



FMC Technologies

Flowline Products and Services
World Proven Chiksan® and Weco® Equipment

Flowline Products and Services

FMC Technologies is the world's leading supplier of flowline products and services to the oilfield industry and is the standard against which all others are measured. From the original Chiksan[®] and Weco[®] products to the revolutionary equipment designs and integrated services of today, FMC's fluid control family of products and services enables customers to achieve maximum life and value from their flowline systems throughout a complete range of applications.

The success of FMC's fluid control technology stems from a strong tradition of anticipating and responding to customer needs in every way possible. By focusing on the delivery of top products and services, FMC Technologies is helping its customers face tomorrow's technical and economic challenges today.

Flowline Products and Services



Experienced, Knowledgeable, Productive People

FMC's global fluid control team is structured around top flowline professionals – individuals who understand your business and are dedicated to meeting your needs. The management, engineering, and sales support staff are among the most experienced in the oil and gas industry. Their knowledge and industry expertise show up in the quality of products and services delivered to you.



Health, Safety & Environment

As a leading oilfield equipment and services provider, FMC Technologies stresses overall health, safety, and environment (HSE) in all of its operations and processes. With a proven record of outstanding HSE performance, FMC is a strong advocate of HSE training that goes beyond the basic legal requirements. The goal is to ensure that all field and office personnel are competent to carry out HSE critical duties, having received the appropriate training required by law, company policy, and clients. HSE policy covers all key elements of the business, including company safety policy statements, product safety, risk assessment, monitoring, auditing, and review.

Manufacturing Leader

FMC's fluid control manufacturing facility is located in Stephenville, Texas. The plant was constructed in 1980 and expanded in 1984, 1987, and 1996. The facility



occupies a 44-acre site and comprises 220,000 square feet of manufacturing capacity and 48,000 square feet of customer service, production support, and engineering offices. It utilizes the latest in computer numerical controlled (CNC) machining centers, production planning systems, computer aided design/computer aided manufacturing (CAD/CAM) systems, and the latest technology in order and distribution operating systems. The Stephenville facility produces a wide range of flowline equipment for distribution worldwide.

Flowline Products and Services

Unsurpassed Quality

FMC's fluid control quality system has been surveyed and approved by DNV and meets ISO 9001 and European Pressure Equipment Directive 97/23/CE. Most products are supplied with the CE marking. Chiksan and Weco products also can be supplied with both type and case approval from DNV, Lloyds, ABS, GGTN, and others. Products for sour gas service meet NACE MR-01-75 and API RP-14-E. Complete material certification and traceability are also available.

Research and Development

To meet the evolving needs of its customers, FMC continually invests in flowline research and development. This industry-leading effort has resulted in a host of new products and refinements to existing products. All new products are subjected to exhaustive laboratory and field tests to ensure their reliability and integrity before they are released to the marketplace. Research and development capabilities include exhaustive laboratory and field testing, destructive and nondestructive testing, three-dimensional finite element analysis, computational fluid dynamics, and the flowline industry's only high-velocity flow loop.

Worldwide Distribution

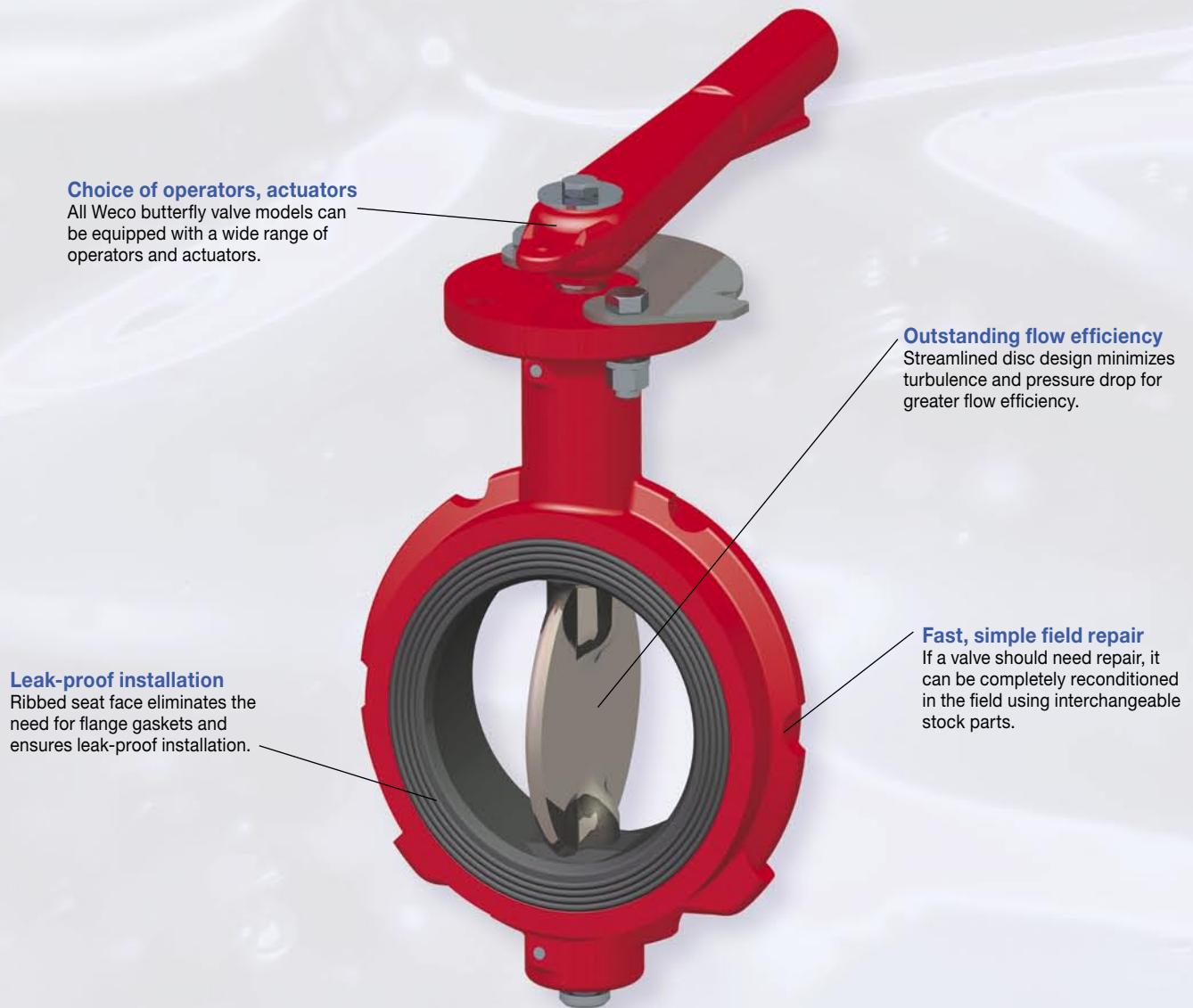
Chiksan and Weco products are distributed from more than 60 locations worldwide. FMC fluid control facilities stock many flowline products in the specific sizes, pressures, and materials common in the various regions. From a replacement seal for a Chiksan swivel joint to a platform full of well servicing equipment, FMC Technologies delivers.

Integrated Services

To satisfy the total flowline requirements of its customers, FMC Technologies has consolidated its industry-leading after-sales capabilities into a comprehensive Integrated Services program. Integrated Services is helping customers worldwide realize the maximum value from their flowline assets to guarantee that the right products are shipped to the job site in top working condition. This total solutions approach includes the InteServ tracking and management system, mobile inspection and repair, strategically located service centers, and genuine Chiksan and Weco spare parts.

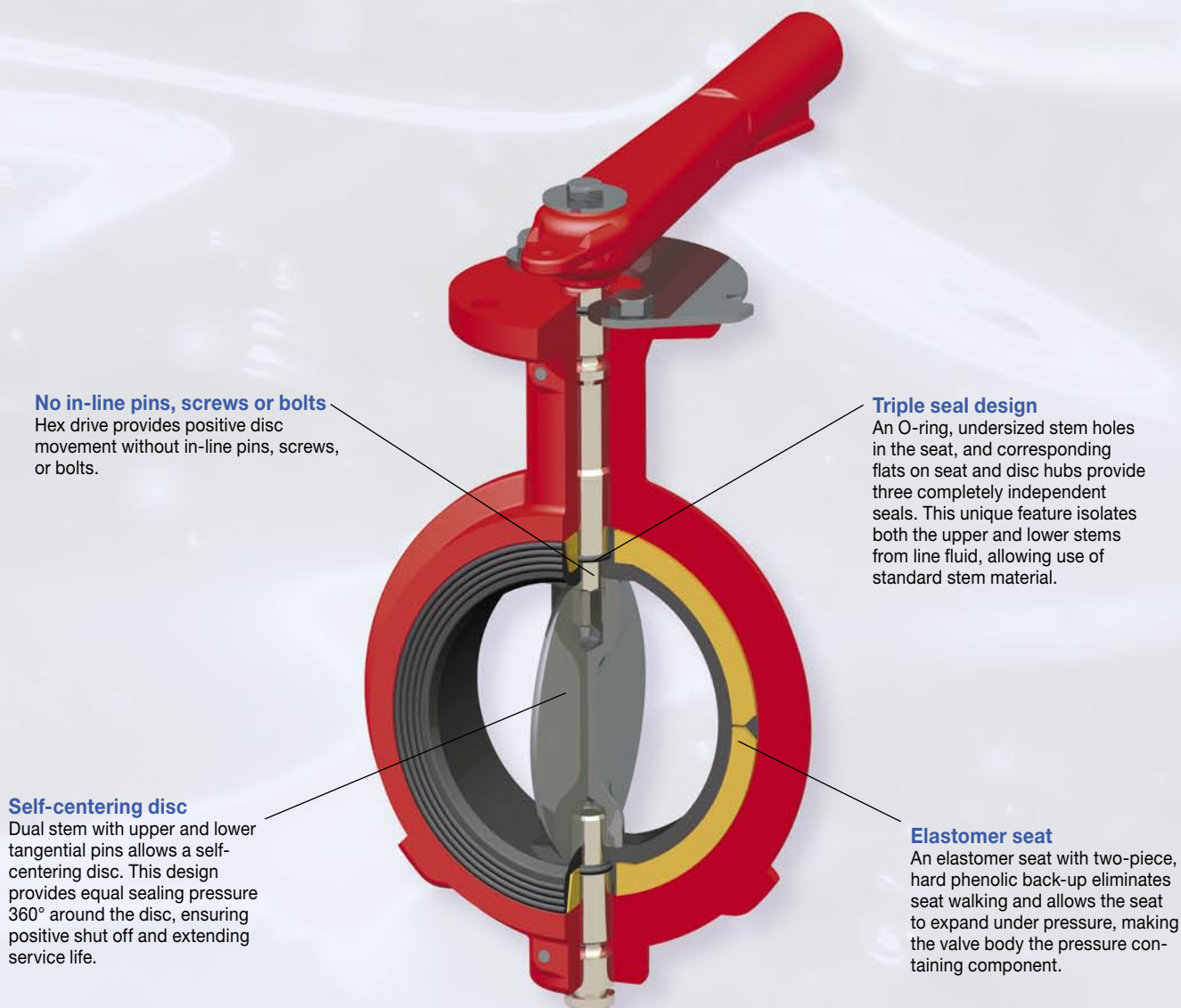


Weco® Butterfly Valves and Actuators



Weco butterfly valves offer the ultimate in dependable, economical flow control. These field-proven valves are available from stock in 2 through 24-inch sizes and can handle working pressures up to 175 psi. For pressure ratings from 176 psi up to 285 psi, consult factory. Wafer, notched, and lug-type body styles meet requirements for new or existing flowline systems. Using a variety of materials, valve bodies, discs, stems, and seats can be individually matched to specific operating conditions, including temperature range, type and concentration of fluid, and various flow conditions. All materials meet ASTM and AISI standards.

Weco® Butterfly Valves and Actuators



Standard Materials of Construction

Valve Part	Standard Material	Optional Materials
Seat & O-ring	Nitrile (Buna N) (-20°F to 200°F)	Hypalon®, Teflon®, Viton®, EPDM, Red Natural Rubber
Body	Ductile Iron	Aluminum, Steel, Stainless Steel
Stem (upper & lower)	410 Stainless Steel	316 Stainless Steel
Disc	Ductile Iron	Aluminum Bronze, 316 Stainless Steel, Rytan®, Kynar®, Halar, Teflon® Coated, Nickel Plated, Hastelloy®
Spirol/Retainer Pins	302 Stainless Steel	

Other materials of construction available. Consult factory.

Weco® Butterfly Valves and Actuators

Model 12

Short neck, wafer body; 175 psi cold working pressure, 2 to 12-inch sizes; 150 psi cold working pressure, 14 and 16-inch sizes

Recommended service

General on/off and throttling services from 1mm Hg absolute vacuum to full working pressure

Features

- Valves are self-centering and mount between 125 or 150 lb ANSI flanges



Model 12N

Short neck, notched body; 175 psi cold working pressure, 2 to 6-inch sizes

Recommended service

General on/off and throttling services from 1mm Hg absolute vacuum to full working pressure

Features

- Valves are notched to fit between lightweight flanges



Model 22

Long neck, wafer body; 175 psi cold working pressure, 2 to 12-inch sizes

Recommended service

General on/off and throttling services from 1mm Hg absolute vacuum to full working pressure

Features

- Valves are self-centering and mount between 125 or 150 lb ANSI flanges
- Long neck allows for pipe insulation



Model 22L

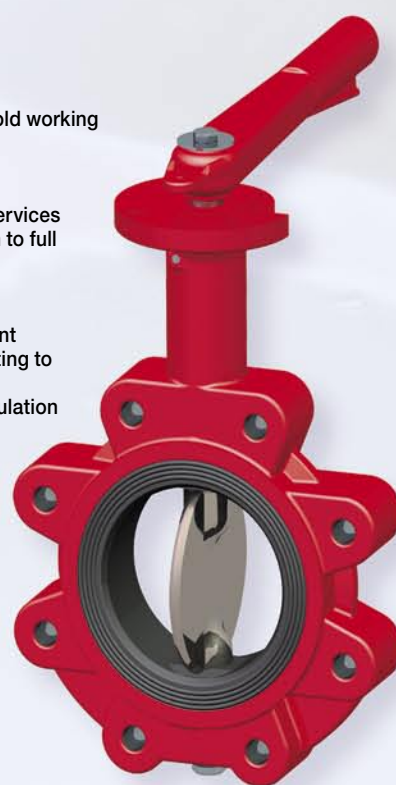
Long neck, lug body, 175 psi cold working pressure, 2 to 24-inch sizes

Recommended service

General on/off and throttling services from 1mm Hg absolute vacuum to full working pressure

Features

- Tapped lugs allow independent upstream or downstream bolting to 125 or 150 lb ANSI flanges
- Long neck allows for pipe insulation



See specifications tables (pages BV1A to BV3A) for sizes, dimensions, weights, materials, and part numbers.

Weco® Butterfly Valves and Actuators

Operators & Actuators

All models and sizes of Weco butterfly valves can be equipped with Weco operators or actuators as well as other brands of actuators. Typical options include standard and throttling handles, gear operators, chain-wheel operators, vane actuators, pneumatic actuators, special controllers, and positioners.

Pneumatic Actuators

Double-acting or fail-safe spring return; 2 through 12-inch valve sizes

Recommended service

Pneumatic actuator for on/off valve operation

Features

- Mounts directly to Weco butterfly valves without special adapters or mounting hardware
- Full 90° operation with a minimum of 30 psi air, no adjustments required



Standard Handle

2 through 12-inch valve sizes

Recommended service

Recommended for 8-inch valves and larger

Features

- Positive-stop gripper with integral locking lug ensures full open/full closed operation
- Model 12 and 12N valves have a detent plate which bolts on the valve body in each of four quadrants; Model 22 and 22L valve have a pre-notched top flange with on/off detent positions



Vane Actuator

Quarter-turn, double acting actuator; 2 through 6-inch valve sizes

Recommended service

Compact, pneumatic actuator for on/off valve operation

Features

- The only moving part, the vane, is cast integral to the shaft for sturdiness; does not require field lubrication
- Fully repairable in-line
- Mounts directly to valve in any quadrant

Gear Operators

Weatherproof, worm gear operator; 2 through 24-inch valve sizes

Recommended service

Manual on/off or throttling services

Features

- Operator has 90° travel arc with internal travel stop screws for a plus or minus 20° adjustment at either end of the travel
- Mounts on the valve in any quadrant
- Chain wheel attachment available
- Hand-wheel shaft extensions available



Throttling Handle

2 through 12-inch valve sizes

Recommended service

Recommended for 8-inch valves and larger

Features

- Notched detent plate and positive-stop gripper with integral locking lug ensures positive locking in any of 10 positions from full open or full closed operation
- Detent plate bolts on the valve body in each of the four quadrants

See specifications tables (pages BV4A to BV10A) for sizes, dimensions, weights, materials, and part numbers.

Weco® Butterfly Valve Specifications

Model 12

Sizes, in.		2	2 1/2	3	4	6	8	10	12	14	16
Part No.		3227485	3227486	3227487	3245819	3227493	3232417	3227495	3227496	3255865	3255869
Dimensions, in., mm	A	4 ^{31/32} 126	5 ^{5/8} 150	5 ^{29/32} 150	7 ^{9/32} 185	7 ^{25/32} 198	9 ^{13/32} 239	10 ^{21/32} 271	12 ^{5/32} 309	14 ^{31/32} 380	17 ^{7/16} 443
	B	3 76.2	3 ^{11/32} 84.9	3 ^{5/8} 92.1	4 ^{1/4} 108	5 ^{5/16} 135	7 178	8 ^{1/4} 210	9 ^{3/4} 248	10 ^{3/8} 264	11 ^{15/16} 303
	C	4 ^{1/8} 105	4 ^{7/8} 124	5 ^{3/8} 137	6 ^{7/8} 175	8 ^{3/4} 222	11 279	13 ^{3/8} 340	16 ^{1/8} 410	17 ^{11/16} 449	20 ^{1/8} 511
	D	2 ^{1/16} 52.4	2 ^{1/2} 63.5	3 ^{1/16} 77.8	4 ^{1/16} 103	6 ^{1/16} 154	8 ^{1/16} 205	10 254	12 305	13 ^{1/4} 337	15 ^{1/4} 387
	E	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁷ / ₈ Sq. 22.2	⁷ / ₈ Sq. 22.2	1 ¹ / ₈ Sq. 28.6	1 ¹ / ₈ Sq. 28.6	2* 50.8
	F	4 102	4 102	4 102	4 102	4 102	6 152	6 152	6 152	6 152	8 203
	G	1 ¹ / ₃₂ 26.2	1 ¹ / ₃₂ 26.2	1 ¹ / ₃₂ 26.2	1 ⁹ / ₃₂ 32.5	1 ⁹ / ₃₂ 32.5	1 ⁹ / ₃₂ 32.5	1 ⁹ / ₃₂ 32.5	1 ⁹ / ₃₂ 32.5	1 ⁹ / ₃₂ 32.5	3 ³ / ₁₆ 81
	H	1 ⁵ / ₈ 41	1 ³ / ₄ 45	1 ³ / ₄ 45	2 51	2 ¹ / ₈ 54	2 ¹ / ₂ 64	2 ¹ / ₂ 64	3 76	3 76	4 102
	I	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁹ / ₁₆ 14.3	⁹ / ₁₆ 14.3	⁹ / ₁₆ 14.3	⁹ / ₁₆ 14.3	¹⁷ / ₃₂ 13.5
	J	3 ³ / ₄ 82.6	3 ³ / ₄ 82.6	3 ³ / ₄ 82.6	3 ³ / ₄ 82.6	3 ³ / ₄ 82.6	5 127	5 127	5 127	5 127	6 ¹ / ₂ 165

Body: Ductile Iron Disc: Ductile Iron
* 2 inch diameter with 1/2 inch keyway

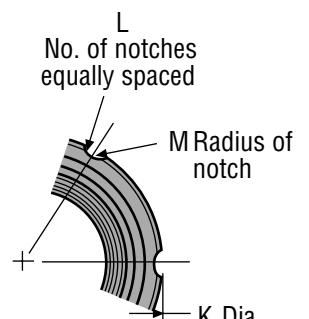
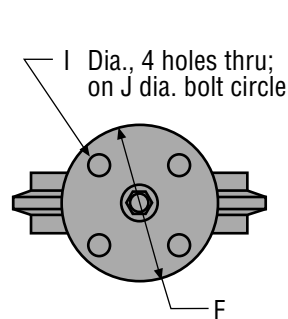
Stems: 416 Stainless Steel

Seat: Nitrile

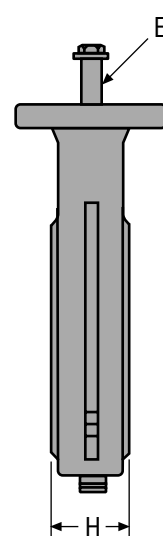
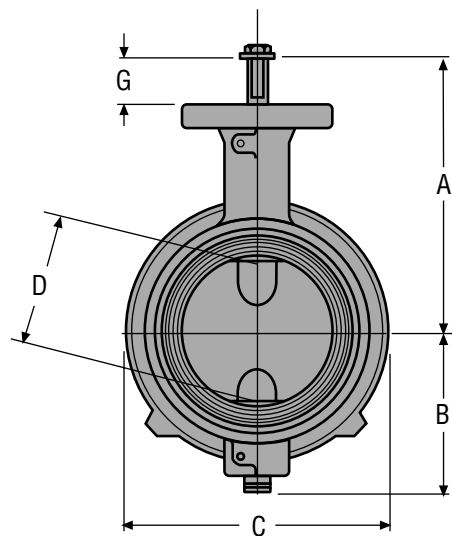
Model 12N (For use with lightweight industrial flanges.)

Sizes, in.		2	3	4	5	6
Part No.		3229885	3230052	3229886	3229887	3229888
Dimensions, in., mm	A	4 ^{31/32} 126	5 ^{29/32} 150	7 ^{9/32} 185	7 ^{9/32} 185	7 ^{25/32} 198
	B	3 76.2	3 ^{5/8} 92.1	4 ^{1/4} 108	4 ^{13/16} 122	5 ^{5/16} 135
	C	4 ^{1/8} 105	5 ^{3/8} 137	6 ^{7/8} 175	7 ^{3/4} 197	8 ^{3/4} 222
	D	2 ^{1/16} 52.4	3 ^{1/16} 77.8	4 ^{1/16} 103	5 ^{1/16} 129	6 ^{1/16} 154
	E	5/8 Sq. 15.9	5/8 Sq. 15.9	5/8 Sq. 15.9	5/8 Sq. 15.9	5/8 Sq. 15.9
	F	4 101.6	4 101.6	4 101.6	4 101.6	4 101.6
	G	1 ^{1/32} 26.2	1 ^{1/32} 26.2	1 ^{9/32} 32.5	1 ^{9/32} 32.5	1 ^{9/32} 32.5
	H	1 ^{5/8} 41.3	1 ^{3/4} 44.5	2 50.8	2 ^{1/8} 54	2 ^{1/8} 54
	I	7/16 11.1	7/16 11.1	7/16 11.1	7/16 11.1	7/16 11.1
	J	3 ^{1/4} 82.6	3 ^{1/4} 82.6	3 ^{1/4} 82.6	3 ^{1/4} 82.6	3 ^{1/4} 82.6
	K	3 ^{3/4} 82.6	4 ^{3/8} 111	6 ^{3/8} 162	6 ^{29/32} 175	8 ^{1/2} 216
	L	4 102	6 152	6 152	6 152	8 203
	M	5/16 7.9	5/16 7.9	3/8 9.5	3/8 9.5	3/8 9.5

Body: Ductile Iron Disc: Ductile Iron
Stems: 416 Stainless Steel Seat: Nitrile



Model 12N only



BV1A

Weco® Butterfly Valve Specifications

Model 22

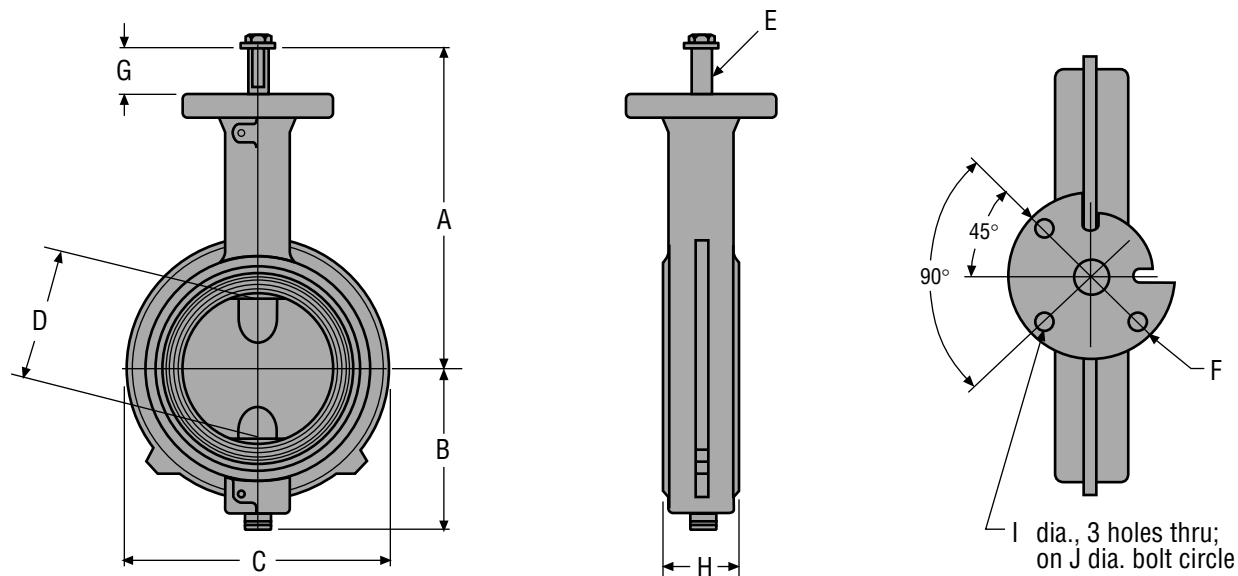
Sizes, in.		2	2 1/2	3	4	5	6	8	10	12
Part No.		3225730	3225731	3225732	3225733	3225734	3225735	3225736	3225737	3225738
Dimensions, in., mm	A	7 ⁹ / ₃₂ 185	7 ²⁵ / ₃₂ 198	8 ¹ / ₁₆ 205	9 ⁵ / ₃₂ 233	9 ²¹ / ₃₂ 245	10 ⁵ / ₃₂ 258	11 ¹⁹ / ₃₂ 294.5	12 ²⁷ / ₃₂ 326	14 ¹¹ / ₃₂ 364
	B	3 76.2	3 ¹ / ₃₂ 84.9	3 ⁵ / ₈ 92.1	4 ¹ / ₄ 108	4 ¹³ / ₁₆ 122	5 ⁵ / ₁₆ 135	7 178	8 ¹ / ₄ 210	9 ³ / ₄ 248
	C	4 ¹ / ₈ 105	4 ⁷ / ₈ 124	5 ³ / ₈ 131	6 ⁷ / ₈ 175	7 ³ / ₄ 197	8 ³ / ₄ 222	11 279	13 ³ / ₈ 340	16 ¹ / ₁₆ 408
	D	2 ¹ / ₁₆ 52.4	2 ¹ / ₂ 63.5	3 ¹ / ₁₆ 77.8	4 ¹ / ₁₆ 103	5 ¹ / ₁₆ 129	6 ¹ / ₁₆ 154	8 ¹ / ₁₆ 205	10 254	12 305
	E	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁷ / ₈ Sq. 22.2	⁷ / ₈ Sq. 22.2	1 ¹ / ₈ Sq. 28.6
	F	4 101.6	4 101.6	4 101.6	4 101.6	4 101.6	4 101.6	6 152.4	6 152.4	6 152.4
	G	1 ¹ / ₃₂ 26.2	1 ¹ / ₃₂ 26.2	1 ¹ / ₃₂ 26.2	1 ³ / ₃₂ 32.5	1 ³ / ₃₂ 32.5	1 ³ / ₃₂ 32.5	1 ³ / ₃₂ 32.5	1 ³ / ₃₂ 32.5	1 ³ / ₃₂ 32.5
	H	1 ⁵ / ₈ 41.3	1 ³ / ₄ 44.5	1 ³ / ₄ 44.5	2 50.8	2 ¹ / ₄ 54	2 ¹ / ₄ 54	2 ¹ / ₂ 63.5	2 ¹ / ₂ 63.5	3 76.2
	I	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁹ / ₁₆ 14.3	⁹ / ₁₆ 14.3	⁹ / ₁₆ 14.3
	J	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	5 127	5 127	5 127

Body: Ductile Iron

Disc: Ductile Iron

Stems: 416 Stainless Steel

Seat: Nitrile



Weco® Butterfly Valve Specifications

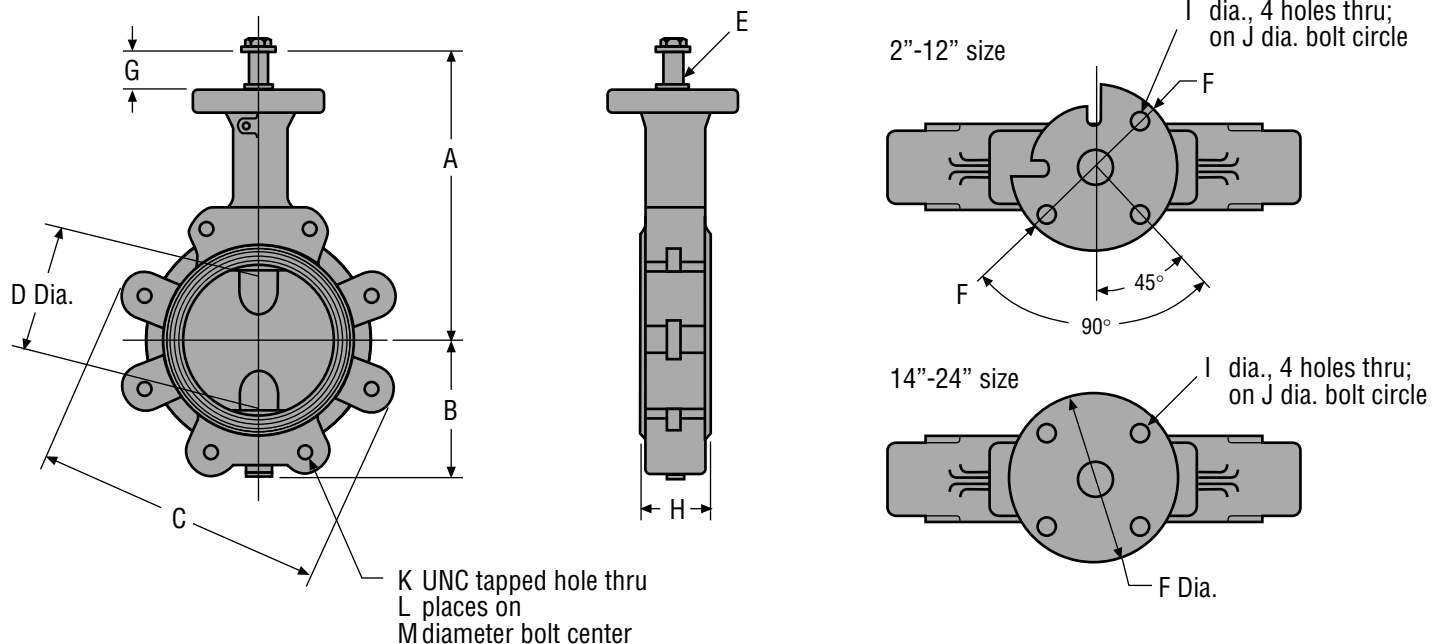
Model 22L

Sizes, in.		2	2 1/2	3	4	5	6	8	10	12	14	16	18	20	24
Part No.		3225748	3225749	3225750	3225751	3225752	3225753	3225754	3225755	3225756	3255867	3255870	3255871	3255872	3255873
Dimensions, in., mm	A	7 ⁹ / ₃₂ 185	7 ²⁵ / ₃₂ 198	8 ¹ / ₁₆ 205	9 ⁵ / ₃₂ 233	9 ²¹ / ₃₂ 245	10 ⁵ / ₃₂ 258	11 ¹⁹ / ₃₂ 295	12 ²⁷ / ₃₂ 326	14 ¹¹ / ₃₂ 364	14 ³¹ / ₃₂ 380	17 ⁷ / ₁₆ 443	18 ⁷ / ₁₆ 468	19 ⁷ / ₁₆ 494	23 ³ / ₄ 603
	B	3 76.2	3 ¹¹ / ₃₂ 84.9	3 ⁵ / ₈ 92.1	4 ¹ / ₄ 108	4 ¹⁹ / ₁₆ 122	5 ⁵ / ₁₆ 135	7 178	8 ¹ / ₄ 210	9 ³ / ₄ 248	10 ³ / ₈ 264	11 ¹⁵ / ₁₆ 303	12 ¹⁵ / ₁₆ 329	13 ¹⁵ / ₁₆ 354	17 ⁷ / ₈ 435
	C	6 152	7 178	7 ¹ / ₂ 191	9 229	10 254	11 279	13 ¹ / ₂ 343	16 406	19 483	20 ³ / ₄ 527	23 ¹ / ₄ 591	25 635	27 ¹ / ₄ 692	32 813
	D	2 ⁷ / ₁₆ 52.4	2 ¹ / ₂ 63.5	3 ¹ / ₁₆ 77.8	4 ¹ / ₁₆ 103	5 ¹ / ₁₆ 129	6 ¹ / ₁₆ 154	8 ¹ / ₁₆ 205	10 254	12 305	13 ¹ / ₄ 337	15 ⁹ / ₃₂ 388	17 ⁹ / ₃₂ 439	19 ¹ / ₄ 489	23 584
	E	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁵ / ₈ Sq. 15.9	⁷ / ₈ Sq. 22.2	⁷ / ₈ Sq. 22.2	1 ¹ / ₈ Sq. 28.6	1 ¹ / ₈ Sq. 28.6	2* 50.8	2* 50.8	2* 50.8	2.5** 63.5
	F	4 101.6	4 101.6	4 101.6	4 101.6	4 101.6	4 101.6	6 152.4	6 152.4	6 152.4	6 152.4	8 203.2	8 203.2	8 203.2	8 203.2
	G	1 ¹ / ₃₂ 26.2	1 ¹ / ₃₂ 26.2	1 ¹ / ₃₂ 26.2	1 ⁹ / ₃₂ 32.5	1 ⁹ / ₃₂ 32.5	1 ⁹ / ₃₂ 32.5	1 ⁹ / ₃₂ 32.5	1 ⁹ / ₃₂ 32.5	1 ⁹ / ₃₂ 32.5	1 ⁹ / ₃₂ 32.5	3 ³ / ₁₆ 81	3 ³ / ₁₆ 81	3 ³ / ₁₆ 81	4 ³ / ₈ 111
	H	1 ⁵ / ₈ 41.3	1 ³ / ₄ 44.5	1 ³ / ₄ 44.5	2 50.8	2 ¹ / ₈ 54	2 ¹ / ₈ 54	2 ¹ / ₂ 63.5	2 ¹ / ₂ 63.5	3 76.2	3 76.2	4 101.6	4 ¹ / ₂ 114.3	5 127	6 ¹ / ₁₆ 154
	I	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁷ / ₁₆ 11.1	⁹ / ₁₆ 14.3	⁹ / ₁₆ 14.3	⁹ / ₁₆ 14.3	⁹ / ₁₆ 14.3	¹⁷ / ₃₂ 13.5	¹⁷ / ₃₂ 13.5	¹⁷ / ₃₂ 13.5	²¹ / ₃₂ 16.7
	J	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	5 127	5 127	5 127	5 127	6 ¹ / ₂ 165.1	6 ¹ / ₂ 165.1	6 ¹ / ₂ 165.1	6 ¹ / ₂ 165.1
	K	⁵ / ₈ -11	⁵ / ₈ -11	⁵ / ₈ -11	⁵ / ₈ -11	³ / ₄ -10	³ / ₄ -10	³ / ₄ -10	⁷ / ₈ -9	⁷ / ₈ -9	1-8	1-8	1 ¹ / ₈ -7	1 ¹ / ₈ -7	1 ¹ / ₄ -7
	L	4 102	4 102	4 102	8 204	8 204	8 204	8 204	12 305	12 305	12 305	16 406	16 406	20 508	20 508
	M	4 ³ / ₄ 121	5 ¹ / ₂ 140	6 152	7 ¹ / ₂ 191	8 ¹ / ₂ 216	9 ¹ / ₂ 241	11 ³ / ₄ 299	14 ¹ / ₄ 362	17 432	18 ³ / ₄ 476	21 ¹ / ₄ 540	22 ³ / ₄ 578	25 635	29 ¹ / ₂ 750

Body: Ductile Iron Disc: Ductile Iron Stems: 416 Stainless Steel Seat: Nitrile

* 2 inch diameter with 1/2 inch keyway

** 2.5 inch diameter with 5/8 inch keyway

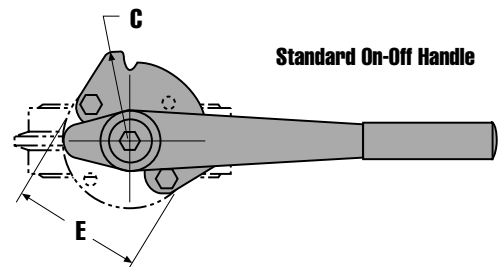


Weco® Butterfly Valve Accessories

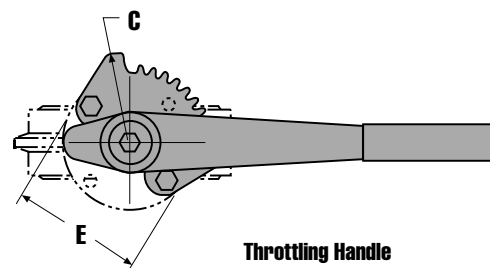
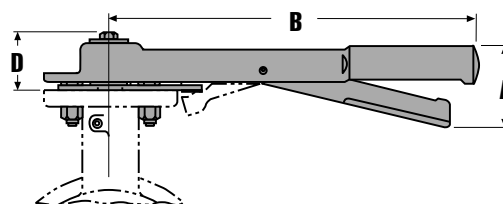
Standard and Throttle Handles

		Valve Size, in.			
		2 - 3	4 & 6	8 & 10	12
Standard for Models 12, 12N		3234078	3231336	3227946	3227947
Standard for Models 22, 22L		3234092	3231337	3216208	3216224
Throttling for all Models		3235577	3235578	3228018	3228019
Dimensions, in., mm	A	$2\frac{3}{8}$ 60.3	$2\frac{1}{2}$ 63.5	$\frac{3}{4}$ 76.2	$2\frac{3}{4}$ 69.9
	B	$9\frac{1}{2}$ 241	$10\frac{7}{8}$ 276	15 381	19 483
	C	$2\frac{3}{4}$ 69.9	$2\frac{3}{4}$ 69.9	4 102	4 102
	D	$1\frac{1}{16}$ 36.5	$1\frac{11}{16}$ 42.9	$1\frac{11}{16}$ 42.9	$1\frac{11}{16}$ 42.9
	E	4 102	4 102	6 152	6 152

Note: Butterfly valve assemblies include a standard detent plate for on-off operations.
Handle assemblies for throttling service include a throttling detent plate to replace the standard detent plate on the valve.



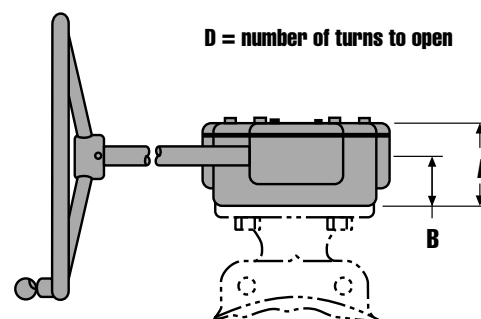
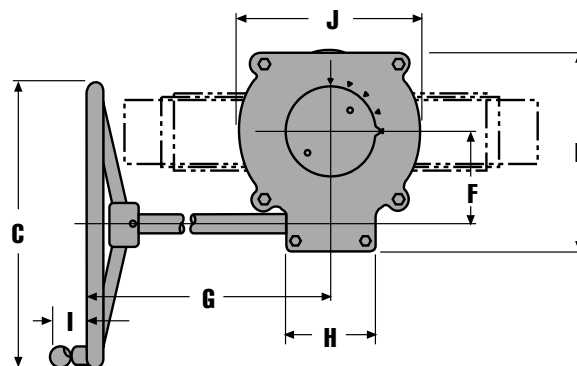
Standard On-Off Handle



Throttling Handle

Gear Operators

		Valve Size, in.					
		2 - 6	8 & 10	12	14	16 - 20	24
Standard Handwheel		3217838	3217839	3217840	3256506	3256507	3256508
Chain-wheel Attachment		3223689	3223690	3223691	3256839	3256840	CF
Dimensions in., mm	A	$2\frac{1}{8}$ 54	$2\frac{1}{2}$ 63.5	$2\frac{1}{2}$ 63.5	$\frac{3}{4}$ 76.2	$3\frac{5}{8}$ 92.1	5 127
	B	$1\frac{1}{16}$ 27	$1\frac{1}{4}$ 31.8	$1\frac{1}{4}$ 31.8	$1\frac{1}{2}$ 38.1	$2\frac{3}{8}$ 60.3	$2\frac{1}{2}$ 63.5
	C	$6\frac{1}{2}$ 165	10 254	10 254	14 356	14 356	14 356
	D	5 127	$7\frac{1}{2}$ 191	$7\frac{1}{2}$ 191	15 381	15 381	15 381
	E	$4\frac{3}{4}$ 121	7 178	7 178	$7\frac{3}{4}$ 197	$9\frac{5}{8}$ 245	$11\frac{5}{8}$ 295
	F	$1\frac{5}{8}$ 41.3	$2\frac{9}{16}$ 65.1	$2\frac{9}{16}$ 65.1	$3\frac{1}{8}$ 79.4	$4\frac{1}{2}$ 114	$4\frac{5}{8}$ 118
	G	$6\frac{5}{16}$ 160	$9\frac{1}{8}$ 232	$11\frac{5}{8}$ 295	$15\frac{1}{4}$ 387	$15\frac{1}{4}$ 387	$17\frac{1}{4}$ 438
	H	$3\frac{1}{2}$ 88.9	$4\frac{3}{4}$ 121	$4\frac{3}{4}$ 121	$5\frac{5}{8}$ 143	$5\frac{3}{4}$ 146	$9\frac{1}{2}$ 241
	I	3 76.2	$3\frac{1}{2}$ 88.9	$3\frac{1}{2}$ 88.9	$3\frac{1}{2}$ 88.9	$3\frac{1}{2}$ 88.9	$3\frac{1}{2}$ 88.9
	J	4 102	$6\frac{1}{4}$ 159	$6\frac{1}{4}$ 159	$6\frac{1}{2}$ 165	9 229	$10\frac{1}{4}$ 260

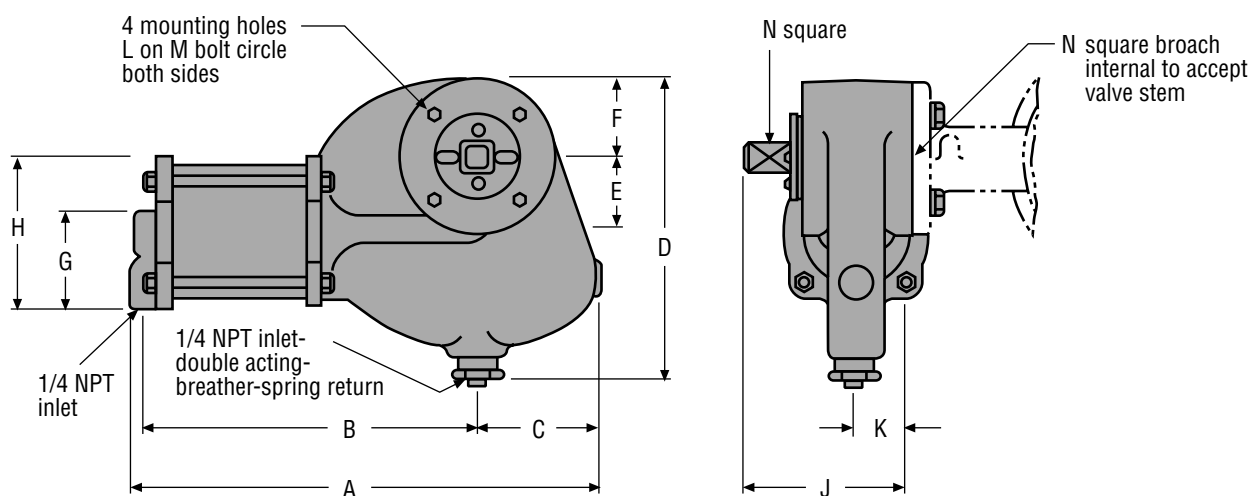


D = number of turns to open

Weco® Pneumatic Actuator Specifications

Pneumatic Actuators - Double Acting

Model	330	350	550	550A	590	590A
Sizes, in.	2 - 6	5 - 6	8 - 10	12	10	12
Part #	3235438	3237369	3236771	3237183	3237886	3237887
Weight	lb kg	8½ 3.9	18 8.2	35 15.9	55 25	55 25
A	in. mm	12 ⁹ / ₁₆ 319	16 ¹ / ₈ 511	19 ⁹ / ₈ 492	22 559	22 559
B	in. mm	8 ³ / ₄ 222	12 ⁵ / ₁₆ 313	13 ¹¹ / ₁₆ 348	15 ⁷ / ₈ 403	15 ⁷ / ₈ 403
C	in. mm	3 ⁵ / ₁₆ 84.1	3 ⁵ / ₁₆ 84.1	5 ³ / ₁₆ 133	5 ³ / ₁₆ 132	5 ³ / ₁₆ 139
D	in. mm	7 ¹³ / ₁₆ 198	7 ¹³ / ₁₆ 198	12 ¹ / ₁₆ 308	12 ¹ / ₁₆ 308	12 ¹ / ₁₆ 308
E	in. mm	1 ¹⁵ / ₁₆ 49.2	1 ¹⁵ / ₁₆ 49.2	3 ³ / ₁₆ 90.5	3 ³ / ₁₆ 81	3 ³ / ₁₆ 81
F	in. mm	2 ¹ / ₁₆ 52.4	2 ¹ / ₁₆ 52.4	3 ¹ / ₁₆ 77.8	3 ¹ / ₁₆ 77.8	3 ¹ / ₁₆ 77.8
G	in. mm	2 50.8	3 ⁵ / ₁₆ 84.1	3 ⁵ / ₁₆ 84.1	5 ⁵ / ₁₆ 135	5 ⁵ / ₁₆ 135
H	in. mm	3 ⁷ / ₈ 98.4	6 ¹ / ₂ 165.1	6 ¹ / ₂ 165	10 ⁹ / ₁₆ 268	10 ⁹ / ₁₆ 268
J	in. mm	4 ⁵ / ₁₆ 110	4 ⁵ / ₁₆ 110	5 ⁵ / ₁₆ 135	5 ⁵ / ₁₆ 135	5 ⁵ / ₁₆ 135
K	in. mm	1 ⁷ / ₁₆ 36.5	1 ⁷ / ₁₆ 36.5	1 ⁷ / ₈ 47.6	1 ⁷ / ₈ 47.6	1 ⁷ / ₈ 47.6
L	in.	³ / ₈ -16 UNC	³ / ₈ -16 UNC	¹ / ₂ -13 UNC	¹ / ₂ -13 UNC	¹ / ₂ -13 UNC
M	in. mm	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	5 127	5 127	5 127
N	in. mm	5 ⁵ / ₈ 15.9	5 ⁵ / ₈ 15.9	7 ⁷ / ₈ 22.2	1 ¹ / ₈ 28.6	1 ¹ / ₈ 28.6

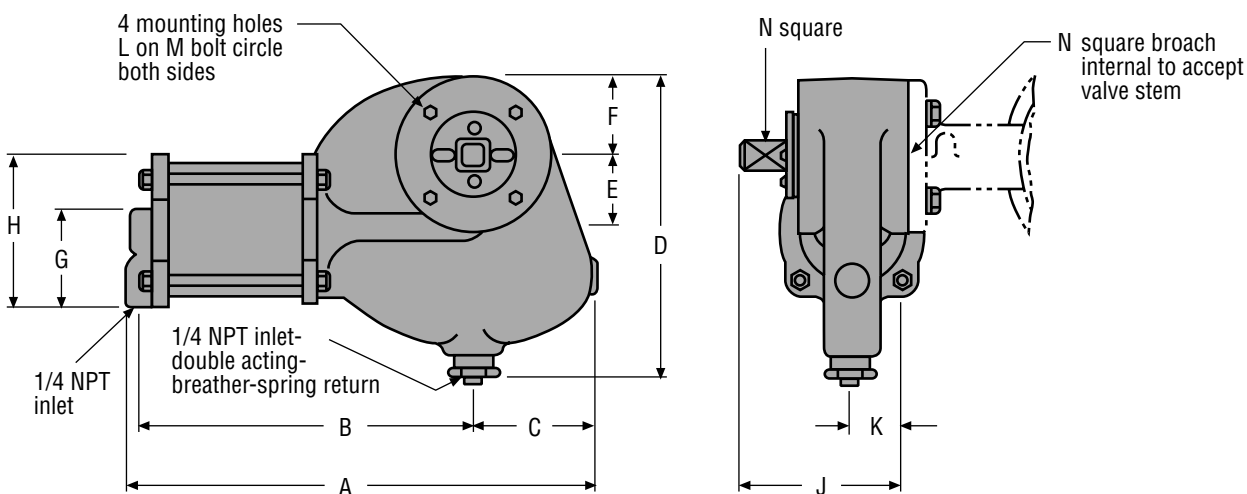


BV5A

Weco® Pneumatic Actuator Specifications

Pneumatic Actuators - Spring Acting

Model	332	333	354	355	596	597A
Sizes, in.	2 - 2 1/2	3 - 4	3 - 4	5 - 6	8 - 10	12
Part #	3237525	3237368	3237373	3237515	3237865	3237866
Weight	lb	13	25	31	93	106
	kg	5.9	11.3	14.1	42.2	48.1
A	in. mm	19 ⁹ / ₁₆ 497	19 ⁹ / ₁₆ 497	20 ¹ / ₄ 514	30 ¹ / ₈ 765	30 ¹ / ₈ 765.2
B	in. mm	15 ³ / ₄ 400	15 ³ / ₄ 400	16 ⁷ / ₁₆ 418	24 610	24 610
C	in. mm	3 ⁵ / ₁₆ 84.1	3 ⁵ / ₁₆ 84.1	3 ⁵ / ₁₆ 84.1	5 ¹ / ₁₆ 129	5 ³ / ₁₆ 132
D	in. mm	8 ⁵ / ₈ 219	8 ⁵ / ₈ 219	8 ⁵ / ₈ 219	13 ¹ / ₈ 333	13 ¹ / ₈ 333
E	in. mm	1 ¹⁵ / ₁₆ 49.2	1 ¹⁵ / ₁₆ 49.2	1 ¹⁵ / ₁₆ 49.2	3 ³ / ₁₆ 81	3 ³ / ₁₆ 81
F	in. mm	2 ¹ / ₁₆ 52.4	2 ¹ / ₁₆ 52.4	2 ¹ / ₁₆ 52.4	3 ¹ / ₁₆ 77.8	3 ¹ / ₁₆ 77.8
G	in. mm	2 50.8	2 50.8	3 ⁵ / ₁₆ 84.1	5 ⁵ / ₁₆ 135	5 ⁵ / ₁₆ 135
H	in. mm	3 ⁷ / ₈ 98.4	3 ⁷ / ₈ 98.4	6 ¹ / ₂ 165	10 ⁹ / ₁₆ 268	10 ⁹ / ₁₆ 268
J	in. mm	4 ⁵ / ₁₆ 110	4 ⁵ / ₁₆ 110	4 ⁵ / ₁₆ 110	5 ⁵ / ₁₆ 135	5 ⁵ / ₁₆ 135
K	in. mm	1 ⁷ / ₁₆ 36.5	1 ⁷ / ₁₆ 36.5	1 ⁷ / ₁₆ 36.5	1 ⁷ / ₈ 47.6	1 ⁷ / ₈ 47.6
L	in.	³ / ₈ -16 UNC	³ / ₈ -16 UNC	³ / ₈ -16 UNC	¹ / ₂ -13 UNC	¹ / ₂ -13 UNC
M	in. mm	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	3 ¹ / ₄ 82.6	5 127	5 127
N	in. mm	⁵ / ₈ 15.9	⁵ / ₈ 15.9	⁵ / ₈ 15.9	⁷ / ₈ 22.2	1 ¹ / ₈ 28.6



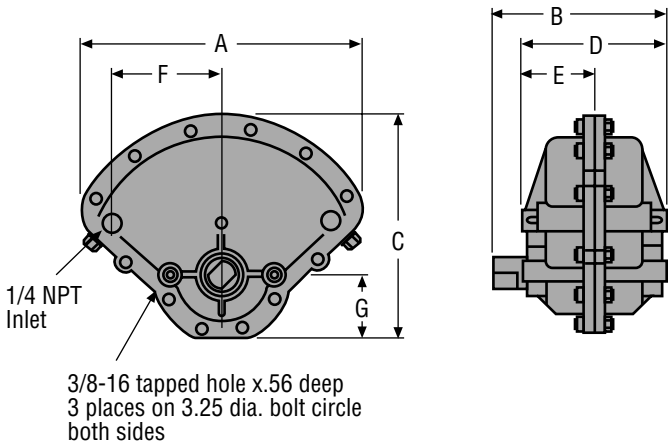
BV6A

Weco® Pneumatic Actuator Specifications

Pneumatic Vane Actuator

Fits 2" - 6" size butterfly valves

Model	200
Part #	3258068
Weight	lb kg
	10 4.54
A	in. mm
	8.66 220
B	in. mm
	5.56 141
C	in. mm
	7.00 178
D	in. mm
	4.62 117
E	in. mm
	2.31 58.7
F	in. mm
	3.41 86.6
G	in. mm
	2.00 50.8



Weco® Actuator Sizing Information

Actuator Sizing Information

Required Operating Torques:

There are three torques to be considered when selecting the proper actuator for a butterfly valve:

- (1) Seating Torque - The torque required to displace a resilient seat and effect shutoff
- (2) Bearing Torque - The torque required to overcome friction forces on the valve shaft bearing surfaces
- (3) Dynamic Torque - Torque due to fluid forces which tend to close the valve.

The torques for resilient seated valves tabulated in this section are the sum of (1) and (2) above for various shut-off pressures. These tabulated values include a safety factor large enough to insure proper valve operation in most general butterfly valve applications. Where unusual service conditions exist (such as likelihood of seat swelling, or low and high temperature seat hardening), an additional safety factor may be applicable.

Dynamic Torque

Dynamic torque is torque on the valve shaft due to the fluid forces on the valve disc. This torque is a function of valve diameter, pressure drop, and a torque coefficient (C_t) which varies with angle opening. Torque is calculated by the equation:

$$T = C_t D^3 \Delta P$$

Where: T = Dynamic torque (in-lb)
 D = Valve Dia. (in.)
 C_t = Dynamic torque coefficient
(see table below)

C_t vs. Angle Open										
Angle Open	0	10	20	30	40	50	60	70	80	90
C_t	0	.007	.014	.022	.033	.050	.087	.143	.215	0

Weco® Actuator Sizing Information

Dynamic torque is not usually of major concern in resilient seated butterfly valves unless the line velocity exceeds 20 fps. If line velocity exceeds this, a check should be made to insure that actuator output exceeds the calculated dynamic torque. Dynamic torque should be checked at 80° open for on-off applications.

Dynamic torque is of prime consideration in situations where line velocity is not recovered downstream of the valve. This situation exists on installations where there is an unlimited source and less than 6 diameters of pipe downstream of the valve. If a valve discharges to the atmosphere, the pressure drop across the valve will be equal to the height of water above the valve for all angles of valve opening. This pressure drop must not exceed the pressure drop tabulated in Maximum ΔP vs. Angle

Opening Tables for any angle. If it does, provisions must be made for velocity recovery by adding downstream piping.

Actuator Sizing For Tee Linkages

For standard tee linkage applications where one actuator operates two butterfly valves of the same size with one valve opening as the other valve closes, the actuator sizing will be the same as for a single butterfly valve application. For the actuator sizing for other tandem linkage applications, consult the factory.

Low-Torque Valves

Undercut discs are available for butterfly valve applications that require lower seating torques. For complete information, consult factory.

Actuators Sizing Torque for Weco Butterfly Valves

Valve Size, in.	Seating Torque In Inch-lb (N*m), @ Various Line Pressures						
	0 psi 0 kPa	50 psi 345 kPa	75 psi 517 kPa	100 psi 690 kPa	125 psi 862 kPa	150 psi 1034 kPa	175 psi 1207 kPa
2	90 10	90 10	92 10	94 11	96 11	98 11	100 11
2 1/2	130 15	130 15	134 15	138 16	142 16	146 17	150 17
3	200 23	200 23	206 23	212 24	218 25	224 25	230 26
4	350 40	350 40	366 41	382 43	398 45	414 47	430 49
5	535 60	535 60	566 64	597 67	628 71	659 74	690 78
6	770 87	770 87	823 93	876 99	929 105	982 111	1,035 117
8	1,350 153	1,350 153	1,475 167	1,600 181	1,725 195	1,850 209	1,975 223
10	2,100 237	2,100 237	2,340 264	2,580 292	2,820 319	3,060 346	3,300 373
12	3,000 339	3,000 339	3,400 384	3,800 429	4,200 475	4,600 520	5,000 565
14	3,680 416	4,240 479	4,790 541	5,350 605	5,900 667	6,480 732	
16	4,880 551	5,730 647	6,580 744	7,430 840	8,280 936	9,140 1030	
18	6,230 704	7,460 843	8,690 982	9,920 1121	11,150 1260	12,390 1400	
20	7,770 878	9,380 1060	11,000 1243	12,610 1425	14,230 1610	15,840 1790	
24	11,100 1250	14,010 1580	16,920 1910	19,830 2240	22,740 2570	25,650 2900	

NOTE: For valves using Teflon seats, use torque value at highest standard value rating even for lower pressure applications. Above figures are for values used in wet service, for dry service valves contact factory.

Typical Weco® and Chiksan® Equipment Recommended Temperature Ranges

(Consult factory for specific values)

Elastomer Selection	Product Line and Materials of Construction					Temperature Ranges
	Wing Unions, Swivel Joints		Wing Unions, Swivel Joints, Plug Valves, Check Valves, Fittings, Pup Joints, Adapters		Butterfly Valves	
	Ductile Iron	Carbon Steel	Alloy Steel Standard Service	Alloy Steel Sour Gas Service		
No Seal (Wing Union)	X					20°F (-7°C) to 300°F (149°C)
No Seal (Wing Union)		X				0°F (-18°C) to 300°F (149°C)
Nitrile	X					20°F (-7°C) to 240°F (116°C)
Nitrile		X				0°F (-18°C) to 240°F (116°C)
Nitrile			X			-20°F (-29°C) to 240°F (116°C)
Winterized Nitrile				X		-50°F (-46°C) to 240°F (116°C)
HNBR	X					20°F (-7°C) to 300°F (149°C)
HNBR		X	X	X		10°F (-12°C) to 300°F (149°C)
Viton®	X	X	X	X		20°F (-7°C) to 300°F (149°C)
Natural Rubber Seat					X	-20°F (-29°C) to 150°F(66°C)
Nitrile Seat					X	-20°F (-29°C) to 200°F (93°C)
EPDM, Hypalon, or PTFE Seat					X	-20°F (-29°C) to 250°F (121°C)
Silicone Rubber Seat					X	-20°F (-29°C) to 300°F (149°C)
Fluoroelastomer Seat					X	-10°F (-23°C) to 300°F (149°C)
Neoprene Seat					X	0°F (-18°C) to 200°F (93°C)

Warnings and Cautions

FMC Technologies cannot anticipate all of the situations a user may encounter while installing and using FMC products. Therefore, the user of FMC products MUST know and follow all applicable industry specifications and practices on the safe installation and use of these products. For additional safety information, refer to FMC Technologies product catalogs, product brochures, and installation, operating, and maintenance manuals, which can be accessed at www.fmctechnologies/fluidcontrol.com, or contact FMC Technologies at 800-772-8582.

WARNING

Failure to follow these safety warnings could result in death, serious personal injury, and/or severe property damage.

- Never mix or assemble components, parts, or end connections with different pressure ratings. Mismatched conditions, including but not limited to that of a 2" Figure 1502 male sub end connected to a 2" Figure 602 female sub, may fail under pressure resulting in death, serious personal injury, or severe property damage.
- Never use or substitute non FMC components or parts in FMC products or assemblies.
- Never modify or repair FMC products in a manner not specifically directed in instructions published by FMC Technologies.
- Never strike, tighten, loosen, or attempt repairs on pressurized components or connections.
- Never exceed the rated working pressure of the product.
- Complete and proper make-up of components and connections is required to attain rated working pressure. Always apply essential care, attention, handling, and inspection to threaded components before, during and after make-up.
- Never use severely worn, eroded, or corroded products. Contact FMC Technologies for more information on how to identify the limits of erosion and corrosion.
- Never strike wing union nuts having severely flattened and extruded ears. This condition can result in flying debris leading to serious personal injury and must immediately be addressed by either grinding off extruded material or removing the nut from service.
- Always follow safe practices when using products in overhead applications. Products not properly secured could fall.
 - Never exceed the load rating of lifting devices on products or lifting equipment.
 - Use of FMC products in suspension applications can result in over-stress conditions leading to catastrophic failure.
 - If externally applied loads are anticipated, consult factory.
- Always follow safe practices when manually lifting and carrying products.
- Always select only appropriate product and materials for the intended service:
 - Never expose standard service products to sour gas fluids (Refer to NACE MR-01-75). Do not interchange sour gas with standard service components.
 - Always use appropriate safety precautions when working with ferrous products in below freezing temperatures. Freezing temperatures lower the impact strength of ferrous materials.
- Always follow manufacturer's instructions and Material Safety Data Sheet directions when using solvents.
- Always make certain that personnel and facilities are protected from residual hazardous fluids before disassembly of any product.
- Whenever leakage is detected from FMC Technologies products, remove them from service immediately to prevent death, serious personal injury, and/or property damage.

SAFETY INSTRUCTIONS: The applications of FMC products are in working environments and systems which must be properly designed and controlled. Safety procedures and policies MUST be clearly established by the user and followed. Always use appropriate protective equipment.

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