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Capacitive Level Meter

- Versatile sensing options: Available with rod, rope, and fully coated electrodes for solids and liquid medium
- Wide measurement range: Operates effectively in both conductive and non-conductive tanks with no dead zones
- 4...20mA with HART: Offers industry-standard digital communication for configuration and diagnostics
- Resilient design: Coated electrodes available for aggressive or adherent media, plus high-temperature versions up to 572°F (300°C)
- Real-time data display: OLED or LCD options provide immediate level feedback on the device

HART COMMUNICATION PROTOCOL CE

About

The P105 capacitive level meter is a compact, robust measurement device designed for continuous level detection of liquids and bulk solids. It integrates measurement electronics, and a display module housed in a durable body. By measuring the electrical capacitance between its electrodes, it determines the level height and outputs data via a 4–20 mA current loop with HART® communication. The device is adaptable to a variety of industrial settings thanks to its different electrode configurations (rod, rope, and co-axial) and coating options for aggressive media, making it suitable for a wide range of process applications.

Applications

- ✓ Food & Beverage
- ✓ Chemical Refining & Manufacturing
- ✓ Pharmaceuticals
- ✓ Oil & Gas
- ✓ Bulk Materials
- ✓ Water & Wastewater
- ✓ Paper & Pulp
- ✓ Test & Measurement
- ✓ More

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Build Your Part Number

Series P105

Example: P105SAE85P6VC10

Series
P105

Hazard Performance - *select one*	
SA	Standard atmosphere (non-explosive)
SS	Standard atmosphere (non-explosive), stainless steel housing and lid (Only for electrical connection S1)
SH	For standard atmosphere (non-explosive) in high temperature environments
HT	For standard atmosphere (non-explosive) in high temperature environments, stainless steel housing and lid (Only for electrical connection S1)

Electrode - *select one; see diagrams on page 6*	
E0	Without electrode (Only for Process Connection P1 and P6)
E1	Uncoated stainless steel rod electrode, length 0.2 ... 8 m (Only for Process Connection P1 and P6)
E2	Fully coated stainless steel rod electrode (PFA insulation), length 0.2 ... 3 m, (Cannot select Process Connection P3 or P6)
E3	Fully coated stainless steel rod electrode (FEP insulation), length 0.2 ... 3 m, (Cannot select Process Connection P3 or P6)
E4	Semi-coated rod electrode (FEP insulation), length 0.5...8 m, (Cannot select Process Connection P3 or P6)
E5	Uncoated stainless steel rod electrode with reference tube, length 0.2 ... 3 m, can only be used with G1 process connection
E6	Coated stainless steel rod electrode with reference tube (FEP insulation), length 0.2 ... 3 m (Only for Process Connection P1)
E7	Uncoated rope electrode, length 1 ... 20 m (Only for Process Connection P1 and P6)
E8	Uncoated rope electrode with anchor, length 1 ... 20 m (Only for Process Connection P1 and P6)
E9	Electrode with insulated cable (FEP) and insulated weight (FEP), length 1 ... 15 m (Cannot select Process Connection P3 or P6)
E10	Two fully coated stainless steel rod electrodes (PFA), length 0.2 ... 2 m (Only for Process Connection P3) (Hazard Performance SA, SS, and HT Only)

Electrode Length – *please inform in meters*	
XX	Electrode length in meters (Example: 1.5 meters = 1.5)

Process Connection - *select one; see diagrams on page 6*	
P1	G 1“ male, housing material stainless steel W. Nr. 1.4404 / AISI 316L (Cannot be selected for Electrode E10)
P2	G 1” male, housing material nickel-based alloy (W. Nr. 2.4856 / ALLOY 825 (Only for Electrode E2, E3, E4, and E9)
P3	G 1.5“ (Only for Electrode E10)
P4	1.5” Tri-Clamp (Ø 50.5 mm) (Only for Electrode E2, E3, E4, and E9)
P5	2” Tri-Clamp (Ø 64 mm) (Only for Electrode E2, E3, E4, E9)
P6	NPT 1" male (Only for Electrode E0, E1, E7, and E8) (Cannot be selected with SH Hazard Performance)

Inner O-Ring Material - *select one if only with Electrode E0, E1, E5, E7, or E8*	
V	FPM
E	EFDM
B	NBR
K	FFPM

Electrical Connection - *select one; see diagrams on page 6*	
C1	Plastic cable gland M16 (Only for Hazard Performance SA and SH)
C2	Plastic cable gland M20 (Only for Hazard Performance SA and SH)
C3	Plastic cable gland for protective hose (Only for Hazard Performance SA and SH)
C4	Stainless steel cable gland M16 (Only for Hazard Performance SS and HT)

Cable Length - *please inform in meters*	
XX	Cable length in meters (Example: 1.5 meters = 1.5 / Example: 7 meters = 7)

Set Up Elements- *select one*	
O	OLED Display
L	LCD Display
W	Without Display

Note: Product Includes 1 asbestos free seal

Accessories – *optional; will be quoted as a separate line item*	
SF	Steel welding flange, G1½
SSF	Stainless steel welding flange, G1½
FN	Fixing nut, G1½ (stainless steel, plastic)
AR	Anchor roll (only for Electrode E8)
DB	Dust proof bushing (only for Electrode E8)
EC	Extension cable for display

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Technical Parameters

Technical Parameters

Electrical

1) Including resistor 250R with connection with HART®.

2) OLED – suitable for internal applications and applications at reduced lighting levels. LCD – suitable for outdoor applications, especially with direct sunlight.

Supply voltage	18 ...36VDC		
Current output	4 ... 20 mA (2-wire), HART®		
Current output resolution	10 µA		
Capacity Range	0 to 3,000 pF		
Resolution	0.01 pF for capacities from 0 to 300 pF 0.1 pF for capacities from 300 to 3,000 pF		
Temperature error (for a temperature range from -30 to 70 °C)	<1 pF up to 100 pF <1% of the measured value from 100 to 3,000 pF		
Measuring frequency	100 to 800 kHz		
Non-linearity (electronics)	Max. 1%		
Damping (time constant)	Adjustable 0 ... 99 sec		
Maximum slew rate	<1 sec (0 ... 100%) ; for damping 0 sec		
Current output error	Max. 80 µA		
Maximal resistance of current output load R_{max} for voltage - 24V DC / 22V DC / 20V DC	270 Ω / 180 Ω / 90 Ω [1]		
Maximum length of measuring electrodes	See dimensional drawings		
Recommended cable	PVC 2× 0.75 mm2 shielded		
Cable gland tightening torque	3 Nm		
Display type	Matrix OLED, LCD [2]		
Resolution	128 × 64 pixels		
Digit height / Number of displayed digits of the measured quantity	9 mm / 5 digits		
Display color	OLED	Yellow	
	LCD	Black with white background light	
Type of keys	Membrane type with low travel distance		
Ambient temperature range	OLED	-30 ... +70 °C	
	LCD	-20 ... +70 °C	

Materials

* Verify chemical compatibility with the media. Upon agreement it is possible to select a different type of material.

Lid	Aluminum alloy with coating		
Glass	Polycarbonate		
Body	Aluminum alloy with coating		
Housing with thread or with Tri-Clamp	All except Electrode E10	St. Steel W. Nr. 1.4404 (AISI 316 L)	
	Electrode E10	Mat. PTFE	
Electrode	Electrode E1, E2, E3, E4, E5, E6, and E10	St. Steel W. Nr. 1.4404 (AISI 316 L)	
	Electrode E7, E8, and E9	St. Steel W. Nr. 1.4401 (AISI 316)	
Electrode Coating	Electrode E2 and E10	PFA	
	Electrode E3, E4, E6, and E9	FEP	
Reference Tube	Electrode E5 and E6	St. Steel W. Nr. 1.4301 (AISI 304)	
Weight	Electrode E7 and E8	St. Steel W. Nr. 1.4301 (AISI 304)	
Weight Coating	Electrode E9	PTFE	
Anchorage	Electrode E8	Steel / St. Steel W. Nr. 1.4401 (AISI 316)	
Display module	Plastic material POM		
Cable Gland	Hazard Performance SA and SH	Plastic – polyamide	
		Metal - nickel-plated brass	
Level Meter Weight without electrode	Approx. 0.5 kg (1 kg NT variant)		
Display Weight	46 g		

Environmental

Electrical Protection Class (All)	EN 33 2000-4-41 EN 55 011 EN 61326-1 EN 61000-4-2 to -6	
Water Protection Class	IP67	
Device Class (EN 60079-10-1 and EN 60079-10-2)	Hazard Performance SA	Basic performance for use in non-explosive areas.
	Hazard Performance SH	High-temperature performance for use in non-explosive areas (max. 200 °C)
Ambient Temperature Range	-22°F ... +158°F (-30 °C to +70 °C)	

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Technical Parameters Cont.

Temperature and Pressure Resistivity

Variant	Media Temperature	Process Temperature	Ambient Temperature	Maximum Overpressure for Process Temperature				
				≤ 86°F (30°C)	≤ 185°F (85°C)	≤ 266°F (130°C)	≤ 320°F (160°C)	≤ 392°F (200°C)
SA Performance with Electrode E1	-40°F ... +572°F (-40°C ... +300°C)	-40°F ... +185°F (-40°C ... +85°C)	-22°F ... +158°F (-30°C ... +70°C)	2175 PSI	1450 PSI	-	-	-
SA Performance with Electrode E2, E3, and E4	-40°F ... +392°F (-40°C ... +200°C)	-40°F ... +185°F (-40°C ... +85°C)	-22°F ... +158°F (-30°C ... +70°C)	580 PSI	362 PSI	-	-	-
SA Performance with Electrode E5	-40°F ... +392°F (-40°C ... +200°C)	-40°F ... +185°F (-40°C ... +85°C)	-22°F ... +158°F (-30°C ... +70°C)	2175 PSI	1450 PSI	-	-	-
SA Performance with Electrode E6	-40°F ... +392°F (-40°C ... +200°C)	-40°F ... +185°F (-40°C ... +85°C)	-22°F ... +158°F (-30°C ... +70°C)	580 PSI	290 PSI	-	-	-
SA Performance with Electrode E7	-40°F ... +392°F (-40°C ... +200°C)	-40°F ... +185°F (-40°C ... +85°C)	-22°F ... +158°F (-30°C ... +70°C)	2175 PSI	1450 PSI	-	-	-
SA Performance with Electrode E8 with KV	-40°F ... +392°F (-40°C ... +200°C)	-40°F ... +185°F (-40°C ... +85°C)	-22°F ... +158°F (-30°C ... +70°C)	2175 PSI	1450 PSI	-	-	-
SA Performance with Electrode E8 with PR	-40°F ... +266°F (-40°C ... +130°C)	-40°F ... +185°F (-40°C ... +85°C)	-22°F ... +158°F (-30°C ... +70°C)	2175 PSI	1450 PSI	-	-	-
SA Performance with Electrode E9	-40°F ... +266°F (-40°C ... +130°C)	-40°F ... +185°F (-40°C ... +85°C)	-22°F ... +158°F (-30°C ... +70°C)	145 PSI	72.5 PSI	-	-	-
SA Performance with Electrode E10	-40°F ... +392°F (-40°C ... +200°C)	-40°F ... +185°F (-40°C ... +85°C)	-22°F ... +158°F (-30°C ... +70°C)	14.5 PSI	14.5 PSI	-	-	-
SH Performance with Electrode E1	-40°F ... +572°F (-40°C ... +300°C)	-40°F ... +392°F (-40°C ... +200°C)	-22°F ... +158°F (-30°C ... +70°C)	2175 PSI	1450 PSI	435 PSI[1)]	290 PSI[1)]	145 PSI[1)]
SH Performance with Electrode E2, E3, and E4	-40°F ... +392°F (-40°C ... +200°C)	-40°F ... +392°F (-40°C ... +200°C)	-22°F ... +158°F (-30°C ... +70°C)	580 PSI	362 PSI	290 PSI	217 PSI	43.5 PSI
SH Performance with Electrode E5	-40°F ... +392°F (-40°C ... +200°C)	-40°F ... +392°F (-40°C ... +200°C)	-22°F ... +158°F (-30°C ... +70°C)	2175 PSI	1450 PSI	435 PSI[1)]	290 PSI[1)]	145 PSI[1)]
SH Performance with Electrode E6	-40°F ... +392°F (-40°C ... +200°C)	-40°F ... +392°F (-40°C ... +200°C)	-22°F ... +158°F (-30°C ... +70°C)	580 PSI	362 PSI	290 PSI	217 PSI	43.5 PSI
SH Performance with Electrode E7	-40°F ... +392°F (-40°C ... +200°C)	-40°F ... +266°F (-40°C ... +130°C)	-22°F ... +158°F (-30°C ... +70°C)	2175 PSI	1450 PSI	435 PSI[1)]	290 PSI[1)]	145 PSI[1)]
SH Performance with Electrode E8 with KV	-40°F ... +392°F (-40°C ... +200°C)	-40°F ... +266°F (-40°C ... +130°C)	-22°F ... +158°F (-30°C ... +70°C)	-	-	-	-	-
SH Performance with Electrode E8 with PR	-40°F ... +266°F (-40°C ... +130°C)	-40°F ... +266°F (-40°C ... +130°C)	-22°F ... +158°F (-30°C ... +70°C)	-	-	-	-	-
SH Performance with Electrode E9	-40°F ... +266°F (-40°C ... +130°C)	-40°F ... +266°F (-40°C ... +130°C)	-22°F ... +158°F (-30°C ... +70°C)	145 PSI	72.5 PSI	14.5 PSI	-	-
SH Performance with Electrode E10	-	-	-	-	-	-	-	-

1) The above-mentioned values do not apply to hot water, aqueous solutions, and steam. In such cases, the use must be consulted with the manufacturer.

Note: For the correct operation of the level transmitter, none of the provided temperature ranges may be exceeded (media, process, or ambient temperature). The above temperatures are visually explained in the Figure below.

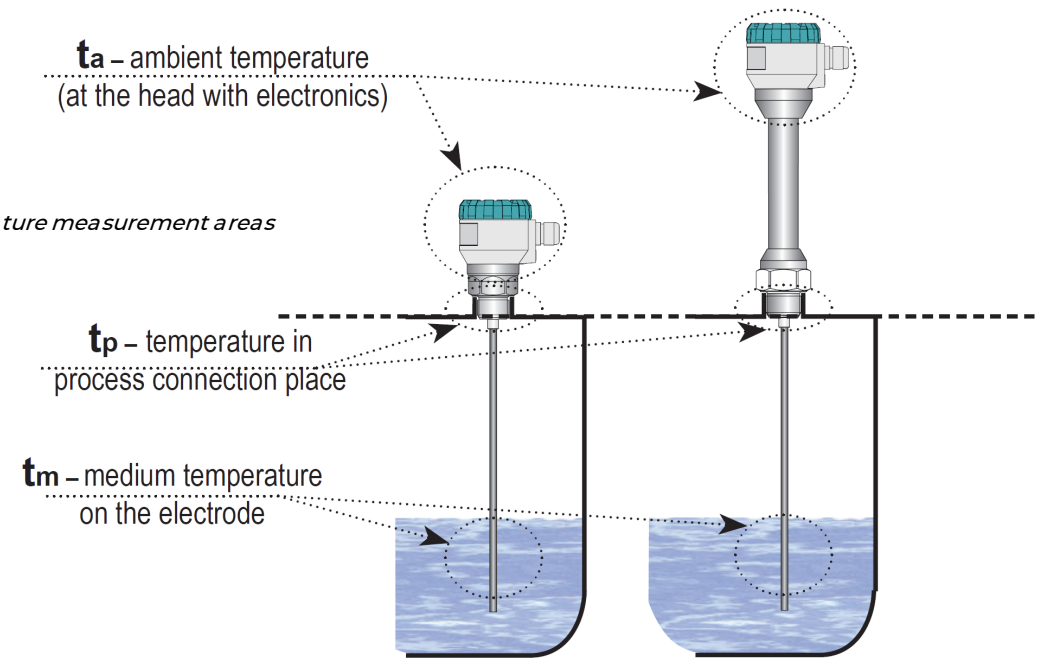

Figure 1:
Illustration of temperature measurement areas

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Electrical Connection and Settings

Electrical Connection

The level meter is connected to the follow-up (evaluation) device using a suitable cable with an outer diameter of 6–8 mm by means of screw terminals located under the display module. The recommended wire cross-section is 2× 0.5–0.75 mm2 (shielded) for the current version. The positive pole (+U) is connected to the (+) terminal, the negative pole (0 V) to the (-) terminal, and the shield (only for shielded cables) is connected to the ( ) terminal.

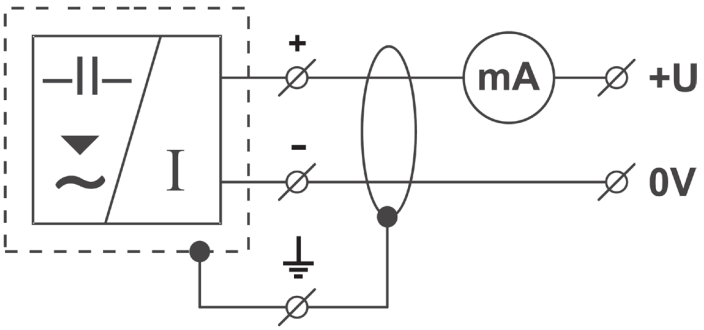


Fig. 2: Connection diagram of level meter with current output 4 ... 20 mA

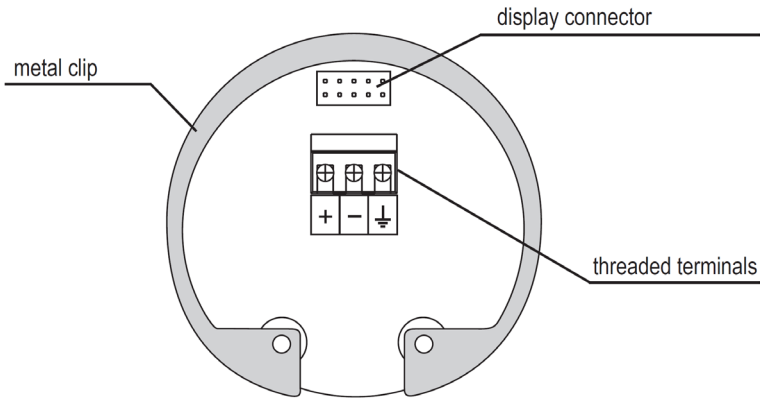


Fig. 3: Internal view of threaded terminals of level meter with current output 4 ... 20 mA

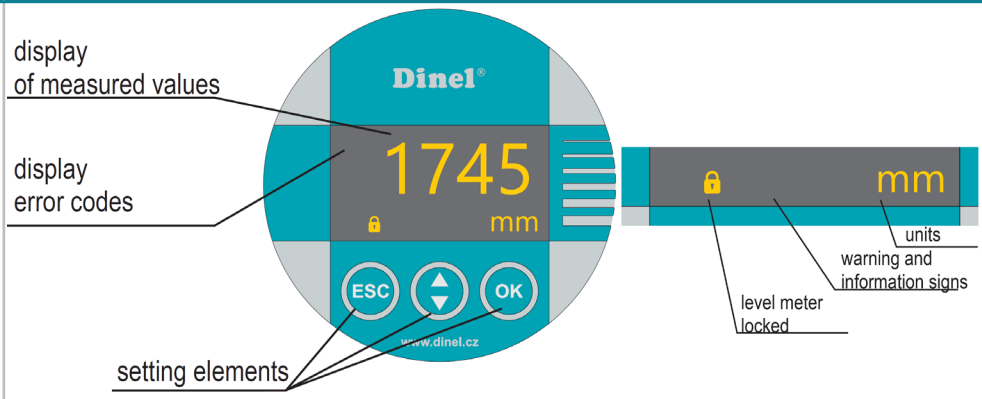
Settings

Setting is done using the 3 buttons located on the P105 display module. All setting items are available in the level meter menu. Unit will flash intermittently when receiving a reflected signal (echo) from the measured level.

Button OK
- Access to the setting menu
- Acknowledgement of the selected menu item
- Cursor movement in line
- Saving settings

Button ▲▼
- Navigation in menu
- Changing values

Button ESC
- Cancelling changes
- Moving up a level



⚠ A P105 level meter selected without a display (W) is supplied without display module. To set up the level meter, it is necessary to connect a display module (or it can be configured via HART). When the set-up is complete, the display module can be disconnected, and the level meter takes measurements without it.

Status and Failure Signalization

Status indication (lower left corner of the display):

Lights permanently – the level meter is locked against unauthorized settings; a password is required for unlocking (see MENU – PASSWORD)

Warning signs:

FIXED OUTPUT – the output current is fixed to a constant value (see MENU – DIAGNOSTIC – CURRENT)

LOW POWER – low supply voltage (it must be within the specified range – see TECHNICAL SPECIFICATIONS)

NO PASSWORD – when changing the locked level meter settings

NO DATA AVAILABLE – display module doesn't communicate with the electronics of the level meter (e.g. incorrectly inserted display module into connector or measuring module is not functional).

Information Signs:

CAPACITY – actual capacity displayed (see DIAGNOSTIC – CAPACITY)

CURRENT – actual current displayed (see DIAGNOSTIC – CURRENT)

Error Codes:

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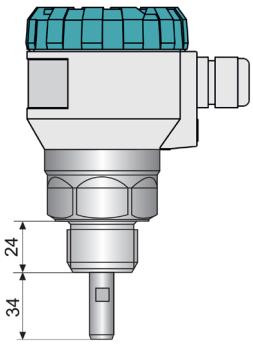
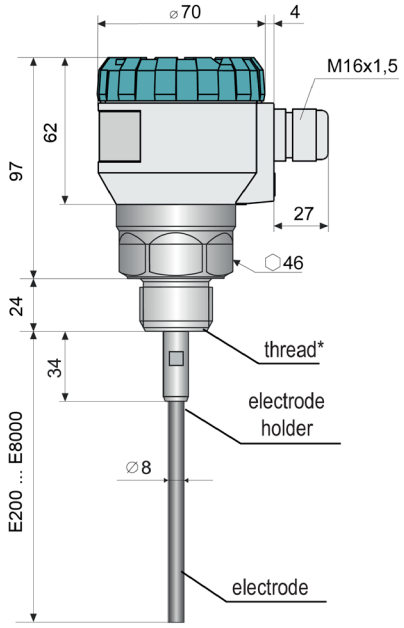
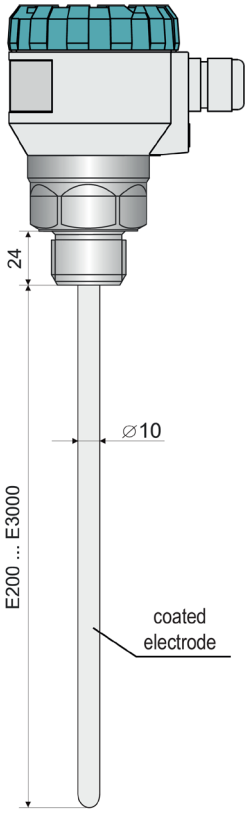
Dimensions



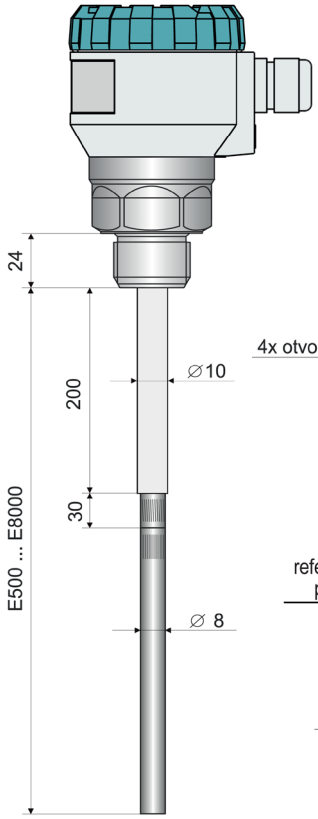
Electrode E0



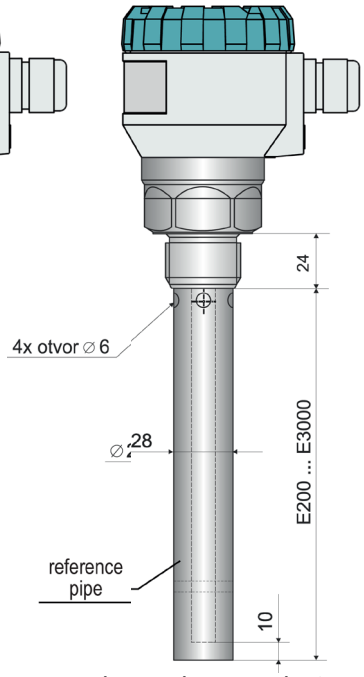
Electrode E1



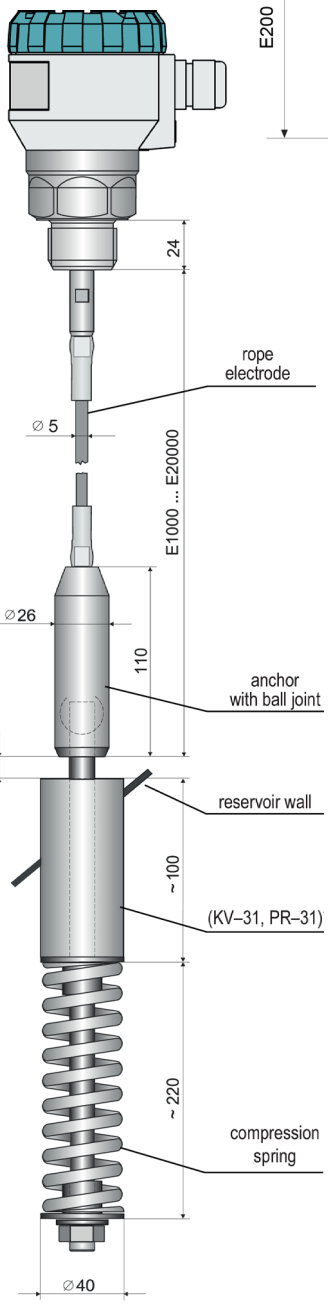
Electrode E2 and E3



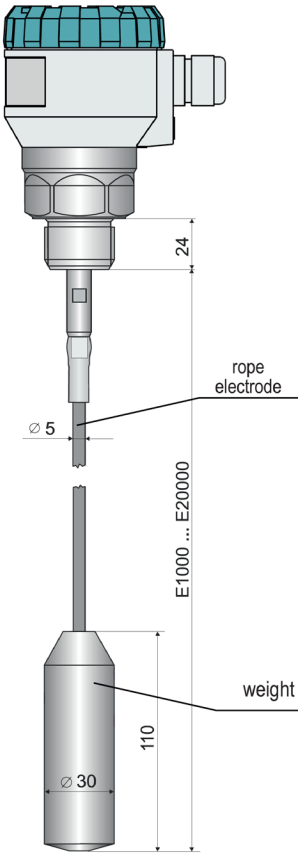
Electrode E4



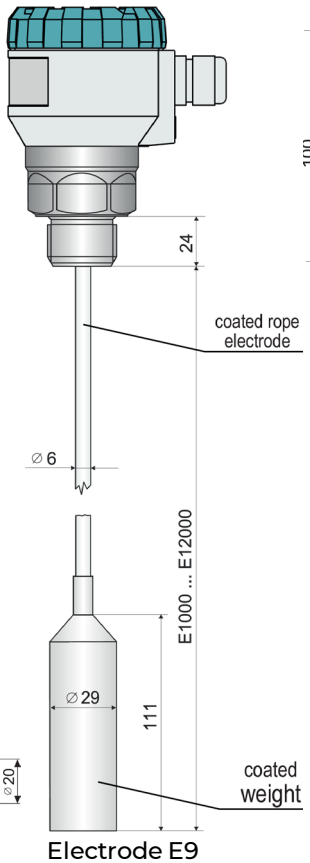
Electrode E5 and E6



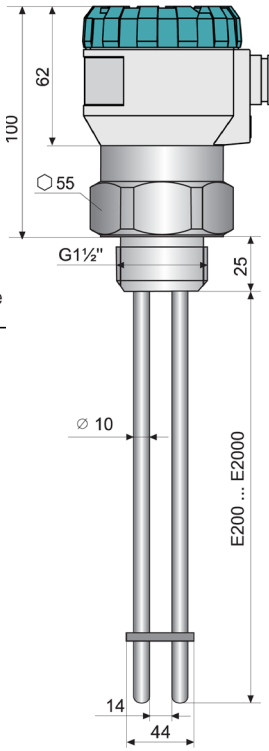
Electrode E8



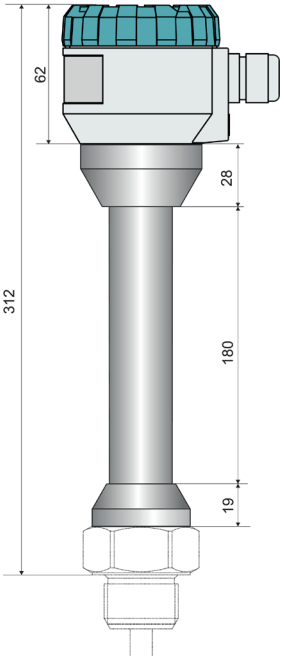
Electrode E7



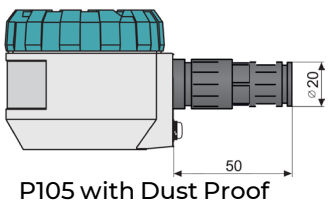
Electrode E9



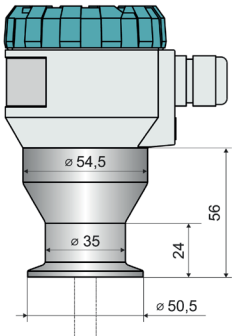
Electrode E10



Hazard Performance SH and HT



P105 with Dust Proof Bushing (DB)



Process Connection P4 and P5

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Safety & Applications

Safety, Protections, Compatibility and Explosion Proof

The level meter is equipped with protection against fault voltage on the electrode, supply voltage polarity reversal, short-term overvoltage, and current overload on the output.

Protection against direct contact is ensured:

- By safe voltage ČSN EN 33 2000-4-41

Electromagnetic compatibility is in accordance with the following standards:

- EN 55 011 (B), EN 61326-1, EN 61000-4-2 (A, 30kV)
- EN 61000-4-3 (A, 10V), EN 61000-4-4 (A, 2kV)
- EN 61000-4-5 (A, 2kV), EN 61000-4-6 (A, 10V)

This equipment has been issued with a Declaration of Conformity pursuant to Act No. 90/2016 Sb., as amended. The electrical equipment supplied complies with the requirements of applicable government regulations on safety and electromagnetic compatibility.

Applications of Individual Variants

P105 with Electrode E0
Without electrode; and attaches it to the electrode holder using M8 threaded connection

P105 with Electrode E1
Uncoated stainless steel rod electrode for level measurement of electrically non-conductive liquids (oils, diesel fuel) and bulk solids (flour, sand, cement, granulated plastic materials, etc.). Length 0.2 ... 8 m

P105 with Electrode E2
Coated stainless steel rod electrode (PFA) with enhanced resistance to penetration (diffusion) of vapors and gases. For level measurement of water and other electrically conductive liquids in food processing, pharmaceutical, and chemical industries. It can be used temporarily for high-temperature applications (e.g. sanitization with hot steam) or for volatile aggressive liquids, etc. Length 0.2 ... 3 m

P105 with Electrode E3
Coated stainless steel rod electrode (FEP), suitable for level measurement of water and other electrically conductive liquids. Also suitable for impure liquids in metallic tanks, concrete sumps, etc. Length 0.2 ... 3 m

P105 with Electrode E4
Semi-coated stainless steel rod electrode (FEP) for level measurement of electrically non-conductive liquids in environments where partial condensation of vapors on the electrode may occur. Length 0.5 ... 8 m

P105 with Electrode E5
Uncoated stainless steel rod electrode with reference tube for level measurement of unpolluted and electrically non-conductive liquids (oil, diesel fuel, petrol). Length 0.2–3 m

P105 with Electrode E6
Coated stainless steel rod electrode (FEP) with reference tube for level measurement of clean electrically conductive liquids (e.g. in plastic and glass tanks) and for higher measuring accuracy. Length 0.2 ... 3 m

P105 with Electrode E7
Uncoated stainless steel rope electrode and weight for level measurement of bulk solids (sand, flour, cement, etc.). The rope can also be shortened. Length 1 ... 20 m

P105 with Electrode E8
Uncoated stainless steel rope electrode and coated dynamic anchor for measurement of bulk solids in taller silos. Length 1 ... 20 m

P105 with Electrode E9
Fully coated stainless steel rope electrode and weight (FEP rope insulation, FEP weight insulation), designed for level measurement of electrically conductive and non-conductive liquids. Length 1 ... 15 m

P105 with Electrode E10
Two coated stainless steel rod electrodes (PFA electrode insulation, PTFE head) for level measurement of aggressive liquids. Length 0.2 ... 2 m.