The Drive & Control Company

Rexroth Bosch Group

Hydraulic Cylinder NFPA Industrial Type

RA 17 041/05.12 1/76
Replaces: 03.12

Model CDT4/CGT4 NFPA Cylinders
Model CST4 Linear Positioning Cylinders


Type CDT4


Type CST4

Series 1X
Nominal pressure: 3,000 psi
Non shock rating: 5,000 psi

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Features

- Duty, nominal 3,000 psi hydraulic, non-shock 5,000 psi
- Standards, meets or exceeds all JIC and NFPA requirements
- Bore Sizes, 1-1/2" - 8" (CDT4/CGT4)
- Piston Rods, 5/8" - 5-1/2" (CDT4/CGT4)
- Mountings,19 standard NFPA mountings (CDT4/CGT4)
- Ports, SAE o-ring straight thread ports
- Stroke, standard strokes furnished in 1/8" increments. Normal stroke tolerance + 1/16" / -0". Closer stroke tolerances available; consult factory.
- Rod End Threads, standard KK1 male and female threads plus KK2 oversize male thread. Other rod end styles optional.
- Cushions, available for all bore sizes, at either or both ends.

Technical Data (for applications outside these parameters, please consult factory)

Standards:

Meets or exceeds all J.I.C. and NFPA requirements.

Nominal pressure: 3,000 psi

Static proof pressure: 5,000 psi

With extreme shock loads the mounting styles and piston rod threads have to be considered, taking the fatigue limits into account.

Maximum operating pressure up to: 3,000 psi

Static non-shock: 5,000 psi

Installation position: Various

Pressure fluid:

Mineral oils (HL, HLP)
Phosphate ester (HFD-R) (-4°F to +300°F)
HFA (41°F to 131°F)
Water glycol HFC (–4°F to 140°F)

Hydraulic fluid temperature range: (-4°F to 176°F)

Viscosity range: 32 to 1760 ssu

Degree of contamination:

Max. permissible degree of contamination of the pressure fluid is to NAS 1638 class 10.

We therefore recommend a filter with a minium retention rate of $\beta_{10} \geq 75$.

Stroke speed: 20 in/sec
(dependent on the connection port)

Air bleed standard: Secured against removal

Acceptance:
Each cylinder is tested to Bosch Rexroth standards.

Cylinders, outside the above parameters are also available. Consult factory

For applications above 230°F specify a non studded piston rod end and advise operating temperature before ordering.

Under no-load conditions, a minimum pressure of 150 psi is recommended for single rod cylinders. In case of lower pressures or double rod cylinders, please consult factory.

Operating Pressures (PSI) by Cylinder Bore Sizes*

Cylinder Bore	Standard Rod	Nominal	Non-Shock
1-1/2	5/8	3,000 psi	5,000 psi
2	1		
2-1/2	1		
3-1/4	1-3/8		
4	1-3/4		
5	2		
6	2-1/2		
7	3		
8	3-1/2		

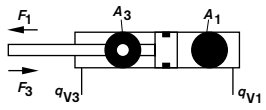
*1) For flange mounted and double rod cylinders, see pages 12 and 25.

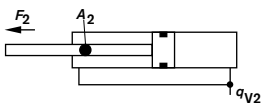
2) Exceptions to 5,000 psi non-shock rating:

a) 1-1/2” bore with 5/8” rod, all mounts.
b) All bore sizes using the following mounts:
MT1, MT2, MT4, MF1, MF2, MF5, MF6, MS7
c) The following mounts for bore sizes listed:
MP1: 2-1/2”
MP5: 2-1/2”, 3-1/4”
MF5 & MF6: 6” thru 8”

Areas, Forces, Flows (dimensions in inches)

Bore	Piston rod	Area ratio	Areas			Force at 3000 psi [1]			Flow at 4"/s [2]		
			Piston	Rod	Annulus	Push	Regen.	Pull	Out	Regen.	In
		j	A_1	A_2	A_3	F_1	F_2	F_3	q_{V1}	q_{V2}	q_{V3}
Ø in.	Ø in.	A_1/A_3	in.²	in.²	in.²	Lb.	Lb.	Lb.	gpm	gpm	gpm
	5/8"	1.21		0.31	1.46		920	4390		.32	1.52
1-1/2"	1"	1.80	1.77	0.79	0.98	5,310	2370	2940	1.84	.82	1.02
	1"	1.33		0.79	2.35		2370	7050		.82	2.44
2"	1-3/8"	1.89	3.14	1.48	1.66	9,420	4440	4980	3.26	1.54	1.72
	1"	1.19		0.79	4.12		2370	12,360		.82	4.28
2-1/2"	1-3/8"	1.43	4.91	1.48	3.43	14,730	4440	10,290	5.10	1.54	3.56
	1-3/4"	1.96		2.40	2.51		7200	7530		2.49	2.60
	1-3/8"	1.21		1.48	6.82		4440	20,460		1.54	7.08
3-1/4"	1-3/4"	1.40	8.30	2.40	5.90	24,900	7,200	17,700	8.62	2.49	6.13
	2"	1.60		3.14	5.16		9,420	15,480		3.26	5.36
	1-3/4"	1.24		2.40	10.17		7,200	30,510		2.49	10.56
4"	2"	1.33	12.57	3.14	9.43	37,710	9,420	28,290	13.05	3.26	9.79
	2-1/2"	1.64		4.91	7.66		14,730	22,980		5.10	7.95
	2"	1.19		3.14	16.50		9420	49,500		3.26	17.14
	2-1/2"	1.33		4.91	14.73		14,730	44,190		5.10	15.30
5"	3"	1.56	19.64	7.07	12.57	58,920	21,210	37,710	20.40	7.35	13.05
	3-1/2"	1.96		9.62	10.02		28,860	30,060		9.99	10.41
	2-1/2"	1.21		4.91	23.34		14,730	70,020		5.10	24.25
	3"	1.33		7.07	21.18		21,210	63,540		7.35	22.00
6"	3-1/2"	1.51	28.25	9.62	18.63	84,750	28,860	55,890	29.35	9.99	19.36
	4"	1.80		12.57	15.68		37,710	47,040		13.05	16.30
	3"	1.22		7.07	31.42		21,210	94,260		7.35	32.65
	3-1/2"	1.33		9.62	28.87		28,860	86,610		9.99	30.01
7"	4"	1.48	38.49	12.57	25.92	115,470	37,710	77,760	40.00	13.05	26.95
	4-1/2"	1.70		15.91	22.58		47,730	67,740		16.53	23.46
	5"	2.04		19.63	18.86		58,890	56,580		20.39	19.61
	3-1/2"	1.23		9.62	40.65		28,860	121,950		9.99	42.23
	4"	1.33		12.57	37.70		37,710	113,100		13.05	39.17
8"	4-1/2"	1.46	50.27	15.91	34.37	150,810	47,730	103,110	52.22	16.53	35.70
	5"	1.64		19.63	30.64		58,890	91,920		20.39	31.83
	5-1/2"	1.89		23.76	26.51		71,280	79,530		24.68	27.54





Note

[1] Theoretical force (efficiency not taken into account)
[2] Stroke velocity

Stroke tolerances

Stroke tolerances result from the cylinder head, cylinder base, cylinder tube, piston and piston rod. The stroke tolerance for all piston diameters and stroke lengths is +1/16" / -0". Tighter stroke tolerances can be requested, however, details regarding the operating pressure and operating temperature must be stated.

Stroke lengths	Stroke tolerances
≤ 120"	+1/16" / -0"

Approximate Uncrated CDT4 Hydraulic Cylinder Weights (lbs.)*

Cylinder Bore	1-1/2	2	2-1/2	3-1/4	4	5	6	7	8
Zero Stroke	7.5	10	16	31	41	73	138	180	310
Add Per Inch of Stroke	.5	.7	1.17	1.75	2.5	4.0	5.2	6.2	8.7

* Weights based on standard (first) rod sizes. Add 10% to cover additional weight for crating.

Ordering Details

	T4	/	/	/	Z	1X	/									*

Single rod cylinder = **CD**
Double rod cylinder = **CG**

Series = **T4**

Mounting types
Rectangular head = **ME5**
Rectangular cap = **ME6**
Rectangular flange at head = **MF1**
Rectangular flange at cap = **MF2**
Square flange at head = **MF5**
Square flange at cap = **MF6**
Clevis mounting = **MP1**
Pivot mount w/spherical bearing = **MP5**
Side lug = **MS2**
Side tapped = **MS4**
Centerline lugs = **MS3**
End lugs = **MS7**
Trunnion at head = **MT1**
Trunnion at cap = **MT2**
Trunnion at intermediate position [3] = **MT4**
Basic version = **MX0**
Extended tie rods, both ends = **MX1**
Extended tie rods, at cap = **MX2**
Extended tie rods, at head = **MX3**

Bore Dia. Ø 1.50 to 8.00 inch

Piston rod Ø 0.63 to 5.50 inch

[4] **Stroke length in inches (ex. 12.00)**

Design principle
Head and cap connected by tie rods = **Z**

Series
10 to 19 unchanged installation and connection dimensions = **1X**

Port connections/ types
SAE straight thread port (ISO 11926-1) = **S**
NPT pipe thread port = **U**
SAE Code 61 - 3000 psi 4-bolt flange = **F**
Special (specify), see pg. 32 = **X**

Further details in clear text

Option 2
W = Without options
K = Thrust key
S = Stop tube (specify length)
Y = Additional piston rod ext.
state length in inches in clear text

Option 1
W = Without options
E = Proximity switch, both ends
B = Gland drain connection
A = Test point, both sides

Seal version
Suitable for mineral oil to DIN 51 524 HL, HLP and HFA
M = Polyurethane seal system
T* = Servo quality/reduced friction
F* = BUNA-N seal system for HFC
Suitable for phosphate ester HFD-R
V* = Flourocarbon seal system

End position cushioning
U = Without
D = Both sides, adjustable
S = Rod sides, adjustable
K = Cap sides, adjustable

Piston rod end [2]
H = Small male thread KK1
D = Intermediate male thread KK2
E = Female thread KK1
T = S.A.F.E., rod end
X = Special (specify)

Piston rod version
H = Case hardened and hard chromium plated [1]
S = 17-4 PH stainless steel

Port location at cap
1 =
2 =
3 =
4 =

Viewed on piston rod

Port location at head
1 =
2 =
3 =
4 =

Viewed on piston rod

Remarks:

[1] Only 5/8" to 4" diameter piston rods are case hardened and hard chrome plated. Above 4" diameter piston rods are chrome plated only.

[2] With extreme shock loads the piston rod threads have to be selected, taking the fatigue limits into account. Rod and clevis, installed parts, etc. must always be firmly clamped against the piston rod shoulder.

[3] State XV dimensions in inches in clear text.

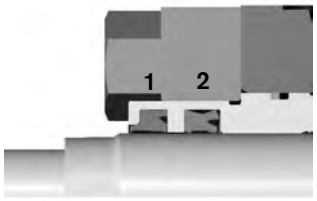
[4] For cylinders with stoptube, the stroke in the model code in the effective stroke.

* Not recommended for load holding applications. Consult factory for load holding options.

Sealing System

"M" Polyurethane seal system (standard)

** - not recommended for load holding applications. Consult factory for load holding options*



1. Double lip wiper
2. U-cup rod seal

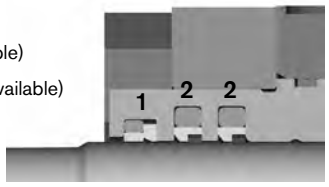
3. Double acting piston seal
4. Wear bands
5. Piston threaded and sealed to piston rod with permanent adhesive and mechanically secured with a set screw.

"T"* Seal system for low friction applications (available)

"F"* Standard seal system for HFC (water glycol) (available)

"V"* Seal system for (phosphate ester) (available)

** - not recommended for load holding applications. Consult factory for load holding options*



1. Double lip wiper
2. PTFE step seals

3. Low friction piston seal
4. Wear bands
5. Piston threaded and sealed to piston rod with permanent adhesive and mechanically secured with a set screw.

Cushioning System (optional)

Patented Exact-a-just™ cushioning provides accurate micro-meter adjustment

Exact-a-just™ cushioning permits adjustment over a wide range of settings for faster cycle times

Results in reduced maintenance costs, reduced internal and external shock, and softer cushioning stops

May be supplied at head, cap, or both ends

Exact-a-just™ cushioning

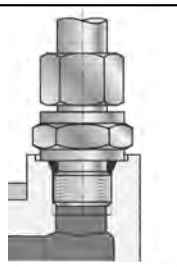
Connection Port and Secured Air Bleed (standard)

ISO 11926-1 SAE straight thread (standard)

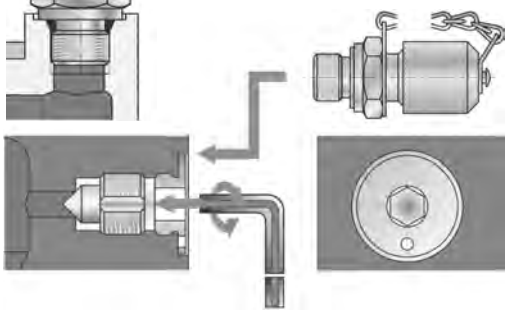
For other port options consult factory

To provide safety and prevent accidents, patented air bleed is secured against unscrewing (standard)

Air bleed ports can become an alternate connection for a pressure test fitting (optional)



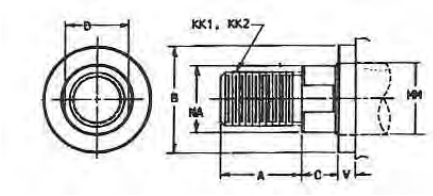
Alternate pressure test fitting



Piston Rod Versions

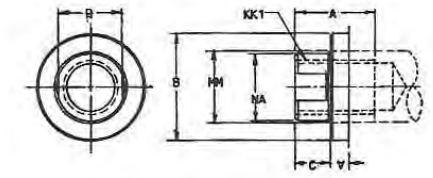
Male Rod End

Option H & D



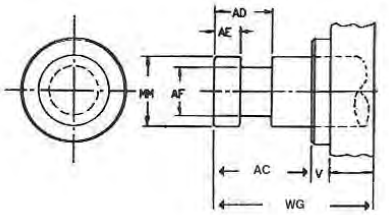
Female Rod End

Option E



S.A.F.E. Rod End

Option T



F or RT depending on mounting

Rod Thread Options:

Standard KK1 Male furnished when not specified.
Male thread available in KK1 and KK2 thread sizes.
KK1 studded male rod end standard for 5/8", 1" & 1-3/8" rod dia.
Female thread available in KK1 thread size only.

Piston Rod End

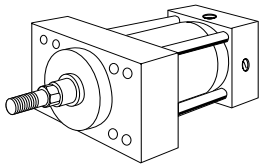
MM Rod Diameter	A	B +0.000 -0.002	C	D	AC	AD	AE	AF	KK1	KK2	NA	WG
0.625	0.750	1.124	0.38	0.50	1.13	0.63	0.250	0.375	7/16-20	1/2-20	0.54	1.75
1.000	1.125	1.499	0.50	0.88	1.50	0.94	0.375	0.688	3/4-16	7/8-14	0.94	2.38
1.375	1.625	1.999	0.63	1.13	1.75	1.06	0.375	0.875	1-14	1-1/4-12	1.32	2.75
1.750	2.000	2.374	0.75	1.50	2.00	1.31	0.500	1.125	1-1/4-12	1-1/2-12	1.69	3.13
2.000	2.250	2.624	0.88	1.69	2.63	1.69	0.625	1.375	1-1/2-12	1-3/4-12	1.94	3.75
2.500	3.000	3.124	1.00	2.06	3.25	1.94	0.750	1.750	1-7/8-12	2-1/4-12	2.44	4.50
3.000	3.500	3.749	1.00	2.63	3.63	2.44	0.875	2.250	2-1/4-12	2-3/4-12	2.94	4.88
3.500	3.500	4.249	1.00	3.00	4.38	2.69	1.000	2.500	2-1/2-12	3-1/4-12	3.44	5.63
4.000	4.000	4.749	1.00	3.38	4.50	2.69	1.000	3.000	3-12	3-3/4-12	3.94	5.75
4.500	4.500	5.249	1.00	SH 1	5.25	3.19	1.500	3.500	3-1/4-12	4-1/4-12	4.44	6.50
5.000	5.000	5.749	1.00	SH 1	5.38	3.19	1.500	3.875	3-1/2-12	4-3/4-12	4.94	6.63
5.500	5.500	6.249	1.00	SH 1	6.25	3.94	1.875	4.375	4-12	5-1/4-12	5.44	7.50

Note: Spanner wrench holes: SH1 = 0.56" dia.

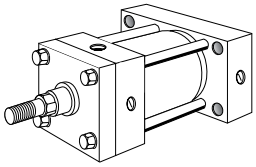
For "F, RT and V" dimensions, see respective mounting dimensions shown on pages 8 thru 26

Mounting Type Overview

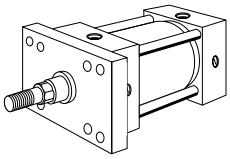
ME5 (see Page 8, 9)



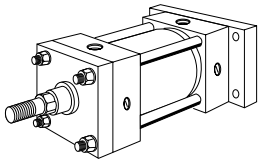
ME6 (see Page 8, 9)



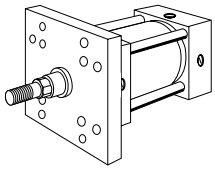
MF1 (see Page 10, 11, 12)



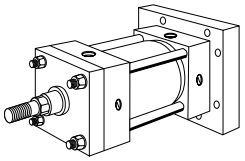
MF2 (see Page 10, 11, 12)



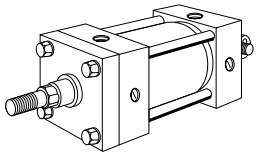
MF5 (see Page 10, 11, 12)



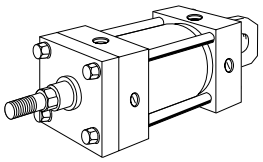
MF6 (see Page 10, 11, 12)



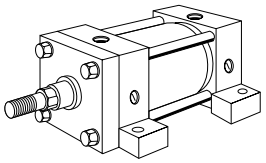
MP1 (see Page 13)



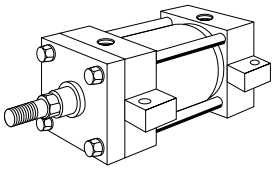
MP5 (see Page 14)



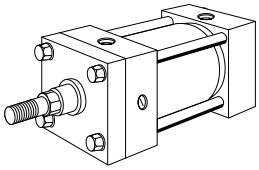
MS2 (see Page 15, 16)



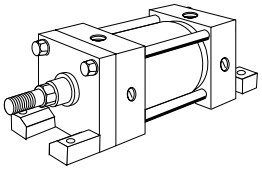
MS3 (see Page 17, 18)



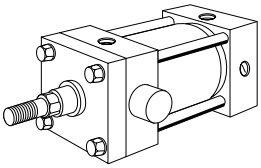
MS4 (see Page 15, 16)



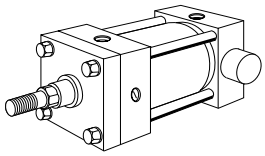
MS7 (see Page 17, 18)



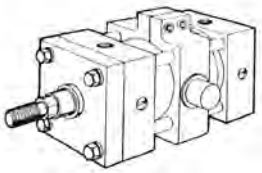
MT1 (see Page 19, 20)



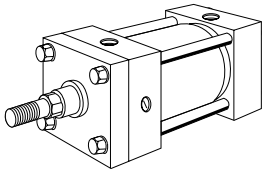
MT2 (see Page 19, 20)



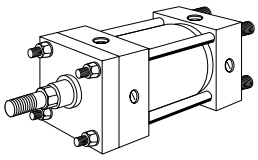
MT4 (see Page 21, 22)



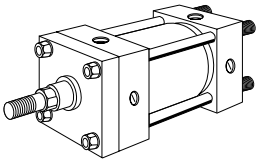
MX0 (see Page 23, 24)



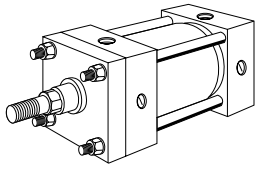
MX1 (see Page 23, 24)



MX2 (see Page 23, 24)

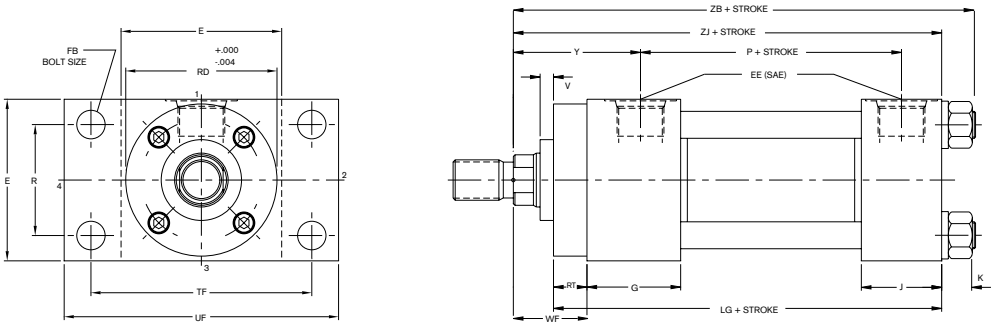


MX3 (see Page 23, 24)

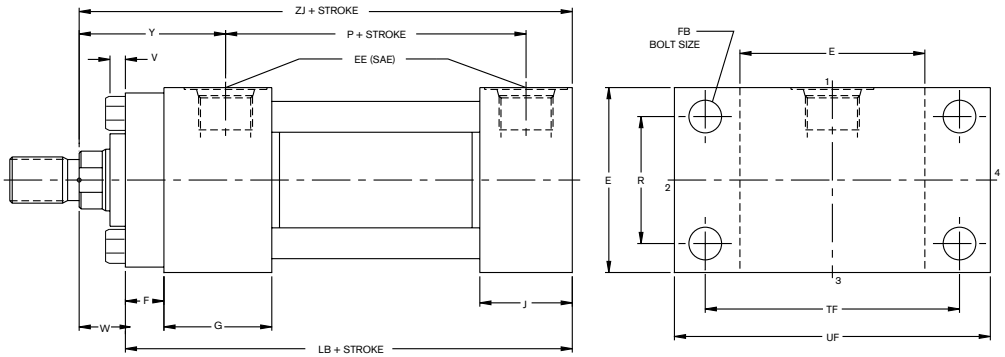


Mounting ME5, ME6

CDT4 ME5



CDT4 ME6



Dimensions ME5, ME6

Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	Y	RD*	W	WF	ZB	ZJ	RT	LG
1.500	0.625	0.25	2.00	2.125	0.63	1.00	6.06	5.63	.38	5.00
	1.000	0.50	2.38	2.500	1.00	1.38	6.43	6.00	.38	5.00
2.000	1.000	0.50	2.38	2.500	0.75	1.38	6.57	6.00	.38	5.00
	1.375	0.62	2.63	3.000	1.00	1.63	6.82	6.25	.38	5.00
2.500	1.000	0.50	2.38	2.500	0.75	1.38	6.70	6.13	.38	5.13
	1.375	0.62	2.63	3.000	1.00	1.63	6.95	6.38	.38	5.13
	1.750	0.75	2.88	3.500	1.25	1.88	7.20	6.63	.38	5.13
3.250	1.375	0.62	2.75	3.000	0.88	1.63	7.85	7.13	.38	5.88
	1.750	0.75	3.00	3.500	1.13	1.88	8.10	7.38	.38	5.88
	2.000	0.50	3.13	4.000	1.25	2.00	8.22	7.50	.63	6.13
4.000	1.750	0.75	3.00	3.500	1.00	1.88	8.35	7.63	.38	6.13
	2.000	0.50	3.13	4.000	1.13	2.00	8.48	7.75	.63	6.38
	2.500	0.63	3.38	4.500	1.38	2.25	8.73	8.00	.63	6.38
5.000	2.000	0.50	3.13	4.000	1.13	2.00	9.26	8.25	.63	6.88
	2.500	0.63	3.38	4.500	1.38	2.25	9.51	8.50	.63	6.88
	3.000	0.63	3.38	5.250	1.38	2.25	9.51	8.50	.63	6.88
	3.500	0.63	3.38	5.750	1.38	2.25	9.51	8.50	.63	6.88
6.000	2.500	0.63	3.50	4.500	1.25	2.25	10.77	9.63	.63	8.00
	3.000	0.63	3.50	5.250	1.25	2.25	10.77	9.63	.63	8.00
	3.500	0.63	3.50	5.750	1.25	2.25	10.77	9.63	.63	8.00
	4.000	0.50	3.50	6.500	1.25	2.25	10.77	9.63	.75	8.13
7.000	3.000	0.63	3.75	5.250	-	2.25	12.03	10.75	.63	9.13
	3.500	0.63	3.75	5.750	-	2.25	12.03	10.75	.63	9.13
	4.000	0.50	3.75	6.500	-	2.25	12.03	10.75	.75	9.25
	4.500	0.50	3.75	7.000	-	2.25	12.03	10.75	.75	9.25
	5.000	0.25	3.75	7.250	-	2.25	12.03	10.75	1.00	9.50
8.000	3.500	0.63	3.88	5.750	-	2.25	13.16	11.75	.63	10.13
	4.000	0.50	3.88	6.500	-	2.25	13.16	11.75	.75	10.25
	4.500	0.50	3.88	7.000	-	2.25	13.16	11.75	.75	10.25
	5.000	0.50	3.88	7.250	-	2.25	13.16	11.75	1.00	10.50
	5.500	0.25	3.88	8.250	-	2.25	13.16	11.75	1.00	10.50

"RT" dimension replaces "F" dimension on 7" – 8" bore sizes
"WF" dimension equals "W" and "F" on 7" – 8" bore sizes

Solid head and cap flange mounts are some of the strongest, most rigid methods of mounting cylinders. The head flange type mounting is best in a tension application. The cap flange type mounting is best in a thrust application.

Rod end options shown on page 6.

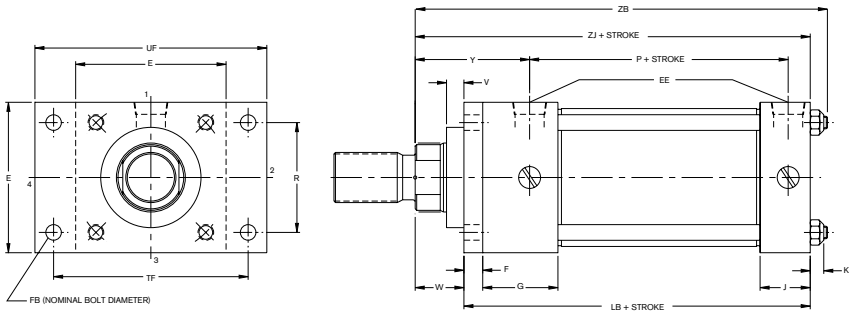
***Note:** "RD" dimension is not specified by NFPA. Please verify this dimension for retrofit or replacement applications.

Table 2 - Dimensions not affected by rod diameter

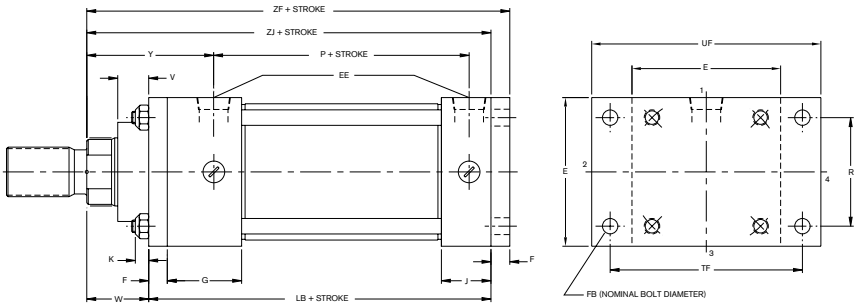
Bore In.	E	F	G	J	K	P	R	SAE Port EE	NPT Port EE	FB Bolt	LB	TF	UF
1.500	2.50	0.38	1.75	1.50	0.33	2.88	1.63	-10	1/2	0.38	5.00	3.44	4.25
2.000	3.00	0.63	1.75	1.50	0.44	2.88	2.06	-10	1/2	0.50	5.25	4.13	5.13
2.500	3.50	0.63	1.75	1.50	0.44	3.00	2.56	-10	1/2	0.50	5.38	4.63	5.63
3.250	4.50	0.75	2.00	1.75	0.55	3.50	3.25	-12	3/4	0.63	6.25	5.88	7.13
4.000	5.00	0.88	2.00	1.75	0.55	3.75	3.81	-12	3/4	0.63	6.63	6.38	7.63
5.000	6.50	0.88	2.00	1.75	0.77	4.25	4.95	-12	3/4	0.88	7.13	8.19	9.75
6.000	7.50	1.00	2.25	2.25	0.85	4.88	5.72	-16	1	1.00	8.38	9.44	11.25
7.000	8.50	1.00	2.75	2.75	0.95	5.50	6.58	-20	1-1/4	1.13	9.50	10.63	12.63
8.000	9.50	1.00	3.00	3.00	1.05	6.25	7.50	-24	1-1/2	1.25	10.50	11.81	14.00

Mounting MF1, MF2, MF5, MF6

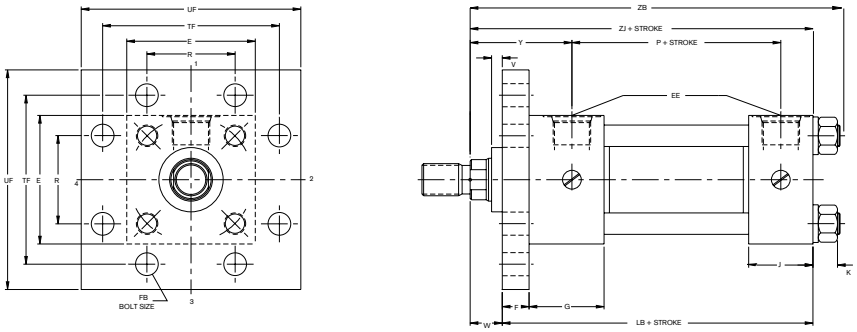
CDT4 MF1



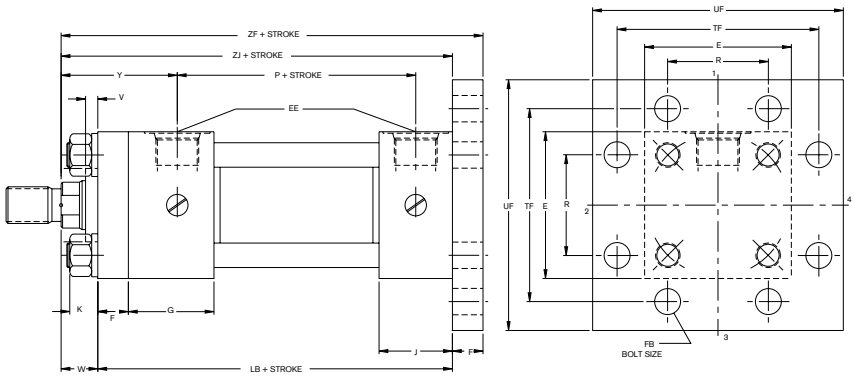
CDT4 MF2



CDT4 MF5



CDT4 MF6



Dimensions MF1, MF2, MF5, MF6

Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	RD	RT	ZB	ZF	ZJ	WF	LG
1.500	0.625	0.25	0.63	2.00	-	-	6.06	6.00	5.63	-	-
	1.000	0.50	1.00	2.38	-	-	6.43	6.38	6.00	-	-
2.000	1.000	0.25	0.75	2.38	-	-	6.57	6.63	6.00	-	-
	1.375	0.38	1.00	2.63	-	-	6.82	6.88	6.25	-	-
2.500	1.000	0.25	0.75	2.38	-	-	6.70	6.75	6.13	-	-
	1.375	0.38	1.00	2.63	-	-	6.95	7.00	6.38	-	-
	1.750	0.50	1.25	2.88	-	-	7.20	7.25	6.63	-	-
3.250	1.375	0.25	0.88	2.75	-	-	7.85	7.88	7.13	-	-
	1.750	0.38	1.13	3.00	-	-	8.10	8.13	7.38	-	-
	2.000	0.38	1.25	3.13	-	-	8.22	8.25	7.50	-	-
4.000	1.750	0.25	1.00	3.00	-	-	8.35	8.50	7.63	-	-
	2.000	0.25	1.13	3.13	-	-	8.48	8.63	7.75	-	-
	2.500	0.38	1.38	3.38	-	-	8.73	8.88	8.00	-	-
5.000	2.000	0.25	1.13	3.13	-	-	9.26	9.13	8.25	-	-
	2.500	0.38	1.38	3.38	-	-	9.51	9.38	8.50	-	-
	3.000	0.38	1.38	3.38	-	-	9.51	9.38	8.50	-	-
	3.500	0.38	1.38	3.38	-	-	9.51	9.38	8.50	-	-
6.000	2.500	0.25	1.25	3.50	-	-	10.77	10.63	9.63	-	-
	3.000	0.25	1.25	3.50	-	-	10.77	10.63	9.63	-	-
	3.500	0.25	1.25	3.50	-	-	10.77	10.63	9.63	-	-
	4.000	0.25	1.25	3.50	-	-	10.77	10.63	9.63	-	-
7.000	3.000	0.63	-	3.75	5.25	.63	12.00	11.75	10.75	2.25	9.13
	3.500	0.63	-	3.75	5.75	.63	12.00	11.75	10.75	2.25	9.13
	4.000	0.50	-	3.75	6.50	.75	12.00	11.75	10.75	2.25	9.25
	4.500	0.50	-	3.75	6.50	.75	12.00	11.75	10.75	2.25	9.25
	5.000	0.25	-	3.75	7.75	1.00	12.00	11.75	10.75	2.25	9.50
8.000	3.500	0.63	-	3.88	5.75	.63	13.25	12.75	11.75	2.25	10.13
	4.000	0.50	-	3.88	6.50	.75	13.25	12.75	11.75	2.25	10.25
	4.500	0.50	-	3.88	7.00	.75	13.25	12.75	11.75	2.25	10.25
	5.000	0.25	-	3.88	7.25	1.00	13.25	12.75	11.75	2.25	10.50
	5.500	0.25	-	3.88	8.25	1.00	13.25	12.75	11.75	2.25	10.50

"RT" dimension replaces "F" dimension on 7" – 8" bore sizes, except MF1 and MF5 mounts
“LG” dimension replaces “LB” dimension on 7” – 8” bore sizes, excep MF1 and MF5 mounts

Table 2 - Dimensions not affected by rod diameter

Bore In.	E	SAE Port EE	NPT Port EE	F	FB Bolt	G	J	K	LB	P	R	TF	UF
1.500	2.50	-10	1/2	0.38	0.38	1.75	1.50	0.34	5.00	2.88	1.63	3.44	4.25
2.000	3.00	-10	1/2	0.63	0.50	1.75	1.50	0.44	5.25	2.88	2.06	4.13	5.13
2.500	3.50	-10	1/2	0.63	0.50	1.75	1.50	0.44	5.38	3.00	2.56	4.63	5.63
3.250	4.50	-12	3/4	0.75	0.63	2.00	1.75	0.55	6.25	3.50	3.25	5.88	7.13
4.000	5.00	-12	3/4	0.88	0.63	2.00	1.75	0.55	6.63	3.75	3.81	6.38	7.63
5.000	6.50	-12	3/4	0.88	0.88	2.00	1.75	0.77	7.13	4.25	4.94	8.19	9.75
6.000	7.50	-16	1	1.00	1.00	2.25	2.25	0.85	8.38	4.88	5.72	9.44	11.25
7.000	8.50	-20	1-1/4	1.00	1.13	2.75	2.75	0.95	-	5.50	6.58	10.63	12.63
8.000	9.50	-24	1-1/2	1.00	1.25	3.00	3.00	1.05	-	6.25	7.50	11.81	14.00

Dimensions MF1, MF2

Table 1 - Maximum pressure rating for flange mounted cylinders.

Bore Size	Rod Dia.	Push MF1*	Pull MF2*
1.500	0.625	2,500	3,000
	1.000	1,500	3,000
2.000	1.000	2,500	3,000
	1.375	1,500	3,000
2.500	1.000	2,500	3,000
	1.375	1,900	3,000
	1.750	1,500	3,000
3.250	1.375	2,500	3,000
	1.750	2,100	3,000
	2.000	1,500	3,000
4.000	1.750	2,500	3,000
	2.000	1,800	3,000
	2.500	1,500	3,000
5.000	2.000	2,200	2,000
	2.500	1,650	2,500
	3.000	1,200	2,800
	3.500	750	3,000
6.000	2.500	1,800	2,000
	3.000	1,450	2,500
	3.500	1,100	2,800
	4.000	750	3,000
7.000	3.000		
	3.500	Order	Order
	4.000	ME5	ME6
	4.500	Mount	Mount
	5.000		
8.000	3.500		
	4.000	Order	Order
	4.500	ME5	ME6
	5.000	Mount	Mount
	5.500		

* Maximum pressure rating for MF1 Push applications

* Maximum pressure rating for MF2 Pull applications

Flange mounts are one of the strongest, most rigid methods of mounting. With this type of mount, there is little allowance for misalignment, so when long strokes are required, the free end opposite the mounting should be supported to prevent sagging and possible binding of the cylinder. Blind end mounts are best in a thrust load application and rod end mounts are best in tension applications. If an application exceeds the rectangular flange rating, a solid head or cap flange mount ME5 or ME6 is available (refer to page 8). When a less rigid mount can be used and the cylinder can be attached to a panel or bulkhead, an extended tie rod mount could be considered.

Notes: The bearing retainer plate is the same as the “E” dimension for 1-1/2”–6” bore sizes and the “RD” dimension for the 7”–8” bore sizes. Removable bearing retainer is not available in the 1-1/2”–6” bore sizes.

Rod end options shown on page 6.

Mounting and Dimensions MP1

CDT4 MP1

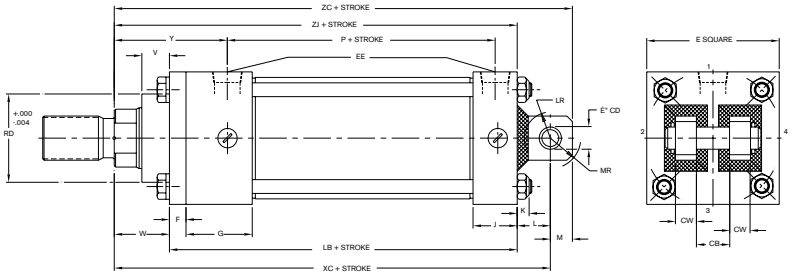


Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	RD	RT	XC	ZC	ZJ	WF	LG
1.500	0.625	0.25	0.63	2.00	-	-	6.38	6.88	5.63	-	-
	1.000	0.50	1.00	2.38	-	-	6.75	7.25	6.00	-	-
2.000	1.000	0.25	0.75	2.38	-	-	7.25	8.00	6.00	-	-
	1.375	0.38	1.00	2.63	-	-	7.50	8.25	6.25	-	-
2.500	1.000	0.25	0.75	2.38	-	-	7.38	8.13	6.13	-	-
	1.375	0.38	1.00	2.63	-	-	7.63	8.38	6.38	-	-
	1.750	0.50	1.25	2.88	-	-	7.88	8.63	6.63	-	-
3.250	1.375	0.25	0.88	2.75	-	-	8.63	9.63	7.13	-	-
	1.750	0.38	1.13	3.00	-	-	8.88	9.88	7.38	-	-
	2.000	0.38	1.25	3.13	-	-	9.00	10.00	7.50	-	-
4.000	1.750	0.25	1.00	3.00	-	-	9.75	11.13	7.63	-	-
	2.000	0.25	1.13	3.13	-	-	9.88	11.25	7.75	-	-
	2.500	0.38	1.38	3.38	-	-	10.13	11.50	8.00	-	-
5.000	2.000	0.25	1.13	3.13	-	-	10.50	12.25	8.25	-	-
	2.500	0.38	1.38	3.38	-	-	10.75	12.50	8.50	-	-
	3.000	0.38	1.38	3.38	-	-	10.75	12.50	8.50	-	-
	3.500	0.38	1.38	3.38	-	-	10.75	12.50	8.50	-	-
6.000	2.500	0.25	1.25	3.50	-	-	12.13	14.13	9.63	-	-
	3.000	0.25	1.25	3.50	-	-	12.13	14.13	9.63	-	-
	3.500	0.25	1.25	3.50	-	-	12.13	14.13	9.63	-	-
	4.000	0.25	1.25	3.50	-	-	12.13	14.13	9.63	-	-
7.000	3.000	0.63	-	3.75	5.25	.63	13.75	16.25	10.75	2.25	9.13
	3.500	0.63	-	3.75	5.75	.63	13.75	16.25	10.75	2.25	9.13
	4.000	0.50	-	3.75	6.50	.75	13.75	16.25	10.75	2.25	9.25
	4.500	0.50	-	3.75	6.50	.75	13.75	16.25	10.75	2.25	9.25
	5.000	0.25	-	3.75	7.75	1.00	13.75	16.25	10.75	2.25	9.50
8.000	3.500	0.63	-	3.88	5.75	.63	15.00	17.75	11.75	2.25	10.13
	4.000	0.50	-	3.88	6.50	.75	15.00	17.75	11.75	2.25	10.25
	4.500	0.50	-	3.88	7.00	.75	15.00	17.75	11.75	2.25	10.25
	5.000	0.25	-	3.88	7.25	1.00	15.00	17.75	11.75	2.25	10.50
	5.500	0.25	-	3.88	8.25	1.00	15.00	17.75	11.75	2.25	10.50

"RT" dimension replaces "F" dimension on 7" – 8" bore sizes
"WF" dimension equals "W" and "F" on 7" – 8" bore sizes
“LG” dimension replaces “LB” dimension on 7” – 8” bore sizes

The Clevis or Pin mounted cylinder is probably the most widely used of all mounts. For short strokes, medium or small cylinder applications, the clevis mounts are recommended. If this mount is applied where stroke requirements cause the overall length to be excessive, the Cap Trunnion mount can be used. Pivot mounts must always be used with a pivot type rod end attachment. Pivot pin and retainer rings included with MP1 mount.

The bearing retainer plate is the same as the “E” dimension for 1-1/2”–6” bore sizes and the “RD” dimension for the 7”–8” bore sizes. Rod end options shown on page 6.

Table 2 - Dimensions not affected by rod diameter

Bore In.	CB	CD	CW	E	SAE Port EE	NPT Port EE	F	G	J	K	L	LB	LR	M	MR	P
1.500	0.75	0.500	0.50	2.50	-10	1/2	0.38	1.75	1.50	0.33	0.75	5.00	0.59	0.50	0.69	2.88
2.000	1.25	0.750	0.63	3.00	-10	1/2	0.63	1.75	1.50	0.44	1.25	5.25	0.88	0.75	0.94	2.88
2.500	1.25	0.750	0.63	3.50	-10	1/2	0.63	1.75	1.50	0.44	1.25	5.38	0.88	0.75	0.94	3.00
3.250	1.50	1.000	0.75	4.50	-12	3/4	0.75	2.00	1.75	0.55	1.50	6.25	1.13	1.00	1.25	3.50
4.000	2.00	1.375	1.00	5.00	-12	3/4	0.88	2.00	1.75	0.55	2.13	6.63	1.75	1.38	1.63	3.75
5.000	2.50	1.750	1.25	6.50	-12	3/4	0.88	2.00	1.75	0.77	2.25	7.13	1.88	1.75	2.00	4.25
6.000	2.50	2.000	1.25	7.50	-16	1	1.00	2.25	2.25	0.85	2.50	8.38	2.13	2.00	2.38	4.88
7.000	3.00	2.500	1.50	8.50	-20	1-1/4	-	2.75	2.75	0.95	3.00	-	2.38	2.50	2.88	5.50
8.000	3.00	3.000	1.50	9.50	-24	1-1/2	-	3.00	3.00	1.05	3.25	-	2.63	2.75	3.13	6.25

Mounting MP5

CDT4 MP5

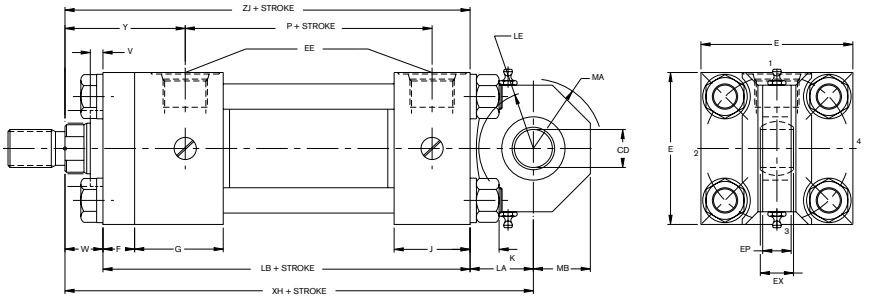


Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	XH	ZH	ZJ
1.500	0.625	0.25	0.63	2.00	6.38	7.13	5.63
	1.000	0.50	1.00	2.38	6.75	7.50	6.00
2.000	1.000	0.25	0.75	2.38	7.25	8.34	6.00
	1.375	0.38	1.00	2.63	7.50	8.63	6.25
2.500	1.000	0.25	0.75	2.38	7.38	8.50	6.13
	1.375	0.38	1.00	2.63	7.63	8.75	6.38
	1.750	0.50	1.25	2.88	7.88	9.00	6.63
3.250	1.375	0.25	0.88	2.75	8.63	10.13	7.13
	1.750	0.38	1.13	3.00	8.88	10.38	7.38
	2.000	0.38	1.25	3.13	9.00	10.50	7.50
4.000	1.750	0.25	1.00	3.00	9.75	11.69	7.63
	2.000	0.25	1.13	3.13	9.88	11.94	7.75
	2.500	0.38	1.38	3.38	10.13	12.19	8.00
5.000	2.000	0.25	1.13	3.13	10.50	13.19	8.25
	2.500	0.38	1.38	3.38	10.75	13.44	8.50
	3.000	0.38	1.38	3.38	10.75	13.44	8.50
	3.500	0.38	1.38	3.38	10.75	13.44	8.50
6.000	2.500	0.25	1.25	3.50	12.13	15.31	9.63
	3.000	0.25	1.25	3.50	12.13	15.31	9.63
	3.500	0.25	1.25	3.50	12.13	15.31	9.63
	4.000	0.25	1.25	3.50	12.13	15.31	9.63

The MP5 (Universal) type mount is a pivot mount with a spherical bearing fitted into the pivot to permit 5 to 10 degrees of movement in a plane perpendicular to the major plane of pivot movement. It is probably the most serviceable of the pivoted centerline mounts. For maximum effectiveness, a spherical rod end fitting should be utilized at the same time.

Rod end options shown on page 6.

Bore	Max. Operating Pressure *
1.500	1,800
2.000	2,250
2.500	1,450
3.250	1,500
4.000	1,850
5.000	1,950
6.000	1,800

* Pressure ratings are based on standard commercial bearing ratings.

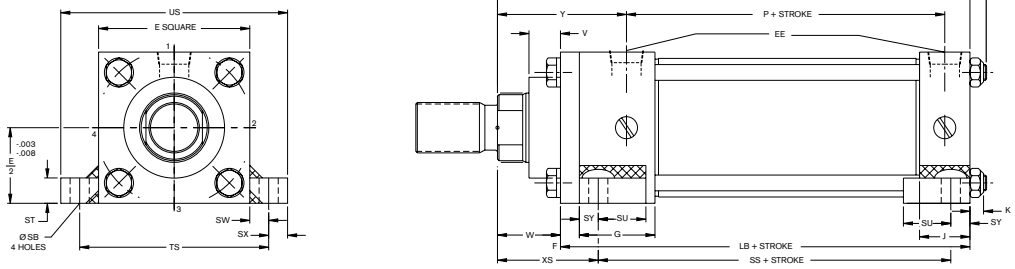
Note: Only one (1) grease nipple is supplied up to 2.50" bore. On bore sizes 2.50" and larger, two (2) grease nipples will be supplied, as shown.

Table 2 - Dimensions not affected by rod diameter

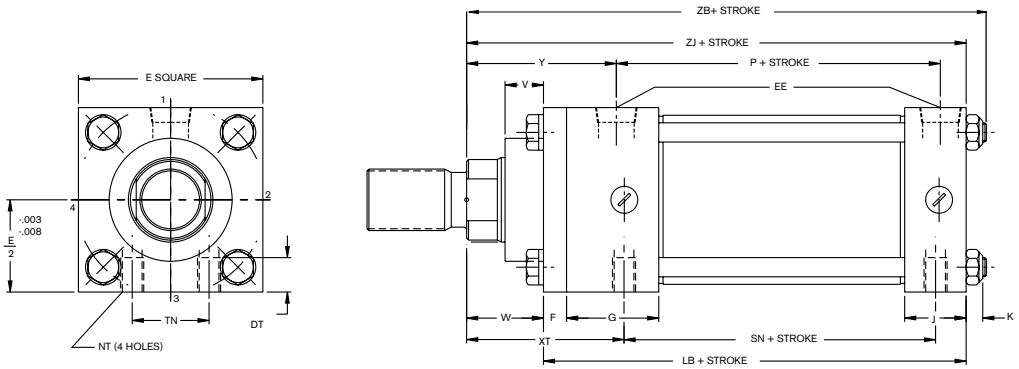
Bore In.	CD	E	SAE Port EE	NPT Port EE	EX	EP	F	G	J	K	LA	LB	LE	MA	MB	P
1.500	0.500	2.50	-10	1/2	0.44	0.38	0.38	1.75	1.50	0.325	0.75	5.00	0.63	0.88	0.75	2.88
2.000	0.750	3.00	-10	1/2	0.66	0.56	0.63	1.75	1.50	0.437	1.25	5.25	1.13	1.38	1.13	2.88
2.500	0.750	3.50	-10	1/2	0.66	0.56	0.63	1.75	1.50	0.437	1.25	5.38	1.13	1.38	1.13	3.00
3.250	1.000	4.50	-12	3/4	0.88	0.75	0.75	2.00	1.75	0.547	1.50	6.25	1.38	1.84	1.50	3.50
4.000	1.375	5.00	-12	3/4	1.19	1.03	0.88	2.00	1.75	0.547	2.13	6.63	1.94	2.25	2.06	3.75
5.000	1.750	6.50	-12	3/4	1.53	1.31	0.88	2.00	1.75	0.766	2.25	7.13	2.06	2.88	2.69	4.25
6.000	2.000	7.50	-16	1	1.75	1.50	1.00	2.25	2.25	0.845	2.50	8.38	2.31	3.31	3.06	4.88

Mounting MS2, MS4

CDT4 MS2



CDT4 MS4



The side or lug mounted cylinder provides a fairly rigid mount. These type mounts can tolerate a slight amount of misalignment when the cylinder is at full stroke, but as the piston moves toward the blind end, the tolerance for misalignment decreases. It is important to note that if the cylinder is used properly, the mounting bolts are either in simple shear or tension without any compound stresses. An extended key plate option is available to eliminate the need for fitted bolts or external keys to carry the thrust load.

Note:
When specifying an MS2 mount with ports in the 2 or 4 quandrant, be sure to see that sufficient clearance between the port fitting and the lug is available to insert a bolt or cap screw into the lug.

Rod end options shown on page 6.

Dimensions MS2, MS4

Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	RD	RT	XS	XT	ZB	ZJ	WF	LG
1.500	0.625	0.25	0.63	2.00	-	-	1.38	2.00	6.06	5.63	-	-
	1.000	0.50	1.00	2.38	-	-	1.75	2.38	6.43	6.00	-	-
2.000	1.000	0.25	0.75	2.38	-	-	1.88	2.38	6.57	6.00	-	-
	1.375	0.38	1.00	2.63	-	-	2.13	2.63	6.82	6.25	-	-
2.500	1.000	0.25	0.75	2.38	-	-	2.06	2.38	6.70	6.13	-	-
	1.375	0.38	1.00	2.63	-	-	2.31	2.63	6.95	6.38	-	-
	1.750	0.50	1.25	2.88	-	-	2.56	2.88	7.20	6.63	-	-
3.250	1.375	0.25	0.88	2.75	-	-	2.31	2.75	7.85	7.13	-	-
	1.750	0.38	1.13	3.00	-	-	2.56	3.00	8.10	7.38	-	-
	2.000	0.38	1.25	3.13	-	-	2.68	3.13	8.22	7.50	-	-
4.000	1.750	0.25	1.00	3.00	-	-	2.75	3.00	8.35	7.63	-	-
	2.000	0.25	1.13	3.13	-	-	2.88	3.13	8.48	7.75	-	-
	2.500	0.38	1.38	3.38	-	-	3.13	3.38	8.73	8.00	-	-
5.000	2.000	0.25	1.13	3.13	-	-	2.88	3.13	9.26	8.25	-	-
	2.500	0.38	1.38	3.38	-	-	3.13	3.38	9.51	8.50	-	-
	3.000	0.38	1.38	3.38	-	-	3.13	3.38	9.51	8.50	-	-
	3.500	0.38	1.38	3.38	-	-	3.13	3.38	9.51	8.50	-	-
6.000	2.500	0.25	1.25	3.50	-	-	3.38	3.50	10.77	9.63	-	-
	3.000	0.25	1.25	3.50	-	-	3.38	3.50	10.77	9.63	-	-
	3.500	0.25	1.25	3.50	-	-	3.38	3.50	10.77	9.63	-	-
	4.000	0.25	1.25	3.50	-	-	3.38	3.50	10.77	9.63	-	-
7.000	3.000	0.63	-	3.75	5.250	.63	3.63	3.81	12.00	10.75	2.25	9.13
	3.500	0.63	-	3.75	5.750	.63	3.63	3.81	12.00	10.75	2.25	9.13
	4.000	0.50	-	3.75	6.500	.75	3.63	3.81	12.00	10.75	2.25	9.25
	4.500	0.50	-	3.75	6.500	.75	3.63	3.81	12.00	10.75	2.25	9.25
	5.000	0.25	-	3.75	7.750	1.00	3.63	3.81	12.00	10.75	2.25	9.50
8.000	3.500	0.63	-	3.88	5.750	.63	3.63	3.93	13.25	11.75	2.25	10.13
	4.000	0.50	-	3.88	6.500	.75	3.63	3.93	13.25	11.75	2.25	10.25
	4.500	0.50	-	3.88	7.000	.75	3.63	3.93	13.25	11.75	2.25	10.25
	5.000	0.25	-	3.88	7.250	1.00	3.63	3.93	13.25	11.75	2.25	10.50
	5.500	0.25	-	3.88	8.250	1.00	3.63	3.93	13.25	11.75	2.25	10.50

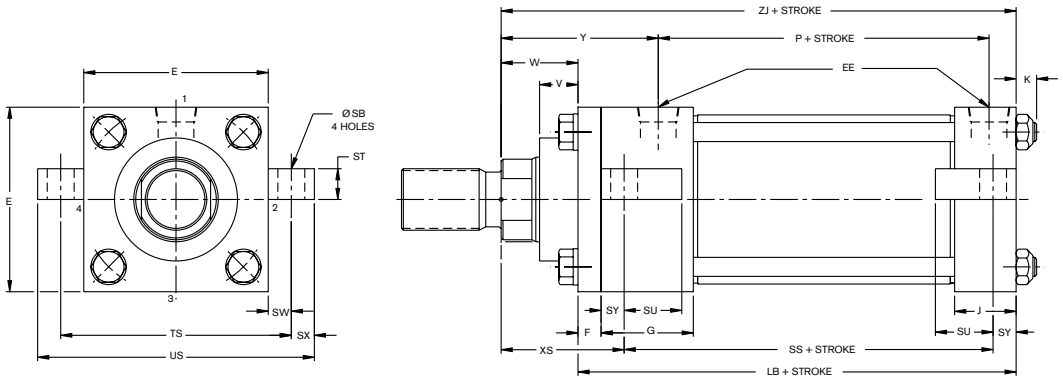
"RT" dimension replaces "F" dimension on 7" – 8" bore sizes
"WF" dimension equals "W" and "F" on 7" – 8" bore sizes
“LG” dimension replaces “LB” dimension on 7” – 8” bore sizes

Table 2 - Dimensions not affected by rod diameter

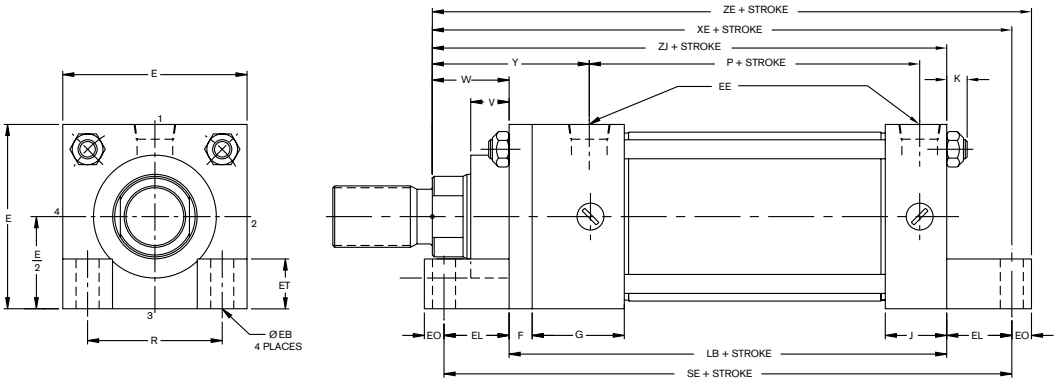
Bore In.	DT	E	SAE Port EE	NPT Port EE	F	G	J	K	LB	NT-THD	P	SB Bolt	SN	SS	ST	SU	SW	SX	SY	TN	TS	US
1.500	0.41	2.50	-10	1/2	0.38	1.75	1.50	0.33	5.00	0.38-16	2.88	0.38	2.88	3.88	0.50	0.94	0.38	0.38	0.38	0.75	3.25	4.00
2.000	0.50	3.00	-10	1/2	0.63	1.75	1.50	0.44	5.25	0.50-13	2.88	0.50	2.88	3.63	0.75	1.25	0.50	0.50	0.50	0.94	4.00	5.00
2.500	0.50	3.50	-10	1/2	0.63	1.75	1.50	0.44	5.38	0.63-11	3.00	0.75	3.00	3.38	1.00	1.56	0.69	0.69	0.69	1.31	4.88	6.25
3.250	0.75	4.50	-12	3/4	0.75	2.00	1.75	0.55	6.25	0.75-10	3.50	0.75	3.50	4.12	1.00	1.56	0.69	0.69	0.69	1.50	5.88	7.25
4.000	0.75	5.00	-12	3/4	0.88	2.00	1.75	0.55	6.63	1.00-8	3.75	1.00	3.75	4.00	1.25	2.00	0.88	0.88	0.88	2.06	6.75	8.50
5.000	0.75	6.50	-12	3/4	0.88	2.00	1.75	0.76	7.13	1.00-8	4.25	1.00	4.25	4.50	1.25	2.00	0.88	0.88	0.88	2.94	8.25	10.00
6.000	1.00	7.50	-16	1	1.00	2.25	2.25	0.85	8.38	1.25-7	4.88	1.25	5.13	5.13	1.50	2.50	1.13	1.13	1.13	3.31	9.75	12.00
7.000	1.13	8.50	-20	1-1/4	-	2.75	2.75	0.95	9.50	1.50-6	5.50	1.50	5.88	5.75	1.75	2.88	1.38	1.38	1.38	3.75	11.25	14.00
8.000	1.50	9.50	-24	1-1/2	-	3.00	3.00	1.05	10.50	1.50-6	6.25	1.50	6.63	6.75	1.75	2.88	1.38	1.38	1.38	4.25	12.25	15.00

Mounting MS3, MS7

CDT4 MS3



CDT4 MS7



The side or lug mounted cylinder provides a fairly rigid mount. These type mounts can tolerate a slight amount of misalignment when the cylinder is at full stroke, but as the piston moves toward the blind end, the tolerance for misalignment decreases. It is important to note that if the cylinder is used properly, the mounting bolts are either in simple shear or tension without any compound stresses. An extended key plate option is available to eliminate the need for fitted bolts or external keys to carry the thrust load (see page 34).

Notes: The MS3 and MS7 mounts are only offered in 1-1/2"–6" bore sizes and have a square retainer the same size as the head.

When specifiying an MS7 mount, carefully check the distance between the rod and lug to determine sufficient clearnace for the rod end attachment. It may be necessary to add extra plain rod extension to move the threaded rod end out beyond the lug. The lugs serve as nuts on the bottom two tie rods therefore making it necessary to loosen the tie rods to remove the rod bearing.

Rod end options shown on page 6.

Dimensions MS3, MS7

Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	XS	ZJ	XE	ZE
1.500	0.625	0.25	0.63	2.00	1.38	5.63	6.50	6.88
	1.000	0.25	1.00	2.38	2.38	6.00	6.88	7.25
2.000	1.000	0.25	0.75	2.38	1.88	6.00	6.94	7.44
	1.375	0.38	1.00	2.63	2.13	6.25	7.18	7.69
2.500	1.000	0.25	0.75	2.38	2.06	6.13	7.06	7.56
	1.375	0.38	1.00	2.63	2.31	6.38	7.31	7.81
	1.750	0.50	1.25	2.88	2.56	6.63	7.56	8.06
3.250	1.375	0.25	0.88	2.75	2.31	7.13	8.25	8.88
	1.750	0.38	1.13	3.00	2.56	7.38	8.50	9.13
	2.000	0.38	1.25	3.13	2.68	7.50	8.63	9.25
4.000	1.750	0.25	1.00	3.00	2.75	7.63	8.75	9.38
	2.000	0.25	1.13	3.13	2.88	7.75	8.88	9.50
	2.500	0.38	1.38	3.38	3.13	8.00	9.13	9.75
5.000	2.000	0.25	1.13	3.13	2.88	8.25	9.75	10.50
	2.500	0.38	1.38	3.38	3.13	8.50	10.00	10.75
	3.000	0.38	1.38	3.38	3.13	8.50	10.00	10.75
	3.500	0.38	1.38	3.38	3.13	8.50	10.00	10.75
6.000	2.500	0.25	1.25	3.50	3.38	9.63	11.31	12.19
	3.000	0.25	1.25	3.50	3.38	9.63	11.31	12.19
	3.500	0.25	1.25	3.50	3.38	9.63	11.31	12.19
	4.000	0.25	1.25	3.50	3.38	9.63	11.31	12.19

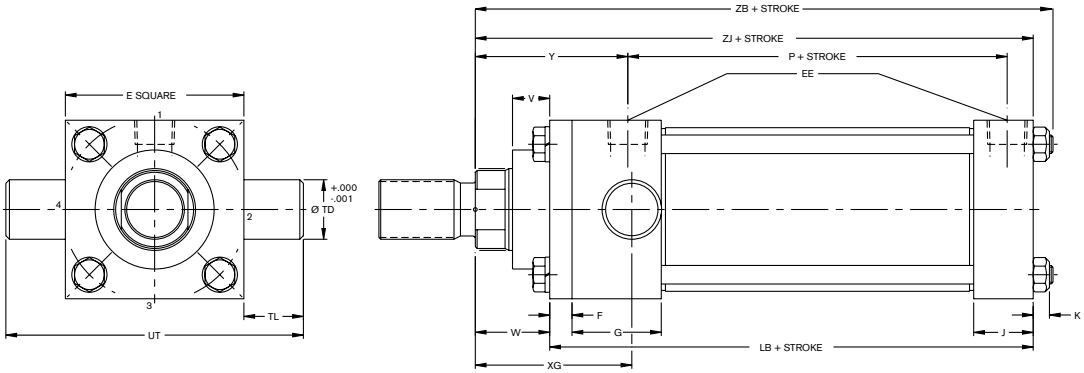
Table 2 - Dimensions not affected by rod diameter

Bore In.	E	EB Bolt	SAE Port EE	NPT Port EE	EL	EO	ET	F	G	J	K	LB
1.500	2.50	0.38	-10	1/2	0.88	0.38	0.81	0.38	1.75	1.50	0.33	5.00
2.000	3.00	0.50	-10	1/2	0.94	0.50	0.88	0.63	1.75	1.50	0.44	5.25
2.500	3.50	0.50	-10	1/2	0.94	0.50	0.88	0.63	1.75	1.50	0.44	5.38
3.250	4.50	0.62	-12	3/4	1.13	0.63	1.19	0.75	2.00	1.75	0.55	6.25
4.000	5.00	0.62	-12	3/4	1.13	0.63	1.13	0.88	2.00	1.75	0.55	6.63
5.000	6.50	0.88	-12	3/4	1.50	0.75	1.47	0.88	2.00	1.75	0.77	7.13
6.000	7.50	1.00	-16	1	1.69	0.88	1.69	1.00	2.25	2.25	0.85	8.38

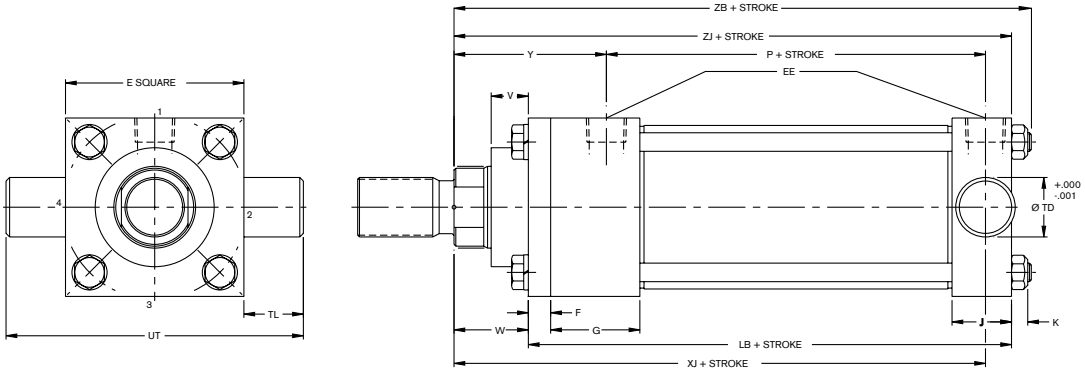
NT THD	P	R	SB Bolt	SE	SS	ST	SU	SW	SX	SY	TN	TS	US
0.38-16	2.88	1.63	0.38	6.75	3.88	0.50	0.94	0.38	0.38	0.38	0.75	3.25	4.00
0.50-13	2.88	2.05	0.50	7.13	3.63	0.75	1.25	0.50	0.50	0.50	0.94	4.00	5.00
0.63-11	3.00	2.55	0.75	7.25	3.38	1.00	1.56	0.69	0.69	0.69	1.31	4.88	6.25
0.75-10	3.50	3.25	0.75	8.50	4.12	1.00	1.56	0.69	0.69	0.69	1.50	5.88	7.25
1.00-8	3.75	3.82	1.00	8.88	4.00	1.25	2.00	0.88	0.88	0.88	2.06	6.75	8.50
1.00-8	4.25	4.95	1.00	10.13	4.50	1.25	2.00	0.88	0.88	0.88	1.94	8.25	10.00
1.25-7	4.88	5.73	1.25	11.75	5.13	1.50	2.50	1.13	1.13	1.13	3.31	9.75	12.00

Mounting MT1, MT2

CDT4 MT1



CDT4 MT2



MT1 Max. Pressure Rating

Bore	PSI
1.500	3,000
2.000	3,000
2.500	3,000
3.250	2,800
4.000	1,800
5.000	1,200
6.000	1,000
7.000	1,100
8.000	1,100

MT2 Max. Pressure Rating

Bore	PSI
1.500	3,000
2.000	3,000
2.500	3,000
3.250	2,800
4.000	1,800
5.000	1,200
6.000	1,000
7.000	1,100
8.000	1,100

Dimensions MT1, MT2

Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	RD	RT	XG	XJ	ZB	ZJ	WF	LG
1.500	0.625	0.25	0.63	2.00	-	-	1.88	4.88	6.06	5.63	-	-
	1.000	0.50	1.00	2.38	-	-	2.25	5.25	6.43	6.00	-	-
2.000	1.000	0.25	0.75	2.38	-	-	2.25	5.25	6.57	6.00	-	-
	1.375	0.38	1.00	2.63	-	-	2.50	5.50	6.82	6.25	-	-
2.500	1.000	0.25	0.75	2.38	-	-	2.25	5.38	6.70	6.13	-	-
	1.375	0.38	1.00	2.63	-	-	2.50	5.63	6.95	6.38	-	-
	1.750	0.50	1.25	2.88	-	-	2.75	5.88	7.20	6.63	-	-
3.250	1.375	0.25	0.88	2.75	-	-	2.63	6.25	7.85	7.13	-	-
	1.750	0.38	1.13	3.00	-	-	2.88	6.50	8.10	7.38	-	-
	2.000	0.38	1.25	3.13	-	-	3.00	6.63	8.22	7.50	-	-
4.000	1.750	0.25	1.00	3.00	-	-	2.88	6.75	8.35	7.63	-	-
	2.000	0.25	1.13	3.13	-	-	3.00	6.88	8.48	7.75	-	-
	2.500	0.38	1.38	3.38	-	-	3.25	7.13	8.73	8.00	-	-
5.000	2.000	0.25	1.13	3.13	-	-	3.00	7.38	9.26	8.25	-	-
	2.500	0.38	1.38	3.38	-	-	3.25	7.63	9.51	8.50	-	-
	3.000	0.38	1.38	3.38	-	-	3.25	7.63	9.51	8.50	-	-
	3.500	0.38	1.38	3.38	-	-	3.25	7.63	9.51	8.50	-	-
6.000	2.500	0.25	1.25	3.50	-	-	3.38	8.38	10.77	9.63	-	-
	3.000	0.25	1.25	3.50	-	-	3.38	8.38	10.77	9.63	-	-
	3.500	0.25	1.25	3.50	-	-	3.38	8.38	10.77	9.63	-	-
	4.000	0.25	1.25	3.50	-	-	3.38	8.38	10.77	9.63	-	-
7.000	3.000	0.63	-	3.75	5.250	.63	3.63	9.38	12.00	10.75	2.25	9.13
	3.500	0.63	-	3.75	5.750	.63	3.63	9.38	12.00	10.75	2.25	9.13
	4.000	0.50	-	3.75	6.500	.75	3.63	9.38	12.00	10.75	2.25	9.25
	4.500	0.50	-	3.75	6.500	.75	3.63	9.38	12.00	10.75	2.25	9.25
	5.000	0.25	-	3.75	7.750	1.00	3.63	9.38	12.00	10.75	2.25	9.50
8.000	3.500	0.63	-	3.88	5.750	.63	3.75	10.25	13.25	11.75	2.25	10.13
	4.000	0.50	-	3.88	6.500	.75	3.75	10.25	13.25	11.75	2.25	10.25
	4.500	0.50	-	3.88	7.000	.75	3.75	10.25	13.25	11.75	2.25	10.25
	5.000	0.25	-	3.88	7.250	1.00	3.75	10.25	13.25	11.75	2.25	10.50
	5.500	0.25	-	3.88	8.250	1.00	3.75	10.25	13.25	11.75	2.25	10.50

"RT" dimension replaces "F" dimension on 7" – 8" bore sizes
"WF" dimension equals "W" and "F" on 7" – 8" bore sizes
“LG” dimension replaces “LB” dimension on 7” – 8” bore sizes

All trunnion mount cylinders need a provision on both ends for pivoting. These types of cylinders are designed to carry shear loads and the trunnion and pivot pins should be carried by bearings that are rigidly held and closely fit for the entire length of the pin.

The bearing retainer plate is the same as the “E” dimension for 1-1/2”–6” bore sizes and the “RD” dimension for the 7”–8” bore sizes.

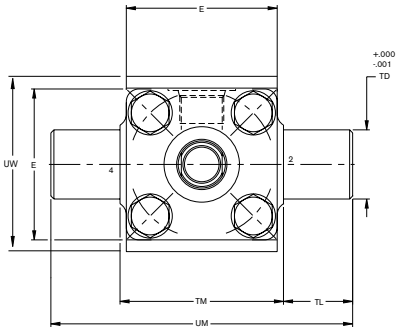
Rod end options shown on page 6.

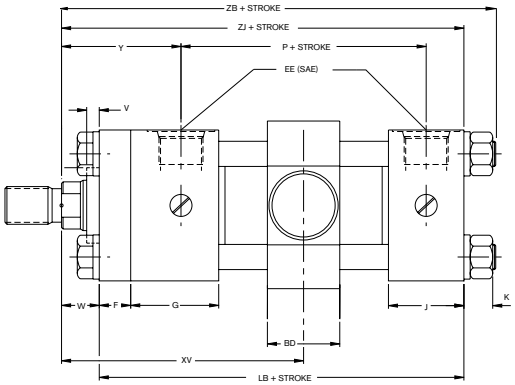
Table 2 - Dimensions not affected by rod diameter

Bore In.	E	SAE Port EE	NPT Port EE	F	G	J	K	LB	P	TD	TL	UT
1.500	2.50	-10	1/2	0.38	1.75	1.50	0.33	5.00	2.88	1.000	1.00	4.50
2.000	3.00	-10	1/2	0.63	1.75	1.50	0.44	5.25	2.88	1.375	1.38	5.75
2.500	3.50	-10	1/2	0.63	1.75	1.50	0.44	5.38	3.00	1.375	1.38	6.25
3.250	4.50	-12	3/4	0.75	2.00	1.75	0.55	6.25	3.50	1.750	1.75	8.00
4.000	5.00	-12	3/4	0.88	2.00	1.75	0.55	6.63	3.75	1.750	1.75	8.50
5.000	6.50	-12	3/4	0.88	2.00	1.75	0.77	7.13	4.25	1.750	1.75	10.00
6.000	7.50	-16	1	1.00	2.25	2.25	0.85	8.38	4.88	2.000	2.00	11.50
7.000	8.50	-20	1-1/4	-	2.75	2.75	0.95	9.50	5.50	2.500	2.50	13.50
8.000	9.50	-24	1-1/2	-	3.00	3.00	1.05	10.50	6.25	3.000	3.00	15.50

Mounting MT4

CDT4 MT4





All trunnion mount cylinders need a provision on both ends for pivoting. These types of cylinders are designed to carry shear loads and the trunnion and pivot pins should be carried by bearings that are rigidly held and closely fit for the entire length of the pin.

Specify “XV” dimension when ordering MT4 Intermediate Fixed Trunnion mounts. If not specified, trunnion will be located at the center of the tube.

The bearing retainer plate is the same as the “E” dimension for 1-1/2”–6” bore sizes and the “RD” dimension for the 7”–8” bore sizes.

Rod end options shown on page 6.

MT4Max. Pressure Rating

Bore	PSI
1.500	3,000
2.000	3,000
2.500	3,000
3.250	2,800
4.000	1,800
5.000	1,200
6.000	1,000
7.000	1,100
8.000	1,100

Dimensions MT4

Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	RD	RT	XV Min.	ZB	ZJ	WF
1.500	0.625	0.25	0.63	2.00	-	-	3.66	6.06	5.63	-
	1.000	0.50	1.00	2.38	-	-	4.03	6.43	6.00	-
2.000	1.000	0.25	0.75	2.38	-	-	4.03	6.57	6.00	-
	1.375	0.38	1.00	2.63	-	-	4.28	6.82	6.25	-
2.500	1.000	0.25	0.75	2.38	-	-	4.16	6.70	6.13	-
	1.375	0.38	1.00	2.63	-	-	4.41	6.95	6.38	-
	1.750	0.50	1.25	2.88	-	-	4.66	7.20	6.63	-
3.250	1.375	0.25	0.88	2.75	-	-	4.78	7.85	7.13	-
	1.750	0.38	1.13	3.00	-	-	5.03	8.10	7.38	-
	2.000	0.38	1.25	3.13	-	-	5.16	8.22	7.50	-
4.000	1.750	0.25	1.00	3.00	-	-	5.16	8.35	7.63	-
	2.000	0.25	1.13	3.13	-	-	5.28	8.48	7.75	-
	2.500	0.38	1.38	3.38	-	-	5.53	8.73	8.00	-
5.000	2.000	0.25	1.13	3.13	-	-	5.53	9.26	8.25	-
	2.500	0.38	1.38	3.38	-	-	5.72	9.51	8.50	-
	3.000	0.38	1.38	3.38	-	-	5.72	9.51	8.50	-
	3.500	0.38	1.38	3.38	-	-	5.72	9.51	8.50	-
6.000	2.500	0.25	1.25	3.50	-	-	6.16	10.77	9.63	-
	3.000	0.25	1.25	3.50	-	-	6.16	10.77	9.63	-
	3.500	0.25	1.25	3.50	-	-	6.16	10.77	9.63	-
	4.000	0.25	1.25	3.50	-	-	6.16	10.77	9.63	-
7.000	3.000	0.63	-	3.75	5.25	.63	6.91	12.00	10.75	2.25
	3.500	0.63	-	3.75	5.75	.63	6.91	12.00	10.75	2.25
	4.000	0.50	-	3.75	6.50	.75	6.91	12.00	10.75	2.25
	4.500	0.50	-	3.75	6.50	.75	6.91	12.00	10.75	2.25
	5.000	0.25	-	3.75	7.75	1.00	6.91	12.00	10.75	2.25
8.000	3.500	0.63	-	3.88	5.75	.63	7.16	13.25	11.75	2.25
	4.000	0.50	-	3.88	6.50	.75	7.16	13.25	11.75	2.25
	4.500	0.50	-	3.88	7.00	.75	7.16	13.25	11.75	2.25
	5.000	0.25	-	3.88	7.25	1.00	7.16	13.25	11.75	2.25
	5.500	0.25	-	3.88	8.25	1.00	7.16	13.25	11.75	2.25

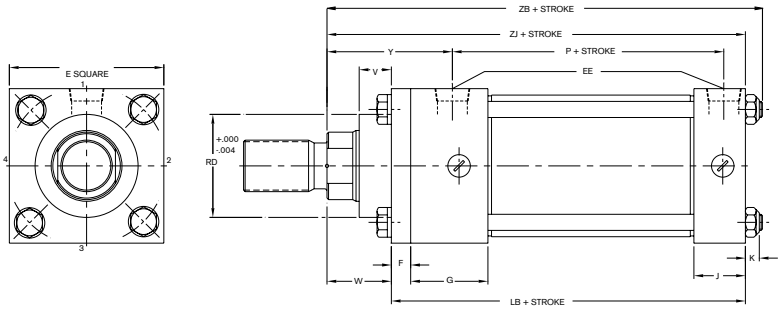
"RT" dimension replaces "F" dimension on 7" - 8" bore sizes
“WF” dimension equals “W” + “F” on 7” - 8” bore sizes

Table 2 - Dimensions not affected by rod diameter

Bore In.	E	SAE Port EE	NPT Port EE	F	G	J	K	LB	P	TD	TL	TM	UM	UT	UW	BD
1.500	2.50	-10	1/2	0.38	1.75	1.50	0.33	5.00	2.88	1.000	1.00	3.00	5.00	4.50	3.38	1.25
2.000	3.00	-10	1/2	0.63	1.75	1.50	0.44	5.25	2.88	1.375	1.38	3.50	6.25	5.75	4.13	1.50
2.500	3.50	-10	1/2	0.63	1.75	1.50	0.44	5.38	3.00	1.380	1.38	4.00	6.75	6.25	4.63	1.50
3.250	4.50	-12	3/4	0.75	2.00	1.75	0.55	6.25	3.50	1.750	1.75	5.00	8.50	8.00	5.81	2.00
4.000	5.00	-12	3/4	0.88	2.00	1.75	0.55	6.63	3.75	1.750	1.75	5.50	9.00	8.50	6.38	2.00
5.000	6.50	-12	3/4	0.88	2.00	1.75	0.77	7.13	4.25	1.750	1.75	7.00	10.50	10.00	7.75	2.00
6.000	7.50	-16	1	1.00	2.25	2.25	0.85	8.38	4.88	2.000	2.00	8.50	12.50	11.50	10.38	3.00
7.000	8.50	-20	1-1/4	-	2.75	2.75	0.95	9.50	5.50	2.500	2.50	9.75	14.75	13.50	11.50	3.00
8.000	9.50	-24	1-1/2	-	3.00	3.00	1.05	10.50	6.25	3.000	3.00	11.00	17.00	15.50	13.38	3.50

Mounting MX0, MX1, MX2, MX3

CDT4 MX0



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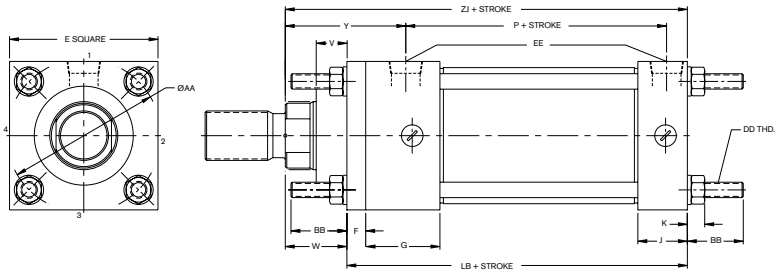
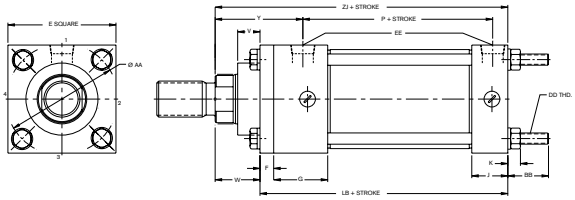
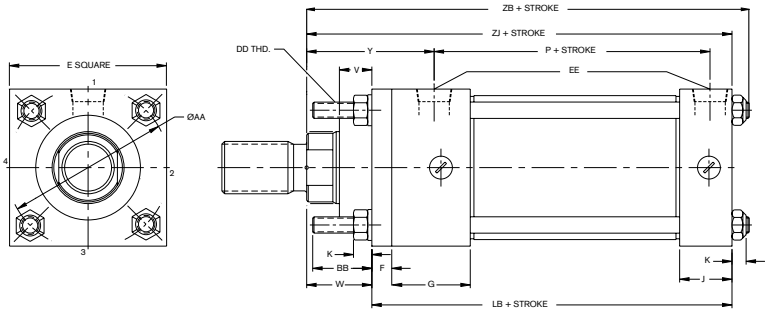


CDT4 MX2



CDT4 MX3



Dimensions MX0, MX1, MX2, MX3

Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	ZB	RD	RT	ZJ	WF
1.500	0.625	0.25	0.63	2.00	6.06	-	-	5.63	-
	1.000	0.50	1.00	2.38	6.43	-	-	6.00	-
2.000	1.000	0.25	0.75	2.38	6.57	-	-	6.00	-
	1.375	0.38	1.00	2.63	6.82	-	-	6.25	
2.500	1.000	0.25	0.75	2.38	6.70	-	-	6.13	-
	1.375	0.38	1.00	2.63	6.95	-	-	6.38	-
	1.750	0.50	1.25	2.88	7.20	-	-	6.63	-
3.250	1.375	0.25	0.88	2.75	7.85	-	-	7.13	-
	1.750	0.38	1.13	3.00	8.10	-	-	7.38	-
	2.000	0.38	1.25	3.13	8.22	-	-	7.50	-
4.000	1.750	0.25	1.00	3.00	8.35	-	-	7.63	-
	2.000	0.25	1.13	3.13	8.48	-	-	7.75	-
	2.500	0.38	1.38	3.38	8.73	-	-	8.00	-
5.000	2.000	0.25	1.13	3.13	9.26	-	-	8.25	-
	2.500	0.38	1.38	3.38	9.51	-	-	8.50	-
	3.000	0.38	1.38	3.38	9.51	-	-	8.50	-
	3.500	0.38	1.38	3.38	9.51	-	-	8.50	-
6.000	2.500	0.25	1.25	3.50	10.77	-	-	9.63	-
	3.000	0.25	1.25	3.50	10.77	-	-	9.63	-
	3.500	0.25	1.25	3.50	10.77	-	-	9.63	-
	4.000	0.25	1.25	3.50	10.77	-	-	9.63	-
7.000	3.000	0.63	-	3.75	12.00	5.25	.63	10.75	2.25
	3.500	0.63	-	3.75	12.00	5.75	.63	10.75	2.25
	4.000	0.50	-	3.75	12.00	6.50	.75	10.75	2.25
	4.500	0.50	-	3.75	12.00	6.50	.75	10.75	2.25
	5.000	0.25	-	3.75	12.00	7.75	1.00	10.75	2.25
8.000	3.500	0.63	-	3.88	13.25	5.75	.63	11.75	2.25
	4.000	0.50	-	3.88	13.25	6.50	.75	11.75	2.25
	4.500	0.50	-	3.88	13.25	7.00	.75	11.75	2.25
	5.000	0.25	-	3.88	13.25	7.25	1.00	11.75	2.25
	5.500	0.25	-	3.88	13.25	8.25	1.00	11.75	2.25

"RT" dimension replaces "F" dimension on 7" - 8" bore sizes
“WF” dimension equals “W” + “F” on 7” - 8” bore sizes

Tie Rod and Flange Mounts are basically the same except that the tie rods are extended and used to mount the cylinder. To prevent misalignment, sagging or binding of the cylinder when long strokes are required, the free end of the cylinder should be supported. For thrust load applications, blind or cap end tie rod extensions are best. For tension load applications, rod or head end tie rod extensions are best. Tie rod mounts are suited for many applications, however, it should be noted that they are not as rigid as the flange mountings.

Notes: The bearing retainer plate is the same as the “E” dimension for 1-1/2”–6” bore sizes and the "RD" dimensions for the 7"-8" bore sizes.

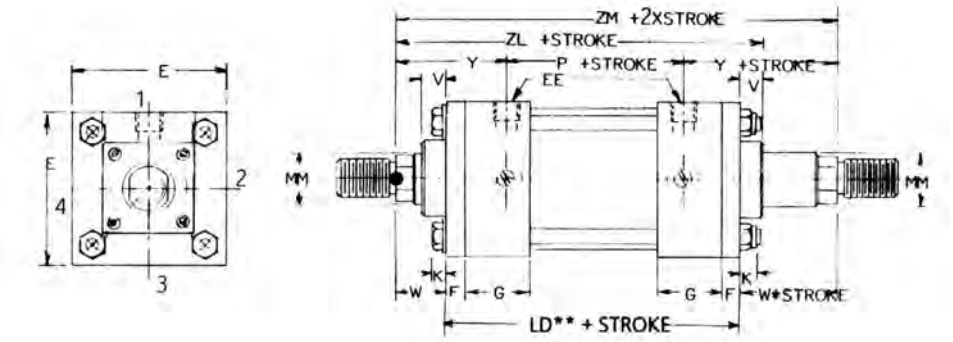
Rod end options shown on page 6.

Table 2 - Dimensions not affected by rod diameter

Bore In.	AA	BB	DD THD	E	SAE Port EE	NPT Port EE	F	G	J	K	LB	P
1.500	2.30	1.38	0.38-24	2.50	-10	1/2	0.38	1.75	1.50	0.33	5.00	2.88
2.000	2.90	1.81	0.50-20	3.00	-10	1/2	0.63	1.75	1.50	0.44	5.25	2.88
2.500	3.60	1.81	0.50-20	3.50	-10	1/2	0.63	1.75	1.50	0.44	5.38	3.00
3.250	4.60	2.31	0.63-18	4.50	-12	3/4	0.75	2.00	1.75	0.55	6.25	3.50
4.000	5.40	2.31	0.63-18	5.00	-12	3/4	0.88	2.00	1.75	0.55	6.63	3.75
5.000	7.00	3.19	0.88-14	6.50	-12	3/4	0.88	2.00	1.75	0.77	7.13	4.25
6.000	8.10	3.63	1.00-14	7.50	-16	1	1.00	2.25	2.25	0.85	8.38	4.88
7.000	9.30	4.13	1.13-12	8.50	-20	1-1/4	-	2.75	2.75	0.95	9.50	5.50
8.000	10.60	4.50	1.25-12	9.50	-24	1-1/2	-	3.00	3.00	1.05	10.50	6.25

Mounting CGT4

CGT4



Pressure Ratings for Double Rod End

Bore Size	Rod Size	Cushion Rod end or Non-Cushion	Cushion Both Ends	Remarks
1.500	0.625	1,500 psi	750 psi	
	1.000	3,000 psi	3,000 psi	
2.000	1.000	2,250 psi	800 psi	
	1.375	3,000 psi	3,000 psi	
	1.000	1,300 psi	None	Non-Cush
2.500	1.375	3,000 psi	3,000 psi	Ext.
	1.750	3,000 psi	3,000 psi	
	1.375	1,500 psi	1,000 psi	
3.250	1.750	3,000 psi	3,000 psi	
	2.000	3,000 psi	3,000 psi	
	1.750	2,000 psi	1,300 psi	
4.000	2.000	3,000 psi	2,000 psi	
	2.500	3,000 psi	3,000 psi	
	2.000	1,300 psi	1,000 psi	
5.000	2.500	3,000 psi	3,000 psi	
	3.000	3,000 psi	1,250 psi	
	3.500	3,000 psi	3,000 psi	
	2.500	1,300 psi	750 psi	
6.000	3.000	3,000 psi	2,250 psi	
	3.500	2,250 psi	1,000 psi	
	4.000	3,000 psi	3,000 psi	

Consult factory where 3,000 psi rating must be maintained.

Double rod end cylinders are available in every mounting style except MP1, MP5. For dimensions on specific mounting styles, consult the page showing the required mounting. On cylinders where the rod ends are not the same, be sure to specify where each rod end is located in relation to the mounting requirements.

Note that bore sizes 1-1/2" = 6" have square retainers, the same square size as the head on both ends. One of these retainers is held in place by the tie rod nuts, and therefore cannot be removed without loosening the tie rods.

Rod end options shown on page 6.

Minimum Stroke Lengths for Double Rod Cylinders

Bore	Rod	Min. Stroke	Rod End Type
1.50	0.63	0.00	Male/Female
	1.00	0.00	Male/Female
2.00	1.00	0.50	Male/Female
	1.38	0.50	Male/Female
2.50	1.00	0.50	Male/Female
	1.38	0.50	Male/Female
	1.75	1.00	Male/Female
3.25	1.38	1.00	Male/Female
	1.75	1.00	Male/Female
	2.00	1.50	Male/Female
4.00	1.75	2.00	Male/Female
	2.00	1.50	Male/Female
	2.50	2.00	Male/Female
5.00	2.00	2.00	Male/Female
	2.50	2.00	Male/Female
	3.00	3.50	Male/Female
	3.50	3.00	Male/Female
6.00	2.50	3.00	Male/Female
	3.00	3.00	Male/Female
	3.50	3.50	Male/Female
	4.00	4.00	Male/Female

Consult factory for other bore/rod combinations

Mounting CGT4

Table 1 - Dimensions affected by rod diameter

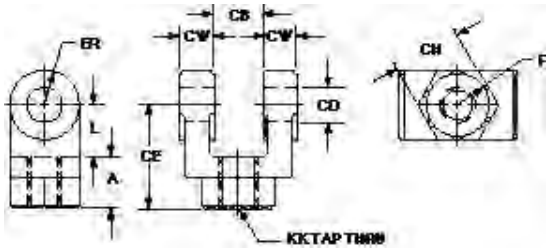
Bore In.	MM Rod	V	W	Y	ZL	ZM
1.500	0.625	0.25	0.63	2.00	6.69	6.88
	1.000	0.50	1.00	2.38	7.06	7.63
2.000	1.000	0.25	0.75	2.38	7.45	7.63
	1.375	0.38	1.00	2.63	7.70	8.13
2.500	1.000	0.25	0.75	2.38	7.57	7.75
	1.375	0.38	1.00	2.63	7.82	8.25
	1.750	0.50	1.25	2.88	8.07	8.75
3.250	1.375	0.25	0.88	2.75	8.85	9.00
	1.750	0.38	1.13	3.00	9.10	9.50
	2.000	0.38	1.25	3.13	9.22	9.75
4.000	1.750	0.25	1.00	3.00	9.47	9.75
	2.000	0.25	1.13	3.13	9.60	10.00
	2.500	0.38	1.38	3.38	9.85	10.50
5.000	2.000	0.25	1.13	3.13	10.38	10.50
	2.500	0.38	1.38	3.38	10.63	11.00
	3.000	0.38	1.38	3.38	10.63	11.00
	3.500	0.38	1.38	3.38	10.63	11.00
6.000	2.500	0.25	1.25	3.50	11.77	11.88
	3.000	0.25	1.25	3.50	11.77	11.88
	3.500	0.25	1.25	3.50	11.77	11.88
	4.000	0.25	1.25	3.50	11.77	11.88

Table 2 - Dimensions not affected by rod diameter

Bore In.	E	F	G	J	K	P	R	SAE Port EE	NPT Port EE	LD
1.500	2.50	0.38	1.75	1.50	0.33	2.88	1.63	7/8-14	1/2	5.63
2.000	3.00	0.63	1.75	1.50	0.44	2.88	2.06	7/8-14	1/2	6.13
2.500	3.50	0.63	1.75	1.50	0.44	3.00	2.56	7/8-14	1/2	6.25
3.250	4.50	0.75	2.00	1.75	0.55	3.50	3.25	1-1/16-12	3/4	7.25
4.000	5.00	0.88	2.00	1.75	0.55	3.75	3.81	1-1/16-12	3/4	7.75
5.000	6.50	0.88	2.00	1.75	0.77	4.25	4.94	1-1/16-12	3/4	8.25
6.000	7.50	1.00	2.25	2.25	0.85	4.88	5.72	1-5/16-12	1	9.38

Rexroth Cylinder Accessories

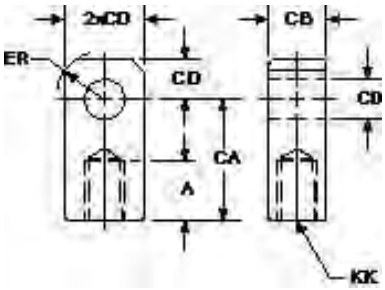
Rod Clevises



Part No.	CB	CD	CE	CH	CW	F	L	A	KK	ER
R978935057	.765	1/2	1-1/2	1	1/2	1	3/4	3/4	7/16-20	1/2
R978935058	1.265	3/4	2-3/8	1-1/4	5/8	1-1/4	1-1/4	1-1/8	3/4-16	3/4
R978935059	1.265	3/4	2-1/8	1-3/8	5/8	1-1/4	1	1-1/8	3/4- 16	3/4
R978935060	1.515	1	3-1/8	1-1/2	3/4	1-1/2	1-1/2	1-5/6	1- 14	1
R978935061	2.032	1-3/8	4-1/8	2	1	2	2-1/8	2	1-1/4 - 12	1-3/8
R978935062	2.531	1-3/4	4-1/2	2-3/8	1-1/4	2-3/8	2-1/4	2-1/4	1-1/2-12	1-3/4
R978935063	2.531	2	5-1/2	2-15/16	1-1/4	2-15/16	2-1/2	3	1-7/8-12	2
R978935064	3.032	2-1/2	6-1/2	3-1/2	1-1/2	3-1/2	3	3-1/2	2-1/4-12	2-1/2
R978935065	3.032	3	6-3/4	3-7/8	1-1/2	3-7/8	3-1/4	3-1/2	2-1/2-12	2-3/4

Note: Pins must be ordered separately, see Page 31 for dimensions and part numbers.

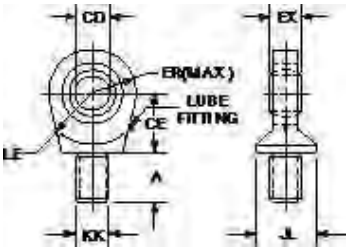
Rod Eyes



Part No.	A	CA	CB	CD	ER	KK
R978935066	3/4	1-1/2	3/4	1/2	5/8	7/16 -20
R978935067	1-1/8	2-1/16	1-1/4	3/4	7/8	3/4 -16
R978935068	1-5/8	2-13/16	1-1/2	1	1-3/16	1 -14
R978935069	1-1/8	2-3/8	1-1/2	1	1-7/16	7/8 -14
R978935070	2	3-7/16	2	1-3/8	1-9/16	1-1/4 -12
R978935071	2-1/4	4	2-1/2	1-3/4	2	1-1/2 -12
R978935072	3	5	2-1/2	2	2-1/2	1-7/8 -12
R978935073	3-1/2	5-13/16	3	2-1/2	2-13/16	2-1/4 -12
R978935074	3-1/2	6-1/8	3	3	3-1/4	2-1/2-12

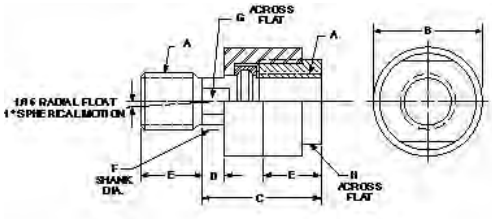
Rexroth Cylinder Accessories

Spherical Rod Eyes



Part No.	CD -.0005	A	CE	EX	ER	LE	KK	JL
R978935075	.500	1-1/16	7/8	7/16	7/8	3/4	7/16 - 20	7/8
R978935076	.750	1	1-1/4	21/32	1-1/4	1-1/16	3/4 - 16	1-5/16
R978935077	1.000	1-1/2	1-7/8	7/8	1-3/8	1-7/16	1 - 14	1-1/2
R978935078	1.375	2	2-1/8	1-3/16	1-13/16	1-7/8	1-1/4 - 12	2
R978935079	1.750	2-1/8	2-1/2	1-17/32	2-3/16	2-1/8	1-1/2 - 12	2-1/4
R978935081	2.000	2-7/8	2-3/4	1-3/4	2-5/8	2-1/2	1-7/8 - 12	2-3/4

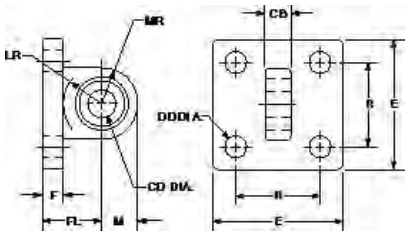
Alignment Couplers



Part No.	A	B	C	D	E	F	0	H	Max. Pull at Yield
R978935082	7/16-20	1-1/4	2	1/2	3/4	5/8	9/16	1-1/8	10,000
R978935080	1/2 - 20	1-1/4	2	1/2	3/4	5/8	9/16	1-1/8	14,000
R978935083	3/4- 16	1-3/4	2-5/16	5/16	1-1/8	3-1/32	7/8	1-1/2	34,000
R978935084	7/8- 14	1-3/4	2-5/16	5/16	1-1/8	3-1/32	7/8	1-1/2	34,000
R978935085	1 - 14	2-1/2	2-15/16	1/2	1-5/8	1-3/8	1-1/4	2-1/4	64,000
R978935086	1-1/4- 12	2-1/2	2-15/16	1/2	1-5/8	1-3/8	1-1/4	2-1/4	64,000
R978935087	1-1/2- 12	3-1/4	4-3/8	13/16	2-1/4	1-3/4	1-1/2	3	120,000
R978935088	1-3/4 - 12	3-1/4	4-3/8	13/16	2-1/4	1-3/4	1-1/2	3	120,000
R978935089	1-7/8 - 12	3-3/4	5-7/16	11/16	3	2-1/4	1-7/8	3-1/2	240,000
R978935090	2 -12	3-3/4	5-7/16	11/16	3	2-1/4	1-7/8	3-1/2	240,000

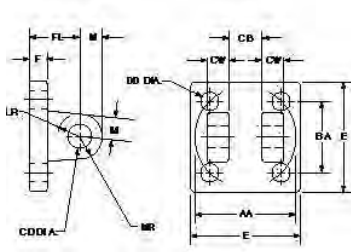
Rexroth Cylinder Accessories

Eye Brackets



Part No.	CB	CD	DD	E	F	FL	LR	M	MR	R
R978935036	3/4	1/2	13/32	2-1/2	3/8	1-1/8	3/4	1/2	9/16	1.63
R978935037	1-1/4	3/4	17/32	3-1/2	5/8	1-7/8	1-1/4	3/4	7/8	2.56
R978935038	1-1/2	1	21/32	4-1/2	3/4	2-1/4	1-1/2	1	1-1/4	3.25
R978935039	2	1-3/8	21/32	5	7/8	3	2-1/8	1-3/8	1-5/8	3.81
R978935040	2-1/2	1-3/4	29/32	6-1/2	7/8	3-1/8	2-1/4	1-3/4	2-1/8	4.95
R978935041	2-1/2	2	1-1/16	7-1/2	1	3-1/2	2-1/2	2	2-7/16	5.75
R978935042	3	2-1/2	1-3/16	8-1/2	1	4	3	2-1/2	3	6.59
R978935043	3	3	1-5/16	9 -1/2	1	4-1/4	3-1/4	3	3-1/4	7.50
R978935044	4	3-1/2	1-13/16	12-5/8	11-1/16	5-11/16	4	3-1/2	4-1/8	9.62
R978935045	4-1/2	4	2-1/16	14-7/8	11-5/16	6-7/16	4-1/2	4	5-1/4	11.50

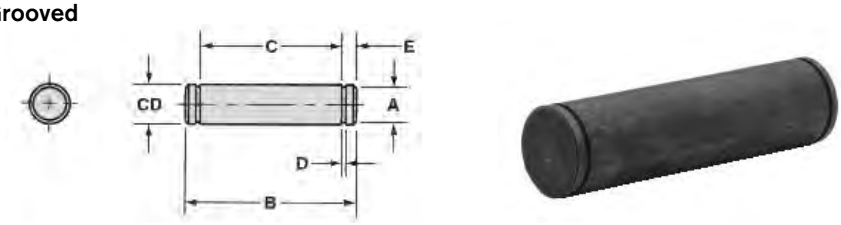
Clevis Brackets



Part No.	AA	BA	CB	CD	CW	DD	E	F	FL	LR	M	MR
R978935046	2.3	1-5/8	.765	1/2	1/2	3/8-24	2-1/2	3/8	1-1/8	1/2	1/2	9/16
R978935047	2.9	2-1/16	1.265	3/4	5/8	1/2-20	3	5/8	1-7/8	1	3/4	1-1/16
R978935048	3.6	2-9/16	1.265	3/4	5/8	1/2-20	3-1/2	5/8	1-7/8	1-1/16	3/4	1-1/16
R978935049	4.6	3-1/4	1.515	1	3/4	5/8-18	4-1/2	3/4	2-1/4	1-1/4	1	1-1/8
R978935050	5.4	3-13/16	2.032	1-3/8	1	5/8-16	5	7/8	3	1-7/8	1-3/8	1-3/4
R978935051	7.0	4 15/16	2.531	1-3/4	1-1/4	7/8-14	6-1/2	7/8	3-1/8	2	1-3/4	1-7/8
R978935052	8.1	5-3/4	2.531	2	1-1/4	1-14	7-1/2	1	3-1/2	2-1/8	2	2-1/8
R978935053	9.3	6 -19/32	3.032	2-1/2	1-1/2	1-1/8-12	8-1/2	1	4	2-5/8	2-1/2	2-1/2
R978935054	10.6	7-1/2	3.032	3	1-1/2	1/4-12	9-1/2	1	4-1/4	2-7/8	2-3/4	2-3/4
R978935055	13.6	9-5/8	4.032	3-1/2	2	1-3/4-12	12-5/8	1-11/16	5-11/16	3-5/8	3-1/2	3-1/2
R978935056	16.2	11-1/2	4.532	4	2-1/4	2-12	14-7/8	1-15/16	6-7/16	4	4	4

Rexroth Cylinder Accessories

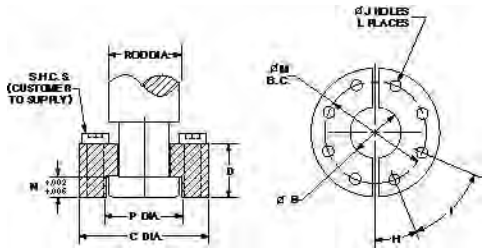
Pivot Pins-Grooved



Pivot Pins							C-Rings	
Part No.	CD	A	B	C	D	E	Part No.	CD
R978935026	.500	.468	2.094	1.875	.041	.109	R978000049	0.500
R978935027	.750	.704	2.875	2.625	.048	.125	R978000189	0.750
R978935028	1.000	.940	3.375	3.125	.048	.125	R978000190	1.000
R978935029	1.375	1.291	4.485	4.187	.056	.149	R978000191	1.375
R978935030	1.750	1.650	5.547	5.188	.068	.180	R978000192	1.750
R978935031	2.000	1.886	5.547	5.188	.068	.180	R978000206	2.000
R978935032	2.500	2.360	6.625	6.188	.086	.219	R978000193	2.500
R978935033	3.000	2.838	6.780	6.250	.103	.265	R978000194	3.000

Note: When ordering pivot pins, two C-rings must also be ordered for each pin. Pivot pins do not automatically ship with C-rings. Additional C-rings are available in any quantity.

Safe Rod End Coupler

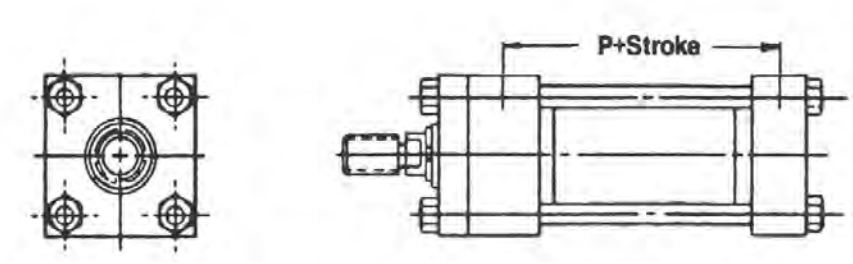


Part No.	Rod. Dia.	B	C	D	H	I	J	L	M	N	P	S.H.C.S. Size *
R978007008	.625	.406	1.500	.562	45°	90°	.218	4	1.125	.250	.656	10-24
R978007009	1.000	.750	2.000	.875	30°	60°	.281	6	1.500	.375	1.063	1/4-20
R978007010	1.375	.938	2.500	1.000	30°	60°	.343	6	2.000	.375	1.438	5/16-18
R978007011	1.750	1.187	3.000	1.250	22.5°	45°	.343	8	2.375	.500	1.813	5/16-18
R978007012	2.000	1.438	3.500	1.625	15°	30°	.406	12	2.688	.625	2.063	3/8-16
R978007013	2.500	1.875	4.000	1.875	15°	30°	.406	12	3.188	.750	2.625	3/8-16
R978007014	3.000	2.375	5.000	2.375	15°	30°	.531	12	4.000	.875	3.125	1/2-13
R978007015	3.500	2.625	5.875	2.625	15°	30°	.656	12	4.688	1.000	3.625	5/8-11
R978007016	4.000	3.125	6.375	2.625	15°	30°	.656	12	5.188	1.000	4.125	5/8-11
R978007017	4.500	3.625	6.875	3.125	15°	30°	.656	12	5.688	1.500	4.625	5/8-11
R978007018	5.000	4.000	7.375	3.125	15°	30°	.656	12	6.188	1.500	5.125	5/8-11
R978007019	5.500	4.500	8.250	3.875	15°	30°	.781	12	6.875	1.875	5.625	3/4-10

* = High tensile socket head cap screw size for reference only. S.H.C.S. to be supplied by customer.

Cylinder Options

Oversize Ports



Port Dimensions

Bore Size	Rod Dia.	Std. SAE St. Thread Port	Oversize SAE Thread Port		Max. SAE Flg. Port
			Head	Cap	
1.5	5/8 Std.	-10	-10	-10	-
	1	-10	-10	-10	-
2	1 Std.	-10	-12*	-12*	-
	1-3/8	-10	-12*	-12*	-
2.5	1 Std.	-10	-12	-12	-
	1-3/8	-10	-12*	-12*	-
	1-3/4	-10	-12*	-12*	-
3.25	1-3/8 Std.	-12	-16*	-16*	1/2" - 3,000 psi
	1-3/4	-12	-16*	-16*	1/2" - 3,000 psi
	2	-12	-14*	-16*	1/2" - 3,000 psi
4	1-3/4 Std.	-12	-16*	-16*	1/2" - 3,000 psi
	2	-12	-16*	-16*	1/2" - 3,000 psi
	2-1/2	-12	-14	-16*	1/2" - 3,000 psi
5	2 Std.	-12	-16*	-16*	1/2" - 3,000 psi
	2-1/2	-12	-16*	-16*	1/2" - 3,000 psi
	3	-12	-16*	-16*	1/2" - 3,000 psi
	3-1/2	-12	-16*	-16*	1/2" - 3,000 psi
6	2-1/2 Std.	-16	-20*	-20*	1" - 3,000 psi
	3	-16	-20*	-20*	1" - 3,000 psi
	3-1/2	-16	-20*	-20*	1" - 3,000 psi
	4	-16	-20*	-20*	1" - 3,000 psi
7	3 Std.	-20	-24*	-24	1-1/4" - 3,000 psi
	3-1/2	-20	-24*	-24	1-1/4" - 3,000 psi
	4	-20	-24*	-24	1-1/4" - 3,000 psi
	4-1/2	-20	-24*	-24	1-1/4" - 3,000 psi
	5	-20	-24*	-24	1-1/4" - 3,000 psi
8	3-1/2 Std.	-20	-32*	-32*	1-1/2" - 3,000 psi
	4	-24	-32*	-32*	1-1/2" - 3,000 psi
	4-1/2	-24	-32*	-32*	1-1/2" - 3,000 psi
	5	-24	-32*	-32*	1-1/2" - 3,000 psi
	5-1/2	-24	-32*	-32*	1-1/2" - 3,000 psi

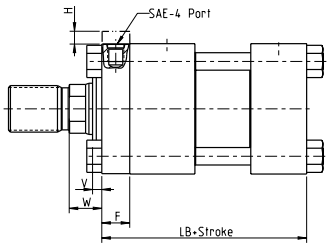
* - Y and P dimensions on dimensional pages must change to accommodate these port sizes.

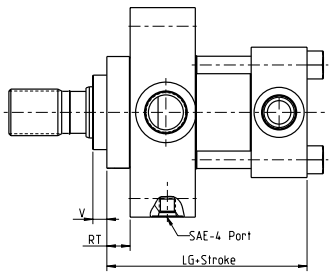
Gland Drain Connection

For cylinders with long stroke lengths or constant pressure (differential circuit), on the annular side, it is possible to drain to tank via a drain line, the fluid which collects between the wiper and rod seal .

Additionally, within the automotive industry, the drain connection is used to monitor seal wear.

To avoid back pressure in the drain line, the tank should be located below the cylinder.





ME5 Mount

Bore Size	Rod Dia.	V	RT	LG
1.50	0.625	0.25	0.38	5.00
	1.00	0.50	0.38	5.00
2.00	1.00	0.50	0.38	5.00
	1.375	**0.38**	**0.63**	**5.25**
2.50	1.00	0.50	0.38	5.13
	1.38	**0.38**	**0.63**	**5.38**
	1.75	**0.38**	**0.63**	**5.38**
3.25	1.375	**0.38**	**0.63**	**6.13**
	1.75	**0.38**	**0.63**	**6.13**
	2.00	0.50	0.63	6.13
4.00	1.75	**0.38**	**0.63**	**6.38**
	2.00	0.50	0.63	6.38
	2.50	0.63	0.63	6.38
5.00	2.00	0.50	0.63	6.88
	2.50	0.63	0.63	6.88
	3.00	**0.50**	**0.75**	**7.00**
	3.50	**0.50**	**0.75**	**7.00**
6.00	2.50	0.63	0.63	8.00
	3.00	**0.50**	**0.75**	**8.13**
	3.50	**0.50**	**0.75**	**8.13**
	4.00	0.50	0.75	8.13
7.00	3.00	**0.50**	**0.75**	**9.25**
	3.50	**0.50**	**0.75**	**9.25**
	4.00	0.50	0.75	9.25
	4.50	0.50	0.75	9.25
	5.00	0.25	1.00	9.50
8.00	3.50	**0.50**	**0.75**	**10.25**
	4.00	0.50	0.75	10.25
	4.50	0.50	0.75	10.25
	5.00	0.50	1.00	10.50
	5.50	0.25	1.00	10.50

All Mounts Except ME5

W	F	V	LB	H
0.38	**0.63**	**0.00**	**5.25**	**0.25**
0.75		**0.25**		**0.25**
0.50	**0.88**	**0.00**	**5.50**	–
0.75		**0.13**		**0.50**
0.63	**0.75**	**0.13**	**5.50**	–
0.88		**0.25**		–
1.13		**0.38**		**0.50**
0.88	0.75	0.25	6.25	–
1.13		0.38		–
1.25		0.38		–
1.00	0.88	0.25	6.63	–
1.13		0.25		–
1.38		0.38		–
1.13	0.88	0.25	7.13	–
1.38		0.38		–
1.38		0.38		–
1.38		0.38		–
1.25	1.00	0.25	8.38	–
1.25		0.25		–
1.25		0.25		–
1.25		0.25		–

Notes:

1. Bold font shows deviation from standard (no drain gland) dimensions.
2. H dimension extends in direction of SAE-4 port (needs more material).
3. MF1 an MF5 flanges have different dimensions, but the thickness as above.
4. For ME5 mount if proximity switch and gland drain are used, consult factory.

Port / Proximity Switch Locations

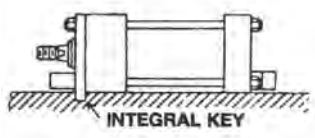
Mount Style	Port Location Head	Port Location Cap	Cushion Adjustment Head	Cushion Adjustment Cap	Air Bleed Head	Air Bleed Cap	Drain Port Head	Prox. Switch Loc. Head	Prox. Switch Loc. Cap
MXO, MF1, MF2,	1	1	2	2	4	4	1	3	3
MF5, MF6, MP1,	2	2	3	3	1	1	2	4	4
MP5, MT4, MX1,	3	3	4	4	2	2	3	1	1
MX2, MX3, MS7	4	4	1	1	3	3	4	2	2
	1	1	3	2	4	4		2	3
ME5	2	2	3	3	1	1	C/F	4	4
	3	3	1	4	2	2		4	1
	4	4	1	1	3	3		2	2
	1	1	2	3	4	4	1	3	2
ME6	2	2	3	3	1	1	2	4	4
	3	3	4	1	2	2	3	1	4
	4	4	1	1	3	3	4	2	2
MT1	1	1	3	2	3	4	1	C/F	3
	3	3	1	4	1	1	3	C/F	1
MT2	1	1	2	3	4	3	1	3	C/F
	3	3	4	1	2	1	3	1	C/F
MS2	1	1	2	2	4	4	1	3	3
	3	3	4	4	2	2	3	1	1
MS3	1	1	3	3	3	3	1	C/F	C/F
	3	3	1	1	1	1	3	C/F	C/F
MS4	1	1	2	2	4	4	1	C/F	C/F
	2	2	4	4	1	1	2	C/F	C/F
	4	4	2	2	1	1	4	C/F	C/F

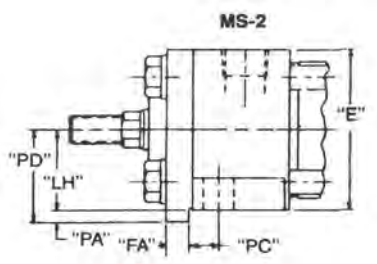
[1]) Drain ports are SAE 4 (7/16" - 20) on all mounting styles and bore sizes.

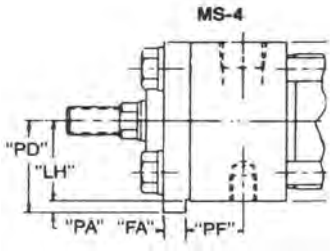
C/F = Consult Factory

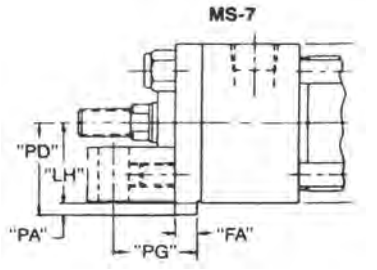
Extended Key Plates

Rexroth offers a standard arrangement of Thrust Key Mountings on the MS2, MS4 and MS7 CDT4 cylinders. This option eliminates the need for fitted bolts or external keys to carry the thrust load. The normal headplate is extended below the head surface of the cylinder and is fitted in a keyway milled into the mounting surface of the machine member. See drawing for details.









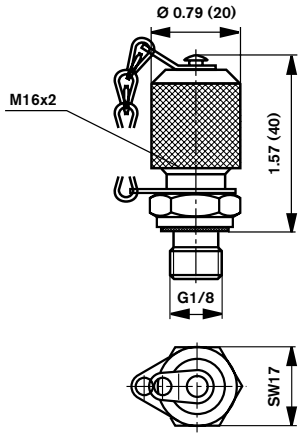
Bore	E	FA		LH		PA	PC	PD	PF	PG
1.50"	2.50	.312	+.000 -.002	1.244	+.000 -.002	.19	.44	1.44	1.06	1.19
2.00"	3.00	.562	+.000 -.002	1.494	+.000 -.002	.31	.56	1.81	1.06	1.50
2.50"	3.50	.562	+.000 -.002	1.744	+.000 -.002	.31	.75	2.06	1.06	1.50
3.25"	4.50	.687	+.000 -.003	2.244	+.000 -.003	.38	.75	2.62	1.19	1.84
4.00"	5.00	.812	+.000 -.003	2.494	+.000 -.003	.44	.94	2.94	1.19	1.94
5.00"	6.50	.812	+.000 -.003	3.244	+.000 -.003	.44	.94	3.69	1.19	2.31
6.00"	7.50	.937	+.000 -.003	3.744	+.000 -.003	.50	1.19	4.25	1.31	2.62

Notes:

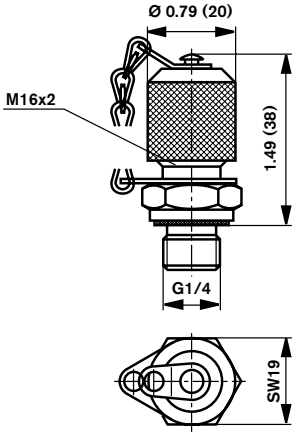
1. Use mounting bolts 0.06 smaller in diameter than hole size.
2. Fitted bolts or dowel pins are not needed with the thrust key headplate.
3. All dimensions not shown are NFPA standard.
4. PD, PA, FA dimensions typical for all mounts.

Test Point Coupling

For bore sizes - 1-1/2“ - 2-1/2“



For Bore Sizes - 3-1/4“-8“



Above dimensions in inches (mm)

Notes

For pressure measurement or bleeding.

For installation in the bleed/measuring port. Coupling with check valve function, it can also be connected under pressure.

Scope of supply for bore sizes - 1-1/2" to 2-1/2"

Coupling AB-E 20-11/K3, G 1/8
with NBR seal, Material No. R900014363

Coupling AB-E 20-11/K3V, G 1/8
with FPM seal, Material No. R900024710

Scope of supply for bore sizes - 3-1/4" to 8"

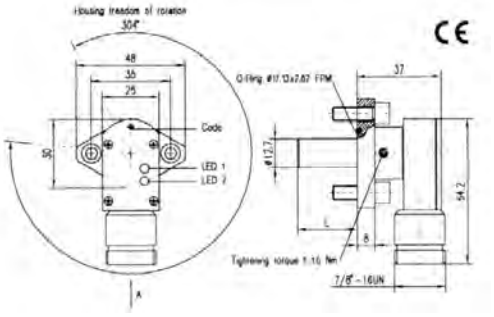
Coupling AB-E 20-11/K1, G 1/4
with NBR seal, Material No. R900009090

Coupling AB-E 20-11/K1V, G 1/4
with FPM seal. Material No. R900001264

CDT4 Proximity Switch

High Pressure - 3000 psi (207 bar) Cylinder Sensors 2 wire AC/ DC Mini-Style Quick Disconnect

Dimensions (in mm)

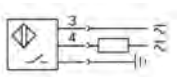


Ordering Code Sensing Distance Sn	Shielded (Flush Mounting) 2 mm
Function	
Normally Open	
Electrical	
Operating distance S_A	0...1.6 mm
Supply voltage	20 - 250 V AC/DC
Supply frequency	50 / 60 Hz
Load current capacity	5 - 400 mA
Inrush current	3A (t = 20 ms)
Leakage current	≤ 1.7 mA
Voltage drop	≤ 6 V
Switching frequency	50 Hz
Start up delay	≤ 150 ms
Switch hysteresis	≤ 15% of Sn
Repeatability	≤ 5% of Sn
Ambient temperature range	-25°C to +70°C
Output function LED	yes
Short circuit & overload protected	yes
Mechanical	
Housing material	Nickel plated brass housing
Electrical connection	AC Mini Style Connector
Protection class	IP 67
Housing, freedom of rotation	304°

Probe Length	Part Number	Code
1.025	R978008781	Blue
1.250	R978008793	White
2.062	R978002203	Red
2.875	R978002204	Orange
3.775	R978008792	Silver
4.560	R978009001	Gold

Wiring Connections

2 Wire AC/DC Normally Open



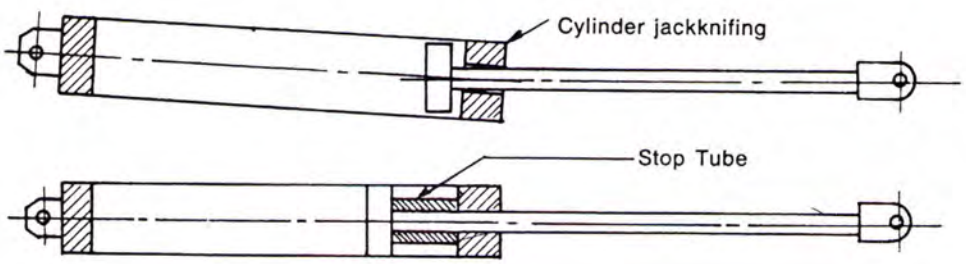
View of male connector pins

Stop Tube

In long cylinders which are pushing a load, internal stop tubes are used to prevent excessive bearing wear and jackknifing of the cylinder. They are installed between the piston and the head, providing additional bearing support by increasing the distance between the piston and the head in the fully extended position.

For long, trouble free bearing service, the bearing loads should not exceed about 200 psi. Standard cylinders are not designed for heavy eccentric loads.

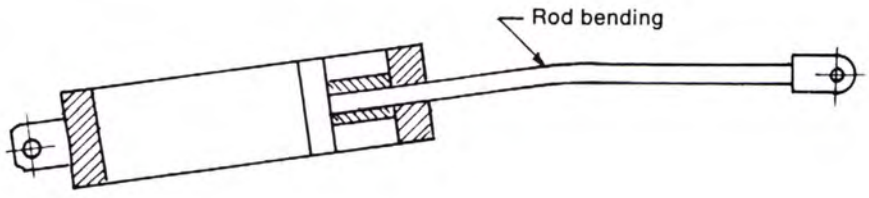
The use of oversize rods to reduced bearing loads is not recommended. They are not as effective as stop tubes, and if misalignment occurs the additional rod stiffness will actually increase bearing loads. For long push stroke cylinders, a stop tube may be required to limit radial bearing loads to a safe value and prevent jackknifing. They are especially desirable in long stroke pivoted centerline style mountings. The effect of a stop tube may be duplicated by providing additional unused stroke and stopping the cylinder extension by external means.



Column Strength Considerations

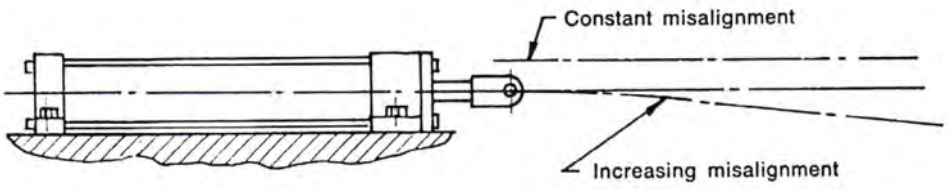
Standard size rods are recommended for use in cylinder applications where column strength, rod sag, or rate of cylinder return do not require an oversize rod. Being more flexible, standard rods absorb shock loads and minimize bearing loads caused by misalignments.

For long push stroke cylinders, an oversize rod may be required to prevent column failure and rod bending. Total cylinder length, extended is considered in column strength. Refer to the tables on the following pages for calculations regarding the column strength and stop tube required for a cylinder application.



Mounting Considerations for Cylinders - Fixed Non Centerline Mountings

Fixed mount cylinders can tolerate a slight misalignment that is zero at full retraction and increases slightly with stroke. With other than very large rods, a misalignment of about .003" to .005" per foot of stroke is usually permissable. Rigid mounted cylinders cannot tolerate a fixed misalignment, particularly at full retraction.



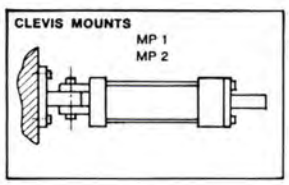
Mounting Considerations for Cylinders - Pivoted Centerline Mountings

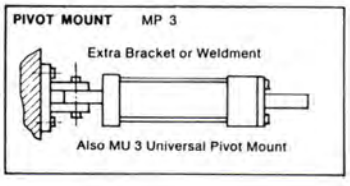
If the path of the load is curved or misalignment is a problem, a pivoted centerline mounting should be used. This compensation of nonlinear travel is in one plane only, as would occur during the operation of a lever. Pivot mounts require the rod end attachment to also be a pivot type. Close tolerance pins should be used and it is recommended that the cylinder manufacturer's accessory brackets be used to maintain good fits.

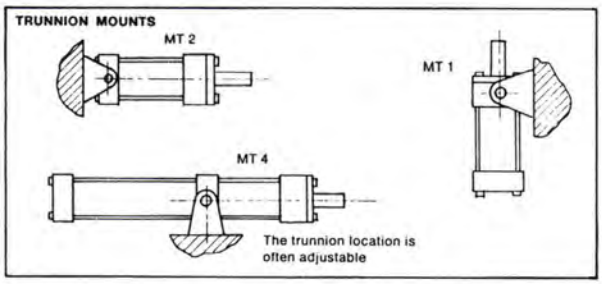
For short strokes, medium or smaller bore cylinder applications, the clevis mount is recommended. This is probably the most widely used cylinder mounting. Where the clevis mount should normally be used, but would cause the overall length of the cylinder to be excessive, the cap trunnion mount can be used. Head end trunnions should be carefully applied to either short strokes or to application where the weight of the cylinder falls vertically below the pin.

For long stroke cylinders and/or heavy cylinders, the center or intermediate trunnion mount is recommended. This mount supports the weight of the cylinder and should be located near the balance point of the cylinder at the time of maximum thrust. For general applications, a good estimate for the location of the intermediate trunnion is 1/3 back from the head end.

The MP5 (universal) type mount is a pivot mount with a spherical bearing fitted into the pivot to permit 5 to 10 degrees of movement in a plane perpendicular to the major plane of pivot movement. It is probably the most serviceable of the pivoted centerline mounts. For maximum effectiveness, a spherical bearing type rod end fitting should be utilized at the same time.

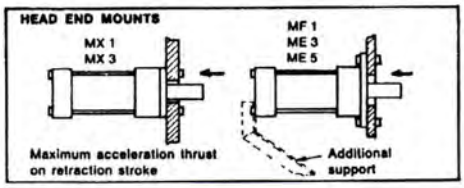


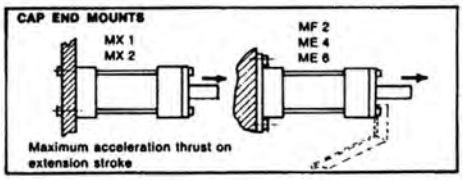


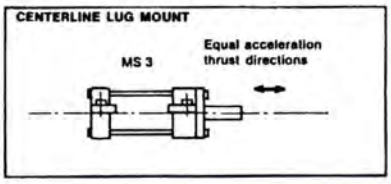


Mounting Considerations for Cylinders - Fixed Centerline Mountings

These mounting styles, illustrated below, tend to be more stable against sway on the power extension stroke. Rigid machine frame members are required to prevent misalignment under loads. The travel path of the rod end should be linear and be guided if at all possible. Long supported extension of the rod end must be avoided. Refer to the stop tube calculation data which shows the advantages of supporting and using reliable guiding on the rod end. Long stroke cylinders with fixed end mounts may require additional support at the free end of the cylinder body. This is illustrated in dotted outlines in the sketches below.



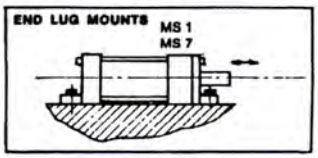


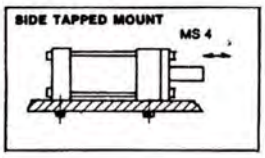


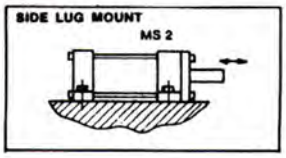
Mounting Considerations for Cylinders - Fixed Non Centerline Mountings

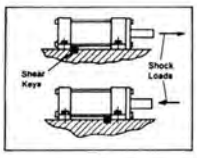
These types of mounts are perhaps the easiest to use for mounting and replacement ease. The offset thrust line introduces bending stresses and additional loads on the mounting bolts. This type should be very well aligned for maximum service life. The load must travel in a very linear path and be supported and guided both horizontally and vertically as the data for calculating stop tube and column strength illustrates.

When applying these mounts with offset thrust under high pressure or shock loads, properly located shear pins or keys can be used. These provide positive location and prevent slight movement of the cylinder under shock conditions, which the normal clearance in the mounting bolt holes would allow. Very close tolerances (.001") should be maintained between keys and keyways. Keys should be located as illustrated below, at one end of the cylinder. When using dowel pins, do no pin across opposite corners, as serious twisting stresses will result.









Mounting Considerations for Cylinders

Selection of mounting style depends primarily upon the operating specifications of the application. Mountings are generally one of the following three types:

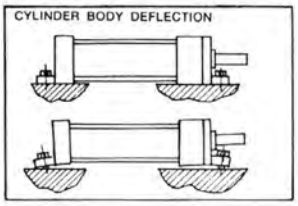
1. Fixed Centerline Mountings
   Where the thrust of the cylinder is focused on the centerline of the cylinder rod.
2. Fixed Non-Centerline Mountings
   Where the thrust of the cylinder is aligned parallel to, but not on, the centerline of the cylinder rod.
3. Pivoted Centerline Mountings
   Where the centerline of the cylinder may swing in one or more directions. Usually major movement is in one plane.

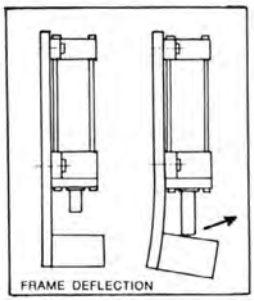
A very important general consideration is to keep the cylinder thrust as close as possible to the centerline of the piston rod and free from misalignment or side thrust. Off-center thrust or side loads subtract substantially from the anticipated rod bearing and rod seal service life.

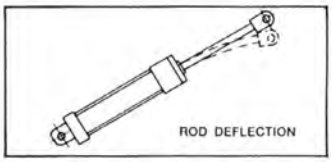
Off-center thrust and side loading can be caused by cylinder deflection under load, machine frame deflection, rod bending or sagging, cylinder pivot binding, nonlinear load movement, shifting of load; some of which are shown below.

In addition to the mounting styles, several other factors should be considered when mounting a cylinder. Care should be taken to avoid painting or damaging the exposed portion of the piston rod during construction. Threaded pieces should be pulled tight against thread shoulders to minimize bending and reduce fatigue stress. Rotation of the piston rod within the cylinder should be avoided to prevent possible scoring of the cylinder tube and damage to piston seals. Long cylinders may require additional body support to prevent damaging sag.

Major consideration must be given to the factors which might cause premature failure of the cylinder: unusual acceleration, unusual deceleration, alignment, support of cylinder weight, linear or curvilinear travel path of the load being moved, jackknifing of the cylinder, and the column strength of the rod. Some mounting styles are more suited than others to each of the above application factors.







Buckling

The permissible stroke with a flexible guided load and a 3.5 factor of safety against buckling can be obtained from the relevant table. For deviating cylinder installation positions, the permissible stroke length has to be interpolated. Permissible strokes for non-guided loads on request.

Calculations for buckling are determined using the following formulas:

1. Calculation according to Euler

$$F = \frac{\pi^2 \cdot E \cdot I}{\nu \cdot L_K^2} \text{ if } \lambda > \lambda g$$

2. Calculation according to Tetmajer

$$F = \frac{d^2 \cdot \pi \,(335 - 0.62 \cdot \lambda)}{4 \cdot \nu} \text{ if } \lambda \leq \lambda g$$

Explanation:

E = Modulus of elasticity in psi

= 30 x 10^6 for steel

I = Moment of inertia in inches^4 for circular cross-sectional area

$$= \frac{d^4 \cdot \pi}{64} = 0.0491 \cdot d^4$$

ν = 3.5 (safety factor)

L_K = Free buckling length in inches (depending on mounting type, see sketches A, B, C)

d = Piston rod Ø in inches

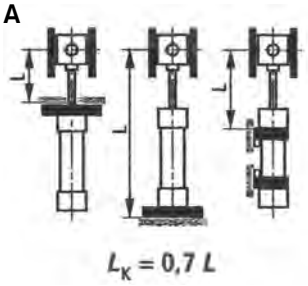
λ = Slenderness ratio

$$= \frac{4 \cdot L_K}{d} \qquad \lambda g = \pi \sqrt{\frac{E}{0.8 \cdot R_e}}$$

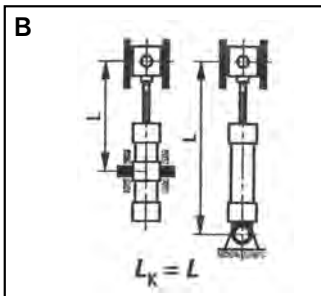
R_e = Yield strength of the piston rod material

Influence of the mounting type on buckling length:

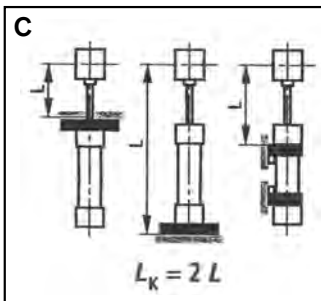
A



B



C



Stop Tube

To determine whether a stop is required on push stroke cylinders:

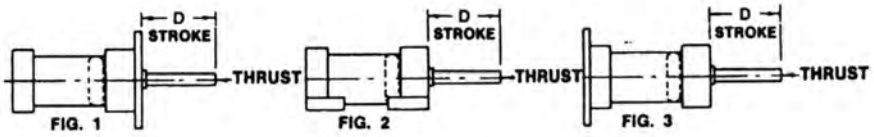
Step 1 - Determine which example below corresponds to your application.

Step 2 - Determine the value of "L" from the instructions given. The find "L" dimension in the table at the right for the required stop tube length. (Specify the effective stroke plus the stop tube length when ordering).

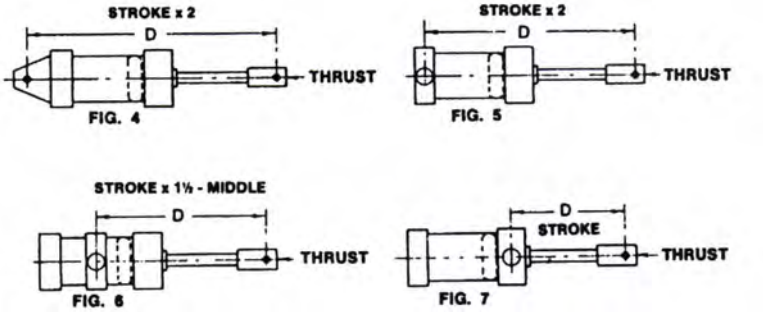
Step 3 - Add stop tube length to original "L" dimension to obtain your adjusted "L" dimension.

Example: "L" = 96", therefore, Stop Tube = 6"
Adjusted L = 102" (96+6)

Step 4 - Use adjusted "L" to figure rod column strength at maximum pressure rating of the cylinder, page 34.

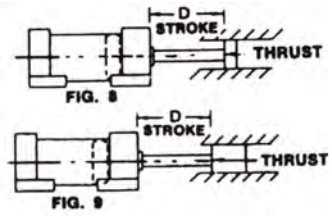


Typical rigidly mounted cylinders with rod unsupported at free end. May be mounted either horizontally or vertically. Use the equation L = 4D to determine values of "L" for all cylinder mountings in this category.



"L" Inches	Stop Tube Length (inches)
0-40	0
41-50	1
51-60	2
61-70	3
71-80	4
81-90	5
91-100	6
101-110	7
111-120	8

Typical trunnion mounted cylinders may be mounted either horizontally or vertically. Use the equation L = D to determine values of "L" for all cylinder mountings in this category. For center trunnion mounted cylinders (Figure 6), the position of the trunnion for most favorable bearing loads is obtained when "D" dimension with the rod retracted is approximately 1/3 overall length of cylinder with rod retracted.



Typically rigidly mounted cylinder with free end of rod supported with short guide. May be mounted either horizontally or vertically. Use the equation L = D to determine values of "L" for all cylinder mountings in this category.

Typical rigidly mounted cylinder with free end of rod supported with long closely-fitted guide. May be mounted either horizontally or vertically. Use the equation L = 1/2 D to determine values of "L" for all cylinder mountings in this category.

Column strength and oversize rod selection

Standard rod diameters are recommended for all Pull Stroke applications. To determine the correct rod diameter required for Push Stroke application, follow these simple steps:

Step 1 – Determine the value of "L_K" from the illustrations shown on page 40. (Use Adjusted "L_K" dimension for cylinder with Stop Tube).

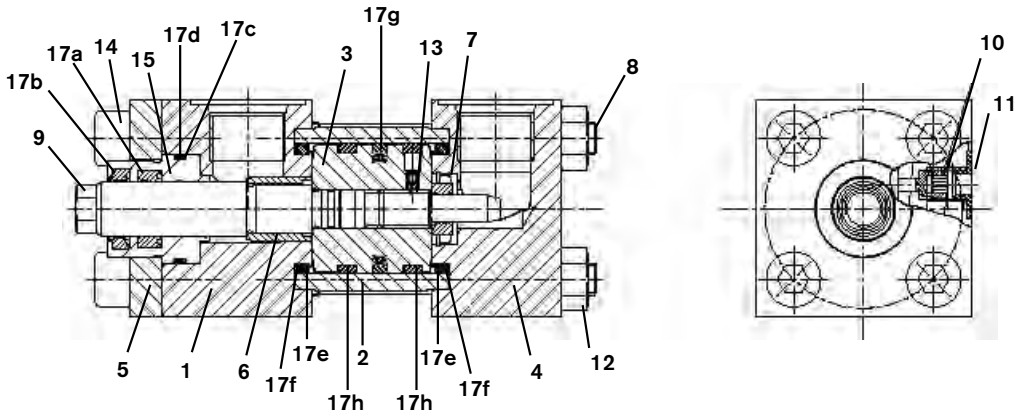
Step 2 – From your cylinder size and maximum operating pressure, determine your Push Stroke Thrust.

Step 3 – Find your thrust in the left hand column and located your "L_K" dimension (or Adjusted "L_K" dimension in the same horizontal line to the right; (if your exact "L_K" or adjusted "L_K" dimension is not shown, move to the right in the same horizontal column to the next larger number). Read vertically up from this number to the rod diameter shown. This is the required rod diameter for your application.

Example: Adjusted L_K of 80" at 16,000# would required 2-1/2" rod in the cylinder.

Thrust in Pounds Force at End of Rod	Rod Diameters											
	5/8	1	1-38	1-34	2	2-1/2	3	3-1/2	4	4-1/2	5	5-1/2
50	67											
100	58	110										
150	53	103										
250	43	94	146									
400	37	83	134	186								
700	30	68	118	168	202	275					Values of "L_K"	
1,000	27	60	105	155	190	257	330					
1,400	24	53	92	142	174	244	308	385				
1,800	22	48	82	127	160	230	296	366	440			
2,400	19	45	75	114	145	213	281	347	415	488		
3,200	16	41	67	103	130	194	261	329	400	461		
4,000	13	38	63	94	119	175	240	310	378	446		
5,000	9	34	60	87	110	163	225	289	360	426	494	
6,000		30	56	82	102	152	208	274	342	410	476	
8,000		26	50	76	93	137	188	245	310	375	447	
10,000		21	45	70	89	125	172	222	279	349	412	485
12,000		17	41	65	84	118	152	210	269	326	388	454
16,000			34	57	75	110	142	188	235	292	350	420
20,000			28	52	68	103	136	172	218	270	326	385
30,000				39	55	87	120	156	189	230	285	330
40,000				22	43	74	108	142	177	210	248	294
50,000					30	66	96	130	165	200	234	269
60,000						57	88	119	154	190	225	256
80,000						36	71	104	137	170	204	240
100,000							57	90	120	154	199	222
120,000							45	77	108	146	175	207
140,000								64	98	128	160	194

Spare Parts CDT4



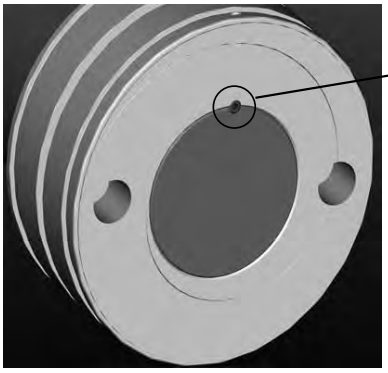
Tie Rods Torque Values

Bore Size Inches	Tie Rod Diameter (inches)	Torque - Lubricated (pound / foot)
1.500	0.38	29
2.000	0.50	52
2.500	0.50	63
3.250	0.63	125
4.000	0.63	150
5.000	0.88	380
6.000	1.00	480
7.000	1.13	700
8.000	1.25	1070

For complete spare parts and service information, refer to service manual RA 17 041-T4SM/10.07

1 Head
2 Tube
3 Piston
4 Cap
5 Flange
6 Cushion bushing
7 Cushion insert w/retainer
8 Tie rod
9 Piston rod
10 Bleed screw
11 Securing plate
12 Tie rod nut
13 Set screw
14 Hex head bolt
15 Rod bearing
16 Cushion valve (not shown)
17 Seal kit:
- **a.** Rod seal
- **b.** Wiper
- **c.** Bearing o-ring
- **d.** Bearing back-up ring
- **e.** Tube o-ring
- **f.** Tube back-up ring
- **g.** Piston seal
- **h.** Wear bands

Additional Piston Rod Security - Optional



For applications where high shock loads are present, an additional set screw is required to secure the piston to the rod.

Piston is still torqued and lock tited to the piston rod.

CST4 Liniear Positioning Cylinders Technical Data

(for applications outside these parameters, please consult factory)

Standards:

Meets or exceeds all J.I.C. and NFPA requirements.

Nominal pressure: 3,000 psi

Static proof pressure: 5,000 psi

With extreme shock loads the mounting styles and piston rod threads have to be considered, taking the fatigue limits into account.

Maximum operating pressure up to: 3,000 psi

Static non-shock: 5,000 psi

Installation position: Various

Pressure fluid:

Mineral oils (HL, HLP)
Phosphate ester (HFD-R) (-4°F to +300°F)
HFA (41°F to 131°F)
Water glycol HFC (–4°F to 140°F)

Hydraulic fluid temperature range: (-4°F to 176°F)

Viscosity range: 32 to 1760 ssu

Degree of contamination:

Max. permissible degree of contamination of the pressure fluid is to NAS 1638 class 10.

We therefore recommend a filter with a minium retention rate of
$\beta_{10} \geq 75$.

Stroke speed: 20 in/sec
(dependent on the connection port)

Air bleed standard: Secured against removal

Acceptance:

Each cylinder is tested to Bosch Rexroth standards.

Cylinders, outside the above parameters are also available. Consult factory

For applications above 250°F specify a non studded piston rod end and advise operating temperature before ordering.

Operating Pressures (PSI) by Cylinder Bore Sizes

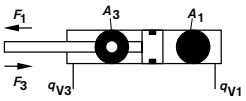
Cylinder Bore	Standard Rod	Nominal
1-1/2	1	3,000 psi
2	1-3/8	3,000 psi
2-1/2	1-3/8	3,000 psi
3-1/4	1-3/8	2,100 psi
4	1-3/4	2,500 psi
5	2	2,500 psi
6	2-1/2	2,500 psi

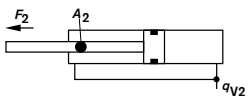
Cylinders with larger rod diameters rated at 3,000 psi.

1) Exceptions to 5,000 psi non-shock rating:
   a) All bore sizes using the following mounts: MT4, ME5
   b) The following mounts for bore sizes listed: MP1: 2-1/2”

Areas, Forces, Flows (dimensions in inches)

Bore	Piston rod	Area ratio	Areas Piston	Areas Rod	Areas Annulus	Force at 3000 psi [1] Push	Force at 3000 psi [1] Regen.	Force at 3000 psi [1] Pull	Flow at 4"/s [2] Out	Flow at 4"/s [2] Regen.	Flow at 4"/s [2] In
		j	A_1	A_2	A_3	F_1	F_2	F_3	q_{V1}	q_{V2}	q_{V3}
Ø in.	Ø in.	A_1/A_3	in.^{2}	in.^{2}	in.^{2}	Lb.	Lb.	Lb.	gpm	gpm	gpm
1-1/2“	1“	1.80	1.77	0.79	0.98	5,310	2,370	2,940	1.84	.82	1.02
2"	1-3/8"	1.89	3.14	1.48	1.66	9,420	4,440	4,980	3.26	1.54	1.72
2-1/2"	1-3/8"	1.43	4.91	1.48	3.43	14,730	4,440	10,290	5.10	1.54	3.56
	1-3/4"	1.96		2.40	2.51		7,200	7,530		2.49	2.60
	1-3/8"	1.21		1.48	6.82		4,440	20,460		1.54	7.08
3-1/4"	1-3/4"	1.40	8.30	2.40	5.90	24,900	7,200	17,700	8.62	2.49	6.13
	2"	1.60		3.14	5.16		9,420	15,480		3.26	5.36
	1-3/4"	1.24		2.40	10.17		7,200	30,510		2.49	10.56
4"	2"	1.33	12.57	3.14	9.43	37,710	9,420	28,290	13.05	3.26	9.79
	2-1/2"	1.64		4.91	7.66		14,730	22,980		5.10	7.95
	2"	1.19		3.14	16.50		9420	49,500		3.26	17.14
	2-1/2"	1.33		4.91	14.73		14,730	44,190		5.10	15.30
5"	3"	1.56	19.64	7.07	12.57	58,920	21,210	37,710	20.40	7.35	13.05
	3-1/2"	1.96		9.62	10.02		28,860	30,060		9.99	10.41
	2-1/2"	1.21		4.91	23.34		14,730	70,020		5.10	24.25
	3"	1.33		7.07	21.18		21,210	63,540		7.35	22.00
6"	3-1/2"	1.51	28.25	9.62	18.63	84,750	28,860	55,890	29.35	9.99	19.36
	4"	1.80		12.57	15.68		37,710	47,040		13.05	16.30





Note

[1] Theoretical force (efficiency not taken into account)
[2] Stroke velocity

Stroke tolerances

Stroke tolerances result from the cylinder head, cylinder base, cylinder tube, piston and piston rod. The stroke tolerance for all piston diameters and stroke lengths is +1/16" / -0". Tighter stroke tolerances can be requested, however, details regarding the operating pressure and operating temperature must be stated.

Stroke lengths	Stroke tolerances
2"- 60"	+1/16" / -0"

Approximate Uncrated CST4 Hydraulic Cylinder Weights (lbs.)*

Cylinder Bore	2	2-1/2	3-1/4	4	5	6
Zero Stroke	10	16	31	41	73	138
Add Per Inch of Stroke	.7	1.17	1.75	2.5	4.0	5.2

* Weights based on standard (first) rod sizes. Add 10% to cover additional weight for crating.

Ordering Details

	T4	/ / /	Z	1X/									*

Linear Positioning Cylinder = **CS**

Series = **T4**

Mounting types
Rectangular head = **ME5**
Clevis mounting = **MP1**
Side lug = **MS2**
Trunnion at head = **MT1**
Trunnion at intermediate position [3] = **MT4**

Bore Dia. Ø 1.50 to 6.00 inch [5]

Piston rod Ø 1.00 to 4.00 inch

[4] **Stroke length in inches (min. stroke length 2")**

Design principle
Head and cap connected by tie rods = **Z**

Series
10 to 19 unchanged installation and connection dimensions = **1X**

Port connections/ types
SAE straight thread port (ISO 11926-1) = **S**
SAE Code 61 - 3000 psi 4-bolt flange = **F**
Integrated NG 6/D03 mount on cap at pos. 1 ONLY = **P**
Integrated NG 10/D05 mount on cap at pos. 1 ONLY = **T**
Integrated NG 16/D07 mount on cap at pos. 1 ONLY = **U**
Special (specify) = **X**

Further details in clear text

Option 2
V = Prepared for position measuring system
C = Analog 4 - 20 mA output
F = Analog 0 - 10 VDC output
D = Digital output SSI
G = Start/stop, RS422
H = Digital pulse modulated, RS422
K = Thrust key
S = Stop tube (specify length)
Y = Additional piston rod ext. state LY dimensions in clear text

Option 1
A = Test point, both sides
B = Drain connection
T = Position measuring system MTS [7]
L = Position measuring system Balluff [7]

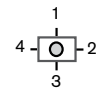
Seal version
Suitable for mineral oil to DIN 51 524 HL, HLP and HFA
T = Servo quality/reduced friction
Suitable for phosphate ester HFD-R
V = Flourocarbon seal system

End position cushioning
U = Without
S = Rod sides, adjustable

Piston rod end [2]
H = Small male thread KK1
D = Intermediate male thread KK2
E = Female thread KK1
T = S.A.F.E., rod end
X = Special (specify)

Piston rod version
H = Surface hardened and hard chromium plated [1]

Port location at cap
1 =
2 = [6]
3 = [6]
4 = [6]



Viewed on piston rod

Port location at head
1 =
2 = [6]
3 = [6]
4 = [6]

Viewed on piston rod

Remarks:

[1] Only 5/8" to 4" diameter piston rods are case hardened and hard chrome plated.

[2] With extreme shock loads the piston rod threads have to be selected, taking the fatigue limits into account. Rod and clevis, installed parts, etc. must always be firmly clamped against the piston rod shoulder.

[3] State XV dimensions in inches in clear text.

[4] For cylinders with stop tube, the stroke in the model code is the effective stroke.

[5] Other bore sizes available on request.

[6] Port connections "P", "T" and "U" not possible.

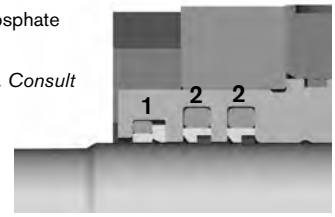
[7] Includes protective transducer cover installed on cap end of cylinder.

Sealing System

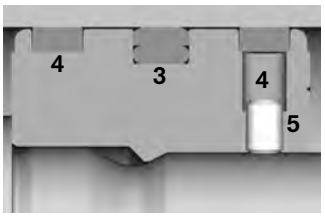
"T"* Seal system for low friction applications (mineral oil)

"V"* Seal system for low friction applications (phosphate ester)

** - not recommended for load holding applications. Consult factory for load holding options*



1. Double lip wiper
2. PTFE step seals



3. Low friction piston seal
4. Wear bands
5. Piston threaded and sealed to piston rod with permanent adhesive and mechanically secured with a set screw

Cushioning System (optional)

Patented Exact-a-just™ cushioning provides accurate micrometer adjustment

Exact-a-just™ cushioning permits adjustment over a wide range of settings for faster cycle times

Results in reduced maintenance costs, reduced internal and external shock, and softer cushioning stops

Available on rod side only

Exact-a-just™ cushioning

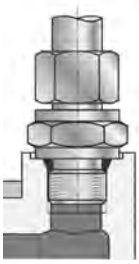
Connection Port and Secured Air Bleed (standard)

ISO 11926-1 SAE straight thread (standard)

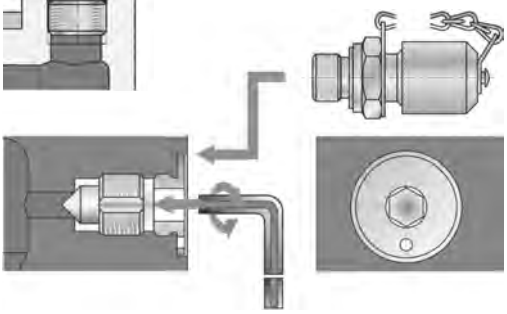
For other port options consult factory

To provide safety and prevent accidents, patented air bleed is secured against unscrewing (standard)

Air bleed ports can become an alternate connection for a pressure test fitting (optional)



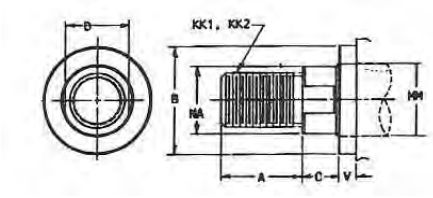
Alternate pressure test fitting



Piston Rod Versions

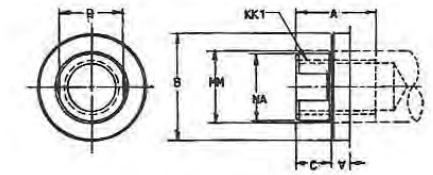
Male Rod End

Option H & D



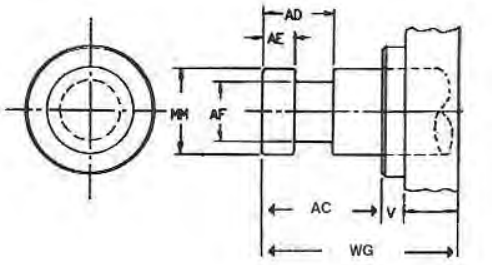
Female Rod End

Option E



S.A.F.E. Rod End

Option T



Rod Thread Options:

Standard KK1 Male furnished when not specified.
Male thread available in KK1 and KK2 thread sizes.
KK1 studded male rod end standard for 1-3/4" rod dia.
Female thread available in KK1 thread size only.

Piston Rod End

MM Rod Diameter	A	B +0.000 -0.002	C	D	AC	AD	AE	AF	KK1*	KK2*	NA	WG
1.000	1.125	1.499	0.50	0.88	1.50	0.94	0.375	0.688	3/4-16	7/8-14	0.94	2.38
1.375	1.625	1.999	0.63	1.13	1.75	1.06	0.375	0.875	1-14	1-1/4-12	1.32	2.75
1.750	2.000	2.374	0.75	1.50	2.00	1.31	0.500	1.125	1-1/4-12	1-1/2-12	1.69	3.13
2.000	2.250	2.624	0.88	1.69	2.63	1.69	0.625	1.375	1-1/2-12	1-3/4-12	1.94	3.75
2.500	3.000	3.124	1.00	2.06	3.25	1.94	0.750	1.750	1-7/8-12	2-1/4-12	2.44	4.50
3.000	3.500	3.749	1.00	2.63	3.63	2.44	0.875	2.250	2-1/4-12	2-3/4-12	2.94	4.88
3.500	3.500	4.249	1.00	3.00	4.38	2.69	1.000	2.500	2-1/2-12	3-1/4-12	3.44	5.63
4.000	4.000	4.749	1.00	3.38	4.50	2.69	1.000	3.000	3-12	3-3/4-12	3.94	5.75

* - Threads machined to class 2 tolerances.

Note: For "F, RT and V" dimensions, see respective mounting dimensions shown on pages 52 thru 59.

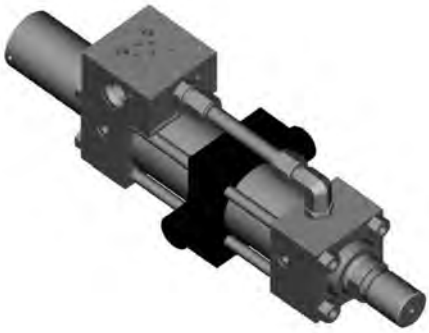
Mounting Type Overview

ME5 (see Page 52)

MP1 (see Page 53)

MS2 (see Page 54, 55)

MT4 (see Page 58, 59)



MT1 (see Page 56, 57)

Mounting and Dimensions ME5

CST4 ME5

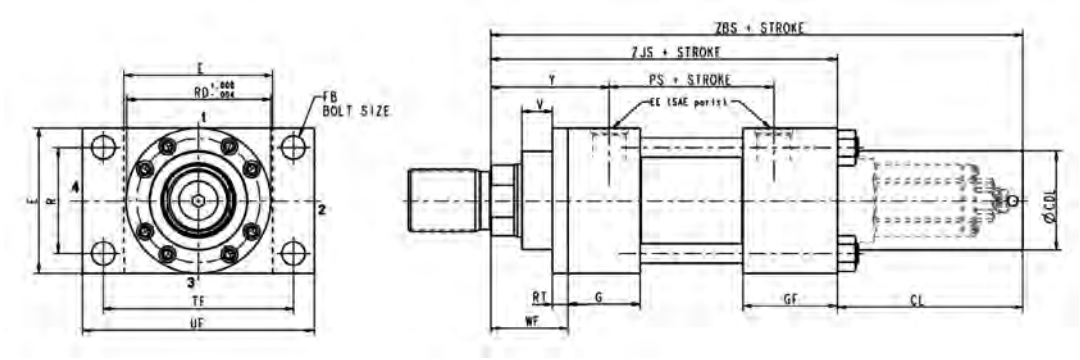


Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	Y	RD*	WF	ZBS	ZJS	RT
1.500	1.000	0.50	2.38	2.500	1.38	12.76	6.76	0.38
2.000	1.375	0.63	2.63	3.000	1.63	13.06	7.06	0.38
2.500	1.375	0.63	2.63	3.000	1.63	13.18	7.18	0.38
	1.750	0.75	2.88	3.500	1.88	13.43	7.43	0.38
3.250	1.375	0.63	2.75	3.000	1.63	14.08	8.08	0.38
	1.750	0.75	3.00	3.500	1.88	14.33	8.33	0.38
	2.000	0.50	3.13	4.000	2.00	14.45	8.45	0.63
4.000	1.750	0.75	3.00	3.500	1.88	14.58	8.58	0.38
	2.000	0.50	3.13	4.000	2.00	14.70	8.70	0.63
	2.500	0.63	3.38	4.500	2.25	14.95	8.95	0.63
5.000	2.000	0.50	3.13	4.000	2.00	15.40	9.40	0.63
	2.500	0.63	3.38	4.500	2.25	15.65	9.65	0.63
	3.000	0.63	3.38	5.250	2.25	15.65	9.65	0.63
	3.500	0.63	3.38	5.750	2.25	15.65	9.65	0.63
6.000	2.500	0.63	3.50	4.500	2.25	16.53	10.53	0.63
	3.000	0.63	3.50	5.250	2.25	16.53	10.53	0.63
	3.500	0.63	3.50	5.750	2.25	16.53	10.53	0.63
	4.000	0.50	3.50	6.500	2.25	16.53	10.53	0.75

Solid head flange mounts are some of the strongest, most rigid methods of mounting cylinders. The head flange type mounting is best in a tension application.

Rod end options shown on page 6.

***Note:** "RD" dimension is not specified by NFPA. Please verify this dimension for retrofit or replacement applications.

Table 2 - Dimensions not affected by rod diameter

Bore In.	E	G	PS	R	SAE Port EE	FB Bolt	GF	TF	UF	*CL	*CLD
1.500	2.50	1.75	2.88	1.63	-10	0.38	2.25	3.44	4.25	6.00	2.38
2.000	3.00	1.75	2.88	2.06	-10	0.50	2.30	4.13	5.13	6.00	2.38
2.500	3.50	1.75	3.00	2.56	-10	0.50	2.30	4.63	5.63	6.00	2.38
3.250	4.50	2.00	3.50	3.25	-12	0.63	2.70	5.88	7.13	6.00	2.38
4.000	5.00	2.00	3.75	3.81	-12	0.63	2.70	6.38	7.63	6.00	2.38
5.000	6.50	2.00	4.25	4.95	-12	0.88	2.90	8.19	9.75	6.00	2.38
6.000	7.50	2.25	4.88	5.72	-16	1.00	3.15	9.44	11.25	6.00	2.38

* Dimensions for protective transducer cover. Included in scope of supply when cylinder is ordered with transducer installed.

Mounting and Dimensions MP1

CST4 MP1

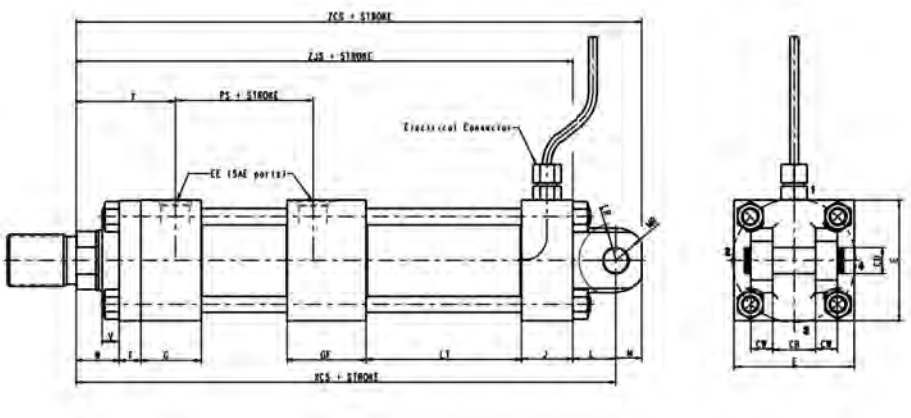


Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	XCS	ZCS	ZJS
1.500	1.000	0.50	1.00	2.38	15.50	16.25	14.25
2.000	1.375	0.38	1.00	2.63	15.88	16.63	14.63
2.500	1.375	0.38	1.00	2.63	16.00	16.75	14.75
	1.750	0.50	1.25	2.88	16.25	17.00	15.00
3.250	1.375	0.25	0.88	2.75	17.38	18.38	15.88
	1.750	0.38	1.13	3.00	17.63	18.63	16.13
	2.000	0.38	1.25	3.13	17.75	18.75	16.25
4.000	1.750	0.25	1.00	3.00	18.63	20.00	16.50
	2.000	0.25	1.13	3.13	18.75	20.13	16.63
	2.500	0.38	1.38	3.38	19.00	20.38	16.88
5.000	2.000	0.25	1.13	3.13	19.38	21.13	17.33
	2.500	0.38	1.38	3.38	19.63	21.38	17.38
	3.000	0.38	1.38	3.38	19.63	21.38	17.38
	3.500	0.38	1.38	3.38	19.63	21.38	17.38
6.000	2.500	0.25	1.25	3.50	21.38	23.38	18.88
	3.000	0.25	1.25	3.50	21.38	23.38	18.88
	3.500	0.25	1.25	3.50	21.38	23.38	18.88
	4.000	0.25	1.25	3.50	21.38	23.38	18.88

The Clevis or Pin mounted cylinder is probably the most widely used of all mounts. For short strokes, medium or small cylinder applications, the clevis mounts are recommended. Pivot mounts must always be used with a pivot type rod end attachment. Pivot pin and retainer rings included with MP1 mount.

The bearing retainer plate is the same as the “E” dimension for 1-1/2” to 6” bore sizes. Rod end options shown on page 50.

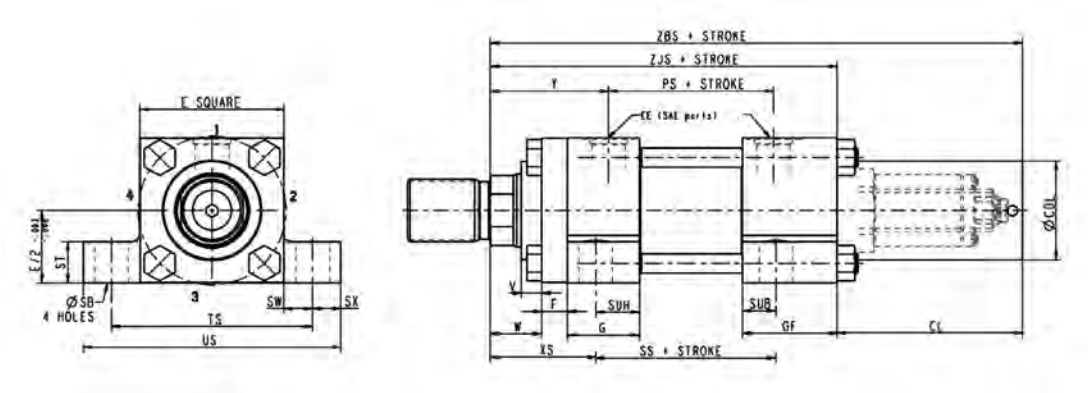
Table 2 - Dimensions not affected by rod diameter

Bore In.	CB	CD	CW	E	SAE Port EE	F	G	GF	J	L	LR	M	MR	PS	LT
1.500	1.250	0.750	0.63	3.00*	-10	0.38	1.75	2.25	1.50	1.25	0.88	0.75	0.94	2.88	6.00
2.000	1.250	0.750	0.63	3.00	-10	0.63	1.75	2.30	1.50	1.25	0.88	0.75	0.94	2.88	6.08
2.500	1.250	0.750	0.63	3.50	-10	0.63	1.75	2.30	1.50	1.25	0.88	0.75	0.94	3.00	6.08
3.250	1.500	1.000	0.75	4.50	-12	0.75	2.00	2.70	1.75	1.50	1.13	1.00	1.25	3.50	6.05
4.000	2.000	1.375	1.00	5.00	-12	0.88	2.00	2.70	1.75	2.13	1.75	1.38	1.63	3.75	6.18
5.000	2.500	1.750	1.25	6.50	-12	0.88	2.00	2.90	1.75	2.25	1.88	1.75	2.00	4.25	5.98
6.000	2.500	2.000	1.25	7.50	-16	1.00	2.25	3.15	2.25	2.50	2.13	2.00	2.38	4.88	6.10

* - “E” dimension for 1.500” bore cylinder pertains to square dimension of intermediate block and base only. Square dimension on rod end is 2.50”.

Mounting MS2

CST4 MS2



The side or lug mounted cylinder provides a fairly rigid mount. These type mounts can tolerate a slight amount of misalignment when the cylinder is at full stroke, but as the piston moves toward the blind end, the tolerance for misalignment decreases. It is important to note that if the cylinder is used properly, the mounting bolts are either in simple shear or tension without any compound stresses. An extended key plate option is available to eliminate the need for fitted bolts or external keys to carry the thrust load.

Note:
When specifying an MS2 mount with ports in the 2 or 4 quandrant, be sure to see that sufficient clearance between the port fitting and the lug is available to insert a bolt or cap screw into the lug.

Rod end options shown on page 50.

Dimensions MS2

Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	XS	ZBS	ZJS
1.500	1.000	0.50	1.00	2.38	1.75	12.76	6.75
2.000	1.375	0.38	1.00	2.63	2.13	13.06	7.06
2.500	1.375	0.38	1.00	2.63	2.31	13.18	7.18
	1.750	0.50	1.25	2.88	2.56	13.43	7.43
3.250	1.375	0.25	0.88	2.75	2.31	14.08	8.08
	1.750	0.38	1.13	3.00	2.56	14.33	8.33
	2.000	0.38	1.25	3.13	2.68	14.45	8.45
4.000	1.750	0.25	1.00	3.00	2.75	14.58	8.58
	2.000	0.25	1.13	3.13	2.88	14.70	8.70
	2.500	0.38	1.38	3.38	3.13	14.95	8.95
5.000	2.000	0.25	1.13	3.13	2.88	15.40	9.40
	2.500	0.38	1.38	3.38	3.13	15.65	9.65
	3.000	0.38	1.38	3.38	3.13	15.65	9.65
	3.500	0.38	1.38	3.38	3.13	15.65	9.65
6.000	2.500	0.25	1.25	3.50	3.38	16.53	10.53
	3.000	0.25	1.25	3.50	3.38	16.53	10.53
	3.500	0.25	1.25	3.50	3.38	16.53	10.53
	4.000	0.25	1.25	3.50	3.38	16.53	10.53

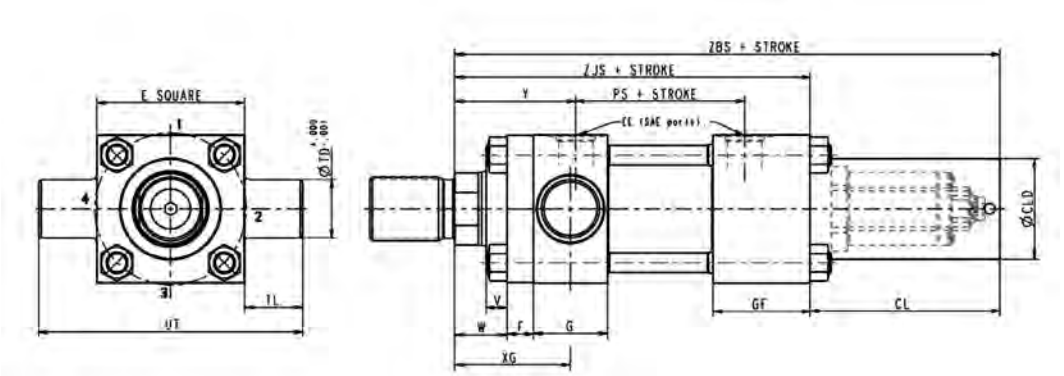
Table 2 - Dimensions not affected by rod diameter

Bore In.	E	SAE Port EE	F	G	GF	PS	SB Bolt	SS	ST	SUH	SUB	SW	SX	TS	US	*CL	*CLD
1.500	2.50	-10	0.38	1.75	2.25	2.88	0.38	3.88	0.50	1.38	1.13	0.38	0.38	3.25	4.00	6.00	2.38
2.000	3.00	-10	0.63	1.75	2.30	2.88	0.50	3.63	0.75	1.25	1.00	0.50	0.50	4.00	5.00	6.00	2.38
2.500	3.50	-10	0.63	1.75	2.30	3.00	0.75	3.38	1.00	1.06	0.81	0.69	0.69	4.88	6.25	6.00	2.38
3.250	4.50	-12	0.75	2.00	2.70	3.50	0.75	4.13	1.00	1.31	1.06	0.69	0.69	5.88	7.25	6.00	2.38
4.000	5.00	-12	0.88	2.00	2.70	3.75	1.00	4.00	1.25	1.13	0.88	0.88	0.88	6.75	8.50	6.00	2.38
5.000	6.50	-12	0.88	2.00	2.90	4.25	1.00	4.50	1.25	1.13	0.88	0.88	0.88	8.25	10.00	6.00	2.38
6.000	7.50	-16	1.00	2.25	3.15	4.88	1.25	5.13	1.50	1.13	1.13	1.13	1.13	9.75	12.00	6.00	2.38

* - Dimensions for protective transducer cover. Included in scope of supply when cylinder is ordered with transducer installed.

Mounting MT1

CST4 MT1



All trunnion mount cylinders need a provision on both ends for pivoting. These types of cylinders are designed to carry shear loads and the trunnion and pivot pins should be carried by bearings that are rigidly held and closely fit for the entire length of the pin.

The bearing retainer plate is the same as the “E” dimension for 1-1/2”– 6” bore sizes.

Rod end options shown on page 50.

MT1 Max. Pressure Rating

Bore	PSI
1.500	3,000
2.000	3,000
2.500	3,000
3.250	2,800
4.000	1,800
5.000	1,200
6.000	1,000

Dimensions MT1

Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	XG	ZBS	ZJS
1.500	1.000	0.50	1.00	2.38	2.25	12.76	6.76
2.000	1.375	0.38	1.00	2.63	2.50	13.06	7.06
2.500	1.375	0.38	1.00	2.63	2.50	13.25	7.18
	1.750	0.50	1.25	2.88	2.75	13.50	7.43
3.250	1.375	0.25	0.88	2.75	2.63	14.13	8.08
	1.750	0.38	1.13	3.00	2.88	14.38	8.33
	2.000	0.38	1.25	3.13	3.00	14.50	8.45
4.000	1.750	0.25	1.00	3.00	2.88	14.75	8.58
	2.000	0.25	1.13	3.13	3.00	14.88	8.70
	2.500	0.38	1.38	3.38	3.25	15.13	8.95
5.000	2.000	0.25	1.13	3.13	3.00	15.38	9.40
	2.500	0.38	1.38	3.38	3.25	15.63	9.65
	3.000	0.38	1.38	3.38	3.25	15.63	9.65
	3.500	0.38	1.38	3.38	3.25	15.63	9.65
6.000	2.500	0.25	1.25	3.50	3.38	16.63	10.53
	3.000	0.25	1.25	3.50	3.38	16.63	10.53
	3.500	0.25	1.25	3.50	3.38	16.63	10.53
	4.000	0.25	1.25	3.50	3.38	16.63	10.53

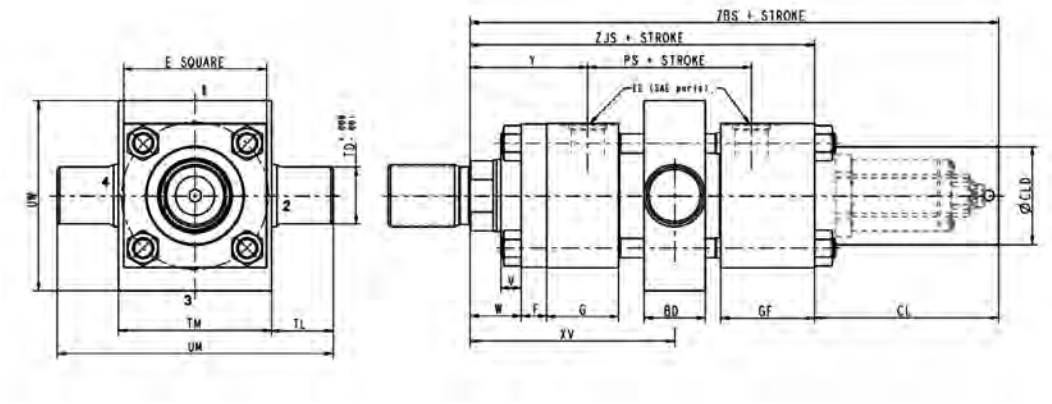
Table 2 - Dimensions not affected by rod diameter

Bore In.	E	SAE Port EE	F	G	GF	PS	TD	TL	UT	*CL	*CLD
1.500	2.50	-10	0.38	1.75	2.25	2.88	1.000	1.00	4.50	6.00	2.38
2.000	3.00	-10	0.63	1.75	2.30	2.88	1.375	1.38	5.75	6.00	2.38
2.500	3.50	-10	0.63	1.75	2.30	3.00	1.380	1.38	6.25	6.00	2.38
3.250	4.50	-12	0.75	2.00	2.70	3.50	1.750	1.75	8.00	6.00	2.38
4.000	5.00	-12	0.88	2.00	2.70	3.75	1.750	1.75	8.50	6.00	2.38
5.000	6.50	-12	0.88	2.00	2.90	4.25	1.750	1.75	10.00	6.00	2.38
6.000	7.50	-16	1.00	2.25	3.15	4.88	2.000	2.00	11.50	6.00	2.38

* - Dimensions for protective transducer cover. Included in scope of supply when cylinder is ordered with transducer installed.

Mounting MT4

CST4 MT4



All trunnion mount cylinders need a provision on both ends for pivoting. These types of cylinders are designed to carry shear loads and the trunnion and pivot pins should be carried by bearings that are rigidly held and closely fit for the entire length of the pin.

Specify “XV” dimension when ordering MT4 intermediate Fixed Trunnion mounts. If not specified, trunnion will be located at the center of the tube.

The bearing retainer plate is the same as the “E” dimension for 1-1/2”– 6” bore sizes.

Rod end options shown on page 50.

MT4 Max. Pressure Rating

Bore	PSI
1.500	3,000
2.000	3,000
2.500	3,000
3.250	2,800
4.000	1,800
5.000	1,200
6.000	1,000

Dimensions MT4

Table 1 - Dimensions affected by rod diameter

Bore In.	MM Rod	V	W	Y	XV Min.	ZBS	ZJS
1.500	1.000	0.50	1.00	2.38	4.03	12.76	6.76
2.000	1.375	0.38	1.00	2.63	4.28	13.06	7.06
2.500	1.375	0.38	1.00	2.63	4.41	13.18	7.18
	1.750	0.50	1.25	2.88	4.66	13.43	7.43
3.250	1.375	0.25	0.88	2.75	4.78	14.08	8.08
	1.750	0.38	1.13	3.00	5.03	14.33	8.33
	2.000	0.38	1.25	3.13	5.16	14.45	8.45
4.000	1.750	0.25	1.00	3.00	5.16	14.58	8.58
	2.000	0.25	1.13	3.13	5.28	14.70	8.70
	2.500	0.38	1.38	3.38	5.53	14.95	8.95
5.000	2.000	0.25	1.13	3.13	5.53	15.40	9.40
	2.500	0.38	1.38	3.38	5.72	15.65	9.65
	3.000	0.38	1.38	3.38	5.72	15.65	9.65
	3.500	0.38	1.38	3.38	5.72	15.65	9.65
6.000	2.500	0.25	1.25	3.50	6.16	16.53	10.53
	3.000	0.25	1.25	3.50	6.16	16.53	10.53
	3.500	0.25	1.25	3.50	6.16	16.53	10.53
	4.000	0.25	1.25	3.50	6.16	16.53	10.53

Table 2 - Dimensions not affected by rod diameter

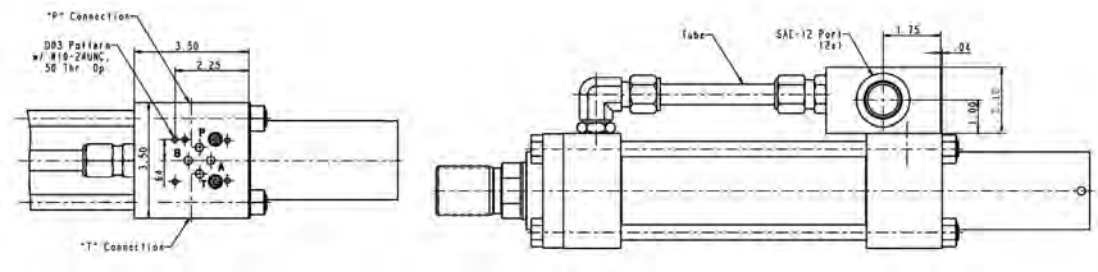
Bore In.	E	SAE Port EE	F	G	K	LB	PS	TD	TL	TM	UM	UT	UW	BD	*CL	*CLD
1.500	2.50	-10	0.38	1.75	0.33	5.00	2.94	1.000	1.00	3.00	5.00	4.50	3.38	1.25	6.00	2.38
2.000	3.00	-10	0.63	1.75	0.44	5.25	2.88	1.375	1.38	3.50	6.25	5.75	4.13	1.50	6.00	2.38
2.500	3.50	-10	0.63	1.75	0.44	5.38	3.00	1.750	1.38	4.00	6.75	6.25	4.63	1.50	6.00	2.38
3.250	4.50	-12	0.75	2.00	0.55	6.25	3.50	1.750	1.75	5.00	8.50	8.00	5.81	2.00	6.00	2.38
4.000	5.00	-12	0.88	2.00	0.55	6.63	3.75	1.750	1.75	5.50	9.00	8.50	6.38	2.00	6.00	2.38
5.000	6.50	-12	0.88	2.00	0.77	7.13	4.25	1.750	1.75	7.00	10.50	10.00	7.75	2.00	6.00	2.38
6.000	7.50	-16	1.00	2.25	0.85	8.38	4.88	2.000	2.00	8.50	12.50	11.50	10.38	3.00	6.00	2.38

* Dimensions for protective transducer cover. Included in scope of supply when cylinder is ordered with transducer installed.

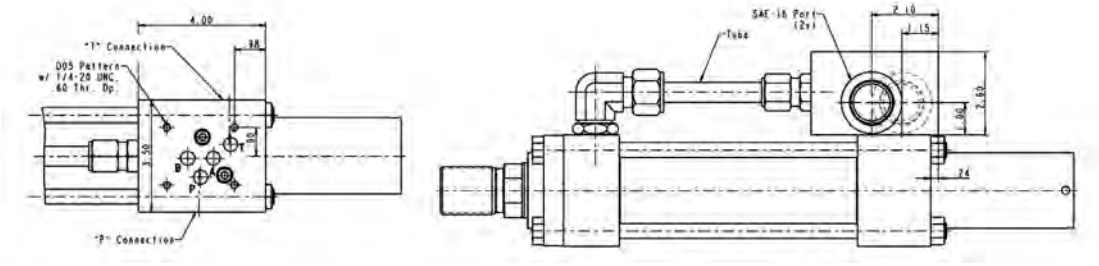
Valve Connection Plates, Dimensions and Porting Patterns

Valve spool parallel to the cylinder axis

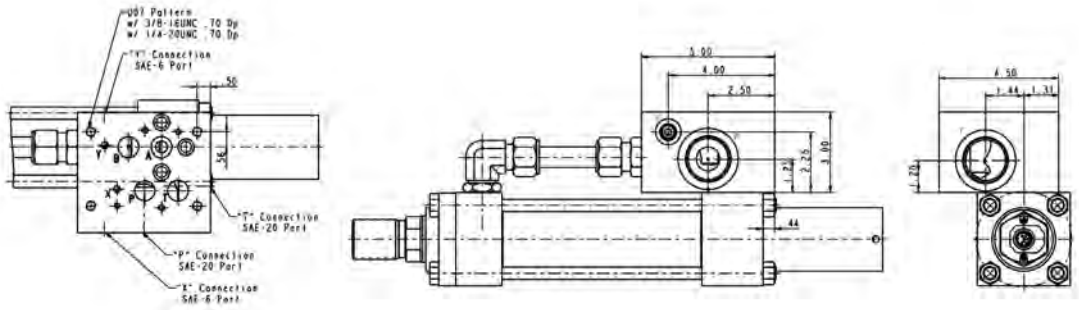
NG 6 (D03) - Pattern shown for cylinders 2.00“ to 6.00“ bore



NG 10 (D05) - Pattern shown for cylinders 2.00“ to 6.00“ bore



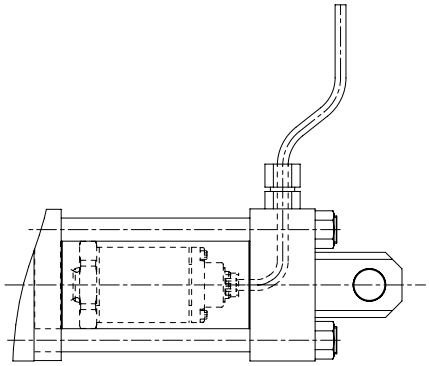
NG 16 (D07) - Pattern shown for cylinders 3.25“ to 6.00“ bore



Nominal Size	Part No.	SAE Str. Thd. Connections P	T	X	Y
NG 6	R978015401	-12	-12	–	–
NG 10	R978019288	-16	-16	–	–
NG 16	R978017315	-20	-20	-6	-6

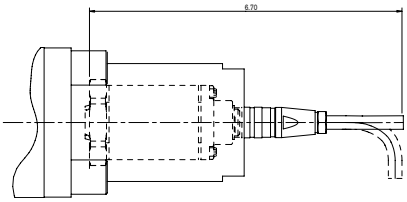
Position Transducer

Mounting style MP1 with integral connector



5 meter integral cable with pigtail termination

Mounting styles ME5, MS2, MT1 and MT4 with plug in connector



[1] Not included with the scope of supply

[1] For analogue output:
8-pin Amphenol plug-in connector
Material No. R978885023
For all BTL transducers.

Position Transducer

Functional Description

The position transducer which is pressure-tight up to 5,000 psi operates without mechanical contact and is absolute. The basis for this position transducer is the magneto-strictive effect. Thus a torsion impulse is released through the contact of two magnetic fields. This impulse runs on the wave guide inside the transducer from the measuring point to the sensor head. The running time is constant and nearly termperature-independent.

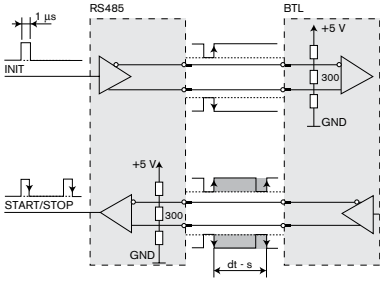
It is proportional to the position of the magnets and thus a measure for the actual position value and is converted into a direct analogue or digital output in the sensor.

Micropulse BTL - Style Z Electrical Options

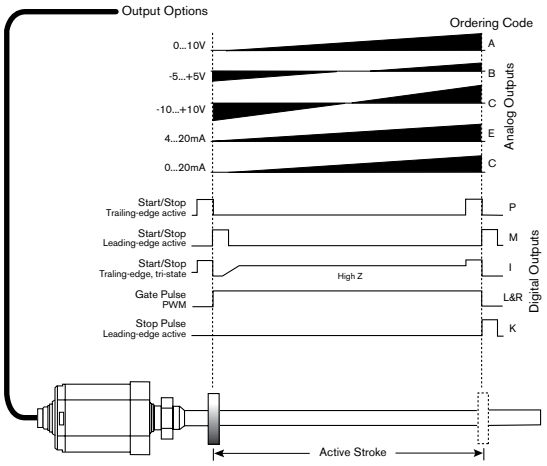
	BTL-7	BTL-7	BTL-5
Electrical Interface	Analog	Analog	Digital
Electrical Type	Voltage	Current	StartStop & PWM
Output	0...+10 V	4...20 mA	Start/Stop or Pulse-width-modulated (RS422/RS485)
Output Load	>2kΩ (5 mA max)	≤ 500Ω	per sec
Resolution	≤ 0.33 mV	≤ 0.66 µA	Controller dependent
Non-Linearity	±50 µm to 500 mm stroke, ±0.01% over 500 mm stroke	±50 µm to 500 mm stroke, ±0.01% over 500 mm stroke	±50 µm to 500 mm stroke, ±0.01% over 500 mm stroke
Hysteresis	≤ 5 µm	≤ 5 µm	≤ 5 µm
Sampling Rate	2 kHz	2 kHz	500 Hz stroke > 2000 mm 1 kHz stroke < 2000 mm
Temperature Coefficient*	≤ 30 ppm/K	≤ 30 ppm/K	≤ 30 ppm/K
Operating Voltage	10 – 30 V DC	10 – 30 V DC	10 – 30 V DC
Operating Current	< 150 mA	< 150 mA	< 150 mA

Notes:
Analog voltage output versions incorporate both rising and falling outputs. Analog current version must be ordered as rising or falling outputs.

*Temperature coefficient variables
V = output range in V
I = output range in [mA]
ΔT = temperature change
P = magnet position



RS-485 signal transmission with digital outputs



Analog and digital output options for the Micropulse BTL-7 and BTL-5

Micropulse BTL-7 - Specialized Interfaces

SSI

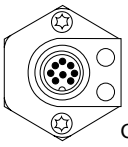
The SSI (synchronous serial interface) output interfaces with control systems from Bosch Rexroth and many others. Cable spans can be up to 400 m with noise-free operation. The internal linearization of this interface makes it ideal for applications requiring the best accuracy available.

Resolution	5 µm
Non-linearity	± 30 µm or ± 2 LSBs, whichever is greater
Repeatabilty	≤ 11 µm
Hysteresis	≤ 20 µm
Sampling Rate	5 kHz – 1 kHz
Temperature Coefficient *	(6 µm + 5 ppm xL) / °C
Communication Speeds	100, 200, 400, 500, 1,000 kHz
Output Modes	24/25/26 bits (binary or gray code)
Operating Voltage	10 – 30 V DC
Operating Current	≤ 120 mA
Output	Standard RS-485 / 422 levels

Micropulse BTL - Wiring Diagrams

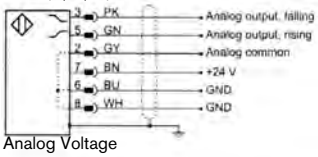
Analog Wiring Diagrams BTL-7

View of mating connector, wiring side

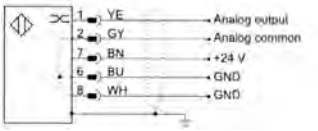


Connector

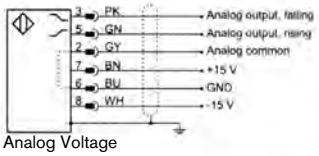
Analog Voltage
24 V (A, B, G)



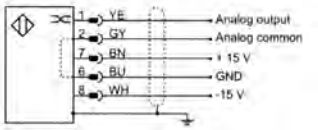
Analog Voltage
24 V (E, C)



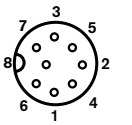
Analog Voltage
± 15 V (A, B, G)



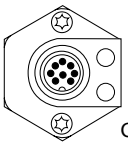
Analog Voltage
± 15 V (E, C)



Digital Wiring Diagrams BTL-5

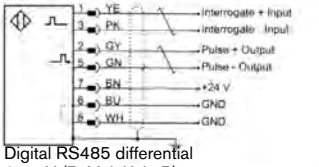


View of mating connector, wiring side

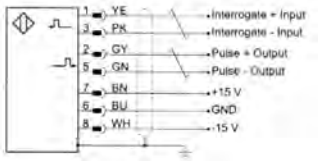


Connector

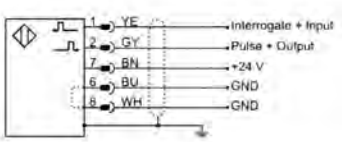
Digital RS485 differential
24 V (P, M, I, K, L, R)



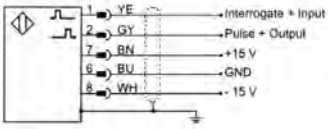
Digital RS485 differential
± 15 V (P, M, I, K, L, R)



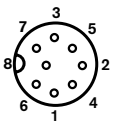
Digital, Single-ended
24 V (N)



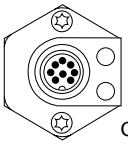
Analog Voltage
± 15 V (E, C)



SSI Wiring Diagrams BTL-7

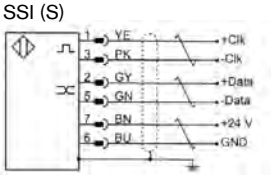


View of mating connector, wiring side



Connector

SSI (S)



Temposonics® G Series

Product Specifications

G-Series position sensors feature a microprocessor-based design with enhanced diagnostics and programmability to maximize backwards compatibility.

Backwards compatibility is one of the primary benefits of the new G-Series position sensor. G-Series position sensors provided the same functionality as Tempo II and L-Series sensors making them an ideal direct replacement for these products.

In addition to providing advanced programming and diagnostic capabilities in a rugged package, G-Series position sensors also include the following features:

• Electronics housing small enough to allow for drop in replacements of legacy Temposonics products

• Standard 24 Vdc and extended input power supply options for compatibility with older controller interfaces.

• Fully adjustable voltage and current outputs within:

-10 to +10 Vdc or +10 to -10 Vdc

0 to 20 mA or 20 to 0 mA

Parameter	Specifications
Measured Variable:	Displacement
Resolution:	Analog: Infinite Digital: 1 ÷ [gradient x cyrstal freq. (mHz) x circulations]
Non-Linearity:	± 0.02% or ± 0.05 mm (± 0.002 in.), whichever is greater.
Repeatability:	± 0.01% of full stroke or ± 0.0001 in (± 0.025 mm), whichever is greater.
Outputs:	Analog: Voltage or Current Digital: Start/Stop or PWM
Measuring Range: Hydraulic-rod style:	Analog: 50 to 2540 mm (2 to 100 in.)* Digital: 50 to 7620 mm (2 to 300 in.)
Operating Voltage:	+ 24 Vdc (20.4 - 28.8 Vdc) standard
Operating Temperature:	-40 to 85° C (-40 to -185° F)
EMC Test:	Emmissions IEC/EN 61000-6-3, Immunity IEC/EN 61000-4-2/3/4/5/6/8, level 3/4 criterium A, CE qualified
Shock Rating:	100 g (single hit) / IEC standard 68-2-27 (survivability)
Vibration Rating:	5 g / 10-150 Hz / IEC standard 68-2-6
Adjustability:	Field adjustable zero and span (for analog sensors only)
Update TIme:	Analog: < 1 ms (typical) Digital (external inerrogate): Minimum = (2.5 + null + stroke) x 10.0 µs/in. x (number of recirculations)
Electronic Head:	Aluminum housing
Sealing:	IP 67
Sensor rod:	304L Stainless steel
Operating Pressure:	350 bar static, 690 bar spike (5,000 psi static, 10,000 psi spike)
Mounting:	Threaded flange 3/4-16 UNF-3A
Typical Mounting Torque:	45 N-m (33 ft.-lbs.)
Magnet Type:	Ring magnet

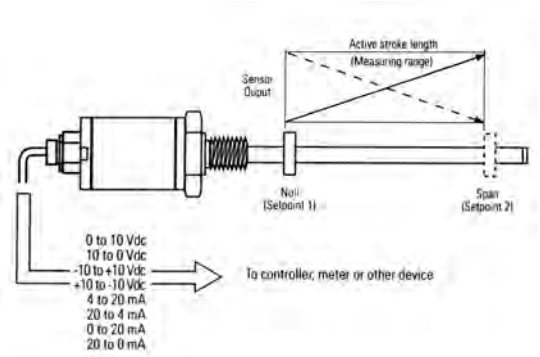
* Stroke lengths longer than 2,540 mm (100 in.) for analog output are available on a custom basis. The above specifications for analog output sensors are basaed on the assumption that output ripple is averaged by the mesuring device as with any typical analog device.

Temposonics® G Series - Analog or Digital Outputs

Analog Outputs

The Temposonics G Series position sensors provide direct analog outputs, including voltage (0 to 10 Vdc, forward or reverse acting) and current (4 to 20 MA, or 0 to 20 mA, forward or reverse acting). Both voltage and current outputs allow full adjustments of zero and span setpoints.

Since the outputs are direct, no signal-conditioning electronics are needed when interfacing with controllers or meters.



Features

- Voltage or Current Outputs
- Full Adjustment on Zero and Span
- Direct Outputs – No Signal-conditioning Required
- Infinite Resolution

Sensor Integral Connector (D60 Male)

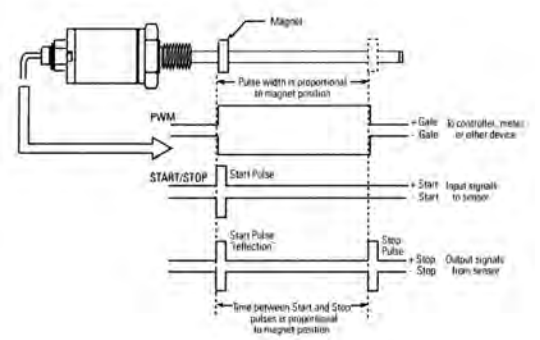
Pinout/wire color code (integral or extension cable)

Pin No.	Wire Color	Function Digital-pulse outputs	Function Analog outputs
1	Gray	(-) Gate for PWM (-) Stop for Start/Stop or Programming (RS-422 RX-)	0 10 10, -10 +10 Vdc or 4 to 10 mA, 0 to 20 mA 10 to 0, 10 to -10 Vdc or 20 to 4 mA, 20 to 0 mA
2	Pink	(+) gate for PWM (+) Stop for Start/Stop or Programming for (RS-422 RX+)	Return for pin 1
3	Yellow	(+) Interrogation for PWM (+) Stop for Start/Stop or Programming for (RS-422 TX+)	Programming (RS-485+)
4	Green	(-) Interrogation for PWM (+) Stop for Start/Stop or Programming for (RS-422 TX-)	Programming (RS-485-)
5	Red/Brown	Supply voltage (+Vdc)	Supply voltage (+Vdc)
6	Whtie	DC Ground (for supply)	DC Ground (for supply)

Integral D6 connector (male) as viewed from end of sensor.

Digital Outputs

The Temposinics G Series position sensors provide direct Start/Stop and PWM outputs. Standard resolution is 0.004 inches (when using a 28 MHz counter). Higher resolutions are possible with increased circulations or with the use of higher resolution counters.



Features

- Start/Stop or PWM outputs
- High Resolution
- Direct Outputs – No Signal-conditioning Required

Temposonics® R Series - SSI Output

Product Specifications

SSI (Synchronous Serial Interface)

The sensors fulfill all requirements of the SSI standard for absolute encoders. It's displacement value is encloded in a 24/25/26 code formate and transmitted at hight speed in SSI standard formate to the control device. Main feature of the SSI is the synchronized data transfer. Synchronization in a closed-loop control system is made simple. A clock pulse train from a controller is used to gate out sensor data: one bit of position data is transmitted to the controller per one clock pulse received by the sensor. The absolute, parallel position data is continually updated by the sensor and converted by the shift-register into serial information.

Parameter	Specifications
Measured Variable:	Displacement
Resolution:	1 µm, 2 µm, 5 µm, 10 µm
Non-Linearity*:	< ±0.01% of full stroke or ± 0.04 mm (0.0016 in.), whichever is greater*
Repeatability:	< ± 0.001% of full scale or ± 0.0025 mm (0.0001 in.), whichever is greater
Hysteresis (Magnetic**):	< 0.004 mm (0.00016 in.)
Output Format:	Binary or Gray code
Measuring Range:	Rod Style Sensors (RH): 25 to 7620 mm (1 to 300 in.)
Operating Voltage:	+24 Vdc (+ 20%, -15%)
Power Consumption:	100 mA typical
Operating Temperature:	-40 to 75°C (-40 to 167°F)
EMC Test:	EN61000-4-2/3/4/6 level 3/4 DIN EN 500081-1 (Emissions) DIN EN 500082-2 (Immunity)
Shock Rating:	100 g (single hit) / IEC standard 68-2-27 (survivability)
Rod Style (RH Model) Electronic Head:	Alminum housing
Sensor Rod with Flange:	304L stainless steel
Operating Pressure:	350 bar static, 690 bar spike (5000 psi static; 10,000 psi spike)
Maximum Hex Torque:	45 N-m (33 ft.-lbs)
Sealing:	IP 67
Mounting:	3/4-16 UNF-3A
Magnet Type:	Ring Magnet

* Varies with sensor model.

Features

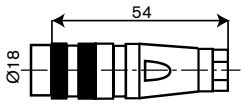
- Rugged industrial sensor
- Linear and absolute measurement
- LEDs for sensor diagnostics
- Contactless sensing with highest durability
- Superior accuracy: Resoltuion up to 1 µm
- Linearity better 0.01%
- Repeatability 0.001%
- Direct 24/25/26 bit SSI output, gray/binary
- Synchronous measurement for real-time sensing
- Field replaceable sensor cartridge

Wiring Connections

Male insert sensor plug rear or cable connector

Wiring	Pin	Cable	Function
	1	grey	Data (-)
	2	pink	Data (+)
	3	yellow	Clock (+)
	4	green	Clock (-)
	5	brown	+24 VDC
	6	white	0 V (gnd)
	7	n.c.	

Cable connector (optional). Not included in scope of supply.

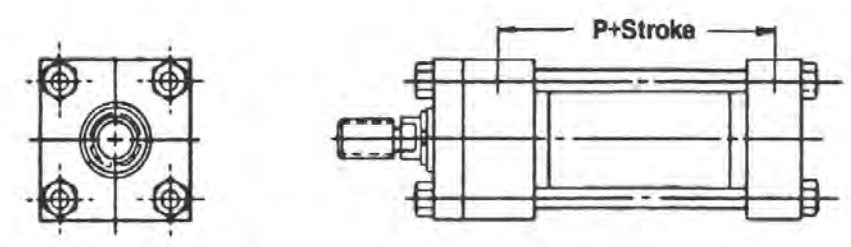


6 pin female connector - analog
Part No. R900072231

7 pin female connector - digital, SSI
Part No. R900079551

Cylinder Options

Oversize Ports (Option X)



Port Dimensions

Bore Size	Rod Dia.	Std. SAE St. Thread Port	Oversize SAE Thread Port		Max. SAE Flg. Port
			Head	Cap	
2	1-3/8	-10	-12*	-12*	-
2.5	1-3/8	-10	-12*	-12*	-
	1-3/4	-10	-12*	-12*	-
	1-3/8 Std.	-12	-16	-16*	1/2" - 3,000 psi
3.25	1-3/4	-12	-16	-16*	1/2" - 3,000 psi
	2	-12	-14	-16*	1/2" - 3,000 psi
	1-3/4 Std.	-12	-16	-16*	1/2" - 3,000 psi
4	2	-12	-16	-16*	1/2" - 3,000 psi
	2-1/2	-12	-14	-16*	1/2" - 3,000 psi
	2 Std.	-12	-16*	-16*	1/2" - 3,000 psi
5	2-1/2	-12	-16*	-16*	1/2" - 3,000 psi
	3	-12	-16*	-16*	1/2" - 3,000 psi
	3-1/2	-12	-16*	-16*	1/2" - 3,000 psi
	2-1/2 Std.	-16	-20*	-20*	1" - 3,000 psi
6	3	-16	-20*	-20*	1" - 3,000 psi
	3-1/2	-16	-20*	-20*	1" - 3,000 psi
	4	-16	-20*	-20*	1" - 3,000 psi

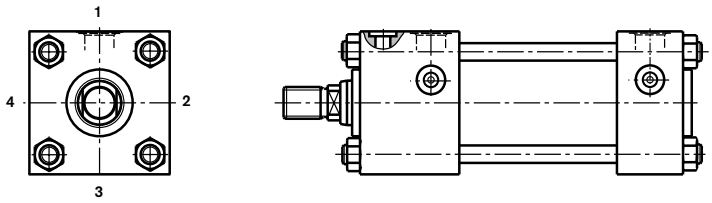
* - Y and P dimensions on dimensional pages must change to accommodate these port sizes.

Gland Drain Connection (Option B)

For cylinders with long stroke lengths or constant pressure (differential circuit), on the annular side, it is possible to drain to tank via a drain line, the fluid which collects between the wiper and rod seal .

Additionally, within the automotive industry, the drain connection is used to monitor seal wear.

To avoid back pressure in the drain line, the tank should be located below the cylinder.



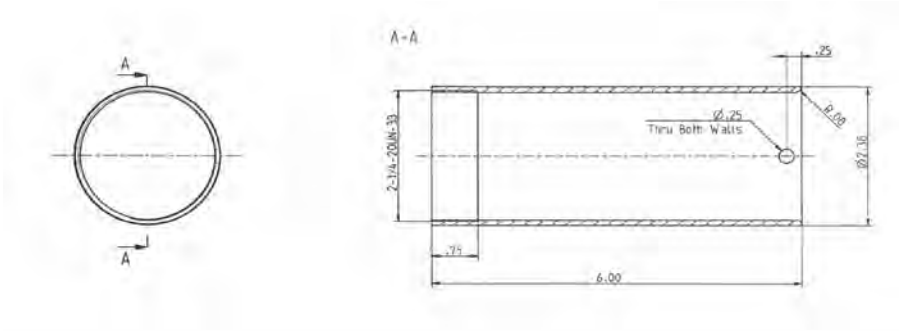
Note: Standard NFPA dimensions shown in this catalog will need to be modified to allow for a gland drain port. Contact factory for further information.

Port / Proximity Switch Locations

Mount Style	Port Location Head	Port Location Cap	Cushion Adjustment Head	Cushion Adjustment Cap	Air Bleed Head	Air Bleed Cap	Drain Port Head	Prox. Switch Loc. Head	Prox. Switch Loc. Cap
MP1, MT4	1	1	2	2	4	4	1	3	3
	2	2	3	3	1	1	2	4	4
	3	3	4	4	2	2	3	1	1
	4	4	1	1	3	3	4	2	2
ME5	1	1	3	2	4	4		2	3
	2	2	3	3	1	1	C/F	4	4
	3	3	1	4	2	2		4	1
	4	4	1	1	3	3		2	2
MS2	1	1	2	2	4	4	1	3	3
	3	3	4	4	2	2	3	1	1
MT1	1	1	3	2	3	4	1	C/F	3
	3	3	1	4	1	1	3	C/F	1

[1]) Drain ports are SAE 4 (7/16" - 20) on all mounting styles and bore sizes.

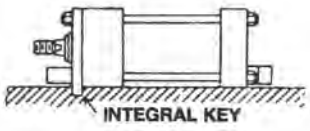
Transducer Cover - Part #R978016905

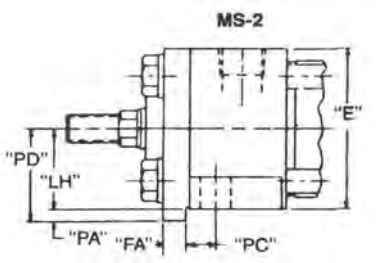


Standard when cylinder is ordered with transducer installed by Bosch Rexroth. If cylinder is ordered with provisions only for a transducer, cover is not included but may be ordered as a separate loose supply item.

Thrust Key Plates (Option K)

Rexroth offers a standard arrangement of Thrust Key Mountings on the MS2 CST4 cylinders. This option eliminates the need for fitted bolts or external keys to carry the thrust load. The normal headplate is extended below the head surface of the cylinder and is fitted in a keyway milled into the mounting surface of the machine member. See drawing for details.





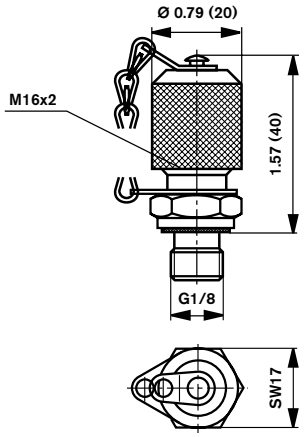
Bore	E	FA		LH		PA	PC	PD	PF	PG
2.00"	3.00	.562	+.000 -.002	1.494	+.000 -.002	.31	.56	1.81	1.06	1.50
2.50"	3.50	.562	+.000 -.002	1.744	+.000 -.002	.31	.75	2.06	1.06	1.50
3.25"	4.50	.687	+.000 -.003	2.244	+.000 -.003	.38	.75	2.62	1.19	1.84
4.00"	5.00	.812	+.000 -.003	2.494	+.000 -.003	.44	.94	2.94	1.19	1.94
5.00"	6.50	.812	+.000 -.003	3.244	+.000 -.003	.44	.94	3.69	1.19	2.31
6.00"	7.50	.937	+.000 -.003	3.744	+.000 -.003	.50	1.19	4.25	1.31	2.62

Notes:

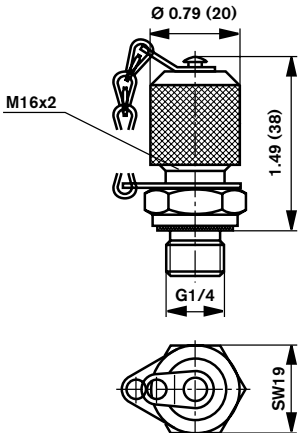
1. Use mounting bolts 0.06 smaller in diameter than hole size.
2. Fitted bolts or dowel pins are not needed with the thrust key headplate.
3. All dimensions not shown are NFPA standard.
4. PD, PA, FA dimensions typical for all mounts.

Test Point Coupling (Option A)

For bore sizes - 2“ - 2-1/2“



For Bore Sizes - 3-1/4“-6“



Above dimensions in inches (mm).

Notes

For pressure measurement or bleeding.

For installation in the bleed/measuring port. Coupling with check valve function, it can also be connected under pressure.

Scope of supply for bore sizes - 2" to 2-1/2"

Coupling AB-E 20-11/K3, G 1/8
with NBR seal, Material No. R900014363

Coupling AB-E 20-11/K3V, G 1/8
with FPM seal, Material No. R900024710

Scope of supply for bore sizes - 3-1/4" to 6"

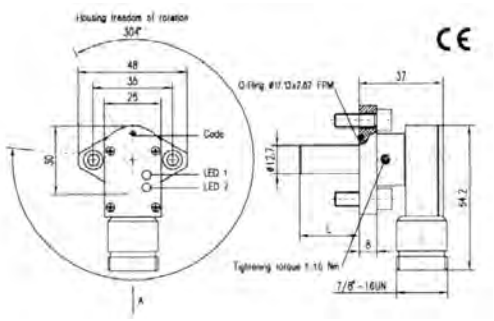
Coupling AB-E 20-11/K1, G 1/4
with NBR seal, Material No. R900009090

Coupling AB-E 20-11/K1V, G 1/4
with FPM seal. Material No. R900001264

CST4 Proximity Switch

High Pressure - 3000 psi (207 bar) Cylinder Sensors 2 wire AC/ DC Mini-Style Quick Disconnect

Dimensions (in mm)

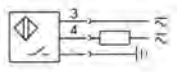


Ordering Code Sensing Distance Sn	Shielded (Flush Mounting) 2 mm
Function	
Normally Open	
Electrical	
Operating distance S_A	0...1.6 mm
Supply voltage	20 - 250 V AC/DC
Supply frequency	50 / 60 Hz
Load current capacity	5 - 400 mA
Inrush current	3A (t = 20 ms)
Leakage current	≤ 1.7 mA
Voltage drop	≤ 6 V
Switching frequency	50 Hz
Start up delay	≤ 150 ms
Switch hysteresis	≤ 15% of Sn
Repeatability	≤ 5% of Sn
Ambient temperature range	-25°C to +70°C
Output function LED	yes
Short circuit & overload protected	yes
Mechanical	
Housing material	Nickel plated brass housing
Electrical connection	AC Mini Style Connector
Protection class	IP 67
Housing, freedom of rotation	304°

Probe Length	Part Number	Code
1.025	R978008781	Blue
1.250	R978008793	White
2.062	R978002203	Red
2.875	R978002204	Orange
3.775	R978008792	Silver
4.560	R978009001	Gold

Wiring Connections

2 Wire AC/DC Normally Open



View of male connector pins

CST4 Seal Kits

Piston and Tube Seal Kits ~
(Series Z10 Prior to November 1, 2006)

Bore Ø (inches)	T	V
1.500	R978006850	R978006840
2.000	R978006851	R978006841
2.500	R978006852	R978006842
3.250	R978006853	R978006843
4.000	R978006854	R978006844
5.000	R978006855	R978006845
6.000	R978006856	R978006846

Piston and Tube Seal Kits ~
(Series Z11 After November 1, 2006)

Bore Ø (inches)	T	V
1.500	R978029065	R978029054
2.000	R978029066	R978029055
2.500	R978029067	R978029056
3.250	R978029068	R978029057
4.000	R978029069	R978029058
5.000	R978029070	R978029059
6.000	R978029071	R978029060

Rod Cartridge Seal Kits w/Rod Bearing †
(Series Z10 or Z11)

Rod Ø (inches)	T	V
1.000 (1.500" bore)	R978021088	R978021097
1.375 (2.000" bore)	R978021089	R978021098
1.375 (2.500"-3.250" bore)	R978021090	R978021099
1.750	R978021091	R978021100
2.000	R978021092	R978021101
2.500	R978021093	R978021102
3.000	R978021094	R978021103
3.500	R978021095	R978021104
4.000	R978021096	R978021105

T = Low friction seal system (std)
V = Low friction seal system for (phosphate ester) (optional)

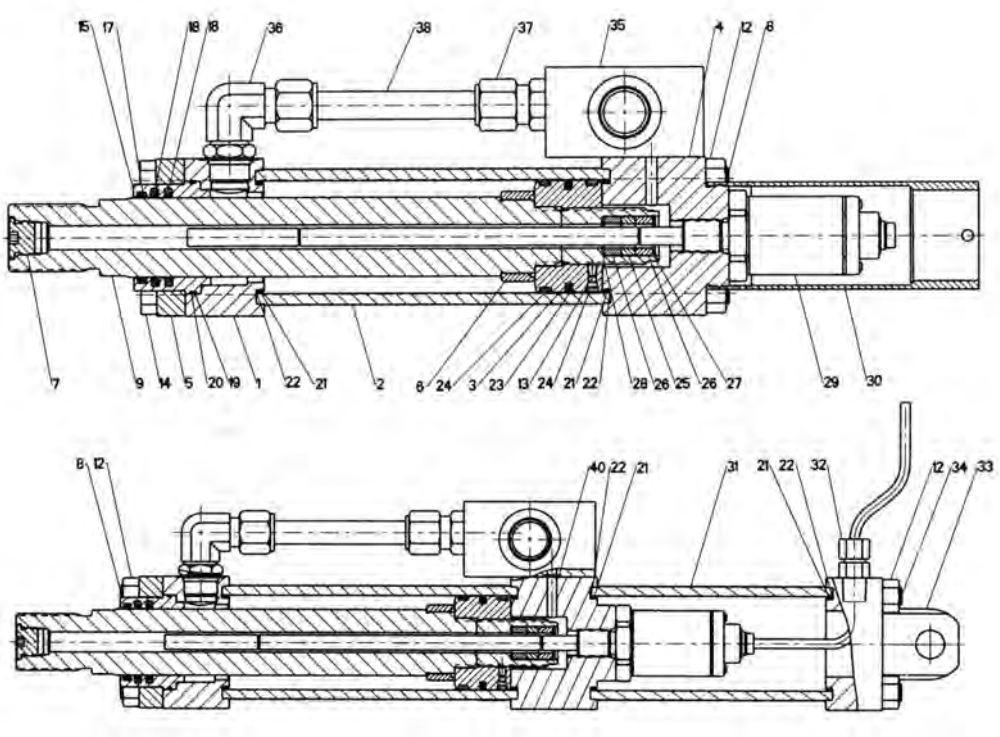
~ Piston/Tube Seal Kits include: one (1) double-acting piston seal;
two (2) wear bands; two (2) o-rings and two (2) back-up rings

† Rod Cartridge Seal Kits include: one (1) excluder wiper; two (2) step rod seal; one (1) rod bearing; one (1) o-ring and one (1) back-up ring

Cushion Valve (Item 16)

Bore Size	T	V
2", 2-1/2"	R433015236	R978006424
3-1/4", 4", 5"	R433016568	R978006436
6"	R433023258	R978006437

Spare Parts CST4



Tie Rods Torque Values		
Bore Size Inches	Tie Rod Diameter (inches)	Torque - Lubricated (pound / foot)
2.000	0.50	52
2.500	0.50	63
3.250	0.63	125
4.000	0.63	150
5.000	0.88	380
6.000	1.00	480

1	Head
2	Tube
3	Piston
4	Base
5	Flange
6	Cushion bushing
7	Plug
8	Tie rod
9	Piston rod
10	Bleed screw (not shown)
11	Securing plate (not shown)
12	Tie rod nut
13	Set screw
14	Hex head bolt
15	Rod bearing
16	Cushion valve (not shown)
17	Wiper
18	Rod seals
19	Bearing o-ring
20	Bearing back-up ring
21	Tube o-ring
22	Tube back-up ring
23	Piston seal
24	Wear band
25	Magnet
26	Spacer
27	Sprial ring
28	Wave washer
29	Transducer
30	Transducer cover
31	MP tube
32	MP connector
33	MP base
34	MP tie rod
35	Manifold pad
36	Elbow fitting
37	Straight fitting
38	Hydraulic tubing
39	SHCS bolt (not shown)
40	R-ring

Notes

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Industrial Hydraulics
2315 City Line Road
Bethlehem, PA 18017-2131
USA
Telephone (610) 694-8300
Facsimile (610) 694-8467
www.boschrexroth-us.com

Notes

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