

BACK-TO-BACK CYLINDERS:

You can back-to-back **any** series of cylinder together — mixed or matched, to provide unlimited design possibilities. Back-to-back cylinders consist of (2) individual cylinders having common bore sizes, built as one unit utilizing common tie-rods. Mounts include a full range of base, tie-rod and head or cap trunnions for pivot mounting. (Tip: You can use a rod clevis on each piston rod to create additional pivot mounting styles. Refer to page 89 for stop tube considerations in combined strokes over 40 inches.)

BACK-TO-BACK BENEFITS:

- **MULTIPLE POSITION CYLINDER** — The back-to-back design creates a true four-position cylinder. By varying stroke lengths, a multitude of positions can be created. (Example: CYL 1 has a 1" stroke; CYL 2 has a 2" stroke. The stroke positions would be: 0", 1", 2" and 3", depending on how the cylinder is cycled.)
- **"HARD" POSITION STOPS** — Unlike a three-position cylinder, a back-to-back cylinder provides "hard" stop positioning. (Note: 3-position cylinders rely on the back piston rod to push against the front piston rod to create the intermediate position. Care must be used to prevent the front piston rod from "extending" in the intermediate position.)
- **ECONOMICAL DESIGN** — The back-to-back design uses standard parts, reducing overall costs.

HOW TO ORDER: BACK-TO-BACK CYLINDERS

CYL. #1

BTB - TA - MS4 - 2 x 10 - HC

↑

BACK-TO-BACK

CYL. #2

TA - MXO - 2 X 5 - MPR - HC

↑

WITH

SERIES	
TA	250 PSI AIR
TD	250 PSI AIR, TOUGH-DUTY
SS	STAINLESS STEEL (Refer to Cat. # CAT-TRDSS-704 for ordering information)
FM	FLUSH MOUNT (Add-A-Mount)
TRA	TRIPLE ROD

BORE	
1.50	
2	
2.50	
3.25	
4	
5	
6	
8	

STROKE (CYL. #1)	
0" to 50"	Made to Order

CUSHIONS	
H	HEAD CUSHION POSITION 2 IS STANDARD SPECIFY FOR POSITIONS: 1, 3 & 4
LH	LONG HEAD CUSHION POSITION 2 IS STANDARD SPECIFY FOR POSITIONS: 1, 3 & 4
ELH	EXTRA LONG HEAD CUSHION POSITION 2 IS STANDARD SPECIFY FOR POSITIONS: 1, 3 & 4
C	CAP CUSHION POSITION 6 IS STANDARD SPECIFY FOR POSITIONS: 5, 7 & 8
LC	LONG CAP CUSHION POSITION 6 IS STANDARD SPECIFY FOR POSITIONS: 5, 7 & 8
ELC	EXTRA LONG CAP CUSHION POSITION 6 IS STANDARD SPECIFY FOR POSITIONS: 5, 7 & 8
FIXED CUSHIONS	
FCH	FIXED HEAD CUSHION (NON-ADJUSTABLE, NO ADJUSTMENT NEEDLE)
FCC	FIXED CAP CUSHION (NON-ADJUSTABLE, NO ADJUSTMENT NEEDLE)
FC	FIXED HEAD AND CAP CUSHION (NON-ADJUSTABLE, NO ADJUSTMENT NEEDLE)

OPTIONS	
A =	EXTENDED PISTON ROD THREAD (Example: A = 2")
A/O	AIR / OIL PISTON
X B	.25" URETHANE BUMPER BOTH ENDS
X BC	.25" URETHANE BUMPER CAP ONLY
X BH	.25" URETHANE BUMPER HEAD ONLY
BP	BUMPER PISTON SEALS (1.50" - 8" Bore)
BSP	BSP PORTS (SPECIFY SIZE, Example: BSP = .25")
C =	EXTENDED PISTON ROD (Example: IF C = 0.50", THEN 1" ROD EXTENSION IS C = 1.50")
EN	ELECTROLESS NICKEL PLATED (Refer to page 84 for specifications)
KK2	LARGE MALE ROD THREAD
KK3	FEMALE ROD THREAD
KK3S	STUDDER PISTON ROD (KK3 with Stud, Loctite in place)
KK4	FULL DIAMETER MALE ROD THREAD
KK5	BLANK ROD END (NO THREADS, "A" = 0")
LF	LOW FRICTION SEALS (Refer to page 84 for specifications)
MPR	MAGNETIC PISTON FOR REED OR SOLID STATE SWITCHES - TRD MODELS: R10, R10P, RAC, RHT & MSS (Refer to pages 107-113 for selection)
MS	METALLIC ROD SCRAPER (BRASS CONSTRUCTION)
NR	NON-ROTATING (Refer to page 86 for specifications)
OP	OPTIONAL PORT LOCATION (Example: Ports @ 3 & 7)
OS	OVERSIZE ROD DIAMETER (SPECIFY SIZE, Example: OS = 1.38")
SAE	SAE PORTS (SPECIFY SIZE, Example: SAE #10)
X SE	SPRING EXTEND (CONSULT FACTORY)
X SP	SPACER PLATE (Refer to page 34 for dimensions)
X SR	SPRING RETURN (CONSULT FACTORY)
SSA	STAINLESS STEEL PISTON ROD, TIE RODS & NUTS, AND FASTENERS
SSF	STAINLESS STEEL FASTENERS
SSR	STAINLESS STEEL PISTON ROD
SST	STAINLESS STEEL TIE RODS & NUTS
X ST	STOP TUBE (SPECIFY STOP TUBE LENGTH AND EFFECTIVE STROKE) (Example: TA MS4 2 X 24" EFFECTIVE STROKE-ST=3)
STEEL TUBE	STEEL CYLINDER TUBE, BLACK EPOXY PAINT FINISH
TH	400 PSI HYDRAULIC NON-SHOCK (Refer to page 90 for specifications)
VS	FLUOROCARBON SEALS
WB	PISTON WEAR BAND
XX	SPECIAL VARIATION (SPECIFY)

STANDARD PORT AND CUSHION ADJUSTMENT POSITIONS

- Ports - Positions 1 and 5 1
- Cushion Adjustment - Positions 2 and 6 on both cylinders (opposite sides from one another)
- Specify Non-Standard Positions When Ordering

About our Part Number System

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

Example: Back-To-Back
 Cyl. 1 is a 'TA' series, MS4 mount, 2" bore X 10" stroke.
 Cyl. 2 is a 'TA' series, MXO (no mount), 2" bore X 5" stroke, with a magnet (for Reed Switches), and Head & Cap cushions.

Part Number:
 BTB-TA-MS4-2 x 10 with
 TA-MXO-2 x 5-MPR-HC

1 Ports are in-line when using standard port locations. To add space between ports (for larger air fittings), a spacer plate can be added as an option. (SPECIFY "SP" OPTION)

"SP" OPTION WILL INCREASE OVERALL LENGTH BY "FH" DIMENSION. (See page 32 for "FH" dimensions)

Tip: If overall length is tight, specify rotating the ports on one of the cylinders in lieu of a spacer plate.

BACK-TO-BACK DIMENSIONS: BASIC CYLINDER (NO MOUNT)

About Rod End Styles

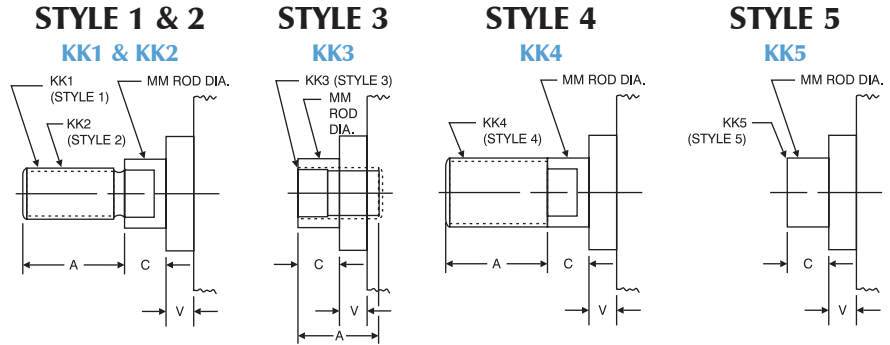
Style 1 Male Rod End is STANDARD

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).

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

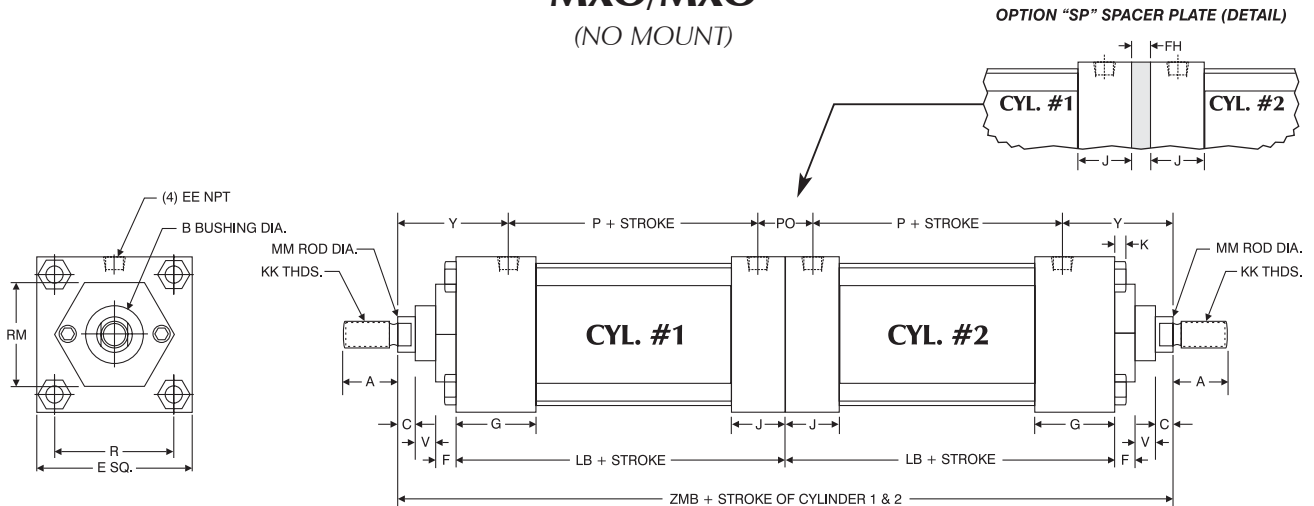
PISTON ROD END STYLES



BORE	MM ROD DIAMETER	STANDARD		OPTIONAL							C	V
		Style 1 - Male	Style 2 - Male	Style 3 - Female	Style 4 - Male	Style 5 - Blank	KK5	KK5	KK5			
1.50, 2, 2.50	.63 Standard	.44-20	.75	.50-20	.75	.44-20	.75	.63-18	.75	No Threads	.38	.25
	1 Oversize	.75-16	1.13	.88-14	1.13	.75-16	1.13	1-14	1.13	No Threads	.50	.50
3.25, 4, 5	1 Standard	.75-16	1.13	.88-14	1.13	.75-16	1.13	1-14	1.13	No Threads	.50	.25
	1.38 Oversize	1-14	1.63	1.25-12	1.63	1-14	1.63	1.38-12	1.63	No Threads	.63	.38
6 & 8	1.38 Standard	1-14	1.63	1.25-12	1.63	1-14	1.63	1.38-12	1.63	No Threads	.63	.38
	1.75 Oversize	1.25-12	2	1.50-12	2	1.25-12	2	1.75-12	2	No Threads	.75	.50

MXO/MXO

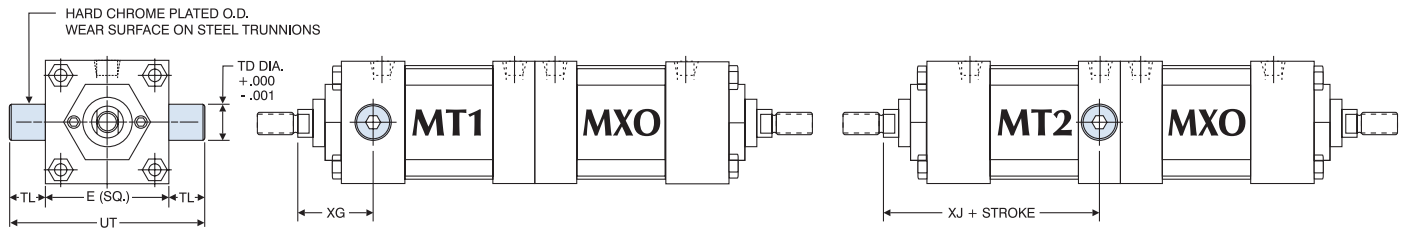
(NO MOUNT)



BACK-TO-BACK BASIC DIMENSIONS 'MXO' STANDARD & OVERSIZE RODS																					
BORE	ROD DIAMETER	A	B	C	E	EE	F	FH	G	J	K	KK	LB	MM	P	PO	R	RM	V	Y	ZMB*
1.50	.63 Standard	.75	1.13	.38	2	.38	.38	.38	1.50	1	.25	.44-20	3.63	.63	2.38	.75	1.43	2 SQ.	.25	1.88	9.25
	1 Oversize	1.13	1.50	.50								.75-16	1	1				2.50 SQ.	.50	2.25	10
2	.63 Standard	.75	1.13	.38	2.50	.38	.38	.38	1.50	1	.31	.44-20	3.63	.63	2.38	.75	1.84	1.75 HEX.	.25	1.88	9.25
	1 Oversize	1.13	1.50	.50								.75-16	1	1				2.50 SQ.	.50	2.25	10
2.50	.63 Standard	.75	1.13	.38	3	.38	.38	.38	1.50	1	.31	.44-20	3.75	.63	2.50	.75	2.19	1.75 HEX.	.25	1.88	9.50
	1 Oversize	1.13	1.50	.50								.75-16	1	1				3 SQ.	.50	2.25	10.25
3.25	1 Standard	1.13	1.50	.50	3.75	.50	.63	.63	1.75	1.25	.38	.75-16	4.25	1	2.75	1	2.76	2.75 DIA.	.25	2.38	11.25
	1.38 Oversize	1.63	2	.63								1-14	1.38	1.38				3.75 SQ.	.38	2.63	11.75
4	1 Standard	1.13	1.50	.50	4.50	.50	.63	.63	1.75	1.25	.38	.75-16	4.25	1	2.75	1	3.32	2.75 DIA.	.25	2.38	11.25
	1.38 Oversize	1.63	2	.63								1-14	1.38	1.38				3.50 DIA.	.38	2.63	11.75
5	1 Standard	1.13	1.50	.50	5.50	.50	.63	.63	1.75	1.25	.44	.75-16	4.50	1	3	1	4.10	2.75 DIA.	.25	2.38	11.75
	1.38 Oversize	1.63	2	.63								1-14	1.38	1.38				3.50 DIA.	.38	2.63	12.25
6	1.38 Standard	1.63	2	.63	6.50	.75	.63	.75	2	1.50	.44	1-14	5	1.38	3.25	1.25	4.88	3.50 DIA.	.38	2.75	13.25
	1.75 Oversize	2	2.38	.75								1.25-12	1.75	1.75					.50	3	13.75
8	1.38 Standard	1.63	2	.63	8.50	.75	.63	—	2	1.50	.56	1-14	5.13	1.38	3.38	1.25	6.44	3.50 DIA.	.38	2.75	13.50
	1.75 Oversize	2	2.38	.75								1.25-12	1.75	1.75					.50	3	14

*Overall length of "ZMB" will increase by "FH" dimension when using spacer plate option "SP".

BACK-TO-BACK DIMENSIONS: PIVOT MOUNTS



MT1 / MT2

Note: MT1 and MT2 Trunnions are bolt on, non-removable design.
Optional: One-piece solid steel trunnion available.

'MT1' HEAD TRUNNION AND 'MT2' CAP TRUNNION MOUNT DIMENSIONS							
BORE	ROD DIAMETER	E	TD	TL	UT	XG	ADD STROKE
							XJ
1.50	.63 Standard	2	1	1	4	1.75	4.13
	1 Oversize						N/A*
2	.63 Standard	2.50	1	1	4.50	1.75	4.13
	1 Oversize						2.13
2.50	.63 Standard	3	1	1	5	1.75	4.25
	1 Oversize						2.13
3.25	1 Standard	3.75	1	1	5.75	2.25	5
	1.38 Oversize						2.50
4	1 Standard	4.50	1	1	6.50	2.25	5
	1.38 Oversize						2.50
5	1 Standard	5.50	1	1	7.50	2.25	5.25
	1.38 Oversize						2.50
6	1.38 Standard	6.50	1.38	1.38	9.25	2.63	5.88
	1.75 Oversize						2.88
8	1.38 Standard	8.50	1.38	1.38	11.25	2.63	6
	1.75 Oversize						2.88

*No oversize rod available on 1.50" bore MT1.

BACK-TO-BACK CYLINDERS: SCHEMATICS

The following schematic is commonly used for back-to-back applications.

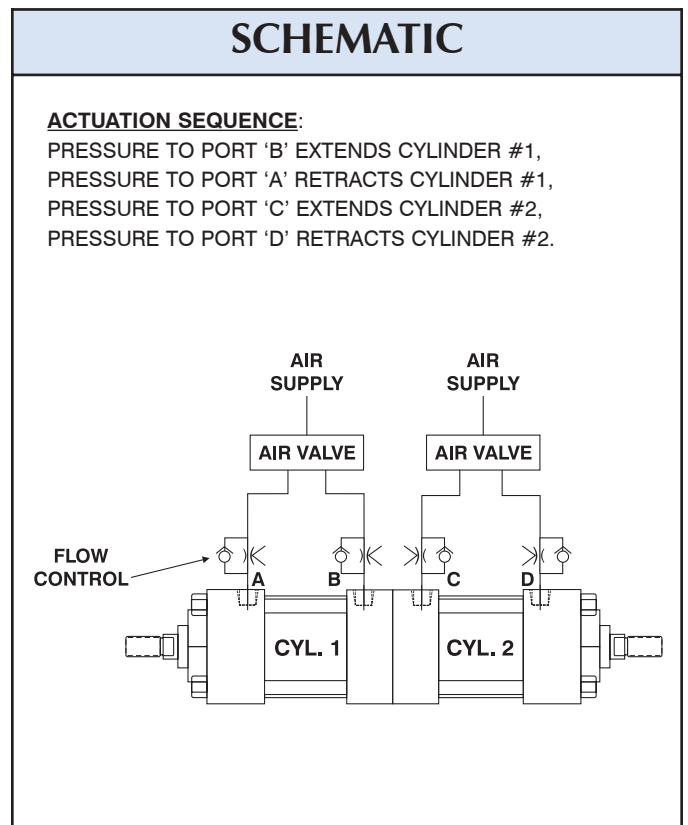
Cylinder strokes can be the same or different.

Back-to-Back cylinders are designed and built with (2) separate piston rods. Cylinders operate independently of one another.

Tip: Before ordering, check the air fitting sizes to be sure you have adequate room at the ports "B" and "C" to install fittings. Ports can be rotated on one cylinder or a spacer plate can be added (between cylinder caps) to provide clearance for fittings.

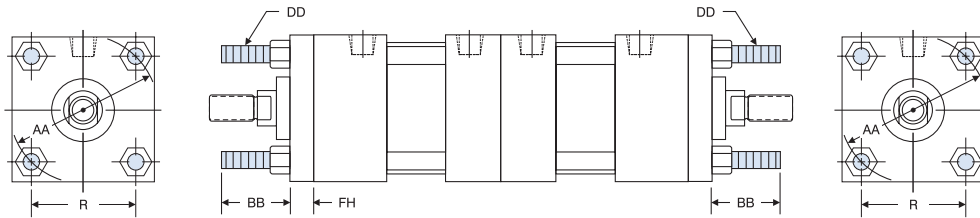
EXAMPLE:

Shown is a back-to-back cylinder with each cylinder operated with an independent air valve & (2) flow controls used to regulate cylinder speed.

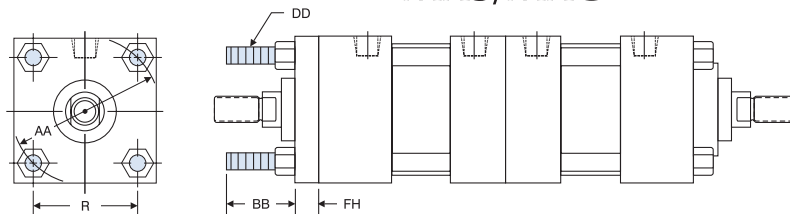


BACK-TO-BACK DIMENSIONS: TIE ROD & FLANGE MOUNTS

MX1



MX3/MXO

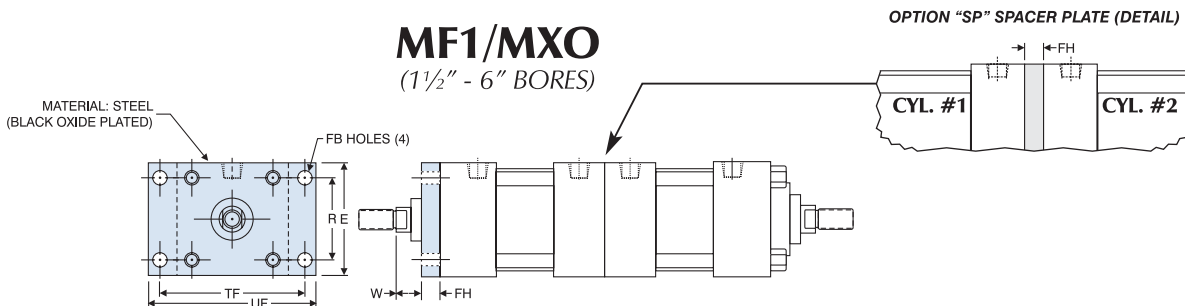


TIE ROD EXTENDED 'MX1' & 'MX3' MOUNT DIMENSIONS						
BORE	ROD DIAMETER	AA	BB	DD	FH	R
1.50	.63 Standard	2.02	1	.25-28	.38	1.43
	1 Oversize					
2	.63 Standard	2.6	1.13	.31-24	.38	1.84
	1 Oversize					
2.50	.63 Standard	3.1	1.13	.31-24	.38	2.19
	1 Oversize					
3.25	1 Standard	3.9	1.38	.38-24	.63	2.76
	1.38 Oversize					

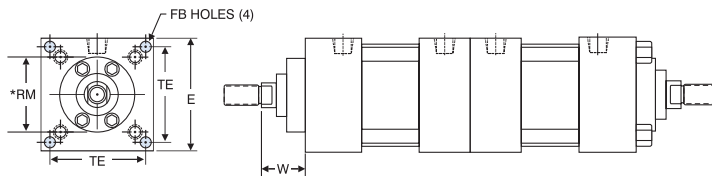
TIE ROD EXTENDED 'MX1' & 'MX3' MOUNT DIMENSIONS						
BORE	ROD DIAMETER	AA	BB	DD	FH	R
4	1 Standard	4.7	1.38	.38-24	.63	3.32
	1.38 Oversize					
5	1 Standard	5.8	1.81	.50-20	.63	4.10
	1.38 Oversize					
6	1.38 Standard	6.9	1.81	.50-20	.75	4.88
	1.75 Oversize					
8	1.38 Standard	9.1	**2.31	.63-18	*.63	6.44
	1.75 Oversize					

*Round retainer used to retain bushing, not a full front plate as other bores.
 **"BB" dimension from head on 8" bore.

MF1/MXO (1 1/2" - 6" BORES)



ME3/MXO (8" BORE ONLY)



'MF1' FLANGE & 'ME3' CAP MOUNT DIMENSIONS										
BORE	ROD DIAMETER	E	FB	FH	R	RM	TE	TF	UF	W
1.50	.63 Standard	2	.31	.38	1.43	—	—	2.75	3.38	.63
	1									
2	.63 Standard	2.50	.38	.38	1.84	—	—	3.38	4.13	.63
	1									
2.50	.63 Standard	3	.38	.38	2.19	—	—	3.88	4.63	.63
	1									
3.25	1 Standard	3.75	.44	.63	2.76	—	—	4.69	5.50	.75
	1									

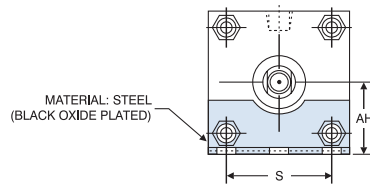
'MF1D' FLANGE & 'ME3D' CAP MOUNT DIMENSIONS										
BORE	ROD DIAMETER	E	FB	FH	R	RM	TE	TF	UF	W
4	1 Standard	4.50	.44	.63	3.32	—	—	5.44	6.25	.75
	1									
5	1 Standard	5.50	.56	.63	4.10	—	—	6.63	7.63	.75
	1									
6	1.38 Standard	6.50	.56	.75	4.88	—	—	7.63	8.63	.88
	1.75 Oversize									
8	1.38 Standard	8.50	.69	N/A	N/A	*3.50	7.57	N/A	N/A	1.63
	1.75 Oversize									

*Round retainer used to retain bushing, not a rectangular flange plate as other bores.

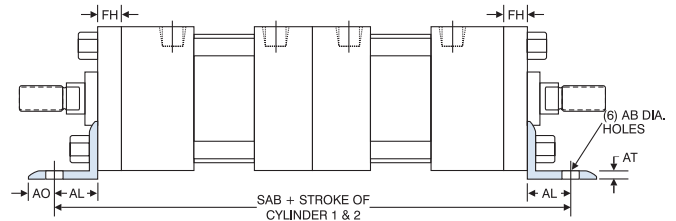
BACK-TO-BACK DIMENSIONS: BASE MOUNTS

'MS1' ANGLE MOUNT DIMENSIONS									
BORE	ROD DIAMETER	AB	AH	AL	AO	AT	FH	S	ADD STROKE
									SAB
1.50	.63 Standard	.44	1.19	1	.38	.13	.38	1.25	10
	1 Oversize								
2	.63 Standard	.44	1.44	1	.38	.13	.38	1.75	10
	1 Oversize								
2.50	.63 Standard	.44	1.63	1	.38	.13	.38	2.25	10.25
	1 Oversize								
3.25	1 Standard	.56	1.94	1.25	.50	.13	.63	2.75	12.25
	1.38 Oversize								
4	1 Standard	.56	2.25	1.25	.50	.13	.63	3.50	12.25
	1.38 Oversize								
5	1 Standard	.69	2.75	1.38	.63	.19	.63	4.25	13
	1.38 Oversize								
6	1.38 Standard	.81	3.25	1.38	.63	.19	.75	5.25	14.25
	1.75 Oversize								
8	1.38 Standard	.81	4.25	1.81	.69	.25	.63*	7.13	13.88
	1.75 Oversize								

*3.50" diameter round retainer on 8" bore.



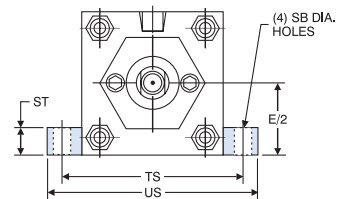
MS1



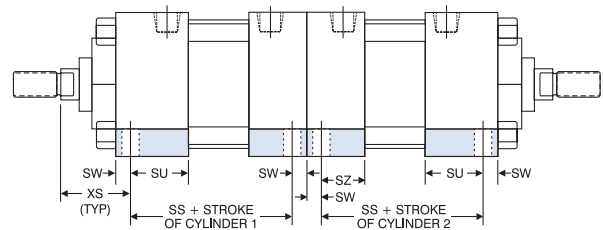
'MS2' SIDE LUG MOUNT DIMENSIONS											
BORE	ROD DIAMETER	SB	E/2	ST	SU	SW	SZ	TS	US	XS	ADD STROKE
											SS
1.50	.63 Standard	.44	1	.50	1.13	.38	.63	2.75	3.50	1.38	2.88
	1.75										
2	.63 Standard	.44	1.25	.50	1.13	.38	.63	3.25	4	1.38	2.88
	1.75										
2.50	.63 Standard	.44	1.50	.50	1.13	.38	.63	3.75	4.50	1.38	3
	1.75										
3.25	1 Standard	.56	1.88	.75	1.25	.50	.75	4.75	5.75	1.88	3.25
	1.38 Oversize										
4	1 Standard	.56	2.25	.75	1.25	.50	.75	5.50	6.50	1.88	3.25
	1.38 Oversize										
5	1 Standard	.81	2.75	1	1.06	.69	.56	6.88	8.25	2.06	3.13
	1.38 Oversize										
6	1.38 Standard	.81	3.25	1	1.31	.69	.81	7.88	9.25	2.31	3.63
	1.75 Oversize										
8	1.38 Standard	.81	4.25	1	1.31	.69	.81	9.88	11.25	2.31	3.75
	1.75 Oversize										

Note: The option not to have side lugs on center (2) caps is available. Use the "XX" option in the "How To Order" section (specify).

Example: BTB-TA-MS2-4 X 5-MPR with TA-MS2-4 X 3-BP-"XX"
"XX" = No side lugs on center (2) caps



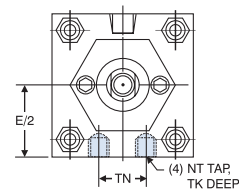
MS2



'MS4' BOTTOM TAPPED MOUNT DIMENSIONS								
BORE	ROD DIAMETER	E/2	NT	TK	TN	XT	SNB	ADD STROKE
								SN
1.50	.63 Standard	1	.25-20	.38	.63	1.94	.88	2.25
	2.31							
2	.63 Standard	1.25	.31-18	.50	.88	1.94	.88	2.25
	2.31							
2.50	.63 Standard	1.50	.38-16	.63	1.25	1.94	.88	2.38
	2.31							
3.25	1 Standard	1.88	.50-13	.75	1.50	2.44	1.13	2.63
	1.38 Oversize							
4	1 Standard	2.25	.50-13	.75	2.06	2.44	1.13	2.63
	1.38 Oversize							
5	1 Standard	2.75	.63-11	1	2.69	2.44	1.13	2.88
	1.38 Oversize							
6	1.38 Standard	3.25	.75-10	1.13	3.25	2.81	1.38	3.13
	1.75 Oversize							
8	1.38 Standard	4.25	.75-10	1.13	4.50	2.81	1.38	3.25
	1.75 Oversize							

Note: The option not to have 'MS4' taps on center (2) caps is available. Use the "XX" option in the "How To Order" section (specify).

Example: BTB-TA-MS4-6 X 7-H with TA-MS4-6 X 4-C-"XX"
"XX" = No 'MS4' taps on center (2) caps



MS4

