FM Series with Rod Lock

- Integrated rod lock system delivers reliable, high-force holding up to 2,850 lbs for secure load control
- Precise rod lock alignment combined with a floating rod bushing ensures smooth operation and consistent locking performance
- Robust clamping design minimizes metal fatigue, enhancing durability and long-term reliability
- Optimized construction reduces wear and supports extended service life up to 5 million cycles at full load
- Built on proven FM Series construction, combining flush mount flexibility with rod lock capability

Technical data

Medium:
Compressed air, filtered, non-lubricated.

Standard: NFPA

Operating pressure:
250 PSI Air (17 BAR)

Operating temperature:
Standard Seals: 10°F to 180°F (-12°C to 82°C)
Viton Seals: 0°F to 400°F (-18°C to 204°C)

Operation: Double acting

Cushioning: Fixed and adjustable

Standard strokes: 0-120"

Standard bores: 1.50", 2.00", 2.50", 3.25" 4.00", 5.00", 6.00", 8.00"

Axial Movement (Clamped)*
Standard: .001" to .008"
Close Tol. (Optional): .001" to .003"
Represents clearance within the rod lock unit,.000" movement due to actuation.

Standard Materials:
Tube: Aluminum
Head / cap: Black anodized aluminum
Piston rod: Steel
Rod seals: Nitrile
Tie rods: Carbon steel
Lubrication: PTFE grease

Rod Material Requirements:
Diameter: +.000" to -.002" Nominal Diameter
Hardened Shaft: .0005" Minimum hard chrome
Unhardened Shaft: .001" Minimum hard chrome
Finish: 6 to 10 Ra

Option selector

FM-MS4-D-2.5 x 10-HC-RL-063-250-MPR

see next page

Series	Substitute
250 PSI Air	FM
NFPA Mounts	**Substitute**
Front Flange (1.50"- 6.00" Bore)	MF1
Rear Flange (1.50"- 6.00" Bore)	MF2
Rear Pivot Clevis (1.50"- 6.00" Bore)	MP1
Rear Pivot Clevis (1.50"- 6.00" Bore)	MP2
Rear Pivot Eye (1.50"- 4.00" Bore)	MP4
Front & Rear End Angle (1.50"- 6.00" Bore)	MS1
Side Lug (1.50"- 6.00" Bore)	MS2
Bottom Tapped Holes (1.50"- 6.00" Bore)	MS4
Front Trunnion (1.50"- 6.00" Bore)	MT1
Rear Trunnion (1.50"- 6.00" Bore)	MT2
Style	**Substitute**
Single Rod	(Blank)
Double Rod End	D
Bore	**Substitute**
1.50"	1.5
2.00"	2
2.50"	2.5
3.25"	3.25
4.00"	4
5.00"	5
6.00"	6
Stroke	
0" to 120" Made to order	
Adjustable Cushions	**Substitute**
Adjustable Head Cushion Position 2 Is Standard Specify For Positions: 1, 3 & 4	H
Adjustable Long Head Cushion Position 2 Is Standard Specify For Positions: 1, 3 & 4	LH
Adjustable Extra Long Head Cushion Position 2 Is Standard Specify For Positions: 1, 3 & 4	ELH»
Adjustable Cap Cushion Position 6 Is Standard Specify For Positions: 5, 7 & 8	C
Adjustable Long Cap Cushion Position 6 Is Standard Specify For Positions: 5, 7 & 8	LC
Adjustable Extra Long Cap Cushion Position 6 Is Standard Specify For Positions: 5, 7 & 8	ELC»
Fixed Cushions	**Substitute**
Fixed Head Cushion (Non-Adjustable, No Adjustment Needle)	FCH
Fixed Cap Cushion (Non-Adjustable, No Adjustment Needle)	FCC
Fixed Head and Cap Cushion (Non-Adjustable, No Adjustment Needle)	FC

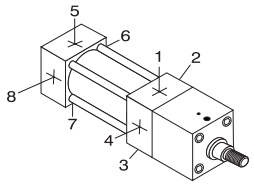
Bore	Substitute
1.5"	150
2"	200
2.5"	250
3.25"	325
4"	400
5"	500
6"	600
Rod Size	**Substitute**
0.625"	063
1.000"	100
1.375"	138
1.750"	175
Rod Lock	
RL	

Notes:
1) Ordering example for adjustable cushions in non-standard locations: H3C7
2) Refer to Options for assistance with cushion length selection.
3) Cushions can be ordered on same side as ports.

Note:
Refer to Options for specifications
» Refer to Option Length Adder

Standard Port and Cushion Adjustment Positions

- Ports - Positions 1 and 5
- Cushion Adjustment - Positions 2 and 6
- Rod lock port follows head port
- Specify Non-Standard Positions When Ordering



Special Rod Lock Modifications

Common rod lock modifications include metallic rod scraper, close tolerance axial movement, fluorocarbon seals, electroless nickel plating or stainless steel housing.

Consult your local distributor or IMI customer service for more information and delivery.

Options	Substitute
Extended Piston Rod Thread (Example: A = 2")	**A**
Adjustable Stroke - Retract (Specify Length, Example: AS = 4")	**AS**
Air / Oil Piston	**AO**
.250" Urethane Bumper Both Ends	**B»**
.250" Urethane Bumper Cap Only	**BC»**
.250" Urethane Bumper Head Only	**BH»**
Bumper Piston Seals (1.50" - 6.00" Bore)	**BP**
Large Male Rod Thread	**KK2**
Female Rod Thread	**KK3**
Studded Piston Rod (KK3 With Stud, Loctite In Place)	**KK3S**
Full Diameter Male Rod Thread	**KK4**
Blank Rod End (No Threads, "A" = 0")	**KK5**
Low Friction Seals	**LF**
Low Temperature Seals	**LT**
Micro-Adjust (12" Max Stroke) Available On Double Rod End Models	**MA**
Magnetic Piston For Reed Or Solid State Switches - Models: R10, R10P, RAC, RHT & MSS	**MPR**
Non-Rotating	**NR**
Optional Port Location (Example: OP=3,7)	**OP**
Oversize Rod Diameter (Specify Size, Example: OS = 1.375")	**OS**
Proximity Switch (1.50" - 6.00" Bore) Shipped Unassembled	**P**
Extended Piston Rod (Example: If RLC= 0.50", Then 1" Rod Extension Is RLC= 1.50")	**RLC**
SAE Ports (Specify Size, Example: SAE#10)	**SAE**
Stainless Steel Piston Rod, Tie Rods, Nuts & Fasteners	**SSA**
Stainless Steel Piston Rod	**SSR**
Stainless Steel Tie Rods & Sleeve Nuts	**SST**
Stop Tube - Specify Stop Tube Length (In Inches) Specify Stroke as ES (Effective Stroke) (Example: FM-MS4-2x24ES-ST=3)	**ST»**
Steel Cylinder Tube, Black Epoxy Paint Finish	**TMS**
Stainless Steel Cylinder Tube	**TMSS**
400 PSI Hydraulic Non-Shock	**TH**
Fluorocarbon Rod Lock Seals	**V**
Fluorocarbon Seals	**VS**
Special Variation (Specify)	**XX**

Performance characteristics

Basic Cylinder Force Chart

Bore	Rod Diameter	Stroke Type	Effective Piston Area	Pounds Of Force At:		
				60 PSI	80 PSI	100 PSI
1.50	All	Push	1.767	106	142	177
	0.625	Pull	1.460	88	117	146
2.00	All	Push	3.142	188	251	314
	0.625	Pull	2.835	170	227	284
	1.000	Pull	2.357	141	189	236
2.50	All	Push	4.909	295	393	491
	0.625	Pull	4.602	276	368	460
	1.000	Pull	4.124	247	330	412
3.25	All	Push	8.296	498	664	830
	1.000	Pull	7.511	451	601	751
	1.375	Pull	6.811	409	545	681
4.00	All	Push	12.566	754	1005	1257
	1.000	Pull	11.781	707	942	1178
	1.375	Pull	11.081	665	886	1108
5.00	All	Push	19.635	1178	1571	1964
	1.000	Pull	18.850	1131	1508	1885
	1.375	Pull	18.150	1089	1452	1815
6.00	All	Push	28.274	1696	2262	2827
	1.375	Pull	26.789	1607	2144	2679
	1.750	Pull	25.869	1552	2070	2587

Rated Holding Force

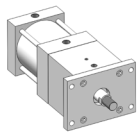
Bore	Rod Diameter	Rod Lock Model	Holding Force*
1.50	0.625	RL-063150	200
2.00	0.625	RL-063200	500
	1.000	RL-100200	350
2.50	0.625	RL-063250	650
	1.000	RL-100250	650
3.25	1.000	RL-100325	1000
	1.375	RL-138325	1000
4.00	1.000	RL-100400	1550
	1.375	RL-138400	1550
5.00	1.000	RL-100500	2150
	1.375	RL-138500	2150
6.00	1.375	RL-138600	2850
	1.750	RL-175600	2850

*Holding force is the minimum rating on clean and dry rods over the entire life of the unit. Add the load weight to the basic cylinder force when sizing rod lock.

Rod locks are 100% tested to assure that each unit exceeds the published rated holding force. When properly applied, rod locks will maintain the published holding force over the life of the unit.

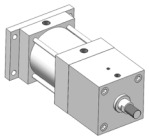
FM NFPA Mounts with Rod Lock

MF1



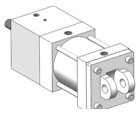
1.50" - 6.00" bores

MF2



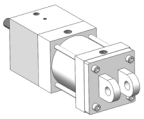
1.50" - 6.00" bores

MP1



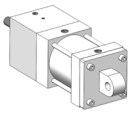
1.50" - 6.00" bores

MP2



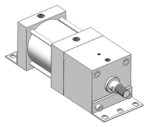
1.50" - 6.00" bores

MP4



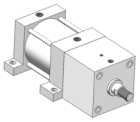
1.50" - 4.00" bores

MS1



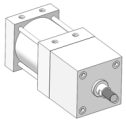
1.50" - 6.00"

MS2



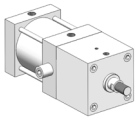
1.50" - 6.00" bores

MS4



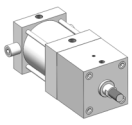
1.50" - 6.00" bores

MT1



1.50" - 6.00" bores

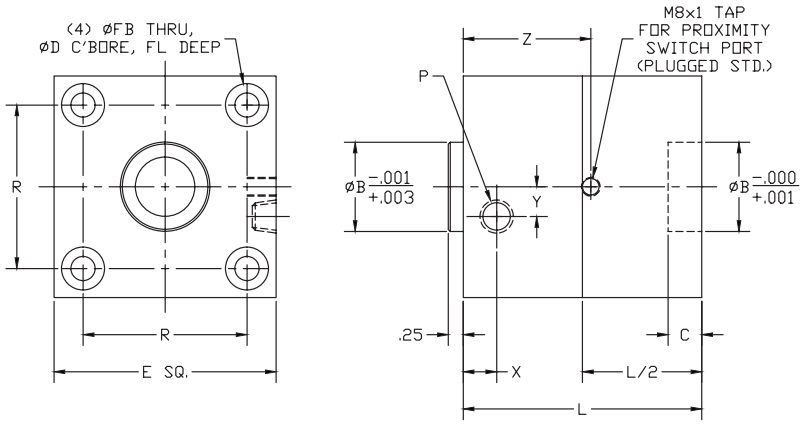
MT2



1.50" - 6.00" bores

*Required Rod Diameter: Nominal size +000/-.002.

Dimensions



Rod Lock Dimensions																
Bore	Rod Diameter*	Part No. Rod Lock Only	Axial Holding Force	B	C	D	FL	E	FB	L	P	R	X	Y	Z	Weight (Lbs.)
1.50	0.625 Standard	RL-063150-1	200	1.125	0.375	0.422	0.896	1.975	0.281	3.000	1/8 NPT	1.430	0.310	0.250	1.529	3.0
2.00	0.625 Standard	RL-063200-1	500	1.125	0.375	0.515	1.031	2.475	0.343	3.000	1/8 NPT	1.840	0.310	0.380	1.196	4.0
	1.000 Oversize	RL-100200-1	350	1.500	0.563					3.750			0.500		1.869	3.5
2.50	0.625 Standard	RL-063250-1	650	1.125	0.375	0.515	1.031	2.975	0.343	3.250	1/8 NPT	2.190	0.380	0.500	1.490	5.0
	1.000 Oversize	RL-100250-1	650	1.500	0.563					3.750			0.500		1.857	5.0
3.25	1.000 Standard	RL-100325-1	1000	1.500	0.563	0.719	1.281	3.725	0.406	4.000	1/4 NPT	2.760	0.560	0.000	2.140	8.0
	1.375 Oversize	RL-138325-1	1000	2.000	0.625					4.000			0.500		2.000	9.0
4.00	1.000 Standard	RL-100400-1	1550	1.500	0.563	0.719	1.281	4.475	0.406	4.000	1/4 NPT	3.320	0.560	0.000	1.782	14.0
	1.375 Oversize	RL-138400-1	1550	2.000	0.625					4.000			0.500		1.811	13.0
5.00	1.000 Standard	RL-100500-1	2150	1.500	0.563	0.844	1.500	5.475	0.531	4.000	1/4 NPT	4.100	0.560	0.750	1.810	18.0
	1.375 Oversize	RL-138500-1	2150	2.000	0.625					4.125			0.625		1.941	19.0
6.00	1.375 Standard	RL-138600-1	2850	2.000	0.625	0.844	1.500	6.475	0.531	4.500	1/4 NPT	4.880	0.820	0.000	2.055	16.0
	1.750 Oversize	RL-175600-1	2850	2.375	0.750					4.500			0.560		1.923	14.0

Option Length Adder (Add To Catalog Basic Overall Length Dimensions)						
Bore	Option					
	B	BC	BH	ELC	ELH	ST[1] (Stop Tube) Example: ST=2
1.50	0.500	0.250	0.250	1.000	1.000	2.000
2.00	0.500	0.250	0.250	1.000	1.000	2.000
2.50	0.500	0.250	0.250	1.000	1.000	2.000
3.25	0.500	0.250	0.250	1.250	1.250	2.000
4.00	0.500	0.250	0.250	1.250	1.250	2.000
5.00	0.500	0.250	0.250	1.250	1.250	2.000
6.00	0.500	0.250	0.250	1.500	1.500	2.000

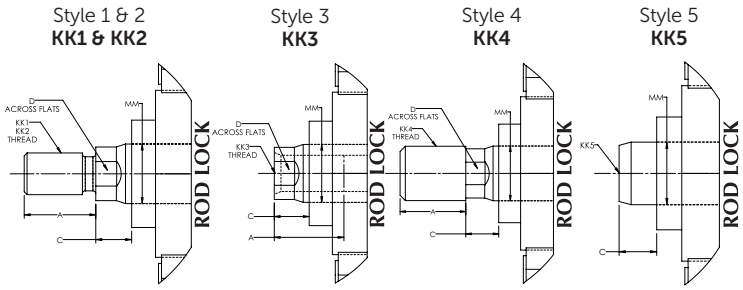
[1] The desired stop tube length adds directly to the overall cylinder length.

About Rod End Styles

Style 1 Male Rod End is Standard
Other NFPA styles can be specified (see chart).

Custom rod end configurations are readily accommodated. Each piston rod is manufactured to order, with options including coarse UNC threads, metric threads, or plain rod ends. Thread lengths are produced to your specified dimension ("A" = length). For requirements beyond standard configurations, please contact IMI.

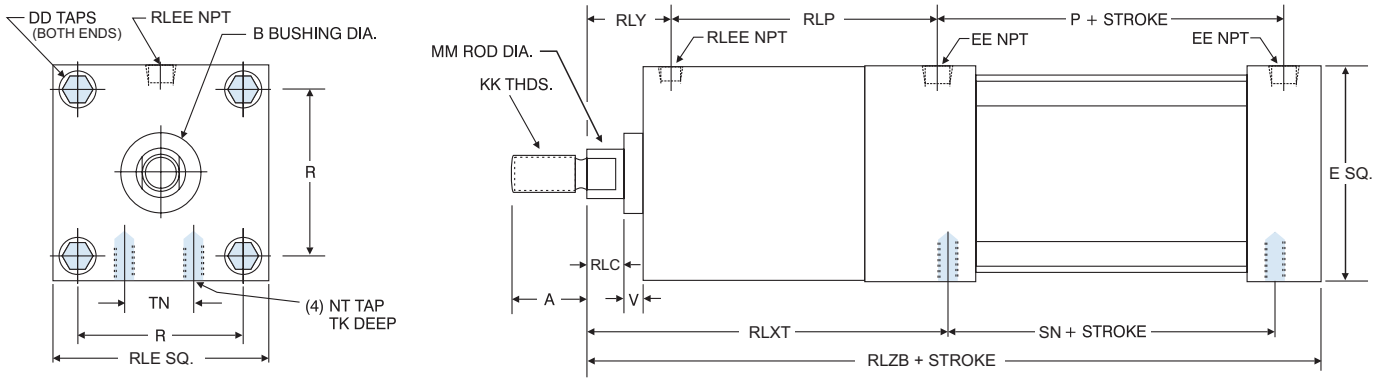
Piston Rod End Styles



Bore	Rod Diameter (MM)	Standard Style 1 - Male KK1	A	Style 2 - Male KK2	A	Optional Style 3 - Female KK3	A	Style 4 - Male KK4	A	Style 5 - Blank KK5	RLC	D
1.50, 2.00, 2.50	0.625	7/16-20	0.750	1/2-20	0.750	7/16-20	0.750	5/8-18	0.750	No Threads	0.375	0.500
3.25, 4.00, 5.00	1.000	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	No Threads	0.500	0.875
6.00	1.375	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8-12	1.625	No Threads	0.625	1.125

Bore	Rod Diameter (MM)	Standard Style 1 - Male KK1	A	Style 2 - Male KK2	A	Optional Style 3 - Female KK3	A	Style 4 - Male KK4	A	Style 5 - Blank KK5	RLC	V
2.00, 2.50	1.000	3/4-16	1.125	7/8-14	1.125	3/4-16	1.125	1-14	1.125	No Threads	0.500	0.250
3.25, 4.00, 5.00	1.375	1-14	1.625	1 1/4-12	1.625	1-14	1.625	1 3/8 -12	1.625	No Threads	0.625	0.250
6.00	1.750	1 1/4-12	2.000	1 1/2-12	2.000	1 1/4-12	2.000	1 3/4-12	2.000	No Threads	0.750	0.250

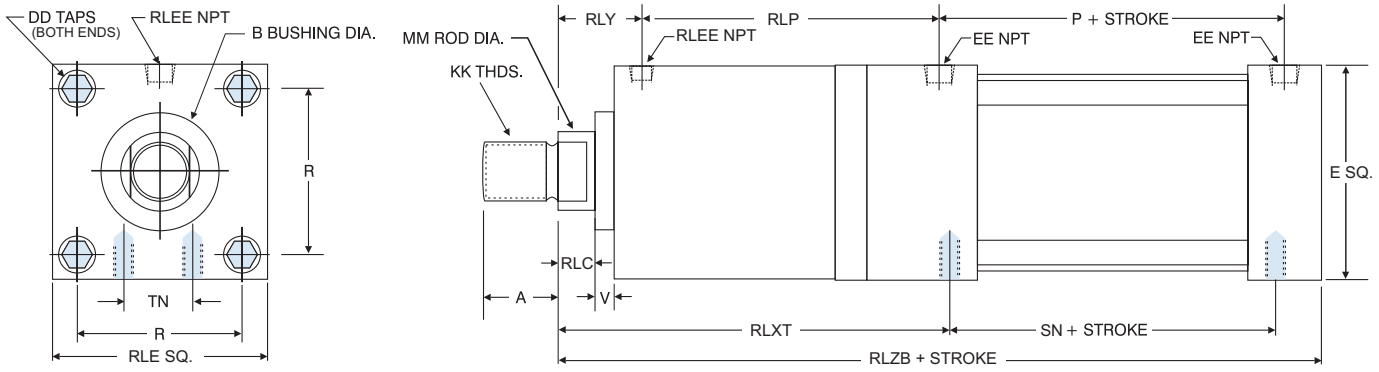
MS4 (Bottom Tapped Holes): Standard Rod With Rod Lock Mounted



	FM Series MS4 Flush Mount Dimensions													Rod Lock Basic Dimensions						
Bore	**A**	**B**	**DD**	**E**	**EE**	**KK**	**MM**	**NT**	**P**	**R**	**SN**	**TK**	**TN**	**RLC**	**RLE**	**RLEE**	**RLP**	**RLXT**	**RLY**	**RLZB**	**V**
1.50	0.750	1.125	1/4-28	2.000	1/4 NPT	7/16-20	0.625	1/4-20	2.375	1.438	2.250	0.375	0.625	0.375	1.984	1/8 NPT	3.563	4.570	0.938	7.250	0.250
2.00	0.750	1.125	5/16-24	2.500	1/4 NPT	7/16-20	0.625	5/16-18	2.375	1.844	2.250	0.500	0.875	0.375	2.484	1/8 NPT	3.563	4.570	0.938	7.250	0.250
2.50	0.750	1.125	5/16-24	3.000	1/4 NPT	7/16-20	0.625	3/4-16	2.500	2.188	2.375	0.625	1.250	0.375	2.984	1/8 NPT	3.750	4.820	1.000	7.625	0.250
3.25	1.125	1.500	3/8-24	3.750	3/8 NPT	3/4-16	1.000	1/2-13	2.750	2.760	2.625	0.750	1.500	0.500	3.734	1/4 NPT	4.438	5.820	1.313	9.000	0.250
4.00	1.125	1.500	3/8-24	4.500	3/8 NPT	3/4-16	1.000	1/2-13	2.750	3.320	2.625	0.750	2.063	0.500	4.484	1/4 NPT	4.438	5.820	1.313	9.000	0.250
5.00	1.125	1.500	1/2-20	5.500	3/8 NPT	3/4-16	1.000	5/8-11	3.000	4.100	2.875	1.000	2.688	0.500	5.484	1/4 NPT	4.438	5.820	1.313	9.250	0.250
6.00	1.625	2.000	1/2-20	6.500	1/2 NPT	1-14	1.375	3/4-10	3.250	4.875	3.125	1.125	3.250	0.625	6.484	1/4 NPT	5.063	6.560	1.438	10.375	0.250

For dimensions not shown, see page 55.

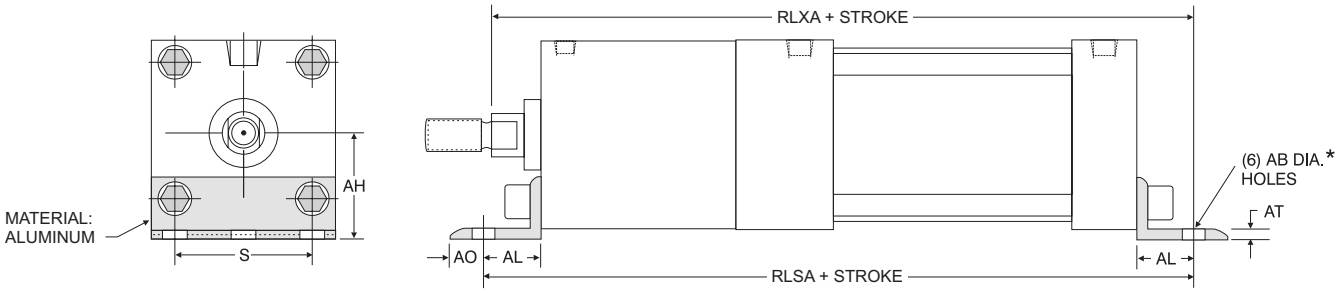
MS4 (Bottom Tapped Holes): Oversized Rod With Rod Lock Mounted



	FM Series Oversize Rod MS4 Flush Mount Dimensions													Rod Lock Basic Dimensions						
Bore	**A**	**B**	**DD**	**E**	**EE**	**KK**	**MM**	**NT**	**P**	**R**	**SN**	**TK**	**TN**	**RLC**	**RLE**	**RLEE**	**RLP**	**RLXT**	**RLY**	**RLZB**	**V**
2.00	1.125	1.500	5/16-24	2.500	1/4 NPT	3/4-16	1.000	5/16-18	2.375	1.844	2.250	0.500	0.875	0.500	2.484	1/8 NPT	4.500	5.813	1.250	8.500	0.250
2.50	1.125	1.500	5/16-24	3.000	1/4 NPT	3/4-16	1.000	3/4-16	2.500	2.188	2.375	0.625	1.250	0.500	2.984	1/8 NPT	4.500	5.813	1.250	8.625	0.250
3.25	1.625	2.000	3/8-24	3.750	3/8 NPT	1-14	1.375	1/2-13	2.750	2.760	2.625	0.750	1.500	0.625	3.734	1/4 NPT	5.063	6.570	1.438	9.750	0.250
4.00	1.625	2.000	3/8-24	4.500	3/8 NPT	1-14	1.375	1/2-13	2.750	3.320	2.625	0.750	2.063	0.625	4.484	1/4 NPT	5.063	6.570	1.438	9.750	0.250
5.00	1.625	2.000	1/2-20	5.500	3/8 NPT	1-14	1.375	5/8-11	3.000	4.100	2.875	1.000	2.688	0.625	5.484	1/4 NPT	5.188	6.688	1.438	10.125	0.250
6.00	2.000	2.375	1/2-20	6.500	1/2 NPT	1 1/4-12	1.750	3/4-10	3.250	4.875	3.125	1.125	3.250	0.750	6.484	1/4 NPT	5.820	7.438	1.563	11.250	0.250

For dimensions not shown, see page 55.

MS1 (Head & Cap End Angle): Standard Rod with Rod Lock Mounted



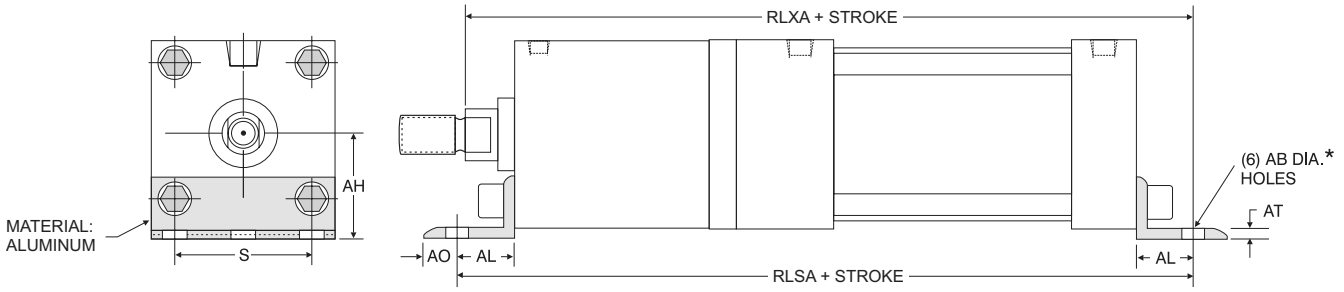
FM Series MS1 Angle Mount Dimensions

Bore	Rod Diameter	AB	AH	AL	AO	AT	S	Add Stroke RLSA	Add Stroke RLXA
1.50	0.625	0.438	1.188	1.000	0.375	0.125	1.250	8.625	8.250
2.00	0.625	0.438	1.438	1.000	0.375	0.125	1.750	8.625	8.250
2.50	0.625	0.438	1.625	1.000	0.375	0.125	2.250	9.000	8.625
3.25	1.000	0.563	1.938	1.250	0.500	0.125	2.750	10.750	10.250
4.00	1.000	0.563	2.250	1.250	0.500	0.125	3.500	10.750	10.250
5.00	1.000	0.688	2.750	1.375	0.625	0.188	4.250	11.250	10.625
6.00	1.375	0.813	3.250	1.375	0.625	0.188	5.250	12.250	11.750

*Note: 1.50" bore has four (4) "AB" holes on "S" dimension.

For dimensions not shown, see page 55.

MS1 (Head & Cap End Angle): Oversized Rod with Rod Lock Mounted



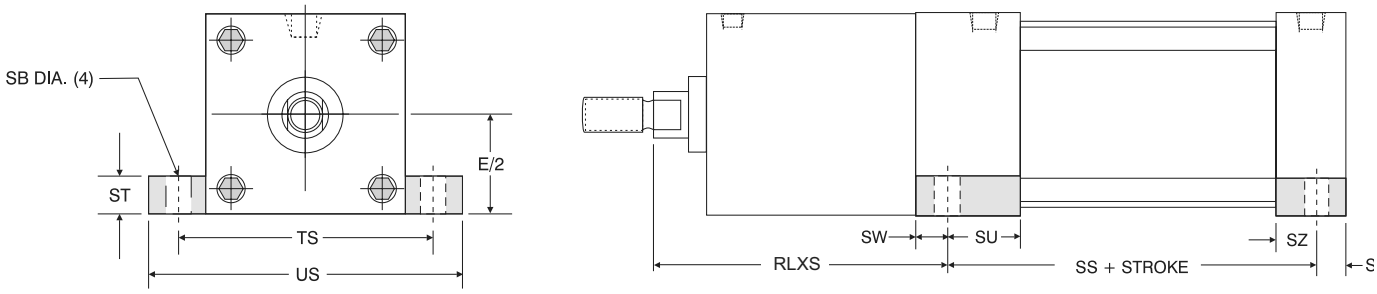
FM Series MS1 Angle Mount Dimensions

Bore	Rod Diameter	AB	AH	AL	AO	AT	S	Add Stroke RLSA	Add Stroke RLXA
2.00	1.000	0.438	1.438	1.000	0.375	0.125	1.750	9.750	9.500
2.50	1.000	0.438	1.625	1.000	0.375	0.125	2.250	9.875	9.625
3.25	1.375	0.563	1.938	1.250	0.500	0.125	2.750	11.375	11.000
4.00	1.375	0.563	2.250	1.250	0.500	0.125	3.500	11.375	11.000
5.00	1.375	0.688	2.750	1.375	0.625	0.188	4.250	12.000	11.500
6.00	1.750	0.813	3.250	1.375	0.625	0.188	5.250	13.000	12.625

*Note: 1.50" bore has four (4) "AB" holes on "S" dimension.

For dimensions not shown, see page 55.

MS2 (Side Lug): Standard Rod With Rod Lock Mounted

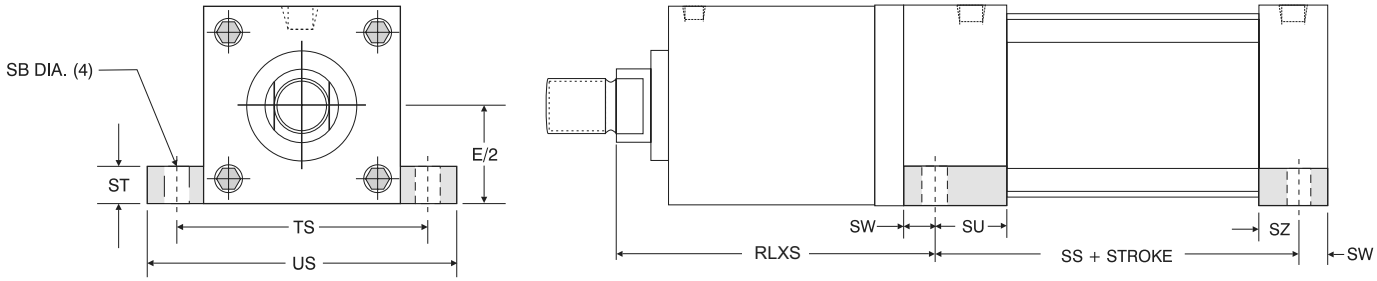


FM Series MS2 Side Lug Mount Dimensions

Bore	Rod Diameter	SB	E/2	ST	SU	SW	SZ	TS	US	RLXS	Add Stroke SS
1.50	0.625	0.438	1.000	0.500	1.125	0.375	0.625	2.750	3.500	4.000	2.875
2.00	0.625	0.438	1.250	0.500	1.125	0.375	0.625	3.250	4.000	4.000	2.875
2.50	0.625	0.438	1.500	0.500	1.125	0.375	0.625	3.750	4.500	4.250	3.000
3.25	1.000	0.563	1.875	0.750	1.250	0.500	0.750	4.750	5.750	5.250	3.250
4.00	1.000	0.563	2.250	0.750	1.250	0.500	0.750	5.500	6.500	5.250	3.250
5.00	1.000	0.813	2.750	1.000	1.063	0.688	0.563	6.875	8.250	5.438	3.125
6.00	1.375	0.813	3.250	1.000	1.313	0.688	0.813	7.875	9.250	6.070	3.625

For dimensions not shown, see page 55.

MS2 (Side Lug): Oversized Rod With Rod Lock Mounted

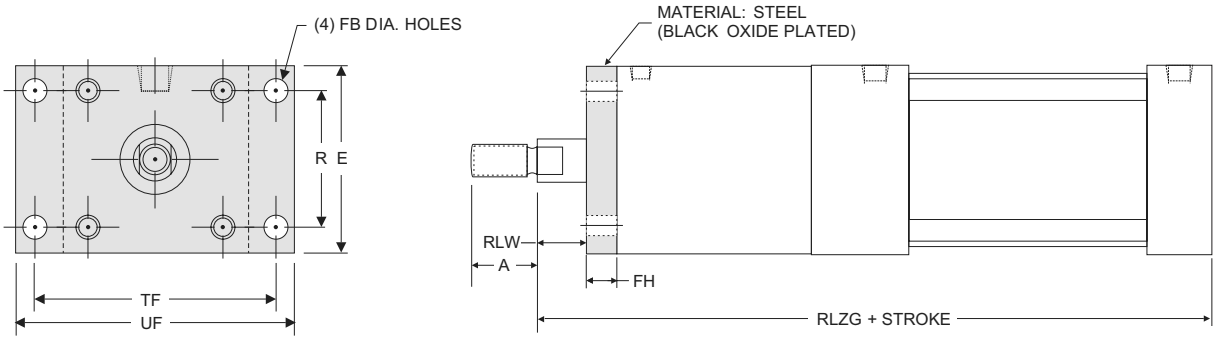


FM Series MS2 Side Lug Mount Dimensions

Bore	Rod Diameter	SB	E/2	ST	SU	SW	SZ	TS	US	RLXS	Add Stroke SS
2.00	1.000	0.438	1.250	0.500	1.125	0.375	0.625	3.250	4.000	5.250	2.875
2.50	1.000	0.438	1.500	0.500	1.125	0.375	0.625	3.750	4.500	5.250	3.000
3.25	1.375	0.563	1.875	0.750	1.250	0.500	0.750	4.750	5.750	6.000	3.250
4.00	1.375	0.563	2.250	0.750	1.250	0.500	0.750	5.500	6.500	6.000	3.250
5.00	1.375	0.813	2.750	1.000	1.063	0.688	0.531	6.875	8.250	6.313	3.125
6.00	1.750	0.813	3.250	1.000	1.313	0.688	0.813	7.875	9.250	6.938	3.625

For dimensions not shown, see page 55.

MF1 (Head Flange): Standard Rod With Rod Lock Mounted

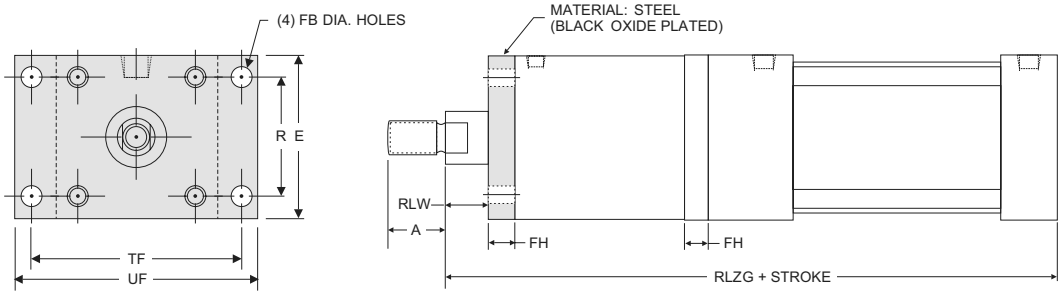


FM Series MF1 Flange Mount Dimensions

Bore	Rod Diameter	A	E	FB	FH	R	RLW	TF	UF	RLZG
1.50	0.625	0.750	2.000	0.313	0.375	1.438	0.625	2.750	3.375	7.625
2.00	0.625	0.750	2.500	0.375	0.375	1.844	0.625	3.375	4.125	7.625
2.50	0.625	0.750	3.000	0.375	0.375	2.188	0.625	3.875	4.625	8.000
3.25	1.000	1.125	3.750	0.438	0.625	2.760	0.750	4.688	5.500	9.625
4.00	1.000	1.125	4.500	0.438	0.625	3.320	0.750	5.438	6.250	9.625
5.00	1.000	1.125	5.500	0.563	0.625	4.100	0.750	6.625	7.625	9.875
6.00	1.375	1.625	6.500	0.563	0.750	4.875	0.875	7.625	8.625	11.125

For dimensions not shown, see page 55.

MF1 (Head Flange): Oversized Rod With Rod Lock Mounted

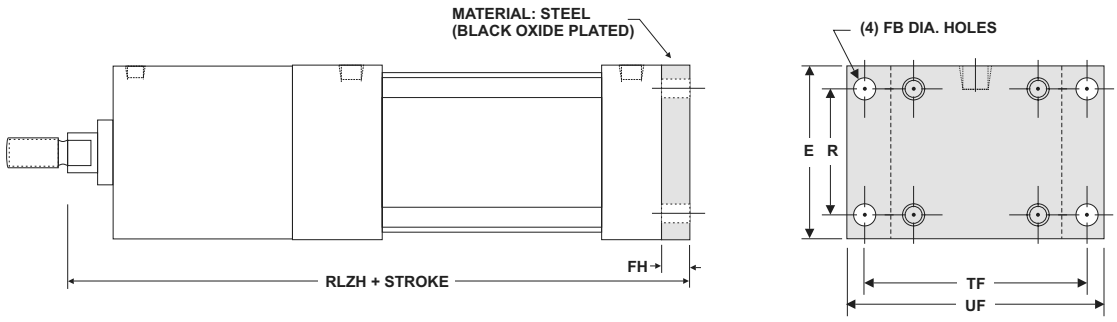


FM Series MF2 Flange Mount Dimensions

Bore	Rod Diameter	A	E	FB	FH	R	RLW	TF	UF	RLZG
2.00	1.000	1.125	2.500	0.375	0.375	1.844	1.000	3.375	4.125	9.125
2.50	1.000	1.125	3.000	0.375	0.375	2.188	1.000	3.875	4.625	9.250
3.25	1.375	1.625	3.750	0.438	0.625	2.760	1.000	4.688	5.500	10.500
4.00	1.375	1.625	4.500	0.438	0.625	3.320	1.000	5.438	6.250	10.500
5.00	1.375	1.625	5.500	0.563	0.625	4.100	1.000	6.625	7.625	10.875
6.00	1.750	2.000	6.500	0.563	0.750	4.875	1.125	7.625	8.625	12.125

For dimensions not shown, see page 55.

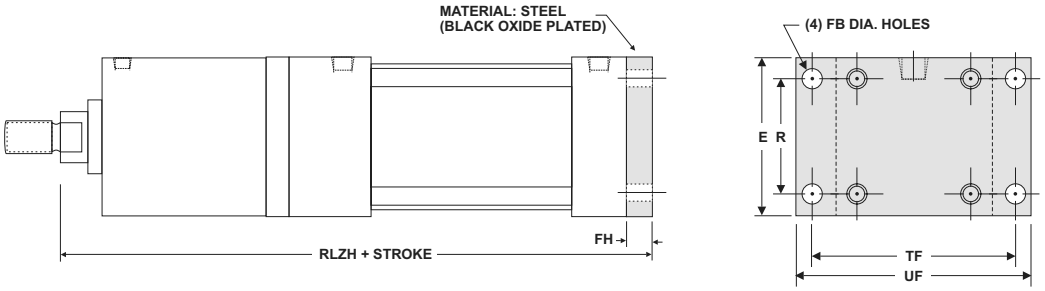
MF2 (Cap Flange): Standard Rod With Rod Lock Mounted



FM Series MF2 Flange Mount Dimensions								
Bore	**Rod Diameter**	**E**	**FB**	**FH**	**R**	**TF**	**UF**	**RLZH**
1.50	0.625	2.000	0.313	0.375	1.438	2.750	3.375	7.625
2.00	0.625	2.500	0.375	0.375	1.844	3.375	4.125	7.625
2.50	0.625	3.000	0.375	0.375	2.188	3.875	4.625	8.000
3.25	1.000	3.750	0.438	0.625	2.760	4.688	5.500	9.625
4.00	1.000	4.500	0.438	0.625	3.320	5.438	6.250	9.625
5.00	1.000	5.500	0.563	0.625	4.100	6.625	7.625	9.875
6.00	1.375	6.500	0.563	0.750	4.875	7.625	8.625	11.125

For dimensions not shown, see page 55.

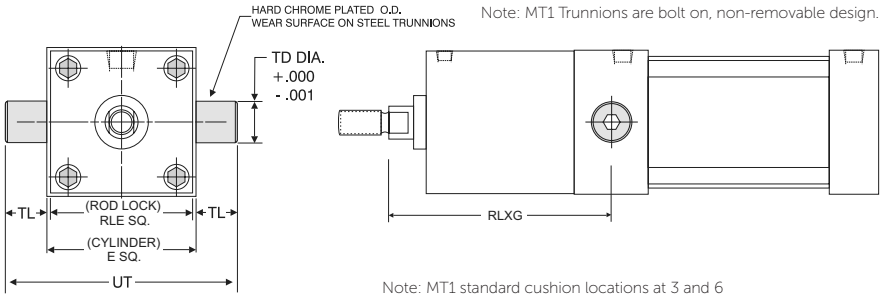
MF2 (Cap Flange): Oversized Rod With Rod Lock Mounted



FM Series MF2 Flange Mount Dimensions								
Bore	**Rod Diameter**	**E**	**FB**	**FH**	**R**	**TF**	**UF**	**RLZH**
2.00	1.000	2.500	0.375	0.375	1.844	3.375	4.125	8.875
2.50	1.000	3.000	0.375	0.375	2.188	3.875	4.625	9.000
3.25	1.375	3.750	0.438	0.625	2.760	4.688	5.500	10.375
4.00	1.375	4.500	0.438	0.625	3.320	5.438	6.250	10.375
5.00	1.375	5.500	0.563	0.625	4.100	6.625	7.625	10.750
6.00	1.750	6.500	0.563	0.750	4.875	7.625	8.625	12.000

For dimensions not shown, see page 55.

MT1 (Head Trunnion): Standard Rod With Rod Lock Mounted



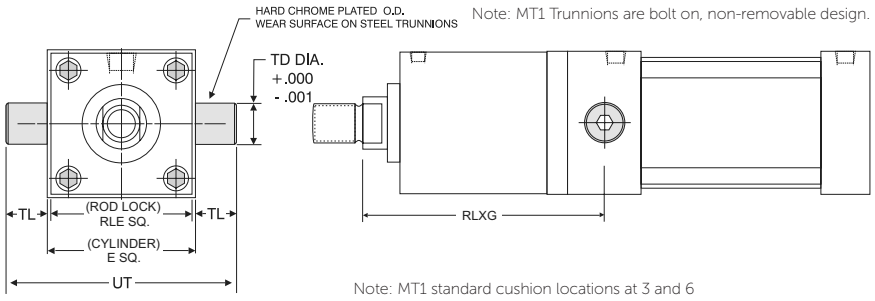
Note: MT1 Trunnions are bolt on, non-removable design.

Note: MT1 standard cushion locations at 3 and 6

FM Series MT1 Head Trunnion and MT2 Cap Trunnion Mount Dimensions							
Bore	**Rod Diameter**	**E**	**RLE**	**TD**	**TL**	**UT**	**RLXG**
1.50	0.625	2.000	1.984	1.000	1.000	4.000	4.375
2.00	0.625	2.500	2.484	1.000	1.000	4.500	4.375
2.50	0.625	3.000	2.984	1.000	1.000	5.000	4.625
3.25	1.000	3.750	3.734	1.000	1.000	5.750	5.625
4.00	1.000	4.500	4.484	1.000	1.000	6.500	5.625
5.00	1.000	5.500	5.484	1.000	1.000	7.500	5.625
6.00	1.375	6.500	6.484	1.375	1.375	9.250	6.375

For dimensions not shown, see page 55.

MT1 (Head Trunnion): Oversized Rod With Rod Lock Mounted



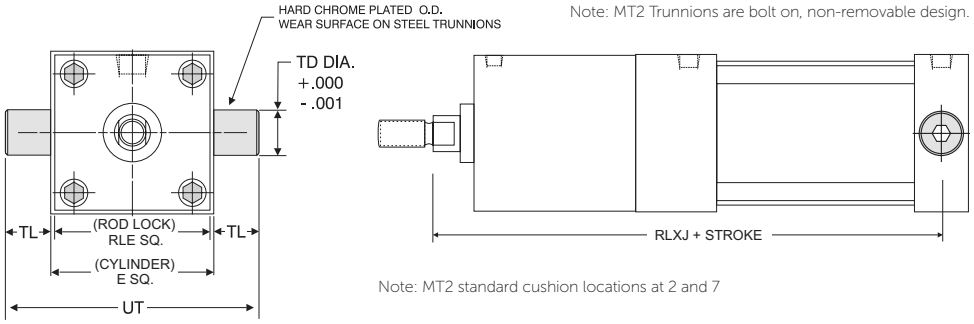
Note: MT1 Trunnions are bolt on, non-removable design.

Note: MT1 standard cushion locations at 3 and 6

FM Series MT1 Head Trunnion and MT2 Cap Trunnion Mount Dimensions							
Bore	**Rod Diameter**	**E**	**RLE**	**TD**	**TL**	**UT**	**RLXG**
2.00	1.000	2.500	2.484	1.000	1.000	4.500	5.625
2.50	1.000	3.000	2.984	1.000	1.000	5.000	5.625
3.25	1.375	3.750	3.734	1.000	1.000	5.750	6.375
4.00	1.375	4.500	4.484	1.000	1.000	6.500	6.375
5.00	1.375	5.500	5.484	1.000	1.000	7.500	6.500
6.00	1.750	6.500	6.484	1.375	1.375	9.250	7.250

For dimensions not shown, see page 55.

MT2 (Cap Trunnion): Standard Rod With Rod Lock Mounted



Note: MT2 Trunnions are bolt on, non-removable design.

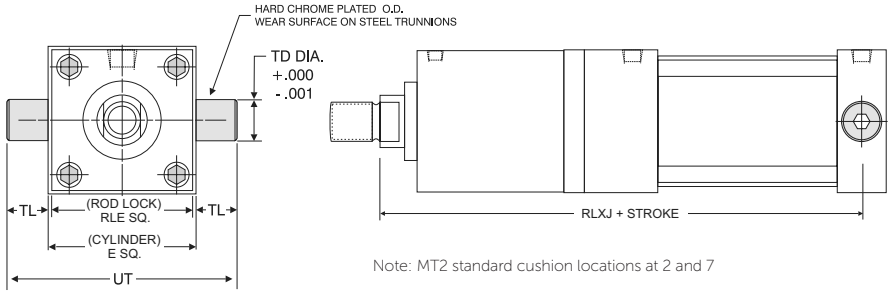
Note: MT2 standard cushion locations at 2 and 7

FM Series MT1 Head Trunnion and MT2 Cap Trunnion Mount Dimensions

Bore	Rod Diameter	E	RLE	TD	TL	UT	Add Stroke RLXJ
1.50	0.625	2.000	1.984	1.000	1.000	4.000	6.750
2.00	0.625	2.500	2.484	1.000	1.000	4.500	6.750
2.50	0.625	3.000	2.984	1.000	1.000	5.000	7.125
3.25	1.000	3.750	3.734	1.000	1.000	5.750	8.375
4.00	1.000	4.500	4.484	1.000	1.000	6.500	8.375
5.00	1.000	5.500	5.484	1.000	1.000	7.500	8.625
6.00	1.375	6.500	6.484	1.375	1.375	9.250	9.625

For dimensions not shown, see page 55.

MT2 (Cap Trunnion): Oversized Rod With Rod Lock Mounted



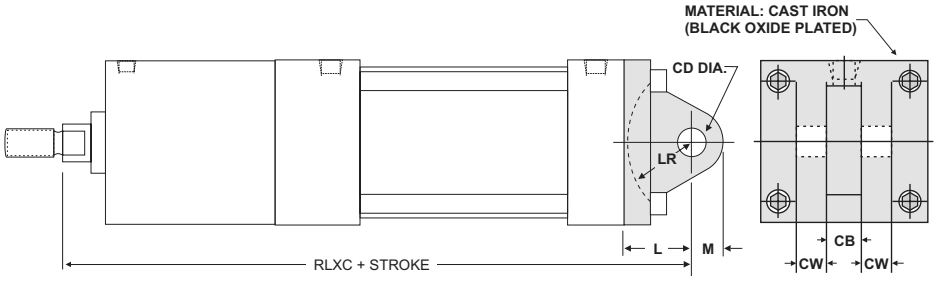
Note: MT2 standard cushion locations at 2 and 7

FM Series MT1 Head Trunnion and MT2 Cap Trunnion Mount Dimensions

Bore	Rod Diameter	E	RLE	TD	TL	UT	Add Stroke RLXJ
2.00	1.000	2.500	2.484	1.000	1.000	4.500	8.000
2.50	1.000	3.000	2.984	1.000	1.000	5.000	8.125
3.25	1.375	3.750	3.734	1.000	1.000	5.750	9.125
4.00	1.375	4.500	4.484	1.000	1.000	6.500	9.125
5.00	1.375	5.500	5.484	1.000	1.000	7.500	9.375
6.00	1.750	6.500	6.484	1.375	1.375	9.250	10.500

For dimensions not shown, see page 55.

MP1 (Detachable Cap Pivot Clevis): Standard Rod With Rod Lock Mounted

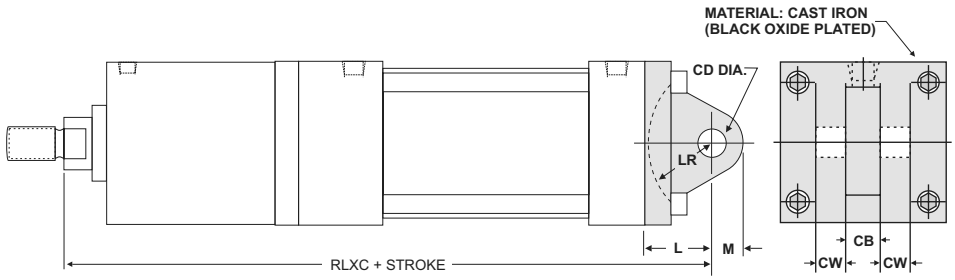


FM Series MP1 Clevis Mount Dimensions								
Bore	Rod Diameter	CB	CD	CW	L	LR	M	Add Stroke RLXC
1.50	0.625	0.750	0.500	0.500	0.750	0.750	0.625	8.000
2.00	0.625	0.750	0.500	0.500	0.750	0.750	0.625	8.000
2.50	0.625	0.750	0.500	0.500	0.750	0.750	0.625	8.375
3.25	1.000	1.250	0.750	0.625	1.250	1.250	0.875	10.250
4.00	1.000	1.250	0.750	0.625	1.250	1.250	0.875	10.250
5.00	1.000	1.250	0.750	0.625	1.250	1.250	0.875	10.500
6.00	1.375	1.500	1.000	0.750	1.500	1.500	1.000	11.875

For dimensions not shown, see page 55.

Clevis pins are provided with pivot mounts.

MP1 (Detachable Cap Pivot Clevis): Oversized Rod With Rod Lock Mounted

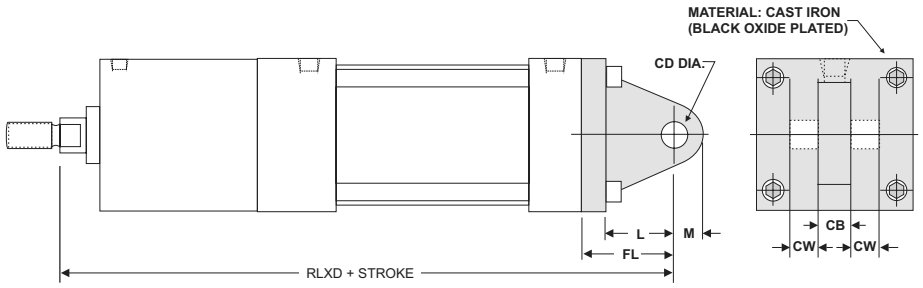


FM Series MP1 Clevis Mount Dimensions								
Bore	Rod Diameter	CB	CD	CW	L	LR	M	Add Stroke RLXC
2.00	1.000	0.750	0.500	0.500	0.750	0.750	0.625	9.250
2.50	1.000	0.750	0.500	0.500	0.750	0.750	0.625	9.375
3.25	1.375	1.250	0.750	0.625	1.250	1.250	0.875	11.000
4.00	1.375	1.250	0.750	0.625	1.250	1.250	0.875	11.000
5.00	1.375	1.250	0.750	0.625	1.250	1.250	0.875	11.375
6.00	1.750	1.500	1.000	0.750	1.500	1.500	1.000	12.750

For dimensions not shown, see page 55.

Clevis pins are provided with pivot mounts.

MP2 (Detachable Cap Pivot Clevis): Standard Rod With Rod Lock Mounted

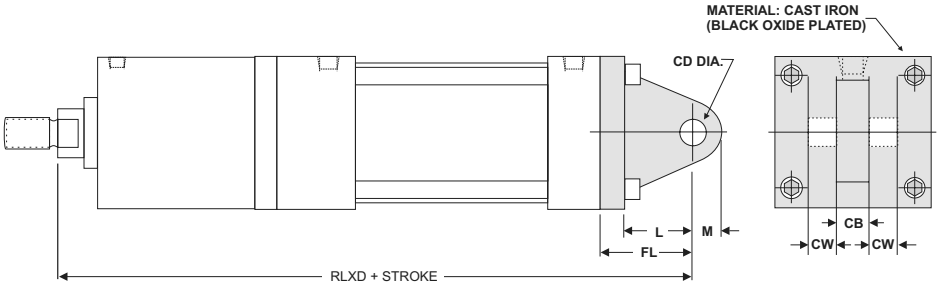


FM Series MP2 Clevis Mount Dimensions								
Bore	Rod Diameter	CB	CD	CW	FL	L	M	Add Stroke RLXD
1.50	0.625	0.750	0.500	0.500	1.125	0.750	0.625	8.375
2.00	0.625	0.750	0.500	0.500	1.125	0.750	0.625	8.375
2.50	0.625	0.750	0.500	0.500	1.125	0.750	0.625	8.750
3.25	1.000	1.250	0.750	0.625	1.875	1.250	0.875	10.875
4.00	1.000	1.250	0.750	0.625	1.875	1.250	0.875	10.875
5.00	1.000	1.250	0.750	0.625	1.875	1.250	0.875	11.125
6.00	1.375	1.500	1.000	0.750	2.250	1.500	1.000	12.625

For dimensions not shown, see page 55.

Clevis pins are provided with pivot mounts.

MP2 (Detachable Cap Pivot Clevis): Oversized Rod With Rod Lock Mounted

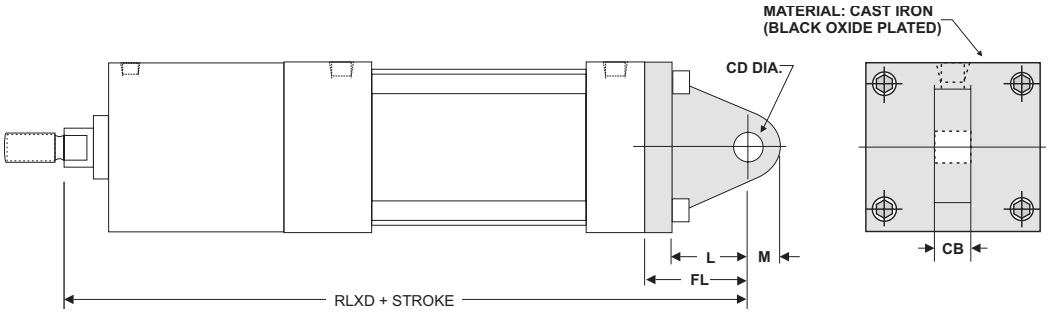


FM Series MP2 Clevis Mount Dimensions								
Bore	Rod Diameter	CB	CD	CW	FL	L	M	Add Stroke RLXD
2.00	1.000	0.750	0.500	0.500	1.125	0.750	0.625	9.625
2.50	1.000	0.750	0.500	0.500	1.125	0.750	0.625	9.750
3.25	1.375	1.250	0.750	0.625	1.875	1.250	0.875	11.625
4.00	1.375	1.250	0.750	0.625	1.875	1.250	0.875	11.625
5.00	1.375	1.250	0.750	0.625	1.875	1.250	0.875	12.000
6.00	1.750	1.500	1.000	0.750	2.250	1.500	1.000	13.500

For dimensions not shown, see page 55.

Clevis pins are provided with pivot mounts.

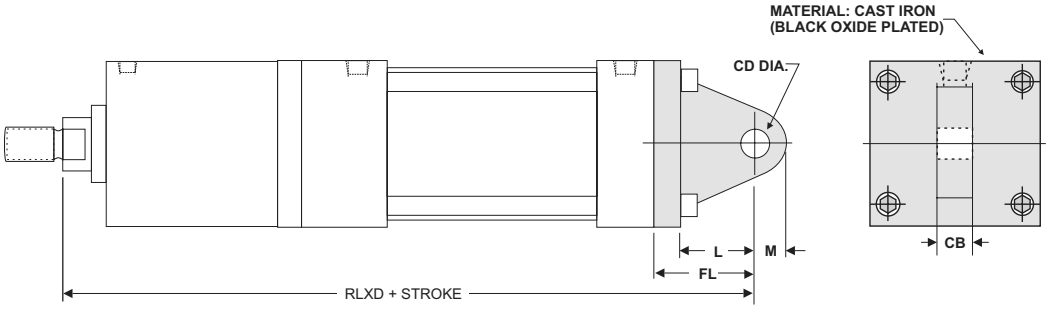
MP4 (Detachable Cap Pivot Eye): Standard Rod With Rod Lock Mounted



FM Series MP4 Rod Eye Mount Dimensions								
Bore	Rod Diameter	CB	CD	CW	FL	L	M	Add Stroke RLXD
1.50	0.625	0.750	0.500	0.500	1.125	0.750	0.625	8.375
2.00	0.625	0.750	0.500	0.500	1.125	0.750	0.625	8.375
2.50	0.625	0.750	0.500	0.500	1.125	0.750	0.625	8.750
3.25	1.000	1.250	0.750	0.625	1.875	1.250	0.875	10.875
4.00	1.000	1.250	0.750	0.625	1.875	1.250	0.875	10.875

For dimensions not shown, see page 55. Clevis pins are provided with pivot mounts.

MP4 (Detachable Cap Pivot Eye): Oversized Rod With Rod Lock Mounted



FM Series MP4 Rod Eye Mount Dimensions								
Bore	Rod Diameter	CB	CD	CW	FL	L	M	Add Stroke RLXD
2.00	1.000	0.750	0.500	0.500	1.125	0.750	0.625	9.625
2.50	1.000	0.750	0.500	0.500	1.125	0.750	0.625	9.750
3.25	1.375	1.250	0.750	0.625	1.875	1.250	0.875	11.625
4.00	1.375	1.250	0.750	0.625	1.875	1.250	0.875	11.625

For dimensions not shown, see page 55. Clevis pins are provided with pivot mounts.

Appendix

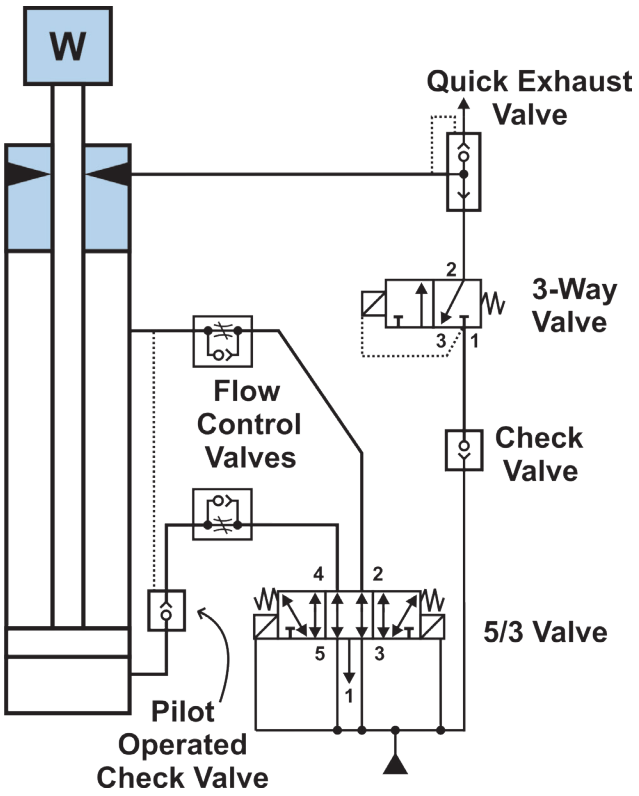
Technical Data: Rod Lock Air Controls

Rod Locks can be used in a wide range of general purpose applications. They are designed to mechanically lock the cylinder piston rod when the air supply (60-150 PSI) is removed. Rod Locks are designed for millions of trouble-free actuations if properly applied. Avoid designs or situations where the rod lock is frequently engaged while the piston rod is in motion. Since Rod Locks have a high degree of rigidity, they can be used in positioning systems. Total Rod Lock play (under loaded conditions) is very low (.000" to .008").

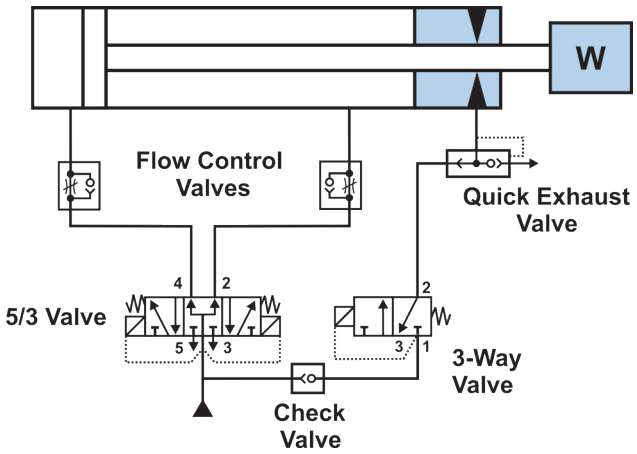
1. **Cylinder Control** – Use a 5/3 valve to extend and retract cylinder with rod lock. A four-way valve or closed center valve can cause the cylinder to lunge before the rod lock is fully released, causing damage to the rod lock or piston rod.
2. **Rod Lock Control** – Use a four-way NC valve to supply 60 - 150 PSI to engage and disengage the rod lock.
3. **Check Valve** – Can be used to isolate three-way valve from drop in supply air during cylinder operation.
4. **Air Regulator** – Can be used in vertical applications to offset the cylinder displacement differential between the rod end and cap end. They can also be used to help balance or counter the effects of gravity on the load.
5. **Quick Exhaust Valve** – Can be used to accelerate the rod lock response time for maximum performance. Typical rod lock response time is 200ms.
6. **E-Stop** – Rod locks can be used in E-Stop applications provided the design calls for infrequent actuation of rod lock while the cylinder rods are in motion.
7. **Manual Override** – A three-way valve can be added to the control circuits below to act as a manual override for tooling set-up or adjustments.

Consult your local distributor (or fluid power specialist) for proper air circuit design. Avoid situations where the cylinder can lunge on power up or cycling.

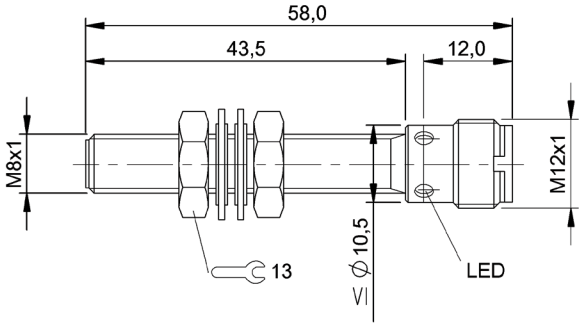
Vertical Application



Horizontal Application



Rod Lock Proximity Switch: Option P



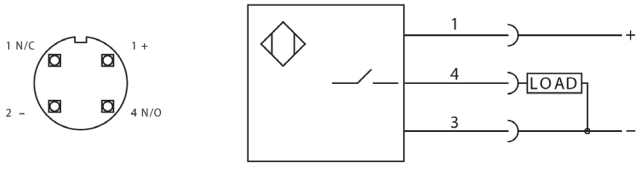
An inductive proximity switch (with M12x1 thread) can be used to sense the rod lock unclamped condition. Jam nuts are included and the switch is shipped unassembled (unthreaded) from the rod lock.

Balluff Model: BES M08EH-PSC15B-S04G

Electrical Data	Substitute
Connection type:	**Connector**
Effective operating current Ie:	**200 mA**
Effective operating voltage Ue DC:	**24.0 V**
Electrical version:	**DC, direct current**
Load capacitance max. (at Ue):	**0.500 µF**
Max. no-load cur. Io undamped:	**3.0 mA**
Minimum operating current Im:	**0 mA**
No-load current Io damped max.:	**9.0 mA**
Operating voltage UB max. DC [V]:	**30.0 V**
Operating voltage UB min. DC [V]:	**10.0 V**
Rated insulation voltage Ui:	**250 VAC**
Rated short circuit current:	**100 A**
Ripple max. (% of Ue):	**15%**
Switching freq. f max. (at Ue):	**3000 Hz**
Switching function:	**Normally open (NO)**
Switching output:	**PNP**
Voltage drop static max.:	**2.5 V**

Mechanical Data	Substitute
Ambient temperature Ta max.	**70°C**
Ambient temperature Ta min.	**-25°C**
Assured operating distance Sa	**1.20 mm**
Connector type	**M12x1-S04**
Depth	**58.0 mm**
Diameter d1	**M08x1**
Effective operating distance Sr	**1.50 mm**
Housing material	**Stainless steel**
Mech. Installation condition	**Flush (shielded)**
Mounting length	**43.0 mm**
Rated operating distance Sn [mm]	**1.50 mm**
Sensing face material	**PBT**
Tightening torque	**8 Nm (6 FT-Lbs)**
Function indicator	**Yes**
Function display	**LED**
Polarity reversal protected	**Yes**
Short circuit protected	**Yes**

Wiring Connections: PNP Normally Open



Proximity Switch Setting Instructions

1. Set the rod lock to the unclamped "pressure applied" position.
2. Screw the proximity switch (with jam nuts) into the designated M8x1 proximity switch hole until it contacts the position flange.
3. Unscrew (back off) the proximity switch approximately 3/4 turn. While holding the proximity switch in the set position, tighten the locking nut using 6 ft/lbs of torque. Final adjustment may be necessary to achieve desired results.
4. With the electrical power in the "off" position, connect the electrical wiring per the wiring diagram supplied with the switch. After the electrical power has been turned on, the proximity switch should indicate that the rod lock is in the unclamped position.

Notes: Ensure that the electrical power has been turned off before making adjustments. The locking nut should be tightened to a maximum of 15 ft/lbs of torque to prevent damage to the internal components of the switch. If sealing the unit for food or chemical service, make sure to include optional sealing ring.

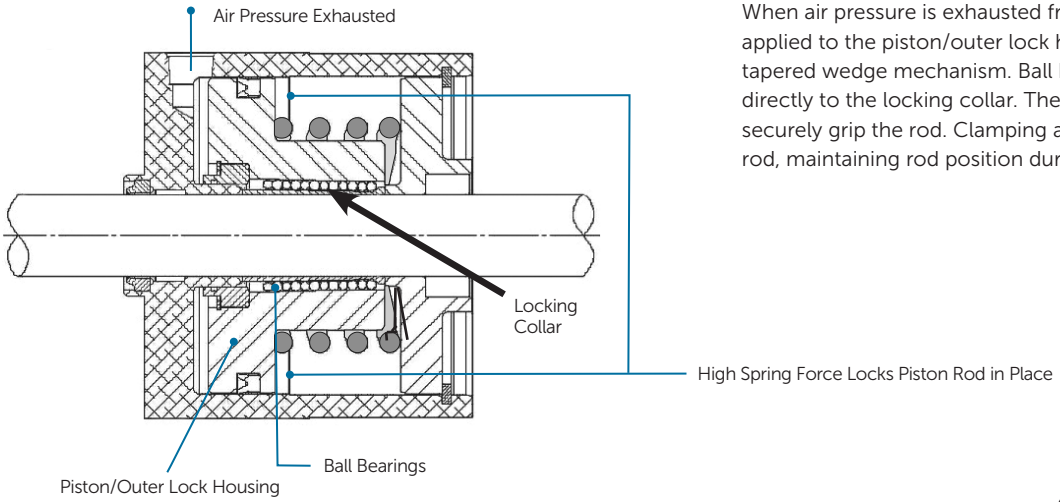
The IMI Difference

IMI's floating rod bushing design and 'RL' Series Rod Lock = OPTIMIZED RESULTS and SUPERIOR PERFORMANCE.

For rod locks to achieve the rated holding force and maximize cycle life, good alignment must be maintained between the locking mechanism and cylinder rod. IMI's Floating Rod Bushing design and accurate rod lock alignment ensure superior performance and trouble-free operation.

Rod Locks are used to hold linear cylinder loads stationary in any mounting orientation. Units will lock in both directions to rated holding force. They are not designed to withstand rotational loads or to brake the load in dynamic applications. Units are commonly used in work holding applications and for locking tools or fixtures in the event of air pressure loss. They are very common in positioning systems since they will hold the cylinder position very rigidly. Units are also common in emergency stop (E-Stop) applications.

Operating Principle

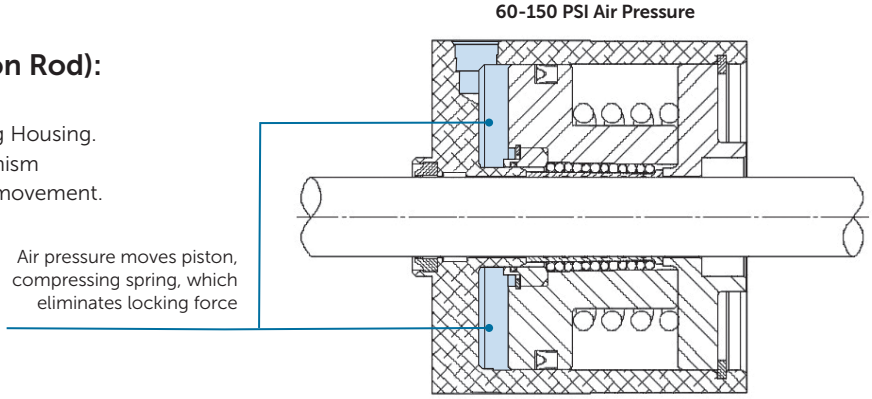


Clamping (Locked) Condition

When air pressure is exhausted from rod lock, high spring force is applied to the piston/outer lock housing, which utilizes an ultra-fine tapered wedge mechanism. Ball bearings transfer the spring force directly to the locking collar. The locking collar is designed to flex and securely grip the rod. Clamping action does not move or disturb the rod, maintaining rod position during actuation.

Unclamped Condition (Free Moving Piston Rod):

When air pressure is applied to rod lock, the air pressure overcomes the spring force, moving Piston/Outer Locking Housing. This movement provides clearance in the tapered mechanism allowing the Locking Collar to relax and provide free rod movement.



Rod Lock Installation Instructions

1. Apply constant air supply to rod lock port (60-150 PSI).
2. Remove shipping arbor from inside rod lock. Save for future use.
3. Remove excess grease and dirt from cylinder piston rod. Slide rod lock onto piston rod, using care not to damage seals or bearings.
4. Align rod lock to cylinder so that unit is square and flush. Make sure that the cylinder is at least 1/2" extended.
5. Remove 60-150 PSI air supply to rod lock.
6. Fasten rod lock to cylinder using four (4) sleeve nuts & rods. Tighten sleeve nuts a little at a time, in a clockwise rotation, finishing with the proper torque specification.
7. Cycle Rod Lock by applying 60-150 PSI to rod lock port, then removing 60-150 PSI pressure; cycle several times in this manner.
8. Apply constant 60-150 PSI air supply to rod lock, then hand cycle the cylinder piston rod to check for proper alignment.
9. If cylinder piston rod does not move freely, remove rod lock and repeat Installation Instructions. If the piston rod still drags or is difficult to move, check the squareness of the Rod Lock to the cylinder.

Note: Faulty alignment will cause rod damage, cylinder failure and may drastically reduce holding force.

Sleeve Nut Torque Specs	
Bore	Torque (Ft/Lbs)
1.50	**5 - 7**
2.00	**12 - 14**
2.50	**12 - 14**
3.25	**30**
4.00	**35**
5.00	**45**
6.00	**50**

WARNING

UNIT CONTAINS HIGH SPRING FORCE

DO NOT DISASSEMBLE – INJURY MAY OCCUR

Return to IMI for service

Refer to Rod Lock Catalog or visit **www.Bimba.com** for complete instructions on proper use of rod lock.

DO NOT REMOVE 60-150 PSI AIR SUPPLY TO ROD LOCK WHEN DISASSEMBLED FROM CYLINDER. PERMANENT DAMAGE MAY OCCUR.

Safety Information

DANGER

IF PERSONAL SAFETY IS REQUIRED, AN UNRELATED, REDUNDANT SAFETY SYSTEM IS REQUIRED TO PREVENT BODILY INJURY

WARNING

DO NOT DISASSEMBLE ROD LOCK-UNIT CONTAINS HIGH SPRING FORCE.

Return to IMI for service.

WARNING

ROD LOCKS SHOULD BE INSTALLED, OPERATED AND MAINTAINED BY QUALIFIED PERSONNEL ONLY.
UNITS SHOULD BE CHECKED PERIODICALLY FOR PROPER HOLDING FORCE.

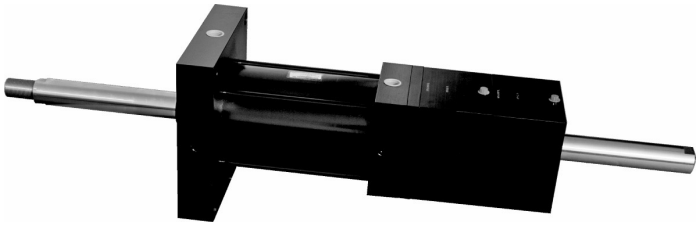
General Information

One (or more rod locks) can be used on the same shaft or cylinder. Two units when combined will double the holding force. Steel cylinders should be considered in all high-load applications.

Rod locks are designed for static applications (rod not moving while engaging rod lock) and are suitable for infrequent dynamic braking (E-Stop) when used with proper shafting materials. Repeated dynamic stops may cause rod and seal damage and/or rod lock wear resulting in reduced life or holding force.

Filtered and dry air is important for proper rod lock functioning. Debris or moisture inside the rod lock may inhibit performance and/or shorten the life of the unit. Rod locks are pre-lubricated for life, no additional air lubrication is required.

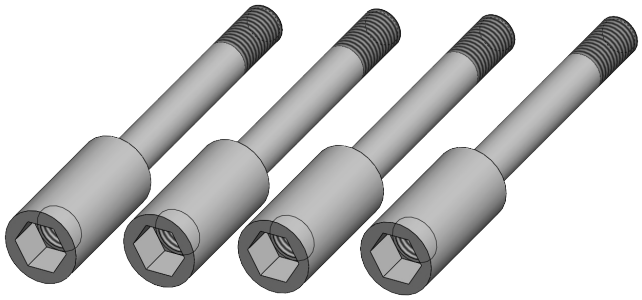
The rod which the rod lock engages (clamps) must be kept clean and dry for optimum holding force.



The rod lock requires a minimum of 60 PSI to fully release. A low PSI condition (below 60 PSI) may cause the rod lock to drag on the rod, causing damage to the rod. Care should be taken to eliminate low PSI conditions.

Rod locks are intended for use with industrial compressed air systems within the operation specifications.

Rod Lock



Mounting Kit

Rod Lock Part List					
Bore	**Rod Diameter**	**Rod Lock Model (Rod Lock & Mounting Kit)**	**Rated Holding Force (Lbs.)**	**Rod Lock Only**	**Mounting Kit Only**
1.50	0.625	RL-063150	200	RL-063150-1	MK-063150
2.00	0.625	RL-063200	500	RL-063200-1	MK-063200
	1.000	RL-100200	350	RL-100200-1	MK-100200
2.50	0.625	RL-063250	650	RL-063250-1	MK-063250
	1.000	RL-100250	650	RL-100250-1	MK-100250
3.25	1.000	RL-100325	1000	RL-100325-1	MK-100325
	1.375	RL-138325	1000	RL-138325-1	MK-138325
4.00	1.000	RL-100400	1550	RL-100400-1	MK-100400
	1.375	RL-138400	1550	RL-138400-1	MK-138400
5.00	1.000	RL-100500	2150	RL-100500-1	MK-100500
	1.375	RL-138500	2150	RL-138500-1	MK-138500
6.00	1.375	RL-138600	2850	RL-138600-1	MK-138600
	1.750	RL-175600	2850	RL-175600-1	MK-175600

Notes: Holding Force – The minimum rating over the entire life of the rod lock.

Initial actual holding forces are higher.

DO NOT disassemble rod lock – UNIT CONTAINS HIGH SPRING FORCE. Return to IMI Bimba for service.

Replacement Rod Locks are shipped with a steel shaft. DO NOT remove 60-150 PSI supply air to Rod Lock without steel shaft or cylinder rod in place – permanent damage to Rod Lock may occur.

Warning

Improper selection, misuse, age or malfunction of components used in systems can cause failure in various modes. The system designer is warned to consider the failure modes of all component parts and to provide adequate safeguards to prevent personal injury or damage to equipment or property in the event of such failure modes. System designers and end users are cautioned to consult instruction sheets and specifications available from the factory. The system designer/end user is responsible for verifying that all requirements for the application are met.

Warranty

The products described herein are warranted subject to seller's Standard Terms and Condition of Sale, available at seller's website.

Proposition 65: These products may contain chemicals known to the state of California to cause cancer, or birth defects, or other reproductive harm.