

numatics®

NB Series

Compact Air Cylinders



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EMERSON
Industrial Automation

BCAE
Automation Solutions

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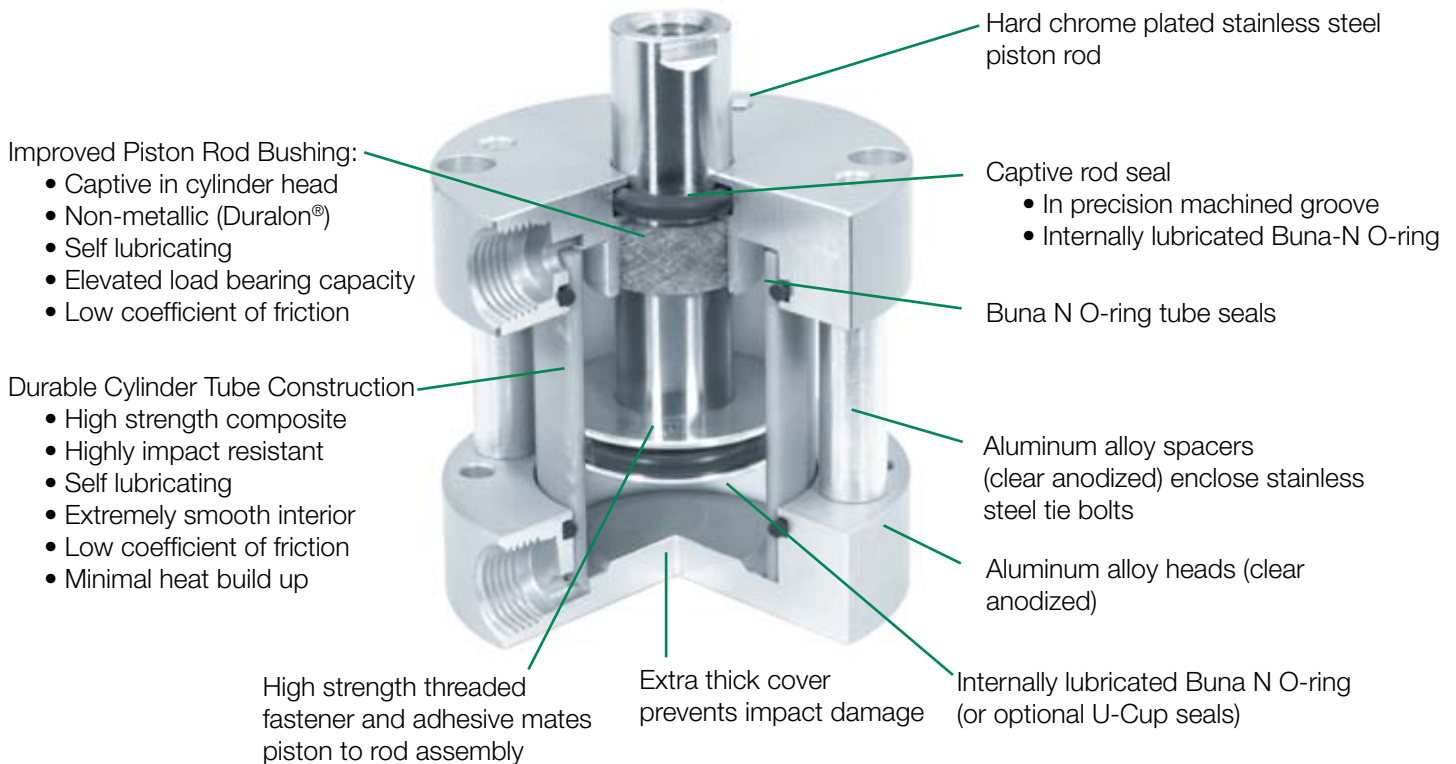
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The NB Series



Compact Interchangeable Air Cylinders that are loaded with Features and Benefits

Value-Added Features – Stainless steel tie bolts and aluminum spacers lock precision machined heads tightly around a unique, high strength, composite cylinder tube. The tube is extremely smooth, the self-lubricating interior surface insures highly reliable performance and extended seal life. Its high impact resistance reduces chances of cylinder failure due to dings or dents. Zero slip-stick avoids problems that metal cylinders encounter when they sit in a static condition for extended periods of time. Combined with hard chrome plated stainless steel piston rods and a unique, non-metallic rod bearing.

Exceptional Piston Rod Bearing – The better the bearing, the more cycle life you can expect from your air cylinders. **The NB Series** cylinders incorporate a truly superior rod bearing material - Duralon®. Duralon® is a composite with a PTFE/ Dacron® fabric liner bonded to a supporting filament-wound, high strength, fiberglass and epoxy resin shell. Resistant to corrosion, moisture and temperature to 325°F, the bearing is reliable in any environment. It has an extremely high load bearing capacity, very low friction, and will not gall or score the piston rod.

Duralon® Rod Bearings Excel

Load Capacity (psi)	Friction Properties	
Machine Design 1972/73	Coefficient Slip-stick	
Bearing Reference Issue	Steel-on-steel	.50 Yes
Porous Bronze... 4,500	Bronze-on-steel ...	.35 Yes
Porous iron 8,000	Sintered Bronze-on-steel	
Phenolics..... 6,000	with mineral oil	.13 No
Nylon® 1,000	Bronze-on-steel	
PTFE 500	with mineral oil	.16 No
Reinforced PTFE	Copper lead	
2,500	alloy-on-steel.	.22 Yes
*PTFE fabric 60,000	Acetal-on-steel	.20 No
Polycarbonate ... 1,000	Nylon-on-steel.....	.32 Yes
Acetal 1,000	Duralon-on-steel	.05 - .16 No
Carbon-graphite 600		

* Shows Duralon bearing classification. Not to be used for design purposes.



Features

- Double acting, single rod
- Double acting, double rod
- Double acting, hole through double rod
- Single acting, spring retracted rod
- Reverse acting, spring extended rod
- 8 Bore sizes 1/2" through 4"
- Strokes to 4" (standard)

Ratings-Standard Units All Series

Tube	Self-lubricating composite
End Caps	Clear anodized aluminum alloy
Tie Bolts	Stainless steel
Rod	Chrome plated stainless steel
Piston	Aluminum alloy
Rod End	Female thread with wrench flats
Ports	Position #1
Seals	Internally lubricated Buna-N
Rod Bushing	PTFE composite bearing
Stroke Tolerance	± 1/64"
Media	Air
Max Pressure Rating	200 psi
Min. Operating Pressure	15 psi
Temperature Rating Cylinder	-25° to ± 221°F (-32° to ± 105°C)
Temperature Rating	
Electronic Sensors	-4° to ± 176° F (-20° to ± 80°C)

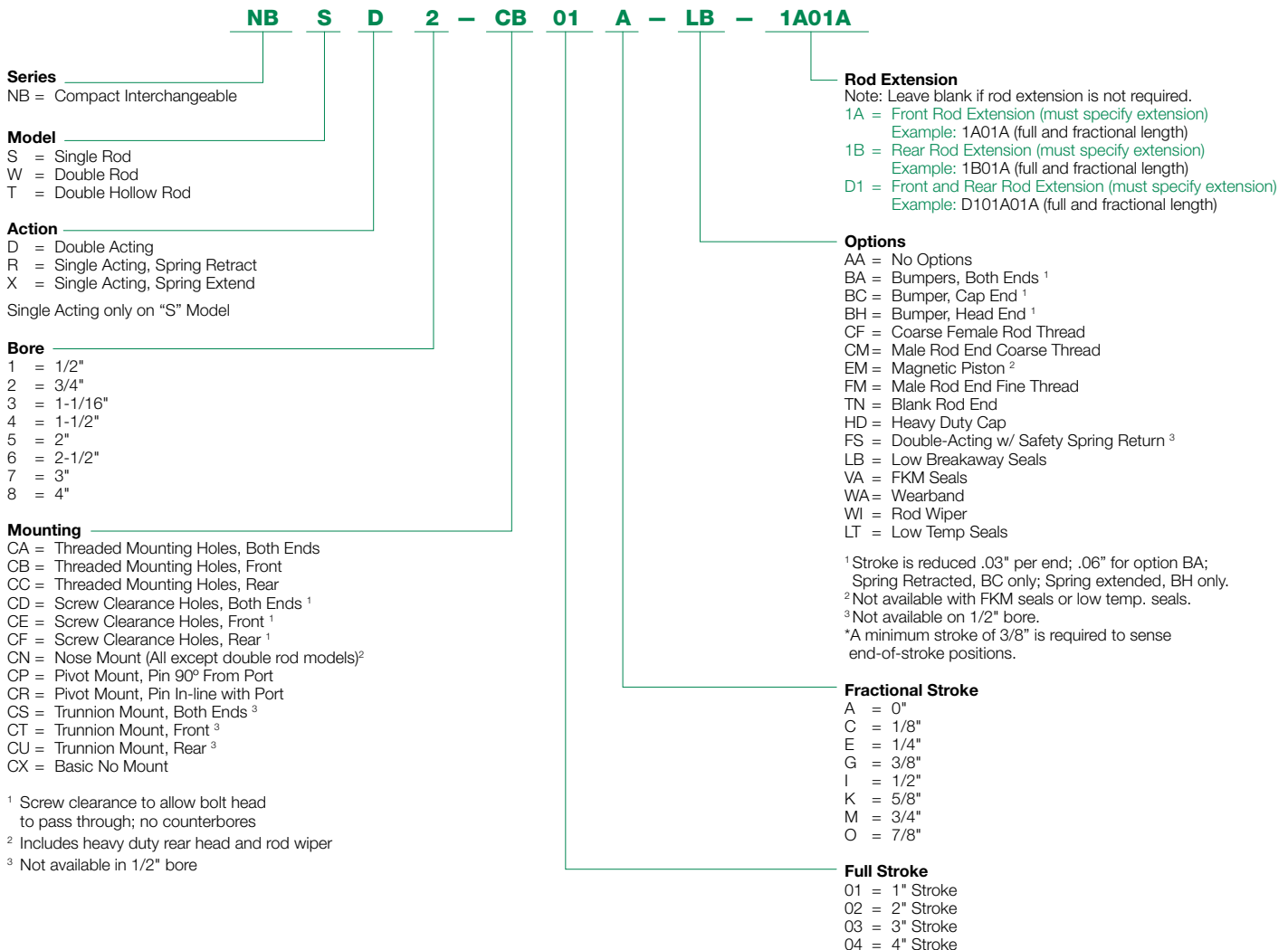
Approximate Spring Forces

Bore	Maximum Force	Spring Rate (lbs/inch) for Stroke Range			
		0.12 to 1" Stroke	1.001 to 2" Stroke	2.001 to 3" Stroke	3.001 to 4" Stroke
1/2	5.25	4.25	2.13	1.42	1.06
3/4	10.00	6.00	3.00	2.00	1.50
1-1/16	13.00	6.50	3.25	2.17	1.63
1-1/2	13.00	6.50	3.25	2.17	1.63
2	13.00	6.50	3.25	2.17	1.63
2-1/2	25.00	12.50	6.25	4.17	3.13
3	25.00	12.50	6.25	4.17	3.13
4	25.00	12.50	6.25	4.17	3.13

Cylinder Sizing Guide

Bore	Rod Diameter	Rod Area	Extend Area (Single Rod)	Extend Area (Double Rod)	Retract Area
1/2	0.25	0.05	0.20	0.15	0.15
3/4	0.31	0.08	0.44	0.36	0.36
1-1/16	0.50	0.19	0.88	0.69	0.69
1-1/2	0.63	0.31	1.76	1.45	1.45
2	0.75	0.44	3.14	2.66	2.66
2-1/2	0.75	0.44	4.91	4.47	4.47
3	0.88	0.60	7.07	6.47	6.47
4	1.00	0.79	12.57	11.78	11.78

How to Order



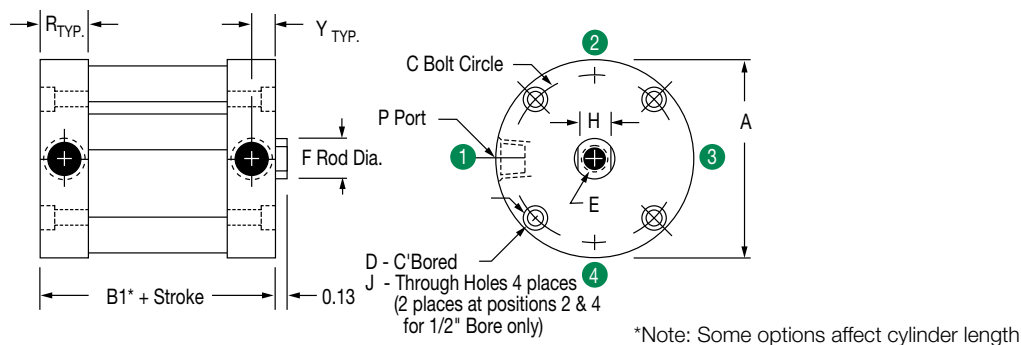
How to Order Example:

NBTD4-CB02I-VA

NB Series with double rod hole through,
double-acting, 1-1/2" bore, front threaded
mounting holes, 2-1/2" stroke, and FKM seals.

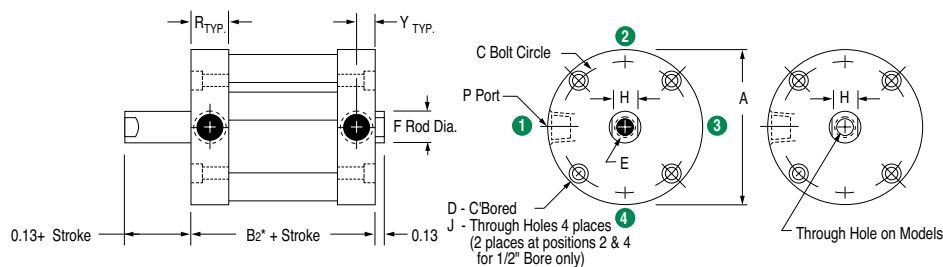
*Note that some options affect cylinder length. See
page 9 for length adders.

Double Acting, Single Rod



Standard Strokes – All Models: 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, 1, 1-1/4, 1-1/2, 1-3/4, 2, 2-1/2, 3, 3-1/2, 4
Special strokes available on request.

Dimensions: Inches

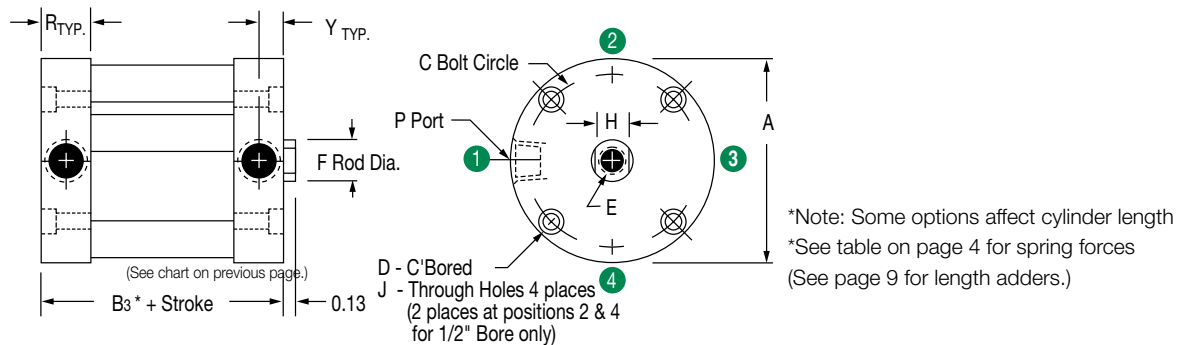
Double Acting, Double Rod
Double Acting, Hole Through Double Rod

Hole Through Diameter

Bore	Female Rod Thread	Male Rod Thread
1/2 (1)	0.14	N/A
3/4 (2)	0.14	0.09
1-1/16 (3)	0.22	0.16
1-1/2 (4)	0.28	0.19
2 (5)	0.38	0.25
2-1/2 (6)	0.38	0.25
3 (7)	0.44	0.31
4 (8)	0.50	0.38

Bore	A	B1*	B2*	B3* for Stroke Range				B4* for Stroke Range				C	D C'Bore
				0-1	1.001-2	2.001-3	3.001-4	0-1	1.001-2	2.001-3	3.001-4		
1/2 (1)	1.12	0.56	0.69	0.81	1.38	1.96	2.52	1.06	1.62	2.14	3.21	0.88	0.20 x 0.13 dp
3/4 (2)	1.49	0.56	0.69	0.81	1.38	1.94	2.50	1.06	1.62	2.19	2.75	1.22	0.24 x 0.15 dp
1-1/16 (3)	1.99	0.88	0.94	0.88	1.50	2.13	2.75	1.38	2.00	2.63	3.25	1.69	0.24 x 0.15 dp
1-1/2 (4)	2.62	0.88	1.00	0.88	1.50	2.13	2.75	1.38	2.00	2.63	3.25	2.19	0.34 x 0.22 dp
2 (5)	3.12	0.94	1.06	0.94	1.56	2.19	2.81	1.44	2.06	2.69	NA	2.69	0.34 x 0.22 dp
2-1/2 (6)	3.75	1.19	1.31	1.19	2.06	2.94	3.81	1.94	2.81	2.81	NA	3.25	0.40 x 0.27 dp
3 (7)	4.25	1.25	1.38	1.25	2.12	3.00	3.88	2.00	2.88	2.88	NA	3.78	0.40 x 0.27 dp
4 (8)	5.50	1.56	1.69	1.56	2.44	3.31	4.19	2.31	3.19	3.19	NA	4.94	0.49 x 0.33 dp

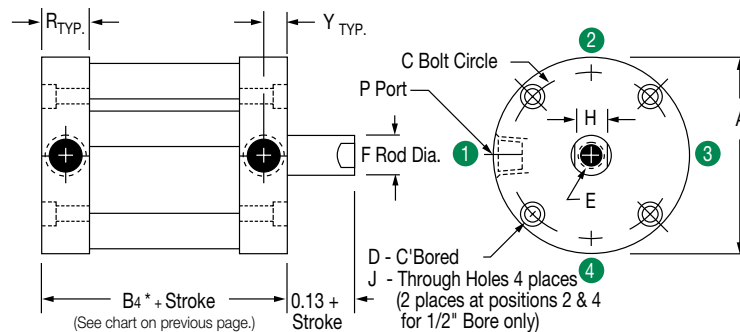
Single Acting, Spring Retract



Standard Strokes – All Models: 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, 1, 1-1/4, 1-1/2, 1-3/4, 2, 2-1/2, 3, 3-1/2, 4
Special strokes available on request.

Dimensions: Inches

Single Acting, Spring Extended



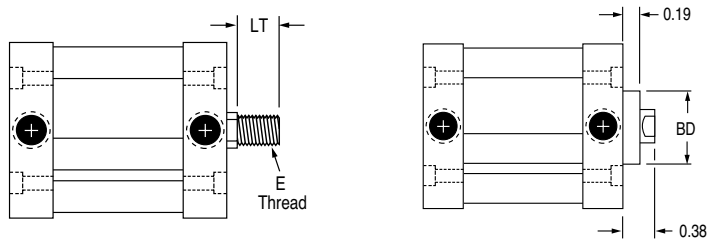
Approximate Cylinder Weights (ounces)

Double Acting, Single Rod Single Acting, Spring Return			Double Acting, Double Rod Double Acting, Hole Through Rod			Single Acting, Spring Extend		Nose Mount Option
Bore	Base	Added per 1/8 of Stroke	Base	Added per 1/8 of Stroke	Added per 1/8 of Stroke	Base	Added per 1/8 of Stroke	Added to Base Weight
1/2 (1)	1.15	.06	1.26	.14	.08	1.25	.06	0.1
3/4 (2)	1.82	.08	2.03	.18	.13	1.92	.08	0.2
1-1/16 (3)	4.70	.24	5.61	.37	.25	5.09	.24	1.1
1-1/2 (4)	9.22	.32	10.84	.55	.42	10.08	.32	1.8
2 (5)	12.48	.40	14.71	.64	.50	13.44	.40	2.7
2-1/2 (6)	21.50	.48	27.10	.74	.59	24.00	.48	3.1
3 (7)	27.74	.64	36.78	1.01	.76	31.20	.64	3.5
4 (8)	53.47	.80	69.50	1.20	.92	59.33	.80	5.9

Bore	E Standard	E Coarse	E Depth for Stroke Range		F	H	J Hole	P Port	R	Y
			1/8-1/2	5/8 +						
1/2 (1)	#8-32 UNC	N/A	0.30-0.46	0.46	0.25	0.22	0.13	#10-32 UNF	0.34	0.14
3/4 (2)	#10-32 UNF	#10-24 UNC	0.30-0.46	0.46	0.31	0.25	0.15	#10-32 UNF	0.34	0.14
1-1/16 (3)	5/16-24 UNF	5/16-18 UNC	0.37-0.63	0.70	0.50	0.44	0.15	1/8 NPT	0.50	0.25
1-1/2 (4)	3/8-24 UNF	3/8-16 UNC	0.37-0.70	0.70	0.63	0.50	0.20	1/8 NPT	0.50	0.25
2 (5)	1/2-20 UNF	1/2-13 UNC	0.30-0.63	0.70	0.75	0.63	0.20	1/8 NPT	0.53	0.25
2-1/2 (6)	1/2-20 UNF	1/2-13 UNC	0.42-0.70	0.70	0.75	0.63	0.26	1/4 NPT	0.66	0.33
3 (7)	5/8-18 UNF	5/8-11 UNC	0.45-0.73	0.73	0.88	0.75	0.26	1/4 NPT	0.69	0.33
4 (8)	3/4-16 UNF	3/4-10 UNC	0.40-0.70	0.80	1.00	0.88	0.33	3/8 NPT	0.84	0.42

Model Options

Male Rod Ends
(Option CM or FM)



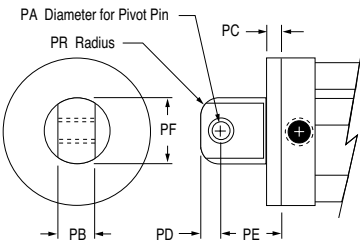
Bore	E Thread		LT
	CM (Coarse)	FM (Fine)	
1/2 (1)	#8-32 UNC	N/A	0.38
3/4 (2)	#10-24 UNC	#10-32 UNF	0.38
1-1/16 (3)	5/16-18 UNC	5/16-24 UNF	0.50
1-1/2 (4)	3/8-16 UNC	3/8-24 UNF	0.50
2 (5)	1/2-13 UNC	1/2-20 UNF	0.63
2-1/2 (6)	1/2-13 UNC	1/2-20 UNF	0.63
3 (7)	5/8-11 UNC	5/8-18 UNF	0.75
4 (8)	3/4-10 UNC	3/4-16 UNF	0.75

Bore	BD
1/2 (1)	0.56
3/4 (2)	0.69
1-1/16 (3)	0.88
1-1/2 (4)	1.00
2 (5)	1.13
2-1/2 (6)	1.13
3 (7)	1.25
4 (8)	1.38

Mounting Options

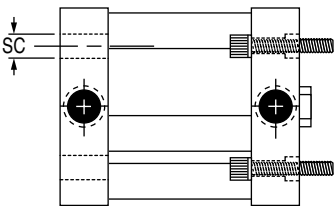
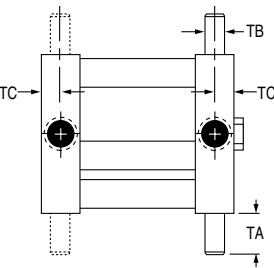
Pivot Mount

Complete with bronze pivot bushing. Not available as an accessory. (CR shown)



Trunnion Mount

Available rear, front or both. Not available on 1/2" bore. (CT shown solid)



Bore	PA	PB	PC	PD	PE	PF	PR	SC	TA	TB	TC
1/2 (1)	0.19	0.38	0.19	0.25	0.75	0.63	0.19	0.17	NA	NA	NA
3/4 (2)	0.19	0.38	0.19	0.25	0.75	0.75	0.19	0.23	0.31	0.125	0.17
1-1/16 (3)	0.19	0.38	0.25	0.25	0.81	0.75	0.19	0.25	0.50	0.250	0.25
1-1/2 (4)	0.38	0.75	0.25	0.44	1.19	1.38	0.38	0.34	0.50	0.250	0.25
2 (5)	0.38	0.75	0.31	0.44	1.25	1.38	0.38	0.34	0.50	0.250	0.25
2-1/2 (6)	0.38	0.75	0.38	0.44	1.31	1.38	0.38	0.41	0.63	0.312	0.33
3 (7)	0.63	1.00	0.38	0.56	1.69	1.88	0.38	0.41	0.63	0.312	0.33
4 (8)	0.63	1.00	0.44	0.56	1.75	1.88	0.38	0.50	0.75	0.375	0.42

Deviation from Standard Dimensions

Length Adder (inches)

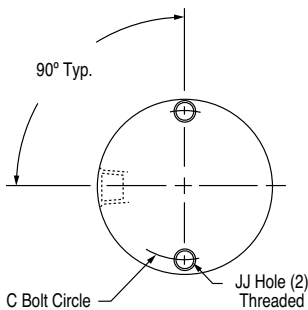
Bore	Low Friction Seals (LB)	Heavy Duty Rear Head (HD)	Magnetic Position Sensing (EM)			WA Adder
			Double Acting, Single Rod Double Acting, Double Rod Double Acting, Hole Thru Rod	Single-Acting, Spring Return	Single-Acting, Spring Extend	
1/2 (1)	0.25	0.13	0.88	0.63	0.38	0.13
3/4 (2)	0.25	0.13	0.88	0.88	0.88	0.13
1-1/16 (3)	0.38	0.19	0.88	0.88	0.88	0.13
1-1/2 (4)	0.38	0.19	0.88	0.88	0.88	0.25
2 (5)	0.38	0.19	0.88	0.88	0.88	0.25
2-1/2 (6)	0.38	0.25	0.88	0.88	0.88	0.25
3 (7)	0.50	0.25	0.88	0.88	0.88	0.25
4 (8)	0.50	0.38	0.88	0.88	0.88	0.25

† Heavy duty rear head is recommended for applications where the cylinder is mounted on the front face or trunnion-mounted, and impact loading (20 or more cycles/minute) occurs between the piston and rear head. It increases the overall length of the cylinder as shown. † A minimum stroke of 3/8" is required to sense end-of-stroke positions. For low friction seals used in conjunction with magnetic position sensing, use "EM" length adder only.

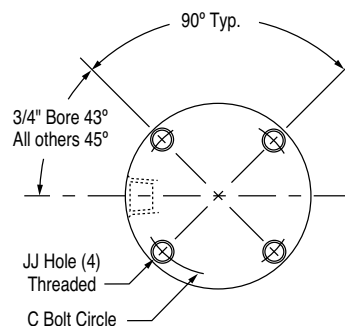
Threaded Mounting Holes

1/2" Bore

Available either or both ends. (CC shown)

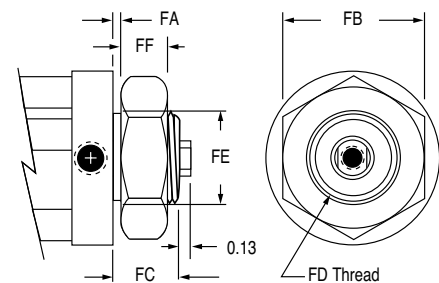


3/4" Bore & Up



Nose Mount

Available on: Double Acting, Single Rod; Single Acting, Spring Return; Single Acting, Spring Extend. Includes rod wiper and heavy duty rear head. See length adder above.



Dimensions: Inches

Bore	C	JJ	FA	FB	FC	FD	FE	FF
1/2 (1)	0.88	#4-40 UNC	.06	0.75 Hex	.38	1/2-20 UNF-2A	.50	.31
3/4 (2)	1.22	#6-32 UNC	.06	0.75 Hex	.38	5/8-18 UNF-2A	.062	.25
1-1/16 (3)	1.69	#6-32 UNC	.13	1.50 Hex	.75	1-14 UNF-2A	1.00	.55
1-1/2 (4)	2.19	#10-24 UNC	.13	1.88 Hex	.75	1-1/4-12 UNF-2A	1.25	.52
2 (5)	2.69	#10-24 UNC	.19	1.88 Hex	.88	1-3/8-12 UNF-2A	1.38	.52
2-1/2 (6)	3.25	1/4-20 UNC	.25	1.88 Hex	1.00	1-3/8-12 UNF-2A	1.38	.52
3 (7)	3.78	1/4-20 UNC	.25	1.88 Hex	1.00	1-3/8-12 UNF-2A	1.38	.52
4 (8)	4.94	5/16-18 UNC	.19	2.62 Hex	1.12	1-3/4-12 UNF-2A	1.75	.88

Maximum Torque for Nose Mount Option

Bore	Foot-Pounds
1/2 (1)	12
3/4 (2)	28
1-1/16 (3)	100
1-1/2 (4)	120
2 (5)	130
2-1/2 (6)	130
3 (7)	130
4 (8)	150



Non-rotating, double acting
4 Bore sizes 3/4" through 2"
Strokes to 4" standard

Twin piston rods are incorporated into the cylinder head to achieve NON-ROTATION. The rods are securely fastened to the piston and tied together externally by a rod end tool bar. The tool bar insures that the rods move in tandem and provides an ideal mounting surface for any attachments required by your application. The tool bar is furnished with threaded mounting holes or optional counter-bored mounting holes.

Ratings-Standard Units All Series

Tube	Self-lubricating composite
End Caps	Clear anodized aluminum alloy
Tie Bolts	Stainless steel
Rod	Chrome plated stainless steel
Piston	Stainless steel
Rod End	Tool Bar
Ports	Position #1
Seals	Internally lubricated Buna-N
Rod Bushing	Bronze
Stroke Tolerance.....	± 1/64"
Media	Air
Max Pressure Rating	200 psi
Min. Operating Pressure.....	15 psi
Temperature Rating Cylinder.....	-25° to + 221°F (-32° to + 105°C)
Temperature Rating	
Electronic Sensors.....	-4° to + 176° F (-20° to + 80°C)

Allowable Torsion Load and Rotational Tolerance

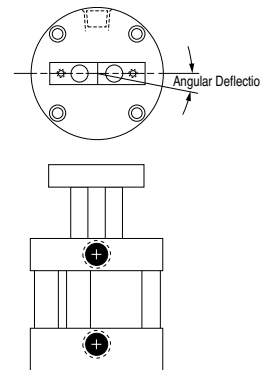
Side loading should be avoided for any cylinder application. The smaller diameter twin rods will have more deflection due to side load than the one standard rod in a comparable NB Series cylinder. However, those cylinders are designed to work satisfactorily against pure torsional loads. Maximum torsional load per bore size is shown in the following table.

Approximate Angular Deflection (Degrees) due to max torsional load

Bore	Torsional Load Max.	Stroke					
		0 to 1-1/2	2	2-1/2	3	3-1/2	4
3/4 (2)	0.3	less than 0.22	0.51	0.98	1.67	2.62	3.88
1-1/16 (3)	1.0	less than 0.15	0.33	0.64	1.09	1.71	2.53
1-1/2 (4)	5.0	less than 0.08	0.18	0.36	0.61	0.95	1.41
2 (5)	10.0	less than 0.03	0.07	0.13	0.22	0.34	0.50

Rotational Tolerance

Bore	Max. Rotation
3/4 (2)	±1°
1-1/16 (3)	±3/4°
1-1/2 (4)	±1/2°
2 (5)	±1/2°



Cylinder Sizing Guide

Bore Diameter	Rod Diameter	Rod Area	Push Area	Pull Area
3/4 (2)	0.19	0.05	0.44	0.39
1-1/16 (3)	0.25	0.10	0.88	0.78
1-1/2 (4)	0.38	0.22	1.76	1.54
2 (5)	0.50	0.38	3.14	2.76

How to Order

Series NB **Model** N **Action** D **Bore** 2 **Mounting** CB **Fractional Stroke** 01 **Options** A **Full Stroke** AA **Rod Extension** 1A01A

NB = Compact Interchangeable
N = Non-Rotating, Twin Rod
D = Double Acting
2 = 3/4"
3 = 1-1/16"
4 = 1-1/2"
5 = 2"
CA = Threaded Mounting Holes, Both Ends
CB = Threaded Mounting Holes, Front
CC = Threaded Mounting Holes, Rear
CD = Screw Clearance Holes, Both Ends
CE = Screw Clearance Holes, Front
CF = Screw Clearance Holes, Rear
CP = Pivot Mount, Pin 90° From Port
CR = Pivot Mount, Pin In-line with Port
CS = Trunnion Mount, Both Ends
CT = Trunnion Mount, Front
CU = Trunnion Mount, Rear
CX = Basic No Mount

Rod Extension
Note: Leave blank if rod extension is not required.
1A = Front Rod Extension (must specify extension)
Example: 1A01A (full and fractional length)

Options
AA = No Option
CB = Counterbored Tooling Plate
EM = Magnetic Piston
LT = Low Temperature Seals
VA = FKM Seals
*A minimum stroke of 3/8" is required to sense end-of-stroke positions.

Fractional Stroke
A = 0"
C = 1/8"
E = 1/4"
G = 3/8"
I = 1/2"
K = 5/8"
M = 3/4"
O = 7/8"

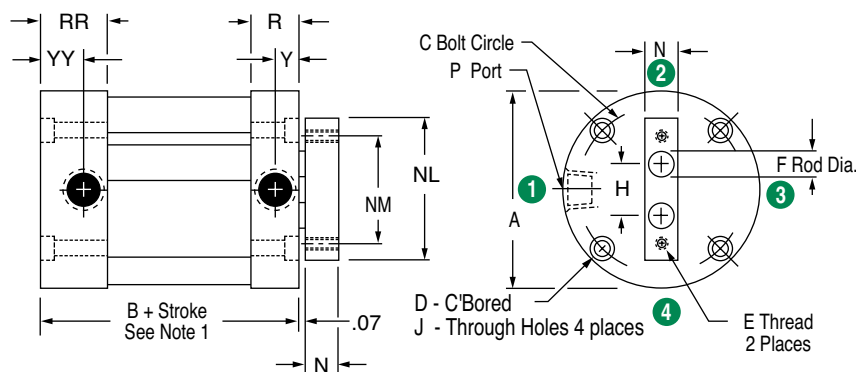
Full Stroke
01 = 1" Stroke
02 = 2" Stroke
03 = 3" Stroke
04 = 4" Stroke

How to Order Example:

NBND5-CA02A-AA

- NB Series-Non-Rotating, Twin Rod
- Double Acting
- 2" Bore
- Threaded Mounting Hole at Both Ends
- 2" Stroke
- No Option

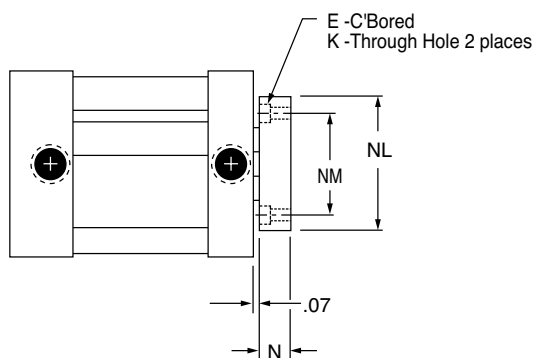
Basic Model-Twin Rod, Non-rotating, Double Acting



*Note 1: Magnetic Position Sensing Length Adder = 0.63
A minimum stroke of 3/8" is required to sense end-of-stroke positions

Standard Strokes – All Models: 1/8, 1/4, 3/8, 1/2, 5/8, 3/4, 7/8, 1, 1-1/4, 1-1/2, 1-3/4, 2, 2-1/2, 3, 3-1/2, 4
Special stroke available on request.

Dimensions: Inches

Counterbored Tooling Plate Option
Option CB

C'Bore Hole Dimensions (inches)

Bore	E C'Bore	K
3/4 (2)	0.24 x 0.15 dp	0.15
1-1/16 (3)	0.29 x 0.18 dp	0.18
1-1/2 (4)	0.40 x 0.27 dp	0.26
2 (5)	0.49 x 0.33 dp	0.33

Dimensions (inches)

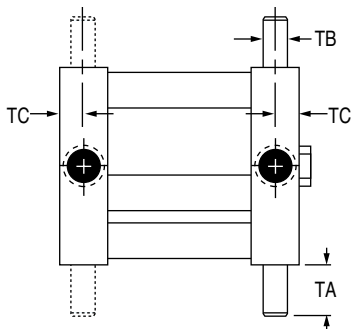
Bore	A	B	C	D	E Thread	F	H	J	N	NL	NM	P	R	RR	Y	YY
3/4 (2)	1.49	0.94	1.22	0.24 x 0.15 dp	#6-32 UNC	0.19	0.332	0.15	0.38	1.25	0.88	#10-32 UNF	0.34	0.47	0.14	0.27
1-1/16 (3)	1.99	1.31	1.69	0.24 x 0.15 dp	#8-32 UNC	0.25	0.422	0.15	0.38	1.44	1.06	1/8 NPT	0.50	0.69	0.25	0.44
1-1/2 (4)	2.62	1.31	2.19	0.34 x 0.22 dp	1/4-20 UNC	0.38	0.562	0.20	0.50	2.00	1.50	1/8 NPT	0.50	0.69	0.25	0.44
2 (5)	3.12	1.38	2.69	0.34 x 0.22 dp	5/16-18 UNC	0.50	0.750	0.20	0.63	2.50	1.88	1/8 NPT	0.53	0.72	0.25	0.44

Dimensions: Inches

Mounting Options

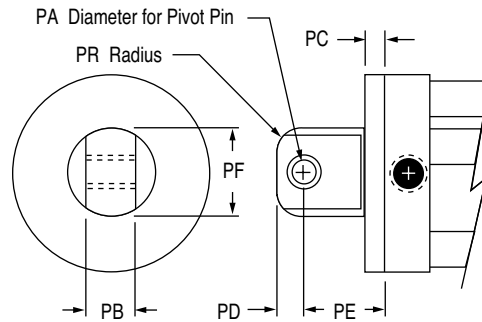
Trunnion Mount

Available rear, front or both.
(CT shown solid)



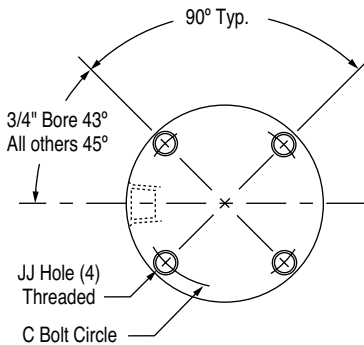
Pivot Mount

Complete with bronze pivot bushing.
Not available as an accessory. (CR shown)



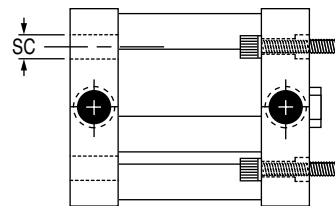
Threaded Mounting Holes

Available either or both ends.
(CC shown)



Screw Clearance Holes

Available either or both ends.
(CF shown)



Approximate Cylinder Weights (ounces)

Bore	Base	Adder per 1/8 of Stroke
3/4 (2)	3.1	0.1
1-1/16 (3)	7.4	0.5
1-1/2 (4)	14.3	0.7
2 (5)	21.5	0.9

Bore	C	JJ	PA	PB	PC	PD	PE	PF	PR	SC	TA	TB	TC
3/4 (2)	1.22	#6-32 UNC	0.19	0.38	0.19	0.25	0.75	0.75	0.19	0.23	0.31	0.125	0.17
1-1/16 (3)	1.69	#6-32 UNC	0.19	0.38	0.25	0.25	0.81	0.75	0.19	0.25	0.50	0.250	0.25
1-1/2 (4)	2.19	#10-24 UNC	0.38	0.75	0.25	0.44	1.19	1.38	0.38	0.34	0.50	0.250	0.25
2 (5)	2.69	#10-24 UNC	0.38	0.75	0.31	0.44	1.25	1.38	0.38	0.34	0.50	0.250	0.25

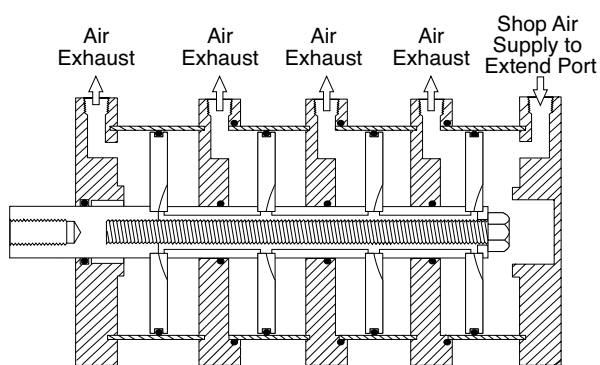


Features

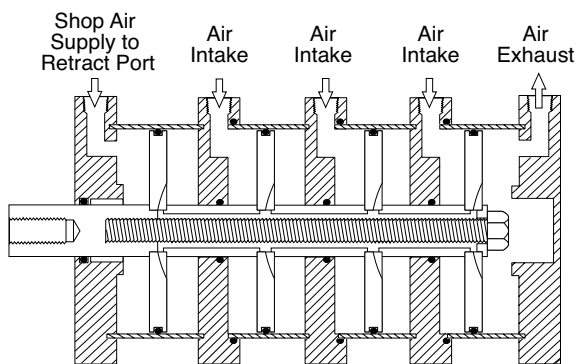
- Double acting, single rod end
- Cylinders multiply force output
- 3 Bore sizes 2-1/2" through 4"
- Strokes to 4" standard

Ratings-Standard Units All Series

Tube	Lubricating composite
End Caps	Clear anodized aluminum alloy
Tie Bolts	Stainless steel
Rod	Chrome plated stainless steel
Piston	Stainless steel
Rod End	Tool Bar
Ports	Position #1
Seals	Internally lubricated Buna-N
Rod Bushing	Bronze
Stroke Tolerance	± 1/64"
Media	Air
Max Pressure Rating	200 psi
Min. Operating Pressure	15 psi
Temperature Rating Cylinder	-25° to + 221°F (-32° to + 105°C)
Temperature Rating	
Electronic Sensors	-4° to + 176° F (-20° to + 80°C)



Extend Port - Air supplied to all pistons



Retract Port - Air supplied to front piston only

How it Works

We attach multiple pistons to a common shaft and provide internal air passages through the shaft to all pistons.

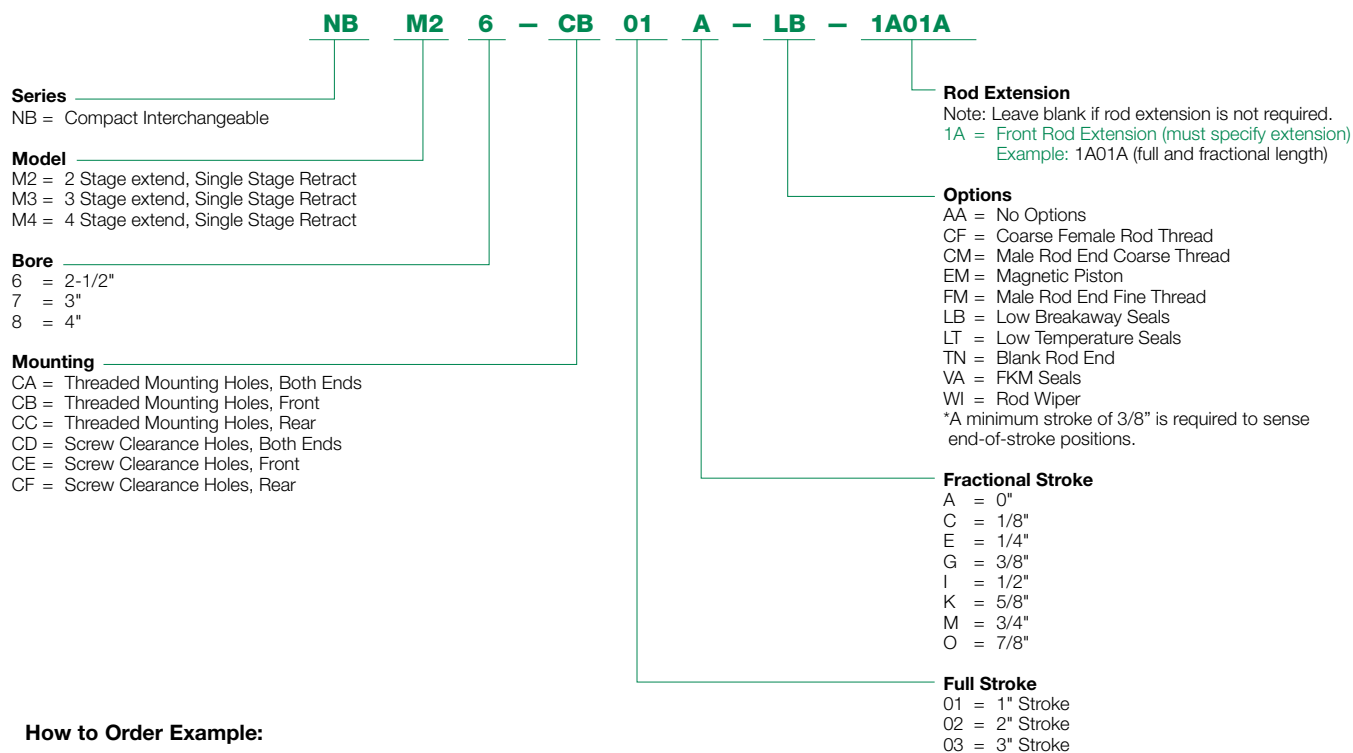
When air pressure is applied to the extend port, all pistons are pressurized simultaneously, enabling tremendous thrust forces to be obtained. (See the cylinder sizing guide below for the force multiplying factors.)

When air pressure is applied to the retract port only one piston is pressurized.

Cylinder Sizing Guide

Bore	Bore Model Designation	Extend Power Factor			Retract Power Factor
		M2	M3	M4	
2-1/2 (6)	6	9.4	13.8	18.3	4.5
3 (7)	7	13.5	20.0	26.5	6.5
4 (8)	8	24.3	36.1	47.9	11.8

How to Order

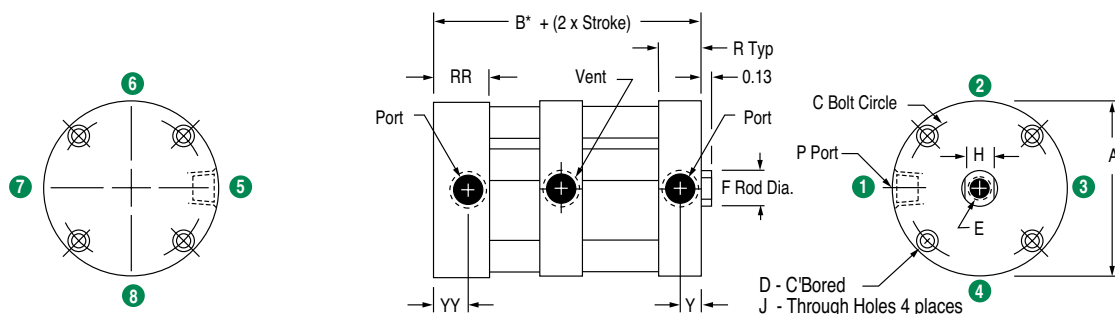


How to Order Example:

NBM27 - CC04I - LT

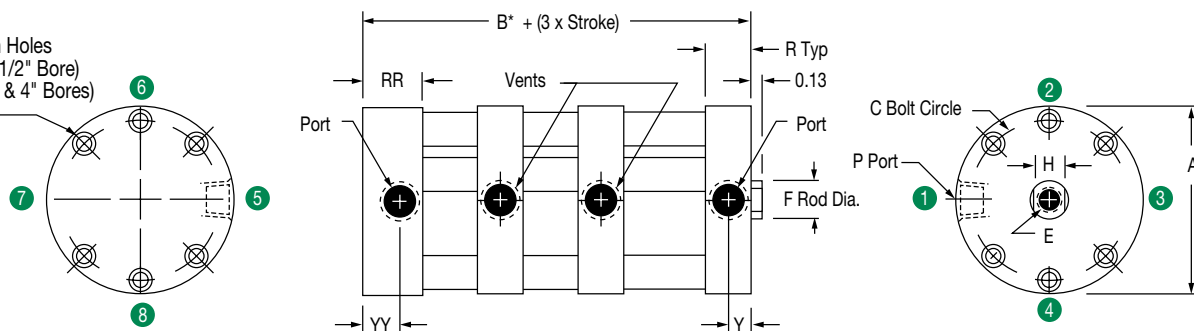
- Multi-Stage NB Series
- 2 Stage Extend, Single Stage Retract
- 3" Bore
- Threaded Mounting Holes, Rear
- 4-1/2" Stroke
- Low Temperature Seals

Model M2



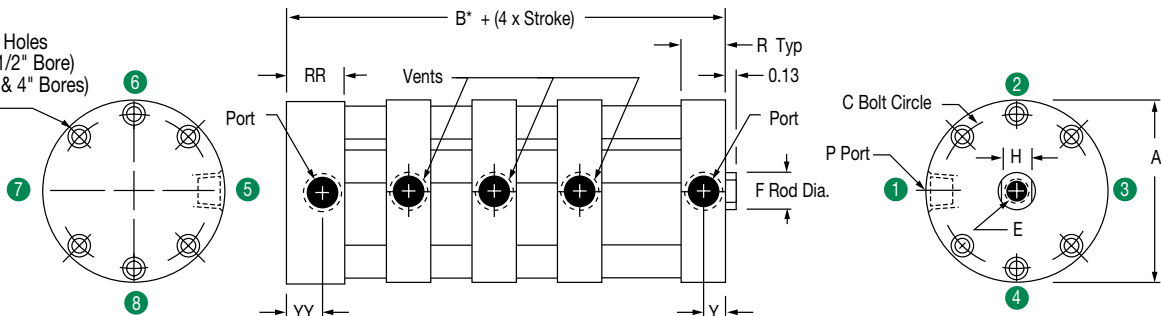
Model M3

D - C Bored
J - Through Holes
4 Places (2-1/2" Bore)
6 Places (3" & 4" Bores)
Both Ends



Model M4

D - C Bored
J - Through Holes
4 Places (2-1/2" Bore)
6 Places (3" & 4" Bores)
Both Ends



*Dimension "B" for Strokes .125, .188 and .250

Bore	.125 Stroke			.188 Stroke			.250 Stroke		
	M2	M3	M4	M2	M3	M4	M2	M3	M4
2-1/2 (6)	2.65	3.64	4.63	2.71	3.76	4.81	2.77	3.87	4.97
3 (7)	2.75	3.77	4.79	2.81	3.90	4.98	2.88	4.01	5.15
4 (8)	3.38	4.61	5.85	3.44	4.74	6.04	3.53	4.89	6.24

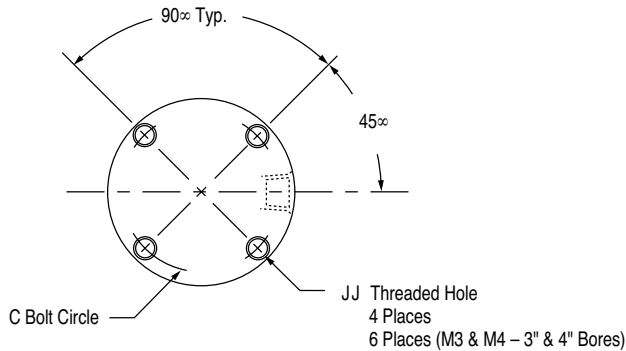
Dimensions (inches)

Bore	A	B* (strokes over .250)			C	D C Bore	E Female Thread		E Depth for Stroke Range		F	H	J	R	RR	Y	YY
		M2	M3	M4			E Standard	E Coarse	1/8-1/2	5/8 +							
2-1/2 (6)	3.75	2.29	3.15	4.02	3.25	0.40 x 0.27 dp	1/2-20 UNF	1/2-13 UNC	0.42-0.70	0.70	0.75	0.63	0.26	0.66	0.91	0.33	0.58
3 (7)	4.25	2.39	3.28	4.18	3.78	0.40 x 0.27 dp	5/8-18 UNF	5/8-11 UNC	0.45-0.73	0.73	0.88	0.75	0.26	0.69	0.94	0.33	0.58
4 (8)	5.50	3.04	4.15	5.27	4.94	0.49 x 0.33 dp	3/4-16 UNF	3/4-10 UNC	0.40-0.70	0.80	1.00	0.88	0.33	0.84	1.22	0.42	0.80

Mounting Options

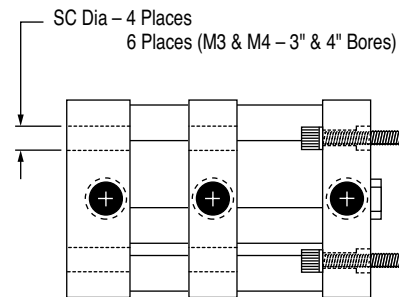
Threaded Mounting Holes

Available either or both ends.
(CC shown)



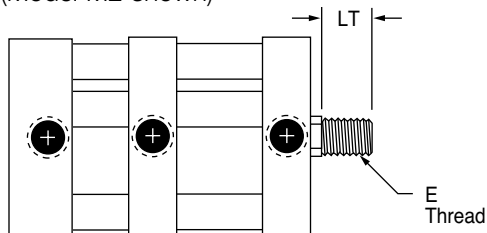
Screw Clearance Holes

Available either or both ends. (CF shown)
Screw clearance holes are standard on all center sections.

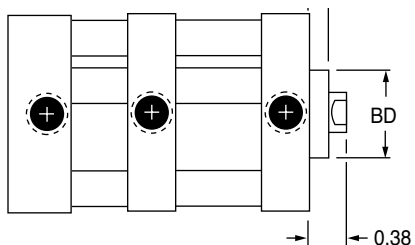


Model Options

Male Rod Ends (Options CM or FM)
(Model M2 shown)



Rod Wiper (Option WI)
Buna-N only. (Model M2 shown)



Length Adder for Options (inches)

Bore	Series	Low Friction Seals (LB)	Magnetic Position Sensing (EM)	Low Friction Seals & Magnetic Position Sensing (LB or EM)
2-1/2	M2	0.75	0.88	1.25
	M3	1.13		1.63
	M4	1.50		2.00
3	M2	1.00	0.88	1.38
	M3	1.50		1.88
	M4	2.00		2.38
4	M2	1.00	0.88	1.38
	M3	1.50		1.88
	M4	2.00		2.38

* 1) A minimum stroke of 3/8" is required to sense end-of-stroke positions.
2) Magnet is applied to front piston.

Dimensions: Inches

Bore	BD	C	JJ	E Male Thread		LT	SC
				CM (Coarse)	FM (Fine)		
2-1/2 (6)	1.13	3.25	1/4-20 UNC	1/2-13 UNC	1/2-20 UNF	0.63	0.41
3 (7)	1.25	3.78	1/4-20 UNC	5/8-11 UNC	5/8-18 UNF	0.75	0.41
4 (8)	1.38	4.64	5/16-18 UNC	3/4-10 UNC	3/4-16 UNF	0.75	0.50

Approximate Cylinder Weights (ounces)

Bore	M2		M3		M4	
	Base	Adder per 1/8 Stroke	Base	Adder per 1/8 Stroke	Base	Adder per 1/8 Stroke
2-1/2 (6)	37.2	1.2	53.5	1.8	69.4	2.4
3 (7)	49.9	1.6	71.0	2.4	92.1	3.2
4 (8)	93.1	2.0	133.8	3.0	174.5	4.0



Other multi-position cylinders
(4 position, 5 position, etc.)
are available as specials.

Features

- Double acting, single rod end
- Cylinder provides 3 positions
- 8 Bore sizes 1/2" through 4"
- Strokes to 4" standard

Ratings-Standard Units All Series

Tube	Self-lubricating composite
End Caps	Clear anodized aluminum alloy
Tie Bolts.....	Stainless steel
Rod.....	Chrome plated stainless steel
Piston.....	Aluminum alloy
Rod End.....	Female thread with wrench flats
Ports	Position #1
Seals	Internally lubricated Buna-N
Rod Bushing	PTFE composite bearing
Stroke Tolerance.....	± 1/64" per stroke
Media	Air
Max Pressure Rating	200 psi
Min. Operating Pressure.....	15 psi
Temperature Rating Cylinder.....	-25° to + 221°F (-32° to + 105°C)
Temperature Rating	
Electronic Sensors.....	-4° to + 176° F (-20° to + 80°C)

Cylinder Sizing Guide

Bore Diameter	Rod Diameter	Rod Area	Push Area	Pull Area
1/2 (1)	0.25	0.05	0.20	0.15
3/4 (2)	0.31	0.08	0.44	0.36
1-1/16 (3)	0.50	0.19	0.88	0.69
1-1/2 (4)	0.63	0.31	1.76	1.45
2 (5)	0.75	0.44	3.14	2.66
2-1/2 (6)	0.75	0.44	4.91	4.47
3 (7)	0.88	0.60	7.07	6.47
4 (8)	1.00	0.79	12.57	11.78

How to Order

Series NB MU 2 - CB 00 G - 02 A - LB 1A01A

Model
NB = Compact Interchangeable
MU = Multi-Position, Double Acting

Bore
1 = 1/2"
2 = 3/4"
3 = 1-1/16"
4 = 1-1/2"
5 = 2"
6 = 2-1/2"
7 = 3"
8 = 4"

Mounting
CA = Threaded Mounting Holes, Both Ends
CB = Threaded Mounting Holes, Front
CC = Threaded Mounting Holes, Rear
CD = Screw Clearance Holes, Both Ends
CE = Screw Clearance Holes, Front
CF = Screw Clearance Holes, Rear
CP = Pivot Mount, Pin 90° from Port
CR = Pivot Mount, Pin In-line with Port
CX = Basic No Mount

Stroke "A" Full Stroke
01 = 1" Stroke
02 = 2" Stroke
03 = 3" Stroke
04 = 4" Stroke

Stroke "B" Fractional Stroke
A = 0"
C = 1/8"
E = 1/4"
G = 3/8"
I = 1/2"
K = 5/8"
M = 3/4"
O = 7/8"

Stroke "B" Full Stroke
01 = 1" Stroke
02 = 2" Stroke
03 = 3" Stroke
04 = 4" Stroke

Stroke "A" Fractional Stroke
A = 0"
C = 1/8"
E = 1/4"
G = 3/8"
I = 1/2"
K = 5/8"
M = 3/4"
O = 7/8"

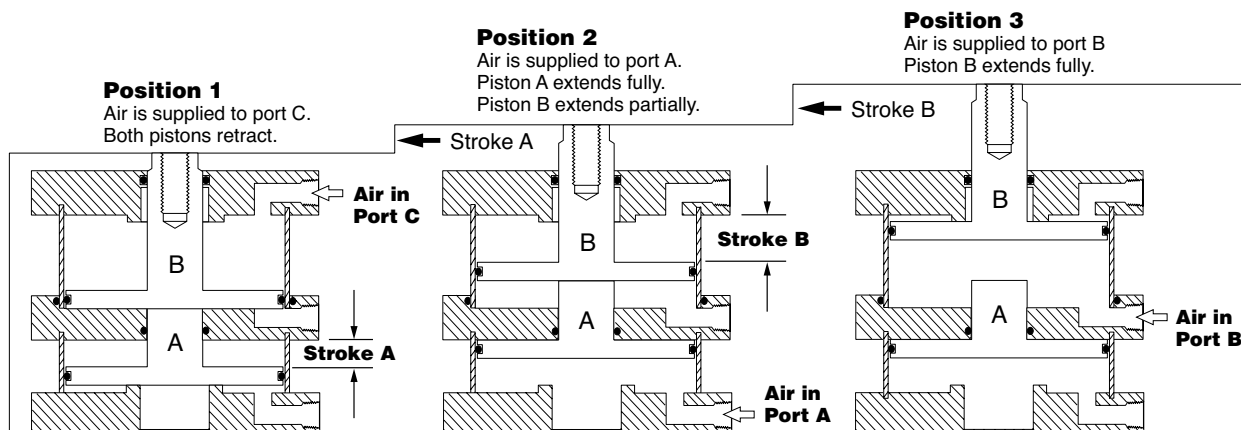
Rod Extension
Note: Leave blank if rod extension is not required.
1A = Rod Extension (must specify extension)
Example: 1A01A (full and fractional length)

Options
AA = No Options
CF = Coarse Female Rod Thread
CM = Male Rod End Coarse Thread
EM = Magnetic Piston
FM = Male Rod End Fine Thread
LB = Low Breakaway Seals
LT = Low Temperature Seals
TN = Blank Rod End
VA = FKM Seals
WA = Wearband
WI = Rod Wiper
*A minimum stroke of 3/8" is required to sense end-of-stroke positions.

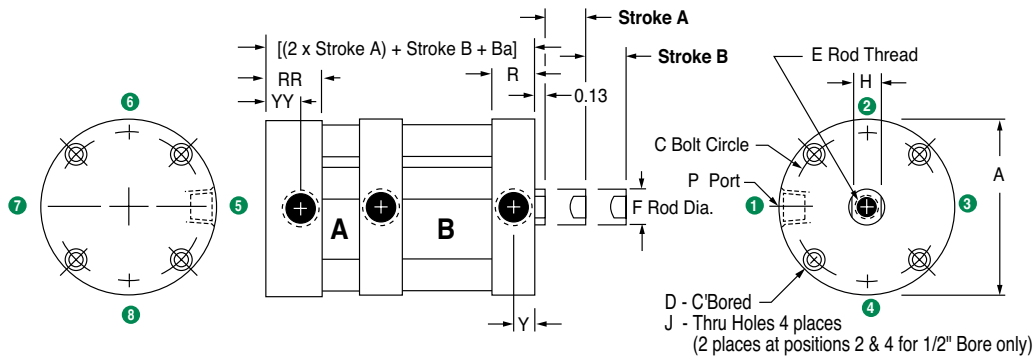
How to Order Example:
NBMU5-CA04M-03A-TN

- Multi-Position, Double Acting
- 2" Bore
- Threaded Mounting Holes, Both Ends
- 4-3/4" Front Stroke
- 3" Rear Stroke
- Blank Rod End

How it Works



Basic Model



Minimum Stroke*

Bore	Base Model Stroke A
1/2 (1)	0.19
3/4 (2)	0.19
1-1/16 (3)	0.25
1-1/2 (4)	0.25
2 (5)	0.25
2-1/2 (6)	0.38
3 (7)	0.38
4 (8)	0.34

*Note:

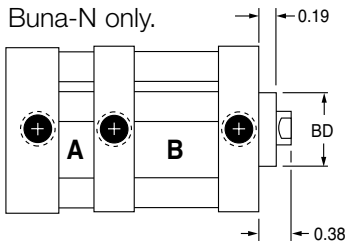
- 1) No minimum for stroke B.
- 2) No minimum for stroke A or B with Low Breakaway Option -LB

Dimensions: Inches

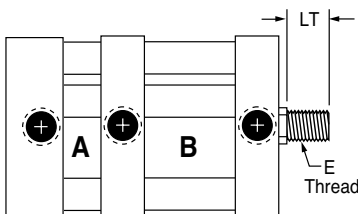
Model Options

Rod Wiper (Option WI)

Buna-N only.



Male Rod Ends (Options CM or FM)

Deviations from Standard Dimensions
(Options LB or EM)

Length Adder (inches)

Bore	Low Friction Seals (LB)	Magnetic Position Sensing [†] (EM)	Low Friction Seals & Magnetic Position Sensing [†] (LB or EM)
1/2 (1)	0.50	0.88	1.13
3/4 (2)	0.50	0.88	1.13
1-1/16 (3)	0.75	0.88	1.25
1-1/2 (4)	0.75	0.88	1.25
2 (5)	0.75	0.88	1.25
2-1/2 (6)	0.75	0.88	1.25
3 (7)	1.00	0.88	1.38
4 (8)	1.00	0.88	1.38

- † 1) A minimum stroke of 3/8" is required to sense end-of-stroke positions.
- 2) Magnet is applied to front piston.

Dimensions (inches)

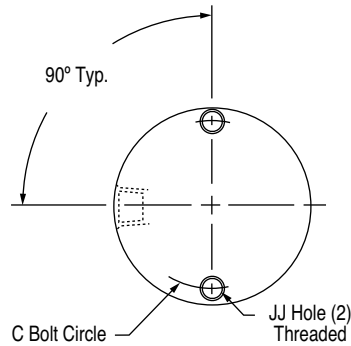
Bore	A	BA	BD	C	C'Bore	E Female Thread		E Depth for Stroke Range		F	H	J	P	R	RR	Y	YY
						E Standard	E Coarse	1/8-1/2	5/8 +								
1/2 (1)	1.12	1.14	0.56	0.88	0.20 x 0.13 dp	#8-32 UNC	N/A	0.30-0.46	0.46	0.25	0.22	0.13	#10-32 UNF	0.34	0.47	0.14	0.27
3/4 (2)	1.49	1.14	0.69	1.22	0.24 x 0.15 dp	#10-32 UNF	#10-24 UNC	0.30-0.46	0.46	0.31	0.25	0.15	#10-32 UNF	0.34	0.47	0.14	0.27
1-1/16 (3)	1.99	1.67	0.88	1.69	0.24 x 0.15 dp	5/16-24 UNF	5/16-18 UNC	0.37-0.63	0.70	0.50	0.44	0.15	1/8 NPT	0.50	0.69	0.25	0.44
1-1/2 (4)	2.62	1.70	1.00	2.19	0.34 x 0.22 dp	3/8-24 UNF	3/8-16 UNC	0.37-0.70	0.70	0.63	0.50	0.20	1/8 NPT	0.50	0.69	0.25	0.44
2 (5)	3.12	1.80	1.13	2.69	0.34 x 0.22 dp	1/2-20 UNF	1/2-13 UNC	0.30-0.63	0.70	0.75	0.63	0.20	1/8 NPT	0.53	0.72	0.25	0.44
2-1/2 (6)	3.75	2.25	1.13	3.25	0.40 x 0.27 dp	1/2-20 UNF	1/2-13 UNC	0.42-0.70	0.70	0.75	0.63	0.26	1/4 NPT	0.66	.91	0.33	0.58
3 (7)	4.25	2.34	1.25	3.78	0.40 x 0.27 dp	5/8-18 UNF	5/8-11 UNC	0.45-0.73	0.73	0.88	0.75	0.26	1/4 NPT	0.69	0.94	0.33	0.58
4 (8)	5.50	3.00	1.38	4.94	0.49 x 0.33 dp	3/4-16 UNF	3/4-10 UNC	0.40-0.70	0.80	1.00	0.88	0.33	3/8 NPT	0.84	1.22	0.42	0.80

Mounting Options

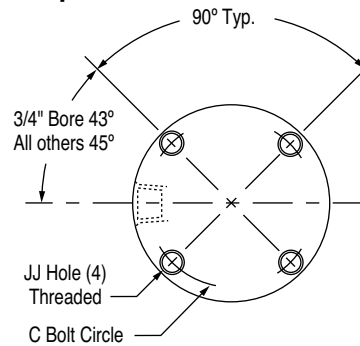
Threaded Mounting Holes

Available either or both ends.
(CC shown)

1/2" Bore

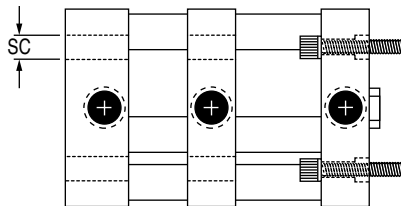


3/4" Bore & Up



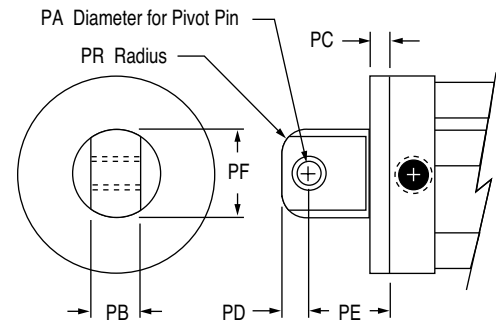
Screw Clearance Holes

Available either or both ends. (CF shown)
Screw clearance holes are standard on all center sections.



Pivot Mount

Complete with bronze pivot bushing. Not available as an accessory. (CR shown)



Dimensions: Inches										
Bore	C	JJ	PA	PB	PC	PD	PE	PF	PR	SC
1/2 (1)	0.88	#4-40 UNC	0.19	0.38	0.19	0.25	0.75	0.63	0.19	0.17
3/4 (2)	1.22	#6-32 UNC	0.19	0.38	0.19	0.25	0.75	0.75	0.19	0.23
1-1/16 (3)	1.69	#6-32 UNC	0.19	0.38	0.25	0.25	0.81	0.75	0.19	0.25
1-1/2 (4)	2.19	#10-24 UNC	0.38	0.75	0.25	0.44	1.19	1.38	0.38	0.34
2 (5)	2.69	#10-24 UNC	0.38	0.75	0.31	0.44	1.25	1.38	0.38	0.34
2-1/2 (6)	3.25	1/4-20 UNC	0.38	0.75	0.38	0.44	1.31	1.38	0.38	0.41
3 (7)	3.78	1/4-20 UNC	0.63	1.00	0.38	0.56	1.69	1.88	0.38	0.41
4 (8)	4.94	5/16-18 UNC	0.63	1.00	0.44	.056	1.75	1.88	0.38	0.50

Approximate Cylinder Weights (ounces)

Bore	Base	Adder per 1/8 of Stroke
1/2 (1)	3.3	0.16
3/4 (2)	4.5	0.2
1-1/16 (3)	9.9	0.6
1-1/2 (4)	18.7	0.8
2 (5)	24.5	1.0
2-1/2 (6)	41.3	1.2
3 (7)	52.9	1.6
4 (8)	102.7	2.0

Accessories

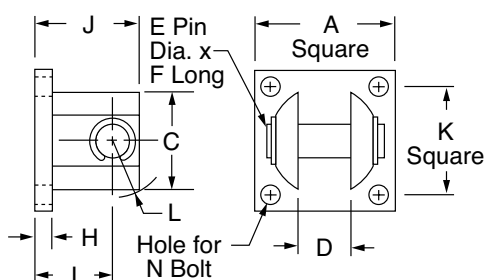
Selection Guide

Accessory	Standard Series	PND Series	Multi-Power Series	P3D Series
Clevis Bracket	Yes	Yes	N/A	Yes
Trunnion Bracket	Yes	Yes	N/A	N/A
Rod Eye	Yes	N/A	Yes	Yes

Clevis Bracket

Anodized aluminum alloy.

Chrome plated steel pin included



The bracket is intended for mounting with either a rod pivot or pivot mount; it is not intended to mount directly with the rear cylinder head.

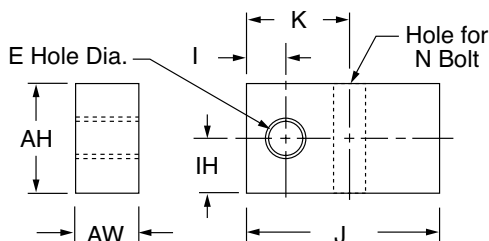
Dimensions: Inches

Kit No.	Bore	A	C	D	E	F	H	I	J	K	L	N
CB-3	1/2 (1) 3/4 (2) 1-1/16 (3)	1.00	0.71	0.39	0.187	0.93	0.16	0.56	0.78	0.75	0.42	#6
CB-6	1-1/2 (4) 2 (5) 2-1/2 (6)	1.75	1.37	0.75	0.375	1.63	0.22	0.94	1.34	1.38	0.80	#10
CB-8	3 (7) 4 (8)	2.50	2.10	1.00	0.625	2.42	0.25	1.25	1.81	2.00	1.19	1/4

Trunnion Bracket (pair)

Anodized aluminum alloy

complete with bronze pivot bushings

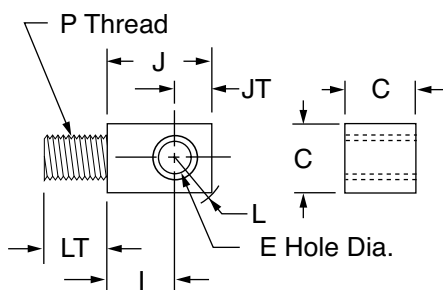


Dimensions: Inches

Kit No.	Bore	AH	AW	E	I	IH	J	K	N
TB-2	3/4 (2)	0.63	0.31	0.126	0.22	0.30	1.12	0.56	#10
TB-5	1-1/16 (3) 1-1/2 (4) 2 (5)	0.88	0.50	0.251	0.31	0.38	1.50	0.81	1/4
TB-7	2-1/2 (6) 3 (7)	1.00	0.63	0.313	0.38	0.45	1.63	0.94	5/16
TB-8	4 (8)	1.25	0.75	0.376	0.44	0.55	1.88	1.06	3/8

Rod Eye

Steel with bronze pivot bushing and nut

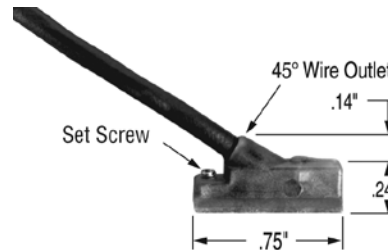


Dimensions: Inches

Kit No.	Bore	C	E	I	J	JT	L	LT	P
RE-1	1/2 (1)	0.38	0.187	0.47	0.72	0.25	0.32	0.38	#8-32 UNC
RE-2	3/4 (2)	0.38	0.187	0.47	0.72	0.25	0.32	0.38	#10-32 UNF
RE-3	1-1/16 (3)	0.38	0.187	0.47	0.72	0.25	0.32	0.63	5/16-24 UNF
RE-4	1-1/2 (4)	0.75	0.375	0.72	1.16	0.44	0.58	0.63	3/8-24 UNF
RE-6	2 (5) 2-1/2 (6)	0.75	0.375	0.72	1.16	0.44	0.58	0.75	1/2-20 UNF
RE-7	3 (7)	1.00	0.625	1.00	1.63	0.63	0.80	0.88	5/8-18 UNF
RE-8	4 (8)	1.00	0.625	1.00	1.63	0.63	0.80	0.88	3/4-16 UNF

Sensor Specifications & Ordering Information

- Encased in a plastic housing, dovetail style electronic sensors are corrosion resistant. 45° wire outlet allows close mounting.



Ordering Guide-Dovetail Style Magnetic Sensor with LED

Sensor Type	Prewired 9 ft Part No.	Quick Disconnect Part No*	Wire Leads	Electrical Characteristics
Electronic	949-200-031	949-200-331	3	Sourcing PNP 6-24 VDC, 0.20 Amp Max current, 0.5 Voltage Drop
Electronic	949-200-032	949-200-332	3	Sinking NPN 6-24 VDC, 0.20 Amp Max current, 0.5 Voltage Drop

Note*: Quick disconnect styles are supplied with 6 inch pigtail with male connector.
Order female cordsets separately.

Female Cordsets for Quick Disconnect

Length	Part No.
5 Meter	PXCST

Sensor Temperature Range
-20° to +80° C (-4° to +176° F)

NB Series

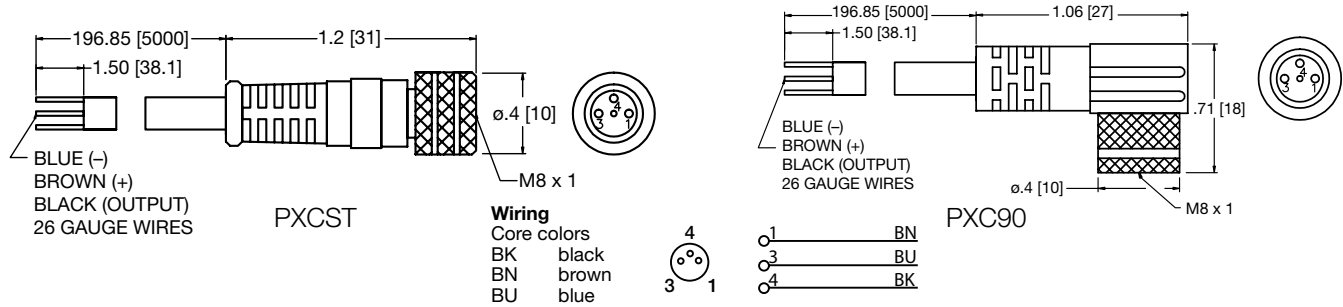
Bore	Bracket P/N
1/2"	SC-1
3/4"	SC-2
1 1/16"	SC-3
1 1/2"	SC-5
2"	SC-5
2 1/2"	SC-7
3"	SC-7
4"	SC-8



Sensor Description	Standard Cord Set	Quick Disconnect
Hall PNP	949-200-031	949-200-331
Hall NPN	949-200-032	949-200-332

See page 18 for sensor specifications

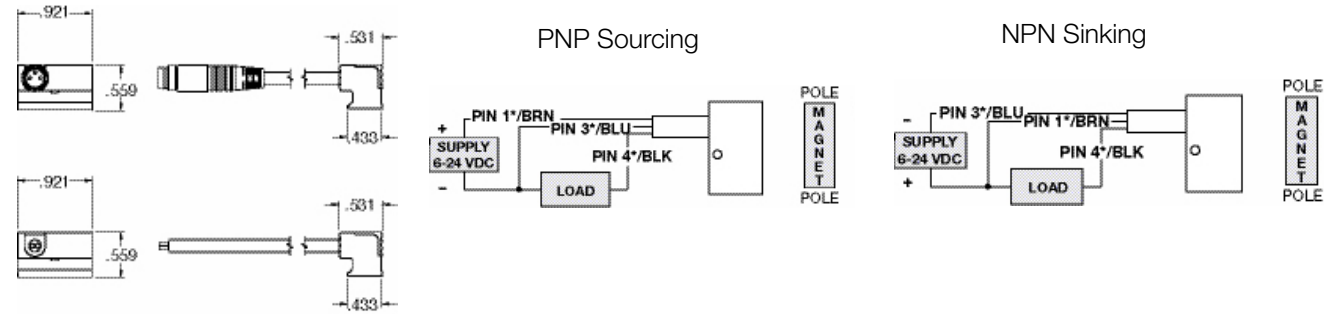
Quick Disconnect Cables



Order Code	Type	Operating Voltage	Current Rating	Cable Material	Protection	Connector
PXCST	Straight 5 m Cable (3 x 26 Gauge wire)	60 AC/75 DC	3 A	PUR	IP 68, III	M8
PXC90	90° 5 m Cable (3 x 26 Gauge wire)	60 AC/75 DC	3 A	PUR	IP 68, III	M8

NB Series World Switch Hall Effect Part Numbers

P/N	Switch Style	Electrical Design	Output	Operating Voltage	Current Rating	Switching Power	Voltage Drop	NEMA IP Rating	Temperature Rating
SH6-031	Flying Lead	DC PNP	Normally Open	6-24 VDC	0.3 Amps Max.	7.2 Watts Max.	.5 Volts	NEMA 6	-25° to +75+ C
SH6-032	Flying Lead	DC PNP	Normally Open	6-24 VDC	0.3 Amps Max.	7.2 Watts Max.	.5 Volts	NEMA 6	-25° to +75+ C
SH6-021	M8 Connector	DC NPN	Normally Open	6-24 VDC	0.3 Amps Max.	7.2 Watts Max.	.5 Volts	NEMA 6	-25° to +75+ C
SH6-022	M8 Connector	DC NPN	Normally Open	6-24 VDC	0.3 Amps Max.	7.2 Watts Max.	.5 Volts	NEMA 6	-25° to +75+ C





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