Model 2010

Three-Way Thermostatic Valve

2010	2” NPT
2010-1	1 1/2” NPT
2010J24	1 1/2” SAE O-Ring
A2010J32	2” SAE O-Ring
F2010	2” 125# FF Flange
SF2010	2” 150# RF Flange
SF2010X	2” 300# RF Flange

FPE Thermostatic Valves utilize the principle of expanding wax, which in the semi-liquid state undergoes large expansion rates within a relatively narrow temperature range. The self-contained element activates a stainless steel sleeve, which directs flow. All FPE Thermostatic Valves are factory set at predetermined temperatures: no further adjustments are necessary. A wide range of temperatures are available for water and oil temperature control applications.

When used in a diverting application, on start-up the total fluid flow is routed back to the main system. As fluid temperature rises to the control range, some fluid is diverted to the cooling system. As fluid temperature continues to increase, more flow is diverted. When the thermostat is in a fully stroked condition, all fluid flow is directed to the cooling system. FPE Thermostatic Valves may also be used in a mixing application.

In a mixing application, hot fluid enters the “B” port and colder fluid enters the “C” port. The flows mix and the thermostat adjusts to reach the desired temperature, exiting the “A” port.

Standard FPE thermostatic valve housings are made from aluminum and grey iron castings, however, ductile iron, bronze, steel and stainless steel housings are available.

Available Connections: NPT, SAE O-Ring, 125# FF Flange, 150# and 300# RF.

Optional features: High over temperature element, plated element.

Features

- Self-Contained
- Non-Adjustable
- Tamper-Proof
- Compact
- Wide Range of Temperatures
- Heavy Duty
- Replaceable Element
- Rugged Construction
- Operate in Any Position

FLUID POWER ENERGY, INC.

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www.fpevalves.com

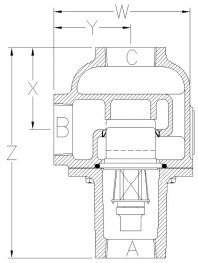
ISO 9001-2000

MADE IN U. S. A

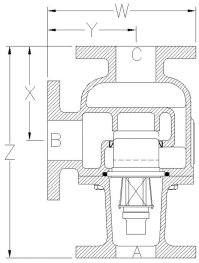
Model 2010

MODEL NUMBER	BODY MATERIAL (*)	NOMINAL PIPE SIZE	PRINCIPAL DIMENSIONS (UNITS in. & (mm)) "X"	"Y"	"W"	"Z"	MAX WIDTH IN THE OTHER PLANE	FLANGE DRILLING NO. OF HOLES	DIA. OF HOLES	BOLT CIRCLE	NO. OF ELEMENTS	APPROX. SHIPPING WEIGHT	NOTES OR NUMBERED ENDNOTES
*2010-1	A, B, D S, SS	1 1/2" NPT	3 13/16 (96.84)	3 9/16 (90.49)	6 5/16 (160.34)	9 3/4 (247.65)	5 1/2 (139.70)	N/A	N/A	N/A	1	A & D=21#, B=24# S & SS=23#	
*2010	A, B, D S, SS	2" NPT	3 13/16 (96.84)	3 9/16 (90.49)	6 5/16 (160.34)	9 3/4 (247.65)	5 1/2 (139.70)	N/A	N/A	N/A	1	A & D=21#, B=24# S & SS=23#	
*2010J24	A, B, D S, SS	SAE 24 1 1/2"	3 13/16 (96.84)	3 9/16 (90.49)	6 5/16 (160.34)	9 3/4 (247.65)	5 1/2 (139.70)	N/A	N/A	N/A	1	A & D=21#, B=24# S & SS=23#	
*2010J32	A, B, D S, SS	SAE 32 2"	3 13/16 (96.84)	3 9/16 (90.49)	6 5/16 (160.34)	9 3/4 (247.65)	5 1/2 (139.70)	N/A	N/A	N/A	1	A & D=21#, B=24# S & SS=23#	
*F2010	A, B, D	2" 125# FF FLANGE	4 3/4 (120.65)	4 9/16 (115.89)	7 9/16 (192.09)	10 5/8 (269.88)	6 (152.40)	4	3/4 (19.05)	4 3/4 (120.65)	1	A=32#, B=40# D=32#	
	S, SS	2" 150# RF FLANGE	4 7/8 (123.83)	4 9/16 (115.89)	7 9/16 (192.09)	10 7/8 (276.23)	6 (152.40)	4	3/4 (19.05)	4 3/4 (120.65)	1	S & SS=34#	
*F2010X	S, SS	2" 300# RF FLANGE	5 (127.00)	4 11/16 (119.06)	7 15/16 (201.61)	11 1/8 (282.58)	6 1/2 (165.10)	8	7/8 (22.23)	5 (127.00)	1	S & SS=36#	

* (Replace * with body material type; A=Cast Iron, AL= Aluminum, B=Bronze, D=Ductile, S=Steel, SS=Stainless Steel)

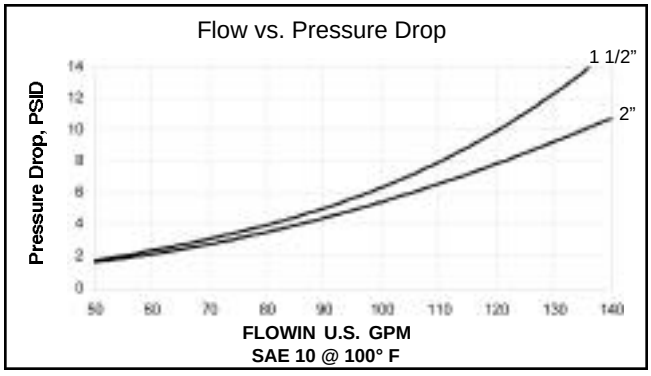


#2010-1, #2010, #2010J



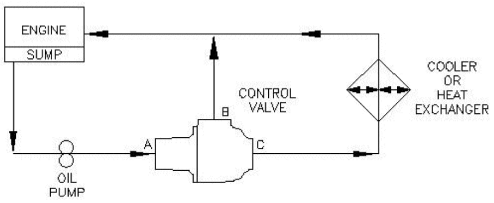
*F2010, *F2010X

PRESSURE RATINGS	
MATERIAL	PSI
A, B	150
D	250
S, SS	500
SF, SSF	275
SFX, SSFX	350

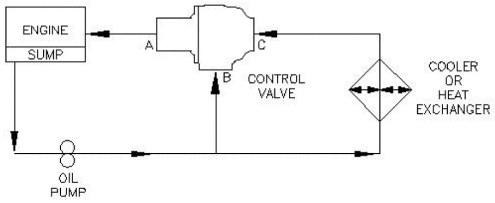


PART #	DESCRIPTION
*2010	VALVE BODY (*See table for material)
*2020	VALVE COVER (*See table for material)
1570*	O-RING (*Specify B, V or E for material)
2071	LIP SEAL
2050-Temp	THERMOSTAT (Temp to follow dash)
1600	HEX BOLT
1601	LOCK WASHER
FPE Model 2000* Replacement Kit (*Includes the following:*)	
1570B	BUNA O-RING
2071	LIP SEAL
2050-Temp	THERMOSTAT (Temp to follow dash)
(Replace * with O-Ring material type for Viton (V) & Neoprene (E) only)	
Viton® is a registered trademark of Dupont Dow Elastomers	

APPLICATION CHARTS



DIVERTING SYSTEM



MIXING SYSTEM

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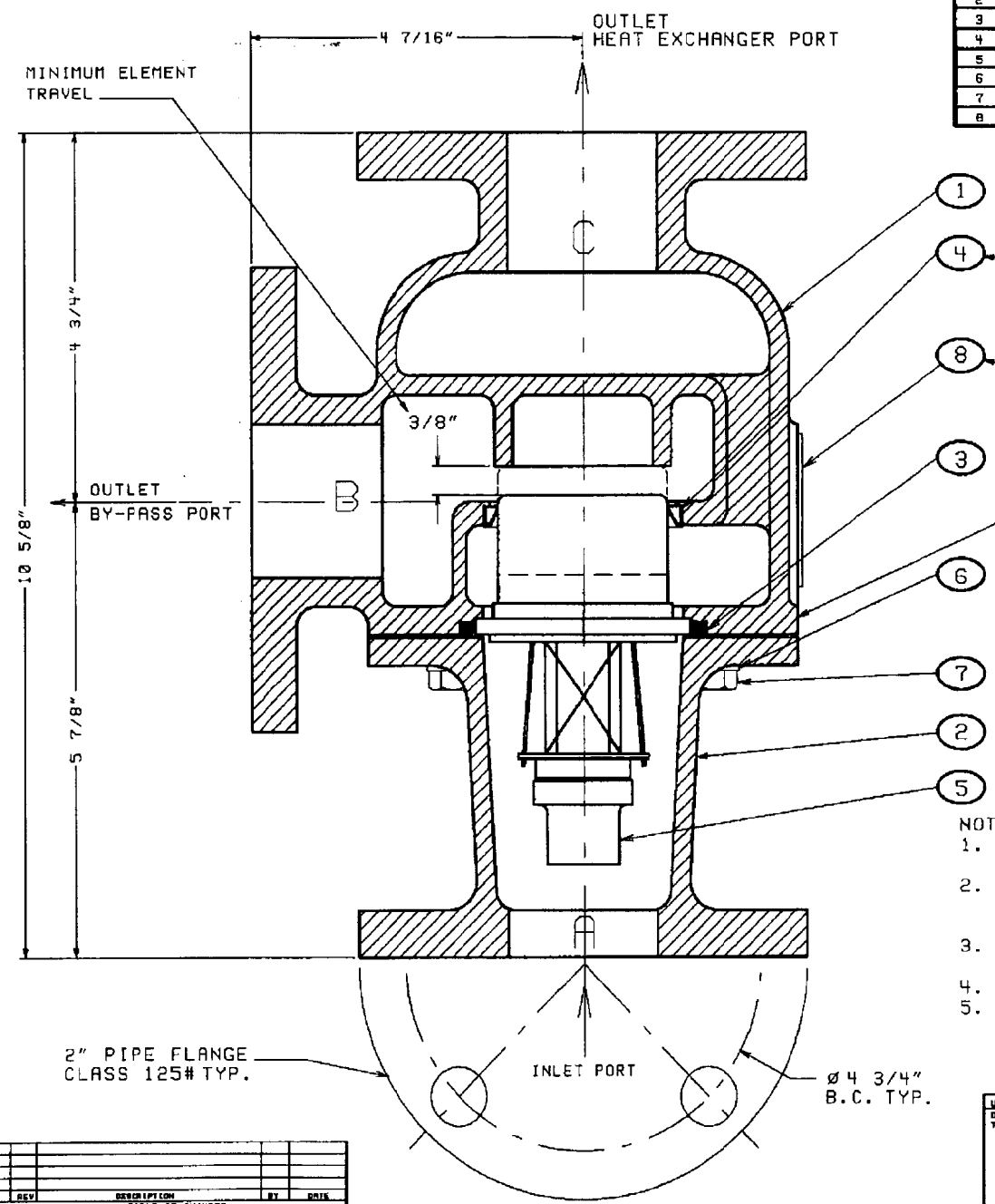
To Order

Specify Model Number, nominal temperature desired, and housing material. For Model coding information, visit our website or consult your factory representative.

ITEM	# REQ'D	PART NO.	DESCRIPTION
1	1	F2010	VALVE BODY, 2", #125 FLANGE TYPE
2	1	F2020	VALVE COVER, 2", #125 FLANGE TYPE
3	1	1570	"O" RING SEAL
4	1	2071	LIP SEAL
5	1	<2050-	ELEMENT
6	4	1601	LOCKWASHER - 3/8"
7	4	1600	CAPSCREW - 3/8"-16 X 1" LONG
8	1	1590	NAME PLATE



NOTES:
1. MAXIMUM WORKING PRESSURE: 125 PSI UNLESS OTHERWISE NOTED
2. MAXIMUM CONTINUOUS TEMPERATURE: 60 DEG F OVER THE FULLY OPEN TEMPERATURE OR 250 DEG F - WHICHEVER COMES FIRST
3. PART NUMBER 2050- CARRIES A DASH NUMBER INDICATING THE NOMINAL TEMPERATURE
4. THIS VALVE TO OPERATE WITH OIL OR WATER
5. WEIGHT: 31 1/4 LBS

ECN NO.	REV	DESCRIPTION	BY	DATE
TABLE OF CHANGES				

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONAL +/- 1/32
DECIMAL .XX +/- .01
.XXX +/- .005
ANGLES +/-
FINISH

FLUID POWER ENERGY, INC.
WAUKESHA WISCONSIN

TITLE: CONTROL VALVE ASSEMBLY - 2" FLAT FACE FLANGE

MATERIAL: CAST IRON CLASS 125# F.F. FLANGE

DRAWN: JJK DATE: 8-2-84 SCALE: NONE

CHKD: JJK DATE: 8-2-84 SHEET 1 OF 1

FILE ID: DC\FPE\AF2010 SIZE C

PART NO. F2010

FLUID POWER ENERGY
THERMOSTATIC VALVES

INSTRUCTION AND APPLICATION GUIDELINES

Your FPE Thermostatic Valve has been manufactured with extreme care and tested to insure that it had no detectable defects at the time it left the factory. If the valve is correctly applied and installed it will give years of service under reasonable operating conditions. This instruction manual will give you service information for nearly all normal operating conditions, but for the unusual situations it may be necessary to contact your FPE representative or the FPE factory. All FPE valves use the "Expanding Wax" type of temperature sensing element set to their normal rating under closely controlled conditions, and cannot be altered once they are set. If it is ever necessary to change the nominal rating of the valve, a different set of elements must be used.

INSPECTING THE VALVE UPON RECEIPT

Immediately upon receipt of your valve, check it over carefully for damage received in shipping, and be sure you have received the proper unit. In checking the model number of the valve against your order you may find that the nominal temperature rating is stamped below the part number, which is not how it was ordered. This numbering system merely allows us to identify the construction and thermostat setting on a more exact basis. If you have any questions do not hesitate to call the factory or your representative.

MATERIALS

FPE valves are available in cast iron, steel, stainless steel, ductile iron, aluminum and bronze. For information concerning these different materials, please contact your factory representative. Sometimes electrolysis may be encountered in a system. If this is the case, a zinc or magnesium waste plug can be installed in the valve at port A. If the valve is installed in seawater, cast iron housings are not generally satisfactory. In this type of installation, bronze valves must be used. In mounting the valve in a system, the valve must be properly vented so that the possibility of trapping air in the valve or around the elements is eliminated. A good rule to follow on systems is to place air vents so that air can be bled from the systems to a single collection point. Please note the vent lines in the different piping diagrams.

INSTALLATION

FPE valve dimensions are given on an attached sheet. If special engineered drawings have been prepared, these drawings and FPE standard instructions should be resolved before the valve is put into service. Figure 1 illustrates a cooling water diverting system using a radiator. Figure 2 is a cooling water mixing system using a heat exchanger. Please note the difference between a diverting system and a mixing system. In the diverting system the three-way thermostatic control valve diverts part of the fluid out of the C port into the cooler, and part of the fluid out of the B port to bypass the cooler. In a mixing situation part of the flow comes from the cooler or heat exchanger into the C port, the other part of the fluid comes from the B port or by-pass, mixes in the valve and comes out the A port at the desired temperature. In comparing these two systems, diverting and mixing, it has been found that the diverting system will provide a better and more even temperature control than the mixing system. This is because the diverting system has introduced a more temperature-even homogeneous fluid to the sensing element. On the other hand a mixing system requires two different fluid temperatures to mix in a small volume of the valve in order to exit through the tempera-

ture-sensing unit. You will note that in all of the piping diagrams, a mixing system controls the temperature of the fluid going into the engine or the compressor. The diverting system controls the temperature coming out of the engine or compressor.

MAINTENANCE

FPE thermostatic valves probably require less maintenance than any other type of similar use. Elements in normal service should be good for 6 to 10 years. Excessive temperatures, chemical, electrolytic or cavitation attack will of course shorten the life of the elements and seats which are replaceable. Carbonates, scale and other solids must not be permitted to build up on sliding valve or sensing cup surfaces. FPE does not recommend that a large stock of spare parts be maintained at the valve installation. Most commonly used elements and seals are immediately available from FPE's stocking area representatives or from the factory direct. Seals and composition gaskets are rated for a shelf life of one year from date of shipment. If adequately sealed from air, they may be good for longer periods. The shelf life of an FPE element is from one to two years, depending on storage conditions.

OPERATION

After installation of the valve has been completed into the system, and operating of the valve has been started, system temperatures should be monitored so that the circuit is performing satisfactorily. Water cooling systems generally operate at a temperature at or slightly below the nominal temperature of the valve. Oil systems or more viscous fluids operate at temperatures at or slightly above the nominal temperature. To check an elements temperature, place the element in a water bath at a temperature of 5 degrees below the opening temperature of the element. Make sure you stir the water vigorously with the element for at least five minutes. Check the sliding valve to make sure it is not off its seat. Next, place the element in the same water bath at 25 degrees above the full open temperature reading and again stir vigorously for five minutes. Check the element and it should now by fully stroked. This can be determined by placing the element back into the FPE valve housing and pushing the element's spider fully into the counter bore. FPE valves have an over travel spring which can be felt by pushing the element down into the counter bore. If this resistance is felt, the element is now fully stroked. Since the element has a tendency to cool quickly, you must do this last step before the element has cooled.

TROUBLE SHOOTING

I. SYSTEM TEMPERATURE RUNNING TOO HOT

(a) Presence of foreign objects, dirt and solid buildup inside the valve (e.g. sliding piston, piston's seat, and lip seal area) may prevent proper operation of the valve. Example: By-pass port will not close.
(b) Valve's by-pass and cooler ports (port B & C) installed backward. As port B closes due to temperature increase, flow is greatly restricted to cooler.
(c) Valve is undersized, causing increase in pressure drop and possibly cavitation.
(d) Thermostatic wax element may have been exposed to temperature higher than the recommended maximum temperature.
(e) Excessive pressure drop (in excess of 25 psi) may cause one or more of the following conditions:
1. Thermostatic wax element failure
2. Lip seal dislocation
3. O-ring damage
4. Improper piston movement.
f) Improper system cooling capacity.
g) Improper sizing of the valve in a mixing application. If the valve is sized too large for the application it could result in poor mixing, which could cause the temperature to run either too hot or too cold.

II. SYSTEM TEMPERATURE RUNNNG TOO COLD

(a) Incorrect selection of valve's nominal temperature.
(b) Valve's by-pass and cooler ports (port B & C) installed backward. This condition forces fluid to cooler at lower temperature.
(c) Worn Teflon lip seal.
(d) Presence of foreign object, dirt and solid buildup inside of valve (e.g. sliding piston, piston's seat, and lip seal area) may prevent proper operation of the valve.
(e) Excessive pressure drop. Refer to part 1, item E above.
(f) Thermostatic control valve is oversized.
(g) Outlet temperature is not maintained due to insufficient heat rejected to coolant.

III. ADDITIONAL ITEMS THAT MAY BE CHECKED:

(a) System thermometers should be regularly checked to make sure that they are operational
(b) Thermometers should be located on the side of horizontal pipe runs whenever possible and particularly on oil systems.
(c) Thermometers should be as far as possible downstream from the valve in a mixing application.
(d) The system should not have any bypasses or "sneak circuits" which prevent proper operation of thermostatic control valve.
(e) Cracked or broken valves may be caused by:
1. Piping too short, and therefore, over-tightening bolts
2. Lack of expansion isolation between piping and valve.
3. Misalignment of piping.
4. Excessive weight
5. Allowing untreated water to freeze in the system.

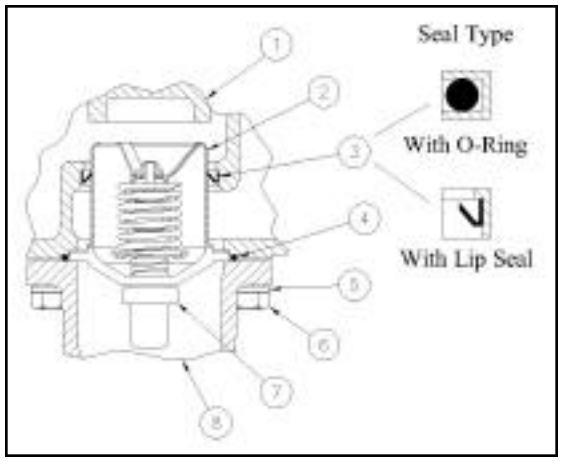
REPAIR INSTRUCTIONS
THERMOSTATIC VALVE MAINTENANCE KITS

ELEMENT TESTING

Place element in water at a temperature 15 deg. F. to 20 deg. F. above its nominal setting and stir water vigorously with the element for five minutes. The temperature stamped on the sleeve of the element is the nominal temperature. The cracking temperature and the fully open temperature are stamped on the pill of the thermostat. After stirring vigorously immediately place the element in the housing. If the element is fully stroked, the seating and overtravel spring can be felt as it is pushed down. To determine if the element will close at a specific temperature, place the element in a bath of water approximately 5 deg. F below the start to open temperature. This is the number stamped on the element. Due to the effect of hysteresys the element will close 5 deg. F. below the start to open temperature.

ELEMENT REPLACING

Remove four capscrews (6), lockwashers (5) and separate housings (1) and (8). Remove element assembly (7) and seal (3). Remove housing gasket or O-ring (4). Clean housing sections; remove any scale or foreign material from seal faces. Lubricate new element seal (3), lip seal is pressed into upper housing (1), O-ring is inserted into sleeve (2). Place the new housing gasket (4) in recess of upper housing (1). Insert element (7) into upper housing (1) to position shown in section view. Place lower housing (8) over exposed section of element (7) against face of upper housing (1). Secure housings with capscrews (6) and lockwashers (5).



Ref. No.	Description
1	Upper Housing
2	Sleeve
3	“O” Ring or Lip Seal
4	Gasket or O-ring
5	Lock-washer
6	Cap-screw
7	Element Assembly
8	Lower Housing