Алматы (7273)495-231
Ангарск (3955)60-70-56
Архангельск (8182)63-90-72
Астрахань (8512)99-46-04
Барнаул (3852)73-04-60
Белгород (4722)40-23-64
Благовещенск (4162)22-76-07
Брянск (4832)59-03-52
Владивосток (423)249-28-31
Владикавказ (8672)28-90-48
Владимир (4922)49-43-18
Волгоград (844)278-03-48
Вологда (8172)26-41-59
Воронеж (473)204-51-73
Екатеринбург (343)384-55-89
Иваново (4932)77-34-06
Ижевск (3412)26-03-58
Иркутск (395)279-98-46
Казань (843)206-01-48
Калининград (4012)72-03-81
Калуга (4842)92-23-67
Кемерово (3842)65-04-62
Киров (8332)68-02-04
Коломна (4966)23-41-49
Кострома (4942)77-07-48
Краснодар (861)203-40-90
Красноярск (391)204-63-61
Курск (4712)77-13-04
Курган (3522)50-90-47
Липецк (4742)52-20-81
Магнитогорск (3519)55-03-13
Москва (495)268-04-70
Мурманск (8152)59-64-93
Набережные Челны (8552)20-53-41
Нижний Новгород (831)429-08-12
Новокузнецк (3843)20-46-81
Ноябрьск (3496)41-32-12
Новосибирск (383)227-86-73
Омск (3812)21-46-40
Орел (4862)44-53-42
Оренбург (3532)37-68-04
Пенза (8412)22-31-16
Петрозаводск (8142)55-98-37
Псков (8112)59-10-37
Пермь (342)205-81-47
Ростов-на-Дону (863)308-18-15
Рязань (4912)46-61-64
Самара (846)206-03-16
Саранск (8342)22-96-24
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54
Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Сыктывкар (8212)25-95-17
Тамбов (4752)50-40-97
Тверь (4822)63-31-35
Тольятти (8482)63-91-07
Томск (3822)98-41-53
Тула (4872)33-79-87
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Улан-Удэ (3012)59-97-51
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Чебоксары (8352)28-53-07
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Чита (3022)38-34-83
Якутск (4112)23-90-97
Ярославль (4852)69-52-93

Россия +7(495)268-04-70 **Казахстан** +7(7172)727-132 **Киргизия** +996(312)96-26-47

www.delta-mobrey.nt-rt.ru | | dye@nt-rt.ru

Технические характеристики на датчики перепада давления D32, D34, D35, D33

компании Delta Mobrey

Technical **Datasheet**

D Series
SMART Compact Differential Pressure Transmitter
Model: D33

Key **Features**

- Accuracy ±0.1%.
- 4-20mA + Hart output signal.
- Static pressure limit up to 413 bar.
- Gold plated diaphragm option.
- Hastelloy C276 wetted parts option.
- ATEX certified (both protection mode: Intrinsic Safety & Flameproof)
- IECEx Certified Flameproof only (Intrinsic Safety is coming soon)
- Gold plated diaphragm.

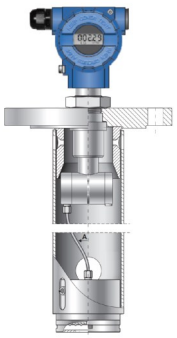
Series **Overview**

The D-Series pressure, differential pressure and temperature transmitters offer customers cost-effective and accurate solutions to their individual process requirements.

Available with a wide range of process connections and is easily configurable via the D-Soft software. The D-Series can be used for a variety of applications when pressure, differential pressure, temperature, level or flow measurements are needed.

Other products in the series include:

- D32 Analogue Differential Pressure Transmitter
- D31 SMART HART Differential Pressure Transmitter with display
- D45 SMART HART Level Transmitter



Product **applications**

The D33 D-Series is suitable for a wide range of applications for measuring:

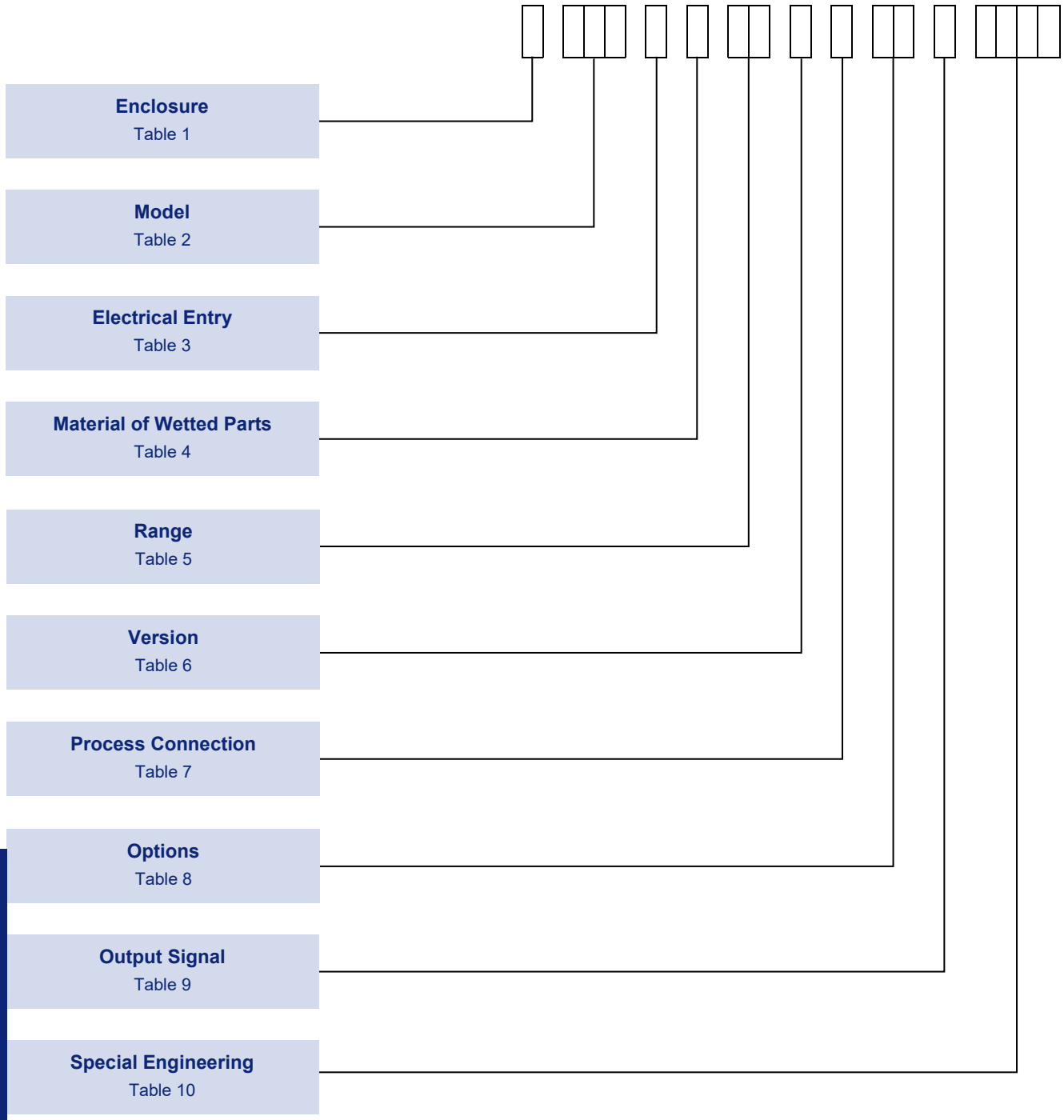
- Differential Pressure
- Level
- Flow

The choice of models available ensures that the D33 D-Series is suitable for use in:

- Corrosive atmospheres
- Resistant to chemical attack
- Hydrogen

How to order

Transmitters can be configured by selecting codes representing the desired features from the tables that follow. The chart below, describes how the model code is built up. For assistance in configuring a transmitter that best suits your needs, please contact your local sales office.



***NOTE**: Only the most common options are shown in this datasheet. Should you require a feature that is not shown, please contact your local sales office for further details.*

***NOTE:** The non-standard option code is shown by "X" in the part number. Should you require any clarification on these codes please contact your local sales office.*

Enclosure

TABLE 1

ENCLOSURES TYPES	Code
WEATHERPROOF ENCLOSURE	
304 Stainless steel housing, IP65.	**B**
316 Stainless steel housing, IP65.	**D**
304 Stainless steel housing, IP66.	**G**
316 Stainless steel housing, IP66.	**K**
304 Stainless steel housing, IP67.	**M**
316L Stainless steel housing, IP68.	**Q**
INTRINSICALLY SAFE ENCLOSURES (ZONE 0)	
304 Stainless steel housing, IP65. (Ex ia)	**C**
316 Stainless steel housing, IP65. (Ex ia)	**F**
304 Stainless steel housing, IP66. (Ex ia)	**J**
316 Stainless steel housing, IP66. (Ex ia)	**L**
304 Stainless steel housing, IP67. (Ex ia)	**N**
316L Stainless steel housing, IP68. (Ex ia)	**S**
FLAMEPROOF ENCLOSURES (ZONE 1)	
316L Stainless steel housing, IP68. (Ex d)	**Z**

NOTE 1:
Refer to the 'Approvals' section for details about the certification on Intrinsically Safe models & Flameproof model.

NOTE 2:
An aluminium enclosure with programmable local display is available, please contact local sales for more details.

Model

TABLE 2

	Code
D23 SMART Compact Pressure Transmitter For applications up to 25 bar. Overpressure limit up to 413 bar. Refer Table 5.	**D33**

Electrical Entry

TABLE 3

	Code
PZ type connection, packing gland M20x1.5	**1**
PD type connection, DIN43650 Connector	**3**
PM12 type connection, thread M12x1 & connector with cable 3m length	**4**
SG type connection, cable 3m length	**7**
SGM type connection, cable 3m length	**8**
FL type connection, thread 1/2" NPTM & cable 2m length (for Ex d only)	**A**
SGM type connection, thread 1/2"NPT Male& cable 3m length (for Ex d only)	**B**

NOTE: Code 1
Available on Enclosure code G,K,J & L only.
NOTE: Code 3
Available on Enclosure code B,D,C & F only.
NOTE: Code 4
Available on Enclosure code M & N only.

NOTE: Code 7
Available on Enclosure code Q & S only.
NOTE: Code 8
Available on Enclosure code Q, S & Z only.
NOTE: Code A & B
Available on Enclosure code Z only.
Refer Table 1 for Enclosure

Material of Wetted Parts

TABLE 4

	Code
Stainless Steel 316L diaphragm and process connection	**A**
Hastelloy C276 diaphragm and Stainless Steel 316L process connection **(See Note 1)**	**D**
Stainless Steel 316L diaphragm. Other wetted parts in stainless steel 316L. FPM Viton gasket.	**E**
Hastelloy C276 diaphragm. Other wetted parts in stainless steel 316L. FPM Viton gasket.	**F**
Gold plated diaphragm. Other wetted parts in stainless steel 316L. FPM Viton gasket.	**G**
Stainless Steel 316L diaphragm. Other wetted parts in stainless steel 316L. NBR gasket (for oxygen service)	**H**
Hastelloy C276 diaphragm. Other wetted parts in stainless steel 316L. NBR gasket (for oxygen service)	**I**
Gold plated diaphragm. Other wetted parts in stainless steel 316L. NBR gasket (for oxygen service)	**J**
Stainless Steel 316L diaphragm. Other wetted parts in stainless steel 316L. PTFE gasket.	**K**
Hastelloy C276 diaphragm. Other wetted parts in stainless steel 316L. PTFE gasket.	**L**
Gold plated diaphragm. Other wetted parts in stainless steel 316L. PTFE gasket.	**M**

Range

TABLE 5

Code	Nominal measuring range (FSO)		Minimum set range		Rangeability	Overpressure limit/ Static pressure limit
A1	-25...25 mbar *	(-2,5..2.5 kPa)	2 mbar	(0,2 kPa)	25:1	C type: 20 bar
A0	-100...100 mbar	(-10...10 kPa)	10 mbar	(1 kPa)	20:1	C-type : 250 / 320 / 413 bar PN-Type : 40bar (70bar for range E2)
B0	-5...70 mbar	(-0.05...7 kPa)	4 mbar	(0.4 kPa)	18:1	
C3	-0,5...0,5 bar	(-50...50 kPa)	0.1 bar	(10 kPa)	10:1	
D0	0...0,25 bar	(0...25 kPa)	10 mbar	(1 kPa)	25:1	
D1	0...1 bar	(0...100 kPa)	50 mbar	(5 kPa)	20:1	
D2	0...2.5 bar	(0...250 kPa)	0.2 bar	(20 kPa)	12.5:1	
E0	0...16 bar	(0...1,6 MPa)	1.6 bar	(160 kPa)	10:1	
E2	0...70bar	(0...7MPa)	7 bar	(700 kPa)	10:1	

only for transmitters without diaphragm seal.

Version

TABLE 6

	Code
Applies when no option is required.	**0**
For oxygen service (sensor filled with Fluorolube fluid)	**4**
Static Pressure 320 bar (C-type only)	**7**
Static Pressure 413 bar (C-type only)	**8**

Process Connection

NOTE: Codes C & D
Available with NACE MR-01-75 certificate

Note: Codes C
With M10 threaded holes according to DIN19213, Pmax is 250bar

TABLE 7

	Code
G 1/2" (male)	**Y**
1/4" NPT Female	**Q**
1/4" NPT Female on the cover flanges. Cover flanges material SS316L. Allows mounting with valve manifold (C type)	**C**
C type process connection rotated 90°	**M**
1/2" NPT Female via adaptor on the cover flanges for C type process connection. Material AISI316	**N**
Connection for fitting diaphragm seal (GP/PN)	**9**
1/4" NPT Female on the cover flanges. Cover flanges material SS316L. Allows mounting with 7/16-20 UNF threaded holes according to IEC61518	**D**
D type process connection rotated 90°	**R**

Options

Combination of more than one option is available.

TABLE 8

	Code
Applies when no option is required	**0**
Stainless Steel Tag plate mounted on wire	**3**
Mounting bracket for 2" pipe (only version with C-type process connection), zinced steel	**5**
Mounting bracket for 2" pipe (only version with C-type process connection), stainless steel	**6**
Mounting bracket for 2" pipe (only version with process connection Code P & Q), stainless steel	**7**
Adapter for differential pressure transmitters with C-type process connection, output thread 1/2NPT Female in SS316L	**8**
Connector to weld impulse pipes Ø12 and Ø14 mm, material 15HM (only version with C-type process connection)	**C**
Connector to weld impulse pipes Ø12 and Ø14 mm, material 15HM(SO) or SS316(S) (only version with process connection Code P & Q)	**D**

Output Signal

Note: For the constructions certified for Hazardous area, the instruments are supplied as standard with ATEX marking on the label. The instrument will be supplied with nameplate marked according to the selected code on Table 9,

TABLE 9

	Code
4 to 20mA (Weatherproof or Hazardous Area with ATEX marking)	**O**
4 to 20mA (Hazardous Area with IECEx marking)	**6**

Special Engineering

Last 4 digits of model code only used when special engineering is required.

TABLE 10

	Code
Please consult Delta Mobrey sales engineering for special requirements	**TBA**

Application & Construction

The D33 SMART Compact Differential Pressure Transmitters are suitable for measuring the differential pressure of gases, vapours and liquids. The active sensing element is a piezoresistive silicon sensor separated from the medium by a diaphragm and by a specifically selected type of manometric liquid. The simple construction of the instrument allows the full features offered by any SMART Hart type.

The communication standard for data interchange with the transmitter is the HART protocol.

- Communication with the transmitter is carried out with:
  – A DKAP communicator,
  – Some other HART type communicators,(*)
  – A PC using a HART/USB/Bluetooth converter and D-Soft configuration software

The data interchange with the transmitter enables the users to:

- Identify the transmitter
- Configure the output parameters:
  – Measurement units and the values of the start points and end points at the measurement range;
  – Damping time constant;
  – Conversion characteristic (inversion, user's non-linear characteristic);
- Read the currently measured pressure value of the output current and the percentage output control level
- Force an output current with a set value
- Calibrate the transmitter in relation to a model pressure

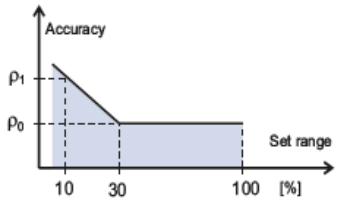
Installation

The transmitter is not heavy, so it can be installed without an additional mounting bracket. When the pressure of steam or other hot media is measured, a siphon or impulse line should be used. The needle valve is placed upstream and the transmitter simplifies the installation process and enables the zero point adjustment or the transmitter replacement. The transmitter's electrical connections should be performed with a twisted cable. The place for the communicator should be assigned before the communicators installation.

Technical Data

Metrological parameters

Accuracy ≤ ±0.1% of calibrated range



ρ_0 – error for nominal measuring range (0...100% FSO)
ρ_1 – error for range 0...10% FSO
$\rho_r = 2 \times \rho_0$
Numerical error values are given in the technical data under metrological

Long-term stability ≤ accuracy for 3 years
(for the nominal measuring range)
Thermal error < ±0,08% (FSO) / 10°C
max. ±0,3% (FSO) in the temperature range -25...80°C
Thermal compensation range -25...80°C
Response time 16..230ms (programmable)
Additional electronic damping 0...30 s
Error due to supply voltage changes 0.002% (FSO) / V

Operating conditions

Operating temperature range (ambient temp.) -25...85°C
Ex version –25…80°C
Medium temperature range -25...120°C
Over 120°C – measurement with the use of impulse line or diaphragm seals.

CAUTION: The medium must not be allowed to freeze in the impulse line or close to the process connection of the transmitter.

Electrical parameter

Power supply: 7.5...55 V DC (Ex ia 7.5...28 VDC)
Output signal: 4...20 mA + Hart 5, two wire transmission
Hart Version Ver. 5 as standard
Load resistance $R\ [\Omega] \leq \frac{U_{sup}\ [V] - 7.5V}{0.0225A}$
Resistance required for communication min 240 Ω

Materials

Wetted parts: Type P, PN process connection: 316Lss
Type P(H) process connection: 316Lss or Hastelloy C276
Type C process connection: 316Lss
Diaphragms: 316Lss , Hastelloy C 276, Au
Casing : 304ss
Option : 316ss

Approvals

GLOBAL CERTIFICATION

IECEx Certified

FLAMEPROOF:
Certificate No.: IECEx KDB 19.0005X

IEC 60079-0, IEC 60079-1, IEC 60079-31

For Zone 1 models **(Refer Table 1 for Enclosure code)**

Ex db IIC T6/T5/T4 Gb
Ex tb IIIC T85°C/T100°C/T120°C Db

INTRINSICALLY SAFE:
Certificate No.: Coming soon for intrinsically Safe version
IEC 60079-0, IEC 60079-11

EUROPEAN DIRECTIVES

ATEX Directive 2014/34/EU

INTRINSICALLY SAFE:
Certificate No.: KDB 14ATEX0121X
EN 60079-0, EN 60079-11, EN 60079-26, EN 50303

For Zone 0 models **(Refer Table 1 for Enclosure code)**

I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb
II 1D Ex ia IIIC T105°C Da

FLAMEPROOF:
Certificate No.: KDB 19 ATEX0030X

EN 60079-0, EN 60079-1, EN 60079-31

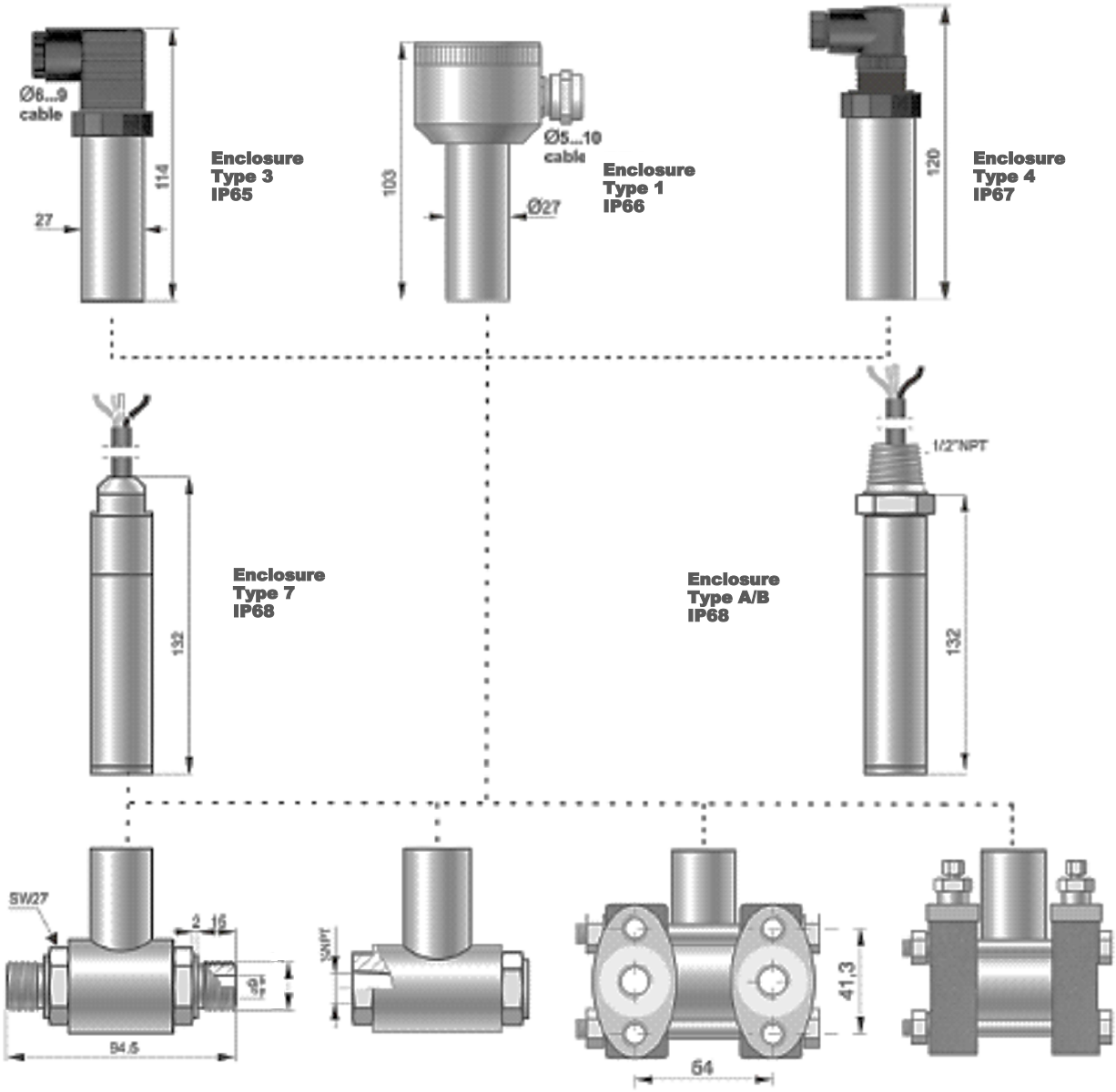
For Zone 1 models **(Refer Table 1 for Enclosure code)**

II 2G Ex db IIC T6/T5/T4 Gb
II 2D Ex tb IIIC T85°C Da

EMC Directive 2014/30/EU
Conformity assessment procedure: module A
The following standards were applied: EN 61326-1:2013; EN61326-2-3:2013

Restriction of hazardous substances (RoHS 2) 2011/65/EU
Compliant to RoHS.
The following standard was applied: EN IEC 63000:2018

Dimensions



Y Type process connection

Q Type process connection

C & M Type process connection to mount with a valve manifold

FM00720

Technical **Datasheet**

D Series

Analogue Compact Differential Pressure Transmitter

Model: D32

Key **Features**

- Accuracy ±0.25%.
- 4-20mA output signal.
- Static pressure limit up to 420 bar.
- Gold plated diaphragm option.
- Hastelloy C276 wetted parts option.
- Intrinsic safety certificate (ATEX, IECEx)

Series **Overview**

The D-Series pressure, differential pressure and temperature transmitters offer customers cost-effective and accurate solutions to their individual process requirements.

Available with a wide range of process connections, the D-Series can be used for a variety of applications when pressure, differential pressure, temperature, level or flow measurements are needed.

Other products in the series include:

- D22 Pressure Transmitter

Product **applications**

The D32 D-Series is suitable for a wide range of applications for measuring:

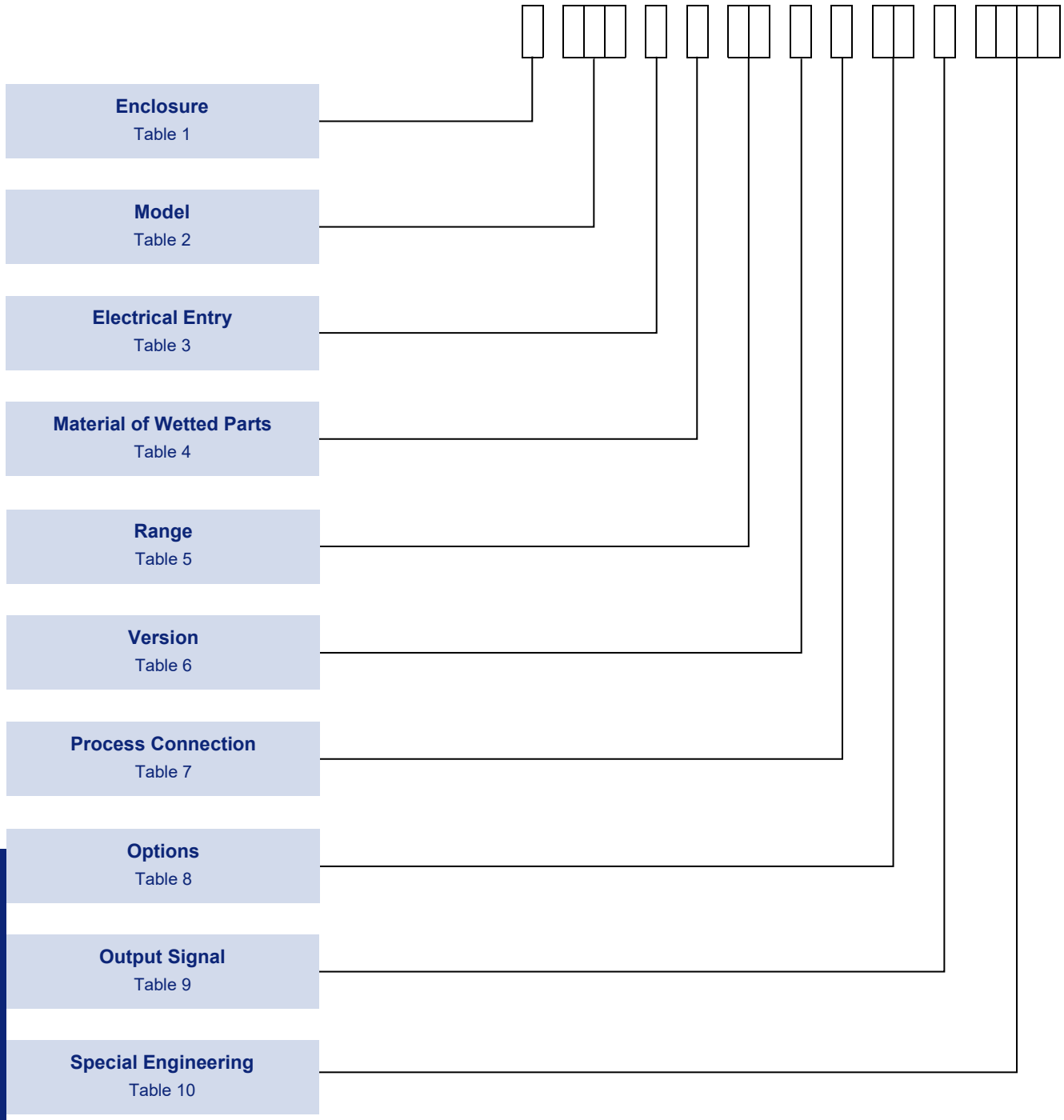
- Differential Pressure
- Level
- Flow

The choice of models available ensures that the D32 D-Series is suitable for use in:

- Corrosive atmospheres
- Resistant to chemical attack

How to order

Transmitters can be configured by selecting codes representing the desired features from the tables that follow. The chart below, describes how the model code is built up. For assistance in configuring a transmitter that best suits your needs, please contact your local sales office.



***NOTE**: Only the most common options are shown in this datasheet. Should you require a feature that is not shown, please contact your local sales office for further details.*

***NOTE:** The non-standard option code is shown by "X" in the part number. Should you require any clarification on this codes please contact your local sales office.*

Enclosure

TABLE 1

NOTE 1:
Refer to the Approvals' section for details about the certification on Intrinsically Safe models and Flameproof models.

NOTE 2:
An aluminium enclosure with programmable local display for weatherproof construction only, is available, please contact local sales for more details.

ENCLOSURES TYPES	Code
WEATHERPROOF ENCLOSURE	
304 Stainless steel housing, IP65.	**B**
316 Stainless steel housing, IP65.	**D**
304 Stainless steel housing, IP66.	**G**
316 Stainless steel housing, IP66.	**K**
304 Stainless steel housing, IP67.	**M**
304 Stainless steel housing, IP66/67.	**O**
316L Stainless steel housing, IP68.	**Q**
INTRINSICALLY SAFE ENCLOSURES (ZONE 0)	
304 Stainless steel housing, IP65. (Ex ia)	**C**
316 Stainless steel housing, IP65. (Ex ia)	**F**
304 Stainless steel housing, IP66. (Ex ia)	**J**
316 Stainless steel housing, IP66. (Ex ia)	**L**
304 Stainless steel housing, IP67. (Ex ia)	**N**
304 Stainless steel housing, IP66/67. (Ex ia)	**P**
316L Stainless steel housing, IP68. (Ex ia)	**S**
FLAMEPROOF ENCLOSURES (ZONE 1)	
316L Stainless steel housing, IP68. (Ex d)	**Z**

Model

TABLE 2

	Code
D32 Analogue Differential Pressure Transmitter For applications up to 25 bar. Static pressure up to 413 bar Refer Table 5.	**D32**

Electrical Entry

TABLE 3

NOTE: Code 1
Available on Enclosure code G,K,J & L only.
NOTE: Code 3
Available on Enclosure code B,D,C & F only.
NOTE: Code 4
Available on Enclosure code M & N only.
NOTE: Code 5
Available on Enclosure code O & P only.

	Code
PZ type connection, packing gland M20x1.5	**1**
PD type connection, DIN43650 Connector	**3**
PM12 type connection, thread M12x1 & connector with cable 3m length	**4**
PK type connection, cable 3m length	**5**

NOTE: Code 6
Available on Enclosure code M & N only.
NOTE: Code 7 & 8
Available on Enclosure code Q & S only.
Note: Code A & B
Available on Enclosure code Z only.

Refer Table 1 for Enclosure

(Table 3 continued…)	Code
PKD type connection, cable 3m length	6
SG type connection, cable 3m length	7
SGM type connection, thread 1/2” NPT Male & cable 3m length	8
FL type connection, thread 1/2" NPT Male & flying leads 2m length (for Ex d only)	A
SGM type connection, thread 1/2” NPT Male & cable 3m length (for Ex d only)	B

Material of Wetted Parts

TABLE 4

	Code
Stainless Steel 316L diaphragm and process connection	A
Hastelloy C276 diaphragm and process connection	B
Gold plated diaphragm and Stainless Steel 316L process connection	C

Range

TABLE 5

Note:
Other ranges available on request

Code	Nominal measuring range (FSO)	
D0	0...0.25 bar	(0...25 kPa)
D1	0...1 bar	(0...100 kPa)
D2	0...2.5 bar	(0...250 kPa)
D5	0...0.4 bar	(0...40 kPa)
D6	0...0.6 bar	(0...60 kPa)
D7	0...1.6 bar	(0...160 kPa)
D8	0...4 bar	(0...400 kPa)
D9	0...6 bar	(0...600 kPa)
E0	0...16 bar	(0...1.6 MPa)
E1	0...25 bar	(0...2.5 MPa)
XX	Non Standard Range	

	Measuring range				
	25 mbar	100 mbar	1 bar	2 bar	25 bar
Overpressure Limit Static Pressure Limit (repeated, without hysteresis)	250 bar (option 420 bar) (40 bar for P type process connection)				
Accuracy	0,4%	0,4%	0,25%		
Long term stability	0,6% / year	0,2% / year	0,1% / year		
Thermal error	Typically 0,6% / 10°C Max 1% / 10°C	Typically 0,3% / 10°C	Typically 0,2% / 10°C		
Zero shift error for static pressure*	0,1% / 10 bar				

Version

TABLE 6

NOTE: Code 4
Only available with process connection code A & D.

NOTE: Code B
Only available with output signal code O.

Refer Table 7 for Process Connection
Refer Table 9 for Output Signal

	Code
Applies when no option is required.	**0**
For oxygen service (sensor filled with Fluorolube fluid)	**4**
Response time < 30ms	**B**

Process Connection

TABLE 7

NOTE: Codes C & D
Available with NACE MR-01-75 certificate.

Note: Codes C
With M10 threaded holes, Pmax 250bar

	Code
G1/2 (male)	**Y**
1/4" NPT Female	**Q**
1/4" NPT Female on the cover flanges. Cover flanges material SS316L. Allows mounting with valve manifold with M10 threaded holes	**C**
C type process connection rotated 90°	**M**
1/4" NPT Female on the cover flanges. Cover flanges material SS316L. Allows mounting with 7/16-20 UNF threaded holes according to IEC61508	**D**
D type process connection rotated 90°	**R**

Options

TABLE 8

Combination of more than one option is available.
(i.e. Code 35 - combination of code 30 & 50)

	Code
Applies when no option is required	**00**
Stainless Steel Tag plate mounted on wire	**30**
Mounting bracket for 2" pipe (only version with C-type process connection), zinced steel	**50**
Mounting bracket for 2" pipe (only version with C-type process connection), stainless steel	**60**
Mounting bracket for 2" pipe (only version with process connection Code P & Q), stainless steel	**70**
Connector to weld impulse pipes Ø12 and Ø14 mm, material 15HM (only version with C-type process connection)	**C0**
Connector to weld impulse pipes Ø12 and Ø14 mm, material 15HM(SO) or SS316(S) (only version with process connection Code P & Q)	**D0**

Output Signal

TABLE 9

Note: For the constructions certified for Hazardous areas, the instruments are supplied as standard with ATEX marking on the label. The instrument will be supplied with nameplate marked according to the selected code on Table 9,

	Code
4 to 20mA (Weatherproof or Hazardous Area with ATEX marking)	**O**
4 to 20mA (Hazardous Area with IECEx marking)	**6**
0 to 10VDC / power supply 13-30VDC	**C**

Special Engineering

TABLE 10

Last 4 digits of model code only used when special engineering is required.

	Code
Please consult Delta Mobrey sales engineering for special	**TBA**

Application & Construction

The D32 Analogue Differential Pressure Transmitters are suitable for measurement of the differential pressure of gases, vapours and liquids. The active sensing element is a piezoresistive silicon sensor separated from the medium by a diaphragm and by a specifically selected type of manometric liquid. The electronics is placed in a casing with a degree of protection from IP 65 to IP 68, depending on the type of electrical connection applied. Refer Technical Data for more details.

Calibration

Potentiometers can be used to shift the zero position and the range by up to ±10%, without altering the settings.

Installation

The transmitter with GP type process connection is not heavy, so it can be installed directly onto impulse lines. For fitting in any desired position on a 25 pipe the Delta Mobrey mounting bracket (FI25 mounting bracket), is recommended. The version with C type process connection can be fitted directly to a 3- or 5-valve manifold.

When the special process connections are required for the measurement of levels and pressures (e.g. at food and chemical industries), the transmitter is provided with a diaphragm seal. The differential pressure transmitters with diaphragm seals are described in detail further in the catalogue.

When the special process connections are required for the measurement of levels and pressures (e.g. at food and chemical industries), the transmitter is provided with a Delta Mobrey diaphragm seal. Contact a Delta Mobrey sales representatives to get a quote for a suitable diaphragm seal.

Technical Data

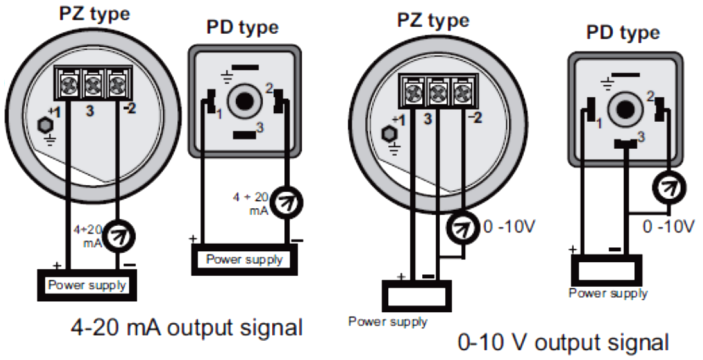
Hysteresis, repeatability	0,05%
Thermal compensation range	0...70°C
Operating temperature range (ambient temp.)	-25...70°C
FL electrical connection (Code B)	-25...70°C*
SGM electrical connection (Code A)	-25...65°C*
**more information available in user 's manual and certificate*	
Medium temperature range	-25...120°C

Over 120°C – measurement with use an impulse line or diaphragm seals

CAUTION: The medium must not be allowed to freeze in the impulse line or close to the process connection of the transmitter.

Output signal	4...20 mA, two wire transmission 0..10V
Material of diaphragms	316Lss, Hastelloy C 276, Au
Wetted parts type P/Q	316L SS or Hastelloy C276
Wetted parts typ C/M/D/R	316LSS
Material of casing	304 SS optional.316SS
Power supply	output 4..20mA 8…36 V DC (Ex 9...28 V DC) Version B: 10.5...36 V DC (Ex 12...28 V DC output 0..10V 13…30 VDC
Error due to supply voltage changes	0,005% (FSO) / V
Load resistance	$R[\Omega] \leq \frac{(U_{sup}[V]-8V)}{0,02A}$

Electrical diagrams



4-20 mA output signal

0-10 V output signal

D-Series
Model: D32

Approvals

EUROPEAN DIRECTIVES

ATEX Directive 2014/34/EU

INTRINSICALLY SAFE:
Certificate No.: FTZU 18 ATEX 0143X
EN 60079-0, EN 60079-11, EN 50303

For Zone 0 models **(Refer Table 1 for Enclosure code)**

M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb
II 1D Ex ia IIIC T110°C Da
II 1/2G Ex ia IIC T4 Ga/Gb (for transmitter with electrical connection ALW, ALM)

FLAMEPROOF:
Certificate No.: KDB 19 ATEX 0030X
EN60079-0, EN 60079-1, EN 60079-31

For Zone 1 models **(Refer Table 1 for Enclosure code)**

II 2G Ex db IIC T6/T5/T4 Gb
II 2D Ex tb IIIC T85°C/T100°C/T120°C Db

GLOBAL CERTIFICATION

IECEx Certified

INTRINSICALLY SAFE:
Certificate No.: IECEx FTZU 18.0023X
IEC 60079-0, IEC 60079-11

For Zone 0 models **(Refer Table 1 for Enclosure code)**

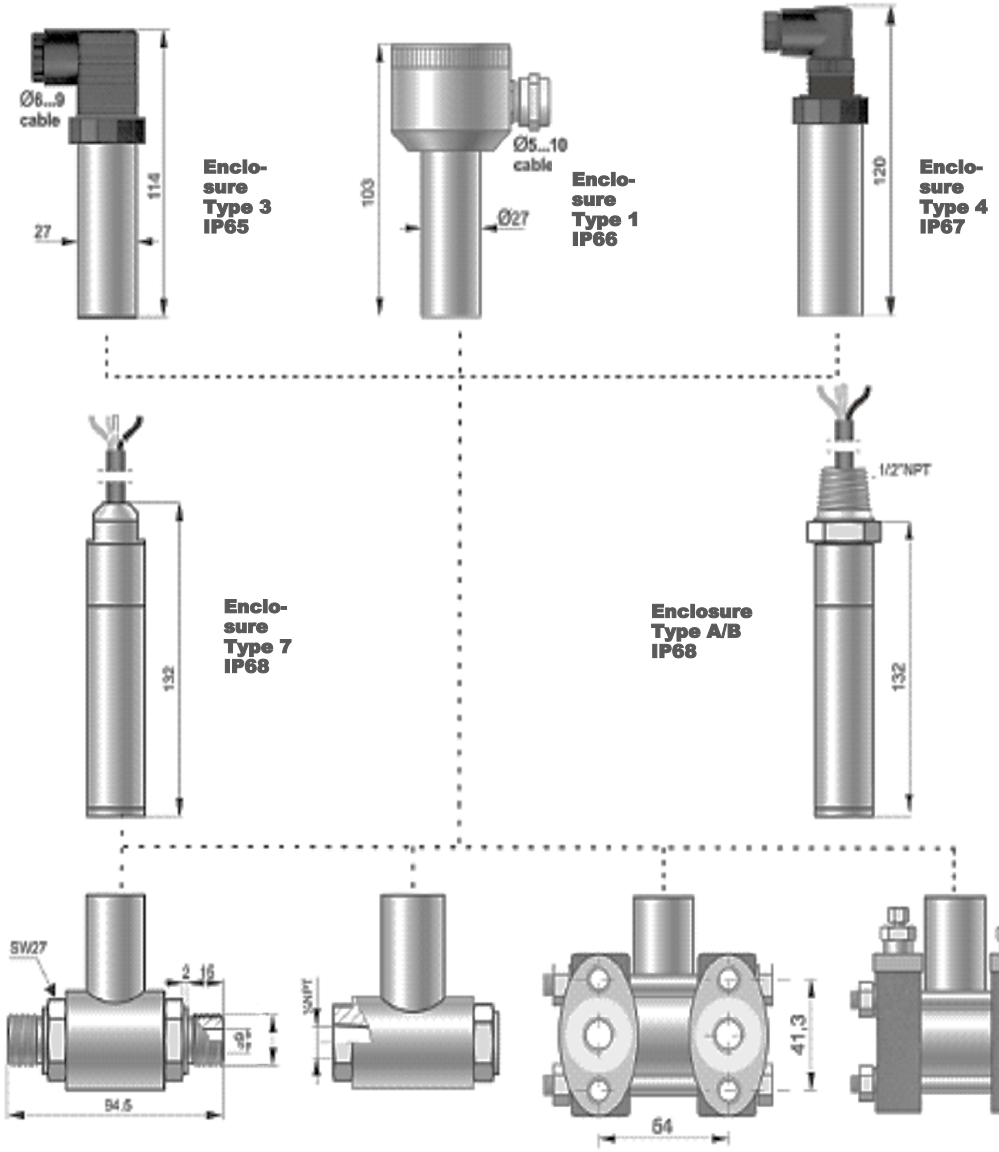
Ex ia I Ma
Ex ia IIC T4/T5/T6 Ga/Gb
Ex ia IIIC T110°C Da
Ex ia IIC T4 Ga/Gb (for transmitter with electrical connection ALW, ALM)

FLAMEPROOF:
Certificate No.: IECEx KDB 19.0005X
IEC 60079-0, IEC 60079-1, IEC 60079-31

For Zone 1 models **(Refer Table 1 for Enclosure code)**

Ex db IIC T6/T5/T4 Gb
Ex tb IIIC T85°C/T100°C/T120°C Db

Dimensions



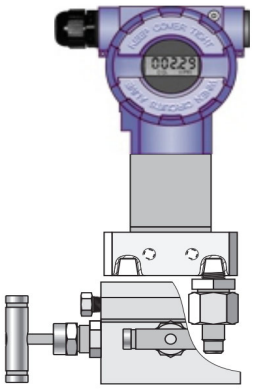
Y Type process connection

Q Type process connection

C & M Type process connection to mount with a valve manifold

Technical **Datasheet**

D Series
Low ranges,SMART Differential Pressure Transmitter



Key **Features**

- ATEX - Intrinsically Safe
  IECEx - Intrinsically Safe
- SIL 2 certificate
- Compliant to NAMUR NE-43
- High accuracy ±0.01% (better accuracy upon request)
- Fully HART ® compatible
- Static pressure limit up to 1 bar
- 4-20mA, with digital communications
- Suitable for clean gasses
- Programmable range, zero shift, characteristic and damping ratio with local panel keys
- Linearisation of output signal on 20 point curve for specific application is available
- Write protection option through DKAP-03 communicator, 'D-Soft' program or software using library EDDL

Product **applications**

The D Series SMART Differential Pressure Transmitter is suitable for a wide range of applications for measuring:

- Differential Pressure
- Flow

The choice of models available ensures that the Delta Transmitter is suitable for use in:

- Air & Flue gasses
- Any clean & dry gas

Series **Overview**

- The D-Series pressure, differential pressure and temperature transmitters offer customers reliable and accurate solutions to their individual process requirements.
- Available with a wide range of process connections and easily configurable via the D-Soft software, the D-Series can be used for a variety of applications when pressure, differential pressure, temperature, level or flow measurements are needed.

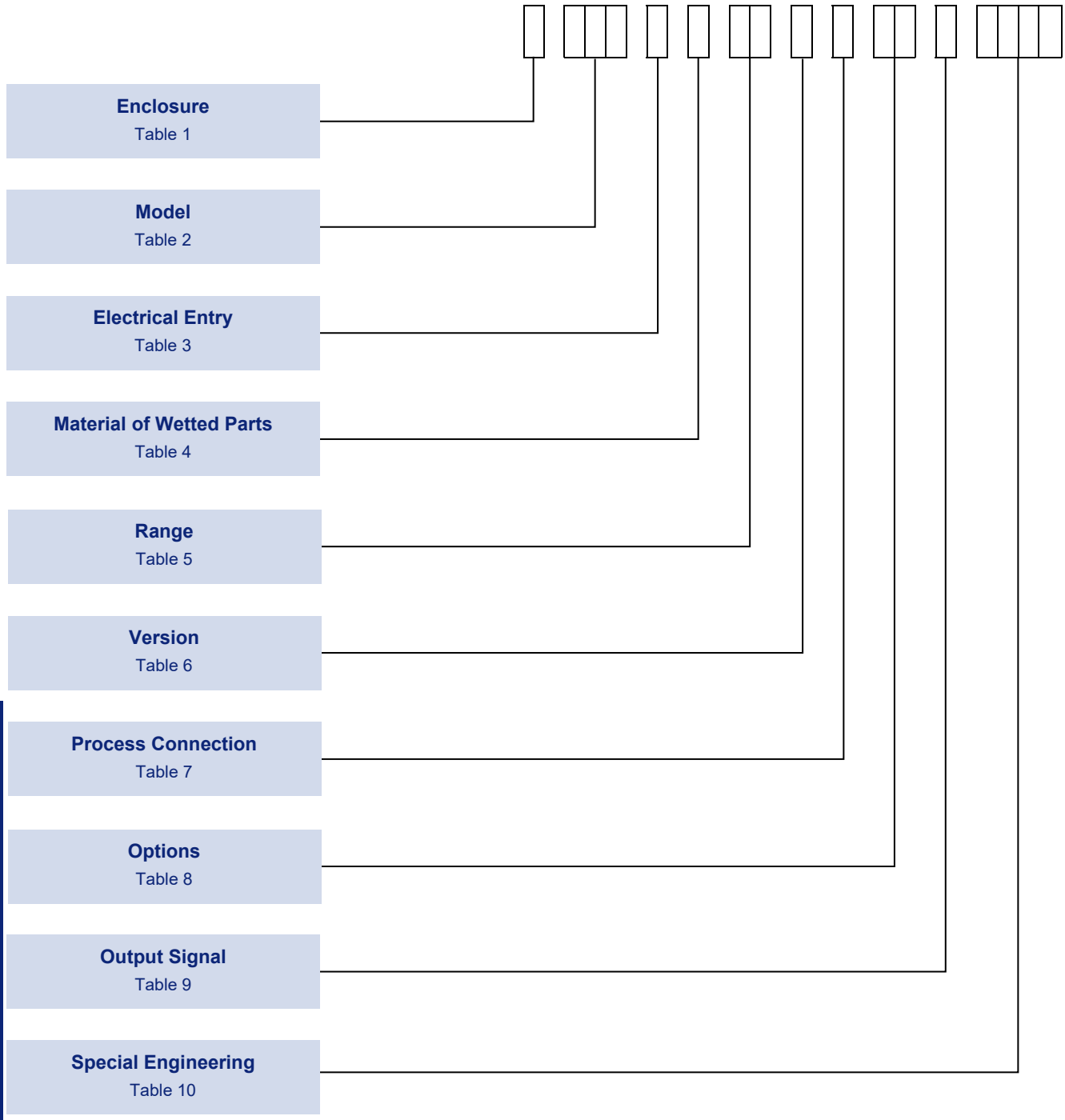
Other products in the series include:

- SMART Differential Pressure Transmitter
- SMART Pressure Transmitter
- SMART Temperature Transmitter

D-Series
Low ranges, SMART Differential Pressure Transmitter

How to order

Transmitters can be configured by selecting codes representing the desired features from the tables that follow. The chart below, describes how the model code is built up. For assistance in configuring a transmitter that best suits your needs, please contact your local sales office.



***NOTE**: Only the most common options are shown in this datasheet. Should you require a feature that is not shown, please contact your local sales office for further details.*

***NOTE:** The non-standard option code is shown by "X" in the part number. Should you require any clarification on this codes please contact your local sales office.*

Enclosure

Refer to 'Approvals' section for details about the certification on Flameproof & Intrinsically Safe models .

TABLE 1

ENCLOSURES TYPES	Code
WEATHERPROOF ENCLOSURE	
General Purpose Aluminum housing, IP66, with display.	**W**
For Aggressive Atmosphere 316 Stainless steel housing, IP66, with display.	**A**
FLAMEPROOF ENCLOSURES	
Aluminum housing, IP66, with display. (Ex d) *II 1/2GD -*	**H**
316 Stainless steel housing, IP66, with display. (Ex d) *II 1/2GD - I M2*	**R**
Aluminum housing, IP66, with display. (Ex d) *II G*	**2**
316 Stainless steel housing, IP66, with display. (Ex d) *IIG - I M2*	**3**
INTRINSICALLY SAFE ENCLOSURES	
Aluminum housing, IP66, with display. (Ex ia) *II 1/2G*	**5**
316 Stainless steel housing, IP66 with display. (Ex ia) *II 1/2G - I M1*	**4**
Aluminum housing, IP66, with display. (Ex ia/Da) *II 1/2GD*	**7**
316 Stainless steel housing, IP66 with display. (Ex ia/Da) *II 1/2GD - I M1*	**6**
INTRINSICALLY SAFE & FLAMEPROOF ENCLOSURES	
Aluminum housing, IP66, with display. (Ex ia / Ex d according to the installation) *II 1/2GD*	**8**
316 Stainless steel housing, IP66 with display. (Ex ia / Ex d according to the installation) *II 1/2GD - I M2/M1*	**9**

Model

TABLE 2

	Code
D34 SMART Differential Pressure Transmitter For applications up to 100 mbar. Static pressure up to 1 bar. Refer Table 5.	**D34**

Electrical Entry

NOTE: Code 1
Available on Enclosure code W, A, 5 & 4 as standard.

TABLE 3

	Code
M20x1.5 thread	**0**
Packing gland M20x1.5	**1**
Electrical connection with thread 1/2NPT Female	**2**

Material of Wetted Parts

NOTE: Codes A, C & D
Only applicable with process connection code P & Q.

TABLE 4

	Code
Stainless Steel 304 process connection	**C**

Range

TABLE 5

Code	Nominal measuring range (FSO)		Minimum set range		Rangeability	Overpressure limit/ Static pressure limit
A0	-100...100 mbar	(-10...10 kPa)	20 mbar	(2 kPa)	10:1	1 bar / 1 bar
A1	-25...25 mbar	(-2.5...2.5 kPa)	5 mbar	(500 Pa)	10:1	1 bar / 1 bar
B1	-7...7 mbar	(-700...700 Pa)	1 mbar	(100 Pa)	14:1	350 mbar / 350 mbar
B2	0...25 mbar	(0...2500Pa)	1 mbar	(0.1 kPa)	25:1	1 bar / 350 mbar
B3	-2.5...2.5 mbar	(-250...250Pa)	0.2 mbar	(20 kPa)	25:1	350 mbar / 350 mbar

Version

TABLE 6

Combination of more than one option is available.

	Code
Applies when no option is required	**0**
Surge arrester for Ex ia version	**1**
Protection class IP67	**6**
SIL2 - Functional Safety Certificate	**Z**

Process Connection

TABLE 7

	Code
Process connection with impulse line for 6mm OD elastic pipe	**O**
1/4" NPT Female on the cover flanges. Cover flanges material SS304 Allows mounting with valve manifold.	**C**

Options

TABLE 8

Combination of more than one option is available.

	Code
Applies when no option is required	**00**
Mounting bracket for 2" pipe (type AL), stainless steel	**10**
Stainless Steel rating label riveted to the housing	**20**
Stainless Steel Tag plate mounted on wire	**30**
Mounting bracket for 2" pipe (type AL) zinced steel	**40**
Stainless Steel rating label riveted to the housing, Stainless Steel Tag plate mounted on wire	**A0**
Connector to weld impulse pipes Ø12 and Ø14 mm, material 15HM	**C0**

Output Signal

TABLE 9

	Code
4 to 20mA	**O**

Special Engineering

TABLE 10

Last 4 digits of model code only used when special engineering is required.

	Code
Please consult Delta sales engineering for special requirements	**TBA**

Technical Data

Metrological parameters

Accuracy:
Range B2 ≤ ±0 .075% of the calibrated range
Range B3 ≤ ±0 .25% of the calibrated range
Range B1 ≤ ±0 .1% of the calibrated range
Range A1 ≤ ±0 .1% of the calibrated range
Range A0 ≤ ±0 .075% of the calibrated range

Thermal error
for all ranges ≤ ±0.1% (FSO) / 10°C
max. ±0.4% (FSO) in the whole compensation range

Thermal compensation range -10…70°C

Zero shift error for static pressure
Zeroing the transmitter in conditions of static pressure can eliminate this error.

Ambient temperature: -25...85°C

Operating temperature: -25...85°C

Electrical parameters

Power supply:
10...55 VDC / Exia:10,.5...30 VDC
SIL2: 11.5...36 VDC / SIL2 Exia: 11.5...36 VDC

Output signal 4...20 mA + Hart, two wire transmission

Load resistance (for standard version) $R\ [\Omega] \leq \frac{U_{sup}\ [V] - 10V}{0.0225A}$

Resistance required for communication min. 240 Ω

Additional electronic damping 0…30 s

Error due to supply voltage changes 0.002% (FSO) / V

Wetted parts: Code C process connection: SS304
Code (6mmOD elastic pipe): Brass

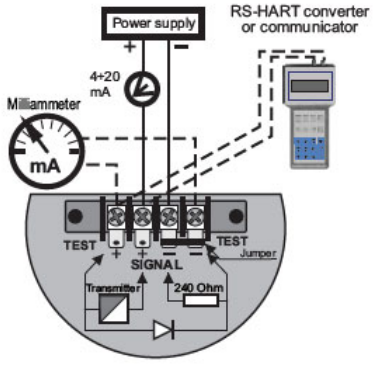
Casing : Aluminium / 316SS

Material of window: polycarbonate glass, hardened glass

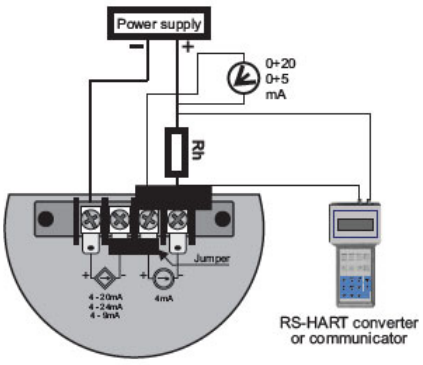
(FSO) / V

Electrical diagrams

Electrical diagrams for transmitters with HART protocol



Version with output signal: 4-20mA



Version with output signal: 0-5mA or 0-20mA

Approvals

GLOBAL CERTIFICATION

IECEx Certified - output signal code 6 (see table 9)

INTRINSICALLY SAFE:

Certificate No.:**IECEx FTZU 15.0027X**
IEC 60079-0, IEC 60079-11,

For Zone 0/1 models

Enclosure code 7 (refer Table 1)
Ex ia IIC T4/T5 Ga/Gb
Ex ia IIIC T105°C Da (version with PTFE shielded cable)

Enclosure code 8 (refer Table 1)
Ex ia I Ma
Ex ia IIC T4/T5 Ga/Gb
Ex ia IIB T4/T5 Ga/Gb (version with PTFE shielded cable)

Certificate No.: **KDB19ATEX006X**
EN IEC 60079-0, EN 60079-11, EN 60079-26, EN 50303

For Zone 0/1,20 models

Enclosure code 5 SIL version (refer Table 1)
Ex ia IIC T4/T5 Ga/Gb

Enclosure code 4 SIL version (refer Table 1)
Ex ia I Ma
Ex ia IIC T4/T5 Ga/Gb

Enclosure code 7 (refer Table 1)
Ex ia IIC T4/T5 Ga/Gb
Ex ia IIIC T105°C Da

Enclosure code 8 (refer Table 1)
Ex ia I Ma
Ex ia IIC T4/T5 Ga/Gb
Ex ia IIIC T105°C Da

FLAMEPROOF:

Certificate No.**: IECEx KDB 19.006X**
IEC 60079-0, IEC 60079-1, IEC 60079-11, IEC 60079-26, IEC 60079-31

For Zone 0/1, 20/21 models

Enclosure code H (refer Table 1)
Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T105°C Da/Db

Enclosure code R (refer Table 1)
Ex db ia I Mb
Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T105°C Da/Db

For Zone 1, 21 models

Enclosure code 2 (refer Table 1)
Ex ia/db IIC T6/T5 Gb
Ex ia/tb IIIC T105°C Db

Enclosure code 3 (refer Table 1)
Ex db ia I Mb
Ex ia/db IIC T6/T5 Gb
Ex ia/tb IIIC T105°C Db

INTRINSICALLY SAFE & FLAMEPROOF (*): **(*) According to the selection on the label**

Certificate No.: **IECEx KDB 19.0006X**
IEC 60079-0, IEC 60079-1, IEC 60079-11, IEC 60079-26, IEC 60079-31

For Zone 0/1, 20/21 or 0/1, 20 models

Enclosure code 8 (refer Table 1)
Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T105°C Da/Db
Or

Ex ia IIC T5/T4 Ga/Gb
Ex ia IIIC T105°C Da

Enclosure code 9 (refer Table 1)
M2 Ex db ia I Mb
Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T105°C Da/Db
Or

Ex ia I Ma
Ex ia IIC T5/T4 Ga/Gb
Ex ia IIIC T105°C Da

Approvals

EUROPEAN DIRECTIVE)

ATEX Directive 2014/34/EU - output signal code O (see table 9)

INTRINSICALLY SAFE:

Certificate No.: **FTZU 19ATEX0111X**
EN IEC 60079-0, EN 60079-11, EN 50303

For Zone 0/1 models

Enclosure code 5 (refer Table 1)
II 1/2G Ex ia IIC T4/T5 Ga/Gb
II 1D Ex ia IIIC T105°C Da (version with PTFE shielded cable)

Enclosure code 4 (refer Table 1)
I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5 Ga/Gb
II 1D Ex ia IIIC T105°C Da (version with PTFE shielded cable)

Certificate No.: **KDB19ATEX0045X**
EN IEC 60079-0, EN 60079-11, EN 60079-26, EN 50303

For Zone 0/1,20 models

Enclosure code 5 SIL version (refer Table 1)
II 1/2G Ex ia IIC T4/T5 Ga/Gb

Enclosure code 4 SIL version (refer Table 1)
I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5 Ga/Gb

Enclosure code 7 (refer Table 1)
II 1/2G Ex ia IIC T4/T5 Ga/Gb
II 1D Ex ia IIIC T105°C Da

Enclosure code 8 (refer Table 1)
I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5 Ga/Gb

FLAMEPROOF:

Certificate No.**: KDB19ATEX0045X**
EN IEC 60079-0, EN 60079-1, EN 60079-11, EN 60079-26, EN 60079-31, EN50303

For Zone 0/1, 20/21 models

Enclosure code H (refer Table 1)
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db

Enclosure code R (refer Table 1)
I M2 Ex db ia I Mb
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db

For Zone 1, 21 models

Enclosure code 2 (refer Table 1)
II 2G Ex ia/db IIC T6/T5 Gb
II 2D Ex ia/tb IIIC T105°C Db

Enclosure code 3 (refer Table 1)
I M2 Ex db ia I Mb
II 2G Ex ia/db IIC T6/T5 Gb

INTRINSICALLY SAFE & FLAMEPROOF (*):

(*) According to the selection on the label

Certificate No.: **KDB19ATEX0045X**
EN IEC 60079-0, EN 60079-1, EN 60079-11, EN 60079-26, EN 60079-31, EN50303
For Zone 0/1, 20/21 or 0/1, 20 models

Enclosure code 2 (refer Table 1)
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db
Or
II 1/2G Ex ia IIC T5/T4 Ga/Gb

II 1D Ex ia IIIC T105°C Da

Enclosure code 3 (refer Table 1)
M2 Ex db ia I Mb
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db
or

I M1 Ex ia I Ma
II 1/2G Ex ia IIC T5/T4 Ga/Gb
II 1D Ex ia IIIC T105°C Da

EMC Directive 2014/30/EU

Conformity assessment procedure: module A
The following standards were applied: EN 61326-1:2013; EN61326-2-3:2013

2014/68/EU Pressure Equipment Directive

For Nameplate Parameter **PS>200 bar**: The transmitters in PED version according to Module A of Directive 201/68/EU have specified on the nameplate parameters PS>200bar, P(range).....T(amb.).....

For Nameplate Parameter **PS< 200bar**, P(range),.....T(amb.).... are manufactured on the basis of Article 4, Clause 3 of Directive 2014/68/EU in accordance with the sound engineering practice

Restriction of hazardous substances (RoHS 2) 2011/65/EU

Compliant to RoHS. The folloing stabdard was applied: EN IEC 63000:201

Approvals

UK REGULATIONS

Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 2016

Output signal code 7 (see table 9)

INTRINSICALLY SAFE:

Certificate No.: **ExVeritas 22UKEX1416X**
EN IEC 60079-0, EN 60079-11, EN60079-26 , EN 50303

For Zone 0/1, 20 models

Enclosure code 5 SIL version (refer Table 1)
II 1/2G Ex ia IIC T4/T5 Ga/Gb

Enclosure code 4 SIL version (refer Table 1)
I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5 Ga/Gb

Enclosure code 7 (refer Table 1)
II 1/2G Ex ia IIC T4/T5 Ga/Gb
II 1D Ex ia IIIC T105°C Da

Enclosure code 8 (refer Table 1)
I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5 Ga/Gb
II 1D Ex ia IIIC T105°C Da

FLAME-PROOF:

Certificate No**.: 22UKEX1416X**
EN IEC 60079-0, EN 60079-1, EN 60079-11, EN 60079-26, EN 60079-31, EN50303

For Zone 0/1, 20/21 models

Enclosure code H (refer Table 1)
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db

Enclosure code R (refer Table 1)
I M2 Ex db ia I Mb
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db

For Zone 1, 21 models

Enclosure code 2 (refer Table 1)
II 2G Ex ia/db IIC T6/T5 Gb
II 2D Ex ia/tb IIIC T105°C Db

Enclosure code 3 (refer Table 1)
I M2 Ex db ia I Mb
II 2G Ex ia/db IIC T6/T5 Gb
II 2D Ex ia/tb IIIC T105°C Db

INTRINSICALLY SAFE & FLAMEPROOF (*):

(*) According to the selection on the label

Certificate No.: **22UKEX1416X**
EN IEC 60079-0, EN 60079-1, EN 60079-11, EN 60079-26, EN 60079-31, EN50303

For Zone 0/1, 20/21 or 0/1, 20 models

Enclosure code 2 (refer Table 1)
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db
or
II 1/2G Ex ia IIC T5/T4 Ga/Gb
II 1D Ex ia IIIC T105°C Da

Enclosure code 3 (refer Table 1)
M2 Ex db ia I Mb
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db
or
I M1 Ex ia I Ma
II 1/2G Ex ia IIC T5/T4 Ga/Gb
II 1D Ex ia IIIC T105°C Da

FLAME
Certificate No.: IECEx KDB 17.0001X
IEC 60079-0, IEC 60079-1, IEC 60079-11, IEC 60079-26, IEC 60079-31

For Zone 1 models **(Enclosure code H/R, refer Table 1)**

Enclosure R (refer Table 1)

Ex db ia I Mb
Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T85°C/T100°C Da/Db
or
Ex db ia I Mb
Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T85°C/T100°C Db

Enclosure H (refer Table 1)

Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T85°C/T100°C Da/Db
or
Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T85°C/T100°C Db

Installation

The instrument can be supplied with a universal Delta mounting bracket for 2" pipe (Refer Table 8). The base economical version is supplied with impulse line for 6mm OD elastic pipe in Brass. The process connections code C has 1/4" NPT-F connection and can be fitted directly to a 3- or 5 valve manifold. We recommend factory-mounted transmitters with VM type valve manifold.
The instrument should be installed in vertical position, in such a way that any condensed liquid, flew off from the device. To prevent dust from entering the measuring cells, the impulse line should be attached with care, with particular attention paid to the tightness of the connections between the impulse line and the transmitter.
Where there is a significant different in height between the place where the instrument is installed and the place where the process pressure is taken, the temperature of the impulse line may affect the measurement. Connecting a compensating pipe close to the impulse line, can minimise this effect.

Construction

The SMART Differential Pressure Transmitters are suitable for measuring differential pressure of gases. The active sensing element is a piezoresistive silicon sensor This instrument is suitable for the measurement of differential pressures in furnaces, chimney draughts, air ducts. The root extraction option, enable the instrument to be used in gas flow measurement, in combination with our flow orifices and Pitot tubes in low pressure application. The casing is made of cast aluminium alloy with epoxy coating or 316 stainless steel with degree of protection IP66/67. The design of the casing enables the use of a local display, rotation of the display,

The communication standard for data interchange with the transmitter is the Hart protocol.

Communication with the transmitter is carried out with:

– a DKAP-03 communicator,

– some other Hart type communicators,(*)

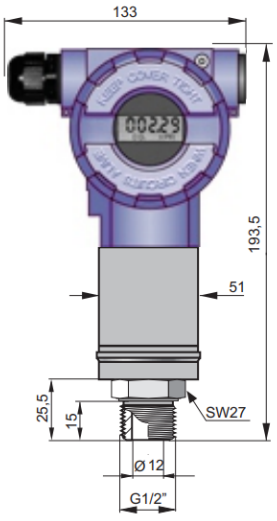
– a PC using a HART/USB/Bluetooth converter and

D-Soft configuration software

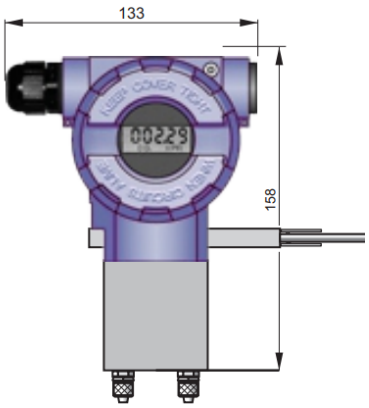
The data interchange with the transmitter enables the users to:

- identify the transmitter;
- configure the output parameters:
  - measurement units and the values of the start points and end points at the measurement range;
  - damping time constant;
  - conversion characteristic (inversion, user's non-linear characteristic);
- read the currently measured pressure value of the output current and the percentage output control level;
- force an output current with a set value;
- calibrate the transmitter in relation to a model pressure

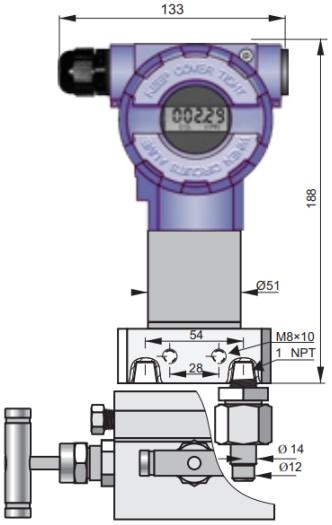
Dimensions



Process connection 1/2"GM for gauge pressure measurement



Basic economic version with Process connection with impulse line for 6mm OD elastic pipe

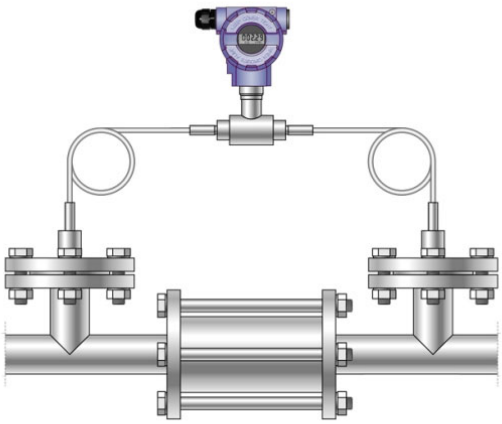


Process connection type C, with or without valve manifold

Technical **Datasheet**

delta-mobrey

D Series
SMART Differential Pressure Transmitter with Two Diaphragm Seals



Key **Features**

- ATEX - Flameproof and Intrinsically Safe
  UKEx - Flameproof and Intrinsically Safe
  IECEx - Flameproof and Intrinsically Safe
- High accuracy ±0.1%
- Fully HART ® compatible
- 4-20mA analogue with digital communications
- Fully welded sensor guarantees tightness of oil systems for long term usage
- Programmable range, zero shift, characteristic and damping ratio with local panel keys
- Linearisation of output signal on 20 point curve for specific application is available
- Write protection option through DKAP-03 communicator, 'D-Soft' program or software using library EDDL

Series **Overview**

The D35 is a D31 type Differential Pressure Transmitter, but with addition of chemical seals. The general performance and characteristics typical of the D-Series transmitters, are the same.

- The D-Series pressure, differential pressure and temperature transmitters offer customers reliable and accurate solutions to their individual process requirements.
- Available with a wide range of process connections and easily configurable via the D-Soft software, the D-Series can be used for a variety of applications when pressure, differential pressure, temperature, level or flow measurements are needed.

Other products in the series include:
- SMART Differential Pressure Transmitter
- SMART Differential Pressure Transmitter for low ranges
- SMART Pressure Transmitter

Product **applications**

The D Series SMART Differential Pressure Transmitter is suitable for a wide range of applications for measuring:

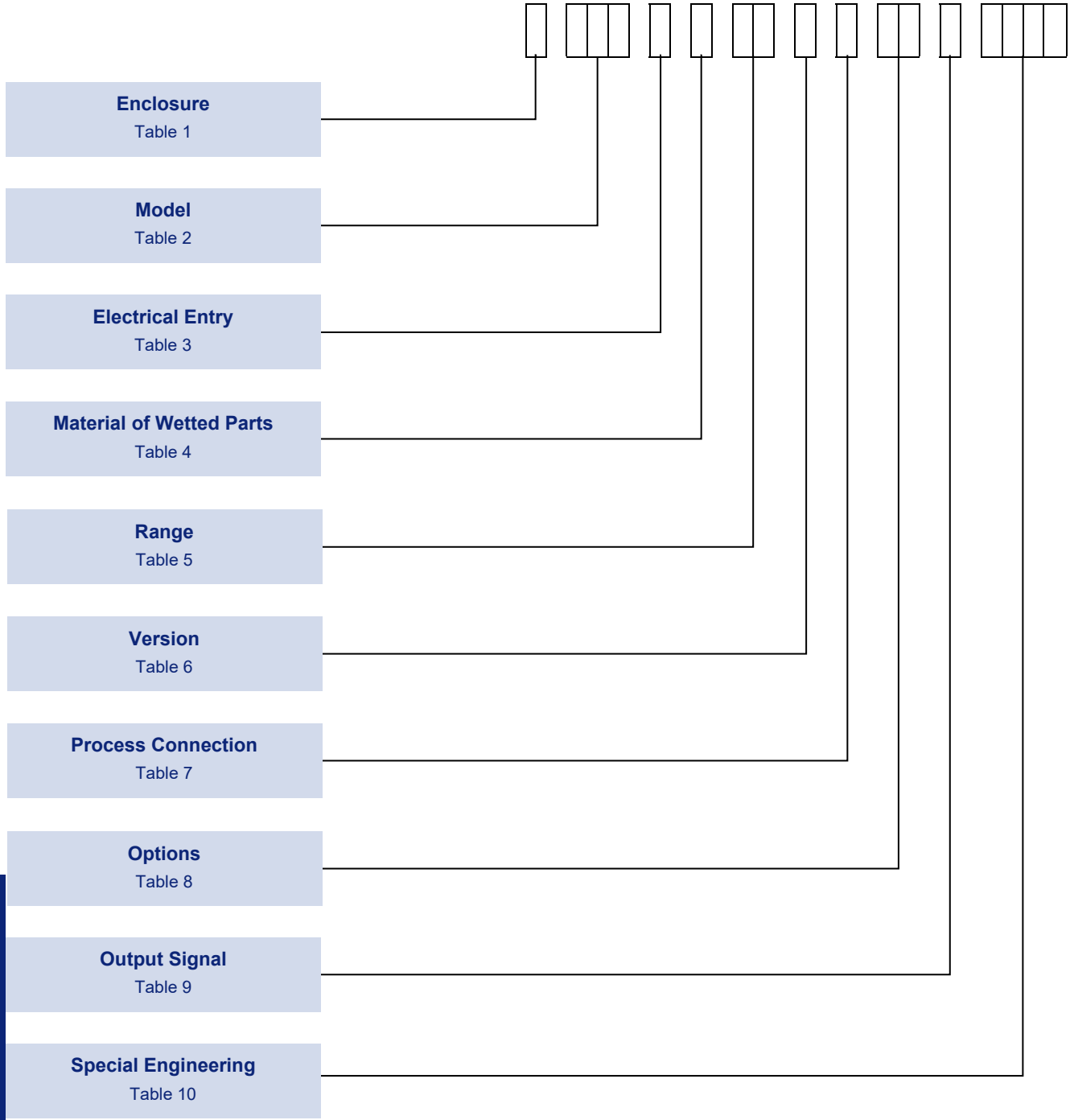
- Differential Pressure
- Level
- Flow

The choice of models available ensures that the Delta Transmitter is suitable for use in:

- Corrosive atmospheres
- Resistant to chemical attack

How to order

Transmitters can be configured by selecting codes representing the desired features from the tables that follow. The chart below, describes how the model code is built up. For assistance in configuring a transmitter that best suits your needs, please contact your local sales office.



***NOTE**: Only the most common options are shown in this datasheet. Should you require a feature that is not shown, please contact your local sales office for further details.*

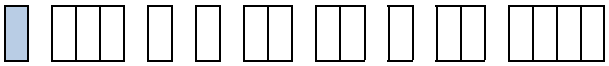
***NOTE:** The non-standard option code is shown by "X" in the part number. Should you require any clarification on this codes please contact your local sales office.*

***NOTE:** Please confirm before ordering if the backlight of the display is required to be settled differently from our standard. It cannot be successively settled in field.*

- *Instruments in Std, Exd, Exi construction are normally supplied with backlight ON.*
- *instruments in Safety and double certified construction, are supplied with backlight OFF*

Enclosure

TABLE 1

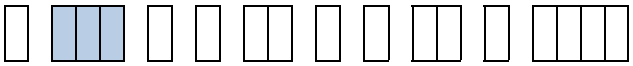


Refer to 'Approvals' section for details about the certification on Flameproof & Intrinsically Safe models .

ENCLOSURES TYPES	Code
WEATHERPROOF ENCLOSURE	
General Purpose Aluminum housing, IP66, with display.	**W**
For Aggressive Atmosphere 316 Stainless steel housing, IP66, with display.	**A**
FLAMEPROOF ENCLOSURES (ZONE 1)	
Aluminum housing, IP66, with display. (Ex d)	**H**
316 Stainless steel housing, IP66, with display. (Ex d)	**R**
INTRINSICALLY SAFE ENCLOSURES (ZONE 0)	
Aluminum housing, IP66, with display. (Ex ia)	**5**
316 Stainless steel housing, IP66 with display. (Ex ia)	**4**

Model

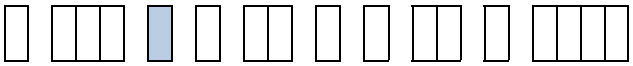
TABLE 2



	Code
SMART Differential Pressure Transmitter with Two Diaphragm Seals For applications up to 16 bar. Static pressure up to 160 bar. Refer Table 5.	**D35**

Electrical Entry

TABLE 3



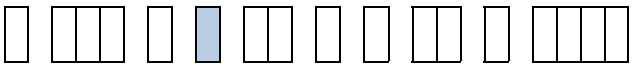
NOTE: Code 0
Available on Enclosure code H & R as standard.

NOTE: Code 1
Available on Enclosure code W, A, 5 & 4 as standard.

	Code
M20x1.5 thread	**0**
Packing gland M20x1.5	**1**
Electrical connection with thread 1/2NPT Female	**2**

Material of Wetted Parts

TABLE 4



NOTE 1:
Please refer 'Process Connection' & 'Engineering Specials' section.

	Code
Not applicable. **(SEE NOTE 1)**	**0**

Range

TABLE 5

Code	Nominal measuring range (FSO)		Minimum set range	Vertical Spacing of diaphragm seals	Maximum set range width, considering the actual vertical spacing of the diaphragm seals (m)	Static Pressure Limit
A3	-160...160 mbar	(-16...16 kPa)	0.1 m H_2O	≤ 1.7 m	[1.6 + (vertical spacing of seals x 0.94)] m H_2O	40 bar
C3	-0.5...0.5 bar	(-50...50 kPa)	0.5 m H_2O	≤ 6 m	[5 + (vertical spacing of seals x 1.04)] m H_2O	40 bar
C6	-1.6...2 bar	(-160...200 kPa)	1.5 m H_2O	≤ 15 m	[20 + (vertical spacing of seals x 1.04)] m H_2O	40 bar
C7	-1.6...16 bar	(-160...160 kPa)	1 bar	≤ 15 m	16 bar	40 bar

CAUTION: The maximum vertical diaphragm seal spacing shown in the table applies to level measurement, ensuring that it is possible to set the zero point of the transmitter when the tank is empty. For measurement of density or phase boundaries (in the sugar, chemical or refinery industries) the vertical spacing of the diaphragm seals can be larger.

Version

TABLE 6

Combination of more than one option is available.

NOTE:
Surge arrester is available as standard for Ex d version.

	Code
Applies when no option is required	**0**
Surge arrester for Ex ia version	**1**
Protection class IP67	**6**
Static pressure 100 bar	**G**
Static pressure 160 bar	**H**

Process Connection

TABLE 7

NOTE 2:
Refers to the transmitter's wetted parts.

	Code
Stainless Steel 316L diaphragm and process connection. **(SEE NOTE 2)**	**A**

Options

TABLE 8

Combination of more than one option is available.
(i.e. Code 37 - combination of code 30 & 70)

	Code
Applies when no option is required	**00**
Stainless Steel rating label riveted to the housing	**20**
Stainless Steel Tag plate mounted on wire	**30**
Mounting bracket for 1" pipe, stainless steel	**70**
Stainless Steel plate riveted to the housing. Stainless Steel tag plate mounted on wire.	**A0**

Output Signal

TABLE 9

Note: Please refer to APPROVALS page for marking & protection.

	Code
4 to 20mA (Weatherproof or Hazardous Area with ATEX marking)	**O**
4 to 20mA (Hazardous Area with IECEx marking only)	**6**
4 to 20mA (Hazardous Area with UKEx marking)	**7**

Special Engineering

TABLE 10

Last 4 digits of model code will be allocated for specified diaphragm seal or any special requirements when required.

Please specify the requirement of the diaphragm seals,

1. Diaphragm seal type
2. Direct or remote diaphragm seal to be mounted on each side of transmitter.
3. Capillary length on each side of transmitter.

	Code
Please consult Delta sales engineering for special requirements	**TBA**

Application & Construction

The differential pressure transmitter is applicable to the measurement of pressure differences of: gases, vapours and liquids in cases where it is necessary to use seals and the pressure pulse source points may be several metres apart. Typical applications include the hydrostatic measurement of: levels in closed tanks, densities and phase boundaries, and the measurement of a filter loss, pressure differences between media in pasteurisers etc. The available range of the diaphragm seals allows measurement at great majority of media. The active element is a piezoresistant silicon sensor separated from the medium by a distance sealing system. The special design of the measuring units means that it can withstand pressure surges and overloads of up to 40 bar. The electronic circuits are enclosed in a casing with a degree of protection IP65 or IP66.

Configuration

The settings of the following metrological parameters can be changed:

- The units of pressure in which the range is configured.
- Start and end points of the range, time constant,
- Inverted characteristics (output signal 20 to 4 mA)

Communication

The transmitter is configured and calibrated using a DKAP-03 communicator, some other communications (HART) or a PC using and HART/USB converted and D-Soft configuration software.

The data interchange with the transmitters enables the users the transmitter identification, as well as reading of the currently measured differential pressure value, output current and percent of range width.

Technical Data

Metrological parameters

Accuracy ≤ ±0 .1% (FSO)

The other parameters as given in the technical datasheet for SMART Differentials Pressure Transmitter D31.

Sealing effect errors - as given in the relevant D Series Diaphragm seal's technical datasheets, concerning the distance seal.

NOTE: The additional absolute zero error due to ambient temperature can be compensated by configuring the transmitter, seals and capillaries in accordance with the recommendations on **'Example'** section.

Electrical Parameters

As given in the datasheet of D31 SMART Differential Pressure Transmitter.

Operating Conditions

Operating temperature range (ambient temperature) -25...85°C

D35/Exia -25...80°C

D35/Exd -25...75°C

Medium temperature range – as given in the appropriate diaphragm seal's technical datasheets (remote seal).

Special versions, certificates:

Exia - ATEX Intrinsic safety
Exd - ATEX Explosion proof

100 bar, 160 bar - static pressure 100 bar or 160 bar

Approvals

GLOBAL CERTIFICATION

IECEx Certified - output signal code 6 (see table 9)

INTRINSICALLY SAFE:

Certificate No.:**IECEx FTZU 15.0027X**
IEC 60079-0, IEC 60079-11,

For Zone 0/1 models

Enclosure code 7 (refer Table 1)
Ex ia IIC T4/T5 Ga/Gb
Ex ia IIIC T105°C Da (version with PTFE shielded cable)

Enclosure code 8 (refer Table 1)
Ex ia I Ma
Ex ia IIC T4/T5 Ga/Gb
Ex ia IIB T4/T5 Ga/Gb (version with PTFE shielded cable)

Certificate No.: **KDB19ATEX006X**
EN IEC 60079-0, EN 60079-11, EN 60079-26, EN 50303

For Zone 0/1,20 models

Enclosure code 5 SIL version (refer Table 1)
Ex ia IIC T4/T5 Ga/Gb

Enclosure code 4 SIL version (refer Table 1)
Ex ia I Ma
Ex ia IIC T4/T5 Ga/Gb

Enclosure code 7 (refer Table 1)
Ex ia IIC T4/T5 Ga/Gb
Ex ia IIIC T105°C Da

Enclosure code 8 (refer Table 1)
Ex ia I Ma
Ex ia IIC T4/T5 Ga/Gb
Ex ia IIIC T105°C Da

FLAMEPROOF:

Certificate No**.: IECEx KDB 19.006X**
IEC 60079-0, IEC 60079-1, IEC 60079-11, IEC 60079-26, IEC 60079-31

For Zone 0/1, 20/21 models

Enclosure code H (refer Table 1)
Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T105°C Da/Db

Enclosure code R (refer Table 1)
Ex db ia I Mb
Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T105°C Da/Db

For Zone 1, 21 models

Enclosure code 2 (refer Table 1)
Ex ia/db IIC T6/T5 Gb
Ex ia/tb IIIC T105°C Db

Enclosure code 3 (refer Table 1)
Ex db ia I Mb
Ex ia/db IIC T6/T5 Gb
Ex ia/tb IIIC T105°C Db

INTRINSICALLY SAFE & FLAMEPROOF (*): **(*) According to the selection on the label**

Certificate No.: **IECEx KDB 19.0006X**
IEC 60079-0, IEC 60079-1, IEC 60079-11, IEC 60079-26, IEC 60079-31

For Zone 0/1, 20/21 or 0/1, 20 models

Enclosure code 8 (refer Table 1)
Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T105°C Da/Db
Or

Ex ia IIC T5/T4 Ga/Gb
Ex ia IIIC T105°C Da

Enclosure code 9 (refer Table 1)
M2 Ex db ia I Mb
Ex ia/db IIC T6/T5 Ga/Gb
Ex ia/tb IIIC T105°C Da/Db
Or

Ex ia I Ma
Ex ia IIC T5/T4 Ga/Gb
Ex ia IIIC T105°C Da

Approvals

EUROPEAN DIRECTIVE)

ATEX Directive 2014/34/EU - output signal code O (see table 9)

INTRINSICALLY SAFE:

Certificate No.: **FTZU 19ATEX0111X**
EN IEC 60079-0, EN 60079-11, EN 50303

For Zone 0/1 models

Enclosure code 5 (refer Table 1)
II 1/2G Ex ia IIC T4/T5 Ga/Gb
II 1D Ex ia IIIC T105°C Da (version with PTFE shielded cable)

Enclosure code 4 (refer Table 1)
I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5 Ga/Gb
II 1D Ex ia IIIC T105°C Da (version with PTFE shielded cable)

Certificate No.: **KDB19ATEX0045X**
EN IEC 60079-0, EN 60079-11, EN 60079-26, EN 50303

For Zone 0/1,20 models

Enclosure code 5 SIL version (refer Table 1)
II 1/2G Ex ia IIC T4/T5 Ga/Gb

Enclosure code 4 SIL version (refer Table 1)
I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5 Ga/Gb

Enclosure code 7 (refer Table 1)
II 1/2G Ex ia IIC T4/T5 Ga/Gb
II 1D Ex ia IIIC T105°C Da

Enclosure code 8 (refer Table 1)
I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5 Ga/Gb
II 1D Ex ia IIIC T105°C Da

FLAMEPROOF:

Certificate No.**: KDB19ATEX0045X**
EN IEC 60079-0, EN 60079-1, EN 60079-11, EN 60079-26, EN 60079-31, EN50303

For Zone 0/1, 20/21 models

Enclosure code H (refer Table 1)
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db

Enclosure code R (refer Table 1)
I M2 Ex db ia I Mb
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db

For Zone 1, 21 models

Enclosure code 2 (refer Table 1)
II 2G Ex ia/db IIC T6/T5 Gb
II 2D Ex ia/tb IIIC T105°C Db

Enclosure code 3 (refer Table 1)
I M2 Ex db ia I Mb
II 2G Ex ia/db IIC T6/T5 Gb
II 2D Ex ia/tb IIIC T105°C Db

INTRINSICALLY SAFE & FLAMEPROOF (*):

(*) According to the selection on the label

Certificate No.: **KDB19ATEX0045X**
EN IEC 60079-0, EN 60079-1, EN 60079-11, EN 60079-26, EN 60079-31, EN50303

For Zone 0/1, 20/21 or 0/1, 20 models

Enclosure code 2 (refer Table 1)
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db
Or
II 1/2G Ex ia IIC T5/T4 Ga/Gb

II 1D Ex ia IIIC T105°C Da

Enclosure code 3 (refer Table 1)
M2 Ex db ia I Mb
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db
or

I M1 Ex ia I Ma
II 1/2G Ex ia IIC T5/T4 Ga/Gb
II 1D Ex ia IIIC T105°C Da

EMC Directive 2014/30/EU

Conformity assessment procedure: module A
The following standards were applied: EN 61326-1:2013; EN61326-2-3:2013

2014/68/EU Pressure Equipment Directive

For Nameplate Parameter **PS>200 bar**: The transmitters in PED version according to Module A of Directive 201/68/EU have specified on the nameplate parameters PS>200bar, P(range).....T(amb.).....

For Nameplate Parameter **PS< 200bar**, P(range),.....T(amb.).... are manufactured on the basis of Article 4, Clause 3 of Directive 2014/68/EU in accordance with the sound engineering practice

Restriction of hazardous substances (RoHS 2) 2011/65/EU
Compliant to RoHS. The folloing stabdard was applied: EN IEC 63000:201

Approvals

UK REGULATIONS

Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 2016
Output signal code 7 (see table 9)

INTRINSICALLY SAFE:

Certificate No.: **ExVeritas 22UKEX1416X**
EN IEC 60079-0, EN 60079-11, EN60079-26 , EN 50303

For Zone 0/1, 20 models

Enclosure code 5 SIL version (refer Table 1)
II 1/2G Ex ia IIC T4/T5 Ga/Gb

Enclosure code 4 SIL version (refer Table 1)
I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5 Ga/Gb

Enclosure code 7 (refer Table 1)
II 1/2G Ex ia IIC T4/T5 Ga/Gb
II 1D Ex ia IIIC T105°C Da

Enclosure code 8 (refer Table 1)
I M1 Ex ia I Ma
II 1/2G Ex ia IIC T4/T5 Ga/Gb
II 1D Ex ia IIIC T105°C Da

FLAME-PROOF:

Certificate No**.: 22UKEX1416X**
EN IEC 60079-0, EN 60079-1, EN 60079-11, EN 60079-26, EN 60079-31, EN50303

For Zone 0/1, 20/21 models

Enclosure code H (refer Table 1)
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db

Enclosure code R (refer Table 1)
I M2 Ex db ia I Mb
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db

For Zone 1, 21 models

Enclosure code 2 (refer Table 1)
II 2G Ex ia/db IIC T6/T5 Gb
II 2D Ex ia/tb IIIC T105°C Db

Enclosure code 3 (refer Table 1)
I M2 Ex db ia I Mb
II 2G Ex ia/db IIC T6/T5 Gb
II 2D Ex ia/tb IIIC T105°C Db

INTRINSICALLY SAFE & FLAMEPROOF (*):

(*) According to the selection on the label

Certificate No.: **22UKEX1416X**
EN IEC 60079-0, EN 60079-1, EN 60079-11, EN 60079-26, EN 60079-31, EN50303

For Zone 0/1, 20/21 or 0/1, 20 models

Enclosure code 2 (refer Table 1)
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db
or

II 1/2G Ex ia IIC T5/T4 Ga/Gb
II 1D Ex ia IIIC T105°C Da

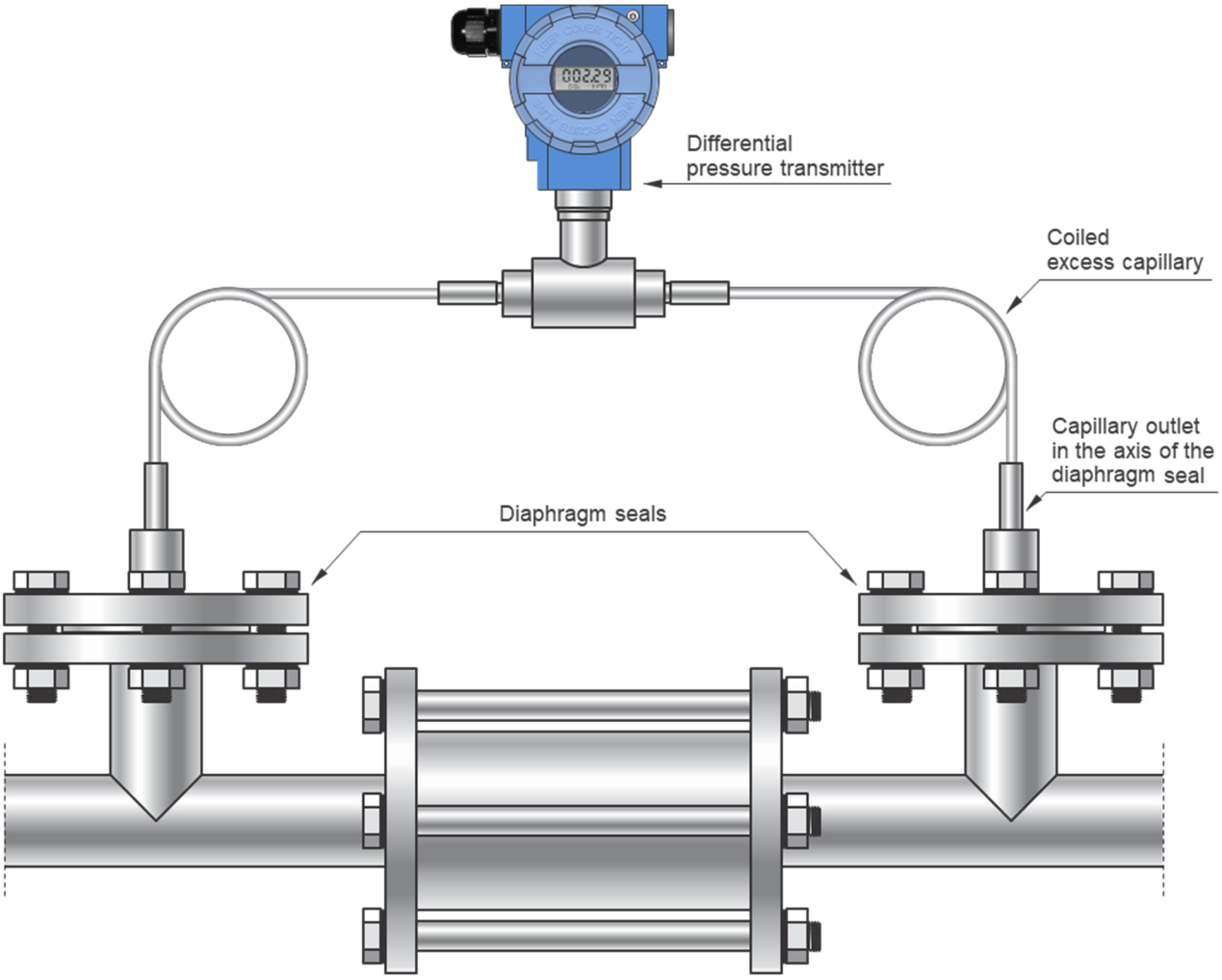
Enclosure code 3 (refer Table 1)
M2 Ex db ia I Mb
II 1/2G Ex ia/db IIC T6/T5 Ga/Gb
II 1/2D Ex ia/tb IIIC T105°C Da/Db
or

I M1 Ex ia I Ma
II 1/2G Ex ia IIC T5/T4 Ga/Gb
II 1D Ex ia IIIC T105°C Da

Examples

1. Example of a filter loss measurement

Transmitter with two remote diaphragm seals



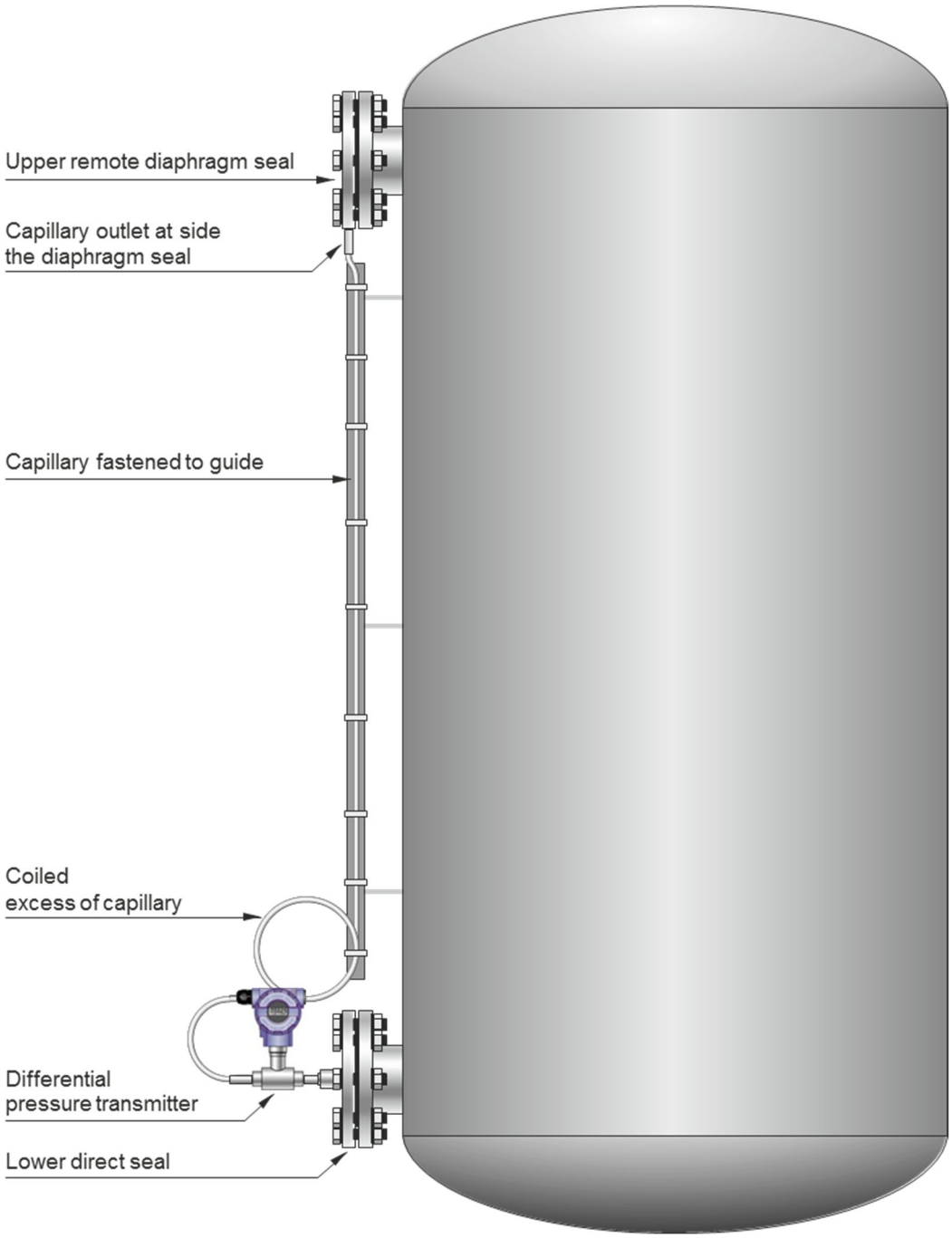
Recommendations

The version of the transmitter with two remote diaphragm seals is recommended for the measurement of pressure differences when the hydrostatic pressure of the manometric fluid in the capillaries (which depends on the vertical spacing of the seals) is significantly less than the measuring range of the transmitter.

The best metrological results are obtained when the applied capillaries are identical, as short as possible, and terminated with identical seals. At such a configuration additional temperatures errors, related to the remote sealing, affect both of the measurement chambers of the differential pressure transmitter in the same way, and thus cancel each other out.

2. Example of measurement of the level in a pressure tank

Transmitter with two types of diaphragm seal: one – direct diaphragm seal and the other – remote diaphragm seal



Recommendations

The transmitter with a direct diaphragm seal (connected to the positive measurement chamber) and a remote diaphragm seal (connected to the negative chamber) is recommended for hydrostatic measurements of: levels densities, phase boundaries and pressure differences (with differential height of pulse points*.)

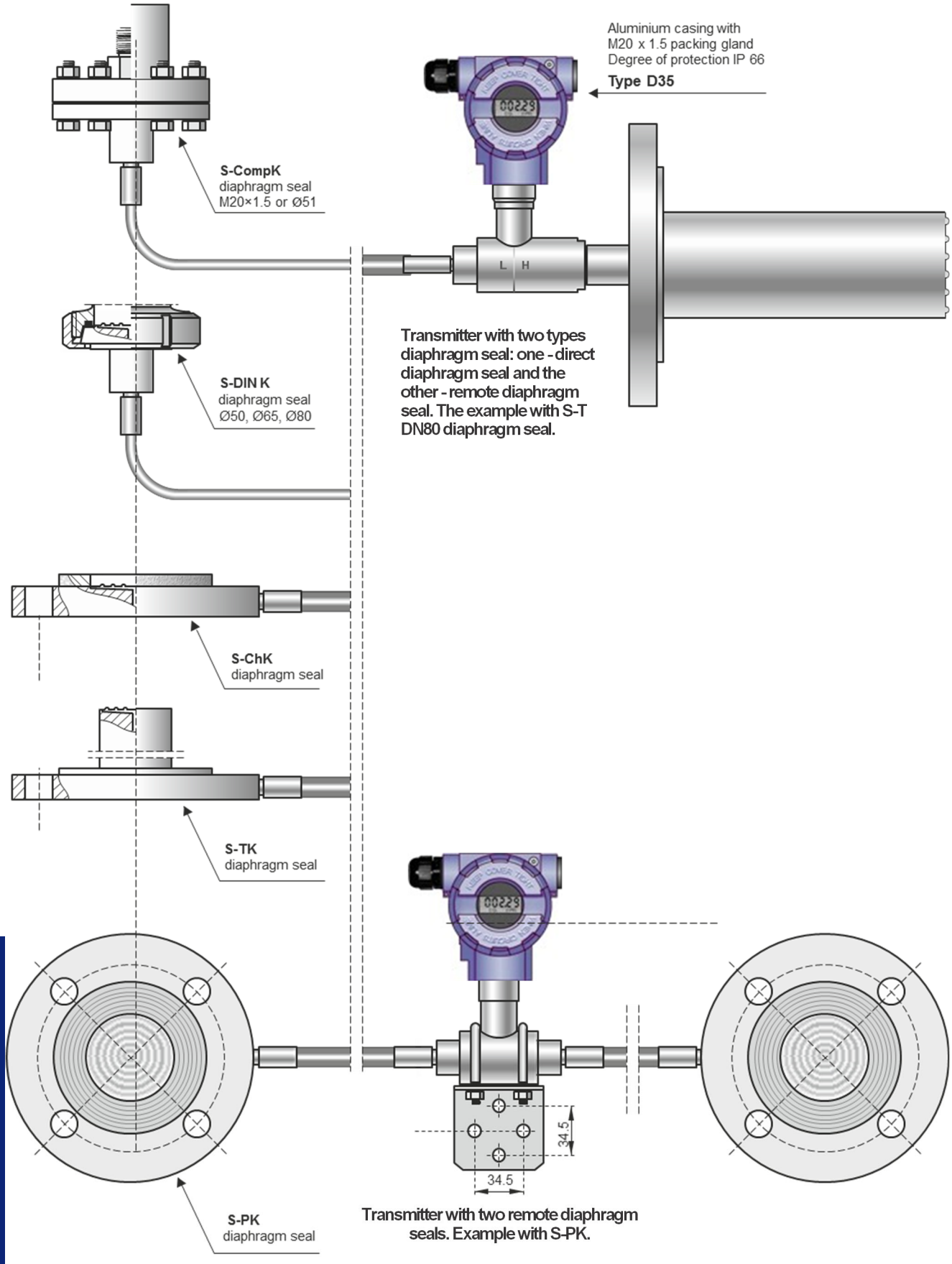
In such a configuration, at ambient temperature changes, two opposite phenomena appear concurrently.

Thermal expansion causes the change in the volume (and hence also the change in density) of the manometric fluid in the capillary, which results in a change of the hydrostatic pressure related to the vertical spacing of the seals.

This phenomenon in counteracted by the elastic reaction of the diaphragm of the upper diaphragm seal, which is displaced by the change in volume manometric fluid. Based on tests and experiments, the Delta-Mobrey Transmitters are provided with carefully selected seal diaphragms, which guarantee compensation of the errors resulted from the ambient temperature changes.

The best metrological results are obtained using assembly, which include DN 80, DN 100, A 109 and S-Comp diaphragm seals or S-Mazut, S-DIN and S-Clamp diaphragm seals with a diameter of at least 65mm, where the length of the capillary is (1...1.3) x (vertical spacing of seals). It is recommended using identical diaphragm seals at the both upper and lower connection points.

3. Example version



Transmitter with two types diaphragm seal: one - direct diaphragm seal and the other - remote diaphragm seal. The example with S-T DN80 diaphragm seal.

Transmitter with two remote diaphragm seals. Example with S-PK.

Note: The appropriate configuration of the complete set of pressure transmitter, diaphragm seals and capillaries, as well as the proper selection of manometric fluid depends on several factors such as: the physical and chemical properties; the temperature range of the medium; the vertical spacing of the diaphragm seals; the measuring range; the static pressure range; the range of ambient temperatures; the technical specification for the mechanical connection of the diaphragm seals to the pressure devices.

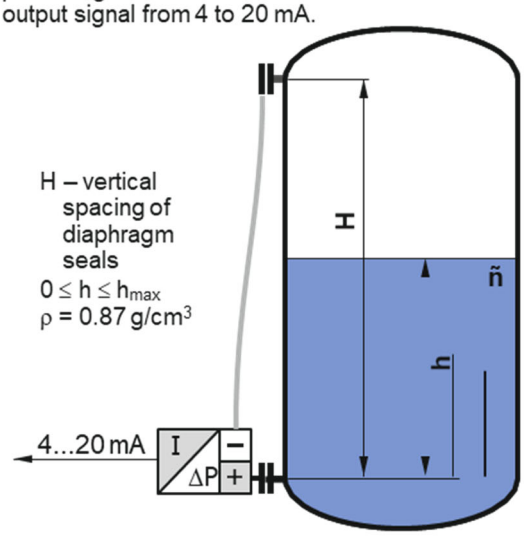
To simplify the mathematical operations, we introduce the density coefficient of the medium, Xρ.

$$X\rho = \frac{\rho_{medium}\,[g/cm]^3}{\rho_{water\ at\ 4\ ^\circ C}\,[g/cm^3]}$$

Since the density of water at 4°C is 1 g/cm^3, the **density coefficient Xρ is numerically equal to the density of the medium expressed in g/cm^3**. To determine the hydrostatic pressure of a column of liquid in mm H_2O, it is sufficient to multiply the height of the column h [mm] by the density coefficient of the liquid Xρ. Since it is easy to determine the hydrostatic pressure in mm H_2O and the transmitter can be configured in those units, in the descriptions of measurement methods given below we will make use of pressures expressed in mm H_2O and the density coefficient Xρ.

Configuration of the transmitter to measure the level of liquid in a tank

The measurement task:
To convert a variation in the level of a liquid with density ρ = 0.87 g/cm^3 between 0 and h_{max} to a variation in the output signal from 4 to 20 mA.



1. Install the transmitter in its working position on an empty tank.
2. Make the electrical connections of the transmitter, providing for the ability to use HART communication.
3. Connect the KAP-02 communicator, identify the transmitter and select the "configuration" function.
4. On the configuration menu select the "Reranging" procedure.
5. On the "Reranging" menu:
   a) change the units of measurement to mm H_2O at 4°C;
   b) enter the values for the start (Xρ × h_{min} [mm]) and end (Xρ × h_{max} [mm]) of the measurement range, namely 0 and (0.87 h_{max} [mm]) respectively;
   c) to compensate for the hydrostatic pressure of the manometric fluid, the start of the measurement range should be set using regulated pressure; when subject to the action of only the manometric fluid (empty tank) the transmitter will shift the start and end-points of the range, compensating for the value of that pressure.

When the transmitter has been configured in this way it is ready to be used to carry out the given measurement task.

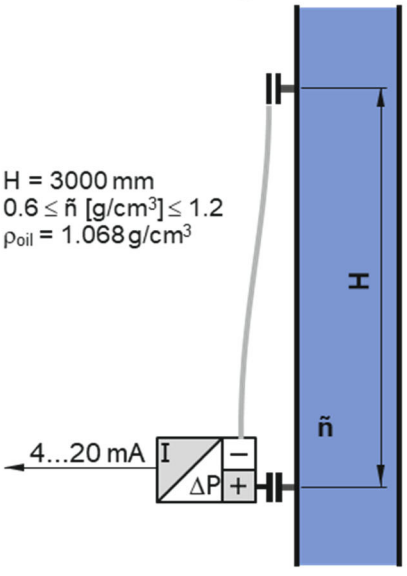
If it is not possible to empty the tank to configure the transmitter, the hydrostatic pressure of the manometric fluid should be calculated by multiplying the vertical spacing of the diaphragm seals by the density coefficient of the oil in the capillaries. This pressure should be taken into account when entering the values for the start and end of the range:

Start [mm H_2O] = –H [mm] × $X\rho_{oil}$

End [mm H_2O] =
= h_{max}[mm] × $X\,\rho_{measured\ liquid}$ – H [mm] × $X\rho_{oil}$

ρ_{oil} for DC-550 oil is equal to 1.068 g/cm^3
ρ_{oil} for AK-20 oil is equal to 0.945 g/cm^3

Configuration of the transmitter to measure density of liquids



The measurement task:
To convert a variation in liquid density from ρ_{min} = 0.6 g/cm^3 to $ñ_{max}$ = 1.2 g /cm^3 to a variation in the output signal from 4 to 20 mA, with the vertical spacing of the diaphragm seals equal to H = 3000 mm. The sealing system is filled with DC-550 oil with density ρ_{oil} = 1.068 g/cm^3.

1. Calculate the value o f the start of the range as follows:
   $H_{[mm]} \times (X\rho_{min} - X\rho_{oil}) =$
   = 3000 × (0.6 – 1.068) = –1404 [mm H_2O]
2. Calculate the value of the end of the range as follows:
   $H_{[mm]} \times (X\rho_{max} - X\rho_{oil}) =$
   = 3000 × (1.2 – 1.068) = 396 [mm H_2O]
3. Set the zero point of the transmitter with the diaphragm seals positioned at the same level.
4. Install the transmitter in its working position.
5. Make the electrical connections to the transmitter, providing for the possibility of using HART communication.

6. Connect the KAP-03 communicator, identify the transmitter and select the “configuration” function.

7. On the configuration menu select “Reranging” proce dure.

8. On the “Reranging” menu:

A) change the measurement units to mm H_2O at 4°C;

B) enter the calculated values for the start (–1404) and end (396) of the range.

When the transmitter has been configured in this way it is ready to be used to carry out the given measurement task.

Note: If it is possible to fill the space between the seals with a liquid whose density corresponds to the start of the measurement range, the start of the range of the transmitter can be set using regulated pressure.

Measurement of phase boundary

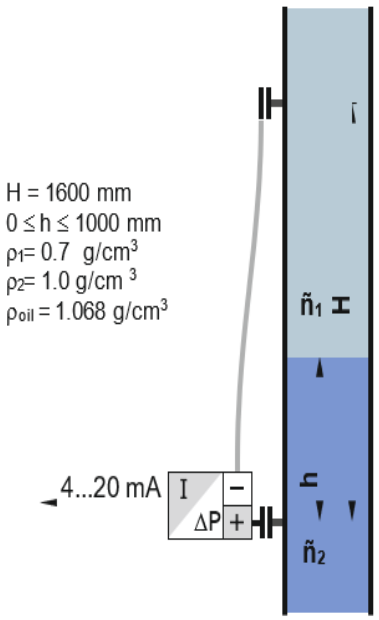
The height of the phase boundary of liquids of different densities is determined by measuring the average dens i- ty of the medium between the seals.

Example:

Calculate the measurement range start and end points for an D35 transmitter configured to measure phase boundary height in the range 0 –1000 mm between

liquids of density ρ 1 = 0.7 g/cm 3 and ρ 2 = 1.0 g/cm 3,

where the vertical spacing of the seals **H** = 1600 mm.
The sealing system uses DC -550 oil with a density of 1.068 g/cm3.



To determine the start of the measurement range, calculate the pressure difference at the transmitter when the tank is filled with the lighter liquid only:
1600 [mm] × (0.7 – 1.068) = –588.8 [mm H2O]

To determine the end-point of the range, add the increase in pressure resulting from the appearance of a 1 metre column of the heavier liquid:
–588.8 [mm H2O] + (1.0 – 0.7) × 1000 [mm] = –288.8 [mm H2O]

Additional remarks

The settings of the transmitter can be adjusted with reference to laboratory results from density measurements carried out on samples of the liquid being measured. This is most often necessary when the measurement takes place in a pipeline segment where the flow velocity of the measured liquid reaches several m/s.

Increasing the vertical spacing of the diaphragm seals widens the range and often improves measurement accuracy.

In planning the spacing of the diaphragm seals, ensure that the pressure difference at the transmitter lies within the basic range.

The maximum vertical spacing of the diaphragm seals

(H) depends on the transmitter’s basic range and the boundary values for the density of the measured liquid (ρ min; ρ max).

If ρ min < ρ oil < ρ max, the seal spacing H should satisfy the following conditions:

H [mm] Λ lower boundary of range [mm H2O]
Xρ min - Xρ oil

H [mm] Λ Upper boundary of range [mm H2O]
Xρ max- Xρ oil

Example:

Determine the maximum vertical spacing of the seals for the D35 / -10...10 kPa transmitter when measuring the density of liquid between 0.6 and 1.2 g/cm 3. The sealing system uses AK -20 silicone oil with a density of 0.945 g/cm3.

ρ The lower boundary of the range of the transmitter is –**10 kPa = –1020 mm H2O**

H [mm] Λ -1020 ? H [mm] Λ -1020 ?
0.6 - 0.945 -0.345

H [mm] Λ 2957

ρ The upper boundary of the range of the transmitter is **+10 kPa = 1020 mm H2O**

H [mm] Λ 1020 ? H [mm] Λ 1020 ?
1.2 - 0.945 0.255

H [mm] Λ 4000

In the example, both conditions are satisfied when the spacing of the seals is not more than 2957 mm.

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Россия +7(495)268-04-70 **Казахстан** +7(7172)727-132 **Киргизия** +996(312)96-26-47

www.delta-mobrey.nt-rt.ru | | dye@nt-rt.ru