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Limitorque® Valve Actuation Systems

Electric and Fluid Power
Actuators and Control Systems



Experience In Motion



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Flowserve: Solutions to Keep You Moving

Flowserve is one of the world's leading providers of fluid motion and control products and services. Globally, we produce engineered and industrial pumps, valves, seals, systems and automation equipment, and provide a range of related flow management services. Our solutions move even the most volatile and corrosive fluids safely and securely through some of the most extreme temperatures, terrain and challenging operating environments on the planet. Flowserve markets are large, diverse and worldwide. Our products and services are specified for use in a vast range of industries, including oil and gas, chemical, power generation and various general industries.

Changing the Valve Control Industry

In the 1920s, Payne Dean, an emigré inventor from England, was issued a U.S. patent for a machine with the unique ability to sense and subsequently limit output torque in a controlled manner. This "limit the torque device," or Limitorque, fundamentally changed the valve control industry. Today, all heavy-duty electric actuators employ some method that limits torque in order to safely operate automated valves while protecting people and property.

In 2012 Flowserve established the Limitorque Fluid Power Systems team with the expressed mission to develop a comprehensive line of fluid power valve actuators that meet the oil and gas industry's most current and stringent standards for safety, performance and reliability. Unlike the modified or re-purposed actuators offered by competitive manufacturers, the engineers specifically designed and built heavy-duty, fluid-power, piston-type Scotch yoke actuation for rotary and linear valve operation.





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Limitorque Timeline

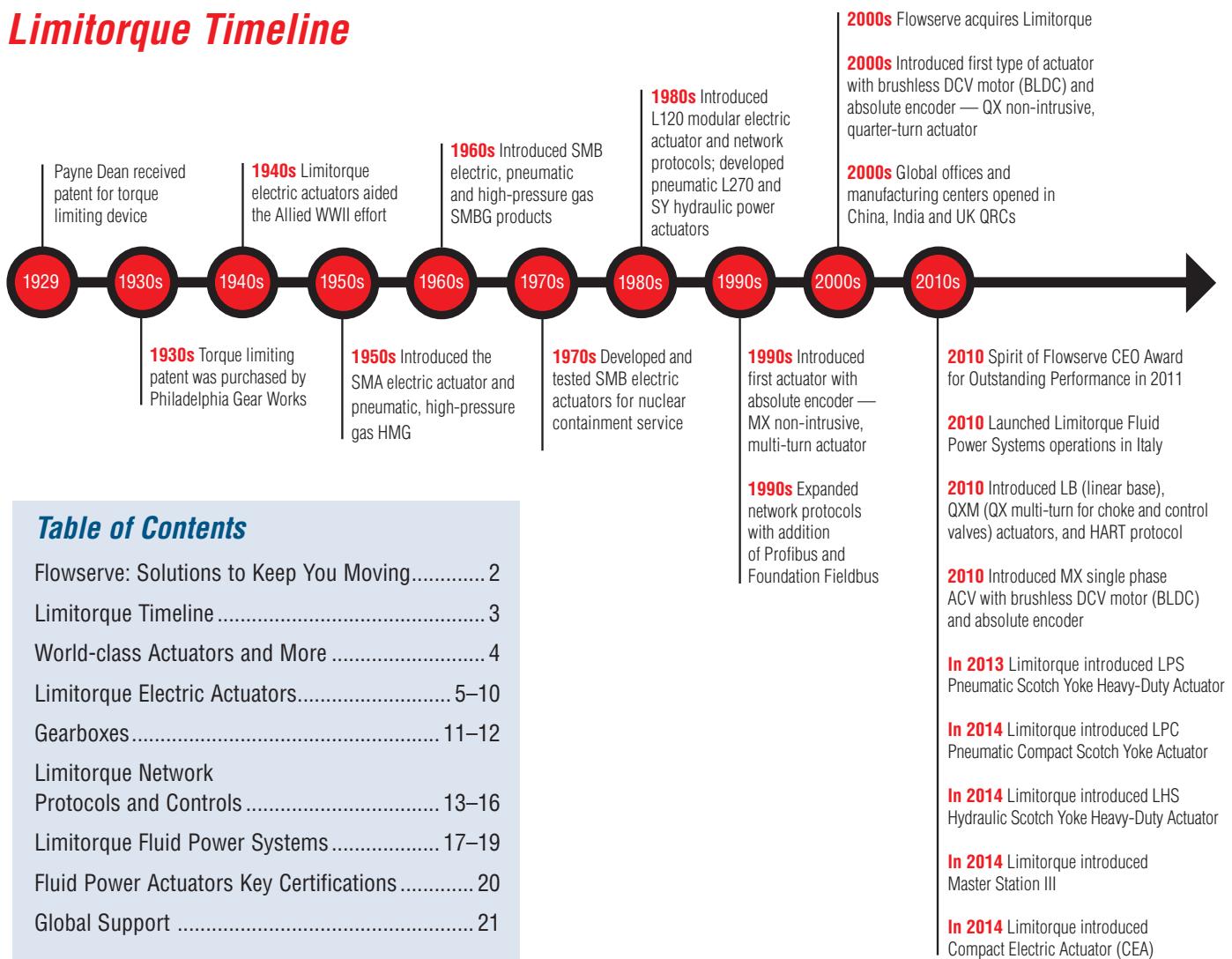


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World-class Actuators and More

Flowserve Limitorque Products

Flowserve Limitorque products help make valve control easier in ways as diverse as the applications in which they are used. Whether you need an electric actuator with the strength to handle 2224 kN (500 000 lb) of thrust, a fluid power actuator to deliver 250 kNm (184 000 ft-lb) or more of torque or a sophisticated control network to precisely orchestrate hundreds of valves, you will find that Limitorque products make the task easier. With almost 90 years of experience in the field of valve control, Flowserve Limitorque understands the particular needs of customers in every major industrial segment. Limitorque actuators are at work in hundreds of thousands of sites around the world, reliably automating valves in some of the harshest conditions imaginable: from scorching desert sands to frozen tundra, from rainforest humidity to the stormy salt spray of offshore oil rigs. Automating industrial valves can help increase safety, raise productivity and reduce operating costs. You can rely on Flowserve Limitorque for extraordinary electric or fluid power actuated valve control.



A Comprehensive Range of Actuators and Controls

Flowserve Limitorque offers its customers a complete menu of proven automation products:

- The unexcelled Limitorque range of heavy-duty electric actuators along with fluid power actuators, designed to meet the arduous demands of the oil and gas industry
- Excellent operating efficiencies for applications from control room performance sequencing and continuous process optimization to configuration for ESD (emergency shutdown) and SIL-rated safety requirements
- A full suite of digital network protocols delivering visibility of diagnostics and configurations





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Limitorque Electric Actuators

Limitorque's range of electric products leads the valve automation industry with innovative products and state-of-the-art solutions. They are available for both multi-turn and quarter-turn operation in the most demanding environmental conditions, with non-intrusive designs offering a full complement of network controls and options, or basic intrusive actuation for simplified control applications.

State-of-the-art, Non-intrusive Actuation

The Flowserve Limitorque QX quarter-turn and MX multi-turn electronic valve actuators lead the industry in quality, safety and ease of use. Both models provide the user with predictable, reliable and safe operation plus extended service life, in the most rigorous applications and extreme environments.



Upon its introduction the MX included innovations that were “market firsts.” The latest MX and QX generations have improved on these versions by adding:

- Non-intrusive design employing selection knobs with solid state Hall-effect devices instead of electro-mechanical reed switches
- Non-contacting, optical and “system on a chip” absolute encoders for accurate position sensing
- Batteries-not-required design for the absolute encoder to retain position data in the event of loss of main power, thus eliminating the need for costly battery maintenance programs or the potential loss of equipment availability due to battery failure
- BIST (BUILT-IN-SELF-TEST) absolute encoders including redundant position sensors and comparator logic for increased reliability and safety
- LimiGard™ technology featuring internal logic that validates the bandwidth of incoming external commands to prevent actuator malfunctions. LimiGard ensures a Fail/No Action operation.
- Graphical display for access to operational data in 11 languages
- Optional Bluetooth® wireless connectivity

Limitorque Electric Actuators

MX Multi-turn, Non-intrusive Actuator

Flowserve Limitorque introduced the MX electric actuator in 1997 as the first smart actuator providing uncompromised reliability and performance in an easy-to-use design.

The next generation MX improves on its market-first innovations: a unique absolute encoder that does not require battery backup; LimiGard technology; easy-to-use menus in 11 languages; and the use of Hall-effect devices to eliminate potentially troublesome reed switches. Altogether, these enhancements provide predictable, reliable and safe operation in the most extreme applications.

The MX includes an absolute encoder with increased span, improved diagnostics capability and built-in self-test (BIST), which verifies and validates the integrity of its components. The reliability of an absolute encoder along with BIST is a major reason that the MX is certified by exida® Certification as capable for use in up to SIL 3 applications. No additional hardware is needed to make the MX SIL capable. Another MX feature, MX Quik, provides an uninterrupted power transfer option during main power losses. This further strengthens the MX position as the only smart actuator with “no batteries required.”

HART protocol is now a communication option to complement Modbus, Foundation Fieldbus H1, PROFIBUS DP_V1 with redundancy, PROFIBUS PA and DeviceNet. Eleven languages are supported, including English, Spanish, French, Italian, German, Portuguese, Japanese (Katakana), Mandarin, Russian, Malay and Turkish. A Device Type Manager (DTM) is also available for Profibus, HART and Foundation Fieldbus.



The MX can be directly mounted to any rising or non-rising stem valve. When combined with a Limitorque WG or HBC series worm gearbox, it can be used to control butterfly, ball and plug valves, as well as damper drives, flop gates or similar devices. MX actuators can also be coupled with Limitorque V series bevel gearboxes or SR series spur gearboxes for motorized operation of multi-turn valves when extended operating times or reduced motor current requirements are required.

The MX uses synthetic oil lubrication, and is suitable for service in temperatures ranging from -60°C (-76°F) to 65°C (150°F). MX actuators are submersible to 15 m (49 ft) for 96 hours under the IP68 standard and are certified for installation into global hazardous environments by Factory Mutual, Canadian Standards Association ATEX and IECEx requirements.

These features, along with an improved graphical dot-matrix display, optional Bluetooth wireless connectivity and the Dashboard Software suite, truly make the MX the next generation in smart actuation.

Actuator Model	Max Torque		Max Thrust		Output Speed
	ft-lb	Nm	lb	kN	RPM
MX-05	55	75	8000	35	15–200
MX-10	125	170	15 000	66	15–200
MX-20	225	305	25 000	111	15–200
MX-40	440	597	36 000	160	15–200
MX-85	1225	1662	50 000	222	22–170
MX-140	1700	2307	75 000	333	22–170
MX-150	1500	2036	75 000	333	165–200



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Limitorque Electric Actuators

QX Quarter-turn Actuator and QXM Limited Multi-turn, Non-intrusive Actuators

QX

The Flowserve Limitorque QX quarter-turn, smart electronic valve actuator mimics the state-of-the-art, multi-turn MX actuator by including a unique absolute encoder for tracking position without the use of batteries.

The QX design provides enhanced safety and reduced downtime through improved diagnostics, built-in self-test (BIST) features and LimiGard fault protection.

The QX design builds on almost 20 years of experience with proven Limitorque MX technology — the first-generation, double-sealed electronic valve actuator from Flowserve designed to provide control, ease of use and accuracy. The QX includes all the user-preferred features of the MX in a quarter-turn, smart actuator package.



QXM

The industry-leading feature set of the QX has been extended to a multi-turn version, the QXM. The QXM is available for up to 20 drive sleeve turns, with speed ranges from 6–24 RPM. When combined with faster speeds, the torque ranges are consistent with the speed required for limited linear travel. All of the MX and QX features are included in the QXM. An optional A1 base can be attached to the QXM to accept multi-turn valve thrust. A linear base is also available for mounting to valves that require more precise process control. It is designed in conjunction with EN 15714, Electric Actuators for Industrial Valves. The QXM has been tested to the Class D, continuous duty modulating requirements of EN 15714 and is capable of modulating up to 1800 starts per hour.

Actuator Model	Max Torque		Operating Speed (Seconds)
QX-1	100	136	5–20
QX-2	250	339	8–30
QX-3	400	542	15–60
QX-4	750	1017	30–120
QX-5	1500	2033	60–120

Actuator Model	Max Torque		Max Thrust		Output Speed	
	ft-lb	Nm	lb	kN	Seconds	RPM
QXM-1	100	135	9065	40	130–400	3
QXM-2	250	339	N/A		195–600	2
QX-1/MH6	90	122	8159	36	65–200	6
QX-1/ML6	45	61	3173	14	65–200	6
QX-1/MH12	78	106	7071	31	33–100	12
QX-1/ML12	48	65	5786	26	33–100	12
QX-1/MH18	55	75	4986	22	22–67	18
QX-1/ML18	33	48	4080	18	22–67	18
QX-1/MH24	38	52	2538	11	16–50	24
QX-1/ML24	22	30	2077	9	16–50	24

Continued on next page

Limitorque Electric Actuators

QX Quarter-turn Actuator and QXM Limited Multi-turn, Non-intrusive Actuators

Continued from previous page

Brushless DC Motors

The QX family of actuators was the first non-intrusive actuator to employ advanced brushless DC motors. BLDC motors eliminate sparks, reduce mechanical and electrical noise, and dissipate heat better than motors with brushes. The brushless actuator design lasts longer than conventional motors and allows for more accurate positioning while permitting a global range of voltages (single-phase and three-phase ACV and DCV) to be connected without modification.

Other features include a graphical dot-matrix display allowing 180-degree rotation and supporting 11 languages: English, Spanish, French, Italian, German, Portuguese, Japanese (Katakana), Mandarin, Russian, Malay and Turkish.



Optional Bluetooth wireless connectivity with a range up to 10 meters enables easy transfer of diagnostic information to a PDA or laptop computer when used with Flowserve Limitorque Dashboard Windows®-based software.

Network communications such as Modbus, Foundation Fieldbus H1, DeviceNet, HART, Profibus DP_V1 redundancy and Profibus PA offer the user remote accessibility to a vast array of status alarm and diagnostic data that is embedded in the QX. A Device Type Manager (DTM) is also available for Profibus, HART and Foundation Fieldbus.



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Limitorque Electric Actuators

Limitorque Intrusive Electric Actuators

L120 Multi-turn Actuator

The Flowserve Limitorque L120 series, with more than 25 years of field-proven reliability, is a long-standing product of choice for any valve requiring either rotary or linear actuation. Regardless of the valve design, the L120 performs consistently and predictably in any situation demanding positive, dependable control.

The L120 can be directly mounted to any rising or non-rising stem valve. When combined with a Limitorque WG or HBC series worm gearbox, it can be used to control butterfly, ball and plug valves, as well as damper drives, flop gates or similar devices. For motorized operation of multi-turn valves when extended operating times or reduced motor current requirements are required, L120 actuators can be coupled with Limitorque V series bevel gearboxes or SR series spur gearboxes.

For high-speed or high-temperature applications, the L120-190, 420 and 800, covering thrust requirements from 334 to 1112 kN (75 000 to 250 000 lb) and torque requirements from 2584 to 10 846 Nm (1900 to 8000 ft-lb), are available with spring compensation packages for high-speed temperature applications.



The L120 is factory-lubricated, suitable for weatherproof service in temperatures ranging from -40°C (-40°F) to 65°C (150°F), as well as explosion proof and temporary submersion applications. Weatherproof enclosures meet NEMA 4 standards, as well as NEMA 6, IP67, and IP68 submersible standards. Explosionproof actuators meet Factory Mutual and Canadian Standards Association requirements.

Basic integral control packages and the UEX electronic control package with MX-style functionality are also available. The UEX offers optional digital communication boards for the five supported network protocols available with the MX and QX.

Actuator Model	Max Torque		Max Thrust		Output Speed
	ft-lb	Nm	lb	kN	RPM
L120-10	100	136	10 000	45	10-250
L120-20	200	272	20 000	90	10-250
L120-40	400	544	30 000	135	20-250
L120-85	850	1156	45 000	203	20-192
L120-190	1900	2584	75 000	338	20-196
L120-420	4200	5712	140 000	630	16-196
L120-800	8000	10 880	250 000	1125	10-168
L120-2000	20 000	27 200	500 000	2250	10-60

Limitorque Electric Actuators

SMB Multi-turn Actuator

With more than 50 years of proven performance and reliability, the eight models in the Flowserve Limitorque SMB series offer rugged dependability from the smaller SMB-000 through the industry's largest electric valve actuator, the SMB-5XT. An extensive gearing selection for each actuator size delivers unmatched versatility for meeting exacting operating speed requirements. Three-phase, single-phase, pneumatic and DC motors are available to meet wide ranges of power and speed. Optional controls include an integral reversing starter and control voltage transformer package, an actuator-mounted control station, and position indication feedback.

The SMB is well suited to applications involving gate and globe valves, sluice gates and other applications where long-term, uncompromised, reliable operation is critical. Fully qualified for use in nuclear power generating plants, the SMB is the recognized veteran of the nuclear power industry. The SB, a high-speed, high-temperature version of the SMB, is also available. The SMB, when coupled to the V or SR series gearboxes for multi-turn applications, or with the HBC or WG for quarter-turn valve applications, can be counted on to provide long-lasting performance.



For critical and/or severe service, the decades-long history of reliable and dependable performance clearly demonstrates the lasting value of SMB and SB actuators.

The more severe the service, the more rugged the electric actuator required to withstand and reliably work in that environment. The SMB has a long-standing and well known reputation for performance in harsh environments like those in refinery coker units. The SMB has decades of proven performance in these types of difficult applications.

Actuator Model	Max Torque		Max Thrust		Output Speed
	ft-lb	Nm	lb	kN	RPM
SMB-000	120	163	8000	36	12-250
SMB-000	260	353	14 000	62	10-250
SMB-000	700	949	24 000	107	10-250
SMB-1	1100	1491	45 000	200	10-250
SMB-2	1950	2644	70 000	311	10-250
SMB-3	4200	5694	140 000	623	10-250
SMB-4	8300	11 253	250 000	1112	10-250
SMB-5	20 000	27 116	500 000	2224	12-55
SMB-5XT	60 000	81 350	N/A	N/A	12-55



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Limitorque Electric Actuators

Limitorque Compact Electric Actuator (CEA) Series

Flowserve Limitorque now offers the CEA electric actuator, which brings new levels of performance and reliability when automating small- to medium-sized valves. The CEA features a multitude of user benefits which are combined in one unit to provide a genuine breakthrough in capability for compact, single-phase ACV (to 250 V) or 24–48 DCV electric actuators. Designed for on/off or modulating duty, the CEA is ideally suited for numerous applications, including chemical and water/wastewater treatment industries. Use of intelligent technologies, the range of valve applications and extended service life mean that, for the first time, industrial OEMs and end users specifying single-phase electric actuators can now benefit from enhanced cycle performance and advanced diagnostic capabilities. It is available in seven torque sizes from 17 Nm to 1695 Nm (1500 to 15 000 in-lb).



The CEA is equipped with an absolute encoder patterned after the QX encoder, sensing valve position to less than 1.0% in some applications. Valve torque is sensed from motor current, providing a tried and true method of torque control similar to the method use in the QX. The CEA is available for modulating control and can be outfitted with a full suite of network protocols.

Max Torque		Operating Time
in-lb	Nm	Seconds
15 000	1695	5–10





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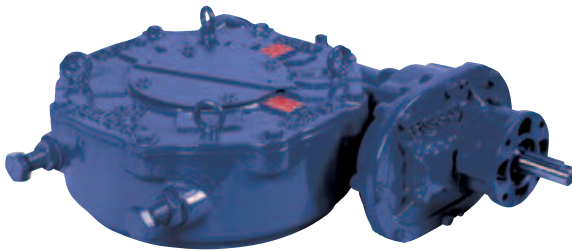


Gearboxes

Limiterque Worm Gear, Bevel Gear and Spur Gearboxes

WG Worm Gearboxes

WG gearboxes are designed to meet the performance requirements and environmental challenges for manual and motorized applications. When combined with Limitorque electric actuators such as the MX, L120 or SMB, the WG quarter-turn, 90-degree and multi-turn, 360-degree gearboxes provide the user with dependable, efficient and economical solutions for valve and damper applications. The WG delivers extraordinary valve and damper control in a wide range of output torques and gearing selections.



Max Torque	
ft-lb	Nm
449 900	610 000



V Series Bevel Gearboxes

The V series of bevel gearboxes offers an extensive range of thrust and torque outputs for multi-turn applications such as gate and globe valves, and slide gates.

Whether controlled manually or motorized with MX, L120 or SMB actuators, V series gearboxes are ideal for any multi-turn application requiring accurate, reliable performance. V gearboxes are suited for weatherproof and temporary submersion applications. The top entry, splined, bronze alloy stem nut is removable from the drive sleeve for thread machining. For very high thrust loads the VH version is available, featuring a bolt-on thrust base with removable stem nut.

Max Torque		Max Thrust	
ft-lb	Nm	lb	kN
38 353	52 000	1 719 800	7650



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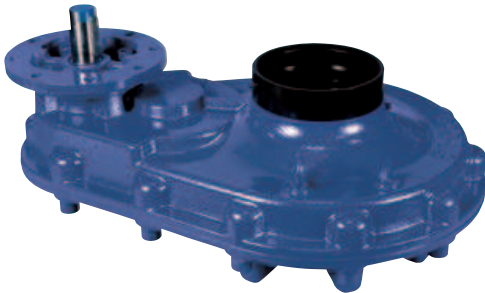
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Gearboxes

SR Spur Gearboxes

The SR series spur gearbox is designed for multi-turn applications for gate and globe valves, and slide gates. The well-designed SR has a top-entry bronze stem nut that is easily removed for thread machining. Ductile iron housings and bearing-supported shafts provide high strength and durability.

SR gearboxes are sealed for weatherproof and temporary submersion applications. When motorized by the Limitorque MX, L120 or SMB electric actuators, the SR delivers reliable operation for a wide range of thrust and torque loads. SRH gearboxes are available for very high thrust loads, with a bolt-on thrust base and removable stem nut.



Max Torque		Max Thrust	Max Thrust
ft-lb	Nm	lb	kN
9588	13 000	519 300	2310



HBC Worm Gearboxes

HBC worm gearboxes have proven their rugged dependability in the nuclear power industry, large damper operations, and power plant flue gas desulphurization applications. Whether controlled manually or with MX, L120 or SMB actuators, HBCs are the right choice for any quarter-turn or multi-turn application requiring accurate, reliable, uncompromised performance. They are commonly used with butterfly, ball and plug valves in power plants, petrochemical installations, pipelines, and water and wastewater treatment facilities. HBCs are available in weatherproof, buried service and submersible constructions.

Max Torque	
ft-lb	Nm
93 000	126 090

Limatorque Network Protocols and Controls

Master Station III

The next-generation master station is designed specifically for use with Limatorque's line of DDC (Modbus) electric actuators. For power, petrochemical, oil and gas, water and wastewater applications, the Master Station III acts as a single-source controller for up to 250 actuators.

The Master Station III is a plug-and-play solution that provides complete control and diagnostics for Limatorque MX, QX, L120 and CEA actuator field units through a simple touch-panel operator interface.

The MSIII offers many key features, including a network time protocol to allow for time synchronization of alarms and diagnostic data to the host device. Intended



for global deployment, multilingual support for English, Spanish, German, French and Italian is standard.

Configuration of the field device register polling schedule provides optimized accessibility to critical networked data using industry standard Modbus RTU or TCP/IP protocols. Three levels of user password protection, entered in to the 40 mm (5.6 in) TFT touch-screen display, allow for varying levels of access to status, configuration and control features, such as email notification of configurable alarm conditions, data/event logging, and control of up to 250 devices.

A user-friendly hardware package provides front access to multiple peripheral ports: Ethernet, USB x 2, VGA and printer/debug. The hardware also offers a modular hot-swappable redundant design to prevent downtime during service.





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Limitorque Network Protocols and Controls

DDC (Modbus)

The DDC (Modbus) valve control network efficiently connects as many as 250 valve actuators directly to an existing host system without adding hardware or new equipment. The network's design also reduces the costs of engineering, cable and installation.

With a simple and reliable communications path between the host system and the network, actuators and other devices (such as pumps and solenoids) can be efficiently automated and monitored from a central control room.

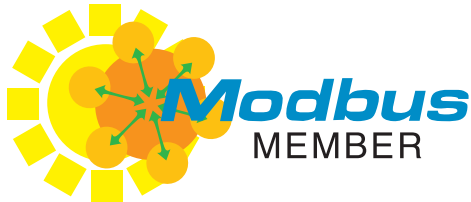
The system's open architecture is compatible with Modbus RTU and ASCII transmission modes, protocols and communication standards, and is easily expanded to include MX, QX, L120 and CEA actuator field units. Limitorque's partnerships with host suppliers ensure that connection and programming can be smoothly accomplished with minimal equipment, effort and cost.

The Limitorque DDC (Modbus) direct-to-host network simplifies valve operation, enhances control and reduces costs.



DeviceNet

DeviceNet is a digital, trunk/drop network that serves as a digital communication network between host controllers and MX/QX actuators. Up to 63 actuators can be connected by a single five-strand, twisted-pair cable to form a DeviceNet network. DeviceNet follows the Open Systems Interconnection (OSI) model, an ISO standard for network communications, and is another communication option of the MX, QX, L120 and CEA actuators. DeviceNet offers the user bit-strobe I/O messaging and a host of other benefits.





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Limitorque Network Protocols and Controls

Foundation Fieldbus H1

Limitorque's Foundation Fieldbus H1 interface for MX, QX, L120 and CEA actuators uses an all-digital, serial, two-way communications system to permit a truly field-distributed control system.

Standard Function Blocks for Analog Output (AO), Digital Output (DO), Digital Input (DI), and Proportional-Integral-Derivative (PID) are used to easily integrate the actuator into the plant control system. These standard Function Blocks permit a seamless interface to control and monitor the actuator with other field instrumentation for increased visibility and control of the plant processes.

Other features of Foundation Fieldbus (FF):

- Increased visibility of actuator status, alarms and diagnostics
- Reduced wiring and wire terminations
- Ease of configuration
- Open standard, non-proprietary fieldbus protocol

The FF field unit may command its actuator to open, stop, close, move to a set position or perform an emergency shutdown operation. Commands to the field unit come over the network from the host system, which may be a PC, distributed control system (DCS), programmable logic controller (PLC) or some other microprocessor-based device. Commands may also be generated in another network actuator or device and transmitted over Fieldbus using publisher/subscriber communication.



ValveSight DTM

Profibus, HART and FF field units support Device Type Manager (DTM) technology via a software component that contains device-specific application information. The DTM can be integrated into Field Device Tool (FDT) frame applications, such as stand-alone commissioning tools or asset management systems that are equipped with FDT interfaces. FDT technology is independent from any specific communication protocol, device software or host system, allowing any device to be accessed from any DCS host through any protocol.

- Reduces commissioning time, maintenance and related operating costs
- Improves productivity by providing a user-friendly graphical interface
- Increases efficiency by enabling network users to communicate in real time with the device and, thus, monitor diagnostics information, including alarms
- Interfaces for offline and online parameterization, configuration, reading status and diagnostic data





Limitorque Network Protocols and Controls

PROFIBUS PB DPV1/PA

The PROFIBUS (PB) field unit is another option for networking and communicating with MX, QX, L120 and CEA actuators. The PROFIBUS communications system is a digital, serial, two-way open bus system that supports a variety of communication rates. The PB field unit allows the actuator to send multiple variables to the control system over a high-resolution and distortion-free digital communication network, providing control and self-test capabilities. This system allows a network host station such as a distributed control system (DCS) or a programmable logic controller (PLC) to control and monitor up to 126 MX, QX, L120 and CEA actuators, including the acquisition of status and alarm data from each actuator.

The PB field unit supports two different communication board options:

- PROFIBUS DP, now available with DTM technology, is designed for redundant or non-redundant communication between a master host station and distributed devices at the field level
- PROFIBUS PA, which is also available with DTM technology, is designed for high-speed and reliable communications, along with the ability to link sensors and actuators to a common fieldbus line, even in potentially explosive areas

A PROFIBUS DP and PA Device Type Manager (DTM) are available to serve as an interface between the MX and QX application software and a host's Field Device Tool (FDT) frame. The DTM can be integrated into FDT frame applications to allow users to perform offline and online parameterization, configuration, and status and diagnostic retrieval.

Limitorque MX/QX HART (Highway Addressable Remote Transducer)

The HART network employs a bi-directional communication protocol, operating at 1200 bits/sec that provides data access among intelligent devices such as Limitorque MX, QX, L120 and CEA electronic actuators and a digital control system (DCS) and/or other monitoring systems. In addition to a digital system, the network simultaneously provides a 4-20 mA analog signal that is proportional to the field unit's primary measured value.

Features and Benefits

The following commands and feedback information can be transmitted and received by an MX/QX HART unit:

- OPEN, CLOSE and STOP commands
- ESD (emergency shutdown) commands
- Partial stroke test (PST) commands
- Go-to-position commands
- Unit output torque (0–100% rating)
- Actuator status, alarm and diagnostic messages
- Burst messages
- Travel histogram
- Event notifications
- LimiGard patented signal monitoring

Limitorque Fluid Power Systems

Limitorque is dedicated to providing heavy-duty, fluid-powered valve actuators and control systems for the oil and gas industry. Every product accounts for the most recent and stringent industry standards for safety and service life, providing users with unprecedented operating life and maintenance intervals.

LPS Pneumatic Quarter-turn Scotch Yoke Actuators

Equipment performance and safety standards continue to evolve and increase across the infrastructure industries. To more aggressively meet these demands, Flowserve Limitorque is offering the LPS pneumatic Scotch yoke actuator — specifically designed to meet or exceed the latest and most rigorous of these requirements.

Features and Benefits

- True modular design permits the flexibility of configuring the actuator in either clockwise (CW) fail close or counter-clockwise (CCW) fail open configurations as needed, including in the field, if necessary
- Fabricated carbon steel Scotch yoke housing, pneumatic cylinder and spring can provide the most rugged actuator available; different construction materials for polar or offshore applications available upon request
- Suitable for use in on/off, modulating and control valve application in general service, protective service and safety applications such as Emergency



Shut Down (ESD) or High Integrity Pressure Protection System (HIPPS)

- Symmetrical and canted Scotch yoke types to perfectly fit valve torque requirement
- End mounted adjustable travel stops $\pm 5^\circ$, available also in enclosed protected version upon request
- Available in standard single-acting spring return and double-acting configurations, in torque ranges up to 250 kNm (184 000 ft-lb); contact factory for larger sizes
- 12 barg (174 psig) maximum allowable working pressure (MAWP)
- -29°C to 100°C (-20°F to 212°F) standard operating temperature range; Low temperature -60°C (-76°F) and high temperature 160°C (320°F) ranges available upon request (polar, cold, arid and tropical temperature requirements in accordance with IEC 60721)
- Suitable for use in safety integrated systems up to and including SIL Level 3 in accordance with IEC 61508
- Full range of accessories: switchboxes; positioners; ESD, PST and line-break functionality; custom control panels; fire protection; manual and hydraulic overrides

Actuator Model	Max Operating Torque		Maximum Operating Pressure		MAWP	
	ft-lb	Nm	psig	barg	psig	barg
LPS-15	4057	5500	Variable for every cylinder size Please refer to Technical Bulletin LFENTB0001		174	12
LPS-20	8113	11 000				
LPS-25	14 014	19 000				
LPS-30	28 027	38 000				
LPS-35	51 629	70 000				
LPS-40	103 259	140 000				
LPS-45	Consult Factory		Consult Factory			
LPS-50						
LPS-60						



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Limitorque Fluid Power Systems

LPC Compact Pneumatic Scotch Yoke Actuators

The Limitorque Pneumatic Compact (LPC) Scotch yoke is a robust yet lightweight, modular, pneumatic, piston-type actuator design, with nodular ductile cast iron or carbon steel housing and carbon steel ENP cylinders. The LPC actuator is available in both spring-return and double-acting configurations, with an easy field conversion feature from Fail Close Clockwise to Fail Open Counter-Clockwise. With a maximum allowable working pressure of 12 barg (174 psig), it is ideally suited for smaller size valves and those requiring less than 1600 Nm (1180 ft-lb) of maximum output torque. The LPC is fully complementary to the LPS, employing a similar design philosophy and meeting the same industry specifications, but in a more compact, lower cost package.



Features and Benefits

- Symmetrical and canted Scotch yoke types to perfectly fit valve torque requirement
- Upon request, available in balanced weight configuration, with cylinder and spring installed on opposite sides of central body
- Suitable for use in on/off, modulating and control valve application in general service, protective service and safety applications such as ESD or HIPPS
- -29°C to 100°C (-20°F to 212°F) standard operating temperature range; Low temperature -60°C (-76°F) and high temperature 160°C (320°F) ranges available upon request (polar, cold, arid and tropical temperature requirements in accordance with IEC 60721)
- End mounted adjustable travel stops $\pm 5^\circ$, available also in an enclosed protected version upon request

Actuator Model	Max Operating Torque		Maximum Operating Pressure		MAWP	
	ft-lb	Nm	psig	barg	psig	barg
LPC-05	369	500	Variable for every cylinder size		174	12
LPC-10	1180	1600	Please refer to Technical Bulletin LFENTB0002			

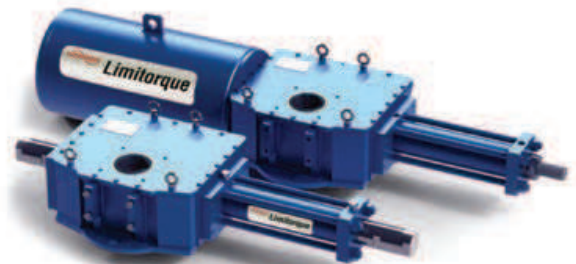
Limitorque Fluid Power Systems

LHS Limitorque Hydraulic Scotch Yoke Actuators

The Limitorque Fluid Power family of heavy-duty actuators includes the Limitorque Hydraulic Scotch yoke actuator (LHS).

Often lighter and more compact than its LPS counterpart, the LHS offers a choice for those preferring hydraulic motive power. For some, such as those working in an offshore environment, it may be the only practical option in terms of fluid-power availability and performance requirements.

The LHS Limitorque hydraulic actuators have a robust, modular Scotch yoke design, and are available in both spring-return and double-acting configurations. They are suitable for actuating ball, butterfly and plug valves or any other quarter-turn applications. LHS hydraulic actuators deliver up to 250 kNm (184 000 ft-lb) of precisely controlled controlled torque (contact factory for larger sizes).



Features and Benefits

- Symmetrical and canted Scotch yoke types to perfectly fit valve torque requirement
- Fabricated carbon steel Scotch yoke housing, hydraulic cylinder and spring can, providing the most rugged actuator available; different materials of construction for polar or offshore applications upon request
- Suitable for use in on/off, modulating and control valve application in general service, protective service and safety applications such as ESD or HIPPS
- -29°C to 100°C (-20°F to 212°F) standard operating temperature range; Low temperature -60°C (-76°F) and high temperature 160°C (320°F) ranges available upon request (polar, cold, arid and tropical temperature requirements in accordance with IEC 60721)
- End mounted adjustable travel stops $\pm 5^\circ$, available also in enclosed protected version upon request

Actuator Model	Max Operating Torque		Maximum Operating Pressure		MAWP	
	ft-lb	Nm	psig	barg	psig	barg
LHS-15	4057	5500	Variable for every cylinder size Please refer to Technical Bulletin LFENTB0003		3000 (*)	207 (*)
LHS-20	8113	11 000				
LHS-25	14 014	19 000				
LHS-30	28 027	38 000				
LHS-35	51 629	70 000				
LHS-40	103 259	140 000				
LHS-45	Consult Factory		Consult Factory			
LHS-50						
LHS-60						

* MAWP 345 barg (5000 psig) available upon request



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LPS, LPC, LHS Fluid Power Actuators

Key Certifications and Standards Compliance

- Available according to ATEX 94/9/EC Ex II 2GD c IIC T6
- NEMA4 and NEMA4X per NEMA 250
- IP66/IP66M and IP67/IP67M configurations
- Manufactured and tested in compliance with ISO 9001 and EN 15714 Part 3 for pneumatic actuators and Part 4 for hydraulic actuators
- Actuator spring design in compliance with EN 13906
- Available valve interface in compliance with ISO 5211
- Corrosion protection in compliance with ISO 12944-2 and EN 15714; optionally available up to and including C5-M
- Available in compliance with NACE specification MR0175 for sour gas applications
- Available for use in safety integrated systems up to and including SIL Level 3 in accordance with IEC 61508
- Available in compliance with PED 97/23/EC, ASME BPVC Sec. VIII Div. 1, EN 13445-3 Part 2 for Unfired Pressure Vessels
- Available according to CU TR and GOST-R

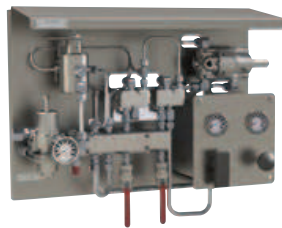


Control System Options

Limatorque offers a selection of standard and custom controls packages for most applications to meet customers' needs for short-lead time, low cost solutions.

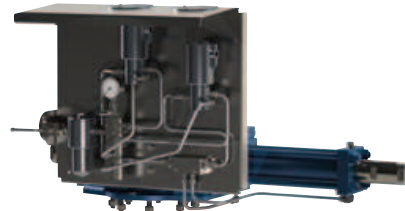
Pneumatic Systems

- PST
- ESD
- Quick-closing
- Modulating/CV functionality
- Quick exhaust valve with flow regulator suitable for closed loop assembly, when required
- Cylinder integral quick exhaust valve for fast-acting actuators
- Pneumatic booster (¼ in, ½ in, 1 in size, AL and 316 SS)
- 3/2 and 5/2 pneumatic piloted valve with manual reset and override (¼ in, ½ in, 1 in size, AL and 316 SS)
- Unidirectional and bidirectional flow regulator valve (¼ in, ½ in, 1 in size, AL and 316 SS)
- Compact fittings to reduce pipe and control dimensions (¼ in, ½ in, 1 in size, AL and 316 SS)



Hydraulic Systems

- Hydraulic control panels
- Hydraulic Power Units (HPU)
- Hydraulic Accumulators Racks
- Self-Contained Units (SCU)
- Electro-Hydraulic Integrated Solutions, upon request





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Flowserve Limatorque's determination to make valve control easier is reflected in a comprehensive customer support program.



Global Support for the Latest Valve Control Technology

Support begins before the sale, when customers turn to Flowserve experts for technical assistance in selecting the proper equipment. After the sale, Limatorque customers are backed by 200 factory-trained service technicians. Stationed around the globe, these technicians are available to assist with installation, commissioning and maintenance.

Service

Limatorque customers find their needs met by factories, stocking distributors, parts/service centers and sales offices in more than 100 cities around the world. A network of Flowserve Limatorque Blue Ribbon and global Quick Response Centers with authorized technicians have exclusive access to advanced factory-based engineering resources, repair procedures and information, providing the best in parts and service.

This global Flowserve network ensures that the end user, engineer, contractor or valve manufacturer can access parts and service through a local office.

Technical Support

Internet technology also plays a part in the Limatorque customer service support program. Using the

Flowserve Limatorque website, customers can access key information around the clock, including product specifications and local service contacts. Customers can also use the website for downloading sales and technical literature from the continuously expanding Limatorque library of detailed documentation.

Online documentation (at www.flowserve.com/limatorque) includes sales brochures, specification bulletins, and installation and operation manuals.

Training

Customers can receive individualized hands-on instruction at the Learning Resource Center (the Flowserve national training facility in Dallas, Texas, USA), Flowserve Limatorque's Lynchburg, Virginia, USA headquarters. Training is also offered at Limatorque Houston, Texas, USA, the Limatorque Mezzago, Italy training facilities, and at sales offices located around the world. Training includes proper equipment selection, installation, commissioning, and maintenance of valve actuators and controls.



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Automax Valve Automation Systems *Pneumatic Actuators and Accessories*

RG Series Scotch Yoke

- IP67M Approved
- SIL 3 Capable



Experience In Motion



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Flow Control Division Automax Valve Automation Systems

Flowserve Corporation's Automax Valve Automation Systems provides complete valve and damper automation to the worldwide processing industries. We provide maximum value to the end user through a broad offering of products, services, application engineering and our systematic approach to automation.



Quality, Dependability and Productivity

Recognized as the leader in valve automation systems, Automax pneumatic actuators can automate valves with torque values from 25 to 2.2 million in-lbs (2.8 - 248,566Nm). Actuators are available in a wide range of materials suitable for use in the most demanding applications. Flowserve also offers a comprehensive range of NAMUR Controls and accessories such as lockout modules and gear overrides. To complete the package Flowserve can provide engineering design services for AutoBrakit Mounting hardware. To complete the package Flowserve can provide engineering design services for automation mounting brackets, "AutoBrakit" and mounting hardware.

Automax



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SuperNova

SuperNova B Series Rack and Pinion actuators are designed for butterfly, plug or ball valves, and offer one compact design for double acting and spring return. Precision die-cast pistons with large cylinder bearings increase efficiency and cycle life. Available in torque ranges from 25 to 58,000 in-lbs, for optimum actuator sizing.

Controls & Accessories

The actuator is the heart of an automation system, but control accessories are important in creating a complete system to meet increasingly sophisticated customer requirements. Solenoid valves and related accessories with NAMUR interfaces provide direct, modular mounting on actuator. Switches, Positioners, Gear Overrides and Lockout Modules can also be integrated into the assembly. Automation mounting brackets, "AutoBrakit" with mounting hardware are engineered to assure consistency and proper alignment

Stainless Steel

The SXL® Series utilizes a 316 Series stainless steel housing and is ideal for use in corrosive environments. It is available in both double acting and spring return and can be supplied with optional stainless steel internals. For sanitary applications the housing can be polished. Available in torque ranges from 78 to 7279 in-lbs.

Heavy-Duty RG Series RG1 - RG8

A complete line of Scotch Yoke heavy-duty actuators provides torques from 950 to 2.2M in-lbs. The combination of Scotch Yoke actuators plus Rack and Pinion actuators offers the opportunity to standardize on one source for your complete quarter-turn automation needs. Scotch Yoke actuators can also be configured with high pressure hydraulic cylinders.



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Sales and service facilities are strategically located in industrial centers throughout the world.



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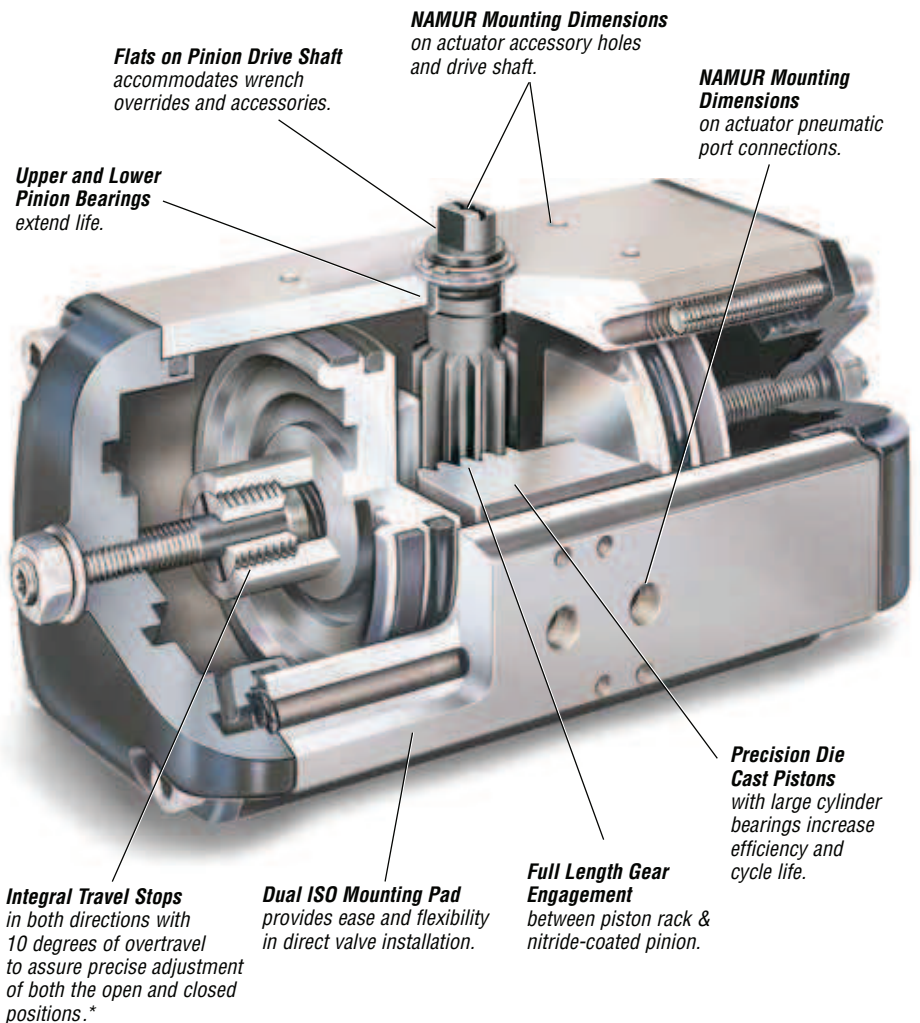


SuperNova B Series Double Acting

Rack & Pinion Actuators are designed for automating butterfly, plug or ball valves and dampers. The actuators incorporate a precision-extruded hard anodized aluminum body and a one-piece nitride-coated pinion gear, factory lubricated for a long trouble-free life. Actuators are designed for 100-degree travel with clockwise and counterclockwise travel adjustment for open and closed positions.



Broad size range offers optimum actuator sizing for each valve requirement.



Flats on Pinion Drive Shaft accommodates wrench overrides and accessories.

NAMUR Mounting Dimensions on actuator accessory holes and drive shaft.

NAMUR Mounting Dimensions on actuator pneumatic port connections.

Upper and Lower Pinion Bearings extend life.

Precision Die Cast Pistons with large cylinder bearings increase efficiency and cycle life.

Integral Travel Stops in both directions with 10 degrees of overtravel to assure precise adjustment of both the open and closed positions.*

Dual ISO Mounting Pad provides ease and flexibility in direct valve installation.

Full Length Gear Engagement between piston rack & nitride-coated pinion.

* Bidirectional travel stops are available via a bottom-mounted Travel Stop Module on models SNA250 & SNA 300.



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SuperNova B Series Spring Return



The most useful properties of the oxide coating are:

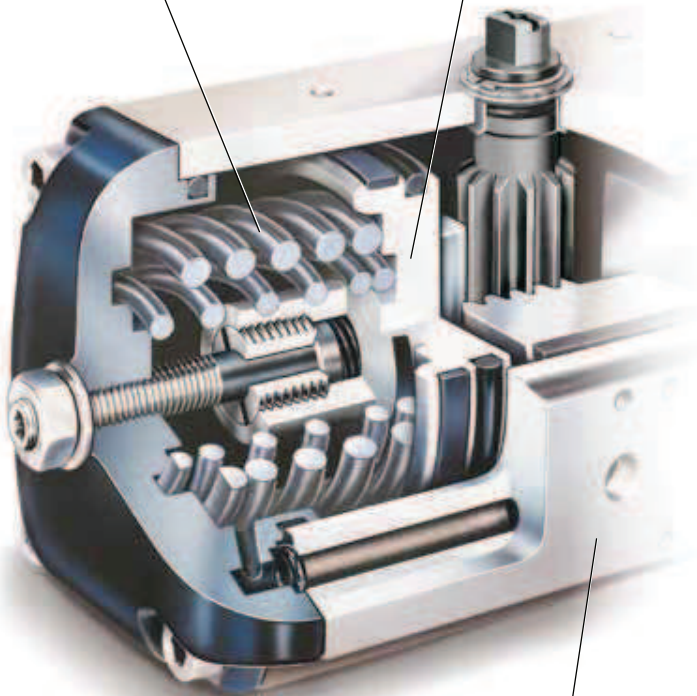
- The oxide coating is integral with the base substrate and will prevent spalling from impact, thermal shock, or high temperatures up to aluminum's melting point. The oxide has negligible effect on the other properties of aluminum.
- Aluminum oxide is one of the hardest materials known with a hardness of corundum (45 to 65 Rockwell C). Further, abrasion tests show only half as much wear as hardened steel.
- Aluminum oxide is relatively stable and chemically inert. The Oxide is usually stable over a pH range of 4.5 to 8.5 but can be dissolved by strong acids and alkalis. It normally resists concentrated nitric acid at a pH 1 and ammonium hydroxide at pH 13, so consult factory for chemical compatibility.

One Compact Design

for double acting and spring return is easily field convertible by installing or removing springs.

Field Reversible

action simply by rotating pistons 180°.



Corrosion Resistant

hard anodized aluminum housings with stainless steel fasteners.

Automax Aluminum Alloy

Hard anodic oxidation is an electrolytic conversion process which results in the formation of an oxide film. Continuation of the process produces the "hard" anodic coating to more than 50µm. The chemical composition provides the optimum alloy for strength, abrasion resistance, cold working and chemical resistance.



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MaxGuard™ Severe Service Actuator

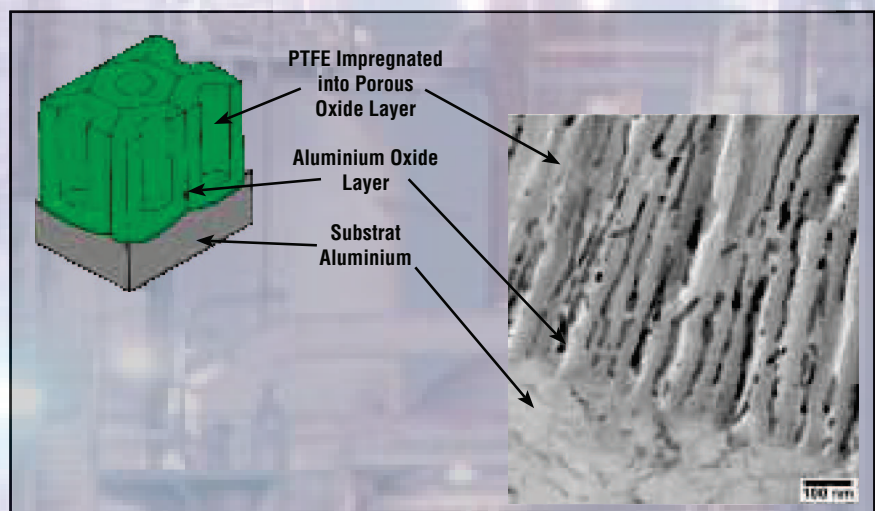
The MaxGuard™ process is designed to provide maximum protection against corrosive environments. The patented MaxGuard™ formula is a chemical conversion process specifically developed for anodized aluminum alloys. During the anodizing process PTFE is impregnated into the aluminum oxide layer. A 2MIL (50µm) protective layer imparted with PTFE is created.



- **Superior Chemical Resistance**
- **Increased Internal/External Wear Resistance**

This advanced process was originally developed by the U.S. Dept. of Defense and applied to aluminum material deployed for deep space exploration. The MaxGuard™ coating complies with the following specifications:

- MIL-A-63576A-Type1-Aluminum Oxide Coating - Lubrication
- MIL-A-8625 (Anodic Coatings)
- ASTM B 117 (Salt Spray Testing)





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The MaxGuard™ process is applied to the actuator body and both end caps providing an armored layer of protection – both internal and external.

Recommended Applications:

Acids / Caustics

Chemical

Offshore

Wash down

Coastal (Desalination)



Specify MaxGuard™ for the following products:

- SuperNova B050 – B200
- SuperNova SNA250 – SNA300



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FLOWSERVE

AUTHORIZED Distributor

SuperNova B Series

Torque Outputs

Model	Spring			Air Supply (psi)					
	No	End	Break	60		80		100	
				End	Break	End	Break	End	Break
B050	5	36	55	56	76				
	6	43	64	46	69				
	7	49	73	35	63	74	102		
	8	61	92	15	49	54	88	93	127
	9	73	110			34	74	73	113
B063	6	68	102	103	141				
	7	79	119	85	128				
	8	90	136	66	116				
	9	102	153			119	175		
	10	113	170			100	163		
	11	124	186			82	150	153	222
	12	135	203					135	210
B085	6	141	211	215	293				
	7	164	246	177	267				
	8	188	282	138	241				
	9	211	317			248	365		
	10	235	352			209	339	320	463
	11	258	387			171	313		463
	12	282	422					281	437
B100	6	260	390	397	541				
	7	303	455	325	493				
	8	347	520	253	445				
	9	390	585			457	673		
	10	433	651			385	625		
	11	477	716			313	577	589	853
	12	520	781					518	805
B115	6	430	645	656	894				
	7	502	753	537	814				
	8	573	860	418	735				
	9	645	968			756	1112		
	10	717	1075			637	1033		
	11	789	1183			518	954	975	1410
	12	860	1290					856	1331
B125	6	610	915	930	1267				
	7	712	1067	761	1155				
	8	813	1220	593	1042				
	9	915	1372			1071	1577		
	10	1017	1525			903	1464		
	11	1118	1677			734	1352	1381	1999
	12	1220	1830					1213	1887

Note: For additional air supply pressures, consult factory or your AutoSize software program.

Model	Spring			Air Supply (psi)					
	No	End	Break	60		80		100	
				End	Break	End	Break	End	Break
B150	6	1098	1648	1673	2280				
	7	1281	1922	1369	2078				
	8	1465	2197	1066	1875				
	9	1648	2471			1927	2837		
	10	1831	2746			1624	2635		
	11	2014	3020			1320	2432	2485	3597
	12	2198	3295					2182	3394
B175	6	1606	2527	2438	3457				
	7	1899	2907	2079	3133				
	8	2153	3349	1530	2851				
	9	2427	3759			2820	4292		
	10	2701	4170			2366	3989		
	11	2975	4581			1912	3686	3656	5430
	12	3249	4992					3201	5127
B200	6	2343	3516	3568	4864				
	7	2734	4107	2914	4432				
	8	3125	4691	2269	4000				
	9	3515	5277			4106	6053		
	10	3906	5865			3456	5622		
	11	4296	6451			2808	5190	5293	7674
	12	4687	7037					4645	7243
SNA250	6	2854	6591	7421	12025				
	7	3393	7690	6448	11441				
	8	3945	8788	5428	10857				
	9	4519	9887	4373	10273	9780	15450		
	10	5106	10985	3274	9689	8566	14866		
	11	5715	12084			7352	14281	12529	19458
	12	6343	13182			6138	13697	11314	18874
SNA300	6	4744	11096	9931	17473				
	7	5640	12945	8245	16501				
	8	6558	14795	6482	15530				
	9	7512	16644	4658	14559	12669	22326		
	10	8487	18493	2762	13588	10625	21355		
	11	9500	20343			8581	20384	16348	28150
	12	10543	22192			6537	19412	14304	27179

Spring Chart B050²

Spring Group	Spring Combination ¹		
	#1 Spring (inner)	#2 Spring (low rate outer)	#3 Spring (high rate outer)
4	1 ³	1 ³	
5		2	
6	2	1	
7	1	2	
8	2	2	
9	2		2

Spring Chart B063-B200

Spring Group	Spring Combination ¹		
	#1 Spring (inner)	#2 Spring (middle)	#3 Spring (outer)
4		2	
5		1 ³	1 ³
6			2
7	1		2
8	2		2
9	1 ³	1 ³	2
10		2	2
11	1	2	2
12	2	2	2

Notes:

- ¹ #1 Spring has one color code dot
- ² B050 has maximum of 2 springs per endcap
- ³ Install springs on opposite sides

• All dimensions are in inches.

• **SNA250-SNA300 Spring Combinations** – Spring number is total number of springs in endcaps. There should never be a difference in springs per endcap greater than one. Example: SNA250S09 would have four springs in one endcap and five in the other.

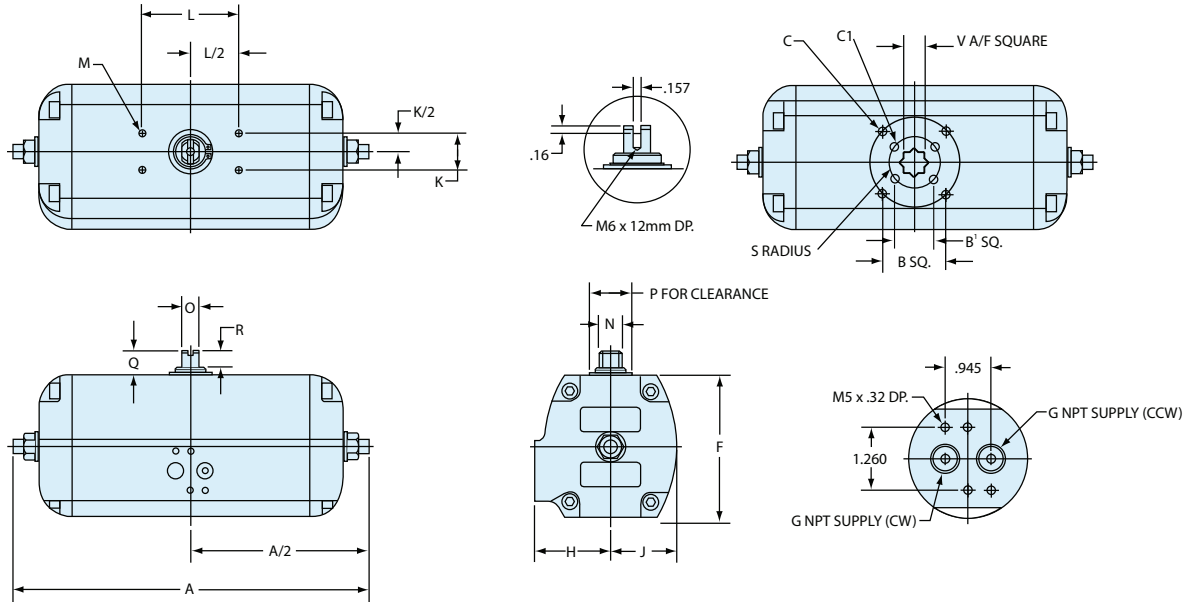


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flowserve.com

Dimensions



Model	ISO	A		B	B'	C	C ₁	D	E	F	G	H	J	K	L	M ^{1,2}	N	O	P	Q	R	Weights (lbs)		Volume (in)		Cycle Time ³	
		DA&SR	180	SQ.	SQ.																	DA	SR	CW	CCW	CW	CCW
B050	F04S11E	6.69	8.70	1.169	N/A	#10-24x.31	N/A	.433	.47	2.56	1/8	1.58	1.14	1.181	3.150	#10-24	.47	.394	.75	.79	.39	2.7	3.1	8.2	5.4	.5	.5
B063	F03/F05S14E	7.95	9.92	1.392	1.002	1/4-20x.31	#10-24x.31	.551	.63	3.19	1/8	1.77	1.40	1.181	3.150	#10-24	.47	.394	.88	.79	.39	3.8	4.4	16	10	.5	.5
B085	F05/F07S17E	9.84	12.13	1.949	1.392	5/16-18x.31	1/4-20x.31	.669	.75	4.15	1/8	2.24	1.87	1.181	3.150	#10-24	.77	.551	1.00	.79	.55	7.5	9.3	34	20	.5	.5
B100	F05/F07S17E	11.65	14.80	1.949	1.392	5/16-18x.31	1/4-20x.31	.669	.75	4.80	1/4	2.48	2.17	1.181	3.150	#10-24	.77	.551	1.38	.79	.55	11.5	14.6	56	38	1	.5
B115	F07/F10S22E	13.47	17.60	2.840	1.949	3/8-16x.39	5/16-18x.31	.866	.98	5.30	1/4	2.91	2.46	1.181	5.118	#10-24	1.10	.787	1.63	1.18	.79	17.7	22.5	94	65	1	1
B125	F07/F10S22E	15.83	20.35	2.840	1.949	3/8-16x.39	5/16-18x.31	.866	.98	5.79	1/4	3.07	2.68	1.181	5.118	#10-24	1.10	.787	2.00	1.18	.79	23.8	30.2	128	90	1	1
B150	F10/F12S27E	19.13	25.20	3.480	2.840	1/2-13x.45	3/8-16x.39	1.063	1.18	6.85	1/4	3.47	3.19	1.181	5.118	#10-24	1.87	1.417	2.38	1.18	.89	40.8	51.2	224	159	2.0	1.5
B175	F10/F14S36E	21.34	28.58	3.897	2.840	5/8-11x.63	3/8-16x.39	1.417	1.57	8.21	1/4	4.17	3.74	1.181	5.118	#10-24	1.87	1.417	2.75	1.18	.89	63.7	77.2	351	232	3.0	2.0
B200	F10/F14S36E	24.41	31.69	3.897	2.840	5/8-11x.63	3/8-16x.39	1.417	1.57	9.39	1/4	4.72	4.25	1.181	5.118	#10-24	1.97	1.417	2.94	1.18	.89	91.5	118	507	332	4.5	3.0

Note:

- Actuator shown in the full clockwise (CW) position as viewed from top.
 - Accessory mounting holes not for gear override or stop block.
 - Cycle times under no load conditions. Air line size, air capacity, and valve torque characteristics affect these cycle times. Faster or slower cycle times can be accomplished using special control components.
- All dimensions are in inches.
 - Double Acting** – Pressure at port “CW” will result in clockwise rotation. Pressure at port “CCW” will result in counter-clockwise rotation.
 - Spring Return** – Pressure at port “CCW” will result in counterclockwise rotation. Springs provide clockwise rotation upon loss of pressure.

How To Order (Select Bold Type Code from each column that applies)

Model	Type	Springs (Select One)* 050 Thru 300	Seals	Materials	Options
B050	D - Double Acting	04	Blank - Buna (Std.)	Blank - Std. Hard Anodized Aluminum	R - Extra Long Travel Stop
B063	S - Spring Return (FCW)	05	L - Low Temp.	K - K-Mass Coated	C - Stainless Steel Pinion/ Snap Ring
B085	C - Spring Return (FCCW)	06	H - Viton (High Temp.)	W - White Epoxy Coated	
B100	M - 180° Double Acting	07		G - Gray Epoxy Coated	
B115		08		X - BlackMax Coating	
B125		09		M - MaxGuard™ Severe Service Actuator	
B150		10			
B175		11			
B200		12			
SNA250					
SNA300					

* Consult torque charts or AutoSize for applicable spring combinations.
 Example: A model B100 spring return (FCW) spring set 10 would be coded as **B100S10**.



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SuperNova

Models SNA250 & SNA300 90° and 180° Actuators



SNA250



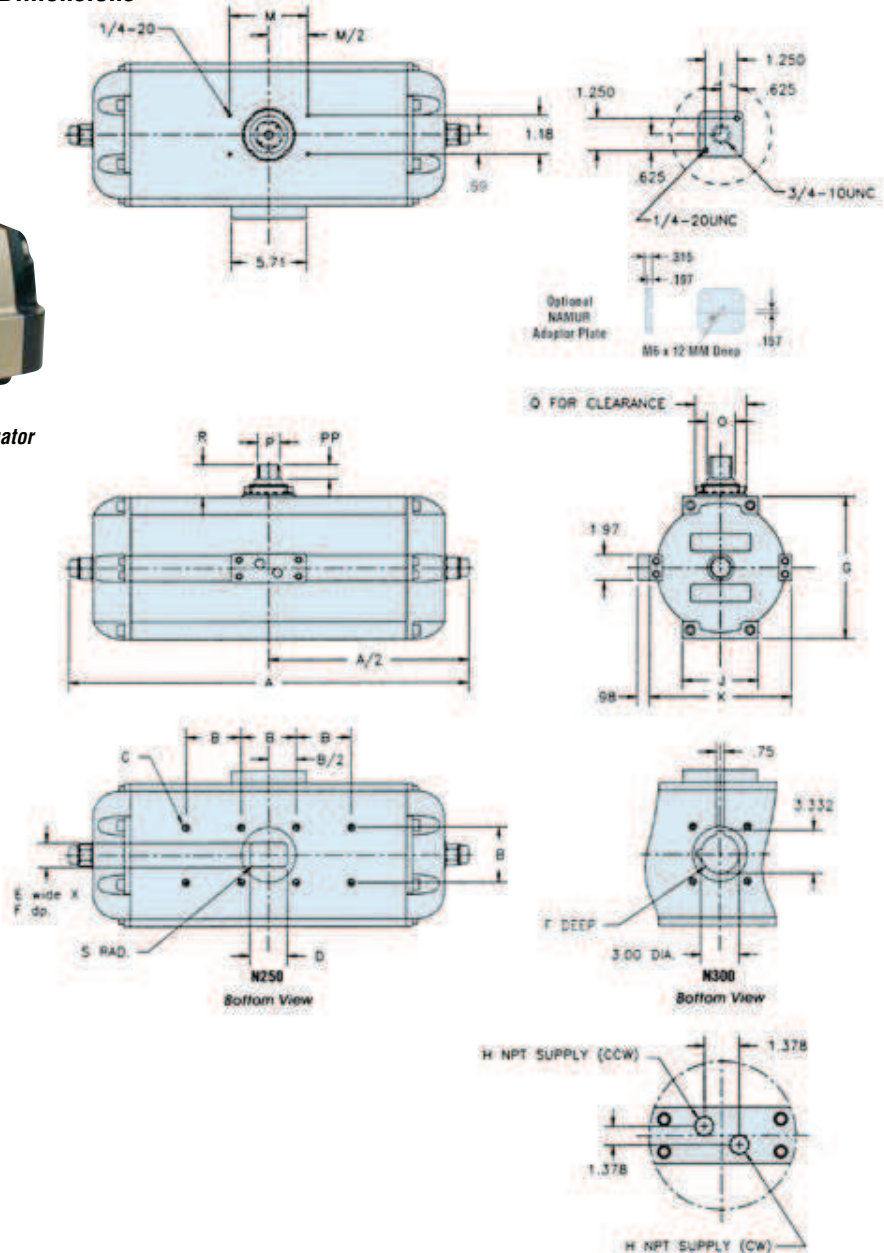
Typical 180° Rotary Actuator

180° Rack & Pinion Actuators

Automax 180 Degree Actuators are available in the same models and with the same torque outputs as the standard SuperNova Double Acting actuators. The integral mechanical, end-of-stroke travel adjustment is for one direction only. As options, travel stops can be furnished for less than 180° travel and an additional travel stop for the other direction can be provided in the valve actuator adaption. Automax has developed economical control circuits and devices to actuate multiport valves both 2 position (0°, 180°) and 3 position (0°, 90°, 180°) utilizing the UltraSwitch. Consult your Automax Representative for assistance in selecting the best control package.

Dimensions for 50-200 size 180° actuators on previous page.

Dimensions



Model	A		B ¹	C	D	E	F	G	H		J	K	M ^{2,3}	O	P	PP	Q	R	S	Weights (lbs)		Volume (in)		Cycle Time	
	DA&SR	180							NPT	1/2										DA	SR	CW	CCW	CW	CCW
SNA250	27.32	39.14	4.250	5/8-11X.63	2.87	1.850	1.81	11.02	1/2	5.91	11.02	5.118	2.20	1.969	0.98	3.75	1.65	.24	137	172	757	720	5-7	5-7	
SNA300	32.60	44.00	5.000	5/8-11X.94	N/A	N/A	2.50	13.39	1/2	6.30	13.39	5.118	2.44	1.969	0.98	3.75	1.65	N/A	217	288	1403	1019	6-9	6-9	

Notes:

- Actuator shown in the full clockwise (CW) position as viewed from top.
- Accessory mounting holes not for gear override or stop block.
- Use studs only to mount. Bolts not recommended.

- All dimensions are in inches.
- Cycle times under no load conditions. Air line size, air capacity, and valve torque characteristics affect these cycle times. Faster or slower cycle times can be accomplished using special control components.

For "How To Order" see page 13



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Controls & Accessories

Controls

S25N Directional Valve*

The Automax Directional Valve mounts directly to SuperNova series actuators which eliminates the cost of tubing and fittings. The valves are available for double acting and spring return actuators with NEMA 4X, 7 & 9, or intrinsically-safe and low power solenoid operators. These valves have been tested and proven reliable for over 1 million cycles.

APS1 Module*

The Automax APS1 module works with the Automax S25N solenoid valve and diverts exhaust air from between the pistons into the spring chamber. This prevents corrosive atmospheres from being pulled into the spring chamber.

APS2 Module*

The Automax APS2 module works with remote/line mounted solenoid valves and diverts exhaust air from between the pistons into the spring chamber. This prevents corrosive atmospheres from being pulled into the spring chamber.

LV1 Lockout & Vent Valve*

The LV1 Lockout and Vent Valve module provides two primary functions. The LV1 may be used with a manual override to shut off supply air and vent actuator ports. The LV1 may also be used as a pneumatic lockout valve which, when properly implemented, will satisfy OSHA Standard 1910.47. The LV1 may be sandwich mounted with other Automax NAMUR accessories or may be used with the NPT1 adaptor.

FC1, FCDA & FCSR*

The 'FC' Series Flow Control modules provide compact flow controls for precise adjustment of SuperNova actuator speeds. The Flow Control Modules may be sandwich mounted with other Automax accessories or may be used with the NPT1 adaptor.



Accessories

"Pharos" NAMUR Indicator*

Provides an economical solution for positive visual indication of the actuator position. Constructed of tough industrial engineered resin, the UltraIndicator can be used on actuators that utilize a NAMUR mounting interface.

UltraSwitch GL/XCL/PL Series Rotary Position Indicators*

The UltraSwitch series of position indicators provides a compact and economical package for both visual and remote electrical indication of valve position. Models are available in both die cast aluminum and non-metallic versions. Suitable for non-hazardous, hazardous and intrinsically-safe applications.

Aviator II and BUSwitch Rotary Position Indicator with Internal Pilot Solenoid*

The Aviator rotary position indicator enclosure with internal pilot solenoid coil provides a truly integrated package. It can easily be converted to a BUSwitch by simply adding a Fieldbus communication printed circuit board.

APEX Modular Positioner*

Epoxy coated aluminium construction, the Apex positioner combines precise valve positioning with advanced features. A modular manifold base allows 3-15 psi pneumatic control signals, or 4-20 mA signals with the addition of the I/P module. Models are available for corrosion resistant applications and hazardous locations as defined by UL, C-UL, ATEX, and SAA.

Lockouts*

The lockout option permits easy lockout of automated valves. Lockouts are designed to withstand the rated output torque of the actuator, with the intent to meet the requirements of OSHA Standard 1910.47 "The Control of Hazardous Energy" (Lockout/Tagout.)

Gear Overrides*

Declutchable gear overrides are options which allow local manual control of actuated valves and dampers. The gear overrides are sized for easy operation and can be combined with other control accessories.

AutoBrakits*

Automax heavy-duty mounting kits are designed to close tolerances to assure consistency and proper alignment, which are essential to ensure maximum actuator and valve cycle life.



* Consult individual catalogs and IOMs for additional information



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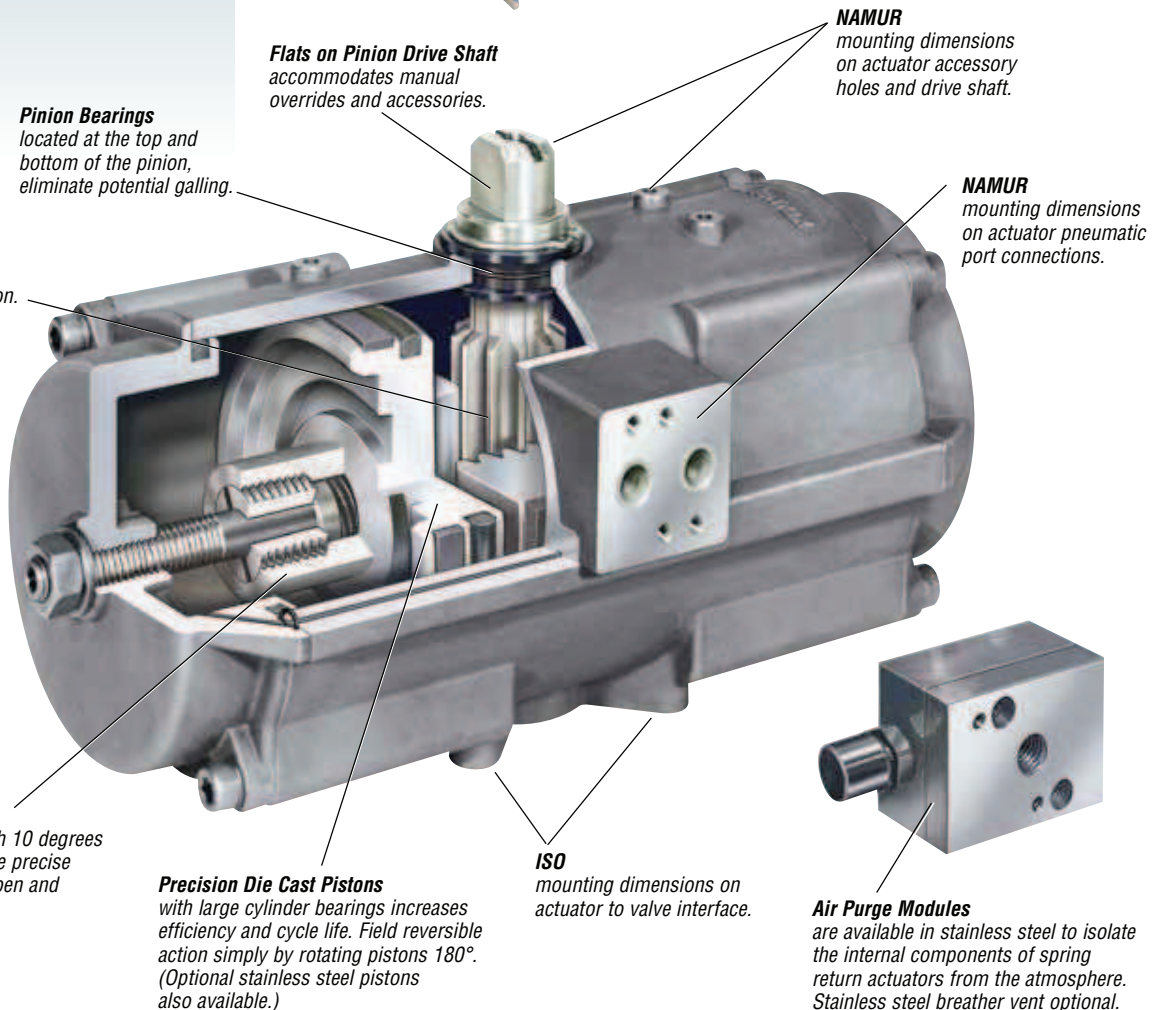
SXL Series Stainless Steel

The SXL Series utilizes a 316 Series stainless steel body and is ideal for use in corrosive environments.



SXL Series

The SXL Series is available in both Double Acting and Spring Return versions with a maximum double acting torque output of 7,279 in-lbs. It can be supplied with stainless steel or aluminum pistons and springs per customer requirements and is also available with optional polished finishes for sanitary applications.



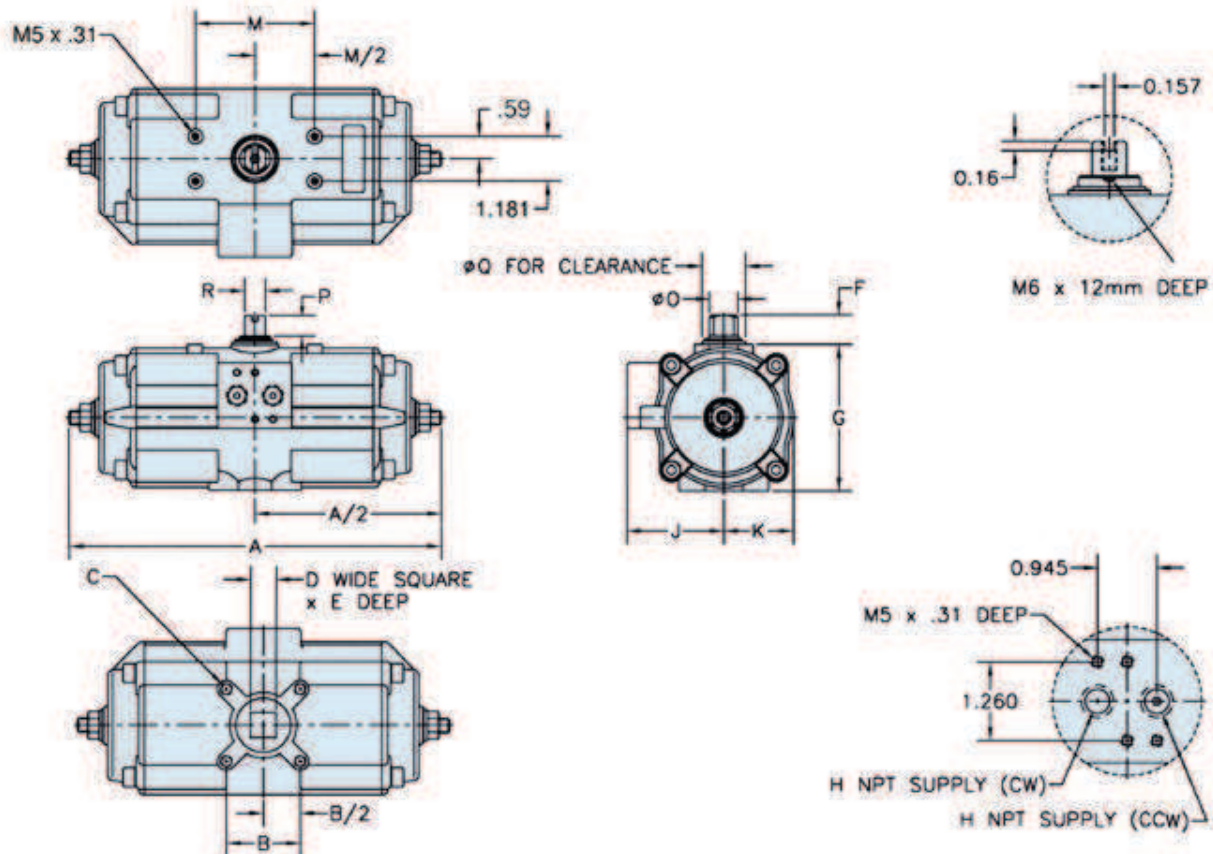


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Dimensions



Model	ISO	A SQUARE	B ¹	C	D	E	F	G	H	J NPT	K	M ^{2,3}	O	P	Q	R	Weights (lbs)		Volume (in)		Cycle Time	
																	DA	SR	CW	CCW	CW	CCW
SXL050	F04S11M	6.69	1.169	M5 x .31	.433	.47	.79	2.56	1/8	1.85	1.18	3.150	.56	.39	.83	.39	4.85	5.15	8.2	5.4	.5	.5
SXL063	F05S14M	7.95	1.392	M6 x .31	.551	.63	.79	2.56	1/8	2.11	1.44	3.150	.56	.39	.91	.39	7.05	7.80	16	10	.5	.5
SXL085	F07S17M	9.84	1.949	M8 x .31	.669	.79	.79	3.94	1/8	2.60	1.87	3.150	.77	.55	1.18	.55	11.24	13.18	34	20	.5	.5
SXL100	F07S17M	11.65	1.949	M8 x .31	.669	.79	.79	4.57	1/4	2.95	2.	3.150	.77	.55	1.46	.55	16.09	19.02	56	38	1	.5
SXL115	F10S22M	13.46	2.840	M10 x .31	.866	.98	1.18	5.16	1/4	3.23	2.46	5.118	1.38	.79	1.77	.79	23.14	27.55	94	65	1	1
SXL125	F10S22M	15.83	2.840	M10 x .31	.866	.98	1.18	6.61	1/4	3.43	2.70	5.118	1.38	.79	2.17	.79	38.14	45.12	128	90	1	1
SXL150	F12S27M	19.13	3.480	M12 x .47	1.063	1.14	1.18	6.61	1/4	3.94	3.19	5.118	1.97	.89	2.64	1.42	51.14	61.50	224	159	2	1.5

Notes:

- ¹ Actuator shown in the full clockwise (CW) position as viewed from top.
- ² Accessory mounting holes not for gear override or stop block.
- ³ Use studs only to mount. Bolts not recommended.

- All dimensions are in inches.
- Cycle times under no load conditions. Air line size, air capacity, and valve torque characteristics affect these cycle times. Faster or slower cycle times can be accomplished using special control components.

How To Order (Select Bold Type Code from each column that applies)

Model	Type	Springs (Select One)* 050 Thru 300	Seals	Materials	Options
SXL050	D - Double Acting	04	Blank - Viton (Std.)	Blank - Std. Hard Anodized Aluminum	R -Extra Long Travel Stop
SXL063	S - Spring Return (FCW)	05	L - Low Temp.	K - K-Mass Coated	M -Stainless Steel Springs
SXL085	C - Spring Return (FCCW)	06		F - Polished	P -Stainless Steel Pistons
SXL100		07			
SXL115		08			
SXL125		09			
SXL150		10			
		11			
		12			

Example: A model SXL100 spring return (FCW) spring set 10 would be coded as **SXL100S10**.



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RG Series

Heavy-Duty Scotch Yoke Actuator

The Automax RG Series provides up to 2.2 million in-lbs of heavy-duty Scotch yoke torque. Enhanced performance is achieved by using a superior yoke support system that significantly reduces transverse loads.



Features

- True Modular Design
- On-Off, Multi-Position and Throttling
- Pneumatic, Gas and Hydraulic Models
- Spring Return "Fail Safe" and Double Acting
- Torque Outputs:
 - DA – 2.2M in-lbs (248K Nm)
 - SR – 1.2M in-lbs (124K Nm)
- Operating Pressures:
 - Pneumatic: 40-150psi
 - Hydraulic: 500-3000psi

IP67M Ingress Protection

O-Rings or dynamic quad seals are utilized to conform to IP67M specifications, ensuring optimal ingress protection.

Modular Construction

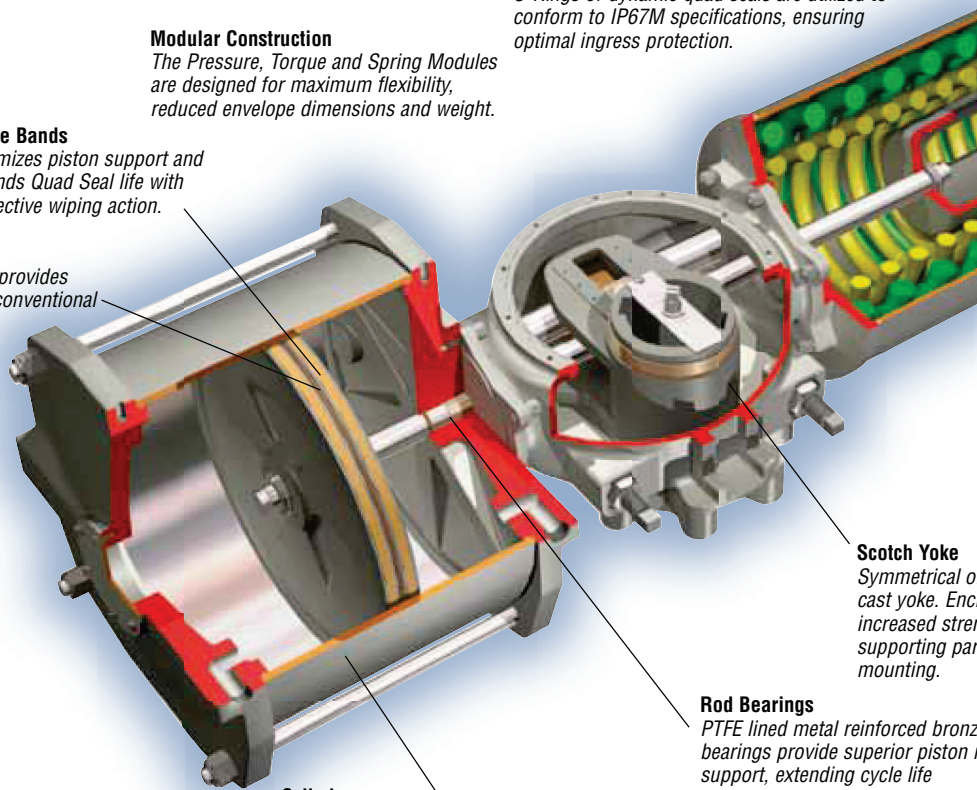
The Pressure, Torque and Spring Modules are designed for maximum flexibility, reduced envelope dimensions and weight.

Guide Bands

Optimizes piston support and extends Quad Seal life with protective wiping action.

Piston Seals

Dynamic Quad Seal design provides enhanced cycle life versus conventional O-Rings.



Scotch Yoke

Symmetrical or canted ductile iron cast yoke. Enclosed yoke slot for increased strength with 2 keyways supporting parallel or perpendicular mounting.

Rod Bearings

PTFE lined metal reinforced bronze bearings provide superior piston rod support, extending cycle life

Cylinder

Heavy wall cylinders provide increased "job site" durability. Interior surface is honed and hard chrome plated to provide superior corrosion and wear resistance.



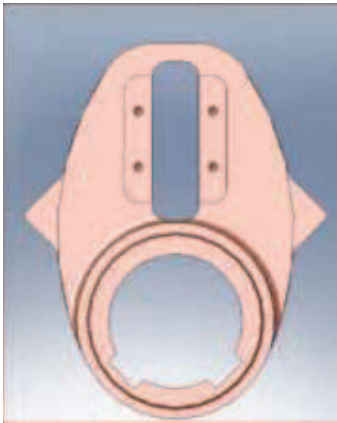
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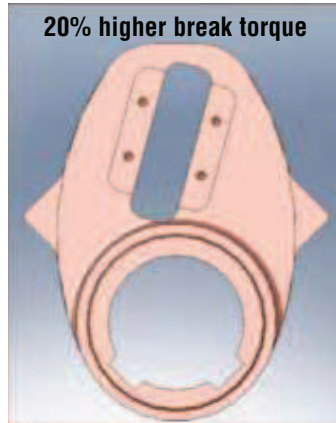
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RG Series

Heavy-Duty Scotch Yoke Actuator



Symmetrical Yoke



Canted Yoke

Features

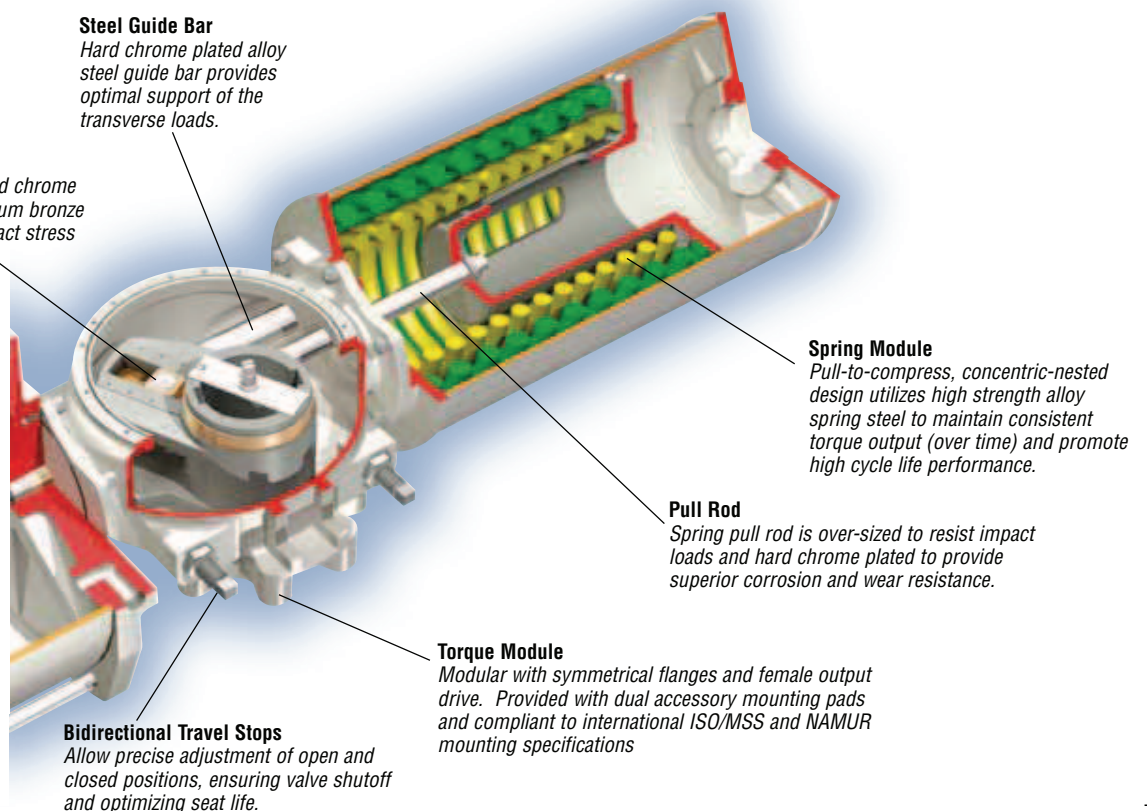
- Hard Chrome Plated Cylinder Walls
- Symmetrical and Canted Yoke
- Guide Bar Yoke Support
- Dual DD Cylinder Option
- Field Reversible Action
- Overrides, Line Break and Special Controls
- ESD Performance

Override Options

Spring Module design facilitates field retrofitting of jackscrew or hydraulic overrides

Interchangeable Yoke System

- Ductile iron casting
- Totally enclosed yoke slot for increased strength and cycle life
- Canted yoke results in approx. 20% higher break torque
- 2 keyway provision for flexibility of parallel or perpendicular mounting





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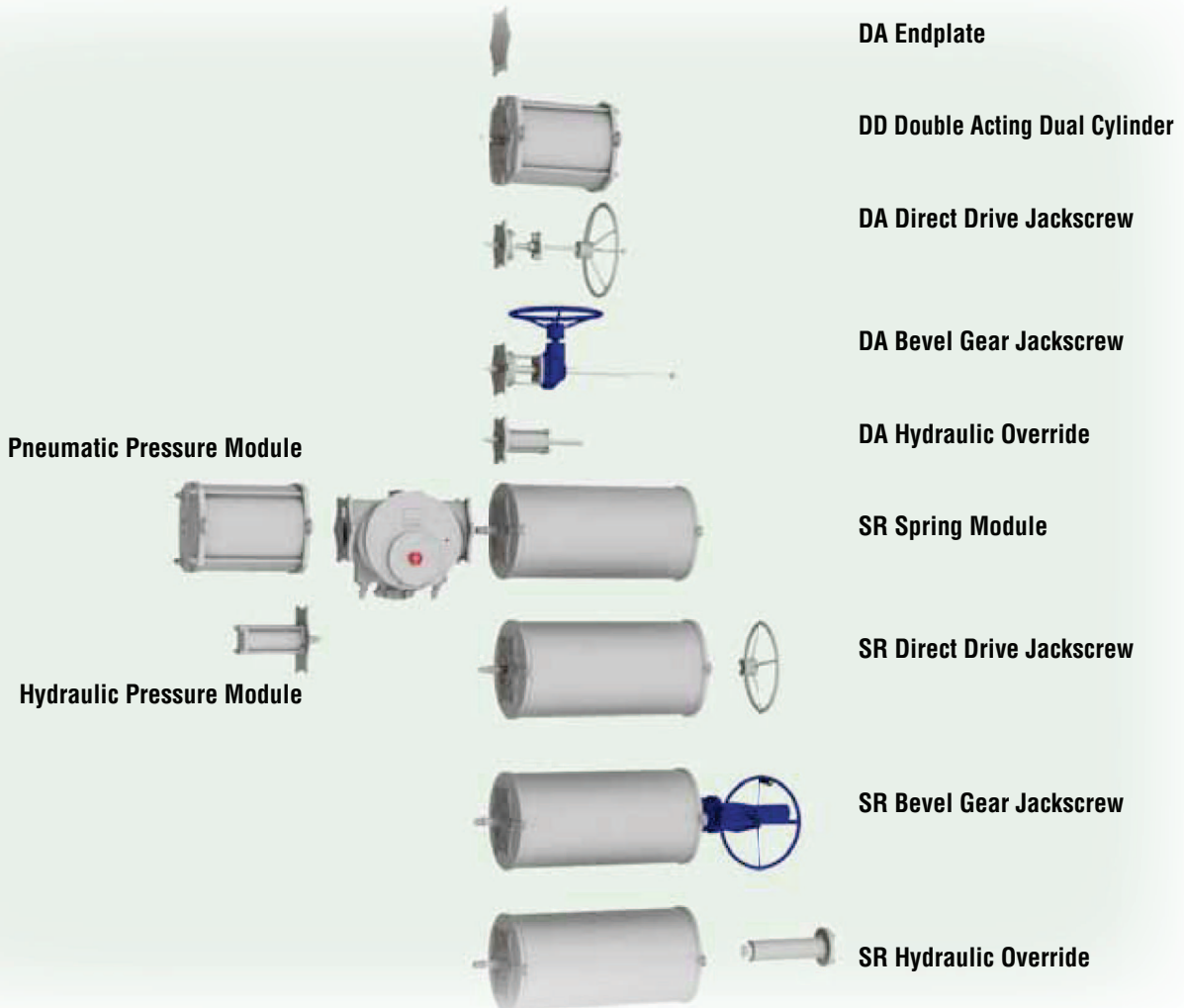
RG Series

Heavy-Duty Scotch Yoke Actuator

Accessories

Modular Construction

- Double Acting or Spring Return (FCW or FCCW)
- Pneumatic or Hydraulic Pressure Modules
- Torque Module with symmetrical or canted yokes
- Override Options – Direct Drive Jackscrew, Bevel Gear Jackscrew or Hydraulic Override



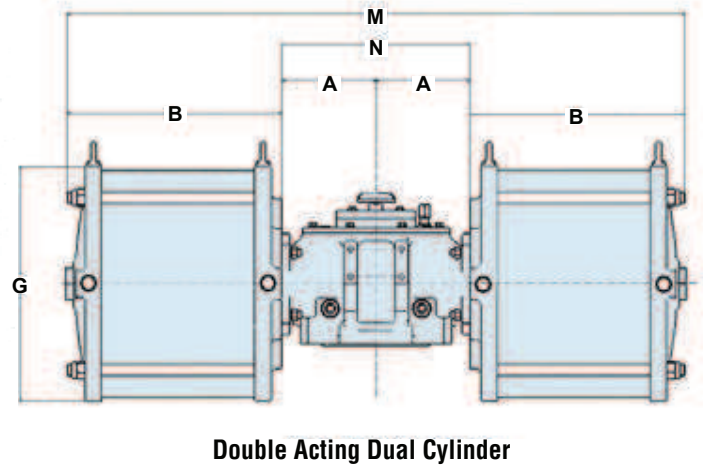
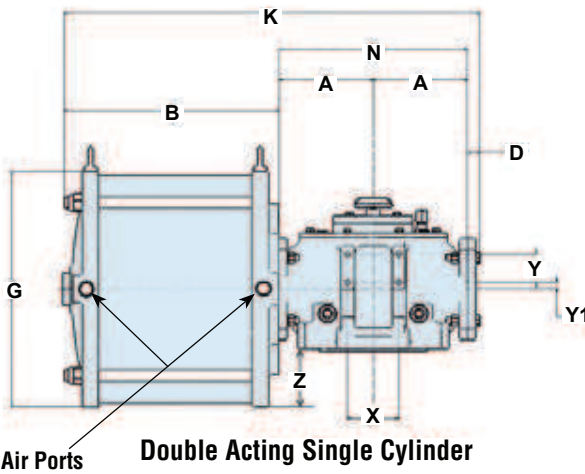
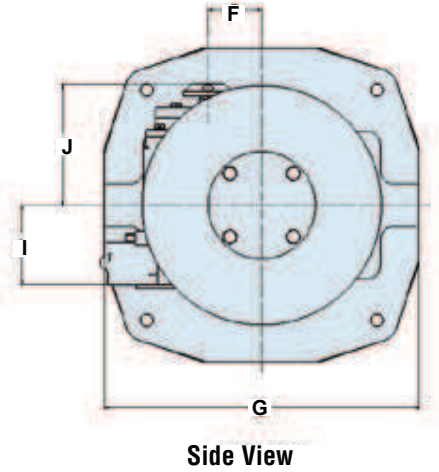
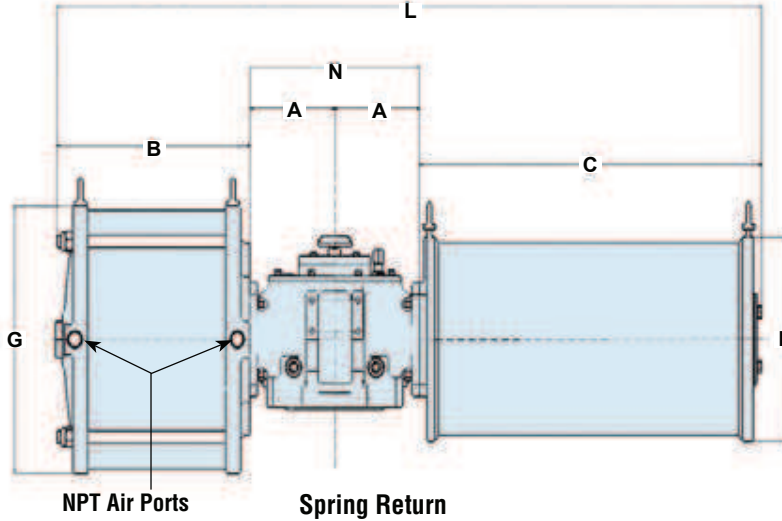


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flowserve.com

Dimensions



Actuator Dimensions, mm (inch)																
SERIES	A	B	C	D	E	F	I	J	K	L	M	N	X	Y	Y1	
RG1	141 (5.55)	310 (12.20)	498 (19.61)	18,5 (0.73)	264 (10.39)	55 (2.17)	99 (3.90)	129 (5.08)	610,5 (24.04)	1090 (42.91)	902 (35.51)	282 (11.10)	68 (2.68)	60 (3.36)	30 (1.18)	
RG2	162 (6.38)	368 (14.49)	586 (23.07)	20 (0.79)	322 (12.68)	65 (2.56)	116 (4.57)	144 (5.67)	712 (28.03)	1278 (50.31)	1060 (41.73)	324 (12.76)	68 (2.68)	60 (3.36)	30 (1.18)	
RG3	175 (6.98)	444 (17.48)	706 (27.80)	23 (0.91)	380 (14.96)	75 (2.95)	111 (4.37)	151 (5.94)	817 (32.17)	1500 (59.06)	1238 (48.74)	350 (13.78)	95 (3.74)	52 (2.05)	13 (0.51)	
RG4	243 (9.57)	565 (22.24)	868 (34.17)	23 (0.91)	467 (18.39)	91 (3.58)	145 (5.71)	175 (6.89)	1074 (42.28)	1919 (75.55)	1616 (63.62)	486 (19.13)	95 (3.74)	60 (3.36)	30 (1.18)	
RG5	312 (12.28)	716 (28.19)	1008 (39.69)	26 (1.02)	568 (22.36)	145 (5.71)	175,5 (6.91)	189,5 (7.46)	1366 (53.78)	2348 (92.44)	2056 (80.94)	624 (24.57)	95 (3.74)	60 (3.36)	30 (1.18)	
RG6	394 (15.51)	756 (29.76)	1640 (64.57)	28 (1.10)	600 (23.62)	185 (7.28)	208 (8.19)	218 (8.58)	1572 (61.89)	3184 (125.35)	2300 (90.55)	788 (31.02)	95 (3.74)	60 (3.36)	30 (1.18)	
RG7	500 (19.69)	810 (31.89)	2030 (79.92)	50 (1.97)	615 (24.21)	220 (8.66)	265 (10.43)	310 (12.20)	1860 (73.23)	3840 (151.18)	2620 (103.18)	1000 (39.37)	95 (3.74)	100 (3.94)	30 (1.18)	
RG8	665 (26.18)	860 (33.86)	2600 (102.36)	55 (2.17)	680 (26.77)	280 (11.02)	306 (12.05)	360 (14.17)	2245 (88.39)	4790 (188.58)	3050 (120.08)	1330 (52.36)	95 (3.74)	100 (3.94)	30 (1.18)	

Cylinder Size	5"	6"	7"	8"	9"	10"	12"	14"	16"	18"	20"	22"	24"	28"	32"	36"	40"
G	178 (7.01)	178 (7.01)	196 (7.72)	222 (8.74)	248 (9.76)	274 (10.79)	324 (12.76)	375 (14.76)	438 (17.24)	486 (19.13)	532 (20.94)	588 (23.15)	648 (25.51)	865 (34.06)	967 (38.07)	1069 (42.09)	1170 (46.06)
Port Size NPT	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	3/4"	3/4"	3/4"	1"	1"	1"	1"	1 1/2"	1 1/2"	1 1/2"	2"

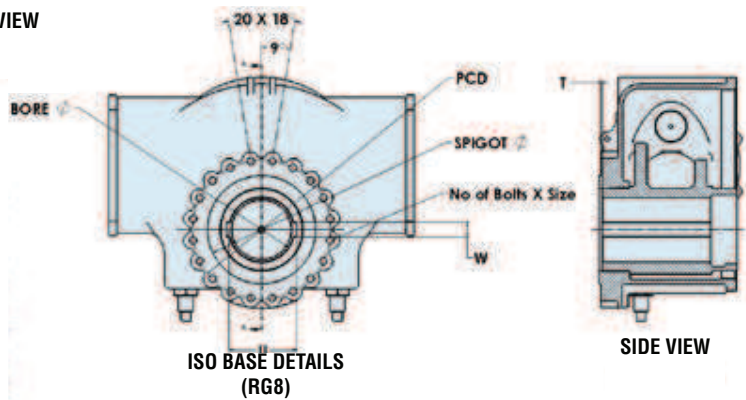
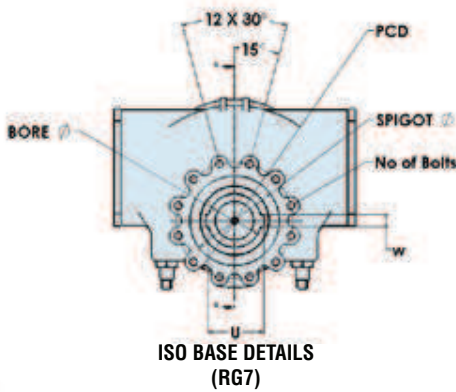
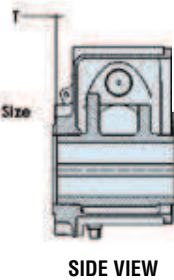
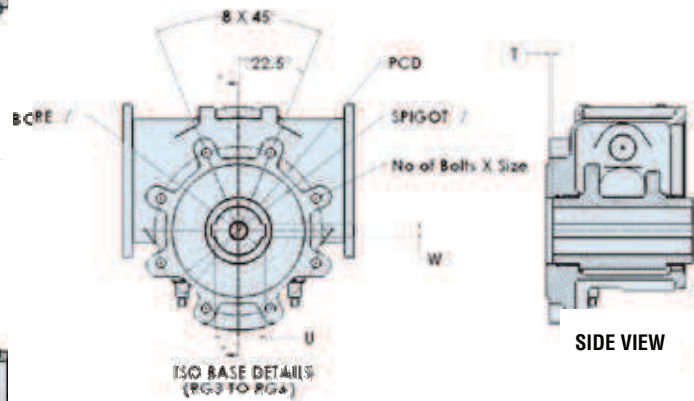
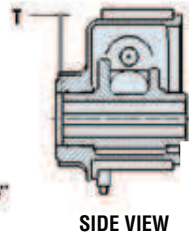
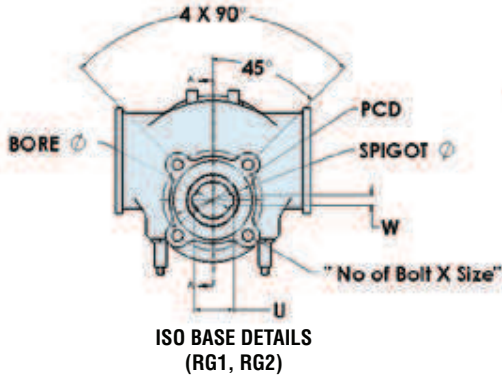


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Dimensions



Mounting Base Details & Dimensions, mm (inch)

SERIES	ISO BASE	SPIGOT Ø	PCD	BORE Ø	BORE Tol	W	W Tol	No of Bolt X Size	T	U	U Tol
RG1	F14	100 (3.94)	140 (5.51)	48 (1.89)	H9	14 (0.55)	+0.12/+0.05	4 X M16	5 (0.20)	51,8 (2.04)	+0.2/+0.0
RG2	F16	130 (5.12)	165 (6.50)	60 (2.36)	H9	18 (0.71)	+0.15/+0.07	4 X M20	5 (0.20)	64,4 (2.54)	+0.2/+0.0
RG3	F25	200 (7.87)	254 (10.0)	72 (2.83)	H9	20 (0.79)	+0.15/+0.07	8 X M16	5 (0.20)	76,9 (3.03)	+0.2/+0.0
RG4	F30	230 (9.06)	298 (11.73)	98 (3.86)	H9	28 (1.10)	+0.15/+0.07	8 X M20	5 (0.20)	104,4 (4.11)	+0.2/+0.0
RG5	F35	260 (10.24)	356 (14.02)	160 (6.30)	H9	40 (1.57)	+0.18/+0.08	8 X M30	5 (0.20)	169,4 (6.67)	+0.2/+0.0
RG6	F40	300 (11.81)	406 (15.98)	180 (7.09)	H9	45 (1.77)	+0.18/+0.08	8 X M36	8 (0.20)	190,4 (5.50)	+0.2/+0.0
RG7	F48	370 (14.57)	483 (19.02)	220 (8.66)	H9	50 (1.97)	+0.18/+0.08	12 X M36	8 (0.20)	231,4 (9.11)	+0.3/+0.0
RG8	F60	470 (18.5)	603 (23.74)	280 (11.02)	H9	63 (2.48)	+0.22/+0.10	20 X M36	8 (0.20)	292,4 (11.51)	+0.3/+0.0

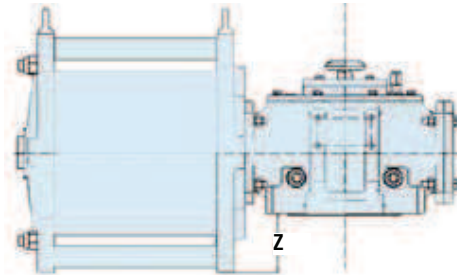


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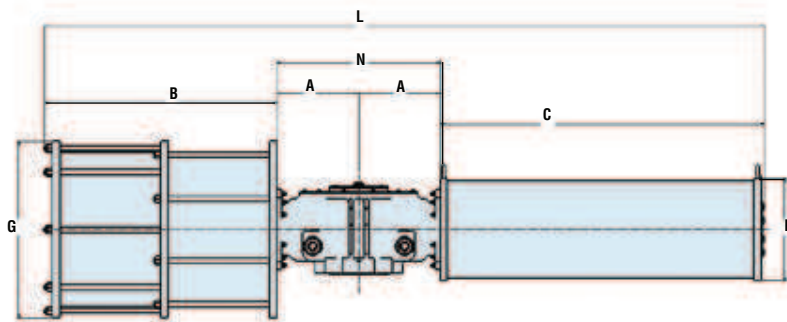
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Dimensions



Double Acting Single Cylinder

SERIES	Dimension Z, mm (inch)																
	5"	6"	7"	8"	9"	10"	12"	14"	16"	18"	20"	22"	24"	28"	32"	36"	40"
RG1	10 (0.39)	10 (0.39)	1 (0.04)	12 (0.47)	25 (0.98)	38 (1.50)	63 (2.48)	-	-	-	-	-	-	-	-	-	-
RG2	-	-	-	5 (0.20)	8 (0.31)	21 (0.83)	46 (1.81)	71,5 (2.81)	103 (4.06)	-	-	-	-	-	-	-	-
RG3	-	-	-	-	-	26 (1.02)	51 (2.01)	76,5 (3.01)	108 (4.25)	132 (5.20)	155 (6.10)	-	-	-	-	-	-
RG4	-	-	-	-	-	-	-	42,5 (1.67)	74 (2.91)	98 (3.86)	121 (4.76)	149 (5.87)	179 (7.05)	-	-	-	-
RG5	-	-	-	-	-	-	-	-	43,5 (1.71)	67,5 (2.66)	90,5 (3.56)	118,5 (4.67)	148,5 (5.85)	257 (10.12)	-	-	-
RG6	-	-	-	-	-	-	-	-	-	35 (1.38)	58 (2.28)	86 (3.39)	116 (4.57)	224,5 (8.84)	275,5 (10.85)	326,5 (12.85)	-
RG7	-	-	-	-	-	-	-	-	-	-	-	-	59 (2.32)	167,5 (6.59)	218,5 (8.6)	269,5 (10.61)	320 (12.60)
RG8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	177,5 (6.99)	228,5 (9.00)	279 (10.98)



Double Acting Tandem Cylinder

SERIES	Dimensions for Spring Return Tandem Cylinders, mm (inch)						
	A	B	C	E	G	N	L
RG8 32-32	665 (26.18)	1715 (67.52)	2600 (102.36)	680 (26.77)	1170 (46.06)	1330 (52.36)	5645 (222.24)
RG836-36	665 (26.18)	1740 (68.50)	2600 (102.36)	680 (26.77)	1170 (46.06)	1330 (52.36)	5670 (223.23)



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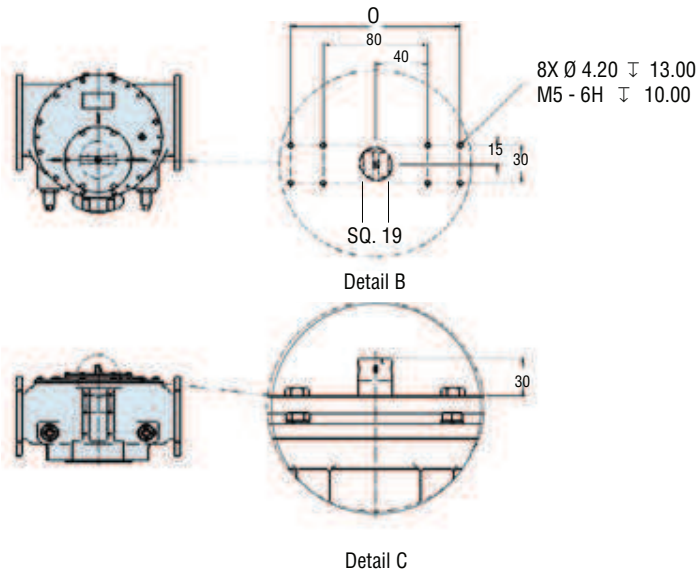
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Module Weights

Module Weights, Lbs (kgs)																											
Model	Torque Module	Pressure Module																Spring Module									
		5	6	7	8	9	10	12	14	16	18	20	22	24	28	32	36	40	1	2	3	4	5	6	7	8	
RG1	68 (31)	31 (14)	35 (16)	47 (22)	53 (24)	66 (30)	94 (43)	139 (63)	-	-	-	-	-	-	-	-	-	-	88 (40)	97 (44)	101 (46)	103 (47)	106 (48)	114 (52)	119 (54)	119 (54)	
RG2	99 (45)	-	-	-	56 (25)	69 (32)	99 (45)	143 (65)	209 (95)	320 (145)	-	-	-	-	-	-	-	-	128 (58)	145 (66)	154 (70)	158 (72)	158 (72)	172 (78)	180 (82)	186 (85)	
RG3	143 (65)	-	-	-	-	-	100 (45)	142 (64)	200 (91)	318 (145)	406 (185)	561 (255)	-	-	-	-	-	-	226 (103)	260 (118)	267 (121)	269 (122)	276 (125)	330 (150)	321 (146)	-	
RG4	295 (134)	-	-	-	-	-	-	-	217 (99)	339 (154)	427 (194)	586 (266)	741 (337)	942 (428)	-	-	-	-	402 (183)	442 (201)	462 (210)	477 (217)	510 (232)	545 (248)	565 (257)	581 (254)	
RG5	510 (231)	-	-	-	-	-	-	-	-	356 (162)	455 (207)	610 (277)	853 (388)	994 (452)	1634 (743)	-	-	-	639 (290)	737 (335)	770 (350)	783 (356)	901 (410)	955 (434)	-	-	
RG6	933 (423)	-	-	-	-	-	-	-	-	-	493 (224)	616 (280)	861 (391)	1051 (478)	1732 (787)	2321 (1055)	3044 (1384)	-	1283 (583)	1738 (790)	1671 (760)	1730 (787)	2061 (937)	1995 (907)	-	-	
RG7	1881 (853)	-	-	-	-	-	-	-	-	-	-	-	-	-	1824 (829)	2411 (1096)	3156 (1435)	3913 (1779)	2283 (1038)	2946 (1339)	3043 (1383)	3177 (1444)	3630 (1650)	3709 (1686)	-	-	
RG8	3718 (1686)	-	-	-	-	-	-	-	-	-	-	-	-	-	2165 (984)	2819 (1282)	3372 (1533)	4159 (1891)	4627 (2103)	5800 (2637)	6113 (2779)	6227 (2830)	7111 (3232)	7423 (3374)	-	-	

NAMUR shaft height and bracket mounting details



Series	0
RG1	-
RG2	-
RG3	-
RG4	130
RG5	130
RG6	130
RG7	130
RG8	130



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Product Specification

- Actuator shall be designed in accordance with EN15714-3 to define minimum cycle life performance and designed for on-off and modulating service.
- Actuator output shall meet ISO rated torque compliance to provide safe mounting interface and comply with ISO 5211/MSS SP-101 mounting standards and NAMUR VDI/VDE standards for accessory mounting.
- Actuator shall have a symmetrical torque module to simplify field service and interchangeability of spring and air modules. Manual overrides and mounting is consistent for both spring and torque module to simplify mounting.
- The actuator torque module shall utilize an interchangeable yoke system to allow simple field conversion of symmetrical and canted yokes.
- The spring module shall use a pull-to-compress motion with single or concentric-nested springs that are internally supported and guided and weld secured for safety.
- The spring module shall be designed for minimum length and weight to improve the center of gravity, reduce material stress and assembly support requirements.
- The actuator shall have hard chrome plated cylinder walls to provide superior corrosion and wear resistance.
- The actuator piston sealing should use advanced Quad Seal technology to provide enhanced cycle life compared to conventional O-Rings.
- The internal support guide rods, spring rods and piston rods shall be hard chrome plated for superior corrosion and wear resistance.
- The pneumatic cylinder shall use external retention rods to provide visual confirmation and inspection of rod integrity for increased safety.

Agency & Environmental Approvals

- IP67M (1 meter depth for 30 minutes)
- IEC 61508 SIL 3 Suitable
- ATEX Certified

Standard Paint Specification

The standard external surface treatment consists of a 2 pack primer and 2 pack epoxy coating. This international marine coating is suitable for chemical, coastal and offshore environments providing superior corrosion resistance.

Primer Coat: Akzo Nobel Intergard 251, anticorrosive zinc phosphate epoxy primer, 75 microns DFT, color: KGA902-Red.

Top Coat: Akzo Nobel Intergard 740 epoxy finish, 2 mills DFT

Finished Color: ECK724 – Storm Grey, High Gloss



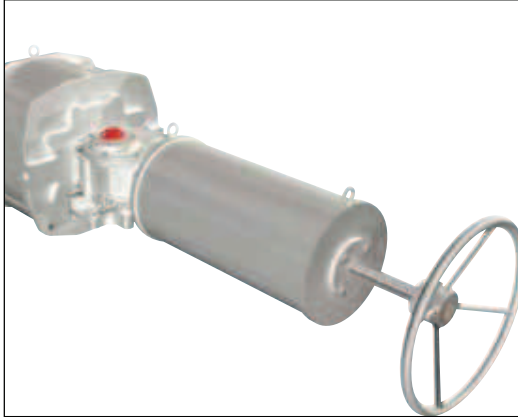
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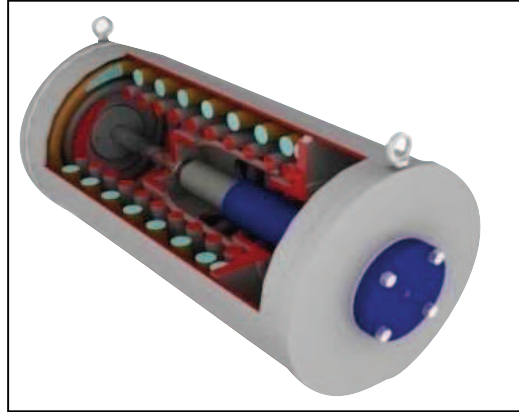


Manual Override Options

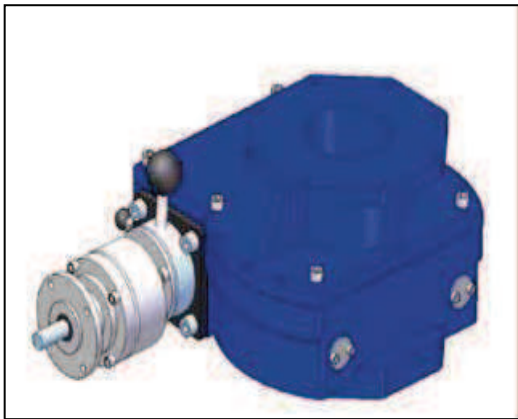
Jackscrew



Hydraulic



Sandwich Gear



Bevel Gear



Model	ISO Mounting	Torque		DA				SR			
		N-m	in-lb	Jackscrew		Sandwich Declutchable Gear	Hydraulic	Jackscrew		Sandwich Declutchable Gear	Hydraulic
				Direct Operation	Bevel Gear			Direct Operator	Bevel Gear		
RG1	F14	2000	17702	✓	-	✓	-	✓	-	✓	-
RG2	F16	4000	35404	✓	-	✓	-	✓	-	✓	-
RG3	F25	8000	70808	✓	✓	✓	✓	✓	✓	✓	✓
RG4	F30	16000	141616	-	✓	✓	✓	-	✓	✓	✓
RG5	F35	32000	283232	-	✓	✓	✓	-	✓	✓	✓
RG6	F40	63000	557613	-	-	-	✓	-	-	-	✓
RG7	F48	125000	1106375	-	-	-	✓	-	-	-	✓
RG8	F60	250000	2212750	-	-	-	✓	-	-	-	✓



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Actuator Model Designation

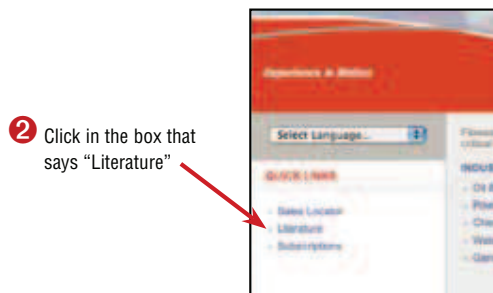
How to Order															
Series	Body Size	Cylinder Size				Action	Spring Module	Torque Pattern (Yoke)	Sealing/Temp	Manual Override	Material/ Coatings	Options			
RG	1	05	06	07	08	09	10	12	DA- Double Acting Single Cylinder	0	S- Symmetrical	N- Nitrile, -20° F to 180° F	0- None	GE- Grey Epoxy (std)	00- None
	2	08	09	10	12	14	16	DD- Double Acting Dual Cylinder	1	C- Canted		G- Sandwich Declutch Gbox	PO- Primer Only	TC- Ext. Stopper -CW	
	3	10	12	14	16	18	20		2		H- High Temp (Viton), 0° F to 300° F	J- Jackscrew	WE- White Epoxy	TO- Ext. Stopper -CCW	
	4	14	16	18	20	22	24		3			D- Bevel Gear Jackscrew	SP- Specials	TB- Ext. Stopper -Both Dir	
	5	16	18	20	22	24	28		4		L- Low Temp, (material) -55° F to 180° F	H- Hydraulic		S xxx- Specials code	
	6	18	20	22	24	28	32	36	SR- Spring Return Fail CW	5					
	7	24	28	32	36	40	SO- Spring Return Fail CCW	6							
	8	28	32	36	40		7								
									8						
Model Code Example:															
RG	5	22				SR	6	C	N	D	GE	TC			

To Access Literature Online

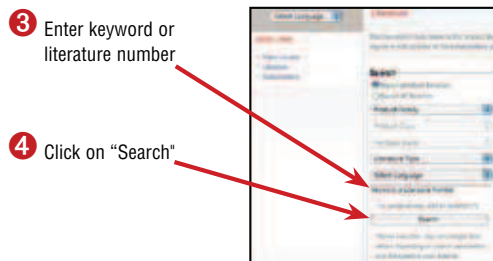
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Worcester Controls Series F39 Pneumatic Actuator Twin-piston, double rack-and-pinion



Experience In Motion



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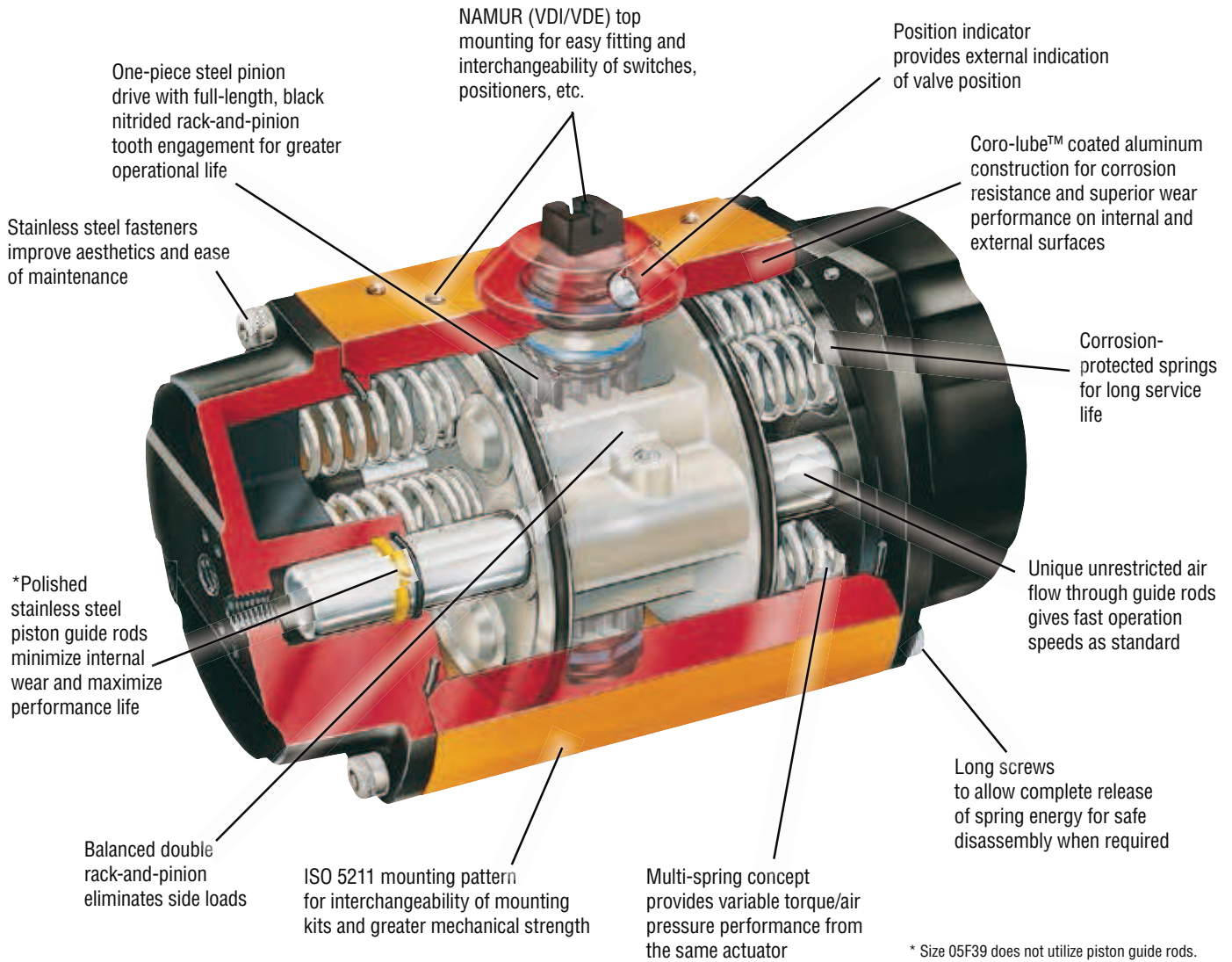
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Series F39 Pneumatic Actuators

High cycle pneumatic power for on/off or throttling control of rotary valves and dampers



Features and Benefits

- Available as spring-return or double-acting
- Large range of sizes for efficient torque matching
- Internal parts are factory lubricated for maximum service life
- Safe disassembly, no special tools required
- Can be mounted for fail-open or fail-closed operation
- Limit stop for accurate rotational positioning
- Standard NAMUR ancillary attachment
- International ISO5211 actuator mounting pattern



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Operating Principle



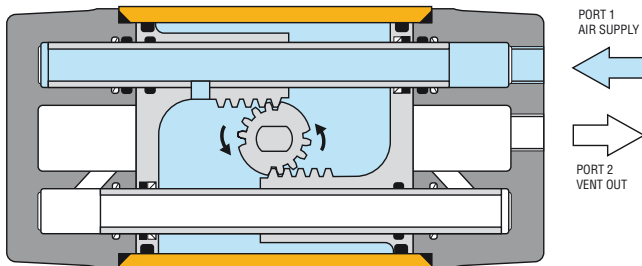
The Series F39 Pneumatic Actuator design is based on the opposed rack-and-pinion principle utilizing piston guide rods to guarantee part alignment. The fully supported guide rods minimize friction and wear between the pistons and the body bore.

In the double-acting actuator, compressed air is applied to Port 1. The air flows through the rear guide rod and enters the center chamber to push the pistons apart, turning the shaft counterclockwise (as seen from above) to open the valve. During this action, air in the end caps is vented through Port 2 via the front guide rod. Action is reversed, i.e., the valve is closed by applying air to Port 2 and venting air through Port 1.

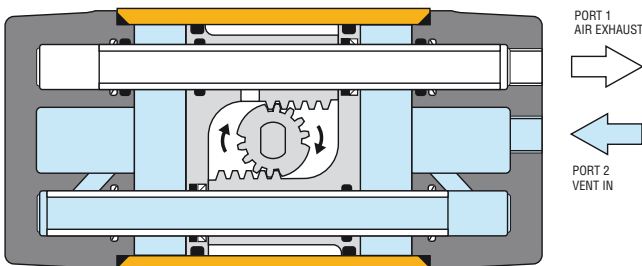
In a fail-safe spring-return actuator, springs are located in the end caps. The number of springs in each cap depends on the available supply air pressure and required torque output. Air is supplied through Port 1 to the center chamber to push the pistons apart, which compresses the springs. During this action, air in the end caps is vented through Port 2 via the front guide rod. When air is vented out through Port 1 (via a three-way solenoid valve) the springs push the pistons back together thus closing the valve. Port 2 is continuously vented. The springs provide a dependable, safe closure in the event of electrical or air supply failure.

DOUBLE-ACTING ACTUATOR F39

TOP VIEW



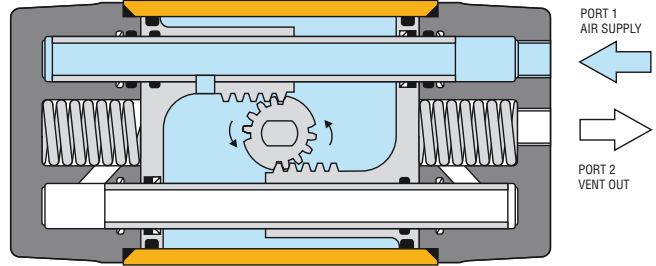
STROKE OPENING
TOP VIEW



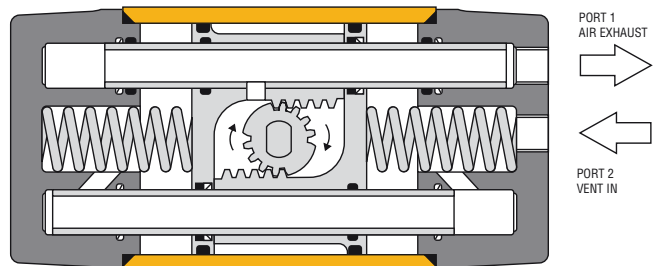
STROKE CLOSING

SPRING-RETURN ACTUATOR F39S

TOP VIEW



STROKE OPENING
TOP VIEW



STROKE CLOSING



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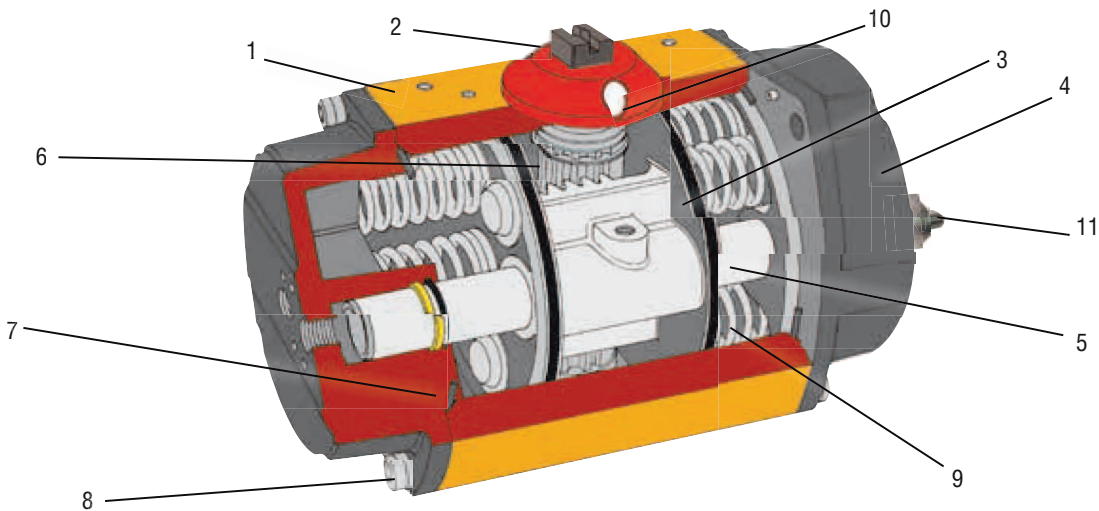
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Product Specifications

- Pneumatic Actuators are of a dual-piston design for compactness, highest torque output, minimal air consumption and even weight distribution (balanced) on the valve stem.
- Actuators are equipped with two piston guide rods to bear the lateral rack-and-pinion thrust forces, increasing piston seal life and eliminating the possibility of cylinder scratching by the pistons. Elastomeric seals are not loaded as bearings.
- The torque is generated through a double rack-and-pinion gearing mechanism with full-length, uninterrupted engagement of the rack-and-pinion teeth.
- The rack is machined as part of the piston in order to extend the actuator life and eliminate hysteresis.
- Actuator housings are protected both internally and externally from corrosion using an anodizing process.
- Single-acting actuators use multi-springs at each end to eliminate uneven forces on the pistons and are field adaptable to balance reduced pressure air supplies.
- Actuators are supplied with end mounted limit stops for accurate position control
- Actuators can have optional integral end-mounted limit switches, reducing overall height and allowing the use of the actuator pinion for manual override (cannot be combined with limit stops).
- Actuators can be supplied with integral solenoid valving without the use of transfer tubes. Valving incorporates fail-safe action upon interruption of electrical signal.

Parts List/Material Specifications



Item No.	Description	Material/Finish
1	Body	Aluminum (Extrusion) Anodized
2	Pinion	Carbon Steel (Corrosion-Resistant Nitride Treatment)
3	Pistons	Aluminum
4	End Caps	Aluminum Anodized
5	Guide Rods	Stainless Steel
6	Bearings	Acetal
7	"O" Rings	Nitrile Rubber
8	End Cap Screws	Stainless Steel
9	Springs	Chrome Silicon (Corrosion-Resistant Coated)
10	Position Indicator	Polyethylene
11	Limit Stops	Stainless Steel



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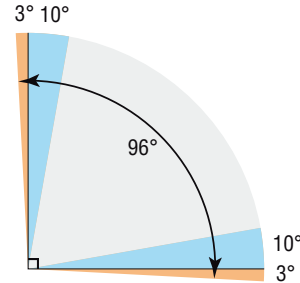
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End Mounted Limit Stops



Recognizing the increasing need for accurate rotation adjustment on many applications within the process industry, Worcester Controls has developed a unique method of providing this feature which is now standard on the actuator. The design takes advantage of the moving guide rods within the actuator and uses two stops in the end cap to limit their



travel and therefore adjust the rotation of the actuator in both directions.

The design allows for a nominal rotation of 90° providing 3° of adjustable over travel at each end of the actuator stroke. The limit stop screws can also be used to adjust the under travel of the actuator by 10° at each end of the actuator stroke.

End Mounted Solenoid Block

The solenoid end cap of each actuator is pre-drilled to VDE/VDI NAMUR 3845 to allow rapid attachment of either a double-acting or spring-return solenoid control block.

The double-acting solenoid control block provides extremely fine and independent adjustments for speed control on the opening and closing strokes of a double-acting actuator (20:1 ratio). The double-acting solenoid control block can be overridden by manual operation of the control block spool.

The spring-return solenoid control block provides an optional adjustment for speed control on the spring stroke of a spring-return actuator. The advanced design prohibits environmental ingress to spring chamber during piston stroke extending actuator life.

Both double-acting and spring-return styles return to the actuator “closed” position (pistons together) upon electrical failure.

An extensive range of Weatherproof and Explosionproof coil options is available, along with a wide voltage selection including low-power and intrinsically safe.

W25NFA 2-position, 3-Way, Single Operator and W25NAA 2-position, 4-way, Single Operator

- NAMUR mounting
- Weatherproof and Hazardous Area
- Speed control – Standard
- Momentary override – Standard
- Interchangeable coils – Standard
- -40F to 180F - Standard
- Rebreather design - Standard

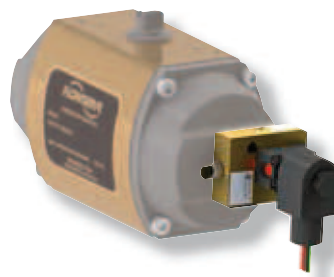
Watertight Class F Coil (Type 4, 4x)

Voltage	Inrush amps	Holding Amps
24/60. 22/50 VAC	0.36	0.24
120/60. 110/50 VAC	0.08	0.05
240/60. 220/50 VAC	0.04	0.03
12 VDC	0.38	0.38
24 VDC	0.20	0.20
120 VDC	0.04	0.04

Hazardous Class H Coil (Type 4, 4x, 7, 9)

Voltage	Inrush amps	Holding Amps
24/60. 22/50 VAC	Consult Factory	
120/60. 110/50 VAC	0.10	0.05
240/60. 220/50 VAC	0.05	0.03
12 VDC	0.38	0.38
24 VDC	0.19	0.19
120 VDC	Consult Factory	

Type 7 (UL & CSA listed for Class I, Division I, groups A, B, C & D) and Type 9 (UL & CSA listed for class II E, F & G) The type 7 solenoid is also rated 4, 4x



W25NFA Three-Way Spring-Return Solenoid



W25NAA Four-Way Double-Acting Solenoid



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Torque Output Sizing

Determine appropriate valve torque requirements from valve literature. For double-acting actuators, select the actuator whose torque output at available air supply exceeds breakaway torque requirements of the valve. For detailed instructions, consult Worcester Controls Ball Valve Actuator Selection Manual.

For fail-closed, spring-return actuators, select the appropriate size actuator whose torque output at the end of the spring stroke (at available air supply) is sufficient to close the valve.

For fail-open spring-return actuators, select appropriate actuator whose torque output at the end of the air stroke is sufficient to close the valve. For fail-open actuators, it is also necessary to determine that the torque output at the start of the spring stroke exceeds breakaway requirements of the valve.

Spring-Return Actuator Torque Output Series 05F39 (in-lb/Nm)

Model No.	Stroke	Operating Pressure psi (Bar)							
		50 (3.4) 2 Springs		60 (4.1) 2 Springs		70 (4.8) 2 Springs		80 (5.5) 4 Springs	
		Start	End	Start	End	Start	End	Start	End
05F39	Air	27	16	35	24	49	38	53	37
	Spring	4.7	3.6	4.7	3.6	4.7	3.6	6.0	4.6

Spring-Return Actuator Torque Output (in-lb/Nm)

Model No.	Stroke	Operating Pressure psi (Bar)															
		30 (2.0) 4 Springs		40 (2.7) 4 Springs		50 (3.4) 6 Springs		60 (4.1) 8 Springs		70 (4.8) 8 Springs		80 (5.5) 10 Springs		90 (6.2) 10 Springs			
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End		
10F39	Air	57	27	89	60	105	60	118	60	152	91	168	89	201	114		
	Spring	6.4	3.0	10.0	6.8	11.9	6.8	13.3	6.8	17.2	10.3	19.0	10.0	22.7	12.9		
15F39	Air	70	42	70	42	105	63	140	84	140	84	175	104	175	104		
	Spring	7.9	4.7	7.9	4.7	11.9	7.1	15.8	9.5	15.8	9.5	19.8	11.8	19.8	11.8		
20F39	Air	115	70	181	133	193	140	239	145	284	193	335	219	399	282		
	Spring	13.0	7.9	20.5	15.0	21.8	15.8	27.0	16.4	32.1	21.8	37.8	24.8	45.1	31.9		
25F39	Air	115	74	115	74	173	112	231	149	231	149	289	186	289	186		
	Spring	13.0	8.4	13.0	8.4	19.5	12.6	26.1	16.8	26.1	16.8	32.6	21.0	32.6	21.0		
30F39	Air	210	128	332	243	389	257	443	274	558	389	612	404	735	513		
	Spring	23.7	14.5	37.5	27.5	44.0	29.0	50.0	31.0	63.0	44.0	69.2	45.6	83.0	58.0		
35F39	Air	210	135	210	135	315	212	419	272	419	272	525	339	525	339		
	Spring	23.7	15.3	23.7	15.3	35.6	23.9	47.4	30.7	47.4	30.7	59.3	38.3	59.3	38.3		
40F39	Air	345	188	549	381	637	398	730	398	925	549	1009	611	1212	797		
	Spring	39.0	21.2	62.0	43.0	72.0	45.0	82.5	45.0	104.5	62.0	114.0	69.0	137.0	90.0		
45F39	Air	379	232	379	232	568	348	758	465	758	465	947	581	947	581		
	Spring	42.8	26.2	42.8	26.2	64.2	39.3	85.6	52.5	85.6	52.5	107.0	65.6	107.0	65.6		
50F39	Air	577	320	912	628	1044	646	1204	690	1531	991	1682	1027	2009	1345		
	Spring	65.2	36.2	103.0	71.0	118.0	73.0	136.0	78.0	173.0	112.0	190.0	116.0	227.0	152.0		
55F39	Air	609	372	609	372	912	558	1221	744	1221	744	1522	929	1522	929		
	Spring	68.8	42.0	68.8	42.0	103.0	63.1	138.0	84.1	138.0	84.1	172.0	105.0	172.0	105.0		
60F39	Air	1053	564	1682	1177	1947	1221	2213	1221	2832	1859	3098	1850	3735	2460		
	Spring	119	64	190	133	220	138	250	138	320	210	350	209	422	278		
65F39	Air	1257	804	1257	804	1885	1204	2513	1611	2513	1611	3151	2009	3151	2009		
	Spring	142	91	142	91	213	136	284	182	284	182	356	227	356	227		
70F39	Air	1345	780	2133	1522	2478	1593	2814	1682	3717	2434	3938	2487	4752	3230		
	Spring	152	88	241	172	280	180	318	190	420	275	445	281	537	365		
75F39	Air	1451	929	1451	929	2177	1398	2903	1859	2903	1859	3629	2328	3629	2328		
	Spring	164	105	164	105	246	158	328	210	328	210	410	263	410	263		
80F39	Air	2142	1080	3407	2301	3983	2354	4469	2390	5620	3452	6257	3567	7523	4779		
	Spring	242	122	385	260	450	266	505	270	635	390	707	403	850	540		
85F39	Air	2487	1496	2487	1496	3726	2239	4974	2982	4974	29798	6213	3735	6213	3735		
	Spring	281	169	281	169	421	253	562	337	562	337	702	422	702	422		
90F39	Air	3717	1797	5974	3983	6859	3938	7744	3894	9912	6018	10859	6000	13054	8142		
	Spring	420	203	675	450	775	445	875	440	1120	680	1227	678	1475	920		
95F39	Air	4390	2593	4390	2593	6584	3885	8779	5177	8779	5177	10974	6469	10974	6469		
	Spring	496	293	496	293	744	439	992	585	992	585	1240	731	1240	731		
		8 springs		12 springs		16 springs		20 springs		20 springs		24 springs		24 springs			
100F39	Air	6275	3142	7965	3452	9735	3717	11505	3894	14868	6992	16470	7204	19736	10399		
	Spring	709	355	900	390	1100	420	1300	440	1680	790	1861	814	2230	1175		
105F39	Air	6107	3159	9160	4735	12213	6319	15266	7894	15266	7894	18320	9478	18320	9478		
	Spring	690	357	1035	535	1380	714	1725	892	1725	892	2070	1071	2070	1071		
110F39	Air	9717	4876	12169	5310	15045	5664	17700	5753	20355	10399	24877	10585	30533	15488		
	Spring	1098	551	1375	600	1700	640	2000	650	2300	1175	2811	1196	3450	1750		
115F39	Air	9647	4885	14470	7319	19293	9762	24116	12204	24116	12204	28940	14638	28940	14638		
	Spring	1090	552	1635	827	2180	1103	2725	1379	2725	1379	3270	1654	3270	1654		



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Double-Acting Actuator Torque Output (in-lb/Nm)

Model No.	Operating Pressure psi (Bar)									
	30 (2.0)	40 (2.7)	50 (3.4)	60 (4.1)	70 (4.8)	80 (5.5)	90 (6.2)	100 (6.9)	110 (7.6)	120 (8.3)
05F39	34	49	60	73	87	97	106	126	137	148
	3.8	5.5	6.8	8.3	9.8	11.0	12.0	14.2	15.5	16.7
10F39	89	130	173	202	239	274	310	350	385	425
	10.0	14.7	19.5	22.8	27.0	31.0	35.0	39.6	43.5	48.0
15F39	177	248	319	389	460	531	602	673	743	814
	20.0	28.0	36.0	44.0	52.0	60.0	68.0	76.0	84.0	92.0
20F39	327	451	584	708	841	965	1097	1221	1354	1478
	37.0	51.0	66.0	80.0	95.0	109	124	138	153	167
25F39	540	752	965	1177	1389	1620	1841	2062	2283	2505
	61.0	85.0	109	133	157	183	208	233	258	283
30F39	885	1239	1593	1947	2301	2655	3009	3363	3717	4071
	100	140	180	220	260	300	340	380	420	460
33F39	1735	2390	3053	3717	4514	5195	5885	6638	7346	8054
	196	270	345	420	510	587	665	750	830	910
35F39	2124	2974	3806	4691	5531	6372	7213	8098	8983	9824
	240	336	430	530	625	720	815	915	1015	1110
40F39	3390	4717	6062	7390	8717	10169	11505	12921	14337	15753
	383	533	685	835	985	1149	1300	1460	1620	1780
42F39	5885	8319	10620	12833	15222	17638	20134	22568	25001	27435
	665	940	1200	1450	1720	1993	2275	2550	2825	3100
45F39	8806	12213	15753	19293	22833	26408	29913	33630	37170	40710
	995	1380	1780	2180	2580	2984	3380	3800	4200	4600
50F39	13620	19028	24338	29913	35400	40860	46374	51861	57348	62835
	1539	2150	2750	3380	4000	4617	5240	5860	6480	7100

Engineering Data

Stroke Time (seconds)*

Actuator Free Internal Volume

Tubing Requirements

Weights lb. (kg)

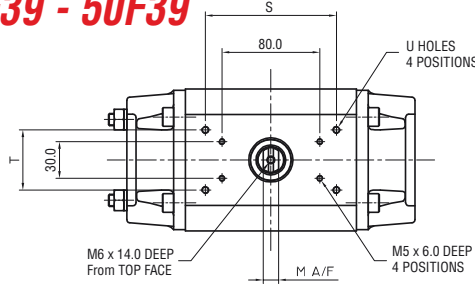
Model No.	Double Acting	Spring Return	With Max.* Speed Control	Open		Close DA Only		Under 4 ft. Run	Over 4 ft. Run	Double Acting	Spring Return
				Cubic Inches (in ³)	Litres	Cubic Inches (in ³)	Litres				
05F39	Less than 1	Less than 1	10	3	0.05	3	0.05	1/8"	1/4"	1.6 (0.7)	1.8 (0.8)
10F39	Less than 1	Less than 1	10	10	0.17	13	0.22	1/8"	1/4"	3 (1.3)	3.5 (1.6)
15F39	Less than 1	1	15	21	0.35	24	0.39	1/8"	1/4"	6 (2.7)	7 (3.1)
20F39	1	1-2	15	42	0.69	45	0.74	1/8"	1/4"	10 (4.5)	12 (5.5)
25F39	2-3	2-3	18	74	1.22	80	1.31	1/8"	1/4"	16 (7.4)	18.5 (8.4)
30F39	3-4	3-4	20	114	1.86	125	2.05	1/4"	1/2"	24 (11)	27 (12)
33F39	4-5	7-8	25	207	3.39	292	4.79	1/4"	1/2"	50 (22.5)	57 (26)
35F39	4-5	8-9	25	240	3.93	338	5.54	1/4"	1/2"	57 (26)	66 (30)
40F39	5-6	9-10	30	411	6.73	500	8.19	1/4"	1/2"	96 (43.6)	107 (48.6)
42F39	10-11	11-12	36	732	12.00	848	13.89	1/4"	1/2"	158 (71.8)	177 (80.6)
45F39	10-12	11-13	40	824	13.51	1220	20.00	1/4"	1/2"	213 (97)	253 (115)
50F39	12-14	13-15	60	1457	23.87	1861	30.50	1/4"	1/2"	304 (138)	354 (161)

* NOTE: These figures are meant as an indication of obtainable speeds only. For more precise figures for any particular application, contact your Flowserve rep. Faster speeds are obtainable, if required, by using additional control equipment. Speed control with spring-return actuators only available on exhaust air (spring stroke).

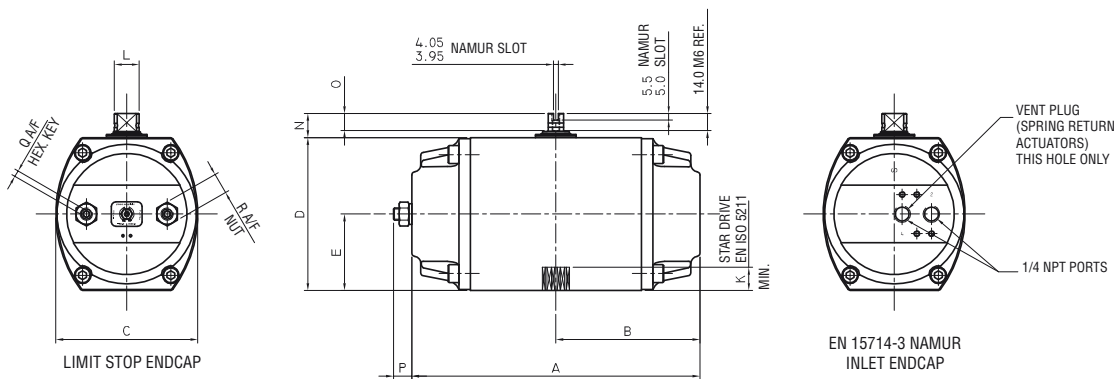
Operating Conditions

Pressure Range	30–120 psi Double-Acting, 40–120 psi All Spring-Return Versions (Standard spring-return units require 80 psi minimum. Reduced-pressure versions are available).
Media	Air or non-corrosive gas.
Temperature Range	Standard temperature option: Actuator only 0° to 212°F (-18° to 100°C) Actuator with Watertight Type 4, 4x or Hazardous Locations Type 4, 4x, 7 & 9 solenoid to 180°F (82°C) continuous High temperature option to 250°F continuous, to 300°F intermittent (without solenoid) Low temperature option to -40°F (without Solenoid)
Rotation	Actuators rotate in counterclockwise direction when the outer air connection is pressurized.
Movement	90° with 3° over travel and 10° under travel controllable
Supply Air	The Series F39 Actuator is factory lubricated. For optimum performance, standard filtered and lubricated air is recommended.

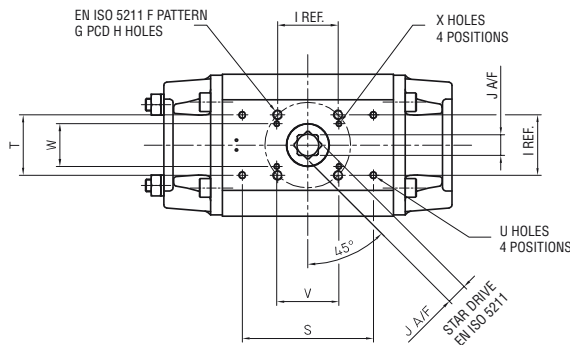
Dimensions Sizes 10F39 - 50F39 Inches (mm)



EN 15714-3 NAMUR TOP ACCESSORY MOUNTING



EN 15714-3 NAMUR INLET ENDCAP



ACTUATOR MOUNTING ATTACHMENT EN ISO 5211

Model	Legacy Mount Dimensions		
	V	W	X
10F39	2.00	1.37	10-32 UNF x 0.3 (7.7) DP
	50.8	34.9	0.31 (8.0) DP
15F39	2.00	1.37	10-32 UNF x 0.3 (7.7) DP
	50.8	34.9	0.31 (8.0) DP
20F39	2.00	1.37	10-32 UNF x 0.3 (7.7) DP
	50.8	34.9	0.31 (8.0) DP

Model	Basic Dimensions					Bottom ISO Mounting Dimensions					Top Pinion Dimensions					Limit Stop Dimensions			Ancillary Hole Dimensions (Note 2)		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
10F39	6.11	3.06	3.02	3.37	1.69	F04	1.65	M5 x 0.25 6.25 DP	1.17	0.43	0.47	0.59	0.35	0.79	0.63	0.39	0.16	0.51	2.87	1.25	M5 x 0.25 6.3 DP
	155.3	77.7	76.8	85.5	42.8		42.0		29.7	11.0	12.0	15.0	9.0	20.0	16.0	10.0	4.0	13.0	73.0	31.8	
15F39	7.69	3.84	3.70	4.09	2.05	F05	1.97	M6 x 0.30 7.5 DP	1.39	0.55	0.63	0.63	0.50	0.79	0.55	0.43	0.16	0.51	2.87	1.25	M5 x 0.24 6.0 DP
	195.3	97.7	94.0	104.0	52.0		50.0		35.4	14.0	16.0	16.0	12.6	20.0	13.9	11.0	4.0	13.0	73.0	31.8	
20F39	9.27	4.63	4.57	4.92	2.46	F07	2.76	M8 x 0.40 10.0 DP	1.95	0.67	0.75	0.80	0.50	0.79	0.54	0.59	0.20	0.67	4.22	1.94	M6 x 0.27 7.0 DP
	235.4	117.7	116.0	125.0	62.5		70.0		49.5	17.0	19.0	20.3	12.6	20.0	13.8	15.0	5.0	17.0	107.2	49.2	
25F39	10.67	5.33	5.33	5.77	2.89	F07	2.76	M8 x 0.40 10.0 DP	1.95	0.67	0.75	0.75	0.75	1.18	0.87	0.83	0.24	0.75	4.22	1.94	M6 x 0.4 10.0 DP
	271.0	135.5	135.5	146.6	73.5		70.0		49.5	17.0	19.0	19.0	19.0	30.0	22.2	21.0	6.0	19.0	107.2	49.2	
30F39	12.80	6.40	6.10	6.59	3.30	F10	4.02	M10 x 0.50 12.5 DP	2.84	0.87	0.94	0.87	0.87	1.18	0.86	0.91	0.24	0.75	6.34	2.87	M6 x 0.4 10.0 DP
	325.1	162.6	155.0	167.5	83.8		102.0		72.1	22.0	24.0	22.1	22.1	30.0	21.9	23.0	6.0	19.0	161.1	73.0	
33F39	15.70	7.85	8.11	8.43	4.21	F12	4.92	M12 x 0.70 18.0 DP	3.48	1.06	1.14	1.12	1.12	1.18	0.83	0.91	0.31	0.94	6.34	3.39	M8 x 0.5 13.0 DP
	398.7	199.4	206.0	214.0	107.0		125.0		88.4	27.0	29.0	28.5	28.5	30.0	21.2	23.0	8.0	24.0	161.1	86.0	
35F39	16.69	8.34	8.39	8.54	4.27	F12	4.92	M12 x 0.63 16.0 DP	3.48	1.06	1.14	1.12	1.12	1.18	0.82	1.18	0.31	0.94	8.37	4.00	M8 x 0.6 14.0 DP
	423.9	212.0	213.0	217.0	108.5		125.0		88.4	27.0	29.0	28.5	28.5	30.0	20.9	30.0	8.0	24.0	212.7	101.6	
40F39	20.15	10.07	9.64	10.87	5.87	F14	5.51	M16 x 0.95 24.0 DP	3.90	1.42	1.57	1.37	1.37	1.97	1.46	1.06	0.39	1.18	9.59	4.63	M10 x 0.6 15.0 DP
	511.8	255.9	244.9	276.0	149.0		140.0		99.0	36.0	40.0	34.9	34.9	50.0	37.0	27.0	10.0	30.0	243.6	117.5	
42F39	24.40	12.20	11.14	12.44	6.69	F16	6.50	M20 x 1.20 30.0 DP	4.59	1.81	1.97	2.00	2.00	1.97	1.36	1.18	0.39	1.18	5.25	4.00	M8 x 0.5 13.0 DP
	619.7	309.9	283.0	316.0	170.0		165.0		116.7	46.0	50.0	50.8	50.8	50.0	34.5	30.0	10.0	30.0	133.4	101.6	
45F39	22.67	11.34	13.19	14.70	7.99	F16	6.50	M20 x 1.20 30.0 DP	4.59	1.81	1.89	2.00	2.00	1.97	1.36	1.10	0.39	1.18	13.00	6.25	M16 x 0.95 24.0 DP
	575.9	288.0	334.9	373.5	203.0		165.0		116.7	46.0	48.0	50.8	50.8	50.0	34.5	28.0	10.0	30.0	330.2	158.7	
50F39	24.65	12.32	15.26	16.70	8.95	F25	10.00	M16 x 0.95 24.0 DP	Note 1	2.17	2.24	2.24	2.24	1.97	1.29	1.38	0.39	1.18	9.59	4.63	M10 x 0.6 15.0 DP
	626.0	313.0	387.5	424.2	227.4		254.0		55.0	57.0	57.0	57.0	57.0	50.0	32.8	35.0	10.0	30.0	243.7	117.5	

1. The model 50F39 uses 8 mounting holes on a 10.0 inch (254mm) PCD distributed evenly about the center lines of the actuator.
 2. On models 42F39, 45F39 and 50F39 ancillary mounting holes are only on the top of the actuator, on 40F39, only on the base. These sizes also have a location spigot on the base of the actuator in accordance with ISO 5211

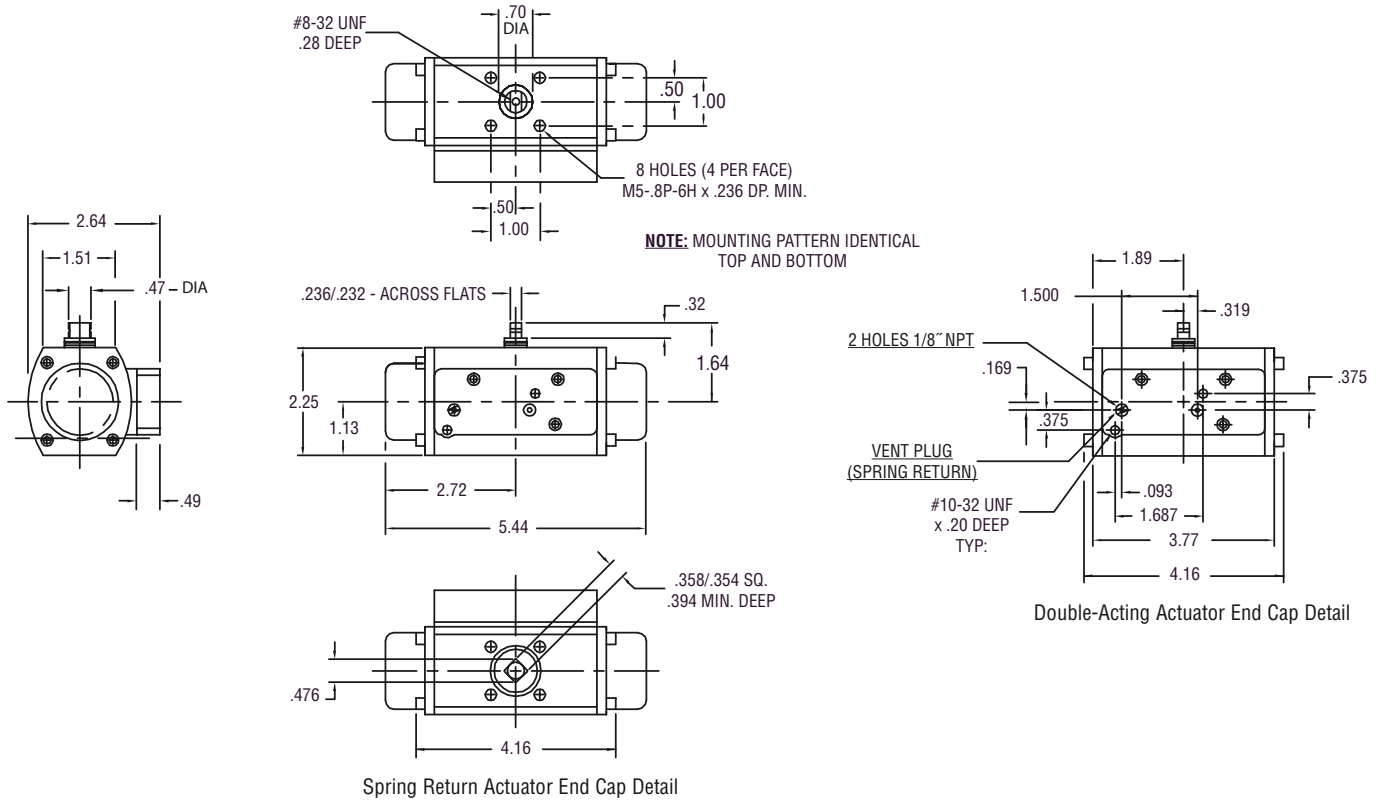


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flowserve.com

Dimensions Size 05F39 Inches



How to Order

10	E	F39	S	W	Z	120A	----	----
Actuator Sizes	Special Services	Series	Operating Mode	Solenoid	End Mount Limit Switches	Solenoid Voltage	Spring Return Supply Pressure	Options †
05	Blank - None	F39	Blank - Double Acting	W - Watertight Solenoid (Type 4, 4x)	(must specify "E" in Special Service Column)†	12D - 12 DC	Blank - 80 psig	V54 - SST Springs (Sizes 10-30 only)
10	9 - Fail-Open Mount				Z - Watertight/Hazardous Locations, SPDT Switches	24D - 24 DC	7 - 70 psig	
15			S - Spring Return	X - Hazardous Locations Solenoid (Type 4, 4x, 7 & 9)	ZD - Watertight/Hazardous Locations, DPDT Switches	24A - 24/60 AC	6 - 60 psig	V90 - Reverse Rotation (FCCW)
20	H - High Temperature** (N & SN Models Only)				Z1 - Watertight/Hazardous Locations, 2-Wire AC/DC Proximity Sensors	120A - 120/60 AC	5 - 50 psig	
25						240A - 240/60 AC	4 - 40 psig	V95 - NorGuard Severe Service Actuator***
30	E - End mounted Limit Switch Module*			N - No Solenoid				V96 - CE Marking***
33								
35								
40								
42								
45	L - Low Temperature** (N, SN, W models only)							
50								

† Not available on Series 05F39.

* NOTE: Not available with end mounted travel stops. Top-mounted travel stops available on 10-30 Sizes only - consult factory. End-mounted travel stops standard on all size 10-42 actuators, excluding end mount switches.

** NOTE: Consult Factory for high and low temperature solenoid variations.

*** NOTE: Applies to actuator only.



Series 40R, 39R & 33 Actuator

Identification chart

FIELD A - Size

Digits 1 & 2	
05 Norbro Actuator	30 Norbro Actuator
10 Norbro Actuator	33 Norbro Actuator
15 Norbro Actuator	35 Norbro Actuator
20 Norbro Actuator	40 Norbro Actuator
25 Norbro Actuator	42 Norbro Actuator

FIELD C Product series

Digits 7 & 8
40 - Product code 40R
39 - Product code 39R
33 - Product code 33

FIELD E Variations

Digit 14 Pinion drive
E - Standard female drive with Namur slot
M - Standard male drive with Namur slot
N - DIN 3337 female drive (45°) with Namur slot
X - Special feature
Digit 15 Standard options
O - If not used
H - Hydraulic
Digit 17 Revision

A		B				C		D					E				
SIZE		I	ROTATION	BODY	FUNCTION	PRODUCT SERIES		I	FINISH	TEMPERATURE	INLET ENDCAP	SWITCH ENDCAP	PINION DRIVE	STANDARD OPTIONS		I	REVISION
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	

FIELD B Variations

Digit 4 Rotation	Digit 6 Function
R - Standard 40R - 92°	A - Double acting
39R - 94.4°	B - Spring return 10 springs
33R - 180°	C - Spring return 8 springs
	D - Spring return 6 springs
Digit 5 Body	E - Spring return 4 springs
D - Standard (includes DIN/ISO location ring Namur top mounting pattern, metric tappings)	F - Spring return 2 springs (05 only)
K - As 'D' without ISO/DIN location ring	

FIELD D Variations

Digit 10 Finish	Digit 12 Inlet endcap
1 - Standard gold body/black end caps-anodised	D - Standard Namur tappings
2 - Epoxy coated	G - Norbro tappings
3 - PVC coated	K - Access
X - Special finish	S - Special large port
Digit 11 Temperature	Digit 13 Switch endcap
S - Standard -20°C to +100°C	1 - Standard metric tapping for switch box
H - High temperature -20°C to +150°C	2 - Unified tapping for switch box
L - Low temperature -40°C to +85°C	B - Blank
X - Special 'O' rings	P - P & F endcap not included
	O - 05 Actuators only
	M - Metric limit stops



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PMV Automation Positioners & Switch Boxes

Product Selection Guide





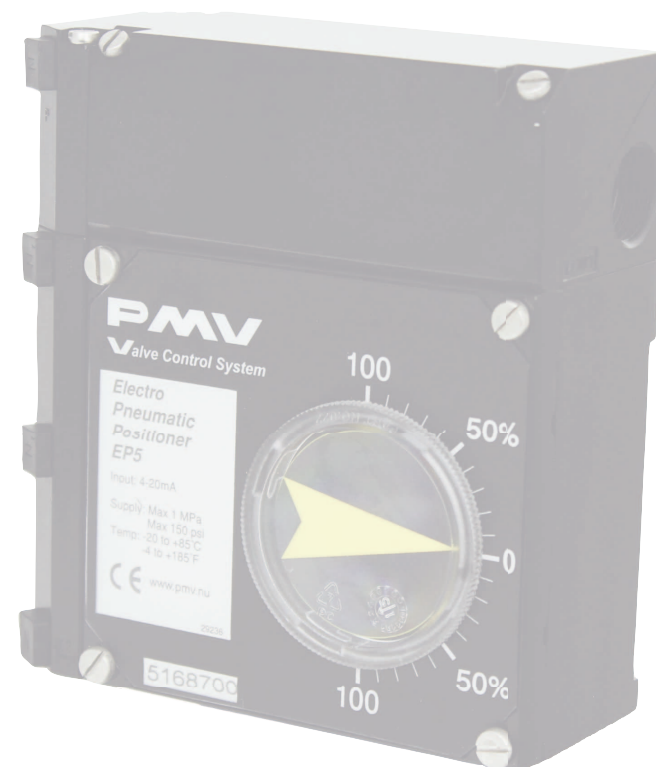
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PMV Automation Positioners & Switches

Product Selection Guide

	Single Acting & Double Acting	Linear & Rotary valves	Kits for direct mounting	Stainless steel/resin available	Zero Bleed air consumption	Fail Freeze option	Remote mounting option	Limit switch options	Max no of internal switches	Opt ext pressure guages	Opt integr pressure sensors	4-20 mA position transmitter	3-15 psi input	4-20 mA input	AS-i / DeviceNet	Hart	Profibus PA	Profibus DP	Foundation Fieldbus	IEC ISA100 Wireless com	ValveSight diagnostics DTM	Partial Stroke Testing	LCD Display	ATEX haz loc certificates	IEC haz loc certificates	FM haz loc certificates	CSA haz loc certificates	SIL - Safety Integrity Level	
D30	x	x	x				x	x	2	x	x	x		x		x	x		x		x	x	In progress					D30	
D20	SA	x	x	SST			x	x	2	x	x	x		x		x	x		x		x	x	IS/Exd	IS	IS/NI/Exd	Exd		D20	
D3	x	x	x	SST	x	x	x	x	2	x	x	x		x		x	x	x	x	x	x	x	IS/Exd	Exd	Exd	Exd	2	D3	
P5/EP5	x	Rot						F5	F5	x		F5	x	x									IS/Exd	Exd	IS/Exd	IS/Exd		P5/EP5	
F5		x	x					x	2			x											IS/Exd		IS/Exd	IS/Exd		F5	
WS/WM		R		Res				x	2						x								IS			IS/NI		WS/WM	
PS/PM		x		Res				x	4			x			x		x		x	x			IS/mb	IS	IS/NI	IS/NI	2	PS/PM	
FS/FM		Rot	x	Res				x	2														x					FS/FM	
XCL/XML		x						x	4			x			x		x		x	x			Exd	Exd	IS	IS/NI/Exd	2	XCL/XML	
DS/DM		x		SST				x	4			x			x								Exd	Exd			2	DS/DM	
RS/RM	x	x			x			x	4						x		x		x	x								RS/RM	
Aviator II / BuSwitch	x	x			x			x	4						x		x		x	x			Exd	Exd	Exd	NI/Exd		Aviator II / BuSwitch	
Aviator III <small>NEW 2017!</small>	x	x			x			x	4		x	x			x	x	x		x	x	x	x	In progress					Aviator III	



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Switch Boxes: Weather proof

Product			
Model	WS/WM - compact design	PS/PM - engineered resin	FS/FM - direct mounting
Key features	Compact design Corrosion resistant option	Modular design Global certificates Corrosion resistant Low weight Open terminals available	Direct mounting (NAMUR holes 30x80/30x130 mm) Field attachable terminal Connection for solenoid LEDs indicating switching state, valve status, operating voltage
Indicator	Dome or Flat	Dome or Flat	Dome
Enclosure material	Aluminum or PC	Fiberglass Reinforced Nylon	PC
Connections	Prewired terminals 2 or 4 x 1/2" NPT or 2 or 4 x M20	Prewired terminals 3 x 3/4" or 1/2" NPT or 3 x M20 or M25	M20 x 1.5 or 1/2" NPT
Switch options	Mech, proximity, inductive 2 x switches	Mech, proximity, inductive Up to 4 x switches	2 Inductive switches in 2-wire or 3-wires DC technology
Dimensions	120 x 80 x 59 mm Flat 120 x 80 x 106 mm Dome	146 x 140 x 103 mm Flat 146 x 140 x 154 mm Dome	191 x 98 x 78 mm
Special options	AS-i DeviceNet	Viton O-rings (low temp) AS-i DeviceNet	Modular housing configuration Metal protective cover resistant to 7 Joule impact
Ratings and certification	Aluminum enclosure, ATEX II 1G Ex ia IIC T4-T6, ATEX II 1G Ex ia IIB T4-T6, ATEX II 1D Ex ta IIIC T80 °C, T50085 °C Da cCSAus: Class I, II, III Div. 1&2 Grps. A-D & F-G IP66 / IP67, Nema 4 PC version General purpose only IP66 / IP67 xx PC version General purpose only IP66 / IP67	ATEX II 1G Ex ia IIC T4-T6 ATEX II 1G Ex ia IIB T4-T6 ATEX II 2G Ex e mb IIC T5-T6 IECEx Ex ia IIC T4-T6 cMus: Class I, II, III Div. 1&2 Grps. A -G cCSAus: Class I, II, III Div. 1&2 Grps. A-G SIL 2 IP66, Nema 4 x	IP66 / IP67 / IP69 K Available certifications II 3G Ex nA IIC T6 Gc II 3D Ex tc IIIC T80°C Dc Exi in preparation
Further information/Literature	PMENBR0019	PMENBR0018	To be added








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Switch Boxes: Explosion proof

On/Off Control

Product					
Model	XCL/XML - explosion proof	DS/DM - highest explosion proof rating	RS/RM - resin On Off control	XV Aviator II/BUSwitch - aluminum On Off control	Aviator III ESD
Key features	Global certificates Multiple switch options Transmitter available 3-way dribble control Open terminals available	Heavy duty design Explosion proof ATEX IIC North American approvals Gr. A-D Transmitter available Corrosion resistant option Open terminals available	Modular design Integrated coil and spool valve Corrosion resistant Several switch options	Integrated coil and spool valve Explosion proof Several switch options	Intelligent On Off control Partial Stroke Testing Emergency Shut Down ValveSight™ valve equipment diagnostics Robust explosion proof IIC Gr A housing
Indicator	Dome or Flat	Dome or Skirt	Dome or Flat	Dome	Dome
Enclosure material	Aluminum	Aluminum or Stainless Steel	Fiberglass reinforced Nylon	Aluminum	Aluminum
Connections	Prewired terminals 2 x ¾" NPT or 2 x M25	Prewired terminals 3 x ¾" NPT or 3 x M25	Prewired terminals 3 x ¾" or ½" NPT or 3 x M20 or M25	Prewired terminals 3 x ¾" NPT	Prewired terminals 2 x ¾" and 2 x ½" NPT or 2 x M25 and 2 x M20
Switch options	Multiple options Up to 4 x switches	Multiple options Up to 4 x switches	Multiple options Up to 4 x switches	Multiple options Up to 4 x switches	Multiple options Up to 4 x switches
Dimensions	157 x 135 x 87 mm Flat 157 x 135 x 148 mm Dome	150 x 137 x 100 mm	Flat: 146 x 140 (+solenoid) x 103 mm Dome: 146 x 140 (+solenoid) x 154 mm	Dome: 157 x 135 (+solenoid) x 148 mm	175x140x155 mm
Special options	Viton O-rings (low temp) AS-i DeviceNet 4 - 20 mA transmitter Fieldbus/Profibus available Wireless IEC ISA100 Communication	Viton O-rings (low temp) AS-i DeviceNet 4 - 20 mA transmitter	High Cv spool valve Stainless steel spool valve 4-20mA Transmitter Viton O-rings AS-i DeviceNet Profibus Foundation Fieldbus	High Cv 4.5 spool valve Stainless steel spool valve AS-i Foundation Fieldbus DeviceNet Profibus Wireless IEC ISA100 Communication	High Cv spool valve SST spool valve Nat Gas supply medium ESD, SIL 4-20mA Transmitter AS-i, DeviceNet Fieldbus, Hart ValveSight™ Wireless IEC ISA100 Communication
Ratings and certification	ATEX II 2 G Ex d IIB T5, ATEX II 2 D Ex tD A21, IP 65, IECEx Ex d IIB T5 IECEx Ex tD A21 IP 65, InMetro BR Ex d IIB T5, Kosha Ex d IIB T5, cCSAus EX: Class I, II & III, Div. 1&2, Grps.C, D, E,F&G Class I, Div. 2, Grps. A,B,C&D. cCSAus IS: Class I, II, III Div. 1, Grps. A, B, C, D, E, F & G, SIL 2, IP66/67/Nema 4x	ATEX II 2GD Ex d IIC T4 Gb ATEX IIIC T113 °C Db IECEx Ex d IIC T4 Gb IECEx tb IIIC T113 °C Db cCSAus CI I, Div 1, Gr B,C,D T4, CSAus CI I, Div 1, Gr A,B,C,D T4, SIL 2, IP66/Nema 4x	Pending IP66/Nema 4x	ATEX II 2G Ex d IIB T3/T4 CSA Class I, Div.1, Gr. C, D, Class II, Div.1 &2, Gr. E, F, G, Class III TYPE 4X Class I, Div.2, Gr. A, B, C, D, Class I, Zone 1, Gr. IIB Ex d IIB T3/T4 IP65 AEx d IIB T3/T4 IP65 IECEx Ex d IIB T3/T4 InMetro BR Ex d IIB T3/T4 FM Class I, II, III. Div. 1, Gr. A, B, C, D, E, F, G IP65/Nema 4x	Pending
Further information/Literature	AXENBR0006	PMENBR0020	PMENBR0018	AXENBR0006	To be added



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Positioners: Digital

Software

Product				
Model	D30	D20	D3	ValveSight software (D3, D20, D30)
Key features	<ul style="list-style-type: none"> Very robust, modular, high capacity positioner Designed to fit large down to small valves Suitable for tough environments Instant quick calibration Friction clutch 	<ul style="list-style-type: none"> Very high precision on small valves Friction clutch Explosion proof Intrinsically safe Non incensive Very user friendly 	<ul style="list-style-type: none"> Extremely low air/energy consumption - zero bleed - meets EPA 6.0 SCFH leak limit => can use NG as supply medium Friction clutch Explosion proof Intrinsically safe Multitude of options incl 4-20 mA position feedback, integrated limit switches, 270 deg travel range, fail in last set position function, external pressure gauges, integrated pressure sensors, remote mounting 	<ul style="list-style-type: none"> Online and Offline diagnostics of valve, actuator and positioner Health bars to help predict repairs and plan maintenance Graphs presenting trends of key valve health parameters PST / Partial Stroke Testing User-friendly positioner configurator Alarm limits easily customized FDT/DTM format
Communication	HART, Profibus PA, Foundation Fieldbus	HART, Profibus PA, Foundation Fieldbus	HART, Profibus PA and DP, Foundation Fieldbus, Wireless ISA100	HART, Profibus PA, Foundation Fieldbus
Output	Large Spool Valve Single acting Double acting	Small High Precision Poppet Valve Single acting	Digital Poppets Air Relay Single acting Double acting Fail Freeze option	
Enclosure material	Aluminum	Aluminum, Stainless steel	Aluminum, Stainless steel	
Diagnostic	Standard Local alarm monitoring ValveSight FDT/DTM diagnostics AMS SnapOn application	Standard Local alarm monitoring ValveSight FDT/DTM diagnostics AMS SnapOn application	Standard Local alarm monitoring ValveSight FDT/DTM diagnostics for Hart, Profibus PA and Fieldbus AMS SnapOn application	
User interface	Status LED's, LCD + Menu interface, ValveSight	Status LED's, LCD + Menu interface, ValveSight	LCD + Menu interface, ValveSight	
Motion	Linear, Rotary	Linear, Rotary	Linear, Rotary	
Mounting option	IEC 534-6 (NAMUR) VDI/VDE 3845, 3847 Remote mounting Direct mounting for NAF, FlowAct	IEC 534-6 (NAMUR) VDI/VDE 3845, 3847 Remote mounting Direct mounting for FlowAct	IEC 534-6 (NAMUR) VDI/VDE 3845, 3847 Remote mounting Direct mounting for FlowAct	
Ratings and certification	IP66 Hazardous location certificates (pending)	IECEX Ex d IIB + H2, ATEX II 2G EEx d IIB + H2, ATEX II 2D T85°C Ta: 80°C D20E: CSA/FM Cl 1 Div 1 Gr B, C, D; Cl II Div 1, Gr E, F, G; Cl III Div 1, ATEX II 1G EEx ia IIC, FM Ex II 1G ia Cl 1, Zone 0&1 Gr. IIC, FM NI Cl 1 Div 2 Gr A-D and Cl 1 Zone 2, Gr IIC, InMetro, TR CU IP66, Nema 4 X	IECEX Ex d IIB + H2, ATEX II 2G EEx d IIB + H2, ATEX II 2D T85°C Ta: 80°C D3E: CSA/FM Cl 1 Div 1 Gr B, C, D; Cl II Div 1, Gr E, F, G; Cl III Div 1, CSA Cl 1, Div1&2, Gr B,C,D, Cl II, Div1&2, Gr E,F,G, Cl III, ATEX II 1G EEx ia IIC, NEPSI (IS and Eexd), SIL 2 IP66, Nema 4 X	
Further information/Literature	PMENBR0030	PMENBR0015	PMENBR0001	





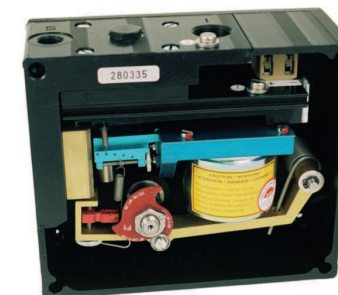
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Positioners: Analog

Product		
Model	P5/EP5	F5
Key features	<ul style="list-style-type: none"> • Modular, sturdy, simple reliable design • Single or Double acting • Easy calibration, external zero adjustment • Non interactive zero and span settings • High gain pilot valve • Low bleed version available • Vibration resistant • Suitable for rotary or linear operation • Flat or dome indicator 	<ul style="list-style-type: none"> • Feedback function for P5/EP5 • Direct mounting to P5/EP5 • 2x switches, 4-20 mA feedback • Easy to setup and calibrate • Flat or dome indicator • Stand alone operation possible
Input signal	4 - 20 mA 3 -15 psi / 0.2 - 1 bar 6 - 30 psi / 0.4 - 2 bar Split range	-
Output signal	0 - 100% of air supply	Switches and 4 - 20 mA
Air supply	Up to 10 bar /1 M Pa / 150 Psi	-
Air consumption (standard version)	1.32 nm ³ /h (at 6 bar supply pressure)	
Temperature range	-20 °C to +85 °C -40 °C to +85 °C	-40 °C to +85 °C
Mounting option	Namur standard	Namur standard
Design options	<ul style="list-style-type: none"> • Explosion Proof or Intrinsically Safe I/P Feed-back Unit • Tufram coating option • Multiple cam alternatives • Dome indicators 	<ul style="list-style-type: none"> • Explosion Proof or Intrinsically Safe • Dome indicators • Tufram coating option
Ratings and certification	ATEX II 2 GD EEx d IIB + H2 T6 FM/CSA ClassI Div1 Gr. B, C, D; ClassII Div1 Gr. E, F, G; ClassIII IEC EEx d IIB+H2 T6 IP 66 ATEX ia IIC T4-T6 II 1G FM/CSA Cl 1 Div 1 Gr ABCD IP66, Nema 4	ATEX II 2 GD EEx d IIB + H2 T6 FM/CSA ClassI Div1 Gr. B, C, D; ClassII Div1 Gr. E, F, G; ClassIII ATEX ia IIC T4 FM/CSA Cl 1 Div 1 Gr C,D IP66, Nema 4
Further information/Literature	PMENBR0008 PMENBR0006	PMV 22524



Additional models for covering special applications include:

- P1520 *Super High Temp*
- P1540 *High Vibration*
- PT700 *Pressure Transducer*
- P2000/2050 *Dirty Air / High Performance*

Contact PMV for more info!



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PMV Products are Designed for Automation

- *Designed to fit all valve brands*
- *Multitude of features to fit all applications*
- *Modular flexible design to enable quick tailor-made solutions*
- *Multitude of mounting kits, spindle shafts , connections*
- *Reliable valve operation provided by robust and proven technology*
- *Very short lead-times*

Point of Contact

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