Tolomatic™
EXCELLENCE *IN MOTION*

CC CABLE CYLINDER

RODLESS CYLINDER

CONTENTS

CABLE CYLINDER

ENDURANCE TECHNOLOGY℠

A Tolomatic Design Principle

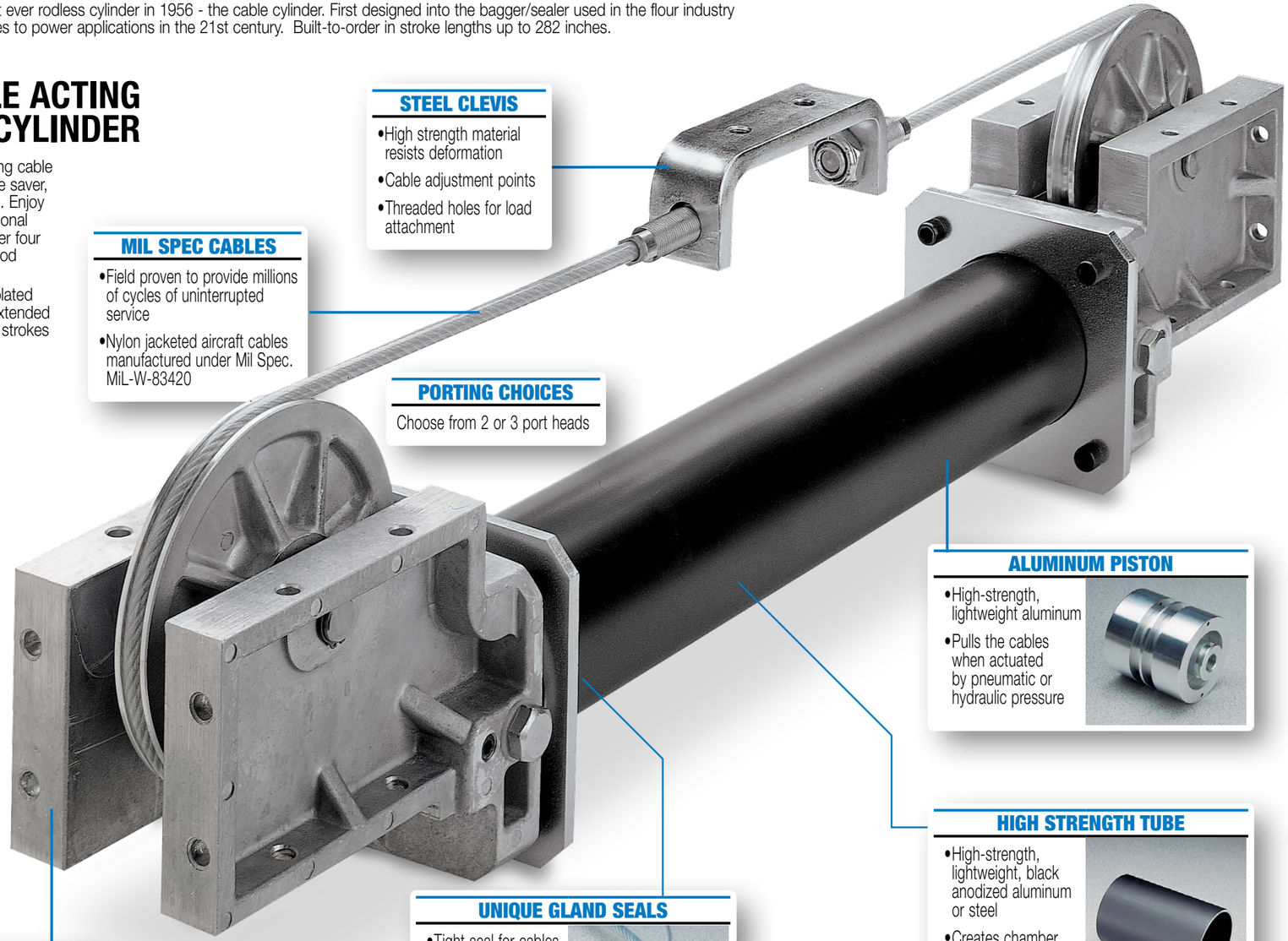
Endurance Technology features are designed for maximum durability to provide extended service life.

Tolomatic invented the first ever rodless cylinder in 1956 - the cable cylinder. First designed into the bagger/sealer used in the flour industry the cable cylinder continues to power applications in the 21st century. Built-to-order in stroke lengths up to 282 inches.

CC DOUBLE ACTING CABLE CYLINDER

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 without 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.



STEEL CLEVIS

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

MIL SPEC CABLES

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

PORTING CHOICES

Choose from 2 or 3 port heads

LOCATE REMOTELY

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

ALUMINUM PISTON

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

HIGH STRENGTH TUBE

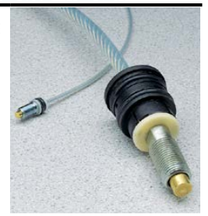
- High-strength, lightweight, black anodized aluminum or steel
- Creates chamber for pneumatic or hydraulic pressure and protects piston

DIE CAST HEAD ASSEMBLY

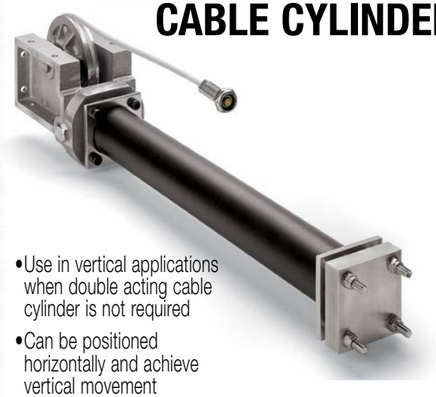
- High-strength, lightweight anodized aluminum
- Protects piston and creates chamber for pneumatic or hydraulic pressure

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



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

OPTIONS

AUTO TENSIONER

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

CALIPER DISC BRAKE HM HN

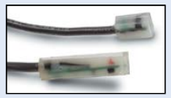
- Best mounting choice in most applications

STEEL TUBE

- For extra strength & use in harsh environments

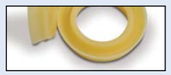
3 PORTED HEAD

- 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

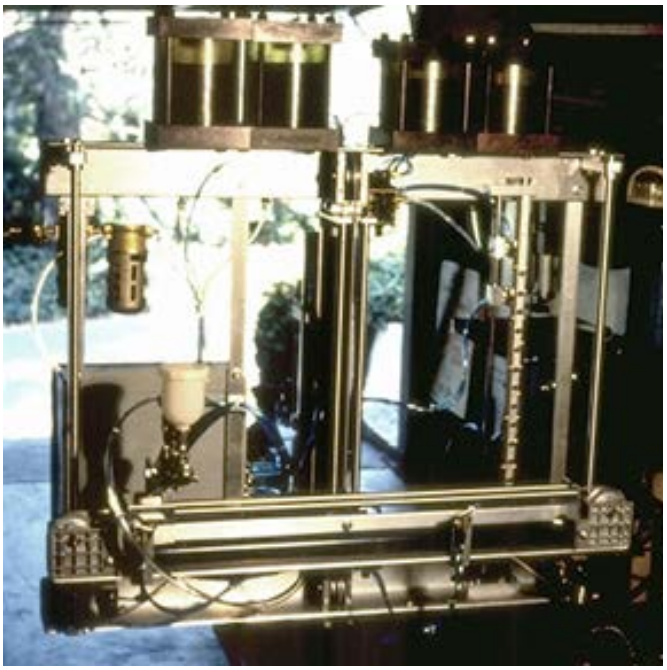
- To remotely locate cable cylinder

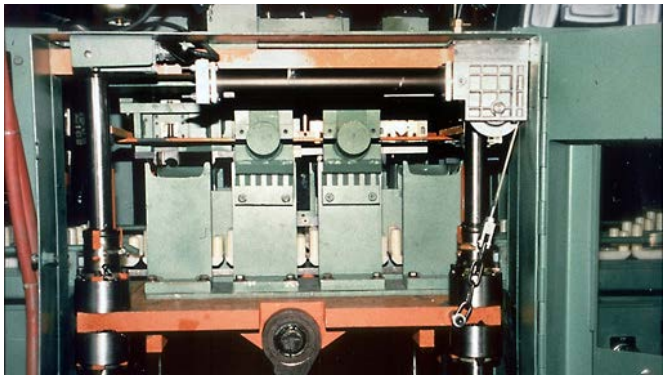
CC Cable Cylinder

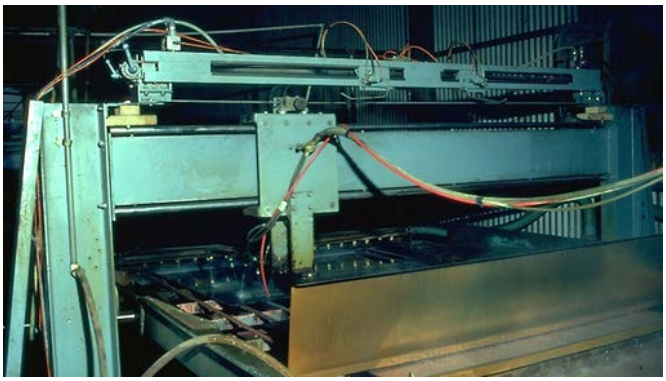
APPLICATIONS

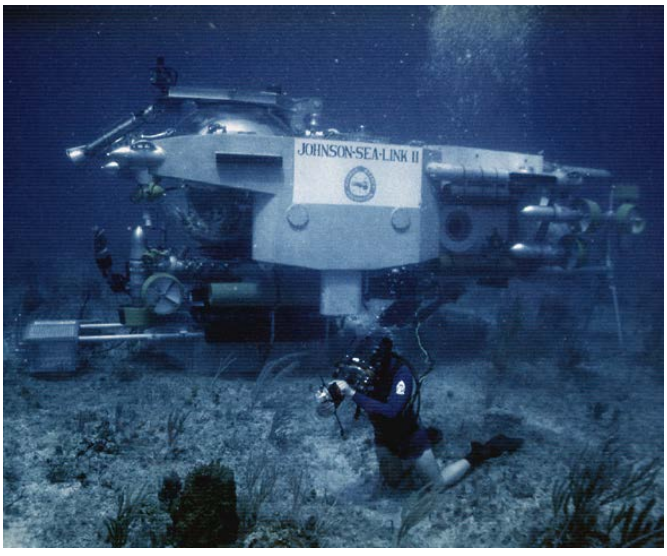
Tolomatic invented the first ever rodless cylinder in 1956 - the cable cylinder. First designed into the bagger/sealer used in the flour industry the cable cylinder continues to power applications in the 21st century. The cable cylinder has been a key component in the following industries:

- Packaging
- Automotive
- Food & Beverage
- Material Handling & Conveying
- Plastic Injection Molding
- Metal Processing
- Paper and Textiles
- Medical
- Electronics
- Printing
- Many Others



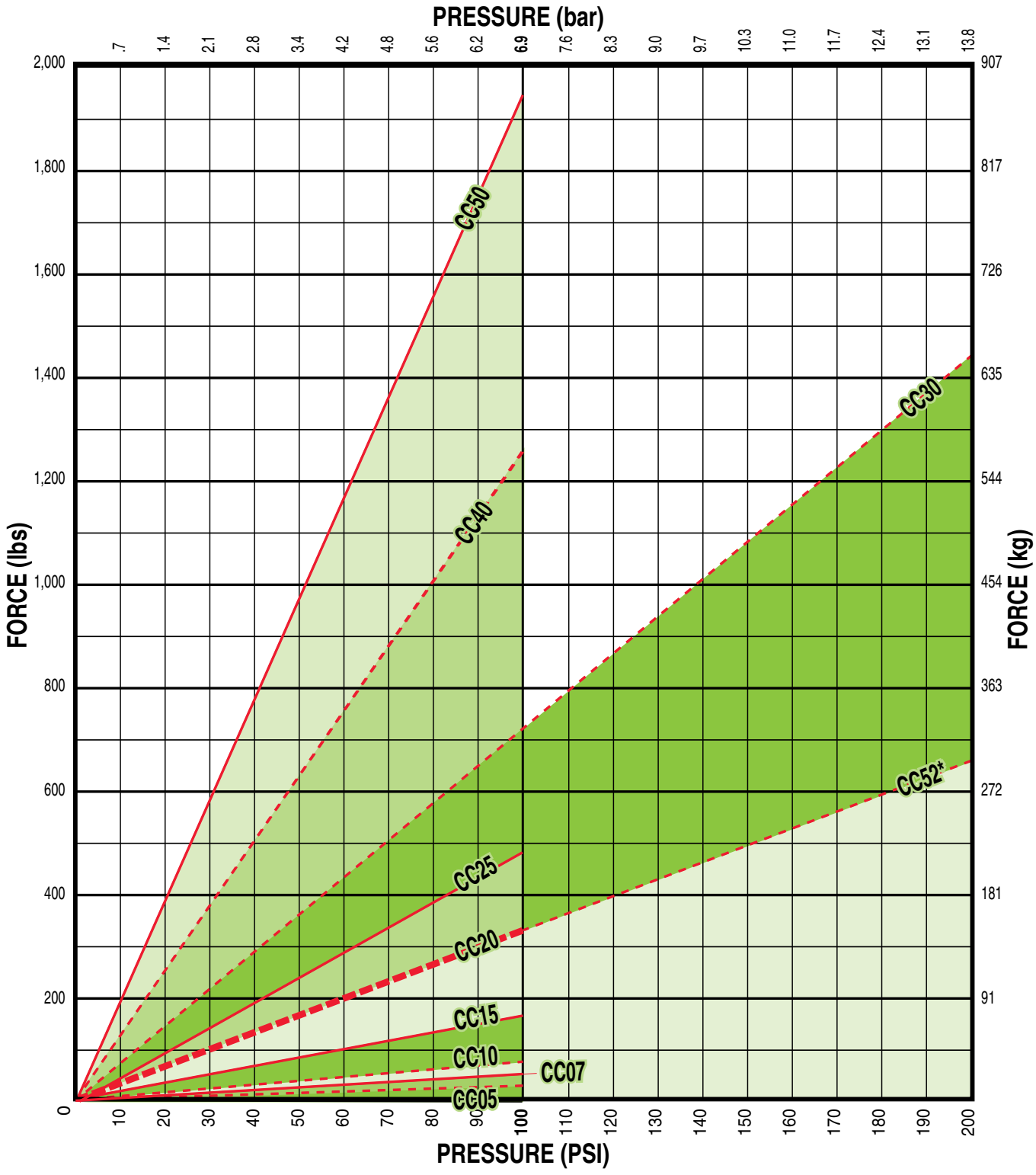






PERFORMANCE

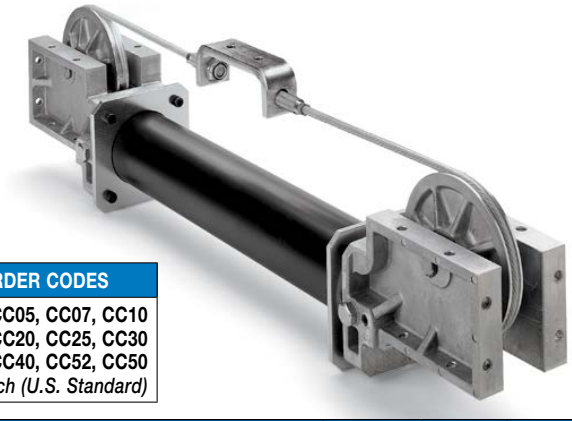
CABLE CYLINDER THEORETICAL FORCE VS PRESSURE



*CC52 up to 500 psi

CC Double Acting Cable Cylinder - All Sizes

FEATURES AND OPTIONS



ORDER CODES

CC05, CC07, CC10
CC15, CC20, CC25, CC30
CC40, CC52, CC50
inch (U.S. Standard)

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. Contact Tolomatic to achieve strokes of up to 60 feet in length.

CC OPTIONS	Order Code	Page	CC05	CC07	CC10	CC15	CC20	CC25	CC30	CC40	CC52	CC50
Auto Tensioner w/ one 1" Stroke Unit	HI, HJ	CC_16	–	OP	OP	OP	OP	OP	OP	OP	OP	–
Auto Tensioner w/ two 1" Stroke Units	HI, HJ	CC_16	–	OP	OP	OP	OP	OP	OP	OP	OP	–
Auto Tensioner w/ one 2" Stroke Unit	HK,HL	CC_16	–	–	–	–	OP	OP	OP	OP	OP	OP
Auto Tensioner w/ two 2" Stroke Units	HK,HL	CC_16	–	–	–	–	OP	OP	OP	OP	OP	OP
Caliper Disc Brake	HM, HN	CC_19	–	–	–	OP	OP	OP	OP	OP	OP	OP
Switches (DC Reed & Triac)	(several)	CC_22	OP	OP	OP	OP	OP	OP	OP	OP	OP	OP
Aluminum Tube			ST	ST	ST	ST	ST	ST	ST	ST	ST	ST
Steel Tube (Switches NOT available)	S		–	–	OP	OP	OP	OP	OP	OP	OP	-
Seals of Viton® Material	V		–	OP	OP	OP	OP	OP	OP	OP	OP	-
3 Ported Heads	HG		OP	OP	OP	OP	OP	OP	OP	OP	OP	-
MORE INFORMATION	**Page**											
Application Guidelines	CC_29		ST	ST	ST	ST	ST	ST	ST	ST	ST	ST
Cushion Needle Adjustment	CC_31		–	ST	ST	ST	ST	ST	ST	ST	ST	ST
Ordering	CC_33		ST	ST	ST	ST	ST	ST	ST	ST	ST	ST
Selection	CC_24		ST	ST	ST	ST	ST	ST	ST	ST	ST	ST
Caliper Disc Brake Option Selection	CC_26		–	–	–	OP	OP	OP	OP	OP	OP	OP
STANDARD FEATURE	**Page**											
Fixed Orifice Cushions	CC_31		–	ST	ST	–	–	–	–	–	–	–
Adjustable Cushions	CC_31		–	–	–	ST	ST	ST	ST	ST	ST	ST
Single Ported Head			ST	ST	ST	ST	ST	ST	ST	ST	ST	ST

– = Not Available OP = Optional ST = Standard

Double Acting Cable Cylinder - CC05, CC07, CC10

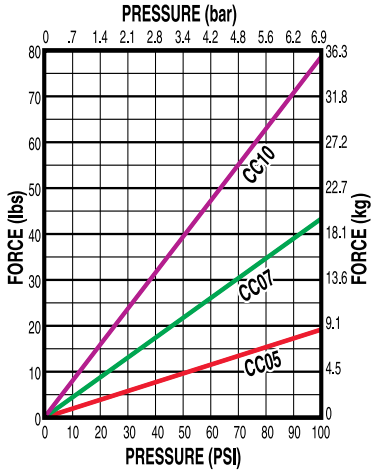
OVERALL UNIT SPECIFICATIONS			CC05	CC07	CC10
BORE SIZE		in	0.50	0.75	1.00
MAX STROKE		in	60	138	282
		mm	*1524*	*3505*	*7163*
BASE WEIGHT	Alum.	lb	1.38	1.38	1.38
		kg	*0.63*	*0.63*	*0.63*
	Steel	lb	NA	NA	1.49
		kg	*NA*	*NA*	*0.68*
WEIGHT PER UNIT OF STROKE	Alum.	lb per in	0.011	0.034	0.043
		g per mm	*0.197*	*0.606*	*0.768*
	Steel	lb per in	NA	NA	0.125
		g per mm	*NA*	*NA*	*2.244*
MAX PRESSURE		PSI	100	100	100
		bar	*6.9*	*6.9*	*6.9*
MAX TEMP		°F	140	140	140
		°C	*60*	*60*	*60*
MAX FORCE OUTPUT		lb	19.4	43.5	77.9
		N	*86.3*	*193.5*	*346.5*

TUBING SPECIFICATIONS			CC05	CC07	CC10
DEAD LENGTH*		in	1.11	1.18	1.31
		mm	*28.2*	*30*	*33.3*
WALL THICKNESS		in	0.0937	0.125	0.125
		mm	*2.38*	*3.175*	*3.175*
MATERIAL			Alum.	Alum.	Alum or Steel
TUBE SUPPORT SPAN	Alum.	in	60	60	72
		mm	*1524*	*1524*	*1829*
	Steel	in	NA	NA	78
		mm	*NA*	*NA*	*1981*

*Add to stroke length to determine overall length

CABLE SPECIFICATIONS		CC05	CC07	CC10
WIRE DIA	in	0.0468	0.0468	0.0468
	mm	*1.189*	*1.189*	*1.189*
NYLON O.D.	in	0.0937	0.0937	0.0937
	mm	*2.38*	*2.38*	*2.38*
STRAND CONFIGURATION		7 x 7	7 x 7	7 x 7
TENSILE STRENGTH	lb	270	270	270
	kg	*122.47*	*122.47*	*122.47*
PROOF-LOAD TORQUE	in-lb	15	15	15
	N-m	*1.69*	*1.69*	*1.69*
PRETENSIONING TORQUE	in-lb	2.5	2.5	2.5
	N-m	*0.28*	*0.28*	*0.28*

THEORETICAL FORCE vs PRESSURE



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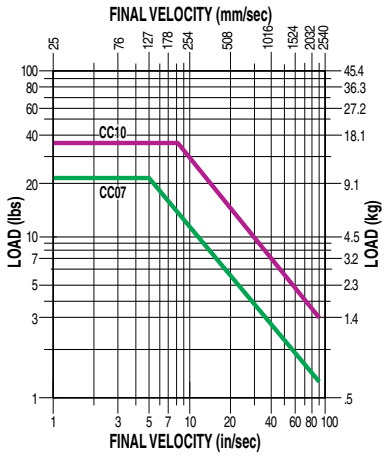
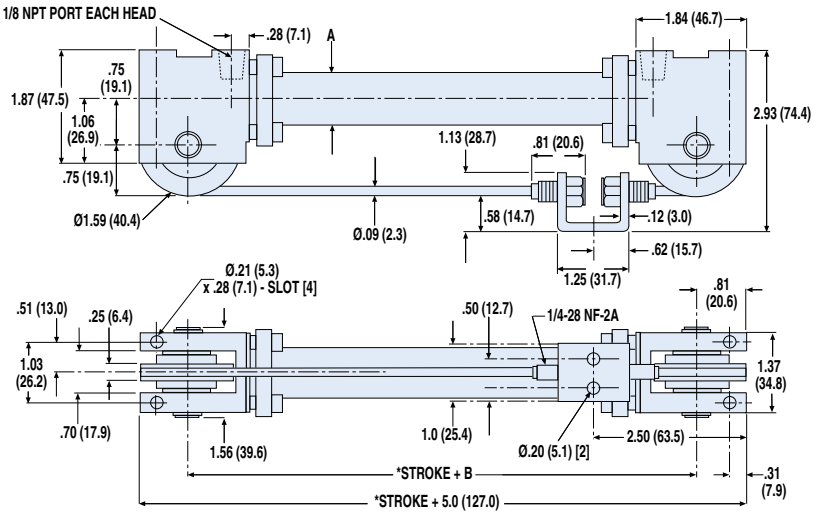


CC10
CC07
CC05

NOTE: The CC05 cylinder does not have cushions.

DIMENSIONS



*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

Double Acting Cable Cylinder - CC15

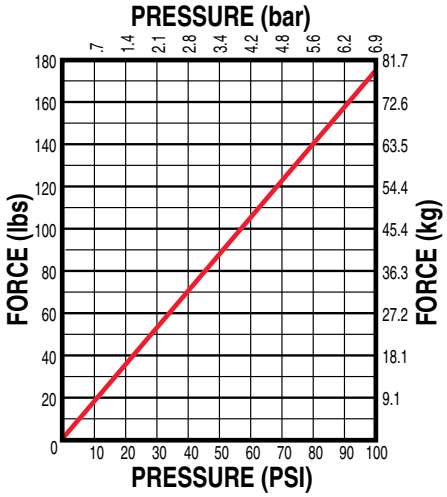
OVERALL UNIT SPECIFICATIONS			CC15
BORE SIZE		in	1.50
MAX STROKE		in	280
		mm	*7112*
BASE WEIGHT	Alum.	lb	5.12
		kg	*2.32*
	Steel	lb	5.27
		kg	*2.39*
WEIGHT PER UNIT OF STROKE	Alum.	lb per in	0.063
		g per mm	*1.1259*
	Steel	lb per in	0.181
		g per mm	*3.2322*
MAX PRESSURE		PSI	100
		bar	*6.9*
MAX TEMP		°F	140
		°C	*60*
MAX FORCE OUTPUT		lb	174
		N	*774.0*

TUBING SPECIFICATIONS			CC15
DEAD LENGTH*		in	3.40
		mm	*86.4*
WALL THICKNESS		in	0.125
		mm	*3.175*
MATERIAL			Alum. or Steel
TUBE SUPPORT SPAN	Alum.	in	84
		mm	*2134*
	Steel	in	90
		mm	*2286*

*Add to stroke length to determine overall length

CABLE SPECIFICATIONS			CC15
WIRE DIA		in	0.0937
		mm	*2.380*
NYLON O.D.		in	0.187
		mm	*4.750*
STRAND CONFIGURATION			7 x 7
TENSILE STRENGTH		lb	920
		kg	*417.30*
PROOF-LOAD TORQUE		in-lb	45
		N-m	*5.08*
PRETENSIONING TORQUE		in-lb	8
		N-m	*0.90*

THEORETICAL FORCE vs PRESSURE



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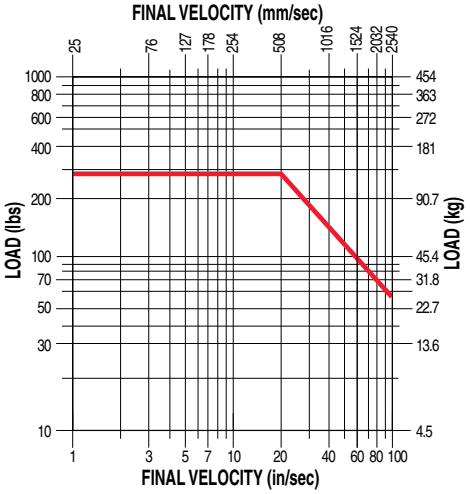
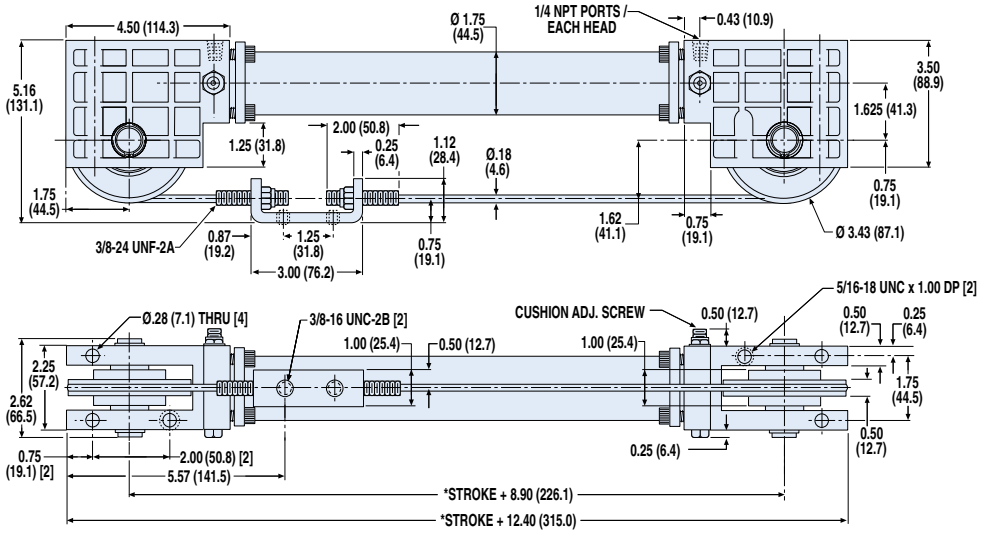


CC15

DIMENSIONS



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

Dimensions in inches, in parentheses ( ) dimensions in millimeters

Double Acting Cable Cylinder - CC20, CC25

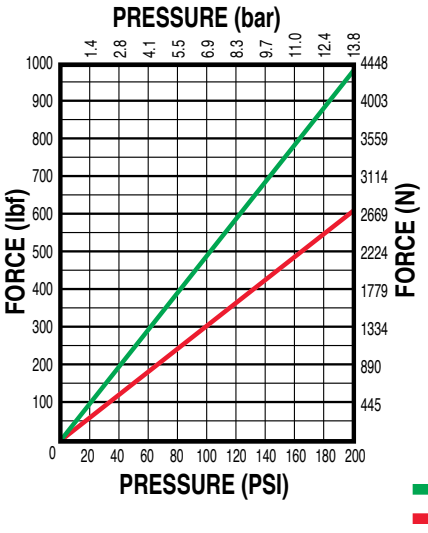
OVERALL UNIT SPECIFICATIONS			CC20	CC25
BORE SIZE		in	2.00	2.50
MAX STROKE		in	281	281
		mm	*7137*	*7137*
BASE WEIGHT	Alum.	lb	12.44	12.9
		kg	*5.64*	*5.85*
	Steel	lb	12.9	13.48
		kg	*5.85*	*6.11*
WEIGHT PER UNIT OF STROKE	Alum.	lb per in	0.083	0.103
		g per mm	*1.482*	*1.839*
	Steel	lb per in	0.236	0.292
		g per mm	*4.214*	*5.214*
MAX PRESSURE		PSI	200	200
		bar	*13.8*	*13.8*
MAX TEMP		°F	140	140
		°C	*60*	*60*
MAX FORCE OUTPUT		lb	618	972
		N	*2749*	*4324*

TUBING SPECIFICATIONS			CC20	CC25
DEAD LENGTH*		in	3.00	3.00
		mm	*76.2*	*76.2*
WALL THICKNESS		in	0.125	0.125
		mm	*3.175*	*3.175*
MATERIAL			Alum or Steel	Alum or Steel
TUBE SUPPORT SPAN	Alum.	in	90	96
		mm	*2286*	*2438*
	Steel	in	96	108
		mm	*2438*	*2743*

*Add to stroke length to determine overall length

CABLE SPECIFICATIONS		CC20	CC25
WIRE DIA	in	0.125	0.125
	mm	*3.175*	*3.175*
NYLON O.D.	in	0.250	0.250
	mm	*6.350*	*6.350*
STRAND CONFIGURATION		7 x 19	7 x 19
TENSILE STRENGTH	lb	2000	2000
	kg	*907.18*	*907.18*
PROOF-LOAD TORQUE	in-lb	115	115
	N-m	*12.99*	*12.99*
PRETENSIONING TORQUE	in-lb	46.0	73.0
	N-m	*5.20*	*8.25*

THEORETICAL FORCE vs PRESSURE



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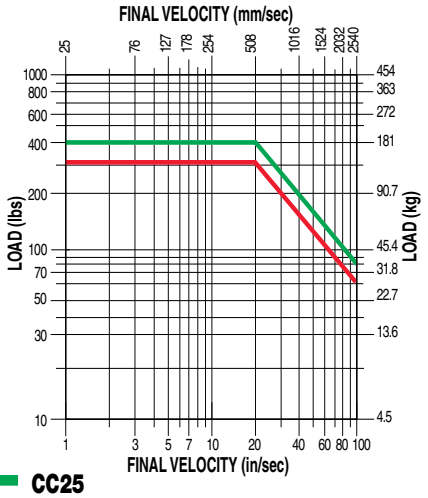

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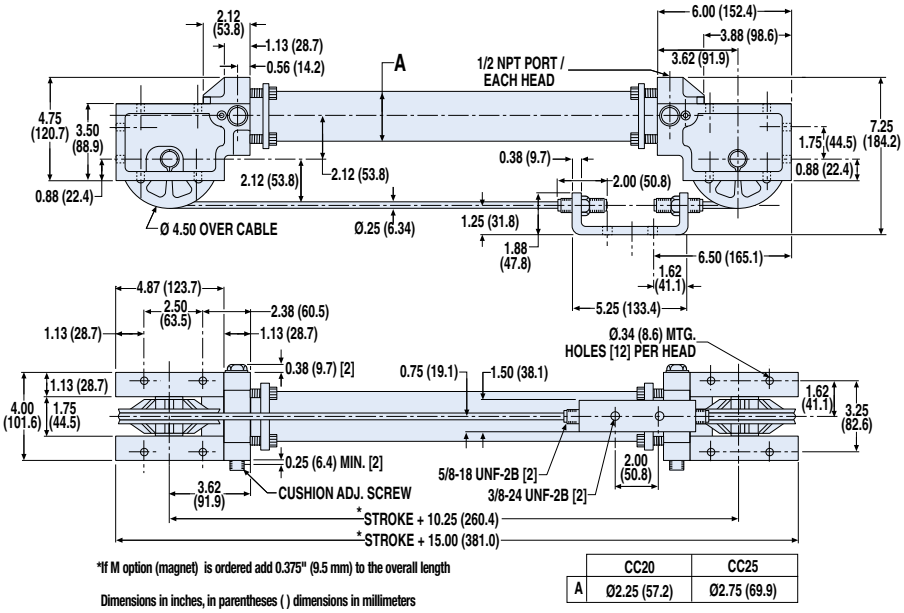


*If M option (magnet) is ordered add 0.375" (9.5 mm) to the overall length

Dimensions in inches, in parentheses ( ) dimensions in millimeters

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

Double Acting Cable Cylinder - CC30, CC40, CC52

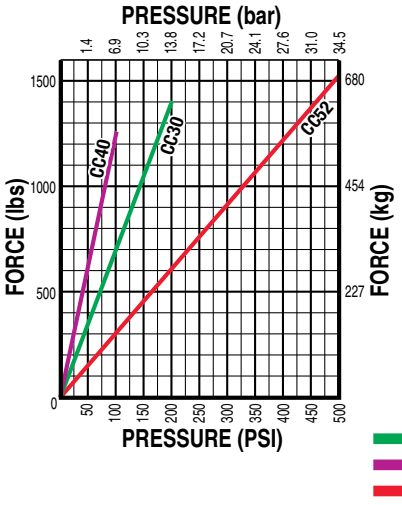
OVERALL UNIT SPECIFICATIONS			CC30	CC40	CC52
BORE SIZE		in	3.00	4.00	2.00
MAX STROKE		in	280	279	280
		mm	*7112*	*7087*	*7112*
BASE WEIGHT	Alum.	lb	18.69	20.75	12.44
		kg	*8.48*	*9.41*	*5.64*
	Steel	lb	19.45	22.09	12.9
		kg	*8.82*	*10.02*	*5.85*
WEIGHT PER UNIT OF STROKE	Alum.	lb per in	0.12	0.159	0.081
		g per mm	*2.143*	*2.839*	*1.446*
	Steel	lb per in	0.334	0.459	0.236
		g per mm	*5.965*	*8.197*	*4.214*
MAX PRESSURE		PSI	200	100	500
		bar	*13.8*	*6.9*	*34.5*
MAX TEMP		°F	140	140	140
		°C	*60*	*60*	*60*
MAX FORCE OUTPUT		lb	1398.4	1248.9	1532.4
		N	*6220*	*5555*	*6816*

TUBING SPECIFICATIONS			CC30	CC40	CC52
DEAD LENGTH*		in	3.50	4.50	3.00
		mm	*88.9*	*114.3*	*76.2*
WALL THICKNESS		in	0.125	0.125	0.125
		mm	*3.175*	*3.175*	*3.175*
MATERIAL			Alum or Steel	Alum or Steel	Alum or Steel
TUBE SUPPORT SPAN	Alum.	in	102	108	96
		mm	*2591*	*2743*	*2438*
	Steel	in	120	132	96
		mm	*3048*	*3353*	*2438*

*Add to stroke length to determine overall length

CABLE SPECIFICATIONS		CC30	CC40	CC52
WIRE DIA	in	0.187	0.187	0.187
	mm	*4.750*	*4.750*	*4.750*
NYLON O.D.	in	0.312	0.312	0.312
	mm	*7.925*	*7.925*	*7.925*
STRAND CONFIGURATION		7 x 19	7 x 19	7 x 19
TENSILE STRENGTH	lb	4200	4200	4200
	kg	*1905*	*1905*	*1905*
PROOF-LOAD TORQUE	in-lb	210	210	210
	N-m	*23.73*	*23.73*	*23.73*
PRETENSIONING TORQUE	in-lb	105	187.5	115
	N-m	*11.86*	*21.19*	*12.99*

THEORETICAL FORCE vs PRESSURE



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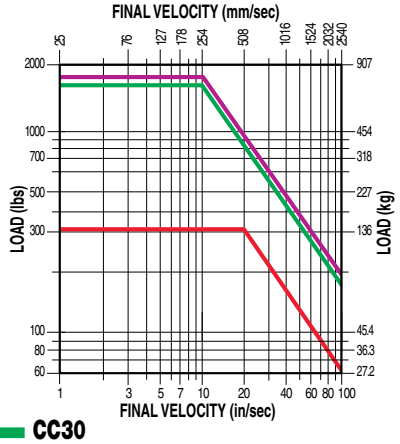
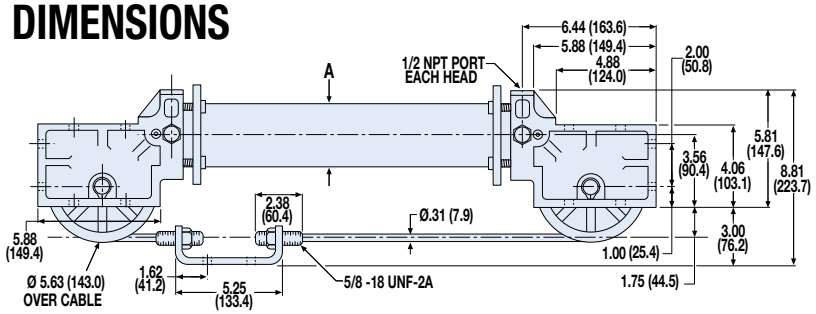
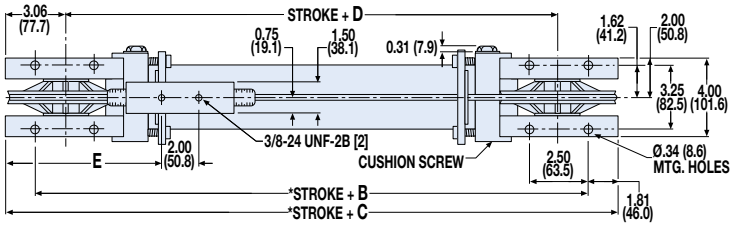


DIMENSIONS





	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 (444.5)	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

Tolomatic™ EXCELLENCE IN MOTION

3D CAD available at www.tolomatic.com
Always use configurated CAD solid model to determine critical dimensions

1-800-328-2174

Double Acting Cable Cylinder - CC50

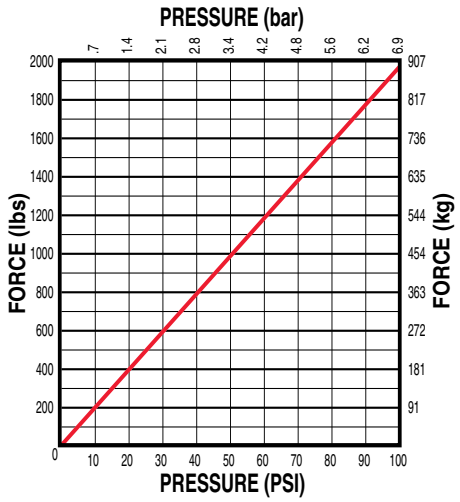
OVERALL UNIT SPECIFICATIONS			
			CC50
BORE SIZE		in	5.00
MAX STROKE		in	134
		mm	*3404*
BASE WEIGHT	Alum.	lb	30.75
		kg	*13.95*
WEIGHT PER UNIT OF STROKE	Alum.	lb per in	0.202
		g per mm	*3.786*
MAX PRESSURE		PSI	100
		bar	*6.9*
MAX TEMP		°F	140
		°C	*60*
MAX FORCE OUTPUT		lb	1919
		N	*8536*

TUBING SPECIFICATIONS			
			CC50
DEAD LENGTH*		in	6.00
		mm	*152.4*
WALL THICKNESS		in	0.125
		mm	*3.175*
MATERIAL			Alum.
TUBE SUPPORT SPAN	Alum.	in	166.8
		mm	*4237*

*Add to stroke length to determine overall length

CABLE SPECIFICATIONS		
		CC50
WIRE DIA	in	0.25
	mm	*6.350*
NYLON O.D.	in	0.375
	mm	*9.525*
STRAND CONFIGURATION		7 x 19
TENSILE STRENGTH	lb	7000
	kg	*3175.13*
PROOF-LOAD TORQUE	in-lb	325
	N-m	*36.72*
PRETENSIONING TORQUE	in-lb	180
	N-m	*20.34*

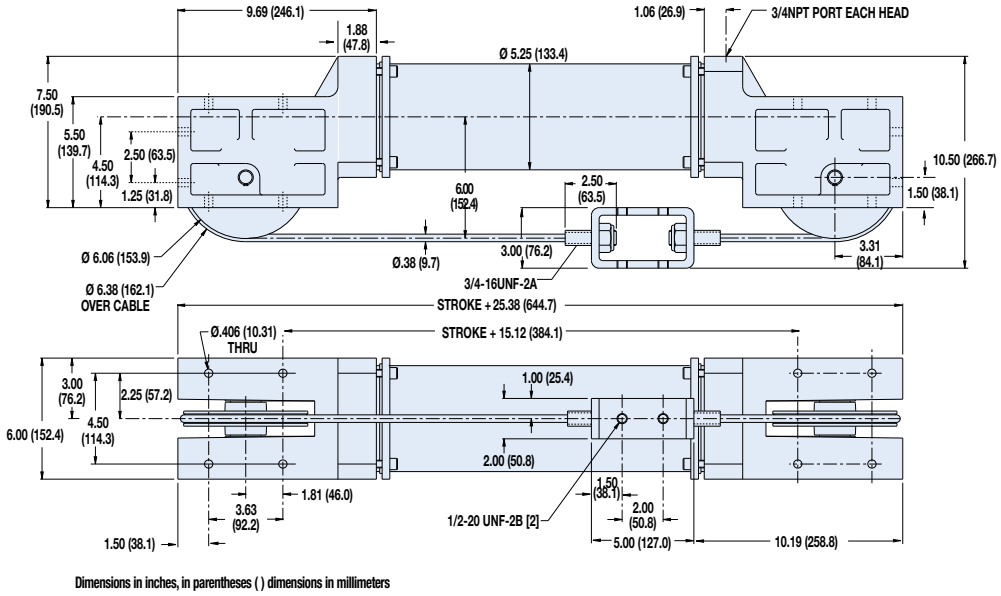
THEORETICAL FORCE vs PRESSURE



CC50

NOTE: The CC50 cylinder does not have cushions.

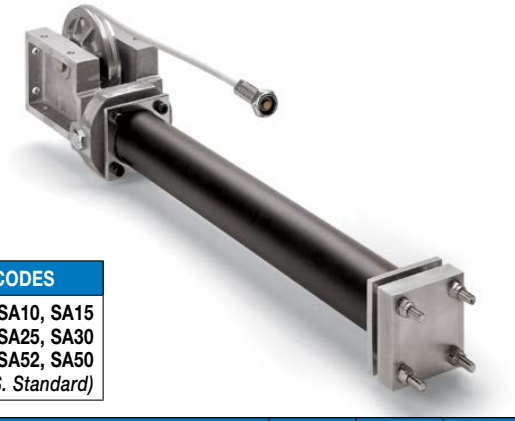
DIMENSIONS



Dimensions in inches, in parentheses ( ) dimensions in millimeters

SA Single Acting Cable Cylinder - All Sizes

FEATURES AND OPTIONS



ORDER CODES

SA07, SA10, SA15
SA20, SA25, SA30
SA40, SA52, SA50
inch (U.S. Standard)

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 switches.

SA OPTIONS	Order Code	Page	SA07	SA10	SA15	SA20	SA25	SA30	SA40	SA52	SA50
Switches (DC Reed & Triac)	(several)	CC_22	OP	OP	OP	OP	OP	OP	OP	OP	-
Aluminum Tube			ST	ST	ST	ST	ST	ST	ST	ST	ST
Steel Tube (Switches NOT available)	S		–	OP	OP	OP	OP	OP	OP	OP	-
Seals of Viton® Material	V		OP	OP	OP	OP	OP	OP	OP	OP	-
3 Ported Heads	HG		OP	OP	OP	OP	OP	OP	OP	OP	-
MORE INFORMATION	**Page**										
Application Guidelines	CC_29		ST	ST	ST	ST	ST	ST	ST	ST	ST
Cushion Needle Adjustment	CC_31		ST	ST	ST	ST	ST	ST	ST	ST	ST
Ordering	CC_33		ST	ST	ST	ST	ST	ST	ST	ST	ST
Selection	CC_24		ST	ST	ST	ST	ST	ST	ST	ST	ST
STANDARD FEATURE	**Page**										
Fixed Orifice Cushions	CC_31		ST	ST	–	–	–	–	–	–	–
Adjustable Cushions	CC_31		–	–	ST	ST	ST	ST	ST	ST	ST
Single Ported Head			ST	ST	ST	ST	ST	ST	ST	ST	ST

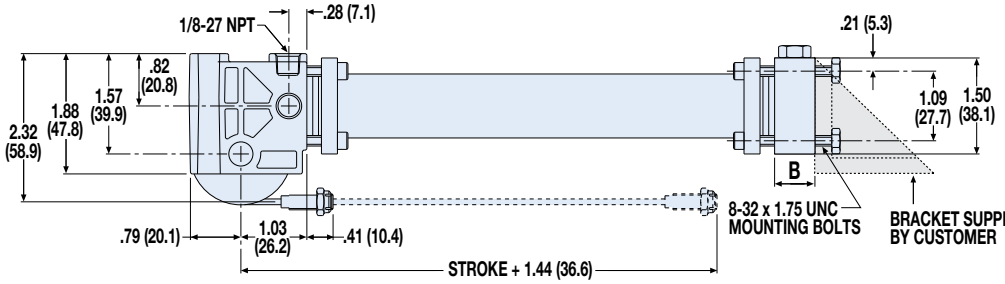
– = Not Available OP = Optional ST = Standard

NOTE: See corresponding CC (double actting cable cylinder) for performance, tubing and cable specifications Page CC_7 to Page CC_11

Single Acting Cable Cylinder - SA07, SA10, SA15

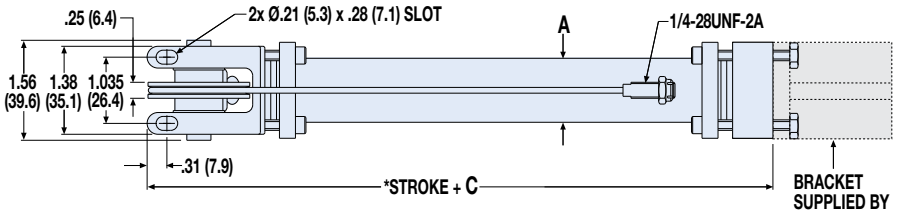
SA07, SA10

DIMENSIONS



OVERALL UNIT SPECIFICATIONS			
		SA07	SA10
BORE SIZE	in	0.75	1.00
MAX STROKE	in	138	282
	mm	*3505*	*7163*
MAX PRESSURE	PSI	100	100
	bar	*6.9*	*6.9*
MAX FORCE OUTPUT	lb	43.5	77.9
	N	*193.5*	*346.5*

NOTE: Additional specifications Page CC_7



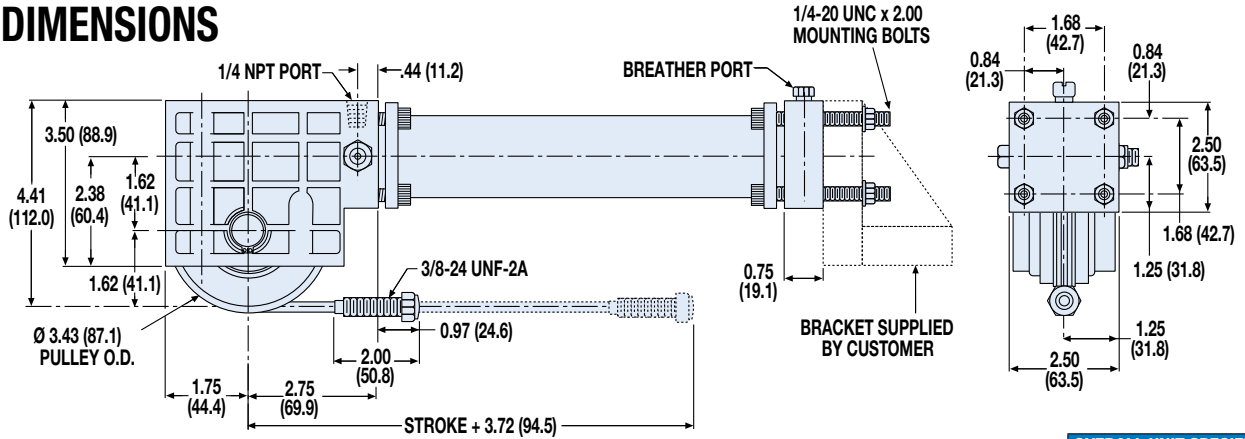
	SA07	SA10
A	Ø 1.00 (25.4)	Ø 1.25 (31.8)
B	0.50 (12.7)	0.63 (16.0)
C	3.62 (92.0)	3.81 (96.8)
D	1.46 (37.1)	1.62 (41.2)

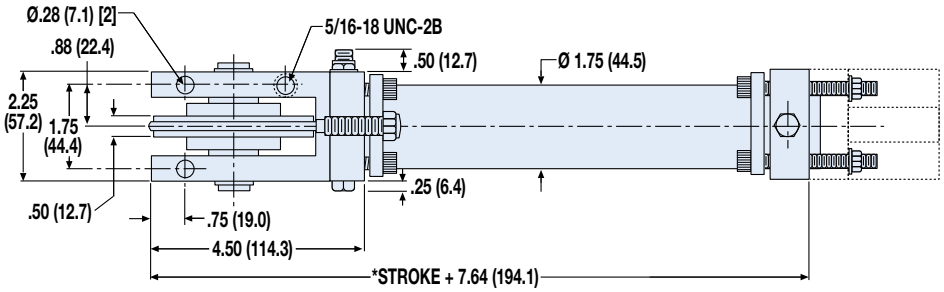
Dimensions in inches, in parentheses ( ) dimensions in millimeters

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

SA15

DIMENSIONS





OVERALL UNIT SPECIFICATIONS		
		SA15
BORE SIZE	in	1.50
MAX STROKE	in	280
	mm	*7112*
MAX PRESSURE	PSI	100
	bar	*6.9*
MAX FORCE OUTPUT	lb	174
	N	*774.0*

NOTE: Additional specifications Page CC_8

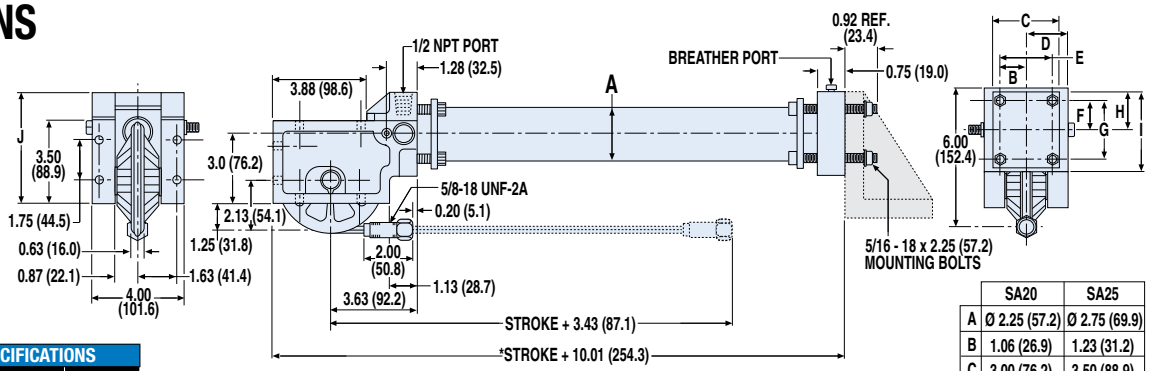
Dimensions in inches, in parentheses ( ) dimensions in millimeters

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

Single Acting Cable Cylinder - SA20, SA25, SA30, SA40, SA52

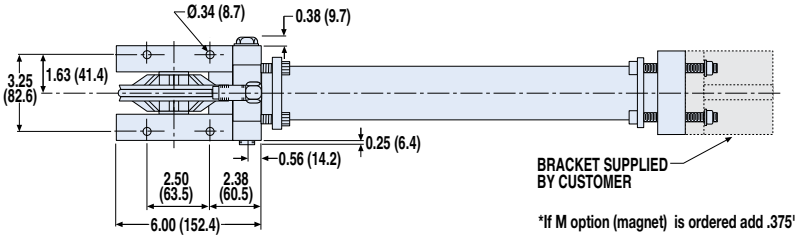
SA20, SA25

DIMENSIONS



OVERALL UNIT SPECIFICATIONS		SA20	SA25
BORE SIZE	in	2.00	2.50
MAX STROKE	in	281	281
	mm	*7137*	*7137*
MAX PRESSURE	PSI	200	200
	bar	*13.8*	*13.8*
MAX FORCE OUTPUT	lb	618.5	971.9
	N	*2751*	*4323*

	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)



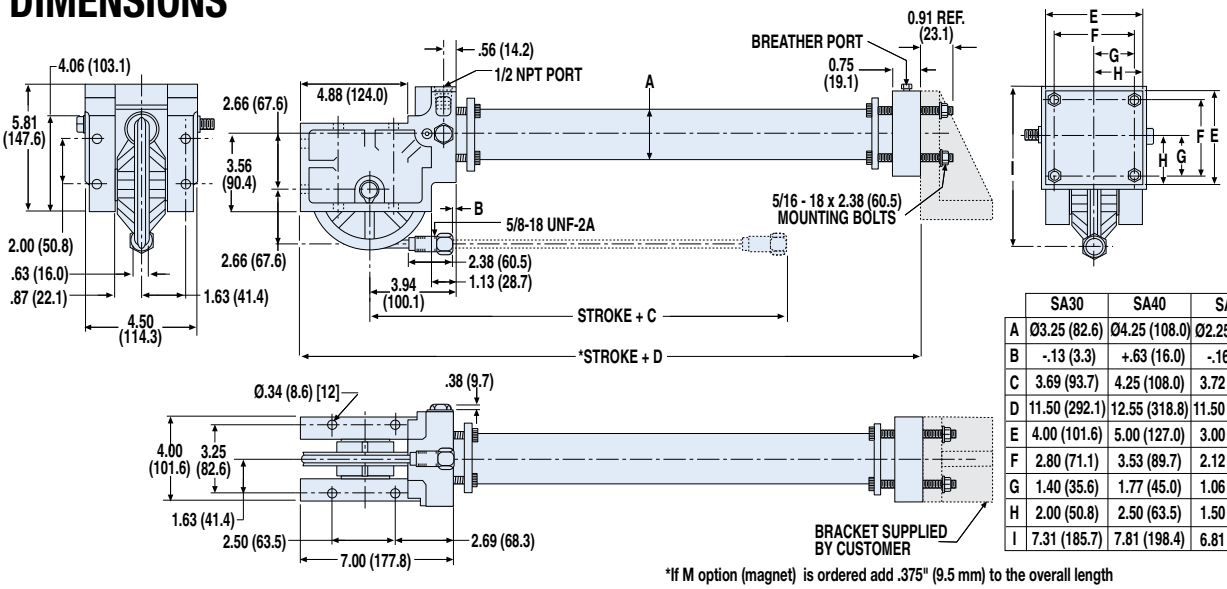
NOTE: Additional specifications Page CC_9

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

Dimensions in inches, in parentheses ( ) dimensions in millimeters

SA30, SA40, SA52

DIMENSIONS



	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

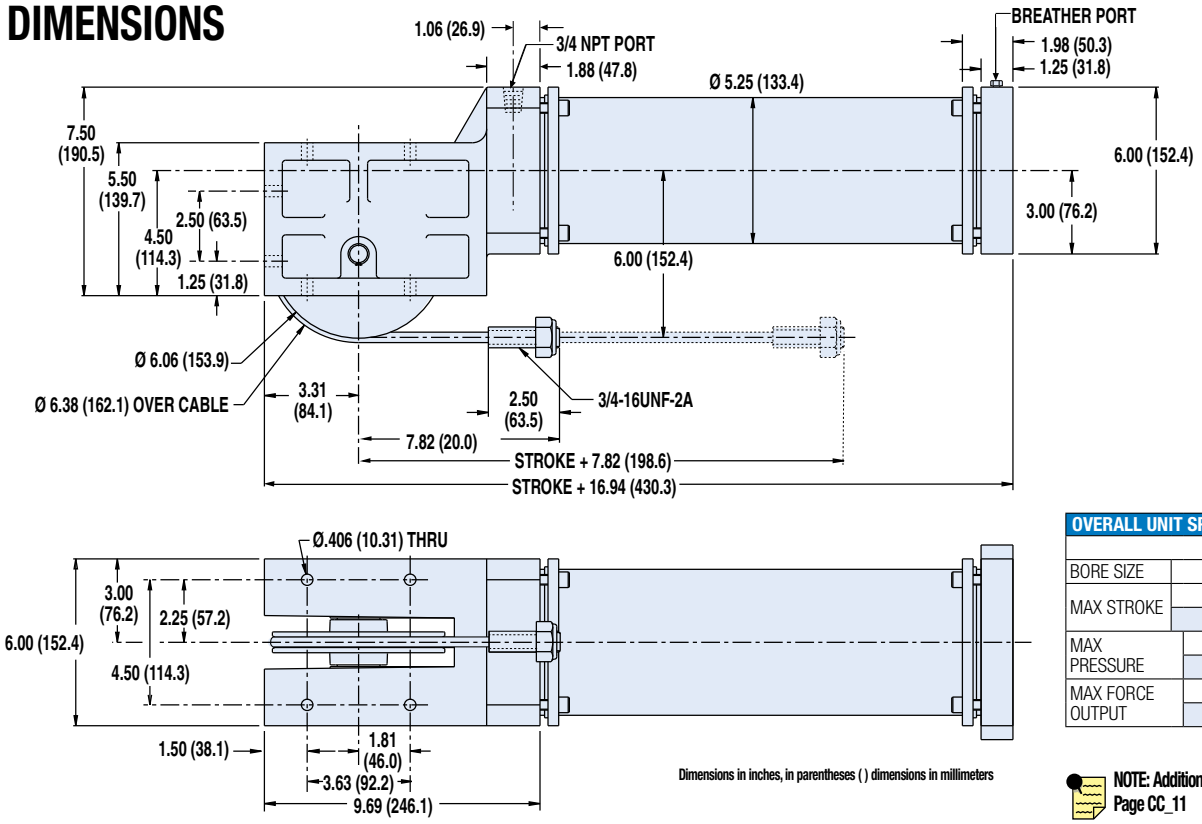
OVERALL UNIT SPECIFICATIONS		SA30	SA40	SA52
BORE SIZE	in	3.00	4.00	2.50
MAX STROKE	in	280	279	280
	mm	*7112*	*7087*	*7112*
MAX PRESSURE	PSI	200	100	500
	bar	*13.8*	*6.9*	*34.5*
MAX FORCE OUTPUT	lb	1398.4	1248.9	1532.4
	N	*6220*	*5555*	*6816*

Dimensions in inches, in parentheses ( ) dimensions in millimeters

NOTE: Additional specifications Page CC_10

SA50

DIMENSIONS



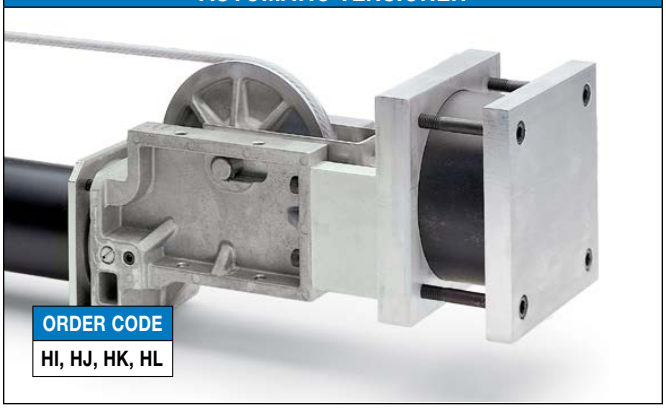
Dimensions in inches, in parentheses ( ) dimensions in millimeters

OVERALL UNIT SPECIFICATIONS		
		SA50
BORE SIZE	in	5.00
MAX STROKE	in	134
	mm	*3404*
MAX PRESSURE	PSI	100
	bar	*6.9*
MAX FORCE OUTPUT	lb	1919
	N	*8536*

NOTE: Additional specifications Page CC_11

CC Automatic Tensioner - All Sizes

AUTOMATIC TENSIONER



ORDER CODE
HI, HJ, HK, HL

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 Method or the Field Method in order for the auto tensioner to achieve the maximum stroke lengths shown in the table below. (For more information on proof-loading and pretensioning, please see page CC_29)

	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 1" stroke unit	NA	134.4	134.4	361.2	260.4	159.6	243.6	134.4	NA	266.8
Auto Tensioner with two 1" stroke units	NA	252.0	252.0	579.6	369.6	266.8	344.4	193.2	NA	327.6
Auto Tensioner with one 2" stroke unit	NA	NA	NA	NA	369.6	266.8	344.4	193.2	468.0	327.6
Auto Tensioner with two 2" stroke units	NA	NA	NA	NA	524.4	322.8	487.2	277.2	714.0	472.8

Above Dimensions 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 1" stroke unit	*NA*	*3.41*	*3.41*	*9.17*	*6.61*	*4.05*	*6.19*	*3.41*	*NA*	*6.78*
Auto Tensioner with two 1" stroke units	*NA*	*6.40*	*6.40*	*14.72*	*9.39*	*6.78*	*8.75*	*4.91*	*NA*	*8.32*
Auto Tensioner with one 2" stroke unit	*NA*	*NA*	*NA*	*NA*	*9.39*	*6.78*	*8.75*	*4.91*	*11.89*	*8.32*
Auto Tensioner with two 2" stroke units	*NA*	*NA*	*NA*	*NA*	*13.32*	*8.20*	*12.37*	*7.04*	*18.14*	*12.01*

Above Dimensions in METERS

NOTE: Tube couplers are required on cable cylinders with strokes over 280 inches (7.11m).

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
(1-½ inch bore) with one 1-inch stroke AT unit:

Actual PSI: 80
Max. PSI: 100
Differential: 20%
20% x 361.2 in. (maximum stroke) = 72.24 in.
72.24 in. + 361.2 in. = 433.44 in. (36.12 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.

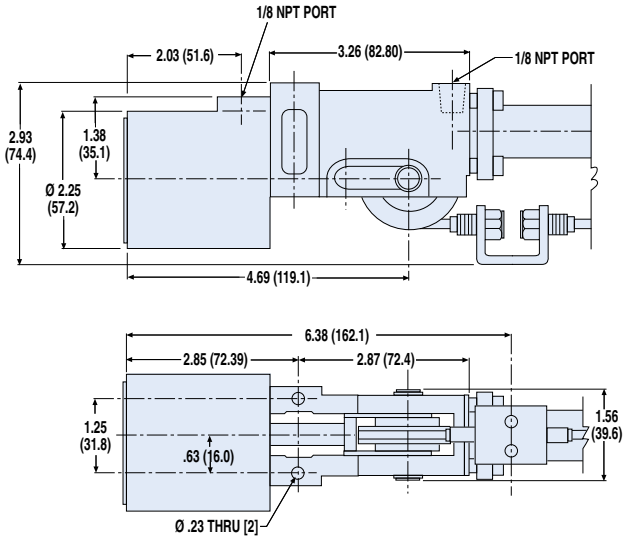
NOTE: When using an AT unit in an application where the cylinder is loaded in only one direction, it is recommended to have the AT unit located so the load direction of travel is away from the AT unit. On vertical applications, the AT unit should be located on the bottom.

AUTO TENSIONER PRESSURE SETTINGS

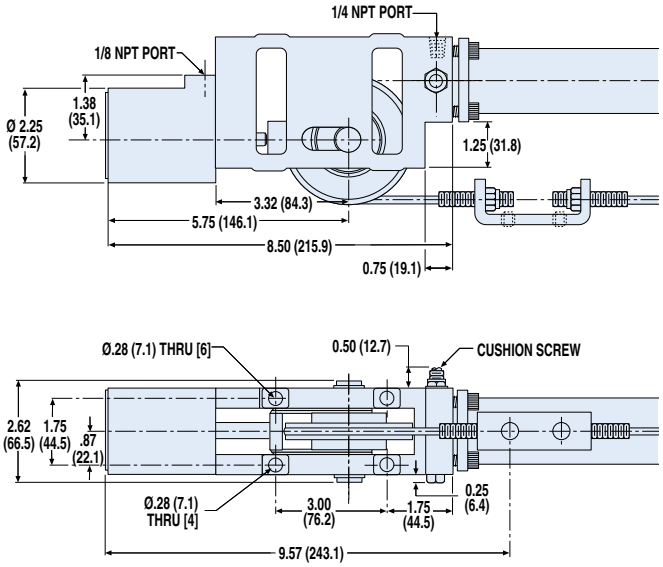
FOR MODEL	% OF LOAD PRESSURE
CC07	22%
CC10	40%
CC15	86%
CC20	32%
CC25	51%
CC30	54%
CC40	96%
CC50	75%
CC52	24%

DIMENSIONS

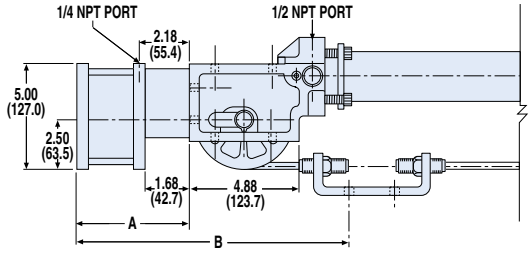
AT FOR CC07, CC10



AT FOR CC15

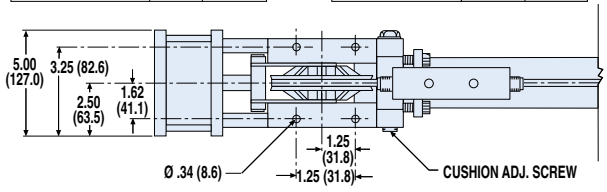


AT FOR CC20, CC25



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



Dimensions in inches, in parentheses ( ) dimensions in millimeters

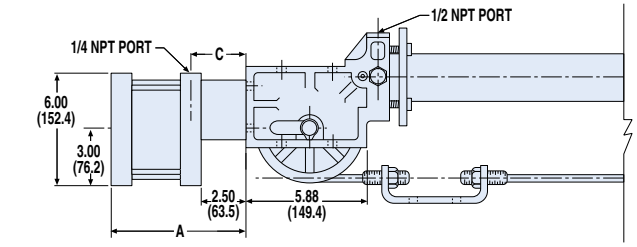
SPACE AND WEIGHT REQUIREMENTS		
MODEL	DEAD LENGTH (in)*	WEIGHT (lbs)
CC07	8.87	1.06
CC10	8.87	1.06
CC15	16.41	2.76
CC20	20.66	8.41
CC25	20.66	8.41

*Add dead length to stroke length to determine overall cylinder length

SPACE AND WEIGHT REQUIREMENTS		
MODEL	DEAD LENGTH (mm)*	WEIGHT (kg)
CC07	225	0.48
CC10	225	0.48
CC15	417	1.25
CC20	525	3.81
CC25	525	3.81

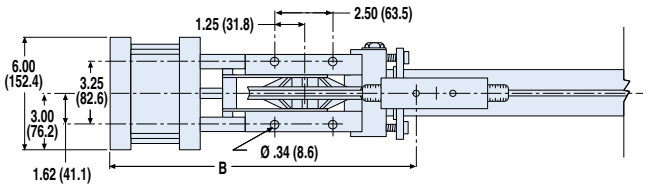
DIMENSIONS

AT FOR CC30, CC40, CC52

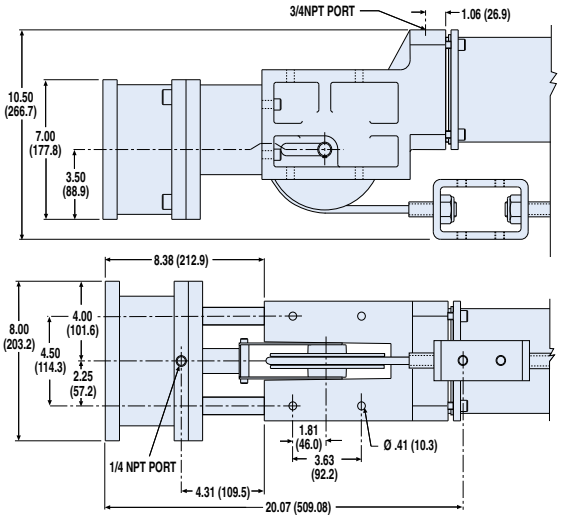


MODEL	A	B	C
1" Stroke Tensioner	6.38"	14.12"	3.01"
2" Stroke Tensioner	7.38"	15.12"	3.50"

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)
CC30	23.88	14.36
CC40	24.88	14.36
CC52	23.88	14.36
CC50	33.75	23.68

*Add dead length to stroke length to determine overall cylinder length

SPACE AND WEIGHT REQUIREMENTS		
MODEL	DEAD LENGTH (mm)*	WEIGHT (kg)
CC30	607	6.51
CC40	632	6.51
CC52	607	6.51
CC50	857	10.74

CC Cylinder/Brake Combinations - All Sizes

CALIPER DISC BRAKE

ORDER CODE
HM, HN

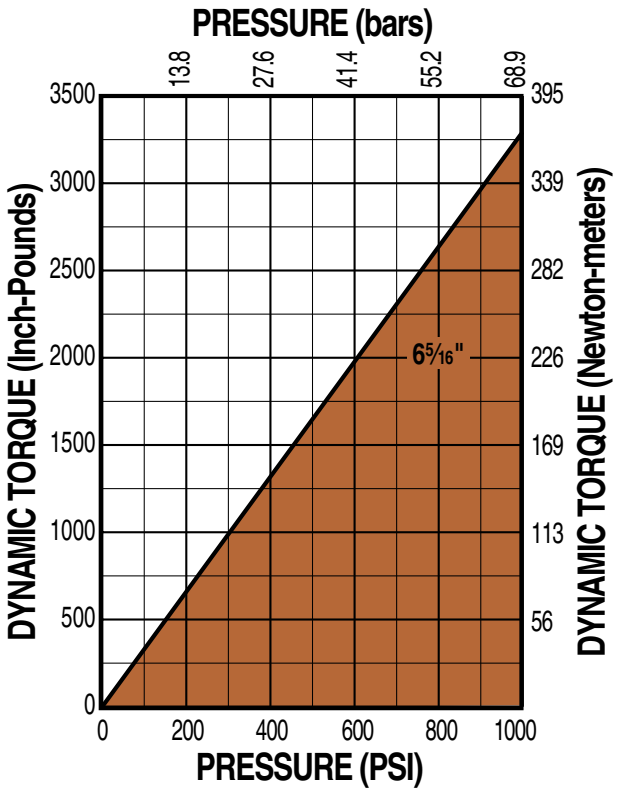
Caliper disc brakes can be used to add holding force in horizontal applications and aid in deceleration at the end of stroke. Caliper disc brakes must be used with an automatic tensioner to function properly. See page CC_26 for selection information and braking formulae.

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

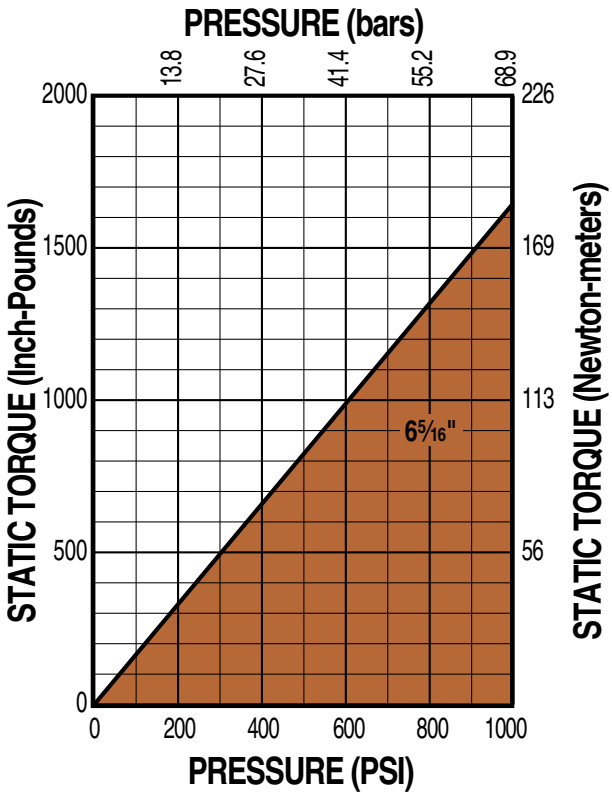
	CC15	CC20	CC25	CC30	CC40	CC52
Brake Number	0728-0010	0728-0010	0728-0010	0728-0010	0728-0010	0728-0010
Disc & Hub No.	0801-0008	0801-0010	0801-0010	0801-0010	0801-0010	0801-0010

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

DYNAMIC TORQUE
H-20 BRAKE with 6-5/16" DISC
(FOR CC15, CC20, CC25, CC30, CC40, CC52)

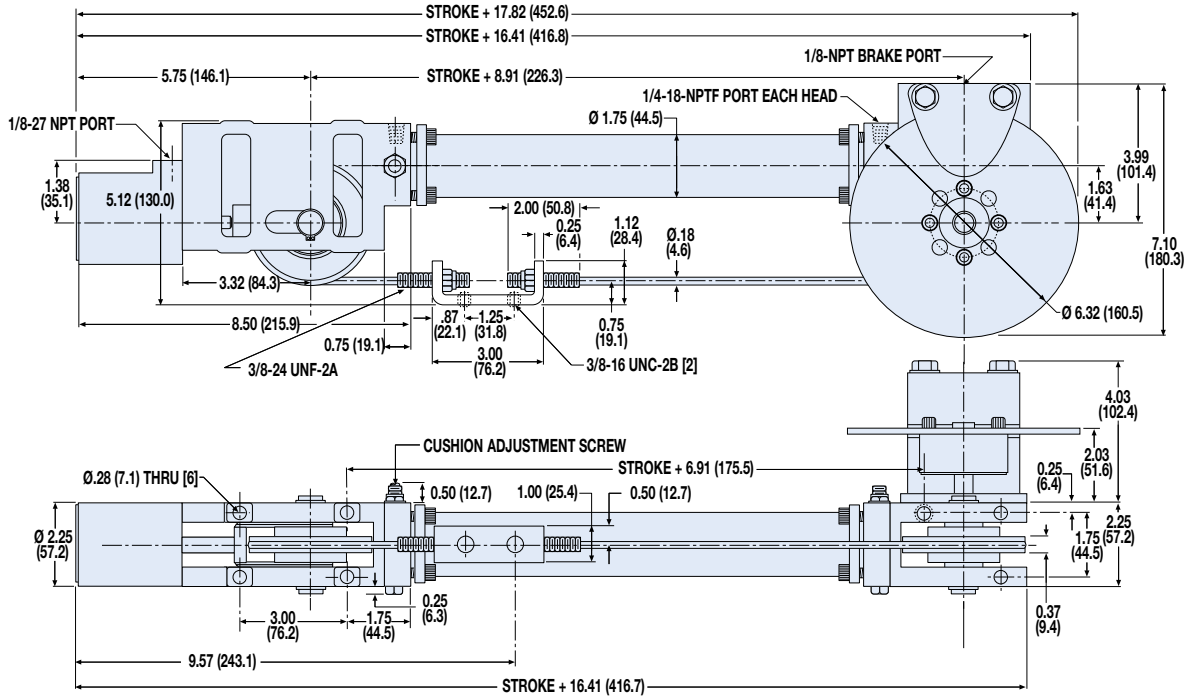


STATIC TORQUE
H-20 BRAKE with 6-5/16" DISC
(FOR CC15, CC20, CC25, CC30, CC40, CC52)

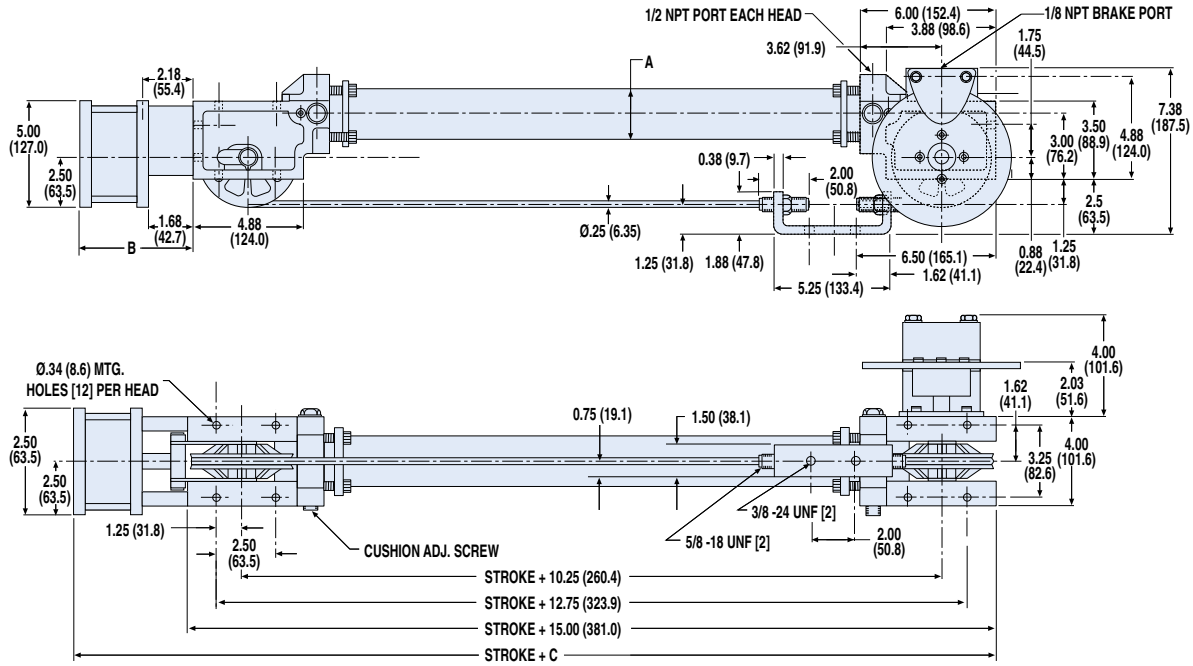


DIMENSIONS

CYLINDER/ BRAKE COMBINATION FOR CC15



CYLINDER/ BRAKE COMBINATION FOR CC20, CC25



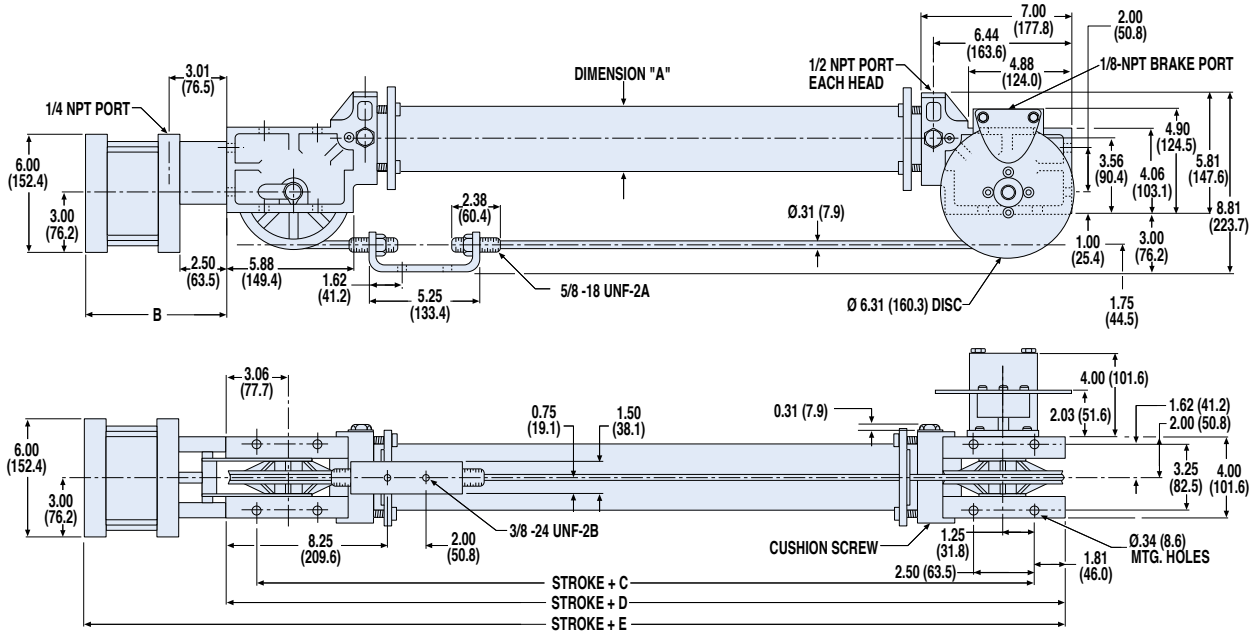
MODEL	A	B	C
CC20 w/ 1" Stroke Tensioner	Ø 2.25"	5.66"	20.66"
CC20 w/ 2" Stroke Tensioner	Ø 2.25"	6.66"	22.15"
CC25 w/ 1" Stroke Tensioner	Ø 2.75"	5.66"	20.66"
CC25 w/ 2" Stroke Tensioner	Ø 2.75"	6.66"	22.15"

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

DIMENSIONS

CYLINDER/ BRAKE COMBINATION FOR CC30, CC40, CC52

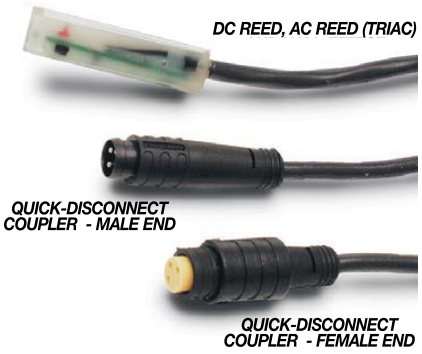


MODEL	A	B	C	D	E
CC30 w/ 1" Stroke Tensioner	Ø 3.25"	6.38"	13.87"	17.50"	23.89"
CC30 w/ 2" Stroke Tensioner	Ø 3.25"	7.38"	13.87"	17.50"	24.89"
CC40 w/ 1" Stroke Tensioner	Ø 4.25"	6.38"	14.87"	18.50"	24.89"
CC40 w/ 2" Stroke Tensioner	Ø 4.25"	7.38"	14.87"	18.50"	25.88"
CC52 w/ 1" Stroke Tensioner	Ø 2.25"	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	634.5mm
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

SWITCHES



sensing choices: DC reed, form A (open) or form C (open or closed); AC reed (Triac, 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
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					

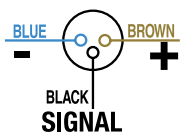
CAUTION: DO NOT OVER TIGHTEN SWITCH HARDWARE WHEN INSTALLING!

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

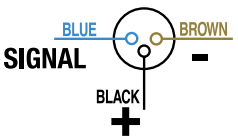
*QD = Quick Disconnect; Male coupler is located 6" [152mm} from sensor,
Female coupler to flying lead distance is 197" [5m] also see Cable Shielding specification above

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)

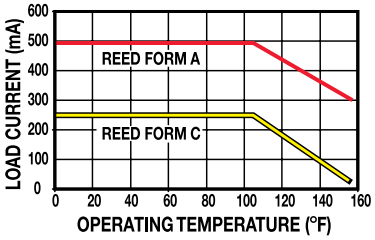
†Shielded from the female quick disconnect coupler to the flying leads. Shield should be terminated at flying lead end.

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

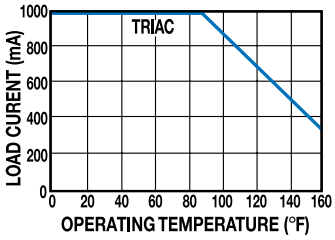
CC, SA Switches - All Sizes

PERFORMANCE

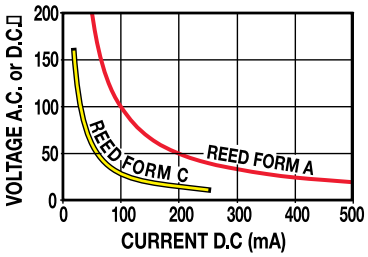
TEMP. vs CURRENT, DC REED



TEMP. vs CURRENT, AC REED

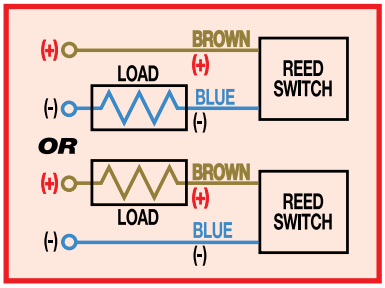


VOLTAGE DERATING, DC REED

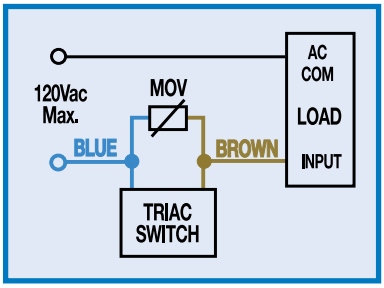


WIRING DIAGRAMS

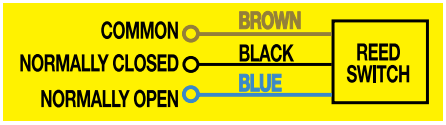
R T & R M DC REED, FORM A



C T & C M AC REED, TRIAC



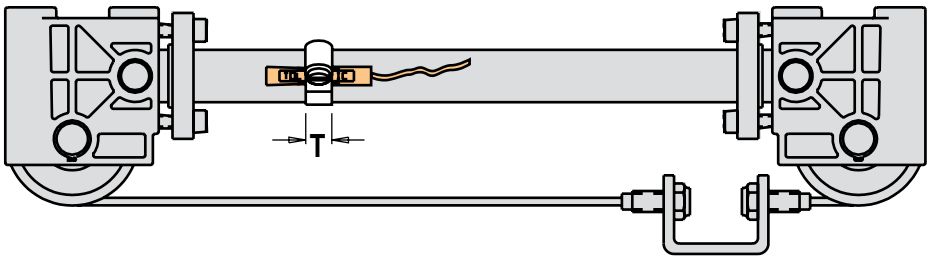
B T & B M DC REED, FORM C



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
CCM05	0.50	0.81	1.09	0.35	0.31
CCM07	0.75	0.81	1.09	0.35	0.31
CCM10	1.00	1.12	1.65	0.35	0.31
CCM15	1.50	1.56	2.15	0.35	0.31
CCM20	2.00	2.08	2.65	0.35	0.31
CCM52	2.00	2.08	2.65	0.35	0.31
CCM25	2.50	2.75	3.15	0.35	0.31
CCM30	3.00	3.25	3.65	0.35	0.31
CCM40	4.00	4.25	4.65	0.35	0.56
CCM50	5.00	5.25	5.65	0.35	0.56

Above dimensions in inches
*Inside Dimension ±.06"

MODEL	BORE	A*	B	C	T
CCM05	0.50"	20.57	27.69	8.76	7.87
CCM07	0.75"	20.57	27.69	8.76	7.87
CCM10	1.00"	28.45	41.91	8.76	7.87
CCM15	1.50"	39.62	54.61	8.76	7.87
CCM20	2.00"	52.83	67.31	8.76	7.87
CCM52	2.00"	52.83	67.31	8.76	7.87
CCM25	2.50"	69.85	80.01	8.76	7.87
CCM30	3.00"	82.55	92.71	8.76	7.87
CCM40	4.00"	107.95	118.11	8.76	14.22
CCM50	5.00"	133.35	143.51	8.76	14.22

Above dimensions in millimeters
*Inside Dimension ±1.5mm

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	CCM05	CCM07 SAM07	CCM10 SAM10	CCM15 SAM15	CCM20 SAM20	CCM52 SAM52	CCM25 SAM25	CCM30 SAM30	CCM40 SAM40	CCM50
	BORE	0.50"	0.75"	1.00"	1.50"	2.00"	2.00"	2.50"	3.00"	4.00"	5.00"
SPACE REQUIREMENTS - ADD DEAD LENGTH TO STROKE LENGTH	IN.	1.62	1.62	1.62	0.375	0.375	0.375	0.375	0.375	0.375	0
	MM	41.2	41.2	41.2	9.5	9.5	9.5	9.5	9.5	9.5	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_25.)

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_29 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.

Example: If the cylinder selected is a CC15 (1½ - inch bore):

Actual PSI:	**80**
Max. PSI:	**100**
Differential:	**20%**

20% x 126 in. (maximum stroke) = 25.2 in.

25.2 + 126 = 151.2 in. (12.6 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_16.

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_29 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.

5 CONSIDER OPTIONS

Avialable options for cable cylinders include:

- Auto Tensioner
- Caliper Disc Brake
- Switches (DC Reed & Triac)
- Steel Tube *(Switches NOT available)*
- Seals of Viton® Material
- 3 Ported Heads

CC: Cable Cylinder Selection Example

The procedure for selection of cable cylinder and magnetically coupled cylinder are very similar. For illustrative purposes, charts for the CC10 model are used in this example.

1 COMPILE APPLICATION REQUIREMENTS

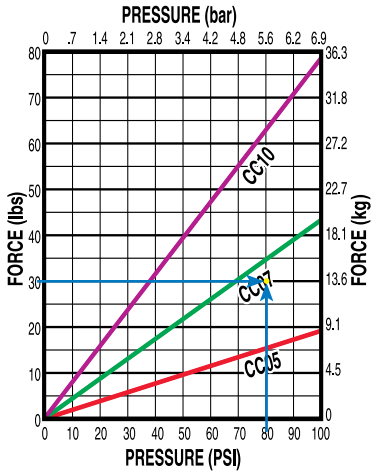
- Available pressure **80 psi**
- Weight of load **30 lbs.**
- Orientation of load **horiz.**
- Final velocity* of load **10"per sec**
- Stroke length **68"**

*2x average velocity, see page CC_30

2 SELECT CYLINDER SIZE

- Consult the Theoretical Force vs. Pressure charts.
- Cross-reference the load force and the available operating pressure. In this example a CC07 would accommodate this load at the available PSI.

THEORETICAL FORCE vs PRESSURE

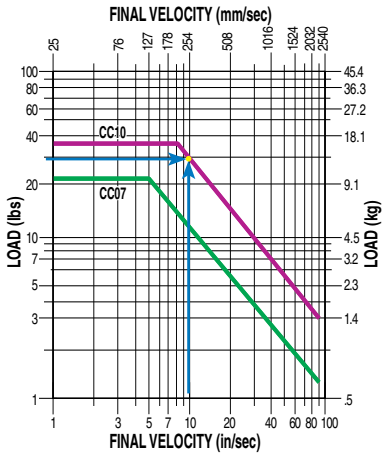


3 DETERMINE INTERNAL CUSHION CAPACITY

- Consult the Cushion Data Chart for the model selected.

In this example the calculated value for the final velocity and the load intersect at the line for the internal cushions capacity. Thus the CC10 will work for this application.

CUSHION DATA



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

- Consult the chart at right.

In our example we are using 80 PSI, the chart indicates a maximum of 100 PSI, so we can calculate the maximum stroke length with manual adjustment:

1.20 x 20.4" = 24.48"

Our stroke length is 68" so it will require the automatic tensioner option.

5 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

CC MAXIMUM STROKE LENGTHS

For Full Manual Cable Adjustment

	BORE	MAX PRESSURE		MAX STROKE	
	in	PSI	*bar*	in	*mm*
CC05	0.50	100	*6.89*	20.40	*518.2*
CC07	0.75	100	*6.89*	20.40	*518.2*
CC10	1.00	100	*6.89*	20.40	*518.2*
CC15	1.50	100	*6.89*	126.00	*3200.4*
CC20	2.00	200	*13.79*	159.60	*4053.8*
CC25	2.50	200	*13.79*	100.80	*2560.3*
CC30	3.00	200	*13.79*	151.20	*3840.5*
CC40	4.00	100	*6.89*	84.00	*2133.6*
CC50	5.00	100	*6.89*	222.00	*5638.8*
CC52	2.00	500	*34.47*	134.40	*3413.8*

CC: Caliper Disc Brake for Cable Cylinder Selection Guidelines

CALIPER DISC BRAKE

ORDER CODE
HM, HN

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 (P_c).

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.

$$F_c = P_c \times A_c$$

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.

NOMENCLATURE

- a = Deceleration, in/sec^2
- g = Deceleration due to gravity = 386.4 in/sec^2
- f^* = Coefficient of friction of sliding load
- f_c = Coefficient of friction between cable and sheave
- F_c = Unbalanced cylinder force, lbs.
- F_{ta} = Tangential braking force required with pressure still applied when braking, lbs.
- F_{tr} = Tangential braking force required with pressure removed prior to braking, lbs.
- L_{tr} = Tension in cable of brake side half while braking with pressure removed, lbs.
- L_{ta} = Tension in cable of brake side half while braking with pressure applied, lbs.
- L_{trm} = Maximum tension in cable with pressure removed while braking, lbs.
- L_{tam} = Maximum tension in cable with pressure applied while braking, lbs.
- S = Stopping distance, inches
- T = Stopping time, seconds
- V = Velocity of load, in/sec.
- W = Weight of load, lbs.
- W_e = Equivalent Load, lbs. $W_e = W (\sin \vartheta + f \cos \vartheta)$
- ϑ = Angle of inclination ($\theta = 0°$ for horizontal, $\theta = 90°$ for vertical)
- R_s = Root radius of sheave groove, inches
- P_c = Load Pressure, PSI
- A_c = Area of cable cylinder bore, in^2
- P_t = Load Pressure, PSI
- A_t = Area of tensioner cylinder, in^2
- P_{ba} = Brake pressure setting. Pressure applied while braking, PSI
- P_{br} = Brake pressure setting. Pressure removed while braking, PSI

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

Carefully note conditions:

$$F_{tr} = W\left[\left(\frac{a}{g} - \sin\vartheta\right) - (f\cos\vartheta)\right], \text{ Horizontal or Load rising}$$

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

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

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

$$= F_c + W\left(\frac{a}{g} - 1\right), \text{ Vertical load rising}$$

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

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

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

$$L_{tr} = \frac{F_{tr}}{0.369}, \text{ lbs.; Pressure removed while braking}$$

$$L_{ta} = \frac{F_{ta}}{0.369}, \text{ lbs.; Pressure applied while braking}$$

CC: Caliper Disc Brake for Cable Cylinder Selection Guidelines

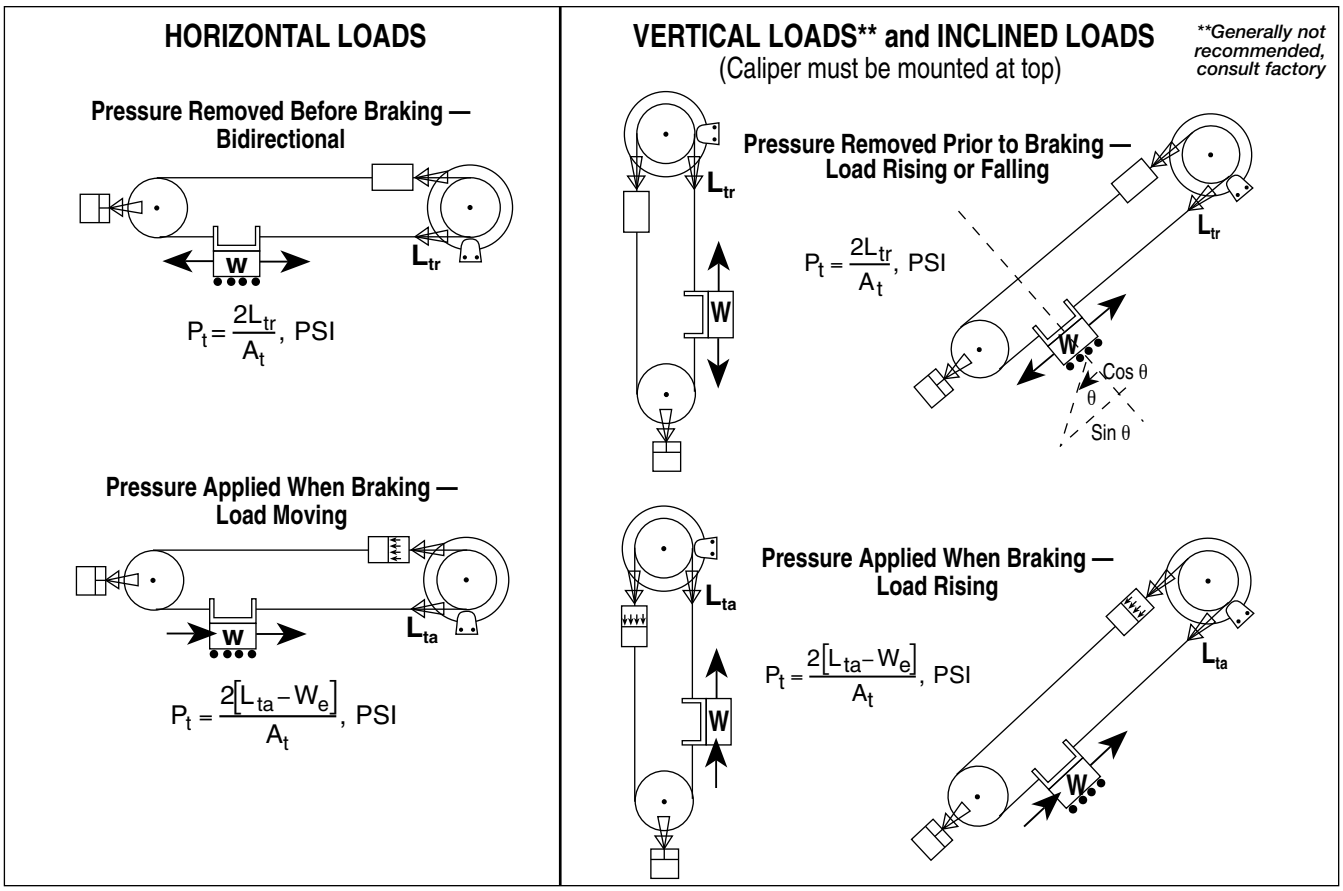


Figure 1

5. Calculate tensioner pressure setting, (P_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.; Pressure removed prior to braking bidirectional

$L_{tam} = L_{ta}$, lbs.; Pressure applied when braking and load moving toward caliper

$L_{tam} = L_{ta} + 2W_e$, lbs.; Pressure applied when braking and load moving away from caliper.

Vertical or Inclined Loads:

$L_{trm} = L_{tr} + W_e$, lbs.; Pressure removed prior to braking and load rising or falling

$L_{tam} = L_{ta}$, lbs.; Pressure still applied when braking 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

$P_{br} = .113[L_{tr}R_s]$, PSI; Pressure removed prior to braking

$P_{ba} = .113[L_{ta}R_s]$, PSI; Pressure still applied when braking

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 brake can hold the load if:

$.369\ L_{tr} \geq W_e$

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

Table 1

	A_t; in^2	R_s; in.	A_c; in^2
CC07	2.30		
CC10	2.30		
CC15	2.30	1.531	1.767
CC20	11.96	2.00	3.142
CC25	11.96	2.00	4.909
CC30	16.20	2.50	7.069
CC40	16.20	2.50	12.566
CC52	16.20	2.50	3.142
CC50	27.05		

Application Data Worksheet

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

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

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

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

MOVE TIME sec. _____

NO. OF CYCLES _____
❑ per minute ❑ per hour

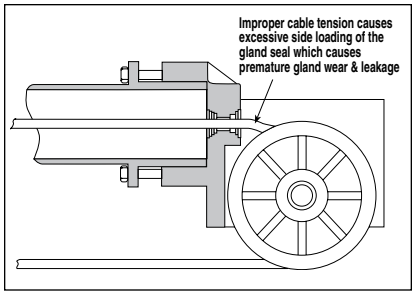
OTHER ISSUES: (i.e. Environment, Temperature, Contamination, etc.) _____

Contact information: _____

Call Tolomatic 763-478-8000 (1-800-328-2174) with the above information. We will provide any assistance needed to determine the proper actuator.

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

1. **Tighten the clevis terminal lock nuts equally with a torque wrench to the values listed under Proof-loading torque in the Proof-loading, Pretensioning table below.**
2. **Let tightened nuts sit for 30 seconds.**
3. **Loosen the lock nuts to remove tension (but tight enough to eliminate any slack).**
4. **Re-torque clevis terminal lock nuts equally with a torque wrench to the total preten-sioning figures listed in the table below.**

PROOF-LOADING AND PRETENSIONING TORQUE OF CABLES

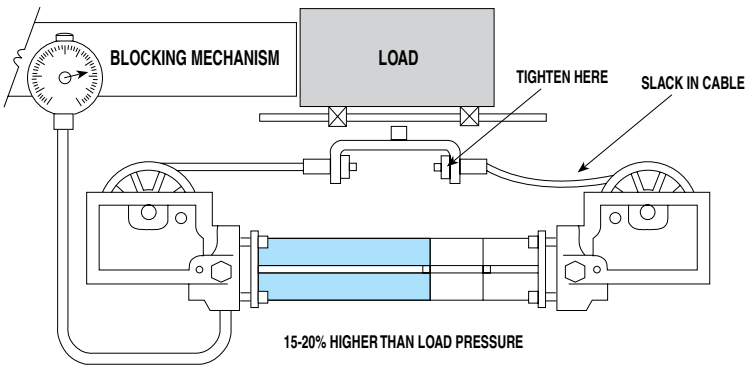
CC Model	Proof-loading Torque		Pretensioning Torque		+ Starting Torque of Nuts on Terminals		= Total Pretensioning Torque	
CC05	15 in.-lbs.	1.69 N-m	2.5 in.-lbs.	0.28 N-m	10 in.-lbs.	1.13 N-m	12.5 in.-lbs.	1.41 N-m
CC07	15 in.-lbs.	1.69 N-m	2.5 in.-lbs.	0.28 N-m	10 in.-lbs.	1.13 N-m	12.5 in.-lbs.	1.41 N-m
CC10	15 in.-lbs.	1.69 N-m	2.5 in.-lbs.	0.28 N-m	10 in.-lbs.	1.13 N-m	12.5 in.-lbs.	1.41 N-m
CC15	45 in.-lbs.	5.08 N-m	8.0 in.-lbs.	0.90 N-m	20 in.-lbs.	2.26 N-m	28.8 in.-lbs.	3.25 N-m
CC20	115 in.-lbs.	12.99 N-m	46.0 in.-lbs.	5.20 N-m	25 in.-lbs.	2.82 N-m	71.0 in.-lbs.	8.02 N-m
CC25	115 in.-lbs.	12.99 N-m	73.0 in.-lbs.	8.25 N-m	25 in.-lbs.	2.82 N-m	98.0 in.-lbs.	11.07 N-m
CC30	210 in.-lbs.	23.73 N-m	105.0 in.-lbs.	11.86 N-m	25 in.-lbs.	2.82 N-m	130.0 in.-lbs.	14.69 N-m
CC40	210 in.-lbs.	23.73 N-m	187.5 in.-lbs.	21.19 N-m	25 in.-lbs.	2.82 N-m	212.5 in.-lbs.	24.01 N-m
CC50	325 in.-lbs.	36.72 N-m	180.0 in.-lbs.	20.34 N-m	30 in.-lbs.	3.39 N-m	210.0 in.-lbs.	23.73 N-m
CC52	210 in.-lbs.	23.73 N-m	115.0 in.-lbs.	12.99 N-m	25 in.-lbs.	2.82 N-m	140.0 in.-lbs.	15.82 N-m

THE FIELD METHOD

The Field Method simplifies Proof-loading and Pretensioning the cable cylinder by combining the two processes.

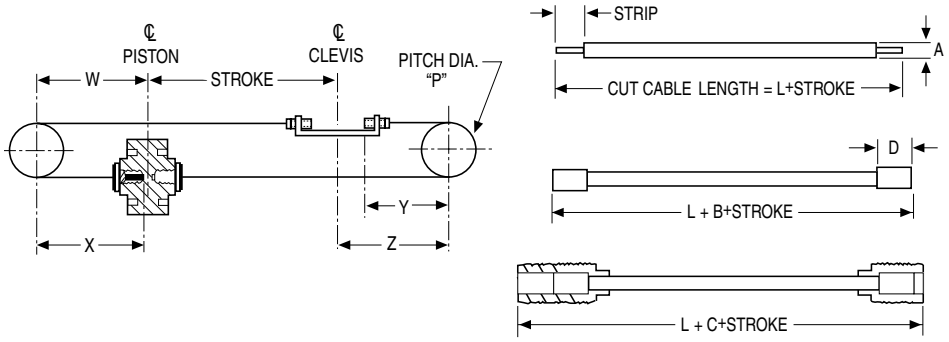
1. **Block the load some distance from the end of stroke to keep the piston from bottoming.**
2. **Apply a pressure that is 15% to 20% higher than the actual load pressure.**

   NOTE: Load pressure is defined as the pressure required to move the load. When the load is stopped externally, before the piston bottoms, the relief valve or regulator setting becomes the load pressure.
3. **Upon pressurizing, one cable will become tight while the other will become slack. Manually adjust out the slack with a wrench on the clevis terminal lock nut.**
4. **Release the pressure, block the load on the other side and repeat steps 1 through 3. When these steps are done, turn down the regulator pressure to the normal operating pressure and remove the block.**



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	1.500	38.1	1.687	42.8	1.350	34.3	1.406	35.7	1.687	42.8	0.328	8.3	0.093	2.4	0.234	5.9	0.375	9.5	0.437	11.1	4.68	118.9
CC07	1.500	38.1	1.687	42.8	1.350	34.3	1.406	35.7	1.687	42.8	0.328	8.3	0.093	2.4	0.234	5.9	0.375	9.5	0.437	11.1	4.68	118.9
CC10	1.500	38.1	1.687	42.8	1.350	34.3	1.406	35.7	1.687	42.8	0.328	8.3	0.093	2.4	0.234	5.9	0.375	9.5	0.437	11.1	4.68	118.9
CC15	3.250	82.6	4.452	113.1	4.325	109.9	3.725	94.6	4.452	113.1	0.468	11.9	0.187	4.7	0.343	8.7	0.420	10.7	0.828	21.0	12.50	317.5
CC20	4.250	108.0	5.125	130.2	4.688	119.1	3.426	87.0	5.125	130.2	0.620	15.7	0.250	6.4	0.641	16.3	0.540	13.7	1.060	26.9	14.25	362.0
CC25	4.250	108.0	5.125	130.2	4.688	119.1	3.426	87.0	5.125	130.2	0.620	15.7	0.250	6.4	0.641	16.3	0.540	13.7	1.060	26.9	14.25	362.0
CC30	5.312	134.9	5.687	144.4	5.000	127.0	3.601	91.5	5.687	144.4	0.844	21.4	0.312	7.9	0.500	12.7	0.195	5.0	1.100	27.9	17.00	431.8
CC40	5.312	134.9	6.187	157.1	5.000	127.0	4.315	109.6	6.187	157.1	0.844	21.4	0.312	7.9	0.500	12.7	0.195	5.0	1.100	27.9	17.50	444.5
*CC50	6.000	152.4	9.370	238.0	8.630	219.2	7.820	198.6	9.370	238.0	*1.300	33.0	0.375	9.5	1.000	25.4	0.500	12.7	1.930	49.0	*25.05	636.3
CC52	5.312	134.9	5.702	144.8	5.000	127.0	3.850	97.8	5.702	144.8	0.844	21.4	0.312	7.9	0.500	12.7	0.195	5.0	1.100	27.9	17.00	431.8

*For CC50, Orders shipped prior to Oct. 31, 2017 are **STRIP** 1.180 in [30.0 mm] and **L(std)** 24.55 in [623.6 mm]

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).**

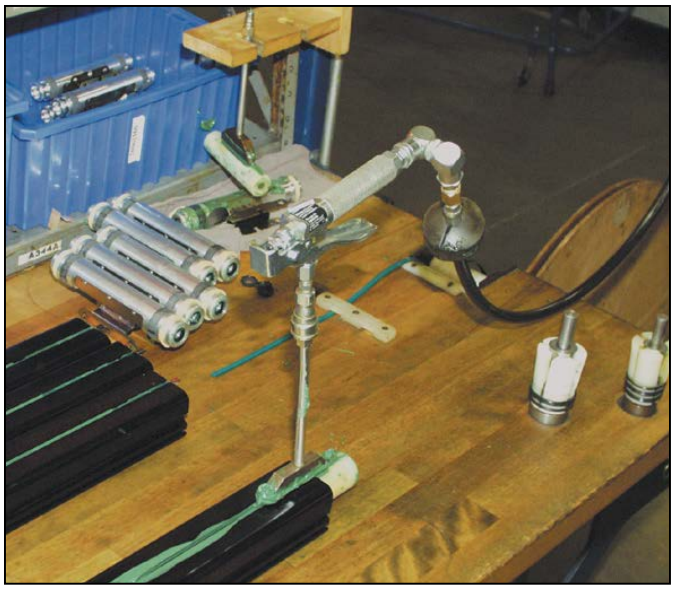
- **Sanitary environments**
  Oil mist lubricators must dispense "Food Grade" lubricants to the air supply. Use fluids with ORAL **LD50 toxicity ratings of 35 or higher** such as **Multitherm® PG-1 or equivalent.** Demanding conditions can require a review of the application.

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).

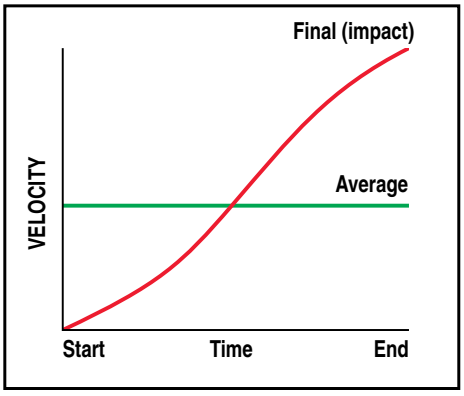
  NOTE: Use of external lubricators may wash away the factory installed lubrication. External lubricants must be maintained in a constant supply or the results will be a dry actuator prone to premature wear.

- **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.

CC, SA, DP, TC Service Parts Ordering - ALL Sizes

CABLE ASSEMBLIES[1] AND REPAIR KITS[2] PART NUMBERS

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

MODEL	CABLE ASSY.	REPAIR KITS
CC05	CACC05	RKCC05
TC05	CATC05	RKTC05
CCM05	CACCM05	RKCCM05
TCM05	CATCM05	RKTCM05
CC07	CACC07	RKCC07
SA07	CASA07	RKSA07
TC07	CATC07	RKTC07
CCM07	CACCM07	RKCCM07
SAM07	CASAM07	RKSAM07
TCM07	CATCM07	RKTCM07
CC10	CACC10	RKCC10
SA10	CASA10	RKSA10
TC10	CATC10	RKTC10
CCM10	CACCM10	RKCCM10
SAM10	CASAM10	RKSAM10
TCM10	CATCM15	RKTCM10
CC15	CACC15	RKCC15
DP15	CADP15	RKDP15
SA15	CASA15	RKSA15

MODEL	CABLE ASSY.	REPAIR KITS
TC15	CATC15	RKTC15
CCM15	CACCM15	RKCCM15
DPM15	CADPM15	RKDPM15
SAM15	CASAM15	RKSAM15
TCM15	CATCM15	RKTCM15
CC20	CACC20	RKCC20
DP20	CADP20	RKDP20
SA20	CASA20	RKSA20
CCM20	CACCM20	RKCCM20
DPM20	CADPM20	RKDPM20
SAM20	CASAM20	RKSAM20
CC25	CACC25	RKCC25
DP25	CADP25	RKDP25
SA25	CASA25	RKSA25
CCM25	CACCM25	RKCCM25
DPM25	CADPM25	RKDPM25
SAM25	CASAM52	RKSAM25
CC52	CACC52	RKCC52
DP52	CADP52	RKDP52

MODEL	CABLE ASSY.	REPAIR KITS
SA52	CASA52	RKSA52
CCM52	CACCM52	RKCCM52
DPM52	CADPM52	RKDPM52
SAM52	CASAM52	RKSAM52
CC30	CACC30	RKCC30
DP30	CADP30	RKDP30
SA30	CASA30	RKSA30
CCM30	CACCM30	RKCCM30
DPM30	CADPM30	RKDPM30
SAM30	CASAM30	RKSAM30
CC40	CACC40	RKCC40
DP40	CADP40	RKDP40
SA40	CASA40	RKSA40
CCM40	CACCM40	RKCCM40
DPM40	CADPM40	RKDPM40
SAM40	CASAM40	RKSAM40
CC50(ALL)	CACC50	RKCC50
SA50(ALL)	CASA50	RKSA50

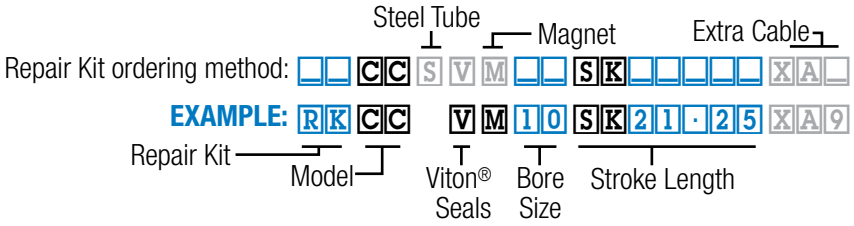
Service Parts Ordering NOTES:

1 Cable Assemblies contain: one Cable Assembly (specify stroke).

2 Repair Kits contain: two Cable Assemblies (specify stroke) and all wearable seals required to rebuild the cylinder.

CONFIGURATED REPAIR KIT[2] ORDERING EXAMPLE:

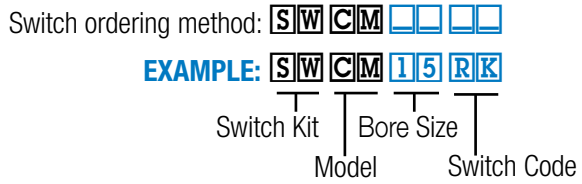
Repair Kits contain: two Cable Assemblies (specify stroke) and all wearable seals required to rebuild the cylinder.



SWITCH ORDERING

Switch Ordering NOTES:

To order field retrofit switch and hardware kits for all Tolomatic actuators: SW (Then the model and bore size, and type of switch required)
(Hardware and Form A Reed switch with 5 meter lead for 1.5" bore cable cylinder)



	CONFIG. CODE ORDERING Mounting Hardware & FE conn. included
DESCRIPTION	CODE
Switch Kit, Reed, Form C, 5m	BT
Switch Kit, Reed, Form C, Male Conn.	BM
Switch Kit, Reed, Form A, 5m	RT
Switch Kit, Reed, Form A, Male Conn.	RM
Switch Kit, Triac, 5m	CT
Switch Kit, Triac, Male Conn.	CM

NOTE: When kit is ordered female connector & all mounting hardware is included

Cable Cylinder Ordering - CC, SA - All Sizes

MODEL, BORE, STROKE

CC V _ M 15 SK125.250

OPTIONS

END #1 HJ END #2 HG RT2 XA_._ XB_._

MODEL

CC Double Acting Cable Cylinder
SA Single Acting Cable Cylinder

SEALS

V Seals of Viton® material

TUBING

S Steel Tube
- ⊗ *Not available for 05, 07 or 50 size*
- ⊗ *Switches cannot be used with steel tubing*

SWITCH MAGNET

M Internally Mounted Magnet
- *Required for use with switches*
- *Magnet will increase dead length of CC, SA & DP actuator (see page CC_23)*

BORE SIZE

05	0.50" *(16mm)*	**25**	2.50" *(63mm)*
07	0.75" *(19mm)*	**30**	3.00" *(76mm)*
10	1.00" *(25mm)*	**40**	4.00" *(100mm)*
12	1.25" *(32mm)*	**50**	5.00" *(127mm)*
15	1.50" *(40mm)*	**52**	2.00" [500 PSI] *(50mm)*
20	2.00" *(50mm)*		

STROKE LENGTH

SK_._._ Enter desired stroke length in decimal inches

NOTE: Strokes over 281" (7137mm) require Tube Couplers. Consult Tolomatic for lead time. Max. stroke length varies by model and bore size, see dimensions page for specification.

HEAD OPTIONS (CC_16 & CC_19)

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

– – standard single port head
[1,3]HG 3-ported head
HI 1" auto tensioner assembly
[3]HJ 1" auto tensioner assembly with 3-ported head
HK 2" auto tensioner assembly
[3]HL 2" auto tensioner assembly with 3-ported head
[2]HM caliper disc brake assembly
[2,3]HN caliper disc brake assembly with 3-ported head

[1]Only head option available for single-acting cylinders

[2]Autotensioner assembly required on one end of the cylinder

[3]Cushions are removed on all 3-ported heads

SWITCHES (CC_22)

TYPE		QUICK-DISCONNECT	CODE	QUANTITY	LEAD LENGTH
REED	Form A	QD	**RM**	After code enter quantity desired	5 meters
		no	**RT**		
	Form C	QD	**BM**		
		no	**BT**		
TRIAC		QD	**CM**		
		no	**CT**		

EXTRA CABLE

XA for extra beyond standard in inches
XB for extra beyond standard in inches

Not all codes listed are compatible with all options. Contact Tolomatic with any questions.

Fast delivery Built-to-Order