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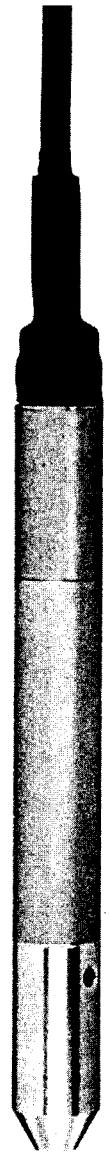
JUMO
MEASUREMENT AND CONTROL

Level probe for liquids Type 4390



Application

The level probe Type 4390 is used to measure hydrostatic levels in liquids. Applications include level measurement in wells, boreholes, wastewater plants, vessels, rivers and lakes.

Type designation

4390-242

4390	Level probe
-242	output 4 — 20 mA, 2-wire connection

Extra Codes

/ 013 PUR cable sheath
/ 017 PE cable sheath (suitable for heating oil and Diesel fuel)
/ 027 with built-in Pt 100 temperature sensor (see Data Sheet 92.1121)
/ 038 open bottom connection
/ 093 special ranges (e.g. m WC)
/ 130 pressure connection ¼" pipe female

Accessories

standard:
Operating Instructions B 40.4390

at extra charge:
cable holder Type 48 700
clamping case with pressure equilibration Type 48 701

Ordering example

Level probe

Type:	4390-242
range:	0 to 1 bar
cable length:	15 m

Ranges

0 to 250 mbar
0 to 400 mbar
0 to 600 mbar
0 to 1 bar
0 to 1.6 bar
0 to 2.5 bar
0 to 4 bar
0 to 6 bar
0 to 10 bar
0 to 16 bar
0 to 25 bar

Technical data

Wetted components
stainless steel, Mat.Ref. 1.4541
st.steel diaphragm Mat.Ref. 1.4435
FPM fluorocarbon
PE polyethylene

Cable cross-section
6 x 0.25 mm²

cable length:
2, 5, 10, 15, 20, 25, 30, 40, 75, 120 m
other lengths to special order

Electrical connection
6-core screened PE cable with internal pressure equilibration tubing. Minimum bending radius of cable: 120 mm (fixed installation). Can be used to 250 m depth without additional tension relief.

Supply U_B
10 — 30 V DC

Residual hum: the voltage peaks must not exceed the specified values for the supply voltage. Max. current loading 30 mA.

Supply voltage error
not exceeding 0.1 % full scale per 10 V (nominal supply voltage 24 V)

Output signal
4 — 20 mA 2-wire connection

The instruments can be calibrated to special order to indicate the reading in metres water column.

Burden
Type 4390 $\frac{U_B - 10V}{0.02\ A}$ (Ω) max.

Burden error
0.1 % max. of full scale

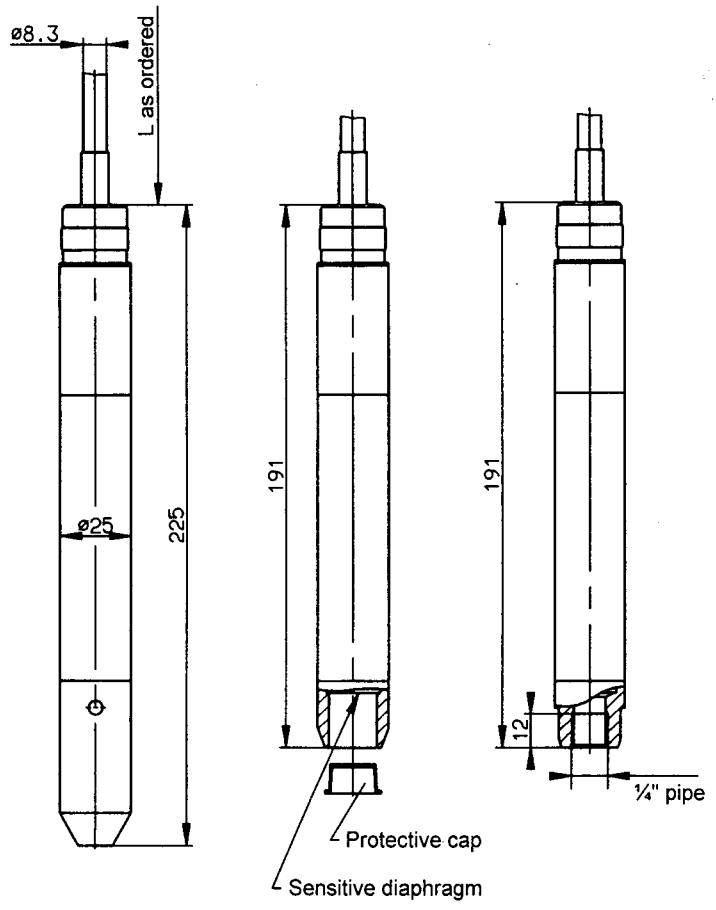
Characteristic
linear

Deviation from characteristic after zero adjustment
0.5 % max. of full scale to DIN 16 086

Zero offset
0.5 % max.

Overload limit
300 % full scale to DIN 16 086
40 bar max.

Dimensions

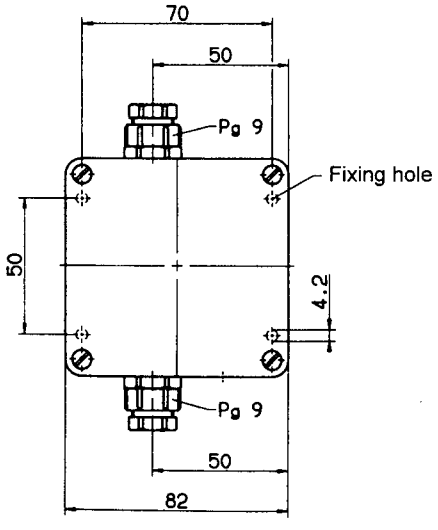


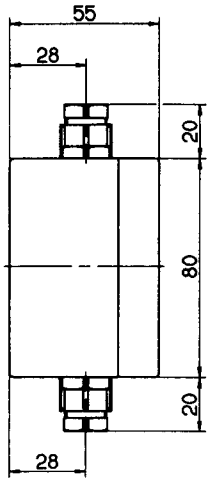
Typ 4390-242 TZ / 038 TZ / 130

mm	inch
4.2	0.17
8.3	0.33
12	0.47
19	0.75
20	0.79
25	0.98
28	1.10
48	1.89
50	1.97
56	2.20
70	2.76
80	3.15
82	3.23
175	6.89
191	7.52
225	8.86

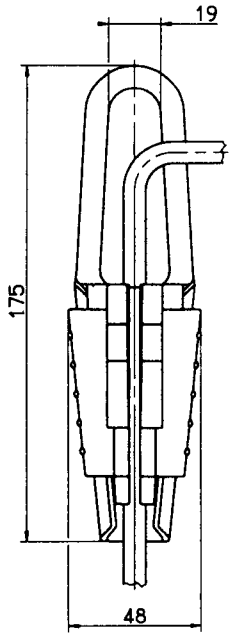
Accessories

Clamping housing with pressure equilibration, Part No. 00061206





Cable holder Part No. 00061389



Bursting pressure
at least 400 % full scale to DIN 16 086
50 bar max.

Permitted ambient and liquid temperature
0 to 50 °C

Storage temperature
–20 to +80 °C (dry)

Temperature coefficient of zero signal
within the range 0 — 50 °C
0.2 % / 10 °C typical
0.4 % / 10 °C max.
on ranges 0 — 250 mbar and 0 — 400 mbar:
0.4 % / 10 °C typical
0.6 % / 10 °C max.

Temperature coefficient of output span
within the range 0 — 50 °C
0.2 % / 10 °C typical
0.4 % / 10 °C max.
on ranges 0 — 250 mbar and 0 — 400 mbar:
0.3 % / 10 °C typical
0.5 % / 10 °C max.

Response time
10 msec max.

Nominal position
vertical, hanging on the control cable

Protection
IP68, up to 40 bar to EN 60 529

Weight
400 g approx. (without cable)

Test voltage
connections against housing to VDE 0411, 150 V $_{rms}$, 50 Hz, 1 min

Electromagnetic compatibility
electrostatic discharge:
IEC 801-2 / severity 4
(test voltage 15 kV)

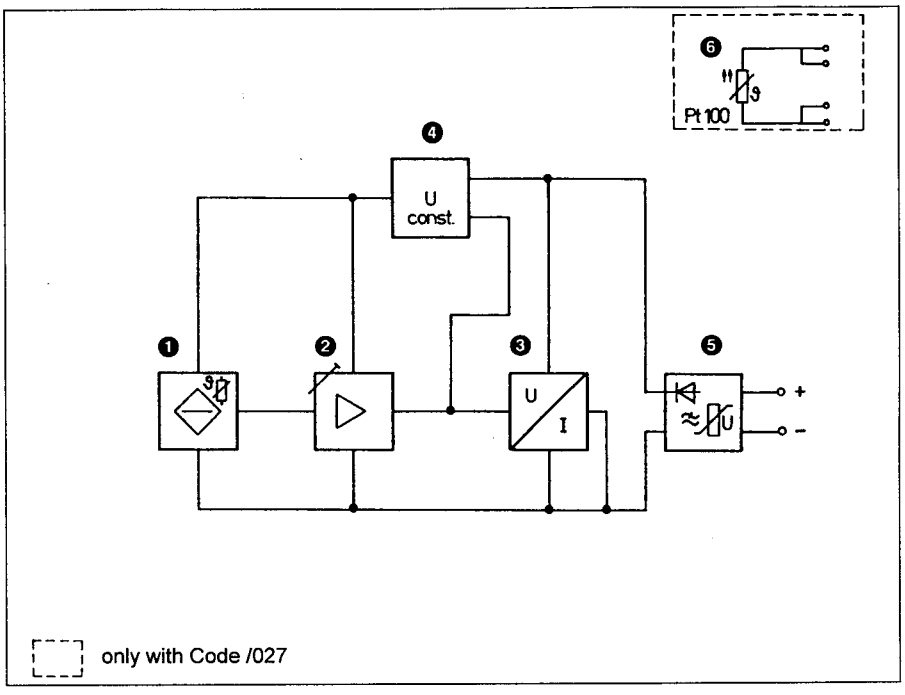
electromagnetic fields:
IEC 801-3 / severity 3
(test field strength 10 V / m)

transient disturbance (burst):
IEC 801-4 / severity 4
(test voltage in I / O line 4 kV)

surge voltage:
VDE 0843 Part 5 / severity X
(test voltage 3 kV, nominal conducted surge current 1 kA, wave 8 / 20 μsec)

Immunity to conductor-borne interference induced by high-frequency fields:
VDE 0843 Part 6 / severity 3

Block diagram



Operation

When the level probe is immersed, the hydrostatic pressure of the liquid acts on the separating diaphragm of the piezo-resistive pressure cell. The separating diaphragm transfers the pressure through a liquid to the silicon diaphragm with doped resistance bridge ❶ which works on the piezo-resistive principle. The deflection of the silicon diaphragm due to the pressure produces a resistance change in the bridge and thereby a change in the bridge output voltage proportional to the pressure. The back of the silicon diaphragm is exposed to atmospheric pressure through the equilibration tubing. As a result the pressure on the diaphragm, is proportional to the liquid height above the diaphragm.

In order to compensate the temperature error a PTC temperature sensor is built into the pressure sensor and included in the circuit in order to keep the temperature drift as small as possible. An amplifier ❷ amplifies the mV signal of the sensor and a U / I converter produces a 4 — 20 mA output current proportional to pressure. The power supply ❹ provides the pressure sensor ❶ and the amplifier ❷ with a stabilised supply. Variations in the supply voltage are compensated. Feedback is used where required to reduce the linearity error of the sensor signal.

A filter and limiter module ❺ is connected in the circuit before the probe in order to conform to EMC requirements.

Reverse polarity protection is provided to protect against damage due to incorrect connection.

A Pt 100 temperature probe ❻ fitted as option determines the temperature of the surrounding liquid. It is arranged for 4-wire connection (Code / 027 only).

Connection Diagram

Connection			Termination
Supply 10 — 30 V DC	L+ L–		white grey
Output 2-wire*	+ –		white grey
Temperature sensor		for code / 027	pink, brown, green, yellow
Screen			black

Subject to modification.