

The Parker 5-Year Extended Warranty

Parker Hannifin Corporation will extend its warranty on all pneumatic components to sixty (60) months providing they are correctly installed and protected by Parker pneumatic filters which are properly maintained. Components covered by this warranty include all cylinders, valves and pneumatic automation components manufactured by Parker in any of our global facilities. This warranty covers our components anywhere in the world you may ship your equipment.

Parker's obligation under this warranty is limited to the replacement or repair of any failed components. The buyer understands that the seller will not be liable for any other costs or damages.

The buyers of quality Parker components and filters benefit by having ONE source for all pneumatic needs - Parker.



Roger Sherrard
President
Automation Group





DISTRIBUTION NETWORK

At Parker, we have the largest global distribution network in motion and control, with over 7,500 distributors serving more than 422,000 customers. To find the distributor nearest you, please visit our DISTRIBUTOR LOCATOR at <http://www.parker.com/pneu/distributor>



ENGINEERING YOUR SUCCESS.

⚠ WARNING

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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 having 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.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

Offer of Sale

The items described in this document are hereby offered for sale by Parker Hannifin Corporation, its subsidiaries or its authorized distributors. This offer and its acceptance are governed by the provisions stated on the separate page of this document entitled "Offer of Sale".

- Repairable aluminum cylinder, anodized body and end caps
- 8 bore sizes: 20mm to 100mm (3/4" to 4")
- 4 Standard rod ends: inch, metric, male, female
- Bumpers standard on both ends
- Adjustable cushions optional at both ends
- Mounting styles: 9 standard
- Strokes available in any practical length
- Available in metric or inch mounting threads



Operating information

Operating pressure: 10 bar (145 PSIG)
 Temperature range:
 Standard -23°C to 74°C (-10°F to 250°F)
 High temperature version* -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.

Filtration requirements: 40 micron, dry filtered air

For technical information see CD

Ordering information

P1L N 032 D M N 0200 W B N N N

Construction 1	Stroke	Version 3	Rod material
N Inch mounting threads	Specify in mm	B Basic	N Carbon steel (std on 32-100mm bores)
M Metric mounting threads		W With options	S Stainless (std on 20-25mm bores)
		/ Special	

Bores (mm)	Seal material	Rod end style 1
020 032 050 080	N Standard seals	N Inch male 4
025 040 063 100	T Fluorocarbon	6 Metric female
		5 Metric male 5
		9 Inch female
		3 Special

Function	Mounting style	Port type 1
D Double acting, single rod	N No mountings fitted (std.)	N NPT threads 4
K Double acting, double rod	J Front flange	B BSPT threads 5
	H Rear flange	
	B Single rear clevis	
	A Double rear clevis	
	F Foot, front & rear	
	G Nose mount	
	E Front trunnion	
	D Rear trunnion	

Cushions/magnetic piston	Stroke length for standard cylinders	
N No cushion, no magnetic piston	Bore	Min. stroke (mm)
M No cushion, magnetic piston 2	20	2
F Cushioned both ends, no magnetic piston	25	2
Y Cushioned both ends, magnetic piston 2	32	2
	40	4
	50	5
	63	7
	80	4
	100	4
		Max. stroke (mm) 6
		1000
		1000
		1000
		1000
		1000
		1000
		1000

Notes:

- 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.
- Not available with fluorocarbon seal option.
- 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.
- Standard with Inch Construction
- Standard with Metric Construction
- Please consult factory for availability of stroke lengths longer than those listed.

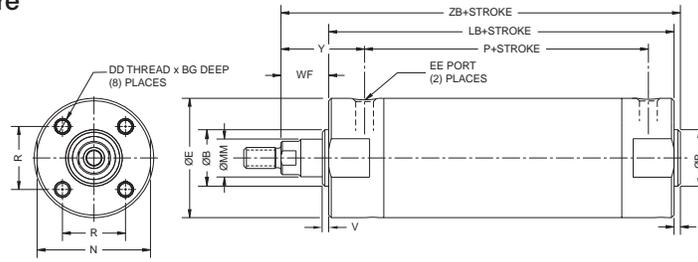
Sensors

For sensors see page B296.

B
 Round Body Cylinders
 Actuator Products

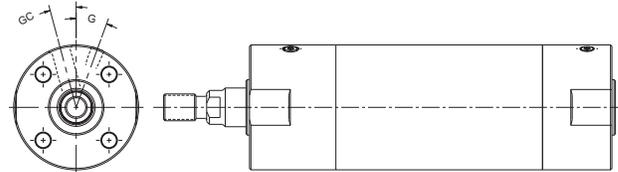
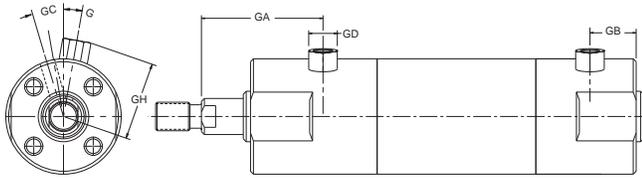
Style N - Basic No Mount

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)



Style N, envelope and mounting dimensions – mm (inch)

Bore size	ØB +0 -0.02 (+0 -0.001)	DD (UNF)	BG depth	ØE	EE (NPTF)	Ø MM rod dia.	N	NA	R	V	WF	Y
20	12 (0.472)	M4x0.7 (8-32)	7 (0.28)	27 (1.06)	1/8* (1/8 †)	8 (0.315)	24 (0.94)	-	14 (0.55)	2 (0.08)	13 (0.50)	28 (1.10)
25	14 (0.551)	M5x0.8 (10-32)	7.6 (0.30)	32 (1.26)	1/8* (1/8 †)	10 (0.394)	29 (1.14)	-	16.5 (0.65)	2 (0.08)	16 (0.62)	30 (1.18)
32	18 (0.709)	M5x0.8 (10-32)	7.6 (0.30)	39 (1.53)	1/8 (1/8)	12 (0.472)	36 (1.42)	11 (0.43)	20 (0.79)	2 (0.08)	22 (0.88)	40 (1.57)
40	25 (0.984)	M6x1 (1/4-28)	12 (0.47)	48.5 (1.91)	1/8 (1/8)	16 (0.630)	44 (1.73)	14 (0.55)	26 (1.02)	2 (0.08)	22 (0.88)	42 (1.65)
50	30 (1.181)	M8x1.25 (5/16-24)	16 (0.63)	59 (2.32)	1/4 (1/4)	20 (0.787)	55 (2.17)	18 (0.71)	32 (1.26)	2 (0.08)	30 (1.19)	53 (2.09)
63	32 (1.260)	M10x1.5 (3/8-24)	16 (0.63)	72 (2.83)	1/4 (1/4)	20 (0.787)	69 (2.72)	18 (0.71)	38 (1.50)	2 (0.08)	30 (1.19)	53 (2.09)
80	40 (1.575)	M10x1.5 (3/8-24)	22 (0.88)	90 (3.54)	3/8 (3/8)	25 (0.984)	86 (3.39)	23 (0.91)	50 (1.97)	3 (0.12)	31 (1.22)	59 (2.32)
100	50 (1.968)	M12x1.75 (1/2-20)	22 (0.88)	110 (4.33)	1/2 (1/2)	32 (1.260)	106 (4.17)	30 (1.18)	60 (2.36)	3 (0.12)	31 (1.22)	57 (2.24)

Add stroke

Bore size	LB	P	ZB
20	69 (2.70)	45 (1.77)	83 (3.28)
25	69 (2.70)	46 (1.81)	86 (3.40)
32	71 (2.78)	43 (1.69)	95 (3.74)
40	78 (3.06)	49 (1.93)	102 (4.02)
50	90 (3.53)	53 (2.09)	122 (4.80)
63	90 (3.53)	52 (2.05)	122 (4.80)
80	108 (4.25)	64 (2.52)	142 (5.59)
100	108 (4.25)	66 (2.60)	142 (5.59)

Adjustable air cushion

Bore size	GA	GB	GD Hex	GC°	G°	GH	EE	Cushion length
20	33 (1.30)	14 (0.55)	8 (0.31)	13-1/2	25-1/2	20.5 (0.81)	M5 x 0.8 (10-32 UNF)	9 (0.35)
25	35 (1.38)	14 (0.55)	8 (0.31)	15-1/2	20-1/2	23 (0.91)	M5 x 0.8 (10-32 UNF)	9 (0.35)
32	-	-	-	10-1/2	30-1/2	-	1/8 (1/8 NPTF)	10 (0.39)
40	-	-	-	10-1/2	22-1/2	-	1/8 (1/8 NPTF)	12 (0.47)
50	-	-	-	10-1/2	23-1/2	-	1/4 (1/4 NPTF)	15 (0.59)
63	-	-	-	15-1/2	20-1/2	-	1/4 (1/4 NPTF)	15 (0.59)
80	-	-	-	15-1/2	25-1/2	-	3/8 (3/8 NPTF)	15 (0.59)
100	-	-	-	15-1/2	25-1/2	-	1/2 (1/2 NPTF)	15 (0.59)

* Ports are M5 for cushioned versions, metric
 † Ports are 10-32 for cushioned versions, inch

B

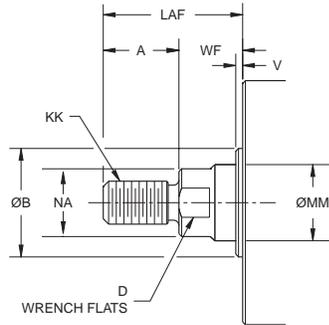
Round Body Cylinders
 Actuator Products



Rod End Details

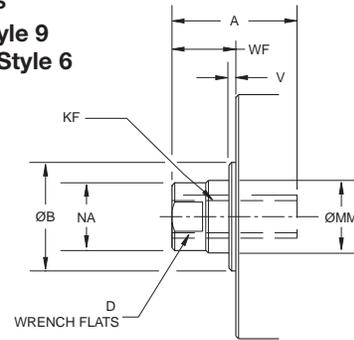
Male threads

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.

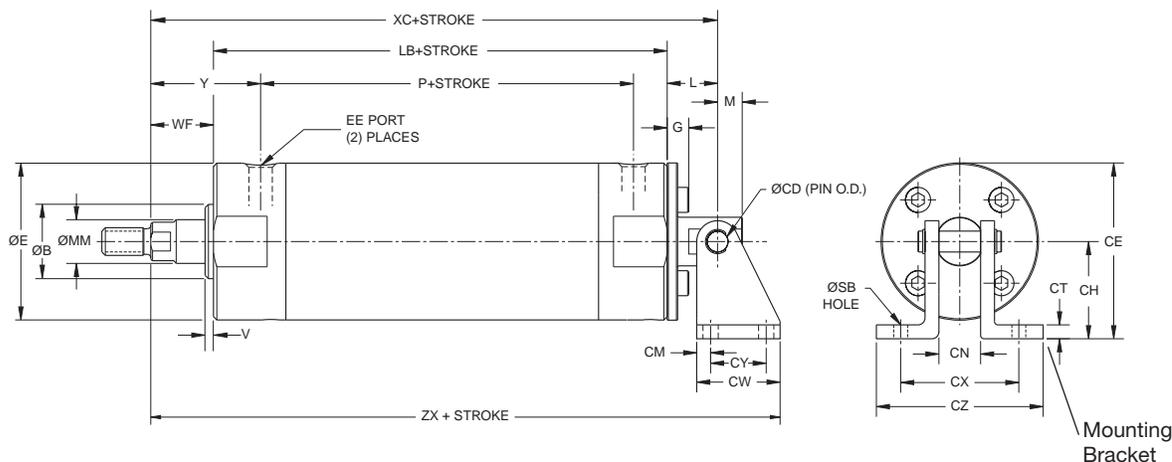
Rod ends – mm (inch)

Bore size	A	ØB +0 -0.02 (+0 -0.001)	D	Thread		LAF	Ø MM rod dia.	NA	V	WF
				KK Style 5 (Style N)	KF Style 6 (Style 9)					
20	13 (0.50)	12 (0.472)	6 (0.24)	M8 x 1.25 (1/4-28)	M5 x 0.80 (#10-32)	26 (1.00)	8 (0.315)	-	2 (0.08)	13 (0.50)
25	13 (0.50)	14 (0.551)	8 (0.31)	M10 x 1.25 (5/16-24)	M6 x 1.00 (1/4-28)	29 (1.12)	10 (0.394)	-	2 (0.08)	16 (0.62)
32	19 (0.75)	18 (0.709)	10 (0.39)	M10 x 1.25 (7/16-20)	M8 x 1.25 (5/16-24)	41 (1.63)	12 (0.472)	11 (0.43)	2 (0.08)	22 (0.88)
40	19 (0.75)	25 (0.984)	12 (0.47)	M14 x 1.5 (7/16-20)	M8 x 1.25 (3/8-24)	41 (1.63)	16 (0.630)	14 (0.55)	2 (0.08)	22 (0.88)
50	22 (0.88)	30 (1.181)	16 (0.63)	M18 x 1.5 (1/2-20)	M10 x 1.25 (1/2-20)	52 (2.07)	20 (0.787)	18 (0.71)	2 (0.08)	30 (1.19)
63	22 (0.88)	32 (1.260)	16 (0.63)	M18 x 1.5 (1/2-20)	M10 x 1.25 (1/2-20)	52 (2.07)	20 (0.787)	18 (0.71)	2 (0.08)	30 (1.19)
80	38 (1.50)	40 (1.575)	20 (0.79)	M22 x 1.5 (3/4-16)	M16 x 1.5 (5/8-18)	69 (2.72)	25 (0.984)	23 (0.91)	3 (0.12)	31 (1.22)
100	48 (1.88)	50 (1.968)	26 (1.02)	M26 x 1.5 (1-14)	M20 x 1.5 (3/4-16)	79 (3.11)	32 (1.260)	30 (1.18)	3 (0.12)	31 (1.22)

B
 Round Body Cylinders
 Actuator Products

Style B - Single Rear Clevis

Typical 20 to 100 mm Bore



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

Style B, envelope and mounting dimensions – mm (inch)

Bore size	ØB +0 - 0.02 (+0 - 0.001)	ØCD h9 (+0 - 0.002)	ØE	EE BSPT (NTPF)	G	L	M	ØMM rod dia.	V	WF	Y
20	12 (0.472)	6.35 (0.250)	27 (1.06)	1/8* (1/8 †)	7 (0.26)	18 (0.70)	7 (0.28)	8 (0.315)	2 (0.08)	13 (0.50)	28 (1.10)
25	14 (0.551)	6.35 (0.250)	32 (1.26)	1/8* (1/8 †)	8 (0.27)	17 (0.68)	7 (0.28)	10 (0.394)	2 (0.08)	16 (0.62)	30 (1.18)
32	18 (0.709)	6.35 (0.250)	39 (1.53)	1/8 (1/8)	15.5 (0.57)	27 (1.07)	10 (0.39)	12 (0.472)	2 (0.08)	22 (0.88)	40 (1.57)
40	25 (0.984)	9.52 (0.375)	48.5 (1.91)	1/8 (1/8)	10 (0.36)	22 (0.88)	10 (0.39)	16 (0.630)	2 (0.08)	22 (0.88)	42 (1.65)
50	30 (1.181)	9.52 (0.375)	59 (2.32)	1/4 (1/4)	12 (0.43)	23 (0.91)	11 (0.44)	20 (0.787)	2 (0.08)	30 (1.19)	53 (2.09)
63	32 (1.260)	9.52 (0.375)	72 (2.83)	1/4 (1/4)	13 (0.46)	23 (0.91)	11 (0.44)	20 (0.787)	2 (0.08)	30 (1.19)	53 (2.09)
80	40 (1.575)	19.07 (0.751)	90 (3.54)	3/8 (3/8)	15 (0.54)	35 (1.38)	19 (0.75)	25 (0.984)	3 (0.12)	31 (1.22)	59 (2.32)
100	50 (1.968)	19.07 (0.751)	110 (4.33)	1/2 (1/2)	17 (0.64)	43 (1.69)	19 (0.75)	32 (1.260)	3 (0.12)	31 (1.22)	57 (2.24)

Bore size											Add stroke			
	CE	CH	CM	CN	CT	CW	CX	CY	CZ	ØSB	LB	P	XC	ZX
20	35.5 (1.39)	22 (0.87)	5 (0.19)	10 (0.38)	3 (0.12)	29 (1.13)	32 (1.25)	19 (0.75)	51 (2.00)	7 (0.27)	69 (2.70)	45 (1.77)	99 (3.91)	120 (4.74)
25	38 (1.49)	22 (0.87)	5 (0.19)	10 (0.38)	3 (0.12)	29 (1.13)	32 (1.25)	19 (0.75)	51 (2.00)	7 (0.27)	69 (2.70)	46 (1.81)	102 (4.00)	123 (4.83)
32	41.5 (1.63)	22 (0.87)	5 (0.19)	13 (0.50)	3 (0.12)	29 (1.13)	35 (1.38)	19 (0.75)	54 (2.12)	7 (0.27)	71 (2.78)	43 (1.69)	120 (4.72)	141 (5.55)
40	59 (2.31)	35 (1.38)	6 (0.25)	16 (0.62)	3 (0.12)	38 (1.50)	47 (1.86)	25 (1.00)	67 (2.62)	7 (0.27)	78 (3.06)	49 (1.93)	122 (4.81)	151 (5.94)
50	64.5 (2.52)	35 (1.38)	6 (0.25)	19 (0.75)	6 (0.25)	38 (1.50)	54 (2.12)	25 (1.00)	76 (3.00)	7 (0.27)	90 (3.53)	53 (2.09)	143 (5.63)	172 (6.76)
63	80 (3.17)	44 (1.75)	6 (0.25)	19 (0.75)	6 (0.25)	38 (1.50)	54 (2.12)	25 (1.00)	76 (3.00)	7 (0.27)	90 (3.53)	52 (2.05)	143 (5.63)	172 (6.76)
80	96 (3.77)	51 (2.00)	13 (0.50)	28 (1.09)	6 (0.25)	64 (2.50)	72 (2.84)	38 (1.50)	104 (4.09)	11 (0.42)	108 (4.25)	64 (2.52)	173 (6.82)	218 (8.57)
100	115 (4.54)	60 (2.37)	13 (0.50)	32 (1.25)	6 (0.25)	70 (2.75)	76 (3.00)	44 (1.75)	108 (4.25)	14 (0.55)	108 (4.25)	66 (2.60)	189 (7.44)	240 (9.44)

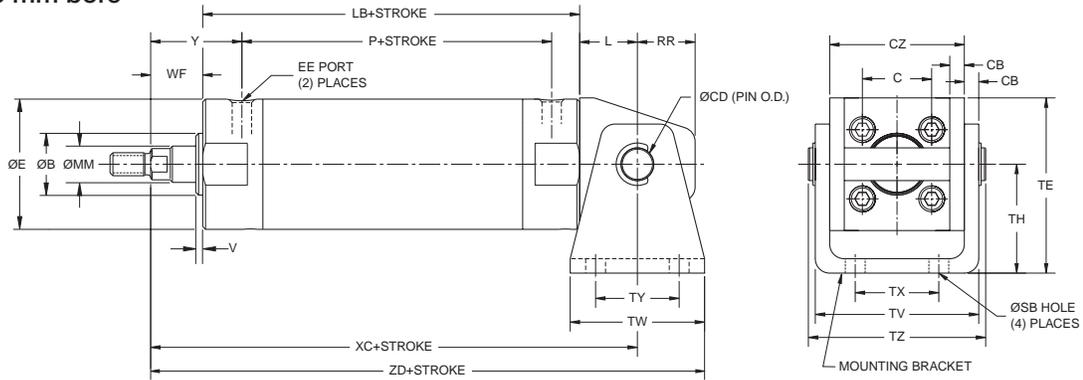
* Ports are M5 for cushioned versions, metric
 † Ports are 10-32 for cushioned versions, inch

B

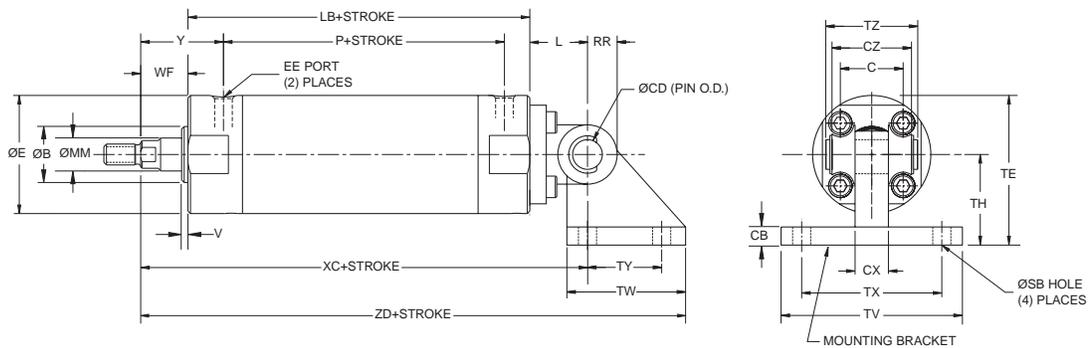
Round Body Cylinders
 Actuator Products

Style A - Double Rear Clevis

Typical 20 to 63 mm bore



Typical 80 to 100 mm bore



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

Style A, envelope and mounting dimensions – mm (inch)

Bore size	ØB +0 -0.02 (+0 -0.001)	C	CB	ØCD d 9 (-0.001 -0.003)	CZ	CX	ØE	EE BSPT (NPTF)	L	ØMM rod dia.	RR	V	WF
20	12 (0.472)	14 (0.55)	3 (0.12)	8 (0.315)	29 (1.14)	-	27 (1.06)	1/8* (1/8†)	14 (0.55)	8 (0.315)	11 (0.43)	2 (0.08)	13 (0.50)
25	14 (0.551)	16.5 (0.65)	3 (0.12)	10 (0.394)	33 (1.30)	-	32 (1.26)	1/8* (1/8†)	16 (0.63)	10 (0.394)	13 (0.51)	2 (0.08)	16 (0.62)
32	18 (0.709)	20 (0.79)	4.5 (0.18)	12 (0.472)	40 (1.57)	-	39 (1.53)	1/8 (1/8)	20 (0.79)	12 (0.472)	15 (0.59)	2 (0.08)	22 (0.88)
40	25 (0.984)	26 (1.02)	4.5 (0.18)	14 (0.551)	49 (1.93)	-	48.5 (1.91)	1/8 (1/8)	22 (0.87)	16 (0.630)	18 (0.71)	2 (0.08)	22 (0.88)
50	30 (1.181)	32 (1.26)	6 (0.25)	16 (0.630)	60 (2.36)	-	59 (2.32)	1/4 (1/4)	25 (0.98)	20 (0.787)	20 (0.79)	2 (0.08)	30 (1.19)
63	32 (1.260)	38 (1.50)	8 (0.31)	18 (0.709)	74 (2.91)	-	72 (2.83)	1/4 (1/4)	30 (1.18)	20 (0.787)	22 (0.87)	2 (0.08)	30 (1.19)
80	40 (1.575)	50 (1.97)	11 (0.43)	18 (0.709)	56 (2.20)	28 (1.10)	90 (3.54)	3/8 (3/8)	35 (1.38)	25 (0.984)	18 (0.71)	3 (0.12)	31 (1.22)
100	50 (1.968)	60 (2.36)	12 (0.47)	22 (0.866)	64 (2.52)	32 (1.26)	110 (4.33)	1/2 (1/2)	43 (1.69)	32 (1.260)	22 (0.87)	3 (0.12)	31 (1.22)

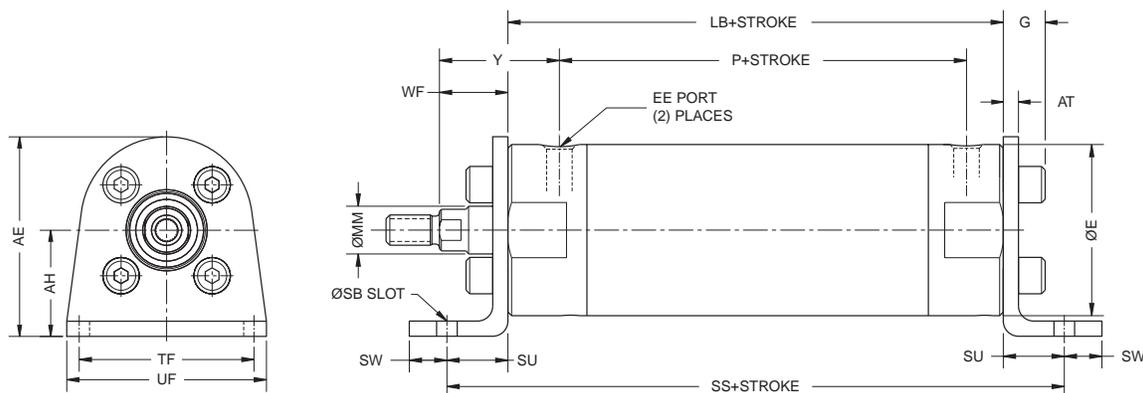
Bore size	Ø SB	TY	TV	TE	TH	TX	TW	TZ	Y	Add Stroke			
										LB	P	XC	ZD
20	5.5 (0.22)	28 (1.10)	35 (1.39)	38 (1.50)	25 (0.98)	16 (0.63)	42 (1.66)	43.4 (1.71)	28 (1.10)	69 (2.70)	45 (1.77)	95 (3.75)	116 (4.58)
25	5.5 (0.22)	28 (1.10)	39 (1.55)	45.5 (1.79)	30 (1.18)	20 (0.79)	42 (1.66)	48 (1.89)	30 (1.18)	69 (2.70)	46 (1.81)	100 (3.95)	121 (4.78)
32	7 (0.28)	28 (1.10)	49 (1.93)	54 (2.13)	35 (1.38)	22 (0.87)	48 (1.88)	59.4 (2.34)	40 (1.57)	71 (2.78)	43 (1.69)	113 (4.45)	137 (5.39)
40	7 (0.28)	30 (1.18)	58 (2.28)	63.5 (2.50)	40 (1.57)	30 (1.18)	56 (2.20)	71.4 (2.81)	42 (1.65)	78 (3.06)	49 (1.93)	122 (4.81)	150 (5.91)
50	9 (0.35)	36 (1.42)	72 (2.83)	79 (3.11)	50 (1.97)	36 (1.42)	64 (2.52)	86 (3.38)	53 (2.09)	90 (3.53)	53 (2.09)	145 (5.70)	177 (6.96)
63	11 (0.43)	46 (1.81)	90 (3.54)	96 (3.78)	60 (2.36)	46 (1.81)	74 (2.91)	105.4 (4.15)	53 (2.09)	90 (3.53)	52 (2.05)	150 (5.90)	187 (7.36)
80	11 (0.43)	45 (1.77)	110 (4.33)	100 (3.94)	55 (2.17)	85 (3.35)	72 (2.83)	64 (2.52)	59 (2.32)	108 (4.25)	64 (2.52)	174 (6.85)	232.5 (9.15)
100	13.5 (0.53)	60 (2.36)	130 (5.12)	120 (4.72)	65 (2.56)	100 (3.94)	93 (3.66)	72 (2.83)	57 (2.24)	108 (4.25)	66 (2.60)	182 (7.17)	258.5 (10.18)

* Ports are M5 for cushioned versions, metric
 † Ports are 10-32 for cushioned versions, inch



Style F - Foot Mount

Typical 20 to 100 mm bore



Style F, envelope and mounting dimensions – mm (inch)

Bore size	AE	AH	AT	ØE	EE (BSPT)	G	ØMM rod dia.	ØSB
20	36.5 (1.44)	20.6 (0.81)	3 (0.12)	27 (1.06)	1/8* (1/8†)	6 (0.20)	8 (0.315)	7 (0.27)
25	38.5 (1.52)	20.6 (0.81)	3 (0.12)	32 (1.26)	1/8* (1/8†)	6.5 (0.22)	10 (0.394)	7 (0.27)
32	46.5 (1.83)	25.4 (1.00)	3 (0.12)	39 (1.53)	1/8 (1/8)	6.5 (0.22)	12 (0.472)	7 (0.28)
40	51 (2.02)	25.4 (1.00)	3 (0.12)	48.5 (1.91)	1/8 (1/8)	7 (0.25)	16 (0.630)	7 (0.28)
50	72 (2.84)	38.1 (1.50)	6 (0.25)	59 (2.32)	1/4 (1/4)	11 (0.41)	20 (0.787)	9 (0.34)
63	83.5 (3.29)	44.5 (1.75)	6 (0.25)	72 (2.83)	1/4 (1/4)	12 (0.44)	20 (0.787)	9 (0.34)
80	101 (3.98)	55 (2.17)	6 (0.25)	90 (3.54)	3/8 (3/8)	12 (0.44)	25 (0.984)	11 (0.43)
100	121 (4.76)	65 (2.56)	6 (0.25)	110 (4.33)	1/2 (1/2)	13 (0.50)	32 (1.260)	14 (0.55)

Bore size	SU	SW	TF	UF	WF	Y	Add stroke		
							LB	P	SS
20	14 (0.56)	11 (0.44)	38 (1.50)	48 (1.88)	13 (0.50)	28 (1.10)	69 (2.70)	45 (1.77)	97 (3.82)
25	14 (0.56)	11 (0.44)	38 (1.50)	48 (1.88)	16 (0.62)	30 (1.18)	69 (2.70)	46 (1.81)	97 (3.82)
32	19 (0.75)	19 (0.75)	48 (1.88)	63.5 (2.50)	22 (0.88)	40 (1.57)	71 (2.78)	43 (1.69)	109 (4.28)
40	18 (0.72)	20 (0.78)	48 (1.88)	63.5 (2.50)	22 (0.88)	42 (1.65)	78 (3.06)	49 (1.93)	114 (4.50)
50	25 (1.00)	16 (0.62)	57 (2.24)	79 (3.12)	30 (1.19)	53 (2.09)	90 (3.53)	53 (2.09)	140 (5.53)
63	25 (1.00)	16 (0.62)	73 (2.88)	95 (3.75)	30 (1.19)	53 (2.09)	90 (3.53)	52 (2.05)	140 (5.53)
80	28.5 (1.12)	14 (0.55)	100 (3.94)	125 (4.92)	31 (1.22)	59 (2.32)	108 (4.25)	64 (2.52)	165 (6.49)
100	30 (1.18)	16 (0.63)	120 (4.72)	150 (5.91)	31 (1.22)	57 (2.24)	108 (4.25)	66 (2.60)	168 (6.61)

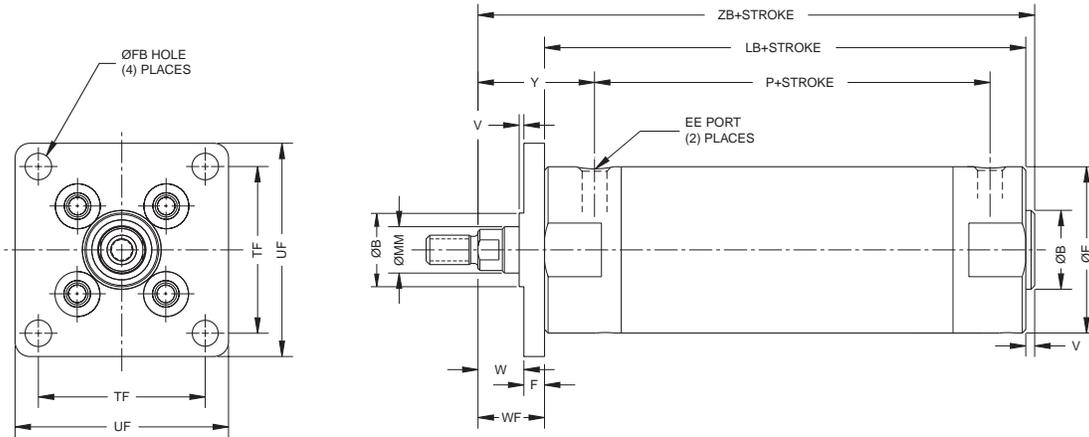
* Ports are M5 for cushioned versions, metric
 † Ports are 10-32 for cushioned versions, inch

B

Round Body Cylinders
 Actuator Products

Style J - Front Flange

Typical 20 to 100 mm bore



Style J, envelope and mounting dimensions – mm (inch)

Bore size	ØB	ØE	EE (BSPT)	F	ØFB	ØMM rod dia.	TF	UF	V	WF	W	Y
	+0 -0.02											
20	12 (0.472)	27 (1.06)	1/8* (1/8†)	6 (0.24)	5.5 (0.22)	8 (0.315)	28 (1.10)	40 (1.57)	2 (0.08)	13 (0.50)	7 (0.26)	28 (1.10)
25	14 (0.551)	32 (1.26)	1/8* (1/8†)	7 (0.28)	5.5 (0.22)	10 (0.394)	32 (1.26)	44 (1.73)	2 (0.08)	16 (0.62)	9 (0.34)	30 (1.18)
32	18 (0.709)	39 (1.53)	1/8 (1/8)	7 (0.28)	7 (0.28)	12 (0.472)	38 (1.50)	53 (2.09)	2 (0.08)	22 (0.88)	15 (0.60)	40 (1.57)
40	25 (0.984)	48.5 (1.91)	1/8 (1/8)	8 (0.31)	7 (0.28)	16 (0.630)	46 (1.81)	61 (2.40)	2 (0.08)	22 (0.88)	14 (0.57)	42 (1.65)
50	30 (1.181)	59 (2.32)	1/4 (1/4)	9 (0.35)	9 (0.35)	20 (0.787)	58 (2.28)	76 (3.00)	2 (0.08)	30 (1.19)	21 (0.84)	53 (2.09)
63	32 (1.260)	72 (2.83)	1/4 (1/4)	9 (0.35)	11 (0.43)	20 (0.787)	70 (2.76)	92 (3.62)	2 (0.08)	30 (1.19)	21 (0.84)	53 (2.09)
80	40 (1.575)	90 (3.54)	3/8 (3/8)	11 (0.43)	11 (0.43)	25 (0.984)	82 (3.23)	104 (4.09)	3 (0.12)	31 (1.22)	20 (0.79)	59 (2.32)
100	50 (1.968)	110 (4.33)	1/2 (1/2)	14 (0.55)	14 (0.55)	32 (1.260)	100 (3.94)	128 (5.04)	3 (0.12)	31 (1.22)	17 (0.67)	57 (2.24)

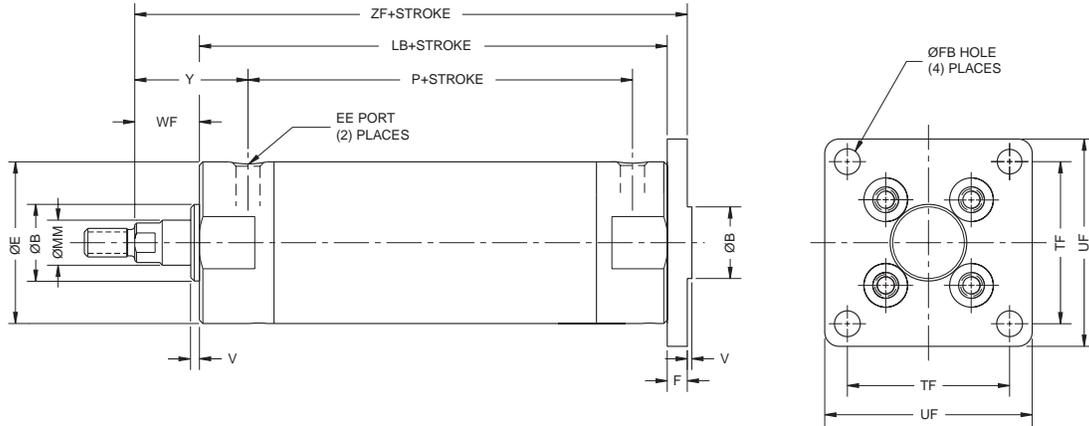
Bore size	Add stroke		
	LB	P	ZB
20	69 (2.70)	45 (1.77)	83 (3.28)
25	69 (2.70)	46 (1.81)	86 (3.40)
32	71 (2.78)	43 (1.69)	95 (3.74)
40	78 (3.06)	49 (1.93)	102 (4.02)
50	90 (3.53)	53 (2.09)	122 (4.80)
63	90 (3.53)	52 (2.05)	122 (4.80)
80	108 (4.25)	64 (2.52)	142 (5.59)
100	108 (4.25)	66 (2.60)	142 (5.59)

* Ports are M5 for cushioned versions, metric
 † Ports are 10-32 for cushioned versions, inch

B
 Round Body Cylinders
 Actuator Products

Style H - Rear Flange

Typical 20 to 100 mm bore



Style H, envelope and mounting dimensions – mm (inch)

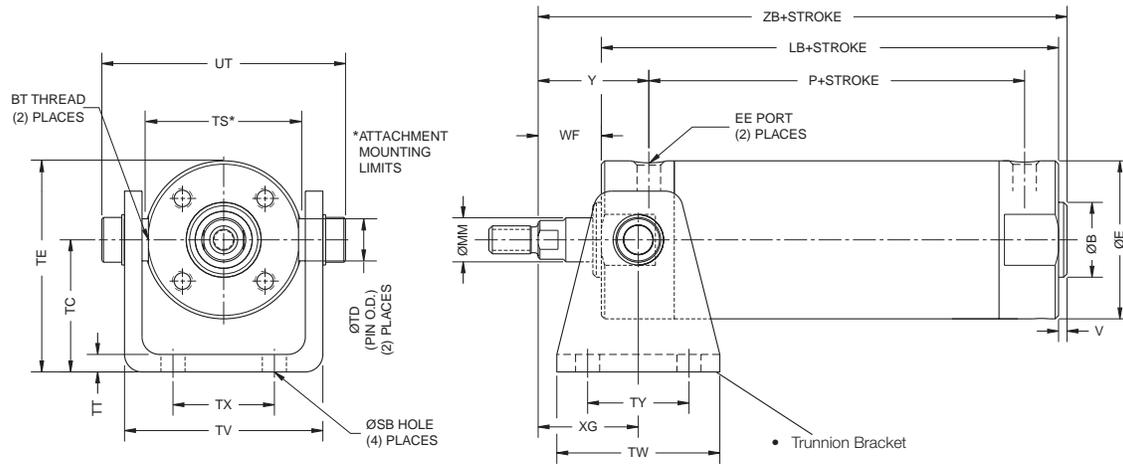
Bore size	ØB +0 -0.02	ØE	EE (BSPT)	F	ØFB	ØMM rod dia.	TF	UF	V	WF	Y
20	12 (0.472)	27 (1.06)	1/8* (1/8†)	6 (0.24)	5.5 (0.22)	8 (0.315)	28 (1.10)	40 (1.57)	2 (0.08)	13 (0.50)	28 (1.10)
25	14 (0.551)	32 (1.26)	1/8* (1/8†)	7 (0.28)	5.5 (0.22)	10 (0.394)	32 (1.26)	44 (1.73)	2 (0.08)	16 (0.62)	30 (1.18)
32	18 (0.709)	39 (1.53)	1/8 (1/8)	7 (0.28)	7 (0.28)	12 (0.472)	38 (1.50)	53 (2.09)	2 (0.08)	22 (0.88)	40 (1.57)
40	25 (0.984)	48.5 (1.91)	1/8 (1/8)	8 (0.31)	7 (0.28)	16 (0.630)	46 (1.81)	61 (2.40)	2 (0.08)	22 (0.88)	42 (1.65)
50	30 (1.181)	59 (2.32)	1/4 (1/4)	9 (0.35)	9 (0.35)	20 (0.787)	58 (2.28)	76 (3.00)	2 (0.08)	30 (1.19)	53 (2.09)
63	32 (1.260)	72 (2.83)	1/4 (1/4)	9 (0.35)	11 (0.43)	20 (0.787)	70 (2.76)	92 (3.62)	2 (0.08)	30 (1.19)	53 (2.09)
80	40 (1.575)	90 (3.54)	3/8 (3/8)	11 (0.43)	11 (0.43)	25 (0.984)	82 (3.23)	104 (4.09)	3 (0.12)	31 (1.22)	59 (2.32)
100	50 (1.968)	110 (4.33)	1/2 (1/2)	14 (0.55)	14 (0.55)	32 (1.260)	100 (3.94)	128 (5.04)	3 (0.12)	31 (1.22)	57 (2.24)

Bore size	Add stroke		
	LB	P	ZF
20	69 (2.70)	45 (1.77)	87 (3.44)
25	69 (2.70)	46 (1.81)	91 (3.60)
32	71 (2.78)	43 (1.69)	100 (3.94)
40	78 (3.06)	49 (1.93)	108 (4.25)
50	90 (3.53)	53 (2.09)	129 (5.07)
63	90 (3.53)	52 (2.05)	129 (5.07)
80	108 (4.25)	64 (2.52)	150 (5.91)
100	108 (4.25)	66 (2.60)	153 (6.02)

* Ports are M5 for cushioned versions, metric
 † Ports are 10-32 for cushioned versions, inch

Style E - Front Trunnion

Typical 20 to 63 mm bore



Note: Trunnion Bracket must be ordered as separate item

Style E, envelope and mounting dimensions – mm (inch)

Bore size	ØB	BT	D	ØE	EE (BSPT)	ØMM rod dia.	V	WF	XG	Y	ØSB	TC
	+0 -0.02											
20	12 (0.472)	M5x0.80	6 (0.24)	27 (1.06)	1/8* (1/8†)	8 (0.315)	2 (0.08)	13 (0.50)	24 (0.93)	28 (1.10)	5.5 (0.22)	25 (0.98)
25	14 (0.551)	M6x0.75	8 (0.31)	32 (1.26)	1/8* (1/8†)	10 (0.394)	2 (0.08)	16 (0.62)	27 (1.05)	30 (1.18)	5.5 (0.22)	30 (1.18)
32	18 (0.709)	M8x1.00	10 (0.39)	39 (1.53)	1/8 (1/8)	12 (0.472)	2 (0.08)	22 (0.88)	33 (1.31)	40 (1.57)	7 (0.28)	35 (1.38)
40	25 (0.984)	M10x1.25	12 (0.47)	48.5 (1.91)	1/8 (1/8)	16 (0.630)	2 (0.08)	22 (0.88)	34 (1.35)	42 (1.65)	7 (0.28)	40 (1.57)
50	30 (1.181)	M12x1.25	16 (0.63)	59 (2.32)	1/4 (1/4)	20 (0.787)	2 (0.08)	30 (1.19)	43 (1.70)	53 (2.09)	9 (0.35)	50 (1.97)
63	32 (1.260)	M14x1.50	16 (0.63)	72 (2.83)	1/4 (1/4)	20 (0.787)	2 (0.08)	30 (1.19)	43 (1.70)	53 (2.09)	11 (0.43)	60 (2.36)

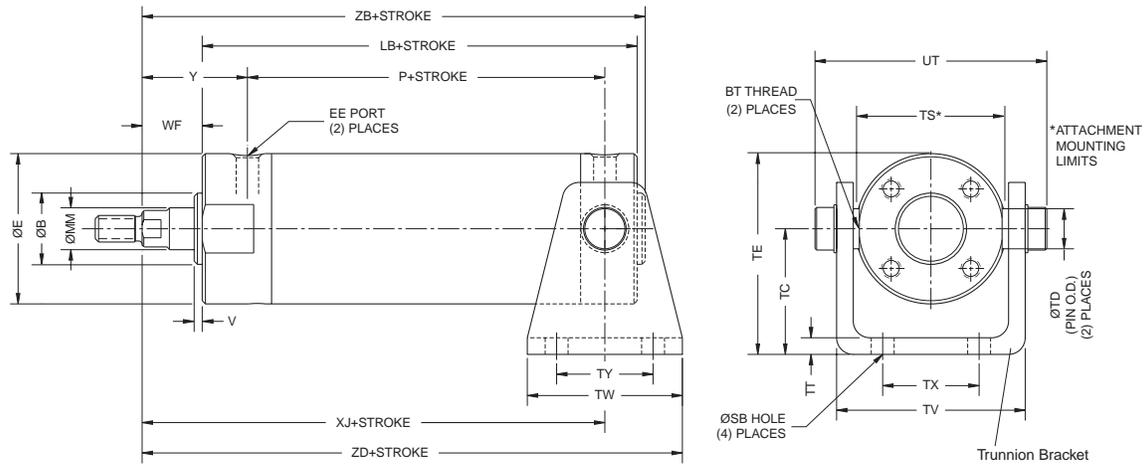
Bore size	ØTD e8	TE	TS	TT	TV	TW	TX	TY	UT	Add stroke		
										LB	P	ZB
20	8 (0.315)	38.5 (1.51)	28 (1.10)	3 (0.12)	35 (1.39)	42 (1.66)	16 (0.63)	28 (1.10)	47.5 (1.87)	69 (2.70)	45 (1.77)	83 (3.28)
25	10 (0.394)	46 (1.81)	33 (1.30)	3 (0.12)	39 (1.55)	42 (1.66)	20 (0.79)	28 (1.10)	53 (2.09)	69 (2.70)	46 (1.81)	86 (3.40)
32	12 (0.472)	54.5 (2.15)	40 (1.58)	4.5 (0.18)	49 (1.93)	48 (1.88)	22 (0.87)	28 (1.10)	68 (2.67)	71 (2.78)	43 (1.69)	95 (3.74)
40	14 (0.551)	64 (2.53)	49 (1.93)	4.5 (0.18)	58 (2.28)	56 (2.20)	30 (1.18)	30 (1.18)	79 (3.10)	78 (3.06)	49 (1.93)	102 (4.02)
50	16 (0.630)	79.5 (3.13)	60 (2.36)	6 (0.25)	72 (2.83)	64 (2.52)	36 (1.42)	36 (1.42)	99 (3.88)	90 (3.53)	53 (2.09)	122 (4.80)
63	18 (0.709)	96 (3.78)	74 (2.91)	8 (0.31)	90 (3.54)	74 (2.91)	46 (1.81)	46 (1.81)	119 (4.69)	90 (3.53)	52 (2.05)	122 (4.80)

* Ports are M5 for cushioned versions, metric
 † Ports are 10-32 for cushioned versions, inch

B
 Round Body Cylinders
 Actuator Products

Style D - Rear Trunnion

Typical 20 to 63 mm bore



Note: Trunnion Bracket must be ordered as separate item

Style D, envelope and mounting dimensions – mm (inch)

Bore size	ØB +0 -0.02	BT	ØE	EE (BSPT)	ØMM rod dia.	V	WF	Y	ØSB	TC	ØTD e8	TE
20	12 (0.472)	M5x0.80	27 (1.06)	1/8* (1/8†)	8 (0.315)	2 (0.08)	13 (0.50)	28 (1.10)	5.5 (0.22)	25 (0.98)	8 (0.315)	38.5 (1.51)
25	14 (0.551)	M6x0.75	32 (1.26)	1/8* (1/8†)	10 (0.394)	2 (0.08)	16 (0.62)	30 (1.18)	5.5 (0.22)	30 (1.18)	10 (0.394)	46 (1.81)
32	18 (0.709)	M8x1.00	39 (1.53)	1/8 (1/8)	12 (0.472)	2 (0.08)	22 (0.88)	40 (1.57)	7 (0.28)	35 (1.38)	12 (0.472)	54.5 (2.15)
40	25 (0.984)	M10x1.25	48.5 (1.91)	1/8 (1/8)	16 (0.630)	2 (0.08)	22 (0.88)	42 (1.65)	7 (0.28)	40 (1.57)	14 (0.551)	64 (2.53)
50	30 (1.181)	M12x1.25	59 (2.32)	1/4 (1/4)	20 (0.787)	2 (0.08)	30 (1.19)	53 (2.09)	9 (0.35)	50 (1.97)	16 (0.630)	79.5 (3.13)
63	32 (1.260)	M14x1.50	72 (2.83)	1/4 (1/4)	20 (0.787)	2 (0.08)	30 (1.19)	53 (2.09)	11 (0.43)	60 (2.36)	18 (0.709)	96 (3.78)

Bore size	Add stroke											
	TS	TT	TV	TW	TX	TY	UT	LB	P	XJ	ZB	ZD
20	28 (1.10)	3 (0.12)	35 (1.39)	42 (1.66)	16 (0.63)	28 (1.10)	47.5 (1.87)	69 (2.70)	45 (1.77)	70 (2.77)	83 (3.28)	91 (3.60)
25	33 (1.30)	3 (0.12)	39 (1.55)	42 (1.66)	20 (0.79)	28 (1.10)	53 (2.09)	69 (2.70)	46 (1.81)	73 (2.89)	86 (3.40)	94 (3.72)
32	40 (1.58)	4.5 (0.18)	49 (1.93)	48 (1.88)	22 (0.87)	28 (1.10)	68 (2.67)	71 (2.78)	43 (1.69)	83 (3.27)	95 (3.74)	107 (4.21)
40	49 (1.93)	4.5 (0.18)	58 (2.28)	56 (2.20)	30 (1.18)	30 (1.18)	79 (3.10)	78 (3.06)	49 (1.93)	90 (3.54)	102 (4.02)	118 (4.64)
50	60 (2.36)	6 (0.25)	72 (2.83)	64 (2.52)	36 (1.42)	36 (1.42)	99 (3.88)	90 (3.53)	53 (2.09)	108 (4.25)	122 (4.80)	140 (5.51)
63	74 (2.91)	8 (0.31)	90 (3.54)	74 (2.91)	46 (1.81)	46 (1.81)	119 (4.69)	90 (3.53)	52 (2.05)	108 (4.25)	122 (4.80)	145 (5.71)

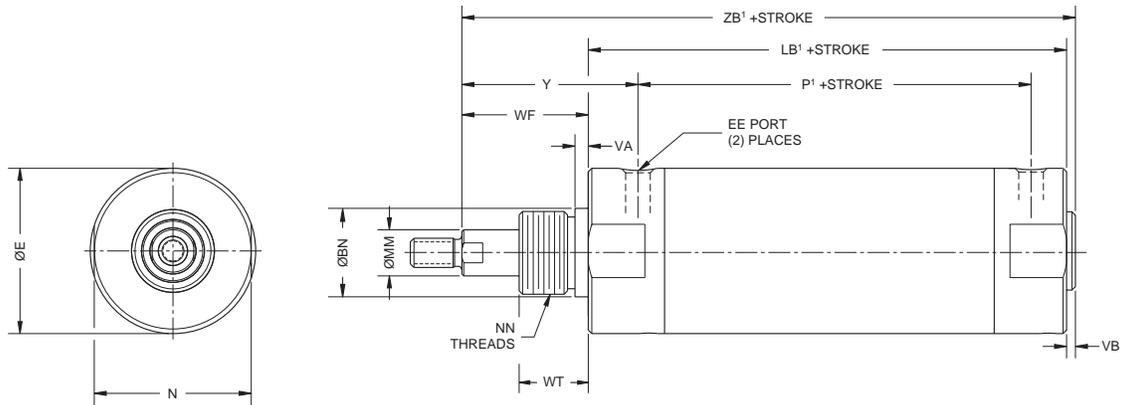
* Ports are M5 for cushioned versions, metric
 † Ports are 10-32 for cushioned versions, inch

B

Round Body Cylinders
 Actuator Products

Style G - Nose Mount

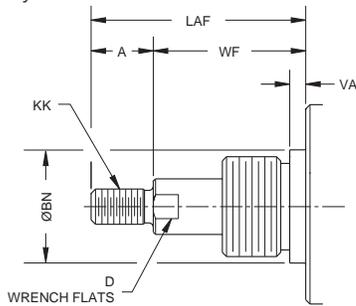
Typical 20 to 25 mm bore



Rod end details – 20 and 25 mm bore

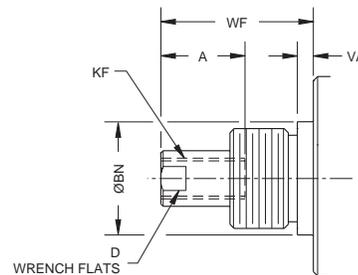
Male threads

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.

Style G, envelope and mounting dimensions – mm (inch)

Bore size	A	BN +0 -0.08		D	ØE	EE (BSPT)	Thread KK Style 5	Thread KF Style 6	ØMM rod dia.	LAF	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	
	(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	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	
	(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)	

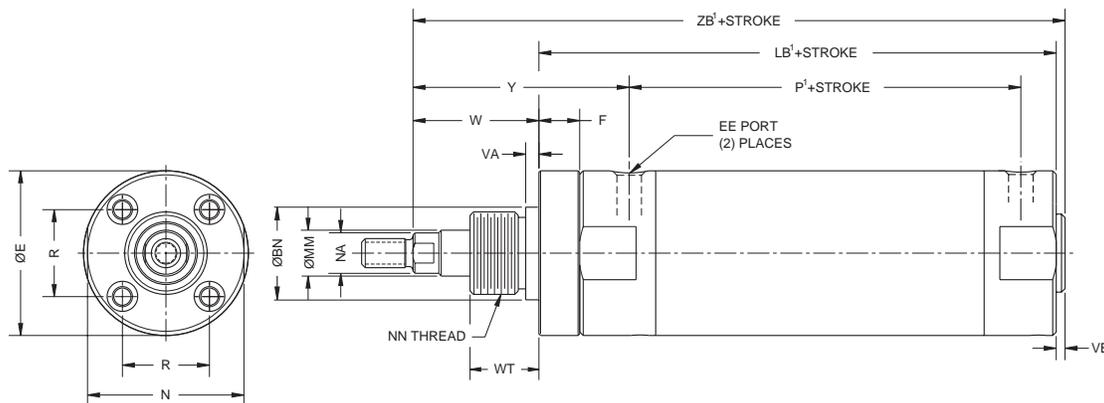
* Ports are M5 for cushioned versions, metric

† Ports are 10-32 for cushioned versions, inch

B
 Round Body Cylinders
 Actuator Products

Style G - Nose Mount

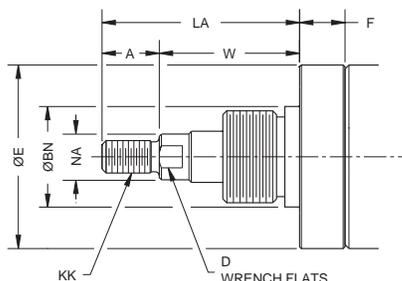
Typical 32 to 63mm bore



Rod end details – 32 to 63mm bore

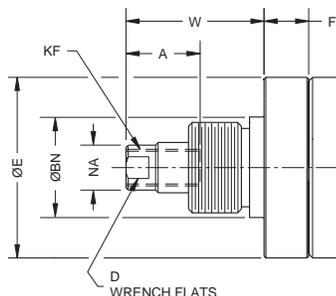
Male threads

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.

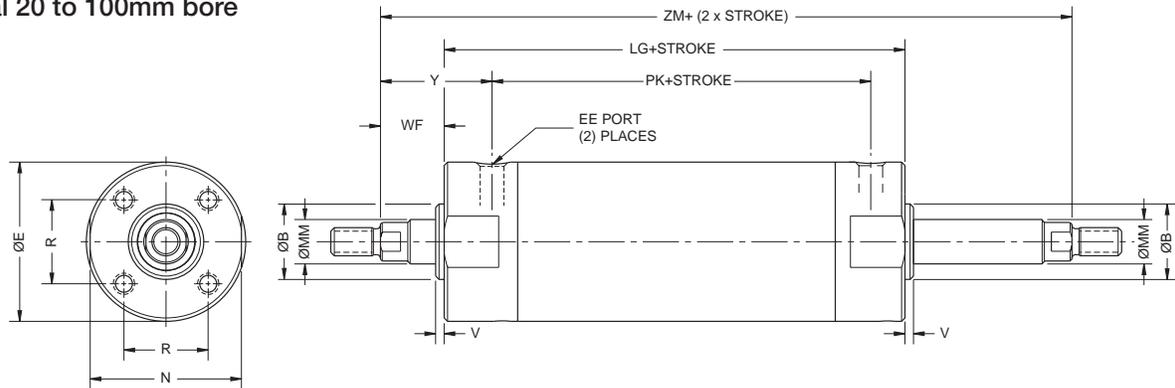
Style G, envelope and mounting dimensions – mm (inch)

Bore size	A	BN +0 -0.8		D	ØE		EE* (BSPT) F	Thread		LA	ØMM rod dia.		N	NA	R	VA	VB	W	WT	Y	Add stroke		
		KK Style 5	KF Style 6		NN	N		NA	LB ¹		P ¹	ZB ¹											
32	19 (0.75)	19.02 (0.749)	10 (0.39)	39 (1.53)	1/8 (1/8)	9 (0.37)	M10x1.25 (7/16-20)	M8x1.25 (5/16-24)	41 (1.63)	12 (0.472)	3/4-16 (3/4-16)	36 (1.42)	11 (0.43)	20 (0.79)	3 (0.12)	2 (0.08)	22 (0.88)	16 (0.63)	49 (1.93)	80 (3.15)	43 (1.69)	104 (4.11)	
40	19 (0.75)	26.87 (1.058)	12 (0.47)	48.5 (1.91)	1/8 (1/8)	14 (0.56)	M14x1.5 (7/16-20)	M8x1.25 (3/8-24)	51 (2.00)	16 (0.630)	1-14 (1-14)	44 (1.73)	14 (0.55)	26 (1.02)	5 (0.19)	2 (0.08)	32 (1.25)	22 (0.88)	66 (2.60)	92 (3.62)	49 (1.93)	126 (4.95)	
50	22 (0.88)	34.90 (1.374)	16 (0.63)	59 (2.32)	1/4 (1/4)	15 (0.59)	M18x1.5 (1/2-20)	M10x1.25 (1/2-20)	52 (2.07)	20 (0.787)	1-1/4-12 (1-1/4-12)	55 (2.17)	18 (0.71)	32 (1.26)	3 (0.12)	2 (0.08)	30 (1.19)	20.5 (0.81)	68 (2.68)	105 (4.12)	53 (2.09)	137 (5.39)	
63	22 (0.88)	38.10 (1.500)	16 (0.63)	72 (2.83)	1/4 (1/4)	16 (0.63)	M18x1.5 (1/2-20)	M10x1.25 (1/2-20)	52 (2.07)	20 (0.787)	1-3/8-12 (1-3/8-12)	69 (2.72)	18 (0.71)	38 (1.50)	3 (0.12)	2 (0.08)	30 (1.19)	20.5 (0.81)	70 (2.76)	106 (4.19)	52 (2.05)	139 (5.46)	

* See Metric Dimensions for BSPT Port Size.
See Inch Dimensions for NPTF Port Size.

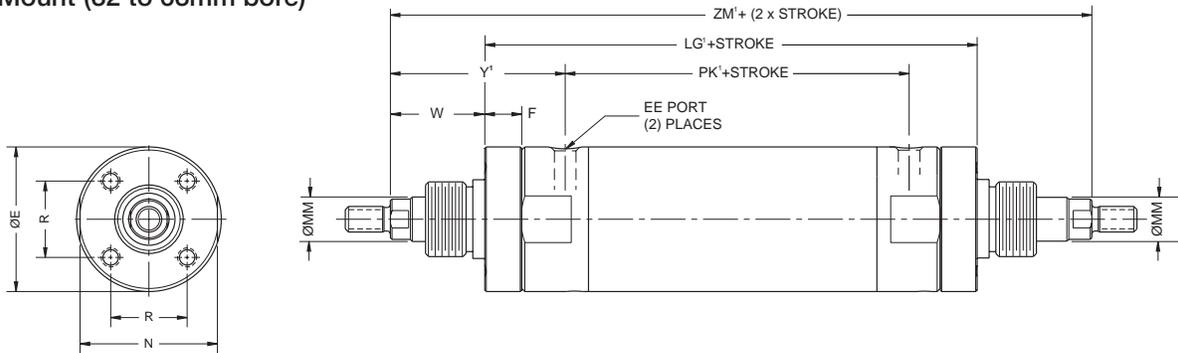
Double-Rod

Typical 20 to 100mm bore



Double-Rod

Nose Mount (32 to 63mm bore)



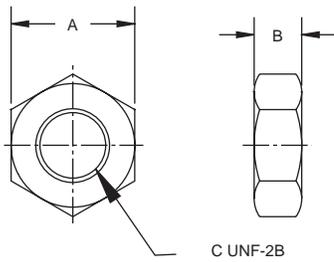
For detailed dimensions for the nose mount from 20 to 63 mm bore, please reference previous pages.

Double rod, envelope and mounting dimensions – mm (inch)

Bore size	ØB +0 -0.02		F	EE (BSPT)	ØMM rod dia.			Add stroke										
	ØE				N	R	V	W	WF	Y	Y1	LG	LG1	PK	PK1	ZM	ZM1	
20	12 (0.472)	27 (1.06)	-	1/8* (1/8†)	8 (0.315)	24 (0.94)	14 (0.55)	2 (0.08)	-	13 (0.50)	28 (1.10)	32 (1.25)	75 (2.97)	70 (2.74)	45 (1.77)	50 (1.97)	101 (3.97)	95 (3.74)
25	14 (0.551)	32 (1.26)	-	1/8* (1/8†)	10 (0.394)	29 (1.14)	16.5 (0.65)	2 (0.08)	-	16 (0.62)	30 (1.18)	32 (1.25)	75 (2.97)	70 (2.74)	47 (1.85)	50 (1.97)	107 (4.21)	101 (3.98)
32	18 (0.709)	39 (1.53)	9 (0.37)	1/8 (1/8)	12 (0.472)	36 (1.42)	20 (0.79)	2 (0.08)	22 (0.88)	22 (0.88)	40 (1.57)	49 (1.93)	78 (3.06)	78 (3.80)	42 (1.65)	42 (1.65)	122 (4.82)	141 (5.56)
40	25 (0.984)	48.5 (1.91)	14 (0.56)	1/8 (1/8)	16 (0.630)	44 (1.73)	26 (1.02)	2 (0.08)	32 (1.25)	22 (0.88)	42 (1.65)	66 (2.60)	87 (3.41)	115 (4.53)	47 (1.85)	47 (1.85)	131 (5.17)	179 (7.03)
50	30 (1.181)	59 (2.32)	15 (0.59)	1/4 (1/4)	20 (0.787)	55 (2.17)	32 (1.26)	2 (0.08)	30 (1.19)	30 (1.19)	53 (2.09)	68 (2.68)	100 (3.93)	130 (5.11)	54 (2.13)	54 (2.13)	160 (6.31)	190 (7.49)
63	32 (1.260)	72 (2.83)	17 (0.66)	1/4 (1/4)	20 (0.787)	69 (2.72)	38 (1.50)	2 (0.08)	30 (1.19)	30 (1.19)	53 (2.09)	70 (2.76)	100 (3.93)	133 (5.25)	54 (2.13)	54 (2.13)	160 (6.31)	194 (7.63)
80	40 (1.575)	90 (3.54)	-	3/8 (3/8)	25 (0.984)	86 (3.39)	50 (1.97)	3 (0.12)	-	31 (1.22)	59 (2.32)	-	119 (4.70)	-	61 (2.40)	-	181 (7.14)	-
100	50 (1.968)	110 (4.33)	-	1/2 (1/2)	32 (1.260)	106 (4.17)	60 (2.36)	3 (0.12)	-	31 (1.22)	57 (2.24)	-	119 (4.70)	-	65 (2.56)	-	181 (7.14)	-

* Ports are M5 for cushioned versions, metric
 † Ports are 10-32 for cushioned versions, inch

Rod Jam Nut



Rod jam nut should be ordered separately on all mounting styles.

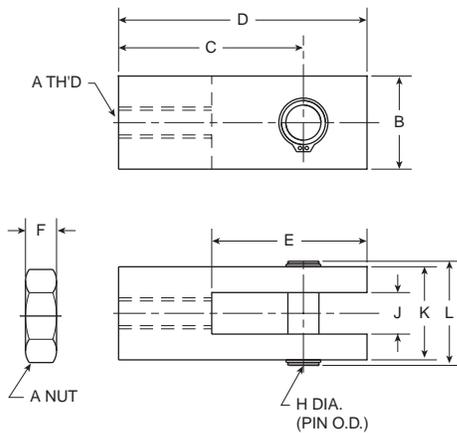
Rod Jam Nut Dimensions – mm

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

Rod Jam Nut Dimensions – inch

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

Piston Rod Clevis



Piston Rod Clevis Dimensions – mm

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

Piston Rod Clevis Dimensions – inch

Bore size	A	B	C	D	E	F	H	J	K +0 -0.02	L	Part number
20	1/4-28	0.50	0.94	1.19	0.69	0.16	0.250	0.26	0.50	0.69	L077960025
25	5/16-24	0.50	0.94	1.19	0.69	0.19	0.250	0.26	0.50	0.69	L077960031
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	L077960044
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	L077960050
80	3/4-16	1.25	1.81	2.38	1.31	0.42	0.437	0.52	1.25	1.66	L077960075
100	1-14	1.50	2.63	3.38	1.81	0.55	0.500	0.64	1.50	1.91	L077960100

B

Round Body Cylinders
Actuator Products

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 reviewed 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:

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

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.

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.

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods or work described will be referred to as "Products".

- 1. Terms and Conditions.** Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is expressly conditioned on Buyer's assent to these Terms and Conditions and to the terms and conditions found on-line at www.parker.com/saleterms/. Seller objects to any contrary or additional term or condition of Buyer's order or any other document issued by Buyer.
- 2. Price Adjustments; Payments.** Prices stated on the reverse side or preceding pages of this document are valid for 30 days. After 30 days, Seller may change prices to reflect any increase in its costs resulting from state, federal or local legislation, price increases from its suppliers, or any change in the rate, charge, or classification of any carrier. The prices stated on the reverse or preceding pages of this document do not include any sales, use, or other taxes unless so stated specifically. Unless otherwise specified by Seller, all prices are F.O.B. Seller's facility, and payment is due 30 days from the date of invoice. After 30 days, Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.
- 3. Delivery Dates; Title and Risk; Shipment.** All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon tender to the carrier at Seller's facility (i.e., when it's on the truck, it's yours). Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyers' request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's changes in shipping, product specifications or in accordance with Section 13, herein.
- 4. Warranty.** Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of twelve months from the date of delivery to Buyer or 2,000 hours of normal use, whichever occurs first. This warranty is made only to Buyer and does not extend to anyone to whom Products are sold after purchased from Seller. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**
- 5. Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 60 days after delivery or, in the case of an alleged breach of warranty, within 30 days after the date within the warranty period on which the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for any amount due to Seller from Buyer) must be commenced within thirteen months from the date of tender of delivery by Seller or, for a cause of action based upon an alleged breach of warranty, within thirteen months from the date within the warranty period on which the defect is or should have been discovered by Buyer.
- 6. LIMITATION OF LIABILITY.** UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. **IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.**
- 7. Contingencies.** Seller shall not be liable for any default or delay in performance if caused by circumstances beyond the reasonable control of Seller.
- 8. User Responsibility.** The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.
- 9. Loss to Buyer's Property.** Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.
- 10. Special Tooling.** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. 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 Products, 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.

- 11. Buyer's Obligation; Rights of Seller.** To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest. Seller shall have a security interest in, and lien upon, any property of Buyer in Seller's possession as security for the payment of any amounts owed to Seller by Buyer.
- 12. Improper use and Indemnity.** Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.
- 13. Cancellations and Changes.** Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.
- 14. Limitation on Assignment.** Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.
- 15. Entire Agreement.** This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of the agreement. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.
- 16. Waiver and Severability.** Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.
- 17. Termination.** This agreement may be terminated by Seller for any reason and at any time by giving Buyer thirty (30) days written notice of termination. In addition, Seller may by written notice immediately terminate this agreement for the following: (a) Buyer commits a breach of any provision of this agreement (b) the appointment of a trustee, receiver or custodian for all or any part of Buyer's property (b) the filing of a petition for relief in bankruptcy of the other Party on its own behalf, or by a third party (c) an assignment for the benefit of creditors, or (d) the dissolution or liquidation of the Buyer.
- 18. Governing Law.** This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement. Disputes between the parties shall not be settled by arbitration unless, after a dispute has arisen, both parties expressly agree in writing to arbitrate the dispute.
- 19. 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 Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("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 a Product sold pursuant to this Agreement 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 a Product 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 the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product 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 Products 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 Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.
- 20. Taxes.** Unless otherwise indicated, 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 Products.
- 21. Equal Opportunity Clause.** For the performance of government contracts and where dollar value of the Products exceed \$10,000, the equal employment opportunity clauses in Executive Order 11246, VEVRAA, and 41 C.F.R. §§ 60-1.4(a), 60-741.5(a), and 60-250.4, are hereby incorporated.

