NASON

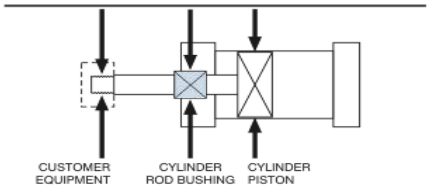
NEW THINKING

CRN Series - Corrosion Resistant Nason

CORROSION RESISTANT NASON 'CRN' : CONSTRUCTION

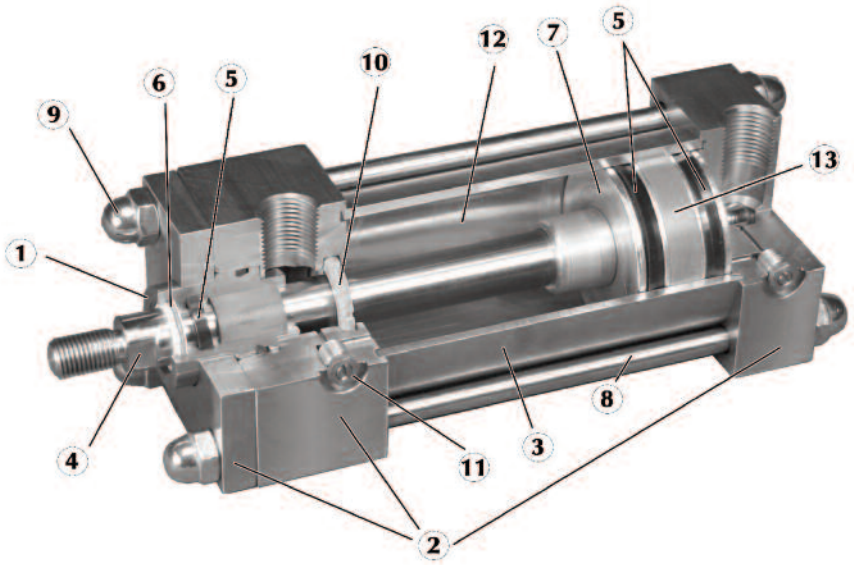
Floating Rod Bushing

SELF ALIGNMENT FEATURE
Rod Bushing is designed to float .002", improving bearing surface alignment.



- ***Reduces cylinder drag and erractic operation***
- ***Reduces cylinder wear***
- ***Provides a minimum of 25% longer life than "fixed" Rod Bushing designs***

Ideal for:
- Food Processing Applications
- Chemical, Medical or Pharmaceutical
- Offshore or Marine Equipment
- Energy Production or Waste Treatment



① ***FLOATING ROD BUSHING*** – Precision machined from 303 stainless steel, extra-long PTFE composite wear band for extended service.

② ***HEAD, CAP & RETAINER*** – 100% Precision machined from highly corrosion resistant 303 stainless steel bar for tough and corrosive environments.

③ ***CYLINDER TUBE*** – Precision machined and honed from 304 stainless steel, providing smooth consistent operation.

④ ***PISTON ROD*** – Drawn, ground and polished high yield 303 stainless steel, Hard Chrome plated.

⑤ ***PISTON & ROD SEALS*** – Heavy lip design Carboxilated Nitrile construction. Seals are pressure activated and wear compensating for long life.

⑥ ***ROD WIPER*** – PTFE scraper design for maximum compatibility with wash-down and chemical solutions (FDA approved material).

⑦ ***PISTON*** – Precision machined from 6061-T651 alloy aluminum, provides an excellent bearing surface for extended cylinder life. (Optional: Stainless Steel with PTFE wear band)

⑧ ***TIE RODS*** – Drawn and ground 303 high strength stainless steel, rolled threads for maximum strength.

⑨ ***ACORN NUTS*** – 304 Stainless steel, eliminates exposed threads for food grade applications.

⑩ ***CUSHIONS*** – (Options H & C) Floating cushion seal designed for maximum cushion performance, quick return stroke break-away and extended life.

⑪ ***CUSHION ADJUSTMENT NEEDLE*** - 303 stainless steel design has fine thread metering and is positively captured to prevent needle ejection during adjustment.

⑫ ***LUBRICATION*** - Permanently lubricated with Magna-Lube G PTFE based grease on all internal components. This lubricant is a non-migratory type high performance grease, providing outstanding service for life. (no additional lubrication is required)

⑬ ***PISTON WEAR BAND*** - 90% Virgin PTFE and 10% Polyphenylene Sulfide filled wear band; 65,000 PSI Compressive Strength; extremely low wear rate.

OPERATING PRESSURE	250 PSI AIR (17 BAR) 400 PSI Hydraulic (27 BAR) ("TH" Option)

OPERATING TEMPERATURE	Carboxilated Nitrile: -20°F to 200°F (-25°C to 90°C) Fluorocarbon: 0°F to 400°F (-20°C to 200°C)

Performance options:

- ***FDAL*** – FDA approved lubricant, rated for 0°F to 300°F (-20°C to 150°C)
- ***DRB*** – Solid Delrin® Rod Bushing (FDA approved) for extra long life under "high pressure" wash-down applications. This bearing material requires ZERO lubrication due to self lubricating properties.
- ***VS*** – Fluorocarbon seals provide a higher chemical resistance to most wash-down solutions.
- ***SSP*** – Solid Stainless Steel Piston provides maximum corrosion resistance and FDA approval for food contact. (PTFE wear band standard)

SERIES 'CRN': HOW TO ORDER

CRN - MX0 __ - 1.50 X 1.00 - H1C5 - BP - KK3 - MPR - OP = PORTS AT 3 & 7

SERIES	
CRN	250 PSI AIR

NFPA MOUNTS	
MX0	NO MOUNT (1.50" - 8".00 BORE)
MP1	REAR PIVOT CLEVIS (1.50" - .8.00" BORE)
MP4	REAR PIVOT EYE (1.50" - 6.00" BORE)
MT1	FRONT TRUNNION (1.50" - 8.00" BORE)
MT2	REAR TRUNNION (1.50" - 8.00" BORE)
MX1	EXTENDED TIE-RODS (HEAD & CAP) (1.50" - 8.00" BORE)
MX2	EXTENDED TIE-RODS (CAP) (1.50" - 8.00" BORE)
MX3	EXTENDED TIE-RODS (HEAD) (1.50" - 8.00" BORE)
MF1	FRONT FLANGE (1.50" - 6.00" BORE)
MF2	REAR FLANGE (1.50" - 6.00" BORE)
ME3	FRONT MOUNTING HOLES (8.0.0" BORE)
ME4	REAR MOUNTING HOLES (8.00" BORE)
MS2	SIDE LUG (1.50" - 8.00" BORE)
MS4	BOTTOM TAPPED HOLES (1.50" - 8.00" BORE)

STYLE
SINGLE ROD (LEAVE BLANK)
D = DOUBLE ROD END

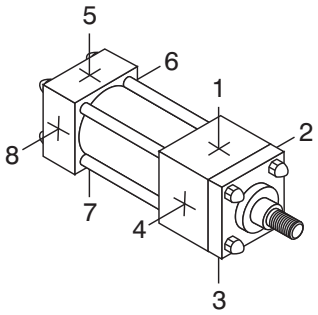
BORE
1.50
2.00
2.50
3.25
4.00
5.00
6.00
8.00

STROKE
0" TO 120" CONSULT FACTORY FOR OTHER STROKES

CUSHIONS
H = HEAD CUSHION POSITION 2 STANDARD SPECIFY FOR POSITIONS 1, 3 OR 4
C = CAP CUSHION POSITION 6 STANDARD SPECIFY FOR POSITIONS 5, 7 OR 8

OPTIONS	
A / O	AIR / OIL PISTON
B**	.25" URETHANE BUMPER BOTH ENDS
BH**	.25" URETHANE BUMPER HEAD ONLY
BC**	.25" URETHANE BUMPER CAP ONLY
BP	BUMPER PISTON SEAL (1.50" - 5.00" BORE)
"A"-	EXTENDED PISTON ROD THREAD (SPECIFY)
"C"-	EXTENDED PISTON ROD (SPECIFY)
DRB	DELRIN® ROD BUSHING
FDAL	FDA APPROVED LUBRICANT
KK2	INTERMEDIATE MALE ROD THREAD
KK3	FEMALE ROD THREAD
KK3S	STUDDED PISTON ROD (WITH KK3)
KK4	FULL DIAMETER MALE ROD THREAD
LF	LOW FRICTION, 250 PSI AIR
MPR	MAGNETIC PISTON FOR REED SWITCHES
MPH	MAGNETIC PISTON FOR HALL SWITCHES
MS	METALLIC ROD SCRAPER (BRASS)
NR	NON-ROTATING
OP	OPTIONAL PORT LOCATION
OS	OVERSIZED ROD DIAMETER (SPECIFY SIZE)
SE	SPRING EXTEND (CONSULT FACTORY)
SR	SPRING RETURN (CONSULT FACTORY)
SSP	STAINLESS STEEL PISTON (WITH WEARBAND)
ST	STOP TUBE (SPECIFY LENGTH)
TH	400 PSI HYDRAULIC, NON-SHOCK
VS	FLUOROCARBON SEALS
AS	ADJUSTABLE STROKE (RETRACT)
XX	SPECIAL VARIATION (SPECIFY)
	BSP, SAE PORTS (SPECIFY SIZE)

** BUMPERS ADD 0.250" PER END TO CYLINDER LENGTH



STANDARD PORT AND CUSHION ADJUSTMENT POSITIONS

- Ports - Positions 1 and 5
- Cushion Adjustment - Positions 2 and 6
- Specify Non-Standard Positions When Ordering

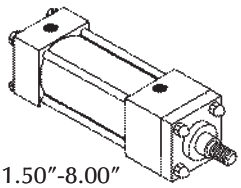
About our Part Number System

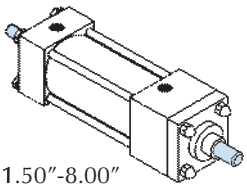
- Simple, easy to understand
- No excessive codes!
- Eliminates mistakes when ordering

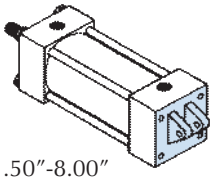
Example: A 2.50" Bore by 10" Stroke, Front Flange Mount, Head & Cap Cushions

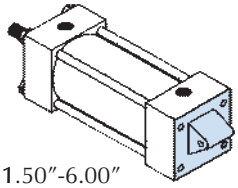
Part Number: CRN-MF1-2.50 x 10-HC

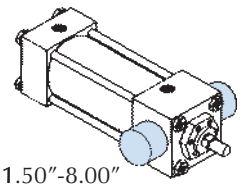
NFPA MOUNTS

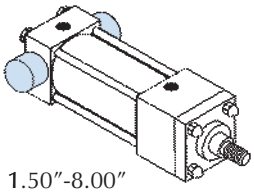
MXO

1.50"-8.00" Bores Page 74 FO

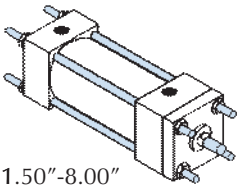
MXOD

1.50"-8.00" Bores Page 78-FO

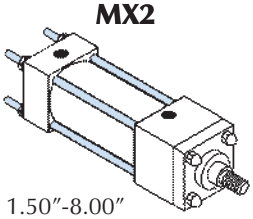
MP1

1.50"-8.00" Bores Page 75

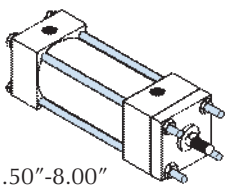
MP4

1.50"-6.00" Bores Page 75

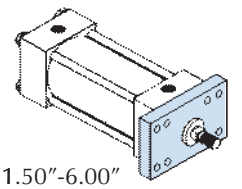
MT1

1.50"-8.00" Bores Page 75

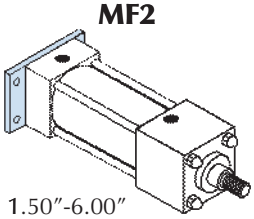
MT2

1.50"-8.00" Bores Page 75

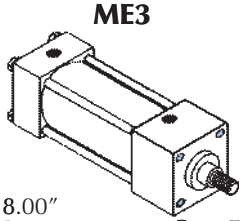
MX1

1.50"-8.00" Bores Page 76

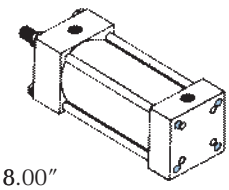
MX2

1.50"-8.00" Bores Page 76

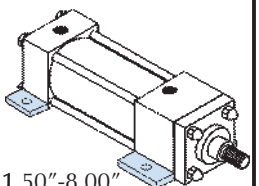
MX3

1.50"-8.00" Bores Page 76

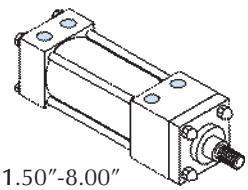
MF1

1.50"-6.00" Bores Page 76

MF2

1.50"-6.00" Bores Page 76

ME3

8.00" Bore Page 76

ME4

8.00" Bore Page 76

MS2

1.50"-8.00" Bores Page 77

MS4

1.50"-8.00" Bores Page 77

SERIES 'CRN' DIMENSIONS: BASIC CYLINDER (NO MOUNT)

About Rod End Styles

Style 1 Male Rod End is STANDARD

Other NFPA Styles can be specified (See Chart).

Need a rod end not listed?
NO PROBLEM! Each Piston Rod is made to order and does not delay shipment. Coarse (UNC) threads, Metric threads or just plain rod ends are common. Thread lengths are also made to order (Specify: "A"=Length).

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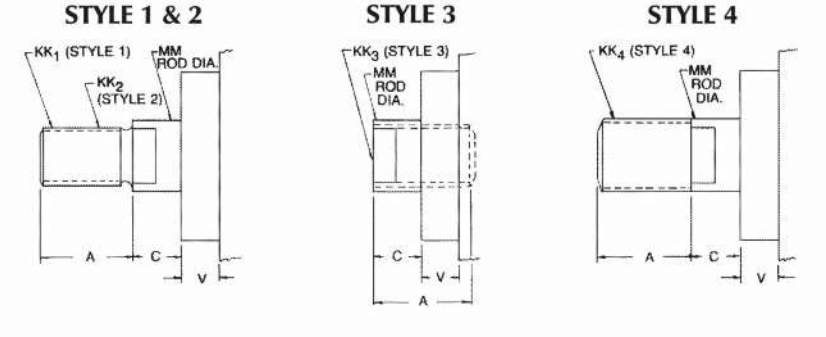
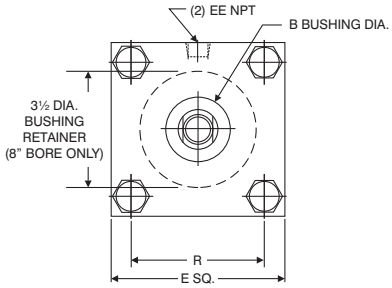
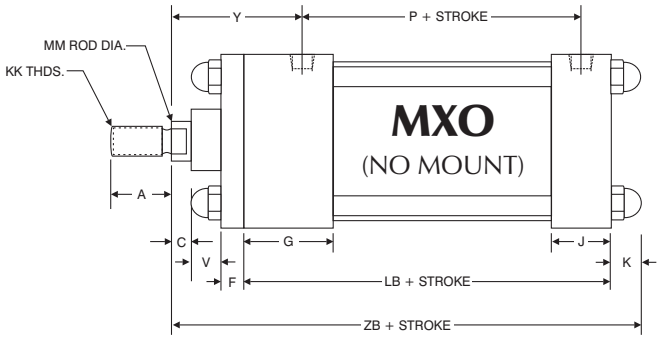
PISTON ROD END STYLES



BORE	MM ROD DIAMETER	STANDARD STYLE 1 - MALE KK1	STANDARD STYLE 1 - MALE A	OPTIONAL STYLE 2 - MALE KK2	OPTIONAL STYLE 2 - MALE A	OPTIONAL STYLE 3 - FEMALE KK3	OPTIONAL STYLE 3 - FEMALE A	OPTIONAL STYLE 4 - MALE KK4	OPTIONAL STYLE 4 - MALE A	C	V
1.50, 2.00, 2.50	0.625 Standard	7/16 -20	0.750	0.500-20	0.750	7/16 -20	0.750	5/8 -18	0.750	0.375	0.250
	1.000 Oversize	3/4 -16	1.125	0.875-14	1.125	3/4 -16	1.125	1 -14	1.125	0.500	0.500
3.25, 4.00, 5.00	1.000 Standard	3/4 -16	1.125	0.875-14	1.125	3/4 -16	1.125	1 -14	1.125	0.500	0.250
	1.375 Oversize	1 -14	1.625	1.250-12	1.625	1 -14	1.625	1 3/8 -12	1.625	0.625	0.375
6.00 & 8.00	1.375 Standard	1 -14	1.625	1.250-12	1.625	1 -14	1.625	1 3/8 -12	1.625	0.625	0.375
	1.750 Oversize	1 1/4 -12	2.000	1.500-12	2.000	1 1/4 -12	2.000	1 3/4 -12	2.000	0.750	0.500





BASIC DIMENSIONS 'MXO' STANDARD & OVERSIZED RODS																	
BORE	ROD DIAMETER	A	B	C	E	EE	F	G	J	K	KK	LB	MM	P	R	V	Y	ZB
1.50	0.625 Standard	0.750	1.125	0.375	2.000	0.375	0.375	1.500	1.000	0.438	7/16 -20	3.625	0.625	2.375	1.430	0.250	1.875	5.063
	1.000 Oversize	1.125	1.500	0.500							3/4 -16		1.000			0.500	2.250	5.438
2.00	0.625 Standard	0.750	1.125	0.375	2.500	0.375	0.375	1.500	1.000	0.563	7/16 -20	3.625	0.625	2.375	1.840	0.250	1.875	5.188
	1.000 Oversize	1.125	1.500	0.500							3/4 -16		1.000			0.500	2.250	5.563
2.50	0.625 Standard	0.750	1.125	0.375	3.000	0.375	0.375	1.500	1.000	0.563	7/16 -20	3.750	0.625	2.500	2.190	0.250	1.875	5.313
	1.000 Oversize	1.125	1.500	0.500							3/4 -16		1.000			0.500	2.250	5.688
3.25	1.000 Standard	1.125	1.500	0.500	3.750	0.500	0.625	1.750	1.250	0.625	3/4 -16	4.250	1.000	2.750	2.760	0.250	2.375	6.250
	1.375 Oversize	1.625	2.000	0.625							1 -14		1.375			0.375	2.625	6.500
4.00	1.000 Standard	1.125	1.500	0.500	4.500	0.500	0.625	1.750	1.250	0.625	3/4 -16	4.250	1.000	2.750	3.320	0.250	2.375	6.250
	1.375 Oversize	1.625	2.000	0.625							1 -14		1.375			0.375	2.625	6.500
5.00	1.000 Standard	1.125	1.500	0.500	5.500	0.500	0.625	1.750	1.250	0.813	3/4 -16	4.500	1.000	3.000	4.100	0.250	2.375	6.625
	1.375 Oversize	1.625	2.000	0.625							1 -14		1.375			0.375	2.625	6.875
6.00	1.375 Standard	1.625	2.000	0.625	6.500	0.750	0.750	2.000	1.500	0.813	1 -14	5.000	1.375	3.250	4.880	0.250	2.750	7.375
	1.750 Oversize	2.000	2.375	0.750							1 1/4 -12		1.750			0.375	3.000	7.625
8.00	1.375 Standard	1.625	2.000	0.625	8.500	0.750	0.625	2.000	1.500	1.000	1 -14	5.125	1.375	3.375	6.440	0.375	2.750	7.750
	1.750 Oversize	2.000	2.375	0.750							1 1/4 -12		1.750			0.500	3.000	8.000

BASE DIMENSION FOLD OUT

EASY FLIP OUT PAGE FOR REFERENCE

SERIES 'CRN' DIMENSIONS: BASIC CYLINDER (NO MOUNT)

About Rod End Styles

Style 1 Male Rod End is STANDARD

Other NFPA Styles can be specified (See Chart).

Need a rod end not listed?
NO PROBLEM! Each Piston Rod is made to order and does not delay shipment. Coarse (UNC) threads, Metric threads or just plain rod ends are common. Thread lengths are also made to order (Specify: "A"=Length).

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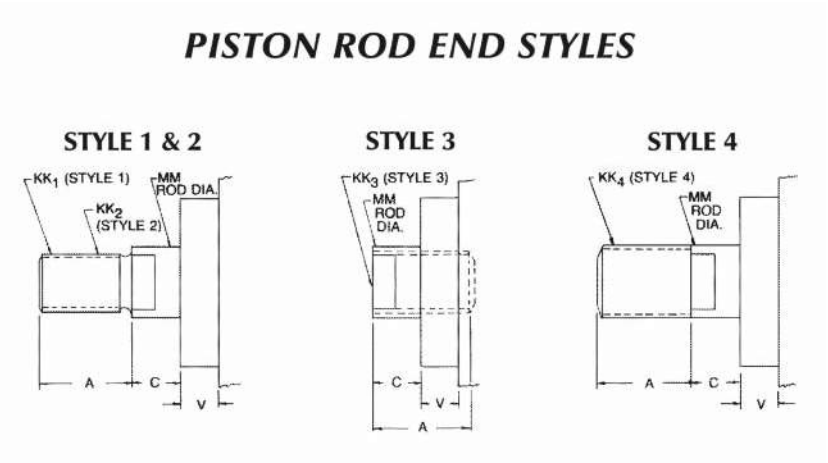
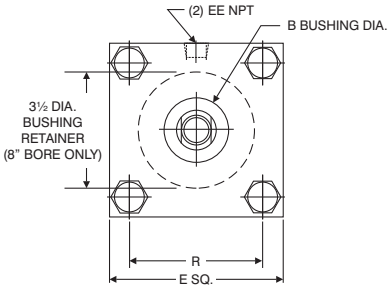
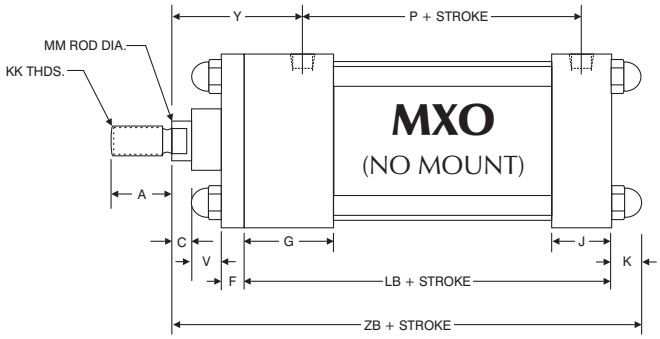
PISTON ROD END STYLES



BORE	MM ROD DIAMETER	STANDARD STYLE 1 - MALE KK1	STANDARD STYLE 1 - MALE A	OPTIONAL STYLE 2 - MALE KK2	OPTIONAL STYLE 2 - MALE A	OPTIONAL STYLE 3 - FEMALE KK3	OPTIONAL STYLE 3 - FEMALE A	OPTIONAL STYLE 4 - MALE KK4	OPTIONAL STYLE 4 - MALE A	C	V
1.50, 2.00, 2.50	0.625 Standard	7/16 -20	0.750	0.500-20	0.750	7/16 -20	0.750	5/8 -18	0.750	0.375	0.250
	1.000 Oversize	3/4 -16	1.125	0.875-14	1.125	3/4 -16	1.125	1 -14	1.125	0.500	0.500
3.25, 4.00, 5.00	1.000 Standard	3/4 -16	1.125	0.875-14	1.125	3/4 -16	1.125	1 -14	1.125	0.500	0.250
	1.375 Oversize	1 -14	1.625	1.250-12	1.625	1 -14	1.625	1 3/8 -12	1.625	0.625	0.375
6.00 & 8.00	1.375 Standard	1 -14	1.625	1.250-12	1.625	1 -14	1.625	1 3/8 -12	1.625	0.625	0.375
	1.750 Oversize	1 1/4 -12	2.000	1.500-12	2.000	1 1/4 -12	2.000	1 3/4 -12	2.000	0.750	0.500





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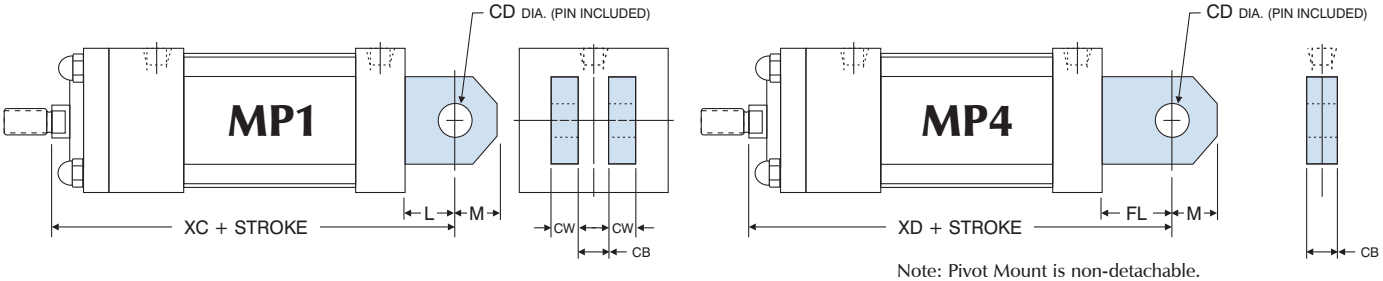
	1.000 Oversize	1.125	1.500	0.500							3/4 -16		1.000			0.500	2.250	5.438
2.00	0.625 Standard	0.750	1.125	0.375	2.500	0.375	0.375	1.500	1.000	0.563	7/16 -20	3.625	0.625	2.375	1.840	0.250	1.875	5.188
	1.000 Oversize	1.125	1.500	0.500							3/4 -16		1.000			0.500	2.250	5.563
2.50	0.625 Standard	0.750	1.125	0.375	3.000	0.375	0.375	1.500	1.000	0.563	7/16 -20	3.750	0.625	2.500	2.190	0.250	1.875	5.313
	1.000 Oversize	1.125	1.500	0.500							3/4 -16		1.000			0.500	2.250	5.688
3.25	1.000 Standard	1.125	1.500	0.500	3.750	0.500	0.625	1.750	1.250	0.625	3/4 -16	4.250	1.000	2.750	2.760	0.250	2.375	6.250
	1.375 Oversize	1.625	2.000	0.625							1 -14		1.375			0.375	2.625	6.500
4.00	1.000 Standard	1.125	1.500	0.500	4.500	0.500	0.625	1.750	1.250	0.625	3/4 -16	4.250	1.000	2.750	3.320	0.250	2.375	6.250
	1.375 Oversize	1.625	2.000	0.625							1 -14		1.375			0.375	2.625	6.500
5.00	1.000 Standard	1.125	1.500	0.500	5.500	0.500	0.625	1.750	1.250	0.813	3/4 -16	4.500	1.000	3.000	4.100	0.250	2.375	6.625
	1.375 Oversize	1.625	2.000	0.625							1 -14		1.375			0.375	2.625	6.875
6.00	1.375 Standard	1.625	2.000	0.625	6.500	0.750	0.750	2.000	1.500	0.813	1 -14	5.000	1.375	3.250	4.880	0.250	2.750	7.375
	1.750 Oversize	2.000	2.375	0.750							1 1/4 -12		1.750			0.375	3.000	7.625
8.00	1.375 Standard	1.625	2.000	0.625	8.500	0.750	0.625	2.000	1.500	1.000	1 -14	5.125	1.375	3.375	6.440	0.375	2.750	7.750
	1.750 Oversize	2.000	2.375	0.750							1 1/4 -12		1.750			0.500	3.000	8.000

BASE DIMENSION FOLD OUT

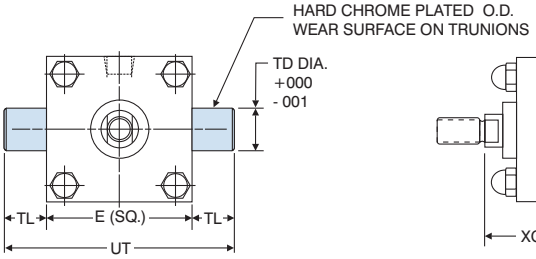
SERIES 'CRN' DIMENSIONS: PIVOT MOUNTS

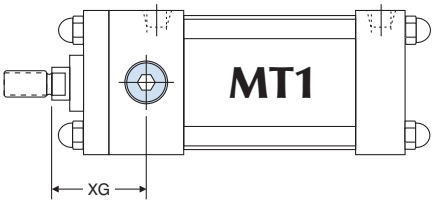


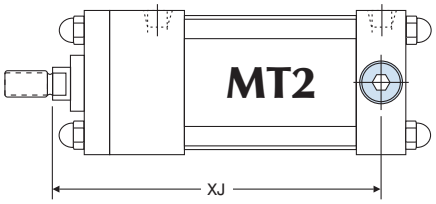
Note: Pivot Mount is non-detachable.
Contact factory for detachable mount options.

'MP1' CLEVIS AND 'MP4' EYE MOUNT DIMENSIONS										ACCESSORIES (SEE PAGE 172 FOR DIMENSIONS)			
BORE	ROD DIAMETER	CB	CD	CW	FL	L	M	XC	XD	ROD CLEVIS	ROD EYE	CLEVIS PIN	EYE BRACKET (FOR MP1)
1.50	0.625 Standard	0.750	0.500	0.500	1.125	0.750	0.625	5.375	5.750	SS-RC437	SS-RE437	SS-CP500	
	1.000 Oversize							5.750	6.125	SS-RC750	SS-RE750	SS-CP750	
2.00	0.625 Standard	0.750	0.500	0.500	1.125	0.750	0.625	5.375	5.750	SS-RC437	SS-RE437	SS-CP500	SS-EB500
	1.000 Oversize							5.750	6.125	SS-RC750	SS-RE750	SS-CP750	
2.50	0.625 Standard	0.750	0.500	0.500	1.125	0.750	0.625	5.500	5.875	SS-RC437	SS-RE437	SS-CP500	
	1.000 Oversize							5.875	6.250	SS-RC750	SS-RE750	SS-CP750	
3.25	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.875	6.875	7.500	SS-RC750	SS-RE750	SS-CP750	
	1.375 Oversize							7.125	7.750	SS-RC1000	SS-RE1000	SS-CP1000	
4.00	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.875	6.875	7.500	SS-RC750	SS-RE750	SS-CP750	SS-EB750
	1.375 Oversize							7.125	7.750	SS-RC1000	SS-RE1000	SS-CP1000	
5.00	1.000 Standard	1.250	0.750	0.625	1.875	1.250	0.875	7.125	7.750	SS-RC750	SS-RE750	SS-CP750	
	1.375 Oversize							7.375	8.000	SS-RC1000	SS-RE1000	SS-CP1000	
6.00	1.375 Standard	1.500	1.000	0.750	2.250	1.500	1.000	8.125	8.875	SS-RC1000	SS-RE1000	SS-CP1000	
	1.750 Oversize							8.375	9.125	SS-RC1250	SS-RE1250	SS-CP1375	SS-EB1000
8.00	1.375 Standard	1.500	1.000	0.750	N/A	1.500	1.000	8.250	N/A	SS-RC1000	SS-RE1000	SS-CP1000	
	1.750 Oversize							8.500	N/A	SS-RC1250	SS-RE1250	SS-CP1375	

Clevis pin provided with MP1 and MP4 mounts.
MP4 8.00" bore not available.
For dimensions not shown see page 74-Fold Out.







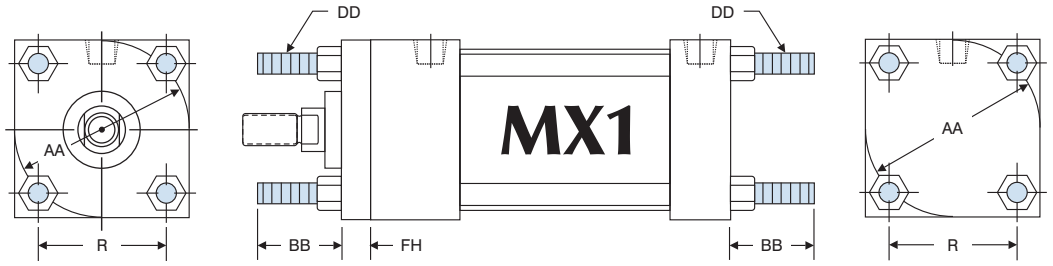
MT1 / MT2

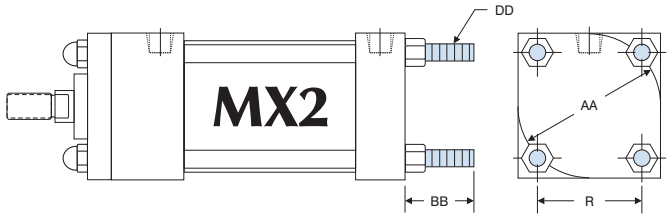
Note: Trunnions are bolt on, non-removable design.

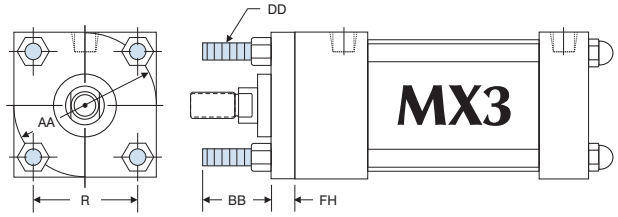
'MT1' HEAD TRUNNION AND 'MT2' CAP TRUNNION MOUNT DIMENSIONS								ACCESSORIES (SEE PAGE 172 FOR DIMENSIONS)		
BORE	ROD DIAMETER	E	TD	TL	UT	XG	XJ	ROD CLEVIS	ROD EYE	CLEVIS PIN
1.50	0.625 Standard	2.000	1.000	1.000	4.000	1.750	4.125	SS-RC437	SS-RE437	SS-CP500
	1.000 Oversize*					N/A	4.500	SS-RC750	SS-RE750	SS-CP750
2.00	0.625 Standard	2.500	1.000	1.000	4.500	1.750	4.125	SS-RC437	SS-RE437	SS-CP500
	1.000 Oversize					2.125	4.500	SS-RC750	SS-RE750	SS-CP750
2.50	0.625 Standard	3.000	1.000	1.000	5.000	1.750	4.250	SS-RC437	SS-RE437	SS-CP500
	1.000 Oversize					2.125	4.625	SS-RC750	SS-RE750	SS-CP750
3.25	1.000 Standard	3.750	1.000	1.000	5.750	2.250	5.000	SS-RC750	SS-RE750	SS-CP750
	1.375 Oversize					2.500	5.250	SS-RC1000	SS-RE1000	SS-CP1000
4.00	1.000 Standard	4.500	1.000	1.000	6.500	2.250	5.000	SS-RC750	SS-RE750	SS-CP750
	1.375 Oversize					2.500	5.250	SS-RC1000	SS-RE1000	SS-CP1000
5.00	1.000 Standard	5.500	1.000	1.000	7.500	2.250	5.250	SS-RC750	SS-RE750	SS-CP750
	1.375 Oversize					2.500	5.500	SS-RC1000	SS-RE1000	SS-CP1000
6.00	1.375 Standard	6.500	1.375	1.375	9.250	2.625	5.875	SS-RC1000	SS-RE1000	SS-CP1000
	1.750 Oversize					2.875	6.125	SS-RC1250	SS-RE1250	SS-CP1375
8.00	1.375 Standard	8.500	1.375	1.375	11.250	2.625	6.000	SS-RC1000	SS-RE1000	SS-CP1000
	1.750 Oversize					2.875	6.250	SS-RC1250	SS-RE1250	SS-CP1375

* No Oversize rod on 1.50" bore on MT1 mount.
For dimensions not shown see page 74-Fold Out.

SERIES 'CRN' DIMENSIONS: TIE ROD & FLANGE MOUNTS



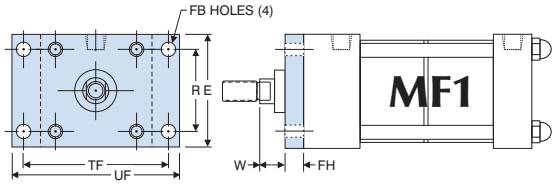




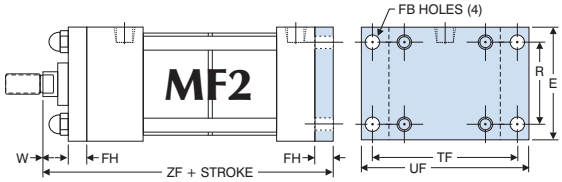
TIE ROD EXTENDED 'MX1', 'MX2' & 'MX3' MOUNT DIMENSIONS						
BORE	ROD DIAMETER	AA	BB	DD	FH	R
1.50	0.625 Standard	2.020	1.000	1/4 -28	0.375	1.430
	1.000 Oversize					
2.00	0.625 Standard	2.600	1.125	5/16 -24	0.375	1.840
	1.000 Oversize					
2.50	0.625 Standard	3.100	1.125	5/16 -24	0.375	2.190
	1.000 Oversize					
3.25	1.000 Standard	3.900	1.375	3/8 -24	0.625	2.760
	1.375 Oversize					

TIE ROD EXTENDED 'MX1', 'MX2' & 'MX3' MOUNT DIMENSIONS						
BORE	ROD DIAMETER	AA	BB	DD	FH	R
4.00	1.000 Standard	4.700	1.375	3/8 -24	0.625	3.320
	1.375 Oversize					
5.00	1.000 Standard	5.800	1.813	1/2 -20	0.625	4.100
	1.375 Oversize					
6.00	1.375 Standard	6.900	1.813	1/2 -20	0.750	4.880
	1.750 Oversize					
8.00	1.375 Standard	9.100	2.313	5/8 -18	0.625*	6.440
	1.750 Oversize					

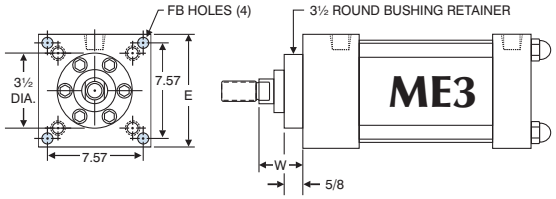
Full square bushing retainer on 1.50" thru 6.00" bore.
* Round retainer on 8.00" bore. BB dimension from face of head.
For dimensions not shown, see page 74-Fold Out.



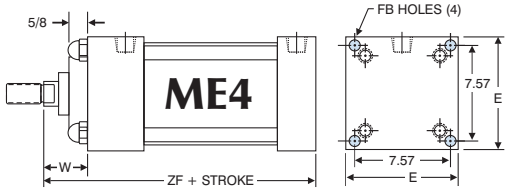
1.50" - 6.00" BORES



1.50" - 6.00" BORES



8.00" BORE ONLY



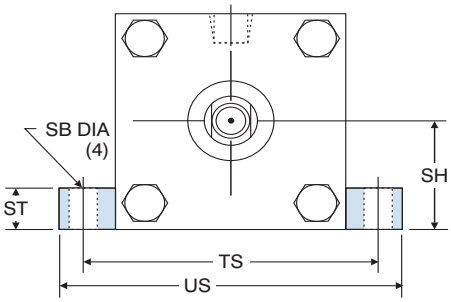
8.00" BORE ONLY

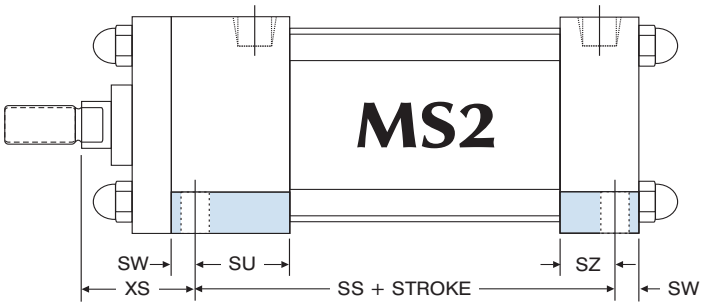
'MF1', 'MF2' FLANGE & 'ME3', 'ME4' CAP MOUNT DIMENSIONS									
BORE	ROD DIAMETER	E	FB	FH	R	TF	UF	W	ZF
1.50	0.625 Standard	2.000	0.313	0.375	1.430	2.750	3.375	0.625	5.000
	1.000 Oversize							1.000	5.375
2.00	0.625 Standard	2.500	0.375	0.375	1.840	3.375	4.125	0.625	5.000
	1.000 Oversize							1.000	5.375
2.50	0.625 Standard	3.000	0.375	0.375	2.190	3.875	4.625	0.625	5.125
	1.000 Oversize							1.000	5.500
3.25	1.000 Standard	3.750	0.438	0.625	2.760	4.688	5.500	0.750	6.250
	1.375 Oversize							1.000	6.500

'MF1', 'MF2' FLANGE & 'ME3', 'ME4' CAP MOUNT DIMENSIONS									
BORE	ROD DIAMETER	E	FB	FH	R	TF	UF	W	ZF
4.00	1.000 Standard	4.500	0.438	0.625	3.320	5.438	6.250	0.750	6.250
	1.375 Oversize							1.000	6.500
5.00	1.000 Standard	5.500	0.563	0.625	4.100	6.625	7.625	0.750	6.500
	1.375 Oversize							1.000	6.750
6.00	1.375 Standard	6.500	0.563	0.750	4.880	7.625	8.625	0.875	7.375
	1.750 Oversize							1.125	7.625
8.00	1.375 Standard	8.500	0.688	N/A	N/A	N/A	N/A	1.625	6.750
	1.750 Oversize							1.875	7.000

Full square bushing retainer on 1.50" thru 6.00" bore.
* Round retainer on 8.00" bore.
For dimensions not shown, see page 74-Fold Out.

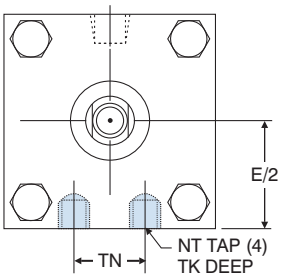
SERIES 'CRN' DIMENSIONS: BASE MOUNTS

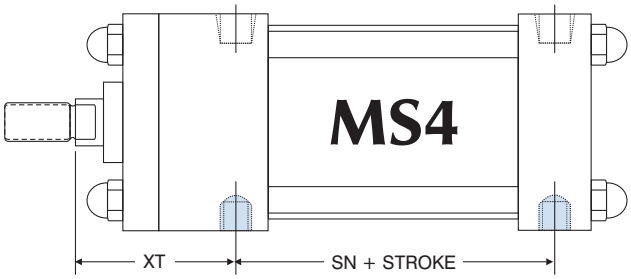




'MS2' SIDE LUG MOUNT DIMENSIONS											
BORE	ROD DIAMETER	SB	SH	ST	SU	SW	SZ	TS	US	XS	SS ADD STROKE
1.50	0.625 Standard	0.438	1.000	0.500	1.125	0.375	0.625	2.750	3.500	1.375	2.875
	1.000 Oversize									1.750	
2.00	0.625 Standard	0.438	1.250	0.500	1.125	0.375	0.625	3.250	4.000	1.375	2.875
	1.000 Oversize									1.750	
2.50	0.625 Standard	0.438	1.500	0.500	1.125	0.375	0.625	3.750	4.500	1.375	3.000
	1.000 Oversize									1.750	
3.25	1.000 Standard	0.563	1.875	0.750	1.250	0.500	0.750	4.750	5.750	1.875	3.250
	1.375 Oversize									2.125	
4.00	1.000 Standard	0.563	2.250	0.750	1.250	0.500	0.750	5.500	6.500	1.875	3.250
	1.375 Oversize									2.125	
5.00	1.000 Standard	0.813	2.750	1.000	1.063	0.688	0.563	6.875	8.250	2.063	3.125
	1.375 Oversize									2.313	
6.00	1.375 Standard	0.813	3.250	1.000	1.313	0.688	0.813	7.875	9.250	2.313	3.625
	1.750 Oversize									2.563	
8.00	1.375 Standard	0.813	4.250	1.000	1.563	0.688	0.813	9.875	11.250	2.313	3.750
	1.750 Oversize									2.563	

Full square bushing retainer on 1.50" thru 6.00" bore.
Round retainer on 8.00" bore.
For dimensions not shown, see page 74-Fold Out.





'MS4' BOTTOM TAP MOUNT DIMENSIONS							
BORE	ROD DIAMETER	E/2	NT	TK	TN	XT	SN ADD STROKE
1.50	0.625 Standard	1.000	1/4 -20	0.375	0.625	1.938	2.250
	1.000 Oversize					2.313	
2.00	0.625 Standard	1.250	5/16 -18	0.500	0.875	1.938	2.250
	1.000 Oversize					2.313	
2.50	0.625 Standard	1.500	3/8 -16	0.625	1.250	1.938	2.375
	1.000 Oversize					2.313	
3.25	1.000 Standard	1.875	1/2 -13	0.750	1.500	2.438	2.625
	1.375 Oversize					2.688	
4.00	1.000 Standard	2.250	1/2 -13	0.750	2.063	2.438	2.625
	1.375 Oversize					2.688	
5.00	1.000 Standard	2.750	5/8 -11	1.000	2.688	2.438	2.875
	1.375 Oversize					2.688	
6.00	1.375 Standard	3.250	3/4 -10	1.125	3.250	2.813	3.125
	1.750 Oversize					3.063	
8.00	1.375 Standard	4.250	3/4 -10	1.125	4.500	2.813	3.250
	1.750 Oversize					3.063	

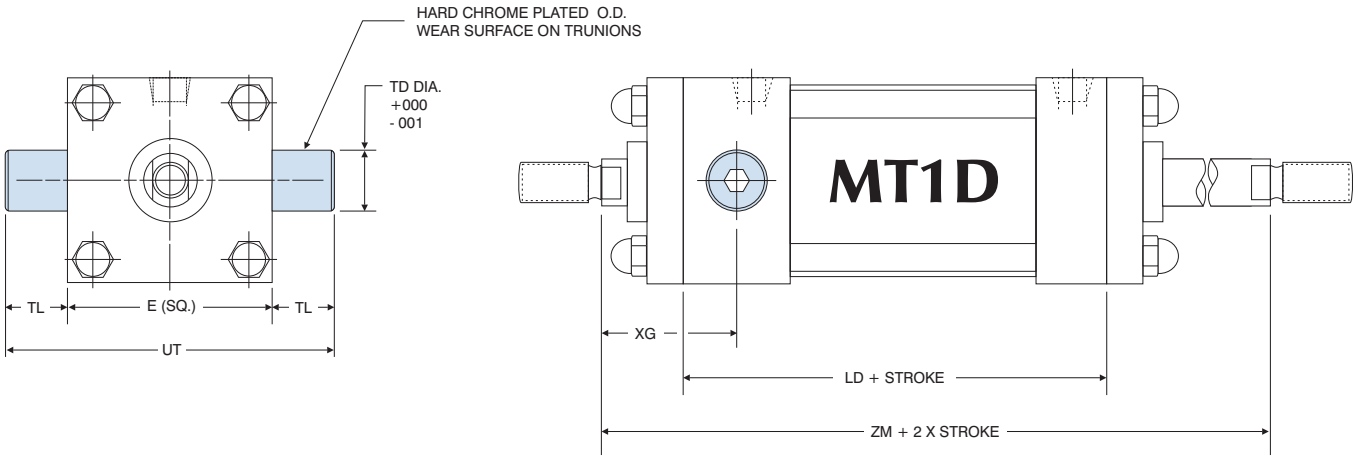
Full square bushing retainer on 1.50" thru 6.00" bore
Round retainer on 8.00" bore.
For dimensions not shown, see 74-Fold Out.

SERIES 'CRN' DIMENSIONS: DOUBLE ROD END

Benefits

- Standard and Oversized Piston Rods available.
- Full range of Standard Options.
- Durable design. Full Rod Bearing at each end of cylinder.
- Can be provided with Hollow Piston Rods (gun-drilled through, to your size requirements).
- Can be used in adjustable extend stroke applications (by adding a stop collar on one rod end).

(MT1D MOUNT SHOWN)



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

'CRN-MT1D' HEAD TRUNNION MOUNT DIMENSIONS								
BORE	ROD DIAMETER	E	LD	TD	TL	UT	XG	ZM
1.50	0.625 Standard	2.000	4.125	1.000	1.000	4.000	1.750	6.125
	N/A*						N/A	N/A
2.00	0.625 Standard	2.500	4.125	1.000	1.000	4.500	1.750	6.125
	1.000 Oversize						2.125	6.875
2.50	0.625 Standard	3.000	4.250	1.000	1.000	5.000	1.750	6.250
	1.000 Oversize						2.125	7.000
3.25	1.000 Standard	3.750	4.750	1.000	1.000	5.750	2.250	7.500
	1.375 Oversize						2.500	8.000
4.00	1.000 Standard	4.500	4.750	1.000	1.000	6.500	2.250	7.500
	1.375 Oversize						2.500	8.000
5.00	1.000 Standard	5.500	5.000	1.000	1.000	7.500	2.250	7.750
	1.375 Oversize						2.500	8.250
6.00	1.375 Standard	6.500	5.500	1.375	1.375	9.250	2.625	8.750
	1.750 Oversize						2.875	9.250
8.00	1.375 Standard	8.500	5.625	1.375	1.375	11.250	2.625	8.875
	1.750 Oversize						2.875	9.375

* No oversized rod available on 1.50" bore.

SERIES 'CRN' DIMENSIONS: DOUBLE ROD END

About Rod End Styles

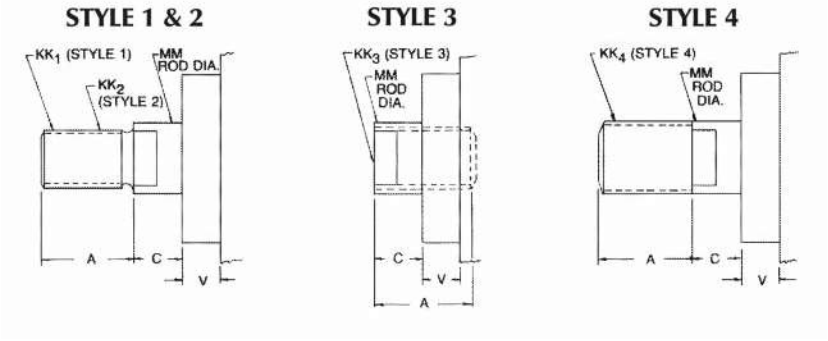
Style 1 Male Rod End is STANDARD

Other NFPA Styles can be specified (See Chart).

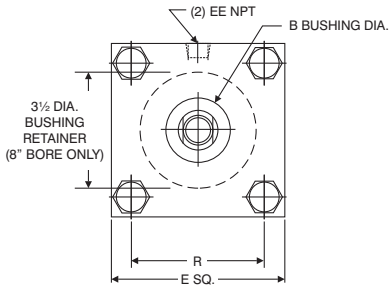
Need a rod end not listed?
NO PROBLEM! Each Piston Rod is made to order and does not delay shipment. Coarse (UNC) threads, Metric threads or just plain rod ends are common. Thread lengths are also made to order (Specify: "A"=Length).

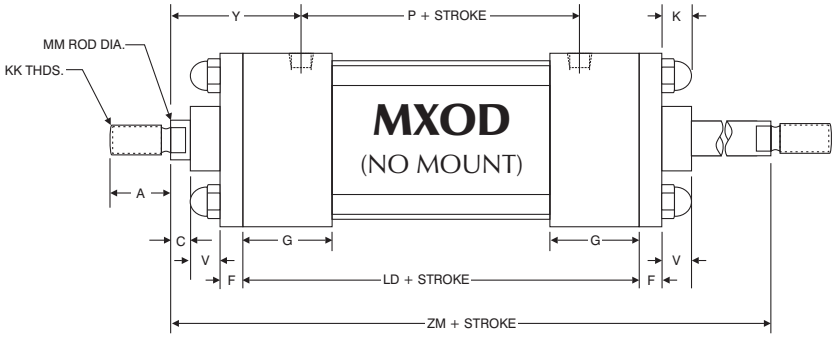
NEED SOMETHING NOT LISTED?
Just send us a sketch.
In most cases, quotes are turned around in one day!

PISTON ROD END STYLES



BORE	MM ROD DIAMETER	STANDARD STYLE 1 - MALE KK1	STANDARD STYLE 1 - MALE A	OPTIONAL STYLE 2 - MALE KK2	OPTIONAL STYLE 2 - MALE A	OPTIONAL STYLE 3 - FEMALE KK3	OPTIONAL STYLE 3 - FEMALE A	OPTIONAL STYLE 4 - MALE KK4	OPTIONAL STYLE 4 - MALE A	C	V
1.50, 2.00, 2.50	0.625 Standard	7/16 -20	0.750	1/2 -20	0.750	7/16 -20	0.750	5/8 -18	0.750	0.375	0.250
	1.000 Oversize	3/4 -16	1.125	7/8 -14	1.125	3/4 -16	1.125	1 -14	1.125	0.500	0.500
3.25, 4.00, 5.00	1.000 Standard	3/4 -16	1.125	7/8 -14	1.125	3/4 -16	1.125	1 -14	1.125	0.500	0.250
	1.375 Oversize	1 -14	1.625	1 1/4 -12	1.625	1 -14	1.625	1 3/8 -12	1.625	0.625	0.375
6.00 & 8.00	1.375 Standard	1 -14	1.625	1 1/4 -12	1.625	1 -14	1.625	1 3/8 -12	1.625	0.625	0.375
	1.750 Oversize	1 1/4 -12	2.000	1 1/2-12	2.000	1 1/4 -12	2.000	1 3/4 -12	2.000	0.750	0.500





DOUBLE ROD 'MXOD' DIMENSIONS STANDARD & OVERSIZED RODS																	
BORE	ROD DIAMETER	A	B	C	E	EE	F	G	K	KK	LD	MM	P	R	V	Y	ZM
1.50	0.625 Standard	0.750	1.125	0.375	2.000	0.375	0.375	1.500	0.438	7/16 -20	4.125	0.625	2.375	1.430	0.250	1.875	6.125
	1.000 Oversize	1.125	1.500	0.500						3/4 -16		1.000			0.500	2.250	6.875
2.00	0.625 Standard	0.750	1.125	0.375	2.500	0.375	0.375	1.500	0.563	7/16 -20	4.125	0.625	2.375	1.840	0.250	1.875	6.125
	1.000 Oversize	1.125	1.500	0.500						3/4 -16		1.000			0.500	2.250	6.875
2.50	0.625 Standard	0.750	1.125	0.375	3.000	0.375	0.375	1.500	0.563	7/16 -20	4.250	0.625	2.500	2.190	0.250	1.875	6.250
	1.000 Oversize	1.125	1.500	0.500						3/4 -16		1.000			0.500	2.250	7.000
3.25	1.000 Standard	1.125	1.500	0.500	3.750	0.500	0.625	1.750	0.625	3/4 -16	4.750	1.000	2.750	2.760	0.250	2.375	7.500
	1.375 Oversize	1.625	2.000	0.625						1 -14		1.375			0.375	2.625	8.000
4.00	1.000 Standard	1.125	1.500	0.500	4.500	0.500	0.625	1.750	0.625	3/4 -16	4.750	1.000	2.750	3.320	0.250	2.375	7.500
	1.375 Oversize	1.625	2.000	0.625						1 -14		1.375			0.375	2.625	8.000
5.00	1.000 Standard	1.125	1.500	0.500	5.500	0.500	0.625	1.750	0.813	3/4 -16	5.000	1.000	3.000	4.100	0.250	2.375	7.750
	1.375 Oversize	1.625	2.000	0.625						1 -14		1.375			0.375	2.625	8.250
6.00	1.375 Standard	1.625	2.000	0.625	6.500	0.750	0.750	2.000	0.813	1 -14	5.500	1.375	3.250	4.880	0.250	2.750	8.750
	1.750 Oversize	2.000	2.375	0.750						1 1/4 -12		1.750			0.375	3.000	9.250
8.00	1.375 Standard	1.625	2.000	0.625	8.500	0.750	0.625	2.000	1.000	1 -14	5.625	1.375	3.375	6.440	0.375	2.750	8.875
	1.750 Oversize	2.000	2.375	0.750						1 1/4 -12		1.750			0.500	3.000	9.375

EASY FLIP OUT PAGE FOR REFERENCE

SERIES 'CRN' DIMENSIONS: DOUBLE ROD END

About Rod End Styles

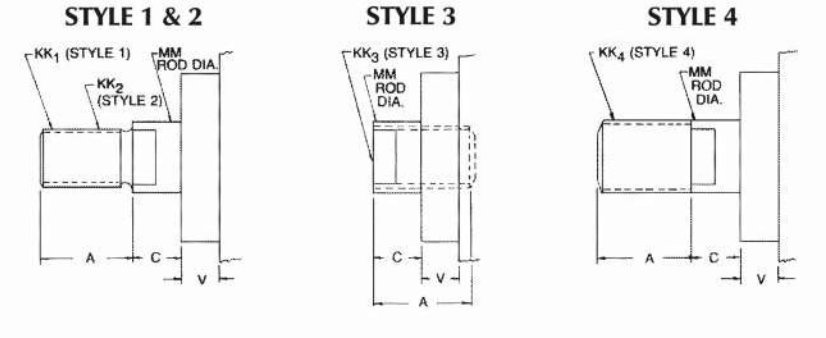
Style 1 Male Rod End is STANDARD

Other NFPA Styles can be specified (See Chart).

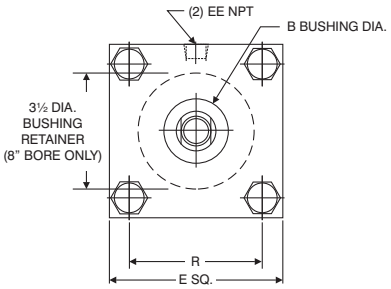
Need a rod end not listed?
NO PROBLEM! Each Piston Rod is made to order and does not delay shipment. Coarse (UNC) threads, Metric threads or just plain rod ends are common. Thread lengths are also made to order (Specify: "A"=Length).

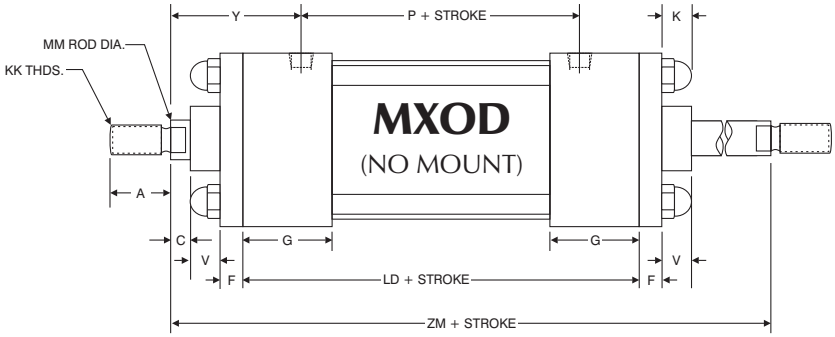
NEED SOMETHING NOT LISTED?
Just send us a sketch.
In most cases, quotes are turned around in one day!

PISTON ROD END STYLES



BORE	MM ROD DIAMETER	STANDARD STYLE 1 - MALE KK1	A	OPTIONAL STYLE 2 - MALE KK2	A	STYLE 3 - FEMALE KK3	A	STYLE 4 - MALE KK4	A	C	V
1.50, 2.00, 2.50	0.625 Standard	7/16 -20	0.750	1/2 -20	0.750	7/16 -20	0.750	5/8 -18	0.750	0.375	0.250
	1.000 Oversize	3/4 -16	1.125	7/8 -14	1.125	3/4 -16	1.125	1 -14	1.125	0.500	0.500
3.25, 4.00, 5.00	1.000 Standard	3/4 -16	1.125	7/8 -14	1.125	3/4 -16	1.125	1 -14	1.125	0.500	0.250
	1.375 Oversize	1 -14	1.625	1 1/4 -12	1.625	1 -14	1.625	1 3/8 -12	1.625	0.625	0.375
6.00 & 8.00	1.375 Standard	1 -14	1.625	1 1/4 -12	1.625	1 -14	1.625	1 3/8 -12	1.625	0.625	0.375
	1.750 Oversize	1 1/4 -12	2.000	1 1/2-12	2.000	1 1/4 -12	2.000	1 3/4 -12	2.000	0.750	0.500

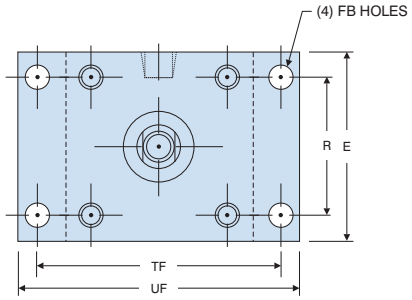


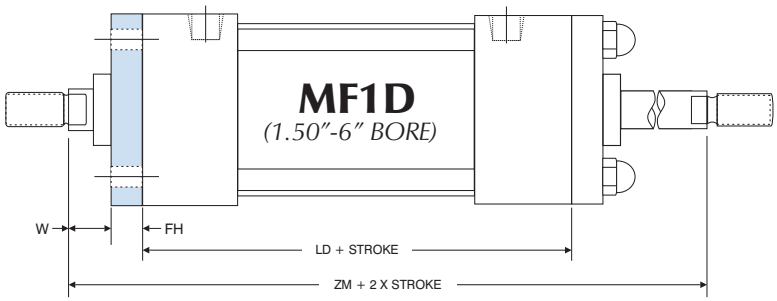


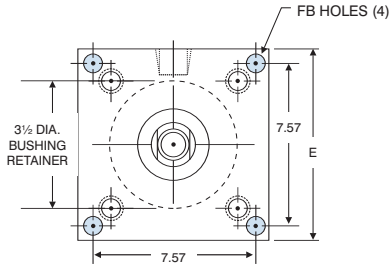
DOUBLE ROD 'MXOD' DIMENSIONS STANDARD & OVERSIZED RODS																	
BORE	ROD DIAMETER	A	B	C	E	EE	F	G	K	KK	LD	MM	P	R	V	Y	ZM
1.50	0.625 Standard	0.750	1.125	0.375	2.000	0.375	0.375	1.500	0.438	7/16 -20	4.125	0.625	2.375	1.430	0.250	1.875	6.125
	1.000 Oversize	1.125	1.500	0.500						3/4 -16		1.000			0.500	2.250	6.875
2.00	0.625 Standard	0.750	1.125	0.375	2.500	0.375	0.375	1.500	0.563	7/16 -20	4.125	0.625	2.375	1.840	0.250	1.875	6.125
	1.000 Oversize	1.125	1.500	0.500						3/4 -16		1.000			0.500	2.250	6.875
2.50	0.625 Standard	0.750	1.125	0.375	3.000	0.375	0.375	1.500	0.563	7/16 -20	4.250	0.625	2.500	2.190	0.250	1.875	6.250
	1.000 Oversize	1.125	1.500	0.500						3/4 -16		1.000			0.500	2.250	7.000
3.25	1.000 Standard	1.125	1.500	0.500	3.750	0.500	0.625	1.750	0.625	3/4 -16	4.750	1.000	2.750	2.760	0.250	2.375	7.500
	1.375 Oversize	1.625	2.000	0.625						1 -14		1.375			0.375	2.625	8.000
4.00	1.000 Standard	1.125	1.500	0.500	4.500	0.500	0.625	1.750	0.625	3/4 -16	4.750	1.000	2.750	3.320	0.250	2.375	7.500
	1.375 Oversize	1.625	2.000	0.625						1 -14		1.375			0.375	2.625	8.000
5.00	1.000 Standard	1.125	1.500	0.500	5.500	0.500	0.625	1.750	0.813	3/4 -16	5.000	1.000	3.000	4.100	0.250	2.375	7.750
	1.375 Oversize	1.625	2.000	0.625						1 -14		1.375			0.375	2.625	8.250
6.00	1.375 Standard	1.625	2.000	0.625	6.500	0.750	0.750	2.000	0.813	1 -14	5.500	1.375	3.250	4.880	0.250	2.750	8.750
	1.750 Oversize	2.000	2.375	0.750						1 1/4 -12		1.750			0.375	3.000	9.250
8.00	1.375 Standard	1.625	2.000	0.625	8.500	0.750	0.625	2.000	1.000	1 -14	5.625	1.375	3.375	6.440	0.375	2.750	8.875
	1.750 Oversize	2.000	2.375	0.750						1 1/4 -12		1.750			0.500	3.000	9.375

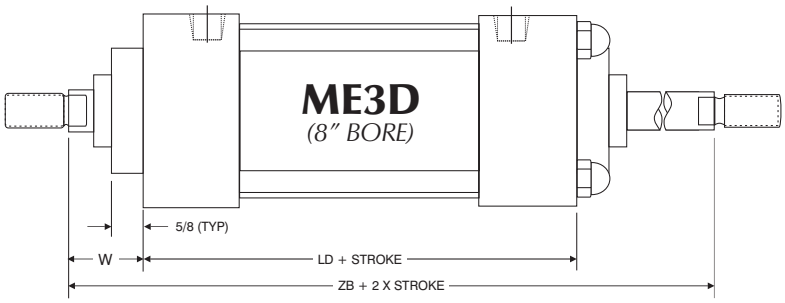
BASE DIMENSION FOLD OUT

SERIES 'CRN' DIMENSIONS: DOUBLE ROD END FLANGE MOUNTS



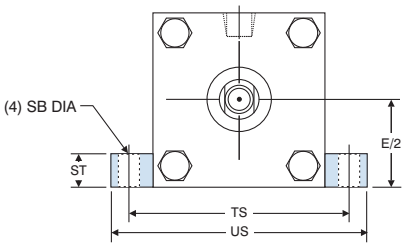


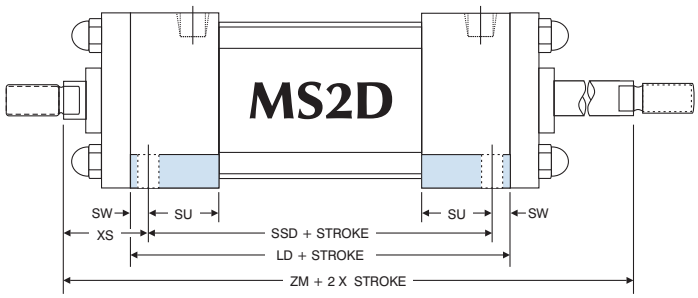




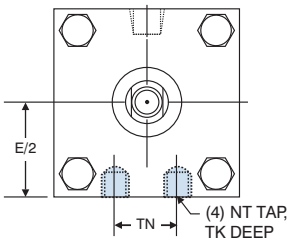
'CRN-MF1D' FLANGE & 'CRN-ME3D' HEAD MOUNT DIMENSIONS										
BORE	ROD DIAMETER	E	FB	FH	LD	R	TF	UF	W	ZM
1.50	0.625 Standard	2.000	0.313	0.375	4.125	1.430	2.750	3.375	0.625	6.125
	1.000 Oversize								1.000	6.875
2.00	0.625 Standard	2.500	0.375	0.375	4.125	1.840	3.375	4.125	0.625	6.125
	1.000 Oversize								1.000	6.875
2.50	0.625 Standard	3.000	0.375	0.375	4.250	2.190	3.875	4.625	0.625	6.250
	1.000 Oversize								1.000	7.000
3.25	1.000 Standard	3.750	0.438	0.625	4.750	2.760	4.688	5.500	0.750	7.500
	1.375 Oversize								1.000	8.000
4.00	1.000 Standard	4.500	0.438	0.625	4.750	3.320	5.438	6.250	0.750	7.500
	1.375 Oversize								1.000	8.000
5.00	1.000 Standard	5.500	0.563	0.625	5.000	4.100	6.625	7.625	0.750	7.750
	1.375 Oversize								1.000	8.250
6.00	1.375 Standard	6.500	0.563	0.750	5.500	4.880	7.625	8.625	0.875	8.750
	1.750 Oversize								1.125	9.250
8.00	1.375 Standard	8.500	0.688	N/A	5.625	N/A	N/A	N/A	1.625	8.875
	1.750 Oversize								1.875	9.375

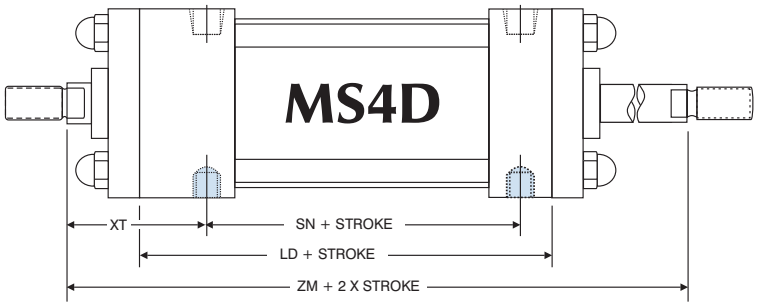
SERIES 'CRN' DIMENSIONS: DOUBLE ROD END BASE MOUNTS





'CRN-MS2D' SIDE LUG MOUNT DIMENSIONS												
BORE	ROD DIAMETER	E/2	LD	SB	ST	SU	SW	TS	US	XS	ZM	SSD
1.50	0.625 Standard	1.000	4.125	0.438	0.500	1.125	0.375	2.750	3.500	1.375	6.125	3.375
	1.000 Oversize									1.750	6.875	
2.00	0.625 Standard	1.250	4.125	0.438	0.500	1.125	0.375	3.250	4.000	1.375	6.125	3.375
	1.000 Oversize									1.750	6.875	
2.50	0.625 Standard	1.500	4.250	0.438	0.500	1.125	0.375	3.750	4.500	1.375	6.250	3.500
	1.000 Oversize									1.750	7.000	
3.25	1.000 Standard	1.875	4.750	0.563	0.750	1.250	0.500	4.750	5.750	1.875	7.500	3.750
	1.375 Oversize									2.125	8.000	
4.00	1.000 Standard	2.250	4.750	0.563	0.750	1.250	0.500	5.500	6.500	1.875	7.500	3.750
	1.375 Oversize									2.125	8.000	
5.00	1.000 Standard	2.750	5.000	0.813	1.000	1.063	0.688	6.875	8.250	2.063	7.750	3.625
	1.375 Oversize									2.313	8.250	
6.00	1.375 Standard	3.250	5.500	0.813	1.000	1.313	0.688	7.875	9.250	2.313	8.750	4.125
	1.750 Oversize									2.563	9.250	
8.00	1.375 Standard	4.250	5.625	0.813	1.000	1.313	0.688	9.875	11.250	2.313	8.875	4.250
	1.750 Oversize									2.563	9.375	





'CRN-MS4D' BOTTOM TAPPED MOUNT DIMENSIONS									
BORE	ROD DIAMETER	E/2	LD	NT	TK	TN	XT	SN	ZM
1.50	0.625 Standard	1.000	4.125	1/4 - 20	0.375	0.625	1.938	2.250	6.125
	1.000 Oversize						2.313		6.875
2.00	0.625 Standard	1.250	4.125	5/16 - 18	0.500	0.875	1.938	2.250	6.125
	1.000 Oversize						2.313		6.875
2.50	0.625 Standard	1.500	4.250	3/8 - 16	0.625	1.250	1.938	2.375	6.250
	1.000 Oversize						2.313		7.000
3.25	1.000 Standard	1.875	4.750	1/2 - 13	0.750	1.500	2.438	2.625	7.500
	1.375 Oversize						2.688		8.000
4.00	1.000 Standard	2.250	4.750	1/2 - 13	0.750	2.063	2.438	2.625	7.500
	1.375 Oversize						2.688		8.000
5.00	1.000 Standard	2.750	5.000	5/8 - 11	1.000	2.688	2.438	2.875	7.750
	1.375 Oversize						2.688		8.125
6.00	1.375 Standard	3.250	5.500	3/4 - 10	1.125	3.250	2.813	3.125	8.750
	1.750 Oversize						3.063		9.250
8.00	1.375 Standard	4.250	5.625	3/4 - 10	1.125	4.500	2.813	3.250	8.875
	1.750 Oversize						3.063		9.375

SERIES 'CRN': TECHNICAL DATA

How to determine the right size Cylinder for the job

To determine what size cylinder the task requires, you need to answer a few questions about three main points: load, velocity and air pressure.

How heavy (in pounds) is the load to be moved? The answer to this is usually given, set by the machine design. However, unless you are lifting a load vertically-with no external friction, it can be difficult to determine the true load. If the load cannot be calculated, try to physically measure the load. The closer the true load is known, the better the results. In order to move the load, you need to choose a cylinder that provides force greater than the load. So, if the load is 100 lbs., it will take a force greater than 100 lbs. to move it. In fact, it's a good idea to allow an additional factor of 25% force to allow for friction.

What's the required velocity? Although velocity may also be set by machine design, often you have some latitude within a range. Whenever possible, for best results, we recommend using moderate speed because the greater the velocity required, the greater the *additional* force needed to achieve it. Slow speeds (up to 4 in/sec) require 25% more force than the load, moderate speeds (4 to 16 in/sec) about 50% more, and high speeds (greater than 16 in/sec) about 100% more force. So, for that 100 lb. load, you need 125 lbs. of force to move it slowly, 150 lbs. of force to move it at moderate speeds, and 200 lbs. of force to move it quickly. *Don't forget to add 25 lbs. (25% of 100 lbs.) for friction!*

What's the minimum effective air pressure you can use - and is your pressure source constant?
This is important because high pressures can accelerate seal wear and create stress on the cylinder, and inconsistent pressures can cause system malfunctions or failures. So, to maximize cylinder life and performance, you need to provide consistent airflow at the minimum effective pressure to maintain the desired velocity. The idea then, is for the cylinder to be able to move the maximum load, at the minimum acceptable velocity, and at the minimum available pressure.

About bore sizes
Once you've determined the force you need to move the load at the desired velocity and allow for friction, here's how to find the cylinder bore that meets your specifications.
The force generated by a cylinder is determined by the effective piston area times the air pressure. The chart below lists the effective piston area for each bore size, the "Push" (extend) and "Pull" (retract) stroke, at various air pressures. If you assume a maximum load of 100 lbs., a minimum velocity of 4 in/sec, and a minimum pressure of 60 psi, here's how to select the right cylinder bore. Since the velocity is slow, the force should be 25% greater than the load, or 125 lbs. After adding 25 lbs. for friction (25% of 100 lbs.), the total force needed is 150 lbs. The chart below shows that at 60 psi, the 2.00" bore with 0.625" rod extend force is 188 lbs., and retract force is 170 lbs. - the right cylinder for the application.

FORCE/VOLUME CHART

CYLINDER		STROKE TYPE	EFFECTIVE PISTON AREA	POUNDS OF FORCE AT PSI						CU. FT. DISPLACEMENT PER IN. OF STROKE
BORE	ROD			60	80	100	200	250	400	
1.50	ALL	PUSH	1.767	106	142	177	353	442	706	.00102
	0.625	PULL	1.460	88	117	146	292	365	584	.00084
	1.000	PULL	0.982	59	79	98	196	246	392	.00057
2.00	ALL	PUSH	3.142	188	251	314	628	785	1256	.00182
	0.625	PULL	2.835	170	227	284	567	708	1134	.00164
	1.000	PULL	2.357	141	189	236	471	589	942	.00136
2.50	ALL	PUSH	4.909	295	393	491	981	1227	1961	.00284
	0.625	PULL	4.602	267	368	460	920	1150	1840	.00266
	1.000	PULL	4.124	247	330	412	825	1031	1650	.00239
3.25	ALL	PUSH	8.296	498	664	830	1659	2074	3318	.00480
	1.000	PULL	7.511	451	601	751	1502	1877	3004	.00435
	1.375	PULL	6.811	409	545	681	1362	1702	2724	.00394
4.00	ALL	PUSH	12.566	754	1005	1257	2513	3141	5026	.00727
	1.000	PULL	11.781	707	942	1178	2356	2945	4712	.00682
	1.375	PULL	11.081	665	886	1108	2216	2770	4432	.00641
5.00	ALL	PUSH	19.635	1178	1571	1964	3927	4908	7854	.01136
	1.000	PULL	18.850	1131	1508	1885	3770	4712	7540	.01090
	1.375	PULL	18.150	1089	1452	1815	3630	4537	7260	.01050
6.00	ALL	PUSH	28.274	1696	2262	2827	5655	7068	11310	.01636
	1.375	PULL	26.789	1607	2144	2679	5358	6697	10716	.01550
	1.750	PULL	25.869	1552	2070	2587	5174	6467	10348	.01497
8.00	ALL	PUSH	50.265	3016	4021	5026	10053	12566	20106	.02908
	1.375	PULL	48.780	2927	3902	4878	9756	12195	19512	.02823
	1.750	PULL	47.860	2872	3829	4786	9572	11965	19144	.02770