

Flush accessory – Flush flange

Design description

The flush flange is made of bar stock or forged material. The flange contains one or two flush holes. The flush holes can be selected in most common sizes. The biggest advantage of the flush flange is the easy positioning and alignment of the parts. All kind of facings are available on the flush flange.



Flush flange materials

The flush flange can be made in several materials. In the table below is a selection of materials.

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

Size, rating and facings - ASME B16.5

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

Size, rating and facings - EN 1092-1

EN 1092-1			
Size	Rating	Type	Roughness
DN20 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

Size, rating and facings – JIS B2220

JIS B2220			
Size	Rating	Type	Roughness
DN25 to DN100	10-20K	RF	Ra 3.2-12.5 µm

Material Certification

Material traceability and related certification are applicable for all process wetted parts. Material certification possibilities depend on the type of flange, 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 flush 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 flush 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.

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 flange. 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 "A" in the tables refer to the start of the gasket surface.

Flush connections

Flush ports can be made in all kind of variations both threaded as weld connection.

Flush size	following standard
G 1/4", G 1/2", G 3/4"	ISO 228 thread (acc DIN 3852-2 / ISO 1179-4)
1/4", 1/2", 3/4" NPT	ASME B1.20.1
Butt weld 1/2" / 20mm	ASME B16.9 / EN 12627
Butt weld 3/4" / 28mm	
Socket weld 1/2"	ASME B16.11 / EN 12760
Socket weld 3/4"	

Assemblies

The flush flanges are typical used for vent or drain the process when installed under a pressure instrument like a pressure gauge or pressure transmitter. Venting the process can be made easy by installing a needle valve, extension pipe or welding neck flange to the flush flange. These assemblies are common practice for Badotherm and can be welded, tested and assembled in advance.

Pressure testing

All assembled flush flanges are pressure tested. The methods are described below.

Standard testing

In line with the EN 12266-1 each sealing point will be 100% tested with leak detection fluid under standard test pressure. The test medium is a gas. At leaking point, after application of the leak detection fluid, bubbles become visible. This bubble detection method can detect leak rates of approximately 1×10^{-3} mbar l/s. Assemblies of flush flanges with plugs or valves are leak tested by this method. During the leak test all fittings and welds are tested at 6 bar for 30 seconds after application of the leak detection fluid.

Optional test method

Additionally to the standard method the assemblies of and flush flanges combined with plugs or valves can be tested at customer determined pressure values with a maximum of 150% of the MWP. The 6 bar of air in the standard method will be changed to the customer value of 150% of the MWP. Above 150 bar the test medium will be changed from gas to liquid.

Flange thickness

Thickness of the flush flange is depending on flush hole size and facing height. The dimensions tables are based on 1/2" flush connections. For 1/4", 3/4", BW, SW connection below rules can be followed.

Flush size (C1)	RF /B1 facing	RJF facing
1/4"	B = 20.0 + 2*f	B = 20.0 + 2*E
1/2"	B = 35.0 + 2*f	B = 35.0 + 2*E
3/4"	B = 40.0 + 2*f	B = 40.0 + 2*E
Butt weld 1/2" / 20mm	B = 24.0 + 2*f	B = 24.0 + 2*E
Butt weld 3/4" / 28mm	B = 30.0 + 2*f	B = 30.0 + 2*E
Socket weld 1/2"	B = 33.5 + 2*f	B = 33.5 + 2*E
Socket weld 3/4"	B = 41.0 + 2*f	B = 41.0 + 2*E

Assemblies

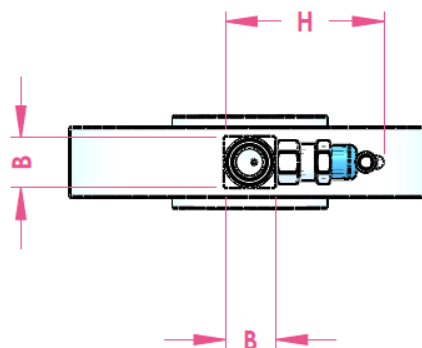
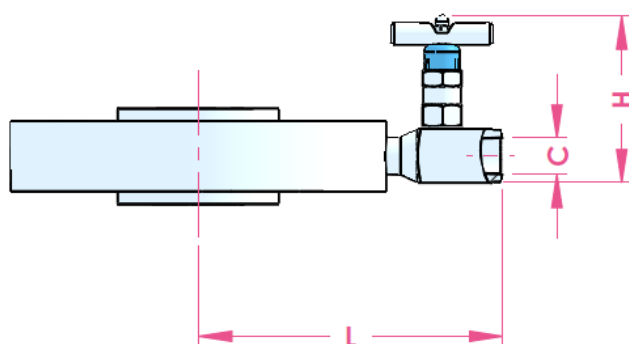
The flush flanges are typical used for vent or drain the process when installed under a pressure instrument like a pressure gauge or pressure transmitter. Venting the process can be made easy by installing a needle valve, extension pipe or welding neck flange to the flush flange. These assemblies are common practice for Badotherm and can be welded, tested and assembled in advance.

Orientation

Mounting flush devices vertical or horizontal can results in difficulties in orientation. There are two main positions of the valve operating handle.

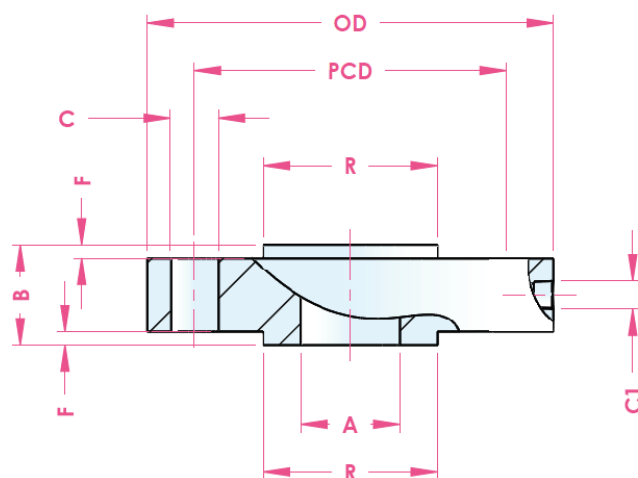
Position 1: this is the default position of the valve and most commonly used in vertical setup. This way the valve faces forward for easy operating.

Position 2: The valve handle are rotated 90° so the valve handles are facing forward in case of horizontal assembly.



size	rating	L	H	B	C
1" – 4"	cl. 150-2500	OD + 65.0	102.3	30.0	½" NPT
DN20 - DN100	PN10-PN400				

Dimensions table: ASME 16.5 RF facing

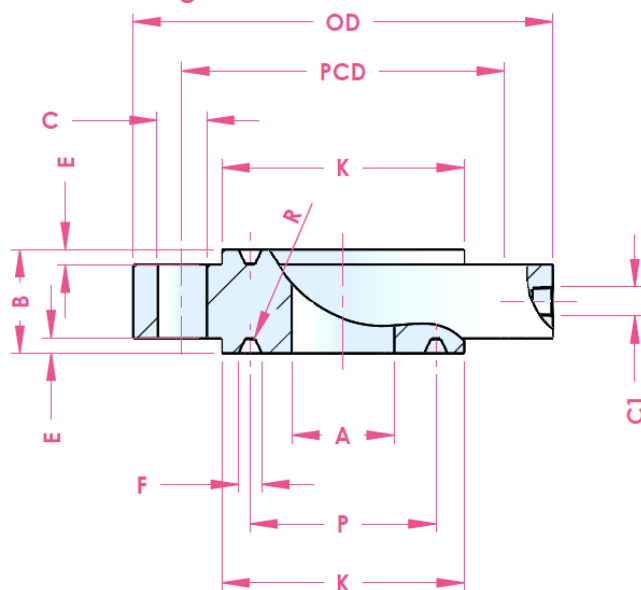


size	rating	OD	B *1	A	PCD	C / pcs	R	F	weight
1"	cl. 150	108.0	39.0	26.6	79.2	15.9 / 4x	50.8	1.5	0.9
	cl. 300	124.0		26.6	88.9	19.1 / 4x		1.5	1.4
	cl. 400-600	149.0	49.0	24.3	101.6	25.4 / 4x	50.8	6.4	1.6
	cl. 900-1500	159.0		20.7	108.0	25.4 / 4x		6.4	3.6
	cl. 2500	124.0	39.0	40.9	98.6	15.9 / 4x	73.0	1.5	5.0
1.5"	cl. 150	155.0	39.0	40.9	114.3	22.3 / 4x		1.5	1.5
	cl. 300	178.0		38.1	124.0	28.6 / 4x	73.0	6.4	2.7
	cl. 400-600	203.0	49.0	34.0	146.0	31.8 / 4x		6.4	3.3
	cl. 900-1500	152.0		52.5	120.6	19.1 / 4x	91.9	6.4	5.8
	cl. 2500	165.0	39.0	49.2	127.0	19.1 / 8x		1.5	10.4
2"	cl. 150	216.0	39.0	42.9	171.4	28.6 / 8x	91.9	6.4	2.4
	cl. 300	235.0		77.9	152.4	19.1 / 4x		1.5	3.2
	cl. 400-600	190.0	49.0	73.7	168.1	22.3 / 8x	127.0	6.4	4.2
	cl. 900	241.0		66.4	190.5	25.4 / 8x		6.4	10.1
	cl. 1500	267.0	39.0	97.2	203.2	31.9 / 8x	157.2	1.5	15.6
3"	cl. 2500	305.0	39.0	87.3	228.6	35.0 / 8x		6.4	4.9
	cl. 150	229.0		102.3	190.5	19.1 / 8x	127.0	1.5	6.8
	cl. 300	254.0	49.0	97.2	200.2	22.3 / 8x		6.4	8.4
	cl. 400	273.0		87.3	215.9	25.5 / 8x	157.2	6.4	13.1
	cl. 600	292.0	39.0	102.3	235.0	31.8 / 8x		1.5	19.1
4"	cl. 900	311.0	39.0	97.2	241.3	34.9 / 8x	157.2	6.4	34.8
	cl. 1500	356.0		87.3	273.0	41.3 / 8x		1.5	7.0
	cl. 150	229.0	49.0	102.3	200.2	22.3 / 8x	127.0	1.5	11.5
	cl. 300	254.0		97.2	215.9	25.5 / 8x		6.4	14.8
	cl. 400	273.0	39.0	102.3	235.0	31.8 / 8x	157.2	6.4	17.3
4"	cl. 600	292.0	39.0	97.2	241.3	34.9 / 8x		1.5	26.9
	cl. 900	311.0		87.3	273.0	41.3 / 8x		6.4	29.9
	cl. 1500	356.0	49.0	102.3	200.2	22.3 / 8x	127.0	1.5	53.9
	cl. 2500	229.0		97.2	215.9	25.5 / 8x		6.4	14.8
	cl. 150	254.0	39.0	102.3	235.0	31.8 / 8x	157.2	6.4	17.3
4"	cl. 300	273.0	49.0	97.2	241.3	34.9 / 8x		1.5	26.9
	cl. 400	292.0		87.3	273.0	41.3 / 8x		6.4	29.9
	cl. 600	311.0	39.0	102.3	200.2	22.3 / 8x	127.0	1.5	53.9
	cl. 900	356.0		97.2	215.9	25.5 / 8x		6.4	14.8
	cl. 1500	229.0	49.0	102.3	235.0	31.8 / 8x	157.2	6.4	17.3
4"	cl. 2500	254.0	39.0	97.2	241.3	34.9 / 8x		1.5	26.9
	cl. 150	273.0		87.3	273.0	41.3 / 8x		6.4	29.9
	cl. 300	292.0	49.0	102.3	200.2	22.3 / 8x	127.0	1.5	53.9
	cl. 400	311.0		97.2	215.9	25.5 / 8x		6.4	14.8
	cl. 600	356.0	39.0	102.3	235.0	31.8 / 8x	157.2	6.4	17.3

All dimensions in mm

*1) Dimension B is based on 1/2" flush connection. Depending on the flush size the dimension B will vary (see table "Flange thickness")

Dimensions table: ASME 16.5 RJF facing

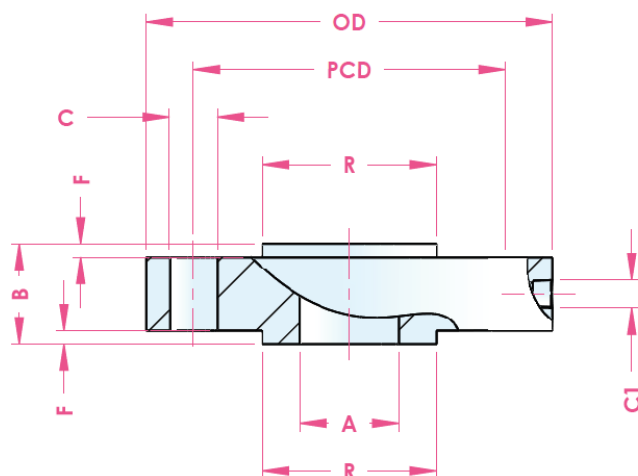


size	rating	OD	A	B *1	PCD	C / pcs	K	E	F	P	R	C1	Ring #	weight					
1"	cl. 150	108.0	26.6	47.8	79.2	15.9 / 4x	63.5	6.35	8.74	47.62	0.8	½" NPT	15	0.7 kg					
	cl. 300	124.0			88.9	19.1 / 4x	69.8			50.80			16	0.9 kg					
	cl. 400-600		101.6		25.4 / 4x	71.4	60.33			18			0.9 kg						
	cl. 900-1500	149.0	20.7			108.0	82.6			65.07			19	1.3 kg					
	cl. 2500	159.0	98.6		15.9 / 4x	90.4	68.28			20			1.3 kg						
1.5"	cl. 150	124.0	40.9	50.8	98.6	15.9 / 4x	90.4	7.92	11.91	82.55			11.91	95.25	101.60	21	1.4 kg		
	cl. 300	155.0			114.3	22.3 / 4x	91.9									68.28	22	1.4 kg	
	cl. 400-600		178.0		38.1	124.0	28.6 / 4x									91.9	68.28	23	1.6 kg
	cl. 900-1500	203.0	34.0		146.0	31.8 / 4x	114.0									68.28	24	2.3 kg	
2"	cl. 2500	203.0	34.0	47.8	120.6	19.1 / 4x	102.0	6.35	8.74	82.55			11.91	95.25	101.60	25	2.3 kg		
	cl. 150	152.0	52.5		50.8	127.0	19.1 / 8x									108.0	68.28	26	1.8 kg
	cl. 300	165.0				165.1	25.4 / 8x									124.0	68.28	27	2.1 kg
	cl. 400-600		216.0			49.2	171.4				28.6 / 8x	133.0				68.28	28	2.1 kg	
	cl. 900-1500	235.0	42.9			171.4	28.6 / 8x				133.0	68.28				29	2.8 kg		
3"	cl. 2500	235.0	42.9	47.8		152.4	19.1 / 4x	133.0	6.35	8.74	114.30	11.91	95.25	101.60	30	3.1 kg			
	cl. 150	190.0	77.9		50.8	168.1	22.3 / 8x	146.0							123.82	31	3.7 kg		
	cl. 300	210.0				190.5	25.4 / 8x	156.0							136.52	32	3.7 kg		
	cl. 400-600		241.0			73.7	203.2	31.9 / 8x							168.0	123.82	33	4.2 kg	
	cl. 900	267.0	66.4			203.2	31.9 / 8x	168.0							123.82	34	5.0 kg		
4"	cl. 1500	267.0	66.4	54.0		228.6	35.0 / 8x	168.0	9.53	13.49	127.00	1.5	1.5	35	5.0 kg				
	cl. 2500	305.0	47.8		190.5	19.1 / 8x	171.0	6.35						8.74	36	5.8 kg			
	cl. 150	229.0	102.3		200.2	22.3 / 8x	175.0	7.92						11.91	149.22	0.8	37	5.5 kg	
	cl. 300	254.0																	215.9
	cl. 400	273.0	97.2		235.0	31.8 / 8x	181.0	161.92						39	6.1 kg				
	cl. 600	292.0			241.3	34.9 / 8x	194.0	161.92						40	7.2 kg				
	cl. 900	311.0			273.0	41.3 / 8x	203.0	157.18						41	7.9 kg				
cl. 1500	311.0	87.3	57.2	273.0	41.3 / 8x	203.0	11.13	16.66	157.18	1.5	38	7.9 kg							
cl. 2500	356.0	87.3	57.2	273.0	41.3 / 8x	203.0	11.13	16.66	157.18	1.5	38	7.9 kg							

All dimensions in mm

*1) Dimension B is based on 1/2" flush connection. Depending on the flush size the dimension B will vary (see table "Flange thickness")

Dimensions table: EN 1092-1 B1 type



size	rating	OD	B *1	A	PCD	C / pcs	R	f	C1	Weight
DN20	PN10-40	105.0	39.0	22.3	75.0	14.0 / 4x	58.0	2.0	½" NPT	1.0
	PN63-100	130.0			90.0	18.0 / 4x				2.0
DN25	PN10-40	115.0		28.5	85.0	14.0 / 4x	68.0			1.0
	PN63-100	140.0			100.0	18.0 / 4x				2.5
	PN160	150.0		27.9	22.0 / 4x	2.7				
	PN250			26.5		105.0				3.6
	PN320			23.7		115.0				5.2
	PN400			28.7		130.0				26.0 / 4x
DN32	PN10-40	140.0	37.2	100.0	18.0 / 4x	78.0	2.0			
	PN63-100	155.0		22.0 / 4x	3.0					
DN40	PN10-40	150.0	41.0	43.1	110.0	18.0 / 4x	88.0	2.0		
	PN63-100	170.0			42.5	125.0		22.0 / 4x		4.0
	PN160	185.0		41.1	26.0 / 4x	4.4				
	PN250			38.3		135.0		6.7		
	PN320			35.7		145.0		8.7		
	PN400			40.3		165.0		30.0 / 4x		14.1
DN50	PN10-40	165.0		54.5	125.0	18.0 / 4x	102.0	3.0		
	PN63	180.0			135.0	22.0 / 4x		4.5		
	PN100	195.0			53.9	145.0		26.0 / 4x	6.0	
	PN160				52.3	150.0		26.0 / 8x	6.4	
	PN250				47.7	160.0		26.0 / 8x	8.2	
	PN320					210.0		160.0	18.0 / 8x	10.7
DN80	PN400	235.0		51.1	180.0	30.0 / 8x	138.0	16.7		
	PN10-40	215.0		82.5	160.0	18.0 / 8x		5.0		
	PN63			81.7	170.0	22.0 / 8x		6.5		
	PN100			80.9	180.0	26.0 / 8x		9.0		
	PN160			76.3		200.0		26.0 / 8x	10.3	
	PN250			79.6		220.0		30.0 / 8x	16.5	
PN320	275.0		76.6	220.0		30.0 / 8x	25.4			
DN100	PN400	305.0	79.3	240.0	33.0 / 8x	162.0	38.4			
	PN10-16	220.0	107.1	180.0	18.0 / 8x		4.5			
	PN25-40	235.0		190.0	22.0 / 8x		6.5			
	PN63	250.0	106.3	200.0	26.0 / 8x		9.0			
	PN100	265.0	104.3	210.0	30.0 / 8x		13.0			
	PN160		98.3		235.0		30.0 / 8x	15.3		
	PN250		300.0		98.6		265.0	36.0 / 8x	27.2	
	PN320		335.0		101.0		265.0	36.0 / 8x	42.5	
	PN400	370.0	95.3	295.0	39.0 / 8x	67.3				

All dimensions in mm

*1) Dimension B is based on 1/2" flush connection. Depending on the flush size the dimension B will vary (see table "Flange thickness")

Product code ASME Flush Flanges

Code	
Example code:	FF A 08 A1 RF S316 2 7 OP -
Standard	
ASME B16.5	A
Size	
1"	02
1.5"	04
2"	05
3"	08
4"	10
Class	
cl. 150	A1
cl. 300	A2
cl. 400 ^{*1}	A3
cl. 600	A4
cl. 900 ^{*2}	A5
cl. 1500	A6
cl. 2500	A7
Facing	
Raised Face ◀	RF
Ring Joint Face	RJF
Material	
AISI 316(L) ◀	S316
Alloy C276	A276
AISI 321	S321
Alloy 400	A400
Alloy 825	A825
254 SMO (F44)	DF44
Duplex (F51)	DF51
Super Duplex (F53)	SF53
Duper Duplex (F55)	SF55
Flush Connection Quantity	
1 side	1
2 sides ◀	2
Flush connection size	
1/4" NPT	N41F
1/2" NPT ◀	N12F
3/4" NPT	N34F
1/2" Butt Weld	B12M
3/4" Butt Weld	B34M
1/2" Socket Weld	S12M
3/4" Socket Weld	S34M
G 1/4 with ISO 1179-4 port connection	G49F
G 1/2 with ISO 1179-4 port connection	G29F
Flush connection mounting	
Open ports ◀	OP
Blind plug	BP
Vent plug	VP
BDTV910 needle valve 1/2" NPT-f ^{*3}	V910-N12F
Fitting method	
PTFE tape	P
Grafoil tape	G
SWAK®	S

SWAK® is a trademark of Swagelok

*1For size ≥4"

*2For size ≥3"

*3 Select female connection of valve from table 3

Product code EN Flush Flanges

Code										
Example code:	FF E	27	D4	B1	S316	2	7	OP	-	
Standard										
EN 1092-1	E									
Size										
DN25	24									
DN40	26									
DN50	27									
DN80	29									
DN100	30									
Class										
PN 10-16 ^{*1}	D2									
PN 25-40 ^{*1}	D3									
PN 10-40	D4									
PN 63	D5									
PN 100	D6									
PN 250	D7									
PN 400	D8									
Facing^{*2}										
Raised Face ◀	B1									
Material										
AISI 316(L) ◀	S316									
Alloy C276	A276									
AISI 321	S321									
Alloy 400	A400									
Alloy 825	A825									
254 SMO (F44)	DF44									
Duplex (F51)	DF51									
Super Duplex (F53)	SF53									
Duper Duplex (F55)	SF55									
Flush Connection Quantity										
1 side	1									
2 sides ◀	2									
Flush connection size										
1/4" NPT	N41F									
1/2" NPT ◀	N12F									
3/4" NPT	N34F									
22mm Butt Weld (1/2")	B12M									
28mm Butt Weld (3/4")	B34M									
1/2" Socket Weld	S12M									
3/4" Socket Weld	S34M									
G ¼ with ISO 1179-4 port connection	G49F									
G ½ with ISO 1179-4 port connection	G29F									
Flush connection mounting										
Open ports ◀	OP									
Blind plug	BP									
Vent plug	VP									
BDTV910 needle valve ½" NPT-f ^{*3}	V910-N12F									
Fitting method										
PTFE tape	P									
Grafoil tape	G									
SWAK®	S									

SWAK® is a trademark of Swagelok

*1: For size ≥DN100

*2: Other facings then RF/ RJF, fill in facing code from table 1.

*3 Select female connection of valve from table 3

Table 1: Additional Facing

Description	code
Large Male Face	LMF
Small Male Face	SMF
Flat Face	FF
Large Tongue Face	LTF
Small Tongue Face	STF
Large Groove Face	LGF
Small Groove Face	SGF
Large Female Face	LFF
Small Female Face	SFF

Description	code
Flat Face	A
Raised face (smooth finish)	B2
Tongue	C
Groove	D
Spigot	E
Recess	F

For the Groove and Tongue Facings the instrument and process and side are the opposites
(eg Instrument side is LTF then Process side is LGF)

Table 2: Options

Option (start options with X_)	code
Cleaned from Oil and Grease	_K1
NACE ISO 15156 (MR 01 75)	_N75
Position 2 mounted valves	_VP2
3.1 material certificate	_IC31
2.1 Pressure leak test certificate standard pressure* ¹	_LTPS
2.1 Pressure leak test certificate acc PED 2014/68/EU* ¹	_LTCE
2.1 Penetrant test certificate* ²	_PT1
2.2 Positive Material Identification	_PMI
2.2 Welding documents (WPS/PQR)* ²	_WPS

*1: For fitted and welded accessory

*2: Only for welded accessory

Table 3: Options

BDTV910 with...	
G 1/4 female connection	BDTV910_G14F
G 3/8" A female connection	BDTV910_G38M
G 1/2 female connection	BDTV910_G12F
1/4" NPT female connection	BDTV910_N14F
1/2" NPT female connection	BDTV910_N12F
3/8" tube Compression fitting	BDTV910_CI38

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DSS 7023 – 8th of March 2021

Change log

Date	Change
30-3-2020	1.5" cl 2500 dimension "P" in RJF changed. / Valve coding table 3 added
8-3-2021	Updated ASME dimensions table with ASME 16.5:2020

Holland – Romania – India – Thailand – Dubai – USA

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