

NFPA Interchangeable Cylinder: Standard Type Double Acting, Single Rod (Medium Duty) Series *NCA1*

Inch size: $\varnothing 1.5"$, $\varnothing 2"$, $\varnothing 2.5"$, $\varnothing 3.25"$, $\varnothing 4"$

How to Order

NC **D** **A1** **B** **150** **04** **00** **A54** **XB5**

Built-in magnet ●

Nil	None
D	W/ auto switch (Magnetic piston)

Style ●

Nil	Standard cylinder
K	Non-rotating cylinder
W	Double rod
M	Male rod stud

Mounting style ●

B	MX0	Basic style
L	MS1	Foot style
F	MF1	Rod side flange style
G	MF2	Head side flange style
R	MS4	Side tapped style
D	MP2	Double detachable head side clevis style
T	MT4	Center trunnion style
C	MP4	Single detachable head side clevis style
X	MP1	Double head side clevis style
S	MS2	Side lug style
U	MT1	Rod side trunnion style
J	MT2	Head side trunnion style

Bore size ●

150	1.5"
200	2"
250	2.5"
325	3.25"
400	4"

For larger bore sizes up to 32" bore. Please consult CAT: N304-EX.

Standard stroke ●

Inches

Stroke ●

Hundredths of an inch

Rod boot

Nil	None
J	Nylon
K	Neoprene

Air cushion

Nil	Both ends
N	None
H	Head end
R	Rod end

Option

-XB5	Oversized rod
-XB6	High temperature
-XB7	Low temperature
-XB9	Low speed
-XC6	Stainless steel piston rod
-XC8	Adjustable stroke/Extend
-XC9	Adjustable stroke/Return
-XC10	Dual operation/Double rod
-XC11	Dual operation/Single rod
-XC22	Fluoro rubber seals
-XC35	With coil scraper

For special rod end modifications, please see page 6-15-33.

Number of auto switches

Nil	2 pcs.
S	1 pcs.
3	3 pcs.
n	"n" pcs.

Auto switch

Nil	Without auto switch
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* For the applicable auto switch model, refer to the table on page 6-15-7.
* Auto switches are shipped together, (but not assembled.)

Mounting Bracket Part No.

Mounting bracket / Bore size	Part no.				
	150 (1.5")	200 (2")	250 (2.5")	325 (3.25")	400 (4")
Foot *	NCA1-L150	NCA1-L200	NCA1-L250	NCA1-L325	NCA1-L400
Flange	NCA1-F150	NCA1-F200	NCA1-F250	NCA1-F325	NCA1-F400
Double clevis (MP2)	NCA1-D150	NCA1-D200	NCA1-D250	NCA1-D325	NCA1-D400
Single clevis	NCA1-C150	NCA1-C200	NCA1-C250	NCA1-C325	NCA1-C400
Side lug *	NCA1-S150	NCA1-S200	NCA1-S250	NCA1-S325	NCA1-S400
Double clevis (MP1)	NCA1-X150	NCA1-X200	NCA1-X250	NCA1-X325	NCA1-X400

* These kits are for standard single rod/double acting cylinders without options. For option kits, please contact your local SMC sales office. One kit required per cylinder.



The SMC NCA1 expanded Series NFPA Industrial Interchangeable Pneumatic Cylinders are now available in bore sizes ranging from 5"-8" Medium Duty, and 1.5"-14" Heavy Duty.

The NCA1 Expanded Series Cylinders offer:

- Replaceable Rod Gland
- A full range of NFPA interchangeable mounting configurations.
- Available in three construction types: Aluminum, Steel, and Stainless steel
- Composite fiber tube optional.
- Fully adjustable cushion

For further information, please consult CAT: N304-EX or contact your local SMC sales office.

Specifications



Type	Standard	Double rod	Non-rotating rod
Fluid	Air	Air	Air
Lubrication	Non-lube	Non-lube	Non-lube
Max. operating pressure	250 psi (1.75 MPa)	250 psi (1.75 MPa)	250 psi (1.75 MPa) *
Min. operating pressure	8 psi (0.06 MPa)	8 psi (0.06 MPa)	15 psi (0.1 MPa)
Ambient & fluid temperature	40 to 140°F (5 to 60°C)	40 to 140°F (5 to 60°C)	0 to 140°F (5 to 60°C)
Piston speed	2 to 20 in/s (50 to 500 mm/s)	2 to 20 in/s (50 to 500 mm/s)	2 to 20 in/s (50 to 500 mm/s)
Cushion	Air cushion standard		
Mounting	Basic style, Foot style, Rod side flange style, Head side flange style, Clevis style, Side tapped style, Center trunnion style, Head side trunnion style, Side lug style, Rod side trunnion style	Basic style, Foot style, Flange style, Center trunnion style, Side tapped style, Rod side trunnion style	Basic style, Foot style, Clevis style, Rod side flange style, Head side flange style, Center trunnion style, Side tapped style, Side lug style
Non-rotating accuracy	N/A	N/A	N/A

* Rod and head side trunnion maximum operating pressure for 325 and 400 bore is up to 150 psi.

Base Material/Surface Treatment

Description	Material	Note
Cover	Aluminum alloy	Silver paint
Tube	Aluminum alloy	Hard alumite
Seal	Nitrile rubber	PLD, PLP
Piston rod	Carbon steel	Hard chrom plating
Piston	Aluminum alloy	Chromate

To calculate thrust forces not shown in the table, multiply operating pressure by piston area.

How to use this table

1. Locate column with desired operating pressure.
2. Move down that column and locate the thrust value which is equal (or the next larger to the force to be delivered by the cylinder).
3. On that same line, locate in the first (left) column the bore size recommended for your application.

Note) These are guide lines only, which must be substantiated using additional data specific to your application.

To calculate pull forces not shown in the table, use the following formula:

$$\text{Pull Force} = (\text{Piston area} - \text{Rod area}) \times \text{Working pressure}$$

How to read this table

1. To find the force on the pull stroke, locate the required piston rod diameter in the left most column.
2. Moving to the right, locate the required working pressure.
3. Deduct the value shown at the intersection from the push stroke force value determined from the Push Stroke table. The resultant is the available pull stroke table.

Standard Stroke

(in)

Bore size (in)	Standard stroke	Maximum stroke
1.5"	1, 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20,	
2", 2.5"	1, 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 24	Please consult with SMC.
3.25", 4"	1, 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 24, 28,	

Weight/Aluminum Tube

(lbs)

Bore size (in)		150 (1.5")	200 (2")	250 (2.5")	325 (3.25")	400 (4")
Basic weight	Basic style	1.58	2.35	3.19	6.03	7.79
	Foot mounting style	1.95	2.86	3.80	7.45	10.12
	Flange mounting style	2.30	3.22	4.45	8.85	11.66
	Clevis mounting style	2.27	3.23	4.28	8.95	11.41
	Trunnion mounting style	2.79	3.81	5.50	10.05	3.50
Add'l weight per each 2" of stroke	For all mountings style	0.38	0.48	0.51	0.97	1.06

Cylinder Bore and Force: Push Stroke

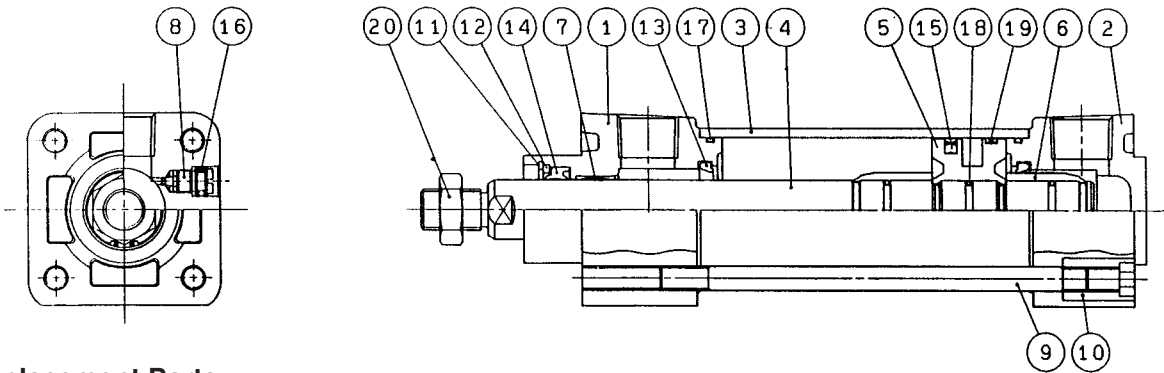
Bore size (in)	Piston area (in)	Force (lbs); Push stroke					
		Operating medium pressure (PSI)					
		50	60	80	100	200	250
1.5	1.767	88	106	141	177	353	442
2	3.142	157	188	251	314	628	785
2.5	4.909	245	295	393	491	982	1227
3.25	8.296	415	498	664	830	1659	2074
4	12.566	628	754	1005	1257	2513	3142

Cylinder Bore and Force: Pull Stroke

Piston rod diameter (in)	Piston rod area (in)	Force (lbs); Pull stroke (Deduct the listed thrusts corresponding to the rod size from push stroke pressure)					
		Operating medium pressure (psi)					
		50	60	80	100	200	250
0.625	0.307	15	18	25	31	61	77
1	0.785	39	47	63	79	157	196
1.375	1.485	74	89	119	148	297	371

Series NCA1

Construction



Replacement Parts

No.	Description	Material
①	Rod cover	Aluminum alloy
②	Head cover	Aluminum alloy
③	Cylinder tube	Aluminum alloy
④	Piston rod	Carbon steel
⑤	Piston	Aluminum alloy
⑥	Cushion ring	Brass
⑦	Rod bushing	Bronze casted
⑧	Cushion valve	Carbon steel
⑨	Tie-rod	Carbon steel
⑩	Tie-rod nut	Carbon steel
⑪	Retaining ring	Carbon steel
⑫	Rod seal retainer	Carbon steel
⑬*	Cushion seal	Urethan rubber
⑭*	Rod seal	NBR
⑮*	Piston seal	NBR
⑯*	Cushion valve seal	NBR
⑰*	Cylinder tube gasket	NBR
⑱	Piston gasket	NBR
⑲	Wear ring	Resin
⑳	Rod jam nut	Carbon steel

* Components included in a seal kit.

How to Order Seal Kit

NCA1

W

150

PS

Option

—

Single rod

W

Double rod

K*

Non-rotating

Bore

150

200

250

325

400

Option

-XB5***

Oversized rod

-XB6***

High temperature

-XB7***

Low temperature

-XC11

Dual operation/Single rod**

* Available for 150, 200 and 250 bores only.

** Use single rod designation when ordering XC11 kit.

Note: XC10 seal kit order 2 single rod kits.

*** Not available with W and K option

Series NCA1

Auto Switch Specifications

Applicable Auto Switch/Refer to page 6-16-1 for further information on auto switches.

Type	Special function	Electrical entry	Indicator light	Wiring (Output)	Load voltage		Auto switch model	Lead wire length (m) ^{Note}			Connector	Applicable load	
					DC	AC		0.5 (Nil)	3 (L)	5 (Z)			
Reed switch	—	Grommet	Yes	2-wire	24 V	12 V	A53	●	●	●	—	—	PLC
	—			3-wire (Equiv. NPN)	—	5 V	A54	●	●	●	—	—	Relay, PLC
	Diagnosis indication (2-color)			2-wire	24 V	12 V	A59W	●	●	—	—	—	Relay, PLC
	—			2-wire	24 V	5 V, 12 V	A64	●	●	—	—	—	PLC
Solid state switch	—	Grommet	Yes	3-wire (NPN)	—	5 V, 12 V	A67	●	●	—	—	—	IC circuit
	—			3-wire (PNP)	—	5 V, 12 V	F59	●	●	○	○	—	Relay, PLC
	—			2-wire	—	100 V, 200 V	F5P	●	●	○	○	—	Relay, PLC
	—			2-wire	24 V	12 V	J51	●	●	○	○	—	Relay, PLC
	—			3-wire (NPN)	24 V	5 V, 12 V	J59	●	●	○	○	—	Relay, PLC
	—			3-wire (PNP)	24 V	5 V, 12 V	F59W	●	●	○	○	—	Relay, PLC
	Diagnosis indication (2-color)			2-wire	24 V	12 V	F5PW	●	●	○	○	—	Relay, PLC
	Water resistant (2-color)			4-wire (NPN)	24 V	12 V	J59W	●	●	○	○	—	Relay, PLC
	Diagnosis output (2-color)			3-wire (NPN)	24 V	5 V, 12 V	F5BAL	—	●	○	○	—	Relay, PLC
	With timer			3-wire (NPN)	24 V	5 V, 12 V	F59F	●	●	○	○	—	Relay, PLC
	—			3-wire (NPN)	24 V	5 V, 12 V	F5NTL	—	●	○	○	—	Relay, PLC

Note) Lead wire length symbols: 0.5 m Nil (Example) A53
 3 m L (Example) A53L
 5 m Z (Example) A53Z

* Solid state auto switches marked with "○" are produced upon receipt of order.

CJ1

CJP

CJ2

CM2

CG1

MB

MB1

CA2

CS1

C76

C85

C95

CP95

NCM

NCA

D-

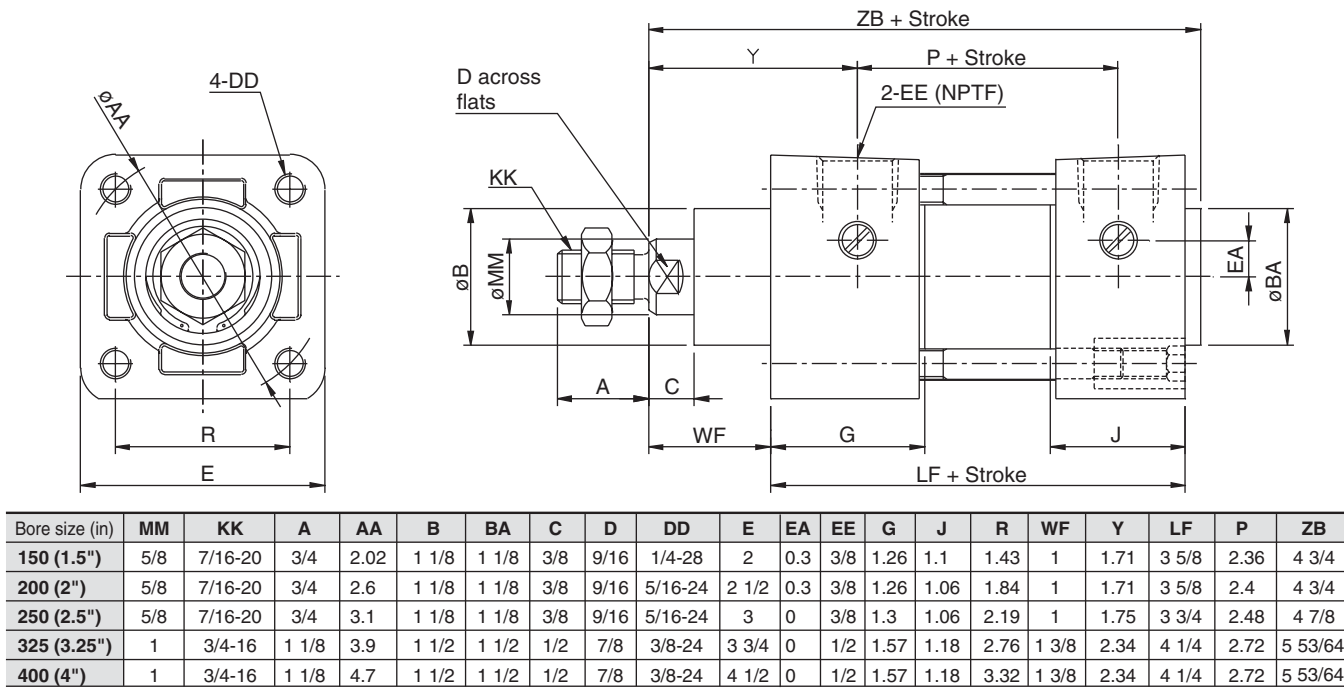
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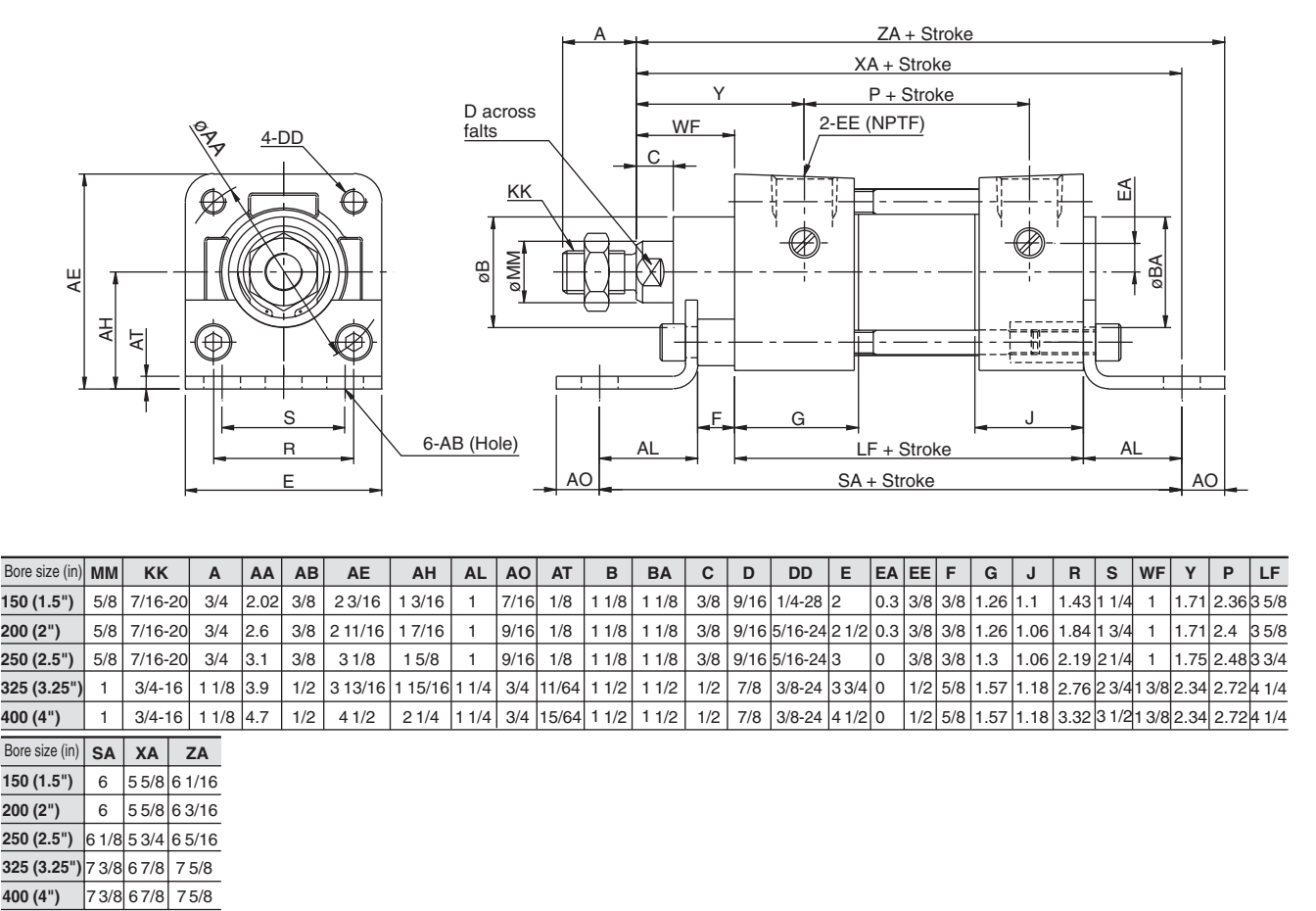
Data

Series NCA1

Basic Style: NC□A1B (MX0 mounting style)



Foot Style: NC□A1L (MS1 mounting style)



Oversized Rod

Specifications

Bore size (inch)	2	2.5	3.25	4
Fluid	Air			
Max. operating pressure	250 psi (1.75 MPa)			
Min. operating pressure	8 psi (0.06 MPa)			
Ambient & fluid temperature	40 to 140°F (5 to 60°C)			
Piston speed	2 to 20 inch/sec (50 to 500 mm/sec)			
Cushion	Air cushion standard			
Mounting	Basic style, Foot style, Flange style, Center trunnion style, Side tapped style			

Standard Stroke

Bore size (in)	Standard stroke
2, 2.50	1, 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 24
3.25, 4	1, 2, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 24, 28

How to Order Oversized Rod/Standard

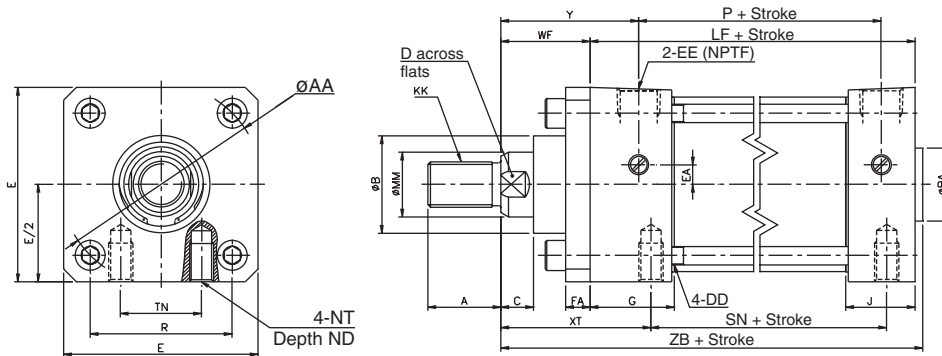
NC **D** A1 **Mounting** **Bore** **Stroke** **Suffix** - XB5

Ex: NCDA1B 250-0200-XB5

Auto switch capable

Oversized/rod

Oversized Rod-Basic Style: NC□A1B (XB5)



Bore size (in)	MM	KK	A	AA	B	BA	C	D	DD	E	EA	EE	FA	G	J	R	ND	NT	TN	WF	XT	Y	LF	P	SN	ZB
200 (2")	1	3/4-16	1 1/8	2.6	1 1/2	1 1/8	1/2	7/8	5/16-24	2 1/2	0.3	3/8	3/8	1.26	1.06	1.84	7/16	5/16-18	7/8	1 3/8	2 5/16	2.09	3 5/8	2.40	2 1/4	5 1/8
250 (2.5")	1	3/4-16	1 1/8	3.1	1 1/2	1 1/8	1/2	7/8	5/16-24	3	0	3/8	3/8	1.30	1.06	2.19	19/32	3/8-18	1 1/4	1 3/8	2 5/16	2.13	3 3/4	2.48	2 3/8	5 1/4
325 (3.25")	1 3/8	1-14	1 5/8	3.9	2	1 1/2	5/8	1 1/4	3/8-24	3 3/4	0	1/2	5/8	1.57	1.18	2.76	5/8	1/2-13	1 1/2	1 5/8	2 11/16	2.59	4 1/4	2.72	2 5/8	6 5/64
400 (4")	1 3/8	1-14	1 5/8	4.7	2	1 1/2	5/8	1 1/4	3/8-24	3 3/4	0	1/2	5/8	1.57	1.18	3.32	5/8	1/2-13	2 1/16	1 5/8	2 11/16	2.59	4 1/4	2.72	2 5/8	6 5/64



N304-EX

Air Cylinder

NCA1 Series



NFPA Industrial Interchangeable Pneumatic Cylinders
Medium Duty 5" to 8"
Heavy Duty 1.5" to 14"

Air Cylinder Series NCA1-EX

MATERIAL SPECIFICATIONS

MEDIUM DUTY XTAT			
Bore Size	5	6	8
Barrel -			
Aluminum	Std	Std	Std
Composite Fiber	Opt	Opt	Opt
Head/Cap - Aluminum	Std	Std	N/A
Head/Cap - Steel	N/A	N/A	Std
Piston - Aluminum	Std	Std	Std
Gland Bushing	Bronze Material		
Note Material Specifications for above: Aluminum; 6061-T6, Steel; ASTM A36, Stainless Steel; 316.			

TECHNICAL SPECIFICATIONS

Fluid	Air / Hydraulic* (250psi non-shock)
Lubrication	Non Lube
Max operating Pressure	250 PSI
Min Operating Pressure	5 PSI
Ambient & Fluid Temp	40~140°F / 5~60°C
Please note for Hydraulic Service please order the H option as denoted in the How to Order breakdown on pgs 2 & 3	

HEAVY DUTY XTST

Bore Size	1.5~4	5	6	8	10	12	14
Barrel -							
Steel	Std	Std	Std	Std	Std	Std	Std
Composite Fiber	Opt	Opt	Opt	Opt	Opt	Opt	Opt
Head/Cap - Steel	Std	Std	Std	Std	Std	Std	Std
Piston - Aluminum	Std	Std	Std	Std	N/A	N/A	N/A
Piston - Steel	N/A	N/A	N/A	N/A	Std	Std	Std
Gland Bushing	Bronze Material						

Note Material Specifications for above: Aluminum; 6061-T6, Steel; ASTM A36, Stainless Steel; 316,

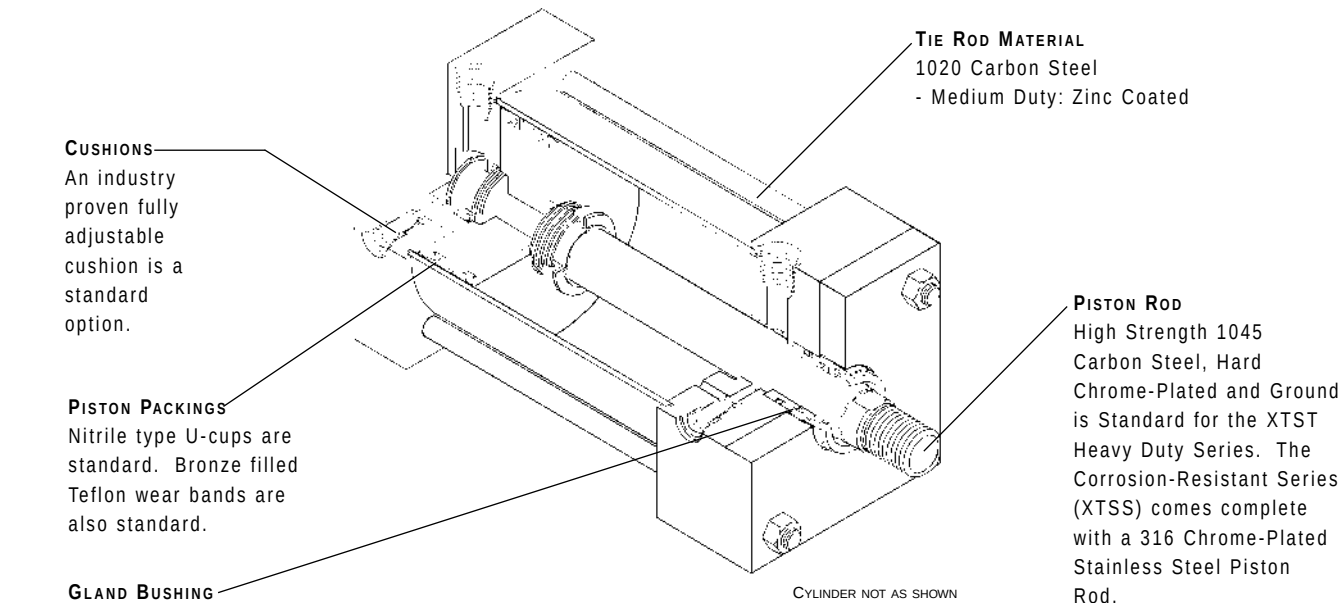
N/A - Not Available; please contact SMC Customer Service

OPT - Optional; see How to Order

CORROSION RESISTANT XTSS

Barrel	Stainless Steel
	Composite Tube Optional
Head/Cap	Stainless Steel
Piston	Aluminum
Tie Rods	Stainless Steel
Gland Bushing	Delrin

Note Material Specifications for above: Aluminum; 6061-T6, Stainless Steel; 316,



- **Steel and Stainless Steel Construction**
- **Replaceable Rod Gland Design**
- **Auto Switch Sensing Option (Stainless and Composite Tube Only)**
- **Hydraulic Service / 250PSI Non Shock (H Option)**
- **Non Rotating Piston Rod & Through Hole Rod Types Available**
- **Full Range of NFPA Interchangeable Mounting Configurations**
 - **Mounting Dimensions are in accordance with ANSI(NFPA)**
T3.6.7 R2-1996, Fluid Power Systems and products -
Square Head Industrial Cylinders - Mounting Dimensions.

AUTO SWITCH

-Standard
DAuto Switch capable (Stainless and Composite tube only)

STYLE

-Standard Cylinder
WDouble Rod (Please see Page 19 for Mounting Information)
K Non-rotating Piston Rod (5 to 14"Ø)

MOUNTING / SINGLE ROD ONLY

EA ... **ME3** - Head Square Mount (8 to 14"Ø)
EB ... **ME4** - Cap Square Mount (8 to 14"Ø)
F ... **MF1** - Front Flange (1.5 to 6"Ø)
G ... **MF2** - Rear Flange (1.5 to 6"Ø)
M ... **MF5** - Front Flange (1.5 to 6"Ø)
N ... **MF6** - Rear Flange (1.5 to 6"Ø)
X ... **MP1** - Double Rear Clevis (1.5 to 14"Ø)
D ... **MP2** - Double Detachable Rear Clevis/Female (1.5 to 14"Ø)
E ... **MP3** - Cap Fixed Eye (1.5 to 14"Ø)
C ... **MP4** - Single Detachable Rear Clevis/Male (1.5 to 14"Ø)
L ... **MS1** - Foot Mount (1.5 to 14"Ø)
S ... **MS2** - Side Lug (1.5 to 14"Ø)
O ... **MS3** - Centerline Lug (1.5 to 14"Ø)
R ... **MS4** - Side-Tapped (1.5 to 14"Ø)
P ... **MS7** - Front Lug Mount (1.5 to 14"Ø)
U ... **MT1** - Rod End Trunnion (1.5 to 14"Ø)
J ... **MT2** - Cap Trunnion (1.5 - 14"Ø)
T ... **MT4** - Center Trunnion (1.5 to 14"Ø) *See below
B ... **MX0** - Basic/No Mount (1.5 to 14"Ø)
BA ... **MX1** - Extended Tie-Rods; Head/Cap (1.5 to 14"Ø)
BB ... **MX2** - Extended Tie-Rods; Cap (1.5 to 14"Ø)
BC ... **MX3** - Extended Tie-Rods; Head (1.5 to 14"Ø)

To Order MT4 With Non Standard XI Dimension

A1 T ○ - ○ - X46US (XI = Total Inches) T ○

Specify XI Dimension in inches _____ Construction Type _____

STYLE

-Pneumatic
H ...Hydraulic

CONSTRUCTION TYPE
(PLEASE SEE PAGE 1 FOR CONSTRUCTION DETAILS)

ST ...Steel Construction (1.5~14"Ø)
SS ...All Stainless Steel (1.5~14"Ø)
SCT ...Steel w/ Composite Tube (1.5 - 14"Ø)
SSCT ...Stainless Steel w/ Composite Tube (1.5- 14"Ø)

OPTIONS

ASpecial Rod Thread (See Page 22)
B5Oversized Rod (See Chart below)
B6High Temperature *
C3Port and Cushion Location (see Page 23)
C6Stainless Steel Piston Rod (Std. on XTSS series)
C8Adjustable Stroke Extended Piston Rod *
C9Adjustable Stroke Return Piston Rod *
C10Dual Operation/Double Piston Rod *
C11Dual Operation/Single Piston Rod *
C12Tandem Cylinder*
* (Contact SMC Customer Service)

NO OF SWITCHES

-2 Pieces
S1 Piece
nNumber Of Switches

ROD BOOT

-Without Boot
KNeoprene Boot

AIR CUSHION

-Both Ends
NNone
HCap End
RRod End

*Note: Non Adjustable Cushions are available on units above 4"Bore
Please Consult SMC Customer Service
**Note: Cushions not recommended for Strokes below 3"

OPTION

OVERSIZED ROD - XB5 OPTION

When ordering an oversized rod, please order the following way to represent the rod size required.

XB5

E 1"
G 1 3/8"
H 1 3/4"
J 2"
K 2 1/2"
L 3"
M 3 1/2"
Z Please consult SMC Customer Service for larger sizes.

BORE SIZE	STD. ROD Ø	STD. ROD THREAD	
1501.5"	5/8"	7/16-20	
2002"	5/8"	7/16-20	
2502.5"	5/8"	7/16-20	
3253.25"	1"	3/4-16	
4004"	1"	3/4-16	
5005"	1"	3/4-16	
6006"	1-3/8"	1-14	
8008"	1-3/8"	1-14	
100010"	1-3/4"	1 1/4-12	
120012"	2"	1 1/2-12	
140014"	2-1/2"	1 7/8-12	

STANDARD STROKE

Inches
Example: 04 = 4" Stroke

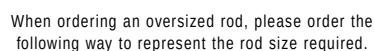
STROKE

Hundredths Of An Inch
Example: 25 = 0.25 (1/4) Inch Stroke

Up to 32" Bore available
Please contact SMC Customer Service
REFER TO PAGE 22 FOR OPTIONAL ROD THREADS

- **Aluminum Construction**
- **Replaceable Rod Gland Design**
- **Auto Switch Capable**
- **Hydraulic Service / 250PSI Non-Shock (H Option)**
- **Full Range of NFPA Interchangeable Mounting Configurations**
 - Mounting Dimensions are in accordance with ANSI(NFPA) T3.6.7 R2-1996, Fluid Power Systems and products - Square Head Industrial Cylinders - Mounting Dimension

How To ORDER



XB5	
G	1 3/8"
H	1 3/4"
J	2"
K	2 1/2"
L	3"
M	3 1/2"
Z	Please contact SMC Customer Service for larger sizes