Pressure Transmitters for Hydrogen Applications
For more than 40 years, HYDAC ELECTRONIC has developed and manufactured pressure transmitters for industrial and mobile applications.

The pressure transmitter series for hydrogen applications represents the latest innovation within our existing product range. These devices are based on a robust and long-life thin-film sensor cell, which is welded onto the process connection eliminating the requirement for seals within the fluid port connection. All parts in contact with the hydrogen are constructed out of specifically approved stainless steel.

### Stationary applications

For the use in industrial hydrogen applications such as hydrogen compressors, dispensers etc., HYDAC now offers a range of pressure transmitters from the HDA 4400 series, with approvals for hydrogen applications in explosive atmospheres. The combination of a variety of approvals enables universal, almost worldwide use of this product range.

A double-approval version with ATEX and IECEx has been developed with the ignition protection types “intrinsically safe” and “non-incendive”. These devices are also available as a redundant version for implementing into systems requiring increased functional safety.

The transmitters with the ignition protection type “flameproof enclosure” combine ATEX and IECEx certification as well as CCSAUS certification, which is especially for the North American market. Additionally, a CCSAUS approval version is also available with ignition protection types “intrinsically safe” and “non-incendive”.

### Mobile applications

The pressure transmitter series HDA 8400 has been developed for the use in mobile applications, i.e. for the application in fuel cell electric vehicles such as automobiles, trucks and buses etc.

The devices are certified according to the type approval regulations EC 79/2009, for hydrogen-driven vehicles. For optimal integration into the respective applications, a variety of hydrogen-approved process connectors have been included in the certification.

For the integration into modern controllers, standard analogue output signals are available for 4..20 mA, 0.5..4.5 V or 1..5 V. Ratiometric output signals are also available.

A large variety of integrated connectors and diverse cable solutions common to mobile applications are available for the electrical connection.
## Pressure transmitters

<table>
<thead>
<tr>
<th>Type</th>
<th>Approval</th>
<th>Ignition protection type</th>
<th>Area of application</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDA 4400</td>
<td>ATEX, IECEx</td>
<td>Intrinsically safe; non-sparking</td>
<td>Stationary</td>
<td>5</td>
</tr>
<tr>
<td>HDA 4400 redundant</td>
<td>ATEX, IECEx</td>
<td>Intrinsically safe; non-sparking</td>
<td>Stationary</td>
<td>9</td>
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<tr>
<td>HDA 4400</td>
<td>cCSAUS</td>
<td>Intrinsically safe; non-incendive</td>
<td>Stationary</td>
<td>13</td>
</tr>
<tr>
<td>HDA 4400</td>
<td>ATEX, IECEx, cCSAUS</td>
<td>Flameproof enclosure</td>
<td>Stationary</td>
<td>17</td>
</tr>
<tr>
<td>HDA 8400</td>
<td>EC 79/2009</td>
<td></td>
<td>Mobile</td>
<td>23</td>
</tr>
</tbody>
</table>
Pressure transmitter
HDA 4400
Hydrogen, Ex applications
ATEX, IECEx, dual approval
Intrinsically safe, Non-sparking

Features

- Specially designed for the measurement of hydrogen
- Parts in contact with the fluid: 1.4435 with a Ni content ≥ 13 % (316L)
- ATEX, IECEx, dual approval
- Ignition protection type: Intrinsically safe, Non-sparking

Description

The pressure transmitter series HDA 4400 has been specially developed for measuring tasks with hydrogen. The transmitters are based on a robust, long-life sensor cell with a thin-film strain gauge on a stainless steel membrane. The sensor cell is welded to the process connection, there are no internal seals. The compatibility with hydrogen is ensured by using a particular material. All hydrogen-wetted parts are made of stainless steel 1.4435 with a Ni content of ≥ 13 %.

The pressure transmitters are applicable in potentially explosive atmospheres, and for this purpose, they are approved for the ignition protection types "intrinsically safe" and "non-sparking" according to ATEX and IECEx.

Application fields

The applications can be found throughout the hydrogen cycle, beginning with systems for hydrogen production (i.e. electrolyzers) through to systems for hydrogen fueling stations, but also in test stands for hydrogen system components etc.

ATEX

<table>
<thead>
<tr>
<th>Grade</th>
<th>Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>I M2</td>
<td>Ex ia I Ma</td>
</tr>
<tr>
<td>II 1G</td>
<td>Ex ia IIIC T6 Ga</td>
</tr>
<tr>
<td>II 1/2G</td>
<td>Ex ia IIIC T6 Ga/Gb</td>
</tr>
<tr>
<td>II 2G</td>
<td>Ex ia IIIC T6 Gb</td>
</tr>
<tr>
<td>II 1D</td>
<td>Ex ia IIIC T85 °C Da</td>
</tr>
<tr>
<td>II 3G</td>
<td>Ex nA IIIC T6, T5, T4 Gc</td>
</tr>
<tr>
<td>II 3G</td>
<td>Ex ic IIIC T6, T5, T4 Gc</td>
</tr>
<tr>
<td>II 3D</td>
<td>Ex ic IIIC T80 °C, T90 °C, T100 °C Dc</td>
</tr>
</tbody>
</table>

IECEx

<table>
<thead>
<tr>
<th>Grade</th>
<th>Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex ia I Ma</td>
<td></td>
</tr>
<tr>
<td>Ex ia IIIC T6 Ga</td>
<td></td>
</tr>
<tr>
<td>Ex ia IIIC T6 Ga/Gb</td>
<td></td>
</tr>
<tr>
<td>Ex ia IIIC T6 Gb</td>
<td></td>
</tr>
<tr>
<td>Ex ia IIIC T85 °C Da</td>
<td></td>
</tr>
<tr>
<td>Ex nA IIIC T6, T5, T4 Gc</td>
<td></td>
</tr>
<tr>
<td>Ex ic IIIC T6, T5, T4 Gc</td>
<td></td>
</tr>
<tr>
<td>Ex ic IIIC T80 °C, T90 °C, T100 °C Dc</td>
<td></td>
</tr>
</tbody>
</table>
Technical details

Input data

<table>
<thead>
<tr>
<th>Measuring ranges</th>
<th>bar</th>
<th>16</th>
<th>25</th>
<th>40</th>
<th>60</th>
<th>100</th>
<th>200</th>
<th>250</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>1050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overload pressures</td>
<td>bar</td>
<td>50</td>
<td>50</td>
<td>80</td>
<td>120</td>
<td>200</td>
<td>500</td>
<td>500</td>
<td>800</td>
<td>1000</td>
<td>1000</td>
<td>1400</td>
</tr>
<tr>
<td>Burst pressure</td>
<td>bar</td>
<td>125</td>
<td>125</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td>1250</td>
<td>1250</td>
<td>2000</td>
<td>3000</td>
<td>3000</td>
<td>3000</td>
</tr>
</tbody>
</table>

Mechanical connection
(Tightening torque, recommended)
SF250CX20, Autoclave (7/16-20 UNF 2B)
(15 Nm for measuring range ≤ 600 bar;
20 Nm for measuring range 1050 bar)
G 1/4 B DIN EN 837
(20 Nm for measuring range ≤ 600 bar;
40 Nm for measuring range 1050 bar)

Overload pressures

<table>
<thead>
<tr>
<th>Pressure (bar)</th>
<th>50</th>
<th>50</th>
<th>80</th>
<th>120</th>
<th>200</th>
<th>500</th>
<th>500</th>
<th>800</th>
<th>1000</th>
<th>1000</th>
<th>1400</th>
</tr>
</thead>
</table>

Burst pressure

<table>
<thead>
<tr>
<th>Pressure (bar)</th>
<th>125</th>
<th>125</th>
<th>200</th>
<th>300</th>
<th>500</th>
<th>1250</th>
<th>1250</th>
<th>2000</th>
<th>3000</th>
<th>3000</th>
<th>3000</th>
</tr>
</thead>
</table>

Mechanical connection
(Tightening torque, recommended)
SF250CX20, Autoclave (7/16-20 UNF 2B)
(15 Nm for measuring range ≤ 600 bar;
20 Nm for measuring range 1050 bar)
G 1/4 B DIN EN 837
(20 Nm for measuring range ≤ 600 bar;
40 Nm for measuring range 1050 bar)

Parts in contact with the fluid
Stainless steel 1.4435 (Ni content ≥ 13 %)
Measurement cell gold-plated
Seal Copper (Cu-DHP) (G 1/4 B)

Output data

Output signal, permitted load resistance
4 .. 20 mA, 2-conductor,
\[ R_{\text{max}} (U_B – 12 V) / 20 mA \] [kΩ]

Accuracy acc. to DIN 16086, terminal based
\[ \leq \pm 0.5 \% \text{ FS typ.} \]
\[ \leq \pm 1 \% \text{ FS max.} \]

Accuracy, B.F.S.L
\[ \leq \pm 0.25 \% \text{ FS typ.} \]
\[ \leq \pm 0.5 \% \text{ FS max.} \]

Temperature compensation
zero point
\[ \leq \pm 0.015 \% \text{ FS} / {^\circ C} \text{ typ.} \]
\[ \leq \pm 0.025 \% \text{ FS} / {^\circ C} \text{ max.} \]

Temperature compensation
span
\[ \leq \pm 0.015 \% \text{ FS} / {^\circ C} \text{ typ.} \]
\[ \leq \pm 0.025 \% \text{ FS} / {^\circ C} \text{ max.} \]

Non-linearity acc. to DIN 16086, terminal based
\[ \leq \pm 0.3 \% \text{ FS max.} \]

Hysteresis
\[ \leq \pm 0.4 \% \text{ FS max.} \]

Repeatability
\[ \leq \pm 0.1 \% \text{ FS} \]

Rise time
\[ \leq 2 \text{ ms} \]

Long-term drift
\[ \leq \pm 0.3 \% \text{ FS typ.} / \text{ year} \]

Environmental conditions

Compensated temperature range
\[-25 .. +85 \degree C\]

Operation / ambient / fluid temperature range
\[ T_6, T_80/T_85 \degree C \]
\[ T_{5, 90} \degree C \]
\[ T_{100} \degree C \]
\[ T_4 \]

Ta = -40 to +60 \degree C
Ta = -40 to +70 \degree C
Ta = -40 to +80 \degree C
Ta = -40 to +85 \degree C

Storage temperature range
\[-40 .. +100 \degree C \]

Vibration resistance to DIN EN 60068-2-6 at 10 .. 500 Hz
\[ \leq 20 \text{ g} \]

Protection type to DIN EN 60529
IP 67

Relevant data for Ex applications
Ex ia, ic
Ex nA

Supply voltage
12 .. 28 V DC
12 .. 28 V DC

Max. input current
\[ I_i = 100 \text{ mA} \]

Maximum input power
\[ P_i = 1 \text{ W} \]
max. power consumption \[ \leq 1 \text{ W} \]

Connection capacitance of the sensor
\[ C_i \leq 22 \text{ nF} \]

Inductance of the sensor
\[ L_i = 0 \text{ mH} \]

Insulation voltage
50 V AC, with integrated overvoltage protection to EN 61000-6-2

Other data

Residual ripple of supply voltage
\[ \leq 5 \% \]

Current consumption
\[ \leq 25 \text{ mA} \]

Life expectancy
\[ > \text{10 million load cycles (0 .. 100 \% FS)} \]

Weight
\[ \approx 150 \text{ g} \]

Note:
Reverse polarity protection of the supply voltage, overvoltage, override and short circuit protection are provided.

FS (Full Scale) = relative to complete measuring range
B.F.S.L. = Best Fit Straight Line

1) For instruments with an M12x1 connector the temperature at the electrical connection may not be lower than -25 \degree C.
2) With mounted mating connector in corresponding protection type
Dimensions

Electrical Connection Variants

| Male connector EN175301-803, 3 pole + PE | Related mating connector ZBE01 (included in delivery) | SF250CX20 Autoclave (7/16-20 UNF 2B female thread) |

With impact protection metal safety sleeve:
Protection types and applications (code): 9

The impact protection metal safety sleeve is included in delivery. A straight mating connector is required for electrical connection. E.g. mating connector M12x1, 4 pole, straight, with 3 m shielded cable: ZBE 06S-03, Part.no. 6098243
Pin connections

<table>
<thead>
<tr>
<th>M12x1, 4 pole</th>
<th>Pin</th>
<th>Output signal: A</th>
<th>EN 175301-803, 3 pole + PE</th>
<th>Pin</th>
<th>Output signal: A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Signal +</td>
<td></td>
<td>1</td>
<td>Signal +</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>n.c.</td>
<td></td>
<td>2</td>
<td>Signal -</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Signal -</td>
<td></td>
<td>3</td>
<td>n.c.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>n.c.</td>
<td></td>
<td>$\perp$</td>
<td>Housing</td>
</tr>
</tbody>
</table>

Model code

Mechanical connection
C = SF250CX20, Autoclave (7/16-20 UNF 2B)
G = G1/4 B DIN EN 837

Electrical connection
5 = Male connector EN 175301-803, 3 pole + PE (IP 67 mating connector included)
6 = Male connector M12X1, 4 pole (mating connector not included)

Output signal
A = 4 .. 20 mA, 2-conductor

Measuring ranges in bar
0016; 0025; 0040; 0060; 0100; 0200; 0250; 0400; 0500; 0600; 1050

Approval
E = ATEX; IECEx

Insulation voltage
N = 50 V AC to housing

Protection types and application fields (code)
(see table below)

Modification number
H00 = for hydrogen applications

<table>
<thead>
<tr>
<th>Code no. - Model Code</th>
<th>Application fields</th>
<th>Electrical connection (see model code)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mining protection type: intrinsically safe ia with barrier</td>
<td>5, 6</td>
</tr>
<tr>
<td></td>
<td>Gases / conductive dusts protection type: intrinsically safe ia with barrier</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gases / conductive dusts protection type: non-sparking na</td>
<td>6</td>
</tr>
<tr>
<td>9 ¹/₂</td>
<td>Gases protection type: non-sparking na</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Mining protection type: intrinsically safe ic with barrier</td>
<td>5, 6</td>
</tr>
</tbody>
</table>

Note:
¹) Only in conjunction with electric output "6" and the impact protection metal safety sleeve (see also dimensions).
Devices for other protection types are available on request.

Note
The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Pressure transmitter
HDA 4400

Hydrogen, Ex applications
ATEX, IECEx, dual approval
Intrinsically safe, Non-sparking
Redundant

Relative pressure | Accuracy 0.5 %

Features
- Redundant design
- Specially designed for the measurement of hydrogen
- Parts in contact with the fluid: 1.4435 with a Ni content ≥ 13 % (316L)
- ATEX, IECEx, dual approval
- Ignition protection type: Intrinsically safe, Non-sparking

Description
The redundant version of the pressure transmitter series HDA 4400 has been specially developed for measuring tasks with hydrogen. Thanks to the use of two highly accurate and robust stainless steel sensor cells with thin-film strain gauge, each with their own electronics unit, the device has a fully redundant architecture and, thus, two separate and independent output signals. The sensor cell is welded to the process connection, there are no internal seals. The compatibility with hydrogen is ensured by using a particular material. All hydrogen-wetted parts are made of stainless steel 1.4435 with a Ni content of ≥ 13 %.

The pressure transmitters are applicable in potentially explosive atmospheres, and for this purpose, they are approved for the ignition protection types "intrinsically safe" and "non-sparking" according to ATEX and IECEx.

Application fields
Thanks to its redundant design, the device is ideally suited for the use in systems with increased functional safety requirements. The applications can be found throughout the hydrogen cycle, beginning with systems for hydrogen production (i.e. electrolyzers) through to systems for hydrogen fueling stations, but also in test stands for hydrogen system components etc.

ATEX

<table>
<thead>
<tr>
<th></th>
<th>Ex ia I Ma</th>
</tr>
</thead>
<tbody>
<tr>
<td>I M2</td>
<td>Ex ia I Ma</td>
</tr>
<tr>
<td>II 1G</td>
<td>Ex ia IIC T6, T5 Ga</td>
</tr>
<tr>
<td>II 1/2G</td>
<td>Ex ia IIC T6, T5 Ga/Gb</td>
</tr>
<tr>
<td>II 2G</td>
<td>Ex ia IIC T6, T5 Gb</td>
</tr>
<tr>
<td>II 1D</td>
<td>Ex ia IIC T85 °C, T95 °C Da</td>
</tr>
<tr>
<td>II 3G</td>
<td>Ex nA IIC T6, T5, T4 Gc</td>
</tr>
<tr>
<td>II 3G</td>
<td>Ex ic IIC T6, T5, T4 Gc</td>
</tr>
<tr>
<td>II 3D</td>
<td>Ex ic IIIIC T85 °C, T95 °C, T105 °C Dc</td>
</tr>
</tbody>
</table>

IECEx

<table>
<thead>
<tr>
<th></th>
<th>Ex ia I Ma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex ia IIC T6, T5 Ga</td>
<td></td>
</tr>
<tr>
<td>Ex ia IIC T6, T5 Ga/Gb</td>
<td></td>
</tr>
<tr>
<td>Ex ia IIC T6, T5 Gb</td>
<td></td>
</tr>
<tr>
<td>Ex ia IIC T85 °C, T95 °C Da</td>
<td></td>
</tr>
<tr>
<td>Ex nA IIC T6, T5, T4 Gc</td>
<td></td>
</tr>
<tr>
<td>Ex ic IIC T6, T5, T4 Gc</td>
<td></td>
</tr>
<tr>
<td>Ex ic IIIIC T85 °C, T95 °C, T105 °C Dc</td>
<td></td>
</tr>
</tbody>
</table>
### Technical details

#### Input data

<table>
<thead>
<tr>
<th>Measuring ranges signal 1</th>
<th>bar</th>
<th>16</th>
<th>25</th>
<th>40</th>
<th>60</th>
<th>100</th>
<th>200</th>
<th>250</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>1050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring ranges signal 2</td>
<td>bar</td>
<td>16</td>
<td>25</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td>200</td>
<td>250</td>
<td>400</td>
<td>500</td>
<td>600</td>
<td>1050</td>
</tr>
<tr>
<td>Overload pressures</td>
<td>bar</td>
<td>50</td>
<td>50</td>
<td>80</td>
<td>120</td>
<td>200</td>
<td>500</td>
<td>500</td>
<td>800</td>
<td>1000</td>
<td>1000</td>
<td>1400</td>
</tr>
<tr>
<td>Burst pressure</td>
<td>bar</td>
<td>125</td>
<td>125</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td>1250</td>
<td>1250</td>
<td>2000</td>
<td>3000</td>
<td>3000</td>
<td>3000</td>
</tr>
</tbody>
</table>

#### Mechanical connection
(Tightening torque, recommended)

| SF250CX20, Autoclave (7/16-20 UNF 2B) | (15 Nm for measuring range ≤ 600 bar; 20 Nm for measuring range 1050 bar) |

#### Parts in contact with the fluid

| Stainless steel | 1.4435 (Ni content ≥ 13 %) |
| Measurement cell | gold-plated |

#### Output data

<table>
<thead>
<tr>
<th>Output signal 1</th>
<th>Output signal 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 .. 20 mA, 2-conductor</td>
<td>20 .. 4 mA, 2-conductor,</td>
</tr>
<tr>
<td>R_Lmax (U_B – 12 V) / 20 mA [kΩ]</td>
<td></td>
</tr>
</tbody>
</table>

#### Environmental conditions

<table>
<thead>
<tr>
<th>Compensated temperature range</th>
<th>-25 .. +85 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation / ambient / fluid temperature range</td>
<td>T6, T85 °C Ta = -40 to +60 °C</td>
</tr>
<tr>
<td></td>
<td>T5, T95 °C Ta = -40 to +70 °C</td>
</tr>
<tr>
<td></td>
<td>T105 °C Ta = -40 to +80 °C</td>
</tr>
<tr>
<td></td>
<td>T4 Ta = -40 to +85 °C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>-40 .. +100 °C</td>
</tr>
</tbody>
</table>

#### Relevant data for Ex applications

<table>
<thead>
<tr>
<th>Ex ia, ic</th>
<th>Ex na</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>12 .. 28 V DC</td>
</tr>
<tr>
<td>Max. input current</td>
<td>I_i = 100 mA</td>
</tr>
<tr>
<td>Maximum input power</td>
<td>P_i = 0.7 W</td>
</tr>
<tr>
<td>Connection capacitance of the sensor</td>
<td>C_i ≤ 22 nF</td>
</tr>
<tr>
<td>Inductance of the sensor</td>
<td>L_i = 0 mH</td>
</tr>
<tr>
<td>Intrinsic safety barrier</td>
<td>2-channel, R_min = 280 Ω (e.g. Pepperl &amp; Fuchs Z789)</td>
</tr>
<tr>
<td>Insulation voltage</td>
<td>50 V AC, with integrated overvoltage protection to EN 61000-6-2</td>
</tr>
<tr>
<td>Protection type</td>
<td>IP 67</td>
</tr>
</tbody>
</table>

#### Other data

| Residual ripple of supply voltage | ≤ 5 % |
| Current consumption | ≤ 25 mA |
| Life expectancy | > 10 million load cycles (0 .. 100 % FS) |
| Weight | ~ 210 g |

**Note:** Reverse polarity protection of the supply voltage, overvoltage, override and short circuit protection are provided.

**FS (Full Scale)** = relative to complete measuring range

**B.F.S.L. = Best Fit Straight Line**

1) For instruments with an M12x1 connector the temperature at the electrical connection may not be lower than -25 °C.

2) With mounted mating connector in corresponding protection type.
**Dimensions**

Version as ignition protection type "intrinsically safe" (Ex ia, Ex ic)

Version as ignition protection type "non-sparking" (Ex nA) with impact protection metal safety sleeve

The impact protection metal safety sleeve is included in delivery. A straight mating connector is required for electrical connection. E.g. mating connector M12x1, 4 pole, straight, with 3 m shielded cable: ZBE 06S-03, Part.no. 6098243

**Pin connections**

<table>
<thead>
<tr>
<th>M12x1, 4 pole</th>
<th>Pin</th>
<th>Output signal: AA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>+ Signal 1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>- Signal 1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>+ Signal 2</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>- Signal 2</td>
</tr>
</tbody>
</table>
Model code

Mechanical connection
C = SF250CX20, Autoclave (7/16-20 UNF 2B)

Electrical connection
6 = Male connector M12X1, 4 pole (mating connector not included)

Output signal
AA = Signal 1: 4 .. 20 mA, 2 conductor
    Signal 2: 20 .. 4 mA, 2 conductor

Measuring ranges in bar (output signal 1)
0016; 0025; 0040; 0060; 0100; 0200; 0250; 0400; 0500; 0600; 1050

Measuring ranges in bar (output signal 2)
0016; 0025; 0040; 0060; 0100; 0200; 0250; 0400; 0500; 0600; 1050

Modification number
H00 = for hydrogen applications

Approval
E = ATEX; IECEx

Insulation voltage
N = 50 V AC to housing

Protection types and application fields (code)
(see table below)

Note:
Instruments for other protection types and application fields are available upon request.

<table>
<thead>
<tr>
<th>Code no. - Model Code</th>
<th>ATEX KEMA 05 ATEX 1016X</th>
<th>IECEx KEM 08.0014X</th>
<th>Application fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 =</td>
<td>I M1 Ex ia I Ma</td>
<td>Ex ia I Ma</td>
<td>Mining protection type: intrinsically safe ia with barrier</td>
</tr>
<tr>
<td></td>
<td>II 1G Ex ia IIIC T6, T5 Ga</td>
<td>Ex ia IIIC T6, T5 Ga</td>
<td>Gases / conductive dusts protection type: intrinsically safe ia with barrier</td>
</tr>
<tr>
<td></td>
<td>II 1/2G Ex ia IIIC T6, T5 Ga/Gb</td>
<td>Ex ia IIIC T6, T5 Ga/Gb</td>
<td></td>
</tr>
<tr>
<td></td>
<td>II 2G Ex ia IIIC T6, T5 Gb</td>
<td>Ex ia IIIC T6, T5 Gb</td>
<td></td>
</tr>
<tr>
<td></td>
<td>II 1D Ex ia IIIC T85 °C, T95 °C Da</td>
<td>Ex ia IIIC T85 °C, T95 °C Da</td>
<td></td>
</tr>
<tr>
<td>9 =</td>
<td>II 3G Ex nA IIIC T6, T5 Gc</td>
<td>Ex nA IIIC T6,T5 Gc</td>
<td>Gases protection type: non-sparking nA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C =</td>
<td>II 3G Ex ic IIIC T6,T5 Gc</td>
<td>Ex ic IIIC T6,T5 Gc</td>
<td>Gases / conductive dusts protection type: intrinsically safe ic with barrier</td>
</tr>
<tr>
<td></td>
<td>II 3D Ex ic IIIC T85 °C, T95 °C Dc</td>
<td>Ex ic IIIC T85 °C, T95 °C Dc</td>
<td></td>
</tr>
</tbody>
</table>

Note:
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Subject to technical modifications.

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Internet: www.hydac.com
**Pressure transmitter**

**HDA 4400**

Hydrogen, Ex applications

CSA Approval

Intrinsically safe, Non incendive

---

**Features**

- Specially designed for the measurement of hydrogen
- Parts in contact with the fluid: 1.4435 with a Ni content ≥ 13 % (316L)
- CSA US Approval for Canada and USA
- Ignition protection type: Intrinsically safe, Non-incendive

---

**Description**

The pressure transmitter series HDA 4400 has been specially developed for measuring tasks with hydrogen. The transmitters are based on a robust, long-life sensor cell with a thin-film strain gauge on a stainless steel membrane. The sensor cell is welded to the process connection, there are no internal seals. The compatibility with hydrogen is ensured by using a particular material. All hydrogen-wetted parts are made of stainless steel 1.4435 with a Ni content of ≥ 13 %.

The pressure transmitters are applicable in potentially explosive atmospheres, and for this purpose, they are available as ignition protection types "intrinsically safe" and "non-incendive" approved for the use on the North American market.

---

**Application fields**

The applications can be found throughout the hydrogen cycle, beginning with systems for hydrogen production (i.e. electrolysers) through to systems for hydrogen fueling stations, but also in test stands for hydrogen system components etc.

**Intrinsically safe**

- Class I Division 1 Group A, B, C, D T6 [C, US]
- Class II Division 1 Group E, F, G [C, US]
- Class III [C, US]
- Class I Zone 0 AEx ia IIC T6 Ga [US]
- Ex ia IIC T6 Ga [C]
- Zone 20 AEx ia IIIC T85 °C Da [US]
- Ex ia IIIC T85 °C Da [C]

**Non incendive**

- Class I Division 2 Group A, B, C, D, T6, T5, T4 [C, US]
- Class II Division 2 Group F, G [C, US]
- Class III [C, US]
- Class I Zone 2 AEx ic IIC T6, T5, T4 Gc [US]
- Ex ic IIC T6, T5, T4 Gc [C]
- Zone 2 AEx nA IIC T6, T5, T4 Gc [US]
- Ex nA IIC T6, T5, T4 Gc [C]
- Zone 22 AEx tc IIIB T80 °C, T90 °C, T100 °C Dc [US]
- Ex tc IIIB T80 °C, T90 °C, T100 °C Dc [C]
## Technical Data

### Input data

<table>
<thead>
<tr>
<th>Measuring ranges</th>
<th>bar</th>
<th>16</th>
<th>25</th>
<th>40</th>
<th>60</th>
<th>100</th>
<th>200</th>
<th>250</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>1050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overload pressures</td>
<td>bar</td>
<td>50</td>
<td>50</td>
<td>80</td>
<td>120</td>
<td>200</td>
<td>500</td>
<td>500</td>
<td>800</td>
<td>1000</td>
<td>1000</td>
<td>1400</td>
</tr>
<tr>
<td>Burst pressure</td>
<td>bar</td>
<td>125</td>
<td>125</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td>1250</td>
<td>1250</td>
<td>2000</td>
<td>3000</td>
<td>3000</td>
<td>3000</td>
</tr>
</tbody>
</table>

**Mechanical connection**
(Tightening torque, recommended)
SF250CX20, Autoclave (7/16-20 UNF 2B)
(15 Nm for measuring range ≤ 600 bar;
20 Nm for measuring range 1050 bar)
G 1/4 B DIN EN 837
(20 Nm for measuring range ≤ 600 bar;
40 Nm for measuring range 1050 bar)

**Parts in contact with the fluid**
Stainless steel
1.4435 (Ni content ≥ 13 %)
Measurement cell
Additionally gold-plated
Seal
Copper (Cu-DHP) (G 1/4 B)

### Output data

**Output signal, permitted load resistance**
4 .. 20 mA, 2-conductor,
\[ R_{\text{max}} = \frac{U_{\text{b}} - 12 \text{ V}}{20 \text{ mA}} \text{ [kΩ]} \]

**Accuracy acc. to DIN 16086, terminal based**
\[ \leq \pm 0.5 \% \text{ FS typ.} \]
\[ \leq \pm 1 \% \text{ FS max.} \]

**Accuracy, B.F.S.L**
\[ \leq \pm 0.25 \% \text{ FS typ.} \]
\[ \leq \pm 0.5 \% \text{ FS max.} \]

**Temperature compensation zero point**
\[ \leq \pm 0.015 \% \text{ FS } / ^\circ C \text{ typ.} \]
\[ \leq \pm 0.025 \% \text{ FS } / ^\circ C \text{ max.} \]

**Temperature compensation span**
\[ \leq \pm 0.015 \% \text{ FS } / ^\circ C \text{ typ.} \]
\[ \leq \pm 0.025 \% \text{ FS } / ^\circ C \text{ max.} \]

**Non-linearity acc. to DIN 16086, terminal based**
\[ \leq \pm 0.3 \% \text{ FS max.} \]

**Hysteresis**
\[ \leq \pm 0.4 \% \text{ FS max.} \]

**Repeatability**
\[ \leq \pm 0.1 \% \text{ FS} \]

**Rise time**
\[ \leq 2 \text{ ms} \]

**Long-term drift**
\[ \leq \pm 0.3 \% \text{ FS typ. } / \text{ year} \]

### Environmental conditions

**Compensated temperature range**
-25 .. +85 °C

**Operation / ambient / fluid temperature range**
T6, T80/T85 °C
Ta = -40 to +60 °C
T5, T90 °C
Ta = -40 to +70 °C
T100 °C
Ta = -40 to +80 °C
T4
Ta = -40 to +85 °C

**Storage temperature range**
-40 .. +100 °C

**Vibration resistance to DIN EN 60068-2-6 at 10 .. 500 Hz**
\[ \leq 10 \text{ g (1/2-14 NPT Conduit)} \]
\[ \leq 20 \text{ g (male connector)} \]

**Protection type**
DIN EN 60529 4)
ISO 20653
IP 67 (male connector)
IP6K9K (1/2-14 NPT Conduit)

### Relevant data for Ex applications

<table>
<thead>
<tr>
<th>Ex ia</th>
<th>Ex ic</th>
<th>Ex nA, Ex tc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
<td>12..28 V DC</td>
<td>12..28 V DC</td>
</tr>
<tr>
<td>Max. input current</td>
<td>( I_i = 100 \text{ mA} )</td>
<td>( P_i = 1 \text{ W} )</td>
</tr>
<tr>
<td>Connection capacitance of the sensor</td>
<td>( C_i \leq 22 \text{ nF} )</td>
<td>( C_i \leq 22 \text{ nF} )</td>
</tr>
<tr>
<td>Inductance of the sensor</td>
<td>( L_i = 0 \text{ mH} )</td>
<td>( L_i = 0 \text{ mH} )</td>
</tr>
<tr>
<td>Insulation voltage</td>
<td>( 50 \text{ V AC, with integrated overvoltage protection} )</td>
<td>( 50 \text{ V AC, with integrated overvoltage protection} )</td>
</tr>
</tbody>
</table>

### Other data

**Residual ripple of supply voltage**
\[ \leq 5 \% \]

**Current consumption**
\[ \leq 25 \text{ mA} \]

**Life expectancy**
\[ > 10 \text{ million load cycles (0 .. 100 \% FS)} \]

**Weight**
\[ \sim 150 \text{ g; } \sim 300 \text{ g (1/2-14 NPT Conduit)} \]

Note:
Reverse polarity protection of the supply voltage, overvoltage, override and short circuit protection are provided.

**FS (Full Scale)** = relative to complete measuring range

**B.F.S.L. = Best Fit Straight Line**

1) psi measuring ranges on request
2) For instruments with an M12x1 connector the temperature at the electrical connection may not be lower than -25 °C.
3) With electrical connection M12x1 and EN 175301-803, max. Ta = +70 °C
4) With mounted mating connector in corresponding protection type
**Dimensions**

![Dimensions Diagram]

**Electrical Connection Variants**

- **Male connector EN175301-803, 3 pole + PE**
- Related mating connector ZBE01 included in delivery

**Mechanical Connection Variants**

- SF250CX20 Autoclave (7/16-20 UNF 2B female thread)

**Pin connections**

<table>
<thead>
<tr>
<th>Pin connections</th>
<th>Pin</th>
<th>Output signal: A</th>
</tr>
</thead>
<tbody>
<tr>
<td>M12x1, 4 pole</td>
<td>1</td>
<td>Signal +</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>n.c.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Signal -</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>n.c.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EN 175301-803, 3 pole + PE</th>
<th>Pin</th>
<th>Output signal: A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Signal +</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Signal -</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>n.c.</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Housing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9 = 1/2-14 NPT conduit, single leads</th>
<th>Lead</th>
<th>Output signal: A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Green</td>
<td>Signal +</td>
</tr>
<tr>
<td></td>
<td>White</td>
<td>Signal -</td>
</tr>
<tr>
<td></td>
<td>Green-yellow</td>
<td>Housing</td>
</tr>
</tbody>
</table>
**Model code**

**Mechanical connection**
C = SF250CX20, Autoclave (7/16-20 UNF 2B)
G = G1/4 B DIN EN 837

**Electrical connection**
5 = Male connector EN 175301-803, 3 pole + PE (IP 67 mating connector included)
6 = Male connector M12X1, 4 pole (mating connector not included)
9 = 1/2-14 NPT conduit connector, single leads

**Output signal**
A = 4 .. 20 mA, 2 connector

**Measuring ranges in bar**
0016; 0025; 0040; 0100; 0200; 0250; 0400; 0500; 0600; 1050

**Approval**
C = CSA

**Insulation voltage**
N = 50 V AC to housing

**Protection types and application fields (code)**
(see following table)

**Modification number**
H00 = for hydrogen applications

**Cable length**
(for Conduit connection only, not applicable for device connectors)
Standard = 2 m

<table>
<thead>
<tr>
<th>Code no.</th>
<th>Mechanical connection</th>
<th>CSA certificate number 1760344</th>
<th>Protection types and application fields</th>
<th>Electrical connection (see model code)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A =</td>
<td>Class I Division 1 Group A, B, C, D T6 Class II Division 1 Group E, F, G Class III Class I Zone 0 AEx ia IIC T6 Ga Ex ia IIC T6 Ga Zone 20 AEx ia IIC T85 °C Da Ex ia IIC T85 °C Da</td>
<td>Intrinsically Safe Gases and Dests</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>B =</td>
<td>Class I Division 1 Group A, B, C, D T6 Class I Zone 0 AEx ia IIC T6 Ga Ex ia IIC T6 Ga Class II Division Group A, B, C, D, T6, T5, T4 Class I Zone 2 AEx ic IIC T6, T5, T4 Gc Ex ic IIC T6; T5, T4 Gc</td>
<td>Intrinsically Safe Gases</td>
<td>5; 6; 9</td>
<td></td>
</tr>
<tr>
<td>C =</td>
<td>Class I Division 2 Group A, B, C, D, T6, T5, T4 Class II Division 2 Group F, G Class III Class I Zone 2 AEx na IIC T6, T5, T4 Gc Ex na IIC T6, T5, T4 Gc Zone 22 AEx tc IIIB T80 °C, T90 °C, T100 °C Dc Ex tc IIIB T80 °C, T90 °C, T100 °C Dc</td>
<td>Non incendive with field wiring Gases</td>
<td>9</td>
<td></td>
</tr>
</tbody>
</table>

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Internet: www.hydac.com
Pressure transmitter
HDA 4400

Hydrogen, Ex applications
ATEX / IECEx / CSA, triple approval
Flameproof enclosure

Relative pressure | Accuracy 0.5 %

Features
- Specially designed for the measurement of hydrogen
- Parts in contact with the fluid: 1.4435 with a Ni content of ≥ 13 % (316L)
- ATEX, IECEx, CSA triple approval
- Ignition protection type: Flameproof enclosure

Description
The pressure transmitter series HDA 8400 has been specially developed for measuring tasks with hydrogen. The transmitters are based on a robust, long-life sensor cell with a thin-film strain gauge on a stainless steel membrane. The sensor cell is welded to the process connection, there are no internal seals. The compatibility with hydrogen is ensured by using a particular material. All hydrogen-wetted parts are made of stainless steel 1.4435 with a Ni content of ≥ 13 %.

The transmitters with the ignition protection type "flameproof enclosure" combine ATEX, IECEx and even CSA certification, especially for the North American market. This allows universal worldwide use of the sensor in potentially explosive atmospheres.

Application fields
The applications can be found throughout the hydrogen cycle, beginning with systems for hydrogen production (i.e. electrolysers) through to systems for hydrogen fueling stations, but also in test stands for hydrogen system components etc.

ATEX
- I M2 Ex db I Mb
- II 2G Ex db IIC T6, T5 Gb
- II 2D Ex tb IIIC T110 °C, T120 °C, T130 °C Db

IECEx
- Ex db I Mb
- Ex db IIC T6, T5 Gb
- Ex tb IIIC T110 °C, T120 °C, T130 °C Db

CSA
- Explosion Proof - Seal not required
- Class I Groups A, B, C, D, T6, T5
- Class I Zone 1 AEx db IIC-T6, T5 Gb [US]
- Ex db IIC T6, T5 Gb [C]
- Class II Groups E, F, G T110 °C, T120 °C, T130 °C
  Zone 21 AEx tb IIIC T110 °C, T120 °C, T130 °C Db [US]
  Ex tb IIIC T110 °C, T120 °C, T130 °C Db [C]
- Class III
- Type 4
## Technical Data

### Input data

<table>
<thead>
<tr>
<th>Measuring ranges</th>
<th>bar</th>
<th>16</th>
<th>25</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>100</th>
<th>200</th>
<th>250</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>800</th>
<th>1000</th>
<th>1050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overload pressures</td>
<td>bar</td>
<td>50</td>
<td>50</td>
<td>80</td>
<td>120</td>
<td>200</td>
<td>500</td>
<td>500</td>
<td>800</td>
<td>1000</td>
<td>1000</td>
<td>1400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burst pressure</td>
<td>bar</td>
<td>125</td>
<td>125</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td>1250</td>
<td>1250</td>
<td>2000</td>
<td>3000</td>
<td>3000</td>
<td>3000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mechanical connection**
(Tightening torque, recommended)

- SF250CX20, Autoclave (7/16-20 UNF 2B)
- (15 Nm for measuring range ≤ 600 bar; 20 Nm for measuring range 1050 bar)
- G 1/4 B DIN EN 837 (20 Nm for measuring range ≤ 600 bar; 40 Nm for measuring range 1050 bar)

**Parts in contact with the fluid**

- Stainless steel 1.4435 (Ni content ≥ 13 %)
- Measurement cell gold-plated
- Seal Copper (Cu-DHP) (G 1/4 B)

### Output data

<table>
<thead>
<tr>
<th>Output signal, permitted load resistance</th>
<th>4 .. 20 mA, 2-conductor, $R_{\text{max}} (U_b \sim 8 \text{ V}) / 20 \text{ mA} \ [\text{kΩ}]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy acc. to DIN 16086, terminal based</td>
<td>$\leq \pm 0.5% \text{ FS typ.}$  \hspace{1cm} $\leq \pm 1% \text{ FS max.}$</td>
</tr>
<tr>
<td>Accuracy, B.F.S.L</td>
<td>$\leq \pm 0.25% \text{ FS typ.}$  \hspace{1cm} $\leq \pm 0.5% \text{ FS max.}$</td>
</tr>
<tr>
<td>Temperature compensation zero point</td>
<td>$\leq \pm 0.015% \text{ FS} / ^\circ \text{C typ.}$  \hspace{1cm} $\leq \pm 0.025% \text{ FS} / ^\circ \text{C max.}$</td>
</tr>
<tr>
<td>Temperature compensation span</td>
<td>$\leq \pm 0.015% \text{ FS} / ^\circ \text{C typ.}$  \hspace{1cm} $\leq \pm 0.025% \text{ FS} / ^\circ \text{C max.}$</td>
</tr>
<tr>
<td>Non-linearity acc. to DIN 16086, terminal based</td>
<td>$\leq \pm 0.3% \text{ FS max.}$</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>$\leq \pm 0.4% \text{ FS max.}$</td>
</tr>
<tr>
<td>Repeatability</td>
<td>$\leq \pm 0.1% \text{ FS}$</td>
</tr>
<tr>
<td>Rise time</td>
<td>$\leq 2 \text{ ms}$</td>
</tr>
<tr>
<td>Long-term drift</td>
<td>$\leq \pm 0.3% \text{ FS typ.} / \text{ year}$</td>
</tr>
</tbody>
</table>

### Environmental conditions

| Compensated temperature range | -25 .. +85 °C |
| Operation / ambient / fluid temperature range | T6, T110 °C  \hspace{1cm} Ta = -40 .. +60 °C |
| T5, T130 °C  \hspace{1cm} Ta = -40 .. +80 °C |
| Storage temperature range | -40 .. +100 °C |
| EN 61006-6-1 / 2 / 3 / 4; EN 60079-0 / 1 / 31 |
| Vibration resistance to DIN EN 60068-2-6 at 10 .. 500 Hz | $\leq 10 \text{ g}$  \hspace{1cm} $\leq 5 \text{ g}$ with connection head |
| Protection type | acc. to DIN EN 60529  \hspace{1cm} IP 65 (Vented Gauge), IP 68 (vers. with connection head, seald gauge)  \hspace{1cm} IP 69 (Sealed Gauge)  \hspace{1cm} IP 6K9K (Sealed Gauge) |
| acc. to ISO 20653 |

### Other data

| Supply voltage | 8 .. 30 V DC |
| Residual ripple of supply voltage | $\leq 5\%$ |
| Current consumption | $\leq 25 \text{ mA}$ |
| Life expectancy | $> 10 \text{ million load cycles (0 .. 100\% FS)}$ |
| Weight | $\sim 300 \text{ g}$ |

**Note:** Reverse polarity protection of the supply voltage, overvoltage, override and short circuit protection are provided.

- FS (Full Scale) = relative to complete measuring range
- B.F.S.L. = Best Fit Straight Line
- ”Limited energy” powered according to CAN/UL 61010 (Clause 9.4), Class 2 UL1310, LPS (CAN/UL 60950)
Dimensions

Electrical Connection Variants

<table>
<thead>
<tr>
<th>Variant 1</th>
<th>Variant 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2-14 NPT Conduit, jacketed cable</td>
<td>M20x1.5 Conduit, single leads</td>
</tr>
</tbody>
</table>

Connection head aluminum
### Mechanical Connection Variants

**SF250CX20 Autoclave**  
(7/16-20 UNF 2B female thread)

---

### PIN connection

<table>
<thead>
<tr>
<th>Conduit (single leads)</th>
<th>Lead</th>
<th>Output signal: A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Red</td>
<td>Signal +</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>Signal -</td>
</tr>
<tr>
<td></td>
<td>Green-yellow</td>
<td>Housing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connection head aluminum / stainless steel</th>
<th>Lead</th>
<th>Output signal: A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Red</td>
<td>Signal +</td>
</tr>
<tr>
<td></td>
<td>Black</td>
<td>Signal -</td>
</tr>
<tr>
<td></td>
<td>Green-yellow</td>
<td>Housing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conduit (jacketed cable)</th>
<th>Lead</th>
<th>Output signal: A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>White</td>
<td>Signal -</td>
</tr>
<tr>
<td></td>
<td>Brown</td>
<td>Signal +</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>n.c.</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
<td>n.c.</td>
</tr>
</tbody>
</table>
**Model code**

**Mechanical connection**
C = SF250CX20, Autoclave (7/16-20 UNF 2B)
G = G1/4 B DIN EN 837

**Electrical connection** (details regarding the fields of application, please see table below)
9 = 1/2-14 NPT conduit (male thread), single leads
G = 1/2-14 NPT conduit (male thread), jacketed cable
J = Connection head (aluminum)
W = M20x1,5 conduit (male thread), single leads

**Output signal**
A = 4 .. 20 mA, 2 conductor

**Measuring ranges in bar**
0016; 0025; 0040; 0100; 0200; 0250; 0400; 0500; 0600; 1050

**Modification number**
H00 = for hydrogen applications

**Approval**
D = ATEX Flame Proof
IECEx Flame Proof
CSA Explosion Proof (seal not required)

**Measurement cell type**
S = Sealed Gauge (sealed to atmosphere) ≥ 40 bar
V = Vented Gauge (vented to atmosphere) < 40 bar

**Cable length**
Standard = 2 m

<table>
<thead>
<tr>
<th>Fields of application for the individual electrical connections</th>
<th>ATEX</th>
<th>IECEx</th>
<th>CSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>I M2 Ex db I Mb</td>
<td>Ex db I Mb</td>
<td>Ex db I Mb</td>
<td>Class I Groups A, B, C, D, T6, T5</td>
</tr>
<tr>
<td>II 2G Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Class I Zone 1 AEx db IIC T6, T5 Gb [US] Ex db IIC T6, T5 Gb [C]</td>
</tr>
<tr>
<td>II 2D Ex tb IIIIC T110/T120/T130 °C Db</td>
<td>Ex db IIIIC T110/T120/T130 °C Db</td>
<td>Class II Groups E, F, G T110/T120/T130 °C Zone 21 AEx tb IIIIC T110/T120/T130 °C Db [US] Ex tb IIIIC T110/T120/T130 °C Db [C]</td>
<td></td>
</tr>
<tr>
<td>9, W</td>
<td>Ex db I Mb</td>
<td>Ex db I Mb</td>
<td>Class I Groups A, B, C, D, T6, T5</td>
</tr>
<tr>
<td>II 2G Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Class I Zone 1 AEx db IIC T6, T5 Gb [US] Ex db IIC T6, T5 Gb [C]</td>
</tr>
<tr>
<td>II 2D Ex tb IIIIC T110 °C Db</td>
<td>Ex db IIIIC T110 °C Db</td>
<td>Class II Groups E, F, G T110 °C Zone 21 AEx tb IIIIC T110 °C Db [US] Ex tb IIIIC T110 °C Db [C]</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Ex db I Mb</td>
<td>Ex db I Mb</td>
<td>Class I Groups A, B, C, D, T6, T5</td>
</tr>
<tr>
<td>II 2G Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Class I Zone 1 AEx db IIC T6, T5 Gb [US] Ex db IIC T6, T5 Gb [C]</td>
</tr>
<tr>
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<td>Ex db IIIIC T110/T120/T130 °C Db</td>
<td>Class II Groups E, F, G T110/T120/T130 °C</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Class I Groups A, B, C, D, T6, T5</td>
</tr>
<tr>
<td>II 2G Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Class I Zone 1 AEx db IIC T6, T5 Gb [US] Ex db IIC T6, T5 Gb [C]</td>
</tr>
<tr>
<td>II 2D Ex tb IIIIC T110/T120/T130 °C Db</td>
<td>Ex db IIIIC T110/T120/T130 °C Db</td>
<td>Class II Groups E, F, G T110/T120/T130 °C</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Class I Groups A, B, C, D, T6, T5</td>
</tr>
<tr>
<td>II 2G Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Ex db IIC T6, T5 Gb</td>
<td>Class I Zone 1 AEx db IIC T6, T5 Gb [US] Ex db IIC T6, T5 Gb [C]</td>
</tr>
<tr>
<td>II 2D Ex tb IIIIC T110/T120/T130 °C Db</td>
<td>Ex db IIIIC T110/T120/T130 °C Db</td>
<td>Class II Groups E, F, G T110/T120/T130 °C</td>
<td></td>
</tr>
</tbody>
</table>

| Cable length | Standard = 2 m |
Note

The information in this brochure relates to the operating conditions and applications described.
For applications or operating conditions not described, please contact the relevant technical department.
Subject to technical modifications.

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Internet: www.hydac.com
Pressure transmitter
HDA 8400 for series applications
Hydrogen, mobile applications
EC 79/2009 type approval

Features
- Specially designed for the measurement of hydrogen
- Parts in contact with the fluid: stainless steel 1.4435 with a Ni content ≥ 13 % (316L)
- EC 79/2009 type approval

Description
The pressure transmitter series HDA 8400 has been specially developed for measuring tasks with hydrogen in mobile applications. The transmitters are based on a robust, long-life sensor cell with a thin-film strain gauge on a stainless steel membrane. The sensor cell is welded to the process connection, there are no internal seals. The compatibility with hydrogen is ensured by using a particular material. All hydrogen-wetted parts are made of stainless steel 1.4435 with a Ni content of ≥ 13 %.

The transmitters are certified according to the regulations EC 79/2009, the type approval for hydrogen-driven vehicles. For optimum adaptation to the respective application, a variety of hydrogen-suited process connections have been implied into the certification.

For integration into modern controls, standard analogue output signals are available, e.g. 4..20 mA, 0.5 .. 4.5 V or 1 .. 5 V. Ratiometric output signals are also available. Various mobile suited, integrated connectors and cable solutions are available for the electrical connection.

Application fields
The applications can be found in all hydrogen-driven vehicles, placed on the market in accordance with the regulations EC 79/2009. In fuel cell electric vehicles (FCEV’s) such as cars, buses, trucks, etc., pressures are monitored and regulated, starting with the high-pressure storage system up to the entrance of the fuel cell.
## Technical details

### Input data

<table>
<thead>
<tr>
<th>Measuring ranges</th>
<th>bar</th>
<th>16</th>
<th>25</th>
<th>40</th>
<th>60</th>
<th>100</th>
<th>160</th>
<th>250</th>
<th>400</th>
<th>600</th>
<th>900</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal working pressure ¹</td>
<td>bar</td>
<td>30</td>
<td>30</td>
<td>50</td>
<td>70</td>
<td>80</td>
<td>125</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>700</td>
<td>700</td>
</tr>
<tr>
<td>Maximum allowable working pressure ¹</td>
<td>bar</td>
<td>37</td>
<td>37</td>
<td>62</td>
<td>87</td>
<td>100</td>
<td>156</td>
<td>250</td>
<td>375</td>
<td>500</td>
<td>875</td>
<td>875</td>
</tr>
<tr>
<td>Burst pressure</td>
<td>bar</td>
<td>125</td>
<td>125</td>
<td>200</td>
<td>300</td>
<td>500</td>
<td>800</td>
<td>1250</td>
<td>2000</td>
<td>3000</td>
<td>3000</td>
<td>3000</td>
</tr>
</tbody>
</table>

**Mechanical connection**  
(Tightening torque, recommended)

- SF250CX20, Autoclave (7/16-20 UNF 2B)  
  (15 Nm for measuring ranges ≤ 600 bar;  
  20 Nm for measuring ranges > 600 bar)  
- G 3/4 B DIN EN 837  
  (20 Nm for measuring ranges ≤ 600 bar;  
  40 Nm for measuring ranges > 600 bar)  
- 9/16-18 UNF 2A, ISO 8434-3 (25 Nm)  
- 7/16-20 UNF 2A, SAE 4 (15 Nm)  
- 3/8-24 UNF 2A (SAE 3) (10 Nm), only for measuring ranges ≤ 600 bar

### Parts in contact with the fluid

- Stainless steel 1.4435 (Ni content ≥ 13 %)  
- Copper (Cu-DHP)  
- Zurcon®22 (Polyurethane)  
- Ecopur

### Output data

| Output signal | Various signals e.g.: 4 .. 20 mA, 0 .. 5 V, 0 ..10 V  
  ratiometric 0.5 .. 4.5 V with \( U_B = 5 \) V DC (10 .. 90 % \( U_B \)) |

**Accuracy acc. to DIN 16086, terminal based**

- \( \leq 0.5\% \) FS typ.  
- \( \leq 1\% \) FS max.

**Accuracy, B.F.S.L**

- \( \leq 0.25\% \) FS typ.  
- \( \leq 0.5\% \) FS max.

**Temperature compensation**

- Zero point \( \leq 0.015\% \) FS / °C typ.  
- \( \leq 0.025\% \) FS / °C max.

- Span \( \leq 0.015\% \) FS / °C typ.  
- \( \leq 0.025\% \) FS / °C max.

**Non-linearity acc. to DIN 16086, terminal based**

- \( \leq 0.3\% \) FS max.

**Hysteresis**

- \( \leq 0.4\% \) FS max.

**Repeatability**

- \( \leq 0.1\% \) FS

**Rise time**

- \( \leq 2 \) ms

**Long-term drift**

- \( \leq 0.3\% \) FS typ. / year

### Environmental conditions

- Compensated temperature range: \(-25 .. +85\) °C
- Operating temperature range: \(-40 .. +100\) °C
- Storage temperature range: \(-40 .. +100\) °C
- Fluid temperature range: \(-40 .. +125\) °C

**Vibration resistance acc. to DIN EN 60068-2-6 at 5 .. 2000 Hz**

- \( \leq 25\) g

**Shock resistance acc. to DIN EN 60068-2-27**

- 100 g / 6 ms / half-sine  
- 500 g / 1 ms / half-sine

**Protection type ²**

- acc. to DIN EN 60529 IP 67
- acc. to ISO 20653 IP 6K9K

### Other data

- **Electrical connection** ³
  - e.g.: M12x1, 4 pole, Metri-Pack series 150, 3 pole;  
  - Deutsch DT04-3P, 3 pole
- **Supply voltage**
  - 8 .. 30 V DC  
  - 12 .. 30 V DC (0 .. 10 V output signal)  
  - 5 V ± 5 % for ratiometric output signal
- **Residual ripple of supply voltage**
  - \( \leq 5\) %
- **Current consumption**
  - \( \leq 25\) mA
- **Life expectancy**
  - > 10 million load cycles (0 .. 100% FS)
- **Weight**
  - ~55 g

**Note:** Reverse polarity protection of the supply voltage, overvoltage, override and short circuit protection are provided.

**FS (Full Scale)** = relative to complete measuring range

**B.F.S.L. = Best Fit Straight Line**

1) Type approval EC 79/2009 Nr. e1*79/2009*406/2010*0018*02: Independent of the measuring range associated with the output signal, the transmitters are in compliance with the EC 79/2009 type approval up to the pressures mentioned for *nominal working pressure* and *maximum allowable working pressure*.

2) With mounted mating connector in corresponding protection type

3) Other electrical connections on request
## Dimensions

![Diagram of dimensions and orifice](image)

### Electrical connection variants

<table>
<thead>
<tr>
<th>Male connector, Packard Metri-Pack series 150, 3 pole</th>
<th>Male connector, Deutsch DT 04, 3 pole</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Metri-Pack Series 150 - 3p" /></td>
<td><img src="image" alt="DEUTSCH DT04 - 3p" /></td>
</tr>
<tr>
<td>max. 20</td>
<td>max. 17.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Male connector, AMP Superseal, 3 pole</th>
<th>Male connector, AMP Junior Timer, 3 pole</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Superseal Series 1.5 - 3p" /></td>
<td><img src="image" alt="Junior Power Timer - 3p" /></td>
</tr>
<tr>
<td>max. 19</td>
<td>max. 14.5</td>
</tr>
</tbody>
</table>
### Mechanical connection variants

<table>
<thead>
<tr>
<th>Variant 1</th>
<th>Variant 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/16-20 UNF 2A, male thread</td>
<td>9/16-18 UNF 2A with frontal seal, male thread</td>
</tr>
<tr>
<td><img src="image1.png" alt="Diagram 1" /></td>
<td><img src="image2.png" alt="Diagram 2" /></td>
</tr>
<tr>
<td>SF250CX20, Autoclave 7/16-20 UNF 2B, female thread</td>
<td>3/8-24 UNF 2A, male thread</td>
</tr>
<tr>
<td><img src="image3.png" alt="Diagram 3" /></td>
<td><img src="image4.png" alt="Diagram 4" /></td>
</tr>
</tbody>
</table>

### Order details

The pressure transmitter HDA 8400 with type approval EC 79/2009 for hydrogen applications has been especially developed for the use in series applications.

For precise specifications, please contact our HYDAC ELECTRONIC Sales Department.

### Note

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Subject to technical modifications.

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