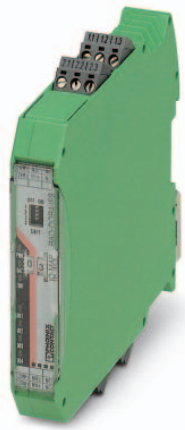
RAD-DOR4-IFS

I/O extension module, 4 digital relay outputs



Data sheet
104834_en_04

1 Description

The **RAD-DOR4-IFS** I/O extension module can be used in conjunction with Radioline wireless modules and other Interface System (IFS) master devices.

The **RAD-DOR4-IFS** digital I/O extension module is used for processing four switching signals that are switched via relay outputs. Signals are forwarded for each switching signal via a floating N/C/N/O contact.

Features

- Easy and tool-free I/O mapping via thumb wheel on the front
- Modular design via DIN rail connector (hot-swap capable)
- Channel-to-channel electrical isolation
- 4 relay outputs
- DIP switches for Hold or Reset behavior of outputs
- International approvals
- Installation in Ex zone 2

WARNING: Explosion hazard when used in potentially explosive areas

The device is a category 3 item of electrical equipment. Follow the instructions provided here during installation and observe the safety notes.

Make sure you always use the latest documentation.

It can be downloaded at: phoenixcontact.net/product/2901536

2 Table of contents

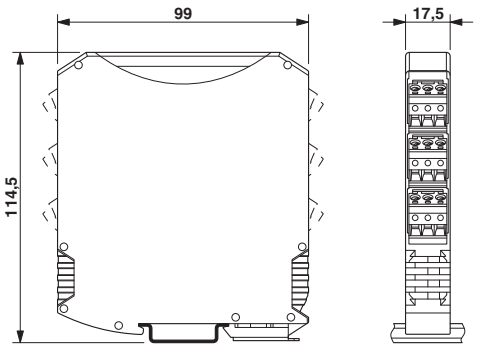
3 Ordering data

Description	Type	Order No.	Pcs./Pkt.
Radioline - I/O extension module, 4 digital relay outputs (5 A, 250 V AC/DC)	RAD-DOR4-IFS	2901536	1

Accessories	Type	Order No.	Pcs./Pkt.
Radioline - I/O extension module, 4 digital inputs (0 ... 250 V AC/DC)	RAD-DI4-IFS	2901535	1
DIN rail connector, number of positions: 5, pitch: 3.81 mm, Articles with gold-plated contacts, bus connectors for connecting with electronic housings	ME 17,5 TBUS 1,5/ 5-ST-3,81 GN	2709561	10
The FB-MUX/HS/DIO-NAM/PA head station can be used with up to three 4-channel NAMUR digital input modules (FB-DI4/NAMUR-IFS) and two 4-channel digital output modules (RAD-DOR4-IFS). This configuration can be used as a valve coupler solution to open and close, as well as monitor, the position of a valve.	FB-MUX/HS/DIO-NAM/PA	2316270	1
Radioline - 2.4 GHz wireless transceiver with RS-232/ RS-485 interface, can be extended with I/O modules, RSMA (female) antenna connection, point-to-point, star, and mesh networks up to 250 stations, range of up to 5 km (with a clear line of sight), for worldwide use	RAD-2400-IFS	2901541	1
Radioline - 900 MHz wireless transceiver with RS-232/ 485 interface, can be extended with I/O modules, RSMA (female) antenna connection, point-to-point, star, and mesh networks up to 250 stations, range of up to 32 km (line of sight), use in North America	RAD-900-IFS	2901540	1
Radioline - 868 MHz wireless transceiver with RS-232/ RS-485 interface, can be extended with I/O modules, RSMA (female) antenna connection, point-to-point, star, and mesh networks up to 99 stations, range of up to 20 km (with a clear line of sight), for use in Europe	RAD-868-IFS	2904909	1
Radioline - RS-485 multipoint multiplexer, can be extended with I/O modules, can be used as Modbus/RTU bus coupler or can be combined with Radioline wireless system, up to 99 stations, range of up to 1.2 km on in-house copper cables	RAD-RS485-IFS	2702184	1
Radioline - 2.4 GHz wireless transceiver with RS-232/ RS-485 interface, can be extended with I/O modules, RSMA (female) antenna connection, point-to-point, star, and mesh networks up to 250 stations, range of up to 5 km (with a clear line of sight), for use in Japan	RAD-2400-IFS-JP	2702863	1
Radioline - 900 MHz wireless transceiver with RS-232/ 485 interface, can be extended with I/O modules, RSMA (female) antenna connection, point-to-point, star, and mesh networks up to 250 stations, range of up to 32 km (line of sight), for use in Australia.	RAD-900-IFS-AU	2702878	1

4 Technical data

Dimensions	



Dimensions W/H/D	17.5 mm / 113 mm / 114.5 mm

General data	
Overvoltage category	II
Mounting position	any, on standard DIN rail NS 35 in accordance with EN 60715
Degree of protection	IP20
Degree of pollution	2
Type of housing	PA 6.6-FR, green
Flammability rating according to UL 94	V0
MTTF (mean time to failure) Telcordia standard, 25°C temperature, 21% operating cycle (5 days a week, 8 hours a day)	1087 Years
MTTF (mean time to failure) Telcordia standard, 40°C temperature, 34.25% operating cycle (5 days a week, 12 hours a day)	523 Years
MTTF (mean time to failure) Telcordia standard, temperature 40 °C, operating cycle 100 % (7 days a week, 24 hours a day)	204 Years

Supply	
Supply voltage range	19.2 V DC ... 30.5 V DC (DIN rail connector)
Max. current consumption	≤ 55 mA (At 24 V DC, at 25°C)
Transient surge protection	Yes

Relay output	
Number of outputs	4
Contact type	PDT
Contact material	$AgSnO_2$
Maximum switching voltage	250 V AC/DC
Min. switching current	≥ 10 mA
Max. switching current	5 A (per channel)
Mechanical service life	1x 10^7 cycles
Electrical service life	1x 10^5 cycles (At 5 A, 250 V AC, ohmic) 2x 10^5 cycles (At 2 A, 250 V AC, cosϕ 0.4) 2x 10^5 cycles (At 1 A, 24 V DC, L/R = 48 ms)
Maximum switching frequency	2 Hz
Switching capacity	120 W (24 V DC) 120 W (30 V DC) 20 W (48 V DC) 18 W (60 V DC) 22 W (110 V DC) 40 W (220 V DC) 42 W (250 V DC) 1250 VA
Behavior of the outputs (adjustable via DIP switch)	Hold / Reset
Electrical isolation	
Digital I/O	300 V (Rated insulation voltage (in each case between the digital outputs // TBUS supply, reinforced insulation according to EN 61010))
	300 V (Rated insulation voltage (to adjacent devices, basic insulation in accordance with EN 61010))
Test voltage	
Digital I/O	2.5 kV AC (50 Hz, 1 min.)
Connection data	
Connection method	Screw connection
Conductor cross section, solid	0.2 mm² ... 2.5 mm²
Conductor cross section, flexible	0.2 mm² ... 2.5 mm²
Conductor cross section AWG/kcmil	24 ... 14
Stripping length	7 mm
Tightening torque	0.6 Nm
Status indication	
Status display	Green LED (supply voltage, PWR) Green LED (bus communication, DAT) Red LED (periphery error, ERR) Yellow LED (digital output, DO1) Yellow LED (digital output, DO2) Yellow LED (digital output, DO3) Yellow LED (digital output, DO4)

Ambient conditions	
Ambient temperature (operation)	-40 °C ... 70 °C (>55°C derating) -40 °F ... 158 °F (>131°F derating)
Ambient temperature (storage/transport)	-40 °C ... 85 °C -40 °F ... 185 °F
Permissible humidity (operation)	20 % ... 85 %
Permissible humidity (storage/transport)	20 % ... 85 %
Altitude	2000 m
Vibration (operation)	in accordance with IEC 60068-2-6: 5g, 10 Hz ... 150 Hz
Shock	16g, 11 ms

Operating conditions for the extended temperature range (+55 °C ... 70 °C)

No function restrictions for the extended temperature range if you observe a minimum spacing of 17.5 mm between the modules. The minimum spacing is the width of a DIN rail connector.
Otherwise please observe the following restrictions:
— Maximum switching current of 1 A per channel
Individual operating conditions available on request.

Certification	
Conformance	CE-compliant EAC
ATEX Please follow the special installation instructions in the documentation!	Ⓔx II 3 G Ex nA nC IIC T4 Gc (IBExU 15 ATEX B008 X)
IECEx	Ex nA nC IIC T4 Gc (IECEx IBE 13.0019X)
UL, USA/Canada	UL 508 Listed Class I, Div. 2, Groups A, B, C, D T4A Class I, Zone 2, IIC T4
Noise emission	EN 61000-6-4
Noxious gas test	ISA-S71.04-1985 G3 Harsh Group A

Conformance	
EMC directive 2014/30/EU	EN 61000-6-2; EN 61000-6-4
Ex directive (ATEX)	EN 60079-0; EN 60079-15

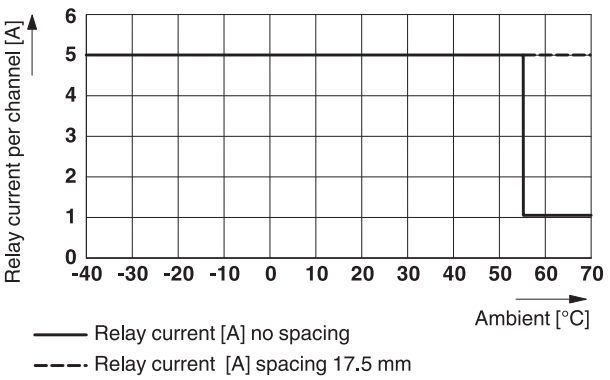


Figure 1 Derating the digital outputs

5 Safety regulations and installation notes

WARNING: Risk of electric shock

During operation, certain parts of this device may carry hazardous voltages. Disregarding this warning may result in damage to equipment and/or serious personal injury.

– For applications with high operating voltages, ensure sufficient distance or insulation and provide shock protection.
– Provide a switch/circuit breaker close to the device, which is labeled as the disconnect device for this device or the entire control cabinet.
– Disconnect the device from all power sources during maintenance work and configuration (the device can remain connected to SELV or PELV circuits).
– The housing of the device provides a basic insulation against the neighboring devices, for 300 V eff. If several devices are installed next to each other, this has to be taken into account, and additional insulation has to be installed if necessary. If the neighboring device is equipped with basic insulation, no additional insulation is necessary.

5.1 Installation notes

WARNING:

Observe the following safety notes when using the device.

- The category 3 device is designed for installation in zone 2 potentially explosive areas. It meets the requirements of EN 60079-0:2012+A11:2013 and EN 60079-15:2010.
- Installation, operation, and maintenance may only be carried out by qualified electricians. Follow the installation instructions as described.
- When installing and operating the device, the applicable regulations and safety directives (including national safety directives), as well as general technical regulations, must be observed. The technical data is provided in the package slip and on the certificates (conformity assessment, additional approvals where applicable).
- The device must not be opened or modified. Do not repair the device yourself, replace it with an equivalent device. Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from violation.
- The IP20 protection (IEC 60529/EN 60529) of the device is intended for use in a clean and dry environment. The device must not be subject to mechanical strain and/or thermal loads, which exceed the limits described.
- To protect the device against mechanical or electrical damage, install it in a suitable housing with appropriate degree of protection as per IEC 60529.
- The device is not designed for use in atmospheres with a danger of dust explosions.
- If dust is present, it is necessary to install into a suitable approved housing, whereby the surface temperature of the housing must be taken into consideration.

5.2 Installation in Zone 2

WARNING: Explosion hazard when used in potentially explosive areas

Please make sure that the following notes and instructions are observed.

- Observe the specified conditions for use in potentially explosive areas! Install the device in a suitable, approved housing that meets the requirements of IEC/EN 60079-15 and has at least IP54 protection. Also observe the requirements of IEC/EN 60079-14.
- In zone 2, only connect devices to the supply and signal circuits that are suitable for operation in the Ex zone 2 and the conditions at the installation location.
- In potentially explosive areas, terminals may only be snapped onto or off the DIN rail connector and wires may only be connected or disconnected when the power is switched off.
- The switches of the device that can be accessed may only be actuated when the power supply to the device is disconnected.
- The device must be stopped and immediately removed from the Ex area if it is damaged, was subject to an impermissible load, stored incorrectly or if it malfunctions.

5.3 UL notes

WARNING: Explosion hazard when used in potentially explosive areas

Please make sure that the following notes and instructions are observed.

INDUSTRIAL CONTROL EQUIPMENT FOR HAZARDOUS LOCATIONS 45FP

A This equipment is suitable for use in Class I, Zone 2, IIC T4 and Class I, Division 2, Groups A, B, C,D T4A hazardous locations or non-hazardous locations only.

B WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

C WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2.

D These devices are open-type devices that are to be installed in an enclosure suitable for the environment that is only accessible with the use of a tool.

E WARNING - Exposure to some chemicals may degrade the sealing properties of materials used in relays within this device.

6 Installation

NOTE: electrostatic discharge!

Electrostatic discharge can damage or destroy components.

– When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) according to EN 61340-5-1 and IEC 61340-5-1.

6.1 Product description

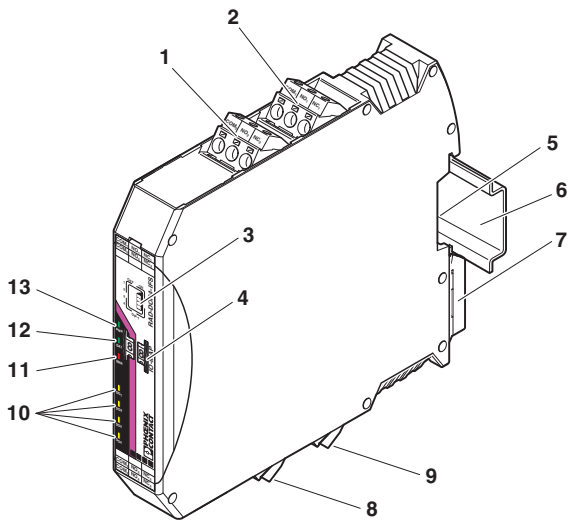


Figure 2 Function elements

Pos.	Terminal block	Designation
1	2.1 / 2.2 / 2.3	Relay output 2 with PDT contact (floating)
2	1.1 / 1.2 / 1.3	Relay output 1 with PDT contact (floating)
3	DIP switches for configuring the output behavior (hold/reset) of the relay outputs	
4	White thumbwheel for setting the I/O-MAP address	
5	Connection option for DIN rail connector	
6	DIN rail	
7	Metal foot catch for DIN rail fixing	
8	5.1 / 5.2 / 5.3	Relay output 3 with PDT contact (floating)
9	6.1 / 6.2 / 6.3	Relay output 4 with PDT contact (floating)
10	Status LEDs for the relay outputs DO1...DO4	
11	ERR status LED, red (communication error)	
12	DAT status LED, green (bus communication)	
13	PWR status LED, green (supply voltage)	

6.2 Basic circuit diagram

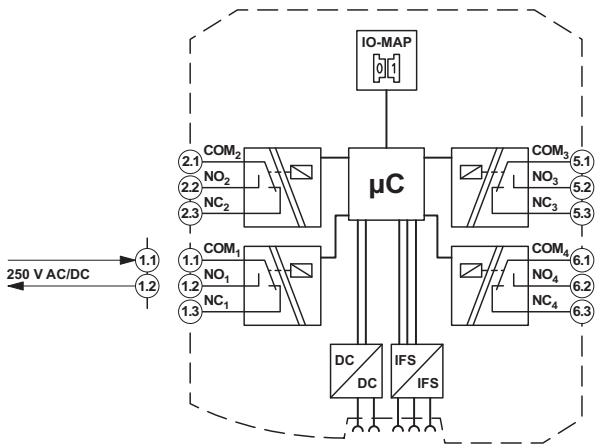


Figure 3 Basic circuit diagram

6.3 Configuration

The DIP switches on the front can be used to set the behavior of the outputs in the event of an error (e.g., interruption of the bus communication by interruption of the wireless connection).

For digital outputs DO1 ... DO4 you can select the “reset” option (relay drops out = Reset) or the “hold last valid state” option (Hold).

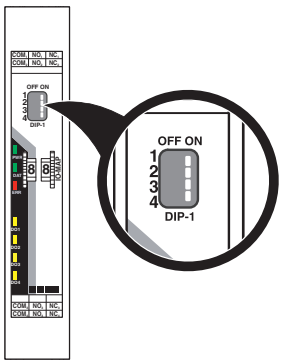


Figure 4 DIP switches

		DIP switch			
Output	**Configuration**	**1**	**2**	**3**	**4**
Digital OUT1	Reset	OFF			
Digital OUT1	Hold	ON			
Digital OUT2	Reset		OFF		
Digital OUT2	Hold		ON		
Digital OUT3	Reset			OFF	
Digital OUT3	Hold			ON	
Digital OUT4	Reset				OFF
Digital OUT4	Hold				ON

6.4 I/O MAP address in the Radioline wireless system

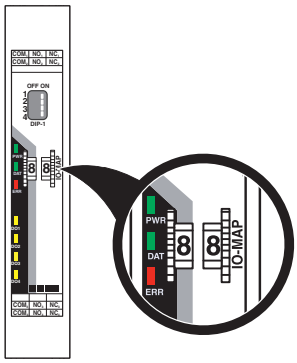


Figure 5 Thumb wheel

Use the thumbwheel to set the I/O-MAP address. The extension module in the Radioline wireless system is addressed using the I/O-MAP address.

On the entire wireless network, addresses 1 to 99 (I/O MAP) (maximum) may be assigned for the I/O extension modules.

Thumbwheel	Description
01 - 99	I/O MAP address
00	Delivery state
**, 1* - 9*	Setting not permitted
*1 - *9	Interface System slave address, for use with other Interface System (IFS) master devices

Wireless module in I/O data mode

The output device must be provided with the same I/O MAP address as the assigned input device at the other wireless station (I/O mapping).

Output modules with the same I/O MAP address may appear several times in the network at different stations.

Example:	I/O MAP address
RAD-DOR4-IFS	02
RAD-DI4-IFS	02

Only the RAD-DI4-IFS module can be assigned to the RAD-DOR-4-IFS module.

Wireless module in PLC/Modbus RTU mode

The I/O MAP address may only appear once in the network. Exception: Output modules with the same I/O MAP address may appear several times in the network at different stations.

The output data is saved in a Modbus memory map in the master wireless module. You can read or write the process data via the serial interface of the master wireless module (RAD-ID = 01) using the Modbus RTU commands (see Section 7).

6.5 Display and diagnostic elements

The I/O extension module uses a total of seven LEDs to indicate the operating states.

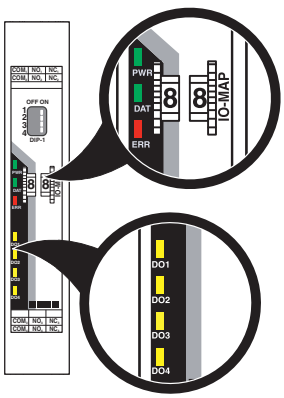


Figure 6 Display and diagnostic elements

PWR-LED

The green PWR LED indicates the supply voltage status.

Off	no supply voltage
On	supply voltage OK

DAT-LED

The green DAT LED indicates the bus communication status.

Off	no communication
Flashing	configuration and addressing mode
On	cyclic data communication

ERR-LED

The red ERR LED indicates the error status, e.g., no corresponding output module found (e.g., incorrect addressing).

Off		no error
Flashing	Slow (1.4 Hz)	I/O-MAP address changed
	Fast (2.8 Hz)	**Wireless module in I/O data mode** missing input module, no bus communication **Wireless module in PLC/Modbus RTU mode** no Modbus communication (safe state of outputs, depending on DIP switch setting)
On		Critical internal error

DO1 ... DO4

The yellow DO1 ... DO4 LEDs indicate the status of the digital outputs.

6.6 Digital outputs

The digital outputs of the extension module (1, 2, 8, 9 in Figure 2) are designed as floating relay contacts (PDT).

The digital outputs are electrically isolated (reinforced insulation) from one another, from the supply voltage (via the bus foot), and from other electronic components.

6.7 Mounting and removing

Connection station with I/O extension modules

Up to 32 different I/O extension modules can be connected to every wireless module via the DIN rail connector (see accessories). Data is transmitted and power is supplied to the I/O extension modules via the bus foot.

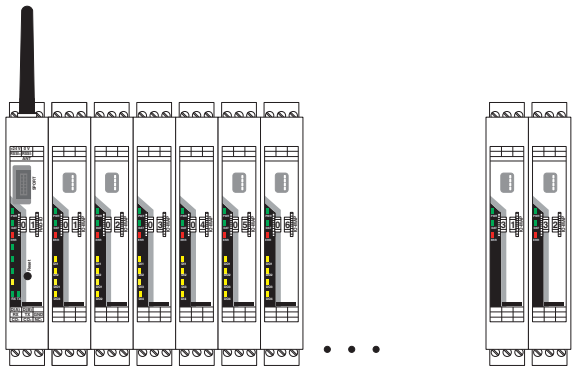


Figure 7 Radioline connection station with up to 32 I/O extension modules

Only mount the I/O extension modules to the right of the wireless module.

Mounting

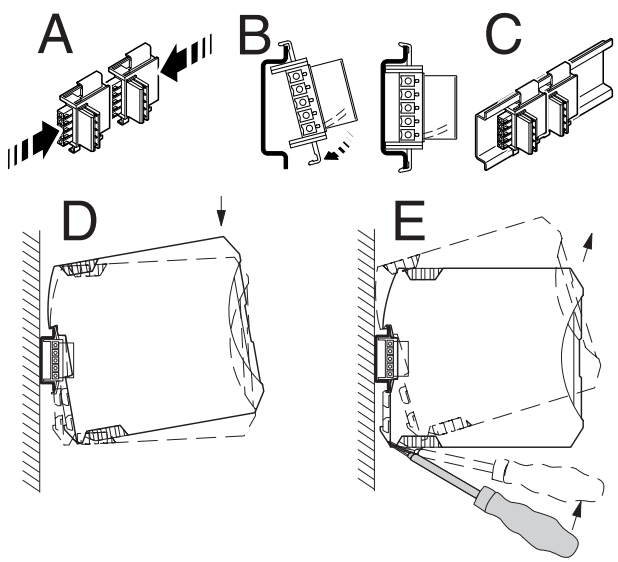


Figure 8 Mounting and removing

When using the device in a connection station, use the 17.5 mm wide DIN rail connector supplied. Only use the DIN rail connector in connection with 24 V DC devices.

Outside the Ex area, module extension or module replacement is also possible during operation.

- Connect the DIN rail connectors together for a connection station.
- Push the connected DIN rail connectors into the DIN rail.
- Place the device onto the DIN rail from above. Ensure the device and DIN rail connector are aligned correctly.
- Holding the device by the housing cover, carefully push the device towards the mounting surface so that the device bus connector is securely fixed onto the DIN rail connector.
- Once the snap-on foot has been audibly snapped onto the DIN rail, check that it is fixed securely. The device is only mechanically secured via the DIN rail.
- Connect the desired number of I/O extension modules to the wireless module via the DIN rail connector.
- In order to meet the requirements for the protection class, install the device in suitable housing.
- During startup, check that the device is operating, wired, and marked correctly.
- You can establish a connection between two DIN rail connectors using MINI COMBICON connectors: MC 1,5/5-ST-3,81 (female, 1803604); IMC 1,5/5-ST-3,81 (male, 1857919).

Removing

- Use a suitable screwdriver to release the locking mechanism on the snap-on foot of the device.
- Hold onto the device by the housing cover and carefully tilt it upwards.
- Carefully lift the device off the DIN rail connector and the DIN rail.

6.8 Connecting cables

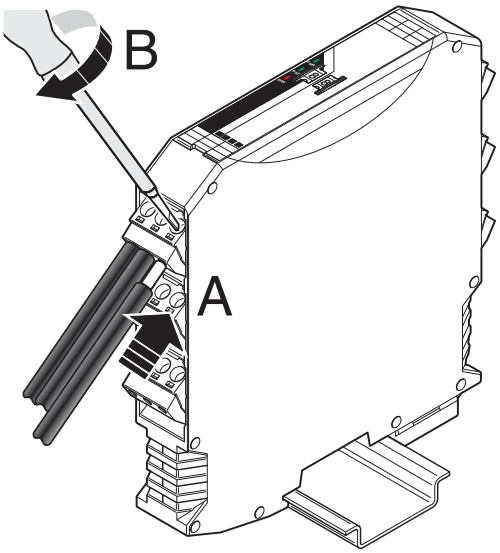


Figure 9 Connecting cables

- Crimp ferrules to the wires.
  Permissible cable cross section: 0.2...2.5 mm².
- Insert the wire with ferrule into the corresponding connection terminal block.
- Use a screwdriver to tighten the screw in the opening above the connection terminal block.
  Tightening torque: 0.6 Nm

7 Process data

You can read or write the process data via the serial interface of the master wireless module (RAD ID = 01) using Modbus RTU commands.

With the PSI-CONF software, you can set the wireless module's network application to “PLC/Modbus RTU mode”.

I/O module	**RAD-DOR4-IFS**
Module type	10_{hex}
Number of registers	02_{hex}
Address space	40xx0 ... 40xx1
Modbus function code	fc 03, 16

xx = I/O MAP address set using the white thumbwheel

40xx0				**Module type and currentness of data**											
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
							Y	Module type							

Register values:

Module type	If the module type in the register is invalid or unavailable, then the register value is 0
Currentness of data	Y = Currentness of data, bit 8 If the data in the register is not up-to-date, then the register value is 1. If process data has been written to one of the registers, the register value = 0. The register value then remains 0 for the entire operating time of the device.

40xx1				**Digital outputs**											
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
												DO 4	DO 3	DO 2	DO 1
Terminal point															
												6.x	5.x	2.x	1.x

40xx2 ... 40xx9	**Reserved**

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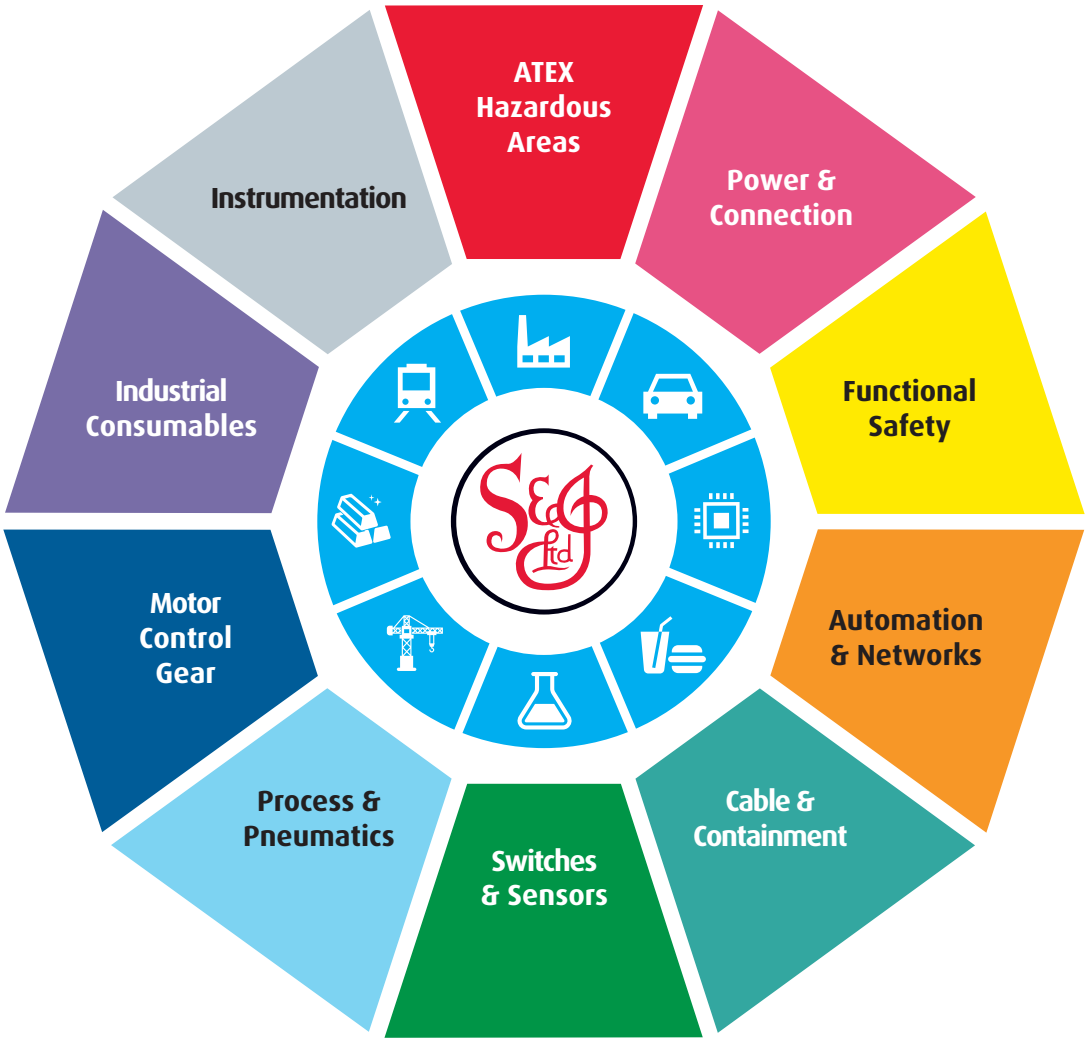

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