Relative and absolute pressure and vacuum sensor with HART® communications INPRES 04 type 704

PRODUCT MANUAL

APPLICATION

- For precision measurement of absolute or relative pressure and vacuum of non-aggressive and aggressive liquids, gasses, steams and dust to 4 MPa in areas such as: oil and gas industry, chemical and petrochemical industry, energy industry, heavy industry
- For the environment, where mechanical resistance is required pursuant to EN 60068-2-6 (class AH2 pursuant to ČSN 33 2000-5-51) and seismic capability of the electrical equipment of the safety system of the nuclear power stations pursuant to IEC 980 (MVZ level SL-2).

DESCRIPTION

The box of the sensor has independent chambers for electronics and for interconnecting terminal board. Both chambers are equipped with screw cover. Cable gland for connection cable and plug are delivered pursuant to the sensor as accessories.
The terminal board is accessible after unscrewing the cover
The sensor is provided with an external terminal for connecting and grounding wire or wire for mutual interconnection
The sensor is powered from an external source and is set by the sensor manufacturer to the desired range
The pressure sensor forms a separating diaphragm. The sensor is equipped with HART® communication.

TECHNICAL DATA

The sensor is designed pursuant to EN 61140 as an electrical equipment of protection class III for the application in networks with category of established impulse withstanding voltage II and pollution grade 2 pursuant to EN 61010-1. The follow-up (evaluation) device shall comply with Article 6.3 of the said standard.
Protection against electric shock is ensured with power supply from a safe source of low voltage SELV/PELV pursuant to ČSN 33 2000-4-41.
Short-circuit protection: permanent.
Reverse polarity protection: no damage, but also no function
Electric strength pursuant to EN 61010-1 Article. 6.8.3:
500 V eff (710 V DC)
Electric insulation resistance:
min. 20 MΩ (100 V DC), at ambient temperature 20 ±15 °C and max. 80 % relative humidity
Power consumption: depending on the supply voltage and output current, max. 660 mW,
Ingress protection
pursuant EN 60529: IP67
: any (standard calibration in a vertical position with the pressure port connection down, differing installation position PN ≤ 0,2 MPa have to be specified in the order)
Display: LCD display, visible range 32,5 x 22,5 mm

Main display	5 – digit 7 segment, height of digits 8 mm, display range ± 9999
Additional display	8 – digit, 14 segment, digit height 5 mm
Barograph	52 segment, accuracy 0,1 % ± 1 digit
Weight:	min. 2570 g
Type of operation:	continuous

Used materials:
materials in contact with measured medium

- Diaphragm: stainless steel 1.4435 (316L)
- Sensor filling: silicone oil
- Input part: steel 1.4541
- Weld-on sleeve and cap-nut: steel 1.0569, 15 128 or 1.4541
- Sealing: standard Al (EN AW-1050A), variants: Cu 42 3005, steel 1.4541 or steel 1.4404

Head and cover of terminal board: aluminium alloy EN AB-AlSi9Cu3(Fe) pursuant to EN 1676, sprayed with fire paint
Viewing glass: safety glass
Cable gland: Nikle-coated brass, polyamide 6/6 or polyamide 6 pursuant to design
Plug: Nikle-coated brass

OPERATION CONDITIONS

The environment is defined by the group of parameters and their severity grades IE 36 pursuant to ČSN EN 60721-3-3 and the following operation conditions:
Ambient temperature: -20 to 70 °C
Temperature of measured medium: -40 to 125 °C
for relative pressure range > 0 MPa max. 150 °C for 60 minutes at maximum ambient temperature 50 °C
Relative ambient humidity:
10 to 95 % with condensation, with upper level of water content 29 g H_2O/kg of dry air
Atmospheric pressure: 70 to 106 kPa
Vibrations pursuant to EN 60068-2-6 ed. 2:
Frequency range: 25 to2000 Hz
Drift amplitude: 49 $m.s^{-2}$ (5g)
Shock pursuant to EN 60068-2-27 : 100 g / 1 ms
Type of power supply voltage: DC 24 V
Power supply:

- standard design DC 12 to 28 V

Current consumption: 25 mA
Load resistance R:

$$R_{max} = \frac{U - U_{min}}{0{,}02} \quad [\Omega, V, A],$$

where U is voltage of supply source at 20 mA
(load during HART® communication: R_{min} = 250 Ω)
Electromagnetic compatibility:
Emissions and resistance to the interference complies with the standard EN 61326-1 for Class A devices.

METROLOGICAL DATA

Input signal:
Absolute or relative pressure against surrounding atmosphere pursuant to the table 3 and 4
Suppressed range and start can be adjusted within the whole range of the sensor.

Output signal:
2-wire 4 to 20 mA with HART® communication

Setting range: max. 1:10
Offset: 0 … 90 % FSO
Dumping: 0 to 100 s**):** **≤** ±0,1 % FSO for range ≤1:5
≤ 0,1 + 0,015 x (range - 5) % FSO for range > 1:5
Long-term stability: ≤ ± 0,1 % FSO/year at reference conditions
Response time: 100 ms (without consideration of electronic damping)

Additional errors:
- Impact of changes of supply voltage: 0,05 % FSO / 10V
- Impact of overloading: 0,05 % FSO / kΩ
- Impact of temperature: ≤ 0,2 % FSO

Impact of other influencing properties has no metrological significance.

DESIGNATION

Data on sensor labels
- Trade mark of the manufacturer
- Made in Czech Republic
- Product ordering number
- Serial number
- Maximum overpressure
- Ingress protection
- Measuring range
- Output signal
- Type of power supply voltage
- Mark CE

DELIVERY

Unless agreed otherwise with the customer, each delivery includes
- Delivery note
- Sensor pursuant to the purchase order
- Accessories (cable gland and plug) pursuant to table 2
- Optional accessories (holder) pursuant to table 1
- Optional accessories (weld-on sleeve with cap nut and sealing) pursuant to table. 3
- Suitable valve or manifold ordered separately pursuant to table 4 and the catalogue, type 961, 964 and 967
- Accompanying technical documentation in Czech:
  - o Product quality and completeness certificate, which also serves as the warranty certificate
  - o Product manual
  - o Manual for the applicable valve or valve set together with the manual of accessories, type 981

If it is established in the purchase contract or agreed otherwise, the following documentation can be also delivered with the product:
- EU Declaration of Conformity
- Declaration of Conformity of the supplier pursuant to EN ISO/IEC 17050-1
- Test report about the seismic and the vibration qualification
- Calibration protocol

PACKING

Both sensors and accessories are delivered in a packing ensuring resistance to the impact of thermal effects and mechanical effects pursuant to controlled packing regulations.

TRANSPORT

The sensors may be transported on conditions corresponding to the set of combinations of classes IE 21 pursuant to EN 60721-3-2 (i.e. by airplanes and trucks, in premises that are ventilated and protected against atmospheric effects).

STORAGE

The sensors may be stored on conditions corresponding to the set of combinations of classes IE 11 pursuant to EN 60721-3-1 (i.e. in places with temperature for design without display between -40 to 80 °C and with display -30 to 80 °C, withs humidity between 5 to 95 %, special threat of an attack with biological agents, with vibrations of small significance and not situated close to sources of dust and sand).

TABLE 1 – DESING OF PRESSURE SENSORS

SPECIFICATIONS			ORDERING NUMBER							
			704	x	x	x	xx	x	x	xxx
Standard design for non-explosive environment				0	0					
Measured pressure	relative					R				
	absolute					A				
Nominal pressure range (relative/absolute) [MPa]	**0 to 0,04 (pouze relativní)**					**R**	**0004**			
	0 to 0,1						0010			
	0 to 0,2						0020			
	0 to 0,4						0040			
	0 to 1,0						0100			
	0 to 2,0						**0200**			
	0 to 4,0 *)						**0400**			
	0 to 10,0						1000			
	0 to 20,0						2000			
	0 to 40,0						4000			
	0 to 60,0						6000			
Vacuum range of nominal pressure (relativ) [MPa]	-0,04 to 0,04					R	P004			
	-0,1 to 0,1					R	P010			
	-0,1 to 0,2					R	P020			
	-0,1 to 0,4					R	P040			
	-0,1 to 1,0					R	P100			
Process connection	M20 × 1,5 with weld on sleeve pursuant to EN 837-1							M		
	other after an agreement ZP							9		
Optional accessories	Holde for sensor attachment	without holder							0	
		on the wall (figure 1)							1	
		on 2” tube (figure. 2)							2	
	weld-on sleeve with cap nut and sealing pursuant to table. 3									NAx

Standard design

*) Standard design only for relative measured pressure
**) If code P1 is not specified, the device are supplied with basic calibration including a calibration protocol
NOTE: If the range of sensor is other than table, is ordering number 09, i.e.. 704 xxx 09 xx.

ORDERING

The purchase order shall specify
- Name
- Product ordering number
- Measuring range (for other than the basic range)
- Other (special) requirements
- Number of pieces

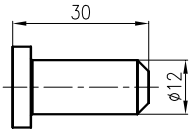
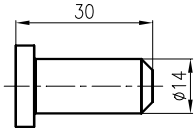
In the order specify, whether it is required to deliver for the sensor valve or manifold for connection to impulse piping. Ordered sparely.

PURCHASE ORDER EXAMPLE

Standard design:

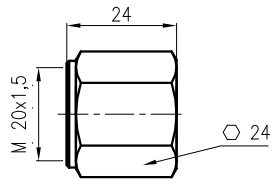
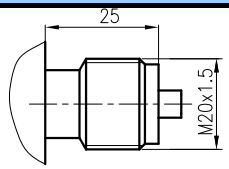
Absolut pressure sensor with HART® communications
704 P0R 40 M1 NA1
2 pcs

TABLE 2 – OVERVIEW OF WELD-ON SLEEVE WITH CAP-NUT AND SEALING – TYPE 981 DELIVERED TO PRESSURE SENSORS

CODE	THREAD OF CAP-NUT	MATERIAL	INNER Ø OF THE SLEEVE [mm]	DIMENSIONAL DRAWING
NA1	M20x1,5	Carbon steel 1.0569	6,5	
NA2	M20x1,5	Stainless steel 1.4541		
NA3	M20x1,5	Carbon steel 1.0569		
NA4	M20x1,5	Carbon steel 1.0569		
NA5	M20x1,5	Stainless steel 1.4541		
NA6	M20x1,5	Heat-resistant steel 15 128		

The sleeve is delivered by 1 piece together with the relevant cap nut and with aluminium sealing.
After putting the cap nut on the sleeve and welding the sleeve on the piping, the armature provided with the corresponding screw joint for the sleeve according to the dimensional drawing of the screw joint can be attached to the piping..

CAP-NUT FOR WELD-ON SLEEVE

MATERIAL OF NUT	DIMENSIONAL DRAWING OF NUT	DIMENSIONAL DRAWING OF SCREW-JOINT
Stainless steel 1.4541 (only for NA2, NA3, NA5 and NA6		
Carbon steel 11 109.0 (only for NA1 and NA4)		

SEALING RINGS FOR WELD-ON SLEEVE
They can also be ordered independently from other materials pursuant to the ordering numbers specified below.

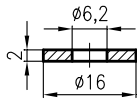
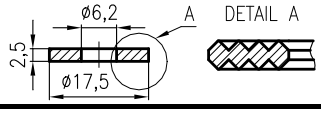
ORDERING NUMBER SEALING	MATERIAL		DIMENSIONAL DRAWING
382 041	Al	EN AW-1050A	
276 067	Cu	42 3005	
382 063	Steel	1.4541	
382 096	Steel	1.4404	

TABLE 3 - OVERVIEW OF CABLE OUTLETS AND PLUGS TYPE 981 DELIVERED TO PRESSURE SENSORS

DESIGN OF PRESSURE SENSOR	**CABLE GLAND** (Connecting thread 1/2-14 NPT)		**PLUG** (Connecting thread 1/2-14 NPT)	
	DESCRIPTION	ORDERING NUMBER	DESCRIPTION	ORDERING NUMBER
Standard design for non-explosive environment	Gland for cable Ø 5-12 mm, material polyamide 6 grey	981 VK 512 P0	Plug Ex d (Ex t), material Nikle-coated brass	981 ZK M1

Standard delivered cable gland and plug for each sensor. Cable gland and plug can be ordered separately under the order number.

TABLE 4 - DESIGN OF VALVES RECOMMENDED FOR COMPLETION WITH PRESSURE SENSOR

SPECIFICATIONS			ORDERING NUMBER				
			xxx	xx	xx	xx	xxx **)
Stainless valve	Direct		967	11			
	Manometric closing with venting valve			41			
	Manometric test with venting valve and screw-joint M20x1.5 to connect the control manometer			51			
	Manometric test with venting valve and screw-joint M20x1.5 to connect the control manometer closing with valve			52			
Brass valve	Manometric closing with venting valve		961	4E			
	Manometric test test with venting valve and screw-joint M20x1.5 to connect the control manometer			5E			
Stainless 2-way manifold			964	41			
CONNECTING TERMINALS pursuant to manual for accessories type 981	OF INLET				31 *)		
					35 *)		
	OF OUTLET					33	
SEALING OF THE SPIN							
SEAT SEALING							
SPECIAL TREATMENT							

*) for type 967 and 964 it is possible to select other terminals of the inlet pursuant to manual for accessories type 981, (for design 967 52 it is possible to select only terminals of inlet s with codes 31 and 35)

**) Select the codes for sealing of the spin, seat sealing and special treatment pursuant to manual for individual type of valve and manifold pursuant to measured medium

ORDERING OF VALVES AND MANIFOLDS

They shall be ordered pursuant to catalogue of valves, types 961 and 967, and catalogue of valve sets, type 964 (recommended valves and valve sets pursuant to table 4)

The purchase order shall specify

- Name
- Product ordering number
- Other (special) requirements
- Number of pieces

PURCHASE ORDER EXAMPLE

Standard design:

Stainless valve
967513133
15 pcs

FIGURE 1 – DIMENSIONAL DRAWING OF PRESSURE SENSOR

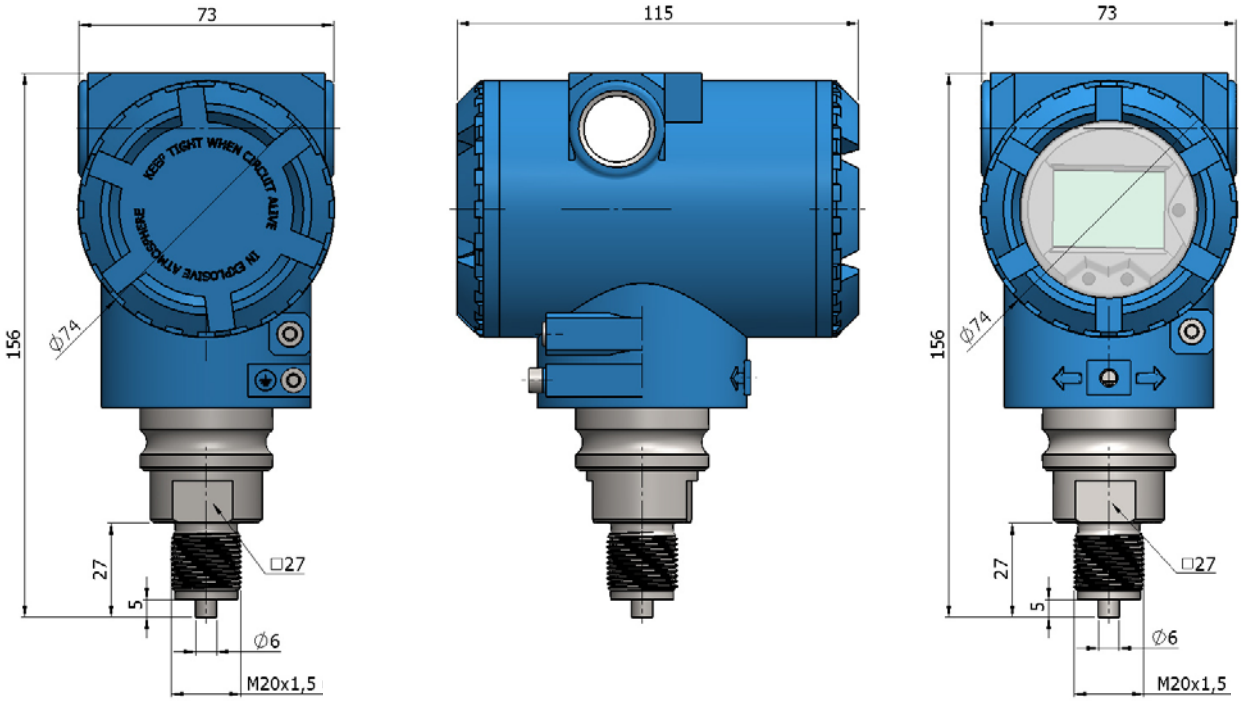


TABLE 5 - MEASURING RANGE AND LIMITS OF OVERLOAD CAPACITY

Limit of measurement range		Max. overload	Destruction
lower *) [MPa]	upper [MPa]	[MPa]	pressure [MPa]
-0,1	0,04	0,2	0,3
-0,1	0,1	0,5	0,75
-0,1	0,2	1,0	1,5
-0,1	0,4	2,0	2,5
-0,1	1,0	4,0	5,0
-0,1	2,0	8,0	12,0
-0,1	4,0	10,5	21,0
-0,1	10,0	21,0	42,0
-0,1	20,0	60,0	100,0
-0,1	40,0	100,0	125,0
-0,1	60,0	100,0	125,0

*) For abs. pressure 0 MPa

Maximum overload can impact metrological properties of the sensor. Overload higher than the maximum can cause damage to the sensor.

Note: The set-up is realized at ambient temperature 20 ±2°C

TABLE 6 - MEASURING VACUUM RANGE AND LIMITS OF OVERLOAD CAPACITY

Limit of vacuum measurement range		Max. overload	
[MPa]	upper [MPa]	[MPa]	
-0,04	0,04	0,2	0,3
-0,1	0,1	0,5	0,75
-0,1	0,2	1,0	1,5
-0,1	0,4	2,0	2,5
-0,1	1,0	4,0	5,0

INSTALLATION AND CONNECTION

SENSOR INSTALLATION

When installing must be considered the device protection and operation position pursuant Article. *Technical data*.

The sensors are fixing using the holder to the wall or on 2“ tube. Examples of sensor installation are provided in figures 2 and 3.

FIGURE 2 - TYPES OF SENSOR INSTALLATION ON 2” TUBE

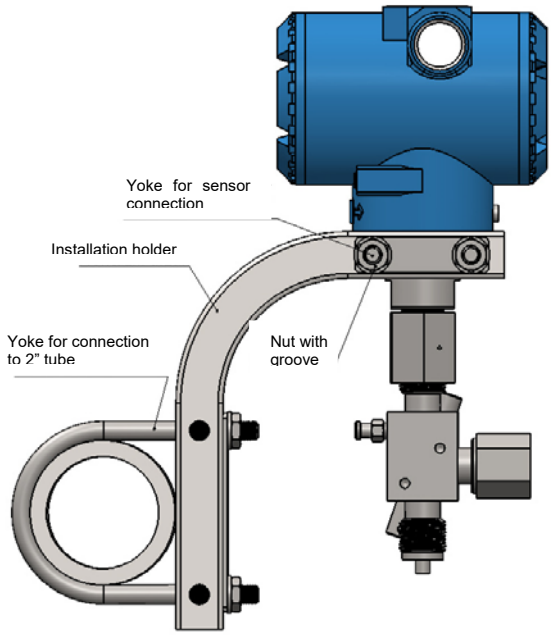
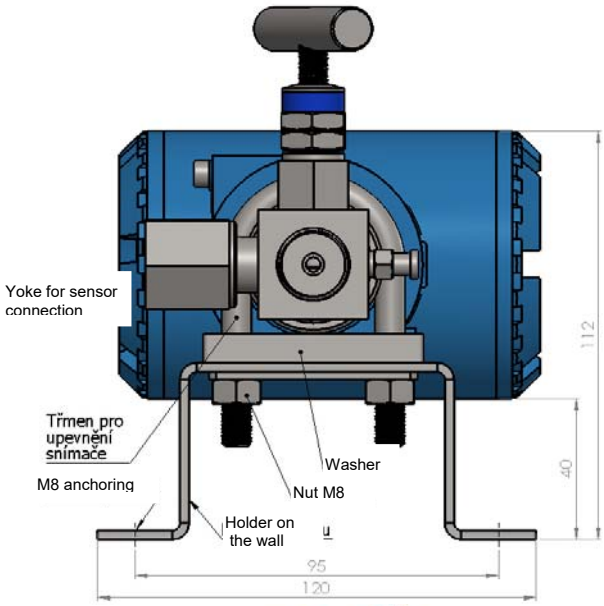
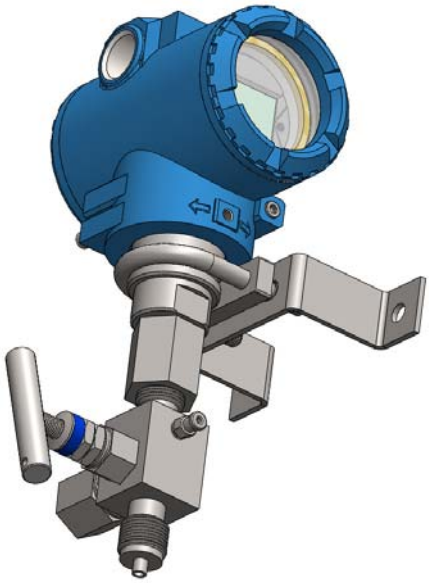


FIGURE 3 - TYPE OF SENSOR INSTALLATION ON THE WALL





CONNECTION TO IMPULSE PIPPING

The connection can be realized either directly while using the valve or another armature with manometric thread M20 x 1.5 and/or by means of accessories (welding sleeve with cap nut and sealing).

Sensor installation with a cap nut on the sleeve:

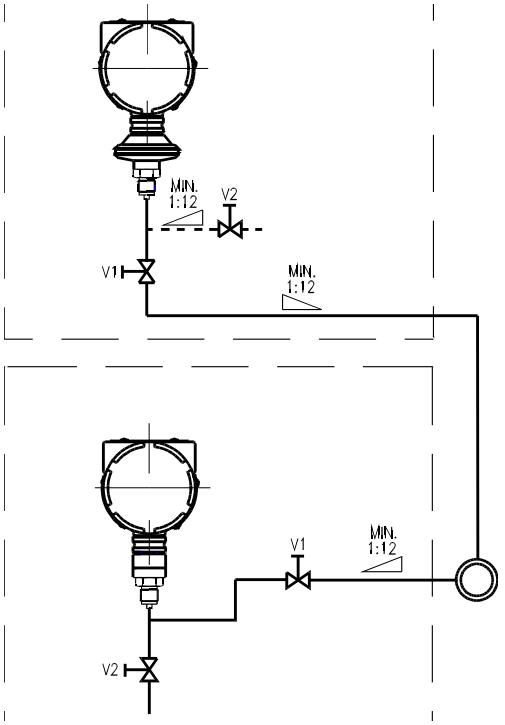
1. Put a cap nut on the sleeve
2. Weld the sleeve on the end of tube
3. Put a metal sealing on the screw joint (use a sealing corresponding to media and pressure)
4. Screw the piping to the screw joint by means of a nut and tighten with torque of max. 120 Nm

The sealing ring of the inlet screw-joint is for single use only (after tightening the inlet screw-joint, it deforms). When reassembling the sensor on the pipe, it is necessary to use a new sealing ring.
Ordering numbers of rings are adducing in Article *Spare parts.*
When using a stainless steel impulse piping, a sealing ring can be ordered of steel 1.4541 or 1.4404.

The pressure sensor can be completed with valves of stainless type 967, brass type 961 or valve sets of type 964. recommended valves and manifolds, see Table 3.
While designing the impulse piping, the following main principles shall be applied:

- While designing the impulse piping, the following main principles shall be applied: The impulse piping should be as short as possible and should have sufficient cross section to avoid pressure losses or blockages;
- The impulse piping shall have a steady inclination downwards from the extraction to the sensor (when measuring pressure of liquid or steam) so that the occurring bubbles could return to the piping, or upwards (when measuring pressure of gas) so that the condensing fluid could flow back to the piping;
- Impulse piping shall have no leakage;
- Avoid freezing of fluid in the impulse piping;
- Do not exceed maximum temperature of measured fluid at the inlet of the sensor

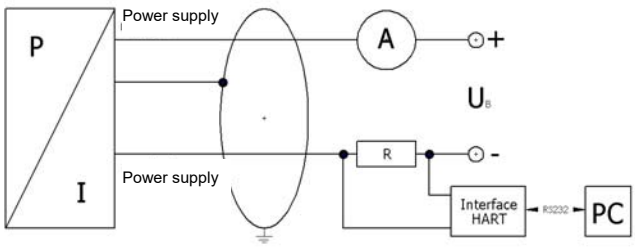
FIGURE 4 – CONNECTION OF SENSOR TO IMPULSE PIPIINGÍ



ELECTRIC CONNECTION

The electrical connection may be only realized by qualified workers.
Install to the sensor housing packing outlet and plug with thread 1/2-14 NPT delivered as sensor accessories.
Installation gland and plug pursuant to manual for accessories for pressure sensors – glands and plugs type 981 and the relevant instruction sheets.
The terminal board is accessible after unscrewing the cover

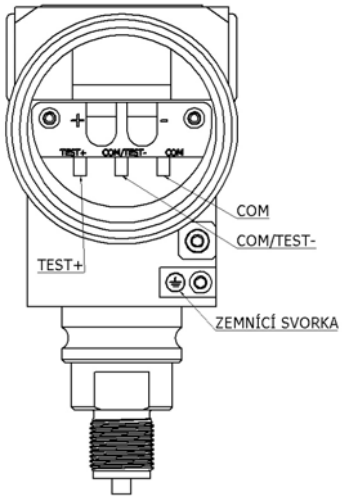
FIGURE 5 - SCHEME OF ELECTRIC CONNECTION:



The terminal allow the power supply and evaluation devices to be connected to the Cu wires to max. cross-section 2,5 mm^2 with total insulation resistance min. 10 MΩ.

The maximum cross-section of wire for connection to an external ground terminal:
External terminal: cable 4,0 mm^2, full wire 6,0 mm^2
If you are use to connected the cable, must be protected against fraying by the pressing sleeve

FIGURE 6 – VIEW ON TERMINAL BOARD



Connect the power supply and evaluation devices according to the scheme of electric connection (Figure 5) a circular cable of diameter 5 (6 or 7) to 12 mm according to the cable gland used. Use multicore, twisted, shielded cable for relative pressure with the ventilation tube.
The reference pressure to the relative pressure sensor is supply in ventilation tube with the electrical cable. The ventilation tube on the outlet side must be connected to the atmosphere.
The sensor has reverse polarity protection of the supply voltage.
Shield ground only at one point. Do not lead the cable together with the power cables. Connect the evaluation device with a cable with a total insulation resistance min. 10 MΩ.
When using a device with cable outlet, turn the outgoing cable downwards. If the cable has to be turned upwards, then point it downward so the moisture can drain. The cable isolation must have chemical, mechanical and thermal resistance in accordance with the environment, in which the cable will be installed. It is recommended to strain relief the cable along the length between the sensor and the following device.

POSITION OF THE DISPLAY AND OPERATING MODULE

The display and operating module is continuously rotatable so that clear readability is guaranteed even in unusual installation positions. To change the position go ahaed as follows:

- Screw off the metal cap by hand
- Turn the display and operating module carefully into the desired position by hand. The module is equipped with a rotational limiter.
- Before screwing on the cap again, the o-ring and sealing surface of the housing have to be checked for damage and if necessary have ti be changed!

HART® COMMUNICATION

Maximum cable length for the sensors with HART® communication is determined by the arrangement of the wires of the connecting cable. The total cable length can be up to 1500 m**.** It requires a twisted two-wire shielded together a

cross-section of the core min. 0,5 mm^2. The HART® communicator is connected in according to Figure 5. For realible communication must be in the output loop circuit a total load resistance min. 250 Ω.

Maximum cable length between the device and the power supply:

$$L_{max} = \frac{65 \cdot 10^6}{R_v \cdot C_v} - \frac{40 \cdot 10^3}{C_v}$$

where L_{max}: Maximum cable length [m]
R_V: Cable resistence with load resistence R_{max} [Ω]
C_V: cable capacity [pF/m]

Load resistance R:

$$R_{max} = \frac{U - U_{min}}{0{,}02} \qquad [\Omega, V, A]$$

where U is voltage of supply source at 20 mA

CABLE OUTLETS AND PLUG INSTALLATION

Cable gland and plug must be tightened in the sensor housing with prescribed method. Torque of gland and plug with thread 1/2-14 NPT is min. 25 Nm.

Cable installation, sealing and protection against rapture in the gland shall be realized pursuant to the supplier's instruction sheet.

WARNING

Do not use other sealing rings in the gland than the original ones supplied by the manufacturer. Do not change artificially the outer diameter of the cable, for example, bandaging by electrically insulating strips..

COMMISSIONING

After the installation of the sensor, the impulse piping and the sensor shall be vented or drained.

When measuring steam before draining the sensor, we recommend filling the impulse piping with water.

After the connection of supply voltage, the sensor is prepared for operation.

OPERATION AND MAINTENANCE

The sensor does not require any operation and maintenance.

DISPLAY AND OPERATION KEYS

A bargraph is shown in the display, indicating the current pressure input as percentage of the specified pressure range.. The indication of the measured value as well as the configuration of the individual parameters occurs through a menu via the display. The individual functions can be set with the help of three miniature push buttons located under the metal cap. The definition of the three buttons is: ▼, ▲, OK (starting at the left side).

The menu system is a closed system allowing you to scroll both forward and backward through the individual set-up menus to navigate to the desired setting item. All settings are permanently stored in a Flash EPROM and therefore available even after disconnecting from the supply voltage.

STRUCTURE OF THE MENU SYSTEM (see. Table 7, 8, 9)

Menu list

- Button ▲: with this button you move forward in the menu system or increase the displayed value: it will also lead you to the operating mode (beginning with menu item "1 DISPLAY")
- Button ▼: with this button you move back in the menu system or decrease the displayed value, it will also lead you to the operating mode (beginning with menu item "5 SERVICE“)
- OK-button: with this button menu item and set values have to be confirmed

Execution of configuration:

- set the desired menu item vy pushing the ▲ or ▼button
- activate the set menu item by pushing the OK button
- set the desired value or select one of the offered settings by using the ▲or ▼button
- store/confirm the set value/selected setting and exit the menu by pushing the OK bottom

If a parameter is configurable by a value, each digit may be configured separately. That means after activating such a menu item (e.g. "2.3.1 OFFSET") by pushing the OK button, the first digit of the currently set value will start to blink. Now scroll up or down to the desired digit via the ▼ or ▲ button and confirm it with the OK button. After that the next digit will start ti blink. Configure it in the same way. In the menu items "2.3.1 OFFSET" and "2.3.2 FINALVAL", the decimal point will then start to blink and it is also possible to change its by using the ▼ or ▲ button. By confirming the position with the OK button, the total value will be stored it permissible. If the valu e is out of range, an error message will appear in the display and the set value will not be stored. If you intend to set a negative value, the first digit has to be configured with the ▼.button.

In principle, this device is maintenance-free. If desired the housing or device can be cleaned when switched of using a damp cloth and non-aggressive cleaning solutions. With certain media, however, the diaphragm may be polluted or coated with deposit. It is recommended to define corresponding service intervals for control.

After placing the device out of service correctly, the diaphragm can usually be cleaned carefully with a non-aggressive cleaning solution and a soft brush or sponge. If the diaphragm is calcified, i tis recommended to send the device to the manufacturer

A false cleaning of the device can cause an irreparable damage on the diaphragm. Therefore never use pointed objects or pressured air for cleaning the diaphragm.

RELIABILITY

Indicators of reliability in operation conditions and ambient conditions specified herein

- Expected service life 100 x 10^8 pressure cycles

SPARE PARTS

SPECIFICATIONS		ORDERING NUMBER
Sealing	Al (EN AW-1050A)	382041
	Cu 42 3005	276067
	steel1.4541	382063
	steel1.4404	382096

WARRANTY

The warranty period is 24 months from the receiving of the product by the customer, unless established otherwise in the contract. Rejection of defects shall be enforced in writing at the manufacturer within the warranty period. The rejecting side shall identify the product name, ordering and manufacturing numbers, date of issue and number of the delivery note, clear description of the occurring defect and the subject of the claim. If the rejecting side is invited to send the device for repair, it shall do so in the original package of the manufacturer and/or in another package ensuring safe transport.

The warranty shall not apply to defects caused by unauthorized intervention into the device, its forced mechanical damage or failure to comply with operation conditions of the product and the product manual.

REPAIRS

The sensors shall be repaired by the manufacturer. They shall be sent for repair in the original or equal package without accessories.

During the life-time of a transmitter, the value of offset and span may shift. As a consequence a deviating signal value in reference to the nominal pressure range starting point or end point may be transmitted. If one these two phenomena occurs after prolonged use, a recalibration is recommended to ensure furthermore high accuracy.

DISABLING AND LIQUIDATION

The product and its package do not include any parts that could impact the environment.
Products that are withdrawn from operation, including their packages (with the exception of products marked as electrical equipment for the purposes of return withdrawal and separate salvage of electrical waste), may be disposed of to sorted or unsorted waste pursuant to the type of waste.

The manufacturer realizes free return withdrawal of marked electrical equipment (from 13.8.2005) from the consumer and points out the danger connected with their illegal disposal. The package of the sensor can be recycled completely. Metal parts of the products are recycled, non-recyclable plastic materials and electrical waste shall be disposed of in accordance with applicable legislation.

TABLE 7 - CONFIGURACION

1 DIPLAY	Display
1.1 P_{max}	**Maximum pressure display (high pressure)** The maximum pressure that occurred during the measurement is shown on the display.
1.2 P_{min}	**Minimum pressure display (low pressure)** The minimum pressure that occurred during the measurement is shown on the display.
1.3 T_{max}	**Maximum temperature display (high pressure)** The maximum temperature that occurred during the measurement is shown on the display.
1.4 T_{min}	**Minimum temperature display (low pressure)** The minimum temperature that occurred during the measurement is shown on the display.
1.5 CLEAR	Delete the values1.1-1.4 (P_{max}, P_{min}, T_{max}, T_{min})
1.6 INFO	**Configuration of the display** Assignment of the settable digits: "1": 1st line: measured pressure — 2nd set pressure unit "2": 1st line: Output signal — 2nd line: mA "3": 1st line: measured temperature — 2nd line : °C "4": 1st line: measured pressure — 2nd line: Change between pressure / output signal in mA "5": 1st line: measured pressure — 2nd line: Change between pressure / temperature in °C "6": 1st line: measured pressure — 2nd line: Change between pressure / output signal in mA temperature in °C
2 CALIB	**Configuration of measuring range, display and output**
2.1 ZERO	**Zeroing the display** The message „CONFIRM“.appears on the display when selecting the subsidiary menu item with OK button By holding the OK button pressed for at least 2. second the zeroing is performed, and the message „CONFIRM“. disappears from the display
2.2 CAL REF	**Adjust the analogue output with pressure reference**
2.2.1 OFFSET	**Adjust the starting value for the output signal** After the reference pressure has been applied and accepted, selecting the subsidiary menu item with the OK button causes the message „CONFIRM“ to appear on the display. By holding the OK button pressed for at least 2 seconds the applied pressure is specified as the starting value for the output signal (4 mA), and the message „CONFIRM“ disappears from the display. The displayed value remains unchanged.
2.2.2 FINALVAL	**Adjust the end value for the output signal** After the reference pressure has been applied and accepted, selecting the subsidiary menu item with the OK button courses the message „CONFIRM“ to appear on the display. By holding the OK button pressed for at least 2 seconds the applied pressure is specified as the starting value for the output signal (20 mA), and the message „CONFIRM“ disappears from the display. The displayed value remains unchanged
2.3 ADJUST	**Sets the measuring range and the zero point**
2.3.1 OFFSET	**Sets the starting value of the measuring range** The ▲ and ▼ buttons allow you to define a starting value for the measuring range. The permitted input range is between 0…90 % of the original measuring range (turn down max. 1:10). 4 mA is output when the value that has been entere dis reached.
2.3.2 FINALVAL	**Sets the end value of the measuring range** The ▲ and ▼ buttons allow you to define a starting value for the measuring range. The permitted input range is between 0…100 % of the original measuring range (turn down max. 1:10). 20 mA is output when the value that has been entere dis reached.
2.3.3 Z-CORR	**Zero-point correction of the display and output signal** The message „CONFIRM“ appears on the display when selecting the subsidiary menu item with OK button- By holding the OK button pressed for at least 2 seconds the applied pressure is specified as the starting value for the output signal (4 mA), and the display is zeroed. The message „CONFIRM“ disappears from the display.
3 SIGNAL	**Signal parameters**
3.1 FUNKTION	**Function selection** e.g. "LINEAR" (linear function)
3.2 DENSITY	**Input of the density** [kg/m3]. Conversion is to the units [mFs].
3.3 DAMP	**Configuration of the damping** settable range: 0 to 100 s
3.4 SIMULAT	**Simulation of the output signal** [mA] settable range (3,8 to 21,6 mA)
4 SETTINGS	**Basic settings**
4.1 DISPLAY	**Configuration of the display units**
4.1.1 UNIT P	**Configuration of the units for pressure** Units: bar, mbar, g/cm², kg/cm², Pa, kPa, Torr, atm, mmWS (mm H20), mmHg, PSI - The conversion of all pressure-related parameters is performed automatically.
4.1.2 UNIT T	**Configuration of the units for temperature** Units [°C] and [°F].
4.2 HART-ID	**HART-ID (only to be set with HART® devices in mode Multidrop)** Set the desired ID no.(between "0 and 15"), and confirm this with the OK bottom. I tis only necessary to configure this number if you want to operate the device in Multidrop mode (connection of a number of HART® devices). If the ID no. is set to “0”, the Multidrop mode is deactivated, and the measurement transducer operates in analog mode.

TABLE 8 – CONFIGURACION continuation from the previous page

4.3 USER-L	**Configuration of the user´s security level** For security reason it is necessary to enter the password before configuring the security level. Confirm this with the OK. button. The password is factory-set to "0000". Security levels: “0”: the whole menu systém is enabled "1": the following menu items are enabled: 1 DISPLAY, 3 SIGNAL, 4.3 USER-L "2": the following menu items are enabled: 1 DISPLAY, 4.3 USER-L
4.4 PASSW	**Configuration of the password** For security reason it is necessary to enter the password before configuring the security level. Confirm this with the OK. button. The password is factory-set to "0000". Than set the new password, and confirm this with the OK. button
4.5 LANGUAGE	**Selection of DE or EN as the user language**.
5 SERVICE	**Service**
5.1 FACTORY	**Reset to factory settings**
5.2 ERR CURR	**Definition of the current** settable values: 21,6 mA or 3,8 mA
5.3 TYPE	**Display of the device type**
5.4 SER-NO	**Display of the set serial number**
5.5 VERS	**Display of the program version**

TABLE 9 - ERROR MESSAGES

PASSED PARAMETER TOO SMALL	entered parameter value is too small
PASSED PARAMETER TOO LARGE	entered parameter value is too large
LOOP CURRENT NOT ACTIVE	loop current is not active (HART ID > 0, device works in Multidrop mode)
APPLIED PROCESS TOO LOW	applied process is to low
APPLIED PROCESS TOO HIGH	applied process is to high
LOWER RANGE VALUE TOO HIGH	lower range value (OFFSET) is to high
LOWER RANGE VALUE TOO LOW	lower range value (OFFSET) is to low
UPPER RANGE VALUE TOO HIGH	lower range value (FINALVAL) příliš vysoká
UPPER RANGE VALUE TOO LOW	lower range value (FINALVAL) is to high
SPAN TOO SMALL	span too small

TABLE 10 – ERROR AND POSSIBLE CORRECTIONS

Malfunction	Possible cause	Error detection / corrective
Display does not work	falsely connected	inspect the connection
	line break	inspect all connecting lines of the device (including the connector plugs)
	defective energy supply	inspect the power supply and the applied supply voltage at the transmitter
No output signal	wrong connected	inspect the connection
	line break	inspect all line connections necessary to supply the device (including the connector plugs)
	defective ampere meter (signal input)	inspect the ampere meter (fine-wire fuse) ort he analogue input of the PLC
Analogue output signal too low	load resistance too high	verify the value of the load resistence
	supply voltage too low	verify the output voltage of the power supply
	selective energy supply	inspect the power supply and the applied supply voltage at the device
Small shift of output signal	diaphragm is highly contaminated	careful cleaning with non-aggressive cleaning solution and a soft brush or sponge, incorrect cleaning noc vouse irreparable damage on diaphragm or seals
	diaphragm is calcified or coated with deposit	if possible it is recommended to send the device to manufacturer. for decalcification or cleaning
Large shift of output signal	diaphragm is damage (coursed by overpressure or manually)	check the diaphragm, if it is damaged, send the service to manufacturer for repair
Measured value (display and analogue output) deviates from the nominal value	high pressure / pressure peaks	a recalibrated or replaced of the pressure port, send the service to manufacturer for repair
	mechanical damage to diaphragm	
Constant output signal at 4 mA	wrong ID-number	ensure in the menu item “ID“ that the set value for the ID-number is"00"

If you do not eliminate the error by using this table, send the device to manufacturer address for repair.

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