

# BDT20 – Safety process pressure gauge 100 & 160mm

## Product description

Badotherm pressure gauge model BDT20 is the solid front, safety pattern gauge according the highest class of the EN 837-1 / 9.7.2 and ANSI B 40.1. The BDT20 stainless steel safety gauge has a solid front baffle wall and a full blow-out back. This pressure gauge is typically used for applications in the chemical, petro-chemical, and oil & gas industry or anywhere where safety comes first. These gauges are designed to withstand the severest of operating conditions created by the ambient environment and the process medium

## Design standard

EN837-1. For the overpressure protected gauge (code \_OPP) the gauge is following the safety pattern of version according the EN 837-1

## Dial sizes, ranges & accuracy

Possibilities in ranges and accuracies are led by the dial size. The reduced volume execution specially designed for the use on diaphragm seals (code\_R). Accuracy class is based on dry gauges. Liquid filling can affect the accuracy. The overpressure protected version (option code \_OPP) has an accuracy according below table up to the measuring range (measuring range ends at the triangle on the scale)

| Dial size    | Ranges                | Accuracy            |
|--------------|-----------------------|---------------------|
| 100mm (100R) | 0...1 to 0...1000     | 1.6% (option 1.0%)  |
| 100mm        | 0...1 to 0...1600 bar | 1.0% (option 0.6 %) |
| 160mm        |                       |                     |
| 160mm (160R) |                       |                     |

## Mounting variation

Not all gauges are suitable for some mounting variations. For the BDT20 series the mounting variations are below.

- **type A** (10) bottom connection, direct mounting
- **type C** (11) bottom connection, surface mounting (back)
- **type D** (30) lower back connection, direct mounting
- **type E** (32) lower back connection, panel mounting (front)

More specifically per dial size:

| Dial size    | A | C | D | E |
|--------------|---|---|---|---|
| 100mm (100R) | • | • |   |   |
| 100mm        | • | • | • | • |
| 160mm        | • | • |   |   |
| 160mm (160R) | • | • |   |   |



## Process connection

| Dial size    | Standard thread | optionally  | SW size |
|--------------|-----------------|-------------|---------|
| 100mm (100R) | G ½ A or ½" NPT | 1/4" , 3/8" | 17mm    |
| 100mm        |                 |             |         |
| 160mm (160R) |                 |             |         |
| 160mm        |                 |             |         |

Other thread standards such as ISO 7-1 R (BSPT), or DIN 13-1 (M20x1.5) can be selected as well.

-> See datasheet "thread information" for specific thread details

## Materials of construction

|                              | BDT20                          | BDT20...M |
|------------------------------|--------------------------------|-----------|
| Case                         | AISI 304 (optionally AISI 316) |           |
| Bezel                        | AISI 304 (optionally AISI 316) |           |
| Connection <sup>1</sup>      | AISI 316                       | Alloy 400 |
| Sensing element <sup>1</sup> | TP316                          | Alloy 400 |
| Movement                     | Stainless steel                |           |
| Pointer                      | Aluminium                      |           |
| Dial                         | Aluminium                      |           |
| Window gasket                | NBR                            |           |
| Blow out                     | AISI 304 with NBR compensation |           |
| Fill plug                    | NBR (HNBR for filled gauges)   |           |
| Mounting flanges             | AISI 304                       |           |
| Window                       | Laminated safety glass         |           |

\*1 wetted materials

## Pressure limitations

The gauge are built to withstand harsh environments however the EN 837 limits the use of a pressure gauge according below table. Over pressure ranges for BDT20-P are seen in overpressure table.

| Dial size    | Steady     | Fluctuating | Short time |
|--------------|------------|-------------|------------|
| 100mm (100R) | 0.75 x FSV | 0.67 x FSV  | FSV        |
| 100mm        | FSV        | 0.9 x FSV   | 1.3 x FSV  |
| 160mm (160R) |            |             |            |
| 160mm        |            |             |            |

FSV: full scale value

### "P" version overpressure protection table

| Range up to 225° scale (bar) | overload 225° up to 315° (bar) |
|------------------------------|--------------------------------|
| -1...0                       | 3                              |
| 0...1                        | 2.5                            |
| 0...1.6                      | 6                              |
| 0...2.5                      | 10                             |
| 0...4                        | 16                             |
| 0...6                        | 25                             |
| 0...10                       | 40                             |
| 0...16                       | 60                             |
| 0...25                       | 80                             |
| 0...40                       | 100                            |

Over pressure for a short period of time

## Temperature limitations

The gauges can withstand ambient and process temperature up to a certain limit. The limitations on temperature are:

|             | Ambient        | Medium         |
|-------------|----------------|----------------|
| Dry case    | -40°C ...+60°C | -40°C...+200°C |
| Filled case | -20°C ...+60°C | -20°C...+90°C  |

The variation of indication caused by the effect of temperature shall not exceed:  $\pm 0.4\% / 10K$  FSV

## Window

Standard BDT20 gauges have a laminated safety glass window.

## Pointer

Standard pointer is an adjustable slotted black painted aluminum pointer. The micro adjustable pointer can be selected as an option

## Dial facing

The dial plate is made from aluminum and coated with UV resistant white coating. The black dial markings, scale, numbering, and interval is according the EN 837. Options like colored dial, customer logo, or colored segments are possible as well. Scale interval and numbering is following the EN837.

## Limit stop

100mm and 160mm gauges are equipped with an internal limit stop on the movement to prevent, in case of overpressure, the pointer reentering the scale (graduations) thus preventing the operator reading a low pressure when in fact the pressure is dangerously high. This internal limit stop normally engages at approx. 130% of full scale value. The gauges have a free zero except for 100R gauges which are equipped with a pointer stop on the dial.

## Degree of protection

The BDT20 has a standard degree of protection of IP65. The values are determined according the IEC/EN 60529. Class IP66 and IP67 are available as option.

## Add-on contacts

The BDT20 is a safety pressure gauge and does not allow the use of an add-on contact due to the Makrolon material that is splintering.

## Case filling

The gauges can be filled with different kind of fill fluids. The fill fluids available are:

- BPF01 - Glycerine 86%
- BPF02 - Silicon
- BPF03 - Silicon for contacts
- BPF04 - Mineral oil (Foaming service)
- BPF05 - Halocarbon (inert fluid for oxygen service)
- BPF06 - Glycerine 99.5%

## Restrictor Screw

All gauges can be executed with a restrictor of 0.8 or 0.3 orifice in AISI316(L). For the Alloy 400 internal the orifice is 0.8mm.

## Special service

The gauges can be supplied cleaned for oxygen use. This means the gauge is assembled and tested in a special area free of oil. The gauges are individually packed in a plastic bag with marking. The symbol used is:



## Certification & Declaration

### Calibration

Gauges are full range calibrated as a factory standard. Optionally you can select a 5 points calibration certificate, and a 10 points calibration certificate for the 0.6% and 0.5% gauges.

### Pressure Equipment Directive - 2014\_68\_EU

PED approval is given according article 3.3 and is valid for ranges >200 bar. All gauges will be marked accordingly. A declaration of conformity can be supplied.

### ATEX 114 - 2014/68/EU

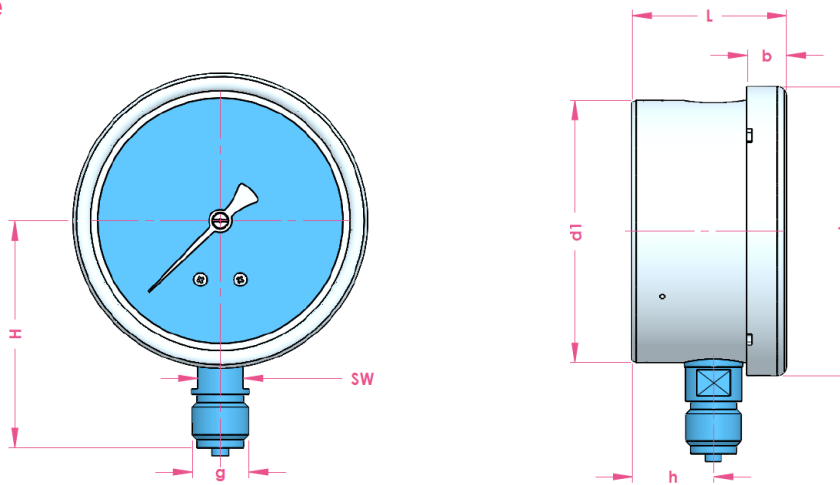
ATEX restrictions are explained in the IOM and in the ATEX background datasheet.

### EN 10204 material certificate

A material 3.1 certificate on the wetted parts can be supplied.

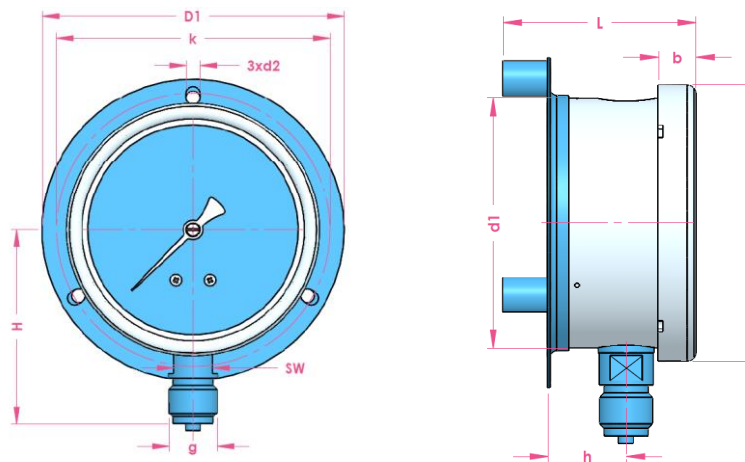
**Dimensions table**

Type A (10)



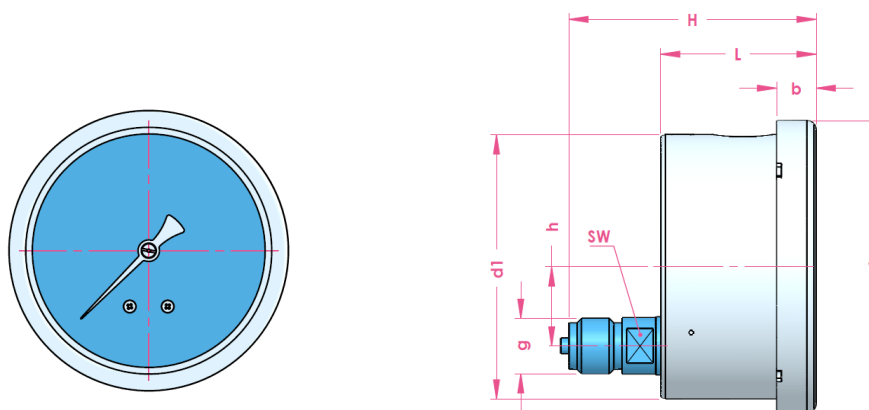
| Dial size | d     | d1    | b    | L    | h    | g     | SW | H     | weight |
|-----------|-------|-------|------|------|------|-------|----|-------|--------|
| 100/100R  | 110.0 | 100.0 | 15.0 | 63.0 | 31.5 | G 1/2 | 17 | 85.0  | 0.5 kg |
| 160/160R  | 160.0 | 150.0 | 16.0 | 63.0 | 30.0 |       |    | 116.0 | 0.8 kg |

Type C (11)



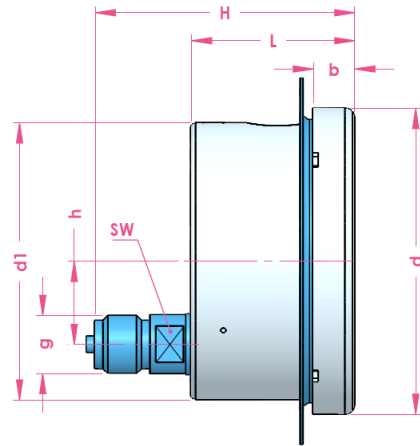
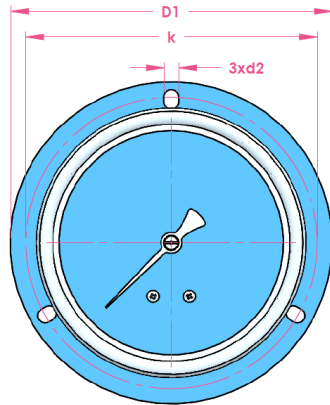
| size     | d     | d1    | b    | L    | h    | K     | D1    | d2  | g     | SW | H     | weight |
|----------|-------|-------|------|------|------|-------|-------|-----|-------|----|-------|--------|
| 100/100R | 110.0 | 100.0 | 15.0 | 78.0 | 31.5 | 117.6 | 132.0 | 6.0 | G 1/2 | 17 | 85.0  | 0.5 kg |
| 150/150R | 160.0 | 150.0 | 16.0 | 78.0 | 30.0 | 168.0 | 190.0 |     |       |    | 116.0 | 0.8 kg |
| 160/160R |       |       |      |      |      | 178.0 |       |     |       |    |       |        |

Type D (30)



| Size | d     | d1    | b    | L    | h    | g     | SW | H    | weight |
|------|-------|-------|------|------|------|-------|----|------|--------|
| 100  | 110.0 | 100.0 | 15.0 | 63.0 | 30.0 | G 1/2 | 17 | 96.5 | 0.5 kg |

## Type E (32)



| Size | d     | d1    | b    | b2   | L    | h    | K     | D1    | d2  | g     | SW | H    | weight |
|------|-------|-------|------|------|------|------|-------|-------|-----|-------|----|------|--------|
| 100  | 110.0 | 100.0 | 15.0 | 41.0 | 63.0 | 30.0 | 117.6 | 132.0 | 6.0 | G 1/2 | 17 | 92.0 | 0.5 kg |

## Product code 100, 150, 160mm

| Code  |  |
|---|--|
| Example code:                                 | <b>BDT20</b> 160 A G12M S363 S304 A 0 L B50 10 |
| <b>TYPE</b>                                   |  |
| 100 mm ◀                                      | 100  |
| 100 mm reduced volume for diaphragm seal      | 100R   |
| 160 mm ◀                                      | 160  |
| 160 mm reduced volume for diaphragm seal      | 160R   |
| <b>MOUNTING</b>                               |  |
| Bottom connection - direct mounting (10) ◀    | A  |
| Bottom connection - surface mounting (11)     | C  |
| Lower back connection. - direct mounting (30) | D  |
| Lower back connection.- panel mount (32)      | E  |
| <b>CONNECTION</b>                             |  |
| G 3/8" A                                      | G38M   |
| G1/2 ◀  | G12M   |
| 1/2" NPT                                      | N12M   |
| R 1/2   | R12M   |
| M20 x 1.5                                     | M20M   |
| <b>TUBE &amp; SOCKET MATERIAL</b>             |  |
| AISI 316L ◀                                   | S363   |
| Alloy 400                                     | A400   |
| <b>CASE/BEZEL MATERIAL</b>                    |  |
| AISI 304 ◀                                    | S304   |
| AISI 316                                      | S300   |
| <b>POINTER</b>                                |  |
| Adjustable slotted pointer ◀                  | A  |
| Micro adjustable pointer                      | M  |
| <b>LIQUID FILLING</b>                         |  |
| Dry ◀   | 0  |
| BPF 01 - Glycerine filled 1,23 (86%)          | 1  |
| BPF 06 - Glycerine filled 1,26 (99,5%)        | 6  |
| BPF 02 - Silicone filled                      | 2  |
| BPF 03 – Silicone Contact use                 | 3  |
| BPF 04 – Mineral oil (Foaming service)        | 4  |
| BPF 05 – Halocarbon (Oxygen service)          | 5  |
| <b>WINDOW</b>                                 |  |
| Laminated glass (S1) ◀                        | L  |
| <b>RANGE</b>                                  |  |
| See page table 1 and table 2                  | ....   |
| <b>ACCURACY</b>                               |  |
| 0.5 (ANSI B40.1 2A)                           | 5  |
| 0,6   | 6  |
| 1.0 ◀   | 10   |
| 1,6 (100 R only)                              | 16   |

◀: is the sign for the standard pressure gauge

-0.5/0.6% not available for 100R

-“R” version reduced volume not possible in combination with option “\_OPP” over pressure protected.

- \_OPP over pressure protected option only possible in combination with mounting A or C

**Tabel 1: Pressure Range code**

| bar  |          | psi  |             | MPa  |         | kPa  |             | kgf/cm2 |          |
|------|----------|------|-------------|------|---------|------|-------------|---------|----------|
| Code | Range    | Code | Range       | Code | Range   | Code | Range       | Code    | Range    |
| C36  | -1...0,6 | C37  | 30Hg/15psi  | N50◀ | 0...1,6 | D36  | -100...60   | E36     | -1...0,6 |
| C38  | -1...1,5 | C39  | 30Hg/30psi  | N54◀ | 0...2,5 | D38  | -100...150  | E38     | -1...1,5 |
| C40  | -1...3   | C41  | 30Hg/60psi  | N57◀ | 0...4   | D40  | -100...300  | E40     | -1...3   |
| C42  | -1...5   | C44  | 30Hg/100psi | N58  | 0...6   | D42  | -100...500  | E42     | -1...5   |
| C45  | -1...9   | C46  | 30Hg/150psi | N60  | 0...10  | D45  | -100...900  | E45     | -1...9   |
| C50  | -1...15  | C50  | 30Hg/220psi | N62  | 0...16  | D50  | -100...1500 | E50     | -1...15  |
| C54  | -1...24  | C53  | 30Hg/300psi | N65  | 0...25  | D54  | -100...2400 | E54     | -1...24  |
| B01◀ | -1...0   | P32◀ | 0...10      | N69  | 0...40  | L01◀ | -100...0    | K01◀    | -1...0   |
| B04  | -0,6...0 | P35◀ | 0...15      | N71  | 0...60  | L04  | -60...0     | K04     | -0,6...0 |
| B31◀ | 0...0,6  | P37◀ | 0...30      | N73  | 0...100 | L31◀ | 0...60      | K31◀    | 0...0,6  |
| B35  | 0...1    | P40◀ | 0...60      | N76  | 0...160 | L35◀ | 0...100     | K35◀    | 0...1    |
| B36◀ | 0...1,6  | P43◀ | 0...100     |      |         | L36◀ | 0...160     | K36◀    | 0...1,6  |
| B38◀ | 0...2,5  | P46◀ | 0...160     |      |         | L38◀ | 0...250     | K38◀    | 0...2,5  |
| B40◀ | 0...4    | P48  | 0...200     |      |         | L40◀ | 0...400     | K40◀    | 0...4    |
| B42◀ | 0...6    | P51◀ | 0...300     |      |         | L42◀ | 0...600     | K42◀    | 0...6    |
| B45◀ | 0...10   | P55  | 0...400     |      |         | L45◀ | 0...1000    | K45◀    | 0...10   |
| B50◀ | 0...16   | P56  | 0...500     |      |         |      |             | K50◀    | 0...16   |
| B54◀ | 0...25   | P57◀ | 0...600     |      |         |      |             | K54◀    | 0...25   |
| B57◀ | 0...40   | P58  | 0...800     |      |         |      |             | K57◀    | 0...40   |
| B58  | 0...60   | P59  | 0...1000    |      |         |      |             | K58     | 0...60   |
| B60  | 0...100  | P60  | 0...1500    |      |         |      |             | K60     | 0...100  |
| B62  | 0...160  | P61  | 0...2000    |      |         |      |             | K62     | 0...160  |
| B65  | 0...250  | P64  | 0...3000    |      |         |      |             | K65     | 0...250  |
| B69  | 0...400  | P66  | 0...4000    |      |         |      |             | K69     | 0...400  |
| B71  | 0...600  | P68  | 0...5000    |      |         |      |             | K71     | 0...600  |
| B73  | 0...1000 | P69  | 0...6000    |      |         |      |             | K73     | 0...1000 |
| B76  | 0...1600 | P72  | 0...10000   |      |         |      |             | K76     | 0...1600 |
|      |          | P73  | 0...15000   |      |         |      |             |         |          |
|      |          | P75  | 0...20000   |      |         |      |             |         |          |

◀ Ranges suitable for overpressure protected version

**Table 2: Secondary scale**

| Dual scale option | code |
|-------------------|------|
| PSI red           | #PR  |
| PSI black         | #PB  |
| PSI blue          | #PBL |
| bar red           | #BR  |
| bar black         | #BB  |
| bar blue          | #BBL |

Add the code behind the pressure code  
(eg B45#PR for 0...10 bar//psi with red scale)

**Table 3: General option code**

| Option (start options with X_)        | code  |
|---------------------------------------|-------|
| IP 66 class                           | _IP66 |
| IP 67 Class                           | _IP67 |
| Restrictor screw 0.8mm                | _RS8  |
| Restrictor screw 0.3mm                | _RS3  |
| Calibrated at 0°                      | C0    |
| Calibrated at 180°                    | _C180 |
| Cleaned for Oxygen use                | _CFO  |
| NACE ISO 15156 (MR 01 75) (alloy 400) | _N75  |
| ATEX II2GDc-IM2c                      | _ATEX |
| 3.1 material certificate              | _IC31 |
| Calibration certificate 5 points      | _CC5  |
| Calibration certificate 10 points     | _CC10 |
| Overrange protected version "P"       | _OPP  |

\_OPP only in combination with mounting A or C

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## Change log

| Date      | Change   |
|-----------|--|
| 30-3-2020 | BDT20-P over pressure safe option added to the datasheet |

Holland – Romania – India – Thailand – Dubai – USA

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