

Masoneilan™ 39005 Series

High Performance
Butterfly Valve



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Overview

Baker Hughes Masoneilan 39005 Series High Performance Butterfly Valve (HPBV) is designed for exceptional performance, application flexibility and long service life. This automatic throttling control valve offers benefits such as enhanced sealing, double offset operation, excellent flow characteristics, accurate positioning, and dynamic operation. The 39005 Series features seal designs for soft seal and fire-safe configurations. Combined with the Masoneilan 98 Series actuator, the 39005 Series High Performance Butterfly Valve package delivers years of dependable performance in demanding applications.

Features

The 39005 Series High Performance Butterfly Valve incorporates two main features that differentiate it from conventional swing-through butterfly valves a seal ring and double offset (eccentric) operating principles for the seal and the shaft.

The use of a seal ring eliminates the inherent problem of high sealing forces due to interference fit and the resultant high wear rates caused by liner scraping and scuffing. Additionally, the dynamic, pressure-assisted seal design results in ASME Class VI shutoff rates available throughout the full range of ASME Class 150, 300 and 600 ratings.

The double offset (eccentric) operating principles shown in Figure 1, apply to both the seal offset, in which the seal ring centerline is offset from the shaft centerline, and shaft offset in which the shaft centerline is offset from the valve centerline. The design allows the disc to lift from the seal quickly due to the camming rotation with respect to the valve/seal centerlines.

These two features contribute to an exceptional high performance butterfly valve that offers many benefits.

Long Seal Life

The double offset operation lifts the disc from the seal quickly to minimize sliding contact and friction. The result is reduced seal wear as well as lower breakaway and seating torque requirements. This design has been extensively tested maintaining zero leakage shutoff performance throughout the entire life-cycle endurance test.

Fast and Dynamic Operation

Double offset operation eliminates disc-to-seal friction throughout the operating range resulting in fast response to input signals. Also, the disc tends to move in the direction of flow which enables the valve and actuator to maximize allowable operating pressures.

Ease of Installation and Maintenance

The reduced size and weight of the 39005 Series valve compared to typical rotary and globe products enables fast and easy installation into the pipeline. The seat design also supports easy maintenance by allowing the removal and replacement of the seat retainer without modifying the disc or stem.

Excellent Flow Characteristics

The offset disc design provides an approximate equal percentage flow characteristic through its full travel of 90° rotation yielding a Cv ratio of 100:1.

Precise Positioning

Extra heavy shafts with keyed ends for actuator mounting offer accurate positioning without lost motion or backlash.

Cost Savings

The design of the HPBV reduces operating torques. As a result, smaller actuation packages are required to operate the valve. Maintenance costs are also reduced through the modular seal design.

Long Service Life

The PTFE-lined low-friction bearings provide excellent service life while resisting corrosion and distortion from high temperatures and mechanical loading.

Application Flexibility

The Masoneilan 39005 Series is suited for a wide range of control applications including corrosive chemicals, water, gases, acids, hydrocarbons and other process fluids.

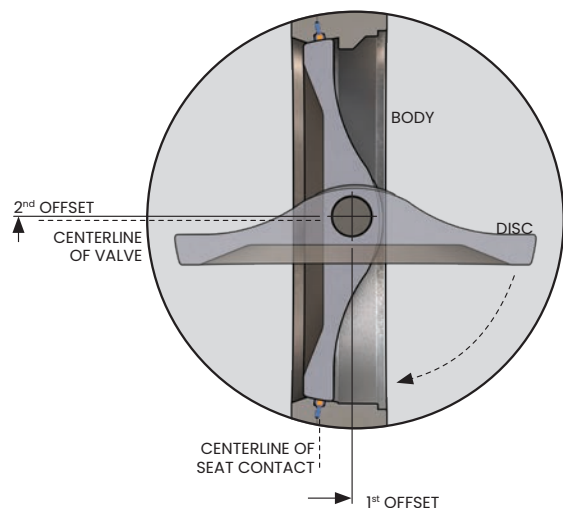


Figure 1: Double offset operating principles

Industries and Applications

The Masoneilan 39005 High Performance Butterfly Valve can handle a wide range of conditions and media, such as corrosive chemicals, water, gases, acids, alkalies, hydrocarbons and many other fluids. Services and optional material include:

Vacuum

Standard valves with TFE seats are recommended for vacuum service down to .02mm Hg absolute pressure, or 20 microns. Under certain conditions, these valves serve well in the high vacuum range down to 1×10^{-6} mm Hg absolute pressure.

Steam

Standard valves with RTFE seats are specifically designed for a wide range of high temperature and high pressure applications including on-off and modulating control of hot water, condensed water or chilled water. For on-off applications this valve is rated 10.3 bar (150 psi) saturated steam at 185°C (366°F). For modulating service, this valve is rated 3.4 bar (50 psi) at 149°C (300°F).

Dry Chlorine – Gas or Liquid

Special materials as well as assembly and testing procedures are applied to assure bubble-tight closure in these critical services.

Oxygen

Valves for critical gaseous oxygen service are specially prepared to ensure the removal of all possible contaminants.

Ash Handling and Abrasive

For applications where flow velocity and differential pressure are low, RTFE or UHMWPE seats and electroless nickel plated discs are recommended. For applications requiring improved resistance to wear and particles of higher hardness, a Fire Safe design is recommended.

Sea Water

Duplex, super duplex and super austenitic stainless trims can be provided for sea water service. Higher alloy materials are available.

Caustic

Valve materials must be selected for sufficient corrosion requirements. Stainless steel is recommended for sodium and potassium hydroxide applications.

Heating, Ventilation and Air Conditioning (HVAC)

This valve can be used for damping or balancing water flow, main stop valves, block valves, throttling valves and control of pump suction or discharge.

Sour Gas

Selected materials of construction meeting NACE standards (ISO 15156, formerly MR-01-75) permit ready application and maximum serviceability in these difficult services.

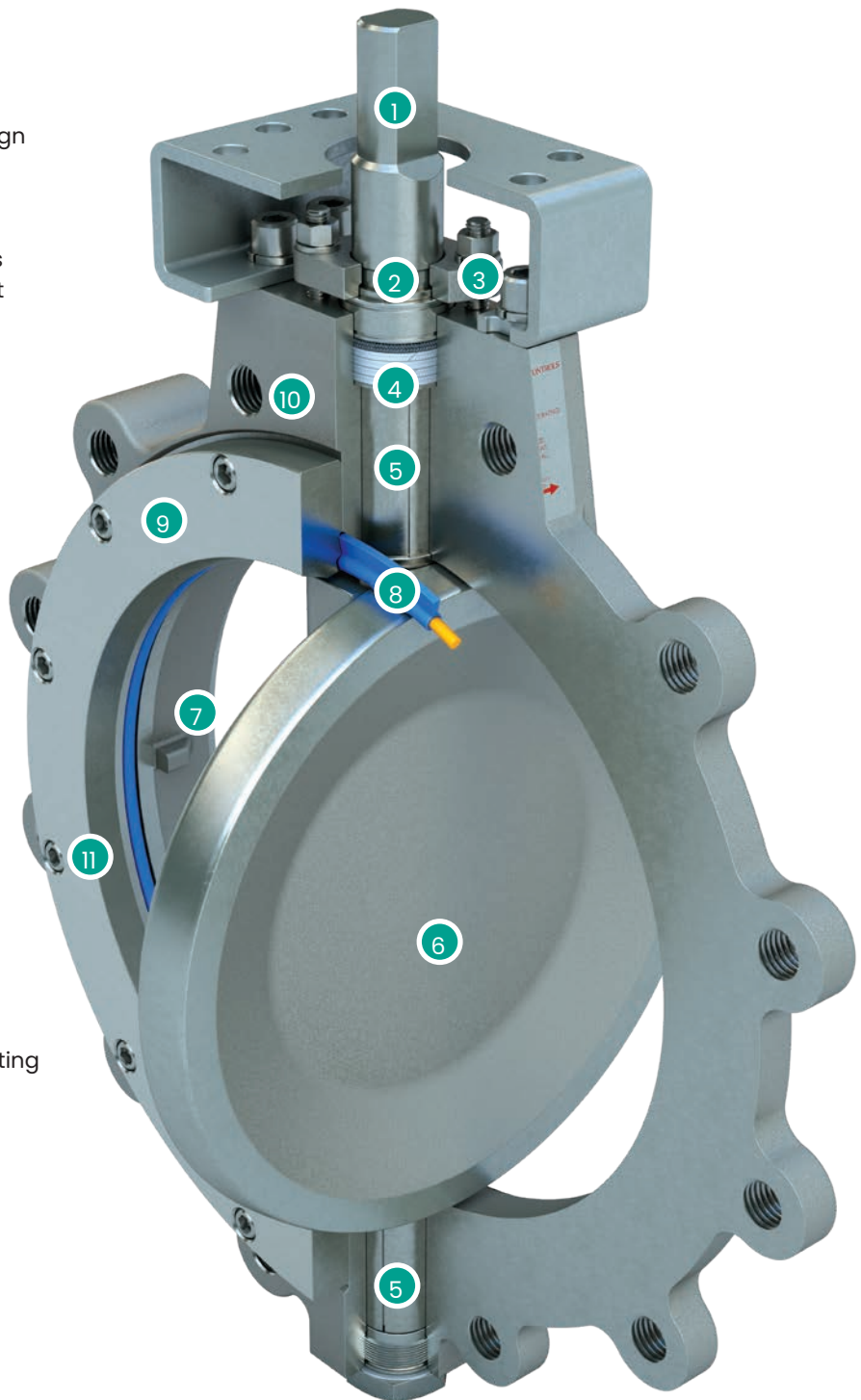
Dead-End Service

Lug bodies for bidirectional dead-end service are offered as standard in full ASME Class 150, 300 and 600 ratings.

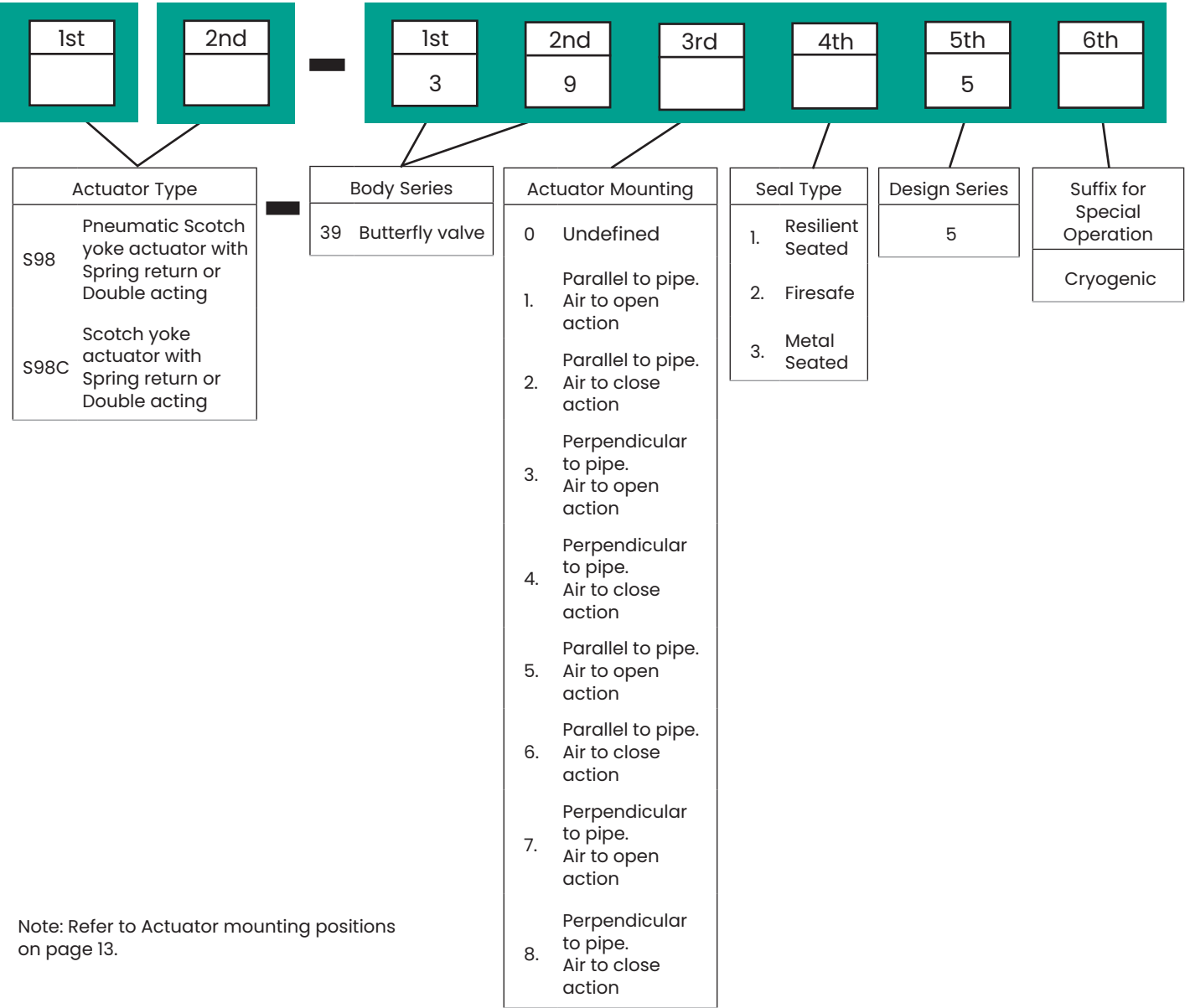
Features and Benefits

Design Features

1. **Stem Design:** High-strength, one-piece stem design is standardized for interchangeability of actuators.
2. **Blowout-proof Stem:** The stem retention design does not rely on actuation components to prevent stem blowout.
3. **Adjustable Stem Packing:** Easy access allows simple quarter-turn field adjustments without actuator removal.
4. **Stem Seal System:** PTFE packing rings with carbon fiber anti-extrusion ring provides constant compression for a positive seal around the stem. Options are available for high temperature, high cycle and firesafe applications.
5. **Stem Bearings:** Top and bottom bearings securely support the stem, provide excellent corrosion resistance, and minimize deflection from high temperatures and mechanical loading forces.
6. **Disc:** The disc is engineered to maximize flow and minimize resistance for optimal flow rates.
7. **Internal Over-travel Stop:** Designed to minimize possible seat damage — extending the service life of the seat.
8. **Bidirectional Resilient Seat:** Provides bidirectional zero-leakage sealing while isolating the energizer from line media.
9. **Full-Faced Seat Retainer:** Cap screws located outside sealing area are protected from corrosion while allowing simple seat replacement.
10. **Body:** Extended neck allows access to stem packing adjustments and actuator mounting when valve is fully insulated.
11. **Dead-End Service:** Lug and double-flanged bodies are full rated for bidirectional dead-end service.



Numbering System



Technical Data

Specifications

Size Range ⁽¹⁾	NPS 2 to 66	
	DN 50 to 1500	
Body Style	Wafer Lug Double Flanged	
Temperature Range ⁽²⁾	Resilient Seated	-62°F to 500°F (-52°C to 260°C)
	Firesafe	-62°F to 500°F (-52°C to 260°C)
	Metal Seated	Up to 900°F (482°C)
Pressure Ratings	ASME Class 150 300 600	
	PN 10 16 25 40 63 100	
Leakage Rate	Resilient Seated	Zero Leakage
		EN12266-1: Rate A
	Metal Seated	FCI 70-2 Class IV

- Notes:
- Other sizes are available on request. Contact Baker Hughes for more information.
 - Depending on material selection. Refer to pressure/temperature graphs.

Material Options

Body Materials	Carbon Steel
	Stainless Steel
	Nickel Aluminum Bronze
	Hastelloy® C
Disc Materials	Titanium
	Stainless Steel
	Nickel Aluminum Bronze
Stem Materials	Monel®
	Stainless Steel
	Monel® K500
Seat Materials	Inconel® 718
	RPTFE with Resilient Energizer
	PTFE with Resilient Energizer
	UHMWPE with Resilient Energizer
	TFM with Low Temperature Resilient Energizer
	(Firesafe) Inconel® and RPTFE with Resilient Energizer

- Note:
- Other materials are available on request. Contact Baker Hughes for more information.

Design Standards

Valve Design	API 609 Category B
	ASME B16.34
	ASME BPVC VIII
	EN 593
	EN 12516
	MSS SP 68
Top Flange	ISO 5211
Flange Drilling ⁽¹⁾	ASME B16.5
	ASME B16.47
	EN 1092-1
Seat Tightness Test	API 598
	EN 12266
	ISO 5208
	MSS SP 61
Face-to-Face	API 609 Category B
	ASME B16.10
	EN 558
	ISO 5752

- Note:
- Additional flange drilling options available.

Certifications and Approvals⁽¹⁾

Certifications	ANSI/NSF 61/372
	CE: PED 2014/68/EU
	SIL 3 Capable
Fire Test	API 607
	ISO 10497
Fugitive Emissions	API 641
	ISO 15848-1
	TA-Luft VDI 2440
Approvals	ABS Type
	ATEX 2014/34/EU
	Bureau Veritas Type
	China Classification Society (CCS) Type
	CRN
	DNV
	EC1935
	TR CU

- Note:
- A complete listing of certifications and approvals is available on request.

Seat Options

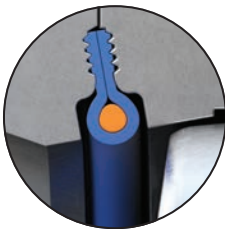
Resilient Seat Design (standard)

Masoneilan's unique, patented resilient seat design offers many exclusive advantages:

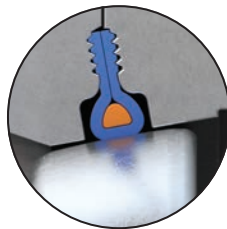
- Proven zero-leakage shutoff in both directions.
- Interference-fit sealing, even when there is no differential line pressure.
- Pressure-assisted sealing is energized by line media pressure, providing a tighter seal in higher differential pressure services.
- Extended service life with reliable sealing after 1 million cycles.
- Resilient energizer ring is fully encapsulated by the seat and isolated from all line media contact.
- Full-faced retainer secures seat in the correct position, even without mating flange.
- Seat self-adjusts for wear and temperature changes, providing longer service life.
- Simplified seat replacement.

Interference-Fit Sealing

Provides bidirectional sealing for low pressure applications



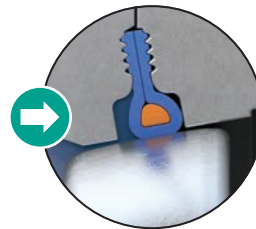
Disc in Open Position
Seat non-compressed



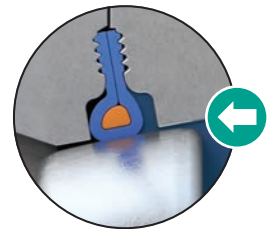
Disc in Closed Position
No line pressure

Pressure-Assisted Sealing

Provides tighter bidirectional sealing in higher pressure applications.



Disc in Closed Position
Line pressure applied from the **preferred** flow direction

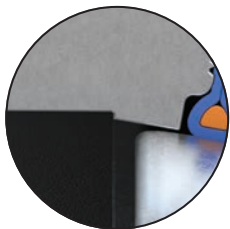


Disc in Closed Position
Line pressure applied from the **non-preferred** flow direction

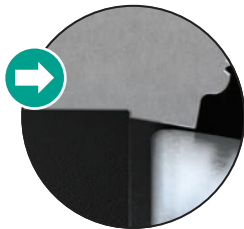
Firesafe Seat Design

The firesafe design consists of the standard bidirectional resilient seat assembly with added Inconel® metal seat. With the valve closed, the firesafe seat assembly contacts the disc with both the resilient seat and metal seat. During and after a fire, when the resilient material has been partially or completely destroyed, the metal seat provides a bidirectional seal by remaining in contact with the disc.

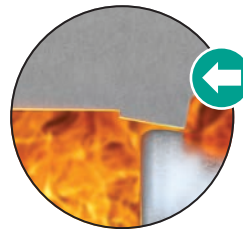
Disc in Closed Position



No line pressure.
(Pre-fire event condition.)



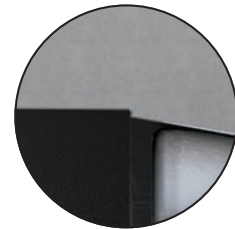
Line pressure applied from **preferred** flow direction.
(During or after fire event.)



Line pressure applied from **non-preferred** flow direction,
(During or after fire event.)

Metal Seat Design

The Inconel® metal seat provides bidirectional FCI 70-2 Class IV leakage. The seat and nitride hardened disc have appropriate differences in hardness to eliminate the risk of valve damage caused by galling.



Disc in Closed Position
No line pressure.

Fire Test Standards — API 607 and ISO 10497 Certified

The proven firesafe valve design meets or exceeds the latest international fire test standards — in lab tests and in field applications.

Valve Sizing

Resilient Seated, Firesafe, Metal Seated

ASME Class 150 — HPBV — C _v Values									
Disc Position (degrees)									
Valve Size NPS	90°	80°	70°	60°	50°	40°	30°	20°	10°
2	87	77	65	51	37	25	14	8	6
2-1/2	160	136	100	78	50	30	16	8	3
3	185	178	155	123	87	56	32	14	5
4	375	365	315	250	175	115	63	31	10
6	1,350	1,070	750	510	330	218	140	81	35
8	2,800	2,230	1,590	1,060	685	456	280	165	65
10	4,300	3,450	2,430	1,630	1,050	700	450	250	100
12	6,650	5,330	3,750	2,530	1,630	1,080	700	390	155
14	7,650	6,100	4,300	2,900	1,890	1,250	810	450	175
16	9,800	7,860	5,510	3,700	2,420	1,530	1,020	580	230
18	10,500	9,100	6,960	5,100	3,520	2,220	1,180	500	170
20	13,500	11,700	8,800	6,500	4,500	2,820	1,530	640	200
24	20,000	17,100	12,800	9,570	6,640	3,880	2,200	920	240
26	20,000	17,100	12,800	9,570	6,640	3,880	2,200	920	240
28	28,000	23,900	18,200	13,500	9,300	5,700	3,100	1,300	290
30	32,000	27,300	20,900	15,500	10,700	6,700	3,600	1,510	320
32	34,000	29,100	22,300	16,500	11,400	7,150	3,850	1,610	340
34	34,000	29,100	22,300	16,500	11,400	7,150	3,850	1,610	340
36	48,500	41,100	31,700	23,200	16,400	10,200	5,430	2,260	480
40	62,000	55,200	44,000	33,300	23,800	15,200	8,600	3,520	670
42	65,000	58,000	46,100	35,000	25,000	16,000	9,000	3,700	700
48	91,000	80,900	63,700	43,600	29,100	20,000	11,000	4,600	920
54	125,000	111,000	87,500	60,000	40,000	27,500	15,000	6,000	1,200
60	160,000	140,000	105,000	75,000	50,000	31,000	17,000	7,000	1,400

ASME Class 300 — HPBV — C _v Values									
Disc Position (degrees)									
NPS	90°	80°	70°	60°	50°	40°	30°	20°	10°
2	87	77	65	51	37	25	14	8	6
2 1/2	160	136	100	78	50	30	16	8	3
3	185	178	155	123	87	56	32	14	5
4	375	365	315	250	175	115	63	31	10
6	1,000	875	710	530	370	240	138	79	26
8	2,000	1,720	1,360	950	630	405	240	121	47
10	2,650	2,250	1,740	1,200	780	510	295	150	61
12	4,000	3,400	2,500	1,690	1,100	710	430	220	92
14	4,100	3,500	2,600	1,770	1,200	830	490	240	100
16	7,800	6,540	4,550	2,970	1,840	1,160	730	420	180
18	9,500	8,000	6,170	4,530	3,110	1,970	1,080	440	94
20	11,000	9,570	7,300	5,400	3,720	2,330	1,250	530	110
24	18,000	15,100	11,400	8,570	5,920	3,700	2,000	830	180
30	29,000	24,400	18,900	13,700	8,500	6,000	3,230	1,330	290
36	45,000	38,100	29,200	21,000	14,800	9,100	4,660	1,730	380
42	60,000	54,000	42,000	30,000	19,000	13,000	7,500	2,600	450
48	83,000	74,000	58,000	41,000	26,000	17,000	10,000	4,400	800

Valve Sizing (cont.)

Resilient Seated, Firesafe, Metal Seated

ASME Class 600 — HPBV — C _v Values									
Disc Position (degrees)									
Valve Size NPS	90°	80°	70°	60°	50°	40°	30°	20°	10°
3	165	158	135	103	67	46	12	8	3
4	300	270	210	150	95	70	45	30	5
6	800	765	600	425	270	200	130	70	15
8	1,500	1,350	1,050	750	480	345	209	78	20
10	2,200	1,970	1,540	1,100	700	500	300	140	40
12	3,100	2,790	2,170	1,550	1,000	680	400	190	55
14	3,900	3,720	3,000	2,220	1,600	1,130	720	340	80
16	5,000	4,200	2,900	1,900	1,200	800	500	250	95
18	6,000	5,000	3,900	2,800	1,900	1,200	660	290	130
20	8,000	6,900	5,300	3,900	2,700	1,700	950	400	143
24	11,000	9,300	7,000	5,200	3,600	2,250	1,200	500	180
30	15,000	13,000	10,000	8,400	5,100	2,800	1,650	600	200

Notes:

C_v varies with the valve size, angle of opening and the manufacturer's valve style.

C_v value is the volume of water in USGPM that will flow through a given restriction or valve opening with a pressure drop of one (1) psi at room temperature.

Value FL, XT, XC as a Function of Disc Rotation

Disc Degree Opening		15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Seat Upstream (FTO)	F _L	0.93	0.92	0.91	0.9	0.87	0.86	0.85	0.81	0.78	0.075	0.74	0.69	0.65	0.6	0.55	0.5
	X _T	0.73	0.71	0.70	0.68	0.64	0.62	0.61	0.55	0.51	0.47	0.46	0.40	0.35	0.30	0.25	0.21
	X _C	0.69	0.68	0.66	0.65	0.61	0.59	0.58	0.52	0.49	0.45	0.44	0.38	0.34	0.29	0.24	0.20
Seat Downstream (FTC)	F _L	0.92	0.9	0.91	0.91	0.88	0.83	0.83	0.79	0.73	0.68	0.67	0.65	0.6	0.55	0.52	0.50
	X _T	0.71	0.68	0.70	0.70	0.32	0.58	0.58	0.52	0.45	0.39	0.38	0.35	0.30	0.25	0.23	0.21
	X _C	0.68	0.65	0.66	0.66	0.62	0.55	0.55	0.50	0.43	0.37	0.36	0.34	0.29	0.24	0.22	0.20

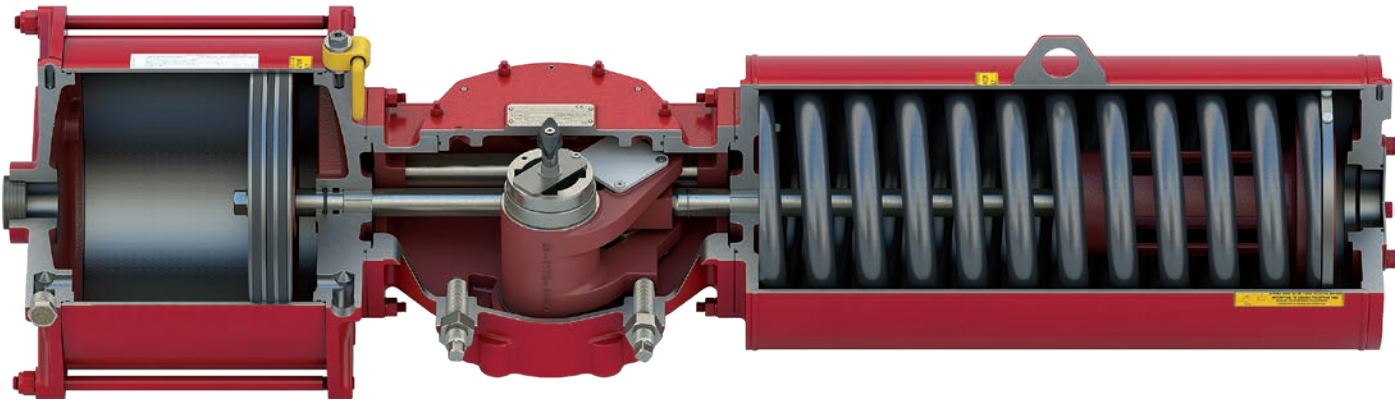
Series 98 Actuators and Controls

Overview

Baker Hughes offers a variety of Masoneilan valve instrumentation suitable for a wide range of applications. The portfolio includes Electro-Pneumatic Transducer, air filter regulators, Booster Relays and Electric Rotary Switches.

Other actuator types can be provided on request, such as:

- Pneumatic Scotch Yoke
- Hydraulic
- Electro-Hydraulic
- Electric



The Scotch Yoke actuators were designed primarily for pneumatic operation to a maximum pressure of 150 psi (10.3 Bar) and for temperature ranges of -50°F to 300°F (-46°C to 149°C).

- Compact design offers a high torque-to-weight ratio
- Modular design offers easy configuration in the field
- Module alignment ensured by precision machined centering rings
- Torque output ranging from 2,744 to 885,100 lb-in (310 to 100,000 Nm)
- Spring end torque ranging from 2,744 to 445,261 lb-in (310 to 50,306 Nm)
- Premium epoxy/polyurethane coating as standard

Design and Construction

Series 98 actuators are suitable for a specific application can be configured by combining modules.



Operating Conditions

Pressure Range ⁽¹⁾	40 - 150 psi (2.8 - 10.3 bar)
Media	Dry Compressed Air/Inert Gas ⁽¹⁾
Temperature Range Options	Standard: -20°F to 200°F (-29°C to 93°C)
	High Temperature: Up to 300°F (149°C) ⁽¹⁾
	Low Temperature: Down to -50°F (-46°C) ⁽¹⁾

Note:

1. Contact factory for other media or non-standard temperature range.

Compliances

Torque Base	Mounting Dimensions as per ISO 5211: 2001(E)
Accessories	Shaft Driven Accessories Mounting per NAMUR-VDE
Performance Testing	EN 15714-3:2009
Ingress Protection	IP66/IP67M per IEC 60529
Safety	ATEX, SIL 3 Suitable, PED on request

Actuator Modules

Design and Construction

The symmetrical yoke provides a balanced torque output curve. This is the best choice in applications where the torque requirements at the seat break out and end positions are similar. As the name suggests, the output torque curve is symmetrical about the mid rotation point.

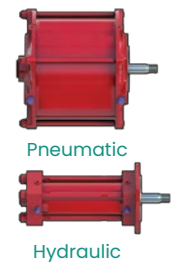
Torque Module

- Integral single piece cast housing for rigidity
- Two ISO drilling patterns in base to maximize direct mounting
- Symmetrical and Canted Yoke options
- Integral travel stops
- Replaceable self lubricating metal backed PTFE bearings for enhanced service life
- NAMUR mounting for shaft driven accessories, standardized across models
- Guided drive supports side loads
- Relief vent prevents ingress and over pressurization



Pressure Modules

- Corrosion protected external tie rods designed for long seal life and reliability
- Honed and hard chrome plated cylinder barrel for wear and corrosion protection and enhanced seal performance
- Multiple ports available
- Quad ring and U-cup seals for dynamic sealing
- Dual wear bands for better guidance of piston



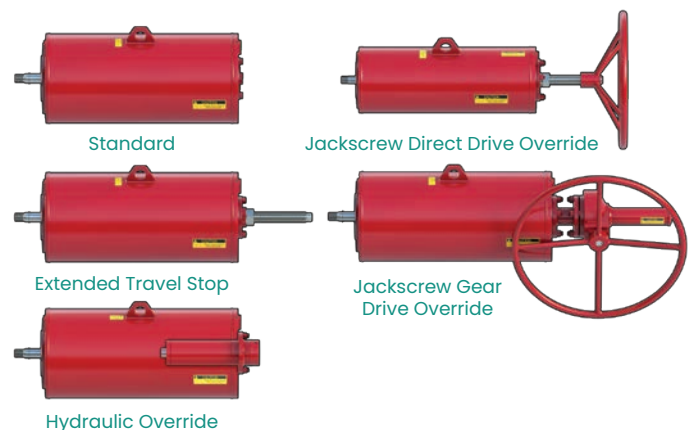
Direct Acting Modules

- Extended stop
- Jack screw
- Pneumatic
- Jack screw with gear drive
- Hydraulic override



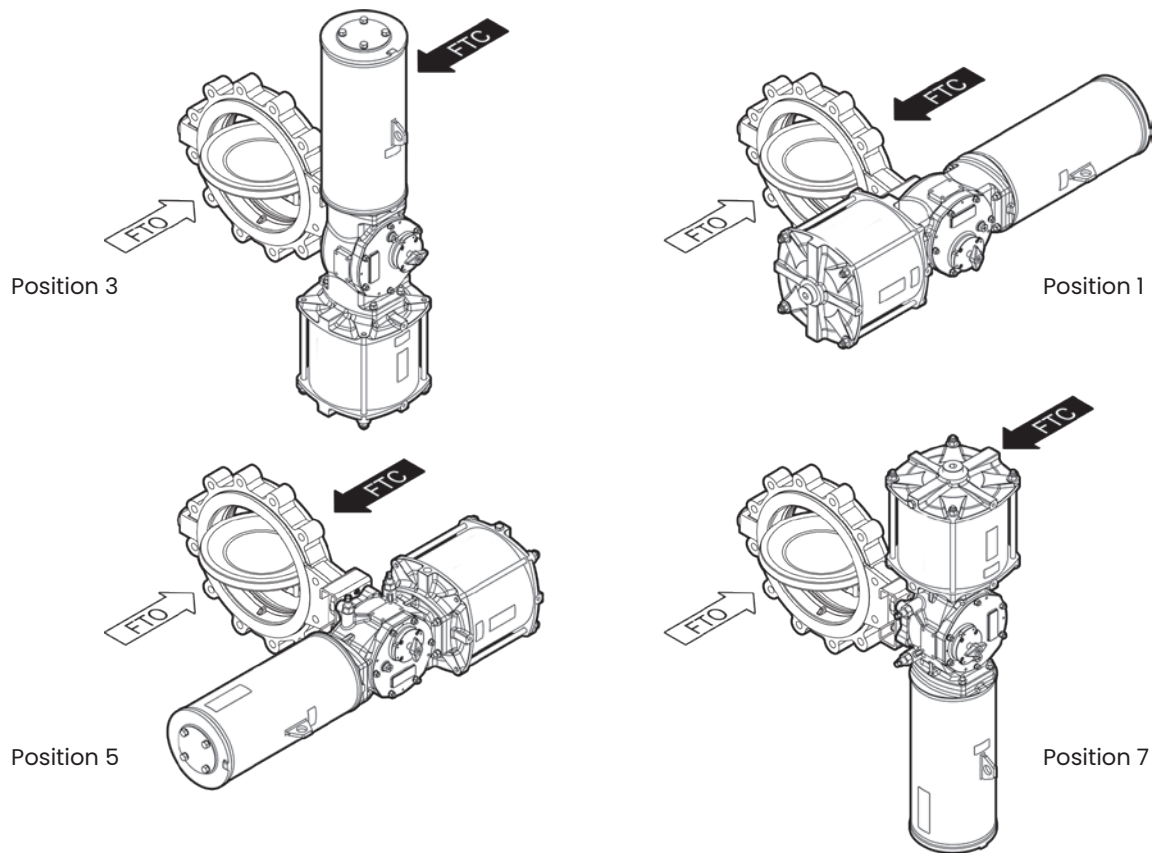
Spring Modules

- Fully enclosed and welded design for safety
- Guided and centered springs for smooth operation
- No metal to metal contact of spring or guide
- Thrust base for mounting jackscrew and hydraulic override
- Tectyl coated springs for corrosion protection

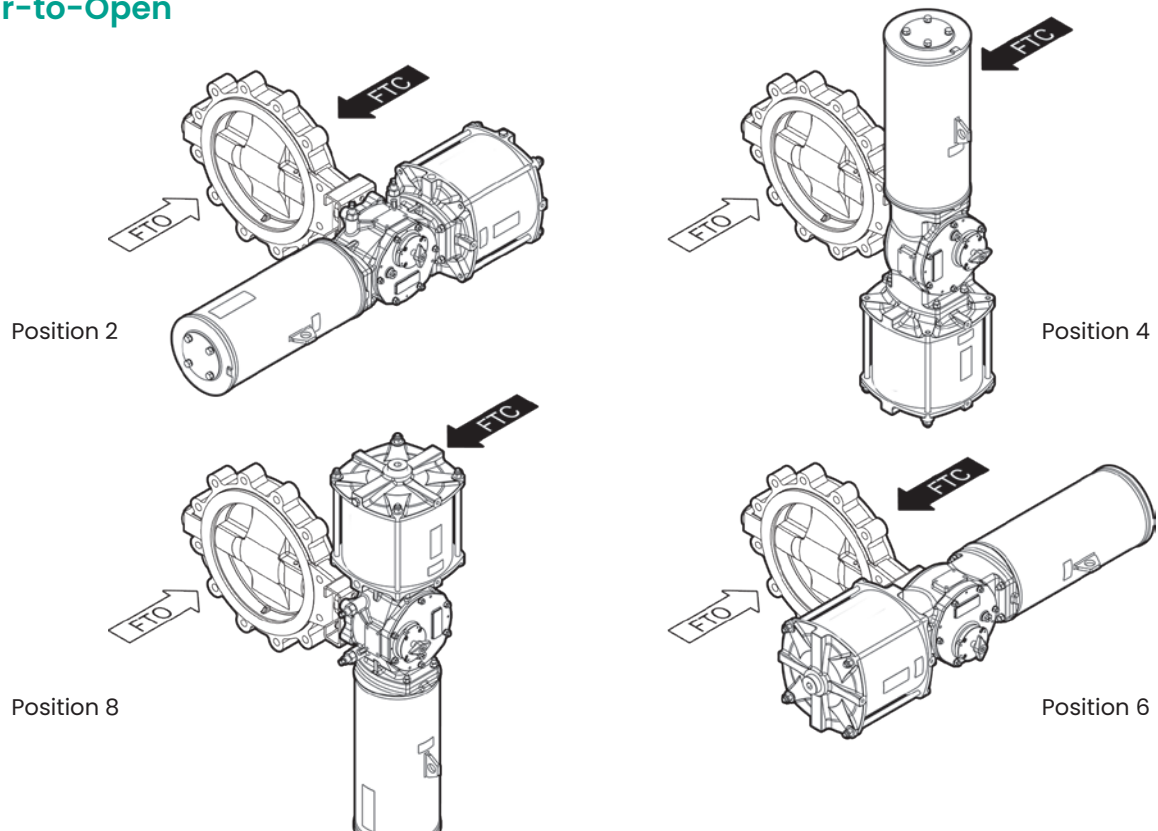


Actuator Mounting Guide

Air-to-Close

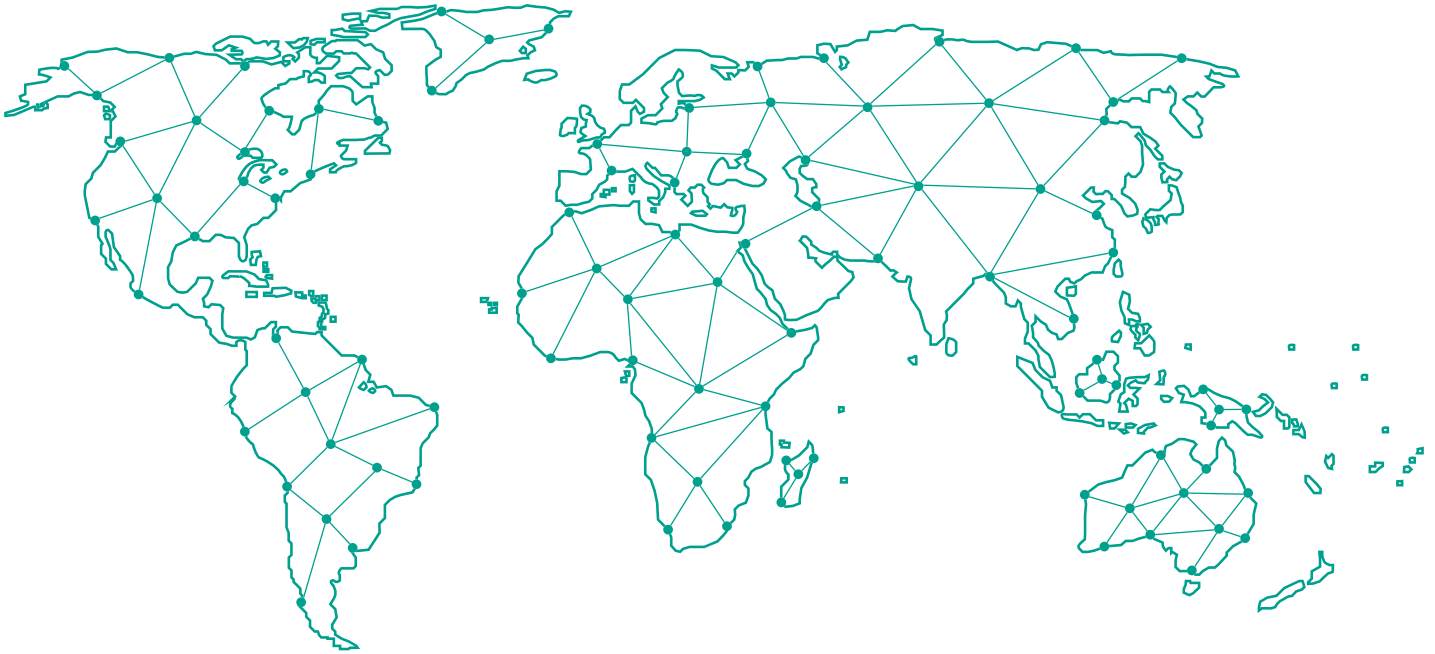


Air-to-Open



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