

M Series
Heavy Duty Mill Series
Rotary Actuators

Market Segments and Applications	A66
Features	A67
Ordering Information	A68
Specifications	A69-A70
Engineering Data	A71
Dimensional Data	A72-A75
Options	
Cushions	A76
Stroke Adjusters	A76
Mounting	A77-A78
Shaft	A79
Port Threads, Port Location	A80
Seals	A80

A

**Rack & Pinion
 Actuators**

**HUB
 Series**

**LTR
 Series**

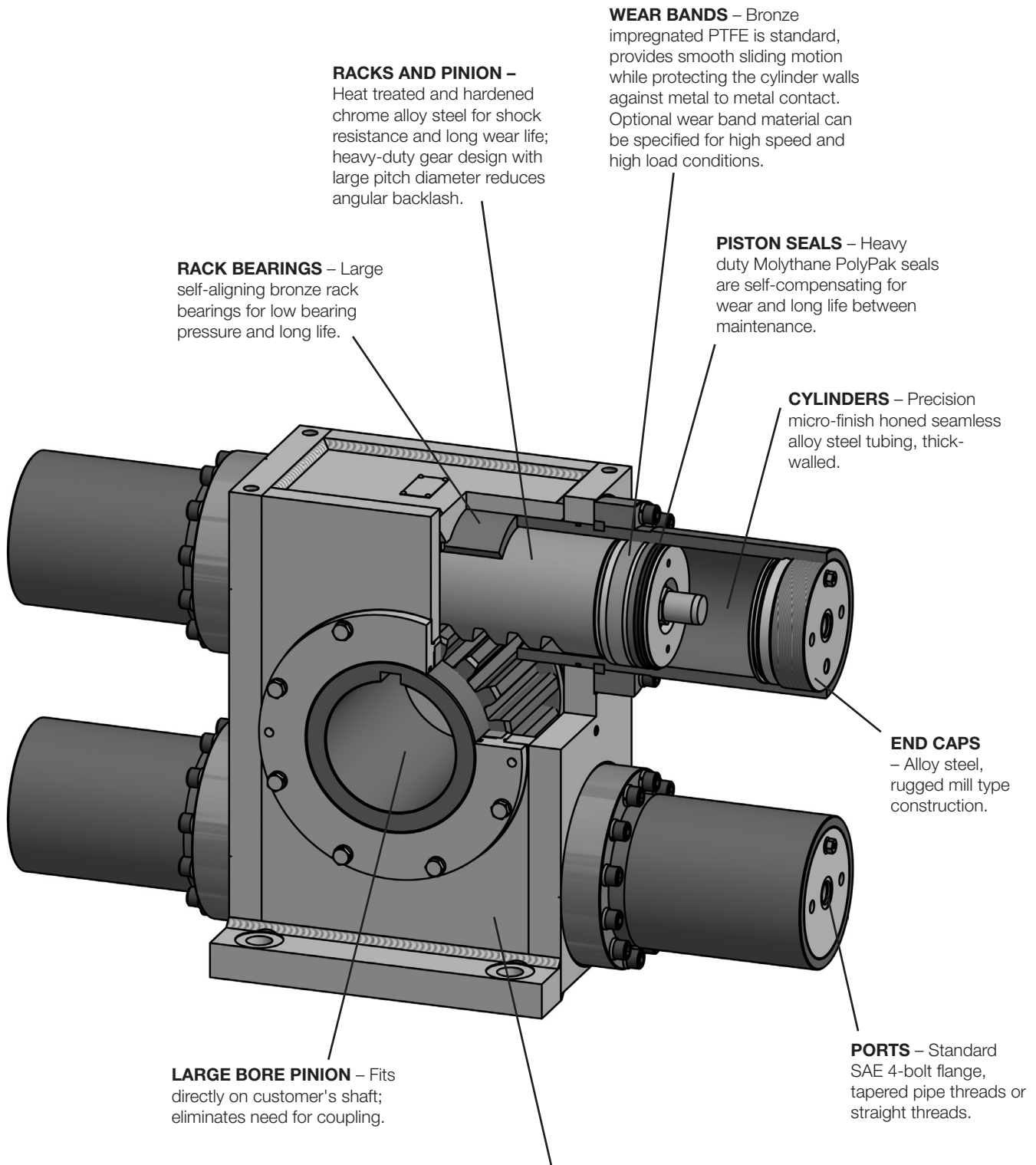
**HTR
 Series**

**M
 Series**

			Product Series					
			HUB	LTR	HTR	M	Tork-Mor	
			Market/Segment	Typical Application(s)				
A	Rack & Pinion Actuators	Aerospace	Water bomb, tank door actuation		●			
		Aggregate	Granite block rollover			●		
		Aluminum	Automation				●	
		Automation	Mounting, Processing, Flood gate actuation, End of arm tooling	●	●	●		●
		Automotive	Automation, Clamping, Tube bending			●		●
		Conveyor	Swing & rotate		●	●		●
		Entertaining	Pool gate actuation, Robotic joint motion					●
		Fluid Management & Flow Control	Power plants			●	●	
		Industrial	Automation, Clamping					●
		Machine Builders	End of arm tooling			●		
		Marine/Offshore	Boomslewer, Submersible			●	●	
		Mining	Mobile longhole drilling, Tunnel boring	●		●	●	
		Mobile	Fire truck ladder rotation, Aerial lift basket, X-ray boom rotation, Forklift handling & storage, Refuse tippers	●	●	●	●	
		Nuclear	Door actuation				●	
		Oil & Gas	Process valve actuation	●		●		
		Oil Industry Machinery	Clamping, Lockout	●				●
		Paper & Pulp	Walking beam				●	
		Plastics	Blow molding, Injection molding			●		●
		Rubber	Mixing			●	●	
		Solar	Panel rotation			●		
		Space	Rocket launch tower				●	
Steel & Casting	Ladle Tilt, Coil Box, Steel Booming, Pipe fabrication			●	●	●		
Testing Equipment	Flight Simulators, Cycle loading, Tensile test Machines			●		●		
Transportation	Bus wheelchair ramp		●					
Water Management		●		●				
Welding	Weld gun indexing, Clamping					●		

A	Rack & Pinion Actuators
HUB Series	
LTR Series	
HTR Series	
M Series	

M Series



NOTE:
 All pressure-containing seals can be inspected or replaced without removing the actuator from customer's shaft.

A
Rack & Pinion Actuators
HUB Series
LTR Series
HTR Series
M Series

Ordering information

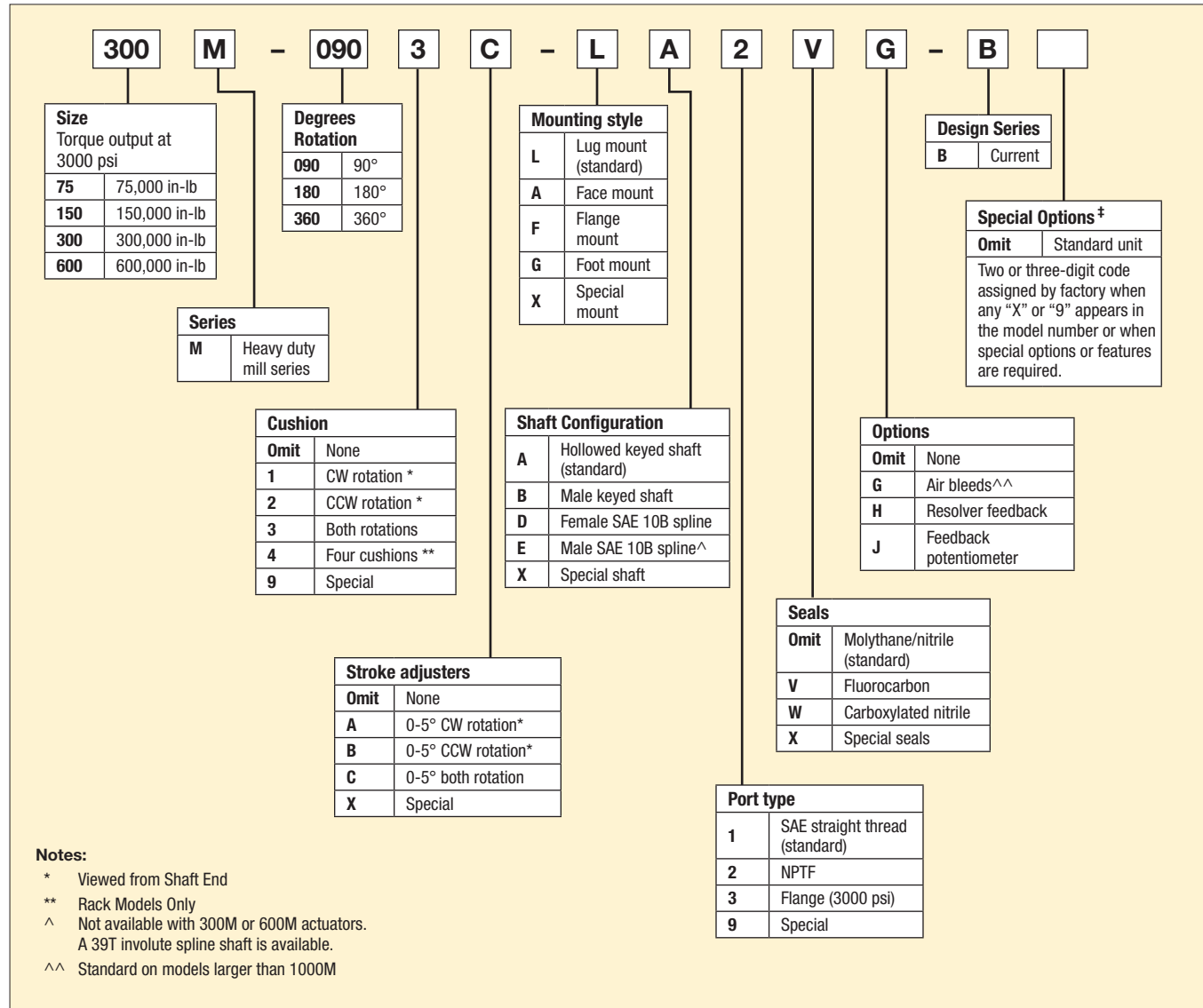
A
 Rack & Pinion
 Actuators

HUB
 Series

LTR
 Series

HTR
 Series

M
 Series



Designed to meet steel mill specifications, these non-tie rod units incorporate a range of features that provide heavy duty dependable service. The heat treated pinions provide low tooth contact pressures and permit hollow shaft configurations with bore sizes capable of transmitting full operating torques, including shock loadings. The M Series units are fitted with wear ring bushings that provide full support and eliminate the possibility of contact between cylinder and piston. The large diameter tapered roller bearings on the pinion allow the actuator to absorb considerable thrust, radial and overhung loads. For ease of maintenance, all pressure seals on M Series can be inspected or replaced without removing the actuator from the customer's shaft.

- Rack and pinion design provides excellent efficiency characteristics and minimizes HPU Size
- Minimal heat build up, limits need for heat exchanger
- Large hollow gears offer more shaft options
- M series are designed for low wear on dynamic seals and longer life
- Excellent in high speed production applications



Operating information

Output torques @ 3000 PSI (207 bar):	75,000 in-lb to 50,000,000 in-lb
Maximum operating pressure:	3000 PSI (207 bar)
Operating temperature range:	
Nitrile seals	-40°F to 180°F (-40°C to 82°C)
Fluorocarbon seals	-20°F to 250°F (-29°C to 121°C)
Standard rotations:	90°, 180°, 360°, 450°
Rotational tolerance:	-0°, +2°
Maximum breakaway pressure:	75 psi (5 bar)
Mounting orientation:	Unrestricted
Standard timing:	Keyway in 12:00 position at midstroke
Housing:	
Heavy duty	Ductile iron (units up to 1000M)
Steel	Weldments (units larger than 1000M)

A

**Rack & Pinion
Actuators**

**HUB
Series**

**LTR
Series**

**HTR
Series**

**M
Series**

Model	Maximum Pressure		Actual output torque, in-lb (Nm) at specified pressure			Maximum angular backlash, minutes	Standard rotation degrees	Displacement (cubic Inches)	Standard unit weight, (lb)
	Single rack	Double rack	Rating, PSI	1000 PSI (69 bar)	2000 PSI (138 bar)				
75M		3,000	25,000	50,000	75,000	15	90	43.4	202
							180	86.9	217
							360	174	259
150M		3,000	50,000	100,000	150,000	15	90	86.9	301
							180	174	331
							360	347	415
300M		3,000	100,000	200,000	300,000	10	90	176	648
							180	351	727
							360	703	881
600M		3,000	200,000	400,000	600,000	10	90	351	1033
							180	703	1191
							360	1,405	1499
1,000M		3,000	333,000	667,000	1,000,000	10	90	556	1526
							180	1,112	1774
							360	2,224	2294
1,500M		3,000	500,000	1,000,000	1,500,000	10	90	833	2100
							180	1,666	2500
							360	3,332	3300
2,000M		3,000	667,000	1,333,000	2,000,000	10	90	1,248	3800
							180	2,496	4480
							360	4,992	5850
3,000M		3,000	1,000,000	2,000,000	3,000,000	10	90	1,727	4900
							180	3,454	5700
							360	6,908	7300
4,000M		3,000	1,333,000	2,667,000	4,000,000	10	90	2,389	Consult
							180	4,778	Factory
							360	9,556	
5,000M		3,000	1,667,000	3,333,000	5,000,000	10	90	2,937	Consult
							180	5,874	Factory
							360	11,748	
6,000M		3,000	2,000,000	4,000,000	6,000,000	10	90	3,552	Consult
							180	7,104	Factory
							360	14,208	
7,000M		3,000	2,333,000	4,667,000	7,000,000	10	90	3,910	Consult
							180	7,820	Factory
							360	15,640	
8,000M		3,000	2,667,000	5,333,000	8,000,000	10	90	4,640	Consult
							180	9,280	Factory
							360	18,560	
9,000M		3,000	3,000,000	6,000,000	9,000,000	10	90	5,020	Consult
							180	10,040	Factory
							360	20,080	
10,000M		3,000	3,333,000	6,667,000	10,000,000	10	90	5,840	Consult
							180	11,680	Factory
							360	23,360	
15,000M		3,000	5,000,000	10,000,000	15,000,000	10	90	8,7100	Consult
							180	17,420	Factory
							360	34,840	
20,000M		3,000	6,667,000	13,333,000	20,000,000	10	90	11,476	Consult
							180	22,952	Factory
							360	45,904	
25,000M		3,000	8,333,000	16,667,000	25,000,000	10	90	14,262	Consult
							180	28,524	Factory
							360	57,048	
30,000M		3,000	10,000,000	20,000,000	30,000,000	10	90	17,815	Consult
							180	35,630	Factory
							360	71,260	
40,000M		3,000	13,333,000	26,667,000	40,000,000	10	90	23,687	Consult
							180	47,374	Factory
							360	94,748	
50,000M		3,000	16,667,000	33,333,000	50,000,000	10	90	27,369	Consult
							180	54,738	Factory
							360	109,476	

A
Rack & Pinion
Actuators
HUB
Series
LTR
Series
HTR
Series
M
Series



Kinetic Energy Capacity

The energy values below assume drive pressure is maintained through cushion stroke.

Single Rack Units with Single Set of Cushions (20°)

Model	Kinetic Energy Rating (in-lb) of Cushion at Specified Drive Pressure*													
	0 PSI		500 PSI		1000 PSI		1500 PSI		2000 PSI		2500 PSI		3000 PSI	
	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability
75M	26175	14245	21812	14245	17448	14245	13088	13088	8724	8724	4362	4362	0	0
300M	194700	54400	87247	54400	69793	54400	52350	52350	34897	34897	17449	17449	0	0

Double Rack Units with Single Set of Cushions (20°)

Model	Kinetic Energy Rating (in-lb) of Cushion at Specified Drive Pressure*													
	0 PSI		500 PSI		1000 PSI		1500 PSI		2000 PSI		2500 PSI		3000 PSI	
	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability
150M	26175	14245	17450	14245	8727	8727	0	0	0	0	0	0	0	0
600M	104700	54400	69801	54400	34907	34907	0	0	0	0	0	0	0	0
1000M	174500	97107	116335	97107	58178	581178	0	0	0	0	0	0	0	0

Double Rack Units with Double Set of Cushions (20°)**

Model	Kinetic Energy Rating (in-lb) of Cushion at Specified Drive Pressure*													
	0 PSI		500 PSI		1000 PSI		1500 PSI		2000 PSI		2500 PSI		3000 PSI	
	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability	Max.	Durability
150M	52350	30168	43623	30168	34879	30168	26175	26175	17448	17448	8725	8725	0	0
600M	209400	115216	174493	115215	13986	115216	104700	69793	69793	69793	34899	34899	0	0
1000M	349000	194215	2090622	194215	232643	194215	174500	174500	116322	116322	58164	58164	0	0

* Must deduct work (energy) done to overcome potential energy effects of load. WPE = TPE x Θ, where Θ is in radians.

** Extreme care must be exercised so that both cushions are adjusted equally for each direction or dangerous pressure intensification and gear train stresses could result. (Suggest high performance cushion option.)

Cushion Deceleration Control

The cushion causes the resisting torque that can be used to decelerate a rotational load. Please note the cushion has to provide enough resistance to control: drive torque caused by the hydraulic system pressure; plus the torque caused by gravity pulling on the rotational load; and the kinetic energy associated with the motion of the inertia load. Since the actuator's cushion has to be able to control the sum of all three torque factors, we suggest including cushion capacity as one of the actuator selection criteria.

It is strongly suggested that proportional valves be used instead of cushions to control (decelerate) high inertial loads. This provides the ability to reduce inlet pressure while generating deceleration pressure. It also allows for longer ramp times, thus increasing deceleration stroke.

**SUPPLEMENTAL INFORMATION
 KINETIC ENERGY BASIC FORMULA**

$$KE = 1/2 J_m \omega^2$$

$$\omega = 0.0175 \times \frac{2\Theta_A + \Theta_C + 2\Theta_D}{\text{Rotation Time (sec.)}}$$

where:

KE = Kinetic Energy (in-lb)

J_m = Rotational Mass Moment of Inertia (in-lb-sec²)

See page A35 of LTR section for formulas.

ω = Peak Velocity (rad/sec)

(Assuming trapezoidal velocity profile)

Θ_A = Acceleration Angle (deg)

Θ_C = Constant Velocity Angle (deg)

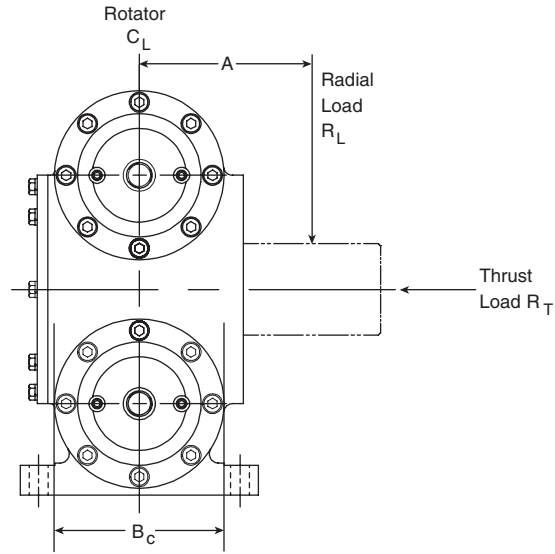
Θ_D = Deceleration Angle (deg)



Bearing Load Capacities

Each M Series Actuator is fitted with heavy duty tapered roller bearings as standard and can support high external loads. The table provides load capacities for each unit.

Any distance "A" is possible as long as bearing limits are observed. See overhung moment equation.



Bearing Load Capacities "M" Series Rotator

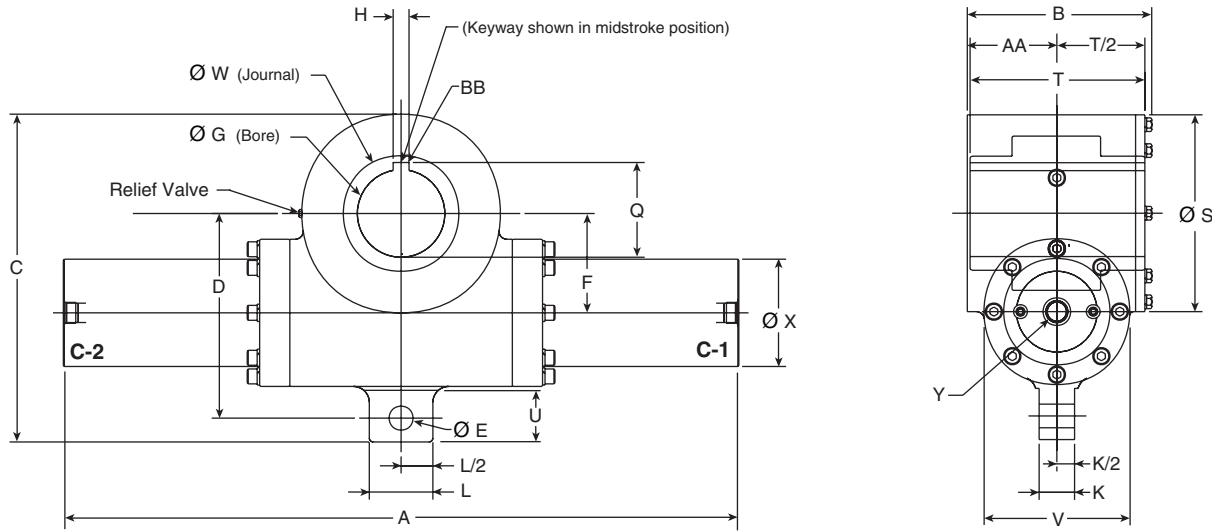
Model	Radial load-lbs. per bearing (R_L)		Thrust load-lbs. (R_T)		Bearing centers (B_c) distances Inch	Overhung moment inch-lbs. $R_L \times (A+B_c/2)$	
	Dynamic	Static	Dynamic	Static		Dynamic	Static
75M	34,000	51,000	15,000	22,500	3.40	115,600	173,400
150M	42,000	63,000	15,000	22,500	3.40	142,800	214,200
300M	42,000	63,000	20,000	30,000	5.65	237,300	355,950
600M	57,000	85,500	20,000	30,000	5.65	322,050	493,075
1000M	50,000	75,000	20,000	30,000	7.40	370,000	555,000

Unit Weights

Model	Rotation					
	90°		180°		360°	
	lb	kg	lb	kg	lb	kg
75M	202	92	217	99	259	118
150M	301	137	331	150	415	188
300M	648	294	727	330	881	400
600M	1033	469	1191	541	1499	681
1000M	1526	693	1774	805	2294	1041
1500M	2100	953	2500	1135	3300	1498
2000M	3800	1725	4500	2043	5900	2679
3000M	4900	2225	5700	2588	7300	3314

Single Rack

with Standard Lug Mount (L) and Hollow Keyed Shaft (A)



Dimension, Inch – Sizes 75M and 300M

Model	Rotation Degrees	A	B	C (+.13 -.00)	D	E	F	G	H*	K	L (+.13 -.00)	Q
75M	90	24.00										
	180	34.50	8.00	14.25	8.63	1.000	4.13	3.500 3.505	.750 .753	1.50	3.00	3.840
	360	55.50										
300M	90	34.25										
	180	48.50	11.88	20.63	12.88	1.500	6.25	5.500 5.505	1.000 1.003	2.25	4.00	5.960
	360	76.75										

Model	Rotation Degrees	S (+.13 -.00)	T	U	V (+.25 -.00)	W	X	Y	AA	BB
75M	90, 180, 360	9.25	7.50	2.13	6.00	5.00	4.00	1-1/16-12 SAE #12	3.81	0.030
300M	90, 180, 360	12.50	11.25	3.25	9.25	7.25	6.75	1-5/16-12 SAE #16	5.69	0.032

Note: All dimensions in inches unless otherwise specified.
 * Tolerance minimum and maximum

A
 Rack & Pinion Actuators

HUB Series

LTR Series

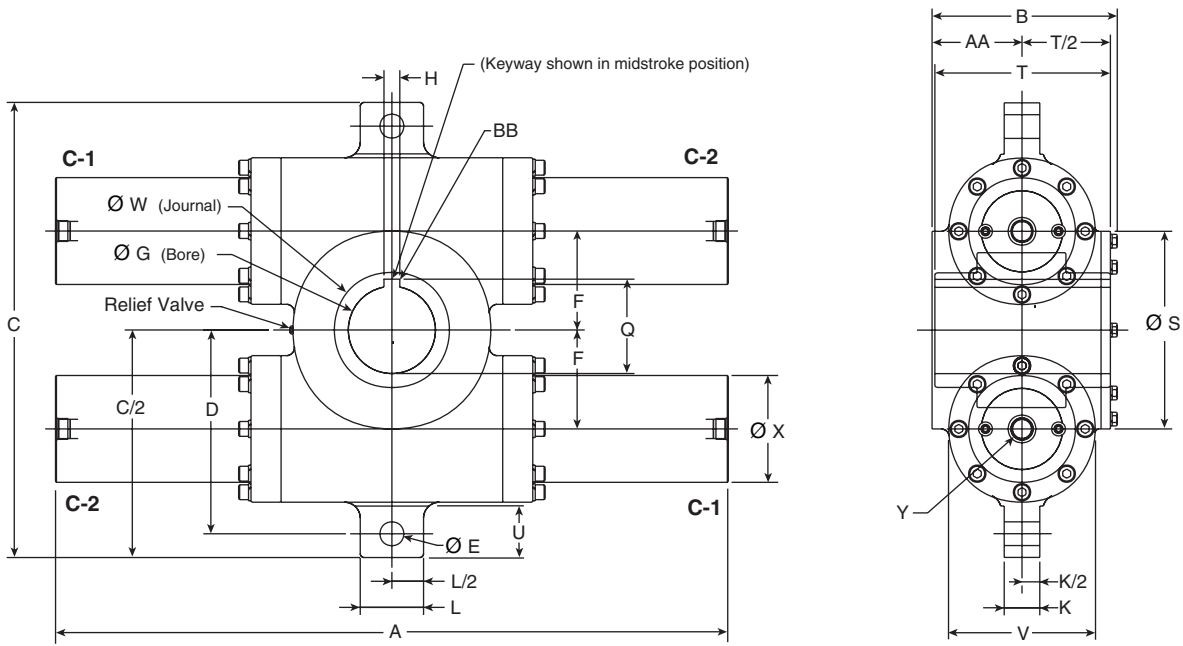
HTR Series

M
 Series

Double Rack

with Standard Lug Mount (L) and Hollow Keyed Shaft (A)

A
 Rack & Pinion
 Actuators
 HUB
 Series
 LTR
 Series
 HTR
 Series
 M
 Series



Dimension, Inch – Sizes 150M, 600M and 1000M

Model	Rotation Degrees	A	B	C (+.13 -.00)	D	E	F	G	H	K	L (+.13 -.00)	Q
150M	90	24.50						3.500	0.750			
	180	34.50	8.00	19.25	8.63	1.000	4.13	3.505	0.753	1.50	3.00	3.840
	360	55.50										
600M	90	34.25						5.500	1.000			
	180	48.50	11.88	28.75	12.88	1.500	6.25	5.505	1.003	2.25	4.00	5.960
	360	76.75										
1000M	90	40.25						7.250	1.000			
	180	57.00	13.88	32.50	14.75	1.500	7.25	7.255	1.002	2.25	4.00	7.725
	360	90.50										

Model	Rotation Degrees	S (+.13 -.00)	T	U	V (+.25 -.00)	W	X	Y	AA	BB
150M	90, 180, 360	9.25	7.50	2.13	6.00	5.00	4.00	1-1/16-12 SAE #12	3.81	0.030
600M	90, 180, 360	12.50	11.25	3.25	9.25	7.25	6.75	1-5/16-12 SAE #16	5.96	0.032
1000M	90, 180, 360	14.50	12.00	3.25	10.25	9.13	7.75	1-5/16-12 SAE #16	6.75	0.060

Note: All dimensions in inches unless otherwise specified.

Double Rack

with Standard Lug Mount (L) and Hollow Keyed Shaft (A)

Dimension, Inch – Sizes 1,500M to 50,000M

Model	Rotation Degrees	A	B	C	D	E	F	G	H	K
1,500M	90	44								
	180	62	16-1/2	35	16	1-1/2	8-1/4	8	1-1/4 x 13-1/2	2-1/4
	360	101-1/2								
2,000M	90	48								
	180	70	19	41-1/2	18-7/8	1-3/4	9-3/8	9-1/2	1-1/2 x 14-1/2	2-1/4
	360	114								
3,000M	90	48-1/2								
	180	70-1/2	21	45-3/4	20-7/8	2	10-1/8	9-3/4	1 (2) x 16	3
	360	114-1/2								
4,000M	90	54								
	180	79	23-1/2	51-1/4	23-3/8	2-1/4	11-3/8	11-1/4	1-1/2 x 18-1/2	3-1/2
	360	129								
5,000M	90	55								
	180	80-1/2	25	54-3/4	25-1/8	2-1/4	12-5/8	12-1/2	1-1/2 x 18-1/2	3-1/2
	360	130-1/2								
6,000M	90	63-1/2								
	180	95	25-1/2	57-1/2	26-1/4	2-1/2	13	13-1/2	1-3/4 x 21-1/2	3-3/4
	360	158								
7,000M	90	74-1/2								
	180	109-1/2	26-1/2	61-1/2	28	2-3/4	14	15	2 x 22	4
	360	179								
8,000M	90	76								
	180	114	26-1/2	63-3/4	29-1/4	2-3/4	15	16	2-1/4 x 22	4
	360	190								
9,000M	90	80								
	180	121	26-1/2	67	30-1/2	3	16	18	2-1/2 x 18-1/2	4-1/2
	360	203								
10,000M	90	85								
	180	129	28	69	31-1/2	3	17	20	2-1/2 x 22	4-1/2
	360	217								
15,000M	90	102								
	180	159	28	82	37-1/2	3-1/2	21-1/2	22	2-1/2 x 22	5
	360	272								
20,000M	90	110								
	180	173	29	87	39-1/2	4	23-1/2	31	2-1/2 (2) x 22	5
	360	298-1/2								
25,000M	90	110								
	180	173	30-1/2	95	42-1/2	5	24-1/2	31	2-1/2 (2) x 26	5
	360	298-1/2								
30,000M	90	112								
	180	175	32-1/2	98	44	5	25	31	2-1/2 (2) x 28	5
	360	300-1/2								
40,000M	90	132								
	180	207-1/2	36	108	49	5	28-1/2	38	3 (2) x 30	6
	360	358								
50,000M	90	133								
	180	209	37	111	50-1/2	5	29-1/4	38	3 (2) x 32	6
	360	359-1/2								

A
Rack & Pinion Actuators
HUB Series
LTR Series
HTR Series
M Series

* Units 1500M and above have dimensions that are subject to change. Consult factory on these dimension before any design implementation is initiated.

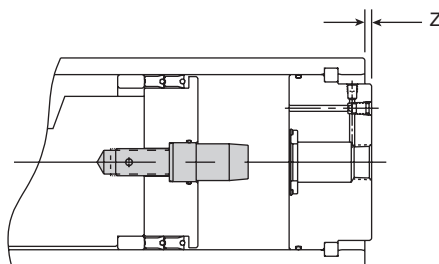
Note: All dimensions in inches unless otherwise specified.



Cushions (1, 2, 3, 4)

The standard cushions operate over the last 20° of rotation in either or both directions. A floating bushing ensures no binding of cushion spear. For severe operating conditions, 4 cushions should be fitted on double rack units.

All cushions are fully adjustable. Double rack units should be fitted with Type 4 cushions.



Model	Z (in)
75M	.50
150M	.50
300M	.25
600M	.25
1000M	.00

NOTE: Proportional valves are recommended instead of cushions for high inertial loads.

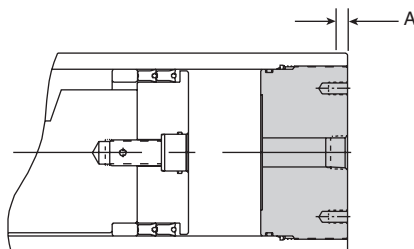
Cushion Kinetic Energy Capacity

Model	Cushion code	Dissipation (Inch lbf)	Cushion code	Cushion work (in-lb)
75M	3	27,630	1,2	27,165
150M	4	55,300	1,2,3	27,165*
300M	3	84,190	1,2	104,700
600M	4	168,370	1,2,3	104,700*
1000M	4	192,000	1,2,3	192,000*

* Must deduct work done by any existing drive pressure and work done to control potential energy.

5° Stroke Adjusters (A, B, C)

Model	(1) Turn adj.
75M	1°
150M	1°
300M	8°
600M	8°
1000M	7°



Model	A (in)
75M	.956
150M	.956
300M	.426
600M	.426
1000M	.527

NOTE:

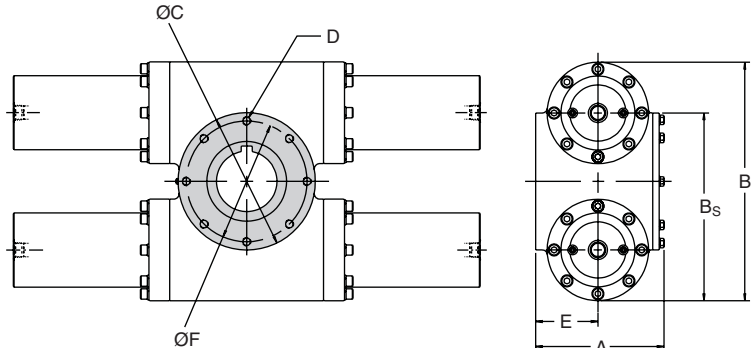
1. Maximum unit rotation is equal to rotation specified in model code. Adjusters allow rotational positioning equal to or less than the maximum rotation.
2. Stroke adjusters are available with or without cushions. Double rack units will have cushions and stroke adjusters on lower rack.

Note: All dimensions in inches unless otherwise specified.

A
Rack & Pinion
Actuators
HUB
Series
LTR
Series
HTR
Series
M
Series

Face Mounting (A)

In addition to the flange shown, made to order sizes can be manufactured.



Model	Torque in-lb @ 3,000 psi	A	BS	BD	C	D	E	F
75M	75,000	8	11.75	N/A	9.25	5/8-18 x 15/16 DP	3.81	8.000
150M	150,000	8	N/A	14.25	9.25	5/8-18 x 15/16 DP	3.81	8.000
300M	300,000	11.875	17.13	N/A	12.50	3/4-16 x 1-1/8 DP	5.69	11.000
600M	600,000	11.875	N/A	21.75	12.50	3/4-16 x 1-1/8 DP	5.69	11.000
1000M	1,000,000	13.625	N/A	24.75	14.50	1-1/4-12 x 1-7/8 DP	6.75	12.000

Face Mounting Bi-directional Torque Capacity (without dowel devices)

Model	Bolt Size	Suggested bolt torque (ft-lb)	Bi-directional torque capacity* (in-lb)
75M	5/8-18 x 15/16 dp	100	105,495
150M	5/8-18 x 15/16 dp	100	105,495
300M	3/4-16 x 1-1/8 dp	160	167,200
600M	3/4-16 x 1-1/8 dp	160	167,200
1000M	1-1/4-12 x 1-7/8 dp	720	496,800

* With additional reinforcement.

Bi-directional bolt torque capacity is equal to:

$$\mu \times \text{clamp load} \times \text{lever arm length from center of rotation}$$

($\mu = .3$ assumed).

Suggested Reinforcement

Model	Dowel Ø	Qty.	Bolt circle diameter
150M	.75	2	8
300M	.75	4	11
600M	1.00	4	11
1000M	1.00	8	12

Note: All dimensions in inches unless otherwise specified.

A
Rack & Pinion Actuators

HUB Series

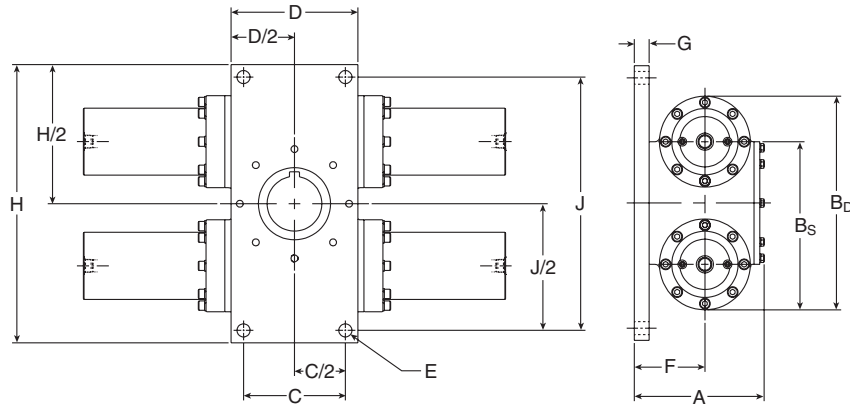
LTR Series

HTR Series

M Series

Flange Mounting (F)

In addition to the flange shown, made to order sizes can be manufactured.

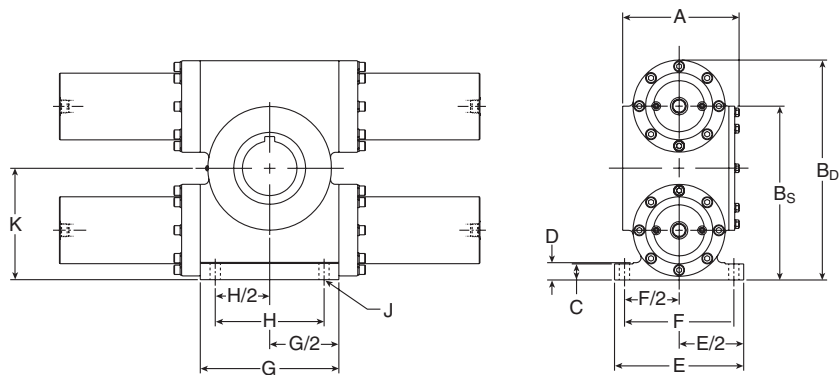


Model	Torque in-lb @ 3000 psi	A	B _S	B _D	C	D	E	F	G	H	J
75M	75,000	9.25	11.75	N/A	7.500	9.500	1.063	5.06	1.25	19.25	17.250
150M	*	9.25	N/A	14.25	7.500	9.500	1.063	5.06	1.25	19.25	17.250
300M	*	13.375	17.13	N/A	10.250	12.750	1.313	7.19	1.50	28.00	25.500
600M	*	13.375	N/A	21.75	10.250	12.750	1.313	7.19	1.50	28.00	25.500
1000M	*	15.375	N/A	24.75	11.500	16.750	1.563	8.50	1.75	32.25	29.250

* Consult factory with applications data.

Foot Mounting (G)

The foot is an integral part of the housing, machined on all sides to accommodate shear block mounting. (1000M & smaller).



Model	Torque in-lb @ 3000 psi	A	B _S	B _D	C	D	E	F	G	H	J	K	
75M	75,000	8	12.00	N/A	1.38	1.50	11.00	9.5000	10.00	7.500	0.781	7.375	+0.005 -0.000
150M	150,000	8	N/A	14.50	1.38	1.50	11.00	9.5000	10.00	7.500	0.781		
300M	300,000	11.875	17.50	N/A	1.63	1.75	13.00	11.000	14.00	11.000	1.031	11.250	+0.005 -0.000
600M	600,000	11.875	N/A	22.13	1.63	1.75	13.00	11.000	14.00	11.000	1.031		
1000M	1,000,000	13.875	N/A	25.13	1.88	2.00	16.00	13.500	16.75	13.500	1.281	12.750	+0.000 -0.005

Note: All dimensions in inches unless otherwise specified.

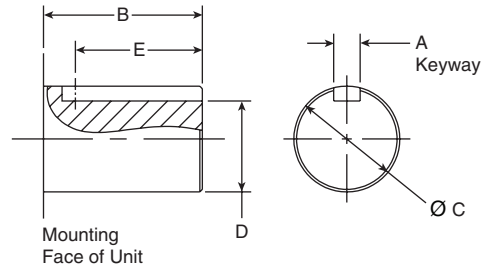


Shaft Options (B, D, E)

All shaft options shown in mid-stroke position.

Male Keyed Shaft (B)

Model	A	B	C	D	E	Torque Rating
75M	.749	4.50	3.000	2.577	3.38	102,000 in-lb
150M	.750	4.50	2.999	2.572	3.38	102,000 in-lb
300M	1.249	7.50	5.000	4.297	6.00	475,000 in-lb
600M	1.250	7.50	4.999	4.292	6.00	475,000 in-lb
1000M	2.000	12.00	8.000	6.873	10.00	1,000,000 in-lb
	2.002	12.00	7.999	6.868	10.00	1,000,000 in-lb



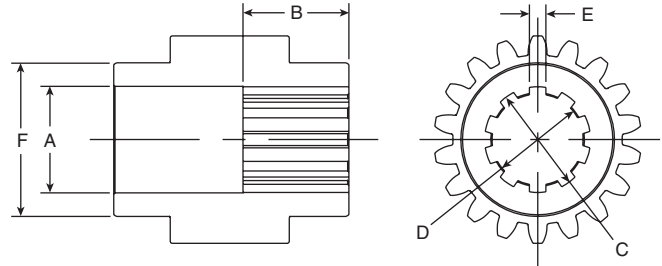
Suggested Key Materials

Model	A	E	Material
75M	0.750/0.749	3.38	C1018 CR
150M	0.750/0.749	3.38	C1045 CR
300M	1.250/1.249	6	C1018 CR
600M	1.250/1.249	6	C1018 CR

Female SAE 10B Spline (D)

Model	A	B	C	D	E	F
75M	3.03	3.00	3.000	2.580	0.468	4.999
150M	3.03	3.00	2.998	2.578	0.465	4.997

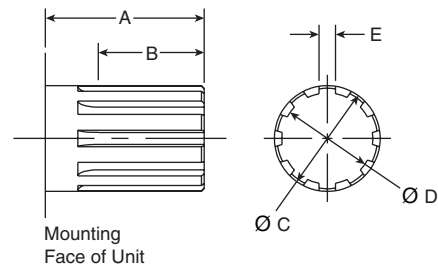
30° involute splined female shaft may be available on all sizes, consult factory.



Male SAE 10B Spline (E)

Model	A	B	C	D	E
75M	4.50	2.88	2.997	2.573	0.464
150M	4.50	2.88	2.995	2.568	0.463

30° involute splined male shaft may be available on all sizes, consult factory.



Note: All dimensions in inches unless otherwise specified.

A

Rack & Pinion Actuators

HUB Series

LTR Series

HTR Series

M Series

Ports (1, 2, 3)

SAE straight thread ports or 4 bolt flanges are recommended for all applications. NPT ports are available but not recommended.

Model	Standard SAE straight thread (1)	NPT (2)	4 bolt flange (3) SAE J518 (3000 psi)
75M 150M	1-1/16 -12 (SAE 12)	3/4	3/4
300M 600M	1-5/16 -12 (SAE 16)	1	1
1000M	1-5/16 -12 (SAE 16)	1	1

Seals (V, W)

Seal class	Seal type	Wear ring type	Fluid medium	Temperature range	Filtration
Standard	Molythane PolyPak	Filled PTFE	General purpose, petroleum-based fluids	-40°F to 180°F -40°C to 82°C	
Fluorocarbon (V)	Fluorocarbon	Filled PTFE	High temperature and/or synthetic fluids	-20°F to 250°F -29°C to 121°C	Class 17/14 Cleanliness Level
Nitrile (W)	Carboxylated Nitrile *	Filled PTFE	Water Glycol, high water content fluids	30°F to 180°F 0°C to 82°C	

* Not available in every size. Factory will automatically make appropriate substitutions as necessary.

For Seal Kits and Spare Parts, contact the Pneumatic Division at 269-629-5000.

Feedback Packages

Feedback packages available for use with M Series rotary actuators include:

- Precision feedback potentiometer (J)
- Precision resolver feedback (H)
- Linear potentiometer feedback (Oildyne Teknar)
- LDT feedback (MTS Temposonics)

The feedback potentiometer (J) and resolver feedback (H) may be ordered as part of the model code. The other options must be ordered separately.

See Sensors section for specifications.

A

Rack & Pinion Actuators

HUB Series

LTR Series

HTR Series

M Series