

MODEL SELECTION INFORMATION

The correct bore size of the cable cylinder can be determined in much the same manner in which a rod cylinder would be chosen. The fact that the effective area is

equal on both sides of the piston makes sizing a cable cylinder even easier. Table 1 gives the forces developed by each model at standard shop pressures.

TABLE 1

CYLINDER DATA					CABLE & CUSHION DATA						
(C) CABLE-TROL (T) TRAC-TROL MODEL	BORE (in.)	EFFECTIVE AREA (sq. in.)	FORCE (T & C) CAPACITY		WIRE DIA.	CABLE SPECIFICATIONS			CABLE FITTING (in)	INTERNAL CUSHION LENGTH (in.)	MAX INERTIA W/INTERNAL CUSHIONS (lbs.)
			80 PSI	150 PSI		NYLON O.D.	STRAND CONFIG.	TENSILE STGH. (lbs.)			
(C) 07	.75	.4348	34.7	65.2	3/64" std.* 1/16" opt.	3/32" 3/32"	7 x 7 7 x 7	270 480	1/4-28 x .82	.375 .375	11 19
(T & C) 10	1.00	.7785	62.3	116.8	3/64" std.* 1/16" opt.	3/32" 3/32"	7 x 7 7 x 7	270 480	1/4-28 x .82	.375 .375	27 47
(T & C) 15	1.50	1.7395	139.2	260.9	1/8"	3/16"	7 x 19	2000	3/8-24 x 1 11/16	.75	205
(T & C) 20	2.00	3.0925	247.4	463.9	5/32"	1/4"	7 x 19	2800	5/8-18 x 1 5/8	.75	357
(T & C) 25	2.50	4.8597	388.8	728.9	5/32"	1/4"	7 x 19	2800	5/8-18 x 1 5/8	.75	463
(T & C) 32	3.25	8.2191	657.5	1232.9	3/16"	5/16"	7 x 19	4200	3/4-16 x 2 1/4	.88	862
(T & C) 40	4.00	12.4560	996.5	1868.4	1/4"	3/8"	7 x 19	7000	3/4-16 x 2 1/2	.88	1410
(T & C) 50	5.00	19.5246	1562.	2928.7	1/4"	3/8"	7 x 19	7000	3/4-16 x 2 1/2	.88	1410
High Pressure Hydraulic			300 PSI	500 PSI **							
(T & C) 20P**	2.00	3.0925	927.7	1546.3	5/32"	1/4"	7 x 19	2800	5/8-18 x 2	.75	357**
(T & C) 25P**	2.50	4.7983	1439.5	2399.2	1/4"	3/8"	7 x 19	7000	3/4-16 x 2 1/2	.75	1158**

(1) To figure forces at other psi, multiply psi x effective area.

Example: model 15 at 50 psi equals 1.74 x 50.

* 3/64 cable is standard, 1/16 is optional.

** Model 20P & 25P - 300 PSI maximum for shock or pressure spike applications, 500 PSI non-shock.

Standard breakaway is 6 to 10 psi - low breakaway available upon request.

MODELS 07-50 - 150 psi max. Pneumatic or Hydraulic.

MODELS 20P-25P - 500 psi max. Hydraulic.

(T) Note - Force capacity does not indicate load capacity. See pages 18 & 20.

NOMENCLATURE

F = Inertia force in cable (lbs) must be less than 60% of cable tensile strength.

W = Maximum weight of load (lbs).

V = Maximum velocity of load (in/sec).

s = Stopping distance or cushion length (Table 1)

g = 386.4 in/sec²

f = Coefficient of friction between all sliding parts

.10 ball bearing

.15 needle bearing

.30 journal bearings - nylon or bronze

q = angle of inclination of 0° - 90°
(horizontal **q** = 0°)

CUSHIONING FOR ALL MODELS

All Greenco cable cylinders are equipped with internal cushions to help decelerate the load without damaging the cylinder or cable.

Excessive inertia forces neutralize the internal cushions causing the cable to stretch and "whip". Eventually, the cable may break.

The following equations and information in Table 1 will determine if the internal cushions are adequate. If the calculations show that the cushions are inadequate, a cylinder with larger diameter cable should be selected or external shock absorbers should be used. See pg. 21.

The equations below determine the inertia force developed when the maximum weight, stopping distance and maximum velocity are known and when the load is moving.

Horizontally: $F = \left(\frac{V^2}{2sg} - f \right) W$

Upward Vertically: $F = \left(\frac{V^2}{2sg} - 1 \right) W$

Downward Vertically: $F = \left(\frac{V^2}{2sg} + 1 \right) W$

Upward on an Incline: $F = \left(\frac{V^2}{2sg} - \sin q - f \cos q \right) W$

Downward on an Incline: $F = \left(\frac{V^2}{2sg} + \sin q - f \cos q \right) W$

The value of "F" obtained from the equation can be compared to the "maximum inertia with internal cushions" found in Table 1 to select the best cylinder for application.

If external cushion devices with longer stopping distance are used, do not exceed 60% of cable tension strength for the value of "F".

By rearranging the first equation, the critical velocity for horizontal loads can be calculated for a known weight and cylinder bore.

$V = \sqrt{(F/W + f) 2sg}$

Use values for "F" and "s" from Table 1 when using internal cushions. Do not exceed this critical velocity unless external cushion devices are used.

CABLE STRETCH, PROOFLOADING AND TENSIONING FOR ALL MODELS

It is very important that cable cylinder cables are properly adjusted to obtain maximum cable and seal life.

Loose cables tend to “whip” at the beginning and end of the stroke, shortening cables and seal life. Excessive cable tension deteriorates the cable and its covering.

Properly tensioned cables prevent all this but periodic inspection is necessary to maintain maximum operating life.

All cables exhibit two types of stretch, constructional and elastic. When cable is stranded, the individual wires and strands are laid in their proper position but are slightly loose. When the cable is subjected to an initial load, the wires align themselves into a tighter position. This readjustment under tension is the constructional stretch.

Once the constructional stretch is removed by proofloading, any further stretch is elastic stretch which relates to the actual material characteristics.

Before operating the cylinder the constructional stretch must be eliminated by proofloading:

1. Tighten the trolley locknuts to the torque indicated on Table 2.
2. Maintain the proofload tension for 30 seconds.
3. Loosen nuts and repeat.

If a torque wrench is not available, the cable tension can be estimated using a common fish scale. Apply the fish scale at the midpoint of the span between two sheaves or between a sheave and the load. The fish scale should read the value indicated on Table 2 when the cable is pulled 1% of the span.

TABLE 2 - PROOFLOADING

MODELS	PROOFLOAD (LBS.)	TIGHTENING TORQUE (IN./LB.)	FISHSCALE (LB.)
07, 10	162	15	1 2/3
15	1200	75	12
20, 20P, 25	1680	150	17
32	2520	260	25 1/2
25P, 40, 50	4200	415	42

After the constructional stretch has been eliminated by proofloading, the cables can be tightened to the operating tension. With the load physically blocked in midstroke, apply operating pressure to one end of the cylinder. Tighten the slack cable to the value indicated on Table 3 (the torques listed are for maximum rated pressure). Repeat the procedure with operating pressure applied to the opposite end. The fish scale method could be use here also, but would take more time to obtain the correct tension.

TABLE 3 - CABLE OPERATING TENSION (at maximum rated pressure)

MODELS	TORQUE (IN./LB.)	FISHSCALE (LB.)
07	12	2/3
10	14	1 1/3
15	32	2 2/3
20	60	4 2/3
25	80	7 1/3
32	140	12 1/2
40	200	19
50	300	30
20P	140	15 1/2
25P	245	24

OPERATION & INSTALLATION FOR ALL MODELS

OPERATION: Operate the cable cylinder just same as you would any other cylinder. Be sure to operate it at pressures within the catalog ratings. For air operation, use a **filter-regulator-lubricator** in the supply line to protect your valves and the cylinder. Use a flow control valves to control speed in each direction. Adjust the cushion needle valves to get smooth stopping at each end of the stroke without bounce or impact. Flow control valves are always desirable for speed control and improved cushion action. For heavier loads and higher speeds, shock absorbers should be used.

To insure acceptable life, the application should be within the limits of the recommendations below.

- For most applications, maximum velocity of 5 feet per second. See page 21.
- Maximum operating pressure 150 psi air and oil (500 psi on hydraulic modes 20P and 25P) on Cable-Trol®.
- Temperature range 32 - 150° F.

INSTALLATION: The cylinder should be mounted firmly to the machine, utilizing the two mounting holes in each head. Pipe air or oil lines making sure that no fitting is scraping the cable or sheave. The cylinder should then be cycled a minimum of 20 times, after which the cable should be retensioned. This procedure should be followed again after the first eight hours of use.

MOUNTING TROLLEY MODELS: Mount the cable cylinder parallel to the load path so that the trolley can move the load through the full designed stroke of the cylinder. Bolt or pin the trolley to the load so that the load does not pull the trolley off its path of travel. Avoid twisting the trolley in any way that could increase or vary cable tension during the full stroke.

MOUNTING NON-TROLLEY MODELS: Mount the cable cylinder so that the cable leaves the sheave on the center of the groove. Connect the cable to the load using GREENCO re-usable cable terminals in such a way that the cable tension will not vary during the stroke.

TABLE 4 - WEIGHT & TUBING SPECIFICATIONS

	MODEL	BORE	WALL THICKNESS	APPROXIMATE BASE WEIGHT			WEIGHT PER FOOT	
				SINGLE ENDED	DOUBLE ENDED	WITH TENSIONER	ALUMINUM	STEEL
CABLE-TROL®	07	3/4 inch	1/8 inch	.75 lbs.	1.25 lbs.	2.25 lbs.	.40 lbs.	N/A
	10	1 inch	1/8 inch	.75 lbs.	1.25 lbs.	2.25 lbs.	.52 lbs.	1.45 lbs.
	15	1 1/2 inches	1/8 inch	2.50 lbs.	5.00 lbs.	8.50 lbs.	.75 lbs.	2.10 lbs.
	20	2 inches	1/8 inch	5.25 lbs.	10.50 lbs.	16.50 lbs.	.98 lbs.	2.73 lbs.
	25	2 1/2 inches	1/8 inch	7.75 lbs.	15.50 lbs.	21.50 lbs.	1.21 lbs.	3.50 lbs.
	32	3 1/4 inches	1/8 inch	16.00 lbs.	32.00 lbs.	37.00 lbs.	1.56 lbs.	4.47 lbs.
	40	4 inches	1/8 inch	26.50 lbs.	52.00 lbs.	60.00 lbs.	1.88 lbs.	5.46 lbs.
	50	5 inches	1/8 inch	32.75 lbs.	65.00 lbs.	74.00 lbs.	2.37 lbs.	N/A
	20P	2 inches	1/8 inch	5.75 lbs.	11.50 lbs.	N/A	.98 lbs.	2.73 lbs.
TRAC-TROL®	25P	2 1/2 inches	1/8 inch	8.25 lbs.	16.50 lbs.	24.50 lbs.	1.21 lbs.	3.50 lbs.
	10	1 inch	1/8 inch	N/A	3.00 lbs.	4.00 lbs.	1.50 lbs.	3.00 lbs.
	15	1 1/2 inches	1/8 inch	N/A	7.75 lbs.	10.25 lbs.	1.80 lbs.	3.60 lbs.
	20	2 inches	1/8 inch	N/A	11.75 lbs.	18.25 lbs.	2.00 lbs.	4.00 lbs.
	20P	2 inches	1/8 inch	N/A	12.50 lbs.	N/A	2.61 lbs.	5.12 lbs.
	25	2 1/2 inches	1/8 inch	N/A	22.00 lbs.	28.00 lbs.	2.70 lbs.	5.40 lbs.
	25P	2 1/2 inches	1/8 inch	N/A	23.50 lbs.	29.50 lbs.	2.90 lbs.	5.80 lbs.
	32	3 1/4 inches	1/8 inch	N/A	43.00 lbs.	49.00 lbs.	4.10 lbs.	8.20 lbs.
	40	4 inches	1/8 inch	N/A	57.00 lbs.	66.00 lbs.	5.20 lbs.	10.40 lbs.
50	5 inches	1/8 inch	N/A	77.00 lbs.	87.00 lbs.	5.90 lbs.	11.18 lbs.	

The data presented in the above chart are average values and may vary slightly.

TABLE 5 - CABLE-TROL®

CUT CABLE LENGTH - VS. ASSEMBLY LENGTH FOR CABLE-TROL® This chart is for standard CABLE-TROL® cylinders only - it also can prove helpful in figuring additional cable needed for special applications.

MODEL	CP	CT	PS	TS	SD	CABLE DIA.	STRIP LENGTH	SWAGE ADDER EACH	SCREW ADDER	STROKE + C.C.L.
07	2.06	2.06	1.46	1.44	1.50	3/32	.30	.13	.31	4.88
10	1.68	1.68	1.24	1.44	1.50	3/32	.30	.13	.38	5.00
15	2.06	3.94	1.24	2.94	3.00	3/16	.45	.25	.38	10.88
20	2.06	4.69	1.68	3.44	4.25	1/4	.45	.25	.38	13.88
20P	2.06	5.06	1.68	3.64	4.00	1/4	.45	.25	.38	13.80
25	2.06	4.69	1.68	3.44	4.25	1/4	.45	.25	.38	13.88
25P	2.63	5.94	2.25	4.19	5.00	3/8	.94	.50	.50	17.88
32	2.72	6.03	1.98	4.19	5.31	5/16	.75	.50	.25	17.50
40	2.72	6.03	1.98	4.19	6.00	3/8	.94	.50	.50	20.00
50	3.00	7.00	2.75	5.25	6.00	3/8	.94	.50	.50	20.50

Dimensions in inches

