WAYLAND

RPA SERIES

Rack & Pinion Pneumatic Actuator



RACK & PINION Pneumatic Actuator

Engineering Reference Guide



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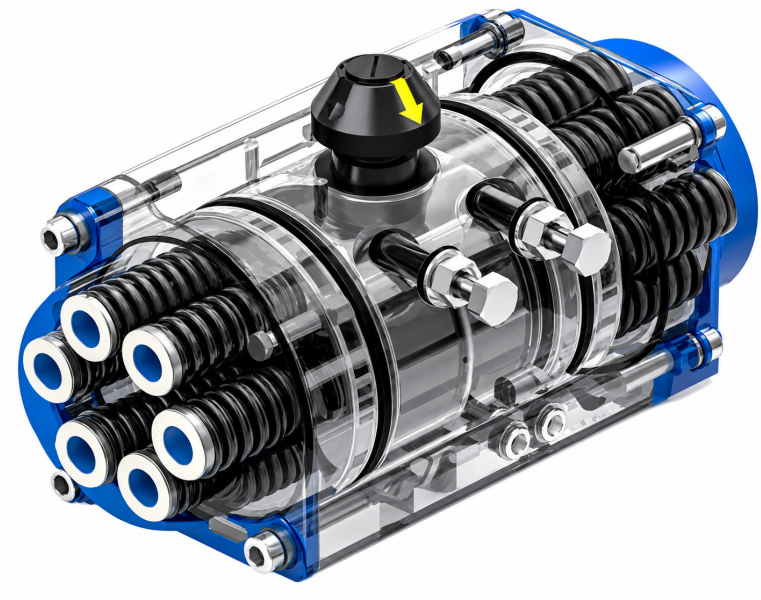
WAYLAND

RACK AND PINION ACTUATOR (RPA SERIES)

Product Overview

The RPA Series pneumatic actuators are designed for reliable quarter-turn valve automation across a wide range of industrial and hygienic process applications. Featuring robust rack-and-pinion construction, universal mounting standards, and a broad selection of configurable options, the RPA Series delivers dependable performance and seamless integration.

The RPA Series actuator platform aligns with industry-standard providing proven architecture, accessory compatibility, and long service life in demanding environments.

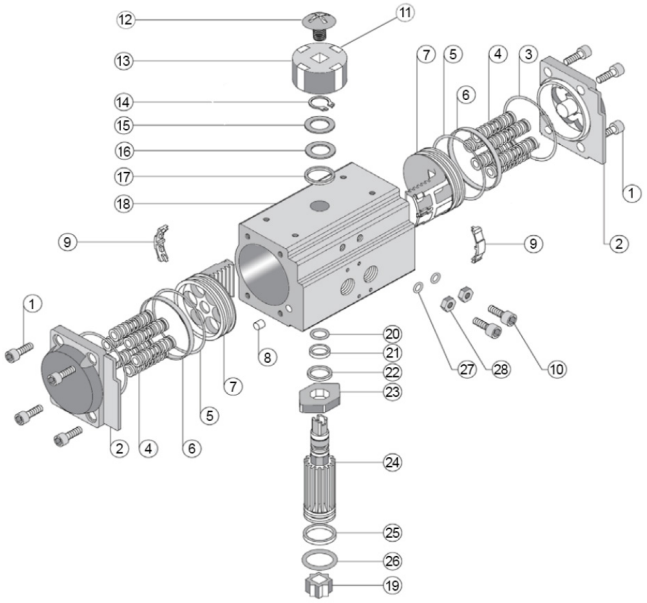


FEATURES:

- Compact rack-and-pinion design
- Hard-anodized aluminum body
- Corrosion-resistant construction
- ISO 5211 direct valve mounting
- NAMUR accessory mounting
- Mechanical open/closed indicator
- Double-acting pneumatic operation
- Spring-return, fail-open or fail-closed
- Bi-directional travel stop adjustment
- Standard or reverse rotation
- Modular, configurable design
- 1/4" NPT air supply ports

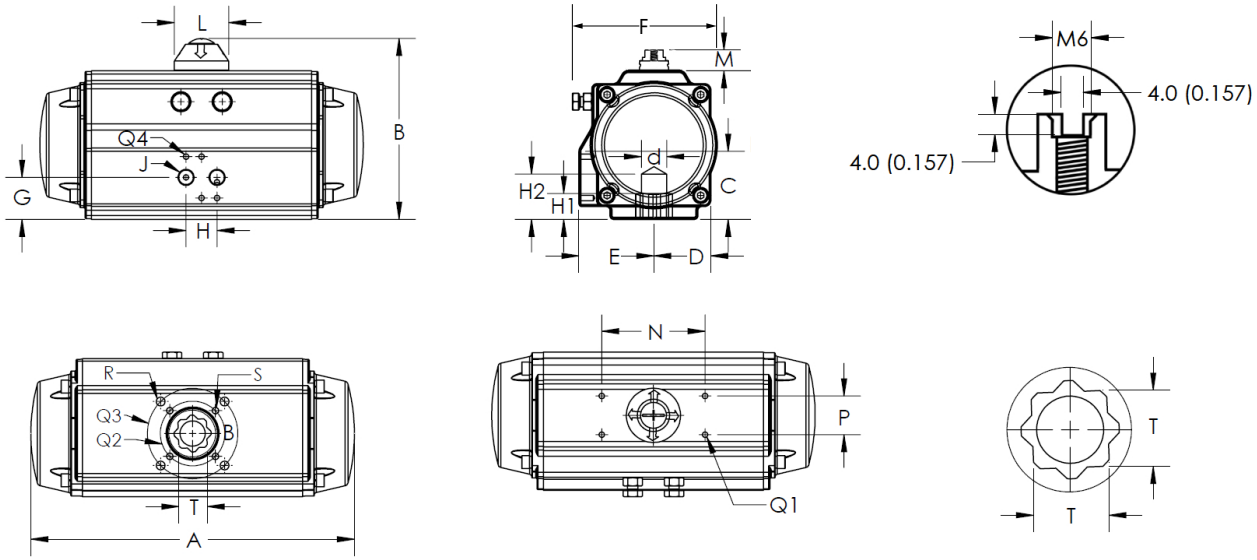
Operating Limits

- Maximum Supply Pressure: 120 psi
- Minimum Supply Pressure: 40 psi
- Temperature Range supported: -40°F to +300°F
- Media: Clean, dry, non-corrosive compressed air
- Operating Environment: Indoor / outdoor industrial service



ITEM	DESCRIPTION	MATERIAL
1	Socket Head Screw	SS 304
2	End Cap	Aluminum
3	O-Ring (End Cap)	NBR/Viton
4	Spring	Spring Steel
5	Piston Ring	Polyoxymethylene
6	O-Ring (Piston)	NBR Rubber
7	Piston	Aluminum
8	Stopper	NBR/Viton
9	Guide Ring	Polyoxymethylene
10	Adjusting Bolt	SS 304
11	Indicator Arrowhead	ABS
12	Indicator Bolt	ABS
13	Indicator	ABS
14	Snap Ring	Stainless Steel
15	Washer	SS 304
16	Disc Bearing	Polyoxymethylene
17	Washer	SUS 304
18	Body	Aluminum (Polyester Coating)
19	Insert	SS 304
20	O-Ring (Pinion Top)	NBR Rubber
21	Bearing (Pinion Top)	Polyoxymethylene
22	Disc Bearing	SS 304
23	Stroke Adjustment Stop	SAE 1020
24	Pinion Shaft	SAE 1045
25	Bearing (Pinion Bottom)	Polyoxymethylene
26	O- Ring (Pinion Bottom)	NBR/Viton
27	O-Ring (Adjusting Bolt)	NBR/Viton
28	Nut	SS 304

DIMENSIONS (inches)



Dimensions

SIZE	RPA040	RPA050	RPA063	RPA075	RPA085	RPA100	RPA115	RPA125	RPA145	RPA160
A	4.29	5.83	6.26	8.39	9.80	10.67	12.40	13.62	16.22	17.44
B	2.95	3.58	4.21	4.88	5.43	5.87	6.89	7.48	8.27	9.06
C	1.10	1.34	1.65	2.01	2.28	2.52	2.87	3.11	3.46	3.86
D	1.06	1.14	1.42	1.73	1.93	2.20	2.52	2.72	3.15	3.46
E	1.30	1.61	1.85	2.09	2.24	2.60	3.03	3.23	3.62	3.86
F	2.36	2.09	2.60	3.23	3.62	4.17	4.76	5.12	5.87	6.30
G	1.10	1.02	1.18	1.14	1.26	1.46	1.46	1.81	2.09	2.05
H	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
I	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26	1.26
J	NPT 1/8"	NPT 1/4"	NPT 1/4"	NPT 1/4"	NPT 1/4"	NPT 1/4"	NPT 1/4"	NPT 1/4"	NPT 1/4"	NPT 1/4"
L	1.18	1.57	1.57	1.57	1.57	1.57	2.36	2.36	2.36	2.36
M	0.79	0.79	0.79	0.79	0.79	0.79	1.18	1.18	1.18	1.18
N	1.61	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
P	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18	1.18
Q1	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5
Q2	F05	F04	F05	F05	F05	F07	F07	F10	F10	F10
Q3	F05	–	F07	F07	F07	F10	F10	–	F12	F12
Q4	M5	M5	M5	M5	M5	M5	M5	M5	M5	M5
R	4–M6	–	4–M8	4–M8	4–M8	4–M10	–	–	4–M12	4–M12
S	4–M5	4–M5	4–M6	4–M6	4–M6	4–M8	4–M8	4–M10	4–M10	4–M10
T	0.35	0.67	0.67	0.87	0.87	0.87	0.87	1.42	1.42	1.42
H1	0.43	0.47	0.63	0.75	0.75	0.91	0.91	1.14	1.14	1.65
d	–	0.56	0.56	0.77	0.77	0.91	0.91	1.42	1.42	1.42
H2	–	1.26	1.34	1.34	1.34	1.89	1.89	2.56	2.56	2.56

1. Top mounting connection is in line with VDI/VDE3845 standards, permitting direct installation of accessories such as positioner or limit switch box.
2. Bottom mounting connection is in line with ISO5211 and DIN3337 standards.
3. Air supply connection is in line with VDI/VDE3845 and NAMUR standards and can install solenoid valves conveniently.

Weight & Air Consumption

Model	Body Diameter (in)	Air Consumption CCW (L)	Air Consumption CW (L)	Opening Time DA S (sec)	Closing Time DA S (sec)	Approx. Weight DA (lb)	Approx. Weight Spring (lb)
RPA050	1.97	0.08	0.13	0.17	0.19	2.38	0.02
RPA063	2.48	0.15	0.25	0.19	0.22	3.42	0.03
RPA075	2.95	0.30	0.48	0.23	0.27	6.06	0.08
RPA085	3.46	0.50	0.73	0.33	0.35	8.33	0.12
RPA100	3.94	0.75	1.08	0.42	0.48	11.68	0.17
RPA115	4.53	1.19	1.80	0.72	0.93	18.5	0.23
RPA125	4.92	1.55	2.18	0.84	1.09	21.89	0.34
RPA145	5.71	2.40	3.55	1.32	1.42	31.08	0.51
RPA160	6.30	3.20	4.72	1.60	2.00	40.45	0.68

The actuator travel times listed above were determined under the following test conditions:

1. Ambient room temperature
2. 90° actuator stroke
3. Solenoid valve with a 4 mm orifice and nominal flow capacity of QN 400 L/min
4. Internal piping diameter of 5 mm
5. Clean, dry air as the operating medium
6. Air supply pressure of 5.5 bar (79.75 psi)
7. Actuator tested without external load or resistance

OutputTorque Double Acting Actuator (in-lbs.)

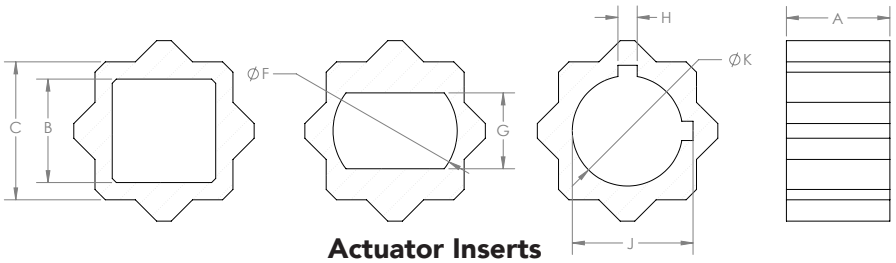
Model	40 PSI	60 PSI	70 PSI	80 PSI	90 PSI	100 PSI	120 PSI
RPA040	41	64	77	89	101	113	137
RPA050	77	110	135	155	174	201	243
RPA063	130	197	245	275	311	340	421
RPA075	277	430	500	559	632	702	833
RPA085	431	641	752	870	970	1081	1328
RPA100	623	952	1085	1261	1419	1604	1959
RPA115	1050	1556	1837	2095	2362	2625	3149
RPA125	1327	1923	2289	2664	3003	3357	4047
RPA145	1872	2884	3588	4102	4862	5145	6317
RPA160	2849	4120	4784	5549	6180	6871	8331

Output Torque of Spring Return Actuator (in-lbs.)

Model	Springs	40 PSI		60 PSI		70 PSI		80 PSI		90 PSI		100 PSI		120 PSI		Spring Return	
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
RPA040	2	–	–	–	–	51	33	62	45	73	56	87	69	110	93	44	27
	4	–	–	–	–	–	–	–	–	55	21	70	34	92	58	80	44
RPA050	5	53	39	82	67	109	95	129	114	146	131	174	160	215	200	42	27
	6	46	31	75	58	103	86	122	105	139	122	167	151	208	190	50	34
	7	41	23	69	49	97	78	115	96	133	113	161	142	201	181	59	40
	8	–	–	61	38	90	68	108	86	125	103	154	133	194	171	69	47
	9	–	–	55	30	84	61	102	78	119	94	148	125	188	163	77	53
	10	–	–	–	–	78	53	96	70	113	86	142	117	181	155	85	59
	11	–	–	–	–	71	44	89	60	105	76	135	107	174	145	95	66
	12	–	–	–	–	64	34	82	51	98	66	128	98	167	135	104	73
RPA063	5	84	60	145	118	197	172	225	199	259	233	290	265	369	342	76	50
	6	75	46	135	102	187	156	215	183	249	216	281	249	359	326	92	60
	7	66	31	125	85	178	141	205	167	239	200	271	234	349	309	108	70
	8	–	–	114	70	167	127	194	153	228	185	261	220	338	295	122	81
	9	–	–	103	54	157	112	184	137	217	168	250	204	327	278	138	91
	10	–	–	92	38	147	97	173	121	206	152	240	188	316	262	154	102
	11	–	–	–	–	138	81	163	105	196	135	230	173	306	245	170	112
	12	–	–	–	–	128	67	154	90	186	120	221	158	296	230	185	121
RPA075	5	183	130	325	266	402	346	457	399	526	467	602	545	728	668	159	102
	6	167	102	307	233	385	316	439	368	508	435	584	514	710	636	190	119
	7	149	73	287	201	366	286	420	337	488	403	565	484	689	604	221	139
	8	–	–	266	169	346	256	399	306	467	371	545	453	668	572	252	159
	9	–	–	246	137	328	226	381	275	448	339	527	423	649	540	283	178
	10	–	–	226	105	309	197	361	244	428	307	507	392	628	514	314	197
	11	–	–	–	–	291	167	342	213	407	275	488	362	609	476	345	217
	12	–	–	–	–	272	137	322	182	387	243	469	331	589	444	376	236
RPA085	5	278	187	469	366	591	496	703	604	798	696	917	820	1155	1053	266	166
	6	248	140	435	313	560	446	670	552	764	643	885	769	1122	1000	317	199
	7	218	93	401	260	528	396	637	501	731	590	853	718	1088	947	368	232
	8	–	–	368	207	497	347	605	449	698	536	821	668	1055	894	419	264
	9	–	–	335	154	467	297	574	398	665	483	790	617	1022	840	471	296
	10	–	–	301	101	435	248	541	346	631	430	758	567	988	787	522	328
	11	–	–	–	–	403	198	508	295	597	377	725	518	954	734	573	361
	12	–	–	–	–	372	140	475	243	563	324	693	466	920	681	625	394
RPA100	5	418	305	722	595	871	752	1038	914	1189	1062	1385	1264	1729	1602	345	222
	6	377	241	676	523	827	664	993	844	1143	990	1341	1195	1683	1530	415	267
	7	335	177	629	450	784	617	947	774	1096	917	1297	1127	1636	1458	485	312
	8	–	–	582	378	740	549	902	704	1049	845	1252	1058	1589	1385	555	358
	9	–	–	536	306	696	482	857	634	1002	773	1208	980	1543	1313	625	403
	10	–	–	490	234	654	415	812	565	957	701	1164	921	1497	1241	694	447
	11	–	–	–	–	610	348	767	494	910	629	1120	852	1450	1169	764	492
	12	–	–	–	–	566	280	721	424	862	557	1074	783	1403	1097	834	538

Output Torque of Spring Return Actuator (in-lbs.)

Model	Springs	40 PSI		60 PSI		70 PSI		80 PSI		90 PSI		100 PSI		120 PSI		Spring Return	
		Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End
RPA115	5	716	513	1199	851	1487	1273	1731	1509	1987	1758	2267	2049	2774	2554	584	363
	6	651	407	1126	851	1418	1162	1660	1403	1913	1648	2197	1936	2701	2435	699	434
	7	586	301	1053	732	1350	1051	1589	1287	1831	1520	2127	1822	2628	2307	814	504
	8	–	–	970	613	1273	940	1518	1172	1758	1401	2049	1709	2554	2188	929	584
	9	–	–	897	494	1205	829	1447	1048	1685	1282	1979	1596	2472	2069	1044	655
	10	–	–	–	–	1136	718	1367	932	1611	1163	1910	1482	2399	1950	1159	726
	11	–	–	–	–	1068	607	1296	817	1538	1044	1840	1369	2325	1831	1274	797
	12	–	–	–	–	–	–	1225	701	1456	925	1761	1256	2243	1712	1389	867
RPA125	5	911	667	1456	1181	1854	1598	2211	1944	2536	2261	2912	2561	3580	3305	717	451
	6	826	529	1360	1025	1765	1453	2117	1793	2440	2106	2821	2502	3484	3149	867	544
	7	741	399	1263	879	1675	1316	2024	1651	2344	1959	2729	2363	3387	3003	1009	637
	8	–	–	1163	723	1581	1171	1926	1500	2243	1804	2633	2215	3287	2847	1159	735
	9	–	–	1067	568	1491	1025	1833	1349	2147	1648	2542	2066	3191	2627	1310	827
	10	–	–	–	–	1401	880	1740	1198	2051	1492	2450	1918	3094	2563	1460	920
	11	–	–	–	–	1312	743	1647	1056	1955	1346	2359	1779	2988	2390	1602	1013
	12	–	–	–	–	1218	598	1549	906	1854	1190	2263	1630	2898	2234	1752	1111
RPA145	5	1213	838	2142	1721	2897	2504	3382	2974	4120	3699	4438	4037	5576	5154	1124	717
	6	1074	627	1987	1483	2751	2281	3231	2743	3964	3461	4290	3810	5420	4916	1354	867
	7	936	415	1831	1245	2606	2059	3081	2512	3809	3223	4142	3584	5264	4678	1584	1018
	8	–	–	1685	1007	2469	1837	2939	2282	3662	2985	4002	3357	5118	4440	1814	1159
	9	–	–	1529	778	2324	1624	2878	2060	3506	2756	3854	3139	4962	4211	2036	1310
	10	–	–	1373	540	2179	1401	2637	1829	3351	2518	3706	2912	4806	3973	2266	1460
	11	–	–	–	–	2042	1179	2495	1598	3204	2280	3566	2866	4660	3735	2496	1602
	12	–	–	–	–	1905	957	2353	1367	3058	2042	3427	2459	4514	3497	2726	1743
RPA160	5	1953	1506	3113	2609	3845	3375	4572	4084	5173	4669	5912	5432	7324	6821	1460	974
	6	1766	1237	2902	2307	3649	3093	4368	3791	4962	4367	5711	5144	7114	6518	1752	1177
	7	1579	960	2692	1996	3452	2803	4164	3489	4752	4056	5511	4844	6903	6207	2053	1381
	8	–	–	2481	1694	3256	2521	3959	3196	4541	3754	5310	4560	6692	5905	2345	1584
	9	–	–	2280	1382	3068	2230	3764	2894	4340	3442	5118	4184	6491	5594	2646	1779
	10	–	–	2069	1080	2871	1948	3560	2601	4129	3100	4918	3862	6280	5292	2938	1982
	11	–	–	–	–	2675	1658	3356	2299	3918	2759	4717	3530	6080	4980	3239	2186
	12	–	–	–	–	2487	1376	3160	2006	3717	2412	4526	3207	5868	4659	3531	2381



Actuator Inserts

Model	Insert Code	Insert Shape	Unit	Insert Size	A	B	C	F	G	H	J	K
50	A	Square	in	0.354	0.472	0.354	0.669	—	—	—	—	—
			mm	9	12	9	17	—	—	—	—	—
	B*	Square	in	0.433	0.472	0.433	0.669	—	—	—	—	—
			mm	11	12	11	17	—	—	—	—	—
	C	Square	in	0.551	0.472	0.551	0.669	—	—	—	—	—
			mm	14	12	14	17	—	—	—	—	—
	G	Flat	in	0.378	0.472	—	0.669	0.567	0.378	—	—	—
			mm	10	12	—	17	14	10	—	—	—
63	A	Square	in	0.354	0.63	0.354	0.669	—	—	—	—	—
			mm	9	16	9	17	—	—	—	—	—
	B*	Square	in	0.433	0.63	0.433	0.669	—	—	—	—	—
			mm	11	16	11	17	—	—	—	—	—
	C	Square	in	0.551	0.63	0.551	0.669	—	—	—	—	—
			mm	14	16	14	17	—	—	—	—	—
	G	Flat	in	0.378	0.63	—	0.669	0.567	0.378	—	—	—
			mm	10	16	—	17	14	10	—	—	—
075 & 085	A	Square	in	0.354	0.709	0.354	0.866	—	—	—	—	—
			mm	9	18	9	22	—	—	—	—	—
	B	Square	in	0.433	0.709	0.433	0.866	—	—	—	—	—
			mm	11	18	11	22	—	—	—	—	—
	C*	Square	in	0.551	0.709	0.551	0.866	—	—	—	—	—
			mm	14	18	14	22	—	—	—	—	—
	D	Square	in	0.669	0.709	0.669	0.866	—	—	—	—	—
			mm	17	18	17	22	—	—	—	—	—
	G	Flat	in	0.378	0.709	—	0.866	0.567	0.378	—	—	—
			mm	10	18	—	22	14	10	—	—	—
	H	Flat	in	0.441	0.709	—	0.866	0.63	0.441	—	—	—
			mm	11	18	—	22	16	11	—	—	—
	I	Flat	in	0.503	0.709	—	0.866	0.756	0.503	—	—	—
			mm	13	18	—	22	19	13	—	—	—
100 & 115	B	Square	in	0.433	0.906	0.433	0.866	—	—	—	—	—
			mm	11	23	11	22	—	—	—	—	—
	C	Square	in	0.551	0.906	0.551	0.866	—	—	—	—	—
			mm	14	23	14	22	—	—	—	—	—
	D*	Square	in	0.669	0.906	0.669	0.866	—	—	—	—	—
			mm	17	23	17	22	—	—	—	—	—
	G	Flat	in	0.378	0.906	—	0.866	0.567	0.378	—	—	—
			mm	10	23	—	22	14	10	—	—	—
	H	Flat	in	0.441	0.906	—	0.866	0.63	0.441	—	—	—
			mm	11	23	—	22	16	11	—	—	—
	I	Flat	in	0.503	0.906	—	0.866	0.756	0.503	—	—	—
			mm	13	23	—	22	19	13	—	—	—
125, 145 & 160	C	Square	in	0.551	1.142	0.551	1.417	—	—	—	—	—
			mm	14	29	14	36	—	—	—	—	—
	D	Square	in	0.669	1.142	0.669	1.417	—	—	—	—	—
			mm	17	29	17	36	—	—	—	—	—
	E	Square	in	0.866	1.142	0.866	1.417	—	—	—	—	—
			mm	22	29	22	36	—	—	—	—	—
	F*	Square	in	1.023	1.142	1.023	1.417	—	—	—	—	—
			mm	27	29	27	36	—	—	—	—	—
	G	Flat	in	0.378	1.142	—	1.417	0.567	0.378	—	—	—
			mm	10	29	—	36	14	10	—	—	—
	H	Flat	in	0.441	1.142	—	1.417	0.63	0.441	—	—	—
			mm	11	29	—	36	16	11	—	—	—
	I	Flat	in	0.503	1.142	—	1.417	0.756	0.503	—	—	—
			mm	13	29	—	36	19	13	—	—	—
	J	Flat	in	0.628	1.142	—	1.417	0.882	0.628	—	—	—
			mm	16	29	—	36	22	16	—	—	—
	K	Round	in	1.13	1.142	—	1.417	—	—	0.252	0.252	1.13
			mm	29	29	—	36	—	—	6	6	29

Control Valve Actuation Sizing Guides

Proper actuator sizing is essential for reliable valve performance and equipment protection. These guidelines help ensure adequate actuator torque under worse-case operating conditions.

Valve Torque Considerations

Quarter-turn valve torque requirements can vary significantly based on several key parameters. All contributing factors should be evaluated to ensure adequate actuator output under worst-case operating conditions.

Seat Design & Material

Valve torque is influenced by seat geometry, material type, and media compatibility. Softer or swelling seat materials may increase operating torque over time. Applicable service multipliers should be applied to account for operating conditions.

Stem & Packing Effects

Additional torque is generated by stem interaction with seals and packing. Packing type, compression, and lubrication all impact required torque. In smaller valve sizes, stem torque may represent a significant portion of total torque and must be considered.

Operating Conditions To Evaluate

The following service parameters must be reviewed when determining actuator sizing:

- Differential Pressure
  Minimum and maximum operating pressure conditions
- Cycle Frequency
  Number of cycles per hour or per day
- Process Media
  Clean fluids, gases, slurries, corrosive or abrasive services
- Operating Temperature
  Minimum and maximum media and ambient temperatures
- Cycle Time Requirements
  Line hammer considerations and process response needs
- Instrument Air Supply
  Available pressure and peak demand capability

Application Multipliers

To determine minimum actuator output torque, multiply the calculated valve torque by the appropriate media and service factors below.

Media Description	Multiplier
Clean, particle-free, non-lubricating fluids	1
Gases or saturated steam, clean and wet	1
Gases or superheated steam, clean and dry	1.3
Slurries, contaminated, or corrosive services	1.8
Dirty or unfiltered gases (natural gas, chlorine, etc.)	1.20-1.50

Service Condition	Multiplier
Simple on/off operation	1
Modulating or throttling service	1.2
Positioner-controlled applications	1.5
Infrequent operation (once per day)	1.2
Continuous duty, frequent cycling, or plant-critical service	1.50

Final Actuator Selection

The selected actuator must be capable of delivering at least the calculated minimum torque, including all applicable safety and service factors, under worst-case operating conditions. Additional margin may be required for:

- Low-temperature operation
- Aging or wear of sealing components
- Air supply pressure fluctuations

For assistance with actuator sizing or application review, contact Wayland Industries Engineering Support.

HOW TO ORDER

Series	Size	Action	Spring QTY	Insert	Actuator Options
RPA (Aluminum RP)	040	D (Double Acting)	Blank (N/A)	A	Blank = (NBR/Std Rotation)
	050	S (Spring Return)	5	B	A1 = (Viton)
	063		6	C	A2 = (NBR Low Temp)
	075		7	D	A3 = (Reverse Rotation)
	085		8	E	
	100		9	F	
	115		10	G	
	125		11	H	
	145		12		
	160				

RPA + 050 - S - 11 + A

(RPA050-S-11A)