AVCO

Alloy Valves and Control

ACTUATORS
PNEUMATIC - Q SERIES

Torque Rating at 80 psig

Double Acting
169 - 15,856 in-lbs

Spring Return
27 - 5,620 in-lbs

Features

Cast Aluminum Body
Die-Cast Aluminum End Caps
Position Indicator with NAMUR slot
Blow-Out Proof Pinion
Quad Rack Pistons
Linear Torque Output (DA Actuator)
Adjustable Travel Stops
NAMUR Solenoid Mount Design
Safe Spring Removal

Temperature Range

Standard (NBR O-Rings)
-4 °F to 175 °F

Low Temperature (LNBR O-Rings)
-40 °F to 175 °F

High Temperature (Viton O-Rings)
5 °F to 250 °F

Supply Pressure

20 psig Minimum
120 psig Maximum

Operation Speed

Between 0.1 & 3 seconds
Depending Upon Model Size

Industries

Chemical
Food Processing
Hydraulic
Oil/Gas
Pharmaceutical
Steam

Applicable Standards

ISO 5211
NAMUR

3210 S. Susan St, Santa Ana, CA 92704 Tel (714) 427-0877 Fax (714) 427-6392 Website: www.avcovalve.com

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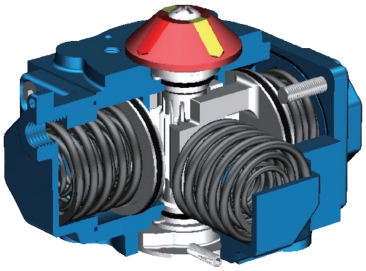
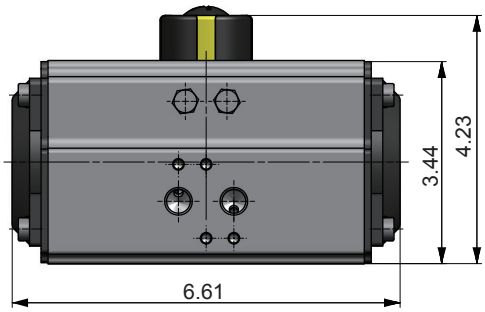
About the AVCO Q Series Compact Quad Actuator

AVCO has introduced the Q Series Compact Quad Pneumatic Actuator in response to a growing need in the market for an actuator that gives greater torque, while conserving space and using less compressed air. The Q Series Compact Quad Pneumatic four piston actuator delivers substantially more torque than the standard rack and pinion two piston designs, yet has a smaller "compact" footprint. Mounting dimensions are fully ISO 5211 compliant and have NAMUR standard mounting for both solenoid valve and top accessories. Innovation and engineering expertise have resulted in the best pneumatic actuator available. We are proud to offer the compact, four piston, quarter turn, rotary, rack and pinion, pneumatic actuator.

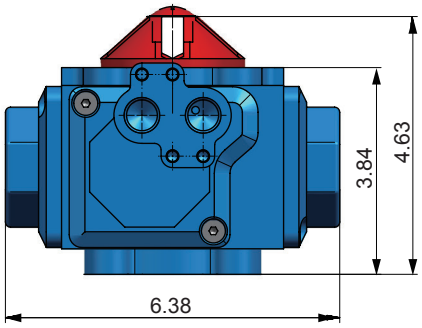


Compact Design with Higher Torque

A more intelligent design yields better performance and longevity. The pistons in the Q Series actuator are smaller in diameter and shorter in length. The 4 pistons work together and travel a shorter distance, thus creating a more efficient mechanism for generating higher output torque. This innovation minimizes the overall actuator size compared to the standard designs and results in a faster cycle times.
As shown in the following figures, in the case of actuators taking about the same space, the Q Series actuator output torque is about 79% higher than 2 piston actuator.



Two Piston Actuator, Output Torque 356 in-lb at 80 psi



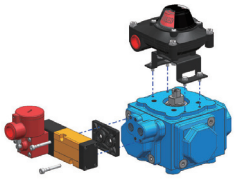
Four Piston Actuator, Output Torque 639 in-lb at 80 psi

Long Service Life

Cost of ownership is a major consideration for any control system and service life is a primary contributor to minimizing cost. The more cycles an actuator can produce without the need for repair; the lower the maintenance costs are. The piston design and configuration allow the Q Series actuator to cycle more than 2 million times free from failure. The pistons are made with the splines centered with its axis. This prevents "side-loading" and results in less stress on the soft components within the cylinders. The Q Series actuator has a much longer operating life compared with actuators having the drive mechanism off center. High quality materials used in the production of soft components and springs also contribute to the extended life.

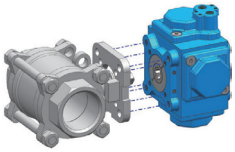
NAMUR Accessories Mounting

A NAMUR output drive extends from the top and facilitates the mounting of limit switches, positioners and other accessories. Additionally, one cap has a NAMUR solenoid mounting interface compatible with all NAMUR solenoid valves.



ISO 5211 Mounting Flange

Most valve brands use the ISO 5211 mounting standard. This creates flexibility and enables the compact actuator to be used over a broad spectrum of quarter turn valves.



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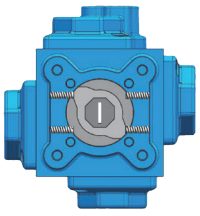
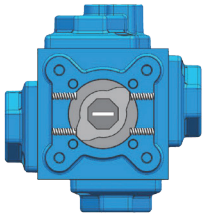
Travel Stops

The rotation of the pinion can be fine-tuned for precise positioning of the valve. The Stroke Adjustment Screws can be adjusted +/- 5 degrees in each direction. Four Stop Screws are threaded into the body and contact the Travel Stop on two sides opposite one another. The Stop is designed so concentric force prevents "side-loading" of the pinion contributing to a longer life and precise positioning.



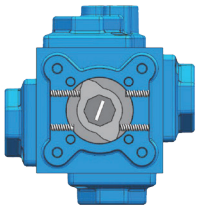
Closed



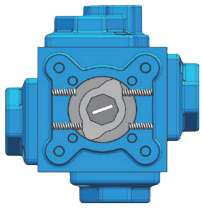
Open

Corrosion Resistance

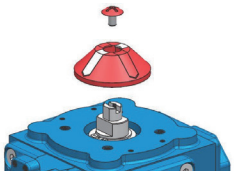
The body and end caps are anodized both internally and externally to provide protection against corrosive environments. Externally, polyester paint fully covers both body and ends providing resistance to harsh environments including wash down.



Closed Limit



Open Limit

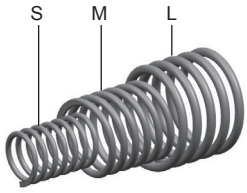


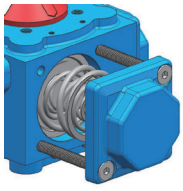
Visible Position Indicator

A high visibility indicator cap is secured with a screw to the top of the pinion and provides a reliable and easy to read flow direction. The indicator can be modified to reflect various flow configurations.

Flexible Spring Combinations

The availability of many different spring configurations creates flexibility when selecting the correct actuator for the existing air supply, media, and valve torque. The springs are coated for protection against corrosion.



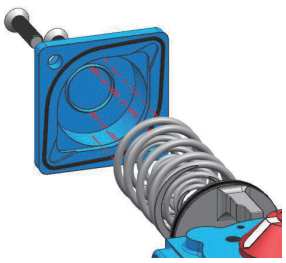


Safe Spring Removal

The end caps are affixed using elongated screws so removing the end caps is safe and prevents damage to the actuator by relieving spring tension.

Spring Alignment

The end caps have Centering Rings ensuring spring alignment when affixing the end caps to the body.



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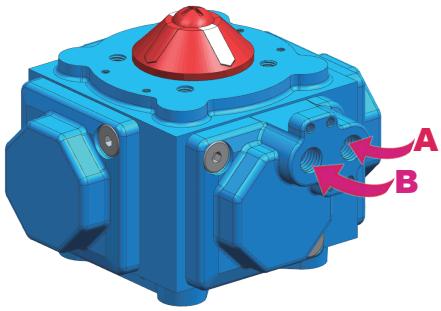
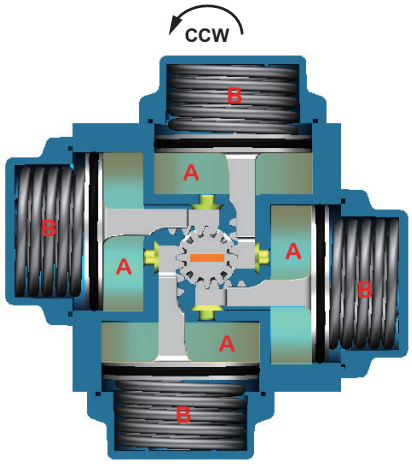
General Operating Principle

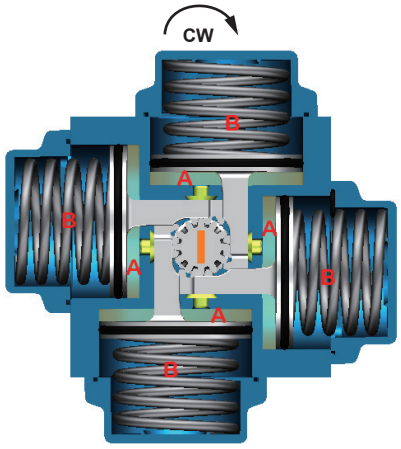
The Q Series Compact Quad quarter turn, pneumatic actuators create a rotary motion though the 4 piston, rack and pinion design. The pistons surround and engage the pinion shaft on four sides. Air is supplied to port “A” which connects to internal chamber in order to drive the pistons. Port “B” connects to outer chambers.



Spring Return Principle

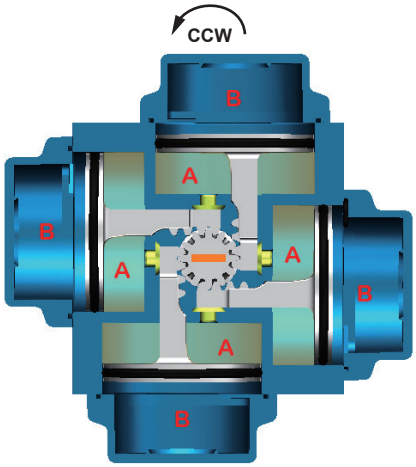


Air is supplied to port “A” to push pistons outward. This action compresses the springs and turns the pinion counterclockwise. Air exhausts via port “B”.

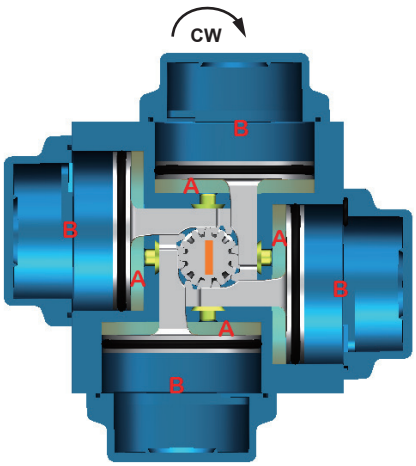


When port “ A ” is de-energized, the compressed springs force the pistons inward. The springs stored energy creates a clockwise rotation. Air moves out through port “A” .

Double Acting Principle



Air is supplied to port “A” to push the pistons outward. This action turns the pinion counterclockwise. Air exhausts via port “B”.



Air is supplied to port “B” to push the pistons inward. This action turns the pinion clockwise. Air exhausts via port “A”..

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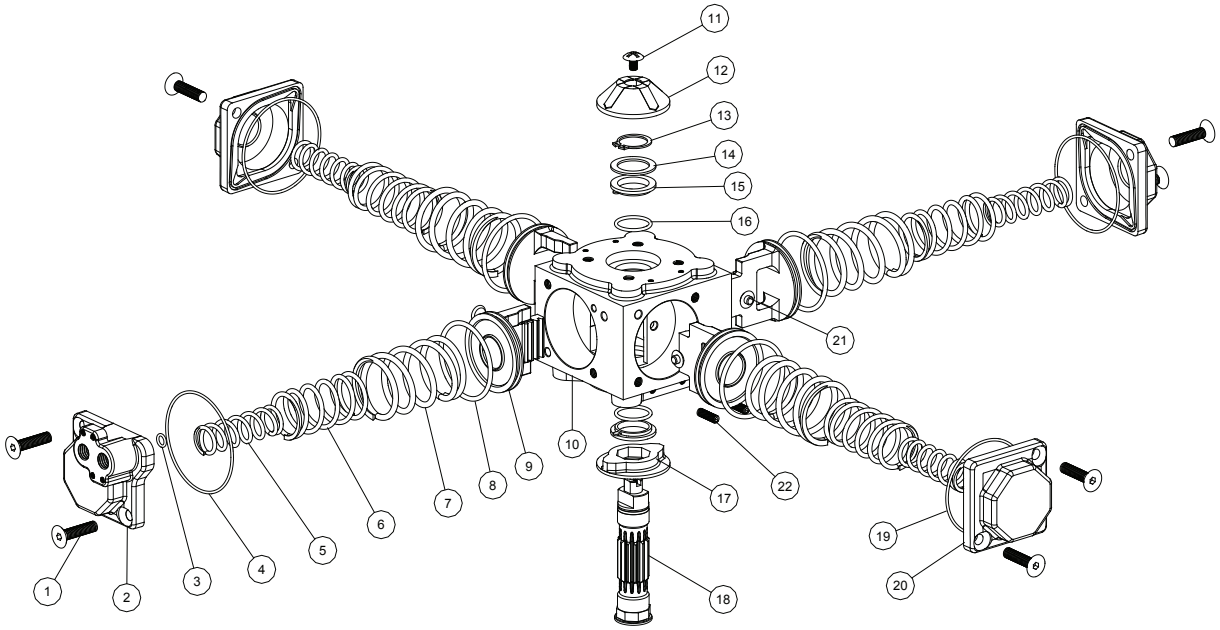

Item	Parts	Material	Qty.
1	End Cap Screw	Stainless Steel	8
2	NAMUR End Cap	Die Cast Aluminum 356	1
3	Air Supply O-Ring	NBR/Viton	1
4	NAMUR End Cap O-Ring	NBR/Viton	1
5	Spring - Small	Spring Steel	4
6	Spring - Medium	Spring Steel	4
7	Spring - Large	Spring Steel	4
8	Piston O-Ring	NBR/Viton	4
9	Piston	Die Cast Aluminum 356	4
10	Body	Gravity Cast Aluminum 356-T6	1
11	Indicator Screw	Stainless Steel	1

Item	Parts	Material	Qty.
12	Indicator	Plastic (ABS)	1
13	Circlip	Stainless Steel	1
14	Thrust Washer	POM	1
15	Bearing	POM	2
16	Pinion O-Ring	NBR/Viton	2
17	Travel Stop	Stainless Steel	1
18	Pinion	Nickel Coated Alloy Steel	1
19	End Cap O-Ring	NBR/Viton	3
20	End Cap	Die Cast Aluminum 356	3
21	Position Pad	POM	4
22	Stroke Adjustment Screw	Stainless Steel	4

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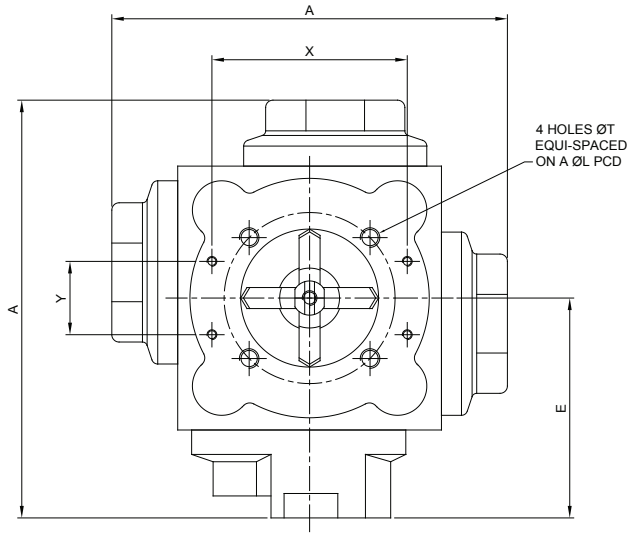
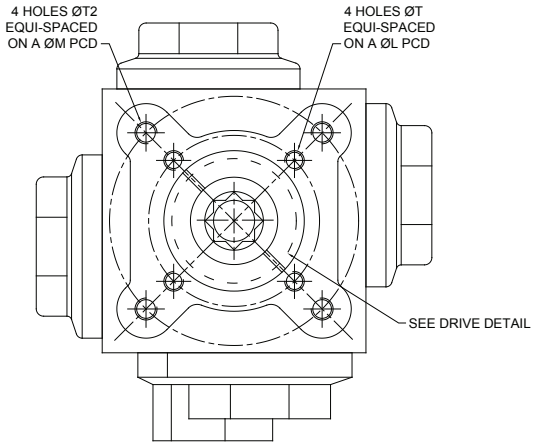
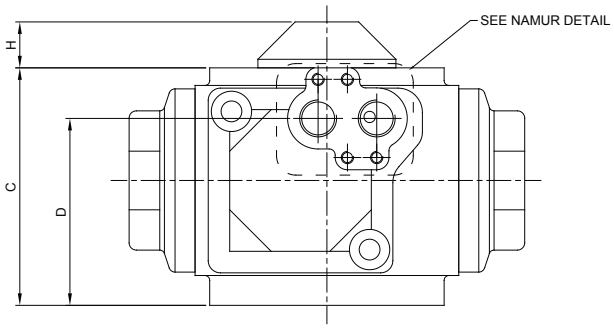


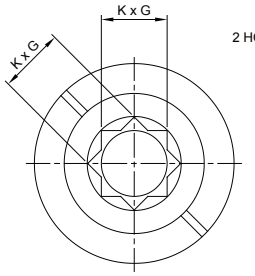
TOP VIEW



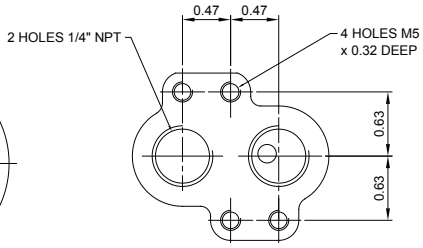
BOTTOM VIEW



SIDE VIEW



DRIVE DETAIL



NAMUR DETAIL

DIMENSIONAL DATA

MODEL	A (in.)	C (in.)	D (in.)	E (in.)	G (in.)	H (in.)	K (in.)	L (in.)	M (in.)	T (mm)	T2 (mm)	X (in.)	Y (in.)	ISO 5211
QDA/QSR15	4.45	2.78	2.06	2.62	0.53	0.79	0.354	1.969	2.756	M6x8 DP	M8x11 DP	3.15	1.18	F05/F07
QDA/QSR20	5.22	3.25	2.5	3.04	0.63	0.79	0.433	1.969	2.756	M6x8 DP	M8x11 DP	3.15	1.18	F05/F07
QDA/QSR25	6.38	3.84	3.03	3.54	0.77	0.79	0.551	2.756	4.016	M8x11 DP	M10x14 DP	3.15	1.18	F07/F10
QDA/QSR30	7.32	4.61	3.69	4.15	0.91	0.79	0.669	2.756	4.016	M8x11 DP	M10x14 DP	3.15	1.18	F07/F10
QDA/QSR35	8.82	5.35	4.12	4.80	1.06	0.79	0.866	4.016	-	M10x14 DP	-	3.15	1.18	F10
QDA/QSR45	10.73	6.48	5.06	5.75	1.30	0.79	1.063	4.016	4.921	M10x14 DP	M12x18 DP	3.15	1.18	F10/F12
QDA/QSR60	14.21	8.58	7.09	5.57	1.69	1.18	1.417	5.512	-	M16x24 DP	-	5.12	1.18	F14
QDA/QSR75	17.05	10.55	8.74	6.54	1.69	1.18	1.496	6.496	-	M20x30 DP	-	5.12	1.18	F16

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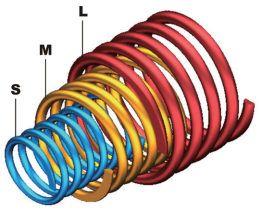
Spring Return Actuator Torque Output (in-lbs)

		OUTPUT AIR TO SPRING														SPRING RETURN	
AIR PRESSURE (psi)		45		60		75		80		85		100		115		OUTPUT	
MODEL No.	SPRING SET	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	90°	0°
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
QSR15	S4	64	37	92	64	119	101	133	107	147	121	174	148	211	184	53	27
	M4			73	37	110	73	115	89	130	95	157	122	193	158	80	44
	S2M4					92	46	107	62	112	78	140	96	175	132	106	62
	S4M4									95	52	122	74	158	105	133	80
QSR20	S2M4	92	46	156	110	220	165	240	195	259	216	323	270	377	325	106	62
	S4M4			146	92	201	146	231	169	251	190	305	253	360	307	133	80
	S4M2L2			128	64	183	119	213	142	233	164	288	227	342	281	159	97
	S4L4					165	92	195	115	216	147	270	201	333	254	186	115
	S4M4L2					156	82	178	107	199	130	174	192	316	246	195	133
	M4L4							169	89	190	112	244	166	307	219	221	142
	S2M4L4									182	95	235	148	290	202	239	150
	S4M4L4									164	78	209	131	263	184	257	168
QSR25	S2M4	229	137	348	247	467	366	515	417	562	458	680	575	790	684	204	115
	S4M4	211	101	330	211	449	330	488	373	536	424	654	541	772	649	248	142
	S4M2L2			302	174	421	293	471	346	519	389	637	506	755	614	283	159
	S4L4					394	247	444	302	493	355	610	462	728	579	319	186
	S4M4L2					375	201	417	257	467	311	584	419	702	535	372	212
	M4L4					348	165	399	213	450	268	558	384	676	491	416	239
	S2M4L4							382	169	432	216	549	331	658	439	460	257
	S4M4L4									406	182	523	296	640	404	504	274
QSR30	S2M4	366	238	568	430	769	641	852	719	925	795	1133	994	1334	1193	310	186
	S4M4	330	174	522	366	732	568	808	648	882	726	1090	933	1299	1132	372	230
	S4M2L2			476	275	687	476	763	559	847	640	1046	837	1255	1035	469	274
	S4L4			439	165	641	394	719	479	804	562	1003	759	1211	956	549	319
	S4M4L2					604	330	684	417	770	502	968	698	1176	904	611	354
	M4L4					586	229	648	346	735	432	933	628	1141	825	690	389
	S2M4L4									692	346	889	541	1097	746	779	434
	S4M4L4									648	285	854	480	1053	676	850	478
QSR35	S2M4	742	458	1080	787	1428	1126	1545	1252	1660	1366	2005	1700	2351	2036	549	283
	S4M4	687	357	1016	677	1373	1025	1491	1145	1453	1271	1953	1604	2299	1939	655	336
	S4M2L2	586	238	916	568	1273	906	1394	1039	1513	1159	1857	1491	2202	1825	770	434
	S4L4			842	403	1190	751	1314	879	1435	1012	1779	1343	2123	1676	929	513
	S4M4L2					1126	613	1252	746	1375	882	1718	1212	2062	1544	1071	575
	M4L4							1181	604	1306	744	1648	1072	1992	1404	1212	646
	S2M4L4									1236	648	1578	977	1921	1307	1319	726
	S4M4L4									1167	545	1508	872	1851	1202	1425	788

Spring Return Actuator Torque Output (in-lbs) - Continued

		OUTPUT AIR TO SPRING														SPRING RETURN	
AIR PRESSURE (psi)		45		60		75		80		85		100		115		OUTPUT	
MODEL No.	SPRING SET	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	90°	0°
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
QSR45	S2M4	1355	787	2032	1447	2701	2097	2939	2344	3173	2594	3836	3235	4501	3878	1177	637
	S4M4	1227	549	1904	1208	2563	1859	2814	2122	3052	2378	3714	3017	4378	3659	1407	761
	S4M2L2			1804	1035	2463	1685	2717	1944	2957	2205	3618	2842	4282	3483	1584	858
	S4L4			1639	751	2307	1401	2557	1669	2810	1937	3470	2572	4132	3211	1876	1018
	S4M4L2					2179	1163	2433	1447	2689	1712	3339	2345	4001	2983	2115	1151
	M4L4					2042	934	2308	1216	2559	1496	3217	2127	3878	2764	2345	1274
	S2M4L4									2447	1271	3095	1901	3755	2536	2584	1398
	S4M4L4									2317	1055	2973	1683	3632	2316	2814	1531
QSR60	S2M4	3287	1978	4871	3525	6464	5072	7031	5673	7600	6251	9173	7769	10748	9300	2673	1434
	S4M4	3003	1465	4587	3012	6180	4559	6765	5176	7332	5767	8902	7281	10476	8809	3186	1717
	S4M2L2			4376	2609	5960	4156	6552	4776	7125	5387	8693	6897	10265	8423	3593	1929
	S4L4			4047	2023	5630	3571	6232	4217	6822	4833	8379	6339	9949	7861	4186	2248
	S4M4L2					5310	2994	5921	3649	6520	4280	8074	5781	9642	7300	4770	2567
	M4L4					5017	2454	5637	3125	6234	3779	7795	5275	9362	6791	5310	2859
	S2M4L4									5949	3268	7507	4761	9072	6273	5850	3151
	S4M4L4									5681	2784	7237	4272	8800	5782	6372	3434
QSR75	S2M4	6152	4056	9082	6912	12012	9769	13068	10857	14103	11915	17011	14735	19916	17547	4531	2584
	S4M4	5621	3159	8560	6015	11490	8871	12553	9979	13610	11068	16514	13881	19407	16688	5443	3098
	S4M2L2			8157	5328	11087	8185	12163	9313	13229	10419	16131	13227	19021	16030	6133	3496
	S4L4			7507	4221	10437	7077	11532	8239	12615	9373	15511	12172	18398	14968	7248	4133
	S4M4L2					9906	6171	11026	7369	12114	8526	15014	11318	17898	14108	8151	4646
	M4L4					9384	5273	10511	6499	11621	7669	14509	10454	17389	13240	9062	5168
	S2M4L4							10005	5620	11119	6822	14012	9600	16889	12380	9965	5682
	S4M4L4									10627	5975	13506	8745	16381	11520	10877	6195

Spring Configuration

S4	M4	S2M4**	S4M4	S4M2L2	Springs
					
S4L4	**S4M4L2**	**M4L4***	**S2M4L4**	**S4M4L4**	
					

S-small size spring; M-middle size springs; L-large size springs.
* Default spring setting for all QSR actuators except QSR15.
** Default spring setting for QSR15 only.

ACTUATORS
PNEUMATIC - Q SERIES

Double Acting Actuator Torque (in-lbs)

MODEL	AIR PRESSURE (psig)						
	45	60	75	80	85	100	115
QDA15	92	128	156	169	182	209	237
QDA20	165	229	293	311	329	392	447
QDA25	357	476	595	639	683	802	921
QDA30	568	769	980	1056	1124	1334	1544
QDA35	1044	1382	1739	1847	1954	2311	2667
QDA45	2032	2719	3397	3622	3848	4525	5203
QDA60	4825	6436	8047	8585	9122	10725	12336
QDA75	8917	11893	14868	15856	16843	19819	22777

Weight (lbs)

MODEL	15	20	25	30	35	45	60	75
QDA	1.9	3.3	6.2	9.7	15.6	24.2	57.2	112.2
QSR	2.4	4.2	7.7	11.0	19.8	33.0	77.0	140.8

Maximum Air Consumption Per Stroke (cubic inches)

MODEL/ ACTION	15	20	25	30	35	45	60	75
CCW	4.3	7.3	15.3	26.8	45.1	81.1	195.2	351.4
CW	5.5	9.2	20.1	32.9	48.8	81.1	195.2	351.4

Actuator Stroke Time (seconds)

MODEL	15	20	25	30	35	45	60	75
TIME	0.1	0.15	0.2	0.3	0.5	0.9	2.0	3.0

Operating Conditions

Working Pressure

Double Acting (QDA): 20 thru 120 psig
Spring Return (QSR): 30 thru 120 psig

Operating Temperature

Standard (NBR O-Ring): -4 °F to 175 °F
Low temperature (LNBR O-Ring): -40 °F to 175 °F
High temperature (Viton O-ring): 5 °F to 250 °F

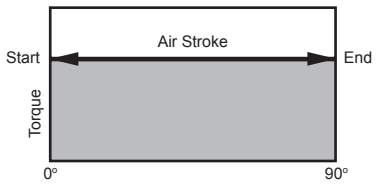
ACTUATOR SIZING GUIDE

Double Acting Actuators

The output torque of a double acting actuator is constant in both clockwise and counter-clockwise rotation. The actuator should be sized as follows:

- Obtain the published maximum valve torque.
- Add a safety factor (margin) to the published torque to give the final torque requirement. We suggest a safety factor in normal operating conditions of at least 20%.
- Determine the required or available air pressure.
- Refer to the double acting actuator torque table in this literature and work down the appropriate air pressure column until you see a torque which just exceeds the final torque requirement.
- Work across the torque output row to find the actuator model number.

DOUBLE ACTING TORQUE CURVE



Example

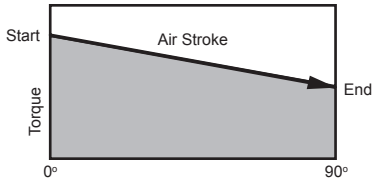
- The published seating/unseating torque for a 1” 1100 series ball valve in full differential pressure is 120 in-lbs.
- Applying a safety factor of 20% equals 120 + (120 x 20/100) = 144 in-lb. final torque requirement.
- The available air pressure is 80 psig.
- Therefore the first torque that exceeds the final torque requirement of 144in-lb is 169 in-lbs.
- The actuator model meeting 169 in-lbs @ 80 psig is a QDA15.

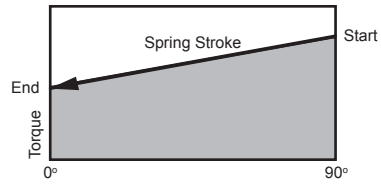
Spring Return Actuators

The output torque of a spring return actuator is determined by two factors - air stroke and spring stroke. Each clockwise or counter-clockwise stroke gives different torque values at start and end, four in total, as shown in the figures to the left. These four values are used for sizing the actuator.

- Obtain the published maximum valve torque.
- Add a safety factor (margin) to the published torque to give the final torque requirement. We suggest a safety factor in normal operating conditions of at least 10%.
- Determine the required or available air pressure.
- Refer to the spring actuator torque table in this literature and work down the appropriate air pressure column until you see a torque which just exceeds the final torque requirement in the ‘END’ column.
- Move across to the spring return ‘END’ column and check that this value also exceeds the final torque requirement. Both values must exceed the final torque requirement.
- Working left from this point determine the actuator model and number of springs.

SPRING RETURN TORQUE CURVES





Example

- A published seating/unseating torque for a 2” 1100 series ball valve in full differential pressure is 450 in-lbs.
- Applying a safety factor of 10% equals 450 + (450 x 10/100) = 495 in-lbs. final torque requirement.
- The available air pressure is 80 psig.
- Therefore the first torque that exceeds the final torque requirement of 495 in-lbs is 879 in-lbs. (air end) @ 80 psig and 513 in-lbs (spring end).
- The actuator model meeting this requirement is a QSR35-S4L4.

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ACTUATORS
PNEUMATIC - Q SERIES

HOW TO ORDER

QDA	20	-	-	-
Series	**Size**	**Spring Configuration (QSR Models only)**	**Seals**	**Options (QSR Models only)**
QDA - Double Acting	15	Blank - Default Option	Blank - NBR	Blank - Fail Close
QSR - Spring Return	20	S4 (QSR15 only)	L - LNBR	FO - Fail Open
	25	M4 (QSR15 only)	V - Viton	
	30	S2M4** (All models)		
	35	S4M4 (All models)		
	45	S4M2L2 (Not QSR15)		
	60	S4L4 (Not QSR15)		
	75	S4M4L2 (Not QSR15)		
		M4L4* (Not QSR15)		
		S2M4L4 (Not QSR15)		
		S4M4L4 (Not QSR15)		
		* Default spring setting for all QSR actuators except QSR15		
		** Default spring setting for QSR15 only.		

Example ordering codes:

QDA20 = Double acting fail close compact quad pneumatic actuator with NBR seals
QSR20 = Spring return fail close compact quad pneumatic actuator with NBR seals & M4L4 spring configuration
QSR20-S2M4L4-V = Spring return fail close compact quad pneumatic actuator with Viton seals & S2M4L4 spring configuration

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