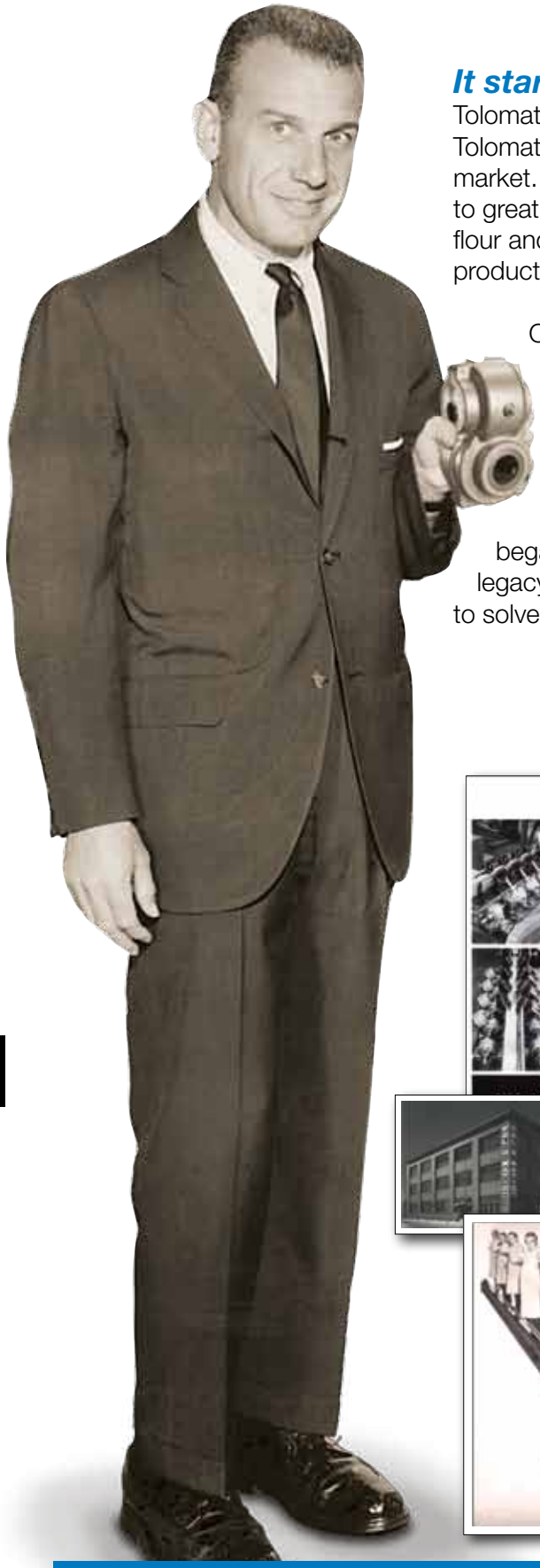
Tolomatic
EXCELLENCE IN MOTION®

CC CABLE CYLINDER

RODLESS CYLINDER

CONTENTS

A legacy of innovation in solving customer needs.



It started with a custom solution.

Tolomatic's first product, the Float-A-Shaft®, marked the beginning of Tolomatic's innovative product solutions for the industrial automation market. Burton Toles, Tolomatic's founder, designed the Float-A-Shaft to greatly improve the efficiency of baler/sealing machinery used in the flour and milling industry. The unique right-angle gear box permitted quick product changeover and is still used in the packaging industry today.

On the same baler/sealer machine, customers also wanted a low-cost simple mechanism to lift and sort bags. Again, the Tolomatic solution proved to be a winner with the invention of the cable cylinder – the world's first rodless product. Thus began Tolomatic's product innovation legacy: unique and robust product solutions to solve customer problems.

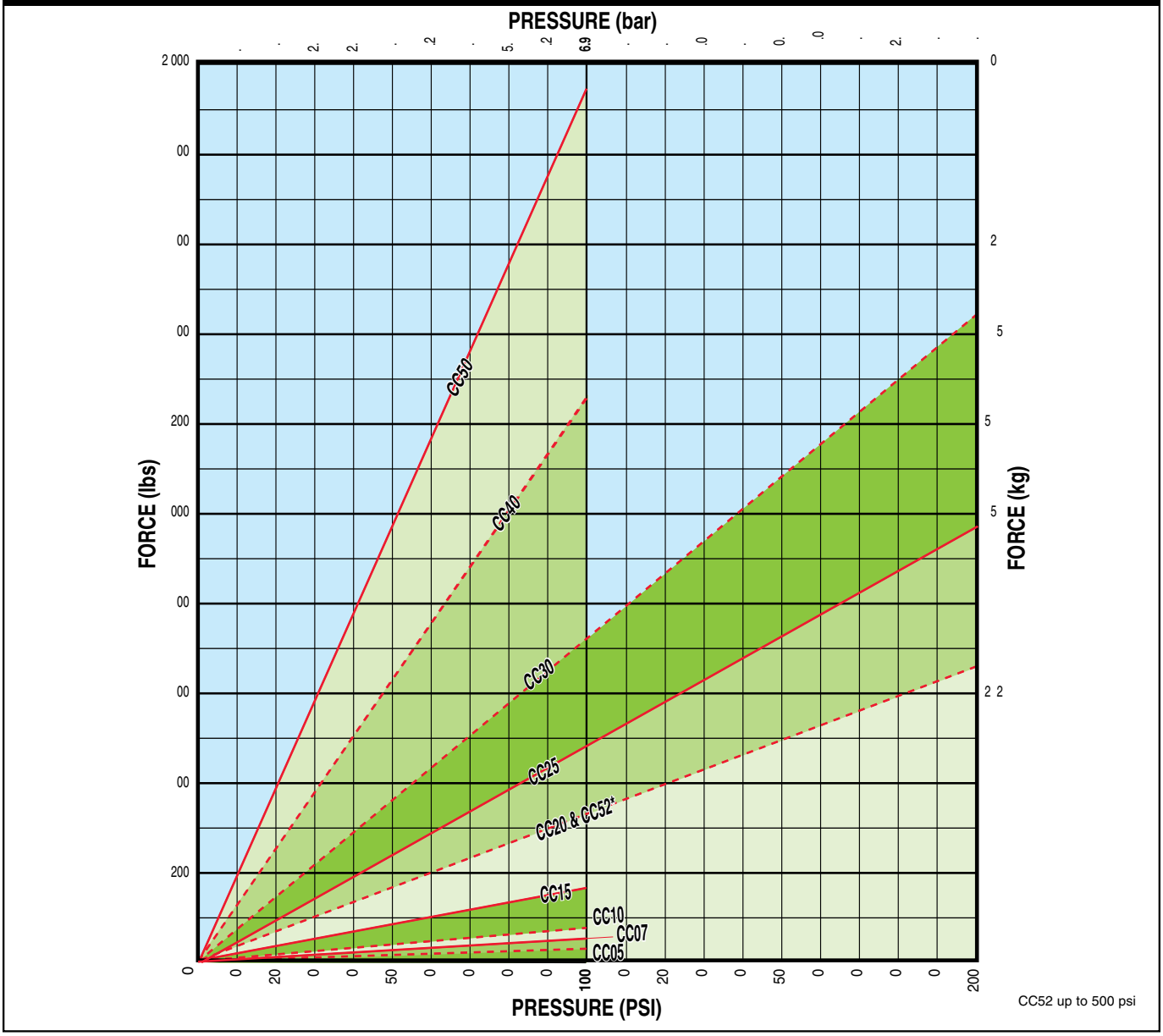
Tolomatic Milestones

- Founded in 1954 by Burton Toles – invention of the first right-angle gearbox that floats along its shaft.
- Designed the first rodless cylinder in 1958 – the cable cylinder is still in production today!
- Introduction of the BC2 – world's best selling pneumatic rodless cylinder.
- Tolomatic holds a portfolio of patents for actuators and mechanical assemblies.
- Tolomatic becomes ISO certified in October of 1995.
- Tolomatic enters the electromechanical actuator market in 1996 with its first electric actuators.
- Top global auto producer selects Tolomatic as its sole worldwide supplier of servo actuators for robotic welding.
- Over 1,000,000 (and counting) Tolomatic actuators put in service in applications all over the world.

CC Cable Cylinder

PERFORMANCE

CA LE C LI ER THEORETICAL FORCE VS PRESSURE



Introduced in 1955 as the first rodless cylinder, the Tolomatic cable cylinder provides reliable linear motion with space and cost-savings features. Its simple yet efficient design solves a wide variety of application requirements. Unlike rod cylinders, the cable cylinder's stroke is contained within the cylinder itself. That can be a big advantage when space limitations are a consideration. The cable cylinder also allows equal force to be applied in both directions.

Cables (fastened to both ends of the piston) pass through gland seals at the ends of the cylinder tube, go around pulleys and are then joined by a load bracket or clevis. The cables can be cut different lengths, threaded through a machine or wrapped around a drum to fill a wide variety of rotary and/or linear motion requirements.

First in the industry to offer an automatic tensioning cylinder and combine it with a caliper disc brake for static holding, Tolomatic also offers reed switch options on most cylinder models.

Available in double-acting, single-acting, double purchase and track cylinder models with 11 bore sizes ranging from 1/2-inch to 5 inches and stroke lengths ranging from a few inches to 60 feet, there is a Tolomatic cable cylinder that can do the job for you.

CABLE CYLINDER

ENDURANCE TECHNOLOGY℠

Endurance Technology features are designed for maximum durability to provide extended service life.

HIGH STRENGTH TUBE

- High-strength, lightweight 6063-T832 black anodized aluminum or steel
- Creates chamber for pneumatic or hydraulic pressure and protects piston

STEEL CLEVIS

- High strength material resists deformation
- Cable adjustment points
- Threaded holes for load attachment

CC DOUBLE ACTING CABLE CYLINDER

PORTING CHOICES

- Choose from 2 or 3 port heads

ALUMINUM PISTON

- High-strength, lightweight aluminum
- Pulls the cables when actuated by pneumatic or hydraulic pressure

UNIQUE GLAND SEALS

- Tight seal for cables to pass through
- Easy installation
- Snap In/Out cable seals or encapsulated gland seals depending on bore size

DIE CAST HEAD ASSEMBLY

- High-strength, lightweight anodized aluminum
- Protects piston and creates chamber for pneumatic or hydraulic pressure

LOCATE REMOTELY

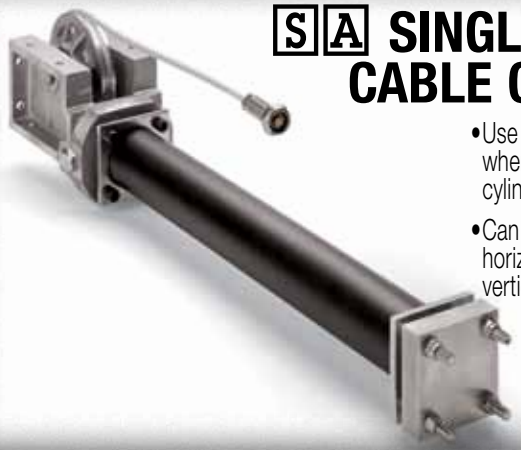
- Cylinder can be located away from work area. Useful in harsh environments and if space/weight are limited

TOLOMATIC…THE RODLESS CYLINDER LEADER

MIL SPEC CABLES

- Field proven to provide millions of cycles of uninterrupted service
- Nylon jacketed aircraft cables manufactured under Mil Spec. MiL-W-83420D

SA SINGLE ACTING CABLE CYLINDER



- Use in vertical applications when double acting cable cylinder is not required
- Can be positioned horizontally and achieve vertical movement

DP DOUBLE PURCHASE CABLE CYLINDER

- Doubles the velocity and stroke capacity of cable cylinder without increasing space requirements
- Stroke lengths up to 120 feet (36.6m)
- Isolates cylinder from harsh environments

TC TRACK CABLE CYLINDER

- Guides and supports load
- Precision linear ball bearings on hardened ground steel shafts

OPTIONS

AUTO TENSIONER
- Maintains proper cable tension
- Maximizes service life of both cable and seals

CALIPER DISC BRAKE HM HN
- Best mounting choice in most applications

STEEL TUBE
- For extra strength & use in harsh environments

3 PORTED HEAD
- For convenient air connection

SWITCHES
- Available in Reed and Triac
- 15ft. cable with flying leads; available with quick-disconnect couplers

SEALS OF VITON MATERIAL V
- Long lasting seal option
- High temperature applications

EXTRA CABLE XA XB
- To remotely locate cable cylinder

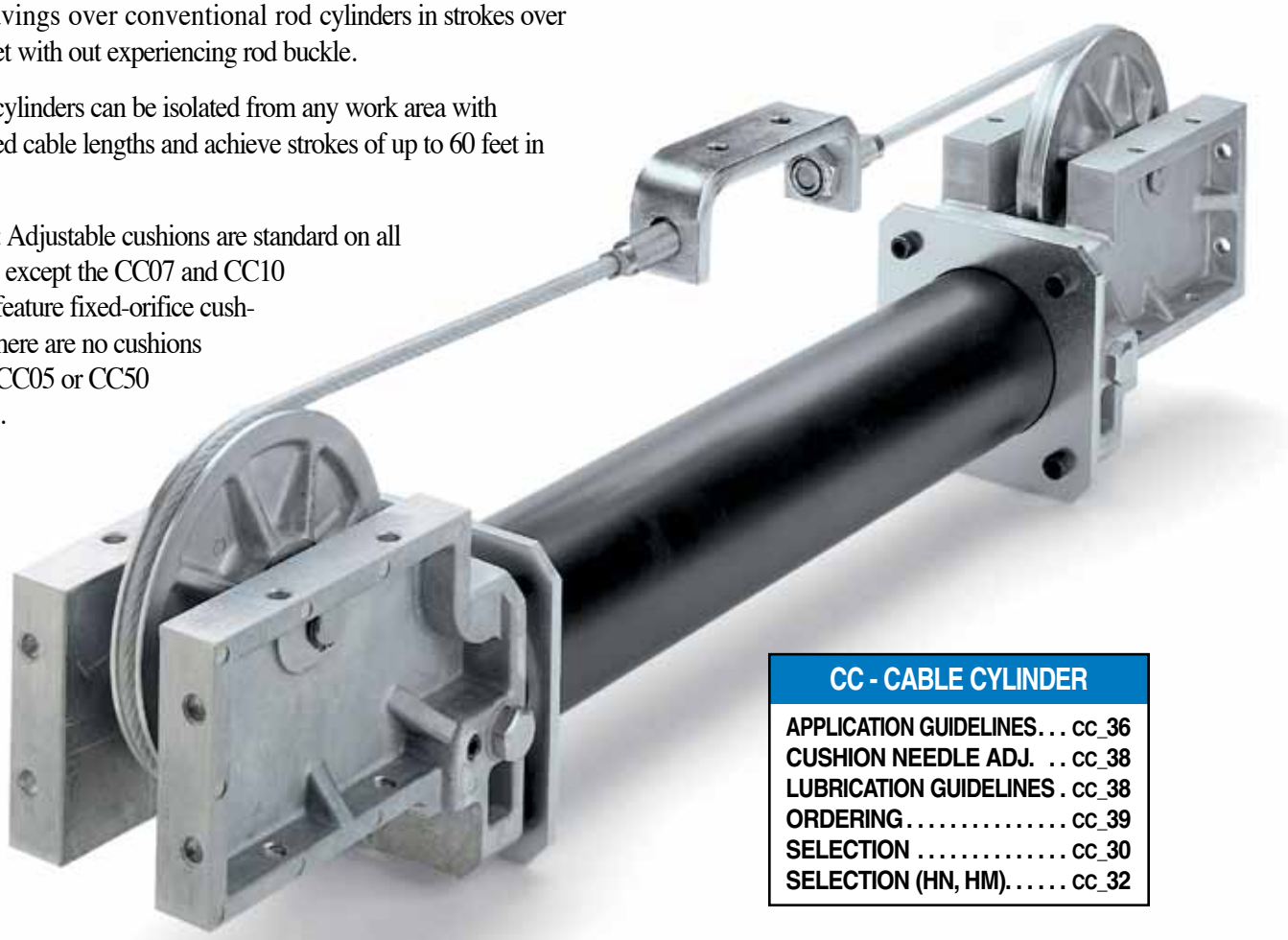
5 DAYS BUILT-TO-ORDER

CC Double Acting Cable Cylinder - All Sizes

The Tolomatic double-acting cable cylinder is a versatile space saver, available in all 9 bore sizes. Enjoy cost savings over conventional rod cylinders in strokes over four feet with out experiencing rod buckle.

These cylinders can be isolated from any work area with extended cable lengths and achieve strokes of up to 60 feet in length.

NOTE: Adjustable cushions are standard on all models except the CC07 and CC10 which feature fixed-orifice cushions. There are no cushions on the CC05 or CC50 models.



FEATURES AVAILABLE FOR DOUBLE-ACTING CABLE CYLINDERS

NOTE Single- orted Heads are standard on all base models.

FEATURES	PAGE #	CC05	CC07	CC10	CC15	CC20	CC25	CC30	CC40	CC52	CC50
AUTO TENSIONER WITH ONE 1" STROKE UNIT	cc_22		O	O	O	O	O	O	O	O	
AUTO TENSIONER WITH TWO 1" STROKE UNITS	cc_22		O	O	O	O	O	O	O	O	
AUTO TENSIONER WITH ONE 2" STROKE UNIT	cc_22					O	O	O	O	O	O
AUTO TENSIONER WITH TWO 2" STROKE UNITS	cc_22					O	O	O	O	O	O
CALIPER DISC BRAKE	cc_25				O	O	O	O	O	O	
SWITCHES (DC REED & AC TRIAC)*	cc_28	O	O	O	O	O	O	O	O	O	O
ALUMINUM TUBE		ST	ST	ST	ST	ST	ST	ST	ST	ST	ST
STEEL TUBE				O	O	O	O	O	O	O	
SEALS OF VITON® MATERIAL			O	O	O	O	O	O	O	O	
3-PORTED HEADS		O	O	O	O	O	O	O	O	O	O

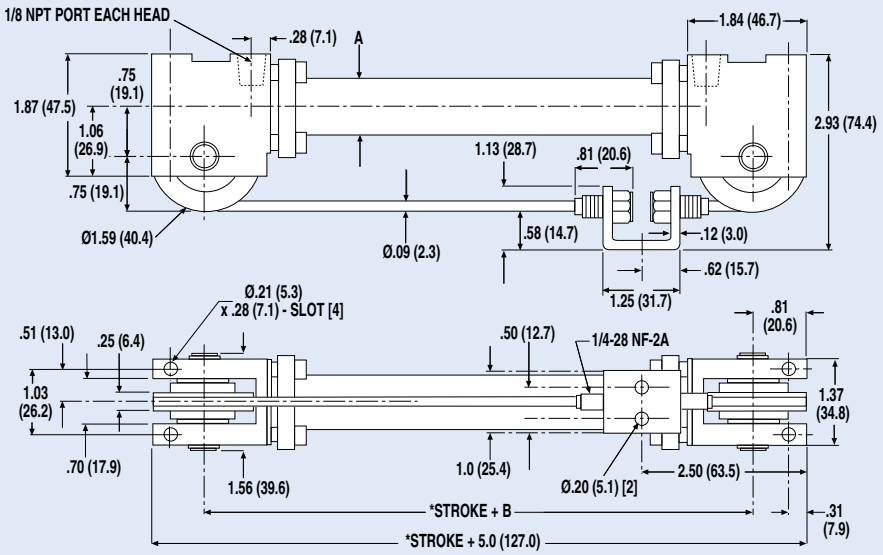
Switches can NOT be used with steel tube option

– Not Available OP Optional ST Standard

Double Acting Cable Cylinder - CC05, CC07, CC10

DIMENSIONAL DATA

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM



*If M option (magnet) is ordered add 1.62" (41.2mm) to the overall length

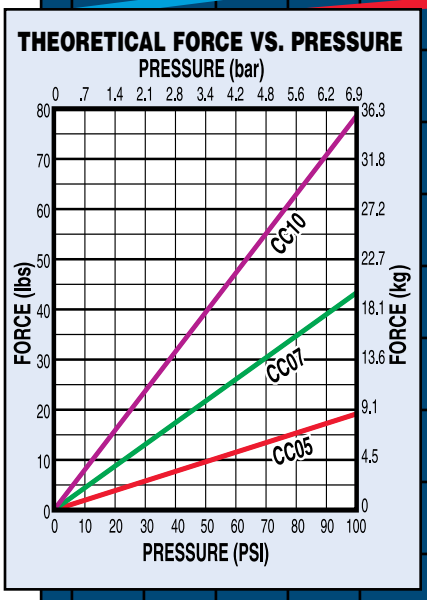
	CC05	CC07	CC10
A	Ø.63 (16.0)	Ø1.00 (25.4)	Ø1.25 (31.8)
B	3.38 (85.8)	3.43 (87.1)	3.43 (87.1)

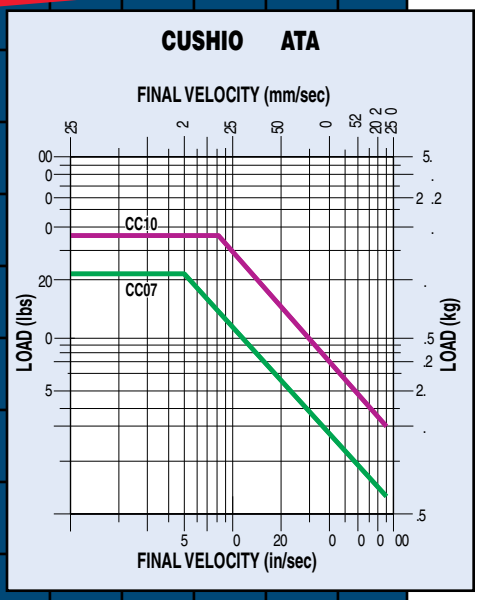
Dimensions in inches, in parentheses ( ) dimensions in millimeters

O ERALL UNIT SPECIFICATIONS	CC05	CC07	CC10
Bore si e in.	0.5	0. 5	
a . stro e in.	.2	0.	2 .
a . stro e mm	0 .	5 .	2 .
Base wt. lbs. Alum	.	.	.
Base wt. gs. Alum	0.	0.	0.
Base wt. lbs. Steel	NA	NA	.
Base wt. gs. Steel	NA	NA	0.
Wt. per in. of str . lbs. Alum	0.0	0.0	0.0
Wt. per in. 25mm of str . gs. Alum	.0050	.0 5	.0 5
Wt. per in. of str . lbs. Steel	NA	NA	. 25
Wt. per in. 25mm of str . gs. Steel	NA	NA	.05
a . pressure SI	00	00	00
a . pressure bars	.	.	.
a . temp. F	0	0	0
a . temp. C	0	0	0
a . force output lbs.	.	.5	.
a . force output gs.	. 0	.	5.
TU IN SPECIFICATIONS			
ead length in.	.	.	.
ead length mm.	2 .2	0.0	.
Wall thic ness in.	0.0	0. 25	0. 25
Wall thic ness mm.	2. 0	. 5	. 5
aterial	Alum.	Alum.	Alum. or Steel
Tube support span ft. Alum.	5	5	
Tube support span m. Alum.	.52	.52	.
Tube support span ft. Steel	NA	NA	.5
Tube support span m. Steel	NA	NA	.
CA LE SPECIFICATIONS			
Wire dia. in.	0.0	0.0	0.0
Wire dia. mm.	.	.	.
Nylon O. . in.	0.0	0.0	0.0
Nylon O. . mm.	2. 0	2. 0	2. 0
Strand configuration			
Tensile strength lbs.	2 0	2 0	2 0
Tensile strength gs.	22.	22.	22.
roof-load torque in.-lbs.	5	5	5
roof-load torque N-m	.	.	.
retensioning torque in.-lbs.	2.5	2.5	2.5
retensioning torque N-m	0.2	0.2	0.2

Add to stro e length.

PERFORMANCE DATA





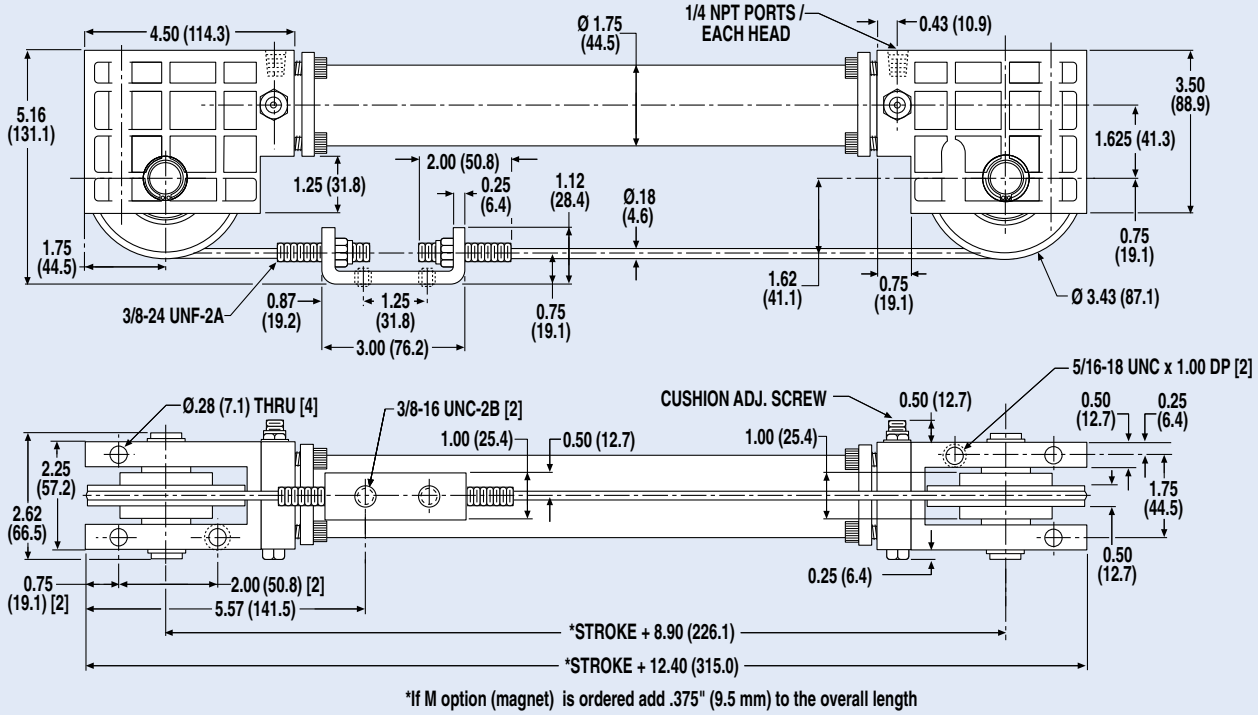
CC
CC
CC

NOTE The CC05 cylinder does not ha e cushions.

Double Acting Cable Cylinder - CC15

DIMENSIONAL DATA

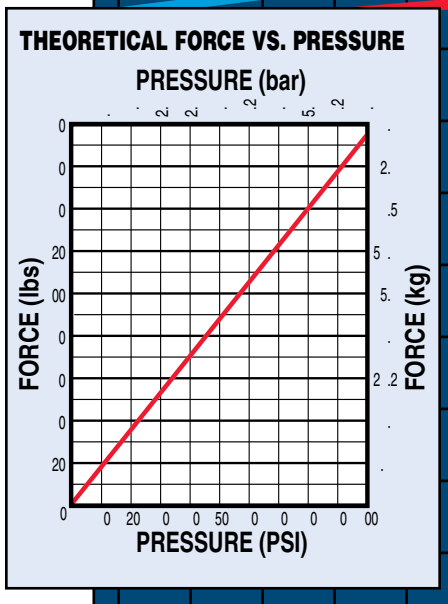
2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

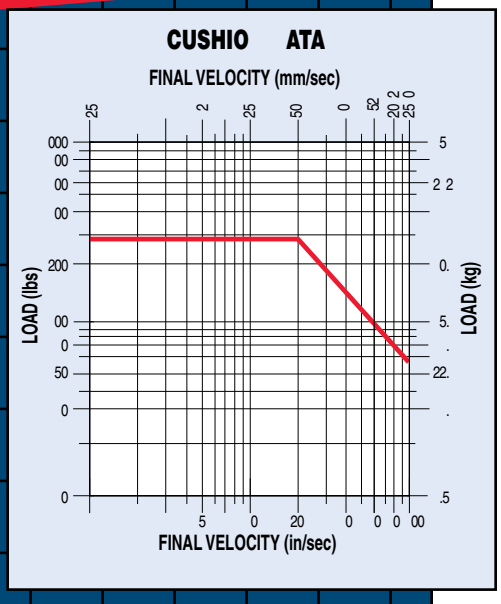


*If M option (magnet) is ordered add .375" (9.5 mm) to the overall length

Dimensions in inches, in parentheses ( ) dimensions in millimeters

PERFORMANCE DATA





CC

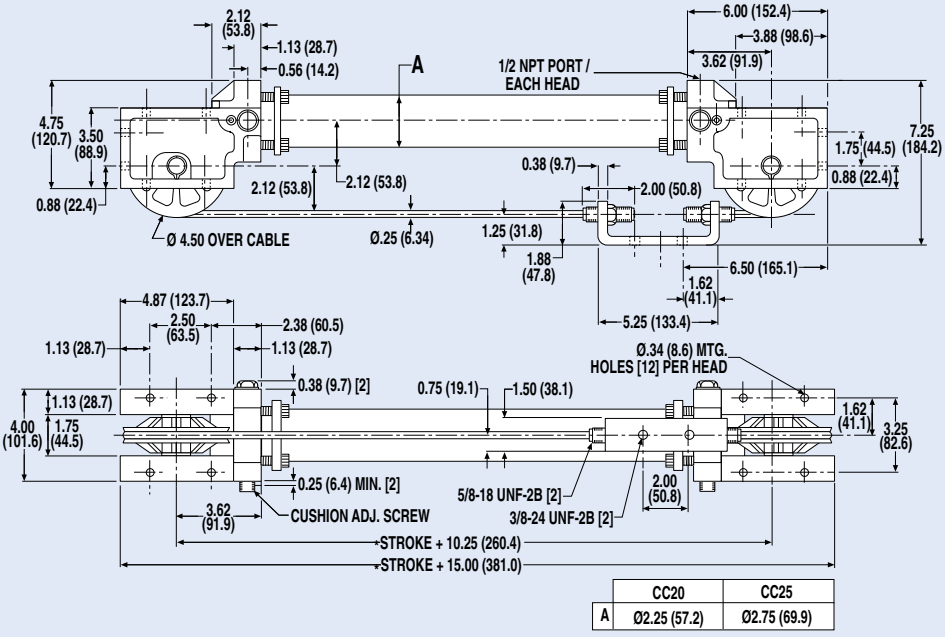
O ERALL UNIT SPECIFICATIONS		
Bore si e	.5 in.	
a . stro e	2 2.5 in.	. mm
Base wt. Alum	5. 2 lbs.	2. 2 gs.
Base wt. Steel	5.2 lbs.	2. gs.
Wt. per in. 25mm of stro e Alum	.0 lbs.	.02 gs.
Wt. per in. 25mm of stro e Steel	. lbs.	.0 2 gs.
a . ressure	00 SI	. bars
a . temp.	0 F	0 C
a . force output	lbs.	. 2 gs.
TU IN SPECIFICATIONS		
ead length	. 0 in.	. mm
Wall thic ness	0. 25 in.	. 5 mm
aterial	Alum. or Steel	
Tube support span Alum	ft.	2. m
Tube support span Steel	.5 ft.	2.2 m
CA LE SPECIFICATIONS		
Wire dia.	0.0 in.	2. 0 mm
Nylon O. .	0. in.	. 50 mm
Strand configuration		
Tensile strength	20 lbs.	. 0 gs.
roof-load torque	5 in.-lbs.	5.0 N-m
retensioning torque	in.-lbs.	0. 0 N-m

Add to stro e length.

Double Acting Cable Cylinder - CC20, CC25

DIMENSIONAL DATA

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM



A	CC20	CC25
	Ø2.25 (57.2)	Ø2.75 (69.9)

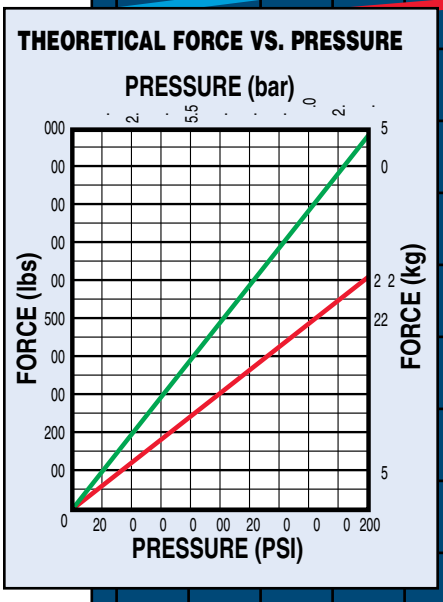
*If M option (magnet) is ordered add 0.375" (9.5 mm) to the overall length

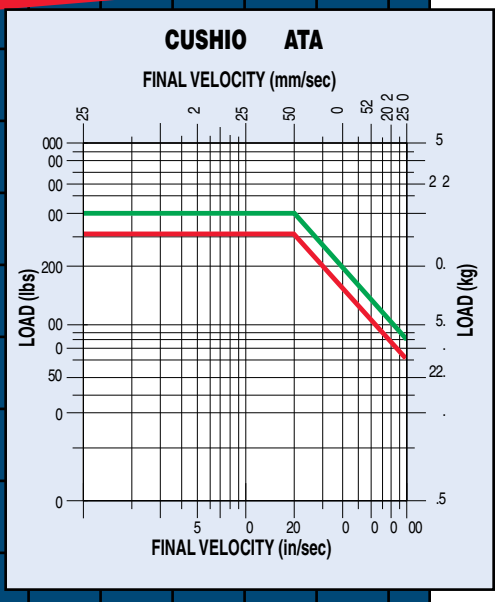
Dimensions in inches, in parentheses ( ) dimensions in millimeters

O ERALL UNIT SPECIFICATIONS	CC20	CC25
Bore si e in.	2	2.5
a . stro e in.	2 .00	2 .00
a . stro e mm	.2	.2
Base wt. lbs. Alum.	2.	2.
Base wt. gs. Alum	5.	5. 5
Base wt. lbs. Steel	2.	.
Base wt. gs. Steel	5. 5	.
Wt. per in. of str . lbs. Alum.	0.0	0. 0
Wt. per in. 25mm of str . gs. Alum	.0	.0
Wt. per in. of str . lbs. Steel	0.2	0.2 2
Wt. per in. 25mm of str . gs. Steel	. 0 0	. 2
a . Sl	200	200
a . pressure bars	.	.
a . temp. F	0	0
a . temp. C	0	0
a . force output lbs.	.5	.
a . force output gs.	2 0.55	0.
TU IN SPECIFICATIONS		
ead length in.		
ead length mm.	.2	.2
Wall thic ness in.	0. 25	0. 25
Wall thic ness mm.	. 5	. 5
aterial	Alum. or Steel	Alum. or Steel
Tube support span ft. Alum.	.5	
Tube support span m. Alum.	2.2	2.
Tube support span ft. Steel		
Tube support span m. Steel	2.	2.
CA LE SPECIFICATIONS		
Wire dia. in.	0. 25	0. 25
Wire dia. mm.	. 5	. 5
Nylon O. . in.	0.25	0.25
Nylon O. . mm.	. 50	. 50
Strand configuration		
Tensile strength lbs.	2000	2000
Tensile strength gs.	0 .	0 .
roof-load torque in.-lbs.	5	5
roof-load torque N-m	2.	2.
retensioning torque in.-lbs.		
retensioning torque N-m	5.20	.25

Add to stro e length.

PERFORMANCE DATA



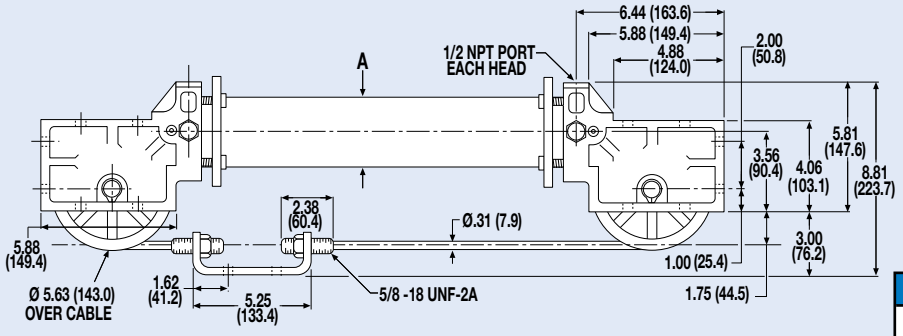


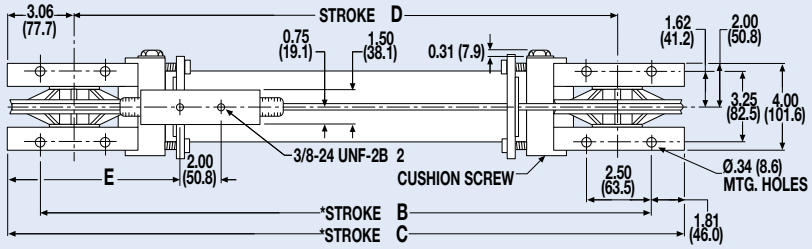
CC
CC

Double Acting Cable Cylinder - CC30, CC40, CC52

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

DIMENSIONAL DATA





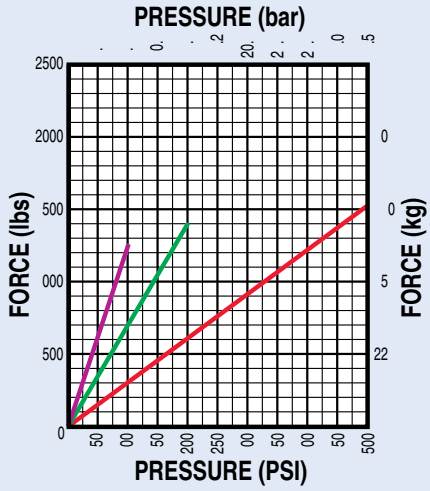
	CC30	CC40	CC52
A	Ø3.25 (82.6)	Ø4.25 (108.0)	Ø2.25 (57.2)
B	13.87(352.3)	14.87 (377.7)	13.87 (352.3)
C	17.50 (44.5)	18.50 (469.9)	17.50 (444.5)
D	11.38 (289.1)	12.38 (314.5)	11.38 (289.1)
E	7.75 (196.9)	8.25 (209.6)	7.75 (196.9)

*If M option (magnet) is ordered add .375" (9.5 mm) to the overall length

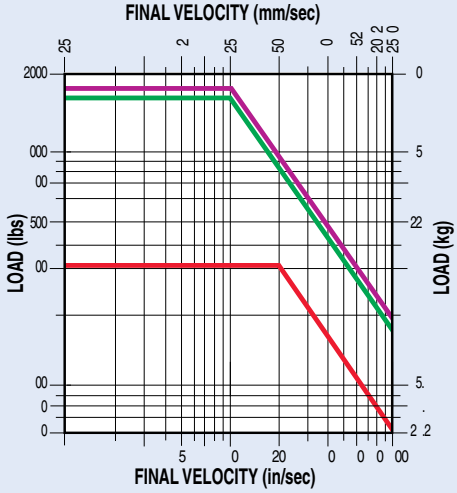
Dimensions in inches, in parentheses ( ) dimensions in millimeters

PERFORMANCE DATA

THEORETICAL FORCE VS. PRESSURE



CUSHIO ATA



cc cc cc

O ERALL UNIT SPECIFICATIONS

	CC30	CC40	CC52
Bore si e in.			2
a . stro e in.	2 2.50	2 .50	2 2.50
a . stro e mm	5.5	50.	5.5
Base wt. lbs. Alum	.	20. 5	2.
Base wt. gs. Alum	.	.	5.
Base wt. lbs. Steel	. 5	22.0	2.
Base wt. gs. Steel	. 2	0.02	5. 5
Wt. per in. of str . lbs. Alum	0. 2	0. 5	0.0
Wt. per in. 25mm of str . gs. Alum	.05	0.0 2	.0
Wt. per in. of str . lbs. Steel	0.	0. 5	0.2
Wt. per in. 25mm of str . gs. Steel	. 5 5	.20 2	. 0 0
a . pressure SI	200	00	500
a . pressure bars	.	.	.5
a . temp. F	0	0	0
a . temp. C	0	0	0
a . force output lbs.	.	2 .	5 2.
a . force output gs.		5	5

TU IN SPECIFICATIONS

ead length in.	.5	.5	
ead length mm.	.	.	.2
Wall thic ness in.	0. 25	0. 25	0. 25
Wall thic ness mm.	. 5	. 5	. 5
aterial	Alum. or Steel	Alum. or Steel	Alum. or Steel
Tube support span ft. Alum.	.5		
Tube support span m. Alum.	2.5	2.	2.
Tube support span ft. Steel	0		
Tube support span m. Steel	.05	. 5	2.

CA LE SPECIFICATIONS

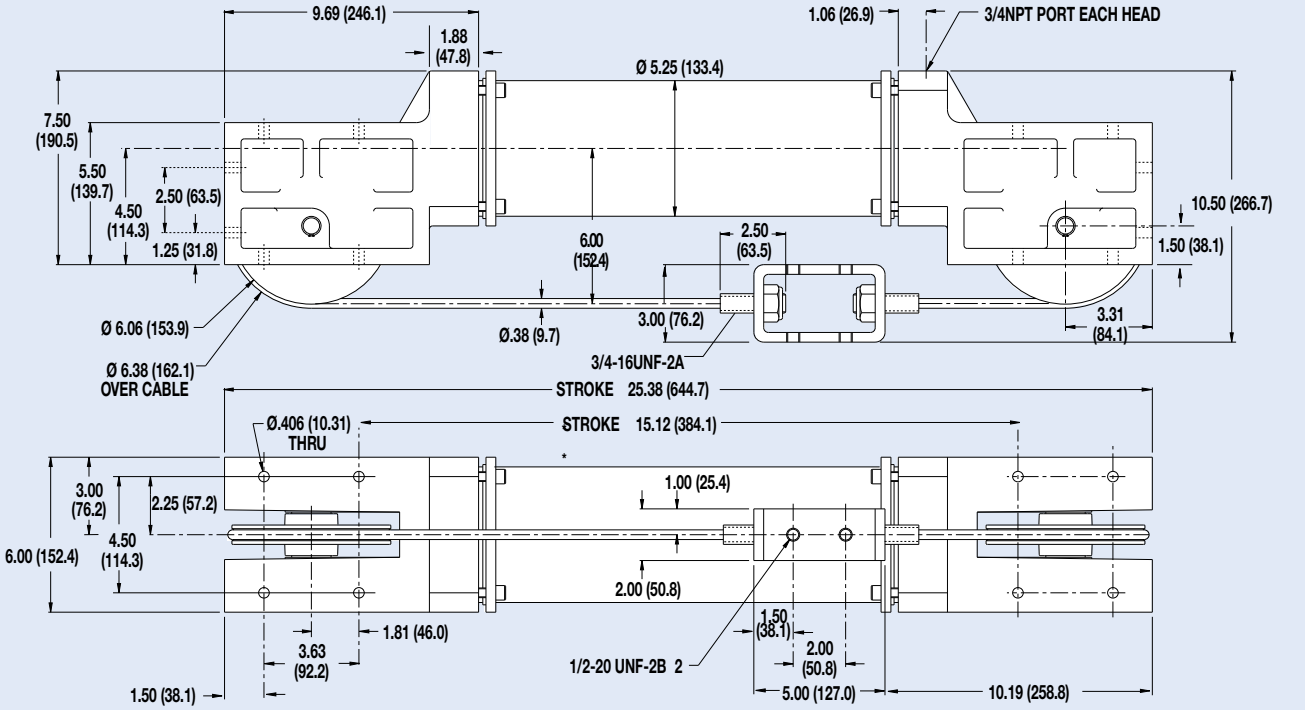
Wire dia. in.	0.	0.	0.
Wire dia. mm.	. 50	. 50	. 50
Nylon O. . in.	0. 2	0. 2	0. 2
Nylon O. . mm.	. 25	. 25	. 25
Strand configuration			
Tensile strength lbs.	200	200	200
Tensile strength gs.	05	05	05
roof-load torque in.-lbs.	5	5	5
roof-load torque N-m	2 0	2 0	2 0
retensioning torque in.-lbs.	05	.5	5
retensioning torque N-m	.	2 .	2.

Add to stro e length.

Double Acting Cable Cylinder - CC50

DIMENSIONAL DATA

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

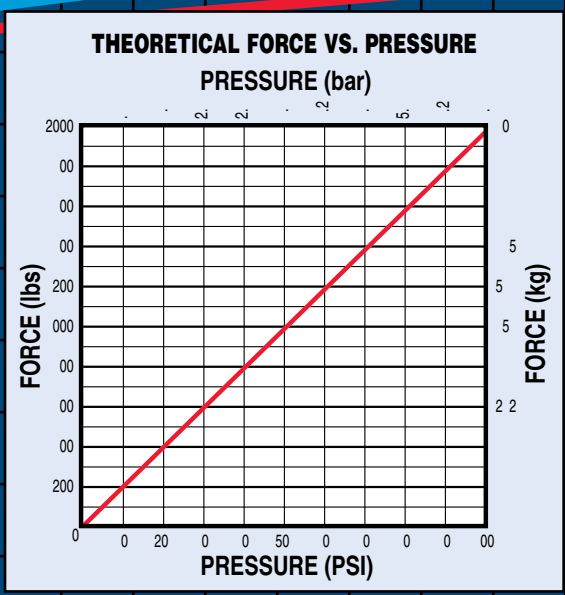


Dimensions in inches, in parentheses ( ) dimensions in millimeters

OVERALL UNIT SPECIFICATIONS		
Bore size	5.0 in.	
Max. stroke	300.00 in.	5 . mm
Base wt. Alum	0. 5 lbs.	. 5 gs.
Base wt. Steel	NA	
Wt. per in. 25mm of stroke Alum	0.202 lbs.	0.0 gs.
Wt. per in. 25mm of stroke Steel	NA	
Max. pressure	00 SI	. bars
Max. temp.	0 F	0 C
Max. force output	lbs.	0. gs..
TUBE SPECIFICATIONS		
Head length	in.	52. mm
Wall thickness	0. 25 in.	. 5 mm
Material	Alum.	
Tube support span Alum	. ft.	.2 m
Tube support span Steel	NA	
CABLE SPECIFICATIONS		
Wire dia.	0.25 in.	. 50 mm
Nylon O. .	0. 5 in.	.525 mm
Strand configuration		
Tensile strength	000 lbs.	5. gs.
Proof-load torque	25 in.-lbs.	. 2 N-m
Retensioning torque	0 in.-lbs.	20. N-m

Add to stroke length.

PERFORMANCE DATA

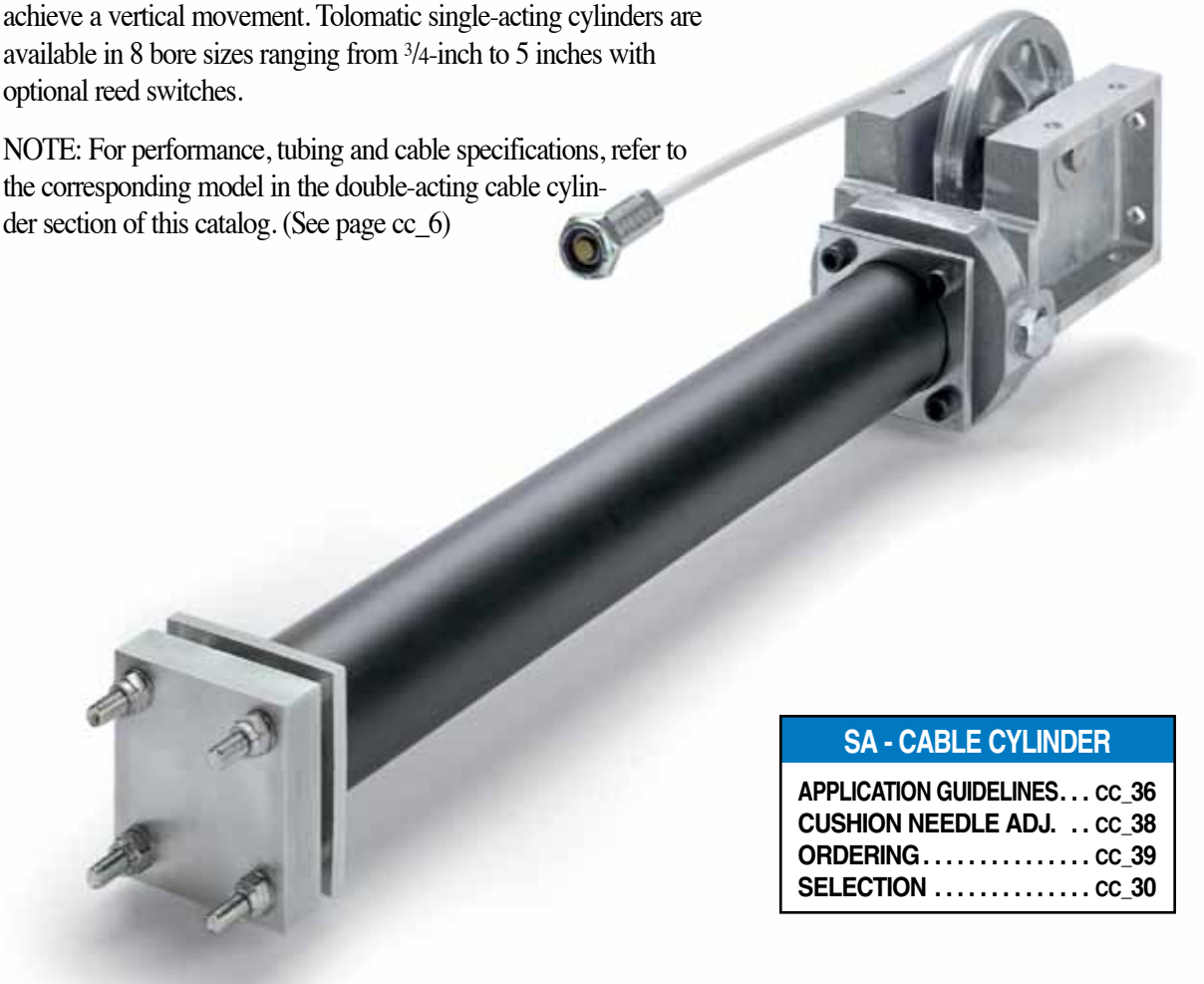


NOTE The CC50 cylinder has no cushions.

SA Single Acting Cable Cylinder - All Sizes

When a standard double-acting cable cylinder is not necessary in vertical applications, Tolomatic single-acting cable cylinders provide a cost savings advantage. Ideal for vertical lifting applications, these cylinders may be positioned horizontally and still achieve a vertical movement. Tolomatic single-acting cylinders are available in 8 bore sizes ranging from 3/4-inch to 5 inches with optional reed switches.

NOTE: For performance, tubing and cable specifications, refer to the corresponding model in the double-acting cable cylinder section of this catalog. (See page cc_6)



SA - CABLE CYLINDER

FEATURES AVAILABLE FOR SINGLE-ACTING CABLE CYLINDERS

NOTE Single-ported heads are standard on all base models.

FEATURES	PAGE #	SA07	SA10	SA15	SA20	SA25	SA30	SA40	SA50	SA52
SWITCHES (DC REED & AC TRIAC)*	cc_28	O	O	O	O	O	O	O		O
AL IN T BE		ST	ST	ST	ST	ST	ST	ST	ST	ST
STEEL T BE			O	O	O	O	O	O		O
SEALS OF VITON ATERIAL		O	O	O	O	O	O	O		O
- ORTE HEA		O	O	O	O	O	O	O		O

Switches can NOT be used with steel tube option

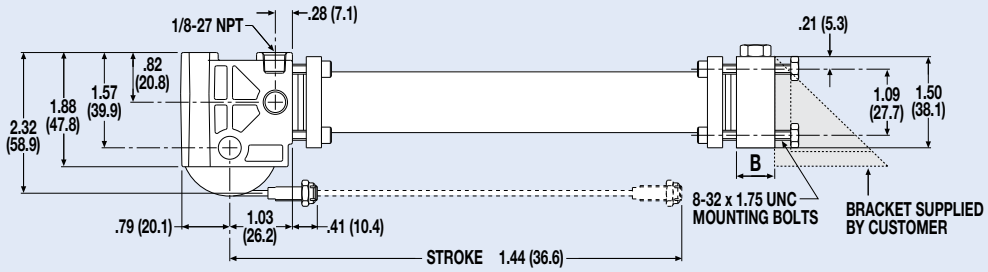
– Not Available OP Optional ST Standard

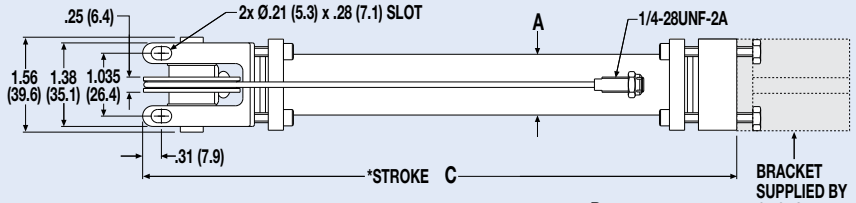
SA07, SA10

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

DIMENSIONAL DATA

OVERALL UNIT SPECIFICATIONS				
	SA07		SA10	
Bore size	.5 in.		.0 in.	
Max. stroke	0. in.	5 .5 mm	2 .	2 . mm
Max. pressure	00 SI	. bars	00 SI	. bars
Max. temp.	0 F	0 C	0 F	0 C





	SA07	SA10
A	Ø 1.00 (25.4)	Ø 1.25 (31.8)
B	0.50 (12.7)	0.63 (16.0)
C	3.62 (92.0)	3.81 (96.8)
D	1.46 (37.1)	1.62 (41.2)

Dimensions in inches, in parentheses ( ) dimensions in millimeters

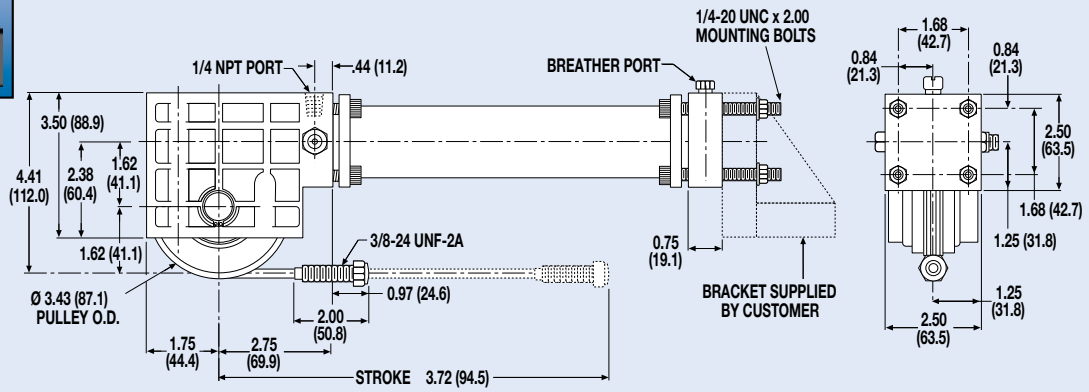
*If M option (magnet) is ordered add D to the overall length

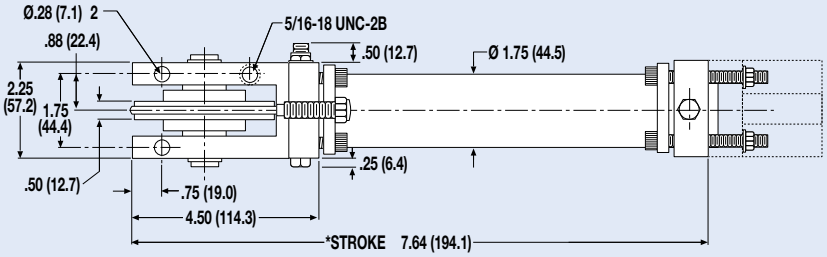
SA15

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

DIMENSIONAL DATA

OVERALL UNIT SPECIFICATIONS		
Bore size	.5 in.	
Max. stroke	2 . in.	20 . mm
Max. pressure	00 SI	. bars
Max. temp.	0 F	0 C





*If M option (magnet) is ordered add .375" (9.5 mm) to the overall length

Dimensions in inches, in parentheses ( ) dimensions in millimeters

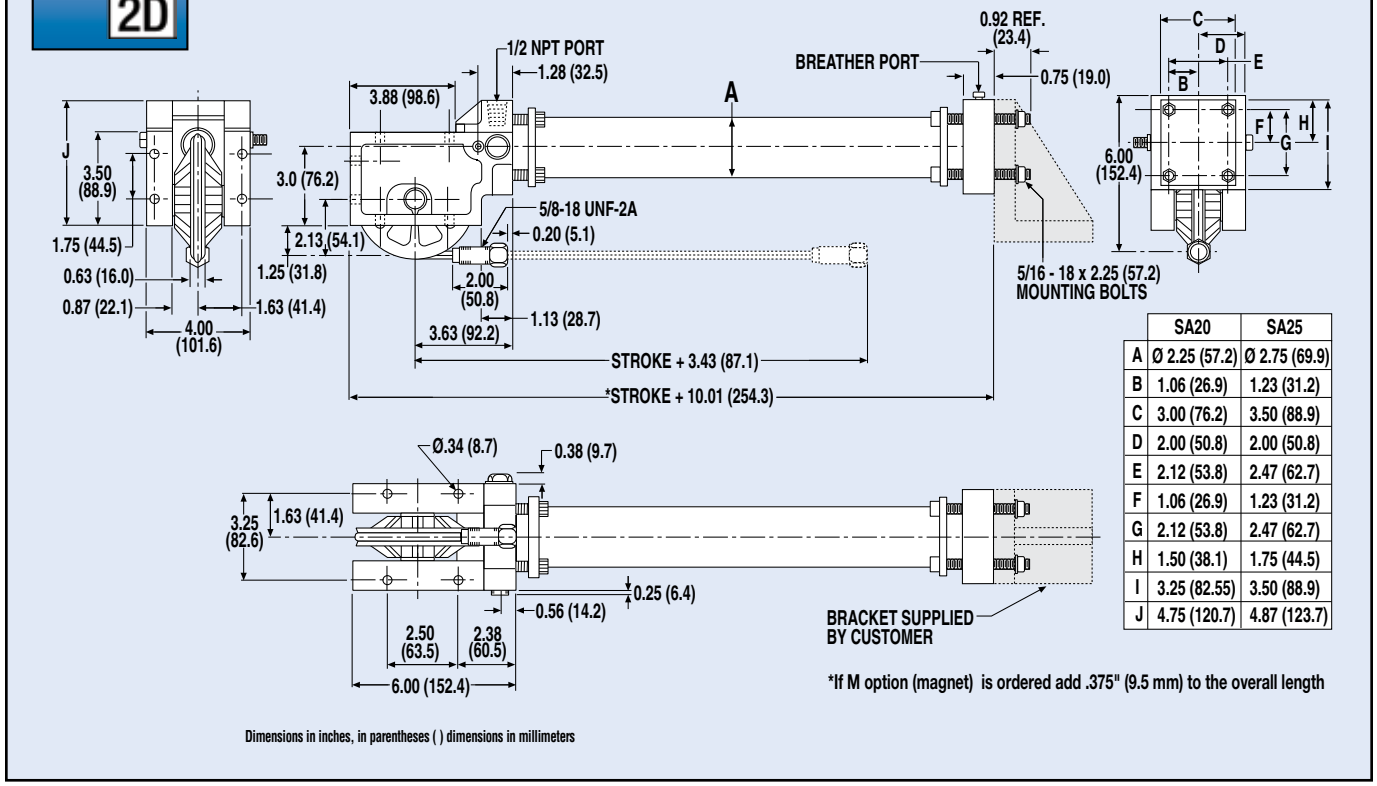
Single Acting Cable Cylinder - SA20, SA25

SA20, SA25

DIMENSIONAL DATA

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

OVERALL UNIT SPECIFICATIONS	SA20		SA25	
Bore size	2.0 in.		2.5 in.	
Max. stroke	22.5 in.	mm	22.5 in.	mm
Max. pressure	200 PSI	bars	200 PSI	bars
Max. temp.	0 F	0 C	0 F	0 C



	SA20	SA25
A	Ø 2.25 (57.2)	Ø 2.75 (69.9)
B	1.06 (26.9)	1.23 (31.2)
C	3.00 (76.2)	3.50 (88.9)
D	2.00 (50.8)	2.00 (50.8)
E	2.12 (53.8)	2.47 (62.7)
F	1.06 (26.9)	1.23 (31.2)
G	2.12 (53.8)	2.47 (62.7)
H	1.50 (38.1)	1.75 (44.5)
I	3.25 (82.55)	3.50 (88.9)
J	4.75 (120.7)	4.87 (123.7)

*If M option (magnet) is ordered add .375" (9.5 mm) to the overall length

Dimensions in inches, in parentheses ( ) dimensions in millimeters

For Assistance Call
1-800-328-2174
(Toll Free U.S. and Canada)
or
763-478-8000
Fax 763-478-8080

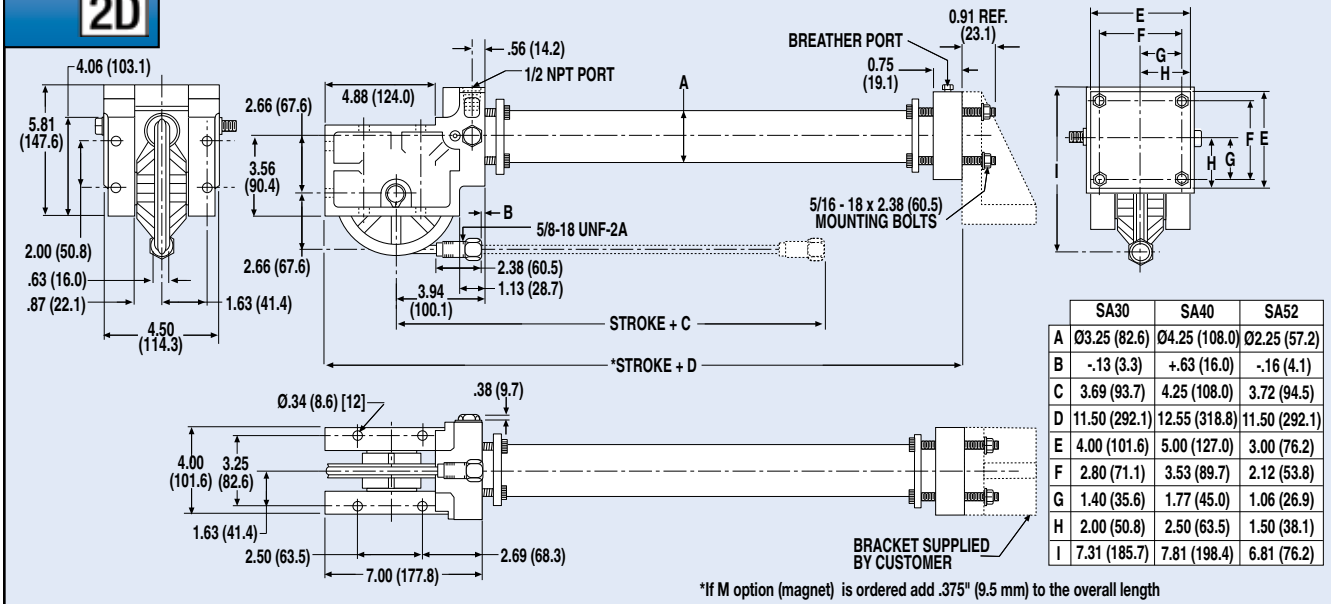
Single Acting Cable Cylinder - SA30, SA40, SA52, SA50

SA30, SA40, SA52

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

DIMENSIONAL DATA

OVERALL UNIT SPECIFICATIONS	SA30		SA40		SA52	
Bore size	.0 in.		.0 in.		2.0 in.	
Max. stroke	2 2.25	mm	2 .25	mm	2 2.25	mm
Max. pressure	200 SI	. bars	00 SI	. bars	500 SI	.5 bars
Max. temp.	0 F	0 C	0 F	0 C	0 F	0 C



	SA30	SA40	SA52
A	Ø3.25 (82.6)	Ø4.25 (108.0)	Ø2.25 (57.2)
B	-.13 (3.3)	+.63 (16.0)	-.16 (4.1)
C	3.69 (93.7)	4.25 (108.0)	3.72 (94.5)
D	11.50 (292.1)	12.55 (318.8)	11.50 (292.1)
E	4.00 (101.6)	5.00 (127.0)	3.00 (76.2)
F	2.80 (71.1)	3.53 (89.7)	2.12 (53.8)
G	1.40 (35.6)	1.77 (45.0)	1.06 (26.9)
H	2.00 (50.8)	2.50 (63.5)	1.50 (38.1)
I	7.31 (185.7)	7.81 (198.4)	6.81 (76.2)

*If M option (magnet) is ordered add .375" (9.5 mm) to the overall length

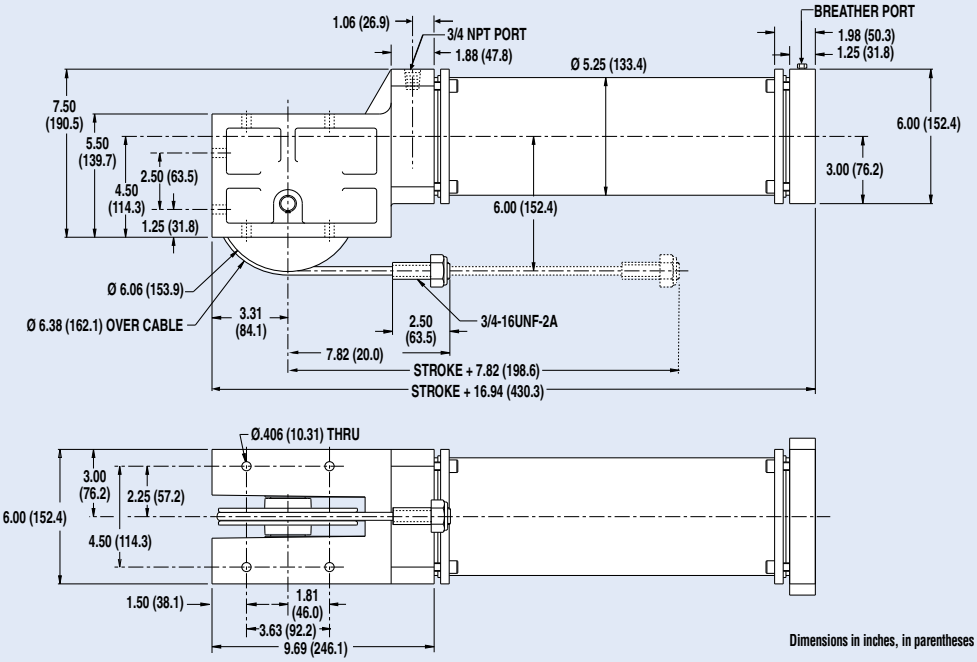
Dimensions in inches, in parentheses ( ) dimensions in millimeters

SA50

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

DIMENSIONAL DATA

OVERALL UNIT SPECIFICATIONS		
Bore size	5.0 in.	
Max. stroke	.00 in.	5 . mm
Max. pressure	00 SI	. bars
Max. temp.	0 F	0 C



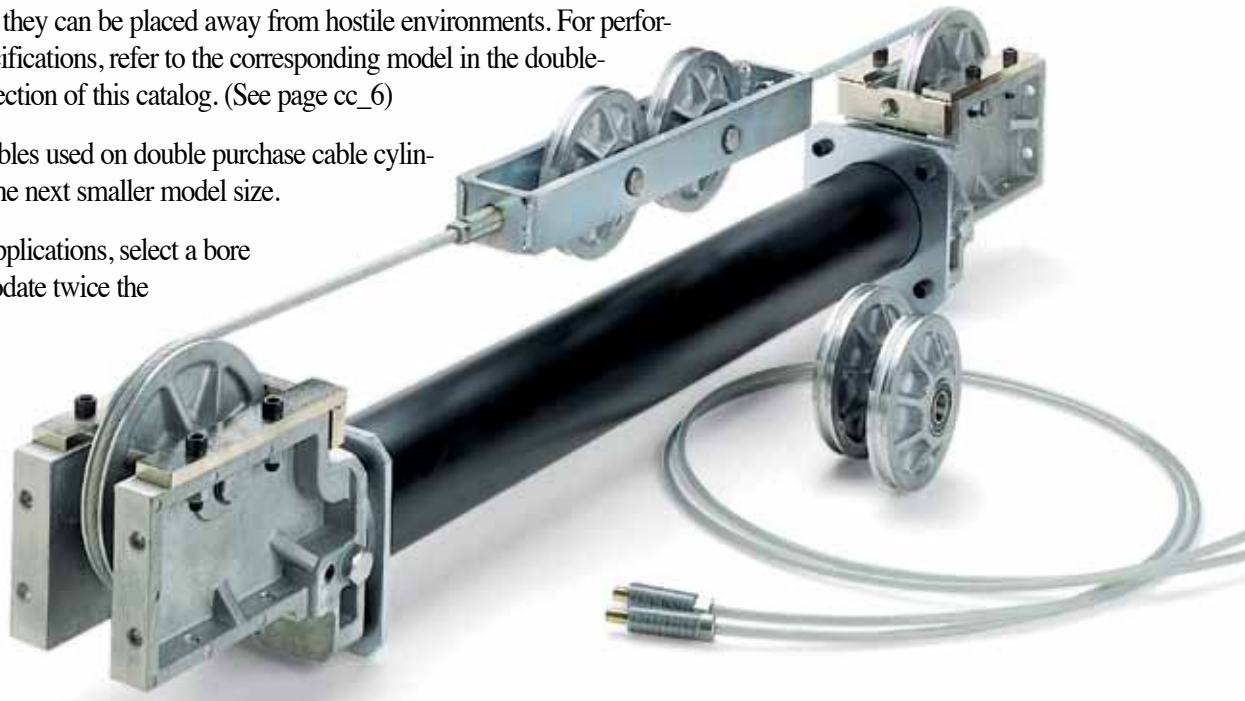
Dimensions in inches, in parentheses ( ) dimensions in millimeters

Double Purchase Cable Cylinder - All Sizes

The Tolomatic double purchase cable cylinder doubles the velocity and stroke capacity of double-acting cylinders without increasing space requirements. Available in 5 bore sizes, these cylinders can extend stroke lengths up to 120 feet with considerable cost-saving advantages and they can be placed away from hostile environments. For performance and tubing specifications, refer to the corresponding model in the double-acting cable cylinder section of this catalog. (See page cc_6)

NOTE: Pulleys and cables used on double purchase cable cylinders are always from the next smaller model size.

For double purchase applications, select a bore size that will accommodate twice the load force.



FEATURES AVAILABLE FOR DOUBLE PURCHASE CABLE CYLINDERS

NOTE Single-ported heads are standard on all base models.

FEATURES	PAGE	DP15	DP20	DP25	DP30	DP40	DP52
AUTO TENSIONER WITH ONE 1" STROKE UNIT	cc_22	O	O	O	O	O	O
AUTO TENSIONER WITH TWO 1" STROKE UNITS	cc_22	O	O	O	O	O	O
AUTO TENSIONER WITH ONE 2" STROKE UNIT	cc_22		O	O	O	O	O
AUTO TENSIONER WITH TWO 2" STROKE UNITS	cc_22		O	O	O	O	O
CALIPER DISC BRAKE	cc_25	O	O	O	O	O	O
SWITCHES (DC REED & AC TRIAC)*	cc_28	O	O	O	O	O	O
ALUMINUM TUBE		ST	ST	ST	ST	ST	ST
STEEL TUBE		O	O	O	O	O	O
SEALS OF VITON® MATERIAL		O	O	O	O	O	O
3-PORTED HEADS		O	O	O	O	O	O

Switches can NOT be used with steel tube option

– Not Available OP Optional ST Standard

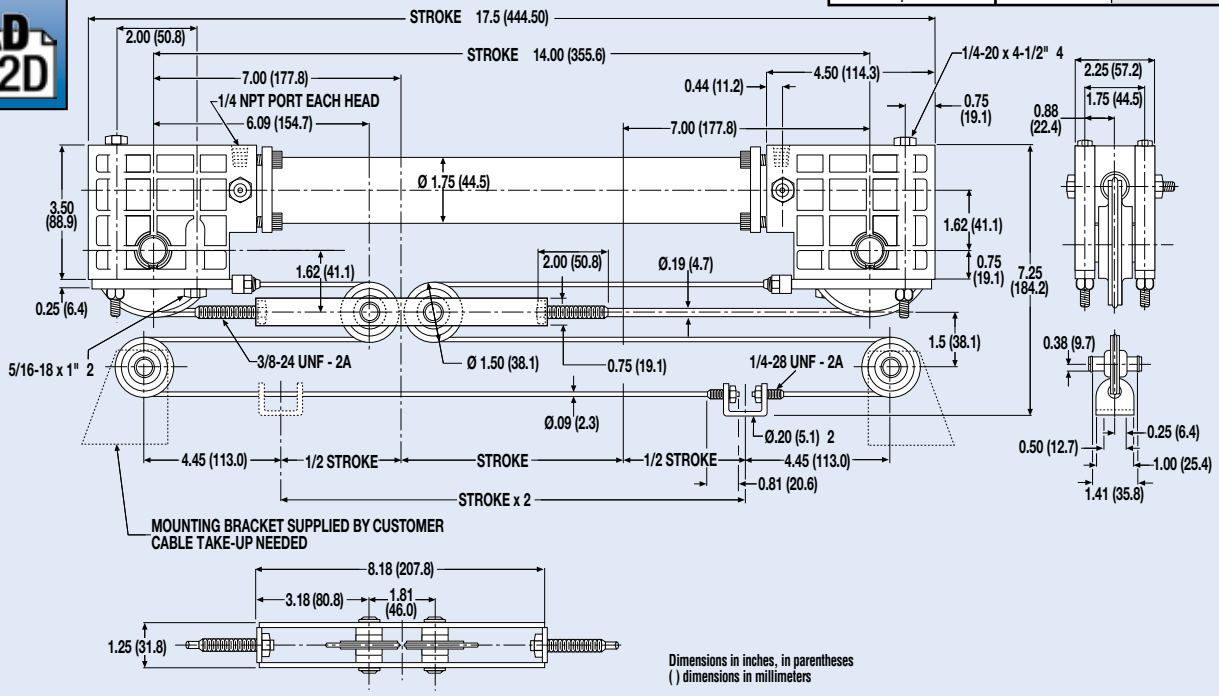
Double Purchase Cable Cylinder - DP15, DP20, DP25

DP15

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

DIMENSIONAL DATA

OVERALL UNIT SPECIFICATIONS		
Bore size	1.5 in.	
Max. stroke	22.50 in	571.5 mm
Max. pressure	100 PSI	6.9 bars
Max. temp.	150 F	65 C

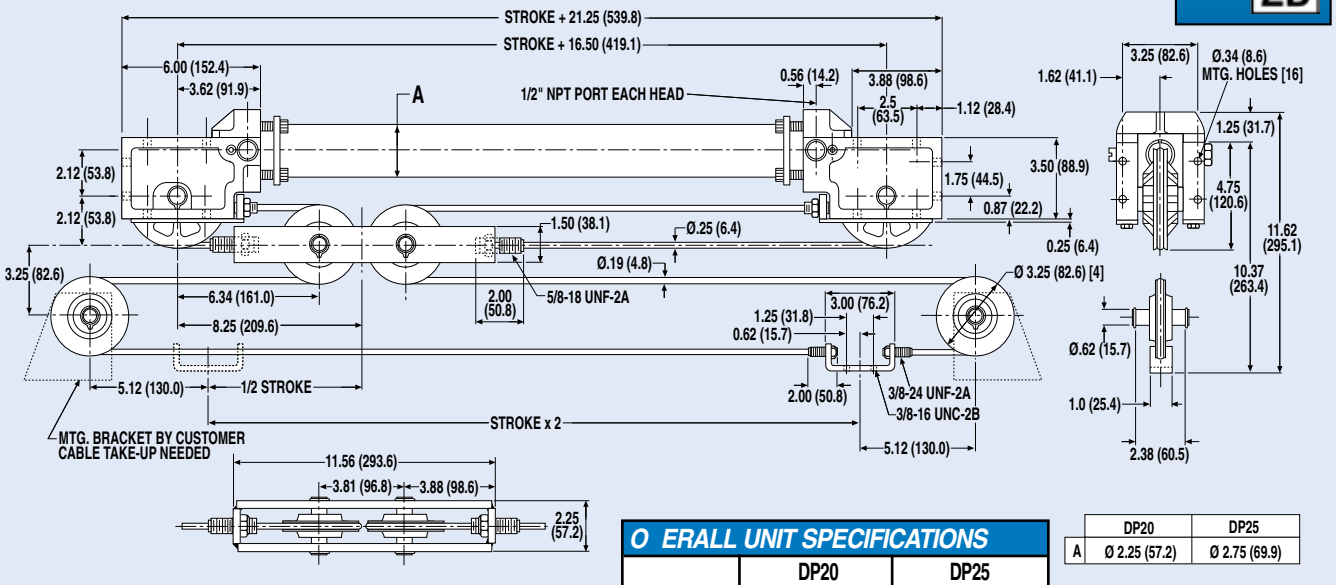


Dimensions in inches, in parentheses ( ) dimensions in millimeters

DP20, DP25

DIMENSIONAL DATA

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM



Dimensions in inches, in parentheses ( ) dimensions in millimeters

OVERALL UNIT SPECIFICATIONS	DP20		DP25	
Bore size	2.0 in.		2.5 in.	
Max. stroke	21.25 in	539.8 mm	21.25 in	539.8 mm
Max. pressure	200 PSI	13.8 bars	200 PSI	13.8 bars
Max. temp.	0 F	0 C	0 F	0 C

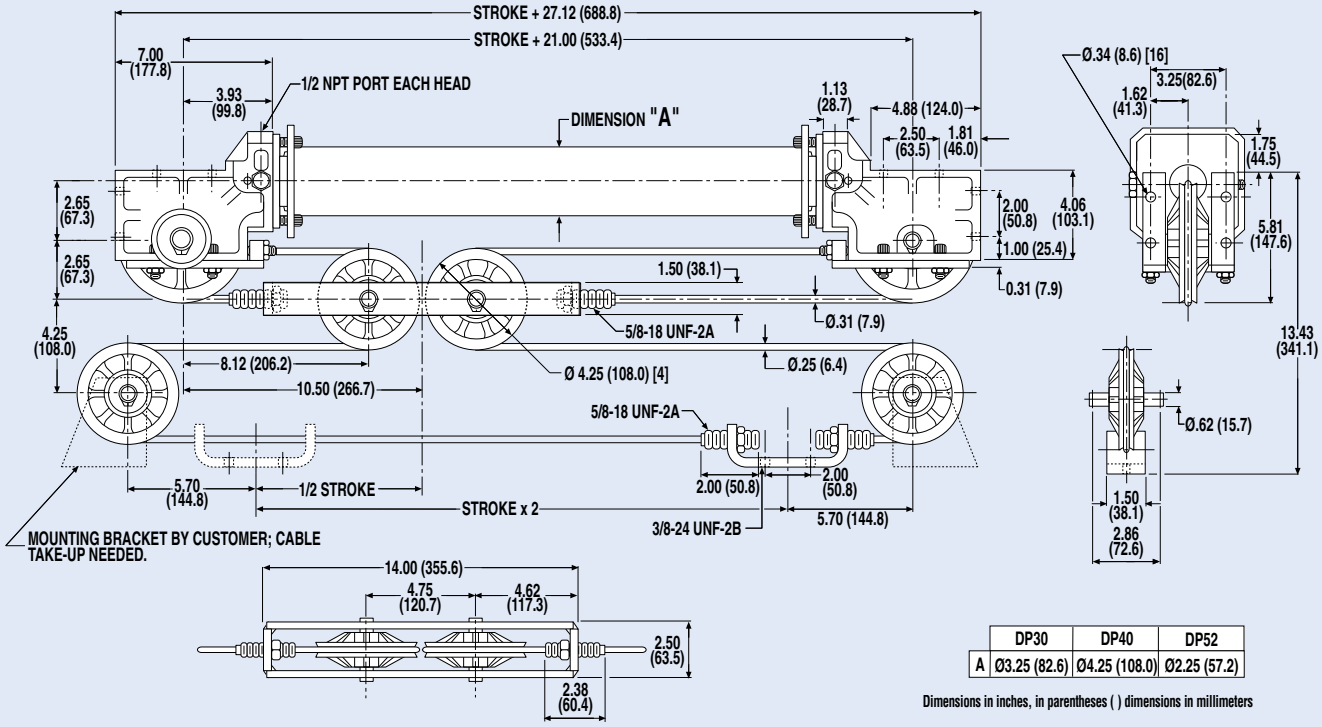
	DP20	DP25
A	Ø 2.25 (57.2)	Ø 2.75 (69.9)

Double Purchase Cable Cylinder - DP30, DP40, DP55

DP30, DP40, DP52

DIMENSIONAL DATA

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM



	DP30	DP40	DP52
A	Ø3.25 (82.6)	Ø4.25 (108.0)	Ø2.25 (57.2)

Dimensions in inches, in parentheses ( ) dimensions in millimeters

O ERALL UNIT SPECIFICATIONS

	DP30		DP40		DP52	
Bore si e	.0 in.		.0 in.		2.0 in.	
a . stro e	2 2.	mm	2 2.	mm	2 2.	mm
a . pressure	200 SI	. bar	00 SI	. bar	500 SI	.5 bar
a . temp.	0 F	0 C	0 F	0 C	0 F	0 C

For Assistance Call
1-800-328-2174
(Toll Free U.S. and Canada)
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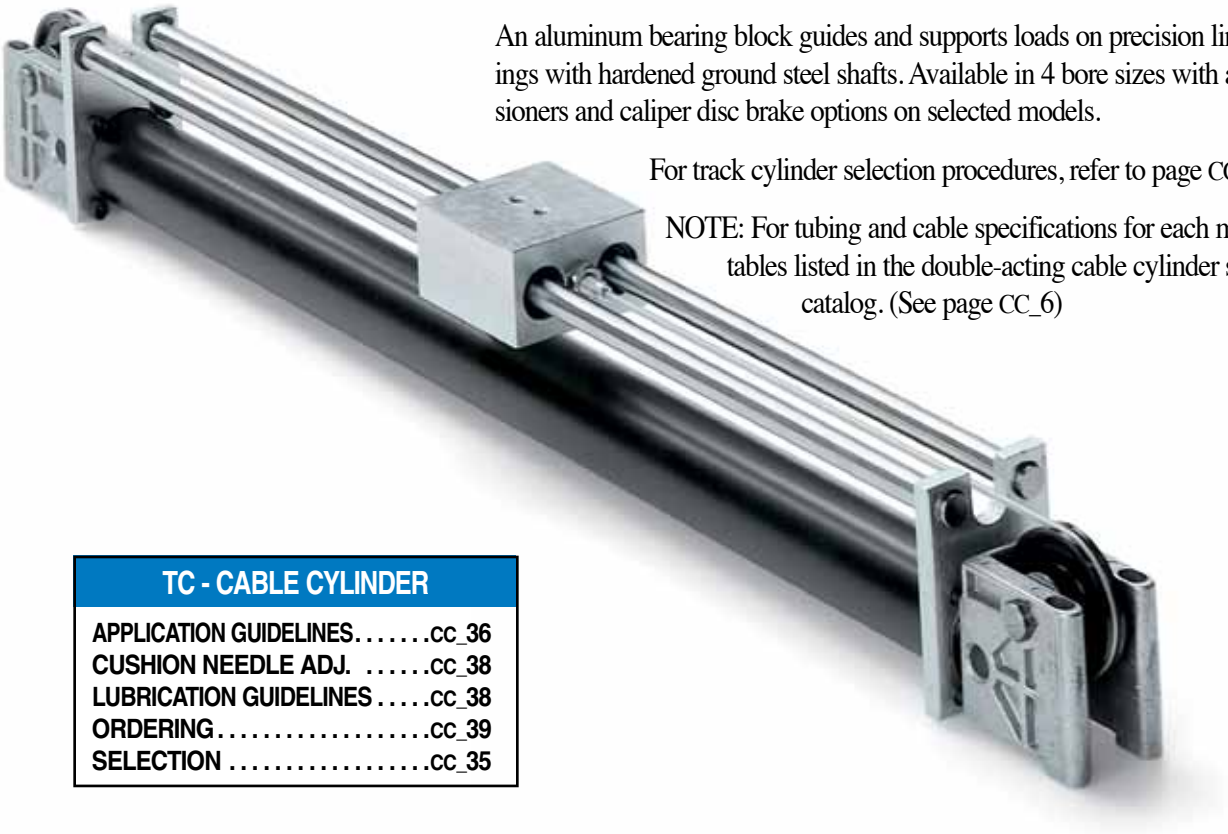
763-478-8000
Fax 763-478-8080

TC Track Cable Cylinder - All Sizes



Tolomatic track cable cylinders provide a pre-packaged, pre-engineered guide and support system for greater bearing surface and larger load capacities.

An aluminum bearing block guides and supports loads on precision linear ball bearings with hardened ground steel shafts. Available in 4 bore sizes with automatic tensioners and caliper disc brake options on selected models.

For track cylinder selection procedures, refer to page CC_35.

NOTE: For tubing and cable specifications for each model, refer to tables listed in the double-acting cable cylinder section of this catalog. (See page CC_6)

TC - CABLE CYLINDER

FEATURES AVAILABLE FOR TRACK CABLE CYLINDERS

NOTE Single-ported heads are standard on all base models.

FEATURES	PAGE	TC05	TC07	TC10	TC15
AUTO TENSIONER WITH ONE 1" STROKE UNIT	CC_22		O	O	O
AUTO TENSIONER WITH TWO 1" STROKE UNITS	CC_22		O	O	O
CALIPER DISC BRAKE	CC_25				O
SWITCHES (DC REED & AC TRIAC)*	CC_28	O	O	O	O
ALUMINUM TUBE		ST	ST	ST	ST
STEEL TUBE				O	O
SEALS OF VITON® MATERIAL			O	O	O
3-PORTED HEADS			O	O	O

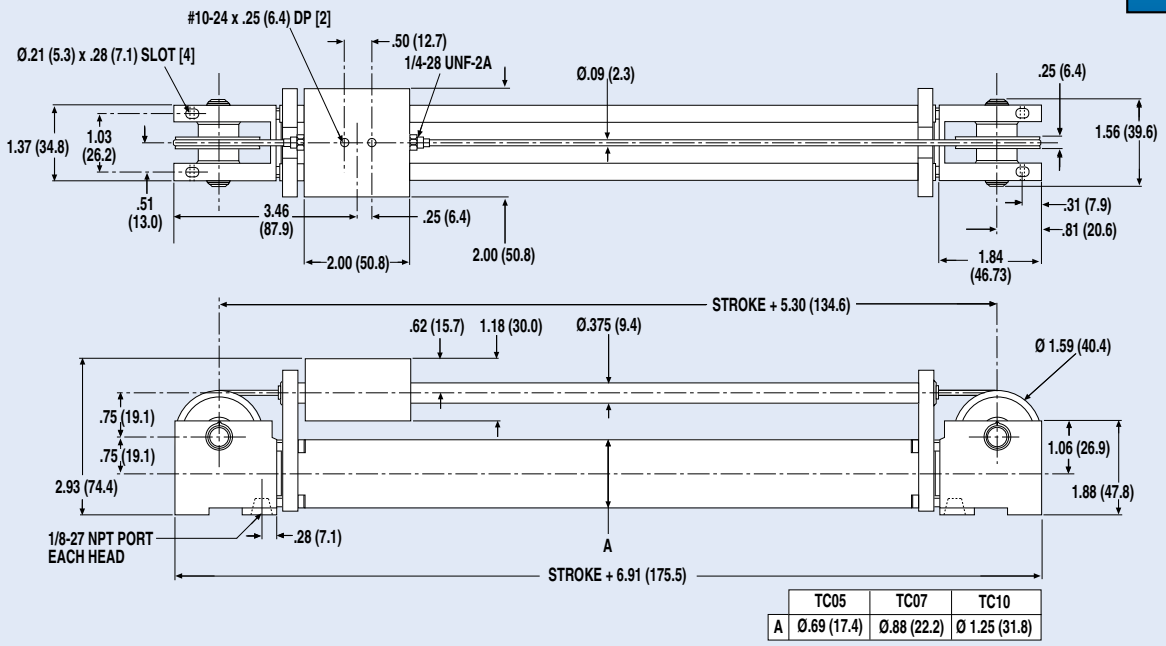
Switches can NOT be used with steel tube option

– Not Available OP Optional ST Standard

TC Track Cable Cylinder - TC05, TC07, TC10

Dimensional Data

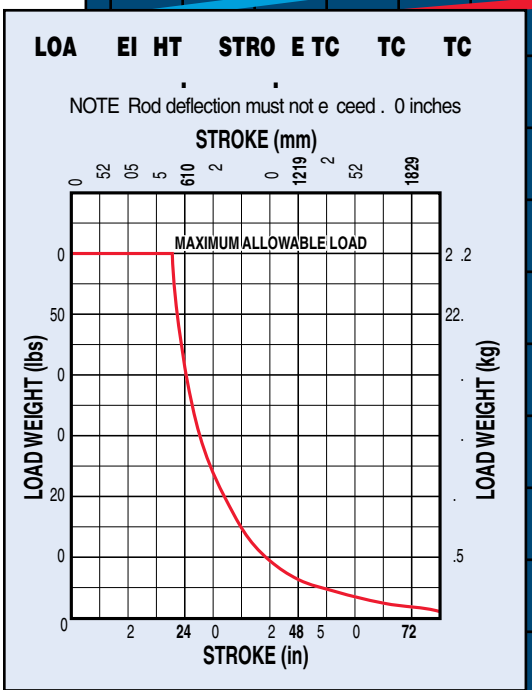
2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

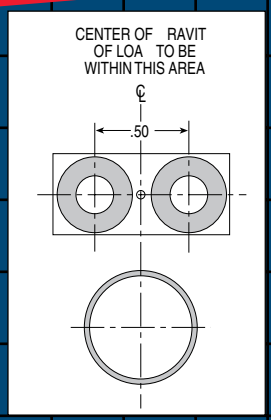


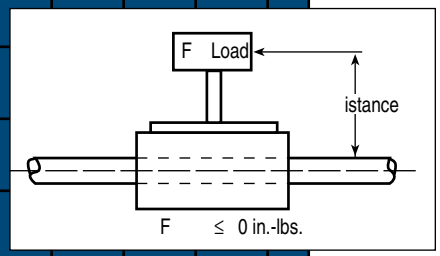
	TC05	TC07	TC10
A	Ø.69 (17.4)	Ø.88 (22.2)	Ø 1.25 (31.8)

Dimensions in inches, in parentheses ( ) dimensions in millimeters

Performance Data







O ERALL UNIT SPECIFICATIONS

	TC05	TC07	TC10
Bore si e in.	.5	. 5	
a . stro e in.	.00	.00	.00
a . stro e mm	0 .	.2	.2
a . pressure SI	00	00	00
a . pressure bars	.	.	.
a . temp. F	0	0	0
a . temp. C	0	0	0

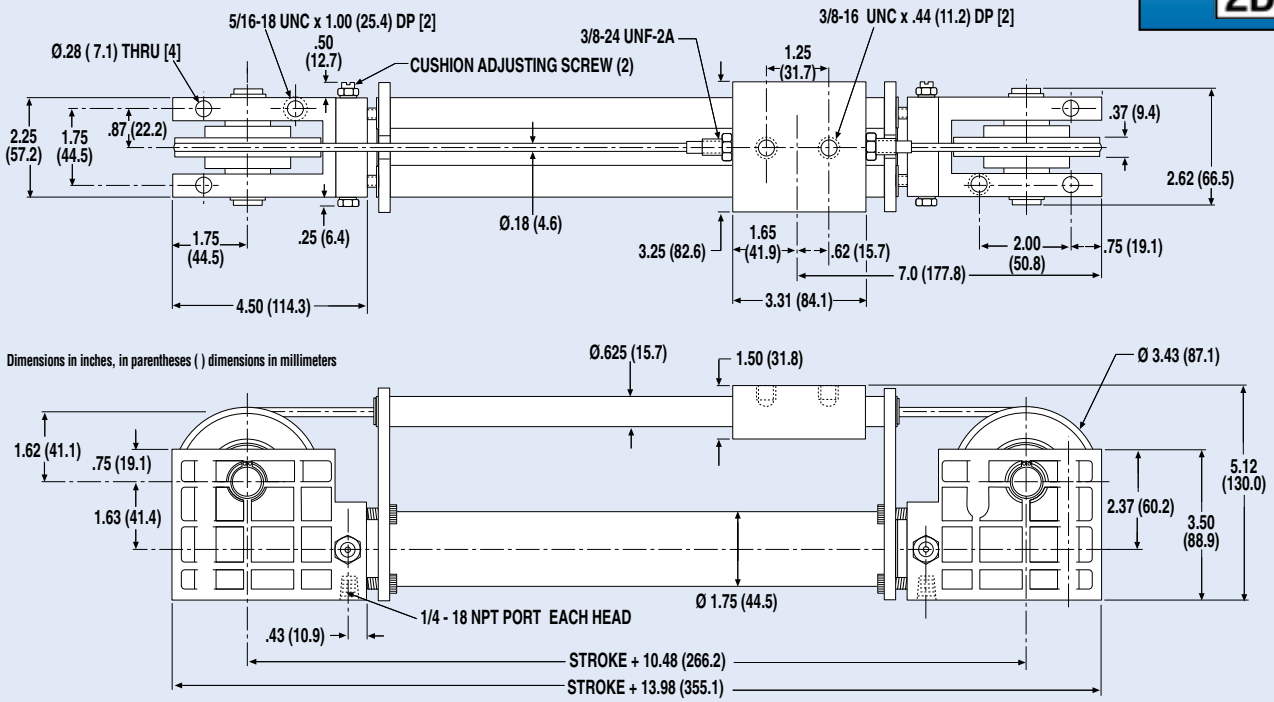
NOTE oderate bending moments are acceptable so long as the moment load does not e ceed 0 inch-pounds for the 2- - and -inch bore cylinders.

The diagrams at left illustrate how this is calculated.

TC Track Cable Cylinder - TC15

DIMENSIONAL DATA

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

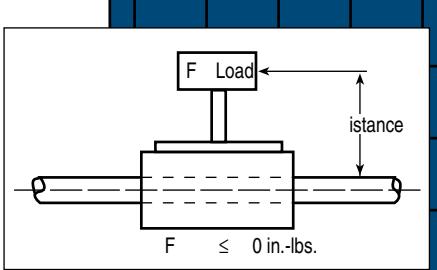


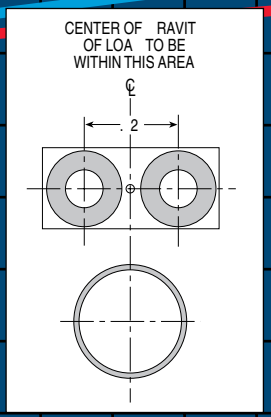
PERFORMANCE DATA

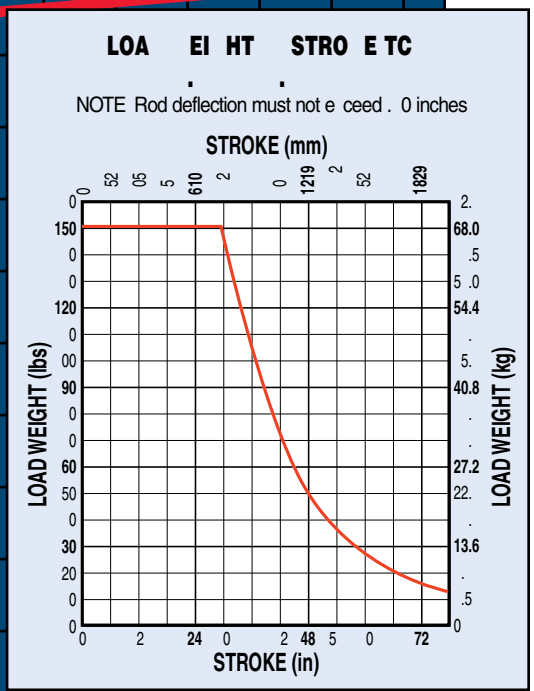
O ERALL UNIT SPECIFICATIONS		
Bore si e	.5 in.	
a . stro e	.00	.2
a . SI	00 SI	. bars
a . temp.	0 F	0 C

NOTE oderate bending moments are acceptable so long as the moment load does not e ceed 0 inch-pounds.

The diagrams at right illustrate how this is calculated.



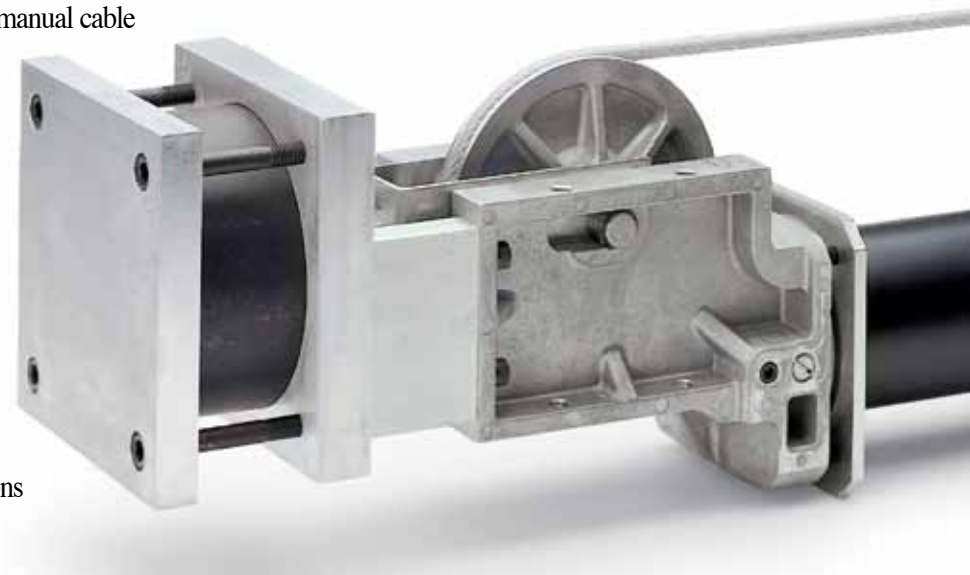




CC Automatic Tensioner - All Sizes

Automatic tensioners are required when a cylinder's stroke length is beyond the maximum stroke length for full manual cable adjustment for that bore size. The AT unit keeps the cable rigid and ensures maximum service life of both the cable and gland seals. AT units are also recommended for vertical lifting or severe, high-cyclic applications.

The standard automatic tensioner unit has a 1-inch stroke, providing 2 inches of cable take-up. A 2-inch stroke AT unit may be installed on a cylinder, providing 4 inches of cable take-up. Refer to the tables below for tensioner stroke options on available bore sizes.



MAXIMUM STROKE LENGTHS FOR CYLINDERS WITH AUTO TENSIONERS

NOTE A cable cylinder should be completely proof-loaded and pretensioned with either the Torque ethod or the Field ethod in order for the auto tensioner to achie e the ma imum stro e lengths shown in the table below. For more information on proof-loading and pretensioning please see page CC

	STROKE LENGTHS IN INCHES BASED ON CYLINDER'S MAXIMUM OPERATING PRESSURE									
STROKE OPTIONS	**CC05**	**CC07**	**CC10**	**CC15**	**CC20**	**CC25**	**CC30**	**CC40**	**CC50**	**CC52**
Auto Tensioner with one stro e unit	NA	.	.	.2	2 0.	5 .	2 .	.	NA	2 .
Auto Tensioner with two stro e units	NA	252.0	252.0	5 .	.	2 .	.	.2	NA	2 .
Auto Tensioner with one 2 stro e unit	NA	NA	NA	NA	.	2 .	.	.2	.0	2 .
Auto Tensioner with two 2 stro e units	NA	NA	NA	NA	52 .	22.	.2	2 .2	.0	2.

Abo e imensions in inches

	STROKE LENGTHS IN METERS BASED ON CYLINDER'S MAXIMUM OPERATING PRESSURE									
STROKE OPTIONS	**CC05**	**CC07**	**CC10**	**CC15**	**CC20**	**CC25**	**CC30**	**CC40**	**CC50**	**CC52**
Auto Tensioner with one stro e unit	NA	.	.	.	.	.05	.	.	NA	.
Auto Tensioner with two stro e units	NA	. 0	. 0	. 2	.	.	. 5	.	NA	. 2
Auto Tensioner with one 2 stro e unit	NA	NA	NA	NA	.	.	. 5	.	.	. 2
Auto Tensioner with two 2 stro e units	NA	NA	NA	NA	. 2	.20	2.	.0	.	2.0

Abo e imensions in ETERS

NOTE Tube couplers are required on cable cylinders with stro es o er 2 0 inches . m .

Maximum stroke lengths in the above table can be extended by using the percentage of the pressure differential between the cylinder's actual operating pressure and the maximum operating pressure.

Example: If the cylinder selected is a CC15 (1½-inch bore) with one 1-inch stroke AT unit:

Actual SI
a . SI
ifferential

0
00
20

20 .2 in. ma imum stro e 2.2 in.
2.2 in. .2 in. . in. . 2 feet

All AT units should be plumbed with a separate, regulated non-fluctuating pressure source which is a set percentage of the actual cylinder operating pressure. These are listed in the table at the right.

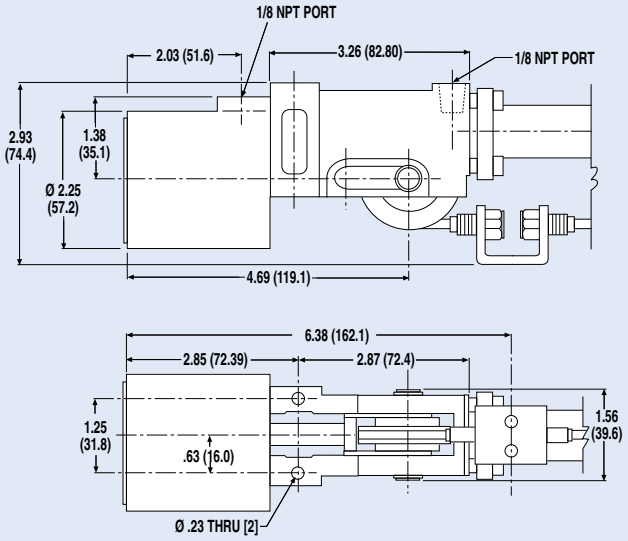
NOTE: When using an AT unit in an application where the cylinder is loaded in only one direction, it is recommended to have the AT unit located so the load direction of travel is away from the AT unit. On vertical applications, the AT unit should be located on the bottom.

AUTO TENSIONER PRESSURE SETTINGS	
FOR MODEL	**% OF LOAD PRESSURE**
CC0	22
CC 0	0
CC 5	
CC20	2
CC25	5
CC 0	5
CC 0	
CC50	5
CC52	2

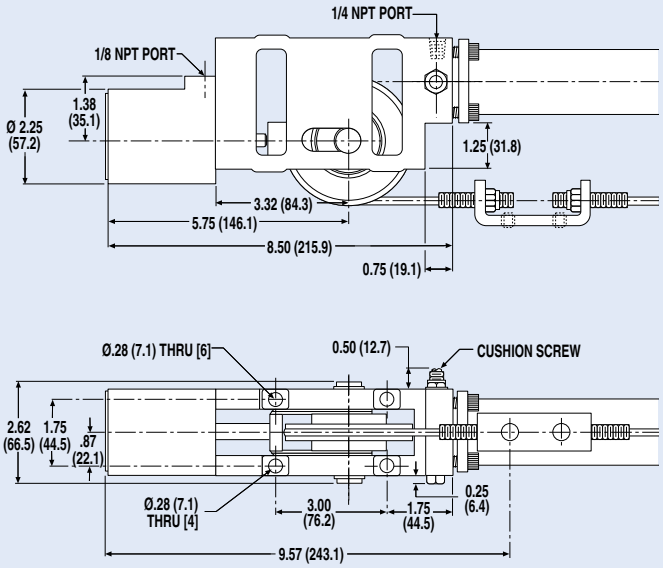
2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

DIMENSIONAL DATA

AT FOR CC07, CC10

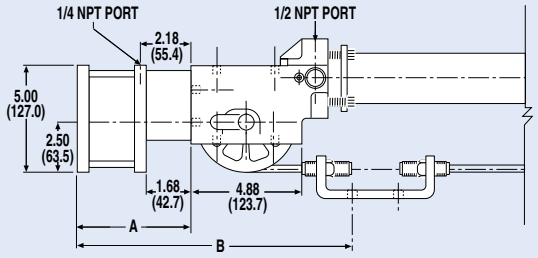


AT FOR CC15



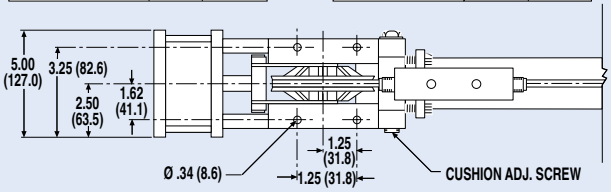
Dimensions in inches, in parentheses ( ) dimensions in millimeters

AT FOR CC20, CC25



MODEL	A	B
1" Stroke Tensioner	5.66"	12.16"
2" Stroke Tensioner	6.66"	13.16"

MODEL	A	B
1" Stroke Tensioner	143.8mm	308.9mm
2" Stroke Tensioner	169.2mm	334.3mm



SPACE AND WEIGHT REQUIREMENTS		
MODEL	DEAD LENGTH (in)*	WEIGHT (lbs)
CC0	.	.0
CC 0	.	.0
CC 5	.	2.
CC20	20.	.
CC25	20.	.

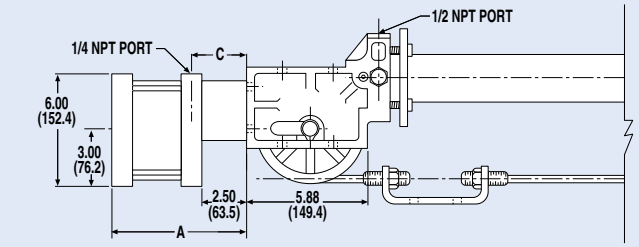
Add dead length to stro e length to determine o erall cylinder length

SPACE AND WEIGHT REQUIREMENTS		
MODEL	DEAD LENGTH (mm)*	WEIGHT (kg)
CC0	225	0.
CC 0	225	0.
CC 5		.25
CC20	525	.
CC25	525	.

DIMENSIONAL DATA

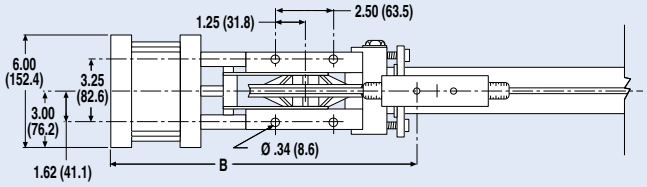
2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

AT FOR CC30, CC40, CC52

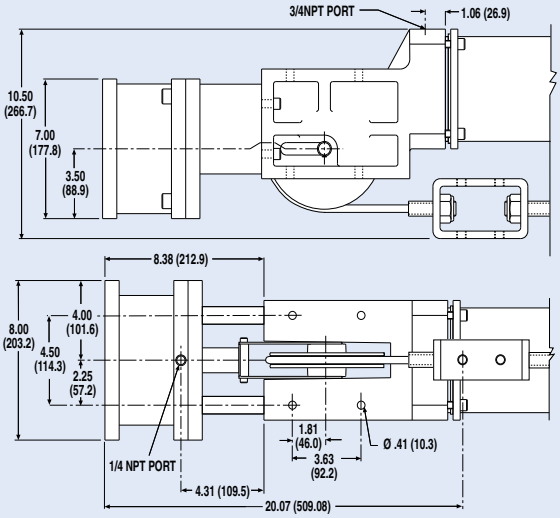


MODEL	A	B	C
1" Stroke Tensioner	6.38"	14.12"	3.01"
2" Stroke Tensioner	7.38"	15.12"	3.50"

MODEL	A	B	C
1" Stroke Tensioner	162.1mm	358.6mm	76.5mm
2" Stroke Tensioner	187.5mm	384.0mm	88.9mm



AT FOR CC50



Dimensions in inches, in parentheses ( ) dimensions in millimeters

SPACE AND WEIGHT REQUIREMENTS		
MODEL	DEAD LENGTH (in)*	WEIGHT (lbs)
CC 0	2 .	.
CC 0	2 .	.
CC52	2 .	.
CC50	. 5	2 .

SPACE AND WEIGHT REQUIREMENTS		
MODEL	DEAD LENGTH (mm)*	WEIGHT (kg)
CC 0	0	.5
CC 0	2	.5
CC52	0	.5
CC50	5	0.

Add dead length to stro e length to determine o er-all cylinder length

CC Cylinder/Brake Combinations - All Sizes

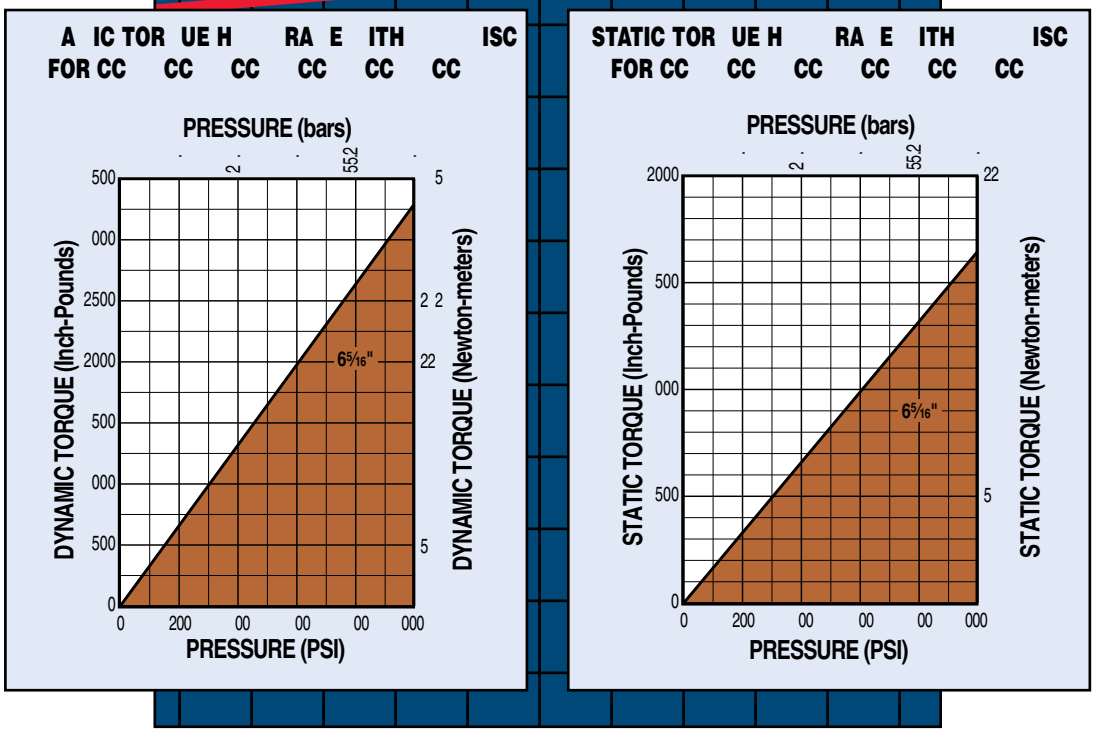
Caliper disc brakes can be used to add holding force in horizontal applications and aid in deceleration at the end of stroke. Caliper disc brakes must be used with an automatic tensioner to function properly. See page CC_32 for selection information and braking formulae.

NOTE: Tolomatic's H20DARC is used on all available models. See part numbers below:

		CC	CC	CC	CC	CC	CC
Bra e Number		0 2 -00 0	0 2 -00 0	0 2 -00 0	0 2 -00 0	0 2 -00 0	0 2 -00 0
isc	Hub No.	0 0 -000	0 0 -00 0	0 0 -00 0	0 0 -00 0	0 0 -00 0	0 0 -00 0

See catalog 9900-4009 for detailed information on brakes and discs.

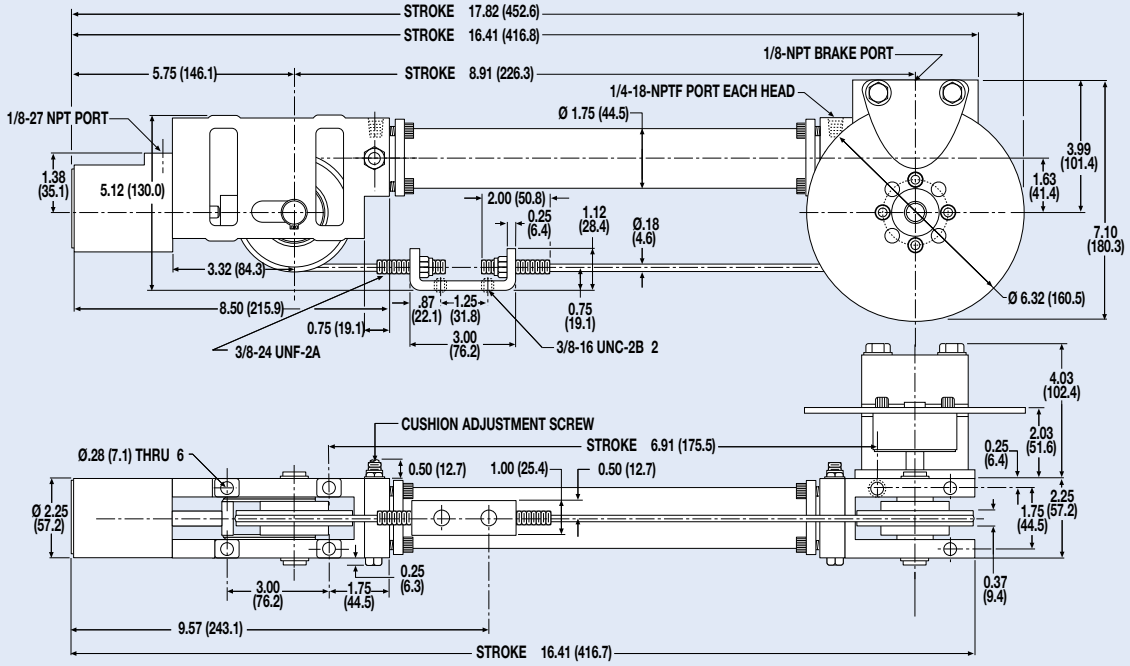
PERFORMANCE DATA



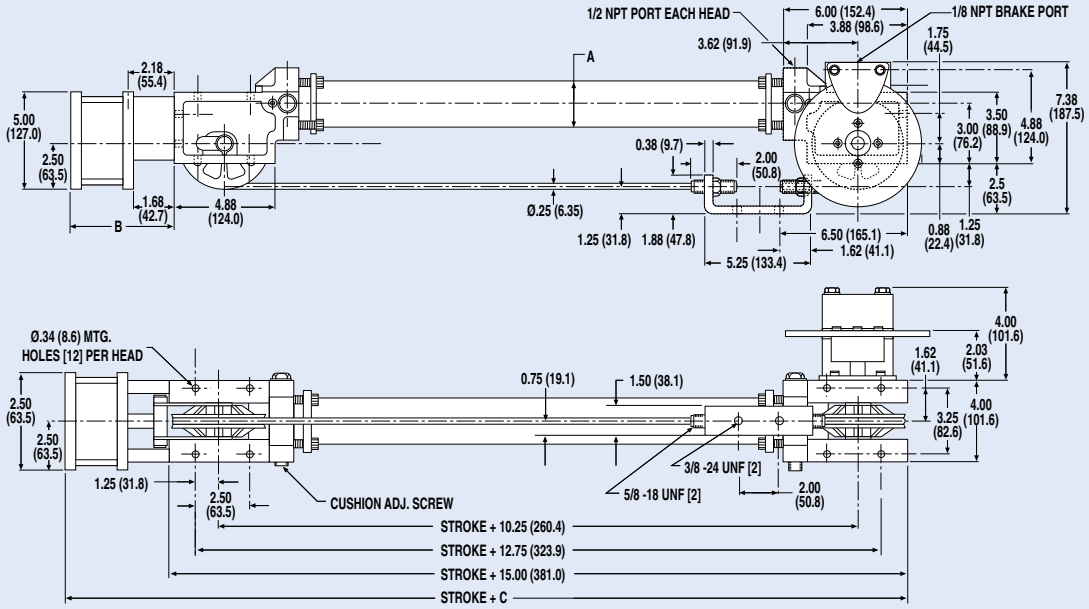
DIMENSIONAL DATA

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

CYLINDER/ BRAKE COMBINATION FOR CC15



CYLINDER/ BRAKE COMBINATION FOR CC20, CC25



MODEL	A	B	C
CC20 w/ 1" Stroke Tensioner	Ø 2.25"	5.66"	20.66"
CC20 w/ 2" Stroke Tensioner	Ø 2.25"	6.66"	22.15"
CC25 w/ 1" Stroke Tensioner	Ø 2.75"	5.66"	20.66"
CC25 w/ 2" Stroke Tensioner	Ø 2.75"	6.66"	22.15"

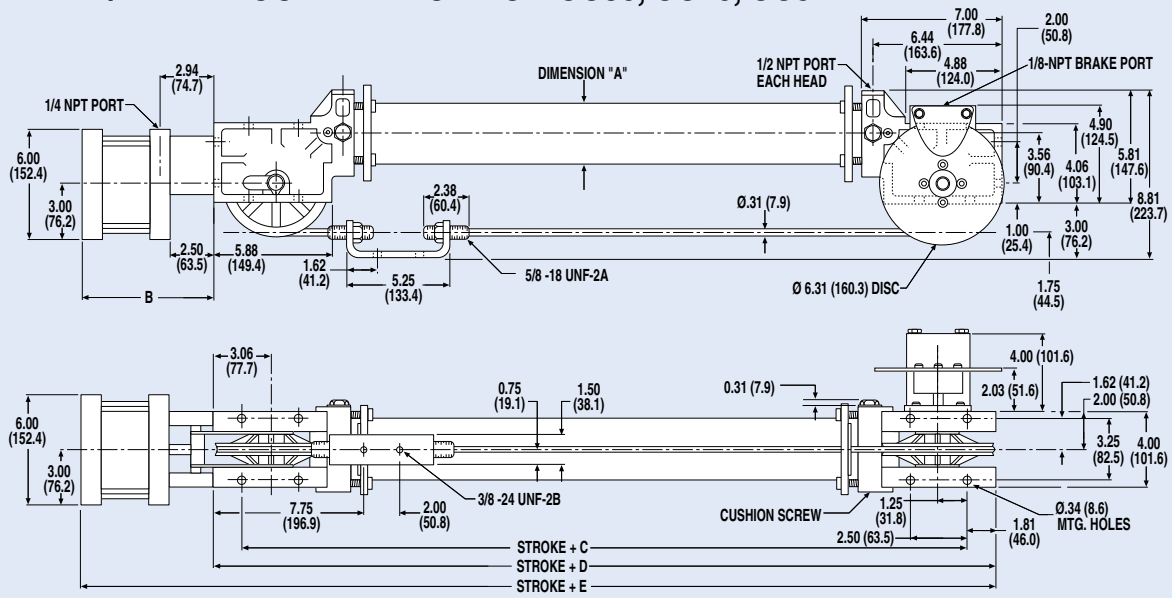
MODEL	A	B	C
CC20 w/ 1" Stroke Tensioner	Ø 57.2mm	143.8mm	524.7mm
CC20 w/ 2" Stroke Tensioner	Ø 57.2mm	169.2mm	561.6mm
CC25 w/ 1" Stroke Tensioner	Ø 69.9mm	143.8mm	524.7mm
CC25 w/ 2" Stroke Tensioner	Ø 69.9mm	169.2mm	561.6mm

Dimensions in inches, in parentheses ( ) dimensions in millimeters

DIMENSIONAL DATA

2D CAD AVAILABLE AT WWW.TOLOMATIC.COM

CYLINDER/ BRAKE COMBINATION FOR CC30, CC40, CC52



MODEL	A	B	C	D	E
CC30 w/ 1" Stroke Tensioner	Ø 3.25"	6.38"	13.87"	17.50"	23.89"
CC30 w/ 2" Stroke Tensioner	Ø 3.25"	7.38"	13.87"	17.50"	24.89"
CC40 w/ 1" Stroke Tensioner	Ø 4.25"	6.38"	14.07"	18.50"	24.89"
CC40 w/ 2" Stroke Tensioner	Ø 4.25"	7.38"	14.07"	18.50"	25.88"
CC52 w/ 1" Stroke Tensioner	Ø 2.25"	6.38"	13.87"	17.50"	23.89"
CC52 w/ 2" Stroke Tensioner	Ø 2.25"	7.38"	13.87"	17.50"	24.09"

MODEL	A	B	C	D	E
CC30 w/ 1" Stroke Tensioner	Ø 82.6mm	162.1mm	352.3mm	444.5mm	609.1mm
CC30 w/ 2" Stroke Tensioner	Ø 82.6mm	187.5mm	352.3mm	444.5mm	634.5mm
CC40 w/ 1" Stroke Tensioner	Ø 108.0mm	162.1mm	357.4mm	469.9mm	609.1mm
CC40 w/ 2" Stroke Tensioner	Ø 108.0mm	187.5mm	357.4mm	469.9mm	634.5mm
CC52 w/ 1" Stroke Tensioner	Ø 57.2mm	162.1mm	352.3mm	444.5mm	609.1mm
CC52 w/ 2" Stroke Tensioner	Ø 57.2mm	187.5mm	352.3mm	444.5mm	634.5mm

Dimensions in inches, in parentheses ( ) dimensions in millimeters

CC, SA, DP, TC Switches - All Sizes

SWITCHES

There are 10 sensing choices: DC reed, form A (open) or form C (open or closed); AC reed (Triac, open); Hall-effect, sourcing, PNP (open); Hall-effect, sinking, NPN (open); each with either flying leads or QD (quick disconnect). Commonly used to send analog signals to PLC (programmable logic controllers), TLL, CMOS circuit or other controller device. These switches are activated by the actuator's magnet.

Switches contain reverse polarity protection. QD cables are shielded; shield should be terminated at flying lead end.

If necessary to remove factory installed switches, be sure to reinstall on the same of side of actuator with scored face of switch toward internal magnet.

SPECIFICATIONS

		REED DC				REED AC	
ORDER CODE		RT	RM	BT	BM	CT	CM
PART NUMBER		3600-9082	3600-9083	3600-9084	3600-9085	3600-9086	3600-9087
LEAD		5m	QD*	5m	QD*	5m	QD*
CABLE SHIELDING		Unshielded	Shielded†	Unshielded	Shielded†	Unshielded	Shielded†
SWITCHING LOGIC		"A" Normally Open		"C" Normally Open or Closed		Triac Normally Open	
MECHANICAL CONTACTS		Single-Pole Single-Throw		Single-Pole Double-Throw		Single-Pole Single-Throw	
COIL DIRECT		Yes		Yes		Yes	
POWER LED		None		None		None	
SIGNAL LED		Red					
OPERATING VOLTAGE		200 Vdc max.		120 Vdc max.		120 Vac max.	
OUTPUT RATING		—				—	
OPERATING TIME		0.6 msec max. (including bounce)		0.7 msec max. (including bounce)		—	
OPERATING TEMPERATURE		-40°F [-40°C] to 158°F [70°C]					
RELEASE TIME		1.0 msec. max.				—	
ON TRIP POINT		—				—	
OFF TRIP POINT		—				—	
**POWER RATING (WATTS)		10.0 §		3.0 §§		10.0	
VOLTAGE DROP		2.6 V typical at 100 mA		NA		—	
RESISTANCE		0.1 Ω Initial (Max.)				—	
CURRENT CONSUMPTION		—				1 Amp at 86°F [30°C]	0.5 Amp at 140°F [60°C]
FREQUENCY		—				47 - 63 Hz	
CABLE MIN. BEND RADIUS	STATIC	0.630" *[16mm]*					
	DYNAMIC	Not Recommended					

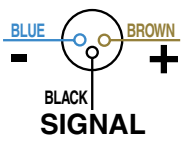
CAUTION: DO NOT OVER TIGHTEN SWITCH HARDWARE WHEN INSTALLING!

** **WARNING**: Do not exceed power rating (Watt = Voltage X Amperage). Permanent damage to sensor will occur.

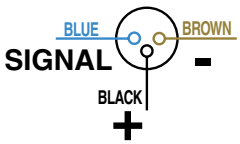
*QD = Quick Disconnect; Male coupler is located 6" [152mm} from sensor,
Female coupler to flying lead (part #2503-1025) distance is 197" [5m] also see Cable Shielding specification above

REPLACEMENT OF QD SWITCHES MANUFACTURED BEFORE JULY 1, 1997: It will be necessary to replace or rewire the female end coupler.

CURRENT
Quick disconnect Wiring



OLD
Quick disconnect Wiring



Reed Switch Life Expectancy: Up to 200,000,000 cycles (depending on load current, duty cycle and environmental conditions)

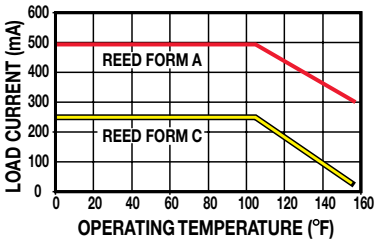
†Shielded from the female quick disconnect coupler to the flying leads. Shield should be terminated at flying lead end.

§ Maximum current 500mA (not to exceed 10VA) Refer to Temperature vs. Current graph and Voltage Derating graph

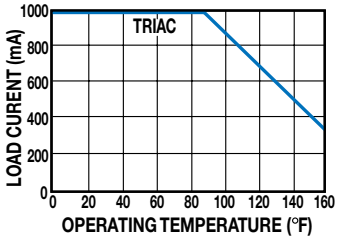
§§ Maximum current 250mA (not to exceed 3VA) Refer to Temperature vs. Current graph and Voltage Derating graph

PERFORMANCE

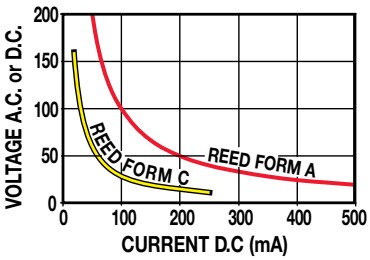
TEMP. vs CURRENT, DC REED



TEMP. vs CURRENT, AC REED

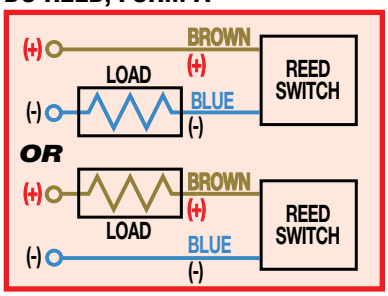


VOLTAGE DERATING, DC REED

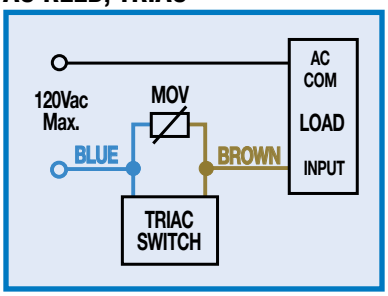


WIRING DIAGRAMS

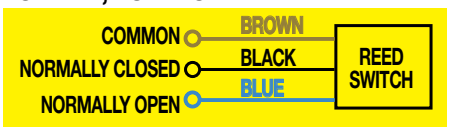
DC REED, FORM A



AC REED, TRIAC



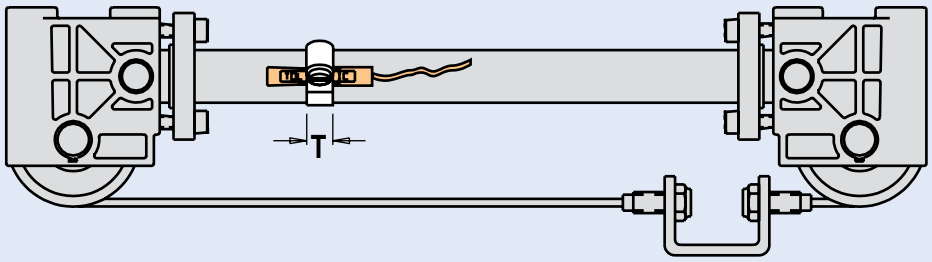
DC REED, FORM C



INSTALLATION INFORMATION

THE NOTCHED FACE OF THE SWITCH INDICATES THE SENSING SURFACE AND MUST FACE TOWARD THE MAGNET.

DIMENSIONS



MODEL	BORE	A*	B	C	T
CC 05	0.50	0.	.0	0. 5	0.
CC 0	0. 5	0.	.0	0. 5	0.
CC 0	.00	. 2	. 5	0. 5	0.
CC 5	.50	.5	2. 5	0. 5	0.
CC 20	2.00	2.0	2. 5	0. 5	0.
CC 52	2.00	2.0	2. 5	0. 5	0.
CC 25	2.50	2. 5	. 5	0. 5	0.
CC 0	.00	.25	. 5	0. 5	0.
CC 0	.00	.25	. 5	0. 5	0.5
CC 50	5.00	5.25	5. 5	0. 5	0.5

Abo e dimensions in inches
Inside imension .0

MODEL	BORE	A*	B	C	T
CC 05	0.50	20.5	2 .	.	.
CC 0	0. 5	20.5	2 .	.	.
CC 0	.00	2 . 5	.	.	.
CC 5	.50	. 2	5 .	.	.
CC 20	2.00	52.	.	.	.
CC 52	2.00	52.	.	.	.
CC 25	2.50	. 5	0.0	.	.
CC 0	.00	2.55	2.	.	.
CC 0	.00	0 . 5	.	.	.22
CC 50	5.00	. 5	.5	.	.22

Abo e dimensions in millimeters
Inside imension .5mm

NOTE: HALL-EFFECT SWITCHES ARE NOT AVAILABLE FOR CABLE CYLINDERS
SWITCHES ARE NOT AVAILABLE FOR CABLE CYLINDERS WITH STEEL TUBE
DEAD LENGTH WILL INCREASE ON MOST MODELS, SEE BELOW

	MODEL	CC 05	CC 0 SA 0	CC 0 SA 0	CC 5 SA 5	CC 20 SA 20	CC 52 SA 52	CC 25 SA 25	CC 0 SA 0	CC 0 SA 0	CC 50
	BORE	0.50	0. 5	.00	.50	2.00	2.00	2.50	.00	.00	5.00
SPACE REQUIREMENTS - ADD DEAD LENGTH TO STROKE LENGTH	IN.	. 2	. 2	. 2	0. 5	0. 5	0. 5	0. 5	0. 5	0. 5	0
	MM	.2	.2	.2	.5	.5	.5	.5	.5	.5	0

CC: Cable Cylinder Selection Guidelines - All Sizes

EXTERNAL LOAD GUIDANCE AND SUPPORT

The process of selecting a cable cylinder for a given application can be complex. It is highly recommended that you contact Tolomatic or a Tolomatic Distributor for assistance in selecting the best actuator for your application. The following overview of the selection guidelines are for educational purposes only.

1 COMPILE APPLICATION REQUIREMENTS

To determine the appropriate Cable Cylinder for an application, compile the following information:

- Available pressure (PSI)
- Weight of load (lbs. or kgs.)
- Orientation of load (lbs. or kgs.)
- Velocity of load (in./sec. or mm/sec.)
- Stroke length (in. or mm)

2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force (or load weight if force is not known) and the available operating pressure. If the intersection falls below the diagonal line, and if moments do not exceed maximum values listed for that model (see Step 3), the actuator will accommodate the application. If the intersection is above the diagonal line, a larger cylinder bore size should be considered.

NOTE: Additional force may be required to obtain the necessary acceleration for vertical or horizontal loads.

3 DETERMINE INTERNAL CUSHION CAPACITY

- Consult the Cushion Data chart for the model selected. The velocities listed on the cushion charts are final or cushion impact velocities. On applications where the internal cushions or bumpers are to be used, be sure the actual, final or impact velocity is known. If the velocity is not known, use of limit switches with valve deceleration circuits or shock absorbers should be considered. Cross-reference the final velocity and weight of the load. If the intersection is below the diagonal lines, the internal cushions on the actuator may be used. If the point falls above the dashed diagonal line or if the velocity is not known, use deceleration circuits, external shock absorbers or select a larger cylinder with greater cushion capacity. On high-cyclic applications, use of external stops is strongly recommended.

NOTE: The 1/2-inch and 5-inch cable cylinders and all sizes of magnetically coupled cylinders do not have internal cushions.

The 1/2-inch cable cylinder can handle only very light inertial loads (5 pounds or less). Heavier loads require external stops or shock absorbers.

4 DETERMINE THE MAXIMUM STROKE LENGTHS FOR FULL MANUAL CABLE ADJUSTMENT (CC ONLY)

Once you have selected the proper bore size for your application and determined the cylinder's cushion capacity, you need to determine the physical stroke length limitation of the cylinder. Refer to the table below to find the bore size selected and its maximum stroke length.

NOTE: Maximum recommended stroke length for full manual cable adjustment is the maximum stroke length at which the cables can be properly proof-loaded, pretensioned and maintained at the required tension by manually adjusting the clevis terminal lock nuts. Maximum stroke length is based on the cylinder's maximum pressure rating.

If the stroke length for your application falls within the maximum stroke length for full manual cable adjustment, your model selection is complete. (Refer to graph on page CC_31.)

IMPORTANT NOTE: Once a cylinder is installed in an application, but before putting it into service, the cables must be proof-loaded and pretensioned for proper operation. Refer to Application Guidelines on page CC_36 for proof-loading and pretensioning methods.

If your stroke length is beyond the maximum stroke lengths shown, you have two options available.

1. Increase the maximum stroke length of the selected cylinder size by the percentage of the pressure differential between the cylinder's actual operating pressure and the cylinder's maximum rated operating pressure.

E ample If the cylinder selected is a CC 5 $_2$ - inch bore

Actual SI 0

a . SI 00

ifferential 20

20 2 in. ma imum stro e 25.2 in.

25.2 2 5 .2 in. 2. feet

2. If your required stroke length is still more than the increased stroke length determined from option "1.", an automatic tensioner (AT) or multiple tensioners may be required.

For maximum stroke lengths when using auto tensioners, refer to the chart on page CC_22.

NOTE: When using auto tensioners, the cylinder's cables must be proof-loaded and pretensioned before pressure is applied to the AT unit. Refer to Application Guidelines on page CC_36 for proper proof-loading and pretensioning methods.

Auto tensioners are strongly recommended for vertical lifting applications and severe, high-cyclic applications even when the cylinder's stroke is within the maximum stroke length at full manual cable adjustment.

CC: Cable Cylinder Selection Example

The procedure for selection of cable cylinder and magnetically coupled cylinder are ery similar. For illustrati e purposes charts for the CC 0 model are used in this e ample.

1. COMPILE APPLICATION REQUIREMENTS

A ailable pressure 80 psi

Weight of load 30 lbs.

Orientation of load horiz.

Final elocity of load 10"per sec

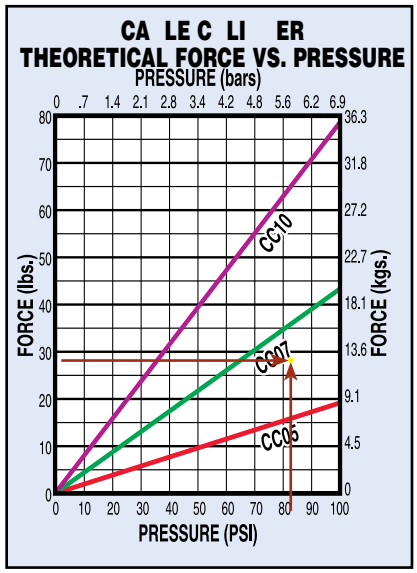
Stro e length 68"

2 a erage elocity see page

2. SELECT CYLINDER SIZE

Consult the Theoretical Force s. ressure charts.

Cross-reference the load force and the a ailable operating pressure. In this e ample a CC0 would accommodate this load at the a ailable SI.



3. DETERMINE COUPLING FORCE REQUIREMENTS (MG ONLY)

Since we are selecting a cable cylinder we can s ip this step.

4. DETERMINE INTERNAL CUSHION CAPACITY (CC ONLY)

Consult the Cushion ata Chart for the model selected.

In this e ample the calculated alue for the final elocity and the load intersect at the line for the internal cushions capacity. Thus the CC 0 will wor for this application.

5. DETERMINE THE MAXIMUM STROKE LENGTHS FOR FULL MANUAL CABLE ADJUSTMENT (CC ONLY)

Consult the chart below left.

In our e ample we are using 0 SI the chart indicates a ma imum of 00 SI so we can calculate the ma imum stro e length with manual ad ustment

.20 20. 2 .

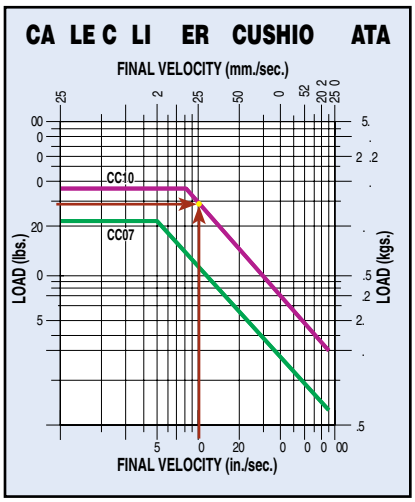
Our stro e length is so it will require the automatic tensioner option.

6. CONSIDER OPTIONS

This application will use Form C dc Reed switches to signal other units in this automated system.

The final configurated string will appear as follows

CCM10SK68.000HIBM2



CABLE CYLINDER MAXIMUM STROKE LENGTHS FOR FULL MANUAL CABLE ADJUSTMENT

MODEL	BORE IN.	MAXIMUM PRESSURE		MAXIMUM STROKE	
		PSI	BARS	IN.	MM
CC05	0.5	00	.	20.	5 .2
CC0	0. 5	00	.	20.	5 .2
CC 0	.0	00	.	20.	5 .2
CC 5	.5	00	.	2 .0	200.
CC20	2.0	200	.	5 .	05 .
CC25	2.5	200	.	00.	25 0.
CC 0	.0	200	.	5 .2	0.5
CC 0	.0	200	.	.0	2 .
CC50	5.0	00	.	222.0	5 .
CC52	2.0	500	.	.	.

For Assistance Call
1-800-328-2174
(Toll Free U.S. and Canada)
or
763-478-8000
Fax 763-478-8080

CC: Caliper Disc Brake for Cable Cylinder Selection Guidelines

DETERMINE THE LOAD CONFIGURATION AND THE HOLDING CAPACITY OF THE BRAKE

The following steps will help determine the adequate stopping time and distance for the cable cylinder equipped with a caliper disc brake under various conditions and loads.

1. *Select the bore size of the cable cylinder based on load to be moved*. Determine *load pressure*. Set regulator at 25% above load pressure ($_c$).

O E CLATURE

a	eceleration in sec^2	V	Velocity of load in sec.
g	eceleration due to gra ity . in sec^2	W	Weight of load lbs.
f	Coefficient of friction of sliding load	W_e	Equi alent Load lbs. W_e W Sin ϑ f cos ϑ
f_c	Coefficient of friction between cable and shea e	ϑ	Angle of inclination (θ 0 for hori ontal; θ 0 for ertical)
F_c	nbalanced cylinder force lbs.	R_s	Root radius of shea e groo e inches
F_{ta}	Tangential bra ing force required with pressure still applied when bra ing lbs.	$_c$	Load ressure SI
F_{tr}	Tangential bra ing force required with pressure remo ed prior to bra ing lbs.	A_c	Area of cable cylinder bore in^2
L_{tr}	Tension in cable of bra e side half while bra ing with pressure remo ed lbs.	$_t$	Load ressure SI
L_{ta}	Tension in cable of bra e side half while bra ing with pressure applied lbs.	A_t	Area of tensioner cylinder in^2
L_{trm}	a imum tension in cable with pressure remo ed while bra ing lbs.	$_{ba}$	Bra e pressure setting. ressure applied while bra ing SI
L_{tam}	a imum tension in cable with pressure applied while bra ing lbs.	$_{br}$	Bra e pressure setting. ressure remo ed while bra ing SI
S	Stopping distance inches		
T	Stopping time seconds		

**Customer must precisely determine coefficient of friction (f), if this value is used.*

2. *Calculate the unbalanced cylinder force* (F_c) ***only*** *if pressure is applied when braking*. If pressure is removed prior to braking, go on to 3.

$$F_c = {}_c \times A_c$$

3. *Calculate the tangential braking force required*. This is (F_{tr}) when pressure is *removed* prior to braking, or (F_{ta}) when pressure is still *applied* when braking. Refer to illustrations in Figure 1.

Carefully note conditions:

$$F_{tr} = W\left[\left(\frac{a}{g} - \text{Sin}\vartheta\right) - (f\cos\vartheta)\right] \quad \text{Hori ontal or Load rising}$$

$$F_{tr} = W\left[\left(\frac{a}{g} + \text{Sin}\vartheta\right) - (f\cos\vartheta)\right] \quad \text{Load falling}$$

$$F_{ta} = F_c + W\left(\frac{a}{g} - f\right) \quad \text{Hori ontal loads}$$

$$= F_c + W\left[\left(\frac{a}{g} - \text{Sin}\vartheta\right) - (f\cos\vartheta)\right] \quad \text{Incline load rising}$$

$$= F_c + W\left(\frac{a}{g} - \right) \quad \text{Vertical load rising}$$

In the above expressions (a) can be calculated from:

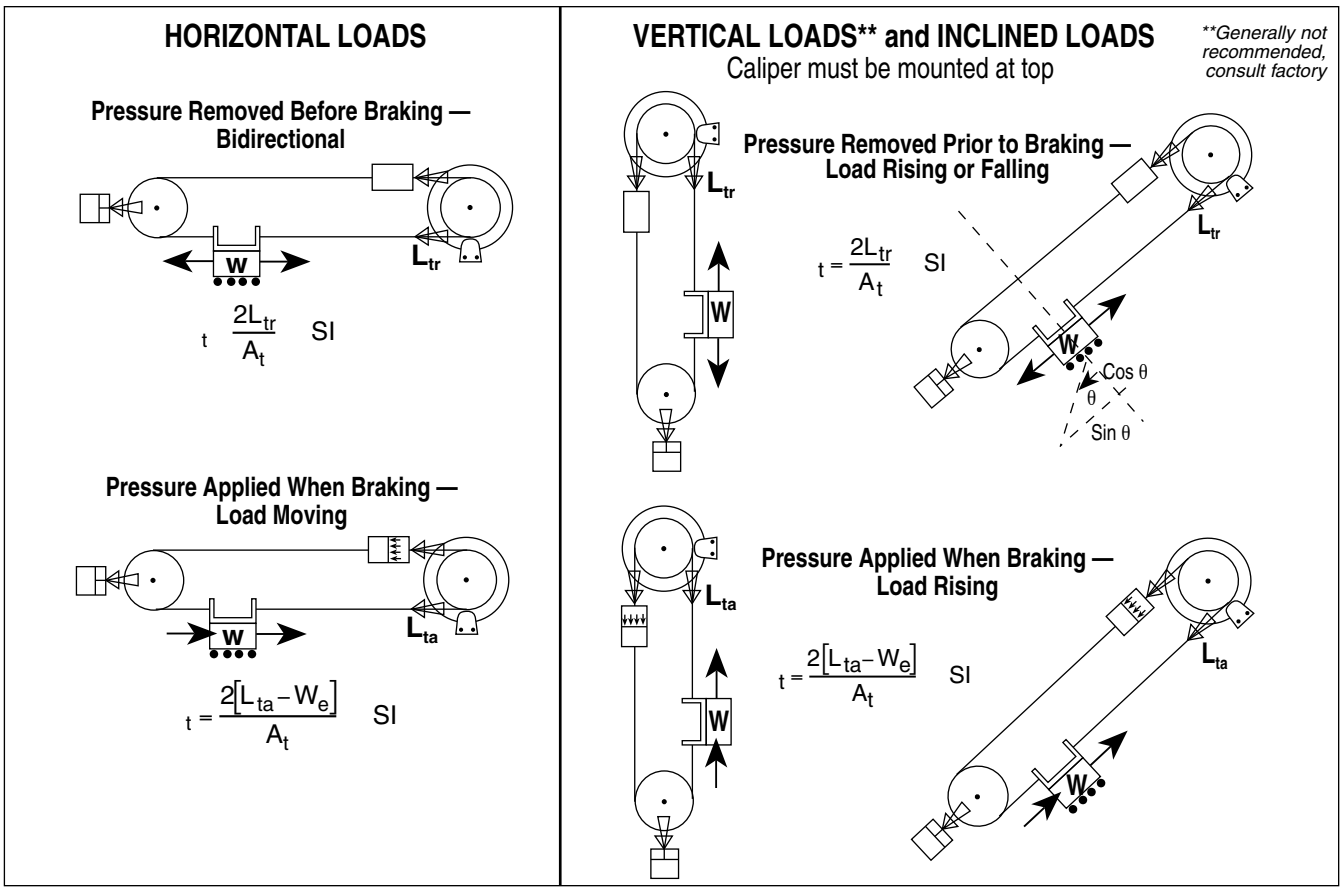
$$a \quad \frac{V^2}{2S} \text{ or } \frac{V}{T} \quad \text{In. Sec.}^2$$

4. *Calculate the tension required in brake side cable at the time of braking*.

$$L_{tr} = \frac{F_{tr}}{0.} \text{ lbs.} \quad \text{ressure remo ed while bra ing}$$

$$L_{ta} = \frac{F_{ta}}{0.} \text{ lbs.} \quad \text{ressure applied while bra ing}$$

CC: Caliper Disc Brake for Cable Cylinder Selection Guidelines



Figure

5. *Calculate tensioner pressure setting, (t) based on type of load configuration. See Figure 1 and Table 1*

6. *Calculate maximum tension in the cable with* ***pressure removed*** *prior to braking* (L_{trm}) *or with* ***pressure applied*** *when braking* (L_{tam}).

Horizontal Loads:

$L_{trm} = L_{tr} + W_e$ lbs. ressure remo ed prior to bra ing bidirectional

$L_{tam} = L_{ta}$ lbs. ressure applied when bra ing and load mo ing toward caliper

$L_{tam} = L_{ta} + 2W_e$ lbs. ressure applied when bra ing and load mo ing away from caliper.

Vertical or Inclined Loads:

$L_{trm} = L_{tr} + W_e$ lbs. ressure remo ed prior to bra ing and load rising or falling

$L_{tam} = L_{ta}$ lbs. ressure still applied when bra ing and load rising

7. *Carefully check that* (L_{trm}) *or* (L_{tam}) *does not exceed 60% of the cable tensile strength*.* If they exceed the 60% figure, either stopping time or stopping distance has to be increased. Repeat steps 1- 7.

8. *Calculate the brake operating pressure. See Table 1*

$_{br} = . \quad [L_{tr} R_s]$ SI ressure remo ed prior to bra ing

$_{ba} = . \quad [L_{ta} R_s]$ SI ressure still applied when bra ing

9. *If pressure is removed prior to braking, check to see if brake can hold the load if application is either vertical or inclined.*

The bra e can hold the load if

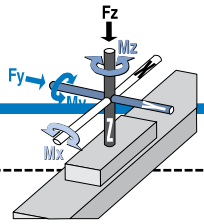
. $L_{tr} \geq W_e$

Refer to Cable Specifications in the double-acting cable cylinder section of this catalog for cable tensile strengths.

Table

	A_t in^2	R_s in.	A_c in^2
CC0	2. 0		
CC 0	2. 0		
CC 5	2. 0	.5	.
CC20	.	2.00	. 2
CC25	.	2.00	. 0
CC 0	.20	2.50	.0
CC 0	.20	2.50	2.5
CC52	.20	2.50	. 2
CC50	2 .05		

Application Data Worksheet



STROKE LENGTH _____
☐ inch (S K) (U.S. Standard) ☐ millimeters (Metric)

AVAILABLE AIR PRESSURE _____
☐ PSI (U.S. Standard) ☐ bar (Metric)

REQUIRED THRUST FORCE _____
☐ lbf (U.S. Standard) ☐ N (Metric)

LOAD _____
☐ lb (U.S. Standard) ☐ kg (Metric)

LOAD CENTER OF GRAVITY DISTANCE TO CARRIER CENTER
d_x _____
d_y _____
d_z _____
☐ inch (U.S. Standard) ☐ millimeters (Metric)

FORCES APPLIED TO CARRIER
F_z _____
F_y _____
☐ lbf (U.S. Standard) ☐ N (Metric)

BENDING MOMENTS APPLIED TO CARRIER
M_x _____
M_y _____
M_z _____
☐ in-lbs (U.S. Standard) ☐ N-m (Metric)

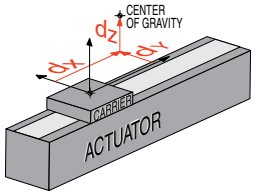
FINAL VELOCITY _____
☐ in/sec (U.S. Standard) ☐ mm/sec (Metric)

MOVE TIME sec. _____

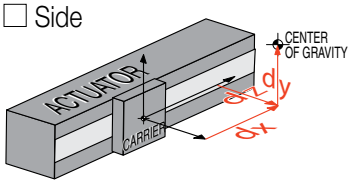
NO. OF CYCLES _____
☐ per minute ☐ per hour

ORIENTATION

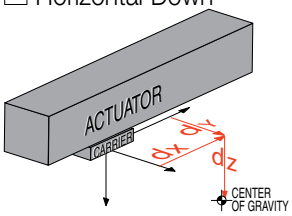
☐ Horizontal



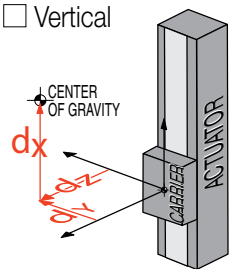
☐ Side



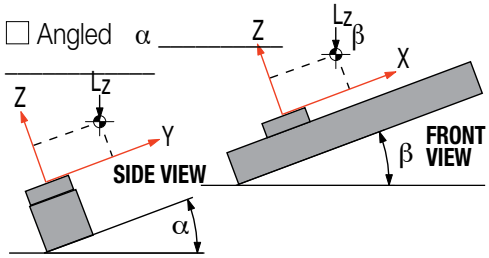
☐ Horizontal Down



☐ Vertical



☐ Angled α _____



OTHER ISSUES:
(i.e. Environment, Temperature, Contamination, etc.)
_____
_____
_____
_____

Contact information: _____
_____
_____
_____

STOP Fax (1-763-478-8080) or call Tolomatic (1-800-328-2174) with the above information. We will provide any assistance needed to determine the proper actuator.

TC: Track Cable Cylinder Selection Guidelines - All Sizes

PROVIDING LOAD GUIDANCE AND SUPPORT

1 COMPILE APPLICATION REQUIREMENTS

To determine the appropriate Track Cable Cylinder for an application, compile the following information:

- Available pressure (PSI)
- Weight of load (lbs. or kgs.)
- Orientation of load (lbs. or kgs.)
- Velocity of load (in./sec. or mm/sec.)
- Stroke length (in. or mm)

2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force (or load weight if force is not known) and the available operating pressure. If the intersection falls below the diagonal line, and if moments do not exceed maximum values listed for that model (see Step 3), the actuator will accommodate the application. If the intersection is above the diagonal line, a larger cylinder bore size should be considered.

NOTE: Additional force may be required to obtain the necessary acceleration for vertical or horizontal loads.

3 KEEP UNDER MAXIMUM STROKE LENGTH

There are specific maximum stroke lengths for each model.
TC05: 67.00"
TC07: 78.00"
TC10: 78.00"
TC15: 78.00"

4 DETERMINE NATURE OF LOAD AND THE EFFECT OF BENDING MOMENTS

If the actuator will guide and support a load located directly over the center of carrier, bending moments will not be a factor in the actuator selection. Track Cable Cylinders perform best that way. See the Bending Moments Formulae below if your application requires the load to be away from center of the carrier.

5 DETERMINE THE BEARING ROD LOAD CAPACITY

Determine whether the Load Weight and Stroke Length will be within the load capacity for the bearing rods.

Cross reference the load weight and stroke on the Load Weight vs. Stroke chart for the selected bore size. (Page CC_20, CC_21) If the intersection falls within the curve, the cylinder will accommodate the application requirements. If the intersection falls outside the curve, consult the chart of a larger bore size that will accommodate the required load weight and stroke for your application.

The weight on the bearing rods causes them to bend or deflect slightly over their length. This deflection is increased for longer rods and/or higher weights on the bearing block. For proper operation, rod deflection must not exceed .30 of an inch.

6 DETERMINE INTERNAL CUSHION CAPACITY

- Consult the Cushion Data chart (Cushion Data for Track Cable Cylinders page CC_7 to CC_11) for the model selected. The velocities listed on the cushion charts are final or cushion impact velocities. On applications where internal cushions are to be used, be sure the actual, final or impact velocity is known. If the velocity is not known, use of limit switches with valve deceleration circuits or shock absorbers should be considered.

BENDING MOMENTS

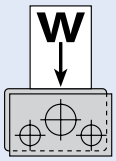
Loading Equation Data

MODEL	BORE SIZE	A (in.)	D (in.)	F (lbs.)	G (lbs.)
TC05	2	.0	.0	.00	
TC0		.0	.0	.00	
TC 0		.0	.0	.00	
TC 5	- 2	.	2.	0.00	

(See M S L S graph on page MG_6)

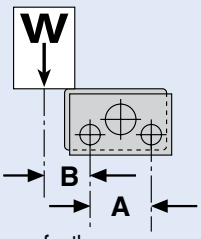
"L" MOMENT

$$L = \frac{W}{2}$$



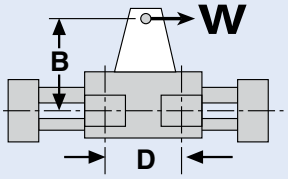
"Mx" MOMENT

$$L = \frac{WB}{A}$$



"My" / "Mz" MOMENT

$$F \text{ or } G = 2L = \frac{WB}{D}$$



L should be below cur e for the corresponding slide on the Load s. Stro e chart for sintered bron e or linear bearings - ag Coupled Slides .

Loading Equation Key

A istance between shaft centers.

B istance from load center to center of nearest shaft in. determined by application.

L Load per shaft lbs. .

W ayload weight lbs. .

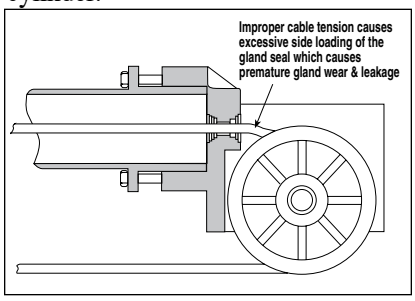
D A ial distance between center of bearings in. .

F a . bearing sliding load linear bearings lbs.

G a . bearing sliding load sintered bron e bearings lbs.

1. PROOF-LOADING AND PRETENSIONING CABLES

Once installed, but before putting in service, the cables on the cylinder should be proof-loaded and pretensioned to ensure that they are rigid for the maximum service life of the cylinder.



Proof-loading and pretensioning involve removing the two types of stretch in the cable by adjusting the clevis terminal lock nuts.

- *Proof-loading* – When cables are manufactured, individual wires and strands are laid in position but left slightly loose. When subjected to proof-loading the wires align themselves, tighten and constructional stretch in the cable is eliminated.
- *Pretensioning*– Elastic stretch in cable is inherent in the wire itself. It is removed when subjected to pretensioning.

There are two ways to proof-load and pretension a cylinder's cables — The Torque Method or The Field Method. These two methods are explained at right. Either method may be used.

All cables should be checked periodically from a preventative maintenance standpoint. When installing new cable assemblies proof-load and pretension using these same methods.

THE TORQUE METHOD

. Tighten the cle is terminal loc nuts equally with a torque wrench to the alues listed under roof-loading torque in the roof-loading retensioning table below.

2. Let tightened nuts sit for 0 seconds.

. Loosen the loc nuts to remo e tension but tight enough to eliminate any slac .

. Re-torque cle is terminal loc nuts equally with a torque wrench to the total pretensioning figures listed in the table below.

PROOF-LOADING AND PRETENSIONING TORQUE OF CABLES

CC Model	Proof-loading Torque		Pretensioning Torque		+ Starting Torque of Nuts on Terminals		= Total Pretensioning Torque	
CC05	5 in.-lbs.	. N-m	2.5 in.-lbs.	0.2 N-m	0 in.-lbs.	. N-m	2.5 in.-lbs.	. N-m
CC0	5 in.-lbs.	. N-m	2.5 in.-lbs.	0.2 N-m	0 in.-lbs.	. N-m	2.5 in.-lbs.	. N-m
CC 0	5 in.-lbs.	. N-m	2.5 in.-lbs.	0.2 N-m	0 in.-lbs.	. N-m	2.5 in.-lbs.	. N-m
CC 5	5 in.-lbs.	5.0 N-m	.0 in.-lbs.	0. 0 N-m	20 in.-lbs.	2.2 N-m	2 . in.-lbs.	.25 N-m
CC20	5 in.-lbs.	2. N-m	.0 in.-lbs.	5.20 N-m	25 in.-lbs.	2. 2 N-m	.0 in.-lbs.	.02 N-m
CC25	5 in.-lbs.	2. N-m	.0 in.-lbs.	.25 N-m	25 in.-lbs.	2. 2 N-m	.0 in.-lbs.	.0 N-m
CC 0	2 0 in.-lbs.	2 . N-m	05.0 in.-lbs.	. N-m	25 in.-lbs.	2. 2 N-m	0.0 in.-lbs.	. N-m
CC 0	2 0 in.-lbs.	2 . N-m	.5 in.-lbs.	2 . N-m	25 in.-lbs.	2. 2 N-m	2 2.5 in.-lbs.	2 .0 N-m
CC50	25 in.-lbs.	. 2 N-m	0.0 in.-lbs.	20. N-m	0 in.-lbs.	. N-m	2 0.0 in.-lbs.	2 . N-m
CC52	2 0 in.-lbs.	2 . N-m	5.0 in.-lbs.	2. N-m	25 in.-lbs.	2. 2 N-m	0.0 in.-lbs.	5. 2 N-m

THE FIELD METHOD

The Field ethod simplifies roof-loading and retensioning the cable cylinder by combining the two processes.

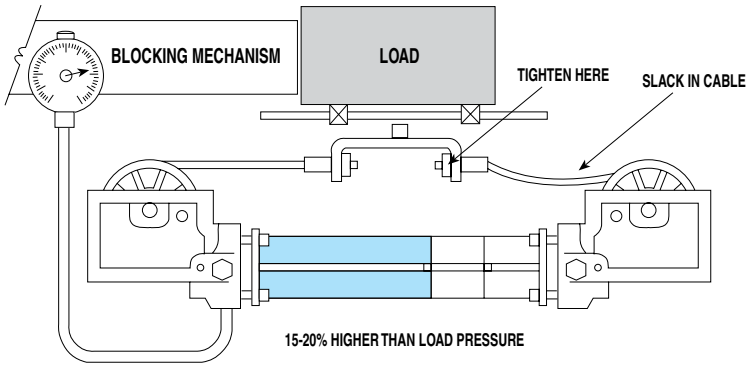
. Bloc the load some distance from the end of stro e to eep the piston from bottoming.

2. Apply a pressure that is 5 to 20 higher than the actual load pressure.

   NOTE Load pressure is defined as the pressure required to mo e the load. When the load is stopped e ternally before the piston bottoms the relief al e or regulator setting becomes the load pressure.

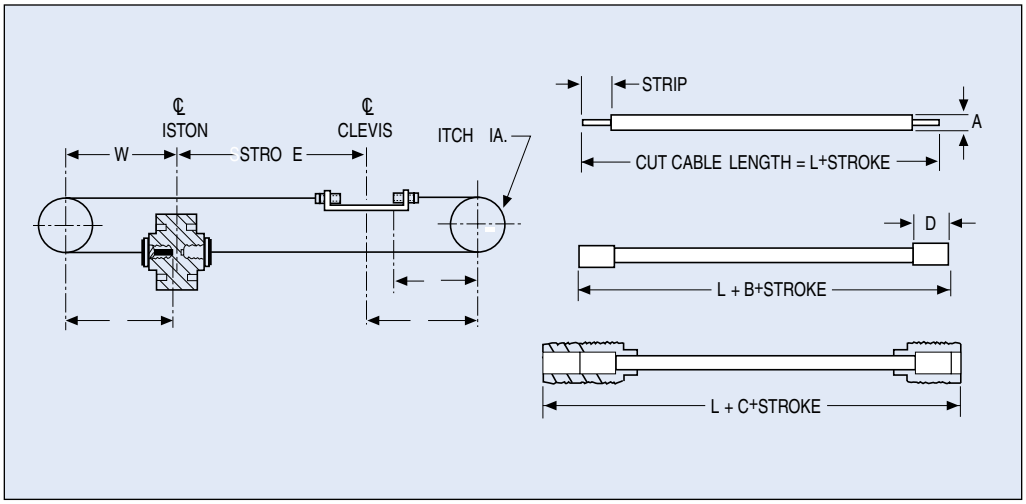
. pon pressuri ing one cable will become tight while the other will become slac . anually ad ust out the slac with a wrench on the cle is terminal loc nut.

. Release the pressure bloc the load on the other side and repeat steps through . When these steps are done turn down the regulator pressure to the normal operating pressure and remo e the bloc .



2. DETERMINING SPECIAL CABLE LENGTHS

When an application requires a specialized cable length, use the dimensional table and illustrations to determine the proper cable length.



MODEL	P		W		X		Y		Z		STRIP		A		B		C		D		L(std) + Stroke	
	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.
CC05	.500	.	.	2.	. 50	.	. 0	5.	.	2.	0. 2	.	0.0	2.	0.2	5.	0. 5	.5	0.	.	.	.
CC0	.500	.	.	2.	. 50	.	. 0	5.	.	2.	0. 2	.	0.0	2.	0.2	5.	0. 5	.5	0.	.	.	.
CC 0	.500	.	.	2.	. 50	.	. 0	5.	.	2.	0. 2	.	0.0	2.	0.2	5.	0. 5	.5	0.	.	.	.
CC 5	.250	2.	. 52	.	. 25	0 .	. 25	.	. 52	.	0.	.	0.	.	0.	.	0. 20	0.	0. 2	2 .0	2.50	.5
CC20	.250	0 .0	5. 25	0.2	.	.	. 2	.0	5. 25	0.2	0. 20	5.	0.250	.	0.	.	0.5 0	.	.0 0	2 .	.25	2.0
CC25	.250	0 .0	5. 25	0.2	.	.	. 2	.0	5. 25	0.2	0. 20	5.	0.250	.	0.	.	0.5 0	.	.0 0	2 .	.25	2.0
CC 0	5. 2	.	5.	.	5.000	2 .0	. 0	.5	5.	.	0.	2 .	0. 2	.	0.500	2.	0. 5	5.0	. 00	2 .	.00	.
CC 0	5. 2	.	.	5 .	5.000	2 .0	. 5	0 .	.	5 .	0.	2 .	0. 2	.	0.500	2.	0. 5	5.0	. 00	2 .	.50	.5
CC50	.000	52.	. 0	2 .0	. 0	2 .2	. 20	.	. 0	2 .0	. 0	0.0	0. 5	.5	.000	25.	0.500	2.	. 0	.0	2 .55	2 .
CC52	5. 2	.	5. 02	.	5.000	2 .0	. 50	.	5. 02	.	0.	2 .	0. 2	.	0.500	2.	0. 5	5.0	. 00	2 .	.00	.

3. LUBRICATION GUIDELINES

All Tolomatic cable cylinders require internal lubrication unless specified. To ensure maximum cylinder life, the following guidelines should be followed.

- ***Filtration***

  We recommend the use of dry, filtered air in our products. "Filtered air" means a level of 10 Micron or less. "Dry" means air should be free of appreciable amounts of moisture. Regular maintenance of installed filters will generally keep excess moisture in check.

- ***External Lubricators***

  External lubrication should be utilized for maximum service life of pneumatic cable cylinders. Lubrication *must be maintained* in a constant supply or the results will be a dry cylinder prone to premature wear.

  Oil lubricators, (mist or drop) should supply a minimum of 1 drop per 20 standard cubic feet per minute to the cylinder. As a rule of thumb, double that rate if water in the system is suspected. Demanding conditions may require more lubricant.

  We recommend a **non-detergent, 20cP @ 140˚F** 10-weight lubricant. Optimum conditions for standard cylinder operation are **+32˚ to +125˚F (+0˚ to 51.6˚C).**

- ***Sanitary environments***

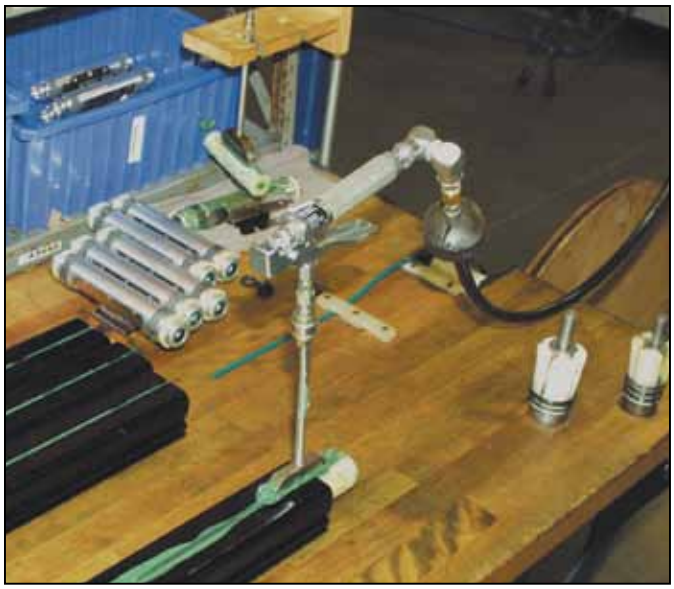
  Oil mist lubricators must dispense "Food Grade" lubricants to the air supply. Use fluids with ORAL **LD50 toxicity ratings of 35 or higher** such as **Multitherm® PG-1 or equivalent.** Demanding conditions can require a review of the application.

Application Guidelines

The following conditional statements are intended as general guidelines for use of Tolomatic actuators. Since all applications have their own specific operating requirements, consult Tolomatic, Inc. or your local Tolomatic distributor if an application is unconventional or if questions arise regarding the selection process.

CUSHION NEEDLE ADJUSTMENT (BC2, BC3, BC4, CC, SA, DP, TC ONLY)

Adjust the cushion needles in the cylinder heads carefully to obtain a smooth, hesitation free deceleration for your particular application. If there are questions on proper adjustment, please consult Tolomatic, Inc.



LUBRICATION GUIDELINES

All Tolomatic actuators (except Cable Cylinders) are prelubricated at the factory. To ensure maximum actuator life, the following guidelines should be followed.

- **Filtration**

  We recommend the use of dry, filtered air in our products. "Filtered air" means a level of 10 Micron or less. "Dry" means air should be free of appreciable amounts of moisture. Regular maintenance of installed filters will generally keep excess moisture in check.

- **External Lubricators (optional)**

  The factory prelubrication of Tolomatic actuators will provide optimal performance without the use of external lubrication. However, external lubricators can further extend service life of pneumatic actuators if the supply is kept constant.

  Oil lubricators, (mist or drop) should supply a minimum of 1 drop per 20 standard cubic feet per minute to the cylinder. As a rule of thumb, double that rate if water in the system is suspected. Demanding conditions may require more lubricant.

  If lubricators are used, we recommend a non-detergent, 20cP @ 140˚F 10-weight lubricant. Optimum conditions for standard cylinder operation are +32˚ to +150˚F (+0˚ to 65.5˚C).

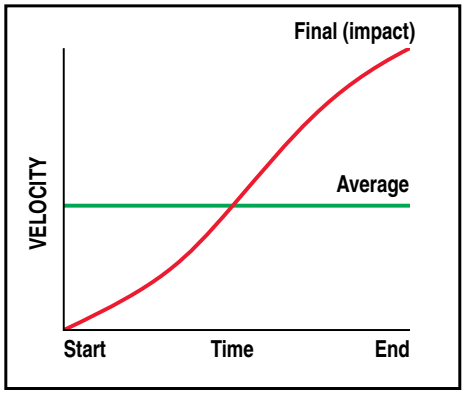
  NOTE: Use of external lubricators may wash away the factory installed lubrication. External lubricants must be maintained in a constant supply or the results will be a dry actuator prone to premature wear.

- **Sanitary Environments**

  Oil mist lubricators must dispense "Food Grade" lubricants to the air supply. Use fluids with ORAL LD50 toxicity ratings of 35 or higher such as Multitherm® PG-1 or equivalent. Demanding conditions can require a review of the application.

FINAL VELOCITY CALCULATION

Velocity calculations for all rodless cylinders need to differentiate between final velocity and average velocity. For example: Stroking a 100-inch BC3 model in one second yields an average velocity of 100 inches per second. To properly determine the inertial forces for cushioning, it is important to know the final (or impact) velocity. Rodless cylinders accelerate and decelerate at each end of the stroke. Therefore this acceleration must be considered (see diagram).



If final (or impact) velocity cannot be calculated directly, a reasonable guideline is to use 2 x average velocity.

Cable Cylinder Ordering - CC, SA, DP, TC - All Sizes

CONFIGURATOR EXAMPLE

MODEL, SEALS, TUBING, BORE, AND STROKE						ACCESSORIES AND OPTIONS					
1.	2.	3.	4.	5.	6.	END #1 7.	END #2 7.	8.	9.	9.
C C	V		M	1 5	S K 1 2 5 . 2 5 0	H J	H G	R T 2	X A _ _ . _	X B _ _ . _

The abo e e ample describes a double-acting cable cylinder with seals of Viton material a standard aluminum tube magnet .5-inch bore and a stro e of 25.25 inches. Options are a -ported head with auto tensioner on right end a -ported head on the left end and two Form A normally open reed switches.

Bo es abo e represent the number of fields a ailable for each section and not all of them will be used in e ery application. Omit empty bo es when you construct your configurated order. For the abo e e ample the order string as it is typed would appear as follows **CCVM15SK125.25HJHGRT2**

1. CYLINDER MODEL

Enter:
CC for double-acting cable cylinder
SA for single-acting cable cylinder
DP for double purchase cable cylinder
TC for track cable cylinder

2. SEALS OF VITON® MATERIAL

Enter:
V if VITON® seals are desired, or leave blank

3. TUBING

Enter:
Blank for standard aluminum tube
S for steel tube

Note Steel tubing is not a ailable on CC05 CC0 or CC50 models.
Switches cannot be used with steel tubing.

4. SWITCH MAGNET

Enter:
M if switch magnet is required, or leave blank

Note agnet will increase dead length. See page cc_2
Increase does not apply to TC odels.

5. BORE SIZE

Enter:

05 for .5-inch bore	**25** for 2.50-inch bore
07 for .75-inch bore	**30** for 3-inch bore
10 for 1-inch bore	**40** for 4-inch bore
15 for 1.5-inch bore	**50** for 5-inch bore
20 for 2-inch bore	**52** for 2-inch bore (500PSI)

6. STROKE LENGTH

Enter:
SK then required stroke length in **inches**:
Example: SK125.25 for 125.250-inch stroke

Note Stro es o er 2 inches require Tube Couplers please consult factory for lead times. ma . stro e aries by model and bore si e *see dimensions page for specification*

7. HEAD OPTIONS

Single-ported heads are standard on all cylinders.

Enter head options for "END #1" (right end) and/or "END #2" (left end) of the cylinder:

HG*+ for 3-ported head
HI for 1-inch auto tensioner assembly
HJ + for 1-inch auto tensioner assembly with 3-ported head
HK for 2-inch auto tensioner assembly
HL + for 2-inch auto tensioner assembly with 3-ported head
HM** for caliper disc brake assembly
HN+** for caliper disc brake assembly with 3-ported head

Only head option a ailable for single-acting cylinders.
Auto tensioner assembly required on one end of the cylinder.
Cushions are remo ed on all -ported heads.

8. SWITCH TYPE

NOTE: "M" must be selected in (4.) before selecting a switch type. Enter:

BT for Form C Reed Switch 5-meter lead
BM for Form C Reed Switch 5-meter lead Quick-disconnect
RT for Form A Reed Switch 5-meter lead
RM for Form A Reed Switch 5-meter lead Quick-disconnect
CT for AC Triac Reed Switch 5-meter lead
CM for AC Triac Reed Switch 5-meter lead Quick-disconnect

Then enter:
The number of Switches required.

9. EXTRA CABLE

Enter:
XA for extra cable beyond standard in inches
XB for extra cable beyond standard in inches

CABLE CYLINDER REPLACEMENT KITS

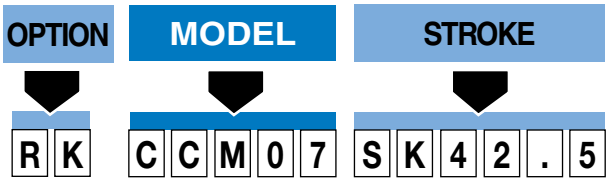
Find the appropriate part number for the specific model and specify that part number with your stroke length when ordering.

CABLE ASSEMBLIES[1] AND REPAIR KITS[2]

MODEL	CABLE ASSY.	REPAIR KITS
CC05	CACC05	R CC05
TC05	CATC05	R TC05
CC 05	CACC 05	R CC 05
TC 05	CATC 05	R TC 05
CC0	CACC0	R CC0
SA0	CASA0	R SA0
TC0	CATC0	R TC0
CC 0	CACC 0	R CC 0
SA 0	CASA 0	R SA 0
TC 0	CATC 0	R TC 0
CC 0	CACC 0	R CC 0
SA 0	CASA 0	R SA 0
TC 0	CATC 5	R TC 0
CC 5	CACC 5	R CC 5
5	CA 5	R 5
SA 5	CASA 5	R SA 5
TC 5	CATC 5	R TC 5
CC 5	CACC 5	R CC 5
5	CA 5	R 5
SA 5	CASA 5	R SA 5
TC 5	CATC 5	R TC 5
CC20	CACC20	R CC20
20	CA 20	R 20
SA20	CASA20	R SA20
CC 20	CACC 20	R CC 20
20	CA 20	R 20
SA 20	CASA 20	R SA 20
CC25	CACC25	R CC25
25	CA 25	R 25
SA25	CASA25	R SA25
CC 25	CACC 25	R CC 25
25	CA 25	R 25
SA 25	CASA 52	R SA 25
CC52	CACC52	R CC52
52	CA 52	R 52
SA52	CASA52	R SA52
CC 52	CACC 52	R CC 52
52	CA 52	R 52
SA 52	CASA 52	R SA 52
CC 0	CACC 0	R CC 0
0	CA 0	R 0
SA 0	CASA 0	R SA 0
CC 0	CACC 0	R CC 0
0	CA 0	R 0
SA 0	CASA 0	R SA 0
CC 0	CACC 0	R CC 0
0	CA 0	R 0
SA 0	CASA 0	R SA 0
CC 0	CACC 0	R CC 0
0	CA 0	R 0
SA 0	CASA 0	R SA 0
CC50 ALL	CACC50	R CC50
SA50 ALL	CASA50	R SA50

REPAIR KIT ORDERING

Example: RKCCMO7SK25



Where **RK** is the Repair Kit code, **CCM** is the Cable Cylinder Code, 07 is the .75" bore and **SK 42.5** indicates a stroke length of 42.5 inches.

Cable Assemblies and Repair Kits for cable cylinder with Viton Seals: Modify Repair Kit Part number to include a "V" after the model style and before the bore size.

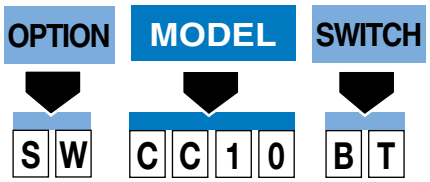
(ex. CACCV10SK_ or RKTCVM15SK_)

[1] Cable Assemblies contain one Cable Assembly specify stro e .

[2] Repair its contain two Cable Assemblies specify stro e and all wearable seals required to rebuild the cylinder.

SWITCH KITS[3]

To order retrofit switch and hardware kits:
Enter: **SW** then the model and bore size, and type of switch needed.



Example: SWCCM10BT

Where **SW** is the Switch Kit code, **CCM** is the Cable Cylinder code, **10** is the 1" bore, and **BT** is the switch code for a Form C Reed Switch.

[3] Switch its contain one reed switch and mounting hardware.

Field Retrofit Switches

- Replacing an existing switch on actuator manufactured AFTER 7/1/97: ***Order from part numbers on table below.***
- Replacing an existing switch on actuator manufactured BEFORE 7/1/97: ***Order via configurator code on page CC_39.***
- Adding switch to an actuator that has not had a switch in the past: ***Order via configurator code on page CC_39.***

00- 0 2	Switch Reed Form A 5m Wire
00- 0	Switch Reed Form A ale Connector
00- 0	Switch Reed Form C 5m Wire
00- 0 5	Switch Reed Form C ale Connector
00- 0	Switch Triac 5m Wire
00- 0	Switch Triac ale Connector
250 - 025	Connector Female 5m

(NOTE: If replacing a quick-disconnect switch manufactured before 7-1-97 it will also be necessary to replace or rewire the female-end coupler with the in-line splice. See page CC_28.)