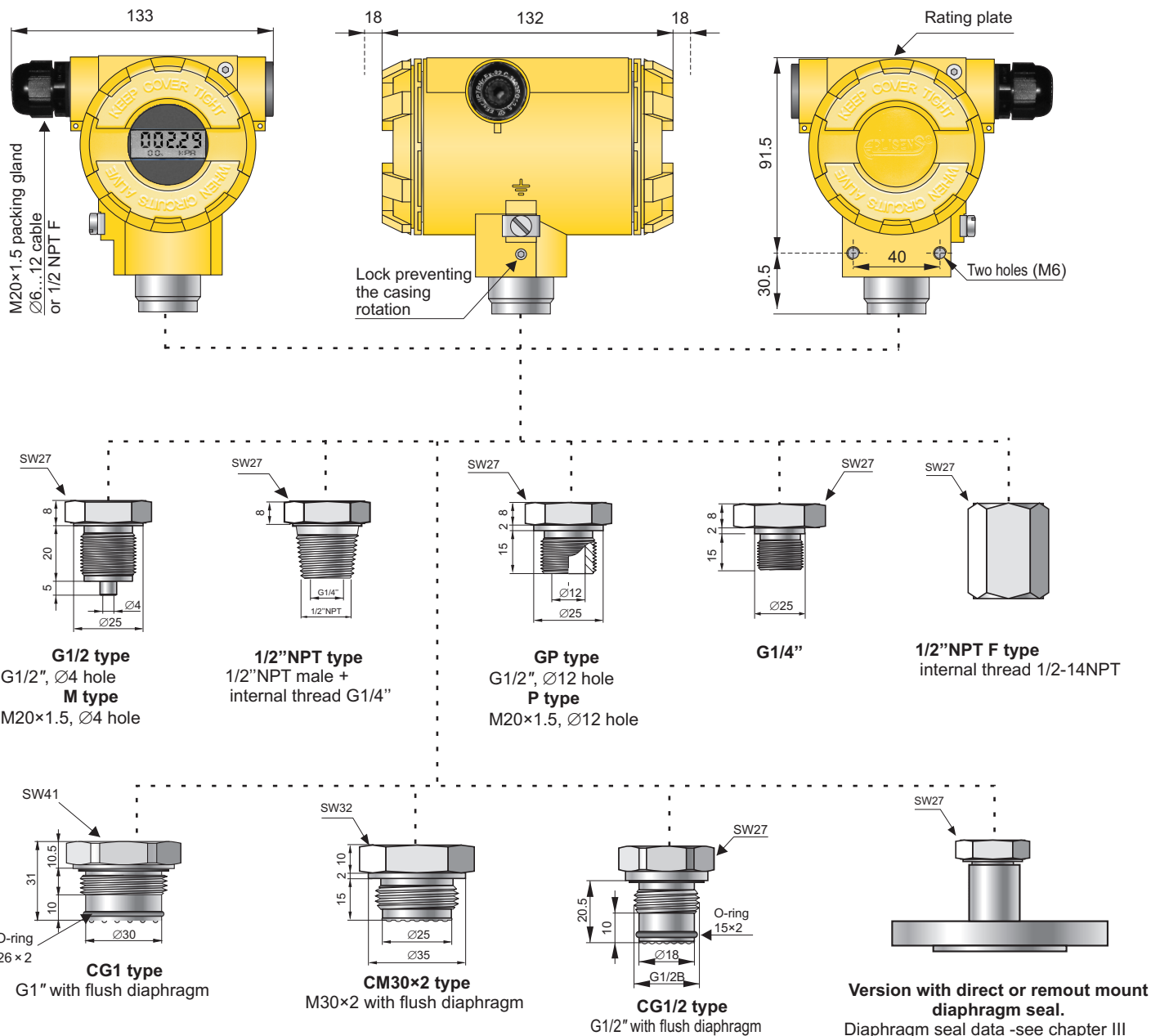


# SMART PRESSURE TRANSMITTER APC-2000ALW



- ✓ **Digital PROFIBUS PA signal**
- ✓ **4...20 mA, 0...20 mA or 0...5 mA output signal + HART protocol**
- ✓ **Programmable range, zero shift, characteristic and damping ratio with local panel keys**
- ✓ **ATEX certificate [Intrinsic safety, Explosion – proof]**
- ✓ **SIL 2 certificate**
- ✓ **Marine certificate - DNV**
- ✓ **PED Conformity (97/23/EC)**
- ✓ **Accuracy 0.075% ( better accuracy on request)**
- ✓ **Gold plated diaphragm (Au)**
- ✓ **MID (Measuring Instruments Directive) – certificate acc. to 2004/22/WE directive and OIML R140:2007 recommendations.**



## Application and construction

Smart pressure transmitters are applicable to the measurement of the pressure, underpressure and absolute pressure of gases, vapours and liquids. The active sensing element is a piezoresistant silicon sensor separated from the medium by a diaphragm and by specially selected type of manometric liquid. The casing is made of aluminium alloy cast or 316SS stainless steel, degree of protection IP66/IP67. The design of the casing enables the use of a local display, rotation of the display by 90°, rotation of the casing by 0–355° relative to the sensor, and a choice of cable direction.

The communication standard for data interchange with the transmitter is the Hart protocol.

Communication with the transmitter is carried out with:

- a KAP-03, KAP-03Ex communicator,
- some other Hart type communicators, (\*)
- a PC using an HART/USB/Bluetooth converter and Raport 2 configuration software.

(\*) .edd files available on [www.aplisens.com](http://www.aplisens.com)

The data interchange with the transmitter enables the users to:

- ♦ identify the transmitter;
- ♦ configure the output parameters:
  - measurement units and the values of the start points and end points at the measurement range;
  - damping time constant;
  - conversion characteristic (inversion, user's non-linear characteristic);
- ♦ read the currently measured pressure value of the output current and the percentage output control level;
- ♦ force an output current with a set value;
- calibrate the transmitter in relation to a model pressure

## Installation

The transmitter can be installed directly on the installation. An universal mounting bracket is provided to transmitter fitting on 2" pipe (the AL mounting bracket, see page IV/ 5). When the pressure of steam or other hot media is measured, a siphon or impulse line should be used. The needle valve placed upstream the transmitter simplifies installation process and enables the zero point adjustment or the transmitter replacement. When the special process connections are required for the measurement of levels and pressures (e.g. at food and chemical industries), the transmitter is provided with an Aplisens diaphragm seal. Installing accessories and a full scope of diaphragm seals are described in detail in the further part of the catalogue. The transmitter's electrical connections should be performed with twisted cable. The place for the communicator should be assigned before the communicator installation.

## Measuring ranges

No.	Nominal measuring range (FSO)	Minimum set range	Rangeability	Overpressure limit (without hysteresis)**
1	0...1000bar (0...100MPa)	10bar (1MPa)	100:1	1200 bar (120 MPa)
2	0...300 bar (0...30 MPa)	3 bar (300 kPa)	100:1	450 bar (45 MPa)
3	0...160 bar (0...16MPa)	1,6bar (160kPa)	100:1	450 bar (45 MPa)
4	0...70 bar (0...7 MPa)	0.7 bar (70 kPa)	100:1	140 bar (14 MPa)
5	0...25 bar (0...2.5 MPa)	0.25 bar (25 kPa)	100:1	50 bar (5 MPa)
6	0...7 bar (0...0.7 MPa)	0.07 bar (7 kPa)	100:1	14 bar (1.4 MPa)
7	-1...7bar (-100...700kPa)	0,07 bar (7 kPa)	114:1	14 bar (1.4 MPa)
8	0...2 bar (0...200 kPa)	100 mbar (10 kPa)	20:1	4 bar (400 kPa)
9	0...1 bar (0...100 kPa)	50 mbar (5 kPa)	20:1	2 bar (200 kPa)
10	-0.5...0.5 bar (-50...50 kPa)	50 mbar (5 kPa)	20:1	2 bar (200 kPa)
11	0...0.25 bar (0...25 kPa)	25 mbar (2.5 kPa)	10:1	1 bar (100 kPa)
12	-100...100 mbar (-10...10 kPa)	20 mbar (2 kPa)	10:1	1 bar (100 kPa)
13	-15...70 mbar* (-1.5...7 kPa)	5 mbar (0.5 kPa)	17:1	0.5 bar (50 kPa)
14	0...1.3 bar abs (0...130 kPa abs)	100 mbar abs (10 kPa abs)	13:1	2 bar (200 kPa)
15	0...7 bar abs (0...0.7 MPa abs)	100 mbar abs (10 kPa abs)	70:1	14 bar (1.4 MPa)
16	0...25 bar abs (0...2.5 MPa abs)	0.25 bar abs (25 kPa abs)	100:1	50 bar (5 MPa)
17	0...70 bar abs (0...7 MPa abs)	0.7 bar abs (70 kPa abs)	100:1	140 bar (14 MPa)

\*only for transmitters without diaphragm seal

\*\*overpressure limit can be different for version according to PED norm N° 97/23/EC

Measurement of lower pressure ranges, possible using transmitter APR-2000GALW with GP process connection.

## Technical data

### Metrological parameters

**Accuracy**  $\leq \pm 0.075\%$  of the calibrated range

**Long-term stability**  $\leq$  accuracy for 3 years  
(for the nominal measuring range)

**Thermal error**  $< \pm 0.05\%$  (FSO) / 10°C  
(0.1% for ranges 12, 13)  
max.  $\pm 0.25\%$  (FSO) in the whole compensation range  
(0.4% for ranges 12, 13)

**Thermal compensation range** -25...80°C  
-40...80°C – special version

**Additional electronic damping** 0...60 s

**Error due to supply voltage changes** 0.002% (FSO) / V

### Electrical parameters

**Power supply:**  
**model APC-2000ALW** 12...55 V DC (Ex ia 13.5...28 V)  
(Ex d 13.5...45V)  
**model APC-2000ALE** 12...36 V DC

**Additional voltage drop when display illumination switched on** 3 V

**Output signal** 4...20 mA, two wire transmission  
special version: 0...20 or 0...5, 4...20 [mA]

**Load resistance**  $R[\Omega] \leq \frac{U_{sup}[V] - 12V^*}{0,02A} \cdot 0.85$

\* - 15 V when display illumination switched on

**Resistance required for communication** 250...1100  $\Omega$

### Materials

**Wetted parts and diaphragms:** 316Lss, Hastelloy C 276, Au

**Casing:** Aluminium, 316SS  
Material of window: polycarbonate glass, hardened glass

## Operating conditions

Operating temperature range (ambient temp.) -40...85°C

Exi version -40...80°C

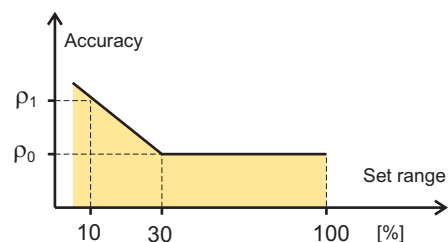
Exd version -40...75°C

Medium temperature range -40...120°C

over 120°C – measurement with the use of impulse line or diaphragm seals

CAUTION: the medium must not be allowed to freeze in the impulse line or close to the process connection of the transmitter

## Accuracy depending on the set range



$\rho_0$  – error for nominal measuring range (0...100% FSO)

$\rho_1$  – error for range 0...10% FSO

$\rho_1 = 2 \times \rho_0$

Numerical error values are given in the technical data under metrological

## SMART PRESSURE TRANSMITTER APC-2000ALW MID

### Application

Smart pressure transmitter APC-2000ALW MID is applicable to the measurement of the pressure and absolute pressure in application designed according to directive 2004/22/WE (MID), harmonized standard PN-EN12405-1:2005/pr A2:2009 and recommendation OIML R140:2007. Device Subcomponent suitable for custody transfer measurement of gas with MID approval. Mechanical construction and installation of the transmitter enclosure shall comply with the transmitter APC-2000ALW are described on page I/ 3 of catalogue. Pressure transmitters APC-2000ALW MID are produced only with nominal ranges according to the table. Transmitter due to factory blockade of transmitter's configuration can not be configurable by user.

Electrical connection of the transmitter is according to drawing on page I/ 3. Available are only terminals SIGNAL + and SIGNAL -. Note! For custody transfer applications, the cover clamp screws have to be locked with seal wire.

### Metrological parameters

**Max. permissible error** according to EN12no5-1 (calculated in relation to the measured value)

- in reference conditions ≤ 0,2%  
- nominal operating conditions ≤ 0,5%  
special version ≤ 0,3%

**Long-term stability** < 0,5% / 5 years  
**Operating temperature range** -25...55°C

### Measuring ranges

Nominal measuring range	Overpressure limit (without hysteresis)
10÷100barABS (1÷10MPa ABS)	450 bar ( 45 MPa)
2÷20barABS (0,2÷2MPa ABS)	50 bar ( 5 MPa)
2÷20bar (0,2÷2MPa )	50 bar ( 5 MPa)
0,9÷70barABS (0,09÷0,7MPa ABS)	14 bar ( 1,4 MPa)
0,9÷70bar (0,09÷0,7MPa)	14 bar ( 1,4 MPa)

## SMART PRESSURE TRANSMITTER APC-2000AL/Profibus PA

### Application and construction

The transmitter electronic system performs the digital processing of measurement and generates the output signal with the communication module according to Profibus PA standard. The transmitter function performance bases on profile 3.0 of Profibus PA standard.

The casing is made of high-pressure casting of aluminium alloy, IP-66/IP67 rated. The casing design allows using a local liquid crystal graphical display, 90° turn of display, 0–355° turn of casing relative to the sensor, and the choice of direction at cable insertion.

The APC-2000AL/Profibus PA transmitter is produced with process connections described on page I/ 2 or, optionally, with Aplisens diaphragm seal.

The measuring ranges, according to the table, page I/ 3.

### Communication

The communication with the transmitter is achieved in two ways:

- cyclic – the transmitter sends primary measured value (4 bytes IEEE754) and status containing the information on the current state of transmitter and measurement validity (1 byte);
- acyclic – this way of communication is used to device configuration and to read both primary measured value and the status.

### Configuration

Full configuration of transmitter settings, adjustment of the display mode, transmitter zeroing and calibration in relation to pressure standards proceeds with the PDM (Process Device Manager) software, by Siemens. The EED program library, worked out by Aplisens for cooperation with this transmitter, is helpful in the configuration.

Other commercial configuration software (e.g. Commuwin by Endress and Hauser, DTM/FDT tools) make transmitter configuration possible in the range of basic commands.

Enclosed to APC-2000AL/Profibus PA is GSD file comprising the description of the transmitter basic properties such as transmission rate, type and format of input data, list of additional functions. GSD file is necessary for the software serving as a device for network configuration and makes the correct connection the appliance to Profibus network possible. The universal file GSD, designed for standard pressure transmitters made according to profile at revision 3 Profibus standard, may also be applicable to APC-2000AL/Profibus PA. The pressure transmitter APC-2000AL/Profibus PA does not have the hardware address switch. This address may be adjusted with accessible configuration software.

## Measurements in the hazardous areas

For pressure measurements in the areas under explosion hazard the ATEX intrinsically safe transmitters, Ex II 1/2G Ex ia IIB T5 Ga/Gb are available

## Technical data

Metrological parameters, materials of process connection, diaphragms and casing, and operating conditions – see the description page 1/ 4.

## Output parameters

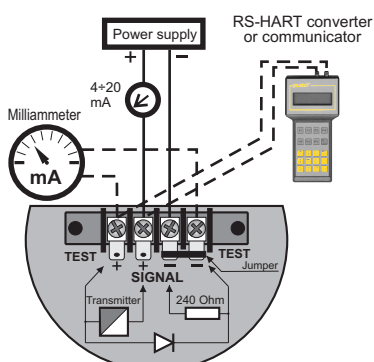
Output signal – Digital communication signal Profibus – PA (according to EN 50170)

PA function slave  
Physical layer IEC61158-2  
Transmission rate 31,25kBit/S

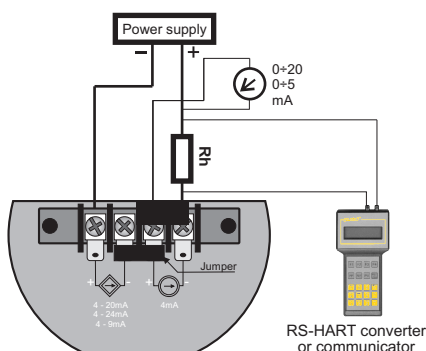
## Electrical parameters

Power supply (from DP/PA coupler )  
10,5 ÷28V DC  
12.05 ÷28V DC - when display illumination switched on. Power supply from intrinsically safe coupler according to FISCO requirements.  
 $V_i = 15VDC$   
 $I_i = 0,38A$  for IIB  
Current consumption 14mA

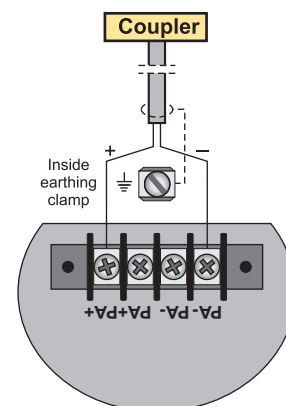
## Electrical diagrams for transmitters



Version: **APC-2000ALW**  
output signal: 4-20mA



Version: **APC-2000ALE**  
with 0...5 or 0...20mA output signal



Version: **APC-2000AL/ProfibusPA**

## Ordering procedure of MID transmitter

Model	Code	Description
<b>APC-2000</b>		Smart pressure transmitter
Casing, output signal,	ALW..... ALW/SS.....	Aluminum housing, IP66/IP67, with display, output 4- 20mA + Hart Stainless steel housing, IP66/IP67, with display, output 4-20mA + Hart
	MID.....	<b>MID</b> – certificate acc. to 2004/22/WE directive and OIML R 140 2007 recommendations
Versions, certificates	/Exia.....	Ex II 1/2G Exia IIC T4/T5 Ga/Gb , II 1 D Exia IIIC T105C Da I M1 Ex ia I Ma ( only version with SS housing)
Nominal measuring range	/10÷100bar ABS..... /2÷20bar ABS..... /2÷20bar ..... /0,9÷70bar ABS..... /0,9÷70bar.....	10÷100bar ABS ( 10÷100MPa ABS) 2÷20bar ABS ( 0,2÷2 Mpa ABS) 2÷20bar ( 0,2÷2MPa) 0,9÷70bar ABS ( 0,09÷7MPa ABS) 0,9÷70bar (0,09÷7MPa)
Process connections	/M..... /G1/2"..... /P..... /GP..... /1/2"NPT M..... /1/2"NPT F.....	Thread M20x1,5 (male) with Ø4hole, wetted parts SS316L Thread G1/2" (male) with Ø4hole , wetted parts SS316L Thread M20x1,5 (male) with Ø12hole, wetted parts SS316L Thread G1/2" (male) with Ø12hole , wetted parts SS316L Thread ½"NPT Male, wetted parts SS316L Thread M20x1,5 with adapter to ½"NPT Female, wetted parts SS316L
Electrical connection	(without marking)..... /US.....	Packing gland M20x1,5 Thread 1/2NPT Female
Accessories	/AL..... /AL.(SS) /ST..... /MT.....	Mounting bracket type AL. for 2" pipe, material zinc steel Mounting bracket type AL. for 2" pipe, material stainless steel Stainless Steel plate riveted to the housing Stainless Steel Tag plate mounted on wire

**Example 1:** Pressure transmitter with display, output 4..20mA + HART, version EExia, nominal measuring range 10..70bar, process connection G1/2", electrical connection gland M20x1,5 , according to MID standard.

**APC-2000ALW/MID/EExia/10..70bar/G1/2"**

## Ordering procedure

Model	Code		Description	
APC-2000			Smart pressure transmitter.	
Casing, output signal,	⇒	ALW..... ALE..... AL./Profibus PA..... AL/Profibus PA/W..... ALW/SS.....	Aluminum housing, IP66/IP67, with display, output 4- 20mA + Hart Aluminium housing, IP66/IP67, with display, output 4-20mA + Hart, 0 – 20mA+ Hart, 0 – 5mA+ Hart, Aluminium housing, IP66/IP67, without display, output Profibus PA Aluminium housing, IP66/IP67, with display, output Profibus PA Stainless steel housing, IP66/IP67, with display, output 4-20mA + Hart	
	Versions, certificates*	/Exia.....	Ex II 1/2G Exia IIC T4/T5 Ga/Gb , II 1 D Exia IIIC T105C Da I M1 Ex ia I Ma ( only version with SS housing) for Profibus PA version Ex II 1/2G EEExia IIB T5 (not available for version ALE)	
		/Exd.....	Ex II 1/2G Exia/d IIC T5/T6 Ga/Gb Ex II 1/2D Exia/t IIIC T85/T100 Da/Db, for pressure >250mbar (not available for ALE AL/Profibus PA, AL./Profibus PA/W, ).Packing gland available on request.	
		/Safety.....	SIL2- Functional Safety certificate according to IEC 61508/61511	
		/MR.....	Marine certificate - DNV	
/PED.....		European Pressure Equipment Directive N° 97/23/EC, category IV		
/Tlen.....		For oxygen service (sensor filled with Fluorolube fluid), only M and G1/2 conn.		
*) more than one option is available	/-60...+50C.....	Extended thermal compensation range -60 ÷ 50°C		
	/-40...+80C.....	Extended thermal compensation range -40 ÷ 80°C		
Nominal measuring range	**) non-standard ranges available on request	/0÷1000bar**.....	0÷1000bar ( 0÷100MPa) 10bar ( 1MPa)	
		/0÷300bar.....	0÷300bar ( 0÷30MPa) 3bar ( 300kPa)	
		/0÷160bar**.....	0÷160bar ( 0÷16MPa) 1,6 bar ( 160kPa)	
		/0÷70bar.....	0÷70bar ( 0÷7MPa) 0,7bar ( 70kPa)	
		/0÷25bar.....	0÷25bar ( 0÷2,5MPa) 0,25bar ( 25kPa)	
		/0÷7bar.....	0÷7bar ( 0÷700kPa) 0,07bar( 7kPa)	
		/0÷2bar.....	0÷2bar ( 0÷200kPa) 100mbar ( 10kPa)	
		/0÷1bar.....	0÷1bar ( 0÷100kPa) 50mbar ( 5kPa)	
		/0÷0,25bar.....	0÷0,25bar ( 0÷25kPa) 25mbar ( 2.5kPa)	
		/-0.5÷ +0.5bar.....	-0,5÷0,5bar ( -50÷50kPa) 50mbar ( 5kPa)	
		/-1÷6bar.....	-1÷6bar ( -100÷600kPa) 300mbar ( 30kPa)	
		/-100÷100mbar.....	-100÷100mbar ( -10÷10kPa) 20mbar ( 2kPa)	
		/-15÷70mbar.....	-15÷70mbar ( -1,5÷7kPa) 5mbar ( 0.5kPa)	
		/0÷1.3bar ABS.....	0÷1.3bar absolute pressure (0÷130kPa abs) 50mbar abs (5kPa abs)	
		/0÷7barABS.....	0÷7bar absolute pressure ( 0÷700kPa abs) 0,07bar abs (7kPa abs)	
Measuring set range	/...→... [ required units]	/0÷25barABS.....	0÷25bar absolute pressure ( 0÷2.5MPa abs) 0.25bar abs (25kPa abs)	
		/0÷70bar ABS.....	0÷70bar absolute pressure ( 0÷7MPa abs) 0.7bar abs ( 70kPa abs)	
		Calibrated range in relation to 4mA and 20mA output		
Process connections	⇒	/M..... /M..(Au)..... /G1/2"..... /G1/2"(Au)..... /G1/4"..... /P..... /P (Hastelloy)..... /GP..... /GP (Hastelloy)..... /CM30x2..... /CM30x2 (Hastelloy)..... /CG1"..... /CG1/2"..... /1/2"NPT M..... /1/2"NPT F..... /code of diaphragm seal .....	Thread M20x1,5 (male) with Ø4hole, wetted parts SS316L Thread M20x1,5 (male) with Ø4hole, gold plated diaphragm (range no. 1, 2, 3, 4) Thread G1/2" (male) with Ø4hole , wetted parts SS316L Thread G1/2" (male) with Ø4hole , gold plated diaphragm (range no. 1, 2, 3, 4) Thread G1/4" (male), wetted parts SS316L (Pressure limits: min. 10mbar / max. 350bar) Thread M20x1,5 (male) with Ø12hole, wetted parts SS316L Thread M20x1,5 (male) with Ø12hole, wetted parts Hastelloy C 276 Thread G1/2" (male) with Ø12hole , wetted parts SS316L Thread G1/2" (male) with Ø12hole , wetted parts Hastelloy C 276 Thread M30x2 with flush diaphragm, wetted parts SS316L (Pressure limits: min. 0,1bar / max. 70bar) Thread M30x2 with flush diaphragm, wetted parts Hastelloy C 276 (Pressure limits: min. 0,1bar / max. 70bar) Thread G1" with flush diaphragm, wetted parts SS316L (Pressure limits: min. 0,1bar / max. 70bar) Thread G1/2" with flush diaphragm, wetted parts SS316L (Pressure limits: min. 2,5bar / max. 600bar) Thread ½"NPT Male, wetted parts SS316L Thread M20x1,5 with adapter to ½"NPT Female, wetted parts SS316L Diaphragm seal (see chapter of diaphragm seals)	
	Electrical connection	⇒	(without marking)..... /US.....	Packing gland M20x1,5 Thread 1/2NPT Female
		Accessories	⇒	/AL..... /AL..(SS)..... /ST..... /MT.....
	*) more than one option is available			
	Other specification		/.....	Description of required parameters (e.g. non-standard process connection G3/4", M22x1.5)
	The most typical specification is marked by "⇒" mark.			

**Example 2:** Pressure transmitter with display, output 4..20mA + HART, version EEExia, version PED, nominal measuring range 0..25bar, calibrated range 0..16bar, process connection G1/2", electrical connection 1/2NPT F, mounting bracket for 2" pipe

**APC-2000ALW/EEExia/PED/0..25bar/0..16bar/G1/2/US/AL**