig. 6-29: Actuator connection example

Connection Notes

Note: **Meet noise immunity requirements**

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

Note: **Ensure degree of IP protection**

To ensure IP 65 / IP 67 protection, cover unused sockets with protective caps.

Note: **Avoid polarity reversal**

Avoid polarity reversal of the supply voltages U_L, U_S and U_A to avoid damage to the device.

Note: **Observe connection point assignment**

When connecting the actuators, observe the assignment of the connection points to the INTERBUS output data (see Process Data on page 6-15).

Programming Data

ID code	01_{hex} (1_{dec})
Length code	81_{hex}
Process data channel	8 bits
Output address area	8 bits
Parameter channel (PCP)	0 bits
Register length (bus)	8 bits

Fig. 6-30: Programming data

Process Data

Assignment of connection points to the OUT process data

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

Fig. 6-31: OUT Process data

7 Ordering Information

7.1 RECO Fieldline INTERBUS Devices

Description	Short text	Material no.
Stand alone device for INTERBUS with 8 digital inputs	RF-FLS IB M12 DI 8 M12	294579
Stand alone device for INTERBUS with 4 digital inputs and 4 digital outputs	RF-FLS IB M12 DIO 4/4 M12-2A	294580
Stand alone device for INTERBUS with 8 digital outputs	RF-FLS IB M12 DO 8 M12-2A	294581

Fig. 7-1: Ordering information 'INTERBUS devices'

7.2 RECO Fieldline INTERBUS Bus Cables

Description	Length	Short text	Material no.
Male connector, straight, shielded, M12 B-encoded, 5 pins, open end	10,0 m	IKB0045/010,0	296605
Female connector, straight, shielded, M12 B-encoded, 5 pins, open end	10,0 m	IKB0046/010,0	296606
	0,5 m	IKB0047/000,5	296607
Male connector, straight, shielded, M12 B-encoded;	2,0 m	IKB0047/002,0	296608
Female connector, straight, shielded, M12 B-encoded, 5 pins	5,0 m	IKB0047/005,0	296609
	10,0 m	IKB0047/010,0	296611

Fig. 7-2: Ordering information 'INTERBUS bus cables'

7.3 RECO Fieldline Voltage Cables

Description	Length	Short text	Material no.
	0,5 m	IKL0267/005,0	296585
Female connector, straight, unshielded, M12 A-encoded, 4 pins, open end	10,0 m	IKL0267/010,0	296624
	15,0 m	IKL0267/015,0	296625
	0,5 m	IKL0268/000,5	296626
Male connector, straight, unshielded, M12 A-encoded;	2,0 m	IKL268/002,0	296627
Female connector, straight, unshielded, M12 A-encoded, 4 pins	5,0 m	IKL0268/005,0	296628
	10,0 m	IKL0268/010,0	296629

Fig. 7-3: Ordering information 'Voltage cables'

7.4 Further Documentation

Description	Short text	Material no.
RECO Fieldline INTERBUS, Application Description	DOK-CONTRL-RF-FLS-IB**-AW..-EN-P	297897

Fig. 7-4: Further documentation

8 List of Figures

9 Service & Support

9.1 Helpdesk

Unser Kundendienst-Helpdesk im Hauptwerk Lohr am Main steht Ihnen mit Rat und Tat zur Seite. Sie erreichen uns

Our service helpdesk at our headquarters in Lohr am Main, Germany can assist you in all kinds of inquiries. Contact us

- telefonisch - by phone: **49 (0) 9352 40 50 60**
  über Service Call Entry Center - via Service Call Entry Center
  Mo-Fr 07:00-18:00 Mo-Fr 7:00 am - 6:00 pm
- per Fax - by fax: **+49 (0) 9352 40 49 41**
- per e-Mail - by e-mail: **service.svc@boschrexroth.de**

9.2 Service-Hotline

Außerhalb der Helpdesk-Zeiten ist der Service direkt ansprechbar unter

After helpdesk hours, contact our service department directly at

+49 (0) 171 333 88 26

oder - or **+49 (0) 172 660 04 06**

9.3 Internet

Unter **www.boschrexroth.com** finden Sie ergänzende Hinweise zu Service, Reparatur und Training sowie die **aktuellen** Adressen *) unserer auf den folgenden Seiten aufgeführten Vertriebs- und Servicebüros.

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Niederlassungen mit Kundendienst

Außerhalb Deutschlands nehmen Sie bitte zuerst Kontakt mit unserem für Sie nächstgelegenen Ansprechpartner auf.

*) Die Angaben in der vorliegenden Dokumentation können seit Drucklegung überholt sein.

At **www.boschrexroth.com** you may find additional notes about service, repairs and training in the Internet, as well as the **actual** addresses *) of our sales- and service facilities figuring on the following pages.

sales agencies
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Please contact our sales / service office in your area first.

*) Data in the present documentation may have become obsolete since printing.

9.4 Vor der Kontaktaufnahme... - Before Contacting Us...

Wir können Ihnen schnell und effizient helfen wenn Sie folgende Informationen bereithalten:

1. detaillierte Beschreibung der Störung und der Umstände.
2. Angaben auf dem Typenschild der betreffenden Produkte, insbesondere Typenschlüssel und Seriennummern.
3. Tel.-/Faxnummern und e-Mail-Adresse, unter denen Sie für Rückfragen zu erreichen sind.

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

1. Detailed description of the failure and circumstances.
2. Information on the type plate of the affected products, especially type codes and serial numbers.
3. Your phone/fax numbers and e-mail address, so we can contact you in case of questions.

9.5 Kundenbetreuungsstellen - Sales & Service Facilities

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