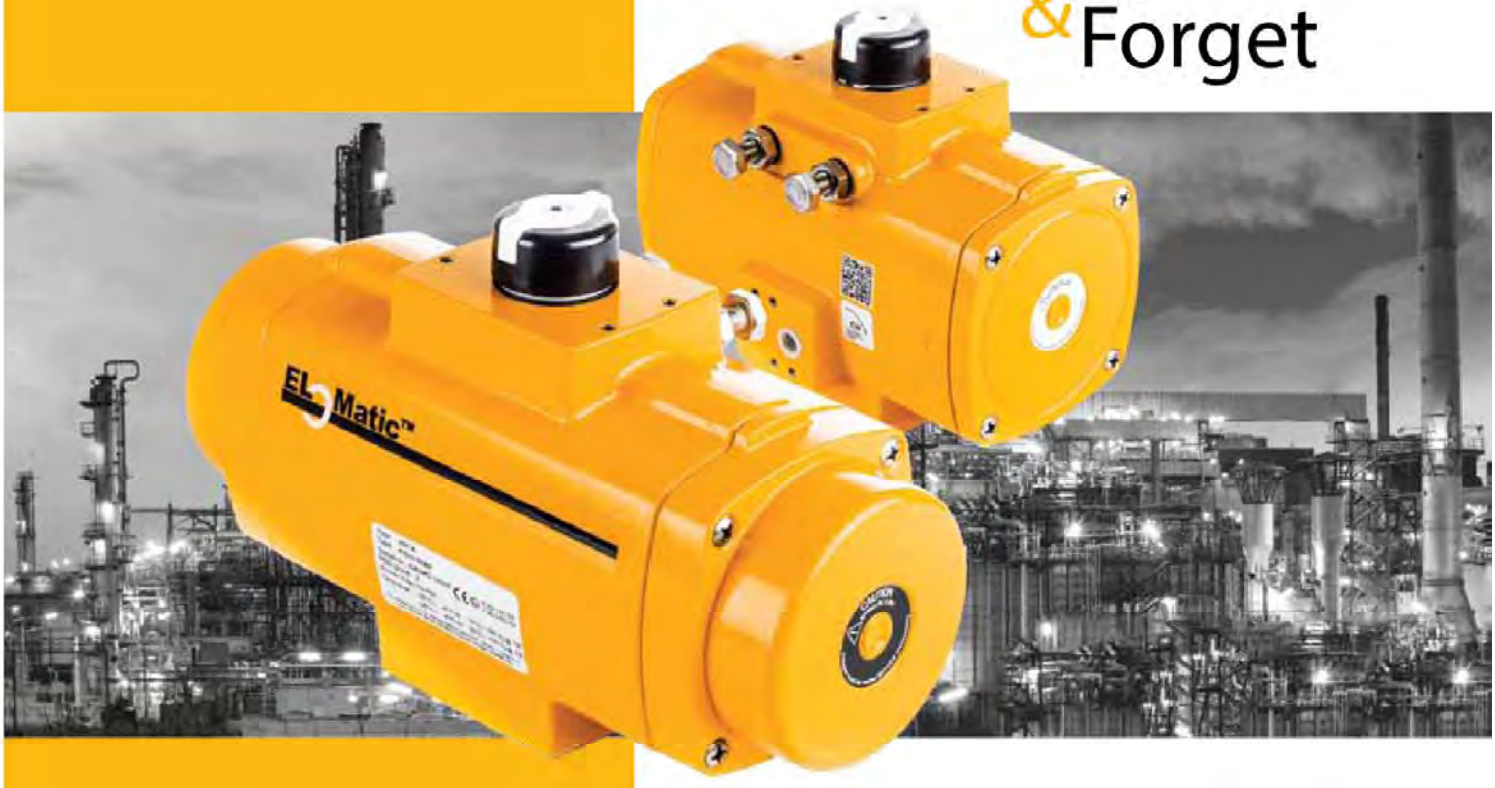
reliable actuators
to Fit
& Forget



EL Matic™

Pneumatic Rack & Pinion Actuators

EL-O-Matic™

Pneumatic Rack & Pinion Actuators

Fit & Forget

EL-O-Matic continues to be the industry standard with innovative features and greater customer benefits from Emerson's portfolio of rack & pinion actuators.

Valve drive adaptors makes the EL-O-Matic's installation quick and reliable.

Built upon 40 years of proven service from millions of applications, EL-O-Matic actuators remain second to none in dependability, providing the optimum "Fit & Forget" performance in a wide range of process industry applications such as Chemicals, Refining, Power Generation, Pulp & Paper, Pharmaceuticals and Food & Beverage. Designed and produced according to standards for high engineering accuracy, in manufacturing sites certified to ISO 9000:2008, assure a long cycle life.

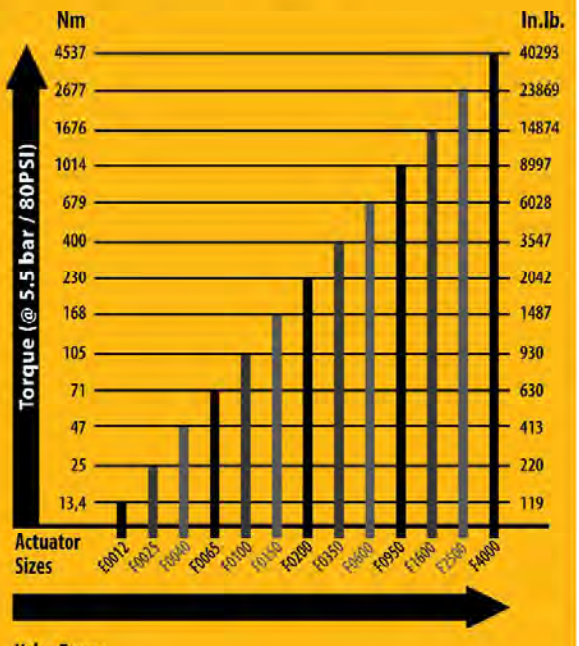
"Fit & Forget" Means Reliability

Product reliability is key to customer satisfaction. EL-O-Matic actuators are quick and easy to install and function faultlessly throughout their long working life.

Rugged, cast aluminum bodies and advanced powder coated finishing provide corrosion protection even in the harsh environments. Modular construction, interchangeable components, dual drilled mounting holes and pinion inserts provide the widest range of mounting options. Drive pinions of aircraft grade ASTM 7075 T6 aluminum alloy ensure the ultimate combination of strength/weight ratio and additional protection against galvanic corrosion. Stainless steel external fasteners complete the corrosion protection specification and combine to provide greater cost savings and better long-term value.

Cast aluminum with two part coating with powder coating provides superior corrosion protection.

EL-O-Matic F-Series - 13 Sizes



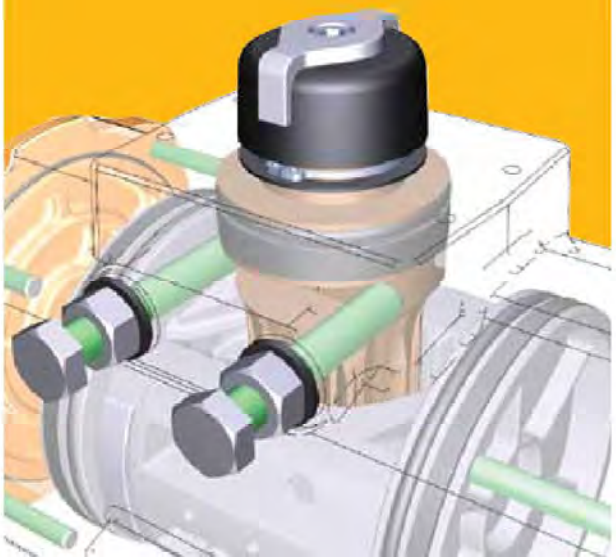
Valve Types:

Ball: 1/2" / DN12 — 12" / DN300

Butterfly: 2" / DN50 — 30" / DN750

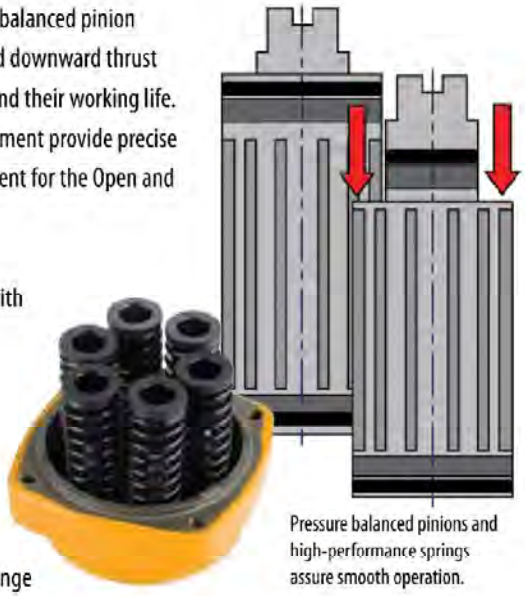
Actuator Temperature Ranges

Standard	-20 °C to +80 °C (-4 °F to +176 °F)
High Temperature	-20 °C to +120 °C (-4 °F to +248 °F)
Low Temperature	-40 °C to +80 °C (-40 °F to +176 °F)



designed to improve Operations and Easy Maintenance

EL-O-Matic actuators' pressure balanced pinion eliminates "endwise" forces and downward thrust from internal pressures to extend their working life. EL-O-Matic's dual stroke adjustment provide precise intuitive end of stroke adjustment for the Open and Closed valve position.



Pressure balanced pinions and high-performance springs assure smooth operation.

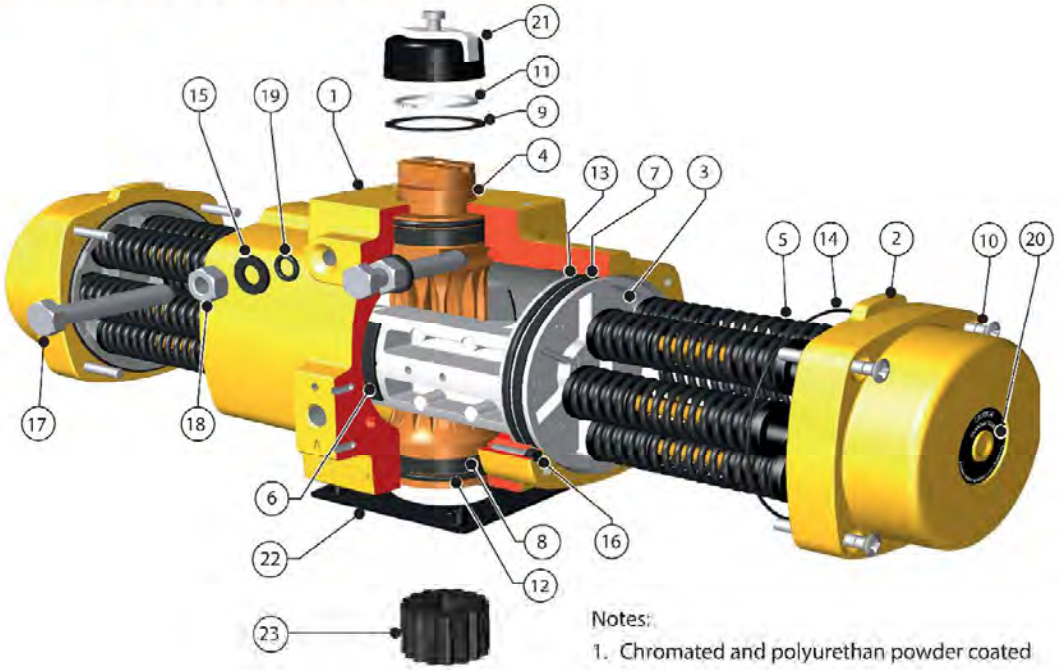
Actuator torque is optimized with high-performance springs, designed to deliver a torque range suitable for a wide range of applications. Six separate spring sets allow proper sizing to all quarter-turn valve types with a wide range of supply pressures. Maximum safety and ease of conversion are accomplished with pre-assembled springs.

EL-O-Matic actuators' wide torque ranges meet all cycle speed demands through 13 sizes with a torque output ranging from 13.4 to 4537 Nm (119 to 40293 lbf.in) for ball valves from 1/2" to 12" and butterfly valves to 30." Cycle speeds are maximized by the use of large internal air ports. Optional "super-fast" and reduced speed versions are also available.

Direct Mounting
Spindle Insert
Fastenings

Indirect Mounting
Box Section Bracket
Drive Adaptor
Fastenings

Construction, Parts and Materials



Notes:

1. Chromated and polyurethan powder coated
2. Chromated and polyurethan powder coated
3. Hard anodized
4. Electrophoretic coated
5. Deltatone ' coated

Pos.	Qty		Description	Material	Notes
1	1		House	Cast Aluminium alloy	1
2	2		End cap	Cast Aluminium alloy	2
3	2		Piston	Cast Aluminium alloy	
4	1		Pinion	High grade aluminium	3
5	Max. 12		Spring cartridge	Spring steel	4
6	2	*	Bearing strip piston rack	POM	
7	2	*	Bearing piston	PTFE 25% carbon filled	
8	2	*	Bearing pinion	POM	
9	1	*	Thrust washer	POM, black UV stabilized	
10	8		End cap screw	Stainless Steel	
11	1	*	Circlip	Spring steel	5
12	2	*	O-ring seal pinion	Nitrile rubber	
13	2	*	O-ring seal piston	Nitrile rubber	
14	2	*	O-ring seal end cap	Nitrile rubber	
15	2	*	O-ring seal limit stop	Nitrile rubber	
16	2	*	B-port seal	Silicon rubber	
17	2		Limit stop screw	Stainless steel	
18	2		Limit stop nut	Stainless steel	
19	2		Limit stop washer	PA66	
20	2		Warning sticker	Polyester	
21	1		Indicator assembly	ABS + stainless steel screw	
22	1		Center plate (option)	Nylon PA6, Black	
23	1		Insert drive	Aluminium alloy	

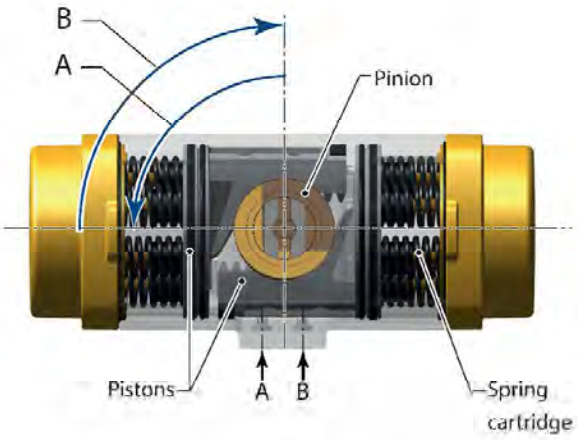
* = Included in repair kit

Assembly codes EL-O-Matic F actuators

Spring return actuators

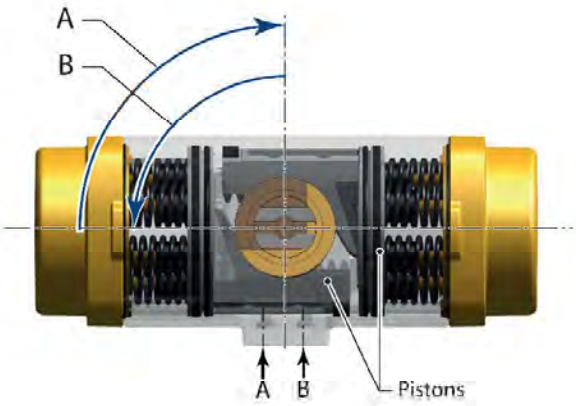
Assembly code: CW
= Standard, Clock Wise-to-Close rotation

= Fail-to-Close



Assembly code: CC
= Reverse, Counter Clock Wise-to-Open

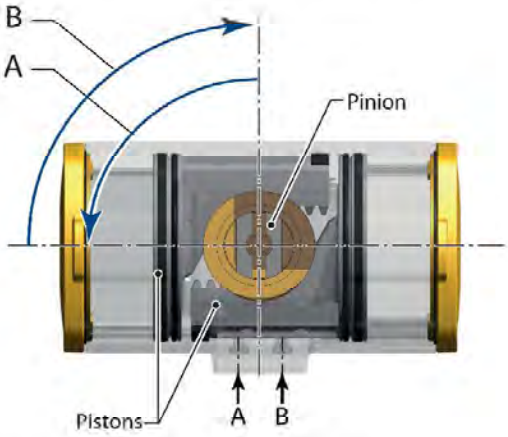
= Fail-to-Open



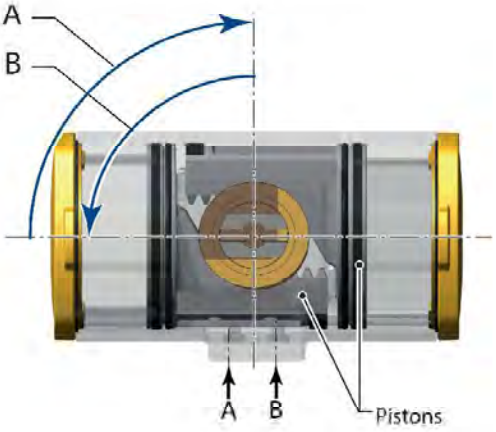
A = Central air chamber pressurized
B = Spring stroke

Double acting actuators

Assembly code: CW
= Standard, Clock Wise-to-Close rotation



Assembly code: CC
= Reverse, Counter Clock Wise-to-Open



A = Central air chamber pressurized
B = End cap air chambers pressurized

All views are from above. Pistons are shown in inward position.

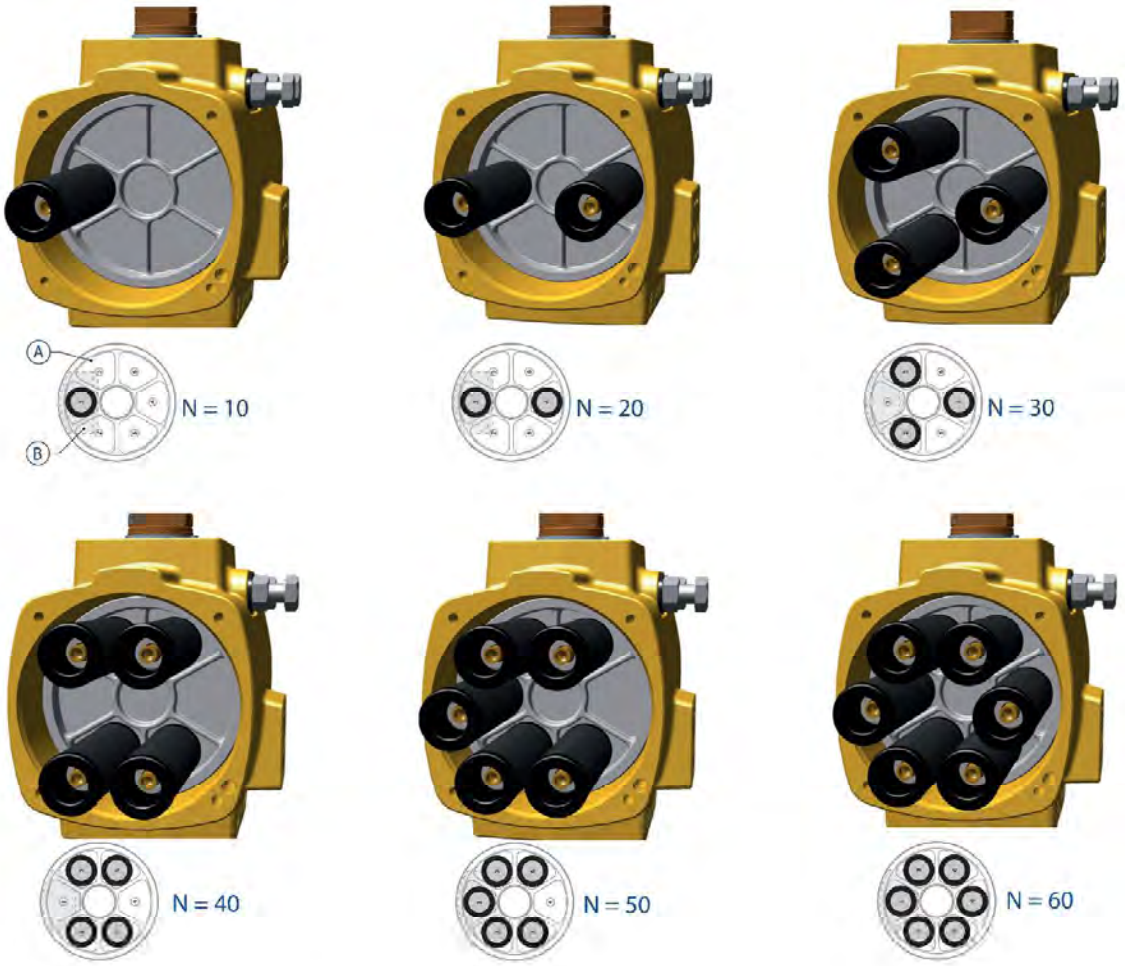
Spring cartridge placement

When replacing spring cartridges in a spring return actuator, ensure that the cartridges are replaced in their identical position from where they were removed.

Check below figure to see where to place the spring cartridges in case of spring set conversion.

Before assembling the spring cartridges and end caps, make sure that the pistons are completely inwards.

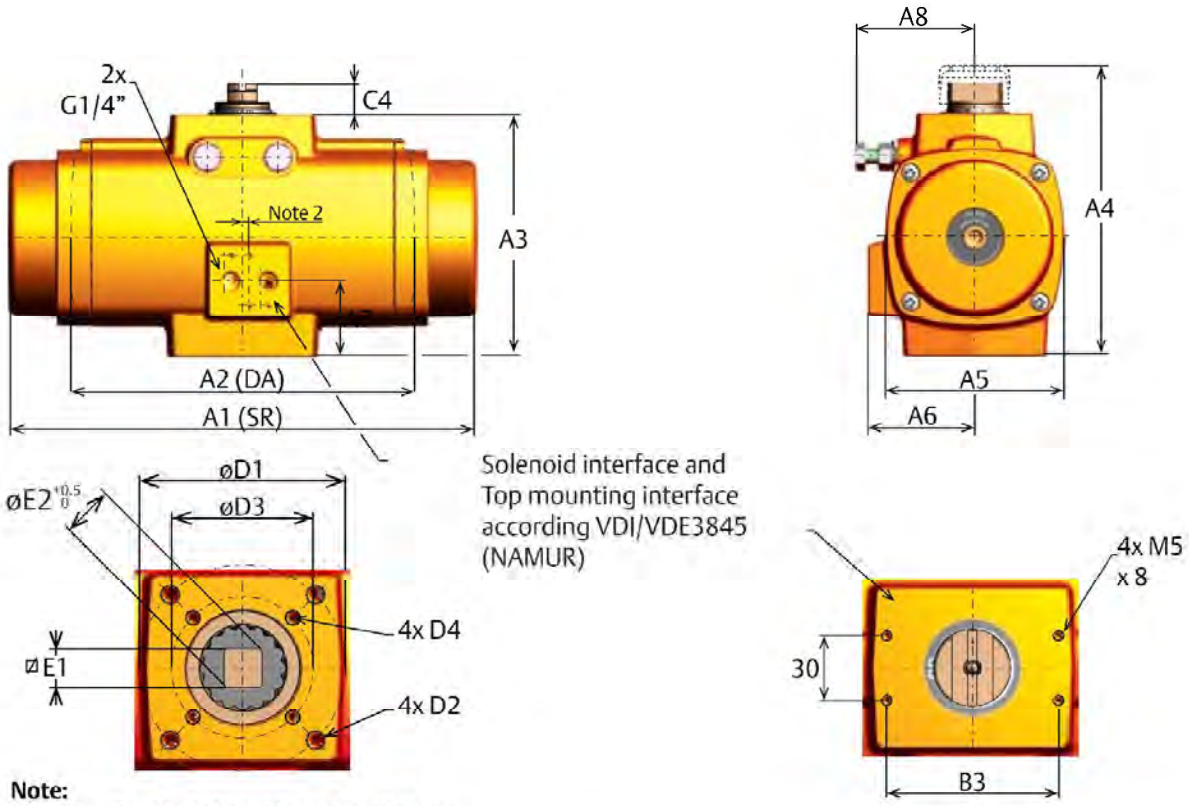
Figure 1. Spring cartridge placement



A = Piston top view
B = Position of piston gear rack

Metric Tables

Dimensions



Note:

1. DA = Double Acting, SR = Spring Return
2. The solenoid drilling pattern is shifted 4 mm for size 0025 and 2mm for size 0040 vs. the centerline of the actuator.

Dim in. mm	Actuator size											
	25	40	65	100	150	200	350	600	950	1600	2500	4000
A1	166	192	217	247	304	362	385	476	xxx	xxx	xxx	xxx
A2	166	192	217	247	223	256	269	336	xxx	xxx	xxx	xxx
A3	91	112	124	131	157	163	201	248	xxx	xxx	xxx	xxx
A4	119	139	151	158	185	191	230	292	xxx	xxx	xxx	xxx
A5	82	95	104	115	127	134	165	199	xxx	xxx	xxx	xxx
A6	49	55	58	64	69	72	85	102	xxx	xxx	xxx	xxx
A8	48	58	69	69	75	87	109	132	xxx	xxx	xxx	xxx
B3	80	80	80	80	80	80	80	130	130	130	130	130
C4	20	20	20	20	20	20	20	30	30	30	30	30
ISO 1	F05	F07	F07	F07	F10	F10	F10	F12	F14	F16	F16	F25
D1	50	70	70	70	102	102	102	125	125	165	165	254
D2	M6x10	M8x13	M8x13	M8x13	M10x15	M10x15	M10x15	M12x18	M12x18	M20x20	M20x20	M16x25
ISO 2	F03	F05	F05	F05	F07	F07	F07	F10	F10	F25*	F25*	F16
D3	36	50	50	50	70	70	70	102	102	-/-	-/-	165
D4	M5x8	M6x10	M6x10	M6x10	M8x13	M8x13	M8x13	M10x16	M10x16	-/-	-/-	M20x20
E1 Max.	11.08	14.08	14.08	19.08	19.08	22.10	27.11	27.11	36.16	46.16	46.16	55.24
E1 Min.	11.00	14.00	14.00	19.00	19.00	22.00	27.00	27.00	36.00	46.00	46.00	55.00
E2	14.1	18.1	18.1	25.2	25.5	28.2	36.2	36.2	58.2	60.2	60.2	72.2

Manual Override Gear-boxes

Topworx

Speed Control Plates

Breather/ Block & Bleed Valves

Actuator Torque - Spring Return (Nm)

Actuator Size	Spring set nr.	Spring Stroke Torque (Nm)		Air Torque (Nm) SUPPLY PRESSURE																	
				3.0 barg		3.5 barg		4.0 barg		4.5 barg		5.0 barg		5.5 barg		6.0 barg		7.0 barg		8.0 barg	
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
FS 12	20	7	5	2	-1	4	1	5	2	6	3	8	5	9	6	10	7	13	10	15	12
FS 25	10	4	2	12	10	14	13	17	15	19	17	21	20	24	22	26	25	31	29	36	34
	20	7	4	9	6	12	9	14	11	16	13	19	16	21	18	24	21	28	25	33	30
	30	11	7	7	2	9	4	11	7	14	9	16	12	19	14	21	17	26	21	31	26
	40	14	9	-	-	-	-	9	3	11	5	14	8	16	10	18	12	23	17	28	22
	50	18	11	-	-	-	-	-	-	9	1	11	4	14	6	16	8	21	13	26	18
	60	21	13	-	-	-	-	-	-	-	-	-	-	11	2	13	4	18	9	23	14
FS 40	10	7	4	22	19	26	24	31	28	36	33	40	37	45	42	49	46	58	55	67	64
	20	13	8	17	12	22	16	26	21	31	25	35	30	40	34	44	39	53	48	62	57
	30	20	12	12	4	17	9	21	13	26	18	31	22	35	27	40	31	49	40	58	49
	40	26	17	-	-	12	1	17	6	21	10	26	15	30	19	35	24	44	33	53	42
	50	33	21	-	-	-	-	-	-	17	3	21	7	26	12	30	16	39	25	48	34
	60	39	25	-	-	-	-	-	-	-	-	-	-	21	4	25	9	34	18	43	27
FS 65	10	10	6	33	29	40	36	47	43	54	50	61	57	68	63	75	70	88	84	102	98
	20	20	13	26	17	33	24	40	31	47	38	53	45	60	52	67	59	81	72	95	86
	30	31	19	19	5	25	12	32	19	39	26	46	33	53	40	60	47	74	61	87	74
	40	41	26	-	-	-	-	25	8	32	14	39	21	46	28	52	35	66	49	80	63
	50	51	32	-	-	-	-	-	-	24	3	31	10	38	17	45	23	59	37	73	51
	60	61	39	-	-	-	-	-	-	-	-	-	-	31	5	38	12	52	25	65	39
FS 100	10	15	9	49	43	60	53	70	64	80	74	90	84	100	94	111	104	131	125	151	145
	20	30	19	39	26	49	36	59	47	69	57	79	67	90	77	100	87	120	108	141	128
	30	44	28	28	9	38	19	48	30	59	40	69	50	79	60	89	70	109	91	130	111
	40	59	37	-	-	27	2	38	13	48	23	58	33	68	43	78	53	99	74	119	94
	50	74	47	-	-	-	-	-	-	37	6	47	16	57	26	68	36	88	57	108	77
	60	89	56	-	-	-	-	-	-	-	-	-	-	47	9	57	19	77	40	98	60
FS 150	10	24	15	79	69	96	86	112	102	128	118	145	135	161	151	177	167	210	200	243	233
	20	47	30	62	42	79	59	95	75	111	91	128	108	144	124	160	140	193	173	226	206
	30	71	44	45	15	62	32	78	48	94	64	111	81	127	97	143	113	176	146	209	179
	40	94	59	-	-	45	5	61	21	77	37	94	54	110	70	126	86	159	119	192	152
	50	118	74	-	-	-	-	-	-	60	10	77	26	93	43	109	59	142	92	175	124
	60	141	89	-	-	-	-	-	-	-	-	-	-	76	16	92	32	125	65	158	97
FS 200	10	33	21	108	94	131	117	153	139	175	161	198	184	220	206	242	228	287	273	332	318
	20	65	41	85	57	107	79	129	102	152	124	174	146	196	169	219	191	263	236	308	280
	30	98	62	61	19	83	42	106	64	128	86	150	109	173	131	195	153	240	198	284	243
	40	131	82	-	-	-	-	82	26	104	49	127	71	149	93	171	116	216	161	261	205
	50	163	103	-	-	-	-	-	-	81	11	103	34	125	56	148	78	192	123	237	168
	60	196	124	-	-	-	-	-	-	-	-	-	-	102	18	124	41	169	85	213	130
FS 350	10	56	35	189	165	227	204	266	243	305	281	344	320	383	359	422	398	499	476	577	553
	20	112	70	148	101	187	139	226	178	265	217	303	256	342	295	381	334	459	411	537	489
	30	168	106	108	36	146	75	185	114	224	153	263	192	302	231	341	269	418	347	496	425
	40	224	141	-	-	106	11	145	50	184	89	222	127	261	166	300	205	378	283	455	360
	50	280	176	-	-	-	-	-	-	143	24	182	63	221	102	260	141	337	218	415	296
	60	335	211	-	-	-	-	-	-	-	-	-	-	180	38	219	77	297	154	374	232
FS 600	10	96	60	320	279	386	345	452	411	518	477	584	543	650	609	716	675	848	807	980	939
	20	192	121	251	169	317	235	383	301	449	367	515	433	581	499	647	565	779	697	911	829
	30	287	181	181	59	247	125	313	191	379	257	445	323	511	389	577	455	709	587	841	719
	40	383	241	-	-	178	15	244	81	310	147	376	213	442	279	508	345	640	477	772	609
	50	479	302	-	-	-	-	-	-	241	37	307	103	373	169	439	235	571	367	703	499
	60	575	362	-	-	-	-	-	-	-	-	-	-	303	59	369	125	501	257	633	389

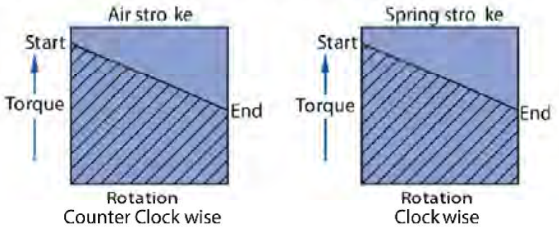
Actuator Torque - Spring Return (Nm)

Actuator Size	Spring set nr.	Spring Stroke Torque (Nm)		Air Torque (Nm) SUPPLY PRESSURE																	
				3.0 barg		3.5 barg		4.0 barg		4.5 barg		5.0 barg		5.5 barg		6.0 barg		7.0 barg		8.0 barg	
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
FS 950	10	150	95	496	432	598	534	701	637	803	739	906	842	1008	944	1110	1047	1315	1251	1520	1456
	20	300	189	387	259	490	362	592	464	694	567	797	669	899	772	1002	874	1207	1079	1412	1284
	30	450	284	278	87	381	189	483	292	586	394	688	497	791	599	893	702	1098	907	1303	1111
	40	600	378	-	-	-	-	375	119	477	222	580	324	682	427	784	529	989	734	1194	939
	50	750	473	-	-	-	-	-	-	368	49	471	152	573	254	676	357	881	562	1086	767
	60	900	567	-	-	-	-	-	-	-	-	-	-	465	82	567	184	772	389	977	594
FS 1600	10	246	155	811	707	979	875	1147	1042	1314	1210	1482	1377	1650	1545	1817	1713	2153	2048	2488	2383
	20	491	309	634	425	801	592	969	760	1136	928	1304	1095	1472	1263	1639	1431	1975	1766	2310	2101
	30	737	464	456	142	623	310	791	478	959	645	1126	813	1294	981	1462	1148	1797	1484	2132	1819
	40	982	619	-	-	-	-	613	195	781	363	948	531	1116	698	1284	866	1619	1201	1954	1537
	50	1228	773	-	-	-	-	-	-	603	81	771	249	938	416	1106	584	1441	919	1777	1254
	60	1473	928	-	-	-	-	-	-	-	-	-	-	761	134	928	302	1263	637	1599	972
FS 2500	10	396	249	1308	1140	1578	1410	1848	1680	2119	1950	2389	2221	2659	2491	2929	2761	3470	3302	4010	3842
	20	792	499	1021	685	1292	955	1562	1225	1832	1495	2102	1766	2373	2036	2643	2306	3183	2847	3724	3387
	30	1187	748	735	230	1005	500	1275	770	1545	1040	1816	1311	2086	1581	2356	1851	2897	2392	3437	2932
	40	1583	997	-	-	-	-	988	315	1259	585	1529	856	1799	1126	2070	1396	2610	1937	3151	2477
	50	1979	1247	-	-	-	-	-	-	972	130	1242	401	1513	671	1783	941	2323	1482	2864	2022
	60	2375	1496	-	-	-	-	-	-	-	-	-	-	1226	216	1496	486	2037	1027	2577	1567
FS 4000	10	633	399	2093	1823	2525	2256	2958	2688	3390	3121	3822	3553	4255	3986	4687	4418	5552	5283	6417	6148
	20	1267	798	1634	1095	2067	1528	2499	1960	2931	2393	3364	2825	3796	3258	4229	3690	5094	4555	5958	5420
	30	1900	1197	1175	367	1608	800	2040	1232	2473	1665	2905	2097	3338	2530	3770	2962	4635	3827	5500	4692
	40	2533	1596	-	-	-	-	1582	504	2014	937	2447	1369	2879	1802	3311	2234	4176	3099	5041	3964
	50	3167	1995	-	-	-	-	-	-	1555	209	1988	641	2420	1074	2853	1506	3718	2371	4583	3236
	60	3800	2394	-	-	-	-	-	-	-	-	-	-	1962	346	2394	778	3259	1643	4124	2508

Note:

1. Emerson Process Management recommends that the valve manufacturer supply the maximum required torque values (including any adjustments or suggested safety factors for valve service conditions or application).
2. Additionally, the valve manufacturer must identify at which position(s) and direction(s) of rotation (Counter Clock Wise or Clock Wise) these maximum requirements occur.
3. If in doubt, or you require any assistance with sizing actuators, do not hesitate to contact your nearest Emerson's Valve Automation Division representative.

Figure 1. Spring Return torque diagram



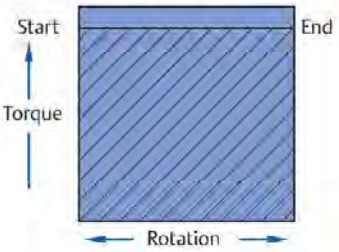
Actuator Torque - Double Acting (Nm)

Actuator Size	Torque in Nm Supply Pressure (barg)										
	2	3	3.5	4	4.5	5	5.5	6	6.5	7	8
FD 12	4.8	7.3	8.5	9.7	10.9	12.2	13.4	14.6	15.9	17.1	19.6
FD 25	9	13	16	18	20	23	25	27	29	32	36
FD 40	17	25	29	34	38	42	47	51	55	59	68
FD 65	25	38	45	51	58	64	71	77	84	90	103
FD 100	38	57	66	76	86	95	105	115	124	134	153
FD 150	60	91	106	122	137	153	168	183	199	214	245
FD 200	82	124	146	167	188	209	230	251	272	293	335
FD 350	143	216	253	290	326	363	400	436	473	510	583
FD 600	243	368	430	492	554	617	679	741	804	866	991
FD 950	377	570	667	764	861	957	1054	1151	1247	1344	1537
FD 1600	617	934	1092	1250	1408	1567	1725	1883	2041	2200	2516
FD 2500	995	1505	1760	2015	2270	2525	2780	3036	3291	3546	4056
FD 4000	1592	2408	2816	3225	3633	4041	4449	4857	5265	5673	6490

Note:

1. Emerson Process Management recommends that the valve manufacturer supply the maximum required torque values (Including any adjustments or suggested safety factors for valve service conditions or application).
2. Additionally, the valve manufacturer must identify at which position(s) and direction(s) of rotation (Counter Clock Wise or Clock Wise) these maximum requirements occur.
3. If in doubt, or you require any assistance with sizing actuators, do not hesitate to contact your nearest Emerson's Valve Automation Division representative.

Figure 1. Double acting torque diagram



Product configuration code

FS 0150 . N U 40 CW AL T . NL17 S K A . 00 XX

- XX — Cycle Speed Option
- 00 — Internal Code 1
- A — Color/Finish
- K — Visual Indicator
- S — Temperature
- NL17 — Valve Stem Connection
- T — Valve Interface
- AL — Pinion Material
- CW — Rotation Direction
- 40 — Spring Set
- U — Threads
- N — Rotation Angle
- 0150 — Size
- FS — Type

Type	
FD	Double-Acting
FS	Spring-Return

Size	
0012	Size 0012
0025	Size 0025
0040	Size 0040
0065	Size 0065
0100	Size 0100
0150	Size 0150
0200	Size 0200
0350	Size 0350
0600	Size 0600

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Rotation Angle	
N	90° Rotation

Threads	
M	Metric ISO 5211
U	UNC/NPT/Imperial

Spring Set	
00	Double-Acting (No Springs)
10	Spring Set 10
20	Spring Set 20
30	Spring Set 30
40	Spring Set 40
50	Spring Set 50
60	Spring Set 60

Rotation Direction	
CW	Spring to Close/Clockwise
CC	Spring to Open/Counterclockwise

Pinion Material	
AL	High-Grade Aluminium, Hard Anodized

Valve Interface	
T	Standard ISO 5211 Interface
S	Small Interface with Center Plate (DIN3337)
L	Large Interface with Center Plate (DIN3337)

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Valve Stem Connection (Insert Sizes)			
Parallel Drive	**Diagonal Drive**	**Square**	**Actuator Size(s)**
0000		**No Insert**	
NL09	**ND09**	9mm / 0.354"	0012
NL11	**YD11**	11mm / 0.433"	0025
NL14	**YD14**	14mm / 0.551"	0040 & 0065
NL19	**YD17**	17mm / 0.669" 19mm / 0.748"	0100 & 0150
NL22	**YD22**	22mm / 0.866"	0200
NL27	**YD22**	22mm / 0.866" 27mm / 1.063"	0350
NL27	**YD72**	27mm / 1.063"	0600

See Insert Supplement for Additional Insert Options.

Temperature Ranges	
S	Standard: -20°C to +80°C (-4°F to +176°F)
H	High: -20°C to +120°C (-4°F to +248°F)
L	Low: -40°C to +80°C (-40°F to +176°F)

Visual Indicator Code	
K	Standard (Knob)
N	No Visual Indicator

Finish	
A	Standard Coating

•

Internal Code 1	
00	Standard

Cycle Speed Options	
XX	Standard
H1	1/2" High Flow plate

Notes

These options are all options available. Not all options apply to all configurations.

Valve Interface: Option "S"; Small Interface with Center Plate (DIN3337) is not available for size 0025.