

# 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](http://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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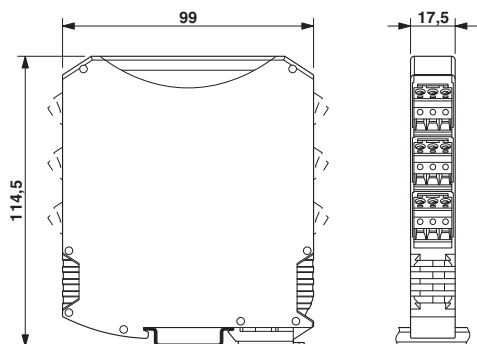
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### 3 Ordering data

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
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#### 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))
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**Test voltage**

Digital I/O	1.5 kV AC (50 Hz, 1 min.)
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**Connection data**

Connection method	Screw connection
Conductor cross section, solid	0.2 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
Conductor cross section, stranded	0.2 mm <sup>2</sup> ... 2.5 mm <sup>2</sup>
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)
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**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

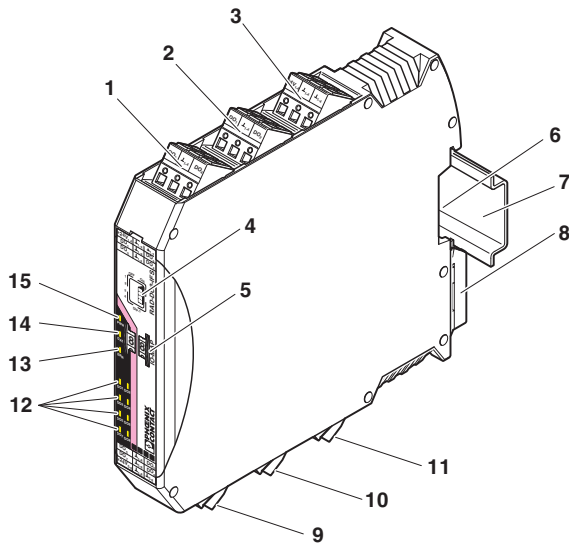


Figure 1 RAD-DO8-IFS

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

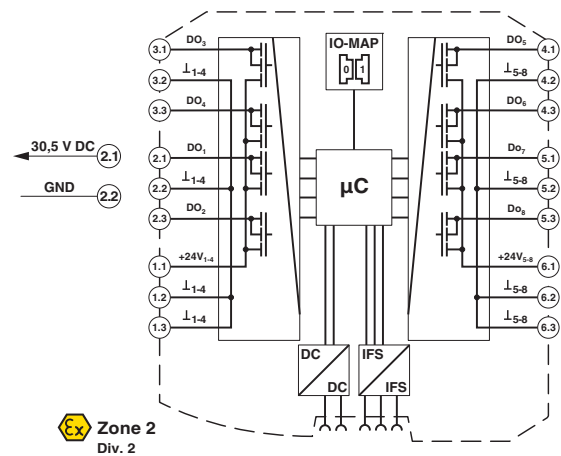


Figure 2 RAD-DO8-IFS basic circuit diagram

### 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")

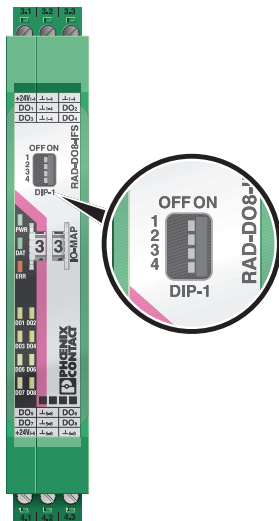


Figure 3 DIP switches

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.

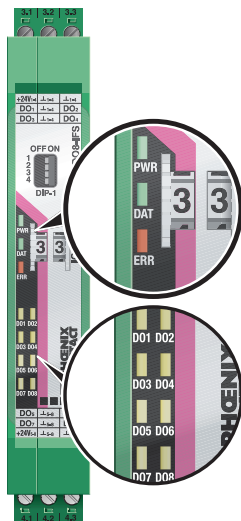


Figure 4 Display and diagnostic elements

**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

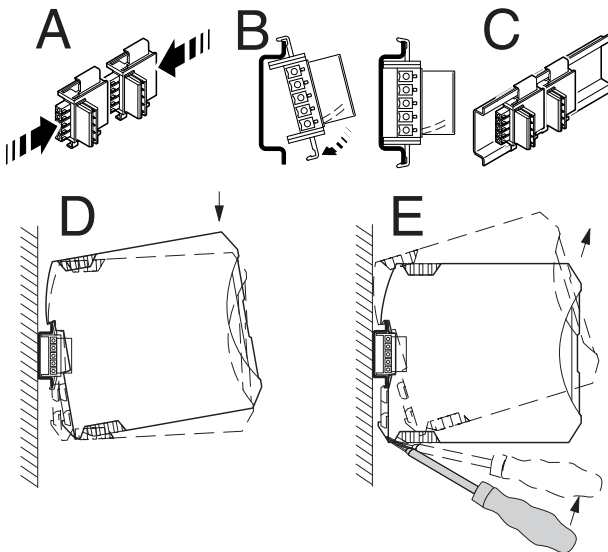


Figure 5 Mounting and removing



**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

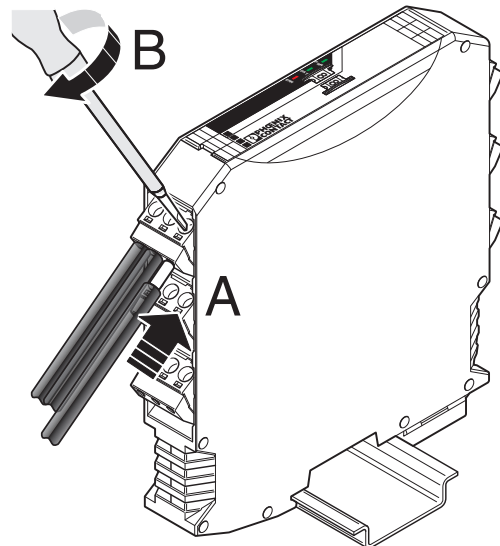


Figure 6 Connection of the cables

- Crimp ferrules to the wires. Permissible cable cross section: 0.2...2.5 mm<sup>2</sup>.
- 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 <sub>hex</sub>	11 <sub>hex</sub>
Number of registers	02 <sub>hex</sub> Outputs	02 <sub>hex</sub> 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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