

Technical Information

RNO22

Output isolating amplifier

Output isolating amplifier, 1- or 2-channel, for 4 to 20 mA, HART® transparent, with 24 V_{DC} and line fault detection, optionally with SIL and Ex



Field of application

- Single or two-channel output isolating amplifier
- Transmission and galvanic isolation of analog 0/4 to 20 mA signals (0.2/4 to 20 mA when short-circuit monitoring is activated)
- Bidirectional transmission of digital HART® communication signals, operation of SMART actuators
- Reliable control of active components such as control valves or current-to-pressure converters
- Intrinsically safe option [Ex-ia], suitable for installation in Ex zone 2
- For ambient temperatures -40 to +70 °C (-40 to 158 °F)

Benefits

- Up to SIL 2 (SC 3) according to IEC 61508 for high functional safety
- Simple and quick wiring using pluggable screw or plug-in terminals, optional power supply via DIN rail bus connector
- High transmission accuracy and line break and short-circuit monitoring
- Compact housing width: up to two channels in just 12.5 mm (0.49 in) for efficient use of space in control cabinets

Table of contents

Function and system design	3	Documentation	10
Product description	3		
Dependability	3		
Input	3		
Version	3		
Input data, measuring range	3		
Output	3		
Output data	3		
Error detection	4		
Ex connection data	4		
Galvanic isolation	4		
Electrical connection	5		
Terminal assignment	5		
Connecting the supply voltage	5		
Performance characteristics	5		
Power supply failure	5		
Terminals	5		
Cable specifications	6		
Performance characteristics	6		
Response time	6		
Maximum measured error	6		
Installation	6		
Mounting location	6		
Installing a DIN rail device	6		
Environment	6		
Important ambient conditions	6		
Shock and vibration resistance	7		
Electromagnetic compatibility (EMC)	7		
Marine approval	7		
Mechanical construction	8		
Design dimensions	8		
Weight	8		
Color	8		
Materials	8		
Display and operating elements	8		
Local operation	9		
Certificates and approvals	9		
CE mark	9		
Functional safety	9		
Ordering information	9		
Accessories	9		
Device-specific accessories	10		
Service-specific accessories	10		
Online tools	10		

Function and system design

Product description

Product design

Output isolating amplifier, 1-channel

- With the "1-channel" option, the output isolating amplifier is used to control I/P converters, control valves and indicators. The device separates and transmits 0/4 to 20 mA signals. For operating the SMART actuators, the analog measuring value can be overlayed with digital communication signals (HART) and transmitted bidirectionally in an electrically isolated manner.
- Sockets for the connection of HART communicators are integrated in the plug-in connectors. The device enables open-circuit and short-circuit monitoring. Short-circuit monitoring can be switched off or on using the DIP switches. An open or shorted field circuit causes a high input impedance on the controller side. This enables open-circuit and short-circuit monitoring by the control system. A green LED indicates that the device is ready for operation.
- The device is optionally available with Ex approvals for the intrinsically safe operation of I/P converters, control valves and indicators installed in the hazardous area. Separate Ex documentation (XA) is supplied with these devices. Compliance with the installation instructions and connection data in this documentation is mandatory!

Output isolating amplifier, 2-channel

With the "2-channel" option, the device has a second channel, which is galvanically isolated from channel 1, while maintaining the same width. In the 2-channel version, short-circuit monitoring **cannot** be switched off or on using the DIP switches. Otherwise, the function corresponds to the 1-channel device.

Dependability

We only provide a warranty if the device is installed and used as described in the Operating Instructions.

Input

Version

The following versions are available:

- 1-channel
- 2-channel

Input data, measuring range

Current input signal:	
Input current	≤ 30 mA
Input impedance in event of line fault at output	> 1 MΩ (if line fault is present)
Voltage drop	< 2.4 V (at 20 mA)
Function (short-circuit detection off; 1-channel only)	0 to 20 mA
Function (short-circuit detection on; 1-channel only)	0.2 to 20 mA
Function (2-channel)	0.2 to 20 mA
Safety	4 to 20 mA
Underload/overload range	0 to 24 mA
Line fault detection: input current response threshold	> 0.2 mA

Output

Output data

Current output signal:	
Function (short-circuit detection off; 1-channel only)	0 to 20 mA
Function (short-circuit detection on; 1-channel only)	0.2 to 20 mA
Function (2-channel)	0.2 to 20 mA
Safety	4 to 20 mA
Underload/overload range	0 to 24 mA
Open-circuit voltage	≤ 27 V
Transmission behavior	1:1 to input signal

Load: Short-circuit detection on (20 / 24 mA) Short-circuit detection off (20 / 24 mA)	100 to 700 Ω / 500 Ω 0 to 700 Ω / 500 Ω
Transmissible communication protocols	HART
Output ripple	< 20 mV _{rms}

Error detection

Wire break detection	Load > 10 k Ω
Short-circuit detection	Load < 50 Ω

Ex connection data

See associated XA Safety Instructions

Galvanic isolation*At operating altitude $\leq 2\,000\text{ m}$ (6 562 ft):*

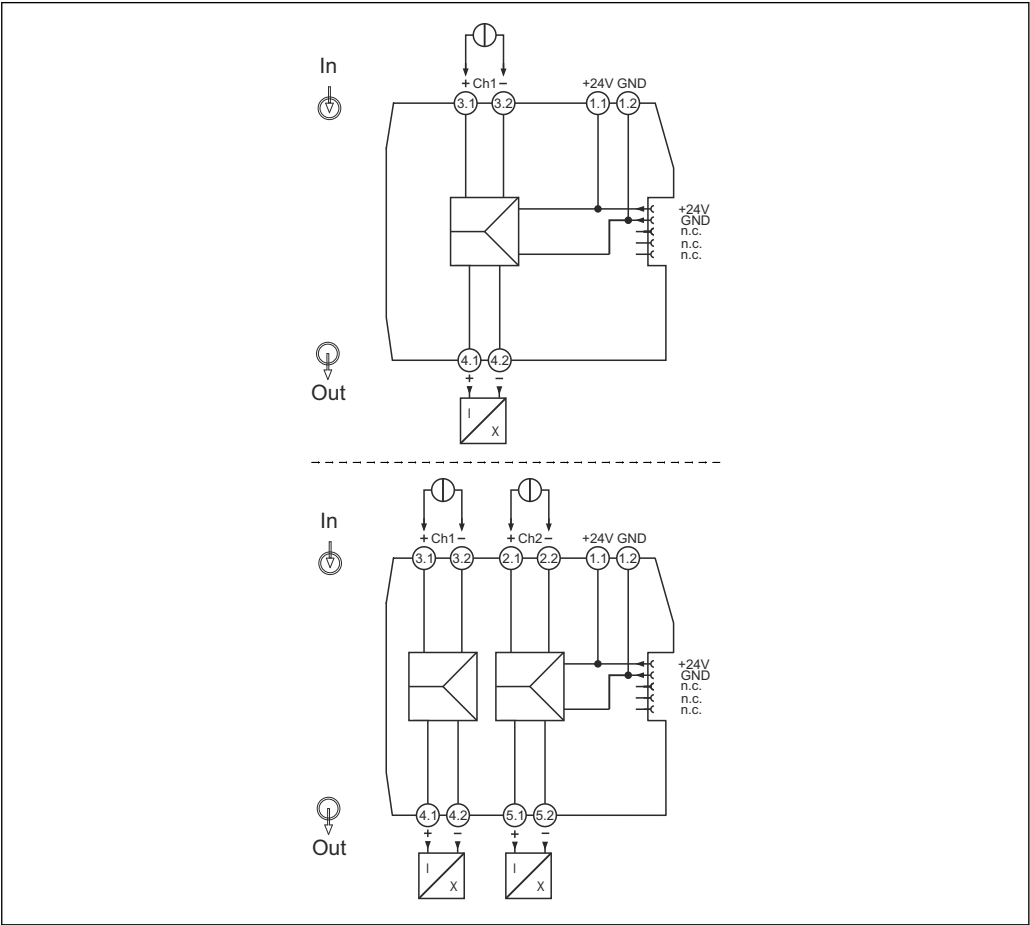
Input / output; output / power supply: Rated insulation voltage Test voltage Insulation	300 V _{rms} 2.5 kVAC (50 Hz, 1 min.) Safe isolation according to IEC 61010-1
Input / power supply: Rated insulation voltage Test voltage Insulation	50 V _{rms} 1.5 kVAC (50 Hz, 1 min.) Safe isolation according to IEC 61010-1
Input 1 / input 2; Output 1 / output 2 (2-channel devices): Test voltage	1.5 kVAC (50 Hz, 1 min.)

Output / input; output / power supply (peak value according to IEC 60079-11)	375 V
Output 1 / output 2 (2-channel devices)	60 V

Electrical connection

Terminal assignment

Quick wiring guide



1 Terminal assignment of RNO22: 1-channel version (top), 2-channel version (bottom)

i Sockets for the connection of HART communicators are integrated in the plug-in connectors (screw connection). Ensure an adequate external resistance ($\geq 230 \Omega$) in the output circuit.

Connecting the supply voltage

Power can be supplied via terminals 1.1 and 1.2 or via the DIN rail bus connector.

Performance characteristics	Supply voltage	24 V _{DC} (-20% / +25%)	Maximum current consumption at 24 V _{DC} / 20 mA	1-channel: < 45 mA 2-channel: < 85 mA
	Power loss at 24 V _{DC} / 20 mA	1-channel: < 0.8 W 2-channel: < 1.4 W	Maximum power consumption at 24 V _{DC} / 20 mA	1-channel: ≤ 1.1 W 2-channel: < 2 W

Power supply failure

To meet SIL and NE21 requirements, voltage interruptions of up to 20 ms must be bridged with a suitable power supply.

Terminals	Terminal design	Cable version	Cable cross-section
	Screw terminals Tightening torque: minimum 0.5 Nm/maximum 0.6 Nm	Rigid or flexible (Stripping length = 7 mm (0.28 in)) Flexible with wire end ferrules (with or without plastic ferrule)	0.2 to 2.5 mm ² (24 to 14 AWG) 0.25 to 2.5 mm ² (24 to 14 AWG)

Terminal design	Cable version	Cable cross-section
Push-in spring terminals	Rigid or flexible (Stripping length = 10 mm (0.39 in))	0.2 to 2.5 mm ² (24 to 14 AWG)
	Flexible with wire end ferrules (with or without plastic ferrule)	0.25 to 2.5 mm ² (24 to 14 AWG)

Cable specifications

A shielded cable is recommended for HART communication. Observe grounding concept of the plant.

Performance characteristics

Response time

Step response (10 to 90 %)	< 140 µs (with step 4 to 20 mA)
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Maximum measured error*Accuracies*

Transmission error (typical / maximum)	0.05 % / 0.1 % of full scale value
Temperature coefficient (typical / maximum)	≤ 0.005 % / 0.01 %/K

Installation

Mounting location

The device is designed for installation on 35 mm (1.38 in) DIN rails in accordance with IEC 60715 (TH35).

The device's housing provides basic insulation from neighboring devices for 300 Veff. If several devices are installed side by side, this must be taken into consideration and additional insulation must be provided if necessary. If the adjacent device also offers basic insulation, no additional insulation is required.

NOTICE

- When using in hazardous areas, the limit values of the certificates and approvals must be observed.

Installing a DIN rail device

The device can be installed in any position (horizontal or vertical) on the DIN rail without lateral clearance from neighboring devices. No tools are required for installation. The use of end brackets (type WEW "35/1" or similar) on the DIN rail is recommended as an end support for the device.

Environment

Important ambient conditions

Ambient temperature range	–40 to 70 °C (–40 to 158 °F)	Storage temperature	–40 to 85 °C (–40 to 185 °F)
Degree of protection	IP 20	Overvoltage category	II
Pollution degree	2	Humidity	5 to 95 % no condensation

Operating altitude ranges

Description Altitude Ambient temperature (operation) Max. voltage U_m (non-intrinsically safe circuits) Max. voltage U_m (non-intrinsically safe circuits) Rated insulation voltage (power supply, input / output)	Ex applications $\leq 2\,000\text{ m}$ (6 562 ft) $-40\text{ to }70\text{ }^{\circ}\text{C}$ ($-40\text{ to }158\text{ }^{\circ}\text{F}$) 253 V_{AC} 125 V_{DC} 320 V	Ex applications $\leq 3\,000\text{ m}$ (9 843 ft) $-40\text{ to }60\text{ }^{\circ}\text{C}$ ($-40\text{ to }140\text{ }^{\circ}\text{F}$) 190 V_{AC} 110 V_{DC} 190 V
Description Altitude Ambient temperature (operation) Max. voltage U_m (non-intrinsically safe circuits) Max. voltage U_m (non-intrinsically safe circuits) Rated insulation voltage (power supply, input / output)	Ex applications $\leq 4\,000\text{ m}$ (13 123 ft) $-40\text{ to }55\text{ }^{\circ}\text{C}$ ($-40\text{ to }131\text{ }^{\circ}\text{F}$) 60 V_{AC} 60 V_{DC} 63 V	Ex applications $\leq 5\,000\text{ m}$ (16 404 ft) $-40\text{ to }45\text{ }^{\circ}\text{C}$ ($-40\text{ to }113\text{ }^{\circ}\text{F}$) 60 V_{AC} 60 V_{DC} 63 V
Description Altitude Ambient temperature (operation) Rated insulation voltage (power supply, input / output)	Non-Ex applications (IEC 61010-1) $\leq 2\,000\text{ m}$ (6 562 ft) $-40\text{ to }70\text{ }^{\circ}\text{C}$ ($-40\text{ to }158\text{ }^{\circ}\text{F}$) 300 V	Non-Ex applications (IEC 61010-1) $\leq 3\,000\text{ m}$ (9 843 ft) $-40\text{ to }60\text{ }^{\circ}\text{C}$ ($-40\text{ to }140\text{ }^{\circ}\text{F}$) 150 V
Description Altitude Ambient temperature (operation) Rated insulation voltage (power supply, input / output)	Non-Ex applications (IEC 61010-1) $\leq 4\,000\text{ m}$ (13 123 ft) $-40\text{ to }55\text{ }^{\circ}\text{C}$ ($-40\text{ to }131\text{ }^{\circ}\text{F}$) 150 V	Non-Ex applications (IEC 61010-1) $\leq 5\,000\text{ m}$ (16 404 ft) $-40\text{ to }45\text{ }^{\circ}\text{C}$ ($-40\text{ to }113\text{ }^{\circ}\text{F}$) 150 V

Shock and vibration resistance

Vibration resistance as per DNVGL-CG-0339 : 2015 and IEC 60068-2-27
DIN rail device: 2 to 100 Hz at 0.7 g (general vibration stress)

Electromagnetic compatibility (EMC)**CE conformity**

Electromagnetic compatibility in accordance with all the relevant requirements of the IEC 61326 series. For details, refer to the Declaration of Conformity.

- Interference immunity as per IEC 61000-6-2
There may be minor deviations during the interference.
- Interference emission as per IEC 61000-6-4

Marine approval**DNV GL TAA00000AG (optional)**

Temperature: B

Humidity: B

Vibration: A

Electromagnetic compatibility (EMC): B

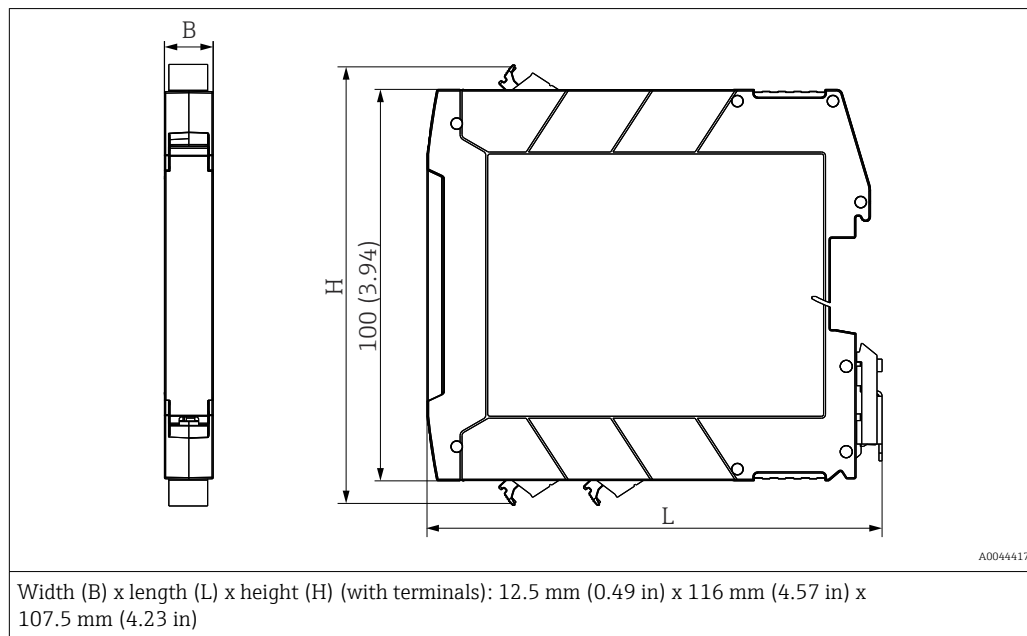
Cabinet: In the event of installation on a ship, the necessary protection must be provided in accordance with regulations

Mechanical construction

Design dimensions

Dimensions in mm (in)

Terminal housing for mounting on DIN rail



Weight

Device with terminals (values rounded up):

1-channel: approx. 100 g (3.53 oz); 2-channel: approx. 120 g (4.23 oz)

Color

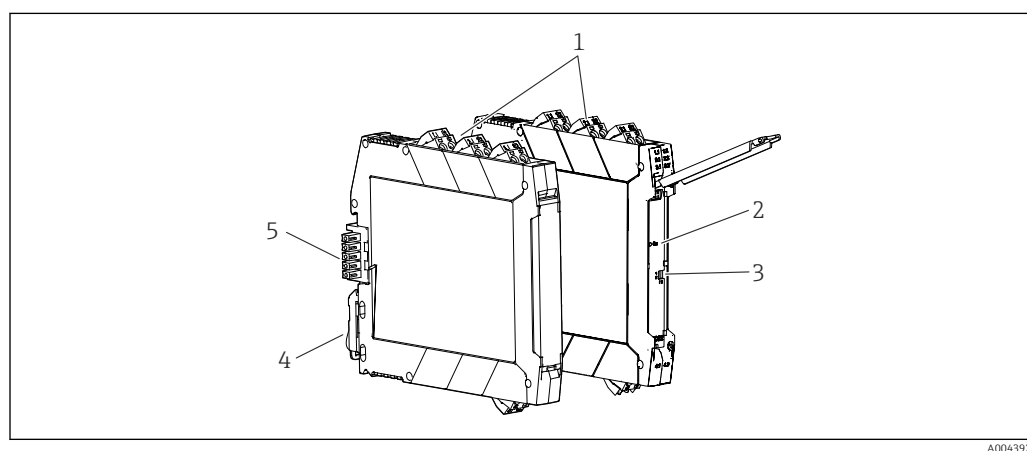
Light gray

Materials

All the materials used are RoHS-compliant.

Housing: polycarbonate (PC); flammability rating according to UL94: V-0

Display and operating elements



2 Display and operating elements

- 1 Plug-in screw or push-in terminal with integrated test socket
- 2 Green LED "PWR" power supply
- 3 DIP switches (only on 1-channel version)
- 4 DIN rail clip for DIN rail mounting
- 5 DIN rail bus connector (optional)

Local operation**Hardware settings / configuration**

Any device settings using the DIP switch must be made when the device is de-energized.

Short-circuit detection

In the 1-channel version, short-circuit monitoring can be switched off or on using the DIP switches.

DIP switch	Short-circuit detection Off	Short-circuit detection On
1	I	II
2	(no function)	(no function)



Short-circuit detection must be disabled for 0 to 20 mA signal transmission.

Otherwise, the signal range can only be used as of the line fault detection response threshold of >0.2 mA.

Certificates and approvals

Current certificates and approvals for the product are available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.

CE mark

The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EC directives. The manufacturer confirms successful testing of the product by affixing to it the CE-mark.

Functional safety

A SIL version of the device is optionally available. It can be used in safety equipment in accordance with IEC 61508 up to SIL 2 (SC 3).



Please refer to Safety Manual FY01037K for the use of the device in safety instrumented systems according to IEC 61508.

**Protection against modifications:**

As it is not possible to disengage the operating elements (DIP switches), a lockable control cabinet is required for use in SIL applications. The cabinet must be locked by key. A normal electrical cabinet key does not suffice for this purpose.

Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

Accessories

The accessories currently available for the product can be selected at www.endress.com:

1. Select the product using the filters and search field.

2. Open the product page.
3. Select **Spare parts & Accessories**.

Device-specific accessories

Type	Order code
DIN rail bus connector 12.5 mm (x 1)	71505349
System power supply	RNB22
Power and error message module	RNF22

Service-specific accessories**Configurator**

Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as the measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

The Configurator is available at www.endress.com on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Configuration**.

Online tools

Product information about the entire life cycle of the device is available at:
www.endress.com/onlinetools

Documentation

The following document types are available in the Downloads area of the Endress+Hauser website (www.endress.com/downloads), depending on the device version:

Document type	Purpose and content of the document
Technical Information (TI)	Planning aid This document contains all the technical data on the product and provides an overview of everything that can be ordered with the product.
Brief Operating Instructions (KA)	The Brief Operating Instructions contain basic safety instructions, installation and connection conditions. They do not replace the Operating Instructions.
Operating Instructions (BA)	Reference document The Operating Instructions contain the information that is required in the various phases of the life cycle of the product: From product identification, incoming acceptance and storage, to installation, connection, operation and commissioning through to troubleshooting, maintenance and disposal.
Description of device parameters (GP)	Reference for parameters The document contains detailed explanations of readable or configurable parameters in the product. The description is aimed at those who work with the product over its entire life cycle and perform specific configurations.
Safety instructions (XA)	Safety Instructions for electrical equipment in hazardous areas are supplied with the product depending on the approval. They are an integral part of the Operating Instructions.  The nameplate indicates the Safety Instructions (XA) that are relevant to the product.
Supplementary device-dependent documentation (SD/CY/ FY)	Always comply strictly with the instructions in the relevant supplementary documentation. The supplementary documentation is an integral part of the product documentation.



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