

FlowLine



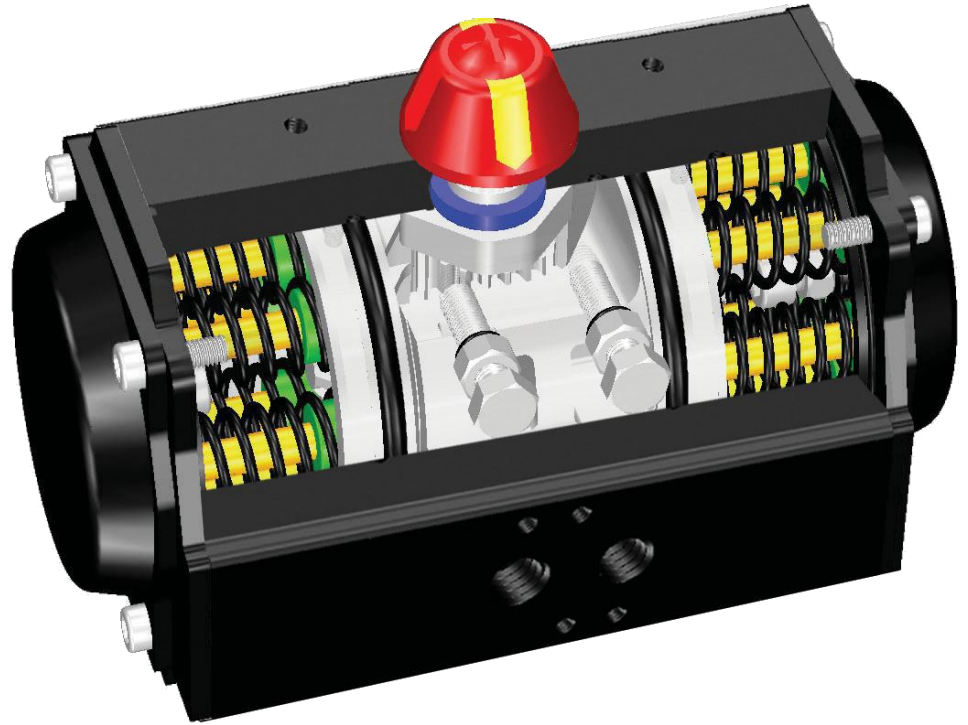
Series 20/21

**Rack and Pinion Actuators
147 to 100,000 Inch Pounds**

FEATURES

Introduction

Flow Line **Series 20 doubleacting** and **Series 21 springreturn** actuators are the latest and most technically advanced rack and pinion actuators on the market today. The Series 20/21 incorporates 17 sizes ranging in torque from 147 to 100,000 inch pounds. Features such as a fine tooth rack and pinion, internal and external travel stops, lifting eyes on larger sizes, and 304 SS hardware, all come from the continuing commitment of Flow Line Controls to innovate and provide the highest quality for our customers.



Body

- Extruded Aluminum body is internally machined, lapped and honed to exacting tolerances
- All internal and exterior surfaces are hard anodized and 2-part polyester coated
- Internal porting is standard, eliminating any need for external tubing
- Mounting is accomplished with dual ISO drilling on all sizes and with three ISO drillings on six models
- Extra deep end cap bolt holes allow for safe spring removal and installation

Pinion

- Pinions are machined from a single piece of hardened steel
- Fine-tooth gears eliminate hysteresis and lost motion typical with wide-tooth designs
- ISO female drives are standard on all models
- Internally machined piston guide prevents vertical piston movement
- Bottom entry pinion provides anti-blowout protection
- All Pinions are electroless nickel plated

Pistons

- Die cast aluminum pistons incorporate three heavy duty wear pads
- An optional fourth wear pad is incorporated for high cycle operations
- Piston o-ring is held in place by a precisely machined groove matching the o-ring diameter
- Internal RTFE piston guide precisely aligns the piston to the pinion to prevent piston roll

EndCaps

- Die cast aluminum end caps are 2-part polyester powder coated inside and out for maximum corrosion resistance
- Precise machining of the end caps leaves no room for movement on the actuator body
- End cap o-rings are captive on all actuator models

AirSupply

- All actuator models are equipped with 1/4" NPT supply ports
- Supply pressure to all models of actuators is rated up to 120 psi air, hydraulic oil or water depending on seals used

TravelStops

- Internal travel stops are integral with the pinion and allow + or - 5 degrees adjustment at both ends of stroke
- Optional travel stops are available to limit rotation between 45 and 90 degrees

BoltsandFasteners

- 300 series stainless steel is standard on all actuators

AccessoriesandValve Mounting

- Namur VDI/VDE 3845 is standard throughout the size range
- ISO 5211 is standard mounting for all actuators throughout the size range
- Special order mounting is available upon request

Springs

- Springs are epoxy coated for corrosion resistance
- Spring retaining rod is stainless steel with stainless steel fasteners

PositionIndicator Functions

- as an indicator for standard 2-way valves and also for 3-way applications with a simple change of built-in indicator tabs

TORQUE

OUTPUT TORQUE for DOUBLE ACTING ACTUATORS (Torque in inch-pounds)

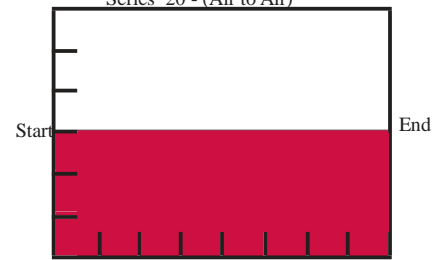
Series	Size	40 psi 3 Bar	60 psi 4.5 Bar	80 psi 5.5 Bar	100 psi 7 Bar	120 psi 8 Bar
20	0050	81	121	147	187	215
20	0075	168	197	204	257	292
20	0100	192	292	354	451	513
20	0150	274	407	496	628	717
20	0200	416	628	761	974	1106
20	0300	611	912	1106	1416	1611
20	0400	876	1319	1602	2045	2337
20	0500	1363	2045	2496	3186	3638
20	0600	2328	3496	4275	5435	6205

Series	Size	40 psi 3 Bar	60 psi 4.5 Bar	80 psi 5.5 Bar	100 psi 7 Bar	120 psi 8 Bar
20	0700	3549	5328	6505	8285	9471
20	0800	5727	8585	10488	13347	15250
20	0900	6992	10480	12816	16304	18623
20	1000	10267	15401	18826	23960	27376
20	2000	15587	23384	28580	36378	41573
20	3000	20260	30394	37148	47273	54027
20	4000	30332	45503	55611	70781	80889
20	5000	43228	64834	79243	100948	115258

All torques are actual. Conversion: Nm = inch-pounds/8.85

DOUBLEACTING TORQUECURVE

Series 20 - (Air to Air)



The Series 20 Actuator has a constant output torque throughout travel from start to end, clockwise or counterclockwise rotation.

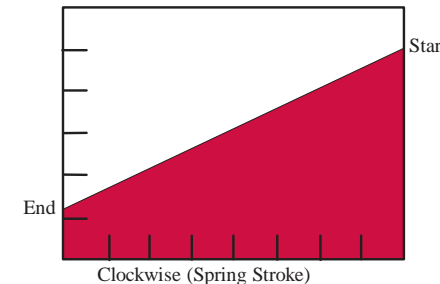
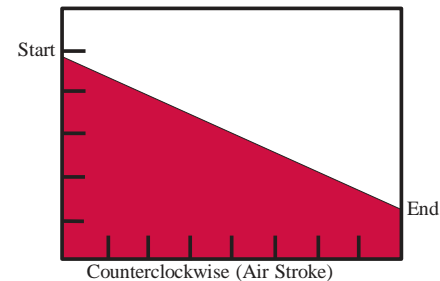
OUTPUT TORQUE for SPRING RETURN ACTUATORS

Series	Size	Number of Springs	Closing Torque (Spring)		Torque Output (inch-pounds)											
			Start	End	40 psi / 3 Bar		60 psi / 4.5 Bar		80 psi / 5.5 Bar		100 psi / 7 Bar		120 psi / 8 Bar			
					Start	End	Start	End	Start	End	Start	End	Start	End		
21	0050	6	49	31	48	30										
		8	66	41	38	12	64	39	90	65						
		10	82	52			54	22	80	58	133	101	161	129		
		12	99	62					69	31	122	84	150	112		
21	0075	6	66	45	64	42	99	80	135	113						
		8	88	60			83	55	155	127	191	162				
		10	110	76					139	105	175	142	211	177		
		12	131	91							160	118	196	155		
21	0100	6	115	73	120	82	184	146	248	213						
		8	151	98			160	116	231	176	355	301				
		10	186	124					204	142	328	266	390	328		
		12	222	151							310	231	372	293		
21	0150	6	160	116	160	116	239	204	333	293						
		8	213	151			213	160	390	337	478	425				
		10	257	195					354	284	443	372	532	461		
		12	284	213					337	257	425	346	514	434		
21	0200	6	248	169	248	178	385	310	523	452						
		8	328	231			337	231	470	372	743	647				
		10	408	280					437	346	691	567	832	701		
		12	496	337					400	272	638	478	771	620		
21	0300	6	372	248	363	239	558	443	762	647						
		8	487	337			478	318	682	523	1080	930				
		10	611	417					594	399	1001	806	1204	1009		
		12	735	496					580	382	921	682	1115	885		
21	0400	6	531	336	540	354	832	646	1124	938						
		8	699	451			717	469	1009	761	1593	1345				
		10	876	566					903	584	1478	1168	1770	1460		
		12	1053	673							1372	1000	1655	1283		
21	0500	6	832	558	805	531	1266	991	1717	1438						
		8	1106	743			1080	717	1531	1168	2434	2071				
		10	1390	929					1372	885	2248	1788	2700	2248		
		12	1664	1106							2071	1514	2531	1974		
21	0600	6	1372	912	1425	965	2195	1735	2974	2514						
		8	1823	1213			1894	1283	2673	2058	4213	3611				
		10	2284	1522					2360	1602	3912	3151	4691	3930		
		12	2744	1823							3611	2691	4390	3461		
21	0700	6	2213	1487	2062	1337	3248	2523	4426	3700						
		8	2947	1974			2762	1788	3948	2947	6311	5337				
		10	3691	2469					3452	2230	5815	4594	7001	5771		
		12	4426	2965							5319	3859	6505	5036		
21	0800	6	3284	2124	3602	2443	5505	4346	7399	6240						
		8	4381	2832			4788	3239	6691	5142	10506	8957				
		10	5470	3540					5983	4054	9798	7869	11710	9780		
		12	6567	4248							9090	6771	11002	8683		
21	0900	6	4036	2921	4063	2947	6390	5275	8718	7603						
		8	5381	3894			5426	3930	7745	6258	12400	10913				
		10	6727	4868					6771	4912	11427	9568	13574	11896		
		12	8072	5842							10453	8223	12781	10550		
21	1000	6	5886	4089	5904	4372	9329	7798	12754	11223						
		8	7843	5806			7877	5842	11303	9267	18145	16109				
		10	9807	7267					9842	7302	16684	14144	20101	17560		
		12	11772	8718							15223	12179	18649	15595		
21	2000	6	7913	5629	9329	6798										
		8	10550	7506			12453	9072	17649	14268						
		10	13188	9382					15560	11338	25951	21729	31147	26925		
		12	15826	11258							23871	18800	29067	23995		
21	3000	6	11267	7753	11648	7745										
		8	15020	10338			15525	10320	22278	17074						
		10	18782	12922					19410	12905	32917	26411	39670	33165		
		12	22535	15507							30040	22234	36794	28987		
21	4000	6	18083	12462	16489	10241										
		8	24110	16613					32094	23774						
		10	30138	20764					27482	17074	47707	37298	57815	47406		
		12	36165	24924							43096	30598	53203	40706		
21	5000	10	36422	23225					46229	42784	69879	52292	84288	66701		
		12	43706	27872					55896	41833	64719	44193	79128	58602		
		14	50991	32519					51775	35354	64719	44193	79128	58602		
		16	58275	37165							59550	36103	73959	50513		

All torques are actual. Conversion: Nm = inch-pounds/8.85

SINGLEACTING TORQUECURVES

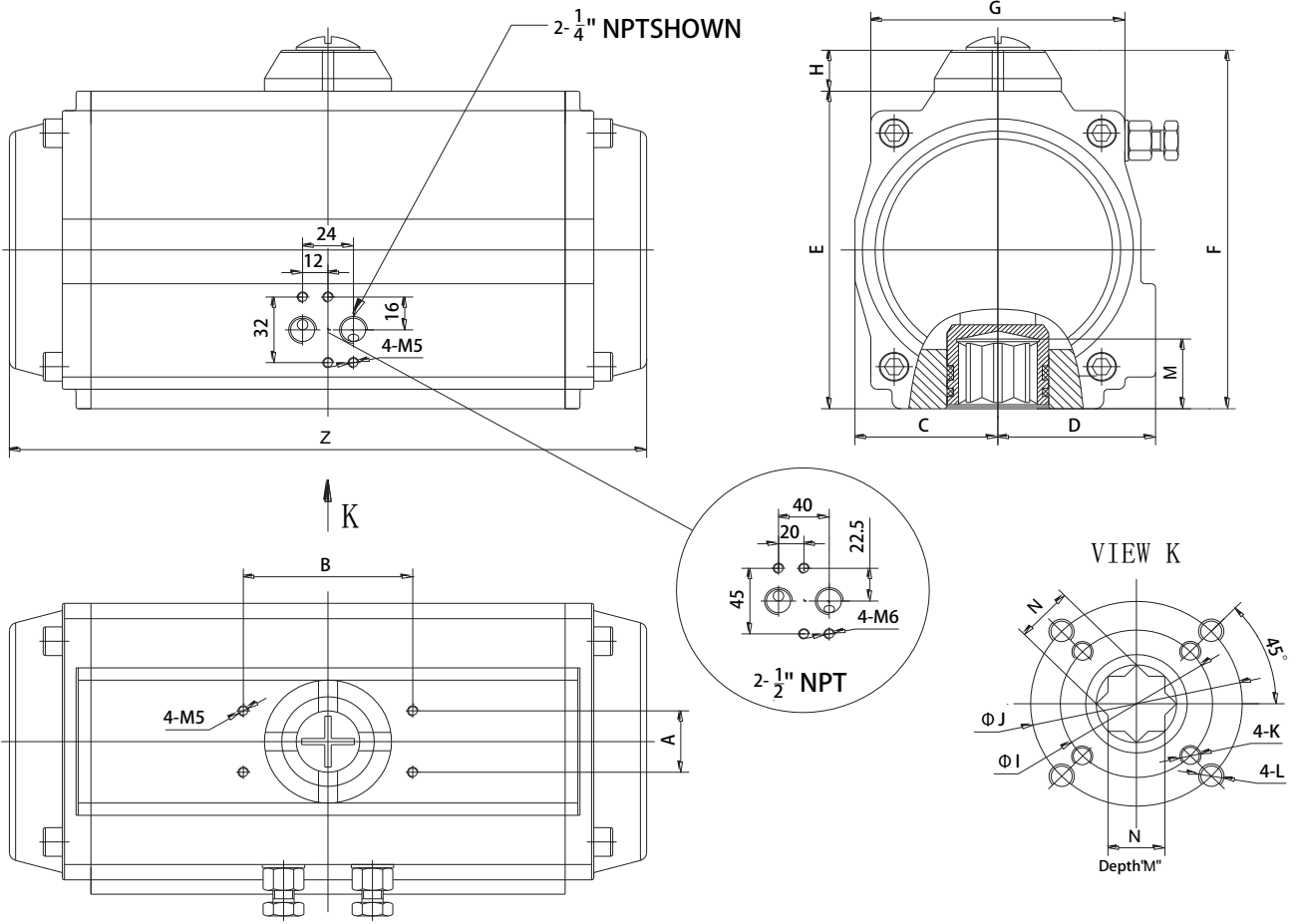
Series 21 - (Spring Return)



Size	Air Volume in Cubic Inches		
0050	4	0700	225
0075	7	0800	360
0100	13	0900	457
0150	18	1000	671
0200	26	2000	735
0300	39	3000	890
0400	58	4000	1172
0500	97	5000	1850
0600	152		

Size	Weights in Pounds		
0050	2	0700	52
0075	4	0800	102
0100	5	0900	118
0150	7	1000	162
0200	8	2000	206
0300	13	3000	242
0400	15	4000	412
0500	23	5000	638
0600	32		

ENGINEERING

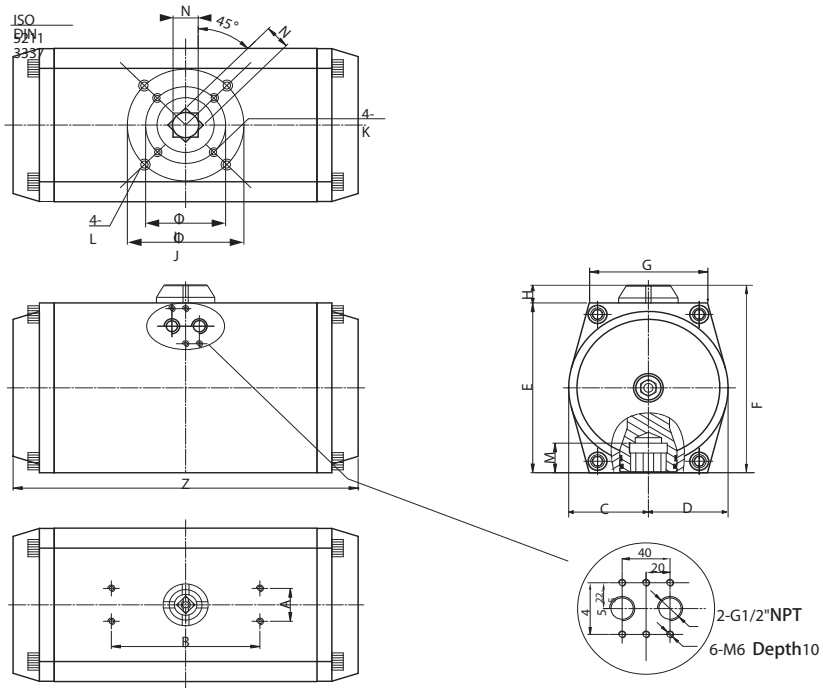


Flowline Model	A	B	C	D	E	F	G	H	I*	J*	K*	L*	M	N	Z	AIR
20-0050	1.18	3.15	1.12	1.44	2.36	2.79	2.05	0.79	1.417 (F03)	1.969 (F05)	M5x8	M6x10	0.55	0.43	4.72	1/4"NPT
20-0075	1.18	3.15	1.18	1.63	2.83	3.62	2.56	0.79	1.417 (F03)	1.969 (F05)	M5x8	M6X10	0.55	0.43	5.79	1/4"NPT
20-0075	1.18	3.15	1.18	1.63	2.83	3.62	2.56	0.79	1.65 (F04)		M5x10		0.55	0.43	5.79	1/4"NPT
20-0100	1.18	3.15	1.42	1.85	3.44	3.83	2.83	0.79	1.969 (F05)		M6x10		0.71	0.55	6.61	1/4"NPT
20-0100	1.18	3.15	1.42	1.85	3.44	3.83	2.83	0.79	1.65 (F04)	2.756 (F07)	M5x10	M8x12	0.71	0.55	6.61	1/4"NPT
20-0150	1.18	3.15	1.65	2.09	3.92	4.72	3.19	0.79	1.969 (F05)	2.756 (F07)	M6x10	M8X12	0.71	0.55	7.24	1/4"NPT
20-0200	1.18	3.15	1.81	2.24	4.28	5.09	3.62	0.79	1.969 (F05)	2.756 (F07)	M6x10	M8X12	0.83	0.67	8.03	1/4"NPT
20-0300	1.18	3.15	1.97	2.40	4.59	5.39	3.86	0.79	2.756 (F07)	4.016 (F10)	M8x12	M10X16	0.83	0.67	10.31	1/4"NPT
20-0400	1.18	3.15	2.26	2.52	5.24	6.06	4.31	0.79	2.756 (F07)	4.016 (F10)	M8x12	M10X16	1.02	0.87	10.55	1/4"NPT
20-0500	1.18	3.15	2.66	2.93	6.10	6.92	5.02	0.79	2.756 (F07)	4.016 (F10)	M8x12	M10X16	1.02	0.87	11.85	1/4"NPT
20-0600	1.18	3.15	2.95	3.03	6.77	7.59	5.41	0.79	4.016 (F10)	4.921 (F12)	M10x16	M12X20	1.22	1.06	15.51	1/4"NPT
20-0700	1.18	3.15	3.43	3.43	7.76	8.93	6.22	1.18	4.016 (F10)	4.921 (F12)	M10x16	M12X20	1.22	1.06	18.03	1/4"NPT
20-0800	1.18	5.12	4.06	4.06	9.06	10.27	7.44	1.18	4.016 (F10)	4.921 (F12)	M10x16	M12X20	1.57	1.42	20.79	1/4"NPT
20-0900	1.18	5.12	4.44	4.44	10.04	11.26	8.31	1.18	4.016 (F10)	5.512 (F14)	M10x16	M16X25	1.57	1.42	20.94	1/4"NPT
20-1000	1.18	5.12	5.12	5.12	11.38	12.67	9.65	1.18	4.016 (F10)	5.512 (F14)	M10x16	M16X25	1.97	1.81	23.70	1/4"NPT
20-2000	1.18	5.12	5.79	5.79	12.83	14.02	10.75	1.18		6.496 (F16)		M20X25	1.97	1.81	28.43	1/2"NPT

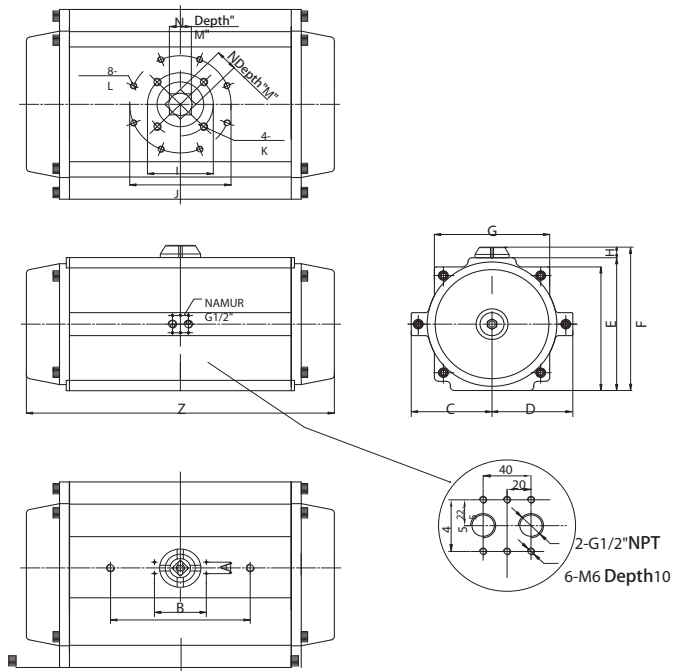
Dimension are in inches

ENGINEERING

3000 & 4000 Actuator



5000 Actuator

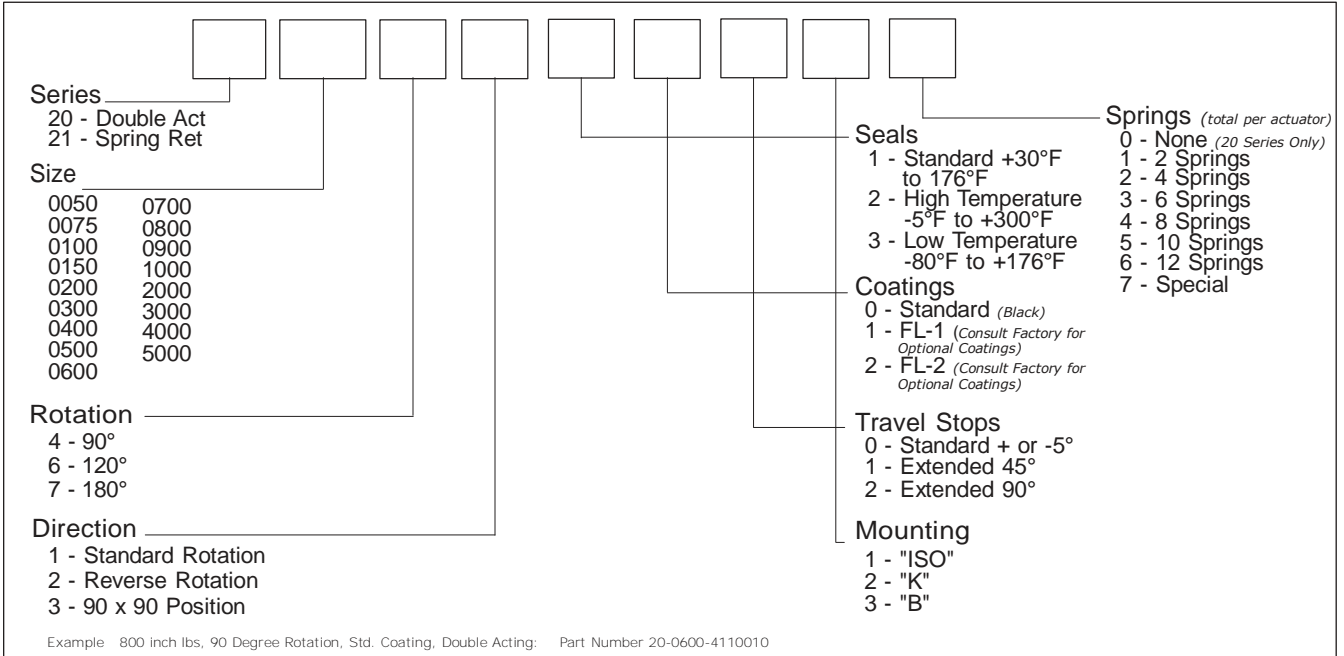


Flowline Model	A	B	C	D	E	F	G	H	I*	J*	K*	L*	M	N	Z	AIR
20-3000	1.18	5.12	6.39	6.39	13.70	14.88	7.72	1.18	6.496 (F16)	8.46(Ø215)	M20X25	M20X30	2.36	1.81	29.21	1/2"NPT
20-4000	1.18	5.12	7.48	7.48	16.06	17.24	8.66	1.18	6.496 (F16)	8.46(Ø215)	M20X25	M20X25	2.36	1.81	33.86	1/2"NPT
20-5000	1.18	5.12	10.16	10.16	18.89	20.08	14.17	1.18	6.496 (F16)	10.00 (F25)	M20X25	M16x25	2.36	2.17	36.61	1/2"NPT

Dimension are in inches

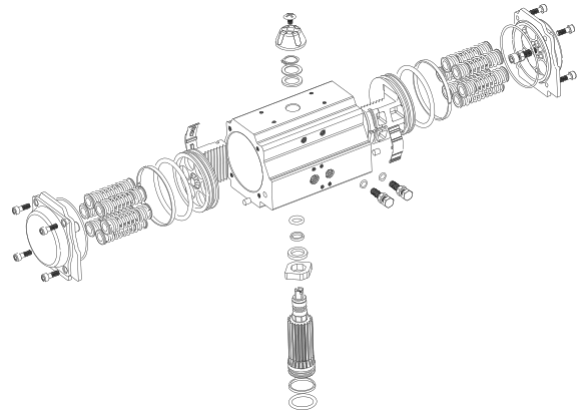
SPECIFICATIONS

HOW TO ORDER



Specifications

The actuator shall be rack and pinion design with two pistons and linear output torque throughout its rotation. The output shaft must travel a minimum of 90 degrees and have external adjustments for a minimum of 5 degrees of additional rotation at each end of travel. Additional internal factory-preset stops set to limit maximum travel if the external stops are not adjusted thus preventing damage to the actuator. The actuator piston and pinion gear shall be "fine tooth" construction with a three tooth engagement throughout the rotation. The output shaft and pinion shall be one-piece hardened steel with female drive conforming to ISO5211 square/star dimensions and the shaft accessory end conforming to Namur VDI/VDE 3845 dimensions. The actuator surface at the drive shaft shall have dimensions conforming to ISO5211 "F" flange sizes and the actuator's accessory mounting surface shall have dimensions conforming to Namur VDI/VDE 3845 specifications. The actuator shall be provided with a solenoid valve mounting surface conforming to Namur VDI/VDE 3845 dimensions. The actuator shall be provided with a 3-D visual indicator that does not have to be removed for the installation of monitoring equipment and control accessories. The actuator housing shall be hard coat anodized and polyester powder coated for corrosion resistance and durability. All trim/hardware shall be stainless steel. Springs shall be spring steel and coated for corrosion resistance. The springs shall be restrained in bobbins to prevent bending during operation and shall fit into pockets in the actuator end caps and pistons.



Description	Qty.	Material
Body	1	Extruded aluminum
End Caps	2	Die Cast Aluminum
Pinion	2	4140 Carbon Steel
Pistons	2	Die Cast Aluminum
Springs	8*	Spring Steel
Travel Stops	2	304 Stainless Steel
Position Indicator	1	Plastic ABS
Air Supply	2	Namur 1/4" & 1/2" NPT
Travel Stop	1	Steel alloy
Piston Guide Bearing	2	Plastic Polyoxymethylene
Piston Bearing	2	Plastic Polyoxymethylene
Piston O-ring	2	NBR, Silicon, Viton
Pinion Bearing	2	NBR, Silicon, Viton
Pinion O-ring	2	NBR, Silicon, Viton
Stop Screw	2	Stainless Steel 304
End Cap O-ring	2	NBR, Silicon, Viton

*All fasteners, washers, and clips are 304 stainless steel

* 8 springs, 4 per piston standard. Size 5000 has 12 springs

VERSATILITY



Series 21 spring return actuators are available through out the size range.



Series 50 solenoid valves are available in 1/8", 1/4", and 1/2"NPT.



Series 52 and 53 limit switches provide local and remote valve position.



Series 55 and 56 positioners are available with either a 3-15 psi or 4-20 MADC signal.



Series 20 and 21 actuators mount directly to ball valves conforming to ISO 5211. Bracket and couplers are available for other patterns.



Series 20 and 21 actuators mount directly to butterfly valves conforming to ISO 5211. Other mounting patterns are available.

Warranty

All products manufactured by Flow Line Controls are warranted against defects in material and workmanship for a period of 2 years from day of startup.

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