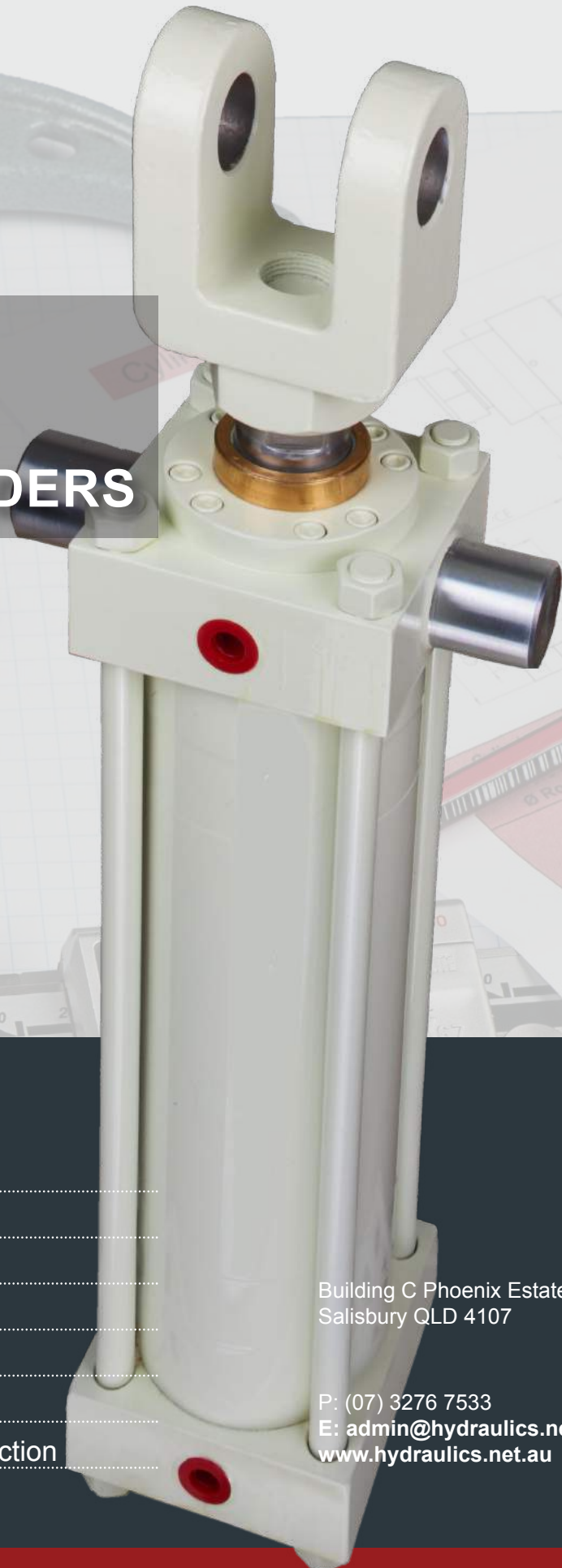




INDUSTRIAL NFPA SERIES 3000 HYDRAULIC CYLINDERS



- > Bore Size to 8"
- > Rod Size to 5½"
- > Maximum Length 18.0 Feet
- > Twenty Mounting Styles
- > Maximum pressure 3,000 psi
- > Factory Tested
- > Optional Stainless Steel Construction

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Salisbury QLD 4107

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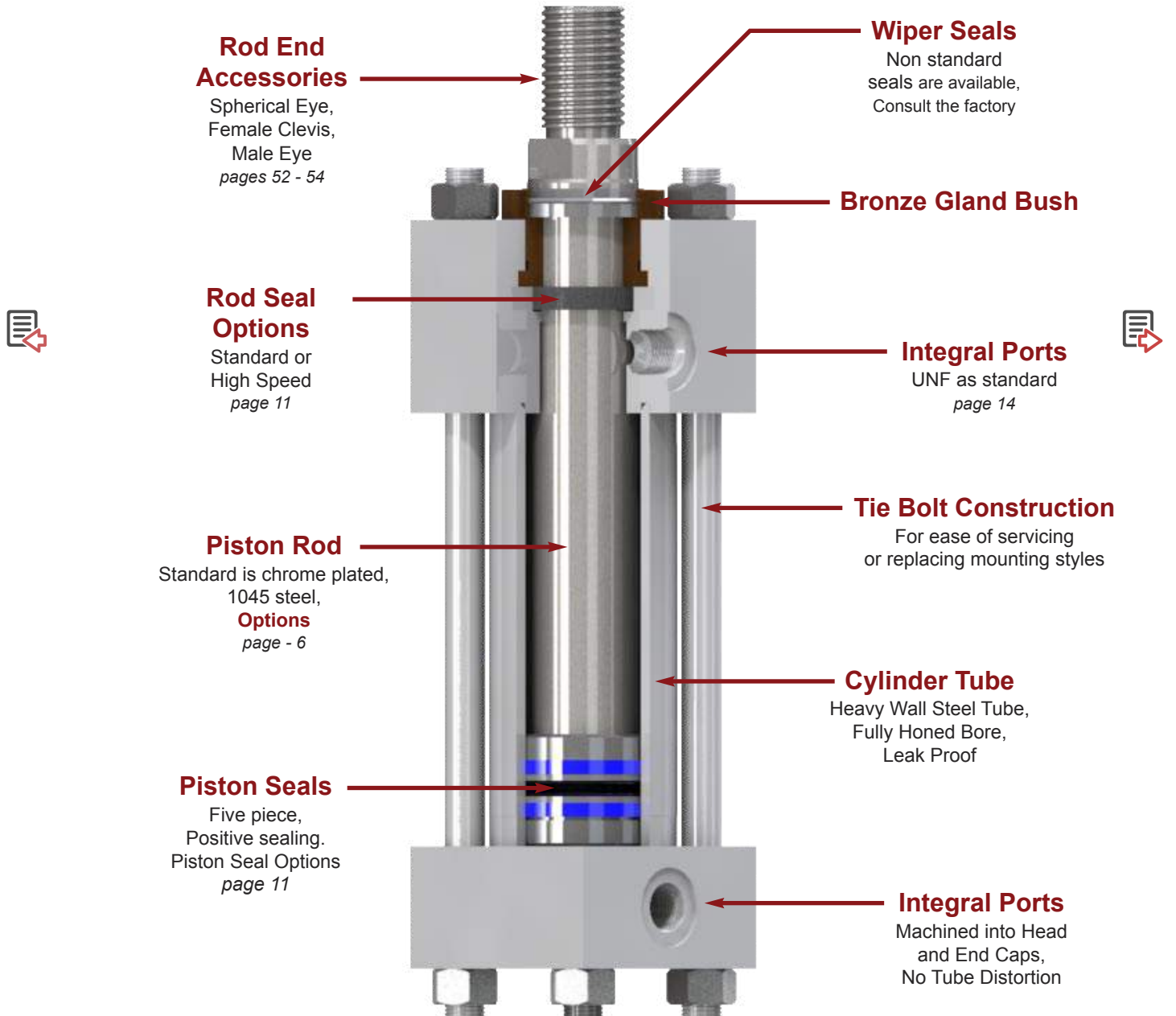
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1. SERIES OVERVIEW

Ver 1.9

- ▶ The NFPA Series 3000 cylinder range is designed for industrial applications and is manufactured to a International standard that has been a proven solution for industry over many years.
- ▶ Benefits are a large number of mounting styles, ease of service and repair, interchangeability of components and a proven design used by OEM's around the world.



- ▶ **Mechanical (metal) Rod Wiper seals available in all piston rod sizes.**
- ▶ **Replaceable Rod Bush assembly. (Normal and High speed operation.)**
- ▶ **Cushioned Cylinders are manufactured with self aligning cushion pieces and cushion studs.**
- ▶ **Cylinder Tubes are Spigotted to fully machined end caps to ensure linear alignment.**

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2. FORCE TABLE

Ver 1.9

Force in Lbs.

Bore Dia	PSI	Push Pull	Rod Ø 5/8"	Rod Ø 1"	Rod Ø 1 3/8"	Rod Ø 1 3/4"	Rod Ø 2"	Rod Ø 2 1/2"	Rod Ø 3"	Rod Ø 3 1/2"	Rod Ø 4"	Rod Ø 4 1/2"	Rod Ø 5"	Rod Ø 5 1/2"	
1 1/2"	1000	Push	1,767	1,767											
		Pull	1,460	982											
	2000	Push	3,534	3,534											
		Pull	2,920	1,964											
	3000	Push	5,301	5,301											
		Pull	4,380	2,946											
2"	1000	Push		3,142	3,142										
		Pull		2,357	1,657										
	2000	Push		6,284	6,284										
		Pull		4,714	3,314										
	3000	Push		9,426	9,426										
		Pull		7,071	4,971										
2 1/2"	1000	Push		4,909	4,909	4,909									
		Pull		4,124	3,424	2,504									
	2000	Push		9,818	9,818	9,818									
		Pull		8,248	6,848	5,008									
	3000	Push		14,730	14,730	14,730									
		Pull		12,372	10,277	7,512									
3 1/4"	1000	Push			8,296	8,296	8,296								
		Pull			6,811	5,891	5,154								
	2000	Push			16,592	16,592	16,592								
		Pull			13,622	11,782	10,308								
	3000	Push			24,888	24,888	24,888								
		Pull			20,433	17,673	15,462								
4"	1000	Push				12,570	12,570	12,570							
		Pull				10,165	9,428	7,861							
	2000	Push				25,140	25,140	25,140							
		Pull				20,330	18,856	15,322							
	3000	Push				37,710	37,710	37,710							
		Pull				30,495	28,284	22,983							
5"	1000	Push					19,640	19,640	19,640	19,640					
		Pull					16,498	14,731	12,571	10,019					
	2000	Push					39,280	39,280	39,280	39,280					
		Pull					32,996	29,462	25,142	20,038					
	3000	Push					58,920	58,920	58,920	58,920					
		Pull					49,494	44,193	37,713	30,057					
6"	1000	Push						28,270	28,270	28,270	28,270				
		Pull						23,360	21,200	18,650	15,700				
	2000	Push							56,540	56,540	56,540	56,540			
		Pull							46,270	42,400	37,300	31,400			
	3000	Push							84,810	84,810	84,810	84,810			
		Pull							70,080	63,600	55,950	47,100			
7"	1000	Push							38,490	38,490	38,490	38,490	38,490		
		Pull							31,420	28,870	25,920	22,590	18,850		
	2000	Push							76,980	76,980	76,980	76,980	76,980		
		Pull							62,840	57,740	51,840	45,180	37,700		
	3000	Push							115,470	115,470	115,470	115,470	115,470		
		Pull							94,260	86,610	77,760	67,770	56,550		
8"	1000	Push								50,270	50,270	50,270	50,270	50,270	
		Pull								40,650	37,700	34,370	30,630	26,510	
	2000	Push									100,540	100,540	100,540	100,540	
		Pull									81,300	75,400	68,740	61,260	53,020
	3000	Push									150,810	150,810	150,810	150,810	150,810
		Pull									121,950	113,100	103,110	91,890	79,530



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3. QUICK CALCULATOR - ROD DIAMETERS

Ver 1.9

Instructions

Compare force expressed in pounds against exposed rod length in inches to achieve minimum rod diameter. For **approximate** values see table below.

If Head Cap is not securely mounted (eg. NFPA style MP1), exposed rod length should be doubled to achieve minimum suggested rod diameter.

In the case of large bore and long stroke cylinders, consideration should be given to the affect of the weight of the cylinder on the piston rod when fully extended, particularly when using mounting styles MP1 or similar.

Note: Column Calculations are available on request from the factory for your specific requirements. Also below is a table of Rod Materials for your consideration when communicating with the factory on Column Calculations. Customers and design engineers are encouraged to use this service.

Load Lbs.	Exposed Length of Piston Rod (inches)							
	10	20	40	60	70	80	100	120
Piston Rod Ø (inches)								
1,120			3/4	1				
1,680			1	1 1/8				
2,240		5/8	1	1 1/8	1 1/8	1 1/8		
3,360		1	1	1 1/8	1 1/8	1 3/4		
4,480		1	1	1 1/8	1 3/4	1 3/4	2	
6,720	1	1	1 1/8	1 1/8	1 3/4	1 3/4	2	
8,960	1	1	1 1/8	1 3/4	1 3/4	1 3/4	2	2 1/2
11,200	1	1	1 1/8	1 3/4	1 3/4	2	2 1/2	2 1/2
16,800	1 1/8	1 1/8	1 3/4	1 3/4	2	2	2 1/2	2 1/2
22,400	1 1/8	1 3/4	1 3/4	2	2	2 1/2	2 1/2	3
33,600	1 3/4	1 3/4	2	2 1/2	2 1/2	2 1/2	3	3
44,800	2	2	2 1/2	2 1/2	2 1/2	3	3	3 1/2
67,200	2 1/2	2 1/2	2 1/2	3	3	3	3 1/2	3 1/2
89,600	3	3	3	3	3	3 1/2	3 1/2	4
112,000	3	3 1/2	3 1/2	3 1/2	3 1/2	3 1/2	4	4

4.

Piston Rod Materials

Ordering Code	Material	Yield Strength (Mpa)	Description
1	*Gr1045 Chrome Plated	~410	Medium tensile mild steel with little corrosion resistance and low abrasion resistance.
2	Gr4140 Chrome Plated	~655	Chrome plated (xx - xx mm thickness) Gr4140 bar. High abrasion resistance and increased corrosion resistance over standard Gr1045 bar.
3	Gr4140 Chrome Plated & Ceramic Densification	~655	Ceramic Densification of the porous chrome microstructure increases the corrosion resistance to above 3 series stainless steel while maintaining high impact resistance and core strength. Economical alternative to super stainless steel grade (Gr2130 etc.)
4	Gr316 Stainless Steel	~220	Austenitic stainless steel.
5	Gr630 Stainless Steel 17/4PH	~590 - 1,170	Heat Treatable High tensile precipitation hardened stainless steel, corrosion resistance similar to Gr304 stainless steel.
6	Gr2205 Stainless Steel	~450	High tensile strength with excellent corrosion resistance.

* Standard Rod Material.

Optional Rod Materials above can be selected, consult with the factory.

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5. CYLINDER PRESSURE RATINGS

Ver 1.9

Note: 4:1 Safety Factor based on minimum yield point of weakest component and smallest rod diameter. All data expressed in imperial measurements.

Cylinder Bore Inches	Maximum Pressure Rating PSI			Standard Cushion Length	
	Piston Rod Ø Inches	Heavy Duty	4:1 Safety Factor (yield)	Head Cap (inch)	End Cap (inch)
1½	⅝, 1	3,000	2,200	1	1
2	1, 1⅜	3,000	2,150	1	1
2½	1, 1⅜, 1¾	3,000	1,900	1	1
3¼	1⅝, 1¾, 2	3,000	2,200	1	1
4	1¾, 2, 2½	2,700	1,700	1	1
5	2, 2½, 3, 3½	3,000	1,900	1⅛	1⅛
6	2½, 3, 3½, 4	2,700	1,750	1¼	1¼
7	3, 3½, 4, 4½, 5	3,000	1,950	1¼	1¼
8	3½, 4, 4½, 5, 5½	3,000	1,900	1¼	1¼



6. Conversion Table - Imperial and Metric

To Convert Metric into Imperial

Metric	Imperial	Multiply by
mm	in	0.039
cm ²	in ²	0.155
cm ³	in ³	0.061
litre	in ³	61.024
litre	gal (US)	0.264
litre	gal (Imp)	0.22
bar	psi	14.5
kPa	psi	0.145
mPa	psi	145.033
Nm	lb. Ft.	0.738
N	lb. (force)	0.225
tonne	ton (US)	1.102
tonne	ton (Imp)	0.984
kg	lb	2.204
kW	HP	1.341
J	Btu	0.00095
dm ³ /s	scfm	2.118

To Convert Imperial into Metric

Imperial	Metric	Multiply by
in	mm	25.4
in ²	cm ²	6.452
in ³	cm ³	16.387
in ³	litre	0.0164
gal (US)	litre	4.546
gal (Imp)	litre	3.785
psi	bar	0.069
psi	kPa	6.895
psi	mPa	0.0069
lb. Ft.	Nm	1.356
lb. (force)	N	4.448
ton (US)	tonne	0.907
ton (Imp)	tonne	1.016
lb	kg	0.454
HP	kW	0.746
Btu	J	1,055
scfm	dm ³ /s	0.472

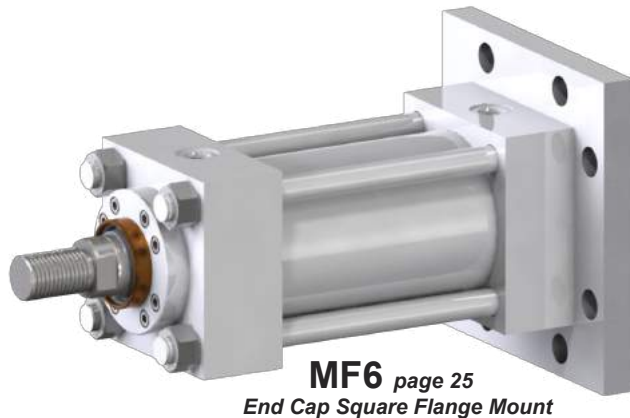
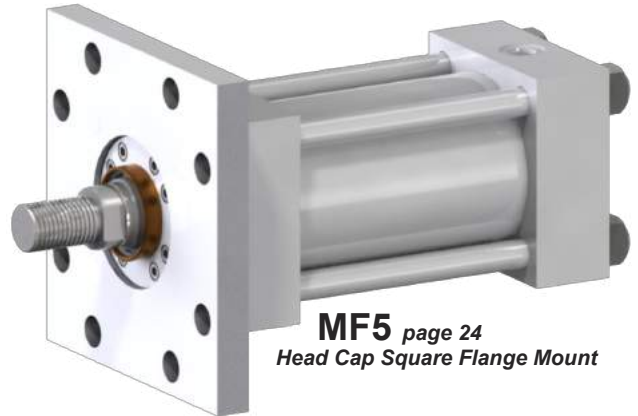
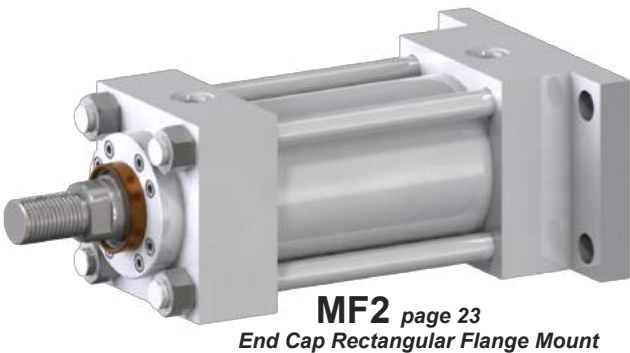
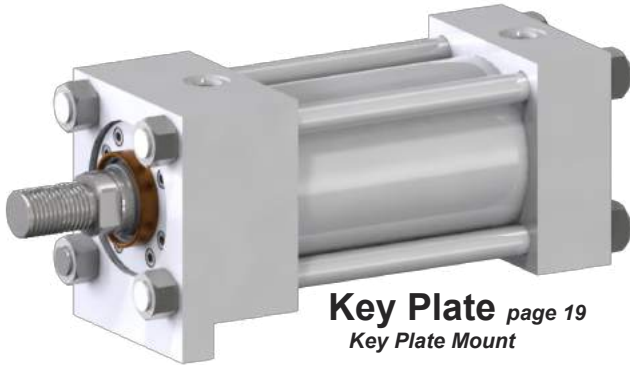
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7.1 MOUNTING STYLE OVERVIEW

- ▶ NFPA Series 3000 can be supplied with the following twenty mounting styles. Cylinder mounting styles can be custom designed and manufactured on request.
- ▶ In addition to those shown below, double rod cylinders providing equal force in both retract and extension are available on request.



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7.2 MOUNTING STYLE OVERVIEW

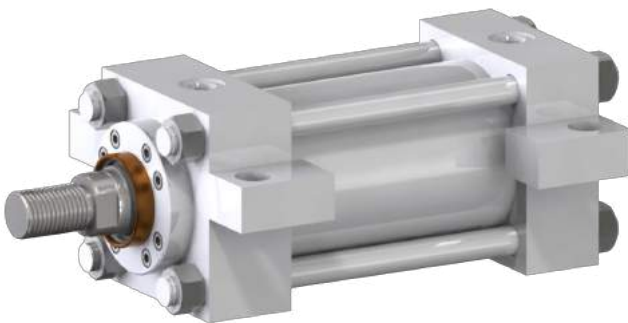
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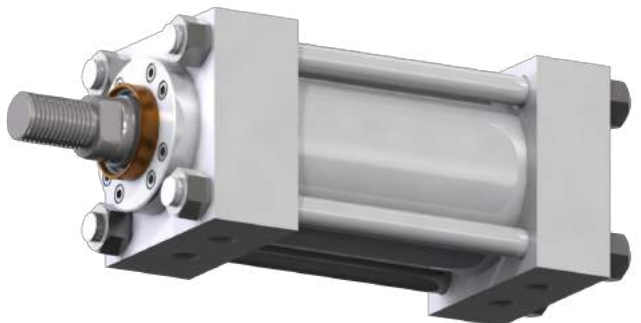
MP2 page 27
Cap Detachable Clevis Mount



MS2 page 28
Side Lugs Mount



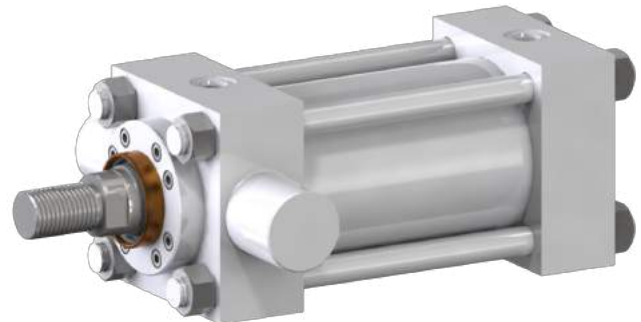
MS3 page 29
Centre Line Lugs Mount



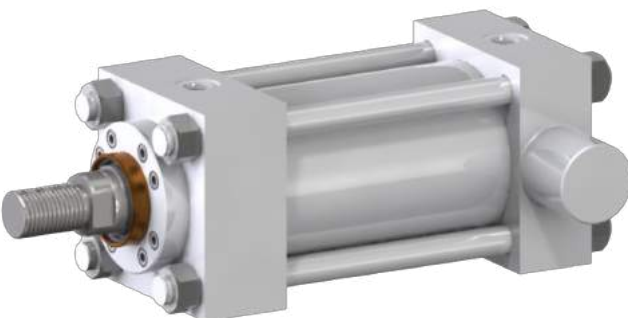
MS4 page 30
Side Tapped Mount



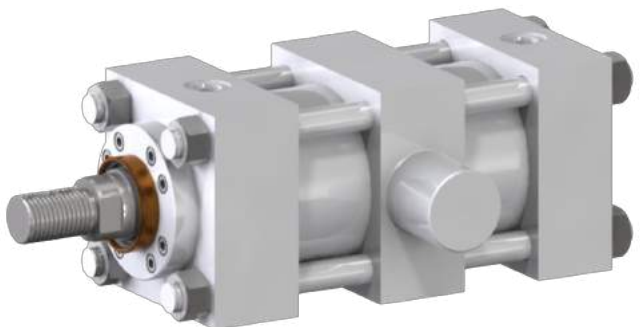
MS7 page 31
Side End Lugs Mount



MT1 page 32
Head Cap Trunnion Mount



MT2 page 33
End Cap Trunnion Mount



MT4 page 34
Intermediate Trunnion Mount

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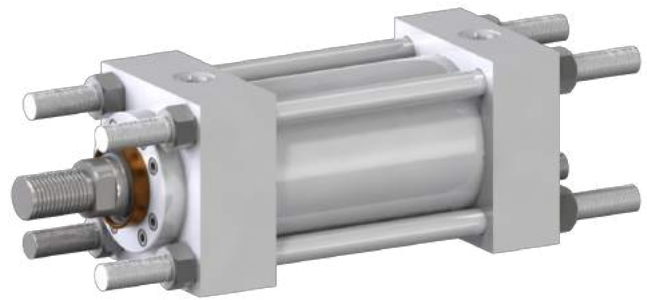


7.3 MOUNTING STYLE OVERVIEW

Ver 1.9



MXO page 17 and 18
Standard Cylinder



MX1 page 35
Both Tie Rods Extended Mount



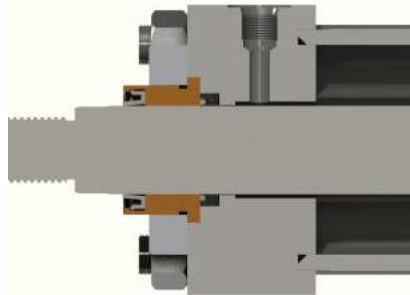
MX2 page 36
End Cap Tie Rods Extended Mount



MX3 page 37
Head Cap Tie Rods Extended Mount

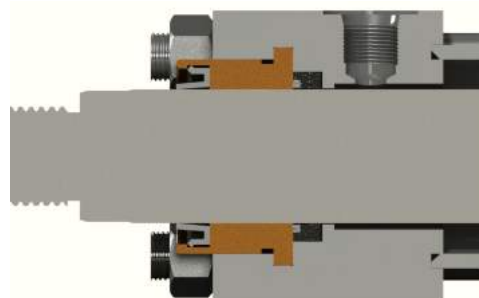


8. PISTON ROD BUSH RETAINERS



Cylinders with the following bore and rod combinations use circular retainers which permit removal of rod bush without disassembling cylinder.

- 1 2½" bore with 1" rod
- 2 3½" bore with 1½" rod
- 3 4" bore through 20" bore all rod diameters



Cylinders use this construction on the following bore and rod combinations except on NFPA MES mounting where the above method is used.

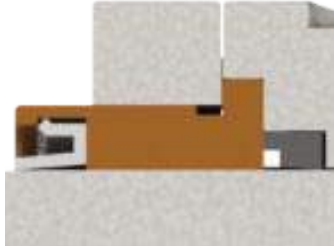
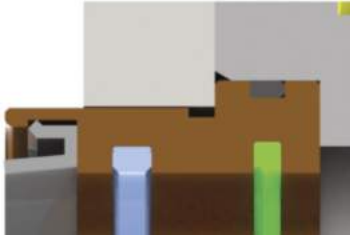
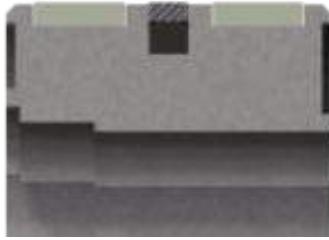
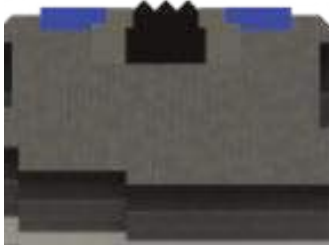
- 1 1½" bore with 5/8" and 1" rods
- 2 2" bore with 1" and 1½" rods
- 3 2½" bore with 1½" and 1¾" rods
- 4 3¼" bore with 1¾" and 2" rods

Contents



9. SEAL ALTERNATIVES

- ▶ Appropriate sealing methodology is imperative to a long-lasting and maintainable hydraulic cylinder. R3000 cylinders contain removable gland bushes which allow all rod seals to be removed without disassembly of the main cylinder barrel.
- ▶ These cartridge style gland bushes are able to be supplied with a myriad of seal types and materials to suit individual applications.
- ▶ Standard sealing methods are shown below; non-standard sealing arrangements in addition to exotic sealing materials are available on request. For these applications please consult with Queensland Hydraulics who will then issue a Special Build Number for ordering.

Ordering Code	Description	Application	General Arrangement
S	ROD Single double acting seals.	Non-sensitive environment with no external fluid pressure.	
UW	ROD Single acting primary seal with double acting secondary seal.	High Speed Applications Non-sensitive environments with external fluid pressure.	
HS	PISTON Single O-Ring energised seal with two independent wear strips.	High Speed Applications long life applications.	
5	PISTON Integrated five piece piston seal with support rings and bearings.	Standard applications.	



10.1 SIZE COMBINATIONS - IMPERIAL

Ver 1.9

1½” to 8” Bore - Flow and Cylinder Force - Imperial Units

Bore Ø Inch	Rod Ø Inch	Area		Force @ 3000psi			Oil Flow @ 100mm/sec		
		Piston Inch ²	Annulus Inch ²	Extend lbf	Retract lbf	Regen lbf	Extend US Gal/min	Retract US Gal/min	Regen US Gal/min
1½	5/8	1.77	1.46	5,310	4,380	899	1.8	1.51	0.32
	1		0.98		2,950	2,360		1.00	0.79
2	1	3.14	2.36	9,420	7,060	2,360	3.22	2.4	0.79
	1 3/8		1.6		4,950	4,450		1.69	1.53
2½	1	4.9	4.1	14,700	12,400	2,360	5.02	4.23	0.79
	1 3/8		3.4		10,300	4,450		3.51	1.53
	1 3/4		2.5		7,510	7,220		2.56	2.46
3¼	1 3/8	8.30	6.81	24,800	20,400	4,450	8.48	6.96	1.53
	1 3/4		5.89		17,650	7,220		6.02	2.46
	2		5.15		15,450	9,420		5.27	3.22
4	1 3/4	12.6	10.2	37,700	30,500	7,220	12.84	10.38	2.46
	2		9.4		28,300	9,420		9.64	3.22
	2½		7.7		23,000	15,000		7.82	5.02
5	2	19.63	16.49	58,905	49,480	9,425	20.00	16.86	3.21
	2½		17.73		44,179	14,726		15.05	5.02
	3		12.57		37,700	21,205		12.84	7.22
	3½		10.01		30,041	28,863		10.23	9.83
6	2½	28.27	23.37	84,823	70,097	14,726	28.90	23.88	5.02
	3		21.21		63,617	21,205		21.67	7.22
	3½		18.65		55,960	28,863		19.06	9.83
	4		15.71		47,124	37,700		16.05	12.84
7	3	38.48	31.42	115,453	94,248	21,205	39.33	32.10	7.22
	3½		28.86		86,590	28,863		29.50	9.83
	4		25.92		77,754	37,700		26.49	12.84
	4½		22.58		67,740	47,713		23.08	16.25
	5		18.85		56,549	58,905		19.26	20.07
8	3½	50.27	4.064	150,796	121,933	28,863	51.37	41.51	9.83
	4		37.70		113,097	37,700		38.53	12.84
	4½		34.36		103,083	47,713		35.11	16.28
	5		30.63		91,891	58,905		31.30	20.07
	5½		26.51		79,521	71,270		27.09	24.28



10.2 SIZE COMBINATIONS - METRIC

Ver 1.9

38.1 to 203.2 mm Bore - Flow and Cylinder Force - Metric Units

Bore	Rod	Area		Force @ 27.7 Pa			Oil Flow @ 100mm/sec		
		Ø mm	Piston mm ²	Annulus mm ²	Extend kN	Retract kN	Regen kN	Extend L/min	Retract L/min
38.1	15.8	1,142	942	23.6	19.5	4.0	6.8	5.7	1.2
	25.4		632		13.1	10.5		3.8	3.0
50.8	25.4	2,026	1,523	41.9	31.4	10.5	12.2	9.1	3.0
	34.9		1,032		22.0	19.8		6.4	5.8
63.5	25.4	3,161	2,645	65.5	55.0	10.5	19.0	16.0	3.0
	34.9		2,194		45.7	19.8		13.3	5.8
	44.5		1,613		33.4	32.1		9.7	9.3
82.55	34.9	5,352	4,394	110.7	90.8	19.8	32.1	26.3	5.8
	44.4		3,800		78.6	32.1		22.8	9.3
	50.8		3,325		68.7	41.9		19.9	12.2
101.6	44.5	8,129	6,581	168	135.6	32.1	48.6	39.3	9.3
	50.8		6,065		125.8	41.9		36.5	12.2
	63.5		4,968		102.2	65.5		29.6	19.0
127	50.8	12,668	10,641	262.0	220.00	41.92	76.01	63.85	12.16
	63.5		9,500		196.51	65.50		57.00	19.00
	76.2		8,107		167.70	94.30		48.64	27.36
	88.9		6,461		133.60	128.40		38.76	37.24
152.4	63.5	18,241	15,075	377.3	311.80	66.50	109.50	90.45	19.00
	76.2		13,681		283.00	94.30		82.09	27.36
	88.9		12,034		248.90	128.40		72.21	37.24
	101.6		10,134		209.60	167.70		60.80	48.64
177.8	76.2	24,829	20,268	513.5	419.20	94.30	148.97	121.61	27.36
	88.9		18,621		385.20	128.40		111.73	37.24
	101.6		16,721		345.85	167.70		100.33	48.64
	114.3		14,568		301.31	212.23		87.41	61.56
	127.0		12,161		251.53	262.00		72.97	76.01
203.2	88.9	32,429	26,222	670.7	542.36	128.40	194.58	157.33	37.24
	101.6		24,322		503.00	167.70		145.93	48.64
	114.1		22,168		458.51	212.23		133.00	61.56
	127.0		19,762		408.70	262.00		118.57	76.01
	139.7		17,101		353.70	317.00		102.60	91.97



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11. PORT SIZE - STYLES

- ▶ Recommended port sizes are outlined in the table below.
- ▶ If a particular application requires a porting arrangement for size and orientation that is . . . non standard then please consult with Queensland Hydraulics for a special build number.
- ▶ Standard supply for ports is that the head cap and end cap are placed inline on the same . . . face unless otherwise specified.

Ordering Code	G	U	Ordering Code	G	U
Cylinder Bore Ø Inch & Metric	BSPP Port Inch	UNF "O" Ring Port Inch	Cylinder Bore Ø Inch & Metric	BSPP Port Inch	UNF "O" Ring Port Inch
1½ - 38.1	½ - 14	¾ - 16	5 - 127	¾ - 14	1½ - 12
2 - 50.8	½ - 14	¾ - 16	6 - 152.4	1 - 11	1½ - 12
2½ - 63.5	½ - 14	¾ - 16	7 - 177.8	1 - 11	1½ - 12
3¼ - 82.5?	¾ - 14	1½ - 12	8 - 203.2	1 - 11	1½ - 12
4 - 101.6	¾ - 14	1½ - 12			



12. TOLERANCES

Table 1

Tolerances for mounting dimensions that are dependant on stroke.

Code for Mounting Dimension	LB	ZB	XC
Nominal Stroke (mm)	Tolerances (mm)		
≤ 1,250	± 1.5	± 1.5	± 2.0
> 1,250 ≤ 3,150	± 3.0	± 3.0	± 4.0
≤ 6,000	± 5.0	± 5.0	± 8.0

Table 2

Tolerances on piston stroke.

Nominal Stroke (mm)	Tolerances (mm)
≤ 1,250	± 2.0 0.0
> 1,250 ≤ 3,150	± 5.0 0.0
≤ 6,000	± 8.0 0.0

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13.1 ORDERING CODE

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- ▶ When requesting a quote or ordering a cylinder it is necessary to supply our staff with the code below in Imperial measurements. This will accelerate our quoting proces and accurately define all aspects of the cylinder required. Custom cylinder requirements must be noted in full within your quote requests and a Special Build number from Queensland Hydraulics will be supplied with their quote outlining your requirements.
- ▶ Standard supply for ports is that the head cap and end cap are placed inline on the same face unless otherwise specified and recorded in the Special Build number supplied by Queensland Hydraulics at the time of quotation.
- ▶ **Note:** The Special Build number can cover multiple custom requirements. The Special Build number ensures non standard cylinders can be accurately supplied into the future.

Cylinder Ordering Code

NFPA Series 3000 - 3¹/₄ - 1³/₄ - 12 - MF2 - UW/HS - G - 1 - 0 - SB001

**Model Type: NFPA
Heavy Duty Series 3000**

Bore Ø (inch) *Ref. Pages 5 and 12*

Rod Ø (inch) *Ref. Pages 5 and 12*

Stroke (inch) *Ref. Pages 5 and 12*

Mounting Style *Ref. Pages 8 - 10 and 17 - 37*

Key Plate	- Key Plate mounted plain cylinder	<i>Ref. Pages 8 and 19</i>
ME5	- Head Cap Rectangular Mount	<i>Ref. Pages 8 and 20</i>
ME6	- End Cap rectangular	<i>Ref. Pages 8 and 21</i>
MF1	- Head Cap Rectangular Flange Mount	<i>Ref. Pages 8 and 22</i>
MF2	- End Cap Rectangular Flange Mount	<i>Ref. Pages 8 and 23</i>
MF5	- Head Cap Square Flange Mount	<i>Ref. Pages 8 and 24</i>
MF6	- End Cap Square Flange Mount	<i>Ref. Pages 8 and 25</i>
MP1	- Cap Fixed Clevis Mount	<i>Ref. Pages 8 and 26</i>
MP2	- Cap Detachable Clevis Mount	<i>Ref. Pages 9 and 27</i>
MS2	- Side Lugs Mount	<i>Ref. Pages 9 and 28</i>
MS3	- Centre Line Lugs Mount	<i>Ref. Pages 9 and 29</i>
MS4	- Side Tapped Mount	<i>Ref. Pages 9 and 30</i>
MS7	- Side End Lugs Mount	<i>Ref. Pages 9 and 31</i>
MT1	- Head Cap Trunnion Mount	<i>Ref. Pages 9 and 32</i>
MT2	- End Cap Trunnion Mount	<i>Ref. Pages 9 and 33</i>
MT4	- Intermediate Trunnion Mount	<i>Ref. Pages 9 and 34</i>
MX0	- Standard Cylinder Dimensions	<i>Ref. Pages 10,17-18</i>
MX1	- Tie Rods Extended Mounting (Both Tie Rods Extended)	<i>Ref. Pages 10 and 35</i>
MX2	- Tie Rods Extended Mounting (End Cap Tie Rods extended)	<i>Ref. Pages 10 and 36</i>
MX3	- Tie Rods Extended Mounting (Head Cap Tie Rods Extended)	<i>Ref. Pages 10 and 37</i>

Gland Bush Sealing *Ref. Page 11*

UW
S

Piston Sealing *Ref. Page 11*

HS
5

Continued over the page...

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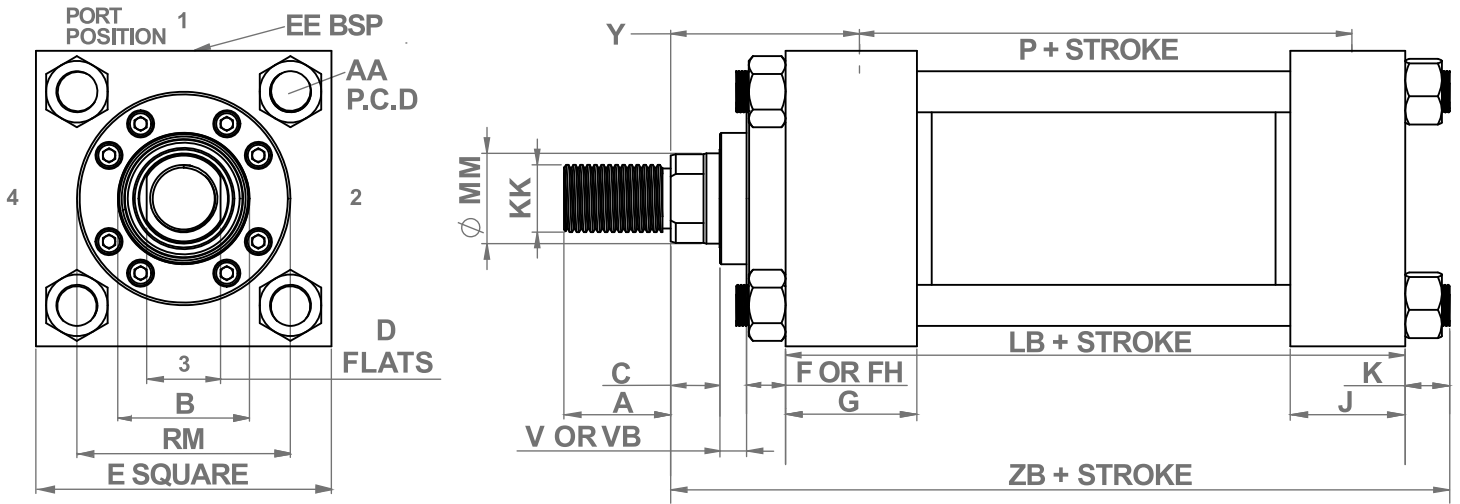
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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.1	MX0	Standard Cylinder



Bore Size	Rod Size	Dimension									
		A	B	C	D	E	F	G	J	K	P
1 1/2	5/8	3/4	1 1/8	3/8	1 1/2	2 1/2	-	1 3/4	1 1/2	3/8	3
	1	1 1/8	1 1/2	1/2	7/8	2 1/2	-	1 3/4	1 1/2	3/8	3
2	1	1 1/8	1 1/2	1/2	7/8	3	-	1 3/4	1 1/2	7/16	3
	1 3/8	1 1/8	2	5/8	1 1/8	3	-	1 3/4	1 1/2	7/16	3
2 1/2	1	1 1/8	1 1/2	1/2	7/8	3 1/2	1/2	1 3/4	1 1/2	7/16	3 1/8
	1 3/8	1 1/8	2	5/8	1 1/8	3 1/2	-	1 3/4	1 1/2	7/16	3 1/8
	1 3/4	2	2 3/8	3/4	1 1/2	3 1/2	-	1 3/4	1 1/2	7/16	3 1/8
3 1/4	1 3/8	1 1/8	2	5/8	1 1/8	4 1/2	1 9/32	2	1 3/4	9/16	3 5/8
	1 3/4	2	2 3/8	3/4	1 1/2	4 1/2	-	2	1 3/4	9/16	3 5/8
	2	2 1/4	2 5/8	7/8	1 3/4	4 1/2	-	2	1 3/4	9/16	3 5/8
4	1 3/4	2	2 3/8	3/4	1 1/2	5	1 19/32	2	1 3/4	9/16	3 7/8
	2	2 1/4	2 5/8	7/8	1 3/4	5	1 19/32	2	1 3/4	9/16	3 7/8
	2 1/2	3	3 1/8	1	2 1/8	5	1 19/32	2	1 3/4	9/16	3 7/8
5	2	2 1/4	2 5/8	7/8	1 3/4	6 1/2	1 19/32	2	1 3/4	1 13/16	4 3/8
	2 1/2	3	3 1/8	1	2 1/8	6 1/2	1 19/32	2	1 3/4	1 13/16	4 3/8
	3	3 1/2	3 3/4	1	2 5/8	6 1/2	2 23/32	2	1 3/4	1 13/16	4 3/8
	3 1/2	3 1/2	4 1/4	1	3	6 1/2	2 23/32	2	1 3/4	1 13/16	4 3/8
6	2 1/2	3	3 1/8	1	2 1/8	7 1/2	1 19/32	2 1/4	2 1/4	1 5/16	5
	3	3 1/2	3 3/4	1	2 5/8	7 1/2	2 23/32	2 1/4	2 1/4	1 5/16	5
	3 1/2	3 1/2	4 1/4	1	3	7 1/2	2 23/32	2 1/4	2 1/4	1 5/16	5
	4	4	4 3/4	1	-	7 1/2	7/8	2 1/4	2 1/4	1 5/16	5
7	3	3 1/2	3 3/4	1	2 5/8	8 1/2	2 23/32	2 3/4	2 3/4	1	5 1/2
	3 1/2	3 1/2	4 1/4	1	3	8 1/2	2 23/32	2 3/4	2 3/4	1	5 1/2
	4	4	4 3/4	1	-	8 1/2	7/8	2 3/4	2 3/4	1	5 1/2
	4 1/2	4 1/2	5 1/4	1	-	8 1/2	7/8	2 3/4	2 3/4	1	5 1/2
8	5	5	5 3/4	1	-	8 1/2	7/8	2 3/4	2 3/4	1	5 1/2
	3 1/2	3 1/2	4 1/4	1	3	9 1/2	2 23/32	3	3	1 1/8	6 1/4
	4	4	4 3/4	1	-	9 1/2	7/8	3	3	1 1/8	6 1/4
	4 1/2	4 1/2	5 1/4	1	-	9 1/2	7/8	3	3	1 1/8	6 1/4
	5	5	5 3/4	1	-	9 1/2	7/8	3	3	1 1/8	6 1/4
8	5 1/2	5 1/2	6 1/4	1	-	9 1/2	7/8	3	3	1 1/8	6 1/4



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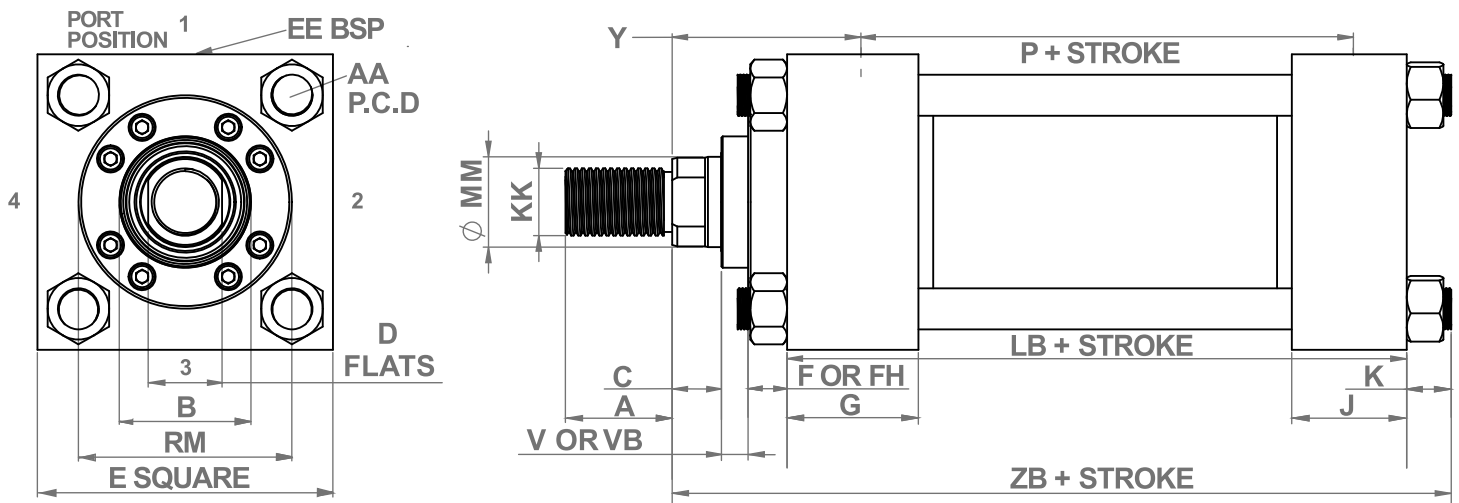


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15. DIMENSIONS - MOUNTING STYLES

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Contents Reference	Ordering Code	Description
15.2	MX0	Standard Cylinder



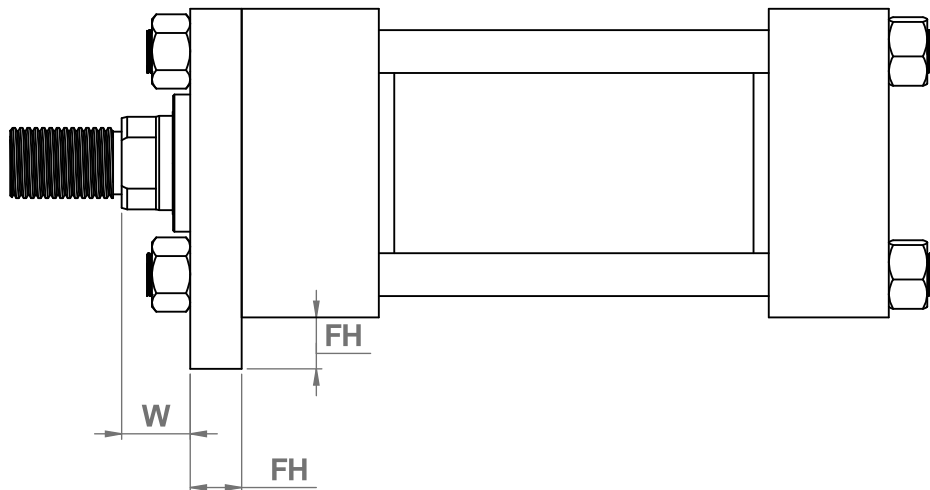
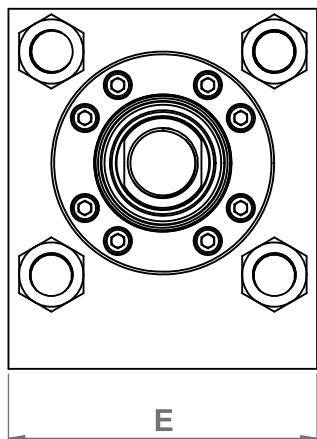
Bore Size	Rod Size	Dimension									
		V	Y	AA	EE	FH	KK	LB	ZB	VB	RM
1½	5/8	-	1 1/16	2.30	1/2	3/8	7/16 - 20	4 5/8	6	1/4	-
	1	-	2 5/16	2.30	1/2	3/8	3/4 - 16	4 5/8	6 3/8	1/2	-
2	1	-	2 5/16	2.30	1/2	3/8	3/4 - 16	4 5/8	6 7/16	1/4	-
	1 3/8	-	2 5/16	2.30	1/2	3/8	1 - 14	4 5/8	6 11/16	3/8	-
2½	1	3/8	2 5/16	3.60	1/2	5/8	3/4 - 16	4 3/4	6 9/16	1/4	2 5/8
	1 3/8	-	2 5/16	3.60	1/2	5/8	1 - 14	4 3/4	6 13/16	3/8	-
	1 3/4	-	2 13/16	3.60	1/2	5/8	1 1/4 - 12	4 3/4	7 1/16	1/2	-
3¼	1 3/8	13/32	2 11/16	4.60	3/4	3/4	1 - 14	5 1/2	7 11/16	1/4	3 1/4
	1 3/4	-	2 15/16	4.60	3/4	3/4	1 1/4 - 12	5 1/2	7 11/16	5/8	-
	2	-	3 1/16	4.60	3/4	3/4	1 1/2 - 12	5 1/2	8 1/16	3/8	-
4	1 3/4	17/32	2 15/16	5.40	3/4	7/8	1 1/2 - 12	5 3/4	8 3/16	1/4	3 7/8
	2	17/32	3 1/16	5.40	3/4	7/8	1 1/2 - 12	5 3/4	8 5/16	1/4	4
	2 1/2	21/32	3 5/16	5.40	3/4	7/8	1 7/8 - 12	5 3/4	8 9/16	3/8	4 7/16
5	2	17/32	3 1/16	7.00	3/4	7/8	1 1/2 - 12	6 1/4	9 1/16	1/4	4
	2 1/2	21/32	3 5/16	7.00	3/4	7/8	1 7/8 - 12	6 1/4	9 5/16	3/8	4 7/16
	3	17/32	3 5/16	7.00	3/4	7/8	2 1/4 - 12	6 1/4	9 5/16	3/8	5 1/4
	3 1/2	17/32	3 5/16	7.00	3/4	7/8	2 1/2 - 12	6 1/4	9 5/16	3/8	5 5/8
6	2 1/2	21/32	3 1/16	8.10	1	1	1 1/16 - 12	7 3/8	10 1/16	1/4	4 7/16
	3	17/32	3 1/16	8.10	1	1	2 1/4 - 12	7 3/8	10 1/16	1/4	5 1/4
	3 1/2	17/32	3 1/16	8.10	1	1	2 1/2 - 12	7 3/8	10 1/16	1/4	5 5/8
	4	3/8	3 1/16	8.10	1	1	3 - 12	7 3/8	10 1/16	1/4	6 1/16
7	3	17/32	3 3/4	9.30	1 1/4	1	2 1/4 - 12	8 1/2	11 1/4	1/4	5 1/4
	3 1/2	17/32	3 3/4	9.30	1 1/4	1	2 1/2 - 12	8 1/2	11 1/4	1/4	5 5/8
	4	3/8	3 3/4	9.30	1 1/4	1	3 - 12	8 1/2	11 1/4	1/4	6 1/16
	4 1/2	3/8	3 3/4	9.30	1 1/4	1	3 1/4 - 12	8 1/2	11 1/4	1/4	7 1/8
	5	3/8	3 3/4	9.30	1 1/4	1	3 1/2 - 12	8 1/2	11 1/4	1/4	7 9/16
8	3 1/2	17/32	3 3/8	10.60	1 1/2	1	2 1/2 - 12	9 1/2	12 1/16	1/4	5 5/8
	4	3/8	3 3/8	10.60	1 1/2	1	3 - 12	9 1/2	12 1/16	1/4	6 7/16
	4 1/2	3/8	3 3/8	10.60	1 1/2	1	3 1/4 - 12	9 1/2	12 1/16	1/4	7 1/8
	5	3/8	3 3/8	10.60	1 1/2	1	3 1/2 - 12	9 1/2	12 1/16	1/4	7 9/16
	5 1/2	3/8	3 3/8	10.60	1 1/2	1	4 - 12	9 1/2	12 1/16	1/4	8 3/8



15. DIMENSIONS - MOUNTING STYLES

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Contents Reference	Ordering Code	Description
15.3	Key Plate	Key Plate Mount



BORE SIZE																	
Inch	1½		2		2½			3¼			4			5			
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
E	2 1/2	2 1/2	3	3	3 1/2	3 1/2	3 1/2	4 1/2	4 1/2	4 1/2	5	5	5	6 1/2	6 1/2	6 1/2	6 1/2
W	5/8	1	3/4	1	3/4	1	1 1/4	7/8	1 1/8	1 1/4	1	1 1/8	1 3/8	1 1/8	1 3/8	1 3/8	1 3/8
FH	3/8	3/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8

BORE SIZE														
Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
E	7 1/2	7 1/2	7 1/2	7 1/2	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	9 1/2	9 1/2	9 1/2	9 1/2	9 1/2
W	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
FH	1	1	1	1	1	1	1	1	1	1	1	1	1	1

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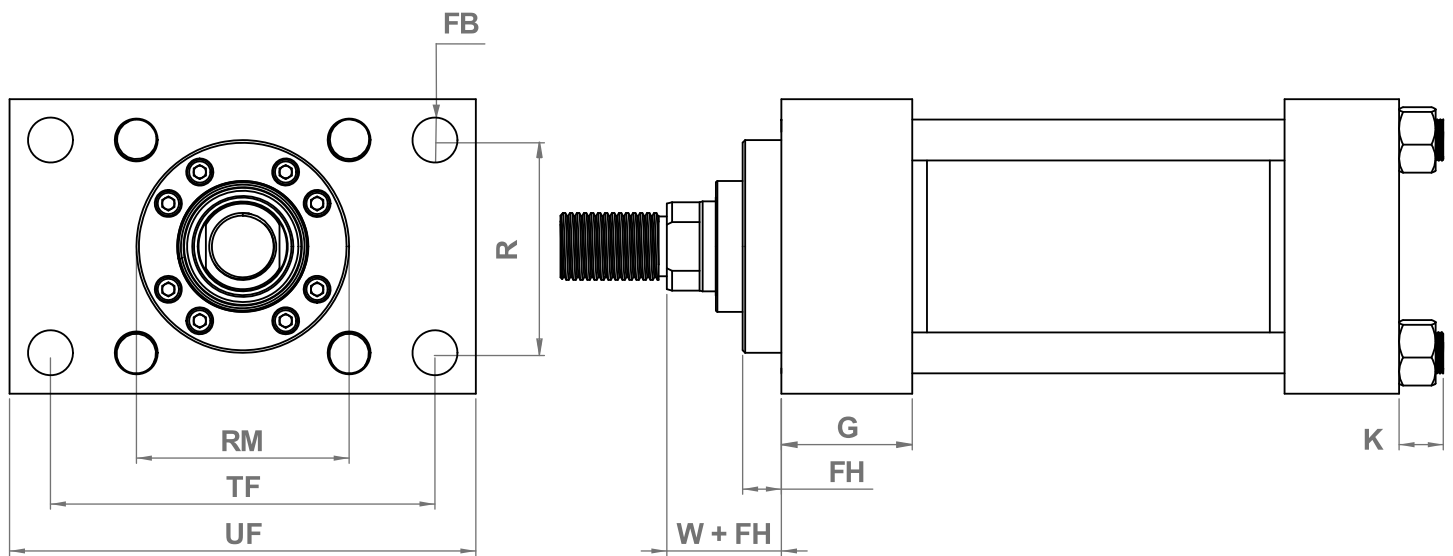


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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.4	ME5	Head Cap Rectangular Mount



BORE SIZE																	
Inch	1½		2		2½		3¼		4		5						
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
B	1 1/8	1 1/2	1 1/2	2	1 1/2	2	2 3/8	2	2 3/8	2 5/8	2 3/8	2 5/8	3 1/8	2 5/8	3 1/8	3 3/4	4 1/4
TF	3 1/16	3 1/16	4 1/8	4 1/8	4 5/8	4 5/8	4 5/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	6 3/8	8 3/16	8 3/16	8 3/16	8 3/16
UF	4 1/4	4 1/4	5 5/8	5 5/8	5 5/8	5 5/8	5 5/8	7 1/8	7 1/8	7 1/8	7 5/8	7 5/8	7 5/8	9 3/4	9 3/4	9 3/4	9 3/4
W	5/8	1	3/4	1	3/4	1	1 1/4	7/8	1 1/8	1 1/4	1	1 1/8	1 3/8	1 1/8	1 3/8	1 3/8	1 3/8
FH	3/8	3/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8
K	3/8	3/8	7/16	7/16	7/16	7/16	7/16	9/16	9/16	9/16	9/16	9/16	9/16	9/16	1 1/16	1 1/16	1 1/16
FB	7/16	7/16	9/16	9/16	9/16	9/16	9/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16
RM	-	-	-	-	2 5/8	-	-	3 1/4	-	-	3 7/8	4	4 1/16	4	4 1/16	5 1/4	5 5/8
G	-	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	2	2	2	2	2	2	2	2	2	2



BORE SIZE														
Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
B	3 3/8	3 3/4	4 1/4	4 3/4	3 3/4	4 1/4	4 3/4	5 1/4	5 3/4	4 1/4	4 3/4	5 1/4	5 3/4	6 1/4
TF	9 7/16	9 7/16	9 7/16	9 7/16	10 5/8	10 5/8	10 5/8	10 5/8	10 5/8	11 13/16	11 13/16	11 13/16	11 13/16	11 13/16
UF	11 1/4	11 1/4	11 1/4	11 1/4	12 5/8	12 5/8	12 5/8	12 5/8	12 5/8	14	14	14	14	14
W	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
FH	1	1	1	1	1	1	1	1	1	1	1	1	1	1
K	1 5/16	1 5/16	1 5/16	1 5/16	1	1	1	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
FB	1 1/16	1 1/16	1 1/16	1 1/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16
RM	4 7/16	5 1/4	5 5/8	6 1/16	5 1/4	5 5/8	6 1/16	7 1/8	7 7/16	5 5/8	6 7/16	7 1/8	7 7/16	8 3/8
G	2 1/4	2 1/4	2 1/4	2 1/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	3	3	3	3	3

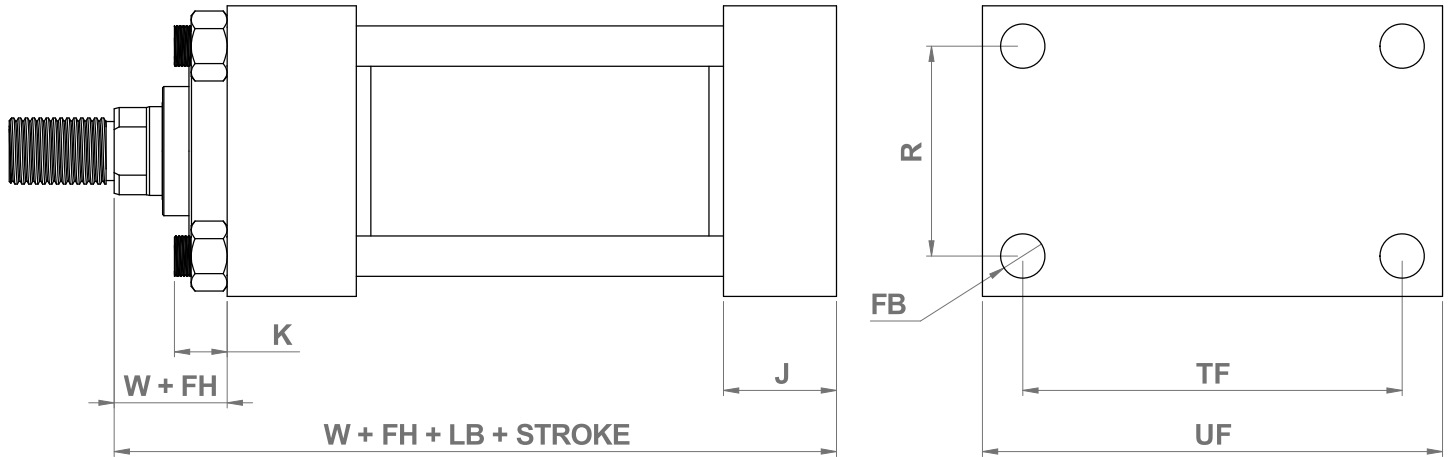
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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.5	ME6	End Cap Rectangular Mount



BORE SIZE																		
Inch	1½			2			2½			3¼			4			5		
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2	
R	1.63	1.63	2.05	2.05	2.55	2.55	2.25	3.25	3.25	3.25	3.82	3.82	3.82	4.95	4.95	4.95	4.95	
TF	3 3/16	3 3/16	4 1/8	4 1/8	4 5/8	4 5/8	4 5/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	6 3/8	8 3/16	8 3/16	8 3/16	8 3/16	
UF	4 1/4	4 1/4	5 1/8	5 1/8	5 5/8	5 5/8	5 5/8	7 1/8	7 1/8	7 1/8	7 5/8	7 5/8	7 5/8	9 1/4	9 1/4	9 1/4	9 1/4	
FB	7/16	7/16	*6	9/16	9/16	9/16	9/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 5/16	1 5/16	1 5/16	1 5/16	
W	5/8	1	3/4	1	3/4	1	1 1/4	7/8	1 1/8	1 1/4	1	1 1/8	1 3/8	1 1/8	1 3/8	1 3/8	1 3/8	
FH	3/8	3/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8	
J	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	
K	3/8	3/8	7/16	7/16	7/16	7/16	7/16	9/16	9/16	9/16	9/16	9/16	9/16	1 3/16	1 3/16	1 3/16	1 3/16	
LB	4 5/8	4 5/8	4 5/8	4 5/8	4 3/4	4 3/4	4 3/4	5 1/2	5 1/2	5 1/2	5 3/4	5 3/4	5 3/4	6 1/4	6 1/4	6 1/4	6 1/4	

BORE SIZE														
Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
R	5.73	5.73	5.73	5.73	6.58	6.58	6.58	6.58	6.58	7.5	7.5	7.5	7.5	7.5
TF	9 7/16	9 7/16	9 7/16	9 7/16	10 5/8	10 5/8	10 5/8	10 5/8	10 5/8	11 13/16	11 13/16	11 13/16	11 13/16	11 13/16
UF	11 1/4	11 1/4	11 1/4	11 1/4	12 5/8	12 5/8	12 5/8	12 5/8	12 5/8	14	14	14	14	14
FB	1 1/16	1 1/16	1 1/16	1 1/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 5/8	1 5/8	1 5/8	1 5/8	1 5/8
W	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
FH	1	1	1	1	1	1	1	1	1	1	1	1	1	1
J	2 1/4	2 1/4	2 1/4	2 1/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	3	3	3	3	3
K	1 5/16	1 5/16	1 5/16	1 5/16	1	1	1	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
LB	7 3/8	7 3/8	7 3/8	7 3/8	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	9 1/2	9 1/2	9 1/2	9 1/2	9 1/2

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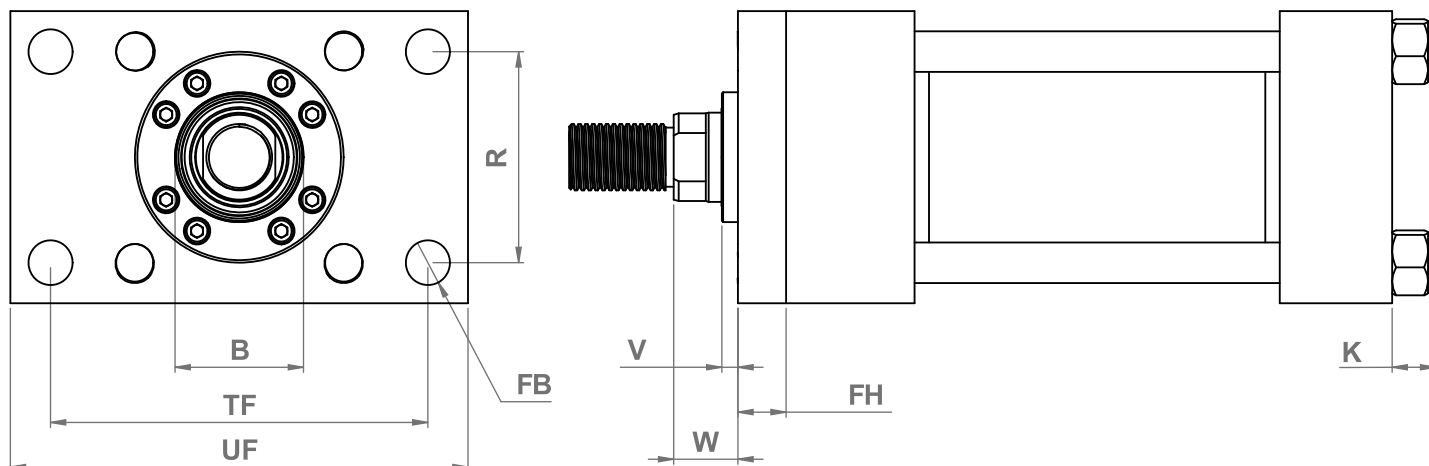


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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.6	MF1	Head Cap Rectangular Flange Mount



BORE SIZE																	
Inch	1½		2		2½		3¼		4		5						
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 3/8	2	2 1/2	2	2 1/2	3	3 1/2
B	1 1/8	1 1/2	1 1/2	2	1 1/2	2	2 3/8	2	2 3/8	2 5/8	2 3/8	2 5/8	3 3/8	2 5/8	3 3/8	3 3/4	4 1/4
TF	3 7/16	3 7/16	4 1/8	4 1/8	4 5/8	4 5/8	4 5/8	5 1/8	5 1/8	5 1/8	6 3/8	6 3/8	6 3/8	8 3/16	8 3/16	8 3/16	8 3/16
UF	4 1/4	4 1/4	5 1/8	5 1/8	5 5/8	5 5/8	5 5/8	7 1/8	7 1/8	7 1/8	7 7/8	7 7/8	7 7/8	9 3/4	9 3/4	9 3/4	9 3/4
W	5/8	1	3/4	1	3/4	1	1 1/4	7/8	1 1/8	1 1/4	1	1 1/8	1 3/8	1 1/8	1 3/8	1 3/8	1 3/8
FH	3/8	3/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8
K	3/8	3/8	7/16	7/16	7/16	7/16	7/16	9/16	9/16	9/16	9/16	9/16	9/16	13/16	13/16	13/16	13/16
R	1.63	1.63	2.05	2.05	2.55	2.55	2.55	3.25	3.25	3.25	3.82	3.82	3.82	4.95	4.95	4.95	4.95
FB	7/16	7/16	9/16	9/16	9/16	9/16	9/16	11/16	11/16	11/16	11/16	11/16	11/16	15/16	15/16	15/16	15/16
V	-	-	-	-	3/8	-	-	13/32	-	-	17/32	17/32	21/32	17/32	21/32	17/32	17/32

BORE SIZE														
Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
B	3 1/8	3 1/4	4 1/4	4 3/4	3 3/4	4 1/4	4 3/4	5 1/4	5 3/4	4 1/4	4 3/4	5 1/4	5 3/4	6 1/4
TF	9 7/16	9 7/16	9 7/16	9 7/16	10 5/8	10 5/8	10 5/8	10 5/8	10 5/8	11 13/16	11 13/16	11 13/16	11 13/16	11 13/16
UF	11 1/4	11 1/4	11 1/4	11 1/4	12 5/8	12 5/8	12 5/8	12 5/8	12 5/8	14	14	14	14	14
W	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
FH	1	1	1	1	1	1	1	1	1	1	1	1	1	1
K	1 5/16	1 5/16	1 5/16	1 5/16	1	1	1	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
R	5.73	5.73	5.73	5.73	6.58	6.58	6.58	6.58	6.58	7.50	7.50	7.50	7.50	7.50
FB	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16
V	2 1/32	1 7/32	1 7/32	3/8	1 7/32	1 7/32	3/8	3/8	3/8	1 7/32	3/8	3/8	3/8	3/8

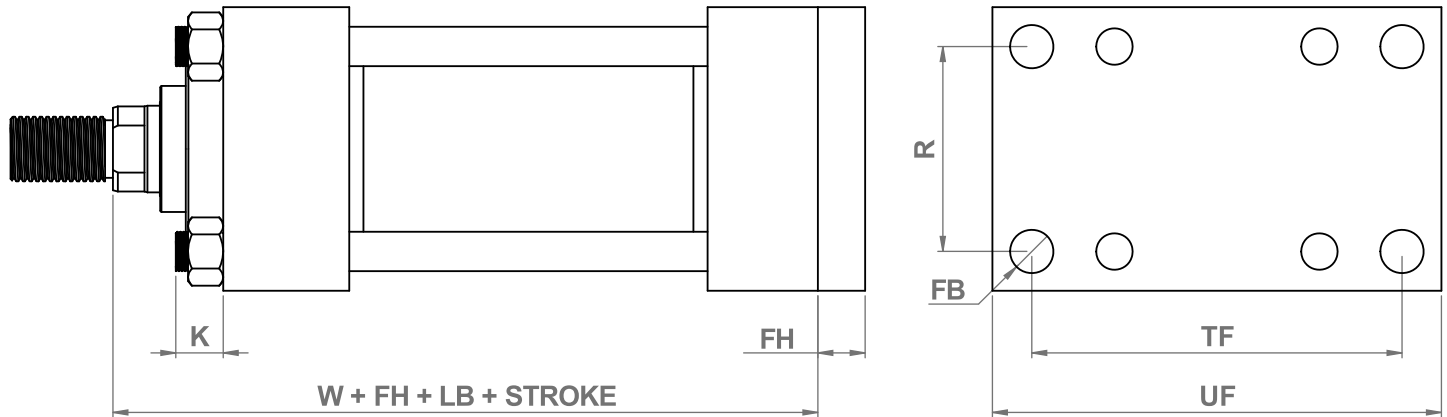
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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.7	MF2	End Cap Rectangular Flange Mount



BORE SIZE																	
Inch	1½		2		2½			3¼			4			5			
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 1/4	2	2 1/2	2	2 1/2	3	3 1/2
R	1.63	1.63	2.05	2.05	2.55	2.55	2.55	3.25	3.25	3.25	3.82	3.82	3.82	4.95	4.95	4.95	4.95
TF	3 1/16	3 1/16	4 1/8	4 1/8	4 5/8	4 5/8	4 5/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	6 3/8	8 3/16	8 3/16	8 3/16	8 3/16
UF	4 1/4	4 1/4	5 1/8	5 1/8	5 5/8	5 5/8	5 5/8	7 1/8	7 1/8	7 1/8	7 7/8	7 7/8	7 7/8	9 3/4	9 3/4	9 3/4	9 3/4
FB	7/16	7/16	9/16	9/16	9/16	9/16	9/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 5/16	1 5/16	1 5/16	1 5/16
W	5/8	1	3/4	1	3/4	1	1 1/4	7/8	1 1/8	1 1/4	1	1 1/8	1 3/8	1 1/8	1 3/8	1 3/8	1 3/8
FH	3/8	3/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8
K	3/8	3/8	7/16	7/16	7/16	7/16	7/16	9/16	9/16	9/16	9/16	9/16	9/16	1 3/16	1 3/16	1 3/16	1 3/16
LB	4 5/8	4 5/8	4 5/8	4 5/8	4 3/4	4 3/4	4 3/4	5 1/2	5 1/2	5 1/2	5 3/4	5 3/4	5 3/4	6 1/4	6 1/4	6 1/4	6 1/4

BORE SIZE														
Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
R	5.73	5.73	5.73	5.73	6.58	6.58	6.58	6.58	6.58	7.50	7.50	7.50	7.50	7.50
TF	9 7/16	9 7/16	9 7/16	9 7/16	10 5/8	10 5/8	10 5/8	10 5/8	10 5/8	11 13/16	11 13/16	11 13/16	11 13/16	11 13/16
UF	11 1/4	11 1/4	11 1/4	11 1/4	12 5/8	12 5/8	12 5/8	12 5/8	12 5/8	14.0	14.0	14.0	14.0	14.0
FB	1 1/16	1 1/16	1 1/16	1 1/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16
W	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
FH	1	1	1	1	1	1	1	1	1	1	1	1	1	1
K	1 5/16	1 5/16	1 5/16	1 5/16	1	1	1	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
LB	7 7/8	7 7/8	7 7/8	7 7/8	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	9 1/2	9 1/2	9 1/2	9 1/2	9 1/2

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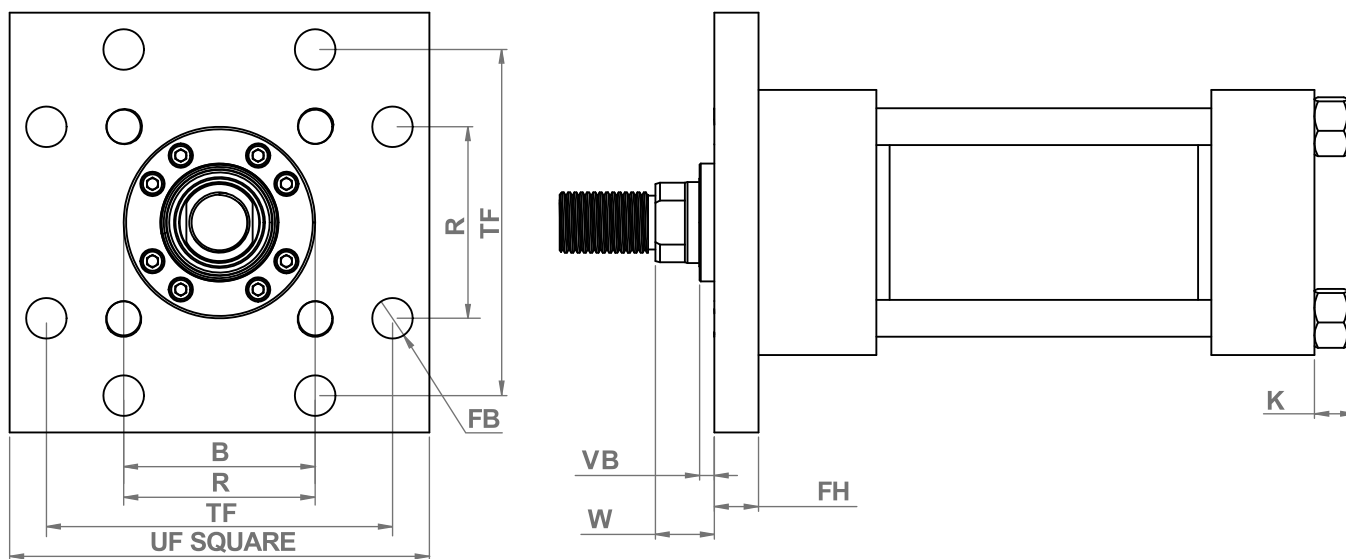


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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.8	MF5	Head Cap Square Flange Mount



BORE SIZE																	
Inch	1½		2		2½			3¼			4			5			
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
B	1 1/8	1 1/2	1 1/2	2	1 1/2	2	2 3/8	2	2 3/8	2 5/8	2 3/8	2 5/8	3 1/8	2 5/8	3 1/8	3 3/4	4 1/4
R	1.63	1.63	2.05	2.05	2.55	2.55	2.55	3.25	3.25	3.25	3.82	3.82	3.82	4.95	4.95	4.95	4.95
TF	3 1/16	3 1/16	4 1/8	4 1/8	4 5/8	4 5/8	4 5/8	5 7/8	5 7/8	5 7/8	6 3/8	6 3/8	6 3/8	8 1/16	8 1/16	8 1/16	8 1/16
UF	4 1/4	4 1/4	5 1/8	5 1/8	5 5/8	5 5/8	5 5/8	7 1/8	7 1/8	7 1/8	7 5/8	7 5/8	7 5/8	9 3/4	9 3/4	9 3/4	9 3/4
FB	7/16	7/16	9/16	9/16	9/16	9/16	9/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 5/16	1 5/16	1 5/16	1 5/16
VB	1/4	1/2	1/4	3/8	1/4	3/8	1/2	1/4	3/8	3/8	1/4	1/4	3/8	1/4	3/8	3/8	3/8
W	5/8	1	3/4	1	3/4	1	1 1/4	7/8	1 1/8	1 1/4	1	1 1/8	1 3/8	1 1/8	1 3/8	1 3/8	1 3/8
FH	3/8	3/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8
K	3/8	3/8	7/16	7/16	7/16	7/16	7/16	9/16	9/16	9/16	9/16	9/16	9/16	1 1/16	1 1/16	1 1/16	1 1/16

BORE SIZE															
Inch	6				7					8					
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2	
B	3 3/8	3 3/4	4 1/4	4 3/4	3 3/4	4 1/4	4 3/4	5 1/4	5 3/4	4 1/4	4 3/4	5 1/4	5 3/4	6 1/4	
R	5.73	5.73	5.73	5.73	6.58	6.58	6.58	6.58	6.58	7.5	7.5	7.5	7.5	7.5	
TF	9 7/16	9 7/16	9 7/16	9 7/16	10 5/8	10 5/8	10 5/8	10 5/8	10 5/8	11 13/16	11 13/16	11 13/16	11 13/16	11 13/16	
UF	11 1/4	11 1/4	11 1/4	11 1/4	12 5/8	12 5/8	12 5/8	12 5/8	12 5/8	14	14	14	14	14	
FB	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	
VB	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	
W	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	
FH	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
K	1 5/16	1 5/16	1 5/16	1 5/16	1	1	1	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	

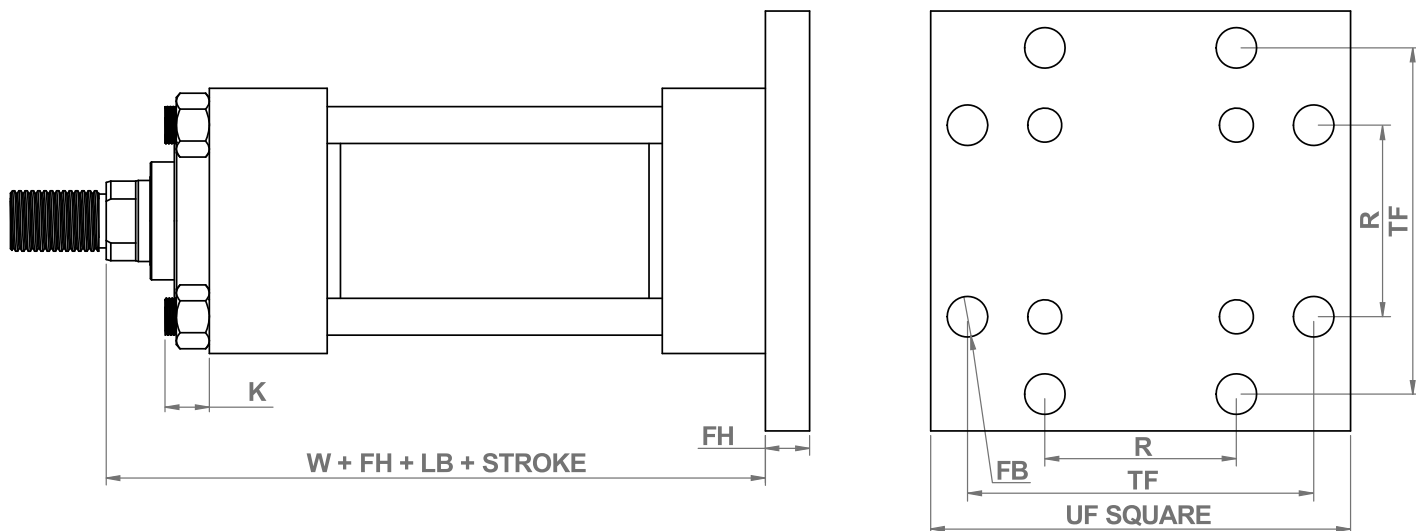
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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.9	MF6	End Cap Square Flange Mount



BORE SIZE																	
Inch	1½		2		2½		3¼		4		5						
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 1/4	2	2 1/2	2	2 1/2	3	3 1/2
R	1.63	1.63	2.05	2.05	2.55	2.55	2.55	3.25	3.25	3.25	3.82	3.82	3.82	4.95	4.95	4.95	4.95
TF	3/16	3/16	4/8	4/8	4 5/8	4 5/8	4 5/8	4 5/8	5 7/8	5 7/8	6 3/8	6 3/8	6 3/8	8 1/8	8 1/8	8 1/8	8 1/8
UF	4 1/4	4 1/4	5 5/8	5 5/8	5 5/8	5 5/8	5 5/8	7 1/8	7 1/8	7 1/8	7 5/8	7 5/8	7 5/8	9 3/4	9 3/4	9 3/4	9 3/4
FB	7/16	7/16	9/16	9/16	9/16	9/16	9/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 5/16	1 5/16	1 5/16	1 5/16
W	5/8	1	3/4	1	3/4	1	1 1/4	7/8	1 1/8	1 1/4	1	1 1/8	1 3/8	1 1/8	1 3/8	1 3/8	1 3/8
FH	3/8	3/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8
K	3/8	3/8	7/16	7/16	7/16	7/16	7/16	9/16	9/16	9/16	9/16	9/16	9/16	1 3/16	1 3/16	1 3/16	1 3/16
LB	4 5/8	4 5/8	4 5/8	4 5/8	4 3/4	4 3/4	4 3/4	5 1/2	5 1/2	5 1/2	5 3/4	5 3/4	5 3/4	6 1/4	6 1/4	6 1/4	6 1/4

BORE SIZE														
Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
R	5.73	5.73	5.73	5.73	6.58	6.58	6.58	6.58	6.58	7.50	7.50	7.50	7.50	7.50
TF	7 1/16	7 1/16	7 1/16	7 1/16	10 5/8	10 5/8	10 5/8	10 5/8	10 5/8	11 13/16	11 13/16	11 13/16	11 13/16	11 13/16
UF	11 1/4	11 1/4	11 1/4	11 1/4	12 5/8	12 5/8	12 5/8	12 5/8	12 5/8	14	14	14	14	14
FB	1 1/16	1 1/16	1 1/16	1 1/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16
W	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
FH	1	1	1	1	1	1	1	1	1	1	1	1	1	1
K	1 5/16	1 5/16	1 5/16	1 5/16	1	1	1	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
LB	7 7/8	7 7/8	7 7/8	7 7/8	8 1/2	8 1/2	8 1/2	8 1/2	8 1/2	9 1/2	9 1/2	9 1/2	9 1/2	9 1/2

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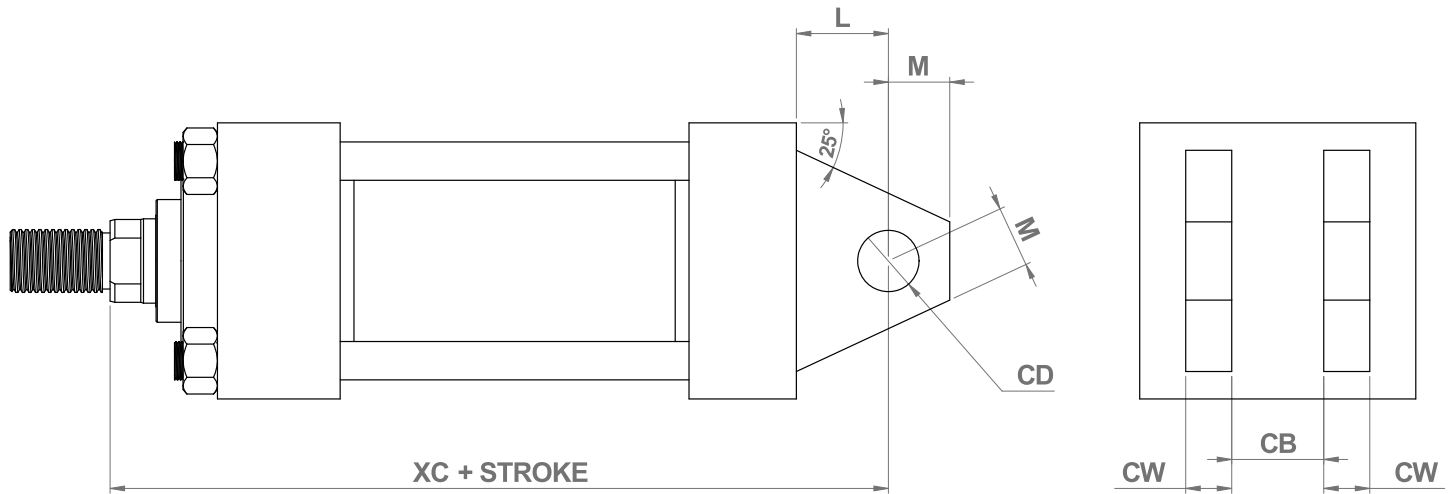


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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.10	MP1	Cap Fixed Clevis Mount



BORE SIZE																	
Inch	1½		2		2½		3¼		4			5					
Rod Size Ø	5/8	1	1	1 3/8	1	1 3/8	1 3/4	1 3/8	1 3/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
XC	6 3/8	6 3/4	7 1/4	7 1/2	7 3/8	7 5/8	7 7/8	8 5/8	8 7/8	9	9 3/4	9 5/8	10 1/8	10 1/2	10 3/4	10 3/4	10 3/4
L	3/4	3/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2 1/8	2 1/8	2 1/8	2 1/4	2 1/4	2 1/4	2 1/4
M	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1	1 1/8	1 1/8	1 1/8	1 3/4	1 3/4	1 3/4	1 3/4
CD	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1	1 1/8	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 1/4
CW	1/2	1/2	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4
CB	3/4	3/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2



BORE SIZE															
Inch	6				7					8					
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2	
XC	12 1/8	12 1/8	12 1/8	12 1/8	13 3/4	13 3/4	13 3/4	13 3/4	13 3/4	15	15	15	15	15	
L	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3	3 1/4	3 1/4	3 1/4	3 1/4	3 1/4	
M	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	
CD	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3	
CW	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	
CB	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3	3	3	3	3	3	

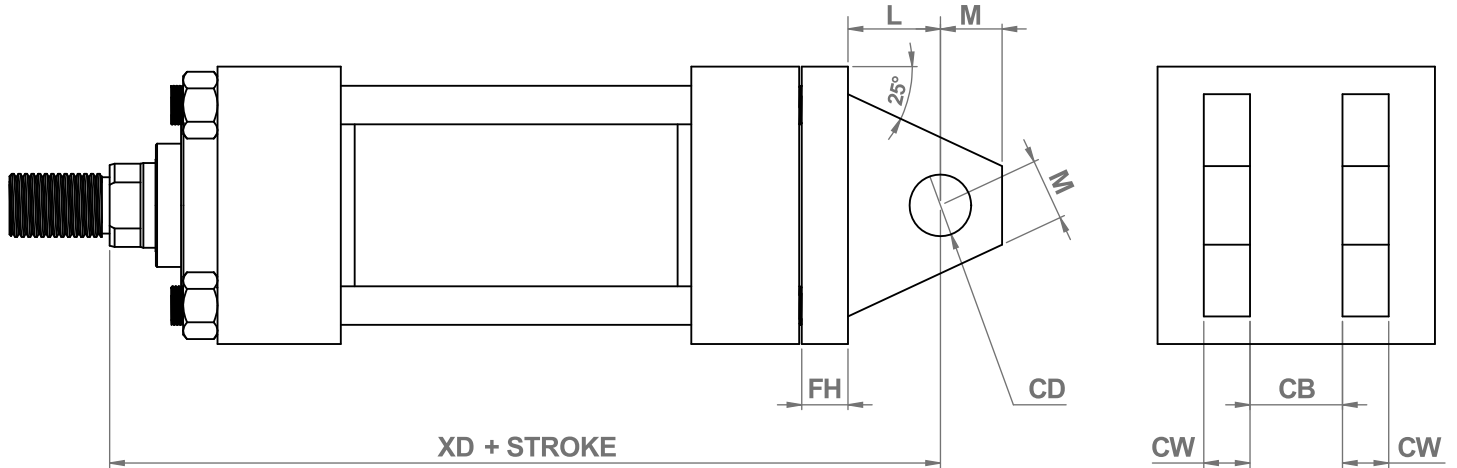
Contents



15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.11	MP2	Cap Detachable Clevis Mount



BORE SIZE																	
Inch	1½		2		2½		3¼		4			5					
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 1/4	2	2 1/2	2	2 1/2	3	3 1/2
XD	6 3/4	7 1/8	7 7/8	8 1/8	8	8 1/4	8 1/2	9 3/8	9 5/8	9 3/4	10 5/8	10 3/4	11	3 3/8	11 5/8	11 5/8	11 5/8
FH	3/8	3/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8
L	3/4	3/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2 1/8	2 1/8	2 1/8	2 1/4	2 1/4	2 1/4	2 1/4
M	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1	1 1/8	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 1/4
CD	1/2	1/2	3/4	3/4	3/4	3/4	3/4	1	1	1	1 1/8	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 3/4
CW	1/2	1/2	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4
CB	3/4	3/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2

BORE SIZE															
Inch	6				7					8					
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2	
XD	13 1/8	13 1/8	13 1/8	13 1/8	14 3/4	14 3/4	14 3/4	14 3/4	14 3/4	16	16	16	16	16	
FH	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
L	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3	3 1/4	3 1/4	3 1/4	3 1/4	3 1/4	
M	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	
CD	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3	
CW	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	
CB	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3	3	3	3	3	3	

Contents

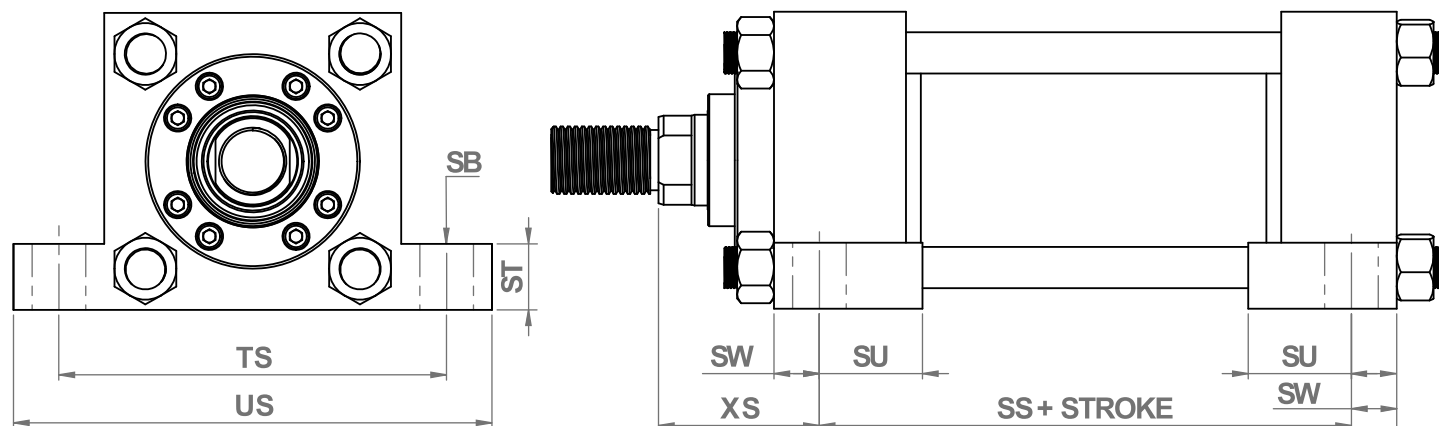


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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.12	MS2	Side Lugs Mount



BORE SIZE																	
Inch	1½		2		2½			3¼			4			5			
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 1/4	2	2 1/2	2	2 1/2	3	3 1/2
TS	3 1/4	3 1/4	4	4	4 7/8	4 7/8	4 7/8	5 5/8	5 5/8	5 5/8	6 3/4	6 3/4	6 3/4	8 1/4	8 1/4	8 1/4	8 1/4
US	4	4	5	5	6 1/4	6 1/4	6 1/4	7 1/4	7 1/4	7 1/4	8 1/2	8 1/2	8 1/2	10	10	10	10
SB	7/16	7/16	9/16	9/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
ST	1/2	1/2	3/4	3/4	1	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
XS	1 3/8	1 3/4	1 7/8	2 1/8	2 1/8	2 5/16	2 5/16	2 5/16	2 5/16	2 11/16	2 3/4	2 7/8	3 1/8	2 7/8	3 1/8	3 3/8	3 3/8
SW	3/8	3/8	1/2	1/2	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	7/8	7/8	7/8	7/8	7/8	7/8	7/8
SU	1 5/16	1 5/16	1 1/4	1 1/4	1 9/16	1 9/16	1 9/16	1 9/16	1 9/16	1 9/16	2	2	2	2	2	2	2
SS	3 7/8	3 7/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	4 1/8	4 1/8	4 1/8	4	4	4	4 1/2	4 1/2	4 1/2	4 1/2

BORE SIZE														
Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
TS	9 3/4	9 3/4	9 3/4	9 3/4	11 1/4	11 1/4	11 1/4	11 1/4	11 1/4	12 1/4	12 1/4	12 1/4	12 1/4	12 1/4
US	12	12	12	12	14	14	14	14	14	15	15	15	15	15
SB	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16
ST	1 1/2	1 1/2	1 1/2	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
XS	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8
SW	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
SU	2 1/2	2 1/2	2 1/2	2 1/2	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8
SS	5 1/8	5 1/8	5 1/8	5 1/8	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	6 3/4	6 3/4	6 3/4	6 3/4	6 3/4

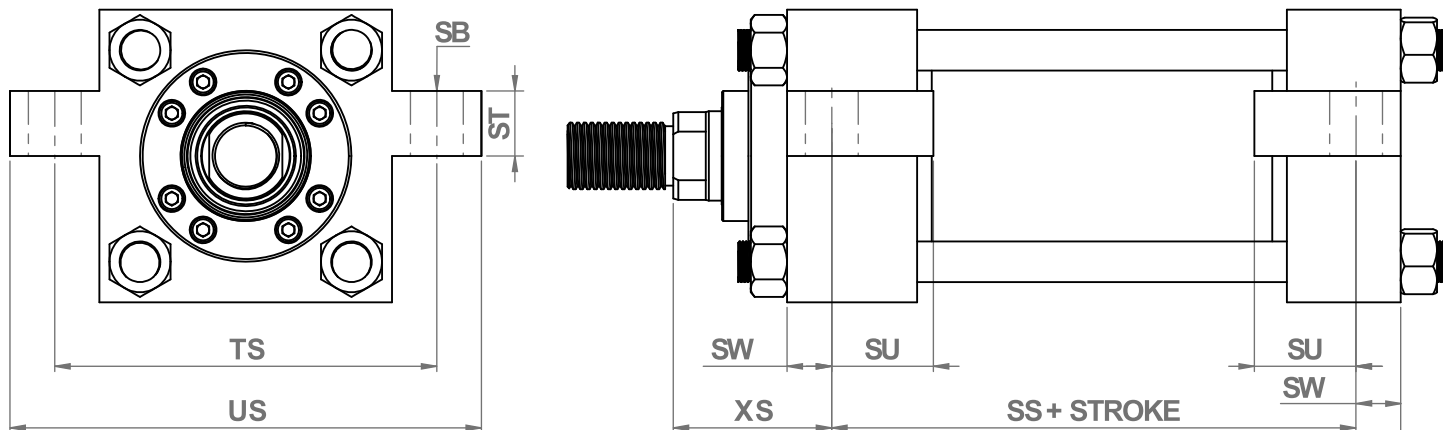
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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.13	MS3	Centre Line Lugs Mount



BORE SIZE																	
Inch	1½		2		2½		3¼			4			5				
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 3/8	1 3/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
TS	3 1/4	3 3/4	4	4	4 7/8	4 7/8	4 7/8	5 1/8	5 5/8	5 5/8	6 3/4	6 3/4	6 3/4	8 1/4	8 1/4	8 1/4	8 1/4
US	4	4	5	5	6 1/4	6 1/4	6 1/4	7 1/4	7 1/4	7 1/4	8 1/2	8 1/2	8 1/2	10	10	10	10
SB	7/16	7/16	9/16	9/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
ST	1/2	1/2	3/4	3/4	1	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
XS	1 3/8	1 3/4	1 7/8	2 1/8	2 1/16	2 5/16	2 9/16	2 5/8	2 9/16	2 11/16	2 3/4	2 7/8	3 1/8	2 7/8	3 1/8	3 3/8	3 3/8
SW	3/8	3/8	1/2	1/2	11/16	11/16	11/16	11/16	11/16	11/16	7/8	7/8	7/8	7/8	7/8	7/8	7/8
SU	1 5/16	1 5/16	1 1/4	1 1/4	1 9/16	1 9/16	1 9/16	1 9/16	1 9/16	1 9/16	2	2	2	2	2	2	2
SS	3 7/8	3 7/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	4 1/8	4 1/8	4 1/8	4	4	4	4 1/2	4 1/2	4 1/2	4 1/2

BORE SIZE														
Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
TS	9 3/4	9 3/4	9 3/4	9 3/4	11 1/4	11 1/4	11 1/4	11 1/4	11 1/4	12 1/4	12 1/4	12 1/4	12 1/4	12 1/4
US	12	12	12	12	14	14	14	14	14	15	15	15	15	15
SB	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16
ST	1 1/2	1 1/2	1 1/2	1 1/2	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4	1 3/4
XS	3 3/8	3 3/8	3 3/8	3 3/8	3 5/8	3 5/8	3 5/8	3 5/8	3 5/8	3 5/8	3 5/8	3 5/8	3 5/8	3 5/8
SW	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
SU	2 1/2	2 1/2	2 1/2	2 1/2	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8	2 7/8
SS	5 1/8	5 1/8	5 1/8	5 1/8	5 3/4	5 3/4	5 3/4	5 3/4	5 3/4	6 3/4	6 3/4	6 3/4	6 3/4	6 3/4

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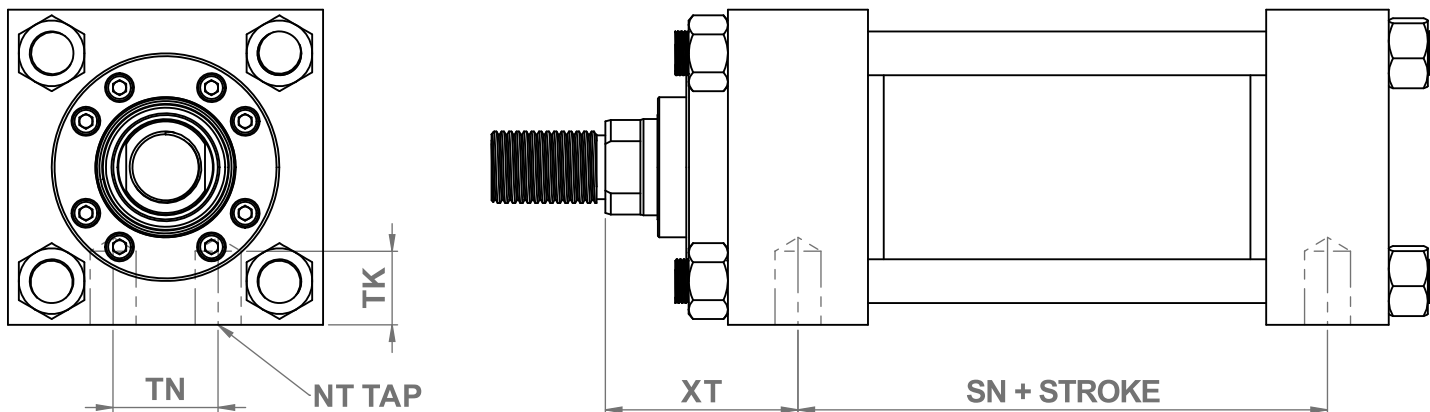


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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.14	MS4	Side Tapped Mount



BORE SIZE

Inch	1½		2		2½			3¼			4			5			
Rod Size Ø	5/8	1	1	1 3/8	1	1 3/8	1 3/4	1 3/8	1 3/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
TN	3/4	3/4	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/2	1 1/2	1 1/2	2 1/16	2 1/16	2 1/16	2 15/16	2 15/16	2 15/16	2 15/16
TK	3/16	1/2	1/2	1/2	1 3/16	5/8	1 3/16	3/4	3/4	1/2	1	3/4	1 1/16	1 1/8	1 1/8	1 1/8	3/4
NT	3/8 - 16	3/8 - 16	1/2 - 13	1/2 - 13	5/8 - 11	5/8 - 11	5/8 - 11	3/4 - 10	3/4 - 10	3/4 - 10	1 - 8	1 - 8	1 - 8	1 - 8	1 - 8	1 - 8	1 - 8
XT	2	2 3/8	2 3/8	2 5/8	2 3/8	2 5/8	2 7/8	2 3/4	3	3 1/8	3	3 1/8	3 3/8	3 1/8	3 3/8	3 3/8	3 3/8
SN	2 7/8	2 7/8	2 7/8	2 7/8	3	3	3	3 1/2	3 1/2	3 1/2	3 3/4	3 3/4	3 3/4	4 1/4	4 1/4	4 1/4	4 1/4

BORE SIZE

Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
TN	3 5/16	3 5/16	3 5/16	3 5/16	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4	4 1/4	4 1/4	4 1/4	4 1/4	4 1/4
TK	1 1/16	1 1/16	1 1/16	7/8	2 1/4	2 1/4	2 1/4	7/8	7/8	1 1/16	1 1/16	1 1/16	1 1/16	1 3/8
NT	1 1/4 - 7	1 1/4 - 7	1 1/4 - 7	1 1/4 - 7	1 1/2 - 6	1 1/2 - 6	1 1/2 - 6	1 1/2 - 6	1 1/2 - 6	1 1/2 - 6	1 1/2 - 6	1 1/2 - 6	1 1/2 - 6	1 1/2 - 6
XT	3 1/2	3 1/2	3 1/2	3 1/2	3 13/16	3 13/16	3 13/16	3 13/16	3 13/16	3 15/16	3 15/16	3 15/16	3 15/16	3 15/16
SN	5 1/8	5 1/8	5 1/8	5 1/8	5 7/8	5 7/8	5 7/8	5 7/8	5 7/8	6 5/8	6 5/8	6 5/8	6 5/8	6 5/8

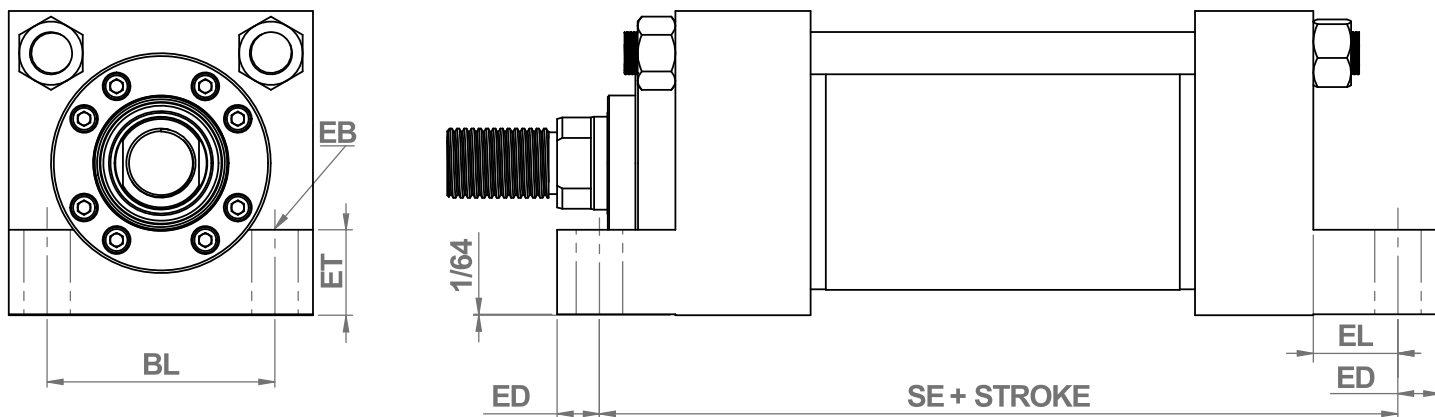
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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.15	MS7	Side End Lugs Mount



BORE SIZE																	
Inch	1½		2		2½			3¼			4			5			
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
EB	7/16	7/16	9/16	9/16	9/16	9/16	9/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 5/16	1 5/16	1 5/16	1 5/16
ET	7/8	7/8	1	1	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2	1 1/2
BL	1.63	1.63	2.07	2.07	2.56	2.56	2.56	3.27	3.27	3.27	3.84	3.84	3.84	4.95	4.95	4.95	4.95
EO	3/8	3/8	1/2	1/2	1/2	1/2	1/2	5/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	3/4
EL	7/8	7/8	1 5/16	1 5/16	1 5/16	1 5/16	1 5/16	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/2	1 1/2	1 1/2	1 1/2
SE	6 3/4	6 3/4	7 7/8	7 7/8	7 1/4	7 1/4	7 1/4	8 1/2	8 1/2	8 1/2	8 7/8	8 7/8	8 7/8	10 1/8	10 1/8	10 1/8	10 1/8

BORE SIZE														
Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
EB	1 1/16	1 1/16	1 1/16	1 1/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16
ET	1 3/4	1 3/4	1 3/4	1 3/4	2	2	2	2	2	2	2	2	2	2
BL	5.74	5.74	5.74	5.74	6.58	6.58	6.58	6.58	6.58	7.51	7.51	7.51	7.51	7.51
EO	7/8	7/8	7/8	7/8	1	1	1	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8
EL	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	2	2	2	2	2
SE	11 3/4	11 3/4	11 3/4	11 3/4	13 1/8	13 1/8	13 1/8	13 1/8	13 1/8	14 1/2	14 1/2	14 1/2	14 1/2	14 1/2

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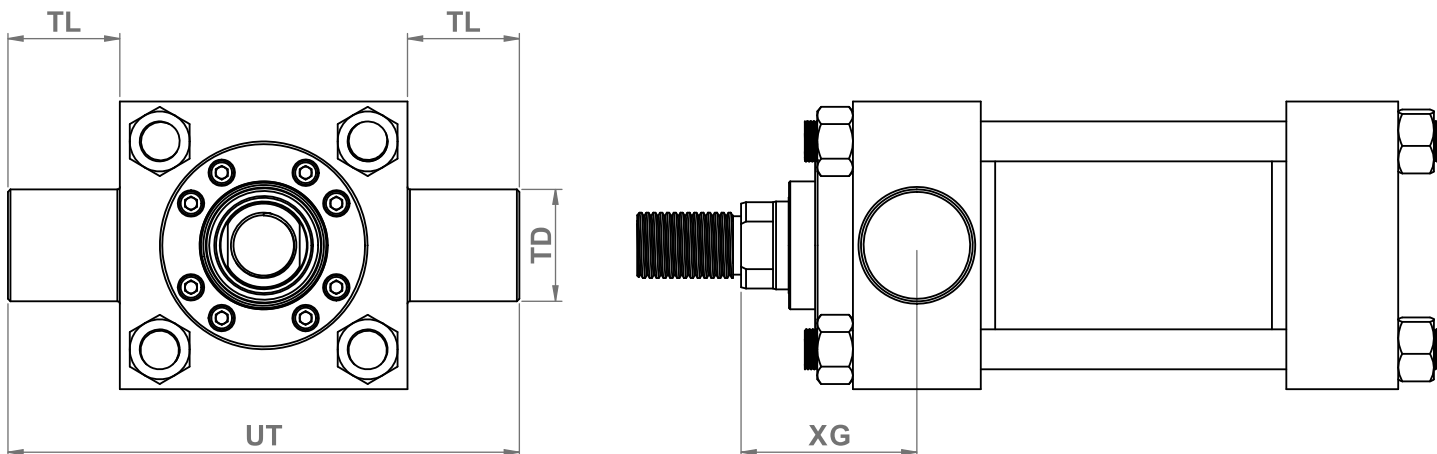


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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.16	MT1	Head Cap Trunnion Mount

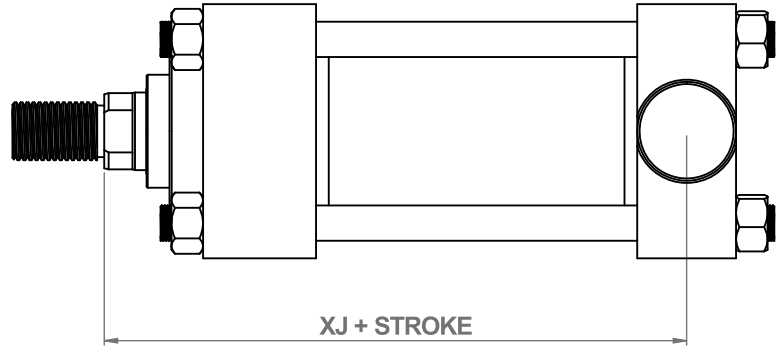
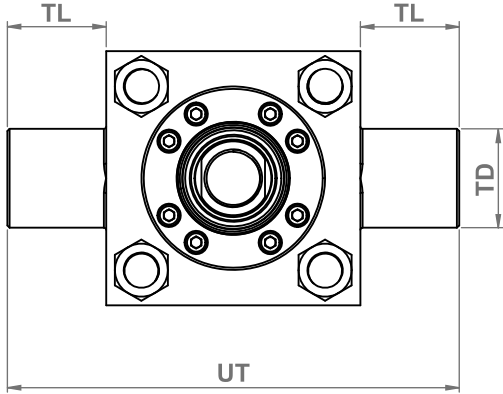


BORE SIZE																	
Inch	1½		2		2½		3¼		4		5						
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
TL	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
UT	4 1/2	4 1/2	5 3/4	5 3/4	6 1/4	6 1/4	6 1/4	8	8	8	8 1/2	8 1/2	8 1/2	10	10	10	10
UM	5	5	6 1/4	6 1/4	6 3/4	6 3/4	6 3/4	8 1/2	8 1/2	8 1/2	9	9	9	10 1/2	10 1/2	10 1/2	10 1/2
TD	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
XG	1 1/8	2 1/4	2 1/4	2 1/2	2 1/4	2 1/2	2 3/4	2 5/8	2 5/8	3	2 7/8	3	3 1/4	3	3 1/4	3 1/4	3 1/4

BORE SIZE														
Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
TL	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3
UT	11 1/2	11 1/2	11 1/2	11 1/2	13 1/2	13 1/2	13 1/2	13 1/2	13 1/2	15 1/2	15 1/2	15 1/2	15 1/2	15 1/2
UM	12 1/2	12 1/2	12 1/2	12 1/2	14 3/4	14 3/4	14 3/4	14 3/4	14 3/4	17	17	17	17	17
TD	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3
XG	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4



Contents Reference	Ordering Code	Description
15.17	MT2	End Cap Trunnion Mount



BORE SIZE																	
Inch	1½		2		2½			3¼			4			5			
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 1/4	2	2 1/2	2	2 1/2	3	3 1/2
TL	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
UT	4 1/2	4 1/2	5 1/4	5 1/4	6 1/4	6 1/4	6 1/4	8	8	8	8 1/2	8 1/2	8 1/2	10	10	10	10
TD	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
XJ	4 7/8	5 1/4	5 1/4	5 1/2	5 5/8	5 5/8	5 5/8	6 1/4	6 1/2	6 5/8	6 3/4	6 7/8	7 1/8	7 3/8	7 3/8	7 3/8	7 3/8

BORE SIZE														
Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
TL	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3
UT	11 1/2	11 1/2	11 1/2	11 1/2	13 1/2	13 1/2	13 1/2	13 1/2	13 1/2	15 1/2	15 1/2	15 1/2	15 1/2	15 1/2
TD	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3
XJ	8 3/8	8 3/8	8 3/8	8 3/8	9 3/8	9 3/8	9 3/8	9 3/8	9 3/8	10 1/4	10 1/4	10 1/4	10 1/4	10 1/4

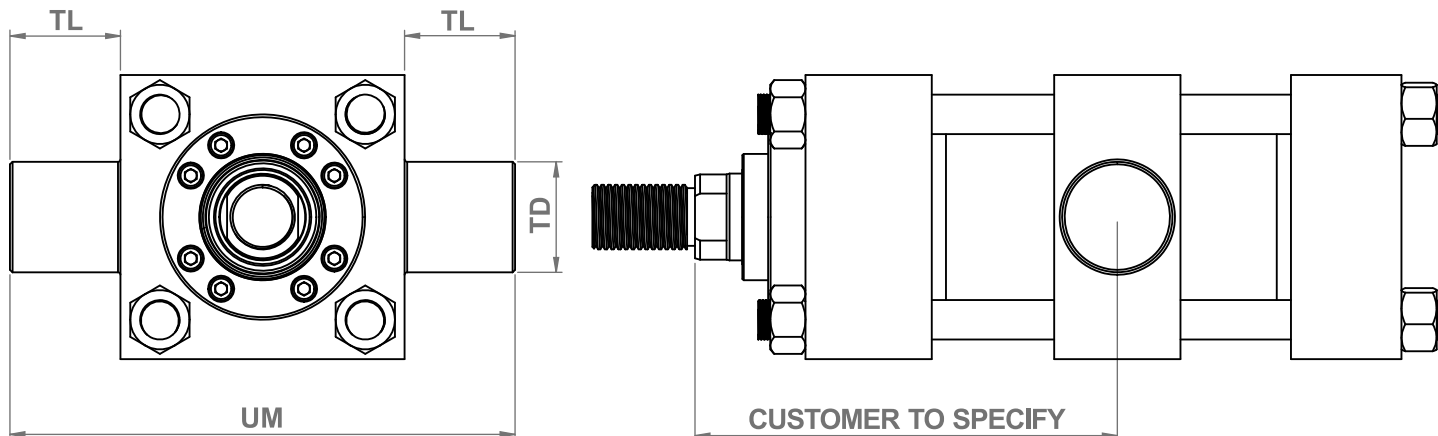
Contents



15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.18	MT4	Intermediate Trunnion Mount



BORE SIZE																	
Inch	1½		2		2½		3¼		4		5						
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 1/8	1 1/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
TL	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
UT	4 1/2	4 1/2	5 3/4	5 3/4	6 1/4	6 1/4	6 1/4	8	8	8	8 1/2	8 1/2	8 1/2	10	10	10	10
UM	5	5	6 1/4	6 1/4	6 3/4	6 3/4	6 3/4	8 1/2	8 1/2	8 1/2	9	9	9	10 1/2	10 1/2	10 1/2	10 1/2
TD	1	1	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
XG	1 1/8	2 1/4	2 1/4	2 1/2	2 1/4	2 1/2	2 3/4	2 5/8	2 5/8	3	2 7/8	3	3 1/4	3	3 1/4	3 1/4	3 1/4

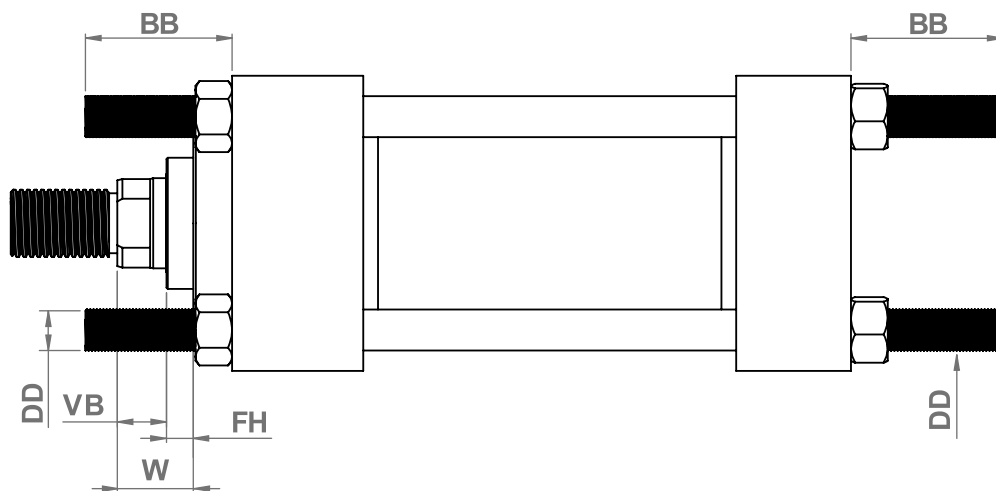
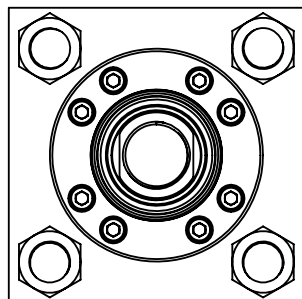
BORE SIZE														
Inch	6				7				8					
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
TL	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3
UT	11 1/2	11 1/2	11 1/2	11 1/2	13 1/2	13 1/2	13 1/2	13 1/2	13 1/2	15 1/2	15 1/2	15 1/2	15 1/2	15 1/2
UM	12 1/2	12 1/2	12 1/2	12 1/2	14 3/4	14 3/4	14 3/4	14 3/4	14 3/4	17	17	17	17	17
TD	2	2	2	2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3	3
XG	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/8	3 3/4	3 3/4	3 3/4	3 3/4	3 3/4



15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.19	MX1	Both Tie Rods Extended Mount



BORE SIZE

Inch	1½		2		2½		3¼		4		5						
Rod Size Ø	5/8	1	1	1 3/8	1	1 3/8	1 3/4	1 3/8	1 3/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
BB	1 3/8	1 3/8	1 13/16	1 13/16	1 13/16	1 13/16	1 13/16	2 5/16	2 5/16	2 5/16	2 5/16	2 5/16	2 5/16	3 3/16	3 3/16	3 3/16	3 3/16
DD	3/8 - 24	3/8 - 24	1/2 - 20	1/2 - 20	1/2 - 20	1/2 - 20	1/2 - 20	5/8 - 18	5/8 - 18	5/8 - 18	5/8 - 18	5/8 - 18	5/8 - 18	7/8 - 14	7/8 - 14	7/8 - 14	7/8 - 14
VB	1/4	1/2	1/4	3/8	1/4	3/8	1/2	1/4	3/8	3/8	1/4	1/4	3/8	1/4	3/8	3/8	3/8
W	5/8	1	3/4	1	3/4	1	1 1/4	7/8	1 1/8	1 1/4	1	1 1/8	1 3/8	1 1/8	1 3/8	1 1/8	1 3/8
FH	3/8	3/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8

BORE SIZE

Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
BB	3 5/8	3 5/8	3 5/8	3 5/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2
DD	1 - 14	1 - 14	1 - 14	1 - 14	1 1/8 - 12	1 1/8 - 12	1 1/8 - 12	1 1/8 - 12	1 1/8 - 12	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
VB	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
W	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
FH	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Contents

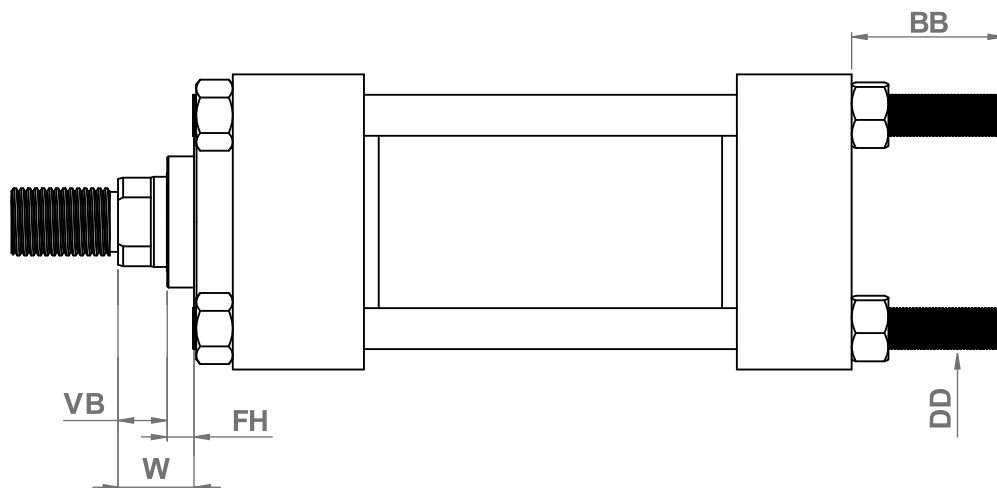
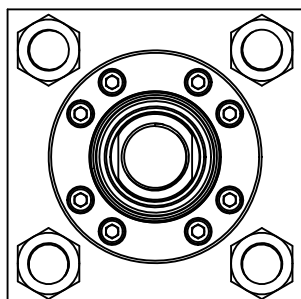


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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.20	MX2	End Cap Tie Rods Extended Mount



BORE SIZE

Inch	1½		2		2½		3¼		4		5						
Rod Size Ø	5/8	1	1	1 3/8	1	1 3/8	1 3/4	1 3/8	1 3/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
BB	1 3/8	1 3/8	1 13/16	1 13/16	1 13/16	1 13/16	1 13/16	2 5/16	2 5/16	2 5/16	2 5/16	2 5/16	2 5/16	3 3/16	3 3/16	3 3/16	3 3/16
DD	3/8 - 24	3/8 - 24	1/2 - 20	1/2 - 20	1/2 - 20	1/2 - 20	1/2 - 20	5/8 - 18	5/8 - 18	5/8 - 18	5/8 - 18	5/8 - 18	5/8 - 18	7/8 - 14	7/8 - 14	7/8 - 14	7/8 - 14
VB	1/4	1/2	1/4	3/8	1/4	3/8	1/2	1/4	3/8	3/8	1/4	1/4	3/8	1/4	3/8	3/8	3/8
W	5/8	1	3/4	1	3/4	1	1 1/4	7/8	1 1/8	1 1/4	1	1 1/8	1 3/8	1 1/8	1 3/8	1 1/8	1 3/8
FH	3/8	3/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8

BORE SIZE

Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
BB	3 5/8	3 5/8	3 5/8	3 5/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2
DD	1 - 14	1 - 14	1 - 14	1 - 14	1 1/8 - 12	1 1/8 - 12	1 1/8 - 12	1 1/8 - 12	1 1/8 - 12	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
VB	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
W	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
FH	1	1	1	1	1	1	1	1	1	1	1	1	1	1

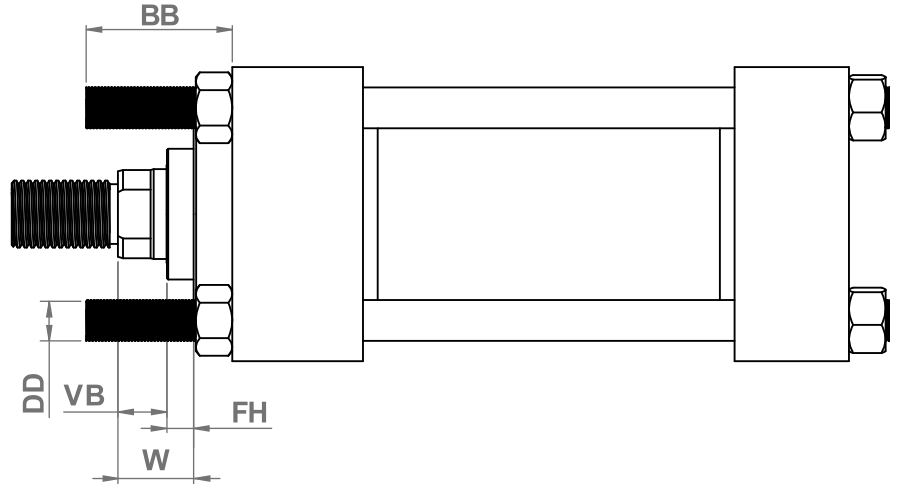
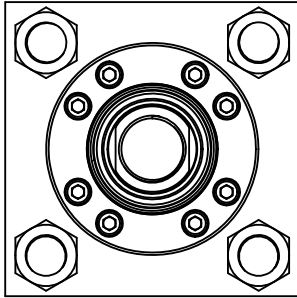
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15. DIMENSIONS - MOUNTING STYLES

Ver 1.9

Contents Reference	Ordering Code	Description
15.21	MX3	Head Cap Tie Rods Extended Mount



BORE SIZE

Inch	1½		2		2½			3¼			4			5			
Rod Size Ø	5/8	1	1	1 1/8	1	1 1/8	1 1/4	1 3/8	1 3/4	2	1 3/4	2	2 1/2	2	2 1/2	3	3 1/2
BB	1 1/8	1 3/8	1 1/16	1 13/16	1 13/16	1 13/16	1 13/16	2 5/16	2 5/16	2 5/16	2 5/16	2 5/16	2 5/16	3 3/16	3 3/16	3 3/16	3 3/16
DD	3/8 - 24	3/8 - 24	1/2 - 20	1/2 - 20	1/2 - 20	1/2 - 20	1/2 - 20	5/8 - 18	5/8 - 18	5/8 - 18	5/8 - 18	5/8 - 18	5/8 - 18	7/8 - 14	7/8 - 14	7/8 - 14	7/8 - 14
VB	1/4	1/2	1/4	3/8	1/4	3/8	1/2	1/4	3/8	3/8	1/4	1/4	3/8	1/4	3/8	3/8	3/8
W	5/8	1	3/4	1	3/4	1	1 1/4	7/8	1 1/8	1 1/4	1	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8
FH	3/8	3/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4	7/8	7/8	7/8	7/8	7/8	7/8	7/8

BORE SIZE

Inch	6				7					8				
Rod Size Ø	2 1/2	3	3 1/2	4	3	3 1/2	4	4 1/2	5	3 1/2	4	4 1/2	5	5 1/2
BB	3 5/8	3 5/8	3 5/8	3 5/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/8	4 1/2	4 1/2	4 1/2	4 1/2	4 1/2
DD	1 - 14	1 - 14	1 - 14	1 - 14	1 1/8 - 12	1 1/8 - 12	1 1/8 - 12	1 1/8 - 12	1 1/8 - 12	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/4 - 12	1 1/2 - 12
VB	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
W	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
FH	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Contents

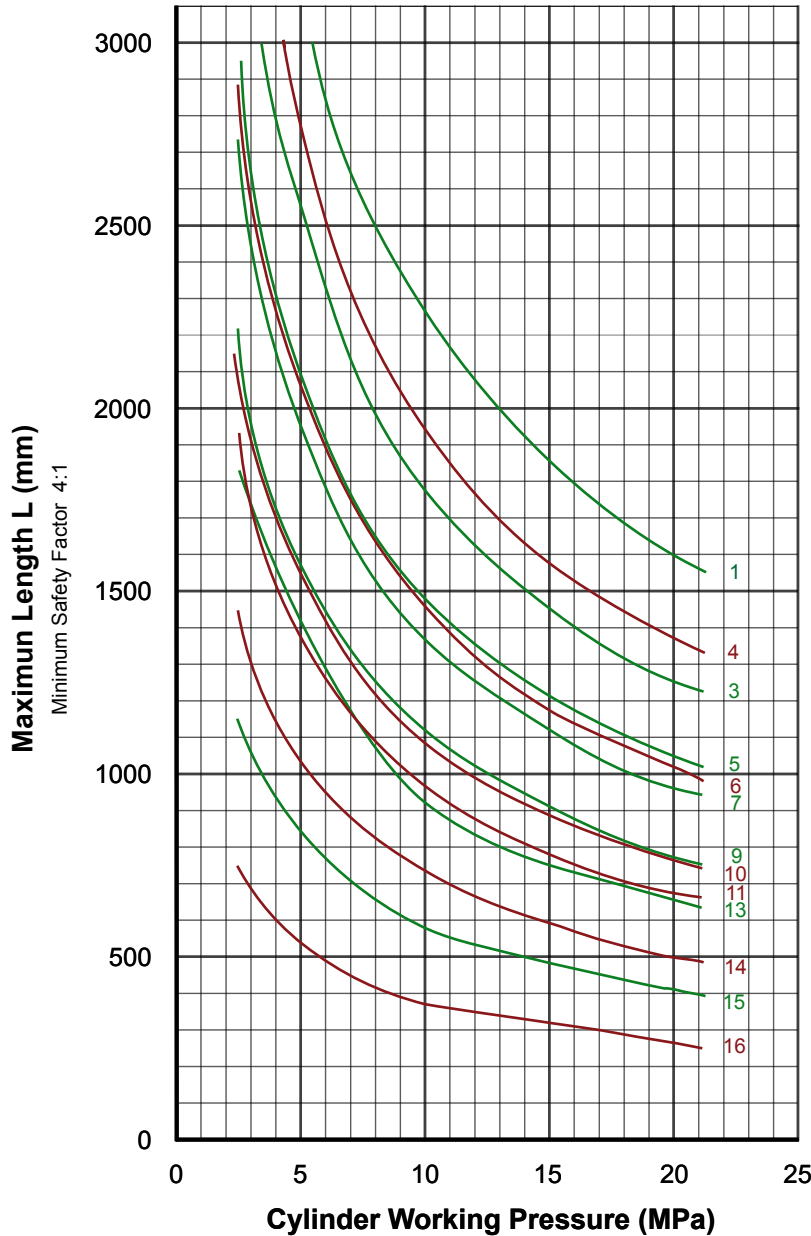


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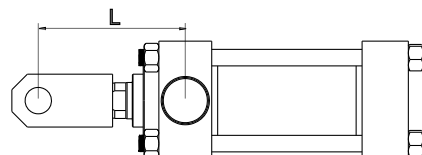
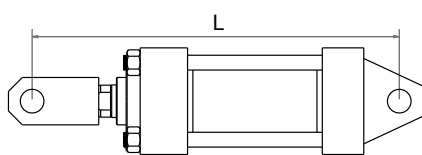
16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.1	1½ - 4 Bore	Pinned Connection Both Ends

All Buckling calculations are based on a 4:1 safety factor on the critical buckling force. The standard maximum length for this cylinder range is 3,000 mm and as such any figures above this value are limited in the following tables. The charts and tables are based upon piston rod material grade GR1045 as per page 6.



Cylinder Size	Graph #
1½ x 5/8	16
1½ x 1	11
2 x 1	14
2 x 1 3/8	7
2½ x 1	15
2½ x 1 3/8	10
2½ x 1 3/4	3
3¼ x 1 3/8	13
3¼ x 1 3/4	5
3¼ x 2	4
4 x 1 3/4	9
4 x 2	6
4 x 2½	1

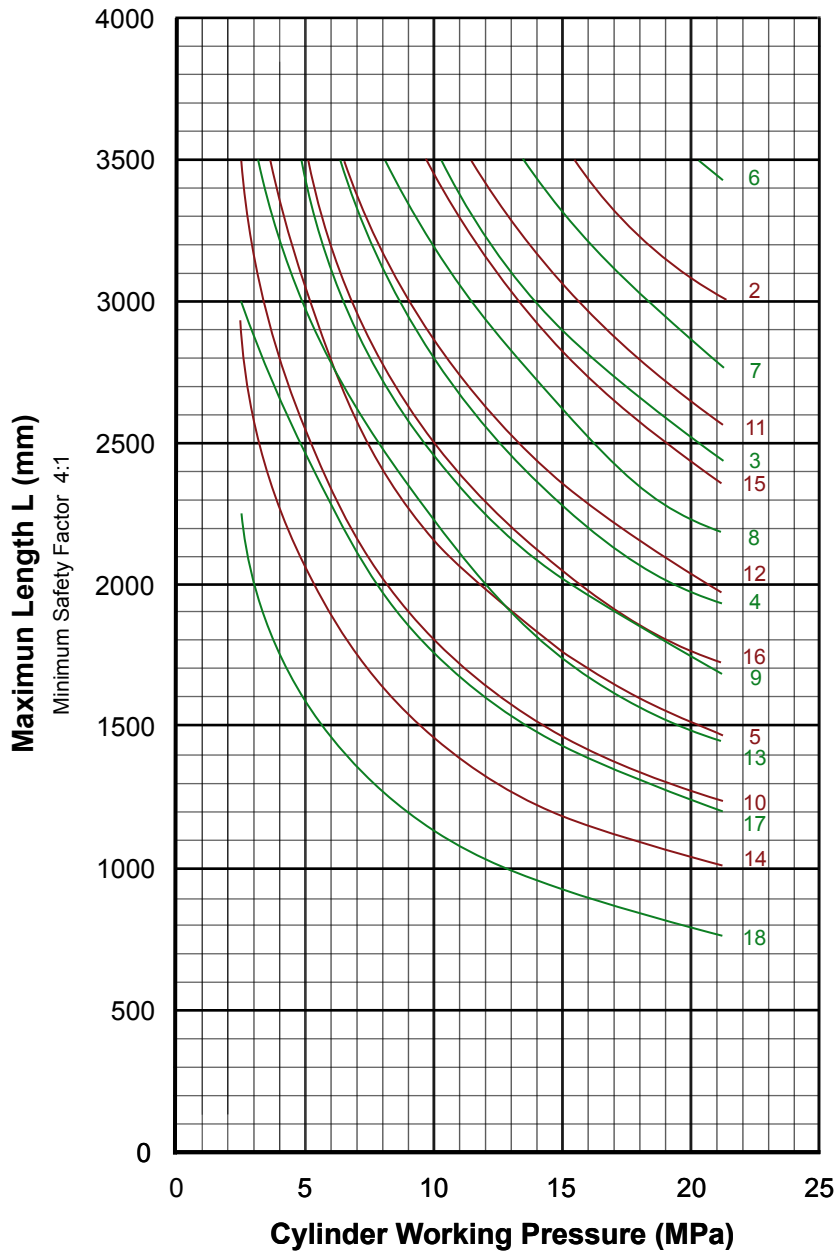


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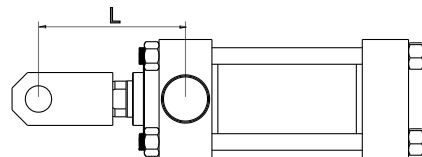
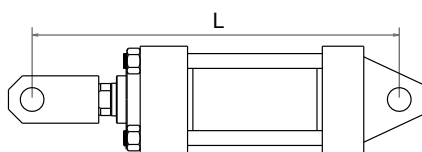


16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.2	5 - 8 Bore	Pinned Connection Both Ends

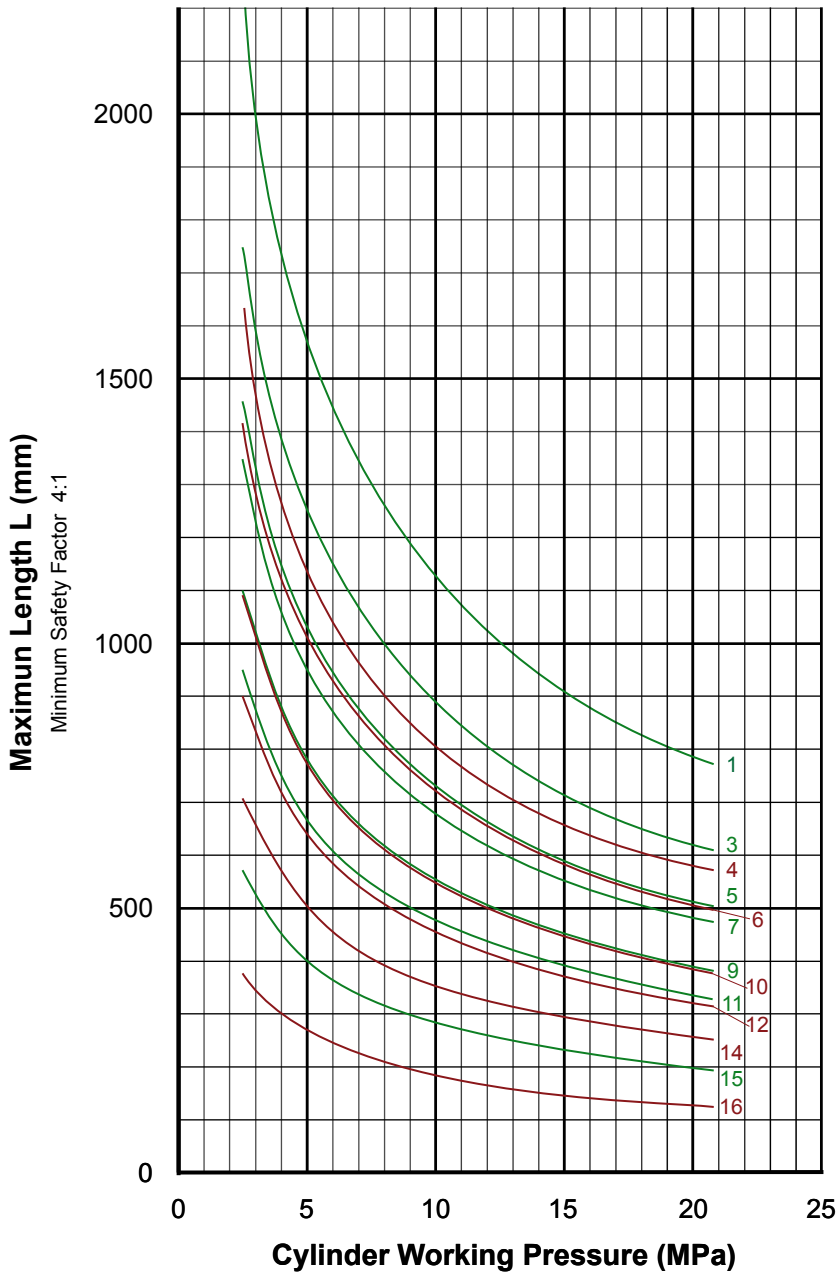


Cylinder Size	Graph #
5 x 2	18
5 x 2½	17
5 x 3	16
5 x 3½	15
6 x 2½	14
6 x 3	13
6 x 3½	12
6 x 4	11
7 x 3	10
7 x 3½	9
7 x 4	8
7 x 4½	7
7 x 5	6
8 x 3½	5
8 x 4	4
8 x 4½	3
8 x 5	2

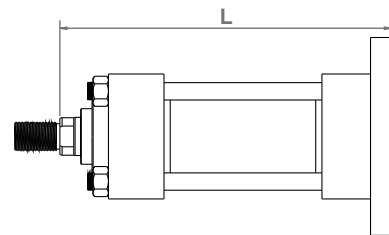
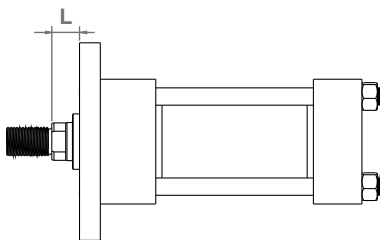


16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.3	1½ - 4 Bore	Fixed Base With Free End



Cylinder Size	Graph #
1½ x 5/8	16
1½ x 1	11
2 x 1	14
2 x 1 3/8	7
2½ x 1	15
2½ x 1 3/8	10
2½ x 1 3/4	3
3¼ x 1 3/8	12
3¼ x 1 3/4	5
3¼ x 2	4
4 x 1 3/4	9
4 x 2	6
4 x 2½	1

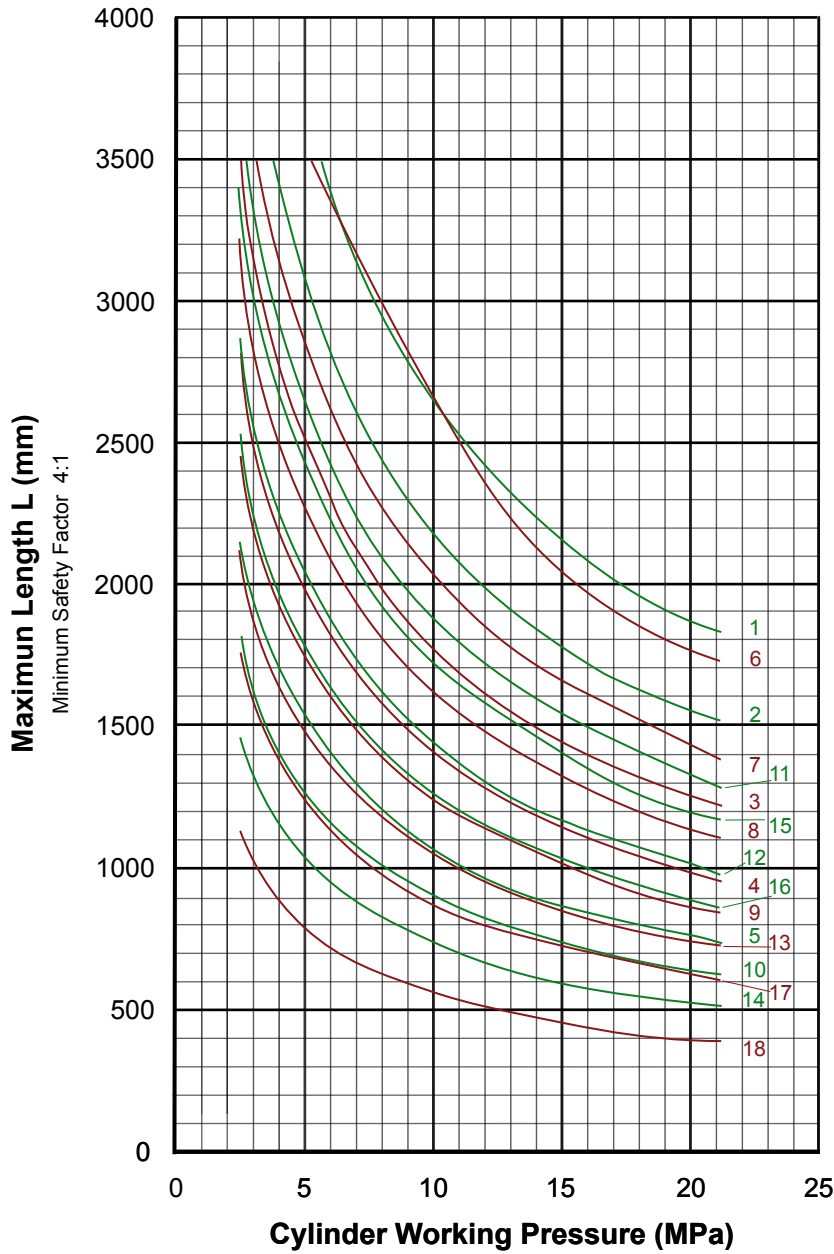


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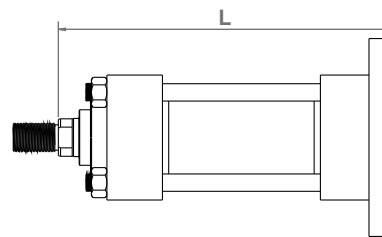
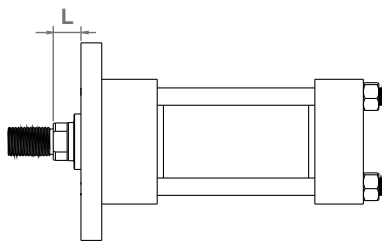


16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.4	5 - 8 Bore	Fixed Base With Free End

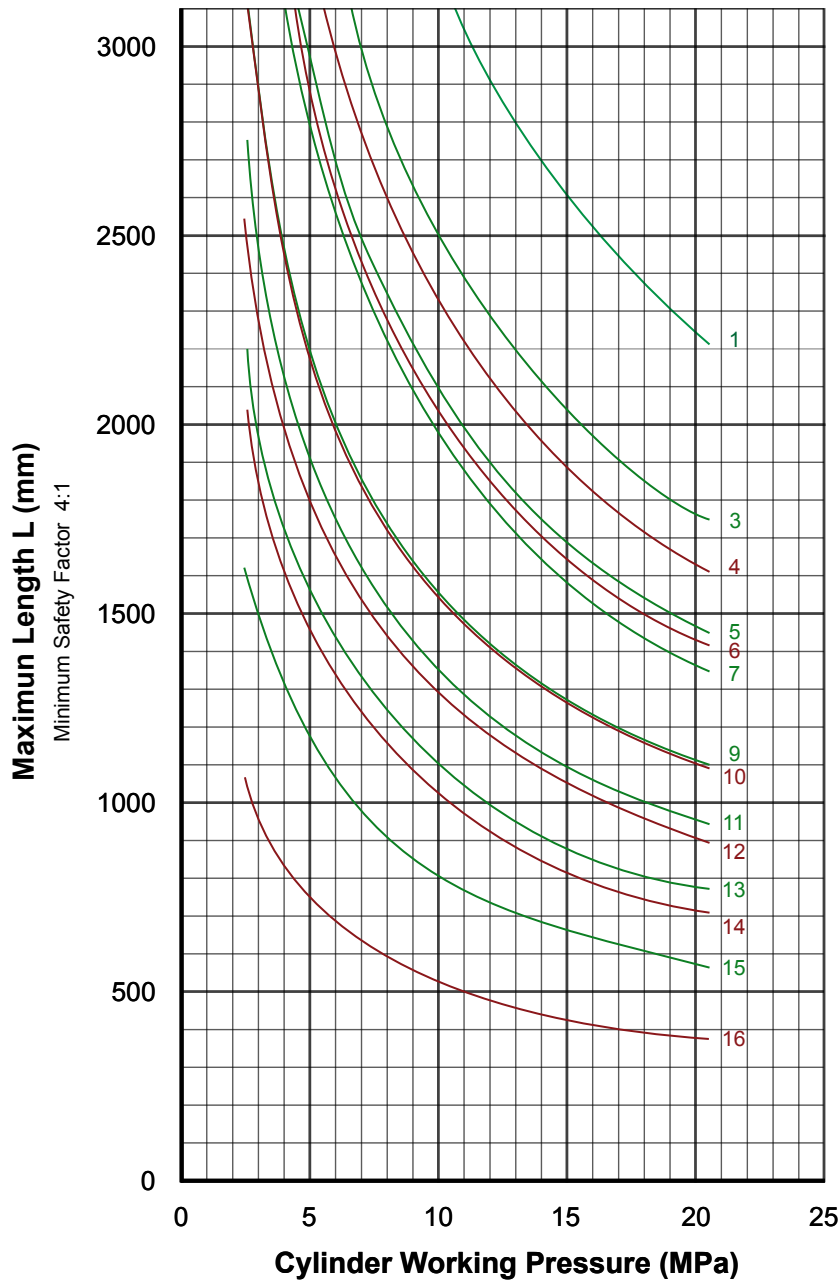


Cylinder Size	Graph #
5 x 2	18
5 x 2½	17
5 x 3	16
5 x 3½	15
6 x 2½	14
6 x 3	13
6 x 3½	12
6 x 4	11
7 x 3	10
7 x 3½	9
7 x 4	8
7 x 4½	7
7 x 5	6
8 x 3½	5
8 x 4	4
8 x 4½	3
8 x 5	2
8 x 5½	1

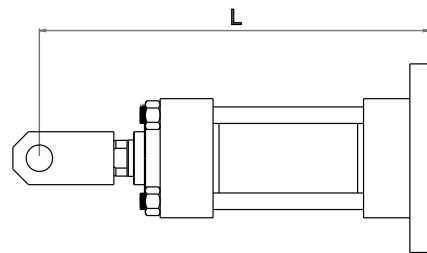
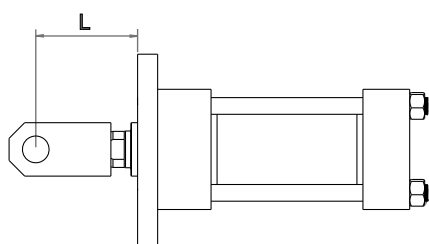


16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.5	1½ - 4 Bore	Fixed Base With Pinned End



Cylinder Size	Graph #
1½ x 5/8	16
1½ x 1	11
2 x 1	14
2 x 1 3/8	7
2½ x 1	15
2½ x 1 3/8	10
2½ x 1 3/4	3
3¼ x 1 3/8	12
3¼ x 1 3/4	5
3¼ x 2	4
4 x 1 3/4	9
4 x 2	6
4 x 2½	1

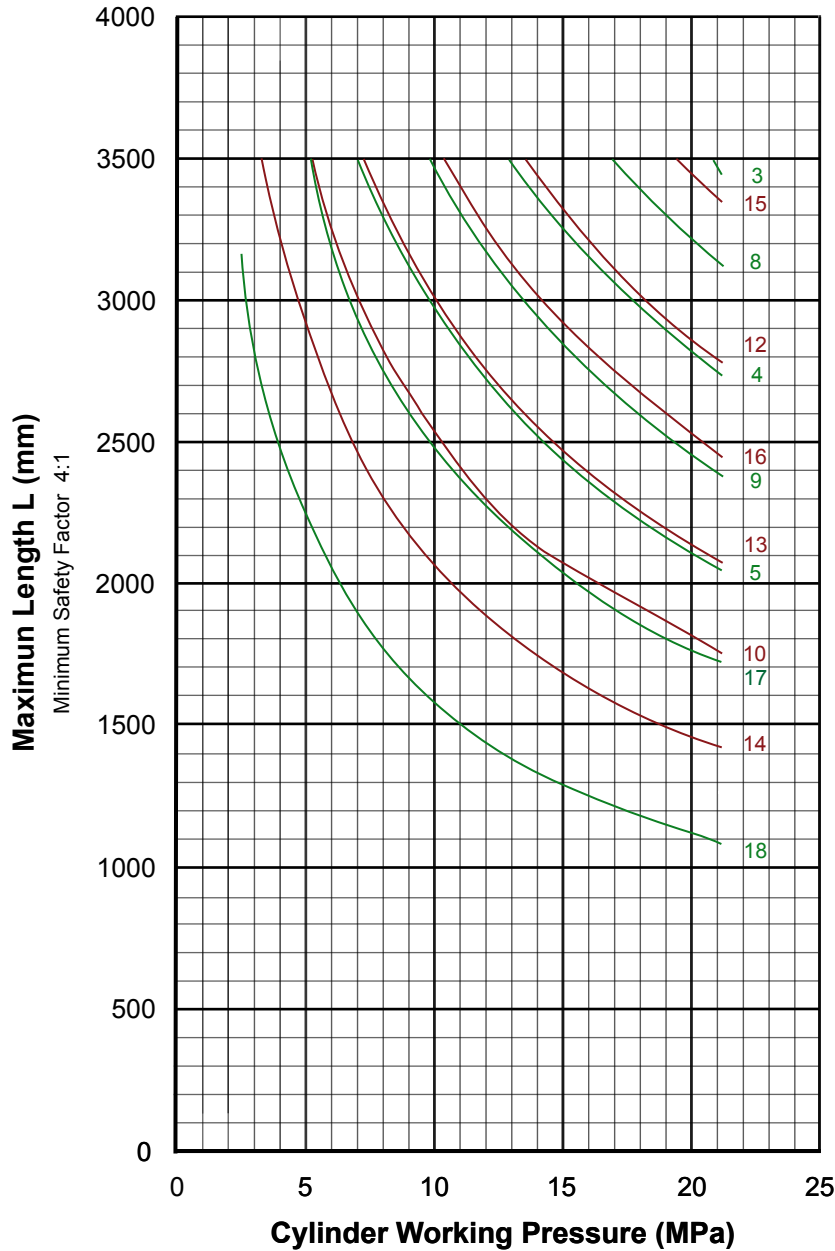


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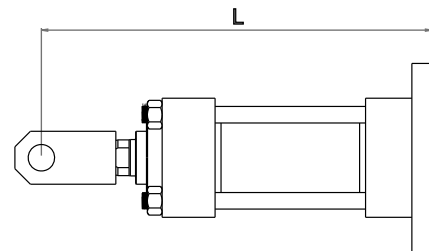
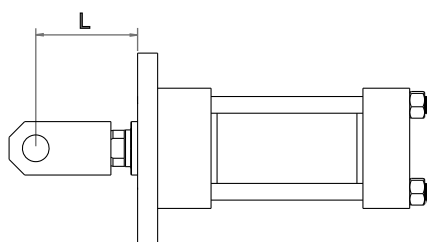


16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.6	5 - 8 Bore	Fixed Base With Pinned End

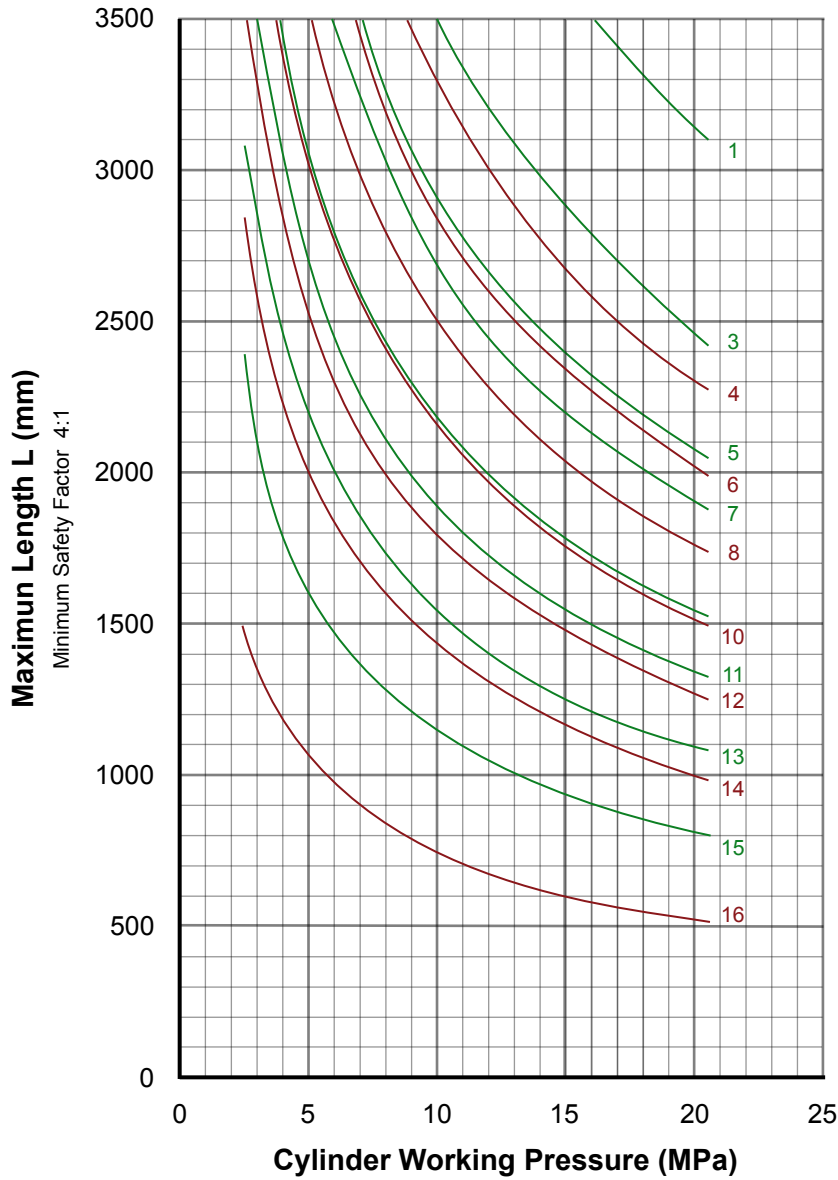


Cylinder Size	Graph #
5 x 2	18
5 x 2½	17
5 x 3	16
5 x 3½	15
6 x 2½	14
6 x 3	13
6 x 3½	12
6 x 4	11
7 x 3	10
7 x 3½	9
7 x 4	8
8 x 3½	5
8 x 4	4
8 x 4½	3

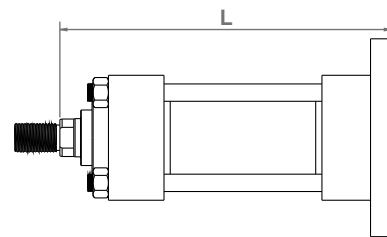
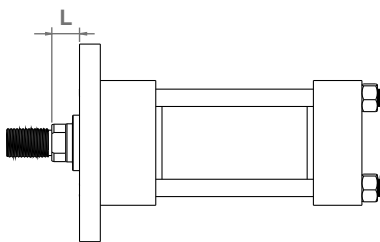


16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.7	1½ - 4 Bore	Fixed Base With Fixed End



Cylinder Size	Graph #
1½ x 5/8	16
1½ x 1	11
2 x 1	14
2 x 1 3/8	7
2½ x 1	15
2½ x 1 3/8	10
2½ x 1 3/4	3
3¼ x 1 3/8	12
3¼ x 1 3/4	5
3¼ x 2	4
4 x 1 3/4	9
4 x 2	6
4 x 2½	1

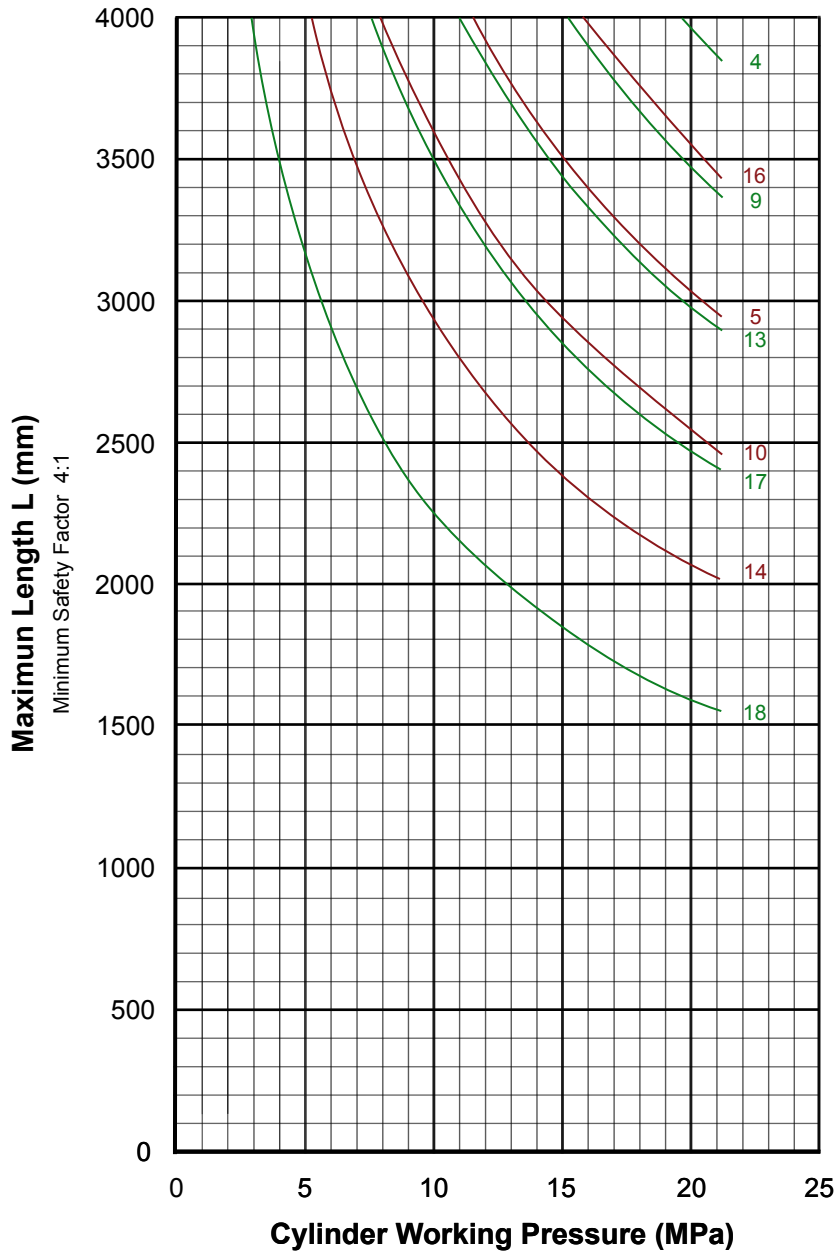


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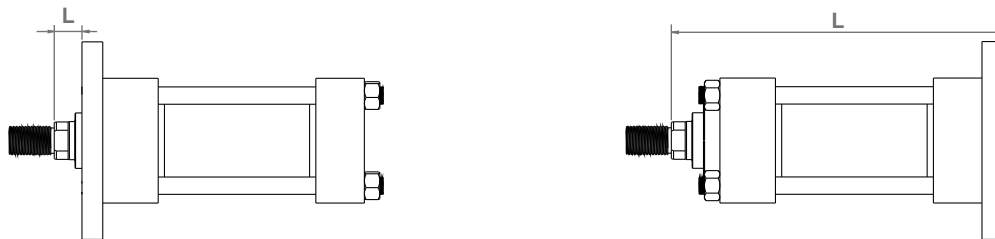


16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.8	5 - 8 Bore	Fixed Base With Fixed End

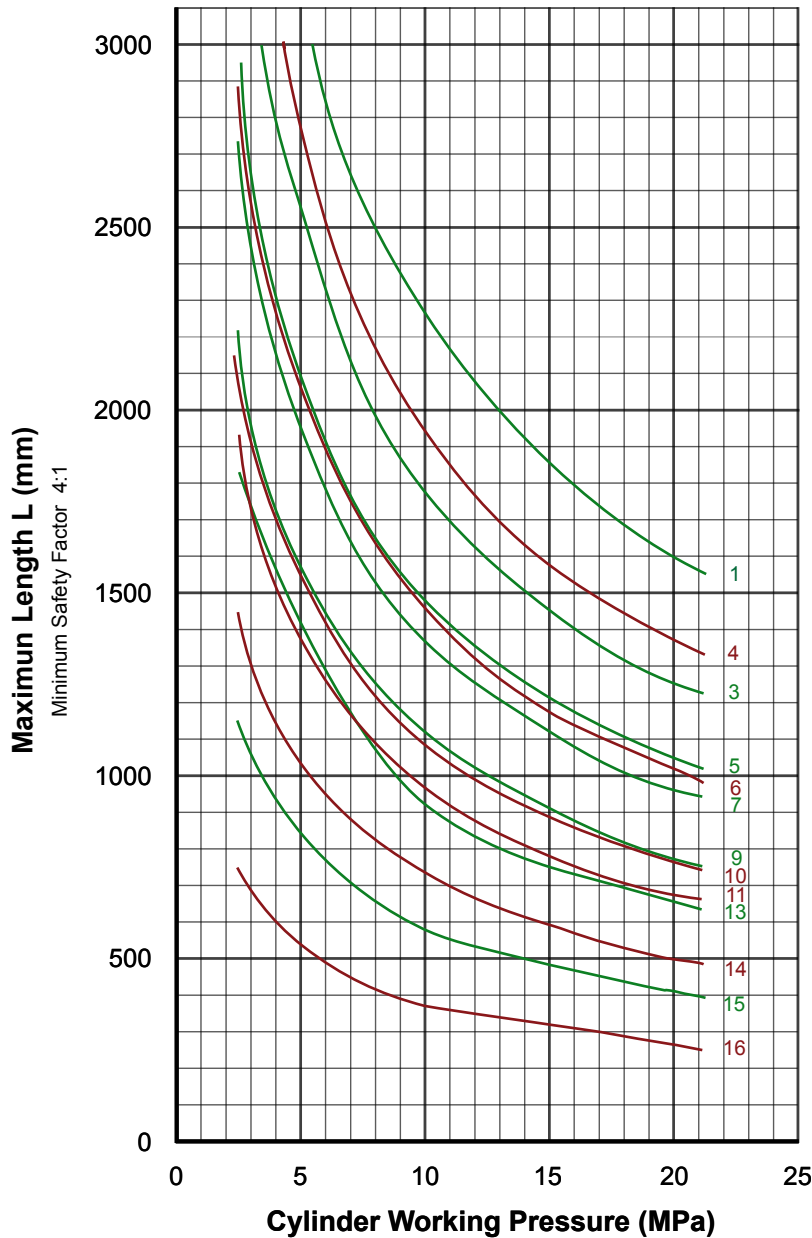


Cylinder Size	Graph #
5 x 2	18
5 x 2½	17
5 x 3	16
6 x 2½	14
6 x 3	13
7 x 3	10
7 x 3½	9
8 x 3½	5
8 x 4	4

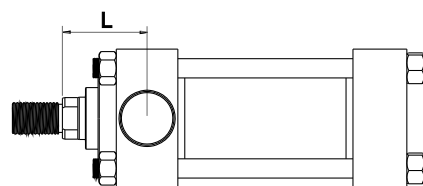


16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.9	1½ - 4 Bore	Intermediate Trunnion Mount With Free End

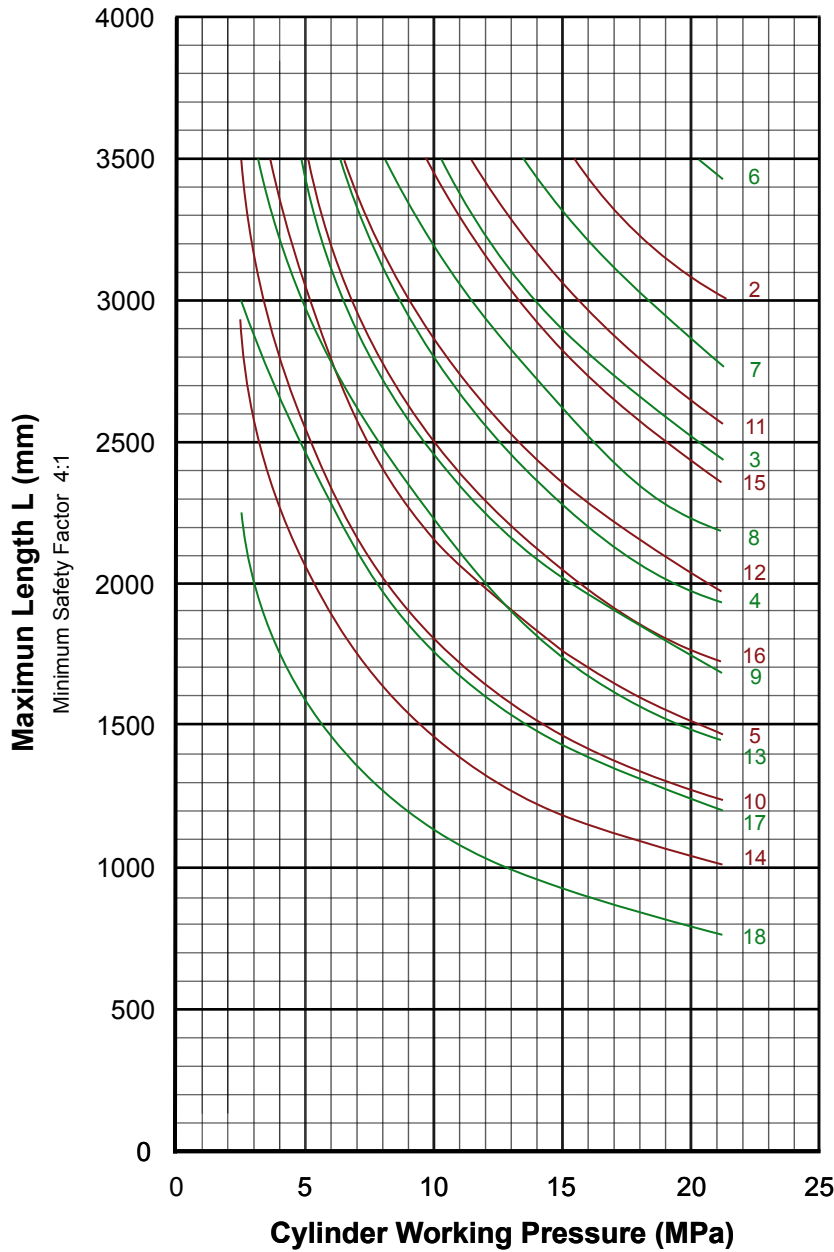


Cylinder Size	Graph #
1½ x 5/8	16
1½ x 1	11
2 x 1	14
2 x 1 3/8	7
2½ x 1	15
2½ x 1 3/8	10
2½ x 1 3/4	3
3¼ x 1 3/8	12
3¼ x 1 3/4	5
3¼ x 2	4
4 x 1 3/4	9
4 x 2	6
4 x 2½	1

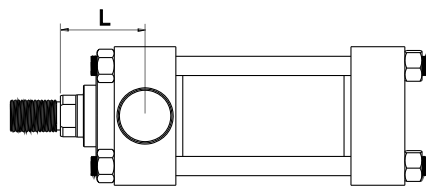


16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.10	5 - 8 Bore	Intermediate Trunnion Mount With Free End

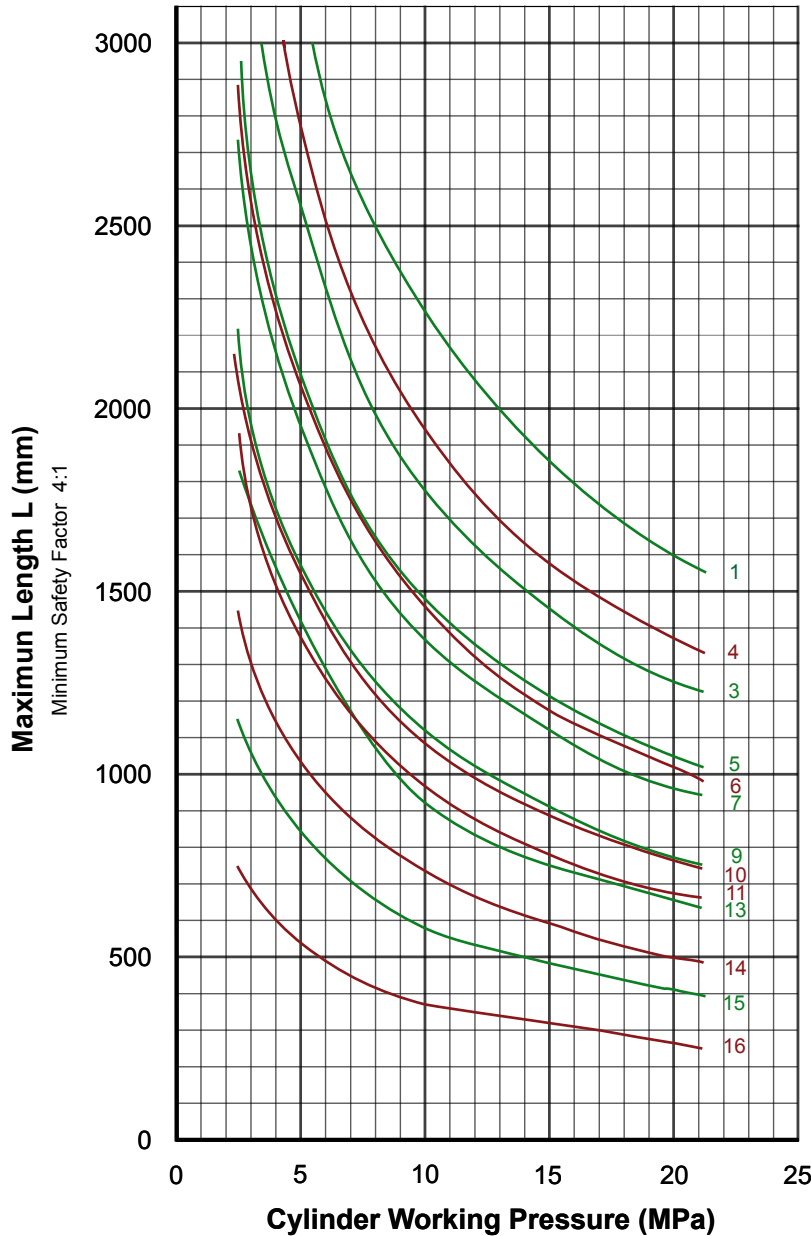


Cylinder Size	Graph #
5 x 2	18
5 x 2½	17
5 x 3	16
5 x 3½	15
6 x 2½	14
6 x 3	13
6 x 3½	12
6 x 4	11
7 x 3	10
7 x 3½	9
7 x 4	8
7 x 4½	7
7 x 5	6
8 x 3½	5
8 x 4	4
8 x 4½	3
8 x 5	2

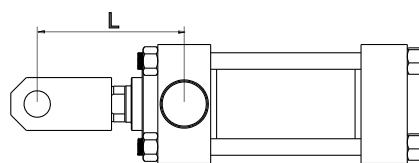


16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.11	1½ - 4 Bore	Intermediate Trunnion Mount With Fixed Clevis End

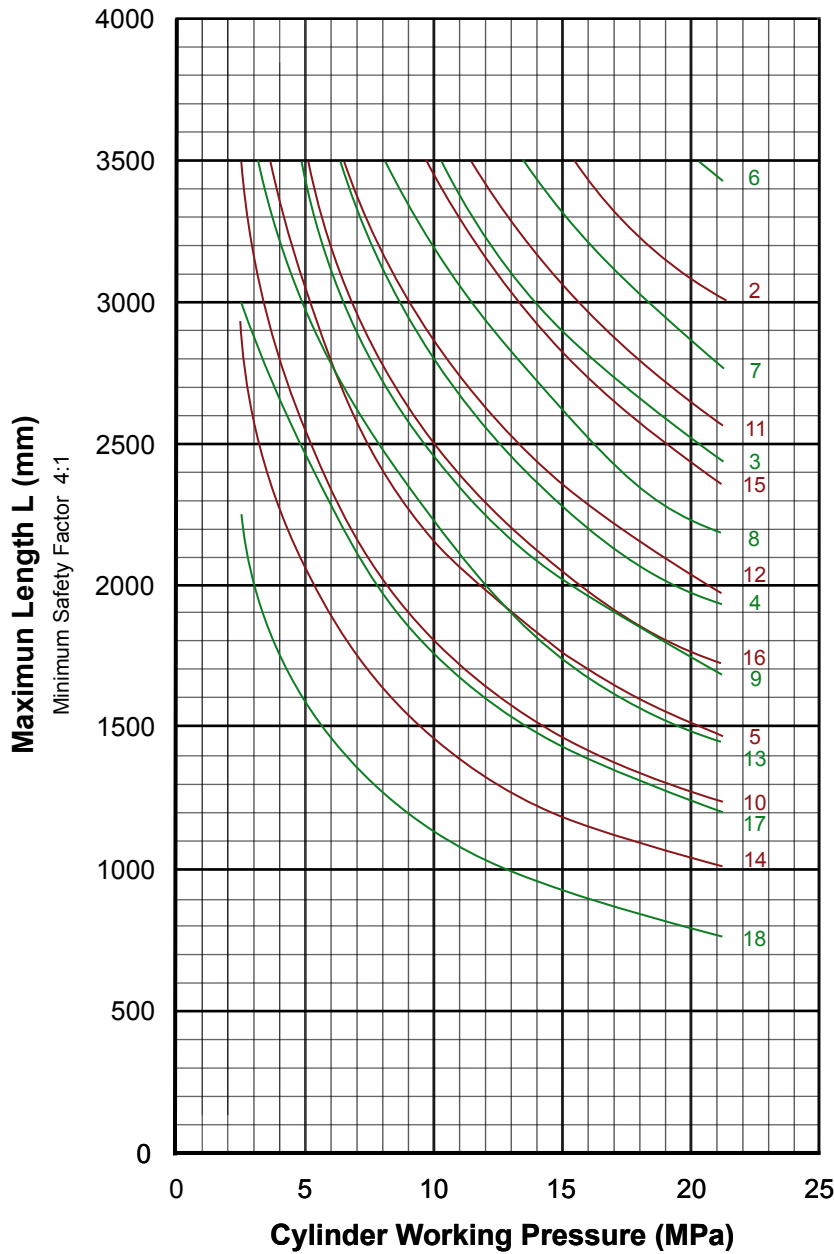


Cylinder Size	Graph #
1½ x 5/8	16
1½ x 1	11
2 x 1	14
2 x 1 5/8	7
2½ x 1	15
2½ x 1 5/8	10
2½ x 1 3/4	3
3¼ x 1 5/8	12
3¼ x 1 3/4	5
3¼ x 2	4
4 x 1 3/4	9
4 x 2	6
4 x 2½	1

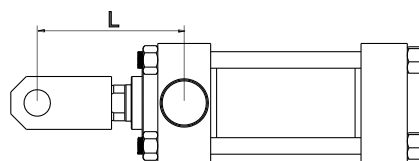


16. ROD BUCKLING

Contents Reference	Cylinder Sizes	Description
16.12	5 - 8 Bore	Intermediate Trunnion Mount With Fixed Clevis End



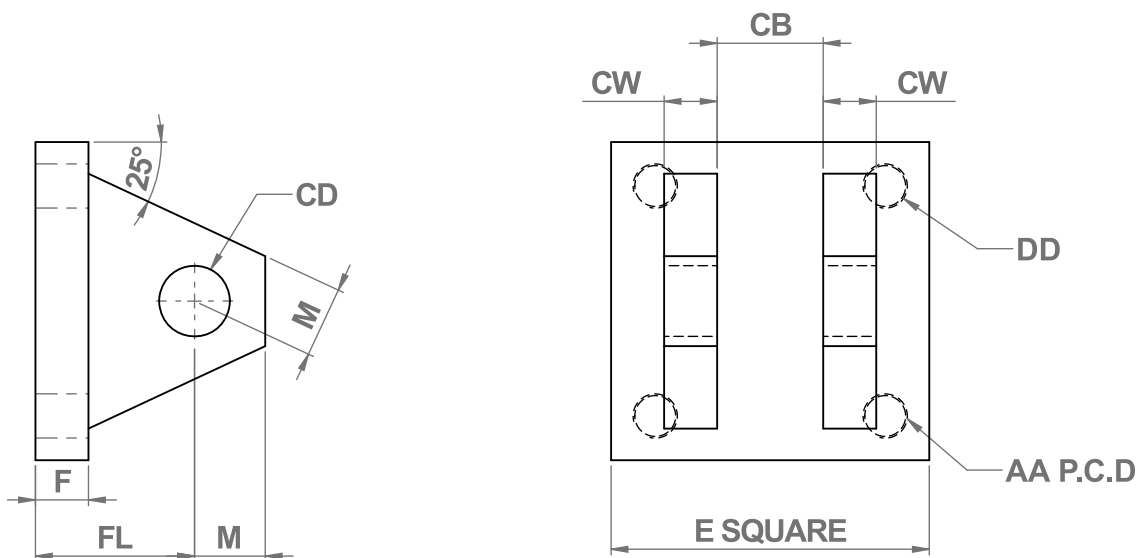
Cylinder Size	Graph #
5 x 2	18
5 x 2½	17
5 x 3	16
5 x 3½	15
6 x 2½	14
6 x 3	13
6 x 3½	12
6 x 4	11
7 x 3	10
7 x 3½	9
7 x 4	8
7 x 4½	7
7 x 5	6
8 x 3½	5
8 x 4	4
8 x 4½	3
8 x 5	2



17. DIMENSIONS - ACCESSORIES

Ver 1.9

Contents Reference	Description
17.1	Clevis Bracket Detachable NFPA Style MP2



DIMENSIONS									
Part Number	AA	CB	CD	CW	DD	E	F	FL	M
QH-CBD-0230	2.3	3/4	1/2	1/2	3/8 - 24	2 1/2	3/8	1 1/8	1/2
QH-CBD-0290	2.9	1 1/4	3/4	5/8	1/2 - 20	3	5/8	1 7/8	3/4
QH-CBD-0360	3.6	1 1/4	3/4	5/8	1/2 - 20	3 1/2	5/8	1 7/8	3/4
QH-CBD-0460	4.6	1 1/2	1	3/4	5/8 - 18	4 1/2	3/4	2 1/4	1
QH-CBD-0540	5.4	2	1 3/8	1	5/8 - 18	5	7/8	3	1 3/8
QH-CBD-0700	7.0	2 1/2	1 3/4	1 1/4	7/8 - 14	6 1/2	7/8	3 3/8	1 3/4
QH-CBD-0810	8.1	2 1/2	2	1 1/4	1 - 14	7 1/2	1	3 1/2	2
QH-CBD-0930	9.3	3	2 1/2	1 1/2	1 1/8 - 12	8 1/2	1	4	2 1/2
QH-CBD-1060	10.6	3	3	1 1/2	1 1/4 - 12	9 1/2	1	4 1/2	2 1/2
QH-CBD-1360	13.6	4	3 1/2	2	1 3/4 - 12	12 5/8	1 1/16	5 11/16	3 1/2
QH-CBD-1620	16.2	4 1/2	4	2 1/4	2 - 12	14 7/8	1 1/16	6 7/16	4

NOTE:

When mating Eye Bracket or Clevis with Female Clevis or Eye, match CD dimension.

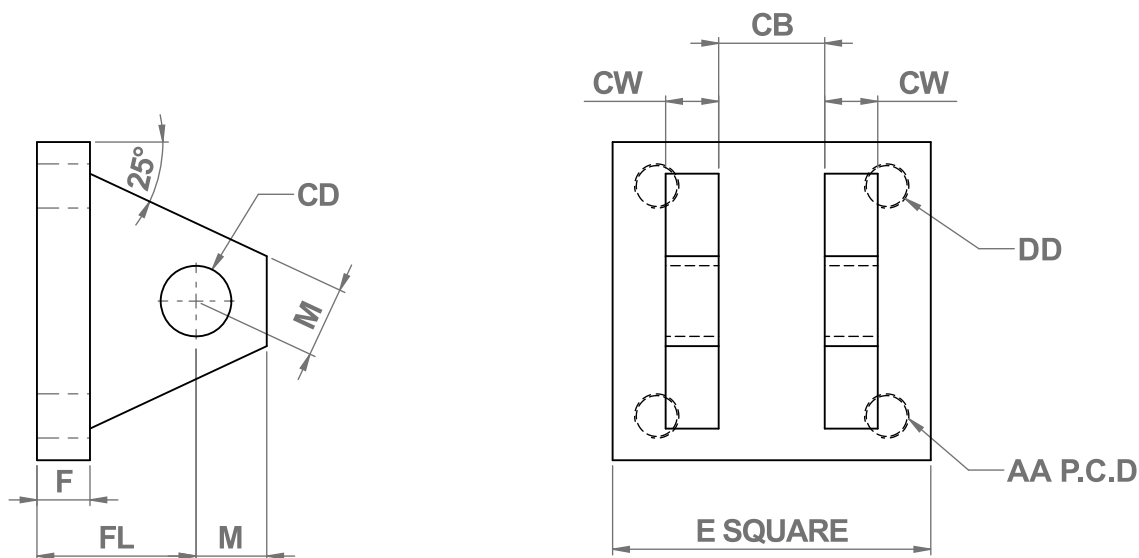
Contents



17. DIMENSIONS - ACCESSORIES

Ver 1.9

Contents Reference	Description
17.2	Eye Bracket Detachable



DIMENSIONS								
Part Number	AA	BD	CB	CD	E	F	FL	M
QH-EB-0230	2.3	1 ¹ / ₂	3 ¹ / ₄	1 ¹ / ₂	2 ¹ / ₂	3 ³ / ₈	1 ¹ / ₈	1 ¹ / ₂
QH-EB-0290	2.9	1 ¹ / ₂	1 ¹ / ₄	3 ³ / ₄	3	5 ⁵ / ₈	1 ¹ / ₈	3 ³ / ₄
QH-EB-0360	3.6	1 ¹ / ₂	1 ¹ / ₄	3 ³ / ₄	3 ¹ / ₂	5 ⁵ / ₈	1 ¹ / ₈	3 ³ / ₄
QH-EB-0460	4.6	2 ¹ / ₂	1 ¹ / ₂	1	4 ¹ / ₂	3 ³ / ₄	2 ¹ / ₄	1
QH-EB-0540	5.4	2 ¹ / ₂	2	1 ³ / ₈	5	7 ⁷ / ₈	3	1 ³ / ₈
QH-EB-0700	7.0	2 ³ / ₂	2 ¹ / ₂	1 ³ / ₄	6 ¹ / ₂	7 ⁷ / ₈	3 ¹ / ₈	1 ³ / ₄
QH-EB-0810	8.1	1 ¹ / ₂	2 ¹ / ₂	2	7 ¹ / ₂	1	3 ¹ / ₂	2
QH-EB-0930	9.3	1 ⁵ / ₂	3	2 ¹ / ₂	8 ¹ / ₂	1	4	2 ¹ / ₂
QH-EB-1060	10.6	1 ¹ / ₂	3	3	9 ¹ / ₂	1	4 ¹ / ₂	2 ³ / ₄
QH-EB-1360	13.6	1 ²⁵ / ₃₂	4	3 ¹ / ₂	12 ⁵ / ₈	1 ¹¹ / ₁₆	5 ¹¹ / ₁₆	3 ¹ / ₂
QH-EB-1620	16.2	2 ¹ / ₂	4 ¹ / ₂	4	14 ⁷ / ₈	1 ¹⁹ / ₁₆	6 ⁷ / ₁₆	4

NOTE:

When mating Eye Bracket or Clevis Bracket, with Female Clevis or Eye, match CD dimension.

Contents

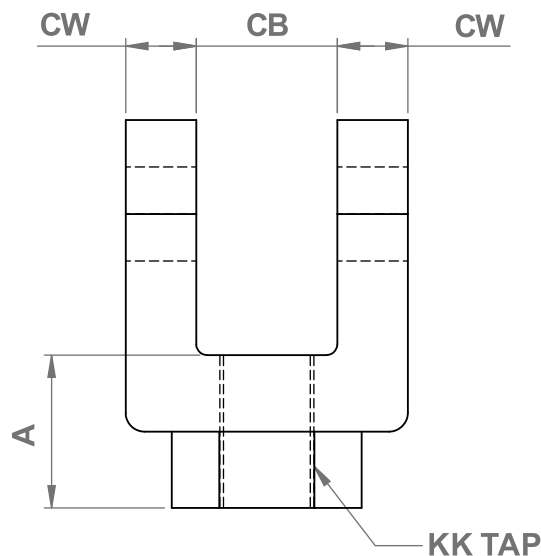
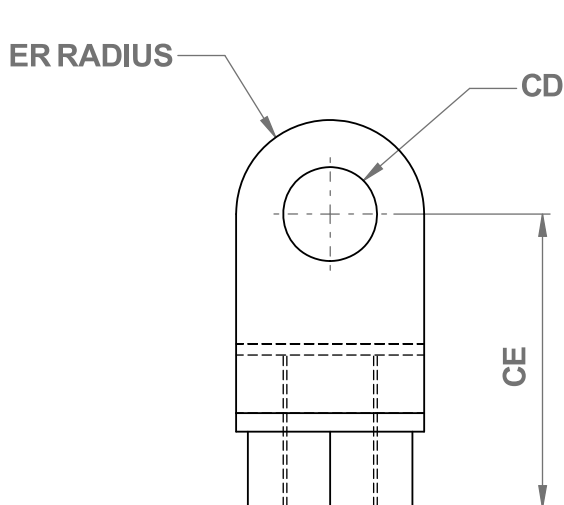


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17. DIMENSIONS - ACCESSORIES

Ver 1.9

Contents Reference	Description
17.3	Female Clevis



DIMENSIONS							
Part Number	KK UNF	A	CB	CD	CE	CW	ER
QH-FC-0437	7/16 - 20	3/4	3/4	1/2	1 1/2	1/2	1/2
QH-FC-0750	3/4 - 16	1 1/8	1 1/4	3/4	2 3/8	5/8	3/4
QH-FC-1000	1 - 14	1 5/8	1 1/2	1	3 1/8	3/4	1
QH-FC-1250	1 1/4 - 12	2	2	1 3/8	4 1/8	1	1 3/8
QH-FC-1500	1 1/2 - 12	2 1/4	2 1/2	1 3/4	4 1/2	1 1/4	1 1/4
QH-FC-1875	1 7/8 - 12	3	2 1/2	2	5 1/2	1 1/4	2
QH-FC-2250	2 1/4 - 12	3 1/2	3	2 1/2	6 1/2	1 1/2	2 1/2
QH-FC-2500	2 1/2 - 12	3 1/2	3	3	6 3/4	1 1/2	2 3/4
QH-FC-3250	3 1/4 - 12	4 1/2	4	3 1/2	8 1/2	2	3 1/2
QH-FC-4000	4 - 12	5 1/2	4 1/2	4	10	2 1/4	4

NOTE:

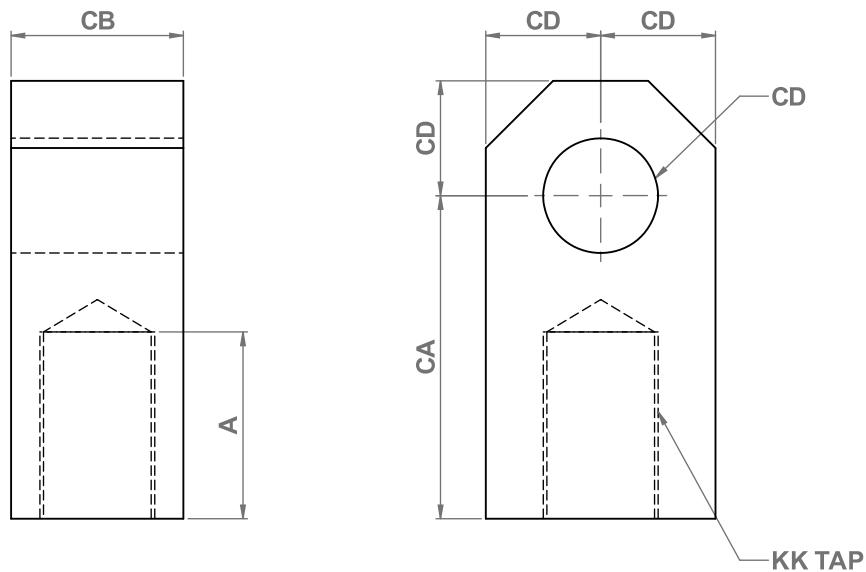
When mating Rod End accessories with Piston Rod, match KK thread dimensions.



17. DIMENSIONS - ACCESSORIES

Ver 1.9

Contents Reference	Description
17.4	Male Eye



DIMENSIONS					
Part Number	KK UNF	A	CA	CB	CD
QH-ME-0437	7/16 - 20	3/4	1 1/2	3/4	1/2
QH-ME-0750	3/4 - 16	1 1/8	2 1/16	1 1/4	3/4
QH-ME-1000	1 - 14	1 5/8	2 13/16	1 1/2	1
QH-ME-1250	1 1/4 - 12	2	3 1/16	2	1 3/8
QH-ME-1500	1 1/2 - 12	2 1/4	4	2 1/2	1 3/4
QH-ME-1875	1 7/8 - 12	3	5	2 1/2	2
QH-ME-2250	2 1/4 - 12	3 1/2	5 13/16	3	2 1/2
QH-ME-2500	2 1/2 - 12	3 1/2	6 1/8	3	3
QH-ME-3250	3 1/4 - 12	4 1/2	7 5/8	4	3 1/2
QH-ME-4000	4 - 12	5 1/2	9 1/8	4 1/2	4

NOTE:

When mating Rod End accessories with Piston Rod, match KK thread dimensions.

Contents

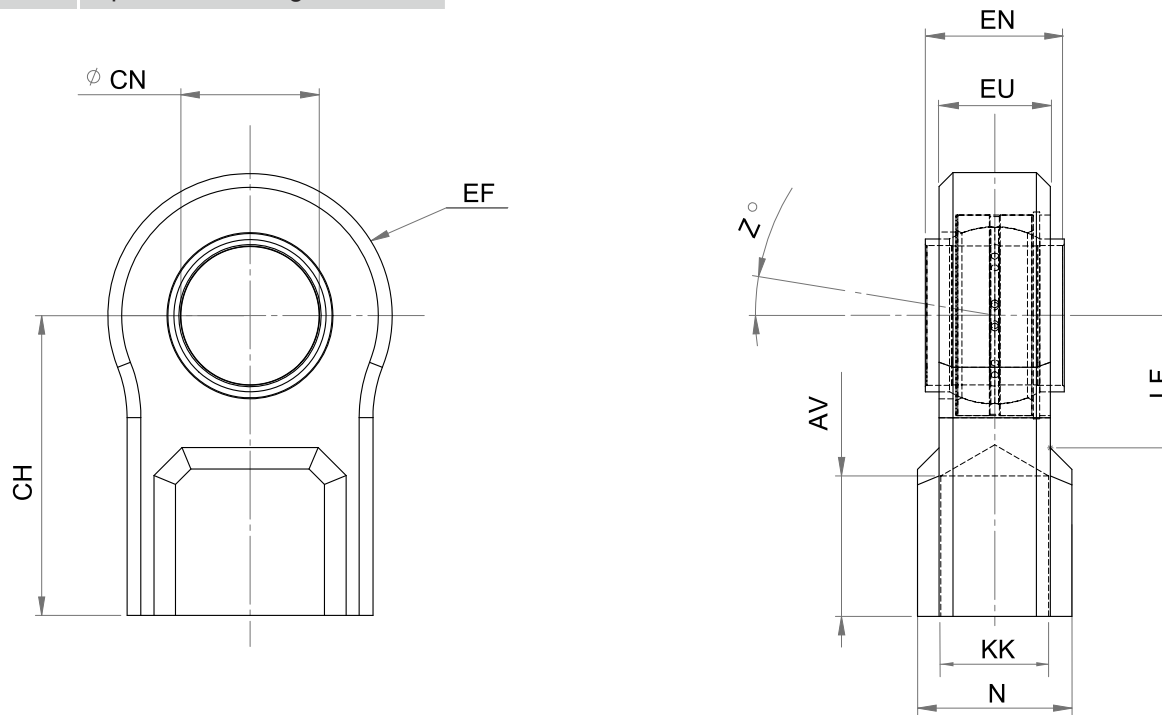


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17. DIMENSIONS - ACCESSORIES

Ver 1.9

Contents Reference	Description
17.5	Spherical Bearing - Rod End



DIMENSIONS

Part Number	KK UNF	AV	CH	CN	EF	EN	EU	LF	N	Z°
QH-SBME-0437	7/16 - 20	3/4	1 1/2	1/2	1 1/4	0.437	1 1/16	0.600	3/4	6
QH-SBME-0750	3/4 - 16	1 1/8	2 1/4	3/4	1 3/4	0.659	1 5/16	0.937	1 1/4	6
QH-SBME-1000	1 - 14	1 5/8	3	1	2 3/8	0.875	1 3/16	1.160	1 1/2	6
QH-SBME-1250	1 1/4 - 12	2	3 3/4	1 3/8	3 1/4	1.187	1 5/8	1.500	2	6
QH-SBME-1500	1 1/2 - 12	2 1/4	4 1/2	1 3/4	4	1.531	2	1.750	2 1/2	6
QH-SBME-1875	1 7/8 - 12	3	5 3/4	2	4 1/2	1.750	2 1/4	2.000	2 1/2	6
QH-SBME-2250	2 1/4 - 12	3 1/2	6 1/2	2 1/2	6	2.187	2 3/4	2.500	3	6
QH-SBME-2500	2 1/2 - 12	3 1/2	7	3	6 3/4	2.250	2 7/8	3.000	3 1/8	6
QH-SBME-3250	3 1/4 - 12	4 1/2	8 3/8	3 1/2	7 1/2	3.062	3 3/4	3.500	4	6
QH-SBME-4000	4 - 12	5 1/2	9 7/8	4	8 1/4	3.500	4 1/4	4.000	4 1/2	6

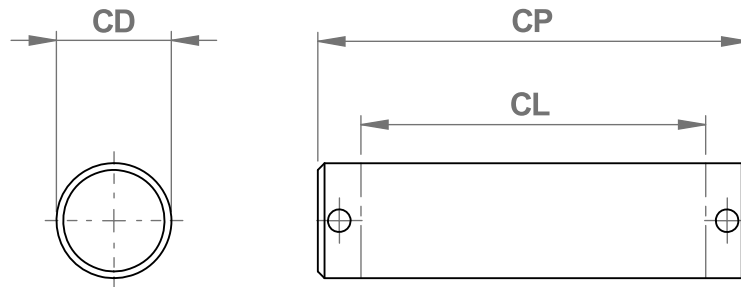
NOTE:

When mating Rod End accessories with Piston Rod, match KK thread dimensions.

17. DIMENSIONS - ACCESSORIES

Ver 1.9

Contents Reference	Description
17.6	Pivot Pin



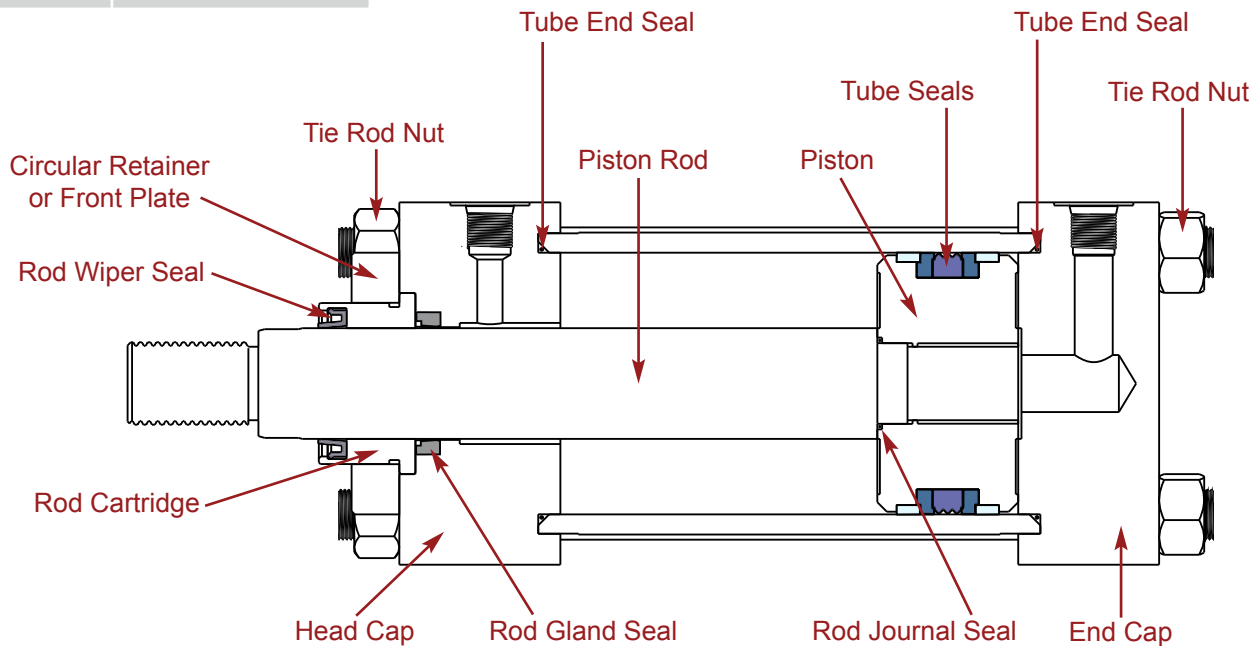
DIMENSIONS			
Part Number	CD	CL	CP
QH-PP-0500	$\frac{1}{2}$	$1\frac{3}{4}$	$2\frac{3}{8}$
QH-PP-0750	$\frac{3}{4}$	$2\frac{1}{2}$	$3\frac{1}{8}$
QH-PP-1000	1	3	$3\frac{3}{4}$
QH-PP-1375	$1\frac{3}{8}$	4	$4\frac{3}{4}$
QH-PP-1750	$1\frac{3}{4}$	5	$6\frac{1}{32}$
QH-PP-2000	2	5	$6\frac{1}{32}$
QH-PP-2500	$2\frac{1}{2}$	6	$7\frac{1}{32}$
QH-PP-3000	3	6	$7\frac{1}{8}$
QH-PP-3500	$3\frac{1}{2}$	8	$9\frac{1}{8}$
QH-PP-4000	4	9	$10\frac{1}{8}$

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Contents Reference	Description
18.1	NFPA Series 3000



IMPORTANT:

Genuine Queensland Hydraulics Pty. Ltd. parts should only be used when repairing NFPA Series 3000 Hydraulic Cylinders. Correct identification of cylinders can be obtained by contacting Queensland Hydraulics Pty. Ltd. and quoting the cylinder manufacturing number stamped into the head end. (usually adjacent to the cylinder port).

ROD CARTRIDGE SEALS AND TUBE END SEALS

TO REPLACE ROD CARTRIDGE SEALS

1. In almost all cases there is a circular retainer at the head end, remove the socket head screws which retain it. Otherwise, remove tie rod nuts.
2. Remove circular retainer or front plate which retains rod cartridge.
3. Remove rod cartridge. To overcome friction, insert screwdriver in external groove. Pry carefully.
4. Remove rod gland seal from cylinder head end.
5. Remove rod wiper seal from rod cartridge.
6. Clean cartridge recess in the head.
7. Fit new rod gland seal and rod wiper seals.
8. Lubricate the inside of the rod cartridge and the outside of the new cartridge prior to assembly.
9. **CAUTION** – Place new cartridge on rod end, being sure to use a twisting, “screwing motion” as you start it onto the rod.
10. Insert cartridge (now mounted on rod) into head recess.

Contents



Contents Reference	Description
18.2	NFPA Series 3000 cont.

11. Replace circular retainer or front plate, and tighten tie rod nuts to original prestress (see chart numbers 1 and 2 at the end of this section).

TO REPLACE TUBE SEALS

1. Remove tie rod nuts at end of cylinder.
2. Remove head and cap from cylinder.
3. Discard used seal and clean all parts thoroughly, including inside of tube and grooves in head and cap.
4. Insert new tube seals ensuring seal is a snug fit over the minor diameter machined in the end caps. Note: Only the correct size ring of the correct hardness should be used.
5. Reassemble cylinder. Tighten Tie Rod Nuts hand tight only.
6. Torque tie rod nuts diagonally in increments until the correct torque is obtained. (see chart number 1 at the end of this section).
7. Recheck torque in same order.



PISTON ROD BUSH RETAINERS



Cylinders with the following bore and rod combinations use circular retainers which permit removal of rod bush without disassembling cylinder.

- ▶ 2½" Bore with 1" Rod
- ▶ 3¼" Bore with 1¾" Rod
- ▶ 4" Bore through 20" Bore, all rod diameters

Cylinders use full retainer plate construction on the following bore and rod combinations except on NFPA ME5 mounting when above method is used.

- ▶ 1½" Bore with 5/8" and 1" Rods
- ▶ 2" Bore with 1" and 3/8" Rods
- ▶ 2½" Bore with 1¾", 8" and 1¼" Rods
- ▶ 3¼" Bore with 1¾" and 2" Rods

(see chart number 2 at the end of this section).

CYLINDER RATINGS AND TORQUE VALUES

(see chart number 1 at the end of this section).

TO REPLACE PISTON (and rod end stud if fitted)

TO REMOVE PISTON FROM ROD – LOCTITE METHOD

1. Heat piston and rod to 400 degrees – 450 degrees Fahrenheit.
2. Disassemble while hot using spanner wrench.
3. Remove piston by turning counterclockwise.

TO REMOVE ROD END STUD FROM ROD

1. Heat Rod End and stud to 400 degrees – 450 degrees Fahrenheit.
2. Unthread while hot.

Contents



Contents Reference	Description
18.3	NFPA Series 3000 cont.

Note: Loctite is recommended for use in the temperature range of –65 degrees to 300 degrees Fahrenheit.

TO FASTEN PISTON TO ROD WITH UP TO 2¼” DIA. THREADS:

1. Clean threads of rod and piston (or piston nut) thoroughly with an organic solvent such as trichlorethylene and a bristle brush.
2. Let parts dry.
3. Apply Loctite #680 to threads of piston (or piston nut) and rod. All threads must be thoroughly wetted by adhesive.
4. Assemble piston onto rod. Back off 2 turns and look to be sure threads are covered with adhesive. Tighten and torque to required specifications.
5. Allow adhesive to cure for 30 minutes before applying test pressure to assembled cylinder.

Note: Loctite #680 is not effective above 300 degrees Fahrenheit. If cylinder is to be subjected to temperatures higher than 300 degrees Fahrenheit, use serrated pin to lock piston rod.



TABLE 1
TIE RODS
CYLINDER RATINGS AND TORQUE VALUES

Cylinder Bore Size Inches	Pressure Ratings (psi)		Tie Rod Diameter	Torque (ft.lbs)	
	Heavy Duty Service	4:1 Design Factor (Yield)		Tie Rod Nut All Mounts Except MT4	Mounting MT4 Only
1½	3,000	2,200	¾	30	17
2	3,000	2,150	½	40	36
2½	3,000	1,900	½	80	56
3¼	3,000	2,200	⅝	190	118
4	2,700	1,700	⅝	190	160
5	3,000	1,900	⅞	550	350
6	2,700	1,750	1	700	560
7	3,000	1,950	1⅛	950	840
8	3,000	1,900	1¼	1,250	1,200
10	3,000	2,100	1⅛	950	850
12	3,000	2,300	1¼	1,250	1,250
14	3,000	1,950	1¼	1,250	1,200
16	3,000	2,050	1½	2,900	2,800
18	3,000	1,900	1½	2,900	2,400
20	3,000	1,950	1½	2,900	2,900

Contents



Contents Reference	Description
18.4	NFPA Series 3000 cont.

TABLE 2
RETAINING BUSHES
TORQUE ON CIRCULAR SOCKET HEAD SCREWS

Screw Size	3/4 - 28	5/8 - 24	3/8 - 24	7/16 - 20	5/8 - 18	3/4 - 16
Torque (ft.lb)	18	34	53	80	270	370



1. Definitions

- a. "The Company" means Queensland Hydraulics Pty Ltd (ABN 35 063 066 517).
- b. "Force Majeure" means events beyond the reasonable control of the Company and, without limitations includes strikes, lock-outs, slow-downs, fire, riot, tempest, war, embargo, governmental act, regulation or request, accident, delay in transportation or inability to obtain necessary labour, materials or manufacturing facilities or default by any manufacturer, supplier, subcontractor to the Company preventing or hindering the Company in due performance and observance of its duties and obligations under this contract for sale of any equipment.
- c. "Goods" means any product delivered pursuant to this agreement including Software.
- d. "Offer" means tender or quotation.
- e. "The Price" means the price quoted in the quotation, offer or the contract or sale price as the case may be.
- f. "The Purchaser" means the Company, firm or persons to whom the Company's offer or invoice is addressed and includes successors in title and permitted assigns.
- g. "Sale" means and includes the sale of the Company's goods and services as well as any order or offer made or given by the Company and any contract entered into between the Purchaser and the Company.
- h. "GST" means any consumption tax imposed by Government, whether at point of sale or at some other occurrence, by whatever name, which operates during the term of this agreement and includes without limitation a goods and services tax, a broad based consumption or indirect tax and value added tax".

2. General

- a. These conditions apply in respect of every sale by the Company.
- b. Each tender or quotation is, notwithstanding any rule of law, an invitation only by the Company to treat and is not an offer by the Company to the Purchaser.
- c. The proper law of the contract shall be the Law of Queensland.

3. Alterations and Variations

No alteration or variation of these terms and conditions shall be made unless expressly stated in the Company's tender or quotation or in any other case agreed in writing by a director of the Company.

4. Period of Offer

Unless otherwise advised in writing to the Purchaser any Offer made by the Company shall remain valid for 30 days from the date of the Offer.

5. Price and Payment

- a. The Price excludes transport and delivery costs, customs excise duties and charges, sales taxes and GST all of which shall:
 - *0i. be paid by the Purchaser; and
 - *1ii. if the Company disburses those costs, be refunded to the Company by the Purchaser.
 - *2iii. Without limitation, the Purchaser must pay to the Company on demand the GST payable by the Company in respect of the Price and the Goods.
- b. The Price shall be paid to the Company by the Purchaser:-
 - *3i. free of exchange at the address of the Company stated in the invoice;

- *4ii. and within 30 days net of invoice date without set-off or discount;
- *5iii. and in Australian dollars.
- c. Unless otherwise agreed, monthly progress payments and/or prepayment shall apply for project related goods received into the Company's stores and services/works completed within the invoice period.
- d. Should the Purchaser delay in payment then the Company shall have the right, in addition to all other rights to which it is entitled at law, to charge on the outstanding amount interest at the rate of 3% per annum calculated from the date of invoice to the actual date of full and final payment. Any payment by the Purchaser shall be credited first against any interest so accrued and the balance of payment if any shall be applied in reduction of the outstanding balance of the Price.
- e. Security/retentions are not applicable to any order or contract arising out of an award pursuant to any quotation or tender response submitted without prior agreement of the Company.

6. Title/Delivery

- a. The parties agree that the ownership of the Goods delivered by the Company to the Purchaser is only transferred to the Purchaser when the Purchaser has paid all sums owing to the Company whether under this or any other Contract.
- b. Where the Company has not been paid the Price and the Company delivers the Goods to the Purchaser, then, until disposed of by the Purchaser in accordance with the provisions of this clause, the Purchaser agrees with the Company to keep the Goods as a fiduciary for the Company and, if required, store the Goods in a manner that clearly shows the ownership of the Company.
- c. If and only if expressly stated in the Offer, delivery of equipment to a carrier shall constitute delivery to the Purchaser and regardless of freight payment, all risk in relation to the equipment shall pass to the Purchaser at that time.
- d. The Company shall make all reasonable efforts to meet any date for delivery of the Goods agreed between the Company and the Purchaser. Where a delay in delivery is caused by Force Majeure the time for delivery shall be extended by a reasonable period.

7. Warranty

Except as now provided or as required by mandatory operation of law, all conditions or warranties expressed or implied in respect of the products or any services supplied in connection therewith are hereby excluded. Subject to the terms of this agreement, the Company will transfer and assign to the Purchaser all warranties which it has been given by the manufacturer or developer of any Goods not manufactured or developed by the Company. The Company's condition on warranty is 12 months from date of delivery of goods to the Purchaser's nominated point of delivery and does not include labour required to dismantle, program or re-install goods onsite. Warranty on any repairs or replacement of defective goods is on a return to base basis with Queensland Hydraulics being responsible for the freight return of goods and buyer being responsible for freight to Queensland Hydraulics store. Subject to the terms of this agreement, the Company warrants engineered applications for 12 months from date of practical completion, warranty includes application and engineering support from Company's base premises only, on-site support is specifically excluded.



8. Goods Returned for Credit

- a. The Purchaser may return Goods for credit only with the Company's prior written consent.
- b. Goods returned for credit shall be delivered to the Company free into store in resaleable condition, i.e. in the original packing, seals unbroken, unsoiled and undamaged. Returned goods shall accompanied by a return of goods authority number and a delivery docket stating the original invoice number, the date of purchase and the reason for return.
- c. Non-standard equipment which is made to special order shall not be returned for credit.
- d. Goods shall not be returned for credit more than 14 days from the date of delivery.
- e. Unless otherwise agreed in writing Goods returned for credit shall be subject to a restocking charge of 20% of their invoice amount.
- f. Credit shall not be given for incorrect supply of Goods unless the Company receives written confirmation of the order prior to dispatch of the Goods.

9. Drawings and Documentation

- a. Any descriptive specifications and drawings and any weights and dimensions furnished by the Company with any Offer and any statement, description, illustration or other information in the Company's catalogues, price lists and other advertising matter are intended merely to give a general idea of the Goods and will not form any part of the Offer.
- b. Any studies, drawings or other documents submitted by the Company to the Purchaser remain the property of the Company and constitute the confidential information of the Company and the Purchaser shall not use them for any purpose other than that stipulated in the contract nor transmit them to third parties.
- c. If the Offer is not completed, any studies, drawings or other documents submitted with the Company's offer shall be returned to the Company within 14 days of expiry of the Offer.



10. Copyright And Other Intellectual Property

- a. Title to all intellectual property, copyright, patents and Documents including software design and other information created under the Contracted Scope of Works shall vest in Queensland Hydraulics.
- b. Subject to Client and/or it's Agents not being in breach of any obligation to make a payment properly due to Queensland Hydraulics, the Client and/or it's Agents shall have a licence to use the Documents created under the Contracted Scope of Works for the purpose of completing the Project, but the Client and/or it's Agents shall not use, or make copies of, such Documents in connection with any work not included in the Project. If Client and/or it's Agents is in breach of any obligation to make a payment to Queensland Hydraulics, Queensland Hydraulics may revoke the licence referred to above and the Client and/or it's Agents shall promptly then cause to be returned to Queensland Hydraulics all Documents referred to above.
- c. Queensland Hydraulics warrants that any intellectual property, supplied by, Queensland Hydraulics and embodied in or used in connection with the Services, is the sole property of, Queensland Hydraulics, or, Queensland Hydraulics is legally entitled to use the intellectual property for the provision of the Services.

- d. If during the course of providing the Services, Queensland Hydraulics develops, discovers or first reduces to practice a concept, product or process which is capable of being patented, then such concept, product or process shall be and remain the property of Queensland Hydraulics and neither the Client and/or it's Agents shall use, infringe or otherwise appropriate the same without first obtaining the written consent of Queensland Hydraulics.
- e. The Client and/or it's Agents shall be entitled to a royalty free licence to use the same solely on the Project and during the life of the works comprising the Project.

11. Termination

- a. The Company may terminate this agreement without notice if the Purchaser:-
 1. i. is in breach of a term of this agreement and fails to remedy the breach within 14 days of notice in writing by the Company specifying the breach and requesting the Purchaser to remedy it; or
 2. ii. has failed or refused to take delivery of the Goods or any part thereof and such failure or refusal continues for a period of 7 days after the Company advises the Purchaser that the Goods are ready for delivery; or
 3. iii. is declared bankrupt, resolves to go into liquidation or has a petition for its bankruptcy or winding up presented or enters into a scheme or arrangement with its creditors or if any liquidator, receiver, official manager or administrator is appointed in respect of the Purchaser.
- b. In the event of such termination the Company shall, after taking into account payments made by the Purchaser to the Company, be entitled to payment for work done and expenditure made under the agreement up to and including the date of termination and any direct and indirect loss suffered by the Company, including without limitation to the Company's loss of profit on the agreement and the legal costs of the Company (on a full indemnity basis) incurred in relation to the termination and any prior breach and in exercising any rights and remedies as a consequence of the termination and any breach.
- c. Termination of the agreement pursuant to these provisions shall be without prejudice to the rights of the Company accruing up to the date of termination
- d. If by reason of the operation of Force Majeure the Company is unable to perform or observe its obligations under this agreement, the Company shall not be deemed to be in breach of its duties and obligations so long as Force Majeure continues to operate



12. Severance

If any provision or part of any provision of these conditions is unenforceable, such unenforceability shall not affect any other part of such provision or any other provision of these conditions.

13. Exclusions

The Company shall not be liable under any circumstances whatsoever for:-

- a. any injury, damage or loss, including consequential damage or loss (including without limitation loss of market, loss of profit or loss of contracts) whether to persons or property arising out of this sale or the Goods supplied pursuant to it including any defects therein or anything connected therewith or with repair or replacement or any other work related thereto and without limitation, the Company shall not be liable for any loss of profit or other special damage or consequential damages arising out of any latent or other defect in the Goods; or

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- b. any reduction in the Price for any shortages in any delivery, unless the shortage is noted by the Purchaser on the Company's delivery note for that delivery; or
- c. any loss of or damage to the Goods whilst in transit. If liability may not be excluded by this sale then the liability of the Company for a breach of a condition or warranty implied by the Trade Practices Act (other than a condition or warranty implied by Section 69) shall be limited to the repair of the Goods or at the Company's option, the replacement of the Goods or the supply of equivalent Goods. In no event will the Company be liable to the Purchaser or any third party, in contract or tort, for more than the Price.

14. Indemnities, Patents and Design Rights

- a. The Purchaser warrants that any design or instructions furnished or given by him shall not be such as to cause the Company to infringe any letters patent, registered design, trademark or copyright in the execution of this agreement.
- b. The Purchaser indemnifies the Company against all claims, damages and costs which arise out of any infringement by the Company of any letters patent, registered design, trademark or copyright as a result of any work carried out by the Company from any information, specifications, designs or other data supplied by the Purchaser.
- c. Any letters patent, registered design, trademark or copyright held by the Company and relating to the Goods shall remain the absolute property of the Company and shall not be reproduced or disclosed without the Company's written consent. The Purchaser will not without the Company's previous written consent, copy or allow others to copy any drawings, equipment or part thereof supplied by the Company.
- d. The Purchaser shall indemnify the Company in respect of any claims, demands, damages, proceedings, costs, charges and other expenses caused by, arising out of or in any way connected with any special, consequential, direct or indirect loss, damage, harm or injury suffered by any person arising out of this sale or the Goods supplied pursuant to it.



15. Disputes

- a. If a dispute arises out of or relates to this agreement or the breach, termination, validity or subject matter thereof, the parties agree to first endeavour to settle the dispute by mediation administered by the Australian Commercial Disputes Centre (ACDC).
- b. In the event that the dispute has not been settled within 28 days (or such other period as agreed to in writing between the parties hereto) after the appointment of the mediator the dispute shall be submitted to arbitration administered by and in accordance with the Arbitration Rules of the ACDC.
- c. The arbitrator shall be a person agreed between the parties. ACDC will assist the parties by providing a list of suggested arbitrators. Failing agreement the arbitrator shall be a person appointed by ACDC. The arbitrator shall not be the same person as the mediator.
- d. The arbitration shall be held in Perth or in such other place as the parties may agree.

16. Limitation of Liability

- a. Notwithstanding any other provision of Contract arising out of or in connection with an award pursuant to any quotation or tender, to the extent permitted by law, neither

the Company nor the Purchaser will in no event be liable to each other for any loss of revenue, loss of profit, loss of use, loss of capital, downtime costs, loss of financial opportunity, economic loss or any consequential or indirect financial loss, damage or expense, whether arising out of a breach of this Contract, at law or in equity.

- b. The Company's liability to the Purchaser arising out of or in connection with an award of contract pursuant to any quotation or tender response submitted is limited to the Contract Price.

