

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*1	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	-

*1: wetted parts with dissimilar materials are not advised and should be checked for suitability with the process.

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.

Tapered execution

In some cases extended seals get stuck in the nozzle by the crystallized or hardened surrounding process media. A tapered extension from tip to flange and jacket holes. The tapered version is reducing the diameter 0.7mm/100mm of extension length

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 to the ISO 20485 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

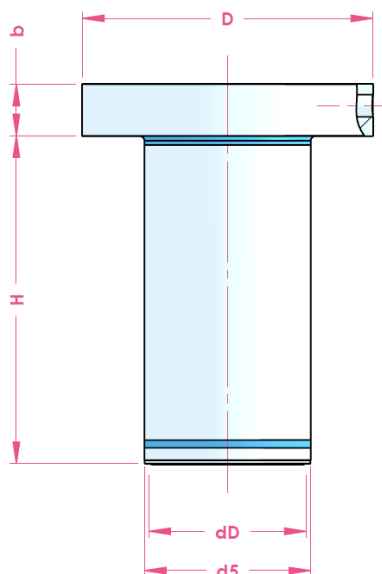
The EXT-BC is standard without fixing holes. There is an option to add 2 x M6 fixing holes on the top of the EXT-BC so the matching cover flange can be mounted to the EXT-BC for easy mounting. The cover flange and the seal part are fixed together hexagon socket cap screws. The length of the screws depends 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	D	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"		91.9	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

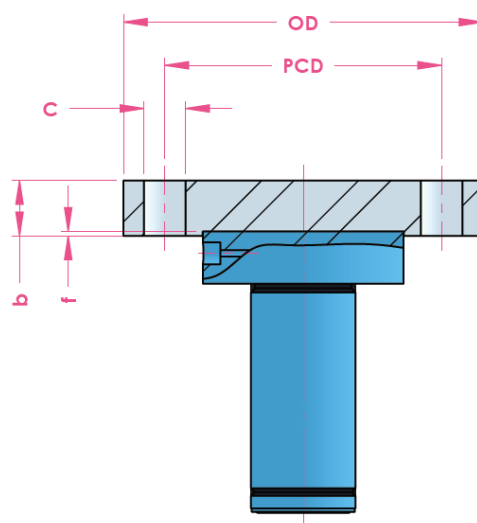
EN 1092-1 B1 type

size	rating	D	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

Dimensions table: ASME 16.5 Cover Flange (optional)



size	rating	OD	b	PCD	C / pcs	f	weight
1.5"	cl. 150	127.0	15.9	98.6	15.9 / 4x	2.0	1.5
	cl. 300	155.0	19.0	114.3	22.3 / 4x		2.7
	cl. 400-600		22.4				3.3
	cl. 900-1500	178.0	31.8	124.0	28.6 / 4x		5.8
cl. 2500	203.0	44.4	146.0	31.8 / 4x	10.4		
2"	cl. 150	152.0	17.5	120.6	19.1 / 4x		2.4
	cl. 300	165.0	20.6	127.0	19.1 / 8x		3.2
	cl. 400-600		25.4				4.2
	cl. 900-1500	216.0	38.1	165.1	25.4 / 8x		10.1
cl. 2500	235.0	50.8	171.4	28.6 / 8x	15.6		
3"	cl. 150	190.0	22.4	152.4	19.1 / 4x		4.9
	cl. 300	210.0	26.9	168.1	22.3 / 8x		6.8
	cl. 400-600		31.8				8.4
	cl. 900	241.0	38.1	190.5	25.4 / 8x		13.1
cl. 1500	267.0	47.8	203.2	31.9 / 8x	19.1		
4"	cl. 2500	305.0	66.5	228.6	35.0 / 8x		34.8
	cl. 150	229.0	22.4	190.5	19.1 / 8x	7.0	
	cl. 300	254.0	30.2	200.2	22.3 / 8x	11.5	
	cl. 400		35.1			14.8	
	cl. 600	273.0	38.1	215.9	25.5 / 8x	17.3	
	cl. 900	292.0	44.5	235.0	31.8 / 8x	26.9	
cl. 1500	311.0	53.8	241.3	34.9 / 8x	29.9		
cl. 2500	355.0	76.2	273.0	41.3 / 8x	53.9		

All dimensions in mm

Change log

Date	Change
24-6-2020	Cover flange table added for ASME.
8-3-2021	Updated dimension table ASME B16.5:2020 version.

Holland – Romania – India – Thailand – Dubai – USA

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