

RAD-DO8-IFS

I/O extension module,
eight digital transistor outputs

Data sheet
105364_en_00

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1 Description

The **RAD-DO8-IFS** I/O extension module can be used in conjunction with Radioline wireless modules and other Interface system (IFS) master devices. In a station structure, you can connect up to 32 I/O extension modules to a wireless module via the DIN rail connector.

The **RAD-DO8-IFS** digital I/O extension module is used for processing eight digital signals that are switched using transistor outputs.

Features

- Easy and tool-free I/O mapping via thumb wheel on the front
- Modular design via TBUS DIN rail connector (hot-swap capable)
- 8 transistor outputs (30.5 V DC/200 mA)
- DIP switches for HOLD/RESET behavior of the outputs
- International approvals
- Installation in Ex- Zone 2



WARNING: Explosion hazard when used in potentially explosive areas

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



Make sure you always use the latest documentation.
It can be downloaded from the product at phoenixcontact.net/products.



Use the I/O extension module in connection with the RAD-2400-IFS wireless module, firmware version 1.40 or higher.

This data sheet is valid for all products listed on the following page:

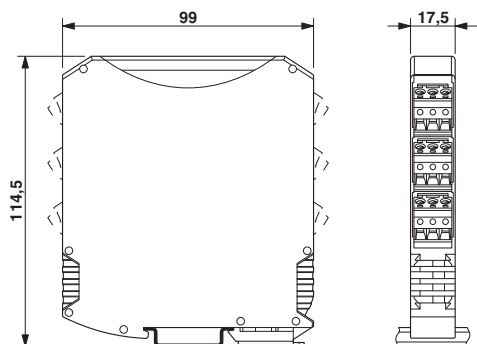
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3 Ordering data

| Description | Type | Order No. | Pcs. / Pkt. |
|---|--------------------------------|-----------|-------------|
| Digital I/O extension module with 8 digital transistor outputs (30.5 V DC/ 200 mA), with screw connection, including DIN rail connector | RAD-DO8-IFS | 2902811 | 1 |
| Accessories | Type | Order No. | Pcs. / Pkt. |
| 2400 MHz wireless transceiver with RS-232, RS-485 2-wire interface, expandable with I/O extension modules, with screw connection, antenna connection: RSMA (female), including DIN rail connector | RAD-2400-IFS | 2901541 | 1 |
| Bidirectional, Radioline 900 MHz transceiver for wireless transmission of serial and I/O data | RAD-900-IFS | 2901540 | 1 |
| DIN rail connector for DIN rail power supply unit, gold-plated contacts, for DIN rail mounting, 5-pos. | ME 17,5 TBUS 1,5/ 5-ST-3,81 GN | 2709561 | 10 |
| Digital I/O extension module with 8 digital inputs (0 ... 30.5 V DC) or 2 pulse inputs (0 ... 100 Hz), with screw connection, including DIN rail connector | RAD-DI8-IFS | 2901539 | 1 |

4 Technical data

Dimensions (nominal sizes in mm)



| | |
|----------------------|----------------------------|
| Dimensions W / H / D | 17.5 mm / 99 mm / 114.5 mm |
|----------------------|----------------------------|

General data

| | |
|------------------------|---|
| Surge voltage category | II |
| Mounting position | Any, on standard DIN rail NS 35 in accordance with EN 60715 |
| Degree of protection | IP20 |
| Pollution degree | 2 |
| Type of housing | PA 6.6-FR, green |

Supply

| | |
|----------------------------|---------------------------------------|
| Supply voltage range | 19.2 V DC ... 30.5 V DC (T-connector) |
| Max. current consumption | max. 22 mA (At 24 V DC, at 25°C) |
| Transient surge protection | Yes |

Transistor output, active

| | |
|---|---|
| Number of outputs | 8 |
| Contact type | Transistor |
| Maximum switching voltage | 30.5 V DC |
| Minimum switching voltage | 12 V DC |
| Max. switching current | 200 mA (per channel) |
| Supply voltage range | 12 V DC ... 30.5 V DC (for digital outputs) |
| Maximum switching frequency | 10 Hz |
| Behavior of the outputs (adjustable via DIP switch) | Hold / Reset |

Electrical isolation

| | |
|-------------|---|
| Digital I/O | 50 V (Rated insulation voltage (between the channel groups 1...4 and 5...8/TBUS supply, reinforced insulation according to EN 61010, EN 50178)) |
|-------------|---|

Test voltage

| | |
|-------------|---------------------------|
| Digital I/O | 1.5 kV AC (50 Hz, 1 min.) |
|-------------|---------------------------|

Connection data

| | |
|-----------------------------------|---|
| Connection method | Screw connection |
| Conductor cross section, solid | 0.2 mm ² ... 2.5 mm ² |
| Conductor cross section, stranded | 0.2 mm ² ... 2.5 mm ² |
| 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) Yellow LED (digital output, DO5) Yellow LED (digital output, DO6) Yellow LED (digital output, DO7) Yellow LED (digital output, DO8) |
|----------------|---|

Ambient conditions

| | |
|--|---|
| Ambient temperature (operation) | -40 °C ... 70 °C -40 °F ... 158 °F |
| 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: 5 g, 10 Hz - 150 Hz |
| Shock | 16 g, 11 ms |

Certification

| | |
|------------------|----------------------------|
| Conformance | CE-compliant |
| ATEX | Ⓜ II 3 G Ex nA IIC T4 Gc X |
| IECEX | Applied for |
| UL, USA / Canada | UL applied for |

Conformance

| | |
|---------------------------|----------------------------|
| EMC directive 2004/108/EC | EN 61000-6-2; EN 61000-6-4 |
| Ex directive (ATEX) | EN 60079-0; EN 60079-15 |

5 Safety regulations and installation notes

5.1 Installation and operation

Follow the installation instructions.



NOTE: Installation, operation, and maintenance may only be carried out by qualified specialist personnel.

Error-free operation of this device can only be ensured if transport, storage, and assembly are carried out correctly and operation and maintenance are carried out with care.

When installing and operating the device, the applicable safety directives (including national safety directives), accident prevention regulations, as well as general technical regulations, must be observed.



NOTE: Access to circuits within the device is not permitted.

Do not repair the device yourself but replace it with an equivalent device.

Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from a failure to comply.



NOTE: The IP20 degree of protection (IEC 60529/EN 60529) of the device is intended for a clean and dry environment. Do not subject the device to mechanical and/or thermal loads that exceed the specified limits.

For the safety data, please refer to the operating instructions and certificates (EC-type examination certificate, other approvals, if necessary).

5.2 Safety regulations for installation in potentially explosive areas

Installation in zone 2



WARNING: Explosion hazard

The device is designed for installation in zone 2 potentially explosive areas according to directive 94/9/EC. Observe the specified conditions for use in potentially explosive areas.



WARNING: Explosion hazard

Install the device into a housing (control or distributor box) that meets the requirements of EN 60079-0 and EN 60079-15 and has at least IP54 protection (EN 60529).



WARNING: Explosion hazard

When installing and connecting the supply and signal circuits observe the requirements of EN 60079-14. Only devices suitable for operation in Ex zone 2 and the conditions at the application site may be connected to the circuits in zone 2.



WARNING: Explosion hazard

In potentially explosive areas, only connect and disconnect cables when the power is disconnected.

Installation/removal of the devices on/from the TBUS DIN rail connector may only be performed when no voltage is applied.



WARNING: Explosion hazard

Only use category 3G devices (ATEX 94/9/EC).



WARNING: Explosion hazard

The device must be stopped and immediately removed from the Ex area if it is damaged or was subject to an impermissible load or stored incorrectly or if it malfunctions.

Installation in areas with a danger of dust explosions



WARNING: Explosion hazard

The device has not been designed for use in potentially dust-explosive atmospheres.

6 Installation



NOTE: electrostatic discharge!

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

6.1 Structure

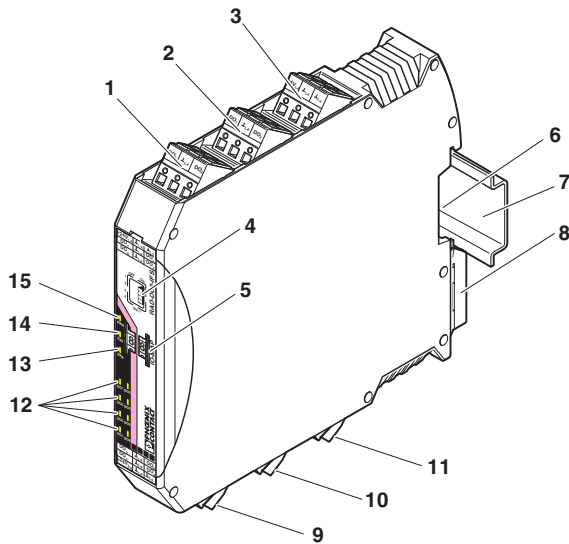


Figure 1 RAD-DO8-IFS

| Pos. | Designation |
|------|---|
| 1 | Transistor outputs 3 + 4 |
| 2 | Transistor outputs 1 + 2 |
| 3 | Supply voltage for outputs 1 ... 4 |
| 4 | DIP switches for configuring the output behavior (hold/reset) of the transistor outputs |
| 5 | I/O MAP address setting via thumb wheel |
| 6 | Connection option for TBUS DIN rail connector |
| 7 | DIN rail |
| 8 | Metal foot catch for DIN rail fixing |
| 9 | Transistor outputs 5 + 6 |
| 10 | Transistor outputs 7 + 8 |
| 11 | Supply voltage for outputs 5 ... 8 |
| 12 | Status LEDs of transistor outputs DO1 ... DO8 |
| 13 | ERR status LED, red (communication error) |
| 14 | DAT status LED, green (BUS communication) |
| 15 | PWR status LED, green (supply voltage) |

6.2 Basic circuit diagram

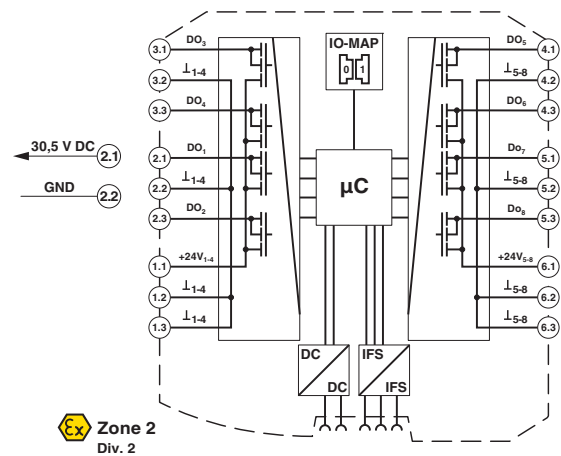


Figure 2 RAD-DO8-IFS basic circuit diagram

6.3 Setting the DIP switches

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 and DO5 ... DO8 you can choose between:

- Reset ("RESET")
- Hold last valid state ("HOLD")

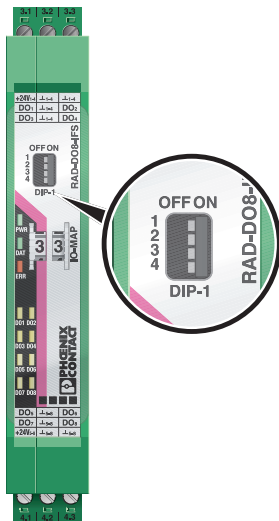


Figure 3 DIP switches

| Output | DIP switch | | | | |
|------------------------|---------------|-----|-----|-------|-------|
| | Configuration | 1 | 2 | 3 | 4 |
| Digital OUT 1 ... 4 | RESET | Off | | n. c. | n. c. |
| Digital OUT 1 ... 4 | HOLD | On | | n. c. | n. c. |
| Digital OUT 5 ... 8 | RESET | | Off | n. c. | n. c. |
| Digital OUT 5 ... 8 | HOLD | | On | n. c. | n. c. |

n. c. = not connected, DIP switches 3 + 4 have no function

6.4 Network applications (operating mode)

You can set the network application of the wireless module with the PSI-CONF software. All RAD-2400-IFS Radioline wireless modules are set to I/O data mode (wire in/wire out) by default.

Wireless module in I/O data mode (wire in/wire out)

In an I/O-to-I/O network, only the I/O signals of the connected analog and digital I/O extension modules are transmitted. Assign the inputs and outputs of the extension modules quickly using the white thumbwheel.

In this mode, the serial RS-232 and RS-485 interfaces on the wireless module are deactivated.

Wireless module in PLC/Modbus RTU mode

In PLC/Modbus RTU mode, the wireless master operates as a Modbus slave. The master PLC controls all commands and initiates all data requests.

Input and output data is stored in a Modbus Memory Map in the master wireless module.

In this mode, you can access process and diagnostic data for the individual network devices via a Modbus controller.

6.5 I/O MAP address in the Radioline wireless system

Use the thumb wheel to set the I/O MAP address. The address is used to address the I/O module for use in the Radioline wireless system.

The following conditions must be met:

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

| Thumb wheel settings | 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 (wire in/wire out)

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).

| Example: | I/O MAP address |
|-------------|-----------------|
| RAD-DO8-IFS | 02 |
| RAD-DI8-IFS | 02 |

Only the RAD-DI8-IFS module can be assigned to the RAD-DO8-IFS module.

Wireless module in PLC/Modbus RTU mode

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 RAD-2400-IFS master wireless module (RAD-ID = 01) using the Modbus RTU command (see Section 7).

6.6 Display and diagnostic elements

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

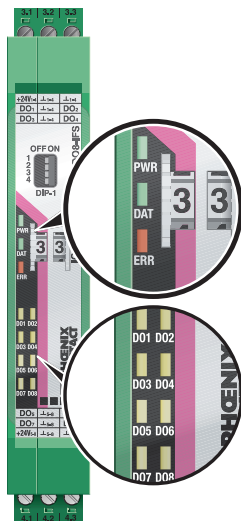


Figure 4 Display and diagnostic elements

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/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: **Wireless module in I/O data mode (wire in/wire out)**
Missing input module, no bus communication
- Wireless module in PLC/Modbus RTU mode**
No Modbus communication, short circuit at one output or several outputs
- On: Critical internal error

DO1 ... DO8

The yellow DO1 ... DO8 LEDs indicate the state of the digital outputs.

DO1 ... DO4

- Flashing: Short circuit at one output or several outputs 1 ... 4

DO5 ... DO8

- Flashing: Short circuit at one output or several outputs 5 ... 8

6.7 Digital outputs

The eight outputs are arranged in two groups of four outputs each with a common electrical supply.

The two output groups are electrically isolated from one another, from the supply voltage (via bus foot), and from other electronic components.

The digital outputs must be externally supplied.

Outputs DO1 ... DO4 are supplied using terminals 1.1 and 1.2/1.3.

Outputs DO5 ... DO8 are supplied using terminals 6.1 and 6.2/6.3.

6.8 Assembly/removal

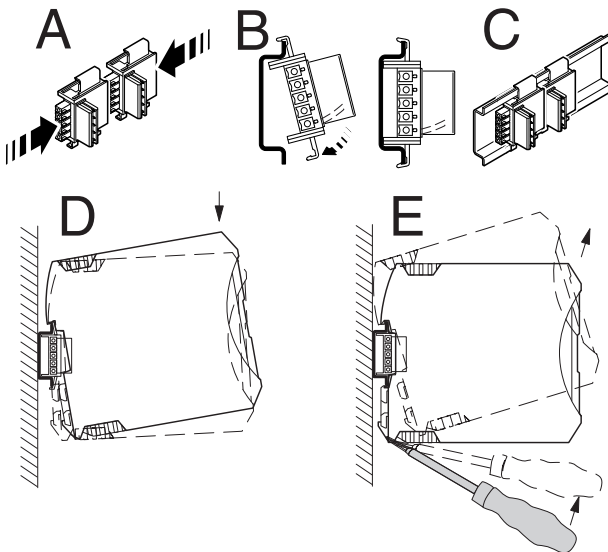


Figure 5 Mounting and removing



NOTE:

The use of the TBUS DIN rail connector for the supply of modules is only possible with 24 V DC devices.

- When using the DIN rail connector, first insert it in the 35 mm DIN rail according to EN 60715 (see Figure 5, A - C). The DIN rail connector is used to bridge the power supply and communication.



In this case, it is vital to observe the mounting direction of the module and DIN rail connector: snap-on foot at the bottom and connector on the left.

- Install the module in a suitable housing to meet the requirements for the protection class.
- Before startup, check that the RAD-DO8-IFS is operating, wired, and marked correctly.
- You can establish a connection between two DIN rail connectors using MINI COMBICON plug-in connectors: MC 1,5/5-ST-3,81 (female, 1803604); IMC 1,5/5-ST-3,81 (male, 1857919).



The maximum cable length is 10 m. Use shielded cables.

6.9 Connecting the cables

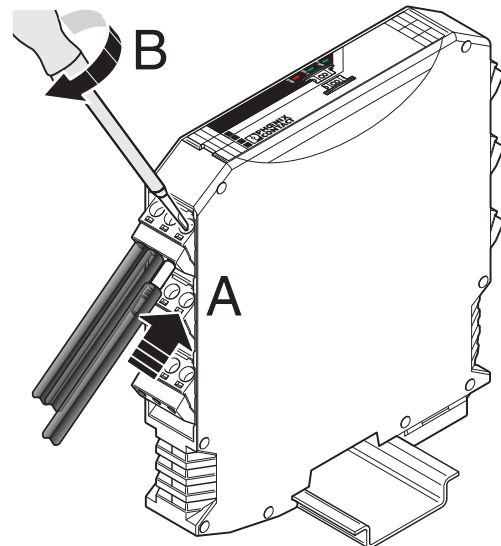


Figure 6 Connection of the cables

- 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 the process data via the serial interface of the RAD-2400-IFS master wireless module (RAD-ID = 01) using the Modbus RTU command.

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

The process image of the I/O modules consists of ten data words of which three are being used.

| I/O module | RAD-DO8-IFS | RAD-DO8-IFS |
|----------------------|---------------------------|---|
| Module type | 11 _{hex} | 11 _{hex} |
| Number of registers | 02 _{hex} Outputs | 02 _{hex} Short-circuit detection |
| Address space | 40xx0 ... 40xx1 | 30xx0 ... 30xx1 |
| Modbus function code | fc 03, 16 | fc04 |

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

Register values:

| | |
|---------------------|---|
| Module type | If the module type in the register is invalid or unavailable, then the register value is 0 |
| Currentness of data | If the data in the register is not up-to-date, then the register value is 1. This is the case if, for example, the wireless connection fails. In the case of an output module, the "Currentness of data" register value is set to 1 until the OUT process data has been written to the Modbus register. |

The read I/O data is only valid and current if a valid module type value is returned by the slave and the "Currentness of data" register value equals 0.

| 30xx0, 40xx0 | Module type and currentness of data | | | | | | | | | | | | | | |
|---------------------------------|-------------------------------------|----|----|----|----|----|------------------------|----|----|----|----|----|----|----|----|
| Currentness of data (high byte) | | | | | | | Module type (low byte) | | | | | | | | |
| 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
| Reserved | | | | | | | X | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |

| 30xx1 | Short-circuit detection at the digital outputs | | | | | | | | | | | | | | |
|---------------------|--|----|----|----|----|----|--------------------|----|----|----|----|----|----|----|----|
| Channel (high byte) | | | | | | | Channel (low byte) | | | | | | | | |
| 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
| Reserved | | | | | | | | | | | | | X | X | |

Bit 0 = 1: short circuit at one output or several outputs 1 ... 4

Bit 1 = 1: short circuit at one output or several outputs 5 ... 8

| 30xx2 ... 30xx9 | Reserved |
|-----------------|----------|
| | |

| 40xx0 | Module type and currentness of data | | | | | | | | | | | | | | |
|---------------------|-------------------------------------|----|----|----|----|----|--------------------|----|----|----|----|----|----|----|----|
| 40xx1 | Digital outputs DO1 ... DO8 | | | | | | | | | | | | | | |
| Channel (high byte) | | | | | | | Channel (low byte) | | | | | | | | |
| 15 | 14 | 13 | 12 | 11 | 10 | 09 | 08 | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
| Reserved | | | | | | | DO | DO | DO | DO | DO | DO | DO | DO | |
| | | | | | | | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
| Terminal point | | | | | | | | | | | | | | | |
| | | | | | | | | 5x | 5x | 4x | 4x | 3x | 3x | 2x | 2x |

| 40xx2 ... 40xx9 | Reserved |
|-----------------|----------|
| | |

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