



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

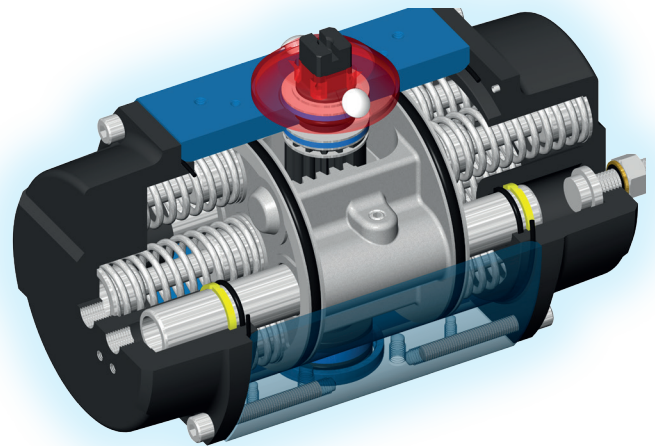
- Balanced double rack and pinion provides a linear torque curve with a large range of sizes for efficient torque matching
- Mounting to ISO 5211 pattern and DIN 3337 female star drive provides common and simple actuator to valve attachment
- Position indicator - provides highly visible external indication 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

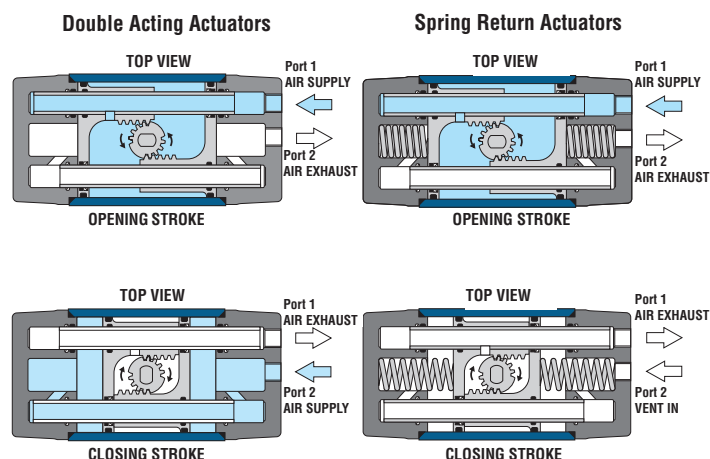
The LRP pneumatic actuator is based on the opposed double rack and pinion principle but utilises unique support rods to transfer air between the chambers of the actuator and minimise friction and wear between pistons and body bore

Double Acting Actuators

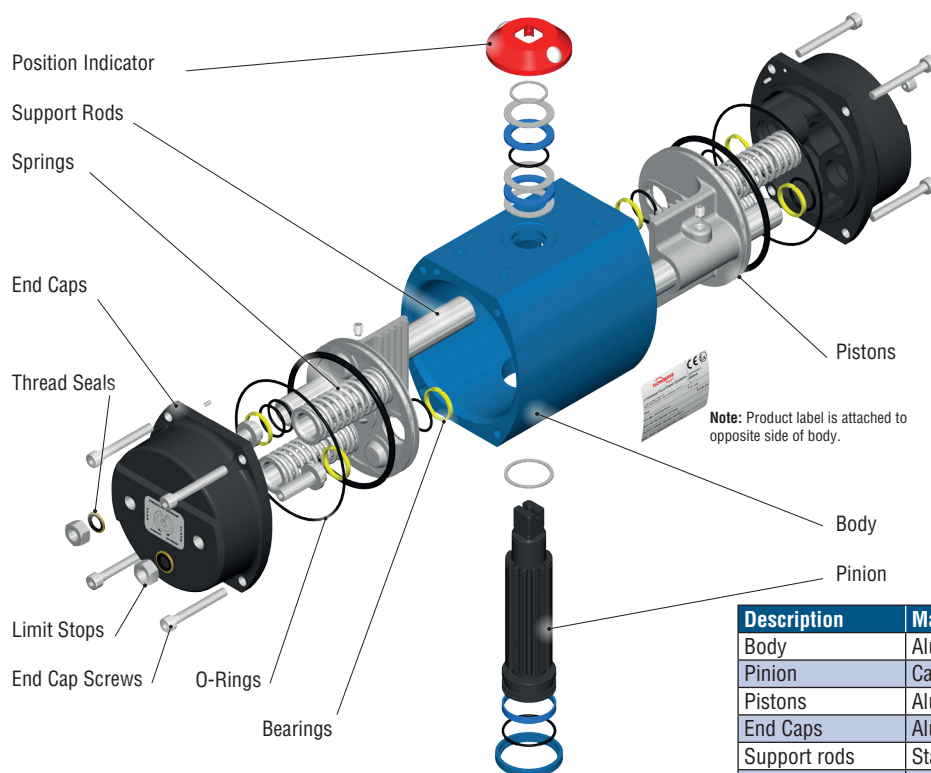
In the double acting model, compressed air is applied to Port 1, which is fed via the large bore support rod into the centre chamber. This forces the pistons apart and turns the actuator's output drive anti-clockwise (seen from above) for valve opening, simultaneously venting the air in the end chambers 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: <ul style="list-style-type: none"> Nominal 96° total travel including nominal 3° adjustable overtravel and adjustable 10° undertravel both clockwise and anti-clockwise. |
| Mounting Configurations |
| Solenoid: <ul style="list-style-type: none"> EN15714-3 VDI/VDE 3845 mounting pattern Top Mount Interface: <ul style="list-style-type: none"> EN15714-3 VDI/VDE 3845 mounting pattern Actuator/Valve Interface: <ul style="list-style-type: none"> 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 |

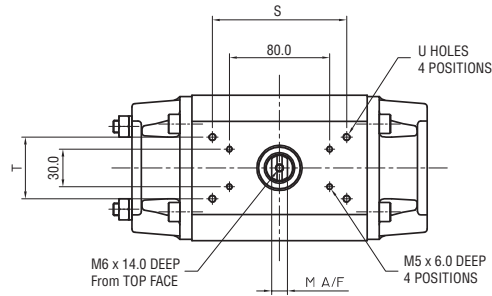
Spring Return Actuators

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.

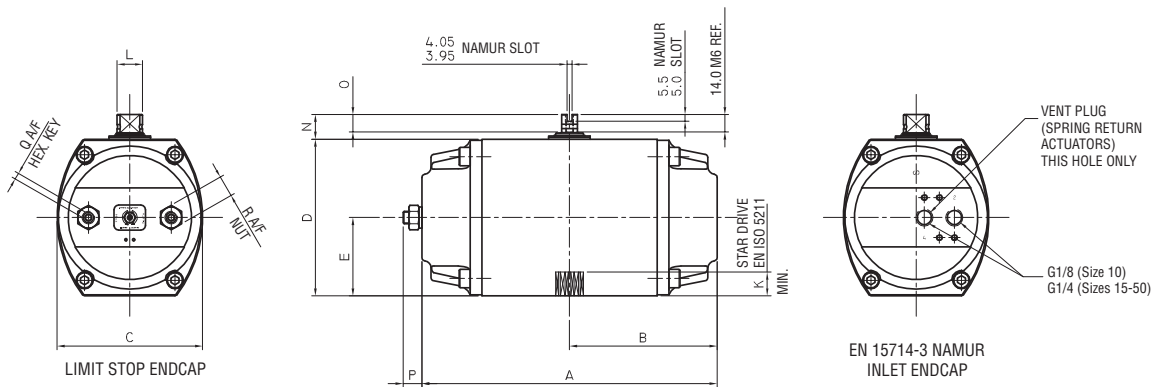
Spring return Actuator Output Torque Nm (lbf/in)

| Size / Series | Number of Springs | Spring Stroke | | Air Stroke | | | | | | | | | | | | | | | | | | |
|---------------|-------------------|---------------|------|---------------------------|------|---------------------------|------|---------------------------|------|---------------------------|------|---------------------------|------|---------------------------|------|---------------------------|------|---------------------------|------|----------------------------|-----|--|
| | | Start | End | 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 | |
| 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 | | |

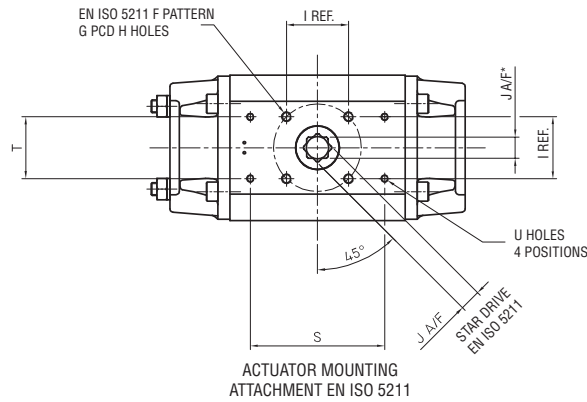
Dimensions Size 10 to 40 (mm)



EN 15714-3 NAMUR TOP ACCESSORY MOUNTING



EN 15714-3 NAMUR INLET ENDCAP

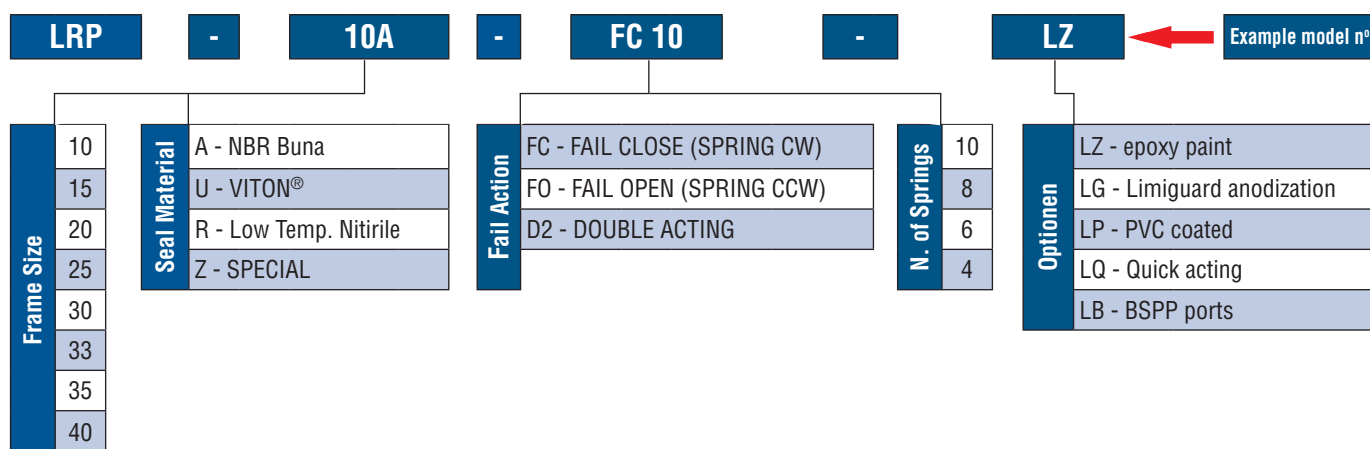


ACTUATOR MOUNTING ATTACHMENT EN ISO 5211

| Size / Series | Basic Dimensions | | | | | Bottom ISO Mounting Dimensions | | | | | | 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.



FCD LFENBR0009-00-A4 02/17

Contact:

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

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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