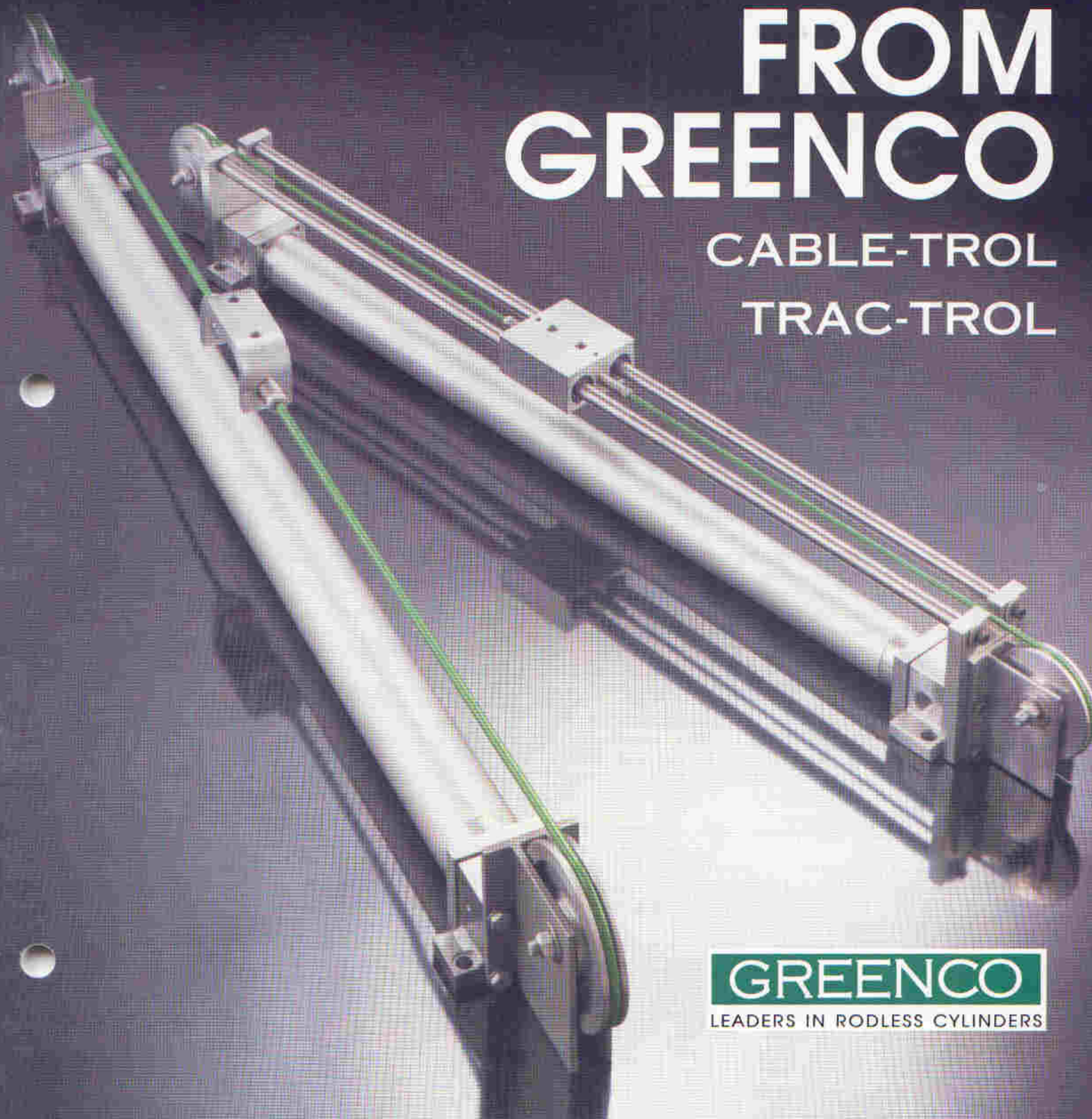




G-95b

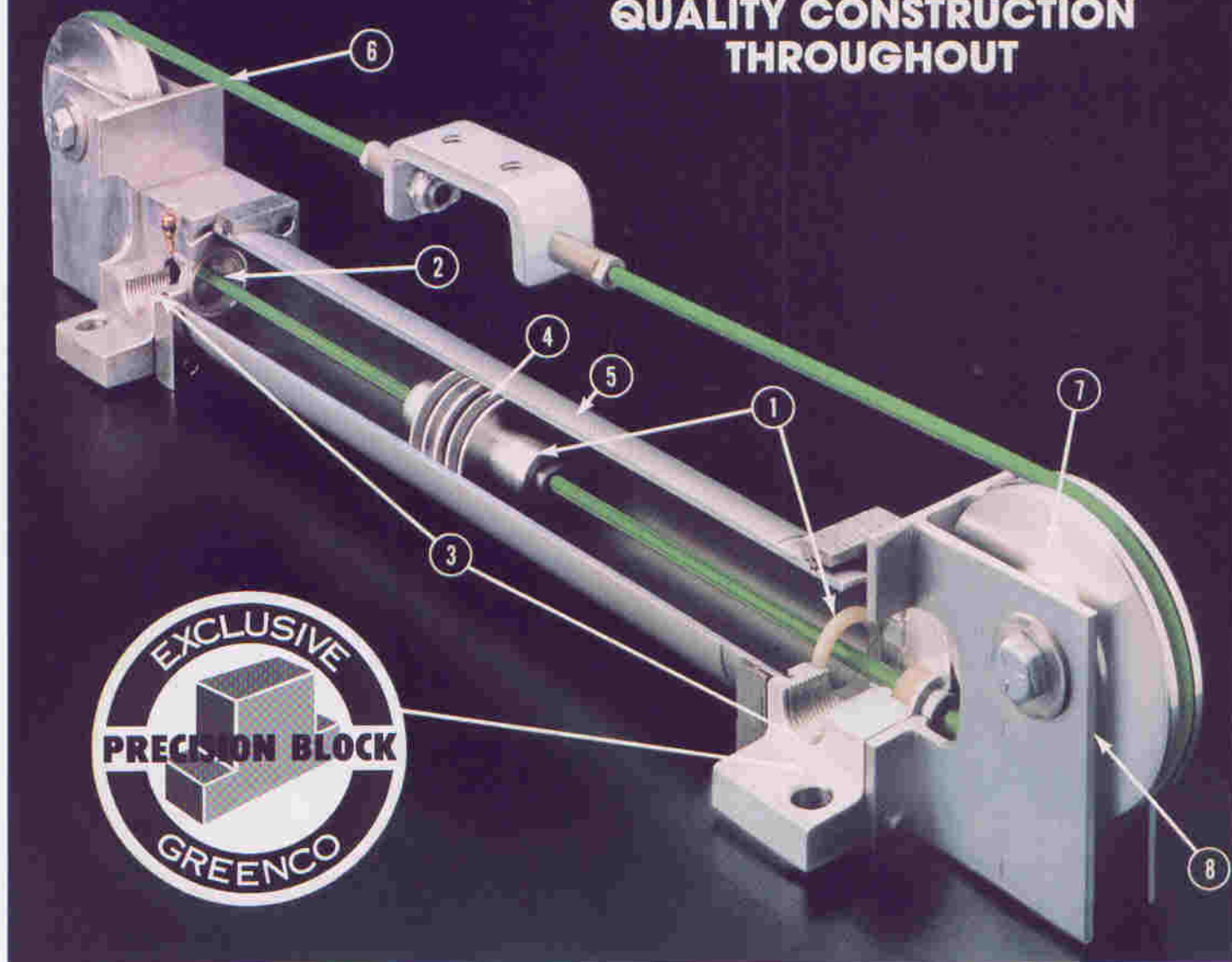
CABLE CYLINDERS FROM GREENCO

CABLE-TROL
TRAC-TROL



GREENCO
LEADERS IN RODLESS CYLINDERS

QUALITY CONSTRUCTION THROUGHOUT



- 1. QUALITY PNEUMATIC CUSHIONING** — The fully-adjustable cushioning brings the piston to a gentle stop at the end of each stroke. Rate of deceleration is controlled by a self-locking needle adjustment valve. Models 05, 07, and 10 have fixed cushioning.
- 2. FAST BREAKAWAY** with quality pneumatic cushioning. A flexible polyurethane cushion seal allows faster breakaway on models 15 - 80.
- 3. EXCLUSIVE PRECISION BLOCK** provides the strongest possible bridge between sheave bracket and tube. N.F.P.A. specifications for foot, flange or tapped hole mounting.
- 4. HIGH STRENGTH ALUMINUM PISTON WITH SYNTHETIC PACKING** — Low friction aluminum piston has greater impact strength than ordinary cast iron type. Provides excellent wearing and corrosion resistant qualities. Each piston is precision machined, polished and securely fastened to the cable.
- 5. PRECISION CYLINDER TUBE** — Available in hard-coated aluminum, steel with painted exterior or plated steel providing rugged strength, low friction and corrosion resistance.
- 6. NYLON COATED STEEL CABLES** — An aircraft-type steel cable replaces the piston rod. A nylon coating acts as a smooth surface on which to seal. Cylinder always "pulls" the load through tension on the cable.
- 7. PRECISION SHEAVES** — These guide the cable through the seal in accurate alignment. The precision sheaves also protect the cable coating for longer seal-cable life. Exclusive symmetrical bolt-on construction allows the sheave to be located in any of four positions (90° apart) with respect to the mounting.
- 8. FACTORY-LUBRICATED NEEDLE BEARINGS** — Precision, pre-lubricated needle bearings can be repacked in the field.
- EQUAL FORCE IN BOTH DIRECTIONS** — Since the cable area is relatively small the "push" and "pull" forces and volume displacement are approximately equal for either single or double ended styles.
- SAVE SPACE — REDUCE UNIT WEIGHT** — The length of a cable cylinder is little more than half that of a conventional piston rod cylinder. Length is always constant, providing the designer with new freedom of arrangement. There is no extended or retracted length. The extra weight of the piston rod is also eliminated by using cable cylinders.

CABLE-TROL**TRAC-TROL****POWR-TUBE****TABLE OF CONTENTS****GREENCO**

LEADERS IN RODLESS CYLINDERS

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GREENCO

LEADERS IN RODLESS CYLINDERS

THE CABLE CYLINDER PEOPLE™

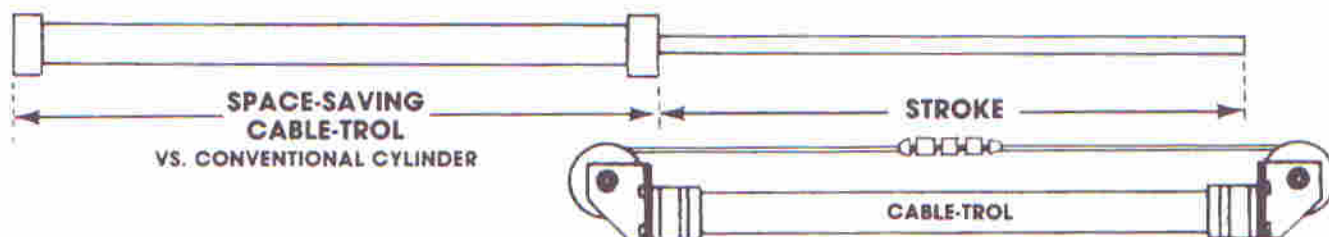
5688 W. Crenshaw, Tampa, FL 33634

• Phone: (813) 882-4400

FAX (813) 888-6688

NOTE: SPECIFICATIONS AND DIMENSIONS MAY BE CHANGED WITHOUT NOTICE.

CABLE-TROL SAVES SPACE



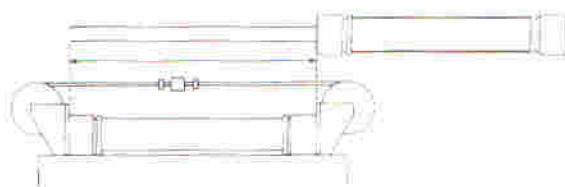
CABLE-TROL cylinders provide the same stroke as conventional cylinders with about **50% SPACE SAVINGS**. As the piston is pushed in one direction, the load is pulled in the

opposite direction, within the length of the cylinder. Effective piston area is greater than in conventional rod cylinders, and there is equal force in both directions.

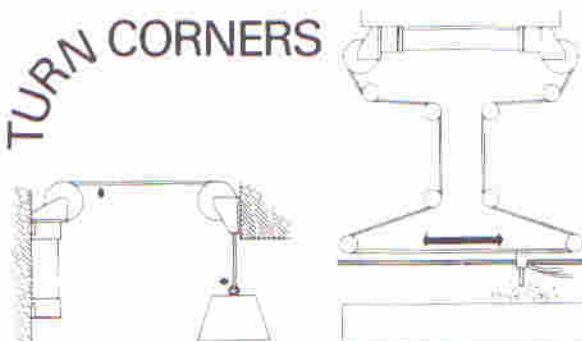
Requirement	Conventional Piston Rod Cylinder	CABLE-TROL
LONG STROKE	HIGH COST SPECIAL	EVERY-DAY STANDARD
LIMITED SPACE	CAN'T REDUCE - MUST ALLOW FOR TUBE PLUS STROKE	SAVES SPACE - STROKE PARALLELS TUBE
PUSH-PULL LOAD AROUND CORNERS	CAN'T DO	JUST UTILIZE STANDARD SHEAVE ACCESSORIES WITH CABLE-TROL
ROTARY MOTIONS	CAN'T DO	NO PROBLEM - USE EXTRA CABLE & WRAP AROUND DRUM
CONCEALED LOCATION	REAL PROBLEM	IDEAL - SIMPLY EXTEND CABLE THROUGH COVER PLATE & CONNECT TO LOAD

TYPICAL APPLICATIONS

SPACE SAVINGS



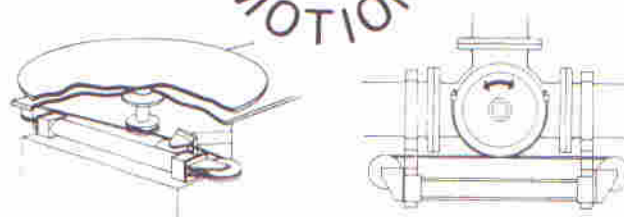
TURN CORNERS



REMOTE LOCATION



ROTARY MOTION

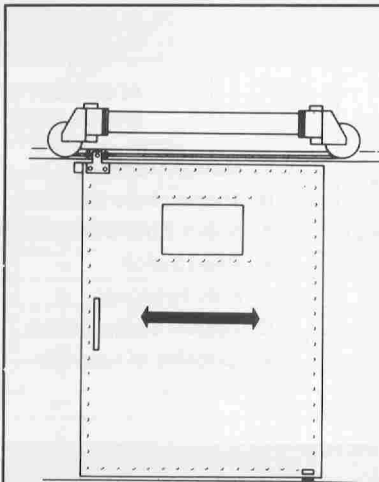


REMOTE LOCATION

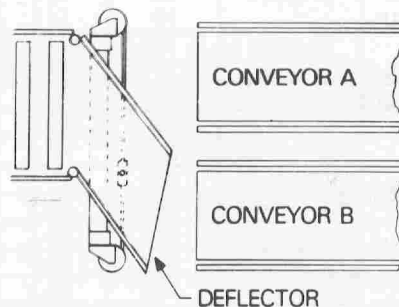
CABLE-TROL sheave assemblies can be ordered separately, as can additional cable. This allows the cylinder to be mounted remotely from where the load is to be moved. This is especially useful in harsh environments.

ROTARY MOTION

The cable can be attached to virtually anything. CABLE-TROLS have been used to rotate valves, loading chutes, even amusement park displays.

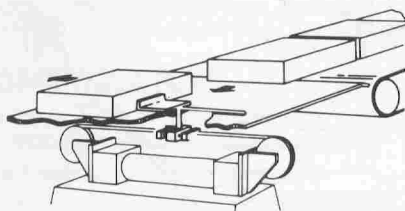


**SLIDING DOORS
OR WINDOWS**

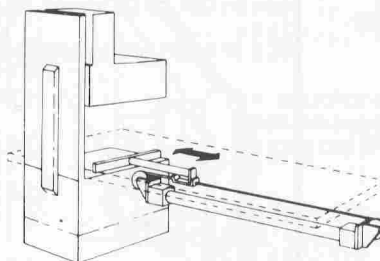


**SWITCHING
CONVEYOR LINES**

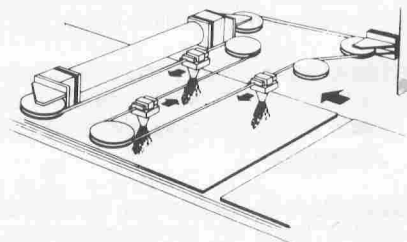
FULLY AUTOMATE A CONVEYOR TRANSFER TABLE



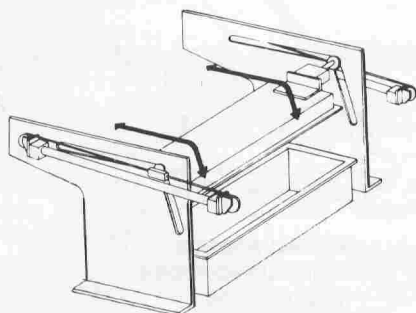
FEED PUNCH PRESS WITH STOCK AND TRANSFER FINISHED PIECE



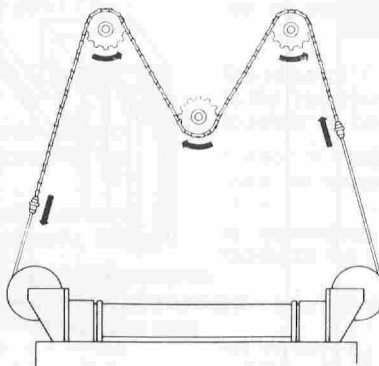
TWO, OR MORE SIMULTANEOUS AND OPPOSING RECIPROCATING MOTIONS



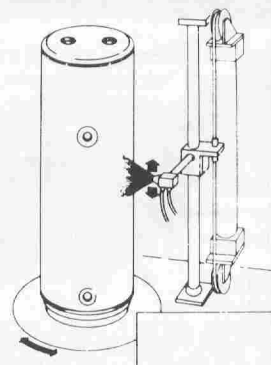
MOLD-LIFT ARRANGEMENT PIVOT MOUNTED CABLE CYLINDERS



RECIPROCAL MOTION IN AN IRREGULAR PATH



AUTOMATE SPRAY PAINT RIG ROTATE TABLE AND RECIPROCATATE NOZZLE



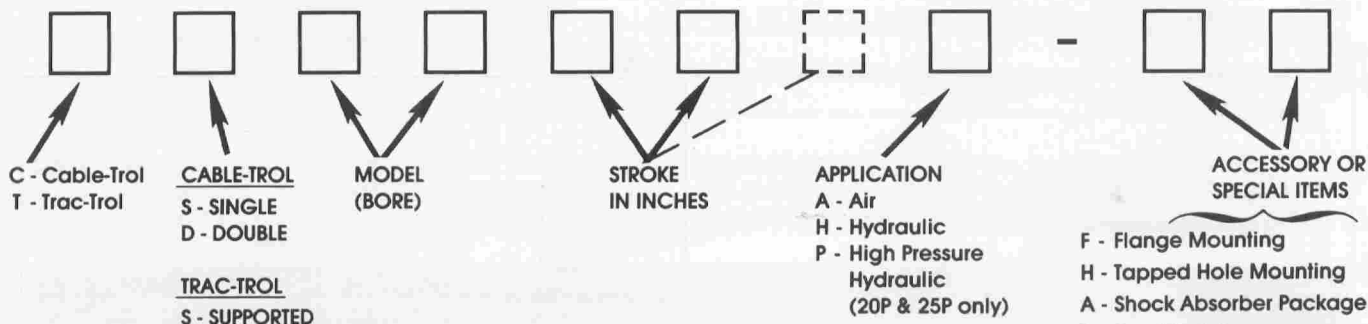
CABLE-TROL TRAC-TROL

HOW TO ORDER

GREENCO
LEADERS IN RODLESS CYLINDERS

Unless otherwise specified all units are

1) base mounting (precision block except models 05-07 and 10), 2) side ports and, 3) Sheave/Trolleys at position 1



EXAMPLES

CD20156A - Cable-Trol, double end, 2" bore x 156" stroke air service, automatic tensioner.

T1524H - Trac-Trol, 1 1/2" bore, 24" stroke, hydraulic service.

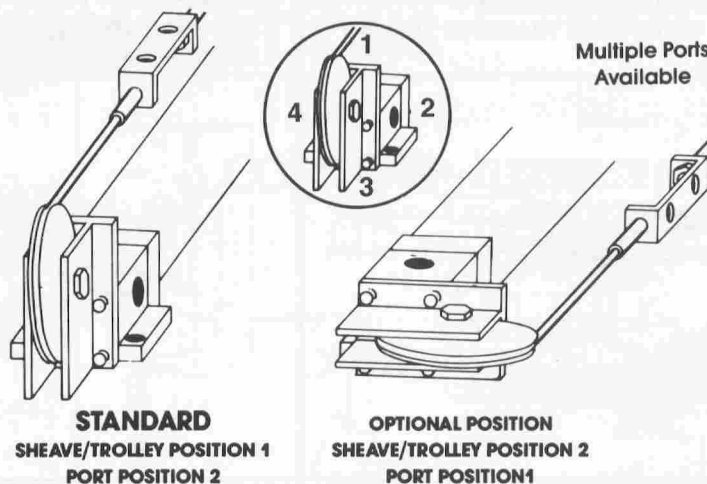
TS2548A-2 - Supported Trac-Trol, 2 1/2" bore, 48" stroke, air service, 2 support.

CD40132H-TR - Cable-Trol, double end, 4" bore, 132" hydraulic service, automatic tensioner, reed switch package.

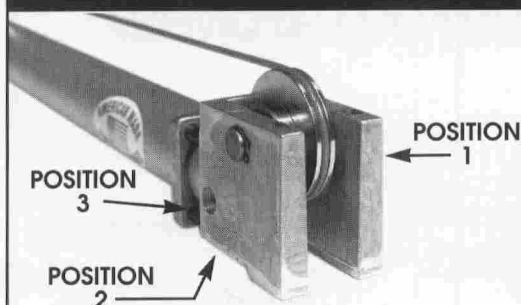
TS15108A-AR-4 - Supported Trac-Trol, 1 1/2" bore, 108" stroke, air service, shock absorber package, reed switch, 4 supports.

CD3248/96A-C - Cable-Trol, double end, 3 1/4" bore 48" stroke, air service, double stroke carrier allowing 96"

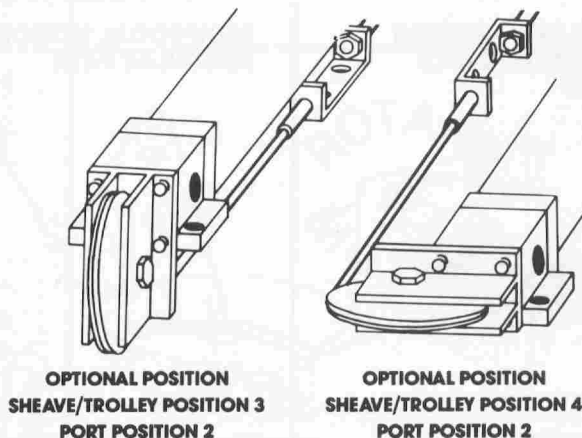
PORT, CUSHION & SHEAVE POSITIONS FOR MODELS 15 THROUGH 80.



PORT POSITIONS FOR MODELS 05, 07 & 10.



Side ports are standard on models 05, 07 and 10.
(Port 4 location - No longer available)



(NOTE: PORT 3 LOCATION IS NOT AVAILABLE ON MODEL 40)

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						
CABLE-TROL TRAC-TROL (T) MODEL	BORE (in.)	EFFECTIVE AREA (sq. in.)	FORCE CAPACITY (1)		CABLE SPECIFICATIONS					INTERNAL CUSHION LENGTH (in.)	MAX. INERTIA W/INTERNAL CUSHIONS (lbs.)
			80 PSI	150 PSI	WIRE DIA.	NYLON O.D.	STRAND CONFIG.	TENSILE STGH. (lbs.)	CABLE FITTING		
05	.50"	.1894	15.2	28.4	3/64" STD.* 1/16" OPT.	3/32" 3/32"	7 x 7 7 x 7	270 480	1/4-28 x .82	— —	8 15
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) 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) 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) 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) 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) 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) 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) 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
60	6.00	28.0781	2246.3	4211.7	5/16"	1/2"	7 x 19	9800	7/8-14 x 2 1/2	.88	2282
80	8.00	49.8730	3989.8	7481.0	5/16"	1/2"	7 x 19	19600	7/8-14 x 2 1/2	.88	4563
High Pressure Hydraulic			300 PSI	500 PSI							
(T) 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) 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 1.73 x 50

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

** Model 20P & 25P must use external cushioning devices when operating above 300 PSI hydraulic.

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

MODELS 05-60 150 psi max. Pneumatic or Hydraulic. Model 80, 80-100 psi max.

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

(T) Note - Force capacity does not indicate load capacity. See Page 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

θ = angle of inclination of 0° - 90°
(horizontal θ = 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 an external cushion device should be used. See page 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...

$$\text{Horizontally: } F = \left[\frac{V^2}{2sg} - f \right] W \quad [1]$$

$$\text{Upward Vertically: } F = \left[\frac{V^2}{2sg} - 1 \right] W \quad [2]$$

$$\text{Downward Vertically: } F = \left[\frac{V^2}{2sg} + 1 \right] W \quad [3]$$

$$\text{Upward on an Incline: } F = \left[\frac{V^2}{2sg} \cdot \sin \theta - f \cos \theta \right] W \quad [4]$$

$$\text{Downward on an Incline: } F = \left[\frac{V^2}{2sg} + \sin \theta - f \cos \theta \right] W \quad [5]$$

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 the application.

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

By rearranging equation [1], the critical velocity for horizontal loads can be calculated for a known weight and cylinder bore

$$V = \sqrt{[F/W + f] 2sg} \quad [6]$$

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 the cables of a cable cylinder are properly adjusted to obtain maximum cable and seal life.

Loose cables tend to "whip" at the beginning and end of the stroke, shortening cable 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.)
05,07,10 Std. Cable	162	15	1 2/3
05,07,10 H.D. Cable	288	20	3
15	1200	75	12
20,20P,25	1680	150	17
32	2520	260	25 1/2
25P,40,50	4200	415	42
60,80 (per cable)	5880	665	59

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

MODEL	TORQUE (In./lb.)	FISH SCALE (lb.)
05	11	1/3
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
60	485	43
80	440 ea.	29 ea.
20P	140	15 1/2
25P	245	24

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 used here also, but would take more time to obtain the correct tension.

OPERATION & INSTALLATION FOR ALL MODELS

OPERATION: Operate the cable cylinder just the 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 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 will improve 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 models 20P and 25P) on CABLE-TROL
- Temperature range 0-150°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 once 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

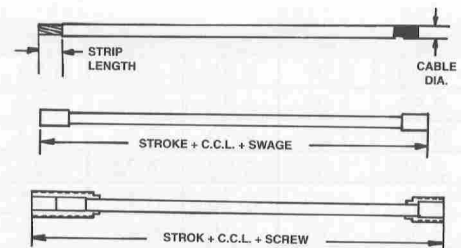
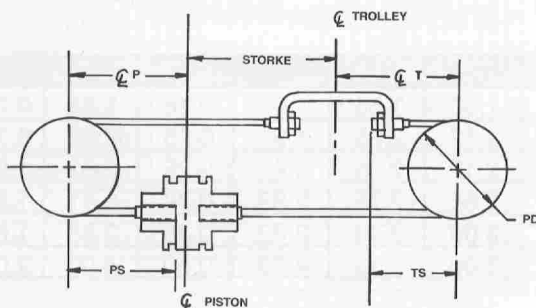
	MODEL	BORE	WALL THICKNESS	APPROXIMATE BASE WEIGHT			WEIGHT PER FOOT	
				SINGLE ENDED	DOUBLE ENDED	WITH TENSIONER	ALUMINUM	STEEL
CABLE-TROL	05	1/2 inch	1/16 inch	.75 lbs.	1.25 lbs.	N/A	N/A	.302 lbs.
	07	3/4 inch	1/8 inch	.75 lbs.	1.25 lbs.	N/A	.404 lbs.	N/A
	10	1 inch	1/8 inch	.75 lbs.	1.25 lbs.	N/A	.520 lbs.	1.448 lbs.
	15	1½ inches	1/8 inch	2.50 lbs.	5.00 lbs.	8.50 lbs.	.751 lbs.	2.098 lbs.
	20	2 inches	1/8 inch	5.25 lbs.	10.50 lbs.	16.50 lbs.	.981 lbs.	2.730 lbs.
	25	2½ inches	1/8 inch	7.75 lbs.	15.50 lbs.	21.50 lbs.	1.210 lbs.	3.504 lbs.
	32	3¼ inches	1/8 inch	16.00 lbs.	32.00 lbs.	37.00 lbs.	1.558 lbs.	4.471 lbs.
	40	4 inches	1/8 inch	26.50 lbs.	52.00 lbs.	60.00 lbs.	1.877 lbs.	5.464 lbs.
	50	5 inches	1/8 inch	32.75 lbs.	65.50 lbs.	N/A	2.367 lbs.	N/A
	60	6 inches	1/8 inch	71 lbs.	142.00 lbs.	158.00 lbs.	2.829 lbs.	N/A
	80	8 inches	3/16 inch	100 lbs.	200.00 lbs.	224.00 lbs.	5.686 lbs.	N/A
	20P	2 inches	1/8 inch	5.75 lbs.	11.50 lbs.	N/A	.981 lbs.	2.730 lbs.
TRAC-TROL	25P	2½ inches	1/8 inch	8.25 lbs.	16.50 lbs.	24.50 lbs.	1.210 lbs.	3.504 lbs.
	10	1 inch	1/8 inch	N/A	3 lbs.	N/A	1.5 lbs.	3.00 lbs.
	15	1½ inches	1/8 inch	N/A	7.75 lbs.	10.25 lbs.	1.8 lbs.	3.60 lbs.
	20	2 inches	1/8 inch	N/A	11.75 lbs.	18.25 lbs.	2.0 lbs.	4.00 lbs.
	20P	2 inches	1/8 inch	N/A	12.50 lbs.	N/A	2.61 lbs.	5.12 lbs.
	25	2½ inches	1/8 inch	N/A	22.00 lbs.	28.00 lbs.	2.7 lbs.	5.40 lbs.
	25P	2½ inches	1/8 inch	N/A	23.5 lbs.	29.5 lbs.	2.9 lbs.	5.80 lbs.
	32	3¼ inches	1/8 inch	N/A	43.00 lbs.	49.00 lbs.	4.1 lbs.	8.20 lbs.
	40	4 inches	1/8 inch	N/A	57.00 lbs.	66.00 lbs.	5.2 lbs.	10.40 lbs.
	50	5 inches	1/8 inch	N/A	77.00 lbs.	N/A	5.9 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	PD	CABLE DIA.	STRIP LENGTH	SWAGE ADDER (EACH)	SCREW ADDER	STROKE + C.C.L.
05	1.68	1.24	1.44	1.50	1.50	3/32	.20	.063	.250	5.06
07	2.06	2.06	1.46	1.44	1.50	3/32	.30	.125	.312	4.88
10	1.68	1.68	1.24	1.44	1.50	3/32	.30	.125	.375	5.00
15	2.06	3.94	1.24	2.94	3.00	3/16	.45	.250	.375	10.88
20	2.06	4.69	1.68	3.44	4.25	1/4	.45	.250	.375	13.88
20P	2.06	5.06	1.68	3.64	4.00	1/4	.45	.250	.375	13.80
25	2.06	4.69	1.68	3.44	4.25	1/4	.45	.250	.375	13.88
25P	2.63	5.94	2.25	4.19	5.00	3/8	.94	.500	.500	17.50
32	2.72	6.03	1.98	4.19	5.31	5/16	.75	.500	.250	17.50
40	2.72	6.03	1.98	4.19	6.00	3/8	.94	.500	.500	20.00
50	3.00	7.00	2.75	5.25	6.00	3/8	.94	.500	.500	20.50
60	3.50	10.13	2.75	N.A.	11.00	1/2	.82	.500	.500	35.18
80	3.50	10.13	2.75	N.A.	11.00	1/2	.82	.500	.500	35.18

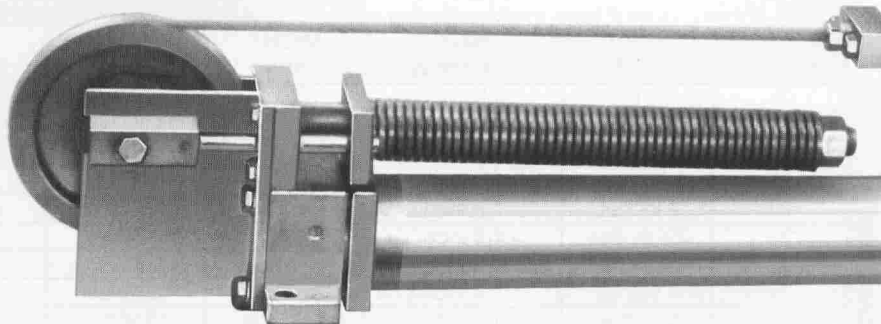


AUTOMATIC TENSIONER (T)

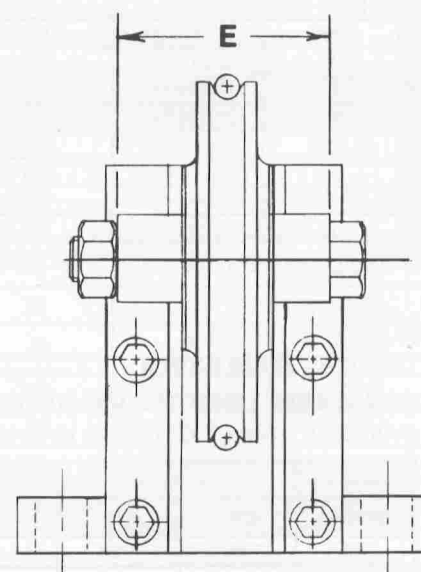
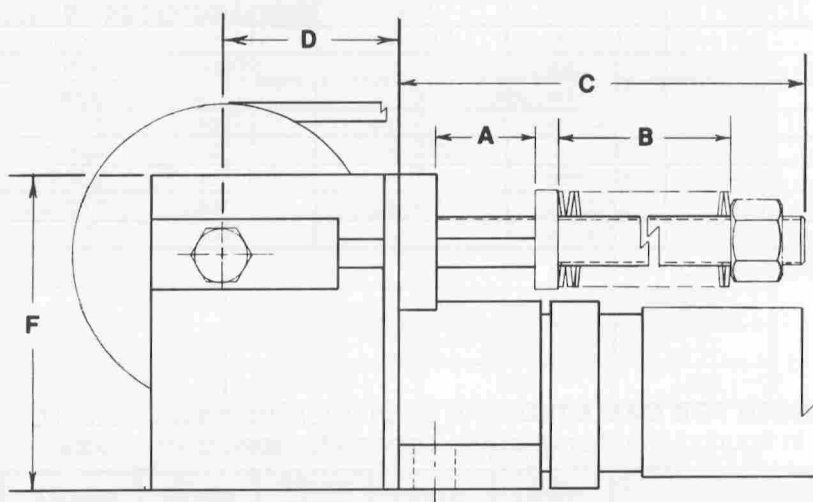
By keeping constant tension on the cable, the automatic tensioner increases both seal and cable life.

To insure that cables will be tensioned properly under any circumstances, we strongly recommend an Automatic Tensioner. The Automatic Tensioner eliminates manual adjustment except for initial installation.

After adjusting Tensioner nut, the cables will remain tight and the unit will automatically compensate for cable stretch.



Does not increase cylinder length • No additional air supply needed.

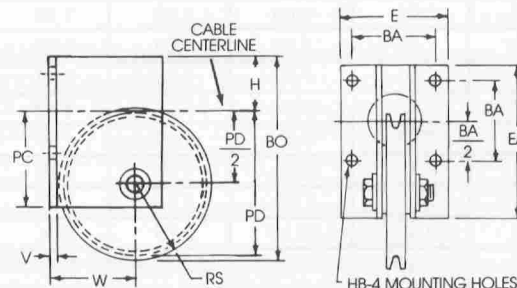


MODEL	A	B*	C	D	E	F
15	1.00	7.25	10.00	1.88	2.05	3.25
20	1.00	9.03	12.50	2.62	2.55	4.25
25	1.00	9.03	12.50	2.62	2.55	4.50
32	1.00	10.34	14.50	3.31	3.55	5.50
40	1.00	11.60	17.75	3.88	3.05	6.75
25P	1.00	11.60	17.75	3.31	3.55	5.12

* After installation

SHEAVE-BRACKET ASSEMBLY

Special applications such as remote location or turning corners may require one or more additional sheave bracket assemblies, they are furnished complete, ready for mounting.



BORE	E	H	EA	BO	HB	PC	PD	PD/2	RS	BA	V	W	BA/2
1.50	2.00	0.97	3.25	4.03	0.28	2.28	3.00	1.50	1.56	1.52	0.16	1.88	0.758
2.00	2.50	1.23	4.25	5.61	0.34	3.02	4.25	2.12	2.25	1.91	0.25	2.62	0.955
2.50	3.00	1.48	4.50	5.86	0.34	3.02	4.25	2.12	2.25	2.41	0.25	2.62	1.205
3.25	3.75	1.83	5.50	7.24	0.41	3.66	5.32	2.66	2.75	2.88	0.38	3.31	1.442
4.00	4.50	2.23	6.73	8.42	0.41	4.50	6.00	3.00	3.19	3.32	0.38	3.88	1.660
5.00	5.50	2.73	6.75	8.92	0.50	4.02	6.00	3.00	3.19	4.10	0.50	4.00	2.05

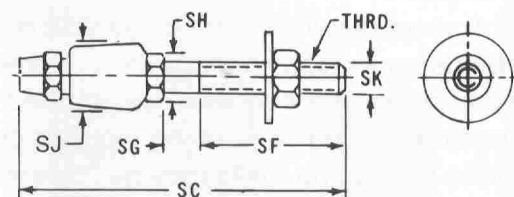
CABLE ATTACHMENTS FOR CABLE TROL

Certain applications may require special accessories as indicated. Where standard trolleys will not carry load properly our optional cable end accessories are offered.

These can be ordered on new units or can be field installed since they utilize a "manual swage" and are available in Models 15 thru 50.

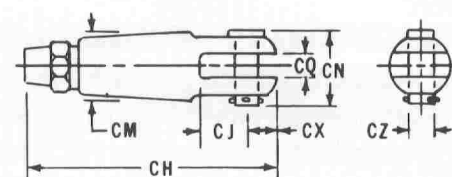
STUD SOCKET ASSEMBLY

CY'L BORE	SF	SG	SC	THR'D	SJ	SK	SH
1.50	1.88	0.12	3.50	0.25-28	0.56	0.25	0.39
2.00	2.19	0.12	4.19	0.38-24	0.69	0.38	0.44
2.50	2.19	0.12	4.19	0.38-24	0.69	0.38	0.44
3.25	2.19	0.12	4.19	0.38-24	0.69	0.38	0.44
4 & 5	4.56	0.19	7.06	0.50-20	0.88	0.50	0.58



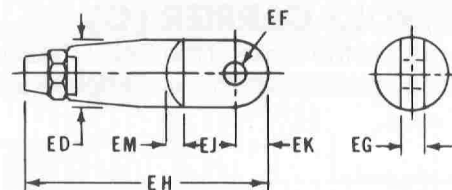
CLEVIS SOCKET ASSEMBLY

CY'L BORE	CX	CJ	CH	CM	CQ	CZ	CN
1.50	0.31	0.50	2.44	0.62	0.25	0.25	0.81
2.00	0.38	0.62	2.97	0.75	0.31	0.31	0.94
2.50	0.38	0.62	2.97	0.75	0.31	0.31	0.94
3.25	0.38	0.62	2.97	0.75	0.31	0.31	0.94
4 & 5	0.47	0.75	3.72	0.94	0.38	0.38	1.12

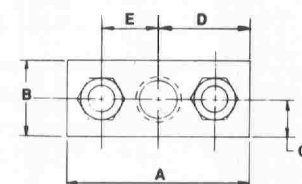
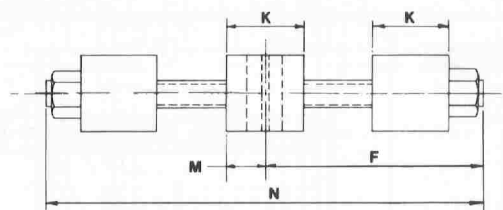
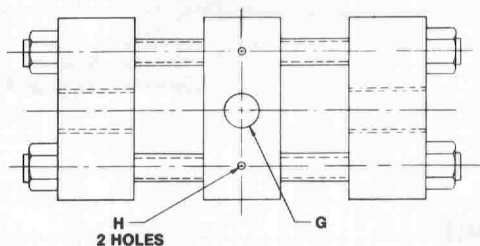


EYE SOCKET ASSEMBLY

CY'L BORE	EK	EJ	EH	ED	EG	EF	EM
1.50	0.34	0.44	2.47	0.62	0.23	0.27	0.19
2.00	0.41	0.56	3.00	0.75	0.30	0.33	0.22
2.50	0.41	0.56	3.00	0.75	0.30	0.33	0.22
3.25	0.41	0.56	3.00	0.75	0.30	0.33	0.22
4 & 5	0.50	0.81	3.75	0.94	0.36	0.39	0.28



"H" TROLLEY STYLE "H" TROLLEY IS STANDARD ON MODELS 50, 60 AND 80
THE "H" IS OPTIONAL ON MODELS 15, 20, 20P, 25, 25P, 32 AND 40.



MODEL	A	B*	C	D	E	F	G	H	K	M	N
15,20,25	1.75	.75	.375	.875	.625	2.50	.31	.094	.75	.375	4.75
20P	2.50	1.00	.50	1.25	.800	3.00	.53	.125	1.00	.50	6.00
32,40,25P	3.00	1.25	.625	1.50	1.00	3.60	.56	.125	1.25	.625	7.125
50	3.00	1.25	.625	1.50	1.00	3.60	.68	.125	1.25	.625	7.125
60	3.00	1.25	.625	1.50	1.00	3.60	.68	.125	1.25	.625	7.125
80	5.00	1.50	.75	2.50	1.88	3.60	*.68(2)	.125	1.50	.75	7.125

REED SWITCH (R)

DESCRIPTION

Greenco's Reed Switch consists of a hermetically sealed glass capsule containing two cantilevered ferromagnetic blades. The blades come together and close the electrical circuit whenever the magnet, mounted on the piston, passes under the response area of the switch.

An integral arc suppressing resistor-capacitor circuit protects blade contacts from voltage spikes, thereby extending cycle life. The lead wires* are shielded to protect against sending or receiving induced currents as false signals. The shield may be "drained" using uninsulated third wire. An ohmmeter is recommended to test the switch function. **DO NOT USE** an incandescent light bulb as high in-rush may damage switch.

The comprehensive design of the cylinder barrel thickness and mass of magnet, coupled with low profile switch provides sensitivity, dependability, repeatability and desired response time. PROXIMITY and GO® switches also available. Contact factory for additional information.

Note: Reed switch wires are 6' long.



IMPORTANT NOTE: For **END STROKE SENSING**, reed switch package will increase mounting dimensions by 1-5/8" on CABLE-TROL models 05, 07, & 10, and by 2" on all other CABLE-TROLS and model 15 TRAC-TROL. Dimensions will not increase for **MID-STROKE SENSING**. Be sure to specify.

REED SWITCH SPECIFICATIONS

Voltage Rating:
200 V Max AC or DC
Switch Current:
1A Max AC or DC
Switching Power - 50 Watts
Contact Type - Form A, N.O.
Single Pole, Single Throw
Initial Contact Resistance:
0.1 ohms
Minimum Breakdown Voltage:
275 VAC or 225 VDC
Temperature Range:
- 40°F to 200°F
Lead Wire Length - 24 in.
Actuation Repeatability:
± .005 in.
Switch Materials: - Stainless
Steel and Nylon
X - Available — Not Available (t) TRAC-TROL sizes

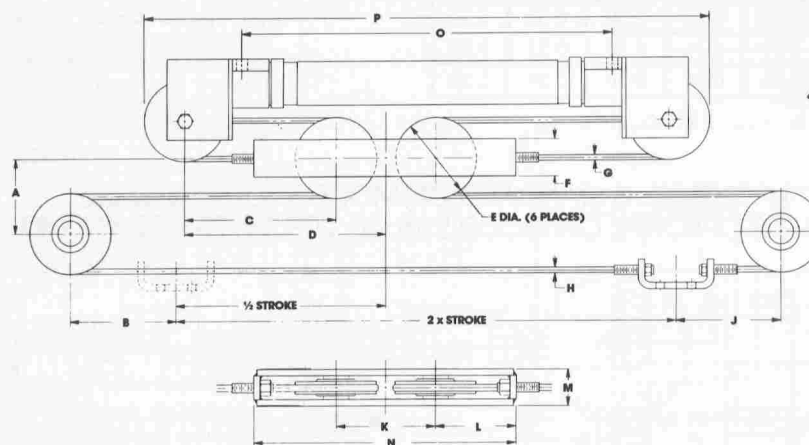
CABLE-TROL/TRAC-TROL AVAILABILITY

ALUMINUM TUBE

MODEL	REED SWITCH
07	X
10 (t)	X
15 (t)	X
20 (t)	X
25 (t)	X
32 (t)	X
40 (t)	X
50 (t)	X
60	X
80	—
20P (t)	X
25P (t)	X

DOUBLE STROKE CARRIER (C)

Allows you to double the stroke of the CABLE-TROL by adding a 2:1 pulley arrangement. Note that this also reduces capacity by 1/2. We can furnish the complete sheave bracket assembly or just the sheave as required.



Note: Refer to page 15, 16 for additional dimensions

Mounting Brackets available - See page 8

DOUBLE STROKE DIMENSIONAL TABLE

MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P
15	3.00	3.94	5.63	7.56	3.13	1.50	.19	.19	3.94	3.88	3.19	1.50	10.25	10.63	19.06
20	4.25	4.69	6.75	9.31	4.50	1.50	.25	.25	4.69	5.13	4.19	2.00	13.50	12.88	23.38
20P	4.00	5.06	6.69	9.19	4.25	1.50	.25	.25	5.06	5.13	4.25	2.00	13.50	11.63	20.88
25	4.25	4.69	6.75	9.31	4.50	1.50	.25	.25	4.69	5.13	4.19	2.00	13.50	12.88	23.38
25P	5.31	6.09	9.19	12.41	5.68	1.50	.38	.38	6.09	7.13	5.72	2.38	17.88	17.44	31.50
32	5.34	6.03	9.16	12.34	5.62	1.50	.31	.31	6.03	7.13	5.75	2.38	17.88	17.06	31.31
40	6.00	6.59	9.34	12.90	6.38	1.50	.38	.38	6.59	7.13	5.38	2.38	17.88	17.06	33.21
50	6.00	7.00	9.38	13.31	6.38	1.50	.38	.38	7.00	7.13	5.00	2.38	17.88	16.50	33.25

AIR/OIL TANK

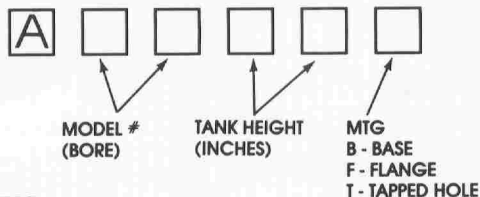
FEATURES & DIMENSIONS

GREENCO
LEADERS IN RODLESS CYLINDERS

Greenco's new air over oil tank is the ideal answer for your power requirements where a smooth, even hydraulic action is required. This lightweight, compact unit is easily installed on any existing or new application. Years of worry-free, inexpensive operation are virtually guaranteed, because there are no moving parts.

HOW TO ORDER

1. Refer to Table No. 1 on page 5 to find effective area, (square inch) of cylinder.
2. Multiply effective area by stroke of cylinder to determine volume.
3. **IMPORTANT:** Multiply area by 1.5 **safety factor**.
4. Select Air/Oil tank capacity closest to volume. See capacity chart below.



EXAMPLE:

CD2511BA
(Effective area of Model 25) 4.8597
(Stroke) X 11
53.45
(Safety Factor) X 1.5
80.19

Base your selection on a combination of space requirements, port size (for high speed) and cost.

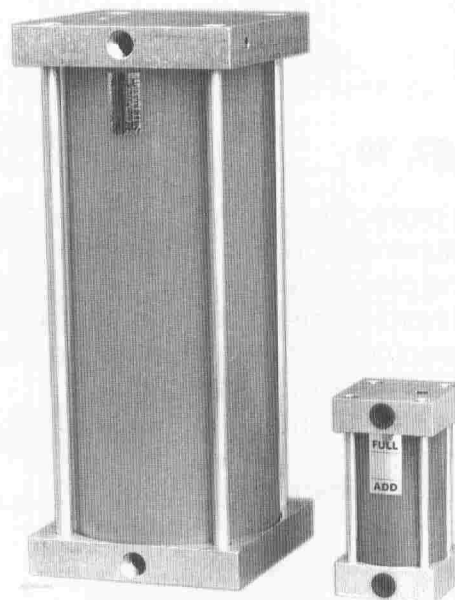
Depending on space available, cost availability the customer could select A-2517-T, A-3210-T, A-4007T, A-5004-T, A-6003-T.

USEABLE OIL CAPACITY CHART (cu. in.)

TANK HEIGHT WITH USEABLE OIL CAPACITY IN CUBIC INCHES	MODEL NUMBERS					
	A-25	A-32	A-40	A-50	A-60	A-80
	TANK BORE SIZE (INCHES)					
	2 1/2"	3 1/4"	4"	5"	6"	8"
1"	5	8	12	20	28	50
2"	10	16	25	39	56	100
3"	15	25	37	59	84	150
4"	19	33	50	78	112	199
5"	24	41	62	98	140	249
6"	29	49	75	117	168	299
7"	34	58	87	137	197	349
8"	39	66	100	156	225	399
9"	44	74	112	176	253	449
10"	48	82	125	195	281	499
11"	53	90	137	215	309	549
12"	58	99	149	234	337	598
13"	63	107	162	254	365	648
14"	68	115	174	273	393	698
15"	73	123	187	293	421	748
16"	78	132	199	312	449	798
17"	82	140	212	332	477	848



Translucent Tubing Design



NOTE: 200° F MAX. OPERATING TEMPERATURE

TAPPED HOLE MOUNT (STANDARD)

BORE	CAPACITY PER CU. IN.	A	B	C	D	E MAX	F	G	P (NPT)
2.500	4.909	3.165	2.300	1.250	3.000	1.125	3/8-16" x .625"	2.190	3/8
3.250	8.296	3.517	2.395	1.500	3.750	1.125	1/2-13" x .750"	2.760	1/2
4.000	12.566	3.544	2.420	2.062	4.500	1.125	1/2-13" x .750"	3.320	1/2
5.000	19.635	3.544	2.420	2.688	5.500	1.125	5/8-11" x 1.00"	4.100	1/2
6.000	28.274	4.044	2.670	3.250	6.500	1.125	3/4-10" x 1.125"	4.880	3/4
8.000	50.265	4.044	2.670	4.500	8.500	1.125	3/4-10" x 1.125"	6.440	3/4

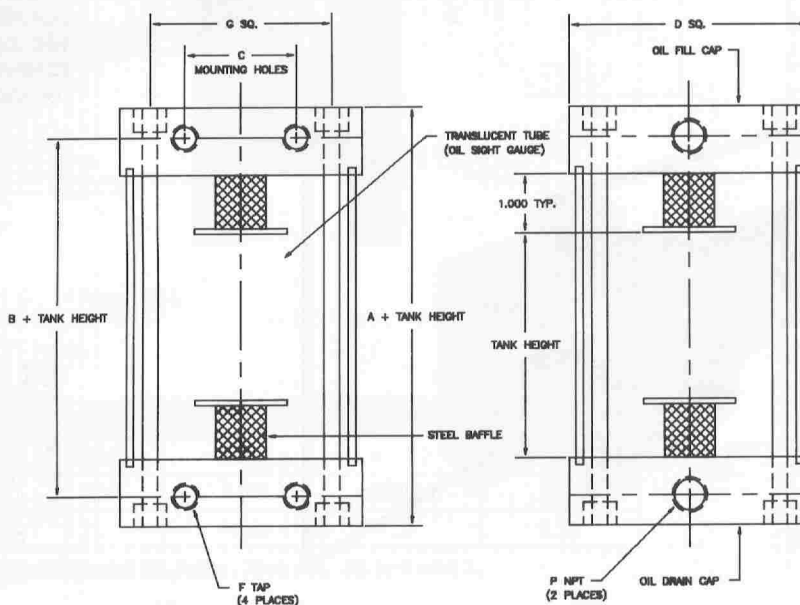
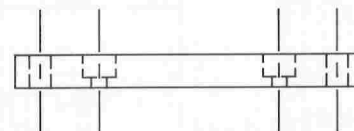
NOTE: 1) Flange & base mounting available as extra cost option.

OPTIONAL BASE MOUNT



NOTE: Flange adds to tank height.

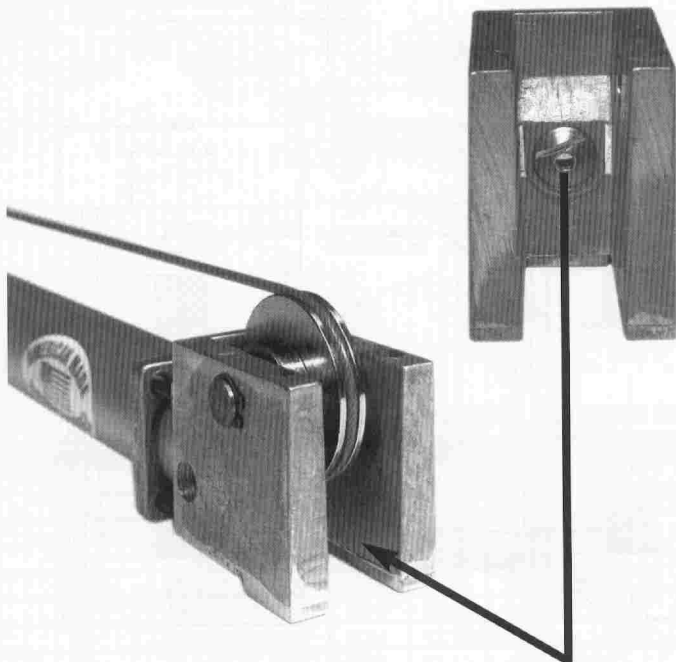
OPTIONAL FLANGE MOUNT



STANDARD FEATURES

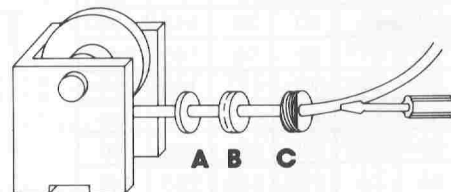
MODEL 05, 07, 10

- Cadmium plated steel sheaves with needle bearings.
- Die-cast aluminum heads.
- Piston - One piece precision aluminum piston with Turcite Slydring bearing.
- Aluminum hard-coated tubes or steel tubes (special plating available).
- Nylon coated aircraft type steel cable (heavy duty cable is available).
- Air and oil use up to 150 psi.
- Strokes to 60 feet or more.
- 1/8" NPT Ports.
- Reed switches available.



EXCLUSIVE E-Z LOCKSEAL

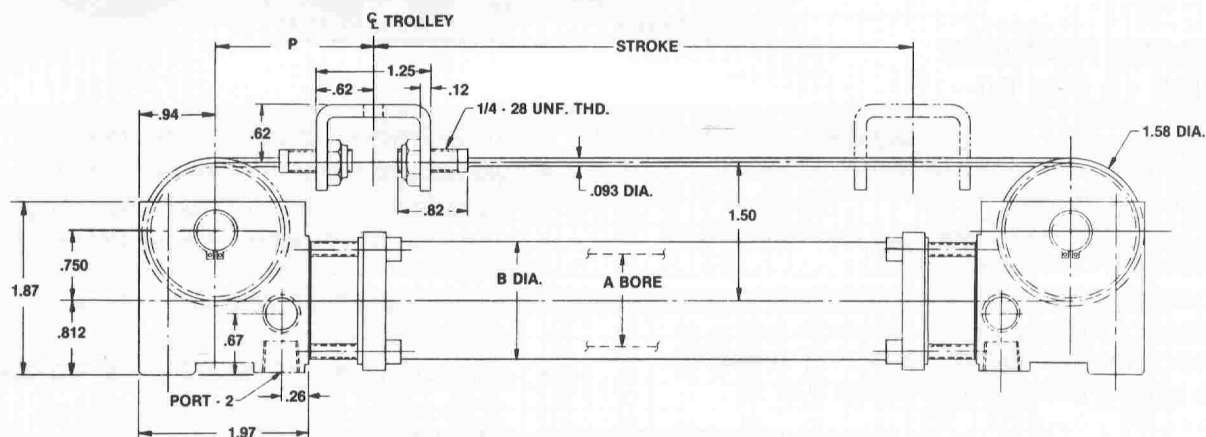
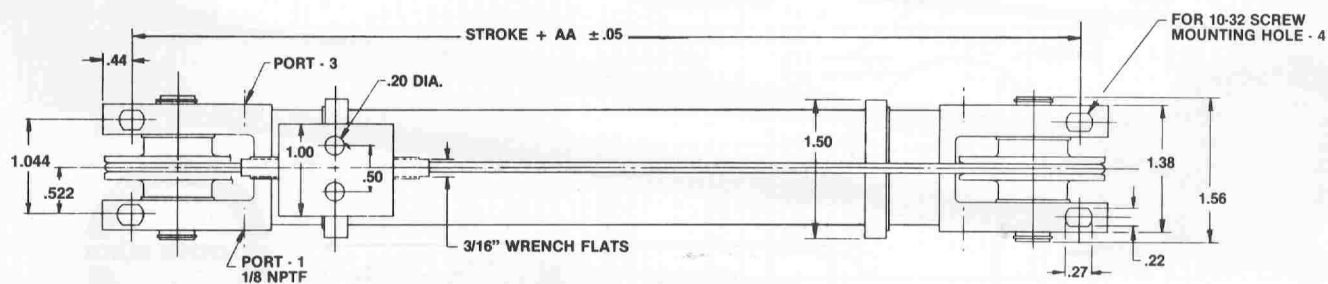
Greenco's exclusive cadmium plated steel E-Z LOCKSEAL provides a positive lock and seal which will prevent accidental "bursting". A standard screwdriver is all that is needed to remove or replace. No retaining rings necessary.



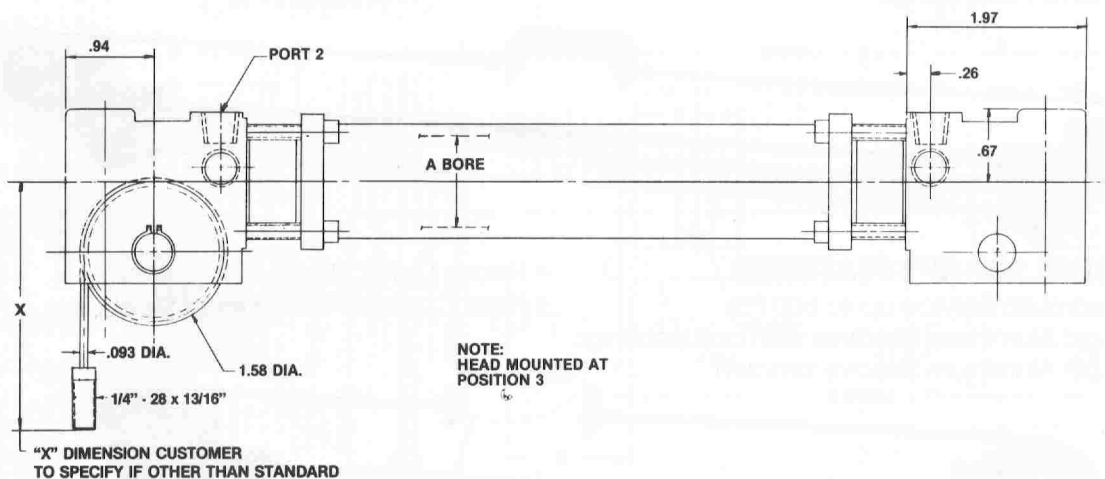
E-Z LOCKSEAL® (WITH SCREWDRIVER SLOT)

- A** O' Ring
- B** Urethane Cable Seal
- C** Cadmium plated steel E-Z LOCKSEAL®
Provides positive lock and seal which cannot accidentally pop-out.

DOUBLE END - CD



SINGLE END - CS

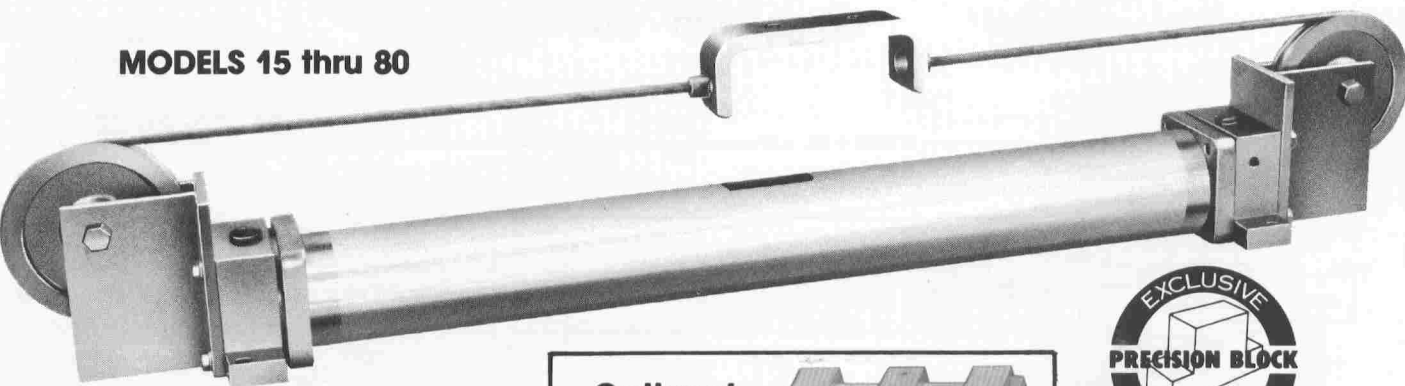


NOTE:
HEAD MOUNTED AT
POSITION 3

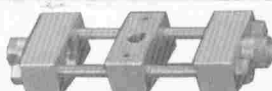
MODEL	A	B	P	AA	X
05	.500	.625	1.68	4.312	3.36
*07	.750	1.00	1.68	4.394	3.36
10	1.00	1.25	1.68	4.50	3.36

* NOTE: Shydrings piston available on Model 07. Adds .75 to AA, .38 to P and X.

MODELS 15 thru 80



**Optional
"H" Trolley**
SEE PAGE 9



STD on 50, 60, 80



STANDARD FEATURES MODELS 15 thru 80

- Exclusive Precision Block provides the strongest possible bridge between sheave bracket and tube.
- Adjustable cushions.
- One piece "C" trolley standard on models 05-40. "H" trolley optional on models 15-40.
- Models 50, 60, 80 – "H" trolley standard.
- Available with hardcoated aluminum tubing or optional steel tubing (special plating available).
- Tube splicing is required for strokes over 24'.
- Aluminum sheaves with needles bearings.
- Nylon coated aircraft type steel cable.
- Available with automatic tensioners, page 8.
- Symmetrically attached sheave bracket can be rotated in 4 directions.
- Air and oil use to 150 psi.
- Reed switches available, page 10
- Optional SAE and Metric BSP ports available.

HIGH PRESSURE UNITS AVAILABLE

NOTE: Hydraulic and High Pressure Hydraulic units are equipped with seals that are compatible for most all mineral and petroleum base hydraulic fluids. Consult factory for special fluid compatibility ratings.



MODEL 20P (2") FEATURES:

- Hydraulic Service up to 500 PSI.
- Cast Aluminum Sheaves with ball bearings.
- Cast Aluminum Sheave bracket.
- Heavy Duty C Trolley.
- Hard Coated Aluminum or Steel Tube.

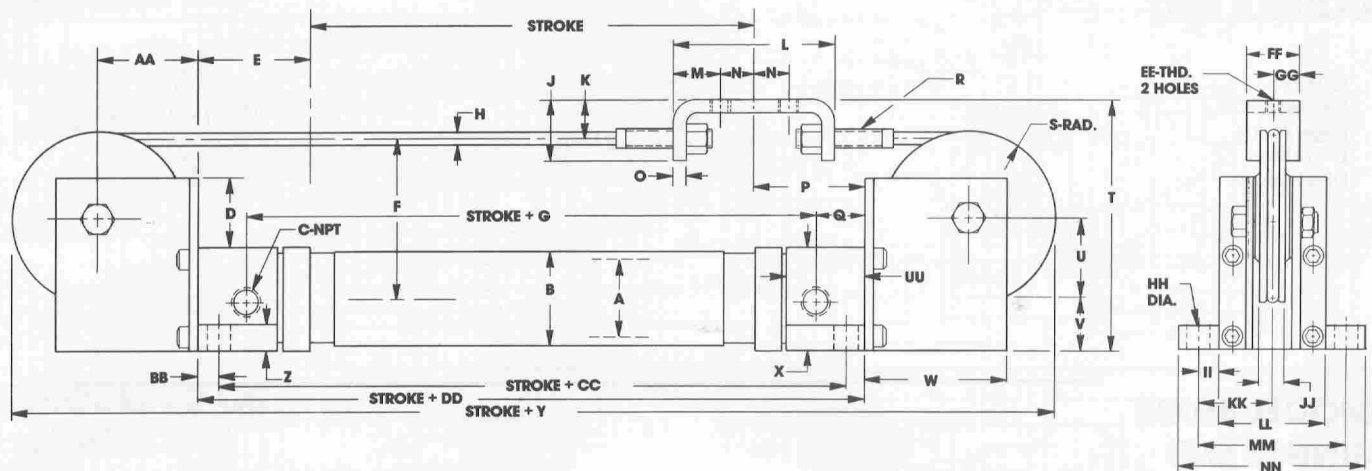


MODEL 25P (2½") FEATURES:

- Hydraulic Service up to 500 PSI.
- Heavy Duty Trolley & Sheave-Bracket Assembly.
- Adjustable Cushions.
- Hard-Coated Aluminum or Steel Tube.

***NOTE:** Must use external cushioning devices when operating above 300 PSI.

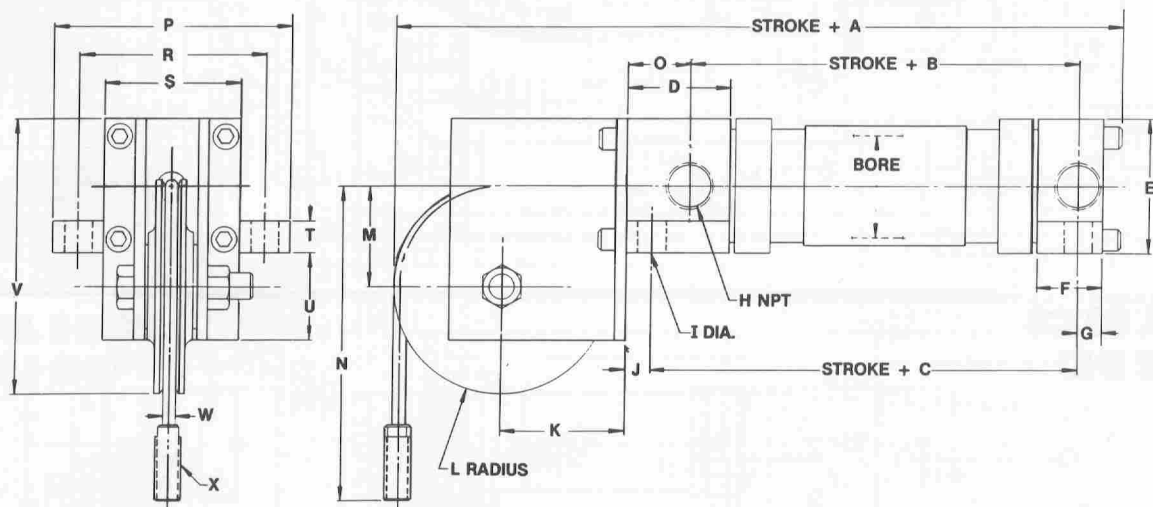
DOUBLE END - CD



MODEL	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
15	1.50	1.75	3/8	1.48	2.06	3.00	2.31	.18	1.12	.75	3.00	.88	.62	.25	2.06	.91	3/8-24 x 1.68	1.59	4.75	1.50	1.00	2.62	2.00	11.06	.50
20	2.00	2.25	3/8	1.88	2.06	4.25	2.31	.25	1.88	1.25	4.00	1.00	1.00	.38	2.06	.91	5/8-18 x 1.63	2.25	6.75	2.12	1.25	3.50	2.50	13.88	.50
25	2.50	2.75	3/8	1.52	2.06	4.25	2.31	.25	1.88	1.25	4.00	1.00	1.00	.38	2.06	.91	5/8-18 x 1.63	2.25	7.00	2.12	1.50	3.50	3.00	13.86	.50
32	3.25	3.50	1/2	1.88	2.72	5.31	3.12	.31	1.88	1.25	5.25	1.62	1.00	.38	2.72	1.03	3/4-16 x 2.25	2.81	8.44	2.66	1.88	4.32	3.75	17.68	.75
20P	2.00	2.25	3/8	1.88	2.06	4.00	2.31	.25	1.88	1.25	5.25	1.62	1.00	.38	2.06	.91	5/8-18 x 1.63	2.12	6.49	2.00	1.24	3.62	2.50	14.36	.50
25P	2.50	2.75	3/8	2.12	2.78	5.31	3.75	.38	1.88	1.25	5.25	1.62	1.00	.38	2.78	.91	3/4-16 x 2.50	2.84	8.06	2.66	1.50	4.32	3.00	17.88	.50

MODEL	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ	KK	LL	MM	NN	UU
15	1.88	.38	3.38	4.12	3/8-16	1.00	.50	.44	.38	.50	1.38	2.00	2.75	3.50	1.50
20	2.62	.38	3.38	4.12	3/8-24	1.50	.75	.44	.38	.68	1.62	2.50	3.25	4.00	1.50
25	2.62	.38	3.38	4.12	3/8-24	1.50	.75	.44	.38	.68	1.88	3.00	3.75	4.50	1.50
32	3.31	.50	4.44	5.44	3/8-24	2.00	1.00	.56	.50	.68	2.38	3.75	4.75	5.75	1.75
20P	3.00	.38	3.38	4.12	3/8-24	2.00	1.00	.44	.38	.62	1.62	2.50	3.25	4.00	1.50
25P	3.31	.38	4.81	5.56	3/8-24	2.00	1.00	.44	.38	.68	1.88	3.00	3.75	4.50	1.50

SINGLE END-CS

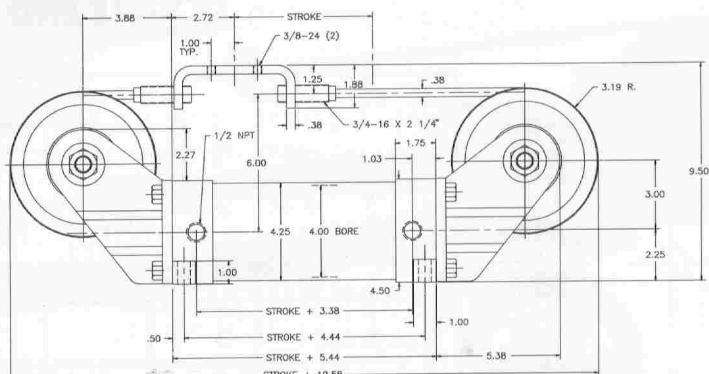
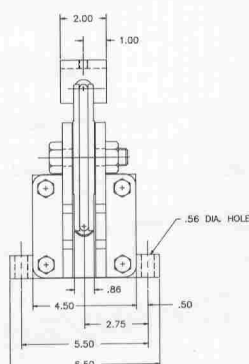


NOTE: N - Dimensions customer to specify if other than standard.

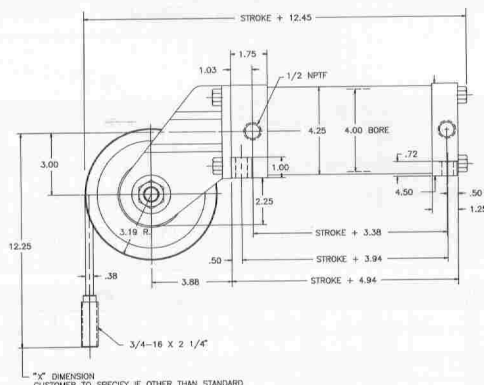
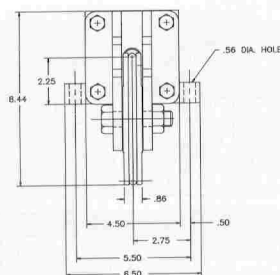
MODEL	BORE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R	S	T	U	V	W	X
15	1.50	7.34	2.31	2.88	1.50	2.00	1.00	.38	3/8	.44	.38	1.88	1.59	1.50	6.81	.91	3.50	2.75	2.00	.50	1.25	4.03	.18	3/8-24 x 1.69
20	2.00	8.86	2.31	2.83	1.50	2.50	.95	.38	3/8	.44	.38	2.62	2.25	2.12	8.88	.91	4.00	3.25	2.50	.50	1.75	5.62	.25	5/8-18 x 1.63
25	2.50	8.86	2.31	2.88	1.50	3.00	1.00	.38	3/8	.44	.38	2.62	2.25	2.12	8.88	.91	4.50	3.75	3.00	.50	1.50	5.88	.25	5/8-18 x 1.63
32	3.25	11.50	3.12	3.94	1.75	3.75	1.25	.50	1/2	.56	.50	3.31	2.81	2.66	11.00	1.03	5.75	4.75	3.75	.75	1.75	7.24	.31	3/4-16 x 2.25
20P	2.00	9.10	2.31	2.83	1.50	2.50	.95	.38	3/8	.44	.38	3.00	2.12	2.00	8.50	.91	4.00	3.25	2.50	.50	1.38	5.36	.25	5/8-18 x 1.63
25P	2.50	9.98	3.75	4.32	1.50	3.00	1.00	.38	3/8	.44	.38	3.31	2.66	2.66	11.16	.91	4.50	3.75	3.00	.50	2.12	6.82	.38	3/4-16 x 2.50

MODEL 40 CD DOUBLE END

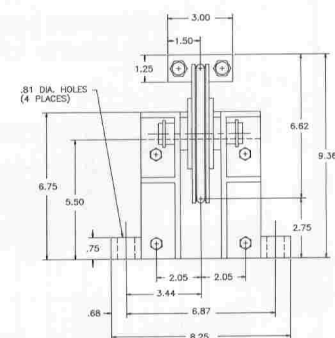
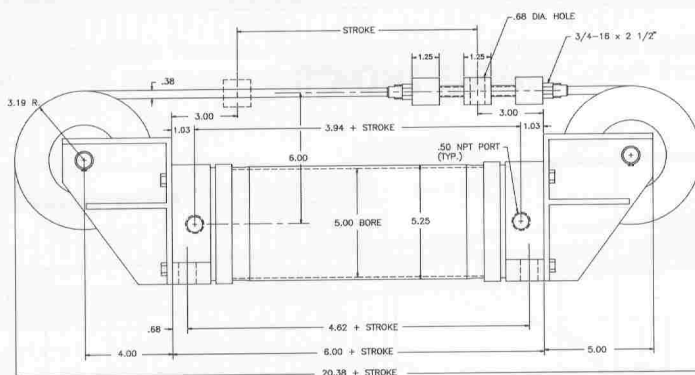
NOTE:
 See Model 32,
 page 15 for
 C-Trolley
 Dimensions



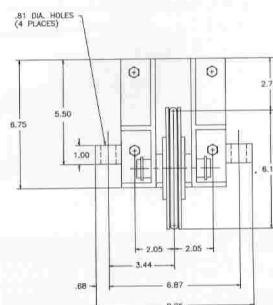
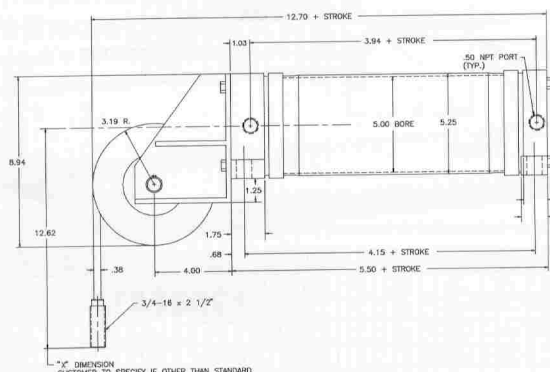
MODEL 40 CS SINGLE END



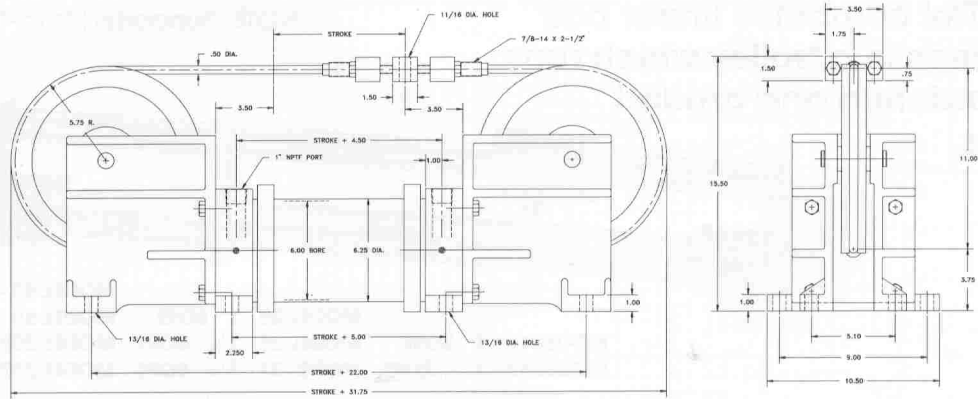
MODEL 50 CD DOUBLE END



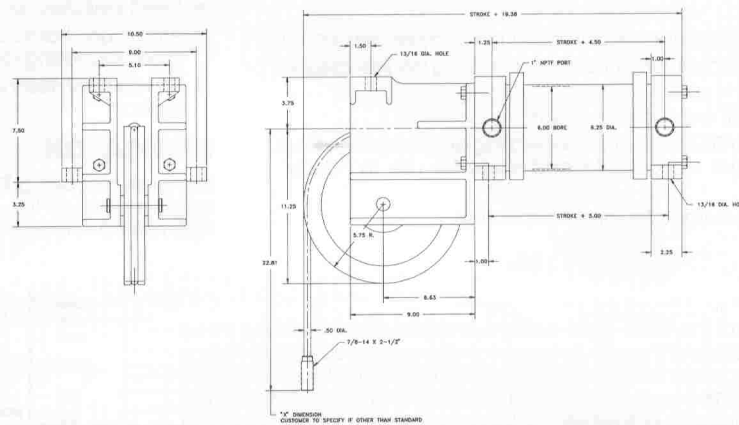
MODEL 50 CS SINGLE END



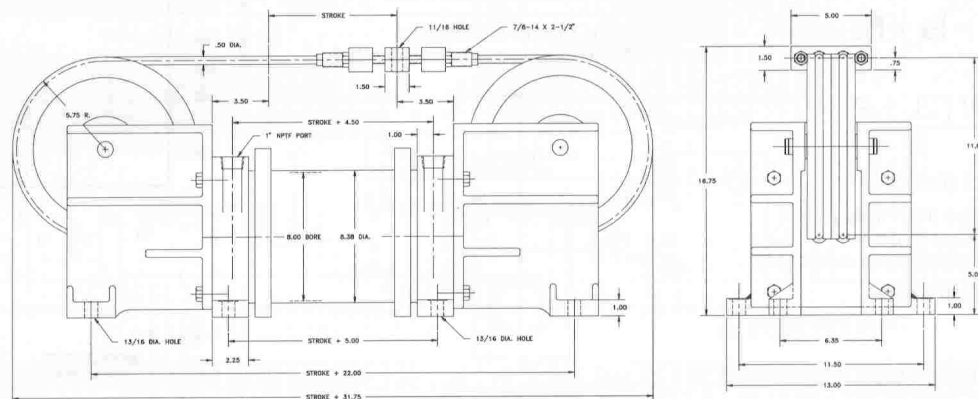
MODEL 60 CD DOUBLE END



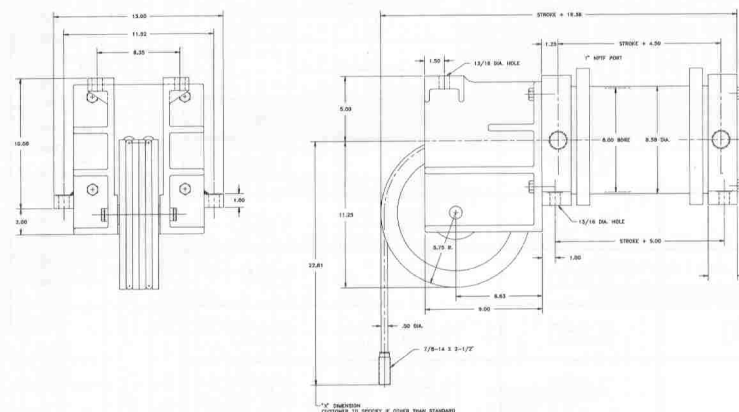
MODEL 60 CS SINGLE END



MODEL 80 CD DOUBLE END

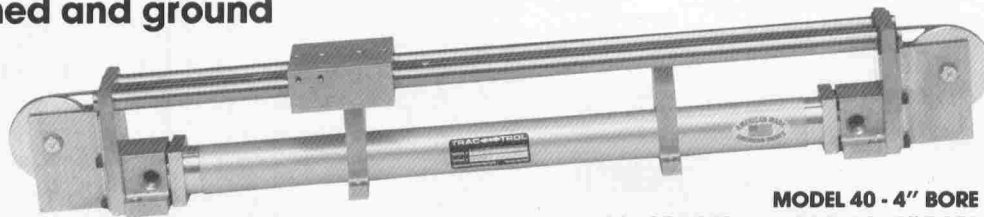


MODEL 80 CS SINGLE END



Trac-Trol combines linear ball bearings in a trolley which runs on hardened and ground shafts.

NOTE: Supported Trac-Trol shown



MODEL 10 - 1" BORE
MODEL 15 - 1½" BORE

MODEL 20 - 2" BORE
MODEL 25 - 2½" BORE
MODEL 32 - 3¼" BORE

MODEL 40 - 4" BORE
MODEL 50 - 5" BORE
MODEL 20P - 2" BORE HIGH PRESSURE
MODEL 25P - 2½" BORE HIGH PRESSURE

FEATURES

- Air or hydraulic service for smooth operation and precise control.
- Nylon-covered, aircraft-type cable for extra-long life. Pre-stressed cable optional.
- Optional low-cost rod & cable wipers.
- Approximately 1/200th the effective sealing area of competitive models for longer working life and ideal for use in "dusty" applications.
- Greater bearing surface for larger capacities.

- Reed switches available.
- Aluminum hardcoated tubes standard or optional steel tube (special plating available).
- Pre-delivery testing and "break-in" to insure customer satisfaction.

LUBRICATION

Generally speaking **TRAC-TROL** trolleys don't need lubrication. To insure maximum life, all pneumatic cylinders should be supplied with filtered and lubricated air.

LOADING

Many applications of the TRAC-TROL cable cylinder involve mounting some of the weight off the side of the unit. To be certain the correct size TRAC-TROL is used in your specific application use the following equations to compare the calculated load to the curves on the Load vs. Stroke graph which shows the maximum load allowed for a given stroke. Do not exceed the maximum load limit.

LOAD = $F_s + F_p$ where F_s = Reaction force due to side loads.
 F_p = Reaction force due to push/pull loads.

$$F_s = \frac{W(2L + R)}{R}$$

W: weight (lbs.)

L: distance from trolley centerline to center of gravity of weight (inches)

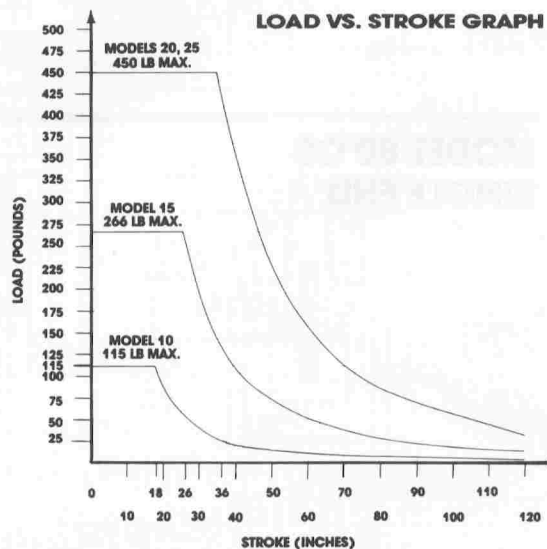
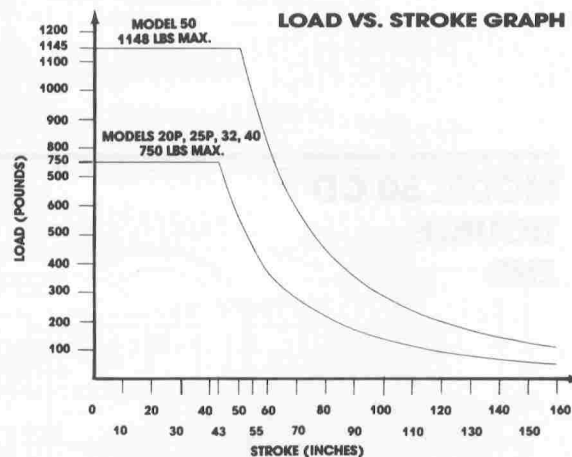
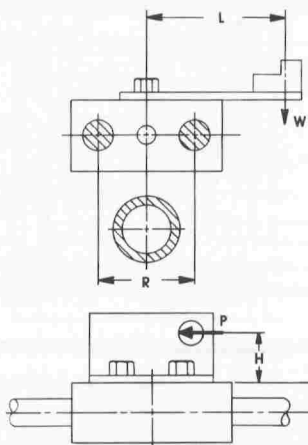
R: see chart below

$$F_p = \frac{P(H+h)}{B}$$

P: push/pull force (lbs.)

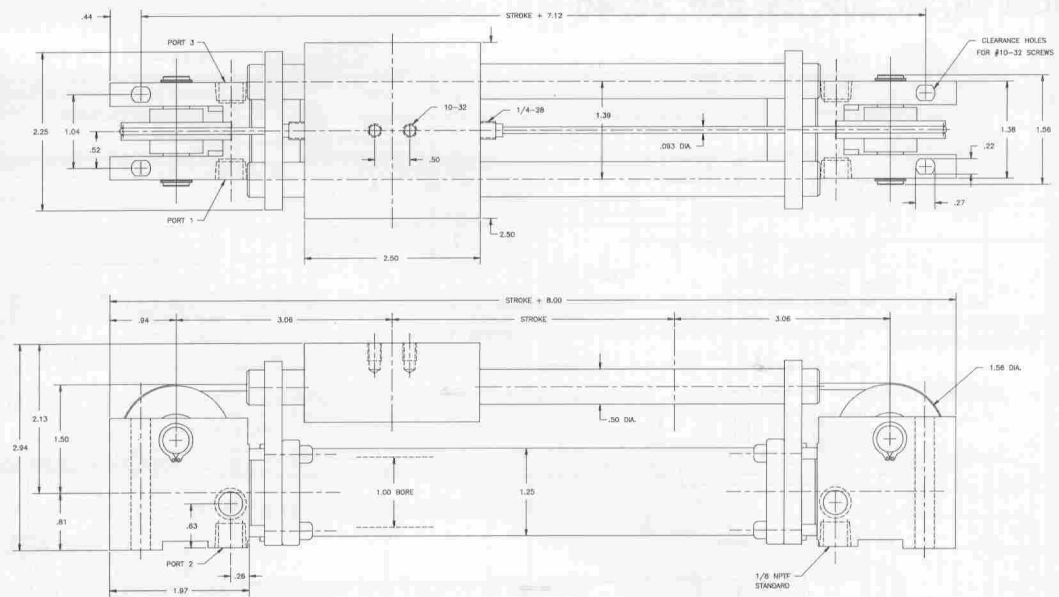
H: height from trolley surface

h,B: see chart below

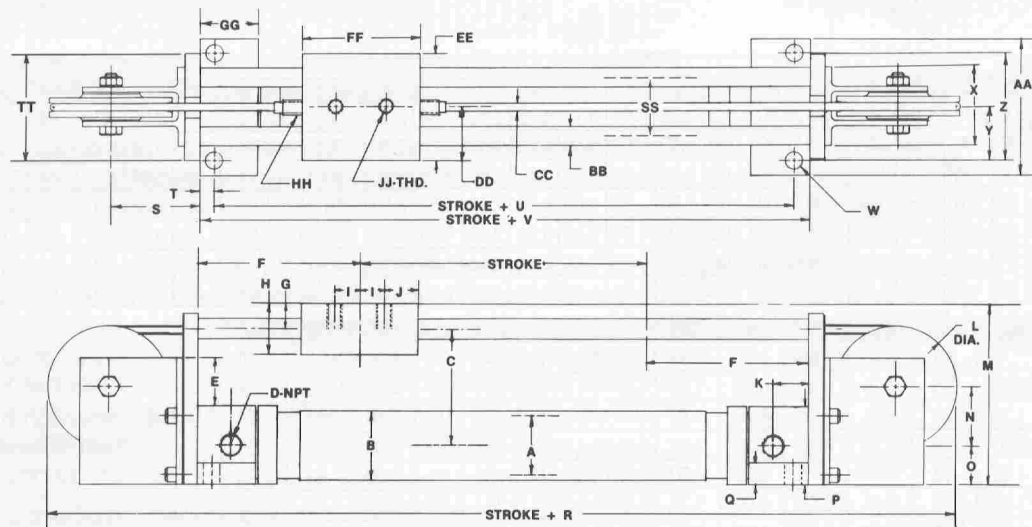


MODEL	R	h	B
T10	1.391	.625	1.250
T15	1.781	.750	1.625
T20, 25	2.500	1.045	2.31
T20P, 25P, 32, 40	3.250	1.250	2.625
T50	7.625	1.500	4.000

MODEL 10



MODEL 15, 20, 20P, 25, 25P, 32, 40 and 50

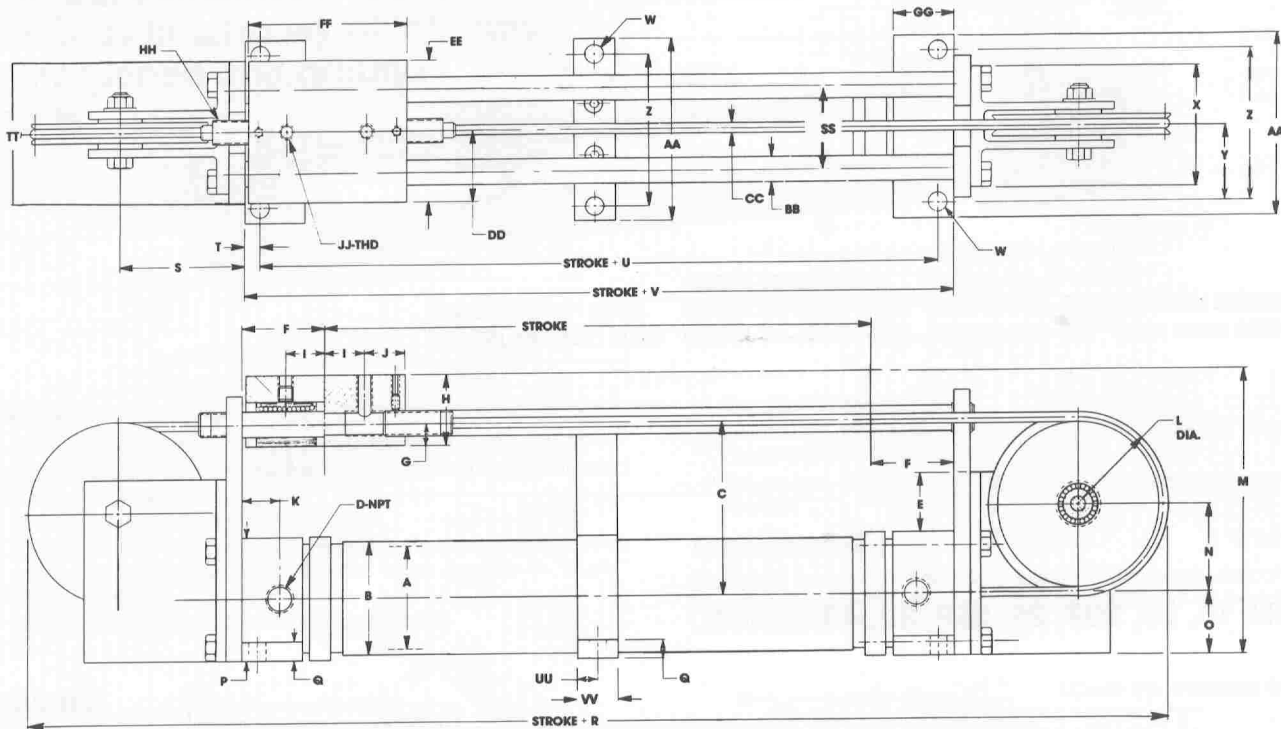


MODEL	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
T15	1.50	1.75	3.00	3/8	1.48	2.06	.75	1.50	.63	1.13	.92	3.13	4.75	1.50	1.00	2.00	.50	12.00	2.38	.38	3.38	4.13	.44	2.00	1.38	2.75
T20	2.00	2.25	4.25	3/8	1.88	3.09	1.00	2.00	1.00	1.50	.91	4.50	6.56	2.13	1.25	2.50	.50	16.88	3.13	.38	5.38	6.13	.44	2.50	1.62	3.25
T20P	2.00	2.25	4.00	3/8	1.38	3.06	1.25	2.50	1.00	2.00	.91	4.25	6.49	2.00	1.25	2.50	.50	17.88	3.75	.38	5.38	6.13	.44	2.50	1.62	3.25
T25	2.50	2.75	4.25	3/8	1.50	3.06	1.00	2.00	1.00	1.50	.91	4.50	6.80	2.13	1.50	3.00	.50	16.88	3.13	.38	5.38	6.13	.44	3.00	1.88	3.75
T25P	2.50	2.75	5.31	3/8	2.13	3.78	1.25	2.50	1.00	2.00	.91	5.68	8.06	2.66	1.50	3.00	.50	21.38	4.06	.38	6.82	7.57	.44	3.00	1.88	3.75
T32	3.25	3.50	5.31	1/2	1.80	3.72	1.25	2.50	1.00	2.00	1.03	5.50	8.44	2.66	1.86	3.75	.75	21.19	4.06	.50	6.44	7.44	.56	3.75	2.38	4.75
T40	4.00	4.25	6.00	1/2	2.35	3.72	1.25	2.50	1.00	2.00	1.03	6.38	9.50	3.00	2.24	4.50	1.00	23.06	4.63	.50	6.44	7.44	.56	4.50	2.75	5.50
T50	5.00	5.25	6.00	1/2	1.25	4.00	1.50	3.00	1.00	2.88	1.03	6.38	10.25	3.00	2.75	5.50	1.00	23.88	4.75	.68	6.63	8.00	.81	5.50	3.44	6.87

MODEL	AA	BB	CC	DD	EE	FF	GG	HH	JJ	SS	TT
T15	3.50	.75	.19	1.75	3.50	3.50	1.50	3/8-24x1.68	3/8-24	1.78	3.00
T20	4.00	1.00	.25	2.25	4.50	5.00	1.50	5/8-18x1.63	3/8-24	2.50	4.00
T20P	4.00	1.25	.25	2.88	5.75	6.00	1.50	3/4-16x2.25	1/2-13	3.25	5.50
T25	4.50	1.00	.25	2.25	4.50	5.00	1.50	5/8-18x1.63	3/8-24	2.50	4.00
T25P	4.50	1.25	.38	2.88	5.75	6.00	1.50	3/4-16x2.25	1/2-13	3.25	5.50
T32	5.75	1.25	.31	2.88	5.75	6.00	1.75	3/4-16x2.25	1/2-13	3.25	5.00
T40	6.50	1.25	.38	2.88	5.75	6.00	1.75	3/4-16x2.50	1/2-13	3.25	5.00
T50	8.25	1.50	.38	5.00	10.00	7.75	1.75	3/4-16x2.50	5/8-18	7.00	10.00

NOTE: Dimension TT may be larger than dimension AA. Dimension Z is mounting hole location.

MODEL 15, 20, 20P, 25, 25P, 32, 40



MODEL	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
TS15	1.50	1.75	3.00	3/8	1.48	2.06	.75	1.50	.63	1.13	.91	3.13	4.75	1.50	1.00	2.00	.50	12.00	2.38	.38	3.38	4.13	.44	2.00	1.38	2.75
TS20	2.00	2.25	4.25	3/8	1.88	3.09	1.00	2.00	1.00	1.50	.91	4.50	6.53	2.13	1.25	2.50	.50	16.88	3.13	.38	5.38	6.13	.44	2.50	1.62	3.25
TS20P	2.00	2.25	4.00	3/8	1.38	3.06	1.25	2.50	1.00	2.00	.91	4.25	6.49	2.00	1.25	2.50	.50	17.88	3.75	.38	5.38	6.13	.44	2.50	1.62	3.25
TS25	2.50	2.75	4.25	3/8	1.50	3.06	1.00	2.00	1.00	1.50	.91	4.50	6.80	2.13	1.50	3.00	.50	16.88	3.13	.38	5.38	6.13	.44	3.00	1.88	3.75
TS25P	2.50	2.75	5.31	3/8	2.13	3.78	1.25	2.50	1.00	2.00	.91	5.68	8.06	2.66	1.50	3.00	.50	21.38	4.06	.38	6.82	7.57	.44	3.00	1.88	3.75
TS32	3.25	3.50	5.31	1/2	1.80	3.72	1.25	2.50	1.00	2.00	1.03	5.63	8.44	2.66	1.86	3.75	1.00	21.19	4.06	.50	6.44	7.44	.56	3.75	2.38	4.75
TS40	4.00	4.25	6.00	1/2	2.35	3.72	1.25	2.50	1.00	2.00	1.03	6.38	9.50	3.00	2.24	4.50	1.00	23.06	4.63	.50	6.44	7.44	.56	4.50	2.75	5.50

MODEL	AA	BB	CC	DD	EE	FF	GG	HH	JJ	SS	TT	UU	W
T15	3.50	.75	.19	1.75	3.50	3.50	1.50	3/8-24x1.68	3/8-24	1.78	3.00	.50	1.00
T20	4.00	1.00	.25	2.25	4.50	5.00	1.50	5/8-18x1.63	3/8-24	2.50	4.00	.63	1.25
T20P	4.00	1.25	.25	2.88	5.75	6.00	1.50	3/4-16x2.25	1/2-13	3.25	5.50	.63	1.25
T25	4.50	1.00	.25	2.25	4.50	5.00	1.50	5/8-18x1.63	3/8-24	2.50	4.00	.63	1.25
T25P	4.50	1.25	.38	2.88	5.75	6.00	1.50	3/4-16x2.26	1/2-13	3.25	5.50	.63	1.25
T32	5.75	1.25	.31	2.88	5.75	6.00	1.75	3/4-16x2.25	1/2-13	3.25	5.00	.75	1.50
T40	6.50	1.25	.38	2.88	5.75	6.00	1.75	3/4-16x2.50	1/2-13	3.25	5.00	.75	1.50

LOAD = $F_s + F_p$ where F_s = Reaction force due to side loads.
 F_p = Reaction force due to push/pull loads.

$$F_s = \frac{W(2L + R)}{R}$$

W: weight (lbs.)

L: distance from trolley centerline to center of gravity of weight (inches)

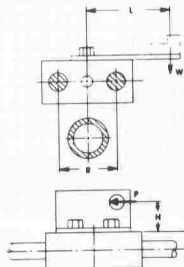
R: see chart at right

$$F_p = \frac{P(H+h)}{B}$$

P: push/pull force (lbs.)

H: height from trolley surface (inches)

h,B: see chart at right



MODEL	R	h	B	KK	U
TS15	1.78	.75	1.63	1.94	3.38
TS20	2.50	.96	2.31	.81	5.38
TS20P	3.25	1.25	2.63	.81	5.38
TS25	2.50	.96	2.31	.81	5.38
TS25P	3.25	1.25	2.63	.81	6.82
TS32	3.25	1.25	2.63	.69	6.44
TS40	3.25	1.25	2.63	.69	6.44

LOADING — MAXIMUM LOADS - Horizontal Mounting

MODEL TS15 - 266 lbs.

MODEL TS20 & 25 - 450 lbs.

MODEL TS20P, 25P, 32 & 40 - 750 lbs.

IMPORTANT! With inverted mounting, maximum load is one half the horizontal mounting maximum load.

Many applications of the TRAC-TROL cable cylinder involve mounting some of the weight off the side of the unit. To be certain the correct size TRAC-TROL is used in your specific application use the $F_s + F_p$ equations to see if the calculated load falls beneath (under) the maximum load limit. Do not exceed the maximum load limit.

SUPPORT SPACING — Determine the number of supports for a given stroke length by subtracting "KK" from the stroke length, then divide by 24:

$$(\text{Stroke} - \text{"KK"}) \div 24 = \text{number of supports}$$

(Round to nearest whole number)

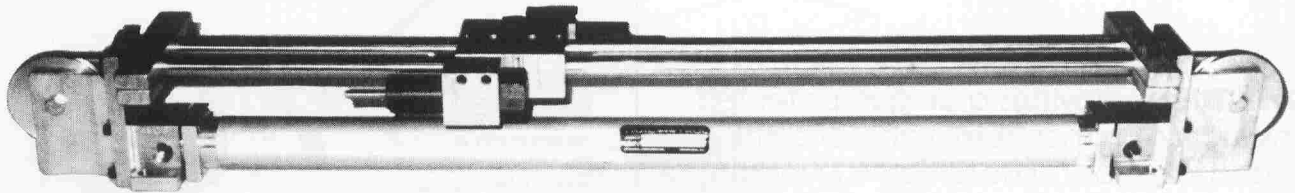
From the head mounting holes, the first support is located by the following:

$$\text{Stroke} + U - (\text{no. of supports} - 1) \times 24 = \text{Hole location of first support}$$

2

Other supports are spaced 24" apart.

NOTE: Dimension TT may be larger than dimension AA. Dimension Z is mounting hole location.



AVAILABLE ON TRAC-TROL MODELS 10, 15, 25, 32 AND 40

The internal cushions, standard on all GREENCO cylinders, are an effective method to decelerate loads, and minimize harmful shock loading at the end of each stroke.

In very high speed applications, cushions may be overloaded and shock absorbers are necessary.

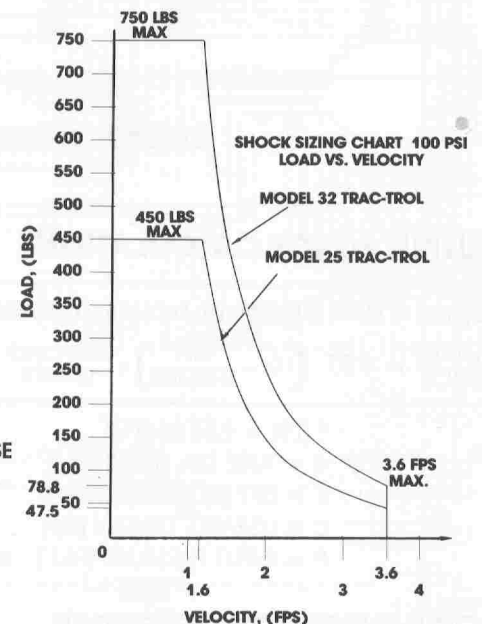
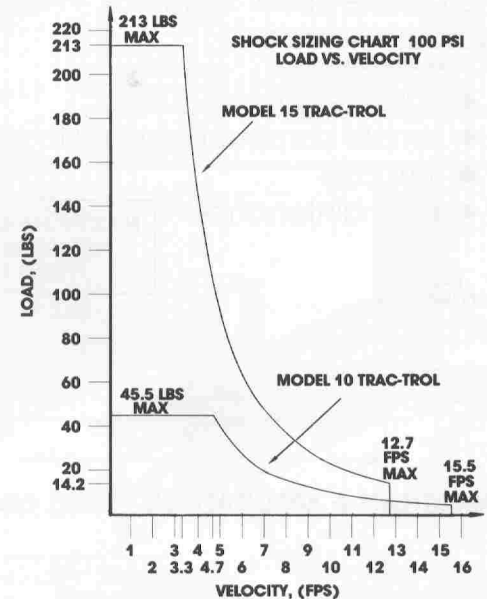
The GREENCO External Shock Absorber Package is a highly effective way to minimize shock loading in a wide variety of applications, (refer to chart). Additionally, the package utilizes (2) two fully adjustable, mechanical stops to vary stroke length as may be required by the application.

SHOCK PACKAGE CONSISTS OF: 2-shock absorbers, 2-shock mounting blocks, 2-stop collars, 2-locknuts, and 2-adjustable stops.

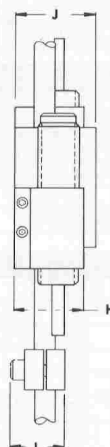
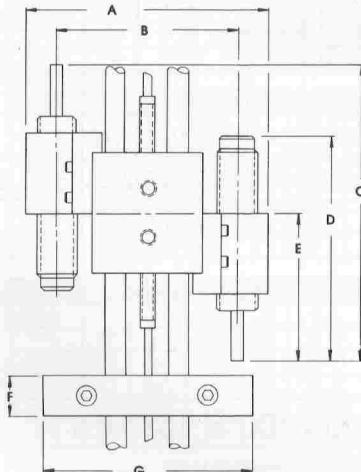
IMPORTANT - some applications may exceed shock design limits and could require a special orifice or non-standard shock absorber. Consult Factory.

EXAMPLE - application requiring a TRAC-TROL model 15 with 100 PSI, and a payload weight of 80 lbs. Referring to the sizing chart you would find 80 lbs. on the vertical axis and move across until you intersect with the model 15 line curve. From this intersection move toward the horizontal axis of the chart which tells you the maximum velocity allowed at impact (5.3 fps).

Shock operating temperature 32°-150°F. At maximum loads cycle rates must be limited to 30 hits per minute on model 10 and 17 hits per minute on models 15, 25, and 32. Cycle rates increase with lower loads.



NOTE - Shock Pkg. Adds to Cylinder O.A.L.



MODEL	INCREASE IN OAL
T10	5.00"
T15, TS15	5.375"
T20, T25, TS20, TS25	5.125"
T20P, T25P, T32, T40, TS40, TS20P, TS25P, TS32	6.06"

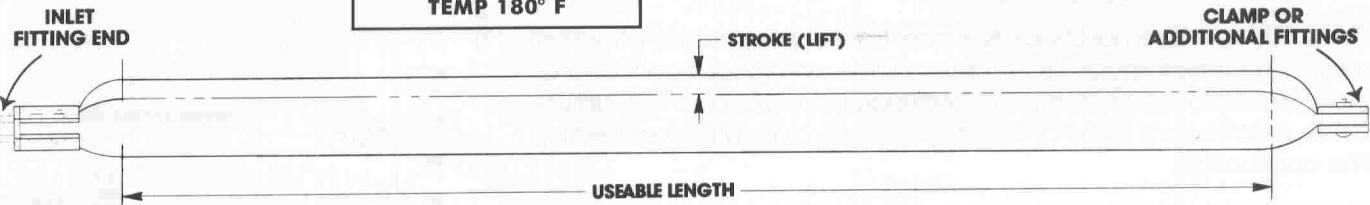
DIMENSION TABLE FOR SHOCKS, 10, 15, 25, 32

	A	B	C	D	E	F	G	H	I	J
T10	5.06	3.81	5.19	3.81	2.59	1.00	4.50	1.50	1.31	1.13
T15, TS15	6.75	5.25	9.50	5.59	4.75	1.00	6.00	1.75	1.31	1.50
T20, T25, TS20, TS25	7.75	6.25	11.0	5.59	5.50	1.13	7.00	1.75	2.13	2.00
T20P, T25P, T32, TS20P, TS25P, TS32	9.00	7.50	12.0	5.59	6.00	1.25	8.25	1.75	2.44	2.50

POWR-TUBE® provides a unique patented construction of a non-removable end fitting bonded to a tube (up to almost 100' length) to give a leak proof, long-lasting, low-cost, short-stroke linear actuator. Pneumatic or hydraulic service.

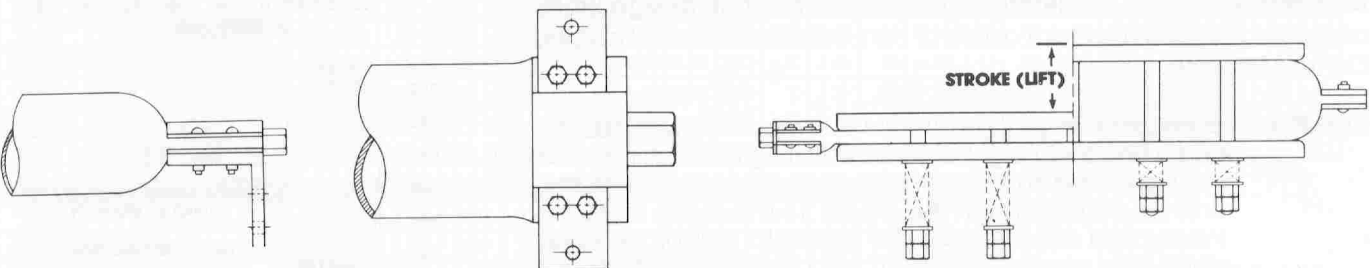
- light weight
- simple construction easy to mount
- low cost
- **no** maintenance

**MAXIMUM OPERATING
PRESSURE 100 PSI
TEMP 180° F**



FUNCTIONS & APPLICATIONS - lifting, clamping, positioning, hold, release and cushioning.

TYPICAL MOUNTINGS



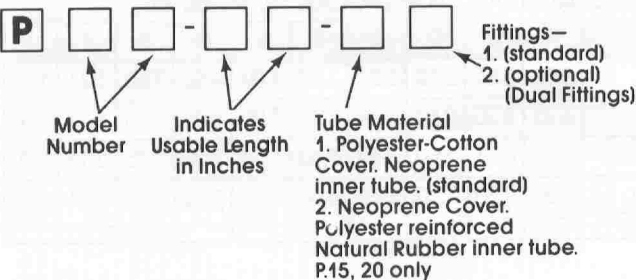
OUTPUT FORCE CALCULATION

THE TABLE AT RIGHT IS COMPUTED FROM THE FOLLOWING FORMULA:

$$\text{OUTPUT FORCE} = 1.57 \left(\text{I.D.} - \frac{\text{LIFT}}{\text{STROKE}} \right) \times \text{EFFECTIVE LENGTH} \times \text{INPUT AIR PRESSURE}$$

where $F \text{ [LB]} = 1.57 (d - \ell) LP$
 d = TUBE DIA. [IN.] (I.D.)
 ℓ = LIFT [IN.] (STROKE)
 L = USEABLE LENGTH [IN.]
 P = INPUT PRESSURE [P.S.I.]

POWR-TUBE® HOW TO ORDER



**TYPICAL OUTPUT FORCES PER 10 INCHES OF
EFFECTIVE LENGTH AT 100 PSI PRESSURE AT LIFT OF:**

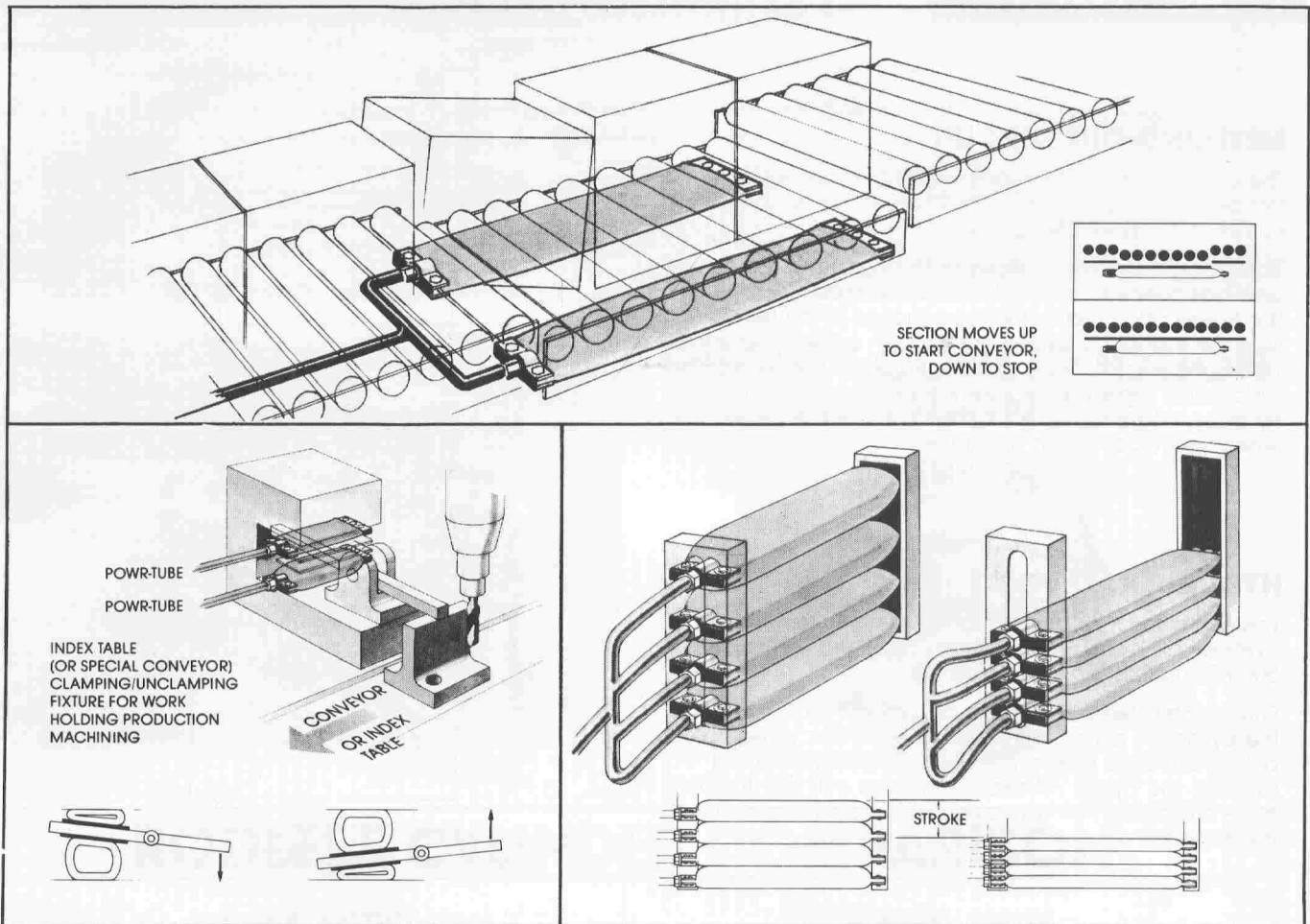
POWR-TUBE MODEL	Lift	.2	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
P1010 (1" dia.)		1255	785								
P1510 (1.5" dia.)		2040	1570	785							
P2010 (2.0 dia.)		2825	2355	1570	785						
P2510 (2.5" dia.)		3610	3140	2355	1570	785					
P4010 (4.0" dia.)		5970	5500	4710	3925	3140	2355	1570	785		
P5010 (5.0" dia.)		7540	7070	6280	5500	4710	3925	3140	2355	1570	785

EXAMPLE

2" Powr-Tube with 1" lift, 10" effective length at 100 psi

Model #

$$P2010-11 \ 1.57 (2.0-1.0) \times 10 \times 100 = 1570 \text{ lbs.}$$



MODEL	A	B	C	D	E	F	G	H
P10	1.67	•	1.12	.64	.75	.88	#8-32x3/4	•
P15	2.30	•	1.50	.75	.75	1.25	1/4-20x1	•
P20	3.20	•	2.25	.72	.88	1.25	3/8-16x1-1/4	.063
P25	3.86	•	2.50	.72	.75	1.25	3/8-16x1-1/4	.063
P40	6.16	4.62	2.62	.92	.88	1.25	3/8-16x1-3/4	.063
P50	8.24	5.75	3.25	.92	.88	1.25	3/8-16x1-3/4	.063

MODEL	K	L	M	N	P	Q	R	S
P10	.10	2.62	.44	.88	1.25	•	1.88	.89
P15	.105	4.00/4.38	.62	1.25	1.75	•	2.62	1.14
P20	.110	5.12/6.38	.62	1.25	2.25	•	3.50	1.40
P25	.115	5.88	.62	1.25	3.00	•	4.25	1.67
P40	.155	8.75	.62	1.25	2.50	5.00	6.50	2.00
P50	.250	11.50	.62	1.25	3.50	7.00	8.62	2.18

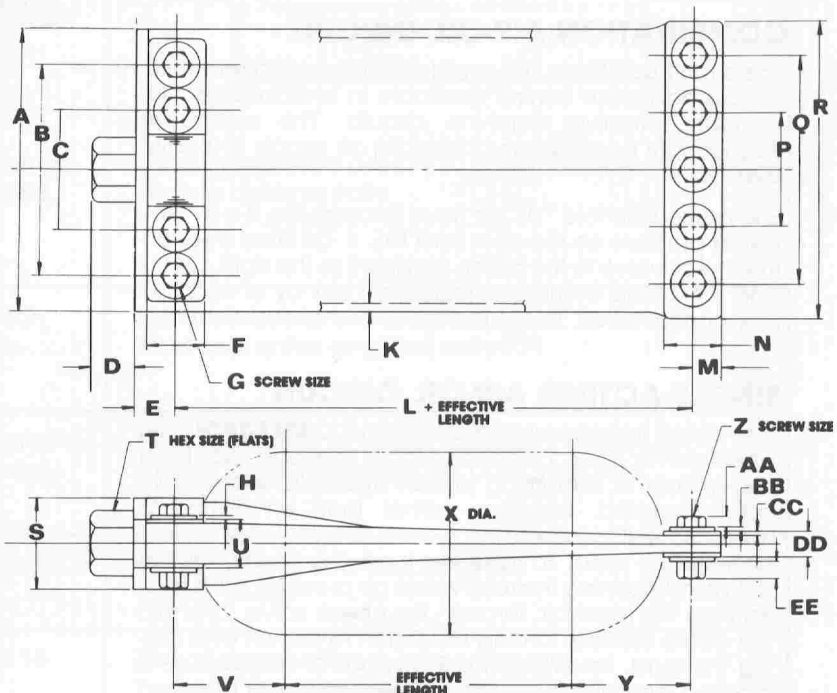
MODEL	T	U	V	X	Y	Z
P10	.75	.52	1.25	1.25	1.38	#8-32x3/8
P15	.88	.64	1.88/2.00	1.75/1.82	2.12/2.38	1/4-20x3/4
P20	1.12	.66	2.12/2.75	2.33	3.00/3.62	3/8-16x1
P25	1.12	.71	2.62	2.88	3.25	3/8-16x1
P40	1.38	1.00	4.00	4.48	4.75	3/8-16x1
P50	1.38	1.18	5.25	5.90	6.25	3/8-16x1-1/4

MODEL	AA	BB	CC	DD	EE	PORT (NPTF)	ORIFICE
P10	.12	.040	.065	.33	.12	1/4-18	.246
P15	.17	.063	.09	.39	.27	3/8-18	.376
P20	.23	.063	.09	.40	.38	1/2-14	.470
P25	.23	.063	.09	.41	.38	1/2-14	.470
P40	.23	.063	.09	.49	.38	3/4-14	.720
P50	.23	.063	.09	.68	.38	3/4-14	.720

NOTE: LV, X & Y Dim. STD Tube / NEOPRENE Tube

NOTE: Dimensions subject to change without notice.

ENGINEERING SPECIFICATIONS



METERING-OUT CIRCUIT

This circuit is typical for many cable cylinder speed control applications. The cylinder stroke in this schematic is common for **GREENCO** units.

Energizing solenoid "A" flows air through the 4-way valve and ball check to piston. As the piston moves to the right the trolley attached to the load moves to the left. Air inside the cylinder is forced out through a metering valve. This circuit maintains a constant back pressure on the piston and prevents lunging if the load drops quickly or reverses. Metering-in and bleed-off circuits work well when their application is required.

HYDRAULIC CIRCUIT

This circuit incorporates a high pressure hydraulic cable cylinder. Oil is supplied from a hydraulic power supply at 500 PSI max. to a 4-way valve.

Energizing solenoid "B" flows oil through a ball check to the cylinder's piston. Oil inside the cylinder is regulated out for effective speed control. Energizing solenoid "A" reverses the cycle. All seals within the cylinder function more effectively with hydraulic fluid added lubrication at these pressures.

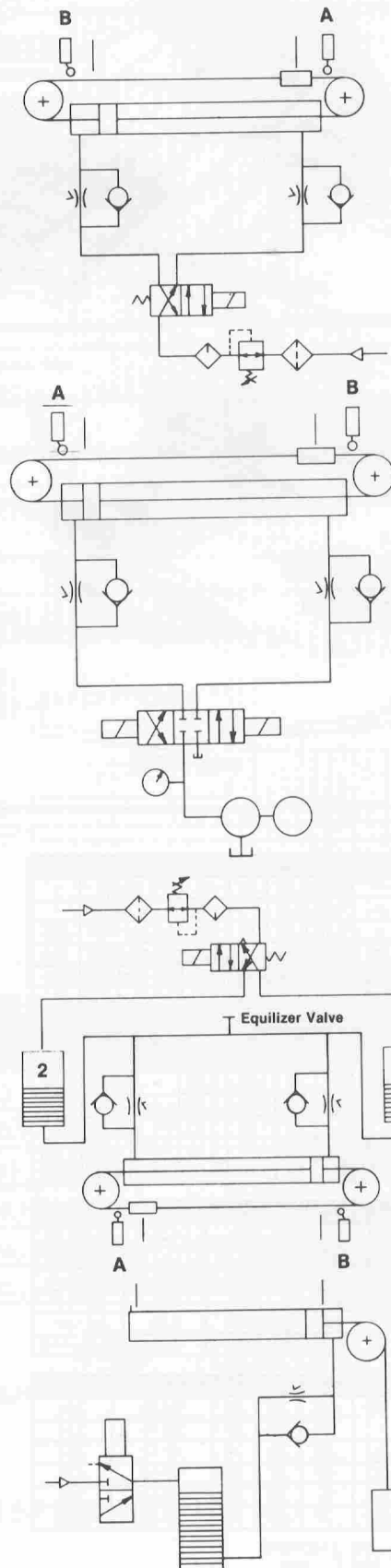
COMBINATION AIR-OIL CIRCUIT

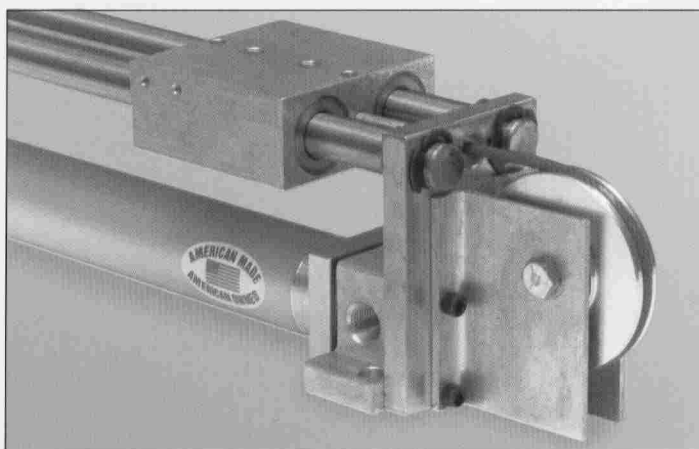
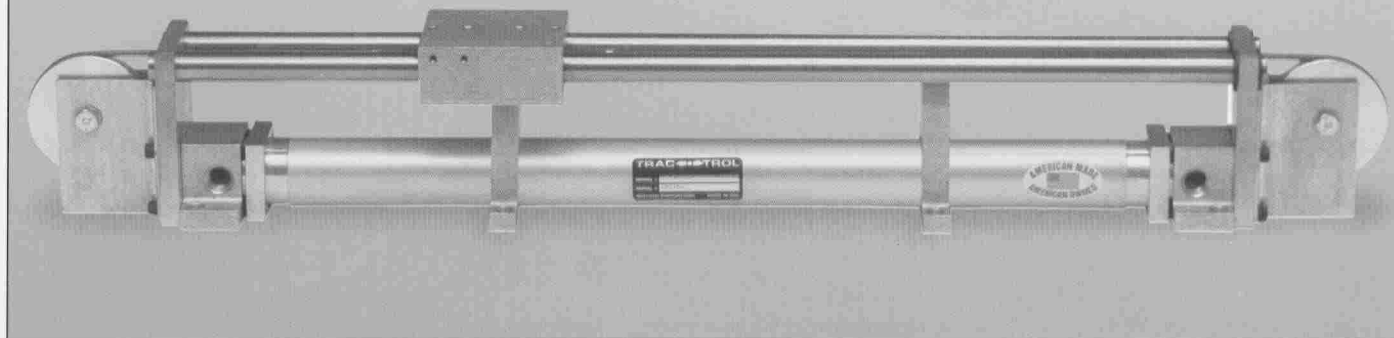
This circuit combines the rapid operation of pneumatic circuits and close control available in hydraulic circuits to form effective machine circuits. This system is economical because an adequate air supply is usually available.

Energizing solenoid "A" air flows through the 4-way applying pressure on the oil in tank No. 1. Oil flows through the check valve to the piston moving it to the right. Oil inside the cable cylinder is regulated out by a variable flow control valve. This circuit gives fine speed control.

SINGLE-ACTING AIR-OIL CIRCUIT

This circuit incorporates a single-end **CABLE-TROL** unit when gravity is used to lower a load. The load may be a heavy door or something similar. Hydraulic speed control is needed, however, rather than employing a hydraulic unit to power the system, a more economical air system is used. To raise the load, the 3-way valve is activated opening the reservoir to air pressure. Oil is forced from the reservoir, through the check valve, and into the cable cylinder forcing the piston to the left and raising the load. Reversing the 3-way valve, air pressure is blocked and gravity lowers the load at a rate of speed governed by variable orifice.



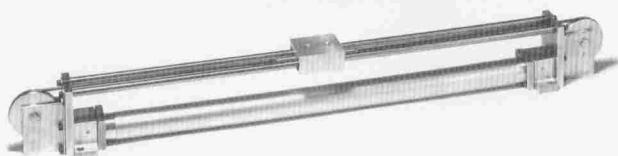


**QUALITY CONSTRUCTION
THROUGHOUT**



RODLESS CYLINDER COMPARISON

CABLE-TYPE



TRAC-TROL guides on close-tolerance metal bearings, completely separated from piston and cable seals. When loaded, there is still no effect on sealing mechanism.

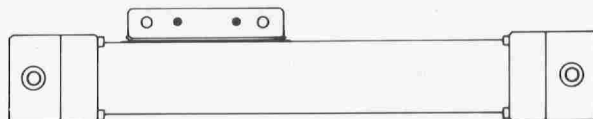
TRAC-TROL has superior sealing mechanism which allows hydraulic service for very smooth, long-life performance.

TRAC-TROL seals through two nylon covered aircraft type, prestressed, steel cables held to $\pm .004$ on the O.D., many times stronger than load carried.

TRAC-TROL has low-cost cable and rod wipers available for extremely contaminated areas.

TRAC-TROL offers 7 bore sizes in 2 styles, total of 16 models.

BAND-TYPE



Load transmitted directly to piston and could effect sealing detrimentally.

Hydraulic service not possible. Must seal entire length of extrusion.

Must seal entire length of tube, exposing much more surface to air loss and contamination problems.

Not available. Real problems in contaminated areas.

Only 4 sizes available, one company. Two sizes from another.