Global Pneumatics, Warning, Offer of Sale

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⚠ WARNING

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This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users h aving technical expertise. It is important that you analyze all aspects of your application including consequences of any failure, and review the information concerning the product or system in the current product catalog. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

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Offer of Sale

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Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

P1L Series

High Performance Repairable Pneumatic Cylinder

Contents

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Optional Piston Magnet
Located under wear band, piston magnet is used for through-the-barrel sensors for electronic piston position indication. Does not add length to the piston.

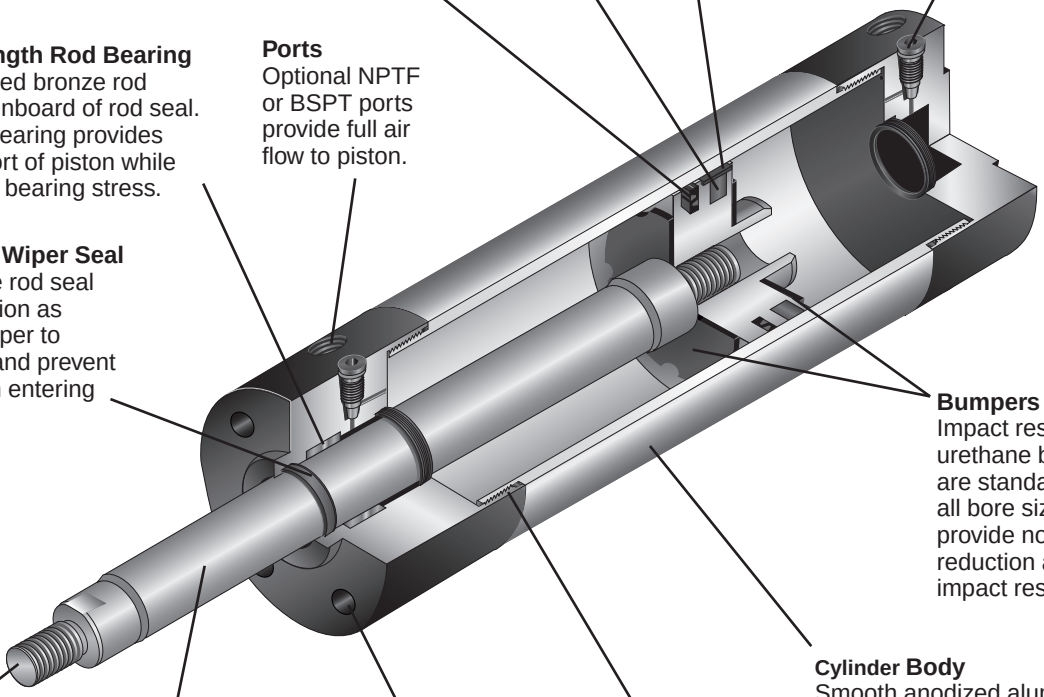
Aluminum Piston with Ultra-Wide Nylon Wear Band
Piston is permanently sealed and locked to rod with anaerobic adhesive. Ultra wide wear band prevents metal-to-metal contact and distributes piston loads across wide bearing area.

Z-Profile Piston Seal
Dynamic nitrile piston seal features two rounded micro sealing edges for maximum wear compensation and rounded grooves for retaining lubrication. Dual lipseal for 40mm to 100mm bore sizes.

Adjustable Cushion Option
Available for high speed applications, it features fine-thread, brass needle valves with a captive design.

High Strength Rod Bearing
PTFE-coated bronze rod bearing is inboard of rod seal. Long rod bearing provides rigid support of piston while minimizing bearing stress.

Ports
Optional NPTF or BSPT ports provide full air flow to piston.



Rounded Lip Rod Wiper Seal
Non-lube, urethane rod seal provides dual function as rod seal and rod wiper to eliminate leakage and prevent contamination from entering the cylinder.

Bumpers
Impact resistant urethane bumpers are standard for all bore sizes to provide noise reduction and impact resistance

Cylinder Body
Smooth anodized aluminum tube provides wear-resistant surface. Clean tubular design eliminates area where contamination can accumulate.

Four Standard Piston Rod Ends
Inch or metric with male or female to meet a variety of requirements.

Tapped Mounting Holes
Inch or metric holes provide flush mounting from the head or cap face. Standard mounting kits can be bolted-on for adapting to a wide range of applications.

Threaded End Cap Construction
Precision-machined, aluminum alloy end caps are black anodized and removable from either end for easy cylinder repair. Construction minimizes cylinder size and weight.

Piston Rod
Ground, polished hard chrome plated steel piston rod. Stainless steel is standard on 20 and 25mm bore. Smooth rod surface finish provides minimum friction and maximum seal life.

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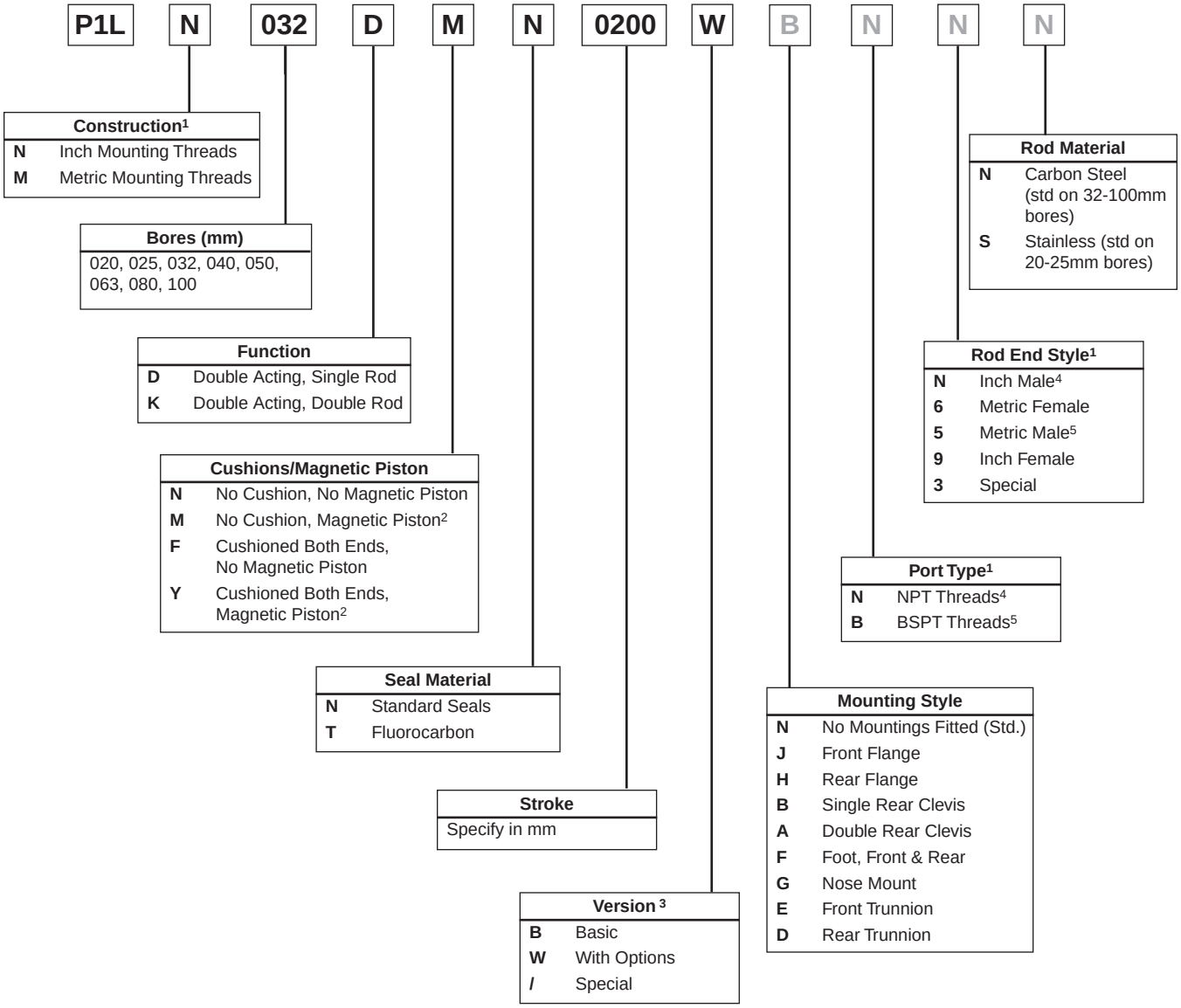

Minimum and Maximum Stroke Length for Standard P1L Cylinders

Bore	Min. Stroke (mm)	Max. Stroke (mm)[6]
20	2	1000
25	2	1000
32	2	1000
40	4	1000
50	5	1000
63	7	1000
80	4	1000
100	4	1000

Notes:

1 When selecting inch or metric construction, be advised that the piston rod end and porting thread will coincide with the mounting thread selected as the standard for the basic cylinder. For example, selecting "M" in the construction field will automatically provide a metric male piston rod end and BSPT ports as standard.

2 Not available with fluorocarbon seal option.

3 If cylinder contains no options, then use "B" as the last digit in the model code. The last 4 boxes are used only when "W" or "/" appears in this field.

4 Standard with Inch Construction

5 Standard with Metric Construction

6 Please consult factory for availability of stroke lengths longer than those listed.

For sensor part numbers and specifications, see the Electronic Sensors Section.

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Specifications

- Bore Sizes: 20 to 100mm (3/4" to 4")
- Rod Diameters: 8 to 32mm (5/16" to 1-1/4")
- Rod Ends: Four Standard, specials to order
- Bumpers standard on both ends
- Adjustable Cushions provided at both ends as an option
- Single End or Double End Mounting
- Mounting Styles: 9 standard
- Rated Air Pressure: 10 bar (145 psi) Non-Lube
- Strokes available in any practical stroke length
- Standard Temperature: -23°C to + 74°C (- 10°F to + 165°F)
- Optional High Temp Service: -23°C to +121°C (-10°F to +250°F)*

*Option intended for limited exposure to temperatures over +80°C or +176°F. This option is primarily for applications which subject the cylinder to fluids that have an adverse effect on external seals.

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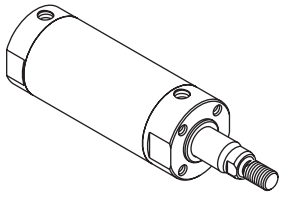
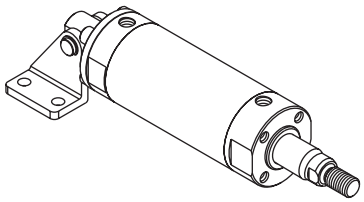
Cylinder Weights

Bore	Base (Lb)	Per 25mm of Stroke (Lb)
20	0.24	0.06
25	0.35	0.08
32	0.55	0.11
40	0.9	0.17
50	1.58	0.25
63	2.19	0.28
80	4	0.41
100	6.75	0.59

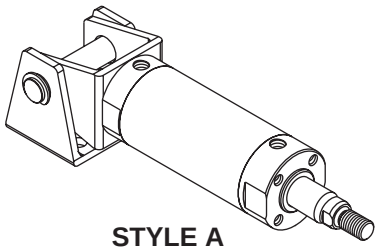
Available Mountings



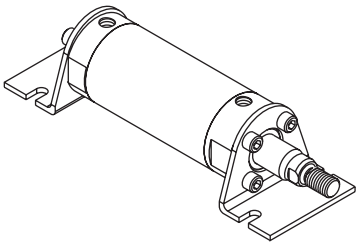
STYLE N
Basic No Mounts



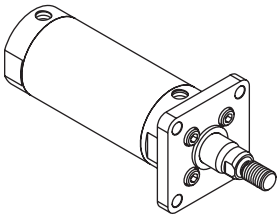
STYLE B
Single Rear Clevis



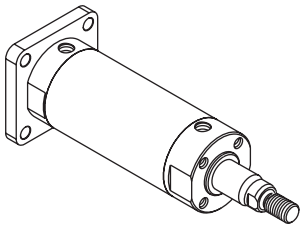
STYLE A
Double Rear Clevis



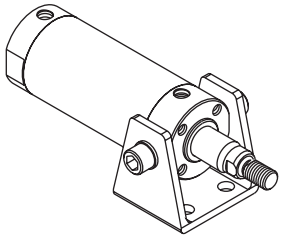
STYLE F
Foot Mount



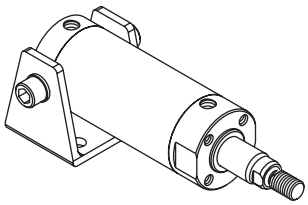
STYLE J
Front Flange



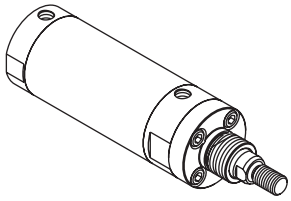
STYLE H
Rear Flange



STYLE E
Front Trunnion



STYLE D
Rear Trunnion



STYLE G
Nose Mount

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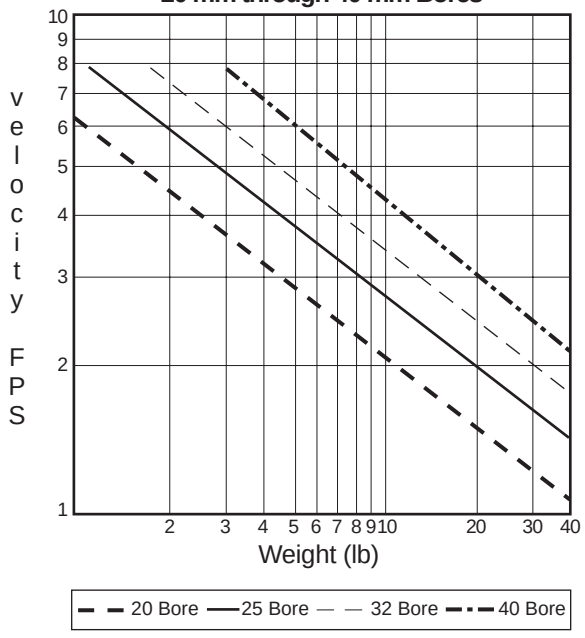
Theoretical Push and Pull Forces in lbs.

Bore mm	Rod Diameter mm	Action	Effective Area in²	Operating Pressure (PSI)				
				40	60	80	100	125
20	0	Extend	0.5	19	29	39	49	61
	8	Retract	0.4	16	24	33	41	51
25	0	Extend	0.8	30	46	61	76	95
	10	Retract	0.6	26	38	51	64	80
32	0	Extend	1.2	50	75	100	125	156
	12	Retract	1.1	43	64	86	107	134
40	0	Extend	1.9	78	117	156	195	243
	16	Retract	1.6	65	98	131	164	204
50	0	Extend	3.0	122	183	243	304	380
	20	Retract	2.6	102	153	204	256	320
63	0	Extend	4.8	193	290	386	483	604
	20	Retract	4.3	174	261	348	434	543
80	0	Extend	7.8	312	467	623	779	974
	25	Retract	7.0	281	422	562	703	879
100	0	Extend	12.2	487	730	974	1217	1522
	32	Retract	10.93	437	656	874	1093	1366

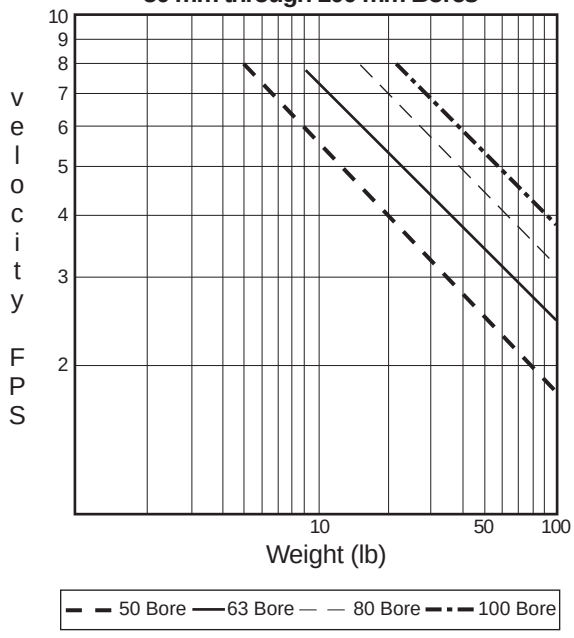
Cushioning Capacity Charts

Use the graphs below to determine whether a cylinder will adequately decelerate a load without damage to the cylinder. Find the point on the graph where the piston rod speed intersects the weight of the load. Any cylinder bore size above the intersect point will adequately decelerate the load at that speed.

20 mm through 40 mm Bores



50 mm through 100 mm Bores



Note: Cushions are recommended for applications with cylinder velocities exceeding 1 ft/sec.

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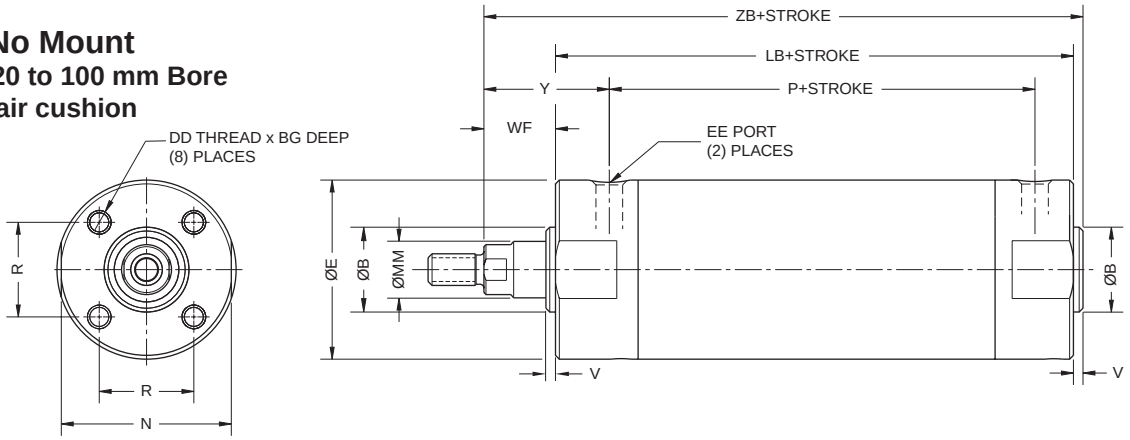
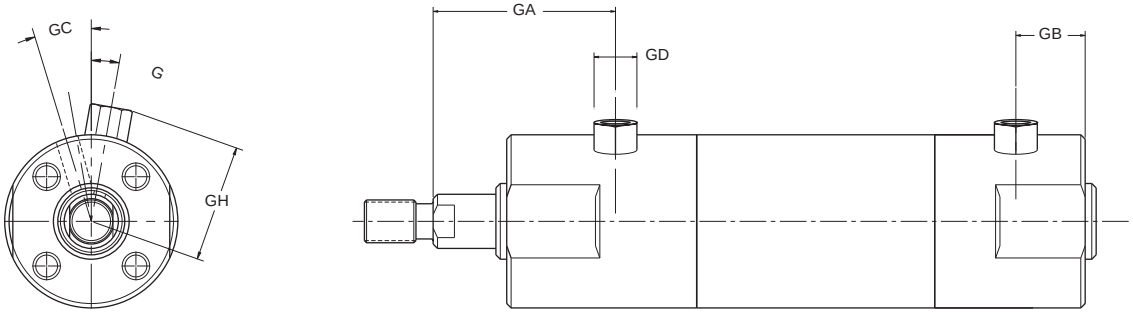
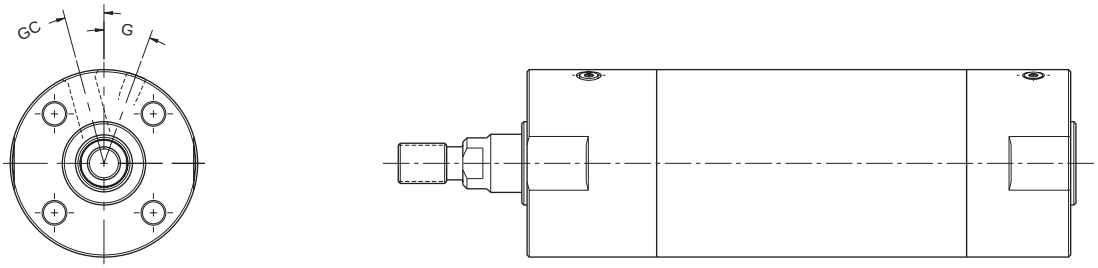
Style N
Basic No Mount
Typical 20 to 100 mm Bore without air cushion



With adjustable air cushion - 20 to 25 mm bores

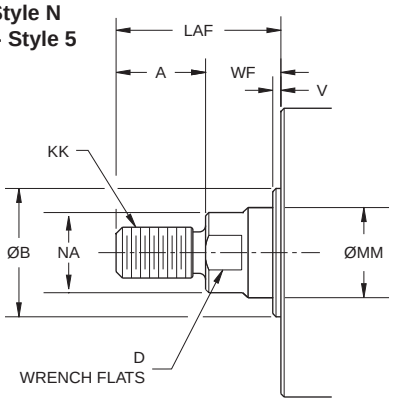


With adjustable air cushion - 32 to 100 mm bores (feature a flush-fit cushion adjustment screw)

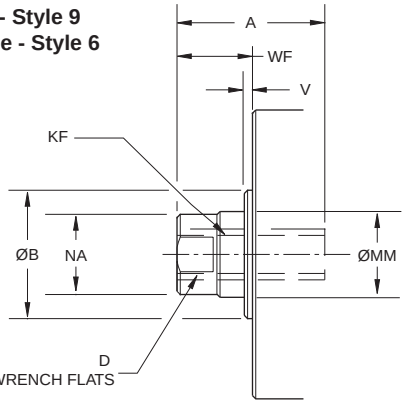


Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3

Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF. If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	DD	BG (Depth)	D	ØE	EE	Thread KK Style 5	Thread KF Style 6	LAF	Ø MM Rod Dia.	N	NA	R	V	WF	Y
20	13	12	M4x0.7	7	6	27	1/8*	M8 x 1.25	M5 x 0.80	26	8	24	–	14	2	13	28
25	13	14	M5x0.8	7.6	8	32	1/8*	M10 x 1.25	M6 x 1.00	29	10	29	–	16.5	2	16	30
32	19	18	M5x0.8	7.6	10	39	1/8	M10 x 1.25	M8 x 1.25	41	12	36	11	20	2	22	40
40	19	25	M6x1	12	12	48.5	1/8	M14 x 1.5	M8 x 1.25	41	16	44	14	26	2	22	42
50	22	30	M8x1.25	16	16	59	1/4	M18 x 1.5	M10 x 1.25	52	20	55	18	32	2	30	53
63	22	32	M10x1.5	16	16	72	1/4	M18 x 1.5	M10 x 1.25	52	20	69	18	38	2	30	53
80	38	40	M10x1.5	22	20	90	3/8	M22 x 1.5	M16 x 1.5	69	25	86	23	50	3	31	59
100	48	50	M12x1.75	22	26	110	1/2	M26 x 1.5	M20 x 1.5	79	32	106	30	60	3	31	57

*Ports are M5 for cushioned versions

Bore	Add Stroke		
	LB	P	ZB
20	69	45	83
25	69	46	86
32	71	43	95
40	78	49	102
50	90	53	122
63	90	52	122
80	108	64	142
100	108	66	142

Bore	Adjustable Air Cushion							
	GA	GB	GD Hex	GC°	G°	GH	EE	Cushion Length
20	33	14	8	13-1/2	25-1/2	20.5	M5 x 0.8	9
25	35	14	8	15-1/2	20-1/2	23	M5 x 0.8	9
32	–	–	–	10-1/2	30-1/2	–	1/8	10
40	–	–	–	10-1/2	22-1/2	–	1/8	12
50	–	–	–	10-1/2	23-1/2	–	1/4	15
63	–	–	–	15-1/2	20-1/2	–	1/4	15
80	–	–	–	15-1/2	25-1/2	–	3/8	15
100	–	–	–	15-1/2	25-1/2	–	1/2	15

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore Size	A	ØB +0 -0.001	DD (UNF)	BG (Depth)	D	ØE	EE (NPTF)	Thread		LAF	ØMM Rod Dia.	N	NA	R	V	WF	Y
								KK (UNF) Style N	KF (UNF) Style 9								
20	0.50	0.472	8-32	0.28	0.24	1.06	1/8†	1/4-28	#10-32	1.00	0.315	0.94	–	0.55	0.08	0.50	1.10
25	0.50	0.551	10-32	0.30	0.31	1.26	1/8†	5/16-24	1/4-28	1.12	0.394	1.14	–	0.65	0.08	0.62	1.18
32	0.75	0.709	10-32	0.30	0.39	1.53	1/8	7/16-20	5/16-24	1.63	0.472	1.42	0.43	0.79	0.08	0.88	1.57
40	0.75	0.984	1/4-28	0.47	0.47	1.91	1/8	7/16-20	3/8-24	1.63	0.630	1.73	0.55	1.02	0.08	0.88	1.65
50	0.88	1.181	5/16-24	0.63	0.63	2.32	1/4	1/2-20	1/2-20	2.07	0.787	2.17	0.71	1.26	0.08	1.19	2.09
63	0.88	1.260	3/8-24	0.63	0.63	2.83	1/4	1/2-20	1/2-20	2.07	0.787	2.72	0.71	1.50	0.08	1.19	2.09
80	1.50	1.575	3/8-24	0.88	0.79	3.54	3/8	3/4-16	5/8-18	2.72	0.984	3.39	0.91	1.97	0.12	1.22	2.32
100	1.88	1.968	1/2-20	0.88	1.02	4.33	1/2	1-14	3/4-16	3.11	1.260	4.17	1.18	2.36	0.12	1.22	2.24

† Ports are 10-32 for cushioned versions

Bore (mm)	Add Stroke		
	LB	P	ZB
20	2.70	1.77	3.28
25	2.70	1.81	3.40
32	2.78	1.69	3.74
40	3.06	1.93	4.02
50	3.53	2.09	4.80
63	3.53	2.05	4.80
80	4.25	2.52	5.59
100	4.25	2.60	5.59

Bore (mm)	Adjustable Air Cushion							
	GA	GB	GD Hex	GC°	G°	GH	EE	Cushion Length
20	1.30	0.55	0.31	13-1/2	25-1/2	0.81	10-32 UNF	0.35
25	1.38	0.55	0.31	15-1/2	20-1/2	0.91	10-32 UNF	0.35
32	–	–	–	10-1/2	30-1/2	–	1/8 NPTF	0.39
40	–	–	–	10-1/2	22-1/2	–	1/8 NPTF	0.47
50	–	–	–	10-1/2	23-1/2	–	1/4 NPTF	0.59
63	–	–	–	15-1/2	20-1/2	–	1/4 NPTF	0.59
80	–	–	–	15-1/2	25-1/2	–	3/8 NPTF	0.59
100	–	–	–	15-1/2	25-1/2	–	1/2 NPTF	0.59

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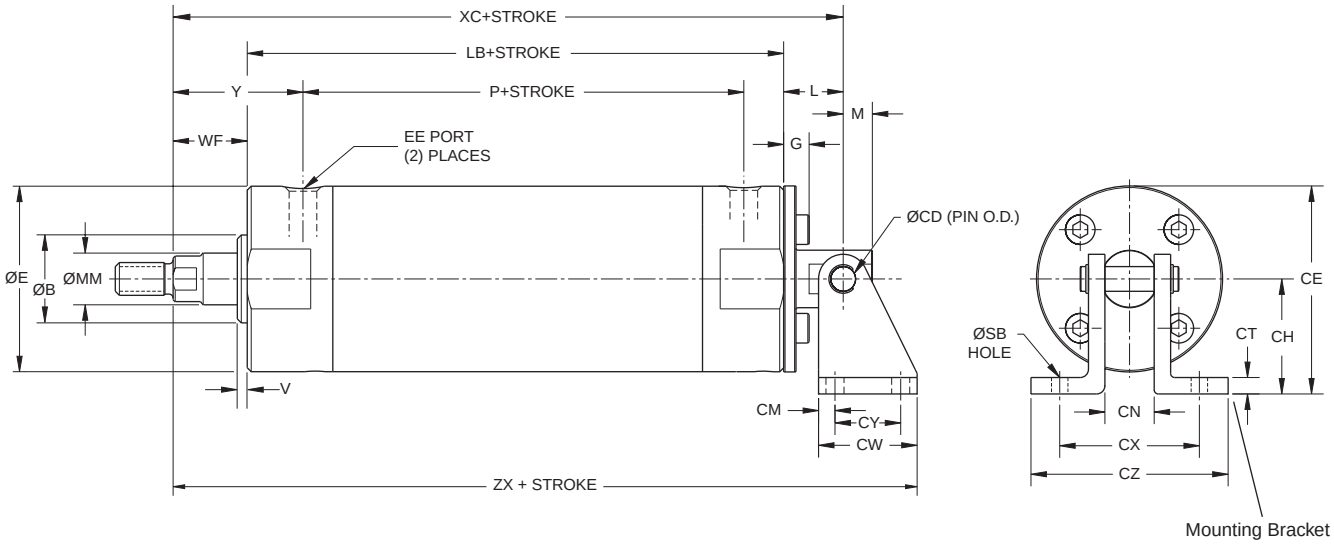
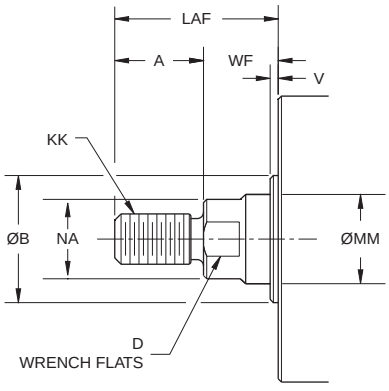
Style B
Single Rear Clevis
Typical 20 to 100 mm Bore



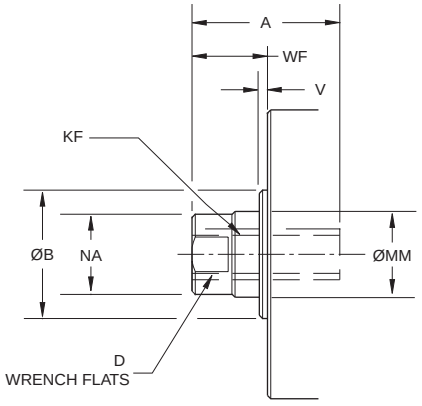
Note: Mating Mounting Bracket and Pin must be ordered as separate items

Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 - 0.02	ØCD h9	D	ØE	EE (BSPT)	G	Thread KK Style 5	Thread KF Style 6	L	LAF	M	ØMM Rod Dia.	NA	V	WF	Y
20	13	12	6.35	6	27	1/8*	7	M8 x 1.25	M5 x 0.80	18	26	7	8	–	2	13	28
25	13	14	6.35	8	32	1/8*	8	M10 x 1.25	M6 x 1.00	17	29	7	10	–	2	16	30
32	19	18	6.35	10	39	1/8	15.5	M10 x 1.25	M8 x 1.25	27	41	10	12	11	2	22	40
40	19	25	9.52	12	48.5	1/8	10	M14 x 1.5	M8 x 1.25	22	41	10	16	14	2	22	42
50	22	30	9.52	16	59	1/4	12	M18 x 1.5	M10 x 1.25	23	52	11	20	18	2	30	53
63	22	32	9.52	16	72	1/4	13	M18 x 1.5	M10 x 1.25	23	52	11	20	18	2	30	53
80	38	40	19.07	20	90	3/8	15	M22 x 1.5	M16 x 1.5	35	69	19	25	23	3	31	59
100	48	50	19.07	26	110	1/2	17	M26 x 1.5	M20 x 1.5	43	79	19	32	30	3	31	57

Bore	CE	CH	CM	CN	CT	CW	CX	CY	CZ	ØSB	Add Stroke			
											LB	P	XC	ZX
20	35.5	22	5	10	3	29	32	19	51	7	69	45	99	120
25	38	22	5	10	3	29	32	19	51	7	69	46	102	123
32	41.5	22	5	13	3	29	35	19	54	7	71	43	120	141
40	59	35	6	16	3	38	47	25	67	7	78	49	122	151
50	64.5	35	6	19	6	38	54	25	76	7	90	53	143	172
63	80	44	6	19	6	38	54	25	76	7	90	52	143	172
80	96	51	13	28	6	64	72	38	104	11	108	64	173	218
100	115	60	13	32	6	70	76	44	108	14	108	66	189	240

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore (mm)	A	ØB +0 - 0.001	ØCD +0 - 0.002	D	ØE	EE (NTPF)	G	Thread KK Style N	Thread KF Style 9	L	LAF	M	ØMM Rod Dia.	NA	V	WF	Y
20	0.50	0.472	0.250	0.24	1.06	1/8†	0.26	1/4-28	#10-32	0.70	1.00	0.28	0.315	–	0.08	0.50	1.10
25	0.50	0.551	0.250	0.31	1.26	1/8†	0.27	5/16-24	1/4-28	0.68	1.12	0.28	0.394	–	0.08	0.62	1.18
32	0.75	0.709	0.250	0.39	1.53	1/8	0.57	7/16-20	5/16-24	1.07	1.63	0.39	0.472	0.43	0.08	0.88	1.57
40	0.75	0.984	0.375	0.47	1.91	1/8	0.36	7/16-20	3/8-24	0.88	1.63	0.38	0.630	0.55	0.08	0.88	1.65
50	0.88	1.181	0.375	0.63	2.32	1/4	0.43	1/2-20	1/2-20	0.91	2.07	0.44	0.787	0.71	0.08	1.19	2.09
63	0.88	1.260	0.375	0.63	2.83	1/4	0.46	1/2-20	1/2-20	0.91	2.07	0.44	0.787	0.71	0.08	1.19	2.09
80	1.50	1.575	0.751	0.79	3.54	3/8	0.54	3/4-16	5/8-18	1.38	2.72	0.75	0.984	0.91	0.12	1.22	2.32
100	1.88	1.968	0.751	1.02	4.33	1/2	0.64	1-14	3/4-16	1.69	3.11	0.75	1.260	1.18	0.12	1.22	2.24

Bore (mm)	CE	CH	CM	CN	CT	CW	CX	CY	CZ	ØSB	Add Stroke			
											LB	P	XC	ZX
20	1.39	0.87	0.19	0.38	0.12	1.13	1.25	0.75	2.00	0.27	2.70	1.77	3.91	4.74
25	1.49	0.87	0.19	0.38	0.12	1.13	1.25	0.75	2.00	0.27	2.70	1.81	4.00	4.83
32	1.63	0.87	0.19	0.50	0.12	1.13	1.38	0.75	2.12	0.27	2.78	1.69	4.72	5.55
40	2.31	1.38	0.25	0.62	0.12	1.50	1.86	1.00	2.62	0.27	3.06	1.93	4.81	5.94
50	2.52	1.38	0.25	0.75	0.25	1.50	2.12	1.00	3.00	0.27	3.53	2.09	5.63	6.76
63	3.17	1.75	0.25	0.75	0.25	1.50	2.12	1.00	3.00	0.27	3.53	2.05	5.63	6.76
80	3.77	2.00	0.50	1.09	0.25	2.50	2.84	1.50	4.09	0.42	4.25	2.52	6.82	8.57
100	4.54	2.37	0.50	1.25	0.25	2.75	3.00	1.75	4.25	0.55	4.25	2.60	7.44	9.44

† Ports are 10-32 for cushioned versions

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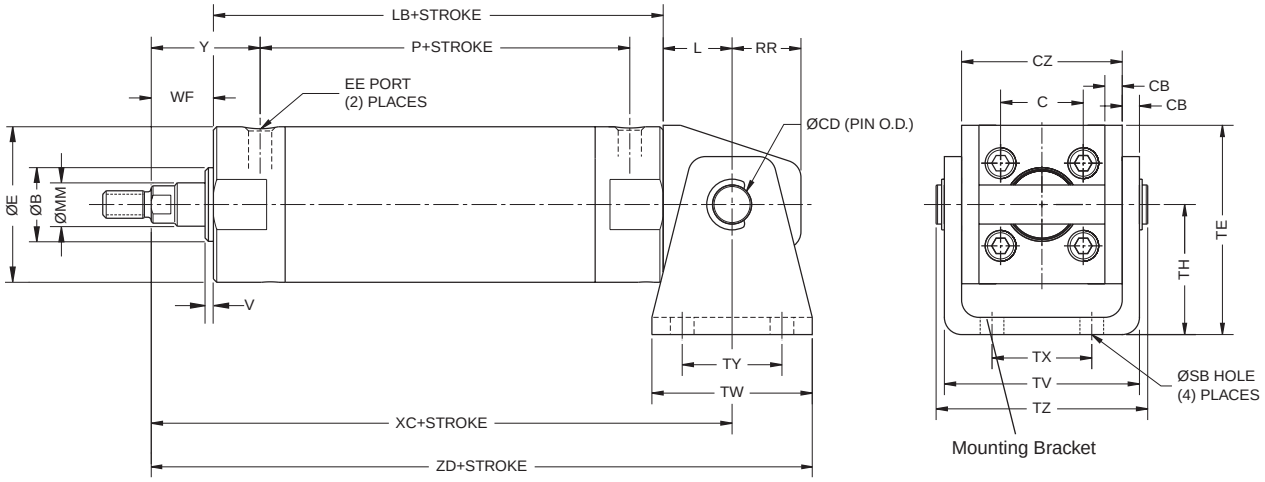
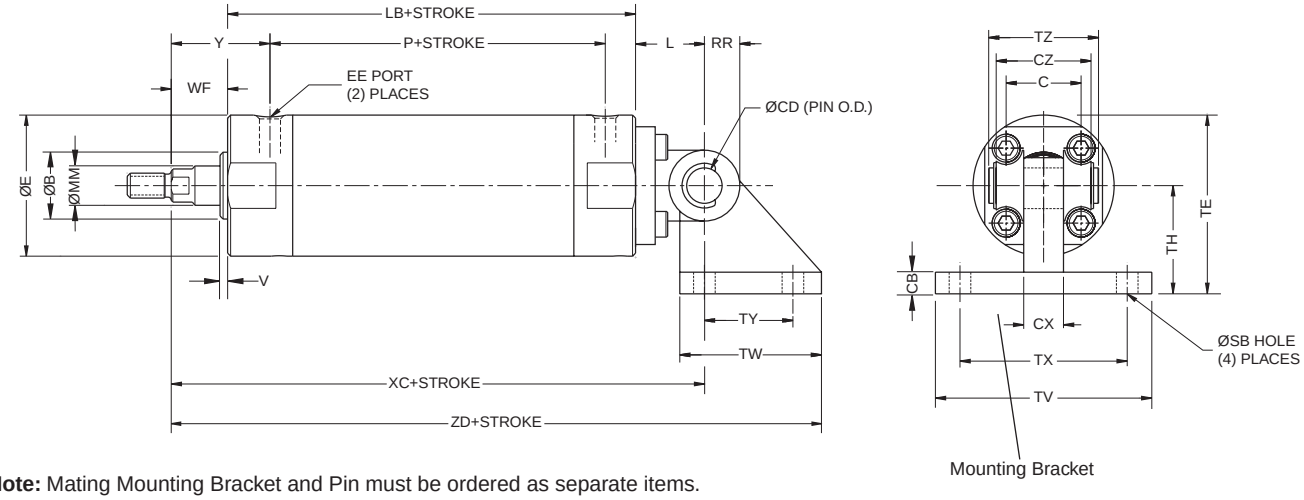
Style A
Double Rear Clevis
Typical 20 to 63 mm Bore



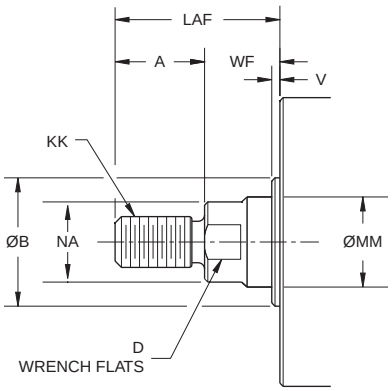
Style A
Double Rear Clevis
Typical 80 to 100 mm Bore



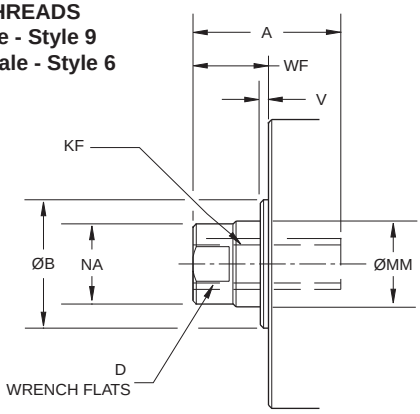
Note: Mating Mounting Bracket and Pin must be ordered as separate items.

Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify "Style 3" and give desired dimensions for KK or KF, A and LAF or WF. If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	C	CB	ØCD d 9	CZ	CX	D	ØE	EE (BSPT)	Thread KK Style 5	Thread KF Style 6	L	LAF	ØMM Rod Dia.	NA	RR	V	WF
20	13	12	14	3	8	29	–	6	27	1/8*	M8x1.25	M5x0.80	14	26	8	–	11	2	13
25	13	14	16.5	3	10	33	–	8	32	1/8*	M10x1.25	M6x1.00	16	29	10	–	13	2	16
32	19	18	20	4.5	12	40	–	10	39	1/8	M10x1.25	M8x1.25	20	41	12	11	15	2	22
40	19	25	26	4.5	14	49	–	12	48.5	1/8	M14x1.5	M8x1.25	22	41	16	14	18	2	22
50	22	30	32	6	16	60	–	16	59	1/4	M18x1.5	M10x1.25	25	52	20	18	20	2	30
63	22	32	38	8	18	74	–	16	72	1/4	M18x1.5	M10x1.25	30	52	20	18	22	2	30
80	38	40	50	11	18	56	28	20	90	3/8	M22x1.5	M16x1.5	35	69	25	23	18	3	31
100	48	50	60	12	22	64	32	26	110	1/2	M26x1.5	M20x1.5	43	79	32	30	22	3	31

Bore	Ø SB	TY	TV	TE	TH	TX	TW	TZ	Y	Add Stroke			
										LB	P	XC	ZD
20	5.5	28	35	38	25	16	42	43.4	28	69	45	95	116
25	5.5	28	39	45.5	30	20	42	48	30	69	46	100	121
32	7	28	49	54	35	22	48	59.4	40	71	43	113	137
40	7	30	58	63.5	40	30	56	71.4	42	78	49	122	150
50	9	36	72	79	50	36	64	86	53	90	53	145	177
63	11	46	90	96	60	46	74	105.4	53	90	52	150	187
80	11	45	110	100	55	85	72	64	59	108	64	174	232.5
100	13.5	60	130	120	65	100	93	72	57	108	66	182	258.5

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore (mm)	A	ØB +0 -0.001	C	CB	ØCD -0.001 -0.003	CZ	CX	D	ØE	EE (NPTF)	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	L	LAF	Ø MM	NA	RR	V	WF
20	0.50	0.472	0.55	0.12	0.315	1.14	–	0.24	1.06	1/8†	1/4-28	#10-32	0.55	1.00	0.315	–	0.43	0.08	0.50
25	0.50	0.551	0.65	0.12	0.394	1.30	–	0.31	1.26	1/8†	5/16-24	1/4-28	0.63	1.12	0.394	–	0.51	0.08	0.62
32	0.75	0.709	0.79	0.18	0.472	1.57	–	0.39	1.53	1/8	7/16-20	5/16-24	0.79	1.63	0.472	0.43	0.59	0.08	0.88
40	0.75	0.984	1.02	0.18	0.551	1.93	–	0.47	1.91	1/8	7/16-20	3/8-24	0.87	1.63	0.630	0.55	0.71	0.08	0.88
50	0.88	1.181	1.26	0.25	0.630	2.36	–	0.63	2.32	1/4	1/2-20	1/2-20	0.98	2.07	0.787	0.71	0.79	0.08	1.19
63	0.88	1.260	1.50	0.31	0.709	2.91	–	0.63	2.83	1/4	1/2-20	1/2-20	1.18	2.07	0.787	0.71	0.87	0.08	1.19
80	1.50	1.575	1.97	0.43	0.709	2.20	1.10	0.79	3.54	3/8	3/4-16	5/8-18	1.38	2.72	0.984	0.91	0.71	0.12	1.22
100	1.88	1.968	2.36	0.47	0.866	2.52	1.26	1.02	4.33	1/2	1-14	3/4-16	1.69	3.11	1.260	1.18	0.87	0.12	1.22

Bore (mm)	ØSB	TY	TV	TE	TH	TX	TW	TZ	Y	Add Stroke			
										LB	P	XC	ZD
20	0.22	1.10	1.39	1.50	0.98	0.63	1.66	1.71	1.10	2.70	1.77	3.75	4.58
25	0.22	1.10	1.55	1.79	1.18	0.79	1.66	1.89	1.18	2.70	1.81	3.95	4.78
32	0.28	1.10	1.93	2.13	1.38	0.87	1.88	2.34	1.57	2.78	1.69	4.45	5.39
40	0.28	1.18	2.28	2.50	1.57	1.18	2.20	2.81	1.65	3.06	1.93	4.81	5.91
50	0.35	1.42	2.83	3.11	1.97	1.42	2.52	3.38	2.09	3.53	2.09	5.70	6.96
63	0.43	1.81	3.54	3.78	2.36	1.81	2.91	4.15	2.09	3.53	2.05	5.90	7.36
80	0.43	1.77	4.33	3.94	2.17	3.35	2.83	2.52	2.32	4.25	2.52	6.85	9.15
100	0.53	2.36	5.12	4.72	2.56	3.94	3.66	2.83	2.24	4.25	2.60	7.17	10.18

†Ports are 10-32 for cushioned versions

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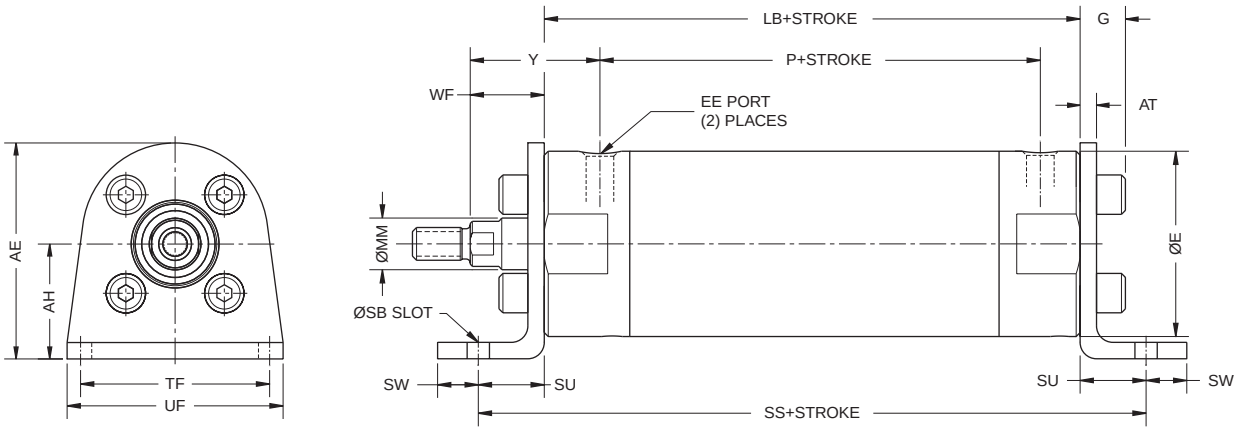
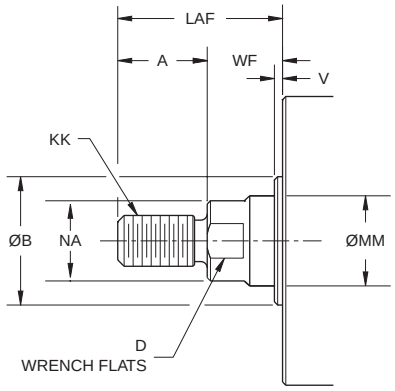
D

Style F
Foot Mount
Typical 20 to 100 mm Bore

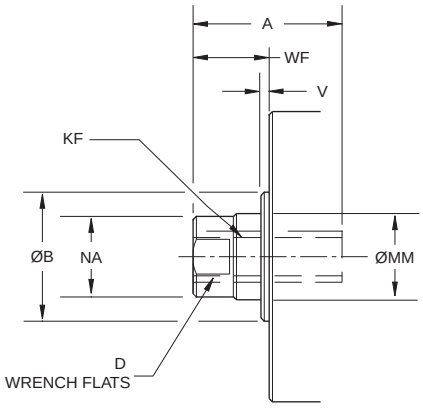


Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	AE	AH	AT	ØB +0 -0.02	D	ØE	EE (BSPT)	G	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NA	ØSB
20	13	36.5	20.6	3	12	6	27	1/8*	6	M8x1.25	M5x0.80	26	8	–	7
25	13	38.5	20.6	3	14	8	32	1/8*	6.5	M10x1.25	M6x1.00	29	10	–	7
32	19	46.5	25.4	3	18	10	39	1/8	6.5	M10x1.25	M8x1.25	41	12	11	7
40	19	51	25.4	3	25	12	48.5	1/8	7	M14x1.5	M8x1.25	41	16	14	7
50	22	72	38.1	6	30	16	59	1/4	11	M18x1.5	M10x1.25	52	20	18	9
63	22	83.5	44.5	6	32	16	72	1/4	12	M18x1.5	M10x1.25	52	20	18	9
80	38	101	55	6	40	20	90	3/8	12	M22x1.5	M16x1.5	69	25	23	11
100	48	121	65	6	50	26	110	1/2	13	M26x1.5	M20x1.5	79	32	30	14

Bore	SU	SW	TF	UF	V	WF	Y	Add Stroke		
								LB	P	SS
20	14	11	38	48	2	13	28	69	45	97
25	14	11	38	48	2	16	30	69	46	97
32	19	19	48	63.5	2	22	40	71	43	109
40	18	20	48	63.5	2	22	42	78	49	114
50	25	16	57	79	2	30	53	90	53	140
63	25	16	73	95	2	30	53	90	52	140
80	28.5	14	100	125	3	31	59	108	64	165
100	30	16	120	150	3	31	57	108	66	168

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore	A	AE	AH	AT	ØB +0 -0.001	D	Ø E	EE (NPTF)	G	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM	NA	ØSB
20	0.50	1.44	0.81	0.12	0.472	0.24	1.06	1/8†	0.20	1/4-28	#10-32	1.00	0.315	–	0.27
25	0.50	1.52	0.81	0.12	0.551	0.31	1.26	1/8†	0.22	5/16-24	1/4-28	1.12	0.394	–	0.27
32	0.75	1.83	1.00	0.12	0.709	0.39	1.53	1/8	0.22	7/16-20	5/16-24	1.63	0.472	0.43	0.28
40	0.75	2.02	1.00	0.12	0.984	0.47	1.91	1/8	0.25	7/16-20	3/8-24	1.63	0.630	0.55	0.28
50	0.88	2.84	1.50	0.25	1.181	0.63	2.32	1/4	0.41	1/2-20	1/2-20	2.07	0.787	0.71	0.34
63	0.88	3.29	1.75	0.25	1.260	0.63	2.83	1/4	0.44	1/2-20	1/2-20	2.07	0.787	0.71	0.34
80	1.50	3.98	2.17	0.25	1.575	0.79	3.54	3/8	0.44	3/4-16	5/8-18	2.72	0.984	0.91	0.43
100	1.88	4.76	2.56	0.25	1.968	1.02	4.33	1/2	0.50	1-14	3/4-16	3.11	1.260	1.18	0.55

Bore (mm)	SU	SW	TF	UF	V	WF	Y	Add Stroke		
								LB	P	SS
20	0.56	0.44	1.50	1.88	0.08	0.50	1.10	2.70	1.77	3.82
25	0.56	0.44	1.50	1.88	0.08	0.62	1.18	2.70	1.81	3.82
32	0.75	0.75	1.88	2.50	0.08	0.88	1.57	2.78	1.69	4.28
40	0.72	0.78	1.88	2.50	0.08	0.88	1.65	3.06	1.93	4.50
50	1.00	0.62	2.24	3.12	0.08	1.19	2.09	3.53	2.09	5.53
63	1.00	0.62	2.88	3.75	0.08	1.19	2.09	3.53	2.05	5.53
80	1.12	0.55	3.94	4.92	0.12	1.22	2.32	4.25	2.52	6.49
100	1.18	0.63	4.72	5.91	0.12	1.22	2.24	4.25	2.60	6.61

† Ports are 10-32 for cushioned versions

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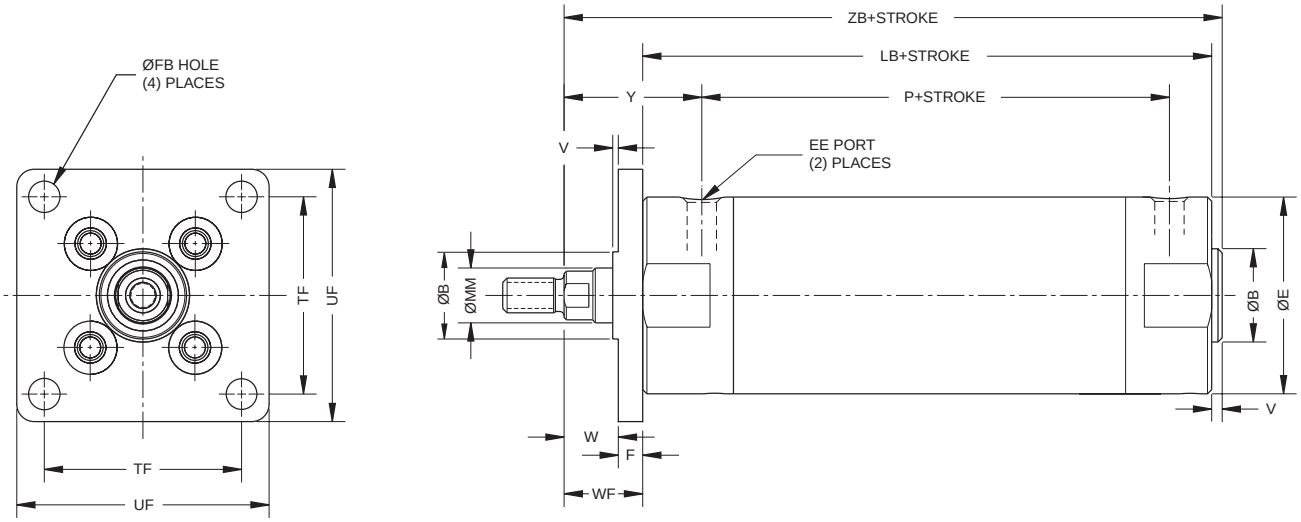
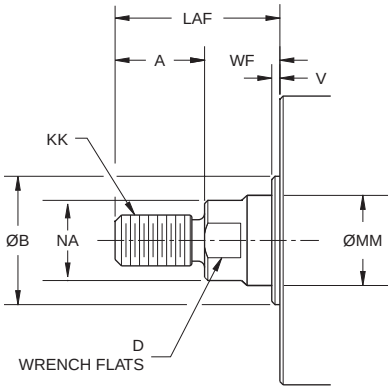
D

Style J
Front Flange
Typical 20 to 100 mm Bore

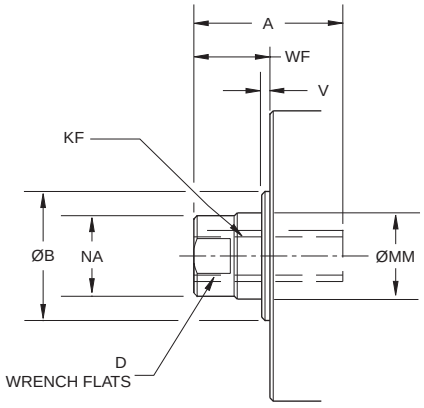


Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

Parker Hannifin Corporation
Pneumatic Division
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C086

Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	D	ØE	EE (BSPT)	F	ØFB	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NA	TF	UF	V	WF	W	Y
20	13	12	6	27	1/8*	6	5.5	M8x1.25	M5x0.80	26	8	–	28	40	2	13	7	28
25	13	14	8	32	1/8*	7	5.5	M10x1.25	M6x1.00	29	10	–	32	44	2	16	9	30
32	19	18	10	39	1/8	7	7	M10x1.25	M8x1.25	41	12	11	38	53	2	22	15	40
40	19	25	12	48.5	1/8	8	7	M14x1.5	M8x1.25	41	16	14	46	61	2	22	14	42
50	22	30	16	59	1/4	9	9	M18x1.5	M10x1.25	52	20	18	58	76	2	30	21	53
63	22	32	16	72	1/4	9	11	M18x1.5	M10x1.25	52	20	18	70	92	2	30	21	53
80	38	40	20	90	3/8	11	11	M22x1.5	M16x1.5	69	25	23	82	104	3	31	20	59
100	48	50	26	110	1/2	14	14	M26x1.5	M20x1.5	79	32	30	100	128	3	31	17	57

Bore	Add Stroke		
	LB	P	ZB
20	69	45	83
25	69	46	86
32	71	43	95
40	78	49	102
50	90	53	122
63	90	52	122
80	108	64	142
100	108	66	142

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore (mm)	A	ØB +0 -0.001	D	ØE	EE (NPTF)	F	ØFB	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	NA	TF	UF	V	WF	W	Y
20	0.50	0.472	0.24	1.06	1/8†	0.24	0.22	1/4-28	#10-32	1.00	0.315	–	1.10	1.57	0.08	0.50	0.26	1.10
25	0.50	0.551	0.31	1.26	1/8†	0.28	0.22	5/16-24	1/4-28	1.12	0.394	–	1.26	1.73	0.08	0.62	0.34	1.18
32	0.75	0.709	0.39	1.53	1/8	0.28	0.28	7/16-20	5/16-24	1.63	0.472	0.43	1.50	2.09	0.08	0.88	0.60	1.57
40	0.75	0.984	0.47	1.91	1/8	0.31	0.28	7/16-20	3/8-24	1.63	0.630	0.55	1.81	2.40	0.08	0.88	0.57	1.65
50	0.88	1.181	0.63	2.32	1/4	0.35	0.35	1/2-20	1/2-20	2.07	0.787	0.71	2.28	3.00	0.08	1.19	0.84	2.09
63	0.88	1.260	0.63	2.83	1/4	0.35	0.43	1/2-20	1/2-20	2.07	0.787	0.71	2.76	3.62	0.08	1.19	0.84	2.09
80	1.50	1.575	0.79	3.54	3/8	0.43	0.43	3/4-16	5/8-18	2.72	0.984	0.91	3.23	4.09	0.12	1.22	0.79	2.32
100	1.88	1.968	1.02	4.33	1/2	0.55	0.55	1-14	3/4-16	3.11	1.260	1.18	3.94	5.04	0.12	1.22	0.67	2.24

Bore (mm)	Add Stroke		
	LB	P	ZB
20	2.70	1.77	3.28
25	2.70	1.81	3.40
32	2.78	1.69	3.74
40	3.06	1.93	4.02
50	3.53	2.09	4.80
63	3.53	2.05	4.80
80	4.25	2.52	5.59
100	4.25	2.60	5.59

† Ports are 10-32 for cushioned versions

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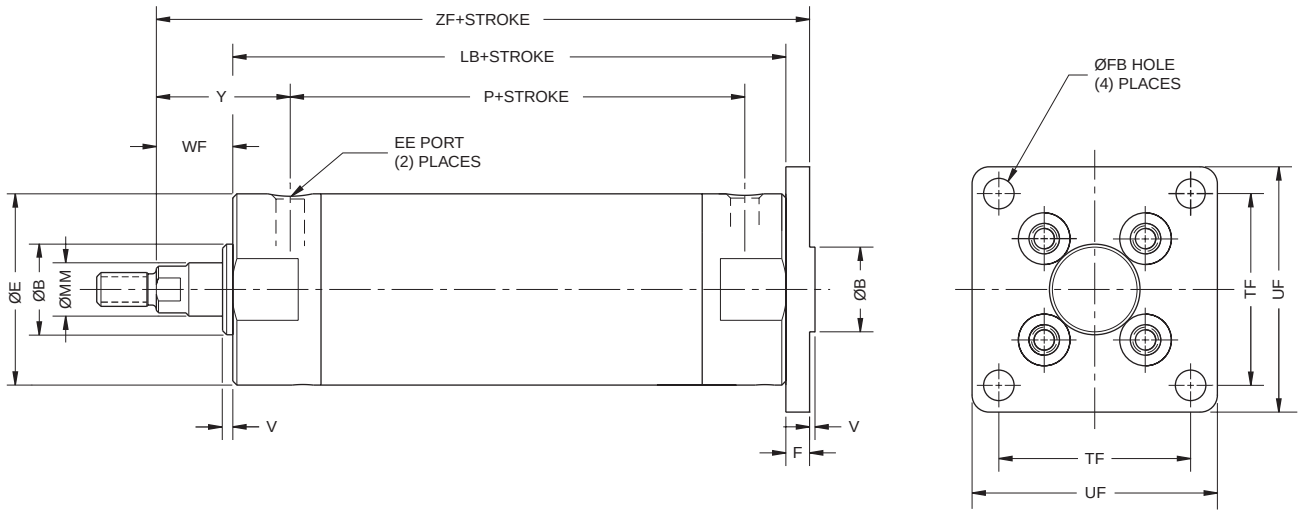
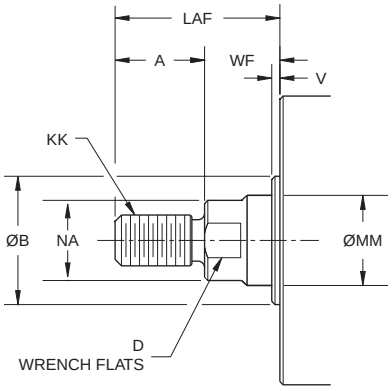
D

Style H
Rear Flange
Typical 20 to 100 mm Bore

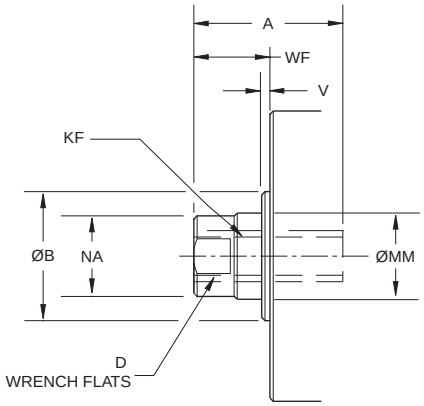


Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	D	ØE	EE (BSPT)	F	ØFB	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NA	TF	UF	V	WF	Y
20	13	12	6	27	1/8*	6	5.5	M8x1.25	M5x0.80	26	8	–	28	40	2	13	28
25	13	14	8	32	1/8*	7	5.5	M10x1.25	M6x1.00	29	10	–	32	44	2	16	30
32	19	18	10	39	1/8	7	7	M10x1.25	M8x1.25	41	12	11	38	53	2	22	40
40	19	25	12	48.5	1/8	8	7	M14x1.5	M8x1.25	41	16	14	46	61	2	22	42
50	22	30	16	59	1/4	9	9	M18x1.5	M10x1.25	52	20	18	58	76	2	30	53
63	22	32	16	72	1/4	9	11	M18x1.5	M10x1.25	52	20	18	70	92	2	30	53
80	38	40	20	90	3/8	11	11	M22x1.5	M16x1.5	69	25	23	82	104	3	31	59
100	48	50	26	110	1/2	14	14	M26x1.5	M20x1.5	79	32	30	100	128	3	31	57

Bore	Add Stroke		
	LB	P	ZF
20	69	45	87
25	69	46	91
32	71	43	100
40	78	49	108
50	90	53	129
63	90	52	129
80	108	64	150
100	108	66	153

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore (mm)	A	ØB +0 -0.001	D	ØE	EE (NPTF)	F	ØFB	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	NA	TF	UF	V	WF	Y
20	0.50	0.472	0.24	1.06	1/8†	0.24	0.22	1/4-28	#10-32	1.00	0.315	–	1.10	1.57	0.08	0.50	1.10
25	0.50	0.551	0.31	1.26	1/8†	0.28	0.22	5/16-24	1/4-28	1.12	0.394	–	1.26	1.73	0.08	0.62	1.18
32	0.75	0.709	0.39	1.53	1/8	0.28	0.28	7/16-20	5/16-24	1.63	0.472	0.43	1.50	2.09	0.08	0.88	1.57
40	0.75	0.984	0.47	1.91	1/8	0.31	0.28	7/16-20	3/8-24	1.63	0.630	0.55	1.81	2.40	0.08	0.88	1.65
50	0.88	1.181	0.63	2.32	1/4	0.35	0.35	1/2-20	1/2-20	2.07	0.787	0.71	2.28	3.00	0.08	1.19	2.09
63	0.88	1.260	0.63	2.83	1/4	0.35	0.43	1/2-20	1/2-20	2.07	0.787	0.71	2.76	3.62	0.08	1.19	2.09
80	1.50	1.575	0.79	3.54	3/8	0.43	0.43	3/4-16	5/8-18	2.72	0.984	0.91	3.23	4.09	0.12	1.22	2.32
100	1.88	1.968	1.02	4.33	1/2	0.55	0.55	1-14	3/4-16	3.11	1.260	1.18	3.94	5.04	0.12	1.22	2.24

Bore (mm)	Add Stroke		
	LB	P	ZF
20	2.70	1.77	3.44
25	2.70	1.81	3.60
32	2.78	1.69	3.94
40	3.06	1.93	4.25
50	3.53	2.09	5.07
63	3.53	2.05	5.07
80	4.25	2.52	5.91
100	4.25	2.60	6.02

† Ports are 10-32 for cushioned versions

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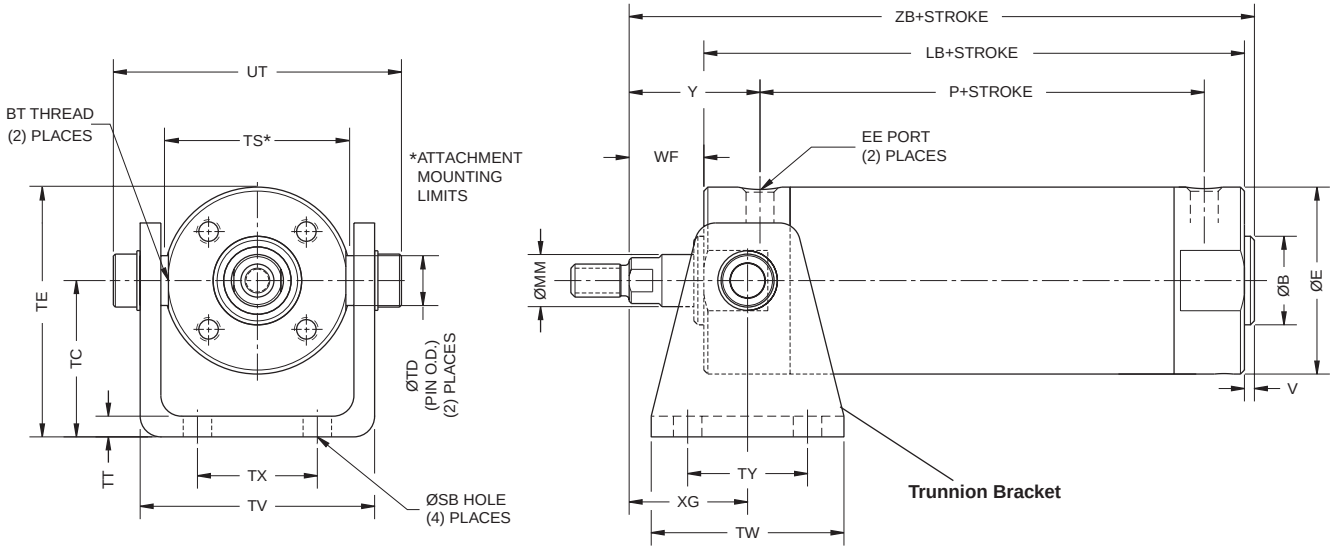
D

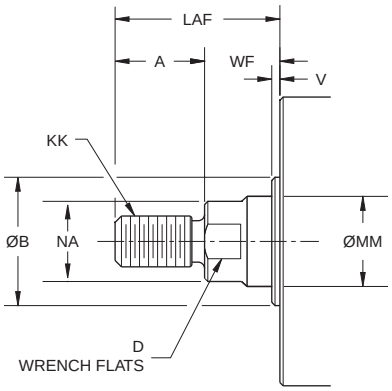
Style E
Front Trunnion
Typical 20 to 63 mm Bore



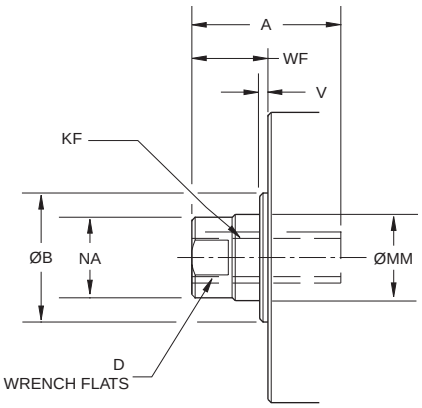
Note: Trunnion Bracket must be ordered as separate item

Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	BT	D	ØE	EE (BSPT)	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NA	V	WF	XG	Y	ØSB
20	13	12	M5x0.80	6	27	1/8*	M8x1.25	M5x0.80	26	8	–	2	13	24	28	5.5
25	13	14	M6x0.75	8	32	1/8*	M10x1.25	M6x1.00	29	10	–	2	16	27	30	5.5
32	19	18	M8x1.00	10	39	1/8	M10x1.25	M8x1.25	41	12	11	2	22	33	40	7
40	19	25	M10x1.25	12	48.5	1/8	M14x1.5	M8x1.25	41	16	14	2	22	34	42	7
50	22	30	M12x1.25	16	59	1/4	M18x1.5	M10x1.25	52	20	18	2	30	43	53	9
63	22	32	M14x1.50	16	72	1/4	M18x1.5	M10x1.25	52	20	18	2	30	43	53	11

Bore	TC	ØTD e8	TE	TS	TT	TV	TW	TX	TY	UT	Add Stroke		
											LB	P	ZB
20	25	8	38.5	28	3	35	42	16	28	47.5	69	45	83
25	30	10	46	33	3	39	42	20	28	53	69	46	86
32	35	12	54.5	40	4.5	49	48	22	28	68	71	43	95
40	40	14	64	49	4.5	58	56	30	30	79	78	49	102
50	50	16	79.5	60	6	72	64	36	36	99	90	53	122
63	60	18	96	74	8	90	74	46	46	119	90	52	122

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore (mm)	A	ØB +0 -0.001	BT	D	ØE	EE (NPTF)	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	NA	V	WF	XG	Y	ØSB
20	0.50	0.472	M5x0.80	0.24	1.06	1/8†	1/4-28	#10-32	1.00	0.315	–	0.08	0.50	0.93	1.10	0.22
25	0.50	0.551	M6x0.75	0.31	1.26	1/8†	5/16-24	1/4-28	1.12	0.394	–	0.08	0.62	1.05	1.18	0.22
32	0.75	0.709	M8x1.00	0.39	1.53	1/8	7/16-20	5/16-24	1.63	0.472	0.43	0.08	0.88	1.31	1.57	0.28
40	0.75	0.984	M10x1.25	0.47	1.91	1/8	7/16-20	3/8-24	1.63	0.630	0.55	0.08	0.88	1.35	1.65	0.28
50	0.88	1.181	M12x1.25	0.63	2.32	1/4	1/2-20	1/2-20	2.07	0.787	0.71	0.08	1.19	1.70	2.09	0.35
63	0.88	1.260	M14x1.50	0.63	2.83	1/4	1/2-20	1/2-20	2.07	0.787	0.71	0.08	1.19	1.70	2.09	0.43

Bore (mm)	TC	ØTD	TE	TS	TT	TV	TW	TX	TY	UT	Add Stroke		
											LB	P	ZB
20	0.98	0.315	1.51	1.10	0.12	1.39	1.66	0.63	1.10	1.87	2.70	1.77	3.28
25	1.18	0.394	1.81	1.30	0.12	1.55	1.66	0.79	1.10	2.09	2.70	1.81	3.40
32	1.38	0.472	2.15	1.58	0.18	1.93	1.88	0.87	1.10	2.67	2.78	1.69	3.74
40	1.57	0.551	2.53	1.93	0.18	2.28	2.20	1.18	1.18	3.10	3.06	1.93	4.02
50	1.97	0.630	3.13	2.36	0.25	2.83	2.52	1.42	1.42	3.88	3.53	2.09	4.80
63	2.36	0.709	3.78	2.91	0.31	3.54	2.91	1.81	1.81	4.69	3.53	2.05	4.80

† Ports are 10-32 for cushioned versions

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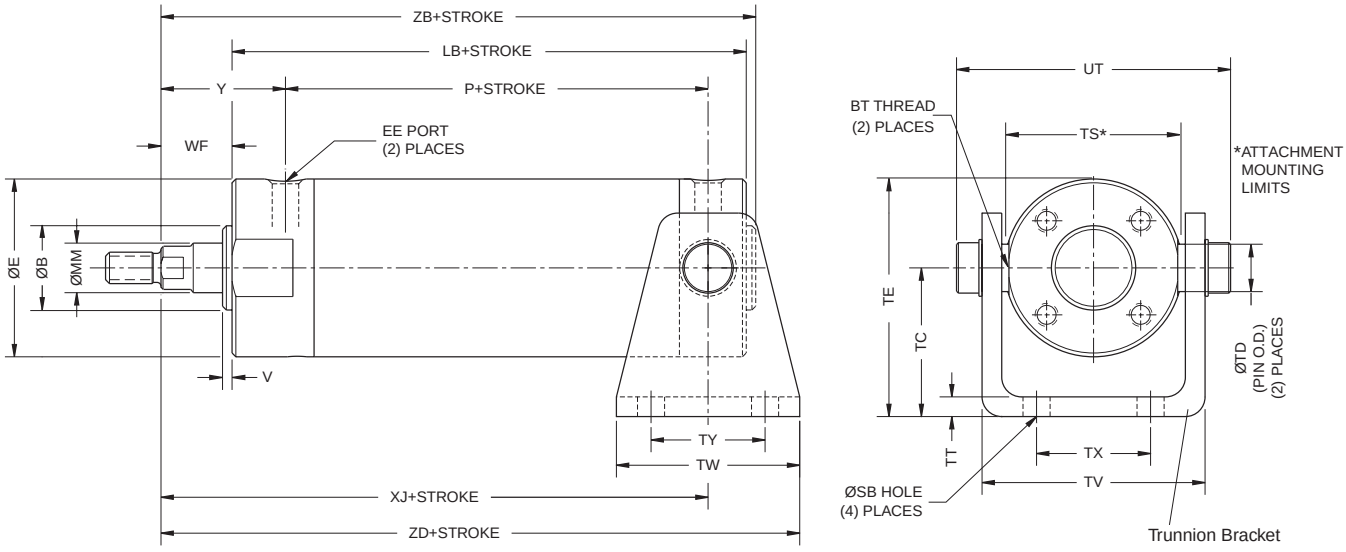
D

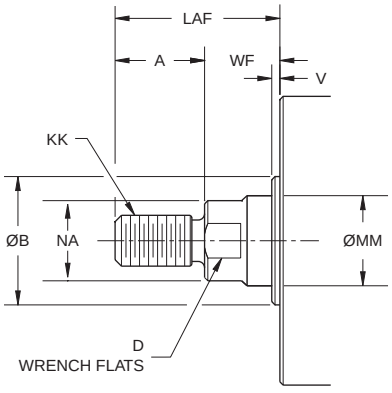
Style D
Rear Trunnion
Typical 20 to 63 mm Bore



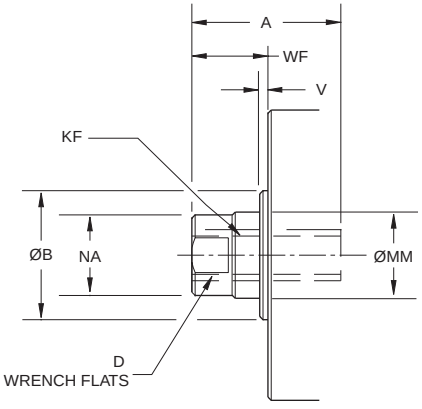
Note: Trunnion Bracket must be ordered as separate item

Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	BT	D	ØE	EE (BSPT)	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NA	V	WF	Y	ØSB	TC
20	13	12	M5x0.80	6	27	1/8*	M8x1.25	M5x0.80	26	8	–	2	13	28	5.5	25
25	13	14	M6x0.75	8	32	1/8*	M10x1.25	M6x1.00	29	10	–	2	16	30	5.5	30
32	19	18	M8x1.00	10	39	1/8	M10x1.25	M8x1.25	41	12	11	2	22	40	7	35
40	19	25	M10x1.25	12	48.5	1/8	M14x1.5	M8x1.25	41	16	14	2	22	42	7	40
50	22	30	M12x1.25	16	59	1/4	M18x1.5	M10x1.25	52	20	18	2	30	53	9	50
63	22	32	M14x1.50	16	72	1/4	M18x1.5	M10x1.25	52	20	18	2	30	53	11	60

Bore	ØTD e8	TE	TS	TT	TV	TW	TX	TY	UT	Add Stroke				
										LB	P	XJ	ZB	ZD
20	8	38.5	28	3	35	42	16	28	47.5	69	45	70	83	91
25	10	46	33	3	39	42	20	28	53	69	46	73	86	94
32	12	54.5	40	4.5	49	48	22	28	68	71	43	83	95	107
40	14	64	49	4.5	58	56	30	30	79	78	49	90	102	118
50	16	79.5	60	6	72	64	36	36	99	90	53	108	122	140
63	18	96	74	8	90	74	46	46	119	90	52	108	122	145

***Ports are M5 for cushioned versions**

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore	A	ØB +0 -0.001	BT	D	ØE	EE (NPTF)	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	NA	V	WF	Y	ØSB	TC
20	0.50	0.472	M5x0.80	0.24	1.06	1/8†	1/4-28	#10-32	1.00	0.315	–	0.08	0.50	1.10	0.22	0.98
25	0.50	0.551	M6x0.75	0.31	1.26	1/8†	5/16-24	1/4-28	1.12	0.394	–	0.08	0.62	1.18	0.22	1.18
32	0.75	0.709	M8x1.00	0.39	1.53	1/8	7/16-20	5/16-24	1.63	0.472	0.43	0.08	0.88	1.57	0.28	1.38
40	0.75	0.984	M10x1.25	0.47	1.91	1/8	7/16-20	3/8-24	1.63	0.630	0.55	0.08	0.88	1.65	0.28	1.57
50	0.88	1.181	M12x1.25	0.63	2.32	1/4	1/2-20	1/2-20	2.07	0.787	0.71	0.08	1.19	2.09	0.35	1.97
63	0.88	1.260	M14x1.50	0.63	2.83	1/4	1/2-20	1/2-20	2.07	0.787	0.71	0.08	1.19	2.09	0.43	2.36

Bore (mm)	ØTD -0.001 -0.002	TE	TS	TT	TV	TW	TX	TY	UT	Add Stroke				
										LB	P	XJ	ZB	ZD
20	0.315	1.51	1.10	0.12	1.39	1.66	0.63	1.10	1.87	2.70	1.77	2.77	3.28	3.60
25	0.394	1.81	1.30	0.12	1.55	1.66	0.79	1.10	2.09	2.70	1.81	2.89	3.40	3.72
32	0.472	2.15	1.58	0.18	1.93	1.88	0.87	1.10	2.67	2.78	1.69	3.27	3.74	4.21
40	0.551	2.53	1.93	0.18	2.28	2.20	1.18	1.18	3.10	3.06	1.93	3.54	4.02	4.64
50	0.630	3.13	2.36	0.25	2.83	2.52	1.42	1.42	3.88	3.53	2.09	4.25	4.80	5.51
63	0.709	3.78	2.91	0.31	3.54	2.91	1.81	1.81	4.69	3.53	2.05	4.25	4.80	5.71

† Ports are 10-32 for cushioned versions

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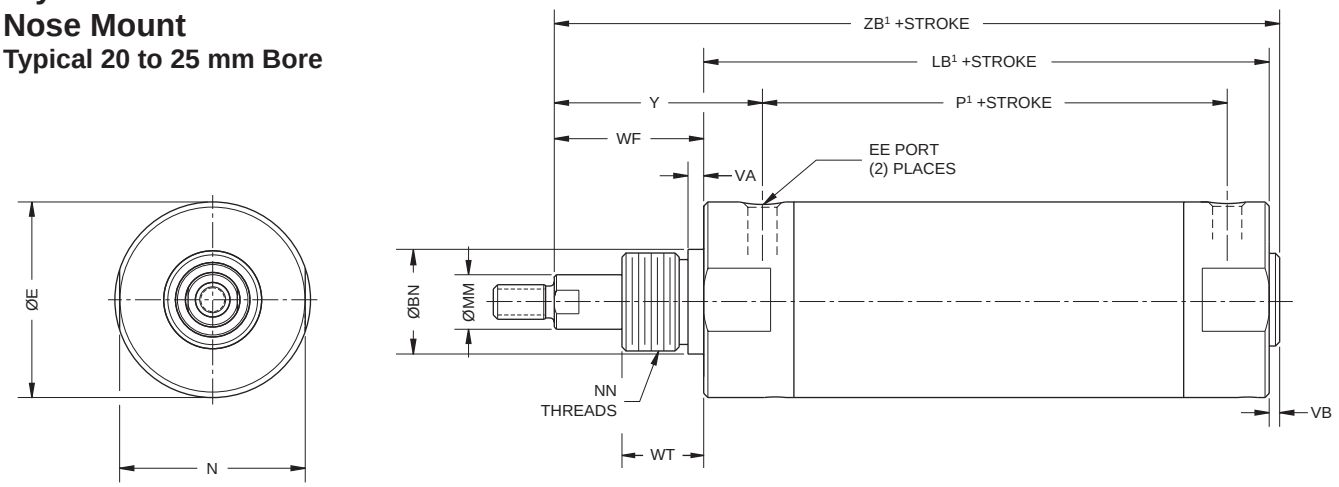
C086

Style G
Nose Mount
Typical 20 to 25 mm Bore



D

Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	BN +0 -0.08	D	ØE	EE (BSPT)	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NN	N	VA	VB	WF	WT	Y	Add Stroke		
																	LB1	P1	ZB1
20	13	19.02	6	27	1/8*	M8x1.25	M5x0.80	35	8	3/4-16	24	3	2	22	16	32	66	47	90
25	13	19.02	8	32	1/8*	M10x1.25	M6x1.00	35	10	3/4-16	29	3	2	22	16	32	66	47	90

* Ports are M5 for cushioned versions

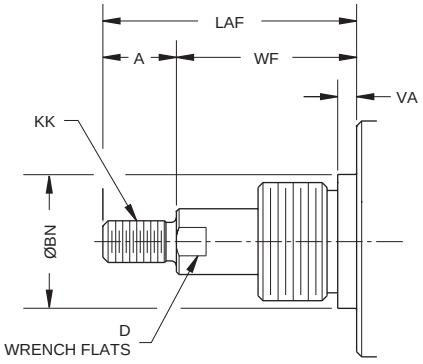
Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore	A	BN +0 -0.003	D	ØE	EE (NPTF)	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	NN	N	VA	VB	WF	WT	Y	Add Stroke		
																	LB1	P1	ZB1
20	0.50	0.749	0.24	1.06	1/8†	1/4-28	#10-32	1.38	0.315	3/4-16	0.94	0.12	0.08	0.88	0.63	1.25	2.60	1.85	3.56
25	0.50	0.749	0.31	1.26	1/8†	5/16-24	1/4-28	1.38	0.394	3/4-16	1.14	0.12	0.08	0.88	0.63	1.25	2.60	1.85	3.56

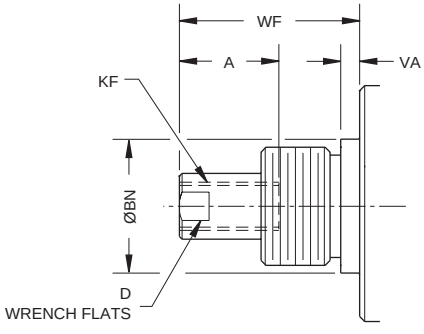
† Ports are 10-32 for cushioned versions

Rod End Details – 20 and 25 mm Bore

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3

Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF. If otherwise special, supply a dimensioned sketch.

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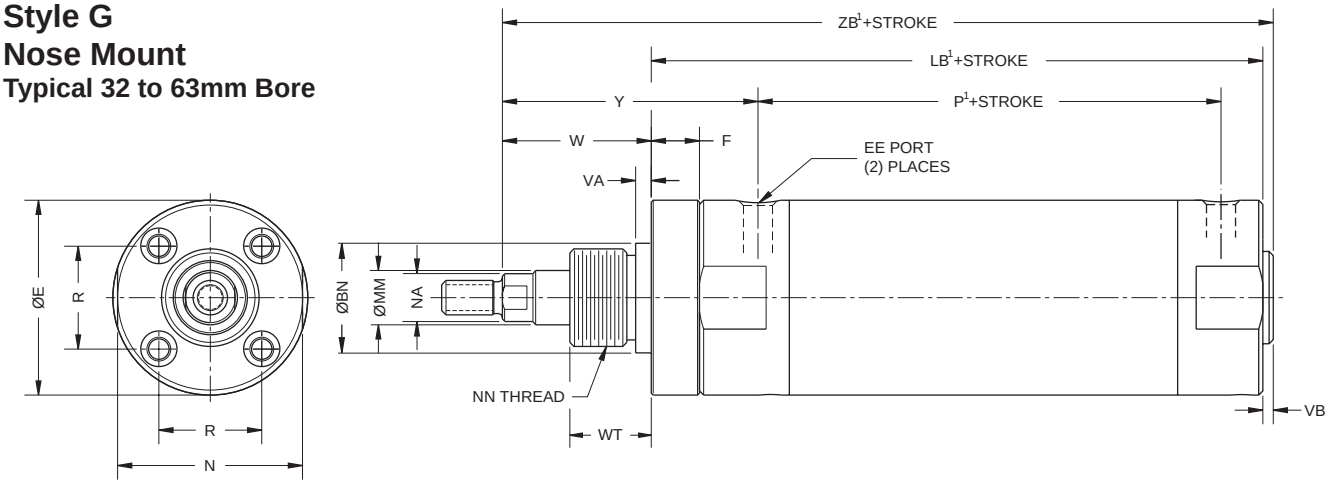
C086

Style G
Nose Mount
Typical 32 to 63mm Bore



Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	BN +0 -0.8	D	ØE	EE* (BSPT)	F	Thread KK Style 5	Thread KF Style 6	LA	ØMM Rod Dia.	NN	N	NA	R	VA	VB	W	WT	Y	Add Stroke		
																				LB[1]	P[1]	ZB[1]
32	19	19.02	10	39	1/8	9	M10x1.25	M8x1.25	41	12	3/4-16	36	11	20	3	2	22	16	49	80	43	104
40	19	26.87	12	48.5	1/8	14	M14x1.5	M8x1.25	51	16	1-14	44	14	26	5	2	32	22	66	92	49	126
50	22	34.90	16	59	1/4	15	M18x1.5	M10x1.25	52	20	1-1/4-12	55	18	32	3	2	30	20.5	68	105	53	137
63	22	38.10	16	72	1/4	16	M18x1.5	M10x1.25	52	20	1-3/8-12	69	18	38	3	2	30	20.5	70	106	52	139

* See Inch Dimensions for NPTF Port Size.

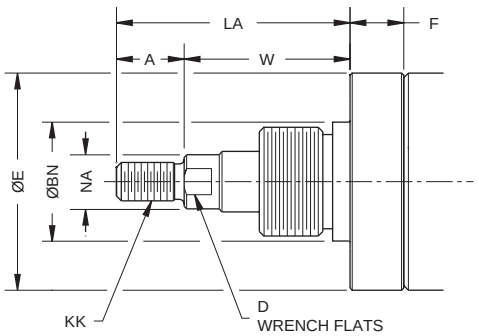
Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore (mm)	A	BN +0 -0.003	D	ØE	EE* (NPTF)	F	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LA	ØMM Rod Dia.	NN	N	NA	R	VA	VB	W	WT	Y	Add Stroke		
																				LB[1]	P[1]	ZB[1]
32	0.75	0.749	0.39	1.53	1/8	0.37	7/16-20	5/16-24	1.63	0.472	3/4-16	1.42	0.43	0.79	0.12	0.08	0.88	0.63	1.93	3.15	1.69	4.11
40	0.75	1.058	0.47	1.91	1/8	0.56	7/16-20	3/8-24	2.00	0.630	1-14	1.73	0.55	1.02	0.19	0.08	1.25	0.88	2.60	3.62	1.93	4.95
50	0.88	1.374	0.63	2.32	1/4	0.59	1/2-20	1/2-20	2.07	0.787	1-1/4-12	2.17	0.71	1.26	0.12	0.08	1.19	0.81	2.68	4.12	2.09	5.39
63	0.88	1.500	0.63	2.83	1/4	0.63	1/2-20	1/2-20	2.07	0.787	1-3/8-12	2.72	0.71	1.50	0.12	0.08	1.19	0.81	2.76	4.19	2.05	5.46

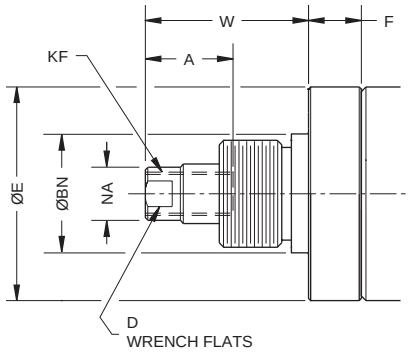
* See Metric Dimensions for BSPT Port Size.

Rod End Details – 32 and 63 mm Bore

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3

Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF (Note: LAF = LA+F and WF = W+F). If otherwise special, supply a dimensioned sketch.

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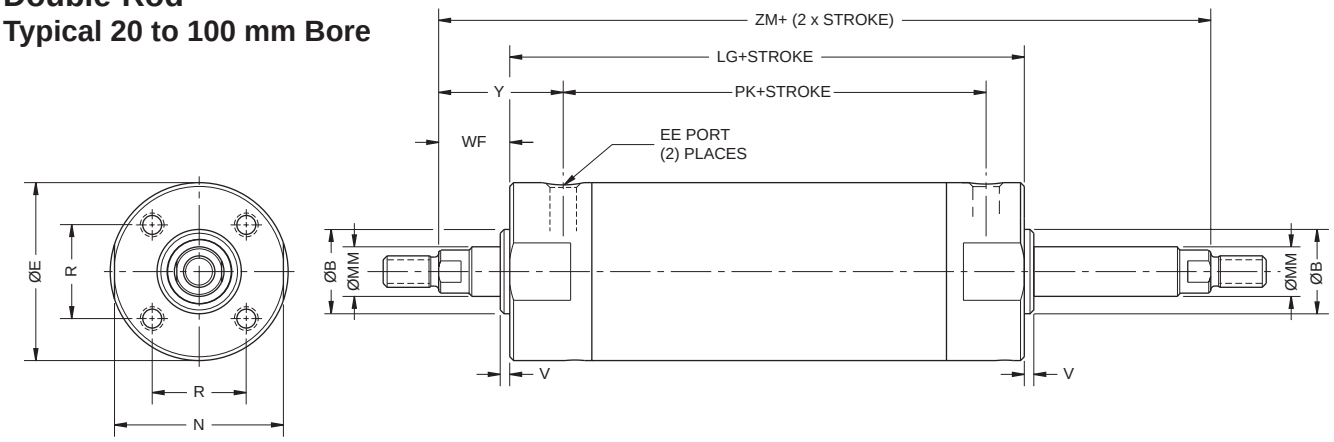
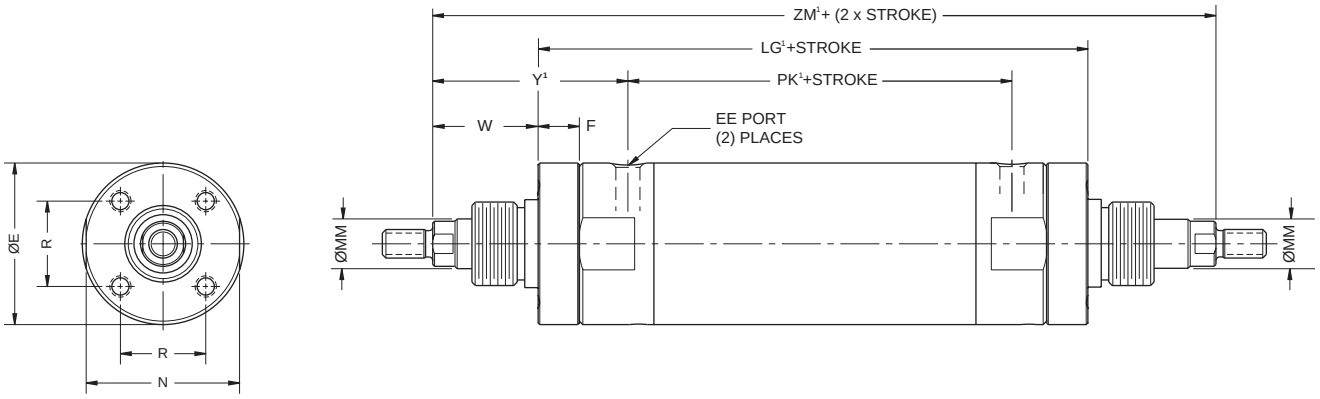
C086

Double-Rod
Typical 20 to 100 mm Bore



D

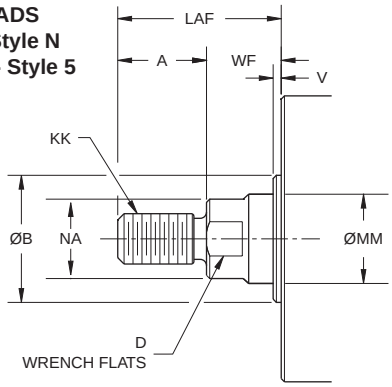
Double-Rod
Nose Mount (32-63mm bore)



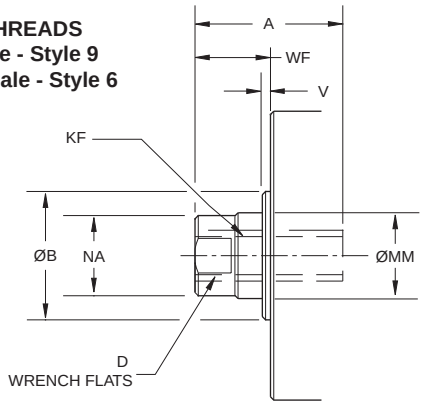
For detailed dimensions for the nose mount from 20 to 63 mm bore, please refer to pages D78 and 2D793.

Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

When two rod ends are different on double rod cylinder, please clearly indicate what rod end should be provided on which end of the cylinder, or provide a sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	D	ØE	F	EE (BSPT)	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	N	NA	R	V	W	WF
20	13	12	6	27	–	1/8*	M8x1.25	M5x0.80	26	8	24	–	14	2	–	13
25	13	14	8	32	–	1/8*	M10x1.25	M6x1.00	29	10	29	–	16.5	2	–	16
32	19	18	10	39	9	1/8	M10x1.25	M8x1.25	41	12	36	11	20	2	22	22
40	19	25	12	48.5	14	1/8	M14x1.5	M8x1.25	41	16	44	14	26	2	32	22
50	22	30	16	59	15	1/4	M18x1.5	M10x1.25	52	20	55	18	32	2	30	30
63	22	32	16	72	17	1/4	M18x 1.5	M10x1.25	52	20	69	18	38	2	30	30
80	38	40	20	90	–	3/8	M22 x1.5	M16x1.5	69	25	86	23	50	3	–	31
100	48	50	26	110	–	1/2	M26x1.5	M20x1.5	79	32	106	30	60	3	–	31

Bore	Y	Y[1]	Add Stroke					
			LG	LG[1]	PK	PK[1]	ZM	ZM[1]
20	28	32	75	70	45	50	101	95
25	30	32	75	70	47	50	107	101
32	40	49	78	97	42	42	122	141
40	42	66	87	115	47	47	131	179
50	53	68	100	130	54	54	160	190
63	53	70	100	133	54	54	160	194
80	59	–	119	–	61	–	181	–
100	57	–	119	–	65	–	181	–

* Ports are M5 for cushioned versions

INCH DIMENSIONS - Envelope and Mounting Dimensions (inch)

Bore (mm)	A	ØB +0 -0.001	D	ØE	F	EE (NPTF)	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	N	NA	R	V	W	WF
20	0.50	0.472	0.24	1.06	–	1/8†	1/4-28	#10-32	1.00	0.315	0.94	–	0.55	0.08	–	0.50
25	0.50	0.551	0.31	1.26	–	1/8†	5/16-24	1/4-28	1.12	0.394	1.14	–	0.65	0.08	–	0.62
32	0.75	0.709	0.39	1.53	0.37	1/8	7/16-20	5/16-24	1.63	0.472	1.42	0.43	0.79	0.08	0.88	0.88
40	0.75	0.984	0.47	1.91	0.56	1/8	7/16-20	3/8-24	1.63	0.630	1.73	0.55	1.02	0.08	1.25	0.88
50	0.88	1.181	0.63	2.32	0.59	1/4	1/2-20	1/2-20	2.07	0.787	2.17	0.71	1.26	0.08	1.19	1.19
63	0.88	1.260	0.63	2.83	0.66	1/4	1/2-20	1/2-20	2.07	0.787	2.72	0.71	1.50	0.08	1.19	1.19
80	1.50	1.575	0.79	3.54	–	3/8	3/4-16	5/8-18	2.72	0.984	3.39	0.91	1.97	0.12	–	1.22
100	1.88	1.968	1.02	4.33	–	1/2	1-14	3/4-16	3.11	1.260	4.17	1.18	2.36	0.12	–	1.22

Bore (mm)	Y	Y[1]	Add Stroke					
			LG	LG[1]	PK	PK[1]	ZM	ZM[1]
20	1.10	1.25	2.97	2.74	1.77	1.97	3.97	3.74
25	1.18	1.25	2.97	2.74	1.85	1.97	4.21	3.98
32	1.57	1.93	3.06	3.80	1.65	1.65	4.82	5.56
40	1.65	2.60	3.41	4.53	1.85	1.85	5.17	7.03
50	2.09	2.68	3.93	5.11	2.13	2.13	6.31	7.49
63	2.09	2.76	3.93	5.25	2.13	2.13	6.31	7.63
80	2.32	–	4.70	–	2.40	–	7.14	–
100	2.24	–	4.70	–	2.56	–	7.14	–

† Ports are 10-32 for cushioned versions

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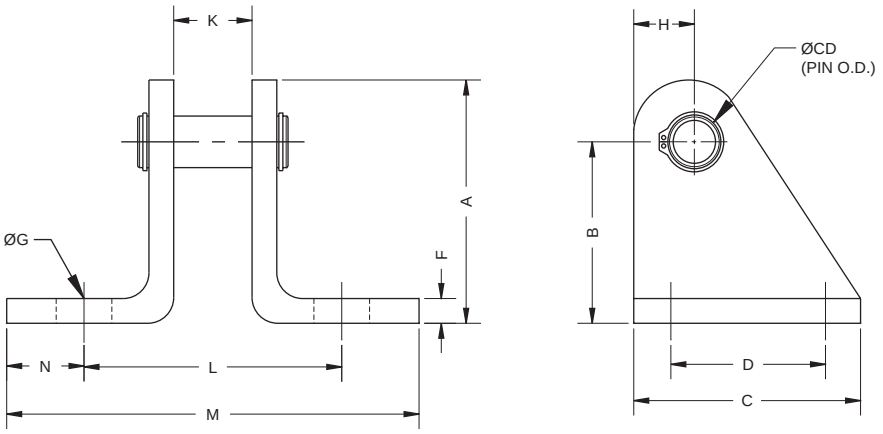
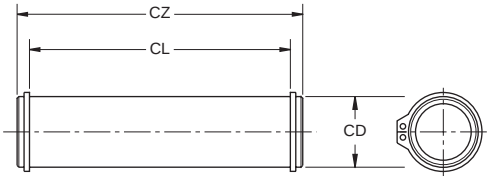
Single Clevis Brackets



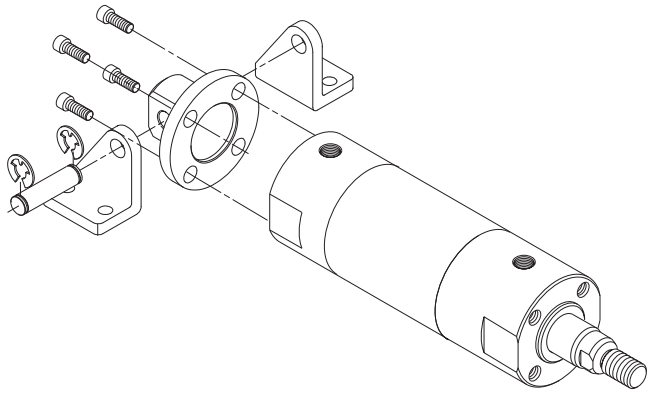
Single Clevis Pin



Note :
Two snap rings shown are included with the pivot pin.
Order clevis bracket separately.

Single Clevis Kit Assembly Instructions

Align the rear clevis with the port location as desired. Insert the four (4) screws through the bracket and thread them into the end caps until they are hand tight. Torque the screws to the values listed in the table below.
Single Clevis Kit, bracket and pivot pin are ordered separately.
Please see next page for part numbers.



Bore	Fastener Size		Torque	
20	8-32	M4x0.7	10-12 in-lbs	1.1-1.4 Nm
25	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
32	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
40	1/4-28	M6x1	32-36 in-lbs	3.6-4.1 Nm
50	5/16-24	M8x1.25	72-82 in-lbs	8.1-9.3 Nm
63	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
80	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
100	1/2-20	M12x1.75	40-44 ft-lbs	54-60 Nm

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Single Clevis Brackets

Metric Dimensions (mm)

Part Number	Bore	A	B	C	ØCD h9	D	F	ØG	H	K	L	M	N
L077520075	20	30	22	29	6.35	19	3	7	8	10	32	51	9
L077520075	25	30	22	29	6.35	19	3	7	8	10	32	51	9
L077520125	32	30	22	29	6.35	19	3	7	8	13	35	54	9
L077520150	40	44	35	38	9.52	25	3	7	9	16	47	67	10
L077520200	50	44	35	38	9.52	25	6	7	9	19	54	76	11
L077520250	63	54	44	38	9.52	25	6	7	9	19	54	76	11
L077520312	80	70	51	64	19.07	38	6	11	19	28	72	104	16
L077520400	100	79	60	70	19.07	44	6	14	19	32	76	108	16

Imperial Dimensions (Inch)

Part Number	Bore (mm)	A	B	C	ØCD +0 -0.002	D	F	ØG	H	K	L	M	N
L077520075	20	1.17	0.87	1.13	0.250	0.75	0.12	0.27	0.30	0.38	1.25	2.00	0.37
L077520075	25	1.17	0.87	1.13	0.250	0.75	0.12	0.27	0.30	0.38	1.25	2.00	0.37
L077520125	32	1.17	0.87	1.13	0.250	0.75	0.12	0.27	0.30	0.50	1.38	2.12	0.37
L077520150	40	1.75	1.38	1.50	0.375	1.00	0.12	0.27	0.37	0.62	1.86	2.62	0.38
L077520200	50	1.75	1.38	1.50	0.375	1.00	0.25	0.27	0.37	0.75	2.12	3.00	0.44
L077520250	63	2.12	1.75	1.50	0.375	1.00	0.25	0.27	0.37	0.75	2.12	3.00	0.44
L077520312	80	2.75	2.00	2.50	0.751	1.50	0.25	0.42	0.75	1.09	2.84	4.09	0.62
L077520400	100	3.12	2.37	2.75	0.751	1.75	0.25	0.55	0.75	1.25	3.00	4.25	0.62

Single Clevis Pins

Metric Dimensions (mm)

Part Number	Bore	ØCD h9	CL	CZ
L077490075	20	6.35	16	22
L077490075	25	6.35	16	22
L077490125	32	6.35	19	25
L077490150	40	9.52	23	29
L077490200	50	9.52	32	39
L077490200	63	9.52	32	39
L077490312	80	19.07	41	51
L077490400	100	19.07	45	55

Imperial Dimensions (Inch)

Part Number	Bore	ØCD +0 -0.002	CL	CZ
L077490075	20	0.250	0.63	0.85
L077490075	25	0.250	0.63	0.85
L077490125	32	0.250	0.76	0.97
L077490150	40	0.375	0.89	1.15
L077490200	50	0.375	1.27	1.53
L077490200	63	0.375	1.27	1.53
L077490312	80	0.751	1.63	2.00
L077490400	100	0.751	1.79	2.16

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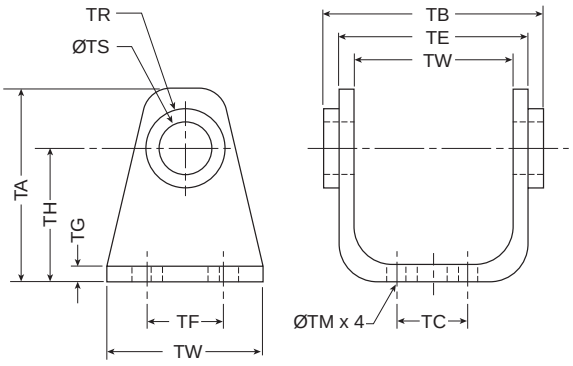
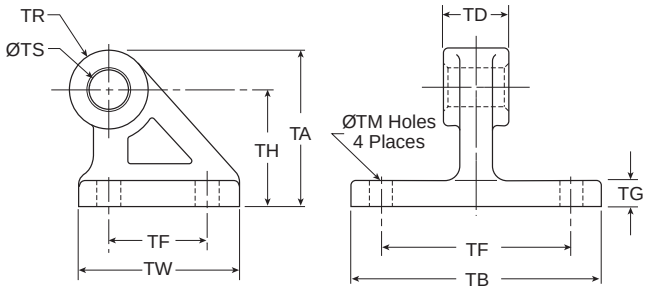
Double Clevis Brackets

20-63 mm Bore Double Clevis Bracket

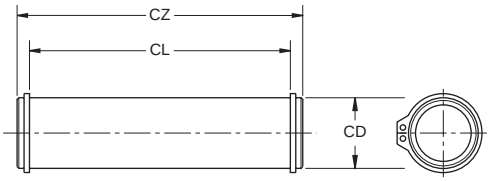


80-100 mm Bore Double Clevis Bracket



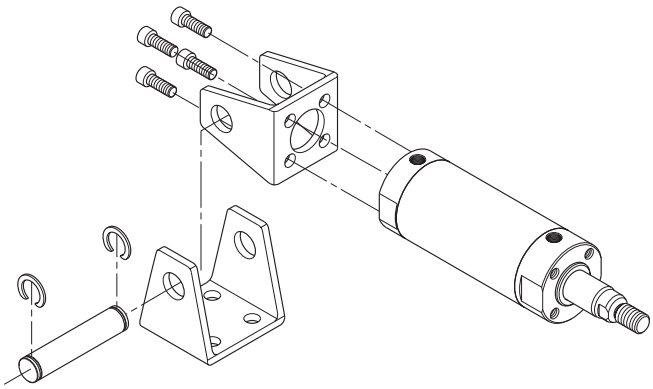
D

Double Clevis Pin

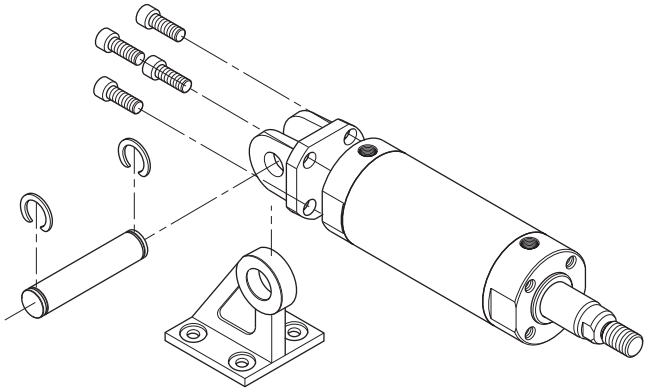


Note:
Two snap rings shown are included with the pivot pin.
Order clevis bracket separately.

Double Clevis 20-63 mm Bore



Double Clevis 80-100 mm Bore



Double Clevis Kit Assembly Instructions

Align the rear clevis with the port location as desired. Insert the four (4) screws through the bracket and thread them into the end caps until they are hand tight. Torque the screws to the values listed in the table beside.
Double Clevis Kit, bracket and pivot pin are ordered separately. Please see next page for part numbers.

Bore	Fastener Size		Torque	
20	8-32	M4x0.7	10-12 in-lbs	1.1-1.4 Nm
25	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
32	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
40	1/4-28	M6x1	32-36 in-lbs	3.6-4.1 Nm
50	5/16-24	M8x1.25	72-82 in-lbs	8.1-9.3 Nm
63	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
80	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
100	1/2-20	M12x1.75	40-44 ft-lbs	54-60 Nm

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Double Clevis Brackets

Metric Dimensions (mm)

Part Number	Bore	TA	TB	TC	TD	TE	TF	TG	TH	TM	TR	TS 49	TW
L077510020	20	36	38	16	29	35	28	3	25	5.5	13	8	42
L077510025	25	43	42	20	33	39	28	3	30	5.5	15	10	42
L077510032	32	50	53.4	22	40	49	28	4.5	35	7	17	12	48
L077510040	40	58	64.4	30	49	58	30	4.5	40	7	21	14	56
L077510050	50	70	78.8	36	60	72	36	6	50	9	24	16	64
L077510063	63	82	96.6	46	74	90	46	8	60	11	26	18	74
L077510080	80	73	110	85	28	110	45	11	55	11	36	18	72
L077510100	100	90	130	100	32	130	60	12	65	13.5	50	22	93

Imperial Dimensions (Inch)

Part Number	Bore	TA	TB	TC	TD	TE	TF	TG	TH	TM	TR	TS +0.002, -0	TW
L077510020	20	1.42	1.50	0.63	1.14	1.39	1.10	0.12	0.98	0.22	0.51	0.315	1.66
L077510025	25	1.69	1.65	0.79	1.30	1.55	1.10	0.12	1.18	0.22	0.59	0.394	1.66
L077510032	32	1.97	2.10	0.87	1.57	1.93	1.10	0.18	1.38	0.28	0.67	0.472	1.88
L077510040	40	2.28	2.53	1.18	1.93	2.28	1.18	0.18	1.57	0.28	0.83	0.551	2.20
L077510050	50	2.76	3.10	1.42	2.36	2.83	1.42	0.25	1.97	0.35	0.94	0.630	2.52
L077510063	63	3.23	3.80	1.81	2.91	3.54	1.81	0.31	2.36	0.43	1.02	0.709	2.91
L077510080	80	2.87	4.33	3.35	1.10	4.33	1.77	0.43	2.17	0.43	1.42	0.709	2.83
L077510100	100	3.54	5.12	3.94	1.26	5.12	2.36	0.47	2.56	0.53	1.97	0.866	3.66

Double Clevis Pins

Metric Dimensions (mm)

Part Number	Bore	ØCD d9	CL	CZ
L077500020	20	8	38.6	43.4
L077500025	25	10	42.6	48
L077500032	32	12	54	59.4
L077500040	40	14	65	71.4
L077500050	50	16	79.6	86
L077500063	63	18	97.8	105.4
L077500080	80	18	56.2	64
L077500100	100	22	64.2	72

Imperial Dimensions (Inch)

Part Number	Bore	ØCD -0.001 -0.003	CL	CZ
L077500020	20	0.315	1.52	1.71
L077500025	25	0.394	1.68	1.89
L077500032	32	0.472	2.12	2.34
L077500040	40	0.551	2.56	2.81
L077500050	50	0.630	3.13	3.38
L077500063	63	0.709	3.85	4.15
L077500080	80	0.709	2.21	2.52
L077500100	100	0.866	2.53	2.83

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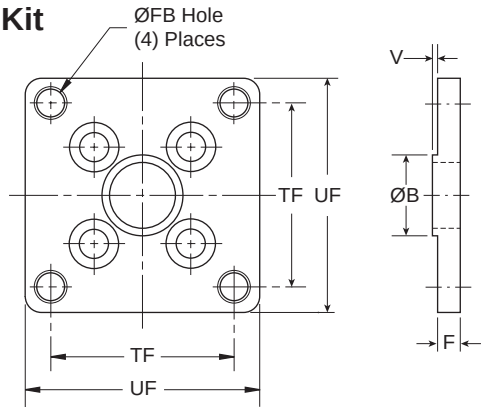
Front or Rear Flange Mount Kit



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Metric Dimensions (mm)

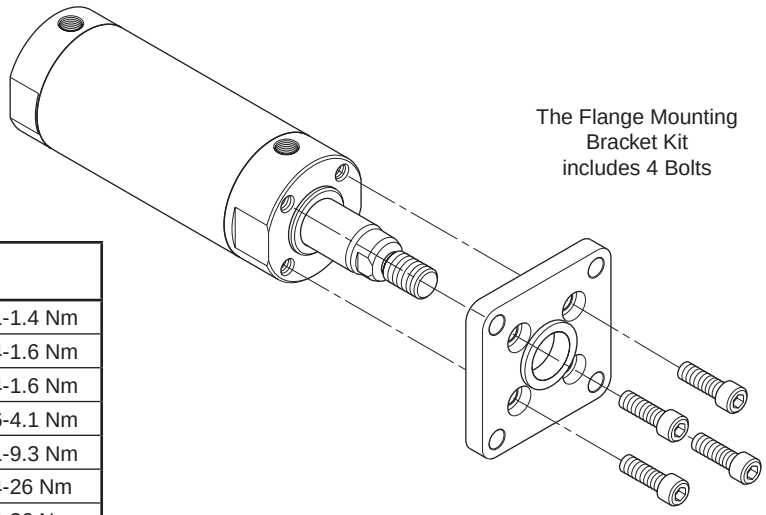
Part Number	Bore	ØB $^{+0}_{-0.02}$	F	FB	UF	TF	V
L077560020	20	12	6	5.5	40	28	2
L077560025	25	14	7	5.5	44	32	2
L077560032	32	18	7	7	53	38	2
L077560040	40	25	8	7	61	46	2
L077560050	50	30	9	9	76	58	2
L077560063	63	32	9	11	92	70	2
L077560080	80	40	11	11	104	82	3
L077560100	100	50	14	14	128	100	3

Imperial Dimensions (Inch)

Part Number	Bore	ØB $^{+0}_{-0.001}$	F	FB	UF	TF	V
L077450075	20	0.472	0.24	0.22	1.57	1.10	0.08
L077450100	25	0.551	0.28	0.22	1.73	1.26	0.08
L077450125	32	0.709	0.28	0.28	2.09	1.50	0.08
L077450150	40	0.984	0.31	0.28	2.40	1.81	0.08
L077450200	50	1.181	0.35	0.35	3.00	2.28	0.08
L077450250	63	1.260	0.35	0.43	3.62	2.76	0.08
L077450312	80	1.575	0.43	0.43	4.09	3.23	0.12
L077450400	100	1.968	0.55	0.55	5.04	3.94	0.12

Flange Mount Kit Installation Instructions

Insert the four (4) screws through the nose mount or the flange mounts and thread them into the cylinder head or cap until they are hand tight. Torque the screws to the values listed in the table below.



The Flange Mounting Bracket Kit includes 4 Bolts

Bore Size	Fastener Size		Torque	
20	8-32	M4x0.7	10-12 in-lbs	1.1-1.4 Nm
25	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
32	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
40	1/4-28	M6x1	32-36 in-lbs	3.6-4.1 Nm
50	5/16-24	M8x1.25	72-82 in-lbs	8.1-9.3 Nm
63	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
80	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
100	1/2-20	M12x1.75	40-44 ft-lbs	54-60 Nm

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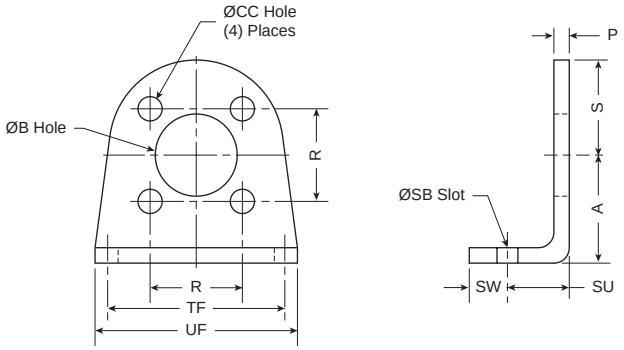
Foot Mount Bracket



Metric Dimensions (mm)

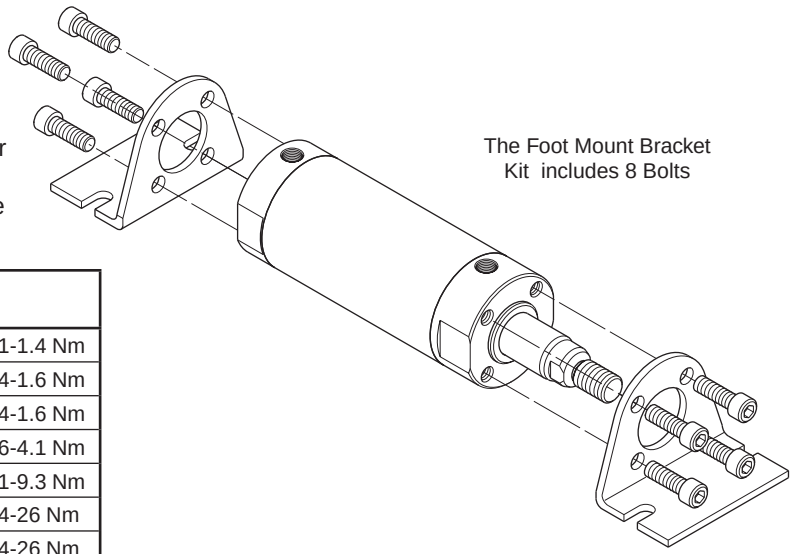
Part Number	Bore	A	ØB $^{+0.15}_{-0}$	ØCC	P	R	S	ØSB	SU	SW	TF	UF
L077550020	20	20.6	12.2	5.00	3	14	16	7	14	11	38	48
L077550025	25	20.6	14.2	5.80	3	16.5	18	7	14	11	38	48
L077550032	32	25.4	18.2	5.80	3	20	21	7	19	19	48	63.5
L077550040	40	25.4	25.2	7.50	3	26	26	7	18	20	48	63.5
L077550050	50	38.1	30.2	9.00	6	32	34	9	25	16	57	79
L077550063	63	44.5	32.2	11.50	6	38	39	9	25	16	73	95
L077550080	80	55	40.2	11.50	6	50	46	11	28.5	14	100	125
L077550100	100	65	50.2	14.50	6	60	56	14	30	16	120	150

Imperial Dimensions (inch)

Part Number	Bore	A	ØB $^{+0.006}_{-0}$	ØCC	P	R	S	ØSB	SU	SW	TF	UF
L077440075	20	0.81	0.480	0.20	0.12	0.55	0.63	0.27	0.56	0.44	1.50	1.88
L077440100	25	0.81	0.559	0.23	0.12	0.65	0.71	0.27	0.56	0.44	1.50	1.88
L077440125	32	1.00	0.717	0.23	0.12	0.79	0.83	0.28	0.75	0.75	1.88	2.50
L077440150	40	1.00	0.992	0.30	0.12	1.02	1.02	0.28	0.72	0.78	1.88	2.50
L077440200	50	1.50	1.189	0.35	0.25	1.26	1.34	0.34	1.00	0.62	2.24	3.12
L077440250	63	1.75	1.268	0.45	0.25	1.50	1.54	0.34	1.00	0.62	2.88	3.75
L077440312	80	2.17	1.583	0.45	0.25	1.97	1.81	0.43	1.12	0.55	3.94	4.92
L077440400	100	2.56	1.976	0.57	0.25	2.36	2.20	0.55	1.18	0.63	4.72	5.91

Foot Mount Kit
Assembly Instructions

Align each of the foot brackets with the port location as desired. Insert the four (4) screws through the foot mounts and thread them into the end caps until they are hand tight. Place the cylinder assembly on to a flat surface and torque the screws to the values listed in the table below. Make sure the foot mounts rest properly on a flat surface.



The Foot Mount Bracket Kit includes 8 Bolts

Bore Size	Fastener Size		Torque	
20	8-32	M4x0.7	10-12 in-lbs	1.1-1.4 Nm
25	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
32	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
40	1/4-28	M6x1	32-36 in-lbs	3.6-4.1 Nm
50	5/16-24	M8x1.25	72-82 in-lbs	8.1-9.3 Nm
63	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
80	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
100	1/2-20	M12x1.75	40-44 ft-lbs	54-60 Nm

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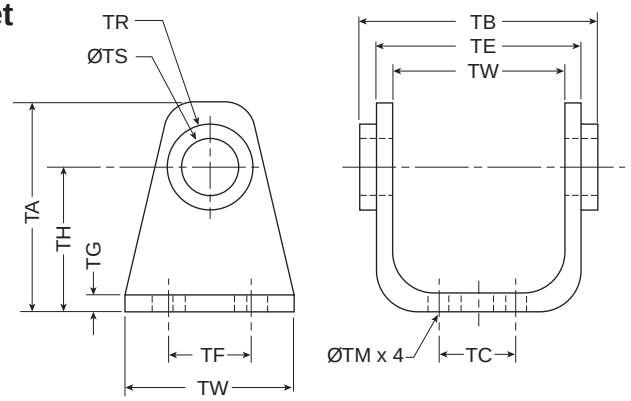
Trunnion Mount Bracket



Metric Dimensions (mm)

Part Number	Bore	TA	TB	TC	TD	TE	TF	TG	TH	TM	TR	TS H9	TW
L077510020	20	36	38	16	29	35	28	3	25	5.5	13	8	42
L077510025	25	43	42	20	33	39	28	3	30	5.5	15	10	42
L077510032	32	50	53.4	22	40	49	28	4.5	35	7	17	12	48
L077510040	40	58	64.4	30	49	58	30	4.5	40	7	21	14	56
L077510050	50	70	78.8	36	60	72	36	6	50	9	24	16	64
L077510063	63	82	96.6	46	74	90	46	8	60	11	26	18	74

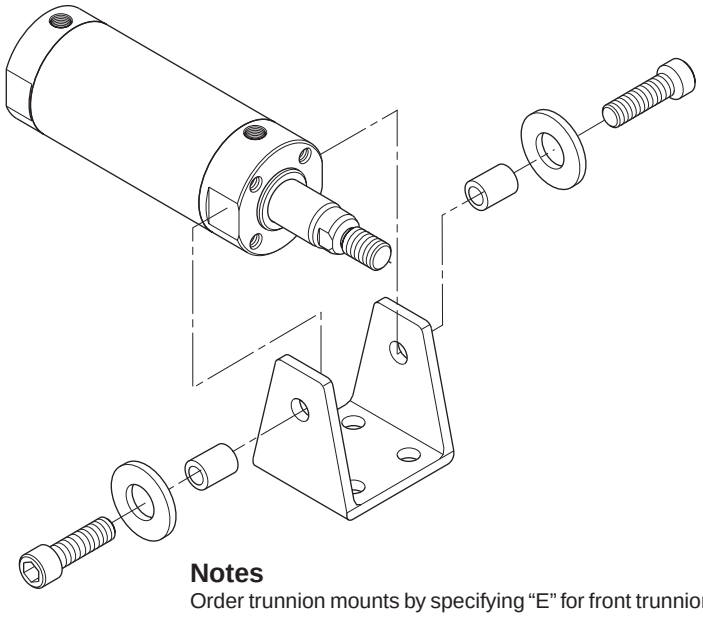
Imperial Dimensions (Inch)

Part Number	Bore	TA	TB	TC	TD	TE	TF	TG	TH	TM	TR	TS $^{+0.002}_{-0}$	TW
L077510020	20	1.42	1.50	0.63	1.14	1.39	1.10	0.12	0.98	0.22	0.51	0.315	1.66
L077510025	25	1.69	1.65	0.79	1.30	1.55	1.10	0.12	1.18	0.22	0.59	0.394	1.66
L077510032	32	1.97	2.10	0.87	1.57	1.93	1.10	0.18	1.38	0.28	0.67	0.472	1.88
L077510040	40	2.28	2.53	1.18	1.93	2.28	1.18	0.18	1.57	0.28	0.83	0.551	2.20
L077510050	50	2.76	3.10	1.42	2.36	2.83	1.42	0.25	1.97	0.35	0.94	0.630	2.52
L077510063	63	3.23	3.80	1.81	2.91	3.54	1.81	0.31	2.36	0.43	1.02	0.709	2.91

Trunnion Mount Assembly Instructions

Align the bracket on the machine member providing cylinder rotation as desired. Securely mount the bracket to the machine member. Align the cylinder head or cap with the bracket. Insert the bearing, washer and pivot bolt on to each side of the cylinder as shown. Torque the pivot bolts to the values listed in the table below. Use only bolts provided, as they have a special adhesive coating for secure fastening.

Bore Size	Trunnion Pivot Bolt	Torque	
20	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
25	M6x0.75	32-36 in-lbs	3.6-4.1 Nm
32	M8x1	72-82 in-lbs	8.1-9.3 Nm
40	M10x1.25	18-19 ft-lbs	24-26 Nm
50	M12x1.25	40-44 ft-lbs	54-60 Nm
63	M14x1.5	70-74 ft-lbs	95-100 Nm



Notes

Order trunnion mounts by specifying “E” for front trunnion or “D” for rear trunnion in the “Mounting Style” digit of the model code. The bearings, washers and pivot bolts will be supplied with the cylinder. The trunnion bracket must be ordered as a separate item, using the part numbers shown above.

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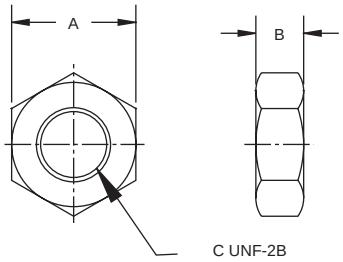
Rod Jam Nut



Rod Jam Nut should be ordered separately on all mounting styles

Rod Jam Nut Dimensions

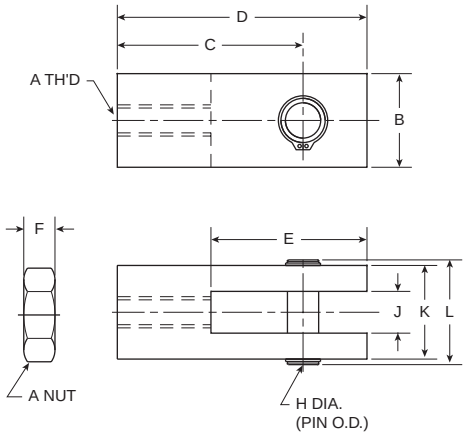
Metric Dimensions (mm)

Part Number	Bore	A	B	C
L075540008	20	13	4	M8 x 1.25
L075540010	25-32	17	5	M10 x 1.25
L075540014	40	22	7	M14 x 1.5
L075540018	50-63	27	8	M18 x 1.5
L075540022	80	32	11	M22 x 1.5
L075540026	100	41	16	M26 x 1.5

Imperial Dimensions (inch)

Part Number	Bore	A	B	C
L077970025	20	0.44	0.16	1/4-28
L077970031	25	0.50	0.19	5/16-24
L077970044	32-40	0.69	0.25	7/16-20
L077970050	50-63	0.75	0.31	1/2-20
L077970075	80	1.12	0.42	3/4 -16
L077970100	100	1.50	0.55	1-14

Piston Rod Clevis



Piston Rod Clevis Dimensions

Metric Dimensions (mm)

Part Number	Bore	A	B	C	D	E	F	H h9	J	K	L
L077590020	20	M8x1.25	13	24	30	18	4	6.35	6.5	13	17.5
L077590025	25	M10x1.25	19	24	30	18	5	6.35	6.5	19	24.5
L077590032	32	M10x1.25	19	34	43	24	5	9.52	10	19	26
L077590040	40	M14x1.5	19	34	43	24	7	9.52	10	19	26
L077590050	50	M18x1.5	28	34	43	24	8	9.52	10	28	36
L077590050	63	M18x1.5	28	34	43	24	8	9.52	10	28	36
PIM-4PRC	80	M22x1.5	38	50	71	48	11	18	28	56	64
L077590100	100	M26x1.5	44	55	79	55	16	22	32	63.5	72

Imperial Dimensions (inch)

Part Number	Bore	A	B	C	D	E	F	H +0 -0.002	J	K	L
L077960025	20	1/4-28	0.50	0.94	1.19	0.69	0.16	0.250	0.26	0.50	0.69
L077960031	25	5/16-24	0.50	0.94	1.19	0.69	0.19	0.250	0.26	0.50	0.69
L077960044	32	7/16-20	0.75	1.32	1.69	0.94	0.25	0.375	0.38	0.75	1.03
L077960044	40	7/16-20	0.75	1.32	1.69	0.94	0.25	0.375	0.38	0.75	1.03
L077960050	50	1/2-20	0.75	1.32	1.69	0.94	0.31	0.375	0.38	0.75	1.03
L077960050	63	1/2-20	0.75	1.32	1.69	0.94	0.31	0.375	0.38	0.75	1.03
L077960075	80	3/4-16	1.25	1.81	2.38	1.31	0.42	0.437	0.52	1.25	1.66
L077960100	100	1-14	1.50	2.63	3.38	1.81	0.55	0.500	0.64	1.50	1.91

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How to Order P1L Mounting Kits as a Separate Item

Bore Size	Foot Mounting		Flange	
	Inch	Metric	Inch	Metric
20	L077440075	L077550020	L077450075	L077560020
25	L077440100	L077550025	L077450100	L077560025
32	L077440125	L077550032	L077450125	L077560032
40	L077440150	L077550040	L077450150	L077560040
50	L077440200	L077550050	L077450200	L077560050
63	L077440250	L077550063	L077450250	L077560063
80	L077440312	L077550080	L077450312	L077560080
100	L077440400	L077550100	L077450400	L077560100

Bore Size	Single Clevis		Double Clevis		Single Clevis Pin	Double Clevis Pin
	Inch	Metric	Inch	Metric		
20	L077470075	L077570020	L077480075	L077580020	L077490075	L077500020
25	L077470100	L077570025	L077480100	L077580025	L077490075	L077500025
32	L077470125	L077570032	L077480125	L077580032	L077490125	L077500032
40	L077470150	L077570040	L077480150	L077580040	L077490150	L077500040
50	L077470200	L077570050	L077480200	L077580050	L077490200	L077500050
63	L077470250	L077570063	L077480250	L077580063	L077490200	L077500063
80	L077470312	L077570080	L077480312	L077580080	L077490312	L077500080
100	L077470400	L077570100	L077480400	L077580100	L077490400	L077500100

Notes :
- "Inch" mounting kits include inch threaded bolts, while "Metric" mounting kits include metric threaded bolts. Please verify that the kit style matches the cylinder Construction type (code "N" or "M") for which it is intended.
- Clevis pins may be used for either Inch or Metric mounting kits.

Mounting Brackets and Rod End Accessories

Bore Size	Trunnion/ Double Clevis Bracket	Single Clevis Bracket	Piston Rod Clevis		Rod Jam Nut	
			Inch	Metric	Inch	Metric
20	L077510020	L077520075	L077960025	L077590020	L077970025	L075540008
25	L077510025	L077520075	L077960031	L077590025	L077970031	L075540010
32	L077510032	L077520125	L077960044	L077590032	L077970044	L075540010
40	L077510040	L077520150	L077960044	L077590040	L077970044	L075540014
50	L077510050	L077520200	L077960050	L077590050	L077970050	L075540018
63	L077510063	L077520250	L077960050	L077590050	L077970050	L075540018
80	L077510080	L077520312	L077960075	PIM-4PRC	L077970075	L075540022
100	L077510100	L077520400	L077960100	L077590100	L077970100	L075540026

Service Kits

Bore Size	Single Rod Cylinder Repair Kits		Double Rod Cylinder Repair Kits	
	Consisting of: 1 ea. Symbol #5, 7, 12, & 2 ea. Symbol #1, 8 11, 14		Consisting of: 1 ea. Symbol #5, 7, & 2 ea. Symbol #1, 8 11, 12, 14	
	Class 1 Seals, Std. Service	Class 5 Seals, High Temp.	Class 1 Seals, Std. Service	Class 5 Seals, High Temp.
mm	**Part No.**	**Part No.**	**Part No.**	**Part No.**
20	P1L020D001	P1L020D005	P1L020K001	P1L020K005
25	P1L025D001	P1L025D005	P1L025K001	P1L025K005
32	P1L032D001	P1L032D005	P1L032K001	P1L032K005
40	P1L040D001	P1L040D005	P1L040K001	P1L040K005
50	P1L050D001	P1L050D005	P1L050K001	P1L050K005
63	P1L063D001	P1L063D005	P1L063K001	P1L063K005
80	P1L080D001	P1L080D005	P1L080K001	P1L080K005
100	P1L100D001	P1L100D005	P1L100K001	P1L100K005

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Safety Guide for Selecting and Using Hydraulic, Pneumatic Cylinders and Their Accessories

WARNING: ⚠ FAILURE OF THE CYLINDER, ITS PARTS, ITS MOUNTING, ITS CONNECTIONS TO OTHER OBJECTS, OR ITS CONTROLS CAN RESULT IN:

- **Unanticipated or uncontrolled movement of the cylinder or objects connected to it.**
- **Falling of the cylinder or objects held up by it.**
- **Fluid escaping from the cylinder, potentially at high velocity.**

THESE EVENTS COULD CAUSE DEATH OR PERSONAL INJURY BY, FOR EXAMPLE, PERSONS FALLING FROM HIGH LOCATIONS, BEING CRUSHED OR STRUCK BY HEAVY OR FAST MOVING OBJECTS, BEING PUSHED INTO DANGEROUS EQUIPMENT OR SITUATIONS, OR SLIPPING ON ESCAPED FLUID.

Before selecting or using Parker (The Company) cylinders or related accessories, it is important that you read, understand and follow the following safety information. Training is advised before selecting and using The Company's products.

1.0 General Instructions

1.1 Scope – This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) cylinder products. This safety guide is a supplement to and is to be used with the specific Company publications for the specific cylinder products that are being considered for use.

1.2 Fail Safe – Cylinder products can and do fail without warning for many reasons. All systems and equipment should be designed in a fail-safe mode so that if the failure of a cylinder product occurs people and property won't be endangered.

1.3 Distribution – Provide a free copy of this safety guide to each person responsible for selecting or using cylinder products. Do not select or use The Company's cylinders without thoroughly reading and understanding this safety guide as well as the specific Company publications for the products considered or selected.

1.4 User Responsibility – Due to very wide variety of cylinder applications and cylinder operating conditions, The Company does not warrant that any particular cylinder is suitable for any specific application. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The hydraulic and pneumatic cylinders outlined in this catalog are designed to The Company's design guidelines and do not necessarily meet the design guideline of other agencies such as American Bureau of Shipping, ASME Pressure Vessel Code etc. The user, through its own
analysis and testing, is solely responsible for:

- Making the final selection of the cylinders and related accessories.
- Determining if the cylinders are required to meet specific design requirements as required by the Agency(s) or industry standards covering the design of the user's equipment.
- Assuring that the user's requirements are met, OSHA requirements are met, and safety guidelines from the applicable agencies such as but not limited to ANSI are followed and that the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the cylinders are used.

1.5 Additional Questions – Call the appropriate Company technical service department if you have any questions or require any additional information. See the Company publication for the product being considered or used, or call 1-800-CPARKER, or go to www.parker.com, for telephone numbers of the appropriate technical service department.

2.0 Cylinder and Accessories Selection

2.1 Seals – Part of the process of selecting a cylinder is the selection of seal compounds. Before making this selection, consult the "seal information page(s)" of the publication for the series of cylinders of interest.

The application of cylinders may allow fluids such as cutting fluids, wash down fluids etc. to come in contact with the external area of the cylinder. These fluids may attack the piston rod wiper and or the primary seal and must be taken into account when selecting and specifying seal compounds.

Dynamic seals will wear. The rate of wear will depend on many operating factors. Wear can be rapid if a cylinder is mis-aligned or if the cylinder has been improperly serviced. The user must take seal wear into consideration in the application of cylinders.

2.2 Piston Rods – Possible consequences of piston rod failure or separation of the piston rod from the piston include, but are not limited to are:

- Piston rod and or attached load thrown off at high speed.
- High velocity fluid discharge.
- Piston rod extending when pressure is applied in the piston retract mode.

Piston rods or machine members attached to the piston rod may move suddenly and without warning as a consequence of other conditions occurring to the machine such as, but not limited to:

- Unexpected detachment of the machine member from the piston rod.
- Failure of the pressurized fluid delivery system (hoses, fittings, valves, pumps, compressors) which maintain cylinder position.
- Catastrophic cylinder seal failure leading to sudden loss of pressurized fluid.
- Failure of the machine control system.

Follow the recommendations of the "Piston Rod Selection Chart and Data" in the publication for the series of cylinders of interest. The suggested piston rod diameter in these charts must be followed in order to avoid piston rod buckling.

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod to fail. If these types of additional loads are expected to be imposed on the piston rod, their magnitude should be made known to our engineering department.

The cylinder user should always make sure that the piston rod is securely attached to the machine member.

On occasion cylinders are ordered with double rods (a piston rod extended from both ends of the cylinder). In some cases a stop is threaded on to one of the piston rods and used as an external stroke adjuster. On occasions spacers are attached to the machine member connected to the piston rod and also used as a stroke adjuster. In both cases the stops will create a pinch point and the user should consider appropriate use of guards. If these external stops are not perpendicular to the mating contact surface, or if debris is trapped between the contact surfaces, a bending moment will be placed on the piston rod, which can lead to piston rod failure. An external stop will also negate the effect of cushioning and will subject the piston rod to impact loading. Those two (2) conditions can cause piston rod failure. Internal stroke adjusters are available with and without cushions. The use of external stroke adjusters should be reviewed with our engineering department.

The piston rod to piston and the stud to piston rod threaded connections are secured with an anaerobic adhesive. The strength of the adhesive decreases with increasing temperature. Cylinders which can be exposed to temperatures above +250°F (+121°C) are to be ordered with a non studded piston rod and a pinned piston to rod joint.

2.3 Cushions – Cushions should be considered for cylinder applications when the piston velocity is expected to be over 4 inches/second.

Cylinder cushions are normally designed to absorb the energy of a linear applied load. A rotating mass has considerably more energy than the same mass moving in a linear mode. Cushioning for a rotating mass application should be review by our engineering department.

2.4 Cylinder Mountings – Some cylinder mounting configurations may have certain limitations such as but not limited to minimum stroke for side or foot mounting cylinders or pressure de-ratings for certain mounts. Carefully review the catalog for these types of restrictions.

Always mount cylinders using the largest possible high tensile alloy steel socket head cap screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

2.5 Port Fittings – Hydraulic cylinders applied with meter out or deceleration circuits are subject to intensified pressure at piston rod end.

The rod end pressure is approximately equal to:

$$\frac{\text{operating pressure x effective cap end area}}{\text{effective rod end piston area}}$$

Contact your connector supplier for the pressure rating of individual connectors.

3.0 Cylinder and Accessories Installation and Mounting

3.1 Installation

3.1.1 – Cleanliness is an important consideration, and cylinders are shipped with the ports plugged to protect them from contaminants entering the ports. These plugs should not be removed until the piping is to be installed. Before making the connection to the cylinder ports, piping should be thoroughly cleaned to remove all chips or burrs which might have resulted from threading or flaring operations.

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3.1.2 – Cylinders operating in an environment where air drying materials are present such as fast-drying chemicals, paint, or weld splatter, or other hazardous conditions such as excessive heat, should have shields installed to prevent damage to the piston rod and piston rod seals.

3.1.3 – Proper alignment of the cylinder piston rod and its mating component on the machine should be checked in both the extended and retracted positions. Improper alignment will result in excessive rod gland and/or cylinder bore wear. On fixed mounting cylinders attaching the piston rod while the rod is retracted will help in achieving proper alignment.

3.1.4 – Sometimes it may be necessary to rotate the piston rod in order to thread the piston rod into the machine member. This operation must always be done with zero pressure being applied to either side of the piston. Failure to follow this procedure may result in loosening the piston to rod-threaded connection. In some rare cases the turning of the piston rod may rotate a threaded piston rod gland and loosen it from the
cylinder head. Confirm that this condition is not occurring. If it does, re-tighten the piston rod gland firmly against the cylinder head.

For double rod cylinders it is also important that when attaching or detaching the piston rod from the machine member that the torque be applied to the piston rod end of the cylinder that is directly attaching to the machine member with the opposite end unrestrained. If the design of the machine is such that only the rod end of the cylinder opposite to where the rod attaches to the machine member can be rotated, consult the factory for further instructions.

3.2 Mounting Recommendations

3.2.1 – Always mount cylinders using the largest possible high tensile alloy steel socket head screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

3.2.2 – Side-Mounted Cylinders – In addition to the mounting bolts, cylinders of this type should be equipped with thrust keys or dowel pins located so as to resist the major load.

3.2.3 – Tie Rod Mounting – Cylinders with tie rod mountings are recommended for applications where mounting space is limited. The standard tie rod extension is shown as BB in dimension tables. Longer or shorter extensions can be supplied. Nuts used for this mounting style should be torqued to the same value as the tie rods for that bore size.

3.2.4 – Flange Mount Cylinders – The controlled diameter of the rod gland extension on head end flange mount cylinders can be used as a pilot to locate the cylinders in relation to the machine. After alignment has been obtained, the flanges may be drilled for pins or dowels to prevent shifting.

3.2.5 – Trunnion Mountings – Cylinders require lubricated bearing blocks with minimum bearing clearances. Bearing blocks should be carefully aligned and rigidly mounted so the trunnions will not be subjected to bending moments. The rod end should also be pivoted with the pivot pin in line and parallel to axis of the trunnion pins.

3.2.6 – Clevis Mountings – Cylinders should be pivoted at both ends with centerline of pins parallel to each other. After cylinder is mounted, be sure to check to assure that the cylinder is free to swing through its working arc without interference from other machine parts.

4.0 Cylinder and Accessories Maintenance, Troubleshooting and Replacement

4.1 Storage – At times cylinders are delivered before a customer is ready to install them and must be stored for a period of time. When storage is required the following procedures are recommended.

4.1.1 – Store the cylinders in an indoor area which has a dry, clean and noncorrosive atmosphere. Take care to protect the cylinder from both internal corrosion and external damage.

4.1.2 – Whenever possible cylinders should be stored in a vertical position (piston rod up). This will minimize corrosion due to possible condensation which could occur inside the cylinder. This will also minimize seal damage.

4.1.3 – Port protector plugs should be left in the cylinder until the time of installation.

4.1.4 – If a cylinder is stored full of hydraulic fluid, expansion of the fluid due to temperature changes must be considered. Installing a check valve with free flow out of the cylinder is one method.

4.1.5 – When cylinders are mounted on equipment that is stored outside for extended periods, exposed unpainted surfaces, e.g. piston rod, must be coated with a rust-inhibiting compound to prevent corrosion.

4.2 Cylinder Trouble Shooting

4.2.1 – **External Leakage**

4.2.1.1 – Rod seal leakage can generally be traced to worn or damaged seals. Examine the piston rod for dents, gouges or score marks, and replace piston rod if surface is rough.

Rod seal leakage could also be traced to gland wear. If clearance is excessive, replace rod bushing and seal. Rod seal leakage can also be traced to seal deterioration. If seals are soft or gummy or brittle, check compatibility of seal material with lubricant used if air cylinder, or operating fluid if hydraulic cylinder. Replace with seal material, which is compatible with these fluids. If the seals are hard or have lost elasticity, it is usually due to exposure to temperatures in excess of 165°F. (+74°C). Shield the cylinder from the heat source to limit temperature to 350°F. (+177°C.) and replace with fluorocarbon seals.

4.2.1.2 – Cylinder body seal leak can generally be traced to loose tie rods. Torque the tie rods to manufacturer's recommendation for that bore size.

Excessive pressure can also result in cylinder body seal leak. Determine maximum pressure to rated limits. Replace seals and retorque tie rods as in paragraph above. Excessive pressure can also result in cylinder body seal leak. Determine if the pressure rating of the cylinder has been exceeded. If so, bring the operating pressure down to the rating of the cylinder and have the tie rods replaced.

Pinched or extruded cylinder body seal will also result in a leak. Replace cylinder body seal and retorque as in paragraph above.

Cylinder body seal leakage due to loss of radial squeeze which shows up in the form of flat spots or due to wear on the O.D. or I.D. – Either of these are symptoms of normal wear due to high cycle rate or length of service. Replace seals as per paragraph above.

4.2.2 – **Internal Leakage**

4.2.2.1 – Piston seal leak (by-pass) 1 to 3 cubic inches per minute leakage is considered normal for piston ring construction. Virtually no static leak with lipseal type seals on piston should be expected. Piston seal wear is a usual cause of piston seal leakage. Replace seals as required.

4.2.2.2 – With lipseal type piston seals excessive back pressure due to over-adjustment of speed control valves could be a direct cause of rapid seal wear. Contamination in a hydraulic system can result in a scored cylinder bore, resulting in rapid seal wear. In either case, replace piston seals as required.

4.2.2.3 – What appears to be piston seal leak, evidenced by the fact that the cylinder drifts, is not always traceable to the piston. To make sure, it is suggested that one side of the cylinder piston be pressurized and the fluid line at the opposite port be disconnected. Observe leakage. If none is evident, seek the cause of cylinder drift in other component parts in the circuit.

4.2.3 – **Cylinder Fails to Move the Load**

4.2.3.1 – Pneumatic or hydraulic pressure is too low. Check the pressure at the cylinder to make sure it is to circuit requirements.

4.2.3.2 – Piston Seal Leak – Operate the valve to cycle the cylinder and observe fluid flow at valve exhaust ports at end of cylinder stroke. Replace piston seals if flow is excessive.

4.2.3.3 – Cylinder is undersized for the load – Replace cylinder with one of a larger bore size.

4.3 Erratic or Chatter Operation

4.3.1 – Excessive friction at rod gland or piston bearing due to load misalignment – Correct cylinder-to-load alignment.

4.3.2 – Cylinder sized too close to load requirements – Reduce load or install larger cylinder.

4.3.3 – Erratic operation could be traced to the difference between static and kinetic friction. Install speed control valves to provide a back pressure to control the stroke.

4.4 Cylinder Modifications, Repairs, or Failed Component – Cylinders as shipped from the factory are not to be disassembled and or modified. If cylinders require modifications, these modifications must be done at company locations or by The Company's certified facilities. The Cylinder Division Engineering Department must be notified in the event of a mechanical fracture or permanent deformation of any cylinder component (excluding seals). This includes a broken piston rod, tie rod, mounting accessory or any other cylinder component. The notification should include all operation and application details. This information will be used to provide an engineered repair that will prevent recurrence of the failure.

It is allowed to disassemble cylinders for the purpose of replacing seals or seal assemblies. However, this work must be done by strictly following all the instructions provided with the seal kits.

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3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

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7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitations, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

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9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (hereinafter "Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgements resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

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