Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Deltatop
DP71B, DP72B, DP73B

Differential pressure flow measurement with Pitot tubes and Deltabar differential pressure transmitter
The universal measuring system for steam, gases and liquids

Application

- Flow measurement of gases, steam and liquids
- Nominal diameters from 2" to 21ft
- Nominal diameters from DN 50 to DN 6000
- Pressure up to 6300 psi (420 bar)
- NACE-compliant materials

Deltabar differential pressure transmitter

- Approvals for hazardous area: FM, CSA, ATEX
- Relevant safety aspects: SIL
- Connection to all common process control systems: HART, Foundation Fieldbus, Profibus

Your benefits

- Selectable according to the application:
  - operational compact version: minimizes installation costs
  - modular remote version: for demanding process conditions (high temperature, high pressure) and difficult installation conditions
- Deltabar differential pressure transmitter ready adjusted
- Display configured for flow rate, differential pressure or 0 to 100%
- Robust design; no moving parts

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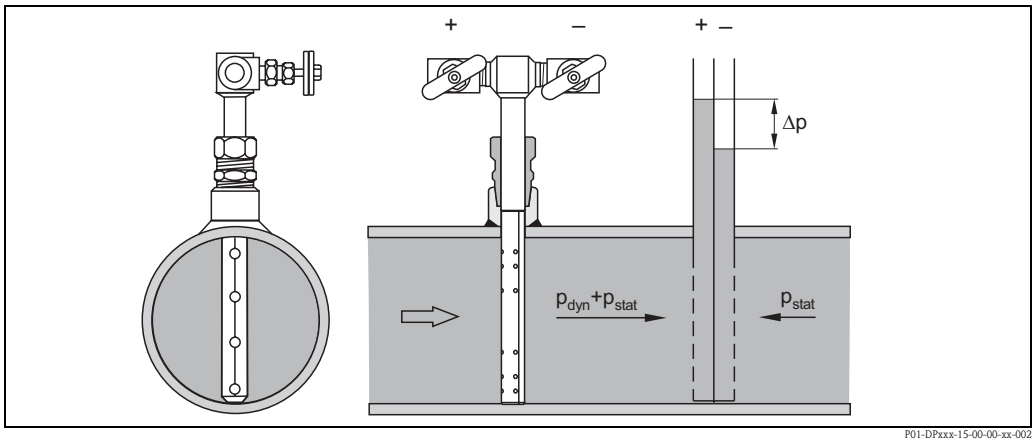
Endress+Hauser
People for Process Automation

Table of Contents

Function and system design

Measuring principle



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The front of the Pitot tube is exposed to the static pressure p_{stat} plus the dynamic pressure p_{dyn}. The side and the back of the tube are exposed only to the static pressure p_{stat}. The resulting **differential pressure Δp** can be used to calculate the **flow rate Q**.

The relationship between flow rate (Q) and differential pressure (Δp) is given by a square root function:

$$Q \sim \sqrt{\Delta p}$$

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Downstream of the Pitot tube the static pressure p_{stat} is reduced by the permanent pressure loss **Δω**. With Pitot tubes, this pressure loss Δω is much less significant than with other primary elements.

Flow calculation

According to the continuity law derived by Bernoulli and the energy equation, the static pressure in the flow plus the dynamic pressure is equal to a constant throughout the flow:

$p_{stat} + p_{dyn} = \text{const.}$

From this law, the following flow equations can be derived:

Volumetric flow for gases under standard conditions

$$Q_{vn} = k\, A\, \varepsilon \sqrt{\frac{2\, \Delta p\, P_b\, Z_n\, T_n}{\rho_n\, P_n\, Z_b\, T_b}}$$

Volumetric flow for gases under operating conditions

$$Q_v = k\, A\, \varepsilon \sqrt{\frac{2\, \Delta p}{\rho_b}}$$

Mass flow for gases and steam

$$Q_m = k\, A\, \varepsilon \sqrt{2\, \Delta p\, \rho_b}$$

Mass flow for liquids

$$Q_m = k\, A \sqrt{2\, \Delta p\, \rho_b}$$

Volumetric flow for liquids

$$Q_v = k\, A \sqrt{\frac{2\, \Delta p}{\rho_b}}$$

Definition of the symbols

Symbol	Quantity	Unit
Δp	Differential pressure at the probe profile	Pa
ρ_n	Medium density at standard conditions	kg/m^3
ρ_b	Medium density at operating conditions	kg/m^3
A	Cross-sectional area of the pipe	m^2
b	Width of the probe profile perpendicular to the flow direction	m
k	k-factor of the Pitot tube	1
κ	Isentropic exponent of the gas[1)]	1
P_b	Operating pressure	Pa
P_n	Absolute pressure of the gas at standard conditions	Pa
Q_m	Mass flow	kg/s
Q_v	Volumetric flow	m^3/s
Q_{vn}	Volumetric flow at standard conditions	m^3/s
T_b	Temperature of the gas at operating conditions	K
T_n	Temperature of the gas at standard conditions	K
Z_b	Real gas factor at operating conditions	1
Z_n	Real gas factor at standard conditions	1
ε	Expansion factor	1

1) The isentropic exponent is: 1.65 for monoatomic gases; 1.4 for diatomic gases; 1.28 for triatomic gases

Sizing and optimization

The exact relationship between differential pressure, flow and pressure loss is described by the k-factor, which depends on the shape and size of the Pitot tube.
The k-factors of the Deltatop Pitot tubes have been determined and verified in elaborate sample calibrations. Every Pitot tube is shipped with a calculation sheet. The differential pressure, pressure loss, application limits and further parameters are calculated based on the customer specifications. For this purpose, a form (Sizing sheet - data sheet, → 49) has to be completed. The user does not have to be involved in complicated sizing calculations.

"Applicator" selection and sizing tool

Endress+Hauser's Applicator software is a convenient selection and sizing tool for planning processes (for details, see booklet IN013F). The Applicator program is available free of charge either in the form of a CD or can be downloaded from the Internet at:
http://www.products.endress.com/applicator

Applicator Sizing Flow

The "Applicator Sizing Flow" module calculates all necessary data for the selected primary device:

- Differential pressure
- Pressure loss
- Measuring uncertainty
- k-factor
- Upstream and downstream straight lengths
- Pressure ratings
- Medium parameters

Additional options

- Sizing sheet - data sheet
- Sizing sheet - calculation sheet
- Determination of the mounting position

Sizing sheet - data sheet

To ensure that the Deltatop measuring point exactly matches the requirements of the process, the completed "Sizing sheet - data sheet" (→ 49) has to be attached to the order.
Endress+Hauser uses the data in this form to determine the optimum configuration of the measuring point. The "Sizing sheet - data sheet" can be generated by the "Applicator" selection and sizing tool.

Selecting the differential pressure transmitter and the measuring cell

If they are ordered together with the primary element, it is possible to order the Deltabar differential pressure transmitter with a suitable measuring cell and calibration even without knowing the complete calculation data. Endress+Hauser will select the most suitable measuring cell based on the calculation results for the Pitot tube. The differential pressure transmitter will be delivered completely configured and preadjusted to the calculated values.
This allows easy and convenient ordering and commissioning of the measuring point even for less experienced users.

Deltabar S PMD70/PMD75

Feature of the product structure	Option to be selected
40: "Nominal Range; PN"	Depending on working pressure PN: ■ 78: "Prepared for Deltatop; PN = 2321 psi (160 bar)" ■ 88: "Prepared for Deltatop; PN = 6092 psi (420 bar)" (only available for PMD75)
50: "Calibration; Unit"	8: "Adjusted for Deltatop"

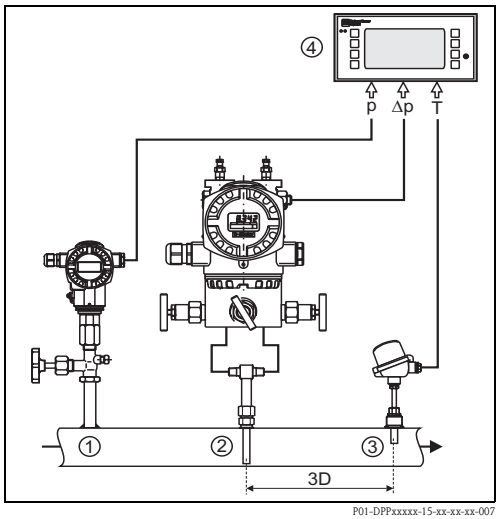
Deltabar M PMD55

Feature of the product structure	Option to be selected
070: "Sensor Nominal Value"	88: "Prepared for Deltatop"
090: "Calibration; Unit"	8: "Adjusted for Deltatop"

Temperature and pressure compensation

Separate process connections
Two additional probes are required for temperature and pressure compensation:

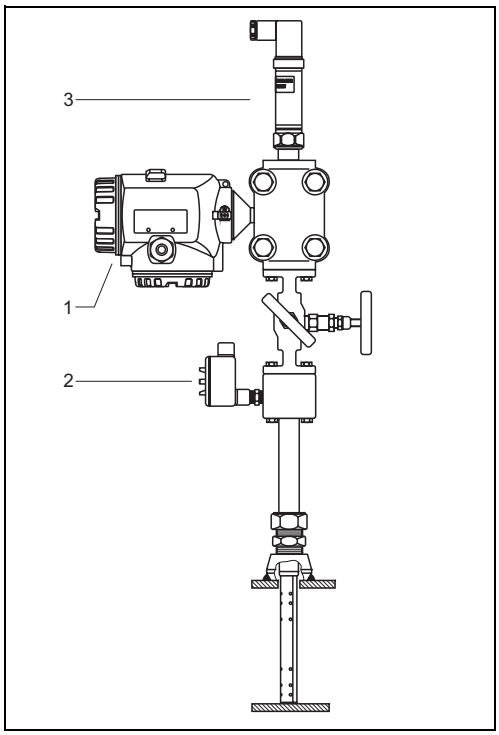
- **An absolute pressure sensor**
  This sensor must be mounted on the upstream side of the Pitot tube.
- **A temperature probe**
  In order to avoid disturbances of the flow profile, this probe must be mounted on the downstream side of the Pitot tube. The minimum distance between the Pitot tube and the temperature probe is 3D.
  (D: diameter of the pipe)



1: *Absolute pressure probe*
2: *Pitot tube and differential pressure transmitter*
3: *Temperature probe*
4: *Flow computer*

Combined process connection for absolute pressure, differential pressure and temperature

- Versions of the Deltatop DP72B and DP73B units are available with an integrated Pt100 temperature probe
- In the case of Deltabar S, an adapter (e.g. oval flange PZO) can be used to screw a pressure transmitter or a pressure sensor into the Deltabar S flange. The absolute pressure sensor must be mounted at the "+" side of the Deltabar S.



1: *Deltabar S differential pressure transmitter*
2: *Integrated Pt100 temperature probe*
3: *Absolute pressure transmitter (has to be ordered separately)*

Calculation of the compensated volume or mass flow

- **For steam:**
  Flow and Energy Manager RMS621 for water and steam from Endress+Hauser;
  for details see Technical Information TI092R
- **For all media:**
  Universal Flow and Energy Manager RMC621 for gases, liquids and steam from Endress+Hauser;
  for details see Technical Information TI098R
- **For all media:**
  by a PLC;
  In this case the compensation calculation has to be programmed by the user.

Calculation formula for temperature and pressure compensation

The starting point for compensation first has to be defined. The starting point is the calculation sheet which accompanies every primary element. Layout data for a specific operating condition (pressure and temperature) can be found on the calculation sheet.

The relationship between flow and differential pressure is described by a square root function:

$Q_m = \sqrt{2\ \Delta p\ \rho}$ for the mass flow (or volume flow at normal or standard conditions)

and

$Q_v = \sqrt{\frac{2\ \Delta p}{\rho}}$ for the volume flow

where
ρ = the density of the medium.

If the current output of the Deltabar transmitter is set to flow values, the square root function is already implemented. Otherwise the square root function must be computed externally, e.g. in a PLC. Please make sure that the square root function is not applied twice.

Whenever the real operating conditions differ from the conditions used in the calculation sheet, the density of the gas will change and thus also the calculated flow rate will change according to the above-mentioned formula.

$$\rho_2 = \rho_1 \frac{P_2}{P_1} \frac{T_1}{T_2} \frac{Z_1}{Z_2}$$

where
P = absolute pressure
T = absolute temperature (K)
Z = compressibility factor
1 = operating condition according to the calculation sheet
2 = operating condition currently measured

The compensation can now be computed as follows:

$$Q_2 = Q_1 \sqrt{\frac{P_2}{P_1} \frac{T_1}{T_2} \frac{Z_1}{Z_2}}$$ for mass flow (or volume flow at standard conditions)

$$Q_2 = Q_1 \sqrt{\frac{P_1}{P_2} \frac{T_2}{T_1} \frac{Z_2}{Z_1}}$$ for volume flow

The compressibility factor Z can be neglected if its value is close to 1. If the compressibility factor is to be included in the compensation, the value must be determined according to the pressure and temperature currently measured. Compressibility factors are available in the corresponding literature in tables or graphs or can be calculated using the Soave-Redlich-Kwong procedure for example.

Split range (expansion of the measuring range)

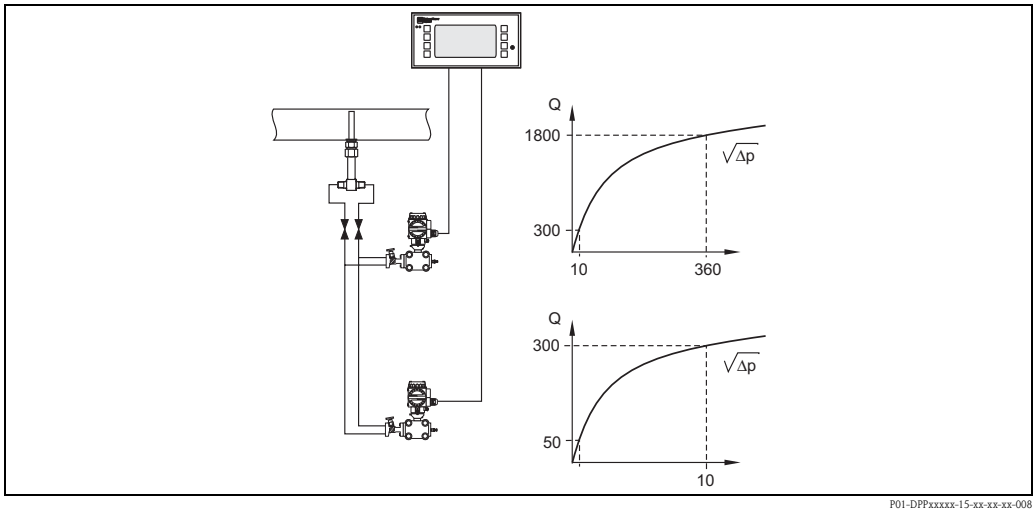
The square root function has a very steep slope in the vicinity of the zero point. Therefore, the measuring range is limited from below, which results in an operable flow range of typically 6:1 (max. 12:1).
If the differential pressure is high enough, it is possible to increase the range by connecting multiple differential pressure transmitters with different measuring ranges.
The following Endress+Hauser devices can be used to evaluate the measuring signals simultaneously:

- Flow and Energy Manager RMS621 for water and steam (see Technical Information TI092R)
- Universal Flow and Energy Computer RMC621 for gases, liquids and steam (see Technical Information TI098R)

Note!
The maximum available operable flow range depends on the differential pressure available.

Note!
The same method can be used to implement redundant measurements.

Example



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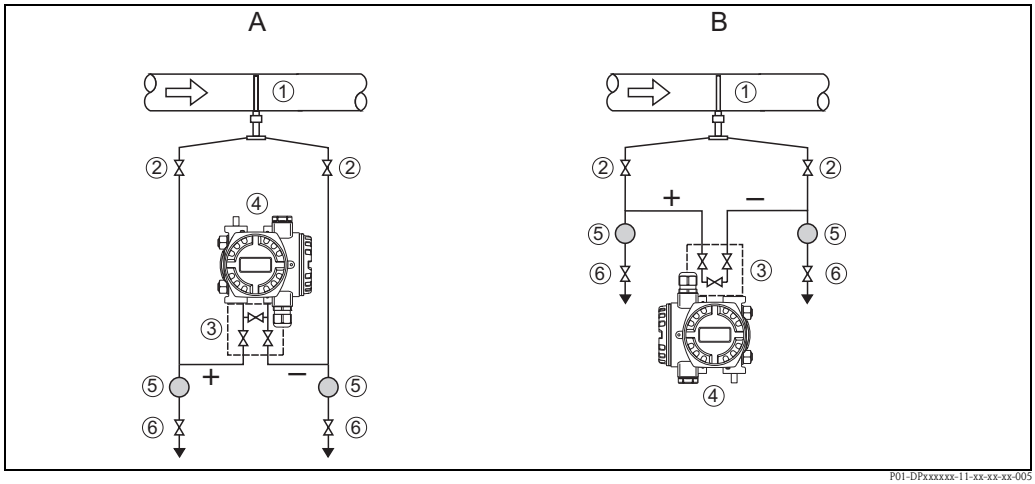
Flow measurements in liquids or steam

With liquid or steam applications, the transmitter must be mounted below the pipe. All impulse pipes must be installed with a slope of at least 1:15 to the process connection – coming from the transmitter. This ensures that trapped air and bubbles rise back to the process pipe and thus do not influence the measurement.

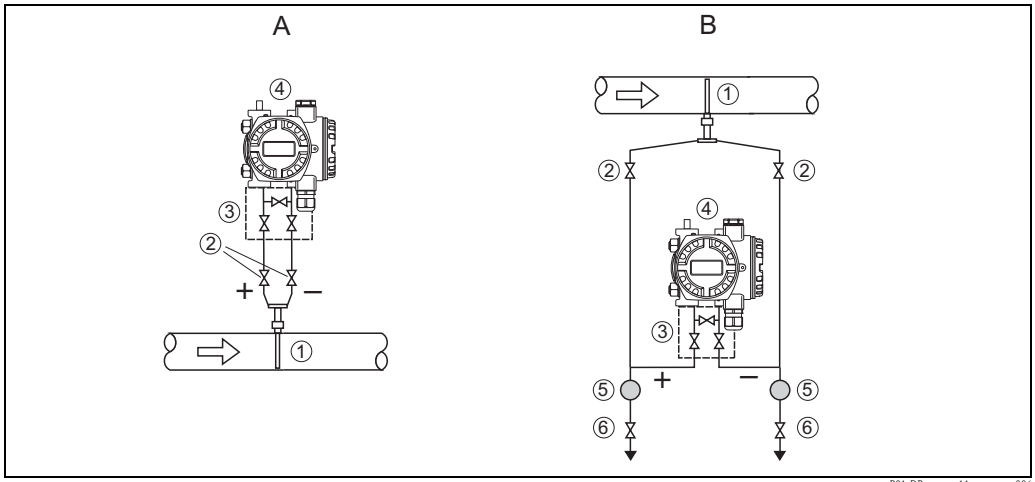
Caution!
With steam applications, the differential pressure transmitter must be located at a sufficient distance to allow for cooling to meet the transmitter specification. A typical cooling rate is 100 °F per foot (55 °C per 300 mm).



A: *Preferred configuration;* **B:***Alternative configuration (requires less space; only possible for clean media)*
1: *Pitot tube;* **2:** *Shut-off valves;* **3:** *Three-valve manifold;* **4:** *Deltabar differential pressure transmitter;* **5:** *Separator;*
6: *Drain valves*

Flow measurement in gases

With gas applications, the transmitter must be mounted above the pipe. All impulse pipes must be installed with a slope of at least 15:1 to the process connection – coming from the transmitter. This ensures that any condensate flows back into the process pipe and thus does not influence the measurement.



A: *Preferred configuration;* **B:** *Alternative configuration (if the transmitter cannot be mounted above the pipe; only possible for clean media)*
1: *Pitot tube;* **2:** *Shut-off valves;* **3:** *Three-valve manifold;* **4:** *Deltabar differential pressure transmitter;* **5:** *Separator;*
6: *Drain valve*

Mounting positions

Versions

Compact version

With the compact version of the Deltatop, the Pitot tube, the manifold and the transmitter are delivered ready-mounted. Additional piping and additional valves are not required. Thus, leakage problems are eliminated.

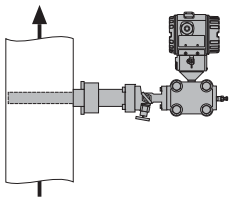
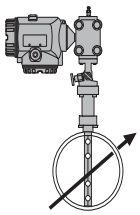
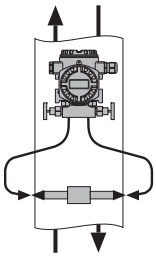
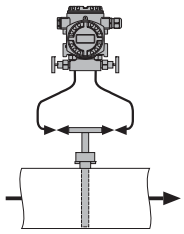
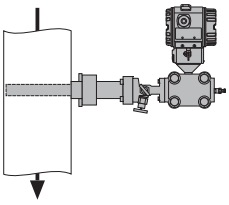
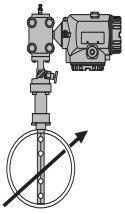
Remote version

With the remote version of the Deltatop, the Pitot tube, the manifold, the shut-off valves and the transmitter are delivered separately and must be mounted on site. This version is recommended:
- For high process temperatures which make direct transmitter mounting impossible.
- If the transmitter cannot be mounted directly at the Pitot tube due to space restrictions.

Flow direction

- The flow direction is indicated by an arrow on the flange plate (compact version) or on the probe head (remote version).
- "Mounting left" and "Mounting right" refer to the flow direction (see drawings below).
- For compact versions, the transmitter is mounted in such a way that the display can be read in the specified mounting position and does not need to be rotated.

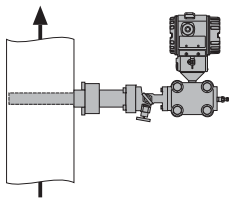
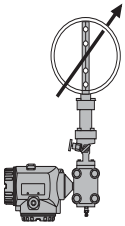
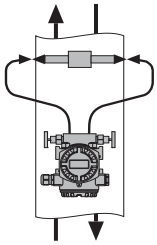
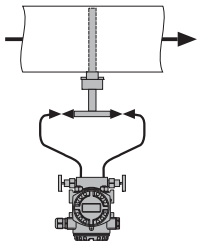
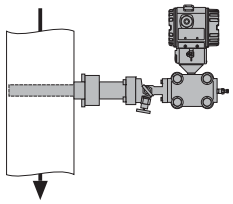
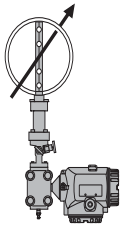
Gas measurements

<table>
<tr><th>Compact; vertical[1)]</th><th>Compact; horizontal[2)]</th><th>Remote; vertical</th><th>Remote; horizontal</th></tr>
<tr><td>flow upwards
DP7xB–CV...
 
P01-DP61Dxxx-11-00-00-xx-001</td><td>mounting left
DP7xB–CB...
 
P01-DP61Dxxx-11-00-00-xx-007</td><td rowspan="2">upwards/downwards
DP7xB–BW...
 
P01-DP61Dxxx-11-00-00-xx-013</td><td rowspan="2">top/bottom
DP7xB–BD...
 
P01-DP61Dxxx-11-00-00-xx-016</td></tr>
<tr><td>flow downwards
DP7xB–CU...
 
P01-DP61Dxxx-11-00-00-xx-002</td><td>mounting right
DP7xB–CC...
 
P01-DP61Dxxx-11-00-00-xx-008</td></tr>
</table>

1) Recommended housing version for the Deltabar S: T14 (for use of the Deltabar display)

2) Recommended housing version for the Deltabar S: T15 (for use of the Deltabar display)

Liquid or steam measurements

<table>
<tr><th>Compact; vertical[1)]</th><th>Compact; horizontal[2)]</th><th>Remote; vertical</th><th>Remote; horizontal</th></tr>
<tr><td>flow upwards
DP7xB-EV... (liquid)
DP7xB-GV... (steam)
 
P01-DP61Dxxx-11-00-00-xx-001</td><td>mounting left
DP7xB-EB... (liquid)
DP7xB-GB... (steam)
 
P01-DP61Dxxx-11-00-00-xx-009</td><td rowspan="2">upwards/downwards
DP7xB-DW... (liquid)
DP7xB-FW... (steam)
 
P01-DP61Dxxx-11-00-00-xx-014</td><td rowspan="2">top/bottom
DP7xB-DD... (liquid)
DP7xB-FD... (steam)
 
P01-DP61Dxxx-11-00-00-xx-017</td></tr>
<tr><td>flow downwards
DP7xB-EU... (liquid)
DP7xB-GU... (steam)
 
P01-DP61Dxxx-11-00-00-xx-002</td><td>mounting right
DP7xB-EC... (liquid)
DP7xB-GC... (steam)
 
P01-DP61Dxxx-11-00-00-xx-010</td></tr>
</table>

1) Recommended housing version for the Deltabar S: T14 (for use of the Deltabar display)

2) Recommended housing version for the Deltabar S: T15 (for use of the Deltabar display)

Installation and process conditions

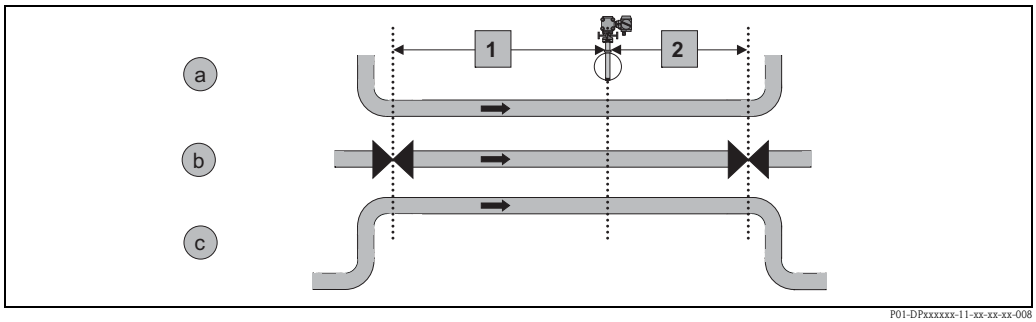
Upstream and downstream lengths

In order to ensure a homogeneous flow profile, it is necessary to mount the Pitot tube at a sufficient distance to narrowings or bends in the pipe. The required upstream and downstream lengths for different types of obstacles are summarized in the following table:

Type of obstacle	Min. upstream length	Min. downstream length
90° bend	7 x D	3 x D
2x90° bend in the same plane	9 x D	3 x D
2x90° bend in perpendicular planes	18 x D	3 x D
Concentric reducer	8 x D	3 x D
Concentric expander	8 x D	3 x D
Ball/gate valve, fully open	24 x D	4 x D

D: Inner pipe diameter

Examples (schematic)



1: *Upstream length;* **2:** *Downstream length;*
a: *90° bend;* **b:** *Valve, open;* **c:** *2x90° bend*

Homogeneity

The fluid must be homogeneous. **Changes of the state of aggregation** (liquid, gas, steam) are not permissible.
The pipe must always be **completely filled**.

Temperature, pressure

	Compact version	Remote version
Max. temperature	■ For gases, liquids and steam: 390 °F (200°C)	■ With standard material: approx. 800 °F (427 °C)
Max. pressure	6000 psi (420 bar)	

Temperature and pressure may **not be subject to large fluctuations**.
If required, **temperature and pressure compensation** must be applied for gases and steam (→ 🖹 6).

Practical limits

For a reliable measurement with Pitot tubes, the practical limits are shown in the table below. Equivalent dp with the respective medium velocity.

Fluid	Minimum DP	Equivalent velocity
Gas	0.1" (2.5 mm) H_2O	15 ft/sec. (4.5 m/sec.)
Liquid	1.0" (25 mm) H_2O	2 ft/sec. (0.6 m/sec.)
Steam	1.5" (38 mm) H_2O	32 ft/sec. (9.7 m/sec.)

Temperature limits of the materials applied

ASME/AISI/ASTM

Designation	Short designation	Material code	Max. temperature	Reference
Steels				
C-Si	A105	K03504	790 °F (425 °C)	ASME B16.5[1)]
Heat-resistant steels				
C-1/2Mo	A182 Gr. F1	K12822	860 °F (465°C)	ASME B16.5[1)]
1 1/4Cr-1/2Mo-Si	A 182 Gr. F11 Cl.2	K11572	1090 °F (590 °C)	ASME B16.5[1)]
2 1/4Cr-1Mo	A 182 Gr. F22 Cl.3	K21590	1090 °F (590 °C)	ASME B16.5[1)]
Stainless steels				
18Cr-8Ni	A 182 Gr. F304	S30400	1000 °F (538 °C)	ASME B16.5[1)]
16Cr-12Ni-2Mo	A 182 Gr. F316	S31600	1000 °F (538 °C)	ASME B16.5[1)]
16Cr-12Ni-2Mo	A 182 Gr. F316L	S31603	840 °F (450 °C)	ASME B16.5[1)]
22Cr-5Ni-3Mo-N	A 182 Gr. F51	S31803	600 °F (315 °C)	ASME B16.5[1)]
	A 182 Gr. F904L	N08904	700 °F (375 °C)	ASME B16.5[1)]

1) Values for flanges: Maximum recommended temperature for permanent use or maximum temperature specification of the pressure-temperature ratings.

Plastics

Designation	Short designation	Max. temperature	Reference
PVC	Polyvinyl chloride	Up to approx. 150 °F (70 °C)	Manufacturer specification
PP	Polypropylene	Up to approx. 190 °F (90 °C)	Manufacturer specification
PE	Polyethylene	Up to approx. 170 °F (80 °C)	Manufacturer specification
PVDF	Polyvinylidene fluoride	Up to approx. 260 °F (130 °C)	Manufacturer specification
PTFE	Polytetrafluorethylene	Up to approx. 300 °F (150 °C)	Manufacturer specification

Other materials

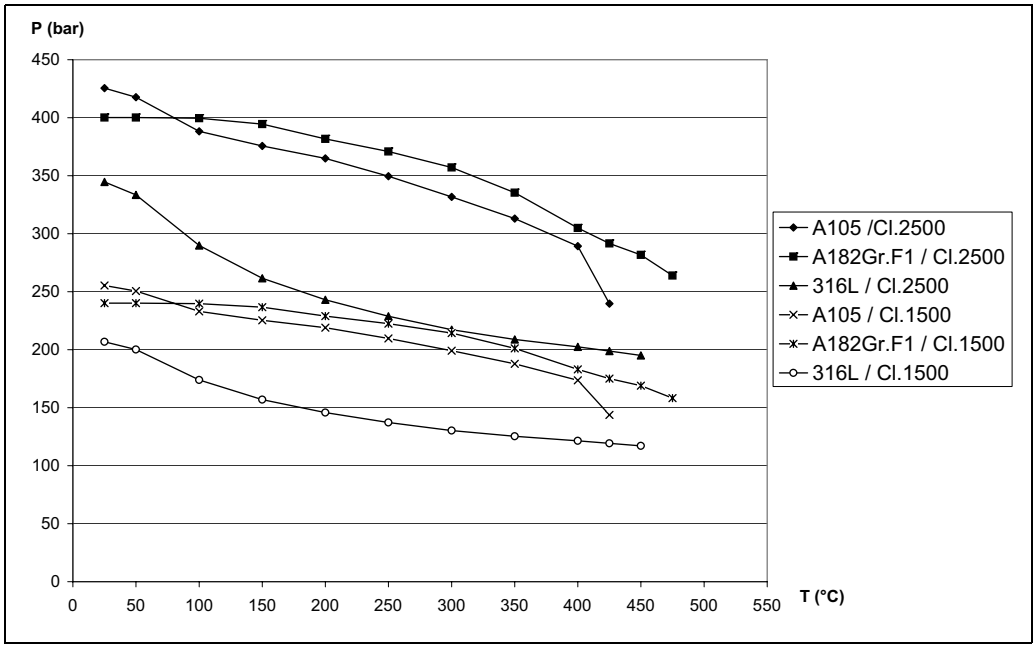
Designation	Short designation	Material code	Max. temperature	Reference
Monel 400	(S-)NiCu 30 Fe	2.4360	790 °F (425 °C)	VdTÜV material data sheet 263
Hastelloy C4	NiMo 16 Cr 16 Ti	2.4610	750 °F (400 °C)	VdTÜV material data sheet 424
Hastelloy C276	NiMo 16 Cr 15 W	2.4819	840 °F (450 °C)	VdTÜV material data sheet 400
Alloy 625	NiCr 22 Mo 9 Nb	2.4856	1650 °F (ca. 900 °C)	Key to steel[1)]
Alloy 825	NiCr 21 Mo	2.4858	840 °F (450 °C)	VdTÜV material data sheet 432

1) Values for forgings: Maximum temperature specification for fatigue strength and 1% creep limit.

Note!
All temperature specifications are only guide values. The temperature limits have to be checked in each case. Depending on the pressure and the medium, they may strongly deviate from these values.

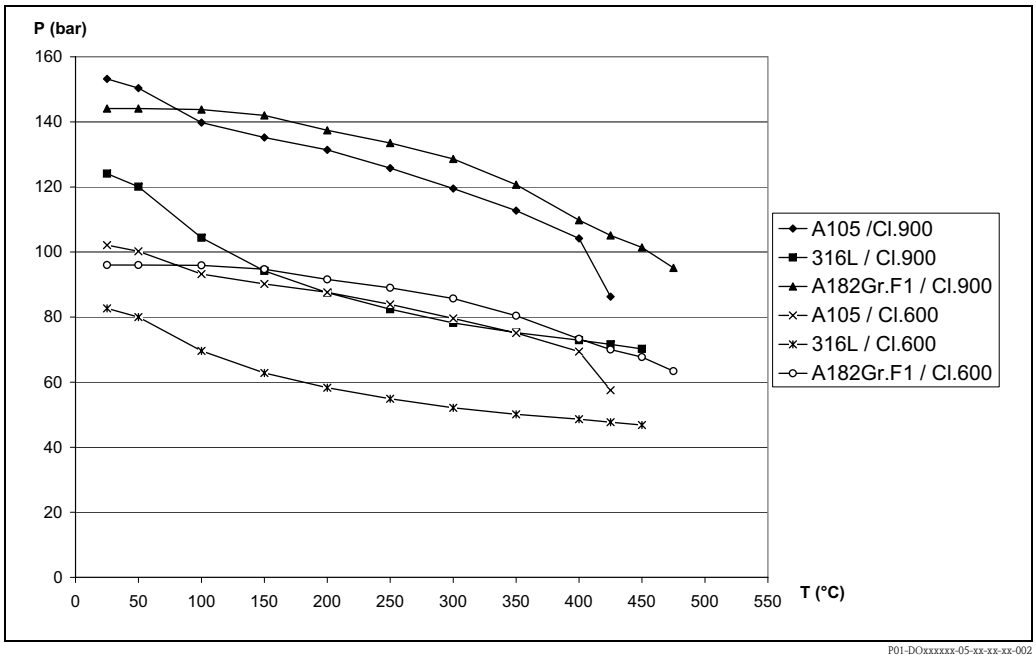
Pressure-temperature curves for flanges according to ANSI B16.5-2003

Cl. 2500 /Cl. 1500



P01-DOxxxxxx-05-xx-xx-xx-003

Cl. 900 / Cl. 600



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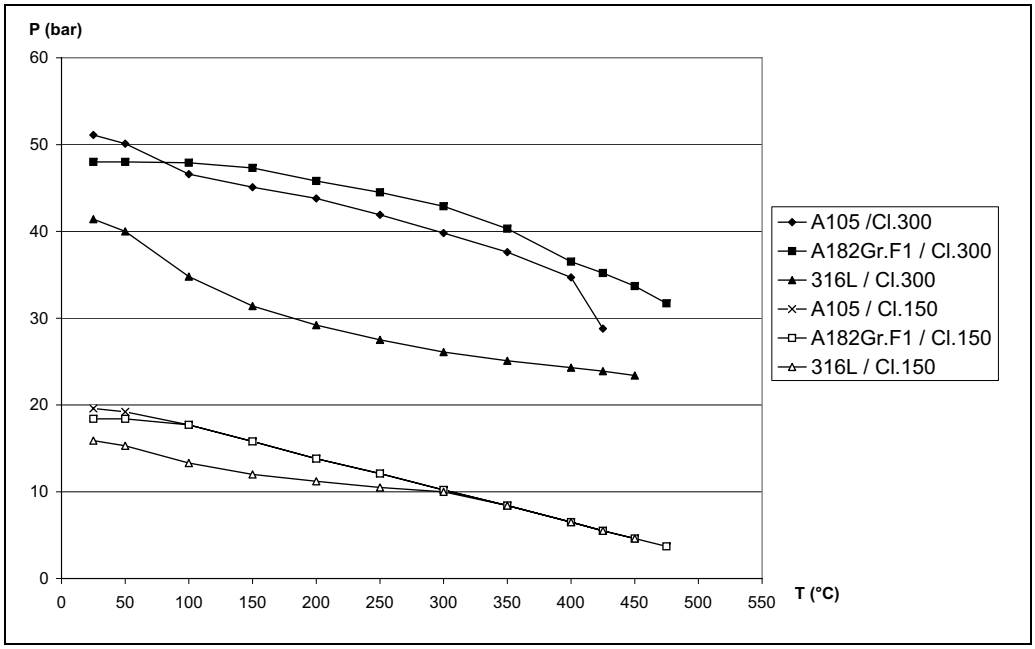
Cl. 300 /Cl. 150



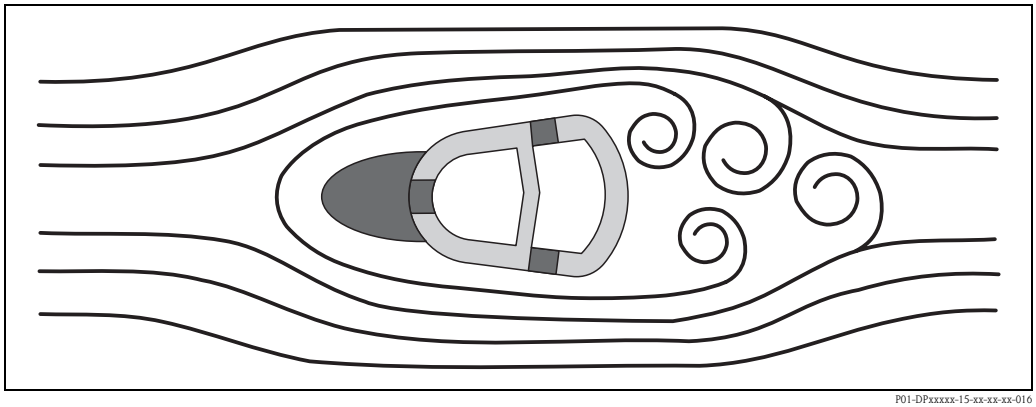
P01-DOxxxxxx-05-xx-xx-xx-001

Note!
The values for 316L refer to the 0.2% yield strength.

Mechanical construction

Probe profile

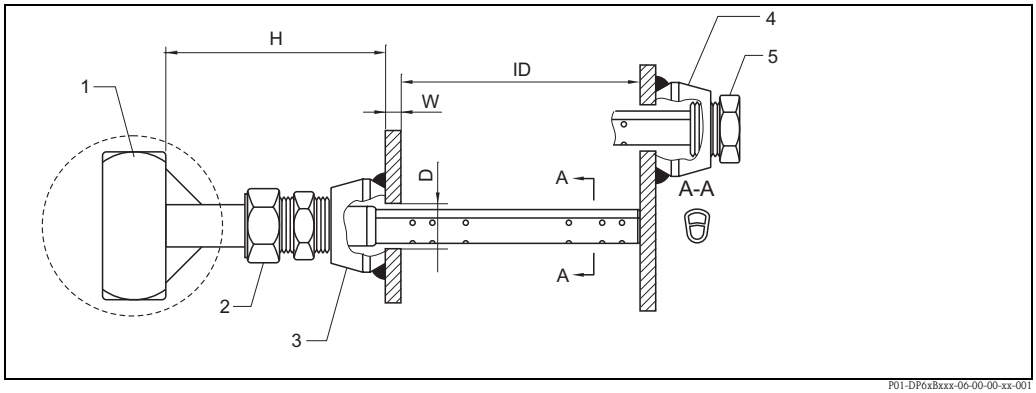
Developed from aerospace technology, the Deltatop averaging Pitot flow sensor provides unsurpassed accuracy and reliability. With its solid one-piece construction and bullet shape, the Deltatop makes flow measurement clog-free and precise. The unique sensor shape reduces drag and flow-induced vibration. The location of the low pressure ports eliminates the potential for clogging, hence improving signal stability.



P01-DPxxxxx-15-xx-xx-xx-016

Design, dimensions

Process connection: "Pipe > cutting ring"



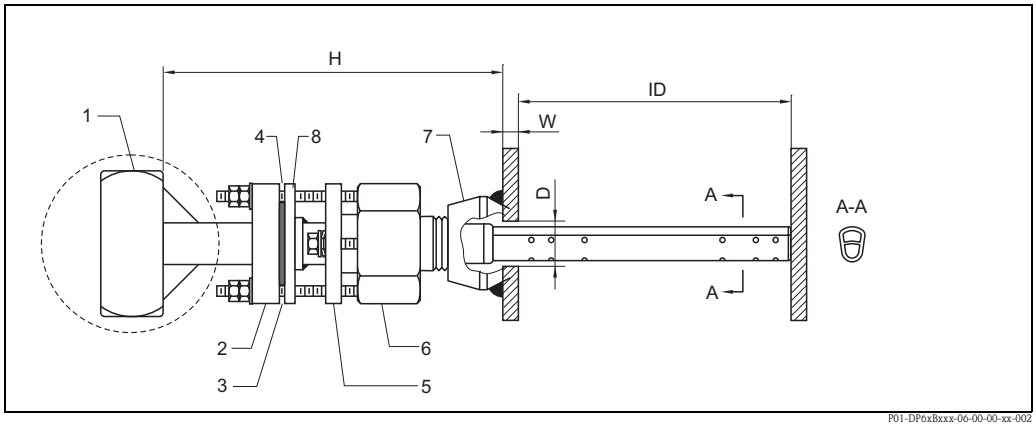
P01-DP6xBxxx-06-00-00-xx-001

1: Device head
2: Tube fitting
3: Welding socket
4: Welding socket for end support (supplied if end support has been selected in the product structure)
5: Plug for end support (supplied if end support has been selected in the product structure)

	DP71B	DP72B	DP73B
ANSI rating	Class 600	Class 300	Not available
Sensor diameter	7/16" (11 mm)	7/8" (22 mm)	
Dim. "D" drilled hole diameter	1/2" (13 mm)	1" (25 mm)	
Tube fitting size	5/8" tube x 3/4" NPT	1" tube x 1" NPT	
Welding socket size	3/4" NPT	1" NPT	
Dim. "H"	4.0" (102 mm)	5.5" (140 mm)	
Pipe size "ID"	2" - 6" (50 mm - 150 mm)	6" - 48" (150 mm - 1200 mm)	

Note!
The wall thickness "W" and the inner diameter "ID" of the pipe have to be specified when ordering a Deltatop measuring system.

Process connection: "Pipe > spring lock"

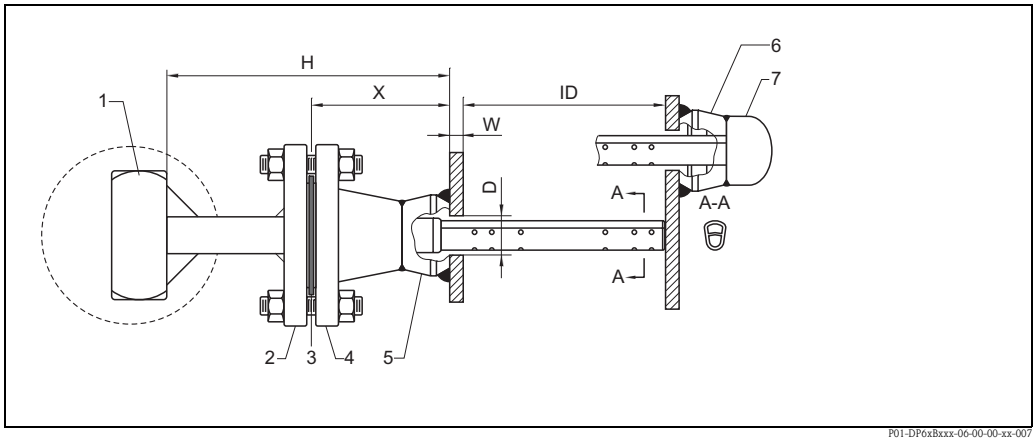


1: Device head
2: Load plate
3: Load springs
4: Visual load indication
5: Packing follower
6: Packing body
7: Welding socket
8: Indication ring

	DP71B	**DP72B**	**DP73B**
ANSI rating	Class 600	Class 600	Class 600
Sensor diameter	7/16" (11 mm)	7/8" (22 mm)	1-3/8" (35 mm)
Dim. "D" drilled hole diameter	1/2" (13 mm)	1" (25 mm)	1-1/2" (39 mm)
Welding socket size	3/4" NPT	1" NPT	2" NPT
Dim. "H"	7.5" (191 mm)	10.2" (259 mm)	11.7" (297 mm)
Pipe size "ID"	2" - 6" (50 mm - 150 mm)	6" - 42" (150 mm - 1050 mm)	12" - 60" 300 mm - 1500 mm

Note!
The wall thickness "W" and the inner diameter "ID" of the pipe have to be specified when ordering a Deltatop measuring system.

Process connection: "ANSI flange"



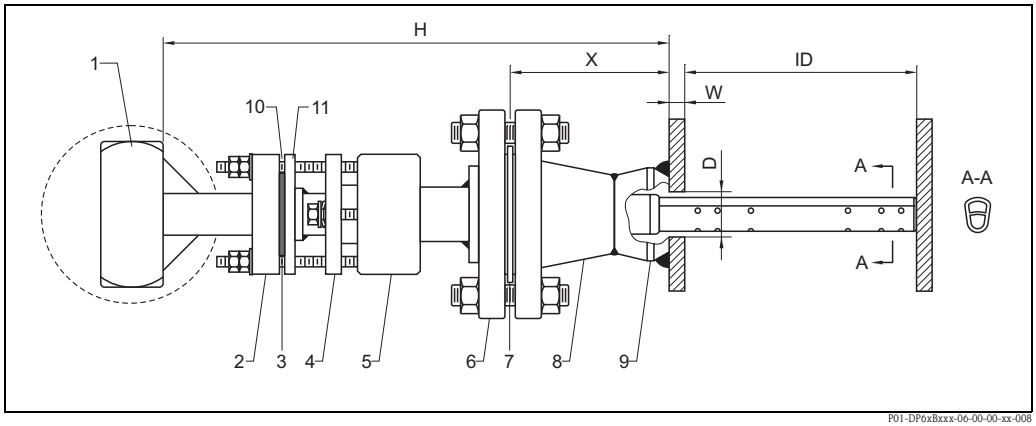
1: Device head
2: Sensor flange
3: Spiral wound gasket
4: Weld neck flange
5: Welding socket
6: Welding socket for end support
7: Weld cap for end support

	DP71B	**DP72B**	**DP73B**
ANSI class[1)]	■ Class 150 ■ Class 300 ■ Class 600	■ Class 150 ■ Class 300 ■ Class 600	■ Class 150 ■ Class 300 ■ Class 600
Sensor diameter	7/16" (11 mm)	7/8" (22 mm)	1-3/8" (35 mm)
Dim. "D" drilled hole diameter	1/2" (13 mm)	1" (25 mm)	1-1/2" (39 mm)
Flange size	1"	1-1/2"	2"
Pipe size "ID"	2" - 6" (50 mm - 150 mm)	6" - 48" (150 mm - 1200 mm)	12" - 192" (300 mm - 5000 mm)
Dim. "X"	■ Class 150: approx. 3.31" (84 mm) ■ Class 300: approx. 3.56" (90 mm) ■ Class 600: approx. 3.81" (97 mm)	■ Class 150: approx. 3.81" (97 mm) ■ Class 300: approx. 4.06" (103 mm) ■ Class 600: approx. 4.38" (111 mm)	■ Class 150: approx. 4.06" (103 mm) ■ Class 300: approx. 4.31" (110 mm) ■ Class 600: approx. 4.69" (119 mm)
Dim. "H"	■ Class 150: approx. 6.7" (150 mm) ■ Class 300: approx. 7.3" (186 mm) ■ Class 600: approx. 7.8" (198 mm)	■ Class 150: approx. 7.9" (200 mm) ■ Class 300: approx. 8.4" (214 mm) ■ Class 600: approx. 9.1" (230 mm)	■ Class 150: approx. 9.3" (235 mm) ■ Class 300: approx. 9.8" (249 mm) ■ Class 600: approx. 10.6" (268 mm)

1) Classes 1500 and 2500 on request

Note!
The wall thickness "W" and the inner diameter "ID" of the pipe have to be specified when ordering a Deltatop measuring system.

Process connection: "Spring lock + flange"

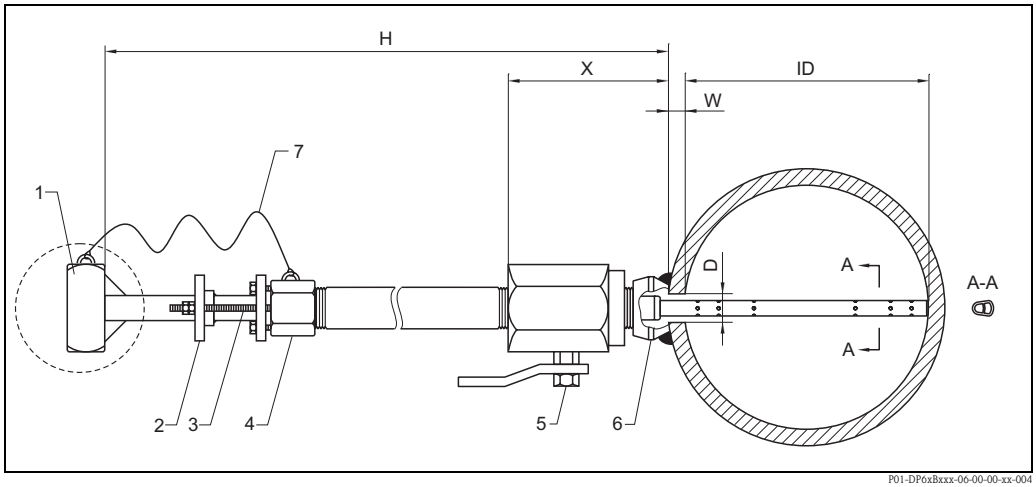


1: Device head
2: Load plate
3: Load springs
4: Packing follower
5: Safety spring lock packing body
6: Sensor flange
7: Spiral-wound gasket
8: Weld neck flange
9: Welding socket
10: Visual load indication
11: Indication ring

	DP71B	**DP72B**	**DP73B**
ANSI class	■ Class 150 ■ Class 300 ■ Class 600	■ Class 150 ■ Class 300 ■ Class 600	■ Class 150 ■ Class 300 ■ Class 600
Sensor diameter	7/16" (11 mm)	7/8" (22 mm)	1-3/8" (35 mm)
Dim. "D" drilled hole diameter	1/2" (13 mm)	1" (25 mm)	1-1/2" (39 mm)
Flange and welding socket size	1"	1-1/2"	2"
Pipe size "ID"	2" - 6" (50 mm - 150 mm)	6" - 42" (150 mm - 1050 mm)	12" - 60" (300 mm - 1500 mm)
Dim. "X"	■ Class 300: approx. 3.56" (90 mm) ■ Class 600: approx. 3.81" (97 mm)	■ Class 150: approx. 3.81" (97 mm) ■ Class 300: approx. 4.06" (103 mm) ■ Class 600: approx. 4.38" (111 mm)	■ Class 150: approx. 4.06" (103 mm) ■ Class 300: approx. 4.31" (110 mm) ■ Class 600: approx. 4.69" (119 mm)
Dim. "H"	■ Class 300: approx. 12.0" (305 mm) ■ Class 600: approx. 12.5" (317 mm)	■ Class 150: approx. 14.5" (368 mm) ■ Class 300: approx. 15.1" (383 mm) ■ Class 600: approx. 15.7" (399 mm)	■ Class 150: approx. 16.8" (427 mm) ■ Class 300: approx. 17.4" (441 mm) ■ Class 600: approx. 18.1" (460 mm)

Note!
The wall thickness "W" and the inner diameter "ID" of the pipe have to be specified when ordering a Deltatop measuring system.

Process connection: "Flowtap + safety cable"

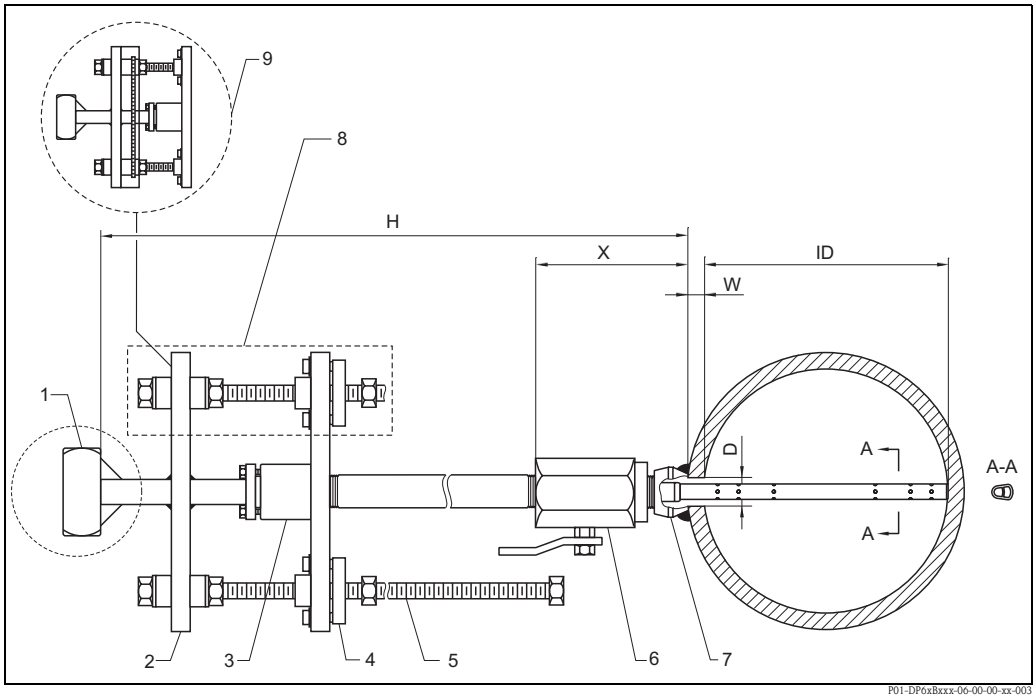


Device head and access valve orientation shown 90 degrees from actual orientation for clarity.
1: Device head
2: Retaining ring
3: Studs and nuts
4: Packing glands
5: Access valve
6: Welding socket
7: Safety cable

	DP71B	DP72B	DP73B
Max. pressure rating		30 psi (2.1 bar)	10 psi (0.7 bar)
Sensor diameter	Not available	7/8" (22 mm)	1-3/8" (35 mm)
Dim. "D" drilled hole diameter		1" (25 mm)	1-1/2" (39 mm)
Welding socket size		1-1/4" NPT	2" NPT
Pipe size "ID"		6" - 42" (150 mm - 1050 mm)	12" - 60" (300 mm - 1500 mm)
Dim. "X" (valve)		■ For steel: approx. 7.7" (196 mm) ■ For 316SS approx. 7.7" (196 mm)	■ For steel: approx. 10.1" (257 mm) ■ For 316SS approx. 8.8" (224 mm)
Dim. "H" - inserted		H=ID+W+X+11.7" (279 mm)	H=ID+W+X+13.5" (343 mm)
Dim. "H" - retracted		H=2(ID+W+X)+11.5" (292 mm)	H=2(ID+W+X)+13.2" (335 mm)

Note!
The wall thickness "W" and the inner diameter "ID" of the pipe have to be specified when ordering a Deltatop measuring system.

Process connection: "Flowtap" (single drive/double drive)

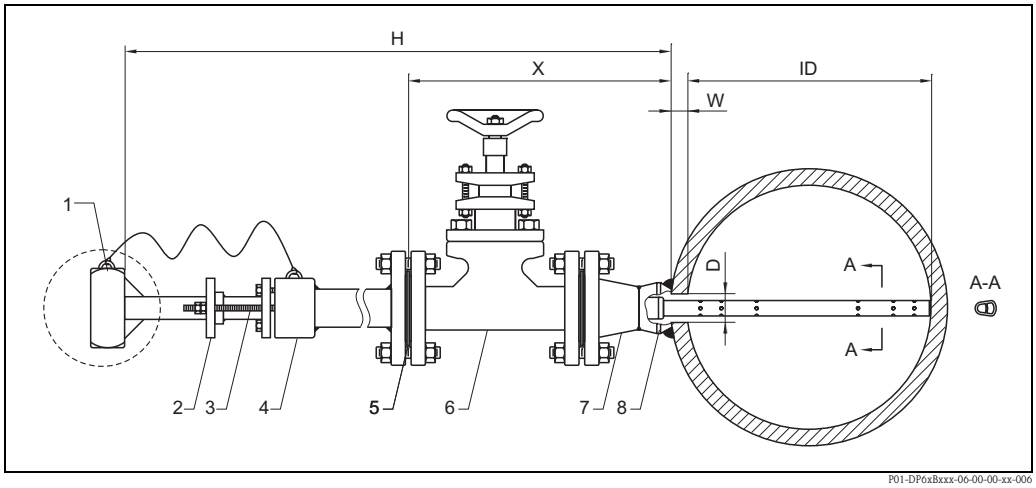


Device head and access valve orientation shown 90 degrees from actual orientation for clarity.
1: Device head
2: Sensor plate
3: Packing gland
4: Anti-seize orbital bearing
5: Screw drive (threaded rod)
6: Access valve
7: Welding socket
8: Optional second drive rod (option for DP62B and DP63B)
9: Optional syncro drive

	DP71B	**DP72B**	**DP73B**
Pressure rating	1000psi @ 100 °F (69 bar @ 38 °C) 100psi @ 400 °F (6.9 bar @ 204 °C)		
Sensor diameter	7/16" (11 mm)	7/8" (22 mm)	1-3/8" (35 mm)
Dim. "D" drilled hole diameter	1/2" (13 mm)	1" (25 mm)	1-1/2" (39 mm)
Welding socket size	3/4" NPT	1-1/4" NPT	2" NPT
Pipe size "ID"	2" - 6" (50 mm - 150 mm)	6" - 42" (150 mm - 1050 mm)	12" - 60" (300 mm - 1500 mm)
Dim. "X" (valve)	■ For steel: approx. 6.2" (157 mm) ■ For 316SS: approx. 6.0" (152 mm)	■ For steel: approx. 7.6" (193 mm) ■ For 316SS: approx. 7.7" (196 mm)	■ For steel: approx. 9.1" (231 mm) ■ For 316SS: approx. 9.1" (231 mm)
Dim. "H" - inserted	H=ID+W+X+10.2" (260 mm)	H=ID+W+X+11.6" (295 mm)	H=ID+W+X+13.6" (345 mm)
Dim. "H" - retracted	H=2(ID+W+X)+10.1" (257 mm)	H=2(ID+W+X)+11.4" (290 mm) add 1.5" for syncro drive	H=2(ID+W+X)+13.3" (338 mm) add 1.75" for syncro drive

Note!
The wall thickness "W" and the inner diameter "ID" of the pipe have to be specified when ordering a Deltatop measuring system.

Process connection: "Flowtap + flange + safety cable"

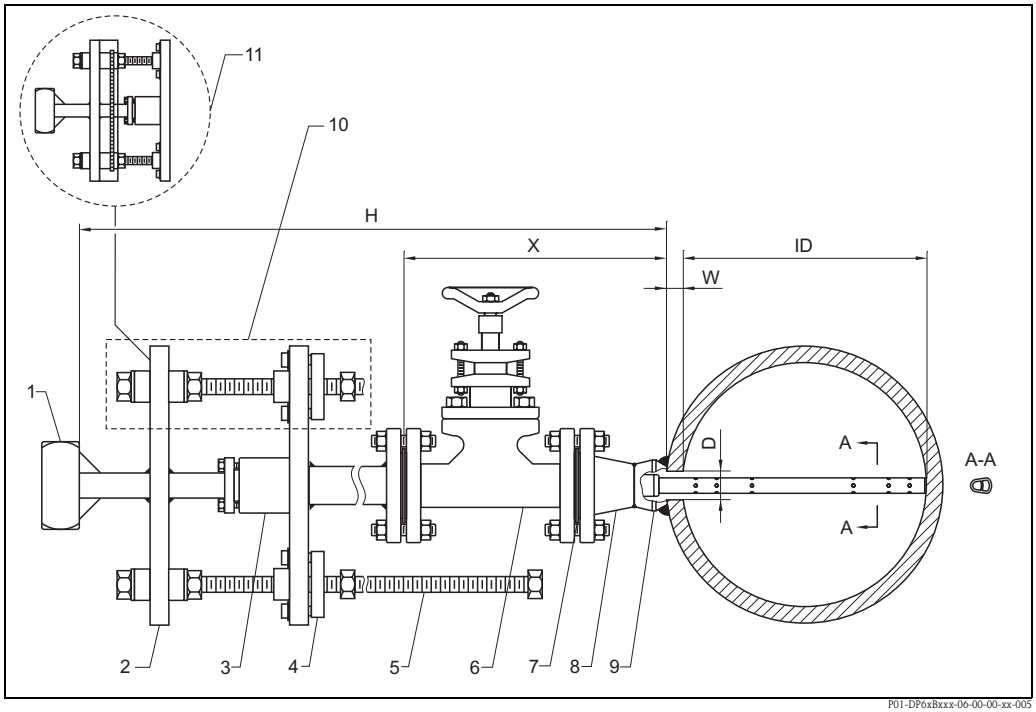


Device head and access valve orientation shown 90 degrees from actual orientation for clarity.
1: Device head
2: Retaining ring
3: Studs and nuts
4: Packing gland
5: Spiral wound gasket (2)
6: Flanged access valve
7: Weld neck flange
8: Welding socket

	DP71B	DP72B	DP73B
Max. pressure rating	Not available	30 psi (2.1 bar)	10 psi (0.7 bar)
Sensor diameter		7/8" (22 mm)	1-3/8" (35 mm)
Dim. "D" drilled hole diameter		1" (25 mm)	1-1/2" (39 mm)
Flange size		1-1/2" NPT	2" NPT
Pipe size "ID"		6" - 42" (150 mm - 1050 mm)	12" - 60" (300 mm - 1500 mm)
Dim. "X" (flange face to outer pipe wall)		10.5" (267 mm)	11.25" (286 mm)
Dim. "H" - inserted		H=ID+W+X+12.6" (320 mm)	H=ID+W+X+14.4" (366 mm)
Dim. "H" - retracted		H=2(ID+W+X)+13.2" (335 mm)	H=2(ID+W+X)+15.0" (381 mm)

Note!
The wall thickness "W" and the inner diameter "ID" of the pipe have to be specified when ordering a Deltatop measuring system.

Process connection: "Flowtap + flange" (single drive/double drive)



Device head and access valve orientation shown 90 degrees from actual orientation for clarity.
1: Device head
2: Sensor plate
3: Packing gland
4: Anti-seize orbital bearing
5: Drive rod
6: Flanged access valve
7: Spiral wound gasket (2)
8: Weld neck flange
9: Welding socket
10: Optional second drive rod (option for DP72B and DP73B)
11: Optional syncro drive

	DP71B	**DP72B**	**DP73B**
Pressure rating	■ Single spindle: ANSI Class 600	■ Single spindle: ANSI Class 150 ■ Double spindle: ANSI Class 600	■ Single spindle: ANSI Class 150 ■ Double spindle: ANSI Class 600
Sensor diameter	7/16" (11 mm)	7/8" (22 mm)	1-3/8" (35 mm)
Dim. "D" drilled hole diameter	1/2" (13 mm)	1" (25 mm)	1-1/2" (39 mm)
Flange size	1/2"	1"	1-1/2"
Pipe size "ID"	2" - 6" (50 mm - 150 mm)	6" - 42" (150 mm - 1050 mm)	12" - 60" (300 mm - 1500 mm)
Dim. "X" (flange face to outer pipe wall)	12.5" (318 mm)	■ ANSI Class 150: approx. 10.5" (267 mm) ■ ANSI Class 600: approx. 14.06" (357 mm)	■ ANSI Class 150: approx. 10.25" (286 mm) ■ ANSI Class 600: approx. 16.38" (416 mm)
Dim. "H" - inserted	H=ID+W+X+11.0" (279 mm)	H=ID+W+X+12.5" (318 mm)	H=ID+W+X+14.5" (368 mm)
Dim. "H" - retracted	H=2(ID+W+X)+11.6" (294 mm)	H=2(ID+W+X)+13.1" (333 mm) add 1.5" for syncro drive	H=2(ID+W+X)+15.1" (384 mm) add 1.75" for syncro drive

Note!
The wall thickness "W" and the inner diameter "ID" of the pipe have to be specified when ordering a Deltatop measuring system.

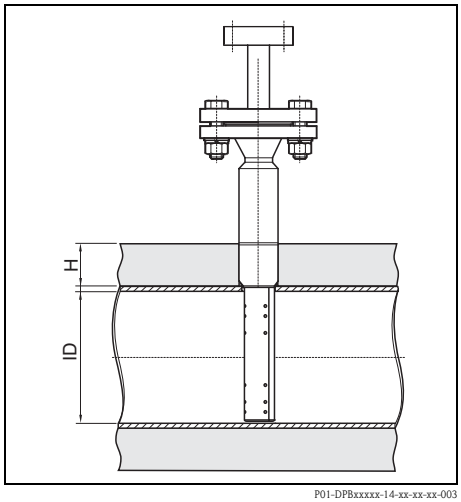
Process connection, mounting nozzle

The features 40 ("Process connection") and 70 ("Welding socket") of the product structure must always be selected in a suitable combination:

Process connection, mounting nozzle	Pressure rating	Feature 40 "Process connection"	Feature 70 "Welding socket"
Standard versions			
Welding socket	300# to 600#	A**	A**
Spring lock	600#	A**	A**
Flange connection	150# to 2500#	G**	G**
Flange connection and spring lock	150# to 600#	P**	P**
Flowtap version for exchanging the Pitot tube during ongoing operation			
Flowtap with safety chain	10psi to 30psi	R**	R**
Flowtap with spindle	150# to 600#	R**	R**
Flowtap with flange and spindle	150# to 600#	R**	R**

Extension welding socket

With insulated pipes, the length of the welding socket must be increased by the thickness H of the insulating layer. Therefore, this thickness must be specified on the "Sizing sheet - data sheet" (→ 49). The material of the mounting nozzle extension must be specified in the product structure (feature 80).
The following lengths are available for the extension of the mounting nozzle:
- 2" (50 mm)
- 4" (100 mm)
- 5" (127 mm)
- 6" (152.4 mm)



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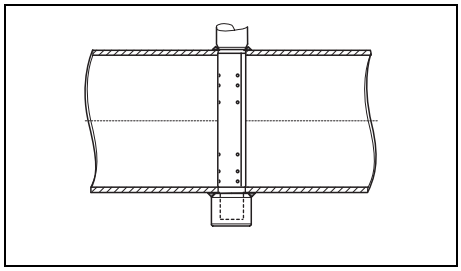
ID: *Inner pipe diameter;*
H: *Thickness of the insulating layer*

End support

For Pitot tubes, an end support can optionally be applied (e.g. for large flow velocities).
The probe length to be specified is always the inner pipe diameter plus one time the wall thickness. The additional length required for the end support is taken into account by Endress+Hauser



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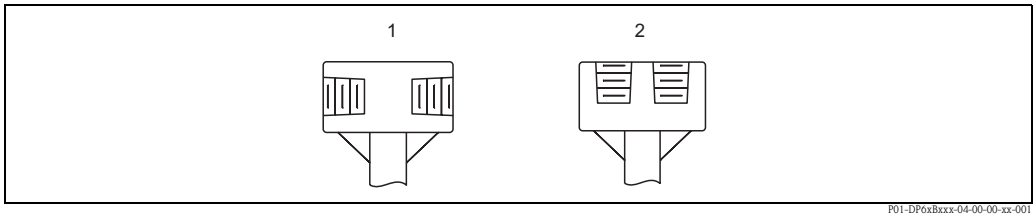
Differential pressure connection

Differential pressure connection for the remote version (FNPT 1/2")

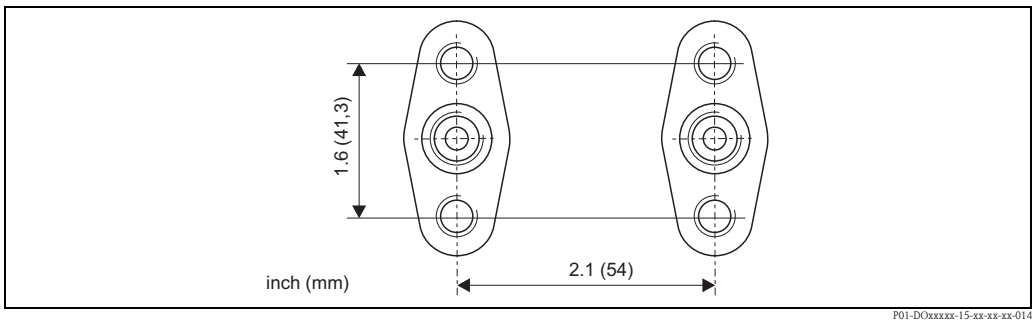
For the remote version, the following connections are available for the impulse line between the individual components (remark: simple mounting; not suited for steam):



1: FNPT 1/2"
2: FNPT 1/2", parallel

Note!
The differential pressure connection is selected in feature 100 of the product structure.

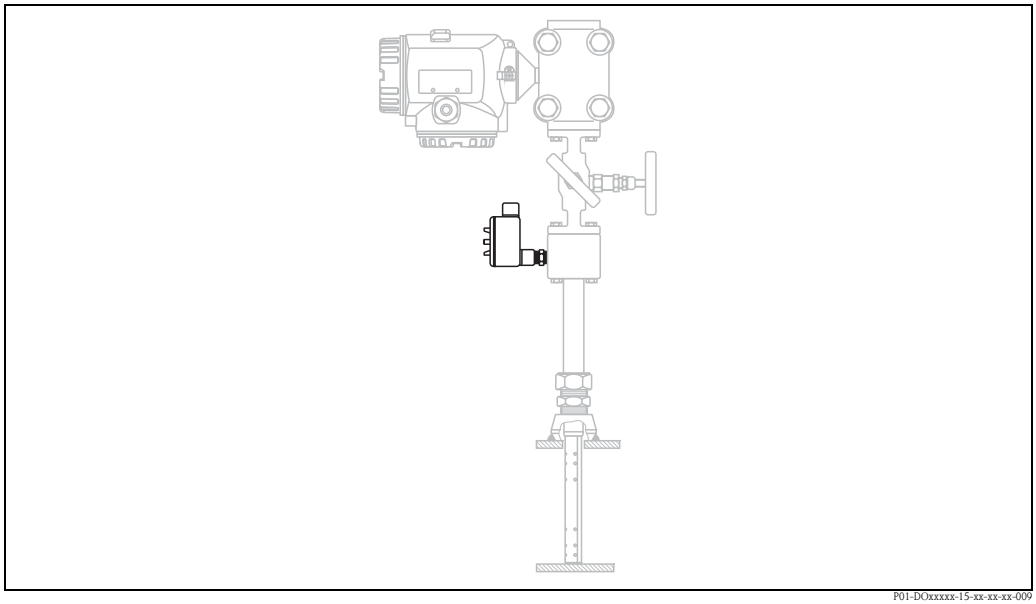
Differential pressure connection for the compact version (IEC61518)



Standard connection for differential pressure transmitter (oval flanges or flange plate); dimensions in mm (inch)

Note!
The differential pressure connection is selected in feature 100 of the product structure.

Integrated temperature sensor



P01-DOxxxxx-15-xx-xx-xx-009

- For Pitot tubes:
  – DP72B
  – DP73B
- The resistance thermometer Pt100 is fixed within the probe profile. The protective tube which is formed by the two partition walls between the probe chambers protects it against damage. It is not in contact with the medium.
- Material of the sensor: 1.4571 (SS316TI)
  Robust and resistant to vibrations
- Rapid installation and removal possible under operating pressure
- Measuring range: -328 °F to +1112 °F
  (-200 °C to +600 °C)
- Probe head made of aluminum
- Output signal:
  – Pt100, 3-wire connection

Note!
The integrated temperature sensor can be applied for pressure ratings up to Class 300/PN40.

Overview of the product structures

Feature	Name	Description	Valid for		
			DP71B	DP72B	DP73B
Primary element					
10	Application; Version	■ Application: "Gas", "Liquid" or "Steam" ■ Version: "remote" or "compact" See chapter "Mounting positions" (→ 10).	x	x	x
20	Pipe; Orientation	■ Pipe: "Horizontal", "Vertical" ■ Orientation: – "left", "right", "top/bottom" for horizontal pipes – "upwards", "downwards", "upwards/downwards" for vertical pipes See chapter "Mounting positions" (→ 10).	x	x	x
40	Process connection	Defines the size, type and material of the process connection: ■ Pipe > cutting ring (→ 16) ■ Pipe > spring lock (→ 17) ■ Flowtap (single drive / double drive) (→ 21) ■ Flowtap + safety cable (→ 20) ■ Flowtap + flange (single drive / double drive) (→ 23) ■ Flowtap + flange + safety cable (→ 22) ■ ANSI flange (→ 18) ■ Spring lock + flange (→ 19) For the temperature limits of the materials → 13.	x	x	x
60	Probe length	Defines the length of the probe in mm. The probe length is the sum of the inner pipe diameter plus the wall thickness of the pipe.	x	x	x
70	Welding socket	Defines the type, size, pressure rating and material of the mounting nozzle. The selection must match the selected process connection (feature 40). For the temperature limits of the materials → 13.	x	x	x
80	Extension welding socket	Defines the length and material of the mounting nozzle extension. The extension of the mounting nozzle is required for insulated pipes (→ 24). Possible lengths: 1.97" (50 mm), 3.94" (100 mm), 4.33" (110 mm), 4.72" (120 mm), 5.12" (130 mm), etc. Note! The selected material must match the selection in feature 70 "Welding socket". Note! "Not selected" means that no mounting nozzle extension is required 0" (= 0 mm).	x	x	x
90	End support	Defines the material of the end support (→ 24). Note! "Not selected" means that the order does not contain an end support.	x	x	x
100	Diff pressure connection; Seal	Defines: ■ The type of differential pressure connection (→ 25) ■ The material of the seal at the differential pressure connection	x	x	x
110	Temperature sensor Pt100	Selection of the temperature sensor if needed. For details → 26. Note! "Not selected" means that no temperature sensor is integrated.		x	x

Feature	Name	Description	valid for		
			DP71B	DP72B	DP73B
Accessory: Condensate chamber on request					
200	2x condens. chamber mat.; volume; PN	Defines: ■ The material of the condensate chambers ■ The volume of the condensate chambers ■ The pressure rating of the condensate chambers ✎ Note! If "not selected" is chosen, no condensate chambers are included in the order. In this case "not needed" has to be selected in features 210 to 230.	x	x	x
210	Filling cap condens. chamber	Defines the type of filling cap.	x	x	x
220	Inlet condens. chamber	Defines the inlet (from the process) of the condensate chamber.	x	x	x
230	Outlet condens. chamber	Defines the outlet of the condensate chamber.	x	x	x
Accessory: Shut-off valve					
250	2 x shut-off valve	Defines: ■ The type of shut-off valve ■ The material of the gasket For details → 🖹 41. ✎ Note! If "not selected" is chosen, no shut-off valves are included in the order. In this case "not needed" has to be selected in features 260 to 280.	x	x	x
260	Material shut-off valve	Defines the material of the shut-off valve. For the temperature limits of the materials → 🖹 13.	x	x	x
270	Inlet shut-off valve	Defines the inlet (from the process) of the shut-off valve.	x	x	x
280	Outlet shut-off valve	Defines the outlet of the shut-off valve.	x	x	x
Accessory: Manifold					
300	Manifold version	Defines the manifold version (→ 🖹 42). ✎ Note! If "not selected" is chosen, no manifold is included in the order. In this case "not needed" has to be selected in features 310 to 330.	x	x	x
310	Gasket manifold	Defines the material of the gasket of the manifold. For the temperature limits of the materials → 🖹 13.	x	x	x
320	Process connection manifold	Defines the process connection of the manifold.	x	x	x
330	Seal manifold, screws	Defines: ■ The material of the seal between the manifold and the transmitter ■ The size of the manifold screws For the temperature limits of the materials → 🖹 13. ☝ Caution! The manifold screws must be selected in accordance with the Deltabar differential pressure transmitter.	x	x	x
Differential pressure transmitter					
450	DP transmitter Deltabar	Defines if a Deltabar differential pressure transmitter is provided separately.	x	x	x
Additional options					
500	Add. option Pitot tube	These features are used to define additional characteristics of the respective components (e.g. material inspection certificates). The features are optional, which means: ■ It is not necessary to select an option in these features. ■ Multiple options can be selected in these features.	x	x	x
510	Add. option temperature sensor			x	x
520	Add. option condensate chamber		x	x	x
530	Add. option shut-off valve		x	x	x
540	Add. option manifold		x	x	x
550	Add. option general		x	x	x
895	Marking	Selection of customer-specific device labeling.	x	x	x

Ordering information

Product structure
Deltatop DP71B

10	Application; Version
B	Gas; remote
D	Liquid; remote
F	Steam; remote
Y	Special version, to be specified

20	Pipe; Orientation
D	Horizontal; top/bottom
W	Vertical; upwards/downwards
Y	Special version, to be specified

40	Process connection
	Tube
AGC	Tube > cutting ring, Cl. 600, 316
ALC	Tube > spring lock, Cl. 600, 316
	ANSI flanges
GAC	1" Cl.150 RF, 316
GBC	1" Cl.300 RF, 316
GCC	1" Cl.600 RF, 316
GEC	1" Cl.1500 RF, 316
GFC	1" Cl.2500 RF, 316
	Spring lock
PGC	1" Cl. 150 RF, 316, spring lock
PHC	1" Cl.300 RF, 316, spring lock
PIC	1" Cl.600 RF, 316, spring lock
	Flowtap
RCC	Flowtap Cl.600, 316 + single spindle
ROC	Flowtap Cl.600, 316 + flange + single spindle
Y99	Special version, to be specified

60	Probe length (pipe ID + wall thickness)
A4	... mm 316
J4	... mm 316, flowtap Cl.600
R4	... inch 316
V4	... inch 316, flowtap Cl.600
Y9	Special version, to be specified

70	Welding socket
	Cutting ring
AQA	Cutting ring, Cl.600, steel
AQC	Cutting ring, Cl.600, 316
	ANSI flanges
GAA	1" Cl.150 RF, steel
GAC	1" Cl.150 RF, 316
GBA	1" Cl.300 RF, steel
GBC	1" Cl.300 RF, 316
GCA	1" Cl.600 RF, steel
GCC	1" Cl.600 RF, 316
GEA	1" Cl.1500 RF, steel
GEC	1" Cl.1500 RF, 316
GFA	1" Cl.2500 RF, steel
GFC	1" Cl.2500 RF, 316
	Spring lock
PCA	Cl.600, steel, spring lock
PCC	Cl.600, 316, spring lock
	Flowtap
RCA	Flowtap Cl.600, steel + single spindle
RCC	Flowtap Cl.600, 316 + single spindle
ROA	Flowtap Cl.600, steel + flange + single spindle
ROC	Flowtap Cl.600, 316 + flange + single spindle
	Miscellaneous
XAX	Not selected
Y99	Special version, to be specified

80	Extension welding socket
A	... mm, carbon steel
D	... mm, 316
K	... inch, carbon steel

80	Extension welding socket
L	... inch, 316
1	Not selected
9	Special version, to be specified

90	End support
A	Carbon steel
D	316
S	Carbon steel, high pressure > Cl.600
T	316, high pressure > Cl.600
1	Not selected
2	Prepared for end support
9	Special version, to be specified

100	Diff. pressure connection; Seal
1	FNPT1/2; w/o
2	FNPT1/2; w/o, parallel
Y	Special version, to be specified

200	2x condens. chamber mat.; Volume; PN
1	Not selected
9	Special version, to be specified

210	Filling cap condens. chamber
A	Not needed
Y	Special version, to be specified

220	Inlet condens. chamber
A	Not needed
Y	Special version, to be specified

230	Outlet condens. chamber
A	Not needed
Y	Special version, to be specified

250	2x shut-off valve
1	Not selected
6	Valve; PTFE gasket, 392°F (200°C)
8	Valve; pure graphite gasket, 572°F (300°C)
9	Special version, to be specified

260	Material shut-off valve
A	Not needed
E	316
Y	Special version, to be specified

270	Inlet shut-off valve
A	Not needed
D	FNPT1/2
U	Integral
Y	Special version, to be specified

280	Outlet shut-off valve
A	Not needed
C	FNPT1/2
Y	Special version, to be specified

300	Manifold version
111	Not selected
AB2	3 valve, 316L, milled
BB2	5 valve, 316L, milled, vent
YY9	Special version, to be specified

310	Gasket manifold
A	Not needed
B	PTFE, 200 °C
D	Graphite / Graphoil
Y	Special version, to be specified

320	Process connection manifold
A	Not needed
B	FNPT1/2
Y	Special version, to be specified

330	Seal manifold; Screws
A	Not needed
B	PTFE; UNF7/16, max 420 bar
D	Viton; UNF7/16, max 420 bar
K	Graphite; UNF7/16, max 420 bar
Y	Special version, to be specified

450	DP transmitter Deltabar
D	Provided, sep. item
W	Not provided

500	Add. option Pitot tube (optional; multiple options can be selected)
A1	EN10204-3.1 material (wetted parts) inspection certificate
A2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate
A5	Cleaned from oil+grease
A6	Oxygen service

520	Add. option condensate chamber (optional; multiple options can be selected)
C1	EN10204-3.1 material (wetted parts) inspection certificate
C2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate

530	Add. option shut-off valve (optional; multiple options can be selected)
D1	EN10204-3.1 material (wetted parts) inspection certificate
D2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate
D5	Cleaned from oil+grease
D6	Oxygen service

540	Add. option manifold (optional; multiple options can be selected)
E1	EN10204-3.1 material (wetted parts) inspection certificate
E2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate
E5	Cleaned from oil+grease
E6	Oxygen service

550	Add. option general (optional; multiple options can be selected)
F8	Pressure test + certificate

895	Marking
Z1	Tagging (TAG), see additional spec.

Product structure
Deltatop DP72B

10	Application; Version
B	Gas; remote
C	Gas; compact
D	Liquid; remote
E	Liquid; compact
F	Steam; remote
G	Steam; compact
Y	Special version, to be specified

20	Pipe; Orientation
B	Horizontal; left
C	Horizontal; right
D	Horizontal; top/bottom
U	Vertical; downwards
V	Vertical; upwards
W	Vertical; upwards/downwards
Y	Special version, to be specified

40	Process connection
	Tube
AFC	Tube > cutting ring, Cl.300, 316
ALC	Tube > spring lock, Cl.600, 316
	ANSI flanges
GNC	1-1/2" Cl.150 RF, 316
GPC	1-1/2" Cl.300 RF, 316
GQC	1-1/2" Cl.600 RF, 316
GSC	1-1/2" Cl.1500 RF, 316
GTC	1-1/2" Cl.2500 RF, 316
	Spring lock
PMC	1-1/2" Cl.150 RF, 316, spring lock
PNC	1-1/2" Cl.300 RF, 316, spring lock
POC	1-1/2" Cl.600 RF, 316, spring lock
	Flowtap
RAC	Flowtap Cl.150, 316 + single spindle
RIC	Flowtap Cl.600, 316 + double spindle
RMC	Flowtap Cl.150, 316 + flange + single spindle
RUC	Flowtap Cl.600, 316 + flange + double spindle
ROC	Flowtap 30psi, 316 + safety cable
R2C	Flowtap 30psi, 316 + flange + safety cable
Y99	Special version, to be specified

60	Probe length (pipe ID + wall thickness)
A4	... mm 316
L4	... mm 316, flowtap 30psi
M4	... mm 316, flowtap Cl.150
N4	... mm 316, flowtap Cl.600
R4	... inch 316
S4	... inch 316, flowtap 30psi
T4	... inch 316, flowtap Cl.150
V4	... inch 316, flowtap Cl.600
Y9	Special version, to be specified

70	Welding socket
	Cutting ring
APA	Cutting ring, Cl.300, steel
APC	Cutting ring, Cl.300, 316
	ANSI flanges
GNA	1-1/2" Cl.150 RF, steel
GNC	1-1/2" Cl.150 RF, 316
GPA	1-1/2" Cl.300 RF, steel
GPC	1-1/2" Cl.300 RF, 316
GQA	1-1/2" Cl.600 RF, steel
GQC	1-1/2" Cl.600 RF, 316
GSA	1-1/2" Cl.1500 RF, steel
GSC	1-1/2" Cl.1500 RF, 316
GTA	1-1/2" Cl.2500 RF, steel
GTC	1-1/2" Cl.2500 RF, 316
	Spring lock
PCA	Cl.600, steel, spring lock
PCC	Cl.600, 316, spring lock

70	Welding socket
	Flowtap
RAA	Flowtap Cl.150, steel + single spindle
RAC	Flowtap Cl.150, 316 + single spindle
RIA	Flowtap Cl.600, steel + double spindle
RIC	Flowtap Cl.600, 316 + double spindle
RMA	Flowtap Cl.150, steel + flange + single spindle
RMC	Flowtap Cl.150, 316 + flange + single spindle
RUA	Flowtap Cl.600, steel + flange + double spindle
RUC	Flowtap Cl.600, 316 + flange + double spindle
R0A	Flowtap 30psi, steel + safety cable
R0C	Flowtap 30psi, 316 + safety cable
R2A	Flowtap 30psi, steel + flange + safety cable
R2C	Flowtap 30psi, 316 + flange + safety cable
	Miscellaneous
XAX	Not selected
Y99	Special version, to be specified

80	Extension welding socket
A	... mm, carbon steel
D	... mm, 316
K	... inch, carbon steel
L	... inch, 316
1	Not selected
9	Special version, to be specified

90	End support
A	Carbon steel
D	316
S	Carbon steel, high pressure > Cl.600
T	316, high pressure > Cl.600
1	Not selected
2	Prepared for end support
9	Special version, to be specified

100	Diff. pressure connection; Seal
B	IEC61518; PTFE
C	IEC61518; FKM
F	IEC61518; graphite
1	FNPT1/2; w/o
2	FNPT1/2; w/o, parallel
Y	Special version, to be specified

110	Temperature sensor Pt100
A	Not selected
F	Terminal block 3-wire, max 425°C
Y	Special version, to be specified

200	2x condens. chamber mat.; Volume; Pn
1	Not selected
9	Special version, to be specified

210	Filling cap condens. chamber
A	Not needed
Y	Special version, to be specified

220	Inlet condens. chamber
A	Not needed
Y	Special version, to be specified

230	Outlet condens. chamber
A	Not needed
Y	Special version, to be specified

250	2x shut-off valve
1	Not selected
6	Valve; PTFE gasket, 392°F (200°C)
8	Valve; pure graphite gasket, 572°F (300°C)
9	Special version, to be specified

260	Material shut-off valve
A	Not needed
E	316

260	Material shut-off valve
Y	Special version, to be specified

270	Inlet shut-off valve
A	Not needed
D	FNPT 1/2
U	Integral
Y	Special version, to be specified

280	Outlet shut-off valve
A	Not needed
C	FNPT1/2
Y	Special version, to be specified

300	Manifold version
111	Not selected
AB2	3 valve, 316L, milled
BB2	5 valve, 316L, milled, vent
HA2	3 valve, 316L, integral, IEC61518
KA2	3 valve, 316L, forging, IEC61518, both sides
LA2	5 valve, 316L, forging, IEC61518, both sides, vent
YY9	Special version, to be specified

310	Gasket manifold
A	Not needed
B	PTFE, 200 °C
D	Graphite / Graphoil
Y	Special version, to be specified

320	Process connection manifold
A	Not needed
B	FNPT1/2
E	IEC61518
Y	Special version, to be specified

330	Seal manifold; Screws
A	Not needed
B	PTFE; UNF7/16, max 420bar
D	Viton; UNF7/16, max 420bar
K	Graphite; UNF7/16, max 420bar
Y	Special version, to be specified

450	DP transmitter Deltabar
D	Provided, sep. item
W	Not provided

500	Add. option Pitot tube (optional; multiple options can be selected)
AA	Syncro drive, flowtap + double spindle
A1	EN10204-3.1 material (wetted parts) inspection certificate
A2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate
A5	Cleaned from oil+grease
A6	Oxygen service

510	Additional option temperature sensor (optional; multiple options can be selected)
B7	Explosion protection NEMA6

520	Add. option condensate chamber (optional; multiple options can be selected)
C1	EN10204-3.1 material (wetted parts) inspection certificate
C2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate

530	Add. option shut-off valve (optional; multiple options can be selected)
D1	EN10204-3.1 material (wetted parts) inspection certificate
D2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate
D5	Cleaned from oil+grease
D6	Oxygen service

540	Add. option manifold (optional; multiple options can be selected)
E1	EN10204-3.1 material (wetted parts) inspection certificate
E2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate

540	**Add. option manifold (optional; multiple options can be selected)**
E5	Cleaned from oil+grease
E6	Oxygen service

550	**Add. option general (optional; multiple options can be selected)**
F8	Pressure test + certificate

895	**Marking**
Z1	Tagging (TAG), see additional spec.

Product structure
Deltatop DP73B

10	Application; Version
B	Gas; remote
C	Gas; compact
D	Liquid; remote
E	Liquid; compact
F	Steam; remote
G	Steam; compact
Y	Special version, to be specified

20	Pipe; Orientation
B	Horizontal; left
C	Horizontal; right
D	Horizontal; top/bottom
U	Vertical; downwards
V	Vertical; upwards
W	Vertical; upwards/downwards
Y	Special version, to be specified

40	Process connection
	Tube
ALC	Tube > spring lock, Cl.600, 316
	ANSI flanges
HAC	2" Cl.150 RF, 316
HBC	2" Cl.300 RF, 316
HCC	2" Cl.600 RF, 316
HEC	3" Cl.1500 RF, 316
HFC	3" Cl.2500 RF, 316
	Spring lock
PSC	2" Cl.150 RF, 316, spring lock
PTC	2" Cl.300 RF, 316, spring lock
PUC	2" Cl.600 RF, 316, spring lock
	Flowtap
RAC	Flowtap Cl.150, 316 + single spindle
RIC	Flowtap Cl.600, 316 + double spindle
RMC	Flowtap Cl.150, 316 + flange + single spindle
RUC	Flowtap Cl.600, 316 + flange + double spindle
R0C	Flowtap 10psi, 316 + safety cable
R2C	Flowtap 10psi, 316 + flange + safety cable
	Miscellaneous
Y99	Special version, to be specified

60	Probe length (pipe ID + wall thickness)
A4	... mm 316
K4	... mm 316, from 1601mm
L4	... mm 316, flowtap 10psi
M4	... mm 316, flowtap Cl.150
N4	... mm 316, flowtap Cl.600
S4	... inch 316, flowtap 10psi
T4	... inch 316, flowtap Cl.150
U4	... inch 316, to 60inch
V4	... inch 316, flowtap Cl.600
W4	... inch 316, from 61inch
Y9	Special version, to be specified

70	Welding socket
	ANSI flanges
HAA	2" Cl.150 RF, steel
HAC	2" Cl.150 RF, 316
HBA	2" Cl.300 RF, steel
HBC	2" Cl.300 RF, 316
HCA	2" Cl.600 RF, steel
HCC	2" Cl.600 RF, 316
HEA	3" Cl.1500 RF, steel
HEC	3" Cl.1500 RF, 316
HFA	3" Cl.2500 RF, steel
HFC	3" Cl.2500 RF, 316
	Spring lock
PCA	Cl.600, steel, spring lock
PCC	Cl.600, 316, spring lock

70	Welding socket
	Flowtap
RAA	Flowtap Cl.150, steel + single spindle
RAC	Flowtap Cl.150, 316 + single spindle
RIA	Flowtap Cl.600, steel + double spindle
RIC	Flowtap Cl.600, 316 + double spindle
RMA	Flowtap Cl.150, steel + flange + single spindle
RMC	Flowtap Cl.150, 316 +flange + single spindle
RUA	Flowtap Cl.600, steel + flange + double spindle
RUC	Flowtap Cl.600, 316 + flange + double spindle
R0A	Flowtap 10psi, steel + safety cable
R0C	Flowtap 10psi, 316 + safety cable
R2A	Flowtap 10psi, steel + flange + safety cable
R2C	Flowtap 10psi, 316 + flange + safety cable
	Miscellaneous
XAX	Not selected
Y99	Special version, to be specified

80	Extension welding socket
A	... mm, carbon steel
D	... mm, 316
K	... inch, carbon steel
L	... inch, 316
1	Not selected
9	Special version, to be specified

90	End support
A	Carbon steel
D	316
S	Carbon steel, high pressure > Cl.600
T	316, high pressure > Cl.600
1	Not selected
2	Prepared for end support
9	Special version, to be specified

100	Diff. pressure connection; Seal
B	IEC61518; PTFE
C	IEC61518; FKM
F	IEC61518; graphite
1	FNPT1/2; w/o
2	FNPT1/2; w/o, parallel
Y	Special version, to be specified

110	Temperature sensor Pt100
A	Not selected
F	Terminal block 3-wire, max 425°C
Y	Special version, to be specified

200	2x condens. chamber mat.; Volume; Pn
1	Not selected
9	Special version, to be specified

210	Filling cap condens. chamber
A	Not needed
Y	Special version, to be specified

220	Inlet condens. chamber
A	Not needed
Y	Special version, to be specified

230	Outlet condens. chamber
A	Not needed
Y	Special version, to be specified

250	2x shut-off valve
1	Not selected
6	Valve; PTFE gasket, 392°F (200°C)
8	Valve; pure graphite gasket, 572°F (300°C)
9	Special version, to be specified

260	Material shut-off valve
A	Not needed
E	316

260	Material shut-off valve
Y	Special version, to be specified

270	Inlet shut-off valve
A	Not needed
D	FNPT1/2
U	Integral
Y	Special version, to be specified

280	Outlet shut-off valve
A	Not needed
C	FNPT1/2
Y	Special version, to be specified

300	Manifold version
111	Not selected
AB2	3 valve, 316L, milled
BB2	5 valve, 316L, milled, vent
HA2	3 valve, 316L, integral, IEC61518
KA2	3 valve, 316, forging, IEC61518, both sides
LA2	5 valve, 316, forging, IEC61518 both sides, vent
YY9	Special version, to be specified

310	Gasket manifold
A	Not needed
B	PTFE, 200 °C
D	Graphite / Graphoil
Y	Special version, to be specified

320	Process connection manifold
A	Not needed
B	FNPT1/2
E	IEC61518
Y	Special version, to be specified

330	Seal manifold; Screws
A	Not needed
B	PTFE; UNF7/16, max 420bar
D	Viton; UNF7/16, max 420bar
K	Graphite; UNF7/16, max 420bar
Y	Special version, to be specified

450	DP transmitter Deltabar
D	Provided, sep. item
W	Not provided

500	Add. option Pitot tube (optional; multiple options can be selected)
AA	Syncro drive, flowtap + double spindle
A1	EN10204-3.1 material (wetted parts) inspection certificate
A2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate
A5	Cleaned from oil+grease
A6	Oxygen service

510	Add. option temperature sensor (optional; multiple options can be selected)
B7	Explosion protection NEMA6

520	Add. option condensate chamber (optional; multiple options can be selected)
C1	EN10204-3.1 material (wetted parts) inspection certificate
C2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate

530	Add. option shut-off valve (optional; multiple options can be selected)
D1	EN10204-3.1 material (wetted parts) inspection certificate
D2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate
D5	Cleaned from oil+grease
D6	Oxygen service

540	Add. option manifold (optional; multiple options can be selected)
E1	EN10204-3.1 material (wetted parts) inspection certificate
E2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate

540	Add. option manifold (optional; multiple options can be selected)
E5	Cleaned from oil+grease
E6	Oxygen service

550	Add. option general (optional; multiple options can be selected)
F8	Pressure test + certificate

895	Marking
Z1	Tagging (TAG), see additional spec.

Accessories

Overview

The following accessories are available for differential-pressure flow measurement with Pitot tubes:

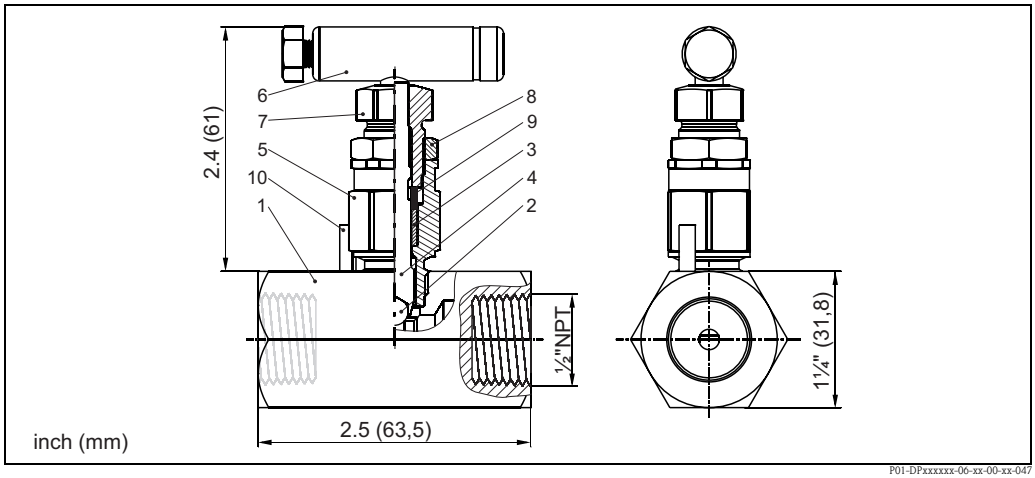
- DA73V: Shut-off valves (→ 🖹 41)
- DA74M: Manifold (→ 🖹 42)

Shut-off valves and the manifold can be ordered together with the Pitot tube. They are contained in the product structures DP71B, DP72B and DP73B.
Alternatively, they can be ordered via their own product structures. The product structures are listed in the following chapters.

Deltatop DA73V: shut-off valve (accessory)

Version: valve (DA73V-6...)

Dimensions



Input FNPT1/2; output FNPT1/2

Weight

Order code	Weight
DA73V-6*CC*	Approx. 1.8 lbs (0.8 kg)

Usage

Universal valve; not suited for humid gases;
DA73V-6*V... and DA73V-6*W...: for pressure ratings up to PN160

Design

- Body: die-pressed part
- Surface: stainless steel
- Stem thread: internal for all versions
- Replaceable valve seat
- Stem with cold rolled surface, back seat and non-rotating cone tip

Materials

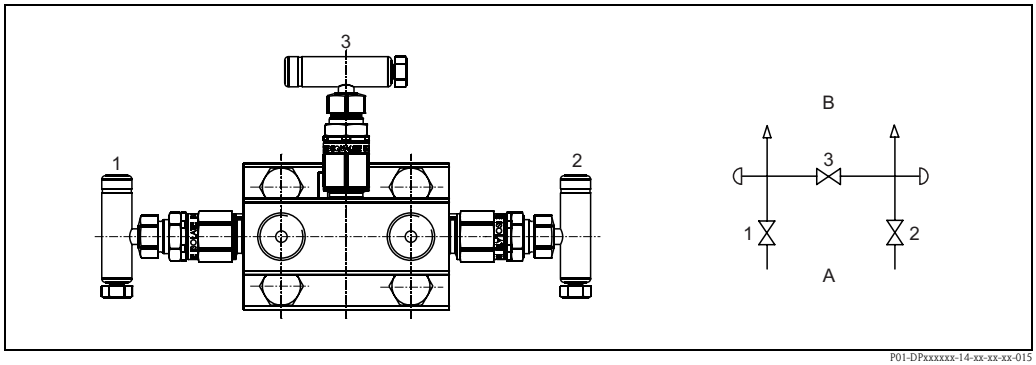
Pos.	Description	Material
1	Valve body	ASTM A479-316
2	Ball	316S.S
3	Stem seal	Teflon
4	Stem	ASTM A479-316
5	Bonnet	ASTM A479-316
6	Handle assembly	300SERIES SS
7	Packing adjuster	ASTM A479-316
8	Jamnut	300SERIES SS
9	Packing follower	ASTM A479-316
10	Rollpin	300SERIES SS

Deltatop DA73M: manifold (accessory)

Usage

3-valve manifold

The manifold is used to connect the impulse pipes to the differential pressure transmitter. Valves 1 and 2 can be used to separate the transmitter from the impulse pipes.
Valve 3 is used for zero point adjustment between the impulse pipes.

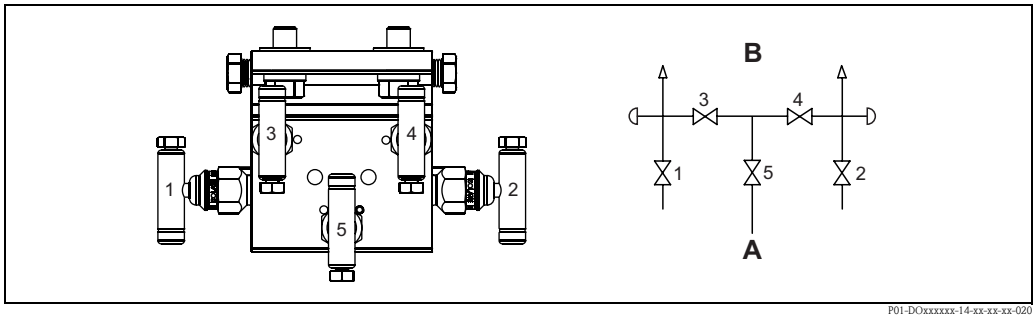


P01-DPxxxxxx-14-xx-xx-xx-015

Left: Milled version (for gases and liquids)
A: Process side; B: Transmitter side

5-valve manifold

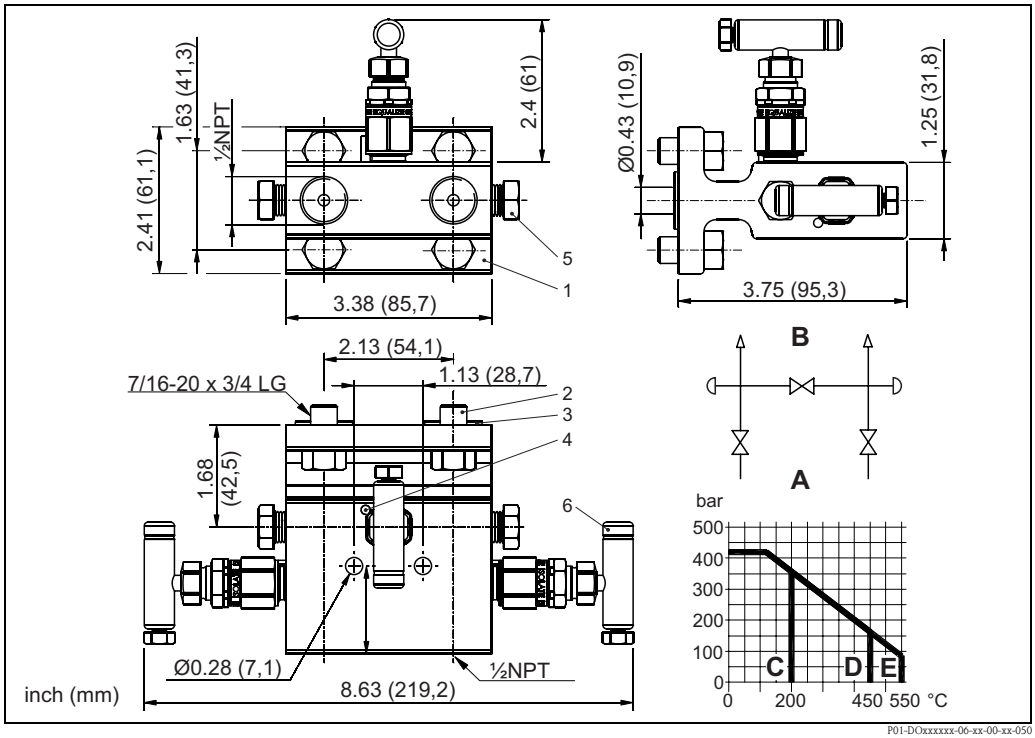
The manifold is used to connect the impulse pipes to the differential pressure transmitter. Valves 1 and 2 can be used to separate the transmitter from the impulse pipes.
Valves 3 and 4 are used for zero point adjustment between the impulse pipes.
Valve 5 offers the possibility of venting or purging the impulse pipes.



P01-DOxxxxxx-14-xx-xx-xx-020

5-valve manifold with venting valve, milled version (for gases and liquids)
A: Process side; B: Transmitter side

Version: 3-valve, manifold



A: *Process side;* **B:** *Transmitter side;*
C: *PTFE gasket;* **D:** *Pure graphite gasket 1.0460;* **E:** *Pure graphite gasket 1.4404*

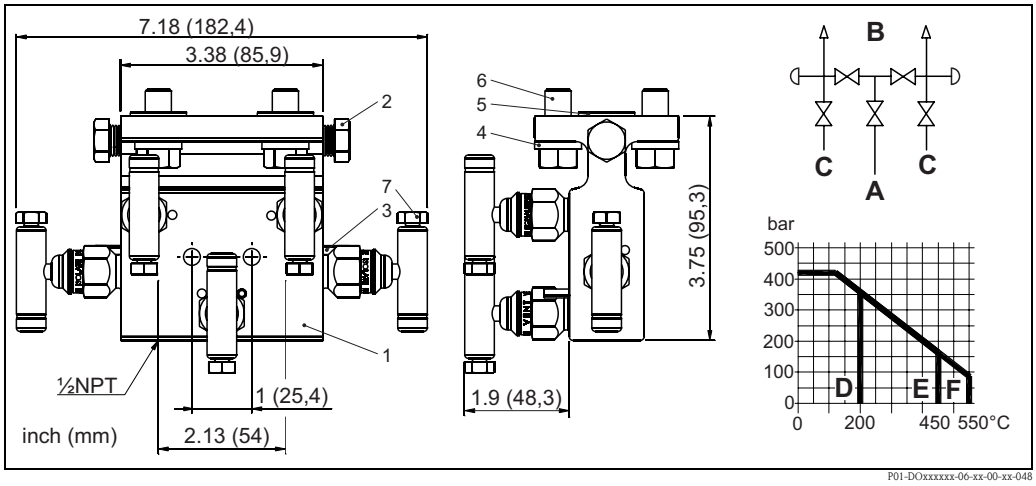
Design

- External stem thread
- Stem with cold rolled surface, back seat and non-rotating needle tip
- Inlet: 1/2 NPT female
- Outlet: IEC61518, type B
- Weight: approx. 4.4 lbs (2.0 kg), including 4 screws with washers and 2 seals

Materials

Pos.	Description	Material
1	Manifold body	ASTM A479-316
2	Mounting bolts	ASTM A479-316
3	Flange seal	Teflon
4	Rollpin	300SERIES SS
5	1/4" NPT hexhd. plug	316 stainless steel
6	Handle assembly	300SERIES SS

Version: 5-valve, manifold



A: *Process side;* **B:** *Transmitter side;* **C:** *Vent*
D: *PTFE gasket;* **E:** *Pure graphite gasket 1.0460;* **F:** *Pure graphite gasket 1.4404*

Usage

Gas and liquid applications

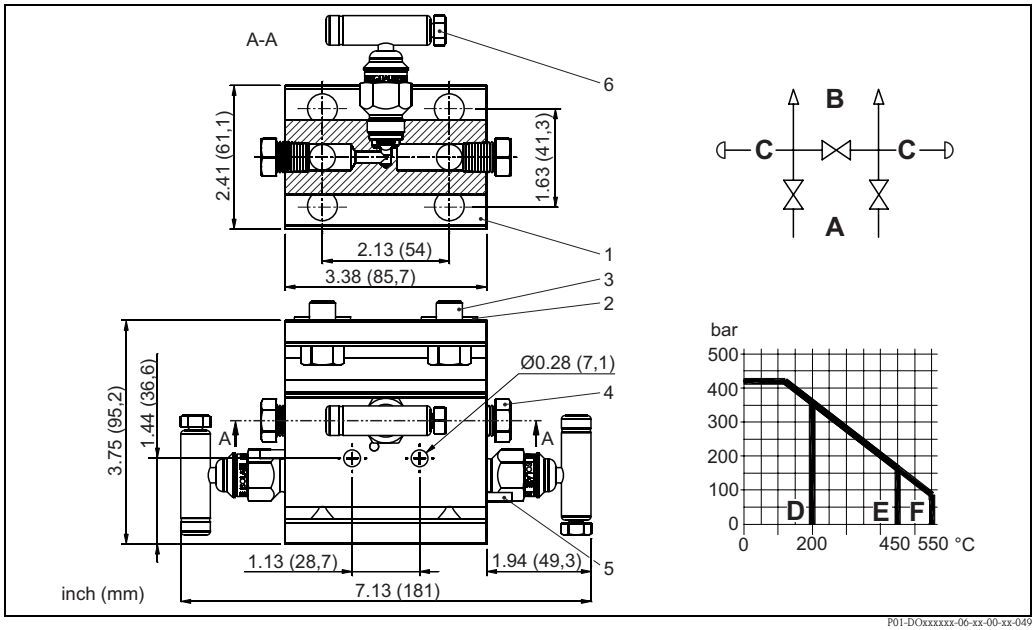
Design

- External stem thread
- Stem with cold rolled surface, back seat and non-rotating needle tip
- Inlet: 1/2 NPT female
- Outlet: IEC61518, Type B
- Weight: approx. 7.3 lbs (3.3 kg), including 4 screws with washers and 2 seals

Materials

Pos.	Description	Material
1	Manifold body	ASTM A479-316
2	1/4" NPT hexhd. plug	INCONEL625
3	Rollpin	300SERIES SS
4	Washer	ASTM A108
5	Flange seal	Teflon
6	Mounting bolt	ASTM A449-Type 1
7	Handle assembly	300SERIES SS

Version: 3-valve, manifold, IEC61518, both sides



A: *Process side;* **B:** *Transmitter side;* **C:** *Purge valve;*
D: *PTFE gasket;* **E:** *Pure graphite gasket 1.0450;* **F:** *Pure graphite gasket 1.4404*

Usage

For the compact version of Deltatop

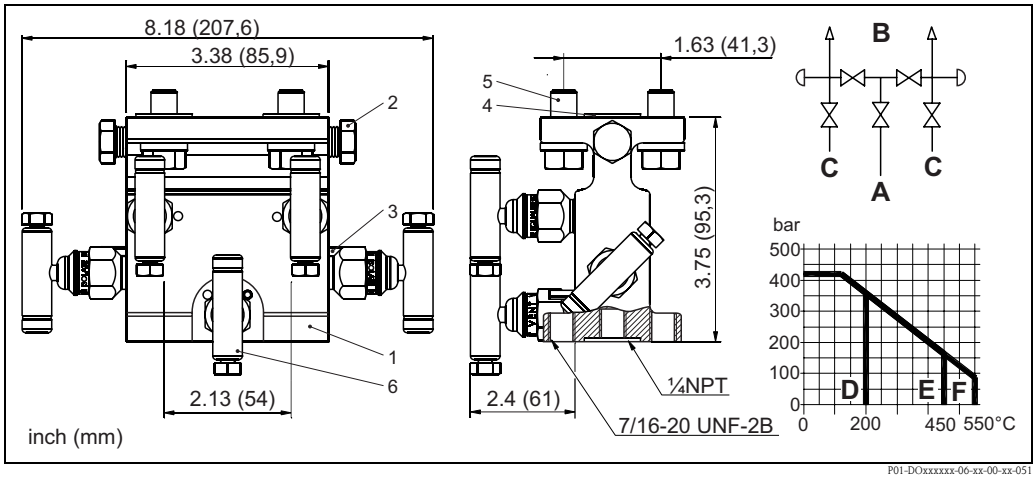
Design:

- Body: die-pressed part
- External stem thread
- Stem with cold rolled surface, back seat and non-rotating needle tip
- Inlet: turned groove ∅18.5 acc. to IEC61518
- IEC61518, type B
- Weight: approx. 4.9 lbs (2.2 kg), including 4 screws with washers and 2 seals

Materials

Pos.	Description	Material
1	Manifold body	ASTM A479-316
2	Flange seal	Teflon
3	Mounting bolts	ASTM A449-Type 1
4	1/4" NPT hexhd. plug	INCONEL625
5	Rollpin	300SERIES SS
6	Handle assembly	300SERIES SS

Version: 5-valve, manifold, IEC61518, both sides



A: *Process side;* **B:** *Transmitter side;* **C:** *Vent;*
D: *PTFE gasket;* **E:** *Pure graphite gasket 1.0460;* **F:** *Pure graphite gasket 1.4404*

Usage

For the compact version of Deltatop

Design

- Body: die-pressed part
- External stem thread
- Stem with cold rolled surface, back seat and non-rotating needle tip
- Inlet: turned groove ∅18.5 acc. to IEC61518
- Outlet (to transmitter): IEC61518, type B
- Outlet (test/vent): 1/4 NPT female with screw plug
- Weight: approx. 3.3kg (7.3 lbs), including 4 screws with washers and 2 seals

Materials

Pos.	Description	Material
1	Manifold body	ASTM A479-316
2	1/4" NPT hexhd. plug	ASTM A479-316
3	Rollpin	300 SERIES SS
4	IEC flange seal	GRAFOIL
5	Mounting bolt 7/16-20 X 1" LG.	ASTM A479-316
6	Handle assembly	300SERIES SS

Product structure DA73M

300	Version
AB2	3 valve, 316L, milled
BB2	5 valve, 316L, milled, vent
KA2	3 valve, 316L, IEC51528, both side
LA2	5 valve, 316L, IEC61518, both sides, vent
YY9	Special version, to be specified

310	Gasket
B	PTFE, 200°C / 392°F
D	Graphite / Graphoil
Y	Special version, to be specified

320	Process connection
B	FNPT1/2
E	IEC61518
Y	Special version, to be specified

330	Seals; Screws
B	PTFE; UNF7/16, max 420bar
D	Viton; UNF7/16, max 420bar
K	Graphite; UNF7/16, max 420bar
Y	Special version, to be specified

540	Additional option
EB	Mounting bracket, stainless steel
E1	EN10204-3.1 material (wetted parts) inspection certificate
E2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate
E5	Cleaned from oil+grease
E6	Oxygen service

895	Marking
Z1	Tagging (TAG), see additional spec.

Product structure DA73V

250	Version; Gasket
6	Valve; PTFE gasket < 200°C / 392°F
8	Valve; pure graphite gasket < 300°C / 572°F
9	Special version, to be specified

260	Material
F	316L
Y	Special version, to be specified

270	Inlet
D	FNPT1/2
Y	Special version, to be specified

280	Output
C	FNPT1/2
Y	Special version, to be specified

530	Additional option
D1	EN10204-3.1 material (wetted parts) inspection certificate
D2	EN10204-3.1 material, NACE MR0175 (wetted parts) inspection certificate
D5	Cleaned from oil+grease
D6	Oxygen service

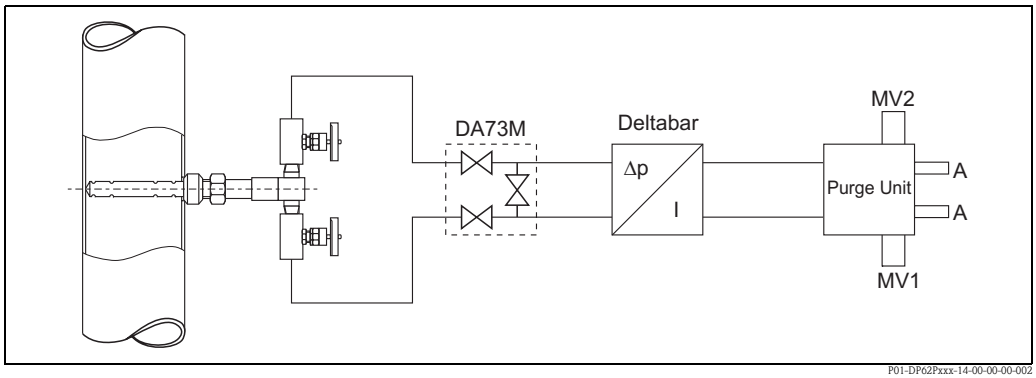
Purge unit

Usage

With flow measurements of waste gases or soiled air, solid particles often settle at the profile of the Pitot tube and, depending on the degree of soiling, reduce the measuring accuracy or even interfere with the functionality of the Pitot tube.
In many applications, recurrent manual cleaning of the Pitot tube is not a feasible solution. Demounting the probe, thorough cleaning and remounting are often too cost-intensive and time-consuming. Furthermore, no measuring data are available during the cleaning procedure.
The purge unit helps to perform fully automated and effortless cleaning.
The application of a purge unit is recommended for a particle concentration of more than 1.17 gr/yd^3 (100 mg/m^3). The usability of the purge unit is restricted for humid or adhesive solid particles. The maximum permissible solid content depends on the abrasiveness and size of the particles and has to be examined separately in each case.

System design

The purge unit consists mainly of a purging block with a 2-way valve which can be directly triggered. A customer-provided relay or a PLC can be used to trigger the two solenoid valves.



MV1, MV2: Solenoid valves; A: Air purge connection

Mounting

1. The purge unit is directly mounted to the differential pressure transmitter with the supplied screws and seals.
2. The vent valves supplied together with the differential pressure transmitter are screwed into the purge unit. The impulse pipes are mounted on the opposite side of the transmitter. This ensures that not only the Pitot tube but also the measuring chambers of the differential pressure transmitter are purged and cleared from any deposit.
3. The connections for the purging air are located at the bottom of the purge unit.

Sizing sheet – data sheet

Sizing Sheet – data sheet / Pitot Tube

Sheet 1/2

Fields marked with * are mandatory to be filled-in

Project:

Customer: | **Project-No.:** | **Contact partner:**

Order Code

	Order code	Order no.*	Position(s) *
Primary element			
Transmitter			

Tag:

Main Parameter

Medium: * | **Status *** ☐ **Gas** ☐ **Liquid** ☐ **Steam**

Operating Conditions

Pressure * For gauge pressure the ambient pressure is additionally required if different from sea level.

☐ **absolute** ☐ **gauge** **ambient pressure:** unit

Only for gases: The values for requested flow resp. density of the medium are based on the following conditions:

	operating	normal	standard (acc. to reference conditions)		unit
Flow rate *	☐	☐	☐	**Reference temp.:**	
Density *	☐	☐	☐	**Reference pressure:**	

	minimum	nominal	maximum	unit *
Requested flow:			*	
Pressure:		*		
Temperature:		*		
Density: 1)				
Viscosity: 1)				
Z-factor: 1,2)				
Isentropic index: 1,2)				

The sizing will be based on the maximum requested flow and nominal pressure and temperature.
The maximum requested flow will be set as upper range value.
1) For clearly specified fluids (e.g. water or air) those entries are not mandatory.
2) For gases only. If there are no values available the sizing will be based on standard values or the ideal gas law.

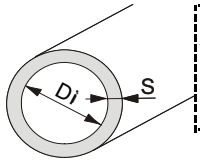
Flowmeter

Nominal width: * | **Pressure rating:***

Pipe dimensions *

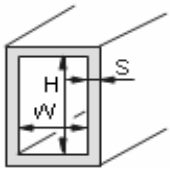
Mounting position s. sheet 2

☐ **Pipe (round) ***



		unit
Inner diameter (DI):		
Wall thickness (S):		
Isolation thickness:		
Pipe material:		

☐ **Rectangular duct**



		unit
Duct height (H) :		
Duct width (W) :		
Wall thickness (S):		
Isolation thickness:		
Pipe material:		

The exact specification of the internal dimensions and wall thickness is absolutely necessary.
Nominal widths of DIN pipes DNxxx are not sufficient. Nominal widths of ANSI pipes including schedules according to ASME are sufficient.

Additional Data

Temperature transmitter not applicable for DP71D

☐ without temperature sensor

☐ PT100 sensor without transmitter

☐ PT100 sensor with 4…20mA transmitter

	unit
Lower range value	
Upper range value	

FLOWDATA3-EN

Sizing Sheet - Mounting Position / Pitot Tube

Gas:

Liquid / Steam:

FLOWDATA4_en

Instructions for completing the sizing sheet – data sheet

- The order code of a primary element does not completely describe the final device. Further information is required. The optimized sizing and calculation of the primary element is based on the requested information about process parameters and pipe dimensions etc. Additionally Endress+Hauser checks if the information provided matches the order code of the device. Furthermore, the feasibility of the measuring point also has to be examined. A fully completed questionnaire, including information on the project, order codes and tag number, ensures the correct assignment of primary elements to differential transmitters and accessories during order processing.
- The "Sizing sheet – data sheet" can be filled in and printed using the Endress+Hauser Applicator sizing software. All required data can be entered or are available in the database.
- All fields marked with an asterisk * have to be completed. The order cannot be processed and device production cannot commence before these points are clarified.
- All parameters have to be filled in with their value and the complete and correct unit (e.g. flow rate in Sm^3/h and not m^3/h for flow at normal conditions).

Section	Field / parameter	Explanation of the entry	Mandatory		
			A[1)]	B[1)]	C[1)]
Project					
	Project Customer Project no.	Order-specific customer data			
Order code					
Primary element	Order code	Order code of the selected primary element			
	Order no.* Positions*	Order position, to be assigned to this data sheet.			yes
Transmitter	Order code	Order code of the associated differential pressure transmitter.			
	Order no. * Positions*	Order position of the dp transmitter, to be assigned to the primary element.			yes
Tag					
	Tag	Tag no. for clear assignment of primary element and dp transmitter.			
Main parameter					
	Medium* Status*	Exact designation of the fluid with name (e.g. water) or chemical formula (e.g. CH_4). Type of fluid or state of aggregation of the medium at the given operating conditions – gas, liquid or steam. Depending on this information, further data may have to be entered.	yes		
Operating conditions					
Process		The differential pressure calculation is based on correct information concerning the process conditions. Generally, the layout point for the primary element is the maximum requested flow rate at nominal pressure and nominal temperature.			
	Pressure* (absolute or gauge)	Clearly state whether the static pressure is given as absolute or gauge pressure.	yes	yes	
	Ambient pressure	The primary element calculation is always based on absolute static pressure in the pipe. If the static pressure is given as gauge pressure, the average ambient pressure (if different from sea level) or alternatively the altitude of the location above sea level also has to be specified.	yes		
	Flow rate* Density* (at operating / normal / standard conditions)	For gases only: Values for the flow rate and/or density can be related to the actual operating conditions (nominal pressure and temperature) or to normal or standard conditions. The resulting difference may be large depending on the pressure and temperature. Please check the data carefully. Furthermore, clearly specify the units for the flow rate and density (e.g. flow rate in Sm^3/h and not m^3/h for flow at normal conditions).	yes		
	Operating conditions	For gases only: The values for the flow rate or density are related to the nominal process conditions (pressure and temperature).	yes		

Section	Field / parameter	Explanation of the entry	Mandatory		
			A[1)]	B[1)]	C[1)]
	Normal conditions	For gases only: The values for the flow rate or density are related to normal conditions (pressure and temperature): Pressure: 14696psi abs. (101.325 kPa abs.) Temperature: 59°F (0°C) 273.15 K	yes		
	Standard conditions (acc. to reference conditions)	For gases only: The values for the flow rate or density are related to standard conditions (pressure and temperature): Pressure: 14696psi abs. (101.325 kPa abs.) Temperature: 59°F (0°C) 273.15 K If other reference conditions are to be considered, the values for these conditions have to be clearly specified.	yes		
	Reference temp.	Reference temperature at standard conditions	yes		
	Reference pressure	Reference pressure at standard conditions	yes		
	Req. flow	Specification of the desired measuring range (minimum to maximum) and of the operating point (nominal). The operable flow range is typically between 1:3 and 1:6 (minimum : maximum). An operable flow range of more than 1:10 usually requires cascading (split range) of several differential pressure transmitters (→ 🖹 8). Too large an operable flow range between the nominal and the maximum flow can result in an increased measuring uncertainty at the operating point and should be avoided.	yes	yes	
	Pressure	Static pressure in the pipe upstream (plus side) of the primary element.	yes	yes	
	Temperature	Temperature of the fluid at the primary element.	yes	yes	
Fluid properties		Clearly defined liquids and gases, such as steam, oxygen, nitrogen, pure water or ethanol, do not require further fluid property entries. All necessary information about these data is easily accessible in the relevant literature. Mixtures (e.g. natural gas) or brand names (e.g. Shell motor oil) do not provide sufficient information for calculation purposes. More information is required. If the fluid properties of a mixture are not clear, a list of ingredients and their composition can be attached to this datasheet for clarification.The Endress+Hauser Applicator sizing tool provides users with a large medium database with all the necessary fluid properties for a wide variety of fluids.			
	Density	The density is an essential input value of the flow calculation. This field must be completed for mixtures and brand names.	yes		
	Viscosity	The influence of the viscosity value on the calculation is normally very small but the Reynolds No. is a function of the viscosity. This may be a limiting factor for the measurement especially with highly viscous liquids.	yes		
	Z-factor	For gases only: The compressibility factor Z has an influence on the density especially at higher pressures and/or higher temperatures. If the density is given at normal or standard conditions this may have quite a big impact on the calculation result. If this value is not available, the calculation will be performed with the factor set to 1 or, in case of clearly defined mixtures, with a factor calculated or estimated from the ingredients.	yes		
	Isentropic index	For gases only: The isentropic index (or specific heat ratio) is required to calculate the expansion factor. If the value is not available, the calculation will be performed with standard values: 1.65 for monoatomic gases (e.g. Helium He) 1.4 for diatomic gases (e.g. nitrogen N_2) 1.28 for triatomic gases (e.g. carbon dioxide CO_2)	yes		
Flowmeter					
	Nominal width*	Nominal width of the pipe according to the relevant standards, e.g. 8" (ASME) or DN200 (DIN)		yes	
	Pressure rating*	Pressure rating of the selected connection (e.g. flange) according to the relevant standard, e.g. Cl.600lbs (ASME) or PN40 (DIN).		yes	
Pipe dimensions					
	Pipe (round) / Rectangular duct	Selection of the type of duct. Only one option can be selected.		yes	

Section	Field / parameter	Explanation of the entry	Mandatory		
			A[1)]	B[1)]	C[1)]
	Inner diameter (DI)	Mean inner diameter of the pipe. The precise inner diameter of the pipe forms the basis for calculating the differential pressure and determines the length of the probe in the pipe. Incorrect specifications when ordering result in corresponding measuring errors or may mean that the probe cannot be mounted properly or cannot be mounted at all. The inner diameter of the pipe is equal to the length of the probe in the pipe. However, the inner diameter is NOT equal to the nominal diameter. A pipe of nominal diameter DN200 according to ISO may have inner diameters between 194 mm and 215 mm depending on the pressure rating. For pipes according to ASME, it suffices to specify the nominal diameter and the schedule number.	yes	yes	
	Duct height (H) / Duct width (W)	With rectangular ducts the inner pipe diameter is replaced by the inner dimensions of the duct (height and width). These dimensions are used to calculate the cross-sectional area, which is needed to calculate the differential pressure. The Pitot tube is usually mounted parallel to the longer side of the rectangular duct. Therefore, this dimension determines the length of the Pitot tube in the pipe. Incorrect specifications when ordering result in corresponding measuring errors or may mean that the probe cannot be mounted properly or cannot be mounted at all.			
	Wall thickness (S)	The wall thickness of the duct is added to the total length of the Pitot tube. Precise specification is essential.		yes	
	Isolation thickness	Thickness of a possible thermal isolation of the pipe or of other covering shells. The isolation thickness is added to the length of the neck of the probe. Failure to specify this information may mean that the Pitot tube cannot be mounted properly (→ 24).			
	Pipe material	Specification of the correct pipe material. The selected material of the mounting components should match the pipe material in order to ensure weldability.		yes	
Additional data					
Temperature transmitter*		Temperature sensors can only be integrated into device types DP72B and DP73B and for pressure ratings up to 300lbs (PN40).			
	Without temperature sensor	An integrated temperature sensor is not required.	yes		
	PT100 sensor without transmitter	A PT100 temperature sensor is required, but without a transmitter however.	yes		
Mounting position					
	Mounting position	A suitable mounting position in accordance with the situation on site can be chosen by marking the check box below the pictogram. The mounting position selected has to match the order code. Endress+Hauser will check if any features in the order code mutually exclude one another.		yes	

1) A: Mandatory for differential pressure calculation;
B: Mandatory for device selection (material, pressure rating etc.);
C: Mandatory for order processing (assignment of devices)

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