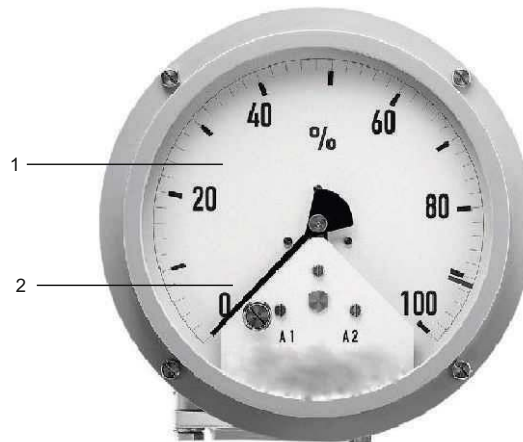


Differential Pressure and Flow Meter



- 1 Housing of indicating unit
- 2 Zero point adjustment

Fig. 1: Spraytech System DP guage

Measurement tasks

- Liquid level measurement in pressure tanks, especially for cryogenic gases
- Differential pressure measurement between low and re- turn low pipe
- Pressure drop measurement across valves and filters
- Flow rate measurement according to the differential pres- sure method

Special features

- Suitable for liquids, gases or vapors
- Overloadable on one side up to the permissible static pressure
- Suitable for field installation (degree of protection IP 54/ IP 65) and panel mounting
- Zero adjustment from the front
- Adjustment of measuring span
- Housing of indicating unit with burst protection
- Directly connectable valve block (optional) with connection to monitor the tank pressure and with connection for pres- sure switch

Versions (Fig. 1)

Spraytech DP guage Consisting of:

Indicator NG 100 with pointer mechanism · dp cell made of (brass) or stainless steel · PN 50 · Free of oil and grease for oxygen · Measuring ranges from 40 to 3600 mbar · ECO measuring diaphragm · Zero adjustment at the front · Process connections G $\frac{3}{8}$ A

Options available:

Dials · Scale 0 to 100 % linear or square root graduation, dial plates detachable dial plates for different media, special dial plates

Screw fittings

Pressure gauge

Special versions on request

Principle of operation (Fig. 2)

The dp cell works according to the deflection method and contains an ECO measuring diaphragm (1.5) which is designed to handle measuring spans from 40 to 3600 mbar. The diaphragm shaft (1.7) is connected to a lever (1.8) and is supported and guided by the range springs. The lever leads the deflection of the measuring system out of the pressure chamber. The pressure chamber is sealed by a flexible disk (1.9). The range springs, which are connected to the housing, and the diaphragm ensure that the position of the lever is independent of the static pressure. The dp cell can be overloaded on one side as the measuring diaphragm lexes against the housing wall whenever the measured values are out of range.

The differential pressure $\Delta p = p_1 - p_2$ creates a force at the measuring diaphragm (1.5) which is balanced by the range springs (1.4). The deflection of the measuring diaphragm and the lever (1.8) is proportional to the differential pressure measured and is transferred to the pointer (2.4) over the adjustable transmission element (2.1) and the pointer mechanism (2.2) with jewelled bearings.

The range springs (1.4) installed in the dp cell determine the upper and lower limit of each measuring span (measuring span limit) of the device. The span can be continuously adjusted within these limits in the ratio of 1:2 at the transmission element. This adjustment changes the transmission ratio between the lever (1.8) and the pointer mechanism (2.2).

The shaft of the measuring unit (3.1) carries the metal tags (3.2) and moves them according to the operating direction into the limit switch unit with the two alarm contacts (proximity switches) A1 and A2 (3.3).

When the metal tag enters the inductive field of the associated proximity switch, it assumes a high resistance (contact open). When the metal tag leaves the inductive field, it assumes a low resistance (contact closed). This function is similar to that of a mechanical-type switching contact.

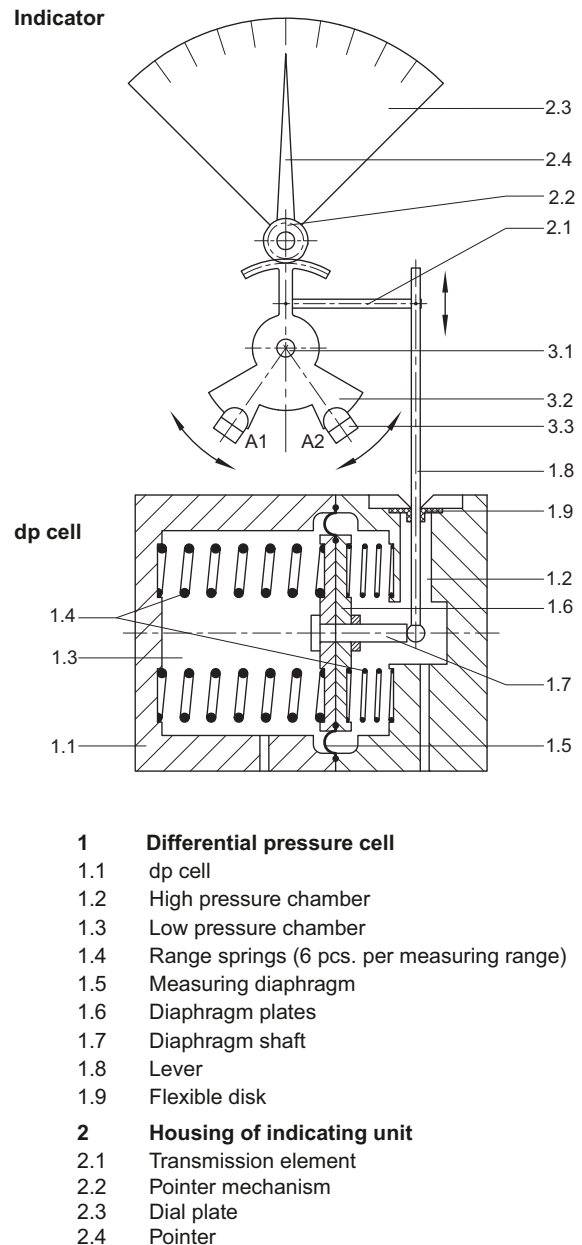


Fig. 2: Functional diagram of Spraytech DP Gauge

Table 1: Technical data · All pressure stated as gauge pressure

| Differential Pressure and Flow Meter | | | | | | | | | | | |
|-----------------------------------------------------------------|----------------------------------------------|------------------------------|-----------|-----------|------------|------------|------------|-------------|-------------|--------------|--------------|
| Measuring range in mbar | | 0 to 60 | 0 to 100 | 0 to 160 | 0 to 250 | 0 to 400 | 0 to 600 | 0 to 1000 | 0 to 1600 | 0 to 2500 | 0 to 3600 |
| Measuring span in mbar | min. max. | 40 to 60 | 50 to 100 | 80 to 160 | 125 to 250 | 200 to 400 | 300 to 600 | 500 to 1000 | 800 to 1600 | 1250 to 2500 | 1800 to 3600 |
| Nominal pressure | PN 50, overloadable on one side up to 50 bar | | | | | | | | | | |
| Indicator | Ø 160 mm | | | | | | | | | | |
| Characteristic | Reading linear to the differential pressure | | | | | | | | | | |
| Deviation from terminal-based linearity | <±2.5 % | <±1.6 % including hysteresis | | | | | | | | | |
| Sensitivity | <±0.5 % | <0.25 % | | | | | | | | | |
| Effect of static pressure | <0.03 %/1 bar | | | | | | | | | | |
| with gaseous oxygen max. temperature max. oxygen pressure | +60 °C 30 bar | | | | | | | | | | |
| Perm. ambient temperature range for oxygen | -40 to +80 °C -40 to +60 °C | | | | | | | | | | |
| Perm. storage temperature range | -40 to +100 °C | | | | | | | | | | |
| Degree of protection according to DIN 40050 | IP 65 | | | | | | | | | | |
| Weight | Approx. 3 kg | | | | | | | | | | |

Note

All pressure stated as gauge pressure

All errors and deviations are specified in % of the adjusted measuring span.

Table 2: Materials

| Media 5 Differential Pressure and Flow Meter | |
|-------------------------------------------------------|----------------------------------------|
| dp cell | CW617N (brass) or CrNi steel |
| Measuring diaphragm and seals | ECO |
| Springs, diaphragm plates and functional parts, lever | CrNi steel |
| Housing of indicating unit | Aluminum / special material on request |

Measurement made easy

Engineered solutions for all applications

Base accuracy

- from 0.06 % of calibrated span (optional 0.04 %)

Reliable sensing system coupled with very latest digital technologies

- provides large turn down ratio up to 100:1

Comprehensive sensor choice

- optimize in-use total performance and stability

10-year stability

- 0.15 % of URL

Flexible configuration facilities

- provided locally via local LCD keypad

New TTG (Through-The-Glass) keypad technology

- allows quick and easy local configuration without opening the cover, even in explosion proof environments

IEC 61508 certification

- version for SIL2 (1oo1) and SIL3 (1oo2) applications

PED compliance

- Category III for PS > 21 MPa, 210 bar
- Sound Engineering Practice (SEP) for PS ≤ 21 MPa, 210 bar

WirelessHART version

- the battery powered solution compliant to IEC 62591

Best-in-class battery life

- up to 10 years @ 32 s update time
- in-field replaceable

Functional Specifications

Range and span limits

| Sensor Code | Upper Range Limit (URL) | Lower Range Limit (LRL) | Minimum span |
|-------------|-------------------------|-------------------------|-------------------------|
| A | 1 kPa | -1 kPa | 0.05 kPa |
| | 10 mbar | -10 mbar | 0.5 mbar |
| | 4 inH ₂ O | -4 inH ₂ O | 0.2 inH ₂ O |
| B | 4 kPa | -4 kPa | 0.2 kPa |
| | 40 mbar | -40 mbar | 2 mbar |
| | 16 inH ₂ O | -16 inH ₂ O | 0.8 inH ₂ O |
| E | 16 kPa | -16 kPa | 0.54 kPa |
| | 160 mbar | -160 mbar | 5.4 mbar |
| | 64 inH ₂ O | -64 inH ₂ O | 2.16 inH ₂ O |
| F | 40 kPa | -40 kPa | 0.4 kPa |
| | 400 mbar | -400 mbar | 4 mbar |
| | 160 inH ₂ O | -160 inH ₂ O | 1.6 inH ₂ O |
| G | 65 kPa | -65 kPa | 0.65 kPa |
| | 650 mbar | -650 mbar | 6.5 mbar |
| | 260 inH ₂ O | -260 inH ₂ O | 2.6 inH ₂ O |
| H | 160 kPa | -160 kPa | 1.6 kPa |
| | 1600 mbar | -1600 mbar | 16 mbar |
| | 642 inH ₂ O | -642 inH ₂ O | 6.4 inH ₂ O |
| M | 600 kPa | -600 kPa | 6 kPa |
| | 6 bar | -6 bar | 0.06 bar |
| | 87 psi | -87 psi | 0.87 psi |
| P | 2400 kPa | -2400 kPa | 24 kPa |
| | 24 bar | -24 bar | 0.24 bar |
| | 348 psi | -348 psi | 3.5 psi |
| Q | 8000 kPa | -8000 kPa | 80 kPa |
| | 80 bar | -80 bar | 0.8 bar |
| | 1160 psi | -1160 psi | 11.6 psi |
| S | 16000 kPa | -16000 kPa | 160 kPa |
| | 160 bar | -160 bar | 1.6 bar |
| | 2320 psi | -2320 psi | 23.2 psi |

(S) Lower Range Limit is 0.135 kPa abs, 1.35 mbar abs, 1 mmHg for inert Galden or 0.4 kPa abs, 4 mbar abs, 3 mmHg for inert Halocarbon.

Span limits

Maximum span = URL (can be further adjusted up to ± URL (TD = 0.5) for differential s, within the range limits)
IT IS RECOMMENDED TO SELECT THE TRANSMITTER SENSOR CODE PROVIDING THE TURNDOWN VALUE AS LOWEST AS POSSIBLE TO OPTIMIZE PERFORMANCE CHARACTERISTICS.

Zero suppression and elevation

Zero and span can be adjusted to any value within the range limits detailed in the table as long as:
— calibrated span ≥ minimum span

Recommendation for square root function

At least 10% of Upper Range Limit (URL)

Damping (feature not available for WirelessHART version)

Selectable time constant : between 0 and 60 s
This is in addition to sensor response time.

Turn on time

Operation within specification in less than 10 s with minimum damping.

Insulation resistance

> 100 MΩ at 500 V DC (terminals to earth)

Operative limits

Pressure limits:

Overpressure limits

Without damage to the transmitter

| Sensors | Fill fluid | Overpressure limits |
|-------------------------------------|--------------------|----------------------------------------------------------------------------|
| Sensor F to S | Silicone oil | 0.07 kPa abs, 0.7 mbar abs, 0.5 mmHg and 21 MPa, 210 bar, 3045 psi (1) (2) |
| Sensor F to Q High Static | Silicone oil | 0.07 kPa abs, 0.7 mbar abs, 0.5 mmHg and 42 MPa, 420 bar, 6090 psi |
| Sensor E | Silicone oil | 0.07 kPa abs, 0.7 mbar abs, 0.5 mmHg and 16 MPa, 160 bar, 2320 psi (1) |
| Sensor B | Silicone oil | 0.07 kPa abs, 0.7 mbar abs, 0.5 mmHg and 7 MPa, 70 bar, 1015 psi (1) |
| Sensor A | Silicone oil | 0.07 kPa abs, 0.7 mbar abs, 0.5 mmHg and 2 MPa, 20 bar, 290 psi (1) |
| Sensor F to S | Inert (Galden) | 0.135 kPa abs, 1.35 mbar abs, 1 mmHg and 21 MPa, 210 bar, 3045 psi (1) (2) |
| Sensor E | Inert (Galden) | 0.135 kPa abs, 1.35 mbar abs, 1 mmHg and 16 MPa, 160 bar, 2320 psi (1) |
| Sensor F to S | Inert (Halocarbon) | 0.4 kPa abs, 4 mbar abs, 3 mmHg and 21 MPa, 210 bar, 3045 psi (1) (2) |
| Sensor F to Q 266DSH High Static | Inert (Halocarbon) | 0.4 kPa abs, 4 mbar abs, 3 mmHg and 42 MPa, 420 bar, 6090 psi |
| Sensor E | Inert (Halocarbon) | 0.4 kPa abs, 4 mbar abs, 3 mmHg and 16 MPa, 160 bar, 2320 psi (1) |

(1) 1 MPa, 10 bar, 145 psi for Kynar-PVDF

(2) 16 MPa, 160 bar, 2320 psi for AISI 316 ss NACE bolting or for specific flange variant

Static pressure limits

Transmitters for differential pressure SCTDPT0Z operates within specifications between the following limits:

| Sensors | Static pressure limits |
|------------------------------|-------------------------------------------------------------------------------------------|
| Sensor F to S | 1.3 kPa abs, 13 mbar abs, 0.2 psia and 21 MPa, 210 bar, 3045 psi (1) (2) |
| Sensor F to Q High Static | 1.3 kPa abs, 13 mbar abs, 0.2 psia and 42 MPa, 420 bar, 6090 psi |
| Sensor E | 1.3 kPa abs, 13 mbar abs, 0.2 psia and 16 MPa, 160 bar, 2320 psi (1) |
| Sensor B | 1.3 kPa abs, 13 mbar abs, 0.2 psia and 7 MPa, 70 bar, 1015 psi (1) |
| Sensor A | 1.3 kPa abs, 13 mbar abs, 0.2 psia and 2 MPa, 20 bar, 290 psi (1) |
| | (1) 1 MPa, 10 bar, 145 psi for Kynar-PVDF |
| | (2) 16 MPa, 160 bar, 2320 psi for AISI 316 ss NACE bolting or for specific flange variant |

Proof pressure

The transmitter can be exposed without leaking to line pressure of up to

— 48 MPa, 480 bar, 6960 psi

— 77 MPa, 770 bar, 11165 psi for 266DSH high static version.

Meet ANSI/ISA-S 82.03 hydrostatic test requirements.

Temperature limits °C (°F) :
Ambient
is the operating temperature

| | |
|--------------------------------------|--------------------------------|
| s SCTDPT0Z | Ambient temperature limits |
| Silicone oil for sensor F to S | -40 and 85 °C (-40 and 185 °F) |
| Silicone oil for sensor A to E | -25 and 85 °C (-13 and 185 °F) |
| Inert (Galden) for sensor F to S | -20 and 85 °C (-4 and 185 °F) |
| Inert (Galden) for sensor E | -10 and 85 °C (14 and 185 °F) |
| Inert (Halocarbon) for sensor F to S | -20 and 85 °C (-4 and 185 °F) |
| Inert (Halocarbon) for sensor E | -10 and 85 °C (14 and 185 °F) |

| | |
|-----------------------------------------------|------------------------------------------|
| s | Ambient temperature limits |
| LCD integral display | -40 and 85 °C (-40 and 185 °F) |
| LCD display may not be clearly readable below | -20 °C (-4 °F) or above +70 °C (+158 °F) |

| | |
|-------------------------------|-------------------------------|
| s 266DSH | Ambient temperature limit |
| Painted AISI 316 L ss housing | max 70 °C (158 °F) continuous |

IMPORTANT

For Hazardous Atmosphere applications see the temperature range specified on the certificate/approval relevant to the aimed type of protection

Process

| | |
|--------------------------------------|-------------------------------------|
| s | Process temperature limits |
| Silicone oil for sensor F to S | -40 and 121 °C (-40 and 250 °F) (1) |
| Silicone oil for sensor A to E | -25 and 121 °C (-13 and 250 °F) (1) |
| Inert (Galden) for sensor F to S | -20 and 100 °C (-4 and 212 °F) (2) |
| Inert (Galden) for sensor E | -10 and 100 °C (14 and 212 °F) (2) |
| Inert (Halocarbon) for sensor F to S | -20 and 100 °C (-4 and 212 °F) (2) |
| Inert (Halocarbon) for sensor E | -10 and 100 °C (14 and 212 °F) (2) |

(1) 100 °C (212 °F) for application below atmospheric pressure
(2) 65 °C (150 °F) for application below atmospheric pressure

| | |
|--------------|--------------------------------|
| s | Process temperature limits |
| Viton gasket | -20 and 121 °C (-4 and 250 °F) |

Storage

| | |
|----------------------|--------------------------------|
| s | Storage temperature limits |
| Storage limits | -50 and 85 °C (-58 and 185 °F) |
| LCD integral display | -40 and 85 °C (-40 and 185 °F) |

Environmental limits

Electromagnetic compatibility (EMC)
Comply with EN 61326 and NAMUR NE 21 (on request).
Surge immunity level (with surge protector): 4 kV
(according to IEC 1000-4-5 EN 61000-4-5)

Pressure equipment directive (PED)
Comply with 97/23/EEC
— Category III Module H for PS ≥ than 21 MPa, 210 bar
— Sound Engineering Practice (SEP) for PS < 21 MPa, 210 bar

Humidity
Relative humidity: up to 100 %
Condensing, icing: admissible

Vibration resistance
Accelerations up to 2 g at frequency up to 1000 Hz
(according to IEC 60068-2-6)

Shock resistance
Acceleration: 50 g
Duration: 11 ms
(according to IEC 60068-2-27)

Wet and dust-laden atmospheres
The transmitter is dust and sand tight and protected against immersion effects as defined by IEC 60529 (2001) to IP 67 (IP 68 on request) or by NEMA Type 4X.
IP65 with HART Han connector.
Aluminium and AISI housings as barrel version also comply to IP 66 as defined by IEC 60529 (2001).

Hazardous atmospheres
(FOR ALL VERSIONS EXCEPT Wireless HART)
With or without integral display

INTRINSIC SAFETY:

ATEX Europe (code E1) approval

II 1 G Ex ia IIC T6/T5/T4 and II 1/2 G Ex ia IIC T6/T5/T4 and

II 1 D Ex iaD 20 T85 °C and II 1/2 D Ex iaD 21 T85 °C; IP67.

IECEX (code E8) approval

Ex ia IIC T6/T5/T4 and Ex iaD 20 T85 °C and Ex iaD 21 T85 °C; IP67.

NEPSI China (code EY)

Ex ia IIC T4~T6, DIP A20T A, T4~T6.

EXPLOSION PROOF:

ATEX Europe (code E2) approval

II 1/2 G Ex d IIC T6 and II 1/2 D Ex tD A21 IP67 T85 °C (Ta = -50 to +75 °C).

IECEX (code E9) approval

Ex d IIC T6 and Ex tD A21 IP67 T85 °C (Ta = -50 to +75 °C).

NEPSI China (code EZ)

Ex d IIC T6, DIP A21T A, T6.

TYPE "N":

ATEX Europe (code E3) type examination

II 3 G Ex nL IIC T6/T5/T4 and II 3 D Ex tD A22 IP67 T85 °C; IP67.

IECEX (code ER) type examination

Ex nL IIC T6/T5/T4; IP67.

NEPSI China (code ES) type examination

Ex nL IIC T4~T6, DIP A22T A, T6.

FM Approvals US (code E6) and FM Approvals Canada (code E4):

— Explosionproof (US): Class I, Div. 1, Groups A, B, C, D

— Explosionproof (Canada): Class I, Div. 1, Groups B, C, D

— Dust ignitionproof : Class II, Div. 1, Groups E, F, G

— Suitable for: Class II, Div. 2, Groups F, G; Class III, Div.1, 2

— Nonincendive: Class I, Div. 2, Groups A, B, C, D

— Intrinsically safe: Class I, II, III, Div. 1, Groups A, B, C, D, E, F, G

Class I, Zone 0 AEx ia IIC T6/T4, Zone 0 (FM US)

Class I, Zone 0 Ex ia IIC T6/T4, Zone 0 (FM Canada)

COMBINED ATEX (code EW = E1 + E2 + E3), (code E7 = E1 + E2)

COMBINED ATEX, FM and IECEX Approvals (code EN = EW + E4 + E6+ E1)

COMBINED FM Approvals US and Canada

— Intrinsically safe (code EA)

— Explosionproof (code EB)

— Nonincendive (code EC)

COMBINED IECEX (code EH = E8 + E9), (code EI = E8 + E9 + ER)

COMBINED NEPSI (code EP = EY + EZ), (code EQ = EY + EZ + ES)

GOST (Russia), GOST (Kazakhstan), GOST (Belarus), Inmetro (Brazil),

Kosha (Korea).

REFER TO CERTIFICATES FOR AMBIENT TEMPERATURE RANGES (WITHIN THE LIMITS OF -50 TO 85°C) RELATED TO THE DIFFERENT TEMPERATURE CLASSES

Hazardous atmospheres
(ONLY FOR Wireless HART VERSION)
With or without integral display

INTRINSIC SAFETY:

ATEX Europe (code E1) approval

II 1 G Ex ia IIC T4 Ga and II 1/2 G Ex ia IIC T4 Ga/Gb; IP67.

IECEX (code E8) approval

Ex ia IIC T4; IP67.

NEPSI China (code EY)

Ex ia IIC T4~T6.

TYPE "N":

ATEX Europe (code E3) type examination

II 3 G Ex nA IIC T6/T5/T4; IP67.

IECEX (code ER) type examination

Ex nA IIC T6/T5/T4; IP67.

NEPSI China (code ES) type examination

Ex nA IIC T4~T6.

FM Approvals US and FM Approvals Canada:

— Nonincendive: Class I, Div. 2, Groups A, B, C, D (code EC)

— Intrinsically safe: Class I, Div. 1, Groups A, B, C, D (code EA)

Class I, Zone 0 AEx ia IIC T4, Zone 0 (FM US)

Class I, Zone 0 Ex ia IIC T4, Zone 0 (FM Canada)

COMBINED ATEX (code ED = E1 + E3)

COMBINED FM Approvals US and Canada (Code EE = EA + EC)

COMBINED ATEX and FM Approvals US and Canada (Code EF = ED + EE)

COMBINED IEC (code EM = E8 + ER)

COMBINED NEPSI (code EG = EY + ES)

REFER TO CERTIFICATES FOR AMBIENT TEMPERATURE RANGES (WITHIN THE LIMITS OF -50 TO 75°C) RELATED TO THE DIFFERENT TEMPERATURE CLASSES

Electrical Characteristics and Options

Optional indicators

Standard integral display
(code L9; only available with Standard HART)
Wide screen LCD, 128 x 64 pixel,
52.5 x 27.2 mm (2.06 x 1.07 in.) dot matrix.
Multilanguage. Without keypad.
User selectable application-specific
visualizations.
Totalized and instantaneous flow indication.
Display may also indicate static pressure,
sensor temperature and diagnostic messages
and provides configuration facilities.

Integral display with integral keypad
(code L1; not available with Standard HART)
Wide screen LCD, 128 x 64 pixel,
52.5 x 27.2 mm (2.06 x 1.07 in.) dot matrix.
Multilanguage.
Four keys for configuration and
management of device.
Easy setup for quick commissioning.
User selectable application-specific visualizations.
Totalized and instantaneous flow indication.
Display may also indicate static pressure,
sensor temperature and diagnostic
messages and provides configuration facilities.

Integral display with Through-The-Glass (TTG) activated
keypad (code L5; not available with Standard HART)
As above integral display but equipped
with the innovative TTG keypad allowing
the activation of the configuration and
management menus of the device without
the need of removing the transmitter
housing cover.
TTG keypad is protected against
accidental activations.

Optional surge protection

Up to 4kV
— voltage 1.2 μ s rise time / 50 μ s delay time to half value
— current 8 μ s rise time / 20 μ s delay time to half value

HART® digital communication and 4 to 20 mA output
Standard and Advanced functionality
Device type: 1a07_{hex} (listed with HCF)

Power supply

The transmitter operates from 10.5 to 42 V DC with no load
and is protected against reverse polarity connection
(additional load allows operations over 42 V DC).
For Ex ia and other intrinsically safe approval power supply
must not exceed 30 V DC. Minimum operating voltage
increase to 12.3 V DC with optional surge protector

Ripple

20 mV max on a 250 Ω load as per HART specifications.

Load limitations

4 to 20 mA and HART total loop resistance :
Supply voltage – min. operating voltage (V DC)
R (k Ω) = $\frac{22 \text{ mA}}{\text{Supply voltage} - \text{min. operating voltage}}$
A minimum of 250 Ω is required for HART communication.

Output signal

Two-wire 4 to 20 mA, user-selectable for linear or square root
output, power of $\sqrt[3]{2}$ or $\sqrt[5]{2}$, square root for bidirectional flow,
22 points linearization table (i.e. for horizontal or spherical
tank level measurement). HART® communication provides
digital process variable superimposed on 4 to 20 mA signal,
with protocol based on Bell 202 FSK standard.

Output current limits (to NAMUR NE 43 standard)

Overload condition
— Lower limit: 3.8 mA (configurable from 3.8 to 4 mA)
— Upper limit: 20.5 mA (configurable from 20 to 21 mA)
Alarm current
— Lower limit: 3.6 mA (configurable from 3.6 to 4 mA)
— Upper limit: 21 mA (configurable from 20 to 23 mA,
limited to 22 mA for HART Safety;
apply for electronics release 7.1.15 or later)
Factory setting: high alarm current

Process diagnostics (PILD)

Plugged impulse line detection (PILD) generates a warning via
HART communication. The device can also be configured to
drive the analog output signal to the "Alarm current".

IEC 62591 WirelessHART[®] output
Device type: 1a06_{hex} (listed with HCF)
Network ID: ABB_{hex} (2747 decimal)
Join keys: 57495245_{hex} (1464422981) 4c455353_{hex} (1279611731)
4649454_{Chex} (1179206988) 444b4559_{hex} (1145783641).

Power Supply

1x D-cell size lithium-thionyl chloride battery.
Battery life: 10 years at 32 sec. update time, 8 years at 16 sec. update time or 5 years at 8 sec. update time.
(at reference conditions of 25 ± 2 °C ambient temperature, data routed from 3 additional devices, LCD off).
THE BATTERY CAN BE REPLACED IN FIELD, ALSO IN HAZARDOUS CLASSIFIED AREA.

Output signal

IEC 62591 Wireless HART Version 7.5 (IEEE 802.15.4-2006);
Frequency band: 2.4 GHz DSSS
Update rate: user selectable from 1 sec. to 60 min.

Integrated adjustable omnidirectional antenna

— Output radio frequency: maximum 10 mW (10 dBm) EIRP
— Range: up to 300 m. (328 yds.)
Minimum distance between antenna and person is 0.2 m. (8 in.)

Telecommunications directive

Every wireless measuring device must be certified in accordance with the telecommunications directive, in this case the frequency range. This certification is country-specific.

European directives

Radio Equipment and Telecommunications Terminal Equipment Directive 99/5/EC R&TTE
ETSI EN 300 328 V1.7.1 in accordance with Article 3.2
ETSI EN 301 489-17
In Europe, use of the 2400 - 2483.5 MHz frequency band is not harmonized. Country-specific regulations must be observed.

Power supply

The transmitter operates from 9 to 32 V DC , polarity independent, with or without surge protector.
For Ex ia approval power supply must not exceed 17.5 V DC.
Intrinsic safety installation according to FISCO .

Current consumption

operating (quiescent): 15 mA
fault current limiting: 20 mA max.

Output signal

Physical layer in compliance to IEC 1158-2/EN 61158-2 with transmission to Manchester II modulation, at 31.25 kbit/s.

Output interface

PROFIBUS PA communication according to Profibus DP50170 Part 2/DIN 19245 part 1-3.

Output update time

25 ms

Data blocks

3 analog input, 1 physical.

Additional blocks

1 Pressure with calibration transducer block
1 Advanced Diagnostics transducer block including Plugged Input Line Detection
1 Local Display transducer block

Transmitter failure mode

On gross transmitter failure condition, detected by self-diagnostics, the output signal can be driven to defined conditions, selectable by the user as safe, last valid or calculated value.
If electronic failure or short circuit occur the transmitter consumption is electronically limited at a defined value (20 mA approx), for safety of the network.

FOUNDATION Fieldbus™ output

Device type
LINK MASTER DEVICE
Link Active Scheduler (LAS) capability implemented.
Manufacturer code: 000320_{hex}
Device type code: 0007_{hex}

Power supply

The transmitter operates from 9 to 32 V DC, polarity independent, with or without surge protector.
For Ex ia approval power supply must not exceed 24 V DC (entity certification) or 17.5 V DC (FISCO certification), according to FF-816.

Current consumption

operating (quiescent): 15 mA
fault current limiting: 20 mA max.

Output signal

Physical layer in compliance to IEC 1158-2/EN 61158-2 with transmission to Manchester II modulation, at 31.25 kbit/s.

Function blocks/execution period

3 enhanced Analog Input blocks/25 ms max (each)
1 enhanced PID block/40 ms max.
1 standard Arithmetic block/25 ms
1 standard Input Selector block/25 ms
1 standard Control Selector block/25 ms
1 standard Signal Characterization block/25 ms
1 standard Integrator/Totalizer block/25 ms

Additional blocks

1 enhanced Resource block,
1 custom Pressure with calibration transducer block
1 custom Advanced Diagnostics transducer block including Plugged Input Line Detection
1 custom Local Display transducer block

Number of link objects

35

Number of VCRs

35

Output interface

FOUNDATION fieldbus digital communication protocol to standard H1, compliant to specification V. 1.7.

Transmitter failure mode

The output signal is "frozen" to the last valid value on gross transmitter failure condition, detected by self-diagnostics which also indicate a BAD conditions. If electronic failure or short circuit occur the transmitter consumption is electronically limited at a defined value (20 mA approx), for safety of the network.

Performance specifications

Stated at reference condition to IEC 60770 ambient temperature of 20 °C (68 °F), relative humidity of 65 %, atmospheric pressure of 1013 hPa (1013 mbar), mounting position with vertical diaphragm and zero based range for transmitter with isolating diaphragms in AISI 316 L SS or Hastelloy and silicone oil fill and HART digital trim values equal to 4 mA and to 20 mA span end points, in linear mode. Unless otherwise specified, errors are quoted as % of span. Some performance referring to the Upper Range Limit are affected by the actual turndown (TD) as ratio between Upper Range Limit (URL) and calibrated span. **IT IS RECOMMENDED TO SELECT THE TRANSMITTER SENSOR CODE PROVIDING THE TURNDOWN VALUE AS LOWEST AS POSSIBLE TO OPTIMIZE PERFORMANCE CHARACTERISTICS.** Dynamic performance (according to IEC 61298-1 definition)

| Sensors | Time constant (63.2 % of total step change) |
|---------------|---------------------------------------------|
| Sensor M to S | ≤ 70 ms |
| Sensor H | 100 ms |
| Sensor G | 130 ms |
| Sensor F | 180 ms |

Dead time for all sensors 30 ms

Response time (total) = dead time + time constant
See "Update rate" for Wireless HART version.

Accuracy rating

% of calibrated span, including combined effects of terminal based linearity, hysteresis and repeatability. For fieldbus versions SPAN refer to analog input function block outscale range

| Sensor | for TD | |
|---------------------------------------------|--------------------------------------------|----------------------------|
| F to P | from 1:1 to 10:1 | ± 0.06 % |
| F to P | from 10:1 to 100:1 ± (0.006 x TD) | % |
| E, Q, S | from 1:1 to 10:1 | ± 0.075 % |
| standard static and for gauge application B | Q and S from 10:1 to 100:1 ± (0.0075 x TD) | % |
| | E from 10:1 to 30:1 | ± (0.0075 x TD) % |
| | B from 1:1 to 10:1 | ± 0.10 % |
| | from 10:1 to 20:1 | ± (0.01 x TD) % |
| | A from 1:1 to 4:1 | ± 0.10 % |
| | A from 4:1 to 20:1 | ± (0.025 x TD) % |
| | F to Q from 1:1 to 5:1 | ± 0.04 % |
| (option D2) F to P | from 5:1 to 100:1 | ± (0.0105 + 0.0059 x TD) % |
| | Q from 5:1 to 100:1 | ± (0.003 + 0.0074 x TD) % |
| | F to Q from 1:1 to 10:1 | ± 0.075 % |
| high static F to Q | from 10:1 to 100:1 ± (0.0075 x TD) | % |

Ambient temperature

per 20K change between the limits of -40 °C to +85 °C (per 36 °F change between the limits of -40 to +185 °F):

| Sensor | for TD up to | |
|---------|--------------|-------------------------------|
| F to Q | 10:1 | ± (0.03 % URL + 0.045 % span) |
| E and S | 10:1 | ± (0.04 % URL + 0.065 % span) |
| B | 10:1 | ± (0.06 % URL + 0.10 % span) |
| A | 4:1 | ± (0.10 % URL + 0.10 % span) |

for an ambient temperature change from -10 °C to +60 °C (+14 to +140 °F):

| Sensor | for TD up to | |
|---------|--------------|-------------------------------|
| F to Q | 10:1 | ± (0.055 % URL + 0.08 % span) |
| E and S | 10:1 | ± (0.075 % URL + 0.11 % span) |
| B | 10:1 | ± (0.11 % URL + 0.18 % span) |
| A | 4:1 | ± (0.18 % URL + 0.18 % span) |

per 10K change between the limits of -40 °C to -10 °C or +60 °C to +85 °C (per 18 °F change between the limits of -40 to +14 °F or +140 °C to +185 °F):

| Sensor | for TD up to | |
|---------|--------------|-------------------------------|
| F to Q | 10:1 | ± (0.03 % URL + 0.04 % span) |
| E and S | 10:1 | ± (0.04 % URL + 0.055 % span) |
| B | 10:1 | ± (0.055 % URL + 0.09 % span) |
| A | 4:1 | ± (0.09 % URL + 0.09 % span) |

Static pressure

(zero errors can be calibrated out at line pressure)

per 0.5 MPa, 5 bar or 72.5 psi (sensor A)

per 2 MPa, 20 bar or 290 psi (sensor B)

per 3.5 MPa, 35 bar or 500 psi (sensor E)

per 7 MPa, 70 bar or 1015 psi (sensor F to S)

SCTDPT0Z standard static

— zero error: ±0.05 % of URL for sensor F to S

±0.08 % of URL for sensor A, B and E

— span error: ±0.08 % of reading.

SCTDPT0Z high static

— zero error: ±0.08 % of URL for sensor F to Q

— span error: ±0.20 % of reading.

Supply voltage

Within voltage/load specified limits the total effect is less than 0.005 % of URL per volt.

Load

Within load/voltage specified limits the total effect is negligible.

Electromagnetic field

Meets all the requirements of EN 61326 for surge immunity level (of NAMUR NE 21 on request).

Common mode interference

No effect from 100Vrms @ 50Hz, or 50 V DC

Mounting position

No effect for rotation on diaphragm plane. A tilt up to 90° from vertical causes a zero shifts up to 0.5 kPa, 5 mbar or 2 inH₂O, which can be corrected with zero adjustment. No span effect.

Stability

±0.15 % of URL over a ten years period
(±0.25 % of URL over a ten years period for sensor A and B)
0.15 % of URL over a five years period for 266DSH high static.

Maximum total performance

For temperature change of 28 °C (50 °F), static pressure change of 5,1 MPa, 51 bar, 740 psi, for SCTDPT0Z with accuracy option code D2 (± 0.04 %)

| Sensor | Span | Maximum total performance |
|--------|------------------------------------------|-------------------------------|
| F | 35 kPa, 350 mbar, 140 inH ₂ O | ≤± 0.125 % of calibrated span |
| H | 150 kPa, 1,5 bar, 600 inH ₂ O | |
| M | 550 kPa, 5,5 bar, 80 psi | |

$$E_{Mperf} = \sqrt{(E_{\Delta Tz} + E_{\Delta Ts})^2 + E_{\Delta Ps}^2 + E_{lin}^2}$$

E_{Mperf} = Maximum total performance

$E_{\Delta Tz}$ = Effect of the ambient temperature on zero

$E_{\Delta Ts}$ = Effect of the ambient temperature on span

$E_{\Delta Ps}$ = Effect of the static pressure on span

E_{lin} = Accuracy rating (for terminal-based linearity 0.04 %)

Total performance

similar to DIN 16086

Temperature change in the range from –10 to 60 °C (14 to 140 °F), static pressure change (266DSH) 10 MPa, 100 bar, 1450 psi

Sensor TD Total performance

266DSH std. static, D2 option F to Q 1:1 ≤± 0.16 % of calibrated span

$$E_{perf} = \sqrt{(E_{\Delta Tz} + E_{\Delta Ts})^2 + E_{\Delta Ps}^2 + E_{lin}^2}$$

E_{perf} = Total Performance

$E_{\Delta Tz}$ = Effect of the ambient temperature on zero

$E_{\Delta Ts}$ = Effect of the ambient temperature on span

$E_{\Delta Ps}$ = Effect of the static pressure on span (266DSH only)

E_{lin} = Accuracy rating (for terminal-based linearity 0.04 % or 0.075% as per /sensor accuracy)

Maximum total performance and Total performance includes the measuring errors of

- non-linearity including hysteresis and non-reproducibility,
- thermal change of the ambient temperature as regards the zero signal and the calibrated span,
- effect of static pressure change on the calibrated span, with transmitter re-zeroed at line pressure

Physical Specification

(Refer to ordering information sheets for variant availability related to specific or versions code)

Materials

Process isolating diaphragms (*)

AISI 316 L ss; AISI 316 L ss gold plated; Monel 400[®]; Tantalum; Hastelloy[®] C-276; Hastelloy[®] C-276 on AISI 316L ss gasket seat.

Process flanges, adapters, plugs and drain/vent valves (*)

AISI 316 L ss (1); Hastelloy[®] C-276 (2); Monel 400[®] (3); Kynar[®] (PVDF insert in AISI 316 ss flange).

Sensor fill fluid

Silicone oil; Inert fill (Halocarbon[®] 4.2 or Galden[®]).

Mounting bracket (**)

Zinc plated carbon steel with chrome passivation; AISI 316 ss; AISI 316 L ss.

Gaskets (*)

Viton[®]; PTFE.

Sensor housing

AISI 316 L ss.

Bolts and nuts

AISI 316 ss bolts Class A4–80 and nuts Class A4–70 per UNI 7323 (ISO 3506); AISI 316 ss bolts and nuts Class A4–50 per UNI 7323 (ISO 3506), in compliance with NACE MR0175 Class II (std. static only). Plated alloy steel bolts per ASTM-A-193-77a grade B7M and nuts per ASTM A194/A 194 M-90 grade 2HM, in compliance with NACE MR0175 Class II. Stainless steel per ASTM-A-453 grade 660D, in compliance with NACE MR0175 Class II (high static only).

Electronic housing and covers

Aluminium alloy (copper content $\leq 0.3\%$) with baked epoxy finish (colour RAL9002); AISI 316 L ss; AISI 316 L ss with two components epoxy mastic coated with acrylic epoxy finish (colour aluminium grey), with antistatic agents according to CEI EN 60079.

Covers O-ring

Buna N.

Local adjustments (zero, span and write protect)

For Standard HART version:

- Internal for zero and span (on communication board)
- External non-intrusive for zero, span and write protect in glass filled polyphenylene oxide, removable (code R1).

For all other versions:

- External non-intrusive for zero, span and write protect in glass filled polyphenylene oxide, removable.

Plates

Transmitter nameplate: AISI 316 ss screwed to the electronics housing.

Certification plate and optional tag/calibration plate : self-adhesive attached to the electronics housing or AISI 316 ss fastened to the electronics housing with rivets or screws.

Optional wired-on customer data plate: AISI 316 ss.

Laser printing on metal or thermal printing on self-adhesive. For AISI 316 L ss housing it is mandatory to select option I2 or I3 for plates in AISI 316 ss.

Calibration

Standard: at maximum span, zero based range, ambient temperature and pressure;

Optional: at specified range and ambient conditions.

(*) Wetted parts of the transmitter.

(**) U-bolt material: high-strength alloy steel or AISI 316 L ss; bolts/nuts material: high-strength alloy steel or AISI 316 ss.

Supplied as AISI 316 L or as ASTM A351 Grade CF -3M

Supplied as Hastelloy C-276 or as ASTM A494 alloy CW-12MW

Supplied as Monel 400 or as ASTM A494 Grade M-35-1

Optional extras

Mounting brackets (code Bx)

For vertical and horizontal 60mm. (2in) pipes or wall mounting.
(EXCEPT U-BOLT ASSEMBLY WHICH IS NOT SUPPLIED FOR WALL MOUNTING, PARTS ARE THE SAME FOR PIPE AND WALL BRACKET OPTIONS, AS PER RELEVANT MATERIALS).

Display (code Lx)

4-position (at 90°) user orientable.

Optional plates (code lx)

Code I2: AISI 316 ss plate with laser printed tag (up to 31 characters) and calibration details (up to 31 characters: lower and upper range values and engineering unit) fixed onto transmitter housing.

Code I1: AISI 316 ss wired-on plate with laser printed customized data (4 lines of 32 characters with 4 mm/0.16 in. height).

Surge protection (code S2)

Cleaning procedure for oxygen service (code P1)

Test Certificates (test, design, calibration, material traceability) (codes Cx and Hx)

Tag and manual language (codes Tx and Mx)

Communication connectors (code Ux)

Manifold mounting (code A1)

Factory mounting and pressure test of ABB M26 manifolds.

Process connections

on flanges : 1/4 in. – 18 NPT on process axis
on adapters : 1/2 in. – 14 NPT on process axis
centre distance (266DSH): 54 mm. (2.13 in.) on flange;
51, 54 or 57 mm. (2.01, 2.13 or 2.24 in.) as per adapters fittings
fixing threads: 7/16 in. – 20 UNF at 41.3 mm centre distance

Electrical connections

Two 1/2 in. – 14 NPT or M20x1.5 threaded conduit entries, direct on housing. Only M20x1.5 for WirelessHART with one port used for antenna.

Special communication connector (on request)

— HART: straight or angle Harting Han 8D connector and one plug.
— FOUNDATION Fieldbus, PROFIBUS PA: M12x1 or 7/8 in.

Terminal block

HART version: three terminals for signal/external meter wiring up to 2.5 mm² (14 AWG), also connection points for test and communication purposes.

WirelessHART version: connection points for test and communication purposes; additional fast connection for external harvesting unit.

Fieldbus versions: two terminals for signal wiring (bus connection) up to 2.5 mm² (14 AWG)

Grounding

Internal and external 6 mm² (10 AWG) ground termination points are provided.

Mounting position

Transmitter can be mounted in any position.

Electronics housing may be rotated to any position. A positive stop prevents over travel.

Mass (without options)

4 kg approx (8.8 lb);
4.35 kg approx (9.6 lb) for 266DSH high static version;
add 1.5 kg (3.3 lb) for AISI housing.
Add 650 g (1.5 lb) for packing.

Packing

Carton 27 x 24 x 20 cm approx (11 x 10 x 8 in.);
Carton 28 x 28 x 24 cm approx (11 x 11 x 10 in.) for WirelessHART version.

Transmitter with PROFIBUS PA communication
Standard configuration

Transmitters are factory calibrated to customer's specified range. Calibrated range and tag number are stamped on the tag plate. If a calibration range and tag data are not specified, the transmitter will be supplied with the plate left blank and configured as follows:

Measure Profile Pressure
Engineering Unit kPa
Output scale 0 % Lower Range Limit (LRL)
Output scale 100 % Upper Range Limit (URL)
Output Linear
Hi-Hi Limit Upper Range Limit (URL)
Hi Limit Upper Range Limit (URL)
Low Limit Lower Range Limit (LRL)
Low-Low Limit Lower Range Limit (LRL)
Limits hysteresis 0.5 % of output scale
PV filter 0s
Address (set by local key) 126
Tag 32 alphanumeric characters
Optional LCD display PV in kPa; output in percentage on bargraph

Any or all the above configurable parameters, including the range values which must be the same unit of measure, can be easily changed by a PC running the configuration software with DTM for 266 s. The transmitter database is customized with specified flange type and material, O-ring and drain/vent materials and meter code option.

Custom configuration (option N6)

The following data may be specified in addition to the standard configuration parameters:

Descriptor 32 alphanumeric characters
Message 32 alphanumeric characters
Date Day, month, year

Transmitter with FOUNDATION Fieldbus communication
Standard configuration

Transmitters are factory calibrated to customer's specified range. Calibrated range and tag number are stamped on the tag plate. If a calibration range and tag data are not specified, the transmitter will be supplied with the plate left blank and the analog input function block FB1 is configured as follows:

Measure Profile Pressure
Engineering Unit kPa
Output scale 0 % Lower Range Limit (LRL)
Output scale 100 % Upper Range Limit (URL)
Output Linear
Hi-Hi Limit Upper Range Limit (URL)
Hi Limit : Upper Range Limit (URL)
Low Limit Lower Range Limit (LRL)
Low-Low Limit Lower Range Limit (LRL)
Limits hysteresis 0.5 % of output scale
PV filter time 0s
Tag 32 alphanumeric characters
Optional LCD display PV in kPa; output in percentage on bargraph

The analog input function block FB2 and FB3 are configured respectively for the sensor temperature measured in °C and for the static pressure measured in MPa.

Any or all the above configurable parameters, including the range values, can be changed using any host compliant to FOUNDATION fieldbus. The transmitter database is customized with specified flange type and material, O-ring and drain/vent materials and meter code option.

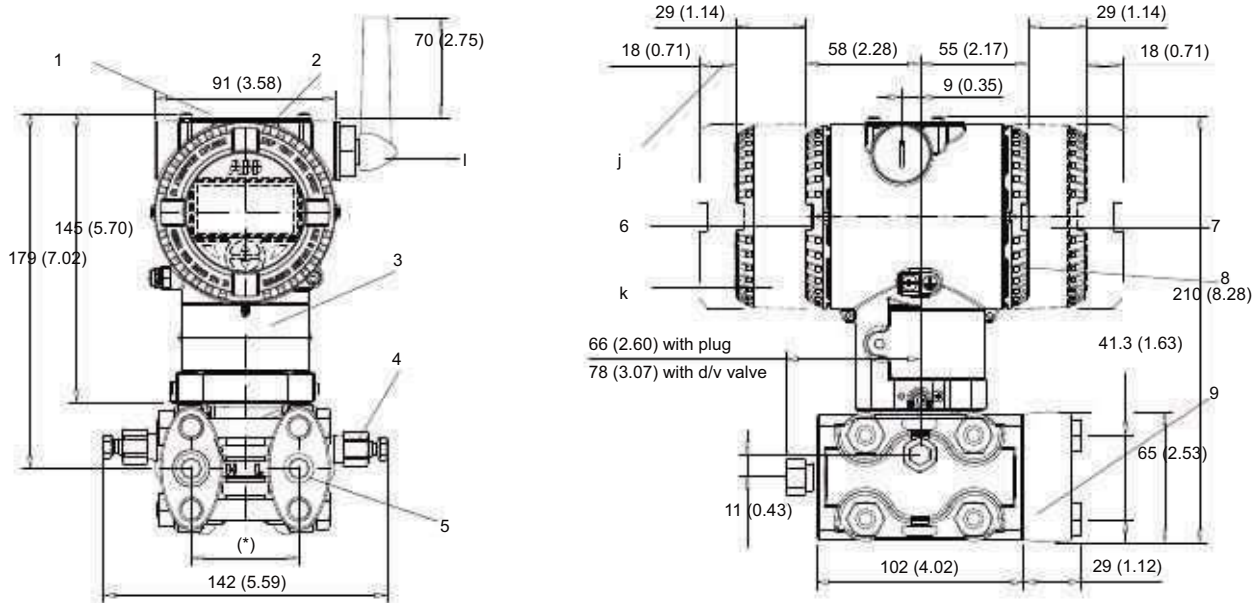
Custom configuration (option N6)

The following data may be specified in addition to the standard configuration parameters:

Descriptor 32 alphanumeric characters
Message 32 alphanumeric characters
Date Day, month, year

Mounting dimensions (not for construction unless certified) – dimensions in mm. (in.)

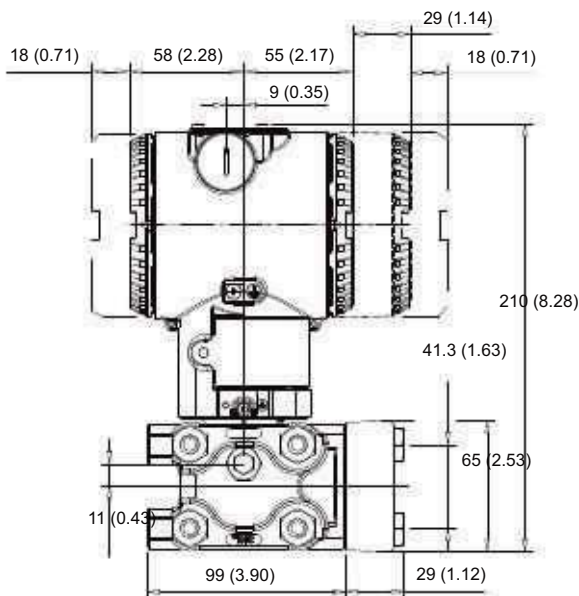
Standard static transmitter with barrel housing - horizontal flanges



(*) FOR SCTDPT0Z: 54 (2.13) mm (in) on 1/4 – 18 NPT process flange; 51 (2.01), 54 (2.13) or 57 (2.24) mm (in) according to 1/2 – 14 NPT adapters fitting

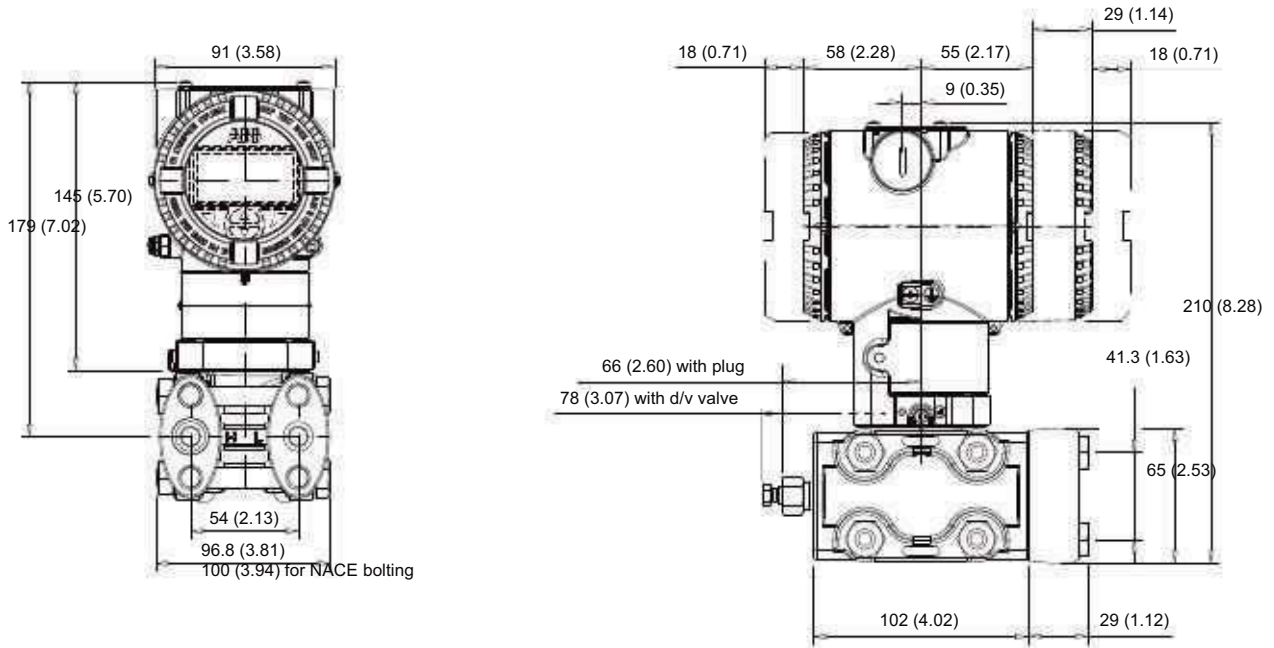
- 1 Adjustments | 2 Identification plate | 3 Certification plate | 4 Drain/vent valve | 5 Process connection | 6 Terminal side |
7 Integral display housing | 8 Electronic side | 9 Adapter | j Space for cover removal | k Battery housing of WirelessHART version |
l Antenna of WirelessHART version

Standard static transmitter with barrel housing - horizontal flanges with MWP= 16 MPa

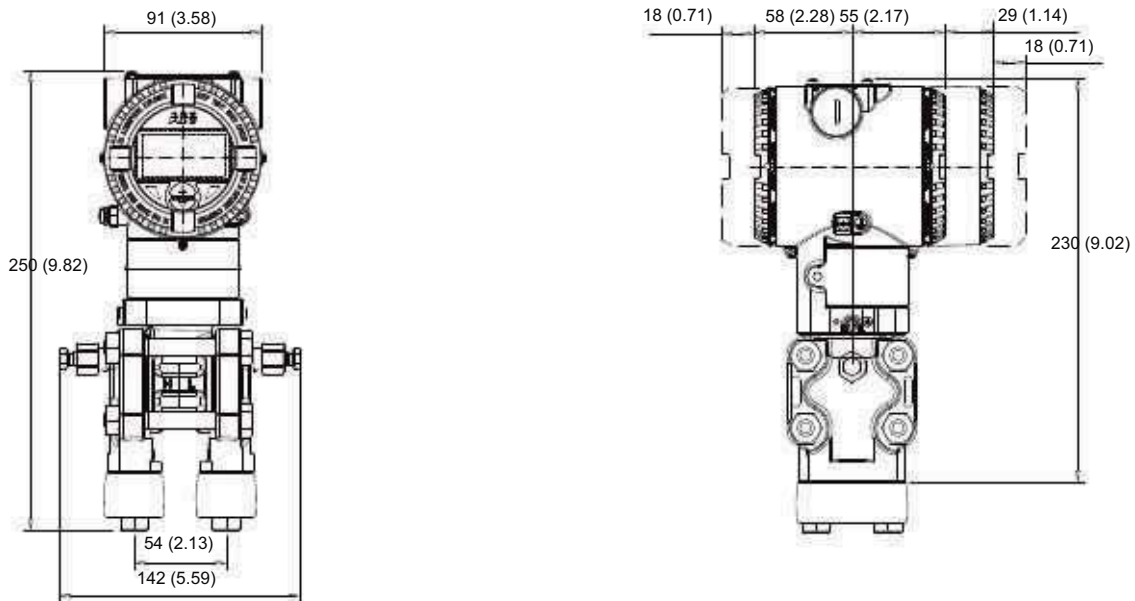


NOTE
Process connection, gasket groove and gaskets are in accordance with IEC 61518.
Bolting threads for fixing adapter or other devices (i.e. manifold etc.) on process flange is 7/16 – 20 UNF.

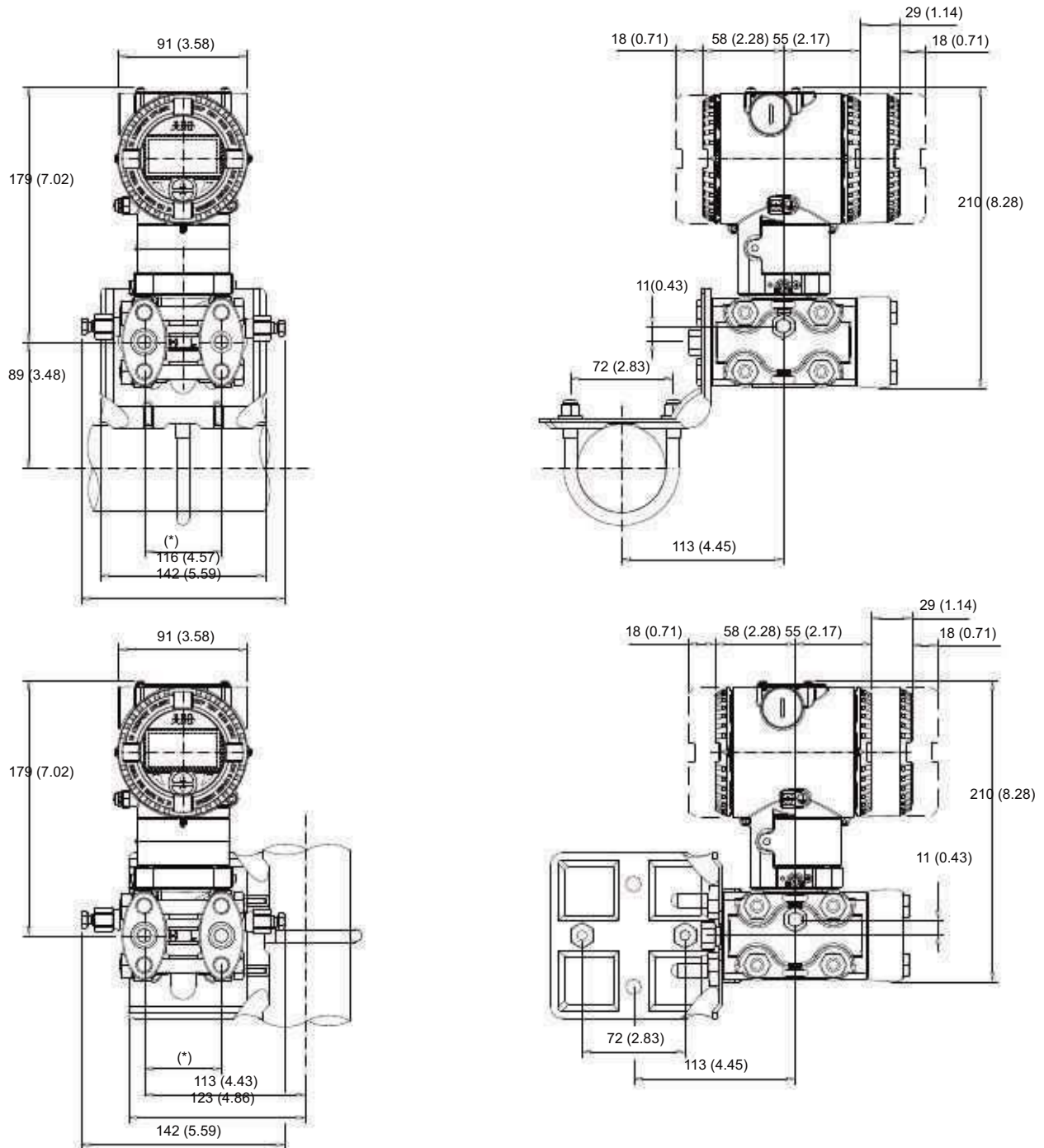
High static transmitter with barrel housing - horizontal flanges



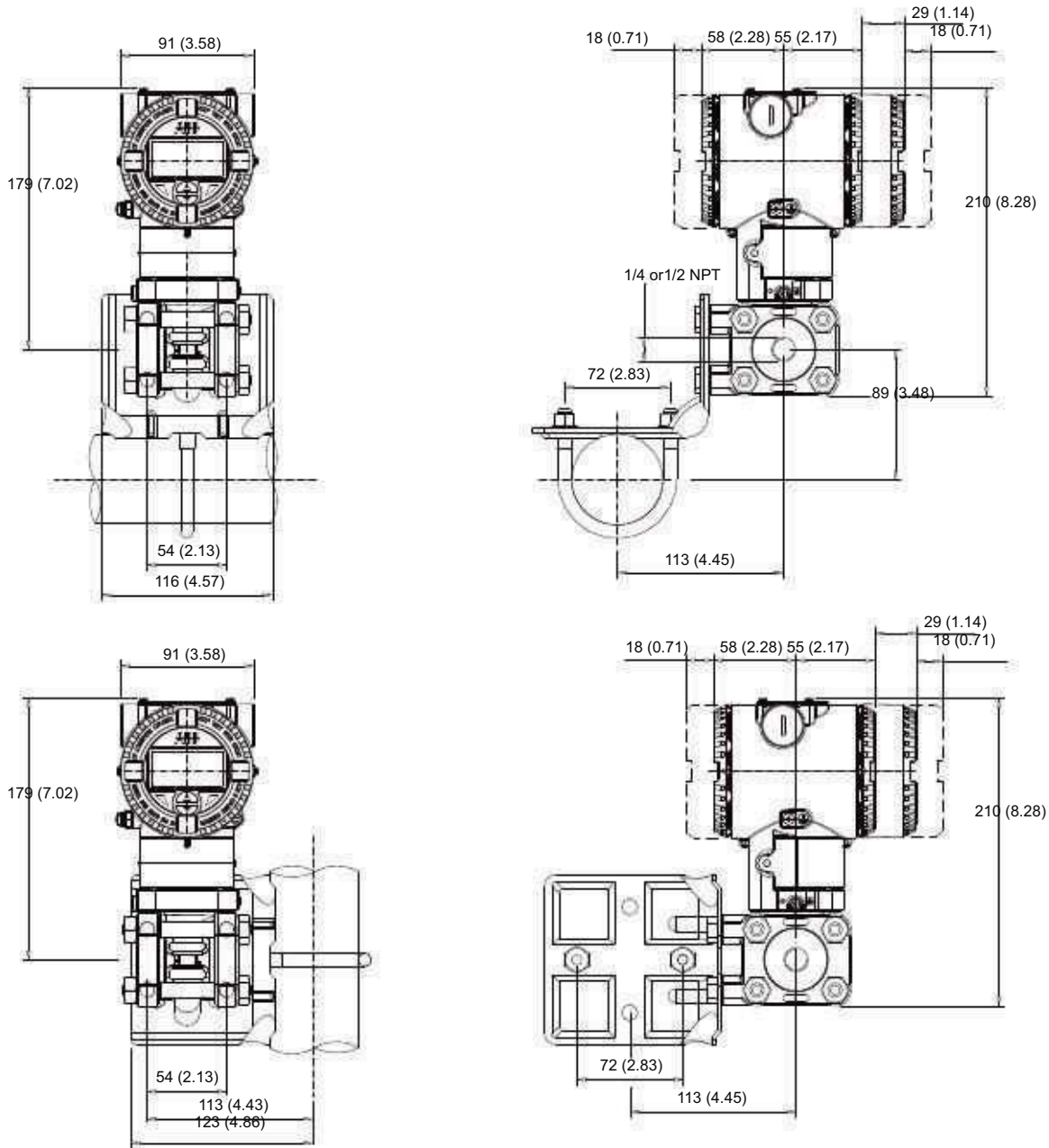
Standard static transmitter with barrel housing - vertical flanges



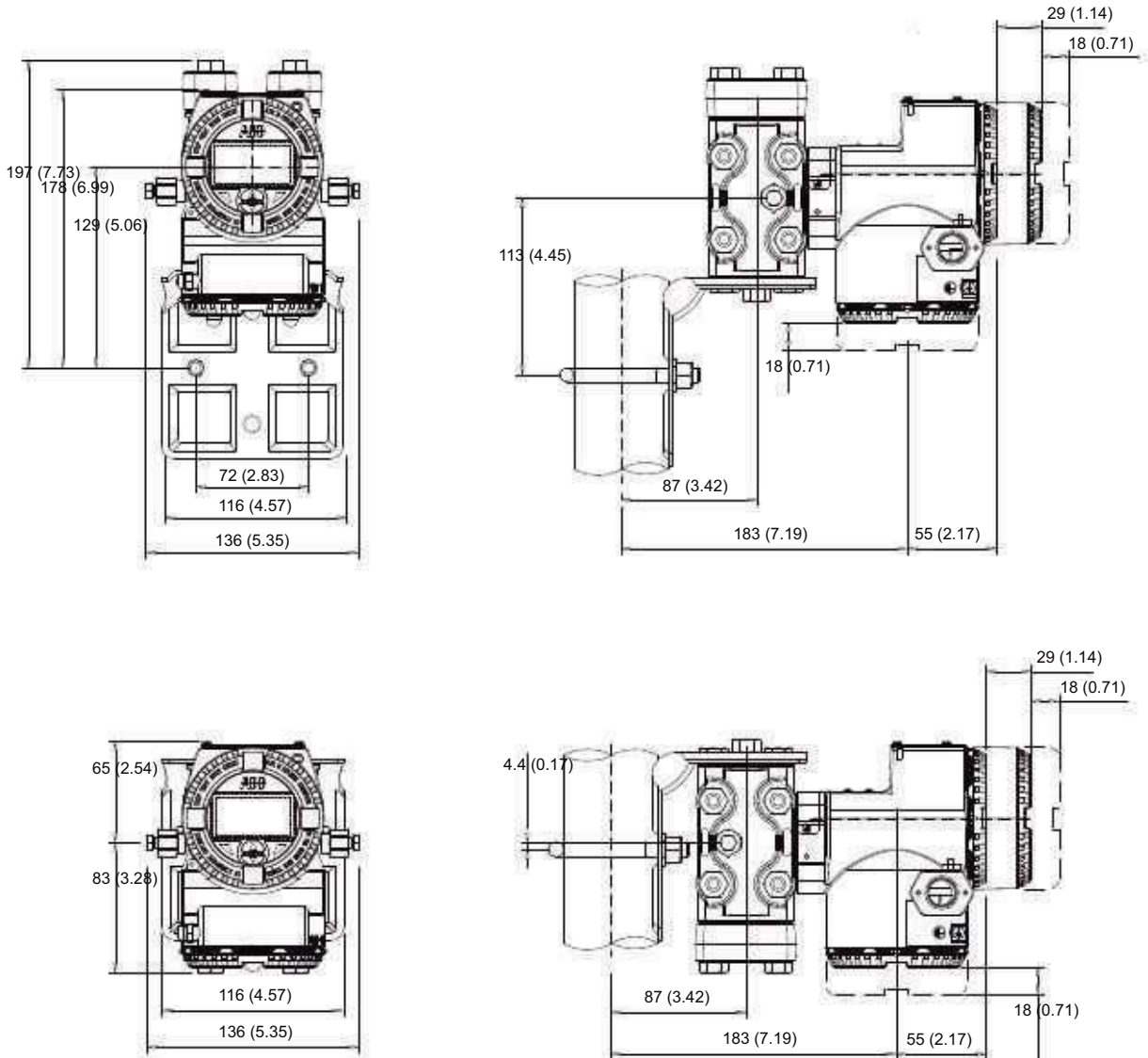
Transmitter on bracket for vertical or horizontal 60 mm. (2 in.) pipe mounting



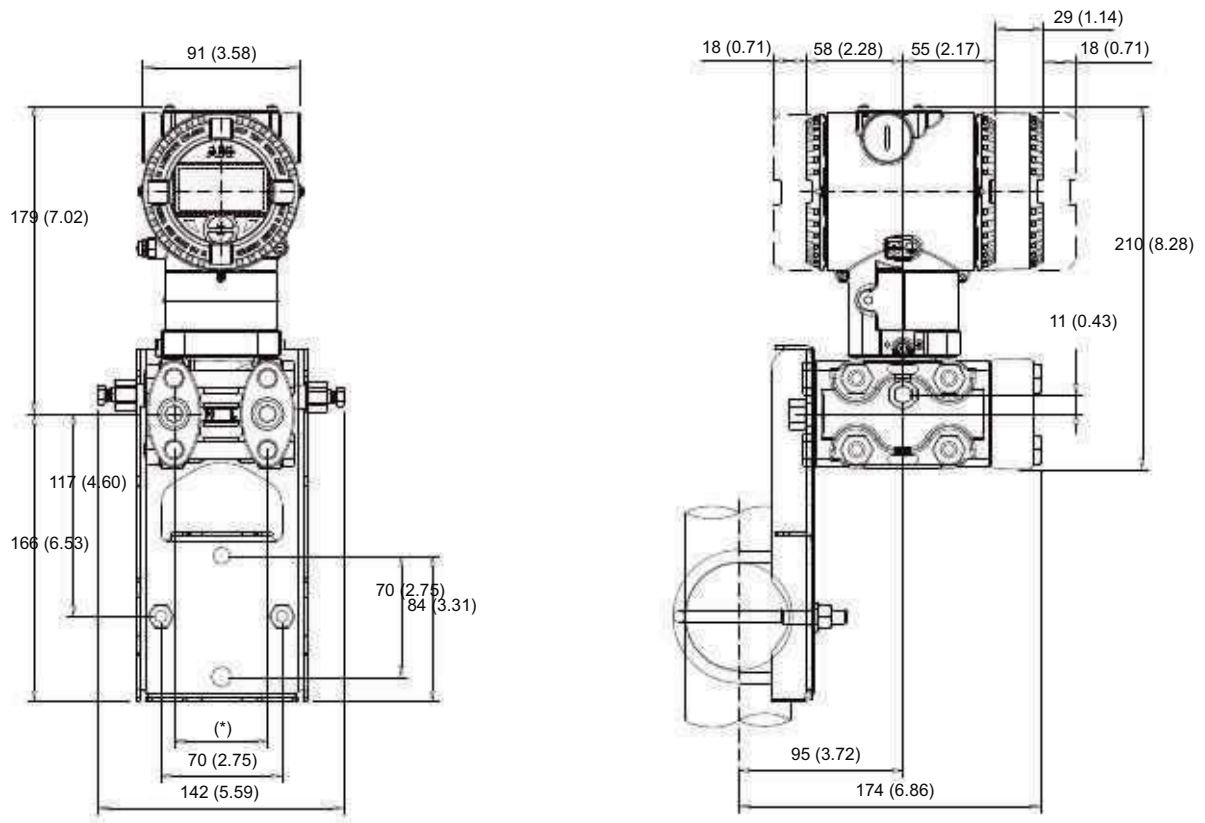
Transmitter with Kynar flanges on bracket for vertical or horizontal 60 mm. (2 in.) pipe mounting



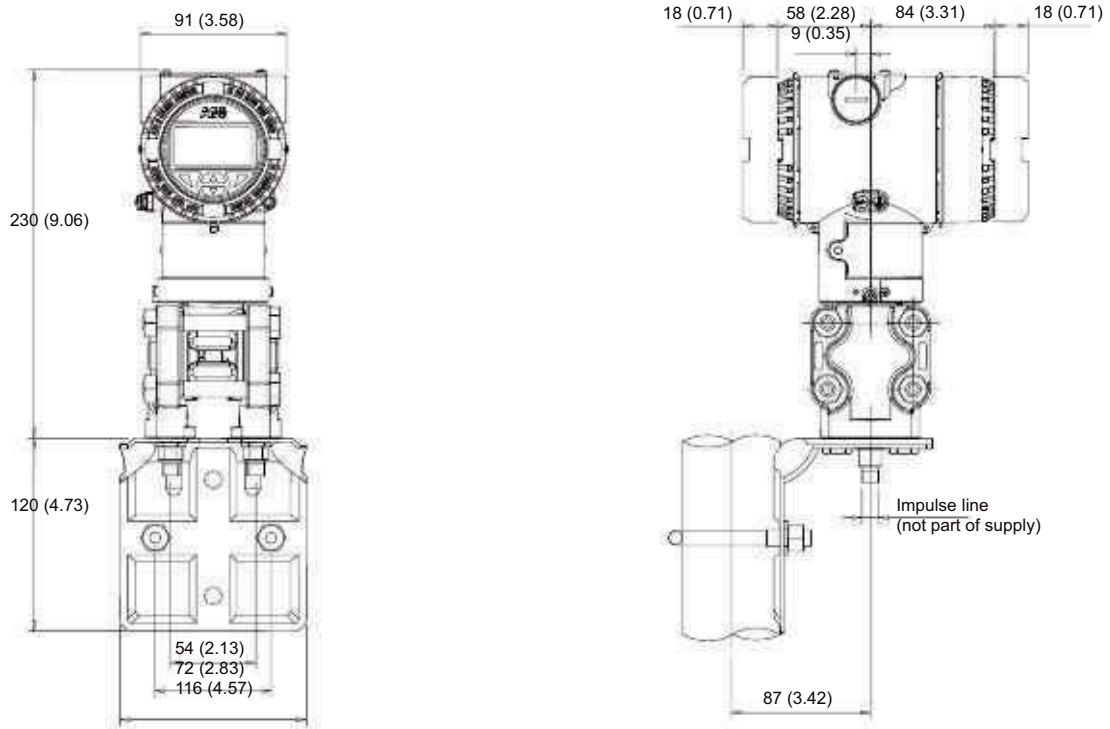
Transmitter with DIN aluminium housing - horizontal flanges on bracket for vertical or horizontal 60 mm. (2 in.) pipe mounting



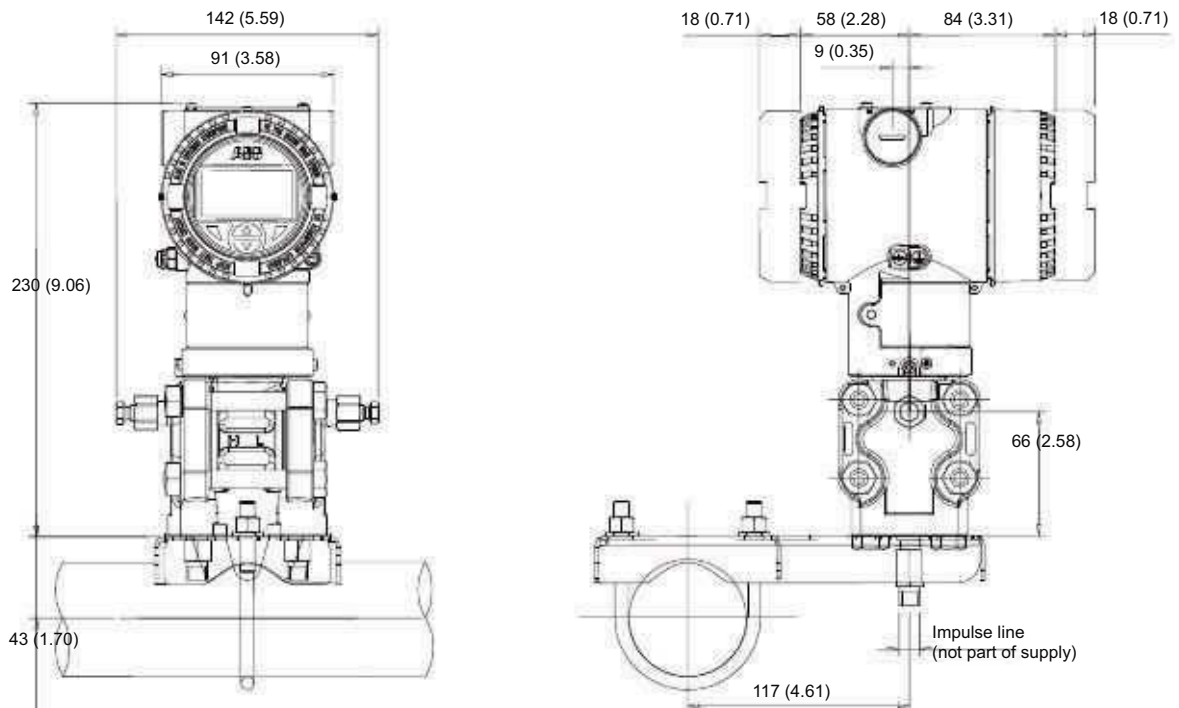
Transmitter with horizontal flanges on flat bracket for vertical or horizontal 60 mm. (2 in.) pipe mounting



Transmitter with vertical flanges on bracket for vertical or horizontal 60 mm. (2 in.) pipe mounting

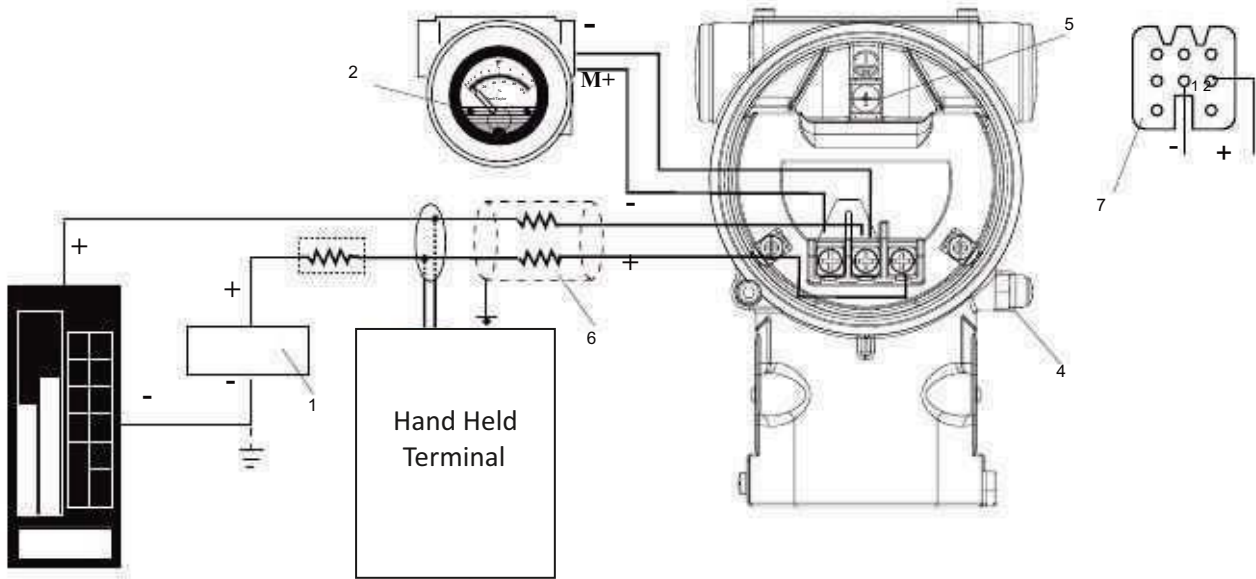


Transmitter with vertical flanges on flat bracket for vertical or horizontal 60 mm. (2 in.) pipe mounting



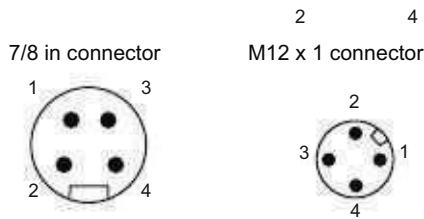
Electrical connections

HART Version



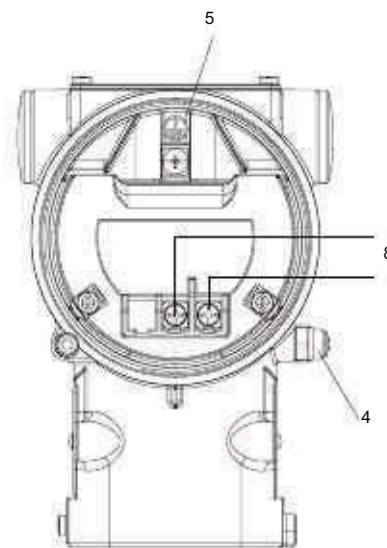
HART hand-held communicator may be connected at any wiring termination point in the loop, providing the minimum resistance is 250 ohm. If this is less than 250 ohm, additional resistance should be added to allow communications.
13Maximum voltage drop on external remote indicator is 0.7 V DC.

FIELDBUS Versions



| PIN (male) IDENTIFICATION | | |
|---------------------------|---------------------|-------------|
| | FOUNDATION Fieldbus | PROFIBUS PA |
| 1 | DATA - | DATA + |
| 2 | DATA + | GROUND |
| 3 | SHIELD | DATA - |
| 4 | GROUND | SHIELD |

CONNECTOR IS SUPPLIED LOOSE
WITHOUT MATING FEMALE PLUG



1 Power source | 2 Remote indicator | 3 Handheld communicator | 4 External ground termination point | 5 Internal ground termination point |
6 Line load | 7 Harting Han 8D socket insert for mating plug (supplied loose) | 8 Fieldbus line (polarity independent)