

# RAD-NAM4-IFS

## RAD-NAM4-IFS I/O module for collecting NAMUR digital signals



Data sheet  
3812\_en\_D

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### 1 Description

The RAD-NAM4-IFS is a four-channel NAMUR digital input module for use in Radioline and PROFIBUS PA MUX I/O systems. It conforms to the NAMUR proximity sensor standard EN 60947-5-6 and communicates to Radioline, FB-MUX/HS/DIO-NAM/PA, and FB-MUX/HS/DI24/PA head stations via the TBUS connector in the DIN rail. This module provides channel-to-channel isolation.

#### 1.1 Features

- Easy and tool-free I/O mapping via thumbwheel on the front of the device
- Modular design mounts on DIN rail with rail-channel connector
- Line break detection
- Short circuit detection
- Channel-to-channel electrical isolation
- International approvals
- Installation in hazardous locations



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This document is valid for all products listed in the “Ordering data” on page 3

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## 2 Ordering data

### Products

Description	Type	Order No.	Pcs./Pkt.
<b>Digital input module</b> , four-channel, Namur. For use in PROFIBUS PA MUX I/O systems. Communicates with all RAD... head modules with firmware v1.90 and higher and FB/MUX....	RAD-NAM4-IFS	2316275	1

### Accessories

Description	Type	Order No.	Pcs./Pkt.
<b>Head station</b> , maximum of 12 digital input and 8 digital output channels. Functions with up to two RAD-DOR4-IFS modules and three FB-DI4/NAMUR-IFS modules. Typical application: valve monitor and control.	FB-MUX/HS/DIO-NAM/PA	2316270	1
<b>Head station</b> , maximum of 24 digital inputs. Functions with up to six RAD-DI4-IFS modules, six FB-DI4/NAMUR-IFS, or three RAD-DI8-IFS modules.	FB-MUX/HS/DI24/PA	1005332	1
<b>900 MHz wireless transceiver</b> 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
<b>2400 MHz wireless transceiver</b> 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 5 km (line of sight), for worldwide use.	RAD-2400-IFS	2901541	1
<b>2400 MHz wireless transceiver</b> 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 5 km (line of sight), for use in Japan.	RAD-2400-IFS-JP	2702863	1
<b>900 MHz wireless transceiver</b> 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 Australia.	RAD-900-IFS-AU	2702878	1
<b>I/O extension module</b> , 8 digital transistor outputs (30.5 V DC/200 mA)	RAD-DO8-IFS	2902811	1

### 3 Technical data

General data	
Ambient temperature, operation	-40 ... 70°C
Ambient temperature, storage/transport	-40 ... 85°C
Permissible humidity, non-condensing	20 ... 95%
Altitude	<2000 m
Degree of protection	IP20
Flammability rating according to UL 94	V0
Overvoltage category	II
Housing material	PA 6.6-FR
Electrical data	
Nominal voltage	24 V DC
Supply voltage range	19.2 ... 30.5 V DC
Nominal supply current	25 mA
Rated isolation	500 V AC between PA/DC supply input
NAMUR data	
Type	NAMUR proximity sensors (EN 60947-5-6) Open circuit contacts Switch contacts with resistance circuit in accordance with IEC/EN 60947-5-6
Blocking	<1.2 mA
Conductive	>2.1 mA
Excitation voltage	8 V
Line fault detection	$I_{in} < 350 \mu A$
Short circuit	$R_{sensor} < 360 \Omega$
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, flexible	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

## 4 Dimensions

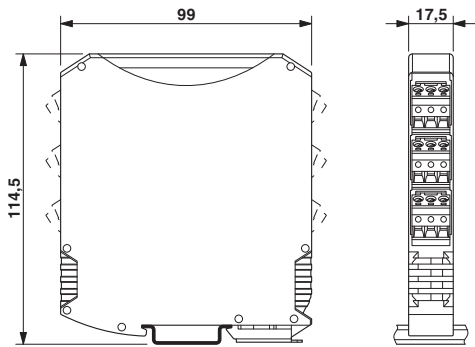


Figure 1 Dimensions

## 5 Structure

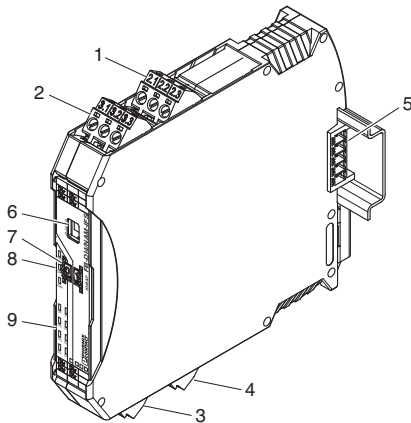


Figure 2 Structure

Pos.	Description
1	Digital input 1
2	Digital input 2
3	Digital input 3
4	Digital input 4
5	Connection for DIN rail connector
6	DIP switch
7	Thumbwheel for setting IO-MAP address
8	Module diagnostic and status indicators
9	Digital input diagnostic and status indicators

## 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), in accordance with EN 61340-5-1 and IEC 61340-5-1.

### 6.1 Assembly

Multiple modules (head station and I/O modules) are often installed in the same DIN rail section.

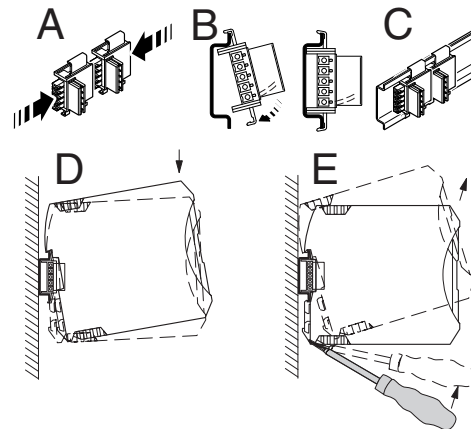


Figure 3 Module assembly and installation

1. Connect desired number of TBUS connectors (A).
2. Place TBUS connectors in the DIN rail (B).
3. Slide TBUS connectors into the desired location in the DIN rail (C).
4. Align the device over the TBUS connector. Hook it onto the top edge of the DIN rail.
5. Rotate the device down toward the DIN rail so it mates with the TBUS connector (D).
6. Ensure the device is securely installed on the DIN rail.
7. Align desired I/O modules over appropriate TBUS connectors and repeat steps 3, 4, and 5.

### 6.2 Removal

To remove:

1. Use a suitable screwdriver to release the latch mechanism on the foot of the device (E).
2. Rotate the bottom of the device upward, away from the DIN rail.
3. Left the device off the TBUS connector and DIN rail.

6.3 Connections

Connector	Pos.	Label	Function
Digital input 1	1	2.1	NAMUR supply +
	2	2.2	NAMUR supply -
	3	2.3	-
Digital input 2	1	3.1	NAMUR supply +
	2	3.2	NAMUR supply -
	3	3.3	-
Digital input 3	1	4.1	NAMUR supply +
	2	4.2	NAMUR supply -
	3	4.3	-
Digital input 4	1	5.1	NAMUR supply +
	2	5.2	NAMUR supply -
	3	5.3	-

1. Crimp optional ferrules to wires.
2. Insert the wire into the appropriate terminal.

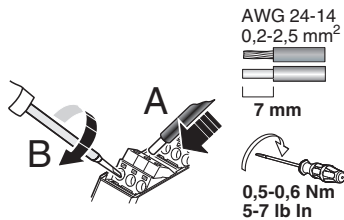


Figure 4 Wire connections

3. Tighten the wire-clamp screw to 0.6 Nm.

7 Startup and configuration

7.1 Addressing the RAD-NAM4-IFS modules (IO-MAP)

The IO-MAP is used to give each RAD-NAM4-IFS I/O module a unique address on the TBUS. It is best to configure each IO-MAP address before powering the system.

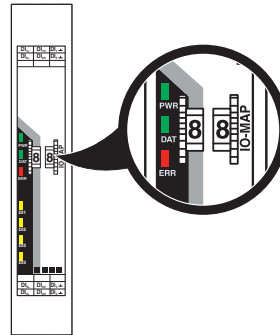


Figure 5 Thumbwheel

If an IO-MAP needs to be changed during operation, change the address on the RAD-NAM4-IFS I/O module, and then press and hold the “Set” button for two seconds on the head station to finalize the changes.

7.2 RAD-NAM4-IFS I/O module local configuration

Each RAD-NAM4-IFS I/O module has a DIP switch for additional configuration. The DIP switch disables the line fault detection (line break and short circuit) for applications, such as a closed contact switch I/O module. Each DIP switch controls the corresponding digital input (DIP 1 = Digital input 1, etc.).

7.3 Status LEDs

Label		Indicates
PWR LED	Solid green	Supply voltage OK
	Off	No supply voltage
DAT LED	Solid green	Bus communication
	Flashing green	Configuration mode
	Off	No communication
ERR LED	Solid red	System error
	Flashing red	Configuration error

### 7.4 Wireless module in I/O data mode

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

The I/O MAP address of an input module may only appear once in the network.

Example	I/O MAP address
RAD-NAM4-IFS	02
RAD-DO8-IFS	02

Only the RAD-DO8-IFS module can be assigned to the RAD-NAM4-IFS.

### 7.5 Supervised digital inputs

Supervised digital inputs are standard digital inputs with some component to help detect different states of the input beyond on and off. In particular, a supervised digital input allows the system to detect the differences between a digital input in the on state and a short-circuit state, as well as the difference between an off state and an open-circuit state. An example of a supervised digital input circuit is shown in the diagram below.

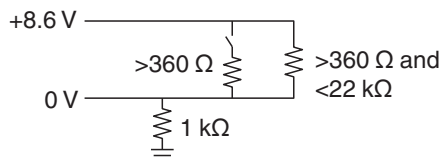


Figure 6 Example of supervised digital inputs

The NAMUR input module has four supervised digital input channels and each channel has two signals. The first signal is value signal, which represents whether the digital input is ON or OFF. The second signal is an error signal, which represents either a short circuit or open circuit. The error checking behavior of the NAMUR module is modified via the DIP switches for each channel at the top of the module (see Figure 2). **ON** represents error checking is enabled, and **OFF** disables the error checking behavior.

The value signal for NAMUR inputs 1 through 4 are represented on the DO8 module via output channels 1 to 4. The error signal is represented on the DO8 module via output channels 5 through 8, with the error status for NAMUR input 1 represented on channel 5, NAMUR input 2 represented on channel 6, and so on.

RAD-NAM4-IFS input	RAD-DO8-IFS output
DI1 (2.x)	DO1 (2.1)
DI2 (3.x)	DO2 (2.3)
DI3 (4.x)	DO3 (3.1)
DI4 (5.x)	DO4 (3.3)
E1	DO5 (4.1)
E2	DO6 (4.3)
E3	DO7 (5.1)
E4	DO8 (5.3)

#### Behavior of the ERROR channels on the DO8

The ERROR LEDs at RAD-NAM4-IFS input module are inverted on the RAD-DO8-IFS output module. This behavior demonstrates that the system status is OK instead of potentially reading a power failure to the IO module as a safe system state. An error (short circuit or open circuit) is indicated with a flashing LED at the RAD-NAM4-IFS and the LED and digital output at the RAD-DO8-IFS will be **OFF** as long as the error is present.

- **NAMUR input module DIP switch OFF:** The error status represented by DO8 channels 5 through 8 will always remain in the LED and digital output **ON** state, which represents no error.
- **NAMUR DIP switch ON:** The error status is represented on DO8 module channels 5 through 8 with the default behavior of no error indicated with the LED **ON** and digital output **ON**. If a short circuit or open circuit is detected on the NAMUR input channel, the DO8 error channel indicates this with the LED **OFF** and digital output **OFF**. See below for example.

	Value LED	Error LED
DI1/E1	On	Off
DI2/E2	Off	Off
DI3/E3	On	On (short circuit)
DI4/E4	Off	On (open circuit)

## 8 Process data

Read and write process data via the serial interface of the master wireless module (RAD ID = 01) using Modbus RTU commands.

Set the wireless module's network application to "PLC/Modbus RTU mode" using the PSI-CONF software.

<b>I/O module</b>	<b>RAD-NAM4-IFS</b>
Module type	03 <sub>hex</sub>
Number of registers	02 <sub>hex</sub>
Address space	30xx0 ... 30xx2
Modbus function code	fc04

where xx is the I/O MAP address set using the white thumbwheel.

30xx0		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**.

**Timeout** Y = Timeout bit 8. If the data in the register is not up-to-date, then the register value is **1**.  
 This is the case, for example, if the wireless connection or communication with an input module fails. In this case, the IN process data is retained in the Modbus table, but is no longer updated.

30xx1		Digital inputs																		
15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00					
								E4	E3	E2	E1	DI	DI	DI	DI					
												4	3	2	1					
Terminal points																				
												5.x	4.x	3.x	2.x					



E1, E2, E3, and E4 are the line-fault detection signals (ERR LEDs) for each channel and only available if the DIP switch is set to ON (enabled line fault function).