W.C. BRANHAM INC.

SOLUTIONS IN MOTION

Double Acting

Integral Guides

Totally Enclosed

Single Acting

Many Options

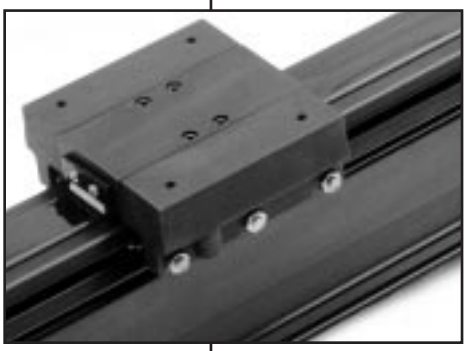
CABLE CYLINDERS

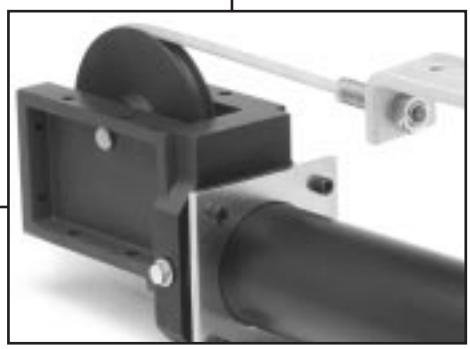
Providing solutions to your linear motion needs

SINGLE ACTING CYLINDERS

Articulating arms
Opening gates or doors
Lifting products i.e. tires
Raising material
Counter Balancing

TOTALLY ENCLOSED SERIES





DOUBLE ACTING CYLINDERS

Textile machinery
Paper splicers
Cage washers
Packaging machinery
Printing machinery
Drill feeds
Shrink wrapping
Silk screening
Food processing
Material transfers
Automotive assembly

WHAT'S INSIDE

Sizing standard cable cylinders is an easy process.

The goal is to determine how much force is required to move the load taking into consideration available operating pressure, load weight, sliding coefficient of friction, comparison with 20% rule, load velocity, and stroke length. Depending upon cylinder type, other factors such as load offset moments and cycle rate need to be considered. Doing so, will produce the most efficient and cost effective cable cylinder solution for the intended application. If you desire confirmation of your selection, please submit a copy of the sizing worksheet, on page 29, to one of our technical sales specialists via Fax 715.426.1400.

QUICK STEP SELECTION PROCESS

i. What operating pressure is available to the cable cylinder, PSI? Example: 100 PSI

i_a. Calculate load force, lb., (the amount of force required to move the load). Load force is the product of load weight multiplied by the sliding coefficient of friction of the mechanism guiding the load. For help determining sliding coefficients see table 1 on next page. If sizing a GCC - Guided Cable Cylinder use a .2 CF. If sizing a TEC - Totally Enclosed Cable Cylinder use a .3 CF. If using a GCC or TEC with an externally guided load, use CF for load mechanism.

LF = (W) (CF), Lb.

Where:
LF = Load force, lb.
W = Load weight, lb.
CF = Sliding coefficient of friction

Ex.: 70 lb. = (350 lb.) (.2)

i_b. Go to "Force at various pressures" table 2 on next page. Find the the column of the available operating pressure. Then, scroll down to find the available cable cylinder sizes that exceed the load force calculated. Make a note of the available bore sizes.

In the example, a 1" bore or higher can produce 70 lbs. of force or more at 100 PSI.

i_c. The 20% rule factor. So far, you have found the available bore sizes that can handle the load force at the available operating pressure. Next, we need to apply the 20% rule to narrow the selection search.

What is the 20% rule? This is our 5:1 safety rule which states that the total load does not exceed 20% of the cable tensile strength. Go to the Cable Specifications Chart on page 8 for the cable tensile ratings and corresponding 20% rule figure.

If the load force exceeds 20% of the cable tensile strength move to the next largest bore size.

In the example, a 1" bore can produce 70 lbs. of force at 90 PSI or greater. But, the 20% rule of a 1" bore is not to exceed 54 lbs. of force. Step up in size to the 1.5" bore.

SELECTION PROCESS (CONT.'D)

i_c. The 1.5" bore can produce the force required in the example and the cable tensile strength exceeds the force required. It is the acceptable solution.

i_d. Refer back to the "Force at various pressures chart" and find the 1.5" bore. You'll note that the effective area of this bore size is 1.74 $in.^2$. Calculate the desired operating pressure based on the load force and the effective area.

$$\text{Desired PSI} = \frac{LF}{A}$$

Where:
LF = Load force, lb.
A = Effective bore area, $in.^2$
PSI = Desired operating pressure

The desired operating pressure using a 1.5" bore with a load force of 70 lb. is 41 PSI. Set the regulator at 41 PSI. As a rule of thumb, the pressure setting should be set just enough to move the load. The cable cylinder will run most efficient at this point which will greatly increase the service life. If for example, the regulator setting was kept at 100 PSI. That's 174 lb. force which is significantly above the actual requirement. Running the cylinder at 100 PSI, in this example, will put additional strain on cable that will reduce service life.

i_e. Load velocity vs. the cable cylinder's internal cushions. Ask yourself, "Can the cable cylinder adequately and safely decelerate (cushion) the load at the end of each stroke with the desired velocity?" See table 3 for maximum allowable inertia loads. Use the following formulae to determine inertia load:

Horizontal	**F, lbs. = w[a/g]**
Vertical - Falling	**F, lbs. = w[a/g + w]**
Vertical - Rising	**F, lbs. = w[a/g - w]**
Incline - Falling	**F, lbs. = w[a/g + Sin θ - f Cos θ]**
Incline - Rising	**F, lbs. = w[a/g - Sin θ - f Cos θ]**

Where:
w = gross weight of load, lb.
a = deceleration rate $(in./sec)^2$ or $a = v/t = v^2/2s$
f = sliding coefficient of friction
g = gravity, 386.4 $(in./sec)^2$
v = load velocity, in/sec.
t = stopping time, sec.
s = stopping distance, in. or cushion length, in.
θ = angle of inclination

Disclaimer: All formulae and graphs depicted in this catalog are theoretical. W.C. Branham Inc. does not imply or state in any terms that formulae and graphs are correct for any given application. The formulae and graphs are supplied as a guide only. It is suggested that each application be prototyped and tested. All specifications subject to change without notification.

TABLE 1.
Friction Sliding Coefficients

Steel on Steel	.58
Steel on Steel (Greased)	.15
Aluminum on Steel	.45
Copper on Steel	.36
Brass on Steel	.44
Plastic on Steel	.20
Linear Ball Bearings	.10

TABLE 4.
Maximum stroke length for manual cable adjustment, inches.

1070/1100/1101	30
1150/1151	126
1200/1203	160
1250/1251	101
1300/1301	151
1400/1401	84
1501	222
1201/1206/HP	134

TABLE 2.
Force at various pressures

BORE SIZE, IN.	EFFECTIVE AREA	CYLINDER BASE MODEL	25 PSI	50 PSI	60 PSI	80 PSI	90 PSI	100 PSI
1/2	.19	1050	5	10	11	15	17	19
3/4	.44	1070	11	22	26	35	39	44
1	.78	1100/1101	20	39	47	62	70	78
1.5	1.74	1150/1151	44	87	104	139	157	174
2	3.09	1200/1203	77	155	186	247	278	309
2.5	4.86	1250/1251	122	243	292	389	437	486
3	6.99	1300/1301	175	350	420	559	629	699
4	12.49	1400/1401	312	625	749	999	1124	1249
5	19.20	1501	480	960	1152	1536	1728	1920

TABLE 3.
Maximum allowable inertia loads when using internal cushions

BORE SIZE, IN.	CUSHION LENGTH, IN.	INERTIA LOAD, LBS.
3/4	.375	5
1	.375	11
1.5	1.188	75
2	.75	130
2.5	.75	165
3	.75	348
4	.75	360
2HP	.75	130
5	.75	562

Helpful guidelines

1. Before operating your new W.C. Branham Cable Cylinder, it is very important to make sure that the cables are properly adjusted to ensure the cylinder's maximum service life. We call this adjustment: Proof-Loading and Pre-Tensioning. See page 27.

2. If the application requires automatic tensioners, Proof-Loading and Pre-Tensioning must be completed prior to pressurizing tensioner unit.

3. Automatic tensioners are strongly suggested for vertical lifting (tensioner unit mounted on the bottom) and high cycle applications even when the cylinder's stroke is within the manual cable adjustment guidelines.

SELECTION PROCESS (CONT.'D)

If. Determine if the cable cylinder stroke length falls within the suggested guidelines of maximum stroke length for manual cable adjustment. For TEC cylinders go to page 7.

We define the maximum stroke length for manual cable adjustment as the maximum stroke length that the cables can be properly proof-loaded, pretensioned and maintained at the required tension by manually adjusting the clevis terminal lock nuts.

Refer to the table 4, at left, to determine the maximum stroke length. Maximum stroke length is based on the cylinder's maximum pressure rating. ***If the stroke of the bore size selected falls within the maximum rating, you have finished the sizing process. If not, you can consider one of two options:***

1. Use the Pressure Differential method which uses the pressure differential between the cylinder's actual operating pressure and the cylinder's maximum rated operating pressure.

2. Use an automatic tensioner unit. The purpose of an automatic tensioner is to maintain tension on the cable to ensure the maximum service life of the cable cylinder. Primarily, the cable and the gland seals. Each automatic tensioner has a 1-inch stroke that provides 2-inches of cable take up. A second automatic tensioner provides 4-inches of cable take up total.

Pressure Differential Method
Example: 1.5" Bore

Actual PSI	41
Max. PSI	100
Differential:	59%

Calculate::
59% x 126 in.(max. stroke) = 74.3 in.
74.3 + 126 = 200.3 in. (16.69 feet)

Table 5 below, shows the Maximum Stroke Length using Auto Tensioners on available cable cylinders. ***Note: Cable cylinders must be proof-loaded and pre-tensioned in order for automatic tensioners to achieve its maximum effectiveness.*** ***See page 27 for more information.***

When using an automatic tensioner in an application where the cable cylinder is seeing the load in one direction only, place the automatic tensioner opposite the direction of the load. In vertical applications, the automatic tensioner should be located at the bottom. We strongly suggest using an automatic tensioner in high cycle applications to maximize cable cylinder service life.

The automatic tensioner must be plumbed with a non-fluctuating, separate pressure source. The recommended tensioner pressure setting is a percentage of the actual load pressure required. We define load pressure as the pressure that is required to move the load. ***Note: If the load is stopped externally, before the cylinder piston bottoms into the cylinder head, the relief valve or regulator setting becomes the load pressure. See table 5 below for pressure setting percentages.***

TABLE 5.
Pressure settings for automatic tensioners as percentage of actual load pressure. Maximum stroke lengths using automatic tensioners, inches.

Models	% of Load Pressure	Max.Stroke w/ 1 Automatic Tensioner	Max. Stroke w/ 2 Automatic Tensioners
1070	22%	134	N/A
1100/1101	40%	134	N/A
1150/1151	86%	288	N/A
1200/1203	32%	260	288
1250/1251	51%	160	227
1300/1301	54%	244	288
1400/1401	89%	134	193
1201/1206HP	24%	227	288

Automatic tensioners for models 1050, 1107 & 1501 not available. Consult factory.

Stop. Your double acting or single acting cable cylinder is now properly sized.

Continue. If you are sizing either a guided cable cylinder (GCC) or totally enclosed cylinder (TEC).

Wide range of guided cable cylinders with integrated precision rails, bearings and guide block. Choose from nine models - 1/2" through 4" bores.

SELECTION PROCESS

i_g. This is a continuation of the sizing process. If you have not performed the preceding steps, please do so now.

i_h. After selecting the bore size, verify that the load weight and stroke length are within the limits of the guide rods.

Go to the dimensional data for the GCC bore size you're interested in. Find the Load vs. Stroke curve for that model. If your load and stroke fall under the curve, the correct GCC model has been selected. If above the curve, go to next largest GCC model or ask us about our other cylinder product lines.

i_i. Determine acceptable offset load, if applicable.

Radial Load Formula:

$$W = W_1/2L_1$$

Where:

W	=	True load weight, lbs.
W_1	=	Maximum load weight per Load vs. Stroke curve. See applicable GCC model.
L_1	=	Distance between centerline of cylinder and center of gravity of load.
L	=	Distance between centerline of carrier block and center of gravity of load.

Longitudinal Load Formula:

$$W = W_1/L$$

Model GCC1301 Shown

All cable cylinder options available except double stroke.

STOP. YOU HAVE PROPERLY SIZED THE GUIDED CABLE CYLINDER

Totally Enclosed Cable Cylinders (TEC) - Encapsulates cable, main seals and sheaves. Available in either 2" or 2.5" bores. Ideal for rugged environments.

TEC CYLINDER DESCRIPTION

TEC cylinders are designed to be operated with either pneumatic or hydraulic pressure up to 100 psi. A hardcoated ID aluminum tube is mounted inside the extrusion body. The cable connects the cylinder piston to the load moving member (carrier). The carrier rides on four, 2 inch long x .5 inch diameter Nylatron NSB bearings. The load is transferred from the carrier through the bearings to the load supporting extrusion. TEC cylinders can be provided with manual or automatic tensioners as well as brake combinations for mid-stroke positioning. They are fully gasketed to operate in extreme environments from -40 to + 200 degrees F.

SELECTION PROCESS

i_j. This is a continuation of the sizing process. If you have not performed steps i_a - i_e, please do so now. When you reach step i_f, determine if the TEC cylinder stroke length falls within the suggested guidelines of maximum stroke length for manual cable adjustment.

We define the maximum stroke length for manual cable adjustment as the maximum stroke length that the cables can be properly proof-loaded, pretensioned and maintained at the required tension by manually adjusting the clevis terminal lock nuts.

Refer to the table 6 to determine the maximum stroke length. Maximum stroke length is based on the cylinder's maximum pressure rating. ***If the stroke of the bore size selected falls within the maximum rating, you have finished the sizing process. If not, you can consider one of two options:***

1. Use the Pressure Differential method which uses the pressure differential between the cylinder's actual operating pressure and the cylinder's maximum rated operating pressure. See page 5.

2. Use a manual or automatic tensioner unit. The purpose of a manual or automatic tensioner is to maintain tension on the cable to ensure the maximum service life of the cable cylinder. Primarily, the cable and the gland seals. Each tensioner has a 1-inch stroke that provides 2-inches of cable take up. A second automatic tensioner provides 4-inches of cable take up total.

Table 6, shows the Maximum Stroke Length Using Auto Tensioners. ***Note: TEC cylinders must be proof-loaded and pre-tensioned in order for automatic tensioners to achieve its maximum effectiveness. See page 27 for more information. See page 6. for more information on using automatic tensioners.***

i_k. After selecting either a 2" or 2.5" bore size, determine acceptable carrier bending moments.

Radial Load Formula : **$(W)(L_1) = 600$, in. lbs.**

Longitudinal Load Formula: **$(W)(L) = 875$, in. lbs.**

Where:
W = True load weight, lbs.
L_1 = Distance between centerline of cylinder and center of gravity of load.
L = Distance between centerline of carrier block and center of gravity of load.

Cannot exceed 600 in. lbs. or 875 in. lbs., respectively.

STOP. YOU HAVE PROPERLY SIZED THE TEC CYLINDER. SEE PAGE 20 FOR DIMENSIONS.

TABLE 6.
Pressure settings for automatic tensioners as percentage of actual load pressure. Maximum stroke lengths for manual adjustment and automatic tensioners, inches. Manual tension adjustment torque.

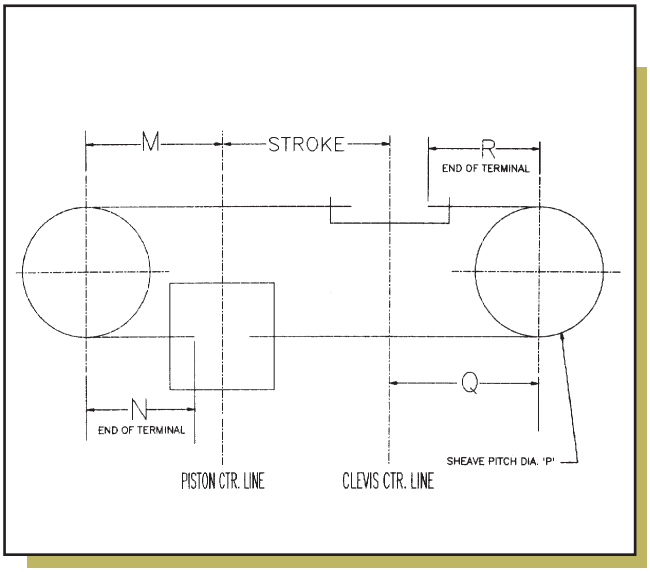
Model/ Bore Size, in.	% of Load Pressure	Max. Stroke For Manual Adjustment, in.	Max. Stroke w/ 1 Automatic Tensioner, in.	Max. Stroke w/ 2 Automatic Tensioners, in.	Manual Tension, in. lbs.
TEC1881/2	32%	60	260	288	45
TEC1882/2.5	51%	48	160	227	72

Tubing and Cable Specifications

MODEL	BORE SIZE	TUBING MATERIAL	CUT TUBE STK+	BASE WEIGHT LB.	WT/FT OF STK LB.	TUBE SUPPORT SPAN, FT.	CABLE WIRE DIA.	CABLE NYLON O.D.	STRAND CONFIG.	TENSILE STRENGTH LB.	20% RULE LB.	STD CUT CABLE LENGTH STK+
1050	1/2	ALUMINUM	1.31	1.38	.30	5.0	3/64	3/32	7 x 7	270	54	4.688
1070	3/4	ALUMINUM	1.17	1.38	.52	5.0	3/64	3/32	7 x 7	270	54	4.688
1100	1.0	STEEL	1.31	1.38	1.5	6.5	3/64	3/32	7 x 7	270	54	4.688
1101	1.0	ALUMINUM	1.31	1.38	.52	6.0	3/64	3/32	7 x 7	270	54	4.688
1107	1.0	ALUMINUM	2.016	1.00	.52	3.0	3/64	3/32	7 x 19	270	54	4.50
1150	1.5	STEEL	3.41	5.75	2.16	7.5	3/32	3/16	7 x 19	920	184	12.5
1151	1.5	ALUMINUM	3.41	5.75	.75	7.0	3/32	3/16	7 x 19	920	184	12.5
1200	2.0	STEEL	3.0	12.44	2.83	8.0	1/8	1/4	7 x 19	2000	400	14.0
1203	2.0	ALUMINUM	3.0	12.44	.98	7.5	1/8	1/4	7 x 19	2000	400	14.0
1250	2.5	STEEL	3.0	12.90	3.50	9.0	1/8	1/4	7 x 19	2000	400	14.0
1251	2.5	ALUMINUM	3.0	12.90	1.21	8.0	1/8	1/4	7 x 19	2000	400	14.0
1300	3.0	STEEL	3.5	18.69	4.17	10.0	3/16	5/16	7 x 19	4200	840	17.0
1301	3.0	ALUMINUM	3.5	18.69	1.44	8.5	3/16	5/16	7 x 19	4200	840	17.0
1400	4.0	STEEL	4.5	20.75	5.50	11.0	3/16	5/16	7 x 19	4200	840	17.5
1401	4.0	ALUMINUM	4.5	20.75	1.91	9.0	3/16	5/16	7 x 19	4200	840	17.0
1501	5.0	ALUMINUM	4.5	40.00	3.0	20.0	1/4	3/8	7 x 19	7000	1400	23.5
1201	2.0HP	STEEL	3.5	18.69	2.83	8.0	3/16	5/16	7 x 19	4200	840	17.0
1206	2.0HP	ALUMINUM	3.5	18.69	.98	7.5	3/16	5/16	7 x 19	4200	840	17.0

Additional Cable Specifications

BORE SIZE IN.	CYLINDER BASE MODEL	P	M	N	R	Q
1/2	1050	1.50	1.68	1.35	1.41	1.68
3/4	1070	1.50	1.68	1.35	1.41	1.68
1.0	1100/1101	1.50	1.68	1.35	1.41	1.68
1.0	1107	.95	2.15	1.55	1.71	2.13
1.5	1150/1151	3.25	4.45	4.32	3.72	4.45
2	1200/1203	4.25	5.12	4.68	3.42	5.12
2.5	1250/1251	4.25	5.12	4.68	3.42	5.12
3	1300/1301	5.31	5.68	5.00	3.60	5.68
4	1400/1401	5.31	6.18	5.00	4.35	6.18
5	1501	6.0	8.62	7.37	6.98	11.94
2.0	1201/1206HP	5.31	5.70	5.00	3.85	5.70



Need Technical Assistance? Call Toll Free 1.800.428.1974

NOMENCLATURE

a = Deceleration, in/sec^2
g = Deceleration from gravity, 386.4 in/sec^2
f = Sliding load, coefficient of friction
f_c = Cable and sheave coefficient of friction
F_c = Unbalanced cylinder force, lbs.
F_{ta} = Tangential braking force required with pressure 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 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 = Load Equivalent
W_e= (W)(f), lbs. {Horizontal Loads}
W_e= (W), lbs. {Vertical Loads}
W_e= W(Sinf + fCosf) {Incline Loads}
f = Angle of inclination
R_s = Root radius of sheave groove, inches.
P_c = Pressure regulator or relief valve setting, PSI
A_c = Area of cable cylinder bore, in^2.
P_t = Pressure setting of tensioner, 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.

PROCEDURAL STEPS

Step 1. Select a bore size of cable cylinder based on the load to be moved. Determine load pressure. Set regulator @ 25% above load pressure, (P_t).

Step 2. Calculate the unbalanced cylinder force (F_c). This step is not applicable when pressure is removed prior to braking.

$F_c = (P_c)(A_c) - W$ {Vertical Loads}
$F_c = (P_c)(A_c) - W_e$ {Horizontal & Inclined Loads}

Step 3. Calculate the tangential braking force required when pressure is removed prior to braking (F_{tr}) or when pressure is still applied when braking (F_{ta}).

• Use Desired Formula •

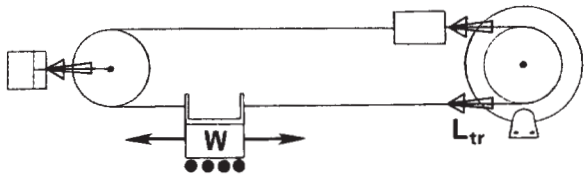
F_{tr} = W [a/g - f], Horizontal Loads.
F_{tr} = W [a/g - Sin⊖ - f Cos⊖], Incline load rising.
F_{tr} = W [a/g +Sin⊖ - f Cos⊖], Incline load falling.
F_{tr} = W [a/g - 1], Vertical load rising.
F_{tr} = W [a/g + 1], Vertical load falling.
F_{ta} = F_c + W[a/g - f], Horizontal loads.
F_{ta} = F_c + W[a/g - Sin⊖ - f Cos⊖], Incline load rising.
F_{ta} = F_c + W[a/g - 1], Vertical load rising.

Hint: To calculate (a) use: a = $V^2/2S$ or V/T, in/sec^2.

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

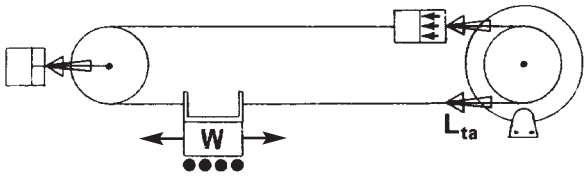
L_{tr} = F_{tr}/.369, lbs. Pressure removed while braking
L_{ta} = F_{ta}/.369, lbs. Pressure applied while braking

Step 5. Calculate tensioner pressure setting (P_t).



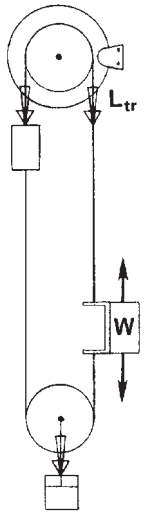
Horizontal - Pressure removed prior to braking - Bidirectional
$P_t = 2L_{tr}/A_t$, PSI

Where: A_t=11.97 in^2 for models 120/125 series.
A_t=16.20 in^2 for models 120HP/130/140 series



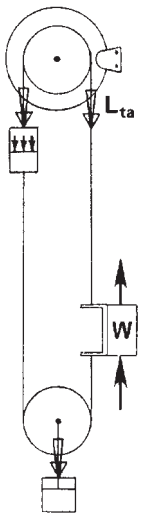
Horizontal - Pressure applied when braking - Bidirectional
$P_t = 2\,[L_{ta} - W_e]/A_t$, PSI

Caliper Must Be Mounted at the Top



Pressure removed prior to braking, load rising or falling

$P_t = 2L_{tr}/A_t$, PSI

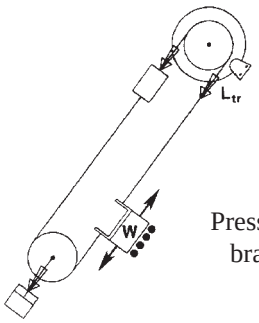


Caliper Must Be Mounted at the Top

Pressure applied when braking, load rising

$P_t = 2L_{ta}- W_e/A_t$, PSI

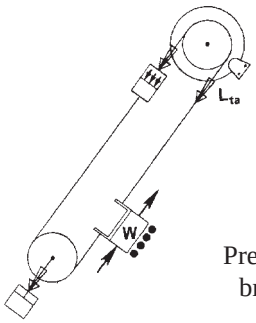
Inclined Load - Caliper Must Be Mounted at the Top



Pressure removed prior to braking, load rising or falling

$P_t = 2L_{tr}/A_t$, PSI

Inclined Load - Caliper Must Be Mounted at the Top



Pressure applied when braking, load rising

$P_t = 2L_{ta}- W_e/A_t$, PSI

Step 6. Calculate the maximum tension in the cable with pressure removed while braking (L_{trm}) or pressure applied (L_{tam}).

Horizontal Loads:

L_{trm} $=L_{tr} + W_e$, lbs. Pressure removed prior to braking. Bidirectional.
L_{tam} $=L_{ta}$, lbs. Pressure applied while braking. Bidirectional.

Vertical Loads:

L_{trm} $=L_{tr} + W$, lbs. Pressure removed prior to braking. Bidirectional.
L_{tam} $=L_{ta}$, lbs. Pressure applied while braking. Bidirectional.

Inclined Loads:

L_{trm} $=L_{tr} + W_e$, lbs. Pressure removed prior to braking. Bidirectional.
L_{tam} $=L_{ta}$, lbs. Pressure applied while braking. Bidirectional.

Step 7. Check to see that L_{trm} or L_{tam} does not exceed 20% of the breaking strength of the cable. Please refer to page for cable specifications on various models. If L_{trm} or L_{tam} exceeds the 20% rule, then either the stopping time or stopping distance must be increased. Repeat Steps 1 thru 7.

Step 8. Calculate the brake operating pressure.

P_{br} $=.113[L_{tr}R_s]$, PSI for pressure removed when braking.
P_{ba} $=.113[L_{ta}R_s]$, PSI for pressure applied when braking.

Where: R_s for various cylinders =

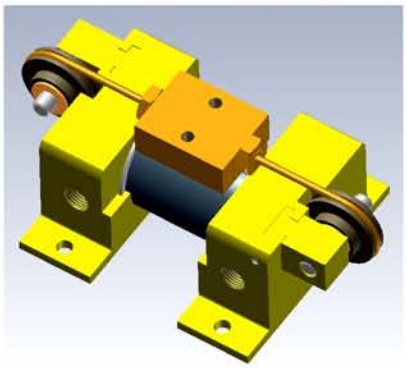
1.53 inches: 1.5” Bore
2.00 inches: 2” & 2.5” Bores
2.50 inches: 3”, 4” & 2”HP Bores

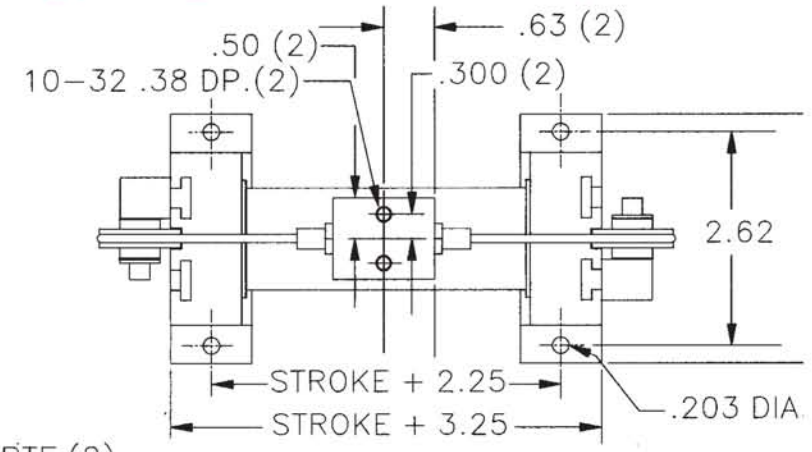
Step 9. If the pressure is removed prior to braking, check to see if the brake can hold the load if application is either vertical or incline. The brake can hold the load if:

$.369_{Ltr}$ is greater than or equal to W, Vertical Load
$.369_{Ltr}$ is greater than W_e, Inclined Load

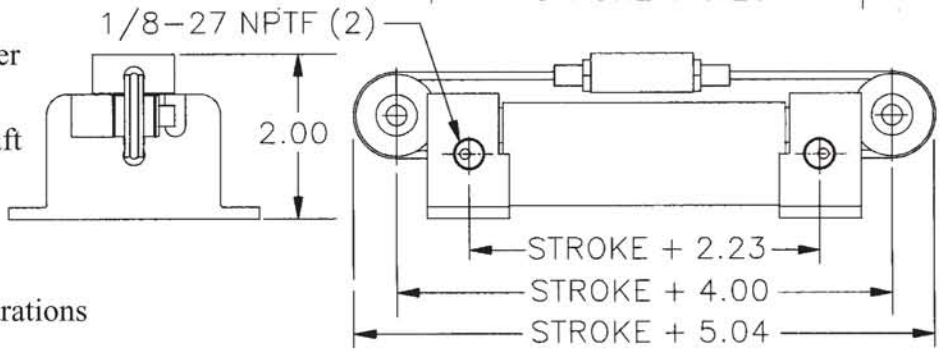
New Series 1107F Base Model, 1" Bore

Ideal for packaging, silk screening, knifing, printing and bobbin machinery.



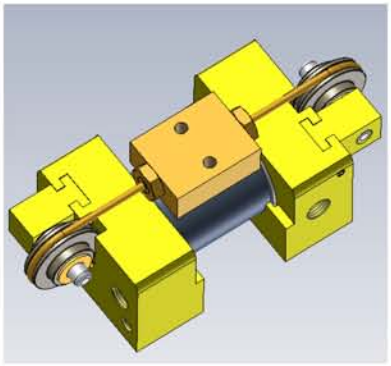


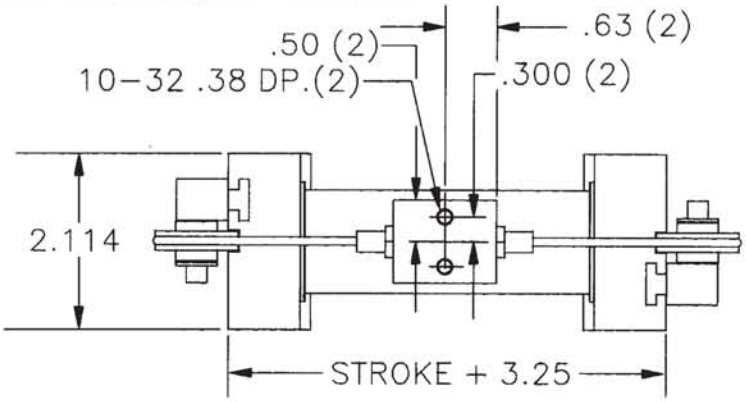
- 1 inch bore, 60 lbf. at 100 psi
- Low profile, 2 inches tall
- Extruded aluminum cylinder heads
- Type 11 nylon jacket aircraft cable mil-spec rated
- Spring cushions
- Reed switch option
- Foot or rear mount configurations
- Nylatron GS® sheaves
- Any stroke increment to 36 inches
- Fewer parts means lighter weight



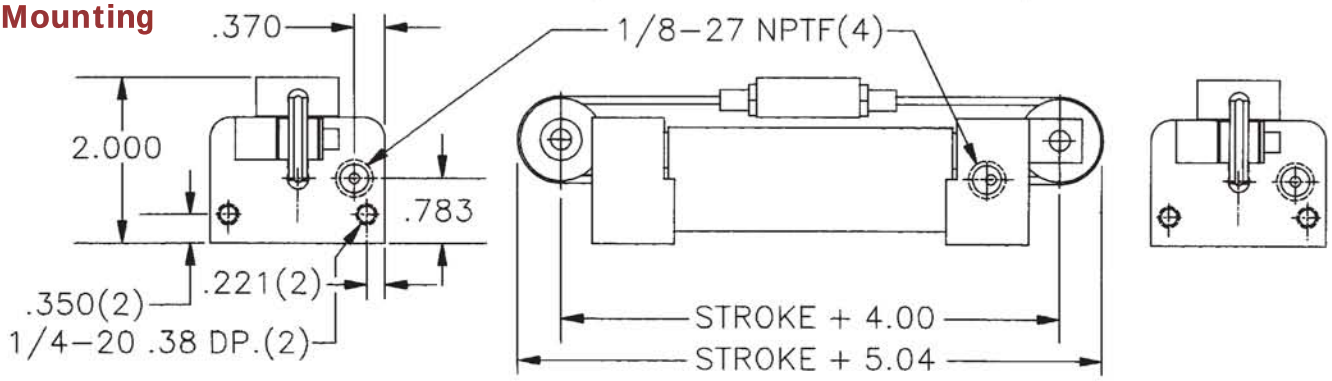
Integral Foot Mounts

New Series 1107R Base Model, 1" Bore





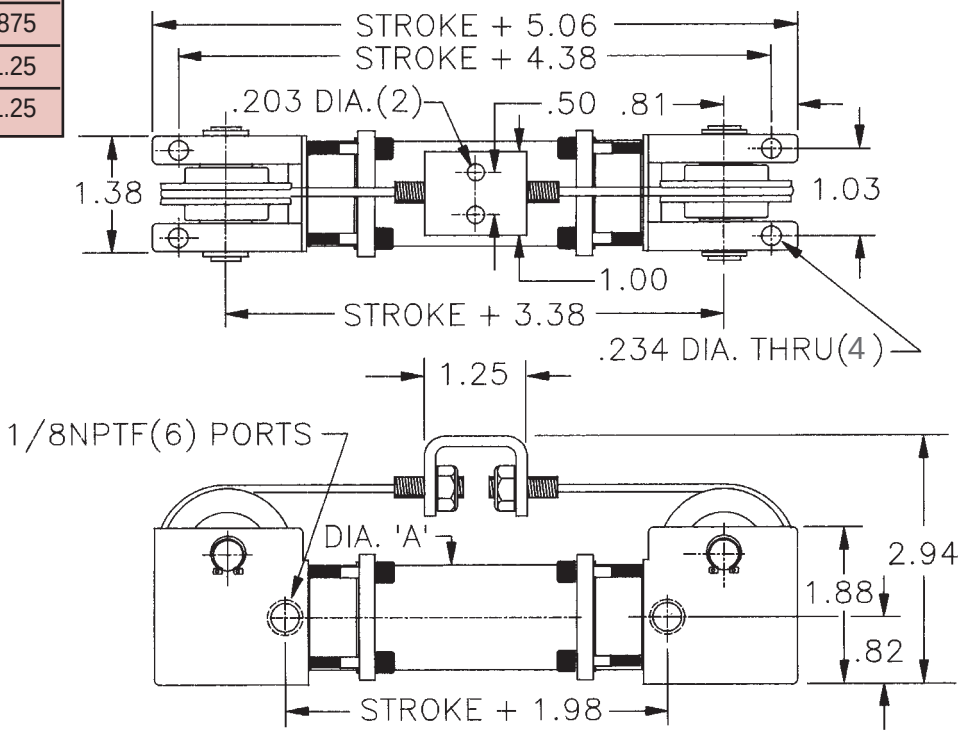
Rear Mounting



Double Acting Base Models

MODEL	BORE SIZE	TUBE	A
1050	.50”	Aluminum	.625
1070	.75”	Aluminum	.875
1100	1.0”	Steel	1.25
1101	1.0”	Aluminum	1.25

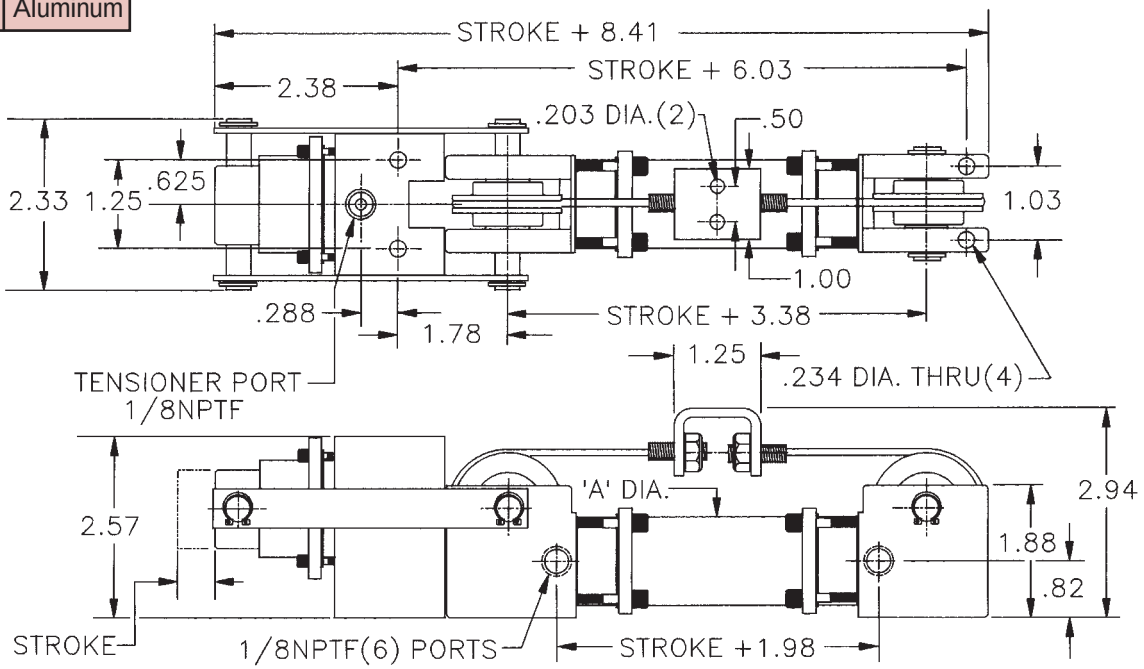
Add 1.62 inches to overall length when designating RS or M options.



Double Acting; Auto Tensioner Base Models

MODEL	BORE SIZE	TUBE
1070T	.75”	Aluminum
1100T	1.0”	Steel
1101T	1.0”	Aluminum

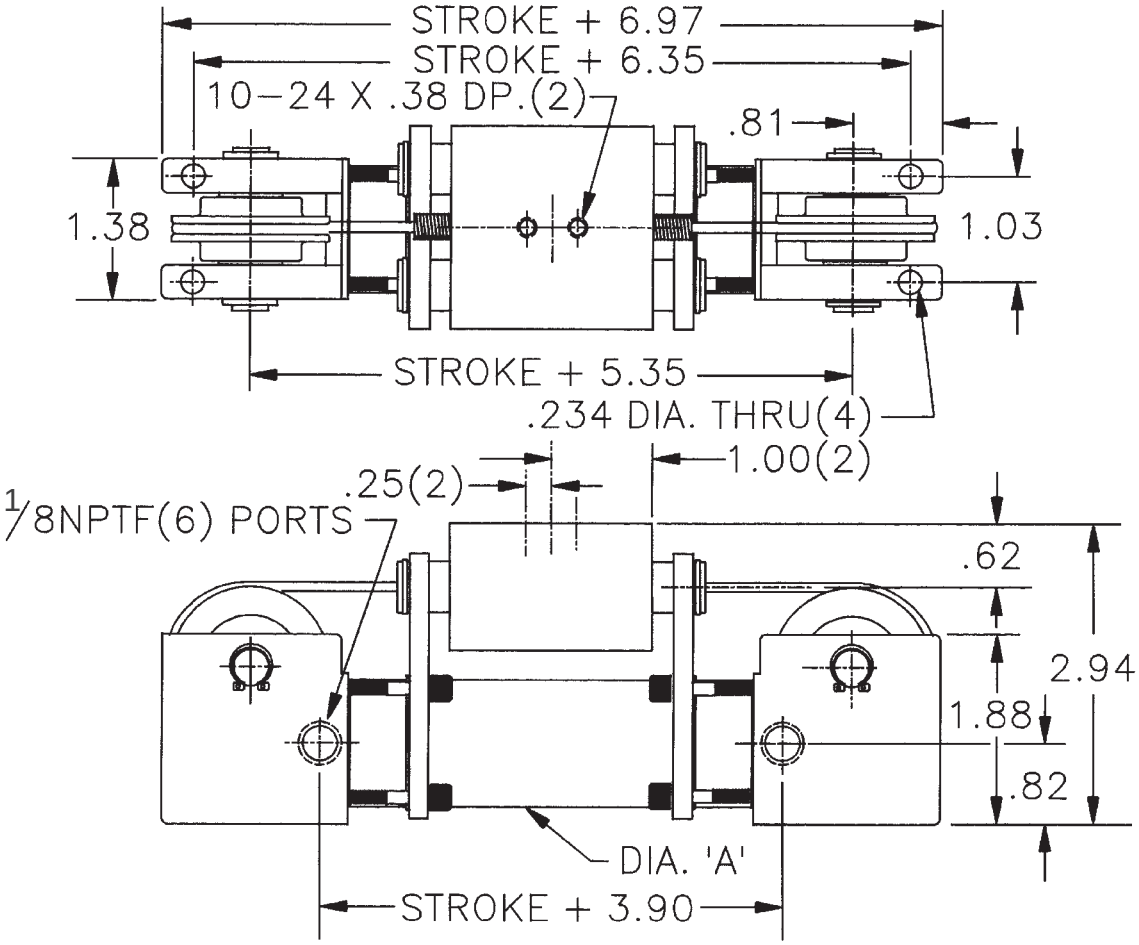
Add 1.62 inches to overall length when designating RS or M options.

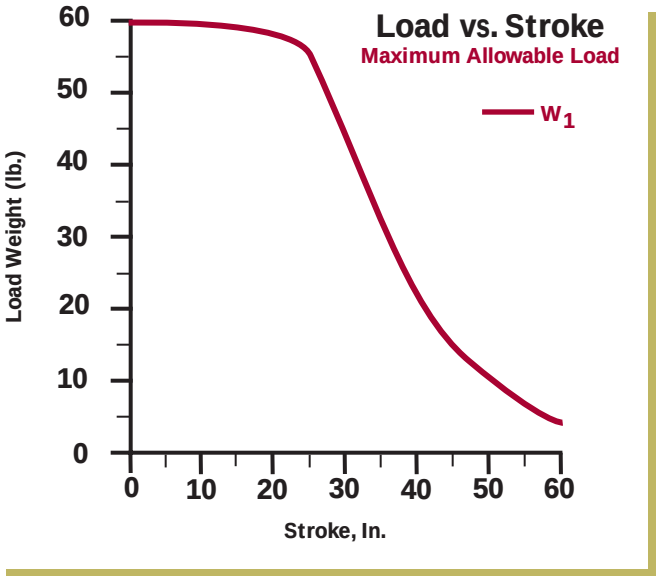


Guided Cable Cylinder Base Models

.50" chrome plated guide rods.

MODEL	BORE SIZE	TUBE	A
GCC1050	.50"	Aluminum	.625
GCC1070	.75"	Aluminum	.875
GCC1100	1.0"	Steel	1.25
GCC1101	1.0"	Aluminum	1.25



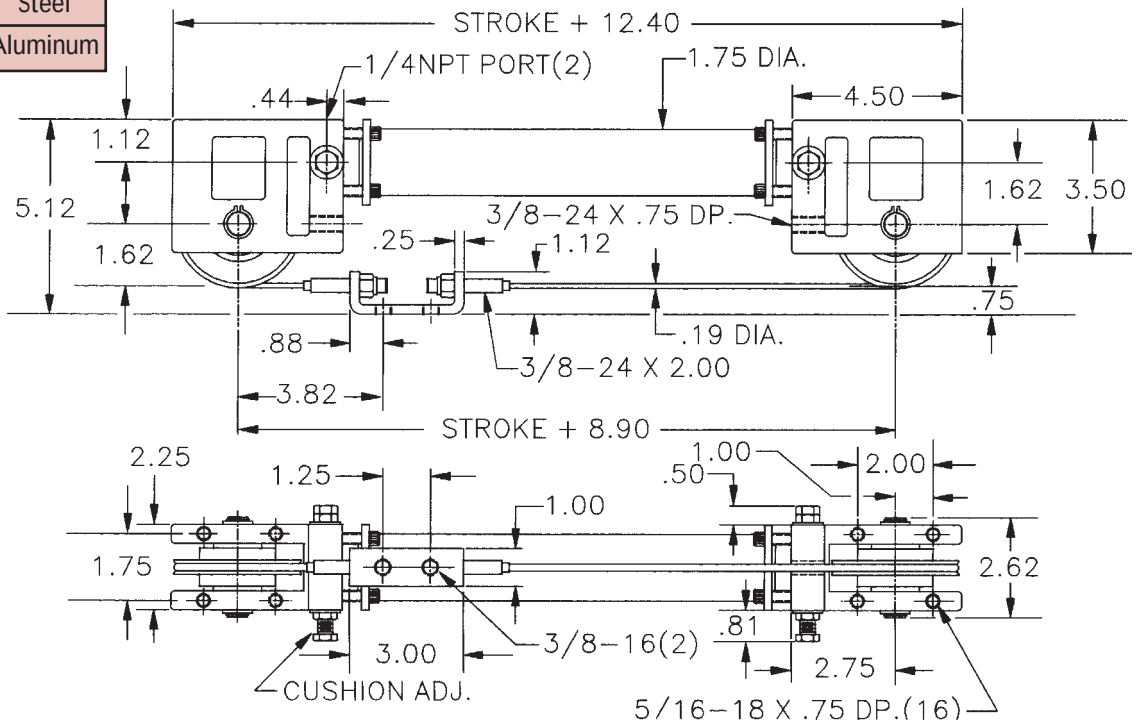


*Aftermarket Repair Kits For T-O-M Brand Cable Cylinders Available • Call For Details**

Double Acting Base Models

MODEL	BORE SIZE	TUBE
1150	1.5”	Steel
1151	1.5”	Aluminum

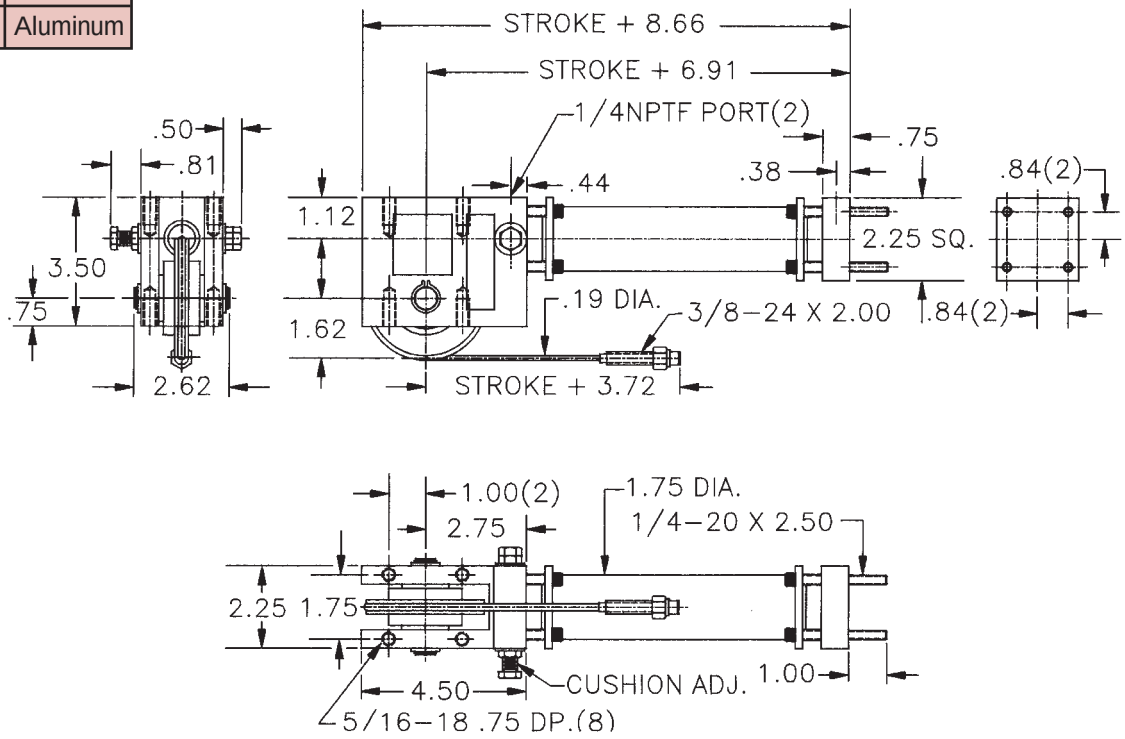
Add .375 inches to overall length when designating RS or M options.



Single Acting Base Models

MODEL	BORE SIZE	TUBE
1150SA	1.5”	Steel
1151SA	1.5”	Aluminum

Add .375 inches to overall length when designating RS or M options.

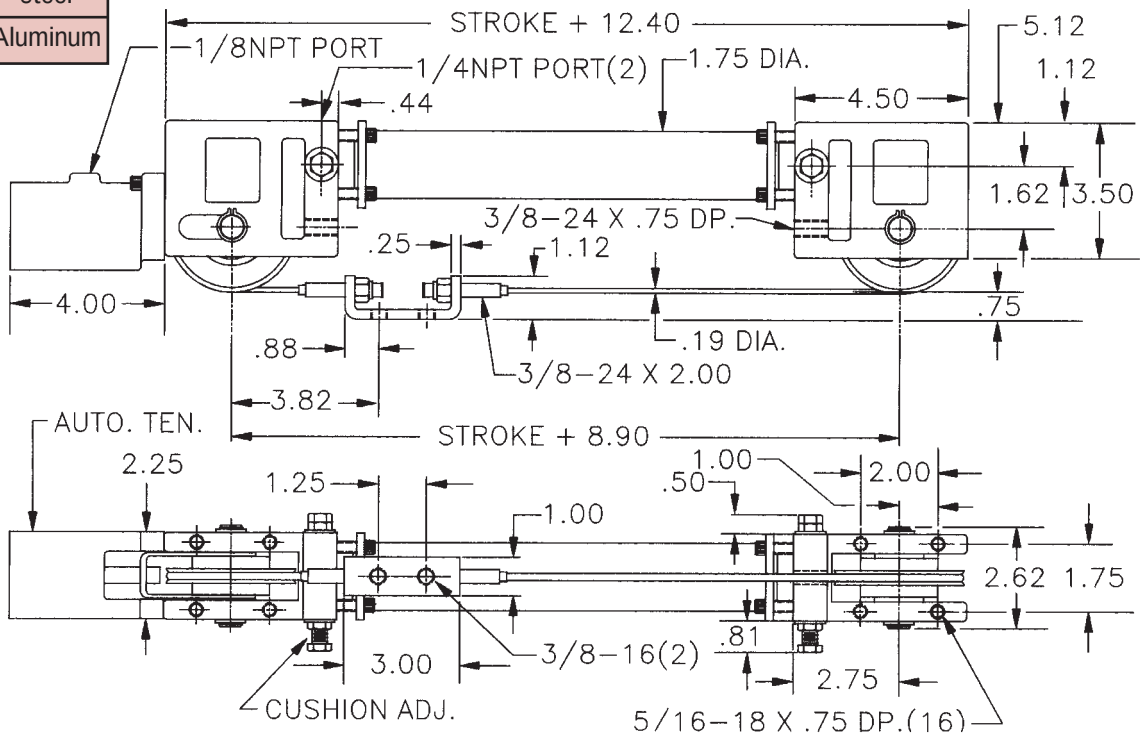


Need Technical Assistance? Call Toll Free 1.800.428.1974

Double Acting; Auto Tensioner Base Models

MODEL	BORE SIZE	TUBE
1150T	1.5"	Steel
1151T	1.5"	Aluminum

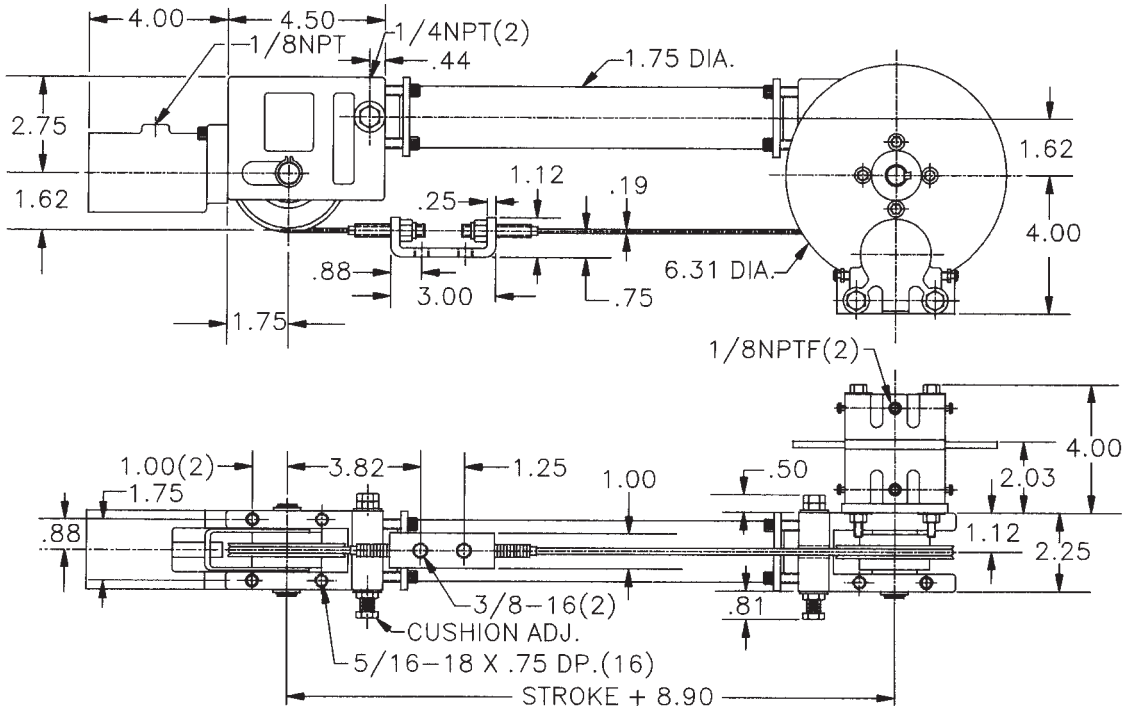
Add .375 inches to overall length when designating RS or M options.



Double Acting; Auto Tensioner & Brake Combo Base Models

MODEL	BORE SIZE	TUBE
1150TB	1.5"	Steel
1151TB	1.5"	Aluminum

Add .375 inches to overall length when designating RS or M options.
Brake sizing instructions on page 9.

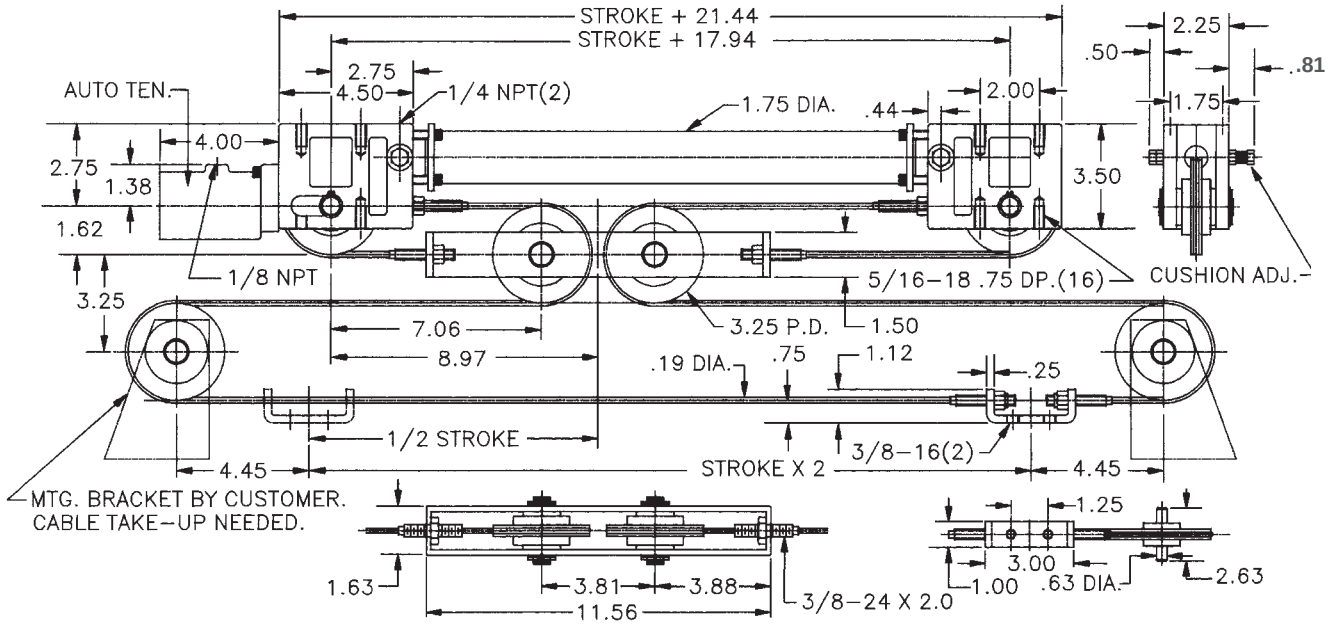


*Aftermarket Repair Kits For T-O-M Brand Cable Cylinders Available • Call For Details**

Double Stroke Base Models

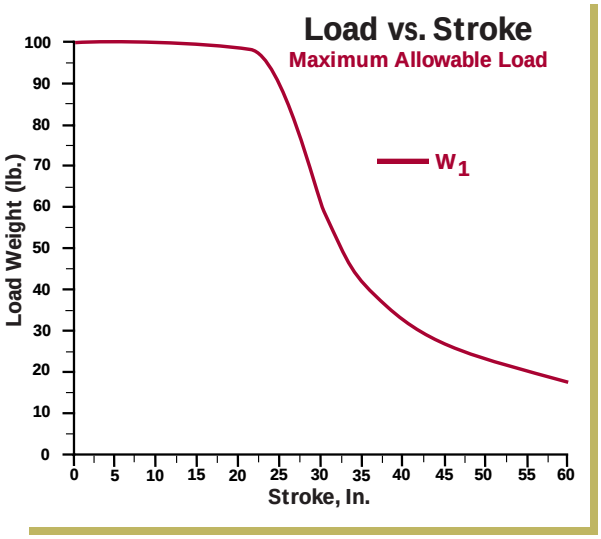
MODEL	BORE SIZE	TUBE
1150TD	1.5”	Steel
1151TD	1.5”	Aluminum

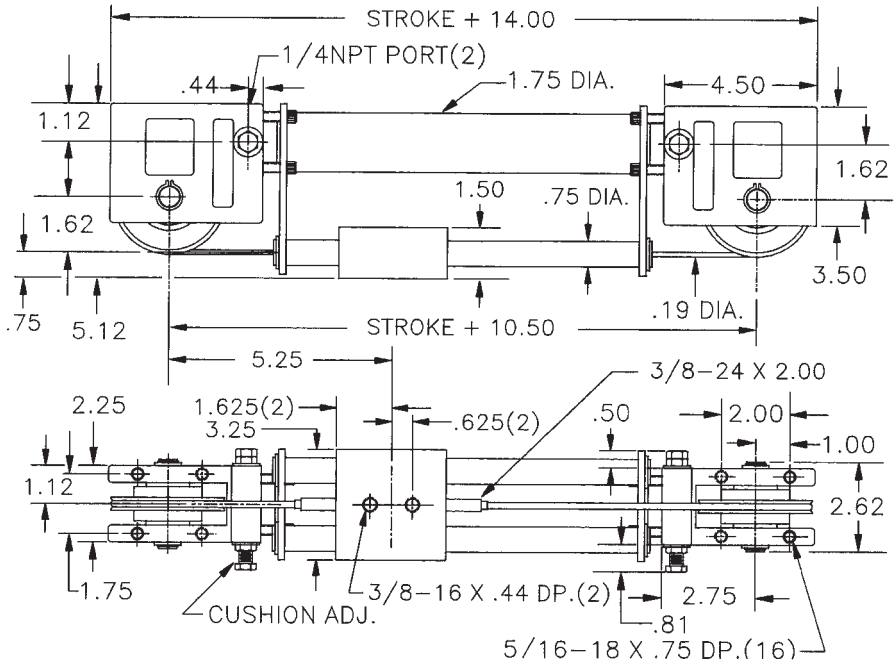
Double stroke information on page 26.



Guided Cable Cylinder Base Models

MODEL	BORE SIZE	TUBE
GCC1150	1.5”	Steel
GCC1151	1.5”	Aluminum

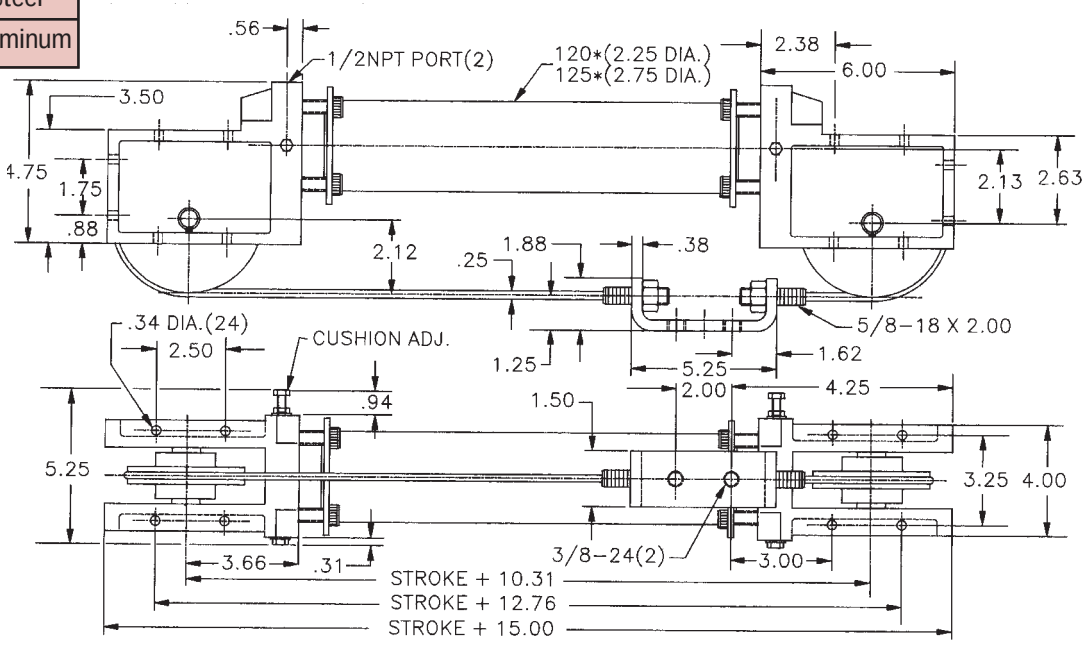




Double Acting Base Models

MODEL	BORE SIZE	TUBE
1200	2.0”	Steel
1203	2.0”	Aluminum
1250	2.5”	Steel
1251	2.5”	Aluminum

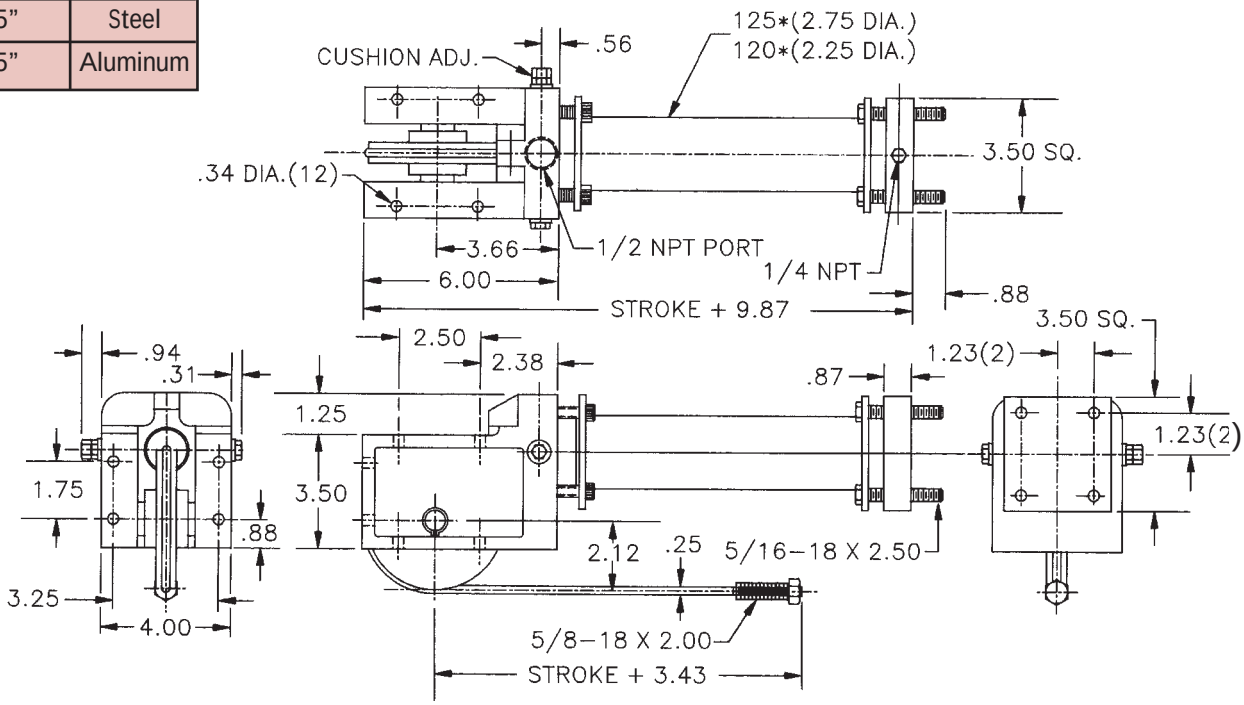
Add .375 inches to overall length when designating RS or M options. Strokes greater than 23.5 feet require tube coupler kit.



Single Acting Base Models

MODEL	BORE SIZE	TUBE
1200SA	2.0”	Steel
1203SA	2.0”	Aluminum
1250SA	2.5”	Steel
1251SA	2.5”	Aluminum

Add .375 inches to overall length when designating RS or M options. Strokes greater than 23.5 feet require tube coupler kit.

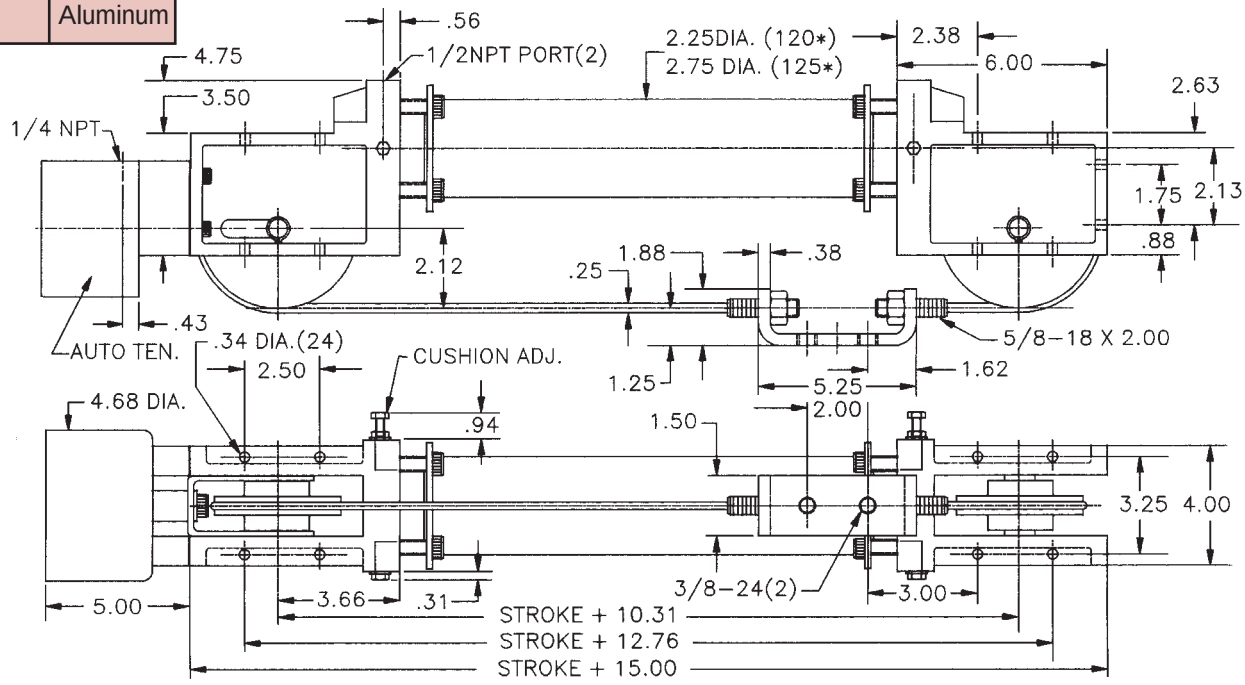


*Aftermarket Repair Kits For T-O-M Brand Cable Cylinders Available • Call For Details**

Double Acting; Auto Tensioner Base Models

MODEL	BORE SIZE	TUBE
1200T	2.0”	Steel
1203T	2.0”	Aluminum
1250T	2.5”	Steel
1251T	2.5”	Aluminum

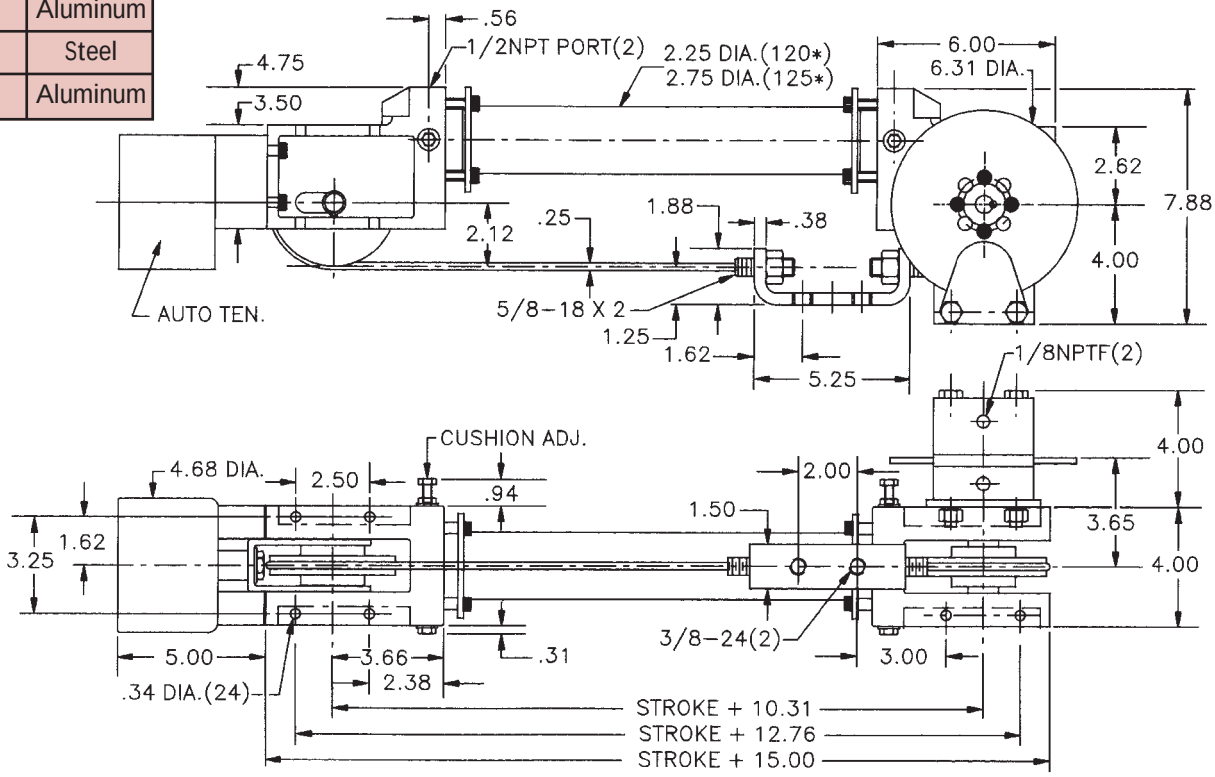
Add .375 inches to overall length when designating RS or M options. Strokes greater than 23.5 feet require tube coupler kit.



Double Acting; Auto Tensioner & Brake Combo Base Models

MODEL	BORE SIZE	TUBE
1200TB	2.0”	Steel
1203TB	2.0”	Aluminum
1250TB	2.5”	Steel
1251TB	2.5”	Aluminum

Add .375 inches to overall length when designating RS or M options. Strokes greater than 23.5 feet require tube coupler kit. Brake sizing instructions on page 9.

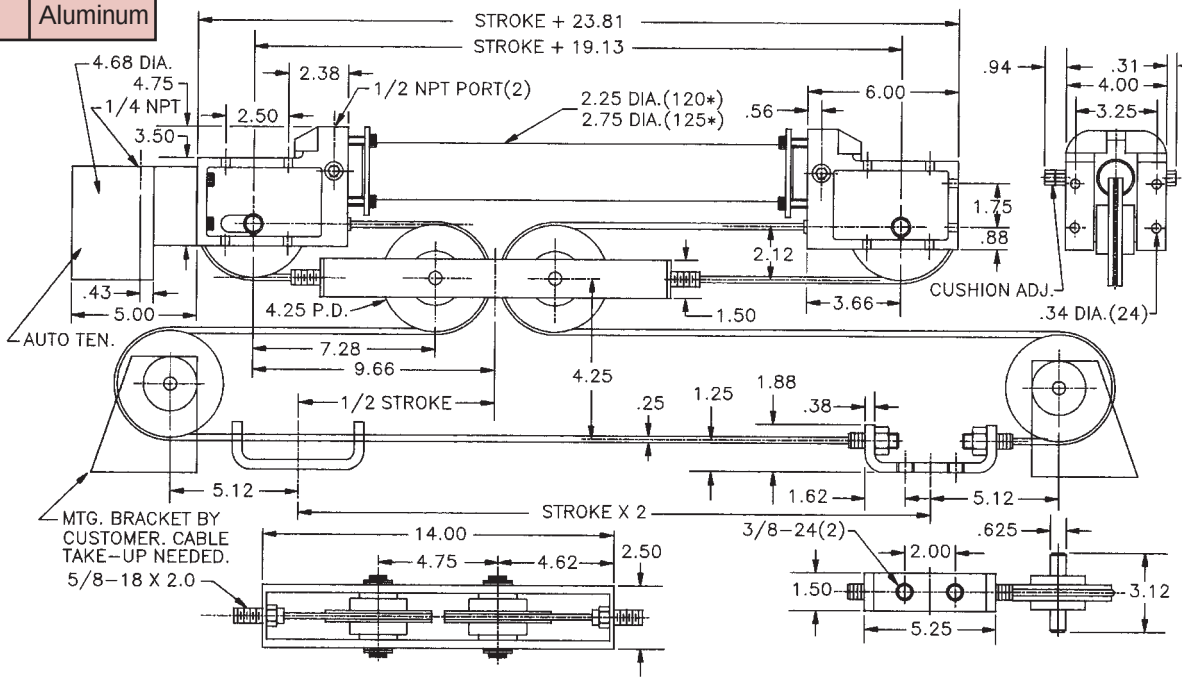


Need Technical Assistance? Call Toll Free 1.800.428.1974

Double Stroke Base Models

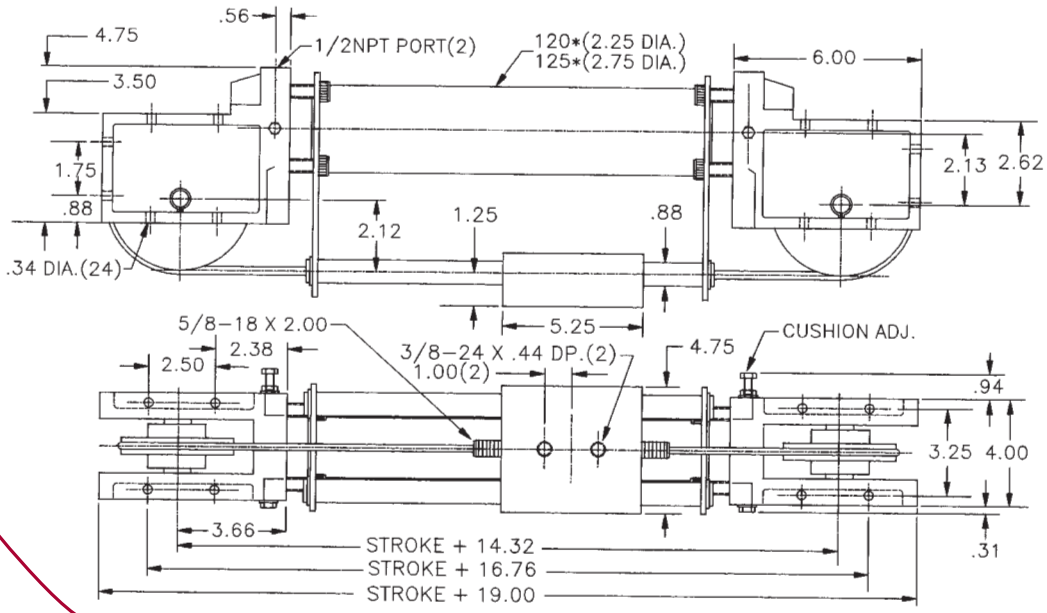
MODEL	BORE SIZE	TUBE
1200TD	2.0”	Steel
1203TD	2.0”	Aluminum
1250TD	2.5”	Steel
1251TD	2.5”	Aluminum

Double stroke information on page 26.



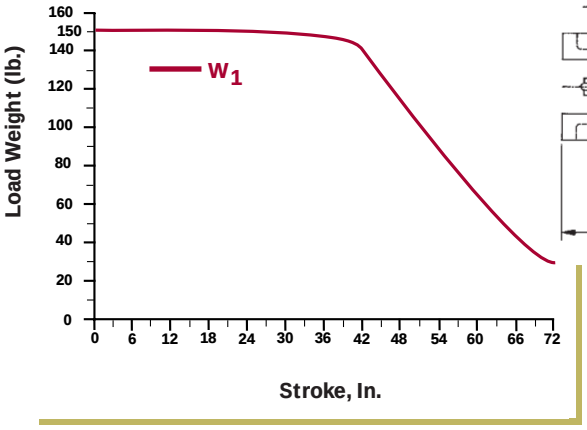
Guided Cable Cylinder Base Models

MODEL	BORE SIZE	TUBE
GCC1200	2.0”	Steel
GCC1203	2.0”	Aluminum
GCC1250	2.5”	Steel
GCC1251	2.5”	Aluminum



Load vs. Stroke

Maximum Allowable Load



*Aftermarket Repair Kits For T-O-M Brand Cable Cylinders Available • Call For Details**

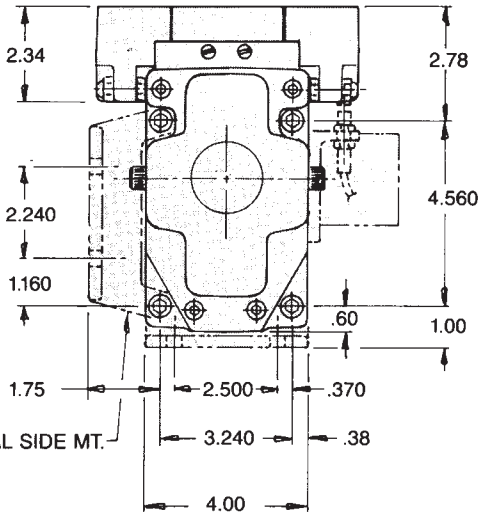
Totally Enclosed Cable Cylinders - TEC

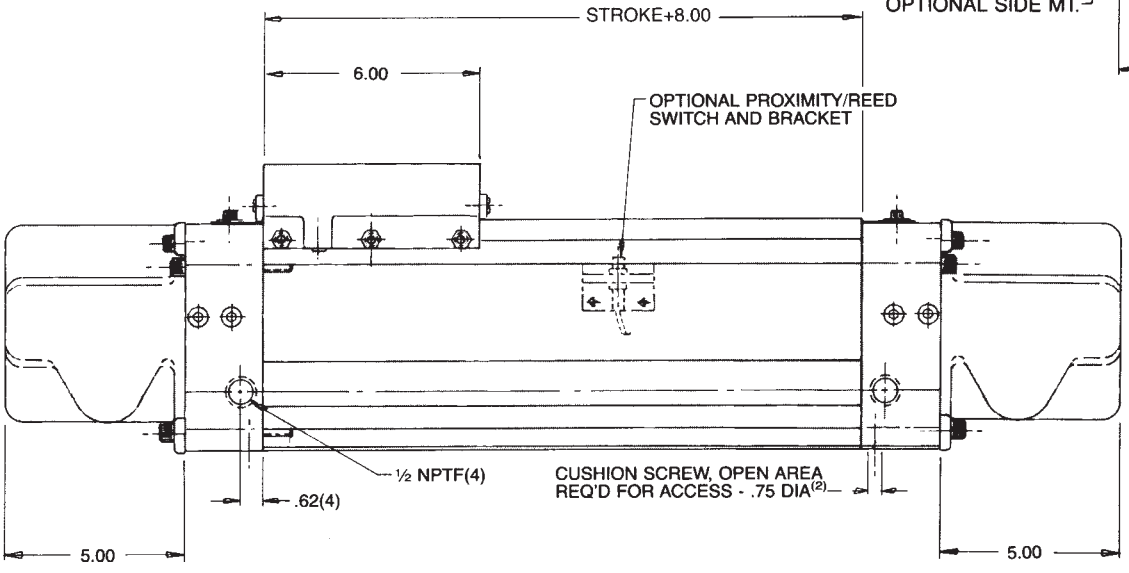
Standard Features

- Rugged Extrusion
- Main sealing enclosed
- Strokes to 23.5 feet
- Adjustable cushions
- Multi-ported heads
- Foot or side mounts
- 10 years field proven

TEC Cylinder Base Models

MODEL	BORE SIZE	EXTRUSION
1881	2.0”	Aluminum
1882	2.5”	Aluminum

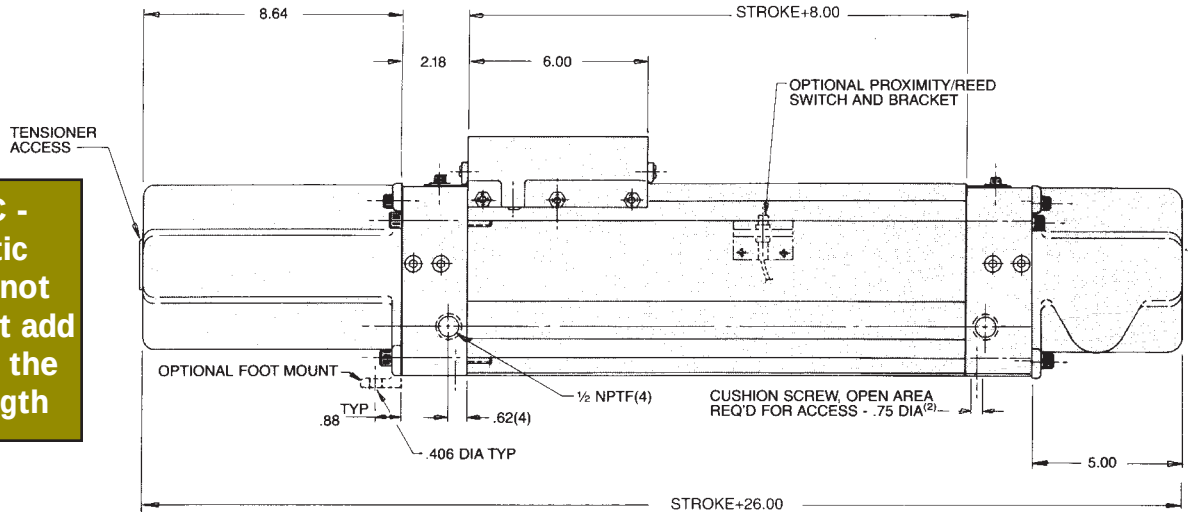




TEC Cylinder with Manual Tensioner

MODEL	BORE SIZE	EXTRUSION
1881T	2.0”	Aluminum
1882T	2.5”	Aluminum

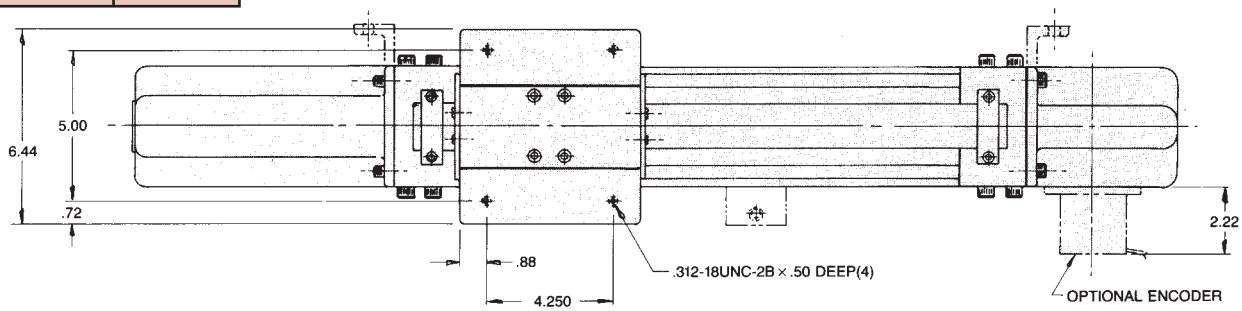
Option C - Pneumatic Tensioner not shown. Must add 5 inches to the overall length



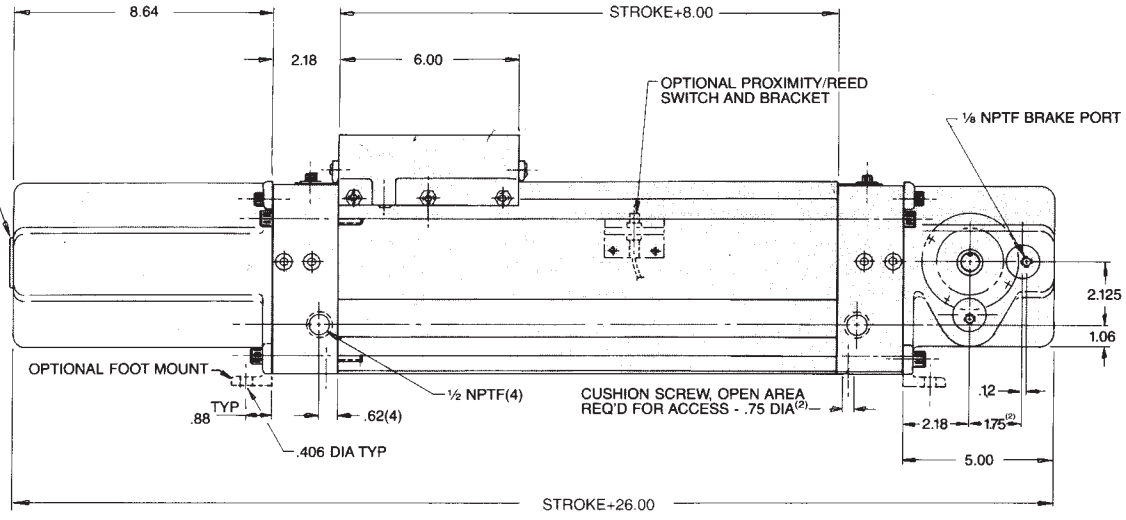
TEC Cylinder with Manual Tensioner & Brake Combo

MODEL	BORE SIZE	EXTRUSION
1881TB	2.0”	Aluminum
1881TB	2.5”	Aluminum

Brake sizing instructions on page 26.



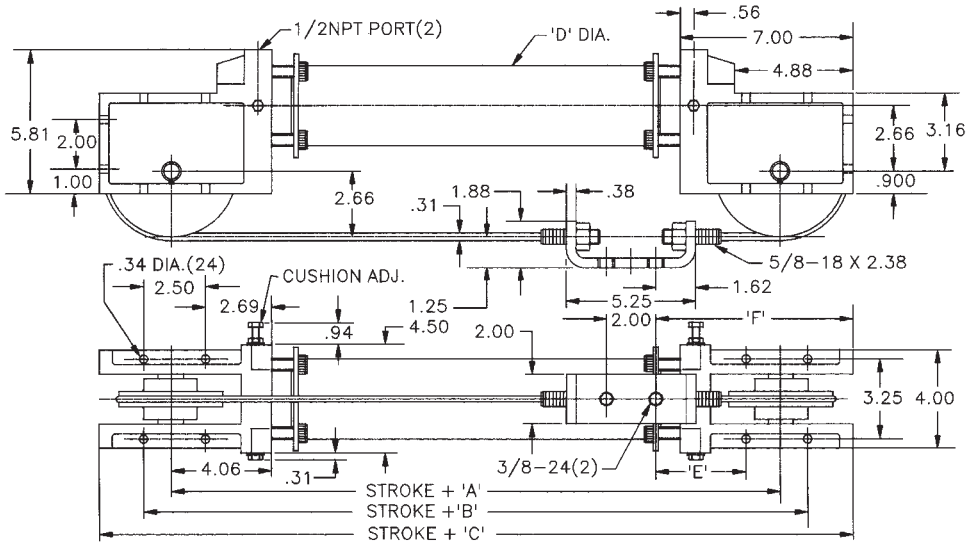
Option C - Pneumatic Tensioner not shown. Must add 5 inches to the overall length



Double Acting Base Models

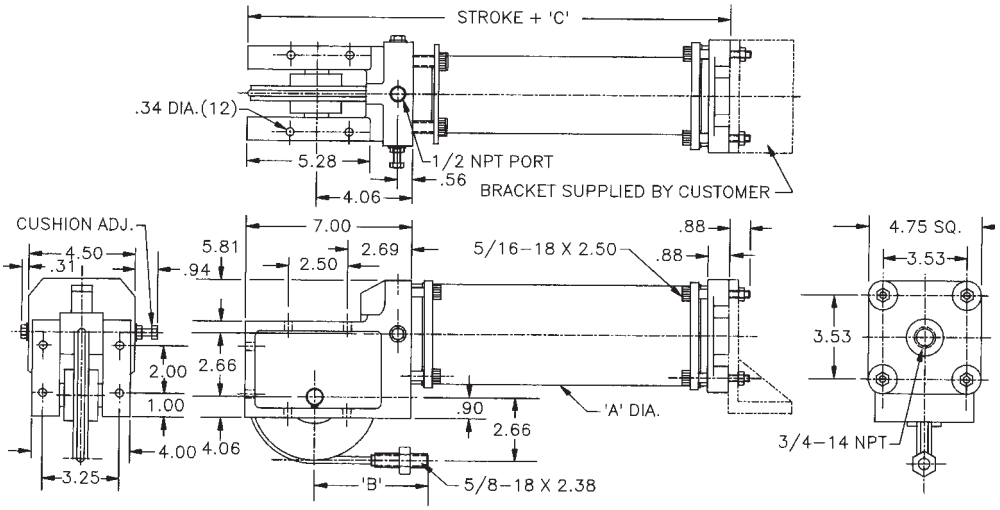
MODEL	BORE SIZE	TUBE	DIMENSIONAL DATA A	B	C	D	E	F
1201HP	2.0”	Steel	11.68	13.94	17.50	2.25	3.44	7.75
1206HP	2.0”	Aluminum	11.68	13.94	17.50	2.25	3.44	7.75
1300	3.0”	Steel	11.68	13.94	17.50	3.25	3.44	7.75
1301	3.0”	Aluminum	11.68	13.94	17.50	3.25	3.44	7.75
1400	4.0”	Steel	12.68	14.94	18.50	4.25	3.94	8.25
1401	4.0”	Aluminum	12.68	14.94	18.50	4.25	3.94	8.25

Strokes greater than 23.5 ft. require tube coupler kit.



Single Acting Base Models

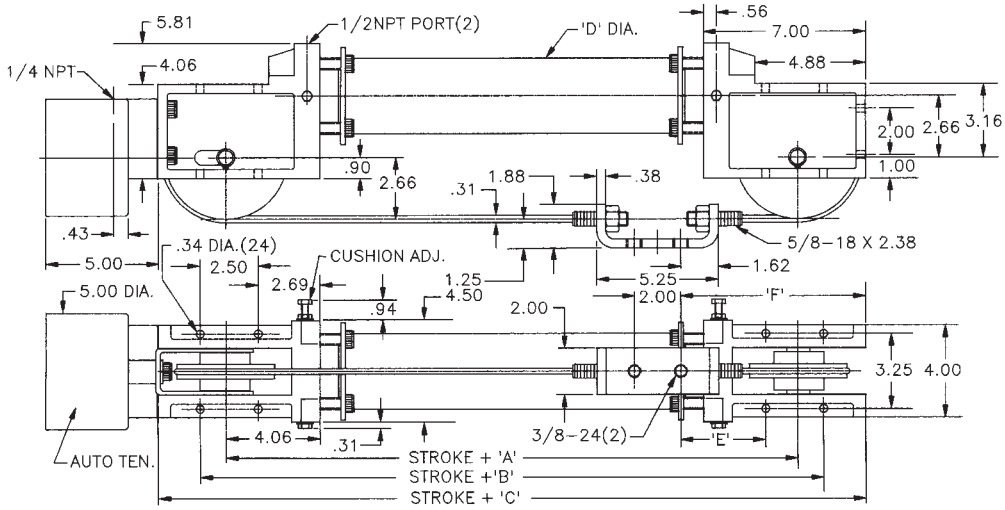
MODEL	BORE SIZE	TUBE	DIMENSIONAL DATA A	B	C
1201SAHP	2.0”	Steel	2.25	3.60	11.38
1206SAHP	2.0”	Aluminum	2.25	3.60	11.38
1300SA	3.0”	Steel	3.25	3.60	11.38
1301SA	3.0”	Aluminum	3.25	3.60	11.38
1400SA	4.0”	Steel	4.25	4.35	12.38
1401SA	4.0”	Aluminum	4.25	4.35	12.38



Need Technical Assistance? Call Toll Free 1.800.428.1974

Double Acting; Auto Tensioner Base Models

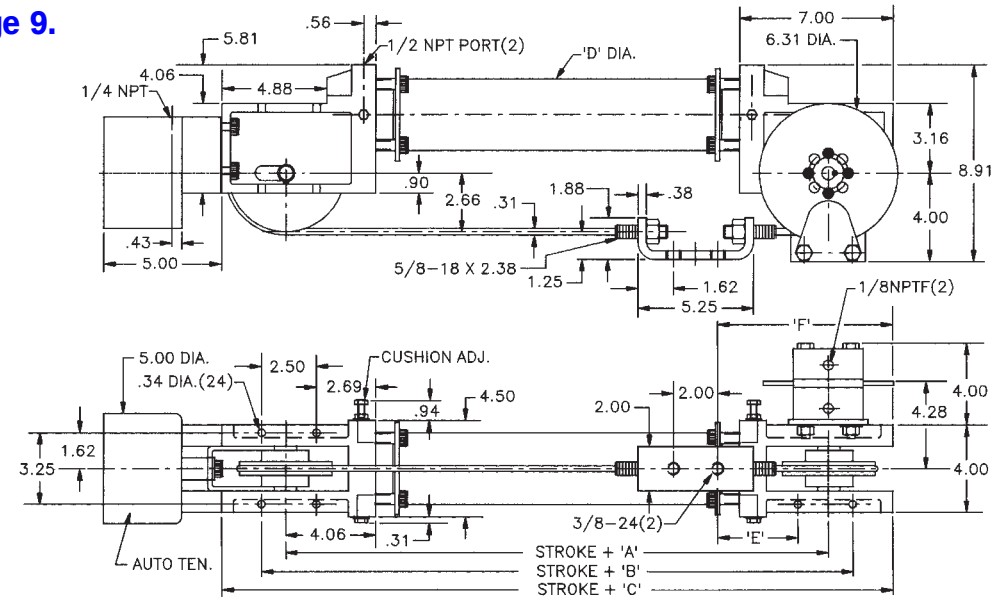
MODEL	BORE SIZE	TUBE	DIMENSIONAL DATA A	B	C	D	E	F
1201HPT	2.0”	Steel	11.68	13.94	17.50	2.25	3.44	7.75
1206HPT	2.0”	Aluminum	11.68	13.94	17.50	2.25	3.44	7.75
1300T	3.0”	Steel	11.68	13.94	17.50	3.25	3.44	7.75
1301T	3.0”	Aluminum	11.68	13.94	17.50	3.25	3.44	7.75
1400T	4.0”	Steel	12.68	14.94	18.50	4.25	3.94	8.25
1401T	4.0”	Aluminum	12.68	14.94	18.50	4.25	3.94	8.25



Double Acting; Auto Tensioner & Brake Combo Base Models

MODEL	BORE SIZE	TUBE	DIMENSIONAL DATA A	B	C	D	E	F
1201HPTB	2.0”	Steel	11.68	13.94	17.50	2.25	3.44	7.75
1206HPTB	2.0”	Aluminum	11.68	13.94	17.50	2.25	3.44	7.75
1300TB	3.0”	Steel	11.68	13.94	17.50	3.25	3.44	7.75
1301TB	3.0”	Aluminum	11.68	13.94	17.50	3.25	3.44	7.75
1400TB	4.0”	Steel	12.68	14.94	18.50	4.25	3.94	8.25
1401TB	4.0”	Aluminum	12.68	14.94	18.50	4.25	3.94	8.25

Brake sizing instructions on page 9.

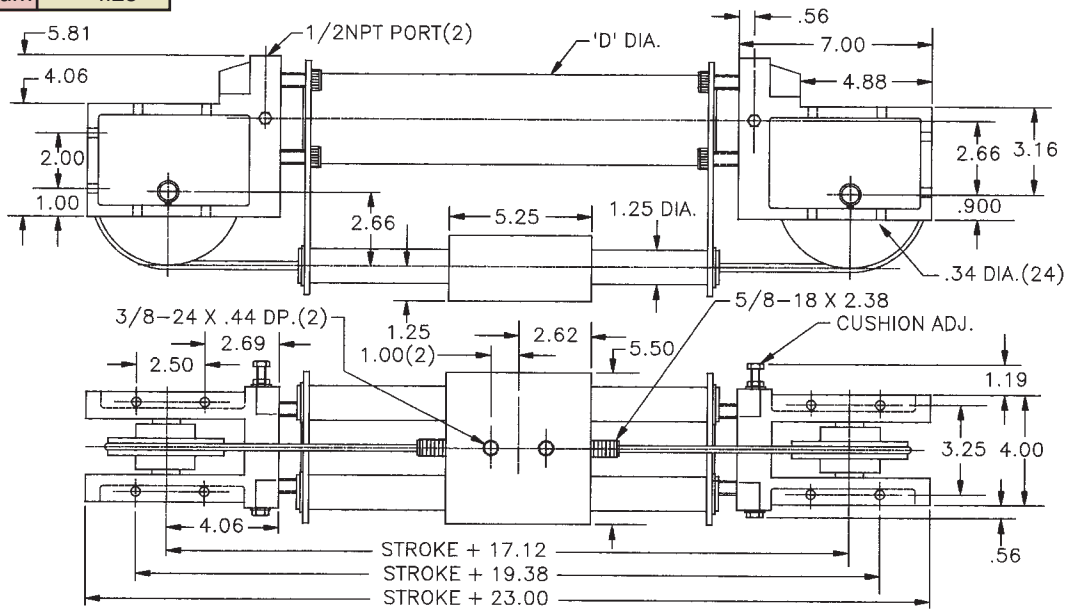


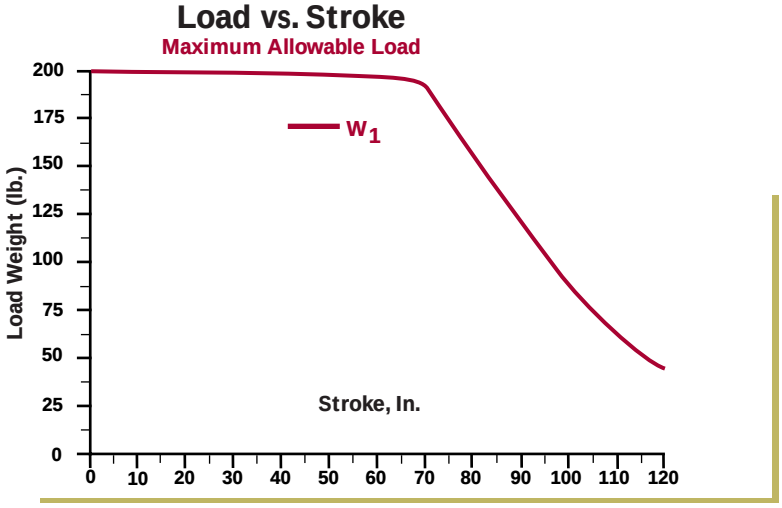
Double Stroke Base Models (see opposite page)

MODEL	BORE SIZE	TUBE	DIMENSIONAL DATA A	B	C	D	E	F
1201HPTD	2.0”	Steel	21.44	27.56	2.25	5.69	7.81	10.72
1206HPTD	2.0”	Aluminum	21.44	27.56	2.25	5.69	7.81	10.72
1300TD	3.0”	Steel	21.44	27.56	3.25	5.69	7.81	10.72
1301TD	3.0”	Aluminum	21.44	27.56	3.25	5.69	7.81	10.72
1400TD	4.0”	Steel	22.88	29.00	4.25	6.19	8.54	11.44
1401TD	4.0”	Aluminum	22.88	29.00	4.25	6.19	8.54	11.44

Guided Cable Cylinder Base Models

MODEL	BORE SIZE	TUBE	D
GCC1201HP	2.0”	Steel	2.25
GCC1206HP	2.0”	Aluminum	2.25
GCC1300	3.0”	Steel	3.25
GCC1301	3.0”	Aluminum	3.25
GCC1400	4.0”	Steel	4.25
GCC1401	4.0”	Aluminum	4.25

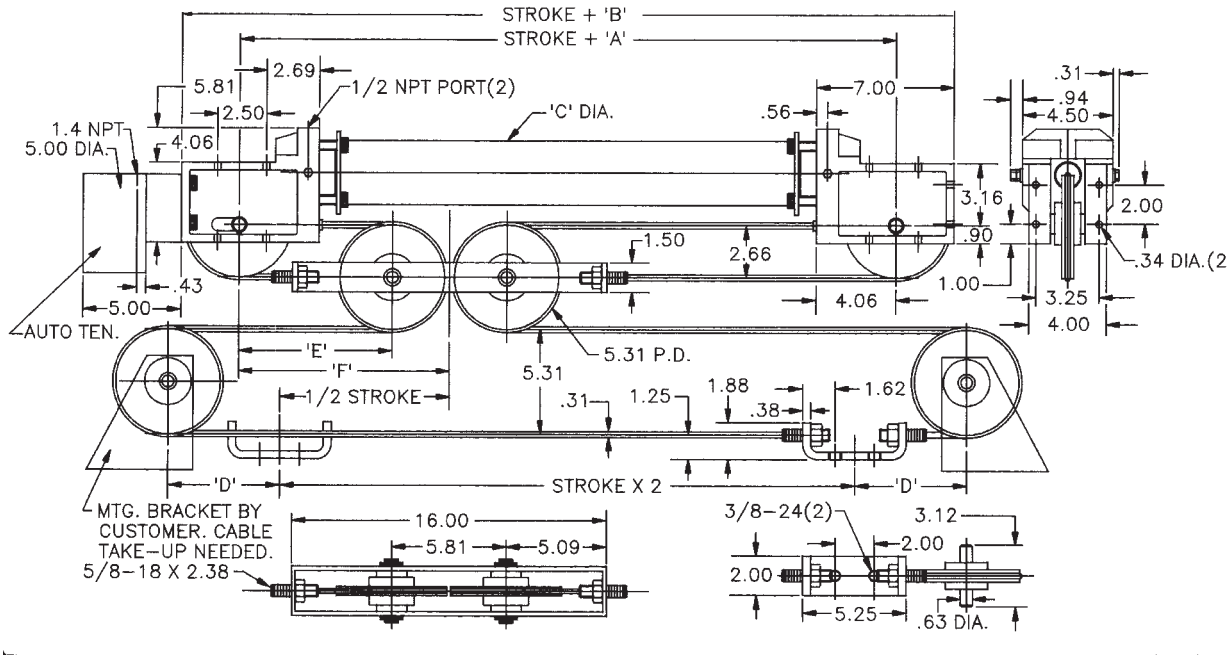




Need Technical Assistance? Call Toll Free 1.800.428.1974

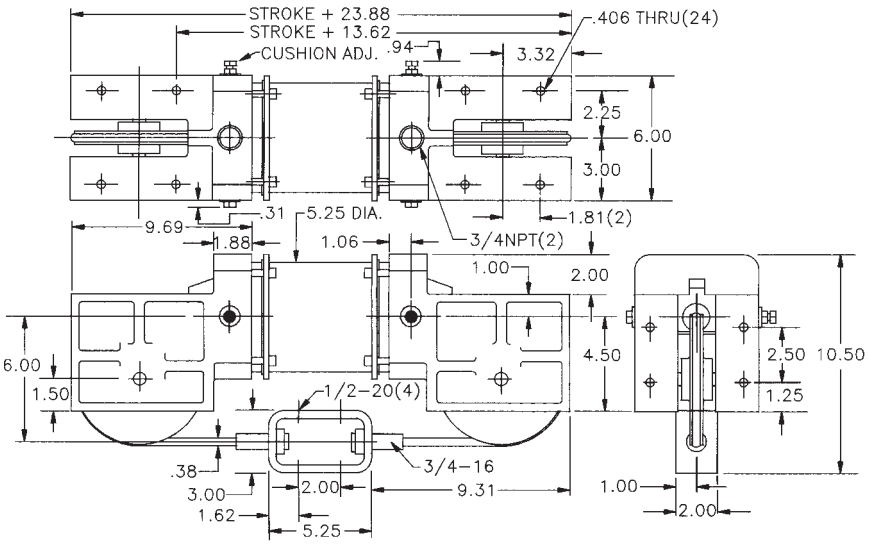
Double Stroke Base Models

Double stroke information on page 26.

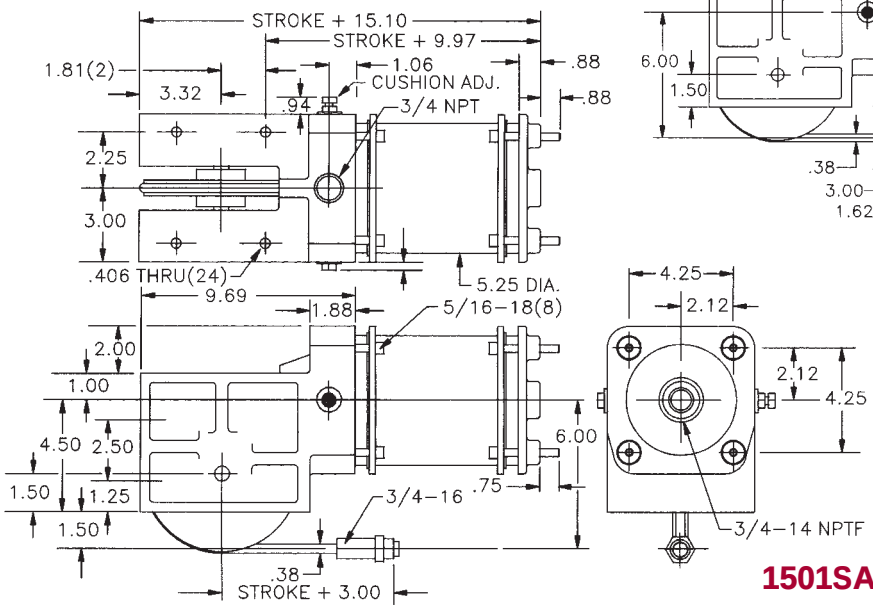


Double and Single Acting, 5” Bore Base Models

MODEL	BORE SIZE	TUBE
1501	5.0”	Aluminum
1501SA	5.0”	Aluminum



1501



1501SA

DOUBLE STROKE MODELS

The double stroke models offers twice the stroke and velocity of double acting cable cylinders. Saves space and gives you the flexibility to mount main body away from harsh contaminants.

Here is how to determine the correct double stroke option for your application:

1. Choose a double acting cable cylinder with an automatic tensioner that will produce twice the load force of the intended application.
2. Sheaves and cables of double stroke option are the same size as the ones used on the double acting cable cylinder
3. Correctly proof-load and pre-tension cables prior to cylinder operation.

BRAKE COMBINATION

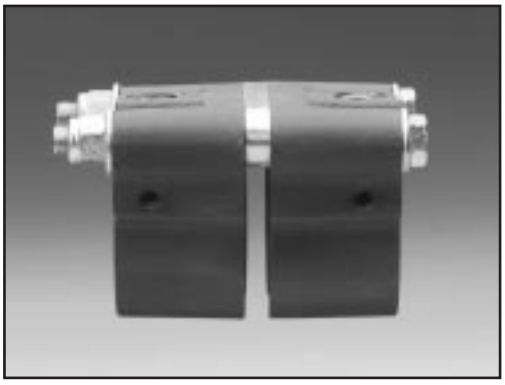
Use the caliper disc brake option for mid-stroke positioning or decelerating loads at the end of stroke.

For position holding, use a 3-position valve with pressure to both cylinder ports in the center position.

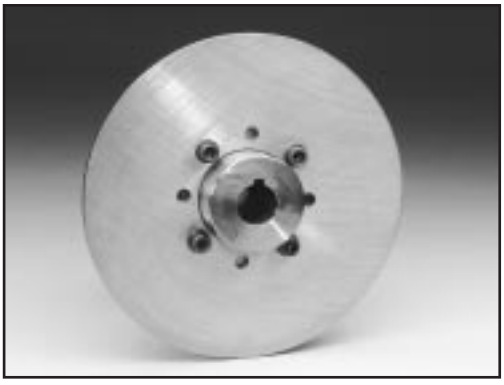
TEC cylinder only: The maximum load the brake can hold is 140 lbs. with 51 PSI applied to the automatic tensioner or 54 in.lbs. of torque applied to the jam nut of the manual tensioner. 100 PSI to the brake. The maximum is based on pressure being removed form the cylinder before applying brake.

Max. Brake Force = (PSI/100) (140)

Max. Brake Torque, in.lbs. = [(PSI/100) (140)] (1.75)



P47D Caliper Disc Brake



6 5/16 in. Dia. Hub/Disc Assy

INTRODUCTION

Before operating your new WCB Cable Cylinder it is very important to make sure the cables on your new cylinder are properly adjusted to ensure its maximum service life.

Your cable cylinder is shipped without the correct cable tension. Only after the cylinder is installed and a load is applied can you correctly tension the cables.

Once the cable cylinder is installed but before putting it into operation you must PROOF-LOAD AND PRE-TENSION the cables.

All cables have two kinds of stretch - constructional and elastic. As the cables are manufactured, their individual wire strands are laid in proper position but left somewhat slack. PROOF-LOADING aligns the wires into a tighter position eliminating the constructional stretch. PRE-TENSIONING removes the elastic stretch.

PROCEDURES

By adjusting the terminal lock nuts on the load clevis bracket you can perform PROOF-LOADING and PRE-TENSIONING procedures.

Step 1. Tighten the two terminal lock nuts equally with a torque wrench to the assigned torque values shown in table 7 below.

Step 2. Maintain tension for 30 seconds.

Step 3. Loosen nuts to remove cable tension but tight enough to remove slack. Repeat steps 1 and 2.

Step 4. Re-torque the two terminal lock nuts equally to the correct value depicted in table 8 below.

The cable cylinder is now ready for service.

TABLE 7.
Proof - loading torque values, in.lbs.

1050/1070/1100/1101	15
1150/1151	45
1200/1203	115
1250/1251	115
1300/1301	210
1400/1401	210
1501	290
1201/1206/HP	210

TABLE 8.
Pre - tensioning torque values, in.lbs.

1050/1070/1100/1101	13
1150/1151	29
1200/1203	71
1250/1251	98
1300/1301	130
1400/1401	213
1501	310
1201/1206/HP	140

CABLE CYLINDERS

Add option RS to model configuration of cylinders with aluminum tubing.

Note: Using RS or M option increases the overall cylinder length on some models by:

1050/1070/1101 Base Models	+ 1.62 inches
1151 Base Models	+ .375 inches.
1203/1251 Base Models	+ .375 inches.

1. RS option includes two normally open reed switches, piston magnet and tube clamps. Specify all other quantities after RS in model number, i.e. RS(3)...

2. Technical Data:

Housing	PVC, .25 x .20 x .90 long	Cable	2 lead (22 awg) with PVC jacket
Contact	SPST/NO	Switch Response	0.5 mS
Contact Resistance	0.2 Ohm (max)	Power Rating (VA)*	10
Voltage (max)	220 AC or DC	Current (amp	.5
Breaking Voltage	500 Volts min.	Operating Temp	14 to 140 degrees F, -10 to 60 degrees C
Shock Resistance	50g	Vibration Resistance	30g
Magnetic Strength	40 gauss min.	Normal Life Expect.	10 million cycles
Lead Length	36 inches	Circuit Protection	Additional recommended for inductive loads (diode on DC R-C on AC)

*VA rating is a product of Voltage times Current. The product must not be exceeded i.e. 24V x 0.5 A = 12 VA, which *exceeds* the 10 VA rating.

TEC CYLINDERS

Add option P2 to model configuration of TEC cylinders.

1. P2 option includes two normally open reed switches, carrier magnet and switch brackets. Specify all other quantities after P in model number, i.e. P(3)...

2. Technical Data:

Housing	PVC	Cable	2 lead (22 awg) with PVC jacket
Contact	SPST/NO	Switch Response	1.0 mS
Contact Resistance	0.2 Ohm (max)	Voltage (max)	200 DC
Contact Rating	10 VA*	Current (amp)	.5
Operating Temp	-40 to 105 degrees C	Shock Resistance	100g
Normal Life Expect.	5 VDC, 10 ma 50 million cycles		
	24VDC, 250ma 40 million cycles		
	100VDC, 10 ma 20 million cycles		
Lead Length	12 inches standard, 15 ft optional	Circuit Protection	Additional recommended for inductive loads (diode on DC R-C on AC)

*VA rating is a product of Voltage times Current. The product must not be exceeded i.e. 24V x 0.5 A = 12 VA, which *exceeds* the 10 VA rating.

Sizing worksheet

for cable cylinders, guided cable cylinders and totally enclosed cylinders.

Complete the following. Keep this page as an original by copying before proceeding.

Your Name: _____

Company: _____ Title: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Phone (_____) _____ Fax (_____) _____

Email _____

Describe the application:

_____

_____

_____

_____

Application data:

Load weight, lbs. . . . . _____
Stroke, in.. . . . . _____
Load velocity, in./sec. . . . . _____
Sliding coefficient of friction. . . . . _____
# of cycles/minute . . . . . _____
Operating pressure, psi. . . . . _____
Offset load, in. lbs.(GCC & TEC only). . . . . _____
Actuation: Pneumatic • Hydraulic
Orientation: Horizontal • Vertical • Incline. . . . . _____
Mid-stroke positioning: Yes • No . . . . . _____
Type of Environment, Specify . . . . . _____
Ambient temperature . . . . . _____
Reed switches: How many? . . . . . _____
.

Please submit this form via fax 715.426.1400. Attention: Customer Service Group.
We will acknowledge receipt of your criteria promptly. Our recommendation is based on information supplied by the customer. Final acceptance and approval is the responsibility of the customer. Each application should be prototyped and tested.

How To Order Your WCB Cable Cylinder

Model/Bore Size/Aluminum Tubing

1050 - .50” bore
1101 - 1.0” bore
1151 - 1.5” bore
1206 - 2.0” bore
1301 - 3.0” bore
1501 - 5.0” bore
1070 - .75” bore
1107 - 1.0” bore
1203 - 2.0” bore
1251 - 2.5” bore
1401 - 4.0” bore

Stroke Length (inches)

example: XXX.XX
54 ¼"= 054.25

1151 — [ ][ ] — RS3...T — 054.25

Model/ Bore Size/ Steel Tubing

1100 - 1.0” bore
1150 - 1.5” bore
1200 - 2.0” bore
1201 - 2.0” bore
1250 - 2.5” bore
1300 - 3.0” bore
1400 - 4.0” bore

Designators

for these models only. Leave blank otherwise.

F - 1107 Foot Mount
R - 1107 Rear Mount
HP - 1201 High Pressure
HP - 1206 High Pressure

Options - Not available (N/A) for all models. Any Order.

T	Auto Tensioner. N/A on 1107 or 1501 models.
T2	Auto Tensioners, 2 Total. N/A on 1107 or 1501 models.
M	Piston Magnet. N/A on 1050 or GCC1050 models.
RS	Reed Switch Package. N/A on models with steel tubing, 1050 or GCC1050 models. Includes (2) normally open reed switches with 6 foot lead wires, option M magnet, and mounting hardware. If one switch or more than two switches desired specify qty after RS(*) i.e. RS(1)...RS(3)...
LBA	Low Breakaway. N/A on 1050 or GCC1050 models.
B	Caliper Disc Brake. Only available on bore sizes of 1.5” or higher except 5.0” bore. Option T - Auto Tensioner required.
V	Viton Seals.
P3	Three Port Heads. Note: Cushions are eliminated using this option on all models except .75” and 1.0” bores.
LB	Linear Bearings. Only available on select GCC models. Consult factory for cylinder dimensions.
SA	Single Acting. N/A on GCC models and available only on bore sizes of 1.5” or higher.
D	Double Purchase Kit. N/A on GCC models and available only on bore sizes of 1.5” or higher except 5.0” bore.
CPLD	Coupler Kit. Not available on GCC models. Only available on bore sizes of 2.0” or higher except 5.0” bore.

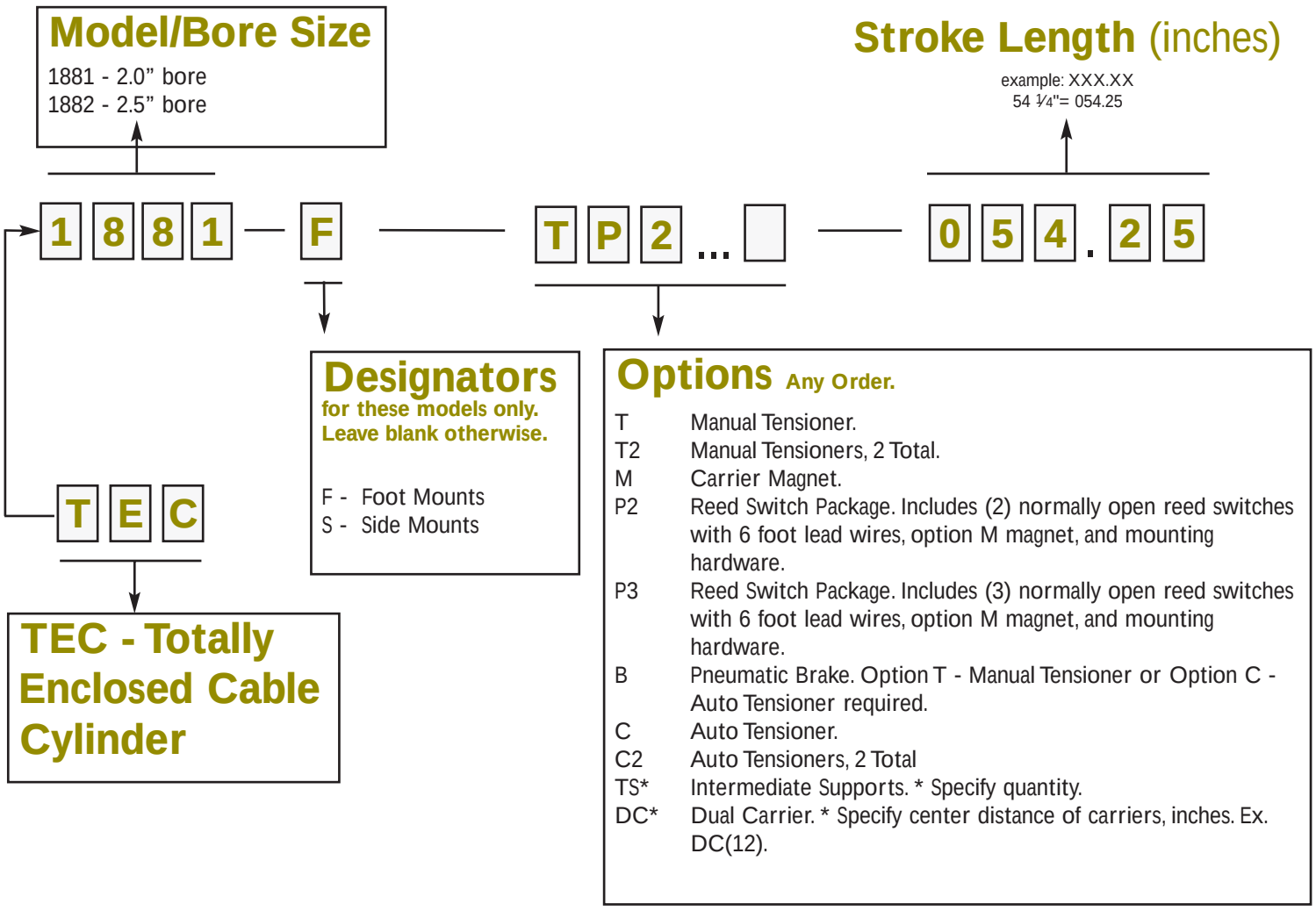
GCC

GCC - Guided Cable Cylinder. For these bore sizes only. Specify model & tubing as standard models.

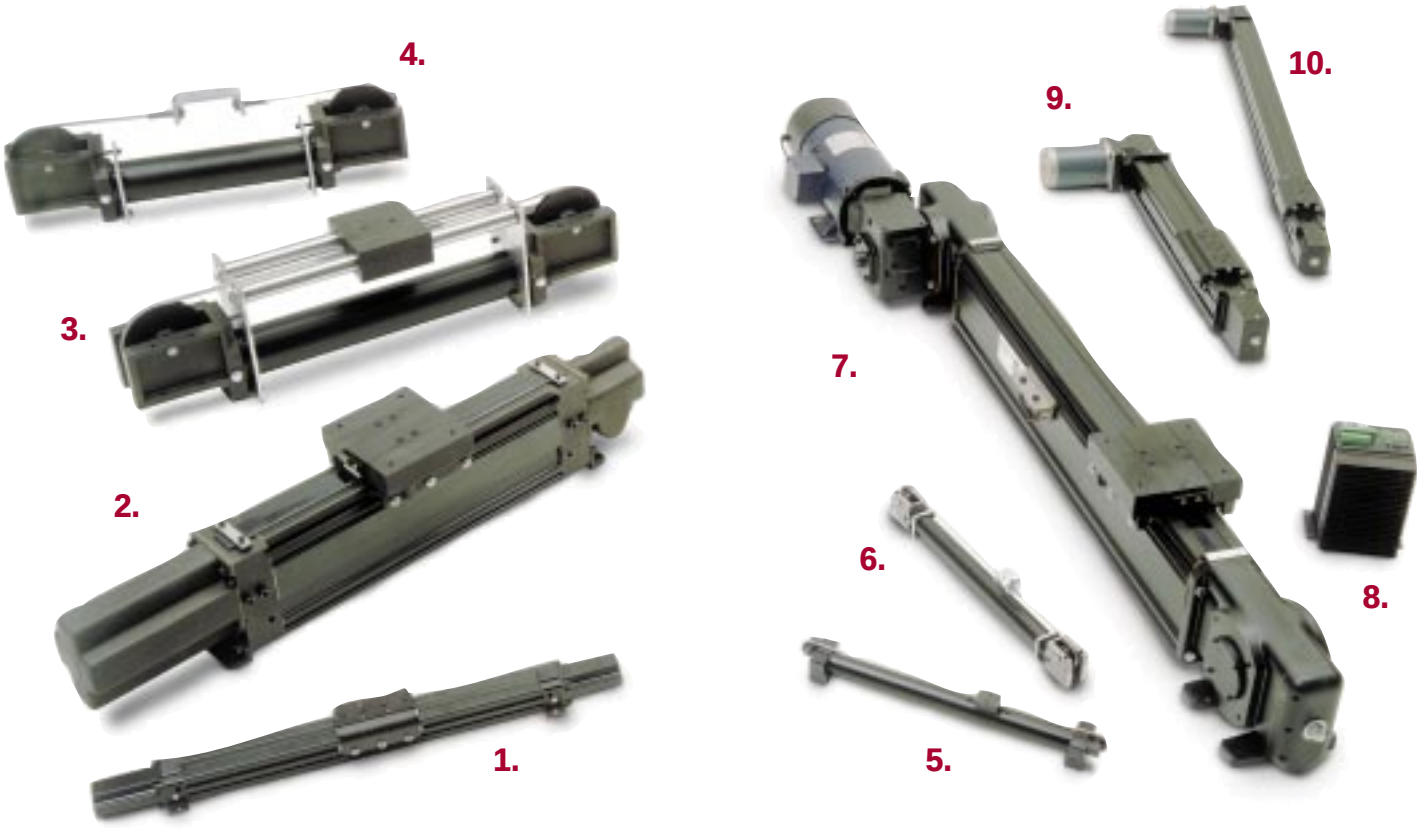
1050 - .50” bore
1070 - .75” bore
1100/1101 - 1.0” bore
1150/1151 - 1.5” bore
1200/1203 - 2.0” bore
1201/1206 - 2.0” bore
1250/1251 - 2.5” bore
1300/1301 - 3.0” bore
1400/1401 - 4.0” bore

W.C. BRANHAM INC.
CUSTOMER SERVICE 715.426.2000 • FAX 715.426.1400

How To Order Your TEC Series Cable Cylinder



Widest Range of Pneumatic, Low Pressure Hydraulic and Electric Cylinders for most applications.



1. **pneU-SA® Rodless Cylinders -** 25mm, 32mm, 40mm, 44mm bores.
2. **TEC Rodless Cylinders -** 50mm & 63mm bores.
3. **Guide Cable Cylinders (GCC) -** 1/2" through 4" bores.
4. **Cable Cylinders -** 1/2" through 5" bores.
5. ***New* - 1107 Series Low Profile Cable Cylinder - 1" bore.**
6. **1" bore Cable Cylinder Standard.**
7. **ELECTEC Programmable Belt Driven Actuator -** Nema 56-C, Strokes to 24 Ft.
8. **Step Motor Motion Controllers.**
9. **stepTEC® Nema 34 Belt Driven Actuator.**
10. **stepTEC® Nema 23 Belt Driven Actuator.**

W.C. BRANHAM INC.

398 TROY STREET • RIVER FALLS, WI 54022
CUSTOMER SERVICE (715) 426.2000 • FAX (715) 426.1400
E-MAIL • INFO@WCBRANHAMINC.COM
INTERNET • WWW.WCBRANHAMINC.COM