

INSTALLATION, OPERATION and MAINTENANCE MANUAL



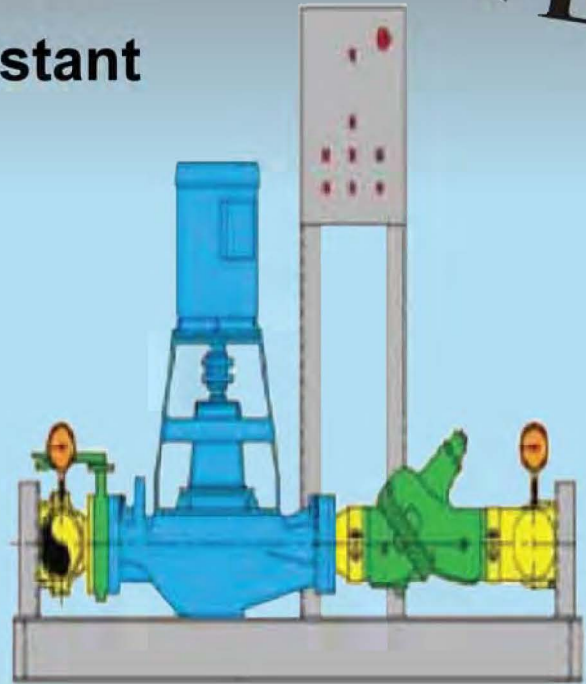
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with the **FLO**

Water Pressure Booster System

Type CPS Constant



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Manufacturer of Pumps, Tanks, Heat Exchangers & Accessories
for HVAC Market After-Sales Parts and Services

Water Pressure Booster System
Type CPS Constant

FLO FAB INC
LAKE WORTH,
FLORIDA, USA



FLO FAB

05/02/97- Update
5-XU-070-E1

WATER PRESSURE BOOSTER SYSTEMS TYPE "CPS"

APPLICATION

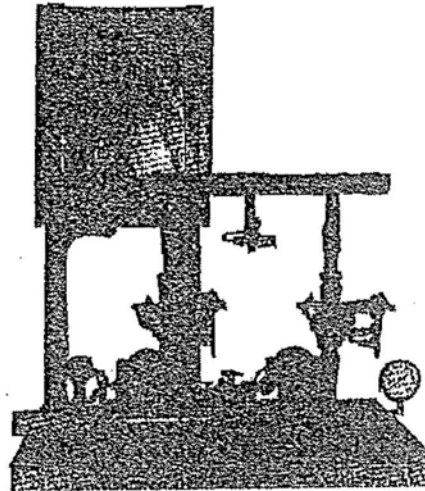
- | | |
|-----------------------|---------------|
| ■ Apartment buildings | ■ Hospitals |
| ■ Shopping Centers | ■ Factories |
| ■ Office Building | ■ Schools |
| ■ Hotels / Motels | ■ Dormitories |

FEATURES

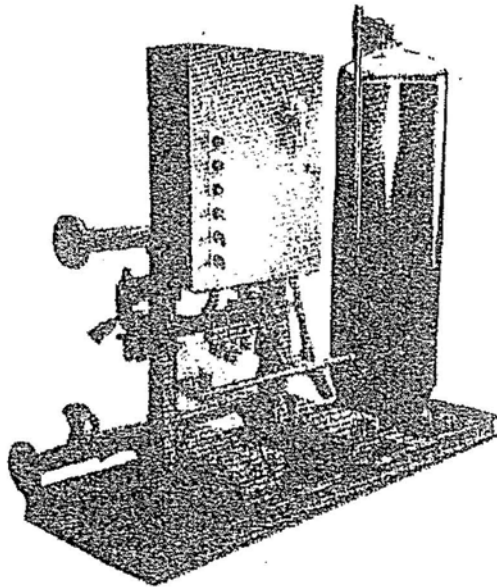
- Automatic supply of domestic water pressure to buildings
- Factory assembled and wired
- Single source responsibility
- Low installed cost
- Ease of selection

The *Flo Fab* CPS System is generally suggested for applications with constant base load requirements, including hotel, hospital, industrial, and municipal complexes. It is especially recommended when boost pressures or peak volume requirements are low to medium, and when first-costs are a primary design consideration.

The CPS System permits major operating savings by dividing peak flow into several capacity ranges. By using a small lead pump for low flows, and one or more lag pumps for higher flows. CPS Systems achieve substantial reductions in power consumption and eliminate unnecessary pump wear.



CPS Duplex System



CPS with Hydro-Tank Duplex System

The *Flo Fab* CPS System with Hydro-Tank is generally suggested for applications with extended periods of minimum flow or no-flow conditions, including high-rise apartments, office buildings, and schools.

The system permits major operating savings through the use of the Hydro-Tank which allows complete pump shutdown while maintaining constant system pressure under minimum or no-load conditions. Resulting energy savings are usually greater than 25%.

When flow demand reaches a level beyond efficient Hydro-Tank operation, the system switches to economical multiple-pump sequencing operation. A lead pump meets low flow demands. Constant system pressure, substantial energy savings, and elimination of unnecessary pump wear are the system's benefits.



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(R.P.(95/96); 5-X-070-E22)

WATER PRESSURE SYSTEM OPERATING AND MAINTENANCE INSTRUCTIONS

FUNCTION

The module provides a constant pressure output at the discharge header over the full range of the rated capacity.

Full flow is obtained by a single pump or multiple pumps running in parallel. In multi-pump systems, each pump handles a percentage of the design flow. The lead pump is continuously running and the lag pumps are automatically started and stopped as dictated by water consumption. Sequencing of the lag pumps is effected by flow switches (there are no flow switches in single pump systems).

Combination pressure reducing and on-slam check valves are located at each pump discharge to regulate pressure in the discharge header. Actual pump output is slightly higher than the design constant pressure in order to overcome internal package losses.

A temperature purge valve or a pressure switch mounted on the hydro-tank (if supplied) guards against overheating of the pumps at a no flow condition.

A control panel contains the electrical components required for the control functions.

INSTALLATION

Module is a pre-piped and pre-wired unit requiring as field connections only:

- Bolting to foundation
- One electrical power connection
- City water supply and system piping connections
- Piping purge valve and/or pressure relief valve to floor drain.

A. TEMPORARY STORAGE

If the unit not to be installed and operated soon after arrival, store it in a clean dry area. Avoid exposure to freezing temperatures or temperatures above 40 Deg C (104 Deg F)



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***WATER PRESSURE SYSTEM
OPERATING AND MAINTENANCE
INSTRUCTIONS
Suite...***

B. LOCATION

Place in dry location. Level and securely bolt frame to a concrete base. Provide sufficient clearance from walls for proper maintenance and servicing of pumps and valves. National electric code requires at least 36" clear space in front of the control panel. Grouting of the frame base for maximum support and reduced vibration and noise is strongly recommended.

C. PIPING

Piping flanges must be brought squarely against module flanges before bolts are tightened. Attempting to pull misaligned flanges together with the flange bolts will impose excessive forces on the module piping and pumps. The proper way is to first install the module and firmly anchor it in place and then pipe up to it. If this cannot be done flexible connectors should be used between system piping and both headers of the module.

Under no circumstances should the module serve to support the piping.

Provide isolation valves on both the suction and discharge headers of the unit to facilitate future maintenance work. A system by-pass should be considered.

Provide a suitable drain pipe for discharge side of the temperature purge valve and for pressure relief valve on the hydro-tank.

Provide die-electric union whenever two dissimilar pipings are connected to each other.

System should be supplied with a minimum of 5 P.S.I. water source (city water).

D. POWER

Connect the specified power to the control panel. Consult wiring diagram and observe local codes.

E. START-UP

Before filling the system with water make sure the module is firmly secured and all flange bolts are tight and make sure the hydro-tank (if supplied) is pre-charged to the specified pressure (air).

Before energizing the control panel check the following:

- Is the supply voltage correct?
- Has proper ground fault protection been provided?
- Is the feeder wire size adequate to carry the current?
- Are all terminal screws in the panel tight?
- Close all valves on the discharge side of the module so there will be no flow to the system.
- Remove all air from system piping and careful attention should be given the system pressure



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***WATER PRESSURE SYSTEM
OPERATING AND MAINTENANCE
INSTRUCTIONS
Suite...***

control valves. These valves must be freed of all air by loosening bolts and purge plugs at the highest points. If milky or white water is noticed, this shows evidence of air. This will cause the valve to mis-function.

Set all pump selector switches (H-O-A) on "OFF" and energize panel.

Check the rotation of each pump by setting the pump selector switch on the "hand" position. Correct if necessary.

If all pumps are operating properly in the "hand" position, set the pump selector switches on "auto", one at the time, beginning with pump number one.

Open all valves on the discharge side of the module, one at a time, beginning with pump number one. Also open all isolation needle valves beneath pressure gauges and pressure switches and those on the purge valve piping.

The module is now in its automatic operating mode.

All flow and pressure switches are factory set from information given by customer at time of ordering the unit, and will not normally require any field adjustment. If an adjustment is necessary proceed in accordance with the manufacturer's instructions.

NOTE: If the system demand is zero, the discharge pressure will be somewhat higher than indicated on the name plate. Therefore, do not attempt to re-adjust the pressure reducing valves unless there is some flow to the system.

Factory settings are based on information received at time of order. Suction pressure different than reported to the factory could require resetting of both pressure switches. I.E. due to low suction pressure, pump may run continuous or longer than normal before reaching shut off setting.

F. MAINTENANCE

Lubricate pump motor in accordance with lubrication instructions on motor.

For servicing of any components, review the appropriate manufacturer's instruction sheets, available upon request.

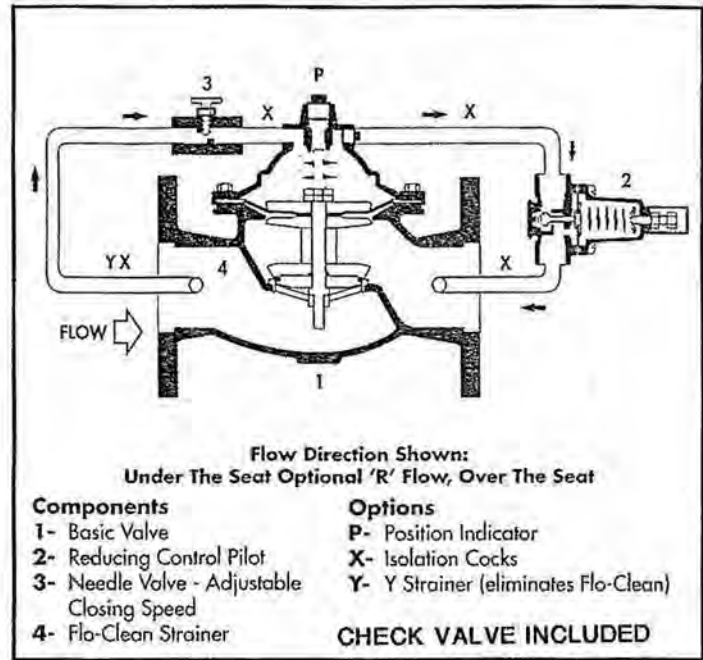
NOTE: Consult factory for pump operation / parts breakdown on this units. Provide model no. and serial no. for proper identification.

Purge the air from all points of pump casing.

Model ZX 200
Pressure Reducing Valve

See page 100

- Modified globe design (best configuration for accurate control)
- Diaphragm actuated (one moving part)
- Hydraulically operated
- Frictionless operation (no internal hysteresis)
- Fully guided stainless steel stem
- Packless construction (less maintenance)
- Available in globe or angle pattern
- Baked-on epoxy inside and out (Maximum Corrosion Protection)



Description:

The ZX 200 Pressure Reducing Valve provides desired constant downstream pressure regardless of a changing flow rate or varying inlet pressure. This valve is hydraulically operated, single seated and controlled by a direct acting, spring loaded diaphragm pilot valve. It is extremely sensitive to changing downstream pressures and reacts to modulate the main valve to hold the downstream pressure accurately at the set point.

Setting the pressure to be maintained downstream is easily performed by turning the adjusting screw in the reducing control pilot.

Information needed when ordering

- 1- Size
- 2- Valve model number
- 3- Flow rates
- 4- Materials
- 5- End connections
- 6- Liquid to be controlled
- 7- Working temperature and pressure

Pressure Set Range

| | |
|---------------------------------|----------------|
| 20 to 175 psig/140 to 1205 kPa | Std. |
| 0 to 30 psig/0 to 210 kPa | also available |
| 100 to 300 psig/690 to 2070 kPa | upon request |

| Valve Size | Inches (mm) | 1-1/4" (32) | 1-1/2" (40) | 2" (50) | 2-1/2" (65) | 3" (80) | 4" (100) | 6" (150) |
|------------------------------------|-------------|-------------|-------------|---------|-------------|---------|----------|----------|
| Max. Continuous Flow Rate | | | | | | | | |
| USGPM | | 93 | 125 | 208 | 300 | 460 | 800 | 1800 |
| LITERS/SEC | | 5.9 | 7.9 | 13.1 | 18.9 | 29.0 | 50.5 | 113.6 |
| Max. Intermittent Flow Rate | | | | | | | | |
| USGPM | | 115 | 158 | 260 | 370 | 570 | 1000 | 2300 |
| LITERS/SEC | | 7.3 | 10.0 | 16.4 | 23.3 | 36.0 | 63.1 | 145.1 |

When a wide range of flow rates are possible, we recommend two ZX200 pressure reducing valves in parallel be used, a small valve to handle the low flows and a large valve to handle peak flows.

Note: Improper sizing of pressure reducing valves can result in problems. There are factors to consider such as the inlet pressure, outlet pressure and flow rates for the maximum and minimum design flows when applying a pressure reducing valve in the system.

Note: Velocities in G.P.M. are equivalent to Flow in Ft./Sec. through schedule 40 pipe.

1. introduction of the product

This type of product is good to be used in the industry factory, high building, water system, it can take the place of the water tank in the building where require to reduce the static pressure and the dynamic pressure, expand the usage room. Valve adopts whole pipeline streamline design, to achieve the small resistance and big flow. In transmission, it adopts waterpower handling, that is automatically handle the move of the main valve plate by the water pressure in the pipeline, control the opening degree of the valve, adjust the downriver pressure to maintain the designed figure. When the downriver pressure exceeds the designed pressure figure, the reduce valve will close automatically. No matter what the inlet pressure P1 changes, it can supply the stable outlet pressure P2. No matter what the downriver pressure changes, it can supply the outlet pressure P2 in the designed figure of lead valve. The scope of the outlet pressure is from 10% to 80% of the pressure before valve by the adjusting the lead valve. The valve works stable without water hammer impact.

2. structure

The valve is combined by the main valve, lead valve, needle valve, ball valve, mini strainer and gauges etc. As lead valve,needle valve and gauges are connected with main valve by the pipe, we called them the pipe control system. According to the different demand on the diameter of the pipe,the valves are divided into two types: spacer type and piston type, as below drawing:

spacer type structure

piston type structure

3. Main parts and material

| No | part name | Material | No. | part name | Material |
|---------|-------------|---|-------|------------------------|--|
| 1 | Valve body | Cast iron , cast steel, stainless steel | 8 | Press plate for spacer | Brass, stainless steel |
| 2 | Valve seat | Brass,stainless steel | 9 | Lead valve | brass |
| 3 | Seal seat | Strengthen rubber | 11.17 | Gauge | |
| 4 | Press plate | Brass, stainless steel | 12 | Compresss spring | Stainless steel |
| 5 | Valve plate | Brass,stainless steel | 13 | Valve pole | Stainless steel |
| 6.10.16 | Ball valve | Brass | 14 | Valve cover | Cast iron, cast steel, stainless steel |
| 7 | spacer | Strengthen rubber | 15 | Needle valve | Brass |

4.working principle

Inlet pressure P1 enter the control room of the main valve through the pipe and needle valve 15, then give the down pressure P3. Outlet pressure P2 under spacer(or the piston) resist the spring of the lead valve through the pipe also. When the down pressure exceed the designed pressure of the lead valve, the lead valve will close to make the excretive water in the control room to be 0 , changeable pressure P3 reach the maximum figure ,then the main valve plate presses the valve seat tightly and the reduce valve closes. Once the downriver pressure P2 goes down to the designed figure, the lead valve will open, the water in the control room will excrete to the downriver throught the lead valve 9 and ball valve 6. As the needle valve's opening degree is small and the diameter of inlet pipe is smaller than that of the outlet pipe, the excreting speed is faster that the incoming speed of water by the inlet pressure, which makes the pressure P3 in the control room lower. The inlet pressure P1 which make up pressure on the main valve plate lift the main valve plate up, then the reduce valve open. In the moving adjusting condition, when the excreting flow is equal to the incoming flow, the opening degree of the main valve does not change and the downflow pressure is stable.(This is the working principle for both the spacer type valve and piston type valve)

5.Main technical function

| | | | |
|-------------------------------------|-------------|-------------|-------------|
| Nominal pressure PN | 1.0Mpa | 1.6Mpa | 2.5Mpa |
| Testing pressure of cover | 1.5Mpa | 2.4Mpa | 3.75Mpa |
| Testing pressure of seal | 1.1Mpa | 1.76Mpa | 2.75Mpa |
| Maximum inlet pressure | 1.0Mpa | 1.6Mpa | 2.5Mpa |
| Adjustable scope of outlet pressure | 0.09-0.8Mpa | 0.10-1.2Mpa | 0.15-1.6Mpa |
| applicable temperature | 0C-80C | | |
| applicable medium | water | | |

6. shape dimension

spacer type

7. Install and adjust

- a. It is better to install the main valve horizontal with upturned valve's cover. Other install way also works.
- b. Clean up the pipe system and remove the impurity before water comes through the valve.
- c. Should install the Y strainer before the valve and clean the valve once per half year(or one year)
- d. It is better to install the main valve horizontal with upturned valve's cover. If install the valve vertically,the usage life of the valve will be shorter.
- e. When the proportion of reduced pressure is more than 4:1, it is suggested to install two valves to reduce pressure so can reduce the air rust and extend the usage life.
- f. Bypass pipe isolated valve should be closed tightly, it is suggested to use the good quality stop valve or butterfly valve.

8. adjusting procedure

lead valve 9 and the pipe control system are assembled and adjusted before being sold. You can also adjust the pressure if the designed pressure of lead valve 9 is not applicable to the actual usage.

- a. First release safty cover of the lead valve 9, turn the adjusting screw of the lead valve 9 to the top position (relative outlet lowest pressure).
- b. Turn clockwise the adjusting screw of the lead valve 9 until the outlet pressure is up to the pressure you need. Then mount the safty cover of the lead valve.
- c. Adjust the opening degree of the needle valve 15 until the flow through the needle valve 15 and the flow through the lead valve 9 balance, by the time the downriver pressure is more stable. (turn clockwise the handle of the needle valve 15 is to reduce the opening degree, turn anti-clockwise the handle is to increase the opening degree.)
- d. If the pressure just adjusted is more than what you need, you need to adjust from first step as you can only adjust from low pressure to high pressure.

9. Main valve maintenance

Reduce valve is one kind of water lubricating valve, do not need extra lubricating oil. If the parts inside of the valve are damaged, PLS follow below instruction to dismount the valve.(remark: the easily damaged parts are the seal gasket and the spacer, other metal parts are not easily damaged)

- a. close the front gate valve and back gate valve.
- b. Loosen all the screws on the assemble pipe connection of the main valve cover so that the pressure inside of the valve released.
- c. Take off all the screws including some brass pipes and the nut in the control pipe system.
- d. Take off the valve cover and spring
- e. Take the shaft, spacer (piston)etc, make sure not damage the spacer.
- f. Check all the parts you take especially the spacer and the seal gasket to see if any of them are damaged. If not, PLS dismount other inside parts.

- g. If you found that the spacer or the seal gasket are damaged, PLS release the screw on the shaft, take slowly the spacer or the seal gasket out, mount the new spacer or the seal gasket.
- h. check carefully if the inner valve seat or the shaft in the main valve are good, remove the impurity inside if there is.
- i. assemble all the parts in reversed turn. Install the main valve properly, make sure no block..
- j. PLS use the valve according to the instruction manual.

Install drawing

ZY200X reduce valve

ZC500X
Releasing Pressure valve

To puddle

Bypass pipe (should be closed tightly)

(The size of the reduce valve is not necessary to the same as the size of the pipe,
It is decided by the flow.)

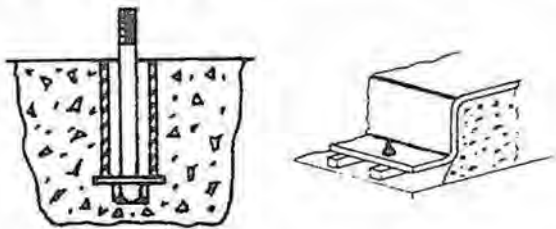
STORAGE - Make sure that all components are kept as clean as possible. Do not remove the crating or plastic wrapping until the unit is ready for installation.

UNCRATING - After removal of the unit from the crate, check to see that the equipment is in good order and that all components are received as called for on the packing slip. Any shortages or damage should be reported immediately.

LOCATION - Locate the unit where it is easily accessible for inspection and servicing. Provide adequate room for pump withdrawal and also for access to the interior of the control panel.

FOUNDATION - The foundation should be sufficiently substantial to absorb any vibration and to form a permanent rigid support for the baseplate. A good concrete foundation should be approximately 2-1/2 times the weight of the packaged unit. In building the foundation, make ample allowance for grouting.

FOUNDATION BOLTS - Foundation bolts of the proper size should be arranged as shown in the sketch, with a pipe sleeve embedded in the concrete to permit adjustment of the bolts after the concrete has been poured. Use sleeves with a diameter 2-1/2 times the diameter of bolts.



LEVELING - When the unit has been placed on its foundation, insert metal wedges approximately 1" thick on either side of the foundation bolts under the baseplate as shown in the sketch. Adjust the wedges until the suction and discharge headers are truly vertical. Check this by means of a spirit level on the suction and discharge flanges. When leveling is complete, the foundation bolts should be tightened evenly and firmly. Do not overtighten the bolts at this stage.

GROUTING - Fill the baseplate completely with grout, allowing it to flow around the wedges under the baseplate. Allow 48 hours for the grout to set before final tightening of the foundation bolts.

PIPING - Both the suction and discharge pipes should be independently supported so that no strain is imposed on the packaged unit when the pipes are connected. All connecting pipework should be accurately located-do not attempt to force the suction and discharge pipes into position.

INITIAL RUN - Open the main supply valve and also the isolating valves on the suction and discharge sides of the packaged unit. Turn all the pump selector switches to the "Off" position and close the main disconnect switch. Switch pump No. 1 to the "On" or "Hand" position for a brief period and check the rotation of the motor. This should correspond to the directional arrow i.e. clockwise when looking down on top of the motor.

If the motor is running the wrong way, interchange two of the connections at the main supply terminals in the control panel. This will ensure proper rotation of the other pumps since all motors are phased for the same rotation on test before the unit is shipped.

After correct rotation has been established, switch pump No. 1 to the "On" or "hand" position and run the pump for a few minutes to check for noise, vibration, etc., and any leaks in the pipework. Repeat this procedure for the other pump(s) in the package.

ADJUSTMENTS - The adjustable devices in the package are as follows:

- (a) Low pressure switch
- (b) Current sensing relay(s)
- (c) Time delay relay(s)
- (d) Pressure reducing valves
- (e) Aquastat

The operation and adjustment procedures for these controls are described on pages 3 and 4.

Note carefully, however, that all devices are pre-set at the factory and, with the possible exception of the pressure reducing valve, will normally require no further adjustment. A final adjustment should be made on the pressure reducing valve to match the output pressure to the exact system requirements.

THERMAL BLEED TEST - To test the thermal bleed circuit, switch pump No. 1 to the "On" or "hand" position and close the isolating valve on the pump discharge side. When the temperature in the pump rises to approx. 120°F, the thermostat will operate and open the solenoid valve, allowing the heated water to bleed to drain. Repeat this procedure with the other pump(s).

AUTOMATIC OPERATION - Setting the unit for automatic operation is very straightforward. Turn all the isolating valves to fully open position and close the main disconnect. Switch pump No. 1 to the "On" or "Auto" position and switch the other pump(s) to "Auto".

CONSTANT SPEED BOOSTER SYSTEMS

BASIC OPERATING FUNCTIONS

Every constant speed packaged system – regardless of size or type or horsepower rating – incorporates seven (7) basic operating functions as follows:

- 1) One pump (lead pump) operates continuously. ** When the system demand exceeds the capacity of the lead pump, the second pump (lag pump) is automatically started up to share the load. On a three-pump system, the third pump is brought on in the same way when demand exceeds the combined capacity of the two lead pumps. A similar sequence of events takes place in reverse on decreasing demand.
- 2) Sequential starting and stopping of the pumps is achieved by means of pressure switches which sense the system pressure. In the diagram shown at the right, when the pump reaches its design capacity (Q), the pressure drops. This value X required setting on the pressure sensing relay.
- 3) When a lag pump is started up, a time delay relay keeps it operating for a minimum time period to prevent the pump from cycling on and off if the demand is fluctuating.
- 4) During periods of low demand, the pumps are operating at, or near, shut-off and there is a tendency for the pumps to overheat. To prevent this, each package incorporates a thermal bleed circuit. A small quantity of water from each pump discharge is continuously circulated past the bulb of an aquastat and back to the suction header. Rising water temperature is sensed by the aquastat which operates a solenoid valve and allows a controlled quantity of water to bleed to drain.**
- 5) A pressure switch is connected into each package to protect against low suction pressure. If the city supply pressure falls to a dangerously low level, the switch operates and prevents the pumps from running. This condition is indicated by a red light on the control panel.

- 6) Each individual pump has a selector switch to permit manual or automatic operation.
- 7) Should a motor overload and fail to operate, the next pump in sequence starts up automatically.

** Except when no-flow shut-down is provided.

OPTIONAL FUNCTIONS

The following optional functions may be incorporated:

- a) Automatic (electrical) alternation featuring a time clock and transfer relay.
- b) Pressure switch to provide protection against high system pressure.
- c) Pressure switch to provide protection against low system pressure (burst main).
- d) Pressure switch to shut off the pumps when the city supply pressure is sufficient to supply the system without boosting.
- e) No-Flow Shut-Down replaces thermal bleed circuit. An Aquastat senses the water temperature in the lead pump casing (volute) and, on rising temperature, the Aquastat turns off the system. A system pressure switch, connected to the discharge header, re-energizes the lead pump. A draw down tank must be installed preferably on the top floor with any type shut-down.

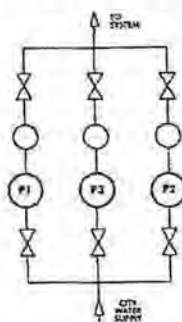
VALVING

Ball valves, or butterfly valves, are provided on the suction and discharge sides of each individual pump to permit isolation for servicing. Each pump discharge line is also fitted with either

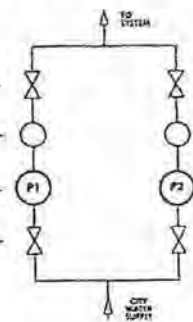
- (a) A non-slam check valve
or
- (b) A combination pressure reducing and check valve which provides constant system pressure regardless of variations in city supply pressure.

PIPING ARRANGEMENTS

THREE-PUMP
PACKAGED SYSTEMS
SCHEMATIC LAYOUT

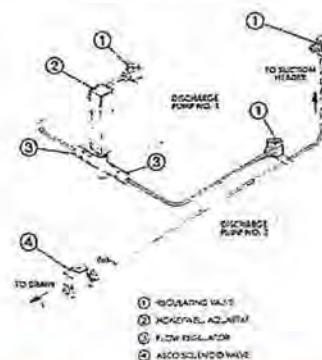


TWO-PUMP
PACKAGED SYSTEMS
SCHEMATIC LAYOUT



(*) ALTERNATIVELY NON-SLAM CHECK VALVES

THERMAL BLEED CIRCUIT



LOW PRESSURE SWITCH • ALLEN-BRADLEY



- 1-2 Normally closed. Open on increasing pressure.
- 3-4 Normally open, close on increasing pressure.

APPROXIMATE FACTORY SETTING

Operating Point.....5 psi
Differential.....10 psi

AQUASTAT

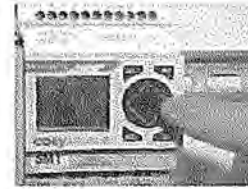


The Aquastat is connected in series with the Asco solenoid valve and is arranged to operate when the water temperature rises to a predetermined value. A visible control point scale and external adjustment screw permit easy setting.

FACTORY ADJUSTMENT 120°F for continuously running systems

When no-flow shut-down is provided, the Asco solenoid valve is not supplied. The Aquastat is set at between 80-90°F and turns off the system.

EASY RELAY - TIME DELAY RELAY ADJUSTMENT



Electronic time delay relay(s) are used to prevent rapid on/off cycling of the pumps and other delayed control functions. To make changes to the timer values:

- 1) Move cursor to the PARAMETERS value
- 2) Press OK
- 3) Select the timer value that you wish to change, move cursor over to the value field and increase the value using the up arrow or decrease the value using the down arrow.
- 4) Press OK

PRESSURE REDUCING & CHECK VALVE

Pressure adjustment is made by turning the adjustment screw to vary the spring pressure on the diaphragm. The greater the compression on the spring, the higher the pressure setting.



- 1) Remove the protective cap from the pressure reducing control.
- 2) Turn the adjustment screw in (clockwise) to increase delivery pressure.
- 3) Turn the adjustment screw out (counter-clockwise) to decrease delivery pressure.
- 4) Tighten jam nut on adjustment screw and replace protective cap.

BOOSTER TROUBLE SHOOTING CHART

| CAUSES | SOLUTIONS |
|--|---|
| - 1 - PUMP DOES NOT RUN | |
| No power to the motor | <ul style="list-style-type: none"> • Check for voltage at the motor terminal box • If no voltage at motor check control panel for tripped circuits • Reset circuit |
| Fuses are blown or circuit breakers are tripped | <ul style="list-style-type: none"> • Turn off power and remove fuses and check for continuity with ohmmeter • Replace blown fuses or reset circuit breakers • If new fuses blow or circuit breaker trips, the motor and wires should be checked • System should be verified for unusual pump cycling |
| Motor starter overloads are burned or have tripped out | <ul style="list-style-type: none"> • Check for voltage on load side and line side of starter • Replace burned heaters • Inspect starter for other damage • If heater trips again check supply voltage, holding coil • Allow time for overloads to cool before resetting • System should be verified for unusual pump cycling |
| Starter does not energize | <ul style="list-style-type: none"> • Energize control circuit and check for voltage at the holding coil • If no voltage, check control circuit fuses/breakers • If voltage exists check holding coil for shorts and replace bad coil |
| Defective or wrongly adjusted pressure switches | <ul style="list-style-type: none"> • Check all safety controls i.e.: Low suction, high suction, high and low system pressure switches • Low suction pressure switch = 5 PSI • High suction pressure switch = required system pressure + 5 PSI • High system pressure = system required pressure + 25 PSI or according to system limitations • Low system pressure = 25% below system required pressure • Check contacts on control devices • Replace worn or defective parts or switches |
| Motor is defective | <ul style="list-style-type: none"> • Disconnect power and wiring to motor • Measure lead to lead resistance's • Measure lead to ground resistance's • If and open or grounded winding is found, remove motor and repair or replace |
| Pump is bound | <ul style="list-style-type: none"> • Turn off power and manually rotate pump shaft • If shaft does not rotate easily remove pump • Disassemble and repair |
| - 2 - LAG PUMPS DO NOT SEQUENCE ON | |
| Pressure switch not set properly | <ul style="list-style-type: none"> • With main pump running, turn the lag pump pressure switch clockwise until the pump starts • Starting value should be 5 to 10 psi below the no flow shut down. • Pump not placed in automatic |
| - 3 - LAG PUMP DOES NOT SHUT OFF | |
| No f;pw suction switch not set properly | <ul style="list-style-type: none"> • With main pump running, turn the low flow pressure switch clockwise until the pump stops. |

BOOSTER TROUBLE SHOOTING CHART

| CAUSES | SOLUTIONS |
|--|---|
| - 4 - OUTLET PRESSURE TOO HIGH | |
| PRV has to be readjusted | <ul style="list-style-type: none"> • Check pressure gauge on discharge header • To decrease outlet pressure turn adjustment screw counterclockwise on pressure control valve on pilot assembly |
| PRV does not close | <ul style="list-style-type: none"> • Check pilot system for: closed isolation and control valves, damaged control line, blocked strainers, obstruction in valve between disk and seat, damaged diaphragm, inoperative pilot PRV • Open all valves, check strainers for foreign material and pilot tubing for any damage • If foreign material is suspect in the main body chamber valve will have to be disassembled |
| - 5 - OUTLET PRESSURE TOO LOW | |
| PRV has to be readjusted | <ul style="list-style-type: none"> • Check pressure gauge on discharge header • To increase outlet pressure turn adjustment screw clockwise on pressure control valve on pilot assembly |
| PRV does not open | <ul style="list-style-type: none"> • Ensure that there is pressure at the valve main inlet Verify the following: valve opening flow control device is blocked or inoperative, main valve diaphragm assembly is inoperative, Pilot Control Valve is not opening and inlet strainer for blockage • Disassemble flow control valve clean & polish stem and replace worn parts • Disassemble diaphragm clean & polish stem, replace worn parts |
| - 6 - PRV DOES NOT REGULATE | |
| Air in the main valve cover and / or tubing | <ul style="list-style-type: none"> • Loosen top cover plug and fittings and bleed air • Bleed air from top chamber and pilot |
| Pilot Control Valve internal interference | <ul style="list-style-type: none"> • Disassemble Pilot Control Valve |
| Pilot spring not in correct range to control | <ul style="list-style-type: none"> • Check spring vs. chart in O & I manual |
| - 7 - PRV CHECK VALVE FEATURE NOT WORKING | |
| Pilot check valve inoperative or pilot isolation valve closed | <ul style="list-style-type: none"> • Open isolation valve • Remove check valve • Clean or replace check valve |
| - 8 - PUMP RUNS AT REDUCED CAPACITY OR DOES NOT DELIVER WATER | |
| Wrong pump rotation | <ul style="list-style-type: none"> • Check incoming wiring for proper connections • Correct wiring |
| Pump impeller, suction strainers, check valves, foot valves or upstream piping are clogged | <ul style="list-style-type: none"> • Disassemble pump and inspect • Remove strainers and valves and inspect • Remove all foreign materials found |
| Suction or discharge piping leaks | <ul style="list-style-type: none"> • Pump runs backward when turned off • Air in suction piping • Suction piping must be air tight, repair any leaks and tighten any loose fittings |
| Pump is worn | <ul style="list-style-type: none"> • Install pressure gauge on pump discharge • Gradually close discharge isolation valve and read pressure at shut off • If measured pressure is close to pump curve pump is probably OK • If not remove and inspect pump |

BOOSTER TROUBLE SHOOTING CHART

| CAUSES | POSSIBLE SOLUTIONS |
|---|--|
| - 9 - LAG PUMP CYCLES TOO MUCH | |
| Current setting or trip point (Threshold) set too low | <ul style="list-style-type: none"> • Increase set point (Threshold) and observe • Generally set near FLA of motor, do not go beyond the motor service factor Amps |
| Current rest value set to low (Hysteresis) | <ul style="list-style-type: none"> • Increase Reset value (Hysteresis) and observe • Threshold set between 15 - 25% in most instances • If the value is overshoot then lag pump will never shut off |
| - 10 - LEAD PUMP CYCLES TOO MUCH (Units with no-flow shutdown) | |
| Pressure switch needs readjusting or is defective | <ul style="list-style-type: none"> • Check pressure setting on switch and observe operation • Check voltage across closed contacts • Readjust switch to minimum of 15 PSI below system required pressure or replace if necessary |
| Insufficient air charging or leaking tank | <ul style="list-style-type: none"> • Pressurize tank to 2 - 3 PSI below system required pressure • Check for leaks or loss of pressure using soap & water • Repair as required |
| Tank is too small | <ul style="list-style-type: none"> • Tank should be sized for an average storage of 20 Gallons (Refer to catalogue for proper tank sizing) • Replace tank if necessary |
| Temperature probe has to be readjusted | <ul style="list-style-type: none"> • Temperature probe should be set at 90°F • Raising the temperature will reduce cycling at low flow conditions • See I & O manual for probe temperature adjustment |
| - 11- PUMP IS NOISY | |
| Faulty pump motor | <ul style="list-style-type: none"> • Grease bearing and let run, observe change • Check motor amperage • Disconnect motor and have it checked by service dealer • Have bearings changed • If motor Amps are above nameplate FLA, windings and stator should be verified |

Read all instructions thoroughly

INSTRUCTION

PRESSURE SWITCH "TYPE SNS·HNS"



PREFACE

Failure to read and follow all instructions carefully before installing or operating this PRESSURE CONTROLS could cause personal injury and/or property damage. Save these instructions for future use.

NOTE FOR SAFETY

⚠ WARNING

- Do not open a cover during power on. Otherwise fingers may touch to alive parts and cause of electric shock.
- Make sure to power off the Product before wiring. It will be cause of electric shock.
- Do not drop water on the Product. Water drip will touch to the alive parts makes earth circuit and electric shock accident may result.
- Use the attached screws (M4×0.7×8 with washer) when installing a main body. In case of missing the attached screws, use a screw with insert depth of less than 5mm. Otherwise the screw will touch to the alive parts and may cause electric shock or malfunction.

MOUNTING

Standard bracket is regularly supplied. Controls may be mounted to wall surface or panel board by 4 mounting holes provided in the back of the case (M4×0.7). Before and during installation, be careful about the below Caution, otherwise it may cause failure or defect.

CAUTION

- Do not move any screw or parts other than adjusting screws and terminal screws.
- Do not drop the Product.
- Do not paint the Product.
- Be sure to remove dust or other foreign particles in the pipes before connecting the Product to the pipe.
- When connecting pipes to the element, be sure to use two spanners at the hexagonal portion of bellows element in order to avoid deformation of the element.

MOUNTING CONDITIONS

The operation of the Product should follow the below conditions, otherwise it will be cause of malfunction or performance decrement.

In case of using to exceed the below conditions, contact the Company.

- Install the Product where vibration is less than 9.8m/s².
- Use the Product with the below temperature ranges.
Ambient temperature: -20°C to 70°C, Fluid temperature: -20 to 120°C
- Use the Product with fluid which does not corrode the bellows cap (copper alloy). In case of usage with any corrosive fluid and steam, use the model with Stainless Steel bellows.
- Use the Product within the Maximum working pressure range. And, install the Product where no pressure pulsation, excessive pressure fluctuation or pressure hummer generates.

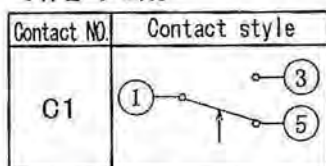
WIRING

Electrical wires should be connected to the terminal screws of micro switch according to a particular application. Refer to the wiring diagrams for the details, and be careful about the below points.

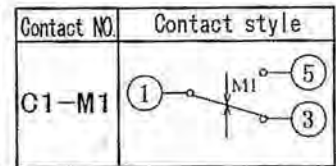
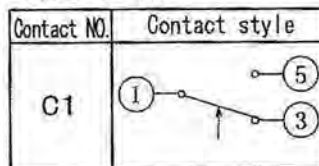
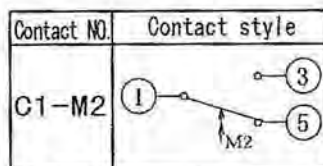
- Use the Product within the electrical ratings.
- Use the fixed terminal screw (M4×0.7×6).

WIRING DIAGRAM

TYPE : SNS



TYPE : HNS



↑ : Operating direction on pressure increase.

M2 ↑, M1 ↓ : Operating direction on manual reset.

ELECTRICAL RATINGS

| | Small Current (TYPE:0C) | | | | Medium Current (TYPE:1C) | | | | Large Current (TYPE:2C) | | | |
|--------------|-------------------------|------|--------|------|--------------------------|------|------|------|-------------------------|------|------|------|
| Terminals | 1-3 | | 1-5 | | 1-3 | | 1-5 | | 1-3 | | 1-5 | |
| AC Voltage | 120V | 240V | 120V | 240V | 120V | 240V | 120V | 240V | 120V | 240V | 120V | 240V |
| Full Load | 0.075A | | 0.075A | | 10A | | 10A | | 8A | | 20A | |
| Locked Rotor | 0.075A | | 0.075A | | 60A | | 60A | | 48A | | 120A | |

OPERATION/ADJUSTMENT

TYPE : SNS

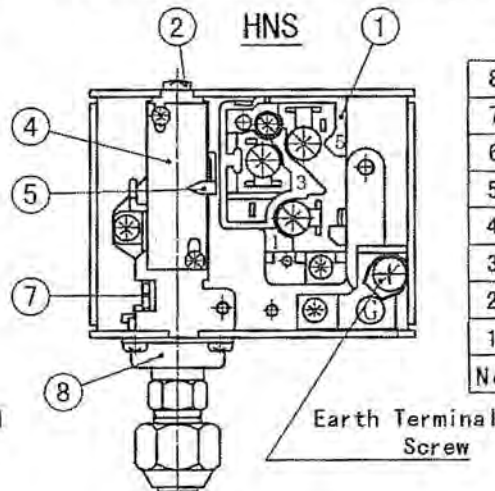
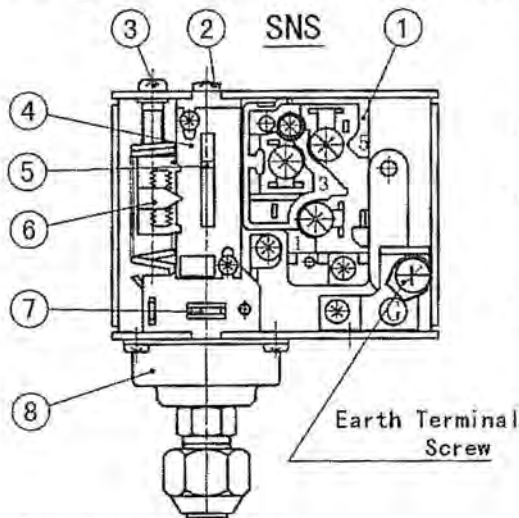
Adjustment procedure: Firstly, set the operation value with the range adjusting screw while pressure is rising. Then, set the operation value with the differential adjusting screw while pressure is decreasing. With turning the range adjusting screw to counterclockwise, the setting pressure rises. With turning the differential adjusting screw to clockwise, the differential enlarges. By turning these two adjusting screws, the desired setting pressure and differential are obtained.

Note : The manual reset series is not adjustable in the field. At the pressure decreasing, the contact operates automatically. At the pressure rising, the contact should be manually reset.

TYPE : HNS

Adjustment procedure : Set the operation value with the range adjusting screw while pressure is rising. With turning the range adjusting screw to clockwise, the setting pressure rises and the returning pressure also rise alongside.

Note : In case of the manual reset series, the contact operates automatically at the pressure rising. At the pressure decreasing, the contact should be manually reset.



| | |
|-----|------------------------------|
| 8 | Bellows cover |
| 7 | Operation plate |
| 6 | Differential pointer |
| 5 | Range pointer |
| 4 | Scale plate |
| 3 | Differential Adjusting Screw |
| 2 | Range Adjusting Screw |
| 1 | Micro Switch |
| No. | PART NAME |

OPERATION CHECK

Install and calibrate the product correctly and then check its operation to confirm correct function of the whole system when using.

LIMIT ON APPLICATION

The Product is not designed nor manufactured for an use in such equipment or system that is intended to be used under such circumstances that may affect human life.

For application requiring extreme high reliability, please contact the Company first.

SCOPE OF WARRANTY

Unless otherwise agreed by the parties, warranty period of the product shall be one year after date of delivery to Buyer. In case of failure attributable to the Company within such period, the product shall be repaired or replaced without charge, provided that any one of followings are out of the warranty:

- ① Improper handling or application by user.
- ② Modification or repair by other than Company.
- ③ Any failure to be caused by acts of God, fire, storm or the like, war, riot, or the like and other causes beyond the control of the Company.

Warranty described in this paragraph means the warranty for the product itself and does not include warranty for any consequential damage arising out of or occasioned by a defect or failure of the product.

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2004. 1 NS-14

FLO FAB INC. LAKE WORTH, FLORIDA, USA



Therm-Omega-Tech

ISO 9001 CERTIFIED

MODEL ECONO/HAT IN-LINE TEMPERATURE CONTROL

FREEZE PROBLEMS?
CALL THE GURU 1-877-FRZ-VALV

DESIGN FEATURES

- ◆ Compact, low mass - Fast response
- ◆ Corrosion resistant - Long service life
- ◆ All Brass body, stainless steel spring and plug
- ◆ Ram-type plug for tight reliable shutoff
- ◆ Eliminates live steam losses
- ◆ Narrow temperature band
- ◆ Downstream actuator for greater sensitivity
- ◆ Operating temperatures unaffected by pressure
- ◆ Wide choice of set points
- ◆ 100% factory tested



ADVANTAGES

These valves save space and are easy and inexpensive to install. The unique ram-type plug & seat provide reliable, tight shut off longer than any other design available. *ECONO/HAT* valves are covered with our standard 18 month warranty & service policy to further reduce maintenance cost. Since *ECONO/HAT* valves discharge condensate well below steam temperature, live steam losses are eliminated. For heating of temperature sensitive instruments or process fluids, the reduced temperature available for tracing simplifies operations and eliminates overheating problems. For other heat transfer fluids, *ECONO/HAT* valves maintain a constant discharge temperature, thus providing benefits of accurate process temperature control and improved efficiency.

OPERATION

The *ECONO/HAT* valve responds only to temperature. After condensate forms and cools to near the setpoint, the *ECONO/HAT* valve modulates the flow to maintain a constant condensate discharge temperature. *ECONO/HAT* valves are wide open at start-up for rapid venting and initial heat-up. *ECONO/HAT* valves are self-draining after shutdown, to eliminate freeze damage.

APPLICATIONS

ECONO/HAT valves are ideal for replacing conventional steam traps on winterization tracing, instrument tracing, condensate return system freeze protection, tracing for processes under 150°F, and other applications requiring in-line flow control based on temperature.

MODEL ECONO/HAT

IN-LINE TEMPERATURE CONTROL

PARTS AND MATERIALS

|  | | ITEM | DESCRIPTION | MATERIAL |
|--|--|------|---------------------|----------------------|
| | | 1 | BODY | BRASS |
| | | 2 | THERMAL ACTUATOR | BRASS |
| | | 3 | OPERATING SPRING | 300 SERIES STAINLESS |
| | | 4 | RAM-TYPE PLUG | 300 SERIES STAINLESS |
| | | 5 | SEAT FITTING | BRASS |
| | | 6 | SEAT SEAL | PTFE |
| | | 7 | BODY SEAL | BUNA-N |
| | | 8 | CALIBRATION LOCKNUT | 300 SERIES STAINLESS |

SPECIFICATIONS

| Size (NPTF) | D | | L | | Weight | | Cv | Maximum Pressure | Maximum Temperature |
|----------------|------|----|-----|----|--------|------|-----|------------------------|------------------------|
| | in | mm | in | mm | Lb | Kg | | | |
| 1/4" | 1.00 | 25 | 3.5 | 89 | 0.35 | 0.16 | 0.5 | 300 PSIG (20.7 BAR) | 250°F (121°C) |

TO ORDER, SPECIFY:

| Part Number | Description |
|--------------------|----------------------|
| 232 - 000000 - XXX | 1/4" ECONO-HAT- M/ F |
| 232 - 001000 - XXX | 1/4" ECONO-HAT- F/ F |

NOTES:

- Standard open temperatures "XXX" available:
040°F, 050°F, 055°F, 060°F, 065°F, 075°F, 085°F, 090°F, 095°F, 100°F, 105°F, 110°F, 125°F, 130°F, 140°F,
150°F, 155°F, 160°F, 170°F, 180°F, 190°F and 200°F.

Note: Closing temperature is typically 10°F above opening temperature.

- A #20 mesh strainer is recommended to prevent clogging.

Therm-Omega-Tech, Inc. reserves the right to change the design and specifications without notice



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FF

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for HVAC Market After-Sales Parts and Services**

FLO-FAB INC
LAKE WORTH,
FLORIDA, USA

SEPTEMBER 2009