

# AVCO

## ACTUATORS PNEUMATIC - TYPE C

*Alloy Valves and Control*



### Torque Rating at 80 psig

Double Acting  
195 - 28,500 lbf-in

Spring Return  
50 - 16,500 lbf-in

### Features

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

### Temperature Range

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

Low Temperature (Silicone O-Ring)  
-30 °F to 175 °F

High Temperature (Viton O-Ring)  
5 °F to 300 °F

### Supply Pressure

35 psig Minimum  
150 psig Maximum

### Operation Speed

Between 0.3 & 6 seconds  
Depending Upon Model Size

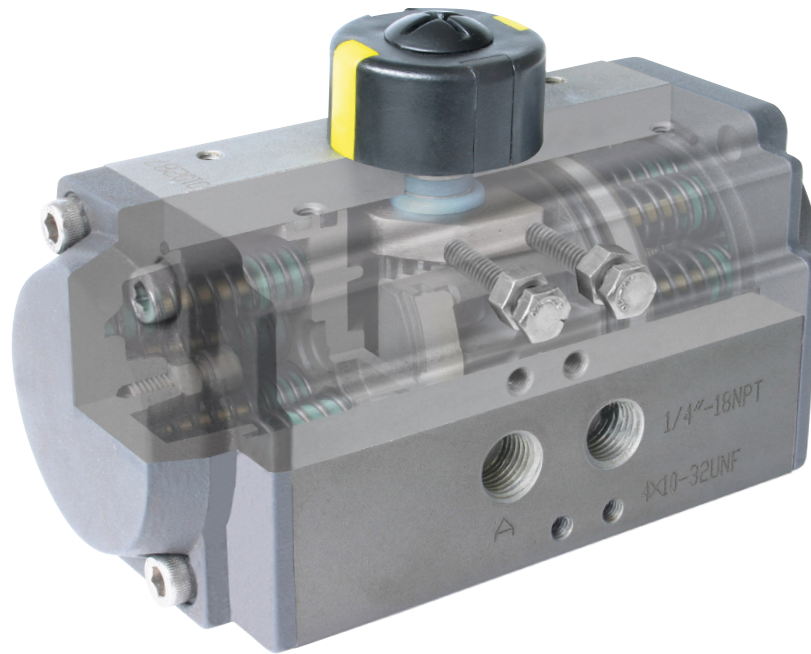
### Industries

Chemical  
Food Processing  
Hydraulic  
Oil/Gas  
Pharmaceutical  
Steam

### Applicable Standards

ISO 5211  
NAMUR

*Alloy Valves and Control*

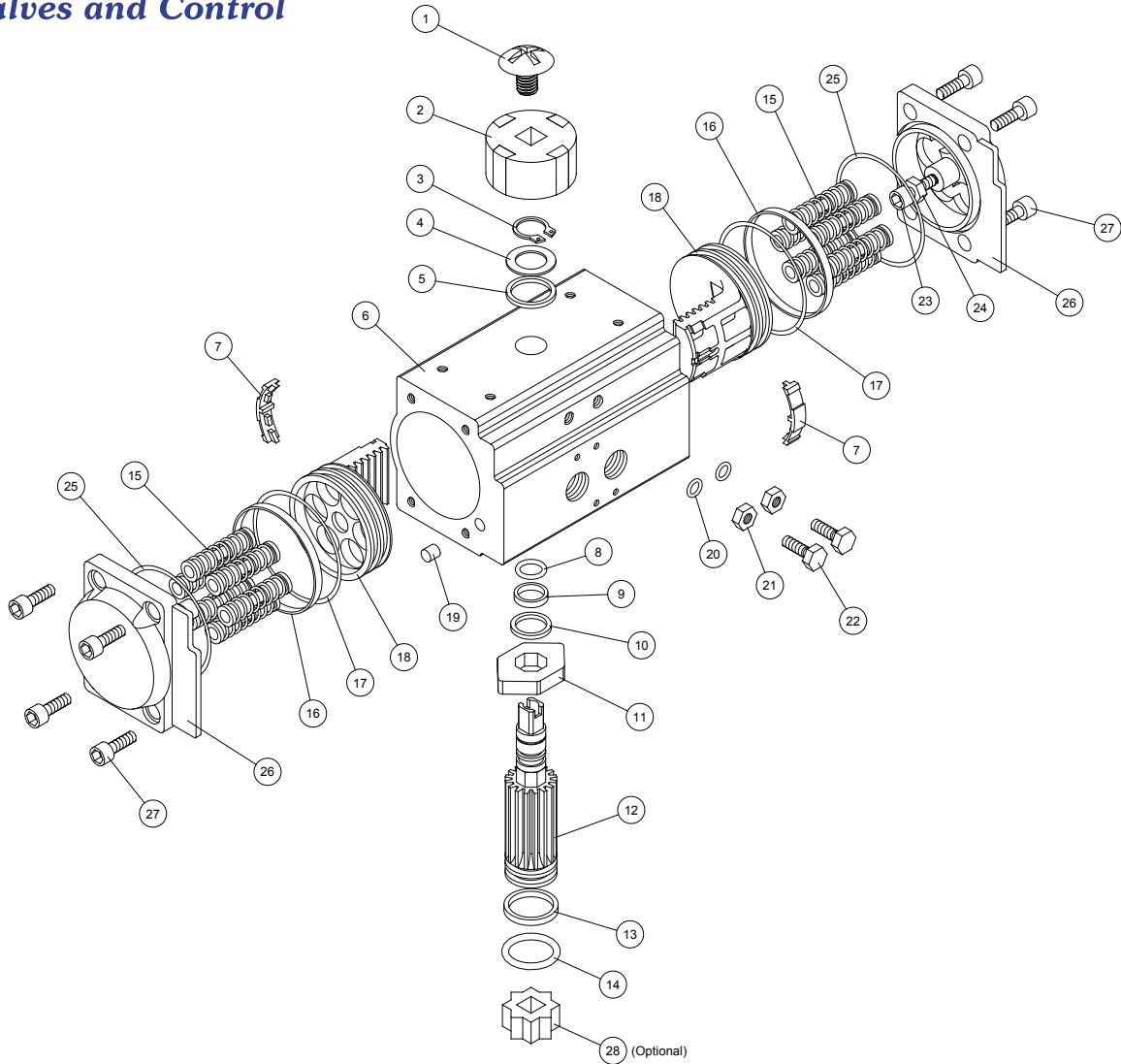


### Features and Benefits

All our actuators are made to the highest standards to give long life and durability, coupled with competitive pricing. We pride ourselves in giving the customer exactly what they need and in providing first class after sales care.

- **Extruded Aluminum Body** with hard anodized finish and polished internal surfaces as standard.
- **Die Cast Aluminum End Caps** coated with powder polyester paint, PTFE or nickel plating.
- **Position Indicator** complete with NAMUR slot for simplified accessory mounting.
- **High Precision Nickel Alloy Steel Blow-Out Proof Pinion** for corrosion protection and fully conforming to ISO 5211 and NAMUR.
- **Dual Opposed Rack Pistons** with low friction bearings and guides for a high performance, long cycle life and fast operation. Simple inversion of the pistons for rotation reversal.
- **Linear Torque Output** from 0° through 90° stroke on the double acting actuators.
- **Independent Adjustable Travel Stops** giving  $\pm 5^\circ$  of adjustment for the open and closed position to facilitate exact valve alignment.
- **High Performance Pre-Loaded Spring Cartridges** give greater safety and longer spring life. Double acting actuators can easily be converted to spring return by simply adding the spring cartridges. Different torque requirements can be achieved by simply changing the number of springs.
- **NAMUR Solenoid Mounting Design** enables direct mounting of the solenoid valve to the actuator without the need for adaptors.
- **Stainless Steel 304 Fasteners** are used throughout as standard.
- **Select High Quality O-rings** provide trouble free operation in a wide range of temperatures.
- **Precision Replaceable Inserts** including variable internal geometry configuration for specific customer requests.
- **Specialised Corrosion Protection** available for the body and end caps upon request.

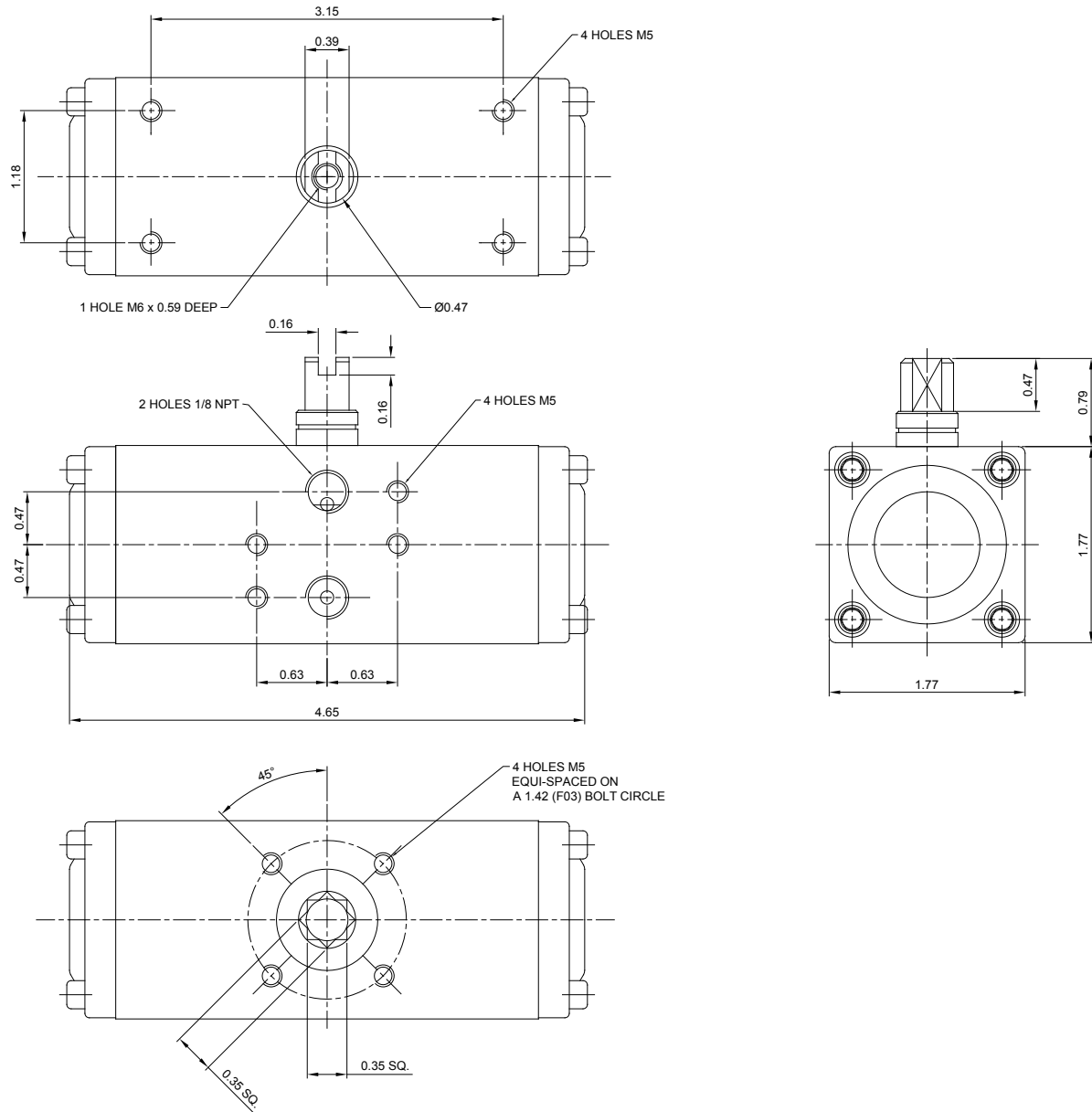
Alloy Valves and Control



Item	Parts	Material	Qty.
1	Indicator Cap Screw	Plastic/Stainless Steel	1
2	Position Indicator	Plastic (ABS)	1
3	Pinion Snap Ring	Stainless Steel 300 Series	1
4	Thrust Washer	Stainless Steel 300 Series	1
5	Thrust Bearing	Polyoxymethylene (Delrin)	1
6	Body	Aluminum Alloy (6005-T5)	1
7	Piston Guide	Polyoxymethylene (Delrin)	2
8	O-ring (Pinion Top)	NBR	1
9	Bearing (Pinion Top)	Polyoxymethylene (Delrin)	1
10	Inside Washer	Polyoxymethylene (Delrin)	1
11	Cam	Stainless Steel 300 Series	1
12	Pinion (Drive Shaft)	Stainless Steel 300 Series	1
13	Bearing (Pinion Bottom)	Polyoxymethylene (Delrin)	1
14	O-ring (Pinion Bottom)	NBR	1

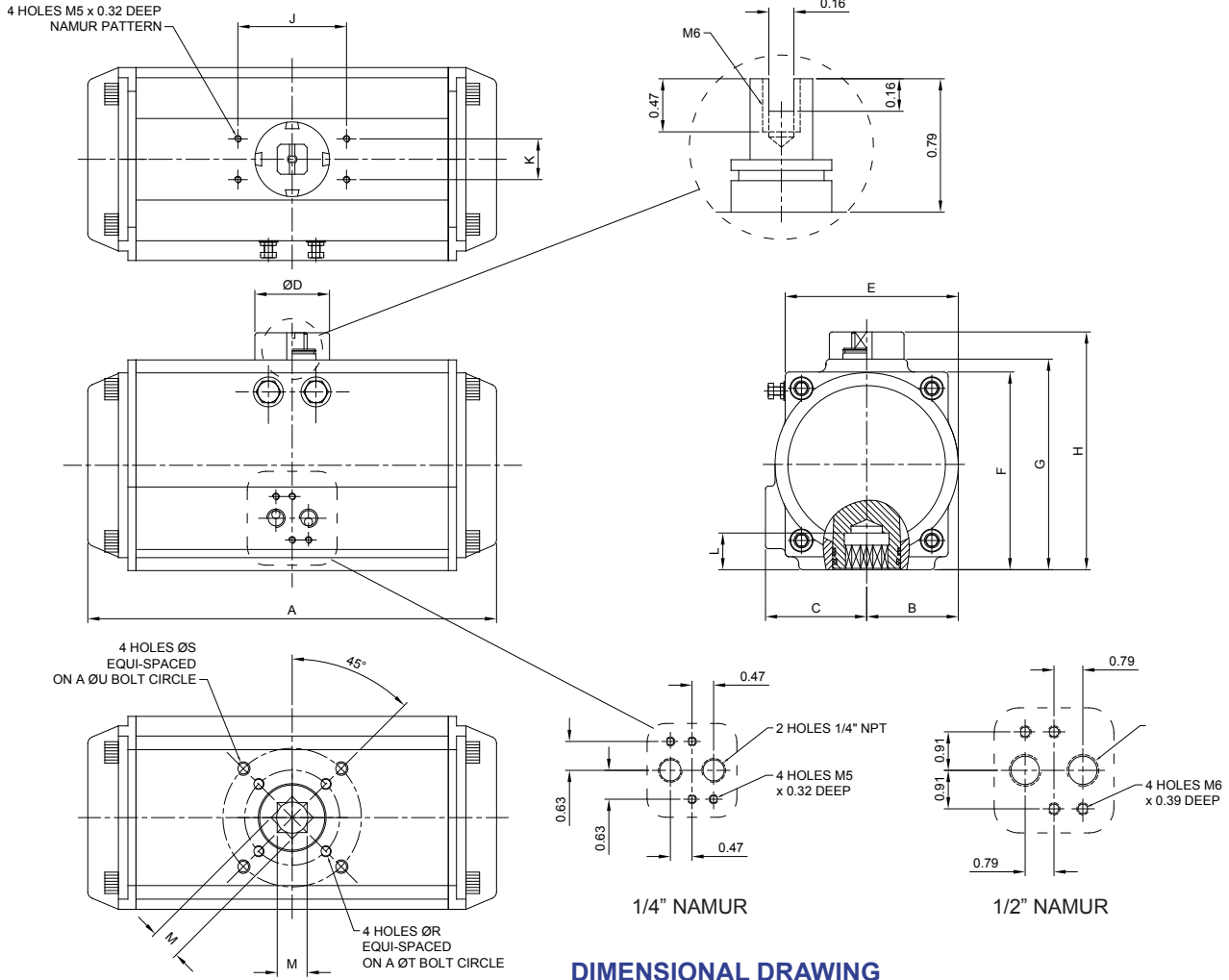
Item	Parts	Material	Qty.
15	Spring (Cartridge)	High Alloy Spring Steel	0-12
16	Bearing (Piston)	Polyoxymethylene (Delrin)	2
17	O-ring (Piston)	NBR	2
18	Piston	Die-Cast Aluminum	2
19	Plug	NBR	2
20	O-ring (Adjusting Screw)	NBR	2
21	Stop Nut (Adjusting Screw)	Stainless Steel 300 Series	2
22	Adjusting Screw	Stainless Steel 300 Series	2
23	Stop Screw	Stainless Steel 300 Series	2
24	Nut (Stop Screw)	Stainless Steel 300 Series	2
25	O-ring (End Cap)	NBR	2
26	End Cap	Die-Cast Aluminum	2
27	End Cap Screw	Stainless Steel 300 Series	8
28	Shaft Adapter	Sintered Metal	1

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**DIMENSIONAL DRAWING  
CDA032 ONLY**

## Alloy Valves and Control

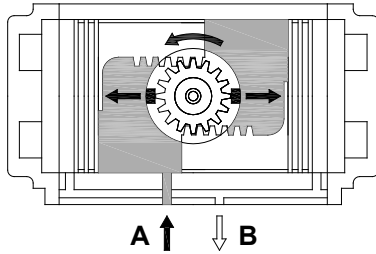


**DIMENSIONAL DRAWING  
(ALL MODELS EXCEPT CDA032)**

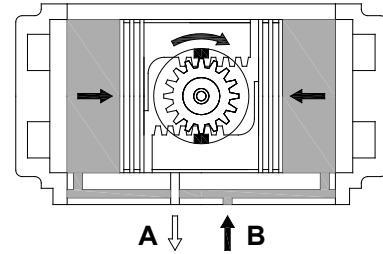
MODEL	A (in.)	B (in.)	C (in.)	D (in.)	E (in.)	F (in.)	G (in.)	H (in.)	J (in.)	K (in.)	L (in.)	M (in.)	R (mm)	S (mm)	T (in.)	U (in.)	ISO 5211
CDA040	4.81	1.44	1.13	1.58	2.05	2.36		3.15	3.15	1.18	0.55	0.43	M5x8 DP	M6x10 DP	1.42	1.97	F03/F05
CDA/CSR052	5.79	1.18	1.63	1.58	2.56	2.58	2.83	3.62	3.15	1.18	0.55	0.43	M5x8 DP	M6x10 DP	1.42	1.97	F03/F05
CDA/CSR063	6.61	1.42	1.85	1.58	2.83	3.19	3.44	4.23	3.15	1.18	0.71	0.55	M6x10 DP	M8x13 DP	1.97	2.76	F05/F07
CDA/CSR075	7.24	1.65	2.09	1.58	3.19	3.70	3.92	4.70	3.15	1.18	0.71	0.55	M6x10 DP	M8x13 DP	1.97	2.76	F05/F07
CDA/CSR083	8.03	1.81	2.24	1.58	3.62	3.88	4.28	5.07	3.15	1.18	0.83	0.67	M6x10 DP	M8x13 DP	1.97	2.76	F05/F07
CDA/CSR092	10.31	1.97	2.30	1.58	3.86	4.34	4.60	5.39	3.15	1.18	0.83	0.67	M6x10 DP	M8x13 DP	1.97	2.76	F05/F07
CDA/CSR105	10.55	2.26	2.52	1.58	4.31	4.82	5.24	6.02	3.15	1.18	1.02	0.87	M8x13 DP	M10x16 DP	2.76	4.02	F07/F10
CDA/CSR125	11.65	2.66	2.93	2.17	5.02	5.73	6.10	6.89	5.12	1.18	1.02	0.87	M8x13 DP	M10x16 DP	2.76	4.02	F07/F10
CDA/CSR140	15.35	2.95	3.03	2.17	5.41	6.33	6.75	7.54	5.12	1.18	1.22	1.06	M10x16 DP	M12x20 DP	4.02	4.92	F10/F12
CDA/CSR160	18.03	3.43	3.43	2.17	6.22	7.24	7.76	8.54	5.12	1.18	1.22	1.06	M10x16 DP	M12x20 DP	4.02	4.92	F10/F12
CDA/CSR190	20.79	4.06	4.06	3.15	7.44	8.50	9.06	9.84	5.12	1.18	1.57	1.42		M16x25 DP		5.51	F14
CDA/CSR210	22.20	4.45	4.45	3.15	8.27	9.27	10.04	10.83	5.12	1.18	1.57	1.42		M16x25 DP		5.51	F14
CDA/CSR240	23.70	5.12	5.12	3.15	9.65	10.39	11.34	12.13	5.12	1.18	1.97	1.81		M20x25 DP		6.50	F16
CDA/CSR270	27.80	5.79	5.79	3.15	10.75	11.77	12.83	13.62	5.12	1.18	1.97	1.81		M20x25 DP		6.50	F16

#### ACTUATOR OPERATION

##### Double Acting

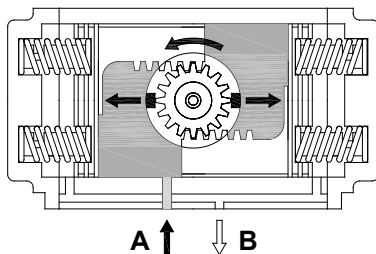


By supplying air to Port A, pressure is applied to the center chamber forcing the pistons outward. Linear piston force is transferred via gear racks to the pinion gear, causing the pinion to rotate counter-clockwise whilst air is exhausted from Port B.

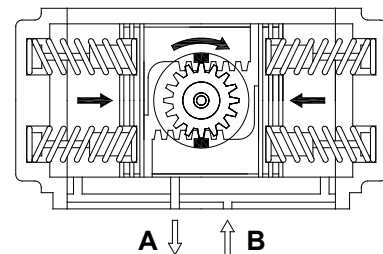


By supplying air to Port B, pressure is applied to the outside chamber and drives the dual pistons inwards, causing the pinion to turn clockwise whilst air is exhausted from Port A.

##### Spring Return (Fail-Safe)



By supplying air to Port A, pressure is applied to the center chamber forcing the pistons outward and compressing the springs in the outside chambers resulting in a counter-clockwise rotation. Exhaust air exits Port B.



Upon loss of air pressure, the stored energy in the compressed springs forces the pistons inwards to give a clockwise rotation with exhaust air exiting Port A. This 'fail-safe' position is held by spring force until air pressure is reapplied to Port A.

## Alloy Valves and Control

### Spring Return Actuator Torque Output (lbf-in)

AIR PRESSURE (psi)		OUTPUT AIR TO SPRING														SPRING RETURN	
		40		50		60		70		80		90		100		OUTPUT	
MODEL No.	No. of SPRINGS	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
CSR052	5	55	37	77	58											55	38
	6	48	24	70	46	94	78									66	45
	7	39	13	61	34	90	67	120	89							77	52
	8			53	20	84	55	113	78	140	114					87	60
	9			44	8	76	44	105	67	133	104	160	132			98	67
	10					68	33	98	57	126	94	153	122			109	75
	11					60	21	91	46	119	84	146	113	172	140	120	82
	12								83	36	112	74	139	95	166	130	131
CSR063	5	111	75	153	116	204	137									92	61
	6	98	55	138	95	191	152	242	205							111	72
	7	84	35	127	73	179	133	229	187							129	85
	8			111	52	167	114	218	169	267	220	315	269			148	97
	9					154	95	206	151	255	203	304	253			166	109
	10					132	75	195	133	244	186	293	236	341	286	185	121
	11							184	115	234	169	283	220	330	270	203	133
	12							171	97	222	152	271	204	320	254	222	145
CSR075	5	141	103	197	158	270	235									128	93
	6	121	74	176	128	251	208	321	280							154	112
	7	101	47	155	99	232	182	303	256							179	131
	8			133	69	211	155	284	231	352	301	418	369			205	149
	9					192	129	266	206	335	278	402	347			231	168
	10					174	102	246	181	318	254	386	324	451	391	256	187
	11							231	157	301	231	369	301	435	369	282	205
	12							213	132	284	207	353	278	419	346	308	224
CSR083	5	227	157	317	244	428	364									204	140
	6	196	112	285	196	400	321	508	434							244	168
	7	166	67	252	151	371	279	481	395							285	196
	8			221	103	342	237	454	355	560	466	663	572			326	224
	9					313	195	426	316	534	429	638	536			367	252
	10					284	152	400	276	508	391	613	500	715	605	407	280
	11							373	237	483	353	588	464	691	570	448	308
	12							345	198	456	316	536	428	667	536	489	336
CSR092	5	322	214	450	338	612	511									304	207
	6	277	148	403	269	569	449	725	612							365	248
	7	231	80	355	197	526	385	685	553							426	289
	8			319	128	484	323	646	495	799	655	947	808			487	331
	9					441	260	606	436	761	599	911	755			548	372
	10					399	197	566	377	726	543	874	700	1022	853	608	413
	11							525	318	685	487	837	647	986	801	669	454
	12							486	260	647	432	800	593	950	749	730	496

### Spring Return Actuator Torque Output (lbf-in) (Continued)

AIR PRESSURE (psi)		OUTPUT AIR TO SPRING														SPRING RETURN		
		40		50		60		70		80		90		100		OUTPUT		
MODEL No.	No. of SPRINGS	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	
CSR105	5	497	325	687	508	921	760										436	280
	6	435	229	622	407	862	670	1088	908								523	336
	7	374	133	559	308	805	580	1035	824								610	392
	8			494	208	747	490	980	740	1203	974	1419	1198				697	448
	9					689	400	927	656	1152	894	1370	1122				784	504
	10					631	306	872	569	1100	811	1320	1041	1535	1264		871	560
	11							818	487	1048	733	1270	966	1486	1191		958	616
	12							764	406	997	656	1221	892	1439	1119		1045	672
CSR125	5	712	453	1000	729	1358	1115										698	462
	6	610	305	893	574	1263	976	1608	1340								832	555
	7	509	148	787	410	1167	828	1519	1202								971	647
	8			681	255	1071	689	1429	1072	1770	1429	2100	1772				1110	740
	9					976	541	1340	934	1685	1298	2018	1645				1249	832
	10					880	402	1251	804	1600	1174	1936	1526	2264	1865		1387	925
	11							1161	666	1514	1043	1854	1399	2184	1742		1530	1017
	12							1072	536	1429	919	1772	1280	2105	1626		1665	1110
CSR140	5	1246	823	1737	1296	2346	1948										1143	759
	6	1082	573	1566	1035	2192	1713	2778	2331								1370	908
	7	916	324	1392	773	2035	1478	2631	2112								1598	1059
	8			1218	512	1878	1244	2485	1892	3063	2498	6324	3080				1826	1211
	9					1713	1009	2331	1673	2916	2290	3483	2879				2054	1370
	10					1557	765	2185	1446	2777	2073	3348	2670	3906	3247		2283	1522
	11							2039	1226	2638	1864	3214	2468	3776	3051		2510	1673
	12							1892	1007	2498	1655	3080	2267	3645	2855		2741	1824
CSR160	5	1877	1212	2640	1943	3592	2966										1844	1236
	6	1609	805	2359	1518	3340	2583	4256	3549								2212	1483
	7	1332	398	2069	1093	3079	2200	4012	3192								2581	1730
	8			1789	667	2826	1818	3777	2022	4680	3782	5556	4691				2949	1977
	9					2566	1435	3533	2477	4448	3442	5332	4363				3321	2225
	10					2313	1052	3297	2120	4223	3102	5116	4034	5986	4935		3691	2472
	11							3062	1771	3999	2769	4900	3714	5776	4624		4056	2719
	12							2818	1413	3767	2429	4676	3386	5559	4305		4422	2966
CSR190	5	3228	2164	4457	3345	5957	4957										2737	1774
	6	2839	1563	4051	2717	5592	4392	7041	5921								3287	2127
	7	2451	962	3645	2088	5227	3827	6700	5393								3834	2480
	8			3239	1460	4861	3261	6359	4865	7789	6366	9180	7808				4380	2833
	9					4496	2696	6018	4337	7464	5863	8867	7323				4927	3186
	10					4131	2131	5677	3809	7139	5360	8554	6838	9936	8269		5473	3540
	11							5336	3281	6814	4858	8240	6354	9632	7798		6020	3893
	12							4995	2753	6490	4355	7927	5869	9327	7327		6566	4246

### Spring Return Actuator Torque Output (lbf-in) (Continued)

AIR PRESSURE (psi)		OUTPUT AIR TO SPRING														SPRING RETURN		
		40		50		60		70		80		90		100		OUTPUT		
MODEL No.	No. of SPRINGS	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	
CSR210	5	3801	2774	5327	4254	7227	6262										3363	2430
	6	3265	2035	4767	3481	6723	5566	8552	7472								4036	2917
	7	2728	1295	4206	2707	6218	4870	8081	6822								4708	3405
	8			3645	1934	5714	4174	7610	6172	9413	8044	11164	9844				5381	3893
	9					5209	3479	7139	5523	8965	7426	10731	9247				6053	4380
	10					4705	2783	6668	4873	8516	6807	10299	8651	12038	10436		6726	4868
	11							6197	4223	8068	6188	9866	8054	11617	9856		7399	5356
	12							5726	3574	7619	5569	9434	7457	11197	9276		8071	5843
CSR240	5	5373	3977	7571	6111	10332	9018										4902	3632
	6	4578	2895	6739	4979	9584	8001	12239	10761								5885	4355
	7	3773	1822	5898	3858	8827	6992	11533	9819								6861	5087
	8			5066	2727	8079	5975	10834	8869	13451	11579	15989	14184				7844	5810
	9					7323	4957	10128	7919	12778	10674	15340	13312				8828	6541
	10					6575	3948	9429	6976	12113	9777	14699	12446	17220	15031		9803	7264
	11							8731	6026	11448	8872	14057	11574	16596	14183		10787	7987
	12							8024	5076	10775	7967	13408	10701	15966	13335		11771	8719
CSR270	5	8786	6576	12163	9852	16289	14210										6961	4952
	6	7695	5050	11022	8257	15263	12775	19256	16934								8349	5944
	7	6612	3514	9891	6652	14245	11332	18306	15585								9744	6928
	8			8750	5057	13219	9897	17348	14245	21286	18332	25109	22260				11132	7920
	9					12193	8453	16389	12897	20374	17048	24229	21023				12527	8912
	10					11167	7018	15431	11557	19461	15771	23349	19792	27156	23699		13914	9904
	11							14473	10209	18548	14487	22469	18554	26300	22496		15310	10896
	12							13523	8869	17643	13211	21597	17324	25452	21300		16697	11880

### Operating Conditions

#### Operating Media

Dry and lubricated air or non-corrosive gas.  
Maximum particle size to be less than 30 µm.

#### Air Supply Pressure

Minimum supply pressure is 35 psig  
Maximum supply pressure is 150 psig

#### Operating Temperature

Standard (NBR O-ring): -4 °F to 175 °F  
Low temperature (Silicone O-ring): -30 °F to 175 °F  
High temperature (Viton O-ring): 5 °F to 300 °F

#### Stroke Adjustment

±5° from 0° & 90° position

#### Location

Indoor and outdoor

### Interface Specification

#### Main Drive Interface (Bottom)

Meets ISO 5211 for direct mount to suitable a valve or connection with standardized mounting hardware.

#### Secondary Drive Interface (Top)

Meets NAMUR specification for direct installation of accessories such as a limit switch or positioner.

#### Air Supply Connection (Side)

Meets NAMUR specification for direct mount of suitable solenoid valves.

### Double Acting Actuator Torque (lbf-in)

MODEL	AIR PRESSURE (psig)								
	40	50	60	70	80	90	100	110	120
CDA032	38	47	57	66	76	85	95	104	113
CDA040	55	71	85	100	115	129	142	157	171
CDA052	97	122	146	171	195	219	244	268	292
CDA063	178	223	267	313	356	401	446	490	535
CDA075	245	306	368	430	490	551	613	674	735
CDA083	383	476	574	671	766	861	957	1053	1149
CDA092	551	689	827	967	1103	1240	1378	1516	1654
CDA105	808	1009	1211	1416	1615	1817	2019	2221	2423
CDA125	1225	1532	1833	2149	2450	2757	3063	3369	3676
CDA140	2088	2611	3133	3662	4177	4699	5221	5743	6265
CDA160	3249	4061	4873	5697	6497	7309	8122	8934	9746
CDA190	5198	6497	7797	9115	10396	11695	12995	14294	15594
CDA210	6497	8122	9746	11394	12995	14619	16243	17868	19492
CDA240	9398	11753	14097	16480	18796	21151	23495	25850	28194
CDA270	14282	17856	21430	25046	28565	32139	35712	39286	42859

### Weight (lbs)

MODEL	032	040	052	063	075	083	092	105	125	140	160	190	210	240	270
CDA	2	2	3	4	6	7	10	13	19	25	36	70	76	106	163
CSR	N/A	N/A	3	4	6	7	12	14	22	29	44	78	85	135	216

### Maximum Air Consumption Per Stroke (cubic inches)

MODEL/ ACTION	032	040	052	063	075	083	092	105	125	140	160	190	210	240	270
CCW	2.5	5.0	7.3	12.9	18.3	26.2	39.1	58.0	97.6	152.5	225.7	359.9	457.5	671.2	1037.5
CW	2.5	6.9	9.7	14.1	20.7	28.7	44.6	53.7	85.4	134.2	195.2	329.4	457.5	549.3	854.4

### Actuator Cycle Speed (seconds)

ACTION	MODEL	032	040	052	063	075	083	092	105	125	140	160	190	210	240	270
CCW	DA	0.3	0.3	0.3	0.5	0.5	0.5	0.6	0.8	0.9	1.2	1.5	2.2	2.8	3.5	3.5
	SR	N/A	N/A	0.4	0.6	0.6	0.6	0.7	1.0	1.1	1.4	2.0	2.5	3.5	4.2	4.5
CW	DA	0.3	0.3	0.4	0.6	0.6	0.7	0.8	1.0	1.2	1.5	1.8	2.5	3.5	4.2	4.5
	SR	N/A	N/A	0.4	0.8	1.0	1.0	1.2	1.2	1.5	1.8	2.5	3.0	4.0	5.0	6.0

### ACTUATOR SIZING GUIDE

#### Double Acting Actuators

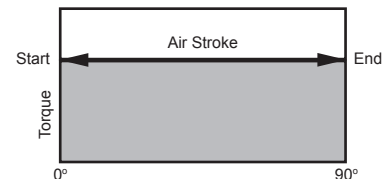
The output torque of a double acting actuator is constant in both clockwise and counter-clockwise rotation. The actuator should be sized as follows:

- 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.

#### Example

- A published seating/unseating torque for an 8" high performance butterfly valve is 2600 lbf-in and the hydrodynamic torque for a 2 psi pressure drop is 500 lbf-in. Therefore the maximum valve torque is  $2600 + 500 = 3100$  lbf-in.
- Applying a safety factor of 20% equals  $3100 + (3100 \times 20/100) = 3720$  lbf-in. final torque requirement.
- The available air pressure is 80 psig.
- Therefore the first torque that just exceeds the final torque requirement of 3720 lbf-in is 4177 lbf-in.
- The actuator model meeting 4177 lbf-in @ 80 psig is a CDA140.

**DOUBLE ACTING TORQUE CURVE**



#### Spring Return Actuators

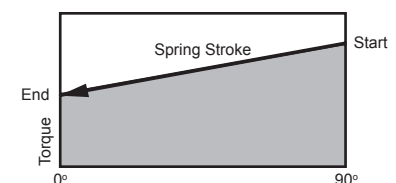
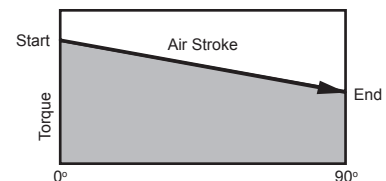
The output torque of a spring return actuator is determined by two factors - air stroke and spring stroke. Each clockwise or counter-clockwise stroke gives different torque values at start and end, four in total, as shown in the figures to the left. These four values are used for sizing the actuator.

- 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.

#### Example

- A published seating/unseating torque for a 2" ball valve in full differential pressure is 400 lbf-in.
- Applying a safety factor of 10% equals  $400 + (400 \times 10/100) = 440$  lbf-in. final torque requirement.
- The available air pressure is 80 psig.
- Therefore the first torque that just exceeds the final torque requirement of 440 lbf-in is 487 lbf-in. (air end) @ 80 psig and 454 lbf-in (spring end).
- The actuator model meeting this requirement is a CSR092 with 11 springs

**SPRING RETURN TORQUE CURVES**



Alloy Valves and Control



**Indirect Mount**



**Direct Mount**



**Compatible with Most  
Accessories via Direct or  
Indirect Mount**

### HOW TO ORDER

ACT	PN	CDA	075	0	N
Actuator	Type	Series	Size	Number of Springs	Seals
ACT	PN - Pneumatic	CDA - Double Acting CSR - Spring Return	032 - CDA Only 040 - CDA Only 052 063 075 083 092 105 125 140 160 190 210 240 270	0 - CDA Only 5 6 7 8 9 10 11 12	N - NBR S - Silicone V - Viton