

EXT-BC type seal – cel type, extended diaphragm

Design description

The EXT-BC construction has a seal body that is made of bar stock or forged material. The weld between the seal body and the diaphragm is a wetted part and therefore diaphragm materials are mostly chosen the same as the body material. The EXT-BC is recommended when special body or flange material grades are required. EXT-BC is typically used in combination with (differential) pressure transmitters for applications such as level, flow and (absolute) pressure measurement.



Body diaphragm combinations

The diaphragm is TIG-welded to the flange and is designed to have the best performance for the specific size. This means that the flexibility and shape is carefully tested and measured. The standard thickness of diaphragm foil is 0.075mm

| Body Material | Diaphragm material | | |
|----------------|--------------------|--------|--------|
| | General name | UNS | Wst. |
| AISI 316(L) | AISI 316L | S31603 | 1.4404 |
| | AISI 304L | S30400 | 1.4306 |
| | AISI 321 | S32100 | 1.4541 |
| | AISI 316 UG | S31603 | 1.4435 |
| | Alloy C276 | N27600 | 2.4810 |
| AISI 304L | AISI 304L | S30400 | 1.4306 |
| AISI 310 MoLn | 25-22-2 LMN | S31050 | 1.4466 |
| AISI 316 UG | AISI 316 UG | S31600 | 1.4435 |
| AISI 321 | AISI 321 | S32100 | 1.4541 |
| AISI 904(L) | AISI 904L | N08904 | 1.4539 |
| Alloy 20 | Alloy 20 | N08020 | 2.4660 |
| Alloy 400 | Alloy 400 | N04400 | 2.4360 |
| Alloy 600 | Alloy 600 | N06600 | 2.4816 |
| Alloy 625 | Alloy 625 | N06625 | 2.4856 |
| Alloy 825 | Alloy 825 | N08825 | 2.4858 |
| Alloy B2 | Alloy B2 | N10665 | 2.4617 |
| Alloy C-22 | Alloy C-22 | N06022 | 2.4602 |
| Alloy C-276 | Alloy C-276 | N10276 | 2.4810 |
| Duplex F44 | 254 SMO (6Mo) | S31254 | 1.4547 |
| Duplex F51/F60 | Duplex 2205 | S32205 | 1.4462 |
| Duplex F53 | Super Duplex 2507 | S32750 | 1.4410 |
| Duplex F55 | Super Duplex 2507 | S32750 | 1.4410 |
| Nickel 201 | Nickel 201 | N02201 | 2.4068 |
| Titanium Gr. 2 | Titanium Gr. 1 | R50250 | 2.7025 |
| Zirconium 702 | Zirconium 702 | R60702 | - |

Flange size, rating and facings - ASME B16.5

| ASME B16.5 | | | |
|------------|--------------------|-------------------------|---------------|
| Size | Rating | Facing | Roughness |
| 1.5" to 4" | cl. 150 - cl. 2500 | RF, LMF, FF, SGF | Ra 3.2-6.3 µm |
| | | RJF, SFF | Ra <1.6 µm |
| | | SMF, LTF, STF, LGF, LFF | Ra <3.2 µm |

Flange size, rating and facings - EN 1092-1

| EN 1092-1 | | | |
|---------------|----------|----------------|----------------|
| Size | Rating | Type | Roughness |
| DN40 to DN100 | PN10-400 | A, B1, E, F | Ra 3.2-12.5 µm |
| | | B2, C, D, G, H | Ra <0.8-3.2 µm |

Gold coatings

Several types of gold coating can be applied on the seals. The selection possibilities are:

- 25 µm Hydrogen protection (diaphragm only)
- 40 µm Hydrogen protection (diaphragm only)

-> See datasheet "Gold coatings"

Polymer coatings

Polymer coatings come in several types. The technical data on thickness and temperature limitation can be found in datasheet "polymer solutions" The applicable selection on BF seals are:

- PTFE coating
- ECTFE (Halar®) coating
- PFA coating
- FEP coating
- PTFE sheet

-> See datasheet "Polymer solutions"

Capillary tube and armor (protection)

The standard capillary mounting position is top side (axial) of the seal. Alternatively, the capillary can be placed at the side of the seal (radial). The standard tube material is TP316 (316SS), optionally available in Alloy 400. There are three options in ID of the capillary; 2mm, 1mm, and 0.7mm. Badotherm capillaries are always protected against mechanical forces by armor. This doubled shielded armor consist is standard AISI 304, and optionally AISI 316. Additionally, the armor could be protected with a PVC sleeve in white, black, optionally with ATEX114 approval to protect against dust and water ingress and possibly corrosive ambient atmosphere.

-> See datasheet "Capillary lines"

Cover Flange

The EXT-BC will be clamped to the process. This can be done with a standard blind flange. However positioning the seal in line with the flange and gasket will be challenging. Therefore Badotherm offers the option for a cover flange. This flange has a groove to fit the seal part and fixing holes to fix the seal into the flange. Details can be found in the dimensions section.

Material Certification

Material traceability and related certification are applicable for all process wetted parts. Material certification possibilities depend on the type of seal, the assembly construction and the materials used. Material certification is in accordance with EN10204 3.1.

Additional material certification and testing can be provided on request, such as Positive Material Identification (PMI), Intergranular corrosion (IGC) testing, material certification in accordance with EN10204 3.2, NACE conformity for ISO-15156 (MR-0175) and/or ISO-17945 (MR-0103), NORSOK M-630 and many more.

-> Please note that the responsibility for material selection always rests with the user.

Flange Marking & Traceability

All flanges are marked by the forging shop with heat number, material designation, size, and rating. Badotherm adds a Badotherm reference number and the manufacturers name to the flange for traceability purposes.

Flanges and origin

The seal parts are made from forged materials according to the applicable standards. The standard sourcing of flanges is of international origin. Optionally regional preference can be requested, for example materials from EU origin.

Testing

All seals are helium tested according the EN 13185 test procedure A.3 up to 10^{-9} mbar l/s before used on a diaphragm seal application.

-> See datasheet "Diaphragm Seal testing"

Cleanliness of the wetted parts

All parts are standard cleaned from excessive oil and grease. When additional requirements are needed, the parts can be cleaned according customer requirements and cleaning specifications.

Gaskets

Sizes of the diaphragm area are designed to match the gaskets used between the process and seal or flush ring. For the ASME B16.5 RF flanges the ASME B16.20 is used for dimension restriction to ensure both the spiral and grooved gaskets are fully supported by the serrated area. For the EN type B1 flanges the gasket dimensions are matching the sizes of the EN 1514-2. The size "G" in the tables refer to the start of the gasket surface.

Example performance calculation

Whether a diaphragm seal can be used for a specific measurement, depends on the size of the diaphragm. That size is restricted by the size of the diaphragm seal.

For pressure transmitters, Badotherm offers an online performance calculation tool to calculate its performance and to ensure that the diaphragm size is suitable for your measurement.

The table below presents the minimum span of the respective diaphragm sizes with standard process conditions. As rule of thumb, a TPE of max 5% is often considered acceptable, but it depends per situation.

Minimum span table

| dD | AP/GP | DP |
|------|-----------|-----------|
| 32mm | 11 bar | 1850 mbar |
| 44mm | 1575 mbar | 255 mbar |
| 72mm | 155 mbar | 30 mbar |
| 81mm | 110 mbar | 20 mbar |

Pressure transmitter; ambient temperature -10...+30°C; process temperature 100°C with BSO 22 fill fluid; 3 meter capillary; ID 1mm, DP both sides mounted with seal

See the general overview of all diaphragm sizes with several standard situations and in combination with Badotherm pressure gauges.

Retaining screws

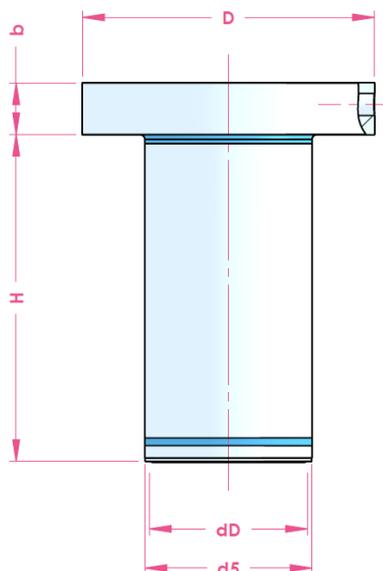
The EXT-BC is standard without fixing holes. There is an option to add 2 x M6 fixing holes on the top of the EXT-BC so the matching cover flange can be mounted to the EXT-BC for easy mounting. The cover flange and the seal part are fixed together hexagon socket cap screws. The length of the screws depends on the thickness of the cover flange.

| Grade bolt | Type | Size |
|---------------------|----------|------|
| A2-70 (ISO 3506-1) | ISO 4762 | M6 |

Extension length and diameter

Length and diameter can be selected in random dimensions. In the dimension tables the standard diameters are given, however variation can be made upon request. The length of the extension is always customer selected. Most common length of extensions are 50mm, 100mm, and 150mm.

Dimensions tables:



ASME 16.5 RF facing

| size | rating | OD | dD | b | d5 | H | weight | EXT weight ¹ |
|------|--------------|-------|------|------|------|---------|--------|-------------------------|
| 1.5" | cl. 150-2500 | 73.0 | 32.0 | 24.0 | 38.0 | Various | 0.8 | + 0.09 x H* |
| 2" | | 92.1 | 44.0 | | 48.0 | | 1.3 | + 0.014 x H* |
| 3" | | 127.0 | 72.0 | | 76.0 | | 2.4 | + 0.035 x H* |
| 4" | | 157.2 | 81.0 | | 93.0 | | 3.7 | + 0.055x H* |

All dimensions in mm, weight in kg

1) Weights marked with * are based on bar stock material. This weight should be taken for exotics as well

EN 1092-1 B1 type

| size | rating | OD | dD | b | d5 | H | weight | EXT weight ¹ |
|-------|----------|-------|------|------|------|---------|--------|-------------------------|
| DN40 | PN10-400 | 55.4 | 32.0 | 24.0 | 38.0 | Various | 1.2 | + 0.09 x H* |
| DN50 | | 70.2 | 44.0 | | 48.0 | | 1.5 | + 0.014 x H* |
| DN80 | | 93.0 | 72.0 | | 76.0 | | 2.9 | + 0.035 x H* |
| DN100 | | 101.0 | 81.0 | | 93.0 | | 3.8 | + 0.055x H* |

All dimensions in mm, weight in kg

1) Weights marked with * are based on bar stock material. This weight should be taken for exotics as well

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