Coreline

Rubber seat butterfly valve

Fig.211 : Wafer and lug
Fig.211M : Marine approved

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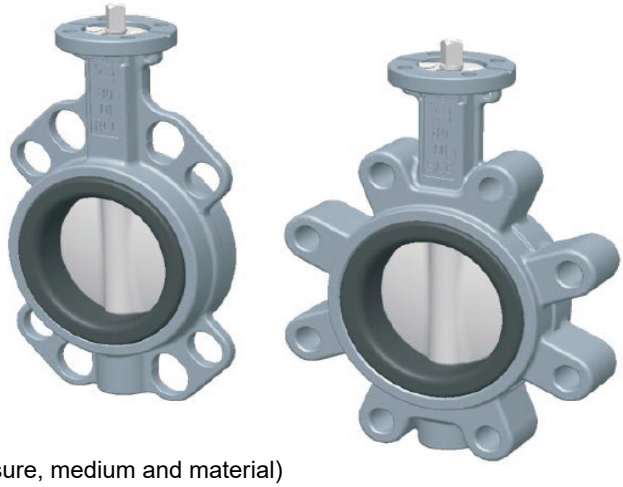
Specifications

Specifications



Nominal diameter:	DN25-DN800
Standard working pressure:	16bar for DN25-DN150
	10bar for DN200-DN800
Flange accommodation:	EN1092 PN6, PN10, PN16
	ASME B16.5 Class150
	JIS B2239 10K, 16K
	BS10 Table D, Table E
Face to face:	EN558 series 20, API 609 table 1
Top flange:	EN ISO 5211
Working temperature:	-20°C to +150°C (depending on pressure, medium and material)
Tightness test:	ISO 5208 rate A, API 598 table 5 (medium: water)

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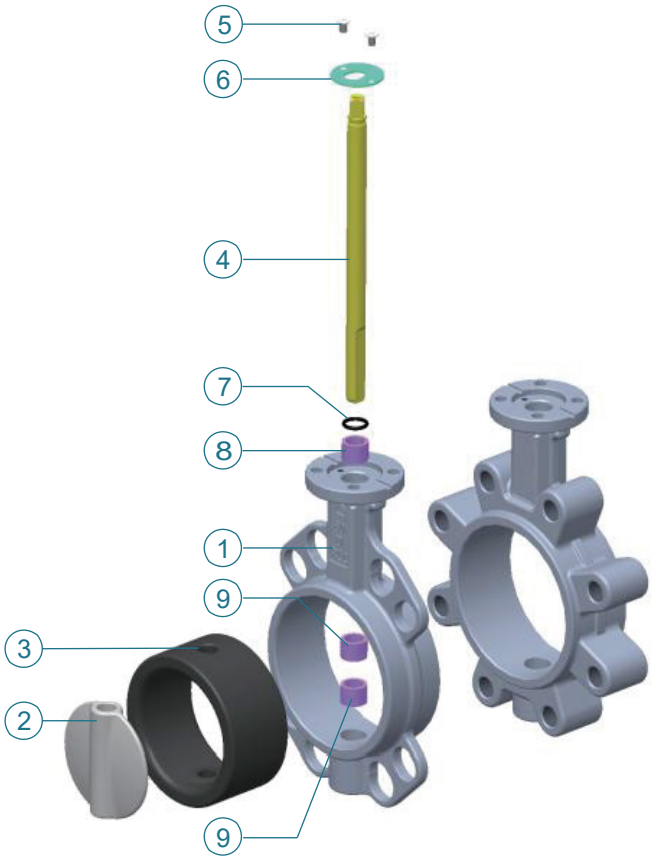
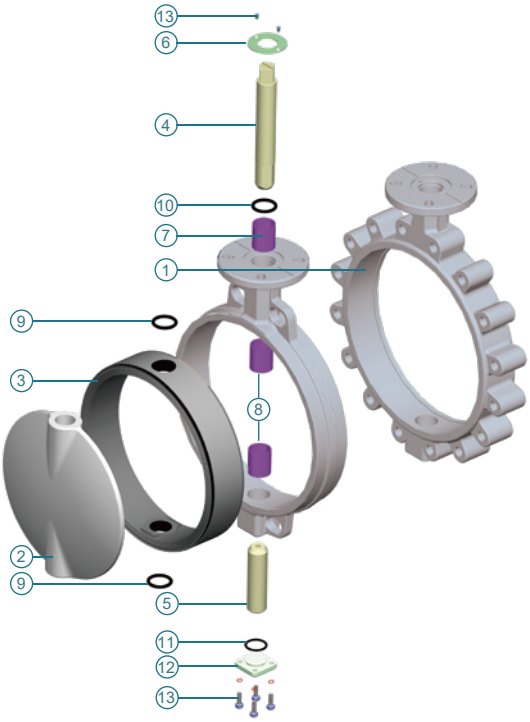
DN25-DN300 material part list



No.	Part name	Material	Specification	No.	Part name	Material
1	Body	Ductile iron	EN1563 JS1030	4	Stem	SS420
2	Disc	Stainless steel	ASTM A351 CF8			SS431
			ASTM A351 CF8M	5	Screw	SS304
			SS201	6	Preventing plate	SS304
		Alloy steel	1.4462 (SAF2205)	7	Weather seal	NBR
			1.4469 (SAF2507)	8	Body bearing	RPTFE with graphite
		Aluminium bronze	C95800	9	Bearing	RPTFE with graphite
		Ductile iron	Nylon, Halar coated			
3	Seat *)	NBR	-15℃~+85℃			
		EPDM	-20℃~+120℃			
		FPM	-15℃~+150℃			

Notes:
*) Rubber seat with hard UPR backup. Other seat material available on request.
The above temperature range for the valve seats are provided as reference for general working conditions.
Please note that the actual applications may vary due to the different media, pressure etc. in the pipeline.
Contact Coreline for more details.

DN350-DN800 material part list

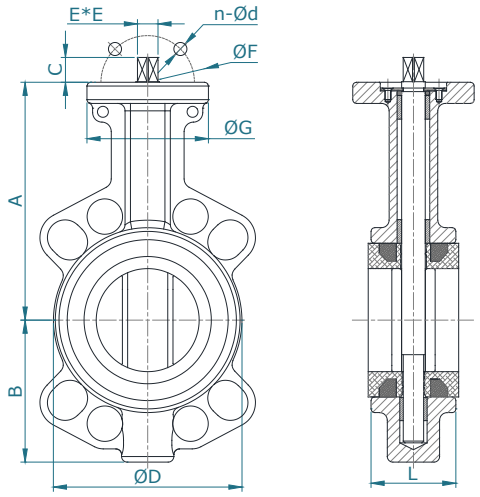


No.	Part name	Material	Specification	No.	Part name	Material
1	Body	Ductile iron	EN1563 JS1030	4/5	Stem	SS420
2	Disc	Stainless steel	ASTM A351 CF8			SS431
			ASTM A351 CF8M			17-4PH SS
			ASTM A351 CF3M	6	Preventing plate	SS304
		Alloy steel	1.4469 (SAF2507)			SS316
			1.4462 (SAF2205)	7	Body bearing	RPTFE with graphite
			1.4529	8	Disc bearing	Rainforced nylon
			1.4539 (904L)	9	O ring	Same as seat
			Hastelloy	10	Weather seal	NBR
		Aluminium bronze	C95800	11	Anti-dust seal	NBR
		Ductile iron	Nylon, Halar coated	12	Bottom cover	Same as body
3	Seat *)	NBR （Eq. Nitrile)	-15℃~+85℃	13	Bolt	SS304
		X-NBR 1)	-15℃~+85℃			SS316
		NBR-DVGW 2)	-15℃~+60℃			
		EPDM-H	-20℃~+125℃			
		EPDM-FDA (white)	-20℃~+85℃			
		EPDM-FDA (black)	-20℃~+125℃			
		FPM (Eq. FKM, Viton)	-15℃~+150℃			
		3) FPM-B (Eq. FEPM)	-15℃~+150℃			
		PTFE	-15℃~+150℃ 4)			

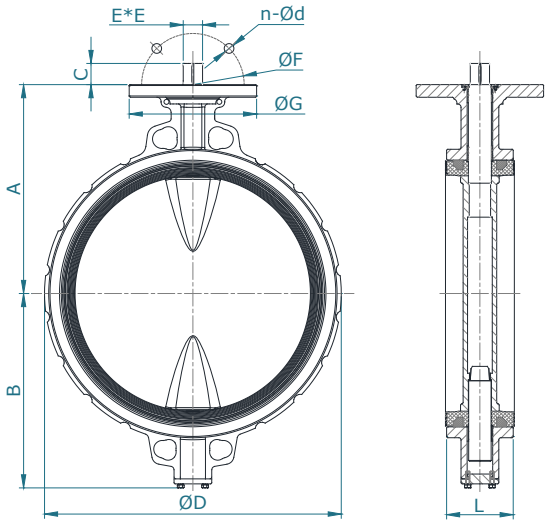
Notes:
*) Rubber seat with hard UPR backup.
1) Well -resistant NBR.
2) German gas certificate.
3) Steam resistant FPM.
4) Depending on the backup rubber material, available with EPDM and FPM backup.
The above temperature range for the valve seats are provided as reference for general working conditions. Please note that the actual applications may vary due to the different media, pressure etc. in the pipeline. Contact Coreline in advance for technique supports.

Wafer type dimensions

DN25-DN300



DN350-DN800

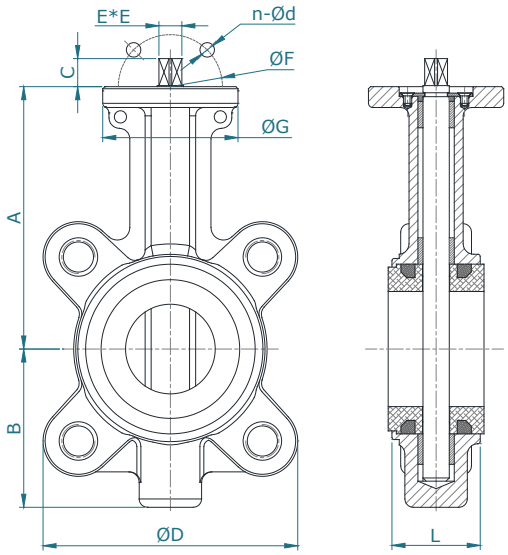


SIZE		A	B	C	D	E	F	n	d	G	L	Weight
DN	INCH											[kg]
25/32	1" / 1 ¼"	108	60	13.5	72	9	50	4	8	65	32	1.1
40	1 ½"	113	67.5	14	85	9	50	4	8	65	33	1.5
50	2"	126	74	14.5	99	9	50	4	8	65	43	1.8
65	2 ½"	134	80	14.5	113	9	50	4	8	65	46	2.3
80	3"	138	93	14.5	129	9	50	4	8	65	46	2.9
100	4"	167	110	18.5	157	11	50+70	4+4	8+10	90	52	4.4
125	5"	180	126	18.5	190	14	70	4	10	90	56	5.7
150	6"	203	139	18.5	213	14	70	4	10	90	56	6.9
200	8"	228	169	21.5	266	17	70+102	4	10+12	125	60	10.9
250	10"	266	209	21.5	324	22	102	4	12	125	68	16.6
300	12"	291	238	22	377	22	102+125	4+4	12+14	150	76	23.2
350	14"	332	273	30	422	27	125+140	4+4	14+18	175	78	41
400	16"	363	317	30	484	27	125+140	4+4	14+18	175	102	58
450	18"	397	348	39	542	36	140+165	4+4	18+22	210	114	80
500	20"	425	393	49	597	46	140+165	4+4	18+22	210	127	97
600	24"	498	453	49	708	46	165+254	4+8	22+18	300	154	169
700	28"	626	531	90	928	63.1	254	8	18	300	165	252
750	30"	660	564	90	984	63.1	254	8	18	300	165	290
800	32"	666	601	90	1061	63.1	254	8	18	300	190	367

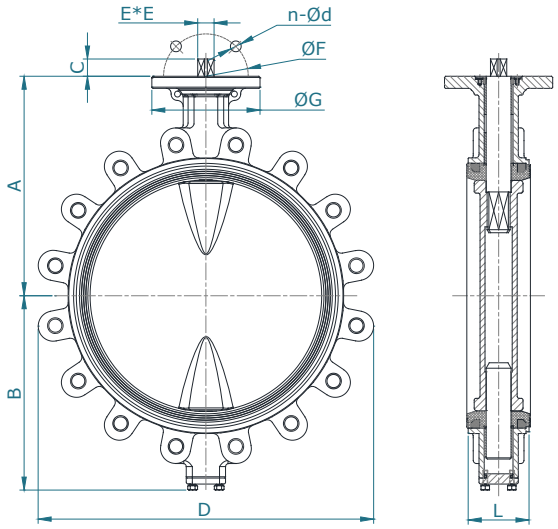
Different pressure may cause different dimension of “D”.

Lug type dimensions

DN40-DN300



DN350-DN800



SIZE		A	B	C	D	E	F	n	d	G	L	Weight
DN	INCH											[kg]
40	1 ½"	113	67.5	10	113	9	50	4	8	65	33	2
50	2"	126	74	10	118	9	50	4	8	65	43	2.4
65	2 ½"	134	80	10	131	9	50	4	8	65	46	3
80	3"	138	93	10	177	9	50	4	8	65	46	3.3
100	4"	167	110	13	206	11	50+70	4+4	8+10	90	52	5.8
125	5"	180	126	13	235	14	70	4	10	90	56	8
150	6"	203	139	13	258	14	70	4	10	90	56	8.8
200	8"	228	169	13	321	17	70+102	4	10+12	125	60	13.8
250	10"	266	209	15	395	22	102	4	12	125	68	22.4
300	12"	291	238	15	461	22	102+125	4+4	12+14	150	76	32.5
350	14"	332	273	30	511	27	125+140	4+4	14+18	175	78	55
400	16"	363	317	30	580	27	125+140	4+4	14+18	175	102	85
450	18"	397	348	39	630	36	140+165	4+4	18+22	210	114	114
500	20"	425	393	49	700	46	140+165	4+4	18+22	210	127	144
600	24"	498	453	49	823	46	165+254	4+8	22+18	300	154	227
700	28"	626	531	90	928	63.1	254	8	18	300	165	342
750	30"	660	564	90	984	63.1	254	8	18	300	165	400
800	32"	666	601	90	1061	63.1	254	8	18	300	190	485

Different pressure may cause different dimension of “D”.

Torque values (Nm)

SIZE		Standard disc differential pressure			Increased PN16 disc	Increased PN20 disc	Reduced PN6 disc	MAST value		
DN	INCH	△P=6bar	△P=10bar	△P=16bar	△P=16bar	△P=20bar	△P=6bar	SS420	SS431	17-4 PH
25/32	1" / 1 ¼"			10						
40	1 ½"	9	10	11		15	7	55	87	163
50	2"	10	11	13		16	8	55	87	163
65	2 ½"	13	15	19		25	10	55	87	163
80	3"	19	24	27		40	15	55	87	163
100	4"	28	38	40		60	22	100	159	298
125	5"	47	57	60		80	35	206	328	615
150	6"	67	90	110		150	55	206	328	615
200	8"	110	130		195	256	91	370	588	1100
250	10"	180	260		380	450	170	801	1274	2385
300	12"	260	300		400	510	230	801	1274	2385
350	14"	550	600		720	870	400	1481	2356	4408
400	16"	700	800		870	1100	500	1481	2356	4408
450	18"	1000	1200		1600	2000	700	3510	5584	10449
500	20"	1900	2200		3700	5700	950	3510	5584	10449
600	24"	2500	2800		4900	7800	1600	6540	10404	19471
700	28"	3600	3900		7300		2520	12157	19341	36195
750	30"	4800	5300		8900		3400	12157	19341	36195
800	32"	6700	7300		11000		4700	12157	19341	36195

1) The torque above are not including safety factor. Contact the factory for special working conditions.
2) MAST: Maximum Allowable Stem Torque. Please contact Coreline for MAST values for other materials.

Service and medium factor - Actuator Sizing

Service factor [SF]	Multiply by	Medium factor [MF]	Multiply by	Medium factor [MF]	Multiply by
ON/OFF operation	1.15	Lubricating liquid/gas	0.90	For dry service (Dry gas/air)	1.25
Modulating operation	1.25	Viscous Liquids, Molasses	1.30	Dirty air slurry, natural gas, dirty slurry,	1.50-1.80
*) 2 cycle/day “NC”	1.15	Degreasing liquid	1.25	Lime water, chlorin gas,oxygen, powder	1.50-1.80
**) 1 cycle/week “NC”	1.50	Saturated steam	1.20	Hydrodynamic torque	NA

OBS: Butterfly valve torque is 100% by 0° to 6° angle and 33% from 7° to 90° angle.
* Valve is completely closed and opened 2 times a day minimum.
** Valve is completely closed and opened only one time per week or longer.
Having a long period without maneuvering the valve, will increase the breakaway torque.
EXAMPLE OF ACTUATOR SIZING: Simple ON/OFF operation, Medium: Molasses.
Valve: 211 DN100 PN16. 1.15[SF] x 1.30[MF] x 40[Nm] = 59.8Nm (Sizing torque actuator)
Only choose one Service factor [SF] and one Medium factor [MF] when calculating the sizing torque.

Flow capacities

Kv values (m³/h at 1bar △P)

SIZE		10°	20°	30°	40°	50°	60°	70°	80°	90°
DN	INCH									
40	1 ½"	-	1	3	7	14	26	38	47	52
50	2"	-	1	5	11	25	45	65	90	100
65	2 ½"	-	3	9	25	46	72	115	165	210
80	3"	-	5	26	50	85	135	201	290	365
100	4"	-	17	35	75	132	220	388	560	640
125	5"	-	25	80	148	235	370	589	900	1070
150	6"	6	47	122	215	340	545	935	1440	1740
200	8"	20	110	220	385	610	980	1690	2580	2960
250	10"	31	160	320	605	930	1460	2560	3950	5010
300	12"	47	235	465	880	1360	2150	3700	6100	7080
350	14"	118	301	631	1131	1918	3081	4963	8035	9993
400	16"	153	393	824	1478	2506	4024	6482	10983	12595
450	18"	195	498	1043	1871	3170	5093	8210	13695	16850
500	20"	240	615	1288	2309	3913	6287	10128	17250	19306
600	24"	345	885	1853	2958	5635	9054	14584	24980	28323
700	28"	390	930	2210	3750	6959	11100	19200	33080	39700
750	30"	450	1160	2400	4350	7890	12900	21200	36750	45350
800	32"	520	1330	2650	5030	8890	14350	23750	39900	49530

Calculation of Kv

Determining the size of butterfly valves for control purposes should not be done on the basis of the nominal diameter of the pipe but should be calculated on the basis of the operating characteristics in order to attain the correct control characteristics.

Butterfly valves Fig.211 from Coreline valve are with approximately equal percentage characteristics over an opening angle of 65°.

You only need to consider the opening angle when determining the size of control valves. When determining the valve nominal diameter calculate the Kv value from the below formula:

Liquid:

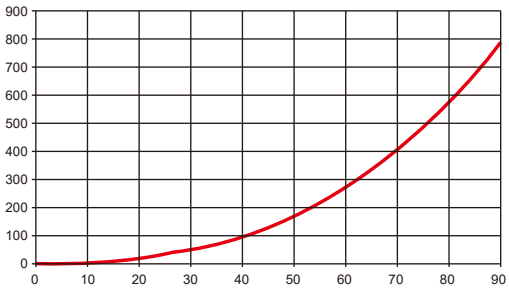
$$K_V = Q \times \sqrt{\frac{W}{\Delta p}}$$

Gas:

$$K_V = \frac{V_N}{514} \sqrt{\frac{G \times T}{\Delta p \times p_d}}$$

K_V = Flow coefficient
Q = Max. flow volume in m³/h
w = Exact weight in kg/m³
Δp = Pressure drop in bar
V_N = Max. flow in Nm³/h
G = Exact weight in kg/Nm³
T = Absolute temp. in ° Kelvin
P_d = Absolute pressure downstream in bar

Example: DN100



Hand lever dimensions

Fig.500 Aluminium hand lever

- Excellent design and comfortable operating 90° in 10 positions. The lever is fixed by screw on top of stem to avoid the lever getting loose by operation or vibrations. For safety, the hand lever can be locked in position by bolt/nut or a locker.
- Material is AL-Si alloy, which has better performance than Al-Mg and Al-Zn alloy.
- Electrophoresed surface treatment, which has stronger adhesion than traditional painting and much better resistance to corrosion.

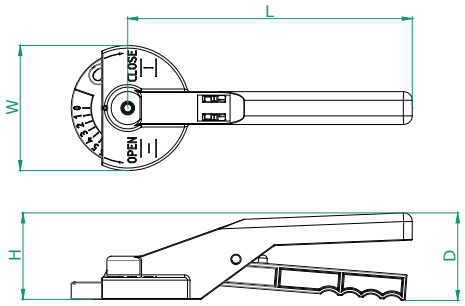


Fig.211 Size	D	H	L	W	Stem drive	[kg]
DN25-DN80	56	65	195	74	F05 - 9×9	0.28
DN100	78	82	269	101	F07 - 11×11	0.63
DN125-DN150	78	82	269	101	F07 - 14×14	0.63
DN200	101	100	330	145	F10 - 17×17	1.46

Fig.503 GGG40 and CF8M hand lever

- GGG40 and CF8M hand lever have the same shape and share the same angle place and locker.
- GGG40 hand lever has strong electrophoresed surface treatment. CF8M hand lever is with precise casting which has very smooth surface.
- Locker and plate in stainless steel SS316 and spring in SS321.
- Good design and comfortable operating 90° in 10 positions, but also adjustable screw to choose any position for regulation.
- The lever is fixed by screw on top of stem and not by side of stem, to avoid the lever getting loose by operation or vibrations. For safety, the hand lever can be locked in position by bolt/nut or a padlock.

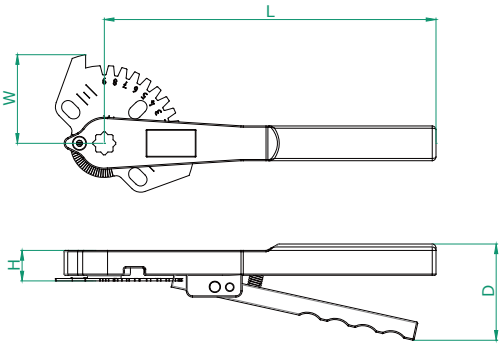
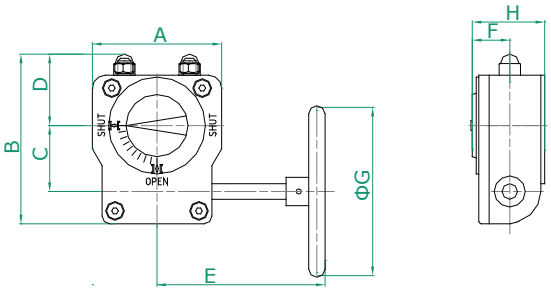


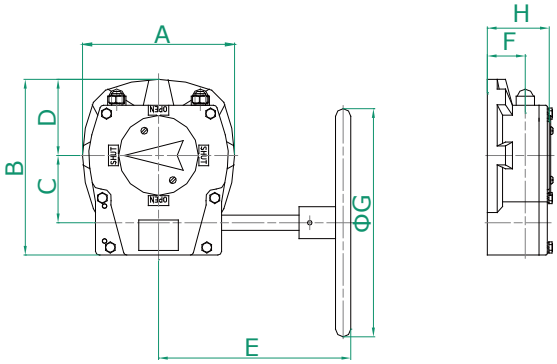
Fig.211 Size	D	H	L	W	Stem drive	[kg]
DN50-DN80	53	23	195	60	F05 - 9×9	0.8
DN100	77	30	267	73	F07 - 11×11	1.2
DN125-DN150	77	30	267	73	F07 - 14×14	1.2

Gear box dimensions

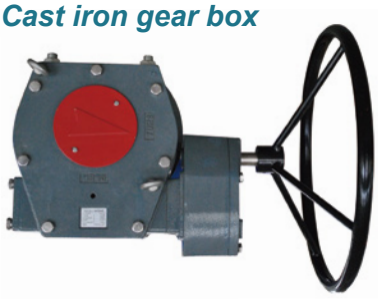
Aluminium gear box

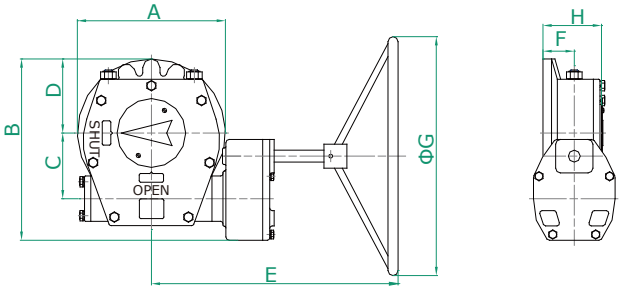


Cast iron gear box



Cast iron gear box





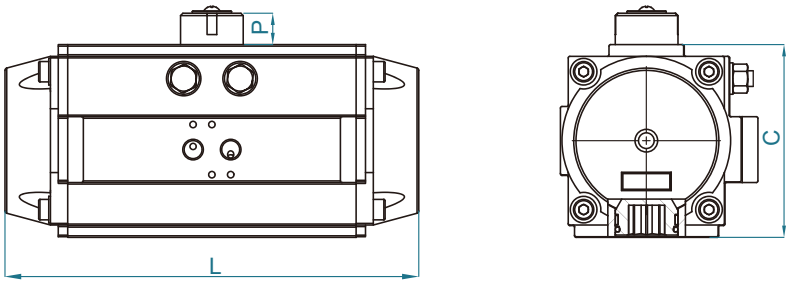
Size	Model	Material	Output [Nm]	Ratio	Input [Nm]	A	B	C	D	E	F	G	H	Weight [kg]
DN25-DN100	520-10	**Housing:** Aluminium	150	40:1	18.5	80	98	42.5	45	99	26	120	48	1.45
DN125-DN200	520-15	**Input shaft:** SS410/SS304/SS304	250	37:1	34	100	115	50	55	115	27	120	54	1.9
DN250-DN300	520-50	**Gear:** Ductile iron	750	45:1	83	146	155	60	81	220	38	300	71	5.2
DN350	521-M12		1000	42:1	90	165	182	66	76	210	42	300	72	11
DN400	521-M14	**Housing:** Cast iron/CF8/CF8M	1800	60:1	110	200	231	89	100	277	50	300	81	14
DN450-DN500	521-M15	**Input shaft:** Steel/SS304/SS316	3400	68:1	165	252	296	123	118	357	50	400	91	32
DN600	521-M16	**Gear:** Ductile iron/Bronze	4400	88:1	169	315	354	153	145	382	50	500	93	44
DN700-DN800	521-M36		8000	184:1	180	310	380	138	155	448	73	500	130	66

Notes:

1. Gearbox sizing is based on the torque of Coreline butterfly valves with EPDM-H seats under standard pressure.
Seats such as FDA-EPDM or PTFE require higher torque (see page 10 for values at different materials and pressure ratings).
2. Standard gearbox is supplied with C3 painting. For other materials or painting requirements, contact Coreline.

Valve/Pneu. actuator sizing - 6bar air supply

Actuator housing: Aluminium



Double acting actuators for butterfly valves

Fig.211			Sizing - Fig.540 Double acting							
Size	**Torque [Nm]**	**ISO5211**	**Size**	**Output torque [Nm]**	**ISO5211**	**Stem drive**	**C [mm]**	**P [mm]**	**L [mm]**	**[kg]**
DN25/32	11	F05	**40**	14.3	F03+F05	9×9	**60**	**20**	**144**	**1**
DN40	11	F05	**40**	14.3	F03+F05	9×9	**60**	**20**	**144**	**1**
DN50	13	F05	50	21.6	F03+F05	9×9	70	20	154	1.13
DN65	19	F05	50	21.6	F03+F05	9×9	70	20	154	1.13
DN80	27	F05	65	43.9	F03+F05	9×9	89	20	189	1.97
DN100	40	F05+07	75	68.2	F05+F07	11×11	100	20	210	2.93
DN125	60	F07	85	100.1	F05+F07	14×14	113	20	229	3.78
DN150	110	F07	95	140.6	F05+F07	14×14	123	20	264	5.14
DN200	130	F07+10	110	183.3	F07+F10	17×17	136	20	266	6.09
DN250	260	F10	125	327.4	F07+F10	22×22	161	30	337	10.86
DN300	300	F10+12	140	482.9	F10+F12	22×22	178	30	377	13.77
DN350	600	F12+14	190	1053.9	F10+F14	27×27	232	30	488	28.41
DN400	800	F12+14	190	1053.9	F10+F14	27×27	232	30	488	28.41

* The torque above are not including safety factor. Refer to page 7 for sizing guide.

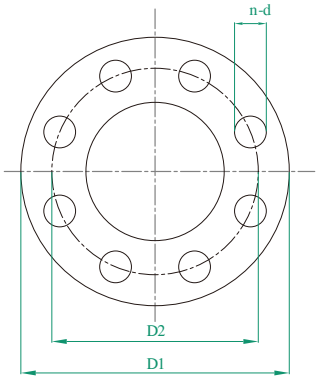
Spring return actuators for butterfly valves

Fig.211			Sizing - Fig.541 Spring return							
Size	**Torque [Nm]**	**ISO5211**	**Size**	**Torque air [Nm] 0° - 90°**	**Torque spring [Nm] 90° - 0°**	**ISO5211**	**Stem drive**	**C [mm]**	**P [mm]**	**L [mm]**	**[kg]**
DN25/32	11	F05	65 S10	26.5 - 17.7	26.2 - 17.4	F03+F05	9×9	89	20	189	2.21
DN40	11	F05	65 S10	26.5 - 17.7	26.2 - 17.4	F03+F05	9×9	89	20	189	2.21
DN50	13	F05	65 S10	26.5 - 17.7	26.2 - 17.4	F03+F05	9×9	89	20	189	2.21
DN65	19	F05	75 S12	42.5 - 27.7	40.4 - 25.7	F05+F07	9×9	100	20	210	3.29
DN80	27	F05	85 S12	60.3 - 37.5	62.5 - 39.7	F05+F07	1111	113	20	229	4.26
DN100	40	F05+07	95 S12	87.6 - 57.0	83.6 - 53	F05+F07	14×14	123	20	264	5.86
DN125	60	F07	110 S12	114.6 -73.2	110 - 68.6	F07+F10	14×14	136	20	266	7.17
DN150	110	F07	125 S12	205 - 134	193.3 - 122.4	F07+F10	17×17	161	30	337	12.54
DN200	130	F07+10	140 S12	285.5 - 189.3	293.6 - 197.4	F10+F12	17×17	178	30	377	15.93
DN250	260	F10	190 S12	617.7 - 427.1	626.8 - 436.2	F10+F14	22×22	232	30	488	33.81
DN300	300	F10+12	190 S12	617.7 - 427.1	626.8 - 436.2	F10+F14	27×27	232	30	488	33.81
DN350	600	F12+14	240S12	1296.9-952.5	1329.6-985.2	F14	27×27	292	30	602	77.76
DN400	800	F12+14	240S12	1296.9-952.5	1329.6-985.2	F14	27×27	292	30	602	77.76

* The torque above are not including safety factor. Refer to page 7 for sizing guide.

Mating flange dimensions

- ☐ ISO 7005/1/2/3 PN6,10,16,20 Metallic Flanges
- ☐ DIN2501 PN6,10,16 Flanges, Mating Dimensions
- ☐ BS4504 PN6,10,16 Flanges and Bolting, Metric Series
- ☐ ANSI B16.5 CLASS150 Pipe Flanges and Flanged Fittings
- ☐ MSSSP44 Class150 Steel Pipeline Flanges
- ☐ BS10 Flanges and Bolting for Pipes, Valves and Fittings
- ☐ API605 CLASS150 Large Diameter Carbon Steel Flanges
- ☐ JISB2211 JIS 5K Basic Dimensions of 5bar Ferrous Materials Pipe Flanges
- ☐ JISB2212 JIS 10K Basic dimensions of 10bar Ferrous Materials Pipe Flanges
- ☐ JISB2213 JIS 16K Basic dimensions of 16bar Ferrous Materials Pipe Flanges



Size		PN6 (Cast iron)					PN10 (Cast iron)					PN16 (Cast iron)					PN20					ANSI Class150					MSS BS Class150				
DN	NPS	D1	D2	d	Bolt	n	D1	D2	d	Bolt	n	D1	D2	d	Bolt	n	D1	D2	d	Bolt	n	D1	D2	d	Bolt	n	D1	D2	d	Bolt	n
50	2"	140	110	14	12	4	165	125	19	16	4	165	125	19	16	4	150	120.5	18	16	4	152	120.6	19.1	5/8"	4					
65	2 1/2"	160	130	14	12	4	185	145	19	16	4	185	145	19	16	4	180	139.5	18	16	4	178	139.7	19.1	5/8"	4					
80	3"	190	150	19	16	4	200	160	19	16	8	200	160	19	16	8	190	152.5	18	16	4	191	152.4	19.1	5/8"	4					
100	4"	210	170	19	16	4	220	180	19	16	8	220	180	19	16	8	230	190.5	18	16	8	229	190.5	19.1	5/8"	8					
125	5"	240	200	19	16	8	250	210	19	16	8	250	210	19	16	8	255	216	22	20	8	254	215.9	22.4	3/4"	8					
150	6"	265	225	19	16	8	285	240	23	20	8	285	240	23	20	8	280	241.5	22	20	8	279	241.3	22.4	3/4"	8					
200	8"	320	280	19	16	8	340	295	23	20	8	340	295	23	20	12	345	298.5	22	20	8	343	298.5	22.4	3/4"	8					
250	10"	375	335	19	16	12	395	350	23	20	12	400	355	28	24	12	405	362	26	24	12	406	362	25.4	7/8"	12					
300	12"	440	395	23	20	12	445	400	23	20	12	455	410	28	24	12	485	432	26	24	12	483	431.8	25.4	7/8"	12	483	432	25	7/8"	12
350	14"	490	445	23	20	12	505	460	23	20	16	520	470	28	24	16	535	476	29.5	27	12	533	476.3	28.5	1"	12	535	476	29	1"	12
400	16"	540	495	23	20	16	565	515	28	24	16	580	525	31	27	16	600	540	29.5	27	16	597	539.8	28.5	1"	16	595	540	29	1"	16
450	18"	595	550	23	20	16	615	565	28	24	20	640	585	31	27	20	635	578	32.5	30	16	635	577.9	31.8	1 1/8"	16	635	578	32	1 1/8"	16
500	20"	645	600	23	20	20	670	620	28	24	20	715	650	34	30	20	700	635	32.5	30	20	699	635	31.8	1 1/8"	20	700	635	32	1 1/8"	20
600	24"	755	705	26	24	20	780	725	31	27	20	840	770	37	33	20	815	749.5	35.5	33	20	813	749.3	35.1	1 1/4"	20	815	749	35	1 1/4"	20
700	28"	860	810	26	M24	24	895	840	31	M27	24	910	840	37	M33	24											925	863	35	1 1/4"	28
800	32"	975	920	31	M27	24	1015	950	34	M30	24	1025	950	40	M36	24											1060	978	41	1 1/2"	28

It should be noted that the diameters of the bolt holes in steel and copper alloy flanges are different from cast iron flanges.

Size		BS TABLE D					BS TABLE E					JIS 5K					JIS 10K					JIS 16K				
DN	NPS	D1	D2	d	Bolt	n	D1	D2	d	Bolt	n	D1	D2	d	Bolt	n	D1	D2	d	Bolt	n	D1	D2	d	Bolt	n
50	2"	152.4	114.3	19.1	5/8"	4	152.4	114.3	19.1	5/8"	4	130	105	15	12	4	155	120	19	16	4	155	120	19	16	8
65	2 1/2"	165.1	127	19.1	5/8"	4	165.1	127	19.1	5/8"	4	155	130	15	12	4	175	140	19	16	4	175	140	19	16	8
80	3"	184.2	146.1	19.1	5/8"	4	184.2	146.1	19.1	5/8"	4	180	145	19	16	4	185	150	19	16	8	200	160	23	20	8
100	4"	215.9	177.8	19.1	5/8"	4	215.9	177.8	19.1	5/8"	8	200	165	19	16	8	210	175	19	16	8	225	185	23	20	8
125	5"	254	209.6	19.1	5/8"	8	254	209.6	19.1	5/8"	8	235	200	19	16	8	250	210	23	20	8	270	225	25	22	8
150	6"	279.4	235	19.1	5/8"	8	279.4	235	22.2	3/4"	8	265	230	19	16	8	280	240	23	20	8	305	260	25	22	12
200	8"	336.6	292.1	19.1	5/8"	8	336.6	292.1	22.2	3/4"	8	320	280	23	20	8	330	290	23	20	12	350	305	25	22	12
250	10"	406.4	355.6	22.2	3/4"	8	406.4	355.6	22.2	3/4"	12	385	345	23	20	12	400	355	25	22	12	430	380	27	24	12
300	12"	457.2	406.4	22.2	3/4"	12	457.2	406.4	25.4	7/8"	12	430	390	23	20	12	445	400	25	22	16	480	430	27	24	16
350	14"	527.1	469.9	25.4	7/8"	12	527.1	469.9	25.4	7/8"	12	480	435	25	22	12	490	445	25	22	16	540	480	33	30	16
400	16"	577.9	520.7	25.4	7/8"	12	577.9	520.7	25.4	7/8"	12	540	495	25	22	16	560	510	27	24	16	605	540	33	30	16
450	18"	641.4	584.2	25.4	7/8"	12	641.4	584.2	25.4	7/8"	16	605	555	25	22	16	620	565	27	24	20	675	605	33	30	20
500	20"	704.9	641.2	25.4	7/8"	16	704.9	641.2	25.4	7/8"	16	655	605	25	22	20	675	620	27	24	20	730	660	33	30	20
600	24"	825.5	755.7	28.5	1"	16	825.5	755.7	31.7	1 1/8"	16	770	770	27	24	20	795	730	33	30	24	845	770	39	36	24
700	28"											875	820	27	M24	24	905	840	33	M30	24	960	875	42	M39	24
800	32"											995	930	33	M30	24	1020	950	33	M30	28	1085	990	48	M45	24

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