



Level



Pressure



Flow



Temperature



Liquid  
Analysis



Registration



Systems  
Components



Services



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## Technical Information

# Active barrier RN221N with optional HART<sup>®</sup> diagnosis

Active barrier with power supply for safe separation of 4...20 mA current circuits



### Application

- Galvanic isolation of 4...20 mA current circuits
- Removing large loop circuits
- Powering 2-wire transmitters
- Monitoring of SMART transmitters with early-warning system
- Intrinsically safe sensor supply for Ex-area

### Your benefits

- Wide range power supply, flexible power source
- Compact side by side housing
- International Ex approvals
  - ATEX
  - FM
  - CSA
  - TIIS
- Germanischer Lloyd / marine approval
- Bi-directional HART<sup>®</sup> transmission
- Communication sockets for HART<sup>®</sup> sensor setting up
- Evaluation of status information from connected transmitter with HART<sup>®</sup> protocol
- Primary or secondary master operating mode, automatic selection
- Sensor monitoring with early-warning system
- Manual or automatic reset of the relay contact



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## Function and system design

### Measuring principle

Active barrier with power supply for safe separation of 4...20 mA current signal circuits. The unit has an optional intrinsically safe input. The current transmitted from the transmitter to the input circuit (4...20 mA) is linearly transmitted to the output.

#### RN221N with HART® diagnosis:

The operating mode of the RN221N with HART® diagnosis is selected at face via a DIP switch. Three different operating modes are distinguished:

1. Current measurement: Monitoring the 4 - 20 mA signal for compliance with NAMUR NE43 specifications.
2. Evaluation of the HART® status byte of the connected SMART transmitter
3. Evaluation of the E+H-specific diagnostic command #231 of connected new generation E+H transmitters

The user defines via DIP-switch, for which transmitter status an alarm signal is issued.

#### Automatic shut-off of the HART® master RN221N with HART® diagnosis.

The HART® specification states that a maximum of two HART® masters may be present at any one time in a network. These two masters are distinguished into the so-called "Primary Master" and "Secondary Master" (can be selected via DIP switch). If a further HART® master is to be included in the network, one of the first two masters must be switched off. In this case, the HART® communication of the RN221N with HART® diagnosis automatically switches to idle state.

### Measuring system

The unit creates a safe galvanic isolation between input and output of the circuits. Separation between hazardous and non-hazardous areas is available as an option. A built-in loop power supply can supply connected sensors with the necessary energy. A current signal is available at the output (passive output) for connection to further instrumentation. Bi-directional HART®-communication with SMART transmitters is possible using the built-in communication sockets (with resistance  $R=250 \Omega$ ).

## Input

### Standard

<b>Number</b>	1	<p style="text-align: center;"><b>U/I diagram</b></p>
<b>Supply voltage</b>	16.7 V $\pm$ 0.2 V (for I = 20 mA)	
<b>Open circuit voltage</b>	26 V $\pm$ 5%	
<b>Short circuit current</b>	$\leq$ 40 mA	
<b>Internal resistance</b>	328 $\Omega$	
<b>Overrange</b>	10%	

### Intrinsically safe input option<sup>1</sup>

<b>Open circuit voltage</b>	27.3 V			
<b>Short circuit current</b>	87.6 mA			
<b>Power consumption</b>	597 mW			
<b>Capacitance</b>	86 nF	[EEx ia] IIC	683 nF	[EEx ia] IIB, IIA
	86 nF	Group A, B	681 nF	Group C
			2278 nF	Group D
<b>Inductance</b>	5.2 mH	[EEx ia] IIC	18.9 mH	[EEx ia] IIB, IIA
	2.9 mH	Group A, B	9.9 mH	Group C
			19.9 mH	Group D

1) Max. values in the event of an error

**Reset relay**

This input is used to connect a passive button or switch to reset the relay activation. Both terminals are galvanically connected to the 4-20 mA current output.

## Output

**Output 4...20 mA**

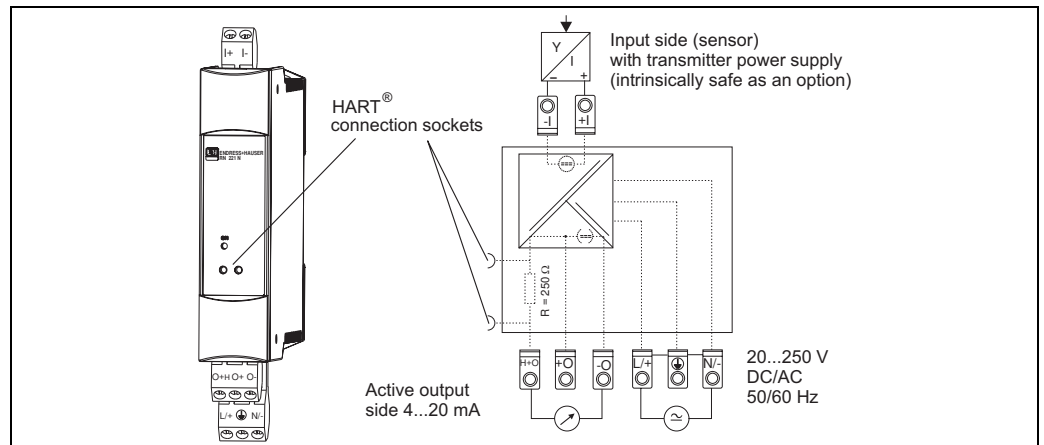
<b>Number</b>	1
<b>Open circuit voltage</b>	24 V ± 10%
<b>Overrange</b>	10%
<b>Load (impedance)</b>	0...700 Ω (without communication resistance)
<b>Galv. isolation</b>	To all other current circuits

**Relay output (option)**

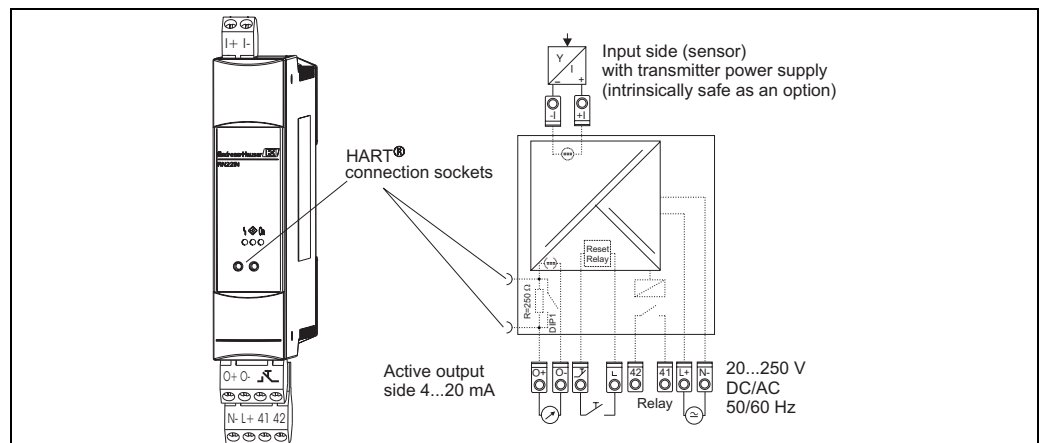
Switching voltage for 250 V AC/ 30 V DC  
 Max. switching current up to 3 A AC/DC  
 Number of switching cycles 10<sup>5</sup>  
 Configurable as normally closed (NC) or normally open (NO)

## Power supply

**Electrical connection**



*Electrical connection RN221N without HART® diagnosis*



*Electrical connection RN221N with HART® diagnosis*

<b>Supply voltage</b>	20...250 V DC/AC, 50/60 Hz
<b>Power consumption</b>	RN221N without HART® diagnosis: max. 2.5 W RN221N with HART® diagnosis: max. 5.0 W
<b>Current consumption</b>	$I_{\max}/I_n < 15$
<b>Electrical safety</b>	To IEC 61 010-1, protection class I, overvoltage category II, pollution degree 2, overload protection $\leq 10$ A, fuse RN221N without HART® diagnosis: 315 mA T, with HART® diagnosis: 500 mA T

## Performance characteristics

<b>Reference conditions</b>	Calibration temperature at 25 °C (77 °F)
<b>Linearity</b>	$\leq 0.15\%$
<b>Load influence</b>	$\leq 0.1\%$
<b>Ambient temperature influence</b>	$\leq 0.1\%$ in range 0 °C to 50 °C (32 to 122 °F) $\leq 0.2\%/10K$ (18 °F) in range -20 °C to 0 °C (-4 to 32 °F)

## Installation

<b>Installation angle</b>	No restrictions
<b>Installation hints</b>	Vibration free installation point, protect from external heating

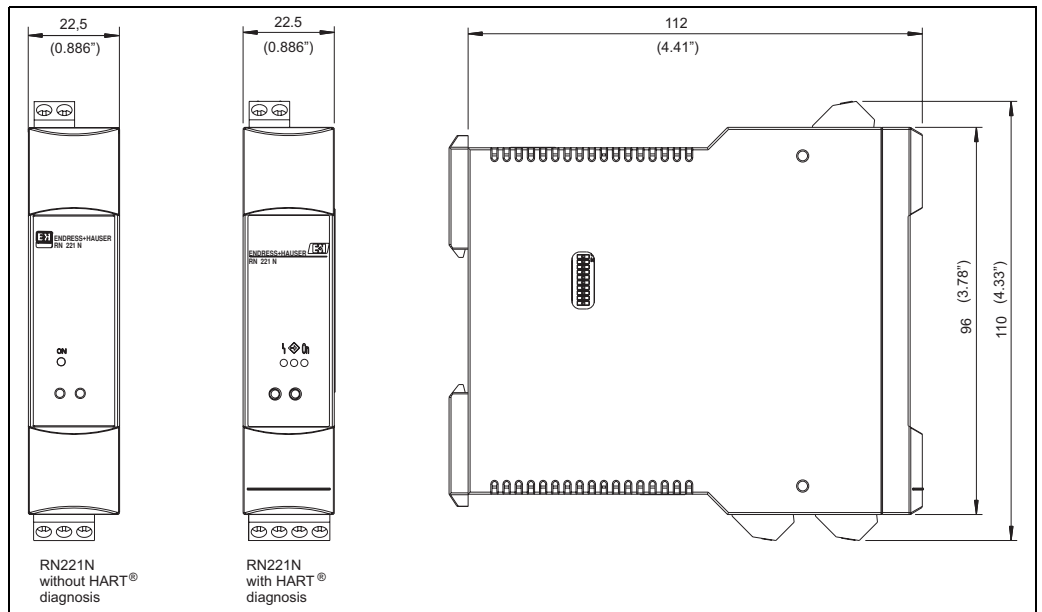
## Environment

<b>Ambient temperature limits</b>	-20 to +50 °C (-4 to 122 °F)
<b>Storage temperature</b>	-20 to +70 °C (-4 to 158 °F)
<b>Operating height</b>	To IEC 61010-1: < 2000 m (6561 ft) height above sea level
<b>Climate class</b>	To IEC 60654-1 Class B2
<b>Degree of protection</b>	IP 20
<b>Electromagnetic compatibility (EMC)</b>	Immunity to IEC 61326, Class A (industrial environment)

## Mechanical construction

### Design, dimensions

### Housing for top hat DIN rail to IEC 60715 TH35:



Dimensions of RN221N (data in mm, data in inches in brackets)

### Weight

approx. 150 g (1.1 lb)

### Materials

Housing: Plastic PC/ABS, UL 940

### Terminals

- Keyed plug-on screw terminals, core size 2.5mm<sup>2</sup> solid, or strands with ferrules
- Front mounted communication socket for 2 mm jack plugs

## Human interface

### Display and operating elements

	RN221N	RN221N with HART® diagnosis
Display elements	LED, yellow, in series to current output: Illuminates, when output current circuit and output current circuit are closed. LED current > 2 mA	3 LED's are available: 1. Yellow LED: "ON" - Input and output current circuit are closed "OFF" - Input or output current circuit (or both) are not closed -> line break 2. Yellow LED: lights for every HART® data transmission 3. Red LED: lights if a sensor warning is present
Operating elements	-	10 DIP switches for bit mask and error evaluation setting

### Remote operation

HART® communication:  
Communication signals are transmitted in both directions.  
Communication resistance:  
Resistance for HART® communication 250 Ω built in.  
Communication sockets:  
Access for HART® communicator, e.g. DXR-275



Note!  
Please take note of voltage drop!

## Certificates and approvals

### CE mark

Guidelines 89/336/EWG and 73/23/EWG

### Hazardous area approvals

- ATEX:
  - II (1) GD [Ex ia] IIC
- FM:
  - AIS Class I, II, III, Div. 1+2, Groups A, B, C, D, E, F, G
  - ANI Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G
- CSA:
  - Class I, Zone 0: [Ex ia] IIC
  - Class I, Groups A, B, C, D
  - Class II, Groups E, F, G
  - Class III
- TIS:
  - [Ex ia] IIC

### Functional safety according to IEC 61508/ IEC 61511

FMEDA including SFF determination and PFDAVG calculation according to IEC 61508. See also Functional Safety manual ('Further documentation').

## Ordering information

### Product structure

<b>Active barrier RN221N</b> transmitter power supply, 4-20mA, 1:1 transmission, bi-directional HART communication, SIL2. housing 22,5mm, top hat DIN rail 35mm, IP20.	
<b>Approval</b>	
<b>A</b>	Non-Ex area
<b>B</b>	ATEX II (1)GD (EEx ia) IIC
<b>C</b>	FM AIS, Cl. I, II, III, Div. 1, Gr. ABCDEFG
<b>D</b>	CSA (EEx ia), Cl. I, II, III, Div. 1, Gr. A-G
<b>E</b>	TIIS (EEx ia) IIC
<b>Power supply; diagnosis</b>	
<b>1</b>	20-250 VDC/AC; none
<b>3</b>	20-250 VDC/AC; HART signal, error behavior NAMUR NE43
<b>RN221N-</b>	⇐ Order code

## Accessories

### Accessories

The following accessories are available:

Order code	Accessory
51002468	Protective housing IP66 for field mounting
51004148	Adhesive label, printed (max. 2x16 chars)
51002393	Metal tag for tag number

## Documentation

- Operating Instructions RN221N (KA124R/09/a3)
- Operating Instructions RN221N with HART® diagnosis (KA202R/09/a3)
- ATEX Safety Notes (XA005R/09/a3)
- Functional safety manual RN221N (SD008R/09/en)
- Brochure "System Components" (FA016R/09/en)

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