### Smart Differential Pressure Transmitter

**TM-APR-2000**

- 4...20 mA, 0...20 mA or 0...5 mA output signal + HART protocol
- Digital PROFIBUS PA signal
- Display with backlight
- SIL 2 certificate
- Intrinsic safety certificate (ATEX, IECEx)
- Explosion proof certificate (ATEX, IECEx)
- PED Conformity (97/23/EC)
- Programmable zero range, shift, characteristic and damping ratio with local panel keys
- Static pressure limit up to 420 bar
- Accuracy 0.075% (0.05% on request)
- Marine certificate – DNV, BV
- Gold plated diaphragms
- Wetted parts material Hastelloy C276

**SMART DIFFERENTIAL PRESSURE TRANSMITTER APR-2000ALW**

- 4...20 mA, 0...20 mA or 0...5 mA output signal + HART protocol
- Digital PROFIBUS PA signal
- Display with backlight
- SIL 2 certificate
- Intrinsic safety certificate (ATEX, IECEx)
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- Four holes
  - M10 (standard)
  - 7/16" UNF

- Two holes (M6)

- Venting and draining valves
  - 1/4NPT

**Transmitter APR-2000ALW** – version with type C process connection to be mounted together with a valve manifold

**Transmitter APR-2000ALW**

Version with P type process connection.

**Transmitter APR-2000ALW/SS**

Version with PN type process connection.

**Transmitter APR-2000ALW**

Version with direct or remote diaphragm seal.
**Application and construction**

The APR-2000ALW transmitter is applicable to the measurement of differential pressure of gases, vapours and liquids. The active element is a piezoresistant silicon sensor separated from the medium by separating diaphragms and a specially selected type of manometric fluid. The special design of the active sensing element ensures that it is able to withstand pressure surges and overloads of up to 250/320/420 bar. The casing is made of aluminum 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, rotation of the casing by 0–340° relative to the sensor, and a choice of cable direction.

**Communication and configuration**

The data interchange with the transmitter enables 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 with P or PN type process connection is not heavy, so can be installed without additional mounting bracket on application. For fitting in any desired position we recommend an universal Aplisens mounting bracket for C-type valve manifold (page IV/5). When the special process connections are required for the measurement of specific media levels in closed tanks (e.g. in the sugar and chemical industries) the transmitter is fitted with an Aplisens diaphragm seal. Sets of differential pressure transmitters with diaphragm seals are described in detail in the further part of the catalogue.

**Measuring ranges**

<table>
<thead>
<tr>
<th>No.</th>
<th>Nominal measuring range (FSO)</th>
<th>Minimum set range</th>
<th>Rangeability</th>
<th>Overpressure limit/ static pressure limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0...70 bar (0...7 MPa)</td>
<td>7 bar (700 kPa)</td>
<td>10:1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0...16 bar * (0...1,6 MPa)</td>
<td>1,8 bar (160 kPa)</td>
<td>10:1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0...2,5 bar * (0...250 kPa)</td>
<td>0,2 bar (20 kPa)</td>
<td>125:1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0...1 bar * (0...100 kPa)</td>
<td>50 mbar (5 kPa)</td>
<td>20:1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0...0,25 bar * (0...25 kPa)</td>
<td>10 mbar (1 kPa)</td>
<td>25:1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>-0...5...0,5 bar * (-50...50 kPa)</td>
<td>5,1 bar (5 kPa)</td>
<td>10:1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>-100...100 mbar * (-10...10 kPa)</td>
<td>10 mbar (1 kPa)</td>
<td>20:1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>-5...70 mbar * (0...5...7 kPa)</td>
<td>4 mbar (0,4 kPa)</td>
<td>18:1</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>-25...25 mbar * (-2,5...2,5 kPa)</td>
<td>2 mbar (0,2 kPa)</td>
<td>25:1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>-7...7 mbar ** (-70...-700 kPa)</td>
<td>1 mbar (0,1 kPa)</td>
<td>14:1</td>
<td></td>
</tr>
</tbody>
</table>

**Technical data**

**Metrological parameters**

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>≤ ±0,075% of the calibrated range (≤ ±0,1% for range no. 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special version:</td>
<td>≤ ±0,05% of the calibrated range</td>
</tr>
<tr>
<td>Long term stability</td>
<td>≤ ±2 x accuracy for 5 years (for the nominal measuring range)</td>
</tr>
<tr>
<td>(HS version: ≤ ±0,1% for 5 years)</td>
<td></td>
</tr>
<tr>
<td>Thermal error</td>
<td>≤ ±0,05% (FSO) / 10°C for ranges no. 1 - 9 ≤ ±0,08% (FSO) / 10°C for ranges no. 10</td>
</tr>
<tr>
<td>Thermal compensation range special version for ranges no. 1-9:</td>
<td>≤ ±0,03% (FSO) / 10°C max. ≤ ±0,1% (FSO) in the whole compensation range</td>
</tr>
<tr>
<td>Thermal compensation range</td>
<td>-25...80°C</td>
</tr>
<tr>
<td>Zero shift error for static pressure</td>
<td>0,01% (FSO) / 10 bar for ranges no. 3, 4, 5, 6, 7, 9 0,03% (FSO) / 10 bar for range no. 8 0,06% (FSO) / 10 bar for ranges no. 1, 2 0,01% (FSO) / 10 bar for ranges no. 2, 8 in HS version 0,02% (FSO) / 10 bar for range no. 10</td>
</tr>
<tr>
<td>Zeroing the transmitter in conditions of static pressure can eliminate this error</td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>16...480ms (programmable)</td>
</tr>
<tr>
<td>Additional electronic damping</td>
<td>0...60 s</td>
</tr>
<tr>
<td>Error due to supply voltage changes</td>
<td>0,002% (FSO) / V</td>
</tr>
</tbody>
</table>

| Power supply | 10...55 VDC | |
| Safety SIL2 and MID version: 12...55VDC | |
| model APR-2000ALE | 12...36 VDC | |
| Additional voltage drop | 4...20 mA, two wire transmission | |
| Output signal | APR-2000ALW: 0...20 mA, 4...20 mA | |
| Load resistance (for standard version) | ≤ 100Ω | |
| Resistance required for communication | min. 240 Ω | |

**Materials**

| Wetted parts | type P, PN process connection: SS316L | |
| Diaphragms | type P(H) process connection: SS316L or Hastelloy C276 | |
| Casing | Aluminum | |
| Option | SS316 | |
| Material of window: polycarbonate glass, hardened glass | |

**Electrical parameters**

| Power supply | 10...55 VDC | |
| Safety SIL2 and MID version: 12...55VDC | |
| model APR-2000ALE | 12...36 VDC | |
| Additional voltage drop | 4...20 mA, two wire transmission | |
| Output signal | APR-2000ALW: 0...20 mA, 4...20 mA | |
| Load resistance (for standard version) | ≤ 100Ω | |
| Resistance required for communication | min. 240 Ω | |
Operating conditions

**Operating temperature range (ambient temp.)**
-25...85°C

**Medium temperature range**
-25...120°C

**Ex d version**
-25…75°C

**Exia version**
-25…80°C

**C-type process connection**
rotated 90°

SMART DIFFERENTIAL PRESSURE TRANSMITTER APR-2000AL with Profibus PA protocol

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. The measuring ranges, according to the table, page II/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. Communix by Endress and Hauser, DTM/FDT tools) make transmitter configuration possible in the range of basic commands.

Enclosed to APR-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 APR-2000AL/Profibus PA. The pressure transmitter APR-2000AL/Profibus PA does not have the hardware address switch. This address may be adjusted with accessible configuration software.

Measurements in the areas under explosion hazard

For pressure measurements in the areas under explosion hazard the ATEX intrinsically safe transmitters are available.

Technical data

Metrological parameters, measurement range, materials of process connection, diaphragms and casing, and operating conditions – see the description pages II/3, II/4.

Electrical parameters

**Power supply**
- (from DP/PA coupler )
  - 10.5…28 VDC
  - 12.5…28 VDC when display illumination switched off.

**Current consumption**
- 14mA

**Output parameters**

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

**PA function**
- slave

**Physical layer**
- IEC61158-2

**Transmission range**
- 31,25kBd/S

**Modulation**
- Manchester II

Electrical diagrams
### Smart Differential Pressure Transmitter

**Model:** TM-APR-2000

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALW</td>
<td>Smart differential pressure transmitter</td>
</tr>
<tr>
<td>AL/E</td>
<td>Aluminum housing, IP66 with display, output 4-20mA + Hart</td>
</tr>
<tr>
<td>AL/ProBus PA/W</td>
<td>Aluminum housing, IP66 with display, output ProBus PA</td>
</tr>
<tr>
<td>AL/SS</td>
<td>Stainless steel housing, IP66, with display, output 4-20mA + Hart</td>
</tr>
</tbody>
</table>

### Ordering procedure

#### Code of diaphragm seal

- **(H)**: Diaphragm material SS316L
- **(P)**: Diaphragm material Hastelloy C276
- **(J)**: J-type thermocouple
- **(U)**: Unit prices

#### Process connections

- **/C**: C-type process connection rotated 90°
- **/R**: Thread M20x1.5 (male)
- **/P**: Thread 1/4”NPT (female)

#### Material of diaphragms

- **/(H)**: Diaphragms SS316L
- **/(P)**: Diaphragms Hastelloy C276

#### Accessories

- **/C/2**: Mounting bracket for 2” pipe (to C process conn.), mat. Stainless Steel
- **/P/25**: Mounting bracket for 2” pipe (to P process conn.), mat. Stainless Steel
- **/R/Spaw P:** Connector to weld impulse pipes dia. 12 and 14 mm, material 155M/SO)
- **/R/Spaw C:** Connector to weld impulse pipes dia. 12 and 14 mm, material 155M. Only process connection C type.
- **/R/Spaw +1/2**: Adapter for differential pressure transmitters with C type process connection, output thread 1/2NPT F. Material SS316L
- **/N/ST**: Stainless Steel plate riveted to the housing
- **/N/MT**: Stainless Steel Tag plate mounted on wire

#### Other specifications

- **/IP66/67**: Description of required parameters (e.g. IP66/67)