

ABB MEASUREMENT & ANALYTICS | DATA SHEET

266CRH / CRT

Multivariable pressure transmitter
with Modbus[®] communication



Measurement made easy

Pressure transmitters – 2600T series.
Engineered solutions for all applications.

Base accuracy

- 0.075 % of calibrated span (266CRH)
- 0.04 % of calibrated span (266CRT)

266CRH/CRT mass flow measurement with compensation, level measurement with compensation for gases, steam, and liquids

- Dynamic compensation of pressure and temperature changes

Proven sensor technology together with state-of-the-art digital technology

- Large turn down ratio of up to 60:1

Flexible configuration options

- Local configuration via buttons on LCD indicator
- TTG (Through-The-Glass) keypad technology

Comprehensive range of functions

- Integrated counting function

Introduction

266CRH / 266CRT

Thanks to their multisensor technology, these transmitters are capable of measuring three separate process variables at the same time and offer the option of calculating the following values:

- Mass flow for gases, steam, and liquids by means of dynamic compensation
- Standard volume flow for gases by means of dynamic compensation
- Heat flow for water and steam
- Drum water level and level measurement with density compensation of liquids

The differential pressure and absolute pressure are measured by two integrated sensors. The process temperature is measured by an external standard Pt100 resistance thermometer.

Flow calculation

The flow calculation carried out by these transmitters includes compensation of pressure and / or temperature as well as more complex variables such as discharge coefficient, thermal expansion, Reynolds number, and compressibility factor.

The 266CXX pressure transmitters include flow equations for superheated steam, saturated steam, gases, and liquids - so you only need one device for your system.

Multivariable transmitters represent a more economical solution than the designs that have been used for this type of measuring point up to now, in which three different transmitters for differential pressure, absolute pressure, and temperature report their values to a DCS, PLC, or flow computer.

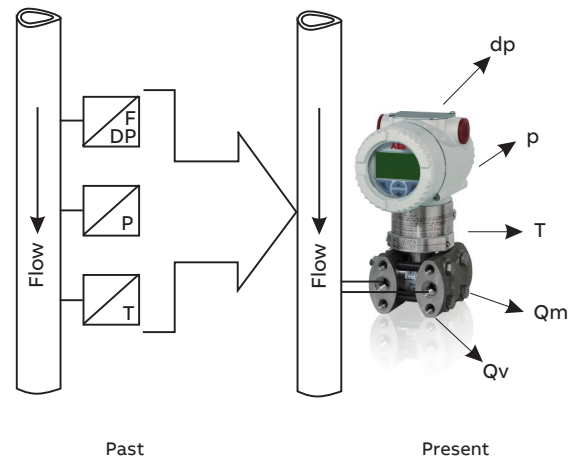


Figure 1: Flow measurement - past and present

The dynamic mass flow of the 266CXX is calculated using the following equation:

$$Q_m \approx \frac{C}{\sqrt{1-\beta^4}} \cdot \varepsilon \cdot d^2 \cdot \sqrt{\rho_1 \cdot dp}$$

Q_m	Mass flow
C	Discharge coefficient
β	Diameter ratio
ε	Gas expansion factor
d	Inside diameter of the differential flow sensor
dp	Differential pressure
ρ	Density

The flow calculation process is based on the following standards:

- AGA 3
- DIN EN ISO 5167

... Introduction

Flow coefficient

The discharge coefficient is defined as the actual flow divided by the theoretical flow. It corrects the theoretical equation for the effect on the velocity profile (Reynolds number), assuming that no energy is lost between the pressure taps and pressure tap location.

It is dependent on the differential flow sensor, the diameter ratio, and the Reynolds number.

Compensation for the discharge coefficient ensures a high level of measuring accuracy for flow measurement with primary elements.

Gas expansion factor

The gas expansion factor corrects for density differences between pressure taps due to expansion of compressible media. It does not apply to liquids which are essentially non-compressible.

The gas expansion factor is dependent on the diameter ratio, the isentropic exponent, the differential pressure, and the static pressure of the medium.

Diameter ratio

The diameter ratio is dependent on the inside diameter of the differential flow sensor and the pipe diameter, which in turn are subject to temperature functions.

If the temperature of the medium being measured changes, the material of the process pipe and differential flow sensor expands or contracts.

The thermal expansion coefficients are dependent on the material of the pipe and differential flow sensor, and are used for calculating the change in diameters. This ensures a high level of flow accuracy in applications with low and high temperatures.

Medium density

The medium density has a direct effect on the flow calculation. The 266CXX pressure transmitters compensate for the medium density resulting from changes in temperature and / or pressure as follows:

- Gases as a function of p and T based on gas laws, taking compressibility factors into account; for natural gas, based on AGA 8 or SGERG
- Superheated steam as a function of p and T based on steam tables
- Saturated steam as a function of p based on steam tables
- Liquids as a function of T

Mass flow calculations

With the 266CXX pressure transmitters, mass flow calculations can be configured for the following differential flow sensors:

- Orifice corner pressure taps, ISO
- Orifice flange pressure taps, ISO
- Orifice D and D/2 pressure taps, ISO
- Orifice corner pressure taps, ASME
- Orifice flange pressure taps, ASME
- Orifice D and D/2 pressure taps, ASME
- Orifice flange pressure taps, AGA 3
- Orifice 2.5D and 8D pressure taps
- Small bore orifice, flange pressure taps
- Small bore orifice, corner pressure taps
- ISA 1932 nozzle
- Long radius nozzle wall pressure taps, ISO
- Long radius nozzle wall pressure taps, ASME
- Standard Venturi pipe, rough-cast inlet, ISO
- Standard Venturi pipe, machined inlet, ISO
- Standard Venturi pipe, welded inlet, ISO
- Standard Venturi pipe, rough-cast inlet, ASME
- Standard Venturi pipe, machined inlet, ASME
- Standard Venturi pipe, welded inlet, ASME
- Venturi, nozzle, ISO
- Pitot tube
- Wedge element
- Plus all non-standard flow sensors

ABB offers a complete range of differential flow sensors. We provide the full testing and documentation that your application needs. Whether the requirement is a single orifice plate with a simple Certificate of Conformity or a project requiring full material inspection, traceability, third-party verification, calibration and comprehensive data dossiers – ABB can satisfy all of the requirements.

In addition compact solutions are available, OriMaster, a compact orifice flowmeter, and PitoMaster, a compact pitot flowmeter.

Level measurement

The following functions are available for level measurement with pressure and temperature compensation:

- Level measurement with temperature compensation, on open tank
- Level measurement with pressure and temperature compensation, on closed tank, with and without diaphragm seal
- Fill volume measurement by means of tank shape specification
- Drum water level measurement

All of the functionality, including all the data required for compensated mass flow or for level measurement, is configured entirely using the PC-based DTM 266-MV.

A simplified setting method, which uses the (optional) LCD indicator, is available for flow and level calculation.

General description

The diaphragm seal models described in this data sheet are combined with transmitters 266CRX. One or two diaphragm seals can be connected to the transmitter via a capillary tube.

The following models, which have different order codes, are available:

Models 266CRH and 266CRT for compensated mass flow measurement are designed with two diaphragm seals of the same type and size. In the case of compensated level measurement, they are designed with one or two diaphragm seals depending on the application.

The table below lists the standard types of remote seal that can be used together with transmitters 266CRX. For specifications and details of the diaphragm seals, please refer to the corresponding diaphragm seal data sheet DS/S26.

Differential pressure transmitters with two diaphragm seals:

In all cases, the specifications below only apply to identical seal designs on both sides.

Diaphragm seal model	Diaphragm seal type	Seal diaphragm size (thickness)	Mnemonic symbol	
S26WA	Wafer diaphragm seal	1.5 in / DN 40	P1.5	
S26WE	(ASME and EN standards)	2 in / DN 50	P2	
		3 in / DN 80	P3	
		1.5 in / DN 40 (thin)	F1.5	
		2 in / DN 50 (thin)	F2	
		3 in / DN 80 (thin)	F3	
S26FA	Flush diaphragm flanged seal	2 in / DN 50	P2	
S26FE	(ASME and EN standards; fixed and rotating flange)	3 in / DN 80	P3	
S26RA		4 in / DN 100	P3	
S26RE		2 in / DN 50 (thin)	F2	
		3 in / DN 80 (thin)	F3	
		4 in / DN 100 (thin)	F3	
		Extended diaphragm flanged seal	2 in / DN 50	E2
		(ASME and EN standards; rotating flange S26RA and S26RE only)	3 in / DN 80	E3
S26RJ	Flush diaphragm flanged seal (JIS standards; rotating flange only)	A 50	P2	
		A 80	P3	
		A 100	P3	
S26RR	Flush diaphragm flanged seal (ring joint in acc. with ASME standards; rotating flange)	1.5 in	P1.5	
		2 in	P2	
		3 in	P3	
S26CN	Flanged diaphragm seal, 'chemical tee'	3 in	P3	

Functional specification

Measuring range limits and span limits

Differential pressure sensor

Sensor code	Measuring range upper limit (URL)	Lower range limit (LRL)	Minimum measuring span
C	6 kPa	-6 kPa	0.6 kPa
	60 mbar	-60 mbar	6 mbar
	24 in H ₂ O	-24 in H ₂ O	2.41 in H ₂ O
F	40 kPa	-40 kPa	0.67 kPa
	400 mbar	-400 mbar	6.7 mbar
	160 in H ₂ O	-160 in H ₂ O	2.67 in H ₂ O
L	250 kPa	-250 kPa	4.17 kPa
	2500 mbar	-2500 mbar	41.7 mbar
	1000 in H ₂ O	-1000 in H ₂ O	16.7 in H ₂ O
N	2000 kPa	-2000 kPa	33.3 kPa
	20 bar	-20 bar	333 mbar
	290 psi	-290 psi	4.83 psi

Absolute pressure sensor (second sensor)

Sensor code	Measuring range upper limit (URL)	Lower range limit (LRL)	Minimum measuring span
2	2000 kPa	0 abs	20 kPa
	20 bar		0.2 bar
	290 psi		2.9 psi
3	10000 kPa	0 abs	100 kPa
	100 bar		1 bar
	1450 psi		14.5 psi
4	41000 kPa	0 abs	410 kPa
	410 bar		4.1 bar
	5945 psi		59.5 psi

... Functional specification

Span limits

Maximum measuring span = Measuring range upper limit (URL). For differential pressure measurements, can be adjusted up to \pm URL (TD = 0.5) within the measuring range limits.

Note

To optimize performance characteristics, it is recommended that you select the transmitter sensor code with the lowest turn down ratio.

Recommendation for square root function

At least 10 % of measuring range upper limit (URL)

Zero position suppression and elevation

The zero position and span can be set to any value within the measuring range limits listed in the table if:

- already set span \geq minimum span

Temperature input

Process temperature range -200 to 850 °C (-328 to 1562 °F) with external resistance thermometer (Pt100) in four-wire circuit.

Damping

Configurable time constant between 0 and 60 s. This is in addition to the sensor response time.

Warm-up time

Ready for operation as per specifications in less than 10 s with minimum damping.

Insulation resistance

> 100 M Ω at 500 V DC (between terminals and ground)

Operating limits

Note

See also data sheet DS/S26 for information on other possible restrictions based on diaphragm seal versions.

Pressure limits

Gauge pressure limits

The transmitter models 266CRX can operate without damage within the following overpressure limits:

Sensors	Filling fluid	Gauge pressure limits
C to N	Silicone oil	0.07 kPa abs., 0.7 mbar abs., 0.5 mm Hg and 2 MPa, 20 bar, 290 psi or 10 MPa, 100 bar, 1450 psi or 41 MPa, 410 bar, 5,945 psi depending on code variant selected
C to N	Fluorocarbon (Galden™)	17.5 kPa abs., 175 mbar abs., 131 mmHg and 2 MPa, 20 bar, 290 psi or 10 MPa, 100 bar, 1450 psi or 41 MPa, 410 bar, 5,945 psi depending on code variant selected

Static pressure limits

The transmitter models 266CRX can operate within the specifications with the following overpressure limits:

Sensors	Filling fluid	Static pressure limits
C to N	Silicone oil	3.5 kPa abs., 35 mbar abs., 0.5 psia and 2 MPa, 20 bar, 290 psi or 10 MPa, 100 bar, 1450 psi or 41 MPa, 410 bar, 5,945 psi depending on code variant selected
C to N	Carbon fluoride (Galden™)	17.5 kPa abs., 175 mbar abs., 2.5 psia and 2 MPa, 20 bar, 290 psi or 10 MPa, 100 bar, 1450 psi or 41 MPa, 410 bar, 5,945 psi depending on code variant selected

The overpressure limits and upper static pressure limits can be lowered by means of the nominal pressure of the diaphragm seal flange; see remote seal data sheet DS/S26.

Test pressure

The transmitters can withstand a pressure test with the following line pressure without leaking:

Model	Test pressure
266CRX	1.5 × nominal pressure (static pressure limit) simultaneously on both sides*

* Or double the value of the pressure sensor flange pressure rating, depending on which value is less. Meets hydrostatic test requirements of ANSI/ISA-S 82.03.

Temperature limits °C (°F)

Environment

This is the operating temperature.

All models	Ambient temperature limits
Silicone oil	-40 and 85 °C (-40 and 185 °F)
Fluorocarbon (Galden™)	-40 and 85 °C (-40 and 185 °F)

All models	Ambient temperature limits
Integral LCD display*	-40 and 85 °C (-40 and 185 °F)
Viton® gasket	-20 and 85 °C (-4 and 185 °F)
PTFE gasket	-20 and 85 °C (-4 and 185 °F)

* If may no longer be possible to read the LCD display clearly below -20 °C (-4 °F) and above 70 °C (158 °F).

Note

For applications in potentially explosive environments, the temperature range specified on the certificate / approval which depends upon the type of protection sought shall apply.

Process

All models	Process temperature limits
Silicone oil	-40 and 121 °C (-40 and 250 °F)*
Fluorocarbon (Galden™)	-40 and 121 °C (-40 and 250 °F)**
Viton® gasket	-20 and 121 °C (-4 and 250 °F)
PTFE gasket	-20 and 85 °C (-4 and 185 °F)

* 85 °C (185 °F) for applications under 10 kPa, 100 mbar abs., 1.45 psia up to 3.5 kPa abs., 35 mbar abs., 0.5 psia

** 85 °C (185 °F) for applications below atmospheric pressure up to 17.5 kPa abs., 175 mbar abs., 2.5 psia

... Operating limits

The table below contains the specifications for diaphragm seal filling fluids when used in transmitters with (a) diaphragm seal(s).

Filling fluid (application)	Process temperature and pressure limits			
	T _{max} °C (°F) @ P _{abs} > than	P _{min} mbar abs (mm Hg)	T _{max} °C (°F) @ P _{min}	T _{min} °C (°F)
Silicone oil DC 200	250 (480)	0.7	130	-40
10 cSt	@ 385 mbar	(0.5)	(266)	(-40)
Silicone oil Baysilone PD5	250 (480)	0.7	45	-85
5 cSt	@ 900 mbar	(0.5)	(123)	(-121)
Fluorocarbon Galden G5™ (oxygen applications)	160 (320) @ 1 bar	2.1 (1.52)	60 (140)	-20 (-4)
Silicone oil (high- temperature applications)	375 (707) @ 1 bar	0.7 (0.5)	220 (328)	-10 (14)
Mineral oil Esso	250 (480)	0.7	110	-6
Marcol 122™ (food and beverage, sanitary applications) with FDA approval	@ 630 mbar	(0.5)	(230)	(21)

Flushing ring gasket material	Process limits		
	Pressure (max.)	Temperature	P x T
Garlock®	6.9 MPa, 69 bar, 1000 psi	-73 and 204 °C (-100 and 400 °F)	250000 (°F x psi)
Graphite	2.5 MPa, 25 bar, 362 psi	-100 and 380 °C (-148 and 716 °F)	
PTFE	6 MPa, 60 bar, 870 psi	-100 and 250 °C (-148 and 482 °F)	

Transport and storage

Models 266Cxx – Transport and storage

Ambient temperature range	-50 to 85 °C (-58 to 185 °F)
	With integrated digital display (LCD):
	-40 to 85 °C (-40 to 185 °F)
Relative humidity	Up to 75 %

Environmental limits

Electromagnetic compatibility (EMC)

In accordance with EN 61326

Overvoltage strength (with overvoltage protection): 4 kV
(in accordance with IEC 1000-4-5 EN 61000-4-5)

Pressure Equipment Directive (PED)

Comply with 2014/68/UE to standards
ANSI/ISA 61010-1:2012 following Sound
Engineering Practice (SEP).

Humidity

Relative humidity: up to 100 %.
Condensation, icing: permitted.

Vibration resistance

Acceleration up to 2 g at frequencies of up to 1000 Hz
(in accordance with IEC 60068-2-6).

Shock resistance

Acceleration: 50 g
Duration: 11 ms
(in accordance with IEC 60068-2-27).

Humid and dusty atmospheres (IP rating)

The transmitter is dust and sand-proof and protected
against immersion effects in accordance with
EN 60529 (2001) with IP 67 (IP 68 on request), by
NEMA 4X, or by JIS C0920.

Use in potentially explosive atmospheres

Ex marking

Devices in hazardous atmospheres with or without integrated digital display.

For ambient temperatures -40 to 85 °C (-40 to 185 °F) the information based on the temperature classes in the associated certificates, must be complied with.

The temperature sensor circuit (Pt100) and the digital output (pulse / limit value output) must be connected in accordance with the requirements of the Ex certificate.

ATEX / IECEx

Ex-marking	
Type of protection	'Ex d' – flameproof (enclosure)
ATEX (Code E2)	
II 1/2 G Ex db IIC T6 Ga/Gb Ta = -50 °C to $+75$ °C – IP67	
II 1/2 D Ex tb IIIC T85°C Db Ta = -50 °C to $+75$ °C – IP67	
IECEx (Code E9)	
Ex db IIC T6 Ga/Gb Ta = -50 °C to $+75$ °C – IP67	
Ex tb IIIC T85°C Db Ta = -50 °C to $+75$ °C – IP67	
Type examination certificate	ATEX (Code E2) FM09AATEX0023X
	IECEx (Code E9) IECEx FME 16.0002X

Ex-marking	
Type of protection	'Ex n' – non-sparking and 'Ex t' – enclosure
ATEX (Code E3)	
II 3 G Ex nA nC IIC T6/T5/T4 nA Gc – IP67	
II 3 D Ex tc IIIC T85°C Dc – IP67	
IECEx (Code ER)	
Ex nA nC IIC T6/T5/T4 nA Gc – IP67	
Ex tc IIIC T85°C Dc IP67	
Type examination certificate	ATEX (Code E3) FM09AATEX0025X
	IECEx (Code ER) IECEx FME 16.0004X

FM (USA and Canada)

Ex-marking	
Type of protection	Explosion proof
Explosion proof (US): Class I, Div. 1, Groups A, B, C, D Ta = -50 to 85 °C	
Explosion proof (Canada): Class I, Div. 1, Groups A, B, C, D / T5 Ta = -50 to 85 °C	
Dust Ignition Proof: Class II/III, Div. 1, Groups E, F, G D Ta = -50 to 85 °C	
Type of protection	Non-Incendive
Class II/III, Div. 1, Groups E, F, G / T5 Ta = -50 to 85 °C	
Type of protection	Energy limited
Energy limited (US): Class I Zone 2, AEx nA nC IIC T6...T4 Ta = -50 to 85 °C	
Energy limited (Canada): Class I Zone 2, Ex nA nC IIC T6...T4 Ta = -50 to 85 °C	
FM approvals	USA (code ET) FM16US0066X
	Canada (code ET) FM16CA0036X
Type 4X, IP67 for all above markings.	

Combined ATEX, FM and IECEx approvals

Code EN = E2+E9+E3+ER+ET

Electrical data and options

Power supply

Devices with Modbus communication

Terminals	PWR + / PWR -
Supply voltage	10.5 to 30 V DC

The transmitter operates on terminal voltage of 10.5 to 30 V DC.

The quiescent supply current is 10 mA typically.

The transmitting supply current does not exceed 25 mA.

Output signal

Modbus® RS 485 with 8 bit Remote Terminal Unit (RTU) data transmission.

Modbus® interface

Configuration (HART®-RS485)	Via an RS485 interface in connection with Asset Vision Basic (DAT200) a HART® communication DTM and a corresponding Device Type Manager (DTM)
Operating (Modbus® communication)	Modbus RTU – 2-wire half-duplex RS485 serial connection
Baud rate	1200, 2400, 4800, 9600 Factory setting: 9600 bps
Parity	None, even, odd Factory setting: none
Typical response time	< 100 milliseconds
Response delay time	0 to 200 milliseconds Factory setting: 50 milliseconds
Device address	1 to 247 Factory setting: 247
Register address offset	One base

LCD display



Figure 2: LCD display (example)

Integral LCD display (code L1)

- Wide screen LCD display, 128 × 64 pixel, 52.5 × 27.2 mm (2.06 × 1.07 in), dot matrix, multilingual.
- Four buttons for device configuration and management.
- Easy setup for quick commissioning.
- Customized visualizations which the user can select.
- Total value and actual value flow indication.

The display can also be used to show static pressure, sensor temperature, and diagnosis notice, as well as make configuration settings.

Integral LCD display with TTG-(Through-The-Glass) operation (code L5)

As with the integral LCD display above, but featuring an innovative TTG (Through-The-Glass) button technology which can be used to activate the device's configuration and management menus without having to remove the transmitter housing cover.

The TTG (Through-The-Glass) buttons are protected against accidental activation.

Measuring accuracy

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.
- Zero based range for transmitter with isolating diaphragms in AISI 316 L ss or Hastelloy, silicone oil fill and digital trim values equal to the span end points.

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.

Note

IT IS RECOMMENDED TO SELECT THE TRANSMITTER SENSOR CODE PROVIDING THE TURNDOWN VALUE AS LOWEST AS POSSIBLE TO OPTIMIZE PERFORMANCE CHARACTERISTICS.

Dynamic behavior

In accordance with IEC 61298-1

Sensors	Time constant (63.2 % of total step response)
Sensors F to R	150 ms
Sensor C	400 ms
Sensor A	1000 ms
266CXX: Reaction time for all sensors	70 ms

Step response time (total) = reaction time + time constant

Measuring error

% of calibrated span, consisting of terminal-based non-linearity, hysteresis, and non-repeatability.

Model	DP sensor	For TD range	Measuring error
266CRH with	C	From 1:1 to 5:1	±0.075 %
DF	C	From 5:1 to 10:1	±(0.015 × TD) %
Mnemonic	F to N	From 1:1 to 10:1	±0.075 %
P3, F3, E3, F2	F to N	From 10:1 to 60:1	±(0.075 + 0.005 × TD - 0.05) %
266CRH with	C	From 1:1 to 5:1	±0.10 %
DF	C	From 5:1 to 10:1	±(0.02 × TD) %
Mnemonic	F to N	From 1:1 to 10:1	±0.10 %
different	F to N	From 10:1 to 60:1	±(0.01 × TD) %
from above			

Model	DP sensor	For TD range	Measuring error
266CRT with	C	From 1:1 to 5:1	±0.04 %
DF	C	From 5:1 to 10:1	±(0.008 × TD) %
Mnemonic	F to N	From 1:1 to 10:1	±0.04 %
P3, F3, E3, F2	F to N	From 10:1 to 60:1	±(0.04 + 0.005 × TD - 0.05) %
266CRT with	C	From 1:1 to 5:1	±0.065 %
DF	C	From 5:1 to 10:1	±(0.013 × TD) %
Mnemonic	F to N	From 1:1 to 10:1	±0.065 %
different	F to N	From 10:1 to 60:1	±(0.0065 × TD) %
from above			

... Measuring accuracy

Recommendation for square root function

At least 10 % of upper measuring range limit (URL)

Model	Pabs sensor (second sensor)	Measuring error
266CXX	1 to 3	±0.05 %
	4	±0.075 %

Model	Process temperature measurement (Pt100) in acc. with IEC 60751	Measuring error – Transmitter component
266CXX	-200 to 850 °C (-328 to 1,562 °F)	±0.3 K (0.54 °F)

266CXX: The measuring accuracy of the mass or standard volume flow is not affected by the accuracy of the dp, p, and T measurement alone; rather, it also depends upon the primary device used (discharge coefficient), the pressure and temperature range to be compensated, as well as other parameters.

In typical applications, the flow measurement accuracy (without the primary device accuracy) is ±0.7 to 0.9 % of the mass flow.

Ambient temperature

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

Model	Sensor	For TD range	
266CRH	C to N	10:1	±(0.04 % URL + 0.06 % measuring span)
266CRT	C to N	10:1	±(0.03 % URL + 0.045 % measuring span)

Absolute pressure sensor

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

$$\pm(0.08 \% \text{ URL} + 0.08 \% \text{ measuring span})$$

Limited to ±(0.1 % URL + 0.1 % measuring span) for the entire temperature range of 125 K within the limits -40 to 85 °C (-40 to 185 °F).

Note

SEE DATA SHEET DS/S26 FOR ADDITIONAL TEMPERATURE EFFECTS ON THE DIAPHRAGM SEALS:

The total temperature effect can be defined as the combined influence of the factors referred to above on the transmitter plus the influence of the diaphragm seal, dependent upon the operating temperature.

Static pressure

Models 266CRX (zero signal errors may be calibrated out at operating pressure)

Measuring range	Sensors C, F, L, N
Zero signal error	Up to 100 bar: 0.05 % URL
	> 100 bar: 0.05 % URL/100 bar
Span error	Up to 100 bar: 0.05 % measuring span
	> 100 bar: 0.05 % measuring span / 100 bar

Electromagnetic field

Meets all requirements of EN 61326.

Technical specification

Note

Please refer to the order information to check the availability of different versions of the relevant model.

Materials

Process separating diaphragms*

Stainless steel 1.4435 (AISI 316L);
Hastelloy C276®; Monel 400®;
Tantalum

A diaphragm seal with the required diaphragm material can be selected in this case too (as with the high pressure side).

Process flanges, adapters, screw plugs, and vent / drain valves*

Stainless steel 1.4404 / 1.4408 (AISI 316L);
Hastelloy C276®; Monel 400®

Screws and nuts

Screws and nuts made from stainless steel AISI 316, class A4-70 as per UNI 7323 (ISO 3506) in compliance with NACE MR0175 Class II

Seals*

Viton™ (FPM); Buna® (NBR); EPDM; PTFE; Graphite

Diaphragm seal membrane material (high pressure side)*

Stainless steel AISI 316 L; Hastelloy C-276®;
Hastelloy C-2000®; Inconel 625®; Tantalum;
Stainless steel AISI 316 L or Hastelloy C-276® with non-stick coating;
Stainless steel AISI 316 L with anti-corrosion coating;
Stainless steel AISI 316 L, gold-plated;
Super duplex stainless steel (UNS S32750 in acc. with ASTM SA479);
Diaflex (AISI with anti-abrasion treatment)

Extension material*

Stainless steel AISI 316 L (also for Diaflex-coated and gold-plated diaphragm); Hastelloy C-276®;
Stainless steel AISI 316 L or Hastelloy C-276® with the same coating as the diaphragm

Diaphragm seal filling fluid

Silicone oil DC200; silicone oil; fluorocarbon (Galden™);
Low-viscosity silicone oil Baysilone PD5;
Mineral oil Esso Marcol 122™

Sensor filling fluid

Silicone oil, fluorocarbon (Galden)

Pressure sensor housing

Stainless steel 1.4404 (AISI 316L)

Electronics housing and cover

Aluminum alloy (copper content ≤ 0.3 %) with baked epoxy finish (color RAL 9002);
Stainless steel AISI 316L.

Cover O-ring

Buna N® (Perbunan)

Mounting bracket**

Galvanized C steel with chromium passivation;
Stainless steel AISI 316, AISI 316L

Local zero point, measuring span, and write protection settings

Fiber glass-reinforced polyphenylene oxide (removable)

Plates

Stainless steel (AISI 316) for transmitter name plate, certification plate, optional measuring point tag plate / settings plate fastened to the electronics housing, and optional tag plate with customer data.
All plates laser-labeled.

* Wetted parts of the transmitter.

** U-bolt material: Stainless steel AISI 400;

Screw material: high-strength alloy steel or stainless steel AISI 316

Calibration

Standard:

0 to measuring range upper limit, for ambient temperature and atmospheric pressure

Optional:

To specified measuring span

... Technical specification

Surge protection

The 266 Modbus multivariable pressure transmitter comes standard with a surge / transient suppression scheme build into the termination block.

- Up to 4 kV on power supply
- Up to 2 kV on I/O
- Voltage: 1.2 μ s rise time / 50 μ s delay time at half value

Optional accessories

Mounting bracket

For vertical and horizontal 60 mm (2 in) pipes or wall mounting

LCD display

Can be rotated in 90° increments into 4 positions

Additional tag plates

Code I2:

For measuring point tag (up to 30 characters) and calibration specifications (up to 30 characters: lower and upper value plus unit), attached to transmitter housing.

Code I1:

For customer data (4 lines with 30 characters each), attached to transmitter housing with wire.

Certificates

Test, design, characteristics, material traceability. Refer to **Ordering Information** on page 23.

Name plate and operating instruction language

Refer to **Ordering Information** on page 23.

Process connections

Flanges

$\frac{1}{4}$ -18 NPT on the process axis

Adapters

$\frac{1}{2}$ -14 NPT on the process axis

Fastening screw threads

$\frac{7}{16}$ -20 UNF with 41.3 mm center distance

Process connection via diaphragm seal

See data sheet DS/S26

Electrical connections

Cable entry

Two $\frac{1}{2}$ -14 NPT or M20 \times 1.5 threaded bores for cable glands, directly on housing.

Terminals

- Two terminal for power (+ and -).
- Two terminals for RS485 communication.
- Four terminals for a Pt100 resistance thermometer with four-wire technology.

For wire cross sections of up to 2.5 mm² (14 AWG) and connection points for testing and communication purposes.

Grounding

Internal and external ground terminals are provided for 6 mm² (10 AWG) wire cross sections.

Mounting position

The transmitters can be installed in any position. The electronic housing can be rotated into any position. A stop is provided to prevent overturning.

Weight

Pressure transmitter without options or diaphragm seal

Approximately 3.8 kg (8.4 lb);
Add 1.5 kg (3.3 lb) for housings made from stainless steel.

Packaging

Add 650 g (1.5 lb) for packaging.

Packaging

Carton, dimensions depending on device design.

Configuration

Standard configuration

Transmitters are calibrated at the factory to the customer's specified measuring range. The calibrated range and measuring point number are specified on a tag plate. If this data has not been specified, the transmitter will be delivered with the plate left blank and the following configuration.

Parameter	Value
Device mode	Operate (Modbus)
Device address	247
Multivariable calculation	No calculation
Software tag (max. 8 characters)	blank
Optional LCD display	PV (DP) in kPa; output in percent as bargraph display
(DP) Physical unit	kPa
(DP) Output scale 0%	0 (LRL)
(DP) Output scale 100%	Upper Range Limit (URL)
Output	Linear
Damping	0.125 s
(PS) Physical unit	MPa
(PS) Output scale 0%	0 (LRL)
(PS) Output scale 100%	Upper Range Limit (URL)
Damping	0.125 s
(T) Physical unit	°C
(T) Output scale 0%	-200 (LRL)
(T) Output scale 100%	+850 Upper Range Limit (URL)
Damping	10 s

Any or all of the configurable parameters listed above – including the lower and upper range values (with the same unit of measurement) – can easily be changed using a PC running the configuration software with the DTM for 266Cxx-Modbus.

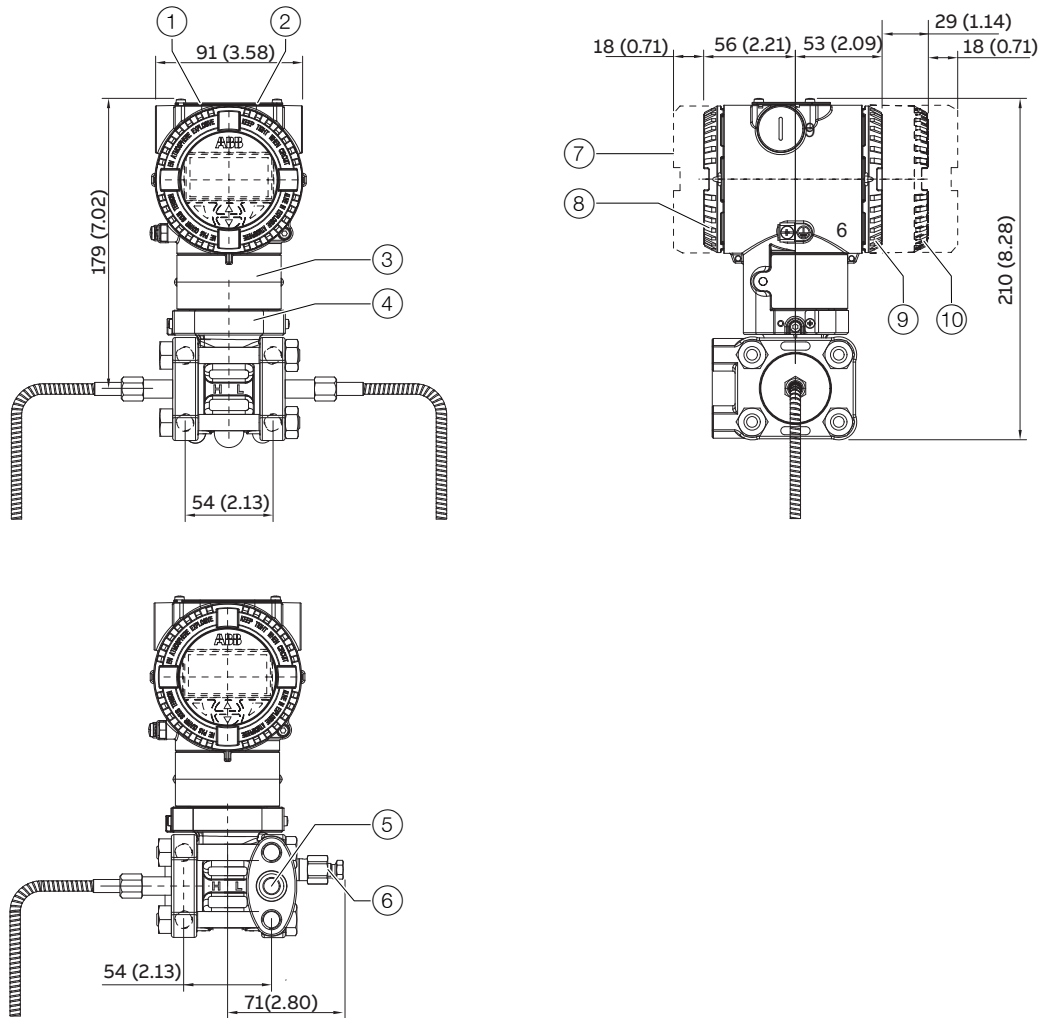
Specifications concerning the flange type and materials, O-ring and vent / drain valve materials, and additional device options are stored in the transmitter database.

Note

For device functionality and simulation purpose a 178 Ω resistor (206 °C [402.8 °F]) and 2 jumpers are installed in the PT100 connection

Mounting dimensions

Transmitter with barrel housing



- ① Push buttons
- ② Name plate
- ③ Certification plate
- ④ Optional plate (code I2)
- ⑤ Process connection
- ⑥ Vent / drain valve
- ⑦ Space for removing the cover
- ⑧ Terminal side
- ⑨ Electronics side
- ⑩ LCD display housing cover

Figure 3: Barrel housing, Dimensions in mm (in)

Transmitter with barrel housing and mounting bracket, for vertical or horizontal mounting on 60 mm (2 in) pipe

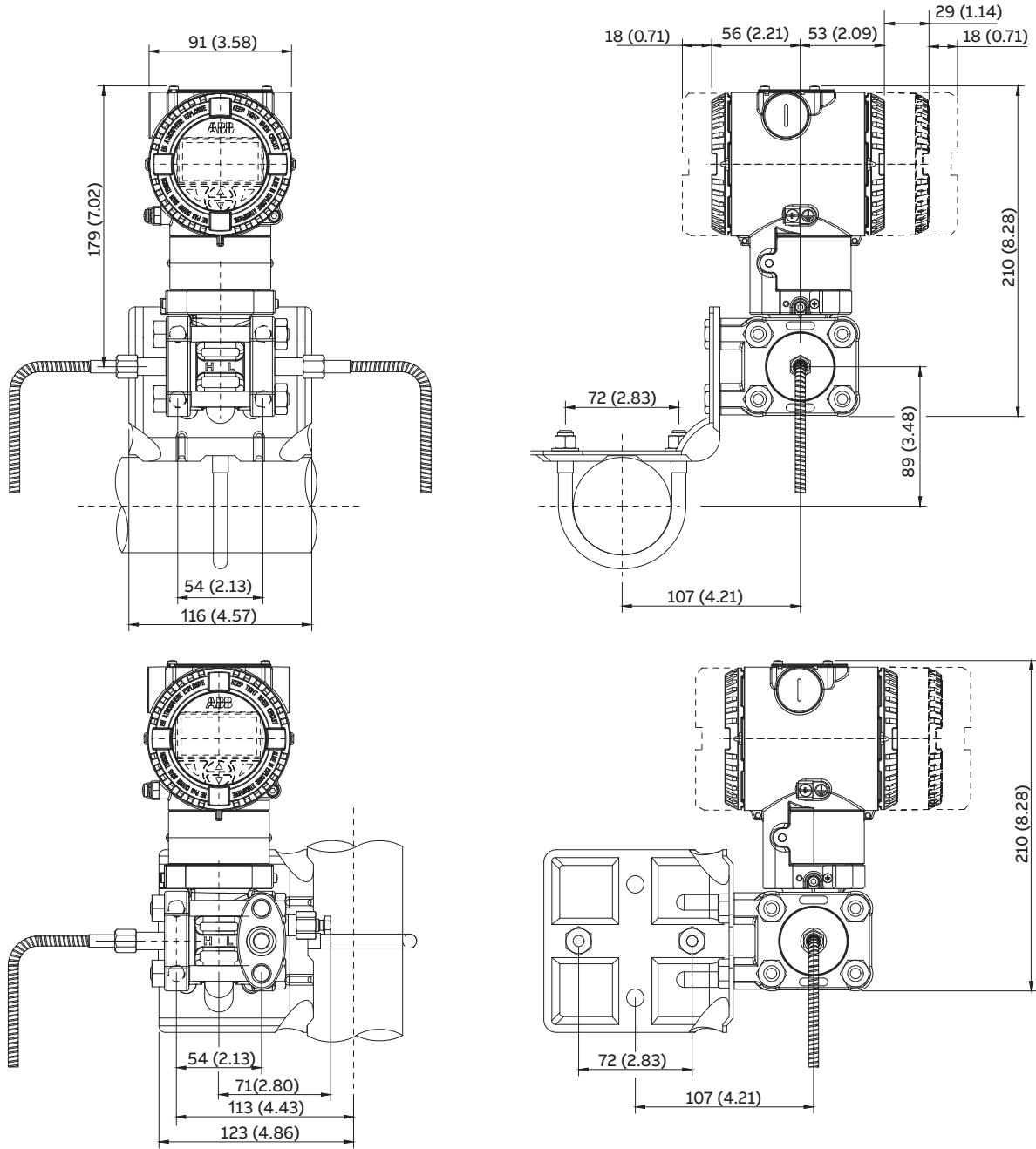


Figure 4: Pipe mounting - barrel housing, Dimensions in mm (in)

... Mounting dimensions

Transmitter with DIN housing and mounting bracket, for vertical or horizontal mounting on 60 mm (2 in) pipe

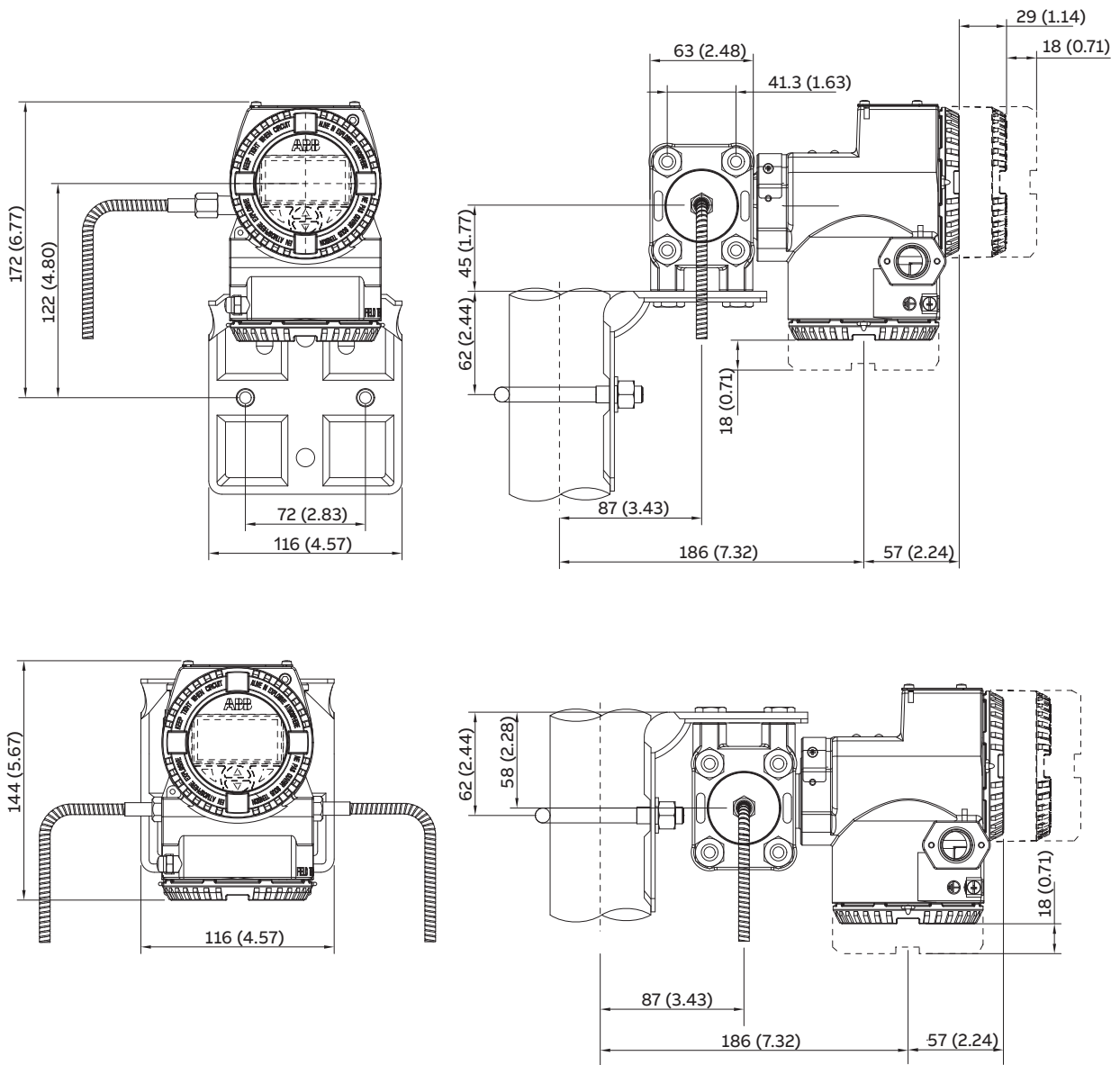


Figure 5: Pipe mounting – DIN housing, Dimensions in mm (in)

Transmitter with barrel housing and flat bracket, for vertical or horizontal mounting on 60 mm (2 in) pipe

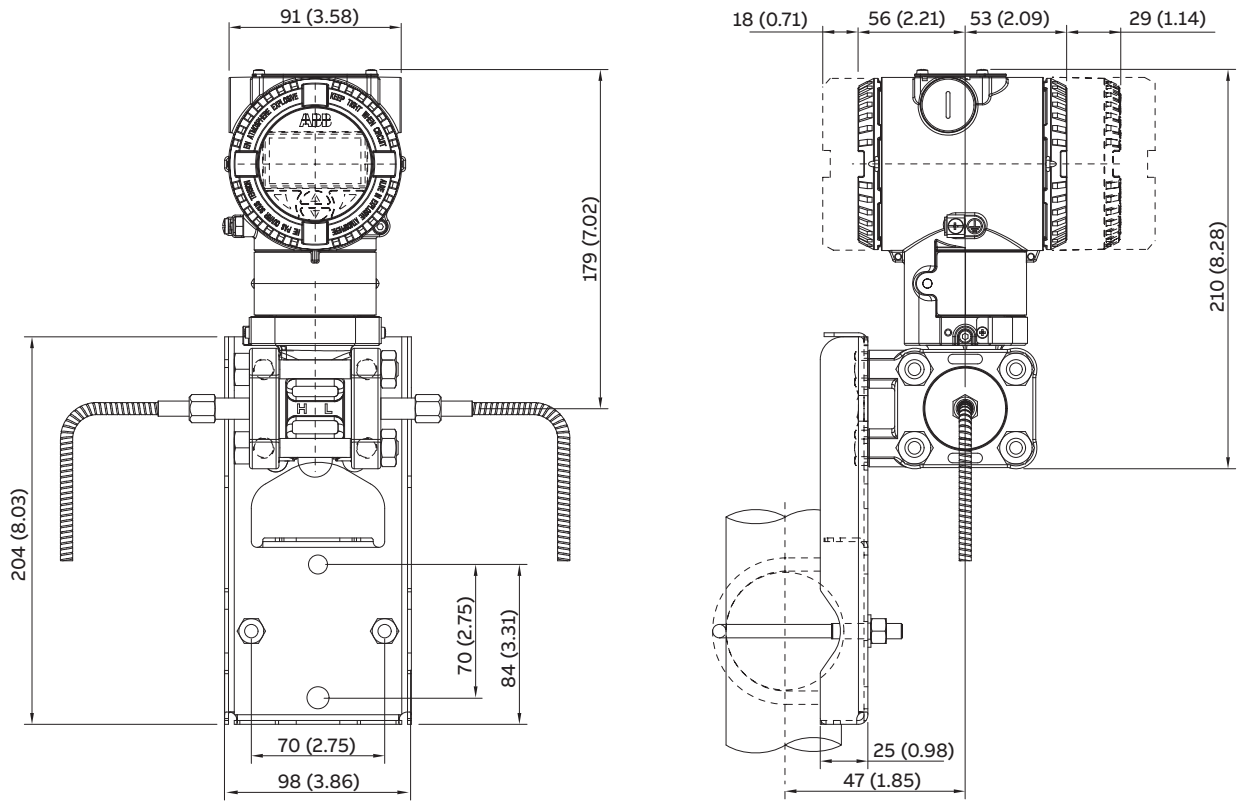


Figure 6: Flat bracket for pipe mounting – barrel housing, Dimensions in mm (in)

Electrical connections

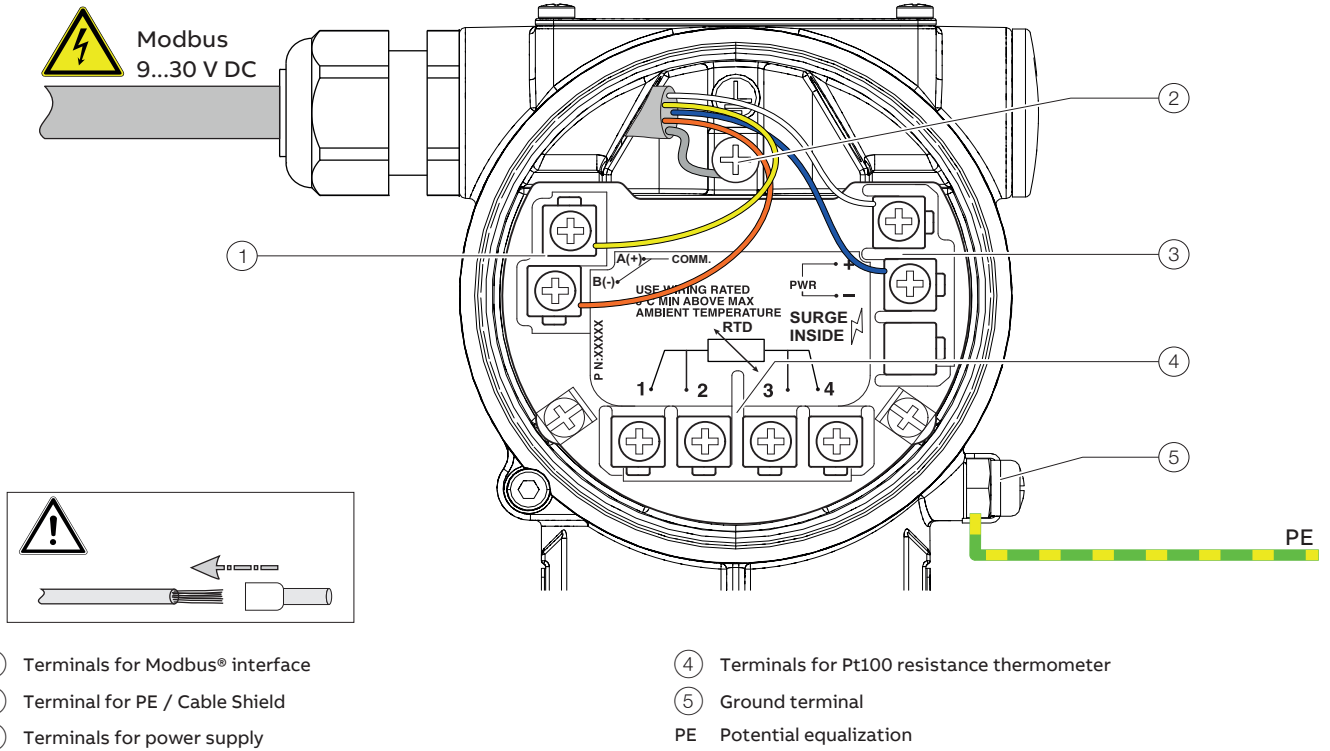


Figure 7: Connection on the device (example)

Ordering Information

266CRH and 266CRT

Base model									
Multivariable transmitter with remote seal(s), for mass flow and level, base accuracy 0.075 %	266CRH	X	X	X	X	X	X	X	X
Multivariable transmitter with remote seal, for mass flow and level, base accuracy 0.04 %	266CRT	X	X	X	X	X	X	X	X
Sensor Span Limits									
0.6 and 6 kPa (6 and 60 mbar / 2.41 and 24 in H ₂ O)		C							
0.67 and 40 kPa (6.7 and 400 mbar / 2.67 and 160 in H ₂ O)		F							
4.17 and 250 kPa (41.7 and 2500 mbar / 16.7 and 1000 in H ₂ O)		L							
33.3 and 2000 kPa (0.333 and 20 bar / 4.83 and 290 psi)		N							
Maximum Working Pressure									
0 and 2 MPa (0 and 20 bar / 0 and 290 psi)									2
0 and 10 MPa (0 and 100 bar / 0 and 1450 psi) (not with Sensor Span Limits code A)									3
0 and 41 MPa (0 and 410 bar / 0 and 5945 psi) (not with Sensor Span Limits code A)									4
Diaphragm Material / Fill Fluid									
AISI 316L SST (1.4435) / Silicone oil (NACE)									S
Hastelloy C-276 / Silicone oil (NACE)									K
Monel 400 / Silicone oil (NACE)									M
Monel 400 gold-plated / Silicone oil (NACE)									V
Tantalum / Silicone oil (NACE)									T
AISI 316L SST (1.4435) / Inert fluid - Galden (Suitable for oxygen applications) (NACE)									A*
Hastelloy C-276 / Inert fluid - Galden (Suitable for oxygen applications) (NACE)									F*
Monel 400 / Inert fluid - Galden (Suitable for oxygen applications) (NACE)									C*
Monel 400 gold-plated / Inert fluid - Galden (Suitable for oxygen applications) (NACE)									Y*
Tantalum / Inert fluid - Galden (Suitable for oxygen applications) (NACE)									D*
Diaphragm seal / Silicone oil (Seal to be quoted separately)									R
Diaphragm seal / Inert fluid - Galden (Seal to be quoted separately)									2
Process Flanges and Adapters Material / Connection									
AISI 316L SST (1.4404 / 1.4408) / ¼-18 NPT female direct / horizontal connection (NACE)									A
AISI 316L SST (1.4404 / 1.4408) / ½-14 NPT female through adapter / horizontal connection (NACE)									B
AISI 316L SST (1.4404 / 1.4408) / ¼-18 NPT female direct (DIN 19212) / horizontal connection (NACE)									C
Hastelloy C-276 / ¼-18 NPT female direct / horizontal connection (NACE)									D
Hastelloy C-276 / ½-14 NPT female through adapter / horizontal connection (NACE)									E
Monel 400 / ¼-18 NPT female direct / horizontal connection (NACE)									G
Monel 400 / ½-14 NPT female through adapter / horizontal connection (NACE)									H
AISI 316L SST (1.4404 / 1.4408) / For two seals construction (NACE)									R

* Suitable for Oxygen service

Continued see next page

... Ordering Information

Base model				
Multivariable transmitter with remote seal(s), for mass flow and level, base accuracy 0.075 %	266CRH	X	X	X
Multivariable transmitter with remote seal, for mass flow and level, base accuracy 0.04 %	266CRT	X	X	X
Bolts Material / Gaskets Material				
AISI 316L SST (NACE - non exposed) / Viton (Suitable for oxygen applications)			3*	
AISI 316L SST (NACE - non exposed) / PTFE (Max. 25 MPa / 250 bar / 3625 psi)			4	
AISI 316L SST (NACE - non exposed) / EPDM			5	
AISI 316L SST (NACE - non exposed) / Perbunan			6	
AISI 316L SST (NACE - non exposed) / Graphite			7	
AISI 316L SST (NACE - non exposed) / Without gaskets (For two seals construction)			R	
Housing Material / Electrical Connection				
Aluminium alloy (Barrel type) ½-14 NPT				A
Aluminium alloy (Barrel type) M20 × 1.5				B
AISI 316L SST (Barrel type) ½-14 NPT				S
AISI 316L SST (Barrel type) M20 × 1.5				T
Output				
Modbus RS 485 / No additional options				N
Modbus RS 485 / Options requested (to be ordered by Additional ordering code)				6

* Suitable for Oxygen service

Additional ordering information for model 266CRH and 266CRT

Multivariable transmitter with remote seal(s), for mass flow and level, base accuracy 0.075 %	266CRH	XX	XX
Multivariable transmitter with remote seal, for mass flow and level, base accuracy 0.04 %	266CRT	XX	XX
Vent and Drain Valve Material / Position			
AISI 316L SST (1.4403) / On process axis (NACE)			V1
AISI 316L SST (1.4403) / On flanges side top (NACE)			V2
AISI 316L SST (1.4403) / On flanges side bottom (NACE)			V3
Hastelloy C-276 / On process axis (NACE)			V4
Hastelloy C-276 / On flanges side top (NACE)			V5
Hastelloy C-276 / On flanges side bottom (NACE)			V6
Monel 400 / On process axis (NACE)			V7
Monel 400 / On flanges side top (NACE)			V8
Monel 400 / On flanges side bottom (NACE)			V9
Explosion Protection Certification			
ATEX Group II Category 1/2 GD - Flameproof Ex d			E2
ATEX Group II Category 3 GD - Type of protection "N" Ex nL design compliance			E3
FM Approvals (USA and Canada) Explosion proof and Type „n“			ET
Combined ATEX, IECEx, FM Approvals (USA and Canada)			EN
IEC Approval Group II Category 1/2 GD - Flameproof Ex d			E9
IEC Approval Group II Category 3 GD - Type of protection "N" Ex nL design compliance			ER

Continued see next page

Additional ordering information

Multivariable transmitter with remote seal(s), for mass flow and level, base accuracy 0.075 %	266CRH	XX	XX	XX	XX	XX	XX
Multivariable transmitter with remote seal, for mass flow and level, base accuracy 0.04 %	266CRT	XX	XX	XX	XX	XX	XX

Integral LCD

With integral LCD display	L1
TTG (Through The Glass) integral digital LCD display	L5

Mounting Bracket Shape / Material

For pipe mounting / Carbon steel (not suitable for AISI housing)	B1
For pipe mounting / AISI 316 SST (1.4401) (not suitable for AISI housing)	B2
For wall mounting / Carbon steel (not suitable for AISI housing)	B3
For wall mounting / AISI 316 SST (1.4401) (not suitable for AISI housing)	B4
Flat type bracket / AISI 316 SST (1.4401) (suitable for AISI housing)	B5

Operating Instruction Language

German	M1
English	M5

Label and Tag Language

German	T1
Italian	T2
Spanish	T3
French	T4

Additional Tag Plate

Supplemental wired-on stainless steel plate (4 lines, 32 characters each)	I1
Laser printing of tag on stainless steel plate	I2
Stainless steel tag, certification and wire-on plates	I3

Configuration

Standard pressure = in H ₂ O / psi at 68 °F	N2
Standard pressure = in H ₂ O / psi at 39.2 °F	N3
Standard pressure = in H ₂ O / psi at 20 °C	N4
Standard pressure = in H ₂ O / psi at 4 °C	N5
Custom	N6

... Ordering Information

Additional ordering information

Multivariable transmitter with remote seal(s), for mass flow and level, base accuracy 0.075 %	266CRH	XX	XX	XX
Multivariable transmitter with remote seal, for mass flow and level, base accuracy 0.04 %	266CRT	XX	XX	XX

Certificates

Inspection certificate 3.1 acc. EN 10204 of calibration	C1
Inspection certificate 3.1 acc. EN 10204 of the cleanliness stage	C3
Inspection certificate 3.1 acc. EN 10204 of helium leakage test of the sensor module	C4
Inspection certificate 3.1 acc. EN 10204 of pressure test	C5
Declaration of compliance with the order 2.1 acc. EN 10204 for instrument design	C6
Separate calibration record	CC
PMI test on wetted parts	CT

Material Traceability

Inspection certificate 3.1 acc. EN 10204 of pressure-bearing and process wetted parts with analysis certificates as material verification	H3*
Material certificate 2.2 acc. EN 10204 of the pressure bearing and process wetted parts	H4

Connector

With cable gland M20 × 1.5	U8
----------------------------	----

* Minor Parts with Factory Certificate acc. to EN 10204

Standard delivery scope (changes possible with additional ordering code)

- Adapters supplied loose
- Sealing plug for horizontal connection flange on the process axis (if no remote seal is selected); no vent / drain valve
- For standard applications (without explosion protection)
- No display, no mounting bracket, no surge protector
- Multilanguage short operating instruction and English labelling
- Configuration with kPa and °C units
- No test, inspection, or material certificates

Important remark for all models

The selection of suitable wetted parts and filling fluid for compatibility with the process media is a customer's responsibility, if not otherwise notified before manufacturing.

NACE compliance information

- 1 The materials of constructions comply with metallurgical recommendations of NACE MR0175/ISO 15156 for sour oil field production environments. As specific environmental limits may apply to certain materials, please consult latest standard for further details. Materials AISI 316 / AISI 316L, Hastelloy C-276, Monel 400 also conform to NACE MR0103 for sour refining environments.
- 2 NACE MR0175 addresses bolting requirements in two classes:
 - Exposed bolts:** bolts directly exposed to the sour environment or buried, encapsulated or anyway not exposed to atmosphere.
 - Non exposed bolts:** the bolting must not be directly exposed to sour environments, and must be directly exposed to the atmosphere at all times.

266CRH, 266CRT bolting identified by 'NACE' are in compliance to the requirements of NACE MR0175 when considered 'non exposed bolting'.

Trademarks

Hastelloy is a registered trademark of Haynes International, Inc.

Monel is a registered trademark of Special Metals Corporation

Modbus is a registered trademark of the Modbus Organization

™ Viton is a DuPont de Nemours trademark

™ DC200 is a Dow Corning Corporation trademark

Galden is a Montefluos trademark

™ Halocarbon is a Halocarbon Products Co. trademark

Neobee M 20 is a Stepan Company trademark

™ Esso Marcol 122 is an Esso Italiana trademark

Syltherm is a Dow Chemical Company trademark

Sales



Service



ABB Limited**Measurement & Analytics**

Howard Road, St. Neots
Cambridgeshire, PE19 8EU
UK

Tel: +44 (0)870 600 6122

Fax: +44 (0)1480 213 339

Email: enquiries.mp.uk@gb.abb.com

ABB Automation Products GmbH**Measurement & Analytics**

Schillerstr. 72
32425 Minden
Germany

Tel: +49 571 830-0

Fax: +49 571 830-1806

abb.com/pressure

ABB Inc.**Measurement & Analytics**

125 E. County Line Road
Warminster, PA 18974
USA

Tel: +1 215 674 6000

Fax: +1 215 674 7183

ABB S.p.A.**Measurement & Analytics**

Via Luigi Vaccani 4
22016 Tremezzina (CO)
Italy

Tel: +39 0344 58111

Email: abb.instrumentation@it.abb.com

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail.

ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB.

Copyright© 2018 ABB

All rights reserved

3KXP400010R1001