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71468732
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Technical Information
RIA452

Process indicator



Digital process indicator in panel mounted housing for monitoring and displaying analog measured values with pump control and batch functions and flow calculation

Application

- Water/wastewater sector
- Power industry
- Raw materials
- Chemicals industry
- Food industry

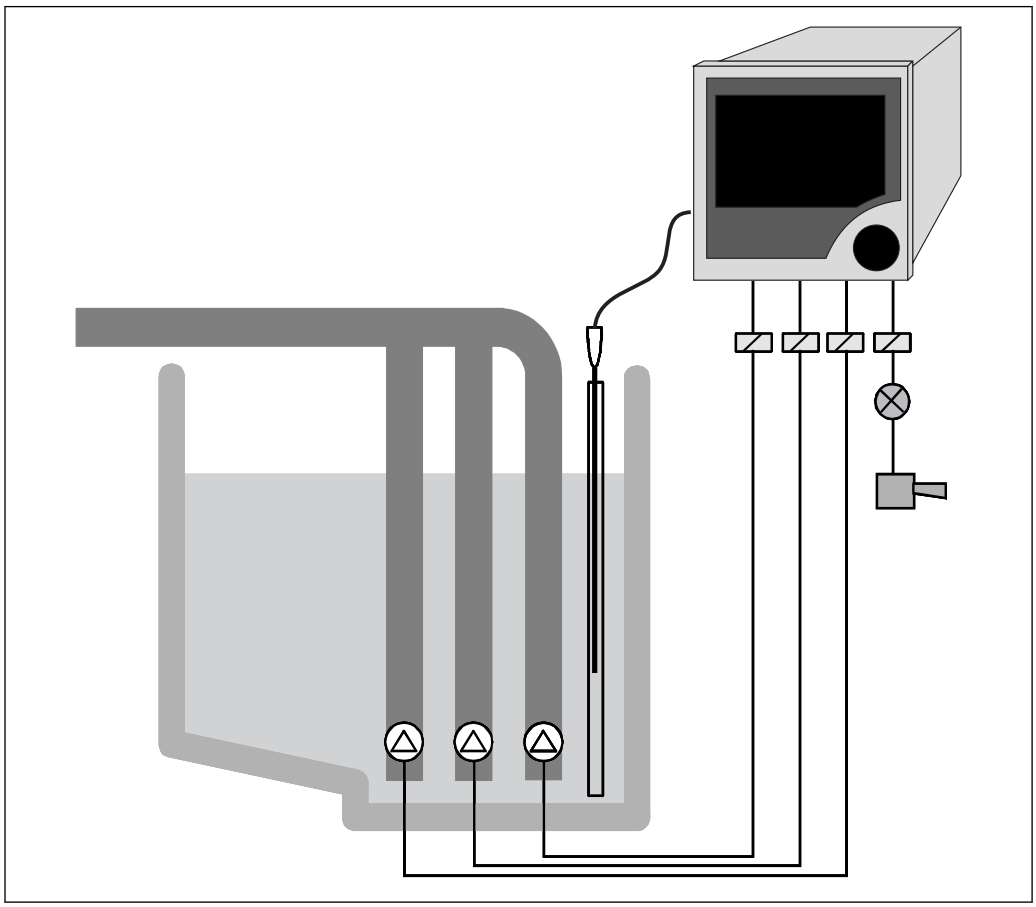
Your benefits

- 7-digit 14-segment LC display
- Multicolored
- Large bar graph with overrange and underrange
- Intrinsically safe input with transmitter power supply
- Digital status inputs for pump monitoring
- Universal input
- Up to eight relays
- Min/Max value saved
- Pump control functions
- Batch functions
- Flow measurement for open channels and weirs
- Linearization table with 32 support points
- Analog output
- Pulse output with totalizer
- Jog-shuttle operation
- Freely programmable units
- Configuration via interface and operating software
- Tank linearization via PC software

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Function and system design

Measuring principle



1 *Example of an application of the process indicator*

The single-channel RIA452 process indicator monitors and displays analog measured values. Pumps can be monitored with the digital status inputs. The measured value is displayed using the seven-digit, 14-segment LC display. Numbers and units are displayed in white, the bar graph in yellow, overrange and underrange in red, and the limit value flags and digital status inputs in green and yellow. The RIA452 can provide power directly to two-wire transmitters that are connected. As an option, it is also possible to select the input and the transmitter power supply as intrinsically safe for Ex applications. Up to eight freely programmable relays monitor the measured value for limit value overshoot and undershoot. Other operating modes for the relays include sensor or device malfunction, batch and pump control functions (e.g. alternating pump control). Furthermore, the RIA452 can be used as a preset counter and for measuring flow at open channels and measuring weirs.

The scalable analog output offers many different ways of forwarding the input signal: zoom function, linearization, offset, inversion and signal conversion (input/output conversion). The optional pulse output allows users to output integrated process values.

Measuring system

Microcontroller-controlled indicator in a panel-mounted housing with a multicolored, illuminated LC display. Analog measured value acquisition is via an analog/digital converter. The digital status inputs are scanned cyclically. Power can be supplied directly to two-wire sensors with the transmitter power supply which is integrated as standard. The current input is optionally available as an intrinsically safe version for Ex applications. In this case, the RIA452 has a second, intrinsically safe transmitter power supply.

The freely scalable analog output is output via digital/analog conversion. The digital pulse output is output directly.

Up to eight relays are available in the device for monitoring limit values, pump control and batch functions.

The device can be operated either onsite via the jog/shuttle dial, or via the PC with an operating software. Operation can be locked using the hardware key or software code.

Linearization

The following flow curves are programmed into the device for open channels and weirs:
- Khafagi-Venturi flume
- ISO Venturi flume
- BST [1] Venturi flume
- Parshall flume
- Palmer-Bowlus flume
- Rectangular weir
- Rectangular weir with constriction
- NFX [2] rectangular weir
- NFX [2] rectangular weir with constriction
- Trapezoidal weir
- Triangular weir
- BST [1] triangular weir
- NFX [2] triangular weir

User-configurable flow formula

$Q = C * (h^{\alpha} + \gamma * h^{\beta})$

The parameters α, β, γ and C can be entered freely.

Linearization function

Up to 32 user-definable linearization points are available in the device for the linearization of the input, e.g. for tank linearization.

The linearization table for standard tanks and customer-specific tanks can be generated with the ReadWin 2000 operating software.

Input

Measured variable

- Current (standard)
- Digital inputs (standard)
- Current/voltage, resistance, RTD assembly, thermocouples (universal input option)

Measuring range

Current input:

Current:
- 0/4 to 20 mA +10% overrange, 0 to 5 mA
- Short-circuit current: max. 150 mA
- Input impedance: ≤ 5 Ω
- Response time: ≤ 100 ms

Universal input:

Current:
- 0/4 to 20 mA + 10% overrange, 0 to 5 mA
- Short-circuit current: max. 100 mA
- Input impedance: ≤ 50 Ω

Voltage:
- ±150 mV, ±1 V, ±10 V, ±30 V, 0 to 100 mV, 0 to 200 mV, 0 to 1 V, 0 to 10 V
- Input impedance: ≥ 100 kΩ

Resistance:
30 to 3 000 Ω in 3/4-wire technology

RTD assembly:
- Pt100/500/1000, Cu50/100, Pt50 in 3/4-wire technology
- Measuring current for Pt100/500/1000 = 0.25 mA

1) BST: British Standard
2) NFX: French standard NFX 10-311

Thermocouple types:
- J, K, T, N, B, S, R as per IEC584
- D, C as per ASTME998
- U, L as per DIN43710/GOST
- Response time: ≤ 100 ms

Digital input:

Digital input:
- Voltage level –3 to 5 V low, 12 to 30 V high (as per DIN19240)
- Input voltage max. 34.5 V
- Input current typ. 3 mA with overload and reverse polarity protection
- Sampling frequency max. 10 Hz

Galvanic isolation

Towards all other circuits

Output

Output signal

- Relay, transmitter power supply (standard)
- Current, voltage, pulse, intrinsically safe transmitter power supply (option)

Signal on alarm

No measured value visible on the LC display, no background illumination, no sensor power supply, no output signals, relays behave in safety-oriented manner.

Current/voltage output

Analog output range:
0/4 to 20 mA (active), 0 to 10 V (active)

Load:
- ≤ 600 Ω (current output)
- Max. output current 22 mA (voltage output)

Signal characteristics:
Freely scalable signal

Galvanic isolation towards all other circuits

Pulse output (open collector)

Pulse output (open collector):
- Frequency range to 2 kHz
- I_{max} = 200 mA
- U_{max} = 28 V
- $U_{low/max}$ = 2 V at 200 mA
- Pulse width = 0.04 to 2 000 ms

Relay output

Signal characteristics:
Binary, switches when the limit value is reached

Switch function: limit relay switches for the operating modes:
- Minimum/maximum safety
- Alternating pump control function
- Batch function
- Time control
- Window function
- Gradient
- Device malfunction
- Sensor malfunction

Switching threshold:
Freely programmable

Hysteresis:
0 to 99%

Signal source:
- Analog input signal
- Integrated value
- Digital input

Number:
4 in basic unit (can be extended to 8 relays, option)

Electrical specifications:
- Relay type: changeover
- Relay switching capacity: 250 V_{AC} / 30 V_{DC}, 3 A
- Switch cycles: typically 10^5
- Switching frequency: max. 5 Hz
- Minimum switching load: 10 mA / 5 V_{DC}

Galvanic isolation towards all other circuits

Mixed assignment of low and extra-low voltage circuits is not permitted for neighboring relays.

Transmitter power supply

Transmitter power supply 1, terminal 81/82 (optionally intrinsically safe):

Electrical specifications:
- Output voltage: 24 V ±15%
- Output current: max. 22 mA (for $U_{out} \geq 16$ V, sustained short-circuit proof)
- Impedance: ≤ 345 Ω

Transmitter power supply 2, terminal 91/92:

Electrical specifications:
- Output voltage: 24 V ±15%
- Output current: max. 250 mA (sustained short-circuit proof)

Transmitter power supply 1 and 2:

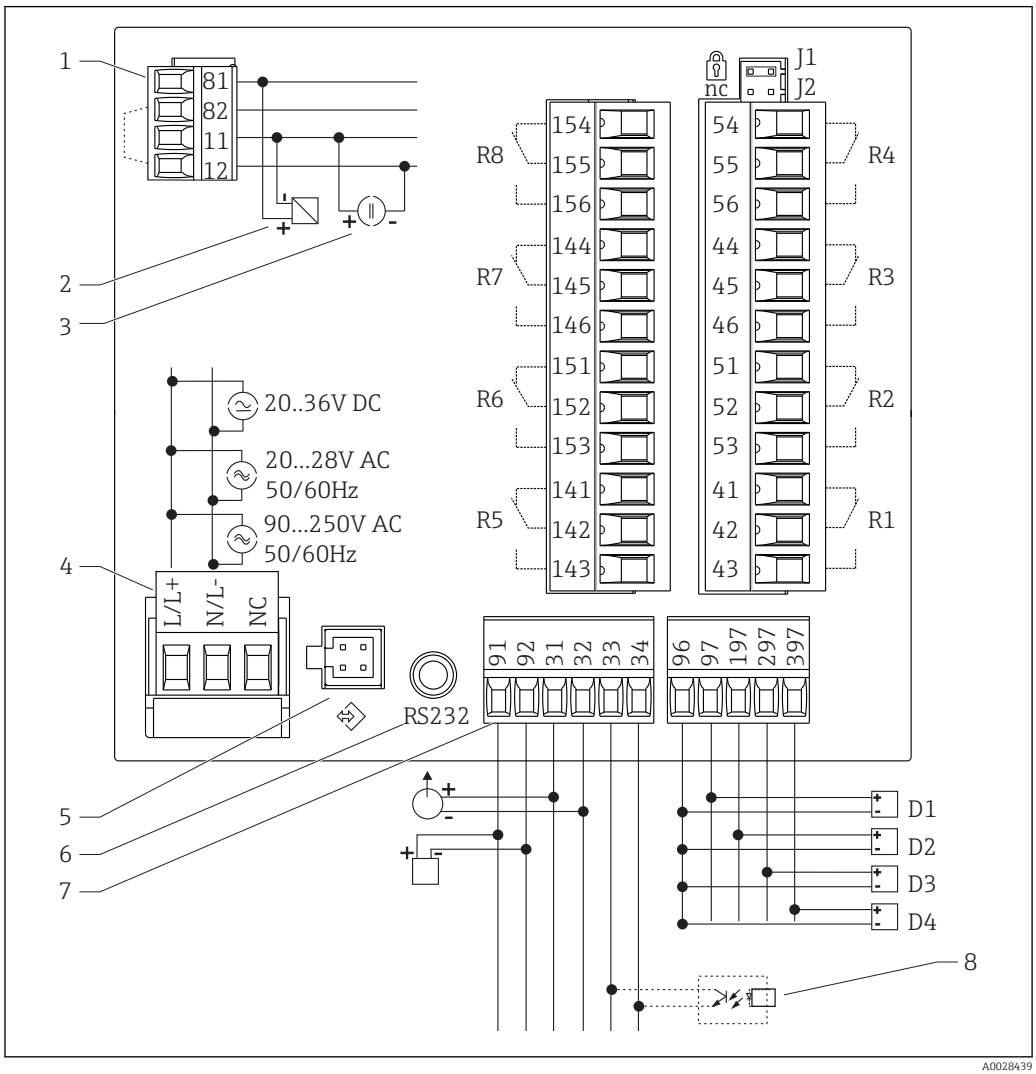
Galvanic isolation:
Towards all other circuits

HART®

HART® signals are not affected

Power supply

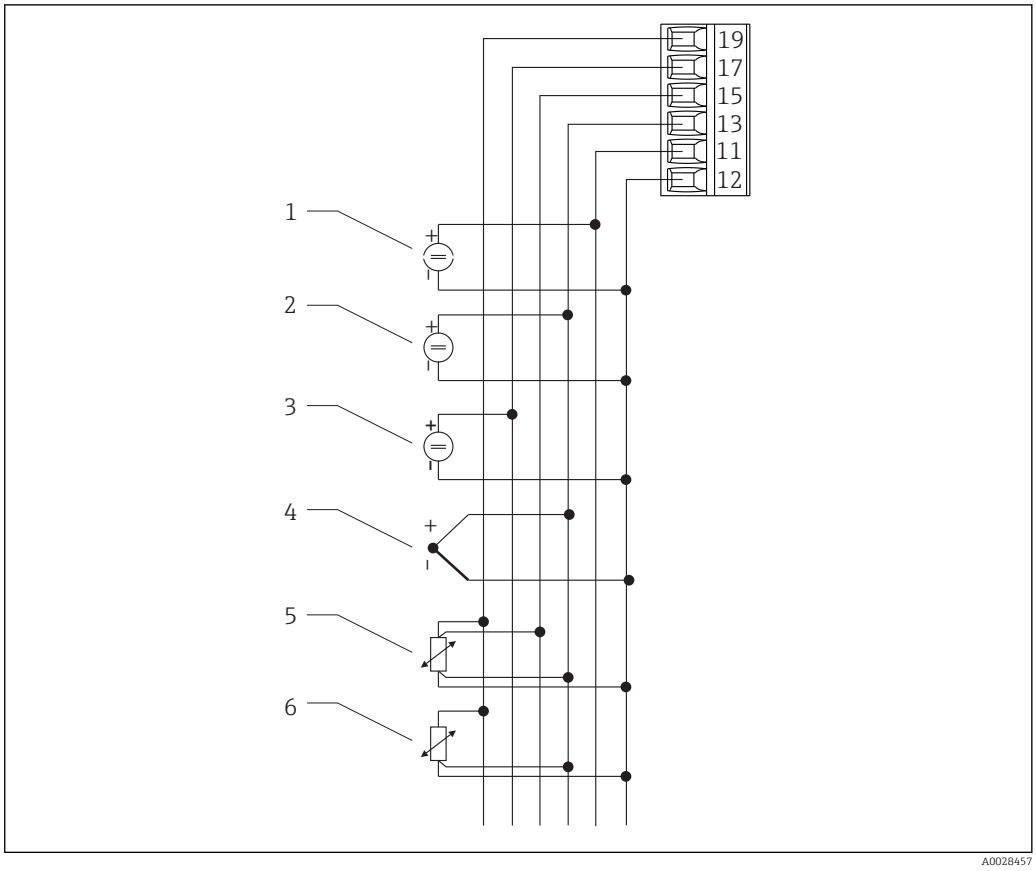
Terminal assignment



2 *Terminal assignment of process indicator*

1	*Current input (12 and 82 jumpered internally)*	*7*	*Transmitter power supply and analog output*
2	*- passive sensor*	*8*	*Open collector output*
3	*- active sensor*	*D1 to D4*	*Digital inputs*
4	*Power supply*	*R1 to R4*	*Relay outputs*
5	*Interface for PC operating software*	*R5 to R8*	*Relay outputs (optional)*
6	*RS232 interface*	*J1*	Hardware write protection

Universal input option



3 Universal input terminal assignment

1 Current input 0/4 to 20 mA
2 Voltage input ±1 V
3 Voltage input ±30 V
4 Thermocouples
5 RTD assembly, 4-wire
6 RTD assembly, 3-wire

Interface connection data

RS232
- Connection: jack socket 3.5 mm, rear of device
- Transmission protocol: ReadWin 2000
- Transmission rate: 38 400 Baud

Supply voltage

- Low voltage power unit 90 to 250 V_{AC} 50/60 Hz
- Extra-low voltage power unit 20 to 36 V_{DC} or 20 to 28 V_{AC} 50/60 Hz
  The device must be powered only by a power unit that operates using a limited energy circuit in accordance with UL/EN/IEC 61010-1, Section 9.4 and the requirements in Table 18.

Power consumption

Power consumption max. 24 VA

Performance characteristics

Reference operating conditions

Power supply: 230 V_{AC} ±10%, 50 Hz ±0.5 Hz

Warm-up period: 90 min

Ambient temperature: 25 °C (77 °F)

Maximum measured error

Current input

Accuracy	0.1% of full scale
Resolution	13 bit
Temperature drift	≤ 0.4%/10 K (18 °F)

Universal input

	Input:	Range:	Maximum measured error of measuring range (oMR):
Accuracy	Current	0 to 20 mA, 0 to 5 mA, 4 to 20 mA; overrange: to 22 mA	±0.10%
	Voltage > 1 V	0 to 10 V, ±10 V, ±30 V	±0.10%
	Voltage ≤ 1 V	±1 V, 0 to 1 V, 0 to 200 mV, 0 to 100 mV, ±150 mV	±0.10%
	Resistance thermometer	Pt100, −200 to 600 °C (−328 to 1 112 °F) (IEC751, JIS1604, GOST) Pt500, −200 to 600 °C (−328 to 1 112 °F) (IEC751, JIS1604) Pt1000, −200 to 600 °C (−328 to 1 112 °F) (IEC751, JIS1604)	4-wire: ± (0.10% oMR + 0.3 K (0.54 °F) 3-wire: ± (0.15% oMR + 0.8 K (1.44 °F))
		Cu100, −200 to 200 °C (−328 to 392 °F) (GOST) Cu50, −200 to 200 °C (−328 to 392 °F) (GOST) Pt50, −200 to 600 °C (−328 to 1 112 °F) (GOST)	4-wire: ± (0.20% oMR + 0.3 K (0.54 °F) 3-wire: ± (0.20% oMR + 0.8 K (1.44 °F))
	Resistance measurement	30 to 3 000 Ω	4-wire: ± (0.20% oMR + 0.3 K (0.54 °F) 3-wire: ± (0.20% oMR + 0.8 K (1.44 °F))
	Thermocouples	Typ J (Fe-CuNi), −210 to 999.9 °C (−346 to 1 382 °F) (IEC584)	± (0.15% oMR + 0.5 K (0.9 °F)) from −100 °C (−148 °F)
		Typ K (NiCr-Ni), −200 to 1 372 °C (−328 to 2 502 °F) (IEC584)	± (0.15% oMR + 0.5 K (0.9 °F)) from −130 °C (−234 °F)
		Typ T (Cu-CuNi), −270 to 400 °C (−454 to 752 °F) (IEC584)	± (0.15% oMR + 0.5 K (0.9 °F)) from −200 °C (−328 °F)
		Typ N (NiCrSi-NiSi), −270 to 1 300 °C (−454 to 2 372 °F) (IEC584)	± (0.15% oMR + 0.5 K (0.9 °F)) from −100 °C (−148 °F)
		Typ B (Pt30Rh-Pt6Rh), 0 to 1 820 °C (32 to 3 308 °F) (IEC584)	± (0.15% oMR + 1.5 K (2.7 °F)) from 600 °C (1 112 °F)
		Typ D (W3Re/W25Re), 0 to 2 315 °C (32 to 4 199 °F) (ASTME998)	± (0.15% oMR + 1.5 K (2.7 °F)) from 500 °C (932 °F)
		Typ C (W5Re/W26Re), 0 to 2 315 °C (32 to 4 199 °F) (ASTME998)	± (0.15% oMR + 1.5 K (2.7 °F)) from 500 °C (932 °F)
		Typ L (Fe-CuNi), −200 to 900 °C (−328 to 1 652 °F) (DIN43710, GOST)	± (0.15% oMR + 0.5 K (0.9 °F)) from −100 °C (−148 °F)
		Typ U (Cu-CuNi), −200 to 600 °C (−328 to 1 112 °F) (DIN43710)	± (0.15% oMR + 0.5 K (0.9 °F)) from −100 °C (−148 °F)
		Typ S (Pt10Rh-Pt), 0 to 1 768 °C (32 to 3 214 °F) (IEC584)	± (0.15% oMR + 3.5 K (6.3 °F)) for 0 to 100 °C (32 to 212 °F) ± (0.15% oMR + 1.5 K (2.7 °F)) for 100 to 1 768 °C (212 to 3 214 °F)
		Typ R (Pt13Rh-Pt), −50 to 1 768 °C (−58 to 3 214 °F) (IEC584)	± (0.15% oMR + 1.5 K (2.7 °F)) for 100 to 1 768 °C (212 to 3 214 °F)
Resolution		16 bit	
Temperature drift		Temperature drift: ≤ 0.1%/10 K (18 °F)	

Current output

Linearity	0.1% of full scale
Resolution	13 bit
Temperature drift	Temperature drift: ≤ 0.1%/10 K (18 °F)
Output Ripple	10 mV at 500 Ω for frequencies ≤ 50 kHz

Voltage output

Linearity	0.1% of full scale
Resolution	13 bit
Temperature drift	Temperature drift: ≤ 0.1%/10 K (18 °F)

Installation

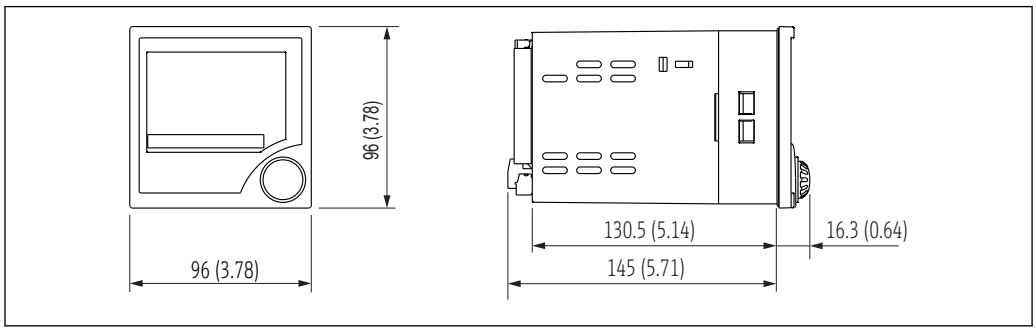
Mounting location	Panel, cut-out 92 x 92 mm (3.62x3.62 in) (see 'Mechanical construction').
Orientation	Horizontal +/- 45° in every direction

Environment

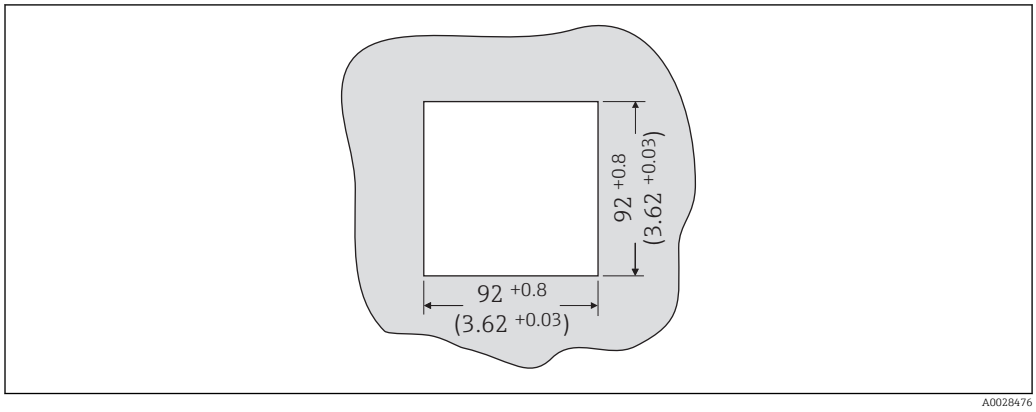
Ambient temperature range	−20 to 60 °C (−4 to 140 °F)
Storage temperature	−30 to 70 °C (−22 to 158 °F)
Operating altitude	< 3 000 m (9 840 ft) over MSL
Climate class	To IEC 60654-1, Class B2
Degree of protection	Front IP 65 / NEMA 4 Device casing IP 20
Shock and vibration resistance	2 Hz (+3/-0) ... 13.2 Hz: ±1 mm (±0.04 in) 13.2 to 100 Hz: 0.7 g
Electromagnetic compatibility (EMC)	**CE compliance** Electromagnetic compatibility in accordance with all the relevant requirements of the IEC/EN 61326 series and NAMUR Recommendation EMC (NE21). For details refer to the EU Declaration of Conformity. Maximum measured error <1% of measuring range. Interference immunity as per IEC/EN 61326 series, industrial requirements. Interference emission as per IEC/EN 61326 series, Class A equipment.
Electrical protection class	IEC 60529 (IP code) / NEMA 250
Condensation	Front: permitted Device casing: not permitted

Mechanical construction

Design, dimensions



4 Dimensions of the process indicator in mm (in)



5 Panel cutout, dimensions in mm (in)

Weight

500 g (17.64 oz)

Materials

- Housing front: ABS plastic
- Housing casing: ABS GF plastic

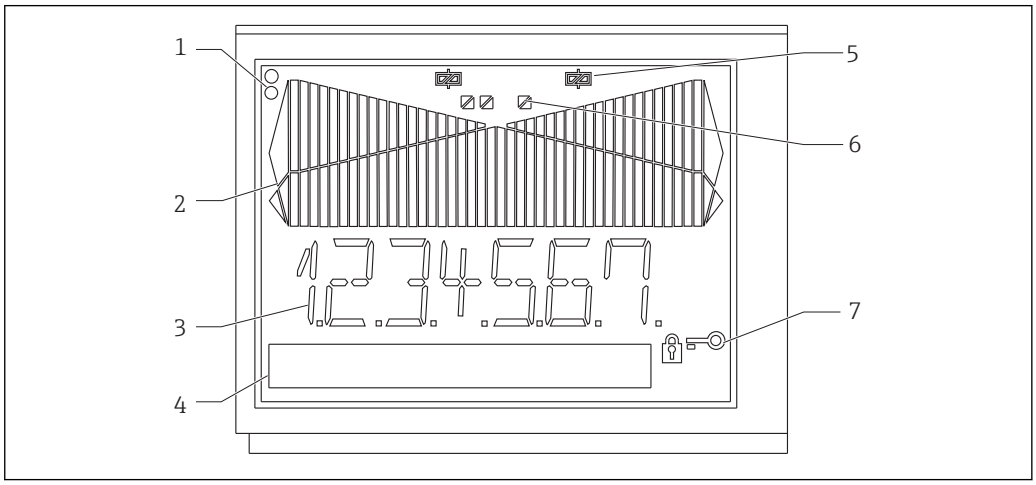
Terminals

Plug-in screw terminals, clamping range 1.5 mm^2 (16 AWG) solid, 1 mm^2 (18 AWG) strand with wire ferrule

Operability

Local operation

Display elements



6 *Display elements of the process indicator*

1 *Device status LEDs: green - device ready for operation; red - device or sensor malfunction*
2 *Bar graph with overrange and underrange*
3 *7-digit 14-segment display*
4 *Unit and text field 9x77 dot matrix*
5 *Relay status indicator: if power is supplied to a relay, the symbol is displayed*
6 *Status indicator for digital inputs*
7 *Symbol for "device operation locked"*

- Display range
  - -99999 to +99999 for measured values
  - 0 to 9999999 for counter values
- Signalization
  - Relay activation
  - Overrange/underrange

Operating elements

Jog/shuttle dial

Remote operation

Configuration

The device can be configured with the ReadWin 2000 PC software.

Interface

CDI interface at device; connection to PC via USB box (see "Accessories")

RS232 interface at device; connection with serial interface cable (see "Accessories")

Certificates and approvals

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.
Ex approval	Information about currently available Ex versions (ATEX, FM, CSA. etc.) can be supplied by your Endress+Hauser sales organization on request. All explosion protection data are given in a separate documentation which is available upon request.
Other standards and guidelines	The manufacturer confirms compliance with all the relevant external standards and guidelines.

Ordering information

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

1. Click Corporate
2. Select the country
3. Click Products
4. Select the product using the filters and search field
5. Open the product page

The Configuration button to the right of the product image opens the Product Configurator.

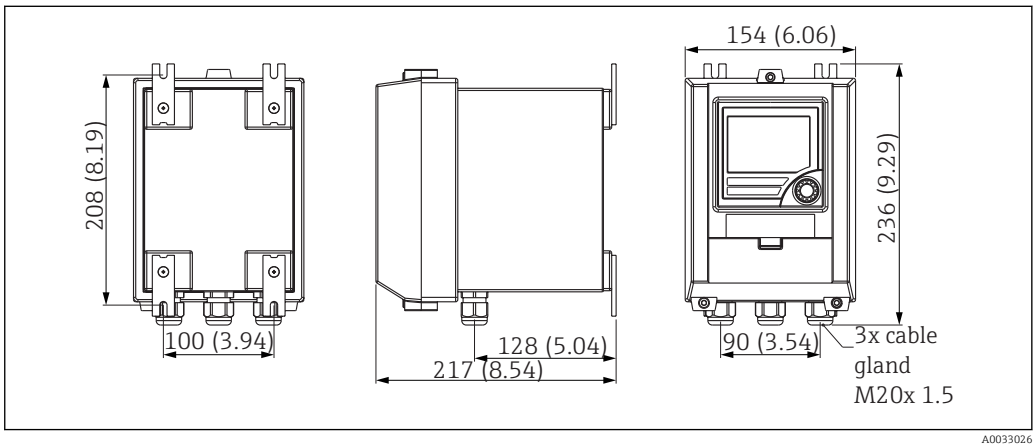
Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation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

Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Device-specific accessories

Designation	Order No.
PC configuration software ReadWin 2000 and serial configuration cable with 3.5 mm jack plug for RS232 port	RIA452A-VK
PC configuration software ReadWin 2000 and serial configuration cable for USB port with CDI connector	TXU10-AA
Field housing in IP65 → 7, 13	51009957
Current simulator active 4-20mA 1-channel, compact housing, 9V block battery	SONDST-S1



7 *Field housing dimensions*

Supplementary documentation

- System components and data manager - solutions to complete your measuring point: FA00016K/09
- Brief Operating Instructions for process indicator RIA452: KA00264R/09
  Operating Instructions for process indicator RIA452: BA00265R/09
- Ex-related additional documentation:
  ATEX II(1)GD: XA00053R/09/a3

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