Fundamental Selection product catalogue 2021

Easy to select, install and maintain

Endress+Hauser

People for Process Automation

FLEX Selections - Flexible answers to individual needs

Simplify your product selection with our FLEX portfolio structure

Xpert Selection	Master your most challenging applications	▪ Specialized products ▪ Designed for demanding applications	F L E **X**
Extended Selection	Optimize your processes with innovative technologies	▪ High-end products ▪ Highly functional and convenient	F L **E** X
Lean Selection	Handle your core processes easily	▪ Standard products ▪ Reliable, robust and low-maintenance	F **L** E X
Fundamental Selection	Meet your basic measurement needs	▪ Simple products ▪ Easy to select, install and operate	**F** L E X

Selecting the right products for your application can be a challenge for several reasons: 1) the instrument has to fit the process 2) sensors with unnecessary functions should be avoided 3) time is usually of the essence. In line with our brand motto, our goal is to provide you the best possible support. With these things in mind, we are introducing our new FLEX structure, which separates our extensive portfolio into four distinct segments based on your needs.

FLEX: Fundamental - Lean - Extended - Xpert

The basic idea of the FLEX structure is that depending on the application, there are different goals to achieve and different challenges to overcome. Some processes you must just monitor, others you want to optimize. Here is a overview of our selections:

- Fundamental: Meet your basic measurement needs
- Lean: Handle your core processes easily
- Extended: Optimize your processes with innovative technologies
- Xpert: Master your most challenging applications

How to make the best use of FLEX Selections

The FLEX structure is organized within the product section on our website in various ways. First, products can be filtered according to the four selections. Filters can also be combined, so you can easily compare Fundamental and Extended products as an example. Every product now has a FLEX indicator that shows to which selection it belongs, all according to the product's key features.

Benefits

- Easy to understand
- Logical structure based on user needs
- Filter function on the website

Fundamental Selection

Meet your basic measurement needs

Every plant, regardless of the industry, has measuring points that are not part of the core processes. But they still have to be measured reliably. This could include applications such as water, coolants or gases. While choosing the right instrument is essential, you have little time to spend on the selection process. And installation and maintenance should not use up a lot of your resources.

Benefits

- Simple products
- Easy to select, install and operate

Fundamental Selection products are deliberately simple, meaning the number of variants are kept to a minimum. That makes selection easy. Compared to the other selections, there are also fewer features and options. Installation, maintenance and handling is thus considerably easier.

Proven quality

Simplicity does not translate to lower product quality however. We rely on the same quality components as we do for other products. We also employ the same technologies that we have developed over the last 60+ years together with customers from various industries.

Complete your measuring points

As a full-range supplier Endress+Hauser not only offers products for different parameters with different technologies but also system products like data mangers, power supplies, transmitter and indicators. Although they are not all part of the Fundamental Selection we decided to include them in here, as they can help you to close your measuring loops and they give you a glimpse into the rest of our portfolio that you can explore on our website endress.com.

Personal and digital: My Endress+Hauser

The benefits of having a My Endress+Hauser account

Your personalized section lets you easily conduct operations within a few minutes. In the office, in the field, on the go.

Complementing the support offered by our sales engineers, your personalized section on our website lets you easily conduct operations within a few minutes. Survey your transactions, buy products, order spare parts, download documentation, and get access to your contacts – in the office, in the field, on the go.

The new e-commerce functionalities on our homepage transform endress.com into a smart and powerful cooperation platform that connects us and accompanies the support offered by our sales engineers. From there, you can access your personalized section and conduct operations, without any effort, in no time.

Get startet now

Prices

Get your prices fast and transparent

Online Transactions

Send RFQs, view, order and track your quotes and orders

Spare parts

Easily order spare parts or replace your devices

Documentation

Easily access technical information such as manuals or CAD drawings

Standards

Save and organize your favorite products with your own reference numbers

Contact

Get in touch with your local sales contacts whenever you need personal support

New products in the Fundamental Selection

Waterpilot FMX11

Hydrostatic level measurement
- Easy and quick to install and commission
- Flexible uses in fresh water applications thanks to the very compact design and materials that are suitable for drinking water

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RN22

Active barrier or signal doubler, HART-transparent
- I/O, 4-20 mA, active or passive
- Connection lugs integrated on front for HART® communicators
- Simple and quick wiring with plug-in terminals, optional power supply via DIN rail bus connector

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RLN22

NAMUR isolating amplifier
- Compact housing width: 12.5 mm (0.49 in)
- Installation in Ex zone 2 permitted in the option with Ex approval
- Optional with power supply and error message via DIN rail bus connector

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RNO22

Output isolating amplifier, HART-transparent
- Simple and quick wiring with plug-in terminals, optional power supply via DIN rail bus connector
- Compact housing width: 12.5 mm (0.49 in)
- High transmission accuracy, line break and short-circuit monitoringy

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RLN42

NAMUR isolating amplifier
- Wide range power supply of 19.2 to 253 VAC/DC
- Compact housing width: 17.5 mm (0.69 in)
- Installation in Ex zone 2 permitted in the option with Ex approval

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Level

Pressure

Flow

Temperature

Registration

Components

Point level switch for liquids

Liquiphant FTL31

- Robust stainless steel housing (316L)
- External function test with test magnet
- Onsite function check possible thanks to LED display

Specs at a glance:

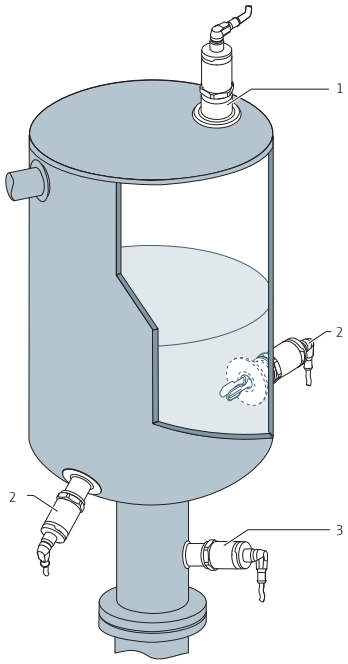
- **Product:**
  Liquids
- **Mounting:**
  Vessels and pipes from DN50
- **Product density:**
  >0.7 g/cm³
  (>0.5 g/cm³ as option)
- **Product temperature:**
  –40 to +100 °C (–40 to +212 °F)/
  +150 °C (+302 °F)
- **Product viscosity:**
  ≤10 000 mm²/s (cSt)
- **Process pressure:**
  Max. 40 bar (580 psi)

Complete product information:
www.endress.com/ftl31

Application The Liquiphant FTL31 is a point level switch for liquids and is used in tanks, vessels and pipes. It is used for overfill prevention or pump protection in cleaning and filter systems as well as in cooling and lubrication vessels, for instance. Ideal for applications in which float switches or conductive, capacitance and optical sensors have been used up to now. The Liquiphant FTL31 also works in areas where these measuring principles are not suitable due to conductivity, buildup, turbulence, flow conditions or air bubbles.

Function A piezoelectric drive causes the tuning fork of the Liquiphant FTL31 to vibrate at its resonance frequency. When the tuning fork is immersed in a liquid, its intrinsic frequency changes due to the change in density of the surrounding medium. The electronics system in the point level switch monitors the resonance frequency and indicates whether the tuning fork is vibrating in air or is covered by liquid. A signal is output via the DC-PNP, AC/DC or IO-Link electrical connection.

Application example



The point level switch can be installed in any position in a vessel, pipe or tank, e.g., as overfill prevention or upper level detection (1), lower level detection (2) or dry running protection for pumps (3)

Technical data

DC-PNP version	
Supply voltage	10 to 30 V DC, 3-wire
Switching capacity	200 mA
Current consumption	<15 mA
Electrical connection	M12 connector, valve plug, cable

AC/DC version	
Supply voltage	20 to 253 V AC/DC, 2-wire
Switching capacity	250 mA
Current consumption	<3.8 mA (in cut-off torque <1 mA for 100 ms)
Electrical connection	Valve plug, cable

IO-Link version	
Supply voltage	18 to 30 V DC, 4-wire
Switching capacity	105 mA (2 × PNP), 200 mA (1 × PNP)
Current consumption	>15 mA
Electrical connection	M12 connector

Output general	
Switching delay	– 0.5 s when tuning fork is covered – 1.0 s when tuning fork is uncovered – IO-Link from 0.3 to 60 s
Hysteresis	max. 3 mm (0.12 in)
Process connections	Thread ISO 228 G½"; G¾"; G1"; Thread ISO 228 G¾" and G1" for flush-mounted installation in weld-in adapter; Thread ASME MNPT½"; ¾"; 1"; EN10226 R½"; R¾"; R1"

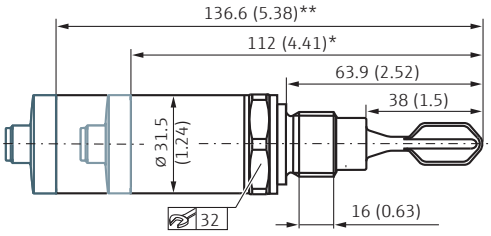
Operating conditions	
Orientation	As required
Switch point	Vertical installation: 13 mm (0.51 in)±1 mm horizontal installation: 10.5 mm (0.4) (water +25 °C (+77 °F), 1 bar (14.5 psi))
Surface roughness	metallic surface in contact with process: R_a ≤3.2 µm (126 µin)
Ambient temperature	–40 to +70 °C (–40 to +158 °F)
Process temperature	–40 to +100 °C (–40 to +212 °F), optionally to 150 °C (to +302 °F)
Process pressure	–1 to +40 bar (–14.5 to +580 psi)
Storage temperature	–40 to +85 °C (–40 to +185 °F)
Climate class	DIN EN 60068-2-38/IEC 68-2-38: test Z/AD
Density	>0.7 g/cm³ (optionally available: >0.5 g/cm³)
Viscosity	1 to 10 000 mPa·s, dynamic viscosity
Degree of protection	IP65/67 NEMA Type 4X Enclosure (M12 connector); IP65 NEMA Type 4X Enclosure (valve plug); IP66/68 NEMA Type 4X/6P Enclosure (cable)
Electromagnetic compatibility	Electromagnetic compatibility in accordance with all relevant requirements of the EN 61326 series and NAMUR recommendation EMC (NE21). For details, refer to the EC Declaration of Conformity.

Approvals	
WHG	Overfill detection system: Z-65.11-531 Leak detection system: Z-65.40-532; Not available for IO-Link

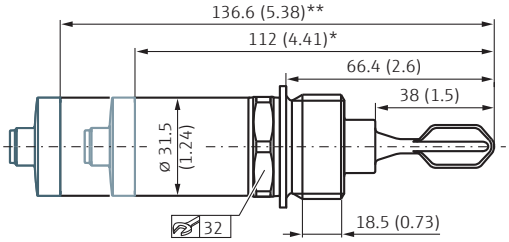
Dimensions in mm (inches)

Compact version

Thread ISO 228 G½"; G¾"

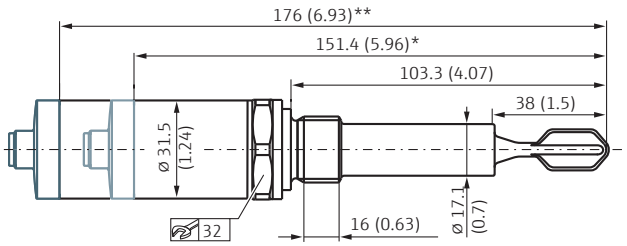


Thread ISO 228 G1"

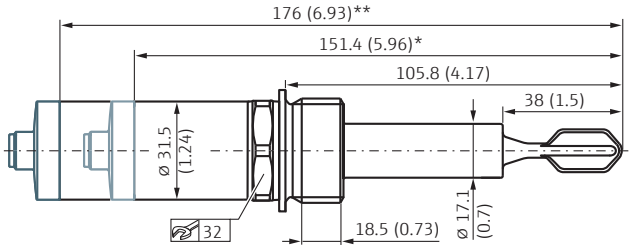


Short tube version

Thread ISO 228 G½"; G¾"



Thread ISO 228 G1"



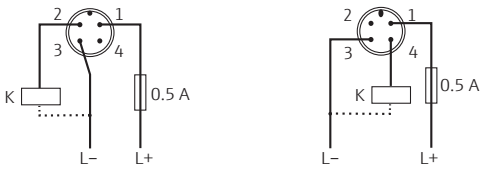
* Dimension for process temperature max. 100 °C (212 °F)
** Dimension for process temperature max. 150 °C (302 °F)

Installation according to instruction manual.

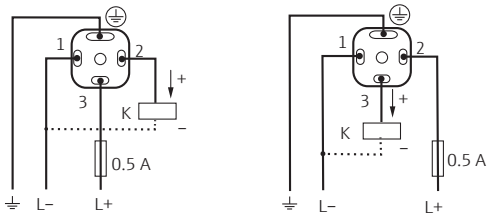
Electrical connection

Electronic version 3-wire DCPNP

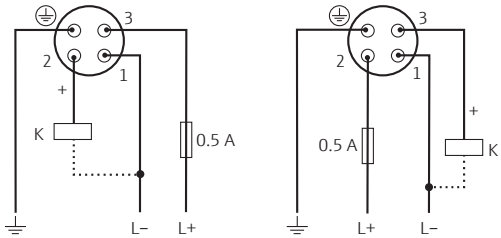
M12 connector MAX MIN



Valve plug MAX MIN



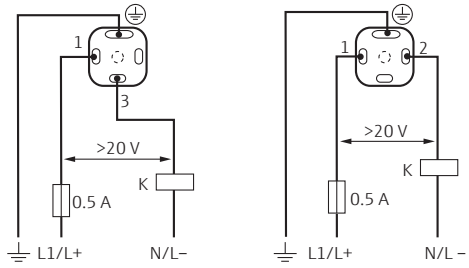
Cable MAX MIN



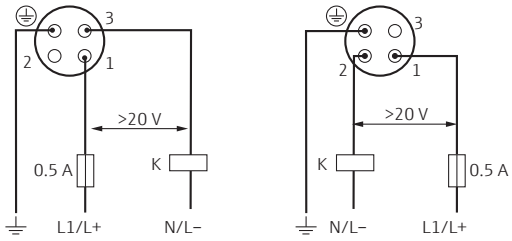
Pin 1 Supply voltage +
Pin 2 1st switch output
Pin 3 Supply voltage –

Electronic version 2-wire AC/DC

Valve plug MAX MIN

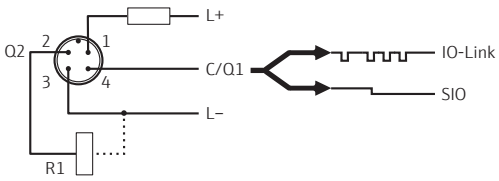


Cable MAX MIN



Pin1 Supply voltage +
Pin 2 Switch output min/Supply voltage –
Pin 3 Switch output max/Supply voltage –

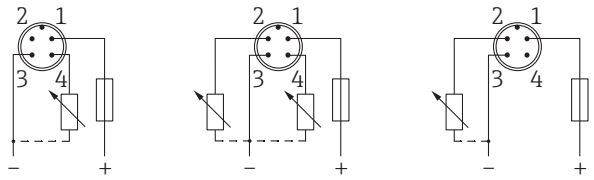
IO-Link with one switch output



Pin 1 Supply voltage +
Pin 2 1st switch output
Pin 3 Supply voltage –
Pin 4 IO-Link communication or 2nd switch output (SIO mode)

Terminal assignment

Minimum safety | **Connection for function monitoring using XOR operation** | **Maximum safety**



Order codes

Electrical connection

Code	Connector
4M	10 to 30 V DC; 3-wire PNP, M12 connector (IP65/67)
4U	10 to 30 V DC; 3-wire PNP, Valve plug ISO 4400 M16 (IP65)
4V	10 to 30 V DC; 3-wire PNP, Valve plug ISO 4400 NPT½ (IP65)
7M	DC-PNP, IO-Link; 4-wire, M12 connector (IP65/67)

Liquiphant FTL31 (DC PNP/IO-Link)

Fork design	Process temperature	Process connection	Order no.
Compact version	max. 100 °C	ISO 228 G½	FTL31-AA□2AAWBJ
		ISO 228 G¾	FTL31-AA□2AAWCJ
		ISO 228 G¾, flush-mounted*	FTL31-AA□2AAW5J
		ISO 228 G1	FTL31-AA□2AAWDJ
		ISO 228 G1, flush-mounted*	FTL31-AA□2AAWSJ
	max. 150 °C	ISO 228 G½	FTL31-AA□3AAWBJ
		ISO 228 G¾	FTL31-AA□3AAWCJ
		ISO 228 G¾, flush-mounted*	FTL31-AA□3AAW5J
		ISO 228 G1	FTL31-AA□3AAWDJ
		ISO 228 G1, flush-mounted*	FTL31-AA□3AAWSJ
Short tube version	max. 100 °C	ISO 228 G½	FTL31-AA□2BAWBJ
		ISO 228 G¾	FTL31-AA□2BAWCJ
		ISO 228 G1	FTL31-AA□2BAWDJ
		ISO 228 G1, flush-mounted*	FTL31-AA□2BAWSJ
	max. 150 °C	ISO 228 G½	FTL31-AA□3BAWBJ
		ISO 228 G¾	FTL31-AA□3BAWCJ
		ISO 228 G1	FTL31-AA□3BAWDJ
		ISO 228 G1, flush-mounted*	FTL31-AA□3BAWSJ

Electrical connection

Code	Connector
U	Valve plug ISO 4400 M16 (IP65)
V	Valve plug ISO 4400 NPT½ (IP65)

Liquiphant FTL31 (20 to 253 V AC/DC)

Fork design	Process temperature	Process connection	Order no.
Compact version	max. 100 °C	ISO 228 G½	FTL31-AA1□2AAWBJ
		ISO 228 G¾	FTL31-AA1□2AAWCJ
		ISO 228 G¾, flush-mounted*	FTL31-AA1□2AAW5J
		ISO 228 G1	FTL31-AA1□2AAWDJ
		ISO 228 G1, flush-mounted*	FTL31-AA1□2AAWSJ
	max. 150 °C	ISO 228 G½	FTL31-AA1□3AAWBJ
		ISO 228 G¾	FTL31-AA1□3AAWCJ
		ISO 228 G¾, flush-mounted*	FTL31-AA1□3AAW5J
		ISO 228 G1	FTL31-AA1□3AAWDJ
		ISO 228 G1, flush-mounted*	FTL31-AA1□3AAWSJ
Short tube version	max. 100 °C	ISO 228 G½	FTL31-AA1□2BAWBJ
		ISO 228 G¾	FTL31-AA1□2BAWCJ
		ISO 228 G1	FTL31-AA1□2BAWDJ
		ISO 228 G1, flush-mounted*	FTL31-AA1□2BAWSJ
	max. 150 °C	ISO 228 G½	FTL31-AA1□3BAWBJ
		ISO 228 G¾	FTL31-AA1□3BAWCJ
		ISO 228 G1	FTL31-AA1□3BAWDJ
		ISO 228 G1, flush-mounted*	FTL31-AA1□3BAWSJ

* for installation in weld-in adapter

Accessories	Order no.
Weld-in adapter G¾. d=50. 316L	71258355
Weld-in adapter G¾. d=29. 316L	71258357
Weld-in adapter G1. d=60. 316L	52001051
Weld-in adapter G1. d=53. 316L	71258358
5 m cable with M12×1 plug	52010285
Straight plug. without cable (self wired)	52006263
Test magnet	71267011

Complete product information:
www.endress.com/ftl31

More products to complete your measuring point ...

Capacitive probe
Liquicap T FMI21
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Pressure switch
Ceraphant PTC31B
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Data manager
Ecograph T RSG35
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Hygienic point level switch for liquids

Liquiphant FTL33

IO-Link

Complete product information:
www.endress.com/ftl33

- 3-A and EHEDG certificates
- Robust stainless steel housing, optionally available with M12×1 connector with IP69 protection
- External function test with test magnet

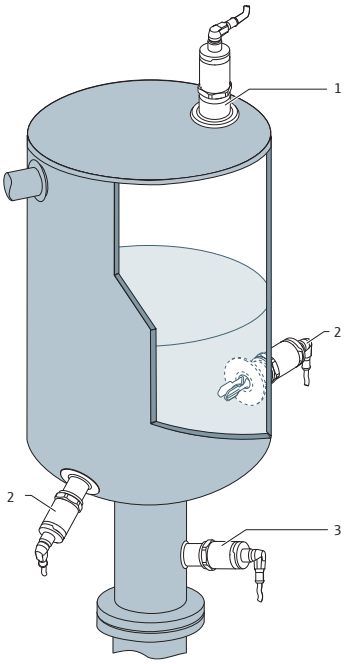
Specs at a glance:

- **Product:**
  Liquids
- **Mounting:**
  Vessels and pipes from DN50
- **Product density:**
  >0.7 g/cm³ (opt. >0.5 g/cm³)
- **Product temperature:**
  –40 to +100 °C/+150 °C
  (–40 to +212 °F/+302 °F)
- **Viscosity:**
  to 10 000 mm²/s (cSt)
- **Process pressure:**
  Max. 40 bar (580 psi)

Application The Liquiphant FTL33 is a point level switch for universal use in all liquids. It is used preferably in storage tanks, mixing vessels and pipes, where the internal and external hygiene requirements are particularly stringent. The reliable switching function works independently from product characteristics such as conductivity and dielectric constant value.

Function A piezoelectric drive causes the tuning fork of the Liquiphant FTL33 to vibrate at its resonance frequency. When the tuning fork is immersed in a liquid, its intrinsic frequency changes due to the change in density of the surrounding medium. The electronics system in the point level switch monitors the resonance frequency and indicates whether the tuning fork is vibrating in air or is covered by liquid. A signal is output via the DC-PNP, AC/DC or IO-Link electrical connection.

Application example



The point level switch can be installed in any position in a vessel, pipe or tank, e.g., as overfill prevention or upper level detection (1), lower level detection (2) or dry running protection for pumps (3)

Technical data

DC-PNP version	
Supply voltage	10 to 30 V DC, 3-wire
Switching capacity	200 mA
Current consumption	<15 mA
Electrical connection	M12 connector, valve plug, cable

AC/DC version	
Supply voltage	20 to 253 V AC/DC, 2-wire
Switching capacity	250 mA
Current consumption	<3.8 mA (in cut-off torque <1 mA for 100 ms)
Electrical connection	Valve plug, cable

IO-Link version	
Supply voltage	18 to 30 V DC, 4-wire
Switching capacity	105 mA (2 × PNP), 200 mA (1 × PNP)
Current consumption	>15 mA
Electrical connection	M12 connector

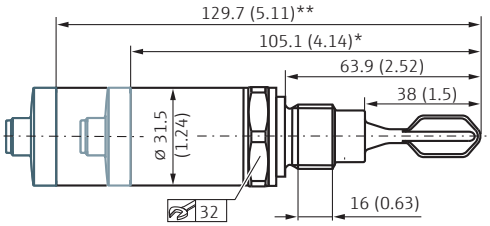
Output general	
Switching delay	– 0.5 s when tuning fork is covered – 1.0 s when tuning fork is uncovered – IO-Link from 0.3 to 60 s
Hysteresis	max. 3 mm (0.12 in)
Process connections	Thread ISO 228 G½"; Thread ISO 228 G¾" and G1" for flush-mounted installation in weld-in adapter; Thread ASME MNPT½"; ¾"; 1"; Thread M24×1,5 for flush-mounted installation in weld-in adapter or process adapter; DIN11851 DN25 PN40 (dairy pipe); DIN11851 DN32 PN40 (dairy pipe); DIN11851 DN40 PN40 (dairy pipe); Tri-Clamp ISO2852 DN25-38 (1 to 1½"); Tri-Clamp ISO2852 DN40-51 (2"); Flush-mounting in weld-in adapter RD52, tuning fork can be aligned

Operating conditions	
Orientation	As required
Switch point	Vertical orientation: 13 mm (0.5) horizontal orientation: 10.5 mm (0.4) (water +25 °C (+77 °F), 1 bar (14.5 psi))
Surface roughness	metallic surface in contact with process: R_a ≤1.5 µm (59 µin), EHEDG R_a ≤0.76 µm (30 µin), EHEDG, 3-A
Ambient temperature	–40 to +70 °C (–40 to +158 °F)
Process temperature	–40 to +100 °C (–40 to +212 °F), optionally to +150 °C (to +302 °F)
Process pressure	–1 to +40 bar (–14.5 to +580 psi)
Storage temperature	–40 to +85 °C (–40 to +185 °F)
Climate class	DIN EN 60068-2-38/IEC 68-2-38: test Z/AD
Density	>0.7 g/cm³ (optionally: >0.5 g/cm³)
Viscosity	1 to 10 000 mPa·s, dynamic viscosity
Degree of protection	IP65/67 NEMA Type 4X Enclosure (M12 connector) IP66/68/69 NEMA Type 4X/6P Enclosure (M12 connector for metal housing cover); IP65 NEMA Type 4X Enclosure (valve plug); IP66/68 NEMA Type 4X/6P Enclosure (cable)
Electromagnetic compatibility	Electromagnetic compatibility in accordance with all relevant requirements of the EN 61326 series and NAMUR recommendation EMC (NE21). For details, refer to the EC Declaration of Conformity

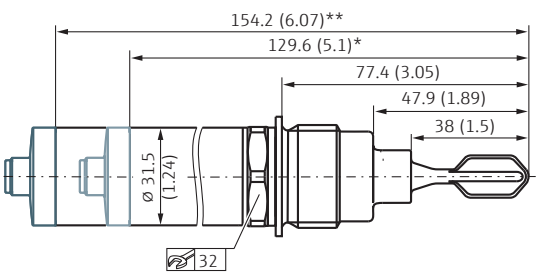
Approvals	
WHG	Overfill detection system: Z-65.11-531 Leak detection system: Z-65.40-532; Not available for IO-Link
3-A, EHEDG	depending on selected product configuration
EAC mark	
RCM-Tick marking	

Dimensions in mm (inches)

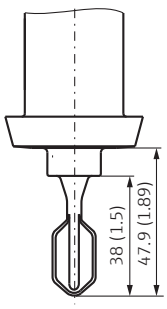
Thread ISO 228 G¾" for flush-mounted installation in weld-in adapter



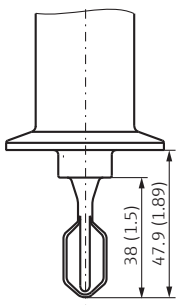
Thread ISO 228 G1" for flush-mounted installation in weld-in adapter



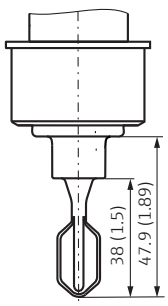
DIN11851 DN25; DN32; DN40



Tri-Clamp ISO2852 DN25-38; DN40-51



Flush-mounting in weld-in adapter RD52



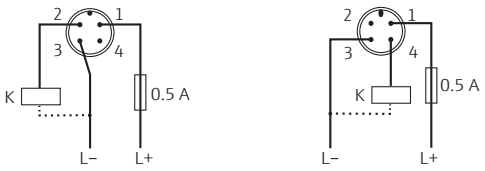
* Dimension for process temperature up to 100 °C (212 °F)
** Dimension for process temperature up to 150 °C (302 °F)

Installation according to instruction manual.

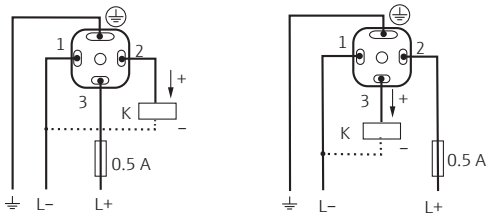
Electrical connection

Electronic version 3-wire DCPNP

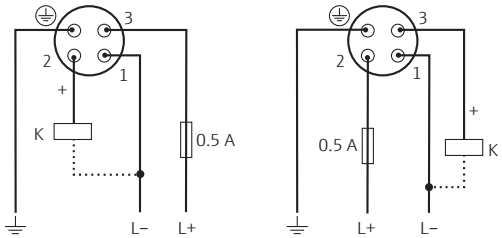
M12 connector MAX MIN



Valve plug MAX MIN



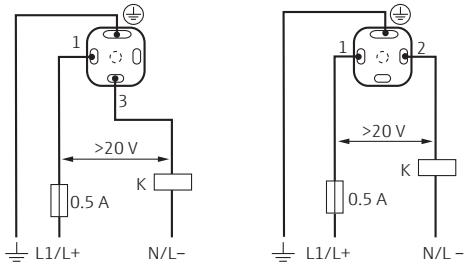
Cable MAX MIN



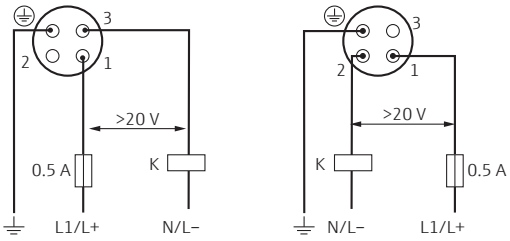
Pin 1 Supply voltage +
Pin 2 1st switch output
Pin 3 Supply voltage –

Electronic version 2-wire AC/DC

Valve plug MAX MIN

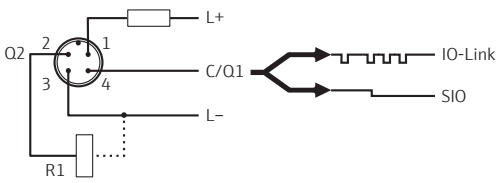


Cable MAX MIN



Pin 1 Supply voltage +
Pin 2 1st switch output min/Supply voltage –
Pin 3 1st switch output max/Supply voltage –

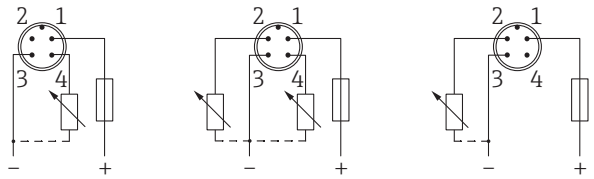
IO-Link with one switch output



Pin 1 Supply voltage +
Pin 2 1st switch output
Pin 3 Supply voltage –
Pin 4 IO-Link communication or 2nd switch output (SIO mode)

Terminal assignment

Minimum safety | **Connection for function monitoring using XOR operation** | **Maximum safety**



Order codes

Electronics system

Code	M12: Power Supply; Output
4	10 to 30 V DC; 3-wire PNP
7	DC-PNP, IO-Link; 4-wire
	Valve plug: Power Supply; Output
1	20 to 253V AC/DC; 2-wire
4	10 to 30 V DC; 3-wire PNP

Electrical connection

Code	Electrical connection
M	M12 connector (IP65/67)
U	Valve plug ISO4400 M16, IP65 NEMA Type 4X Encl.
V	Valve plug ISO4400 NPT1/2, IP65 NEMA Type 4X Encl.

Process connections

Code	Process connection
1GJ	DIN11851 DN25 PN40 excluding slotted nut, 316L
1HJ	DIN11851 DN32 PN40 excluding slotted nut, 316L
1JJ	DIN11851 DN40 PN40 excluding slotted nut, 316L
3CJ	Tri-Clamp ISO2852 DN25-38 (1 to 1½"), 316L
3EJ	Tri-Clamp ISO2852 DN40-51 (2"), 316L
5ZJ	Flush-mounting in weld-in adapter

Liquiphant FTL33

Electrical conn.	Surface roughness	Temperature	Process connection*	Order no.
M12 connector, or valve plug	R_a <1.5 µm	max. 100 °C	G¾ flush-mounted	FTL33-AA☐☐2ABW5J
			G1 flush-mounted	FTL33-AA☐☐2ABWSJ
			M24 flush-mounted	FTL33-AA☐☐2ABX2J
			Hygienic connection	FTL33-AA☐☐2AB☐
		max. 150 °C	G¾ flush-mounted	FTL33-AA☐☐3ABW5J
			G1 flush-mounted	FTL33-AA☐☐3ABWSJ
			M24 flush-mounted	FTL33-AA☐☐3ABX2J
			Hygienic connection	FTL33-AA☐☐3AB☐
	R_a <0.76 µm	max. 100 °C	G¾ flush-mounted	FTL33-AA☐☐2ACW5J
			G1 flush-mounted	FTL33-AA☐☐2ACWSJ
			M24 flush-mounted	FTL33-AA☐☐2ACX2J
			Hygienic connection	FTL33-AA☐☐2AC☐
		max. 150 °C	G¾ flush-mounted	FTL33-AA☐☐3ACW5J
			G1 flush-mounted	FTL33-AA☐☐3ACWSJ
			M24 flush-mounted	FTL33-AA☐☐3ACX2J
			Hygienic connection	FTL33-AA☐☐3AC☐
M12 connector (IP69K), 10 to 30 V DC, 3-wire or DC-PNP, IO-Link; 4-wire	R_a <1.5 µm	max. 100 °C	G¾ flush-mounted	FTL33-AA☐N2ABW5J
			G1 flush-mounted	FTL33-AA☐N2ABWSJ
			M24 flush-mounted	FTL33-AA☐N2ABX2J
			Hygienic connection	FTL33-AA☐N2AB☐
		max. 150 °C	G¾ flush-mounted	FTL33-AA☐N3ABW5J
			G1 flush-mounted	FTL33-AA☐N3ABWSJ
			M24 flush-mounted	FTL33-AA☐N3ABX2J
			Hygienic connection	FTL33-AA☐N3AB☐
	R_a <0.76 µm	max. 100 °C	G¾ flush-mounted	FTL33-AA☐N2ACW5J
			G1 flush-mounted	FTL33-AA☐N2ACWSJ
			M24 flush-mounted	FTL33-AA☐N2ACX2J
			Hygienic connection	FTL33-AA☐N2AC☐
		max. 150 °C	G¾ flush-mounted	FTL33-AA☐N3ACW5J
			G1 flush-mounted	FTL33-AA☐N3ACWSJ
			M24 flush-mounted	FTL33-AA☐N3ACX2J
			Hygienic connection	FTL33-AA☐N3AC☐

Versions with pipe extension available on request. * Flush-mounted versions are for installation in weld-in adapter

Accessories	Order no.
Weld-in adapter G¾, d=50, 316L	71258355
Weld-in adapter G¾, d=29, 316L	71258357
Weld-in adapter G1, d=60, 316L	52001051
Weld-in adapter G1, d=53, 316L	71258358
5 m cable with M12×1 plug + integrated LED	52018763
5 m cable with M12×1 plug	52010285
Straight plug, without cable (self wired)	52006263
Test magnet	71267011

Complete product information:
www.endress.com/ftl33

More products to complete your measuring point ...


Pressure sensor
Cerabar PMP23
page 78


Kompakt termometre
iTHERM CompactLine TM311
page 104


Temperature switch
Thermophant T TTR35
page 134

Point level switch for liquids in the food and beverage industry

Liquipoint FTW23

IO-Link

Complete product information:
www.endress.com/ftw23

- Function testing of switch outputs with test magnet
- Separate configuration of two switching thresholds, e.g. medium detection and medium differentiation
- 3-A and EHEDG certificates

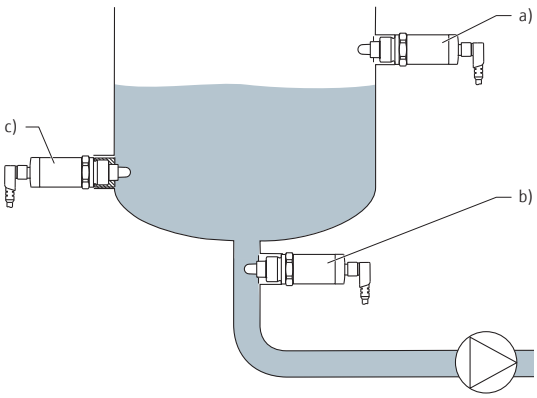
Specs at a glance:

- **Product:**
  Water-based medium
- **Installation:**
  Vessels and pipes
- **Process temperature range:**
  –20 to +100 °C (–4 to +212 °F)
  (For 1 hour: +135 °C (+275 °F))
- **Process pressure range:**
  –1 to +16 bar
  (–14.5 to +232 psi)

Application The Liquipoint FTW23 is a point level switch for water-based liquids. It is used preferably in storage tanks, mixing vessels and pipes. Developed and built for the food and beverage industry, the Liquipoint FTW23 meets international hygienic requirements.
The Liquipoint FTW23 can be used permanently in process temperatures up to 100 °C (212 °F) and in cleaning and sterilization processes to 135 °C (275 °F) for 60 minutes.

Function The capacitance at the tip of the sensor, and therefore the dielectric value of the medium, is determined using an electrical field. Given that the dielectric value of air and a water-based liquid differ, the Liquipoint FTW23 can differentiate between the two states, i.e. covered and uncovered.

Application example



The measuring system consists of a Liquipoint FTW23 point level switch, e.g. for connection to programmable logic controllers (PLC).

a) Overfill protection or upper level detection (MAX)
b) Pump dry running protection (MIN)
c) Lower level detection (MIN)

Technical data

Output	
Switch output	3-wire DC-PNP: – 2 DC-PNP outputs, switched using XOR operation – 200 mA connectable load (short-circuit proof) Devices with IO-Link: – 2 DC-PNP outputs, freely configurable – 1 switch output active: 200 mA connectable load (short-circuit proof) – Both switch outputs active: connectable load of 105 mA each (short-circuit proof)
Residual voltage	<3 V
Residual current	<100 µA
Supply voltage	10 to 30 V DC
Power consumption	<1.2 W (at max. load: 200 mA)
Current consumption	<40 mA
Cable specification	IEC 60947-5-2
Connecting cable length	– max. 25 Ω/core, total capacity < 100 nF – IO-Link communication: < 10 nF

Performance characteristics	
Reference operating conditions	horizontal orientation: – Ambient temperature: 20 °C (68 °F) ±5 °C – Medium temperature: 20 °C (68 °F) ±5 °C – Process pressure: 1 bar (14.5 psi) – Medium: water
Switching accuracy	±2 mm (0.08 in) in accordance with DIN 61298-2
Hysteresis	Typically ±1 mm (0.04 in)
Non-repeatability	±1 mm (0.04 in) in accordance with DIN 61298-2
Switching delay	0.5 s when sensor is covered 1.0 s when sensor is uncovered
Switch-on delay	<2 s (previously not through-connected))
Orientation	any position

Environment	
Ambient temperature range	–20 to +70 °C (–4 to +158 °F) (at $T_{Process}$ ≤80 °C (176 °F)), –20 to +35 °C (–4 to +95 °F) (at $T_{Process}$ = 135 °C (275 °F))
Storage temperature	–40 to +85 °C (–40 to +185 °F)
Climate class	DIN EN 60068-2-38/IEC 68-2-38: test Z/AD
Degree of protection	– IP65/67 NEMA Type 4X Enclosure (M12 connector for plastic housing cover) – IP66/68/69K NEMA Type 4X/6P Enclosure (M12 connector for metal housing cover)
Short-circuit protection	– Overload protection/short-circuit protection at I > 200 mA – Device with IO-Link: 105 mA per output if both switch outputs are active

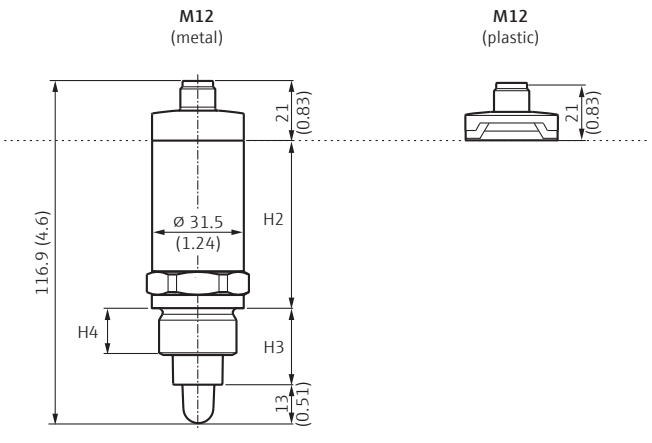
Process	
Process temperature range	–20 to +100 °C (–4 to +212 °F) (For 1 hour: +135 °C (+275 °F))
Process pressure range	–1 to +16 bar (–14.5 to +232 psi)
Process fluid	– Water-based media with a dielectric constant (DC) > 20 (default) – Device with IO-Link communication: adjustment up to DC > 1.5 via the IO-Link interface for water-, alcohol- and oil-based liquids or powdered products

Mechanical construction	
Weight	Max. 300 g (10.58 oz)
Materials in contact with process	– Sensor: 316L (1.4404), PEEK The material PEEK meets the requirements of EU 1935/2004, 10/2011, 2023/2006 and FDA 21 CFR 177.2415 – Process connection: 316L (1.4404 (1.4435))
Materials not in contact with process	Housing covers: – M12 metal: 316L (1.4404) – M12 plastic: PPSU; Design ring: PBT/PC Housing: 316L (1.4404)
Surface	R_a ≤0.76 µm (30 µin)

Approvals	
Approval	CSA C/US General Purpose
Sanitary compatibility	3-A, EHEDG

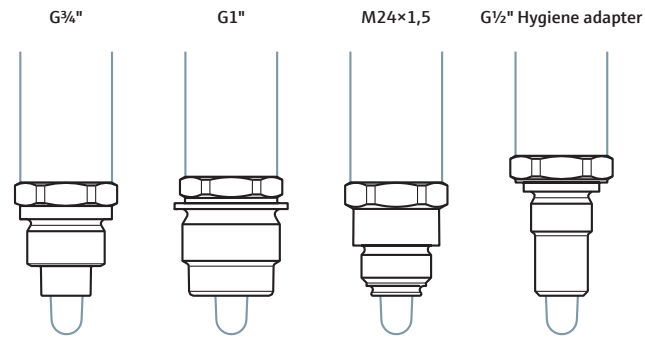
Dimensions in mm (inches)

Housing, electrical connection



Installation according to instruction manual.

Process connections

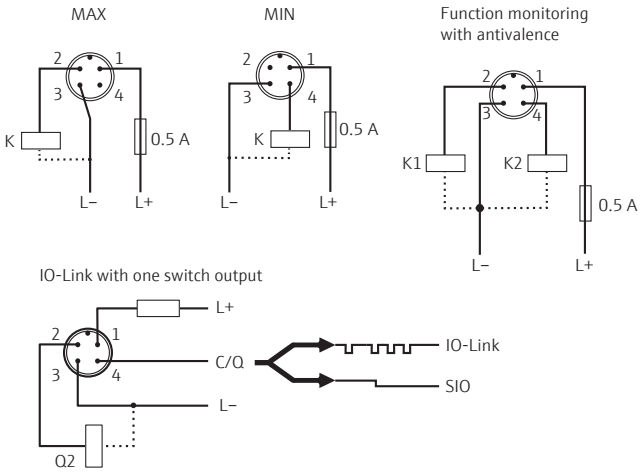


G¾"	G1"	M24×1,5	G½" Hygiene adapter
H2 = 56.7 (2.23) H3 = 26.2 (1.03) H4 = 16.1 (0.63)	H2 = 53.2 (2.09) H3 = 29.6 (1.17) H4 = 19.6 (0.77)	H2 = 65.7 (2.59) H3 = 17.1 (0.67) H4 = 12.8 (0.50)	H2 = 47.2 (1.86) H3 = 35.6 (1.40) H4 = 15.1 (0.59)

Installation according to instruction manual.

Electrical connection

M12 connector



Order codes

Power supply; output

Code	Version
4	10 to 30 V DC; 3-wire DC-PNP
7	IO-Link; DC-PNP

Liquipoint FTW23		Order no.
Electrical connection	Process connection	*
M12 connector, IP65/67 NEMA Type 4 Enclosure	Thread ISO228 G1	FTW23-AA☐MWSJ
	Thread ISO228 G½	FTW23-AA☐MWVJ
	Thread ISO228 G¾	FTW23-AA☐MW5J
	Thread M24	FTW23-AA☐MX2J
M12 connector, IP66/68/69K NEMA Type 4/6P Enclosure	Thread ISO228 G1	FTW23-AA☐NWSJ
	Thread ISO228 G½	FTW23-AA☐NWVJ
	Thread ISO228 G¾	FTW23-AA☐NW5J
	Thread M24	FTW23-AA☐NX2J

* Please add code for power supply; output

Accessories	Order no.
Weld-in adapter G¾, d=50, 316L	71258355
Weld-in adapter G¾, d=29, 316L	71258357
Weld-in adapter G1, d=60, 316L	52001051
Weld-in adapter G1, d=53, 316L	71258358
5 m cable with M12×1 plug + integrated LED	52018763
5 m cable with M12×1 plug	52010285
Straight plug, without cable (self wired)	52006263
Test magnet	71267011

Complete product information:
www.endress.com/ftw23

More products to complete your measuring point ...

Point level switch
Liquiphant FTL33
page 10

Point level switch
Liquipoint FTW33
page 19

Pressure switch
Ceraphant PTP33B
page 88

Point level switch for liquid and pasty media in the food and beverage industry

Liquipoint FTW33

IO-Link

Complete product information:
www.endress.com/ftw33

- Flush-mounted installation, pipes remain piggable
- For water- and oil-based media
- Reliable switching function due to compensation even in the case of heavy buildup

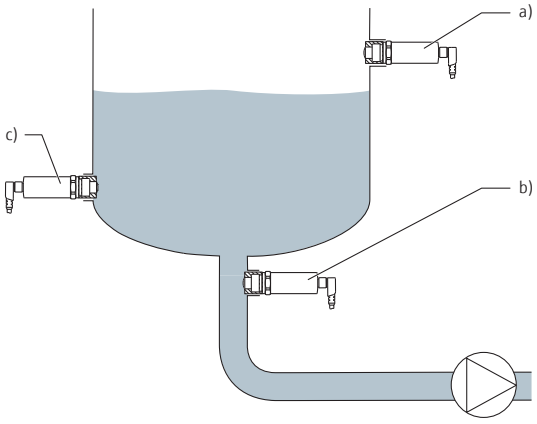
Specs at a glance:

- **Product:**
  Water- and oil-based media with an DC ≥ 2
- **Installation:**
  Vessels and pipes
- **Process temperature range:**
  −20 to +100 °C (−4 to +212 °F)
  (For 1 hour: +150 °C (+302 °F))
- **Process pressure range:**
  −1 to +25 bar
  (−14.5 to +362.5 psi)

Application The Liquipoint FTW33 is a point level switch for liquid and pasty media. It is used preferably in storage tanks, mixing vessels and pipes. Developed and built for the food and beverage industry, the Liquipoint FTW33 meets international hygienic requirements. It is particularly suited to applications where flush-mounting is necessary.
The Liquipoint FTW33 can be used permanently in process temperatures up to 100 °C (212 °F) and for 60 minutes in cleaning and sterilization processes up to 150 °C (302 °F). The Liquipoint FTW33 can also be used for detecting the foam that commonly occurs within the food and beverage industry.

Function A low, galvanically isolated AC voltage is applied at the electrode in contact with the process. If liquid or pasty media come in contact with the electrode, a measurable current flows and the Liquipoint FTW33 switches. Active buildup compensation ensures reliable switching of the measuring device even if buildup occurs on the sensor.

Application example



The measuring system consists of a Liquipoint FTW33 point level switch, e.g. for connection to programmable logic controllers (PLC).

a) Overfill protection or upper level detection (MAX)
b) Pump dry running protection (MIN)
c) Lower level detection (MIN)

Technical data

Output	
Function	– 3-wire DC-PNP – Positive voltage signal at the switch output of the electronics – IO-Link: 2 DC-PNP outputs, freely configurable
Connectable load	200 mA (short-circuit proof)
Residual voltage	<3 V
Residual current	<100 µA
Supply voltage	– 10 to 30 V DC – IO-Link: 18 to 30 V DC
Power consumption	<1 W (at max. load: 200 mA)
Current consumption	<15 mA
Cable specification	– M12 connector: IEC 60947-5-2 – Valve plug: Cable cross-section ≤1.5 mm² (16 AWG); Ø 3.5 to 6.5 mm – Cable: Cable cross-section 0.75 mm² (AWG 20)
Connecting cable length	– max. 25 Ω/core, total capacitance <100 nF – IO-Link communication: < 10 nF

Performance characteristics	
Reference operating conditions	– Ambient temperature: 20 °C (68 °F) ±5 °C – Medium temperature: 20 °C (68 °F) ±5 °C – Process pressure: 1 bar (14.5 psi) – Medium: water – Conductivity: approx. 200 µS/cm
Maximum uncertainty	±1 mm (0.04 in) in accordance with DIN 61298-2
Hysteresis	max. 1 mm (0.04 in)
Non-repeatability	±0.5 mm (0.02 in) in accordance with DIN 61298-2
Switching delay	– 0.5 s when sensor is covered; (can be configured via IO-Link 0.3 to 60 s) – 1.0 s when sensor is uncovered (can be configured via IO-Link 0.3 to 60 s)
Switch-on delay	– <1 s (no defined switching status before this) – IO-Link: < 2 s (no defined switching status before this)
Orientation	any position

Environment	
Ambient temperature range	At the housing: −40 to +70 °C (−40 to +158 °F)
Storage temperature	−40 to +85 °C (−40 to +185 °F)
Climate class	DIN EN 60068-2-38/IEC 68-2-38: test Z/AD
Degree of protection	– IP65 (valve plug) – IP65/67 NEMA Type 4X Enclosure (connector for plastic housing cover) – IP66/68/69K NEMA Type 4X/6P Enclosure (M12 connector for metal housing cover) – IP66/68 NEMA Type 4X/6P Encl. (cable)
Cleaning	Resistant to typical cleaning agents from the outside, in accordance with Ecolab test.
Electromagnetic compatibility	– In accordance with EN 61326-Serie series and NAMUR Recommendation EMV (NE 21). – Only the requirements of IEC/EN 61131-9 are met if IO-Link communication is used.
Short-circuit protection	Overload protection/short-circuit protection at I >250 mA; the sensor is not destroyed. Intelligent monitoring: Testing for overload at intervals of approx. 1.5 s; normal operation resumes once the overload/ short-circuit has been rectified

Process	
Process temperature range	−20 to +100 °C (−4 to +212 °F), M24 process adapter with EPDM process seal for 1 h: +130 °C (+266 °F)
Process pressure range	−1 to +25 bar (−14.5 to +362.5 psi)
Standard	Water- or alcohol-based media (DC ≥ 10)
Extended	Oil-based media (DC > 2.4) or media that form heavy buildup
IO-Link	Adjustment up to DC > 2.4 via the IO-Link interface for water-, alcohol- and oil-based liquids or powdered products

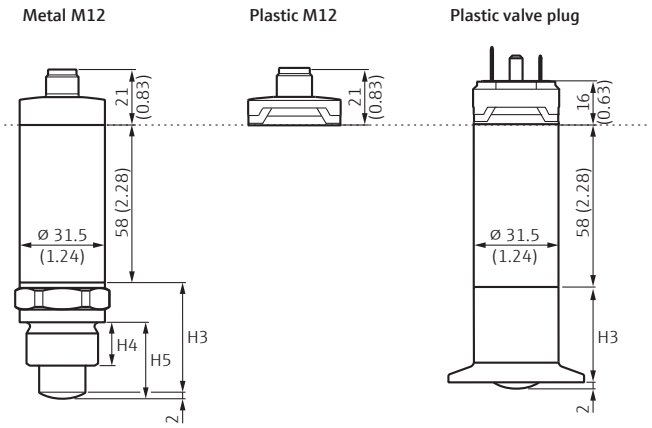
Mechanical construction	
Weight	approx. 300 g (10.58 oz)
Materials in contact with process	– Sensor: 316L (1.4404), PEEK The material PEEK meets the requirements of EU 1935/2004, 10/2011 as well as 2023/2006 and FDA 21 CFR 177.2415 – Process connection: 316L (1.4404 (1.4435))
Materials not in contact with process	Housing covers: – M12 metal: 316L (1.4404) – M12 plastic: PPSU; Design ring: PBT/PC – Valve connector, plastic: PPSU – Plastic cable: PPSU Housing: 316L (1.4404)
Surface	R_a ≤0.76 µm (30 µin)

Operation	
Options	– Local – Via test magnet – Via IO-Link operating menu

Approvals	
Approval	CSA C/US General Purpose
Sanitary compatibility	3-A EHEDG

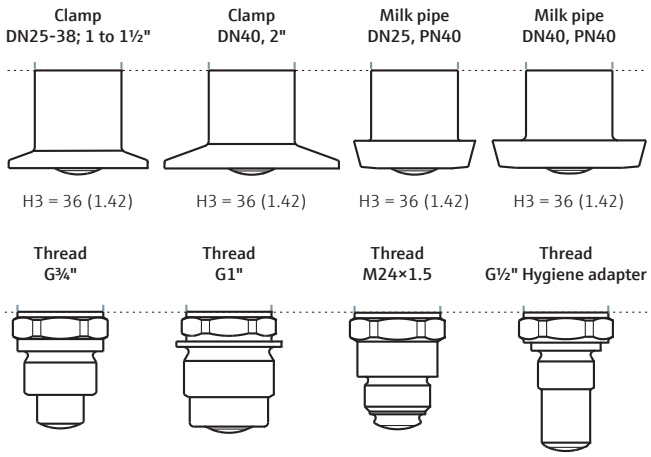
Dimensions in mm (inches)

Housing, electrical connection



Installation according to instruction manual.

Process connections



H3 = 41 (1.61)
H4 = 16 (0.63)
H5 = 28 (1.1)

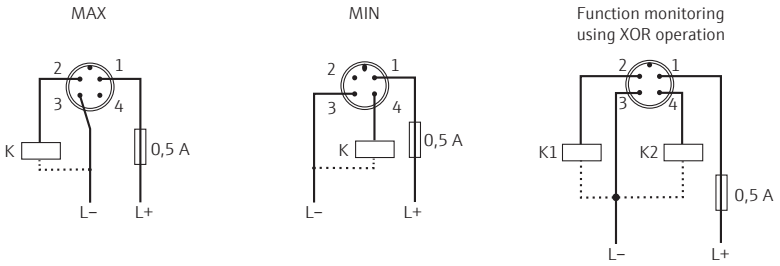
H3 = 43 (1.69)
H4 = 19 (0.75)
H5 = 32 (1.3)

H3 = 41 (1.61)
H4 = 13 (0.51)
H5 = 19 (0.8)

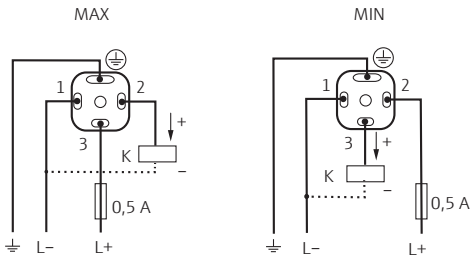
H3 = 50 (1.97)
H4 = 15 (0.59)
H5 = 37 (1.5)

Electrical connection

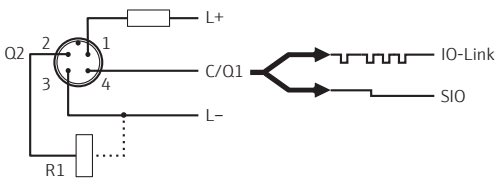
M12 connector



Valve plug

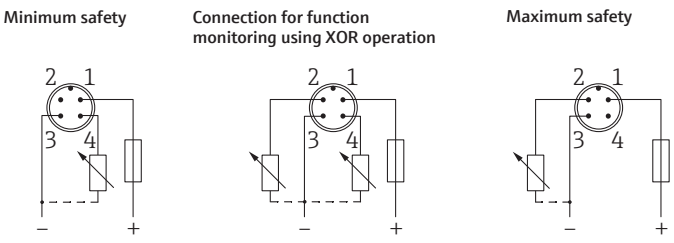


IO-Link with one switch output



Pin 1 Supply voltage +
Pin 2 1st switch output
Pin 3 Supply voltage -
Pin 4 IO-Link communication or 2nd switch output (SIO mode)

Terminal assignment



Order codes

Power supply; output

Code	Version
4	10 to 30 V DC; 3-wire DC-PNP
7	DC-PNP, IO-Link; 4-wire

Liquipoint FTW33		Order no.
Electrical connection	Process connection	*
M12 connector, IP65/67 NEMA Type 4 Enclosure	Thread ISO228 G1	FTW33-AA☐MWSJ
	Thread ISO228 G½	FTW33-AA☐MWVJ
	Thread ISO228 G¾	FTW33-AA☐MW5J
	DIN11851 DN25 PN40	FTW33-AA☐M1AJ
	DIN11851 DN40 PN40	FTW33-AA☐M1CJ
	Tri-Clamp ISO2852 DN25-38 (1 to 1½")	FTW33-AA☐M3CJ
	Tri-Clamp ISO2852 DN40-51 (2")	FTW33-AA☐M3EJ
M12 connector, IP66/68/69K NEMA Type 4/6P Enclosure	Thread ISO228 G1	FTW33-AA☐NWSJ
	Thread ISO228 G½	FTW33-AA☐NWVJ
	Thread ISO228 G¾	FTW33-AA☐NW5J
	DIN11851 DN25 PN40	FTW33-AA☐N1AJ
	DIN11851 DN40 PN40	FTW33-AA☐N1CJ
	Tri-Clamp ISO2852 DN25-38 (1 to 1½")	FTW33-AA☐N3CJ
	Tri-Clamp ISO2852 DN40-51 (2")	FTW33-AA☐N3EJ

* Please add code for power supply; output

Accessories	Order no.
Weld-in adapter G¾, d=50, 316L	71258355
Weld-in adapter G¾, d=29, 316L	71258357
Weld-in adapter G1, d=60, 316L	52001051
Weld-in adapter G1, d=53, 316L	71258358
5 m cable with M12×1 plug + integrated LED	52018763
5 m cable with M12×1 plug	52010285
Straight plug, without cable (self wired)	52006263
Test magnet	71267011

Complete product information:
www.endress.com/ftw33

More products to complete your measuring point ...


Point level switch
Liquiphant FTL33
page 12


Point level switch
Liquipoint FTW23
page 16


Pressure sensor
Cerabar PMP23
page 78

Conductive level switch for multiple point detection

Liquipoint T FTW31/FTW32

FTW31 FTW32

Complete product information:
www.endress.com/ftw31
www.endress.com/ftw32

- Detect up to five level limits with one probe
- Flexible instrumentation (compact/ separate)
- No moving parts

Specs at a glance:

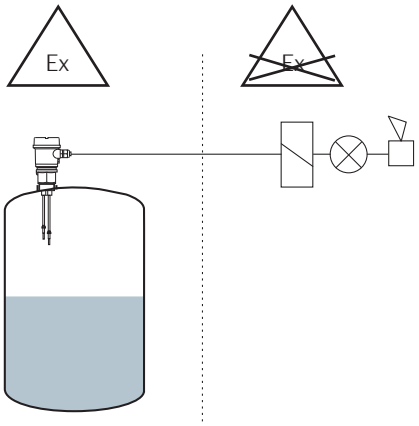
- **Product:** liquids as of 10 µS/cm
- **Approval:** ATEX II 2G EEx ia
- **Measuring points:** up to 4 measuring points with 5 rods or ropes
- **Product temperature:** –40 to +100 °C (–40 to + 212 °F)
- **Process pressure:** –1 to +10 bar (–14.5 to +145 psi)

Application Liquipoint T sensors are used in conductive liquids for determining point levels. Depending on the number of measuring points, measuring tasks such as overspill protection, dry running protection, two-point control of pumps or multiple point detection can be implemented within an existing process connection.

Function An alternating voltage exists between the rod probes in an empty tank. As soon as the conductive liquid in the tank creates a connection between the ground rod probe and the maximum rod probe, for example, a measurable current flows and the Liquipoint T switches.
By using alternating voltage, corrosion of the probe ends and electrolytic destruction of the product is avoided.

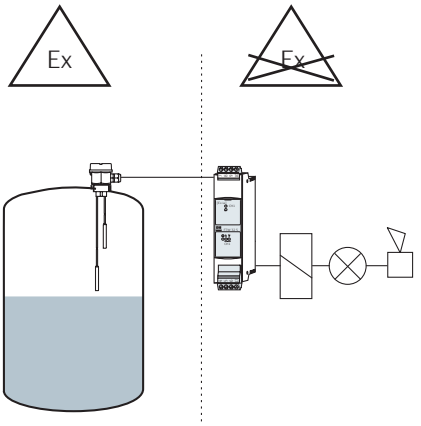
Application Examples

Probes with integrated electronic insert (compact instrument version)



The measuring system consists of:
- FTW31, FTW32 with two/three rods or ropes and an electronic insert
- Control units, switches or signal transmitters, e.g. process control systems PLC, relays or NAMUR isolating amplifier according to IEC 60947-5-6

Probes without integrated electronic insert (separate instrument version)



The measuring system consists of:
- FTW31, FTW32 with two to five rods or ropes
- Nivotester FTW325 or FTW470 Z
- Control units, switches or signal transmitters, e.g. process control systems PLC, relays, etc.

The number of Nivotester depends on the number of measuring points (e.g. 4 measuring points with 2 Nivotester FTW).

Technical data

General	
Version	**Compact version:** two/three (Always ΔS-mode – only three rod-/rope versions) rods or ropes; **Separate version (With integrated line monitoring – in combination with level limit switch FTW325):** two/three/five rods or ropes
Sensor length	Rod: 100 to 4000 mm (4" to 157"); rope: 250 to 15000 mm (10" to 590")
Minimum conductivity	≥10 µS/cm
Cable specification	use standard cable (25 Ω per core)

Operating conditions	
Medium temp.	−40 to +100 °C (−40 to +212 °F)
Ambient temp.	−40 to +70 °C (−40 to +158 °F)
Pressure	−1 to +10 bar (−14.5 to +145 psi)
Ingress Protection	IP 66
Process connection	G1½"

Material	
Electrodes	Rods: 1.4404 (316L)/insulation: PP; ropes: 1.4571 (316TI)/insulation: FEP; weight: 1.4435 (316L)
Process connection	PPS
Housing F16	For compact instrument version; housing: PBT; hat: PPS; adapter: PBT
Housing F24	For separate instrument version; housing: PPS; hat: PBT

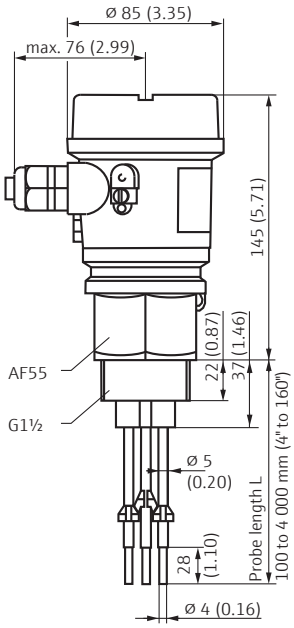
Approvals (Compact instrument version)	
Ex approval	ATEX II 2G EEx ia IIC T6 with FEW58
WHG approval	WHG Z-65.40-360 (DIBt)

Approvals (Separate instrument version)	
Ex approval	ATEX II 2G EEx ia IIC T6

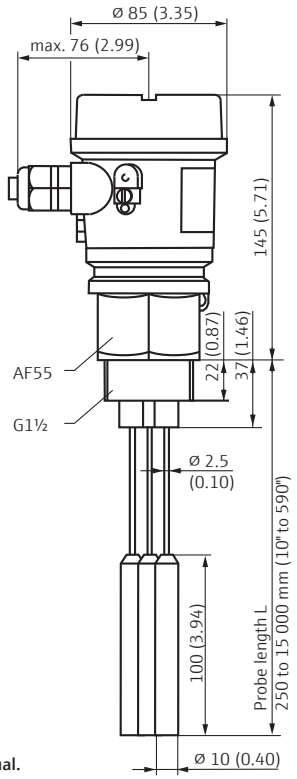
Dimensions in mm (inches)

Compact instrument version with electronic insert

FTW31 (Rod version)



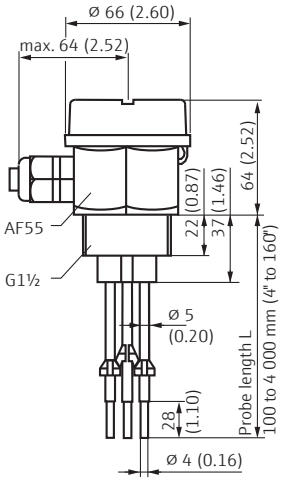
FTW32 (Rope version)



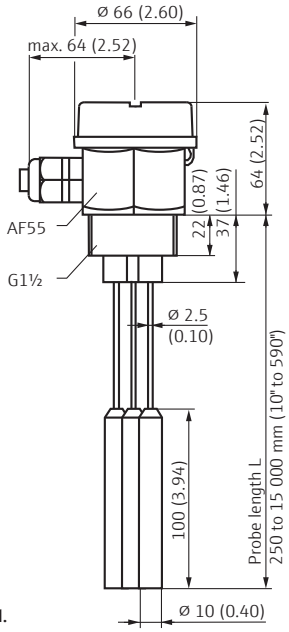
Installation according to instruction manual.

Separate instrument version without electronic insert

FTW31 (Rod version)



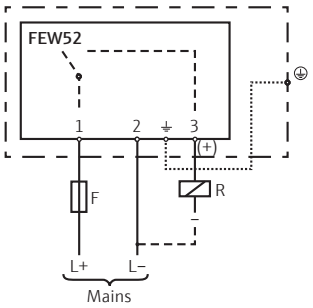
FTW32 (Rope version)



Installation according to instruction manual.

Electrical connection – Probes with electronic insert (compact instrument version)

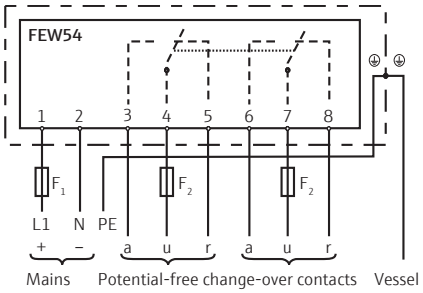
Electronic insert FEW52	
Supply voltage	U = 10.8 to 45 V DC
Current consumption	Max. 25 mA
Load connection	Open collector; PNP
Switching voltage	Max. 45 V
Connectable load	Temporary (max. 1 sec): max. 2 A Continuous: max. 200 mA
Protected against reverse polarity	Yes



Connecting the FEW52 electronic insert

F: Fine-wire fuse, dependent on connected load
R: Connected load, e.g. PLC, PLS, relay
M: Ground connection to protective earth (PE)

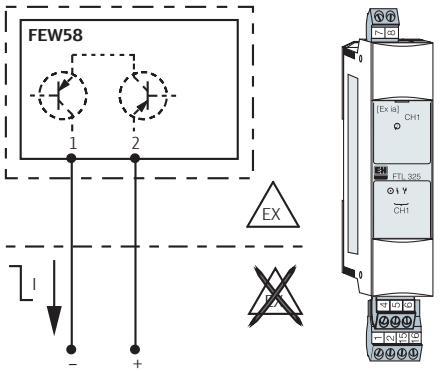
Electronic insert FEW54	
Supply voltage	20 to 55 V DC or 20 to 253 V AC, 50/60 Hz
Current consumption	60 mA
Peak inrush current	Max. 2 A, max. 400 µs
Pulse frequency	Approx. 1.5 s
Output	Two potential-free changeover contacts (DPDT)
Contact load capacity	U~ max. 253 V, I~ max. 4 A, U = 30 V/4 A; 150 V/0.2 A
Power consumption	<2.0 W



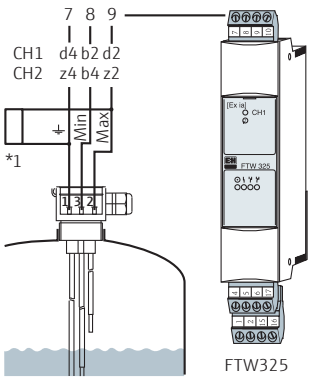
Connecting the FEW54 electronic insert

F1: Fine-wire fuse, 200 mA, semi-time lag
F2: Fine-wire fuse to protect the relay contact, load-dependent
M: Ground connection to PE (protective earth)

Electronic insert FEW58
Supply voltage see Technical data of connected isolating amplifier according to IEC 60947-5-6 (NAMUR).
Use with a separate contactor according to IEC 60947-5-6 (NAMUR); output signal leap of high to low electricity on limit (H-L-flank).
Two-wire signal transfer: H-L-edge 2.2 to 6.5 mA/0.4 to 1.0 mA
Output signal of damaged sensor: <1.0 mA
On access to a multiplexer the cycle time is to adjust on min. 2 sec.



Electrical connection – Probes without integrated electronic insert (separate-instrument version)



For evaluation one or more FTW325 processor units are needed.
Separate instrumentation for three-rod- or rope-probes with cable monitoring.

*1 = Printed circuit board for cable monitoring

Order codes

Liquipoint T FTW31 (Probe length: 1 000 mm)			**Order no.**
Approval	Electronics	Sensing points	
Non Ex	Separate instrument version	2 rods	FTW31-A1A2CA0A
		3 rods	FTW31-A1A3CA0A
		5 rods	FTW31-A1A5CA0A
	Compact instrument version (FEW52)	2 rods	FTW31-A1A2CA2A
		3 rods	FTW31-A1A3CA2A
	Compact instrument version (FEW54)	2 rods	FTW31-A1A2CA4A
		3 rods	FTW31-A1A3CA4A
Non Ex, WHG, leakage-detection	Separate instrument version	2 rods	FTW31-B1A2CA0A
		3 rods	FTW31-B1A3CA0A
		5 rods	FTW31-B1A5CA0A
	Compact instrument version (FEW52)	2 rods	FTW31-B1A2CA2A
		3 rods	FTW31-B1A3CA2A
	Compact instrument version (FEW54)	2 rods	FTW31-B1A2CA4A
		3 rods	FTW31-B1A3CA4A
ATEX, WHG, leakage-detection	Separate instrument version	2 rods	FTW31-D1A2CA0A
		3 rods	FTW31-D1A3CA0A
		5 rods	FTW31-D1A5CA0A
	Compact instrument version (FEW58)	2 rods	FTW31-D1A2CA8A
		3 rods	FTW31-D1A3CA8A

Liquipoint T FTW31 (Probe length: 2 000 mm)			**Order no.**
Approval	Electronics	Sensing points	
Non Ex	Separate instrument version	2 rods	FTW31-A1A2DA0A
		3 rods	FTW31-A1A3DA0A
		5 rods	FTW31-A1A5DA0A
	Compact instrument version (FEW52)	2 rods	FTW31-A1A2DA2A
		3 rods	FTW31-A1A3DA2A
	Compact instrument version (FEW54)	2 rods	FTW31-A1A2DA4A
		3 rods	FTW31-A1A3DA4A
Non Ex, WHG, leakage-detection	Separate instrument version	2 rods	FTW31-B1A2DA0A
		3 rods	FTW31-B1A3DA0A
		5 rods	FTW31-B1A5DA0A
	Compact instrument version (FEW52)	2 rods	FTW31-B1A2DA2A
		3 rods	FTW31-B1A3DA2A
	Compact instrument version (FEW54)	2 rods	FTW31-B1A2DA4A
		3 rods	FTW31-B1A3DA4A
ATEX, WHG, leakage-detection	Separate instrument version	2 rods	FTW31-D1A2DA0A
		3 rods	FTW31-D1A3DA0A
		5 rods	FTW31-D1A5DA0A
	Compact instrument version (FEW58)	2 rods	FTW31-D1A2DA8A
		3 rods	FTW31-D1A3DA8A

Accessories	**Order no.**
Lock nut G1½"	52014146

Order codes

Liquipoint T FTW32 (Probe length: 5 000 mm)			**Order no.**
Approval	Electronics	Sensing points	
Non Ex	Separate instrument version	2 ropes	FTW32-A1D2CA0A
		3 ropes	FTW32-A1D3CA0A
		5 ropes	FTW32-A1D5CA0A
	Compact instrument version (FEW52)	2 ropes	FTW32-A1D2CA2A
		3 ropes	FTW32-A1D3CA2A
	Compact instrument version (FEW54)	2 ropes	FTW32-A1D2CA4A
		3 ropes	FTW32-A1D3CA4A
Non Ex, WHG, leakage-detection	Separate instrument version	2 ropes	FTW32-B1D2CA0A
		3 ropes	FTW32-B1D3CA0A
		5 ropes	FTW32-B1D5CA0A
	Compact instrument version (FEW52)	2 ropes	FTW32-B1D2CA2A
		3 ropes	FTW32-B1D3CA2A
	Compact instrument version (FEW54)	2 ropes	FTW32-B1D2CA4A
		3 ropes	FTW32-B1D3CA4A
ATEX, WHG, leakage-detection	Separate instrument version	2 ropes	FTW32-D1D2CA0A
		3 ropes	FTW32-D1D3CA0A
		5 ropes	FTW32-D1D5CA0A
	Compact instrument version (FEW58)	2 ropes	FTW32-D1D2CA8A
		3 ropes	FTW32-D1D3CA8A

Liquipoint T FTW32 (Probe length: 10 000 mm)			**Order no.**
Approval	Electronics	Sensing points	
Non Ex	Separate instrument version	2 ropes	FTW32-A1D2DA0A
		3 ropes	FTW32-A1D3DA0A
		5 ropes	FTW32-A1D5DA0A
	Compact instrument version (FEW52)	2 ropes	FTW32-A1D2DA2A
		3 ropes	FTW32-A1D3DA2A
	Compact instrument version (FEW54)	2 ropes	FTW32-A1D2DA4A
		3 ropes	FTW32-A1D3DA4A
Non Ex, WHG, leakage-detection	Separate instrument version	2 ropes	FTW32-B1D2DA0A
		3 ropes	FTW32-B1D3DA0A
		5 ropes	FTW32-B1D5DA0A
	Compact instrument version (FEW52)	2 ropes	FTW32-B1D2DA2A
		3 ropes	FTW32-B1D3DA2A
	Compact instrument version (FEW54)	2 ropes	FTW32-B1D2DA4A
		3 ropes	FTW32-B1D3DA4A
ATEX, WHG, leakage-detection	Separate instrument version	2 ropes	FTW32-D1D2DA0A
		3 ropes	FTW32-D1D3DA0A
		5 ropes	FTW32-D1D5DA0A
	Compact instrument version (FEW58)	2 ropes	FTW32-D1D2DA8A
		3 ropes	FTW32-D1D3DA8A

Accessories	**Order no.**
Lock nut G1½"	52014146

Complete product information:
www.endress.com/ftw31
www.endress.com/ftw32

More products to complete your measuring point ...


Switching unit
Nivotester FTW325
page 28


Capacitive probe
Liquicap T FMI21
page 43


Temperature switch
Thermophant T TTR31
page 131

Switching unit for conductive sensors

Nivotester FTW325

Complete product information:
www.endress.com/ftw325

- Easy wiring with terminal blocks
- Configurable sensitivity range
- Intrinsically safe signal circuit EEx ia IIC for using sensors in hazardous areas

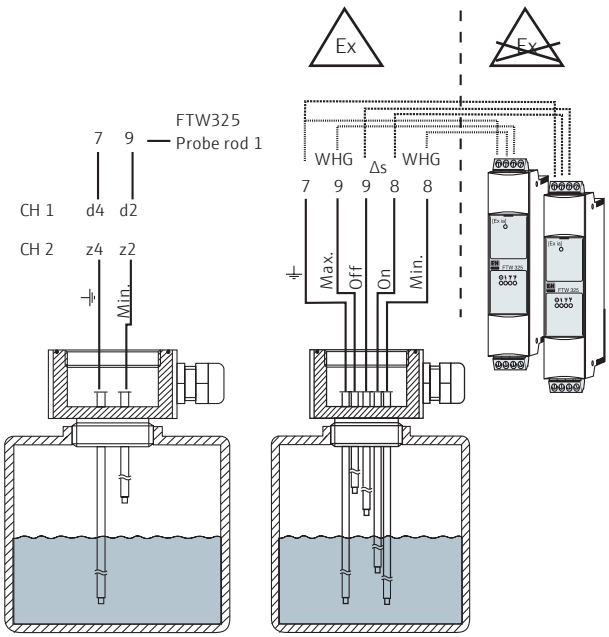
Specs at a glance:

- **Product:**
  liquids as of 5 µS/cm
- **Approval:**
  ATEX II (1) GD EEx ia
- **Feeding sensors:**
  Conductive rod or rope sensors

Application The Nivotester FTW325 can be used for overspill protection (WHG), pump dry running protection or as a two-point control for pumps. Sensors such as the Liquipoint T FTW31/FTW32 can be connected to the FTW325. Multipoint detection for up to five measuring points is possible by using 3 Nivotester FTW325s.

Function The intrinsically safe signal input of the limit switch Nivotester FTW325 is galvanically isolated from the mains and the output. The Nivotester supplies the conductivity probes with an alternating current via a two or three-wire line and monitors its voltage. If the product reaches the switch point of the probe, the voltage between the probe and Nivotester is reduced. The output relays at the Nivotester switch depending on the set failsafe mode. Two yellow LEDs on the front panel of the Nivotester indicate the relay switch status.

Application Example



Technical data

Input	
Measured variable	Depending on the setting selected, the limit signal is triggered at a minimum or maximum level
Measuring range	Three resistance ranges can be set with DIL switches; 0.1 to 1.0 kΩ; 1.0 to 10.0 kΩ; 10.0 to 200.0 kΩ
Input signal	Input galvanically isolated from power supply and output
Type of protection	[EEx ia] IIC

Output	
Output signal	Relay output: one floating changeover contact for the level alarm
Alarm relay	Floating changeover contact for fault reporting, can be switched as second level relay
Switching delay	0.5 s; 2.0 s; 6.0 s when relay energized
Switching power of relay contacts	U~ max. 253 V; I~ max. 2 A; P~ max. 500 VA at cos φ ≥0.7; U– max. 40 V; I– max. 2 A; P– max. 80 W
Function indicators	Light emitting diodes for operation (gn), fault (rd), level alarm 1 (ye) and level alarm 2 (ye) light up when level relay is energized

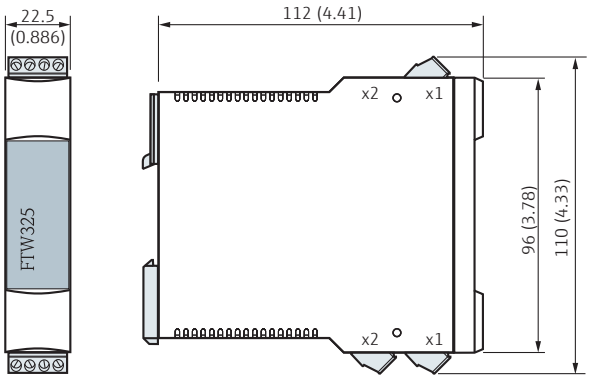
Power supply	
Supply voltage	85 to 253 V AC, 50/60 Hz; 20 to 30 V AC/20 to 60 V DC, max. 60 mA
Power consumption	AC-version maximum 4.5 VA DC-version maximum 1.2 VA (at U_{min} 20 V)

Operating conditions	
Ambient temperature	For individual mounting –20 to +60 °C for series mounting without lateral spacing –20 to +50 °C (–4 to +122 °F)
Storage temperature	–25 to +85 °C (–13 to +185 °F) (preferably at +20 °C/+68 °F)
Installation in protective housing	–20 to +40 °C (–4 to +104 °F)
Ingress Protection	IP 20
EMC	Interference emission to EN 61326; electrical equipment Class B; interference immunity to EN 61326; Annex A (industrial) and NAMUR recommendation NE 21 (EMC)

Electrical connection	
Connection line	two core, screening not required
Line resistance	max. 25 Ω per core
Cross-section	max. 1×2.5 mm² or 2×1.5 mm²

Approvals	
Ex approval	ATEX II (1) GD [EEx ia] IIC
WHG approval	Overspill protection to §19 WHG (Germany)

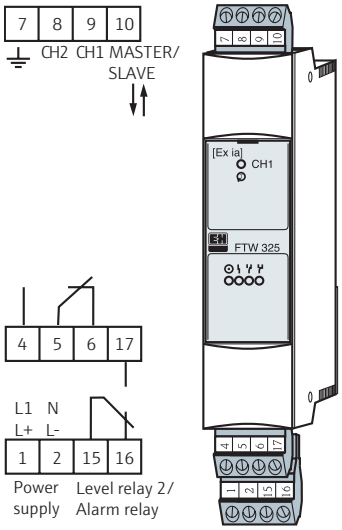
Dimensions in mm (inches)



Mounting on DIN rail (EN 60715 TH35)

Installation according to instruction manual.

Electrical connection



Order codes

Nivotester FTW325		Order no.
Power Supply	Approval	
85 to 253 V AC	Non Ex	FTW325-A2A1A
	Non Ex, WHG and leakage	FTW325-B2A1A
	ATEX, WHG and leakage	FTW325-C2A1A
20 to 30 V AC, 20 to 60 V DC	Non Ex	FTW325-A2B1A
	Non Ex, WHG and leakage	FTW325-B2B1A
	ATEX, WHG and leakage	FTW325-C2B1A

Accessories	Order no.
Housing Field, R4 182×180×165, 5×M20, PC	52010132

Complete product information:
www.endress.com/ftw325

More products to complete your measuring point ...


Point level switch
Liquipoint T FTW31
page 23


Temperature sensor
iTHERM ModuLine TM101
page 108


Data manager
Ecograph T RSG35
page 137

NAMUR isolating amplifier

Nivotester FTL325N

Complete product information:
www.endress.com/ftl325n

- NAMUR interface IEC EN 60947-5-6
- One- to three-channel version
- Two-point control and point level detection with vibronic point level switch Liquiphant M/S, Soliphant M, Solicap M/S, Liquicap M and Liquipoint

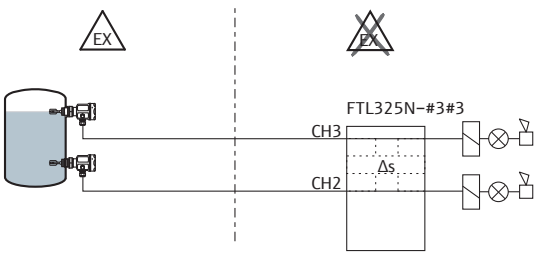
Specs at a glance:

- **Approval:**
  ATEX II (1) GD EEx ia
- **Connectable sensors:**
  All NAMUR switches
- **Output:**
  1 relay per channel
- **Number of channels:**
  1 or 3

Application The isolating amplifier Nivotester isolates and amplifies signals coming from hazardous areas. Proximity switches, vibronic point level switches or mechanic contacts can be used as measuring sensors. Isolating amplifiers can be used for the transmission of the switch status or for limit detection. Two-point control is possible in a liquid tank using the three-channel version. Combined with a Liquiphant M or Liquiphant S the isolating amplifiers are approved as overspill protection according to WHG. For using FTL325N in field a protection housing is available.

Function The isolating amplifiers supply voltage to the measuring sensors via a two-wire loop. The switching status of the sensors is evaluated and put out via a relay. By using the quiescent-current-principle this ensures a high operational safety. At the same time, a control current is transferred along this supply line. Combined with a vibronic point level switch Liquiphant M/S and Soliphant M the measuring line is controlled of short-cut, supply fails also the vibration fork of corrosion.

Application Example



When channels CH2 and CH3 are used for two-point control Δs, the measuring device consists of:

- 2 measuring sensors
- 3-channel Nivotester
- control or signal devices

Technical data

Input	
Measured variable	The limit signal can be triggered at minimum or maximum height as required
Measuring range	The measuring range is dependent on the installation location of the sensors
Input	Galvanically isolated from power supply and output
Protection type	II(1)G [Ex ia Ga] IIC II(1)D [Ex ia Da] IIIC
Connectable measuring sensors	Liquiphant M, Liquiphant S, Soliphant M, Solicap M, Solicap S, Liquicap M; sensors specified to IEC/EN 60947-5-6; contact switches with an appropriate resistance circuit
Connecting line	two-wire, screening unnecessary
Line resistance	max. 25 Ω per wire
Signal transmission	Current signal on supply line
Control current range	<1.2 mA/> 2.1 mA
Line interruption monitoring	<200 µA
Short-circuit	>6.1 mA (can be switched off)

Output	
Relay output	One potential-free switch contact for the level alarm per channel
Quiescent current fail-safe mode	MIN/MAX safety can be selected with DIL switch
Switch delay	approx. 0.5 s
Switching power of the relay contacts	U~ max. 253 V; I~ max. 2 A; P~ max. 500 VA at cos φ ≥0.7; U– max. 40 V; I– max. 2 A; P– max. 80 W
Life	at least 10^5 switching operations at maximum contact load
Function displays	LEDs for operation, level alarm and fault

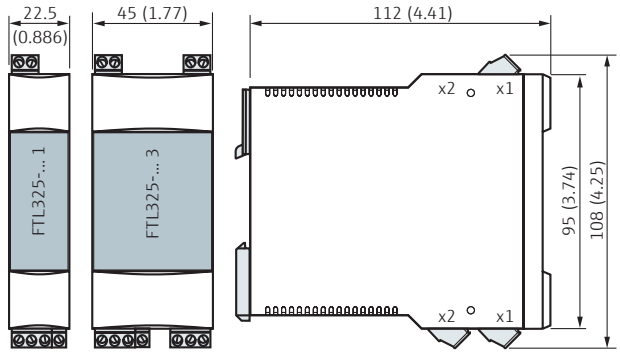
Power supply	
Supply voltage	85 to 253 V AC, 50/60 Hz 20 to 30 V AC, 20 to 60 V DC, max. 60 mA (1-channel), max. 113 mA (3-channel), permissible residual ripple within tolerance: V_{pp} = max. 2 V The Nivotester is equipped with reverse polarity protection.
Power consumption	AC: 1-channel: max. 1.75 W 3-channel: max. 2.75 W DC: 1-channel: max. 1.2 W (at V_{min} 20 V) 3-channel: max. 2.25 W (at V_{min} 20 V)

Operating conditions	
Ambient temperature	For single installation: –20 to +60 °C (–4 to +140 °F) for rail mounting without gaps: –20 to +50 °C (–4 to +122 °F)
Storage temperature	–20 to +85 °C (–4 to +185 °F) (preferably at +20 °C/+68 °F)
Ingress Protection	IP20, IK06
EMC	Interference emission to EN 61326; Class A apparatus; interference immunity to EN 61326; Appendix A (Industry) and NAMUR Recommendation NE 21 (EMC)

Materials	
Housing	Polycarbonate
Front cover	PP polypropylene
Fixing slide	(for fixing to top-hat rail), Polyamide PA6

Approvals	
Ex approval	ATEX II(1)G [Ex ia Ga] IIC ATEX II(1)D [Ex i Da] IIIC
Overfill prevention	WHG, leak approval

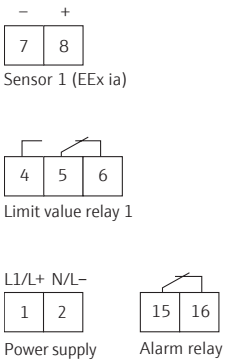
Dimensions in mm (inches)

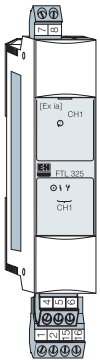


Installation according to instruction manual.

Electrical connection

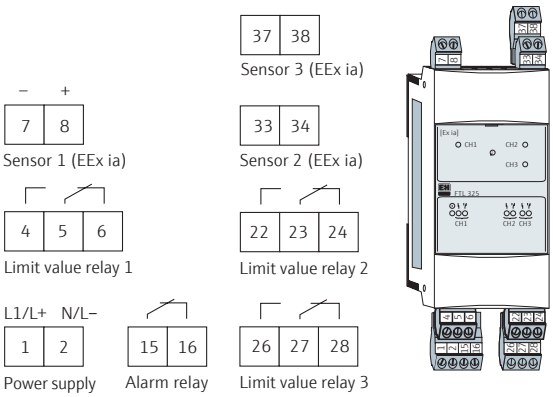
1-channel version





Connection cross section max. 1 × 2.5 mm² or 2 × 1.5 mm²

3-channel version



Connection cross section max. 1 × 2.5 mm² or 2 × 1.5 mm²

Order codes

Nivotester FTL325N		Order no.
Power supply	Channels	
85 to 253 V AC	1	FTL325N-F1A1
	3	FTL325N-F3A3
20 to 30 V AC/20 to 60 V DC	1	FTL325N-F1E1
	3	FTL325N-F3E3

Accessories	Order no.
Protective housing (max. 4 FTL325N. 1-channeled) (182 × 180 × 165 mm/7.28 × 7.09 × 6.49")	52010132

Complete product information:
www.endress.com/ftl325n

More products to complete your measuring point ...

Float switch
Liquifloat T FTS20
page 34

Process meters
RIA46
page 144

Isolating amplifier
RN22
page 162

Float switch for point level detection in liquids

Liquifloat T FTS20

Complete product information:
www.endress.com/fts20

- Simple and cost-effective
- Switching element as proximity or microswitch
- Different cable materials for different liquids

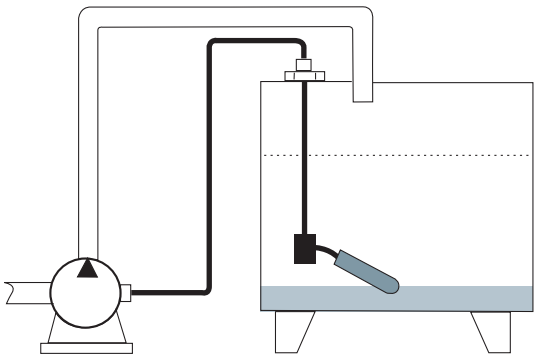
Specs at a glance:

- **Product:**
  Liquids
- **Ambient temperature:**
  ≤85 °C (185 °F)
- **Density:**
  ≥0.8 g/cm³
- **Ambient pressure:**
  ≤3 bar (44 psi)

Application The Liquifloat T FTS20 is an easy and cost-effective alternative for point level detection in liquids. It can be used as overspill or pump protection. Different cable materials are available for a range of liquids including acids, akalis, oils and wastewater.

Function An element built into the float switch switches when a change in level is detected. The switching process is triggered by the movement of a steel ball and, depending on the version, is carried out by an inductive initiator or a microswitch. The inductive initiator acts as a switching output and provides a switching signal to EN 60947- 5- 6 (NAMUR). The microswitch version is a two-way switch.

Application Example



Liquifloat T FTS20 for pump control.
The measuring system consists of
- a FTS20 float switch and
- a NAMUR isolating amplifier (e.g. Nivotester FTL325N)
  or
- FTS20 in AC/DC version

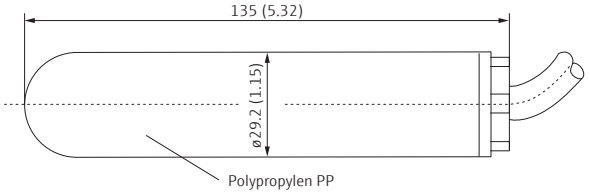
Technical data

FTS20 AC/DC	
Switching element	Microswitch with switching ball
Switching function	Changeover contact
Switching voltage	AC: max. 250 V; DC: max. 150 V
Switching current	AC: max. 3 A; DC: max. 1 A
Switching angle	Upper switching point: +25° ±10°; lower switching point: −14° ±10°, measured to the horizontal
Process temperature range	PVC and PUR: +5 to +70 °C (+41 to +158 °F); CSM: −20 to +85 °C (−4 to +185 °F)
Process pressure	≤3 bar (44 psi) at +20 °C (+68 °F)
Density	≥0.8 g/cm³

FTS20 NAMUR	
Switching element	Inductive proximity switch with switching ball, closed when floating
Power supply	8.2 V ±2 V
Operating current	<1.2 mA unswitched; >2.1 mA switched
Reverse polarity protection	Yes
Switching angle	Upper switching point: +15° ±5°; lower switching point: −15° ±5°, measured to the horizontal
Process temperature range	PVC and PUR: +5 to +70 °C (+41 to +158 °F); CSM: −20 to +85 °C (−4 to +185 °F)
Process pressure	≤3 bar (44 psi) at +20 °C (+68 °F)
Density	≥0.8 g/cm³
Approvals	TÜV 01 ATEX 1709, Ex approval: II 2G EEx ia IIB T5

Cable	
Material	AC/DC, PVC, CSM: cross section 3 × 0.75 mm² PUR: cross section 3 × 0.50 mm²
Areas of application and minimum cable length between fixing and floating body	PVC: ≥50 mm (1.97") suitable for water, dirty water, slightly aggressive media PUR: ≥100 mm (3.94") suitable for fuels, heating oils, liquids containing oil CSM: ≥100 mm (3.94") suitable for acids and alkalis

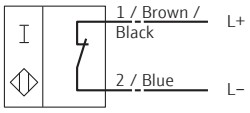
Dimensions in mm (inches)



Installation according to instruction manual

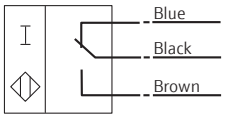
Electrical connection

Inductive proximity switch with switching ball (NAMUR)



Connection indication:
L+ = black or brown
L− = blue
(closing when floating)

Changeover contact (AC/DC)



Connection indication:
Cable colors:
black + brown = contact open
black + blue = contact closed
(contact position when floating)

Order codes

Liquifloat T FTS20			Order no.
Electronics	Cable	Version	
250 V AC/150 V DC	5 m (16 ft)	With PVC cable material	52010122
		With PUR cable material	52010123
		With CSM cable material	52010124
	20 m (66 ft)	With PVC cable material	71035520
		With PUR cable material	71035521
		With CSM cable material	71035522
NAMUR ATEX	5 m (16 ft)	With PVC cable material	52010119
		With PUR cable material	52010120
		With CSM cable material	52010121
	20 m (66 ft)	With PVC cable material	71035516
		With PUR cable material	71035517
		With CSM cable material	71035518

Accessories	Order no.
Compression gland G1", PVC	52010125
Weight coated with polyamide (The weight may not be used in hazardous areas.)	52010127
Counter nut G1", PVC	52010126

Complete product information:
www.endress.com/fts20

Free space radar sensor for non-contact level measurement

Micropilot FMR10

- Most compact radar sensor due to unique radar chip design
- Radar sensor with Bluetooth® wireless technology
- Commissioning, operation and maintenance via SmartBlue App

Specs at a glance:

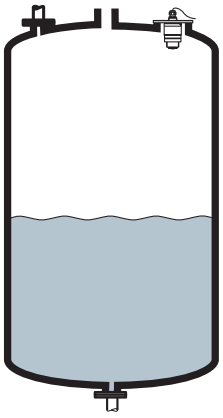
- **Measuring range:** up to 12 m (39.37 ft)
- **Process temperature:** –40 to 60 °C (–40 to 140 °F)
- **Process pressure:** –1 to 3 bar (–14 to 43 psi)
- **Maximum measured error:** ± 0.02 %

Application Micropilot FMR10 is a sensor for continuous level measurement for liquids in storage tanks, open basins, pump shafts and canal systems.

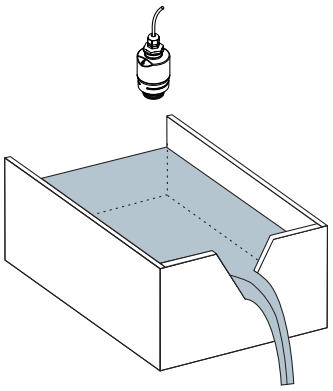
Function The Micropilot is a "downward-looking" measuring system, operating based on the time-of-flight method (ToF). It measures the distance from the reference point (process connection) to the product surface. Radar impulses are emitted by an antenna, reflected off the product surface and received again by the radar system.

Complete product information:
www.endress.com/fmr10

Application example



Level measurement



Flow rate at measuring weirs or channels

Technical data

Input	
Max. measuring range	8 m (26.25 ft) with flooding protection tube 12 m (39.37 ft)
Requirements of the installation	Tank height greater than 1.5 m (5 ft); open channel minimum width 0.5 m (1.6 ft)
Operating frequency	K-band (~26 GHz)
Transmission power	1 m (3.3 ft) distance: <12 nW/cm² 5 m (16 ft) distance: <0.4 nW/cm²
Beam angle α	30°, with flooding protection tube 12°

Output	
Output signal	4 to 20 mA
Signal on alarm	Current output; Alarm current: 22.5 mA
Linearization	Up to 32 value pairs

Electrical connection	
Supply voltage	10.5 to 30 V DC 2-wire
Power consumption	Maximum input power: 675 mW
Current consumption	Maximum input current: <25 mA Maximum start-up current: 3.6 mA
Cable specification	Unshielded cable, 2 × 0.75 mm²; The cable is designed for a tensile strength of 30 N (over a period of 1 h). The sensor is supplied with 10 m (33 ft) cable length as standard.
Overvoltage protection	The device is equipped with integrated overvoltage protection.

Performance characteristics	
Reference operating conditions	– Temperature: +24 °C (+75 °F) ±5 °C (±9 °F) – Pressure: 960 mbar abs. (14 psia) ±100 mbar (±1.45 psi) – Humidity: 60 % ±15 % – Reflector: metal plate with a minimum diameter of ≥1 m (40 in) – No major interference reflections inside the signal beam
Maximum measured error	Sum of non-linearity, non-repeatability and hysteresis: ±5 mm (0.2 in) ±0.02 %; Offset/Zero: ±0.03 %
Measured value resolution	1 mm (0.04 in)
Influence of ambient temperature	Zero point (4 mA): average T_K = 0.02 %/10 K Span (20 mA): average T_K = 0.05 %/10 K

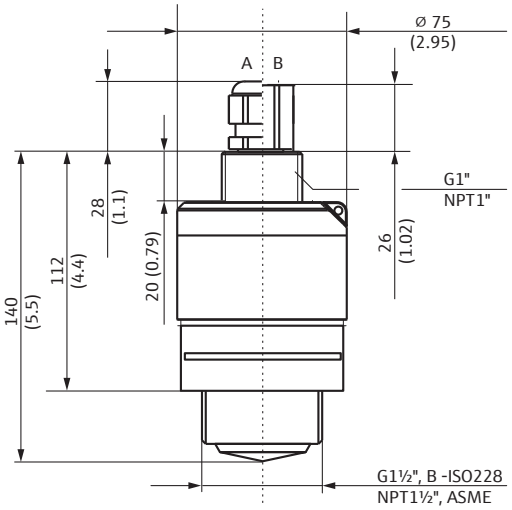
Environment	
Ambient temperature range	–40 to +60 °C (–40 to +140 °F)
Storage temperature	–40 to +80 °C (–40 to +176 °F)
Process temperature range	–40 to +60 °C (–40 to +140 °F)
Process pressure range	p_{rel} = –1 to 3 bar (–14.5 to 43.5 psi); p_{abs} < 4 bar (58 psi)
Degree of protection	– IP66, NEMA 4X – IP68, NEMA 6P (24 h at 1.83 m (6.00 ft) under water)
Climate class	DIN EN 60068-2-38 (test Z/AD)
Dielectric constant	ε_r ≥4
Electromagnetic compatibility (EMC)	In accordance with all of the relevant requirements outlined in the EN 61000 series and NAMUR Recommendation EMC (NE 21)

Materials	
Sensor housing, process connection	PVDF
Seal, O-ring	EPDM
Counter nut	PA6.6
Design ring	PBT PC

Operability	
Operating concept	4 to 20 mA; SmartBlue (app available for Android and iOS) via Bluetooth® wireless technology; Menu guidance with brief explanations of the individual parameter functions in the operating tool

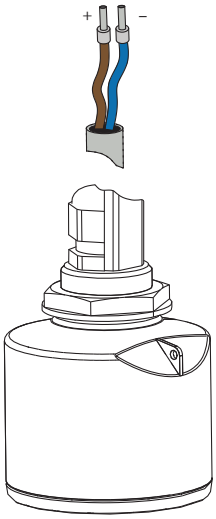
Certificates	
Ex approval	CSA C/US General Purpose; Non-hazardous area, EAC conformity

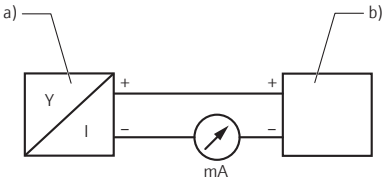
Dimensions in mm (inches)



Installation according to instruction manual.

Electrical connection





a) Micropilot FMR10, 4 to 20 mA
b) Power supply

Order codes

Micropilot FMR10			Order no.
Process connection	Antenna; Max. measuring range	Cable length	
Back: G1 ISO228; Front: G1½ ISO228	40 mm/1½"; 8 m liquid	10 m (32 ft)	FMR10-AAQBMWDEWFE2
Back: G1 ISO228; Front: G1½ ISO228	40 mm/1½"; 12 m liquid	10 m (32 ft)	FMR10- AAQBMWDEWFE2+R7

In free-field installations and/or in applications where there is a risk of flooding, the flooding protection tube (71325090) must be used.

Accessories	Order no.
Securing nut G1½"	52014146
Protective cover	52025686
Flooding protection tube, metallized PBT-PC	71325090
Mounting bracket, adjustable	71325079

Complete product information:
www.endress.com/fmr10

More products to complete your measuring point ...


Electromagnetic flowmeter
Picomag
page 93


Data manager
Ecograph T RSG35
page 137


Process display
RIA452
page 153

Ultrasonic sensor for non-contact level measurement

Prosonic T FMU30

Complete product information:
www.endress.com/fmu30

- Non-contact measurement method minimizes service requirements
- Quick and simple commissioning via menu-guided onsite operation
- Envelope curves on the on-site display

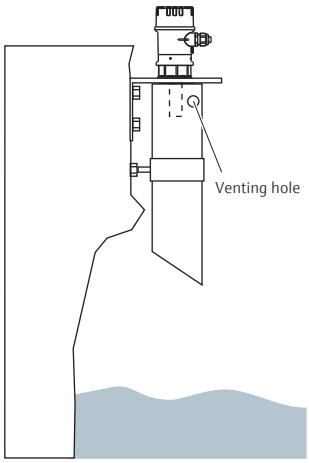
Specs at a glance:

- **Maximum measuring range in fluids:**
  8 m
- **Maximum measuring range in bulk materials:**
  3.5 m
- **Blocking distance:**
  ≥0.25 m
- **Typical measuring error:**
  ±3 mm or 0.2 % of measuring distance

Application Prosonic T FMU30 is a sensor for continuous, non-contact level measurement in simple applications. It can be used in fluids, pastes, sullages and coarse bulk materials. FMU30 is not suited for liquids with foam at the surface.

Function The sensor of the instrument transmits ultrasonic pulses in the direction of the product surface. There, they are reflected back and received by the sensor. The instrument measures the time between pulse transmission and reception.
The instrument uses the time (and the velocity of sound) to calculate the distance between the sensor membrane and the product surface.

Application example



Level measurement in a pump shaft

Technical data

Input	
Max. range fluids	Sensor 1½": 5 m Sensor 2": 8 m
Max. range bulk materials	Sensor 1½": 2 m Sensor 2": 3,5 m
Operating frequency	Sensor 1½": approx. 70 kHz Sensor 2": approx. 50 kHz
Pulse frequency	Max. 0.5 Hz
Emitting angle α	11°
Blocking distance	Sensor 1½": 0.25 m Sensor 2": 0.35 m

Output	
Output signal	4 to 20 mA
Signal on alarm	Selectable, according to NAMUR NE43
Output damping	Freely selectable, 0 to 255 s
Linearization	Up to 32 value pairs

Power supply	
Supply voltage	14 to 35 V DC (protective circuitry against reverse polarity is built into the device)
Power consumption	51 to 800 mW
Cable gland	M20×1.5 (recommended cable diameter 6 to 10 mm)

Performance characteristics	
Reference operating conditions	Temperature = +20 °C; Pressure = 1013 mbar abs.; Humidity = 50 %; Ideal reflective surface (e.g. calm, smooth fluid surface)
Typical measuring error	±3 mm or 0.2 % of measuring distance
Measured value resolution	1 mm

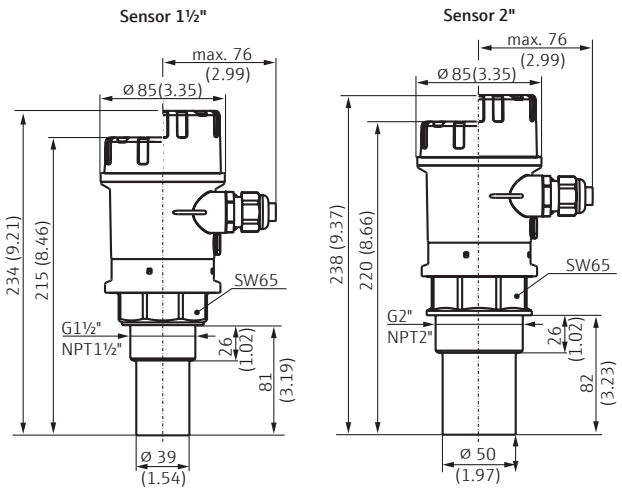
Operating conditions	
Ambient temperature	–20 to +60 °C
Storage temperature	–40 to +80 °C
Process temperature	–20 to +60 °C
Process pressure	0.7 to 3 bar abs.
Ingress protection	IP 66/68
Climate class	DIN EN 60068-2-38 (Test Z/AD) DIN/IEC 68 T2-30Db
Vibration resistance	DIN EN 60068-2-64/IEC 68-2-64: 20 to 2000 Hz, 1 $(m/s^2)^2$/Hz; 3 × 100 min
Electromagnetic compatibility (EMC)	according to all relevant requirements of the EN 61326 series

Materials	
Sensor	PP
Sealing	EPDM
Housing	PBT-FR (cover PBT/PA)

Housing design	
Type of housing	F16 plastic housing
Cover	Plastic cover – For version without on-site display (low, grey) – For version with on-site display (high, transparent)

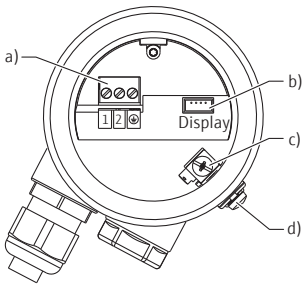
Operability	
Display and operating elements	menu-guided on-site operation with four-line plain text display with envelope curves; Commubox FXA291 (available as accessory)

Dimensions in mm (inches)

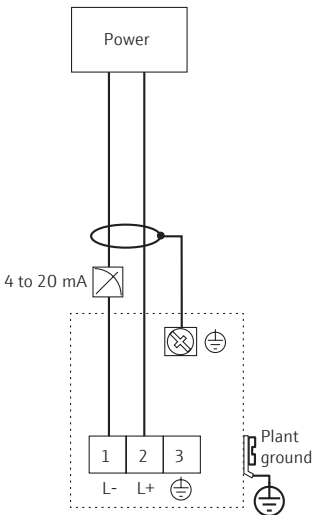


Installation according to instruction manual.

Electrical connection



a) Terminals
b) Optional: display
c) Internal earth terminal
d) External earth terminal



Order codes

Prosonic T FMU30			Order no.
Approval	Display	Sensor; max. range	
Non Ex	No*	1½"; 5 m liquid/2 m solid	FMU30-AAGEAAGGF
		2"; 8 m liquid/3.5 m solid	FMU30-AAGEABGHF
	Yes	1½"; 5 m liquid/2 m solid	FMU30-AAHEAAGGF
		2"; 8 m liquid/3.5 m solid	FMU30-AAHEABGHF
Ex	No*	1½"; 5 m liquid/2 m solid	FMU30-BBGEAAGGF
		2"; 8 m liquid/3.5 m solid	FMU30-BBGEABGHF
	Yes	1½"; 5 m liquid/2 m solid	FMU30-BBHEAAGGF
		2"; 8 m liquid/3.5 m solid	FMU30-BBHEABGHF

* For commissioning, also of more than one device, at least one display is needed.

Accessories	Order no.
Cover F16 high. transparent	52025605

Complete product information:
www.endress.com/fmu30

Capacitive probe for level measurement in liquids

Liquicap T FMI21

- No calibration needed
- Corrosion resistant materials (carbon fiber, stainless steel)
- Safe operation – regardless of tank geometry

Specs at a glance:

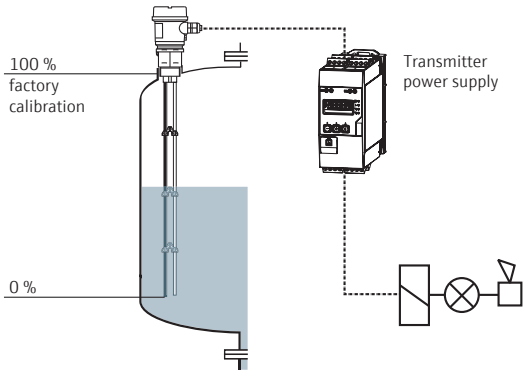
- **Product:**
  Conductive liquids as of 30 µS/cm
- **Probe length:**
  150 to 2500 mm (6 to 98")
- **Process pressure:**
  –1 to +10 bar (–14.5 to 145 psi)
- **Product temperature:**
  –40 to +100 °C (–40 to +212 °F)
- **Viscosity:**
  Max. 2000 cSt

Application The Liquicap T FMI21 sensor is used in conductive liquids for continuous level measurement. The Liquicap T FMI21 is particularly suited to small measuring tanks and works independently of the tank's shape or material (plastic, stainless steel, concrete to).
It is resistant to aggressive liquids like acids or alkalis.

Function The probe and medium form an electric capacitor. If the probe is in air, a certain low initial capacitance is measured. When the tank is filled, the capacitance increases the more the probe is covered. The electronic insert of the probe converts the capacitance measured to a 4 to 20 mA signal in proportion to the level.

Complete product information:
www.endress.com/fmi21

Application example



The measuring system consists of:

- The Liquicap T FMI21 capacitance probe (the probe rods should never be in contact with the tank) with
- Electronic insert FEI20
- Display and housing cover (optional)
- A transmitter power supply unit RMA42, RTA421, RIA45/ RIA46 or RIA452

Technical data

Input	
Maximum viscosity	2 000 cSt
Measuring range	0 pF to 2 000 pF
Probe length	150 to 2 500 mm (5.9 to 98.43")
Permitted span	ΔC = 10 pF to 2 000 pF
Measuring frequency	250 kHz
Input signal	Probes covered → high capacitance Probes exposed → low capacitance

Output (electronic insert FEI20/4 to 20mA)	
Output signal	3.8 to 20.5 mA
Switch-on current	max. 20 mA (< 500 ms)
Signal on alarm	>21 mA

Power supply	
Connection voltage	U = 10 to 30 V DC, Reverse polarity protection (integrated)
Power consumption	P <0.7 W
Current consumption	I <22 mA
Cable entries	M20×1.5 (screw connection)

Performance characteristics (with installed electronic insert)	
Reference operating conditions	Ambient temperature 74 °F (23 °C), atmospheric pressure, probe installation vertical from above
Max. measured error	≤1 % of full scale value
Repeatability	0.25 % of full scale value
Start-up settling time	<2 s
Influence of ambient temperature	<0.01 %/K (−40 to +70 °C/−40 to +158 °F) probe length 1 m
Integration time	1 s
Calibration	In an installed state, recalibration is only necessary if: – the 0 % and 100 % value should be adjusted to suit customer specifications – after the probe rods have been shortened

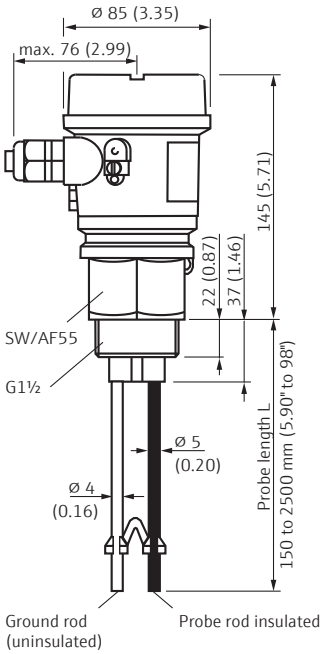
Operating conditions	
Ambient temperature	−40 to +70 °C (−40 to +158°F)
Storage temperature	−40 to +80 °C (−40 to +176°F)
Climate class	Tropicalized as per DIN IEC 68 Part 2-38
Degree of protection	IP 66
Shock resistance	DIN EN 60068-2-27/IEC 68-2-27: 30g
Vibration resistance	DIN EN 60068-2-64/IEC 68-2-64: 20 to 2 000 Hz, 1 $(m/s^2)^2$/Hz (with min. rod length 150 mm)
EMC	Interference emission to EN 61326, electrical equipment class B; Interference immunity to EN 61326, annex A (industrial)
Conductivity of medium	≥30 µS/cm
Process pressure	−1 to +10 bar (−14.5 to 145 psi)
Process temperature	−40 to +100 °C (−40 to +212 °F)
Lateral loading capacity	2 Nm

Materials in contact with medium	
Probe rods	Rod: 1.4404/316L; Optional: carbon fiber CFC; Sealing ring: EPDM; Insulation: PP; Spacer: PP
Process connections	G1½ A (PPS, DIN ISO 228/I)
Seals	Sealing ring for process connection G1½ A: Elastomer fiber asbestos-free (resistant to oils, solvents, steam, weak acids and alkalis)

Display	
Green LED	operational status (slow flashing), calibration status (fast flashing)
Red LED	for key enter validation (short flashing), alarm or warning (flashing)
Display for measured value in %	optional

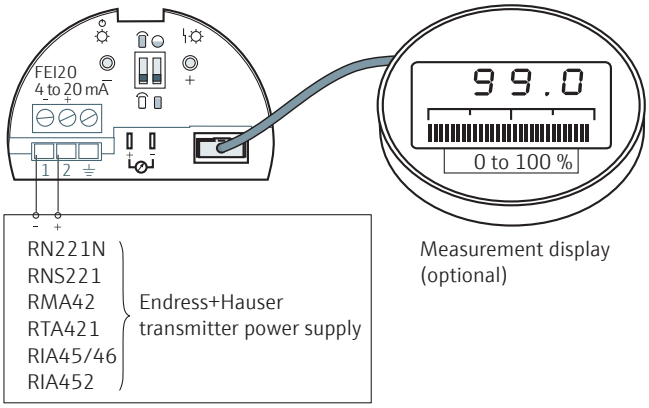
Approvals	
WHG approval	Overspill protection to §19 WHG (Germany)

Dimensions in mm (inches)



Installation according to instruction manual.

Electrical connection



Order codes

Liquicap T FMI21				Order no.
Approval	Probe rod	Display	Length (mm)*	
Non-hazardous area	316L. L = 150 to 2 500 mm (5.9 to 98.43")	Without		FMI21-A1A1B1
		With		FMI21-A1A1C1
	Carbon fiber. L = 150 to 1 000 mm (5.9 to 39.37")	Without		FMI21-A1B1B1
		With		FMI21-A1B1C1
	Carbon fiber. L = 1 000 to 2 500 mm (39.37 to 98.43")	Without		FMI21-A1C1B1
		With		FMI21-A1C1C1
Non-hazardous area. WHG	316L. L = 150 to 2 500 mm (5.9 to 98.43")	Without		FMI21-B1A1B1
		With		FMI21-B1A1C1
	Carbon fiber. L = 150 to 1 000 mm (5.9 to 39.37")	Without		FMI21-B1B1B1
		With		FMI21-B1B1C1
	Carbon fiber. L = 1 000 to 2 500 mm (39.37 to 98.43")	Without		FMI21-B1C1B1
		With		FMI21-B1C1C1

* Please specify sensor length.

Accessories	Order no.
Mounting nut G1½"	52014146
Shortening kit PP for probes	52024300
Display (please order together with transparent cover)	52025604
Cover F16 high. transparent	52025605

Complete product information:
www.endress.com/fmi21

More products to complete your measuring point ...


Pressure sensor
Cerabar PMC21
page 72


Kompakt termometre
iTHERM CompactLine TM311
page 104


Process transmitter
RMA42
page 157

Hydrostatic level measurement

Waterpilot FMX11

NEW!

- Easy and quick to install and commission
- Flexible uses in fresh water applications thanks to the very compact design and materials that are suitable for drinking water

Specs at a glance:

- **Relative nominal pressure** [bar (abs.)] : 0,2 (3), 0.4 (6), 0.6 (9), 1.0 (14.5), 2.0 (29)
- **Level [mH2O]:** 2, 4, 6, 10, 20
- **Signal range:** 2 to 22 mA
- **Supply voltage:** 8 to 28 VDC
- **Ambient temperature range:** −10 to +70 °C (+14 to +158 °F)

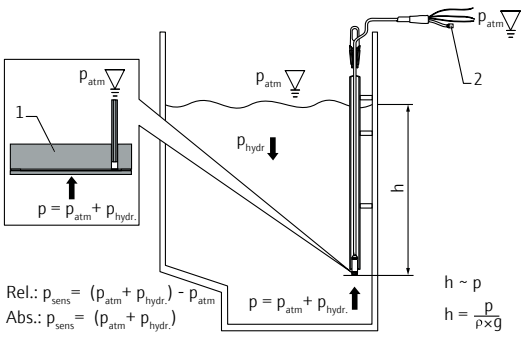
Application The Waterpilot FMX11 is a pressure sensor for hydrostatic level measurement in fresh water applications. Typical applications include:

- Level measurement in groundwater wells; suitable for narrow 1" pipes
- Surface water monitoring in rivers and lakes
- Level monitoring in the extraction of drinking water, e.g., in water towers

Function The process pressure deflects the metal process membrane in the sensor. A fill liquid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change of the bridge output voltage is measured and analyzed.

Complete product information:
www.endress.com/fmx11

Application example



Technical data

Input	
Measured variable	Hydrostatic pressure of a liquid
Measuring range	Customer-specific measuring ranges or calibration that has been preset in the factory.

Input variable absolute pressure	
Relative nominal pressure [bar (abs.)]	0,2 (3), 0.4 (6), 0.6 (9), 1.0 (14.5), 2.0 (29)
Level [mH_2O]	2, 4, 6, 10, 20
Overload OPL [bar (abs.)]	1 (14.5), 2 (29), 5 (72.5), 5 (72.5), 10 (145)
Burst pressure ≥ [bar (abs.)]	1,5 (22), 3 (43.5), 7,5 (109), 7,5 (109), 10 (145)
Negative pressure [bar (abs.)]	−0.7 (−11), −1 (−14.5) (unrestricted vacuum-resistance)

Output	
Output signal	4 to 20 mA analog, 2-wire for hydrostatic pressure measured value.
Signal range	2 to 22 mA

Power supply	
Supply voltage	8 to 28 V_{DC}
Power consumption	≤0.62 W at 28 V_{DC}
Current consumption	Max. current consumption: ≤22 mA Min. current consumption: ≥2 mA
Electrical connection	– The supply voltage must match the supply voltage specified on the nameplate. – The cable must end in a dry room or a suitable terminal box. The terminal box (IP66/IP67) with GORE-TEX® filter from Endress+Hauser is suitable for outdoor installation. The terminal box can be ordered separately as an accessory (order number: 52006152)
Cable specification Connecting cable	Endress+Hauser recommends using shielded, twisted-pair two-wire cables. – Commercially available instrument cable – Terminals, terminal box: 0.08 to 2.5 mm^2 (28 to 14 AWG)
Extension cable	– Total outer diameter: – 6 mm (0.24 in) ±0.2 mm (0.01 in) – PA pressure compensation tube: – Outer diameter 2.5 mm (0.1 in) – Internal diameter 1.5 mm (0.06 in) – Pressure compensation element outer diameter 6 mm (0.24 in)
Cross-section	2 × 0.22 mm^2 + pressure compensation tube
Cable resistance	Per wire: ≤0.09 Ω/m
Residual ripple	No impact on the 4 to 20 mA signal to ±5 % residual ripple within the permitted voltage range.

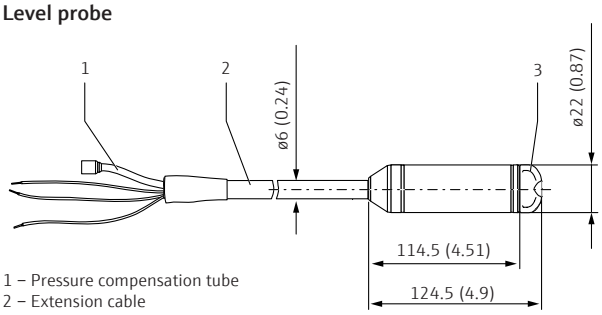
Performance characteristics	
Reference operating conditions	– As per IEC 60770 – Ambient temperature T_U = constant, in the range: +21 to +27 °C (+70 to +81 °F) – Humidity φ = constant, in the range of 20 to 80 % rH – Ambient pressure p_U = constant, in the range: 860 to 1 060 mbar (12.47 to 15.37 psi) – Position of measuring cell constant, vertical in the range of ±1° – Supply voltage constant: 21 V DC to 27 V DC
Reference accuracy	The reference accuracy comprises the non-linearity after limit point configuration, hysteresis and non-reproducibility in accordance IEC 60770. – Sensor measuring range ≥400 mbar: ≤±0.35 % – Sensor measuring range <400 mbar: ≤±0.50 %
Long-term stability	≤±0.1 % of URL/year at reference operating conditions
Influence of medium temperature	– Thermal change in the zero output and the output span: −10 to +70 °C (+14 to 158 °F): <(0.4 + 0.4 × TD)% of set span – Temperature coefficient (TK) of the zero output and the output span 0 to +70 °C (32 to 158 °F): 0.15 %/10 K of URL
Warm-up period	≤10 s
Response time	T90 time: ≤15 ms T99 time: ≤45 ms

Environment	
Ambient temperature range	FMX11: −10 to +70 °C (+14 to +158 °F) (= medium temperature) Terminal box: −40 to +80 °C (−40 to +176 °F)
Storage temperature range	FMX11: −10 to +70 °C (+14 to +158 °F) Terminal box: −40 to +80 °C (−40 to +176 °F)
Degree of protection	FMX11: – IP68, permanently hermetically sealed at 10 bar (145 psi) Terminal box (optional): – IP66, IP67
Electromagnetic compatibility (EMC)	– EMC in accordance with all relevant requirements of EN 61326 series. For details, refer to the Declaration of Conformity. – Maximum deviation: <0.5 % of span.

Process	
Medium temperature range	0 to +70 °C (+32 to +158 °F)

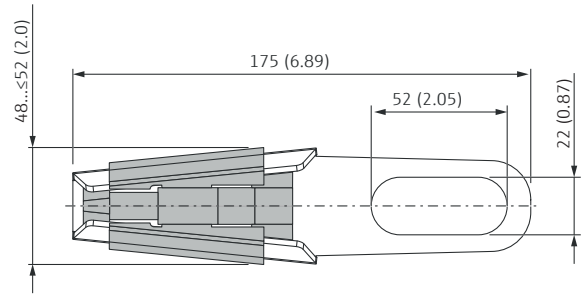
Dimensions in mm (inches)

Level probe



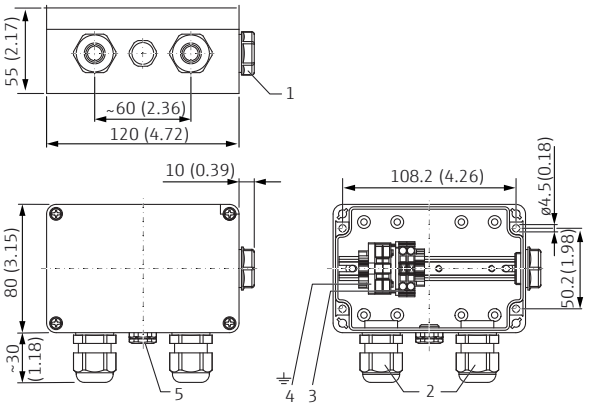
1 – Pressure compensation tube
2 – Extension cable
3 – Protection cap

Suspension clamp



Unit of measurement mm (in)
Installation according to instruction manual.

Terminal box IP66, IP67 with filter



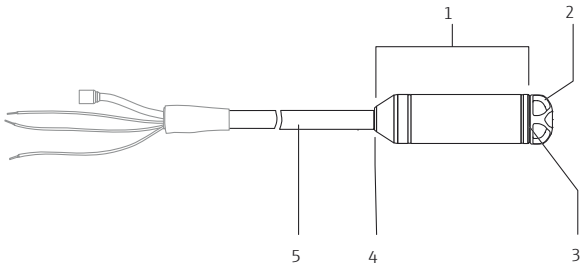
Unit of measurement mm (in)

1 – Dummy plug M20×1.5
2 – Cable gland M20×1.5
3 – 4 to 20 mA; terminals for 0.08 to 2.5 mm (28 to 14 AWG) 0.08 to 2.5 mm²
4 – Ground connection; terminals for 0.08 to 2.5 mm (28 to 14 AWG) 0.08 to 2.5 mm²
5 – GORE-TEX® filter

Terminal box IP66/IP67 with GORE-TEX® filter incl. 3 integrated terminals.

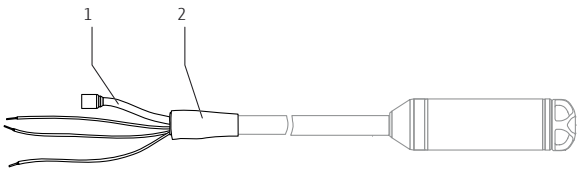
Installation according to instruction manual.

Materials in contact with process



1 – Level probe: 316L (1.4404/1.4435)
2 – Protection cap (order number: 52008999): POM
3 – Process isolating diaphragm: 316L
4 – Seal: EPDM
5 – Extension cable insulation: TPE

Materials not in contact with process



1 – Pressure compensation tube: PA
2 – Heat shrink tube: polyolefin

Cable lengths available for order

- 6 m (20 ft) cable, can be shortened, PE
- 10 m (33 ft) cable, can be shortened, PE
- 20 m (66 ft) cable, can be shortened, PE
- 30 m (98 ft) cable, can be shortened, PE
- Limited cable length when performing installation with freely suspended device with suspension clamp: max. 300 m (984 ft).

Technical data for cable

- Minimum bending radius:
  ≥ 70 mm (2.76 in) static
- Tensile strength: 500 N (112.4 lbf)
- Cable extraction force (= tensile force required to extract the cable from the probe):
  ≥ 400 N (89.92 lbf)
- UV-resistant (UV = ultraviolet)
- TPE: Use in water and drinking water

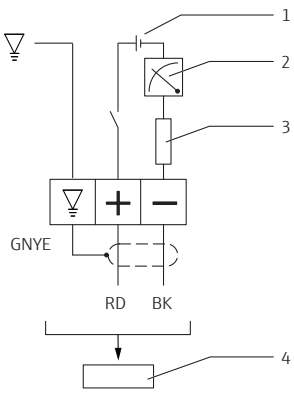
Weight

- Level probe: 165g 165 g (5.82 oz)
- Extension cable: 32 g/m (1.129 oz/ft)
- Suspension clamp: 170 g (5.996 oz)
- Terminal box: 235 g (8.288 oz)

Extension cable

- Abrasion-resistant extension cable with strain-relief members made of high-strength PE fibers
- Shielded (aluminum)
- Insulated with TPE
- Copper wires, twisted
- Pressure compensation tube with Teflon filter

Electrical connection



1 – 8 to 28 VDC
2 – 4 to 20 mA
3 – Resistance (RL)
4 – Waterpilot FMX11

Wire colors
- RD = red
- BK = black
- GNYE = green/yellow

Order codes

Waterpilot FMX11		Order no.
Sensor range	Cable length	
200 mbar/20kPa/3psi gauge, 2mH2O/6ftH2O/80inH2O	6m	FMX11-CA11D506
	10m	FMX11-CA11D510
400 mbar/40kPa/6psi gauge, 4mH2O/12ftH2O/160inH2O	10m	FMX11-CA11F510
600 mbar/60kPa/9psi gauge, 6mH2O/20ftH2O/240inH2O	10m	FMX11-CA11G510
	20m	FMX11-CA11G520
1bar/100kPa/15psi gauge, 10mH2O/33ftH2O/400inH2O	10m	FMX11-CA11H510
	20m	FMX11-CA11H520
2bar/200kPa/30psi gauge, 20mH2O/67ftH2O/800inH2O	20m	FMX11-CA11K520
	30m	FMX11-CA11K530

Accessories	Order no.
Suspension clamp	52006151
Terminal box	52006152

Complete product information:
www.endress.com/fmx11

More products to complete your measuring point ...

Pressure sensor
Cerabar PMC21
page 72

Kompakt termometre
iTHERM CompactLine TM311
page 104

Process transmitter
RMA42
page 157

Point level switch for granular solids

Soliswitch FTE20

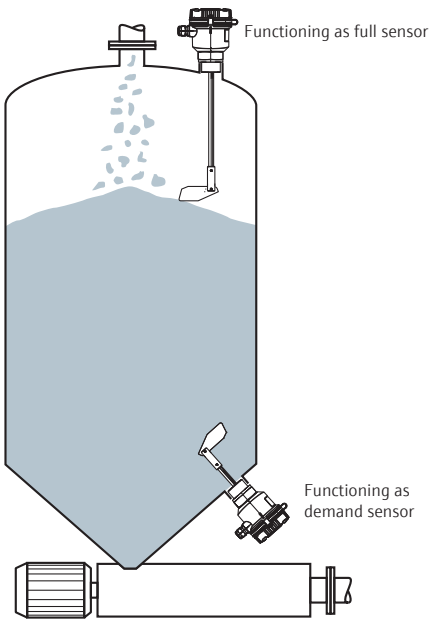
Complete product information:
www.endress.com/fte20

- Easy installation
- Optical and automatic rotation control (optional)
- Weight of solids can be adjusted without the need for tools

Specs at a glance:

- **Medium:**
  Solids weight ≥80 g/l
  (4.99 lb/ft³)
- **Operating pressure (abs.):**
  0.5 to 2.5 bar
  (7.25 to 36.3 psi)
- **Medium temperature:**
  −20 to +80 °C (−4 to 176 °F)

Application example



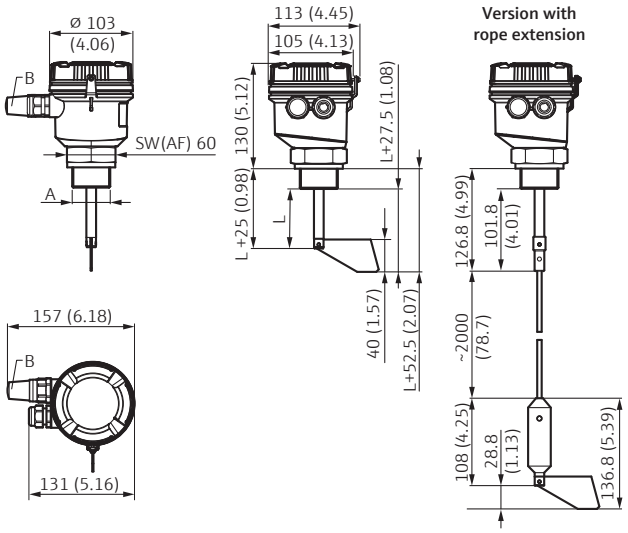
Application The Soliswitch FTE20 is a paddle switch for granular solids. Its robust and compact design makes the point level switch an ideal sensor for detecting the full, empty or refill status in applications with bulk solids, such as in silos containing solids. Typical application areas are point level detection in e.g. cereals, sugar, cacao, animal feeds, washing powders, chalk, dry plaster, cement, granulates and wood chips.

Function The shaft and paddle are driven using a reduction gear and synchronous motor. If the paddle is stopped by material covering it, the hinged motor in the housing moves from the rest to the switch position. This movement operates two switch contacts; the first is for external level indication and the second switches off the power to the motor.
The paddle starts to rotate once the medium level falls below the paddle, the hinged motor returns to its rest position and the two contacts switch to normal operation. Intermittent loads that operate against or even in the same direction of rotation are evened out by a slip clutch.

Technical data

Output	
Output signal	Binary
Response time	From standstill of the paddle until output of the switching signal: 20°, corresponds to 3.5 s
Switching capacity relay	EN 61058: 250 V AC 5E4, 6(2) A; L 1054: 125 to 250 V AC, 5 A; 30 V DC, 8 A; Min. switching load 300 mW (5 V/5 mA)
Function	Detection of full or refill status
Automatic rotation monitoring (optional)	Detection of blockage or failure of the drive unit
Power supply	
Supply voltage	20 to 28 V DC; 24 V AC; 115 V AC; 230 V AC
Power consumption	Max. 3.5 VA
Cable entries	2 × cable gland, M20 × 1.5 (optionally 1 × cable gland M20 × 1.5 and indicator lamp)
Operating conditions	
Side load on the shaft	Max. 60 N
Load on the rope	Max. 1500 N
Operating pressure (abs.)	0.5 to 2.5 bar (7.25 to 36.3 psi)
Ambient temperature	–20 to +60 °C (–4 to 140 °F)
Degree of protection	IP 66
Shock resistance	as per EN 60068-2-27: 30g
Vibration resistance	as per EN 60068-2-64: 0,01g²/Hz
Medium temperature	–20 to +80 °C (–4 to 176 °F)
Solids weight	≥80 g/l
Grain size	≤50 mm (1.97")
Mechanical construction	
Material	– Housing: Polycarbonate – Captive screw cap: Polyamide – Cover seal: Silicone – Shaft/Rope extension/Paddle: Stainless steel – Process seal: Synthetic/organic fiberelastomer sealing (nonasbestos) NPT versions have no process seal and need to be sealed at the thread by the customer – Process connections: Stainless steel or PBT
Shaft seal	NBR
Shaft speed	1 min^{-1}
Process connection	NPT1¼"; NPT1½"; G1½"
Electrical connection	Terminals with spring terminal design, Permitted cable cross-sections 2.5 mm² solid, 1.5 mm² flexible with wire end ferrule with plastic ferrule
Approvals	
Ex approval	ATEX II 1/2D

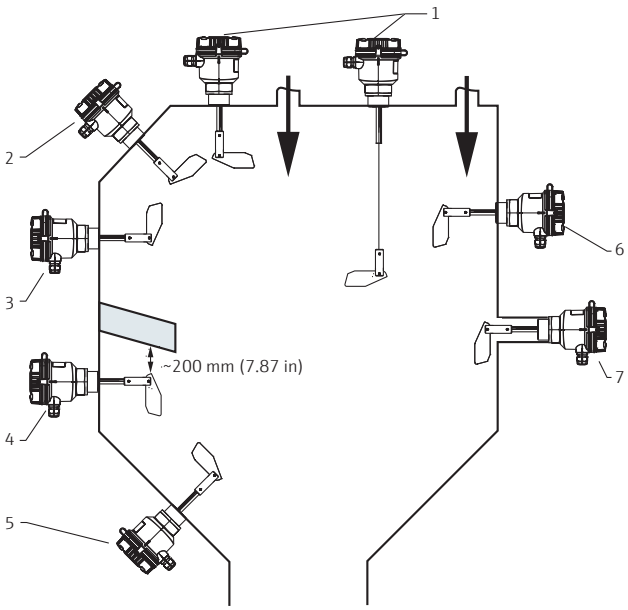
Dimensions in mm (inches)



A: Process connection NPT 1¼", NPT 1½", G 1½"
B: Indicator light (optional)
L: Length of shaft 75 to 300 mm (2.95" to 11.81")

Installation according to instruction manual.

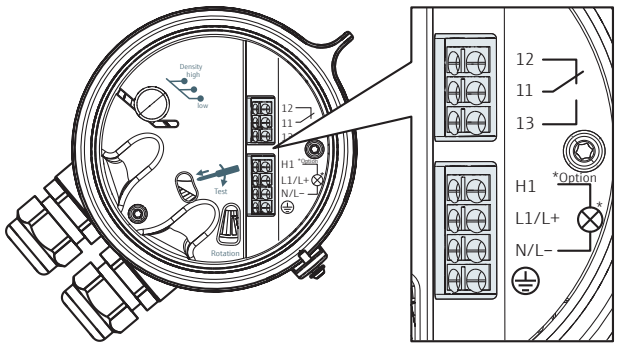
Installation



Correct installation positions of the device:
1: Vertical from the top
2: Angled from the top
3: From the side
4: From the side with protective cover against falling solids
5: From below

Incorrect installation positions of the device:
6: In direction of solids flow
7: Installation coupling too long

Electrical connection



⏚	Protective ground
N (AC), L− (DC):	Power connection
L1 (AC), L+ (DC):	Power connection
H1, N/L−:	Connection for signaling empty/full status detection (optional)
11:	Changeover contact
12:	Normally closed contact
13:	Normally open contact

Order codes

Insertion Length

Code	Length	Code	Length
AA	75 mm	AD	200 mm
AB	100 mm	AE	300 mm
AC	120 mm		

Soliswitch FTE20

Approval	Process connection	Length	Power supply	Order no.
Non Ex	Thread G1½; PBT	75 to 300 mm (2.95" to 11.81")	230 V AC	FTE20-AA13☐41
			24 V AC	FTE20-AA13☐21
			20 to 28 V DC	FTE20-AA13☐11
		2000 mm (78.7") (Rope, shortable)	230 V AC	FTE20-AA13AF41
			24 V AC	FTE20-AA13AF21
			20 to 28 V DC	FTE20-AA13AF11
	Thread G1½; 303	75 to 300 mm (2.95" to 11.81")	230 V AC	FTE20-AA16☐41
			24 V AC	FTE20-AA16☐21
			20 to 28 V DC	FTE20-AA16☐11
		2000 mm (78.7") (Rope, shortable)	230 V AC	FTE20-AA16AF41
			24 V AC	FTE20-AA16AF21
			20 to 28 V DC	FTE20-AA16AF11
ATEX II 1/2D	Thread G1½; PBT	75 to 300 mm (2.95" to 11.81")	230 V AC	FTE20-BI13☐41
			24 V AC	FTE20-BI13☐21
			20 to 28 V DC	FTE20-BI13☐11
		2000 mm (78.7") (Rope, shortable)	230 V AC	FTE20-BI13AF41
			24 V AC	FTE20-BI13AF21
			20 to 28 V DC	FTE20-BI13AF11
	Thread G1½; 303	75 to 300 mm (2.95" to 11.81")	230 V AC	FTE20-BI16☐41
			24 V AC	FTE20-BI16☐21
			20 to 28 V DC	FTE20-BI16☐11

Versions with automatic rotation monitoring available on request.

Complete product information:
www.endress.com/fte20

More products to complete your measuring point ...

Vibronic limit switch
Soliphant T FTM20
page 53

Temperature sensor
iTHERM ModuLine TM101
page 108

Process meters
RIA46
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Vibronic limit switches for bulk solids

Soliphant T FTM20/FTM21

Complete product information:
www.endress.com/ftm20

- No calibration: easy commissioning
- Insensitive to buildup
- Sensor material 316L

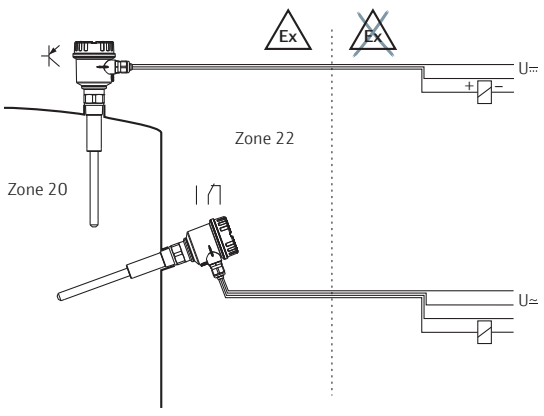
Specs at a glance:

- **Product:**
  Non-fluidized bulk solids
- **Probe length:**
  Compact design:
  225 mm (8.86");
  with extension rod:
  500, 1000 or 1500 mm
  (19.67, 39.37 or 59.06")
- **Product density:**
  ≥200 g/l
- **Process pressure:**
  –1 to +25 bar
  (–14.5 to +363 psi)
- **Product temperature:**
  –40 to +150 °C (–40 to +302 °F)

Application The Soliphant T is a robust point level switch for silos containing fine or coarse-grained, non-fluidized bulk solids. The various designs that are available means the device has a wide range of applications. Soliphant T is available in 4 lengths and the probe length of extended versions can be easily adjusted using a sliding sleeve (see accessories).

Function A piezoelectric drive excites the vibrating rod of Soliphant T FTM20/FTM21 to its resonance frequency. If medium covers the vibrating rod, the rods vibrating amplitude changes (the vibration is damped). Soliphants electronics compare the actual amplitude with a target value and indicates whether the vibrating rod is vibrating freely or whether it is covered by medium. The process connection is de-coupled from the rods vibration movements and thus is insensitive to vibrations and noise.

Application example



The entire measuring system consists of:

- Soliphant T FTM20 or FTM21 with FEM22 or FEM24 electronic insert
- A supply point and
- The connected control systems, switching units, signalling systems (e.g. lamps, horns, PCS, PLC, etc.)

Technical data

Input	
Measuring frequency	700 to 800 Hz

Output parameters	
Fail-safe mode	Minimum/maximum quiescent current
Drop-out signal	Output locked
Switching delay	0.5 s when the sensor is covered, 1 s when the sensor is exposed

Environment	
Ambient temperature	−40 to +70 °C (−40 to +158 °F)
Storage temperature	−40 to +85 °C (−40 to +185 °F)
Climate class	DIN IEC 68 part 2-38
Ingress protection	IP66/IP67, NEMA4X
Vibration resistance	DIN 60068-2-27/IEC 68-2-27; shock 30 g; vibration 0.01 g^2/Hz
EMC	Interference emission to EN 61326, Electrical Equipment Class B; Interference immunity to EN 61326 Annex A (Industrial)

Process	
Bulk density	≥200 g/l, not fluidized
Process pressure	−1 to +25 bar (−14.5 to +363 psi)
Process temperature	−40 to +150 °C (−40 to +302 °F)

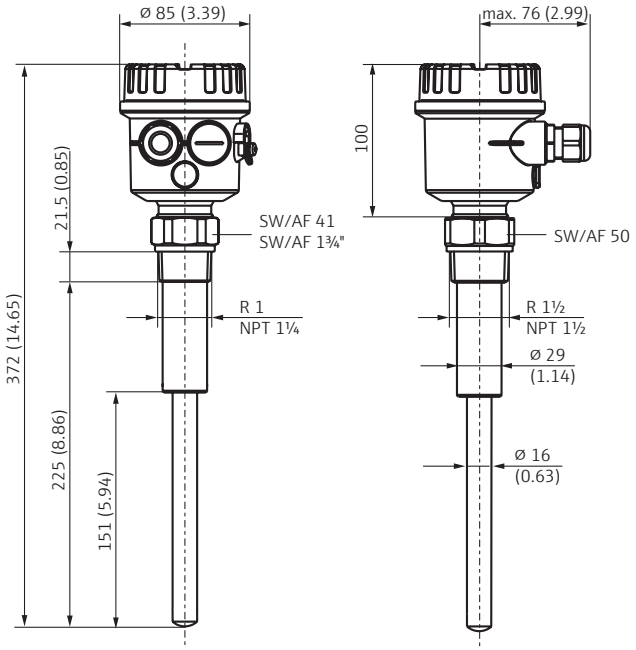
Material	
Sensor	316L
Process connection	R1; 1½ (316L)
Housing	F16 (plastics); F18 (aluminium)

Electrical connection	
Cable specification	Use a usual commercial two-, three- or four-wire cable (25 Ω)
Cable entries	M20×1.5

Approvals
ATEX II 1/3 D, FM, CSA, EAC

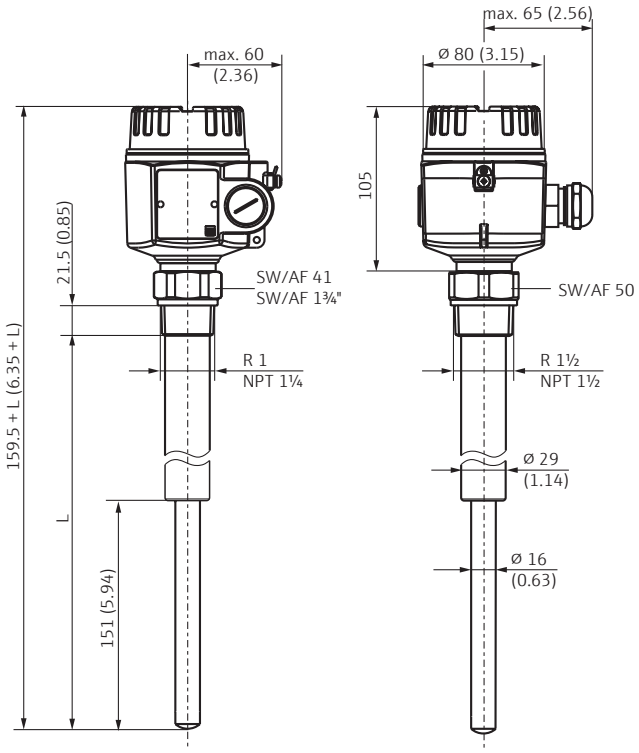
Dimensions in mm (inches)

FTM20 (compact design, polyester housing)



Installation according to instruction manual.

FTM21 (with extension pipe, aluminium housing)

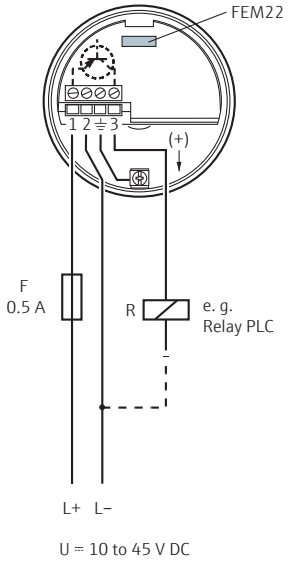


L = 500/1000/1500 (20/40/60)

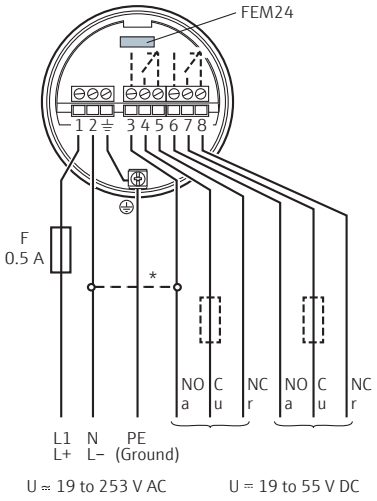
Installation according to instruction manual.

Electrical connection

Electronic insert FEM22 (DC PNP)	
Power supply	10 to 45 V DC
Current consumption	max. 18 mA
Connectable load	– Positive signal at electronics switch output (PNP) – max. 350 mA, short-circuit protection – residual voltage <3 V
Signal on alarm	Output signal on power failure or in the event of device failure: < 100 µA
Preferred in conjunction with programmable logic controllers (PLC), DI modules as per EN 61131-2.	



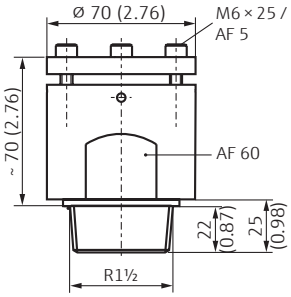
Electronic insert FEM24 (AC/DC with relay output)	
Power supply	19 to 253 V AC 50/60 Hz 19 to 55 V DC
Power consumption	approx. 1.3 VA
Connectable load	– Loads switched via 2 floating changeover contacts – I~ max. 6 A, U~ max. 253 V – P~ max. 1500 VA, cos φ = 1 – P~ max. 750 VA, cos φ >0.7 – I– max. 6 A to 30 V – I– max. 0.2 A to 125 V
Signal on alarm	Output signal in event of power failure: relay de-energised
Both relay contacts switch simultaneously.	
Please note the different voltage ranges for direct and alternating current.	



*When jumpered, the relay output works with NPN logic.

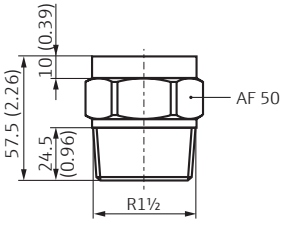
Accessories

Sliding sleeve:
R 1½" for pressurised container



Suitable for multiple switch-point configurations

Sliding sleeve:
R 1½" for unpressurised container



Only suitable for one-time switch-point configuration!

Order codes

Process connections

Code	Thread connection
A	R1″
G	R1½″

Soliphant T FTM20				Order no.
Length	Version	Electronics	Housing	*
225 mm	Non-Ex	10 to 45 V DC	Polyester	FTM20-A□22A
			Aluminium	FTM20-A□25A
		AC/DC/Relay	Polyester	FTM20-A□42A
			Aluminium	FTM20-A□45A
	Ex	10 to 45 V DC	Aluminium	FTM20-4□25A
		AC/DC/Relay	Aluminium	FTM20-4□45A

Soliphant T FTM21				Order no.
Length	Version	Electronics	Housing	
500 mm	Non-Ex	10 to 45 V DC	Polyester	FTM21-A□222A
			Aluminium	FTM21-A□225A
		AC/DC/Relay	Polyester	FTM21-A□242A
			Aluminium	FTM21-A□245A
	Ex	10 to 45 V DC	Aluminium	FTM21-4□225A
		AC/DC/Relay	Aluminium	FTM21-4□245A
1 000 mm	Non-Ex	10 to 45 V DC	Polyester	FTM21-A□322A
			Aluminium	FTM21-A□325A
		AC/DC/Relay	Polyester	FTM21-A□342A
			Aluminium	FTM21-A□345A
	Ex	10 to 45 V DC	Aluminium	FTM21-4□325A
		AC/DC/Relay	Aluminium	FTM21-4□345A
1500 mm	Non-Ex	10 to 45 V DC	Polyester	FTM21-A□422A
			Aluminium	FTM21-A□425A
		AC/DC/Relay	Polyester	FTM21-A□442A
			Aluminium	FTM21-A□445A
	Ex	10 to 45 V DC	Aluminium	FTM21-4□425A
		AC/DC/Relay	Aluminium	FTM21-4□445A

* Please add process connection to order code.

Accessories	Order no.
Sliding sleeve: R 1½" (pressurized)	52023312
Sliding sleeve: R 1½" (unpressurized)	52023313

Complete product information:
www.endress.com/ftm21

More products to complete your measuring point ...


Point level switch
Liquiphant FTL31
page 8


Pressure sensor
Cerabar PMC21
page 72


Flow switch
Flowphant T DTT31
page 98

Capacitive point level switch for bulk solids

Minicap FTC260/FTC262

Complete product information:
www.endress.com/ftc260
www.endress.com/ftc262

- No calibration required
- Active buildup compensation
- Maintenance-free
- Easily shortened rope version

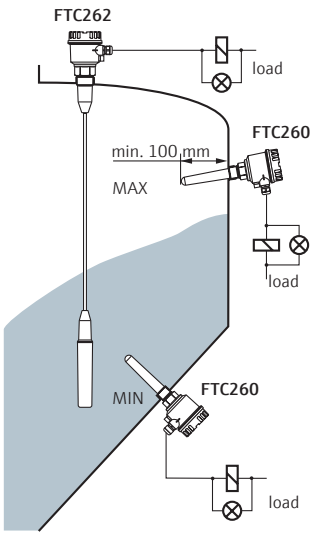
Specs at a glance:

- **Product:**
  Bulk solids
- **Grain size:**
  Diameter ≤30 mm (1.18″)
- **Process pressure:**
  −1 to +25 bar
  (−14.5 to +363 psi)
- **Product dielectric constant:**
  ε_r ≥1.6
- **Product temperature:**
  FTC260: −40 to +120 °C
  (−40 to +248°F)
  FTC262/Ex: −40 to +70 °C
  (−40 to +158°F)
- **Probe length:**
  Rod/FTC260: 140 mm (5.51″)
  Rope/FTC262:
  1.5; 2.5 and 6 m
  (4.9; 8.2 and 19.69 ft)

Application The Minicap is suitable for the level detection of powdery and fine-grain bulk solids, such as grain, flour, powdered milk, mixed feed, cement, chalk or gypsum and is suitable for use in dust explosive areas (ATEX II 1/3 D). The Minicap has two output options:
Relay output (SPDT) or
PNP output

Function The Minicap is an electronic switch. When the limit is exceeded or the load falls below the limit, a switching signal is output. A switch housing or signal output device (e.g. lights, horns, programmable logic sequencer, stored program control, etc.) can be connected to the Minicap. It has an in-built switch-over facility for minimum/maximum safety. It detects the formation of deposits on the probe, and compensates for the effects of this so that the switching point is maintained. The Minicap comes with factory settings. Other sensitivity adjustments can be made on the housing.

Application Example



Level detection in silos with bulk goods. The silos can be made of various materials (e.g. metal, plastic, concrete), as these do not affect measurement.
The filling stream should not be directed onto the probe.

Technical data FTC260

Output	
Output signal	**DC-PNP:** I_{max} 200 mA, secure against overload and shorting, residual voltage at transistor at I_{max} <2.9 V **AC/DC-SPDT:** AC: I_{max} = 4 A, I_{min} = 1 mA, U_{min} = 6 V, U_{max} = 253 V, P_{max} = 1000 VA DC: I_{max} 4 A up to 30 V, I_{max} 0.2 A up to 253 V
Malfunction signal	**DC-PNP:** <100 µA **AC/DC-SPDT:** relay de-energised
Switching delay	0.5 s upon release/covering

Power supply	
Supply voltage	**DC-PNP:** 10.8 to 45 V DC, short pulse up to 55 V DC, current input 30 mA (max.), reverse polarity protection **AC/DC-SPDT (relay contact):** 20 to 253 V AC or 20 to 55 V DC, max. current input: 130 mA
Terminal compartment	Stranded wires max. 1.5 mm^2 in end sleeves, Electric wire max. 2.5 mm^2

Accuracy	
Long-term drift	Horizontal ±3 mm (±0.12"), vertical ±6 mm (±0.24")
Hysteresis	Horizontal 4 mm (0.16"), vertical 7 mm (0.28")
Switchpoint	Horizontal at centre of probe −5 mm (−0.2"), vertical 40 mm (1.58") above probe tip

Operating conditions	
Ambient temperature	−40 to +80 °C (−40 to +176°F) (to +60 °C/140 °F Dust Ex)
Climate class	As per EN 60068 part 2-38
Protection system	IP 66
EMC	Interference Emission to EN 61326, Electrical Equipment Class B; Interference Immunity to EN 61326, Annex A (Industrial) and NAMUR Recommendation NE 21 (EMC)
Process temperature	−40 to +130 °C (−40 to +266 °F) (to +80 °C/176 °F Dust Ex)
Process pressure	−1.0 to +25 bar (−14 to +363 psi)

Material	
Wetted parts	Probe: PPS GF40; FDA: FCN No. 000040

General	
Medium	Bulk solids with grain size up to 30 mm (1.18"), relative dielectric constant ε_r ≥1.6
Flexural strength	1400 N (at tip of probe)
Process connection	R1 DIN 2999/ISO 7
Adapter	Inner thread R1 DIN 2999 ISO 7: for R1½ DIN 2999/ISO 7 for G1½ DIN ISO 228

Approvals	
Ex approval	ATEX II 1/3 D
WHG approval	Overspill protection to §19 WHG (Germany)

Sensor material is FDA registered

Technical data FTC262

Output	
Output signal	**DC-PNP:** I_{max} 200 mA, secure against overload and shorting, residual voltage at transistor at I_{max} <2.9 V **AC/DC-SPDT:** AC: I_{max} = 4 A, I_{min} = 1 mA, U_{min} = 6 V, U_{max} = 253 V, P_{max} = 1000 VA DC: I_{max} 4 A up to 30 V, I_{max} 0.2 A up to 253 V
Malfunction signal	**DC-PNP:** <100 µA **AC/DC-SPDT:** relay de-energised
Switching delay	0.8 s upon release/covering

Power supply	
Supply voltage	**DC-PNP:** 10.8 to 45 V DC, short pulse up to 55 V DC, current input 30 mA (max.), reverse polarity protection **AC/DC-SPDT (relay contact):** 20 to 253 V AC or 20 to 55 V DC, max. current input: 130 mA
Terminal compartment	Stranded wires max. 1.5 mm^2 in end sleeves, Electric wire max. 2.5 mm^2

Accuracy	
Longterm drift	Vertical ±6 mm (0.24")
Hysteresis	Vertical 5 mm (0.2")
Switch point	Vertical 35 mm (1.38") above probe tip

Operating conditions	
Process temperature	−40 to +80 °C (−40 to +176 °F)
Process pressure	−1.0 to +6 bar (−14.5 to +87 psi)
Ambient temperature	−40 to +80 °C (−40 to +176°F) (to +60 °C/140 °F Dust Ex)
Climate class	As per EN 60068 part 2-38
Protection system	IP 66
EMC	Interference Emission to EN 61326, Electrical Equipment Class B; Interference Immunity to EN 61326, Annex A (Industrial) and NAMUR Recommendation NE 21 (EMC)

Material	
Wetted parts	– Probe: PPS GF40; FDA: FCN No. 000040 – Probe rope: PE-HD – Probe rope seal: VMQ; FDA: 21 CFR 177.2600

General	
Medium	Bulk solids, grain size up to 30 mm (≥1.18"), relative dielectric constant ε_r ≥1.6
Tensile strength	Max. 3000 N up to 40 °C (104 °F)
Process connection	R1½ DIN 2999/ISO 7
Length reduction	Shortening kit

Approvals	
Ex approval	ATEX II 1/3 D

Applications

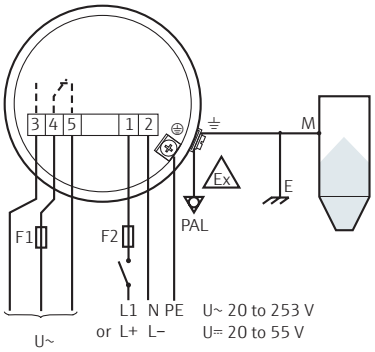
Examples	ρ in g/l (approx.)	ε_r (approx.)	Function
Grain, seed, legumes and their products			
Rice	770	3.0	yes
Cornstarch (packed)	680	2.6	yes
Flour (wheat)	580	2.4	yes
Corn grist	500	2.1	yes
Sunflower seeds	380	1.9	yes
Noodles	370	1.9	yes
Bran (wheat)	250	1.7	yes
Popcorn	30	1.1	no
Minerals, inorganic materials			
Cement	1050	2.2	yes
Plaster	730	1.8	yes
Chalk (packed)	540	1.6	(yes)
Chalk (loose)	360	1.4	no
Plastics			
ABS granulate	630	1.7	yes
PA granulate	620	1.7	yes
PE granulate	560	1.5	no
PVC powder	550	1.4	no
PU dust	80	1.1	no

Grey background:
Application limits of Minicap exceeded.

In general: If the dielectric constant of the solid is not known, then the density of the solid is a deciding factor. Under normal conditions the Minicap functions in foodstuffs with a density of 250 g/l and above or in plastic or mineral materials with a density of 600 g/l and above.

Electrical connection

AC/DC-SPDT

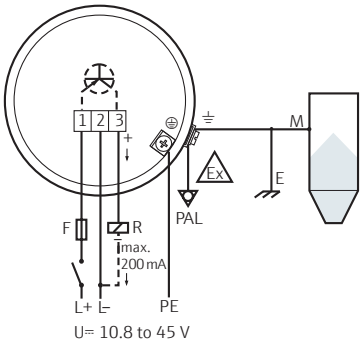


U~
max. 253 V / 4 A
max. 1000 VA, cos φ = 1

U=
max. 30 V / 4 A
max. 253 V / 0.2 A

Minicap FTC260/262 with AC or DC connection and relay output (SPDT)
F1: fine-wire fuse for protection of relay contact depending on the connected load
F2: fine-wire fuse, 500 mA
M: earth connection to silo or to metal parts of silo
E: earthing

DC-PNP

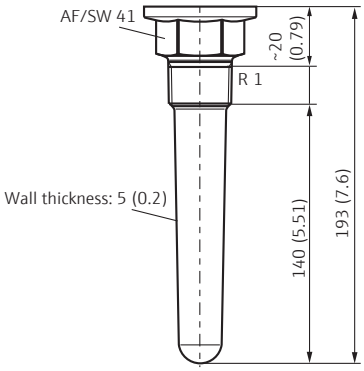


Minicap FTC260/262 with PNP DC connection:
F: fine-wire fuse 500 mA
R: connected load, e.g. stored programme control, programmable logic sequencer, relay
M: earth connection to silo or to metal parts of silo
E: earth

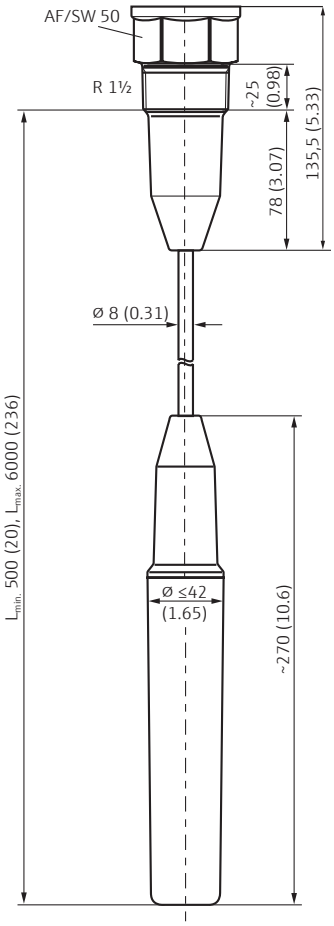
- The Minicap system is protected against reverse polarity.
- If the connections are reversed, then the green light goes out.
- No grounding lines (PE) or potential matching lines (PAL) are required with FTC260.
- The PAL line has to be connected according to local Ex-guidelines

Dimensions in mm (inches)

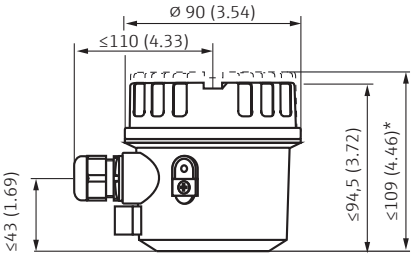
Minicap FTC260



Minicap FTC262

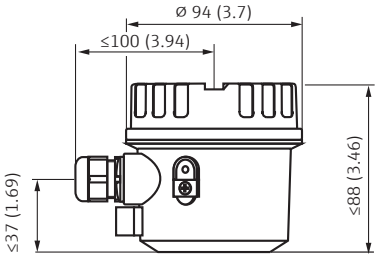


Aluminum housing, IP66

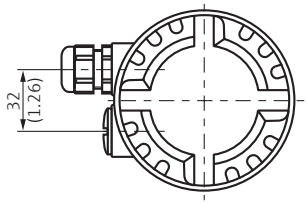


* Height for cover with sight glass

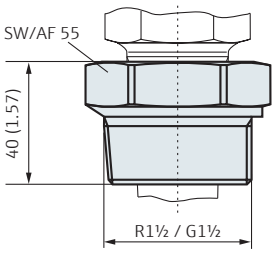
Polyester PBT-FR housing, IP66



Top view, FTC260 / FTC262



Adapter for FTC260



Installation according to instruction manual.

Order codes

Minicap FTC260 (Rod version)			Order no.
Length	Electronics	Version	
140 mm (5.51")	DC-PNP	Non-Ex	FTC260-AA2D1
		Ex	FTC260-BA2J1
	Universal relay	Non-Ex	FTC260-AA4D1
		Ex	FTC260-BA4J1

Minicap FTC262 (Rope version)			Order no.
Length	Electronics	Version	
1500 mm (59.06")	DC-PNP	Non-Ex	FTC262-AA32D1
		Ex	FTC262-BA32J1
	Universal relay	Non-Ex	FTC262-AA34D1
		Ex	FTC262-BA34J1
2500 mm (98.43")	DC-PNP	Non-Ex	FTC262-AA42D1
		Ex	FTC262-BA42J1
	Universal relay	Non-Ex	FTC262-AA44D1
		Ex	FTC262-BA44J1
6000 mm (236.22")	DC-PNP	Non-Ex	FTC262-AA62D1
		Ex	FTC262-BA62J1
	Universal relay	Non-Ex	FTC262-AA64D1
		Ex	FTC262-BA64J1

Accessories		Order no.
Transparent cover (not for dust-Ex)		943 201-1001
Only for FTC260	Adapter for R 1½	943 215-1001
	Adapter for G1½	943 215-1021
Only for FTC262	Shortening kit for ropes	52005918

Complete product information:
www.endress.com/ftc260
www.endress.com/ftc262

Capacitance point level switch for powdered and fine-grained solids

Nivector FTI26

IO-Link

Complete product information:
www.endress.com/fti26

- Unaffected by build-up
- Onsite function check via LED indication
- Hygienic design with stainless steel housing (optional)

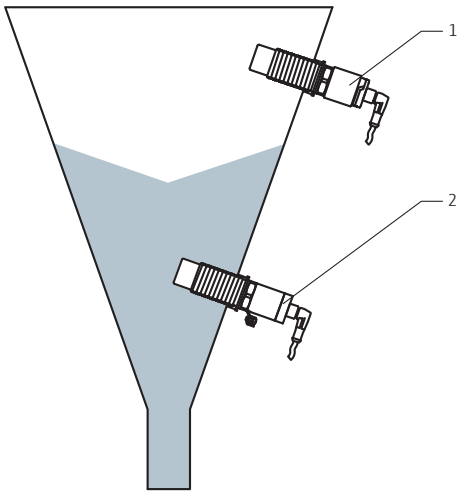
Specs at a glance:

- **Product:**
  Bulk solids ≤10 mm (0.4") grain size
- **Product dielectric constant:**
  $\varepsilon_r \geq 1.3$
- **Process temperature:**
  −20 to +80 °C (−4 to +176 °F)
- **Process pressure:**
  −1 to +6 bar (−15 to +87 psi)

Application The Nivector capacitive point level switch is suitable for all kinds of powdered and fine-grained solids (e.g. plastic granulates, washing agents and animal feed). Because of its materials of construction, Nivector is also suitable for use with foodstuffs such as grain, sugar, herbs and spices or semolina.

Function The sensor surface of the Nivector evaluates the different dielectric values of air and bulk solids. If the bulk solids come into contact with the sensor surface, the electronics change the switch status. The Nivector can be switched to either minimum of maximum fail-safe mode, ensuring quiescent current operation in all applications. The switch status is indicated by an LED. A guard electrode eliminates interference factors due to the vessel wall or possible build-up, for example.

Application example



1: Overfill protection or upper level detection (MAX)
2: Dry-running protection or lower level detection (MIN)

Technical data

Output	
Switch output	– 3-wire DC-PNP – 2 DC-PNP outputs, switched using XOR operation
	Devices with IO-Link: – 3- or 4-wire DC-PNP – 2 DC-PNP outputs, freely configurable – 1 switch output active: 200 mA* connectable load (short-circuit proof) – Both switch outputs active: Connectable load of 105 mA each (short-circuit proof)
	– Residual voltage: < 3 V – Residual current: < 100 µA

* Unlike the IO-Link standard, the SIO mode supports 200 mA

Power supply	
Supply voltage	12 to 30 V DC IO-Link communication is guaranteed only if the supply voltage is at least 18 V
Power consumption	< 1.2 W (at max. load: 200 mA)
Current consumption	< 20 mA
Cable specification	– M12 plug: IEC 60947-5-2 – Valve plug – Cable cross-section: Max. 1.5 mm^2 (16 AWG) – Ø3.5 to 6.5 mm (0.14 to 0.26 in)
Length of connecting cable	– Max. 25 Ω/core, total capacity < 100 nF – IO-Link communication: < 10 nF

Performance characteristics	
Reference operating conditions	Accuracy in accordance with DIN EN 61298-1 based on 100 % (factory adjustment) – Non-repeatability: ± 1 % – Uncertainty, absolute: ± 2.5 % – Hysteresis: + 0.5 % ± 0.5 %
	Horizontal orientation: – Ambient temperature: 20 °C (68 °F) ±5 °C – Medium temperature: 20 °C (68 °F) ±5 °C – Process pressure: 1 bar abs. (14.5 psi) – Medium: Sliding earthed metal plate in front of sensor
Influence of ambient temperature	Maximum 0.07 %/K
Switch-on delay	< 2 s until correct switch status
Switching delay	– 0.5 s when sensor is covered – 1.0 s when sensor is uncovered – IO-Link communication: 0.3 to 60 s configurable

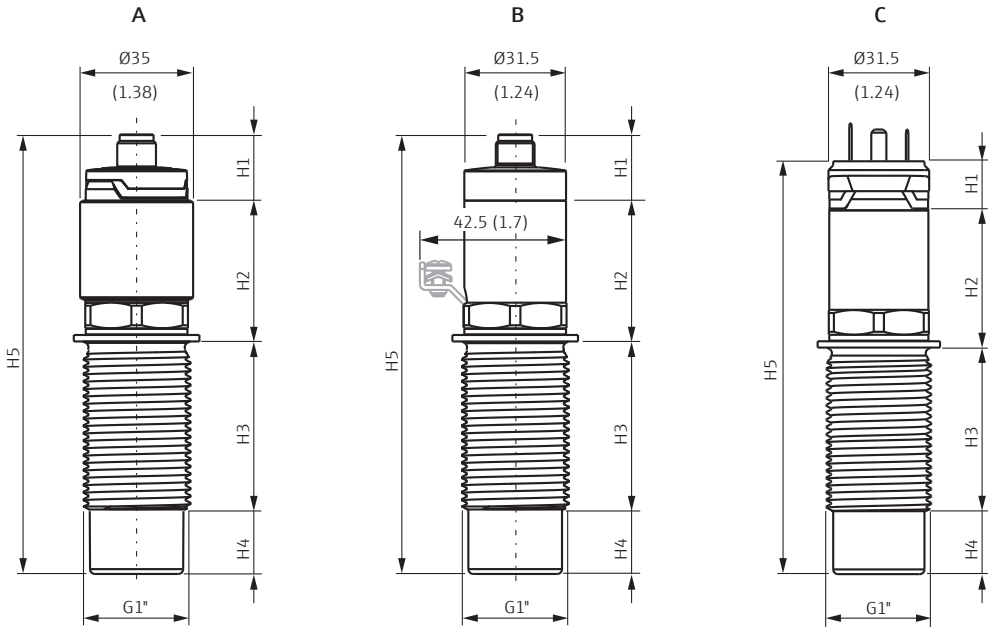
Environment	
Ambient temperature range	–25 to +70 °C (–13 to +158 °F)
Storage temperature	–25 to +85 °C (–13 to +185 °F)
Climate class	DIN EN 60068-2-38/IEC 68-2-38: Test Z/AD
Degree of protection	– IP65/67 NEMA Type 4X Enclosure (M12 plug for plastic housing cover) – IP66/68/69 NEMA Type 4X/6P Enclosure (M12 plug for metal housing cover) – IP65 NEMA Type 4x Enclosure (ISO4400 M16/NPT ½" valve plug for plastic housing cover)
Short-circuit protection	– Overload protection/short-circuit protection at I > 200 mA – IO-Link communication: 105 mA each if both switch outputs are active

Process	
Process temperature range	–20 to +80 °C (–4 to +176 °F) For Ex devices: –20 to +75 °C (–4 to +167 °F)
Process pressure range	–1 to +6 bar (–14.5 to +87 psi)
Process medium	Powdery and fine-grained bulk solids – Grain size ≤ 10 mm (0.4") – Dielectric constant ≥ 1.3

Mechanical construction	
Weight	– Plastic with M12 plug: 118 g (4.162 oz) – Plastic with valve plug: 120 g (4.232 oz) – Stainless steel with M12 plug: 240 g (8.465 oz) – Stainless steel with valve plug: 243 g (8.465 oz) – Stainless steel with M12 plug and protection cover: 288 g (10.158 oz)
Materials	Wetted materials: – Sensor: 316L (1.4404) or Polycarbonate – Protector G 1½", R 1½": PBT-GF, O-Ring EPDM
	Materials not in contact with process: – Process connection: 316L (1.4404/1.4435) or Polycarbonate – Lock nut: PA (black) – Housing cover, valve plug: PPSU, design ring: PBT/PC – M12 housing covers: 316L (1.4404/1.4435) or PPSU, design ring: PBT/PC – Housing: 316L (1.4404/1.4435) or Polycarbonate
Surface roughness	Sensor surface in contact with process: R_a ≤ 0.76 µm (30 µin)

Approvals	
Sanitary compatibility	3-A EHEDG FDA compliant EU 1935/2004
Ex	ATEX II 1/3D Ex ta/tc IIIC T100 °C Da/Dc

Dimensions in mm (in)

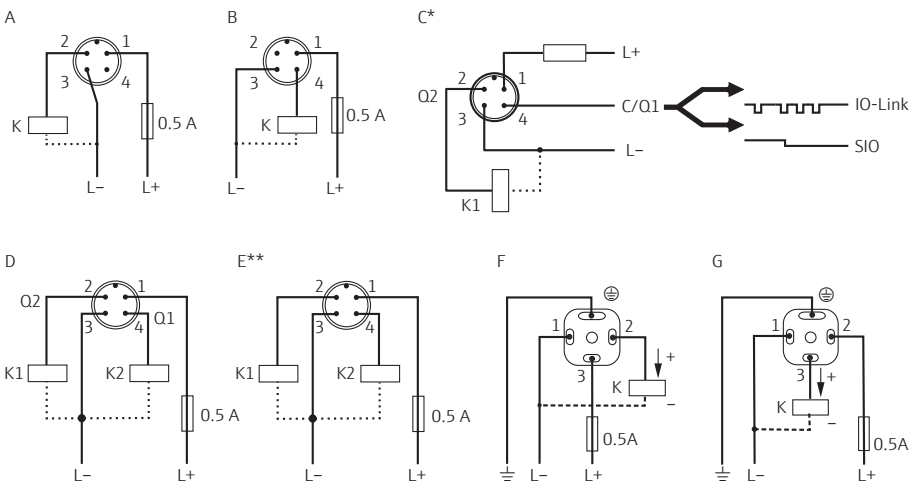


A	Plastic with M12 plug
B	Stainless steel with M12 plug, with optional ground terminal
C	Stainless steel with valve plug

Dimensions in SI/US units

Height	Designation	A [mm (in)]	B [mm (in)]	C [mm (in)]
H1	Housing cover	20.5 (0.81)	20.5 (0.81)	16 (0.36)
H2	Housing	43.6 (1.72)	43.6 (1.72)	43.6 (1.72)
H3	Process connection	52 (2.05)	52 (2.05)	52 (2.05)
H4	Sensor	20 (0.79)	20 (0.79)	20 (0.79)
H5	Nivector FTI26 overall dimensions	136 (5.35)	136 (5.35)	131.2 (5.17)

Electrical connection



M12 plug

A	MAX
B	MIN
C*	IO-Link with one switch output
D	Both switch outputs active simultaneously
E**	Function monitoring with antivalence

Valve plug

F	MAX
G	MIN

* Devices with IO-Link
** Function monitoring

Order codes

Nivector FTI26 (Non Ex)			Order no.
Process connection	Power; Output	Electrical connection	
Thread ISO228 G1, plastic	12 to 30 VDC; 3-wire PNP	Plug M12, IP65/67 NEMA Type 4X Encl.	FTI26-AA4MWDG
		Valve plug ISO4400 M16, IP65 NEMA Type 4X Encl.	FTI26-AA4UWDG
	IO-Link; DC-PNP	Plug M12, IP65/67 NEMA Type 4X Encl.	FTI26-AA7MWDG
Thread ISO228 G1, 316L	12 to 30 VDC; 3-wire PNP	Plug M12, IP65/67 NEMA Type 4X Encl.	FTI26-AA4MWDJ
		Plug M12, IP66/68/69 NEMA Type 4X/6P Encl.	FTI26-AA4NWDJ
		Valve plug ISO4400 M16, IP65 NEMA Type 4X Encl.	FTI26-AA4UWDJ
	IO-Link; DC-PNP	Plug M12, IP65/67 NEMA Type 4X Encl.	FTI26-AA7MWDJ
		Plug M12, IP66/68/69 NEMA Type 4X/6P Encl.	FTI26-AA7NWDJ

Nivector FTI26 (Ex)			Order no.
Process connection	Power; Output	Electrical connection	
Thread ISO228 G1, 316L	12 to 30 VDC; 3-wire PNP	Plug M12, IP66/68/69 NEMA Type 4X/6P Encl.	FTI26-BO4NWDJ

Accessories	Order no.
Protector G1½"	71395785
Protector R1½"	71395862
Weld-in adapter G1"	71444432
Process adapter G1" Tri-Clamp 2"	71444431
Locking nuts G1"	71395801
Ex-protection cover	71395803

Complete product information:
www.endress.com/fti26

Pressure sensor with ceramic and metal sensors

Cerabar PMC11/PMP11

Complete product information:
www.endress.com/pmc11
www.endress.com/pmp11

- High reproducibility and long-term stability
- Customized measuring ranges
- Flush-mounted process connection as option

Specs at a glance:

- **Media:**
  Gases, vapors, liquids and dust
- **Output:**
  4 to 20 mA, 0 to 10 V
- **Process temperature:**
  −25 to +85 °C (−13 to +185 °F)
- **Measuring ranges:**
  From −400 to +400 mbar (−6 to +6 psi) to −1 to +40 bar (−15 to +600 psi)
- **Reference accuracy:**
  ±0.5 %

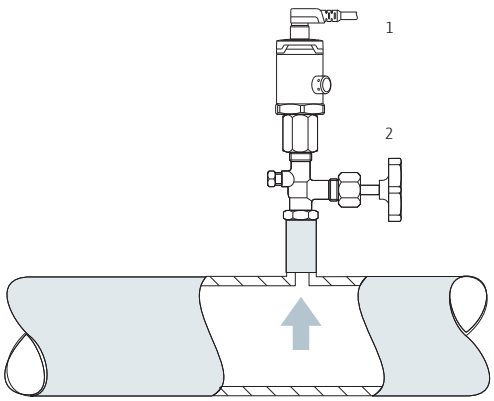
Application The Cerabar is a pressure sensor for the measurement of gauge pressure in gases, vapors, liquids and dust. The Cerabar can be used in versatile applications thanks to a wide range of process connections.

Function

Ceramic process isolating diaphragm:
The ceramic sensor is an oil-free sensor, i.e. the process pressure acts directly on the robust ceramic process isolating diaphragm and causes it to deflect. A pressure-dependent change in capacitance is measured at the electrodes of the ceramic substrate and the process isolating diaphragm.

Metallic process isolating diaphragm:
The process pressure deflects the metal process isolating diaphragm of the sensor and a fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

Application example



Pressure sensor Cerabar (1) with the shutoff device (2) in pipelines

Technical data

Output	
Output signal	4 to 20 mA (two-wire); 0 to 10 V (three-wire)
Signal range 4 to 20 mA	3.8 to 20.5 mA
Load 4 to 20 mA	$R_{Lmax} \leq (U_B - 6.5\ V)/22\ mA$ [1]
Load resistance (for 0 to 10 V devices)	The load resistance must be ≥5 [kΩ]
Signal on alarm 4 to 20 mA	max. alarm >21 mA
Dynamic behavior	Time constant (T_{90}) 15 ms

[1] R_{Lmax}: maximum load resistance; U_B: supply voltage

Power supply	
Supply voltage	4 to 20 mA output: 10 to 30 V DC; 0 to 10 V output: 12 to 30 V DC
Current consumption	two-wire: ≤26 mA; three-wire: <12 mA
Degree of protection	IP65 NEMA Type 4X enclosure
Influence of power supply	≤0.005 % for URL/1 V
Residual ripple	±5 %

Performance characteristics	
Reference accuracy	±0.5 %
Thermal change of the zerooutput and the output span	<1 bar (15 psi): <1 %; ≥1 bar (15 psi): <0.8 %
Long-term stability	1 year: ±0.2 %; 5 years: ±0.4 %; 8 years: ±0.45 %
Switch-on time	≤2 s

Environment	
Ambient temperature range	–40 to +70 °C (–40 to +158 °F)
Storage temperature range	–40 to +85 °C (–40 to +185 °F)
Climate class	Class 3K5
Electromagnetic compatibility	– Interference emission as per EN 61326 equipment B – Interference immunity as per EN 61326 appendix A (industrial sector) – NAMUR recommendation EMC (NE21)

Process	
Process temperature range	–25 to +85 °C (–13 to +185 °F)

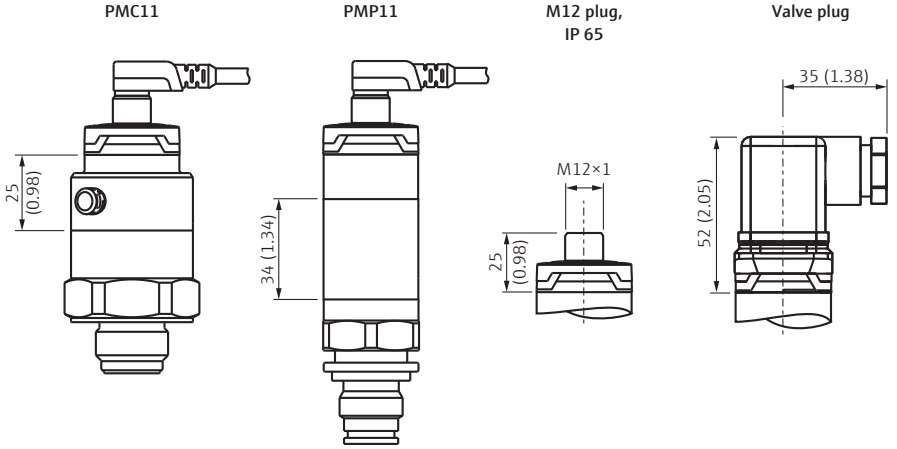
Materials PMC11	
Materials not in contact with process	Housing: Stainless steel 316L (1.4404)
Materials in contact with process	Process connections: 316L (1.4435); Ceramic process isolating diaphragm: Al_2O_3 in accordance with FDA; TSE Certificate of Suitability for all device components in contact with the process; Seal: Viton FKM or EPDM

Materials PMP11	
Materials not in contact with process	Housing: Stainless steel 316L (1.4404); Filling oil: NSF-H1 synthetic oil in accordance with FDA 21 CFR 178.3570
Materials in contact with process	Process connections: 316L; Metallic process isolating diaphragm: AISI 316L (1.4435); TSE Certificate of Suitability for all device components in contact with the process; With flush-mounted process isolating diaphragm: Seal: Viton FKM

Approvals
Pressure Equipment Directive

Dimensions in mm (inches)

Housing

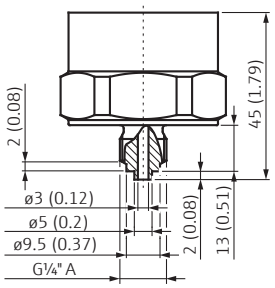


Installation according to instruction manual.

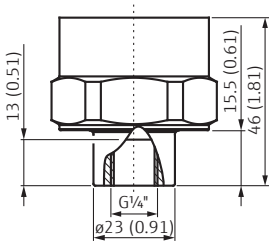
Dimensions process connections PMC11 in mm (inches)

Process connections with internal, ceramic process isolating diaphragm

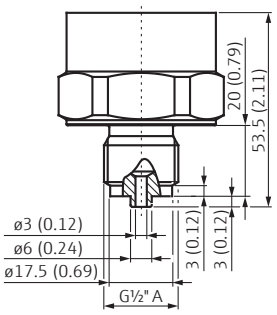
Thread ISO 228 G¼"



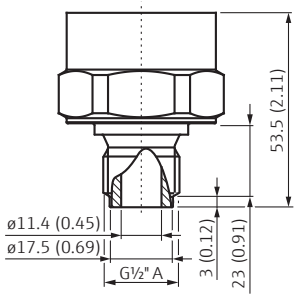
Thread ISO 228 G¼" (female)



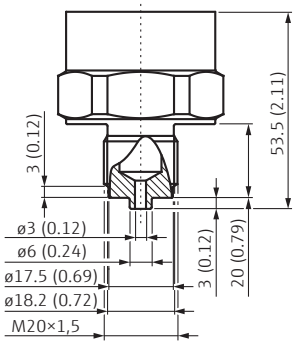
Thread ISO 228 G½"



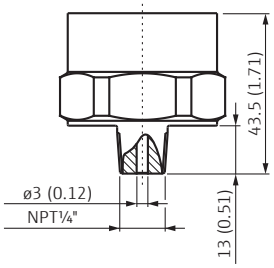
Thread ISO 228 G½", bore 11.4 mm (0.45 in)



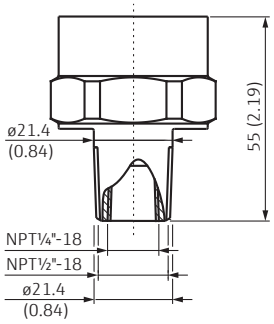
Thread DIN13



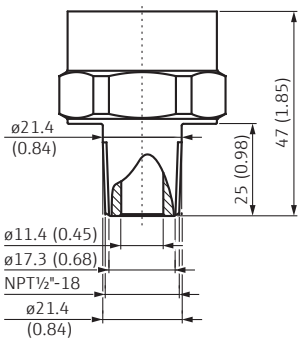
ASME¼" MNPT



ASME½" MNPT (female)



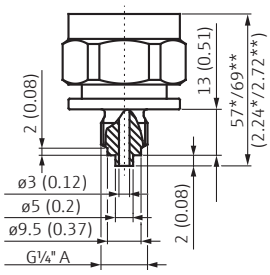
ASME½" MNPT, bore 11.4 mm (0.45 in)



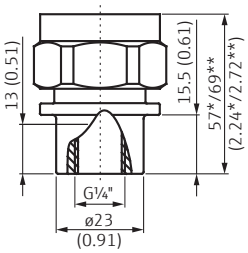
Dimensions process connections PMP11 in mm (inches)

Process connections with internal, metallic process isolating diaphragm

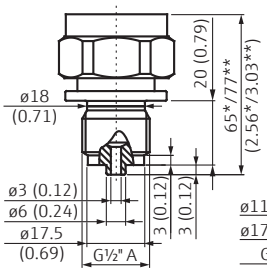
Thread ISO 228 G¼"



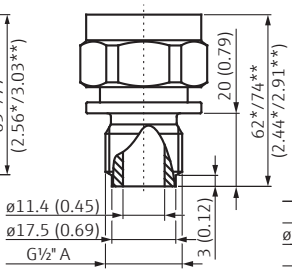
Thread ISO 228 G¼" (female)



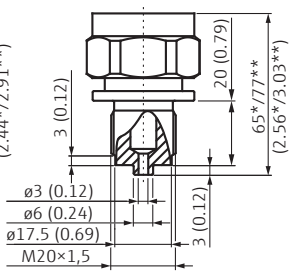
Thread ISO 228 G½"



Thread ISO 228 G½", bore 11.4 mm (0.45 in)

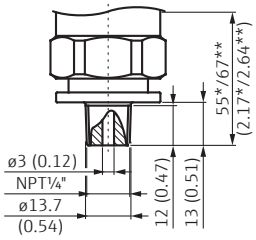


Thread DIN13

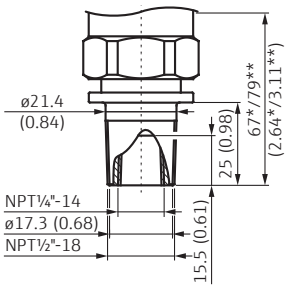


Process connections with flush-mounted, metallic process isolating diaphragm

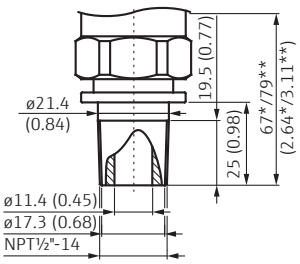
ASME¼" MNPT



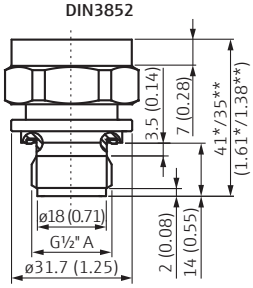
ASME½" MNPT (female)



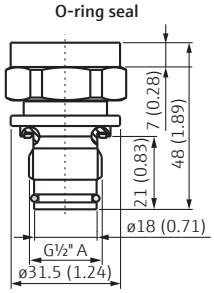
ASME½" MNPT, bore 11.4 mm (0.45 in)



Thread ISO 228 G½" DIN3852



Thread ISO 228 G½" O-ring seal

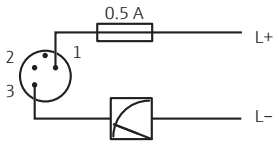


* to 100 bar (1500 psi) / ** 400 bar (6000 psi)

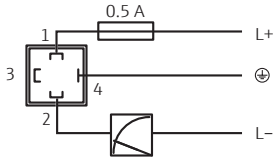
Electrical connection

4 to 20 mA output

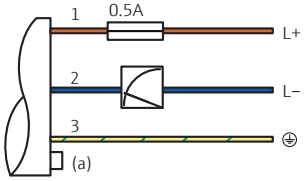
M12 plug



Valve plug

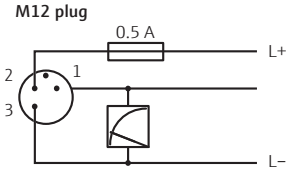


Cable

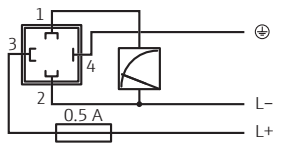


0 to 10 V output

M12 plug



Valve plug



Cable:
1: brown = L+
2: blue = L–
3: green/yellow = ground connection
(a): reference air hose

Order codes

Electrical connection

Code	Plug
L	Plug M12
U	Valve plug M16
V	Valve plug NPT½"

Sensor range

Code	Range (relative)
1F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
1H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
1K	2 bar/200 kPa/30 psi, overload: 10 bar/1 MPa/150 psi
1M	4 bar/400 kPa/60 psi, overload: 16 bar/1.6 MPa/240 psi
1N	6 bar/600 kPa/90 psi, overload: 24 bar/2.4 MPa/360 psi
1P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
1Q	16 bar/1.6 MPa/240 psi, overload: 64 bar/6.4 MPa/960 psi
1R	25 bar/2.5 MPa/375 psi, overload: 100 bar/10 MPa/1500 psi
1S	40 bar/4 MPa/600 psi, overload: 160 bar/16 MPa/2400 psi

Calibration, unit

Code	Version
B	Sensor range; mbar/bar/psi
J	Customized; please specify measuring range in your order

Seal

Code	Version
A	FKM
J	EPDM

Cerabar PMC11		Order no.
Output	Process connection	*
4 to 20 mA	Thread ISO228 G¼" (internal)	PMC11-AA1 ☐☐☐☐WAJ ☐
	Thread ISO228 G½" EN837	PMC11-AA1 ☐☐☐☐WBJ ☐
	Thread ISO228 G¼" EN837	PMC11-AA1 ☐☐☐☐WTJ ☐
	Thread ISO228 G½", bore 11.4 mm (0.45 in)	PMC11-AA1 ☐☐☐☐WWJ ☐
0 to 10 V	Thread ISO228 G¼" (internal)	PMC11-AA2 ☐☐☐☐WAJ ☐
	Thread ISO228 G½" EN837	PMC11-AA2 ☐☐☐☐WBJ ☐
	Thread ISO228 G¼" EN837	PMC11-AA2 ☐☐☐☐WTJ ☐
	Thread ISO228 G½", bore 11.4 mm (0.45 in)	PMC11-AA2 ☐☐☐☐WWJ ☐

* Please add code for electrical connection, sensor range, calibration and seal.

Accessories	Order no.
Weld-in adapter G½, 316L	52002643
Weld-in adapter G1, 316L	52010171
Straight plug, without cable (self wired)	52006263
5 m cable with M12×1 plug	52010285
M12×1 plug angled	71114212
Display PHX20 for Cerabar with analog output	52022914

Electrical connection

Code	Plug
L	Plug M12
U	Valve plug M16
V	Valve plug NPT½"

Sensor range

Code	Range (relative)
1F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
1H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
1K	2 bar/200 kPa/30 psi, overload: 10 bar/1 MPa/150 psi
1M	4 bar/400 kPa/60 psi, overload: 16 bar/1.6 MPa/240 psi
1N	6 bar/600 kPa/90 psi, overload: 24 bar/2.4 MPa/360 psi
1P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
1Q	16 bar/1.6 MPa/240 psi, overload: 64 bar/6.4 MPa/960 psi
1R	25 bar/2.5 MPa/375 psi, overload: 100 bar/10 MPa/1500 psi
1S	40 bar/4 MPa/600 psi, overload: 160 bar/16 MPa/2400 psi

Calibration, unit

Code	Version
B	Sensor range; mbar/bar/psi
J	Customized; please specify measuring range in your order

Cerabar PMP11

Output	Process connection	Order no.
4 to 20 mA	Thread ISO228 G¼" (internal)	PMP11-AA1☐☐☐☐WAJ
	Thread ISO228 G½" EN837	PMP11-AA1☐☐☐☐WBJ
	Thread ISO228 G½", flush-mounted	PMP11-AA1☐☐☐☐WJJ
	Thread ISO228 G¼" EN837	PMP11-AA1☐☐☐☐WTJ
	Thread ISO228 G½", bore 11.4 mm (0.45 in)	PMP11-AA1☐☐☐☐WWJ
0 to 10 V	Thread ISO228 G¼" (internal)	PMP11-AA2☐☐☐☐WAJ
	Thread ISO228 G½" EN837	PMP11-AA2☐☐☐☐WBJ
	Thread ISO228 G½", flush-mounted	PMP11-AA2☐☐☐☐WJJ
	Thread ISO228 G¼" EN837	PMP11-AA2☐☐☐☐WTJ
	Thread ISO228 G½", bore 11.4 mm (0.45 in)	PMP11-AA2☐☐☐☐WWJ

* Please add code for electrical connection, sensor range and calibration.

Accessories	Order no.
Weld-in adapter G½, 316L	52002643
Weld-in adapter G1, 316L	52010171
Straight plug, without cable (self wired)	52006263
5 m cable with M12×1 plug	52010285
M12×1 plug angled	71114212
Display PHX20 for Cerabar with analog output	52022914

Complete product information:
www.endress.com/pmc11
www.endress.com/pmp11

Pressure sensor with ceramic and metal sensors

Cerabar PMC21/PMP21

PMC21

PMP21

Complete product information:
www.endress.com/pmc21
www.endress.com/pmp21

- High reproducibility and long-term stability
- Customized measuring ranges
- Flush-mounted process connection as option

Specs at a glance:

- **Media:**
  Gases, vapors, liquids and dust
- **Output:**
  4 to 20 mA
- **Process temperature:**
  –40 to +100 °C (–40 to +212 °F)
- **Measuring ranges:**
  From –100 to +100 mbar (–1.5 to +1.5 psi) to –1 to +400 bar (–15 to +6000 psi)
- **Reference accuracy:**
  ±0.3 %

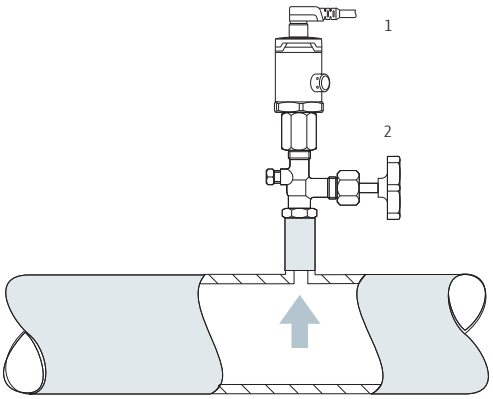
Application The Cerabar is a pressure sensor for the measurement of absolute and gauge pressure in gases, vapors, liquids and dust. The Cerabar can be used internationally thanks to a wide range of approvals and process connections.

Function

Ceramic process isolating diaphragm:
The ceramic sensor is an oil-free sensor, i.e. the process pressure acts directly on the robust ceramic process isolating diaphragm and causes it to deflect. A pressure-dependent change in capacitance is measured at the electrodes of the ceramic substrate and the process isolating diaphragm.

Metallic process isolating diaphragm:
The process pressure deflects the metal process isolating diaphragm of the sensor and a fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

Application example



Pressure sensor Cerabar (1) with the shutoff device (2) in pipelines

Technical data

Output	
Output signal	4 to 20 mA (two-wire)
Signal range 4 to 20 mA	3.8 to 20.5 mA
Load 4 to 20 mA	$R_{Lmax} \leq (U_B - 6.5\ V)/22\ mA$ [1]
Signal on alarm 4 to 20 mA	max. alarm >21 mA; min. alarm current adjustable
Dynamic behavior	Time constant (T_{90}) 15 ms

[1] R_{Lmax}: maximum load resistance; U_B: supply voltage

Power supply	
Supply voltage	10 to 30 V DC
Current consumption	≤26 mA
Degree of protection	Cable: IP66/68 NEMA Type 4X/6P Plug M12: IP65/67 NEMA Type 4X Valve plug: IP65 NEMA Type 4X
Influence of power supply	≤0.005 % of URL/1 V
Residual ripple	±5 %

Performance characteristics	
Reference accuracy	±0.3 %
Thermal change of the zerooutput and the output span	<1 bar (15 psi): <1.2 %; ≥1 bar (15 psi): <1 %
Long-term stability	1 year: ±0.2 %; 5 years: ±0.4 %; 8 years: ±0.45 %
Switch-on time	≤2 s

Environment	
Ambient temperature range	−40 to +85 °C (−40 to +185 °F) Devices for hazardous areas: −40 to +70 °C (−40 to +158 °F)
Storage temperature range	−40 to +85 °C (−40 to +185 °F)
Climate class	Class 3K5
Electromagnetic compatibility	– Interference emission as per EN 61326 equipment B – Interference immunity as per EN 61326 appendix A (industrial sector) – NAMUR recommendation EMC (NE21)

Process	
Process temperature range	PMC21: −25 to +100 °C (−13 to +212 °F); for oxygen applications: −10 to +60 °C (+14 to +140 °F); PMP21: −40 to +100 °C (−40 to +212 °F)

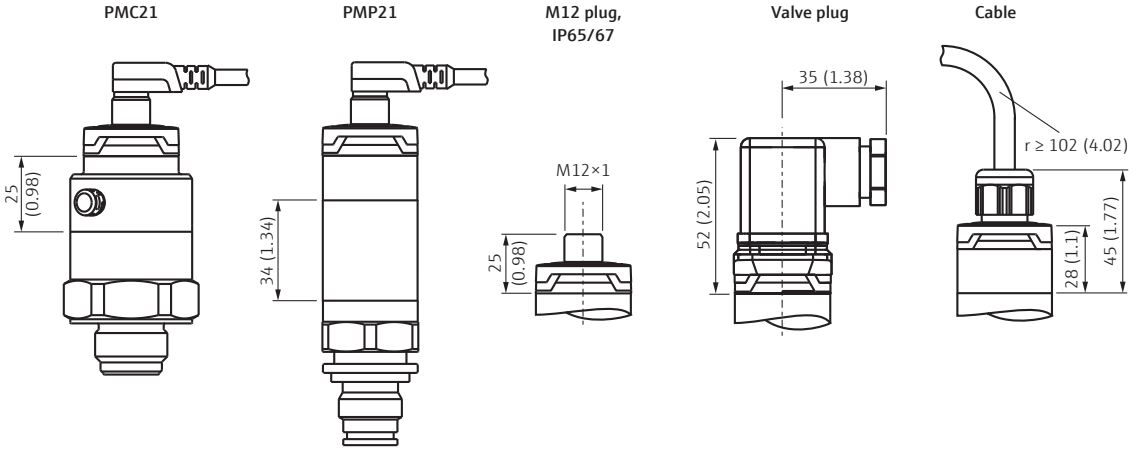
Materials PMC21	
Materials not in contact with process	Housing: Stainless steel 316L (1.4404)
Materials in contact with process	Process connections: 316L (1.4435); Ceramic process isolating diaphragm: Al_2O_3 in accordance with FDA; TSE Certificate of Suitability for all device components in contact with the process; Seal: Viton FKM or EPDM

Materials PMP21	
Materials not in contact with process	Housing: Stainless steel 316L (1.4404); Filling oil: NSF-H1 synthetic oil in accordance with FDA 21 CFR 178.3570
Materials in contact with process	Process connections: 316L; Metallic process isolating diaphragm: AISI 316L (1.4435); TSE Certificate of Suitability for all device components in contact with the process; With flush-mounted process isolating diaphragm: Seal: Viton FKM

Approvals	
Ex	ATEX II 1/2G Ex ia IIC T4 Ga/Gb ATEX II 3G EEx eC IIC T4 Gc CSA C/US IS Cl. I Div. 1 Gr. A-D FM IS Cl. I, Div.1 Gr. A-D T4 IEC Ex ia IIC T4 Ga/Gb NEPSI Ex ia IIC T4
Pressure Equipment Directive	

Dimensions in mm (inches)

Housing

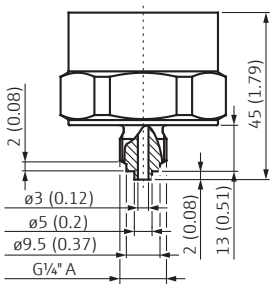


Installation according to instruction manual.

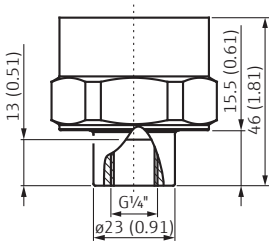
Dimensions process connections PMC21 in mm (inches)

Process connections with internal, ceramic process isolating diaphragm

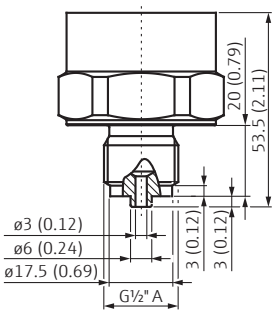
Thread ISO 228 G¼"



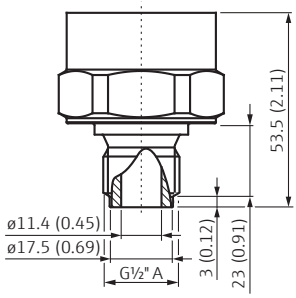
Thread ISO 228 G¼" (female)



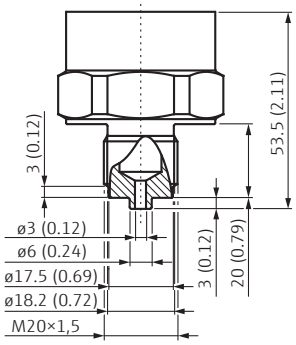
Thread ISO 228 G½"



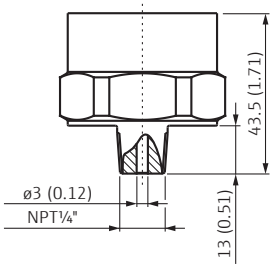
Thread ISO 228 G½", bore 11.4 mm (0.45 in)



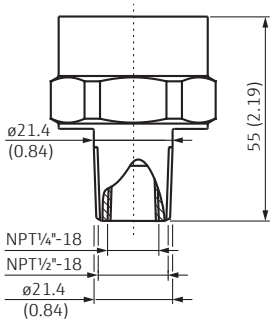
Thread DIN13



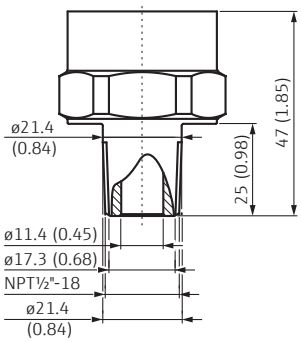
ASME¼" MNPT



ASME½" MNPT (female)



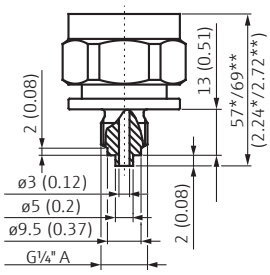
ASME½" MNPT, bore 11.4 mm (0.45 in)



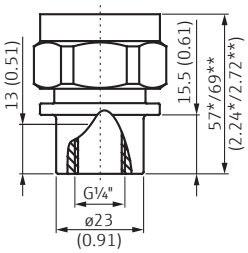
Dimensions process connections PMP21 in mm (inches)

Process connections with internal, metallic process isolating diaphragm

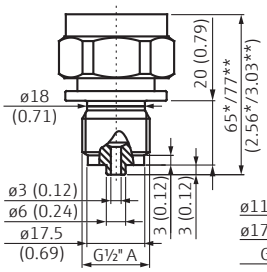
Thread ISO 228 G¼"



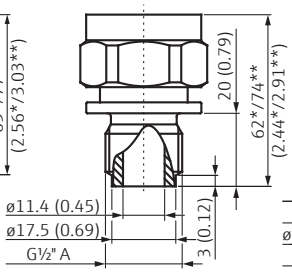
Thread ISO 228 G¼" (female)



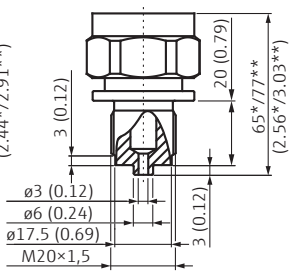
Thread ISO 228 G½"



Thread ISO 228 G½", bore 11.4 mm (0.45 in)

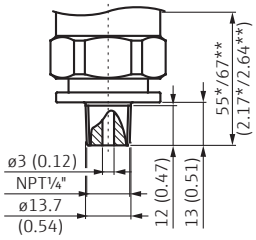


Thread DIN13

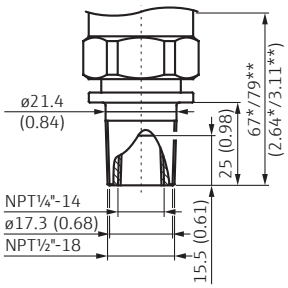


Process connections with flush-mounted, metallic process isolating diaphragm

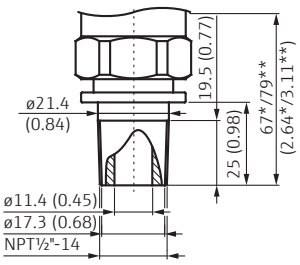
ASME¼" MNPT



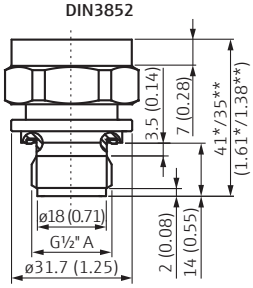
ASME½" MNPT (female)



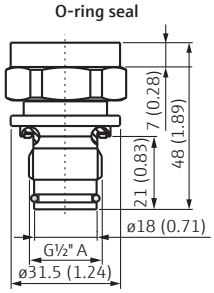
ASME½" MNPT, bore 11.4 mm (0.45 in)



Thread ISO 228 G½" DIN3852



Thread ISO 228 G½" O-ring seal

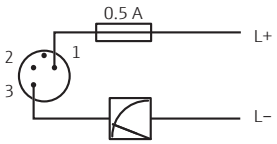


* to 100 bar (1500 psi) / ** 400 bar (6000 psi)

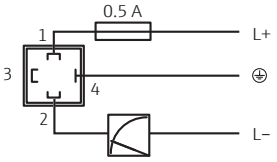
Electrical connection

4 to 20 mA output

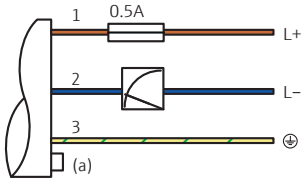
M12 plug



Valve plug



Cable



Cable:
1: brown = L+
2: blue = L–
3: green/yellow = ground connection
(a): reference air hose

Order codes

Electrical connection

Code	Plug
M	Plug M12
U	Valve plug M16
V	Valve plug NPT½"

Sensor range

Code	Range (relative)
1C	100 mbar/10 kPa/1.5 psi, overload: 4 bar/400 kPa/60 psi
1E	250 mbar/25 kPa/3.75 psi, overload: 5 bar/500 kPa/75 psi
1F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
1H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
1K	2 bar/200 kPa/30 psi, overload: 18 bar/1.8 MPa/270 psi
1M	4 bar/400 kPa/60 psi, overload: 25 bar/2.5 MPa/375 psi
1N	6 bar/600 kPa/90 psi, overload: 40 bar/4 MPa/600 psi
1P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
1Q	16 bar/1.6 MPa/240 psi, overload: 60 bar/6 MPa/900 psi
1R	25 bar/2.5 MPa/375 psi, overload: 60 bar/6 MPa/900 psi
1S	40 bar/4 MPa/600 psi, overload: 60 bar/6 MPa/900 psi

Sensor range

Code	Range (absolute)
2C	100 mbar/10 kPa/1.5 psi, overload: 4 bar/400 kPa/60 psi
2E	250 mbar/25 kPa/3.75 psi, overload: 5 bar/500 kPa/75 psi
2F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
2H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
2K	2 bar/200 kPa/30 psi, overload: 18 bar/1.8 MPa/270 psi
2M	4 bar/400 kPa/60 psi, overload: 25 bar/2.5 MPa/375 psi
2P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
2S	40 bar/4 MPa/600 psi, overload: 60 bar/6 MPa/900 psi

Calibration, unit

Code	Version
B	Sensor range; mbar/bar/psi
J	Customized; please specify measuring range in your order

Seal

Code	Version
A	FKM
J	EPDM

Cerabar PMC21

Approval	Electrical conn.	Process connection	Order no.
Non hazardous area	M12/ISO4400	Thread ISO228 G¼" (internal)	PMC21-AA1 □□□□WAJ □ *
		Thread ISO228 G½" EN837	PMC21-AA1 □□□□WBJ □ *
		Thread ISO228 G¼" EN837	PMC21-AA1 □□□□WTJ □ *
		Thread ISO228 G½", bore 11.4 mm (0.45 in)	PMC21-AA1 □□□□WWJ □ *
	5 m cable	Thread ISO228 G¼" (internal)	PMC21-AA1 A □□WAJ □ *
		Thread ISO228 G½" EN837	PMC21-AA1 A □□WBJ □ *
		Thread ISO228 G¼" EN837	PMC21-AA1 A □□WTJ □ *
		Thread ISO228 G½", bore 11.4 mm (0.45 in)	PMC21-AA1 A □□WWJ □ *
Ex	M12/ISO4400	Thread ISO228 G¼" (internal)	PMC21-BA1 □□□□WAJ □ *
		Thread ISO228 G½" EN837	PMC21-BA1 □□□□WBJ □ *
		Thread ISO228 G¼" EN837	PMC21-BA1 □□□□WTJ □ *
		Thread ISO228 G½", bore 11.4 mm (0.45 in)	PMC21-BA1 □□□□WWJ □ *
	5 m cable	Thread ISO228 G¼" (internal)	PMC21-BA1 A □□WAJ □ *
		Thread ISO228 G½" EN837	PMC21-BA1 A □□WBJ □ *
		Thread ISO228 G¼" EN837	PMC21-BA1 A □□WTJ □ *
		Thread ISO228 G½", bore 11.4 mm (0.45 in)	PMC21-BA1 A □□WWJ □ *

* Please add code for electrical connection, sensor range, calibration and seal.

Accessories	Order no.
Weld-in adapter G½, 316L	52002643
Weld-in adapter G1, 316L	52010171
5 m cable with M12×1 plug	52010285
Straight plug, without cable (self wired)	52006263
M12×1 plug angled	71114212
Display PHX20 for Cerabar with analog output	52022914

Electrical connection

Code	Plug
M	Plug M12
U	Valve plug M16
V	Valve plug NPT½"

Sensor range

Code	Range (relative)
1F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
1H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
1K	2 bar/200 kPa/30 psi, overload: 18 bar/1.8 MPa/270 psi
1M	4 bar/400 kPa/60 psi, overload: 25 bar/2.5 MPa/375 psi
1N	6 bar/600 kPa/90 psi, overload: 40 bar/4 MPa/600 psi
1P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
1Q	16 bar/1.6 MPa/240 psi, overload: 60 bar/6 MPa/900 psi
1R	25 bar/2.5 MPa/375 psi, overload: 60 bar/6 MPa/900 psi
1S	40 bar/4 MPa/600 psi, overload: 60 bar/6 MPa/900 psi
1U	100 bar/10 MPa/1500 psi, overload: 160 bar/16 MPa/2400 psi
1W	400 bar/40 MPa/6000 psi, overload: 600 bar/60 MPa/9000 psi

Sensor range

Code	Range (absolute)
2F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
2H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
2K	2 bar/200 kPa/30 psi, overload: 18 bar/1.8 MPa/270 psi
2M	4 bar/400 kPa/60 psi, overload: 25 bar/2.5 MPa/375 psi
2P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
2S	40 bar/4 MPa/600 psi, overload: 60 bar/6 MPa/900 psi
2U	100 bar/10 MPa/1500 psi, overload: 160 bar/16 MPa/2400 psi
2W	400 bar/40 MPa/6000 psi, overload: 600 bar/60 MPa/9000 psi

Calibration, unit

Code	Version
B	Sensor range; mbar/bar/psi
J	Customized; please specify measuring range in your order

Cerabar PMP21

Approval	Electrical conn.	Process connection	Order no.
Non hazardous area	M12/ISO4400	Thread ISO228 G¼" (internal)	PMP21-AA1 □□□ WAJ
		Thread ISO228 G½" EN837	PMP21-AA1 □□□ WBJ
		Thread ISO228 G½". flush-mounted	PMP21-AA1 □□□ WJJ
		Thread ISO228 G¼" EN837	PMP21-AA1 □□□ WTJ
		Thread ISO228 G½". bore 11.4 mm (0.45 in)	PMP21-AA1 □□□ WWJ
	5 m cable	Thread ISO228 G¼" (internal)	PMP21-AA1 A □□ WAJ
		Thread ISO228 G½" EN837	PMP21-AA1 A □□ WBJ
		Thread ISO228 G½". flush-mounted	PMP21-AA1 A □□ WJJ
		Thread ISO228 G¼" EN837	PMP21-AA1 A □□ WTJ
		Thread ISO228 G½". bore 11.4 mm (0.45 in)	PMP21-AA1 A □□ WWJ
Ex	M12/ISO4400	Thread ISO228 G¼" (internal)	PMP21-BA1 □□□ WAJ
		Thread ISO228 G½" EN837	PMP21-BA1 □□□ WBJ
		Thread ISO228 G½". flush-mounted	PMP21-BA1 □□□ WJJ
		Thread ISO228 G¼" EN837	PMP21-BA1 □□□ WTJ
		Thread ISO228 G½". bore 11.4 mm (0.45 in)	PMP21-BA1 □□□ WWJ
	5 m cable	Thread ISO228 G¼" (internal)	PMP21-BA1 A □□ WAJ
		Thread ISO228 G½" EN837	PMP21-BA1 A □□ WBJ
		Thread ISO228 G½". flush-mounted	PMP21-BA1 A □□ WJJ
		Thread ISO228 G¼" EN837	PMP21-BA1 A □□ WTJ
		Thread ISO228 G½". bore 11.4 mm (0.45 in)	PMP21-BA1 A □□ WWJ

* Please add code for electrical connection. sensor range and calibration.

Accessories	Order no.
Weld-in adapter G½. 316L	52002643
Weld-in adapter G1. 316L	52010171
5 m cable with M12×1 plug	52010285
Straight plug. without cable (self wired)	52006263
M12×1 plug angled	71114212
Display PHX20 for Cerabar with analog output	52022914

Complete product information:
www.endress.com/pmc21
www.endress.com/pmp21

More products to complete your measuring point ...


Capacitive probe
Liquicap T FMI21
page 43


Temperature sensor
iTHERM ModuLine TM101
page 108


Process transmitter
RMA42
page 157

Pressure sensor with hygienic, flush-mounted metal sensors

Cerabar PMP23

IO-Link

Complete product information:
www.endress.com/pmp23

- High reproducibility and long-term stability
- Customized measuring ranges
- FDA compliant fill oil

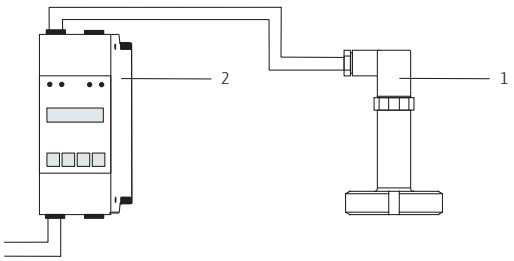
Specs at a glance:

- **Product:**
  Gases, vapors, liquids and dust
- **Output:**
  4 to 20 mA
- **Reference accuracy:**
  ±0,3 %
- **Process temperature range:**
  −10 to +100 °C (+14 to +212 °F); +135 °C (+275 °F) for one hour maximum
- **Measuring ranges:**
  From −400 to +400 mbar (−6 to +6 psi) to −1 to +40 bar (−15 to +600 psi)

Application The Cerabar is a pressure sensor for the measurement of absolute and gauge pressure in gases, vapors, liquids and dust for applications with hygienic requirements. The Cerabar can be used in versatile applications thanks to a wide range of approvals and process connections.

Function The process pressure deflects the metal process isolating diaphragm of the sensor and a fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

Measuring system



Pressure sensor Cerabar PMP23
4 to 20 mA analog output (1)
with auxiliary power supply, such as RMA42 (2)

Technical data

Output	
Output signal	4 to 20 mA (2-wire) IO-Link 4 to 20 mA (3- or 4-wire)
Switching capacity	– Switch status ON: $I_a \leq 250$ mA – Switch status OFF: $I_a \leq 1$ mA – Voltage drop PNP: ≤2 V
Signal range 4 to 20 mA	3.8 to 20.5 mA
Load 4 to 20 mA	$R_{Lmax} \leq (U_B - 6{,}5\ V)/22\ mA$ [1]
Signal on alarm 4 to 20 mA	max. alarm >21 mA; min. alarm current adjustable
Dynamic behavior	4 to 20 mA: Time constant (T90) 15 ms IO-Link: Time constant (T90) 16 ms

[1] R_{Lmax}: maximum load resistance; U_B: supply voltage

Power supply	
Supply voltage	10 to 30 V DC
Current consumption	4 to 20 mA: ≤ 26 mA IO-Link: max. ≤ 300 mA
Degree of protection	– Cable: IP66/68 NEMA Type 4X/6P – Plug M12 Plastic: IP65/67 NEMA Type 4X – Plug M12 Metal: IP66/69 NEMA Type 4X – Valve plug: IP65 NEMA Type 4X
Influence of power supply	≤0.005% of URL/1 V
Residual ripple	±5 %

Performance characteristics	
Reference accuracy	±0.3 %
Thermal change of the zerooutput and the output span	<1 bar: <12 %; ≥1 bar: <1 %
Long-term stability	1 year: ±0.2 %; 5 years: ±0.4 %; 8 years: ±0.45 %
Switch-on time	≤2 s

Environment	
Ambient temperature range	–40 to +85 °C (–40 to +185 °F) Devices for hazardous areas or with IO-Link: –40 to +70 °C (–40 to +158 °F)
Storage temperature range	–40 to +85 °C (–40 to +185 °F)
Climate class	Class 4K4H
Electromagnetic compatibility	– Interference emission as per EN 61326 equipment B – Interference immunity as per EN 61326 appendix A (industrial sector) – NAMUR recommendation EMC (NE21) (not for devices with IO-Link)

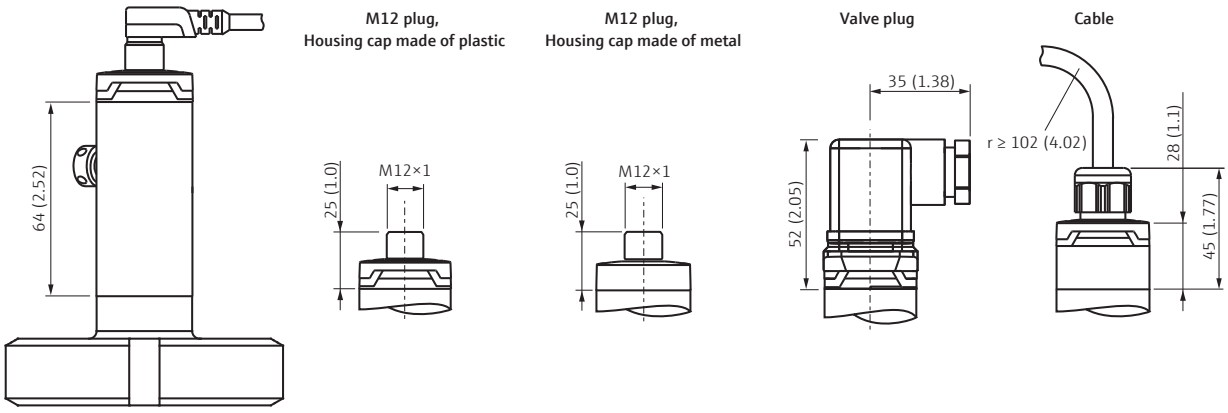
Process	
Process temperature range	–10 to +100 °C (+14 to +212 °F) Sterilization in place (SIP) at +135°C (+275 °F) for a maximum of one hour

Materials	
Materials not in contact with process	– Housing: Stainless steel 316L – Filling oil: Synthetic oil polyalphaolefin FDA 21 CFR 178.3620, NSF H1
Materials in contact with process	– Process connections: 316L – metal process isolating diaphragm: AISI 316L – TSE Certificate of Suitability for all device components in contact with the process

Approvals
ATEX II 1/2G Ex ia IIC T4 Ga/Gb CSA C/US IS Cl. I Div. 1 Gr. A-D FM IS Cl. I, Div.1 Gr. A-D T4 IEC Ex ia IIC T4 Ga/Gb NEPSI Ex ia IIC T4 EAC Ex ia IIC T4 Ga/Gb
3-A, EHEDG, EC1935/2004
Pressure Equipment Directive

Dimensions in mm (inches)

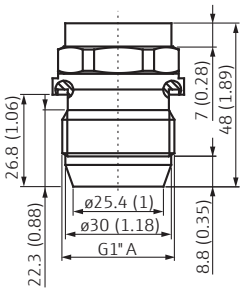
Housing



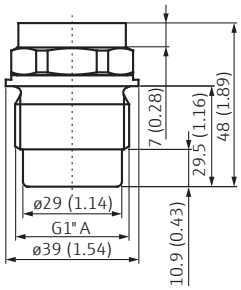
Installation according to instruction manual.

Process connections with flush-mounted, metal process isolating diaphragm

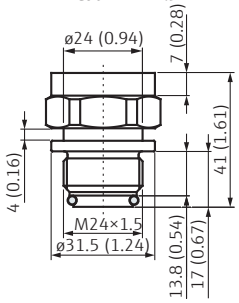
Thread ISO 228 G1" Metal joint



Thread ISO 228 G1" O-ring seal

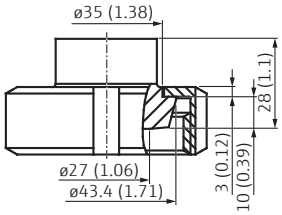


Thread M24×1.5

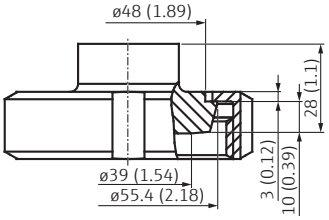


Hygienic connections

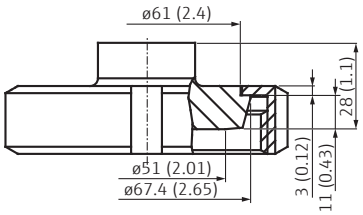
DIN 11851 DN 25



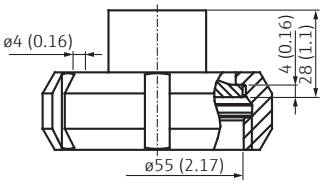
DIN 11851 DN 40



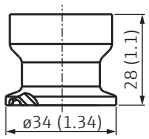
DIN 11851 DN 50



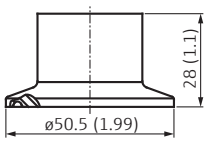
SMS 1½"



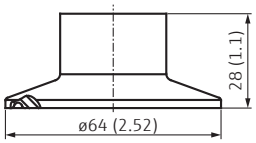
Clamp ISO 2852 DN 22



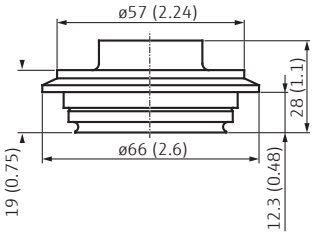
Tri-Clamp ISO 2852 DN 25 – DN 38



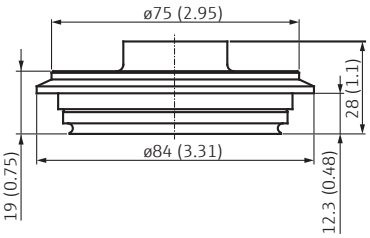
Tri-Clamp ISO 2852 DN 40 – DN 51



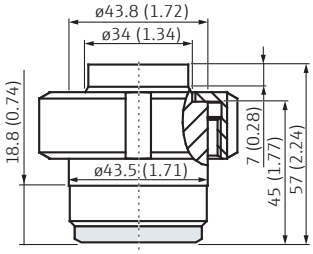
Varivent F pipe DN25 – 32



Varivent N pipe DN40 – 162



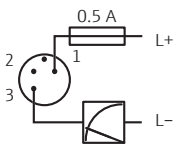
Universal adapter 44 mm



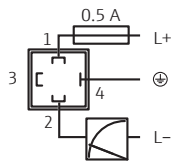
Electrical connection

4 to 20 mA output

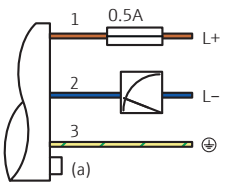
M12 plug



Valve plug

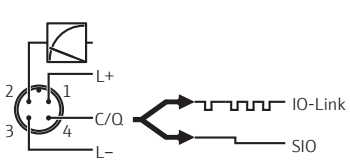


Cable



Devices with IO-Link

M12 plug



Cable:
1: brown = L+
2: blue = L–
3: green/yellow = ground connection
(a): reference air hose

Order codes

Output; Electrical connection

Code	Version
1	4 to 20 mA; IP65
1N	4 to 20 mA; IP69
7	IO-Link; 4 to 20 mA; IP65
7N	IO-Link; 4 to 20 mA; IP69

Sensor range

Code	Range (relative)
1F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
1H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
1K	2 bar/200 kPa/30 psi, overload: 18 bar/1.8 MPa/270 psi
1M	4 bar/400 kPa/60 psi, overload: 25 bar/2.5 MPa/375 psi
1N	6 bar/600 kPa/90 psi, overload: 40 bar/4 MPa/600 psi
1P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
1Q	16 bar/1.6 MPa/240 psi, overload: 60 bar/6 MPa/900 psi
1R	25 bar/2.5 MPa/375 psi, overload: 60 bar/6 MPa/900 psi
1S	40 bar/4 MPa/600 psi, overload: 60 bar/6 MPa/900 psi
	Range (absolute)
2F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
2H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
2K	2 bar/200 kPa/30 psi, overload: 18 bar/1.8 MPa/270 psi
2M	4 bar/400 kPa/60 psi, overload: 25 bar/2.5 MPa/375 psi
2P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
2S	40 bar/4 MPa/600 psi, overload: 60 bar/6 MPa/900 psi

Process connection

Code	Threads M24
X2J	Thread M24, 316L, seal EPDM, 3A, EHEDG
X3J	Thread M24, 316L, seal FKM, 3A, EHEDG
	Threads G1 flush-mounted
WQJ	Thread ISO 228 G1 seal metaljoint
WSJ	Thread ISO 228 G1 seal O-ring
	Hygienic connections
1DJ	DIN11851 DN50 PN25
1GJ	DIN11851 DN25 PN40
1JJ	DIN11851 DN40 PN40
3AJ	Clamp ISO2852 DN22 (¾")
3EJ	Tri-Clamp ISO2852 DN40-51 (2")
4QJ	SMS 1-½" PN25
41J	Varivent F pipe DN25-32 PN40
42J	Varivent N pipe DN40-162 PN40
52J	Universal adapter 44mm

Electrical connection

Code	Plug
M	Plug M12
U	Valve plug M16
V	Valve plug NPT½"

Calibration, unit

Code	Version
B	Sensor range; mbar/bar
J	Customized; please specify measuring range in your order

Cerabar PMP23

Approval	Output; Electrical conn.	Process connection	Order no.
Non-hazardous area	4 to 20 mA; IP65/ IO-Link; 4 to 20 mA; IP65	Tri-Clamp ISO 2852 DN25-38 (1-½")	PMP23-AA □□□□□ 3CJ
		Threads M24	PMP23-AA □□□□□ □□□
		Threads G1" flush-mounted	PMP23-AA □□□□□ □□□
		Hygienic connections	PMP23-AA □□□□□ □□□
	4 to 20 mA; IP69/ IO-Link; 4 to 20 mA; IP69	Tri-Clamp ISO 2852 DN25-38 (1-½")	PMP23-AA □□□□□ 3CJ
		Threads M24	PMP23-AA □□□□□ □□□
		Threads G1" flush-mounted	PMP23-AA □□□□□ □□□
		Hygienic connections	PMP23-AA □□□□□ □□□
Ex	4 to 20 mA; IP69	Tri-Clamp ISO 2852 DN25-38 (1-½")	PMP23-BA1N □□□□□ 3CJ
		Threads M24	PMP23-BA1N □□□□□ □□□
		Threads G1" flush-mounted	PMP23-BA1N □□□□□ □□□
		Hygienic connections	PMP23-BA1N □□□□□ □□□

* Please add code for output. electrical connections. sensor range. calibration and process connection.

Accessories	Order no.
Weld-in adapter G1. 316L	52005087
Weld-in adapter G1. 316L. EN10204	52010171
Weld-in adapter G1. d=60. 316L	52001051
Weld-in adapter G1. d=60. 316L. EN10204	52011896
Straight plug. without cable (self wired)	52006263
5 m cable with M12×1 plug	52010285
M12×1 plug angled	71114212
5 m cable with M12×1 plug angled for hygienic applications	52024216
Display PHX20 for Cerabar with analog output	52022914

Complete product information:
www.endress.com/pmp23

More products to complete your measuring point ...

Point level switch
Liquiphant FTL33
page 12

Kompakt termometre
iTHERM CompactLine TM311
page 104

Field indicator
RIA16
page 147

Pressure switch for measurement and monitoring of absolute and gauge pressure

Ceraphant PTC31B/PTP31B

IO-Link

- High reproducibility and long-term stability
- Customized measuring ranges
- Reference accuracy up to 0.3 %

Specs at a glance:

- **Product:**
  Gases, vapors, liquids and dust
- **Output:**
  1 × PNP
  2 × PNP, IO-Link
  1 × PNP + 4 to 20 mA, IO-Link
- **Display:**
  4 digit with color change
- **Process temperature range:**
  –40 to +100 °C (–40 to +212 °F)
- **Measuring ranges:**
  From 0 to +100 mbar (0 to +6 psi) to 0 to +400 bar (0 to +6000 psi)

Complete product information:
www.endress.com/ptc31b
www.endress.com/ptp31b

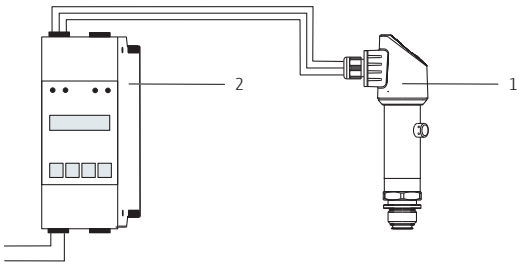
Application The Ceraphant is a pressure switch for the measurement of absolute and gauge pressure in gases, vapors, liquids and dust. The Ceraphant can be used universally thanks to a wide range of approvals and process connections.

Function

Ceramic process isolating diaphragm:
The ceramic switch is an oil-free sensor, i.e. the process pressure acts directly on the robust ceramic process isolating diaphragm and causes it to deflect. A pressure-dependent change in capacitance is measured at the electrodes of the ceramic substrate and the process isolating diaphragm.

Metallic process isolating diaphragm:
The process pressure deflects the metal process isolating diaphragm of the switch and a fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

Application example



Pressure switch Ceraphant with current output (1) with RMA42/ RIA45 (2)

Technical data

Output	
Output signal	PNP switch output + 4 to 20 mA output (4-wire), IO-Link; PNP switch output (3-wire); 2 x PNP switch output (4-wire), IO-Link
Function	Min., max. window
Signal range 4 to 20 mA	3.8 to 20.5 mA
Voltage drop PNP	≤2 V
Load 4 to 20 mA	$R_{Lmax} \leq (U_B - 6.5\ V)/23\ mA$ [1]
Dynamic behavior	Time constant (T_{90}) 16 ms

[1] R_{Lmax}: maximum load resistance; U_B: supply voltage

Power supply	
Supply voltage	10 to 30 V DC IO-Link: 18 to 30 V DC
Current consumption	≤60 mA
Degree of protection	Cable: IP66/67 NEMA Type 4X Plug M12: IP65/67 NEMA Type 4X Valve plug: IP65 NEMA Type 4X
Influence of power supply	≤0.005 % of URL/1 V
Residual ripple	±5 %

Performance characteristics	
Reference accuracy	Standard: ±0.5 %; Platinum: ±0.3 %
Thermal change of the zero output and the output span	<1 bar (15 psi): <1.2 %; ≥1 bar (15 psi): <1 %
Long-term stability	1 year: ±0.2 %; 5 years: ±0.4 %
Switch-on time	≤2 s

Environment	
Ambient temperature	−20 to +70 °C (−4 to +158 °F)
Storage temperature	−40 to +85 °C (−40 to +185 °F)
Climate class	Class 3K5
Electromagnetic compatibility	– Interference emission as per EN 61326 equipment B – Interference immunity as per EN 61326 appendix A (industrial sector) – NAMUR recommendation EMC (NE21)

Process	
Process temperature	PTC31B: −25 to +100 °C (−13 to +212 °F) PTP31B: −40 to +100 °C (−40 to +212 °F)

Materials PTC31B	
Materials not in contact with process	Housing: Stainless steel 316L (1.4404)
Materials in contact with process	Process connections: 316L (1.4435); Ceramic process isolating diaphragm: Al_2O_3 in accordance with FDA; TSE Certificate of Suitability for all device components in contact with the process; Seal: Viton FKM or EPDM

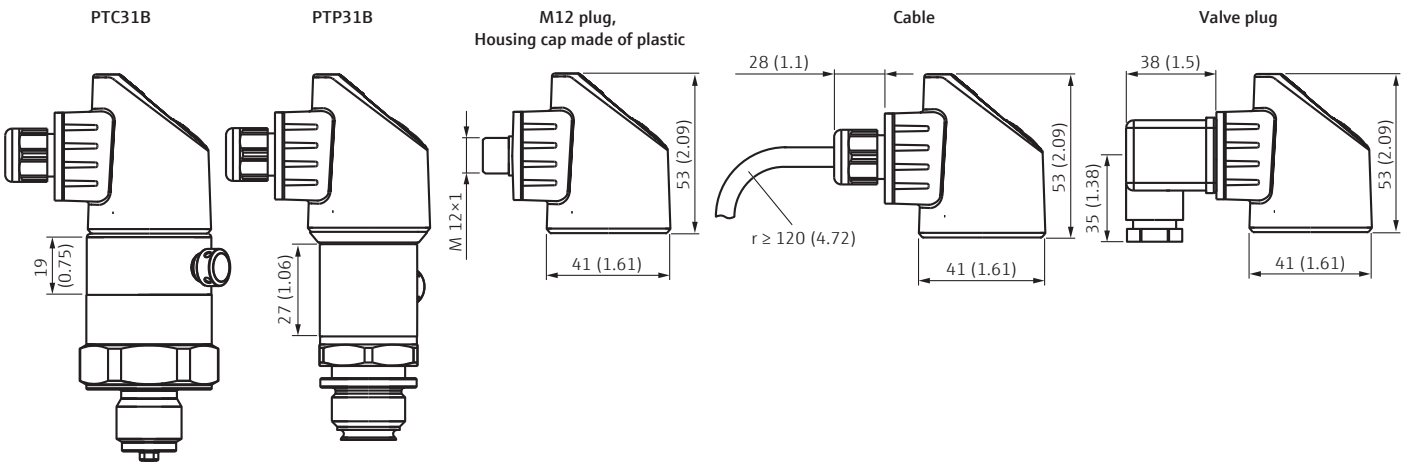
Materials PTP31B	
Materials not in contact with process	Housing: Stainless steel 316L (1.4404); Housing cap: PBT/PC; Filling oil: NSF-H1 synthetic oil in accordance with FDA 21 CFR 178.3570
Materials in contact with process	Process connections: 316L; Metallic process isolating diaphragm: AISI 316L (1.4435); TSE Certificate of Suitability for all device components in contact with the process; With flush-mounted process isolating diaphragm: Seal: Viton FKM

Operability	
Operation with local display	4-digit measured value display, simple and complete menu guidance, comprehensive diagnostic functions, status via LEDs
IO Link	Operator-oriented menu structure for user-specific tasks

Approvals
Pressure Equipment Directive

Dimensions in mm (inches)

Housing

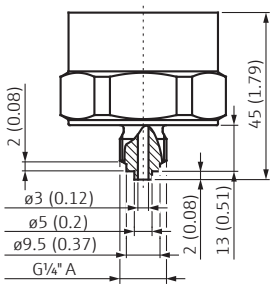


Installation according to instruction manual.

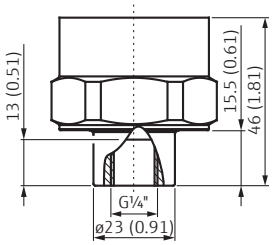
Dimensions process connections PTC31B in mm (inches)

Process connections with internal, ceramic process isolating diaphragm

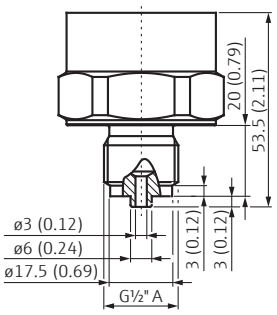
Thread ISO 228 G¼"



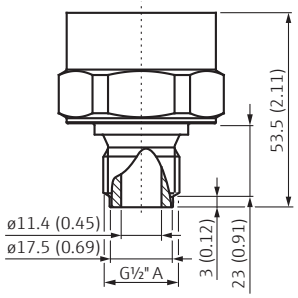
Thread ISO 228 G¼" (female)



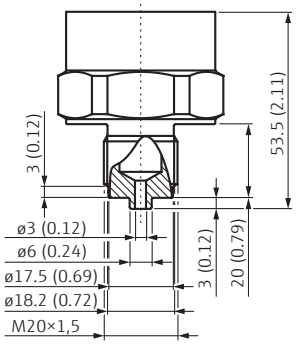
Thread ISO 228 G½"



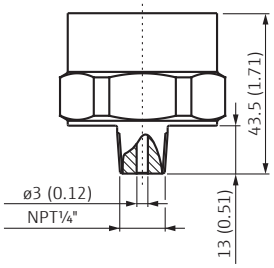
Thread ISO 228 G½", bore 11.4 mm (0.45 in)



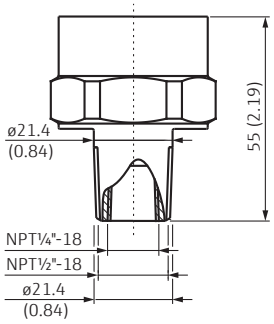
Thread DIN13



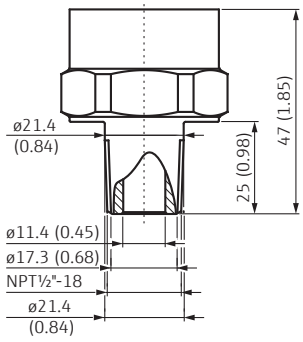
ASME¼" MNPT



ASME½" MNPT (female)



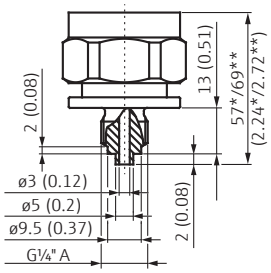
ASME½" MNPT, bore 11.4 mm (0.45 in)



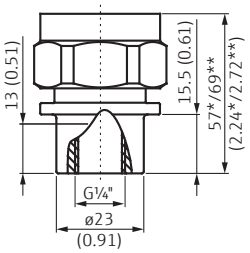
Dimensions process connections PTP31B in mm (inches)

Process connections with internal, metallic process isolating diaphragm

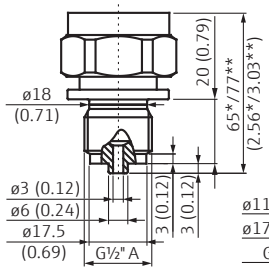
Thread ISO 228 G¼"



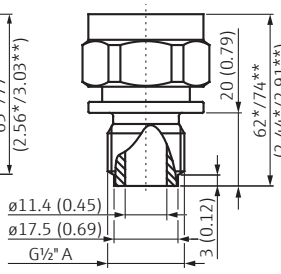
Thread ISO 228 G¼" (female)



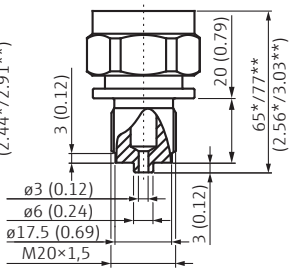
Thread ISO 228 G½"



Thread ISO 228 G½", bore 11.4 mm (0.45 in)

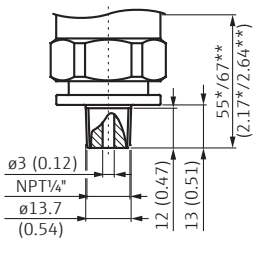


Thread DIN13

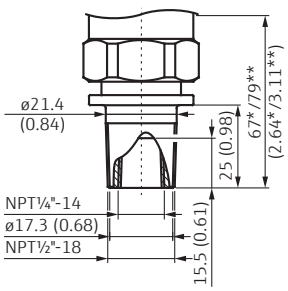


Process connections with flush-mounted, metallic process isolating diaphragm

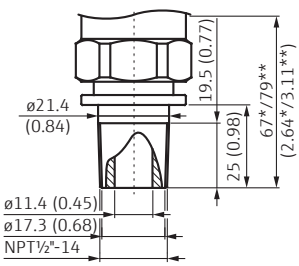
ASME¼" MNPT



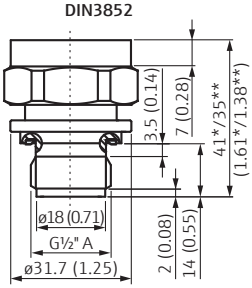
ASME½" MNPT (female)



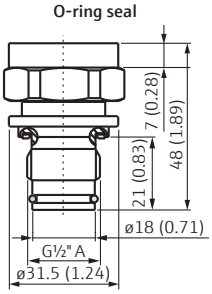
ASME½" MNPT, bore 11.4 mm (0.45 in)



Thread ISO 228 G½" DIN3852



Thread ISO 228 G½" O-ring seal

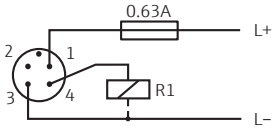


* to 100 bar (1500 psi) / ** 400 bar (6000 psi)

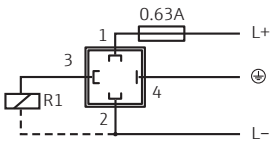
Electrical connection

1 × PNP switch output R1

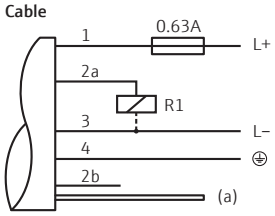
M12 plug



Valve plug

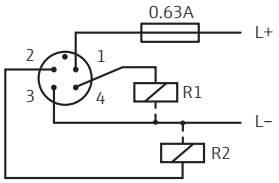


Cable

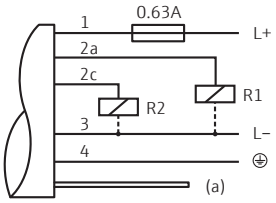


2 × PNP switch outputs R1 and R2

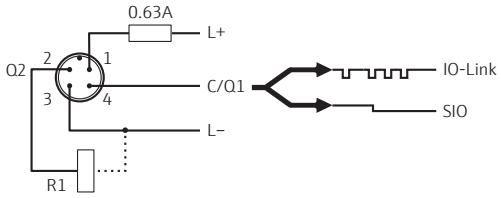
M12 plug



Cable

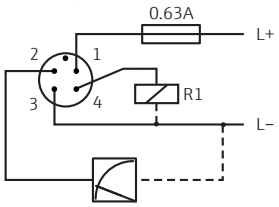


M12 plug, IO-Link

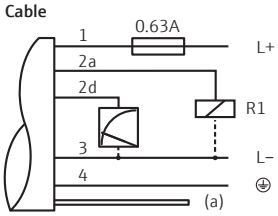


1 × PNP switch output R1 with additional analog output 4 to 20 mA (active)

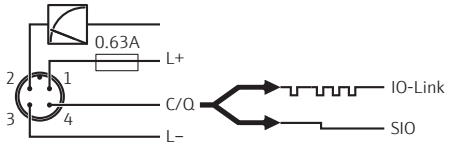
M12 plug



Cable



M12 plug, IO-Link



Cable:
1: brown = L+
2a: black = switch output 1
2b: white = not assigned
2c: white = switch output 2
2d: white = analog output 4 to 20 mA
3: blue = L–
4: green/yellow = ground
(a): reference air hose

Order codes

Electrical connection

Code	Plug
M	Plug M12
U	Valve plug M16
V	Valve plug NPT½"

Sensor range

Code	Range (relative)
1C	100 mbar/10 kPa/1.5 psi, overload: 4 bar/400 kPa/60 psi
1E	250 mbar/25 kPa/3.75 psi, overload: 5 bar/500 kPa/75 psi
1F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
1H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
1K	2 bar/200 kPa/30 psi, overload: 18 bar/1.8 MPa/270 psi
1M	4 bar/400 kPa/60 psi, overload: 25 bar/2.5 MPa/375 psi
1P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
1S	40 bar/4 MPa/600 psi, overload: 60 bar/6 MPa/900 psi

Code	Range (absolute)
2C	100 mbar/10 kPa/1.5 psi, overload: 4 bar/400 kPa/60 psi
2E	250 mbar/25 kPa/3.75 psi, overload: 5 bar/500 kPa/75 psi
2F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
2H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
2K	2 bar/200 kPa/30 psi, overload: 18 bar/1.8 MPa/270 psi
2M	4 bar/400 kPa/60 psi, overload: 25 bar/2.5 MPa/375 psi
2P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
2S	40 bar/4 MPa/600 psi, overload: 60 bar/6 MPa/900 psi

Process connection

Code	Thread
WAJ	Thread ISO228 G¼" (internal)
WBJ	Thread ISO228 G½" EN837
WTJ	Thread ISO228 G¼" EN837
WWJ	Thread ISO228 G½", bore 11.4 mm (0.45 in)
X2J	Thread M24, seal FKM
X3J	Thread M24, seal EPDM
X4J	Thread DIN13 M20×1.5 EN837

Seal

Code	Version
A	FKM
J	EPDM

Ceraphant PTC31B			Order no.
Output	Reference Accuracy	Electrical connection	*
PNP, 3-wire	Standard 0.5 %	M12/ISO4400	PTC31B-AA4 ☐☐GB☐☐
	Platinum 0.3 %	M12/ISO4400	PTC31B-AA4 ☐☐DB☐☐
2 × PNP, IO-Link, 4-wire	Standard 0.5 %	Plug M12	PTC31B-AA8 M ☐GB☐☐
	Platinum 0.3 %	Plug M12	PTC31B-AA8 M ☐DB☐☐
PNP + 4 to 20 mA, IO-Link, 4-wire	Standard 0.5 %	Plug M12	PTC31B-AA7 M ☐GB☐☐
	Platinum 0.3 %	Plug M12	PTC31B-AA7 M ☐DB☐☐

* Please add code for electrical connection, sensor range, process connection and seal.

Accessories	Order no.
Weld-in adapter G½, 316L	52002643
Weld-in adapter G1, 316L, EN10204	52010171
Straight plug, without cable (self wired)	52006263
5 m cable with M12×1 plug	52010285
M12×1 plug angled	71114212

Electrical connection

Code	Plug
M	Plug M12
U	Valve plug M16
V	Valve plug NPT½"

Sensor range

Code	Range (relative)
1F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
1H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
1K	2 bar/200 kPa/30 psi, overload: 18 bar/1.8 MPa/270 psi
1M	4 bar/400 kPa/60 psi, overload: 25 bar/2.5 MPa/375 psi
1P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
1S	40 bar/4 MPa/600 psi, overload: 60 bar/6 MPa/900 psi
1U	100 bar/10 MPa/1500 psi, overload: 160 bar/16 MPa/2400 psi
1W	400 bar/40 MPa/6000 psi, overload: 600 bar/60 MPa/9000 psi

Code	Range (absolute)
2F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
2H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
2K	2 bar/200 kPa/30 psi, overload: 18 bar/1.8 MPa/270 psi
2M	4 bar/400 kPa/60 psi, overload: 25 bar/2.5 MPa/375 psi
2P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
2S	40 bar/4 MPa/600 psi, overload: 60 bar/6 MPa/900 psi
2U	100 bar/10 MPa/1500 psi, overload: 160 bar/16 MPa/2400 psi
2W	400 bar/40 MPa/6000 psi, overload: 600 bar/60 MPa/9000 psi

Process connection

Code	Thread
WAJ	Thread ISO228 G¼" (internal)
WBJ	Thread ISO228 G½" EN837
WTJ	Thread ISO228 G¼" EN837
WWJ	Thread ISO228 G½", bore 11.4 mm (0.45 in)
X2J	Thread M24, seal FKM
X3J	Thread M24, seal EPDM
X4J	Thread DIN13 M20×1.5 EN837

Ceraphant PTP31B

Output	Reference Accuracy	Electrical connection	Order no.
PNP, 3-wire	Standard 0.5 %	M12/ISO4400	PTP31B-AA4 ☐☐ GB ☐
	Platinum 0.3 %	M12/ISO4400	PTP31B-AA4 ☐☐ DB ☐
2 × PNP, IO-Link, 4-wire	Standard 0.5 %	Plug M12	PTP31B-AA8 M ☐ GB ☐
	Platinum 0.3 %	Plug M12	PTP31B-AA8 M ☐ DB ☐
PNP + 4 to 20 mA, IO-Link, 4-wire	Standard 0.5 %	Plug M12	PTP31B-AA7 M ☐ GB ☐
	Platinum 0.3 %	Plug M12	PTP31B-AA7 M ☐ DB ☐

* Please add code for electrical connection, sensor range and process connection.

Accessories	Order no.
Weld-in adapter G½, 316L	52002643
Weld-in adapter G1, 316L, EN10204	52010171
Straight plug, without cable (self wired)	52006263
5 m cable with M12×1 plug	52010285
M12×1 plug angled	71114212

Complete product information:
www.endress.com/ptc31b
www.endress.com/ptp31b

More products to complete your measuring point ...


Point level switch
Liquiphant FTL31
page 8


Flow switch
Flowphant T DTT31
page 98


Temperature switch
Thermophant T TTR31
page 131

Pressure switch for measurement and monitoring of absolute and gauge pressure for hygienic processes

Ceraphant PTP33B

IO-Link

Complete product information:
www.endress.com/ptp33b

- High reproducibility and long-term stability
- Customized measuring ranges
- Flexible process integration thanks to modular connections

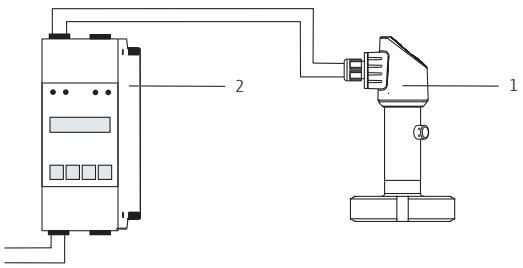
Specs at a glance:

- **Product:**
  Gases, vapors, liquids and dust
- **Measuring ranges:**
  From 0 to +400 mbar (0 to +6 psi) to 0 to +40 bar (0 to +600 psi)
- **Accuracy:**
  Standard: ±0,5 %;
  Platinum: ±0,3 %
- **Filling oil:**
  in accordance with FDA
- **Process temperature:**
  –10 to +100 °C (+14 to +212 °F), +135 °C (+275 °F) for one hour maximum
- **Output:**
  1 × PNP, 2 × PNP,
  1 × PNP + 4 to 20 mA,
  1 × PNP + 4 to 20 mA, IO-Link

Application The Ceraphant is a pressure switch for the measurement of absolute and gauge pressure in gases, vapors, liquids and dust for applications with hygienic requirements. The Ceraphant can be used internationally thanks to a wide range of approvals and process connections.

Function The process pressure deflects the metal process isolating diaphragm of the switch and a fill fluid transfers the pressure to a Wheatstone bridge (semiconductor technology). The pressure-dependent change in the bridge output voltage is measured and evaluated.

Application example



Pressure switch Ceraphant PTP33B with 1 × PNP switch output (1) with RMA42/RIA45 (2)

Technical data

Output	
Output signal	PNP switch output + 4 to 20 mA output (four-wire), IO-Link; PNP switch output (3-wire); 2 × PNP switch output (4-wire), IO-Link
Signal range 4 to 20 mA	3.8 mA to 20.5 mA
Voltage drop PNP	≤2 V
Load 4 to 20 mA	$R_{Lmax} \leq (U_B - 6{,}5\ V)/23\ mA$ [1]
Dynamic behavior	Time constant (T_{90}) 16 ms

[1] R_{Lmax}: maximum load resistance; U_B: supply voltage

Power supply	
Supply voltage	10 to 30 V DC IO-Link: 18 to 30 V DC
Current consumption	≤60 mA
Degree of protection	- Cable: IP66/67 NEMA Type 4X/6P - Plug M12: IP65/67 NEMA Type 4X - Valve plug: IP65 NEMA Type 4X
Influence of power supply	≤0.005 % of URL/1 V
Residual ripple	±5 %

Performance characteristics	
Reference accuracy	Standard: ±0.5 %; Platinum: ±0.3 %
Thermal change of the zero output and the output span	<1 bar: <1.2 %; ≥1 bar: <1 %
Long-term stability	1 year: ±0.2 %; 5 years: ±0.4 %
Switch-on time	≤2 s

Environment	
Ambient temperature	–20 to +70 °C (–4 to +158 °F)
Storage temperature	–40 to +85 °C (–40 to +185 °F)
Climate class	Class 3K5
Electromagnetic compatibility	– Interference emission as per EN 61326 equipment B – Interference immunity as per EN 61326 appendix A (industrial sector) – NAMUR recommendation EMC (NE21)

Process	
Process temperature	–10 to +100 °C (+14 to +212 °F) Sterilization in place (SIP) at +135°C (+275 °F) for a maximum of one hour

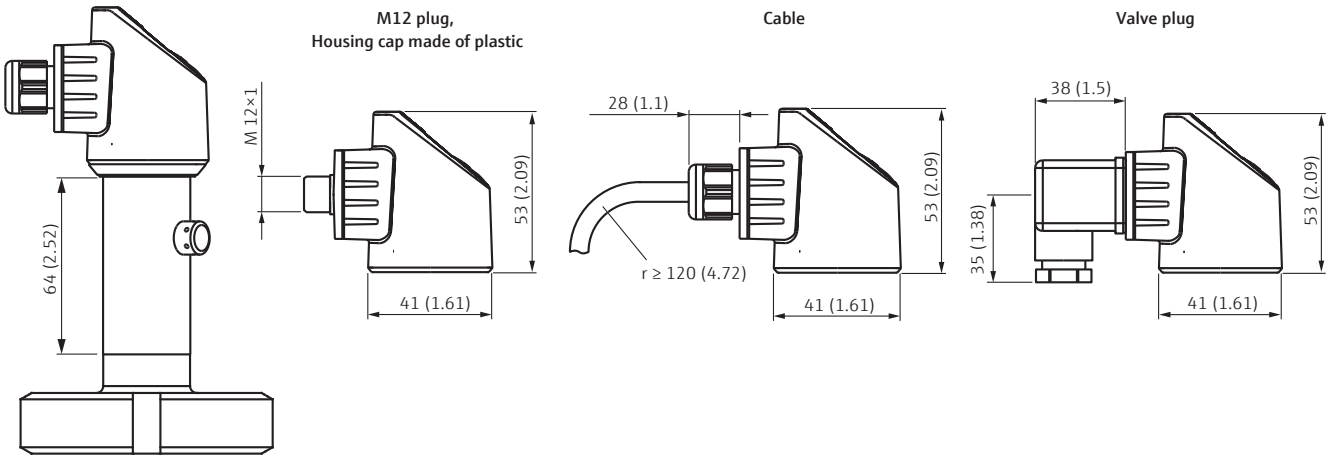
Materials	
Materials not in contact with process	Housing: Stainless steel 316L Filling oil: NSF-H1 synthetic oil in accordance with FDA 21 CFR 178.3570
Materials in contact with process	Process connections: 316L metal process isolating diaphragm: AISI 316L TSE Certificate of Suitability for all device components in contact with the process

Operability	
Operation with local display	4-digit measured value display, simple and complete menu guidance, comprehensive diagnostic functions, status via LEDs
IO Link	Operator-oriented menu structure for user-specific tasks

Approvals
3-A, EHEDG, EC1935/2004
Pressure Equipment Directive

Dimensions in mm (inches)

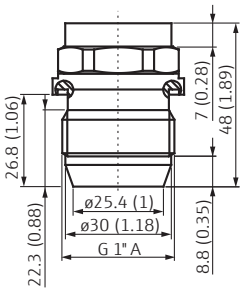
Housing



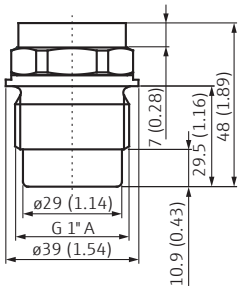
Installation according to instruction manual.

Process connections with flush-mounted, metal process isolating diaphragm

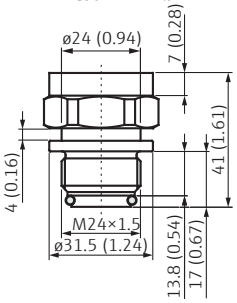
Thread ISO 228 G1" Metal joint



Thread ISO 228 G1" O-ring seal

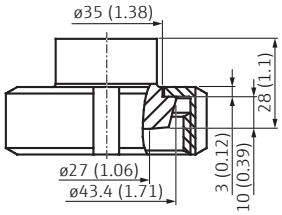


Thread M24×1.5

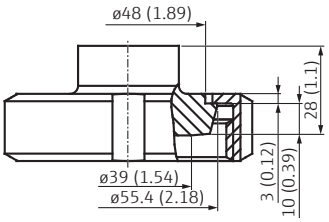


Hygienic connections

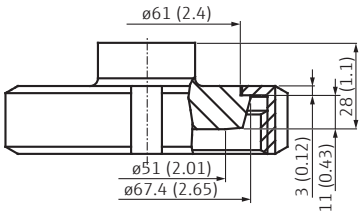
DIN 11851 DN 25



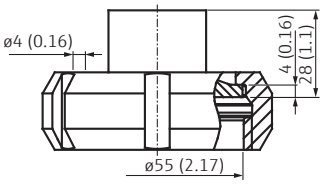
DIN 11851 DN 40



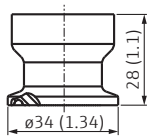
DIN 11851 DN 50



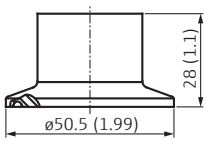
SMS1½"



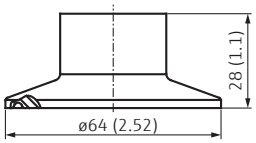
Clamp ISO 2852 DN 22



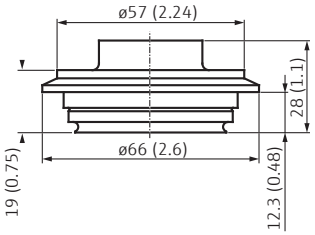
Tri-Clamp ISO 2852 DN 25 – DN 38



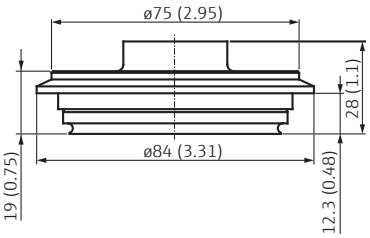
Tri-Clamp ISO 2852 DN 40 – DN 51



Varivent F pipe DN25 – 32



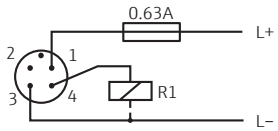
Varivent N pipe DN40 – 162



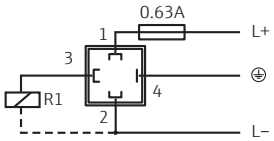
Electrical connection

1 × PNP switch output R1

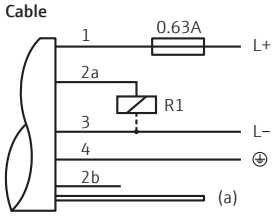
M12 plug



Valve plug



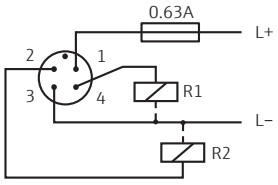
Cable



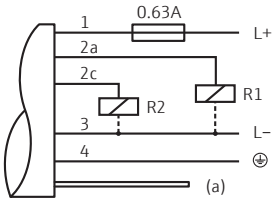
Cable:
1: brown = L+
2a: black = switch output 1
2b: white = not assigned
2c: white = switch output 2
2d: white = analog output 4 to 20 mA
3: blue = L–
4: green/yellow = ground
(a): reference air hose

2 × PNP switch outputs R1 and R2

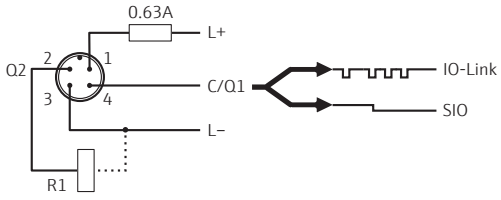
M12 plug



Cable

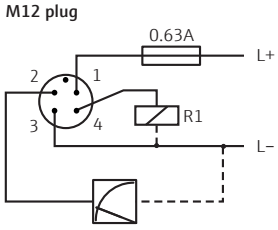


M12 plug, IO-Link

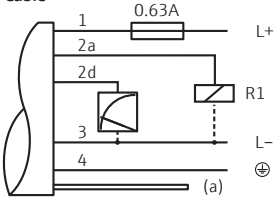


1 × PNP switch output R1 with additional analog output 4 to 20 mA (active)

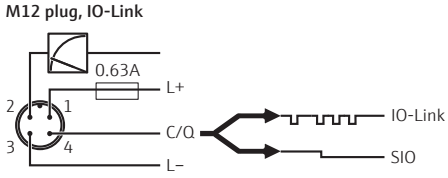
M12 plug



Cable



M12 plug, IO-Link



Order codes

Electrical Connection

Code	Plugs
M	Plug M12
U	Valve plug M16
V	Valve plug NPT½"

Sensor range

Code	Range (relative)
1F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
1H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
1K	2 bar/200 kPa/30 psi, overload: 10bar/1MPa/150 psi
1M	4 bar/400 kPa/60 psi, overload: 16bar/1,6MPa/240 psi
1P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
1S	40 bar/4 MPa/600 psi, overload: 160bar/16MPa/2400 psi

Code	Range (absolute)
2F	400 mbar/40 kPa/6 psi, overload: 1,6 bar/160 kPa/24 psi
2H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
2K	2 bar/200 kPa/30 psi, overload: 10bar/1MPa/150 psi
2M	4 bar/400 kPa/60 psi, overload: 16bar/1,6MPa/240 psi
2P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
2S	40 bar/4 MPa/600 psi, overload: 160bar/16MPa/2400 psi

Process connection

Code	Threads M24
X2J	Thread M24, 316L, seal EPDM, 3A, EHEDG
X3J	Thread M24, 316L, seal FKM, 3A, EHEDG

Process connection

Code	Threads G1 flush-mounted
WQJ	Thread ISO 228 G1 seal metaljoint
WSJ	Thread ISO 228 G1 seal O-ring

Process connection

Code	Hygienic connections
1DJ	DIN11851 DN50 PN25
1GJ	DIN11851 DN25 PN40
1JJ	DIN11851 DN40 PN40
3AJ	Clamp ISO2852 DN22 (¾")
3EJ	Tri-Clamp ISO2852 DN40-51 (2")
4QJ	SMS 1-½" PN25
41J	Varivent F pipe DN25-32 PN40
42J	Varivent N pipe DN40-162 PN40

Ceraphant PTP33B (Reference accuracy: 0.5 %)		**Order no.**
Output	Process connection	*
PNP, 3-wire	Tri-Clamp (1½")	PTP33B-AA4 ☐ ☐ GB3CJ
	Threads M24	PTP33B-AA4 ☐ ☐ GB ☐
	Threads G1 flush-mounted	PTP33B-AA4 ☐ ☐ GB ☐
	Hygienic connections	PTP33B-AA4 ☐ ☐ GB ☐
2x PNP, IO-Link, 4-wire	Tri-Clamp (1½")	PTP33B-AA8M ☐ GB3CJ
	Threads M24	PTP33B-AA8M ☐ GB ☐
	Threads G1 flush-mounted	PTP33B-AA8M ☐ GB ☐
	Hygienic connections	PTP33B-AA8M ☐ GB ☐
PNP + 4 to 20mA, IO-Link, 4-wire	Tri-Clamp (1½")	PTP33B-AA7M ☐ GB3CJ
	Threads M24	PTP33B-AA7M ☐ GB ☐
	Threads G1 flush-mounted	PTP33B-AA7M ☐ GB ☐
	Hygienic connections	PTP33B-AA7M ☐ GB ☐

* Please add code for electrical connection, sensor range and process connection.

Accessories	**Order no.**
Weld-in adapter G1, 316L	52005087
Weld-in adapter G1, 316L, EN10204	52010171
Weld-in adapter G1, d=60, 316L	52001051
Weld-in adapter G1, d=60, 316L, EN10204	52011896
Straight plug, without cable (self wired)	52006263
5 m cable with M12×1 plug	52010285
M12×1 plug angled	71114212

Electrical Connection

Code	Plugs
M	Plug M12
U	Valve plug M16
V	Valve plug NPT½"

Sensor range

Code	Range (relative)
1F	400 mbar/40 kPa/6 psi, overload: 1.6 bar/160 kPa/24 psi
1H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
1K	2 bar/200 kPa/30 psi, overload: 10bar/1MPa/150 psi
1M	4 bar/400 kPa/60 psi, overload: 16bar/1,6MPa/240 psi
1P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
1S	40 bar/4 MPa/600 psi, overload: 160bar/16MPa/2400 psi

Code	Range (absolute)
2F	400 mbar/40 kPa/6 psi, overload: 1,6 bar/160 kPa/24 psi
2H	1 bar/100 kPa/15 psi, overload: 4 bar/400 kPa/60 psi
2K	2 bar/200 kPa/30 psi, overload: 10bar/1MPa/150 psi
2M	4 bar/400 kPa/60 psi, overload: 16bar/1,6MPa/240 psi
2P	10 bar/1 MPa/150 psi, overload: 40 bar/4 MPa/600 psi
2S	40 bar/4 MPa/600 psi, overload: 160bar/16MPa/2400 psi

Process connection

Code	Threads M24
X2J	Thread M24, 316L, seal EPDM, 3A, EHEDG
X3J	Thread M24, 316L, seal FKM, 3A, EHEDG

Process connection

Code	Threads G1 flush-mounted
WQJ	Thread ISO 228 G1 seal metaljoint
WSJ	Thread ISO 228 G1 seal O-ring

Process connection

Code	Hygienic connections
1DJ	DIN11851 DN50 PN25
1GJ	DIN11851 DN25 PN40
1JJ	DIN11851 DN40 PN40
3AJ	Clamp ISO2852 DN22 (¾")
3EJ	Tri-Clamp ISO2852 DN40-51 (2")
4QJ	SMS 1-½" PN25
41J	Varivent F pipe DN25-32 PN40
42J	Varivent N pipe DN40-162 PN40

Ceraphant PTP33B (Reference accuracy: 0.3 %)		**Order no.**
Output	Process connection	*
PNP, 3-wire	Tri-Clamp (1½")	PTP33B-AA4 ☐☐ DB3CJ
	Threads M24	PTP33B-AA4 ☐☐ DB ☐
	Threads G1 flush-mounted	PTP33B-AA4 ☐☐ DB ☐
	Hygienic connections	PTP33B-AA4 ☐☐ DB ☐
2x PNP, IO-Link, 4-wire	Tri-Clamp (1½")	PTP33B-AA8M ☐ DB3CJ
	Threads M24	PTP33B-AA8M ☐ DB ☐
	Threads G1 flush-mounted	PTP33B-AA8M ☐ DB ☐
	Hygienic connections	PTP33B-AA8M ☐ DB ☐
PNP + 4 to 20mA, IO-Link, 4-wire	Tri-Clamp (1½")	PTP33B-AA7M ☐ DB3CJ
	Threads M24	PTP33B-AA7M ☐ DB ☐
	Threads G1 flush-mounted	PTP33B-AA7M ☐ DB ☐
	Hygienic connections	PTP33B-AA7M ☐ DB ☐

* Please add code for electrical connection, sensor range and process connection.

Accessories	**Order no.**
Weld-in adapter G1, 316L	52005087
Weld-in adapter G1, 316L, EN10204	52010171
Weld-in adapter G1, d=60, 316L	52001051
Weld-in adapter G1, d=60, 316L, EN10204	52011896
Straight plug, without cable (self wired)	52006263
5 m cable with M12×1 plug	52010285
M12×1 plug angled	71114212

Complete product information:
www.endress.com/ptp33b

More products to complete your measuring point ...

Flow switch
Flowphant T DTT35
page 101

Kompakt termometre
iTHERM CompactLine TM311
page 104

Temperature switch
Thermophant T TTR35
page 134

Electromagnetic flowmeter for conductive liquids

Picomag

IO-Link

reddot design award winner 2018

Complete product information:
www.endress.com/dma

- Simultaneous measurement of flow, temperature and conductivity
- Flexible integration into all fieldbus systems via IO-Link
- Commissioning and operation via Bluetooth® and SmartBlue App
- Configuration can be duplicated from one device to the next

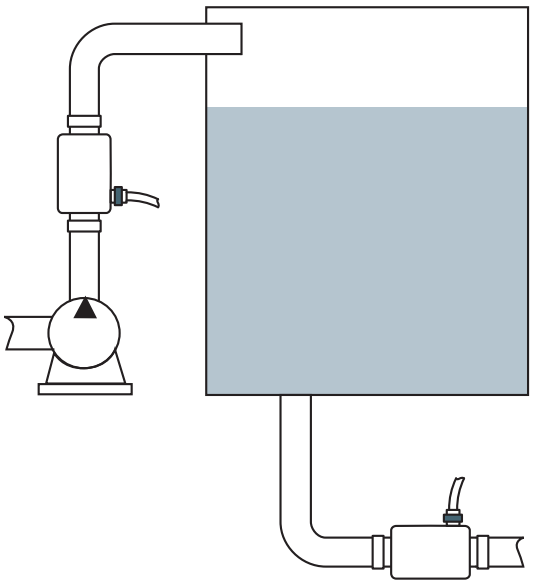
Specs at a glance:

- **Minimum conductivity:** ≥10 µS/cm
- **Fluid temperature:** −10 to +70 °C (+14 to +158 °F), temporary to +85 °C (+185 °F)
- **Materials in contact with medium:** Stainless steel (1.4404), PEEK, FKM
- **Process pressure:** Max. 16 bar (232 psi)

Application Picomag is an electromagnetic flowmeter for bidirectional measurement of conductive liquids. It is used for flow measurements in water or service water applications. Due to its easy installation and operation, its robust design and low price it can be used in applications where only limited principles could be used before.

Function Following Faraday's law of magnetic induction, a voltage is induced in a conductor moving through a magnetic field. In the electromagnetic measuring principle, the flowing fluid is the moving conductor. By measuring the induced voltage, the flow velocity of the medium can be measured. The flow volume is calculated by means of the pipe cross-section area.

Application example



Picomag is used for measurement of inlet as well as outlet flow of different applications:

- Monitoring of cooling circuits
- Monitoring of cleaning and rinsing water
- Secondary circuits for drinking water
- Submetering in utility water networks

Technical data

Input	
Measured values	Volume flow, Temperature, Totalizer, Conductivity
Measuring range	– DN 15(½"): 0.05 to 25 l/min (0.013 to 6.6 gal/min) – DN 20 (¾"): 0.1 to 50 l/min (0.026 to 13.2 gal/min) – DN 25 (1"): 0.2 to 100 l/min (0.052 to 26.4 gal/min) – DN 50 (2"): 1.5 to 750 l/min (0.4 to 198.1 gal/min)

Output	
Current output	4 to 20 mA (500 Ω, the load may not be any greater)
Voltage output	2 to 10 V (500 Ω, the load resistance may not any smaller)
Switch output	PNP or NPN, max. 250 mA – Signal on alarm – Limit value – Range value
Pulse output	PNP, max. 250 mA
Digital input	5 to 30 V_{DC} – Totalizer reset – Value suppression
IO-Link	Version: 1.1 Speed: COM2 (38.4 kBaud)
Signal on alarm	– Status signal (as per NAMUR Recommendation NE 107) – Plain text display with remedial action

Power supply	
Supply voltage range	18 to 30 V_{DC} (SELV, PELV, Class 2)
Power consumption	Max. 3 W [w/o outputs IO1 and IO2, 120 mA (+ 2× 250 mA with I/Os)]

Volume flow measurement	
Maximum measured error	±0.8 % o.r.±0.2 % o.f.s.
Repeatability	±0.2 % o.r.
Response time	The response time depends on the configuration (damping)

Medium temperature measurement	
Maximum measured error	±2.5 °C
Repeatability	±0.5 °C

Conductivity measurement	
Temperature compensated conductivity measurement	
Repeatability	±5 % o.r. ±5 µS/cm

Inlet and outlet runs	
Inlet run	≥0 × DN
Outlet run	≥0 × DN

Environment	
Ambient temperature range	–10 to +60 °C (+14 to +140 °F)
Storage temperature	–25 to +85 °C (–13 to +185 °F)
Degree of protection	IP65/67
Shock resistance	20 g (11 ms) as per IEC/EN60068-2-27
Vibration resistance	Acceleration up to 5 g (10 to 2000 Hz) as per IEC/EN60068-2-6
Electromagnetic compatibility (EMC)	In accordance with IEC/EN61326 and/or IEC/EN55011 (Class A)

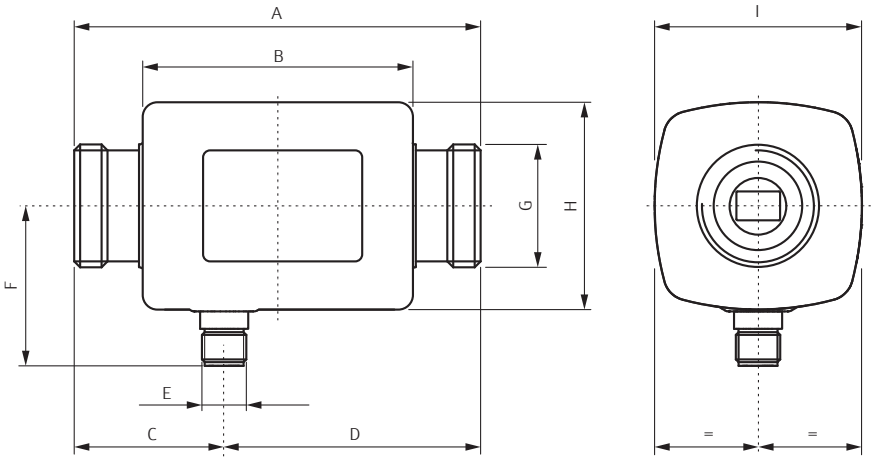
Process	
Medium temperature range	–10 to +70 °C (+14 to +158 °F), temporary to +85 °C (+185 °F)
Medium properties	Liquid, conductivity > 10 µS/cm
Pressure	Max. 16 bar_{rel}

Materials	
Measuring tube	PEEK
Electrodes, temperature sensor	1.4435/316L
Process connection	1.4404/316L
Housing	1.4404/316L
Seal	FKM
Display window	Polycarbonate

Operability	
Operating concept	Bluetooth® wireless technology The device has a Bluetooth® wireless technology interface and can be operated and configured via the SmartBlue App. – The range under reference conditions is 10 m (33 ft) – Incorrect operation by unauthorized persons is prevented by means of encrypted communication and password encryption – The Bluetooth® wireless technology interface can be deactivated

Approvals
Drinking water approvals (in preparation)
UL-listed ($_{c}UL_{US}$)

Dimensions



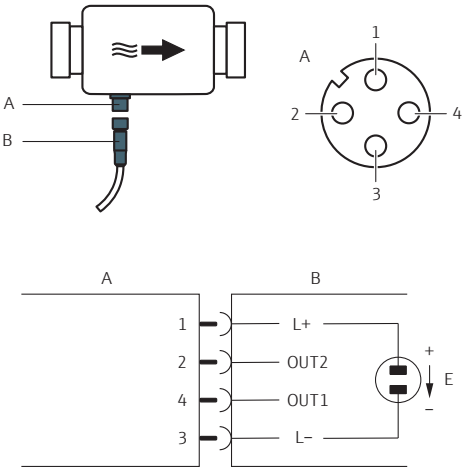
Dimensions in SI units

DN [mm]	A [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	I [mm]
15, 20, 25	110	73	40.5	69.5	M12 × 1	43	½", ¾", 1"	56	56
50	200	113	80	120	M12 × 1	58	2"	86	86

Dimensions in US units

DN [in]	A [in]	B [in]	C [in]	D [in]	E [in]	F [in]	G [in]	H [in]	I [in]
½, ¾, 1	4.33	2.87	1.59	2.74	M12 × 1	1.69	½", ¾", 1"	2.20	2.20
2	7.87	4.45	3.15	4.72	M12 × 1	582.28	2"	3.39	3.39

Electrical connection

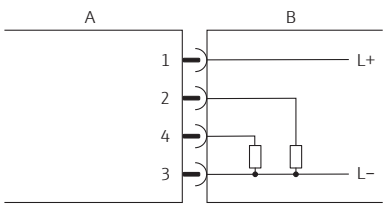


Pin assignment, device plug

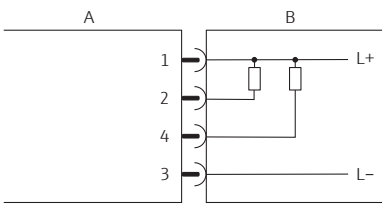
A	Socket
B	Connector

Pin	Assignment	Description
1	L+	Supply voltage + (18 to 30 V_{DC}/max. 3 W)
2	Output 2	Output 2, can be configured independently of output 1
3	L–	Supply voltage –
4	Output 1	Output 1, can be configured independently of output 2

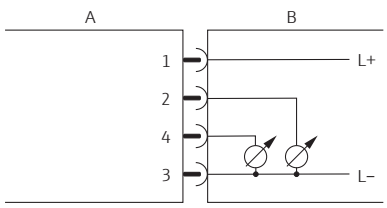
1)



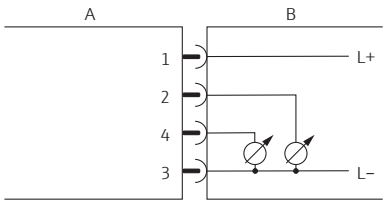
2)



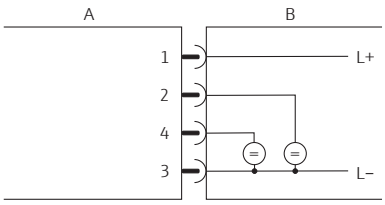
3)



4)



5)



A	Socket
B	Connector
L+	Supply voltage +
L–	Supply voltage –

Switch/pulse output configuration version

1)	pnp
2)	npn

Current output configuration version, active, 4 to 20 mA

3)	The maximum load may not exceed 500 Ω. A bigger load distorts the output signal.

Voltage output configuration version, active, 2 to 10 V

4)	The load must be at least 500 Ω. The output is overload-resistant.

Status input configuration version

5)	– Switch-on threshold: 15 V – Switch-off threshold: 5 V – Internal resistance: 7.5 kΩ

Order codes

Picomag	Order no.
Device model	
Picomag DN 15(½"): 0.05 to 25 l/min (0.013 to 6.6 gal/min)	DMA15-AAAAA1
Picomag DN 20 (¾"): 0.1 to 50 l/min (0.026 to 13.2 gal/min)	DMA20-AAAAA1
Picomag DN 25 (1"): 0.2 to 100 l/min (0.052 to 26.4 gal/min)	DMA25-AAAAA1
Picomag DN 50 (2"): 1.5 to 750 l/min (0.4 to 198.1 gal/min)	DMA50-AAAAA1

Accessories	Order no.
Set cable 2 m (6.5 ft), straight, 4 × 0.34, M12	71349260
Set cable 5 m (16.4 ft), straight, 4 × 0.34, M12	71349261
Set cable 10 m (32.8 ft), straight, 4 × 0.34, M12	71349262
Set cable 2 m (6.5 ft), 90°, 4 × 0.34, M12	71349263
Set cable 5 m (16.4 ft), 90°, 4 × 0.34, M12	71349264
Set cable 10 m (32.8 ft), 90°, 4 × 0.34, M12	71349265
Set earthing terminal	71345225

Accessories Picomag DN 15	Order no.
Set adapter G½"/G⅜" ext.	71355698
Set adapter G½"/R⅜" ext.	71355699
Set adapter G½"/NPT⅜" ext.	71355700
Set adapter G½"/G½" int.	71355701
Set adapter G½"/R½" ext.	71355702
Set adapter G½"/NPT½" ext.	71355703
Set adapter G½"/½" TriClamp	71355704
Set seal DN 15 Cent. 3820	71354741

Accessories Picomag DN 20	Order no.
Set adapter G¾"/R¾" ext.	71355705
Set adapter G¾"/NPT¾" ext.	71355706
Set adapter G¾"/G¾" int.	71355707
Set adapter G¾"/¾" TriClamp	71355708
Set seal DN 20 Cent. 3820	71354742

Accessories Picomag DN 25	Order no.
Set adapter G1"/R1" ext.	71355709
Set adapter G1"/NPT1" ext.	71355710
Set adapter G1"/G1" int.	71355711
Set adapter G1"/1" TriClamp	71355712
Set seal DN 25 Cent. 3820	71354745

Accessories Picomag DN 50	Order no.
Set adapter G2"/R1½" ext.	71355713
Set adapter G2"/R2" ext.	71355714
Set adapter G2"/NPT1½" ext.	71355715
Set adapter G2"/NPT2" ext.	71355716
Set adapter G2"/G1½" ext.	71355717
Set adapter G2"/G2" int.	71355718
Set adapter G2"/2" TriClamp	71355719
Set adapter G2"/2" Victaulic	71355720
Set seal DN 50 Cent. 3820	71354746

Complete product information:
www.endress.com/dma

More products to complete your measuring point ...

Point level switch
Liquiphant FTL31
page 8

Pressure sensor
Cerabar PMP11
page 66

Kompakt termometre
iTHERM CompactLine TM311
page 104

Flow switch for the monitoring of mass flow

Flowphant T DTT31

Complete product information:
www.endress.com/dtt31

- On-site display
- High reproducibility and long-term stability
- Large turndown

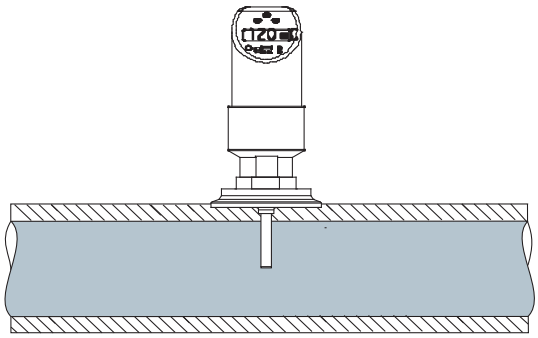
Specs at a glance:

- **Medium:**
  Liquids
- **Measuring range:**
  0.03 to 3 m/s
  (0.1 to 9.84 ft/s)
- **Medium temperature:**
  –20 to +85 °C (–4 to +185 °F)
- **Process pressure:**
  0 to +100 bar (at 20 °C)
  (0 to 1450 psi)

Application The Flowphant T DTT31 is a flow switch for monitoring, displaying and measuring relative mass flow rates of liquid media in the range from 0.03 to 3 m/s (0.1 to 9.84 ft/s). Application examples include: Monitoring cooling water circulation systems of pumps, turbines, compressors and heat exchangers and monitoring lubrication systems.

Function The device measures the mass flow of a liquid medium with the calorimetric measurement method. The calorimetric measuring principle is based on cooling a heated temperature sensor. Heat is removed from the sensor by forced convection due to medium flowing by. The extent of this heat transfer depends on the medium velocity and the difference in temperature between the sensor and medium (King's law). The higher the velocity or the mass flow of the medium, the greater the temperature sensor cooling.

Application example



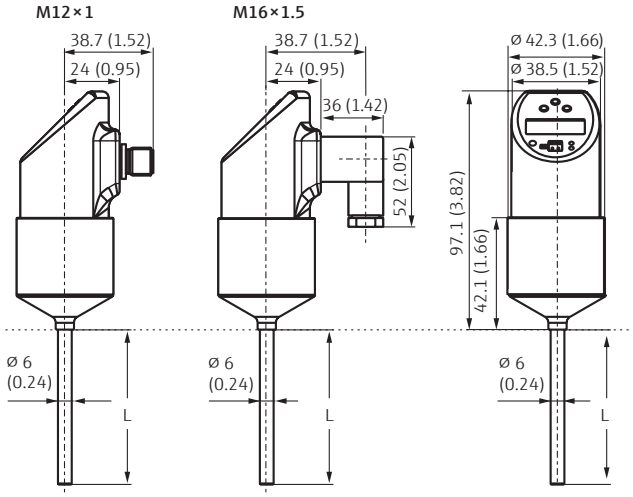
The Flowphant monitors the flow in a cooling circuit and signals when flow drops below a minimum flow rate.

Technical data

Input	
Measurement range	0 to 100 %; resolution 1 % 0.03 to 3 m/s (0.1 to 9.84 ft/s) for liquids
Output	
Output signal	1 × PNP, 2 × PNP or 1 × PNP with analog output for flow and temperature
Voltage drop PNP	≤2 V
Overload protection	Automatic testing
Performance characteristics	
Reference conditions	According to DIN IEC 60770/61003
Measured error	Switch point and display 0.2 %
Long-term drift	≤0.5 % per year under reference operating conditions
Sensor reaction time	6 to 12 s
Response time	Switch output 100 ms
Operating conditions	
Medium temperature	–20 to +85 °C (–4 to +185 °F)
Ambient temperature	–40 to +85 °C (–40 to +185 °F)
Degree of protection	With M16 × 1.5 valve plug: IP 65 with M12 × 1: IP 66
Power supply	
Supply voltage U_b	18 to 30 V DC, reverse polarity protection
Current consumption	Without load <100 mA at 24 V DC
General	
EMC	Interference emission as per IEC 61326 Series, class B electrical equipment; interference immunity as per IEC 61326 Series, appendix A (indust. use) and NAMUR Recomm. NE 21
Operating elements	3 buttons or PC and software
Materials	Process connection, protecting tube and housing 316L
Approvals	
Desina compliant	

Dimensions in mm (inches)

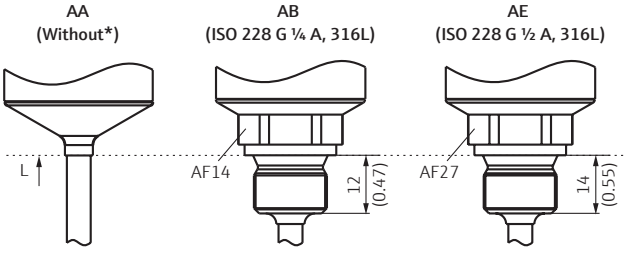
Housing



L = sensor length 30 mm, 100 mm (1.16", 3.94")

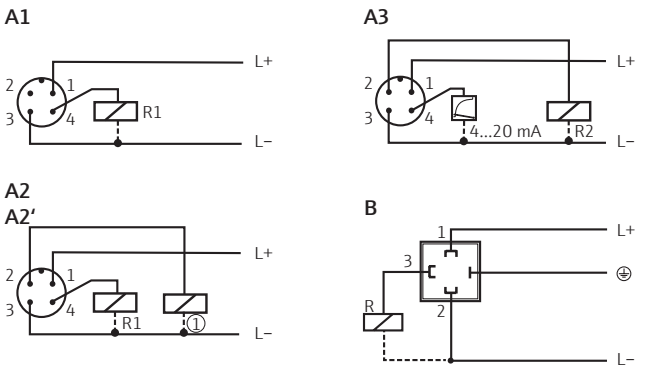
Installation according to instruction manual.

Process connections



* For mounting with welding boss or compression fitting: L ≥100 mm (3.94")

Electrical connection



DC voltage version with M12×1 connector

A1: 1 × PNP switch output
A2: 2 × PNP switch outputs R1 and (1) (R2)
A2' 2 × PNP switch outputs R1 and (1)
(diagnosis/break contact with adjustment „DESINA")
A3: PNP switch output, additional analog output

DC voltage version with valve plug M16×1.5

B: 1 × PNP switch output

Order codes

Insertion length

Code	Length
2A	30 mm (1.18")
2C	100 mm (3.94")

Flowphant T DTT31			Order no.
Process connection	Connector	Output	*
Compression fitting	M12×1**	1 × PNP	DTT31-A1A111AA2CAA
		2 × PNP	DTT31-A1B111AA2CAA
		1 × PNP + analog	DTT31-A1C111AA2CAA
	Valve plug	1 × PNP	DTT31-A2A111AA2CAA
Thread ISO 228 G ¼ A	M12×1**	1 × PNP	DTT31-A1A111AB☐AA
		2 × PNP	DTT31-A1B111AB☐AA
		1 × PNP + analog	DTT31-A1C111AB☐AA
	Valve plug	1 × PNP	DTT31-A2A111AB☐AA
Thread ISO 228 G½ A	M12×1**	1 × PNP	DTT31-A1A111AE☐AA
		2 × PNP	DTT31-A1B111AE☐AA
		1 × PNP + analog	DTT31-A1C111AE☐AA
	Valve plug	1 × PNP	DTT31-A2A111AE☐AA

* Please add code for insertion length.
** Please order cable and plug separately.

Accessories	Order no.
Welding boss with clamping ring	51004751
Compression Fitting TA50 6 mm; G½"; PTFE	TA50-HP
5 m cable with M12×1 counter connector	51005148
Straight plug, without cable (self wired)	52006263
Configuration kit, USB connection	TXU10-AA
Angled plug, without cable (self wired)	51006327
Power supply 24 V DC, for DIN rail	RNB130-A1A

Complete product information:
www.endress.com/dtt31

More products to complete your measuring point ...


Pressure switch
Ceraphant PTC31B
page 82


Electromagnetic flowmeter
Picomag
page 93


Temperature switch
Thermophant T TTR31
page 131

Flow switch for monitoring of mass flow in hygienic design

Flowphant T DTT35

Complete product information:
www.endress.com/dtt35

- On-site display
- High reproducibility and long-term stability
- Large turndown

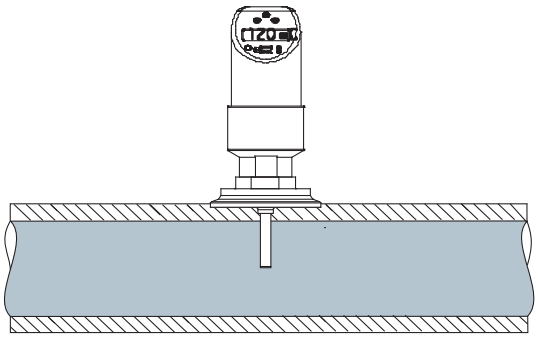
Specs at a glance:

- **Medium:**
  Liquids
- **Measuring range:**
  0.03 to 3 m/s
  (0.1 to 9.84 ft/s)
- **Medium temperature:**
  −20 to +85 °C (−4 to +185 °F)
- **Process pressure:**
  0 to +100 bar (at 20 °C)
  (0 to 1450 psi)

Application The Flowphant T DTT35 is a flow switch (surface quality R_a ≤0.8 µm) for monitoring, displaying and measuring relative mass flow rates of liquid media in the range from 0.03 to 3 m/s (0.1 to 9.84 ft/s). Application examples include: Monitoring cooling water circulation systems of pumps, turbines, compressors and heat exchangers and filter monitoring in the beverage industry.

Function The device measures the mass flow of a liquid medium with the calorimetric measurement method. The calorimetric measuring principle is based on cooling a heated temperature sensor. Heat is removed from the sensor by forced convection due to medium flowing by. The extent of this heat transfer depends on the medium velocity and the difference in temperature between the sensor and medium (King's law). The higher the velocity or the mass flow of the medium, the greater the temperature sensor cooling.

Application example



The Flowphant monitors the flow in a cooling circuit and signals when flow drops below a minimum flow rate.

Technical data

Input	
Measurement range	0 to 100 %; resol. 1 %; 0.03 to 3 m/s (0.1 to 9.84 ft/s) for liquids

Output	
Output signal	1 × PNP, 2 × PNP or 1 × PNP with analog output for flow and temperature
Voltage drop PNP	≤2 V
Overload protection	Automatic testing

Performance characteristics	
Reference conditions	According to DIN IEC 60770/61003
Measured error	Switch point and display 0.2 %
Long-term drift	≤0.5 % per year under reference operating conditions
Sensor reaction time	6 to 12 s
Response time	switch output 100 ms

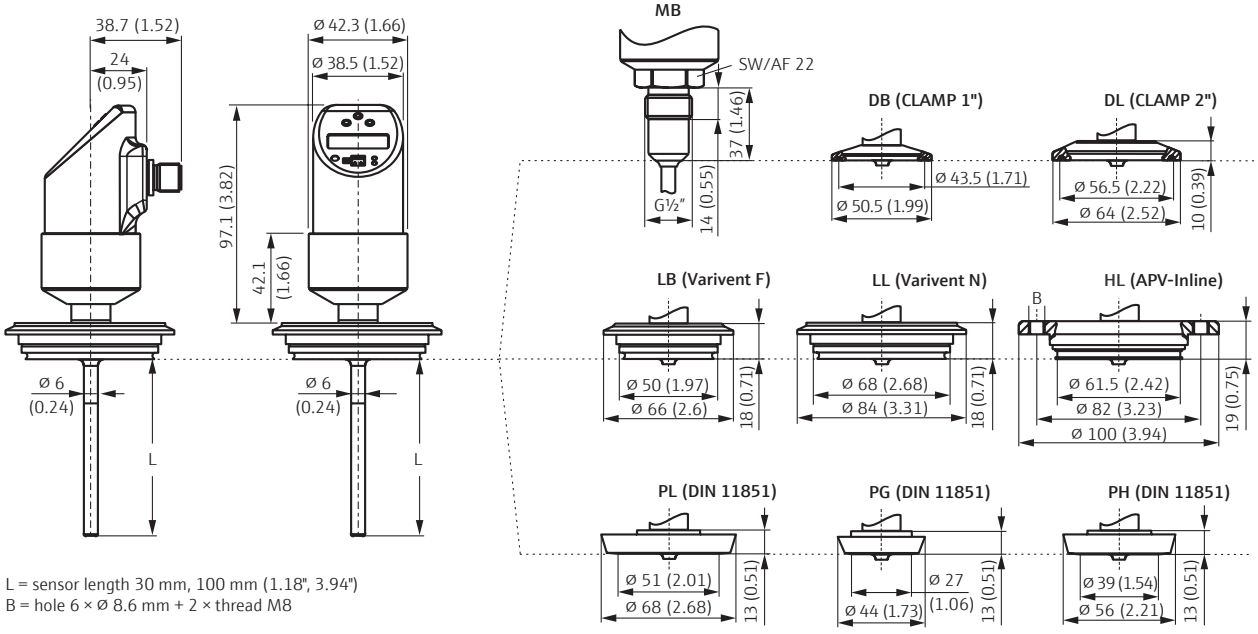
Operating conditions	
Medium temperature	−20 to +85 °C (−4 to +185 °F), 130 °C (266 °F) max. 1h (no measuring at temperatures >85 °C (185 °F))
Ambient temperature	−40 to +85 °C (−40 to +185 °F)
Degree of protection	IP 65 (complete housing)

Power supply	
Supply voltage U_b	18 to 30 V DC, reverse polarity protection
Current consumption	Without load <100 mA at 24 V DC

General	
EMC	Interference emiss. as per IEC 61326 Series, class B electrical equipment, interference immunity as per IEC 61326 Series, app. A (industrial use) and NAMUR Recomm. NE 21
Operating elements	3 buttons or PC and ReadWin® 2000
Materials	316L (process connection, protection tube, housing)
Surface quality	R_a ≤0.8 µm

Approvals
Desina compliant, 3-A

Dimensions in mm (inches)

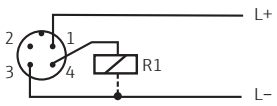


L = sensor length 30 mm, 100 mm (1.18", 3.94")
B = hole 6 × Ø 8.6 mm + 2 × thread M8

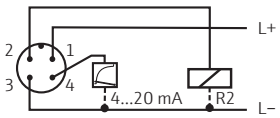
Installation according to instruction manual.

Electrical connection

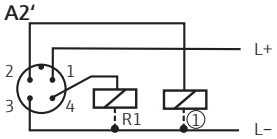
A1



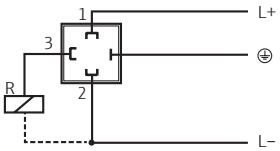
A3



A2
A2'



B



DC voltage version with M12×1 connector
A1: 1 × PNP switch output
A2: 2 × PNP switch outputs R1 and (1) (R2)
A2': 2 × PNP switch outputs R1 and (1)
(diagnosis/break contact with adjustment „DESINA")
A3: PNP switch output, additional analog output

DC voltage version with valve plug M16×1.5
B : 1 × PNP switch output

Order codes

Process connections

Code	TRI-CLAMP®/Metal to metal Connections
DB	Clamp ISO 2852 DN 25-38, 1 to 1½", 316L, 3-A DIN 32676 DN 25-40
DL	Clamp ISO 2852 DN 40-51, 2", 316L, 3-A, DIN 32676 DN 50
MB	Conical metal-metal G½", 316L

Code	Hygienic connections
HL	APV-Inline DN50, PN40, 316L, 3-A
LB	Varivent® F pipe DN25-32, PN40, 316L, 3-A
LL	Varivent® N pipe DN40-162, PN40, 316L, 3-A
PG	DIN 11851, DN25, PN40, 316L, 3-A
PH	DIN 11851, DN40, PN40, 316L, 3-A
PL	DIN 11851, DN50, PN40, 316L, 3-A

More process connections on request

Flowphant T DTT35			Order no.
Process connection	Connector	Output	*
TRI-CLAMP® 30 mm (DB, DL)	M12×1**	1 × PNP	DTT35-A1A111 ☐ 2AAA
		2 × PNP	DTT35-A1B111 ☐ 2AAA
		1 × PNP+ analog	DTT35-A1C111 ☐ 2AAA
	Valve plug	1 × PNP	DTT35-A2A111 ☐ 2AAA
Hygienic connections 30 mm (HL, LB, LL, MB, PG, PH, PL)	M12×1**	1 × PNP	DTT35-A1A111 ☐ 2AAA
		2 × PNP	DTT35-A1B111 ☐ 2AAA
		1 × PNP+ analog	DTT35-A1C111 ☐ 2AAA
	Valve plug	1 × PNP	DTT35-A2A111 ☐ 2AAA
TRI-CLAMP® 100 mm (DB, DL)	M12×1**	1 × PNP	DTT35-A1A111 ☐ 2CAA
		2 × PNP	DTT35-A1B111 ☐ 2CAA
		1 × PNP+ analog	DTT35-A1C111 ☐ 2CAA
	Valve plug	1 × PNP	DTT35-A2A111 ☐ 2CAA
Hygienic connections 100 mm (HL, LB, LL, MB, PG, PH, PL)	M12×1**	1 × PNP	DTT35-A1A111 ☐ 2CAA
		2 × PNP	DTT35-A1B111 ☐ 2CAA
		1 × PNP+ analog	DTT35-A1C111 ☐ 2CAA
	Valve plug	1 × PNP	DTT35-A2A111 ☐ 2CAA

* Please add code for process connection.
** Please order cable and plug separately.

Accessories	Order no.
5 m cable with M12×1 counter connector	51005148
Straight plug, without cable (self wired)	52006263
Configuration kit, USB connection	TXU10-AA

Complete product information:
www.endress.com/dtt35

More products to complete your measuring point ...


Pressure sensor
Cerabar PMP23
page 78


Pressure switch
Ceraphant PTP33B
page 88


Temperature switch
Thermophant T TTR35
page 134

Compact Pt100 thermometer with 4 to 20 mA or IO-Link

iTHERM CompactLine TM311

IO-Link

Complete product information:
www.endress.com/tm311

- Small, compact design entirely made of stainless steel
- Extremely short response time
- Highest accuracy even with short immersion lengths

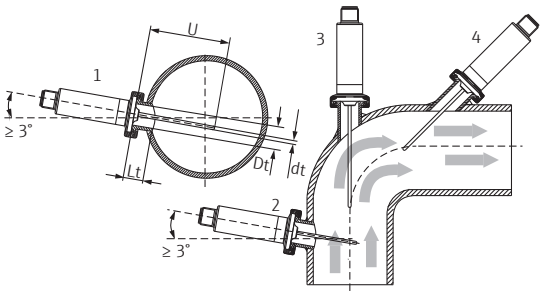
Specs at a glance:

- **Measuring range:**
  −50 to +200 °C (−58 to +392 °F)
- **Pressure range:**
  up to 50 bar (725 psi)
- **Response time:**
  Pt100: 5 s (T_{63}), 11 s (T_{90});
  iTHERM TipSens: 1.0 s (T_{63}),
  2.0 s (T_{90})

Application iTHERM CompactLine TM311 is developed for universal use in hygienic and aseptic applications in the food & beverages and pharmaceutical industries, and for optimum standardization for machine and skid builders.

Function The compact thermometer measures the process temperature with a Pt100 sensor element (class A, 4-wire). An optional built-in transmitter converts the Pt100 input signal. The device with integrated electronics automatically detects the type of communication (IO-Link or 4 to 20 mA).

Application example



The immersion length of the compact thermometer can considerably influence the accuracy. If the immersion length is too short, measurement errors can occur as a result of heat conduction via the process connection and the vessel wall. If installing in a pipe, the immersion length should ideally correspond to half of the pipe diameter.

Installation possibilities: pipes, tanks or other plant components.

Technical data

Input	
Measuring range	– Pt100 (TF) basic: −50 to +150 °C (−58 to +302 °F) – TipSens: −50 to +200 °C (−58 to +392 °F)

Output	
Output signal	– Sensor: Pt100, 4-wire connection, class A – Analog: 4 to 20 mA; variable measuring range – Digital: C/Q (IO-Link or switch output)
Switching capacity	– 1 × PNP switch output – Switch state ON Ia ≤ 200 mA; switch state OFF Ia ≤ 10 µA – Voltage drop PNP ≤ 2 V
Switch output	Response time ≤ 100 ms
Damping	Configurable sensor input damping 0 to 120 s
Switch-on delay	2 s

Power supply	
Supply voltage	IO-Link/4 to 20 mA: U_b = 10 to 30 V_{DC}, protected against reverse polarity

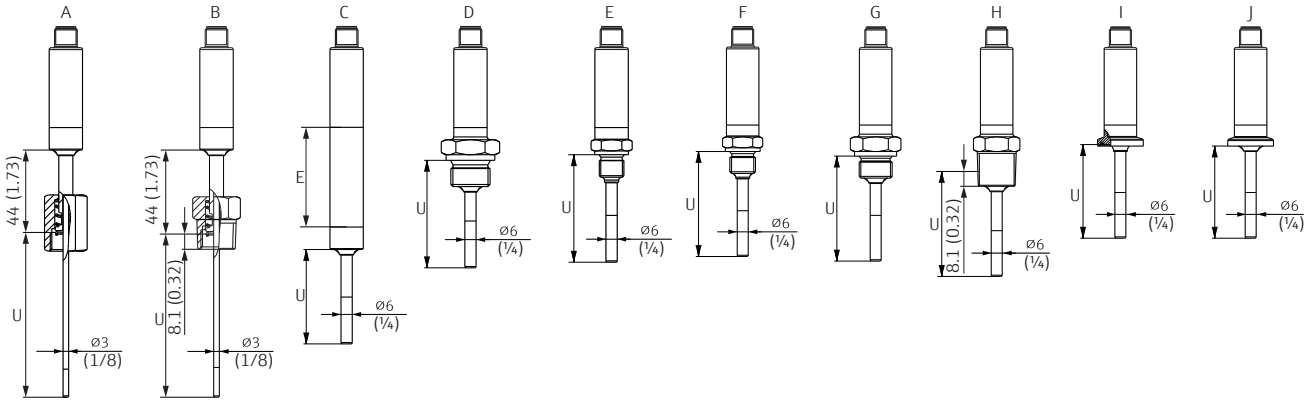
Performance characteristics	
Reference operating conditions	– Adjustment temperature (ice bath): 0 °C (32 °F) for sensor – Ambient temperature range: 25 °C ± 3 °C(77 °F ± 5 °F) for electronics – Supply voltage: 24 V_{DC} ± 10 % – Relative humidity: < 95 %
Maximum measured error	– Thermometer without electronics: 0.55 °C (0.99 °F) – Thermometer with electronics: ≤0.48 °C (0.86 °F) – Thermometer with electronics and sensor-transmitter-matching/increased accuracy: ≤0.14 °C (0.25 °F)
Response time T_{63} and T_{90}	– 6 mm direct contact, straight tip Pt100 (TF) basic: T_{63} 5 s; T_{90} 11 s – 6 mm direct contact, straight tip iTHERM TipSens: T_{63} 1 s; T_{90} 2 s – 6 mm thermowell, straight tip (4.3 × 20 mm) iTHERM TipSens: T_{63} 1 s; T_{90} 3 s
Electronics response time	Max. 1 s
Sensor current	≤ 1 mA

Environment	
Ambient temperature range	−40 to +85 °C (−40 to +185 °F)
Storage temperature	−40 to +85 °C (−40 to +185 °F)
Climate class	As per IEC/EN 60654-1, Class Dx
Degree of protection	As per IEC/EN 60529 IP69
Shock and vibration resistance	The thermometer meets the requirements of IEC 60751, which specifies shock and vibration resistance of 3 g in the 10 to 500 Hz range
Electrical safety	– Protection class III – Overvoltage category II – Pollution level 2

Dimensions in mm (in)

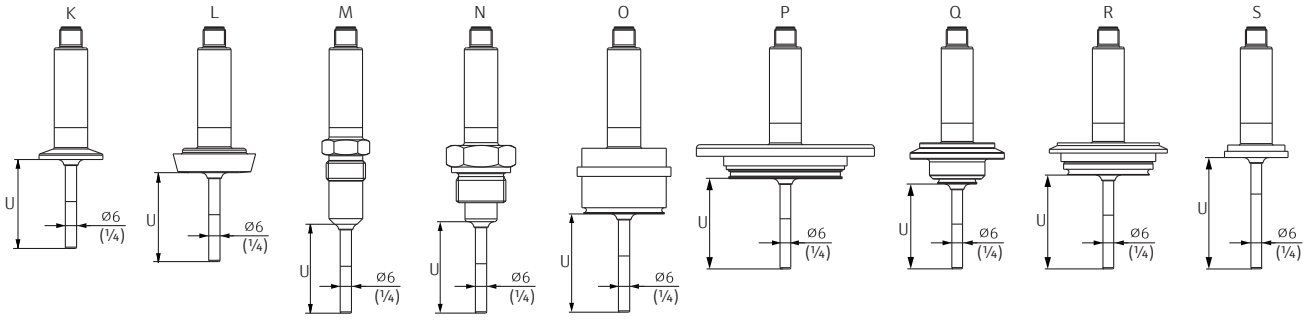
Without thermowell

U – Variable immersion length, depending on the configuration



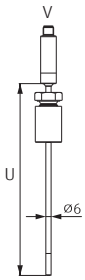
A – Thermometer with spring-loaded cap-nut, G3/8" thread 3 mm for existing thermowell
B – Thermometer with spring-loaded NPT½" male thread 3 mm for existing thermowell
C – Thermometer without process connection for compression fitting, with extension neck
D – Thermometer with G½" male thread
E – Thermometer with G¼" male thread
F – Thermometer with M14 male thread
G – Thermometer with M18 male thread
H – Thermometer with NPT½" male thread
I – Thermometer with Microclamp, DN18 (0.75")
J – Thermometer with Tri-Clamp, DN18 (0.75")

Pay attention to the following equations when calculating the immersion length U for an existing thermowell:
Version 1 (G3/8" cap-nut): $U = U_{(thermowell)} + T_{(thermowell)} + 3\ mm - B_{(thermowell)}$
Version 2 (NPT½" male thread): $U = U_{(thermowell)} + T_{(thermowell)} + 11\ mm - B_{(thermowell)}$



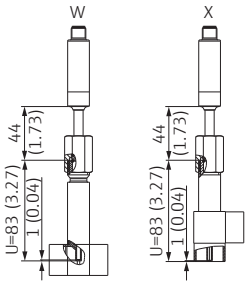
K – Thermometer with ISO2852 clamp for DN12 to 21.3, DN25 to 38, DN40 to 51
L – Thermometer with milk pipe connection DIN11851 for DN25/DN32/DN40/DN50
M – Thermometer with metal sealing system G½"
N – Thermometer with G¾" male thread ISO228 for FTL31/33/20/50 Liquiphant adapter
O – Thermometer with D45 process adapter
P – Thermometer with APV in-line, DN50
Q – Thermometer with Varivent type B, D 31 mm
R – Thermometer with Varivent type F, D 50 mm and Varivent Typ N, D 68 mm
S – Thermometer with SMS 1147, DN25/DN38/DN51

With compression fitting



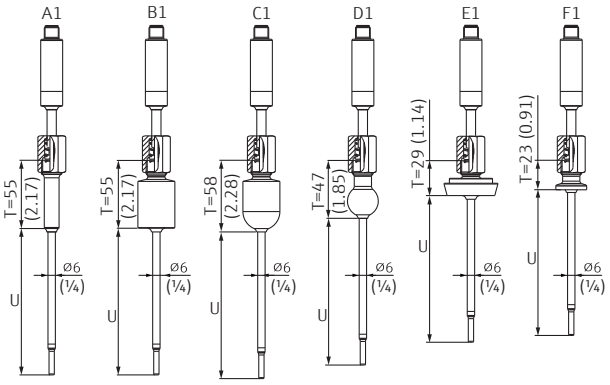
V – Thermometer with TK40 compression fitting, cylindrical, Elastosil ferrule, Ø 25 mm, for weld-in

Thermowell version as T-piece or elbow piece



W – Thermometer with thermowell as T-piece
X – Thermometer with thermowell as elbow piece

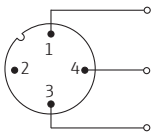
With thermowell diameter 6 mm (¼ in)



A1 – Thermometer with weld-in adapter, cylindrical, D 12 × 40 mm
B1 – Thermometer with weld-in adapter, cylindrical, D 30 × 40 mm
C1 – Thermometer with weld-in adapter, spherical-cylindrical, D 30 × 40 mm
D1 – Thermometer with weld-in adapter, spherical, D 25 mm
E1 – Thermometer with milk pipe connection DIN11851, DN25/DN32/DN40
F1 – Thermometer with Microclamp, DN18 (0.75")

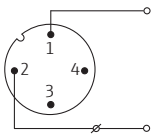
Electrical connection

IO-Link operating mode



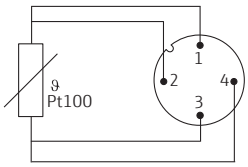
1 – Pin 1 - power supply 15 to 30 V_{DC}
2 – Pin 2 - not used
3 – Pin 3 - power supply 0 V_{DC}
4 – Pin 4 - C/Q (IO-Link or switch output)

4 to 20 mA operating mode



1 – Pin 1 - power supply 10 to 30 V_{DC}
2 – Pin 2 - power supply 0 V_{DC}
3 – Pin 3 - not used
4 – Pin 4 - not used

Without electronics



Pt100, 4-wire connection

Order codes

Process connections

Code 1)

G1	G½ male thread ISO228, 316L
G2	G¼ male thread ISO228, 316L

1)

Code 2)

C1	Microclamp, DN18 (0.75")
C2	Tri-clamp, DN18 (0.75")
D1	Clamp ISO2852, DN12 - 21.3
D2	Clamp ISO2852, DN25 - 38 (1-1.5")
D3	Clamp ISO2852, DN40 - 51 (2")

2)

Code 3)

B2	Weld-in adapter cylindrical, D 30×40 mm
B3	Weld-in adapter cylindrical, D 12×40 mm
B4	Weld-in adapter spherical-cylindrical, D 30×40 mm
B5	Weld-in adapter spherical, D 25 mm

3)

Code 4)

E1	Dairy fitting DN25
E2	Dairy fitting DN32
E3	Dairy fitting DN40
E4	Dairy fitting DN50

4)

Code 5)

KA	D45 process adapter
K1	APV Inline, DN50

5)

Code 6)

L1	Varivent type B, D 31 mm
L2	Varivent type F, D 50 mm
L3	Varivent type N, D 68 mm

6)

Code 7)

UA	Tee thermowell DN20 PN25
UB	Tee thermowell DN32 PN25
U0	Tee thermowell DN10 PN25
U1	Tee thermowell DN15 PN25
U2	Tee thermowell DN25 PN25

7)

Code 8)

VA	Elbow thermowell DN20 PN25
VB	Elbow thermowell DN32 PN25
V0	Elbow thermowell DN10 PN25
V1	Elbow thermowell DN15 PN25
V2	Elbow thermowell DN25 PN25

8)

1), 2), 3), 4), 5), 6), 7), 8)

iTHERM CompactLine TM311 (Thread Version Pt100, 4-wire class A)		**Order no.** *
Design; Diameter insert	Process connection	
Without thermowell, direct contact; 6 mm	G½ male thread ISO228,/ G¼ male thread ISO228	TM311-AAA0B[ ][1] BBX1A2
With thermowell; 3 mm	Compression fitting G½ male thread, TK40-BADA3C	TM311-AAA2BG7BBX1B2
Installation in existing thermowell; 3 mm	Not needed	TM311-AAA1AA0ABX1B2

iTHERM CompactLine TM311 (Thread Version, 4 to 20 mA/ IO-Link, variable measuring range)		**Order no.**
Design; Diameter insert	Process connection	
Without thermowell, direct contact; 6 mm	G½ male thread ISO228,/G¼ male thread ISO228	TM311-AAB0B[ ][1] BBX1A2
With thermowell; 3 mm	Compression fitting G½ male thread, TK40-hygienic versions, Pt100 BADA3C	TM311-AAB2BG7BBX1B2
Installation in existing thermowell; 3 mm	Not needed	TM311-AAB1AA0ABX1B2

iTHERM CompactLine TM311 (Hygienic versions, Pt100)		**Order no.**
Design; Diameter insert	Process connection	
Without thermowell, direct contact; 6 mm	Clamp	TM311-AAA0B[ ][2] BBX1A2
	Weld-in adapter	TM311-AAA0B[ ][3] BBX1A2
	Dairy fitting DIN11851	TM311-AAA0B[ ][4] BBX1A2
	D45 process adapter/APV Inline, DN50	TM311-AAA0B[ ][5] BBX1A2
	Varivent®	TM311-AAA0B[ ][6] BBX1A2
		TM311-AAA0BH2BBX1A2
With thermowell; 3 mm	Clamp	TM311-AAA2B[ ][2] BBX1A2
	Weld-in adapter	TM311-AAA2B[ ][3] BBX1A2
	Dairy fitting DIN11851	TM311-AAA2B[ ][4] BBX1A2
		TM311-AAA2BA1BBX1A2+CA
	Tee thermowell, DIN11865-A	TM311-AAA2B[ ][7] BBX1A2+CA
	Elbow thermowell, DIN11865-A	TM311-AAA2B[ ][8] BBX1A2+CA

iTHERM CompactLine TM311 (Hygienic versions, 4 to 20 mA)		**Order no.**
Design; Diameter insert	Process connection	
Without thermowell, direct contact; 6 mm	Clamp	TM311-AAB0B[ ][2] BBX1A2
	Weld-in adapter	TM311-AAB0B[ ][3] BBX1A2
	Dairy fitting DIN11851	TM311-AAB0B[ ][4] BBX1A2
	D45 process adapter/APV Inline, DN50	TM311-AAB0B[ ][5] BBX1A2
	Varivent®	TM311-AAB0B[ ][6] BBX1A2
		TM311-AAB0BH2BBX1A2
With thermowell; 3 mm	Clamp	TM311-AAB2B[ ][2] BBX1A2
	Weld-in adapter	TM311-AAB2B[ ][3] BBX1A2
	Dairy fitting DIN11851	TM311-AAB2B[ ][4] BBX1A2
		TM311-AAB2BA1BBX1A2+CA
	Tee thermowell, DIN11865-A	TM311-AAB2B[ ][7] BBX1A2+CA
	Elbow thermowell, DIN11865-A	TM311-AAB2B[ ][8] BBX1A2+CA

* Please add code for process connection.

Complete product information:
www.endress.com/tm311

More products to complete your measuring point ...


Process transmitter
RMA42
page 157


Electromagnetic flowmeter
Picomag
page 93


Pressure switch
Ceraphant PTP33B
page 88

RTD or thermocouple temperature probe for direct installation in various industrial applications

iTHERM ModuLine TM101

Complete product information:
www.endress.com/tm101

- High accuracy in sensor and electronics
- Wide range of process connections
- Bluetooth® connectivity (with TMT71)

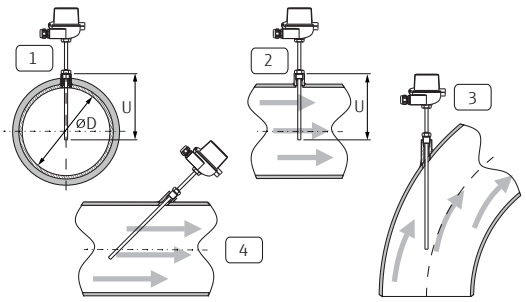
Specs at a glance:

- **Sensor type**
  - Pt100 thin-film
    −50 to +200 °C
    (−58 to +392 °F)
  - Thermocouple, type K
    −40 to +650 °C
    (−40 to +1202 °F)
- **Transmitter TMT71**
  4 to 20 mA, 0.1 K accuracy
- **Process connections**
  Thread, capnut, compression fittings

Application The iTHERM ModuLine TM101 temperature assembly is widely used in many basic or medium duty applications either in vessels or in pipes with low pressures and no extreme temperatures.

Function The mineral insulated sensor insert sits in a protecting tube. The integrated electronics (optional) convert the resistance value in a linear 4 to 20 mA temperature signal.

Installation examples



1 – 2 In pipes with a small cross-section, the sensor tip should reach or extend slightly past the center axis of the pipe (=U).
3 – 4 Slanted orientation.

The immersion length of the thermometer influences the accuracy. If the immersion length is too small, errors in the measurement are caused by heat conduction via the process connection and the container wall. Therefore, if installing in a pipe the immersion length should be at least half the pipe diameter. Installation at an angle (see 3 and 4) could be another solution. When determining the immersion length or installation depth all the parameters of the thermometer and of the process to be measured must be taken into account (e.g. flow velocity, process pressure). The counterparts for process connections and seals are not supplied with the thermometer and must be ordered separately if needed.

Technical data

Input	
Measuring range	Depends on the type of sensor used
Sensor type	– Pt100 thin-film −50 to +200 °C (−58 to +392 °F) – Thermocouple TC, type K −40 to +650 °C (−40 to +1202 °F)

Output	
Sensor	Pt100/Thermocouple type K
Transmitter	4 to 20 mA

Power supply	
Type of sensor connection RTD	– Terminal block mounted – Head mounted transmitter TMT7x (single input)
Type of sensor connection thermocouple (TC)	– Terminal block mounted – Head mounted transmitter TMT7x (single input)
As per IEC 60584	Type K: green (+), white (–)
As per ASTM E230	Type K: yellow (+), red (–)

Maximum measured error	
Standard	IEC 60584/ASTM E230/ANSI MC96.1
Type	K (NiCr-NiAl)
Standard tolerance	Class, 2
	Deviation; ±2.5 °C (−40 to 333 °C) ±0.0075 |t| (333 to 1200 °C)/ Deviation, the larger respective value applies ±2.2 K or ±0.02 |t| (−200 to 0 °C) ±2.2 K or ±0.0075 |t| (0 to 1260 °C)
Special tolerance	Class, 1
	Deviation; ±1.5 °C (−40 to 375 °C) ±0.004 |t| (375 to 1000 °C)/ Deviation, the larger respective value applies ±1.1 K or ±0.004 |t| (0 to 1260 °C)

Response time	
Tests in water at 0.4 m/s (1.3 ft/s), according to IEC 60751; 10 K temperature step change.	
RTD insert	t_{50}: 5 s, t_{90}: 11 s
Thermocouple (TC) insert	t_{50}: 4 s, t_{90}: 9 s

Insulation resistance	
RTD	Insulation resistance according to IEC 60751 > 100 MΩ at 25 °C between terminals and sheath material measured with a minimum test voltage of 100 V DC
TC	Insulation resistance according to IEC 1515 between terminals and sheath material with a test voltage of 500 V DC: – > 1 GΩ at 20 °C – > 5 MΩ at 500 °C

Environment	
Ambient Temperature range	Terminal head with mounted head transmitter: −40 to 85 °C (−40 to 185 °F)
	Terminal head with mounted head transmitter and display: −20 to 70 °C (−4 to 158 °F)
Storage temperature	For information, see the ambient temperature
Humidity	– Condensation permitted as per IEC 60 068-2-33 – Max. rel. humidity: 95% as per IEC 60068-2-30
Climate class	As per EN 60654-1, Class C
Degree of protection	Max. IP66 (NEMA Type 4x encl.), depending on the design (terminal head, connector, etc.)
Shock and vibration resistance	The Endress+Hauser inserts exceed the IEC 60751 requirements stating a shock and vibration resistance of 3 g within a range of 10 to 500 Hz.

Material	
Material	AISI 316L; 1.4404; 1.4435/Alloy600; 2.4816
Recommended max. temperature for continuous use in air	650 °C (1202 °F)/ 1100 °C (2012 °F)
Properties AISI 316L; 1.4404; 1.4435	– Austenitic, stainless steel – High corrosion resistance in general – Particularly high corrosion resistance in chlorine-based and acidic, non-oxidizing atmospheres through the addition of molybdenum (e.g. phosphoric and sulfuric acids, acetic and tartaric acids with a low concentration) – Increased resistance to intergranular corrosion and pitting – Compared to 1.4404, 1.4435 has even higher corrosion resistance and a lower delta ferrite content
Properties Alloy600; 2.4816	– A nickel/chromium alloy with very good resistance to aggressive, oxidizing and reducing atmospheres, even at high temperatures – Resistance to corrosion caused by chlorine gases and chlorinated media as well as any oxidizing mineral and organic acids, sea water etc. – Corrosion from ultrapure water – Not to be used in sulfur-containing atmospheres

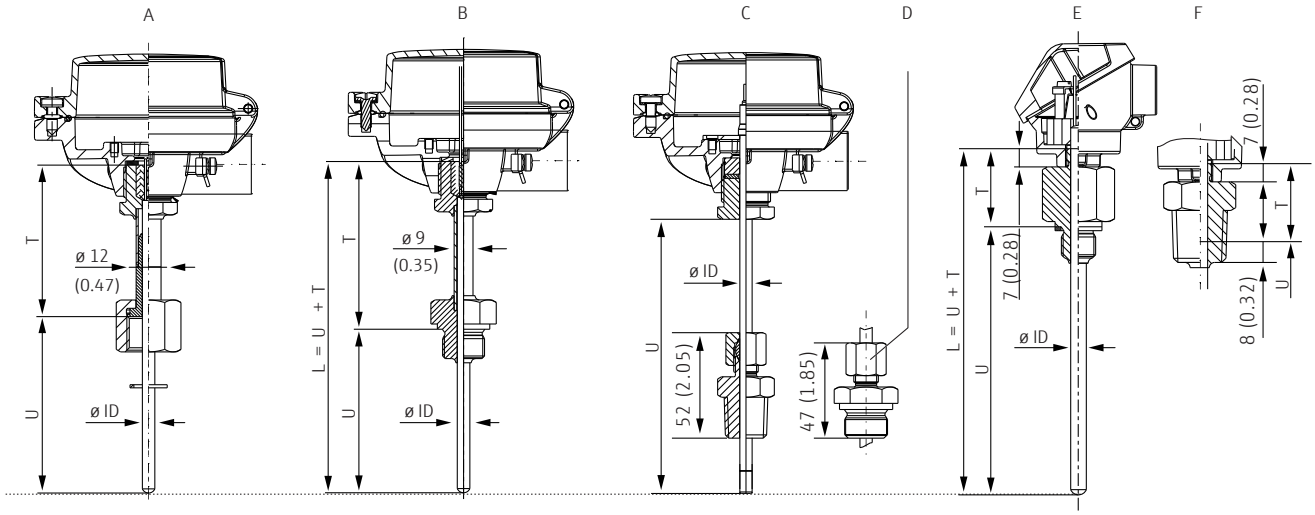
Inserts
The device has got a non-replaceable insert. The sheath is welded to the process connection to ensure thightness.

Sensor, Standard thin-film	
Sensor design; connection method	1 × or 2 × Pt100, 3- or 4-wire, basic version, stainless steel sheath
Vibration resistance of the insert tip	Up to 3g
Measuring range; accuracy class	−50 to +200 °C (−58 to +392 °F), Class A or B
Diameter	6 mm (¼ in)

TC thermocouples Type K	
Sensor design	Mineral insulated, Alloy600 sheated TC cable
Vibration resistance of the insert tip	Up to 3g
Measuring range	−270 to 1100 °C (−454 to 2012 °F)
Connection type	Ungrounded hot junction
Diameter	6 mm (¼ in)

Certificates and approvals	
Electromagnetic compatibility (EMC)	EMC to all relevant requirements of the IEC/EN 61326-series and NAMUR Recommendation EMC (NE21). For details, refer to the Declaration of Conformity. Maximum fluctuations during EMC-tests: < 1 % of measuring span. Interference immunity to IEC/EN 61326-series, requirements for industrial areas Interference emission to IEC/EN 61326-series, electrical equipment Class B

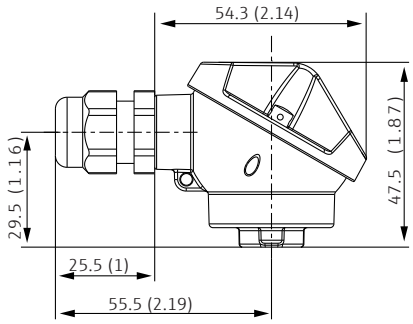
Dimensions in mm (in)



A – With lagging and cap nut, female thread, available in G½" and G¼" type
B – With lagging
C – With compression fitting ½" NPT thread, spring loaded version as option
D – Compression fitting G½"
E – Without lagging, terminal head (Mignon head) process connection, metric thread version
F – Without lagging, terminal head process connection, ½" NPT thread version

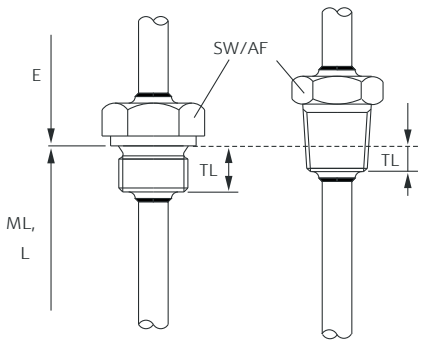
Installation according to instruction manual.

TA20L Mignon



Specification
- Protection class: IP66
- Temperature: −50 to +150 °C (−58 to +302 °F) without cable gland
- Material: aluminum, polyester powder coated seals: silicone
- Threaded cable entry: M16 × 1.5
- Protection armature connection: M10 × 1
- Head color: blue, RAL 5012
  Cap color: gray, RAL 7035
- Weight: 420 g (14.81 oz)
- No ground terminal

Threaded process connection



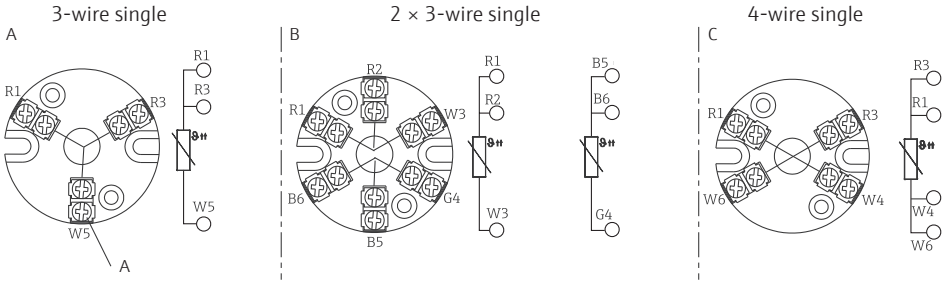
Version		Thread length TL	Width across flats AF
M	M20 × 1.5	14 mm (0.55 in)	27
	M18 × 1.5	12 mm (0.47 in)	24
G	G ½"	15 mm (0.6 in)	24
	G ¼"	12 mm (0.47 in)	24
NPT	NPT ½"	8 mm (0.32 in)	22

Cylindrical (left side) and conical (right side) version

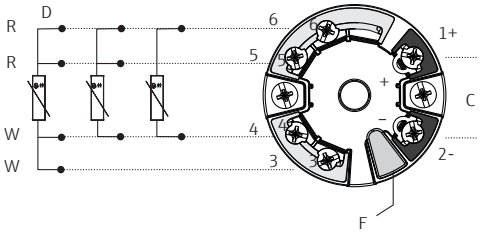
Electrical connection

Type of sensor connection RTD

Terminal block mounted

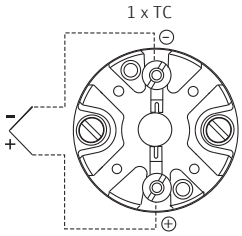


Head mounted transmitter TMT7x (single input)

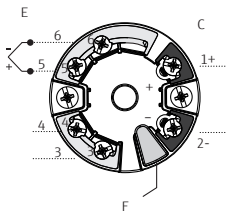


Type of sensor connection thermocouple (TC)

Terminal block mounted



Head mounted transmitter TMT7x (single input)



A – Outside screw
B – Black
C – Supply voltage/bus connection
D – Sensor input RTD, Ω: 4-, 3- and 2-wire
E – Sensor input TC, mV
F – Display connection/CDI interface
R – Red
W – White
G – Green

Order codes

Process connections

Code	Process connections
AB	M18 × 1.5 male thread; 316L
AC	M20 × 1.5 male thread; 316L
CA	G¼ male thread; 316L
FB	G½ cap nut; 316L
FC	G¾ cap nut; 316L

Insertion length

Code	Length
A1	50 mm
A4	100 mm
A6	150 mm
A8	200 mm
B2	250 mm

iTHERM ModuLine TM101			Order no.
Version	Process connection; Material	Immersion Length U	
Pt100, Terminal block	G½ male thread; 316L	50/100/150 mm	TM101-AACC ☐ GC1A1A1
		200/250 mm	TM101-AACC ☐ GC1A1A1
	M18 × 1.5, M20 × 1.5, G¼ male thread; 316L	50/100/150 mm	TM101-AA ☐ ☐ GC1A1A1
		200/250 mm	TM101-AA ☐ ☐ GC1A1A1
	G½, G¾ cap nut; 316L	50/100/150 mm	TM101-AA ☐ ☐ GC1A1A1
		200/250 mm	TM101-AA ☐ ☐ GC1A1A1
Pt100, 4 to 20 mA, 1-channel TMT71, head transmitter DIN B	G½ male thread; 316L	50/100/150 mm	TM101-AACC ☐ GC2C1A1
		200/250 mm	TM101-AACC ☐ GC2C1A1
	M18 × 1.5, M20 × 1.5, G¼ male thread; 316L	50/100/150 mm	TM101-AA ☐ ☐ GC2C1A1
		200/250 mm	TM101-AA ☐ ☐ GC2C1A1
	G½, G¾ cap nut; 316L	50/100/150 mm	TM101-AA ☐ ☐ GC2C1A1
		200/250 mm	TM101-AA ☐ ☐ GC2C1A1
Type K, Terminal block	G½ male thread; 316L	50/100/150 mm	TM101-AACC ☐ GH1A1A1
		200/250 mm	TM101-AACC ☐ GH1A1A1
	M18 × 1.5, M20 × 1.5, G¼ male thread; 316L	50/100/150 mm	TM101-AA ☐ ☐ GH1A1A1
		200/250 mm	TM101-AA ☐ ☐ GH1A1A1
	G½, G¾ cap nut; 316L	50/100/150 mm	TM101-AA ☐ ☐ GH1A1A1
		200/250 mm	TM101-AA ☐ ☐ GH1A1A1
Type K, 4 to 20 mA, 1-channel TMT71, head transmitter DIN B	G½ male thread; 316L	50/100/150 mm	TM101-AACC ☐ GH2C1A1
		200/250 mm	TM101-AACC ☐ GH2C1A1
	M18 × 1.5, M20 × 1.5, G¼ male thread; 316L	50/100/150 mm	TM101-AA ☐ ☐ GH2C1A1
		200/250 mm	TM101-AA ☐ ☐ GH2C1A1
	G½, G¾ cap nut; 316L	50/100/150 mm	TM101-AA ☐ ☐ GH2C1A1
		200/250 mm	TM101-AA ☐ ☐ GH2C1A1

Complete product information:
www.endress.com/tm101

More products to complete your measuring point ...


Process transmitter
RMA42
page 157


Electromagnetic flowmeter
Picomag
page 93


Pressure sensor
Cerabar PMP11
page 66

Thermometer with RTD or TC insert complete with manufactured thermowell produced from pipe material

iTHERM ModuLine TM121

Complete product information:
www.endress.com/tm121

- High accuracy in sensor and electronics
- Wide range of process connections
- Bluetooth® connectivity (with TMT71)

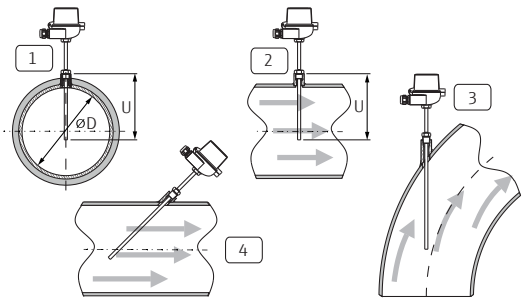
Specs at a glance:

- **Sensor type**
  - Pt100 thin-film
    −50 to +200 °C
    (−58 to +392 °F)
  - Thermocouple, type K
    −40 to +650 °C
    (−40 to +1202 °F)
- **Transmitter TMT71**
  4 to 20 mA, 0.1 K accuracy
- **Process connections**
  Thread, capnut, compression fittings, flange

Application The iTHERM ModuLine TM121 thermometer range covers a wide variety of market needs. Typical applications can be found in the chemical and pharmaceutical industry, pulp and paper, waste water and food industry. It is widely used in vessels and pipes where a reasonable response time is required.

Function iTHERM ModuLine TM121 assembly includes a replaceable insert in a mineral insulated sheath. The head transmitter is thermally decoupled via an extension neck. The integrated electronics (optional) convert the resistance value in a linear 4 to 20 mA temperature signal.

Installation examples



1 – 2 In pipes with a small cross-section, the sensor tip should reach or extend slightly past the center axis of the pipe (=U).
3 – 4 Slanted orientation.

The immersion length of the thermometer influences the accuracy. If the immersion length is too small, errors in the measurement are caused by heat conduction via the process connection and the container wall. Therefore, if installing in a pipe the immersion length should be at least half the pipe diameter. Installation at an angle (see 3 and 4) could be another solution. When determining the immersion length or installation depth all the parameters of the thermometer and of the process to be measured must be taken into account (e.g. flow velocity, process pressure). The counterparts for process connections and seals are not supplied with the thermometer and must be ordered separately if needed.

Technical data

Input	
Measuring range	Depends on the type of sensor used
Sensor type	– Pt100 thin-film −50 to +200 °C (−58 to +392 °F) – Thermocouple TC, type K −40 to +650 °C (−40 to +1202 °F)

Output	
Sensor	Pt100/Thermocouple type K
Transmitter	4 to 20 mA

Power supply	
Type of sensor connection RTD	– Terminal block mounted – Head mounted transmitter TMT7x (single input)
Type of sensor connection thermocouple (TC)	– Terminal block mounted – Head mounted transmitter TMT7x (single input)
As per IEC 60584	Type K: green (+), white (–)
As per ASTM E230	Type K: yellow (+), red (–)

Maximum measured error	
Standard	IEC 60584/ASTM E230/ANSI MC96.1
Type	K (NiCr-NiAl)
Standard tolerance	Class, 2
	Deviation; ±2.5 °C (−40 to 333 °C) ±0.0075 |t| (333 to 1200 °C)/Deviation, the larger respective value applies ±2.2 K or ±0.02 |t| (−200 to 0 °C) ±2.2 K or ±0.0075 |t| (0 to 1260 °C)
Special tolerance	Class, 1
	Deviation; ±1.5 °C (−40 to 375 °C) ±0.004 |t| (375 to 1000 °C)/ Deviation, the larger respective value applies ±1.1 K or ±0.004 |t| (0 to 1 260 °C)

Response time	
Tests in water at 0.4 m/s (1.3 ft/s), according to IEC 60751; 10 K temperature step change.	
Thermowell diameter 9 mm (0.35 in)	RTD insert: – t_{50}: 30 s, t_{90}: 90 s Thermocouple (TC) insert: – t_{50}: 20 s, t_{90}: 60 s
Thermowell diameter 11 mm (0.43 in)	RTD insert: – t_{50}: 40 s, t_{90}: 100 s Thermocouple (TC) insert: – t_{50}: 30 s, t_{90}: 90 s

Insulation resistance	
RTD	Insulation resistance according to IEC 60751 > 100 MΩ at 25 °C between terminals and sheath material measured with a minimum test voltage of 100 V DC
TC	Insulation resistance according to IEC 1515 between terminals and sheath material with a test voltage of 500 V DC: – > 1 GΩ at 20 °C; – > 5 MΩ at 500 °C

Environment	
Ambient Temperature range	Terminal head with mounted head transmitter: −40 to 85 °C (−40 to 185 °F)
	Terminal head with mounted head transmitter and display: −20 to 70 °C (−4 to 158 °F)
Storage temperature	For information, see the ambient temperature
Humidity	– Condensation permitted as per IEC 60 068-2-33 – Max. rel. humidity: 95 % as per IEC 60068-2-30
Climate class	As per EN 60654-1, Class C
Degree of protection	Max. IP66 (NEMA Type 4x encl.), depending on the design (terminal head, connector, etc.)
Shock and vibration resistance	The Endress+Hauser inserts exceed the IEC 60751 requirements stating a shock and vibration resistance of 3 g within a range of 10 to 500 Hz.

Material	
Material	AISI 316L; 1.4404; 1.4435/Alloy600; 2.4816
Recommended max. temperature for continuous use in air	650 °C (1202 °F)/ 1100 °C (2012 °F)
Properties AISI 316L; 1.4404; 1.4435	– Austenitic, stainless steel – High corrosion resistance in general – Particularly high corrosion resistance in chlorine-based and acidic, non-oxidizing atmospheres through the addition of molybdenum (e.g. phosphoric and sulfuric acids, acetic and tartaric acids with a low concentration) – Increased resistance to intergranular corrosion and pitting – Compared to 1.4404, 1.4435 has even higher corrosion resistance and a lower delta ferrite content
Properties Alloy600; 2.4816	– A nickel/chromium alloy with very good resistance to aggressive, oxidizing and reducing atmospheres, even at high temperatures – Resistance to corrosion caused by chlorine gases and chlorinated media as well as any oxidizing mineral and organic acids, sea water etc. – Corrosion from ultrapure water – Not to be used in sulfur-containing atmospheres

Inserts
The device has got a replaceable insert.

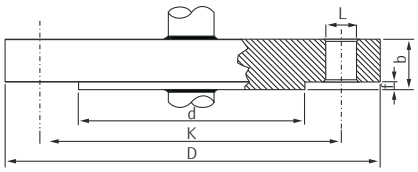
Sensor, Standard thin-film	
Sensor design; connection method	1× or 2× Pt100, 3- or 4-wire, basic version, stainless steel sheath
Vibration resistance of the insert tip	Up to 3g
Measuring range; accuracy class	−50 to +200 °C (−58 to +392 °F), Class A or B
Diameter	6 mm (¼ in)

TC thermocouples Type K	
Sensor design	Mineral insulated, Alloy600 sheated TC cable
Vibration resistance of the insert tip	Up to 3g
Measuring range	−270 to 1100 °C (−454 to 2012 °F)
Connection type	Ungrounded hot junction
Diameter	6 mm (¼ in)

Certificates and approvals	
Electromagnetic compatibility (EMC)	EMC to all relevant requirements of the IEC/EN 61326-series and NAMUR Recommendation EMC (NE21). For details, refer to the Declaration of Conformity. Maximum fluctuations during EMC-tests: < 1 % of measuring span. Interference immunity to IEC/EN 61326-series, requirements for industrial areas Interference emission to IEC/EN 61326-series, electrical equipment Class B

Dimensions in mm (in)

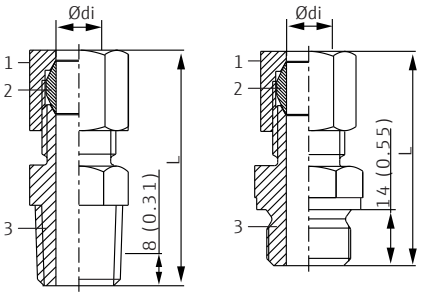
Flange with standard designation of the dimensions



For detailed information on the flange dimensions refer to the following flange standards:
- ANSI/ASME B16.5
- EN 1092-1

The flange material must be the same as of the stem of the thermowell. Models in Hastelloy® have flanges in basic material 316L/1.4404 and a disc in Hastelloy® or Inconel Alloy600 on the surface in contact with the process media. The standard surface finish of the coupling side of flanges ranges from 3.2 to 6.4 µm (Ra). Other types of flanges can be supplied on request.

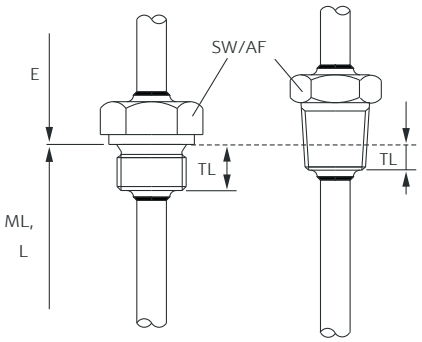
Type TK40



Version	Dimensions			Technical properties [1]
	Ødi	L	Width across flats AF	
NPT ½", ferrule material 316L G ½", ferrule material 316L G 1", ferrule material 316L	9 mm (0.35 in) 11 mm (0.43 in)	NPT ½": 52 mm (2.05 in) G ½": 47 mm (1.85 in) G 1": 66 mm (2.6 in)	NPT ½": 24 mm (0.95 in) G½": 27 mm (1.06 in) G1": 41 mm (1.61 in)	▪ $P_{max.}$: 40 bar (580 psi) at +200 °C (+392 °F) ▪ $P_{max.}$: 25 bar (363 psi) at +400 °C (+752 °F) Min. torque: 70Nm

[1] Pressure specifications apply for cyclic temperature load
1 – Nut; 2 – Sleeve; 3 – Process connection

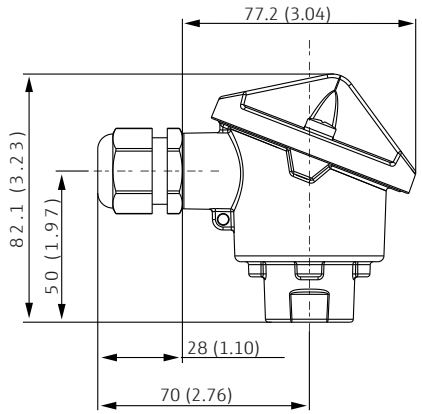
Threaded process connection



Version		Thread length TL	Width across flats AF
M	M20 × 1.5	14 mm (0.55 in)	27
	M18 × 1.5	12 mm (0.47 in)	24
G	G ½"	15 mm (0.6 in)	24
	G ¼"	12 mm (0.47 in)	24
NPT	NPT ½"	8 mm (0.32 in)	22

Cylindrical (left side) and conical (right side) version

TA20AB

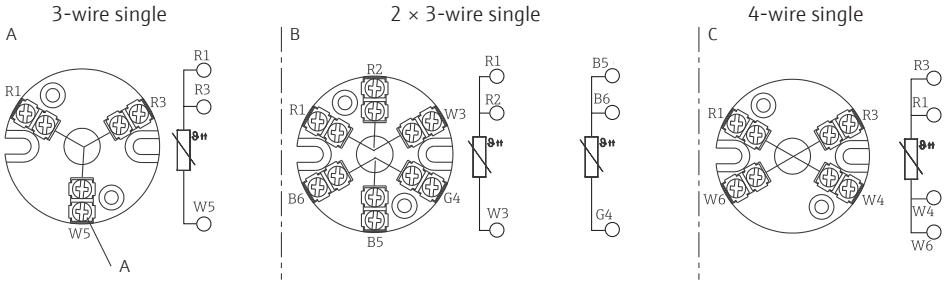


Specification
- Protection class: IP66/68, NEMA 4x
- Temperature: −40 to +100 °C (−40 to +212 °F), polyamide cable gland
- Material: aluminum; polyester powder coated Seals: silicone
- Threaded cable entry: NPT ½" and M20 × 1.5
- Color: blue, RAL 5012
- Weight: approx. 300 g (10.6 oz)

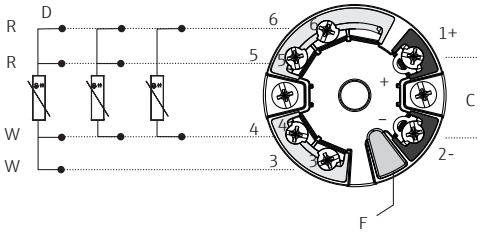
Electrical connection

Type of sensor connection RTD

Terminal block mounted

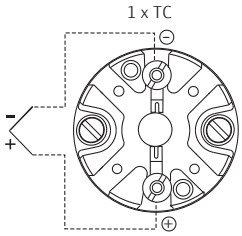


Head mounted transmitter TMT7x (single input)

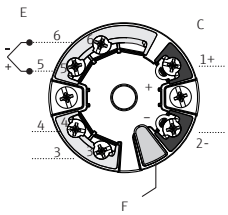


Type of sensor connection thermocouple (TC)

Terminal block mounted



Head mounted transmitter TMT7x (single input)



A – Outside screw
B – Black
C – Supply voltage/bus connection
D – Sensor input RTD, Ω: 4-, 3- and 2-wire
E – Sensor input TC, mV
F – Display connection/CDI interface
R – Red
W – White
G – Green

Order codes

Process connections

Code	Process connections
HA	NPT½ male thread compression fitting; 316L
HB	G½ male thread compression fitting; 316L
IA	Flange ANSI 1" 150 RF B16.5; 316L
JE	Flange DN25 PN40 B1 EN1092-1; 316L

Insertion length

Code	Length
A1	50 mm
A4	100 mm
A6	150 mm
A8	200 mm
B2	250 mm

iTHERM ModuLine TM121

Version	Process connection; Material	Immersion Length U	Order no.
Pt100, Terminal block	G½ male thread; 316L	50/100/150 mm	TM121-AACCB1 ☐ GC1A1A1
		200/250 mm	TM121-AACCB1 ☐ GC1A1A1
	NPT½/G½ male thread compression fitting; 316L	50/100/150 mm	TM121-AA ☐ B1 ☐ GC1A1A1
		200/250 mm	TM121-AA ☐ B1 ☐ GC1A1A1
	Flange ANSI 1" 150 RF B16.5; 316L/Flange DN25 PN40 B1 EN1092-1; 316L	50/100/150 mm	TM121-AA ☐ B1 ☐ GC1A1A1
		200/250 mm	TM121-AA ☐ B1 ☐ GC1A1A1
Pt100, 4 to 20 mA, 1-channel TMT71, head transmitter DIN B	G½ male thread; 316L	50/100/150 mm	TM121-AACCB1 ☐ GC2C1A1
		200/250 mm	TM121-AACCB1 ☐ GC2C1A1
	NPT½/G½ male thread compression fitting; 316L	50/100/150 mm	TM121-AA ☐ B1 ☐ GC2C1A1
		200/250 mm	TM121-AA ☐ B1 ☐ GC2C1A1
	Flange ANSI 1" 150 RF B16.5; 316L/Flange DN25 PN40 B1 EN1092-1; 316L	50/100/150 mm	TM121-AA ☐ B1 ☐ GC2C1A1
		200/250 mm	TM121-AA ☐ B1 ☐ GC2C1A1
TC type K, Terminal block	G½ male thread; 316L	50/100/150 mm	TM121-AACCB1 ☐ GH1A1A1
		200/250 mm	TM121-AACCB1 ☐ GH1A1A1
	NPT½/G½ male thread compression fitting; 316L	50/100/150 mm	TM121-AA ☐ B1 ☐ GH1A1A1
		200/250 mm	TM121-AA ☐ B1 ☐ GH1A1A1
	Flange ANSI 1" 150 RF B16.5; 316L/Flange DN25 PN40 B1 EN1092-1; 316L	50/100/150 mm	TM121-AA ☐ B1 ☐ GH1A1A1
		200/250 mm	TM121-AA ☐ B1 ☐ GH1A1A1
TC type K, 4 to 20 mA, 1-channel TMT71, head transmitter DIN B	G½ male thread; 316L	50/100/150 mm	TM121-AACCB1 ☐ GH2C1A1
		200/250 mm	TM121-AACCB1 ☐ GH2C1A1
	NPT½/G½ male thread compression fitting; 316L	50/100/150 mm	TM121-AA ☐ B1 ☐ GH2C1A1
		200/250 mm	TM121-AA ☐ B1 ☐ GH2C1A1
	Flange ANSI 1" 150 RF B16.5; 316L/Flange DN25 PN40 B1 EN1092-1; 316L	50/100/150 mm	TM121-AA ☐ B1 ☐ GH2C1A1
		200/250 mm	TM121-AA ☐ B1 ☐ GH2C1A1

Complete product information:
www.endress.com/tm121

Hygienic, aseptic RTD thermometer, Pt100 or 4 to 20 mA

iTHERM TM401

Complete product information:
www.endress.com/tm401

- Fast-response sensor technology
- Good long-term stability
- PC programmable transmitter

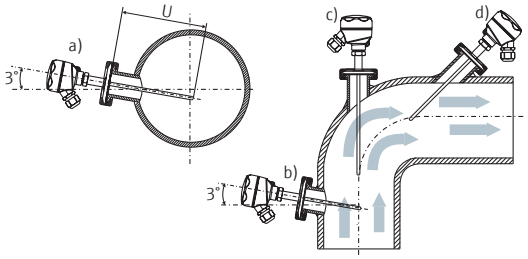
Specs at a glance:

- **Measuring range:**
  −50 to +200 °C
- **Accuracy:**
  Pt100 as per IEC 60751
- **Immersion length (mm):**
  55 to 400 mm, selectable
- **Response time sensor:**
  ≥3.5 s (t_{50}), ≥9 s (t_{90})

Application The iTHERM TM401 in hygienic design measures the temperature in vessels and pipes, e.g. during cleaning and sterilization, in heating/cooling processes.
It is specially designed for use in hygienic and aseptic applications in the Food & Beverages and Life Sciences industries.

Function The compact thermometer consists of a thin film platinum resistance temperature sensor (Pt100 class A), a transmitter (optional) and a housing (aluminum or stainless steel), with various process connections. As an option the signal can directly be converted into a 4 to 20 mA signal using a built-in head transmitter.

Application example



Installation examples
a), b) Perpendicular to the flow direction, installed at a minimum angle of 3° to ensure self-draining
c) On elbows
d) Inclined installation in pipes with a small nominal diameter
U = Immersion length

Technical data

Sensor	
Sensor type	1 × Pt100 thin-film
Tolerance	Class A as per IEC 60751
Process temperature	−50 to +200 °C
Material	316L
Surface roughness	R_a ≤0.76 µm; optional R_a ≤0.38 µm
Diameter	6 mm, straight/8 mm reduced 5.3 × 20 mm/ 6 mm reduced 4.1 × 18 mm
Immersion length	55 to 400 mm selectable
Response time*	t_{50} ≥3.5 s/t_{90} ≥9 s
Max. pressure*	Up to 40 bar

Process connection	
Version	Compression fitting TK40, Clamp, sanitary connection according to DIN 11851, M12×1 or G½" thread metal sealing system, thread according to ISO 228 for Liquiphant weld-in adapter, Varivent®, SMS1147

Terminal head	
Degree of protection	IP 66/68 (depending on configuration)
Electrical connection	Cable gland, polyamide or M12 connector
Material	Stainless steel 316L, aluminum, polypropylene

Operating conditions	
Ambient temperature	Max. −50 to +150 °C (Depends on terminal head used and cable gland or connector)
Storage temperature	Max. −50 to +150 °C (Depends on terminal head used and cable gland or connector)
Climate class	As per EN 60654-1, Class C
Shock and vibration resistance	3g in the range 0 to 500 Hz as per IEC 60751
EMC	Interference immunity and interference emission according to IEC 61326-1

Transmitter – Output	
Signal on alarm	Sensor breakage; sensor short circuit ≤3.6 mA or ≥21.0 mA
Max. load	Max. (V_{supply} − 10 V)/0.022 A (current output)
Input current required	≤3.5 mA
Current limit	≤23 mA
Switch on delay	4 s (during power up I_a = 3.8 mA)
HART®	Available as option

Transmitter – Power supply	
Supply voltage	U_b = 10 to 35 V DC, polarity protected
Residual ripple	Permitted residual ripple U_{ss} ≤3 V at U_b ≥13 V, $f_{max.}$ = 1 kHz

Transmitter – Accuracy	
Response time transmitter	1 s
Reference operating conditions	Calibration temperature: +25 °C ±5 K
Maximum measured error	0.2 K
Influence of power supply	≤ ±0.01 %/V deviation from 24 V
Influence of ambient temperature (temperature drift)	Resistance thermometer (Pt100): T_d = ± (15 ppm/K × (measuring range end value − measuring range start value) + 50 ppm/K × preset meas. range) × Δθ Δθ = Deviation of the ambient temperature according to the reference condition (+25 °C ±5 K).
Long term stability	≤0.1K/year or ≤0.05 %/year

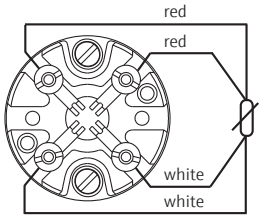
Approvals*
3-A, EHEDG, FDA, TSE Certificate of Suitability, ASME BPE
Factory calibration

Material certification
3.1 „short form" certificate included in standard
more certificates available on request

* depending on configuration

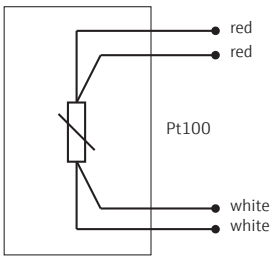
Electrical connection

Terminal block



For direct cable connection

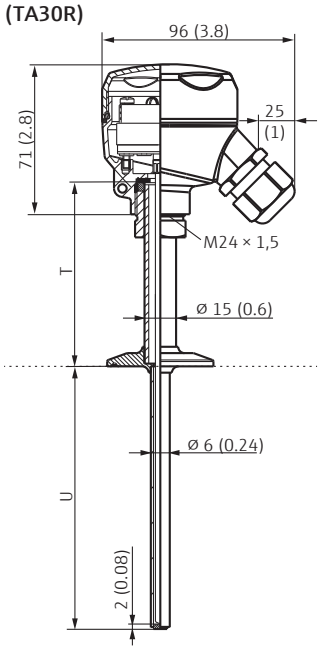
Flying leads



For mounting of head transmitter

Dimensions in mm (inches)

Housing, here with stainless steel head (TA30R)



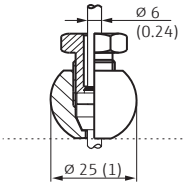
T = Length of extension neck
(T=82 mm in the versions offered here)
U = Immersion length (55...400 mm)

Installation according to instruction manual.

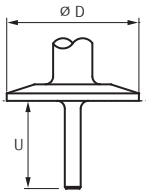
Dimensions in mm (inches)

Process connections

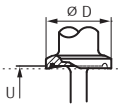
Compression fitting TK40



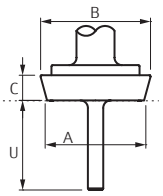
Clamp



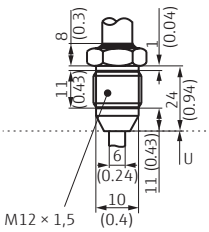
MicroClamp
TriClamp



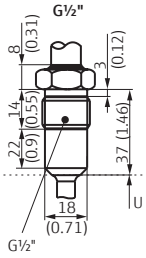
DIN11851



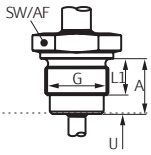
Metal sealing systems
M12 × 1,5



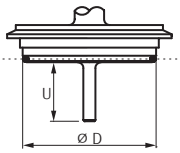
G½"



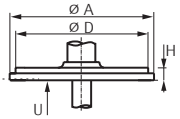
ISO228 G¾" / G1"
(for FTL weld-in adapter)



Varivent®
Type F and N



SMS 1147
DN25, DN38, DN51



Type	Version	Dimensions in mm (inches)						
		ø D	(ø) A	B	C	H	L1	SW/AF
Clamp	DN12–21.3	34 (1.34)						
	DN25–38	50.5 (1.99)						
	DN40–51	64 (2.52)						
Microclamp	DN8–18	25 (0.98)						
Tri-clamp	DN8–18	25 (0.98)						
DIN11851	DN25		30 (1.18)	44 (1.73)	10 (0.39)			
	DN32		36 (1.42)	50 (1.97)	10 (0.39)			
	DN40		42 (1.65)	56 (2.2)	10 (0.39)			
	DN50		54 (2.13)	68 (2.68)	11 (0.43)			
ISO228 (for FTL adapter)	G¾"		16 (0.63)				25.5 (1)	32
	G1"		18,6 (0.73)				29.5 (1.16)	41
Varivent®	Type F (DN25)	50 (1.97)						
	Type N (DN40-125)	68 (2.67)						
SMS 1147	DN25	32 (1.26)	35,5 (1.4)			7 (0.28)		
	DN38	48 (1.89)	55 (2.17)			8 (0.31)		
	DN51	60 (2.36)	65 (2.56)			9 (0.35)		

Order codes

Process connections type and size

Code 1)	Compression fitting TK40, ferrule PEEK
A1A1	fixed, diameter 25 mm
A3A4	movable, diameter 25 mm

1)

Code 2)	Compression fitting TK40, ferrule 316L
A1A3	fixed, diameter 25 mm
A3A6	movable, diameter 25 mm

2)

Code 3)	Clamp/metal sealing system
C1C1	DN8-18 (0,5"-0,75") Microclamp, 3-A
C1C2	DN8-18 (0,5"-0,75") Tri-clamp, 3-A
C1D1	DN12-21,3 Clamp ISO2852, 3-A
C1D2	DN25-38 (1"-1,5") Clamp ISO2852, 3-A
E1H1	M12×1 metal sealing system, EHEDG
E1H2	G½ metal sealing system, EHEDG

3)

Code 4)	Clamp/sanitary connection acc. to DIN 11851
C1D3	DN40-51 (2") clamp ISO2852, 3-A,
D1E1	Sanitary connection, DN25 DIN11851, 3-A

4)

Code 5)	Sanitary connection according to DIN 11851, thread ISO228, Varivent, SMS 1147
D1E2	Sanitary connection DN32 DIN11851, 3-A
D1E3	Sanitary connection DN40 DIN11851, 3-A
D1E4	Sanitary connection DN50 DIN11851, 3-A
F1J1	Thread G¾ ISO228 for FTL20 adapter, 3-A
F1J2	Thread G¾ ISO228 for FTL50 adapter, 3-A
F1J3	Thread G1 ISO228 for FTL50 adapter, 3-A
G1L2	Type F Varivent diameter 50 mm, 3-A
G1L3	Type N Varivent diameter 68 mm, 3-A
H1N1	DN25 SMS 1147
H1N2	DN38 SMS 1147
H1N3	DN51 SMS 1147

5)

Immersion length

Code	Length*
X05	55 to 119 mm
X06	120 to 149 mm
X07	150 to 400 mm

iTHERM TM401 (Pt100 with flying leads)

Terminal head	Pipe diameter	Length**	Order no. *
Alu, IP66/68, NEMA Type 4x	6 mm, reduced 4.1×18 mm	☐ mm	TM401-AA1☐[1)] B14☐A30AA1A1+C1JC
		☐ mm	TM401-AA1☐[2)] B14☐A30AA1A1+C1JC
	6 mm, straight	☐ mm	TM401-AA1☐[3)] A14☐A30AA1A1+C1JC
		☐ mm	TM401-AA1☐[4)] A14☐A30AA1A1+C1JC
		☐ mm	TM401-AA1☐[5)] A14☐A30AA1A1+C1JC
316L, hand-polished , IP69K, NEMA Type 4	6 mm, reduced 4.1×18 mm	☐ mm	TM401-AA1☐[1)] B14☐A30AR1A1+C1JC
		☐ mm	TM401-AA1☐[2)] B14☐A30AR1A1+C1JC
	6 mm, straight	☐ mm	TM401-AA1☐[3)] A14☐A30AR1A1+C1JC
		☐ mm	TM401-AA1☐[4)] A14☐A30AR1A1+C1JC
		☐ mm	TM401-AA1☐[5)] A14☐A30AR1A1+C1JC

* Please add code for immersion length.
** Please specify sensor length (55 to 400 mm)!

Order codes

Process connections type and size

Code 1)	Compression fitting TK40, ferrule PEEK
A1A1	fixed, diameter 25 mm
A3A4	movable, diameter 25 mm

1)

Code 2)	Compression fitting TK40, ferrule 316L
A1A3	fixed, diameter 25 mm
A3A6	movable, diameter 25 mm

2)

Code 3)	Clamp/metal sealing system
C1C1	DN8-18 (0,5"-0,75") Microclamp, 3-A
C1C2	DN8-18 (0,5"-0,75") Tri-clamp, 3-A
C1D1	DN12-21,3 Clamp ISO2852, 3-A
C1D2	DN25-38 (1"-1,5") Clamp ISO2852, 3-A
E1H1	M12×1 metal sealing system, EHEDG
E1H2	G½ metal sealing system, EHEDG

3)

Code 4)	Clamp/sanitary connection acc. to DIN 11851
C1D3	DN40-51 (2") clamp ISO2852, 3-A,
D1E1	Sanitary connection, DN25 DIN11851, 3-A

4)

Code 5)	Sanitary connection according to DIN 11851, thread ISO228, Varivent, SMS 1147
D1E2	Sanitary connection DN32 DIN11851, 3-A
D1E3	Sanitary connection DN40 DIN11851, 3-A
D1E4	Sanitary connection DN50 DIN11851, 3-A
F1J1	Thread G¾ ISO228 for FTL20 adapter, 3-A
F1J2	Thread G¾ ISO228 for FTL50 adapter, 3-A
F1J3	Thread G1 ISO228 for FTL50 adapter, 3-A
G1L2	Type F Varivent diameter 50 mm, 3-A
G1L3	Type N Varivent diameter 68 mm, 3-A
H1N1	DN25 SMS 1147
H1N2	DN38 SMS 1147
H1N3	DN51 SMS 1147

5)

Immersion length

Code	Length*
X05	55 to 119 mm
X06	120 to 149 mm
X07	150 to 400 mm

iTHERM TM401 (4 to 20 mA)

Terminal head	Pipe diameter	Length**	Order no. (1), 2), 3), 4), 5) / *)
Alu, IP66/68, NEMA Type 4x	6 mm, reduced 4.1×18 mm	mm	TM401-AA1 [ ] [1)] B14 [ ] A32BA1A1+C1JC
		mm	TM401-AA1 [ ] [2)] B14 [ ] A32BA1A1+C1JC
	6 mm, straight	mm	TM401-AA1 [ ] [3)] A14 [ ] A32BA1A1+C1JC
		mm	TM401-AA1 [ ] [4)] A14 [ ] A32BA1A1+C1JC
		mm	TM401-AA1 [ ] [5)] A14 [ ] A32BA1A1+C1JC
316L, hand-polished, IP69K, NEMA Type 4	6 mm, reduced 4.1×18 mm	mm	TM401-AA1 [ ] [1)] B14 [ ] A32BR3A1+C1JC
		mm	TM401-AA1 [ ] [2)] B14 [ ] A32BR3A1+C1JC
	6 mm, straight	mm	TM401-AA1 [ ] [3)] A14 [ ] A32BR3A1+C1JC
		mm	TM401-AA1 [ ] [4)] A14 [ ] A32BR3A1+C1JC
		mm	TM401-AA1 [ ] [5)] A14 [ ] A32BR3A1+C1JC

* Please add code for immersion length.
** Please specify sensor length (55 to 400 mm)!

Complete product information:
www.endress.com/tm401

More products to complete your measuring point ...


Point level switch
Liquiphant FTL33
page 12


Pressure switch
Ceraphant PTP33B
page 88


Process transmitter
RMA42
page 157

Temperature transmitters for RTD and thermocouples

iTEMP TMT127/187 and TMT128/188

TMT187/188

TMT127/128

- High accuracy (in total ambient temperature range)
- Fault indication on sensor short or open circuit to NAMUR NE 43
- Galvanic isolation

Specs at a glance:

- **Approval:**
  ATEX II (1) G EEx ia
- **Accuracy:**
  <0.08 % (Pt100)
- **Measuring range:**
  Fixed, selectable
- **RTD sensors:**
  3 or 4-wire

Complete product information:
www.endress.com/tmt127
www.endress.com/tmt187
www.endress.com/tmt128
www.endress.com/tmt188

Application This range of temperature transmitters are available as either head transmitters (TMT187/188) or as rail mounted devices (TMT127/128). The TMT187/188 head transmitters can be installed in the form B sensor head and have a fixed measurement range as well as a 4 to 20 mA analog output.

Input:
TMT127/187 resistance thermometer (RTD) or
TMT128/188 thermoelements (TC)

Function The TMT127/187 RTD temperature transmitter is a two-wire transmitter with an analog output and a three- or four-wire resistance thermometer input.

The TMT128/188 TC temperature transmitter is a two-wire transmitter with an analog output and thermocouple input.

Technical data TMT187/TMT188

Input	
TMT187 (RTD)	Pt100
TMT188 (TC)	Type J, K, N, R, S, T

Output	
Output signal	4 to 20 mA transmission is linear to temperature and resistance
Maximum load	($V_{power\ supply}$ −8 V)/0.025 A
Input current required	≤3.5 mA
Current limit	≤25 mA
Switch on delay	4 s (during power up I_a = 3.8 mA)
Response time	1 s

Signal on alarm	
Underranging	Linear drop to 3.8 mA
Overranging	Linear rise to 20.5 mA
Sensor breakage/ Sensor short circuit	≥21.0 mA

Electrical connection	
Power supply	U_b = 8 to 35 V, reverse polarity protected Ex U_b = 8 to 30 V
Galvanic isolation	U = 2 kV AC
Allowable ripple	U_{ss} ≤5 V at U_b ≥13 V, f_{max} = 1 kHz
Reference conditions	Calibration temperature 23 °C ±5 K (73.4 °F ± 9 °F)

Accuracy	
Influence of power supply	≤ ±0.01 %/V deviation from 24 V
Load influence	≤ ±0.02 %/100 Ω
Temperature drift	Pt100: T_d = ±(15 ppm/K × (max. measuring range + 200) + 50 ppm/K × preset measuring range) × Δθ
	TC: T_d = ± (50 ppm/K × max. measuring range + 50 ppm/K × preset measuring range) × Δθ
	Δθ = Deviation of ambient temperature from the referent working condition (+23 °C ±5 K (73.4 °F ± 9 °F))
Pt100	0.2 K or 0.08 %
Thermocouple type	J and K: typ. 0.5 K N: typ. 1.0 K S and R: typ. 2.0 K Influence of the internal reference junction: Pt100 Class B

Operating conditions	
Ambient temperature	−40 to +85 °C (−40 to 185 °F)
Storage temperature	−40 to +100 °C (−40 to 212 °F)
Climatic class	According to EN 60 654-1, Class C
Vibration protection	4 g/2 to 150 Hz acc. to IEC 60 068-2-6
EMC	Interference immunity and interference emission according to EN 61 326-1 (IEC 1326) and NAMUR NE 21
Max. ambient temperature	T4 = 85 °C, T5 = 70 °C, T6 = 55 °C (T4 = 185 °F, T5 = 158 °F, T6 = 131 °F)

Approvals			
Ex approval	ATEX II 1G	EEx ia/IIC	EEx ia/IIB
Inductivity and capacity	C_i ≈ 0 F L_i ≈ 0 H	C_0 ≤709 µF L_0 ≤4.5 mH	C_0 ≤1300 µF L_0 ≤100 mH
Max. current	I_i = 100 mA	I_0 = 4.5 mA	
Max. voltage	U_i = 30 V	U_0 = 9.6 V	
Max. power	P_i = 0.75 W	P_0 = 11 mW	

Technical data TMT127/TMT128

Input	
TMT127 (RTD)	Pt100
TMT128 (TC)	Type J, K, N, R, S, T

Output	
Output signal	4 to 20 mA transmission is linear to temperature and resistance
Max. load	($V_{power\ supply}$ −12 V)/0.022 A
Input current required	≤3.5 mA
Current limit	≤23 mA
Switch on delay	4 s (during power up I_a = 3.8 mA)
Response time	1 s

Signal on alarm	
Underranging	Linear drop to 3.8 mA
Overranging	Linear rise to 20.5 mA
Sensor breakage/ Sensor short circuit	≥21.0 mA

Electrical connection	
Power supply	U_b = 12 to 35 V, reverse polarity protected Ex U_b = 12 to 30 V
Galvanic isolation	U = 2 kV AC
Allowable ripple	U_{ss} ≤3 V at U_b ≥15 V, f_{max} = 1 kHz
Reference conditions	Calibration temperature 25 °C ±5 K (77 °F ± 9 °F)

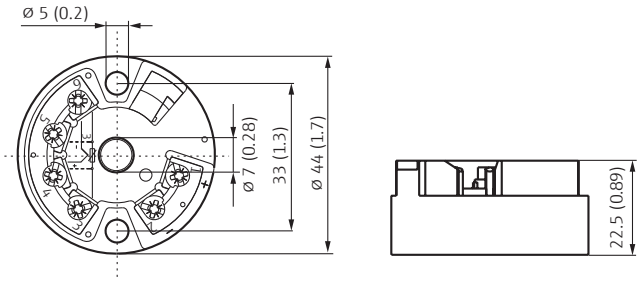
Accuracy	
Influence of power supply	≤ ±0.01 %/V deviation from 24 V
Load influence	≤ ±0.02 %/100 Ω
Temperature drift	Pt100: T_d = ±(15 ppm/K × (max. measuring range + 200) + 50 ppm/K × preset measuring range) × Δθ
	TC: T_d = ± (50 ppm/K × max. measuring range + 50 ppm/K × preset measuring range) × Δθ
	Δθ = Deviation of ambient temperature from the referent working condition (+23 °C ±5 K (73.4 °F ± 9 °F))
Pt100	0.2 K or 0.08 %
Thermocouple type	J and K: typ. 0.5 K N: typ. 1.0 K, S and R: typ. 2.0 K Influence of the internal reference junction: Pt100 Class B

Operating conditions	
Ambient temperature	−40 to +85 °C (−40 to 185 °F)
Storage temperature	−40 to +100 °C (−40 to 212 °F)
Climatic class	according to EN 60 654-1, Class C
Vibration protection	4 g/2 to 150 Hz acc. to IEC 60 068-2-6
EMC	Interference immunity and interference emission according to EN 61 326-1 (IEC 1326) and NAMUR NE 21
Max. ambient temperature	T4 = 85 °C, T5 = 70 °C, T6 = 55 °C (T4 = 185 °F, T5 = 158 °F, T6 = 131 °F)

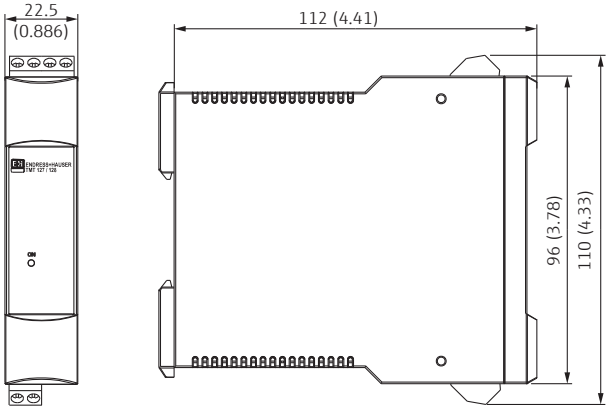
Approvals			
Ex approval	ATEX II 1G	EEx ia/IIC	EEx ia/IIB
Inductivity and capacity	C_i ≈ 0 F L_i ≈ 0 H	C_0 ≤24 µF L_0 ≤100 mH	C_0 ≤12 µF L_0 ≤8.5 mH
Max. current	I_i = 100 mA	I_0 = 9.6 mA	
Max. voltage	U_i = 30 V	U_0 = 4.4 V	
Max. power	P_i = 0.75 W	P_0 = 11 mW	

Dimensions in mm (inches)

TMT187 / TMT188



TMT127 / TMT128

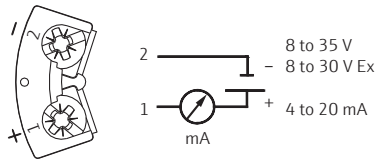


Installation according to operation instructions.

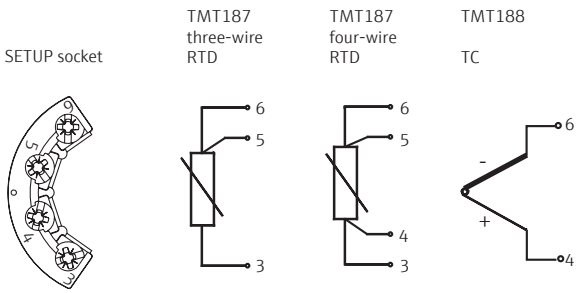
Electrical connection

TMT187 / TMT188

Power supply and current output

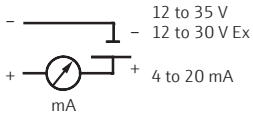


Sensor connection

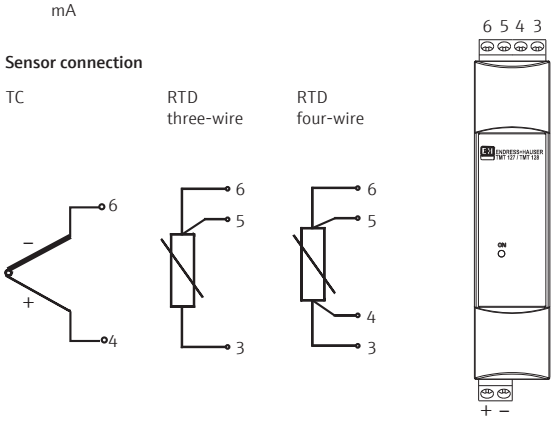


TMT127 / TMT128

Power supply and current output



Sensor connection



Order codes

Measuring range for TMT127/187 (RTD) Pt100

Code	
BA	−50 to +100 °C
CA	−40 to +60 °C
DA	−30 to +60 °C
DB	−30 to +150 °C
EA	−20 to +20 °C
EB	−20 to +60 °C

Code	
FC	0 to +50 °C
FE	0 to 100 °C
FG	0 to 150 °C
FH	0 to 200 °C
FI	0 to 250 °C
FJ	0 to 300 °C
FK	0 to 400 °C
FL	0 to 500 °C
FN	0 to 600 °C

Measuring range for TMT128/188 (TC)

Code	Typ J	Code	Typ K	Code	Typ N
JAB	0 to 1200 °C	KAB	0 to 1200 °C	NAB	0 to 1200 °C
JAK	0 to 150 °C	KAK	0 to 150 °C	NAK	0 to 150 °C
JAC	0 to 200 °C	KAC	0 to 200 °C	NAC	0 to 200 °C
JAL	0 to 250 °C	KAL	0 to 250 °C	NAL	0 to 300 °C
JAD	0 to 300 °C	KAD	0 to 300 °C	NAD	0 to 400 °C
JAE	0 to 400 °C	KAE	0 to 400 °C	NAE	0 to 600 °C
JAF	0 to 600 °C	KAF	0 to 600 °C	NAF	0 to 900 °C
JAG	0 to 900 °C	KAG	0 to 900 °C	NAG	0 to 1000 °C
JAH	0 to 1000 °C	KAH	0 to 1000 °C	NAH	0 to 1200 °C

Typ R		Typ S		Typ T	
RAE	0 to 1600 °C	SAE	0 to 1600 °C	TJA	−50 to +300 °C
RAF	0 to 600 °C	SAF	0 to 600 °C	TAA	−50 to +200 °C
RAG	0 to 900 °C	SAG	0 to 900 °C	TAB	0 to 100 °C
RAH	0 to 1000 °C	SAH	0 to 1000 °C	TAK	0 to 150 °C
RAI	0 to 1200 °C	SAI	0 to 1200 °C	TAC	0 to 200 °C
RAJ	0 to 1400 °C	SAJ	0 to 1400 °C	TAL	0 to 250 °C
					0 to 300 °C

* **

iTEMP TMT127/128/187/188				Order no.	
Design	Product	Approval	Temperature Sensor		
Head transmitter	TMT187	Non-Ex	RTD 3-wire	TMT187-A31 A	
			RTD 4-wire	TMT187-A41 A	
		Ex	RTD 3-wire	TMT187-B31 A	
			RTD 4-wire	TMT187-B41 A	
	TMT188	Non-Ex	TC		TMT188-A A
		Ex	TC		TMT188-B A
Rail mounting transmitter	TMT127 (RTD)	Non-Ex	RTD 3-wire	TMT127-A31 A	
			RTD 4-wire	TMT127-A41 A	
		Ex	RTD 3-wire	TMT127-B31 A	
			RTD 4-wire	TMT127-B41 A	
	TMT128 (TC)	Non-Ex	TC		TMT128-A A
		Ex	TC		TMT128-B A

* Please add measuring range code for Pt100.
** Please add measuring range code for thermocouple.

Accessory	Order no.
Protective housing for max. 4 TMT127/128 (182 × 180 × 165 mm)	52010132

Complete product information:
www.endress.com/tmt127
www.endress.com/tmt187
www.endress.com/tmt128
www.endress.com/tmt188

More products to complete your measuring point ...

Point level switch
Minicap FTC260
page 57

Data manager
Ecograph T RSG35
page 137

Isolating amplifier
RN22
page 162

PC programmable temperature transmitter

iTEMP TMT80

Complete product information:
www.endress.com/tmt80

- Universally programmable via ReadWin® 2000
- NAMUR NE 43
- Galvanic isolation

Specs at a glance:

- **Input:**
  Pt100, Pt1000;
  TC type B, K, N, R, S
- **Accuracy:**
  deviation 0.5 K (Pt100)
- **Measuring range:**
  freely programmable, dependent of sensor
- **Installation:**
  suitable for sensor head (form B)

Application The iTEMP TMT80 head transmitter can be installed in the form B sensor head. It has a 4 to 20 mA analog output. The measuring range can be set up freely via ReadWin® 2000 configuration software. TMT80 can be used for resistance thermometers (RTD) as well as for most commonly used thermocouples.

Function The iTEMP TMT80 head transmitter converts the input signal into a linear 4 to 20 mA signal. It has measurement input for resistance thermometers (RTD) in 2-, 3- or 4-wire connection and thermocouples.

Technical data

Input	
Input signal	Resistance thermometer: Pt100, Pt1000 to IEC 60751 Thermocouples: type B, K, N, R, S
Measurement range	Dependent of applied sensor element

Output	
Output signal	4 to 20 mA
Failure signal	To NAMUR NE 43
Max. load	($V_{power\ supply}$ −8 V)/0.025 A
Input current required	≤3.5 mA
Current limit	≤25 mA
Switch on delay	4 s (during power up I_a ≈ 3.8 mA)
Response time	1 s

Signal on alarm	
Underranging	Linear drop to 3.8 mA
Overranging	Linear rise to 20.5 mA
Sensor breakage; sensor short circuit [1]	<3.6 mA or >21 mA can be set up

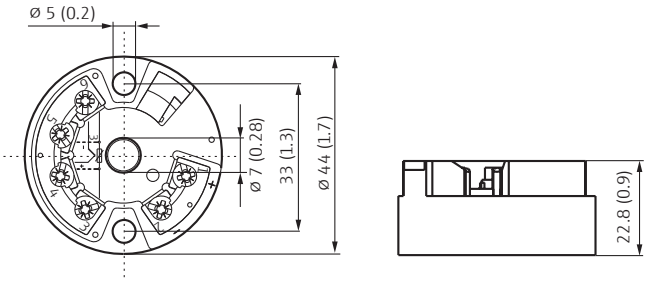
Electrical connection	
Power supply	U_b = 8 to 35 V DC
Galvanic isolation	Û = 0.5 kV
Allowable ripple	U_{ss} ≤3 V at U_b ≥15 V, f_{max} = 1 kHz
Reference conditions	Calibration temperature 25 °C ±5 K

Accuracy	
Influence of power supply	≤ ±0.01 %/V deviation from 24 V
Load influence	≤ ±0.02 %/100 Ω
Temperature drift	Pt100: T_d = ±[(15 ppm/K × (measuring range end value − measuring range start value)) + (50 ppm/K × preset measurement range)] × Δθ TC: T_d = ±[(50 ppm/K × (Measurement range end value − measurement range start value)) + (50 ppm/K × preset measurement range)] × Δθ Δθ = Deviation of ambient temperature according to the reference condition +25 °C ± 5 K (77 °F ± 9 °F)
Measurement accuracy	0.5 K (Pt100)

Application conditions	
Ambient temperature	−40 to +85 °C
Storage temperature	−40 to +100 °C
Climatic class	to EN 60654-1, Class C
Vibration resistance	4 g/2 to 150 Hz to IEC 60 068-2-6
EMC	Interference immunity and interference emission according to IEC 61326 and NAMUR NE 21
Housing	To DIN 50446 form B

[1] Not for thermocouple

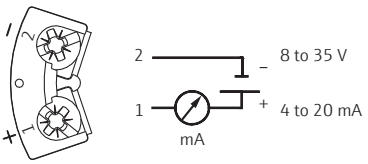
Dimensions in mm (inches)



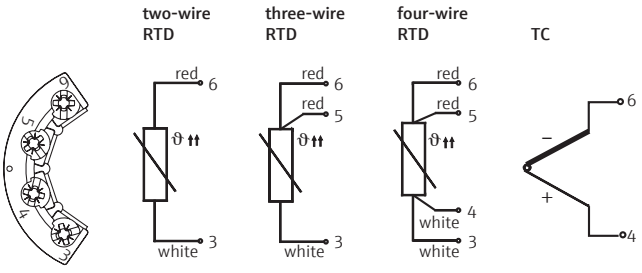
Installation according to operation instructions.

Electrical connection

Power supply and current output



Sensor connection



Order codes

iTEMP TMT80	Order no.
Head transmitter	
Standard	TMT80-AA

Accessories	Order no.
Configuration kit TXU10 – for PC-programmable devices. set-up programme + interface cable for PC with USB-Port. 4 pin plug + ReadWin® 2000	TXU10-AA

Complete product information:
www.endress.com/tmt80

More products to complete your measuring point ...


Point level switch
Liquiphant FTL31
page 8


Temperature sensor
iTHERM ModuLine TM121
page 113


Process transmitter
RMA42
page 157

Temperature switch for monitoring of process temperatures

Thermophant T TTR31

Complete product information:
www.endress.com/ttr31

- High reproducibility and long-term stability
- Stainless steel housing 316L
- Fast response times without reduced tip

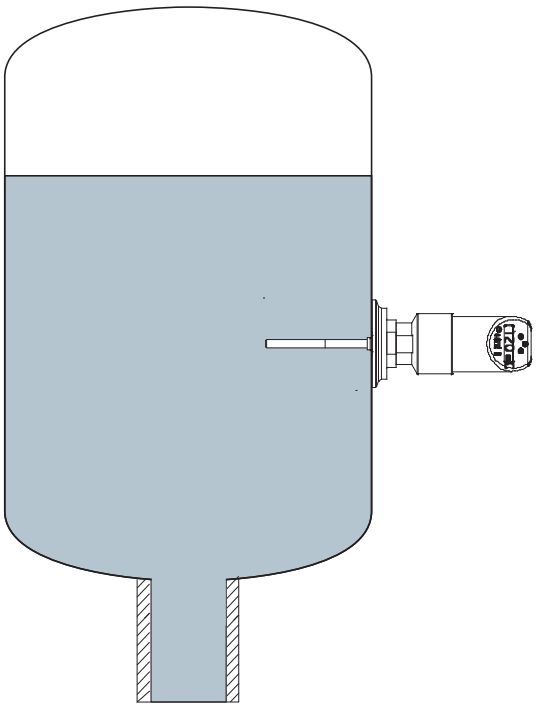
Specs at a glance:

- **Temperature range:**
  −50 to +150 °C (−58 to 302 °F)
- **Display:**
  4 digit, 14 segments display with color change
- **Immersion length:**
  50 mm, 100 mm, 200 mm (1.97", 3.94", 7.87")
- **Response time:**
  <1.0 s (T_{50}); <2.0 s (T_{90})
- **Sensor:**
  Ø 6 mm (0.24")
- **Accuracy:**
  <0.1 %

Application The Thermophant T TTR31 is a temperature switch for the monitoring, display and control of process temperatures and is available with a wide range of process connections.

Function A platinum sensor located at the measuring tip changes its resistance value depending on the temperature. This resistance value is recorded electronically. The conversion of the resistance value into a temperature measurement signal is defined by the international standard IEC 751.

Application example



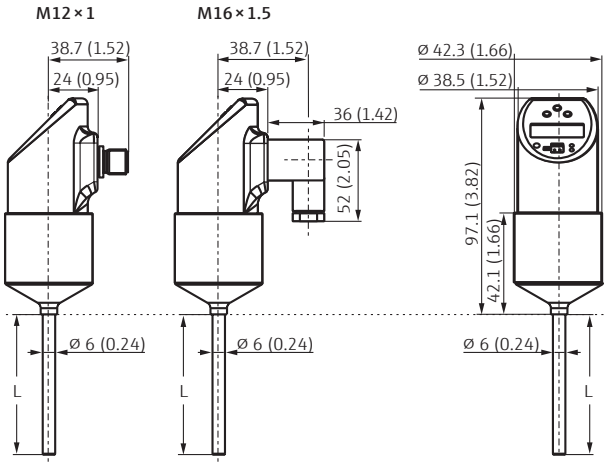
The Thermophant detects the temperature in the vessel and monitors the compliance with limit values.

Technical data

Supply voltage	
Supply voltage	12 to 30 V DC (reverse polarity protection)
Current consumption	Without load <60 mA, reverse polarity protection
Output	
Output signal	1 or 2 × PNP or PNP with 4 to 20 mA
Voltage drop PNP	≤2 V
Overload protection	Automatic testing of switching current
Performance characteristics	
Reference conditions	According to DIN IEC 60770/61003
Measured error	Electronics max. 0.2 K or 0.16 % sensor Class A
Long-term drift	≤0.1 % per year
Sensor response time	T_{50} = <1.0 s; T_{90} = <2.0 s
Analog output	Non-linearity ≤0.2 %
Sensor	
Sensing element	1 × Pt100, four-wire
Tolerance	Class A to IEC 751
Medium temperature	−50 to +150 °C (−58 to 302 °F)
Diameter	6 mm (0.24")
Operating conditions	
Ambient temperature	−40 to +85 °C (−40 to +185 °F)
Protection	IP 65 (complete housing)
EMC	Interference emiss. as per IEC 61326 Series, class B electrical equipment, interference immunity as per IEC 61326 Series, app. A (indust. use) and NAMUR Recomm. NE 21
Materials	
Process connection and protection pipe	316L/R_a ≤0.8 µm; housing 316L
Operation	
Operating elements	3 buttons or PC and software
Approvals	
Desina compliant	

Dimensions in mm (inches)

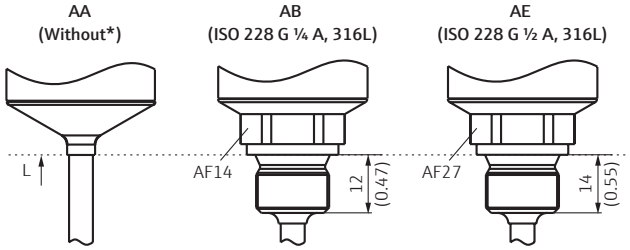
Housing



L = sensor length 50 mm / 100 mm / 200 mm (1.97" / 3.94" / 7.87")

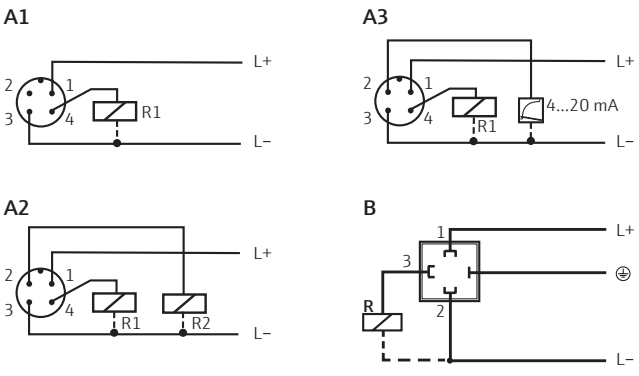
Installation according to instruction manual.

Process connections



* For mounting with welding boss or compression fitting: L ≥100 mm (3.94")

Electrical connection



DC Voltage version with M12 connector
A1: 1 × PNP switch output
A2: 2 × PNP switch output
A3: PNP switch output with additional analog output

DC Voltage version with M16×1.5 connector
B: 1 × PNP switch output

Order codes

Insertion length

Code	Length
1B	50 mm (1.97")
2C	100 mm (3.94")

Thermophant T TTR31				Order no.
Output	Length	Plug	Process Connection	*
1 × PNP	100 mm	M12×1**	Without	TTR31-A1A111AA2CAA
		M16×1.5	Without	TTR31-A2A111AA2CAA
	50/100 mm	M12×1**	G¼ A, 316L	TTR31-A1A111AB ☐ AA
		M16×1.5	G¼ A, 316L	TTR31-A2A111AB ☐ AA
		M12×1**	G½ A, 316L	TTR31-A1A111AE ☐ AA
		M16×1.5	G½ A, 316L	TTR31-A2A111AE ☐ AA
	200 mm	M12×1**	Without	TTR31-A1A111AA2EAA
		M16×1.5	Without	TTR31-A2A111AA2EAA
		M12×1**	G¼ A, 316L	TTR31-A1A111AB2EAA
		M16×1.5	G¼ A, 316L	TTR31-A2A111AB2EAA
		M12×1**	G½ A, 316L	TTR31-A1A111AE2EAA
		M16×1.5	G½ A, 316L	TTR31-A2A111AE2EAA
2 × PNP	100 mm	M12×1**	Without	TTR31-A1B111AA2CAA
	50/100 mm	M12×1**	G¼ A, 316L	TTR31-A1B111AB ☐ AA
			G½ A, 316L	TTR31-A1B111AE ☐ AA
	200 mm	M12×1**	Without	TTR31-A1B111AA2EAA
			G¼ A, 316L	TTR31-A1B111AB2EAA
			G½ A, 316L	TTR31-A1B111AE2EAA
1 × PNP with analog output	100 mm	M12×1**	Without	TTR31-A1C111AA2CAA
	50/100 mm	M12×1**	G¼ A, 316L	TTR31-A1C111AB ☐ AA
			G½ A, 316L	TTR31-A1C111AE ☐ AA
	200 mm	M12×1**	Without	TTR31-A1C111AA2EAA
			G¼ A, 316L	TTR31-A1C111AB2EAA
			G½ A, 316L	TTR31-A1C111AE2EAA

* Please enter code for insertion length. ** Please order cable and plug separately.

Accessories	Order no.
Welding boss with sealing taper	51004751
Compression Fitting TA50 6mm; G1/2"; PTFE	TA50-HP
5 m cable with M12×1 plug	51005148
Configuration kit, USB connection	TXU10-AA
Straight plug, without cable (self wired)	52006263
Angled plug, without cable (self wired)	51006327
Power supply 24 V DC, for DIN rail	RNB130-A1A

Complete product information:
www.endress.com/ttr31

More products to complete your measuring point ...


Point level switch
Liquiphant FTL31
page 8


Pressure switch
Ceraphant PTC31B
page 82


Flow switch
Flowphant T DTT31
page 98

Hygienic Pt100 temperature switch for monitoring of process temperatures

Thermophant T TTR35

Complete product information:
www.endress.com/ttr35

- Hygienic process connections
- Stainless steel housing 316L
- Fast response times without reduced tip

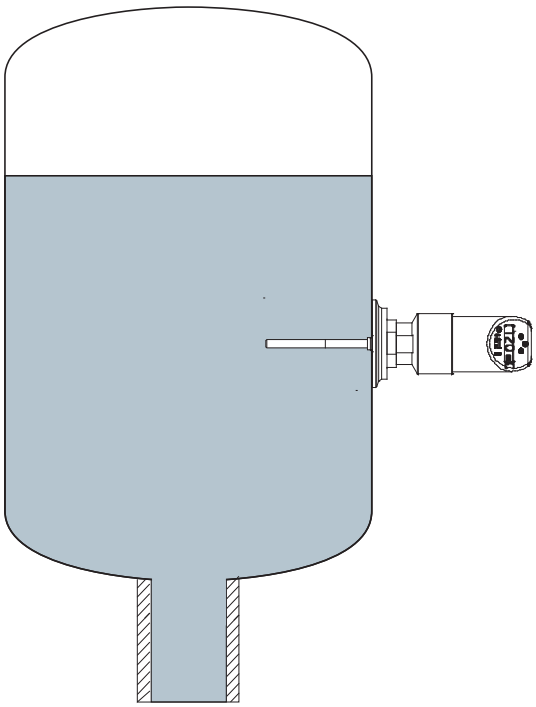
Specs at a glance:

- **Temperature range:**
  −50 to +150 °C (−58 to 302 °F)
- **Display:**
  4 digit, 14 segments display with color change
- **Immersion length (diameter):**
  50/100/200 mm (Ø 6 mm)
  (1.97", 3.94", 7.87" (Ø 0.24"))
- **Response time**
  <1.0 s (T_{50}); <2.0 s (T_{90})
- **Surface finishing:**
  R_a ≤0.8 µm
- **Accuracy:**
  <0.1 %

Application The Thermophant T TTR35 is a Desina compliant temperature switch for the monitoring, display and control of process temperatures in hygienic applications.

Function A platinum sensor located at the measuring tip changes its resistance value depending on the temperature. This resistance value is recorded electronically. The conversion of the resistance value into a temperature measurement signal is defined by the international standard IEC 751.

Application example



The Thermophant detects the temperature in the vessel and monitors the compliance with limit values.

Technical data

Supply voltage	
Supply voltage	12 to 30 V DC (reverse polarity protection)
Current consumption	Without load <60 mA, reverse polarity protection

Output	
Output signal	1 or 2 × PNP or PNP with 4 to 20 mA
Voltage drop PNP	≤2 V
Overload protection	Automatic testing of switching current

Performance characteristics	
Reference conditions	According to DIN IEC 60770/61003
Measured error	Electronics 0.2 K or 0.16 %; sensor Class A
Long-term drift	≤0.1 % per year
Sensor response time	T_{50} = <1.0 s; T_{90} = <2.0 s
Analog output	Non-linearity ≤0.2 %

Sensor	
Sensing element	1 × Pt100, four-wire
Tolerance	Class A to IEC 751
Medium temperature	−50 to +150 °C (−58 to 302 °F)
Diameter	6 mm (Ø 0.24")

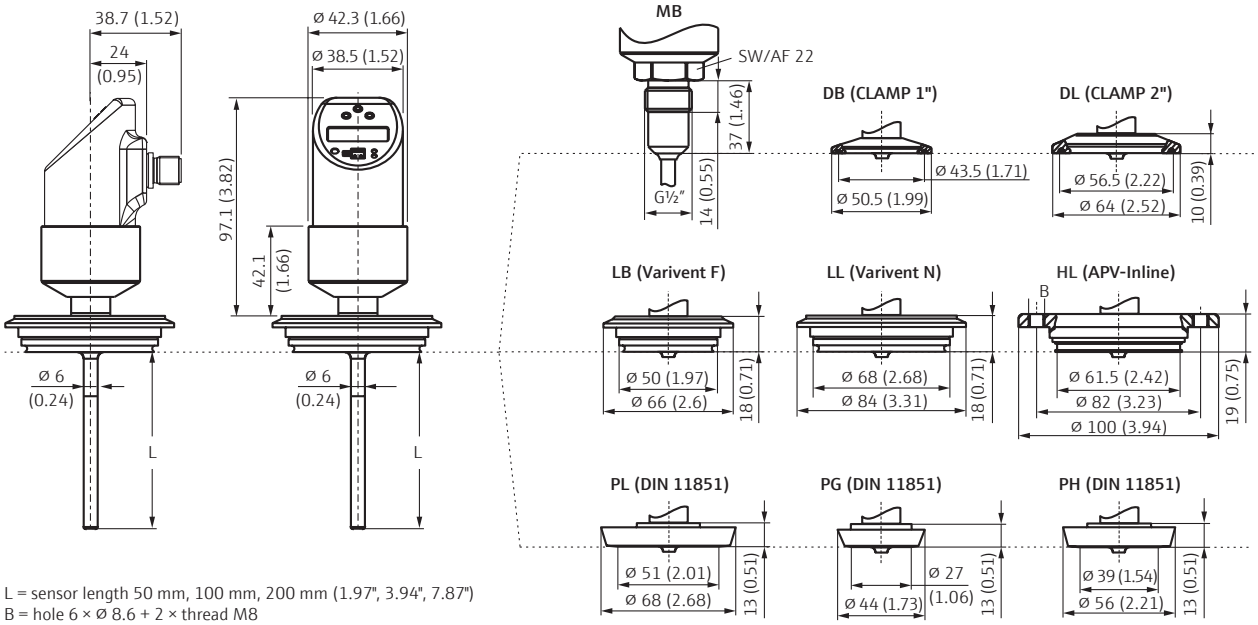
Operating conditions	
Ambient temperature	−40 to +85 °C (−40 to +185 °F)
Degree of Protection	IP 65 (complete housing)
EMC	Interference emission as per IEC 61326 Series, class B electrical equipment, interference immunity as per IEC 61326 Series, app. A (industrial use) and NAMUR Recomm. NE 21

Materials	
Process connection and protection pipe	316L/R_a ≤0.8 µm
Housing	316L

Operation	
Operating elements	3 buttons or PC and software

Approvals
3-A
Desina compliant

Dimensions in mm (inches)

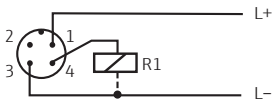


L = sensor length 50 mm, 100 mm, 200 mm (1.97", 3.94", 7.87")
B = hole 6 × Ø 8.6 + 2 × thread M8

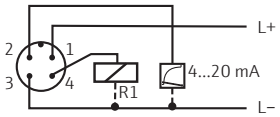
Installation according to instruction manual.

Electrical connection

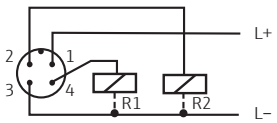
A1



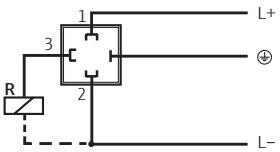
A3



A2



B



DC Voltage version with M12 connector
A1: 1 × PNP switch output
A2: 2 × PNP switch output
A3: PNP switch output with additional analog output

DC Voltage version with M16 × 1.5 connector
B: 1 × PNP switch output

Order codes

Electrical connection

Code	Plug
1	M12 × 1***
2	M16 × 1.5

Process connections

Code	TRI-CLAMP® or threaded connections
DB	Clamp ISO 2852 DN25-38 (1 to 1½"), 316L, 3-A, DIN 32676 DN25-40
DL	Clamp ISO 2852 DN40-51 (2"), 316L, 3-A, DIN 32676 DN50
DP	Clamp ISO 2852 2½", 316L, 3-A

Code	Hygienic connections
HL	APV-Inline DN50, PN40, 316L, 3-A
LB	Varivent® F pipe DN25-32, PN40, 316L, 3-A
LL	Varivent® N pipe DN40-162, PN40, 316L, 3-A
PG	DIN 11851, DN25, PN40, 316L, 3-A
PH	DIN 11851, DN40, PN40, 316L, 3-A
PL	DIN 11851, DN50, PN40, 316L, 3-A

More process connections on request.

Thermophant T TTR35			Order no.	
Output	Process connection	Length	*	**
1 × PNP	TRI-CLAMP® or threaded connection	50 mm (1.97")	TTR35-A	A111 1BAA
		100 mm (3.94")	TTR35-A	A111 2CAA
		200 mm (7.87")	TTR35-A	A111 2EAA
	Hygienic connection	50 mm (1.97")	TTR35-A	A111 1BAA
		100 mm (3.94")	TTR35-A	A111 2CAA
		200 mm (7.87")	TTR35-A	A111 2EAA
2 × PNP	TRI-CLAMP® or threaded connection	50 mm (1.97")	TTR35-A1B111	1BAA
		100 mm (3.94")	TTR35-A1B111	2CAA
		200 mm (7.87")	TTR35-A1B111	2EAA
	Hygienic connection	50 mm (1.97")	TTR35-A1B111	1BAA
		100 mm (3.94")	TTR35-A1B111	2CAA
		200 mm (7.87")	TTR35-A1B111	2EAA
1 × PNP with analog output	TRI-CLAMP® or threaded connection	50 mm (1.97")	TTR35-A1C111	1BAA
		100 mm (3.94")	TTR35-A1C111	2CAA
		200 mm (7.87")	TTR35-A1C111	2EAA
	Hygienic connection	50 mm (1.97")	TTR35-A1C111	1BAA
		100 mm (3.94")	TTR35-A1C111	2CAA
		200 mm (7.87")	TTR35-A1C111	2EAA

* Please insert code for electrical connection. ** Please insert code for the process connection. *** Please order cable and plug separately.

Accessories	Order no.
5 m cable with M12×1 plug	51005148
Configuration kit, USB connection	TXU10-AA
Straight plug, without cable (self wired)	52006263
Angled plug, without cable (self wired)	51006327

Complete product information:
www.endress.com/ttr35

More products to complete your measuring point ...


Pressure sensor
Cerabar PMP23
page 78


Kompakt termometre
iTHERM CompactLine TM311
page 104


Data manager
Ecograph T RSG35
page 137

Universal graphic data manager

Ecograph T RSG35

Complete product information:
www.endress.com/rsg35

- Web server for device configuration and display of measured value curves
- Up to 12 universal inputs, six digital inputs
- 4 mathematics channels

Specs at a glance:

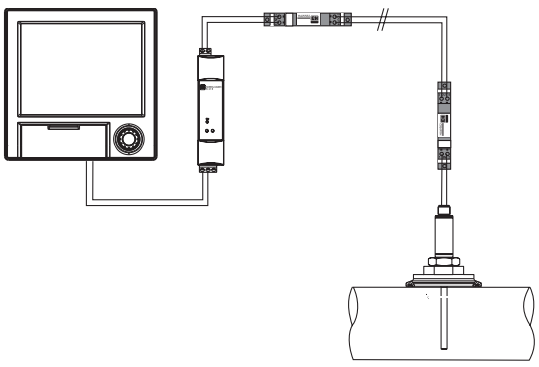
- **Save cycle:**
  1 s to 1 h
- **Memory:**
  128 MB internal memory, external SD card and USB stick
- **Inputs:**
  Current, voltage, pulse/ frequency and temperature
- **Interfaces:**
  Ethernet, RS232/RS485 and USB, Modbus RTU/TCP slave
- **Installation depth:**
  158 mm
- **Display:**
  5.7" TFT screen

Application The Ecograph T is the right solution for a wide range of applications such as:

- Quality and quantity monitoring in the water and wastewater industry
- Monitoring of processes in power stations
- Displaying and recording of critical process parameters
- Tank and level monitoring
- Temperature monitoring in metal working

Function Data archiving with internal memory and separate SD card. Up to 30 internal limit values can be freely assigned to the channels. Limit value violations are saved and can additionally be indicated via up to 6 relays. Measured values can be saved in a maximum of four groups with different save cycles. Groups are selected via the jog/shuttle dial and displayed on the multicolored TFT display. The Essential Version of the Field Data Manager software is supplied with the product as standard. This software can be used to export the recorded data, save the data to an SQL database and visualize the data externally.

Application Example



Ecograph T RSG35 records the temperature profile in a pipe.

Technical data

Input values (universal input)	
Number of inputs	0/4/8/12
Measured variables	Current: 0 to 5/20 mA, 4 to 20 mA; Voltage: 0 to 1/5/10 V, 1 to 5 V, ±150 mV, ±1 V, ±10 V, ±30 V; Resistance thermometer (RTD): Pt46, Pt50, Pt100, Pt500, Pt1000, Cu50, Cu53, Cu100; Thermocouples: Type J, K, T, N, L, D, C, B, S, R; Pulse input: max. 13 kHz Frequency input: 0 to 10 kHz
Measured error	±0.1 % oMR (for current, voltage, resistance thermometer); ±0.01 % oMR (for frequency)
Scan rate	100 ms for all channels
Resolution	24 Bit

Input values (digital input)	
Number of inputs	6
Input frequency	max. 25 Hz
Pulse length	Min. 20 ms (pulse counter); Min. 100 ms (control input)
Input current	max. 2 mA
Input voltage	max. 30 V
Selectable functions	Control input, ON/OFF message, pulse counter, operating time, message+operating time. Functions of the control input: start recording, screen saver on, external memory cycle, lock setup, time synchronization, limit value monitoring on/off

Output values (auxiliary voltage output)	
Output voltage	24 V DC ±15 %
Output current	max. 250 mA, short-circuit proof

Output values (relay output)	
Alarm relay	1 alarm relay with changeover contact
Standard relay	5 relays with NO contact, e.g. for limit value messages (can be configured as NC contact).
Relay switching capacity	max. 3 A @ 250 V AC or 3 A @ 30 V DC

Power supply	
Supply voltage	±24 V AC/DC (−10 %/+15 %) 50/60Hz 100 to 230 V AC (±10 %) 50/60Hz
Power consumption	100 to 230 V: max. 35 VA; 24 V: max. 24 VA

Connection data interface/communication	
Standard	USB, Ethernet
Advanced options	Serial RS232/RS485; Modbus RTU/TCP Slave

Operating conditions	
Ambient temp. range	−10 to +50 °C
Storage temperature	−20 to +60 °C
Climate class	To IEC 60654-1: Class B2
Degree of protection	Front-panel IP 65, NEMA 4; rear-panel IP 20
EMC	Interference immunity: as per IEC 61326 series (industrial environment)/ NAMUR NE 21; Interference emissions: as per IEC 61326-1 Class A

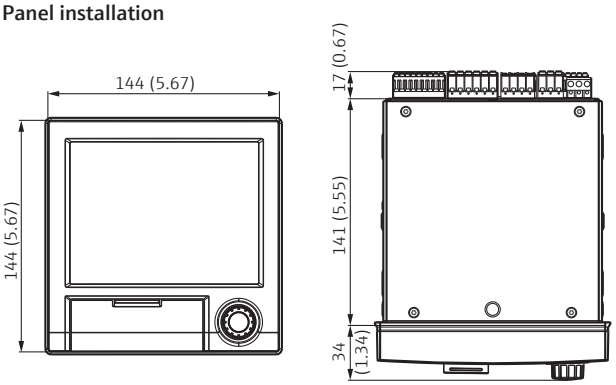
Mechanical construction	
Weight	Panel-mounted version approx. 2.2 kg
Materials	Front frame: Zinc die cast Housing half-panels: sheet steel; Sight glass: Transparent Makrolon plastic

Human interface	
Display	multicolored TFT display (145 mm)
Languages	German, English, Spanish, French, Italian, Dutch, Swedish, Polish, Portuguese, Czech, Russian, Japanese, Chinese

Data storage	
Selectable save cycle	1/2/3/4/5/10/15/20/30 s; 1/2/3/4/5/10/30 min; 1 h
Internal memory	128 MB
Typ. recording length memory cycle 1 min.	4 inputs: 359 weeks 12 inputs: 127 weeks
External memory	supported SD cards: 512 MB up to 32 GB

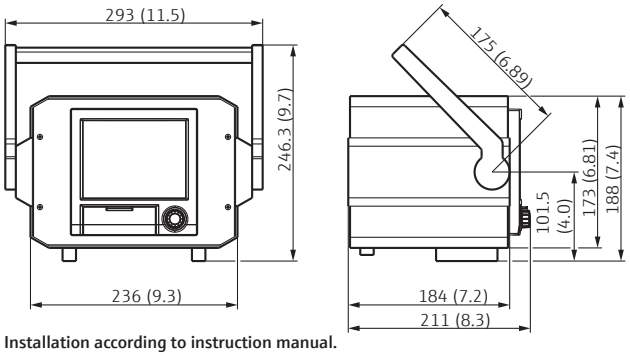
Dimensions in mm (inches)

Panel installation



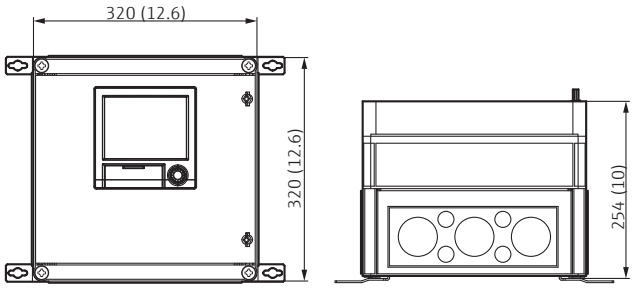
Installation according to instruction manual.

Desktop housing



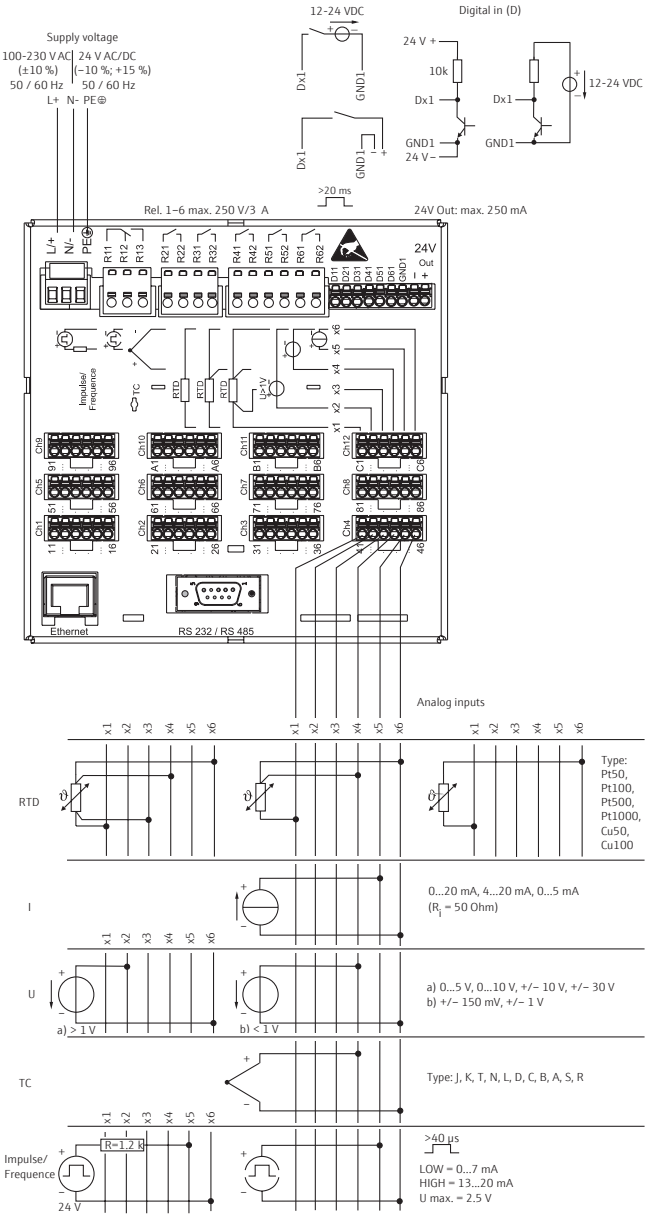
Installation according to instruction manual.

Field housing IP65



Installation according to instruction manual.

Electrical connection



Order codes

Supply voltage

Code	voltage
1	100 to 230 V AC
2	24 V AC/DC

Ecograph T RSG35				Order No.
Version	Input	Communication	Housing	*
Standard	4 × universal	Ethernet + USB	Panel	RSG35-B☐A+AB
			Desk top	RSG35-B1A+ABG2
		RS232/485 + Ethernet + USB	Panel	RSG35-B☐B+AB
			Desk top	RSG35-B1B+ABG2
	8 × universal	Ethernet + USB	Panel	RSG35-C☐A+AB
			Desk top	RSG35-C1A+ABG2
		RS232/485 + Ethernet + USB	Panel	RSG35-C☐B+AB
			Desk top	RSG35-C1B+ABG2
	12 × universal	Ethernet + USB	Panel	RSG35-D☐A+AB
			Desk top	RSG35-D1A+ABG2
		RS232/485 + Ethernet + USB	Panel	RSG35-D☐B+AB
			Desk top	RSG35-D1B+ABG2
	without	Modbus TCP + Ethernet + USB	Panel	RSG35-A☐C+AB
			Desk top	RSG35-A1C+ABG2
		Modbus RTU/TCP + RS232/485 + Ethernet + USB	Panel	RSG35-A☐D+AB
			Desk top	RSG35-A1D+ABG2
Mathematics package	4 × universal	Ethernet + USB	Panel	RSG35-B☐A+ABE1
			Desk top	RSG35-B1A+ABE1G2
		RS232/485 + Ethernet + USB	Panel	RSG35-B☐B+ABE1
			Desk top	RSG35-B1B+ABE1G2
	8 × universal	Ethernet + USB	Panel	RSG35-C☐A+ABE1
			Desk top	RSG35-C1A+ABE1G2
		RS232/485 + Ethernet + USB	Panel	RSG35-C☐B+ABE1
			Desk top	RSG35-C1B+ABE1G2
	12 × universal	Ethernet + USB	Panel	RSG35-D☐A+ABE1
			Desk top	RSG35-D1A+ABE1G2
		RS232/485 + Ethernet + USB	Panel	RSG35-D☐B+ABE1
			Desk top	RSG35-D1B+ABE1G2
	without	Modbus TCP + Ethernet + USB	Panel	RSG35-A☐C+ABE1
			Desk top	RSG35-A1C+ABE1G2
		Modbus RTU/TCP + RS232/485 + Ethernet + USB	Panel	RSG35-A☐D+ABE1
			Desk top	RSG35-A1D+ABE1G2

*Please add code for power supply

Complete product information:
www.endress.com/rsg35

More products to complete your measuring point ...

Point level switch
Liquiphant FTL31
page 8

Pressure switch
Ceraphant PTC31B
page 82

Isolating amplifier
RN22
page 162

Loop-powered indicator for 4 to 20 mA or HART® signals

RIA15

Complete product information:
www.endress.com/ria15

- 5-digit measured value display with backlighting
- Voltage drop ≤1 V
- Powered directly from 4 to 20 mA current loop

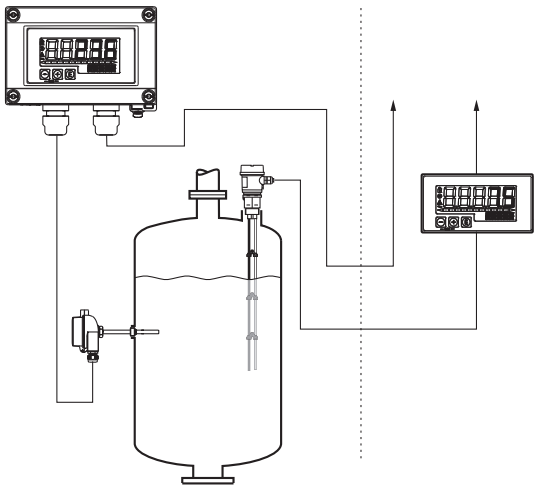
Specs at a glance:

- **Line voltage drop:**
  ≤1 V, display lighting ≤3.9 V
- **Display:**
  5-digit measured value display with dimension
- **Housing:**
  Field or panel housing
- **HART® indicator:**
  up to four HART® values can be indicated in alternation

Application The process indicator RIA15 gathers measurment signals and displays them with high resolution and accuracy. The process indicator is suitable for a wide variety of applications e.g. in switch rooms, cabinets, laboratory instrumentation as well as in plant and apparatus construction.

Function The RIA15 process display unit is looped into the 4 to 20 mA current loop and measures the transmitted current.
The parameterization of the measurement range, the decimal point and the offset can easily be done with the help of three keys on the device. The setting can be done during operation. The measured value indication occurs via a five digit 7-segment LC display. With the optional HART® function up to four measured values of one measurement instrument can be indicated.

Application example



RIA15 as field and panel display

Technical data

Input	
Measuring range	4 to 20 mA (scalable, reverse polarity protect.)
Measured variable	4 to 20 mA current signal optional indication of up to four measured values via HART®
Max. input current	200 mA (short-circuit current)
Voltage drop	Standard device: ≤1 V
	Display lighting: ≤3.9 V independent of the measuring signal
	with HART®: ≤2 V
Max. measured error	±0.1 %
Influence of ambient temperature	<0.01 %/K (0.0056 %/°F) of measuring range

Output	
Transfer behavior	HART® signals are not affected

Operating conditions	
Ambient temperature	−40 to +60 °C (−40 to +140 °F) (At temperatures below −25 °C (−13 °F) the readability of the display can no longer be guaranteed)
Storage temperature	−40 to +85 °C (−40 to +185 °F)
Climate class	IEC 60654-1, Class B2
Electromagnetic compatibility	Interference immunity: as per IEC 61326 (Industrial Environments)/NAMUR NE 21 Interference emission: as per IEC 61326, Class B
Degree of protection	Panel housing: IP65 at front, IP20 at rear
	Field housing: IP67, NEMA4x

Mechanical construction	
Materials	Panel-mount housing: Front: aluminum Rear panel: polycarbonate PC
	Field housing: Aluminum, plastic 2 × cable glands M16
Electrical connection	plug-in spring terminals, terminal range 0.14 to 1.5 mm solid/flexible 0.5 mm² flexible wire with ferrule

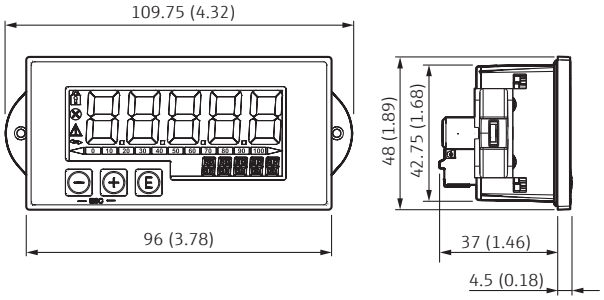
Display and user interface	
Display	5-digit display (17 mm digits), display range: −19 999 to +99 999, bar graph, 14-segment display for unit/TAG
Local operation	3 operating keys

Power supply	
Supply voltage	Powered directly from 4 to 20 mA current loop

Approvals	
Ex approval	ATEX, IECEx, FM, CSA
Marine approval	GL
EAC marc	

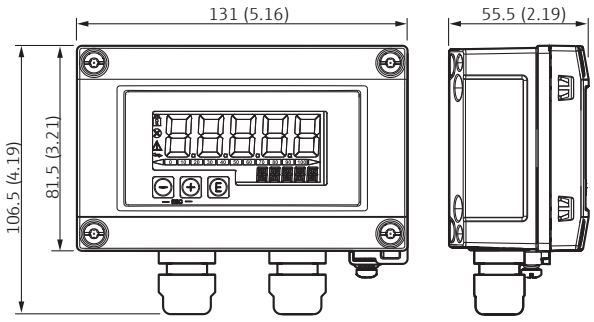
Dimensions in mm (inches)

Panel housing



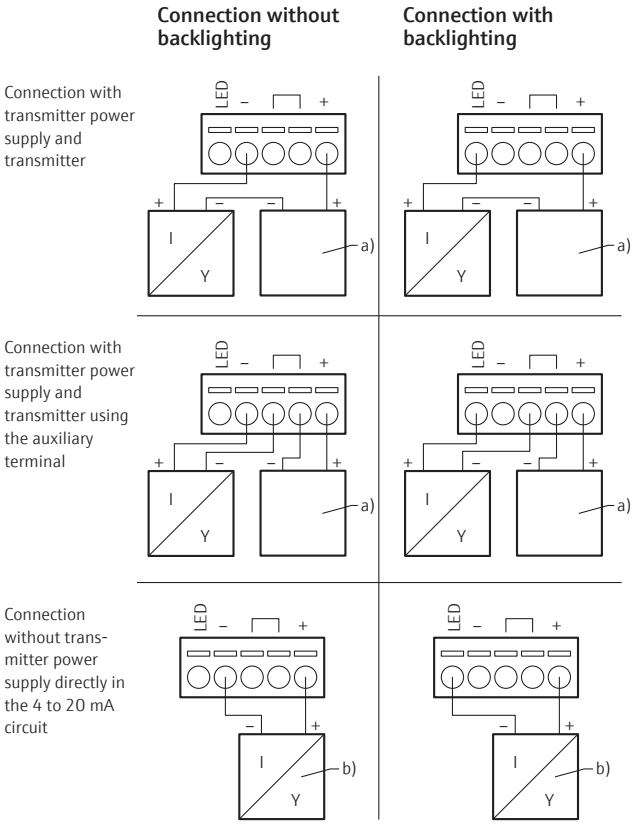
Installation according to instruction manual.

Field Housing



Installation according to instruction manual.

Electrical Connection



a) Transmitter power supply
b) 4 to 20 mA power source

Order codes

RIA15			Order No.
Version	Approval	Housing	
4 to 20 mA	Non-Ex	Panel housing	RIA15-AAA1
		Field housing alu	RIA15-AAB1+NA
		Field housing plastic	RIA15-AAC1+NA
	ATEX II2(1)G Ex ib [ia Ga] IIC T6 Gb	Panel housing	RIA15-BAA1
		Field housing alu	RIA15-BAB1+NA
		Field housing plastic	RIA15-BAC1+NA
4 to 20 mA, HART® communication	Non-Ex	Panel housing	RIA15-AAA2
		Field housing alu	RIA15-AAB2+NA
		Field housing plastic	RIA15-AAC2+NA
	ATEX II2(1)G Ex ib [ia Ga] IIC T6 Gb	Panel housing	RIA15-BAA2
		Field housing alu	RIA15-BAB2+NA
		Field housing plastic	RIA15-BAC2+NA

Complete product information:
www.endress.com/ria15

More products to complete your measuring point ...

Electromagnetic flowmeter
Picomag
page 93

Data manager
Ecograph T RSG35
page 137

Field indicator
RIA16
page 147

Multifunctional process meters with display and control unit

RIA45/RIA46

RIA46

RIA45

Complete product information:
www.endress.com/ria45
www.endress.com/ria46

- 5-digit LCD including bargraph and color alteration
- 1 or 2 channel device with mathematical functionalities
- Wide range power supply

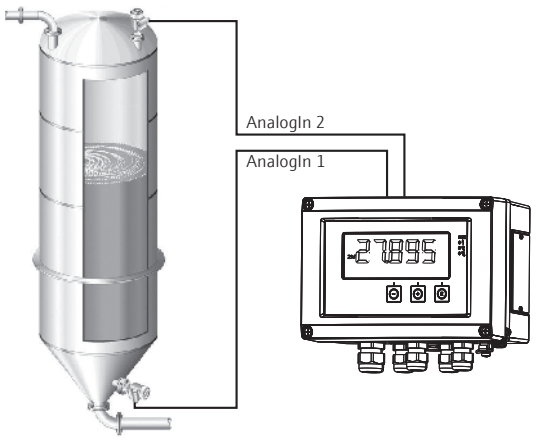
Specs at a glance:

- **Inputs:**
  1/2 universal inputs measuring current, voltage, resistance, temperature (RTD, TC)
- **Outputs:**
  2 relays, 1/2 analog outputs
- **Display:**
  LCD – 2 lines; black/white/yellow; alarm modus: color alteration into red; toggle function between channels
- **Functionalities:**
  Linearization, mathematical calculations (+/–/avg), differential pressure package
- **Dimensions:**
  RIA45: 96 × 48 × 175 mm (3.78" × 1.89" × 6.89")
  RIA46: 133×199×96 mm (5.24" × 7.83" × 3.78")

Application Equipped with an extensive range of functionalities and approvals the RIA45 and RIA46 indicators suit any application in the process industries. Typical applications include displaying and monitoring process values, e.g. where overspill protection is required.
As a panel display the RIA45 is ideal for installation in control rooms, switch cabinets or laboratories while the RIA46 field indicator can be installed within hazardous areas.

Function The indicator detects, evaluates and displays analogue process values. The integrated loop power supply provides power supply to two-wire sensors. Universal inputs allow measuring of current and voltage as well as providing a direct connection to RTDs and thermocouples. For purposes of process control, limit points can be monitored and corresponding integrated relays can be activated. The dual line LC display has been developed especially for the process industries and provides a wide range of information which is programmable. Upon pushing the quick information button the display manually or automatically switches through the various values (process, calculated or memory-values). In the event of a failure the colour of the display alternates to signal an alarm, which is easily visible from distance. The integrated application package "differential pressure" allows a quick, convenient and easy initiation in differential pressure applications.

Application example



Example of application "differential pressure"

Technical data

Input parameters	
Input	1/2× universal input 0 to 20 mA, 4 to 20 mA; Over range: up to 22 mA, 0 to 10 V, 2 to 10 V, 0 to 5 V, 1 to 5 V, ±1 V, ±10 V, ±30 V, ±100 mV, ±150 mV, 30 to 3000 Ω; Pt 100 according to IEC751, GOST, JIS1604, Pt 500 and Pt 1000 according to IEC751; Cu 100, Cu 50, Pt 50, Pt 46, Cu 53 according to GOST; Ni 100, Ni 1000 according to DIN43760; Type J, K, T, N, B, S, R according to IEC584; Type U according to DIN43710; Type L according to DIN43710, GOST; Type C, D according to ASTM E998
Linearization	Linearization of input and calculated values (up to 32 linearization points supported)
Tolerance current	0.05 % of measurement range

Output parameters	
Analog output	1/2 × analog output, 0 to 20 mA, 4 to 20 mA; 0 to 10 V, 2 to 10 V, 0 to 5 V; short-circuit proof, I_{max} < 25 mA
Loop power supply	24 V DC (+15 %/–5 %), max. 25 mA; short-circuit proof and overload proof; galvanically isolated from system and outputs
Status Output	Open collector to monitor device status as well as cable open circuit
Relay	2 changers with function modes: min., max., gradient, alarm, out-band, in-band
Limit function	Max. contact burden DC 30 V/3 A (permanent state, without destruction of the input) Max. contact burden AC 250 V/3 A (permanent state, without destruction of the input) Min. contact load 500 mW (12 V/10 mA)

Operating conditions	
Degree of protection	RIA45: Front: IP65 Back side: IP20 RIA46: IP67/NEMA 4x
Ambient temperature	–20 to +60 °C (–4 to +140 °F)
Storage temperature	–40 to +85 °C (–22 to +185 °F)

Power supply	
Power supply	24 V to 230 V AC/DC

Structural design	
Front (RIA45)	96 × 48 mm (3.78" × 1.89"), cut-out: 92 × 45 mm (3.62" × 1.77")
Depth (RIA45)	151,8 mm (5.98") (w/o ex frame) 175 mm (6.89") (with mounted ex frame)
Field housing (RIA46)	133 × 199 × 96 mm (5.24" × 7.83" × 3.78") glas reinforced plastic or aluminium
Electrical connection	Coded, pluggable spring clip, 2,5 mm²; power supply with screw clamp

Display and user Interface	
Display	LCD 2-lines; black/white/yellow; alarm mode: color alteration into red; toggle function; 1st line: 7 segment, 5-digit, 17 mm (0.67") high; 2nd line: Dot-Matrix free programmable for Bargraph, TAG, unit
LED	2 × Device status; 2 × Relay status
Operation	using three buttons and/or via configuration software FieldCare Device Setup

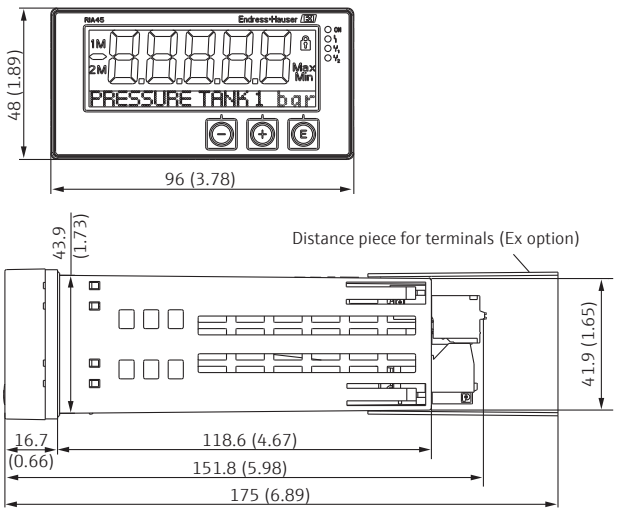
Approvals	
Ex-Approvals	ATEX II(1)GD [Ex ia] IIC; CSA AIS, NI/I/2/ABCDEFG/T4; FM AIS, NI/I/2/ABCDEFG/T4 TIIS [Ex ia] IIC; NEPSI [Ex ia] IIC
Others	SIL2; WHG; GL (German Lloyd) ship building

Software functionalities
Min/max log function/memory, alarm logging, differential pressure application package, 2 calculation channels: sum, difference, average, linearization

Accessories
Configuration software FieldCare Device Setup
Configuration kit TXU10, USB

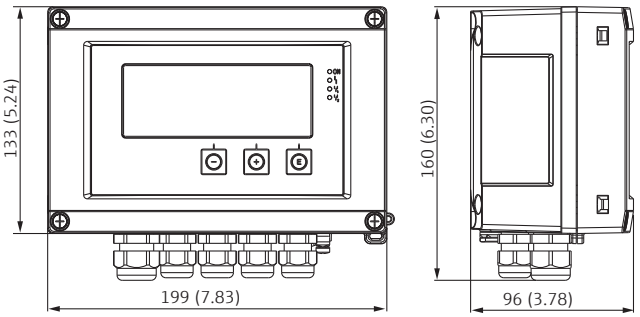
Dimensions in mm (inches)

RIA45



Installation according to instruction manual.

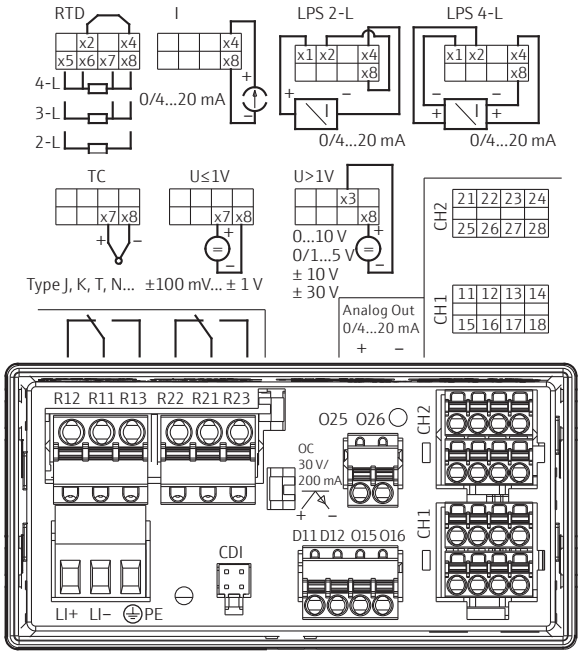
RIA46



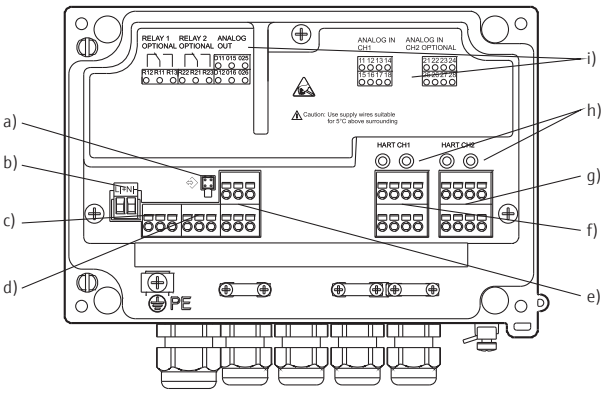
Installation according to instruction manual.

Electrical connection

RIA45



RIA46



a) Connection socket for interface cable
b) Connection supply voltage
c) Connection relay 1 (optional)
d) Connection relay 2 (optional)
e) Connection analog and status output
f) Connection analog input 1
g) Connection analog input 2 (optional)
h) HART® connection sockets
i) Laser labeling of terminal assignment

Order codes

Process indicator RIA45		Order no.
Approval	Input; Output	
Non-hazardous area	1 × Universal; 1 × analog	RIA45-A1A1
	2 × Universal; 2 × analog	RIA45-A1B1
	1 × Universal; 1 × analog + 2 relay	RIA45-A1C1
	2 × Universal; 2 × analog + 2 relay	RIA45-A1D1
ATEX II(1)GD [Ex ia] IIC	1 × Universal; 1 × analog	RIA45-B1A1
	2 × Universal; 2 × analog	RIA45-B1B1
	1 × Universal; 1 × analog + 2 relay	RIA45-B1C1
	2 × Universal; 2 × analog + 2 relay	RIA45-B1D1

Field indicator RIA46*		Order no.
Approval Housing	Input; Output	
Non-hazardous area Field plastic, glass reinforced	1 × Universal; 1 × analog	RIA46-A1A1A
	2 × Universal; 2 × analog	RIA46-A1B1A
	1 × Universal; 1 × analog + 2 relay	RIA46-A1C1A
	2 × Universal; 2 × analog + 2 relay	RIA46-A1D1A
ATEX II(1)GD [Ex ia] IIC Field, Alu	1 × Universal; 1 × analog	RIA46-B1A2A
	2 × Universal; 2 × analog	RIA46-B1B2A
	1 × Universal; 1 × analog + 2 relay	RIA46-B1C2A
	2 × Universal; 2 × analog + 2 relay	RIA46-B1D2A

* All versions without cable gland. We are pleased to offer you further device versions.

Accessories	Order no.
Configuration kit TXU10-for PC-programmable devices. set-up programme+interface cable for PC with USB-Port. 4 pin plug	TXU10-AC

Complete product information:
www.endress.com/ria45 ww.endress.com/ria46

More products to complete your measuring point ...

Capacitive probe
Liquicap T FMI21
page 43

Pressure sensor
Cerabar PMC21
page 72

Temperature sensor
iTHERM ModuLine TM121
page 113

Loop-powered field indicators

RIA14/RIA16

Complete product information:
www.endress.com/ria14
www.endress.com/ria16

- 5-digit backlit LC display
- One limit value
- Bargraph and units

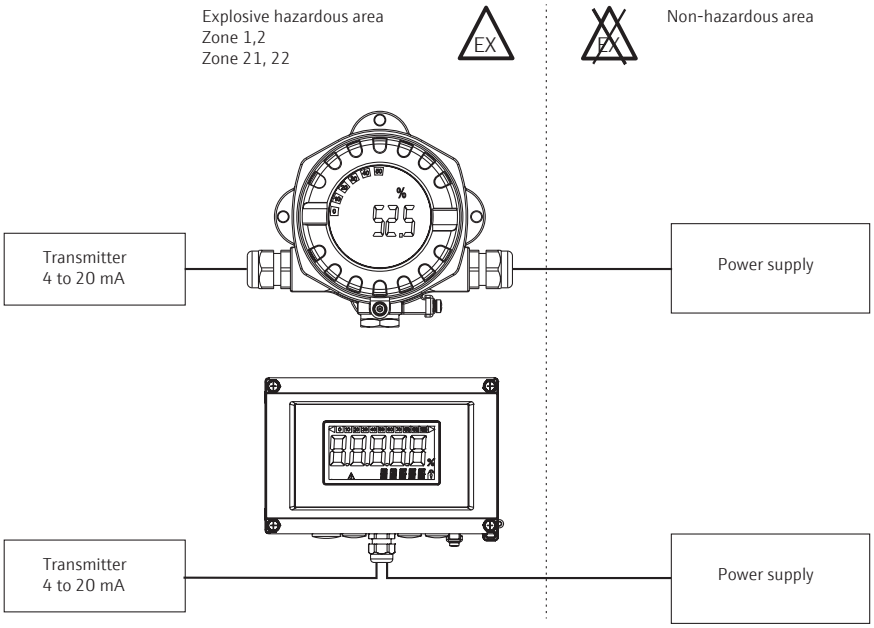
Specs at a glance:

- **Line voltage drop:**
  <4 V at 3 to 22 mA
- **Display:**
  5-digit LC display
- **Degree of protection:**
  IP 67, NEMA 4X
- **Maximum measured error:**
  <0.1 % of scaled display range

Application The RIA14/RIA16 field indicators monitor measurement signals and display them with high resolution and accuracy.
The indicators feature one Open Collector output for monitoring a limit value. They permit universal installation and are particularly suitable for use in the field or in mobile rigs.

Function The indicator records an analog measuring signal and shows this on the display. The LC display shows the current measured value digitally and as a bargraph with limit value violation signalling.
The indicator is looped into the 4 to 20 mA circuit and obtains the required energy from there.

Application example



Technical data

Input	
Measuring range	4 to 20 mA (reverse polarity protection)
Line voltage drop	<4 V at 3 to 22 mA
Max. line voltage drop	<6 V at max. short-circuit current 200 mA

Output	
Output	Digital limit switch Passive, open collector: I_{max} = 200 mA, U_{max}= 35 V, $U_{low/max}$ = <2 V at 200 mA Max. reaction time to limit value = 250 ms
Signal on alarm	No measured value visible on the LC display, no background illumination; open collector inactive

Performance characteristics	
Reference operating conditions	T= 25 °C (77 °F)
Max. measured error	<0.1 % of scaled display range
Influence of ambient temperature	Effect on the accuracy when ambient temperature changes by 1 K: 0.01 %

Operating conditions	
Mounting location	Wall or pipe mounting
Ambient temp. limits	–40 to +80 °C (–40 to +176 °F) (at <–20 °C (<–4 °F) the display can react slowly; at <–30 °C (–22 °F) readability of the display cannot be guaranteed)
Storage temperature	–40 to +80 °C (–40 to +176 °F)
Electrical safety	As per IEC 61010-1, UL61010-1, CSA C22.2 No. 1010.1-92
Climate class	As per IEC 60654-1, Class C
EMC	As per EN 61326 (IEC 61326) and NAMUR (NE21)
Degree of protection	IP 67, NEMA 4X

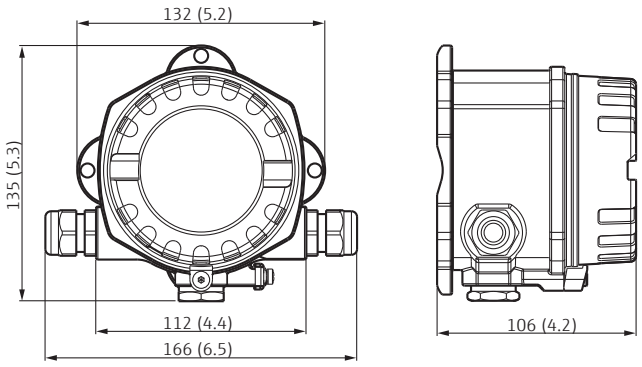
Mechanical construction	
Material	RIA14: housing: die-cast aluminum AlSi10Mg with powder coating on polyester basis; optional: Stainless steel 1.4405; RIA16: housing: Fiber-glass reinforced plastic PBT-GF30; optional: Aluminum AlSi12
Weight	RIA14: aluminium housing: approx. 1.6 kg (3.53 lbs) stainless steel housing: approx. 4.2 kg (9.26 lbs) RIA16: plastic housing: approx. 500 g (1.1 lbs) aluminum housing: approx. 1.7 kg (3.75 lbs)
Terminals	Cables/wires up to max. 2.5 mm² (14 AWG) plus ferrule

Human interface	
Display range	–19999 to +99999
Offset	–19999 to +99999
Character height	RIA14: 20.5 mm (0.81") RIA16: 26 mm (1.02")
Signalling	Measuring range overshoot/undershoot
Operating elements	3-key operation (–/+/E) integrated in device, access with housing open
Remote operation	The device is configured with the FieldCare PC operating software

Approvals	
RIA14	ATEX II2G Ex d IIC T6/T5/T4; ATEX II2D, FM, CSA, GL, UL
RIA16	ATEX II2(1)G Ex ib[ia] IIC T6/T5/T4, FM, CSA, GL, UL

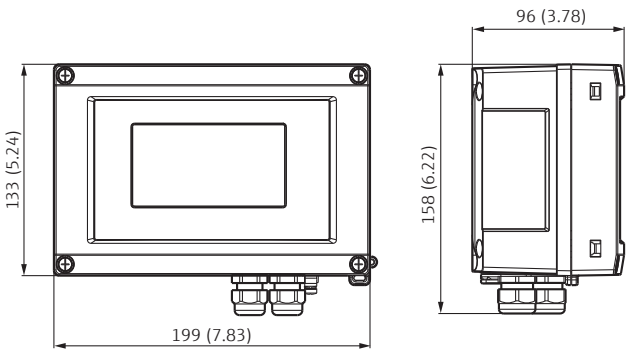
Dimensions in mm (inches)

RIA14



Installation according to instruction manual.

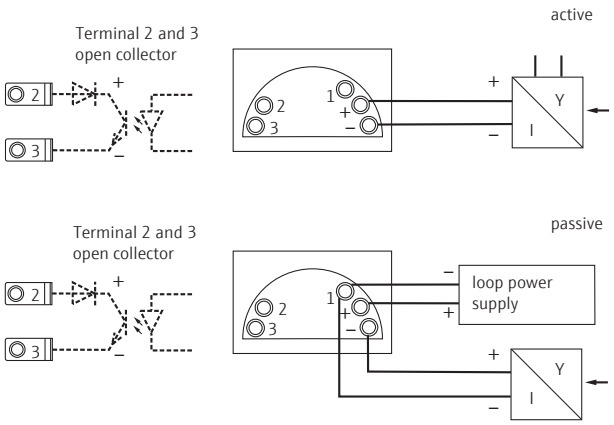
RIA16



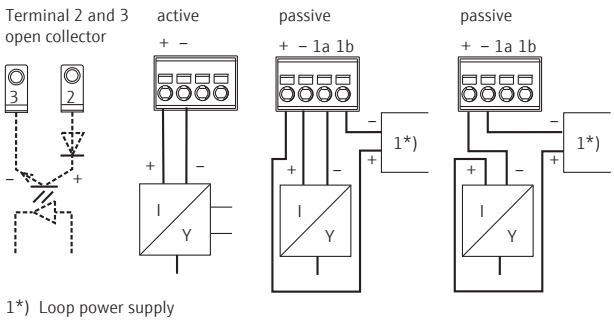
Installation according to instruction manual.

Electrical Connection

RIA14



RIA16



1*) Loop power supply

Order codes

Process indicator RIA14		Order no.
Housing	Approval	
Field, alu die cast	Non-Ex	RIA14-AA3C
	Non-Ex, pipe mounting bracket 2", 316L	RIA14-AA3C+I4
	ATEX II2(1)G Ex ib[ia] IIC T6	RIA14-BA3C
	ATEX II2(1)G Ex ib[ia] IIC T6/T5/T4, pipe mounting bracket 2", 316L	RIA14-BA3C+I4

Field indicator RIA16		Order no.
Housing	Approval	
Plastics, glass fiber reinforced	Non-hazardous area	RIA16-AA1A+E1
	Mounting kit wall/tube	RIA16-AA1A+E1I2
Alu	Non-hazardous area	RIA16-AA2A+E1
	Mounting kit wall/tube	RIA16-AA2A+E1I2
	ATEX II2(1)G Ex ib[ia] IIC T6	RIA16-BA2A+E1
	Mounting kit wall/tube	RIA16-BA2A+E1I2

Accessories	Order no.
Mounting set wall+pipe (W08)	71089844
Configuration kit TXU10-for PC-programmable devices. set-up programme+interface cable for PC with USB-Port. 4 pin plug	TXU10-AC

Complete product information:
www.endress.com/ria14
www.endress.com/ria16

More products to complete your measuring point ...

Point level switch
Liquiphant FTL31
page 8

Pressure sensor
Cerabar PMC21
page 72

Process transmitter
RMA42
page 157

Field indicators with FOUNDATION Fieldbus™ or PROFIBUS® PA

RID14/RID16

RID16

RID14

FOUNDATION

Complete product information:
www.endress.com/rid14
www.endress.com/rid16

- Bright, backlit LC indicator with bar graph, diagnostic symbols and plain text field
- Listener mode for up to 8 analog channels or digital statuses
- Optional aluminum housing for Ex applications

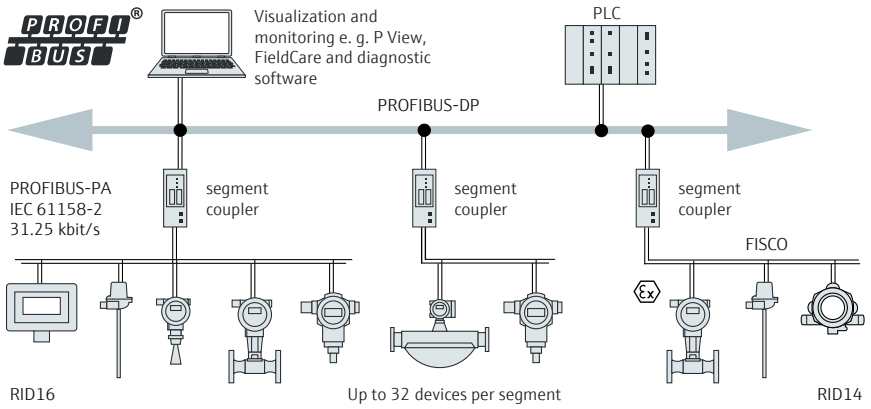
Specs at a glance:

- **Communication and data processing:** FOUNDATION Fieldbus™ OR PROFIBUS® PA
- **Degree of protection:** IP 67, NEMA 4X
- **Approvals:** ATEX Ex ia, Ex nA; FM IS, NI; CSA IS, NI

Application The RID14/RID16 field indicators monitor measurement signals and display them with high resolution and accuracy. Due to the backlit display they permit universal installation and are particularly suitable for use in the field or in mobile rigs.

Function The 8-channel indicator displays the measured values, calculated values and status information of the fieldbus users in a fieldbus network. In the listener mode, the device listens to the set fieldbus addresses and displays their specific values. Furthermore, values available on the bus can also be displayed via function block interconnection in the case of a FOUNDATION Fieldbus™ indicator. The process value status is indicated by icons or as plain text on the measured value display. The plain text display makes it possible to display alphanumeric character combinations, such as the TAG. The device is powered by the fieldbus and can be used in hazardous areas up to temperature class T6.

Application example



System integration via PROFIBUS® PA

Technical data

Communication and data processing	
FOUNDATION Fieldbus™	FOUNDATION Fieldbus™ H1, IEC 61158-2
	FDE (Fault Disconnection Electronic) = 0 mA
	Data transmission rate: supported baud rate = 31.25 kBit/s
	Signal coding = Manchester II
	LAS (link active scheduler), LM (link master) function is supported
	In acc. with IEC 60079-27, FISCO/FNICO
PROFIBUS® PA	PROFIBUS® PA in accordance with EN 50170 Volume 2, IEC 61158-2 (MBP)
	FDE (Fault Disconnection Electronic) = 0 mA
	Data transmission rate: supported baud rate = 31.25 kBit/s
	Signal coding = Manchester II
	Connection data in accordance with IEC 60079-11 FISCO, Entity

Power supply	
Supply voltage	Voltage is supplied via the fieldbus. U = 9 to 32 V DC, polarity-independent (max. voltage U_b = 35 V)
Current consumption	≤11 mA
Cable entry	RID14: Thread M20, NPT½; RID16: Thread M16, NPT½

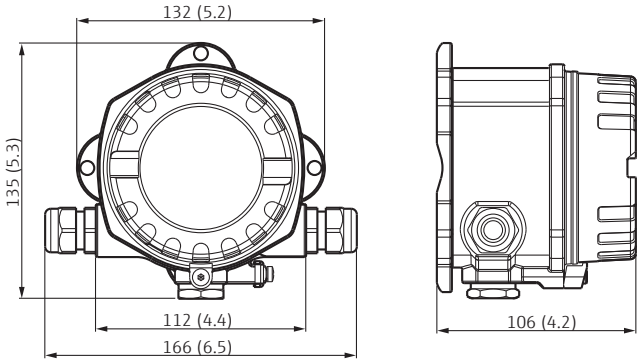
Operating conditions	
Ambient temperature limits	−40 to +80 °C (−40 to 176 °F) The display can react slowly at temperatures < −20 °C (−4 °F). The readability of the display is no longer guaranteed at temperatures < −30 °C (−22 °F).
Storage temperature	−40 to +80 °C (−40 to 176 °F)
Climate class	According to IEC 60654-1, Class C
Degree of protection	IP67. NEMA 4X.

Mechanical construction	
Material	RID14: Housing: Die-cast aluminum AlSi10Mg with powder coating on polyester base; optional: Stainless steel 1.4405
	RID16: Housing: Fiber-glass reinforced plastic PBT-GF30; optional: Aluminum AlSi12
Weight	RID14: Aluminum housing: approx. 1.6 kg (3.5 lb) Stainless steel housing: approx. 4.2 kg (9.3 lb)
	RID16: Plastic housing: approx. 500 g (1.1 lb) Aluminum housing: approx. 1.7 kg (3.75 lb)
Terminals	Screw terminals for cables up to max. 2.5 mm² (14 AWG) plus ferrule

Approvals	
RID14	FM IS, CSA IS, ATEX Ex ia, ATEX Ex d IEC
RID16	FM IS, IN, CSA IS, NI, ATEX Ex ia, ATEX Ex d IEC

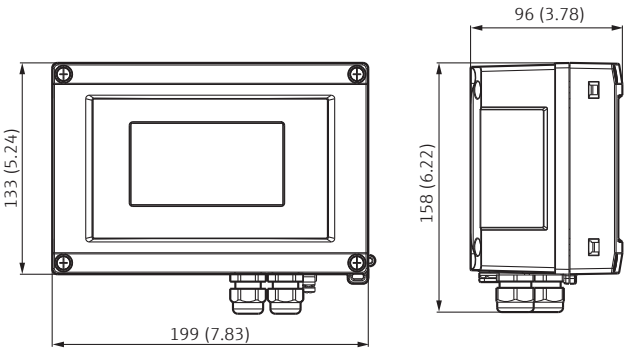
Dimensions in mm (inches)

RID14



Installation according to instruction manual.

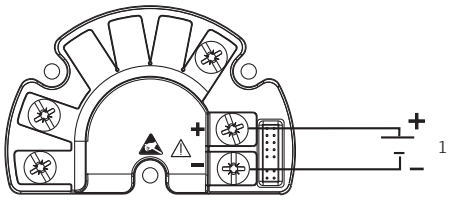
RID16



Installation according to instruction manual.

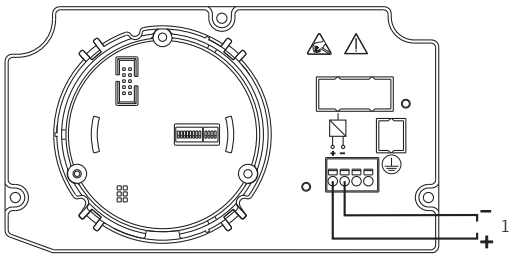
Electrical Connection

RID14



1 Foundation Fieldbus™ or PROFIBUS® PA

RID16



1 Foundation Fieldbus™ or PROFIBUS® PA

Order codes

RID14			Order No.
Housing	Approval	Communication	
Die-cast aluminum	Non-hazardous area	Foundation Fieldbus™	RID14-AA3C1
		PROFIBUS® PA	RID14-AA3C2
	ATEX II 1G Exia IIC T4/T5/T6	Foundation Fieldbus™	RID14-BA3C1
		PROFIBUS® PA	RID14-BA3C2

RID16			Order No.
Housing	Approval	Communication	
Fiber-glass reinforced plastic	Non-hazardous area	Foundation Fieldbus™	RID16-AA1A1
		PROFIBUS® PA	RID16-AA1A2
Aluminum	ATEX II 1G Exia IIC T4/T5/T6	Foundation Fieldbus™	RID16-BA2A1
		PROFIBUS® PA	RID16-BA2A2

Complete product information:
www.endress.com/rid14
www.endress.com/rid16

More products to complete your measuring point ...


Point level switch
Liquiphant FTL31
page 8


Pressure sensor
Cerabar PMC21
page 72


Process transmitter
RMA42
page 157

Process display with digital output, monitoring and pump control functions

RIA452

Complete product information:
www.endress.com/ria452

- Input with two-wire loop power supply and intrinsic safety option
- Pump control function
- Digital output with integration

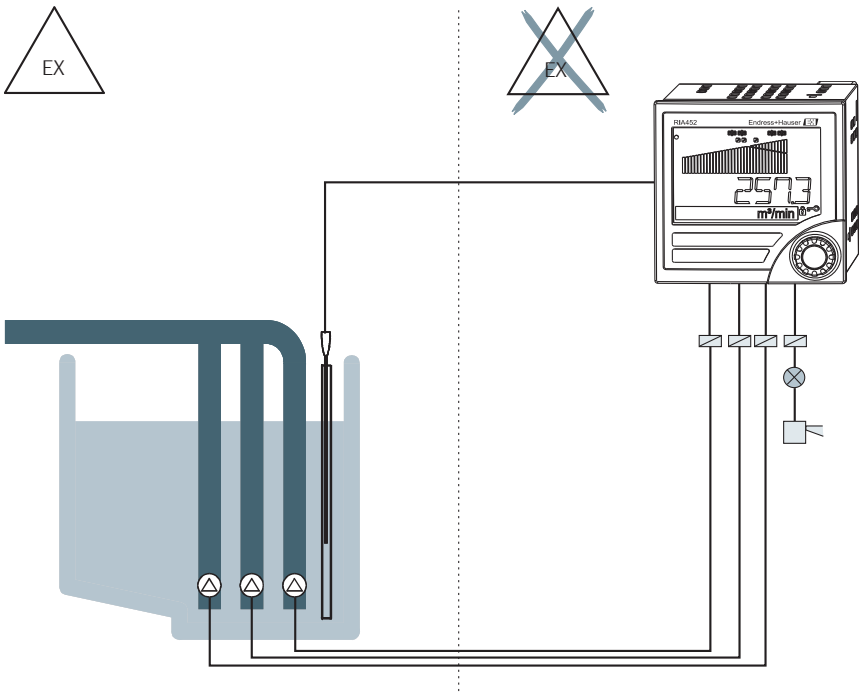
Specs at a glance:

- **Display:**
  7-digit/14 segment multicolored
- **Approval:**
  ATEX via external RB223 (included)
- **Standard Dimensions:**
  96 × 96 mm (3.78" × 3.78")
- **Relays:**
  4 or 8 (optional)
- **Function:**
  Linearization, pump control function, integration
- **Output:**
  Optional 1 × analog output

Application The RIA452 process display interprets and displays process signals with high resolution and accuracy. It can also be used to automate control tasks via limit values or analogue and digital outputs.

Function Up to eight presettable relays monitor the measured value for any infringement (undershooting/ overstepping) of the preset limit values. Further operation modes for the relays are sensor or device errors, batch and pump control functions (e.g. alternating pump control). The scalable analog output offers wide options to transfer the input signal: zoom function, linearization, offset, inverting and signal conversion (conversion in-/output). The optional impuls output offers the possibility to create integrated process values. Simple setting up using a serial interface and PC programme or manually using the configurating dial on the front of the unit.

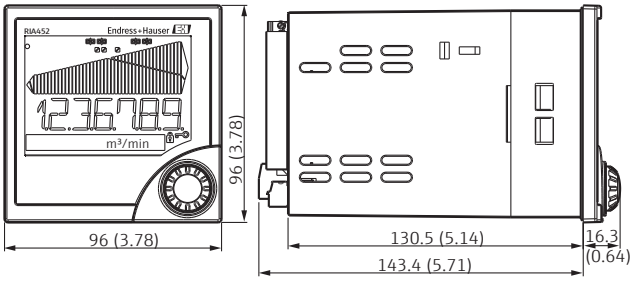
Application example



Technical data

Input	
Analog input	1 × 0/4 to 20 mA (impedance 5 Ω)
Universal input	0/4 to 20 mA, 0 to 5 mA, ±40 mV, ±150 mV, ±600 mV, ±2,5 V, 0 to 10 V, 0 to 5 V, ±10 V, 30 to 3000 Ω resistance thermometer Pt100/500/1000, Cu50/100, Pt50 thermocouple types J, K, T, N, B, S, R to IEC 584; D, C to ASTM E998; L to DIN 43710, GOST
Digital input	4 ×, max. 10 Hz
Accuracy	0.1 % of the measurement range end value
Output	
Transmitter supply	24 V DC, 250 mA, on option intrinsically safe 1 × 24 V DC, 22 mA in addition
Analog output	1 × 0/4 to 20 mA, 0 to 10 V DC
Output impedance	Max. ≤600 Ω
Digital output	1 × open collector passive 12.5 kHz 4 × relays (changeover contact), 250 V AC/ 30 V DC, 3-A; expandable to 8 relays (option)
Linearity	≤0.1 % of the measurement range end value
Operating conditions	
Ambient temperature	−20 to +60 °C (−4 to 140 °F)
Storage temperature	−30 to +70 °C (−22 to 158 °F)
Climatic class	To IEC 60 654-1 class B2 bedewing is forbidden
EMC	Interference immunity to IEC 61326 (industrial environment) and NAMUR NE 21; interference emissions to IEC 61326 Class A
Ingress protection	Front IP 65, Terminals IP 20
Power supply	
Supply voltage	90 to 250 V AC, 50/60 Hz 20 to 36 V DC/20 to 28 V AC, 50/60 Hz
Mechanical construction	
Electrical connection	Plug on screw terminals, size 1.5 m² solid, 1.0 mm² multi with ferrule
Materials used	Housing front: ABS plastic, electro-plated Housing casing: PC10GF plastic
User interface	
Display	7 digit 14-segment LC-display in white (10 mm/0.39"); engineering unit with 9 × 77 Dot Matrix display; 42-parts bargraph in yellow with over- and under range in red; limit value markings in yellow; status display
Range of display	−99999 to +99999
Operation	via Jog-Shuttle or using RS232 and PC software ReadWin® 2000
Functions	
Features	Linearization with 32 points, elapsed hour indicator, alternating pump control, tendency analysis, batch-function, integration, min/ max value storage
Approvals	
Ex approval	ATEX II (1) GD [EEx ia] IIC

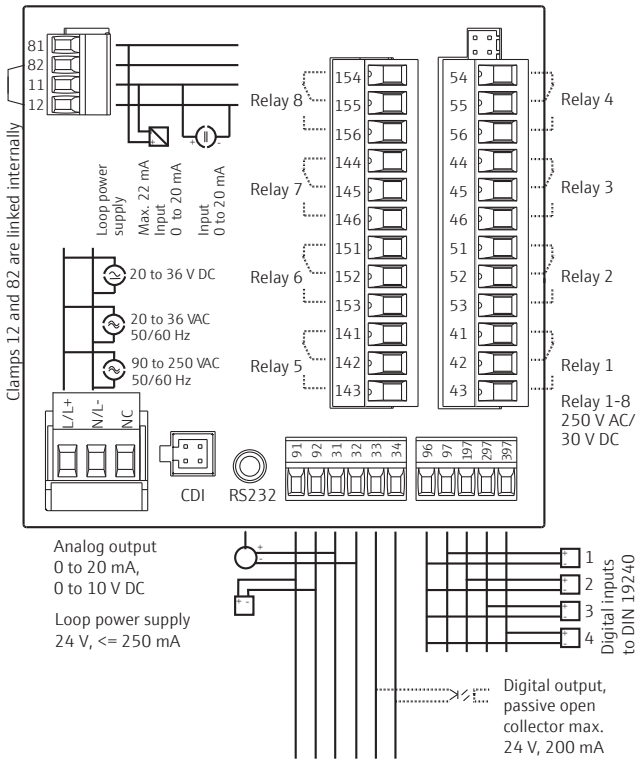
Dimensions in mm (inches)



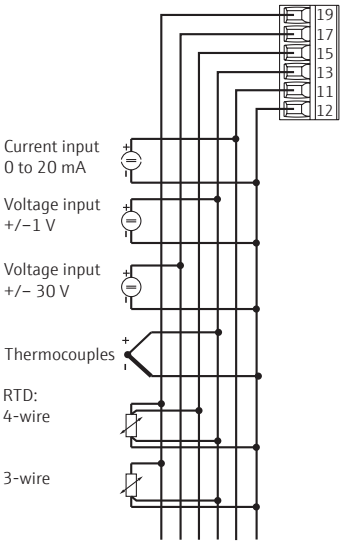
Installation according to instruction manual.

Electrical connection

Current input



Universal input



Order codes

Power supply

Code	Voltage
1	90 to 250 V AC
2	20 to 36 V DC/20 to 28 V AC

Process indicator RIA452			Order no.
Approval	Measuring Signal	Output	
Non-hazardous area	0/4 to 20mA	4 limit values	RIA452-A☐11A11A
		4 limit values, analog	RIA452-A☐12A11A
		4 limit values, pulse and integration	RIA452-A☐15A11A
	Universal U,I,R,RTD,TC	4 limit values	RIA452-A☐21A11A
		4 limit values, analog	RIA452-A☐22A11A
		4 limit values, pulse and integration	RIA452-A☐25A11A
ATEX II(1) GD(EEx ia) IIC	0/4 to 20mA	4 limit values	RIA452-G☐11A11A
		4 limit values, analog	RIA452-G☐12A11A
		4 limit values, pulse and integration	RIA452-G☐15A11A

* Please add code for power supply

Accessories	Order no.
Configuration kit, USB	TXU10-AA
Field housing RIA452 (200 × 160 × 228 mm)	51009957

Complete product information:
www.endress.com/ria452

More products to complete your measuring point ...


Pressure sensor
Cerabar PMP11
page 66


Electromagnetic flowmeter
Picomag
page 93


Data manager
Ecograph T RSG35
page 137

Universal process transmitter with control unit

RMA42

Complete product information:
www.endress.com/rma42

- 1 or 2 universal inputs, optional intrinsically safe
- Backlit 5-digit LCD
- 2 limit value relays with additional status output

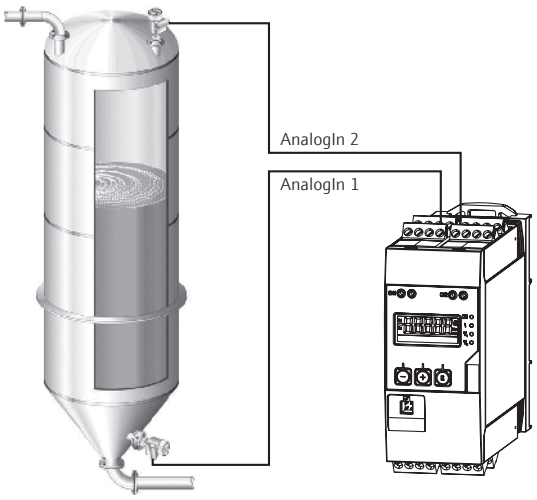
Specs at a glance:

- **Inputs:**
  1/2 universal inputs measuring current, voltage, resistance, temperature, optional intrinsically safe
- **Functionalities:**
  Linearization, mathematical calculations, differential pressure package
- **Outputs:**
  2 relays, 1/2 analog outputs
- **Dimensions:**
  45 × 115 × 118 mm (1.77" × 4.53" × 4.66")
- **Display:**
  LCD – 2 lines; black/white/yellow; toggle function between channels

Application Due to its universal design RMA42 is suitable for many industries such as chemical, water and waste water and food and beverages. Typical applications include monitoring of signals for any violation of preset limit values (also to WHG) as well as transmission of signals from hazardous areas, differential pressure applications and signal multiplying. RMA42 can be installed in a switch cabinet or used in a field housing.

Function The RMA42 process transmitter powers the transmitter or sensor and processes the analog signals from those. These signals are monitored, evaluated, calculated, saved, separated, linked, converted and displayed. The signals, intermediate values and the results of calculations and analysis are transmitted by digital or analog means. With the two relays the process can be controlled.

Application example



Example of application "differential pressure"

Technical data

Input parameters	
Input	1/2 × universal input 0 to 20 mA, 4 to 20 mA; Over range: up to 22 mA, 0 to 10 V, 2 to 10 V, 0 to 5 V, 1 to 5 V, ±1 V, ±10 V, ±30 V, ±100 mV, 30 to 3000 Ω; Pt 100 according to IEC60751, GOST, JIS1604, Pt 500 and Pt 1000 according to IEC60751; Cu 100, Cu 50, Pt 50, Pt 46, Cu 53 according to GOST; Ni 100, Ni 1000 according to DIN43760; Type J, K, T, N, B, S, R according to IEC60584; Type U according to DIN43710; Type L according to DIN43710, GOST; Type C, D according to ASTM E998
Linearization	2 Linearization tables of input values (up to 32 linearization points supported)

Output parameters	
Analog output	1/2 × analog output, 0 to 20 mA, 4 to 20 mA; 0 to 10 V, 2 to 10 V, 0 to 5 V; short-circuit proof, I_{max} <25 mA
Loop power supply	24 V DC (+15 %/−5 %), max. 30 mA; short-circuit proof and overload proof; galvanically isolated from system and outputs
Status Output	Open Collector to monitor device status as well as cable open circuit
Relay	2 changers with function modes: min, max, gradient, alarm, out-band, in-band
Limit function	Max. contact burden DC 30 V/3 A (permanent state, without destruction of the input) Max. contact burden AC 250 V/3 A (permanent state, without destruction of the input) Min. contact load 500 mW (12 V/10 mA)

Operating conditions	
Protection Class	DIN rail housing IP20
Ambient temperature	−20 to +50 °C (−4 to 122 °F)
Storage temperature	−40 to +85 °C (−40 to 185 °F)

Power supply	
Wide range power supply	24 V to 230 V AC/DC (−20%/+10%) 50/60 Hz

Structural design	
Housing (W × H × D)	45 × 115 × 118 mm (1.77" × 4.53" × 4.66")
Electrical Connection	Pluggable screw clamps, 2,5 mm²

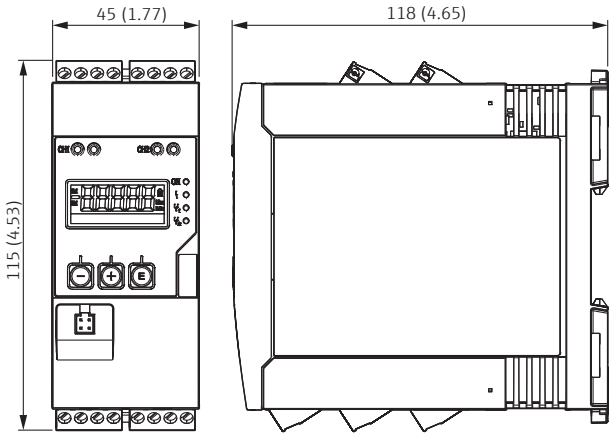
Display and user interface	
Display	LCD 2-lines; black/white/yellow; toggle function; 1st line: 7 segment, 5-digit; 2nd line: Dot-Matrix free programmable for Bargraph, TAG, unit
LED	2× Device status; 2× Relay status
Operation	using three buttons and/or via configuration software FieldCare Device Setup

Approvals	
Ex-Approvals	ATEX II(1)GD [Ex ia] IIC
Others	SIL2, UL, GL, CSA GP

Software functionalities
Min/Max log function/memory, alarm logging, differential pressure application package, 2 calculation channels: sum, difference, average, linearization

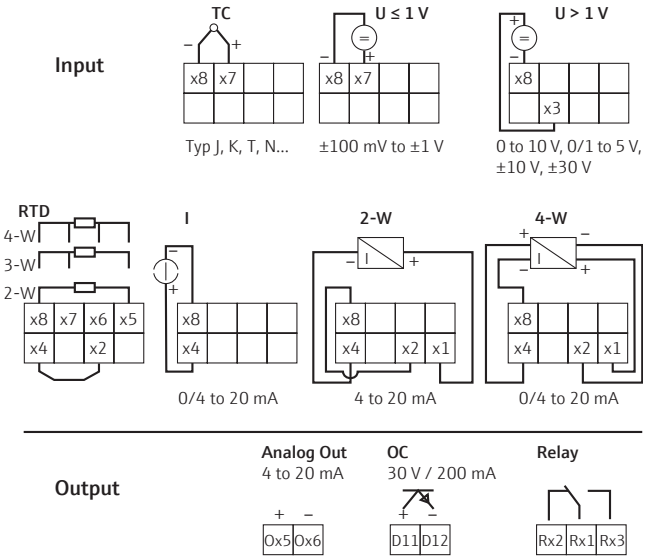
Accessories
Configuration software FieldCare Device Setup
Commubox TXU10 (including FieldCare Device Setup)

Dimensions in mm (inches)



Installation according to instruction manual.

Electrical connection



Order codes

Process transmitter RMA42		Order no.
Approval	Input; Output	
Non-hazardous area	1 × universal; 1 × analog	RMA42-AAA
	2 × universal; 2 × analog	RMA42-AAB
	1 × universal; 1 × analog + 2 relay	RMA42-AAC
	2 × universal; 2 × analog + 2 relay	RMA42-AAD
ATEX II(1)GD [Ex ia] IIC	1 × universal; 1 × analog	RMA42-BHA
	2 × universal; 2 × analog	RMA42-BHB
	1 × universal; 1 × analog + 2 relay	RMA42-BHC
	2 × universal; 2 × analog + 2 relay	RMA42-BHD

Accessories	Order no.
Configuration kit USB	TXU10-AC
Protective housing IP 66 for max. 2 RMA42 (182 × 180 × 165 mm)	52010132

Complete product information:
www.endress.com/rma42

More products to complete your measuring point ...


Capacitive probe
Liquicap T FMI21
page 43


Kompakt termometre
iTHERM CompactLine TM311
page 104


Temperature transmitter
iTEMP TMT80
page 128

Limit switch with loop power supply

RTA421

Complete product information:
www.endress.com/rta421

- 2 relays for setpoint monitoring (with changeover contacts)
- LC display for alarm setpoints and bargraph
- Front end setup using 3 push buttons

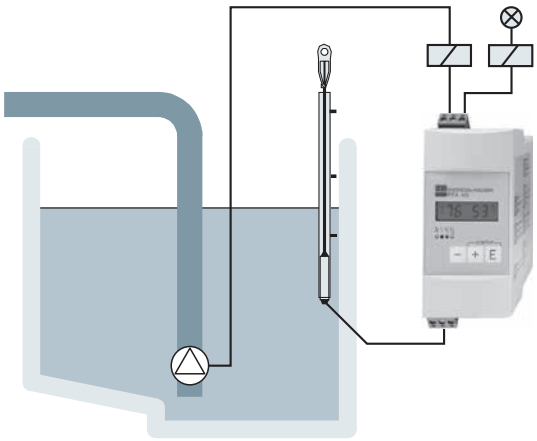
Specs at a glance:

- **Limit function:**
  2 relays
- **Input:**
  Current, voltage
- **Transmitter power supply:**
  Optional
- **Time delay:**
  0 to 99 s

Application The RTA421 contactor is used to monitor and protect industrial processes. The unit has two independent relays which offers a number of cost-effective applications such as pump control in wastewater technology and level monitoring in containers. The quick setup feature allows for changes of limit values and the unit is particularly suited for use in plant and engineering applications as well as switching cabinets.

Function The instrument evaluates current signals (0/4 to 20 mA) and voltage signals (0/2 to 10 V) and switches upon going over or under the predefined limit values. Both limit values are shown on the display. The bargraph displays the connected signal in percentages. A 2-digit bar code is available as an option to prevent entry of limit value.

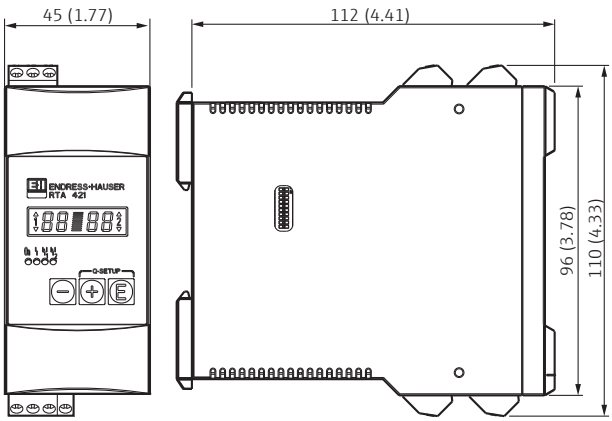
Application example



Technical data

Input	
Input	Current: 0/4 to 20 mA, 20 to 0/4 mA, max. 150 mA, R_i: 5 Ω Voltage: 0/2 to 10 V, 10 to 0/2 V, max. 50 V, R_i: 1 MΩ; Integration time: 4/s
Accuracy	0.5 % FSD
Temperature drift	0.02 %/K ambient temperature
Output	
Output (option)	24 V ±20 %, 30 mA
Output (Relays)	2, binary, switches when alarm setpoint is reached, 1 potential free changeover contact per relay, Contact load ≤ 250 V AC, 8 A, 30 V DC, 5 A
Mechanical construction	
Housing (W×H×D)	45 × 110 × 112 mm (1.77" × 4.33" × 4.41")
Weight	Approx. 150 g (5.29 oz)
Materials Housing	Plastic PC/ABS, UL 940
Electrical connection	Keyed, plug on screw terminals, core sizes flexible to 1.5 mm²
User interface	
LED	Operation, 1 × green (2 mm/0.08") Fault condition, 1 × red (2 mm/0.08") Alarm setpoint, 2 × yellow (2 mm/0.08")
LC display	Numeric display 4 × 7 segment (6 mm/0.24"); alarm setpoint condition 2× channel number, 4 × 1 segment; bargraph 10 × 1 segment
Display range	2 × 0 to 99 %
Operation	3 pushbutton operation
Power supply	
Supply voltage	196 to 250 V AC, 50/60 Hz 98 to 126 V AC, 50/60 Hz 20 to 250 V DC/AC, 50/60 Hz
Power consumption	Max. 9 VA

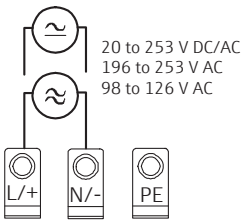
Dimensions in mm (inches)



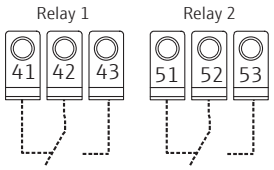
Installation according to instruction manual

Electrical connection

Power supply

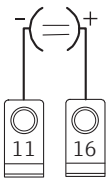


Relays (internal circuit)

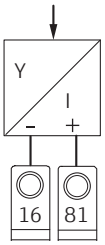


Contact condition shown in alarm or power out

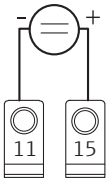
Current input 0/4 to 20 mA



Current input with loop power supply (option) 4 to 20 mA



Voltage input 0/2 to 10 V DC



Order codes

Limit switch RTA421		Order no.
Loop Power Supply	Power Supply	
without	196 to 250V AC	RTA421-A11A
	98 to 126V AC	RTA421-A21A
	20 to 250V DC/AC	RTA421-A31A
with	196 to 250 VAC	RTA421-A12A
	98 to 126V AC	RTA421-A22A
	20 to 250V DC/AC	RTA421-A32A

Accessories	Order no.
Protective housing IP 66 for max. 2 RTA421 (182 × 180 × 165 mm)	52010132

Complete product information:
www.endress.com/rta421

More products to complete your measuring point ...


Electromagnetic flowmeter
Picomag
page 93


Data manager
Ecograph T RSG35
page 137


Field indicator
RIA16
page 147

Active barrier or signal doubler, HART-transparent

RN22

NEW!

Complete product information:
www.endress.com/rn22

- I/O, 4-20 mA, active or passive
- Connection lugs integrated on front for HART® communicators
- Simple and quick wiring with plug-in terminals, optional power supply via DIN rail bus connector

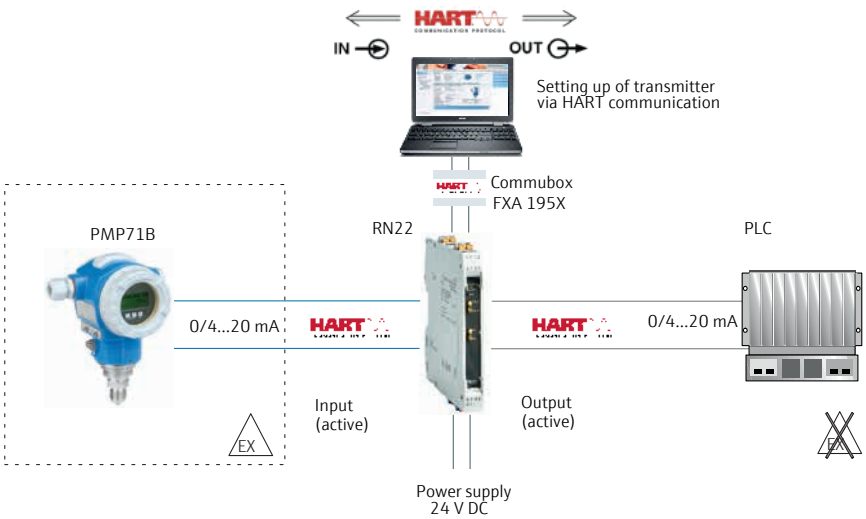
Specs at a glance:

- **Version:**
  1-channel, 2-channel, Signal doubler
- **Transmitter feed voltage:**
  17,5 V ±1 V at 20 mA
- **Idle voltage:**
  24.5 V ±5 %
- **Approval:**
  ATEX, SIL2-compliant

Application The RN22 isolating amplifier supplies two-wire devices - also intrinsically safe as an option - and transmits the signal using galvanic isolation. It can also be passive at the input and transmit the signal with galvanic isolation. The dual-channel version can also be employed as a signal doubler, meaning one input signal is sent to two outputs in parallel.

Function The active barrier is used for the transmission and galvanic isolation of 0/4 to 20 mA signals. The device has an active/passive current input to which a 2- or 4-wire transmitter can be directly connected. The output of the device can be operated actively or passively. The current signal is then available to the PLC/controller or to other instrumentation at plug-in screw terminals or optional push-in terminals. HART communication signals are transmitted bidirectionally by the device. Connecting points for connecting HART communicators are integrated into the front of the device.

Application example



Technical data

Version	
The following versions are available	1-channel, 2-channel, Signal doubler

Input data, measuring range	
Input signal range (underrange/overrange)	0 to 22 mA
Function range, input signal	0/4 to 20 mA
Input voltage drop signal for 4-wire connection	<7 V at 20 mA
Transmitter supply voltage	17.5 V ±1 V at 20 mA Open-circuit voltage: 24.5 V ±5 %

Output data	
Output signal range (underrange/overrange)	0 to 22 mA
Function range, output signal	0/4 to 20 mA
Transmission behavior	1:1 to input signal
NAMUR NE 43	A current at the input that is valid according to NAMUR NE 43 is transmitted to the output (within the specified measuring uncertainty range)
Maximum load, active mode	≤500 Ω
Open-circuit voltage, active mode	17.5 V (± 5%)
Maximum load, passive mode	$R_{max}=(U_{ext}$ - 2 V)/0.022 A
External voltage, passive mode	U_{ext}=12 to 30 V
Transmissible communication protocols	HART®
Line break in input	Input 0 mA/output 0 mA
Line short circuit in input	Input > 22 mA/output > 22 mA
Power supply/input; power supply/output Input/output; output/output	Testing voltage: 3000 V_{AC} 50 Hz, 1 min
Input/input	Testing voltage: 500 V_{AC} 50 Hz, 1 min

Connecting the supply voltage	
Power can be supplied via terminals 1.1 and 1.2 or via the DIN rail bus connector.	
Power is supplied via a feed in and error message module	To supply the voltage to the DIN rail bus connector, the RNF22 feed in and error message module is recommended. Total power of 3.75 mA is possible with this option.

Performance characteristics Power supply[1)]	
Supply voltage	24 V_{DC} (-20%/+25%)
Supply current to the DIN rail bus connector	max. 400 mA
Power consumption at 24 V_{DC}	1-channel: ≤1.5 W (20 mA)/≤1.6 W (22 mA) 2-channel: ≤3 W (20 mA)/≤3.2 W (22 mA Signal doubler: ≤2.4 W (20 mA)/≤2.5 W (22 mA)
Current consumption at 24 V_{DC}	1-channel: ≤0.07 A (20 mA)/≤0.07 A (22 mA) 2-channel: ≤0.13 A (20 mA)/≤0.14 A (22 mA) Signal doubler: ≤0.1 A (20 mA)/≤0.11 A (22 mA)
Power loss at 24 V_{DC}	1-channel: ≤1.2 W (20 mA)/≤1.3 W (22 mA) 2-channel: ≤2.4 W (20 mA)/≤2.5 W (22 mA) Signal doubler: ≤2.1 W (20 mA)/≤2.2 W (22 mA)

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

Response time	
Step response (10 to 90 %)	≤ 1 ms
Step response (10 to 90 %) signal doubler output 2 HART® filter	≤ 50 ms

Reference operating conditions	
Calibration temperature	+25 °C ±3 K (77 °F ±5.4 °F)
Supply voltage	24 V_{DC}/230 V_{AC}
Output load	225 Ω
External output voltage (passive output)	20 V_{DC}
Warm-up	>1 h

Maximum measured error Accuracies	
Transmission error	< 0.1 %/of full scale value (< 20 µA)
Temperature coefficient	< 0.01 %/K

Long-term drift
Max. ±0.1 %/year (of full scale value)

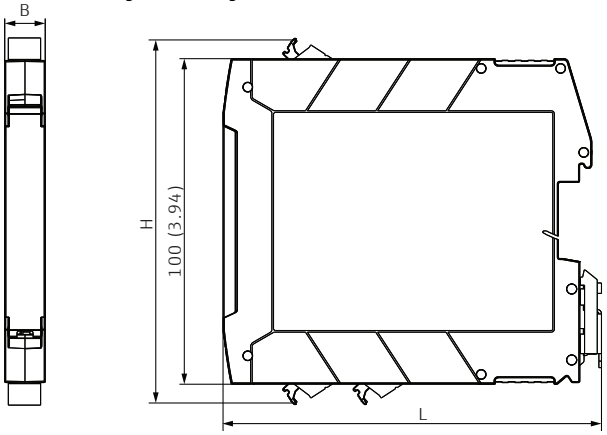
Important ambient conditions	
Ambient temp. range	–40 to 60 °C (–40 to 140 °F)
Degree of protection	IP 20
Pollution degree	2
Altitude	≤2000 m (6562 ft)
Insulation class	Class III
Storage temperature	–40 to 80 °C (–40 to 176 °F)
Overvoltage category	II
Luftfeuchte	5 to 95 %
Maximum temperature change rate	0.5 °C/min, no condensation permitted
Shock and vibration resistance	Sinusoidal vibrations, in accordance with IEC 60068-2-6 – 5 to 13.2 Hz: 1 mm peak – 13.2 to 100 Hz: 0.7g peak
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 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 (CISPR 11) Group 1 Class A

Mechanical construction	
Weight	Device with terminals (values rounded up): 1-channel: approx. 105 g (3.7 oz); 2-channel: approx. 125 g (4.4 oz); signal doubler: 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

[1)] The data apply for the following operating scenario: input active/output active/output load 0 Ω. When external voltages are connected to the output, the power loss in the device may increase. The power loss in the device can be reduced by connecting an external output load.

Dimensions in mm (inches)

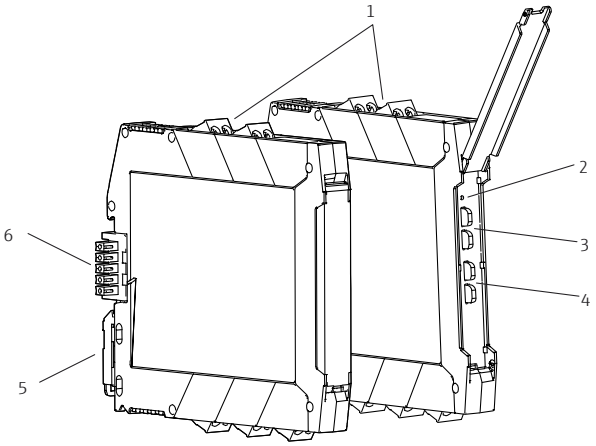
Terminal housing for mounting on DIN rail



Installation according to instruction manual

Width (B) × length (L) × height (H) (with terminals):
12.5 mm (0.49 in) × 116 mm (4.57 in) × 107.5 mm (4.23 in)

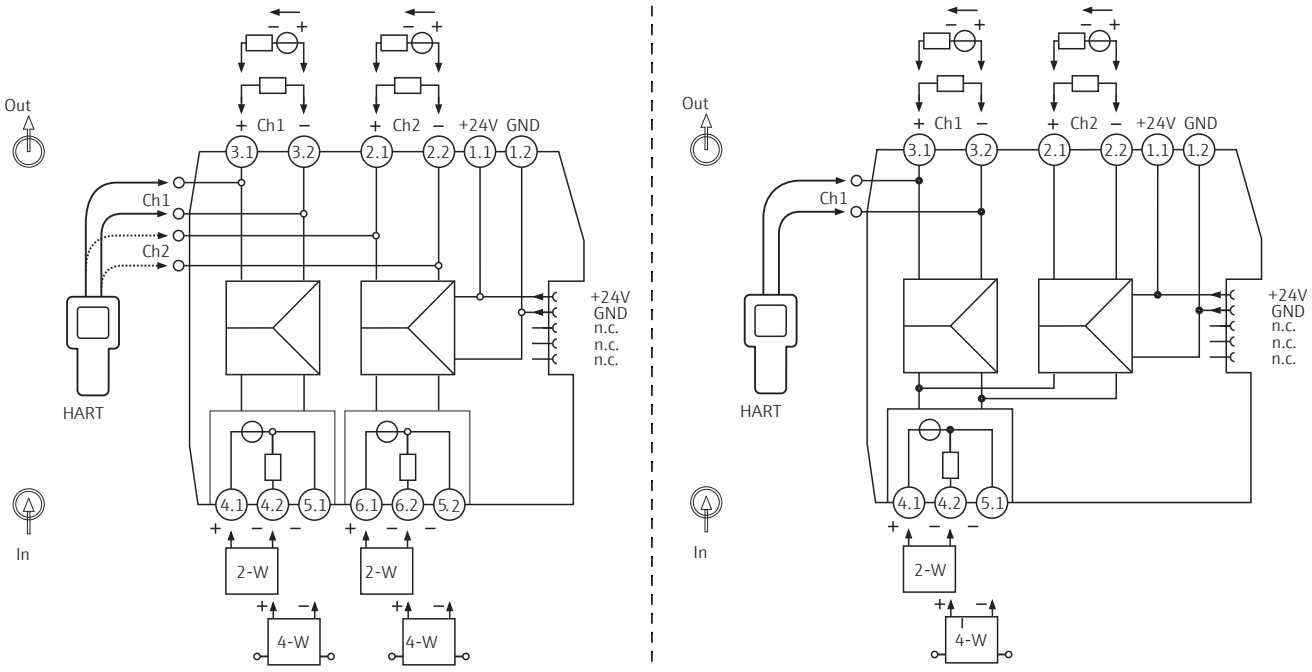
Display and operating elementste



1 – Plug-in screw or push-in terminal
2 – Green LED "On", power supply
3 – Connection lugs for HART communication (channel 1)
4 – Connection lugs for HART communication (channel 2, option)
5 – DIN rail clip for DIN rail mounting
6 – DIN rail bus connector (optional)

Electrical connection

Quick wiring guide



Terminal assignment: 1- and 2-channel version (left), signal doubler (right)

Order codes

Terminals

Code	Version
A	Screw terminals
B	Push-in spring terminals

RN22*			Order no.
SIL2	Version	Approval	*
No	1 channel	Non Ex	RN22-AA1 ☐
		ATEX	RN22-BL1 ☐
	2 channel	Non Ex	RN22-AA2 ☐
		ATEX	RN22-BL2 ☐
	signal doubler	Non Ex	RN22-AA3 ☐
		ATEX	RN22-BL3 ☐
Yes	1 channel	Non Ex	RN22-AA1 ☐ LA
		ATEX	RN22-BL1 ☐ LA
	2 channel	Non Ex	RN22-AA2 ☐ LA
		ATEX	RN22-BL2 ☐ LA

Accessories	Order no.
Power and error message module 24V DC, Screw terminals	RNF22-AAA
Power and error message module 24V DC, Push-in spring terminals	RNF22-AAB
Power and error message module 24V DC, Screw terminals ATEX	RNF22-BNA
Power and error message module 24V DC, Push-in spring terminals ATEX	RNF22-BNB
System power supply RNB22, 24V DC/2,5A	RNB22-AAA
DIN rail bus connector 12.5 mm	71505349

Complete product information:
www.endress.com/rn22

NAMUR isolating amplifier

RLN22

NEW!

Complete product information:
www.endress.com/rln22

- Compact housing width: 12.5 mm (0.49 in)
- Installation in Ex zone 2 permitted in the option with Ex approval
- Optional with power supply and error message via DIN rail bus connector

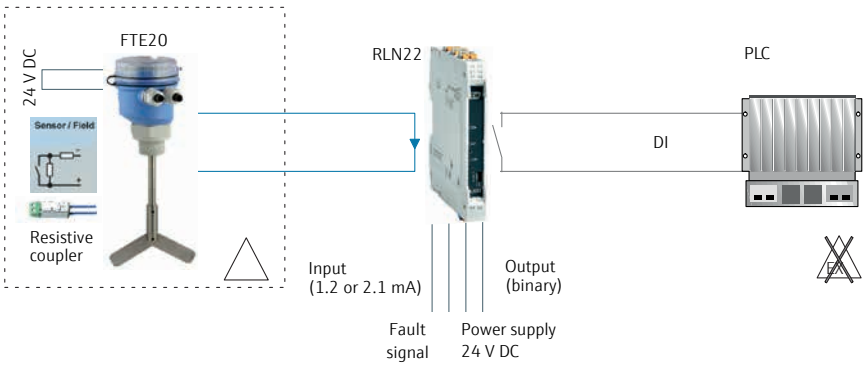
Specs at a glance:

- **Versions:**
  1-channel: 1 contact
  2-channel: 1 contact per channel
- **Connection voltage:**
  Voltage is supplied via connection terminals 1.1 and 1.2 or the DIN rail bus connector
- **Voltage range:**
  19.2 to 30 VDC
  (24 VDC (-20%/+25%))
- **Ambient temperature range:**
  -40 to 60 °C (-40 to 140 °F)

Application The Namur isolating amplifier is used whenever a switching signal has to be galvanically isolated or transmitted from the ex-zone. Signals from Namur sensors or from switch contacts, wired with a resistor bridge, can be transmitted.

Function With the "1-channel changeover" option, the 1-channel NAMUR isolating amplifier is designed for the operation of proximity switches (as per EN 60947-5-6 (NAMUR)) and open and mechanical contacts with resistive coupling elements. A relay (changeover) is available as the signal output. The device is optionally available with Ex approvals for the intrinsically safe operation of proximity switches 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!

Application example



Technical data

Version	
The following versions are available	1-channel, 2-channel

Input data	
floating switch contacts with resistive coupling elements to connect NAMUR proximity switches (IEC/EN 60947-5-6)	
Switch points	Blocking: < 1.2 mA, Conducting: > 2.1 mA
Short-circuit current	~8 mA
Switching hysteresis	<0.2 mA
Line fault detection	Line break: 0.05 mA < I_{IN} < 0.35 mA Short-circuit: 100 Ω < R_{sensor} < 360 Ω
Open-circuit voltage	~ 8 V_{DC}

Relay output data	
Contact version	1-channel: 1 changeover 2-channel: 1 NO contact per channel
Switching voltage, maximum switching current	250 V_{AC} (2 A)/120 V_{DC} (0,2 A)/30 V_{DC} (2 A)
Maximum switching capacity	500 VA
Contact material	AgSnO2, hard gold plated
Mechanical operating life	10^7 switching cycles
Recommended minimum load	5 V/10 mA
Switching frequency (no load)	≤20 Hz

Signal on alarm	
Output behavior in an alarm condition	If line fault detection is switched on and the line to the sensor is disconnected or short-circuits, the relay deenergizes in such a way that the output is set to the safe, non-conducting state.
Line break in input	0.05 mA < I_{IN} < 0.35 mA
Line short circuit in input	100 Ω < R_{Sensor} < 380 Ω

Galvanic isolation	
Input/output	Peak value as per EN 60079-11, 375 V
Input/power supply, DIN rail bus connector	Peak value as per EN 60079-11, 375 V

Connecting the supply voltage	
Power can be supplied via terminals 1.1 and 1.2 or via the DIN rail bus connector.	
Power is supplied via a feed in and error message module	To supply the voltage to the DIN rail bus connector, the RNF22 feed in and error message module is recommended. Total power of 3.75 mA is possible with this option.
Power to the DIN rail bus connection via a feed in connection terminals	Connected devices can be supplied with up to a total of 400 mA via the device's connection terminals using the DIN rail bus connection. A 630 mA fuse (medium time-lag or slow-blow) is recommended.

Performance characteristics	
Supply voltage range	19.2 to 30 V_{DC}, (24 V_{DC} (-20%/+25%))
Supply current to the DIN rail bus connector	max. 400 mA
Current consumption at 24 V_{DC}	1-channel: ≤21 mA 2-channel: ≤35 mA
Power consumption at 24 V_{DC}	1-channel: <0,65 W 2-channel: <0,8 W
Power loss at 24 V_{DC}	1-channel: <0,65 W 2-channel: <1 W

Response time
Following a change of state at the input, the output adopts the safe state in ≤ 40 ms.

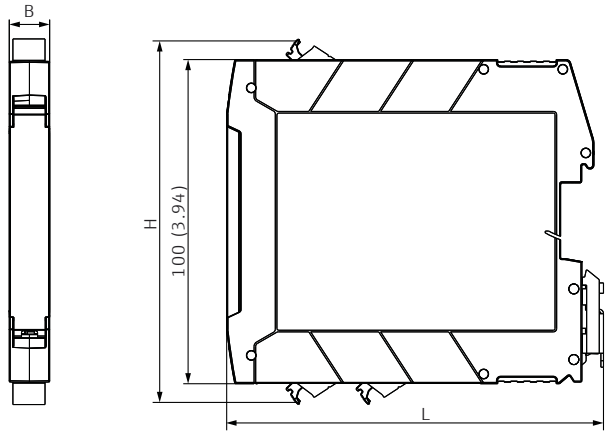
Installation	
Mounting location	The device is designed for installation on 35 mm (1.38 in) DIN rails in accordance with IEC 60715(TH35).
Installing a DIN rail device	The device can be installed in any position (horizontal or vertical) on the DIN rail without lateral clearance from neighboring devices. No tools are required for installation. The use of end brackets (type "WEW 35/1" or similar) on the DIN rail is recommended to fix the device.

Important ambient conditions	
Ambient temperature range	-40 to 60 °C (-40 to 140 °F)
Degree of protection	IP 20
Pollution degree	2
Altitude	≤2000 m (6562 ft)
Storage temperature	-40 to 80 °C (-40 to 176 °F)
Overvoltage category	II
Humidity	10 to 95 % No condensation
Shock and vibration resistance	Vibration resistance as per DNVGL-CG-0339 : 2015 and DIN EN 60068-2-27 DIN rail device: 2 to 100 Hz at 0.7g (general vibration stress)
	Shock resistance as per KTA 3505 (section 5.8.4 Shock test)
Electromagnetic compatibility (EMC)	Interference immunity as per EN 61000-6-2 Interference emission as per EN 61000-6-4

Mechanical construction	
Weight	Device with terminals (values rounded up): 1-channel: approx. 110 g (3.88 oz); 2-channel: approx. 120 g (4.23 oz)
Materials	All the materials used are RoHS-compliant. Housing: polycarbonate (PC); flammability rating according to UL94: V-0

Dimensions in mm (inches)

Terminal housing for mounting on DIN rail

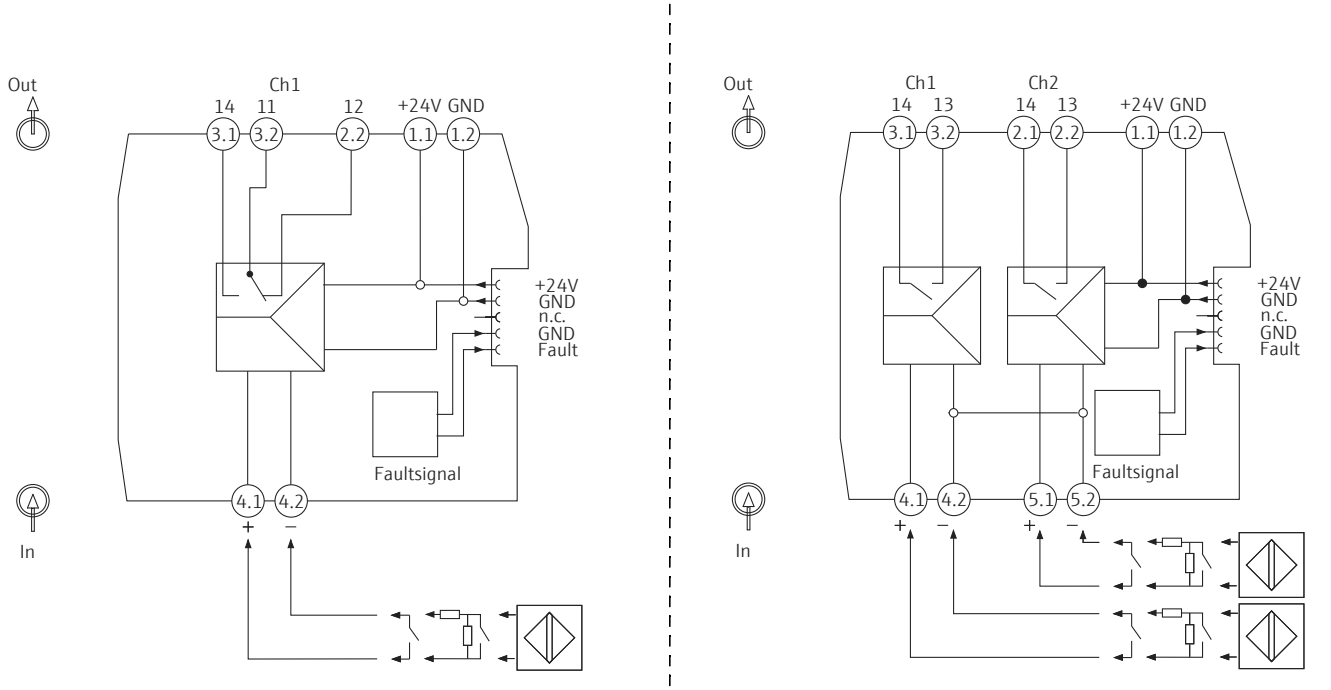


Installation according to instruction manual

Width (B) × length (L) × height (H) (with terminals):
12,5 mm (0.49 in) × 116 mm (4.57 in) × 107.5 mm (4.23 in)

Electrical connection

Quick wiring guide



Terminal assignment RLN22: 1- and 2-channel version (left), signal doubler (right)

Terminal design	Cable design	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)	0.2 to 2.5 mm² (24 to 14 AWG)
	Flexible with wire end ferrules (with or without plastic ferrule)	0.25 to 2.5 mm² (24 to 14 AWG)
Push-in spring terminals	Rigid or flexible (Stripping length = 10 mm (0.39 in)	0.2 to 2.5 mm² (24 to 14 AWG)
	Flexible with wire end ferrules (with or without plastic ferrule)	0.25 to 2.5 mm² (24 to 14 AWG)

Order codes

Terminals

Code	Version
A	Screw terminals
B	Push-in spring terminals

RLN22*			Order no.
SIL2	Version	Approval	*
No	1 channel	Non Ex	RLN22-AA1 ☐
		ATEX	RLN22-BM1 ☐
	2 channel	Non Ex	RLN22-AA2 ☐
		ATEX	RLN22-BM2 ☐
Yes	1 channel	Non Ex	RLN22-AA1 ☐ LA
		ATEX	RLN22-BM1 ☐ LA
	2 channel	Non Ex	RLN22-AA2 ☐ LA
		ATEX	RLN22-BM2 ☐ LA

Accessories	Order no.
Power and error message module 24V DC, Screw terminals	RNF22-AAA
Power and error message module 24V DC, Push-in spring terminals	RNF22-AAB
Power and error message module 24V DC, Screw terminals ATEX	RNF22-BNA
Power and error message module 24V DC, Push-in spring terminals ATEX	RNF22-BNB
System power supply RNB22, 24V DC/2,5A	RNB22-AAA
DIN rail bus connector 12.5 mm	71505349

Complete product information:
www.endress.com/rln22

Output isolating amplifier, HART-transparent

RNO22

NEW!

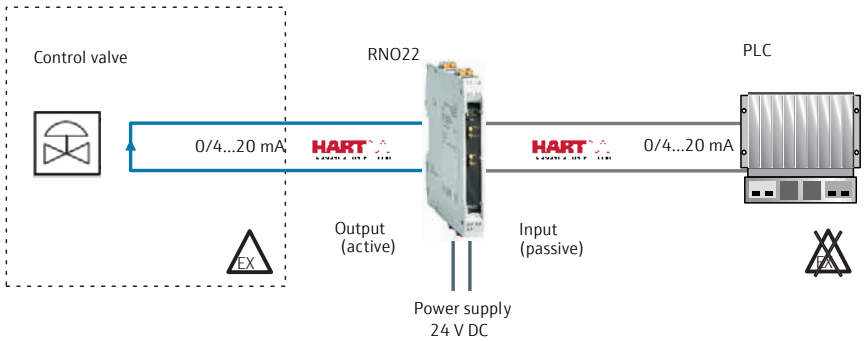
- Simple and quick wiring with plug-in terminals, optional power supply via DIN rail bus connector
- Compact housing width: 12.5 mm (0.49 in)
- High transmission accuracy, line break and short-circuit monitoringy

Specs at a glance:

- **Version:**
  1-channel, 2-channel
- **Function (short-circuit detection deactivated; 1-channel only):**
  0...20 mA
- **Supply voltage:**
  24 VDC (-20%/+25%)
- **Ambient temperature range:**
  -40 to 70 °C (-40 to 158 °F)

Complete product information:
www.endress.com/rno22

Application example



Application The output isolating amplifier is utilized whenever active, non-intrinsically safe control signals in ex-zones must be be transmitted with galvanica isolation. These signals can be used to display measurement values or sent to actuators. The HART® signal is transmitted bi-directionally.

Function 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!

Technical data

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
Safety	0 to 24 mA
Line fault detection: input current response threshold	>0,2 mA

Output data	
Current output signal: (intrinsically safe):	
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)	100 to 700 Ω/500 Ω
Short-circuit detection off (20/24 mA)	0 to 700 Ω/500 Ω
Transmissible communication protocols	HART®
Output ripple	<20 mV_{rms}

Error detection	
Wire break detection	>10 kΩ
Short-circuit detection	<50 Ω

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

Performance characteristics	
Supply voltage	24 V_{DC} (-20%/+25%)
Current fed into the DIN rail bus connector	max. 400 mA
Power loss at 24 V_{DC}/20 mA	1-channel: < 0.8 W 2-channel: < 1.4 W
Maximum current consumption at 24 V_{DC}/20 mA	1-channel: < 45 mA 2-channel: < 85 mA
Maximum power consumption at 24 V_{DC}/20 mA	1-channel: ≤ 1.1 W 2-channel: < 2 W
Power supply failure	To meet the requirements of SIL and NE21, voltage interruptions of up to 20 ms must be bridged with a suitable power supply.

Response time	
Step response (10 to 90 %)	< 140 µs (with step 4 to 20 mA)

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

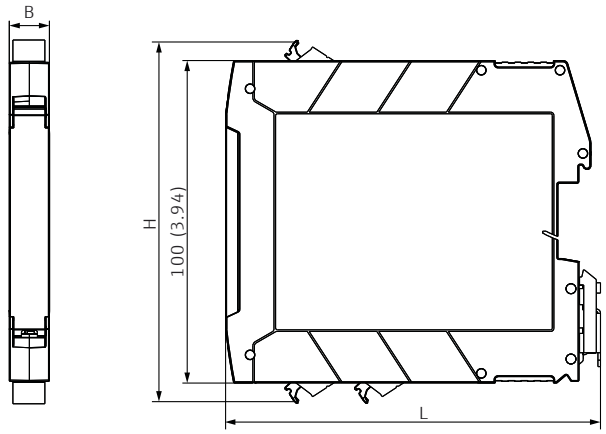
Installation	
Mounting location	The device is designed for installation on 35 mm (1.38 in) DIN rails in accordance with IEC 60715 (TH35).

Important ambient conditions	
Ambient temperature range	–40 to 70 °C (–40 to 158 °F)
Degree of protection	IP 20
Pollution degree	2
Storage temperature	–40 to 85 °C (–40 to 185 °F)
Overvoltage category	II
Humidity	5 to 95 % no condensation
Shock and vibration resistance	Vibration resistance as per DNVGL-CG-0339 : 2015 and DIN EN 60068-2-27 DIN rail device: 2 to 100 Hz at 0.7 g (general vibration stress)
Electromagnetic compatibility (EMC)	CE compliance Electromagnetic compatibility in accordance with all the relevant requirements of the IEC/ EN 61326 series. For details, refer to the Declaration of Conformity. – Interference immunity as per EN 61000-6-2 There may be minor deviations during the interference. – Interference emission as per EN 61000-6-4

Mechanical construction	
Weight	Device with terminals (values rounded up): 1-channel: approx. 100 g (3.53 oz); 2-channel: approx. 120 g (4.23 oz)
Materials	All the materials used are RoHS-compliant. Housing: polycarbonate (PC); flammability rating according to UL94: V-0

Dimensions in mm (inches)

Terminal housing for mounting on DIN rail

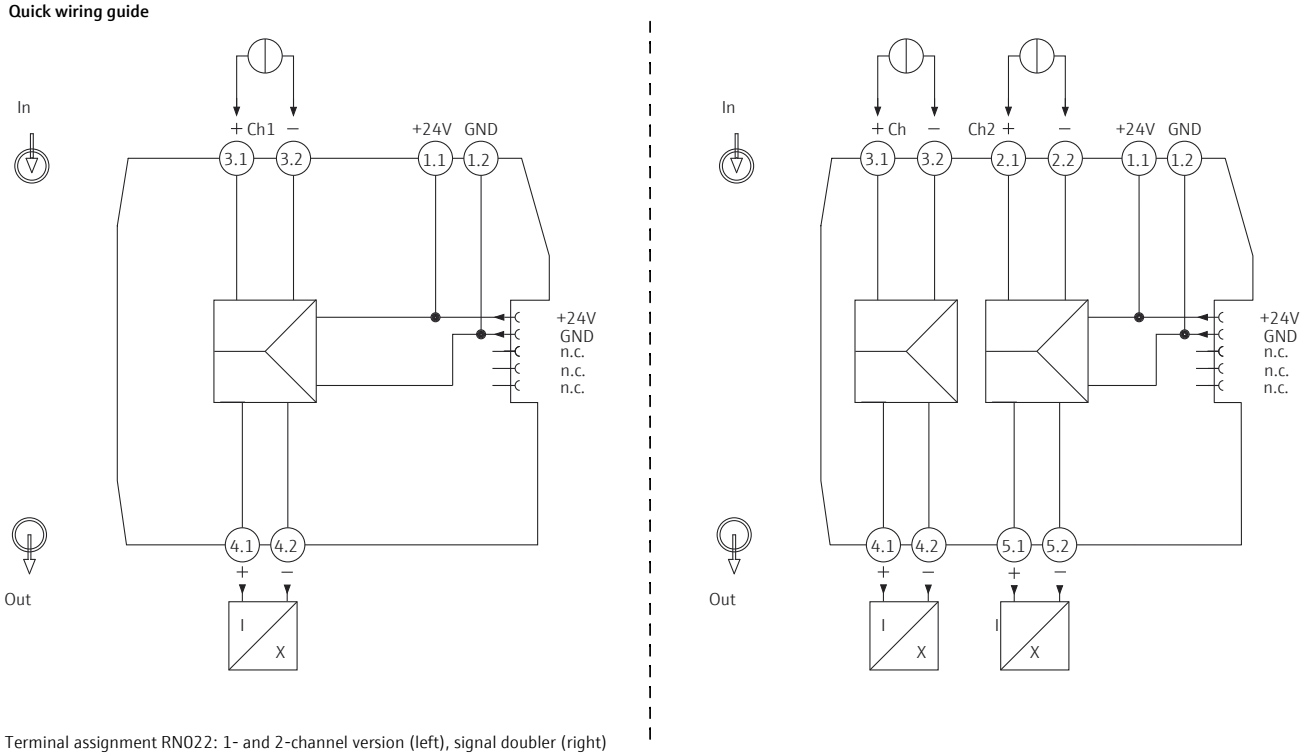


Installation according to instruction manual

Width (B) × length (L) × height (H) (with terminals):
12.5 mm (0.49 in) x 116 mm (4.57 in) x 107.5 mm (4.23 in)

Electrical connection

Quick wiring guide



Terminal assignment RNO22: 1- and 2-channel version (left), signal doubler (right)

Terminal design	Cable design	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)	0.2 to 2.5 mm² (24 to 14 AWG)
	Flexible with wire end ferrules (with or without plastic ferrule)	0.25 to 2.5 mm² (24 to 14 AWG)
Push-in spring terminals	Rigid or flexible (Stripping length = 10 mm (0.39 in)	0.2 to 2.5 mm² (24 to 14 AWG)
	Flexible with wire end ferrules (with or without plastic ferrule)	0.25 to 2.5 mm² (24 to 14 AWG)

Order codes

Terminals

Code	Version
A	Screw terminals
B	Push-in spring terminals

RNO22*			Order no.
SIL2	Version	Approval	*
No	1 channel	Non Ex	RNO22-AA1 ☐
		ATEX	RNO22-BM1 ☐
	2 channel	Non Ex	RNO22-AA2 ☐
		ATEX	RNO22-BM2 ☐
JaYes	1 channel	Non Ex	RNO22-AA1 ☐ LA
		ATEX	RNO22-BM1 ☐ LA
	2 channel	Non Ex	RNO22-AA2 ☐ LA
		ATEX	RNO22-BM2 ☐ LA

Accessories	Order no.
Power and error message module 24V DC, Screw terminals	RNF22-AAA
Power and error message module 24V DC, Push-in spring terminals	RNF22-AAB
Power and error message module 24V DC, Screw terminals ATEX	RNF22-BNA
Power and error message module 24V DC, Push-in spring terminals ATEX	RNF22-BNB
System power supply RNB22, 24V DC/2,5A	RNB22-AAA
DIN rail bus connector 12.5mm	71505349

Complete product information:
www.endress.com/rno22

More products to complete your measuring point ...

Electromagnetic flowmeter
Picomag
page 93

Temperature sensor
iTHERM ModuLine TM121
page 113

Ultrasonic sensor
Prosonic T FMU30
page 40

NAMUR isolating amplifier

RLN42

NEW!

Complete product information:
www.endress.com/rln42

- Wide range power supply of 19.2 to 253 VAC/DC
- Compact housing width: 17.5 mm (0.69 in)
- Installation in Ex zone 2 permitted in the option with Ex approval

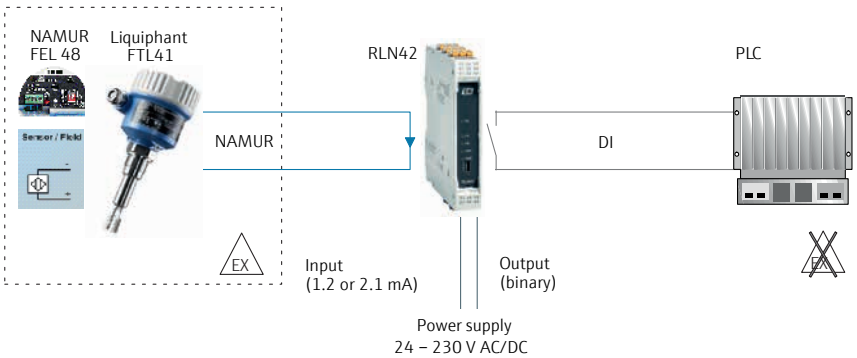
Specs at a glance:

- **Version:** 2-channel
- **Contact versions 2-channel:** 1 contact per channel
- **Voltage range:** 24 to 230 VAC/DC (24 VDC (-20%/+25%))
- **Ambient temperature range:** -40 to 60 °C

Application The Namur isolating amplifier is used whenever a switching signal has to be galvanically isolated or transmitted from the ex-zone. Signals from Namur sensors or from switch contacts, wired with a resistor bridge, can be be transmitted.

Function The NAMUR isolating amplifier is designed for the operation of proximity switches (according to EN 60947-5-6 (NAMUR)) and open and mechanical contacts with resistive coupling elements. One relay (changeover) per channel is available as a signal output. The power supply is designed as a universal power supply (UP). The device is optionally available with Ex approvals for the intrinsically safe operation of proximity switches 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!

Application example



Technical data

Input	
Version	2-channel
Input data	floating switch contacts with resistive coupling elements to connect NAMUR proximity switches (IEC/EN 60947-5-6)
Switch points	Blocking: < 1.2 mA Conducting: > 2.1 mA
Short-circuit current	~ 8 mA
Switching hysteresis	<0.2 mA
Line fault detection	Line break: 0.05 mA < I_{IN} < 0.35 mA Short-circuit: 100 Ω < R_{sensor} < 360 Ω
Open-circuit voltage	~ 8 V_{DC}

Relay output data	
Contact version	2-channel, 1 changeover per channel
Maximum switching voltage/current	250 V_{DC} (2 A)/120 V_{DC} (0,2 A)/30 V_{DC} (2 A)
Maximum switching capacity	500 VA
Contact material	AgSnO2, hard gold plated
Mechanical operating life	10^7 switching cycles
Recommended minimum load	5 V/10 mA
Switching frequency (no load)	≤ 20 Hz

Signal on alarm	
Output behavior in an alarm condition	If line fault detection is switched on and the line to the sensor is disconnected or short-circuits, the relay deenergizes in such a way that the output is set to the safe, non-conducting state.
Line break in input	0,05 mA < I_{IN} < 0,35 mA
Line short circuit in input	100 Ω < R_{Sensor} < 380 Ω

Galvanic isolation	
Input/output	Peak value as per EN 60079-11, 375 V
Input/power supply	Peak value as per EN 60079-11, 375 V

Important connection data	
Supply voltage range	24 to 230 $V_{AC/DC}$ (-20%/+25%, 0/50/60 Hz)
Power loss	≤1,3 W
Maximum current consumption	<80 mA (230 V_{AC}); <42 mA (24 V_{DC})
Power consumption	≤ 1.1 W

Terminals

A slotted screwdriver is required for the electrical connection to screw-in or push-in terminals.

Response time

Following a change of state at the input, the output adopts the safe state in ≤ 40 ms.

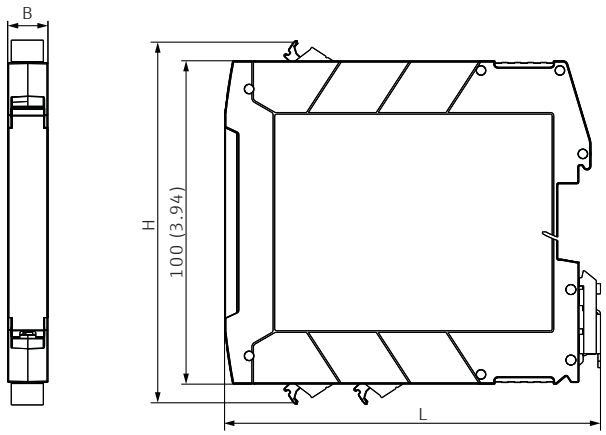
Installation	
Mounting location	The device is designed for installation on 35 mm (1.38 in) DIN rails in accordance with IEC 60715 (TH35). The device's housing provides basic insulation from neighboring devices for 300 Veff. If several devices are installed side by side, this must be taken into consideration and additional insulation must be provided if necessary. If the adjacent device also offers basic insulation, no additional insulation is required.
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 to fix the device.

Important ambient conditions	
Ambient temperature range	–40 to 60 °C (–40 to 140 °F)
Degree of protection	IP 20
Pollution degree	2
Altitude	≤2000 m (6562 ft)
Storage temperature	40 to 80 °C (–40 to 176 °F)
Overvoltage category	III
Humidity	10 to 95 % No condensation
Shock and vibration resistance	Vibration resistance as per DNVGL-CG-0339 : 2015 and DIN EN 60068-2-27 DIN rail device: 2 to 100 Hz at 0.7g (general vibration stress) Shock resistance as per KTA 3505 (section 5.8.4 Shock test)
Electromagnetic compatibility (EMC)	Interference immunity as per EN 61000-6-2 Interference emission as per EN 61000-6-4

Mechanical construction	
Weight	Device with terminals (values rounded up): Approx. 140 g (4.94 oz)
Materials	All the materials used are RoHS-compliant. Housing: polycarbonate (PC); flammability rating according to UL94: V-0

Dimensions in mm (inches)

Terminal housing for mounting on DIN rail

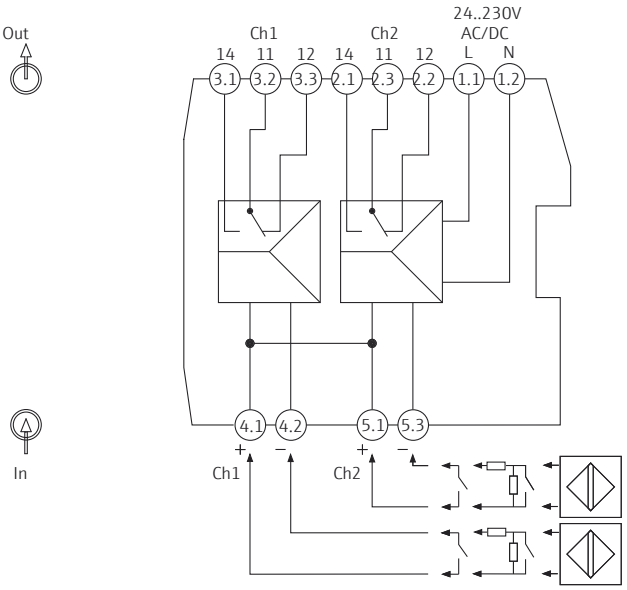


Installation according to instruction manual

Width (B) × length (L) × height (H) (with terminals):
17.5 mm (0.69 in) × 116 mm (4.57 in) × 107.5 mm (4.23 in)

Electrical connection

Quick wiring guide



Terminal assignment RLN42

Terminal design	Cable design	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)	0.2 to 2.5 mm² (24 to 14 AWG)
	Flexible with wire end ferrules (with or without plastic ferrule)	0.25 to 2.5 mm² (24 to 14 AWG)
Push-in spring terminals	Rigid or flexible (Stripping length = 10 mm (0.39 in)	0.2 to 2.5 mm² (24 to 14 AWG)
	Flexible with wire end ferrules (with or without plastic ferrule)	0.25 to 2.5 mm² (24 to 14 AWG)

Order codes

Terminals

Code	Version
A	Screw terminals
B	Push-in spring terminals

RLN42*			Order no.
SIL2	Version	Approval	*
No	2 channel	Non Ex	RLN42-AA2☐
		ATEX	RLN42-BL2☐
Yes	2 channel	Non Ex	RLN42-AA2☐LA
		ATEX	RLN42-BL2☐LA

* available from 10/2021

Complete product information:
www.endress.com/rln42

1 or 2-channel passive barrier

RB223

Complete product information:
www.endress.com/rb223

- Space-saving single/dual channel version
- Can be used up to SIL3
- Bidirectional HART® transmission

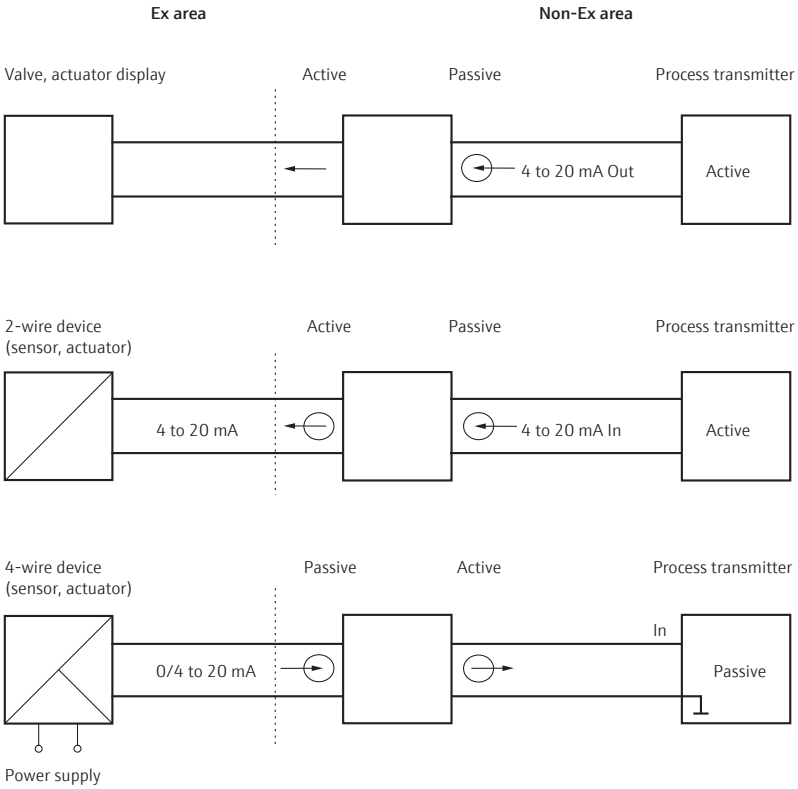
Specs at a glance:

- **Certificates:**
  ATEX II (1) GD EEx ia IIC/IIB
  ATEX II (1) GD EEx ib IIC/IIB
- **HART® communication:**
  Built-in resistance for HART® communication 232 Ω
- **Version:**
  Optional dual-channel version
- **Signal transmission:**
  – From non-Ex to Ex-areas
  – From Ex to non-Ex areas

Application The RB223 isolator can be used to galvanically isolate active signal circuits (0 to 20 mA) in three applications:
Transmission from non-Ex to Ex areas e.g for active adjusters, controllers or indicators
Transmission from Ex to non-Ex areas for connection of active, intrinsically safe circuits to the PLC
Transmission from Ex to non-Ex areas for supply of intrinsically safe transmitters with non-intrinsically safe transmitter power supply

Function The passive isolator transmits signal circuits from the input to the output by galvanic isolation. A HART® signal is also transmitted. The device is optionally available with intrinsically safe input/output. The device is loop-powered and does not need any additional supply voltage of its own.

Application example



Technical data

Current transmission direction Non-Ex → Ex; Input	
Function range	0 to 40 mA (to 22 mA for specified accuracy)
Effective voltage	Max. <26 V for specified accuracy
Short circuit current	I_{max} = 100 mA
Limiting voltage	U_{max} = 30 V

Current transmission direction Non-Ex → Ex; Output	
Function range	0 to 40 mA (to 22 mA for specified accuracy), max. current depends on load
Load	Load resistance max. 0 to 600 Ω
Type of protection	Intrinsically safe according to ATEX: Max. voltage: U_o ≤28 V Max. current: I_o ≤93 mA Max. power: P_o ≤660 mW

Current transmission direction Ex → Non-Ex; Input	
Function range	0 to 40 mA (to 22 mA for specified accuracy)
Type of protection	Intrinsically safe according to ATEX: Max. voltage: U_i ≤30 V Max. current: I_i ≤100 mA Max. power: P_i ≤750 mW

Current transmission direction Ex → Non-Ex; Output	
Function range	0 to 40 mA (to 22 mA for specified accuracy), max. current depends on load
Load	Load resistance max. 0 to 600 Ω

Galvanic isolation	
Test voltage	>1.5 kV AC between input and output >1.5 kV AC between the channels

Power supply	
Starting current	Own consumption < 50 µA
Voltage drop	<(1.9 V + 400 Ω × current loop) for nonEx → Ex <(3.9 V + 120 Ω × current loop) for Ex → nonEx
Power loss	<0.2 W at 20 mA (per channel) without HART® <0.3 W at 20 mA (per channel) with HART®

Accuracy	
Current transmission	< ± 10 µA + 0.15 % from measured value
Temperature drift	≤ ± 0.01 %/10 K

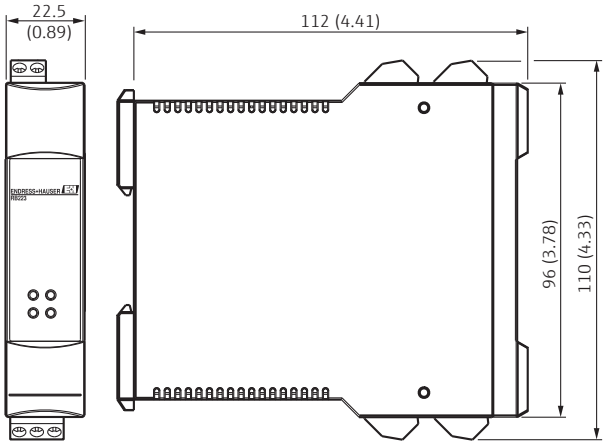
Operating conditions	
Ambient temp.	–20 to +60 °C (–4 to +140 °F)
Storage temperature	–20 to +80 °C (–4 to +176 °F)
Climate class	To IEC 60 654-1 class B2
Relative humidity	<95 % without condensation
EMC	Interference immunity to IEC 61 326 (industry) and NAMUR NE21

Mechanical construction	
Dimens. (W×H×D)	22.5 × 96 × 112 (0.89" × 3.78" × 4.33") for DIN rail to IEC 60 715 TH35
Weight	Approx. 150 g (5.29 oz.)

General	
Communication	HART® protocol: bi-directional possible
Frequency response	650 Hz for 500 Ω load for nonEx → Ex 1300 Hz for 500 Ω load for Ex → nonEx

Approvals	
Ex approvals	ATEX II (1) GD [EEx ia] IIC/IIB ATEX II (1) GD [EEx ib] IIC/IIB
SIL	Can be used up to SIL3

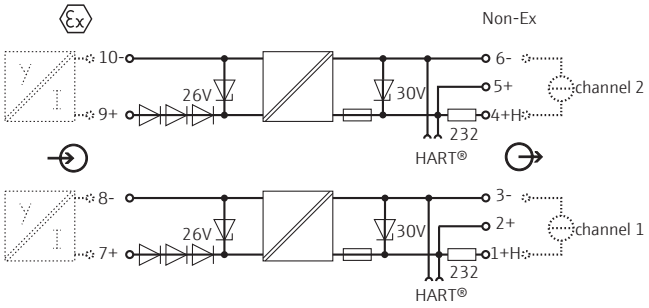
Dimensions in mm (inches)



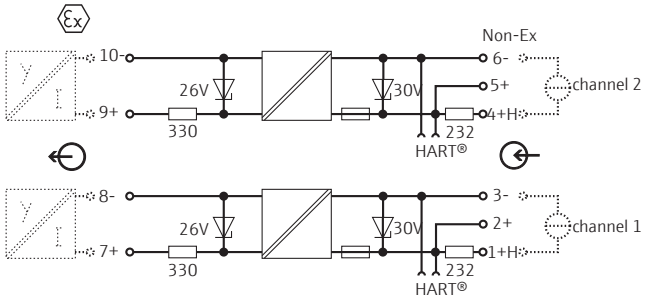
Installation according to instruction manual.

Electrical connection

Ex → Non-Ex 2 channel



Non-Ex → Ex 2 channel



Order codes

RB223			Order no.
Approval	Channel	Transmission direction	
Non-hazardous area	1 ×	In-/Output	RB223-A1A
	2 ×	In-/Output	RB223-A2A
ATEX II(1)GD(Ex ia)IIC	1 ×	Ex → nonEx	RB223-B1A
		nonEx → Ex	RB223-B1B
	2 ×	Ex → nonEx	RB223-B2A
		nonEx → Ex	RB223-B2B

Accessories	Order no.
Protective housing IP 66 for max. 2 RTA421 (182 × 180 × 165 mm)	52010132

Complete product information:
www.endress.com/rb223

More products to complete your measuring point ...


Capacitive probe
Liquicap T FMI21
page 43


Data manager
Ecograph T RSG35
page 137


Process meters
RIA46
page 144

Surge arresters

HAW562 / HAW569

HAW562 HAW569

Complete product information:
www.endress.com/haw562
www.endress.com/haw569

- Field housing version
- Application in Ex areas
- High functional security (SIL2)

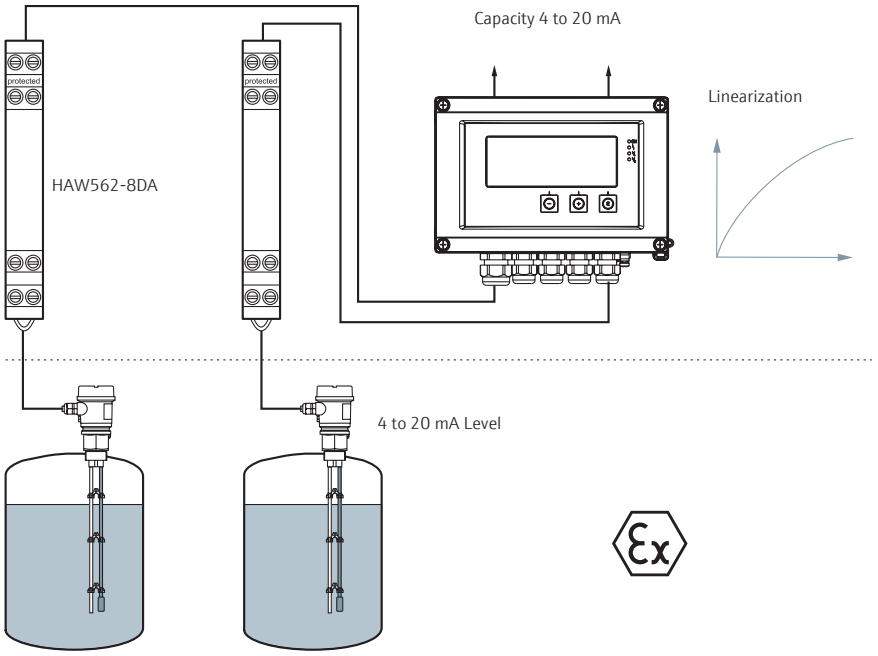
Specs at a glance:

- **Design:**
  DIN rail mountable housing, field housing (HAW569)
- **Approval:**
  ATEX II 2 (1) G
- **Signal:**
  Power supply 24 V DC/AC, 230 V AC,
  current 0/4 to 20 mA,
  PROFIBUS® PA, RS485,
  PROFIBUS® DP

Application The surge arrester is used for limiting high voltages in signal cables of 0/4 to 20 mA, PROFIBUS® PA and PFM signal, for limiting high voltages in bus systems like PROFIBUS® DP and RS485, in ultrasonic sensors and low voltage instrumentation supply cables.

Function Protection of supply to instrumentation, signal cables and components from overvoltage surges – created by lightning strikes or switch sequences for example.
Operation of power supply protection units: Using the impedance-free connection of the protection unit interference voltage drops cannot be introduced on the power lines.
Operation of signal cable protection units: protection steps within the unit guarantee high compatibility with the system to be protected.

Application example



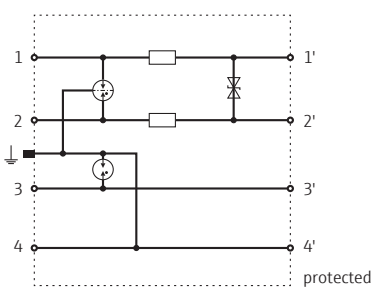
Technical data HAW562

	HAW562-AAA	HAW562-AAB	HAW562-AAC	HAW562-AAD	HAW562-AAE	HAW562-8DA
Supply voltage						
Nominal voltage	24 V	60 V	230 V	5 V	12 V DC[1)] 80 V DC[2)]	24 V
Max. continuous voltage	33 V DC 23.3 V AC	75 V	255 V	6 V DC 4.2 V AC	15 V DC[1)] 180 V DC[2)]	33 V DC 23.3 V AC
Current consumption						
Nominal current [I_L]	1.0 A	25 A	25 A	1.0 A	0.45 A[1)] 3 A[2)]	500 mA at T_{amb} = 80 °C (176 °F)
C2 nominal discharge current [I_n] (8/20) per line	10 kA	2 kA	3 kA	10 kA	10 kA	5 kA
C2 nominal discharge current [I_n] (8/20) total	20 kA	4 kA	5 kA	20 kA	20 kA	10 kA
D1 lightning surge current [I_{imp}] (10/350) per line	2.5 kA	–	–	2.5 kA	2.5 kA	1 kA
D1 lightning surge current [I_{imp}] (10/350) total	9 kA	–	–	9 kA	7.5 kA	2 kA
Voltage protection level						
Line/line	≤52 V at I_{imp}	L–N: ≤400 V	L–N: ≤1250 V	≤25 V	–	≤52 V
Line/PG	≤550 V at I_{imp}	L/N–PE: ≤ 730 V	L/N–PE: ≤1500 V	≤550 V	≤600 V	≤1400 V
Response times						
Line/line	–	L–N: ≤25 ns	L–N: ≤25 ns	–	≤1 ns	≤1 ns
Line/PG	–	L/N–PE: ≤100 ns	L/N–PE: ≤100 ns	–	≤100 ns	≤100 ns
Capacitance						
Line/line	≤1,0 nF	–	–	≤25 pF	–	≤0.8 nF
Line/PG	≤25 pF	–	–	≤25 pF	–	≤16 pF
General						
SPD class	Type 1 P1	Type 3 P3	Type 3 P3	Type 1 P1	Type 1 P1	Type 1 P1
Limit frequency	7.8 MHz	–	–	100 MHz	2 MHz[1)] 15 MHz[2)]	7.7 MHz (50 Ω) 3.2 MHz (100 Ω)
Series impedance per line	1.0 Ω	–	–	1.0 Ω	1.8 Ω[1)] directly connected[3)]	1.0 Ω
Maximum line side overcurrent protection	–	25 A gL/gG or B 25 A	25 A gL/gG or B 25 A	–	–	–

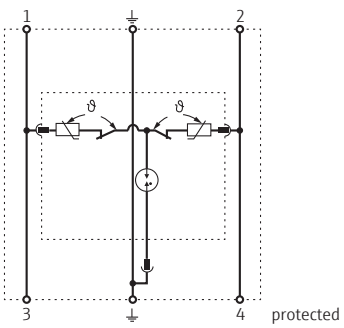
[1)] Terminal 4
[2)] Terminal 2
[3)] Terminal 1+2

Electrical connection

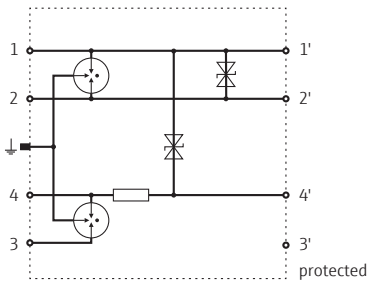
HAW562-AAA, -AAD, -8DA



HAW562-AAB, -AAC



HAW562-AAE

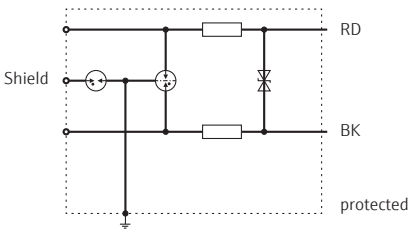


Technical data HAW569

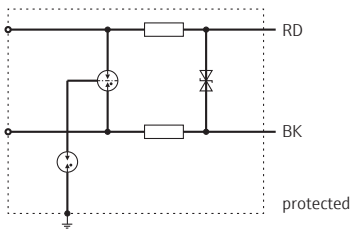
	HAW569-AA2B	HAW569-DA2B	HAW569-CB2C
Supply voltage			
Nominal voltage	24 V	24 V	24 V Signal 120 V/230 V Power supply
Maximum continuous voltage	24.5 V AC 34.8 V DC	24.5 V AC 34.8 V DC	22.6 V AC Signal 255 V AC Power supply; 32 V DC Signal 255 V DC Power supply
Current consumption			
Nominal current [I_L]	0.5 A	0.5 A	0.55 A at 80 °C (176 °F)
C2 nominal discharge current [I_n] (8/20) per line	10 kA	5 kA	–
C2 nominal discharge current [I_n] (8/20) total	10 kA	10 kA	10 kA
C2 nominal discharge current [I_n] (8/20) shielding – PG	20 kA	–	–
Nominal discharge current (8/20) L – N [I_n]	–	–	3 kA
Total discharge current (8/20) L+N – PE [I_{total}]	–	–	5 kA
D1 lightning surge current [I_{imp}] (10/350) line – PG	–	–	1 kA
D1 lightning surge current [I_{imp}] (10/350) total	–	–	–
Voltage protection level			
Line/line at I_n C2	≤65 V	≤55 V	≤58 V
Line/PG at I_n C2	≤650 V	≤1100 V	≤900 V
Shielding/PG at I_n C2	≤650 V	–	–
Line/line at 1 kV/µs C3	≤50 V	≤49 V	≤50 V
Line/PG at 1 kV/µs C3	≤500 V	≤1000 V	≤850 V
Line/line at 1 kV/µs C3	≤600 V	–	–
L – N	–	–	≤1.4 kV
L/N – PE	–	–	≤1.5 kV
Capacitance			
Line/line	≤400 pF	≤850 pF	≤25 pF
Line/PG	≤20 pF	≤15 pF	≤15 pF
General			
SPD class	Type 2 P1	Type 2 P1	Type 2 P2
Limit frequency	14 MHz	7 MHz	–
Series impedance per line	2.2 Ω	1.8 Ω	–
Maximum line side overcurrent protection	–	–	16 A gL/gG or B 16 A

Electrical connection

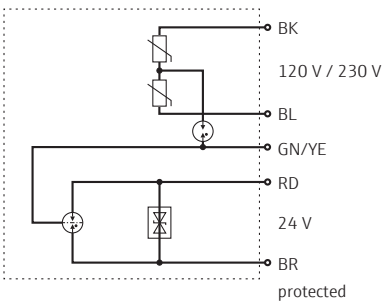
HAW569-AA2B (non-Ex lead-through version)



HAW569-DA2B (Ex ia lead-through version)

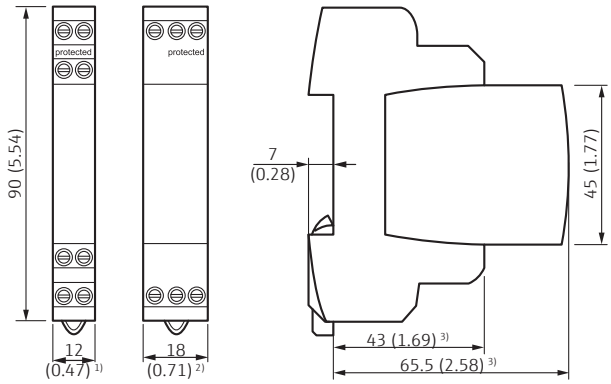


HAW569-CB2C (Ex d screw-in version)



Dimensions in mm (inches)

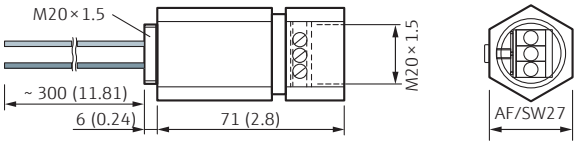
HAW562



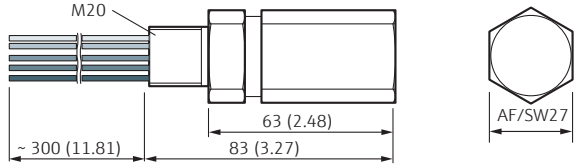
1) HAW562-AAA, -AAD, -AAE, -8DA
2) HAW562-AAB, -AAC
3) HAW562-AAB, -AAC: +0.5 mm

Installation according to instruction manual.

HAW569-AA2B, -DA2B (lead-through version)

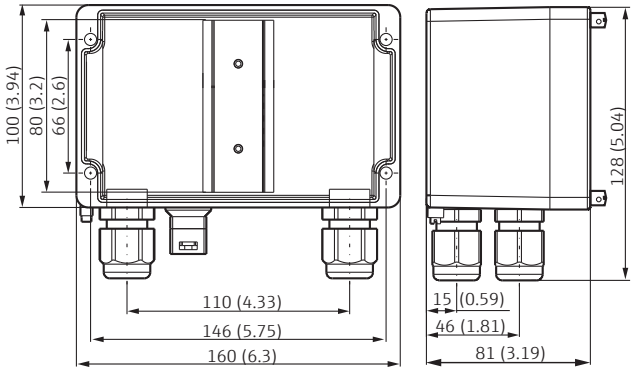


HAW569-CB2C (screw-in version)



Installation according to instruction manual.

Accessory: Protective housing



Technical data
With integrated DIN rail for mounting up to four HAW562 units
Integrated DIN top hat rail
ground connection
GORE-TEX® filter
2 lead seal screws and 4 plastic cable glands M20 × 1.5
material: Pressure die cast aluminium, epoxy coated, ingress protection to IP 66/NEMA 4x

Order codes

HAW562		Order no.
Approval	Application	
Non-hazardous area	Measuring signal 0/4 to 20 mA, PFM,PA,FF	HAW562-AAA
	Supply voltage 10 to 55 V (+/–20%)	HAW562-AAB
	Supply voltage 90 to 230 V (+/–10%)	HAW562-AAC
	Communication RS485, Modbus PROFIBUS® DP	HAW562-AAD
	Protection module Prosonic FMU90	HAW562-AAE
ATEX/IECEx II2(1)G Ex ia[ia Ga]IIC T6 Gb	Measuring signal 0/4 to 20 mA, PFM,PA,FF	HAW562-8DA

HAW569			Order no.
Approval	Housing	Application	
Non-hazardous area	Lead through version	Measuring signal 0/4 to 20 mA	HAW569-AA2B
ATEX/IECEx II2(1)G Ex ia[ia Ga]IIC T6 G	Lead through version	Measuring signal 0/4 to 20 mA	HAW569-DA2B
ATEX/IECEx II2G Gb Ex d IIC T6	Screw in version cable gland M20	Measuring signal 0/4 to 20 mA and supply voltage 0 to 66 V & 80 to 230 V	HAW569-CB2C

Accessories	Order no.
Earthing ring kit for HAW569	51006420
IP 66 protective housing for 4 HAW562	51003750
Mounting kit for IP 66 housing	51003773

Complete product information:
www.endress.com/haw562
www.endress.com/haw569

Notes

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