cowan dynamics

Actuation Solutions and Systems for the
World's Most Challenging Environments

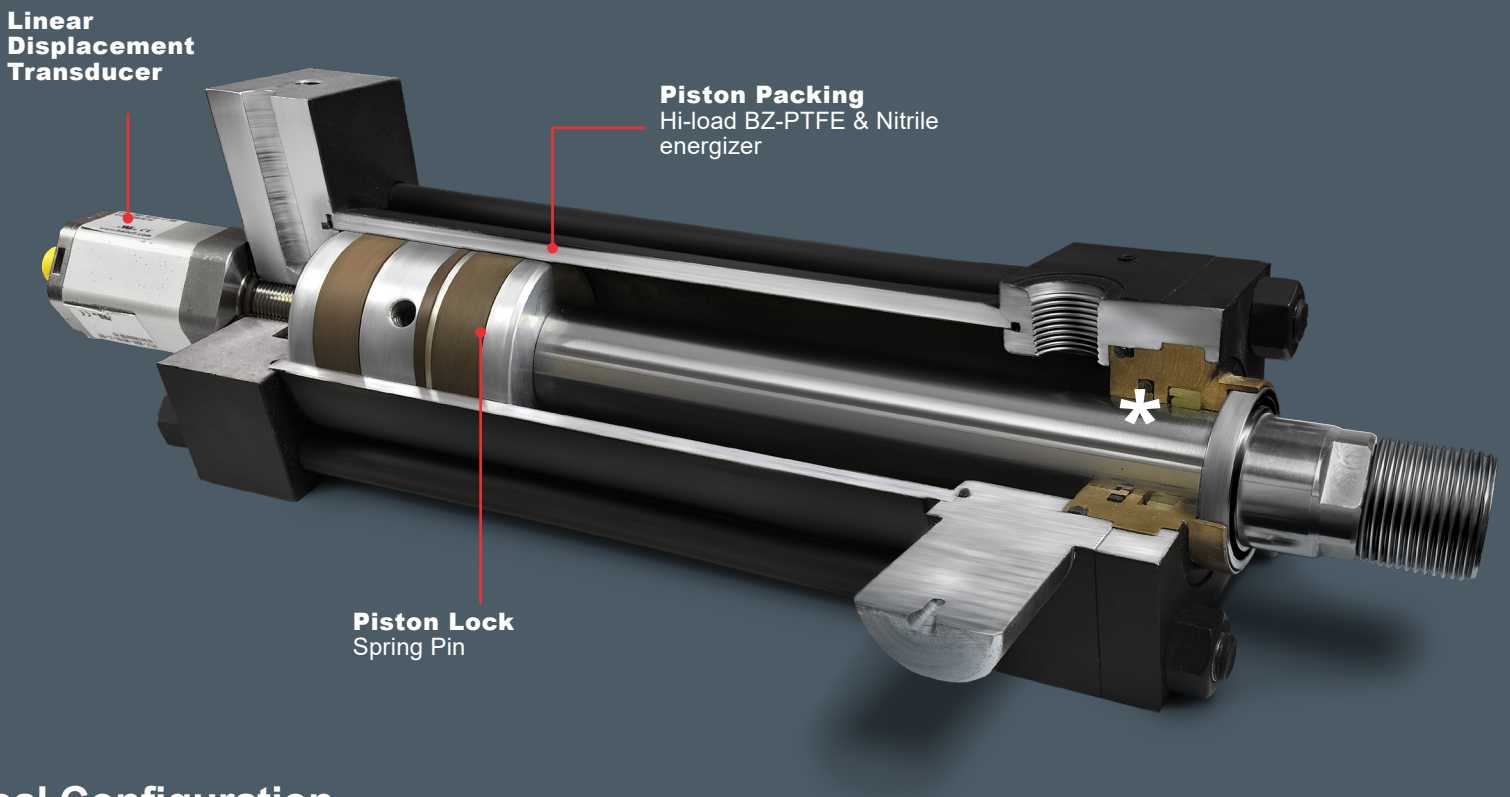
L SERIES

Servo Hydraulic Cylinders

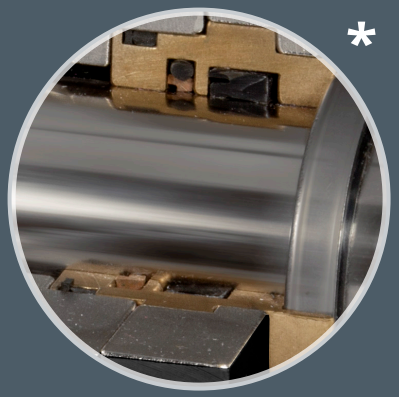
Prepared to Accept a Linear Displacement Transducer

- **Heavy Duty NFPA Hydraulic**
- **Bore Sizes from 1½"-6"**

Design & Materials



Gland Seal Configuration



Triple Seal Gland Standard

Gland Bushing: Cartridge type, no special tools required for removal

Buffer Seal: Protects primary seal from pressure spikes. PTFE for low friction and long service life.

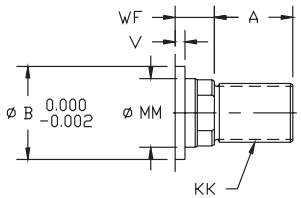
Primary Seal: Heavy Duty Polyurethane "U"-cup for excellent seal ability and long service life.

Encased Rod Wiper: Rugged wiper deflects contamination away for the rod seals for long service.

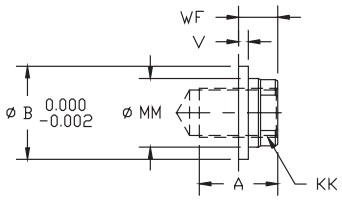
Material Breakdown	STANDARD
Head & cap	Machined Steel
Flange	Machined Steel
Barrel	Seamless Steel Tubing Honed ID *Optional Chrome Plating available
Barrel Seals	Nitrile O-Ring
Piston	Aluminum 6061-T6
Piston rod	Steel SAE 1045
Gland	SAE 660 Bronze
Tie Rod	Stress-proof Steel

Rod Thread Size

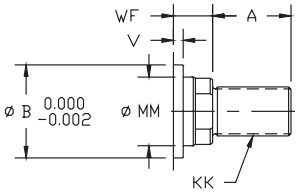
INTERMEDIATE MALE



SMALL FEMALE



SMALL MALE

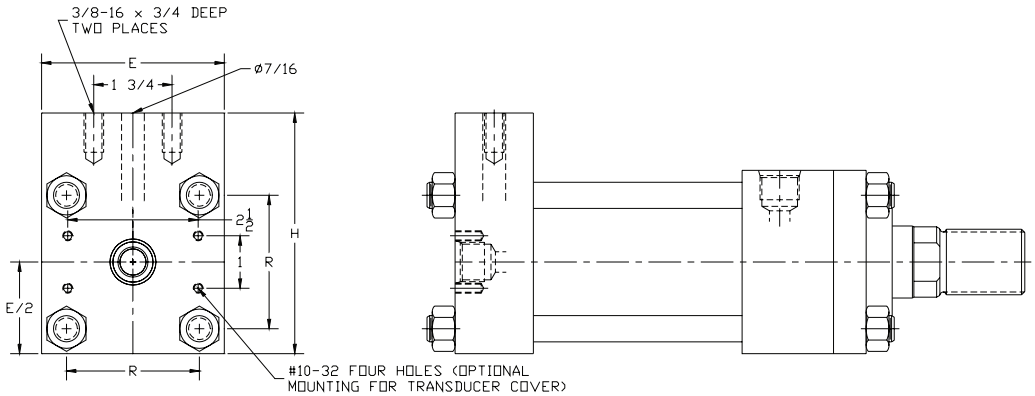


Dimensions (in)								
Bore	Rod Φ MM	Thread (KK)		A	B	V	WF	Y
		IM	LF – SM					
1 1/2	1.00	⅞-14	¾-16*	1.13	1.50	0.50	1.00	2.38
2	1.00	⅞-14	¾-16*	1.13	1.50	0.25	0.75	2.38
	1.38	1¼-12	1-14	1.63	2.00	0.38	1.00	2.63
2 1/2	1.00	⅞-14	¾-16	1.13	1.50	0.25	0.75	2.38
	1.38	1¼-12	1-14	1.63	2.00	0.38	1.00	2.63
	1.75	1½-12	1¼-12	2.00	2.38	0.50	1.25	2.88
3 1/4	1.38	1¼-12	1-14	1.63	2.00	0.25	0.88	2.75
	1.75	1½-12	1¼-12	2.00	2.38	0.38	1.13	3.00
	2.00	1¾-12	1½-12	2.25	2.63	0.38	1.25	3.13
4	1.75	1½-12	1¼-12	2.00	2.38	0.25	1.00	3.00
	2.00	1¾-12	1½-12	2.25	2.63	0.25	1.13	3.13
	2.50	2¼-12	1⅞-12	3.00	3.13	0.38	1.38	3.38
5	2.00	1¾-12	1½-12	2.25	2.63	0.25	1.13	3.13
	2.50	2¼-12	1⅞-12	3.00	3.13	0.38	1.38	3.38
	3.00*	2¾-12	2¼-12	3.50	3.75	0.38	1.38	3.38
	3.50*	3¼-12	2½-12	3.50	4.25	0.38	1.38	3.38
6	2.50	2¼-12	1⅞-12	3.00	3.13	0.25	1.25	3.50
	3.00*	2¾-12	2¼-12	3.50	3.75	0.25	1.25	3.50
	3.50*	3¼-12	2½-12	3.50	4.25	0.25	1.25	3.50
	4.00*	3¾-12	3-12	4.00	4.75	0.25	1.25	3.50

*Special Requests

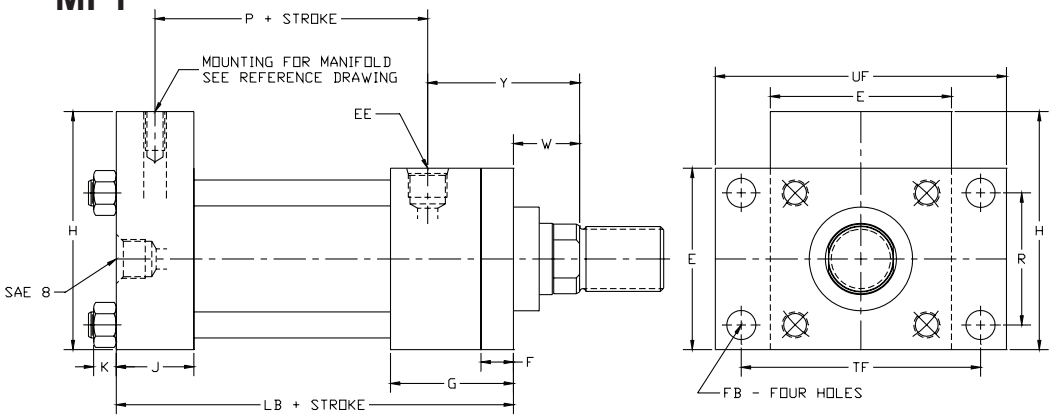
Reference Drawing for Manifold Mount

Dimensions (in)			
BORE	E	H	R
1½	2.50	3.38	1.63
2	3.00	4.00	2.05
2½	3.50	4.56	2.55
3¼	4.50	4.50	3.25
4	5.00	5.00	3.82
5	6.50	6.50	4.95
6	7.50	7.50	5.73

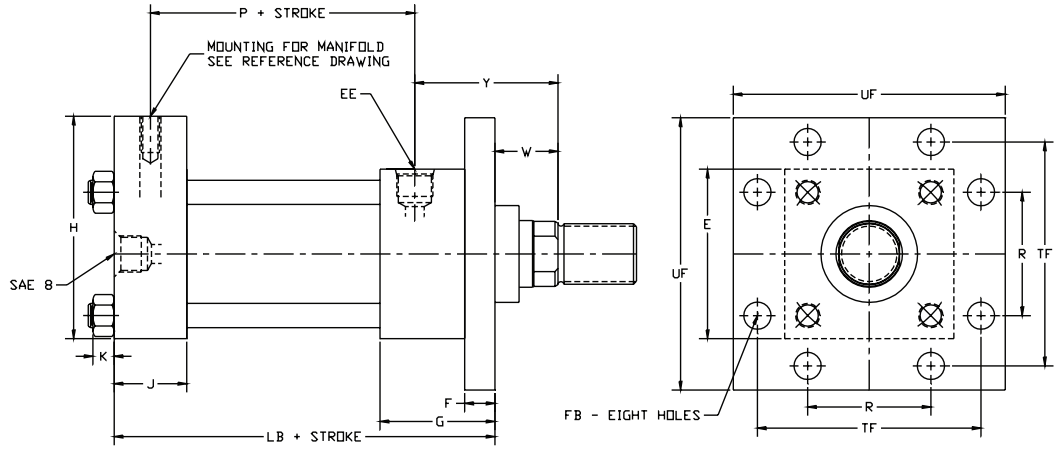


Mounting Style NFPA

MF1



MF5



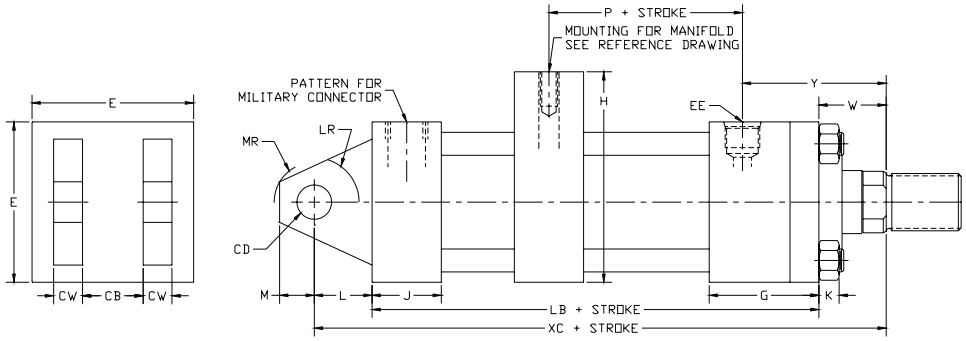
Rod Thread Table

Bore	Rod Φ MM	
1½	1.00	For other values and diagram, please see chart on page 4
2	1.00	
	1.38	
2½	1.00	
	1.38	
	1.75	
3¼	1.38	
	1.75	
	2.00	
4	1.75	
	2.00	
	2.50	
5	2.00	
	2.50	
	3.00*	
	3.50*	
6	2.50	
	3.00*	
	3.50*	
	4.00*	

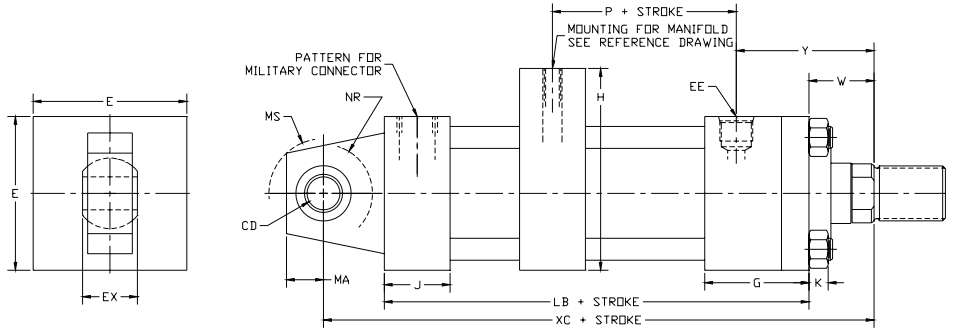
*Special Requests

Dimensions (in)													
BORE	E	EE	F	FB	G	H	J	K	R	TF	UF	LB	P
1 ½	2.50	SAE8	0.38	0.44	2.13	3.38	1.50	0.38	1.63	3.44	4.25	6.63	4.50
2	3.00	SAE8	0.63	0.56	2.38	4.00	1.50	0.44	2.05	4.13	5.13	6.88	4.50
2 ½	3.50	SAE8	0.63	0.56	2.38	4.56	1.50	0.44	2.55	4.63	5.63	6.88	4.50
3 ¼	4.50	SAE12	0.75	0.69	2.75	4.50	1.75	0.56	3.25	5.88	7.13	7.50	4.75
4	5.00	SAE12	0.88	0.69	2.88	5.00	1.75	0.56	3.82	6.38	7.63	7.63	4.75
5	6.50	SAE12	0.88	0.94	2.88	6.50	1.75	0.81	4.95	8.19	9.75	8.13	5.25
6	7.50	SAE16	1.00	1.06	3.25	7.50	2.25	0.88	5.73	9.56	11.25	9.00	5.50

MP1



MP5



MP1

Dimensions (in)																
BORE	CB	CD	CW	E	EE	G	H	J	K	L	LR	M	MR	LB	P	XC
1½	0.75	0.50	0.50	2.50	SAE8	2.13	3.38	1.50	0.38	0.75	0.56	0.50	0.56	13.13	4.50	See Rod Thread Table
2	1.25	0.75	0.63	3.00	SAE8	2.38	4.00	1.50	0.44	1.25	1.06	0.75	0.88	13.38	4.50	
2½	1.25	0.75	0.63	3.50	SAE8	2.38	4.56	1.50	0.44	1.25	1.06	0.75	0.88	13.38	4.50	
3¼	1.50	1.00	0.75	4.50	SAE12	2.75	4.50	1.75	0.56	1.50	1.25	1.00	1.19	14.25	4.75	
4	2.00	1.38	1.00	5.00	SAE12	2.88	5.00	1.75	0.56	2.13	1.88	1.38	1.63	14.38	4.75	
5	2.50	1.75	1.25	6.50	SAE12	2.88	6.50	1.75	0.81	2.25	2.06	1.75	2.13	14.88	5.25	
6	2.50	2.00	1.25	7.50	SAE16	3.25	7.50	2.25	0.88	2.50	2.31	2.00	2.38	16.25	5.50	

MP5

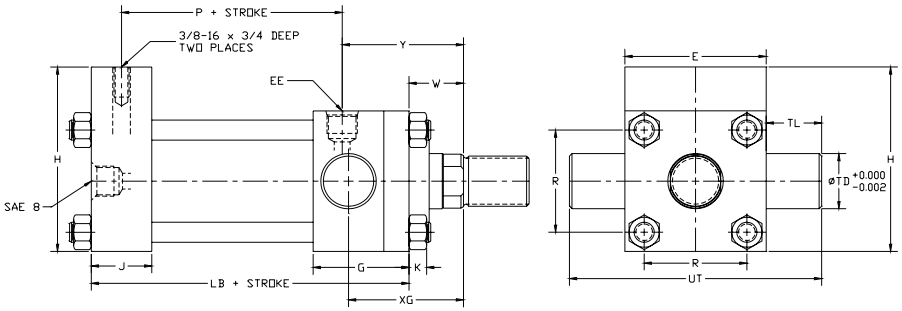
Dimensions (in)												
BORE	EX	CD-Dia -0.0005	E	EE	G	H	J	K	MA	NR Rad	LB	P	XC
1½	0.44	0.50	2.50	SAE8	2.13	3.38	1.50	0.38	0.75	0.63	13.13	4.50	See Rod Thread Table
2	0.66	0.75	3.00	SAE8	2.38	4.00	1.50	0.44	1.00	1.00	13.38	4.50	
2½	0.66	0.75	3.50	SAE8	2.38	4.56	1.50	0.44	1.00	1.00	13.38	4.50	
3¼	0.88	1.00	4.50	SAE12	2.75	4.50	1.75	0.56	1.25	1.25	14.25	4.75	
4	1.19	1.38	5.00	SAE12	2.88	5.00	1.75	0.56	1.88	1.63	14.38	4.75	
5	1.53	1.75	6.50	SAE12	2.88	6.50	1.75	0.81	2.50	2.06	14.88	5.25	
6	1.75	2.00	7.50	SAE16	3.25	7.50	2.25	0.88	2.50	2.38	16.25	5.50	

Rod Thread Table

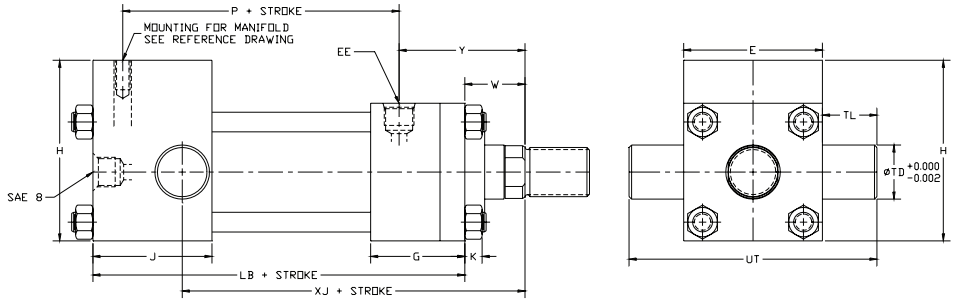
Bore	Rod Φ MM	XC	
1½	1.00	14.88	For other values and diagram, please see chart on page 4
2	1.00	15.38	
	1.38	15.63	
2½	1.00	15.38	
	1.38	15.63	
	1.75	15.88	
3¼	1.38	16.63	
	1.75	16.88	
	2.00	17.00	
4	1.75	17.50	
	2.00	17.63	
	2.50	17.88	
5	2.00	18.13	
	2.50	18.38	
	3.00*	18.38	
	3.50*	18.38	
6	2.50	20.00	
	3.00*	20.00	
	3.50*	20.00	
	4.00*	20.00	

*Special Requests

MT1



MT2



MT1

Dimensions (in)													
BORE	E	EE	F	G	H	J	K	ØTD	TL	UT	LB	P	XG
1½	2.50	SAE8	0.38	2.13	3.38	1.50	0.38	1.00	1.00	4.50	6.63	4.50	See Rod Thread Table
2	3.00	SAE8	0.63	2.38	4.00	1.50	0.44	1.38	1.38	5.75	6.88	4.50	
2½	3.50	SAE8	0.63	2.38	4.56	1.50	0.44	1.38	1.38	6.25	6.88	4.50	
3¼	4.50	SAE12	0.75	2.75	4.50	1.75	0.56	1.75	1.75	8.00	7.50	4.75	
4	5.00	SAE12	0.88	2.88	5.00	1.75	0.56	1.75	1.75	8.50	7.63	4.75	
5	6.50	SAE12	0.88	2.88	6.50	1.75	0.81	1.75	1.75	10.00	8.13	5.25	
6	7.50	SAE16	1.00	3.25	7.50	2.25	0.88	2.00	2.00	11.50	9.00	5.50	

MT2

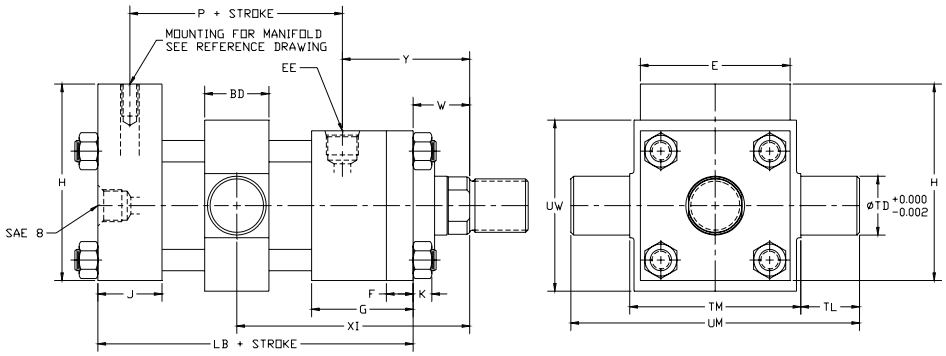
Dimensions (in)													
BORE	E	EE	F	G	H	J	K	ØTD	TL	UT	LB	P	XJ
1½	Not Available												See Rod Thread Table
2	3.00	SAE8	0.63	2.38	4.00	1.50	0.44	1.00	1.00	4.50	6.88	4.50	
2½	3.50	SAE8	0.63	2.38	4.56	1.50	0.44	1.38	1.38	5.75	6.88	4.50	
3¼	4.50	SAE12	0.75	2.75	4.50	1.75	0.56	1.38	1.38	6.25	7.50	4.75	
4	5.00	SAE12	0.88	2.88	5.00	1.75	0.56	1.75	1.75	8.00	7.63	4.75	
5	6.50	SAE12	0.88	2.88	6.50	1.75	0.81	1.75	1.75	8.50	8.13	5.25	
6	7.50	SAE16	1.00	3.25	7.50	2.25	0.88	1.75	1.75	10.00	9.00	5.50	

Rod Thread Table

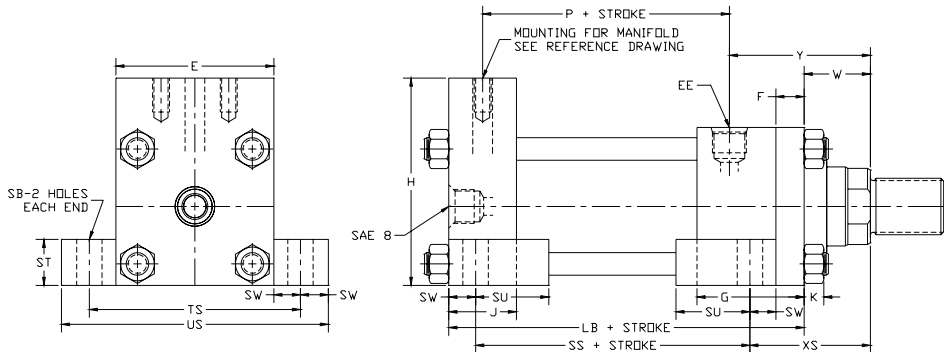
Bore	Rod ΦMM	XG	XJ	
1½	1.00	2.25	5.25	For other values and diagram, please see chart on page 4
2	1.00	2.25	5.25	
	1.38	2.50	5.50	
2½	1.00	2.25	5.38	
	1.38	2.50	5.63	
	1.75	2.75	5.88	
3¼	1.38	2.63	6.25	
	1.75	2.88	6.50	
	2.00	3.00	6.63	
4	1.75	2.88	6.75	
	2.00	3.00	6.88	
	2.50	3.25	7.12	
5	2.00	3.00	7.38	
	2.50	3.25	7.63	
	3.00*	3.25	7.63	
	3.50*	3.25	7.63	
6	2.50	3.38	8.38	
	3.00*	3.38	8.38	
	3.50*	3.38	8.38	
	4.00*	3.38	8.38	

*Special Requests

MT4



MS2



MT4

Dimensions (in)																
BORE	BD	E	EE	F	G	H	J	K	ØTD	TL	TM	UM	UW	LB	P	XI
1½	1.25	2.50	SAE8	0.38	2.13	3.38	1.50	0.38	1.00	1.00	3.00	5.00	3.00	6.63	4.50	Specified by Customer
2	1.50	3.00	SAE8	0.63	2.38	4.00	1.50	0.44	1.38	1.38	3.50	6.25	3.50	6.88	4.50	
2½	1.50	3.50	SAE8	0.63	2.38	4.56	1.50	0.44	1.38	1.38	4.00	6.75	4.00	6.88	4.50	
3¼	2.00	4.50	SAE12	0.75	2.75	4.50	1.75	0.56	1.75	1.75	5.00	8.50	5.00	7.50	4.75	
4	2.00	5.00	SAE12	0.88	2.88	5.00	1.75	0.56	1.75	1.75	5.50	9.00	5.50	7.63	4.75	
5	2.00	6.50	SAE12	0.88	2.88	6.50	1.75	0.81	1.75	1.75	7.00	10.50	7.00	8.13	5.25	
6	3.00	7.50	SAE16	1.00	3.25	7.50	2.25	0.88	2.00	2.00	8.50	12.50	8.50	9.00	5.50	

MS2

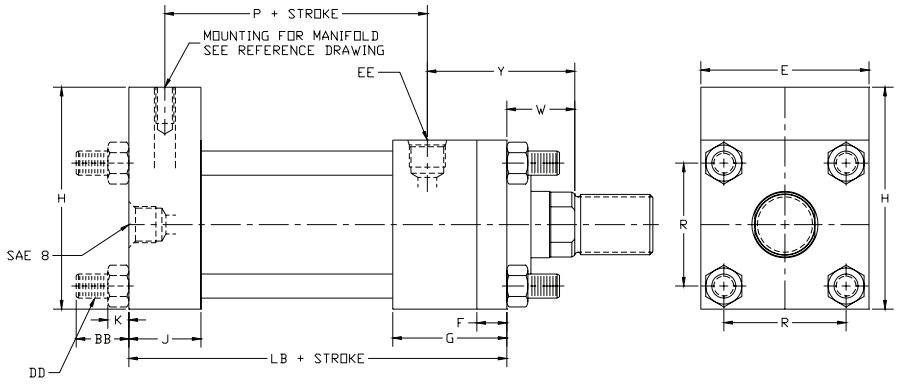
Dimensions (in)													
BORE	E	EE	F	G	H	J	K	SB	SU	SW	LB	P	SS	XS
1½	2.50	SAE8	0.38	2.13	3.38	1.50	0.38	0.44	0.94	0.38	6.63	4.50	5.50	See Rod Thread Table
2	3.00	SAE8	0.63	2.38	4.00	1.50	0.44	0.56	1.25	0.50	6.88	4.50	5.25	
2½	3.50	SAE8	0.63	2.38	4.56	1.50	0.44	1.81	1.56	0.69	6.88	4.50	4.88	
3¼	4.50	SAE12	0.75	2.75	4.50	1.75	0.56	1.81	1.56	0.69	7.50	4.75	5.38	
4	5.00	SAE12	0.88	2.88	5.00	1.75	0.56	1.06	2.00	0.88	7.63	4.75	5.00	
5	6.50	SAE12	0.88	2.88	6.50	1.75	0.81	1.06	2.00	0.88	8.13	5.25	5.50	
6	7.50	SAE16	1.00	3.25	7.50	2.25	0.88	1.31	2.50	1.13	9.00	5.50	5.75	

Rod Thread Table

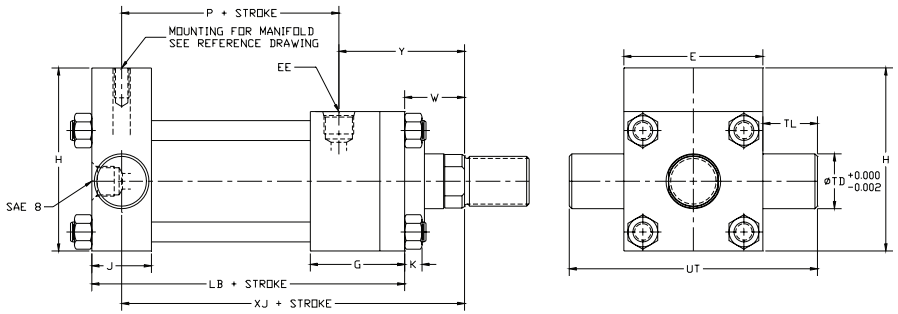
Bore	Rod Φ MM	XS	
1½	1.00	1.75	For other values and diagram, please see chart on page 4
2	1.00	1.88	
	1.38	2.13	
2½	1.00	2.06	
	1.38	2.31	
	1.75	2.56	
3¼	1.38	2.31	
	1.75	2.56	
	2.00	2.69	
4	1.75	2.75	
	2.00	2.88	
	2.50	3.13	
5	2.00	2.88	
	2.50	3.13	
	3.00*	3.13	
	3.50*	3.13	
6	2.50	3.38	
	3.00*	3.38	
	3.50*	3.38	
	4.00*	3.38	

*Special Requests

MX1, MX2, MX3



NON-NFPA



MX1, MX2, MX3

Dimensions (in)												
BORE	BB	DD	E	EE	F	G	H	J	K	R	LB	P
1½	1.38	⅜-24	2.50	SAE8	0.38	2.13	3.38	1.50	0.38	1.63	6.63	4.50
2	1.81	½-20	3.00	SAE8	0.63	2.38	4.00	1.50	0.44	2.05	6.88	4.50
2½	1.81	½-20	3.50	SAE8	0.63	2.38	4.56	1.50	0.44	2.55	6.88	4.50
3¼	2.31	⅝-18	4.50	SAE12	0.75	2.75	4.50	1.75	0.56	3.25	7.50	4.75
4	2.31	⅝-18	5.00	SAE12	0.88	2.88	5.00	1.75	0.56	3.82	7.63	4.75
5	3.19	⅞-14	6.50	SAE12	0.88	2.88	6.50	1.75	0.81	4.95	8.13	5.25
6	3.63	1-14	7.50	SAE16	1.00	3.25	7.50	2.25	0.88	5.73	9.00	5.50

NON-NFPA

Dimensions (in)													
BORE	E	EE	F	G	H	J	K	ØTD	TL	UT	LB	P	XJ
1½	2.50	SAE8	0.38	2.13	3.38	1.50	0.38	1.00	1.00	4.50	6.63	4.50	See Rod Thread Table
2	3.00	SAE8	0.63	2.38	4.00	1.50	0.44	1.38	1.38	5.75	6.88	4.50	
2½	3.50	SAE8	0.63	2.38	4.56	1.50	0.44	1.38	1.38	6.25	6.88	4.50	
3¼	4.50	SAE12	0.75	2.75	4.50	1.75	0.56	1.75	1.75	8.00	7.50	4.75	
4	5.00	SAE12	0.88	2.88	5.00	1.75	0.56	1.75	1.75	8.50	7.63	4.75	
5	6.50	SAE12	0.88	2.88	6.50	1.75	0.81	1.75	1.75	10.00	8.13	5.25	
6	7.50	SAE16	1.00	3.25	7.50	2.25	0.88	2.00	2.00	11.50	9.00	5.50	

Rod Thread Table

Bore	Rod Φ MM	XJ	
1½	1.00	6.88	For other values and diagram, please see chart on page 4
2	1.00	6.88	
	1.38	7.13	
2½	1.00	6.88	
	1.38	7./13	
	1.75	7.38	
3¼	1.38	7.50	
	1.75	7.75	
	2.00	7.88	
4	1.75	7.75	
	2.00	7.88	
	2.50	8.13	
5	2.00	8.38	
	2.50	8.63	
	3.00*	8.63	
	3.50*	8.63	
6	2.50	9.00	
	3.00*	9.00	
	3.50*	9.00	
	4.00*	9.00	

*Special Requests

How to Order

SERIES
L

BORE SIZE
C - 1 1/2"
D - 2"
E - 2 1/2"
G - 3 1/4"
H - 4"
K - 5"
L - 6"

ROD DIAMETER
E - 1"
G - 1 3/8"
H - 1 3/4"
J - 2"
K 2 1/2"
L - 3"
M - 3 1/2"
N - 4"

ROD THREAD STYLE
N - Standard Thread
M - Metric

ROD THREAD SIZE
1 -small male
2 - intermediate male
3 - full male
4 - small female
9 - flange

MOUNTINGS
E5 ME5 mount: Head rectangular
P1 MP1 mount: Female clevis
P5 MP5 mount: Spherical Bearing
F1 MF1 mount: Head rectangular flange
F5 MF5 mount: Head square flange
X1 MX1 mount: Extended tie rod both ends
X3 MX3 mount: Extended tie rod head end
X2 MX2 mount: Extended tie rod cap end
X0 MX0 mount: No mount
S2 MS2 mount: Side lugs
SC2 MS2 mount: Side lugs, thrust key on cap end
SH2 MS2 mount: Side lugs, thrust key on head end
S3 MS3 mount: Centerline lugs
T1 MT1 mount: Head end trunnion
T2 MT2 mount: Cap end trunnion
T4 MT4 mount: Intermediate trunnions
(Specify XI after stroke)

CUSHIONS
8 - none

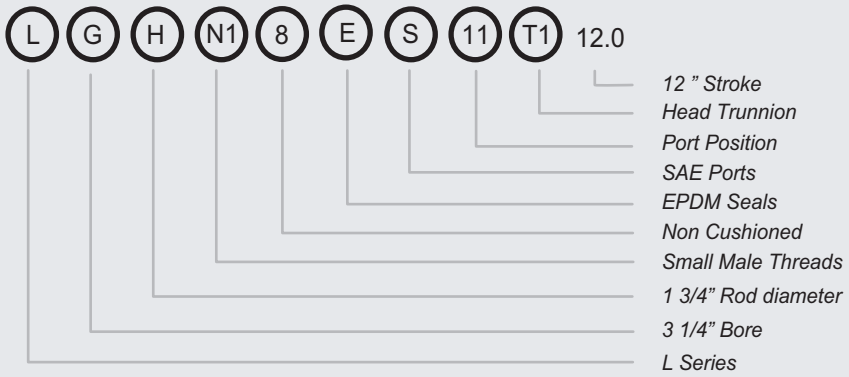
SEALS
N - Standard Seals
F - High Temp
L - Low Temp
W - Water Content
E - EPDM

PORTS
SXX - SAE
BXX - BSPP
FXX - SAE Code 61 flange

XX denotes position
ex: 12 = Pos 1 head, Pos 2 Cap

OPTIONS
Please consult the factory for additional option codes

EXAMPLE



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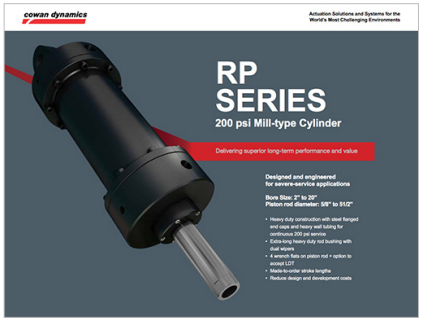

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