fill level | water level | pressure | temperature | flow | visualization | signal converter | sensoric

Precont ML

Pressure transmitter

Measurement of absolute or relative pressure in gases, vapors, liquids and dust

Technical manual
01.14

Main features

Finely graded pressure measuring
- Measuring ranges from -1 to 25 bar, gauge
- Measuring ranges from 0 to 25 bar, absolute
- Measuring spans from 0,1 to 25 bar

Metallic flush-mounted EHEDG conformal membrane for hygienic applications

Process temperature range from – 20 °C to +150 °C

Accuracy ≤ 0,5%

Integrated evaluation electronic
- 2-wire with current signal 4…20 mA
- 3-wire with voltage signal 0...10 V

ACS-CONTROL-SYSTEM
knowledge and systems
Your partner for measuring technology and automation

You have purchased a high-grade and modern measuring device of ACS-CONTROL-SYSTEM GmbH.

We want to give thanks for your purchase and for your confidence to us.

The actual technical manual includes instructions for installation, electrical connection and inauguration, as well as the technical data of the device.

Modifications, that answer the purpose of the technical progress, are reserved by ACS-CONTROL-SYSTEM GmbH without prior notice.

If a question occurs, that can‘t be answered by the listed informations, please call on our technicians team in Eggenfelden Tel: +49 8721/ 9668-0 or info@acs-controlsystem.de

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Application

The device is an electronic pressure transmitter for continuous measuring of relative or gauge pressures in gases, vapors, liquids and dusts within closed container or pipes.

The use of a piezoresistive measuring sensor with EHEDG conformal metallic membrane and the corresponding excellent characteristics, allows the use especially in hygienic applications.

Function

The device is mounted in the wall of the pressure container or of the pipe.

The system pressure is applied to the metallic membrane and causes there a variation of the resistance of the strain gage at the back side of the membrane.

The metallic membrane offers excellent characteristics like high pressure and pressure blow strength, vacuum resistance, high accuracy and reproducibility, good long term stability and a low temperature influence.

A FDA-listed pressure transmitting liquid is used for the transmission of the pressure from the membrane to the strain gage.

The pressure signal, that is transmitted by the membrane to the sensor is converted into an electrical signal and converted by the integrated evaluation electronic into a current signal 4...20 mA resp. voltage signal 0...10 V.

Safety notes

Each person that is engaged with inauguration and operation of this device, must have read and understood this technical manual and especially the safety notes.

Installation, electrical connection, inauguration and operation of the device must be made by a qualified employee according to the informations in this technical manual and the relevant standards and rules.

The device may only be used within the permitted operation limits that are listed in this technical manual.

Every use besides these limits as agreed can lead to serious dangers.

The materials of the device must be chosen resp. checked for compatibility with the respective application requirements (contacting materials, process temperature). An unsuitable material can lead to damage, abnormal behavior or destruction of the device and to the resulting dangers.

The sensors may not be used as sole device for prevention of dangerous conditions in machines and plants.
This measuring device meets article 3 (3) of the EC directive 97/23/EC (pressure equipment device directive) and is designed and produced in good engineer practice.

The device meets the legal requirements of all relevant EC directives. CE

Using the device in a manner that does not fall within the scope of its intended use, disregarding this instruction, using under-qualified personnel, or making unauthorized alterations releases the manufacturer from liability for any resulting damage. This renders the manufacturer‘s warranty null and void.

Installation

The correct function of the device within the specific technical data can only be guaranteed, if the permitted process and environmental temperatures (see chapter „Technical data“) will not be exceeded.

Installation place

The installation of the device at locations where high pressure blows can occur should be avoided.
At a pressure measurement in gases, the device should be installed above the tapping point, so that the condensate can flow into the process.
At a pressure measurement in steams, the device should be installed after a siphon and a shut-off device below the tapping point. The siphon reduces the temperature to almost ambient temperature. Fill the siphon with fluid before commissioning.
At a pressure measurement in liquids, the device should be installed after a shut-off device below or at the same level as the tapping point.
At a filling level measurement in liquids, the device should be installed below the lowest measuring point. Do not mount the device in the fill flow, in the suction area of a pump, in the tank outlet or at a point in the container which could be affected by pressure pulses from an agitator. Calibration and functional test can be carried out more easily if you mount the device after a shut-off device.
The installation position has influence on the measuring result of the kind of a zero value shift because of the deadweight of the measuring membrane.
The correction of this deviation at the device is not possible.

Process and environmental temperature

The installation of the device should be made if possible at temperature calmed places to get a reliable measuring result.
Strong temperature steps, e.g. at filling of a hot liquid into a cold system, can produce a short-time higher measuring signal deviation.
Temperature compensation takes effect after several minutes. Internal temperature compensation is faster the smaller the jump in temperature and the longer the time interval involved.
At a large amplification of the measuring signal this deviation will be also amplified accordingly.
The deviation will be completely neutralized after the adaptation of the measuring membrane to the temperature.
At a step from +20°C ...+80°C this neutralization can wile up to 3 minutes.
The use of a measuring system with process diaphragm seal can cause an essential improvement.
At high process temperatures a heat transfer to the terminal housing can be reduced by isolation of the medium carrying part of the plant, by the use of a temperature decoupler or of a measurement system with process diaphragm seal.

Installation notes

Drive the system pressure free prior installation resp. deinstallation of the sensor.
The installation of the device into a closed off completely with process liquid filled connection can lead to destruction of the measuring membrane. The reduction of the volume of the liquid at screw-in leads to a very high pressure boosting, that can exceed the permitted maximum value by a multiple. Thus, before installation, the connection must be sufficiently emptied.
The screw-in of the thread process connection by using the terminal housing, the connection plug resp. the connection cable is not permitted.
The tightening of the thread process connection may only be done at the hexagon by a suitable spanner and with the maximum permitted torque strength.
The maximum permitted torque strength is 50 Nm.

Air pressure compensation

Avoid the damaging or pollution of the pressure compensation system.
The hindrance of the pressure compensation can lead to faulty measuring results.
The filter element of the pressure compensation system is positioned at the variant:

Plug EN 175-301-803-C	plug socket
Plug EN 175-301-803-A	plug socket
Plug M12	drill hole besides the plug
Connected cable	capillary inside the cable

At the version with connected cable, the environmental air pressure is lead to the measuring membrane by an integrated pressure compensation capillary. This capillary may not be folded or sealed. To avoid faulting, a micro air filter is placed at the end of the capillary.
At an application conditioned cutting of the connected cable there must be especially paid attention that the micro air filter will be replaced to the end of the capillary after cutting.

Electrical connection

The electrical connection of the device must be carried out according to the respective country specific standards.
Incorrect installation or adjustment could cause applicationally conditioned risks.

Potential equalization - earthing

The device must be grounded.
The earthing can be carried out by the metallic process connection.
The metallic parts of the device are electrically connected with the terminal PE of the plug EN 175-301-803-A/-C, with the socket of the plug M12 or with the cable shield of the connected cable.

Connection cable

Use only shielded signal and measurement wires and install these wires separated from power leading wires.
Connect the cable shield of a connected cable only at one side to earth, ideally at the installation place of the device.

Supply voltage

The voltage applied to the terminal contacts may not exceed the maximum permitted supply voltage to avoid damage of the electronic.
The maximum permitted supply voltage range at the respective version is:

2-wire / signal 4…20mA	10…30V_{DC}
3-wire / signal 0…10V	14…30V_{DC}

All connections are reverse polarity protected.

Load resistor

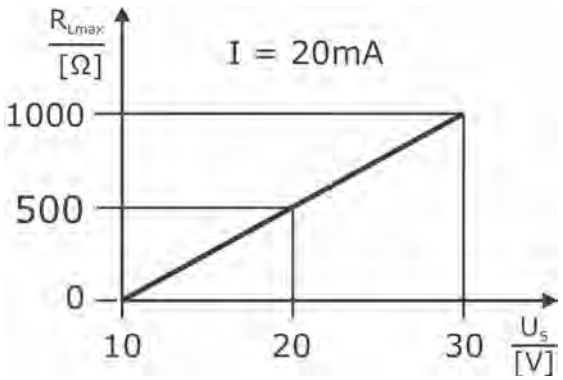
Signal 4…20 mA

A load resistor, e.g. the measuring shunt of an evaluation device, requires a minimum supply voltage. Dependent on the connected supply voltage, it results in a maximum value for this resistor, where a correct function is still possible.
This resistor can be calculated by the following term:

$$R_{Lmax} = (U_S - U_{Smin}) / 20mA$$

R_{Lmax} = maximum load resistor
U_S = connected supply voltage
U_{Smin} = minimum supply voltage

Load resistor characteristic



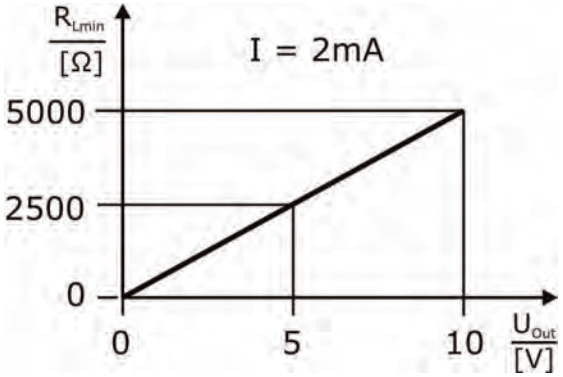
Signal 0...10 V

A load resistor, e.g. the measuring shunt of an evaluation device, requires at a definitive output voltage an output current. Due to the limitation of that output current, it results in a minimum value for this resistor, where a correct function is still possible.
This resistor can be calculated by the following term:

$$R_{Lmin} = U_{Out} / 2mA$$

R_{Lmin} = minimum load resistor
U_{Out} = output voltage

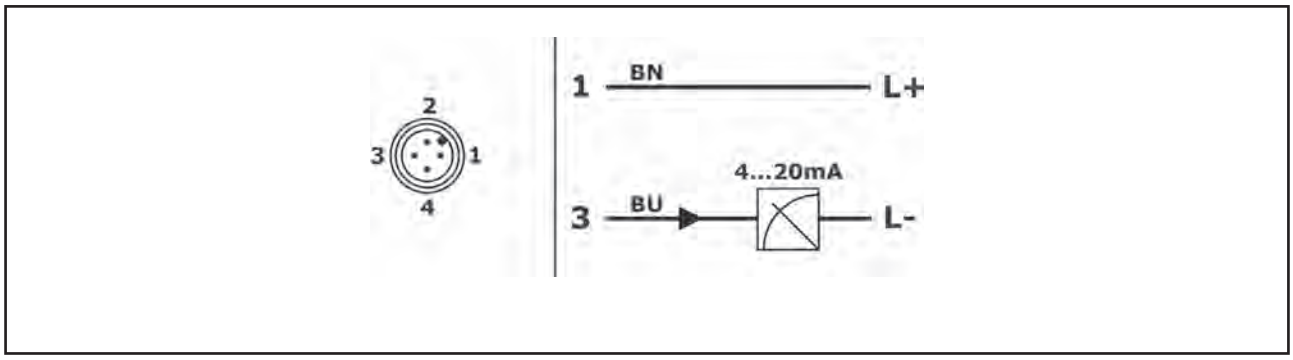
Load resistor characteristic



Connection scheme

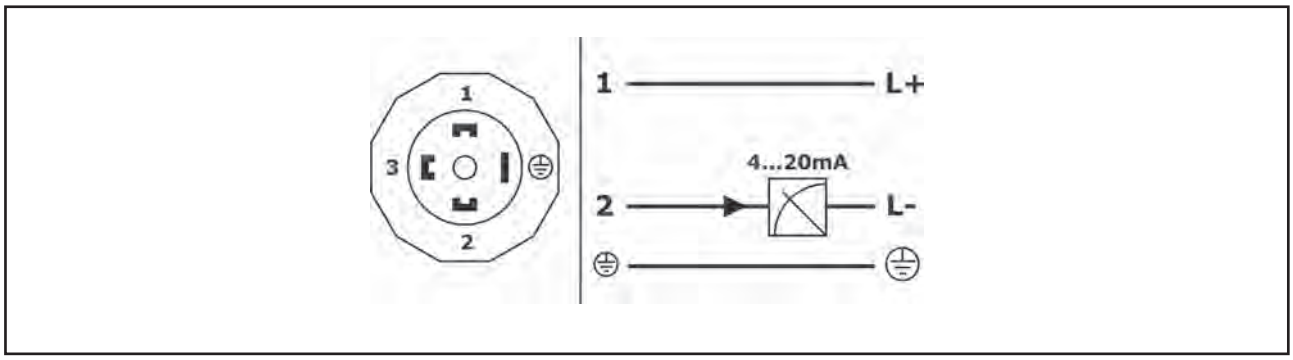
Signal 4...20 mA

Plug M12



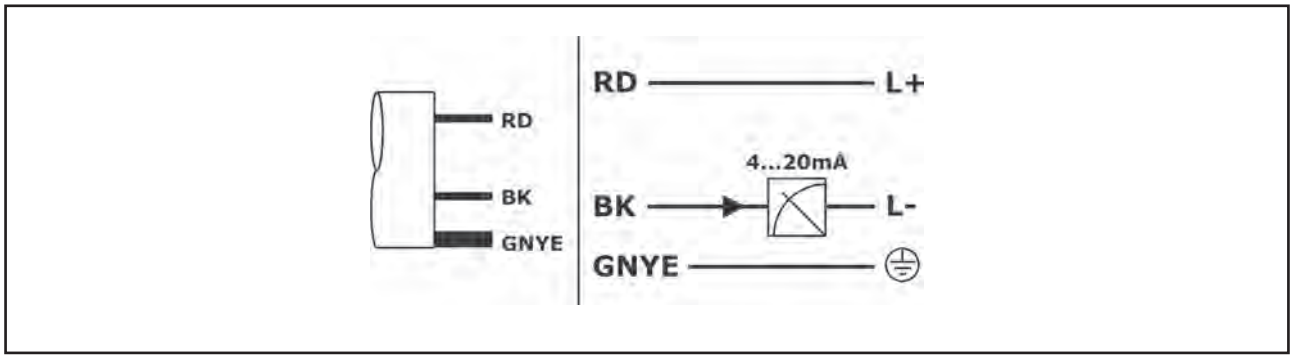
Conductor color standard connection cable M12:
BN = brown, BU = blue
The connection cable in not enclosed in the delivery contents.

Plug EN 175-301-803



The connection cable in not enclosed in the delivery contents.

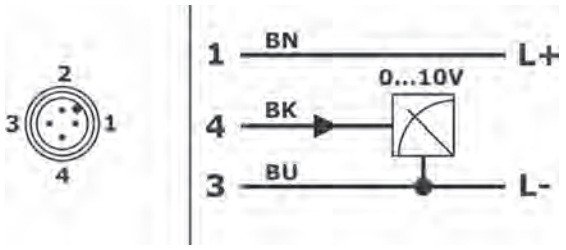
Connected cable



Conductor color cable:
RD = red, BK = black, GNYE = greenyellow

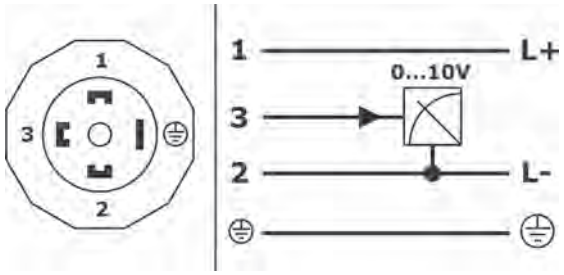
Signal 0...10 V

Plug M12



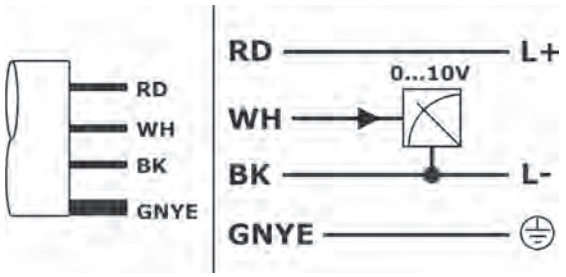
Conductor color standard connection cable M12:
BN = brown, BU = blue, BK = black
The connection cable in not enclosed in the delivery contents.

Plug EN 175-301-803



The connection cable in not enclosed in the delivery contents.

Connected cable



Conductor color cable:
RD = red, BK = black, WH = white, GNYE = greenyellow

Operation

An operation provided by user is not designated.

Maintenance

The device is free of maintenance.

Special substances can lead to solid coatings on the membrane.

Seized depositions can lead to faulty measurement results.

In the case of coat forming liquids the membrane must be regularly cleaned e.g. with clear water.

Don’t use sharp tools or aggressive chemicals for cleaning.

Repair

A repair may only be carried out by the manufacturer.

If the device must be sent back for repair, the following informations must be enclosed:

- An exact description of the application.
- The chemical and physical characteristics of the product.
- A short description of the occurred error.

Before returning the device for repair, the following measures must be proceeded:

- All adhesive product residues must be removed. This is especially important, if the product is unhealthily, e.g. caustic, toxic, carcinogenic, radioactive etc.
- A returning must be refrained, if it is not possible by 100% to remove the unhealthily product completely, because e.g. it is penetrate into cracks or is diffused through plastic.

Technical Data

Auxiliary power supply

Supply voltage U_S	*2-wire 4...20 mA* 10..30 V_{DC}, reverse polarity protected *3-wire 0...10 V* 14..30 V_{DC}, reverse polarity protected
Residual ripple U_{PP}	$\leq 2\ V_{PP}$ / $U_{Smin} \leq U_S \leq U_{Smax}$
Supply current I_{In}	*2-wire 4...20 mA* ≤ 30 mA *3-wire 0...10 V* ≤ 6 mA

Output Signal 4...20mA

Operating range I_{Out}	≤ 3 mA ... ≥ 22 mA, max. 30 mA
Permitted load R_L	≤ (U_S - 10 V) / 20mA
Step response time T_{90}	≤ 6 ms
Start-up time t_{On}	≤ 1s

Output Signal 0...10V

Operating range U_{Out}	0 V ... ≥ 11 V, max. U_S - 1,5 V
Permitted load R_L	≥ U_{Out} / 2mA
Step response time T_{90}	≤ 6 ms
Start-up time t_{On}	≤ 1s

Measuring accuracy

Reference conditions	EN/IEC 60770-1 resp. EN/IEC 61003-1
	T = 25 °C, relative humidity 45...75 %, environmental air pressure 860..1060 kPa
Calibration position	Vertical, process connection bottom side
Warm-up time	≤ 240 s

Characteristic deviation [3) 5) 12)]	≤ ±0,5% FS [2)]
Nonlinearity [12)]	≤ ±0,3% FS [2)]
Hysteresis [12)]	≤ ±0,1% FS [2)]
Influence of supply voltage	≤ ±0,04% FS [2)] / 10V
Long term drift [12)]	≤ ±0,15% FS [2)] / year - not cumulative
Temperature deviation [12)]	T_k [4)] Zero
	≤ ±0,2% FS [2)] / 10 K (0…80°C) ≤ ±0,3% FS [2)] / 10 K (-20…0°C / +80…+150°C)
	Measuring range 0…0,1 bar / 0…0,25 bar ≤ ±0,4% FS [2)] / 10 K (0…+80°C) ≤ ±0,6% FS [2)] / 10 K (-20…0°C / +80…+150°C)
	T_k [4)] Span
	≤ ±0,2% FS [2)] / 10 K (0…80°C) ≤ ±0,3% FS [2)] / 10 K (-20…0°C / +80…+150°C)

Mounting position

Maximum deviation [10)]	≤ 10 mbar

[2)] Referring to nominal measuring span resp. full scale (FS)
[3)] Nonlinearity + Hysteresis + Reproducibility
[4)] T_k = Temperature coefficient
[5)] Limit value adjustment acc. to EN/IEC 60770-1
[10)] Device rotated by 180°, process connection upside
[12)] Higher values for special measuring range

Process conditions

The permitted process temperature range results from the combination of standard range, expansion and limitation, whereby the range is defined by the narrowest limitation.

Process temperature	-20°C...+150°C *Limitation* Gasket - EPDM -40°C...+140°C

Process pressure [R] Gauge pressure [A] Absolute pressure	*Pressure range*	*Over/Burst pressure*	*Vacuum*
	-1…0 bar [R]	5 bar / 6 bar	0 bar [A]
	-1…+1 bar [R]	10 bar / 12 bar	0 bar [A]
	0…0,1 bar [R/A]	1 bar / 2 bar	0 bar [A]
	0…0,25 bar [R/A]	2 bar / 2,4 bar	0 bar [A]
	0…0,4 bar [R/A]	2 bar / 2,4 bar	0 bar [A]
	0…0,6 bar [R/A]	4 bar / 4,8 bar	0 bar [A]
	0…1 bar [R/A]	5 bar / 6 bar	0 bar [A]
	0…1,6 bar [R/A]	10 bar / 12 bar	0 bar [A]
	0…2,5 bar [R/A]	10 bar / 12 bar	0 bar [A]
	0…4 bar [R/A]	17 bar / 20,5 bar	0 bar [A]
	0…6 bar [R/A]	35 bar / 42 bar	0 bar [A]
	0…10 bar [R/A]	35 bar / 42 bar	0 bar [A]
	0…16 bar [R/A]	80 bar / 96 bar	0 bar [A]
	0…25 bar [R/A]	80 bar / 96 bar	0 bar [A]

Environmental conditions

Environmental temperature	-40°C...+85°C *Electrical connection – Connected cable* -40°C...+70°C
Protection	*Electrical connection – Plug EN 175-301-803* IP65 (EN/IEC 60529) *Electrical connection – Plug M12 / Connected cable* IP68 [≤ 1 mWs-1h] (EN/IEC 60529)
Climatic classification	4K4H [-20…+55°C / 4…100%] (EN/IEC 60721-3-4)
Shock classification	50 g [11ms] (EN/IEC 60068-2-27)
Vibration classification	20 g [10 - 2000 Hz] (EN/IEC 60068-2-6)
EM compatibility	Operation device class B / Industrial range (EN/IEC 61326)
Weight	0,25 kg *Electrical connection – Connected cable* 0,3 kg + (L1 x 0,035 kg/m)

Materials - process wetted

Membrane	Steel 1.4435 (AISI 316L)
Process connection	Steel 1.4435 (AISI 316L)
Gaskets	FPM – fluorelastomere (Viton®) EPDM – ethylene-propylene-dienmonomere

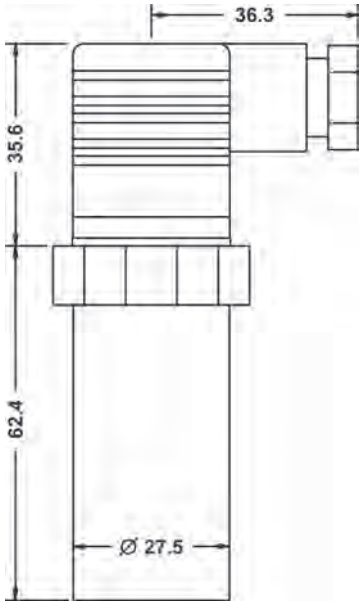
Materials - not process wetted

Terminal enclosure	CrNi-steel
Electrical connection part	*Electrical connection – Plug EN 175-301-803* Device plug PA Gasket NBR *Electrical connection – Plug M12* Device plug PUR *Electrical connection – Connected cable* Cable gland PA Gasket CR / NBR Cable sheath PE
Pressure compensation element	PTFE
Gaskets	FPM – fluorelastomere (Viton®)
Pressure transmitting liquid	Synthetic oil, FDA-listed for food industry

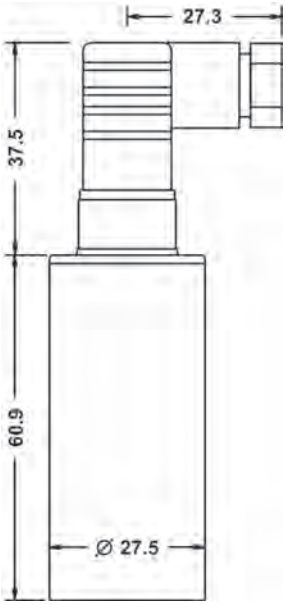
Dimension drawings

Terminal enclosure

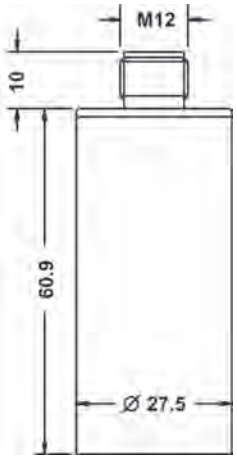
Electrical connection type T - Plug EN 175-301-803-A



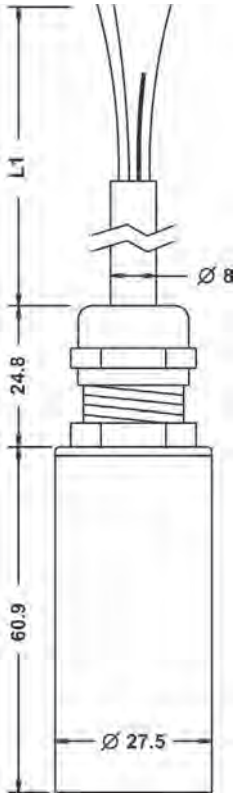
Electrical connection type S - Plug EN 175-301-803-C



Electrical connection type V - Plug M12

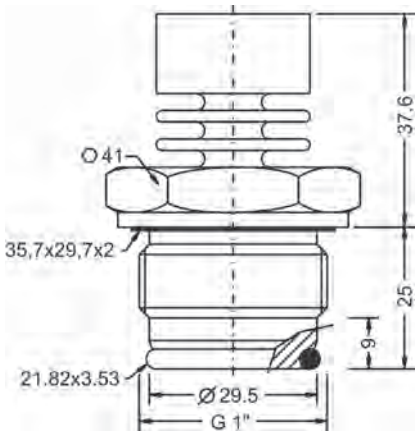


Electrical connection type K - Connected cable

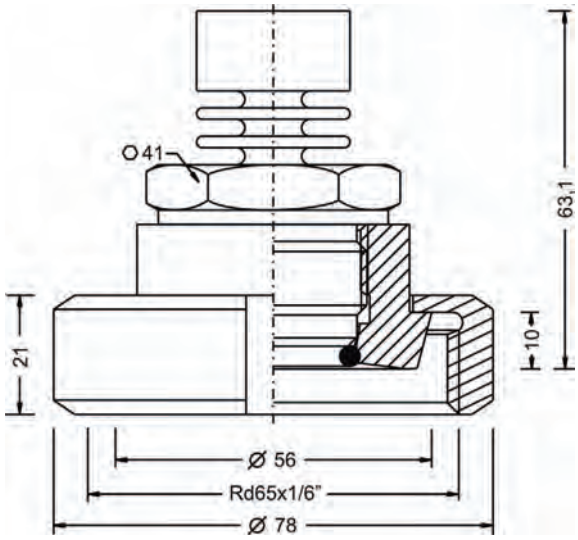


Process connection

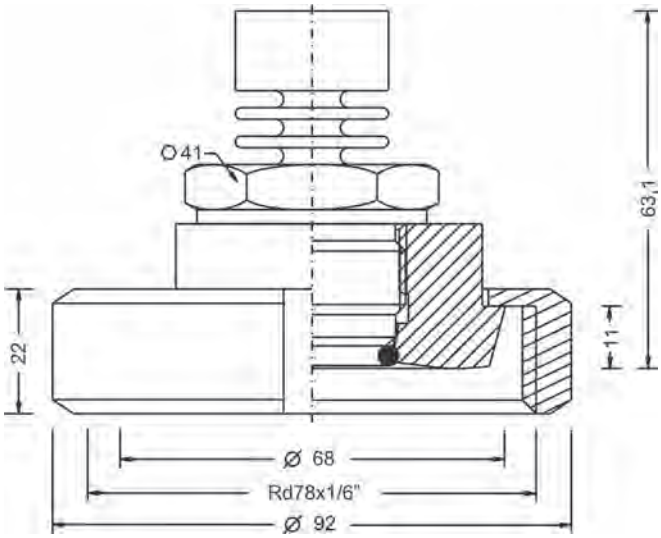
Type 5 - G 1” ISO 228-1 - flush-mounted



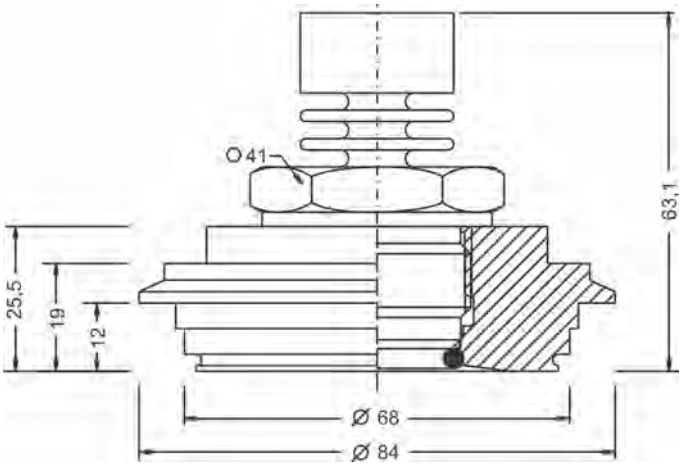
Type N - DN40 DIN 11851 - flush-mounted



Type M - DN50 DIN 11851 - flush-mounted



Type P - Varivent® N, Ø68 mm



Order Code

Type
0 Standard

Measuring membrane - material (process wetted)
ML Metal, strain gage piezoresistive

Process connection
5 G1“ B, ISO 228-1, flush-mounted, radial O-ring, EHEDG conform
N Milk tube DIN 11851, DN40
M Milk tube DIN 11851, DN50
P Varivent® N, Ø68 mm, DN40-125 (1½“-6“)

Material gaskets (process wetted)
1 FPM – fluorelastomere (Viton®)
3 EPDM – ethylene-propylene-dienmonomere - food applications

Material process connection (process wetted)
V Steel 1.4435 (AISI 316L)

Material terminal enclosure
C CrNi-steel

Measuring range
01 0..0,1 bar
02 0..0,25 bar
03 0..0,4 bar
04 0..0,6 bar
05 0..1 bar
06 0..1,6 bar
07 0..2,5 bar
08 0..4 bar
09 0..6 bar
10 0..10 bar
11 0..16 bar
12 0..25 bar
16 -1..0 bar
17 -1..+1 bar
YY Special measuring range (poss. higher deviation accuracy)

Electronic - output
A 2-wire, signal 4…20mA
B 3-wire, signal 0…10V

Process temperature
0 Standard, -20°C…+150°C

Pressure type
R Gauge pressure
A Absolute pressure

Measuring system – accuracy
4 0,5%

Electrical connection
S Plug EN 175-301-803-C (DIN 43650-C)
T Plug EN 175-301-803-A (DIN 43650-A)
V Plug M12
K Connected cable, L1 ≥ 2m

Precont	0	ML			V	C			0		4	

Installation material and connection cable are not enclosed in contents of delivery.

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knowledge and systems
Your partner for measuring technology and automation