

## BWX SERIES BUTTERFLY VALVE FOR CRYOGENIC APPLICATIONS

The BWX series butterfly valve has been especially designed for use in cryogenic applications with high quality CrNi steel. Testing of the valve includes Cold shock test and it can be used for gaseous and liquid oxygen, LNG, nitrogen, hydrogen and other cryogenic fluids. The compact design of the valve permits rapid cool down and minimizes boil off loss.

### FEATURES

- Innovative design with free floating metallic seat
  - Protected seat in area of lowest tear and wear
- High flow rates
- Cryogenic applications;
  - Temperature range:  $-270\text{ }^{\circ}\text{C} < T < 200\text{ }^{\circ}\text{C}$
- Best for oxygen service
  - Oil & grease free assembly and test
  - BAM tested non metallic parts
- Rating and flange face:
  - ASME 150/300/600
  - PN10 / 16 / 25 / 40 / 63
- Face-to-face: API 609, optional EN558
- Sizes NPS4 ... NPS24 / DN100 ... DN600
- 3 different cryogenic extension lengths

### Body

The valve body is a lug design. As option the valve is available in other face-to-face dimensions or also with body design as wafer, flanged or with butt welded ends.

The body is a monolithic design without a clamp ring. This means high safety even under full pressure with open pipe end, no additional parts and no screws in gasket flange face area.

### Disc

The standard disc is made of a high quality stainless steel and has an innovative design, which brings a perfect and reliable seat performance with long life endurance.



### Shaft and drive shaft design

The BWX butterfly valve has a stub shaft design which gives a high flow coefficient. A robust and easy shaft to disc polygon connection requires no additional fasteners inside the flow area and guarantees a fast and effective maintenance of the entire valve.

It is practically free of play and exceeds the strength of the top of the shaft. A visible mark at the shaft clearly indicates the position of the disc.

High safety factor has been included to the bearing design. The thrust bearing is protected from the flow, located in the body neck and realizes the blow out protection of the shaft. The gland packing is live loaded to ensure minimum emissions and is located directly after the upper shaft bearing which prevents any side forces from the packing.

### Seat

The BWX series is equipped with a floating full metal seat located independently in the body. Additionally the seat is protected in the body in an area of lowest wear and tear. This design principle ensures high duration with constant, repeatable and reliable tightness performance even during rapid temperature changes and differentials within the valve. The innovative design gives low operating torques and clears the disc from seat after a few degrees of opening which extends the life of the BWX valve.

### Oxygen service

The design is inherently free of oil and grease. This means that due design features the valves does not require any kind of grease during assembly and testing procedure. Additionally the flow area does neither contain any bolts, pins or nuts nor any sharp edges or corners. All non metallic parts are BAM tested under pure gaseous or liquid oxygen up to rated pressure.

### Actuator

The BWX valve series is equipped with a ISO 5211 mounting face to the actuator. Neles® pneumatic or manual gear actuators are used as standard. The valve can be equipped also with other types of actuators. Optionally the valve can be supplied with any additional instrumentation and positioning equipment.

NPS/DIN	CI 150 PN10/16	CI 300 PN25/40	CI 600 PN63
	Standard actuator sizes		
4/100	B1J10/25	B1J12/55	B1J12/55
6/150	B1J12/55		B1J16/55
8/200		B1J16/55	B1J20/70
10/250	B1J16/55	B1J20/70	B1J25/95
12/300			B1J32/105
14/350	B1J20/70	B1J25/95	B1J32/105
16/400			
18/450			
20/500	B1J25/95	B1J322	
24/600	B1J32/105		

Standard Neles actuators B1J series

### Cold shock test

Beside available standard leakage tests acc. EN12266, AISI or cryogenic tests acc. BS6364 a cold shock test can be performed. This test demonstrates the excellent and repeatable valve performance under real operating conditions.

The valve is cooled down with liquid nitrogen. When the valve has reached -196 °C, the valve is closed and pressure is applied. Leakage – if any – can be monitored. Acceptance criteria is no visible leakage.



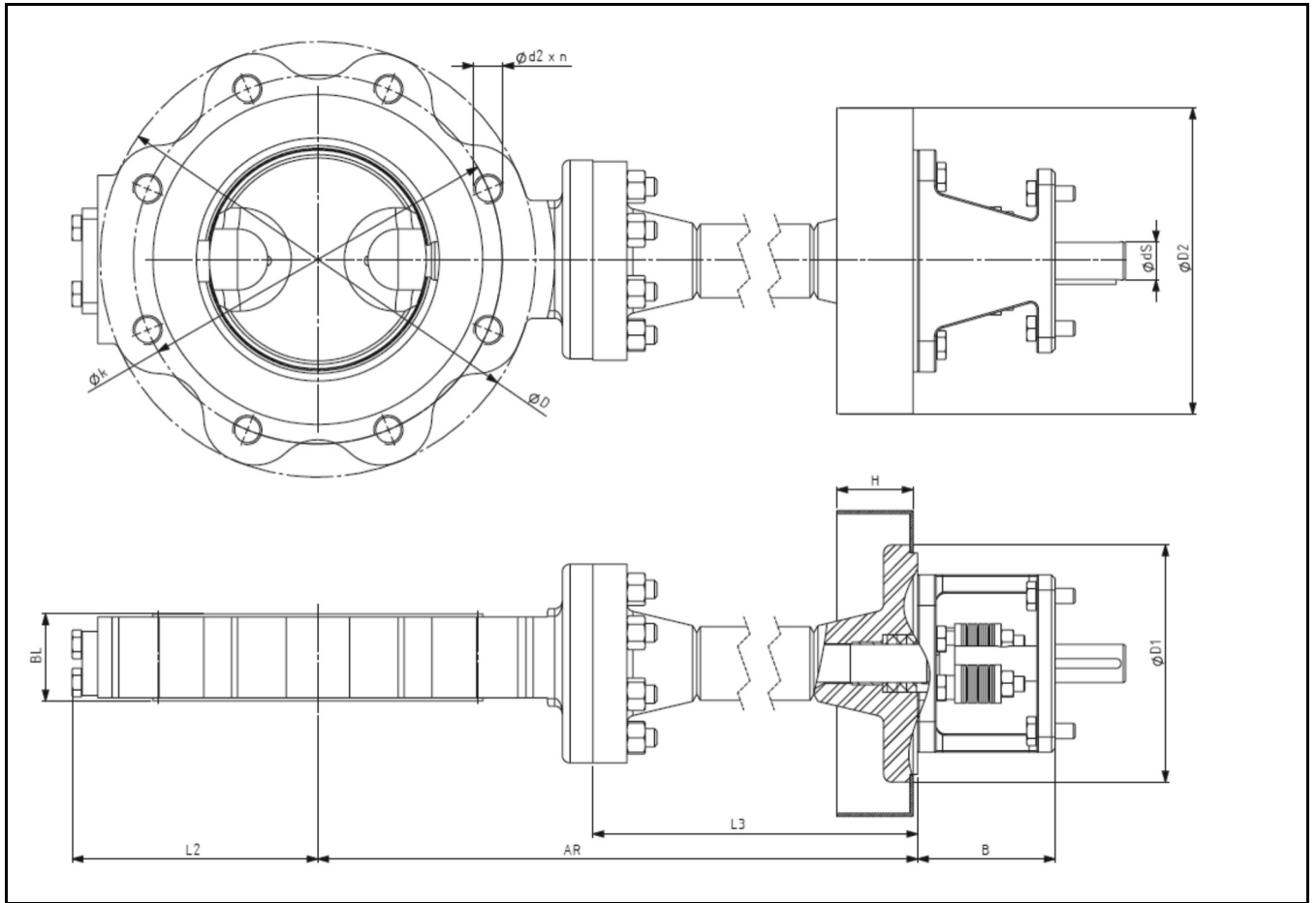
Cold shock test

### Flow capacity

NPS/DIN	CI 150 PN10/16	CI 300 PN25/40	CI 600 PN63
	Cv [gal/min]		
4/100	309	309	223
6/150	1313	1021	732
8/200	2816	2204	1622
10/250	4678	3437	2079
12/300	7446	5261	3375
14/350	9904	7664	
16/400	12361	10067	
18/450	15756	13572	
20/500	19151	17076	
24/600	29770	24124	

BWX flow capacity

## MAIN DIMENSIONS



Main dimensions of BWX valve series

CL150 - PN10 - PN16																			
Standard dimensions [mm]										Flange dimensions									
NPS/DIN	AR *)	D2 / H	BL	L2	L3 *)	B	D1	dS	D	weight	ASME B16.5 cl.150			EN 1092-PN10			EN 1092-PN16		
											k	d2	n	k	d2	n	k	d2	n
4/100	860	200/50	54	136	680	90	155	25	230	30 kg	190,5	5/8-11UNC	8	180	M16	8	180	M16	8
6/150	860	200/50	57	161	680	90	155	25	285	35 kg	241,3	3/4-10UNC	8	240	M20	8	240	M20	8
8/200	860	200/50	64	187	650	90	155	25	345	49 kg	298,5	3/4-10UNC	8	295	M20	8	295	M20	12
10/250	860	200/50	71	247	600	110	165	30	405	70 kg	362	7/8-9UNC	12	350	M20	12	355	M24	12
12/300	1060	200/50	81	272	760	110	165	30	485	102 kg	431,8	7/8-9UNC	12	400	M20	12	410	M24	12
14/350	1060	260/50	92	300	710	120	210	40	535	137 kg	476,3	1-8UN	12	460	M20	16	470	M24	16
16/400	1060	260/50	102	328	710	120	210	40	595	188 kg	539,8	1-8UN	16	515	M24	16	525	M27	16
18/450	1060	260/50	114	375	630	120	210	50	635	240 kg	577,9	1 1/8-8UN	16	565	M24	20	585	M27	20
20/500	1060	260/50	127	423	630	140	210	50	715	305 kg	635	1 1/8-8UN	20	620	M24	20	650	M30	20
24/600	1060	300/50	154	498	580	180	290	70	840	519 kg	749,3	1 1/4-8UN	20	725	M27	20	770	M33	20

\*) Option: +200 mm / +400 mm

CL300- PN25 - PN40																			
Standard dimensions [mm]											Flange dimensions								
											ASME B16.5 cl.300			EN 1092-PN25			EN 1092-PN40		
NPS/DIN	AR *)	D2 / H	BL	L2	L3 *)	B	D1	dS	D	weight	k	d2	n	k	d2	n	k	d2	n
4/100	860	200/50	54	136	680	90	155	25	255	31 kg	200	3/4-10UNC	8	190	M20	8	190	M20	8
6/150	860	200/50	59	187	650	90	155	25	320	46 kg	269,9	3/4-10UNC	12	250	M24	8	250	M24	8
8/200	860	200/50	73	224	600	110	165	30	380	73 kg	330,2	7/8-9UNC	12	310	M24	12	320	M27	12
10/250	860	260/50	83	258	600	120	210	40	445	123 kg	387,4	1-8UN	16	370	M27	12	385	M30	12
12/300	1060	260/50	92	283	710	120	210	40	520	161 kg	450,8	1 1/8-8UN	16	430	M27	16	450	M30	16
14/350	1060	260/50	117	341	710	140	210	50	585	235 kg	514,4	1 1/8-8UN	20	490	M30	16	510	M33	16
16/400	1060	260/50	133	399	630	140	210	50	650	319 kg	571,5	1 1/4-8UN	20	550	M33	16	585	M36	16
18/450	1060	300/50	149	429	580	180	290	70	710	422 kg	628,6	1 1/4-8UN	24	600	M33	20	610	M36	20
20/500	1060	300/50	159	458	580	180	290	70	775	547 kg	685,8	1 1/4-8UN	24	660	M33	20	670	M39	20
24/600	1060	360/50	181	567	510	180	350	85	915	874 kg	812,8	1 1/2-8UN	24	770	M36	20	795	M45	20

\*) Option: +200mm / +400mm

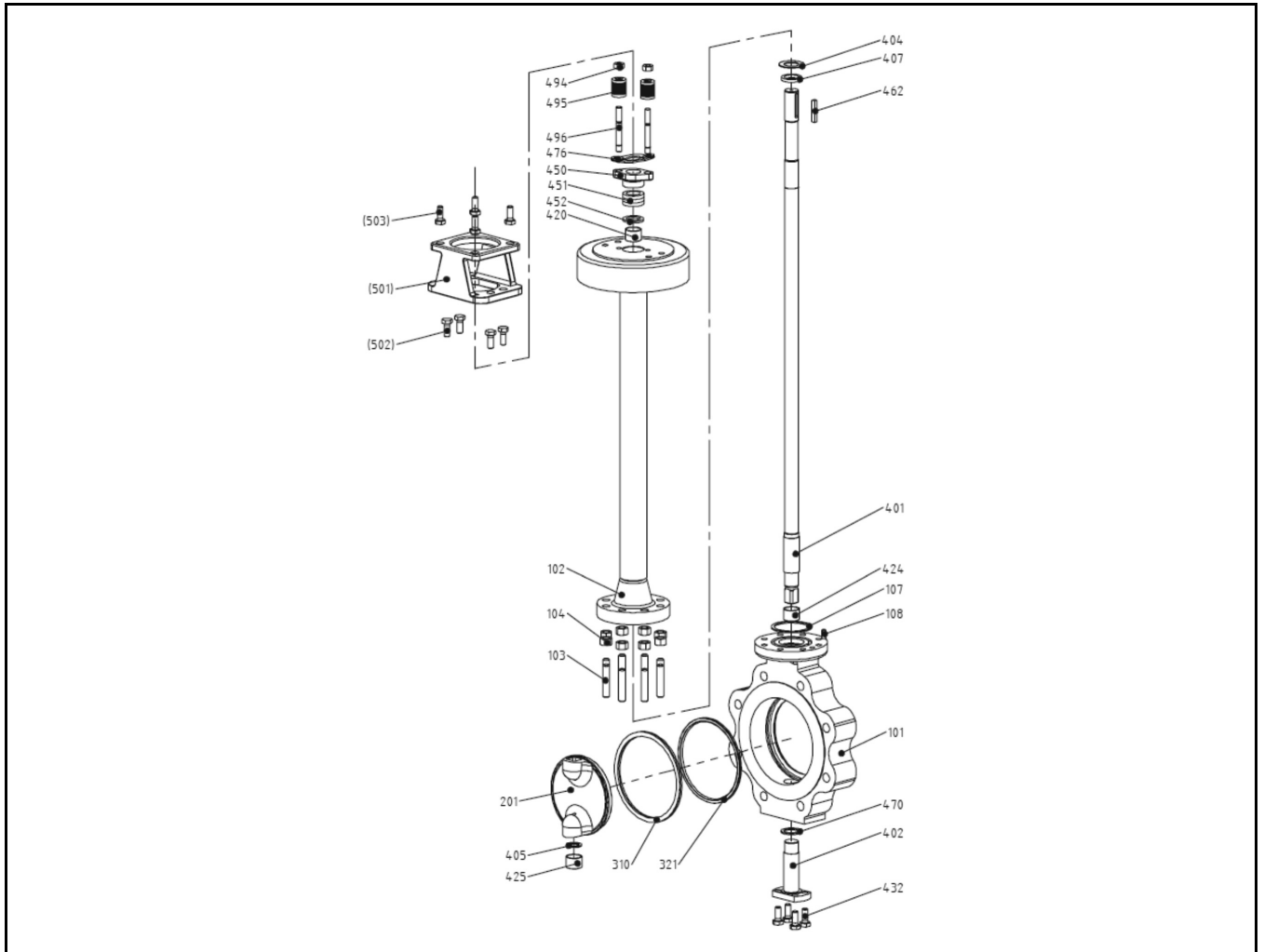
CL600- PN63																			
Standard dimensions [mm]											Flange dimensions								
											ASME B16.5 cl.600			EN 1092-PN63					
NPS/DIN	AR *)	D2 / H	BL	L2	L3 *)	B	D1	dS	D	weight	k	d2	n	k	d2	n	k	d2	n
4/100	860	200/50	64	165	680	90	155	25	275	39 kg	215,9	7/8-9UNC	8	200	M24	8	200	M24	8
6/150	860	200/50	78	201	600	110	165	30	355	77 kg	292,1	1 8UN	12	280	M30	8	280	M30	8
8/200	860	260/50	102	238	600	120	210	40	420	134 kg	349,2	1 1/8-8UN	12	345	M33	12	345	M33	12
10/250	860	260/50	117	323	560	180	210	50	510	208 kg	431,8	1 1/4-8UN	16	400	M33	12	400	M33	12
12/300	1060	300/50	140	323	660	180	290	70	560	340 kg	489	1 1/4-8UN	20	460	M33	16	460	M33	16

### Torque

NPS/DIN	CI 150 PN10/16					CI 300 PN25/40						CI 600 PN63					
	delta p [bar]																
	0	5	10	16	20	0	10	20	30	40	50	0	20	40	60	80	100
4/100	71	85	98	115	125	73	99	124	150	176	202	85	140	195	250	305	360
6/150	73	103	132	167	190	75	135	195	255	315	375	133	261	389	517	645	773
8/200	91	146	202	269	313	149	268	387	505	624	743	122	394	665	937	1208	1480
10/250	170	263	356	467	541	207	397	587	777	967	1157	310	726	1142	1558	1973	2389
12/300	194	317	440	588	686	216	496	775	1055	1335	1615	517	1238	1958	2678	3398	4119
14/350	186	385	584	822	981	265	682	1099	1516	1933	2349						
16/400	253	501	750	1047	1246	312	910	1509	2107	2705	3303						
18/450	498	813	1128	1506	1758	826	1660	2495	3329	4163	4997						
20/500	525	974	1424	1964	2323	596	1722	2848	3974	5100	6226						
24/600	697	1431	2164	3043	3630	793	2611	4429	6247	8065	9883						

Maximum BTO torque under delta pressure

## EXPLODED VIEW



## Part list

Part nr.	Qty.	Description	Material
101	1	Body	ASTM A351 gr. CF8M
102	1	Extension	AISI 316
103	8	Threaded pin	Stainless steel
104	8	Hexagon nut	Stainless steel
107	1	Sealing	Graphite
108	1	Worm screw	Stainless steel
117	1	Sign closed	Aluminium
201	1	Disc	ASTM A351 gr. CF8M
321	1	Sealing element	UNS N07718
310	2	Retaining ring	1.4571
401	1	Drive shaft	ASTM A479 gr. XM-19-H
424	1	Bearing sleeve	Bronze+PTFE
420	1	Bearing sleeve	Bronze+PTFE
404	1	Thrust bearing	Bronze+PTFE
407	1	Thrust washer	ASTM A479 gr. XM-19-H
462	1	Key	1.4460
402	1	Shaft	ASTM A479 gr. XM-19-H
424	1	Bearing sleeve	Bronze+PTFE
425	1	Bearing sleeve	Bronze+PTFE
405	1	Thrust washer	Bronze+PTFE
432	4	Hexagon screw	Stainless steel
470	1	Sealing	Graphite
450	1	Gland	A351 gr. CF8M/1.4408
451	4	Packing ring	PTFE
452	1	Anti extrusion ring	AISI 316
495	2	Disc spring set	Spring steel
476	2	Retainer plate	316L/1.4435
496	2	Stud	Stainless steel
494	2	Hexagon nut	Stainless steel

## HOW TO ORDER

### Standard selection:

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
BWX	4	C	1	A	X	2	08	A	A	N	D	G1	-	-

BWX cryo type for O2 service, API lugged, ASME cl 150 full rated, metallic seat, soft bearings, oxygen service, extension: AR=1060, NPS 8, body CF8M, disc CF8M, shafts XM19, seat Inconel, life loaded packing for oxygen service

1. sign	PRODUCT SERIES / DESIGN
<b>BWX</b>	Cryogenic temperature butterfly valve, free floating metal seated, 3 bearings, stub shaft design with full bore, and cryogenic extension. Standard FtF length acc. API 609.
2. sign	BODY CONSTRUCTION
<b>2</b>	Flanged, long pattern (without threaded holes)
<b>3</b>	Flanged, long pattern (with threaded holes)
<b>4</b>	Lug type
<b>6</b>	Wafer type
<b>Y</b>	Special, to be specified
3. sign	BODY PRESSURE RATING
<b>C</b>	ASME class 150
<b>D</b>	ASME class 300
<b>F</b>	ASME class 600
<b>J</b>	PN10
<b>K</b>	PN16
<b>L</b>	PN25
<b>M</b>	PN40
<b>N</b>	PN63
4. sign	SEAT DESIGN
<b>1</b>	U-Type metal seat with coating Standard tightness in preferred direction: API 598, FCI 70.2 cl V, EN12266 B Optional tightness in preferred direction: API 598, FCI 70.2 cl VI, EN12266 A Max tightness in non-preferred direction, FCI 70.2 cl V (Air), EN12266 B
<b>6</b>	Shoulder (Step seat) for control applications: FCI 70.2 class III
<b>7</b>	No seat for control application: FCI 70.2 class II
5. sign	BEARINGS / BODY
<b>A</b>	Soft bearings, PTFE or eq. on sinter metal. Back material is bronze.
<b>B</b>	Metal bearings for high temperature. Tmax=600 °C
6. sign	APPLICATION
-	<b>Standard</b> , without sign
<b>N</b>	All wetted parts acc. <b>NACE</b>
<b>X</b>	Oxygen service for <b>GOX/LOX</b> applications all internal non-metallic parts have valid test report from notified body (BAM, WHA, etc)
7. sign	EXTENSION
<b>Standard</b> (without cryo extension)	
<b>0</b>	300
<b>1</b>	860
<b>2</b>	1060
<b>3</b>	1260
<b>4</b>	1460
<b>5</b>	1660
<b>Y</b>	Special construction, extension length defined in dimension drawings

8. sign	SIZE (ASME rating = inch / PN rating = metric)				
	<b>Inch:</b> 04, 06, 08, 10, 12, 14, 16, 18, 20, 24 <b>Metric:</b> 100, 150, 200, 250, 300, 350, 400, 450, 500, 600				
9. sign	BODY MATERIAL	10. sign	DISC MATERIAL	11. sign	SHAFT MATERIAL
<b>A</b>	ASTM A351 CF8M / 1.4408	<b>A</b>	ASTM A351 CF8M eq. AISI 316 / 1.4408	<b>N</b>	XM-19 (Nitronic 50 HS)
<b>P</b>	ASTM A216 WCB / A.0619	<b>N2</b>	ASTM A487 CA6NM (similar to 1.4317)	<b>N2</b>	1.4021 equal SS410
12. sign	SEAT MATERIAL				
<b>D</b>	U-type metallic seat, UNS 07718 + silver coated (disc: ENP coated 30 microns or equal) T = -200 °C ... +850 °C				
<b>E</b>	U-type metallic seat, 1.4021 + silver coated (disc: ENP coated 30 microns or equal) T = -20 °C ... +400 °C				
<b>Z</b>	Step seat, seat = body material				
<b>X</b>	No seat; swing through				
13. sign	PACKING CONSTRUCTION				
<b>T3</b>	Live loaded PTFE packing. For emission certificate please contact factory				
<b>G1</b>	Live loaded graphite packing, compatible to <b>GOX/LOX</b>				
<b>G3</b>	Live loaded graphite packing, <b>Firesafe</b> for emission certification, please contact factory				
<b>Y</b>	Special, to be specified				
14. sign	SPECIAL FLANGE FACING TYPES/FORMS				
-	Ra 3.2 - 6.3, standard, without sign covers: <ul style="list-style-type: none"> <li>EN 1092-1 Type B1 (Ra 3.2 - 12.5)</li> <li>ASME B16.5, Ra 3.2 - 6.3 (125 - 250 µin)</li> <li>DIN 2526 Form E (Ra 4)</li> </ul>				
<b>05</b>	Ring joint				
<b>Y</b>	Special, to be specified				
15. sign	FLANGE				
-	without sign according to valve body pressure rating <b>PN-rating</b> <ul style="list-style-type: none"> <li>EN1092-1</li> </ul> <b>ASME-rating</b> <ul style="list-style-type: none"> <li>ASME B 16.5 #150-#1500 size 4 - 24, #2500 size max 12"</li> <li>ASME B 16.47 <b>Series B</b> #150 - 600 size 26" -60". #900 size max 48"</li> <li>Bigger flange drilling has to be agreed with the factory.</li> <li>Butt weld ends acc. ASME B16.25, pipe diameter and pipe class to be defined</li> </ul>				
<b>Y</b>	Special, to be specified				

Subject to change without prior notice.

### Metso Flow Control Inc.

**Europe**, Vanha Porvoontie 229, P.O. Box 304, FI-01301 VANTAA, Finland.  
Tel. +358 20 483 150. Fax +358 20 483 151

**North America**, 44 Bowditch Drive, P.O. Box 8044, Shrewsbury, MA 01545, USA.  
Tel. +1 508 852 0200. Fax +1 508 852 8172

**South America**, Av. Independência, 2500- Iporanga, 18087-101, Sorocaba-São Paulo, Brazil.  
Tel. +55 15 2102 9700. Fax +55 15 2102 9748/49

**Asia Pacific**, Haw Par Centre #06-01, 180 Clemenceau Avenue, Singapore 239922.  
Tel. +65 6511 1011. Fax +65 6250 0830

**China**, 11/F, China Youth Plaza, No.19 North Rd of East 3rd Ring Rd, Chaoyang District, Beijing 100020, China. Tel. +86 10 6566 6600. Fax +86 10 6566 2583.

**Middle East**, Roundabout 8, Unit AB-07, P.O. Box 17175, Jebel Ali Freezone, Dubai, United Arab Emirates. Tel. +971 4 883 6974. Fax +971 4 883 6836

[www.metso.com/valves](http://www.metso.com/valves)

