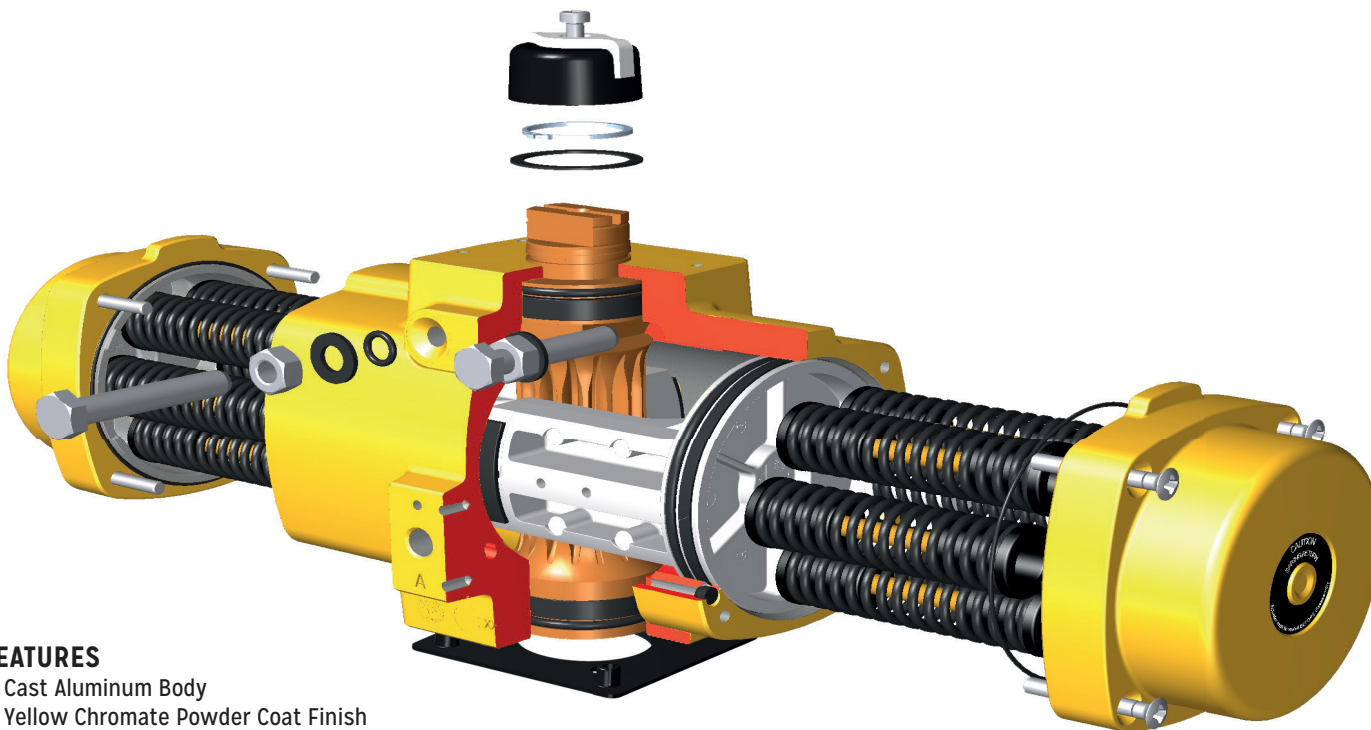


APOLLO® RACK & PINION

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

- Cast Aluminum Body
Yellow Chromate Powder Coat Finish
- Die Cast Aluminum End Caps
Yellow Chromate Powder Coat Finish
- Die Cast Aluminum Pistons
Hard Anodized
- Aluminum Alloy Pinion
Hard-coat Anodized Finish
- Drive Inserts
Extruded Aluminum
Hard-coat Anodized Finish
- Preloaded Concentric Springs
Delta®-Tone Coated
- Bushings
Polyoxymethylene (POM)
- 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
- Capscrews, Nuts & Other Hardware
Stainless Steel or Delta®-Tone Coated

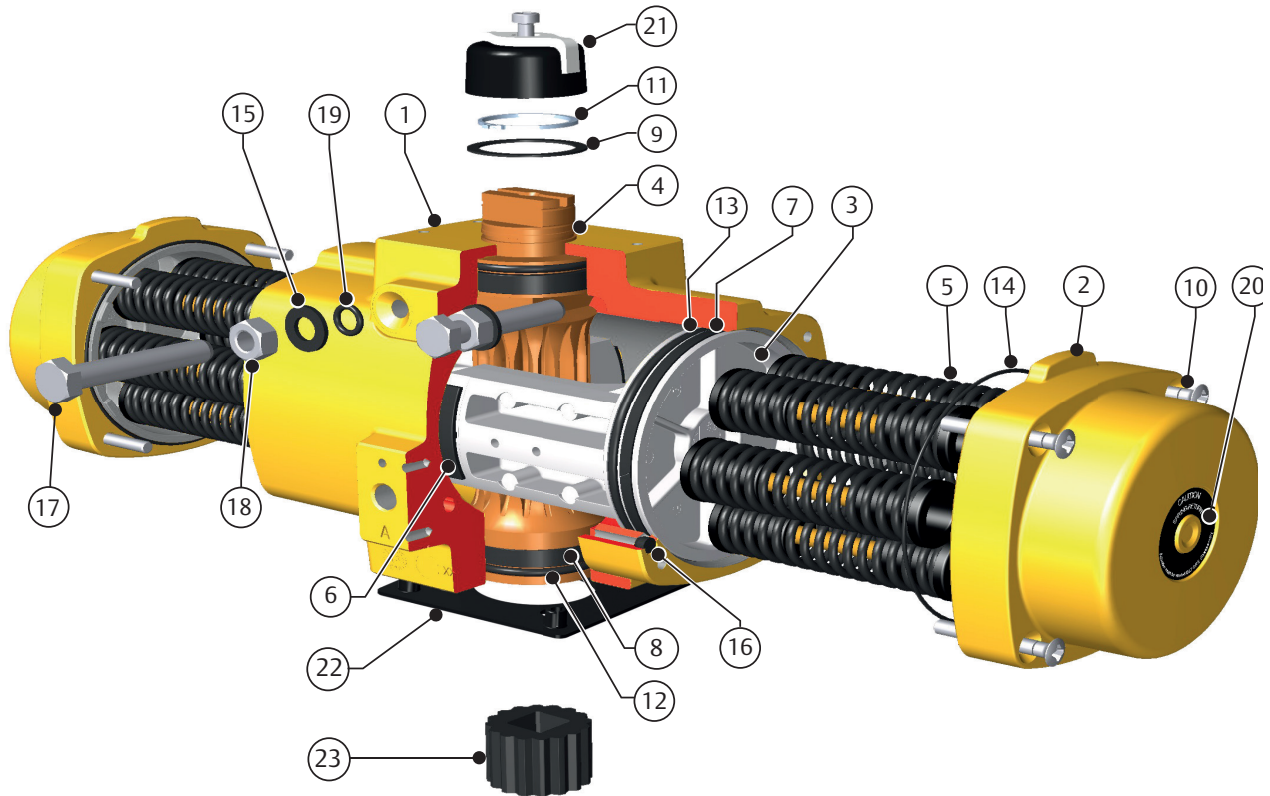
BENEFITS

- 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
- Both Double-Acting and Spring-Return Units
- Double-Acting Torque Outputs from 220 in-lbs to 6028 in-lbs with an 80 psi Air Supply
- Removable/Replaceable Drive Inserts*
- Pre-loaded Spring Assemblies
- ISO 5211 Valve Mounting
- NAMUR (VDI/VDE 3845) Accessory Mounts
- ATEX Classification II, 2 GD, Zones 1 or 2 (Gases) and 21 or 22 (Dust)
- Anti Blowout 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. See page 16.

AD & AS ACTUATORS PARTS LIST - SIZES 0025 TO 0600

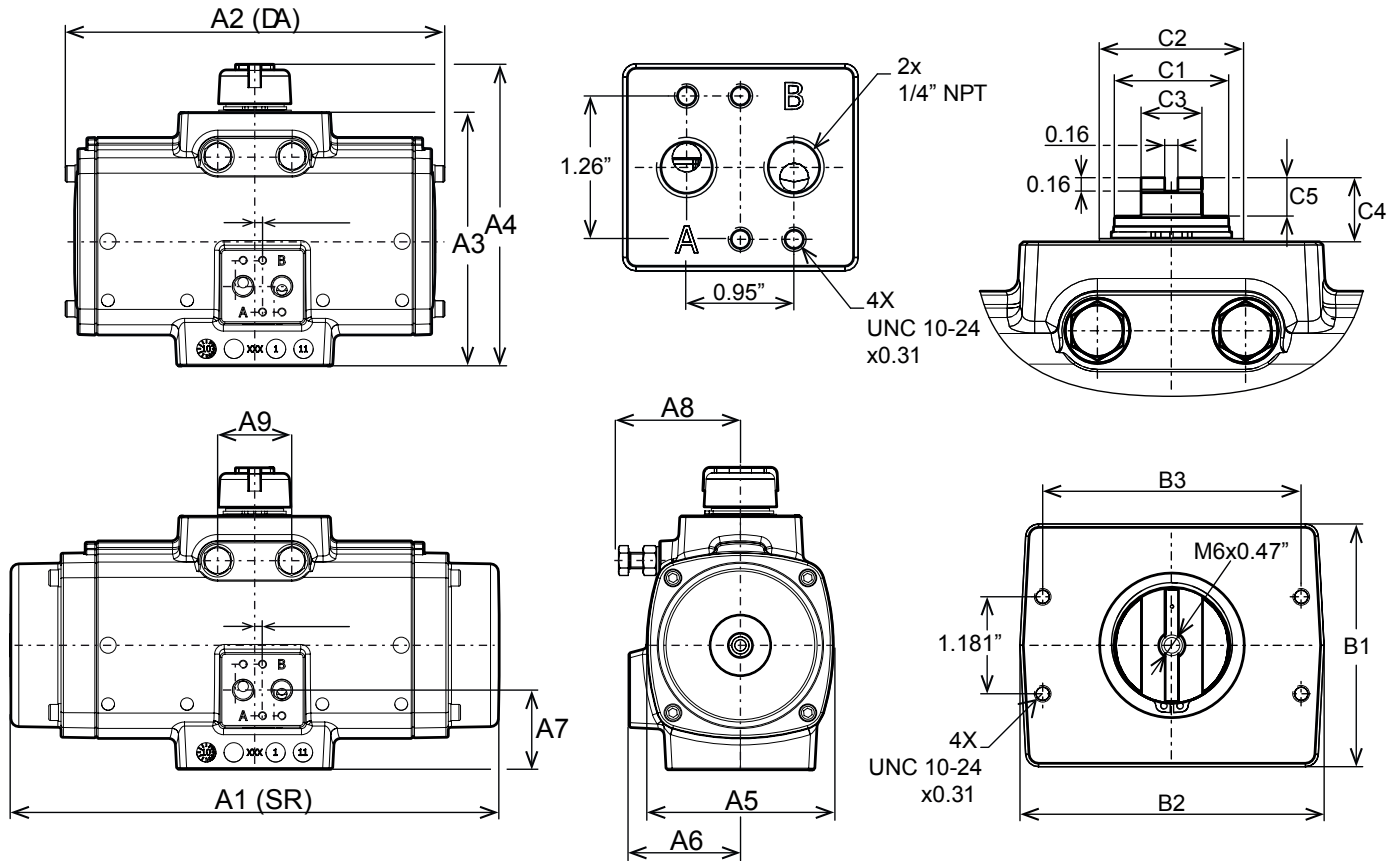


PART	QTY	DESCRIPTION	MATERIAL	NOTES
1	1	Body	Cast Aluminium alloy	Chromated and polyurethane powder coated
2	2	End cap	Cast Aluminium alloy	Chromated and polyurethane powder coated
3	2	Piston	Cast Aluminium alloy	Chromated
4	1	Pinion	High grade aluminium	Hard anodized
5	Max. 12	Spring cartridge	Spring steel	Electrophoretic coated
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	Deltatone® coated
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

AD & AS ACTUATORS DIMENSIONAL DATA - SIZES 0025 TO 0600

ENVELOPE DIMENSIONS - SOLENOID INTERFACE - TOP MOUNTING INTERFACE



Tolerance limits unless otherwise specified:
 X.X = ±0.02"
 X.XX = ±0.01"

DIM IN INCHES	ACTUATOR SIZE							
	0025	0040	0065	0100	0150	0200	0350	0600
A1	6.54	7.55	8.53	9.72	11.97	14.23	15.15	18.73
A2	6.54	7.55	8.53	9.72	9.25	10.43	11.18	14.02
A3	3.59	4.39	4.86	5.14	6.19	6.42	7.92	9.77
A4	4.69	5.47	5.94	6.22	7.28	7.52	9.06	11.50
A5	3.23	3.74	4.09	4.53	5.00	5.28	6.50	7.83
A6	1.91	2.15	2.28	2.50	2.72	2.83	3.35	4.02
A7	1.16	1.34	1.48	1.50	1.93	1.92	1.65	2.64
A8	1.89	2.28	2.72	2.72	2.95	3.43	4.29	5.20
A9	0.71	0.98	1.06	1.10	1.81	1.81	1.81	2.36

DIM IN INCHES	ACTUATOR SIZE							
	0025	0040	0065	0100	0150	0200	0350	0600
B1	1.69	1.77	1.97	2.36	2.95	2.95	3.35	3.86
B2	3.70	3.70	3.70	3.82	3.70	3.70	3.94	5.83
B3	3.15	3.15	3.15	3.15	3.15	3.15	3.15	5.12
C1	0.63	0.87	0.87	0.87	1.34	1.42	1.42	2.17
C2	0.91	1.18	1.18	1.18	1.77	1.77	1.77	2.56
C3	0.39	0.55	0.55	0.55	0.75	0.75	0.75	1.42
C4	0.79	0.79	0.79	0.79	0.79	0.79	0.79	1.18
C5	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.39

Note:

DA = Double-Acting, SR = Spring-Return

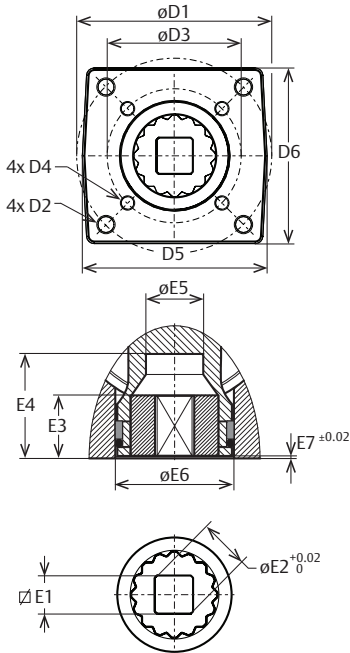
Solenoid interface and top mounting interface according to VDI/VDE3845 (NAMUR)

The solenoid drilling pattern is shifted 0.16" for size 0025 and 0.08" for size 0040 vs. the centerline of the actuator.

AD & AS ACTUATORS DIMENSIONAL DATA - SIZES 0025 TO 0600

VALVE INTERFACE AND DRIVE DETAILS

SIZE 0025 TO 0350



Tolerance limits unless otherwise specified:
 X.X = ± 0.02 "
 X.XX = ± 0.01 "

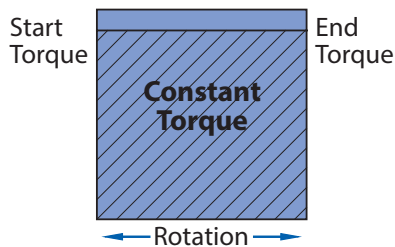
DIM IN INCHES	ACTUATOR SIZE							
	0025	0040	0065	0100	0150	0200	0350	0600
ISO 1	F05	F07	F07	F07	F10	F10	F10	F12
D1	1.969	2.756	2.756	2.756	4.016	4.016	4.016	4.921
D2	1/4"-20 x0.39"	5/16"-18 x0.39"	5/16"-18 x0.39"	5/16"-18 x0.39"	3/8"-16 x0.63"	3/8"-16 x0.63"	3/8"-16 x0.63"	1/2"-13 x0.79"
ISO 2	F03	F05	F05	F05	F07	F07	F07	F10
D3	1.417	1.969	1.969	1.969	2.756	2.756	2.756	4.016
D4	10-24 x0.31"	1/4"-20 x0.39"	1/4"-20 x0.39"	1/4"-20 x0.39"	5/16"-18 x0.39"	5/16"-18 x0.39"	5/16"-18 x0.39"	3/8"-16 x0.63"
D5	1.97	2.68	2.68	2.62	3.82	3.7	3.7	4.65
D6	1.89	2.56	2.56	2.48	3.62	3.54	3.7	4.65
E1 Max	0.436	0.554	0.554	0.751	0.751	0.87	1.067	1.067
E1 Min	0.433	0.551	0.551	0.748	0.748	0.866	1.063	1.063
E2	0.555	0.713	0.713	0.992	1.004	1.11	1.425	1.426
E3	0.591	0.591	0.591	0.709	1.083	1.083	1.083	1.083
E4	1.34	1.34	1.34	1.34	1.97	1.97	1.97	1.97
E5	0.56	0.71	0.83	0.93	1.12	1.26	1.26	1.44
E6	0.96	1.36	1.36	1.5	2.22	2.22	2.22	2.66
E7	0.02	0.04	0.04	0.04	0.05	0.05	0.05	0.05

Note:
 Flange and square drive according to DIN 3337

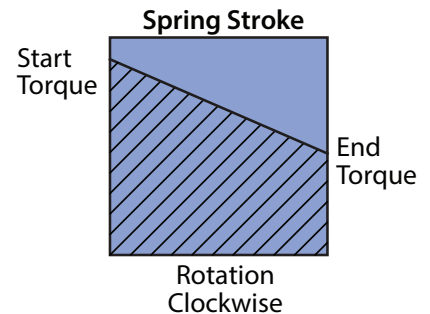
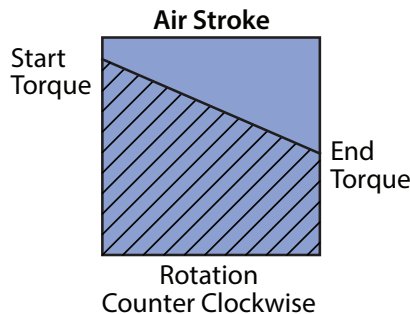
TORQUE OUTPUT OF DOUBLE ACTING RACK & PINION ACTUATORS (IN - LB)

ACTUATOR SIZE	SUPPLY PRESSURE (PSI)										
	40	45	50	55	60	70	75	80	90	100	120
AD0025	109	123	137	151	165	193	207	220	248	276	332
AD0040	205	231	257	283	309	361	387	413	466	518	622
AD0065	312	352	392	431	471	550	590	630	709	789	948
AD0100	461	520	579	638	696	814	873	931	1049	1166	1401
AD0150	739	833	927	1021	1115	1304	1398	1492	1680	1868	2244
AD0200	1011	1140	1269	1398	1527	1784	1913	2042	2299	2557	3072
AD0350	1758	1981	2205	2429	2653	3100	3324	3547	3995	4442	5337
AD0600	2987	3367	3747	4127	4508	5268	5648	6028	6789	7549	9070

DOUBLE-ACTING TORQUE DIAGRAM



SPRING-RETURN TORQUE DIAGRAM



AD & AS ACTUATORS TORQUE OUTPUT

ACTUATOR SIZE	SPRING SET	SPRING STROKE		AIR STROKE SUPPLY PRESSURE (PSI)															
				40		50		60		70		80		90		100		120	
		START	END	START	END	START	END	START	END	START	END	START	END	START	END	START	END	START	END
AS0025	2	63	39	70	44	100	73	129	103	159	132	188	162	218	191	247	221	306	280
	3	94	59	48	8	77	37	107	67	136	96	166	126	195	155	225	185	283	244
	4	125	79	-	-	-	-	84	31	113	60	143	90	172	119	202	149	261	208
	5	156	99	-	-	-	-	-	-	91	24	120	54	150	83	179	113	238	172
	6	188	118	-	-	-	-	-	-	-	-	98	18	127	47	157	77	216	136
AS0040	2	116	73	133	84	188	139	243	195	299	250	354	305	409	360	464	415	575	526
	3	174	110	91	18	146	73	201	128	257	183	312	239	367	294	422	349	533	459
	4	231	146	-	-	-	-	159	62	214	117	270	172	325	227	380	283	491	393
	5	289	183	-	-	-	-	-	-	172	50	228	106	283	161	338	216	449	327
	6	347	220	-	-	-	-	-	-	-	-	186	39	241	94	296	150	407	260
AS0065	2	181	114	200	123	284	207	368	291	452	376	537	460	621	544	705	628	873	796
	3	271	171	134	19	219	103	303	188	387	272	471	356	555	440	639	524	808	693
	4	361	228	-	-	-	-	237	84	322	168	406	252	490	336	574	420	742	589
	5	452	285	-	-	-	-	-	-	256	64	340	148	424	232	509	317	677	485
	6	542	341	-	-	-	-	-	-	-	-	275	44	359	129	443	213	612	381
AS0100	2	262	166	299	188	423	313	548	437	672	562	797	686	921	811	1046	935	1295	1184
	3	392	248	203	38	328	162	452	287	577	411	701	536	826	660	950	785	1199	1034
	4	523	331	-	-	-	-	357	136	482	261	606	385	731	510	855	634	1104	883
	5	654	414	-	-	-	-	-	-	387	110	511	235	636	359	760	484	1009	733
	6	785	497	-	-	-	-	-	-	-	-	416	85	540	209	665	334	914	583
AS0150	2	416	262	482	304	681	504	881	703	1080	902	1279	1102	1479	1301	1678	1500	2077	1899
	3	625	393	332	65	531	264	730	464	930	663	1129	862	1328	1062	1528	1261	1926	1660
	4	833	524	-	-	-	-	580	224	779	424	979	623	1178	823	1377	1022	1776	1421
	5	1041	654	-	-	-	-	-	-	629	185	828	384	1027	583	1227	783	1626	1181
	6	1249	785	-	-	-	-	-	-	-	-	678	145	877	344	1076	543	1475	942
AS0200	2	578	364	653	407	926	680	1198	953	1471	1226	1744	1499	2017	1771	2290	2044	2836	2590
	3	867	547	443	75	716	348	989	621	1262	894	1535	1166	1808	1439	2080	1712	2626	2258
	4	1156	729	-	-	-	-	780	289	1052	561	1325	834	1598	1107	1871	1380	2417	1926
	5	1445	911	-	-	-	-	-	-	843	229	1116	502	1389	775	1662	1048	2207	1593
	6	1734	1093	-	-	-	-	-	-	-	-	906	170	1179	443	1452	716	1998	1261
AS0350	2	990	624	1145	724	1619	1199	2093	1673	2567	2147	3041	2621	3515	3095	3990	3569	4938	4517
	3	1485	936	786	156	1261	630	1735	1104	2209	1578	2683	2052	3157	2526	3631	3000	4579	3948
	4	1979	1248	-	-	-	-	1376	535	1850	1009	2324	1483	2798	1957	3272	2431	4221	3380
	5	2474	1560	-	-	-	-	-	-	1492	440	1966	914	2440	1388	2914	1863	3862	2811
	6	2969	1872	-	-	-	-	-	-	-	-	1607	346	2081	820	2555	1294	3504	2242
AS0600	2	1695	1068	1937	1216	2743	2021	3548	2827	4354	3633	5160	4438	5965	5244	6771	6050	8382	7661
	3	2543	1601	1324	241	2129	1047	2935	1853	3741	2658	4546	3464	5352	4270	6158	5075	7769	6687
	4	3391	2135	-	-	-	-	2321	878	3127	1684	3933	2490	4738	3295	5544	4101	7155	5712
	5	4238	2669	-	-	-	-	-	-	2513	710	3319	1515	4125	2321	4930	3127	6542	4738
	6	5086	3203	-	-	-	-	-	-	-	-	2706	541	3511	1346	4317	2152	5928	3763

▶ STANDARD

AD & AS ACTUATORS TECHNICAL DATA - SIZES 0025 TO 0350

ACTUATOR WEIGHT

ACTUATOR SIZE	DOUBLE-ACTING	SPRING-RETURN
	LBS	LBS
0025	3.1	3.5
0040	4.6	5.1
0065	6.2	7.3
0100	7.7	9.5
0150	10.8	14.6
0200	13.2	18.3
0350	22	32
0600	44	57

OPERATING SPEED RESULTS (SEE TEST CONDITIONS BELOW)

ACTUATOR SIZE	CYCLE TIME IN SECONDS			
	SPRING-RETURN		DOUBLE-ACTING	
	A-PORT PRESSURIZED	SPRING STROKE	A-PORT PRESSURIZED	B-PORT PRESSURIZED
0025	0.5	0.4	0.5	0.4
0040	0.6	0.5	0.6	0.5
0065	0.7	0.5	0.6	0.6
0100	0.8	0.6	0.8	0.7
0150	1.0	0.8	0.9	0.8
0200	1.3	0.9	1.0	1.0
0350	1.9	1.3	1.4	1.5
0600	3.2	1.9	2.2	2.2

DISPLACEMENT

ACTUATOR SIZE	ACTUATOR VOLUME			CONSUMPTION PER STROKE (CUBIC INCH, PRESSURE IN PSIG)					
	MAXIMUM VOLUME (CUBIC INCH)			OUTWARD STROKE (DOUBLE-ACTING & SPRING RETURN)			INWARD STROKE (DOUBLE-ACTING ONLY)		
	CENTRAL ¹ CHAMBER	END CAP ² CHAMBER	DISPLACED ³ VOLUME	40 PSIG	80 PSIG	120 PSIG	40 PSIG	80 PSIG	120 PSIG
0025	6.4	11.8	4.7	28	52	75	38	72	106
0040	10.0	22	8.9	53	96	140	71	133	196
0065	22	34	13.5	81	148	215	107	200	294
0100	22	50	19.9	118	216	314	165	310	455
0150	48	43	32	192	352	512	163	293	424
0200	50	59	44	255	466	676	220	397	573
0350	118	103	76	436	796	1157	392	709	1025
0600	222	201	129	742	1354	1967	683	1237	1790

NOTES:

- For Double-acting and Spring-return. Pistons at 90° outward position
- Only for Double-acting. Pistons at 0° inward position
- Stroke is 90°

OPERATING SPEED TEST	
Solenoid w/ flow capacity:	0.6 m3/hr
Pipe diameter:	6 mm
Medium:	clean air
Supply pressure:	80 psi
Load:	with average load
Stroke:	90°
Temperature:	Room temperature

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 49-51. Use the torque adjustment factors found on page 52 to arrive at an in-service torque. Multiple adjustment factors may be required. Do not forget to include adjustments for graphite stem packing.

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%.

HOW TO ORDER APOLLO PNEUMATIC RACK & PINION ACTUATORS

PART NUMBER MATRIX

A	S	0350	N	04	A	C	A
PREFIX	ACTION	SIZE	SEAL OPTION	SPRING SET	INSERTS	FAIL POSITION	REVISION
A	D - DOUBLE ACTING	0025	N - NITRILE	00 (DA)	A - STANDARD SQUARE	C - FAIL CLOSED (FC)	A
	S - SPRING RETURN	0040	H - FLUOROCARBON	02	B - WITHOUT INSERT	F - FAIL OPEN (FO)	
	K - KIT	0065	L - SILICONE	03		D - NO SPRING	
		0100		04			
		0150		05			
		0200		06			
		0350		08			
		0600					