FLOWSERVE

Limitorque™ LRP

Limitorque Rack & Pinion Pneumatic Actuator

Experience In Motion

LRP Limitorque Rack and Pinion Actuator Series

Limitorque is the brand customers trust when safe, reliable and robust valve automation is demanded in the most arduous operating conditions. Used in a vast range of industries, including oil and gas, petrochemical, power generation, pharmaceutical, and steel production, the Limitorque range of electric, scotch yoke and rack and pinion actuators guarantee precision valve control in challenging applications.
The Limitorque LRP provides durable functionality and prolonged service life through unique features such as piston support rods within the actuator, ensuring that side loads generated by the pistons are transmitted through bearings in the end cap and not the body. This eliminates the need for the body to be used as a loadbearing surface and promotes longer service life. The support rod design of the Limitorque LRP actuator distinguishes it from the standard rack and pinion design and offers reliable operation, performance stability and longer service life.
In addition to offering improved operational safety and ease of maintenance, the modular LRP design provides greater application flexibility for easy fitting and interchangeability of ancillary equipment, making it one of the finest pneumatic actuators available today.

Key Benefits

Robust design for durable functionality and maximum ease of use

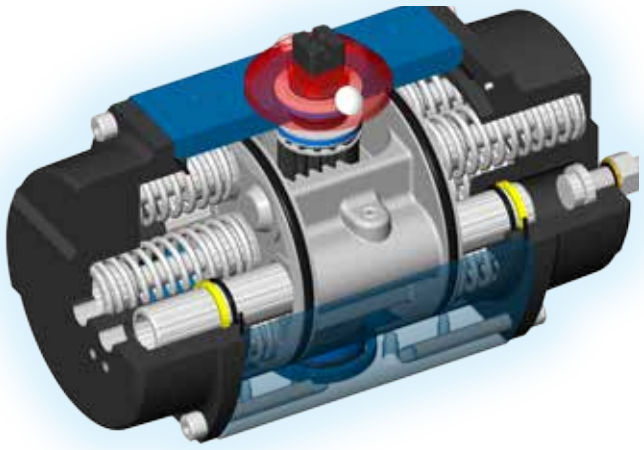
- Balanced double rack and pinion provides a linear torque curve with a large range of sizes for efficient torque matching
- Mounting to ISO 5211 pattern and DIN 3337 female star drive provides common and simple actuator to valve attachment
- Position indicator - provides highly visible external indication of valve position
- Foolproof location pin for correct assembly
- Multi-spring concept - allows variable torque/air pressure requirements from the same actuator by changing spring quantity
- Namur VDI/VDE 3845 top mounting pattern - for easy fitting and interchangeability of switches, positioners, etc
- Namur VDI/VDE 3845 end-cap solenoid mounting pattern - facilitates interchangeability of solenoids or direct port connections
- Compact fail-safe size as per double-acting - minimizes space requirements

Reduced maintenance and Longer Service life

- Anodised aluminium construction - for anti-corrosion and superior wear performance on internal surfaces, plus stainless steel fasteners and corrosion-protected springs
- One piece steel pinion drive with full width piston tooth engagement - for greater operational life

Increased plant and personnel safety

- For fail-safe operation in a fire, polished support rods retain fire-safe capability even if bearings are fire damaged
- Blow-out proof pinion - eliminates risk of pinion ejection even after pinion retaining ring is removed
- Unique unrestricted air flow through support rods gives fast operation speeds as standard - and also provides greater safety (center chamber cannot be pressurized with end cap removed)
- Long end cap screws allow complete release of spring energy for safe removal of end caps.



Operating Principle

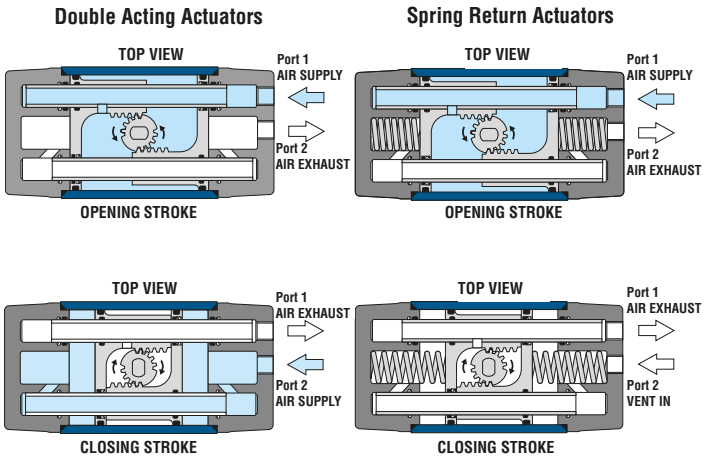
The LRP pneumatic actuator is based on the opposed double rack and pinion principle but utilises unique support rods to transfer air between the chambers of the actuator and minimise friction and wear between pistons and body bore

Double Acting Actuators

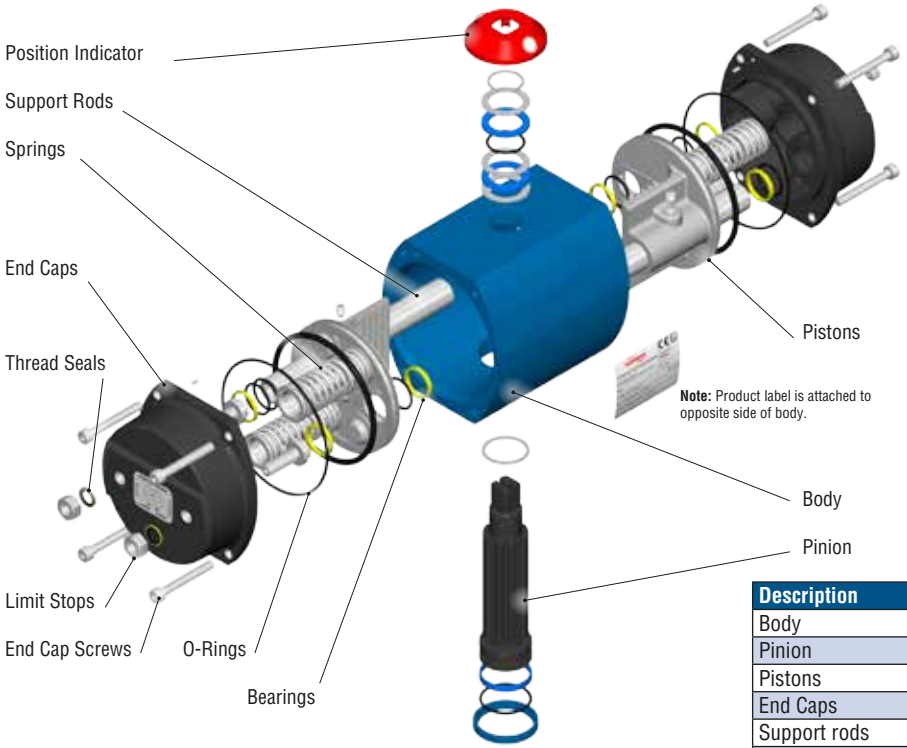
In the double acting model, compressed air is applied to Port 1, which is fed via the large bore support rod into the centre chamber. This forces the pistons apart and turns the actuator's output drive anti-clockwise (seen from above) for valve opening, simultaneously venting the air in the end chambers via the second support rod through Port 2. This operation can be reversed by supplying air into Port 2 for clockwise rotation (valve closing).

Spring Return Actuators

With the fail-safe spring return model, air is applied in a similar way to Port 1 for anti-clockwise operation (valve opening) and the movement of the pistons compresses the springs held in the end chambers of the actuator. This position will be maintained until air pressure is released when the spring force closes the pistons together for clockwise operation (valve closing).



Parts List/Material Specifications



Description	Material/Finish
Body	Aluminium (extrusion) anodised
Pinion	Carbon Steel (corrosion resistant coated)
Pistons	Aluminium
End Caps	Aluminium anodised
Support rods	Stainless Steel
Bearings	Acetal
O-Rings	Nitrile Rubber
End Cap Screws	Stainless Steel
Springs	Chrome Silicon Steel (corrosion resistant coated)
Position Indicator	Polyethylene
Limit Stops	Stainless Steel (Sizes 40 to 50 carbon steel plated)
Thread Seals	Bonded Nitrile and Steel (corrosion resistant coated)

Additional Information

Working Pressure	8.3 bar (120 psig) Maximum. For higher pressures contact our sales office.
Media	Air or non-corrosive fluid
Temperature Range	Standard -20°C to +100°C Low temperature variant -40°C to +85°C* High temperature variant -20°C to +150°C
ATEX	Conforms to ATEX 2014/34/EU under equipment group II, category 2 (non-mining)
SIL	Certified to IEC61508 to SIL level 3 capability

* Please contact Technical Sales for options down to -40 °C

Rotation

When viewed from top, piston rotates anti-clockwise when centre chamber supply port 1 is pressurised (see page 3)

Limit Stop:

- Nominal 96° total travel including nominal 3° adjustable overtravel and adjustable 10° undertravel both clockwise and anti-clockwise.

Mounting Configurations

Solenoid:

- EN15714-3 VDI/VDE 3845 mounting pattern

Top Mount Interface:

- EN15714-3 VDI/VDE 3845 mounting pattern

Actuator/Valve Interface:

- ISO 5211 pattern with DIN3337 Star drive pinion (female)

Actuator Sizing

The torque tables detailed below provide actual torque values for the range of actuators at typical pressure and spring configurations. **When sizing a valve, we recommend that a factor of safety is applied to its nominal torque. Please contact Technical Sales for further advice.**

Double Acting Actuators

For a given air supply pressure the double acting actuator provides a linear (constant) torque output throughout its rotation (see chart below).

Double Acting Actuator Output Torque Nm (lbf/in)

Size / Series	Operating Pressure barg (psig)										
	2 (29)	2,5 (36)	3 (44)	3,5 (51)	4 (58)	4,5 (65)	5 (73)	5,5 (80)	6 (87)	7 (102)	8 (116)
LRP-10	10	13	16	19	22	25	28	31	34	40	46
	89	*115*	*142*	*168*	*195*	*221*	*248*	*274*	*301*	*354*	*407*
LRP-15	20	26	31	37	43	49	54	60	66	77	88
	177	*230*	*274*	*327*	*381*	*434*	*478*	*531*	*584*	*681*	*779*
LRP-20	37	47	57	68	78	89	99	109	120	141	162
	327	*416*	*504*	*602*	*690*	*788*	*876*	*965*	*1062*	*1248*	*1434*
LRP-25	61	78	96	113	131	148	165	183	200	235	270
	540	*690*	*850*	*1000*	*1159*	*1310*	*1460*	*1620*	*1770*	*2080*	*2390*
LRP-30	100	129	157	186	214	243	272	300	329	386	443
	885	*1142*	*1389*	*1646*	*1894*	*2151*	*2407*	*2655*	*2912*	*3416*	*3921*
LRP-33	196	252	308	363	419	475	531	587	643	755	867
	1735	*2230*	*2726*	*3213*	*3708*	*4204*	*4699*	*5195*	*5691*	*6682*	*7673*
LRP-35	240	309	377	446	515	583	652	720	789	926	1063
	2124	*2735*	*3336*	*3947*	*4558*	*5160*	*5770*	*6372*	*6983*	*8195*	*9408*
LRP-40	383	492	602	711	821	931	1040	1149	1259	1478	1697
	3390	*4354*	*5328*	*6292*	*7266*	*8239*	*9204*	*10169*	*11142*	*13080*	*15018*

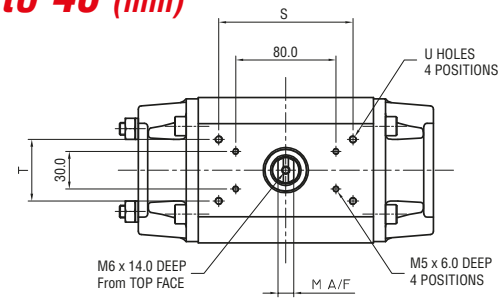
Spring Return Actuators

The table below shows actuator start and end torque by air and by spring, valid for both fail open and fail close configurations. During sizing, ensure that the actuator has sufficient torque to open and close the valve.

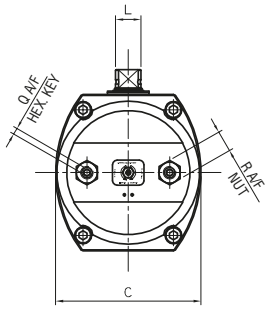
Spring return Actuator Output Torque Nm (lbf/in)

Size / Series	Number of Springs	Spring Stroke		Air Stroke																	
				2.5 bar (g) 29 psi (g)		3.0 bar (g) 36 psi (g)		3.5 bar (g) 44 psi (g)		4.0 bar (g) 51 psi (g)		4.5 bar (g) 58 psi (g)		5.0 bar (g) 65 psi (g)		5.5 bar (g) 80 psi (g)		6.0 bar (g) 87 psi (g)		7.0 bar (g) 102 psi (g)	
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
LRP-10	4	8	5	9	6	12	8														
		71	*44*	*80*	*53*	*106*	*71*														
	6	12	7			10	5	12	7	15	10										
		106	*62*			*89*	*44*	*106*	*62*	*133*	*89*										
	8	16	10							13	6	16	9	18	11						
		142	*89*							*115*	*53*	*142*	*80*	*159*	*97*						
	10	20	12											16	8	19	10	22	13	27	18
		177	*106*											*142*	*71*	*168*	*89*	*195*	*115*	*239*	*159*
LRP-15	4	13	8	18	13	24	18														
		115	*71*	*159*	*115*	*212*	*159*														
	6	20	13			20	12	25	17	30	22										
		177	*115*			*177*	*106*	*221*	*150*	*266*	*195*										
	8	26	17							26	16	31	21	37	26						
		230	*150*							*230*	*142*	*274*	*186*	*327*	*230*						
	10	33	21											33	20	38	25	43	30	54	40
		292	*186*											*292*	*177*	*336*	*221*	*381*	*266*	*478*	*354*
LRP-20	4	24	15	34	24	43	33														
		212	*133*	*301*	*212*	*381*	*292*														
	6	36	24			36	22	46	31	55	40										
		319	*212*			*319*	*195*	*407*	*274*	*487*	*354*										
	8	47	31							48	29	57	38	67	48						
		416	*274*							*425*	*257*	*504*	*336*	*593*	*425*						
	10	59	38									50	27	59	36	69	46	79	55	99	73
		522	*336*									*443*	*239*	*522*	*319*	*611*	*407*	*699*	*487*	*876*	*646*
LRP-25	4	43	26	55	37	72	52														
		381	*230*	*487*	*327*	*637*	*460*														
	6	64	39			59	32	75	47	91	63										
		566	*345*			*522*	*283*	*664*	*416*	*805*	*558*										
	8	86	53							78	43	94	58	111	73						
		761	*469*							*690*	*381*	*832*	*513*	*982*	*646*						
	10	107	66											98	53	114	69	130	84	163	115
		947	*584*											*867*	*469*	*1009*	*611*	*1151*	*743*	*1443*	*1018*
LRP-30	4	69	42	92	62	119	87														
		611	*372*	*814*	*549*	*1053*	*770*														
	6	103	63			98	54	125	80	151	105										
		912	*558*			*867*	*478*	*1106*	*708*	*1336*	*929*										
	8	138	84							130	72	157	98	184	123						
		1221	*743*							*1151*	*637*	*1389*	*867*	*1628*	*1089*						
	10	172	105											163	91	190	116	217	141	270	192
		1522	*929*											*1443*	*805*	*1682*	*1027*	*1920*	*1248*	*2390*	*1699*
LRP-33	4	142	91	171	113	224	163														
		1257	*805*	*1513*	*1000*	*1982*	*1443*														
	6	213	136			178	96	231	145	283	195										
		1885	*1204*			*1575*	*850*	*2044*	*1283*	*2505*	*1726*										
	8	284	182							238	127	290	177	343	226						
		2513	*1611*							*2106*	*1124*	*2567*	*1566*	*3036*	*2000*						
	10	356	227											297	159	250	209	402	258	510	357
		3151	*2009*											*2628*	*1407*	*2213*	*1850*	*3558*	*2283*	*4514*	*3159*
LRP-35	4	164	105	217	149	281	210														
		1451	*929*	*1920*	*1319*	*2487*	*1859*														
	6	246	158			228	132	293	193	357	254										
		2177	*1398*			*2018*	*1168*	*2593*	*1708*	*3159*	*2248*										
	8	328	210							304	176	369	237	433	298						
		2903	*1859*							*2690*	*1558*	*3266*	*2097*	*3832*	*2637*						
	10	*410*	*263*											*381*	*220*	445	281	509	342	638	463
		3629	*2328*											*3372*	*1947*	*3938*	*2487*	*4505*	*3027*	*5646*	*4098*
LRP-40	4	281	169	345	219	447	316														
		2487	*1496*	*3053*	*1938*	*3956*	*2797*														
	6	421	253			363	184	465	281	568	377										
		3726	*2239*			*3213*	*1628*	*4115*	*2487*	*5027*	*3336*										
	8	562	337							483	245	586	342	689	439						
		4974	*2982*							*4275*	*2168*	*5186*	*3027*	*6098*	*3885*						
	10	702	422											604	306	707	403	810	500	1015	694
		6213	*3735*											*5345*	*2708*	*6257*	*3567*	*7169*	*4425*	*8983*	*6142*

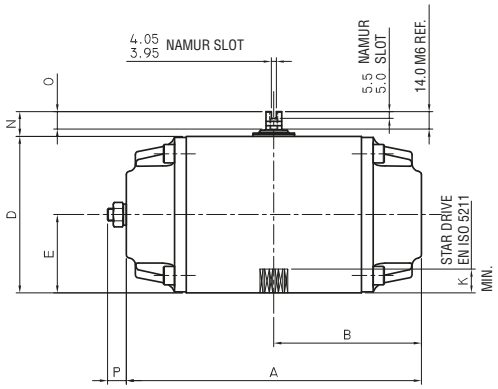
Dimensions Size 10 to 40 (mm)

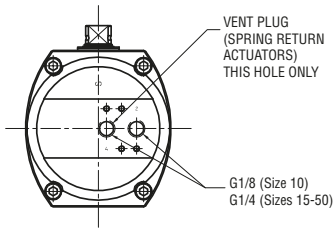


EN 15714-3 NAMUR TOP ACCESSORY MOUNTING

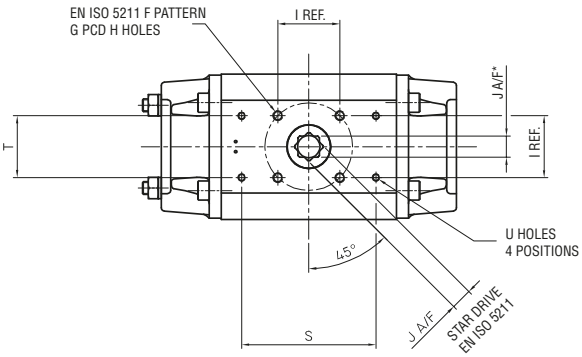


LIMIT STOP ENDCAP





EN 15714-3 NAMUR
INLET ENDCAP

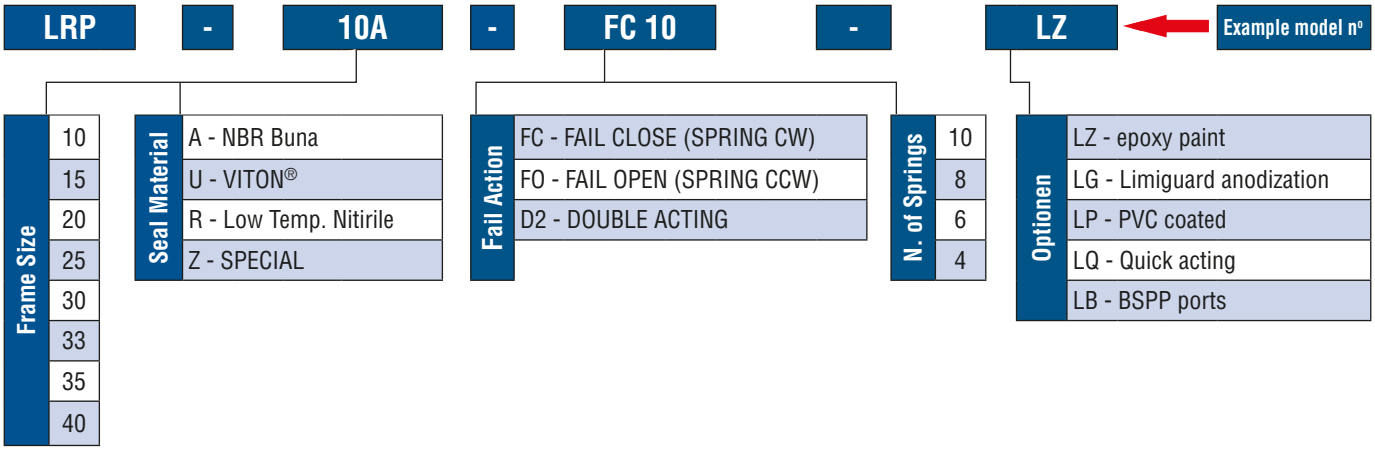


ACTUATOR MOUNTING
ATTACHMENT EN ISO 5211

Size / Series	Basic Dimensions					Bottom ISO Mounting Dimenions						Top Pinion				Limit Stop			Ancillary Hole		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
LRP-10	155,3	77,7	76,8	85,5	42,8	F04	42,0	M5 x 0.25 6.25 DP	29,7	11,0	12,0	15,0	9,0	20,0	16,0	10,0	4,0	13,0	73,0	31,8	M5 x 0.25 6.3 DP
LRP-15	195,3	97,7	94,0	104,0	52,0	F05	50,0	M6 x 0.30 7.5 DP	35,4	14,0	16,0	16,0	12,6	20,0	13,9	11,0	4,0	13,0	73,0	31,8	M5 x 0.24 6.0 DP
LRP-20	235,4	117,7	116,0	125,0	62,5	F07	70,0	M8 x 0.40 10.0 DP	49,5	17,0	19,0	20,3	12,6	20,0	13,8	15,0	5,0	17,0	107,2	49,2	M6 x 0.27 7.0 DP
LRP-25	271,0	135,5	135,5	146,6	73,5	F07	70,0	M8 x 0.40 10.0 DP	49,5	17,0	19,0	19,0	19,0	30,0	22,2	21,0	6,0	19,0	107,2	49,2	M6 x 0.4 10.0 DP
LRP-30	325,1	162,6	155,0	167,5	83,8	F10	102,0	M10 x 0.50 12.5 DP	72,1	22,0	24,0	22,1	22,1	30,0	21,9	23,0	6,0	19,0	161,1	73,0	M6 x 0.4 10.0 DP
LRP-33	398,7	199,4	206,0	214,0	107,0	F12	125,0	M12 x 0.70 18.0 DP	88,4	27,0	29,0	28,5	28,5	30,0	21,2	23,0	8,0	24,0	161,1	86,0	M8 x 0.5 13.0 DP
LRP-35	423,9	212,0	213,0	217,0	108,5	F12	125,0	M12 x 0.63 16.0 DP	88,4	27,0	29,0	28,5	28,5	30,0	20,9	30,0	8,0	24,0	212,7	101,6	M8 x 0.6 14.0 DP
LRP-40	511,8	255,9	244,9	276,0	149,0	F14	140,0	M16 x 0.95 24.0 DP	99,0	36,0	40,0	34,9	34,9	50,0	37,0	27,0	10,0	30,0	243,6	117,5	M10 x 0.6 15.0 DP

Dimensions in mm

LRP Actuator Selection Table



Technical Information

Size / Series	Operating Speed (Seconds) Actuator with no load using Namur solenoid at 5.5 bar (g)			Actuator Free Internal Volume Litres		Weights (Kg)	
	Double Acting	Spring Return (Open)	Spring Return (Close)	Open	Close (DA only)	Double Acting	Spring Return
LRP-10	0,15	0,15	0,15	0,17	0,22	1,3	1,6
LRP-15	0,3	0,3	0,3	0,35	0,39	2,7	3,1
LRP-20	0,5	0,5	0,5	0,69	0,74	4,5	5,5
LRP-25	0,6	0,6	0,6	1,22	1,31	7,4	8,4
LRP-30	1,1	1,4	1,0	1,86	2,05	11,0	12,0
LRP-33	2,1	2,7	1,7	3,39	4,79	22,5	26,0
LRP-35	2,9	3,2	2,2	3,93	5,54	26,0	30,0
LRP-40	3,0	4,5	3,5	6,73	8,19	43,6	48,6

Special Options

Finishes

The LRP actuator is available in a variety of special finishes to meet specific application needs. The Limiguard coating provides a special anodised finish for enhanced protection in highly corrosive or salt water atmospheres. Flowserve also offer epoxy paint finishes and colours to customer requirements.

Fast Acting

A fast acting version can be achieved by providing direct air feed to the centre chamber and adding dump valves for air exhaust. On size 40 a large Namur solenoid mounting can be specified and mounted to the end cap.

Italy
Flowserve Limitorque
via Rio Vallone 17
208 B 3 Mezzago (IM 18)1 Italy
Phone: +39 039 6 2060 1
Fax: +39 039 6 2060 213
Email: lfpsinfo@flowserve.com

China
Flowserve Suzhou Operations
49 Weixin Road, Suzhou
China, 215000
Phone: 86-512-62881711
Fax: 86-512-62888737

USA
Flowserve US, Inc
Valve Automation Center
14219 Westfair
West I Houston, Texas 77041
Phone: 281-671-9209
Email: VACHouston@flowserve.com

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Contact:

For more information about Flowserve Corporation, visit www.flowserve.com or call USA 1-800-225-6989.