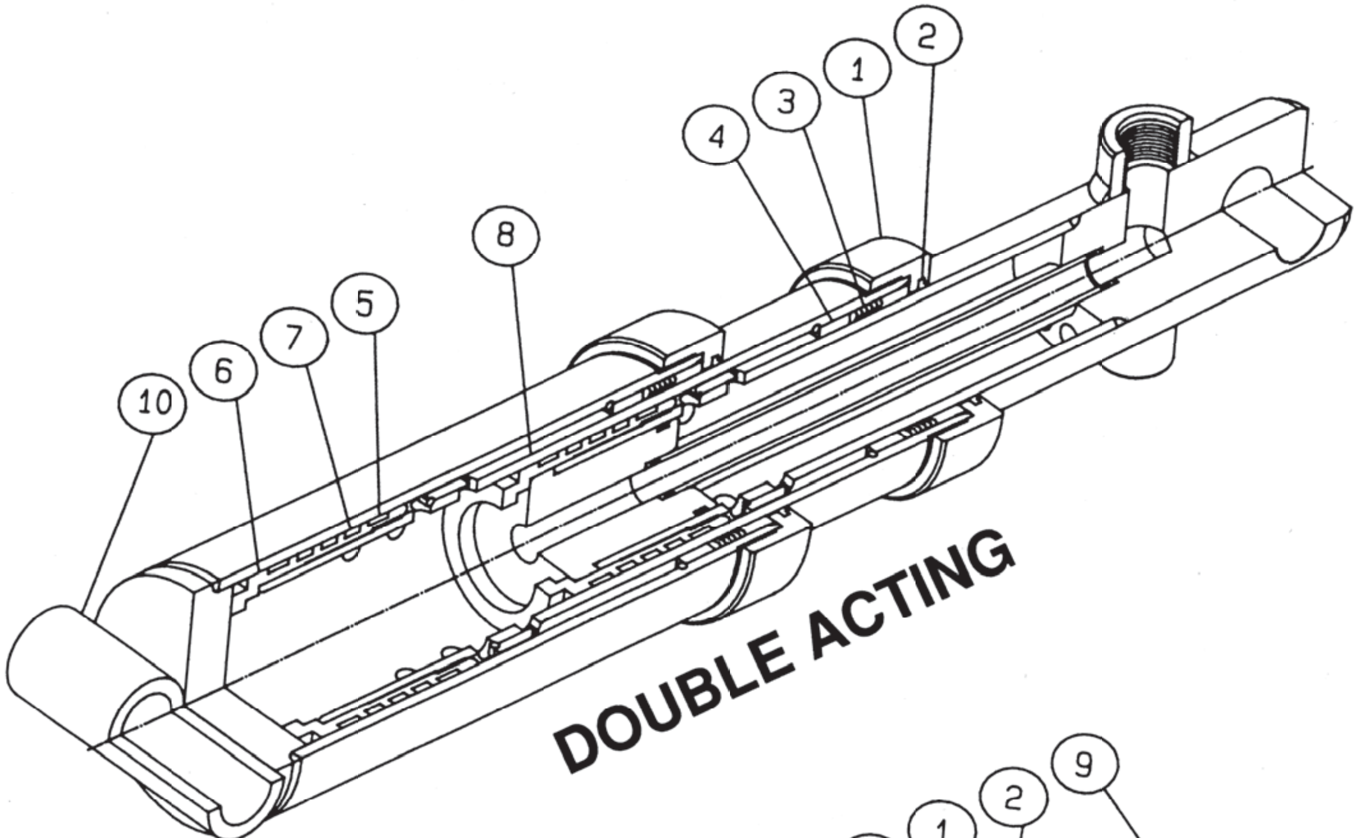
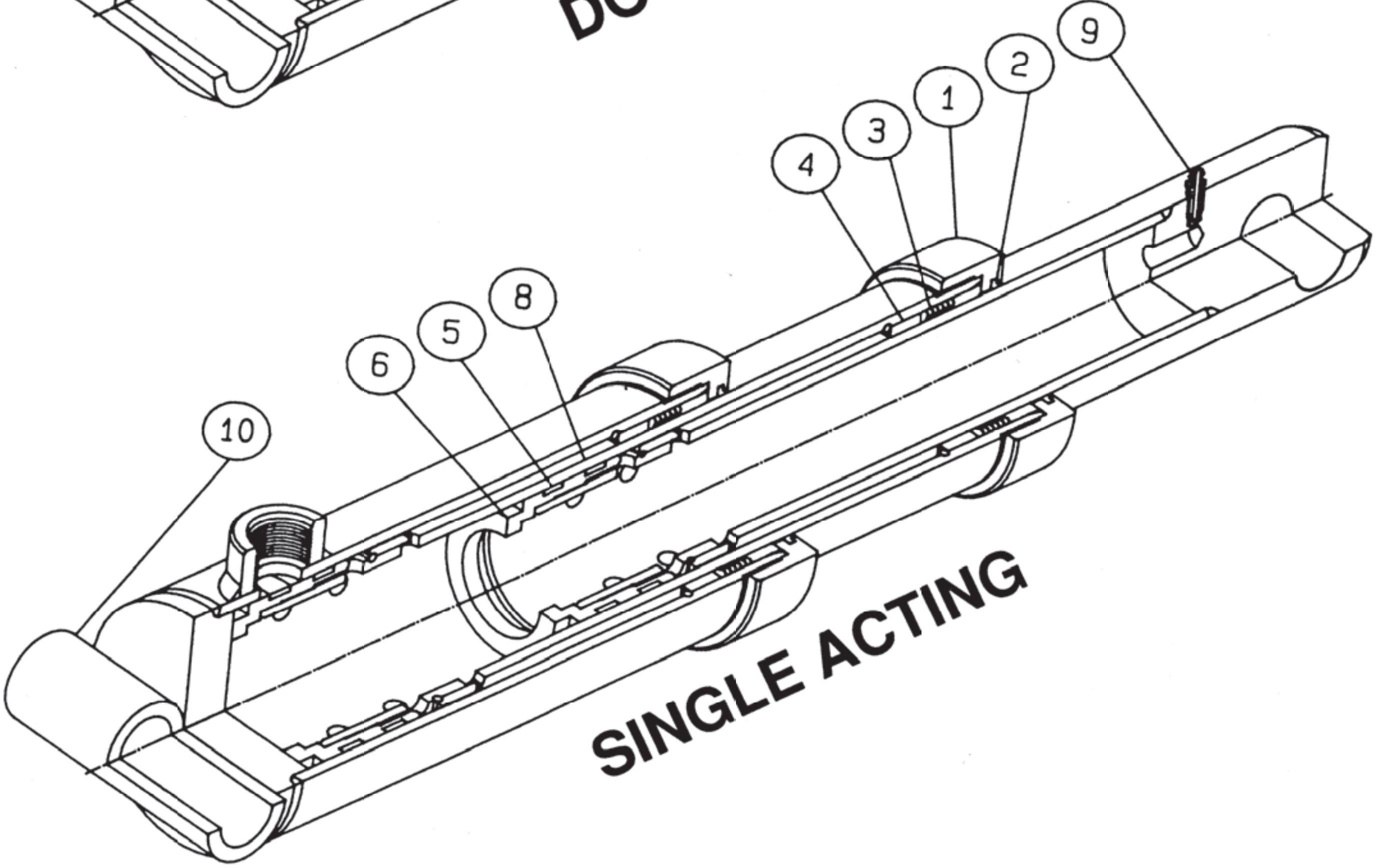
TELESCOPIC CYLINDERS FROM PRINCE

Double & Single Acting





PRINCE MANUFACTURING CORPORATION/WORLD HEADQUARTERS • P.O. BOX 7000 • NORTH SIOUX CITY, SOUTH DAKOTA 57049-7000
URL: www.princehyd.com • E-MAIL: prince@princehyd.com
O.E.M. CUSTOMER SERVICE: (605) 235-1220 • FAX (712) 233-2181 DISTRIBUTOR CUSTOMER SERVICE: PHONE (605) 235-1220 • FAX (712) 233-2181

CATC 24-10-11-01

FEATURES OF THE PRINCE TELESCOPIC CYLINDER

1. GLAND CAP	All steel, externally threaded gland caps provide adjustment of the vee packing.
2. WIPER	Urethane wiper in gland cap to help keep dirt from getting to the seals.
3. ROD SEALS	Homogenous vee sets made of alternating hytrel and nylon.
4. GLAND BEARINGS	Glass-filled nylon bearing rings are used on both sides of the vee seals to eliminate metal-to-metal contact of the chromed stages.
5. PISTON BEARINGS	Glass-filled nylon bearing rings are used at each end of the steel piston to eliminate metal-to-metal contact in the precision tube bores.
6. PISTONS	One-piece threaded construction. The pistons are grooved to contain the bearing rings and the sealing piston rings (double acting only). Each piston also serves to catch the next smaller stage when the cylinder is retracted.
7. PISTON SEALS	Interlocking step-cut cast iron rings provide port passing capability for the cross holes that feed the retracting oil to each stage.
8. TUBE STAGES	Stage construction is of C-1026 carbon steel, precision skived and burnished or honed for control of roundness and surface finish. Tube outside diameters are ground and chromed to provide close control of tolerance, reduce friction and improve wear resistance.
9. BLEEDER	Provided in the small stage of the single acting models to remove trapped air. Bleeders are not usually needed in the double acting since the cylinder fills with oil on both ends.
10. END FITTINGS	An assortment of end fittings are provided for both ends of the cylinder to fit various applications.
11. CUSTOM DESIGN	Special designs are also manufactured. One of our plants specializes the manufacture of telescopic's of all types. Extra short closed lengths, special chrome, no-drift designs, both ports on the main tube, and load holding checks are examples of special telescopic's made by Prince. Variations to the standard models will require additional documentation. Please contact your Prince Sales Representative.

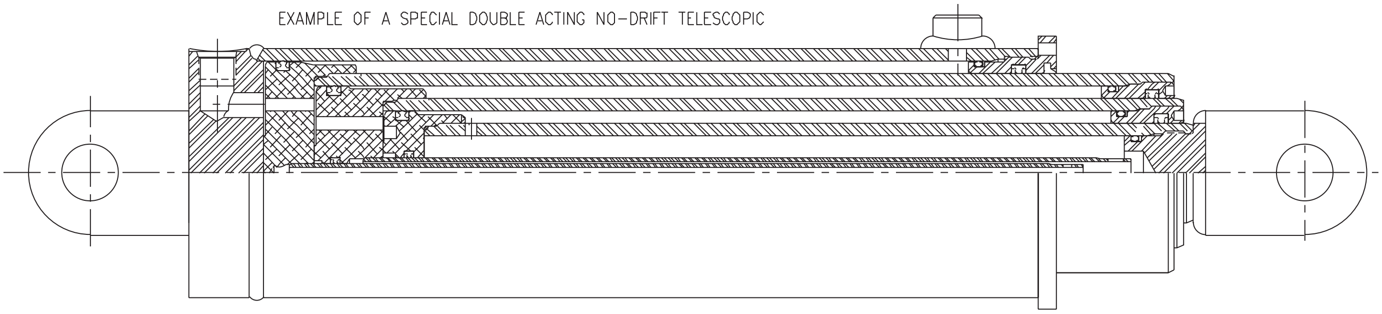
CUSTOM TELESCOPIC CYLINDERS

For some applications, the standard cylinders may not meet all requirements. When this happens, Prince has a staff of engineering personnel to create the special design that is required.

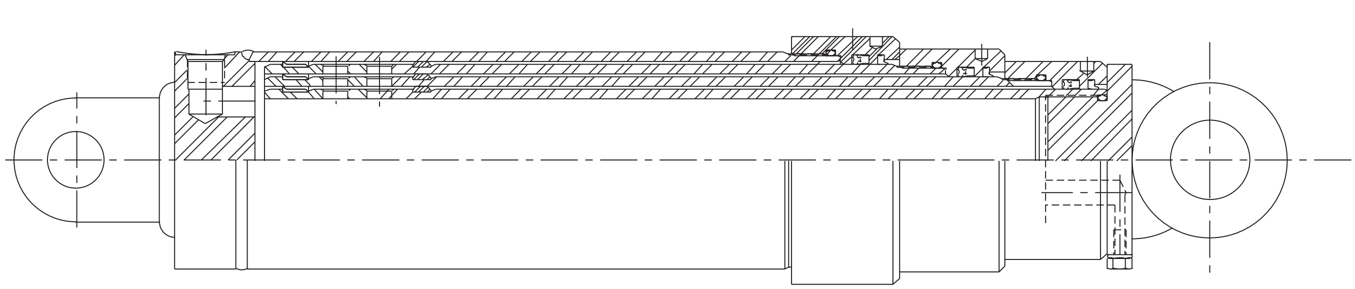
Examples of items a custom telescopic cylinder may require:

- Extra short retracted length.
- Special end fittings.
- Higher pressures.
- Special plating for the stages.
- Holding valves.
- Special seals.
- No-drift piston seals. This is a different design concept where the cross-holes in the stages are eliminated. This design allows the use of soft (urethane, teflon, etc.) piston seals which in turn will allow no drift to take place.

EXAMPLE OF A SPECIAL DOUBLE ACTING NO-DRIFT TELESCOPIC



EXAMPLE OF A SPECIAL SINGLE ACTING, COMPACT DESIGN, CHROME STAGED TELESCOPIC



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CATC 26-10-11-01

STANDARD SINGLE ACTING TELESCOPIC CYLINDER SPECIFICATIONS

BASE END FITTING OPTIONS

CODE NO.	D.DIA.	L	T	W	MAX PIN LOAD (SEE NOTE 6 & 9)
CT-1	1.015	.75	4.50	.25	30,000 lbs
CT2	1.265	.94	5.50	.31	50,000 lbs
CT-3	1.515	1.13	6.5	.38	71,000 lbs
CT-4	2.015	1.38	8	.38	110,000 lbs
CT-5	2.515	1.75	10	.50	161,000 lbs
CT-6	3.031	2.00	12	.50	225,000 lbs

CODE NO.	D.DIA.	L	T	R	MAX PIN LOAD (SEE NOTE 6 & 9)
TG-1	1.015	1.75	1.00	1.00	30,000 lbs
TG-2	1.265	2.00	1.50	1.25	50,000 lbs
TG-3	1.515	2.25	1.75	1.50	71,000 lbs
TG-4	2.015	2.75	2.00	2.00	110,000 lbs
TG-5	2.515	3.00	2.50	2.25	161,000 lbs
TG-6	3.031	3.25	3.00	2.50	225,000 lbs

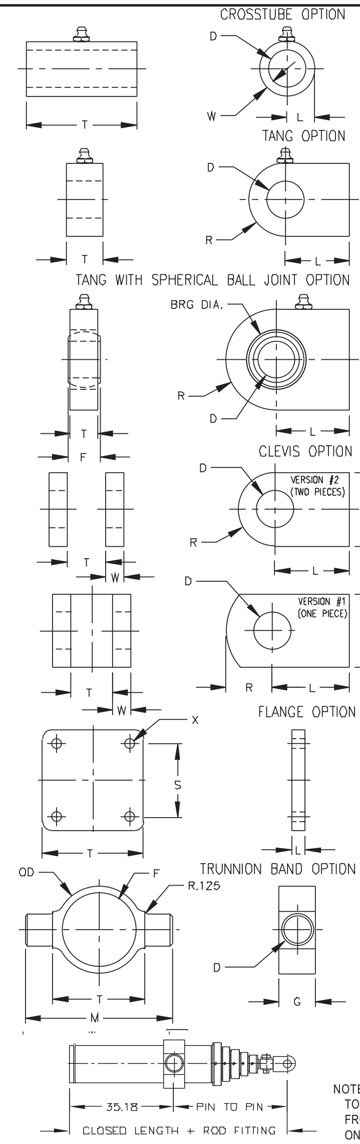
CODE NO	D DIA.	L	T	F	R	BRG. DIA.	MAX PIN LOAD (SEE NOTE 6 & 9)
BJ-1	1.00	2.00	.75	.88	1.38	1.625	30,000 lbs
BJ-2	1.25	2.50	1.00	1.09	1.88	2.000	50,000 lbs
BJ-3	1.50	3.00	1.13	1.31	2.38	2.437	71,000 lbs
BJ-4	2.00	3.50	1.50	1.75	2.88	3.187	110,000 lbs
BJ-5	2.50	4.25	1.88	2.19	3.31	3.937	161,000 lbs
BJ-6	3.00	4.50	2.25	2.63	3.75	4.751	225,000 lbs

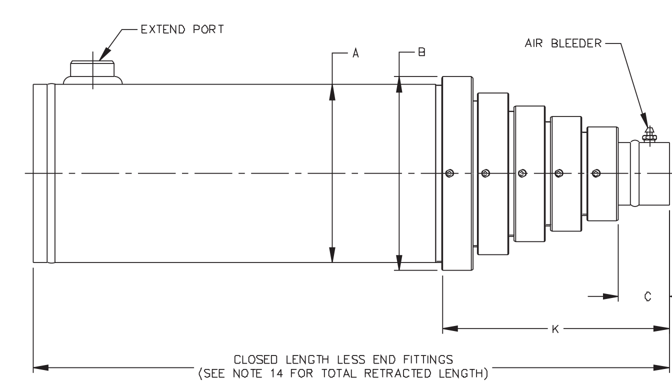
CODE NO.	D.DIA.	L	T	W	R	H	VERSION	MAX PIN LOAD (SEE NOTE 6 & 9)
CL-1	1.015	2.38	1.13	.50	1.25	2.00	VER. 1	30,000 lbs
CL-2	1.265	2.50	1.38	.63	1.25	2.50	VER. 1	50,000 lbs
CL-3	1.515	2.75	1.63	.75	1.50	3.00	VER. 2	71,000 lbs
CL-4	2.015	3.00	2.13	1.00	2.00	4.00	VER. 2	110,000 lbs
CL-5	2.515	3.25	2.38	1.25	2.25	4.50	VER. 2	161,000 lbs
CL-6	3.031	3.50	2.63	1.50	2.50	5.00	VER. 2	225,000 lbs

NOTE:
FLANGE OPTION TO BE WELDED DIRECTLY TO CYLINDER BASE END, IN PLACE OF THE STANDARD BUTT PLATE.

CODE NO.	X.DIA.	L	T SQ.	S SQ.	MAX PIN LOAD (SEE NOTE 6 & 9)
FL-1	.53	.75	5.50	4.00	30,000 lbs
FL-2	.66	1.00	7.00	5.25	50,000 lbs
FL-3	.78	1.25	8.00	6.00	71,000 lbs
FL-4	1.03	1.50	9.50	7.25	110,000 lbs
FL-5	1.28	1.75	11.25	8.50	161,000 lbs
FL-6	1.53	2.00	13.50	10.00	225,000 lbs

CODE NO.	MAT'L	D DIA.	G	T	M	F	OD	MAX PIN LOAD (SEE NOTE 6 & 9)
TR-1-(*)	A-36	1.75	2.00	5.00	8.00	4.00	4.75	30,000 lbs
TR-2-(*)	A-36	2.25	2.50	6.00	10.00	5.00	5.75	50,000 lbs
TR-3-(*)	A-36	2.50	3.00	7.00	11.00	6.00	6.75	71,000 lbs
TR-4-(*)	A-36	3.00	3.50	9.00	14.00	7.50	8.50	110,000 lbs
TR-5-(*)	T-1	3.00	3.50	10.50	15.50	9.00	10.00	161,000 lbs
TR-6-(*)	T-1	3.50	4.00	12.50	18.50	10.75	12.00	225,000 lbs





* MODEL NUMBER STEM

TO SPECIFY YOUR CYLINDER CHOOSE THE SIZES AND NUMBER OF STAGES REQUIRED, THEN ADD THE STROKE AND END FITTING OPTIONS. EXAMPLE:

PMC 32 - 0753 TG TR 03518

PORT
- PMC - NPTF PORT
- SAE - O-RING PORT

MODEL NUMBER
- INDENTIFIES STAGE SIZES

STROKE
- FIRST THREE DIGITS ARE INCHES
- LAST DIGIT IS 1/8'S OF AN INCH
- EXAMPLE: 0753 IS 75 3/8 INCHES

ROD END FITTING OPTION
- BL - BLANK
- PH - PINHOLE
- TG - TANG
- BJ - TANG WITH BALL JOINT
- CL - CLEVIS

BASE END FITTING OPTION
- BL - BLANK
- CT - CROSSTUBE
- TG - TANG
- BJ - TANG WITH BALL JOINT
- CL - CLEVIS
- FL - FLANGE
- TR - TRUNNION

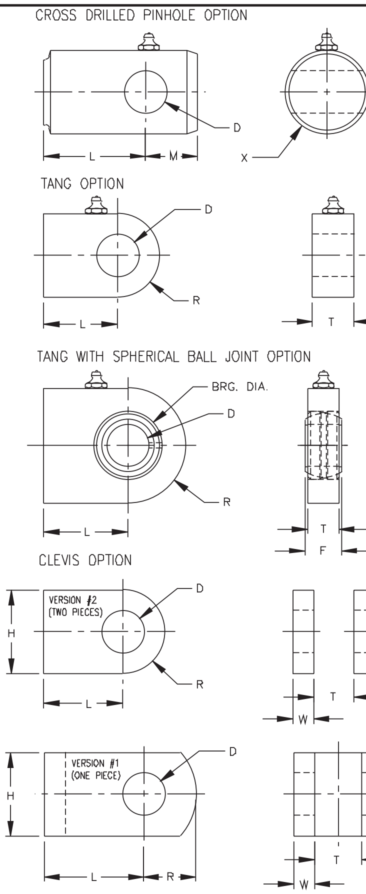
TRUNNION LOCATION
(SEE TRUNNION OPTION TO DERIVE LOCATION)

THIS IS A 4 STAGE CYLINDER WITH 6 X 5 X 4 X 3 RODS, 75 3/8 INCHES TOTAL STROKE, TANG END OPTION ON ROD END, AND TRUNNION OPTION 35.18 INCHES FROM BASE END.

NOTE:
TO DESIGNATE THE TRUNNION LOCATION, ENTER THE DISTANCE, IN INCHES, FROM THE BASE END OF THE CYLINDER TO THE CENTER LINE OF THE PIN ON THE TRUNNION BAND.
EXAMPLE: TRO3518 THIS TRUNNION WILL BE 35.18 INCHES FROM THE BASE END OF THE CYLINDER.

Prince

ROD END FITTING OPTIONS



CODE NO.	D.DIA.	L	M	X DIA.	MAX PIN LOAD (SEE NOTE 6 & 9)
PH-1	1.015	.50	1.25	2	30,000 lbs
PH-2	1.265	.75	1.38	3	50,000 lbs
PH-3	1.515	1.25	1.50	4	71,000 lbs
PH-4	2.015	2.00	1.75	5	110,000 lbs
PH-5	2.515	2.75	2.00	6	161,000 lbs
PH-6	3.031	3.00	2.50	7.5	225,000 lbs

CODE NO.	D.DIA.	L	T	R	MAX PIN LOAD (SEE NOTE 6 & 9)
TG-1	1.015	1.75	1.00	1.00	30,000 lbs
TG-2	1.265	2.00	1.50	1.25	50,000 lbs
TG-3	1.515	2.25	1.75	1.50	71,000 lbs
TG-4	2.015	2.75	2.00	2.00	110,000 lbs
TG-5	2.515	3.00	2.50	2.25	161,000 lbs
TG-6	3.031	3.25	3.00	2.50	225,000 lbs

CODE NO.	D DIA.	L	T	F	R	BRG. DIA.	MAX PIN LOAD (SEE NOTE 6 7 9)
BJ-1	1.00	2.00	.75	.88	1.38	1.625	30,000 lbs
BJ-2	1.25	2.50	1.00	1.09	1.88	2.000	50,000 lbs
BJ-3	1.50	3.00	1.13	1.31	2.38	2.437	71,000 lbs
BJ-4	2.00	3.50	1.50	1.75	2.88	3.187	110,000 lbs
BJ-5	2.50	4.25	1.88	2.19	3.31	3.937	161,000 lbs
BJ-6	3.00	4.50	2.25	2.63	3.75	4.751	225,000 lbs

CODE NO.	D.DIA.	L	T	W	R	H	VERSION	MAX PIN LOAD (SEE NOTE 6 & 9)
CL-1	1.015	2.38	1.13	.50	1.25	2.00	VER. 1	30,000 lbs
CL-2	1.265	2.50	1.38	.63	1.25	2.50	VER. 1	50,000 lbs
CL-3	1.515	2.75	1.63	.75	1.50	3.00	VER. 2	71,000 lbs
CL-4	2.015	3.00	2.13	1.00	2.00	4.00	VER. 2	110,000 lbs
CL-5	2.515	3.25	2.38	1.25	2.25	4.50	VER. 2	161,000 lbs
CL-6	3.031	3.50	2.63	1.50	2.50	5.00	VER. 2	225,000 lbs

NOTES:
1. MAXIMUM DESIGN AND TEST PRESSURE: 3000 P.S.I.
2. NORMAL OPERATING PRESSURE: 3000 P.S.I. (EXCEPT AS NOTED IN SPECIFICATIONS)
3. PAINT INSTRUCTIONS: PRIME PER: PMS-00120
4. MOVING STAGES ARE HARD CHROME PLATED .0010 MIN.
5. DO NOT REDUCE PORT SIZE. RESTRICTION OF FLOW IN ANY WAY MAY NOT ALLOW THE CYLINDER TO CYCLE SMOOTHLY.
6. PIN SIZE IS BASED ON PIN MATERIAL OF 120,000 P.S.I. MIN. TENSILE STRENGTH, RATING CAN BE INCREASED BY USING CORRESPONDINGLY STRONGER MATERIAL.
7. IF THE CYLINDER IS TO BE USED WITH THE ROD END UP, USE THE AIR BLEEDER TO REMOVE AIR FROM THE CYLINDER PRIOR TO USE.
8. MAXIMUM STROKE LENGTHS ARE BASED ON A SAFETY FACTOR OF 2 TO 1 RELATIVE TO LOAD FOR LONG COLUMNS SUBJECT TO BUCKLING. CONTACT STRESS ON THE PISTON WEAR RINGS ALSO LIMITS MAXIMUM LENGTH IN SOME CASES.

NOTES:
9. MAXIMUM LOAD SHOULD NOT EXCEED THE RATING FOR THE ROD END PIN. (IN SOME CASES IT IS SMALLER THAN THE BASE END PIN. - REF: LOAD LIMITS ON END FITTINGS.)
10. MAXIMUM EXTEND LOADS ARE BASED ON MAXIMUM PIN LOADS FOR THE ROD END FITTINGS. SEE ALSO COLUMN DATA.
11. THIS PRODUCT IS DESIGNED WITH A MINIMUM FACTOR OF SAFETY OF 2:1 BASED ON THE YIELD STRENGTH OF THE MATERIALS.
12. UNLESS OTHERWISE SPECIFIED THIS PRODUCT IS DESIGNED FOR USE WITH A GOOD QUALITY PETROLEUM BASE HYDRAULIC FLUID.
13. THIS DRAWING IS THE PROPERTY OF PRINCE MFG. CORP. AND USE IN ANY MANNER DETRIMENTAL TO THE INTEREST OF PRINCE MFG. CORP. IS PROHIBITED.
14. TOTAL RETRACT EQUALS CLOSED LENGTH PLUS DIMENSION "L" OF THE END FITTINGS WITH A TOLERANCE OF +/- 1/8 FOR EACH STAGE.

MODEL NO.	SPECIFICATION								COLUMN DATA					EXTEND AREA					PORT INFO. (SEE NOTE 5)	ROD END FITTING OPTIONS (SEE NOTE9)					BASE END FITTING OPTIONS (SEE NOTE 9)						
									MAX STROKE AT OPER. P.S.I.																						
2-STAGE	ROD SIZES	BORE SIZES	MAX EXTEND LOAD	CLOSED LENGTH	A	B	C	K	3000	2500	2000	1500	1000	FIRST STAGE	SECOND STAGE	THIRD STAGE	FOURTH STAGE	FIFTH STAGE	EXTEND PORT	BLANK	PH	TG	BJ	CL	BLANK	CT	TG	BJ	CL	FL	TR
PMC/SAE-11	3 X 2	3.5 X 2.5	30,000 lbs.	(STROKE ÷ 2) + 10.38	4	4.5	1.50	4.75	75 in.	84 in.	95 in.	111 in.	120 in.	7.07 SQ.IN.	3.14 SQ.IN.				1/2 NPTF - 7/8 SAE	BL	PH-1	TG-1	BJ-1	CL-1	BL	CT-1	TG-1	BJ-1	CL-1	FL-1	TR-1-(_)
PMC/SAE-12	4 X 3	4.5 X 3.5	50,000 lbs.	(STROKE ÷ 2) + 10.88	5	5.5	1.75	5.00	94 in.	104 in.	118 in.	138 in.	165 in.	12.57 SQ.IN.	7.07 SQ.IN.				1 NPTF - 1 5/16 SAE	BL	PH-2	TG-2	BJ-2	CL-2	BL	CT-2	TG-2	BJ-2	CL-2	FL-2	TR-2-(_)
PMC/SAE-13	5 X 4	5.5 X 4.5	71,000 lbs.	(STROKE ÷ 2) + 11.13	6	6.75	2.00	5.25	107 in.	118 in.	134 in.	158 in.	195 in.	19.63 SQ.IN.	12.57 SQ.IN.				1 1/4 NPTF - 1 5/8 SAE	BL	PH-3	TG-3	BJ-3	CL-3	BL	CT-3	TG-3	BJ-3	CL-3	FL-3	TR-3-(_)
PMC/SAE-14	6 X 5	6.75 X 5.5	110,000 lbs.	(STROKE ÷ 2) + 11.63	7.5	8.25	2.25	5.50	119 in.	134 in.	150 in.	175 in.	196 in.	28.27 SQ.IN.	19.63 SQ.IN.				1 1/2 NPTF - 1 7/8 SAE	BL	PH-4	TG-4	BJ-4	CL-4	BL	CT-4	TG-4	BJ-4	CL-4	FL-4	TR-4-(_)
PMC/SAE-15	7.5 X 6	8.25 X 6.75	161,000 lbs.	(STROKE ÷ 2) + 11.88	9	9.75	2.25	5.50	140 in.	158 in.	164 in.	164 in.	164 in.	44.18 SQ.IN.	28.27 SQ.IN.				1 1/2 NPTF - 1 7/8 SAE	BL	PH-5	TG-5	BJ-5	CL-5	BL	CT-5	TG-5	BJ-5	CL-5	FL-5	TR-5-(_)
PMC/SAE-16	9 X 7.5	9.75 X 8.25	225,000 lbs.	(STROKE ÷ 2) + 12.38	10.75	11.38	2.50	5.75	170 in.	170 in.	170 in.	170 in.	170 in.	63.61 SQ.IN..	44.18 SQ.IN.				1 1/2 NPTF - 1 7/8 SAE	BL	PH-6	TG-6	BJ-6	CL-6	BL	CT-6	TG-6	BJ-6	CL-6	FL-6	TR-6-(_)
									MAX STROKE AT OPER. P.S.I.																						
3-STAGE	ROD SIZES	BORE SIZES	MAX EXTEND LOAD (SEE NOTES 6 & 10)	CLOSED LENGTH	A	B	C	K	3000	2500	2000	1500	1000	FIRST STAGE	SECOND STAGE	THIRD STAGE	FOURTH STAGE	FIFTH STAGE	EXTEND PORT	BLANK	PH	TG	BJ	BJ	BLANK	CT	TG	BJ	CL	FL	TR
PMC/SAE-21	4 X 3 X 2	4.5 X 3.5 X 2.5	30,000 lbs.	(STROKE ÷ 3) + 11.50	5	5.5	1.50	6.50	99 in.	109 in.	124 in.	145 in.	145 in.	12.57 SQ.IN.	7.07 SQ.IN.	3.14 SQ.IN.			1 NPTF - 1 5/16 SAE	BL	PH-1	TG-1	BJ-1	CL-1	BL	CT-2	TG-2	BJ-2	CL-2	FL-2	TR-2-(_)
PMC/SAE-22	5 X 4 X 3	5.5 X 4.5 X 3.5	50,000 lbs.	(STROKE ÷ 3) + 11.75	6	6.75	1.75	6.75	120 in.	132 in.	150 in.	166 in.	195 in.	19.63 SQ.IN.	12.57 SQ.IN.	7.07 SQ.IN.			1 1/4 NPTF - 1 5/8 SAE	BL	PH-2	TG-2	BJ-2	CL-2	BL	CT-3	TG-3	BJ-3	CL-3	FL-3	TR-3-(_)
PMC/SAE-23	6 X 5 X 4	6.75 X 5.5 X 4.5	71,000 lbs.	(STROKE ÷ 3) + 12.25	7.5	8.25	2.00	7.00	132 in.	146 in.	167 in.	196 in.	220 in.	28.27 SQ.IN.	19.63 SQ.IN.	12.57 SQ.IN.			1 1/2 NPTF - 1 7/8 SAE	BL	PH-3	TG-3	BJ-3	CL-3	BL	CT-4	TG-4	BJ-4	CL-4	FL-4	TR-4-(_)
PMC/SAE-24	7.5 X 6 X 5	8.25 X 6.75 X 5.5	110,000 lbs.	(STROKE ÷ 3) + 12.75	9	9.75	2.25	7.25	149 in.	167 in.	188 in.	195 in.	195 in.	44.18 SQ.IN.	28.27 SQ.IN.	19.63 SQ.IN.			1 1/2 NPTF - 1 7/8 SAE	BL	PH-4	TG-4	BJ-4	CL-4	BL	CT-5	TG-5	BJ-5	CL-5	FL-5	TR-5-(_)
PMC/SAE-25	9 X 7.5 X 6	9.75 X 8.25 X 6.75	161,000 lbs.	(STROKE ÷ 3) + 13.00	10.75	11.38	2.25	7.25	176 in.	185 in.	185 in.	185 in.	185 in.	63.61 SQ.IN.	44.18 SQ.IN.	28.27 SQ.IN.			1 1/2 NPTF - 1 7/8 SAE	BL	PH-5	TG-5	BJ-5	CL-5	BL	CT-6	TG-6	BJ-6	CL-6	FL-6	TR-6-(_)
									MAX STROKE AT OPER. P.S.I.																						
4-STAGE	ROD SIZES	BORE SIZES	MAX EXTEND LOAD (SEE NOTES 6 & 10)	CLOSED LENGTH	A	B	C	K	3000	2500	2000	1500	1000	FIRST STAGE	SECOND STAGE	THIRD STAGE	FOURTH STAGE	FIFTH STAGE	EXTEND PORT	BLANK	PH	TG	BJ	BJ	BLANK	CT	TG	BJ	CL	FL	TR
PMC/SAE-31	5 X 4 X 3 X 2	5.5 X 4.5 X 3.5 X 2.5	30,000 lbs.	(STROKE ÷ 4) + 12.38	6	6.75	1.50	8.25	118 in.	132 in.	150 in.	155 in.	155 in.	19.63 SQ.IN.	12.57 SQ.IN.	7.07 SQ.IN.	3.14 SQ.IN.		1 1/4 NPTF - 1 5/8 SAE	BL	PH-1	TG-1	BJ-1	CL-1	BL	CT-3	TG-3	BJ-3	CL-3	FL-3	TR-3-(_)
PMC/SAE-32	6 X 5 X 4 X 3	6.75 X 5.5 X 4.5 X 3.5	50,000 lbs.	(STROKE ÷ 4) + 12.88	7.5	8.25	1.75	8.50	140 in.	156 in.	177 in.	190 in.	190 in.	28.27 SQ.IN.	19.63 SQ.IN.	12.57 SQ.IN.	7.07 SQ.IN.		1 /12 NPTF - 1 7/8 SAE	BL	PH-2	TG-2	BJ-2	CL-2	BL	CT-4	TG-4	BJ-4	CL-4	FL-4	TR-4-(_)
PMC/SAE-33	7.5 X 6 X 5 X 4	8.25 X 6.75 X 5.5 X 4.5	71,000 lbs.	(STROKE ÷ 4) + 13.38	9	9.75	2.00	8.75	155 in.	172 in.	196 in.	210 in.	210 in.	44.18 SQ.IN.	28.27 SQ.IN.	19.63 SQ.IN.	12.57 SQ.IN.		1 1/2 NPTF - 1 7/8 SAE	BL	PH-3	TG-3	BJ-3	CL-3	BL	CT-5	TG-5	BJ-5	CL-5	FL-5	TR-5-(_)
PMC/SAE-34	9 X 7.5 X 6 X 5	9.75 X 8.25 X 6.75 X 5.5	110,000 lbs.	(STROKE ÷ 4) + 13.88	10.75	11.38	2.25	9.00	175 in.	190 in.	190 in.	190 in.	190 in.	63.61 SQ.IN.	44.18 SQ.IN.	28.27 SQ.IN.	19.63 SQ.IN.		1 1/2 NPTF - 1 7/8 SAE	BL	PH-4	TG-4	BJ-4	CL4	BL	CT-6	TG-6	BJ-6	CL-6	FL-6	TR-6-(_)
									MAX STROKE AT OPER. P.S.I.																						
5-STAGE	ROD SIZES	BORE SIZES	MAX EXTEND LOAD (SEE NOTES 6 & 10)	CLOSED LENGTH	A	B	C	K	3000	2500	2000	1500	1000	FIRST STAGE	SECOND STAGE	THIRD STAGE	FOURTH STAGE	FIFTH STAGE	EXTEND PORT	BLANK	PH	TG	BJ	BJ	BLANK	CT	TG	BJ	CL	FL	TR
PMC/SAE-41	6 X 5 X 4 X 3 X 2	6.75 X 5.5 X 4.5 X 3.5 X 2.5	30,000 lbs.	(STROKE ÷ 5) + 13.50	7.5	8.25	1.50	10.00	134 in.	148 in.	150 in.	150 in.	150 in.	28.27 SQ.IN.	19.63 SQ.IN.	12.57 SQ.IN.	7.07 SQ.IN.	3.14 SQ.IN.	1 1/2 NPTF - 1 7/8 SAE	BL	PH-1	TG-1	BJ-1	CL-1	BL	CT-4	TG-1	BJ-4	CL-4	FL-4	TR-4-(_)
PMC/SAE-42	7.5 X 6 X 5 X 4 X 3	8.25 X 6.75 X 5.5 X 4.5 X 3.5	50,000 lbs.	(STROKE ÷ 5) + 14.00	9	9.75	1.75	10.25	158 in.	176 in.	180 in.	180 in.	180 in.	44.18 SQ.IN.	28.27 SQ.IN.	19.63 SQ.IN.	12.57 SQ.IN.	7.07 SQ.IN.	1 1/2 NPTF - 1 7/8 SAE	BL	PH-2	TG-2	BJ-2	CL-2	BL	CT-2	TG-5	BJ-5	CL-5	FL-5	TR-5-(_)
PMC/SAE-43	9 X 7.5 X 6 X 5 X 4	9.75 X 8.25 X 6.75 X 5.5 X 4.5	71,000 lbs.	(STROKE ÷ 5) + 14.50	10.75	11.38	2.00	10.50	173 in.	199 in.	200 in.	220 in.	200 in.	63.61 SQ.IN.	28.27 SQ.IN.	19.63 SQ.IN.	12.57 SQ.IN.	12.57 SQ.IN	1 1/2 NPTF - 1 7/8 SAE	BL	PH-3	TG-3	BJ-3	CL-3	BL	CT-3	TG-6	BJ-6	CL-6	FL-6	TR-6-(_)

CATC 27-10-11-01

PRINCE MANUFACTURING CORPORATION/WORLD HEADQUARTERS • P.O. BOX 7000 • NORTH SIOUX CITY, SOUTH DAKOTA 57049-7000
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SEE PAGE 8, 9 & 10 OF THE STANDARD PRODUCT PRICE LIST FOR PRICING

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STANDARD DOUBLE ACTING TELESCOPIC CYLINDER SPECIFICATIONS

CODE NO.	D.DIA.	L	T	W	MAX PIN LOAD (SEE NOTE 6 & 9)
CT-1	1.015	.75	4.50	.25	30,000 lbs
CT2	1.265	.94	5.50	.31	50,000 lbs
CT-3	1.515	1.13	6.5	.38	71,000 lbs
CT-4	2.015	1.38	8	.38	110,000 lbs
CT-5	2.515	1.75	10	.50	161,000 lbs
CT-6	3.031	2.00	123	.50	225,000 lbs

CODE NO.	D.DIA.	L	T	R	MAX PIN LOAD (SEE NOTE 6 & 9)
TG-1	1.015	1.75	1.00	1.00	30,000 lbs
TG-2	1.265	2.00	1.50	1.25	50,000 lbs
TG-3	1.515	2.25	1.75	1.50	71,000 lbs
TG-4	2.015	2.75	2.00	2.00	110,000 lbs
TG-5	2.515	3.00	2.50	2.25	161,000 lbs
TG-6	3.031	3.25	3.00	2.50	225,000 lbs

CODE NO	D DIA.	L	T	F	R	BRG. DIA.	MAX PIN LOAD (SEE NOTE 6 & 9)
BJ-1	1.00	2.00	.75	.88	1.38	1.625	30,000 lbs
BJ-2	1.25	2.50	1.00	1.09	1.88	2.000	50,000 lbs
BJ-3	1.50	3.00	1.125	1.31	2.38	2.437	71,000 lbs
BJ-4	2.00	3.50	1.50	1.75	2.88	3.187	110,000 lbs
BJ-5	2.50	4.25	1.875	2.19	3.31	3.937	161,000 lbs
BJ-6	3.00	4.50	2.250	2.63	3.75	4.751	225,000 lbs

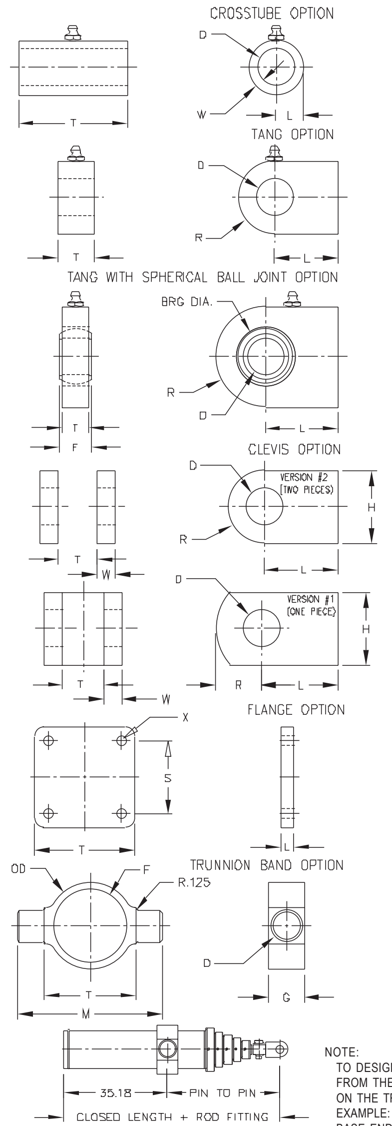
CODE NO.	D.DIA.	L	T	W	R	H	VERSION	MAX PIN LOAD (SEE NOTE 6 & 9)
CL-1	1.015	2.38	1.13	.50	1.25	2.00	VER. 1	30,000 lbs
CL-2	1.265	2.50	1.38	.63	1.25	2.50	VER. 1	50,000 lbs
CL-3	1.515	2.75	1.63	.75	1.50	3.00	VER. 2	71,000 lbs
CL-4	2.015	3.00	2.13	1.00	2.00	4.00	VER. 2	110,000 lbs
CL-5	2.515	3.25	2.38	1.25	2.25	4.50	VER. 2	161,000 lbs
CL-6	3.031	3.50	2.63	1.50	2.50	5.00	VER. 2	225,000 lbs

NOTE:
FLANGE OPTION TO BE WELDED DIRECTLY TO CYLINDER BASE END, IN PLACE OF THE STANDARD BUTT PLATE.

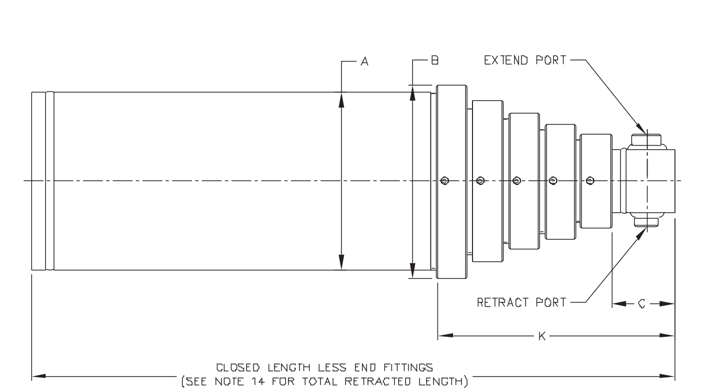
CODE NO.	X.DIA.	L	T SQ.	S SQ.	MAX PIN LOAD (SEE NOTE 6 & 9)
FL-1	.53	.75	5.50	4.00	30,000 lbs
FL-2	.66	1.00	7.00	5.25	50,000 lbs
FL-3	.78	1.25	8.00	6.00	71,000 lbs
FL-4	1.03	1.50	9.50	7.25	110,000 lbs
FL-5	1.28	1.75	11.25	8.50	161,000 lbs
FL-6	1.53	2.00	13.50	10.00	225,000 lbs

CODE NO.	MAT'L	D DIA.	G	T	M	F	0D	MAX PIN LOAD (SEE NOTE 6 & 9)
TR-1-(*)	A-36	1.75	2.00	5.00	8.00	4.00	4.75	30,000 lbs
TR-2-(*)	A-36	2.25	2.50	6.00	10.00	5.00	5.75	50,000 lbs
TR-3-(*)	A-36	2.50	3.00	7.00	11.00	6.00	6.75	71,000 lbs
TR-4-(*)	A-36	3.00	3.50	9.00	14.00	7.50	8.50	110,000 lbs
TR-5-(*)	T-1	3.00	3.50	10.50	15.50	9.00	10.00	161,000 lbs
TR-6-(*)	T-1	3.50	4.00	12.50	18.50	10.75	12.00	225,000 lbs

BASE END FITTING OPTIONS



NOTE:
TO DESIGNATE THE TRUNNION LOCATION, ENTER THE DISTANCE, IN INCHES, FROM THE BASE END OF THE CYLINDER TO THE CENTER LINE OF THE PIN ON THE TRUNNION BAND.
EXAMPLE: TRO3518 THIS TRUNNION WILL BE 35.18 INCHES FROM THE BASE END OF THE CYLINDER.



* MODEL NUMBER STEM

TO SPECIFY YOUR CYLINDER CHOOSE THE SIZES AND NUMBER OF STAGES REQUIRED, THEN ADD THE STROKE AND END FITTING OPTIONS. EXAMPLE:

PMC 72 - 0753 TG TR 03518

PORT
- PMC - NPTF PORTS
- SAE - O-RING PORTS

MODEL NUMBER
- INDENTIFIES STAGE SIZES

STROKE
- FIRST THREE DIGITS ARE INCHES
- LAST DIGIT IS 1/8'S OF AN INCH
- EXAMPLE: 0753 IS 75 3/8 INCHES

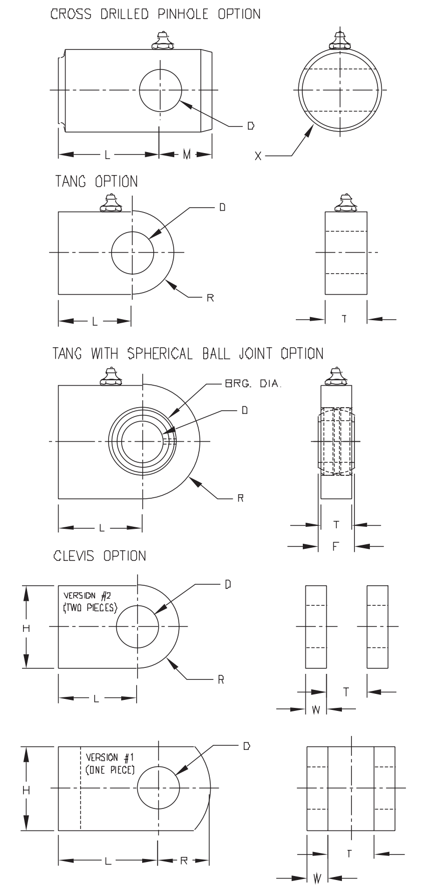
ROD END FITTING OPTION
- BL - BLANK
- PH - PINHOLE
- TG - TANG
- BJ - TANG WITH BALL JOINT
- CL - CLEVIS

BASE END FITTING OPTION
- BL - BLANK
- CT - CROSSTUBE
- TG - TANG
- BJ - TANG WITH BALL JOINT
- CL - CLEVIS
- FL - FLANGE
- TR - TRUNNION

TRUNNION LOCATION (SEE TRUNNION OPTION TO DERIVE LOCATION)

THIS IS A 4 STAGE CYLINDER WITH 6.75 X 5.5 X 4.5 X 3.5 BORES 75 3/8 INCHES TOTAL STROKE, TANG OPTION ON ROD END TRUNNION OPTION 35.18 INCHES FROM BASE END.

ROD END FITTING OPTIONS



CODE NO.	D.DIA.	L	M	X DIA.	MAX PIN LOAD (SEE NOTE 6 & 9)
PH-1	1.015	.50	1.25	2	30,000 lbs
PH-2	1.265	.75	1.38	3	50,000 lbs
PH-3	1.515	1.25	1.50	4	71,000 lbs
PH-4	2.015	2.00	1.75	5	110,000 lbs
PH-5	2.515	2.75	2.00	6	161,000 lbs
PH-6	3.031	3.00	2.50	7.5	225,000 lbs

CODE NO.	D.DIA.	L	T	R	MAX PIN LOAD (SEE NOTE 6 & 9)
TG-1	1.015	1.75	1.00	1.00	30,000 lbs
TG-2	1.265	2.00	1.50	1.25	50,000 lbs
TG-3	1.515	2.25	1.75	1.50	71,000 lbs
TG-4	2.015	2.75	2.00	2.00	110,000 lbs
TG-5	2.515	3.00	2.50	2.25	161,000 lbs
TG-6	3.031	3.25	3.00	2.50	225,000 lbs

CODE NO.	D DIA.	L	T	F	R	BRG. DIA.	MAX PIN LOAD (SEE NOTE 6 7 9)
BJ-1	1.00	2.00	.75	.88	1.38	1.625	30,000 lbs
BJ-2	1.25	2.50	1.00	1.09	1.88	2.000	50,000 lbs
BJ-3	1.50	3.00	1.13	1.31	2.38	2.437	71,000 lbs
BJ-4	2.00	3.50	1.50	1.75	2.88	3.187	110,000 lbs
BJ-5	2.50	4.25	1.88	2.19	3.31	3.937	161,000 lbs
BJ-6	3.00	4.50	2.25	2.63	3.75	4.751	225,000 lbs

CODE NO.	D.DIA.	L	T	W	R	H	VERSION	MAX PIN LOAD (SEE NOTE 6 & 9)
CL-1	1.015	2.38	1.13	.50	1.25	2.00	VER. 1	130,000 lbs
CL-2	1.265	2.50	1.38	.63	1.25	2.50	VER. 1	50,000 lbs
CL-3	1.515	2.75	1.63	.75	1.50	3.00	VER. 2	71,000 lbs
CL-4	2.015	3.00	2.13	1.00	2.00	4.00	VER. 2	110,000 lbs
CL-5	2.515	3.25	2.38	1.25	2.25	4.50	VER. 2	161,000 lbs
CL-6	3.031	3.50	2.63	1.50	2.50	5.00	VER. 2	225,000 lbs

NOTES:
1. MAXIMUM DESIGN AND TEST PRESSURE: 3000 P.S.I.
2. NORMAL OPERATING PRESSURE: 3000 P.S.I. (EXCEPT AS NOTED IN SPECIFICATIONS)
3. PAINT INSTRUCTIONS: PRIME PER: PMS-00120
4. MOVING STAGES ARE HARD CHROME PLATED .0010 MIN.
5. MAXIMUM FLOW RATE IS BASED ON THE MAXIMUM ALLOWABLE FLOW INTO THE RETRACT PORT, LIMITED BY BACK PRESSURE ON FLOW EXITING THE EXTEND PORT.
6. PIN SIZE IS BASED ON PIN MATERIAL OF 120,000 P.S.I. MIN. TENSILE STRENGTH, RATING CAN BE INCREASED BY USING CORRESPONDINGLY STRONGER MATERIAL.
7. IF QUICK DISCONNECTS ARE USED ON THE PORTS, FAILURE TO COMPLETELY FASTEN THE DISCONNECT ON THE RETRACT PORT MAY RESULT IN INTERNAL FAILURE WHEN THE CYLINDER IS EXTENDED.
8. MAXIMUM STROKE LENGTHS ARE BASED ON A SAFETY FACTOR OF 2 TO 1 RELATIVE TO LOAD FOR LONG COLUMNS SUBJECT TO BUCKLING. CONTACT STRESS ON THE PISTON WEAR RINGS ALSO LIMITS MAXIMUM LENGTH IN SOME CASES.

NOTES:
9. MAXIMUM LOAD SHOULD NOT EXCEED THE RATING FOR THE ROD END PIN. (IN SOME CASES IT IS SMALLER THAN THE BASE END PIN. - REF: LOAD LIMITS ON END FITTINGS.)
10. MAXIMUM EXTEND LOADS ARE BASED ON MAXIMUM PIN LOADS FOR THE ROD END FITTINGS. SEE ALSO COLUMN DATA.
11. THIS PRODUCT IS DESIGNED WITH A MINIMUM FACTOR OF SAFETY OF 2:1 BASED ON THE YIELD STRENGTH OF THE MATERIALS.
12. UNLESS OTHERWISE SPECIFIED THIS PRODUCT IS DESIGNED FOR USE WITH A GOOD QUALITY PETROLEUM BASE HYDRAULIC FLUID.
13. THIS DRAWING IS THE PROPERTY OF PRINCE MFG. CORP. AND USE IN ANY MANNER DETRIMENTAL TO THE INTEREST OF PRINCE MFG. CORP. IS PROHIBITED.
14. TOTAL RETRACT EQUALS CLOSED+/- LENGTH PLUS DIMENSION +/- OF THE END BOXES FITTINGS WITH A TOLERANCE OF ? 1/8 FOR EACH STAGE.

MODEL NO.*	SPECIFICATIONS								COLUMN DATA					LARGEST STAGE			PORTING INFORMATION				ROD END FITTING OPTIONS (SEE NOTE 9)					BASE END FITTING OPTIONS (SEE NOTE 9)						
									MAX STROKE AT OPER. P.S.I.																							
2-STAGE	BORE SIZES	ROD SIZES	MAX EXTEND LOAD (SEE NOTES 6 & 10)	CLOSED LENGTH	A	B	C	K	3000	2500	2000	1500	1000	EXTEND AREA	EFFECTIVE RETRACT AREA FOR ALL STAGES	VOLUME OR AREA RATIO	RETRACT PORT	EXTEND PORT	MANIFOLD I.D.	MAX FLOW RATE (SEE NOTE 5)	BLANK	PH	TG	BJ	CL	BLANK	CT	TG	BJ	CL	FL	TR
PMC/SAE-51	3.5 X 2.5	3 X 2	30,000 lbs.	(STROKE ÷ 2) + 13.38	4	4.5	3.00	6.25	55 in.	61 in.	70 in.	84 in.	106 in.	9.62 SQ.IN.	1.77 SQ. IN.	3.77	3/8 NPTF-3/4 SAE	1/2 NPTF-7/8 SAE	.50	17 G.P.M.	BL	PH-1	TG-1	BJ-1	CL-1	BL	CT-1	TG-1	BJ-1	CL-1	FL-1	TR-1-(_)
PMC/SAE-52	4.5 X 3.5	4 X 3	50,000 lbs.	(STROKE ÷ 2) + 14.38	5	5.5	3.75	7.00	74 in.	83 in.	95 in.	113 in.	140 in.	15.90 SQ.IN.	2.55 SQ. IN.	4.77	3/4 NPTF-1 1/16 SAE	1 NPTF-1 5/16 SAE	.75	31 G.P.M.	BL	PH-2	TG-2	BJ-2	CL-2	BL	CT-2	TG-2	BJ-2	CL-2	FL-2	TR-2-(_)
PMC/SAE-53	5.5 X 4.5	5 X 4	71,000 lbs.	(STROKE ÷ 2) + 14.88	6	6.75	4.25	7.50	86 in.	98 in.	113 in.	133 in.	167 in.	23.76 SQ.IN.	3.34 SQ. IN.	5.76	1 NPTF-1 5/16 SAE	1 1/4 NPTF-1 5/8 SAE	1.25	38 G.P.M.	BL	PH-3	TG-3	BJ-3	CL-3	BL	CT-3	TG-3	BJ-2	CL-3	FL-3	TR-3-(_)
PMC/SAE-54	6.75 X 5.5	6 X 5	110,000 lbs.	(STROKE ÷ 2) + 15.38	7.5	8.25	4.50	7.75	100 in.	114 in.	131 in.	154 in.	192 in.	35.79 SQ.IN.	4.12 SQ. IN.	4.77	1 1/4 NPTF-1 5/8 SAE	1 1/2 NPTF-1 7/8 SAE	1.50	41 G.P.M.	BL	PH-4	TG-4	BJ-4	CL-4	BL	CT-4	TG-4	BJ-4	CL-4	FL-4	TR-4-( )
PMC/SAE-55	8.25 X 6.75	7.5 X 6	161,000 lbs.	(STROKE ÷ 2) + 15.63	9	9.75	4.50	7.75	90 in.	132 in.	155 in.	184 in.	210 in.	53.46 SQ.IN.	7.51 SQ. IN.	5.76	1 1/4 NPTF-1 5/8 SAE	1 1/2 NPTF-1 7/8 SAE	1.50	41 G.P.M.	BL	PH-5	TG-5	BJ-5	CL-5	BL	CT-5	TG-5	BJ-5	CL-5	FL-5	TR-5-(_)
PMC/SAE-56	9.75 X 8.25	9 X 7.5	225,000 lbs.	(STROKE ÷ 2) + 15.88	10.75	11.38	4.50	7.75	128 in.	168 in.	190 in.	190 in.	190 in.	74.66 SQ.IN.	9.28 SQ. IN.	6.76	1/1/4 NPTF-1 5/8 SAE	1 1/2 NPTF-1 7/8 SAE	1.50	41 G.P.M	BL	PH-6	TG-6	BJ-6	CL-6	BL	CT-6	TG-6	BJ-6	CL-6	FL-6	TR-6-(_)
									MAX STROKE AT OPER. P.S.I.																							
3-STAGE	BORE SIZES	ROD SIZES	MAX EXTEND LOAD (SEE NOTES 6 & 10)	CLOSED LENGTH	A	B	C	K	3000	2500	2000	1500	1000	EXTEND AREA	EFFECTIVE RETRACT AREA FOR ALL STAGES	VOLUME OR AREA RATIO	RETRACT PORT	EXTEND PORT	MANIFOLD I.D.	MAX FLOW RATE (SEE NOTE 5)	BLANK	PH	TG	BJ	CL	BLANK	CT	TG	BJ	CL	FL	TR
PMC/SAE-61	4.5 X 3.5 X 2.5	4 X 3 X 2	30,000 lbs.	(STROKE ÷ 3) + 14.50	5	5.5	3.00	8.00	84 in.	93 in.	106 in.	126 in.	157 in.	15.90 SQ.IN.	1.77 SQ. IN.	4.77	3/8 NPTF-3/4 SAE	1/2 NPTF-7/8 SAE	.50	13 G.P.M.	BL	PH-1	TG-1	BJ-1	CL-1	BL	CT-2	TG-2	BJ-2	CL-2	FL-2	TR-2(_)
PMC/SAE-62	5.5 X 4.5 X 3.5	5 X 4 X 3	50,000 lbs.	(STROKE ÷ 3) + 15.25	6	6.75	3.75	8.75	93 in.	105 in.	121 in.	143 in.	179 in.	23.76 SQ.IN.	2.55 SQ. IN.	5.76	3/4 NPTF-1 1/6 SAE	1 NPTF-1 5/16 SAE	.75	26 G.P.M	BL	PH-2	TG-2	BJ-2	CL-2	BL	CT-3	TG-3	BJ-3	CL-3	FL-3	TR-3-(_)
PMC/SAE-63	6.75 X 5.5 X 4.5	6 X 5 X 4	161,000 lbs.	(STROKE ÷ 3) + 16.00	7.5	8.25	4.25	9.25	106 in.	122 in.	142 in.	167 in.	208 in.	35.79 SQ.IN.	3.34 SQ. IN.	4.77	NPTF-1 5/16 SAE	1 1/4 NPTF-1 5/8 SAE	1.25	38 G.P.M	BL	PH-3	TG-3	BJ-3	CL-3	BL	CT-4	TG-4	BJ-4	CL-4	FL-4	TR-4-(_)
PMC/SAE-64	8.25 X 6.75 X 5.5	7.5 X 6 X 5	110,000 lbs.	(STROKE ÷ 3) + 16.50	9	9.75	4.50	9.50	125 in.	144 in.	165 in.	195 in.	225 in.	53.46 SQ.IN.	4.12 SQ. IN.	5.76	1 1/4 NPTF-1 5/8 SAE	1 1/2 NPTF-1 7/8 SAE	1.50	41 G.P.M.	BL	PH-4	TG-4	BJ-4	CL-4	BL	CT-5	TG-5	BJ-5	CL-5	FL-5	TR-5-(_)
PMC/SAE-65	9.75 X 8.25 X 6.75	9 X 7.5 X 6	161,000 lbs.	(STROKE ÷ 3) + 16.75	10.75	11.38	4.50	9.50	108 in.	165 in.	196 in.	215 in.	215 in.	74.66 SQ.IN.	7.51 SQ. IN.	6.76	1 1/4 NPTF-1 5/8 SAE	1 1/2 NPTF-1 7/8 SAE	1.50	41 G.P.M.	BL	PH-5	TG-5	BJ-5	CL-5	BL	CT-6	TG-6	BJ-6	CL-6	FL-6	TR-6-(_)
									MAX STROKE AT OPER. P.S.I.																							
4-STAGE	BORE SIZES	ROD SIZES	MAX EXTEND LOAD (SEE NOTES 6 & 10)	CLOSED LENGTH	A	B	C	K	3000	2500	2000	1500	1000	EXTEND AREA	EFFECTIVE RETRACT AREA FOR ALL STAGES	VOLUME OR AREA RATIO	RETRACT PORT	EXTEND PORT	MANIFOLD I.D.	MAX FLOW RATE (SEE NOTE 5)	BLANK	PH	TG	BJ	CL	BLANK	CT	TG	BJ	CL	FL	TR
PMC/SAE-71	5.5 X 4.5 X 3.5 X 2.5	5 X 4 X 3 X 2	30,000 lbs.	(STROKE ÷ 4) + 15.38	6	6.75	3.00	9.75	82 in.	94 in.	108 in.	130 in.	164 in.	23.76 SQ.IN.	1.77 SQ. IN.	5.76	3/8 NPTF-3/4 SAE	1/2 NPTF-7/8 SAE	.50	13 G.P.M.	BL	PH-1	TG-1	BJ-1	CL-1	BL	CT-3	TG-3	BJ-3	CL-3	FL-3	TR-3(_)
PMC/SAE-72	6.75 X 5.5 X 4.5 X 3.5	6 X 5 X 4 X 3	50,000 lbs.	(STROKE ÷ 4) + 16.38	7.5	8.25	3.75	10.5	108 in.	123 in.	142 in.	168 in.	205 in.	35.79 SQ.IN.	2.55 SQ. IN.	4.77	3/4 NPTF-1 1/16 SAE	1 NPTF-1 5/16 SAE	.75	31 G.P.M.	BL	PH-2	TG-2	BJ-2	CL-2	BL	CT-4	TG-4	BJ-4	CL-4	FL-4	TR-4-( )
PMC/SAE-73	8.25 X 6.75 X 5.5 X 4.5	7.5 X 6 X 5 X 4	71,000 lbs.	(STROKE ÷ 4) + 17.13	9	9.75	4.25	11.00	123 in.	142 in.	164 in.	194 in.	225 in.	53.46 SQ.IN.	3.34 SQ. IN.	5.76	1 NPTF-1 5/16 SAE	1 1/4 NPTF-1 5/8 SAE	1.25	38 G.P.M.	BL	PH-3	TG-3	BJ-3	CL-3	BL	CT-5	TG-5	BJ-5	CL-5	FL-5	TR-5-(_)
PMC/SAE-74	9.75 X 8.25 X 6.75 X 5.5	9 X 7.5 X 6 X 5	110,000 lbs.	(STROKE ÷ 4) + 17.63	10.75	11.38	4.50	11.25	148 in.	168 in.	195 in.	225 in.	225 in.	74.66 SQ.IN.	4.12 SQ. IN.	6.76	1 1/4 NPTF-1 5/8 SAE	1 1/2 NPTF-1 7/8 SAE	1.50	41 G.P.M.	BL	PH-4	TG-4	BJ-4	CL-4	BL	CT-6	TG-6	BJ-6	CL-6	FL-6	TR-6-( )
									MAX STROKE AT OPER. P.S.I.																							
5-STAGE	BORE SIZES	ROD SIZES	MAX EXTEND LOAD (SEE NOTES 6 & 10)	CLOSED LENGTH	A	B	C	K	3000	2500	2000	1500	1000	EXTEND AREA	EFFECTIVE RETRACT AREA FOR ALL STAGES	VOLUME OR AREA RATIO	RETRACT PORT	EXTEND PORT	MANIFOLD I.D.	MAX FLOW RATE (SEE NOTE 5)	BLANK	PH	TG	BJ	CL	BLANK	CT	TG	BJ	CL	FL	TR
PMC/SAE-81	6.75 X 5.5 X 4.5 X 3.5 X 2.5	6 X 5 X 4 X 3 X 2	30,000 lbs.	(STROKE ÷ 5) + 16.50	7.5	8.25	3.00	11.50	92 in.	104 in.	121 in.	147 in.	170 in.	35.79 SQ.IN.	1.77 SQ. IN.	4.77	3/8 NPTF-3/4 SAE	1/2 NPTF-7/8 SAE	.50	13 G.P.M.	BL	PH-1	TG-1	BJ-1	CL-1	BL	CT-4	TG-4	BJ-4	CL-4	FL-4	TR-4-(_)
PMC/SAE-82	8.25 X 6.75 X 5.5 X 4.5 X 3.5	7.5 X 6 X 5 X 4 X 3	50,000 lbs.	(STROKE ÷ 5) + 17.50	9	9.75	3.75	12.25	116 in.	138 in.	158 in.	188 in.	200 in.	53.46 SQ.IN.	2.55 SQ. IN.	5.76	3/4 NPTF-1 1/16 SAE	1 NPTF-1 5/16 SAE	.75	26 G.P.M.	BL	PH-2	TG-2	BJ-2	CL-2	BL	CT-5	TG-5	BJ-5	CL-5	FL-5	TR-5-( )
PMC/SAE-83	9.75 X 8.25 X 6.75 X 5.5 X 4.5	9 X 7.5 X 6 X 5 X 4	71,000 lbs.	(STROKE ÷ 5) + 18.25	10.75	11.38	4.25	12.75	135 in.	160 in.	185 in.	220 in.	225 in.	74.66 SQ.IN.	3.34 SQ. IN.	6.76	1 NPTF-1 5/16 SAE	1 1/4 NPTF-1 5/8 SAE	1.25	33 G.P.M.	BL	PH-3	TG-3	BJ-3	CL-3	BL	CT-6	TG-6	BJ-6	CL-6	FL-6	TR-6-(_)

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SEE PAGE 8, 9 & 10 OF THE STANDARD PRODUCT PRICE LIST FOR PRICING
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Additional Data for Standard Prince Double Acting Telescopic Cylinders

Stage Size bore dia /rod dia	Effective extend area of stage (square inches)	Effective retract area of stage (square inches)	Extend volume of stage per foot stroke (gallon / ft)	Retract volume of stage per foot stroke (gallon / ft)	Volume or Area Ratio
2.50 / 2.00	4.91	1.77	.255	.092	2.77
3.50 / 3.00	9.62	2.55	.500	.133	3.77
4.50 / 4.00	15.90	3.34	.826	.173	4.77
5.50 / 5.00	23.76	4.12	1.234	.214	5.76
6.75 / 6.00	35.78	7.51	1.859	.390	4.77
8.25 / 7.50	53.46	9.28	2.777	.482	5.76
9.75 / 9.00	74.66	11.04	3.878	.574	6.76

Basic Hydraulic cylinder formula: Force (pounds) = Pressure (psi) x Area (square inches)

Effective Extend Area: The chart above gives the extend area for each stage size used in the standard Prince Double Acting Telescopic cylinders. These can be used to determine the maximum extend force a cylinder can produce as it extends through each stage. For example we can look at a PMC-71 four stage cylinder in an application that has a maximum system pressure of 1250 psi. The stages are in order 5.50, 4.50, 3.50, and 2.5 inches in diameter. The maximum extend forces will be 29,700 lbs, 19,875 lbs, 12,025 lbs, and 6,137 lbs respectively. As you can see, the maximum extend force is reduced as each stage becomes active.

Effective Retract Area: The chart above gives the retract area for each stage size used in the standard Prince Double acting Telescopic cylinders. These can be used to determine the maximum retract force a cylinder can produce as it retracts through each stage. However, it is the area of the smallest stage that is used to determine the maximum retract force. For example we can look at a PMC-71 four stage cylinder in an application that has a maximum system pressure of 1250 psi. The stages are in order 5.50, 4.50, 3.50, and 2.50 inches in diameter. The smallest stage is 2.50 inches and has a corresponding retract area of 1.77 square inches. The maximum retract force throughout the entire retract stroke of the 4 stage telescopic cylinder in this example will be 2,212 lbs.

Extend and Retract Volume: This information can be used to determine two things, first, how much oil it will take to extend and retract each stage of the cylinder, and second, how much time it will take to extend and retract the cylinder. For example we can look at a PMC-61 three stage cylinder with 72 inches (or 6 feet) of stroke in an application that has 10 gpm of flow available. The stages are in order 4.50, 3.50, and 2.50 inches and, in this example, each will have 24 inches of stroke. It will take 1.652 gallons to extend the first stage 24 inches, 1.00 gallon to extend the second stage 24 inches, and .51 gallon to extend the third stage 24 inches. The total needed to extend the cylinder 72 inches is 3.16 gallons. To calculate the extend time of the cylinder divide this total by the system gpm to get 0.316 minutes (or 18.97 sec) to fully extend this cylinder 72 inches at 10 gpm. For retract it will take .184 gallon to retract the third stage 24 inches, .266 gallon to retract the second stage 24 inches, and .346 gallon to retract the first stage 24 inches. The total needed to retract the cylinder 72 inches is .80 gallon. To calculate the retract time of the cylinder, divide this total by the system gpm to get .08 minutes (or 4.8 sec) to fully retract this cylinder 72 inches at 10 gpm.

Volume ratio: Because of the unique design of a telescopic cylinder, the total extend volume of each stage is considerably larger than the total retract volume. This creates an oil flow amplification out of the extend port during the retract stroke. The volume ratio in the chart above can be used to determine this. Using the previous example of a PMC-61 three stage cylinder the flow out of the extend port will be 27.7 gpm as the 2.50 / 2.00 dia stage retracts, 37.7 gpm as the 3.50 / 3.00 stage retracts, and 47.7 gpm as the 4.50 / 4.00 stage retracts when 10 gpm is pumped into the retract port. This needs to be taken into account when designing a system using a double acting telescopic cylinder.

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Prince

Standard Prince PMC/SAE-50, -60, -70 & 80 Series Double Acting Telescopic Design Considerations

The successful application of a standard Prince double acting telescopic cylinder requires an understanding of the distinctive way in which this type of cylinder functions. The information contained herein is not intended to cover all aspects of designing a hydraulic powered machine using telescopic cylinders. It is just intended to outline some basic design considerations that make these cylinders unique. Failure to take these considerations into account will affect the safe and effective use of the product. Consult your sales representative if you have questions about your application.

A double acting telescopic cylinder can be hydraulically powered in both extend and retract. It is used in applications where a single acting telescopic cylinder will not work because either an external load is not present or it is not large enough to retract the cylinder. The standard Prince double acting telescopic cylinder is best suited for non-critical applications that require a high force on the extend or push out cycle and a low force on the retract or pull back cycle. Examples would be truck hoists and packer ejectors.

A telescopic cylinder should not be considered to be the structural member in the design of a machine. It is not rigid enough to provide stable structural support and should only be considered as the device that generates force. As with all types of hydraulic cylinders, high side load conditions should be avoided whenever possible. There must be enough swing clearance at the end fitting to prevent binding. Also, the cylinder must not come in contact with anything as it moves though its range of stroke. In addition two telescopic cylinders cannot normally be synchronized using a hydraulic flow divider. The standard Prince telescopic cylinder should not be expected to hold a load in place for an extended period of time during the extend stroke. Further, it should never be used where it is necessary to hold a load during the retract stroke. The standard Prince telescopic cylinder design uses cast iron rings to seal the piston. There will be some leakage flow across these cast iron piston rings that will allow the load to drift. The best application for a standard telescopic is one where the normal cycle of operation is to extend the cylinder as needed to perform the required function then retract the cylinder. Generally speaking, the standard Prince double acting telescopic cylinder should be fully retracted at the end of each hydraulic cycle. The standard Prince double acting telescopic cylinder should never be used in a personnel lift application. It is not advisable to use the cylinder when an over-center load reversal takes place part way through the extend cycle. Further, impact forces created by external loads should be avoided at the full extend position.

A telescopic cylinder is made up of a group of nested telescoping tubes called stages. During the extend cycle the largest stage should completely extend first then each progressively smaller stage should in turn completely extend. For a constant input flow the cylinder extend speed will get progressively faster as each smaller stage becomes active. It is normally best to have a minimum system flow of 8 to 12 gpm for proper operation. For a constant load condition the extend pressure will increase as each smaller stage becomes active. However, it should be noted that it is common for the load to decrease as the cylinder extends due to changes in mechanical advantage or a reduction in the load. This will affect the extend pressure needed. Because of their design, double acting telescopic cylinders act as pressure intensifiers while extending and flow intensifiers while retracting. This is caused by the relatively large difference between the extend and retract area/volume. If, during the extend cycle of the cylinder, the retract port is restricted or blocked the potential exists for the pressure to be intensified by the extend to retract area ratio. This area ratio can be as much as 7 to 1. If the system pressure is 2,000 psi this could potentially result in a pressure intensification up to 14,000 psi. Permanent and potentially hazardous damage will occur to the cylinder well before a pressure of this magnitude is reached. The system must be designed to prevent this from occurring. During the retract cycle of a double acting telescopic cylinder, oil is pumped into the retract port and the oil contained on the extend side of the cylinder is forced out the extend port. Again, because of the area or volume ratio of the cylinder, the flow out of the extend port will be amplified. If the system flow is 15 gpm this could potentially result in a flow amplification up to 105 gpm. This needs to be considered when sizing the other components in the system. If these components are sized too small they could potentially fail to operate properly and restrict the flow exiting the extend port.

In summary, telescopic cylinders have their own unique performance characteristics and it is the responsibility of the user to take them into account when selecting one for their specific application.

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