



Process Development & Control, LLC

MAGNUS FORCE PNEUMATIC ACTUATOR

MAGNUS FORCE - PNEUMATIC RACK & PINION ACTUATOR

The PDC Series pneumatic actuator **MAGNUS FORCE** uses the latest technology, combining intelligent design features with a compact footprint. **MAGNUS FORCE** is the perfect fit for practically any automation control system. PDC Series rack and pinion actuators are offered in two styles, PDC Series Double Acting and PDC Series Spring Return.

Double Acting & Spring Return



Operating Principles

Double Acting

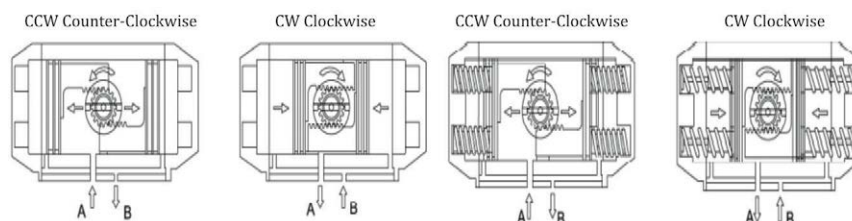
1. Air from Port A forces pistons outward, causing the pinion to turn counter-clockwise while air is exhausted through Port B.
2. Air from Port B forces the pistons inward, causing the pinion to turn clockwise while the air exhausts through Port A.

Spring Return

1. Air from Port A forces the pistons outward, causing the springs to compress and the pinion to turn counter-clockwise while the spring chamber air exhausts through Port B.
2. Upon the loss of air pressure, the springs de-compress forcing the pistons inward, causing the pinion to turn clockwise while the air exhausts through Port A.

Key Applications and Industries

- Automotive
- Chemical
- Downstream Hydrocarbons
- Food & Beverage
- Energy & Onsite Utilities
- Life Sciences & Medical
- Mining, Minerals & Metals
- Marine
- OEM / Engineered Solutions
- Providers
- Oil & GAS
- Power Generation
- Pulp & Paper
- Water & Wastewater



MAGNUS FORCE - PNEUMATIC RACK & PINION ACTUATOR

Double Acting Actuator Selection

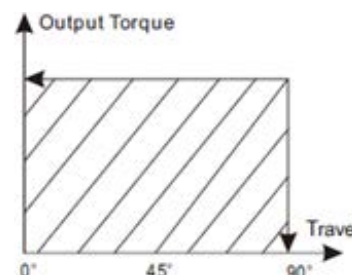
Selection and Verification

When using pneumatic actuators, first confirm the torque of the valve and then consider the pipeline media and calculate a factor of safety that meets your criteria. Recommended safety factors: Increase the actuator torque value by 25% if the media is water vapor or non-lubricating. Increase torque value by 60% if the media is non-lubricated dry gas. Increase the torque value by 100% if the media is non-lubricating air with particles. Increase the torque by 20% if the media is clean, frictionless and lubricated. Then using your working air pressure, find the corresponding actuator in the double or single acting torque tables to find the appropriate actuator model.

Correctly matching the pneumatic actuator, valve and service conditions directly affects the safe operation and service life of the actuator.

Double Acting Actuator Selection

Under normal operating conditions, double acting actuators should have a safety factor of 20% to 30% (consult the selection and verification section for other condition considerations). Find your air supply (PSI) in the chart below and select the model with the torque closest to your requirements without dropping below your service conditions' safety factor.



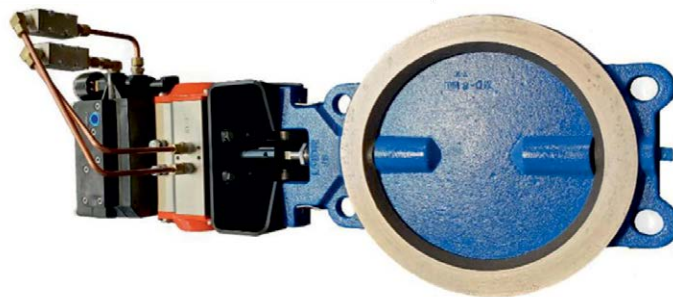
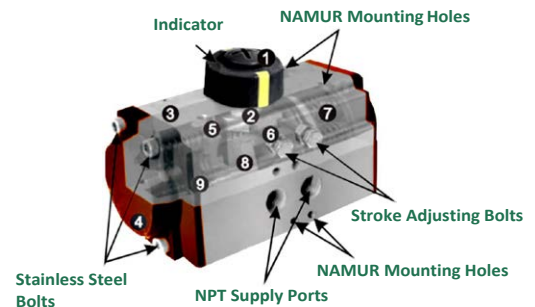
Output Torque for PDC Series Double Acting Actuators (in-lbs)

PDC Series MAGNUS FORCE (in*lbs)										
Model	Air Supply (PSI)									
	30	40	50	60	65	70	80	90	100	115
PDC 32D	27	35	44	53	62	71	71	80	97	106
PDC 40D	44	53	62	89	97	106	115	124	150	168
PDC 52D	71	89	106	142	159	177	195	212	248	283
PDC 63D	133	159	195	257	292	319	354	389	451	513
PDC 75D	177	221	266	354	398	443	487	531	620	708
PDC 83D	274	345	416	558	620	690	761	832	974	1106
PDC 92D	398	496	602	797	903	1000	1097	1195	1398	1602
PDC 105D	584	735	876	1168	1319	1460	1611	1752	2045	2337
PDC 125D	885	1106	1363	1770	2000	2222	2443	2664	3107	3549
PDC 140D	1513	1894	2328	3027	3408	3779	4160	4540	5293	6054
PDC 160D	2354	2938	3549	4709	5293	5886	6470	7063	8240	9417
PDC 190D	3770	4709	5718	7532	8479	9417	10355	11302	13188	15064
PDC 210D	4709	5886	6983	9417	10594	11771	12949	14126	16480	18834
PDC 240D	6806	8514	10267	13621	15321	17029	18728	20428	23835	27243
PDC 270D	10355	12940	15586	20702	23295	25880	28464	31057	36235	41413
PDC 300D	13506	16887	20259	27012	30393	33766	37147	40519	47272	54025
PDC 350D	20224	25278	30332	40448	45502	50555	55609	60663	70779	80887
PDC 400D	28818	36014	43218	57627	64841	72036	79250	86454	100845	115272

MAGNUS FORCE - PNEUMATIC RACK & PINION ACTUATOR

Specifications

Supply Air	Operating Temperature
Dry, lubricated or non-corrosive. Dust below 30 microns.	Standard Seals: -4°F to 176°F Viton Seals: 5°F to 248°F Silicone Seals: -31°F to 176°F
Air Supply Pressure	Stroke Adjustment
Minimum air pressure is 30 PSI Maximum air pressure is 115 PSI	±5° Adjustment range at 0° and 90° points of rotation.
Torque Output	Rotation
27 to 115272 (in-lbs)	90°



Construction

1. Indicator

Multi-function position indicator with NAMUR mounting, convenient for mounting accessories such as positioners and limit switches.

2. Pinion

The pinion is made from nickel plated steel and conforms to ISO5211, DIN3337, and NAMUR standards. Also available in stainless steel.

3. Actuator Body

According to different requirements, the extruded aluminum alloy ASTM 6005 body can be coated with hard anodized, polyester, PTFE, or nickel.

4. End Caps

The end caps are made of die-cast aluminum and can be coated with polyester, metal powder, PTFE or nickel.

5. Piston

The twin pistons are made of hard anodized coated die-cast aluminum or zinc coated steel. Reverse rotation is achieved by reversing air input for fast operation and long-life span.

6. Stroke Adjustment

Two independent external travel bolts can accurately adjust +5° at both open and closed position.

7. High Performance Spring

Preloaded springs are made from high quality material for resistance to corrosion and long lifespan. Torque requirements can be adjusted by safely and conveniently changing the quantity of springs.

8. Bearings and Guides

Made from low friction, long-life compound material to avoid the direct contact between metals. Maintenance and replacement are easy and convenient.

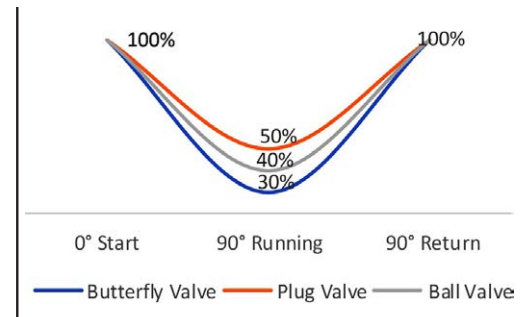
9. O-Rings

NBR O-Rings provide trouble free operation at standard temperature ranges. Viton or silicone options are available for high and low temperature applications.

MAGNUS FORCE - PNEUMATIC RACK & PINION ACTUATOR

Single Acting Actuator Selection

Under normal operating conditions, single acting actuators should have a safety factor of 30% to 50% (consult the selection and verification section for other condition considerations). Find your air supply (PSI) in the chart below and select the model and spring quantity with the torque closest to your requirements without dropping below your service conditions safety factor. Different styles of valves have different torque distributions while opening, running and closing. Confirm that both the air and spring output torques are enough for your requirements



Output Torque for PDC Series Spring Acting Actuators (in-lbs)

Air Supply Pressure		40 PSI		60 PSI		80 PSI		100 PSI		120 PSI		Spring Output Torque	
MODEL	Spring Qty.	0°	90°	0°	90°	0°	90°	0°	90°	0°	90°	90°	0°
PDC52S	5	67	50									55	38
	6	61	40	96	75							66	44
	7	53	29	86	64	125	95					76	52
	8	46	18	81	53	120	85					87	59
	9	38	7	73	42	115	72	179	148			98	67
	10			65	31	105	65	172	138			109	75
	11			58	20	95	52	164	126	200	161	120	82
	12					88	40	157	108	192	151	131	90
PDC63S	5	132	100	197	131							92	60
	6	120	82	184	146	252	213					110	72
	7	110	63	172	128	239	195					129	84
	8	96	45	161	109	225	177	354	303			147	96
	9			148	88	213	158	342	284			166	108
	10			123	72	204	140	330	266	395	331	184	121
	11					192	121	318	247	383	312	202	132
	12					178	103	306	229	370	294	221	145
PDC75S	5	171	137	261	227							128	92
	6	153	111	242	200	333	292					154	112
	7	134	85	223	176	315	264					179	130
	8	115	60	204	149	296	240	471	415			205	149
	9			185	124	278	215	453	391			231	168
	10			168	98	256	189	434	364	523	453	256	186
	11					240	163	415	339	504	428	282	205
	12					222	138	397	313	485	401	307	223

Single Acting actuator selection continued...

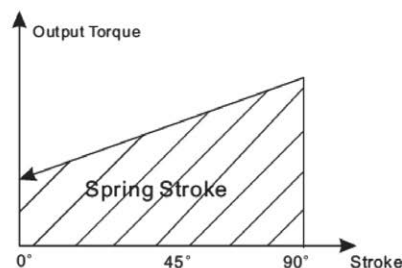
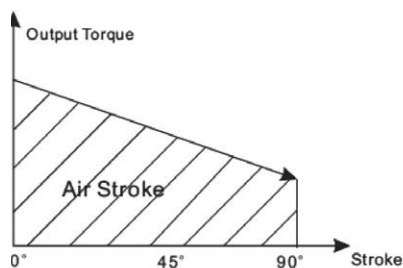
Air Supply Pressure		40 PSI		60 PSI		80 PSI		100 PSI		120 PSI		Spring Output Torque	
PDC83S	5	275	212	414	351							203	139
	6	247	170	386	310	527	450					244	168
	7	219	130	358	269	499	410					284	195
	8	192	89	331	228	471	469	747	645			325	223
	9			302	188	443	329	718	604			366	252
	10			274	146	415	287	691	563	830	701	407	279
	11					387	247	663	523	801	662	447	308
	12					359	207	634	481	773	621	448	336
PDC92S	5	391	212	591	494							304	206
	6	350	170	550	433	752	635					364	247
	7	308	130	508	372	711	574					425	289
	8	277	111	468	314	670	514	1,068	911			486	330
	9			426	251	629	453	1,026	850			547	371
	10			385	190	587	392	985	789	1,186	989	608	413
	11					546	331	943	729	1,143	929	669	454
	12					504	271	901	668	1,101	868	730	495
PDC105S	5	597	441	890	734							435	279
	6	540	354	833	647	1,128	939					532	336
	7	485	268	600	561	1,072	855					609	392
	8	429	180	722	473	1,017	767	1,600	1,351			696	447
	9			667	386	961	697	1,544	1,264			784	503
	10			609	295	904	590	1,488	1,173	1,780	1,466	870	560
	11					849	506	1,432	1,169	1,724	1,382	958	616
	12					793	422	1,376	1,005	1,669	1,298	1,045	671
PDC125S	5	867	637	1,309	1,079							699	460
	6	778	495	1,221	947	1,665	1,391					831	557
	7	681	354	1,124	796	1,577	1,249					973	646
	8	593	221	1,035	663	1,480	1,108	2,372	2,000			1,106	743
	9			947	522	1,391	966	2,274	1,858			1,247	831
	10			849	389	1,294	833	1,274	1,717	2,628	2,168	1,389	929
	11					1,205	692	2,088	1,575	2,531	2,017	1,531	1,017
	12					1,108	557	2,000	1,442	2,442	1,885	1,663	1,106
PDC140S	5	1,513	1,124	2,265	1,885							1,141	761
	6	1,363	902	2,115	1,655	2,878	2,418					1,371	911
	7	1,212	672	1,964	1,433	2,728	2,188					1,601	1,062
	8	1,062	442	1,814	1,203	2,577	1,958	4,089	3,469			1,823	1,212
	9			1,655	973	2,418	1,736	3,929	3,248			2,053	1,371
	10			1,504	743	2,267	1,497	3,779	3,009	4,531	3,770	2,283	1,522
	11					2,108	1,267	3,619	2,779	4,381	3,540	2,513	1,672
	12					1,958	1,046	3,469	2,557	4,230	3,310	2,743	1,823

Single Acting actuator selection continued...

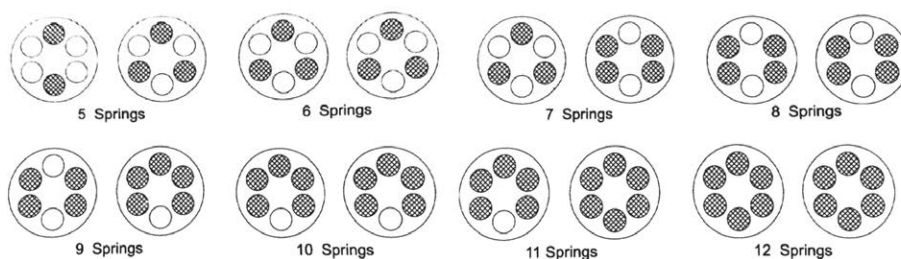
Air Supply Pressure		40 PSI		60 PSI		80 PSI		100 PSI		120 PSI		Spring Output Torque	
PDC160S	5	2,292	1,690	3,469	2,867							1,840	1,239
	6	2,053	1,318	3,230	2,495	4,409	3,675					2,212	1,486
	7	1,796	947	2,973	2,124	4,153	3,303					2,584	1,734
	8	1,557	584	2,734	1,761	3,915	3,000	6,266	5,292			2,947	1,973
	9			2,478	1,389	3,658	2,569	6,009	4,921			3,319	2,221
	10			2,239	1,017	3,419	2,197	5,770	4,549	6,947	5,726	3,690	2,469
	11					3,171	1,833	5,522	4,186	6,700	5,363	4,053	2,717
	12					2,923	1,463	5,275	3,814	6,452	4,991	4,425	2,965
PDC190S	5	3,876	2,911	5,761	4,797							2,734	1,770
	6	3,522	2,363	5,407	4,248	7,295	6,135					3,283	2,124
	7	3,168	1,814	5,053	3,699	6,940	5,587					3,832	2,478
	8	2,814	1,265	4,699	3,150	6,587	5,069	10,346	8,806			4,381	2,832
	9			4,345	2,610	6,233	4,490	10,001	8,257			4,929	3,186
	10			3,991	2,062	5,879	3,950	9,647	7,709	11,523	9,594	5,469	3,540
	11					5,525	3,400	9,293	7,160	11,178	9,045	6,018	3,894
	12					5,171	2,852	8,939	6,620	10,824	8,496	6,567	4,248
PDC210S	5	4,628	6,399	6,983	6,053							3,363	2,433
	6	4,142	3,026	6,496	5,381	8,852	7,737					4,035	2,920
	7	3,655	2,354	6,009	5,593	8,365	7,064					4,708	3,407
	8	3,168	1,681	5,522	4,035	7,878	6,392	12,585	11,098			5,381	3,894
	9			5,036	3,363	7,392	5,719	12,098	10,426			6,053	4,381
	10			4,549	2,690	6,905	5,046	11,612	9,753	13,966	12,107	6,726	4,867
	11					6,418	4,375	11,125	9,080	13,479	11,435	7,399	5,354
	12					5,932	3,701	10,638	8,408	12,992	10,762	8,071	5,841
PDC240S	5	6,584	5,310	9,992	8,717							4,903	3,628
	6	5,505	4,328	9,266	7,735	12,676	11,145					5,885	4,354
	7	5,133	3,354	8,532	6,761	11,941	10,171					6,859	5,089
	8	4,407	2,372	7,815	5,779	11,215	9,180	18,028	15,993			7,841	5,806
	9			7,080	4,797	10,450	8,197	17,294	15,010			8,833	6,540
	10			6,354	3,814	9,764	7,224	16,568	14,037	19,976	17,435	9,806	7,266
	11					9,038	6,241	15,851	13,046	19,259	16,453	10,789	7,992
	12					8,330	5,259	15,117	12,063	18,524	15,471	11,771	8,717
PDC270S	5	10,576	8,567	15,745	13,736							6,965	4,956
	6	9,585	7,177	14,754	12,355	19,933	17,535					8,346	5,947
	7	8,602	5,788	13,771	10,957	18,951	16,136					9,744	6,930
	8	7,611	4,398	12,780	9,567	17,960	14,747	28,313	25,100			11,134	7,921
	9			11,789	8,169	16,968	13,357	27,322	23,702			12,532	8,912
	10			10,797	6,788	15,977	11,968	26,322	22,312	31,508	27,499	13,913	9,903
	11					14,986	10,569	25,330	20,923	30,517	26,100	15,311	10,895
	12					14,003	9,180	24,348	19,533	29,526	24,711	16,701	11,877

Single Acting actuator selection continued...

Air Supply Pressure		40 PSI		60 PSI		80 PSI		100 PSI		120 PSI		Spring Output Torque	
PDC300S	5											9,390	6,461
	6	11,647	7,744									11,267	7,753
	7	10,204	5,655	16,958	12,408							13,143	9,045
	8	8,771	3,566	15,524	10,266	22,279	17,075					15,019	10,337
	9			14,090	8,231	20,845	14,986					16,896	11,629
	10			12,656	6,151	19,411	12,906	32,915	26,410	39,669	33,163	18,781	12,922
	11					17,969	10,818	31,473	24,321	38,226	31,074	20,657	14,214
	12					16,535	8,728	30,039	22,233	36,792	28,986	22,534	15,506
PDC350S	5											15,063	10,381
	6	16,488	10,240									18,082	10,381
	7	14,178	6,894	24,295	17,011							21,091	12,461
	8	11,868	3,549	21,985	13,665	32,094	23,775					24,109	16,612
	9			19,684	10,311	29,528	20,420					27,118	18,692
	10			17,374	6,965	27,483	17,075	47,705	37,297	57,813	47,404	30,136	20,763
	11					25,173	13,729	45,395	33,951	55,503	44,059	33,146	22,843
	12					22,872	10,375	43,094	30,597	53,201	40,704	36,252	24,923
PDC400S	7											25,490	16,258
	8	22,569	10,842									29,136	18,586
	9	19,993	6,797	34,402	21,206							32,774	20,905
	10	17,409	2,752	31,818	17,161	46,229	31,572					36,420	23,224
	11			29,234	13,116	43,645	27,527					40,058	25,552
	12			26,658	9,072	41,069	23,483	69,876	52,290	84,285	66,699	43,705	27,871
	13					38,485	19,429	67,292	48,236	81,701	62,645	47,342	31,570
	14					35,909	15,385	64,716	44,191	79,125	58,600	50,989	27,525
	15					33,325	11,339	62,132	40,147	76,523	54,556	54,626	23,481
	16							59,547	36,102	73,956	50,511	58,273	37,164



Spring Locations for Spring Return Actuators



MAGNUS FORCE - PNEUMATIC RACK & PINION ACTUATOR

Dimension Data and Mounting Standard



Namur Air Connections for easy mounting of Solenoids and other accessories



Standard Namur pattern for mounting of positioner, limit switches or accessories. Position Indicator can be rotated to F.O. or F.C. and used with accessories.



Bottom mounting conforms to ISO5211 and DIN3337. Models PDC32 and PDC190 to PDC300 have 1 bolt pattern, all others have 2.

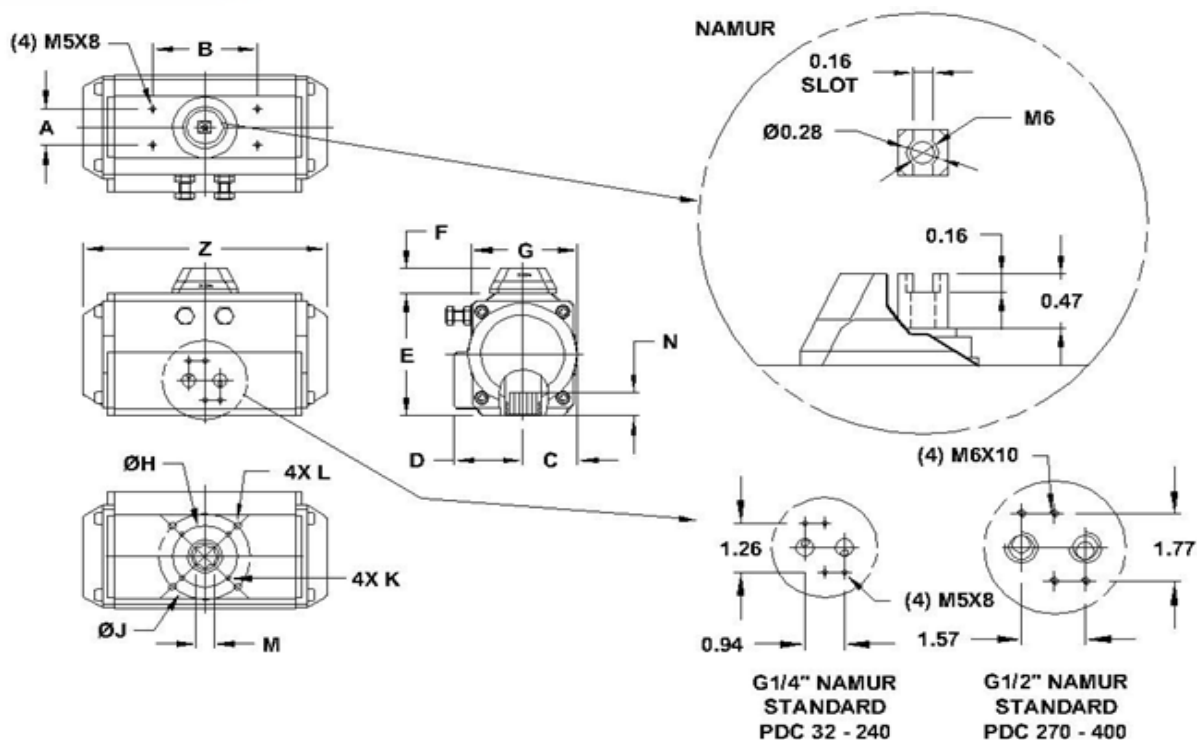
Weight (lbs.)									
Model	PDC 32	PDC 40	PDC 52	PDC 63	PDC 75	PDC 83	PDC 92	PDC 105	PDC 125
Double Acting	1.5	2.2	3.1	4.4	6.0	6.8	10.1	15.0	19.6
Single Return	-	2.4	3.31	4.6	6.4	7.9	11.5	15.2	22.3
Model	PDC 140	PDC 160	PDC 190	PDC 210	PDC 240	PDC 270	PDC 300	PDC 350	PDC 400
Double Acting	28.7	44.1	68.3	103.6	147.7	213.8	242.5	410.1	637.1
Single Return	33.1	53.0	77.1	121.3	176.4	260.1	286.6	515.9	793.7

Air Consumption Opening & Closing (in ³)									
Model	PDC 32	PDC 40	PDC 52	PDC 63	PDC 75	PDC 83	PDC 92	PDC 105	PDC 125
Air Volume Opening	2.4	4.9	7.3	12.8	18.3	26.2	39.1	58.0	97.6
Air Volume Closing	3.1	6.7	9.8	14.0	20.7	28.7	44.5	53.7	85.4
Model	PDC 140	PDC 160	PDC 190	PDC 210	PDC 240	PDC 270	PDC 300	PDC 350	PDC 400
Air Volume Opening	152.6	225.8	360.0	457.7	671.3	1037.4	1452.4	2141.9	3209.8
Air Volume Closing	134.3	207.5	329.5	457.7	549.2	854.3	1812.4	2825.4	3417.3

Product Number: PDC ①②③④⑤-⑥					
① Model Number	② Operation Type	③ Quantity of Springs (Spring Return Only)	④ Stroke Angle	⑤ Ambient Temp.	⑥ Fail Position
52,63,75,83, etc.	D: Double Acting S: Spring Return	K5 - K16 Default 10 springs (PDC 400 has 12 springs)	NONE: 90° T: Special angle	None: -4°F to 176°F HT: 5°F to 248°F LT: -31°F to 176°F	FC: Fail Close FO: Fail Open None: ("in place" for Double Acting)

MAGNUS FORCE - PNEUMATIC RACK & PINION ACTUATOR

Dimension Data and Mounting Standard

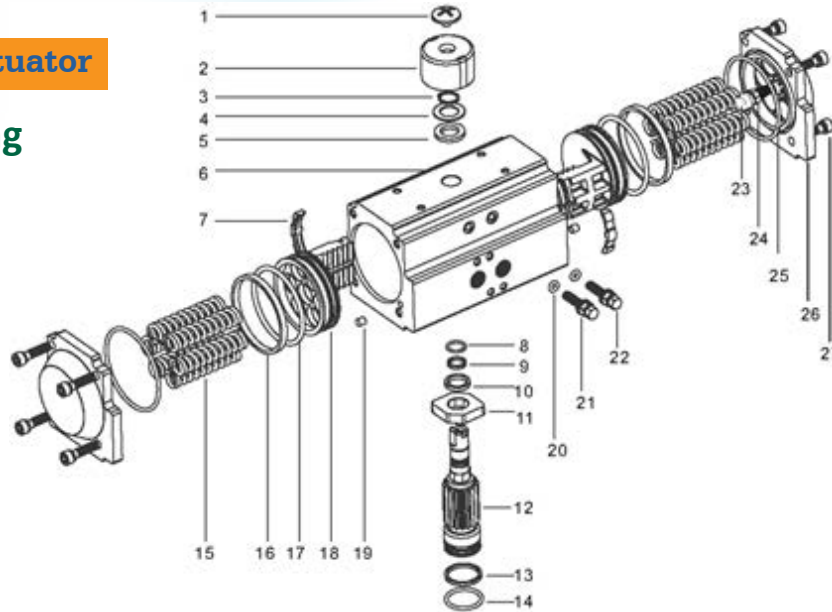


MODEL NO.	A	B	C	D	E	F	G	ØH	ØJ	K	L	M	ISO	N	Z
PDC 32	0.98	1.97	0.91	0.91	1.81	0.79	1.81	-	1.42	-	M5X8	0.35	F03	0.43	4.33
PDC 40	1.18	3.15	1.12	1.44	2.36	0.79	2.05	1.42	1.97	M5X8	M6X10	0.43	F04	0.55	4.80
PDC 52	1.18	3.15	1.18	1.63	2.83	0.79	2.56	1.42	1.97	M5X8	M6X10	0.43	F04	0.55	5.79
PDC 63	1.18	3.15	1.42	1.85	3.44	0.79	2.83	1.97	2.76	M6X10	M8X13	0.55	F05	0.71	6.61
PDC 75	1.18	3.15	1.65	2.09	3.92	0.79	3.19	1.97	2.76	M6X10	M8X13	0.55	F05	0.71	7.24
PDC 83	1.18	3.15	1.81	2.24	4.28	0.79	3.62	1.97	2.76	M6X10	M8X13	0.67	F07	0.83	8.03
PDC 92	1.18	3.15	1.97	2.40	4.59	0.79	3.86	1.97	2.76	M6X10	M8X13	0.67	F07	0.83	10.31
PDC 105	1.18	3.15	2.26	2.52	5.24	0.79	4.31	2.76	4.02	M8X13	M10X16	0.87	F10	1.02	10.55
PDC 125	1.18	5.12	2.66	2.93	6.10	1.18	5.02	2.76	4.02	M8X13	M10X16	0.87	F10	1.02	11.65
PDC 140	1.18	5.12	2.95	3.03	6.77	1.18	5.41	4.02	4.92	M10X16	M12X20	1.06	F12	1.22	15.35
PDC 160	1.18	5.12	3.43	3.43	7.76	1.18	6.22	4.02	4.92	M10X16	M12X20	1.06	F12	1.22	17.87
PDC 190	1.18	5.12	4.06	4.06	9.06	1.18	7.44	-	5.51	-	M16X20	1.42	F14	1.57	20.67
PDC 210	1.18	5.12	4.49	4.49	10.04	1.18	8.31	-	5.51	-	M16X20	1.42	F14	1.57	20.94
PDC 240	1.18	5.12	5.12	5.12	11.38	1.18	9.65	-	6.50	-	M20X25	1.81	F16	1.97	23.70
PDC 270	1.18	5.12	5.79	5.79	12.83	1.18	10.75	-	6.50	-	M20X25	1.81	F16	1.97	28.27
PDC 300	1.18	5.12	6.38	6.85	13.78	1.18	12.28	-	6.50	-	M20X25	1.81	F16	1.97	29.92
PDC 350	1.18	5.12	7.48	7.68	16.14	1.18	14.37	6.50	10.00	M20X25	8-M16X25	1.81	F16	1.97	36.22
PDC 400	1.18	5.12	10.24	10.24	18.35	1.18	15.67	6.50	10.00	M20X25	8-M16X25	1.81	F16	1.97	37.01

MAGNUS FORCE - PNEUMATIC RACK & PINION ACTUATOR

Inside the Actuator

Parts Drawing



Parts Table

Part No.	Description	Quantity	Material	Optional Material
1	Indicator Screw	1	ABS	
2	Indicator	1	ABS	
3	Spring Clip	1	Stainless Steel	
4	Thrust Washer	1	Stainless Steel	
5	Outside Washer	1	Engineered Plastic	
6	Body	1	Aluminum Die-casting (hard anodized)	
7	Piston Guide	2	Engineered Plastic	
8	O-Ring	1	NBR	Viton / Silicone
9	Bearing	1	Engineered Plastic	
10	Inside Washer	1	Engineered Plastic	
11	Cam	1	Alloy Steel	
12	Gear Shaft	1	Alloy Steel	Stainless Steel
13	Bearing	1	Engineered Plastic	
14	O-Ring	1	NBR	Viton / Silicone
15	Spring	0-12	Spring Steel (dip coating)	
16	Bearing	2	Engineered Plastic	
17	O-Ring	2	NBR	Viton / Silicone
18	Piston	2	Aluminum Die-casting (hard anodized)	
19	Plug	2	NBR	Viton / Silicone
20	O-Ring	2	NBR	Viton / Silicone
21	Nut	2	304 Stainless Steel	
22	Adjust Screw	2	304 Stainless Steel	
23	Stop Screw	2	304 Stainless Steel	
24	Stop Nut	2	304 Stainless Steel	
25	O-Ring	2	NBR	Viton / Silicone
26	End Cap	2	Aluminum Die-casting (powder polyester painted)	
27	End Cap Screw	8	304 Stainless Steel	



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