# Intrinsically Safe Hazardous Area Transmitte
# Type IS-20, IS-21, IS-20-F, IS-21-F

INSTRUMENTS • CONTROLS • VALVES
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## Applications

- Chemical, Petrochemical
- Oil and gas refining
- Food industry
- Mechanical engineering

## Special Features

- Pressure ranges from 50 InWC to 15,000 psi
- FM, CSA approval for
  - Intrinsically safe Class I, II and III Division 1, Group A, B, C, D, E, F, G
  - Dust Class II and III Division 1, Group E, F, G
  - Class I, Zone 0, AEx ia II C
- Ex- protection EEx ia I/II C T6 according to ATEX for:
  Gases, vapors and mist: Connection to Zone 0, Zone 1 and Zone 2
  Dust: Connection to Zone 20, Zone 21 and Zone 22
  Mining: Category M1 and M2
  Suitable for SIL 2 according to IEC 61508 / IEC 61511

**Left: IS-20-S standard version**
**Center: IS-21-S with flush diaphragm**
**Right: IS-20-F with integral junction box**

**Approvals meet international standards**
The IS-20 series of intrinsically safe pressure transmitters are designed for industrial pressure measurement applications in hazardous areas where intrinsically safe ratings are required.

Multiple intrinsically safe approvals include FM, ATEX and CSA. These multiple approvals provide for global recognition and acceptance of the intrinsically safe ratings. The transmitters are labeled with all three approvals to help support international shipments of OEM equipment designed with these transmitters.

**Rugged construction**
The stainless steel wetted parts feature an all-welded measuring cell for improved media compatibility. There are no internal soft sealing materials that may react with the media or deteriorate over time. The compact case is also made of stainless steel and is available with environmental protection ratings up to NEMA 6 ( IP 68).

The IS-21-S and IS-21-F transmitters feature a flush diaphragm process connection. They are specifically designed for the measurement of viscous fluids or media containing solids that may clog a NPT process connection.

Types IS-20-F and IS-21-F feature an integral stainless steel junction box with internal terminal block for use in extremely harsh environments. A ½“ NPT female conduit connection is standard on all models and a cable compression electrical connection is available as an option.

All types require a 10 to 30 volt supply provided by an intrinsically safe power supply or through an approved intrinsically safe zener diode barrier.

**Specifications without type designation apply for all types.**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pressure range | 50 InWC | 5 psi | 10 psi | 25 psi | 30 psi | 60 psi | 100 psi | 160 psi | 200 psi |
| Maximum pressure* | 15 psi | 29 psi | 58 psi | 145 psi | 145 psi | 240 psi | 500 psi | 1,160 psi | 1,160 psi |
| Burst pressure** | 29 psi | 35 psi | 69 psi | 170 psi | 170 psi | 290 psi | 600 psi | 1,390 psi | 1,390 psi |
| Pressure range | 300 psi | 500 psi | 1,000 psi | 2,000 psi | 3,000 psi | 5,000 psi | 8,000 psi | 10,000 psi[1] | 15,000 psi[1] |
| Maximum pressure* | 1,160 psi | 1,160 psi | 1,740 psi | 4,600 psi | 7,200 psi | 11,600 psi | 17,400 psi | 17,400 psi | 21,750 psi |
| Burst pressure** | 1,390 psi | 5,800 psi | 7,970 psi | 14,500 psi | 17,400 psi | 24,650 psi[2] | 34,800 psi[2] | 34,800 psi | 43,500 psi |

{vacuum, gauge pressure, compound ranges, and absolute pressure references are available}

[1] Ranges only available with Type IS-20

[2] For Type IS-21 the burst pressure is limited to 21,000 psi unless the pressure seal is accomplished by using the sealing ring underneath the hex.

*Pressure applied up to the maximum rating will cause no permanent change in specifications but may lead to zero and span shifts

**Exceeding the burst pressure may result in destruction of the transmitter and possible loss of media

| | | |
|---|---|---|
| Materials | | |
| ■ Wetted parts | | (for other materials see WIKA diaphragm seal program) |
| ➢ Models IS-20-S, IS-20-F | | Stainless steel |
| ➢ Models IS-21-S, IS-21-F | | Stainless steel {Hastelloy® C4} |
| | | O-ring: NBR {Viton® or EPDM} |
| ■ Case | | Stainless steel |
| Internal transmission fluid [3] | | Synthetic oil {Halocarbon® oil for oxygen applications} [4] {Listed by FDA for food applications} |

[3] Not available with Type IS-20 in pressure ranges > 300 psi

[4] Media temperature for oxygen version: -4 ... +140 °CF (-20 ... +60 °C). Not available in vacuum or absolute pressure ranges or in Type IS-21 flush diaphragm version > 500 psi

| | | |
|---|---|---|
| Power supply $U_B$ | DC V | $10 < U_B \leq 30$ ($11 < U_B \leq 30$ with Type IS-20-F) |
| Signal output and | | 4 ... 20 mA, 2-wire |
| Maximum load $R_A$ | | |
| ➢ Models IS-20-S | | $R_A \leq (U_B - 10\ V) / 0.02\ A$ – (length of cable in feet x 0.043 Ohm) |
| ➢ Models IS-20-F | | $R_A \leq (U_B - 11\ V) / 0.02\ A$ |
| | | with $R_A$ in Ohms and $U_B$ in Volts |
| Test circuit signal / max. load $R_A$ | | $R_A < 15$ Ohm (only for Type IS-20-F) |
| Adjustability zero/span | % | ± 5 using potentiometers inside the instrument |
| Response time (10 ... 90 %) | ms | ≤ 1 (≤ 10 ms at media temperatures below –22°F (-30°C) for ranges < 300 psi |
| Power Pi | W | 1 (750 mW with approval for Category 1D) |
| Isolation voltage | | Isolation complies with EN 50020, 79-11 |
| Accuracy [5] | % of span | ≤ 0.25 {0.125} [6] (BFSL) |
| | % of span | ≤ 0.5 {0.25} [6] (limit point calibration) |

[5] Including non-linearity, hysteresis and repeatability.
Limit point Calibration performed in vertical mounting position with pressure connection facing down.

[6] For pressure ranges above 100 InWC

| | | | |
|---|---|---|---|
| Non-linearity | % of span | ≤ 0.2 | (BFSL) according to IEC 61298-2 |
| Non-repeatability | % of span | ≤ 0.1 | |
| 1-year stability | % of span | ≤ 0.2 | (at reference conditions) |
| Permissible temperature | | | |
| ■ Medium [7] [8] | | -20 ... +80 °C [7] | -4 ... +176 °F [7] |
| | | {extended temperature ranges see page 6} [7] | |
| ■ Ambient [7] [8] | | -20 ... +80 °C [7] | -4 ... +176 °F [7] |
| ■ Storage [8] | | -30 ... +105 °C | -22 ... +221 °F |

[7] Other temperature ranges are possible, depending on the electrical connection; see EC-type

[8] Also complies with EN 50178, Tab. 7, Type C, Class 4KH Operation, 1K4 Storage, 1K3 Transport

[9] Response time for IS-20: ≤ 10 ms at medium temp. below -30 °C (-22 °F) for pressure ranges up to 300 psi
Response time for IS-21: ≤ 10 ms at medium temp. below -30 °C (-22 °F) for all pressure ranges

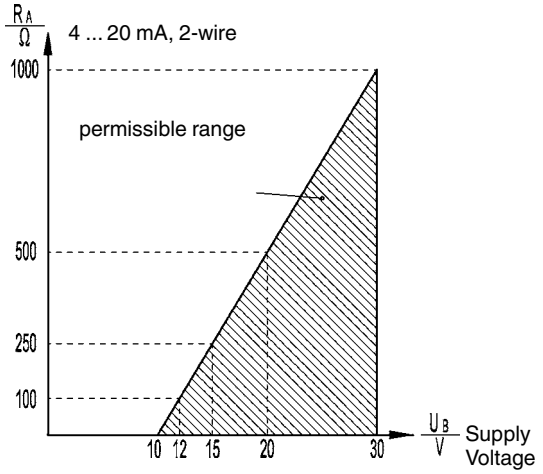
| | | | |
|---|---|---|---|
| Compensated temperature range | | 32 ... +176°F | 0 ... +80°C |
| Temperature coefficients (TC) within compensated temperature range: | | | |
| ■ Mean TC of zero | % of span | ≤ 0.2 / 10 K (< 0.4 for pressure range ≤ 100 InWC) | |
| ■ Mean TC of range | % of span | ≤ 0.2 / 10 K | |
| CE-conformity | | | |
| ■ Pressure equipment directive | | 97/23/EC | |
| ■ EMC directive | | 2004/108/EC, EN 61 326 Emission (Group 1, Class B) and Immunity (industrial locations) | |

| Specifications | | Type IS-20-S, IS-21-S, IS-20-F, IS-21-F |
|---|---|---|
| ■ Directive ATEX of equipment intended for use in potentially explosive atmospheres | | 94/9/EC |
| Ex-protection | ATEX | Category [8] 1G, 1/2G, 2G, 1D, 1/2D, 2D, M1, M2 |
| Ignition protection type | | Ex ia I/II C T4, Ex ia I/II C T5, Ex ia I/II C T6 |
| | [8] Read the operating conditions and safety-relevant data in the EC-type examination certificate in any case (BVS 04 ATEX E 068 X) | |
| Ex-protection | FM, CSA | Class I, II and III |
| Ignition protection type | | Intrinsic safe Class I, II, III Division 1, |
| | | Group A, B, C, D, E, F, G and Class I, Zone 0 AEx ia II C |
| HF-immunity | V/m | 10 |
| Burst | kV | 2 |
| Functional safety | | Suitable for SIL 2 applications according to IEC 61508/ IEC 61511 |
| | | Further information: "Additional Instructions Safety-related data IS-2X SIL" |
| Shock resistance | | |
| » Type IS-2X-S | g | 1,000 according to IEC 60068-2-27 (mechanical shock) |
| » Type IS-2X-F | g | 600 according to IEC 60068-2-27 (mechanical shock) |
| Vibration resistance | | |
| » Type IS-2X-S | g | 20 according to IEC 60068-2-6 (vibration under resonance) |
| » Type IS-2X-F | g | 10 according to IEC 60068-2-6 (vibration under resonance) |
| Wiring protection | | |
| ■ Short-circuit | | Sig+ towards UB- |
| ■ Reverse polarity | | UB+ towards UB- |
| Weight ➢ Type IS-2X-S | lb | Approx. 0.45 |
| ➢ Type IS-2X-F | lb | Approx. 0.80 |

*) In an oxygen version type IS-21 is not available. In an oxygen version type IS-20 is only available in gauge pressure ranges ≥ 0.25 bar with media temperatures between -20 … +60 °C / -4 … +140 °F and using stainless steel or Elgiloy® wetted parts.
{ } Items in curved brackets are optional extras for additional price.

## Output signal and permissible load

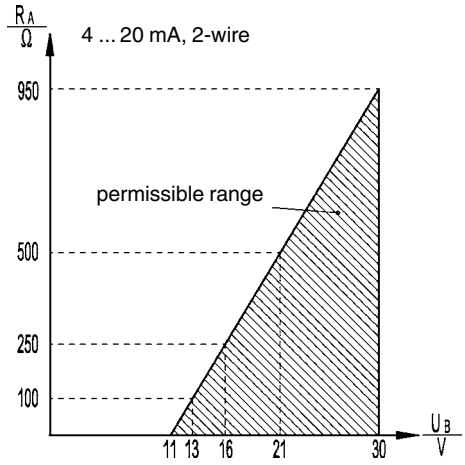
### Type IS-2X-S




Output current (2-wire)

4 ... 20 mA: $R_A \leq (U_B - 10\ V) / 0.02\ A$

### Type IS-2X-F




Output current (2-wire)

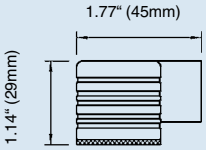
4 ... 20 mA: $R_A \leq (U_B - 11\ V) / 0.02\ A$

# Dimensions in inches (mm)

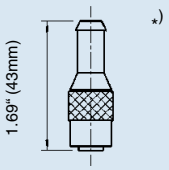
**IS-2X-S (electrical connections)**

Ingress Protection IP per IEC 60 529

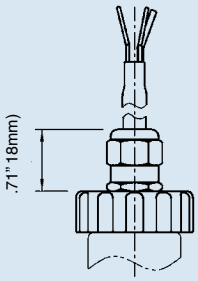
L-connector plug
DIN EN 175301-803,
Form A
½ NPT conduit
IP 65
Order code: AX
ATEX: 1/2 G, M1



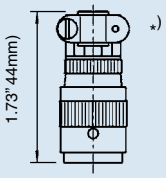

Circular connector,
M 12x1, 4-pin
IP 67
Order code: M4
ATEX: 1/2 G, M1

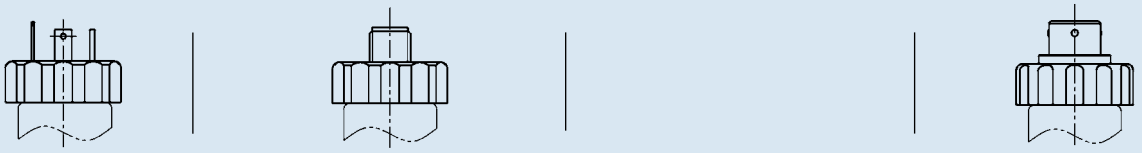



Cable with free ends
outer conductor
diameter 6.8 mm, PUR
NEMA 4 / IP 67
Order code: DL
ATEX: 1/2 G, M1

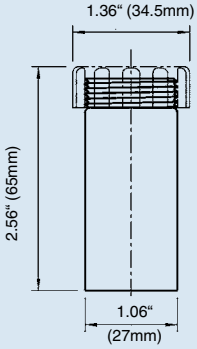



Bayonet connector
6-pin NEMA 4 / IP 67
Order code: C6
ATEX: 1/2 G
(not available with mining approval)



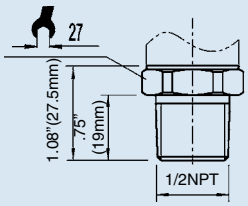



**Case**

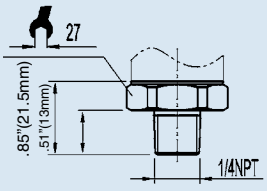



**Pressure connections IS-20-S and IS-20-F**

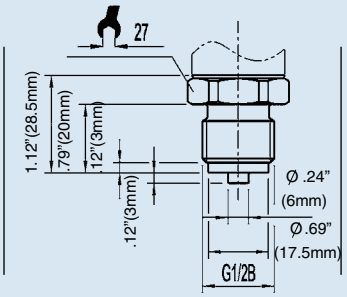
1/ 2 NPT male
Order code: ND



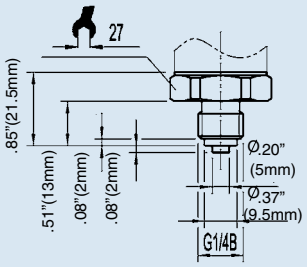

1/4 NPT male
Order code: NB




G 1/2 metric
EN 837
Order code: GD

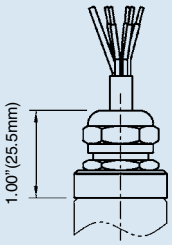



G 1/4 metric
EN 837
Order code: GB



**Electrical connections IS-2X-S**

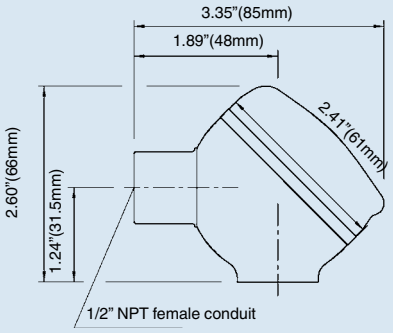
Cable with free ends, zero/span not adjustable, conductor outer diameter 6.8 mm, PUR IP 68/NEMA 6
Order code: EM
ATEX: 1/2 G, M1




Other connections available

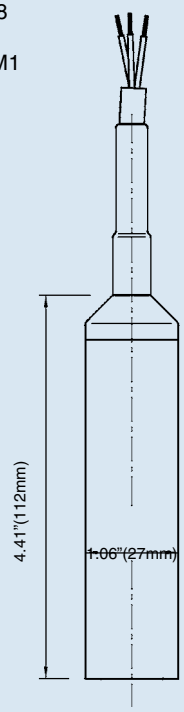
**Electrical connections IS-2X-F**

Integral junction box with internal spring clip terminals NEMA 4X IP 67
Order code:
FE (1/2" NPT female conduit standard)
FH (threaded connection brass nickel-plated)
FC (threaded connection stainless steel)
ATEX: 1/2 G, M1

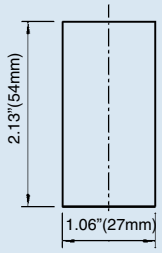



**Electrical connections IS-2X-S**

Cable with free ends, zero/span not adjustable, conductor outer diameter 7.5 mm, PUR {FEP}
NEMA 6P / IP 68
Order code: DM
ATEX: 1G, 1D, M1

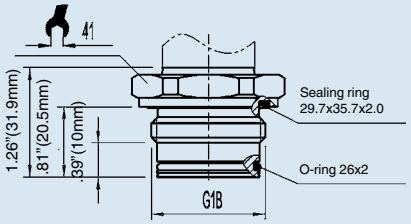



**Case dimensions**

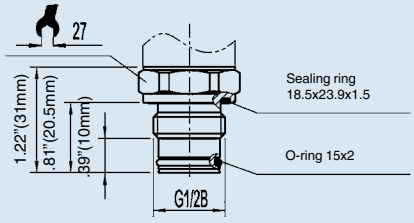



**IS-21-S and IS-21-F flush diaphragm pressure connections**

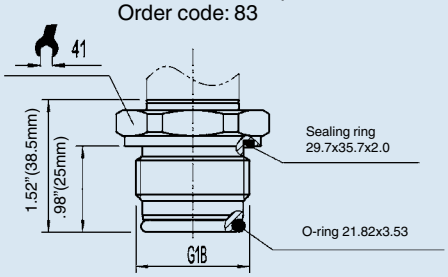
G 1
50 InWC to 25 psi
Order code: 85



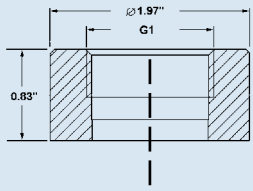

G 1/2
30 psi to 8,000 psi
Order code: 86



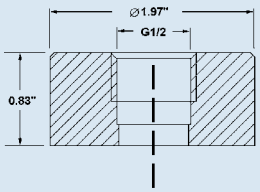

G 1
according to EHEDG **)
100 InWC to 250 psi
Order code: 83



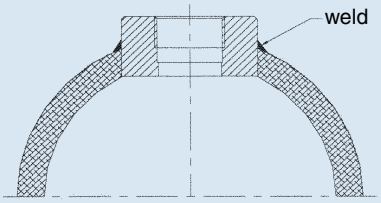

**Matching P-1 weld insert adapters for IS-21-S and IS-21-F transmitters**




P-1 G1 weld insert adapter
Part # 1206974
for pressure ranges ≤ 25 psi




P-1 G1/2 weld insert adapter
Part # 1097008
for pressure ranges ≥ 30 psi




Cross section view of P-1 adapter installed in pipe.

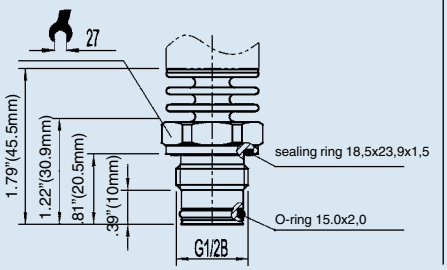
**) European Hygienic Equipment Design Group

{ } Items in curved brackets are optional extras at additional cost.

## Pressure connections for high temperature media

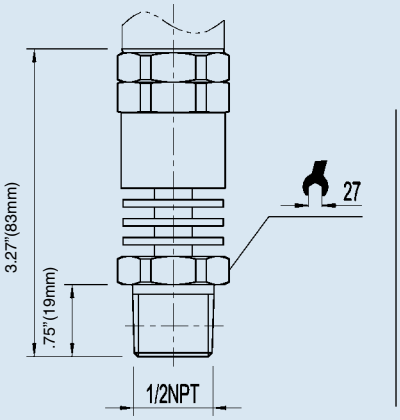
**IS-21-S and IS-21-F, flush diaphragm**
**-4 °F to 302 °F (-20 °C to 150 °C)**

G 1/2
with 2 cooling fins (version Ⓐ)
0 ... 30 psi up to 0 ... 8000 psi
Order code: 86 and C



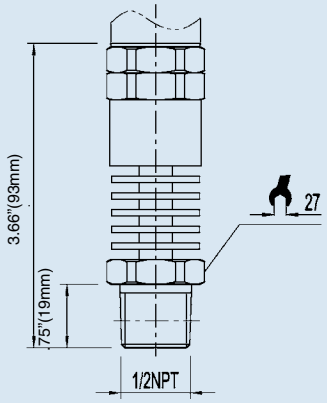

**IS-20-S and IS-20-F**
**-40 °F to 302 °F (-40 °C to 150 °C)**

1/2 NPT male
with 3 cooling fins (version Ⓑ)
0 - 5 psi to 0-15,000 psi
Order code: ND and 8

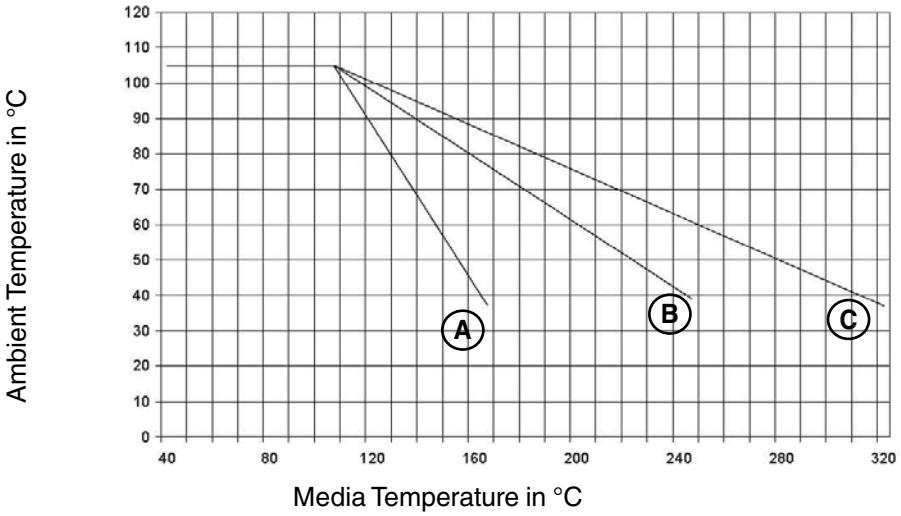



**IS-20-S and IS-20-F**
**-40 °F to 392 °F (-40 °C to 200 °C)**

1/2 NPT male
with 5 cooling fins (version Ⓒ)
0-5 psi to 0-15,000 psi
Order code: ND and 9




### Relationship of media temperature to ambient temperature




| Version | Ⓐ | Ⓑ | Ⓒ |
|---|---|---|---|
| Cooling fins | 2 | 3 | 5 |
| K * | 0.47 | 0.68 | 0.76 |

*cooling constant specific to each version

Calculation of cooling element performance:
$T_B = T_{med} - (T_{med} - T_{amb}) \times K$
$T_B$ = Operating temperature of transmitter
$T_{med}$ = maximum temperature of process media
$T_{amb}$ = maximum ambient temperature
$K$ = Constant of cooling element

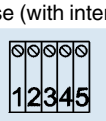
Maximum permissible ambient temperature:
$T_{amb} = T_{med} + (T_B - T_{med}) / K$

## Permissible temperature ranges depending on electrical connections

| Electrical connections | Order-code | Category | Ambient/Medium temperature range | |
|---|---|---|---|---|
| DIN 175301-803 A L-Connector | A4 | 1/2 G (IIC) | -40 ... +140 °F (T6)<br>-40 ... +176 °F (T5)<br>-40 ... +221 °F (T4) | -40 ... +60 °C (T6)<br>-40 ... +80 °C (T5)<br>-40 ... +105 °C (T4) |
| | | M1 | -40 ... +221 °F | -40 ... +105 °C |
| M 12x1 Circular connector | M4 | 1/2 G (IIC) | -13 ... +140 °F (T6)<br>-13 ... +176 °F (T5)<br>-13 ... +194 °F (T4) | -25 ... +60 °C (T6)<br>-25 ... +80 °C (T5)<br>-25 ... +90 °C (T4) |
| | | M1 | -13 ... +194 °F | -25 ... +90 °C |
| Cable | DL | 1/2 G (IIC) | -4 ... +140 °F (T6)<br>-4 ... +176 °F (T5)<br>-4 ... +176 °F (T4) | -20 ... +60 °C (T6)<br>-20 ... +80 °C (T5)<br>-20 ... +80 °C (T4) |
| | | M1 | -4 ... +140 °F | -20 ... +60 °C |
| Bayonet connector<br>(not with mining) | C6 | 1/2 G (IIC) | -58 ... +140 °F (T6)<br>-58 ... +176 °F (T5)<br>-58 ... +221 °F (T4) | -50 ... +60 °C (T6)<br>-50 ... +80 °C (T5)<br>-50 ... +105 °C (T4) |
| Cable<br>zero/span not adjustable | EM | 1/2 G (IIC) | -4 ... +140 °F (T6)<br>-4 ... +176 °F (T5)<br>-4 ... +176 °F (T4) | -20 ... +60 °C (T6)<br>-20 ... +80 °C (T5)<br>-20 ... +80 °C (T4) |
| | | M1 | -4 ... +176 °F | -20 ... +80 °C |
| Fieldcase | FE, FH, FC | 1/2 G (IIC) | -58 ... +140 °F (T6)<br>-58 ... +176 °F (T5)<br>-58 ... +221 °F (T4 | -50 ... +60 °C (T6)<br>-50 ... +80 °C (T5)<br>-50 ... +105 °C (T4 |
| | | M1 | -58 ... +221 °F (T4) | -50 ... +105 °C (T4) |
| PUR Cable<br>zero/span not adjustable | DM | 1 G (IIA), 1/2 G (IIC) | 14 ... +140 °F (T6)<br>14 ... +140 °F (T5)<br>14 ... +140 °F (T4) | -10 ... +60 °C (T6)<br>-10 ... +60 °C (T5)<br>-10 ... +60 °C (T4) |
| | | 1D, M1 | 14 ... +140 °F | -10 ... +60 °C |
| FEP Cable<br>zero/span not adjustable | DM | 1 G (IIA), 1/2 G (IIC) | -22 ... +140 °F (T6)<br>-22 ... +176 °F (T5)<br>-22 ... +221 °F (T4) | -30 ... +60 °C (T6)<br>-30 ... +80 °C (T5)<br>-30 ... +105 °C (T4) |
| | | 1D | -22 ... +140 °F | -30 ... +60 °C |
| | | M1 | -22 ... +221 °F | -30 ... +105 °C |

## Wiring details

| | L-connector<br>DIN 175301-803 A | | Circular connector<br>M12x1, 4 pin | | Cable,<br>1.5 m | |
|---|---|---|---|---|---|---|
| |  | |  | | | |
| 2-wire | U+ = 1 | U- = 2 | U+ = 1 | U- = 3 | U+ = brown | U- = green |
| Cable screen | | | | | PUR-cable: grey<br>FEP-cable: twisted and tinned | |
| Wire gauge | up to max.1.5 mm² | | - | | 0.5 mm² (AWG 20) | |
| Cable diameter | 6-8 mm<br>ship approval: 10-14 mm | | - | | 6.8 mm (Order code: DL / EM)<br>7.5 mm (Order code DM) | |
| Ingress protection according to IEC 60 529 | IP 65 | | IP 67 | | IP 67 - Order code: DL<br>IP 68 zero/span not adjustable - Order code: EM / DM | |
| | The ingress protection classes specified only apply while the pressure transmitter is connected with female connectors that provide the corresponding ingress protection. | | | | | |

| | Bayonet connector, 6 pin | | Field case (with internal spring clip terminals) | | | | |
|---|---|---|---|---|---|---|---|
| |  | |  | | | | |
| 2-wire | U+ = A | U- = B | U+ = 1 | U- = 2 | Test+ = 3 | Test- = 4 | screen = 5 |
| Cable diameter | | | 7-13 mm | | | | |
| Ingress protection according to IEC 60 529 | IP 67 | | IP 67 | | | | |
| | The ingress protection classes specified only apply while the pressure transmitter is connected with female connectors that provide the corresponding ingress protection. | | | | | | |

## Hazardous areas (ATEX zone classifications)

**Group II:** **Electrical equipment for use in all areas (except mines) which are endangered by an explosive atmosphere.**

| Zone | Category | Occurrence of explosive atmosphere |
|---|---|---|
| Zone 0 | Category 1G (gas) | Continuous |
| Mounting to zone 0 | Category 1/2 G | |
| Zone 20 | Category 1D (dust) | |
| Mounting to zone 20 | Category 1/2 D | |
| Zone 1 | Category 2G | Intermittent |
| Zone 21 | Category 2D | |
| Zone 2 | Category 3G | Hazard under abnormal conditions |
| Zone 22 | Category 3D | |

**Group I:** **Electrical equipment for use in mines (hazard due to mine gas)**

| Zone | Category | Requirements |
|---|---|---|
| | Category M 1 | Very high degree of safety |
| | Category M 2 | High degree of safety<br>(instruments have to be turned off if they are exposed to an explosive atmosphere) |

## Hazardous areas (ATEX in comparison with FM, CSA)

| | | ATEX Group | FM / CSA Class | Group |
|---|---|---|---|---|
| *Above ground* | Gases and Vapors | IIA / IIB / IIC | I | A / B / C / D / E / F / G |
| | Dusts | | II | |
| | Fibers | | III | |
| *Mining* | Gas / Dusts | I | ID / IIF | |

| | | | |
|---|---|---|---|
| *ATEX* | Zone 0 (Zone 20 Dust) | Zone 1 (Zone 21 Dust) | Zone 2 (Zone 22 Dust) |
| *FM /CSA* | Zone 0 | Zone 1 | Zone 2 |
| | Division 1 | | Division 2 |
| *FM (NEC505)* | Zone 0 | Zone 1 | Zone 2 |

The specifications given in this document represent the state of engineering at the time of publishing.
We reserve the right to make modifications to the specifications and materials.



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Modifications may take place and materials specified may be replaced by others without prior notice.

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