PUMP GOVERNORS

DESCRIPTIVE BULLETIN

INSTRUCTION BULLETINS

DIMENSION DRAWINGS

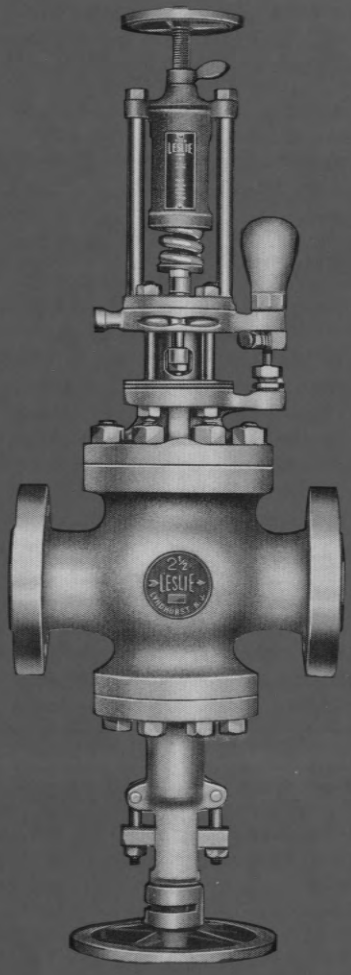
PARTS LISTS

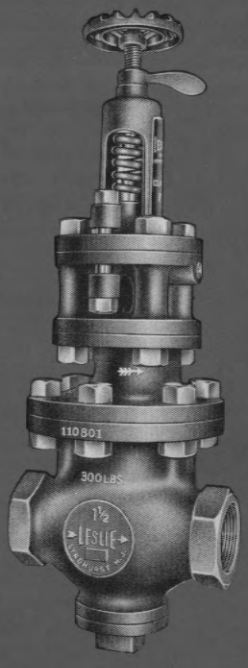
BULLETIN 5306

TRADE LESLIE MARK

CONSTANT and DIFFERENTIAL

pump pressure regulator





- Self-contained Regulators for Steam Pumps
- Self-contained Regulators for Turbine-Driven Pumps
- Controllers for Motor-Driven Pumps
- Auxiliary Pilot Valves

LESLIE CO., Lyndhurst, New Jersey

Pressure Reducing Valves Pressure Controllers Temperature Regulators
Pump Governors Self-Cleaning Strainers Air and Steam Whistles

Regulators since 1900

TRADE LESLIE MARK constant and differential PUMP PRESSURE REGULATORS

TABLE OF CONTENTS

SELECTING, SPECIFYING AND ORDERING

The Leslie pump pressure regulator or "pump governor" is a self-contained, internal pilot, piston operated regulator for controlling steam to a reciprocating steam pump or turbine-driven pump to maintain constant a predetermined pump discharge pressure or differential pressure, as in boiler feedwater service. They are designed for low, medium, and high constant discharge pressures, and for low and high differential pressures with convenient handwheel adjustment. They may be fitted with external, auxiliary pilots for special conditions such as to shut down pump if suction pressure fails, etc.

When to Use

Pump pressure regulators are used for any one or a combination of the following conditions:

1. When economical and safe pump operation is desired.
2. When accurately controlled pump discharge pressure is required.
3. When pump operation must handle frequent load changes including shut-off.
4. When there are sudden load changes (fire pump service) requiring fast regulator action.
5. When fluctuations in inlet steam pressure would adversely affect a direct operated regulator.
6. When response to very small pump pressure changes is necessary.
7. When low load operation requires control stability, as in an "automatic reset" device now available in most of these self-contained regulators.

Writing Specifications

When preparing specifications, insist on *Leslie* pump pressure regulators or use the following general specifications:

"Pump pressure regulators shall be of the self-contained, internal pilot, piston operated type. Internal pilot valve and pilot valve seat shall be interchangeable in all sizes and for all pressure conditions, contained wholly within the regulator and entirely self-draining. The pilot valve shall be operated by the discharge pressure acting under a metallic diaphragm against an adjustable spring. The main valve shall be made of stainless steel hardened to at least 500 Brinell. No stuffing boxes, rubber diaphragms or bellows will be permitted.

"In bronze or cast iron bodies, seat rings shall be renewable and made of stainless steel with stellited seating surface. Steel regulators shall have stellited seats integral with body. Internal pilot valve and renewable piston cylinder to be made of stainless steel, hardened to at least 500 Brinell with ground finish. The controlled fluid shall be separated from the steam space so that it will be impossible to contaminate the steam under any conditions. Only one fluid pressure shall be applied to any one diaphragm."

How to Order

The following data is essential when ordering Leslie pump pressure regulators and should accompany each order to insure getting the proper regulator for the job:

1. Minimum and maximum inlet steam pressure.
2. Superheat, if any.
3. Maximum chest pressure required by pump or turbine at full load.
4. Maximum number single strokes per minute or maximum steam consumption of pump or turbine in lbs. per hr.
5. Adjustable pump discharge pressure range desired.
6. Type and size of pump or turbine.
7. Liquid to be pumped.
8. Screwed or flanged connections. Flanges are furnished drilled when flange standard is specified. Bronze flanged bodies will be undrilled if flange standard is not specified.
9. For differential pressure regulators, state maximum boiler pressure and excess or differential pressure to be maintained.

Ordering Parts

When ordering parts for Leslie pump pressure regulators, give following information:

1. Part name and part reference number from parts list on applicable drawing.
2. Quantity of each part.

OR

1. Serial number, class and size of regulator.
2. Part name (see parts list on applicable drawing).
3. Quantity of each part.

TRADE LESLIE MARK constant and differential PUMP PRESSURE REGULATORS

WHICH REGULATOR TO USE

There are two basic types of pump pressure regulators —constant pressure and differential (or excess) pressure regulators. Both may be furnished for either turbine or reciprocating pumps. The regulator for *constant pressure* maintains a constant pump discharge pressure by changing the steam pressure delivered to the chest to correct for small increases or decreases in discharge pressure acting on the upper diaphragm.

The *differential pressure regulator* maintains a constant excess or differential between boiler and pump discharge pressure by automatically changing the steam pressure delivered to the chest to correct for small variation in either.

The Quick Reference Table below simplifies selection of the correct regulator for your application and refers you to the page where all of the engineering data is available on the best Leslie pump pressure regulator for your conditions.

QUICK REFERENCE TABLE

PUMP PRESSURE REGULATORS FOR RECIPROCATING & TURBINE DRIVEN PUMPS

PUMP DISCHARGE PRESS. RANGE, PSIG									EXCESS OR DIFF. PRESS.		Max. Pump Disch. Press. PSIG	INLET		Min. Press. Differential between Inlet & Outlet PSIG	Pump Regulator Class for Reciprocating Pumps	Page Reference	Pump Regulator Class for Turbine Driven Pumps	Size	Partial List of Applications
5-25	8-75	25-200	50-200	100-350	150-400	300-1000	500-1200	1000-2000	5-50	10-200		Press. PSIG	Temp. °F.						
●												40-600	750	30	PLS-3	4	PLS-3	½-6"	
	●											40-300	550	30	PRL	4	PTL	½-6"	
	●											40-250	450	30	PRLK	4	PTLK	½-6"	
	●											40-600	750	30	PRLS-3	4	PTLS-3	½-6"	
		●										40-300	550	30	PR	6	——	½-6"	
		●										40-250	450	30	PRK	6	——	½-6"	
		●										40-600	750	30	PRS-3	6	——	½-6"	SERVICE OR APPLICATION Flushing Pumps Low Pressure Pumps Lubricating Oil Pumps Loading Pumps Process Pumps Transfer Pumps Boiler Feed Pumps Fire Pumps Fuel Oil Pumps General Service Oil Loading Pumps Boiler Feed Pumps High Pressure Service
			●	●								40-300	550	30	PRH	6	PTH	½-6"	
			●	●								40-250	450	30	PRHK	6	PTHK	½-6"	
			●		●							40-600	750	30	PRHS-3	6	PTHS-3	½-6"	
									●		300	40-300	550	30	——	9	XTL	½-6"	
									●		300	40-250	450	30	——	9	XTLK	½-6"	
									●		300	40-600	750	30	——	9	XTLS-3	½-6"	
						●						40-300	550	30	CRH	8	CTH	½-6"	
						●						40-250	450	30	CRHK	8	CTHK	½-6"	
						●						40-600	750	30	CRHS-3	8	CTHS-3	½-6"	
							●					300-1500	1000	75	CIHS-2	10	CIHS-2	1-2"	
								●				300-1500	1000	75	CHHS-2	10	CHHS-2	1-2"	
										●	500	40-300	550	30	XRH	9	XTH	½-6"	
										●	500	40-250	450	30	XRHK	9	XTHK	½-6"	
										●	800	40-600	750	30	XRHS-3	9	XTHS-3	½-6"	

CONTROLLERS FOR MOTOR DRIVEN PUMPS

PUMP DISCHARGE PRESSURE RANGE PSIG	MAXIMUM PUMP DISCHARGE PRESSURE PSIG	CONTROLLER CONSISTING OF		PAGE REFERENCE
		PILOT TYPES	DIAPHRAGM CONTROL VALVE CLASSES	
30" Hg Vac-15	300	UA-1, UW-1	DL-1 DD-2 DDB-2 DV DLS-1 DDS-1 DDBS-1 DVS	See Page 11. Also Bulletins 5303 (Control Pilots) 5304, 5305 (Dia. Valves)
2-20	300	PDA, PDW		
15-75	400			
50-125	500			
100-200	700			
175-300	700			

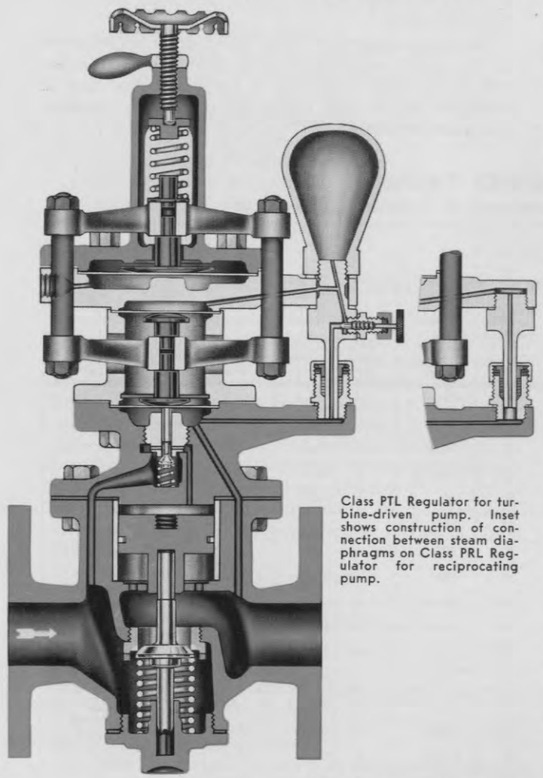
PUMP DISCHARGE PRESSURE RANGE PSIG	MAXIMUM PUMP DISCHARGE PRESSURE PSIG	CONTROLLER CONSISTING OF		PAGE REFERENCE
		PILOT TYPES	DIAPHRAGM CONTROL VALVE CLASSES	
275-450	700	PDA, PDW	DL-1 DD-2 DDB-2 DV DLS-1 DDS-1 DDBS-1 DVS	See Page 11. Also Bulletins 5303 (Control Pilots) 5304, 5305 (Dia. Valves)
400-600	800			
550-800	900			
0-15*	300	UA-1, UW-1		
2-20* 15-75*	300	PDA, PDW		

*Excess or Differential Pressure Range—PSI.

TRADE LESLIE MARK

pump pressure regulators for LOW DISCHARGE PRESSURES

CLASSES PRL, PTL CAST BRONZE; PRLK, PTLK CAST IRON; PLS-3, PRLS-3, PTLS-3 CAST STEEL



Class PTL Regulator for turbine-driven pump. Inset shows construction of connection between steam diaphragms on Class PRL Regulator for reciprocating pump.

FEATURES

SINGLE SEATED—Closing with inlet pressure for positive, discharge pressure control under all conditions, even with zero pump load.

ACCURACY OF REGULATION — comparable to instrument control for full load range. See inside back cover for capacity data.

UNIQUE, FRICTIONLESS YOKE — instantly transmits pump discharge pressure variations to internal pilot.

FLEXIBLE METALLIC DIAPHRAGMS — Spring temper stainless steel for instant response to any flow change and to eliminate troublesome stuffing boxes, bellows seals and possibility of steam contamination.

WIDE ADJUSTABLE RANGE — from minimum to maximum pump discharge pressure range with easy handwheel adjustment.

FULLY GUIDED MAIN VALVE — guided top and bottom to prevent rubbing or binding of internal parts.

GRADUAL OPENING PLUG TYPE MAIN VALVE —in sizes 2½" and larger for improved throttling control under low flow conditions.

INTERNAL SPRINGS of Inconel are heat resistant, non corroding.

RENEWABLE INTERCHANGEABLE PARTS — machined to closely held tolerances. Complete overhaul without machining or removing regulator body from the line.

OPTIONAL CONSTRUCTION FEATURES

UPPER DIAPHRAGM SIZE and material is carefully selected for each discharge pressure range to provide optimum strength and sensitivity. Discharge pressure range 8-75 psi uses a 4-5/16" diameter diaphragm and 5-25 psi range has 7½" diaphragm.

REGULATORS FOR RECIPROCATING PUMPS (designated by "R" in class) have a simple, unrestricted connection between the steam diaphragms for constant balance because reciprocating pumps require a relatively constant chest pressure regardless of speed. See illustration. TURBINE-DRIVEN PUMPS require variable chest pressures dependent on speed. Regulators for these pumps (designated by "T" in class) have a restricted connection with needle valve and steam chamber between the two steam diaphragms. The restriction delays the balancing of the steam diaphragms after a discharge pressure change and compensates for varying turbine chest pressures. This feature eliminates hunting or over-regulation without reducing sensitivity and is similar to "automatic reset", giving the regulator a speed of response corresponding to the relatively slow response of the turbine.

"O" ADAPTOR—an "optional", spacer flange installed between body and top cap flanges with ¼" connection to supply external pressure to controlling valve. Used for filtering and cleaning steam or for remote operation (opening or closing) with ⅜" solenoid valve or auxiliary pilot mechanism to shut down pump if suction pressure fails. Add "O" to regulator class, PRLO, etc.

MANUAL PULL OPEN DEVICE can be added to any ½-3" cast steel regulator. See illustration, page 8. It eliminates need for an external bypass for emergency operation and provides maximum valve opening for overload conditions. Add "M" to class designation.

TRADE LESLIE MARK

pump pressure regulators for LOW DISCHARGE PRESSURES

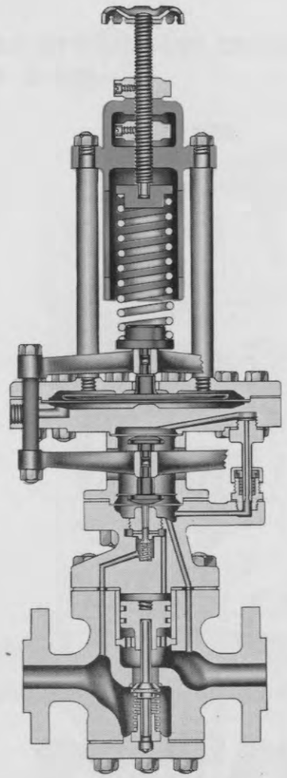
PRINCIPLE OF OPERATION

The handwheel compresses adjusting spring moving the external yoke downward and opening controlling valve. This valve admits high pressure steam from inlet body port to top of piston, opening main valve and admitting steam pressure to turbine or pump chest.

The delivered steam pressure operates the pump and acting through the outlet body port under the first steam diaphragm, it balances itself by acting downward on the center diaphragm. The pump discharge pressure connected through the actuating line to the upper diaphragm acts against the compression of the adjusting spring. As the discharge pressure increases, the external yoke moves upward and throttles the controlling valve so that the required volume of steam is delivered to the pump or turbine to maintain a constant discharge pressure. Any tendency of the discharge pressure to change reacts immediately on upper diaphragm, instantly repositioning the external yoke and main valve, changing the steam flow and maintaining the discharge pressure constant under new load conditions.

Ordinary fluctuations in the inlet pressure do not change discharge pressure setting, only a change in pump discharge pressure affects regulator action.

Dimensions on Layout Dimension Sheet following Bulletin. Parts List for Iron and Bronze Regulators on Dwg. No. C3363 following Bulletin; for Steel Regulators on Dwg. No. 6742F (PLS-3) and 3402F (PRLS-3, PTLS-3) available on request. Capacities on inside back cover.



Class PLS-3 for Reciprocating or Turbine-Driven Pumps

PRESSURE RANGES AND TRIM MATERIAL

MINIMUM DIFFERENTIAL BETWEEN INLET AND OUTLET STEAM PRESSURE — 30 PSI

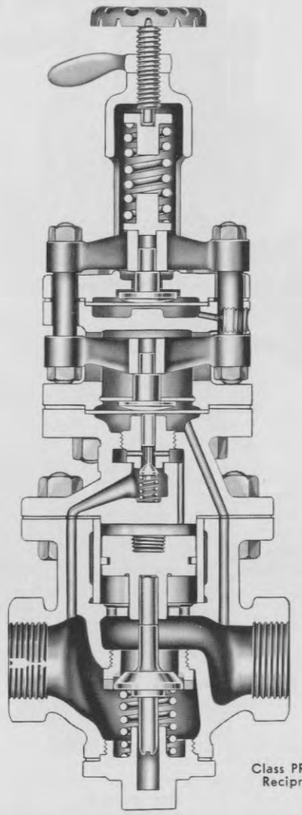
CLASS	SIZE INCHES	MAXIMUM INLET STEAM PRESSURE & TEMPERATURE	DISCHARGE PRESSURE RANGE, PSI MIN.	DISCHARGE PRESSURE RANGE, PSI MAX.	BODY MATERIAL	END CONNECTIONS†	TRIM PARTS & SEAT RING	TRIM PARTS & CONTROLLING AND MAIN VALVES; CYLINDER LINER	TRIM PARTS & CONTROLLING VALVE SEAT	TRIM PARTS & PISTON
PRL PTL	½-6	40-300 psi 550°F. max.	8	75	Cast Bronze	½-2" scr. ½-6" flg.	Type 410 Stainless, Stellited	Type 440C Stainless, hardened	18-8 Stainless	Bronze with Cast Iron Rings
PRLK PTLK	½-3	40-250 psi 450°F. max.	8	75	Cast Iron	½-2" scr. 1½-6" flg.	Type 410 Stainless, Stellited	Type 440C Stainless, hardened		
	3½-6	40-125 psi 450°F. max.								
PRLS-3 PTLS-3	½-6*	40-600 psi 750°F. max.	8	75	Cast Steel	½-6" flg.	Integral Stellite Seating Surface	Type 440C Stainless, hardened	Type 440C Stainless, hardened	Type 410 Stainless Steel with Cast Iron Rings
PLS-3			5	25						

*Inlet Pressure Range 6" size only 65-600 psi.
†Bronze bodies with 150 lb. and 300 lb. MSS flanges in all sizes. Cast Iron bodies with 125 lb. ASA flanges 1½-6"; 250 lb. ASA flanges 1½-3". Cast Steel bodies with 150, 300, 400 and 600 lb. ASA flanges in all sizes.

TRADE LESLIE MARK

pump pressure regulators for MEDIUM DISCHARGE PRESSURES

CLASSES PR, PRH, PTH CAST BRONZE; PRK, PRHK, PTHK CAST IRON; PRS-3, PRHS-3, PTHS-3 CAST STEEL



Class PRK Regulator for Reciprocating Pumps

FEATURES

SINGLE SEATED—Closing with inlet pressure for positive discharge pressure control under all conditions, even with zero pump load.

ACCURACY OF REGULATION—comparable to instrument control for full load range. See inside back cover for capacity data.

UNIQUE, FRICTIONLESS YOKE—instantly transmits pump discharge pressure variations to internal pilot.

FLEXIBLE METALLIC DIAPHRAGMS — Spring temper stainless steel for instant response to any flow change and to eliminate troublesome stuffing boxes, bellows seals and possibility of steam contamination.

WIDE ADJUSTABLE RANGE — from minimum to maximum pump discharge pressure range with easy handwheel adjustment.

INTERNAL SPRINGS of Inconel are non-corroding, heat resistant.

FULLY GUIDED MAIN VALVE — guided top and bottom to prevent rubbing or binding of internal parts.

GRADUAL OPENING PLUG TYPE MAIN VALVE —in sizes 2½" and larger for improved throttling control under low flow conditions.

RENEWABLE, INTERCHANGEABLE PARTS — machined to closely held tolerances. Complete overhaul without machining or removing regulator body from the line.

Dimensions on Layout Dimension Sheet following Bulletin. Parts List for Classes PR and PRK on Dwg. No. CP-117 following Bulletin. Parts Lists for Classes PRH, PTH, PRHK, PTHK on Dwg. No. 3401F; for Classes PRS-3 on Dwg. No. PNS-291F; for Classes PRLS-3 on Dwg. No. 3402F—drawings available on request. Capacities on inside back cover.

OPTIONAL CONSTRUCTION FEATURES

UPPER DIAPHRAGM SIZE and material is carefully selected for each discharge pressure range to provide optimum strength and sensitivity. Medium discharge pressure ranges use 2½" diameter diaphragm of spring temper stainless steel.

REGULATORS FOR RECIPROCATING PUMPS (designated by "R" in class) have a simple, unrestricted connection between the steam diaphragms for constant balance because reciprocating pumps require a relatively constant chest pressure regardless of speed. See insert. Since TURBINE-DRIVEN PUMPS require variable chest pressures dependent on speed, regulators for these pumps (designated by "T" in class) have a restricted connection with needle valve and steam chamber between the two steam diaphragms. The restriction delays the balancing of the steam diaphragms after a discharge pressure change and compensates for varying turbine chest pressures. This feature eliminates hunting or over-regulation without reducing sensitivity and is similar to "automatic reset", giving the regulator a speed of response corresponding to the relatively slow response of the turbine.

"O" ADAPTOR—an "optional", spacer flange installed between body and top cap flanges with ¼" connection to supply external pressure to controlling valve. Used for filtering and cleaning steam or for remote operation (opening or closing) with ⅜" solenoid valve or auxiliary pilot mechanism to shut down pump if suction pressure fails. Add "O" to regulator class, PRHO, etc.

MANUAL PULL OPEN DEVICE can be added to any ½-3" cast steel regulator. See illustration page 8. It eliminates need for an external bypass for emergency operation and provides maximum valve opening for overload conditions. Add "M" to class designation.

TRADE LESLIE MARK

pump pressure regulators for MEDIUM DISCHARGE PRESSURES

Principle of Operation (Two-Diaphragm Regulator)

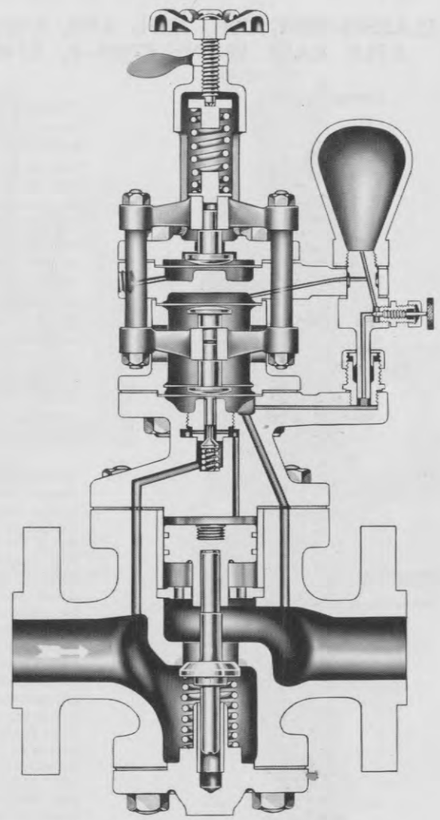
The handwheel compresses adjusting spring moving the external yoke downward and opening controlling valve. This valve admits high pressure steam from inlet body port to top of piston, opening main valve and admitting steam pressure to turbine or pump chest.

The delivered steam pressure operates the pump and acts through the outlet body port on the lower diaphragm. Together with the pump discharge pressure acting on the underside of the upper diaphragm, they balance the compression of the adjusting spring, i.e. Adjusting Spring = Delivered Steam Pressure + Discharge Pressure. If the discharge pressure increases, the external yoke moves upward and throttles the controlling valve so that the required volume of steam is delivered to the pump or turbine to maintain a constant discharge pressure. Any tendency of the discharge pressure to change reacts immediately on upper diaphragm, instantly repositioning the external yoke and the main valve to maintain the discharge pressure constant under new load conditions.

Ordinary fluctuations in the inlet pressure do not change discharge pressure setting; only a change in pump discharge pressure affects regulator action.

(Three-Diaphragm Regulator)

A third or center diaphragm is used in most regulators to balance the effect of the delivered steam pressure on the lower diaphragm by having the same pressure act on an equal opposing center diaphragm. Then, the adjusting spring is balanced only by pump discharge pressure allowing greater discharge pressures to be handled with the same spring and increasing regulator range. The connection between the two steam diaphragms is also used to eliminate hunting or cycling by improving stability as described on page 5.



Class PTHS-3 for Turbine-Driven Pumps

PRESSURE RANGES AND TRIM MATERIAL

MINIMUM DIFFERENTIAL BETWEEN INLET AND OUTLET STEAM PRESSURE — 30 PSI

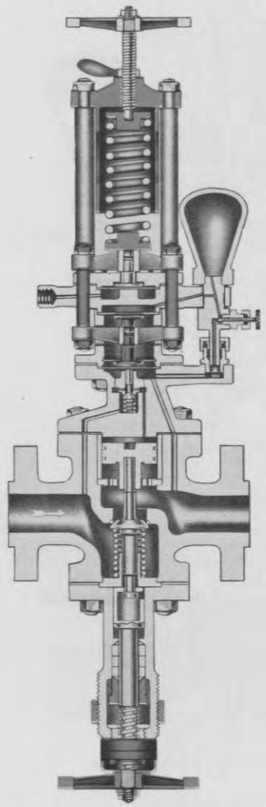
CLASS	SIZE INCHES	MAXIMUM INLET STEAM PRESSURE & TEMPERATURE	DISCHARGE PRESSURE RANGE, PSI MIN.	DISCHARGE PRESSURE RANGE, PSI MAX.	BODY MATERIAL	END CONNECTIONS†	TRIM PARTS & SEAT RING	TRIM PARTS & CONTROLLING & MAIN VALVES; CYLINDER LINER	TRIM PARTS & CONTROLLING VALVE SEAT	TRIM PARTS & PISTON
PR	½-6	40-300 psi 550°F. max.	25	200	Cast Bronze	½-2" scr. ½-6" flg.	Type 410 Stainless, Stellited	Type 440C Stainless, hardened	18-8 Stainless	Bronze with Cast Iron Rings
PRH PTH			50** 100	200 350						
PRK	½-6	40-250 psi ½-3" 40-125 psi 3½-6" 450°F. max.	25	200	Cast Iron	½-2" scr. 1½-6" flg.				
PRHK PTHK			50** 100	200 350						
PRS-3	½-6*	40-600 psi 750°F. max.	25	200	Cast Steel	½-6" flg.	Integrally Stellited Seating Surface	Type 440C Stainless, hardened	Type 440C Stainless, hardened	Type 410 Stainless Steel with Cast Iron Rings
PRHS-3 PTHS-3			50** 150	200 400						

**This range applies only to governors with "T" in class designation.
*Inlet Pressure range for 6" size only 65-600 psi.
†Bronze bodies with 150 lb. and 300 lb. MSS flanges in all sizes. Cast Iron bodies with 125 lb. ASA flanges 1½-6"; 250 lb. ASA flanges 1½-3". Cast Steel bodies with 150, 300, 400 and 600 lb. ASA flanges in all sizes.

TRADE LESLIE MARK

pump pressure regulators for HIGH DISCHARGE AND DIFFERENTIAL PRESSURES

CLASSES CRH, CTH, XRH, XTH, XTL CAST BRONZE; CRHK, CTHK, XRHK, XTHK, XTLK CAST IRON; CRHS-3, CTHS-3, XRHS-3, XTHS-3, XTLS CAST STEEL



Class CTHSM for turbine driven pump with manual pull-open device.

FEATURES

SINGLE SEATED—Closing with inlet pressure for positive discharge pressure control under all conditions, even with zero pump load.

ACCURACY OF REGULATION—comparable to instrument control for full load range. See inside back cover for capacity data.

UNIQUE, FRICTIONLESS YOKE—instantly transmits pump discharge pressure variations to internal pilot.

FLEXIBLE METALLIC DIAPHRAGMS—Spring temper stainless steel for instant response to any flow change and to eliminate troublesome stuffing boxes, bellows seals and possibility of steam contamination.

WIDE ADJUSTABLE RANGE—from 300 to 1000 psi pump discharge pressure range with easy handwheel adjustment.

FULLY GUIDED MAIN VALVE—guided top and bottom to prevent rubbing or binding of internal parts.

GRADUAL OPENING PLUG TYPE MAIN VALVE—in sizes 2½" and larger for improved throttling control under low flow conditions.

RENEWABLE, INTERCHANGEABLE PARTS—machined to closely held tolerances. Complete overhaul without machining or removing regulator body from the line.

OPTIONAL CONSTRUCTION FEATURES

UPPER DIAPHRAGM SIZE and material is carefully selected for each discharge pressure range to provide optimum strength and sensitivity. High discharge pressure range 300-1000 psi uses a 2½" diameter diaphragm of spring temper stainless steel (class designations begin with "C"). Differential pressure range 5-50 psi uses a 4-5/16" diameter diaphragm and 10-200 psi range has a 2½" diameter diaphragm (class designations begin with "X").

REGULATORS FOR RECIPROCATING PUMPS (designated by "R" in class) have a simple, unrestricted connection between the steam diaphragms for constant balance because reciprocating pumps require a relatively constant chest pressure regardless of speed. See illustration.

TURBINE-DRIVEN PUMPS require variable chest pressures dependent on speed. Regulators for these pumps (designated by "T" in class) have a restricted connection with needle valve and steam chamber between the two steam diaphragms. The restriction delays the balancing of the steam diaphragms after a discharge pressure change and compensates for varying turbine chest pressures. This feature eliminates hunting or over-regulation without reducing sensitivity and is similar to "automatic reset", giving the regulator a speed of response corresponding to the relatively slow response of the turbine.

"O" ADAPTOR—an "optional", spacer flange installed between body and top cap flanges with ¼" connection to supply external pressure to controlling valve. Used for filtering and cleaning steam or for remote operation (opening or closing), with ⅜" solenoid valve or auxiliary pilot mechanism to shut down pump if suction pressure fails. Add "O" to regulator class, CTHO, XRHO, etc.

MANUAL PULL OPEN DEVICE can be added to any ½-3" cast steel regulator. See illustration, It eliminates need for an external bypass for emergency operation and provides maximum valve opening for overload conditions. Add "M" to class designation.

PRESSURE RANGES AND TRIM MATERIAL

MINIMUM DIFFERENTIAL BETWEEN INLET AND OUTLET STEAM PRESSURE — 30 PSI

CLASS	SIZE INCHES	MAXIMUM INLET STEAM PRESSURE & TEMPERATURE	DISCHARGE PRESSURE RANGE, PSI MIN.	DISCHARGE PRESSURE RANGE, PSI MAX.	BODY MATERIAL	END CONNECTIONS†	TRIM PARTS: SEAT RING	TRIM PARTS: CONTROLLING & MAIN VALVES; CYLINDER LINER	TRIM PARTS: CONTROLLING VALVE SEAT	TRIM PARTS: PISTON
CRH CTH	½-6	40-300 psi 550°F. max.	300	1000	Cast Bronze	½-2" scr. ½-6" flg.	Type 410 Stainless, Stellited	Type 440C Stainless, hardened	18-8 Stainless	Bronze with C.I. Rings
CRHK CTHK	½-3 3½-6	40-250 psi 450°F. max. 40-125 psi 450°F. max.	300	1000	Cast Iron	½-2" scr. 1½-6" flg.	Type 410 Stainless, Stellited	Type 440C Stainless, hardened	18-8 Stainless	Bronze with C.I. Rings
CRHS-3 CTHS-3	½-6*	40-600 psi 750°F. max.	300	1000	Cast Steel	½-6" flg.	Integral Stellite Seating Surface	Type 440C Stainless, hardened	Type 440C Stainless, hardened	Type 410 Stainless Steel with C.I. Rings

*Inlet Pressure Range 6" size only 65-600 psi.
†Bronze bodies with 150 lb. and 300 lb. MSS flanges in all sizes. Cast Iron bodies with 125 lb. ASA flanges 1½-6". Cast Iron bodies with 250 lb. ASA flanges 1½-3". Cast Steel bodies with 150, 300, 400 and 600 lb. ASA flanges in all sizes.

TRADE LESLIE MARK

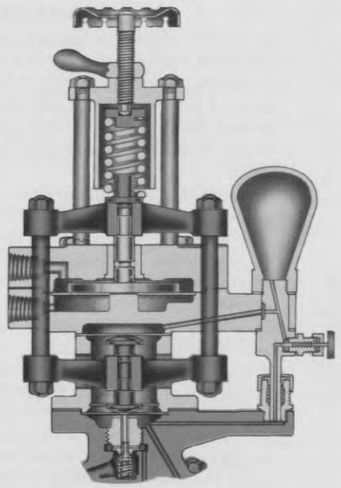
pump pressure regulators for HIGH DISCHARGE AND DIFFERENTIAL PRESSURES

PRINCIPLE OF OPERATION

Classes CRH, CTH, CRHK, CTHK, CRHS-3, CTHS-3

The handwheel compresses adjusting spring moving the external yoke downward and opening controlling valve. This valve admits high pressure steam from inlet body port to top of piston, opening main valve and admitting steam pressure to turbine or pump chest.

The delivered steam pressure operates the pump and acting through the outlet body port under the first steam diaphragm, it balances itself by acting downward on the center diaphragm. The pump discharge pressure connected through the actuating line to the upper diaphragm acts against the compression of the adjusting spring. As the discharge pressure increases, the external yoke moves upward and throttles the controlling valve so that the required volume of steam is delivered to the pump or turbine to maintain a constant discharge pressure. Any tendency of the discharge pressure to change reacts immediately on upper diaphragm, instantly repositioning the external yoke and main valve, changing the steam flow and maintaining the discharge pressure constant under new load conditions.

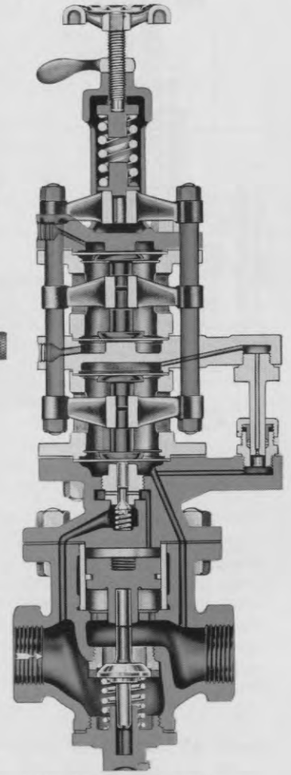


Superstructure for Classes XTL and XTLS with large upper diaphragm for low differential pressures. Note "O" ring seal for top chamber.

Classes XRH, XTH, XTL, XRHK, XTHK, XTLK, XRHS-3, XTHS-3, XTLS

Boiler pressure acting downward on top diaphragm moves external yoke downward and opens controlling valve. This valve admits high pressure steam from inlet body port to top of piston, opening main valve and admitting steam pressure to pump or turbine. The pump discharge pressure acts upward under its diaphragm and balances the boiler pressure. Compressing adjusting spring by handwheel adds to the downward force of the boiler pressure, thereby increasing the pump discharge pressure necessary to balance it. When pump discharge pressure balances boiler pressure plus spring force, controlling valve throttles so that necessary volume of steam is delivered to pump or turbine to maintain this constant excess or differential pressure.

Ordinary fluctuations in the inlet pressure do not change discharge pressure setting, only a change in pump discharge pressure affects regulator action.



Class XRH for reciprocating pumps.

Dimensions on Layout Sheet following Bulletin, Parts List for Classes CTHSM and CRHSM on Dwg. No. C5632; for Classes XRH, XTH, XRHK, XTHK on Dwg. No. CX-115, following Bulletin. Other parts lists and drawings available on request by class designation. Capacities on inside back cover.

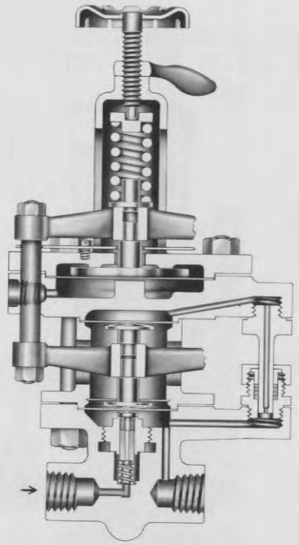
PRESSURE RANGES AND TRIM MATERIAL

MINIMUM DIFFERENTIAL BETWEEN INLET AND OUTLET STEAM PRESSURE — 30 PSI

CLASS	SIZE INCHES	MAXIMUM INLET STEAM PRESSURE & TEMPERATURE	DIFFERENTIAL PRESSURE RANGE, PSIG MIN.	DIFFERENTIAL PRESSURE RANGE, PSIG MAX.	MAXIMUM STATIC PRESSURE PSIG	BODY MATERIAL	END CONNECTIONS†	TRIM PARTS: SEAT RING	TRIM PARTS: CONTROLLING & MAIN VALVES; CYLINDER LINER	TRIM PARTS: CONTROLLING VALVE SEAT
XRH XTH	½-6	40-300 psi 550°F. max.	10	200	500	Cast Bronze	½-2 scr. ½-6 flg.	Type 410 Stainless, Stellited	Type 440C Stainless, hardened	18-8 Stainless
XTL			5	50	300					
XRHK XTHK	½-3	40-250 psi ½-3" 40-125 psi 3½-6" 450°F. max.	10	200	500	Cast Iron	½-2 scr. 1½-6 flg.			
XTLK	3½-6		5	50	300					
XRHS-3 XTHS-3	½-6*	40-600 psi 750°F. max.	10	200	800	Cast Steel	½-6 flg.	Integrally Stellited Seating Surface		Type 440C Stainless, hardened
XTLS			5	50	300					

*Inlet Pressure Range 6" size only 65-600 psi.
†Bronze bodies with 150 lb. and 300 lb. MSS flanges in all sizes. Cast Iron bodies with 125 lb. ASA flanges, 1½-6"; 250 lb. ASA flanges, 1½-3". Cast Steel bodies with 150, 300, 400 and 600 lb. ASA flanges in all sizes.

auxiliary pilot valves and SPECIAL PUMP PRESSURE REGULATORS



Above: Class PCULCS Auxiliary Pilot Valve used for low pressure conditions has adjustable range of 15 - 75 psi.

AUXILIARY PILOT VALVES

An auxiliary pilot valve is a control device used to interrupt the supply of operating steam to the primary pilot of a regulator whenever another pressure condition, required for safe operation, no longer exists.

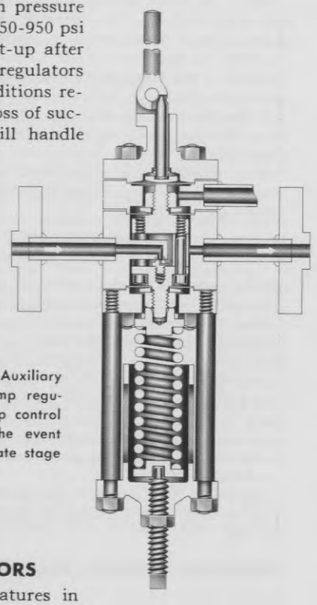
Applied to a pump pressure regulator, an auxiliary pilot valve may be used to shut down the pump with loss of suction pressure or loss of first stage discharge pressure for multistage pumps, thus, protecting the pump from "burning up".

Class PCULCS auxiliary pilot is used for low pressure conditions and has an adjustable range of 15-75 psi with convenient handwheel adjustment.
It is used with pump pressure regulators on feed pump control where operating conditions make automatic, low suction, shut-down desirable. It will handle steam conditions for 600 psi service and total steam temperatures up to 750°F.

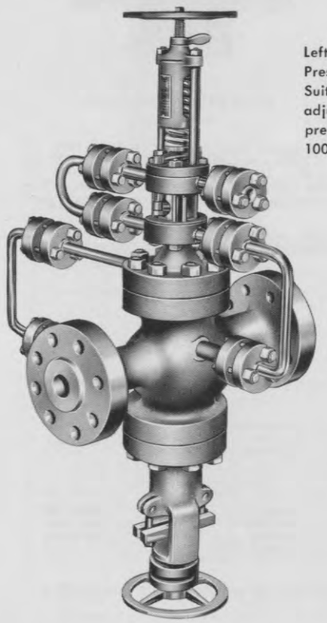
Dimensions on Layout Dimension Sheet following Bulletin. Parts List on Dwg. No. 7558F available on request.

Class PDS auxiliary pilot is used for high pressure conditions and has an adjustable range of 250-950 psi and a manual reset lever for manual start-up after shut-down. It is used with pump pressure regulators on feed pump control where operating conditions require automatic protection in the event of loss of suction or intermediate stage pressure. It will handle steam conditions for 900 psi service and total steam temperatures up to 800°F.

Dimensions on Layout Dimension Sheet following Bulletin. Parts List on Dwg. No. 7971F available on request.



Right: Class PDS Auxiliary Pilot used with pump regulators on feed pump control for protection in the event of loss of intermediate stage pressure.



Left - Class CIHSM-2 High Pressure Pump Regulator. Suitable for 1000 - 2000 psi adjustable range and steam pressures to 1500 psi, 1000°F. total temperature.

HIGH PRESSURE PUMP REGULATORS

Increasing operating pressures and temperatures in industrial, marine and naval power plants have created a need for pump pressure regulators of advanced design for main feed, fuel oil, lubricating oil and fire pumps. These conditions as well as other special requirements necessitate special design features, accessories and materials. Therefore, only a brief mention can be made of these regulators in this bulletin.

The illustration shows a constant discharge pressure pump regulator suitable for 1000-2000 psi adjustable range and steam pressures up to 1500 psi and 1000°F. total temperature. The regulator is fitted with a manual pull open device for start-up or emergency operation. The regulator combines fast response to discharge pressure changes with stability of steam pressure control and is ideal for fast load changes, high accuracy of control and reliability in service.

Leslie control specialists will be pleased to receive inquiries for special pump pressure regulators and make recommendations upon receipt of full information on the operating conditions (see page 2 for information required).

controllers for MOTOR-DRIVEN PUMPS

How a Controller is Used as a Reducing Station to Maintain Constant Pump Discharge Pressure or Constant Differential Pressure.

Because the discharge pressure or head of a constant speed centrifugal pump varies with the quantity of fluid pumped, it is often desirable to control the discharge pressure at a constant value in many industrial processes or power plant applications.

The typical head-capacity curve in Fig. 1 shows discharge pressure variation encountered without control. Dash line curve shows what the controller can do to maintain constant pressure for all flow variations.

Fig. 2 shows proper arrangement in system. To determine pressure drop across the diaphragm control valve for sizing, deduct controller discharge pressure from *pump curve pressure at maximum system flow*, and determine Cv in accordance with instructions on page 13, Bulletin 5304, Single Seated Diaphragm Control Valves.

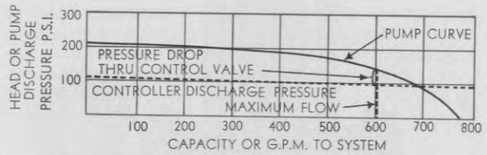


Fig. 1—Typical Head Capacity Curve For Centrifugal Pump

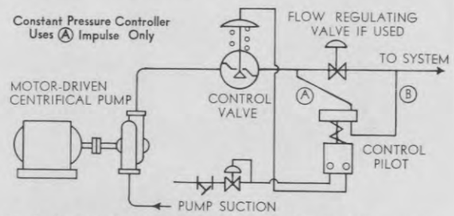


Fig. 2—Typical Controller Application For Constant Pressure or Differential Control

When system flow requirements fall below the pump manufacturer's minimums, it may be necessary to use a recirculating control system (see below) adjusted to start recirculating flow when system flow drops down below safe minimum.

How a Controller is Used as an Overflow or Recirculating Station to Maintain Constant Pump Discharge Pressure or Constant Differential Pressure.

This arrangement is often used for the constant speed, positive displacement, motor-driven pumps.

The typical head-capacity curve in Fig. 3 shows the wide variation in head that results from flow changes in a positive displacement pump with no controller. Dash line curve indicates how system pressure can be maintained by a recirculating or overflow controller.

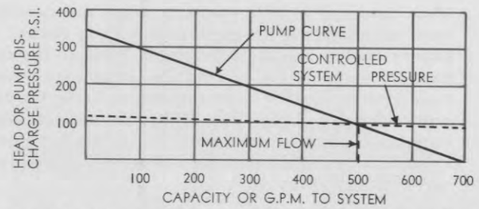


Fig. 3-Typical Head Capacity Curve-Positive Displacement Pump

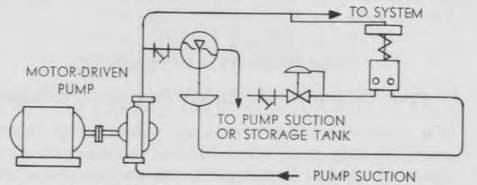
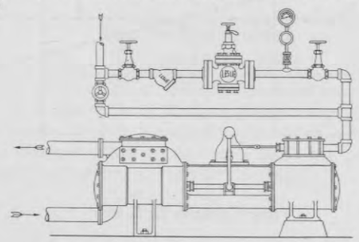


Fig. 4—Typical Controller Application For Constant Pressure or Differential Control

Typical application diagram (Fig. 4) shows proper arrangement in system. The pump always operates at the intersection of the curves. Pressure drop across the control valve is approximately constant (system pressure less valve outlet pressure) and the control valve must be sized to pass the maximum difference in flow between pump rated flow and system minimum flow. Determine diaphragm control valve Cv in accordance with instructions page 13, Bulletin 5304, Single Seated Diaphragm Control Valves.

How a Pressure Reducing Valve Can Be Used to Maintain Constant Discharge Pressure from Reciprocating Pump.

Outdoor, reciprocating, oil transfer and loading pumps and high pressure hydraulic pumps sometimes experience difficulty with actuating lines to pump pressure regulators due to ambient temperature changes or due to high pressure pump shock. In these cases the external actuating line can be eliminated by using an accurate, internal pilot, piston operated reducing valve to maintain constant reduced steam pressure to the pump chest and therefore, a resulting constant pump discharge pressure. See illustration for typical installation. Reducing valves for this service may be sized as shown on the inside back cover of Bulletin 5302, after estimating pump steam consumption. (See page 14 this bulletin.)



pump pressure regulators ENGINEERED FEATURES

More than half a century of experience and development of equipment for pressure control is evident in today's quality line of Leslie Pump Pressure Regulators. By applying the accumulated knowledge gained since 1900 to modern control problems, Leslie Co. has provided many classes from which the engineer concerned with pump pressure regulation may select—providing a standard governor for almost any pump pressure regulation problem.

Examine these Leslie features for accurate regulation, trouble-free service and ease of maintenance. They are an indication as to why it pays to select from the widest line—the quality line—the *Leslie* line.

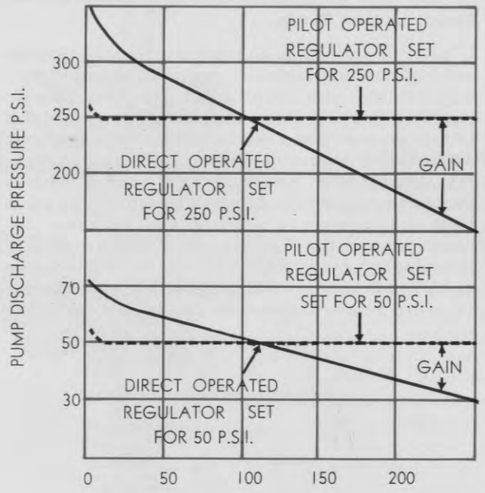
STANDARD LESLIE FEATURES

Pilot Operated vs Direct Operated Design

For many years pump pressure regulators or "governors", as they were called, were of the common, direct operated, rubber diaphragm or piston type valve with spring or weight and lever loading and double seated (not tight closing) inner valve.

These regulators were never satisfactory for shut-off or no flow conditions, were adversely affected by spring rate and diaphragm limitations, and were in constant need of repair or attention. Stuffing box friction and generally poor packing added to their difficulties. Consequently, the accuracy of regulation obtained with these regulators was poor as shown by the solid curves in Fig. 5.

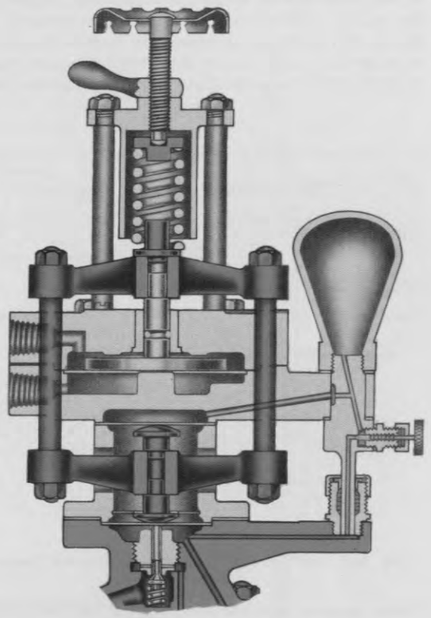
Demands for more accurate and dependable pump control were satisfied by the pilot-operated "governor" introduced by Leslie in 1928.



A Unique Superstructure

Consisting of tough diaphragms of spring temper stainless steel acting as the pressure sensing element, the superstructure directly controls pilot valve movement through a positive, friction-free yoke arrangement. See illustration.

Pilot operation, and a unique yoke arrangement to transmit metal diaphragm movement to pilot, eliminated stuffing boxes, plungers and piston cups, making really accurate control possible. Dash line curves in Fig. 5 are taken from test data and actual performance charts obtained in many installations covering industrial process, marine and navy application.



Incorporated in the superstructure, in the steam connecting port between two opposing metal diaphragms, is a simple stabilizing control device or "automatic reset" feature which eliminates hunting, cycling or over-regulation without reducing sensitivity. See illustration. After a change in pump discharge pressure and the resulting pilot valve movement, the regulator delivered pressure acts first on the lower steam diaphragm to slow down pilot action. The stabilizing needle valve and steam chamber in the connecting port leading to the upper steam diaphragm delay the balancing of the steam diaphragms and prevent over-correction by the regulator. In this way the regulator speed of response is adjusted to the ability of the turbine and pump to respond to a load change. This stabilizing or "automatic

pump pressure regulators ENGINEERED FEATURES

Sensitivity

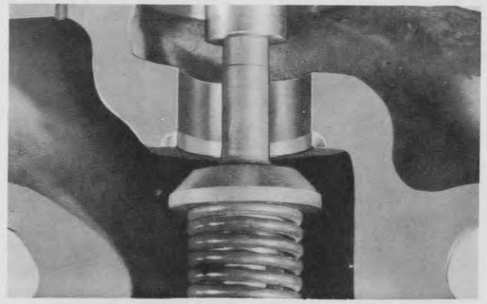
Sensitivity of a pump pressure regulator is its ability to respond to pressure variations and correct for slight changes in pump discharge pressure.

Careful selection of diaphragm size and material for the pressure sensing elements as well as the design of the loading or adjusting springs assure optimum sensitivity for a wide range of discharge pressures. The friction-free yoke arrangement provides an instantaneous signal to the internal pilot valve which translates small variations into positive operating forces on the piston operated main valve.

To obtain full advantage of this sensitivity, pump pressure regulators must be properly selected and sized for the application, installed in accordance with the manufacturers recommendations and maintained so that internal parts move freely.

Single Seated Construction

Leslie single seated construction, closing with inlet pressure, combined with seating surfaces described at right and carefully selected trim, assures positive dead-end shut-off, providing the recommended installation (described in instructions following bulletin) is carefully followed. Every regulator receives an exacting deadend and performance test on steam test stands before shipment.



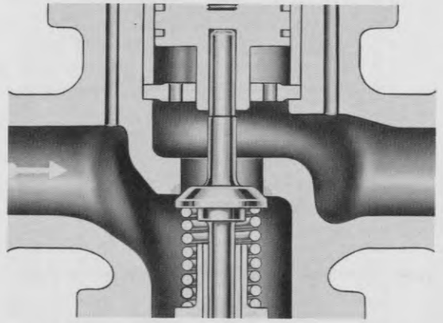
Hardened Stainless Trim

Hardened stainless steel is used for trim parts receiving most wear. Cylinder liner, controlling valve and main valve are hardened to 500 Brinell and ground to a high finish, providing free movement with maximum resistance to erosion. Trims available for corrosive services.

Internal Springs

Corrosion resistant springs, accurately wound with ends ground square and designed for minimum stress, assure maximum spring life even under high temperature conditions. Internal springs of Inconel or 18-8 stainless are non-corroding, heat resistant. Large condensate chamber provides ample protection for temperatures over 750°F.

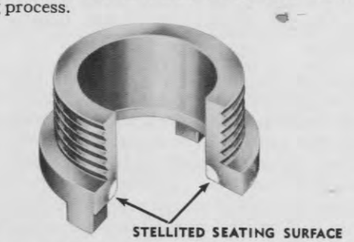
Long Guiding Surfaces



Long guiding surfaces are ground to a high finish on all moving parts to assure true alignment, prevent cocking and binding. Note particularly the "top and bottom" guiding of the piston and main valve, the long stem guide of the controlling valve.

Stellited Seating Surface

Stellited seating surface combined with a hardened stainless main valve (500 Brinell) provides the most erosion resistant combination known to engineers. Stellite is welded to stainless steel seat rings in bronze and iron reducing valves and directly to the main body in steel regulators. This unbeatable combination, introduced by Leslie Co., is the product of many years' experience and knowledge of proper stelliting and heat treating techniques and is obtained only as a result of having these processes as a *standard* part of the manufacturing process.



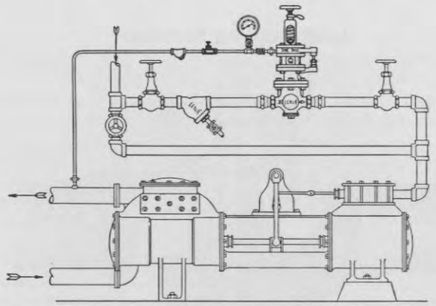
Renewable, Interchangeable Parts

Replaceable parts are manufactured from the highest quality material to closely held interchangeable fits so that complete overhaul is possible without any machining of replacement parts or removing body from line.

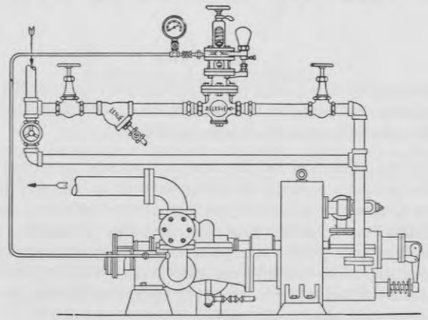
Non Fouling Joints

Properly designed gasket joints—fully annealed copper gaskets, asbestos filled, are used in most regulators to provide a lasting seal. Fouling and consequent cleaning of gasket faces is completely eliminated, saving man hours of labor. All ports in mated parts are prelocated by dowels of corrosion resistant materials.

LESLIE TRADE MARK sizing and STEAM CONSUMPTION FORMULA



Typical Installation, CLASS PRH for Reciprocating Pump



Typical Installation, Class PTH for Turbine-Driven Pump

SIZING

To properly size a pump pressure regulator the following information should be available:

1. Minimum and Maximum inlet steam pressure.
2. Superheat, if any.
3. Maximum steam consumption of pump or turbine in lbs. per hr.
4. Maximum chest pressure required by pump or turbine at full load.

Enter capacity tables, on the next page, at Inlet Pressure heading corresponding to your minimum inlet pressure and select Outlet Pressure column closest to maximum chest pressure required at pump or turbine. Capacities do not increase with outlet pressures lower than those stated. Find capacity equal to your maximum flow or slightly greater.

The size of the regulator is shown in the left hand column horizontally opposite this figure. Below is helpful information in figuring or estimating steam flows. Use caution in making allowances for overload or future requirements. Regulators should be sized as closely as possible to their expected requirements regardless of pipe size. Reliability in service and minimum maintenance expense can be enhanced by properly sizing and installing pump pressure regulators.

STEAM CONSUMPTION FOR TURBINE-DRIVEN PUMPS

Chest pressure and steam consumption must be obtained from the manufacturer or from the performance curves of the turbine unit. Turbine chest pressure is necessary to determine the pressure differential across the regulator by deducting chest pressure from minimum available inlet steam pressure. Steam consumption can be obtained from the turbine water rate per brake horsepower by multiplying this figure by rated brake horsepower.

STEAM CONSUMPTION FOR RECIPROCATING STEAM PUMPS

1. Determine pump chest pressure required at maximum steam flow. It is the maximum outlet steam pressure to be delivered by the regulator. Compute from following formula:

$$\text{Chest Pressure PSI} = \frac{\text{Liquid Piston Area Sq. In.} \times \text{Discharge Pressure PSI}}{\text{Steam Piston Area Sq. In.} \times \text{Mechanical Efficiency}} + \text{Back Pressure PSI}$$

TABLE OF MECHANICAL EFFICIENCIES

Piston Speed Ft. per min.	50	75	100	125	150
Mechanical Efficiency, %	80	77	75	72	70

NOTE: Standard Leslie Pump Pressure Regulators require a 30 lbs. per sq. in. minimum differential across the regulator.

2. Obtain specific volume of steam at chest pressure from Steam Tables or Bulletin 5311 Engineering Data to use in the following formula for computing the steam consumption.

3. Compute steam consumption from formula:

$$\text{Max. Steam Flow Lbs. per hr.} = \frac{\text{Max. No. Strokes per min.} \times \text{Stroke in inches} \times \text{Steam Piston Area, sq. in.}}{20 \times \text{Specific Volume at Chest Pressure}}$$

This formula can safely be applied to used pumps in fair condition as well as new pumps.

4. For used pumps in poor condition increase maximum steam flow obtained from formula by 40%.

LESLIE TRADE MARK sizing and CAPACITY DATA

FOR INTERNAL PILOT, PISTON OPERATED PUMP PRESSURE REGULATORS

- All pressures are in PSI gage.
- Rated capacities do not increase for outlet pressures lower than those shown for each inlet pressure.

For superheated steam correct figures in table as follows:

°F. Superheat	50	100	150	200	300
Multiply by	.92	.85	.80	.75	.65

POUNDS OF SATURATED STEAM PER HOUR

	Inlet Pressure	50 (298°F)	75 (320°F)	100 (338°F)		125 (353°F)		150 (366°F)			175 (378°F)		
	Outlet Pressure	0–20	0–45	0–55	70	0–70	95	0–80	100	120	0–95	125	145
Valve size, inches	1/2	120	165	205	190	250	210	290	280	225	340	315	250
	3/4	225	300	385	345	465	390	550	530	420	620	580	465
	1	375	510	650	580	770	650	900	870	700	1020	960	770
	1 1/4	670	900	1140	1020	1370	1150	1610	1560	1210	1830	1730	1350
	1 1/2	910	1240	1570	1400	1880	1580	2250	2100	1730	2550	2400	1880
	2	1520	2100	2650	2350	3150	2650	3700	3600	2850	4200	4000	3150
	2 1/2	2200	3000	3750	3400	4500	3750	5250	5100	4150	6000	5700	4500
	3	3400	4650	5850	5250	7050	6000	8250	8050	6450	9400	8850	7050
	3 1/2	4600	6500	7900	7100	9500	7900	11200	10800	8600	12800	12000	9800
	4	5900	8200	10100	9100	12500	10300	14300	13900	11200	16500	15000	12000
	5	9400	13000	16100	14500	19900	22700	22100	22100	17850	26300	23900	19150
	6	13500	18700	23150	20800	28600	32600	32600	31850	25650	37300	34300	27400
	Inlet Pressure	200 (388°F)				225 (397°F)					250 (406°F)		
	Outlet Pressure	0–110	125	150	170	0–125	150	175	195	0–135	150	200	220
Valve size, inches	1/2	375	370	340	265	420	405	370	285	460	450	390	300
	3/4	700	690	630	490	790	750	680	530	860	840	720	560
	1	1160	1100	1000	810	1290	1280	1130	870	1420	1400	1190	920
	1 1/4	2100	2050	1860	1450	2300	2250	2000	1550	2550	2500	2100	1650
	1 1/2	2850	2800	2550	2000	3200	3100	2750	2150	3500	3450	2950	2250
	2	4750	4650	4300	3300	5250	5100	4600	3600	5800	5700	4900	3750
	2 1/2	6850	6700	6150	4800	7600	7350	6600	5100	8350	8300	7000	5400
	3	10700	10400	9500	7450	11850	11400	10200	7950	13000	12800	10900	8400
	3 1/2	14300	14000	12800	10000	15900	15400	13700	11600	17500	17300	14600	12200
	4	18600	18200	16600	12500	20500	20000	17900	15100	22700	22200	19000	15900
	5	29650	29000	26450	19800	32650	31900	28500	24100	36200	35400	30300	25350
	6	42600	41700	37800	28300	46950	45800	40500	34500	51800	50750	43400	36400
	Inlet Pressure	300 (421°F)				350 (436°F)					400 (448°F)		
	Outlet Pressure	0–165	200	250	270	0–190	250	300	320	0–220	300	350	370
Valve size, inches	1/2	550	530	430	340	630	590	475	370	720	650	510	400
	3/4	1000	980	790	630	1170	1090	870	700	1320	1190	950	740
	1	1670	1620	1320	1050	1930	1790	1440	1130	2200	1950	1550	1220
	1 1/4	3000	2900	2350	1860	3450	3200	2600	2050	3900	3550	2800	2200
	1 1/2	4150	4000	3200	2600	4750	4400	3600	2800	5400	4900	3750	3050
	2	6850	6700	5400	4350	7900	7350	5950	4650	9000	8300	6400	5050
	2 1/2	9900	9550	7650	6150	11300	10500	8500	6600	12900	11650	9100	7250
	3	15400	14850	12000	9600	17700	16400	13300	10400	20200	17500	14300	11300
	3 1/2	20600	20000	16100	13400	23800	22100	17900	14700	27000	24400	19100	16000
	4	27000	25500	21000	17600	31000	28700	23100	19100	35300	31000	25500	21000
	5	43000	40600	33500	28100	49450	45700	36800	30400	56100	49400	40600	33500
	6	61700	58300	48000	40300	71200	65600	52900	43700	80800	71000	58400	48000
	Inlet Pressure	450 (459°F)				500 (469°F)					600 (490°F)		
	Outlet Pressure	0–250	300	350	420	0–300	350	400	470	0–350	400	500	570
Valve size, inches	1/2	810	770	700	440	900	850	750	470	1070	1040	850	540
	3/4	1490	1440	1290	800	1640	1560	1380	870	1980	1900	1560	990
	1	2500	2400	2140	1330	2750	2580	2300	1430	3250	3150	2600	1630
	1 1/4	4450	4300	3850	2400	4850	4600	4100	2550	5850	5650	4600	2950
	1 1/2	6000	5900	5250	3250	6750	6350	5650	3550	8100	7800	6400	4050
	2	10100	9750	8800	5400	11200	10600	9400	5900	13400	13000	10600	6750
	2 1/2	14650	14000	12600	7900	16150	15300	13600	8500	19300	18600	15200	10000
	3	22500	21800	19500	12100	25200	23700	21200	13200	30200	29100	23700	15700
	3 1/2	30600	39300	26200	17500	33600	31700	28200	18500	40400	39000	31700	21200
	4	39700	38200	34500	22500	43800	41400	36200	24100	52500	50800	41200	27600
	5	63300	60800	55000	35800	69800	66000	57600	38400	83600	81000	65600	43800
	6	90900	87500	78000	51800	100500	94800	83000	55250	120000	115000	99250	63200

TRADE LESLIE MARK

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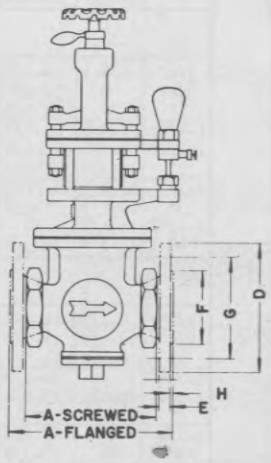
TRADE LESLIE MARK

LAYOUT DIMENSIONS PUMP PRESSURE REGULATORS

CAST BRONZE AND CAST IRON

DIMENSIONS IN INCHES

① PR AND PRK			② PRL, PRLK PTL, PTLK PRH, PRHK PTH AND PTHK		③ CRH, CRHK CTH AND CTHK		④ XRH, XRHK XTH AND XTHK				⑤ XTL AND XTLK			
SIZE	A	① B	② B	③ B	④ B	⑤ B	C	D	E	BOLT CIRCLE G	NO. OF HOLES	BOLT SIZE	BOLT HOLE
SCREWED														
1/2"	5-3/4	13-5/8	15	19-1/2	16-3/4	16	3-5/16	- -	- -	- -	- -	- -	- -
3/4"	5-3/4	13-5/8	15	19-1/2	16-3/4	16	3-5/16	- -	- -	- -	- -	- -	- -
1"	5-3/4	13-5/8	15	19-1/2	16-3/4	16	3-5/16	- -	- -	- -	- -	- -	- -
1-1/4"	5-3/4	13-7/8	15-1/4	19-3/4	17	16-1/4	3-9/16	- -	- -	- -	- -	- -	- -
1-1/2"	6-1/4	14-1/4	15-5/8	20-1/8	17-3/8	16-5/8	3-15/16	- -	- -	- -	- -	- -	- -
2"	7-1/2	14-3/4	16-1/8	20-5/8	17-7/8	17-1/8	4-1/4	- -	- -	- -	- -	- -	- -
FLANGED 125 LB. ASA STANDARD														
1-1/2"	7-1/2	14-1/4	15-5/8	20-1/8	17-3/8	16-5/8	4-1/8	5	9/16	3-7/8	4	1/2	5/8
2"	8-3/4	14-3/4	16-1/8	20-5/8	17-7/8	17-1/8	4-3/8	6	5/8	4-3/4	4	5/8	3/4
2-1/2"	9-3/4	15-5/8	17	21-1/2	18-3/4	18	5-1/2	7	11/16	5-1/2	4	5/8	3/4
3"	11	16-1/8	17-1/2	22	19-1/4	18-1/2	6-1/2	7-1/2	3/4	6	4	5/8	3/4
4"	13-1/2	17-5/8	19-3/4	24-1/4	21-1/2	20-3/4	7	9	15/16	7-1/2	8	5/8	3/4
5"	16	21-1/8	22-1/2	27	24-1/4	23-1/2	10-3/4	10	15/16	8-1/2	8	3/4	7/8
6"	15	20-7/8	22-1/4	26-3/4	24	23-1/4	10-3/8	11	1	9-1/2	8	3/4	7/8
FLANGED 250 LB. ASA STANDARD														
1-1/2"	8	14-1/4	15-5/8	20-1/8	17-3/8	16-5/8	4-1/8	6-1/8	3/4	4-1/2	4	3/4	7/8
2"	9-1/4	14-3/4	16-1/8	20-5/8	17-7/8	17-1/8	4-3/8	6-1/2	13/16	5	8	5/8	3/4
2-1/2	10-3/8	15-5/8	17	21-1/2	18-3/4	18	5-1/2	7-1/2	15/16	5-7/8	8	3/4	7/8
3"	11-3/4	16-1/8	17-1/2	22	19-1/4	18-1/2	6-1/2	8-1/4	1-1/16	6-5/8	8	3/4	7/8
FLANGED 150 LB. MSS STANDARD														
1/2"	6-3/4	13-5/8	15	19-1/2	16-3/4	16	2-13/16	3-1/2	9/16	2-3/8	4	1/2	5/8
3/4"	6-3/4	13-5/8	15	19-1/2	16-3/4	16	2-13/16	3-7/8	9/16	2-3/4	4	1/2	5/8
1"	6-3/4	13-5/8	15	19-1/2	16-3/4	16	2-13/16	4-1/4	9/16	3-1/8	4	1/2	5/8
1-1/4"	7	13-7/8	15-1/4	19-3/4	17	16-1/4	3-1/16	4-5/8	9/16	3-1/2	4	1/2	5/8
1-1/2"	7-1/2	14-1/4	15-5/8	20-1/8	17-3/8	16-5/8	3-7/16	5	9/16	3-7/8	4	1/2	5/8
2"	8-3/4	14-3/4	16-1/8	20-5/8	17-7/8	17-1/8	3-1/2	6	5/8	4-3/4	4	5/8	3/4
2-1/2"	9-3/4	15-5/8	17	21-1/2	18-3/4	18	4-3/8	7	11/16	5-1/2	4	5/8	3/4
3"	11	16-1/8	17-1/2	22	19-1/4	18-1/2	5-1/4	7-1/2	3/4	6	4	5/8	3/4
3-1/2"	12	16-3/4	18-1/8	22-5/8	19-7/8	19-1/8	6	8-1/2	11/16	7	8	5/8	3/4
4"	13	17-5/8	19-3/4	24-1/4	21-1/2	20-3/4	7	9	11/16	7-1/2	8	5/8	3/4
5"	16	21-1/8	22-1/2	27	24-1/4	23-1/2	10-3/4	10	15/16	8-1/2	8	3/4	7/8
6"	15	20-7/8	22-1/4	26-3/4	24	23-1/4	10-3/8	11	1	9-1/2	8	3/4	7/8
FLANGED 300 LB. MSS STANDARD														
1/2"	6-3/4	13-5/8	15	19-1/2	16-3/4	16	2-13/16	3-3/4	9/16	2-5/8	4	1/2	5/8
3/4"	6-3/4	13-5/8	15	19-1/2	16-3/4	16	2-13/16	4-5/8	9/16	3-1/4	4	5/8	3/4
1"	6-3/4	13-5/8	15	19-1/2	16-3/4	16	2-13/16	4-7/8	9/16	3-1/2	4	5/8	3/4
1-1/4"	7	13-7/8	15-1/4	19-3/4	17	16-1/4	3-1/16	5-1/4	9/16	3-7/8	4	5/8	3/4
1-1/2"	7-1/2	14-1/4	15-5/8	20-1/8	17-3/8	16-5/8	3-7/16	6-1/8	9/16	4-1/2	4	3/4	7/8
2"	8-3/4	14-3/4	16-1/8	20-5/8	17-7/8	17-1/8	3-1/2	6-1/2	5/8	5	8	5/8	3/4
2-1/2"	9-3/4	15-5/8	17	21-1/2	18-3/4	18	4-3/8	7-1/2	11/16	5-7/8	8	3/4	7/8
3"	11	16-1/8	17-1/2	22	19-1/4	18-1/2	5-1/4	8-1/4	3/4	6-5/8	8	3/4	7/8
3-1/2"	12	16-3/4	18-1/8	22-5/8	19-7/8	19-1/8	6	9	13/16	7-1/4	8	3/4	7/8
4"	13	17-5/8	19-3/4	24-1/4	21-1/2	20-3/4	7	10	1-1/16	7-7/8	8	3/4	7/8
5"	16	21-1/8	22-1/2	27	24-1/4	23-1/2	10-3/4	11	1-1/8	9-1/4	8	3/4	7/8
6"	15	20-7/8	22-1/4	26-3/4	24	23-1/4	10-3/8	12-1/2	1-3/16	10-5/8	12	3/4	7/8



ADD 1" TO "B" DIMENSION WHEN "O" ADAPTOR IS USED FOR EXTERNAL STEAM SUPPLY.
(INDICATED WHEN BASIC CLASS DESIGNATION IS FOLLOWED BY "O". EXAMPLE: PRO, PRKO, CRHO, XTLKO, ETC.)

FLANGED 250 LB. ASA STANDARD ONLY		
SIZE	F	H
1-1/2"	3-9/16	1/16
2"	4-3/16	1/16
2-1/2"	4-15/16	1/16
3"	5-11/16	1/16

LAYOUT DIMENSIONS PUMP PRESSURE REGULATORS

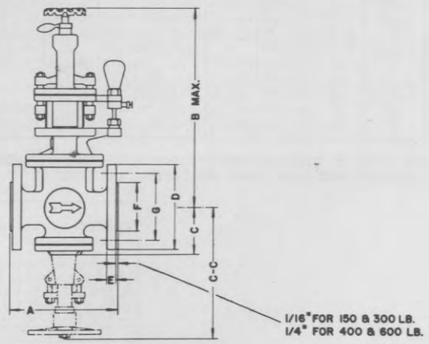
CAST STEEL

DIMENSIONS IN INCHES

	① PRS-3		② PRHS-3, PTHS-3, PRHSM, PTHSM, PRLS-3 AND PTLS-3			③ CRHS-3, CTHS-3, CRHSM AND CTHSM			④ XRHS-3, XTHS-3, XRHSM AND XTHSM			⑤ PLS-3			
SIZE	A	① B	② B	③ B	④ B	⑤ B	C	D	E	F	BOLT CIRCLE G	NO. OF HOLES	BOLT SIZE	BOLT HOLE
FLANGED 150 LB. ASA STANDARD														
1/2"	7-5/8	14-5/8	16	20-1/2	17-11/16	21	3-7/16	3-1/2	5/16	1-3/8	2-3/8	4	1/2	9/16
3/4"	7-5/8	14-5/8	16	20-1/2	17-11/16	21	3-7/16	3-7/8	3/8	1-11/16	2-3/4	4	1/2	9/16
1"	7-1/2	14-5/8	16	20-1/2	17-11/16	21	3-7/16	4-1/4	3/8	2	3-1/8	4	1/2	9/16
1-1/4"	7-7/8	14-7/8	16-1/4	20-3/4	17-15/16	21-1/4	3-13/16	4-5/8	7/16	2-1/2	3-1/2	4	1/2	9/16
1-1/2"	8-3/8	15-1/4	16-5/8	21-1/8	18-5/16	21-5/8	4-1/8	5	1/2	2-7/8	3-7/8	4	1/2	9/16
2"	10-1/4	15-7/16	16-7/8	21-5/16	18-1/2	21-13/16	4-1/2	6	9/16	3-5/8	4-3/4	4	5/8	11/16
2-1/2"	11-5/8	16-7/16	17-7/8	22-5/16	19-1/2	22-13/16	6	7	5/8	4-1/8	5-1/2	4	5/8	11/16
3"	12-1/2	17-3/8	18-7/8	23-1/4	20	23-3/4	6-13/16	7-1/2	11/16	5	6	4	5/8	11/16
3-1/2"	13-3/8	18	19-5/16	23-3/4	20-5/8	24-5/16	7-5/8	8-1/2	3/4	5-1/2	7	8	5/8	11/16
4"	14-3/8	18-3/8	19-11/16	24-1/8	21	24-11/16	7-9/16	9	7/8	6-3/16	7-1/2	8	5/8	11/16
FLANGED 300 LB. ASA STANDARD														
1/2"	8	14-5/8	16	20-1/2	17-11/16	21	3-7/16	3-3/4	1/2	1-3/8	2-5/8	4	1/2	9/16
3/4"	8	14-5/8	16	20-1/2	17-11/16	21	3-7/16	4-5/8	9/16	1-11/16	3-1/4	4	5/8	11/16
1"	8	14-5/8	16	20-1/2	17-11/16	21	3-7/16	4-7/8	5/8	2	3-1/2	4	5/8	11/16
1-1/4"	8-3/8	14-7/8	16-1/4	20-3/4	17-15/16	21-1/4	3-13/16	5-1/4	11/16	2-1/2	3-7/8	4	5/8	11/16
1-1/2"	8-7/8	15-1/4	16-5/8	21-1/8	18-5/16	21-5/8	4-1/8	6-1/8	3/4	2-7/8	4-1/2	4	3/4	13/16
2"	10-3/4	15-7/16	16-7/8	21-5/16	18-1/2	21-13/16	4-1/2	6-1/2	13/16	3-5/8	5	8	5/8	11/16
2-1/2"	12-1/4	16-7/16	17-7/8	22-5/16	19-1/2	22-13/16	6	7-1/2	15/16	4-1/8	5-7/8	8	3/4	13/16
3"	13-1/4	17-3/8	18-7/8	23-1/4	20	23-3/4	6-13/16	8-1/4	1-1/16	5	6-5/8	8	3/4	13/16
3-1/2"	14-1/8	18	19-5/16	23-3/4	20-5/8	24-5/16	7-5/8	9	1-1/8	5-1/2	7-1/4	8	3/4	13/16
4"	15-3/4	18-3/8	19-11/16	24-1/8	21	24-11/16	7-9/16	10	1-3/16	6-3/16	7-7/8	8	3/4	13/16
FLANGED 400 AND 600 LB. ASA STANDARD														
1/2"	8-1/2	14-5/8	16	20-1/2	17-11/16	21	3-7/16	3-3/4	9/16	1-3/8	2-5/8	4	1/2	9/16
3/4"	8-1/2	14-5/8	16	20-1/2	17-11/16	21	3-7/16	4-5/8	5/8	1-11/16	3-1/4	4	5/8	11/16
1"	8-1/2	14-5/8	16	20-1/2	17-11/16	21	3-7/16	4-7/8	11/16	2	3-1/2	4	5/8	11/16
1-1/4"	9	14-7/8	16-1/4	20-3/4	17-15/16	21-1/4	3-13/16	5-1/4	13/16	2-1/2	3-7/8	4	5/8	11/16
1-1/2"	9-1/2	15-1/4	16-5/8	21-1/8	18-5/16	21-5/8	4-1/8	6-1/8	7/8	2-7/8	4-1/2	4	3/4	13/16
2"	11-1/2	15-7/16	16-7/8	21-5/16	18-1/2	21-13/16	4-1/2	6-1/2	1	3-5/8	5	8	5/8	11/16
2-1/2"	13	16-7/16	17-7/8	22-5/16	19-1/2	22-13/16	6	7-1/2	1-1/8	4-1/8	5-7/8	8	3/4	13/16
3"	14	17-3/8	18-7/8	23-1/4	20	23-3/4	6-13/16	8-1/4	1-1/4	5	6-5/8	8	3/4	13/16
3-1/2"	15	18	19-5/16	23-3/4	20-5/8	24-5/16	7-5/8	9	1-3/8	5-1/2	7-1/4	8	7/8	15/16
FLANGED 400 LB. ASA STANDARD														
4"	15	18-3/8	19-11/16	24-1/8	21	24-11/16	7-9/16	10	1-3/8	6-3/16	7-7/8	8	7/8	15/16
FLANGED 600 LB. ASA STANDARD														
4"	16	18-3/8	19-11/16	24-1/8	21	24-11/16	7-9/16	10-3/4	1-1/2	6-3/16	8-1/2	8	7/8	15/16

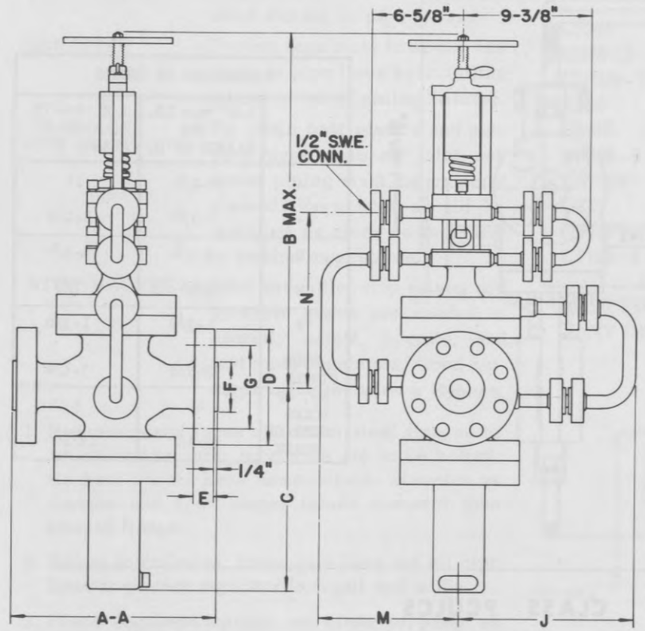
ADD 1" TO "B" DIMENSION WHEN "O" ADAPTOR IS USED FOR EXTERNAL STEAM SUPPLY. (INDICATED WHEN BASIC CLASS DESIGNATION IS FOLLOWED BY "O". EXAMPLE: PRSO-3, CRHSO-3, PLSO-3, ETC.)

CLASSES PRHSM, PTHSM, CRHSM, CTHSM, XRHSM AND XTHSM ONLY	
SIZE	C-C
1/2"	10-1/2
3/4"	10-1/2
1"	10-1/2
1-1/4"	11
1-1/2"	11-3/8
2"	11-3/4
2-1/2"	15-3/4
3"	17-11/16



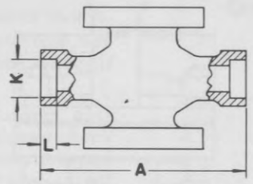
LAYOUT DIMENSIONS PUMP PRESSURE REGULATORS

CLASSES CIHS-2, CHHS-2, CIHPS, CHHPS, CIHPSM-1 AND CHHPSM-1

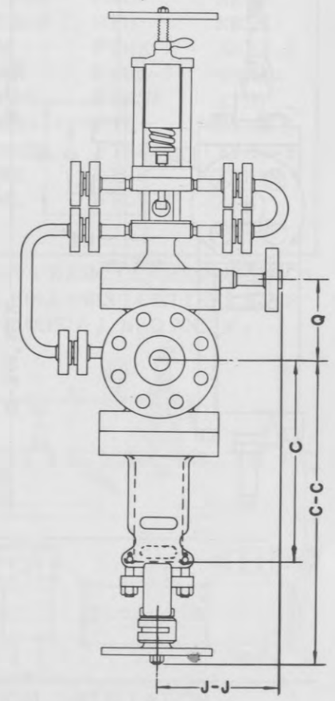


SIDE VIEW
CIHS-2, CHHS-2, CIHPS & CHHPS

END VIEW
CIHS-2 & CHHS-2



SOCKET WELDING END DIMENSIONS



END VIEW
CIHPS, CHHPS, CIHPSM & CHHPSM

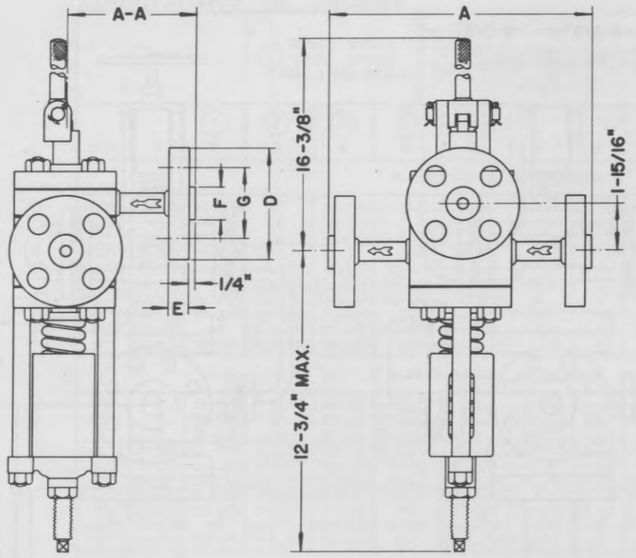
DIMENSION IN INCHES

SIZE	A	A-A	B	* C	** C-C	D	E	F	BOLT CIRCLE G	J	J-J	K	L	M	N	Q	NO. OF HOLES	HOLE SIZE
FLANGED AND SOCKET WELDING ENDS 1500 LB. ASA STANDARD																		
1"	12-1/4	12-1/4	24-5/8	12	20-5/8	5-7/8	1-1/8	2	4	11-1/2	7-3/4	1.330	5/8	9-3/4	11-1/2	4-5/8	4	15/16
1-1/4"	12-1/4	12-1/4	24-5/8	12	20-5/8	6-1/4	1-1/8	2-1/2	4-3/8	11-1/2	7-3/4	1.675	11/16	9-3/4	11-1/2	4-5/8	4	15/16
1-1/2"	14-1/2	14-1/2	26	15	22-7/8	7	1-1/4	2-7/8	4-7/8	12-5/8	8-13/16	1.915	3/4	10-1/4	12-15/16	6	4	1-1/16
2"	14-1/2	15	26	15	22-7/8	8-1/2	1-1/2	3-5/8	6-1/2	12-5/8	8-13/16	2.406	7/8	10-1/4	12-15/16	6	8	15/16

* CLASSES CIHS-2, CHHS-2, CIHPS AND CHHPS ONLY.
** CLASSES CIHPSM AND CHHPSM ONLY.

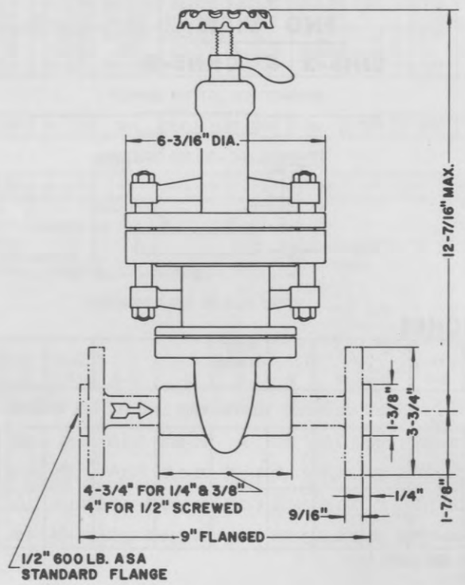
LAYOUT DIMENSIONS PUMP PRESSURE REGULATORS

CLASS PDS



DIMENSIONS IN INCHES		
	1/2" 600 LB. ASA FLANGE ST'D.	1/2" 900 LB. ASA FLANGE ST'D.
A	10-1/4	11
A-A	5-1/8	5-1/2
D	3-3/4	4-3/4
E	9/16	7/8
F	1-3/8	1-3/8
BOLT CIRCLE G	2-5/8	3-1/4
NO. OF HOLES	4	4
SIZE OF HOLES	9/16	13/16

CLASS PCULCS



instructions for PUMP PRESSURE REGULATORS

INSTALLATION, OPERATION and MAINTENANCE

INSTALLATION – Do not use red lead or cement when making up pipe joints.

STRAINER – Protect regulators from dirt and scale in pipe lines by installing a Leslie Self-Cleaning Strainer.

DRAINAGE – To attain best results and prevent water hammer, inlet and outlet piping must be properly drained. Regulators should be installed as close to the pump or turbine as possible.

STOP VALVES – Inlet and outlet stop valves and pressure gages are needed to properly adjust, operate, and test pump regulators. Good piping practice includes a Bypass.

1. Remove raised faces of iron or steel flanges to which bronze pump regulators are to be bolted. Gaskets should have same outside diameter as flanges and 1/4" larger inside diameter than bore of flange.
2. Before installation, thoroughly blow out all pipe lines to protect regulator from grit and scale.
3. Place regulator upright as close to pump as possible in horizontal line of pipe with arrow (cast on side of body) in direction of steam flow.
4. Select actuating pipe connections for applicable conditions as follows:

a. One pump and one regulator – Connect one to three feet from pump discharge. Connection may be made either ahead of or after check valve, if any.

b. Two pumps with one regulator – Connect near pump discharge, preferably after discharge check valve to prevent entrance of high pressure liquid into standby pump casing if stop valve is not closed.

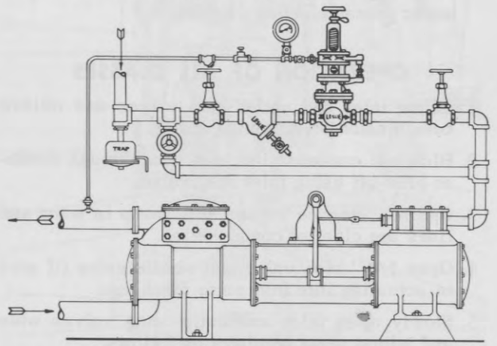
c. Two pumps and two regulators in parallel operation – Connect near pump discharge before discharge check valve so that regulators can be adjusted for parallel operation, i.e., set to deliver equal flow into common header.

5. Plan to use a pulsation retarding needle valve if required. Reciprocating pumps handling thin liquids, such as water and light oils, require 1/4" Strainer and *pulsation retarding needle valve* in actuating pipe AHEAD of gage. They are furnished with regulators ordered for light

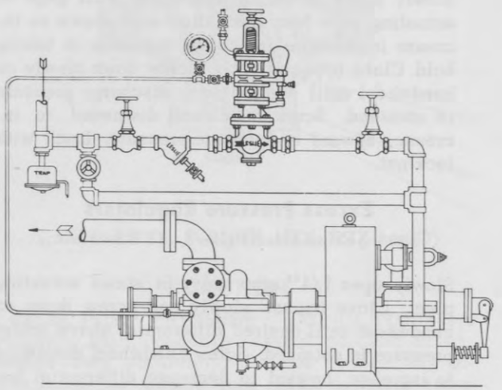
***ALL CLASSES INCLUDING**

CHHS	CTHSM	PRLK	XRH
CIHS–2	PLS–3	PTH	XRHK
CIHSM–2	PR	PTHK	XRHS–3
CRH	PRH	PTHS–3	XRHSM
CRHK	PRHK	PTHSM	XTH
CRHS–3	PRHS–3	PTL	XTHK
CRHSM	PRHSM	PTLHS	XTHS–3
CTH	PRK	PTLK	XTHSM
CTHK	PRL	PTLS–3	XTL
CTHS–3			XTLK

*ALSO FOR ABOVE BASIC CLASSES TO WHICH ANY OF THE FOLLOWING LETTERS HAVE BEEN ADDED: J, N, O AND W



TYPICAL INSTALLATION
Constant Pressure Pump Regulator



TYPICAL INSTALLATION
Differential Pressure Pump Regulator

TRADE LESLIE MARK instructions for PUMP PRESSURE REGULATORS

liquid. Do NOT use with viscous liquids like fuel oils. Regulators for turbine-driven pumps do not require a pulsation retarding needle valve.

6. Install actuating pipe (3/8" for viscous liquids and 1/4" for thin liquids) with stop valve, union and gage (strainer and pulsation retarding needle if necessary) from connection in regulator superstructure to discharge line, one to three feet from pump.
7. Insulate all steam lines to minimize condensation losses.

   EXCESS PRESSURE PUMP REGULATORS – Same steps as above except employ a second actuating pipe from regulator superstructure to a source of boiler pressure as follows: Install 1/4" steam actuating pipe with union and stop valve from 1/4" connection in spring case of pump regulator to boiler or point where *full* boiler pressure *always* exists.

OPERATION OF ALL CLASSES

1. Close inlet and outlet stop valves and relieve compression on adjusting spring.
2. Blow out condensation, dirt, etc., through strainer blow-off using inlet stop valve.
3. Operate pump on bypass until pump is warm and lines are clear of condensation.
4. Open 1/4" stop valve and needle valve (if any) in actuating line from pump discharge.
5. Slowly open inlet and outlet stop valves wide and adjust pump regulator as follows.

Constant Pressure Regulators

Slowly screw down on handwheel until gage in actuating pipe from pump discharge shows an increase in pressure indicating regulator is taking hold. Close bypass tightly. Screw down slowly on handwheel until desired pump discharge pressure is obtained. Screw handwheel downward to increase, upward to decrease pressure. Lock with lock-nut.

Excess Pressure Regulators

(Class XRH, XTH, XRHS–3, XTHS–3 etc.)

Slowly open 1/4" stop valve in steam actuating pipe. Close bypass slowly and screw down on handwheel until desired differential above boiler pressure is obtained. Screw handwheel downward to increase, upward to decrease differential between pump discharge and boiler pressures. Lock with lock-nut.

Manual Operating Device

Regulators fitted with manual pull open device are usually installed without external bypass. Use manual pull open divice to start pump in place of external bypass. When unit has warmed up, slowly close pull open device and adjust regulator handwheel as described above.

Shifting From One Pump To Another

Standby operation with common discharge and actuating lines.

Adjust each regulator as described above. With one regulator and pump in service, open inlet and outlet stop valves of standby regulator. Dispose of condensation. To shift pumps, screw down on handwheel of standby regulator and at same time ease off on handwheel of unit in service until standby unit takes over the load cutting off "service" unit. Close inlet and outlet stop valves on replaced unit.

To Parallel Two Pumps with Two Regulators (See Instruction 4 (c) Actuating Pipe Connection)

Follow steps 1–6 with each pump operated alone. Then operate both pumps together and adjust regulator handwheels until the load is equally distributed between the two pumps indicated by equal operating speeds or by approximately equal steam pressures delivered to turbine chest for turbine-driven pumps. Thereafter, pumps will work together.

Adjustment of Pulsation Retarding Needle Valve

Throttle pulsation retarding needle valve until movement of gage hand is smooth and even with small total movement at end of each stroke. NEVER SHUT NEEDLE VALVE TIGHT, gage must be "alive" to be sure regulator is receiving pressure changes.

Adjustment of Stabilizing Needle Valve

Regulators for turbine-driven pumps have a built-in stabilizing needle valve between the upper and lower steam diaphragms. Classes CHHS, CIHS, PTLHS, PLHNS, CHHNS, have a built-in, *non*-adjustable stabilizer.

Adjust built-in pump regulator needle valve when operating at low capacity to approximately 1/4 turn open so that there is no "hunting" and regulator action is smooth and even. NEVER SHUT NEEDLE VALVE TIGHT

Shutting Down—Starting Up—All Classes

To turn steam off, close outlet and inlet valves tightly.

To turn steam on (with regulator set):

TRADE LESLIE MARK instructions for PUMP PRESSURE REGULATORS

1. Use bypass until pump and lines are warm. Be sure stop valve and needle valve in actuating pipe from pump discharge are open. (On EXCESS PRESSURE PUMP REGULATORS, slowly open stop valve in 1/4" steam actuating pipe).
2. Open inlet stop valve WIDE, dispose of condensation, dirt, etc., by operating strainer blow-off valve.
3. Open outlet stop valve SLOWLY, and close bypass stop valve tightly.

MAINTENANCE

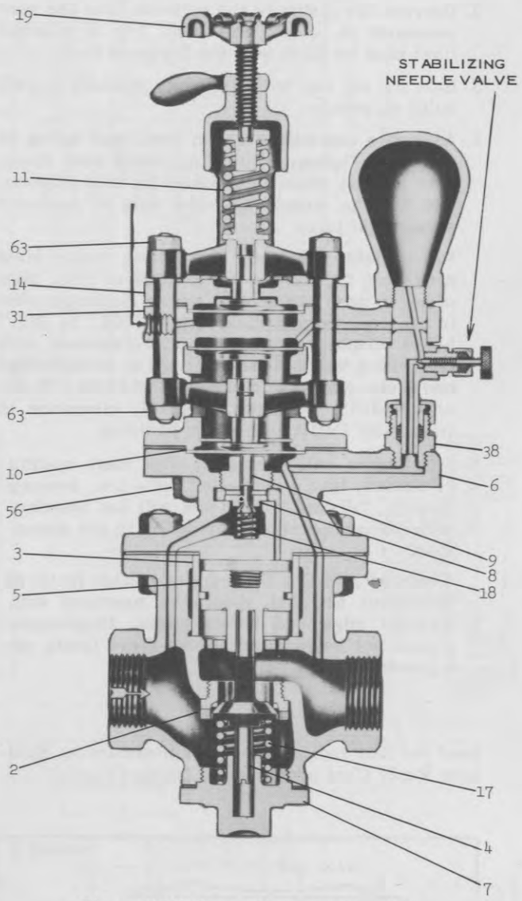
Refer to Proper Drawing Furnished on Request.

1. Close stop valves and open union(s) in the actuating line.
2. Release all compression on the adjusting spring (11) by turning handwheel (19) counterclockwise.
3. Unscrew connector union (38) from top cap (6) and slide up on nipple on all classes except PR and PRS–3.
4. Remove lower nuts from stud bolts (56) and disassemble superstructure. Unscrew connecting rod nuts (63) and remove parts in order starting from the top.
5. Remove steam diaphragm (10) from top cap and unscrew controlling valve seat (8) with socket wrench provided for this purpose.
6. Remove controlling valve (9) and spring (18).
7. Remove top cap (6), piston (5), and cylinder liner (3).
8. Remove bottom cap (7) and take out main valve (4) and main valve spring (17).
9. In classes where used, seat ring (2) in body can be taken out, when necessary, with special seat ring wrench provided for this purpose.

CLEANING

Clean All Parts with Kerosene and Check as Follows:

1. Examine main and controlling valves to be sure they move freely in their guides, and seat properly.
2. If valve seating surfaces are scored or cut, regrind with fine grinding compound, allowing the piston to remain in the cylinder liner when regrinding the main valve to insure perfect centering. Remove all traces of grinding compound before reassembling.
3. Make certain the piston rings are free in their grooves and expand into the cylinder liner.
4. See that the ports in diaphragm case or diaphragm chamber (31) and spring case (14) are open and clean.
5. Have all working parts moving freely.
6. See Drawing No. 1278 F, top cap assembly, for additional maintenance instructions.



Class PTH Pump Pressure Regulator

CAUTION

LESLIE PUMP PRESSURE REGULATORS are ruggedly built, carefully assembled, and dimensioned very accurately. Do not change any dimensions. To assure long life, complete interchangeability, and low maintenance costs, use only standard LESLIE parts.

TRADE LESLIE MARK

instructions for PUMP PRESSURE REGULATORS

ASSEMBLING BODY

Important – Graphite or Compound Should *Not* Be Used on Joints. Moving Parts Require No Lubricant.

1. Place the main valve, spring, and gasket in position on bottom cap, and screw or bolt to the valve body.
2. Depress the piston in the cylinder liner (be sure movement is smooth and free). Top of cylinder liner must be flush with top flange of body.
3. Bolt the top cap with gasket to the body – pull bolts up evenly.
4. Assemble controlling valve, seat, and spring in top cap. Tighten controlling valve seat firmly with special wrench furnished for this purpose, and tap the wrench to make sure of perfectly steam tight joint.

   For reliable shut-off, controlling valve must also seat tightly. To be assured of this, stem of valve must not project above diaphragm seat in top cap. Correct clearance is .001" to .005" below diaphragm seat. Check clearance with controlling valve clearance gage or straight edge and feeler gage. For classes CHNS, CIHS, PTLHS and PLHNS, PTLHNS, CHHNS, clearance is taken with Deflector plate in position.
5. Diaphragms will normally, after many months of service, take a permanent set – i.e., become slightly "dished." This set will not interfere with proper operation provided it is not excessive.

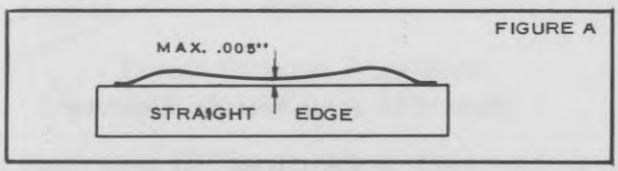
   Figures A,B,C & D show permissible limits of permanent set that should be measured with straight edge and feeler gages. Diaphragms should not be renewed unless these limits are exceeded.

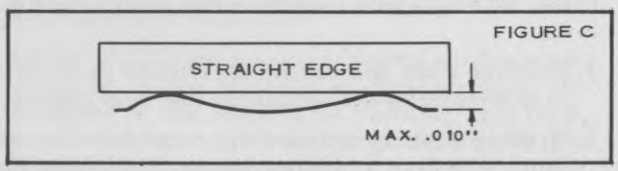
ASSEMBLING SUPERSTRUCTURE

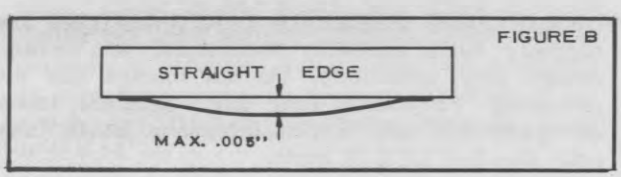
1. Replace lower steam diaphragm (10) diaphragm spacer (32) with diaphragm stem (35) and lower crosshead (26) in place. Be sure diaphragm stem moves freely in diaphragm stem guide (36).
2. Drop connecting rods (27) into holes in lower crosshead (26) and screw on lower connecting rod nuts (63).
3. Refer to proper drawing and assemble remainder of superstructure by adding parts loosely in their proper location until spring case (14) is in position.
4. Place upper crosshead through spring case (14) and on to connecting rods (27). Screw upper connecting rod nuts loosely in place.
5. Drop stud bolts through bolt holes in spring cases (14) and superstructure, including top flange of top cap. Put nuts on FINGER TIGHT.
6. On all classes except PR and PRS–3, remake joint between connector union (38) and top cap (6). Be sure this is steam tight.
7. Line up all parts of superstructure through which stud bolts pass so that connecting rods move freely in guide holes and there is 1/32" play between connecting rods and holes in spring case.
8. Tighten nuts on stud bolts (56), being sure to pull them up evenly all around and not excessively tight.
9. Tighten connecting rod nuts (63) and connector union (38).
10. Test for free movement of connecting rods in guide holes and clearance around same by rotating crossheads back and forth on diaphragm stem (35).
11. Make up unions in actuating lines.

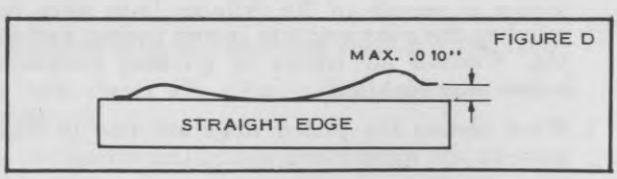
Send for free tools, drawing or literature on Business Reply Card addressed to *Leslie Co.*

TO PUT REGULATOR BACK IN SERVICE, REFER TO OPERATION – PAGE 2









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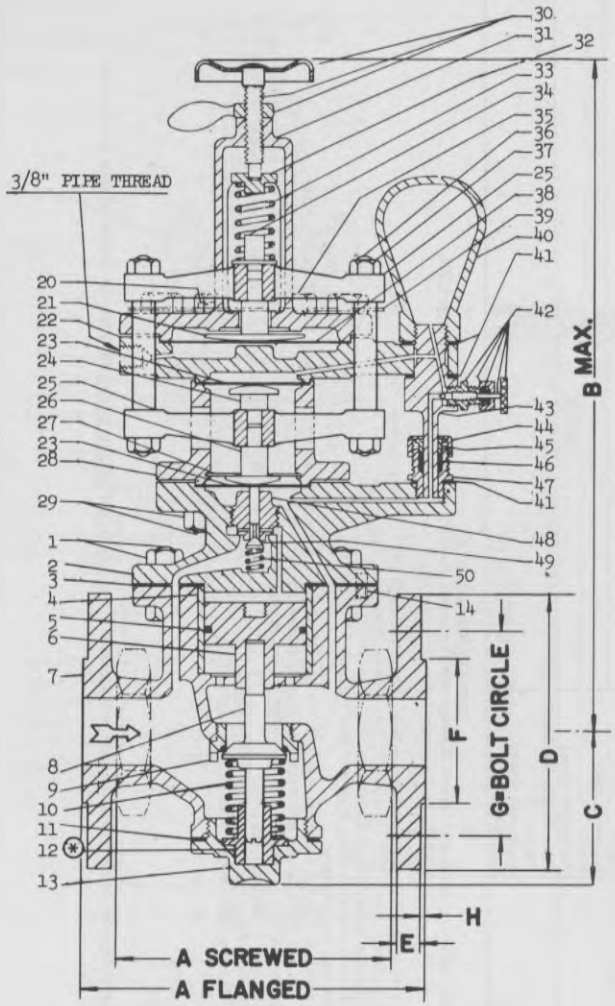
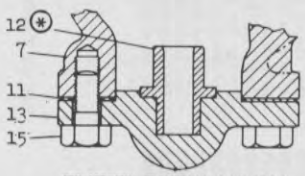
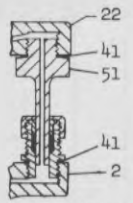


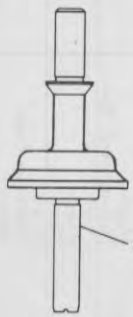
CLASSES PTL AND PTLK
FOR TURBINE DRIVEN PUMPS



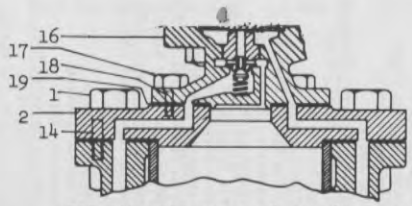
FLANGED BOTTOM CAP FOR
2" TO 6" SIZES



Classes PRL and PRLK for Reciprocating Pumps use this type of connection between Diaphragm Chamber 22 and Top Cap 2.



Gradual Opening Plug
Type Main Valve in
2-1/2" to 6" sizes.



TOP CAP DESIGN FOR 5" AND 6" SIZES

SIZE	A	B	C	D	E	F	G	H	No. of Holes	Bolt Size	Bolt Hole	Net Wt. Lb. **
DIMENSIONS IN INCHES												
SCREWED (PRL, PTL, PRLK & PTLK)												
1/2"	5-3/4	15	2-13/16 *	- -	- -	- -	- -	- -	- -	- -	- -	41
3/4"	5-3/4	15	2-13/16 *	- -	- -	- -	- -	- -	- -	- -	- -	41
1"	5-3/4	15	2-13/16 *	- -	- -	- -	- -	- -	- -	- -	- -	41
1-1/4"	5-3/4	15-1/4	3-1/16 *	- -	- -	- -	- -	- -	- -	- -	- -	45
1-1/2"	6-1/4	15-5/8	3-7/16 *	- -	- -	- -	- -	- -	- -	- -	- -	49
2"	7-1/2	16-1/8	3-1/2 *	- -	- -	- -	- -	- -	- -	- -	- -	61
FLANGED 125 LB. ASA STANDARD (PRLK & PTLK)												
1-1/2"	7-1/2	15-5/8	4-1/8	5	9/16	- -	3-7/8	- -	4	1/2	5/8	50
2"	8-3/4	16-1/8	4-3/8	6	5/8	- -	4-3/4	- -	4	5/8	3/4	60
2-1/2"	9-3/4	17	5-1/2	7	11/16	- -	5-1/2	- -	4	5/8	3/4	70
3"	11	17-1/2	6-1/2	7-1/2	3/4	- -	6	- -	4	5/8	3/4	100
4"	13-1/2	19-3/4	7	9	15/16	- -	7-1/2	- -	8	5/8	3/4	170
5"	16	22-1/2	10-3/4	10	15/16	- -	8-1/2	- -	8	3/4	7/8	225
6"	15	22-1/4	10-3/8	11	1	- -	9-1/2	- -	8	3/4	7/8	250
FLANGED 250 LB. ASA STANDARD (PRLK & PTLK)												
1-1/2"	8	15-5/8	4-1/8	6-1/8	3/4	3-9/16	4-1/2	1/16	4	3/4	7/8	60
2"	9-1/4	16-1/8	4-3/8	6-1/2	13/16	4-3/16	5	1/16	8	5/8	3/4	70
2-1/2"	10-3/8	17	5-1/2	7-1/2	15/16	4-15/16	5-7/8	1/16	8	3/4	7/8	80
3"	11-3/4	17-1/2	6-1/2	8-1/4	1-1/16	5-11/16	6-5/8	1/16	8	3/4	7/8	110
FLANGED 150 LB. MSS STANDARD (PRL & PTL)												
1/2"	6-3/4	15	2-13/16	3-1/2	9/16	- -	2-3/8	- -	4	1/2	5/8	44
3/4"	6-3/4	15	2-13/16	3-7/8	9/16	- -	2-3/4	- -	4	1/2	5/8	45
1"	6-3/4	15	2-13/16	4-1/4	9/16	- -	3-1/8	- -	4	1/2	5/8	46
1-1/4"	7	15-1/4	3-1/16	4-5/8	9/16	- -	3-1/2	- -	4	1/2	5/8	50
1-1/2"	7-1/2	15-5/8	3-7/16	5	9/16	- -	3-7/8	- -	4	1/2	5/8	57
2"	8-3/4	16-1/8	3-1/2	6	5/8	- -	4-3/4	- -	4	5/8	3/4	70
2-1/2"	9-3/4	17	4-3/8	7	11/16	- -	5-1/2	- -	4	5/8	3/4	86
3"	11	17-1/2	5-1/4	7-1/2	3/4	- -	6	- -	4	5/8	3/4	115
3-1/2"	12	18-1/8	6	8-1/2	11/16	- -	7	- -	4	5/8	3/4	135
4"	13	19-3/4	7	9	11/16	- -	7-1/2	- -	4	5/8	3/4	175
5"	16	22-1/2	10-3/4	10	15/16	- -	8-1/2	- -	8	3/4	7/8	350
6"	15	22-1/4	10-3/8	11	1	- -	9-1/2	- -	8	3/4	7/8	375
FLANGED 300 LB. MSS STANDARD (PRL & PTL)												
1/2"	6-3/4	15	2-13/16	3-3/4	9/16	- -	2-5/8	- -	4	1/2	5/8	45
3/4"	6-3/4	15	2-13/16	4-5/8	9/16	- -	3-1/4	- -	4	5/8	3/4	46
1"	6-3/4	15	2-13/16	4-7/8	9/16	- -	3-1/2	- -	4	5/8	3/4	47
1-1/4"	7	15-1/4	3-1/16	5-1/4	9/16	- -	3-7/8	- -	4	5/8	3/4	51
1-1/2"	7-1/2	15-5/8	3-7/16	6-1/8	9/16	- -	4-1/2	- -	4	3/4	7/8	58
2"	8-3/4	16-1/8	3-1/2	6-1/2	5/8	- -	5	- -	8	5/8	3/4	71
2-1/2"	9-3/4	17	4-3/8	7-1/2	11/16	- -	5-7/8	- -	8	3/4	7/8	88
3"	11	17-1/2	5-1/4	8-1/4	3/4	- -	6-5/8	- -	8	3/4	7/8	118
3-1/2"	12	18-1/8	6	9	13/16	- -	7-1/4	- -	8	3/4	7/8	145
4"	13	19-3/4	7	10	1-1/16	- -	7-7/8	- -	8	3/4	7/8	190
5"	16	22-1/2	10-3/4	11	1-1/8	- -	9-1/4	- -	8	3/4	7/8	365
6"	15	22-1/4	10-3/8	12-1/2	1-3/16	- -	10-5/8	- -	12	3/4	7/8	395

* Add 1/2" for sizes 1/2" to 1-1/2" and 3/4" for 2" size on Classes PRLK & PTLK.
** Approximate.
Ⓐ Removable only in 1/2" to 3" sizes for Classes PRLK & PTLK.

SEE REVERSE SIDE FOR PART NAME AND PART REFERENCE NUMBER

LESLIE CO.
LYNDHURST, NEW JERSEY

PUMP PRESSURE REGULATOR
1/2" TO 6" CLASSES PRL,
PTL, PRLK AND PTLK

DATE 5-28-54
D.W.N. H.R.G. C'K'D AHK

DWG. NO. C-3363

Printed in U.S.A.

DRAWING NUMBER C-3363, CLASSES PRL, PTL, PRLK AND PTLK
WHEN ORDERING PARTS, GIVE SIZE, CLASS, PART NAME AND PART REFERENCE NUMBER FROM TABLE BELOW
USE PART NUMBER ONLY TO LOCATE PART ON DRAWING

PART NO.	PART NAME	MATERIAL	REFERENCE NUMBERS-EACH SIZE											
			1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	5"	6"
1	Bolt and Nut (PRL & PTL)	Steel	9008	9008	9008	9008	9008	4021	4021	3653	3653	19389	NOTE 1	12984
1	Bolt and Nut (PRLK & PTLK)	Steel	23624	23624	23624	23624	23624	23624	4021	3653	- -	19389	NOTE 1	12984
2	Top Cap	Cast Bronze	9360	9360	9360	9361	9362	9363	9339	9811	20072	13703	21087	21086
3	Top Cap Gasket (PRL & PTL)	Copper-Asbestos	4960	4960	4960	4945	4977	9003	9099	9177	9195	11967	18208	16024
3	Top Cap Gasket (PRLK & PTLK)	Sheet Packing	23567	23567	23567	23568	23569	23570	30320	30321	- -	30414	17293	17288
4	Cylinder Liner	Stl. Steel, Hardened	11121	11121	11121	11172	11189	11122	11209	11195	11223	11966	18198	18329
5	Piston Ring (NOTE 2)	Cast Iron	3355	3355	3355	3358	3359	3361	3362	3363	3365	3367	21088	19949
6	Piston (NOTE 3)	Cast Bronze	9344	9344	9344	9379	9403	9481	9343	9463	9482	11971	21268	19959
7	Main Body, Screwed (PRL & PTL) (NOTE 4)	Cast Bronze	9400	9414	9528	9413	9412	9511	- -	- -	- -	- -	- -	- -
7	Main Body, Screwed (PRLK & PTLK) (NOTE 4)	Cast Iron	23500	23499	23505	23498	23495	23524	- -	- -	- -	- -	- -	- -
7	Main Body, 125# Flg. (PRLK & PTLK) (NOTE 4)	Cast Iron	- -	- -	- -	- -		30962	26092	26093	- -	21722	18201	15838
7	Main Body, 250# Flg. (PRLK & PTLK) (NOTE 4)	Cast Iron	- -	- -	- -	- -		30963	26156	26162	- -	- -	- -	- -
7	Main Body, 150# Flg. (PRL & PTL) (NOTE 4)	Cast Bronze	9487C	9489C	9529C	9530C	9387C	9521C	9411C	9494C	9512C	11969C	18378	16782
7	Main Body, 300# Flg. (PRL & PTL) (NOTE 4)	Cast Bronze	9487	9489	9529	9530	9387	9521	9411	9494	9512	11969	18379	16798
8	Main Valve	Stl. Steel, Hardened	13282	13282	13283	13284	13285	11124	31427	31428	31429	31430	31431	31432
9	Seat Ring	Stl. Steel (NOTE 5)	9821	9821	9445	9544	9446	9447	9448	9569	9562	11970	21241	19943
10	Main Valve Spring	Inconel	9464	9464	9464	10201	3629	9252	9087	9176	4478	4478	21260	21260
11	Bottom Cap Gasket (PRL & PTL)	(NOTE 6)	3500	3500	3500	3499	9276	3504	9100	9178	9196	3508	18254	18255
11	Bottom Cap Gasket (PRLK & PTLK)	Sheet Packing	28138	28138	28138	28139	28140	18334	18524	18525	- -	18526	18248	18249
12	Bottom Cap Bushing (PRLK & PTLK)	Bronze (NOTE 7)	23497	23497	23497	23501	23503	23526	26101	26119	- -	- -	- -	- -
13	Bottom Cap (PRL & PTL)	Cast Bronze	3116	3116	3116	4241	9405	3122	9098	9175	9193	3126	18395	15442
13	Bottom Cap (PRLK & PTLK)	(NOTE 8)	23496	23496	23496	23502	23504	23525	26100	26118	- -	3126	18202	15840
14	Dowel Pin	Brass	3702	3702	3702	3702	3702	3702	3702	3702	3702	3705	3705	3705
15	Cap Screw, Bottom Cap	Steel	- -	- -	- -	- -	- -	3709	9130	3712	3712	3716	- -	- -
15	Bolt and Nut, Bottom Cap	Steel	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	13145	12984
16	Controlling Valve Housing	Cast Bronze	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	9360	9360
17	Cap Screw	Steel	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	3709	3709
18	Dowel Pin	Brass	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	3702	3702
19	Housing Gasket	Copper-Asbestos	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	4960	4960
	Seat Ring Wrench	Malleable Iron	9551	9551	9552	9553	9554	9555	9144	9232	9233	12008	22157	22157

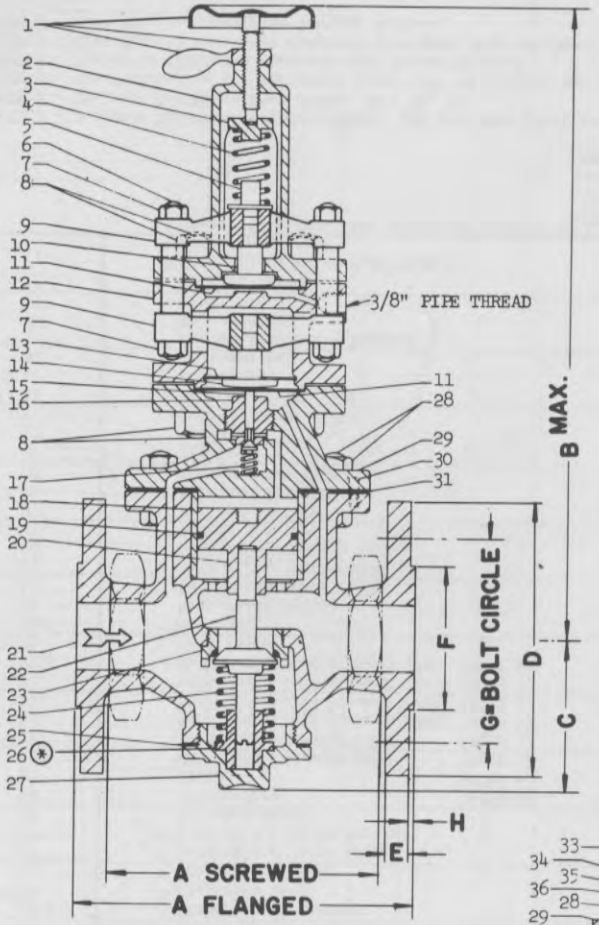
	ALL PARTS LISTED BELOW ARE INTERCHANGEABLE IN ALL SIZES 1/2" TO 6"		REFERENCE NUMBERS 1/2" TO 6"
20	Screw, Connecting Rod Guide	Brass	9837
21	Diaphragm Disc	Cast Bronze	9577
22	Diaphragm Chamber (PTL & PTLK)	Cast Steel	11518
22	Diaphragm Chamber (PRL & PRLK)	Cast Steel	11519
23	Diaphragm	Stainless Steel	4552
24	Diaphragm Stem Cap	Brass	13838
25	Crosshead	Cast Bronze	9575
26	Diaphragm Stem	Brass	4864
27	Diaphragm Stem Guide	Bronze	4872
28	Diaphragm Spacer (NOTE 9)	Cast Iron	20620
29	Stud and Nut	Steel	9810
30	Adjusting Screw, Complete (NOTE 10)	Stainless Steel	9136
31	Adjusting Spring Case	Cast Bronze	9574
32	Top Spring Seat	Brass	4869
33	Adjusting Spring	Spring Steel, Plated	3572
34	Bottom Spring Seat	Brass	4870
35	Cap Screw, Spring Case	Steel	9130
36	Connecting Rod	Bronze	9838
37	Nut, Connecting Rod	Brass	9340
38	Upper Diaphragm	Stainless Steel	9814
39	Connecting Rod Guide	Bronze	9836
40	Steam Chamber (PTL & PTLK)	Cast Steel	10053
41	Needle Valve Body Gasket	Sheet Steel	10559
42	Needle Valve, Compl. (PTL & PTLK) (NOTE 11)	Monel	10795
43	Needle Valve Body (PTL & PTLK)	Stainless Steel	10564
44	Connector Nut	Monel	10794
45	Connector Gland	Brass	9347
46	Connector Packing	Molded Rings	13194
47	Connector Union	Monel	10212
48	Controlling Valve Seat	Stainless Steel	9433
49	Controlling Valve	Stl. Steel, Hardened	4938
50	Controlling Valve Spring	Inconel	4930
51	Connector Nipple (PRL & PRLK)	Stainless Steel	10789
	Controlling Valve Seat Wrench	Malleable Iron	9036

CLASSES PRLB AND PTLB

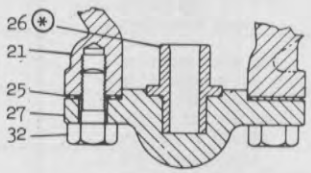
When ordering parts for above Classes use Reference Numbers shown for Classes PRL and PTL.

NOTE 1 - 5" size is assembled with eight (8) Bolts and Nuts, Ref. No. 13145 and four (4) Cap Screws, Ref. No. 4066.
NOTE 2 - One Piston Ring per Regulator sizes 1/2" to 1-1/2"; two Piston Rings per Regulator sizes 2" to 6".
NOTE 3 - Piston is furnished complete with Piston Ring(s).
NOTE 4 - Main Body is furnished complete with Seat Ring and Dowel Pin.
NOTE 5 - Seat Ring has Stellited Seating Surface.
NOTE 6 - Bottom Cap Gasket Material is Copper Annealed for 1/2" to 1-1/2" sizes and Copper, Asbestos Filled for 2" to 6" sizes.
NOTE 7 - Not used in 4" size. 5" and 6" Bushings are Stainless Steel welded to Bottom Cap.
NOTE 8 - Material is Cast Iron for 1/2" to 3" and 5" and 6" sizes. Cast Bronze for 4" size.
NOTE 9 - Includes Diaphragm Stem Guide, Part No. 26.
NOTE 10 - Includes Handwheel (Pressed Steel) and Lock Nut (Cast Iron)
NOTE 11 - Includes Needle Valve Bonnet, Nut, Stem, Head and Packing.

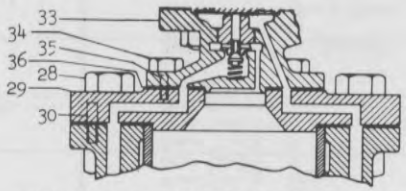
FOR ALL CLASSES NOT LISTED, PLEASE ORDER PARTS BY NAME AND INCLUDE SIZE, CLASS AND SERIAL NUMBER STAMPED ON BOTTOM FLANGE OF TOP CAP.



Gradual Opening Plug Type Main Valve in 2-1/2" to 6" sizes.



FLANGED BOTTOM CAP FOR 2" TO 4" SIZES.



TOP CAP DESIGN FOR 4", 5" AND 6" SIZES

DIMENSIONS IN INCHES

SIZE	A	B	C	D	E	F	G	H	No. of Holes	Bolt Size	Bolt Hole	Net Wt. Lb. **
SCREWED (PR & PRK)												
1/2"	5-3/4	13-5/8	2-13/16 *	- -	- -	- -	- -	- -	- -	- -	- -	26
3/4"	5-3/4	13-5/8	2-13/16 *	- -	- -	- -	- -	- -	- -	- -	- -	26
1"	5-3/4	13-5/8	2-13/16 *	- -	- -	- -	- -	- -	- -	- -	- -	26
1-1/4"	5-3/4	13-7/8	3-1/16 *	- -	- -	- -	- -	- -	- -	- -	- -	30
1-1/2"	6-1/4	14-1/4	3-7/16 *	- -	- -	- -	- -	- -	- -	- -	- -	34
2"	7-1/2	14-3/4	3-1/2 *	- -	- -	- -	- -	- -	- -	- -	- -	46
FLANGED 125 LB. ASA STANDARD (PRK)												
1-1/2"	7-1/2	14-1/4	4-1/8	5	9/16	- -	3-7/8	- -	4	1/2	5/8	36
2"	8-3/4	14-3/4	4-3/8	6	5/8	- -	4-3/4	- -	4	5/8	3/4	46
2-1/2"	9-3/4	15-5/8	5-1/2	7	11/16	- -	5-1/2	- -	4	5/8	3/4	56
3"	11	16-1/8	6-1/2	7-1/2	3/4	- -	6	- -	4	5/8	3/4	86
4"	13-1/2	17-5/8	7	9	15/16	- -	7-1/2	- -	8	5/8	3/4	156
5"	16	21-1/8	10-3/4	10	15/16	- -	8-1/2	- -	8	3/4	7/8	310
6"	15	20-7/8	10-3/8	11	1	- -	9-1/2	- -	8	3/4	7/8	335
FLANGED 250 LB. ASA STANDARD (PRK)												
1-1/2"	8	14-1/4	4-1/8	6-1/8	3/4	3-9/16	4-1/2	1/16	4	3/4	7/8	46
2"	9-1/4	14-3/4	4-3/8	6-1/2	13/16	4-3/16	5	1/16	8	5/8	3/4	56
2-1/2"	10-3/8	15-5/8	5-1/2	7-1/2	15/16	4-15/16	5-7/8	1/16	8	3/4	7/8	66
3"	11-3/4	16-1/8	6-1/2	8-1/4	1-1/16	5-11/16	6-5/8	1/16	8	3/4	7/8	96
FLANGED 150 LB. MSS STANDARD (PR)												
1/2"	6-3/4	13-5/8	2-13/16	3-1/2	9/16	- -	2-3/8	- -	4	1/2	5/8	29
3/4"	6-3/4	13-5/8	2-13/16	3-7/8	9/16	- -	2-3/4	- -	4	1/2	5/8	30
1"	6-3/4	13-5/8	2-13/16	4-1/4	9/16	- -	3-1/8	- -	4	1/2	5/8	31
1-1/4"	7	13-7/8	3-1/16	4-5/8	9/16	- -	3-1/2	- -	4	1/2	5/8	35
1-1/2"	7-1/2	14-1/4	3-7/16	5	9/16	- -	3-7/8	- -	4	1/2	5/8	42
2"	8-3/4	14-3/4	3-1/2	6	5/8	- -	4-3/4	- -	4	5/8	3/4	55
2-1/2"	9-3/4	15-5/8	4-3/8	7	11/16	- -	5-1/2	- -	4	5/8	3/4	71
3"	11	16-1/8	5-1/4	7-1/2	3/4	- -	6	- -	4	5/8	3/4	100
3-1/2"	12	16-3/4	6	8-1/2	11/16	- -	7	- -	8	5/8	3/4	120
4"	13	17-5/8	7	9	11/16	- -	7-1/2	- -	8	5/8	3/4	160
5"	16	21-1/8	10-3/4	10	15/16	- -	8-1/2	- -	8	3/4	7/8	320
6"	15	20-7/8	10-3/8	11	1	- -	9-1/2	- -	8	3/4	7/8	345
FLANGED 300 LB. MSS STANDARD (PR)												
1/2"	6-3/4	13-5/8	2-13/16	3-3/4	9/16	- -	2-5/8	- -	4	1/2	5/8	30
3/4"	6-3/4	13-5/8	2-13/16	4-5/8	9/16	- -	3-1/4	- -	4	5/8	3/4	31
1"	6-3/4	13-5/8	2-13/16	4-7/8	9/16	- -	3-1/2	- -	4	5/8	3/4	32
1-1/4"	7	13-7/8	3-1/16	5-1/4	9/16	- -	3-7/8	- -	4	5/8	3/4	36
1-1/2"	7-1/2	14-1/4	3-7/16	6-1/8	9/16	- -	4-1/2	- -	4	3/4	7/8	43
2"	8-3/4	14-3/4	3-1/2	6-1/2	5/8	- -	5	- -	8	5/8	3/4	56
2-1/2"	9-3/4	15-5/8	4-3/8	7-1/2	11/16	- -	5-7/8	- -	8	3/4	7/8	73
3"	11	16-1/8	5-1/4	8-1/4	3/4	- -	6-5/8	- -	8	3/4	7/8	103
3-1/2"	12	16-3/4	6	9	13/16	- -	7-1/4	- -	8	3/4	7/8	130
4"	13	17-5/8	7	10	1-1/16	- -	7-7/8	- -	8	3/4	7/8	175
5"	16	21-1/8	10-3/4	11	1-1/8	- -	9-1/4	- -	8	3/4	7/8	350
6"	15	20-7/8	10-3/8	12-1/2	1-3/16	- -	10-5/8	- -	12	3/4	7/8	370

* Add 1/2" for sizes 1/2" to 1-1/2" and 3/4" for size 2" on Class PRK.

** Approximate.

(*) Removable only in 1/2" to 3" sizes for Class PRK.

SEE REVERSE SIDE FOR PART NAME AND PART REFERENCE NUMBER

LESLIE CO.
LYNDHURST, NEW JERSEY

PUMP PRESSURE REGULATOR
1/2" TO 6" CLASSES PR AND PRK

DATE 5-27-54 | DWG. NO. CP-117

D'W'N. K. G | C'K'D

Printed in U.S.A.

DRAWING NUMBER CP-117, CLASSES PR AND PRK
WHEN ORDERING PARTS, GIVE SIZE, CLASS, PART NAME AND PART REFERENCE NUMBER FROM TABLE BELOW
USE PART NUMBER ONLY TO LOCATE PART ON DRAWING

PART NO.	PART NAME	MATERIAL	REFERENCE NUMBERS-EACH SIZE											
			1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	5"	6"
1	* Adjusting Screw, Complete (NOTE 1)	Stainless Steel	9136	9136	9136	9136	9136	9136	9136	9136	9136	9136	9136	9136
2	* Adjusting Spring Case	Cast Bronze	9370	9370	9370	9370	9370	9370	9370	9370	9370	9370	9370	9370
3	* Top Spring Seat	Brass	4869	4869	4869	4869	4869	4869	4869	4869	4869	4869	4869	4869
4	* Adjusting Spring	Spring Steel, Plated	3572	3572	3572	3572	3572	3572	3572	3572	3572	3572	3572	3572
5	* Bottom Spring Seat	Brass	4870	4870	4870	4870	4870	4870	4870	4870	4870	4870	4870	4870
6	* Connecting Rod	Bronze	4877	4877	4877	4877	4877	4877	4877	4877	4877	4877	4877	4877
7	* Nut, Connecting Rod	Brass	9340	9340	9340	9340	9340	9340	9340	9340	9340	9340	9340	9340
8	* Stud Bolt and Nut	Steel	9335	9335	9335	9335	9335	9335	9335	9335	9335	9335	9335	9335
9	* Crosshead	Cast Iron	12551	12551	12551	12551	12551	12551	12551	12551	12551	12551	12551	12551
10	* Diaphragm Disc	Brass	4865	4865	4865	4865	4865	4865	4865	4865	4865	4865	4865	4865
11	* Diaphragm	Stainless Steel	4552	4552	4552	4552	4552	4552	4552	4552	4552	4552	4552	4552
12	* Diaphragm Case (NOTE 2)	Cast Bronze	9523	9523	9523	9523	9523	9523	9523	9523	9523	9523	9523	9523
13	* Diaphragm Stem Guide	Bronze	4872	4872	4872	4872	4872	4872	4872	4872	4872	4872	4872	4872
14	* Diaphragm Stem	Brass	4864	4864	4864	4864	4864	4864	4864	4864	4864	4864	4864	4864
15	* Controlling Valve	Stainless Steel, Hardened	4938	4938	4938	4938	4938	4938	4938	4938	4938	4938	4938	4938
16	* Controlling Valve Seat	Stainless Steel	9433	9433	9433	9433	9433	9433	9433	9433	9433	9433	9433	9433
17	* Controlling Valve Spring	Corrosion Resistant Steel	4930	4930	4930	4930	4930	4930	4930	4930	4930	4930	4930	4930
18	Cylinder Liner	Stainless Steel, Hardened	11121	11121	11121	11172	11189	11122	11209	11195	11223	11966	18198	18329
19	Piston Ring (NOTE 3)	Cast Iron	3355	3355	3355	3358	3359	3361	3362	3363	3365	3367	21088	19949
20	Piston (NOTE 4)	Cast Bronze	9344	9344	9344	9379	9403	9481	9343	9463	9482	11971	21268	19959
21	Main Body, Screwed (PR) (NOTE 5)	Cast Bronze	9400	9414	9528	9413	9412	9511	- -	- -	- -	- -	- -	- -
21	Main Body, Screwed (PRK) (NOTE 5)	Cast Iron	23500	23499	23505	23498	23495	23524	- -	- -	- -	- -	- -	- -
21	Main Body, 125# Flanged (PRK) (NOTE 5)	Cast Iron	- -	- -	- -	- -		30962	26092	26093	- -	21722	18201	15838
21	Main Body, 250# Flanged (PRK) (NOTE 5)	Cast Iron	- -	- -	- -	- -		30963	26156	26162	- -	- -	- -	- -
21	Main Body, 150# Flanged (PR) (NOTE 5)	Cast Bronze	9487C	9489C	9529C	9530C	9387C	9521C	9411C	9494C	9512C	11969C	18378	16782
21	Main Body, 300# Flanged (PR) (NOTE 5)	Cast Bronze	9487	9489	9529	9530	9387	9521	9411	9494	9512	11969	18379	16798
22	Main Valve	Stainless Steel, Hardened	13282	13282	13283	13284	13285	11124	31427	31428	31429	31430	31431	31432
23	Seat Ring	Stainless Steel (NOTE 6)	9821	9821	9445	9544	9446	9447	9448	9569	9562	11970	21241	19943
24	Main Valve Spring	Corrosion Resistant Steel	9464	9464	9464	10201	3629	9252	9087	9176	4478	4478	21260	21260
25	Bottom Cap Gasket (PR)	(NOTE 7)	3500	3500	3500	3499	9276	3504	9100	9178	9196	3508	18254	18255
25	Bottom Cap Gasket (PRK)	Sheet Packing	28138	28138	28138	28139	28140	18334	18524	18525	- -	18526	18248	18249
26	Bottom Cap Bushing (PRK)	Bronze (NOTE 8)	23497	23497	23497	23501	23503	23526	26101	26119	- -	- -	- -	- -
27	Bottom Cap (PR)	Cast Bronze	3116	3116	3116	4241	9405	3122	9098	9175	9193	3126	18395	15442
27	Bottom Cap (PRK)	(NOTE 10)	23496	23496	23496	23502	23504	23525	26100	26118	- -	3126	18202	15840
28	Bolt and Nut (PR)	Steel	9008	9008	9008	9008	9008	4021	4021	3653	3653	19389	NOTE 9	12984
28	Bolt and Nut (PRK)	Steel	23624	23624	23624	23624	23624	23624	4021	3653	- -	19389	NOTE 9	12984
29	Top Cap	Cast Bronze	9522	9522	9522	9532	9497	9498	9533	11792	19924	21340	21087	21086
30	Dowel Pin	Brass	3702	3702	3702	3702	3702	3702	3702	3702	3702	3705	3705	3705
31	Top Cap Gasket (PR)	Copper, Asbestos Filled	4960	4960	4960	4945	4977	9003	9099	9177	9195	11967	18208	16024
31	Top Cap Gasket (PRK)	Sheet Packing	23567	23567	23567	23568	23569	23570	30320	30321	- -	30414	17293	17288
32	Cap Screw	Steel	- -	- -	- -	- -	- -	3709	9130	3716	3712	3716	- -	- -
32	Bolt and Nut	Steel	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	13145	12984
33	Controlling Valve Housing	Cast Bronze	- -	- -	- -	- -	- -	- -	- -	- -	- -	9522	9522	9522
34	Cap Screw	Steel	- -	- -	- -	- -	- -	- -	- -	- -	- -	3709	3709	3709
35	Dowel Pin	Brass	- -	- -	- -	- -	- -	- -	- -	- -	- -	3702	3702	3702
36	Housing Gasket	Copper, Asbestos Filled	- -	- -	- -	- -	- -	- -	- -	- -	- -	4960	4960	4960
	* Controlling Valve Seat Wrench	Malleable Iron	9036	9036	9036	9036	9036	9036	9036	9036	9036	9036	9036	9036
	Seat Ring Wrench	Malleable Iron	9551	9551	9552	9553	9554	9555	9144	9232	9233	12008	22157	22157

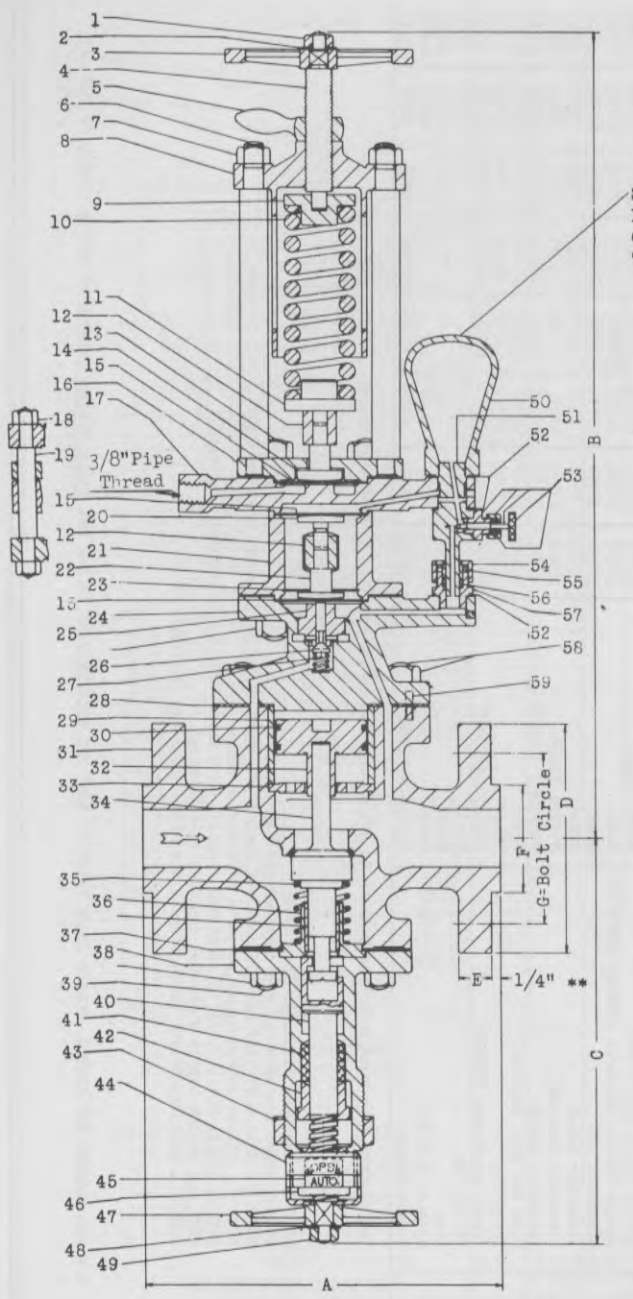
* These items have same Reference Numbers in all sizes indicating complete interchangeability.

CLASSES PRB AND P-1

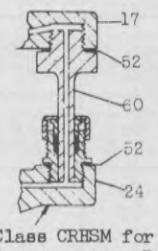
When ordering parts for above Classes, use Reference Numbers shown for Class PR.

NOTE 1 - Includes Handwheel (Pressed Steel) and Lock Nut (Cast Iron).
NOTE 2 - Includes Diaphragm Stem Guide, Part No. 13.
NOTE 3 - One Piston Ring per Regulator sizes 1/2" to 1-1/2"; two Piston Rings per Regulator sizes 2" to 6".
NOTE 4 - Piston is furnished complete with Piston Ring(s).
NOTE 5 - Main Body is furnished complete with Seat Ring and Dowel Pin.
NOTE 6 - Seat Ring has Stellited Seating Surface.
NOTE 7 - Material is Copper, Annealed for 1/2" to 1-1/2" sizes and Copper, Asbestos Filled for 2" to 6" sizes.
NOTE 8 - Not used in 4" size. 5" and 6" Bushings are Stainless Steel welded to Bottom Cap.
NOTE 9 - 5" size is assembled with 8 Bolts and Nuts, Ref. No. 13145 and 4 Cap Screws, Ref. No. 4066.
NOTE 10 - Material is Cast Iron for 1/2" to 3" and 5" and 6" sizes. Cast Bronze for 4" size.

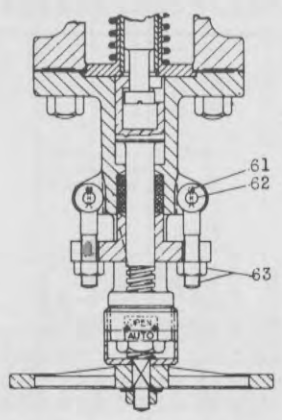
FOR ALL CLASSES NOT LISTED PLEASE ORDER PARTS BY NAME AND INCLUDE SIZE, CLASS AND SERIAL NUMBER STAMPED ON BOTTOM FLANGE OF TOP CAP.



Steam Chamber and Needle Valve used on Class CTHSM for Turbine Driven Pumps.



Class CRHSM for Reciprocating Pumps has this type of connection between Diaphragm Chamber 17 and Top Cap 24.



Pull Open Device shown above is for 2-1/2" & 3" sizes.

DIMENSIONS IN INCHES											
Size	A	B	C	D	E	F	G	No. of Bolts	Bolt Size	Bolt Hole	Wgt. Lb *
150 Lb. (Series 15) ASA Flange Standard											
1/2"	7-5/8	20-1/2	10-1/2	3-1/2	5/16	1-3/8	2-3/8	4	1/2	9/16	63
3/4"	7-5/8	20-1/2	10-1/2	3-7/8	3/8	1-11/16	2-3/4	4	1/2	9/16	64
1"	7-1/2	20-1/2	10-1/2	4-1/4	3/8	2	3-1/8	4	1/2	9/16	65
1-1/4"	7-7/8	20-3/4	11	4-5/8	7/16	2-1/2	3-1/2	4	1/2	9/16	70
1-1/2"	8-3/8	21-1/8	11-3/8	5	1/2	2-7/8	3-7/8	4	1/2	9/16	78
2"	10-1/4	21-5/16	11-3/4	6	9/16	3-5/8	4-3/4	4	5/8	11/16	102
2-1/2"	11-5/8	22-5/16	15-3/4	7	5/8	4-1/8	5-1/2	4	5/8	11/16	146
3"	12-1/2	23-5/16	17-11/16	7-1/2	11/16	5	6	4	5/8	11/16	178
300 Lb. (Series 30) ASA Flange Standard											
1/2"	8	20-1/2	10-1/2	3-3/4	1/2	1-3/8	2-5/8	4	1/2	9/16	63
3/4"	8	20-1/2	10-1/2	4-5/8	9/16	1-11/16	3-1/4	4	5/8	11/16	64
1"	8	20-1/2	10-1/2	4-7/8	5/8	2	3-1/2	4	5/8	11/16	65
1-1/4"	8-3/8	20-3/4	11	5-1/4	11/16	2-1/2	3-7/8	4	5/8	11/16	71
1-1/2"	8-7/8	21-1/8	11-3/8	6-1/8	3/4	2-7/8	4-1/2	4	3/4	13/16	79
2"	10-3/4	21-5/16	11-3/4	6-1/2	13/16	3-5/8	5	8	5/8	11/16	105
2-1/2"	12-1/4	22-5/16	15-3/4	7-1/2	15/16	4-1/8	5-7/8	8	3/4	13/16	152
3"	13-1/4	23-5/16	17-11/16	8-1/4	1-1/16	5	6-5/8	8	3/4	13/16	187
600 Lb. (Series 60) ASA Flange Standard											
1/2"	8-1/2	20-1/2	10-1/2	3-3/4	9/16	1-3/8	2-5/8	4	1/2	9/16	64
3/4"	8-1/2	20-1/2	10-1/2	4-5/8	5/8	1-11/16	3-1/4	4	5/8	11/16	65
1"	8-1/2	20-1/2	10-1/2	4-7/8	11/16	2	3-1/2	4	5/8	11/16	66
1-1/4"	9	20-3/4	11	5-1/4	13/16	2-1/2	3-7/8	4	5/8	11/16	72
1-1/2"	9-1/2	21-1/8	11-3/8	6-1/8	7/8	2-7/8	4-1/2	4	3/4	13/16	80
2"	11-1/2	21-5/16	11-3/4	6-1/2	1	3-5/8	5	8	5/8	11/16	106
2-1/2"	13	22-5/16	15-3/4	7-1/2	1-1/8	4-1/8	5-7/8	8	3/4	13/16	153
3"	14	23-5/16	17-11/16	8-1/4	1-1/4	5	6-5/8	8	3/4	13/16	188

* Approximate

** 150 and 300 Lb. Standard 1/16" Raised Face.

SEE REVERSE SIDE FOR PART NAME AND PART REFERENCE NUMBER.

LESLIE CO.
LYNDHURST, NEW JERSEY

PUMP PRESSURE REGULATOR
SIZES 1/2" TO 3"
CLASSES CRHSM AND CTHSM

DATE 7-5-50 D'W'N. C'K'D. DWG. NO. C-5632

Printed in U.S.A.

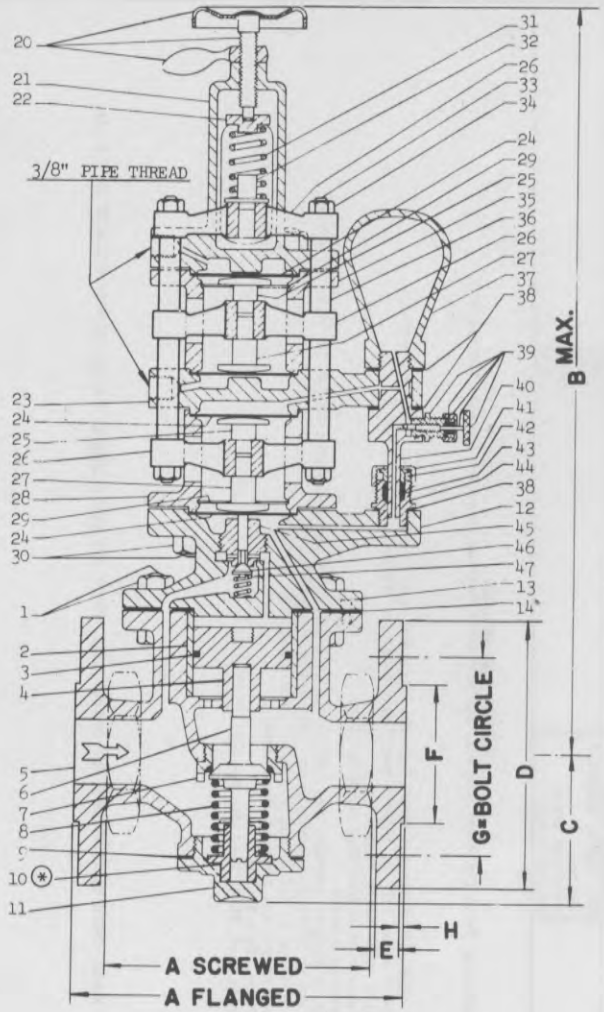
DRAWING NUMBER C-5632, CLASSES CRHSM AND CTHSM
WHEN ORDERING PARTS, GIVE SIZE, CLASS, PART NAME AND PART REFERENCE NUMBER FROM TABLE BELOW
USE PART NUMBER ONLY TO LOCATE PART ON DRAWING

PART NO.	PART NAME	MATERIAL	REFERENCE NUMBER-EACH SIZE							
			1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"
1	* Nut, Handwheel	Brass	9340	9340	9340	9340	9340	9340	9340	9340
2	* Washer	Brass	10606	10606	10606	10606	10606	10606	10606	10606
3	* Handwheel	Cast Bronze	13171	13171	13171	13171	13171	13171	13171	13171
4	* Adjusting Screw	Stainless Steel	12488	12488	12488	12488	12488	12488	12488	12488
5	* Lock Nut	Cast Bronze	12489	12489	12489	12489	12489	12489	12489	12489
6	* Column	Cold Rolled Steel	12483	12483	12483	12483	12483	12483	12483	12483
7	* Nut, Column	Steel	3676	3676	3676	3676	3676	3676	3676	3676
8	* Adjusting Spring Cover	Cast Bronze	12825	12825	12825	12825	12825	12825	12825	12825
9	* Top Spring Seat	Brass	12855	12855	12855	12855	12855	12855	12855	12855
10	* Adjusting Spring	Spring Steel, Plated	12857	12857	12857	12857	12857	12857	12857	12857
11	* Bottom Spring Seat	Brass	12856	12856	12856	12856	12856	12856	12856	12856
12	* Crosshead	Cast Iron	12551	12551	12551	12551	12551	12551	12551	12551
13	* Stud Bolt and Nuts	Steel	9336	9336	9336	9336	9336	9336	9336	9336
14	* Diaphragm Disc	Brass	13823	13823	13823	13823	13823	13823	13823	13823
15	* Diaphragm	Stainless Steel	10425	10425	10425	10425	10425	10425	10425	10425
16	* Plate	Steel	12484	12484	12484	12484	12484	12484	12484	12484
17	* Diaphragm Chamber (CRHSM)	Cast Steel	13596	13596	13596	13596	13596	13596	13596	13596
17	* Diaphragm Chamber (CTHSM)	Cast Steel	13588	13588	13588	13588	13588	13588	13588	13588
18	* Nut, Connecting Rod	Brass	9340	9340	9340	9340	9340	9340	9340	9340
19	* Connecting Rod	Bronze	10790	10790	10790	10790	10790	10790	10790	10790
20	* Diaphragm Stem Cap	Brass	12153	12153	12153	12153	12153	12153	12153	12153
21	* Diaphragm Spacer (NOTE 1)	Cast Iron	20620	20620	20620	20620	20620	20620	20620	20620
22	* Diaphragm Stem	Brass	13824	13824	13824	13824	13824	13824	13824	13824
23	* Diaphragm Stem Guide	Phosphor Bronze	4872	4872	4872	4872	4872	4872	4872	4872
24	Top Cap	Cast Steel	11144	11144	11144	11145	11374	11371	11211	11372
25	* Controlling Valve Seat	Stainless Steel	21906	21906	21906	21906	21906	21906	21906	21906
26	* Controlling Valve	Stainless Steel, Hardened	4938	4938	4938	4938	4938	4938	4938	4938
27	* Controlling Valve Spring	Corrosion Resistant Steel	10756	10756	10756	10756	10756	10756	10756	10756
28	Top Cap Gasket	Copper, Asbestos Filled	13640	13640	13640	13641	13642	13643	16254	13645
29	Cylinder Liner	Stainless Steel, Hardened	11121	11121	11121	11172	11189	11122	11209	11195
30	Piston Rings (NOTE 2)	Cast Iron	3355	3355	3355	3358	3359	3361	3362	3363
31	Main Body, Flanged 150 Lb. (NOTE 3)	Cast Steel, Stellited	14412	14536	14384	14386	14388	14507	14418	14381
31	Main Body, Flanged 300 Lb. (NOTE 3)	Cast Steel, Stellited	14438	14537	14420	14437	14427	14428	14439	14389
31	Main Body, Flanged 600 Lb. (NOTE 3)	Cast Steel, Stellited	14411	14425	14385	14387	14415	14416	14417	14419
32	Piston (NOTE 4)	Stainless Steel	10686	10686	10686	10705	10737	9439	9442	9570
33	Cylinder Bottom	Cast Iron	10054	10054	10054	10055	10056	10057	10058	10059
34	Main Valve	Stainless Steel, Hardened	11645	11645	11165	11646	11203	20636	20593	21365
35	Main Valve Spring	Corrosion Resistant Steel	10740	10740	10740	10822	10741	10741	10821	10731
36	Main Valve Guide Complete (NOTE 5)	Steel	10598	10598	10598	10704	10727	20640	10693	10711
37	Bottom Cap Gasket	Copper, Annealed	11345	11345	11345	11346	11347	11348	11349	11350
38	Bottom Cap, Complete (NOTE 6)	Cast Steel	20646	20646	20646	20647	20648	20639	20649	21376
39	Stud and Nut, Bottom Cap	Steel	9465	9465	9465	9465	9465	11106	11106	11107
40	Stem	Stainless Steel	13152	13152	13152	13152	13152	13152	13153	10713
41	Stem Packing Set	Molded Rings	14461	14461	14461	14461	14461	14461	14462	14463
42	Gland	Bronze	10602	10602	10602	10602	10602	10602	10697	10715
43	Gland Nut	Cast Bronze	10603	10603	10603	10603	10603	10603	- -	- -
44	Indicator Cap	Cast Bronze	13149	13149	13149	13160	13160	13160	13150	13151
45	* Indicator Plate	Brass	13163	13163	13163	13163	13163	13163	13163	13163
46	Bushing	Cast Bronze	10601	10601	10601	10601	10601	10601	10696	10714
47	Handwheel	Cast Bronze	13171	13171	13171	13171	13171	13171	13172	10700
48	Washer	Brass	10606	10606	10606	10606	10606	10606	10264	10606
49	Nut, Handwheel	Brass	9340	9340	9340	9340	9340	9340	3676	3676
50	* Steam Chamber (CTHSM)	Cast Steel	10053	10053	10053	10053	10053	10053	10053	10053
51	* Needle Valve Body (CTHSM)	Stainless Steel	10564	10564	10564	10564	10564	10564	10564	10564
52	* Needle Valve Body Gasket	Sheet Steel	10559	10559	10559	10559	10559	10559	10559	10559
53	* Needle Valve, Complete (CTHSM) (NOTE 7)	Monel	10795	10795	10795	10795	10795	10795	10795	10795
54	* Connector Nut	Monel	10794	10794	10794	10794	10794	10794	10794	10794
55	* Connector Gland	Brass	9347	9347	9347	9347	9347	9347	9347	9347
56	* Connector Packing	Molded Rings	13194	13194	13194	13194	13194	13194	13194	13194
57	* Connector Union	Monel	10212	10212	10212	10212	10212	10212	10212	10212
58	Stud and Nut, Top Cap	Steel	11106	11106	11106	11106	11106	11107	11107	11108
59	* Dowel Pin	Brass	3702	3702	3702	3702	3702	3702	3702	3702
60	* Connector Nipple (CRHSM)	Stainless Steel	10789	10789	10789	10789	10789	10789	10789	10789
61	Cotter Pin	Monel	- -	- -	- -	- -	- -	- -	7080	7080
62	Pin	Monel	- -	- -	- -	- -	- -	- -	10701	10701
63	Eyebolt and Nut	Steel	- -	- -	- -	- -	- -	- -	10698	10698
	* Socket Wrench	Malleable Iron	9036	9036	9036	9036	9036	9036	9036	9036

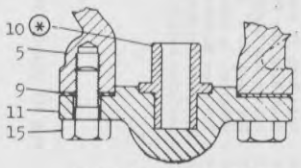
* These items have same Reference Numbers in all sizes, indicating complete interchangeability.

NOTE 1 - Includes Diaphragm Stem Guide.
NOTE 2 - Two Piston Rings are required per Regulator.
NOTE 3 - Main Body is furnished complete with Studs, Nuts, Cylinder Bottom, and Dowel Pin.
NOTE 4 - Piston is furnished complete with Piston Rings.
NOTE 5 - Main Valve Guide is furnished complete with Main Valve Guide Bushing (Hardened).
NOTE 6 - Bottom Cap is furnished complete with Bushing.
NOTE 7 - Includes Needle Valve Bonnet, Nut, Stem, Head and Packing.

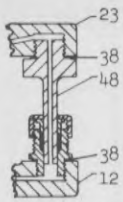
FOR ALL CLASSES NOT LISTED, PLEASE ORDER PARTS BY NAME AND INCLUDE SIZE, CLASS AND SERIAL NUMBER STAMPED ON BOTTOM FLANGE OF TOP CAP.



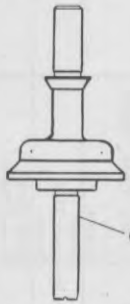
CLASSES XTH AND XTHK
FOR TURBINE DRIVEN PUMPS



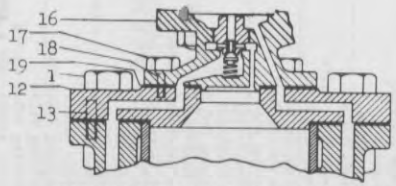
FLANGED BOTTOM CAP ON
2" TO 6" SIZES



Classes XRH and XRHK for Reciprocating Pumps use this type of connection between Diaphragm Chamber 23 and Top Cap 12



Gradual Opening Plug Type Main Valve in 2-1/2" to 6" sizes.



TOP CAP DESIGN FOR 5" AND 6" SIZES

DIMENSIONS IN INCHES

SIZE	A	B	C	D	E	F	G	H	No. of Holes	Bolt Size	Bolt Hole	Net Wt. Lb. **
SCREWED (XRH, XTH, XRHK & XTHK)												
1/2"	5-3/4	16-3/4	2-13/16 *	- -	- -	- -	- -	- -	- -	- -	- -	41
3/4"	5-3/4	16-3/4	2-13/16 *	- -	- -	- -	- -	- -	- -	- -	- -	41
1"	5-3/4	16-3/4	2-13/16 *	- -	- -	- -	- -	- -	- -	- -	- -	41
1-1/4"	5-3/4	17	3-1/16 *	- -	- -	- -	- -	- -	- -	- -	- -	45
1-1/2"	6-1/4	17-3/8	3-7/16 *	- -	- -	- -	- -	- -	- -	- -	- -	49
2"	7-1/2	17-7/8	3-1/2 *	- -	- -	- -	- -	- -	- -	- -	- -	61
FLANGED 125 LB. ASA STANDARD (XRHK & XTHK)												
1-1/2"	7-1/2	17-3/8	4-1/8	5	9/16	- -	3-7/8	- -	4	1/2	5/8	50
2"	8-3/4	17-7/8	4-3/8	6	5/8	- -	4-3/4	- -	4	5/8	3/4	60
2-1/2"	9-3/4	18-3/4	5-1/2	7	11/16	- -	5-1/2	- -	4	5/8	3/4	70
3"	11	19-1/4	6-1/2	7-1/2	3/4	- -	6	- -	4	5/8	3/4	100
4"	13-1/2	21-1/2	7	9	15/16	- -	7-1/2	- -	8	5/8	3/4	170
5"	16	24-1/4	10-3/4	10	15/16	- -	8-1/2	- -	8	3/4	7/8	225
6"	15	24	10-3/8	11	1	- -	9-1/2	- -	8	3/4	7/8	250
FLANGED 250 LB. ASA STANDARD (XRHK & XTHK)												
1-1/2"	8	17-3/8	4-1/8	6-1/8	3/4	3-9/16	4-1/2	1/16	4	3/4	7/8	60
2"	9-1/4	17-7/8	4-3/8	6-1/2	13/16	4-3/16	5	1/16	8	5/8	3/4	70
2-1/2"	10-3/8	18-3/4	5-1/2	7-1/2	15/16	4-15/16	5-7/8	1/16	8	3/4	7/8	80
3"	11-3/4	19-1/4	6-1/2	8-1/4	1-1/16	5-11/16	6-5/8	1/16	8	3/4	7/8	110
FLANGED 150 LB. MSS STANDARD (XRH & XTH)												
1/2"	6-3/4	16-3/4	2-13/16	3-1/2	9/16	- -	2-3/8	- -	4	1/2	5/8	44
3/4"	6-3/4	16-3/4	2-13/16	3-7/8	9/16	- -	2-3/4	- -	4	1/2	5/8	45
1"	6-3/4	16-3/4	2-13/16	4-1/4	9/16	- -	3-1/8	- -	4	1/2	5/8	46
1-1/4"	7	17	3-1/16	4-5/8	9/16	- -	3-1/2	- -	4	1/2	5/8	50
1-1/2"	7-1/2	17-3/8	3-7/16	5	9/16	- -	3-7/8	- -	4	1/2	5/8	57
2"	8-3/4	17-7/8	3-1/2	6	5/8	- -	4-3/4	- -	4	5/8	3/4	70
2-1/2"	9-3/4	18-3/4	4-3/8	7	11/16	- -	5-1/2	- -	4	5/8	3/4	86
3"	11	19-1/4	5-1/4	7-1/2	3/4	- -	6	- -	4	5/8	3/4	115
3-1/2"	12	19-7/8	6	8-1/2	11/16	- -	7	- -	4	5/8	3/4	135
4"	13	21-1/2	7	9	11/16	- -	7-1/2	- -	4	5/8	3/4	175
5"	16	24-1/4	10-3/4	10	15/16	- -	8-1/2	- -	8	3/4	7/8	350
6"	15	24	10-3/8	11	1	- -	9-1/2	- -	8	3/4	7/8	375
FLANGED 300 LB. MSS STANDARD (XRH & XTH)												
1/2"	6-3/4	16-3/4	2-13/16	3-3/4	9/16	- -	2-5/8	- -	4	1/2	5/8	45
3/4"	6-3/4	16-3/4	2-13/16	4-5/8	9/16	- -	3-1/4	- -	4	5/8	3/4	46
1"	6-3/4	16-3/4	2-13/16	4-7/8	9/16	- -	3-1/2	- -	4	5/8	3/4	47
1-1/4"	7	17	3-1/16	5-1/4	9/16	- -	3-7/8	- -	4	5/8	3/4	51
1-1/2"	7-1/2	17-3/8	3-7/16	6-1/8	9/16	- -	4-1/2	- -	4	3/4	7/8	58
2"	8-3/4	17-7/8	3-1/2	6-1/2	5/8	- -	5	- -	8	5/8	3/4	71
2-1/2"	9-3/4	18-3/4	4-3/8	7-1/2	11/16	- -	5-7/8	- -	8	3/4	7/8	88
3"	11	19-1/4	5-1/4	8-1/4	3/4	- -	6-5/8	- -	8	3/4	7/8	118
3-1/2"	12	19-7/8	6	9	13/16	- -	7-1/4	- -	8	3/4	7/8	145
4"	13	21-1/2	7	10	1-1/16	- -	7-7/8	- -	8	3/4	7/8	190
5"	16	24-1/4	10-3/4	11	1-1/8	- -	9-1/4	- -	8	3/4	7/8	365
6"	15	24	10-3/8	12-1/2	1-3/16	- -	10-5/8	- -	12	3/4	7/8	395

* Add 1/2" for sizes 1/2" to 1-1/2" and 3/4" for 2" size on Classes XRHK & XTHK.
** Approximate.

(*) Removable only in 1/2" to 3" sizes for Classes XRHK and XTHK.

SEE REVERSE SIDE FOR PART NAME AND PART REFERENCE NUMBER

LESLIE CO.
LYNDHURST, NEW JERSEY

PUMP PRESSURE REGULATOR
1/2" TO 6" CLASSES XRH,
XTH, XRHK AND XTHK

DATE 5-28-54
D'W'N H.K.G. C'K'D

DWG. NO. CX-115

Printed in U.S.A.

DRAWING NUMBER CX-115, CLASSES XRH, XTH, XRHK AND XTHK
WHEN ORDERING PARTS, GIVE SIZE, CLASS, PART NAME AND PART REFERENCE NUMBER FROM TABLE BELOW
USE PART NUMBER ONLY TO LOCATE PART ON DRAWING

PART NO.	PART NAME	MATERIAL	REFERENCE NUMBERS-EACH SIZE										
			1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	5"	6"
1	Bolt and Nut (XRH & XTH)	Steel	9008	9008	9008	9008	9008	4021	4021	3653	3653	19389	NOTE 1	12984
1	Bolt and Nut (XRHK & XTHK)	Steel	23624	23624	23624	23624	23624	23624	4021	3653	- -	19389	NOTE 1	12984
2	Cylinder Liner	Stl. Steel, Hardened	11121	11121	11121	11172	11189	11122	11209	11195	11223	11966	18198	18329
3	Piston Ring (NOTE 2)	Cast Iron	3355	3355	3355	3358	3359	3361	3362	3363	3365	3367	21088	19949
4	Piston (NOTE 3)	Cast Bronze	9344	9344	9344	9379	9403	9481	9343	9463	9482	11971	21268	19959
5	Main Body, Screwed (XRH & XTH) (NOTE 4)	Cast Bronze	9400	9414	9528	9413	9412	9511	- -	- -	- -	- -	- -	- -
5	Main Body, Screwed (XRHK & XTHK) (NOTE 4)	Cast Iron	23500	23499	23505	23498	23495	23524	- -	- -	- -	- -	- -	- -
5	Main Body, 125# Flg. (XRHK & XTHK) (NOTE 4)	Cast Iron	- -	- -	- -	- -		30962	26092	26093	- -	21722	18201	15838
5	Main Body, 250# Flg. (XRHK & XTHK) (NOTE 4)	Cast Iron	- -	- -	- -	- -		30963	26156	26162	- -	- -	- -	- -
5	Main Body, 150# Flg. (XRH & XTH) (NOTE 4)	Cast Bronze	9487C	9489C	9529C	9530C	9387C	9521C	9411C	9494C	9512C	11969C	18378	16782
5	Main Body, 300# Flg. (XRH & XTH) (NOTE 4)	Cast Bronze	9487	9489	9529	9530	9387	9521	9411	9494	9512	11969	18379	16798
6	Main Valve	Stl. Steel, Hardened	13282	13282	13283	13284	13285	11124	31427	31428	31429	31430	31431	31432
7	Seat Ring	Stl. Steel (NOTE 5)	9821	9821	9445	9544	9446	9447	9448	9569	9562	11970	21241	19943
8	Main Valve Spring	Inconel	9464	9464	9464	10201	3629	9252	9087	9176	4478	4478	21260	21260
9	Bottom Cap Gasket (XRH & XTH)	(NOTE 6)	3500	3500	3500	3499	9276	3504	9100	9178	9196	3508	18254	18255
9	Bottom Cap Gasket (XRHK & XTHK)	Sheet Packing	28138	28138	28138	28139	28140	18334	18524	18525	- -	18526	18248	18249
10	Bottom Cap Bushing (XRHK & XTHK)	Bronze (NOTE 7)	23497	23497	23497	23501	23503	23526	26101	26119	- -	- -	- -	- -
11	Bottom Cap (XRH & XTH)	Cast Bronze	3116	3116	3116	4241	9405	3122	9098	9175	9193	3126	18395	15442
11	Bottom Cap (XRHK & XTHK)	(NOTE 8)	23496	23496	23496	23502	23504	23525	26100	26118	- -	3126	18395	15442
12	Top Cap	Cast Bronze	9360	9360	9360	9361	9362	9363	9339	9811	20072	13703	21087	21086
13	Dowel Pin	Brass	3702	3702	3702	3702	3702	3702	3702	3702	3702	3705	3705	3705
14	Top Cap Gasket (XRH & XTH)	Copper-Asbestos	4960	4960	4960	4945	4977	9003	9099	9177	9195	11967	18208	16024
14	Top Cap Gasket (XRHK & XTHK)	Sheet Packing	23567	23567	23567	23568	23569	23570	30320	30321	- -	30414	17293	17288
15	Cap Screw, Bottom Cap	Steel	- -	- -	- -	- -	- -	3709	9130	3712	3712	3716	- -	- -
15	Bolt and Nut, Bottom Cap	Steel	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	13145	12984
16	Controlling Valve Housing	Cast Bronze	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	9360	9360
17	Cap Screw	Steel	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	3709	3709
18	Dowel Pin	Brass	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	3702	3702
19	Housing Gasket	Copper-Asbestos	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	4960	4960
	Seat Ring Wrench	Malleable Iron	9551	9551	9552	9553	9554	9555	9144	9232	9233	12008	22157	22157
	ALL PARTS LISTED BELOW ARE INTERCHANGEABLE IN ALL SIZES 1/2" TO 6"		REFERENCE NUMBERS 1/2" TO 6"											
20	Adjusting Screw, Complete (NOTE 9)	Stainless Steel	9136											
21	Adjusting Spring Case	Cast Bronze	9372											
22	Top Spring Seat	Brass	4869											
23	Diaphragm Chamber (XRH & XRHK)	Cast Steel	11411											
23	Diaphragm Chamber (XTH & XTHK)	Cast Steel	11182											
24	Diaphragm	Stainless Steel	4552											
25	Diaphragm Stem Cap	Brass	13838											
26	Crosshead	Cast Iron	12551											
27	Diaphragm Stem	Brass	4864											
28	Diaphragm Spacer (NOTE 10)	Cast Iron	20620											
29	Diaphragm Stem Guide	Bronze	4872											
30	Stud Bolt and Nuts	Steel	9337											
31	Adjusting Spring	Spring Steel, Plated	3572											
32	Bottom Spring Seat	Brass	4870											
33	Connecting Rod	Bronze	9237											
34	Nut, Connecting Rod	Brass	9340											
35	Upper Diaphragm Spacer (NOTE 10)	Cast Iron	20621											
36	Connecting Rod Bushing	Brass	9238											
37	Steam Chamber (XTH & XTHK)	Cast Steel	10053											
38	Needle Valve Body Gasket	Sheet Steel	10559											
39	Needle Valve, Compl. (XTH & XTHK) (NOTE 11)	Monel	10795											
40	Needle Valve Body (XTH & XTHK)	Stainless Steel	10564											
41	Connector Nut	Monel	10794											
42	Connector Gland	Brass	9347											
43	Connector Packing	Molded Rings	13194											
44	Connector Union	Monel	10212											
45	Controlling Valve Seat	Stainless Steel	9433											
46	Controlling Valve	Stl. Steel, Hardened	4938											
47	Controlling Valve Spring	Inconel	10756											
48	Connector Nipple (XRH & XRHK)	Stainless Steel	10789											
	Controlling Valve Seat Wrench	Malleable Iron	9036											

CLASSES XRHB AND XTHB

When ordering Parts for above Classes, use Reference Numbers shown for Classes XRH and XTH.

NOTE 1 - 5" size is assembled with eight (8) Bolts and Nuts, Ref. No. 13145 and four (4) Cap Screws, Ref. No. 4066.
NOTE 2 - One Piston Ring per Regulator sizes 1/2" to 1-1/2"; two Piston Rings per Regulator sizes 2" to 6"
NOTE 3 - Piston is furnished complete with Piston Ring(s).
NOTE 4 - Main Body is furnished complete with Seat Ring and Dowel Pin.
NOTE 5 - Seat Ring has Stellited Seating Surface.
NOTE 6 - Bottom Cap Gasket Material is Copper, Annealed for 1/2" to 1-1/2" sizes and Copper, Asbestos Filled for 2" to 6" sizes.
NOTE 7 - Not used in 4" size. 5" and 6" Bushings are Stainless Steel welded to Bottom Cap.
NOTE 8 - Material is Cast Iron for 1/2" to 3" and 5" and 6" sizes. Cast Bronze for 4" size.
NOTE 9 - Includes Handwheel (Pressed Steel) and Lock Nut (Cast Iron).
NOTE 10 - Includes Diaphragm Stem Guide, Part No. 29.
NOTE 11 - Includes Needle Valve Bonnet, Nut, Stem, Head and Packing.

FOR ALL CLASSES NOT LISTED PLEASE ORDER PARTS BY NAME AND INCLUDE SIZE, CLASS AND SERIAL NUMBER STAMPED ON BOTTOM FLANGE OF TOP CAP.

TEMPERATURE REGULATORS

DESCRIPTIVE BULLETIN

INSTRUCTION BULLETINS

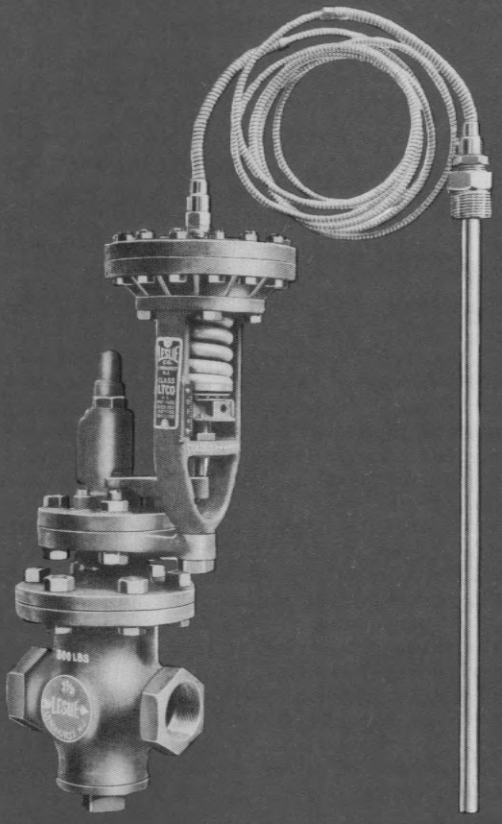
DIMENSION DRAWINGS

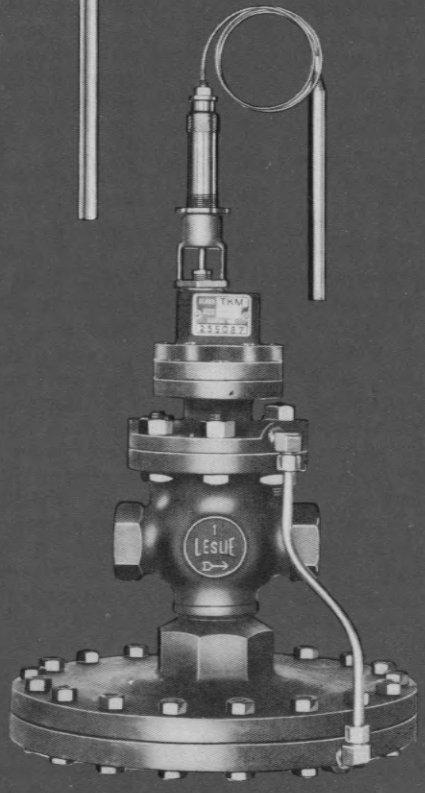
PARTS LISTS

BULLETIN 5307

TRADE LESLIE MARK

SELF-CONTAINED temperature regulators





- Direct Operated for Small Flows, Heating or Cooling
- Pilot Operated, for Heating or Cooling
- Pilot Operated, "Duo-matic" (Temperature and Pressure Control) for Heating Only

LESLIE CO., Lyndhurst, New Jersey

Pressure Reducing Valves Pressure Controllers Temperature Regulators
Pump Governors Self-Cleaning Strainers Air and Steam Whistles

Regulators since 1900

TRADE LESLIE MARK self contained TEMPERATURE REGULATORS

TABLE OF CONTENTS

SELECTING, SPECIFYING AND ORDERING

Where to Use Leslie Temperature Regulators

Leslie Temperature Regulators are used for any one or combination of the following conditions:

1. When accurate, reliable control is required for small flow conditions.
2. When accurate, reliable temperature regulation is required under varying load conditions.
3. When accuracy and stability of the controlled temperature depends upon response to heater steam pressure.

The Leslie Temperature Controller using air or water for operating pressure and consisting of a temperature pilot and diaphragm control valve is used for many temperature control applications. See Bulletins 5303, 5304 and 5305 for details.

How to Write Specifications

When preparing specifications insist on LESLIE or use the following general specifications to insure getting a LESLIE Temperature Regulator or Controller:

Self-Contained Temperature Regulators

DIRECT OPERATED TYPE—The Temperature Regulator shall be self-contained and direct operated by a solidly liquid filled thermostatic element consisting of a small bulb and bellows unit. A yielding spring shall prevent overstressing of bellows for over-range temperatures up to 25% of range. Valve stem shall be sealed with a stuffing box having a low friction, single ring, self-sealing Teflon "cup" packing requiring no adjustment. Easy replacement of thermostatic element shall be possible without shutting off process.

PILOT OPERATED FOR HEATING OR COOLING —The Temperature Regulator shall be self-contained with internal pilot and diaphragm operated, single seated main valve. The thermostatic system shall be a solidly liquid filled type consisting of a bulb and bellows unit of small size. A yielding spring shall prevent overstressing of the bellows for over-range temperatures up to 25% of range. The valve stem shall be sealed with a stuffing box having a low friction, single ring, self-sealing Teflon "cup" packing requiring no adjustment. Easy replacement of the thermostatic element shall be possible without shutting off the process.

PILOT OPERATED TYPE, "DUO-MATIC" TEMPERATURE AND PRESSURE CONTROL — The Temperature Regulator shall act as its own steam pressure reducing valve and must have means for adjusting the temperature as well as the maximum delivered steam pressure. It shall consist of a pressure reducing valve which, through a thermostatic element, is automatically readjusted for different, delivered steam pressures in a definite proportion to temperature change. It shall have but one pilot valve to be contained wholly within the regulator, and the chamber about same shall be entirely self-draining.

Main valve shall be single seated, of stainless steel hardened to at least 500 Brinell. Iron and bronze regulators shall have renewable stainless steel seat rings with Stellited seating surface. Cast steel regulators shall have Stellited seats integral with body. Internal pilot valve and piston cylinder liner to be of stainless steel, hardened to at least 500 Brinell with ground finish.

The thermostatic element shall be of the vapor pressure type having a sturdy metal diaphragm wafer that will withstand 50° over range. Easy replacement shall be possible without removing regulator from line or shutting off steam.

How to Order

When ordering or requesting quotations on Temperature Regulators, please include the following data:

1. Class of regulator.
2. Service (continuous, intermittent, standby).
3. Max. and min. regulator inlet pressure.
4. Max. and min. regulator inlet temperature.
5. Max. and min. regulator flow in lbs. of steam per hour, gpm or cu. ft. of free air or gas per min.
6. Screwed or flanged connections. Flanges are furnished drilled when flange standard is specified. Bronze flanged bodies will be undrilled if flange standard is not specified.
7. Controlled temperature range (when "duo-matic", include pressure range also).
8. Bulb size, material and accessories.
9. Length of flexible tubing and material.
10. Type of heat exchanger.
11. Fluid whose temperature is to be controlled.

Ordering Parts

When ordering parts for Leslie Temperature Regulators, give the following data:

1. Quantity of each part.
2. Part name and reference number (refer to applicable engineering drawing).

TRADE LESLIE MARK self contained TEMPERATURE REGULATORS

THREE BASIC DESIGNS

There are three basic designs for Leslie Self-Contained Temperature Regulators:

1. Direct Operated for small flow (heating or cooling).
2. Pilot Operated for heating or cooling.
3. Pilot Operated, "Duo-matic" Temperature and Pressure Control for heating.

The direct operated design is used for small flow, heating and cooling service, sizes ⅜, ½ and ¾". The liquid filled thermostatic element supplies the sole power to stroke the single seated, inner valve. Valve capacity is directly proportional to temperature change at bulb. Suitable for instantaneous and storage type heaters.

The pilot operated, single element control uses the same thermostatic element to operate a pilot lever which supplies operating pressure from the regulator inlet to a large diaphragm for heating or cooling service. The large diaphragm area and operating pressure supply ample power for controlling a long stroke, single seated main valve with full flow capacity in sizes ½-4". Regulator has narrow proportional band (3-5°F. throttling range) and is suitable for all storage type heat exchangers and for any system requiring on-off control.

The pilot operated, duo-matic (two element control) design offers both temperature and pressure regulating functions in a single piston or diaphragm operated regulator with a *single* pilot valve. It is suitable for heating service only, can handle a wide range of inlet steam pressures from 25 to 600 psi and two regulated or controlled pressure ranges, 2-15 psi and 10-285 psi. These characteristics are ideal for all storage type heaters and for most instantaneous heater problems. Available in sizes ¼-6", with iron, bronze and cast steel construction.

Use the Quick Reference Table below to locate regulator class for specific conditions. Enter the table under "Fluid thru Regulator" and "Regulator Function" and select the regulator class showing a dot by each appropriate condition. Page references are keyed for location of complete data.

QUICK REFERENCE TABLE

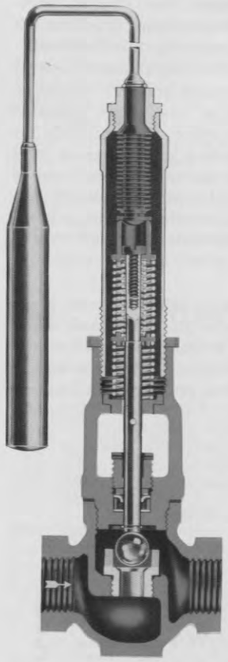
OPERATING CONDITIONS • INDICATES RECOMMENDED SERVICE OR CONDITION SATISFIED

Fluid thru Regulator		Regulator Function					Temperature Ranges —°F									Body Size (Inches)	Class * ‡	Inlet Pressure Range—°F		Page Reference
		Cooling																Dead End	Continuous Flow	
Steam	Liquid	Tight Shut-off	Small Continuous *Bleed	Heating	Temperature Control, only	Pressure and Temperature Control—("Duo-matic")	20-70	20-120	50-150	70-120	70-170	120-170	120-220	170-220	170-270	220-270	250-350					
	●	●	●		●		●			●		●	●	●	●	●		¾	MBR*‡	0-100		
	●	●	●		●		●			●		●	●	●	●	●		⅜ to ½	MCR*‡	0-50		
	●	●	●		●		●			●		●	●	●	●	●		⅜ to ½	MDR*‡	0-100		
●				●	●		●			●		●	●	●	●	●		⅜ to ½	MC-1‡	0-50	0-50	
●				●	●		●			●		●	●	●	●	●		⅜ to ½	MD-1‡	0-50	0-100	4, 5
●				●	●		●			●		●	●	●	●	●		⅜ to ½	ME-1‡	0-50	0-200	
●				●	●		●			●		●	●	●	●	●		⅜ to ½	MOT‡	0-50	0-200	
●				●	●		●			●		●	●	●	●	●			MOT with OT-1‡	0-125		
●				●		●		●	●		●		●		●		●	¼—½	JTCO¶	20-300		8
●				●	●			●	●		●		●		●		●	2—4	TK§‡	15-125		
●				●	●			●	●		●		●		●		●	½—1½	TKM§‡	5-150		
	●	●	●		●			●	●		●		●		●		●	2—4	TRK§‡	15-175		6, 7
	●	●	●		●			●	●		●		●		●		●	½—1½	TRKM§‡	5-175		
●				●	●			●	●		●		●		●		●	½—1½	TKML§‡	5-25		
	●	●	●		●			●	●		●		●		●		●	½—1½	TRKML§‡			
●				●		●		●	●		●		●		●		●	½—6	LTCO¶	25-300		
●				●		●		●	●		●		●		●		●	½—6	LTCOK¶	25-250		9
●				●		●		●	●		●		●		●		●	½—6	LTCL¶			
●				●		●		●	●		●		●		●		●	½—6	LTCLK¶	25-150		
●				●		●		●	●		●		●		●		●	½—3	LTCLS¶			10
●				●		●		●	●		●		●		●		●	½—6	LTCSO-3¶	40-600		

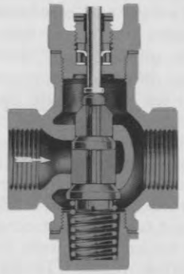
* Add "J" to basic class designation for classes with small continuous bleed, i.e., MBRJ, MCRJ.
‡ May be fitted with calibrated dial for temperature setting. Add "C" to basic class designation.
§ May be fitted with external steam supply to pilot valve. Add "B" to basic class designation.
¶ May be fitted with "O" adapter for external steam supply to controlling valve. Add "O" to basic class designation.
● 50- 170°F.

direct operated, small flow TEMPERATURE REGULATORS

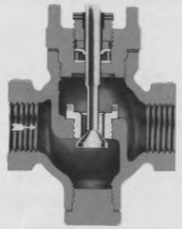
CLASSES MC-1, MD-1, ME-1—FOR PROCESS HEATING MBR, MCR, MDR—FOR PROCESS COOLING
OT-1, MOT—FOR HEATING OR COOLING



Class MC-1 with single seated, ball type, main valve. Heating service.



Class MBR body assembly showing double seated main valve. For cooling water flows.



Class MCR showing valve A below seat construction. Cooling service.

THERMOSTATIC ELEMENTS

Standard 50° Range		Bulb Matl.	Tubing Matl.
20-70 70-120 120-170 170-220	220-270 270-320 250-600*	Brass 18-8 Stainless	Brass 18-8 Stainless
		See Complete Description and 100° ranges page 7.	

*Special pencil bulb.

TEMPERATURE—PRESSURE RANGES

Body Size (Inches)	CLASS*	Orifice Size (Inches)	Maximum Inlet Temp. °F.	Recommended Inlet Pressures—PSI	
				Dead-End Service	Continuous Flow
⅜, ½	MC-1	⅜ (C)	450	0-50	0-50
	MD-1	¼ (D)	450	0-50	0-100
	ME-1	⅛ (E)	450	0-50	0-200
1	OT-1 with MOT	¾	450	0-125	0-125
⅜, ½	MCR	⅜ (C)	450	0-50	0-50
	MDR	¼ (D)	450	0-100	0-100
¾	MBR	¾	450	0-100**	0-100

*Add "C" to basic class if calibrated dial is desired, i.e. MD-1 (MDC-1) MCR (MCRC). Add "J" to basic class if internal by-pass orifice is required.
**Double seated valve has slight leakage when closed.

FEATURES

RUGGED LIQUID FILLED THERMOSTATIC ELEMENT — responds to ¼°F. change. Provides positive valve motion for all conditions. See page 7 for complete description. Screwed connection provides simple installation or removal from regulator.

STRONG PISTON GUIDED BELLOWS DESIGN—transmits motion to valve stem. Yielding springs protect from excessive stress for "over-range" temperatures up to 25% of range.

UNIQUE TEFLON PACKING ARRANGEMENT—Single ring, self-sealing, Teflon "cup" packing provides positive, long lasting, low friction stem seal.

SINGLE SEATED HARDENED STAINLESS STEEL BALL—in four sizes for heating service. Two valve sizes for small cooling water flows.

Double seated quick opening valve for greater cooling water flow in ¾" size. See Table below.

CALIBRATED TEMPERATURE DIAL — for convenient time-saving settings. Available as optional equipment. See page 5.

BASIC APPLICATIONS — Small flow instantaneous heaters or coolers (shell and tube or shell and coil heat exchangers); small storage or tank heaters; small flow process heat exchangers of all types.

HOW THEY OPERATE

Heating Type—As the temperature at the bulb increases, the liquid fill increases its volume, expanding the bellows against the valve stem, and moving ball valve toward seat. Since the liquid expansion is proportional to the temperature change, the valve travel is gradual, giving true throttling control. Thermostatic element has sufficient power for tight shut-off against inlet pressures recommended for each seat ring size.

Cooling Type—These regulators employ the same basic principle of operation except that, when the bellows expands against the valve stem on temperature rise, the valve disc is moved away from its seat, increasing flow of coolant. For continuous flow of coolant, a small internal bypass orifice can be provided, indicated by "J" in the class.

Dimensions and Parts List—See Layout Dimension Sheet and Dwg. No. C1202 following Bulletin. Also Dwg. No. 1203F (MCR, MDR, MBR), No. 7450 F (MOT), and No. 7449 F (OT-1) available on request. Capacity tables on page 14.

CONSTRUCTION

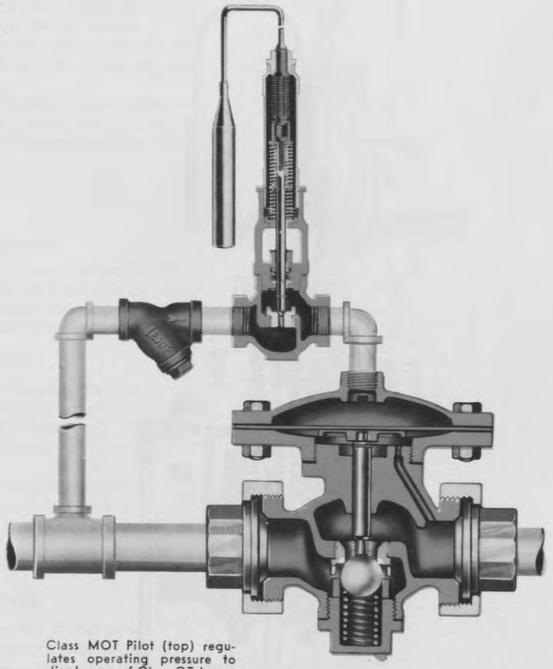
Size & Class	Body Material & Connections	TRIM MATERIAL		
		Seat Ring	Valve	Valve Stem
⅜—½" MC-1 MD-1 ME-1 OT-1	Bronze Screwed	18-8 Stainless Steel	Type 440 Stainless Hardened	18-8 Stainless Steel
MOT			18-8 Stainless	
⅜—½" MCR MDR	Bronze Screwed	18-8 Stainless Steel	18-8 Stainless Steel	18-8 Stainless Steel
¾" MBR		Integral	Bronze	

pilot operated TEMPERATURE REGULATORS

CLASS MOT PILOT WITH 1" CLASS OT-1 REGULATING VALVE

For Steam Service

This temperature regulator supplements and extends the capacity range of the direct operated, Class M type regulator described on page 4. The Class MOT pilot is similar to the Class ME-1 except that a solid stem needle valve is used in place of the ball valve. Pilot pressure operates the diaphragm and ball valve of the Class OT-1 regulating valve, utilizing the capacity of a 1" size valve yet retaining the accuracy of regulation of the Class M types of small flow regulators.



Class MOT Pilot (top) regulates operating pressure to diaphragm of Class OT-1 regulating valve. For steam service.

FEATURES

COMPACT, SIMPLE CONSTRUCTION — of Class OT-1 regulating valve eliminates usual stuffing box and yoke construction.

SINGLE SEATED HARDENED STAINLESS STEEL BALL — Tight closing for steam service.

METAL DIAPHRAGM—Long life. Not affected by live steam or condensate temperatures.

PILOT FEATURES—Class MOT Pilot incorporates all of the advantages of the Class M Type regulator described on page 4.

BASIC APPLICATIONS — Small flow instantaneous heaters; small storage tank heaters; small flow process heat exchangers.

DIMENSIONS & PARTS LISTS: See layout dimension sheet following bulletin and drawings #7449 F and 7450 F available on request. Capacity Tables on Page 14.

Calibrated Dial

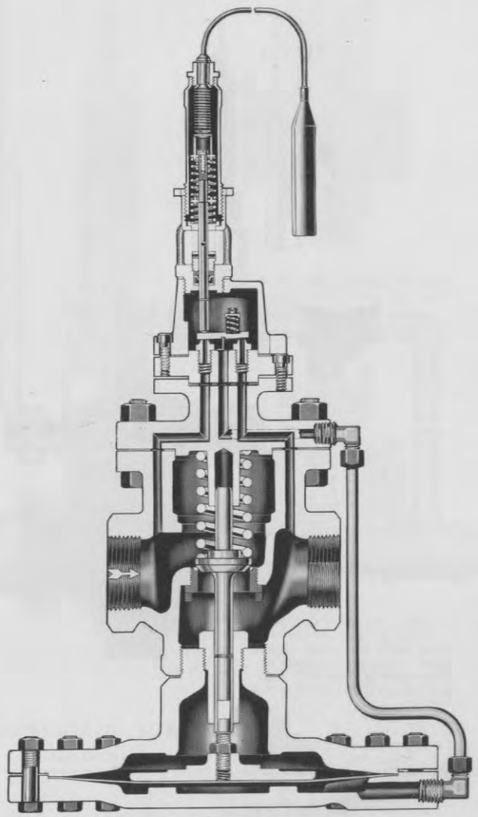
(Indicated by "C" in regulator class designation)

Available for all Leslie direct operated and diaphragm operated temperature regulators (those with class designations starting with an M or T). The calibrated dial provides quick, easy, and dependable temperature settings. The dial eliminates waiting for equipment to heat up to determine correct setting. It avoids overheating due to guess setting. Designed for production line use where frequent dependable readjustments are necessary for process work, it replaces the standard adjusting sleeve. There are no complicated linkages or gages and no increase in friction on the pilot stem. Friction ring prevents accidental change of adjustment.

Calibrated dials are easily installed on any Leslie temperature regulators now in service with class designations starting with the letters M or T.

pilot operated TEMPERATURE REGULATORS

½-1½" CLASSES TKM, TKML FOR PROCESS HEATING TRKM, TRKML FOR PROCESS COOLING



Class TKM Temperature Regulator

POSITIVE DEAD-END SHUT-OFF — Single seated construction. Closes with inlet pressure.

DIAPHRAGM-OPERATED MAIN VALVE — Packless construction assures positive valve operation.

LIQUID FILLED THERMOSTATIC ELEMENT — with 100°F. or 200°F. adjustable range. Easily replaceable without removing regulator from the line. For complete description, see page 13.

LOW FRICTION PILOT STEM SEAL—Single ring, self sealing Teflon cup packing provides positive, long lasting, low friction stem seal.

UNIQUE INTERNAL PILOT — Lever type, double acting, controls both supply and exhaust of operating pressure. Reversible in the field changing valve action from heating to cooling or vice versa.

18-8 STAINLESS STEEL TRIM — suitable for steam or liquid service.

CALIBRATED DIAL — for convenient temperature setting. Available as optional equipment (add "C" to basic class designation).

MAIN VALVE WITH CONTINUOUS BY-PASS — Available for cooling service. (Add "J" to basic class designation.)

How It Operates

Pressure on lower side of diaphragm, operating main valve, is controlled by a double acting, lever-type pilot, which is mounted on a knife edge and actuated by the thermostatic element. The pilot simultaneously controls both the supply of operating pressure from the regulator inlet and the discharge of operating pressure to the regulator outlet. The resultant pressure in the pilot chamber is transmitted to the lower side of the diaphragm through copper tubing.

Metal diaphragm permits direct contact with live steam. In larger sizes, 2-4", a Neoprene diaphragm is used and is protected on both sides from live steam contact by separate condensate reservoirs. See page 7.

Dimensions on layout sheet following bulletin. Parts List on Dwg. No. C9225 following bulletin. Capacity data, Page 15.

PRESSURE—TEMPERATURE RANGES & TRIM MATERIAL

Minimum differential between inlet and outlet pressure—2½ psi

Service and Class	Maximum Inlet Pressure—PSI Steam or Water	Size Inches	Standard 100°F Temperature Ranges**	Max. Working Pressure of Element Bulb: Stuffing Box	Max. Working Pressure of Element Bulb: Bulb Casing	BODY AND TRIM MATERIALS: Body, Top & Bottom Cap Materials; End Connections	Main Valve, Stem, Spring, Seat Ring & Pilot Nozzles	Pilot Lever	Diaphragm	Pilot Spring	Guide Bushing	Pivot
Heating: TKML TKM	5-25 20-150	½-1½	170-270 220-320	200	400	Cast Iron, Screwed	18-8 Stainless	17-4* Stainless	Phosphor Bronze	18-8 Stainless	B61-46 Bronze	Monel
TK	15-125	2-4	450-550 250-600†			Cast Iron, 2-4" 125# ASA flanged 2" scr.			Neoprene			
Cooling: TRKML TRKM	5-25 20-175	½-1½	20-120 50-150	200	400	Cast Iron, Screwed	18-8 Stainless	17-4* Stainless	Phosphor Bronze	18-8 Stainless	B61-46 Bronze	Monel
TRK	15-175	2-4	70-170 120-220			Cast Iron, 2-4" 125# ASA flanged 2" scr.			Neoprene			

*17-4 is a new stainless steel with other components that make it corrosion resistant like 18-8 and hardenable to minimize wear.
**Allowable temperature override beyond top of range is 25% of range.
†Special pencil bulb.

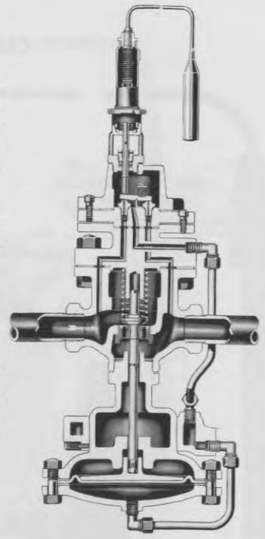
pilot operated TEMPERATURE REGULATORS

2-4" CLASS TK FOR PROCESS HEATING CLASS TRK FOR PROCESS COOLING

Class TK and TRK Regulators are similar in design to Class TKM and TRKM shown on page 6, but employ a rugged neoprene diaphragm that is protected from live steam on both sides by a condensate reservoir. This design feature in the Class TK (body sizes 2"-4") provides greater valve travel with reduced diaphragm area. Class TK converts in the field to Class TRK or vice versa by turning top cap 180° reversing pilot valve action.

FOR INLET STEAM PRESSURES BELOW 5 PSI—Class T type regulators can be specially fitted with ¼" external supply to pilot valve where a higher pressure supply (5-150 psi) is available to operate pilot (designated by adding "B" to valve class).

Dimensions: See layout dimensions sheet following bulletin.
Parts List: Dwg. No. 7927F available on request.

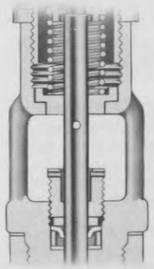


Class TK Temperature Regulator

Freezing Ambient Temperatures

Where ambient temperatures would cause condensate to freeze in the TMK or TK Regulator Chambers, a steam heated insulating jacket is available to cover the regulator below adjusting sleeve. Cylindrical, it is fabricated of heavy sheet steel lined with fibre glass with provision for heating steam coil below regulator.

New, Unique Stem Seal



Stem Seal

Pilot stems on all Leslie internal pilot, diaphragm operated regulators use a new packing assembly employing a *single* ring, self-sealing Teflon "cup" stem seal. The packing gland requires only finger tightening for a positive, low friction seal.

The Teflon cup ring has excellent self lubrication properties, resiliency, strength and is impervious to water and steam at temperatures to 450°F. The smooth finish on the pilot stem, combined with the slippery nature of Teflon reduces stem friction to a minimum.

STANDARD RANGES

50° Ranges	100° Ranges	Other
20-70	20-120	50-250
70-120	50-150	250-600
120-170	70-170	
170-220	120-220	
220-270	170-270	
270-320	220-320	
	450-550	

THERMOSTATIC ELEMENTS

LIQUID FILLED elements are used on the direct operated and diaphragm operated temperature regulators (pages 4, 5, 6, and 7). The bulb, flexible tubing and bellows are completely filled with a liquid. When heat is applied to the bulb, the liquid expands causing bellows of a *direct* operated regulator to exert force to move the valve. In *diaphragm* operated regulators, the bellows opens or closes the pilot nozzle, regulating the pressure of the operating medium to the bottom of the diaphragm. In either type, the force produced is many times greater than needed to assure positive movement.

Copper flexible tubing, nickel plated (standard), or 18-8 stainless steel is furnished in lengths of 5 or 10 feet and in special lengths up to 30 feet in multiples of 5 feet.

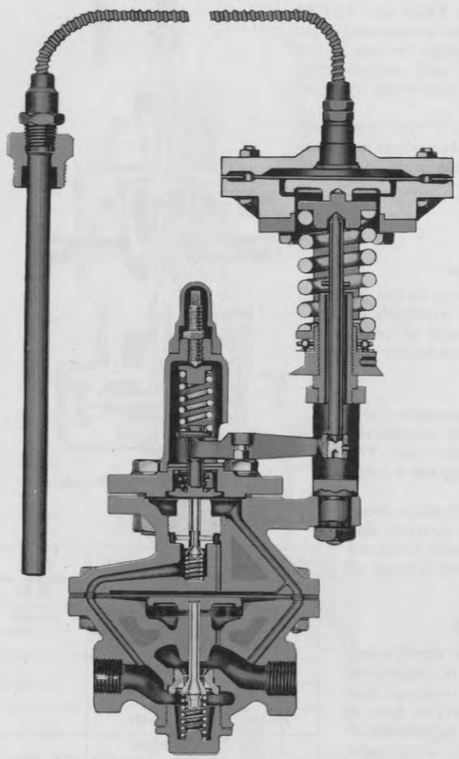
Brass bulbs, nickel plated (standard), or 18-8 stainless steel bulbs are 7⅜" long for 50° ranges and 4" long for 100° ranges. The 50° range element is standard with direct operated regulators (Class M types) for inlet steam or cooling water control. The 100° and 200° range elements are standard on internal pilot, diaphragm operated regulators (Class T types). The 100°F. range may be used on direct operated regulators, as well, but the capacity for the same temperature change at the bulb is reduced to one half.

Finned bulbs, 18" long with fins ⅞" square, are furnished for air conditioning systems or space heating in two ranges only, 20-120° and 120-220°F. Standard Bulb Casings are available in two sizes: 4-13/16" long (No. 2) and 9¾" long (No. 3). Both casings have 11/16" outside diameter and ½" pipe thread. They are furnished in brass, Monel, stainless steel and carbon steel for maximum working pressure of 400 psi.

HIGH PRESSURE, THICK WALL AND EXTENSION NECK CASINGS—High pressure casings are available for maximum working pressures to 3000 psi unplated. Extension neck casings that permit full exterior insulation of the tank or oven are also available as are thick wall bulb casings. See layout dimension sheet following bulletin.

small flow, "duo-matic" TEMPERATURE REGULATORS

CLASS JTCO FOR PROCESS HEATING



FEATURES

DUO-MATIC, TWO ELEMENT CONTROL—Both temperature and pressure are controlled in a single regulator with a single internal pilot valve. Simplifies piping and lowers both initial and operating costs by eliminating need for separate pressure and temperature regulating valves.

ANTICIPATES TEMPERATURE CHANGE — Main valve responds to heater or process load changes through action of pressure sensitive steam diaphragm before temperature change even occurs at the bulb.

ACCURACY OF REGULATION—Comparable to instrument control for most services. Ratio of steam pressure change (psi) to temperature change (°F.) at bulb is 4:1.

SINGLE SEATED VALVE — inlet pressure closing. Positive dead end shut-off.

WIDE RANGE THERMOSTATIC ELEMENT — 100°F adjustable temperature range. Vapor pressure design with metallic wafer diaphragm gives rupture-proof construction.

METAL DIAPHRAGM PRESSURE ELEMENT — has travel less than its own thickness, well within safe stress limit. Eliminates stem packing gland.

COPPER CLAD GASKETS—asbestos filled, provide lasting, reuseable seal without fouling gasket faces.

RENEWABLE, INTERCHANGEABLE PARTS—All wearing parts are renewable allowing complete overhaul without removing the body from the line.

BASIC APPLICATIONS—Instantaneous type heaters (shell and tube type with large tube volume). Storage type heaters (shell and coil type with large shell volume). Process heat exchangers of most types.

Dimensions on Layout Dimension Sheet following bulletin. Parts list on Dwg. TR-209F available on request. Capacity tables, page 14.

TEMPERATURE—PRESSURE RANGES:*

*Minimum differential between inlet and outlet pressure—10 psi.

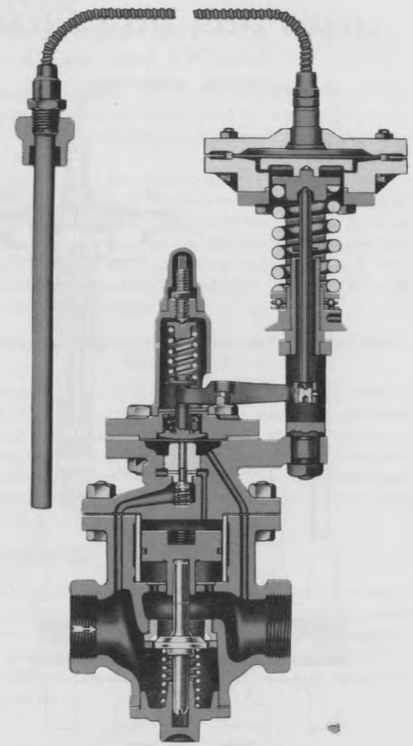
Inlet Steam Pressure PSI	Maximum Inlet Temperature °F	Adjustable Outlet Pressure Range—PSI	Max. Working Pressure on Bulb PSI
20-300	550	10-250	Brass—600 Monel—1250 Stainless Steel—1250 Cold Rolled Steel—1000

CONSTRUCTION & TRIM MATERIAL

Size, Body Material and End Connections	TRIM PARTS & MATERIAL						Standard Temperature Ranges °F
	Seat Ring	Controlling and Main Valve	Controlling Valve Seat	Diaphragm	Lower Diaphragm	Controlling and Main Valve Springs	
¼", ⅜", ½" Bronze, Screwed Ends	Type 410 Stainless Steel Stellited	Type 440C Stainless Hardened	18-8 Stainless	Stainless Steel	Phosphor Bronze	Inconel	20-120 50-170 120-220 170-270 250-350

"duo-matic", temperature and pressure SELF-CONTAINED REGULATORS

CLASSES LTCO, LTCL (BRONZE BODY) LTCOK, LTCLK (CAST IRON BODY) FOR PROCESS HEATING



FEATURES

DUO-MATIC, TWO ELEMENT CONTROL — Both temperature and pressure are controlled in a single regulator with a single internal pilot valve. Simplifies piping and lowers both initial and operating costs by eliminating need for separate pressure and temperature regulating valves.

ANTICIPATES TEMPERATURE CHANGE — Main valve responds to heater or process load changes through action of pressure sensitive steam diaphragm before temperature change occurs at the bulb.

ACCURACY OF REGULATION — Comparable to instrument control for most services. Ratio of steam pressure change (psi) to temperature change (°F.) at bulb is 4:1 for Classes LTCO, LTCOK and 1:1 for Class LTCL and LTCLK.

SINGLE SEATED VALVE — inlet pressure closing. Positive dead end shut-off.

WIDE RANGE THERMOSTATIC ELEMENT — 100°F. adjustable temperature range. Vapor pressure design with metallic wafer diaphragm gives rupture-proof construction.

METAL DIAPHRAGM PRESSURE ELEMENT — has travel less than its own thickness, well within safe stress limit. Eliminates stem packing gland.

INTERNAL SPRINGS of Inconel are non-corroding, heat resistant.

RENEWABLE, INTERCHANGEABLE PARTS—All wearing parts are renewable allowing complete overhaul without removing the body from the line.

Dimensions on Layout Dimension Sheet and Parts List on Dwg. No. CTR-189 following bulletin. Capacity Tables, Page 14.

BASIC APPLICATIONS—Instantaneous type heaters (shell and tube type with large tube volume). Storage type heaters (shell and coil type with large shell volume). Process heat exchangers of most types.

PRESSURE—TEMPERATURE RANGES* & TRIM MATERIAL

*Minimum pressure drop is 15 psi in sizes ½-4", 25 psi in 5" and 6" sizes.

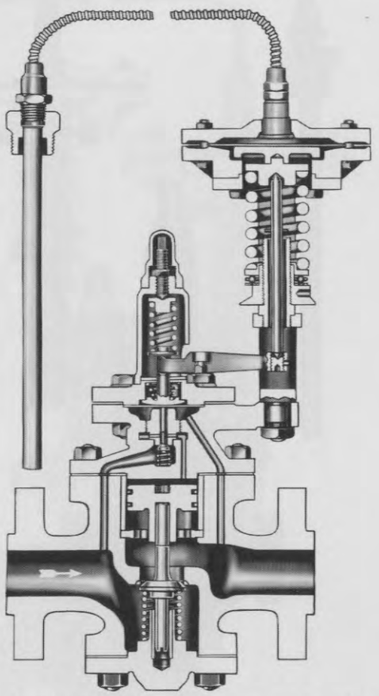
Class and Body Matl.	Size (Inches) and End Connections**	Inlet Steam Pressure, PSI	Body Matl. Max. Inlet Temp., °F	Adjustable Outlet Pressure Range, PSI	TRIM PARTS & MATERIALS—ALL CLASSES				
					Seat Ring	Main Valve Controlling Valve Cylinder Liner	Controlling Valve Seat	Diaphragm	Piston
LTCO (Bronze)	½-2 screwed ½-4 flanged	25-300	550	10-250	Type 410 Stainless Stellited	Type 440C Stainless Hardened	Type 18-8 Stainless	Stainless Steel	ASTM B61-46 Bronze
	5 flanged	45-300		20-250					
	6 flanged	45-200		20-175					
LTCL (Bronze)	½-2 screwed ½-6 flanged	25-150	550	2-15					
LTCLK (Cast Iron)	½-2 screwed 2-3 flanged	25-150	450	2-15					
LTCOK (Cast Iron)	½-2 screwed 2-3 flanged	25-250	450	10-200					
	4-6 flanged	45-125		20-100					

THERMOSTATIC ELEMENTS			
Standard Temperature Ranges—°F	Tubing Materials	Bulb Materials	Bulb. Max. Working Pressure
20-120 50-170 120-220 170-270 250-350	Brass Stainless Monel	Brass	600 psi
		Monel	1250 psi
		Stainless	1250 psi
		Cold Rolled Steel	1000 psi

**Bronze bodies with MSS flanges, 150 and 300 lb. In all sizes. Cast Iron bodies with flanges, 125 lb. ASA, 2-6"—250 lb. ASA, 2-3".

"duo-matic", temperature and pressure SELF-CONTAINED REGULATORS

CLASSES LTCLS, LTCSO-3 (CAST STEEL BODY) — FOR PROCESS HEATING



BASIC APPLICATIONS—Instantaneous type heaters (shell and tube type with large tube volume). Storage type heaters (shell and coil type with large shell volume). Process heat exchangers of most types.

FEATURES

DUO-MATIC, TWO ELEMENT CONTROL—Both temperature and pressure are controlled in a single regulator with a single internal pilot valve. Simplifies piping and lowers both initial and operating costs by eliminating need for separate pressure and temperature regulating valves.

ANTICIPATES TEMPERATURE CHANGE — Main valve responds to heater or process load changes through action of pressure sensitive steam diaphragm before temperature change occurs at the bulb.

ACCURACY OF REGULATION—Comparable to instrument control for most services. Ratio of steam pressure change (psi) to temperature change (°F.) at bulb is 4:1 for class LTCSO-3 and 1:1 for class LTCLS.

SINGLE SEATED VALVE — inlet pressure closing. Positive dead end shut-off.

WIDE RANGE THERMOSTATIC ELEMENT — 100°F adjustable temperature range. Vapor pressure design with metallic wafer diaphragm gives rupture-proof construction.

METAL DIAPHRAGM PRESSURE ELEMENT — has travel less than its own thickness, well within safe stress limit. Eliminates stem packing gland.

INTERNAL SPRINGS of Inconel are non-corroding, heat resistant.

METALLIC CLAD GASKETS—asbestos filled, provide lasting reusable seal without fouling gasket faces.

RENEWABLE, INTERCHANGEABLE PARTS—All wearing parts are renewable allowing complete overhaul without removing the body from the line.

Dimensions on Layout Dimension Sheet and Parts List on Dwg. No. CTR-190 following bulletin. Capacity tables, page 14.

PRESSURE—TEMPERATURE RANGES* & TRIM MATERIAL

*Minimum pressure drop is 15 psi in sizes ½-4", 25 psi in 6" size.

Class and Body Matl.	Size (Inches) with Flgd. Connections**	Inlet Steam Pressure, PSI	Maximum Inlet Temp., °F	Adjustable Outlet Pressure Range, PSI	TRIM PARTS & MATERIALS—ALL CLASSES			
					Seating Surface	Main Valve, Controlling Valve and Seat, Cylinder Liner	Diaphragm	Piston
LTCSO-3 Cast Steel	½-4	40-600	750	25-250	Integral Stellite	Type 440C Stainless, Hardened	Stainless Steel	Type 410 Stainless
	6	50-600			THERMOSTATIC ELEMENTS			
					Standard Temp. Ranges—°F	Tubing Material	Bulb Material	Bulb Working Pressure
LTCLS Cast Steel	½-3	40-150	750	2-15	20-120 50-170 120-220 170-270 250-350	Brass Stainless Monel	Brass	600 psi
							Monel	1250 psi
							Stainless	1250 psi
							Cold Rolled Steel	1000 psi

**ASA flanges, 150, 300, 400 and 600 lb., ½-6". Screwed ends, ½-2".

"duo-matic", temperature and pressure SELF-CONTAINED REGULATORS

PRINCIPLE OF OPERATION
PISTON OPERATED, DUO-MATIC REGULATORS
CLASSES LTCO, LTCL, LTCOK, LTCLK, LTCLS, and LTCSO-3

These Temperature Regulators utilize the famous LESLIE internal pilot, piston operated reducing valve design. A vapor pressure type thermostatic element operating on a lever opposes a pressure limit spring and determines the outlet steam pressure delivered to the heater.

Manual setting of the pressure limit spring determines the maximum outlet steam pressure and opens controlling valve admitting high pressure steam from inlet body port to top of piston opening main valve. The outlet steam pressure acting under steam diaphragm balances compression of pressure limit spring, throttling controlling valve and limiting the maximum outlet steam pressure.

The temperature at which the vapor pressure starts to oppose the limit spring and decrease outlet steam pressure is set on the temperature adjusting spring. This spring opposes the vapor pressure on the large upper diaphragm and by means of this spring the temperature at which all steam to the heater will be shut off can be accurately set.

A temperature drop of 1°F. on element bulb reduces the vapor pressure, allowing limit spring to open controlling valve and deliver an increased steam pressure to the heater.

Therefore, steam pressure to the heater is always proportional to the change in temperature at the bulb and this pressure is automatically maintained regardless of the volume of steam used by the heater or variations in supply pressure. This is an exclusive LESLIE feature which results in INSTRUMENT CONTROL with a self-contained regulator.

Diaphragm Operated, Duo-matic Regulators Class JTCO

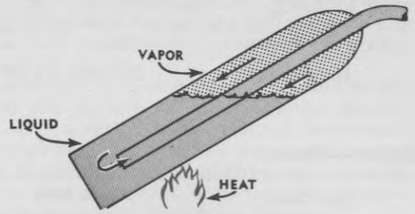
In these small sizes (¼, ⅜ and ½") the piston used in Class LTCO is replaced by a large metal diaphragm. Minimum inlet steam pressure is 20 psi. Steam pressure admitted to top of this diaphragm by controlling valve operates main valve. Pressure limit control and temperature regulation are accomplished in the same manner as describd for Class LTCO.

CLASS LTCO TYPE ELEMENTS

VAPOR FILLED elements are used on all Duo-matic, piston or diaphragm operated regulators and employ a volatile liquid with a boiling point slightly lower than the minimum limit of the element's temperature range.

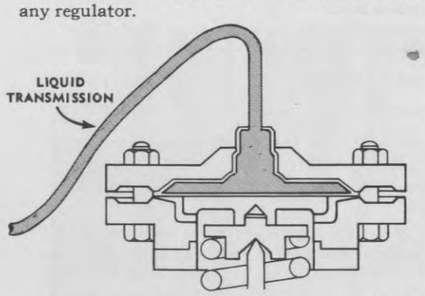
When the ambient bulb temperature is lower than the fill boiling points, the fill is in liquid state. When the ambient temperature is greater than the boiling point, the fill in the bulb partially vaporizes increasing internal pressure on the upper diaphragm.

Vapor filled thermostatic elements are completely interchangeable and consist of three parts: the wafer diaphragm assembly, the armored flexible tubing, and the bulb. The unit is assembled, filled, and sealed into a single closed unit at the factory.



FLEXIBLE TUBING consists of a copper capillary tubing protected by an armored cable of brass as standard material and in variable lengths in multiples of 10 feet up to 70 feet. Flexible tubing can also be furnished with armored cable made of steel or stainless steel on request.

WAFER DIAPHRAGM ASSEMBLY has a simple rupture-proof construction with strong supporting base and cover. All diaphragm chamber assemblies regardless of range have one standard drilling facilitating removal and making it possible to place any range on any regulator.



BULBS are connected and sealed to the flexible tubing by a swivel joint and are complete with union bushing of same material for connection to process equipment. Standard bulbs can be furnished from stock of following materials:

- Brass
- Monel
- Stainless Steel
- Cold Rolled Steel

Finned Bulbs—21" long and equipped with fins 1⅝" square are used for air conditioning systems, ovens, space heating and services that require large surfaces to insure fast response. A bulb 22" long with fins 2¾" square, is used for capillary tubing lengths above 30' and for lengths 20' and over on ranges below 70°F.

(*More on next page*)

LTCO TYPE ELEMENTS (Continued)

The bulb is usually installed tip downward in order to get the benefit of liquid transmission of internal bulb pressure to diaphragm during the start-up period. When installed tip upwards, some vapor may enter the capillary during the start-up period. This vapor condenses quickly, however, and operation after the vapor condenses is identical, tip up or down.

SPECIAL BULB COATINGS can be furnished for services that standard materials will not handle:

- Lead (including up to 3 feet of tubing nearest bulb)
- Rubber (may include all tubing)
- Plastics (may include all tubing)
- Chrome Plating
- Tinning

Bulb Casings—Recommended for use only where removal of bulb may necessitate draining large capacity equipment. Since heat transmission is slower with a bulb casing, its use should be restricted to large tank or storage systems where temperature changes are slow and speed of response is no factor.

Standard bulb casings are available in the following materials with Pressure Ratings as indicated:

• Brass	600 PSI
• Monel	1250 PSI
• Stainless Steel	1250 PSI
• Carbon Steel	1000 PSI
• Stainless Steel Cadmium Plated	2000 PSI
• Steel Cadmium Plated	2000 PSI
• Stainless Steel	3000 PSI

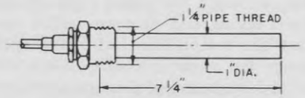
Special bulb casings for thick wall installations or extension neck casings that permit full tank or oven insulation are available. See layout dimension sheet following bulletin.

Special Fittings—For equipment that requires special fittings to prevent damage to bulb, facilitate cleaning, or presents other installation problems, the following are available on request: bulb guard; sanitary fitting; flanges for wooden tanks, etc.

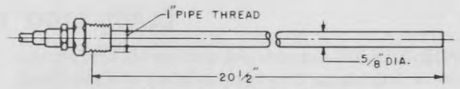
STANDARD BULB SIZE AND TUBING LENGTHS

Temp. Range °F.	Tubing Length Available	Standard Bulb and Fitting Size*		
		Type	Length	Fitting
20-120 50-150	10 ft.	A	20½	1 "
		C	7¼	1¼"
	20 ft. and over	B	21½	1¼"
120-220 170-270 250-350	up to 30 ft.	A	20½	1 "
		C	7¼	1¼"
	30 ft. or more	B	21½	1¼"

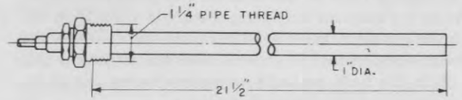
*Other Dimensions given below.



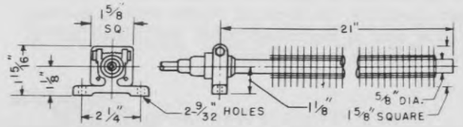
(C)—Short Bulb



(A)—Standard Bulb

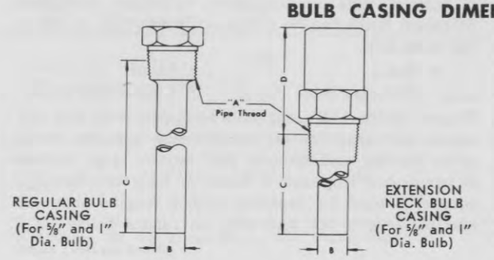


(B)—Large Bulb



End View — Standard Finned Bulb

BULB CASING DIMENSIONS—INCHES



Type Casing and Dimension		TYPE BULB		
		Standard	Large	Short
Regular Casing	A	1	1¼	1¼
	B	¾	1⅛	1⅛
	C	21⅜	21⅞	8¼
Extension Neck Casing	A	1	1¼	—
	B	¾	1⅛	—
	C	19⅜	19⅝	—
	D	2¾	3	—

ENGINEERING FEATURES AND CONSTRUCTION DATA

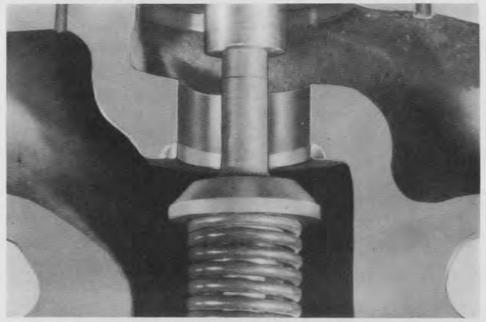
Over fifty years of leadership in the regulating valve industry have resulted in engineering and manufacturing know-how vital to the production of a quality line of self-contained temperature regulators.

Continuous research, experimentation, field trials and progressive production methods have been the key to Leslie leadership in metallurgical and engineering developments.

The construction features explained on the following pages are the result of this half century of work in the regulator field. They are *standard* features on Leslie equipment that are usually found only on "made-to-order", special regulators. They can best be evaluated in terms of long, trouble-free service, accurate regulation and ease of maintenance. Examine them.

Standard Leslie Features

SINGLE SEATED CONSTRUCTION in all sizes provide positive dead-end shut-off, with the inlet pressure acting to tightly close the inner valve except in two classes of the direct operated, small flow regulators described on page 4.


Single Seated Construction

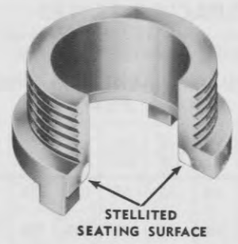
RUGGED, SENSITIVE DIAPHRAGMS — Stainless steel diaphragms are used in all internal pilot, piston operated regulators shown on pages 5, 8 and 9. Practically indestructible in normal use, they guarantee long service without the difficulties encountered with stuffing boxes and bellows seals.

The total travel of the diaphragm is less than its own thickness and the stresses produced within the diaphragm are well within the safe limits of the material.

Diaphragm operated temperature regulators have either a phosphor-bronze, 2 ply diaphragm (indicated by "M" in class designation) or the reinforced neoprene diaphragm shown in the illustration on page 7.

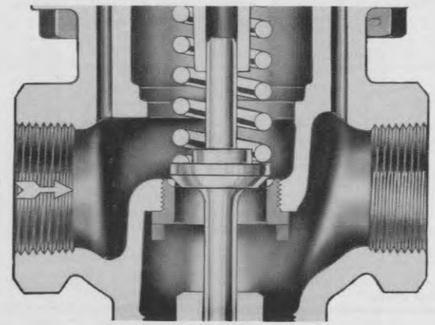
The phosphor bronze diaphragm, used in all diaphragm operated regulators shown on page 6 will withstand pressures far beyond the pressure-temperature limits of the regulator itself. The reinforced neoprene diaphragm used in larger sizes (page 7) is surrounded by a condensate reservoir to protect it from live steam contact on both sides.

STELLITED SEATING SURFACE—A stellited seat ring combined with a hardened stainless steel main valve provides the most erosion resistant combination known to engineers, and is furnished with all Duo-matic (two element control) regulators. The stellite is applied to stainless steel seat rings in bronze and cast iron regulators and directly to the main body in steel regulators. Introduced by Leslie Co., this unsurpassed combination is the product of many years research coupled with the knowledge of stelliting and heat treating techniques.



INTERNAL SPRINGS of Inconel or 18-8 stainless are non-corroding, heat resistant. Ends of all springs are ground square to insure true movement.

LONG GUIDING SURFACES and polished finishes on all moving parts assure true alignment and prevent cocking and binding. Note the top and bottom guiding in both piston and diaphragm operated regulators.


Long Guiding Surfaces

INTERCHANGEABLE PARTS — All replaceable parts are manufactured to closely held tolerances, assuring interchangeable fits so that any part may be replaced in years to come without machining and without removing the regulator body from the line.

LASTING SEAL GASKET JOINTS—Fouling and the necessity for cleaning and scraping gasket or flange faces, is completely eliminated.

temperature regulators SIZING AND CAPACITY DATA

SIZING INTERNAL PILOT REGULATORS

For Internal Pilot, Piston Operated Temperature Regulators and Internal Pilot, Diaphragm Operated Temperature Regulators, the following information is necessary:

1. Maximum and Minimum Inlet Steam Pressure.
2. Superheat, if any.
3. Maximum Steam Pressure required by Heater or Process.
4. Maximum and Minimum Flow of Steam (lbs. per hour).

For water or liquid service the minimum pressure drop and flow (volume of fluid per minute or per hour) are required in addition to Maximum Inlet Pressure and Temperature.

Enter correct Fluid Capacity Table at Inlet Pressure or Pressure Drop Column corresponding to your minimum figure. For steam, select outlet pressure column closest to your requirements. (Capacity does not increase with outlet pressures lower than those stated.)

Find capacity figure equal to your required flow or slightly greater. The proper size temperature regulator or regulating valve is shown in the left hand column horizontally opposite this figure.

CAPACITY TABLES

In pounds of saturated steam per hour
for LESLIE Temperature Regulators

INTERNAL PILOT, DIAPHRAGM OPERATED CLASS JTCO

	Inlet °F.	25	50	75	100	150	175	200	250	300
		267	298	320	338	366	378	388	406	421
Valve size, in.	1/4	25	35	50	65	85	100	110	135	160
	3/8	50	75	100	125	175	200	225	275	325
	1/2	75	120	160	200	290	330	365	450	530

CORRECTIONS FOR SUPERHEATED STEAM:

Correct figures in table for superheat as follows:

With 50°F. superheat multiply by .92
100°F. " " " .85
150°F. " " " .80
200°F. " " " .75
300°F. " " " .65

- *All pressures are in pounds per square inch (PSI gage).*
- *Rated capacities do not increase for lower reduced pressures than shown for each inlet pressure.*

INTERNAL PILOT, PISTON OPERATED CLASSES LTCO, LTCOK, LTCL, LTCLK, LTCLS, LTCSO-3

	Inlet Press.	25	50	75	100		125		150			175		
	°F.	267	298	320	338		353		366			378		
	Outlet Press.	0-14	0-27	0-40	0-55	75	0-70	100	0-80	100	125	0-95	125	150
Valve size, inches	1/2	102	160	220	275	250	330	280	390	375	300	450	415	330
	3/4	190	300	400	510	460	620	520	725	700	560	825	775	620
	1	316	500	675	850	765	1020	860	1200	1150	930	1360	1280	1025
	1 1/4	560	885	1200	1520	1365	1825	1530	2150	2075	1610	2440	2300	1800
	1 1/2	770	1215	1650	2100	1875	2500	2100	3000	2800	2300	3350	3150	2500
	2	1290	2035	2770	3500	3100	4200	3500	4900	4800	3600	5600	5300	4200
	2 1/2	1850	2915	3960	5000	4500	6000	5000	7000	6800	5500	8000	7600	6000
	3	2880	4550	6180	7800	7000	9400	8000	11000	10700	8600	12500	11800	9400
	3 1/2	3880	6125	8325	10500	9500	12600	10600	15000	14400	11500	17000	16000	13000
	4	5000	7900	10800	13500	12200	16300	13700	19000	18500	15000	22000	20000	16000
	5	7820	12500	17000	21500	19300	26000	22000	30000	29000	24000	34000	30000	25000
	6	11400	18000	24500	31000	28000	37000	31000	43000	42000	34000	50000	47000	37000

	Inlet Press.	200		225		250		300	350	400	450	500	600
	°F.	388		397		406		421	436	448	459	469	490
	Outlet Press.	0-110	125	150	0-125	150	0-135	150	0-165	0-190	0-220	0-250	0-300	0-350
Valve size, inches	1/2	500	490	450	560	540	610	600	725	838	955	1070	1190	1430
	3/4	925	910	835	1050	1000	1135	1120	1340	1550	1760	1980	2190	2630
	1	1540	1460	1335	1715	1700	1880	1850	2225	2565	2900	3300	3610	4330
	1 1/4	2750	2700	2475	3060	2960	3350	3300	3975	4600	5200	5900	6475	7770
	1 1/2	3780	3700	3400	4215	4075	4625	4550	5470	6300	7200	8000	8960	10800
	2	6300	6200	5700	7000	6800	7700	7600	9100	10500	12000	13500	14950	17900
	2 1/2	9100	8900	8200	10100	9800	11100	11000	13100	15000	17200	19500	21500	25700
	3	14200	13900	12700	15800	15200	17300	17000	20500	23600	26900	30000	33500	40200
	3 1/2	19000	18700	17100	21200	20500	23300	23000	27500	31700	36000	41000	44800	53800
	4	24600	24100	22100	27400	26500	30100	29600	36000	41200	47000	53000	58500	70200
	5	39000	38200	35000	43400	42000	48000	47000	56000	64200	73000	82500	90500	109000
	6	54000	53000	48500	60000	58000	68000	67000	81000	92800	108000	119000	130000	157000

temperature regulators SIZING AND CAPACITY DATA

SIZING SMALL FLOW, DIRECT OPERATED REGULATORS

Capacity is directly proportional to temperature change on bulb. Enter Capacity Table at inlet steam pressure or at the minimum pressure differential available and for a temperature change equal to the maximum allowable temperature variation for your job. Find capacity equal to your required maximum flow or slightly greater. The SIZE and CLASS Temperature Regulator is shown at the head of the column in which this capacity appears.

LIQUID CAPACITIES*

Press. Diff. Across Valve PSI	Temp. Change °F. at Bulb	Cooling Water Gals. per min. 3/8" or 1/2" sizes Class MDR 1/4" Seat	Class MCR 3/8" Seat	3/4" size Class MBR 3/4" Seat
5	5	.7	1.1	3.2
	10	1.4	2.1	7
	20	2.5	3.7	11.2
10	5	1.0	1.5	4.5
	10	1.9	2.9	8.8
	20	3.3	5.2	15.6
25	5	1.5	2.3	7.2
	10	2.9	4.5	13.5
	20	5.2	7.9	24
50	5	2.1	3.2	10.5
	10	4.1	6.3	18.7
	20	7.1	10.4	33.6
75	5	2.6		13
	10	5.0		22.8
	20	8.7		40.8
100	5	3.0		15.2
	10	5.7		26
	20	9.9		46.8

*Capacities also applicable to those classes with "C" or "J" added.

SATURATED STEAM CAPACITIES*

Inlet Steam Press. PSIG	Temp. Change °F. at Bulb	Steam Lbs. per hr.—3/8" or 1/2" sizes Classes MOT and ME-1 1/8" Seat	Class MD-1 1/4" Seat	Class MC-1 3/8" Seat	Class OT-1† with MOT
5 (227°F)	5	5	11	15	
	10	8	18	28	
	20	13	32	46	
10 (239°F)	5	7	15	22	84
	10	12	26	39	84
	20	20	45	66	84
25 (267°F)	5	12	26	37	261
	10	21	46	67	261
	20	34	78	116	261
50 (298°F)	5	18	40	58	492
	10	32	71	104	492
	20	54	120	174	492
75 (320°F)	5	24	50		740
	10	44	92		740
	20	72	158		740
100 (338°F)	5	34	64		1170
	10	56	114		1170
	20	88	190		1170

†Minimum Inlet Press. 10 psi.
*Capacities also applicable to those classes with "C" added.

SIZING PILOT OPERATED REGULATORS — CLASSES TK, TKM, TRK, TRKM, TKML, TRKML*

Enter the capacity table at the inlet pressure corresponding to your minimum value. Select the capacity figure equal to or slightly greater than your required maximum flow. The correct size regulator is shown in the left hand column horizontally opposite this figure.

WATER CAPACITIES—GALLONS PER MINUTE AT 60°F.

	Press. Diff.	2	3	5	10	20	30	50	75	100	125	150	175
VALVE SIZE INCHES	1/2	6	7	9	13	19	23	30	37	42	46	50	56
	3/4	8	9	13	19	25	31	41	50	55	62	69	75
	1	17	21	27	38	54	64	83	100	110	130	140	150
	1 1/4	23	27	37	52	72	88	113	135	155	175	187	205
	1 1/2	34	41	54	75	100	125	160	190	220	245	270	300
	2	52	68	82	120	165	205	260	320	365	415	440	525
	2 1/2	72	113	145	200	285	350	435	540	615	685	750	820
	3	130	160	205	290	400	490	625	765	850	950	1035	1160
	4	193	230	305	425	590	710	920	1100	1230	1420	1500	1690

CAPACITY IN LBS. SATURATED STEAM PER HR. OR GALS. OF WATER HEATED PER HR.

(Based on 100°F temperature rise and pressure drop of 45% inlet pressure or greater)

	Inlet Press. PSIG	0	1	3	5	7	10	12	15	20	25	30	35	40	50	60	75	100	110	125
	at (°F)	(212)	(215)	(222)	(227)	(232)	(239)	(244)	(250)	(259)	(267)	(274)	(281)	(287)	(298)	(307)	(320)	(338)	(343)	(353)
VALVE SIZE INCHES	1/2	97	105	118	130	140	164	170	185	225	255	290	310	350	420	480	570	750	780	900
	3/4	142	153	171	190	205	240	250	275	340	410	430	460	510	625	700	850	1090	1150	1330
	1	240	255	290	320	350	410	425	470	570	630	720	780	870	1040	1200	1430	1840	1920	2200
	1 1/4	405	440	490	540	570	675	700	770	930	1025	1190	1350	1400	1720	1950	2350	3000	3150	3600
	1 1/2	545	585	660	725	800	920	960	1075	1290	1420	1630	1750	1950	2350	2700	3200	4150	4400	4950
	2	920	980	1110	1220	1350	1540	1600	1800	2120	2350	2750	2900	3200	3900	4400	5400	6940	7150	8250
	2 1/2	1590	1700	1910	2100	2300	2640	2750	3050	3700	4100	4700	5000	5600	6700	7700	9200	11900	12200	14200
	3	2150	2340	2650	2900	3100	3650	3800	4200	5080	5600	6500	7000	7800	9400	10500	13050	16400	17200	19800
	4	3550	3800	4250	4660	5000	5950	6000	6800	8310	9100	10700	11200	12500	15000	17000	20800	26800	27500	32300

*Capacities applicable to all classes shown and also those classes with B, C or J appearing in the basic class designation.

TRADE LESLIE MARK

COAST - TO - COAST SERVICE

A Leslie engineer is as near as your telephone—enlist his aid. Call our representative nearest to you listed below.

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TRADE LESLIE MARK

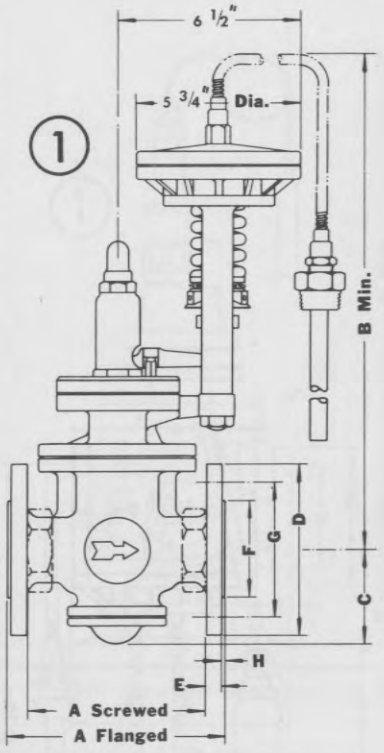
LAYOUT DIMENSIONS TEMPERATURE REGULATOR

CAST BRONZE AND CAST IRON

DIMENSIONS IN INCHES

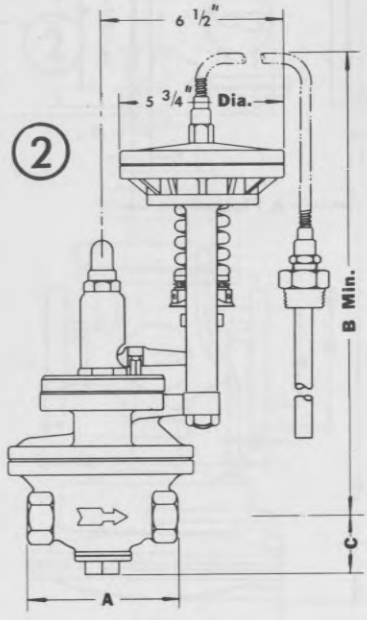
① CLASSES LTCO, LTCOK, LTCL AND LTCLK

SIZE	A	B	C	D	E	F	BOLT CIRCLE G	H	NO. OF HOLES	BOLT SIZE	HOLE SIZE
SCREWED (BRONZE AND IRON)											
1/2"	5-3/4	19-3/8	3-5/16	- -	- -	- -	- -	- -	- -	- -	- -
3/4"	5-3/4	19-3/8	3-5/16	- -	- -	- -	- -	- -	- -	- -	- -
1"	5-3/4	19-3/8	3-5/16	- -	- -	- -	- -	- -	- -	- -	- -
1-1/4"	5-3/4	19-5/8	3-9/16	- -	- -	- -	- -	- -	- -	- -	- -
1-1/2"	6-1/4	20	3-15/16	- -	- -	- -	- -	- -	- -	- -	- -
2"	7-1/2	20-1/2	4-1/4	- -	- -	- -	- -	- -	- -	- -	- -
FLANGED 125 LB. ASA STANDARD (IRON)											
1-1/2"	7-1/2	20	4-1/8	5	9/16	- -	3-7/8	- -	4	1/2	5/8
2"	8-3/4	20-1/2	4-3/8	6	5/8	- -	4-3/4	- -	4	5/8	3/4
2-1/2"	9-3/4	21-3/8	5-1/2	7	11/16	- -	5-1/2	- -	4	5/8	3/4
3"	11	21-7/8	6-1/2	7-1/2	3/4	- -	6	- -	4	5/8	3/4
4"	13-1/2	23-1/2	7	9	15/16	- -	7-1/2	- -	8	5/8	3/4
5"	16	26-1/8	10-3/4	10	15/16	- -	8-1/2	- -	8	3/4	7/8
6"	15	26-1/4	10-3/8	11	1	- -	9-1/2	- -	8	3/4	7/8
FLANGED 250 LB. ASA STANDARD (IRON)											
1-1/2"	8	20	4-1/8	6-1/8	3/4	3-9/16	4-1/2	1/16	4	3/4	7/8
2"	9-1/4	20-1/2	4-3/8	6-1/2	13/16	4-3/16	5	1/16	8	5/8	3/4
2-1/2"	10-3/8	21-3/8	5-1/2	7-1/2	15/16	4-15/16	5-7/8	1/16	8	3/4	7/8
3"	11-3/4	21-7/8	6-1/2	8-1/4	1-1/16	5-11/16	6-5/8	1/16	8	3/4	7/8
FLANGED 150 LB. MSS STANDARD (BRONZE)											
1/2"	6-3/4	19-3/8	2-13/16	3-1/2	9/16	- -	2-3/8	- -	4	1/2	5/8
3/4"	6-3/4	19-3/8	2-13/16	3-7/8	9/16	- -	2-3/4	- -	4	1/2	5/8
1"	6-3/4	19-3/8	2-13/16	4-1/4	9/16	- -	3-1/8	- -	4	1/2	5/8
1-1/4"	7	19-5/8	3-1/16	4-5/8	9/16	- -	3-1/2	- -	4	1/2	5/8
1-1/2"	7-1/2	20	3-7/16	5	9/16	- -	3-7/8	- -	4	1/2	5/8
2"	8-3/4	20-1/2	3-1/2	6	5/8	- -	4-3/4	- -	4	5/8	3/4
2-1/2"	9-3/4	21-3/8	4-3/8	7	11/16	- -	5-1/2	- -	4	5/8	3/4
3"	11	21-7/8	5-1/4	7-1/2	3/4	- -	6	- -	4	5/8	3/4
3-1/2"	12	22-3/8	6	8-1/2	11/16	- -	7	- -	8	5/8	3/4
4"	13	23-1/2	7	9	11/16	- -	7-1/2	- -	8	5/8	3/4
5"	16	26-1/8	10-3/4	10	15/16	- -	8-1/2	- -	8	3/4	7/8
6"	15	26-1/4	10-3/8	11	1	- -	9-1/2	- -	8	3/4	7/8
FLANGED 300 LB. MSS STANDARD (BRONZE)											
1/2"	6-3/4	19-3/8	2-13/16	3-3/4	9/16	- -	2-5/8	- -	4	1/2	5/8
3/4"	6-3/4	19-3/8	2-13/16	4-5/8	9/16	- -	3-1/4	- -	4	5/8	3/4
1"	6-3/4	19-3/8	2-13/16	4-7/8	9/16	- -	3-1/2	- -	4	5/8	3/4
1-1/4"	7	19-5/8	3-1/16	5-1/4	9/16	- -	3-7/8	- -	4	5/8	3/4
1-1/2"	7-1/2	20	3-7/16	6-1/8	9/16	- -	4-1/2	- -	4	3/4	7/8
2"	8-3/4	20-1/2	3-1/2	6-1/2	5/8	- -	5	- -	8	5/8	3/4
2-1/2"	9-3/4	21-3/8	4-3/8	7-1/2	11/16	- -	5-7/8	- -	8	3/4	7/8
3"	11	21-7/8	5-1/4	8-1/4	3/4	- -	6-5/8	- -	8	3/4	7/8
3-1/2"	12	22-3/8	6	9	13/16	- -	7-1/4	- -	8	3/4	7/8
4"	13	23-1/2	7	10	1-1/16	- -	7-7/8	- -	8	3/4	7/8
5"	16	26-1/8	10-3/4	11	1-1/8	- -	9-1/4	- -	8	3/4	7/8
6"	15	26-1/4	10-3/8	12-1/2	1-3/16	- -	10-5/8	- -	12	3/4	7/8



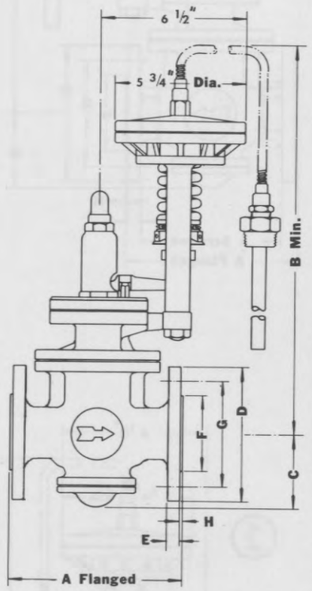
② CLASS JTCO

SIZE	A	B	C
1/4"	5-1/4	16-1/2	1-3/4
3/8"	5-1/4	16-1/2	1-3/4
1/2"	4-1/2	16-1/2	1-3/4



LAYOUT DIMENSIONS TEMPERATURE REGULATOR

CAST STEEL



DIMENSIONS IN INCHES

CLASSES LTCSO-3 AND LTCLS

SIZE	A	B	C	D	E	F	BOLT CIRCLE G	H	NO. OF HOLES	BOLT SIZE	BOLT HOLE
150 LB. ASA FLANGE STANDARD											
1/2"	7-5/8	20-7/8	3-7/16	3-1/2	5/16	1-3/8	2-3/8	1/16	4	1/2	9/16
3/4"	7-5/8	20-7/8	3-7/16	3-7/8	3/8	1-11/16	2-3/4	1/16	4	1/2	9/16
1"	7-1/2	20-7/8	3-7/16	4-1/4	3/8	2	3-1/8	1/16	4	1/2	9/16
1-1/4"	7-7/8	21	3-13/16	4-5/8	7/16	2-7/8	3-1/2	1/16	4	1/2	9/16
1-1/2"	8-3/8	21-3/8	4-1/8	5	1/2	3-5/8	3-7/8	1/16	4	1/2	9/16
2"	10-1/4	21-5/8	4-1/2	6	9/16	4-1/8	4-3/4	1/16	4	5/8	11/16
2-1/2"	11-5/8	22-5/8	6	7	5/8	5	5-1/2	1/16	4	5/8	11/16
3"	12-1/2	23-1/2	6-13/16	7-1/2	11/16	5-1/2	6	1/16	4	5/8	11/16
3-1/2"	13-3/8	24-1/8	7-5/8	8-1/2	3/4	6	7	1/16	4	5/8	11/16
4"	14-3/8	24-1/2	7-9/16	9	7/8	7	7-1/2	1/16	8	5/8	11/16
6"	17-3/4	29	10-3/8	11	15/16	8-1/2	9-1/2	1/16	8	3/4	13/16
300 LB. ASA FLANGE STANDARD											
1/2"	8	20-7/8	3-7/16	3-3/4	1/2	1-3/8	2-5/8	1/16	4	1/2	9/16
3/4"	8	20-7/8	3-7/16	4-5/8	9/16	1-11/16	3-1/4	1/16	4	5/8	11/16
1"	8	20-7/8	3-7/16	4-7/8	5/8	2	3-1/2	1/16	4	5/8	11/16
1-1/4"	8-3/8	21	3-13/16	5-1/4	11/16	2-1/2	3-7/8	1/16	4	5/8	11/16
1-1/2"	8-7/8	21-3/8	4-1/8	6-1/8	3/4	2-7/8	4-1/2	1/16	4	3/4	13/16
2"	10-3/4	21-5/8	4-1/2	6-1/2	13/16	3-5/8	5	1/16	8	5/8	11/16
2-1/2"	12-1/4	22-5/8	6	7-1/2	15/16	4-1/8	5-7/8	1/16	8	3/4	13/16
3"	13-1/4	23-1/2	6-13/16	8-1/4	1-1/16	5	6-5/8	1/16	8	3/4	13/16
3-1/2"	14-1/8	24-1/8	7-5/8	9	1-1/8	5-1/2	7-1/4	1/16	8	3/4	13/16
4"	15	24-1/2	7-9/16	10	1-3/16	6-3/16	7-7/8	1/16	8	3/4	13/16
6"	18-5/8	29	10-3/8	12-1/2	1-3/8	8-1/2	10-5/8	1/16	12	3/4	13/16
400 AND 600 LB. ASA FLANGE STANDARD											
1/2"	8-1/2	20-7/8	3-7/16	3-3/4	9/16	1-3/8	2-5/8	1/4	4	1/2	9/16
3/4"	8-1/2	20-7/8	3-7/16	4-5/8	5/8	1-11/16	3-1/4	1/4	4	5/8	11/16
1"	8-1/2	20-7/8	3-7/16	4-7/8	11/16	2	3-1/2	1/4	4	5/8	11/16
1-1/4"	9	21	3-13/16	5-1/4	13/16	2-1/2	3-7/8	1/4	4	5/8	11/16
1-1/2"	9-1/2	21-3/8	4-1/8	6-1/8	7/8	2-7/8	4-1/2	1/4	4	3/4	13/16
2"	11-1/2	21-5/8	4-1/2	6-1/2	1	3-5/8	5	1/4	8	5/8	11/16
2-1/2"	13	22-5/8	6	7-1/2	1-1/8	4-1/8	5-7/8	1/4	8	3/4	13/16
3"	14	23-1/2	6-13/16	8-1/4	1-1/4	5	6-5/8	1/4	8	3/4	13/16
3-1/2"	15	24-1/8	7-5/8	9	1-3/8	5-1/2	7-1/4	1/4	8	7/8	15/16
400 LB. ASA FLANGE STANDARD											
4"	15-3/4	24-1/2	7-9/16	10	1-3/8	6-3/16	7-7/8	1/4	8	7/8	15/16
6"	19-1/2	29	10-3/8	12-1/2	1-5/8	8-1/2	10-5/8	1/4	12	7/8	15/16
600 LB. ASA FLANGE STANDARD											
4"	16	24-1/2	7-9/16	10-3/4	1-1/2	6-3/16	8-1/2	1/4	8	7/8	15/16
6"	20	29	10-3/8	14	1-7/8	8-1/2	11-1/2	1/4	12	1	1-1/8

LAYOUT DIMENSIONS TEMPERATURE REGULATOR

CAST BRONZE AND CAST IRON

DIMENSIONS IN INCHES

① CLASSES

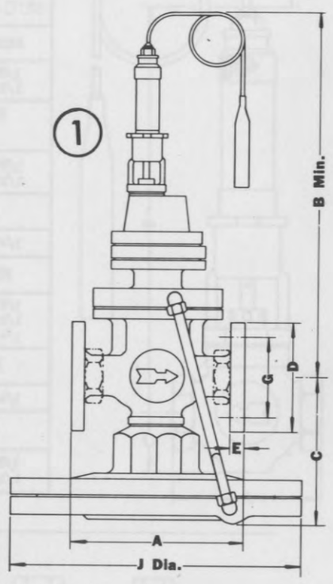
TM TBCKM TRJKM TRKML
TKM TRM TRCJKM TRCML
TCM TRKM TML TRCKML
TCKM TRCM TKML TRJML
TBM TRCKM TCML TRCJML
TBCM TRJM TCKML TRJKML
TBKM TRCJM TRML TRCJKML

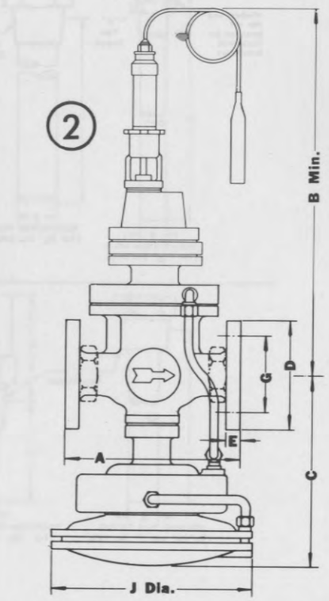
SIZE	A	B	C	D	E	BOLT CIRCLE G	J	NO. OF HOLES	BOLT SIZE	BOLT HOLE
SCREWED (BRONZE AND IRON)										
1/2"	5-3/4	14-1/2	5-7/8	- -	- -	- -	11-1/2	- -	- -	- -
3/4"	5-3/4	14-1/2	5-7/8	- -	- -	- -	11-1/2	- -	- -	- -
1"	5-3/4	14-1/2	5-7/8	- -	- -	- -	11-1/2	- -	- -	- -
1-1/4"	5-3/4	14-11/16	6	- -	- -	- -	11-1/2	- -	- -	- -
1-1/2"	6-1/4	15-1/16	6-7/8	- -	- -	- -	11-1/2	- -	- -	- -
FLANGED 125 LB. ASA STANDARD (IRON)										
1-1/2"	7-1/2	15-1/16	6-7/8	5	9/16	3-7/8	11-1/2	4	1/2	5/8
FLANGED 150 LB. MSS STANDARD (BRONZE)										
1/2"	6-3/4	14-1/2	5-3/4	3-1/2	9/16	2-3/8	11-1/2	4	1/2	5/8
3/4"	6-3/4	14-1/2	5-3/4	3-7/8	9/16	2-3/4	11-1/2	4	1/2	5/8
1"	6-3/4	14-1/2	5-3/4	4-1/4	9/16	3-1/8	11-1/2	4	1/2	5/8
1-1/4"	7	14-11/16	5-7/8	4-5/8	9/16	3-1/2	11-1/2	4	1/2	5/8
1-1/2"	7-1/2	15-1/16	6-3/4	5	9/16	3-7/8	11-1/2	4	1/2	5/8

② CLASSES

T TB TR TRJ
TC TBC TRC TRCJ
TK TBK TRK TRJK
TCK TBCK TRCK TRCJK

SCREWED (BRONZE AND IRON)										
2"	7-1/2	14-3/8	10-5/8	- -	- -	- -	11-1/4	- -	- -	- -
FLANGED 125 LB. ASA STANDARD (IRON)										
2"	8-3/4	14-3/8	10-5/8	6	5/8	4-3/4	11-1/4	4	5/8	3/4
2-1/2"	9-3/4	15-1/4	11-5/8	7	11/16	5-1/2	11-1/4	4	5/8	3/4
3"	11	15-13/16	15-9/16	7-1/2	3/4	6	15-7/16	4	5/8	3/4
4"	13-1/2	17-1/16	17-3/16	9	15/16	7-1/2	15-7/16	8	5/8	3/4
FLANGED 150 LB. MSS STANDARD (BRONZE)										
2"	8-3/4	14-3/8	10-5/8	6	5/8	4-3/4	11-1/4	4	5/8	3/4
2-1/2"	9-3/4	15-1/4	11-5/8	7	11/16	5-1/2	11-1/4	4	5/8	3/4
3"	11	15-13/16	15-9/16	7-1/2	3/4	6	15-7/16	4	5/8	3/4
4"	13	17-1/16	17-3/16	9	11/16	7-1/2	15-7/16	8	5/8	3/4

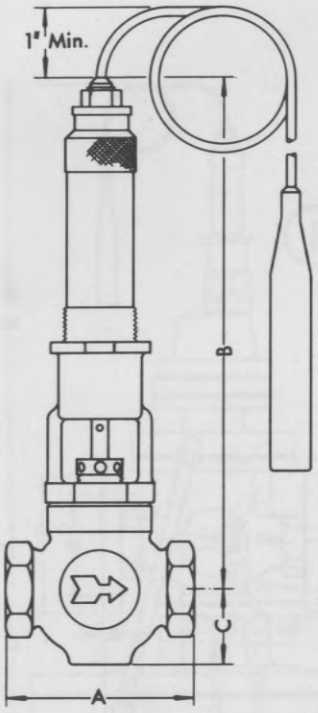




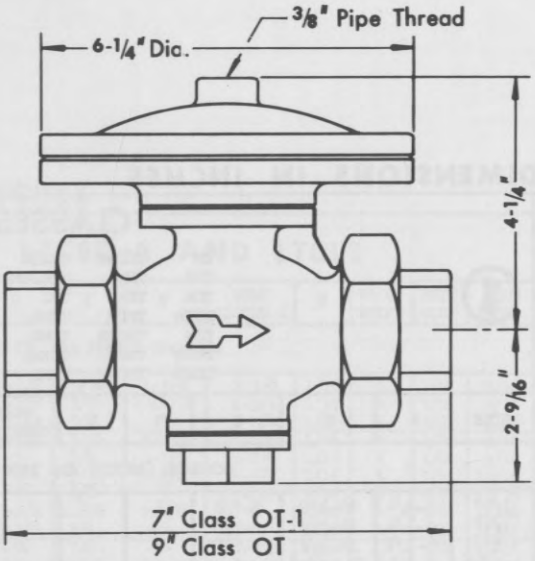
TRADE LESLIE MARK

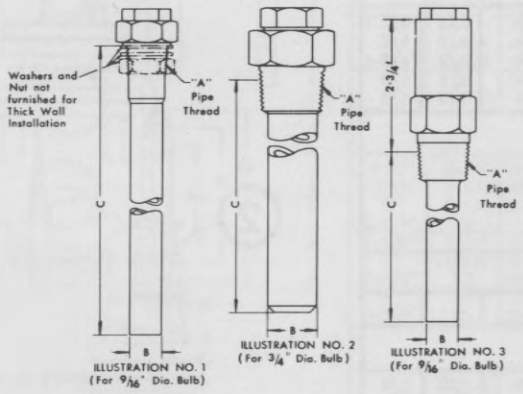
LAYOUT DIMENSIONS TEMPERATURE REGULATOR

DIMENSIONS IN INCHES

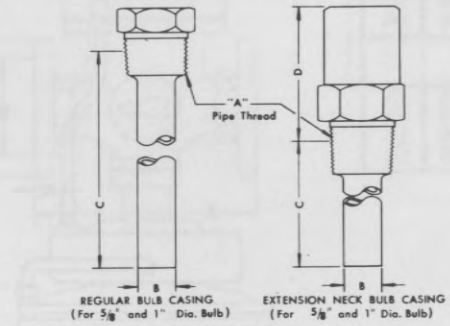


MC-1, MD-1, ME-1, MCC-1, MDC-1 & MEC-1			
SIZE	A	B	C
3/8"	3-3/8	7-1/4	1-1/4
1/2"	2-5/8	7-1/4	1-1/4
MCR, MDR, MCRC AND MDRC			
3/8"	3-3/8	7-1/4	1-9/16
1/2"	2-5/8	7-1/4	1-9/16
MBR AND MBRC			
3/4"	2-3/4	7-3/4	1-7/8
MG-2 AND MGC-2			
3/8"	2-5/8	6-1/2	1-1/2
1/2"	3-3/16	6-1/2	1-1/2
3/4"	3-3/16	6-1/2	1-1/2
MGT AND MGTC			
3/4"	3-3/16	6-1/2	1-1/4
MOT AND MOTC			
3/8"	3-3/8	7-1/4	1-1/4
1/2"	2-5/8	7-1/4	1-1/4





BULB CASING DIMENSIONS FOR CLASSES M AND T TEMPERATURE REGULATORS				
TYPE AND MAX. WORKING PRESSURE PSI	ILLUSTRATION	A	B	C
#1 400 PSI	1	1/2	5/8	4-7/8
#3 400 PSI	1	1/2	5/8	9-3/4
#3 2000 PSI	1	3/4	7/8	8-1/4
#4 2000 PSI	2	1	1	8
#4 3000 PSI	2	1	1-1/8	4
EXTENSION NECK 400 PSI	3	3/4	5/8	7-7/16



BULB CASING DIMENSIONS FOR CLASSES LTCO AND LTCSO TEMPERATURE REGULATORS							
TYPE BULB	REGULAR BULB CASINGS			EXTENSION NECK BULB CASINGS			
	A	B	C	A	B	C	D
STANDARD	1	3/4	21-3/8	1	3/4	19-3/8	2-3/4
LARGE	1-1/4	1-1/8	21-7/8	1-1/4	1-1/8	19-5/8	3
SHORT	1-1/4	1-1/8	8-1/4				

TRADE LESLIE MARK

instructions for TEMPERATURE REGULATORS

Direct Operated and Pilot Operated Types

INSTALLATION, OPERATION and MAINTENANCE

CLASSES*

HEATING		COOLING	
T	MC-1	TR	MCR
TK	MD-1	TRK	MDR
TKM	ME-1	TRKM	MBR
TKML	MOT	TRKML	
TM		TRM	
TML		TRML	

*Also all of the above "T" regulators that include B, C, J or W in the class designation and "M" regulators that include C or J in class.

INSTALLATION
All Classes

Do not lead or cement in making up joints. Use pipe thread compound sparingly on male threads.

1. Protect regulator from scale and dirt with Leslie Self-Cleaning Strainer.
2. Install stop valves and pressure gauges (C) to control setting and operation of regulator. For maintenance without shutting down heater or process, a by-pass should be included.
3. Blow out pipe lines thoroughly before installing regulator.
4. Gaskets should have same outside diameter as flanges and 1/4" larger inside diameter than bore of flange.

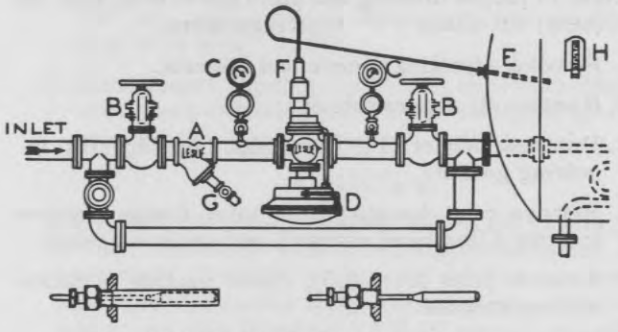


FIG. 1 Typical Installation

5. Install regulator (D) (without thermostatic element) upright in horizontal pipe line with arrow (cast on body) pointing in direction of flow.
6. Install bulb casing or stuffing box into side or bottom of vessel so that Thermostatic Bulb will feel true temperature of the fluid under control. Do not locate bulb closer than 6" to source of heat or coolant. Avoid placing bulb in direct path of injected steam or cooling medium.
7. Remove adjusting sleeve (F) from regulator, insert bellows and screw bellows swivel nut into sleeve full distance. Replace sleeve on regulator and screw downward a few turns. Lock in place.
8. Place bulb and spring in casing or install bulb in stuffing box (E). Install and tighten bulb casing nut or stuffing box nut.
9. Handle flexible tubing carefully and arrange location for maximum protection.
10. Thermometer and thermostatic bulb should be at the same location for an accurate check of regulator action.
11. For injection heating, place regulator above maximum water level in tank. Install check valve on outlet side to prevent water backing up into regulator.
12. For cooling service a small constant circulation of coolant may be desirable and should be provided by a small by-pass with needle valve or orfice (in classes containing letter "J" a small constant flow of coolant is handled through an internal by-pass.)
13. For TB Type Regulators, a 1/4" external pipe is connected from a higher pressure (25-125psi) supply to pilot unit on inlet side through a 1/4" Strainer and Reducing Valve. Be sure 1/4" line is free of dirt and scale.
14. For installation where freezing may occur, install insulated box to completely cover Class "T"type regulator below top cap joint.

OPERATION

Heating Service

Classes T, TK, TM, TKM, etc.
MC-1, MD-1, ME-1, etc.

1. Slowly open inlet stop valve and dispose of condensation, dirt, etc., by opening strainer blow-off valve.
2. Slowly open outlet stop valve. (For Class TB types, set 1/4" reducing valve in external supply line to pilot valve for 20 psi.)
3. At start regulator is wide open and heating will be rapid. When desired temperature is nearly reached, loosen lock nut and turn down on adjusting sleeve (F) until regulator closes at the desired temperature. Tighten lock nut. For regulators fitted with Calibrated Dial, see Page 4.
4. Check controlled temperature after a period of operation and readjust sleeve, if necessary. To

increase temperature setting, gradually turn adjusting sleeve upward until regulator maintains desired temperature. To decrease temperature, turn adjusting sleeve downward.

5. To turn steam off, close inlet stop valve.
6. To turn steam on (with regulator set) keep outlet stop valve closed until inlet stop valve is opened wide.

Cooling Service

Classes TR, TRK, TRM, TRMK, etc.
MDR, MCR, MBR, etc.

1. Slowly open inlet stop valve and dispose of dirt, etc., by opening strainer blow-off valve.
2. Screw adjusting sleeve downward all the way, opening regulator fully. Open outlet stop valve supplying cooling water to equipment.
3. Observe temperature on thermometer, and when desired temperature is nearly reached, back off adjusting sleeve until regulator throttles and closes at the desired temperature. For regulators fitted with Calibrated Dial -- See Page 4.
4. Check controlled temperature after a period of operation and readjust sleeve if necessary. To increase temperature setting, gradually turn adjusting sleeve upward until regulator maintains desired temperature. To decrease temperature turn adjusting sleeve downward.
5. To turn water off, close inlet stop valve.

MAINTENANCE

Repacking Pilot or Valve Stem

Worn packing should be replaced as follows.

1. Remove adjusting sleeve, hold valve stem by placing pin in hole and remove stem screw, freeing springs and seats.
2. Remove bonnet from Housing or Body and clean stuffing box. Clean stem with fine crocus cloth.
3. Replace valve stem in bonnet and assembly dowel over stem. Slide washer, spacer, cup packing and gland ring as shown in Fig. 2 over stem into box.
4. Replace packing gland and tighten only as much as required to obtain seal at A & B. Put bonnet back on Housing or Body and tighten.
5. Replace seats and springs in order with short spring on bottom and two long ones on top.
6. Hold valve stem by placing pin in hole. Place top spring seat and stem screw in position on springs. Press seat down tightly against springs compressing them until screw can be easily run into stem. Tighten.

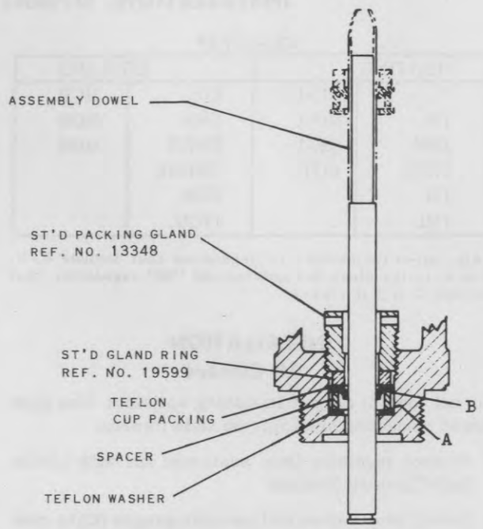


FIG. 2 Assembled Teflon Stuffing Box

7. Reassemble adjusting sleeve on bonnet and readjust for temperature.
8. When steam or water has been turned on, recheck tightness of packing gland.

Dismantling

Refer to proper drawing and parts list— available on request) All Class "T" type regulators.

1. Remove adjusting sleeve and element.
2. Remove all copper tubing.
3. Unscrew bonnet (11) from pilot housing (18) removing gasket.
4. Remove pilot housing from pilot flange (remove top row Allen head screws), and remove gasket.
5. Remove pilot lever (33), clean seating surfaces and reassemble.
6. Remove pilot flange and gasket from top cap (lower row Allen head screws).
7. Remove top cap (1) from body (3).
8. Remove gasket (2), main valve (6), and main valve spring (4).
9. Remove diaphragm base (10) assembly, and seat ring, if necessary. Use special wrench for seat ring.
10. Loosen Allen set screw and remove reservoir (2" regulators and over.)

TRADE LESLIE MARK instructions for TEMPERATURE REGULATORS

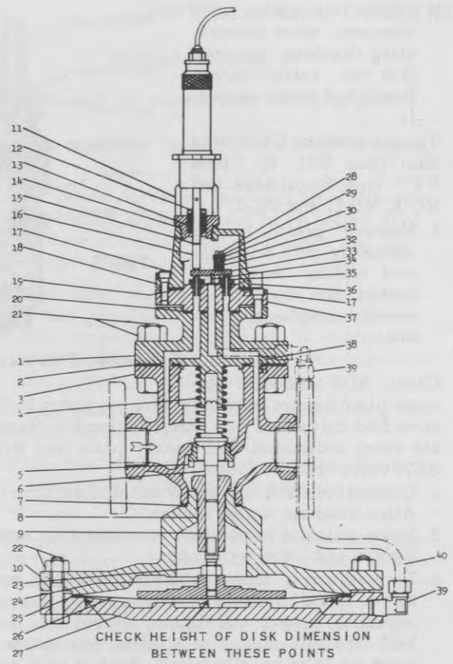


FIG. 3 1/2" to 1-1/2" Classes TM and TKM (For Heating Service)

11. Remove lower bolts and diaphragm cover from bottom cap, also gaskets, diaphragm and diaphragm disc with stem.
12. When inspecting diaphragm only remove diaphragm cover very carefully so as not to damage diaphragm or gaskets.

CAUTION

LESLIE TEMPERATURE REGULATORS are ruggedly built, carefully assembled and dimensioned very accurately. For this reason, do not change any dimensions. To assure long life and low maintenance costs, use only Standard LESLIE parts. Handle flexible tubing carefully. Graphite or compound should not be used on joints. Moving parts require no lubricants.

Cleaning

1. Clean all parts with kerosene or solvent, Make sure lever moves freely and seats tight.
2. If main valve or seat ring surfaces are scored or cut, replace and grind, using fine grinding compound and guide lower end of main valve with bottom cap in position. Remove all traces of compound.

Assembling

1. Replace in order main valve, main valve spring, top cap gasket, and top cap. Install pilot flange gasket, be sure dowel pin is in proper hole for service desired. Add pilot flange, housing gasket and pilot housing. Install bonnet gasket and bonnet.
2. Classes TM, TMK, etc. Assemble bottom cap with bottom cap gasket on main body. Insert stem and disc to which it is attached. Adjust height of the disc so that with main valve closed, the diaphragm disc is 5/64" – 7/64" above diaphragm face on diaphragm base. See Fig. 3.
3. 2-4" Class T, TK, etc. Replace in order on diaphragm cover, the gasket, diaphragm, gasket, diaphragm disc, and bottom cap. Care should be taken not to fold or damage diaphragm when assembling. Loosely assemble nuts and bolts. With diaphragm end down, insert diaphragm stem into stem opening in bottom cap, adjustment end first. Using a blunt instrument, press down on stem forcing diaphragm down against cover. While in this position, tighten nuts in cover. Do not tighten excessively as cover is cast iron. Replace reservoir but do not tighten in place with Allen set screws.
4. Set clearance between main valve and diaphragm stem. See Fig. 4. Measure dimension "A" and "B". Subtract "A" from "B" and call this dimension "C". Adjust diaphragm stem length so that when in place measurement "C" equals dimension "C".

Stem can be removed without disassembly by turning unit upside

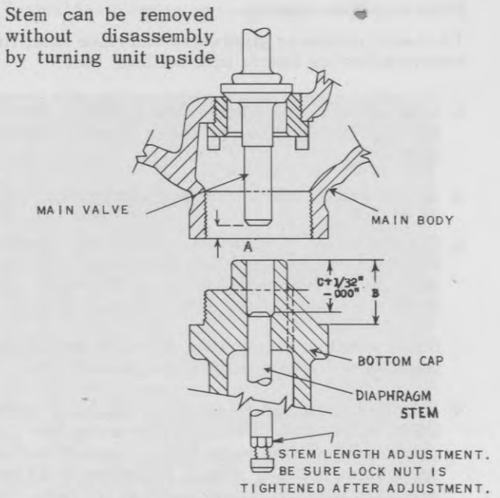


FIG. 4 Setting Clearance Between Main Valve and Diaphragm Stem

TRADE LESLIE MARK instructions for TEMPERATURE REGULATORS

down. Stem must be pushed down so diaphragm disc is against stop when measuring dimension "C".

5. Install bottom cap gasket and bottom cap assembly on body. The thickness of the gasket (.025") is then the clearance between the main valve and diaphragm stem.
6. Replace copper tubing, adjusting sleeve and element. To change Regulator from heating to cooling or vice versa.

To Change Regulator From Heating To Cooling and Vice Versa

1. Close inlet and outlet stop valves.
2. Remove cap screws (17) holding pilot flange (37) to top cap. See FIG. 3.
3. Remove pilot assembly (parts 37 and above) in one piece.
4. Remove gasket and change dowel pin position from "Heating" to "Cooling" or vice versa.
5. Replace gasket so that all ports are open. Replace pilot assembly and cap screws. Regulator action is now reversed – adjust per "OPERATION" of desired service.

Class "M" Type Regulators

Refer to proper drawing.

To check, remove or grind valve and valve seat, first remove adjusting sleeve with bellows, then:

1. Classes MC-1, MD-1, ME-1, MG-2, MCC-1, MDC-1, MEC-1, MGC-2: Remove entire bonnet assembly from body.
2. Classes MBR, MBRC: Remove bottom cap.
3. Classes MCR, MDR, MCRC, and MDRC: Remove valve stem screw permitting the springs and spring seats to be removed, (Care must be taken that these springs are replaced in the same order.)

   Remove bottom cap to take out valve and remove remainder of bonnet assembly to take out seat ring.
4. If scored or cut, reface valve and seat ring (MCR, MDR, MCRC, and MDRC only) by using fine compound and pressing valve lightly against seat using a short twisting motion lifting valve off seat every few turns to change position of valve. Do not overgrind. All traces of compound should be removed before reassembling.
5. Clean all parts with kerosene when reassembling checking to see that the valve moves freely and seats properly.

To add or adjust Calibrated Dial (See FIG. 5) Class "T" type Regulators and MC-1, MD-1, and ME-1.

1. Remove plain bonnet assembly from regulator and replace with calibrated dial bonnet assembly using bonnet gasket.

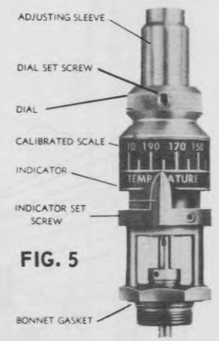


FIG. 5

Calibrated Dial Assembly

Class MDR and MCR Remove plain bonnet assembly from regulator body and stem from calibrated dial bonnet assembly. Reassemble using calibrated dial bonnet parts and MDR or MCR valve stem complete.

2. Loosen indicator set screw and dial set screw with Allen head set screw wrench.
3. Move indicator to position convenient to read and tighten indicator set screw.
4. Turn adjusting sleeve counter-clockwise several turns. Install bellows of thermostatic element in adjusting sleeve and tighten swivel nut. Install bulb into bulb casing or stuffing box where temperature is to be controlled. Heat or cool system to temperature within range of element. Measure temperature at bulb location with an accurate thermometer.
5. Adjust regulator as follows:

Heating Service

Turn adjusting sleeve clockwise until regulator cuts off flow of heating medium. Then turn adjusting sleeve back just far enough to start a slight flow.

Cooling Service

Turn adjusting sleeve clockwise until regulator just starts to pass cooling medium.

6. Calibrate regulator by turning calibrated dial so that scale reading at indicator corresponds to thermometer temperature. Tighten calibrated dial set screw.
7. Dial adjustment is now set for use at any temperature on the scale. Turn dial to desired temperature.

THE FOLLOWING CALIBRATED DIALS ARE AVAILABLE:

Temperature Range	Ref. Number
20-120°	21932
50-150°	21933
50-250°	20724
120-170°	22788
120-220°	20302
170-220°	22789
170-270°	21934
220-270°	20303

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TRADE LESLIE MARK instructions for TEMPERATURE REGULATORS

Classes LTCO, LTCOK, LTCL, LTCLK, LTSCO-3, LTCLS, JTCO, JTCL

INSTALLATION, OPERATION and MAINTENANCE

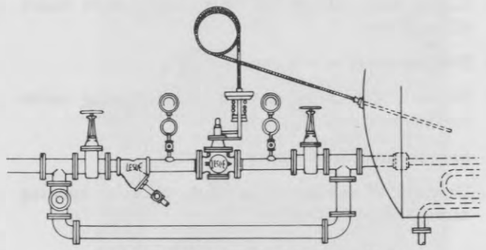
INSTALLATION

Do not use lead or cement in making up joints.

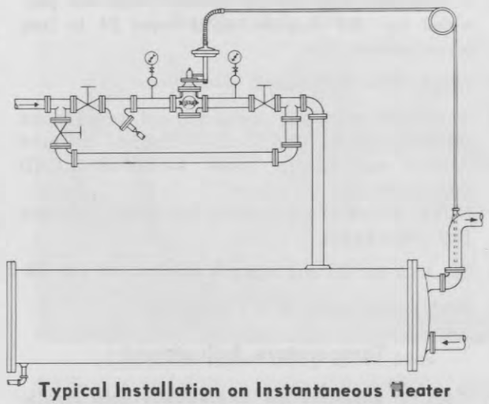
1. Protect regulator with Leslie Self-Cleaning Strainer.
2. Remove raised faces of iron and steel flanges to which bronze regulators are to be bolted. Gaskets to have same diameter as flanges and 1/4" larger inside diameter than bore of same.
3. Inlet and outlet stop valves, gages, and thermometers are needed to properly adjust, operate, and test temperature regulators or controllers. For maintenance without shutting down heater or process, a bypass should be included.
4. Blow out all pipe lines before installation for protection from grit and scale.
5. To attain best results and prevent water hammer, inlet and outlet steam piping must be properly drained.
6. Outlet piping from a Duo-Matic Temperature Regulator (pressure and temperature control) should be expanded to approximately twice the inlet pipe size whenever the pressure limit setting is 25%, or less of the inlet pressure. In such cases use taper expander at outlet of regulator.
7. Place regulator upright in horizontal piping as close to heater as possible with arrow (cast on side of body) in direction of steam flow.
8. Thermostatic bulb must be affected by true temperature of fluid under control. Never install bulb closer than 6" to source of heat. Thermostatic Element Bulbs (vapor pressure type) should be installed in a vertical or sloping position with the union or threaded end of bulb higher than the tip. Screw union nipple into apparatus. Insert bulb and tighten swivel nut.

   HANDLE FLEXIBLE TUBING CAREFULLY. BE SURE IT IS WELL PROTECTED TO PREVENT INJURY DURING INSTALLATION AND OPERATION.
9. *Important - Never unscrew flexible tubing connection or loosen bolts in diaphragm assembly if sealed.*

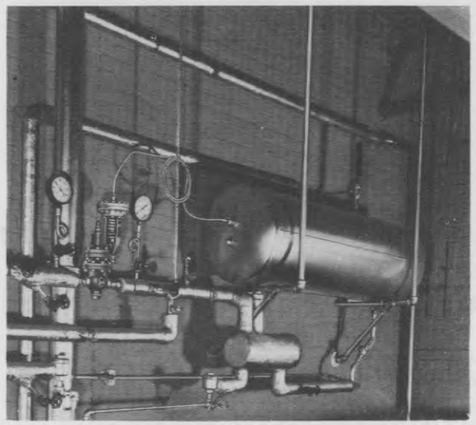
   Any leakage of the volatile liquid in the thermostatic element will render it inoperative. Protect bulb with suitable guard whenever liable to damage in any way, such as when cleaning tank, etc.
10. *INSTANTANEOUS HEATERS* – Install bulb as close to outlet of heater as possible, and point end of bulb against direction of fluid flow to obtain best results.



Typical Installation on Storage Heater



Typical Installation on Instantaneous Heater



Actual Installation On Storage Heater

TRADE LESLIE MARK

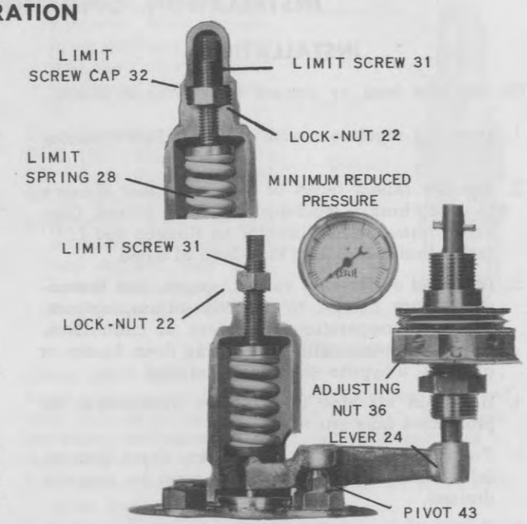
instructions for TEMPERATURE REGULATORS

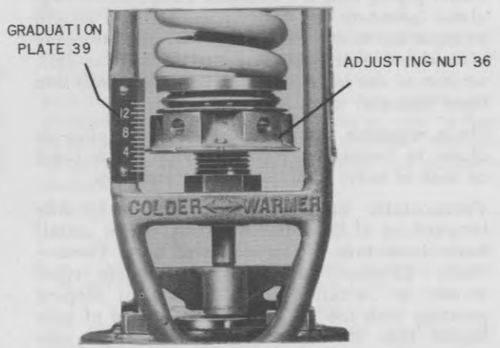
OPERATION

1. Close stop valves on inlet and outlet sides of regulator.
2. Remove limit screw cap 32.
3. Relieve compression from limit spring under limit screw cap 31.
4. Slowly open inlet stop valve wide.
5. Dispose of condensation, dirt, etc., by opening strainer blow-off valve.

Pressure Limit Adjustment

1. Screw adjusting nut 36 upward (with rod provided for this purpose) until lever 24 is free on its pivots.
2. Crack outlet stop valve.
3. Turn limit screw 31 downward and set reduced pressure at MINIMUM value required to give desired temperature under MAXIMUM LOAD conditions.
   NOTE: Lever 24 must remain free during pressure limit adjustment.
4. Set lock-nut 22 and replace limit screw cap 32.
5. Slowly open outlet stop valve wide.





Temperature Adjustment

1. Back off adjusting nut 36 gradually until regulator starts lowering steam pressure to heater at temperature desired.
2. To increase (decrease) temperature setting, gradually turn adjusting nut 36 upward (downward) until regulator maintains desired temperature.
   NOTE: All adjustments for temperature are now made on adjusting nut 36.
3. Record position of adjusting nut 36 on graduation plate 39 for ease in duplicate setting.
4. To turn steam off first close outlet stop valve.
5. To turn steam on (with regulator set) keep outlet stop valve closed until inlet stop valve is opened wide.

MAINTENANCE

Dismantling

(REFER TO PROPER DRAWING AND PARTS LIST – AVAILABLE ON REQUEST)

1. Remove limit spring case and diaphragm cover.
2. Take out diaphragm. Unscrew controlling valve seat with special socket wrench provided for this purpose. Remove controlling valve and controlling valve spring.
3. Remove top cap and lift out piston and cylinder liner.
4. Remove bottom cap and take out main valve and main valve spring.
5. In classes where used, seat ring in body can be taken out, when necessary, with special seat ring wrench.

TRADE LESLIE MARK

instructions for TEMPERATURE REGULATORS

Cleaning

CLEAN ALL PARTS WITH KEROSENE AND CHECK AS FOLLOWS:

1. Examine the main and controlling valves to make sure they move freely in their guides and seat properly.
2. If valve seating surfaces are scored or cut, regrind with fine grinding compound allowing the piston to remain in the cylinder liner when regrinding the main valve to insure perfect centering. Remove all traces of grinding compound before reassembling.
3. Make certain the piston rings are free in the grooves and expand against the cylinder liner.
4. Inspect all other working parts for freedom of movement.

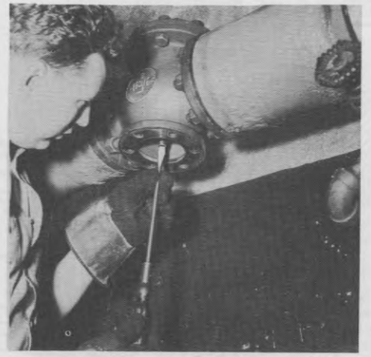
Caution

LESLIE TEMPERATURE REGULATORS are ruggedly built, carefully assembled, and dimensioned very accurately. For this reason, do not change any dimensions. To assure long life and low maintenance costs, use only standard Leslie parts. Handle flexible tubing carefully.

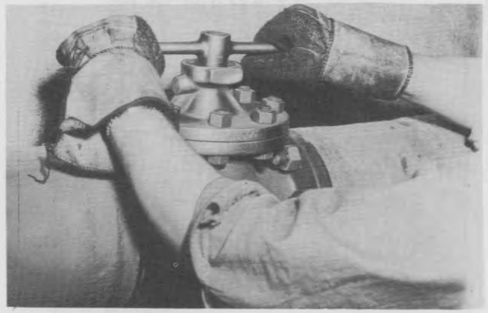
Assembling

Important - Graphite or compound should not be used on joints. Moving parts require no lubricant.

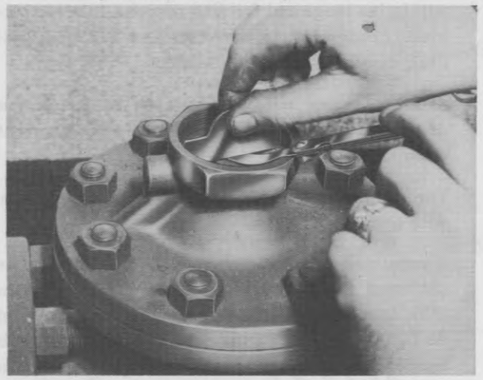
1. Place the main valve, spring and gasket in position on bottom cap, and screw and bolt to the body. (Class JTCO requires adequate lower diaphragm travel for proper operation. To be sure of proper travel, clearance between body flange face and main valve stem should be:
   $$1/16 \begin{matrix} +\ 1/64)" \\ -\ .000)" \end{matrix}$$
2. Replace cylinder liner and piston in cylinder bore. Depress piston in cylinder liner. Be sure movement is smooth and free. Top of liner must be flush with top flange of body.
3. Replace top cap gasket and top cap, then assemble controlling valve, spring, and seat in top cap. Tighten controlling valve seat firmly with wrench furnished for the purpose and tap wrench to make sure of perfectly steam tight joint. For reliable service, controlling valve must also seat tightly.



Grinding Main Valve



Tightening Controlling Valve Seat

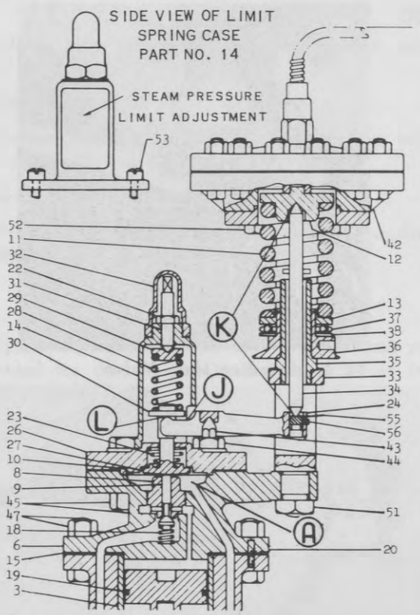


Checking Controlling Valve Stem Clearance

To do this, stem of controlling valve must not project above diaphragm seat in top cap. Correct clearance is .001" to .005" below diaphragm seat. Check with Controlling Valve Stem Clearance Gage or with straight edge and feeler. Make all joints steam tight.

TRADE LESLIE MARK

instructions for TEMPERATURE REGULATORS



Checking For Inoperative Element

When element bulb is in contact with temperature within its range and fails to respond to a temperature change, or to movement of adjusting nut (36), check in following manner:

a. Shut-off steam and check lever clearance as described in lever adjustment below. Set correct clearance.

b. Turn on steam and check for regulator response with temperature rise.

c. If regulator does not respond, remove cap screws (52) and thermostatic element (42) from frame (33). Diaphragm disc in diaphragm chamber should be tight (not free). If the disc is loose with bulb temperature above minimum of range, element is dead. Replace with new element and recheck lever clearance as described below.

Caution

Never remove bolts holding element diaphragm base and cover together, as this can result in a ruptured element.

INSTRUCTIONS FOR ADJUSTMENT WHEN INSTALLING ALL NEW VAPOR FILLED THERMOSTATIC ELEMENTS ON CLASSES LTCO, LTCOK, ETC. TEMPERATURE REGULATORS.

1. Install new Thermostatic Element and adjust as follows:
2. Screw Adjusting Nut 36 up to 10 on the Graduation Plate 39.
3. Remove bolts 44 and diaphragm cover. Insert new Diaphragm 10 and replace cover.
4. Remove Limit Spring Case Screws 53, Limit Spring Case 14, Limit Spring 28 and Limit Spring Seat 30.
5. Press down Lever 24 at point J so that Lever is firmly held in contact with pivots at points K.
6. Hold Limit Spring Seat 30, in place by pressing lightly with the finger on same, sufficient only to feel fit of Gage and positively not enough to force down Controlling Valve 9.
7. Adjust gap between Limit Spring Seat 30 and Lever 24 at points L by means of Lever Screw 55. The correct adjustment is obtained when parts just bite on Feeler Gage. (.020'' thick).
8. Lock Lever Screw 55 with Set Screw 56. Replace parts removed under instructions in Par. 4 and set Regulator for correct limit pressure and temperature in accordance with standard instructions.
9. Diaphragm 10, Feeler Gage and Wrenches for Lever Screw 55 and Set Screw 56 are furnished with Thermostatic Element.

NOTE: If pressure builds up under Diaphragm at (A) from leaky inlet valve or back pressure, an incorrect setting will result. In such cases loosen top cap at body joint to get rid of pressure or if necessary remove top cap and superstructure from body as a unit and make adjustment independent of body..

* * * * *

Send for free tools, drawings and literature on business reply card addressed to Leslie Co.

LESLIE CO., LYNDHURST, NEW JERSEY

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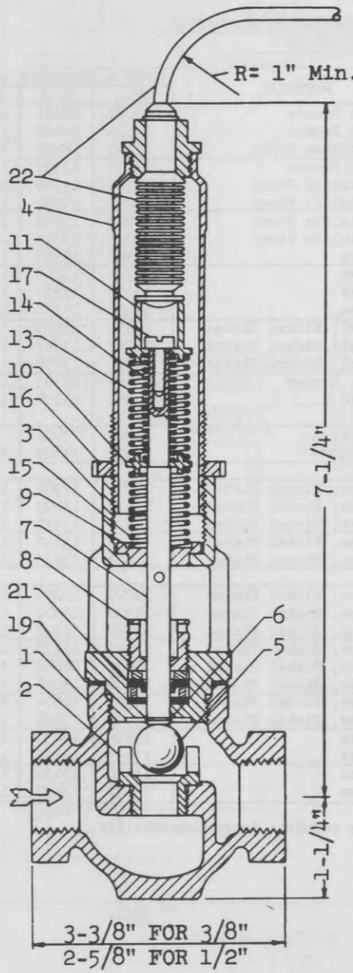
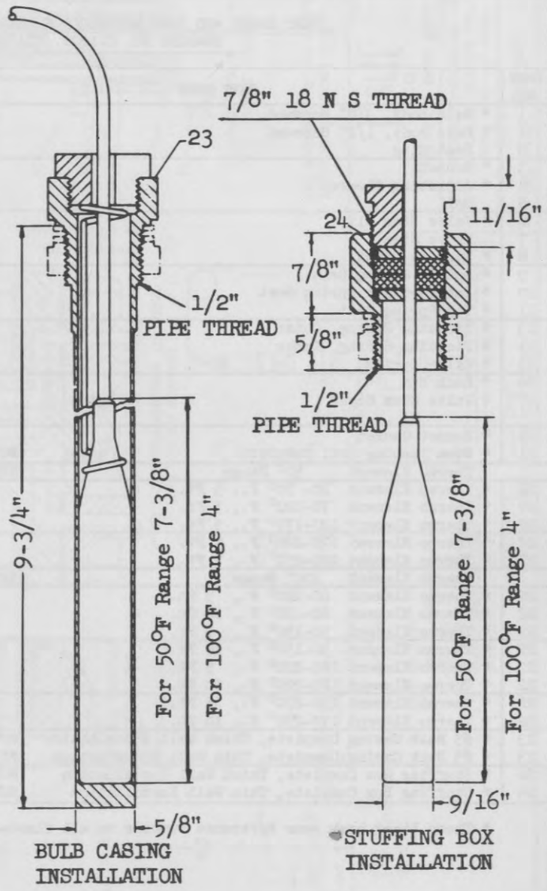




FOR LAYOUT DIMENSIONS OF ALL M TYPE TEMPERATURE REGULATORS SEE PAGE TRD-4 IN THIS SECTION

FOR COMPLETE LIST OF BULB CASINGS SEE DRAWING NO. 8249 F AVAILABLE ON REQUEST.

NET WEIGHT - 3 LBS. APPROX.

SEE REVERSE SIDE FOR PART NAME AND PART REFERENCE NUMBER.

LESLIE CO.
LYNDHURST, NEW JERSEY

TEMPERATURE REGULATOR

3/8" & 1/2" CLASSES MC-1, MD-1 & ME-1

DATE 8-20-54 | D'W'N [illegible] | C'K'D [illegible] | DWG. NO. C-1202

Printed in U.S.A.

WHEN ORDERING PARTS, GIVE SIZE, CLASS, PART NAME AND PART REFERENCE NUMBER FROM TABLE BELOW
USE PART NUMBER ONLY TO LOCATE PART ON DRAWING

PART NAMES AND PART REFERENCE NUMBERS - BRONZE TEMPERATURE REGULATORS
DRAWING NO. C-1202, CLASSES MC-1, MD-1 AND ME-1

PART NO.	PART NAME	MATERIAL	CLASS & REFERENCE NUMBERS		
			MC-1	MD-1	ME-1
1	* Main Body, 3/8" Screwed	Cast Bronze	18081	18081	18081
1	* Main Body, 1/2" Screwed	Cast Bronze	14426	14426	14426
2	Seat Ring	Stainless Steel	15001	14999	15000
3	* Bonnet	Cast Bronze	13339	13339	13339
4	* Adjusting Sleeve	Stainless Steel	13340	13340	13340
5	Ball	Stainless Steel	15090	15089	15088
6	* Valve Stem Clip	Stainless Steel	15002	15002	15002
7	Valve Stem	Stainless Steel	15003	15003	15004
8	* Packing Gland	Brass	13348	13348	13348
9	* Bottom Spring Seat	Brass	13349	13349	13349
10	* Intermediate Spring Seat	Brass	13350	13350	13350
11	* Top Spring Seat	Brass	13351	13351	13351
13	* Yielding Spring, Outer	Steel, Nickel Plated	13356	13356	13356
14	* Yielding Spring, Inner	Steel, Nickel Plated	13357	13357	13357
15	* Valve Spring	Steel, Nickel Plated	13358	13358	13358
16	* Lock Nut	Cast Bronze	13353	13353	13353
17	* Valve Stem Screw	Brass	13354	13354	13354
19	* Bonnet Gasket	Copper	3492	3492	3492
21	* Stem Packing Set, Complete (NOTE 1)	Teflon	27622	27622	27622
	Thermo Element 50° Range (NOTE 2)				
22	* Thermo Element 20- 70° F., 5 Ft.	Brass, Nickel Plated	17984	17984	17984
22	* Thermo Element 70-120° F., 5 Ft.	Brass, Nickel Plated	13429	13429	13429
22	* Thermo Element 120-170° F., 5 Ft.	Brass, Nickel Plated	13430	13430	13430
22	* Thermo Element 170-220° F., 5 Ft.	Brass, Nickel Plated	13432	13432	13432
22	* Thermo Element 220-270° F., 5 Ft.	Brass, Nickel Plated	13433	13433	13433
	Thermo Element 100° Range (NOTE 2)				
22	* Thermo Element 20-120° F., 5 Ft.	Brass, Nickel Plated	19299	19299	19299
22	* Thermo Element 20-120° F., 10 Ft.	Brass, Nickel Plated	19300	19300	19300
22	* Thermo Element 50-150° F., 5 Ft.	Brass, Nickel Plated	12998	12998	12998
22	* Thermo Element 50-150° F., 10 Ft.	Brass, Nickel Plated	13532	13532	13532
22	* Thermo Element 120-220° F., 5 Ft.	Brass, Nickel Plated	12602	12602	12602
22	* Thermo Element 120-220° F., 10 Ft.	Brass, Nickel Plated	13268	13268	13268
22	* Thermo Element 170-270° F., 5 Ft.	Brass, Nickel Plated	12604	12604	12604
22	* Thermo Element 170-270° F., 10 Ft.	Brass, Nickel Plated	13926	13926	13926
23	* #3 Bulb Casing Complete, Thick Wall Installation (NOTE 3&7)	Brass	13434	13434	13434
23	* #3 Bulb Casing Complete, Thin Wall Installation (NOTE 4&7)	Brass	13435	13435	13435
24	* Stuffing Box Complete, Thick Wall Installation (NOTE 5)	Brass	13436	13436	13436
24	* Stuffing Box Complete, Thin Wall Installation (NOTE 6)	Brass	13437	13437	13437

* These Items have same Reference Numbers in all Classes, indicating complete interchangeability.

NOTE 1 - Consists of Teflon Packing, Brass Spacers and Assembly Dowel.
NOTE 2 - Give full information, including Class of Temperature Regulator for ranges, tubing lengths, or bulbs of special material, which are not listed.
NOTE 3 - Consists of one (1) each: Bulb Casing, Ref. No. 13466; Bulb Casing Nut, Ref. No. 12621 and Bulb Spring, Ref. No. 13417.
NOTE 4 - Consists of one (1) each: Bulb Casing, Ref. No. 13466; Bulb Casing Nut, Ref. No. 12621; Bulb Spring, Ref. No. 13417; Nut, Ref. No. 12622 and two (2) Lead Washers, Ref. No. 12620.
NOTE 5 - Consists of one (1) each: Stuffing Box, Ref. No. 12841; Stuffing Box Nut, Ref. No. 12842; and two (2) each: Split Washer, Ref. No. 13419; Lock Ring, Ref. No. 13418 and Packing Ring, Ref. No. 13421.
NOTE 6 - Consists of one (1) each: Stuffing Box, Ref. No. 12841: Stuffing Box Nut, Ref. No. 12842: Nut, Ref. No. 12622; and two (2) each: Split Washer, Ref. No. 13419; Lock Ring, Ref. No. 13418; Packing Ring, Ref. No. 13421; and two (2) Lead Washers, Ref. No. 12620.
NOTE 7 - For Bulb Casings not shown see Dwg. No. 8249 F.

FOR ALL CLASSES NOT LISTED, PLEASE ORDER PARTS BY NAME AND INCLUDE SIZE AND CLASS OF TEMPERATURE REGULATOR.

DIMENSIONS IN INCHES									
SIZE	A	B	C	D	E	G	NO. OF HOLES	SIZE OF HOLES	NET WT. LB. *
SCREWED									
1/2"	5-3/4	14-1/2	5-7/8	- -	- -	- -	- -	- -	56
3/4"	5-3/4	14-1/2	5-7/8	- -	- -	- -	- -	- -	56
1"	5-3/4	14-1/2	5-7/8	- -	- -	- -	- -	- -	56
1-1/4"	5-3/4	14-11/16	6	- -	- -	- -	- -	- -	60
1-1/2"	6-1/4	15-1/16	6-7/8	- -	- -	- -	- -	- -	62
FLANGED 125 LB. ASA STANDARD									
1-1/2"	7-1/2	15-1/16	6-7/8	5	9/16	3-7/8	4	5/8	67

* Approximate

For internal parts see enlarged view.

R= 1" Min.

B MIN.

G=BOLT CIRCLE D

C

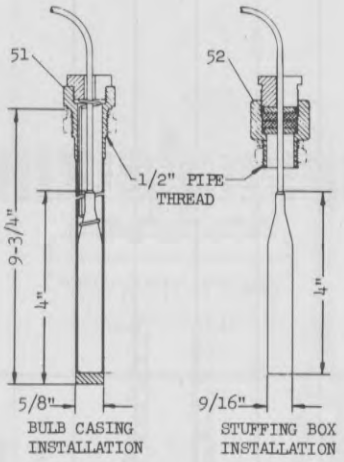
E

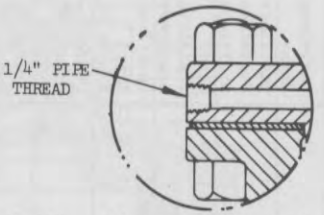
A

11-1/2"

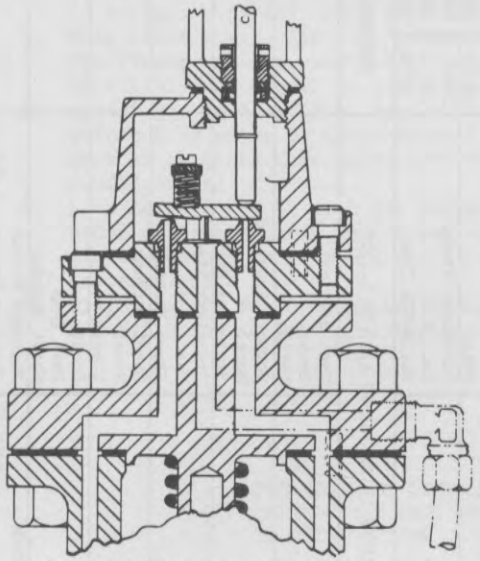
1/2" TO 1-1/2" CLASSES TKM, TKML AND TBKM
(FOR HEATING SERVICE)

FOR COMPLETE LIST OF BULB CASINGS SEE PAGE TRD-4 IN THIS SECTION

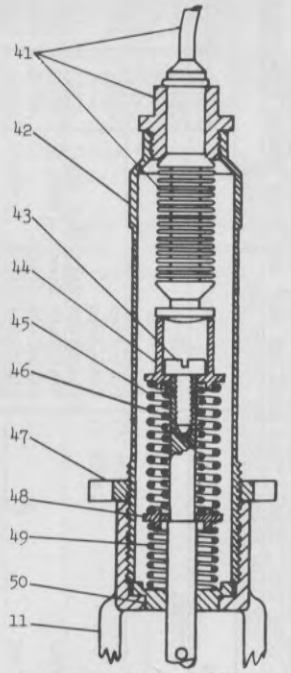




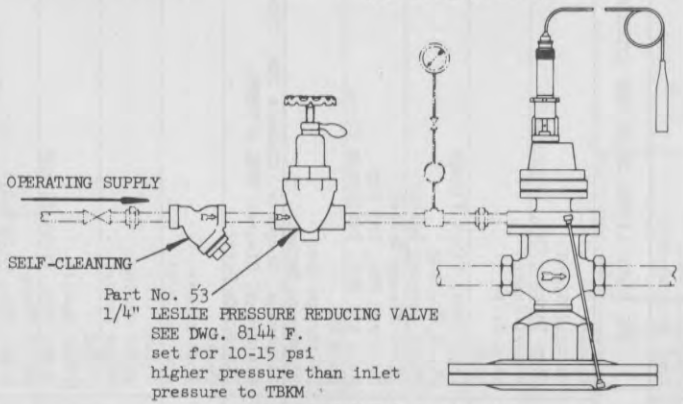
View showing External Port Connection for Class TBKM See Circled Portion Z-Z



1/2" TO 1-1/2" CLASSES TRKM AND TRKML
(FOR COOLING SERVICE)



ENLARGED VIEW OF ADJUSTING SLEEVE ASSEMBLY



INSTALLATION OF CLASS TBKM
SELF-CONTAINED TEMPERATURE REGULATOR

SEE REVERSE SIDE FOR PART NAME AND PART REFERENCE NUMBER

LESLIE CO.
LYNDHURST, NEW JERSEY

SELF-CONTAINED TEMPERATURE REGULATOR
1/2" TO 1-1/2" CLASSES TKM, TRKM, TBKM, TKML AND TRKML

DATE 8-24-54
D'W'N. C'K'D.

DWG. NO. C-9225

DRAWING NUMBER C-9225, CLASSES TKM, TRKM, TBKM, TKML AND TRKML

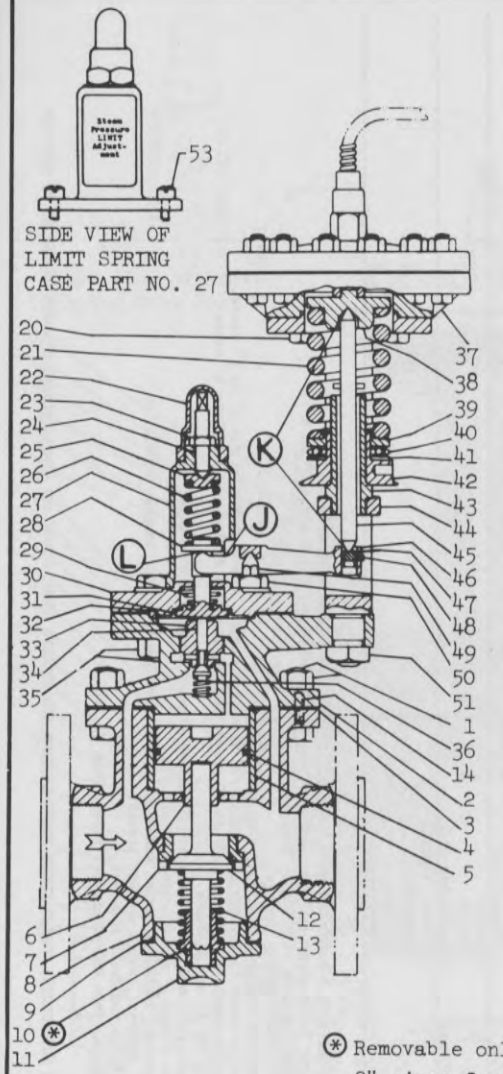
WHEN ORDERING PARTS, GIVE SIZE, CLASS, PART NAME AND PART REFERENCE NUMBER FROM TABLE BELOW

USE PART NUMBER ONLY TO LOCATE PART ON DRAWING

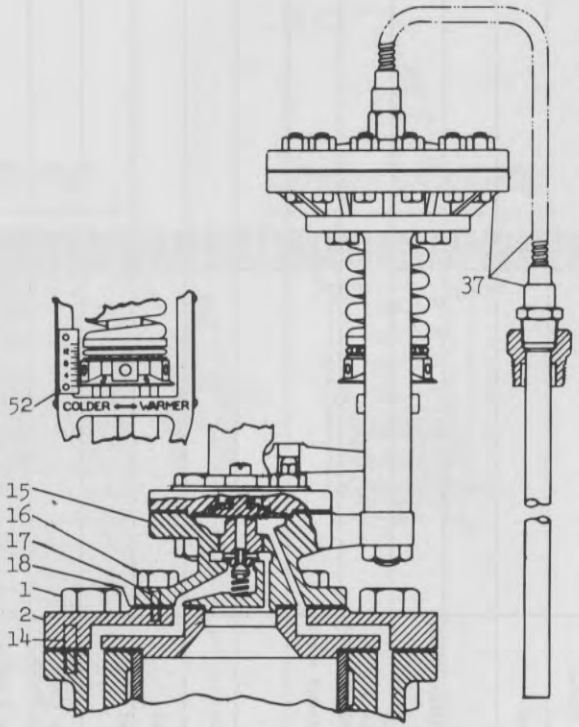
PART NO.	PART NAME	MATERIAL	REFERENCE NUMBERS-EACH SIZE				
			1/2"	3/4"	1"	1-1/4"	1-1/2"
1	Top Cap, Classes TKM, TRKM, TKML & TRKML	Cast Iron	18492	18492	18492	18491	16770
1	Top Cap, Class TBKM	Cast Iron	19394	19394	19394	19368	19367
2	Top Cap Gasket	Sheet Packing	23813	23813	23813	23814	23815
3	Main Body, Screwed (NOTE 1)	Cast Iron	23826	23827	23828	23829	23830
3	Main Body, Flanged 125 Lb. (NOTE 1)	Cast Iron	- -	- -	- -	- -	16342
4	Main Valve Spring	Corrosion Resistant Steel	31303	31303	31303	31304	31305
5	Seat Ring, Classes TKM, TBKM & TKML	Stainless Steel (NOTE 8)	15817	15817	15817	15762	15820
5	Seat Ring, Classes TRKM & TRKML	Stainless Steel	29856	29856	29856	29857	29858
6	Main Valve, Classes TKM, TBKM & TKML	Stainless Steel, Hardened	13283	13283	13283	13284	13285
6	Main Valve, Classes TRKM & TRKML	Stainless Steel	28300	28300	28300	28301	28302
7	Bottom Cap Gasket	Sheet Packing	28138	28138	28138	28139	28140
8	Guide Bushing	Brass	28089	28089	28089	28089	28090
9	Stem	Stainless Steel	28091	28091	28091	28091	28029
10	Diaphragm Base	Cast Iron	28079	28079	28079	28081	28083
	Seat Ring Wrench	Malleable Iron	9552	9552	9552	9553	9554
	ALL PARTS LISTED BELOW ARE INTERCHANGEABLE IN ALL SIZES 1/2" TO 1-1/2"		REFERENCE NUMBERS 1/2" TO 1-1/2"				
11	Bonnet	Cast Bronze	13339				
12	Packing Gland	Brass	13348				
13	Stem Packing Set, Complete	Teflon	27622				
14	Bonnet Gasket	Copper, Annealed	3492				
15	Stem Clip	Monel	15002				
16	Stem	Stainless Steel	16776				
17	Cap Screw, Pilot Flange	Stainless Steel	15852				
18	Pilot Housing	Cast Iron	16772				
19	Pilot Housing Gasket	Sheet Packing	16773				
20	Pilot Flange Gasket	Sheet Packing	18493				
21	Bolt and Nut, Top Cap	Steel	9008				
22	Bolt and Nut, Diaphragm Cover	Steel	13242				
23	Stem Nut	Brass	11544				
24	Diaphragm Disc	Cast Iron	28030				
25	Diaphragm Gasket	Sheet Packing	30676				
26	Diaphragm, Complete, Classes TKM, TRKM & TBKM	Phosphor Bronze	31314				
26	Diaphragm, Classes TKML & TRKML (NOTE 2)	Phosphor Bronze	28036				
27	Diaphragm Cover	Cast Iron	28032				
28	Screw	Brass	17164				
29	Lock Washer	Stainless Steel	21666				
30	Spring Cover	Brass	17128				
31	Column	Stainless Steel	17129				
32	Pilot Spring	Stainless Steel	16767				
33	Pilot Lever	Stainless Steel	19306				
34	Pivot	Monel	19305				
35	Pilot Nozzle	Stainless Steel	16774				
36	Dowel Pin, Pilot Flange	Stainless Steel	19199				
37	Pilot Flange	Cast Iron	18312				
38	Dowel Pin, Main Body	Brass	3702				
39	Union, Male Elbow	Brass	18610				
40	Tubing	Copper	30776				
41	Thermo-Element 20°-120°F. 5 Ft. Standard Bulb	Brass, Nickel Plated	19299				
41	Thermo-Element 20°-120°F. 10 Ft. Finned Bulb	Brass	19301				
41	Thermo-Element 50°-150°F. 5 Ft. Standard Bulb	Brass, Nickel Plated	12998				
41	Thermo-Element 120°-220°F. 5 Ft. Standard Bulb	Brass, Nickel Plated	12602				
41	Thermo-Element 120°-220°F. 5 Ft. Standard Bulb	Stainless Steel	13515				
41	Thermo-Element 170°-270°F. 5 Ft. Standard Bulb	Brass, Nickel Plated	12604				
41	Thermo-Element 250°-600°F. 5 Ft. (NOTE 3)	Brass, Nickel Plated	12687				
42	Adjusting Sleeve	Stainless Steel	13340				
43	Stem Screw	Brass	13354				
44	Top Spring Seat	Brass	13351				
45	Yielding Spring, Outer	Spring Steel, Plated	13356				
46	Yielding Spring, Inner	Spring Steel, Plated	13357				
47	Lock Nut	Cast Bronze	13353				
48	Intermediate Spring Seat	Brass	13350				
49	Stem Spring	Spring Steel, Plated	13358				
50	Bottom Spring Seat	Brass	13349				
51	#3 Bulb Casing Complete, Thick Wall Installation (NOTE 4)	Brass	13434				
51	#3 Bulb Casing Complete, Thin Wall Installation (NOTE 5)	Brass	13435				
52	Stuffing Box Complete, Thick Wall Installation (NOTE 6)	Brass	13436				
52	Stuffing Box Complete, Thin Wall Installation (NOTE 7)	Brass	13437				
53	1/4" Leslie Class LCLB Reducing Valve	Cast Bronze	19444				
54	1/4" Leslie Self-Cleaning Strainer	Cast Bronze	8821				
	Socket Wrench	Malleable Iron	9036				

NOTE 1 - Main Body is furnished complete with Seat Ring and Dowel Pin.
NOTE 2 - Diaphragm for Classes TKML & TRKML consists of 2 leaves.
NOTE 3 - Pencil Type Bulb, 10" x 1/4" diameter.
NOTE 4 - Consists of one (1) each: Bulb Casing, Ref. No. 13466; Bulb Casing Nut, Ref. No. 12621; and Bulb Spring, Ref. No. 13417.
NOTE 5 - Consists of one (1) each: Bulb Casing, Ref. No. 13466; Bulb Casing Nut, Ref. No. 12621; Bulb Spring, Ref. No. 13417; Nut, Ref. No. 12622; and two (2) Lead Washers, Ref. No. 12620.
NOTE 6 - Consists of one (1) each: Stuffing Box, Ref. No. 12841; Stuffing Box Nut, Ref. No. 12842; and two (2) each: Split Washer, Ref. No. 13419; Lock Ring, Ref. No. 13418; and Packing Ring, Ref. No. 13421.
NOTE 7 - Consists of one (1) each: Stuffing Box, Ref. No. 12841; Stuffing Box Nut, Ref. No. 12842; Nut, Ref. No. 12622; and two (2) each: Split Washer, Ref. No. 13419; Lock Ring, Ref. No. 13418; Packing Ring, Ref. No. 13421 and Lead Washer, Ref. No. 12620.
NOTE 8 - Seat Ring for Classes TKM, TBKM & TKML has Stellited Seating Surface.

FOR ALL CLASSES NOT LISTED, PLEASE ORDER PARTS BY NAME AND INCLUDE SIZE, CLASS AND SERIAL NUMBER STAMPED ON BOTTOM FLG. OF TOP CAP



SIDE VIEW OF LIMIT SPRING CASE PART NO. 27



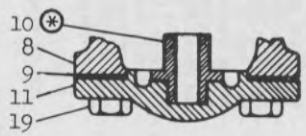
TOP CAP DESIGN OF 4", 5" AND 6" CLASSES LTCO AND LTCOK TEMPERATURE REGULATORS

INSTRUCTIONS FOR ADJUSTMENT WHEN INSTALLING ALL NEW VAPOR FILLED THERMOSTATIC ELEMENTS ON CLASSES LTCO AND LTCOK TEMPERATURE REGULATORS

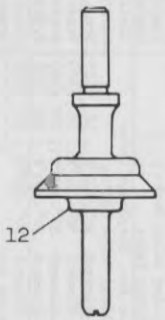
1. Install new Thermostatic Element and adjust as follows:
2. Insert new Diaphragm 32.
3. Screw Adjusting Nut 42 up to 10 on the Graduation Plate 52.
4. Remove Limit Spring Case Screws 53, Limit Spring Case 27, Limit Spring 26 and Limit Spring Seat 25.
5. Press down Lever 46 at point J so that Lever is firmly held in contact with pivots at points K.
6. Hold Limit Spring Seat 28, in place by pressing lightly with the finger on same, sufficient only to feel fit of Gage and positively not enough to force down Controlling Valve 34.
7. Adjust gap between Limit Spring Seat 28 and Lever 46 at points L by means of Lever Screw 47. The correct adjustment is obtained when parts just bite on Feeler Gage. (.020" thick).
8. Lock Lever Screw 47 with Set Screw 48. Replace parts removed under instructions in Par. 4 and set Regulator for correct limit pressure and temperature in accordance with standard instructions.
9. Diaphragm 32, Feeler Gage and Wrenches for Lever Screw 47 and Set Screw 48 are furnished with Thermostatic Element.

FOR COMPLETE LIST OF BULB CASINGS SEE PAGE TRD-4 IN THIS SECTION

⊛ Removable only in 1/2" to 3" sizes for Class LTCOK.



FLANGED BOTTOM CAP ON 2" TO 6" SIZES



GRADUAL OPENING PLUG TYPE MAIN VALVE IN REGULATORS 2-1/2" TO 6" SIZES

FOR LAYOUT DIMENSIONS SEE PAGE TRD-1 IN THIS SECTION

SEE REVERSE SIDE FOR PART NAME AND PART REFERENCE NUMBER

LESLIE CO.
LYNDHURST, NEW JERSEY

SELF-CONTAINED TEMPERATURE REGULATOR
1/2" TO 6" CLASSES LTCO AND LTCOK

DATE 8-20-54
D'W'N
C'K'D
DWG. NO. CTR-189

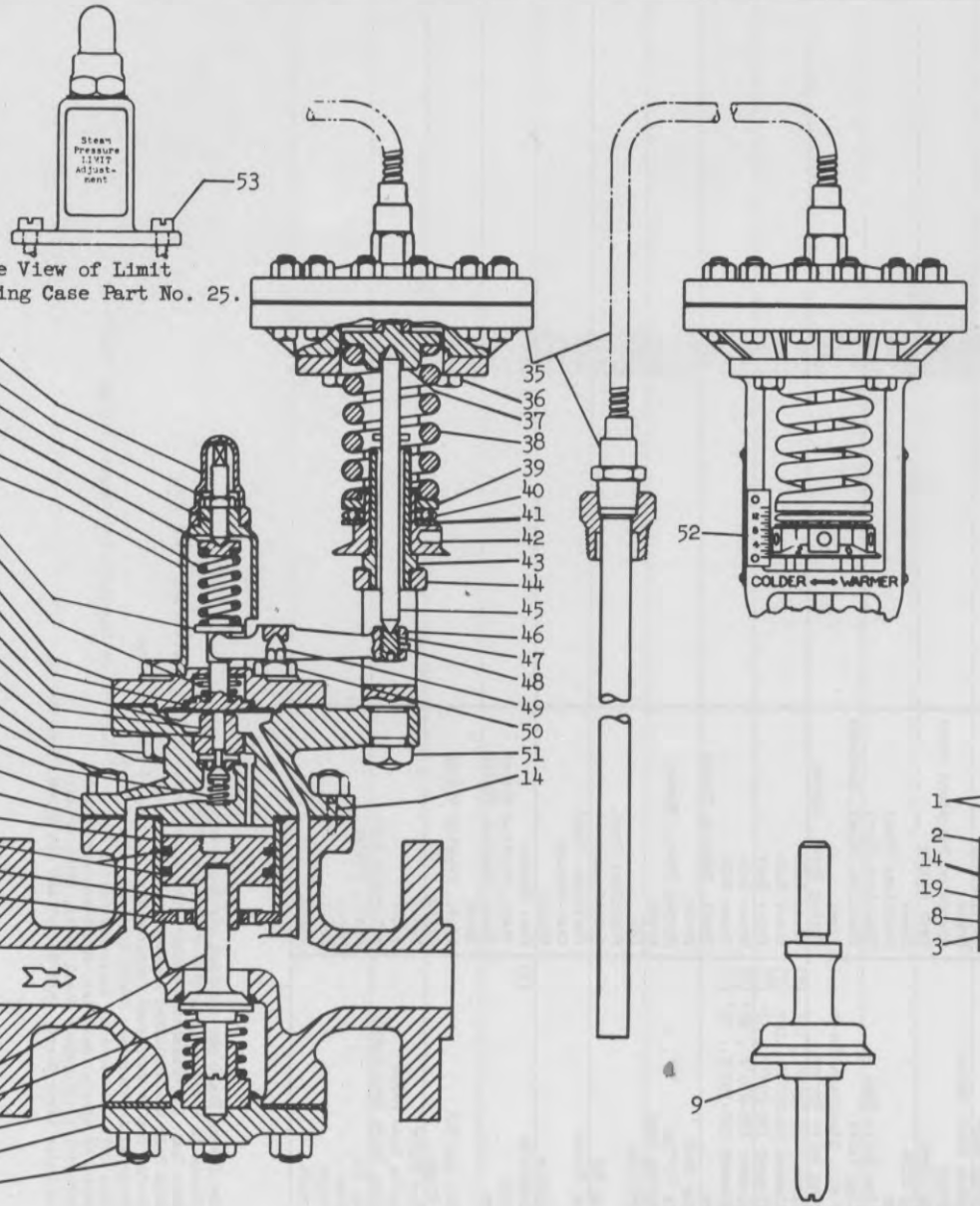
DRAWING NUMBER CTR-189. CLASSES LTCO AND LTCOK
WHEN ORDERING PARTS, GIVE SIZE, CLASS, PART NAME AND PART REFERENCE NUMBERS FROM TABLE BELOW
USE PART NUMBER ONLY TO LOCATE PART ON DRAWING

PART NO.	PART NAME	MATERIAL	REFERENCE NUMBERS-EACH SIZE											
			1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	5"	6"
1	Bolt and Nut, Top Cap (LTCO)	Steel	9008	9008	9008	9008	9008	4021	4021	3653	3653	19389	(1)	12984
1	Bolt and Nut, Top Cap (LTCOK)	Steel	23624	23624	23624	23624	23624	23624	4021	3653	- -	19389	(1)	12984
2	Top Cap	Cast Bronze	11660	11660	11660	11661	11662	11663	11664	11665	11666	21340	21087	21086
3	Top Cap Gasket (LTCO)	Copper, Asbestos Filled	4960	4960	4960	4945	4977	9003	9099	9177	9195	11967	18208	16024
3	Top Cap Gasket (LTCOK)	Sheet Packing	23567	23567	23567	23568	23569	23570	30320	30321	- -	30414	17293	17288
4	Piston Ring (2)	Cast Iron	3355	3355	3355	3358	3359	3361	3362	3363	3365	3367	21088	19949
5	Cylinder Liner	Stainless Steel, Hardened	11121	11121	11121	11172	11189	11122	11209	11195	11223	11966	18198	18329
6	Piston (3)	Cast Bronze	9344	9344	9344	9379	9403	9481	9343	9463	9482	11971	21268	19959
7	Seat Ring	Stainless Steel (4)	9821	9821	9445	9544	9446	9447	9448	9569	9562	11970	21241	19943
8	Main Body, Screwed (LTCO) (5)	Cast Bronze	9400	9414	9528	9413	9412	9511	- -	- -	- -	- -	- -	- -
8	Main Body, Screwed (LTCOK) (5)	Cast Iron	23500	23499	23505	23498	23495	23524	- -	- -	- -	- -	- -	- -
8	Main Body, 125 Lb. Flg. (LTCOK) (5)	Cast Iron	- -	- -	- -	- -		30962	26092	26093	- -	21722	18201	15838
8	Main Body, 250 Lb. Flg. (LTCOK) (5)	Cast Iron	- -	- -	- -	- -		30963	26156	26162	- -	- -	- -	- -
8	Main Body, 150 Lb. Flg. (LTCO) (5)	Cast Bronze	9487C	9489C	9529C	9530C	9387C	9521C	9411C	9494C	9512C	11969C	18378	16782
8	Main Body, 300 Lb. Flg. (LTCO) (5)	Cast Bronze	9487	9489	9529	9530	9387	9521	9411	9494	9512	11969	18379	16798
9	Bottom Cap Gasket (LTCO)	(6)	3500	3500	3500	3499	9276	3504	9100	9178	9196	3508	18254	18255
9	Bottom Cap Gasket (LTCOK)	(7)	28138	28138	28138	28139	28140	18334	9100	9178	- -	3508	18248	18249
10	Bottom Cap Bushing (LTCOK)	Bronze (8)	23497	23497	23497	23501	23503	23526	26101	26119	- -	- -	- -	- -
11	Bottom Cap (LTCO)	Cast Bronze	3116	3116	3116	4241	9405	3122	9098	9175	9193	3126	18395	15442
11	Bottom Cap (LTCOK)	(9)	23496	23496	23496	23502	23504	23525	26100	26118	- -	3126	18202	15840
12	Main Valve	Stainless Steel, Hardened	13282	13282	13283	13284	13285	11124	31427	31428	31429	31430	31431	31432
13	Main Valve Spring	Corrosion Resistant Steel	9464	9464	9464	10201	3629	9252	9087	9176	4478	4478	21260	21260
14	Dowel Pin	Brass	3702	3702	3702	3702	3702	3702	3702	3702	3702	3705	3705	3705
15	Controlling Valve Housing	Cast Bronze	- -	- -	- -	- -	- -	- -	- -	- -	- -	11660	11660	11660
16	Cap Screw	Steel	- -	- -	- -	- -	- -	- -	- -	- -	- -	3709	3709	3709
17	Dowel Pin	Brass	- -	- -	- -	- -	- -	- -	- -	- -	- -	3702	3702	3702
18	Housing Gasket (LTCO)	Copper, Asbestos Filled	- -	- -	- -	- -	- -	- -	- -	- -	- -	4960	4960	4960
18	Housing Gasket (LTCOK)	Sheet Packing	- -	- -	- -	- -	- -	- -	- -	- -	- -	23567	23567	23567
19	Cap Screw, Bottom Cap (LTCO)	Steel	- -	- -	- -	- -	- -	3709	9130	3716	3716	3716	- -	- -
19	Cap Screw, Bottom Cap (LTCOK)	Steel	- -	- -	- -	- -	- -	9130	9130	3716	3716	3716	- -	- -
19	Bolt and Nut, Bottom Cap	Steel	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	13145	12984
	Seat Ring Wrench	Malleable Iron	9551	9551	9552	9553	9554	9555	9144	9232	9233	12008	22157	22157

	ALL PARTS LISTED BELOW ARE INTERCHANGEABLE IN ALL SIZES 1/2" TO 6"		REFERENCE NUMBERS 1/2" TO 6"
20	Cap Screw, Frame	Steel, Cadmium Plated	4921
21	Adjusting Spring	Spring Steel, Plated	11755
22	Limit Screw Cap	Cast Bronze	11783
23	Lock Nut	Brass	9340
24	Limit Screw	Stainless Steel	10974
25	Limit Spring Seat, Top	Brass	10971
26	Limit Spring	Spring Steel	11084
27	Limit Spring Case	Cast Bronze	11782
28	Limit Spring Seat, Bottom	Brass	11784
29	Guide Spring	Corrosion Resistant Steel	11669
30	Diaphragm Cover	Cast Bronze	11779
31	Diaphragm Disc	Brass	11780
32	Diaphragm	Stainless Steel	9120
33	Controlling Valve Seat	Stainless Steel	9433
34	Controlling Valve	Stainless Steel, Hardened	4938
35	Bolt and Nut, Diaphragm Cover	Steel	4488
36	Controlling Valve Spring	Corrosion Resistant Steel	4930
37	Thermo-Element 20°-120°F., 10' (10)	Brass Bulb	11706
37	Thermo-Element 50°-150°F., 10' (10)	Brass Bulb	11709
37	Thermo-Element 120°-220°F., 10' (10)	Brass Bulb	11700
37	Thermo-Element 170°-270°F., 10' (10)	Brass Bulb	11703
37	Thermo-Element 250°-350°F., 10' (10)	Brass Bulb	11712
38	Top Spring Seat	Brass	11785
39	Bottom Spring Seat	Brass	11683
40	Thrust Bearing	(11)	11684
41	Washer	Stainless Steel	11685
42	Adjusting Nut	Cast Bronze	11681
43	Adjusting Sleeve	Stainless Steel	11680
44	Frame	Cast Bronze	11674
45	Rod, Complete	Bronze	11778
46	Lever, Complete (12)	Cast Bronze	13386
47	Lever Screw	Steel, Cadmium Plated	12391
48	Set Screw	Steel, Cadmium Plated	12390
49	Pivot	Monel	11672
50	Pivot Bolt and Nut	Steel, Cadmium Plated	11786
51	Nut, Frame	Brass	11689
52	Graduation Plate	Brass	11686
53	Limit Spring Case Screw	Brass	9982
	Controlling Valve Seat Wrench	Malleable Iron	9036
	Adjusting Rod	Steel, Plated	11808
	Feeler Gage	Monel	13507
	Allen Wrench	Steel	12391A
	Allen Wrench	Steel	12390A

NOTE (1) - 5" size is assembled with 8 Bolts and Nuts, Ref. No. 13145 and 4 Cap Screws, Ref. No. 4066.
NOTE (2) - One Piston Ring per Valve sizes 1/2" to 1-1/2" and two Piston Rings per Valve sizes 2" to 6".
NOTE (3) - Piston is furnished complete with Piston Ring(s).
NOTE (4) - Seat Ring has Stellited Seating Surface.
NOTE (5) - Main Body is furnished complete with Seat Ring and Dowel Pin.
NOTE (6) - Bottom Cap Gasket is Sheet Copper for 1/2" to 1-1/2" sizes and Copper, Asbestos Filled for 2" to 6" sizes.
NOTE (7) - Bottom Cap Gasket is Sheet Packing for 1/2" to 2" sizes, Copper, Asbestos Filled for 2-1/2" to 4" sizes and Sheet Packing for 5" and 6" sizes.
NOTE (8) - Not used in 4" size. 5" and 6" Bushings are Stainless Steel welded to Bottom Caps.
NOTE (9) - Cast Iron 1/2" to 3" and 5" and 6". Cast Bronze 4".
NOTE (10) - Give full information, including Serial Number of Temperature Regulator for ranges, tubing, or Bulbs of special material, which are not listed.
NOTE (11) - Stainless Steel Balls and Brass Retainer.
NOTE (12) - Includes Lever Screw, Part No. 47 and Set Screw, Part No. 48.

FOR ALL CLASSES NOT LISTED, PLEASE ORDER PARTS BY NAME AND INCLUDE SIZE, CLASS AND SERIAL NUMBER STAMPED ON FLANGE OF TOP CAP.

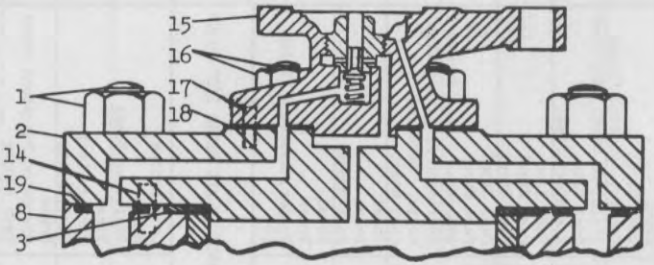


FOR LAYOUT DIMENSIONS SEE PAGE TRD-2 IN THIS SECTION

Gradual opening Plug Type Main Valve in 2-1/2" to 6" sizes.

INSTRUCTIONS FOR ADJUSTMENT WHEN INSTALLING ALL NEW VAPOR FILLED THERMOSTATIC ELEMENTS ON CLASS LTCSO-3 TEMPERATURE REGULATORS

1. Install new Thermostatic Element and adjust as follows:
2. Insert new Diaphragm 30.
3. Screw Adjusting Nut 42 up to 10 on the Graduation Plate 52.
4. Remove Limit Spring Case Screws 53, Limit Spring Case 25, Limit Spring 24 and Limit Spring Seat 23.
5. Press down Lever 46 at point J so that Lever is firmly held in contact with pivots at points K.
6. Hold Limit Spring Seat 26, in place by pressing lightly with the finger on same, sufficient only to feel fit of Gage and positively not enough to force down Controlling Valve 32.
7. Adjust gap between Limit Spring Seat 26 and Lever 46 at points L by means of Lever Screw 47. The correct adjustment is obtained when parts just bite on Feeler Gage. (.020" thick).
8. Lock Lever Screw 47 with Set Screw 48. Replace parts removed under instructions in Par. 4 and set Regulator for correct limit pressure and temperature in accordance with standard instructions.
9. Diaphragm 30, Feeler Gage and Wrenches for Lever Screw 47 and Set Screw 48 are furnished with Thermostatic Element.



VIEW SHOWING ARRANGEMENT OF 6" TOP CAP

FOR COMPLETE LIST OF BULB CASINGS SEE PAGE TRD-4 IN THIS SECTION

SEE REVERSE SIDE FOR PART NAME AND PART REFERENCE NUMBER.

LESLIE CO.
LYNDHURST, NEW JERSEY

SELF-CONTAINED TEMPERATURE REGULATOR
1/2" TO 6" CLASS LTCSO-3

DATE 8-20-54
D'W'N
C'K'D
DWG. NO. CTR-190

DRAWING NUMBER CTR-190, CLASS LTCSO-3
WHEN ORDERING PARTS, GIVE SIZE, CLASS, PART NAME AND PART REFERENCE NUMBER FROM TABLE BELOW
USE PART NUMBER ONLY TO LOCATE PART ON DRAWING

PART NO.	PART NAME	MATERIAL	REFERENCE NUMBER-EACH SIZE									
			1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	3-1/2"	4"	6"
1	Stud and Nut, Top Cap	Steel	11106	11106	11106	11106	11106	11107	11107	11108	11108	11108	21911
2	Top Cap	Cast Steel	11900	11900	11900	11901	11902	11903	11904	11905	11906	11983	24968
3	Top Cap Gasket	Copper, Asbestos Filled	13640	13640	13640	13641	13642	13643	16254	13645	13646	13647	24972
4	Cylinder Liner	Stainless Steel, Hardened	11121	11121	11121	11172	11189	11122	11209	11195	11223	11966	18329
5	Piston Ring (1)	Cast Iron	3355	3355	3355	3358	3359	3361	3362	3363	3365	3367	19949
6	Piston (2)	Stainless Steel	10686	10686	10686	10705	10737	9439	9442	9570	9563	11975	21954
7	Cylinder Bottom	Cast Iron	10054	10054	10054	10055	10056	10057	10058	10059	10060	11978	24985
8	Main Body, Flanged 150 Lb. (3)	Cast Steel (4)	14412	14536	14384	14386	14388	14507	14418	14381	14518	14528	24958
8	Main Body, Flanged 300 Lb. (3)	Cast Steel (4)	14438	14537	14420	14437	14427	14428	14439	14389	14519	14529	24959
8	Main Body, Flanged 400 Lb. (3)	Cast Steel (4)	14411	14425	14385	14387	14415	14416	14417	14419	14423	14530	24960
8	Main Body, Flanged 600 Lb. (3)	Cast Steel (4)	14411	14425	14385	14387	14415	14416	14417	14419	14423	14451	24961
9	Main Valve	Stainless Steel, Hardened	11123	11123	11190	11191	11192	11124	31427	31428	31429	31430	31432
10	Main Valve Spring	Corrosion Resistant Steel	9464	9464	9464	10201	3629	9252	9087	9176	4478	4478	21886
11	Bottom Cap Gasket	Copper, Annealed	11345	11345	11345	11346	11347	11348	11349	11350	11351	11973	24974
12	Bottom Cap, Complete (5)	Cast Steel	11691	11691	11691	11692	11693	11694	11695	11696	11697	11990	24969
13	Stud and Nut, Bottom Cap	Steel	9465	9465	9465	9465	9465	9395	9395	9467	9467	9467	11059
14	Dowel Pin	Brass	3702	3702	3702	3702	3702	3702	3702	3702	3702	3705	3705
15	Controlling Valve Housing	Cast Bronze	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	11900
16	Stud and Nut	Steel	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	11106
17	Dowel Pin	Brass	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	3702
18	Housing Gasket	Copper, Asbestos Filled	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	13640
19	Port Hole Gasket	(6)	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	24970

ALL PARTS LISTED BELOW ARE INTERCHANGEABLE IN ALL SIZES 1/2" TO 6"			REFERENCE NUMBERS 1/2" TO 6"
20	Limit Screw Cap	Cast Bronze	11783
21	Lock Nut	Brass	9340
22	Limit Screw	Stainless Steel	10974
23	Limit Spring Seat, Top	Brass	10971
24	Limit Spring	Spring Steel	11084
25	Limit Spring Case	Cast Bronze	11782
26	Limit Spring Seat, Bottom	Brass	11784
27	Guide Spring	Corrosion Resistant Steel	11669
28	Diaphragm Cover	Cast Bronze	11779
29	Diaphragm Disc	Brass	11780
30	Diaphragm	Stainless Steel	9120
31	Controlling Valve Seat	Stainless Steel	21906
32	Controlling Valve	Stainless Steel, Hardened	4938
33	Bolt and Nut, Diaphragm Cover	Steel	4488
34	Controlling Valve Spring	Spring Steel, Plated	10756
35	Thermo-Element 20-120°F., 10' (7)	Brass Bulb	11706
35	Thermo-Element 50-150°F., 10' (7)	Brass Bulb	11709
35	Thermo-Element 120-220°F., 10' (7)	Brass Bulb	11700
35	Thermo-Element 170-270°F., 10' (7)	Brass Bulb	11703
35	Thermo-Element 250-350°F., 10' (7)	Brass Bulb	11712
36	Cap Screw	Steel, Cadmium Plated	4921
37	Top Spring Seat	Brass	11785
38	Adjusting Spring	Spring Steel, Plated	11755
39	Bottom Spring Seat	Brass	11683
40	Thrust Bearing	(8)	11684
41	Washer	Stainless Steel	11685
42	Adjusting Nut	Cast Bronze	11681
43	Adjusting Sleeve	Stainless Steel	11680
44	Frame	Cast Bronze	11674
45	Rod, Complete	Bronze	11778
46	Lever, Complete (9)	Cast Bronze	13386
47	Lever Screw	Steel, Cadmium Plated	12391
48	Set Screw	Steel, Cadmium Plated	12390
49	Pivot	Monel	11672
50	Pivot Bolt and Nut	Steel, Cadmium Plated	11786
51	Nut for Frame	Brass	11689
52	Graduation Plate	Brass	11686
53	Limit Spring Case Screw	Brass	9982
	Controlling Valve Seat Wrench	Malleable Iron	9036
	Adjusting Rod	Steel, Plated	11808
	Feeler Gage	Monel	13507
	Allen Wrench	Steel	12391A
	Allen Wrench	Steel	12390A

NOTE (1) - Two Piston Rings are required per Regulator.
NOTE (2) - Piston is furnished complete with Piston Rings.
NOTE (3) - Main Body is furnished complete with Studs, Nuts, Cylinder Bottom and Dowel Pin.
NOTE (4) - Main Body has Stellited Seating Surface.
NOTE (5) - Bottom Cap is furnished complete with Main Valve Guide Bushing.
NOTE (6) - Material is Stainless Steel-Asbestos, Spiral Wound.
NOTE (7) - Give full information, including Serial Number of Temperature Regulator for ranges, Tubing lengths or Bulbs of special material, which are not listed.
NOTE (8) - Material is Stainless Steel Balls, Brass Retainer.
NOTE (9) - Includes Lever Screw, Part No. 47 and Set Screw, Part No. 48.

FOR ALL CLASSES NOT LISTED, PLEASE ORDER PARTS BY NAME AND INCLUDE SIZE, CLASS AND SERIAL NUMBER STAMPED ON BOTTOM FLANGE OF TOP CAP.

SELF CLEANING STRAINERS

DESCRIPTIVE BULLETIN

"Y" TYPE STRAINERS

STRAINER SCREENS

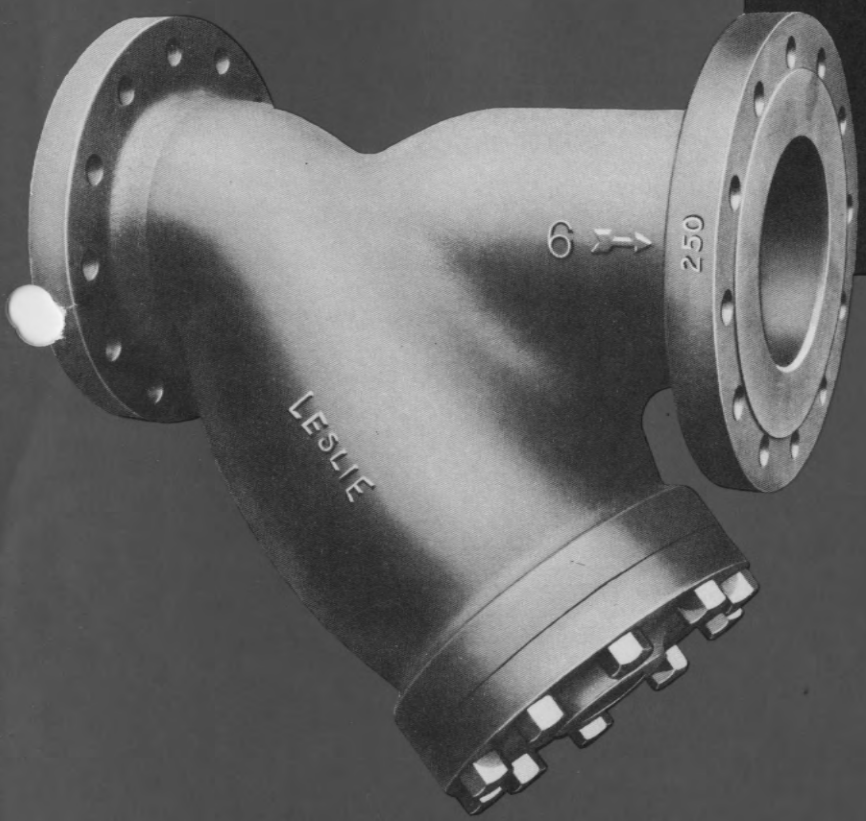
PRESSURE DROP TABLES

BULLETIN 5308

TRADE LESLIE MARK

"Y" TYPE

self cleaning strainers



- STEAM
- AIR
- GAS
- LIQUID

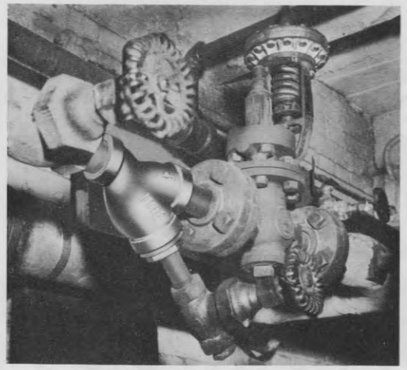
LESLIE CO., Lyndhurst, New Jersey

Regulators since 1900

TRADE LESLIE MARK

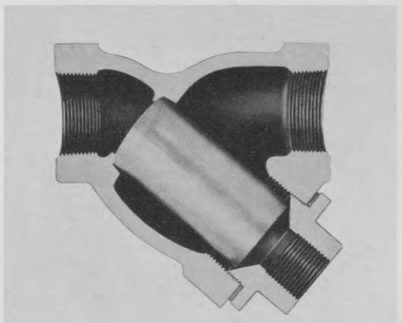
SELF CLEANING STRAINERS

For protection of Process Equipment, Turbines, Regulators, Valves



MAXIMUM PROTECTION

Protects equipment by removing dirt, scale, welding beads and other damaging particles from the line. Reduces down-time and repair costs.



MAXIMUM EFFICIENCY

Friction between moving parts of equipment exposed to flow is minimized by removal of foreign matter. Protective maintenance with Leslie Strainers gives extra life to all equipment in the piping system.

TABLE OF CONTENTS

ORDERING

There are Leslie Strainers for a wide variety of applications. It is important to designate your requirements in order to get equipment engineered to your specific needs. Please indicate on your purchase order:

- ★ Strainer Size
- ★ Body Material
- ★ End Connections, Screwed, Flanged, Welding or Ring Type Joints
- ★ Screen Material and Perforation
- ★ Type of Service

TRADE LESLIE MARK

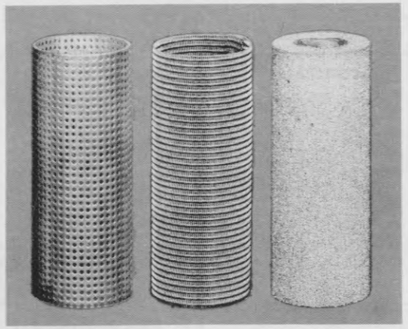
STRAINER SCREENS

Key to Efficient Protection of Equipment Exposed to Flow . . .

A STRAINER IS AS GOOD AS ITS SCREEN . . . and for years, Leslie strainers equipped with Leslie screens have been widely accepted as the most dependable device that you can install to protect equipment exposed to any flow conditions.

Check these advantages:

- ★ Large free-hole area.
- ★ Minimum pressure loss (see charts, pages 11 and 12).
- ★ Rugged, durable construction for all applications.
- ★ Spot welded seams for added strength.
- ★ Monel screens standard in semi-steel, bronze and steel bodies.
- ★ Stainless steel screens standard in ratings over 600 psi and in carbon-moly, chrome-moly or stainless steel bodies.
- ★ Stainless steel screens made from AISI type 316 as standard.
- ★ Other types available on special order.



A B C

A PERFORATED METAL SCREEN
For general service; steam, liquids and gases.

B FILTER CLOTH OR WIRE MESH SCREEN
Recommended particularly for air, gas or vapor service.

C NEW LESLIE POROMET FILTER
For maximum protection of equipment with close clearances. Can replace standard screen in ¼" to ¾" sizes in air, gas and steam lines. Traps particles as small as .001" with low pressure loss.

FREE HOLE AREA

Strainer Size Inches	Total Free Hole Area—Square Inches		
	Steam	Liquid	Air
⅛	.34	.457	.38
¼—⅜	.73	.966	.81
½	1.07	1.43	1.20
¾	1.59	2.11	1.77
1	2.46	3.26	2.73
1¼	3.66	4.85	3.66
1½	5.34	7.08	5.34
2	8.32	11.04	8.32
2½	11.6	15.40	11.6
3	16.0	21.30	16.0
3½	25.7	34.0	25.7
4	32.5	43.0	32.5
5	51.4	61.3	51.4
6	74.6	89.0	74.6
8	128	152.0	128
10	206	244.0	206

STANDARD SCREENS

Strainers are fitted with screens shown in the white area of the table as standard unless ordered otherwise. The standard screens shown in the shaded portion of the table are also standard but are for specific applications and are furnished on request.

Screen Material	Strainer Size Inches	Screen Perforation or Opening Inches	Recommended Service
MONEL STANDARD IN CAST IRON CAST BRONZE CAST STEEL	⅛—10	.020 (Perforated) (1/64")	Steam
	⅛—10	.045 (Perforated) (3/64")	Liquids
	⅛—1 1¼—10	(.006 Opening) 20 x120 Filter Cloth} (.0055 Opening) 100 Mesh Cloth }	Air & Gas
STAINLESS STEEL STANDARD IN FORGED STEEL AND ALLOY STEEL STRAINERS	⅛—10	.033 (Perforated) (1/32")	Steam
	⅛—10	.045 (Perforated) (3/64")	Liquids
	⅛—1 1¼—10	(.006 Opening) 20 x120 Filter Cloth} (.0055 Opening) 100 Mesh Cloth }	Air & Gas
MONEL AND STAINLESS STEEL	1¼—10	(.0150 Opening) 40 Mesh Cloth	Furnished on Request
	⅛—10	.033 (Perforated)	
	¼—10	.0625 (Perforated)	
	¼—10	.0937 (Perforated)	
	⅜—10	.125 (Perforated)	
	½—10	.1875 (Perforated)	
	¾—10	.250 (Perforated)	