

ACTUATORS AND CONTROLS

Pneumatic Actuators – AD and AS

APOLLO RACK & PINION

Designed and manufactured for the ultimate in durability and reliability, the new Apollo® Pneumatic Rack & Pinion Actuators provide outstanding service life.

Apollo Rack & Pinion actuators have replaceable insert drive adapters in all but the largest models, and many units have dual “F” series bolt patterns. The numerous actuator drive and bolt pattern combinations allow direct mounting of several valve styles.



FEATURES

- 1. Cast Aluminum Body**
Yellow Chromate Powder Coat Finish
- 2. Die Cast Aluminum End Caps**
Yellow Chromate Powder Coat Finish
- 3. Die Cast Aluminum Pistons**
Yellow Chromate Coated
- 4. Aluminum Alloy Pinion**
7075-T6
Hard-coat Anodized Finish
- 5. Drive Inserts**
Extruded Aluminum
Hard-coat Anodized Finish
- 6. Preloaded Concentric Springs**
Deltatone® Coated
- 7. Piston Guides**
Molybdenum Disulfide filled Polyamide
- 8. Bushings**
Polyoxymethylene (POM)
- 9. O-Ring Seals**
Standard Temp. (-4°F to 180°F): Buna-N
High Temp. (-4°F to 250°F): Fluorocarbon
Low Temp. (-40°F to 180°F): Silicone
- 10. Capscrews, Nuts & Other Hardware**
304 Stainless Steel

BENEFITS

- Compact Rack & Pinion Design
- Quarter-Turn Operation
- Designed for use on a variety of Valve Types:
Ball Valves, Butterfly Valves, Plug Valves
- Applicable to Damper and Door Openers
- Thirteen Distinct Sizes
- Both Single Stop and Double Stop Versions**
- Both Double-Acting and Spring-Return Units
- Double-Acting Torque Outputs from 119 in-lbs to 40273 in-lbs with an 80 psi Air Supply
- Removable/Replaceable Drive Inserts*



- Pre-loaded Spring Assemblies
- ISO 5211 Valve Mounting
- NAMUR (VDI/VDE) Accessory Mounts
- ATEC Classification II, 2 GD, Zones 1 or 2 (Gases) and 21 or 22 (Dust)
- Anti Blow-Out Pinion Design
- Maximum Pressure Rating: 116 psig (8 bar)
- Compatible Media: Clean, Dry Air, Filtered Non-corrosive Gas or Light Hydraulic Oil
- Pre-lubricated for the life of the Actuator
- Chromate Corrosion Protection on all Aluminum Components
- Each Unit is Serialized
- 5 Year Apollo Warranty**

Notes:

* A wide selection of standard inserts is available for Square, DIN and Double-D drives.

** Single Stop units are used where the open position of the valve requires precise adjustment. These are standard on all actuators with the exception of the two larger sizes where single stops are optional. Actuators with dual adjustable stops are also available for those applications on butterfly valves, for example, to allow precise adjustment of both the open and closed positions.

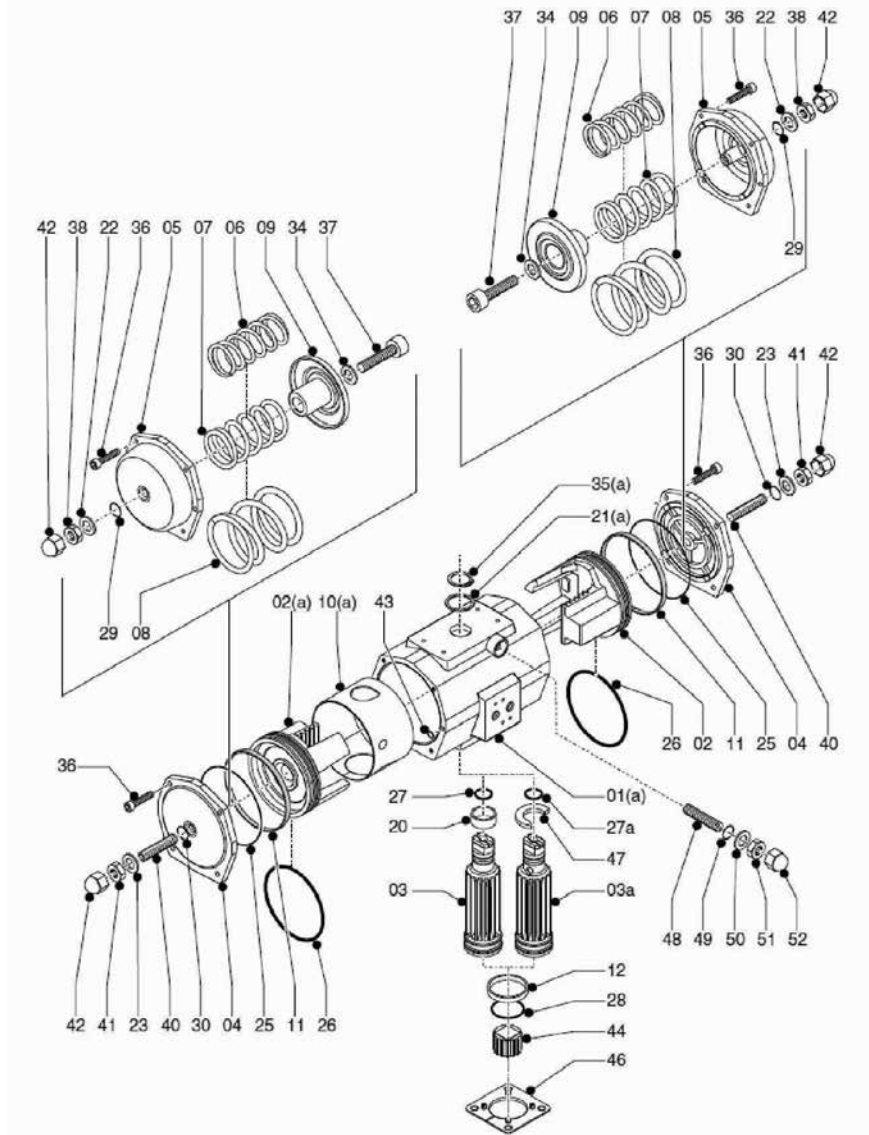


For additional information, submittal sheets and manuals, visit www.apollovalves.com

Customer Service (704) 841-6000

ACTUATORS AND CONTROLS

0025 to 1600 Parts List – AD and AS



Part	Qty	
01	Body	1
02	Piston	2
03	Pinion	1
04	AD End Cap (Double Acting)	2
05	AS End Cap (Spring Return)	2
06	Inner Spring	0 to 2
07	Middle Spring	0 to 2
08	Outer Spring	0 to 2
09	Spring Holder	2
10*	Guide Band	1
11*	Piston Guide	2
12	Lower Bearing	1
20*	Upper Bearing	1

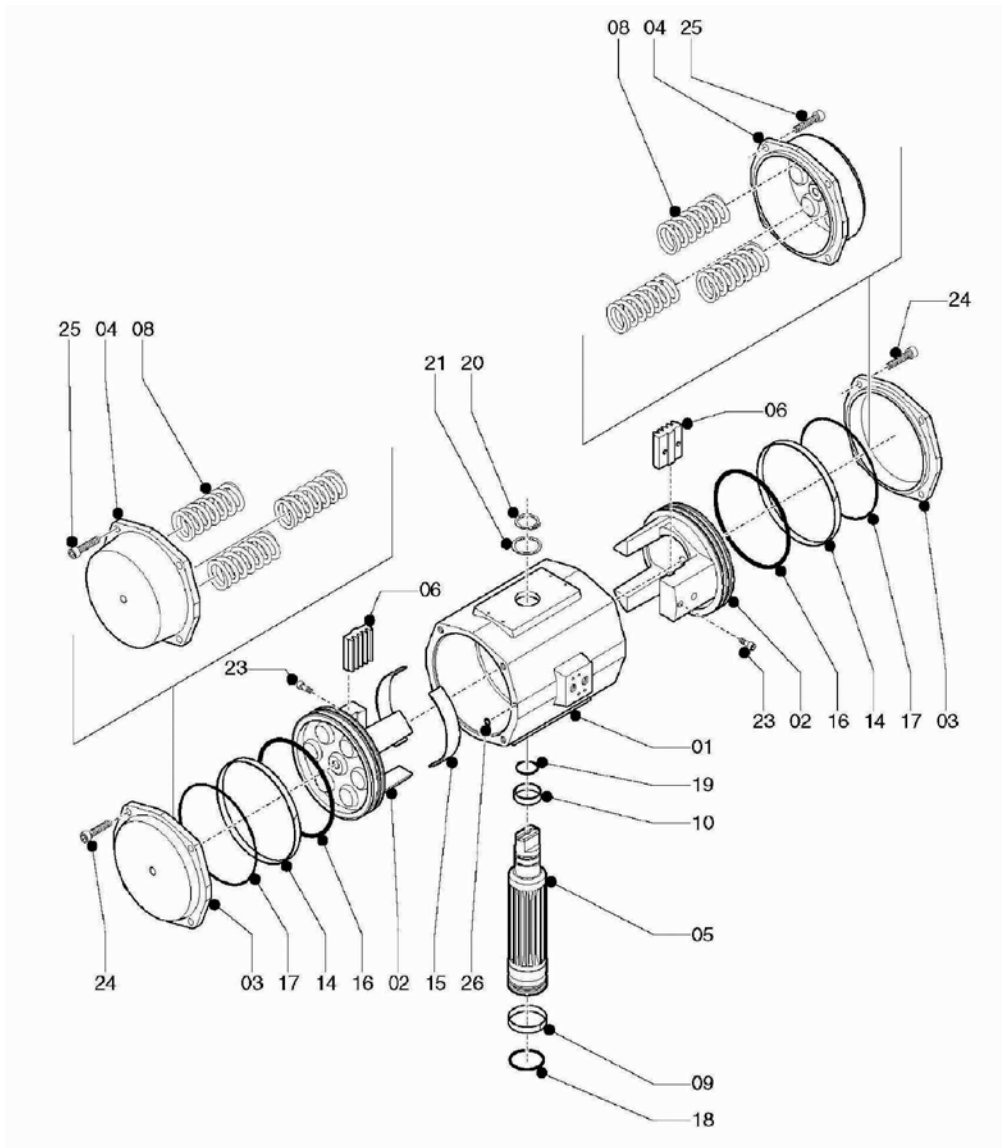
Part	Qty	
21*	Thrust Washer	1
22*	Stop Screw Washer	2
23*	Stop Screw Washer	2
25*	End Cap O-ring	2
26*	Piston O-ring	2
27*	Upper Pinion O-ring	1
28*	Lower Pinion O-ring	1
29*	Stop Screw O-ring	2
30*	Stop Screw O-ring	2
34	Stop Screw Washer	2
35	Spring Clip	1
36	End Cap Bolt	8
37	Limit Stop Bolt	2

Part	Qty	
38	Stop Adjustment Nut	2
40	Limit Stop Bolt	2
42	Nut Cover	2
43	Port O-ring	2
44	Insert/Adapter	1
47	Stroke Cam	1
48	Dual Stop Bolt	1
49*	Dual Stop O-ring	1
50*	Dual Stop Washer	1
51	Dual Stop Lock Nut	1
52	Dual Stop Nut Cover	1

* Contained in Repair Kit

ACTUATORS AND CONTROLS

2500 to 4000 Parts List – AD and AS



Part	Qty	
01	Body	1
02	Piston	2
03	AD End Cap (Double Acting)	2
04	AS End Cap (Spring Return)	2
05	Pinion	1
06	Gear Rack	2
08	Coil Spring	0 to 14
09*	Lower Bearing	1

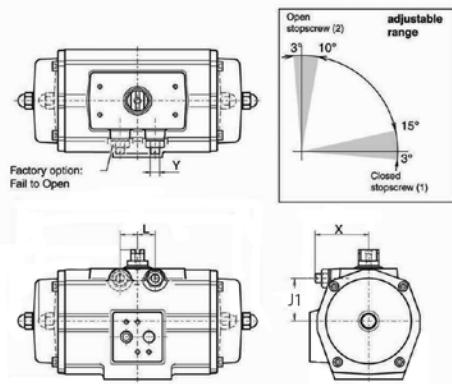
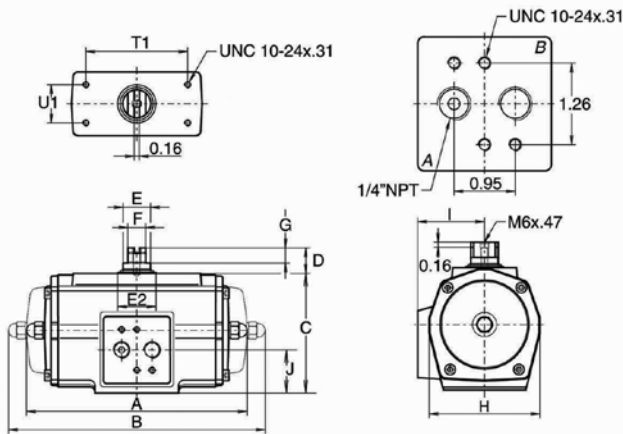
Part	Qty	
10*	Upper Bearing	1
14*	Piston Guide	2
15*	Heel Guide	2
16*	Piston O-ring	2
17*	End Cap O-ring	2
18*	Lower Pinion O-ring	1
19*	Upper Pinion O-ring	1
20*	Spring Clip	1

Part	Qty	
21*	Thrust Washer	1
23	Rack Capscrew	2 or 4
24	DA End Cap Bolt	8 or 20
25	SR End Cap Bolt	8 or 20
26	Port O-ring	2

* Contained in Repair Kit

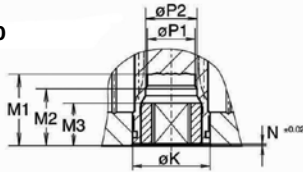
ACTUATORS AND CONTROLS

Dimensional Data – AD and AS

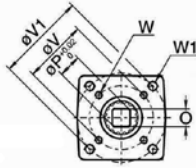


For Models with Dual Adjustable Limit Stops

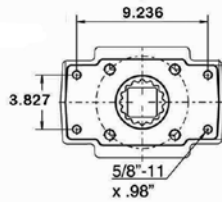
0025 - 1600



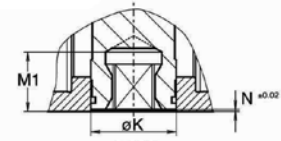
0025 - 0950



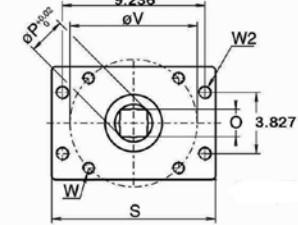
1600



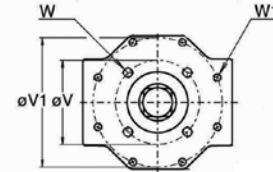
2500, 4000



2500



4000



RACK & PINION ACTUATOR ENVELOPE DIMENSIONS – INCHES

Model	Overall Length A (DA)	Overall Length B (SR)	Body Height C	Body Width H	Solenoid Pad Offset I	Port Location J	Adjustable Closed Stop J1*	Adjustable Closed Stop L*	Stop Size Y*	Stop Protrusion X max.*
0025	6.26	6.77	3.15	2.91	1.81	1.26	1.11	0.45	1/4"-20	1.63
0040	7.09	8.03	3.66	3.39	2.09	1.32	1.38	0.61	5/16"-18	1.91
0065	7.83	9.80	4.13	3.86	2.26	1.54	1.57	0.61	5/16"-18	1.91
0100	8.70	10.51	4.65	4.25	2.48	1.59	1.72	0.73	3/8"-16	2.30
0150	10.00	12.20	5.51	4.76	2.76	1.59	1.92	0.97	3/8"-16	2.64
0200	11.40	14.17	5.63	5.04	2.87	1.99	2.12	0.97	1/2"-13	2.91
0350	12.01	15.24	7.13	6.81	3.71	2.85	2.85	0.97	1/2"-13	3.31
0600	15.24	18.78	8.66	8.15	4.45	3.33	3.50	1.63	5/8"-11	4.51
0950	16.69	20.35	10.20	9.09	4.96	4.15	4.03	1.63	5/8"-11	4.51
1600	20.31	25.08	11.69	10.43	5.59	4.74	4.50	1.87	3/4"-10	4.88
2500	14.88	22.40	14.02	13.78	7.28	7.01	N/A	N/A	N/A	N/A
4000	19.76	32.83	14.96	14.96	7.87	7.48	N/A	N/A	N/A	N/A

*Applies to double stop versions only

www.apollovalves.com

Customer Service (704) 841-6000



ACTUATORS AND CONTROLS

Dimensional Data – AD and AS

RACK & PINION ACTUATOR DRIVE DETAILS – INCHES

Model	Bottom Pinion Diameter K	Valve Stem Clearance M1	Insert or Adapter Height M3	Pinion Recess N	Standard Square Output O max	Standard Square Output O min	Across Corners Diameter P1
0025	0.94	1.36	0.67	0.04	0.437	0.433	0.555
0040	1.30	1.36	0.67	0.04	0.555	0.551	0.713
0065	1.30	1.36	0.67	0.04	0.556	0.551	0.713
0100	1.50	1.36	0.79	0.06	0.753	0.748	0.992
0150	2.17	1.97	0.79	0.04	0.753	0.748	1.004
0200	2.17	1.97	1.16	0.06	0.871	0.866	1.100
0350	2.17	1.97	1.16	0.06	1.068	1.063	1.425
0600	2.68	2.05	1.16	0.06	1.068	1.063	1.425
0950	2.95	2.52	1.95	0.06	1.424	1.417	1.898
1600	3.74	3.23	2.30	0.06	1.817	1.811	2.370
2500	3.35	2.60	N/A	0.12	1.817	1.811	2.370
4000	4.72	3.03	N/A	0.06	2.173	2.165	2.843

RACK & PINION ACTUATOR MOUNTING DIMENSIONS – INCHES

Model	Primary ISO "F" Pattern	Primary Bolt Circle V	Primary Fastener W	Secondary ISO "F" Pattern	Secondary Bolt Circle V1	Secondary Fastener W1
0025	F04	1.65	1/4"-20 x .39"	N/A	N/A	N/A
0040	F05	1.969	1/4"-20 x .39"	F07	2.756	5/16"-18 x .39
0065	F05	1.969	1/4"-20 x .39"	F07	2.756	5/16"-18 x .39
0100	F05	1.969	1/4"-20 x .39"	F07	2.756	5/16"-18 x .39
0150	F07	2.756	5/16"-18 x .39	F10	4.016	3/8"-16 x .63"
0200	F07	2.756	5/16"-18 x .39	F10	4.016	3/8"-16 x .63"
0350	F07	2.756	5/16"-18 x .39	F10	4.016	3/8"-16 x .63"
0600	F10	4.016	3/8"-16 x .63"	F12	4.921	1/2"-13 x .79"
0950	F10	4.016	3/8"-16 x .63"	F14	5.512	5/8"-11 x .98"
1600	F16	6.496	3/4"-10 x 1.14"	N/A	N/A	N/A
2500	F16	6.496	3/4"-10 x 1.14"	N/A	N/A	N/A
4000	F16	6.496	3/4"-10 x 1.14"	F25	10.000	5/8"-11 x .98"

RACK & PINION ACTUATOR MOUNTING DETAILS – INCHES

Model	Namur Shaft Extension D	Namur Shaft Diameter E	Thrust Bearing Diameter E2	Namur Shaft Flats F	Namur Flat Length G	Namur Bolt Pattern T1	Namur Bolt Pattern U1
0025	0.79	0.63	0.91	0.39	0.47	3.150	1.181
0040	0.79	0.87	1.18	0.55	0.47	3.150	1.181
0065	0.79	0.87	1.18	0.55	0.47	3.150	1.181
0100	0.79	0.87	1.18	0.55	0.47	3.150	1.181
0150	0.79	1.42	1.77	0.75	0.47	3.150	1.181
0200	0.79	1.42	1.77	0.75	0.47	3.150	1.181
0350	0.79	1.42	1.77	0.75	0.47	3.150	1.181
0600	1.18	2.17	2.56	1.42	0.39	5.118	1.181
0950	1.18	2.17	2.56	1.42	0.39	5.118	1.181
1600	1.18	2.52	2.95	1.42	0.39	5.118	1.181
2500	1.18	2.17	2.56	1.42	0.39	5.118	1.181
4000	1.18	2.52	3.15	1.42	0.39	5.118	1.181

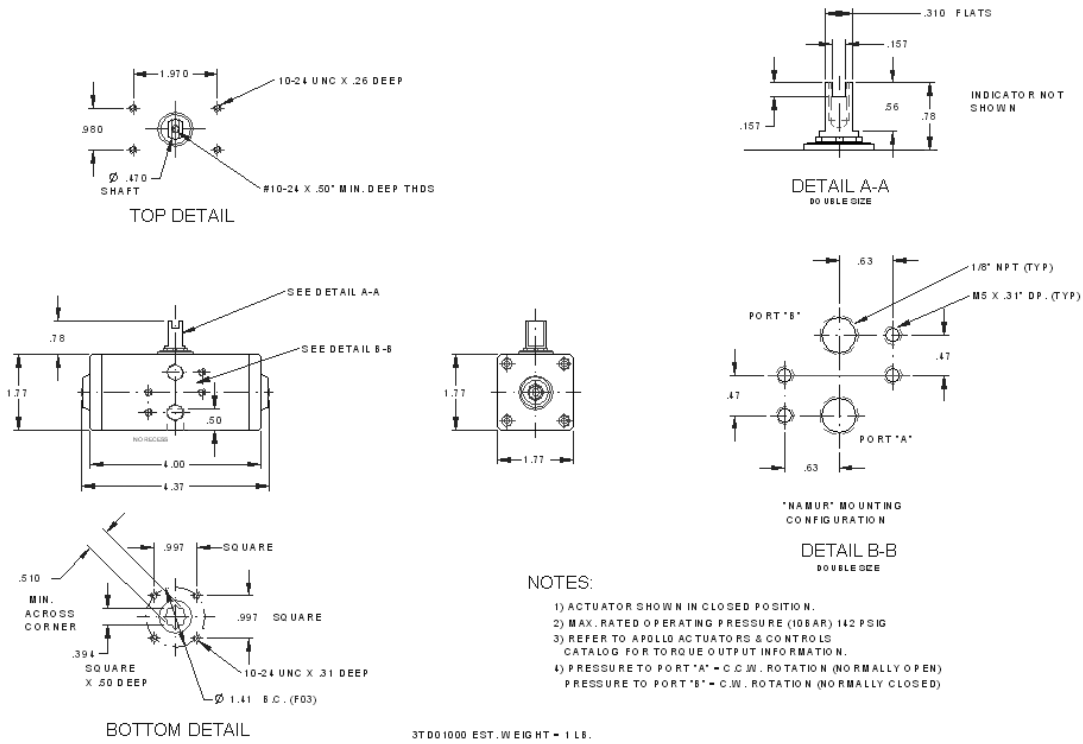


For additional information, submittal sheets and manuals, visit www.apollovalves.com

Customer Service (704) 841-6000

ACTUATORS AND CONTROLS

DIMENSIONS MODEL 32



TORQUE OUTPUT (IN - LB)

Model	Supply Pressure (psi)							
	40	50	60	70	80	90	100	115
DA32	34	43	55	64	71	82	87	101

Rack & Pinion Actuator

TORQUE OUTPUT OF DOUBLE ACTING RACK & PINION ACTUATORS (IN - LB)

Actuator Size	Supply Pressure (psi)										
	40	45	50	55	60	70	75	80	90	100	120
AD0012	58.9	66.4	73.9	81.4	88.9	104	111	119	134	149	179
AD0025	109	123	137	151	165	193	206	220	248	276	332
AD0040	205	231	257	283	309	361	387	413	466	518	622
AD0065	312	352	392	431	471	551	590	630	709	789	948
AD0100	461	520	578	637	696	813	872	930	1048	1165	1400
AD0150	739	833	927	1021	1115	1303	1397	1491	1680	1868	2244
AD0200	1011	1140	1269	1398	1527	1784	1913	2042	2299	2557	3072
AD0350	1757	1981	2205	2428	2652	3100	3323	3547	3994	4442	5337
AD0600	2986	3366	3747	4127	4507	5267	5647	6028	6788	7548	9069
AD0950	4458	5025	5593	6160	6728	7862	8430	8997	10132	11267	13537
AD1600	7369	8307	9245	10183	11121	12998	13936	14874	16750	18626	22379
AD2500	11825	13270	14768	16267	17847	20858	22363	23869	26880	29891	35912
AD4000	19962	22495	25035	27576	30127	35210	37751	40293	45375	50458	60623

ACTUATORS AND CONTROLS

TORQUE OUTPUT OF SPRING RETURN RACK & PINION ACTUATORS (IN - LB)

Actuator Size	Spring Set	Spring Stroke		Air Stroke Supply Pressure (psi)									
				40		60		80		100		120	
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
AS0012	2	63	40	-	-	48	24	80	55	111	87	143	119
	3	62	39	74	44	130	103	189	162	248	221	306	280
AS0025	3	94	59	48	8	107	67	166	126	225	185	284	244
	4	125	78	-	-	85	31	144	90	203	149	262	208
	5	156	98	-	-	-	-	121	54	180	113	239	172
	6	188	117	-	-	-	-	99	18	158	77	217	136
AS0040	2	117	73	133	82	243	193	354	303	464	414	575	524
	3	176	110	91	15	201	125	312	236	422	346	533	457
	4	234	146	-	-	159	58	270	169	380	279	491	390
	5	293	183	-	-	-	-	228	101	338	212	449	322
	6	351	220	-	-	-	-	185	34	296	144	406	255
AS0065	2	186	117	196	117	365	285	533	454	701	622	870	790
	3	279	176	129	10	297	178	466	347	634	515	802	683
	4	372	234	-	-	230	71	398	240	567	408	735	576
	5	465	292	-	-	-	-	331	133	500	301	668	470
	6	558	351	-	-	-	-	264	26	432	194	601	363
AS0100	2	258	161	303	192	552	441	801	690	1050	939	1299	1188
	3	387	242	211	44	460	293	709	542	958	791	1206	1039
	4	516	323	-	-	367	144	616	393	865	642	1114	891
	5	646	403	-	-	-	-	523	245	772	494	1021	743
	6	775	484	-	-	-	-	430	96	679	345	928	594
AS0150	2	423	259	485	297	884	696	1283	1094	1681	1493	2080	1892
	3	634	388	337	54	735	453	1134	852	1533	1250	1931	1649
	4	845	517	-	-	587	210	985	609	1384	1007	1783	1406
	5	1056	647	-	-	-	-	837	366	1235	764	1634	1163
	6	1268	776	-	-	-	-	688	123	1087	522	1485	920
AS0200	2	579	362	656	406	1202	952	1747	1498	2293	2043	2838	2589
	3	868	542	448	74	994	619	1539	1165	2085	1710	2631	2256
	4	1158	723	-	-	786	287	1332	832	1877	1378	2423	1924
	5	1447	904	-	-	-	-	1124	500	1669	1045	2215	1591
	6	1736	1085	-	-	-	-	916	167	1462	713	2007	1258
AS0350	2	1025	658	1105	684	2053	1632	3001	2580	3949	3528	4897	4476
	3	1537	987	727	95	1675	1043	2623	1991	3571	2939	4519	3887
	4	2049	1317	-	-	1297	455	2245	1403	3193	2351	4141	3299
	5	2561	1646	-	-	-	-	1866	814	2814	1762	3762	2710
	6	3074	1975	-	-	-	-	1488	225	2436	1173	3384	2121
AS0600	2	1723	1082	1920	1183	3531	2794	5142	4405	6753	6016	8364	7628
	3	2585	1624	1298	193	2909	1804	4520	3415	6131	5026	7742	6637
	4	3446	2165	-	-	2287	814	3898	2425	5509	4036	7120	5647
	5	4308	2706	-	-	-	-	3276	1434	4887	3046	6498	4657
	6	5169	3247	-	-	-	-	2654	444	4265	2055	5876	3666
AS0950	2	2563	1587	2898	1777	5303	4182	7708	6587	10113	8992	12518	11397
	3	3844	2381	1986	304	4391	2709	6796	5114	9201	7519	11606	9924
	4	5125	3175	-	-	3479	1236	5884	3641	8288	6046	10693	8451
	5	6407	3968	-	-	-	-	4971	2168	7376	4573	9781	6978
	6	7688	4762	-	-	-	-	4059	695	6464	3100	8869	5505
AS1600	2	4193	2646	4765	2988	8741	6964	12716	10939	16692	14915	20668	18890
	3	6289	3970	3244	578	7220	4554	11196	8530	15171	12505	19147	16481
	4	8385	5293	-	-	5699	2145	9675	6120	13650	10096	17626	14071
	5	10481	6616	-	-	-	-	8154	3711	12129	7686	16105	11662
	6	12578	7939	-	-	-	-	6633	1301	10608	5277	14584	9252
AS2500	6	7013	4401	6881	4278	12875	10273	18869	16267	24863	22261	30858	28255
	8	9351	5868	5251	1781	11245	7775	17239	13769	23233	19764	29228	25758
	10	11689	7335	-	-	9615	5278	15609	11272	21603	17266	27597	23260
	12	14026	8803	-	-	7985	2780	13979	8774	19973	14768	25967	20763
	14	16364	10270	-	-	-	-	12349	6277	18343	12271	24337	18265
AS4000	6	11835	7429	11701	7310	21862	17472	32024	27633	42185	37795	52347	47956
	8	15780	9905	8949	3096	19111	13257	29272	23419	39434	33580	49595	43742
	10	19725	12381	-	-	16359	9042	26521	19204	36682	29365	46844	39527
	12	23670	14857	-	-	13608	4828	23770	14989	33931	25150	44093	35312
	14	27615	17333	-	-	-	-	21018	10774	31180	20936	41341	31097

▶ STANDARD



For additional information, submittal sheets and manuals, visit www.apollovalves.com

Customer Service (704) 841-6000

ACTUATORS AND CONTROLS

Technical Data – AD and AS

Double Acting		AD0012	AD0025	AD0040	AD0065	AD0100	AD0150	AD0200	AD0350	AD0600	AD0950	AD1600	AD2500	AD4000
Weight (lbs)		1.3	2.9	4	5.3	6.8	10.5	12.8	23	43	58	95	125	191
Spring Return		AS0012	AS0025	AS0040	AS0065	AS0100	AS0150	AS0200	AS0350	AS0600	AS0950	AS1600	AS2500	AS4000
Weight (lbs)		1.5	3.7	5.3	7.9	10.1	15.2	20.1	37	61	85	145	194	291
Displacement	(cu in.)	AD0012 AS0012	AD0025 AS0025	AD0040 AS0040	AD0065 AS0065	AD0100 AS0100	AD0150 AS0150	AD0200 AS0200	AD0350 AS0350	AD0600 AS0600	AD0950 AS0950	AD1600 AS1600	AD2500 AS2500	AD4000 AS4000
Port A	CCW	3.1	6.1	9.8	20	21	45	49	110	177	287	445	488	824
Port B	CW	3.7	6.7	13	22	30	40	61	116	189	299	488	568	1068

Air consumption (scf per 90°) = (Displacement/1728)*(Supply Pressure + 14.7)/14.7

Operating Time	AD0012 AS0012	AD0025 AS0025	AD0040 AS0040	AD0065 AS0065	AD0100 AS0100	AD0150 AS0150	AD0200 AS0200	AD0350 AS0350	AD0600 AS0600	AD0950 AS0950	AD1600 AS1600	AD2500 AS2500	AD4000 AS4000
Seconds	0.4	0.5	0.7	1.1	1.2	1.8	2.3	3.6	4.5	5.4	6.9	7	12

SELECTING/SIZING APOLLO RACK & PINION ACTUATORS

Establish the valve operating torque beginning with the torque constants for the appropriate pressure and valve as found on pages 41-42. Use the torque adjustment factors found on page 43 to arrive at an in-service torque. Multiple adjustment factors may be required. Do not forget to include adjustments for graphite stem packings (valve options -21, 24 or 65 for conventional ball valves, BO, BS, EV, FD and FP for TEVs')

FOR DOUBLE ACTING ACTUATORS

Based on the available air supply select an actuator with torque outputs that exceed the in-service torque by at least 10%.

FOR SPRING RETURN ACTUATORS

Considering the available air supply, select an actuator where both the Spring-Ending torque figure and the Air-Ending torque figure exceeds the in-service torque by at least 10%.

Note: Single-Stop actuators are appropriate for use on ball valves. Dual-Stop actuators are required for most butterfly valve applications but may also be used on ball valves.

How to Order Apollo Pneumatic Rack & Pinion Actuators – AD and AS

ACTION	SIZE	SEAL OPTION	SPRING SET	LIMIT STOP	INSERT	"AS" MODEL ONLY
D = Double Acting S = Spring Return K = Kit	0012* 0025 0040 0065 0100 0150 0200 0350 0600 0950 1600 2500* 4000*	N = Nitrile (Normal temp range, -4° to 175°F) H = Fluorocarbon (High temp range, -4° to 250°F) L = Silicone (Low temp range, -40° to 175°F)	00 (DA) 01 02 03 04 05 06 07 08 10 12 14	0 = None** (Std. on sizes 0012, 2500, & 4000) 1 = Single Adjustable Limit Stop (For sizes 0025 thru 1600 only) 2 = Dual Adjustable Limit Stops (For sizes 0025 thru 1600 only)	A = STD Square B = Without	Add Suffix "F" if spring-to-open (i.e. fail open), otherwise, leave blank

* No insert adapter options

** Optional double stroke adjustment plate is available for 2500 & 4000 (see price list)