



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



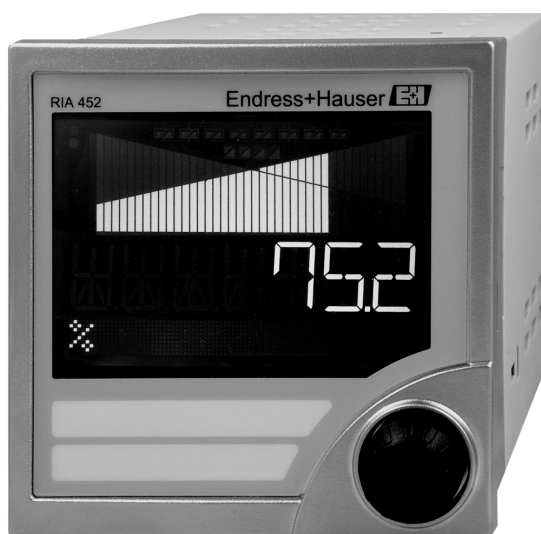
Solutions

Technical Information

RIA452

Process Display Unit

Digital process display unit 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

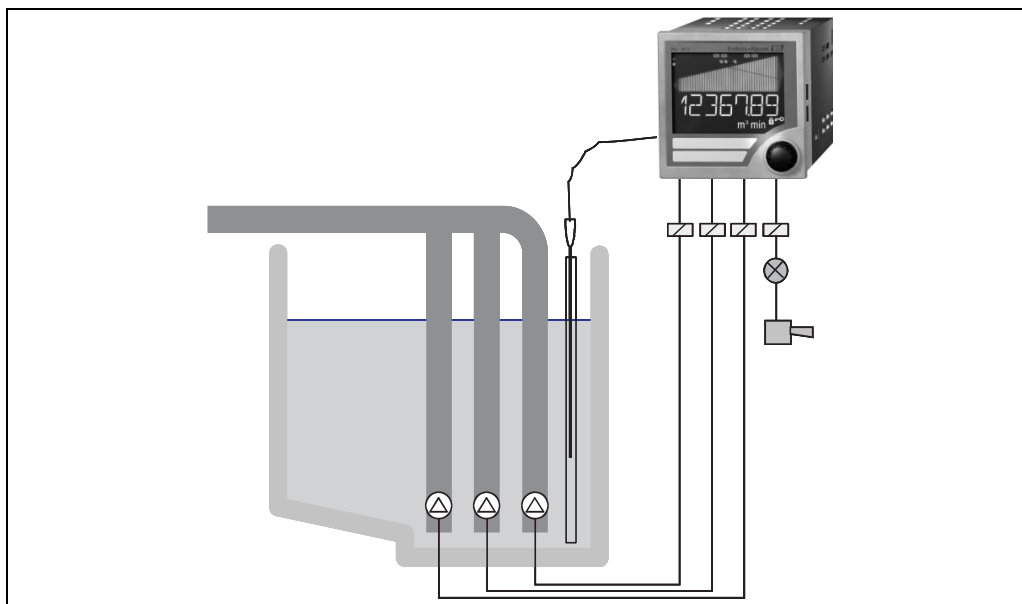
Your benefits

- 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 integration
- Dial operation
- Freely programmable units
- Configuration via interface and operating software ReadWin® 2000
- Tank linearization via ReadWin® 2000



Function and system design

Measuring principle



Example of an application of the process display unit

The single-channel process display unit RIA452 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 underange 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 connected. You have the option of selecting 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 gives the user the option of outputting integrated process values.

Measuring system

Microcontroller controlled display unit in panel mounted housing with multicolored, illuminated LC display. The analog measured value acquisition takes place 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 integrated as standard. The current input is optionally available as an intrinsically safe version for Ex applications. Here, the RIA452 has a second, intrinsically safe transmitter power supply.

The freely scalable analog output is output via a 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 on site, using the jog/shuttle dial or via the PC with the ReadWin® 2000 operating software. Operation can be locked using the hardware key or software code.

Linearization

The following flow curves are stored for open channels and weirs:

- Khafagi-Venturi channel
- ISO-Venturi channel
- BST¹⁾-Venturi channel
- Parshall channel
- Palmer-Bowlus channel
- Rectangular weir
- Rectangular weir with constriction
- NFX²⁾ rectangular weir
- NFX²⁾ rectangular weir with constriction
- Trapezoidal weir
- Triangular ("V") weir
- BST¹⁾ triangular weir
- NFX²⁾

triangular weir

1) BST: British Standard

2) NFX: French Standard NFX 10-311

Flow formula can be freely configured

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

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

Linearization function

Up to 32 freely definable support points are available in the device to linearize 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, resistance thermometer, thermocouples (universal input option)
Measuring ranges	<p>Current input:</p> <ul style="list-style-type: none"> ■ 0/4 to 20 mA +10% overrange, 0 to 5 mA ■ Short-circuit current: max. 150 mA ■ Input impedance: $\leq 5\ \Omega$ ■ Reaction time: $\leq 100\text{ ms}$ <p>Universal input:</p> <p>Current:</p> <ul style="list-style-type: none"> ■ 0/4 to 20 mA +10% overrange, 0 to 5 mA ■ Short-circuit current: max. 100 mA ■ Input impedance: $\leq 50\ \Omega$ <p>Voltage:</p> <ul style="list-style-type: none"> ■ $\pm 150\text{ mV}$, $\pm 1\text{ V}$, $\pm 10\text{ V}$, $\pm 30\text{ V}$, 0 to 100 mV, 0 to 200 mV, 0 to 1 V, 0 to 10 V ■ Input impedance: $\geq 100\text{ k}\Omega$ <p>Resistance:</p> <ul style="list-style-type: none"> ■ 30 to 3,000 Ω in 3/4-wire technology <p>Resistance thermometer:</p> <ul style="list-style-type: none"> ■ Pt100/500/1000, Cu50/100, Pt50 in 3/4-wire technology ■ Measuring current for Pt100/500/1000 = 250 μA <p>Thermocouple types:</p> <ul style="list-style-type: none"> ■ J, K, T, N, B, S, R as per IEC584 ■ D, C as per ASTM E998 ■ U, L as per DIN43710/GOST ■ Reaction time: $\leq 100\text{ ms}$ <p>Digital input:</p> <ul style="list-style-type: none"> ■ 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	<p>Span:</p> <ul style="list-style-type: none"> ■ 0/4 to 20 mA (active), 0 to 10 V (active) <p>Load:</p> <ul style="list-style-type: none"> ■ $\leq 600\ \Omega$ (current output) ■ Max. loop current 22 mA (voltage output) <p>Signal characterization:</p> <ul style="list-style-type: none"> ■ Signal freely scalable <p>Galvanic isolation towards all other circuits</p>

Pulse output (open collector)	<ul style="list-style-type: none">■ Frequency range to 12.5 kHz■ $I_{\max} = 200 \text{ mA}$■ $U_{\max} = 28 \text{ V}$■ $U_{\text{low}/\max} = 2 \text{ V}$ at 200 mA■ Pulse width = 0.04 to 2000 ms
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Relay

Signal characterization:

- 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



Note! Assignment:

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: $24 \text{ V} \pm 15\%$
- Output current: max. 22 mA (at $U_{\text{out}} \geq 16 \text{ V}$, sustained short-circuit proof)
- Impedance: $\leq 345 \Omega$

Approvals:

- ATEX
- FM
- CSA

Transmitter power supply 2, terminal 91/92:

Electrical specifications:

- Output voltage: $24 \text{ V} \pm 15\%$
- Output current: max. 250 mA (sustained short-circuit proof)

Transmitter power supply unit 1 and 2:

Galvanic isolation:

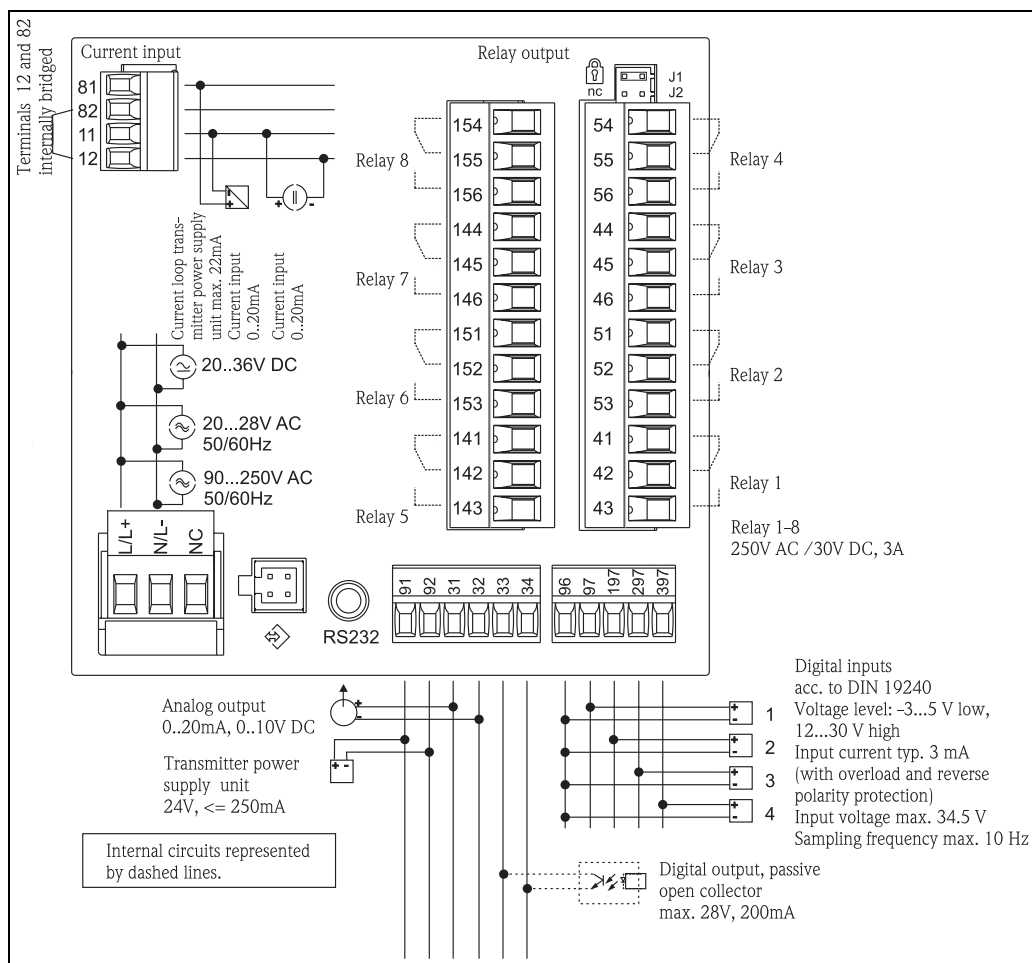
- Towards all other circuits

HART®:

- No HART® signal influence

Power supply

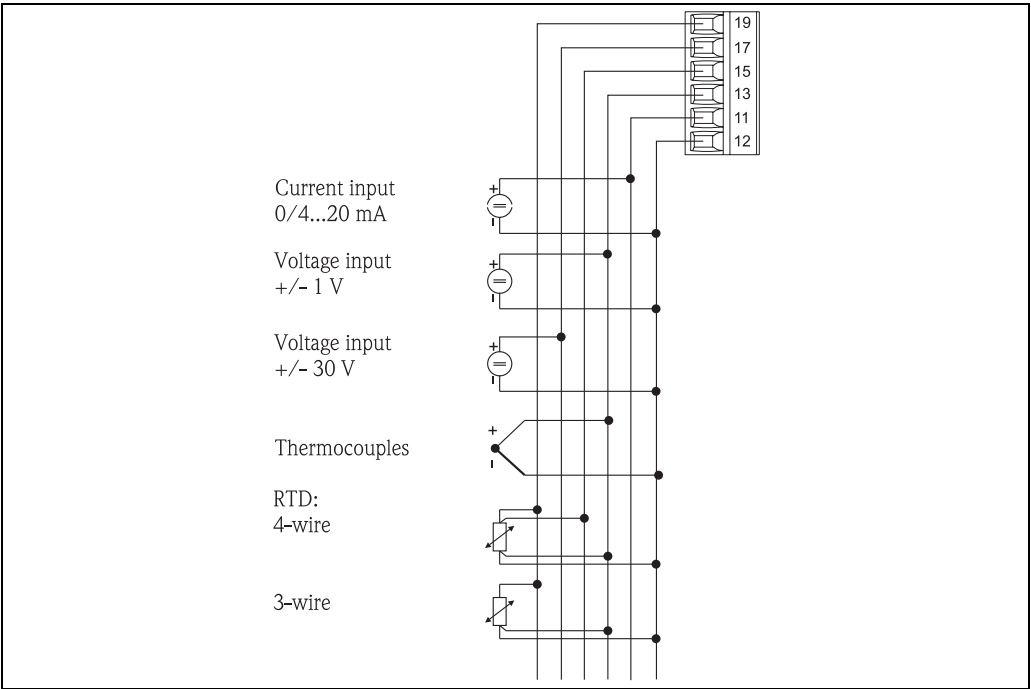
Electrical connection



Terminal assignment of process display unit

Universal input option

The device can be optionally equipped with a universal input instead of a current input.



Universal input terminal assignment

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
Power consumption	Max. 24 VA
Connection data interface	RS232
	■ Connection: jack socket 3.5 mm, rear of device
	■ Transmission protocol: ReadWin® 2000
	■ Transmission rate: 38,400 Baud

Performance characteristics

Reference operating conditions

Power supply: 230 V AC $\pm 10\%$, 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	$\leq 0.4\%/10\text{ K}$ ($\leq 0.4\%/18\text{ °F}$)

Universal input:

Accuracy	Input:	Range:	Maximum measured error of measuring range (oMR):
	Current	0 to 20 mA, 0 to 5 mA, 4 to 20 mA; overrange: to 22 mA	$\pm 0.10\%$
	Voltage > 1 V	0 to 10 V, $\pm 10\text{ V}$, $\pm 30\text{ V}$	$\pm 0.10\%$
	Voltage $\leq 1\text{ V}$	$\pm 1\text{ V}$, 0 to 1 V, 0 to 200 mV, 0 to 100 mV, $\pm 150\text{ mV}$	$\pm 0.10\%$
	Resistance thermometer	Pt100, -200 to 600 °C (-328 to 1112 °F) (IEC751, JIS1604, GOST) Pt500, -200 to 600 °C (-328 to 1112 °F) (IEC751, JIS1604) Pt1000, -200 to 600 °C (-328 to 1112 °F) (IEC751, JIS1604)	4-wire: $\pm (0.10\% \text{ oMR} + 0.3\text{ K } (0.54\text{ °F}))$ 3-wire: $\pm (0.15\% \text{ oMR} + 0.8\text{ K } (1.44\text{ °F}))$
		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 1112 °F) (GOST)	4-wire: $\pm (0.20\% \text{ oMR} + 0.3\text{ K } (0.54\text{ °F}))$ 3-wire: $\pm (0.20\% \text{ oMR} + 0.8\text{ K } (1.44\text{ °F}))$
	Resistance measurement	30 to 3000 Ω	4-wire: $\pm (0.20\% \text{ oMR} + 0.3\text{ K } (0.54\text{ °F}))$ 3-wire: $\pm (0.20\% \text{ oMR} + 0.8\text{ K } (1.44\text{ °F}))$
	Thermocouples	Type J (Fe-CuNi), -210 to 999.9 °C (-346 to 1382 °F) (IEC584)	$\pm (0.15\% \text{ oMR} + 0.5\text{ K } (0.9\text{ °F}))$ as of -100 °C (-148 °F)
		Type K (NiCr-Ni), -200 to 1372 °C (-328 to 2502 °F) (IEC584)	$\pm (0.15\% \text{ oMR} + 0.5\text{ K } (0.9\text{ °F}))$ as of -130 °C (-234 °F)
		Type T (Cu-CuNi), -270 to 400 °C (-454 to 752 °F) (IEC584)	$\pm (0.15\% \text{ oMR} + 0.5\text{ K } (0.9\text{ °F}))$ as of -200 °C (-328 °F)
		Type N (NiCrSi-NiSi), -270 to 1300 °C (-454 to 2372 °F) (IEC584)	$\pm (0.15\% \text{ oMR} + 0.5\text{ K } (0.9\text{ °F}))$ as of -100 °C (-148 °F)
		Type B (Pt30Rh-Pt6Rh), 0 to 1820 °C (32 to 3308 °F) (IEC584)	$\pm (0.15\% \text{ oMR} + 1.5\text{ K } (2.7\text{ °F}))$ as of 600 °C (1112 °F)
		Type D (W3Re/W25Re), 0 to 2315 °C (32 to 4199 °F) (ASTME998)	$\pm (0.15\% \text{ oMR} + 1.5\text{ K } (2.7\text{ °F}))$ as of 500 °C (932 °F)
		Type C (W5Re/W26Re), 0 to 2315 °C (32 to 4199 °F) (ASTME998)	$\pm (0.15\% \text{ oMR} + 1.5\text{ K } (2.7\text{ °F}))$ as of 500 °C (as of 932 °F)
		Type L (Fe-CuNi), -200 to 900 °C (-328 to 1652 °F) (DIN43710, GOST)	$\pm (0.15\% \text{ oMR} + 0.5\text{ K } (0.9\text{ °F}))$ as of -100 °C (-148 °F)
		Type U (Cu-CuNi), -200 to 600 °C (-328 to 1112 °F) (DIN 43710)	$\pm (0.15\% \text{ oMR} + 0.5\text{ K } (0.9\text{ °F}))$ as of -100 °C (-148 °F)
		Type S (Pt10Rh-Pt), 0 to 1768 °C (32 to 3214 °F) (IEC584)	$\pm (0.15\% \text{ oMR} + 3.5\text{ K } (6.3\text{ °F}))$ for 0 to 100 °C (32 to 212 °F) $\pm (0.15\% \text{ oMR} + 1.5\text{ K } (2.7\text{ °F}))$ for 100 to 1768 °C (232 to 3214 °F)
		Type R (Pt13Rh-Pt), -50 to 1768 °C (-58 to 4199 °F) (IEC584)	$\pm (0.15\% \text{ oMR} + 3.5\text{ K } (6.3\text{ °F}))$ for 0 to 100 °C (32 to 212 °F) $\pm (0.15\% \text{ oMR} + 1.5\text{ K } (2.7\text{ °F}))$ for 100 to 1768 °C (232 to 3214 °F)
Resolution	16 bit		
Temperature drift	Temperature drift: $\leq 0.1\%/10\text{ K}$ ($0.1\%/18\text{ °F}$)		

Current output:

Linearity	0.1% of full scale
Resolution	13 bit
Temperature drift	$\leq 0.1\%/10K$ (0.1%/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	$\leq 0.1\%/10K$ (0.1%/18 °F)

Installation

Installation instructions**Mounting location**

Panel, cutout 92 x 92 mm (3.62x3.62 inch) (see 'Mechanical construction').

Orientation

Horizontal $\pm 45^\circ$ 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 height < 3000 m above MSL (9800 ft)

Climate class As per IEC 60654-1, Class B2

Degree of protection Front IP 65 / NEMA 4
Device casing IP 20

Condensation Front: permitted
Device casing: not permitted

Shock and vibration resistance 2(+3/-0) Hz - 13.2 Hz: ± 1.0 mm
13.2 Hz - 100 Hz: 0.7 g

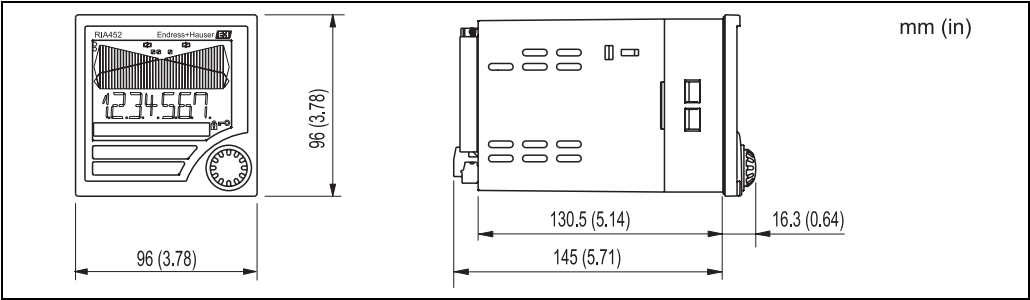
Electromagnetic compatibility (EMC)

- Interference immunity:
To IEC 61326 industrial environments / NAMUR NE 21
- Interference emissions:
To IEC 61326 Class A

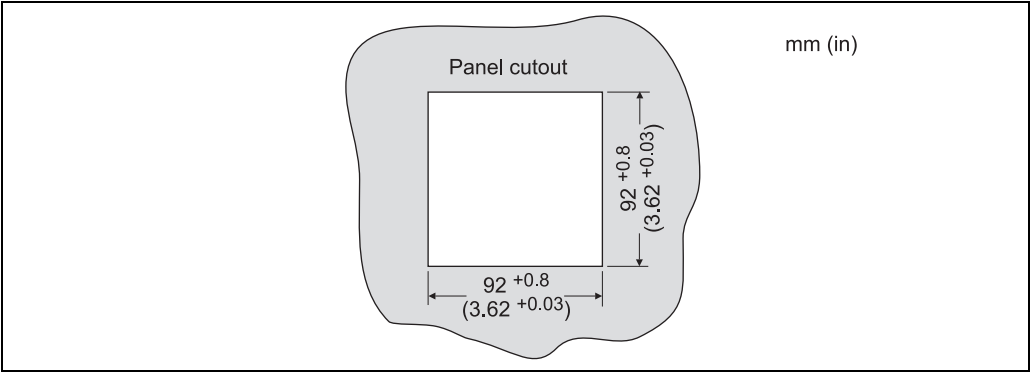
Electrical protection class IEC 60529 (IP code) / NEMA 250

Mechanical construction

Design, dimensions



Dimensions of RIA452

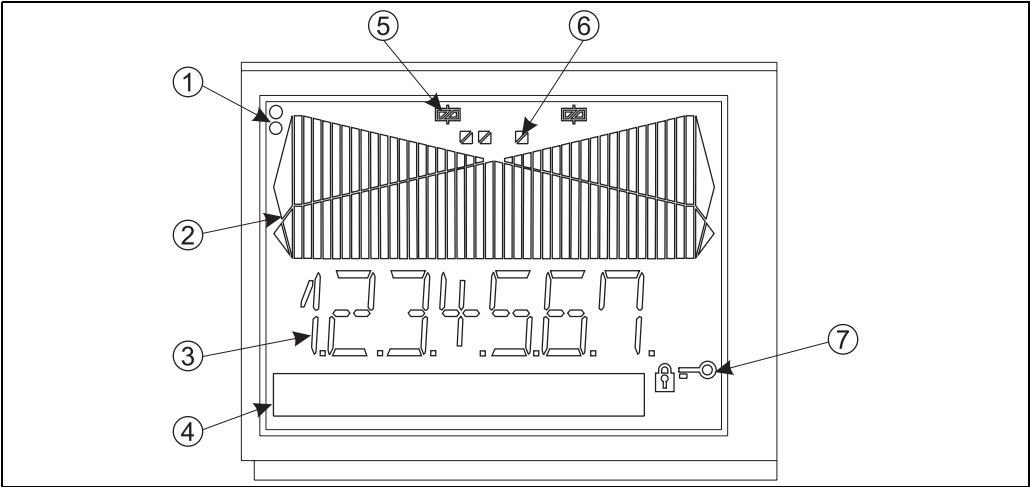


Panel cutout

Weight	Approx. 500 g (17.64 oz)
Material	<ul style="list-style-type: none">■ Housing front: ABS plastic, galvanized■ Housing casing: plastic PC10GF
Terminals	Pluggable screw terminals, core size 1.5 mm ² (16 AWG) solid, 1.0 mm ² (18 AWG) strand with wire ferrule

Human interface

Display elements



LC display of process display unit

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

- Display range
 - 99999 to +99999
- Signaling
 - Relay activation
 - Measuring range overshoot/undershoot

Operating elements

Jog/shuttle dial

Remote operation

Configuration

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

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 device meets the legal requirements of the EU directives. Endress+Hauser confirms that the device has been tested successfully by affixing the CE mark.
Ex approval	Information about currently available Ex versions (ATEX, FM, CSA, etc.) can be supplied by your E+H Sales Center on request. All explosion protection data are given in a separate documentation which is available upon request.
Other standards and guidelines	<ul style="list-style-type: none"> ■ IEC 60529: Degrees of protection by housing (IP code) ■ IEC 61010-1: Protection measures for electrical equipment for measurement, control, regulation and laboratory procedures ■ CSA 1010.1 Safety requirements for electrical equipment for measurement, control, and laboratory use - General requirements ■ FM 3610 Intrinsically safe apparatus and associated apparatus for use in class 1, 2 and 3, division 1 hazardous (classified) locations ■ CSA C22.2.157 Intrinsically safe & non-incendive equipment for use in hazardous locations ■ CSA E79-11 Electrical apparatus for explosive gas atmospheres - intrinsic safety "i" ■ EN 50020 Electrical apparatus for hazardous areas - intrinsic safety "I"

Ordering information

Product structure

RIA452	1 channel, scalable Panel mounting 96x96mm MUS = transmitter power supply, bar graph 7-digit display RS232 interface Min/Max value memory Jog/shuttle operation, 4 digital inputs UL listed, marine approval GL, CSA-GP Pump control functions									
Approval										
A	Non-hazardous area									
B	ATEX II(1)GD(EEx ia)IIC									
C	FM AIS I,II,III/1/ABCDEFG									
D	CSA (Ex ia) I,II,III/1/ABCDEFG									
E	TIIIS (Ex ia) IIC									
Power supply										
1	90-250 V AC 50/60 Hz									
2	20-36 V DC, 20-28 V AC									
Measuring signal										
1	0/4-20 mA									
2	Multifunct. U, I, R, RTD, TC									
Output										
1	4x relay SPDT limit value									
2	4x relay SPDT limit value + 1x analog U, I									
3	8x relay SPDT limit value + 1x pulse + integration + linearization for open channel									
4	8x relay SPDT limit value + 1x analog + 1x pulse + integration + linearization for open channel									
5	4x relay SPDT limit value + 1x pulse + integration + integration + linearization for open channel									
Communication										
A	Standard									
B	Standard + Readwin + RS232 cable									
Housing										
1	96x96 panel mounting, front IP65									
2	Field, IP65/NEMA 4x, 204x155x215mm (8.03x6.10x8.46 inches)									
Additional fittings										
1	Basic version									
2	Factory calib. certificate, 5-point									
Version										
A	Standard version (de, en, fr)									
J	Standard version, Japan									
K	Standard version, North American region									
S	Standard model, China									
RIA452-										⇐ Order code

Accessories

ReadWin® 2000 PC operating software

Field housing IP 65
Order No. 51009957

Interface cable

Order No.	Name
RIA452A-VK	ReadWin® 2000 PC configuration software and serial cable with jack connector 3.5 mm for RS232 port.
RIA452A-VM	RS232 cable, North American region, Readwin® 2000 software
TXU10A-xx	ReadWin® 2000 PC configuration software and serial cable for USB port with TDL connector.

Documentation

- System components - field and panel installation display unit, energy manager, active barrier, process transmitter and overvoltage protection: FA016K/09
- Operating Instructions for 'process display unit RIA452': BA242R/09
- Supplementary Ex documentation:
ATEX II(1)GD: XA053R/09/a3

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