Watson McDaniel

428 Jones Boulevard   Phone: (610)495-5131
Limerick Airport Business Center   Fax: (610)495-5134
Pottstown, PA 19464   www.watsonmcdaniel.com

PTR/PTL
PNEUMATIC TEMPERATURE CONTROLLERS
INSTALLATION & CALIBRATION INSTRUCTIONS

INSTRUCTION PART NO. 2224300   REVISION 1

APPLICATION

The rigid pneumatic temperature controller is recommended for use with the air pressure pilot on applications where rapidly changing load requirements occur. These would include instantaneous water heaters, storage water heaters, shell and tube heat exchangers, in addition to various industrial process control applications.

The remote pneumatic controller is an alternate to the rigid model and offers the same reliability with the added feature of remote control.

The compact liquid filled thermal unit allows easy placement in narrow pipes and can be immersed in difficult access tanks, pipes or air ducts. It comes with a 4 foot capillary as standard.
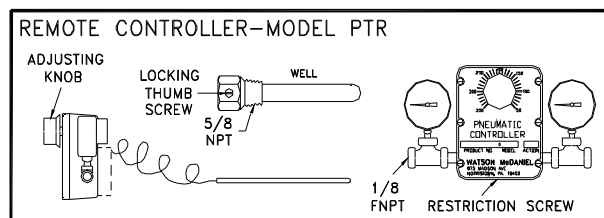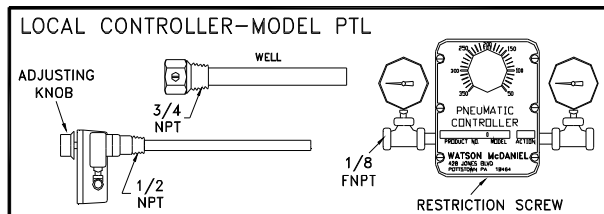
INSTALLATION

The PTL or PTR controllers require a clean, reliable supply of compressed air at 15 to 25 psig pressure.

Select element location with care to insure satisfactory results. Bulb must project entirely into liquid or air being controlled.

Flush or blow out all lines before making final connections. Pressurize all control lines and check for leaks.

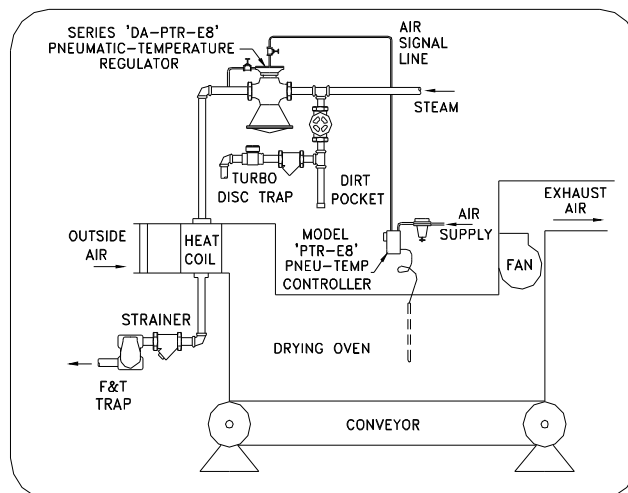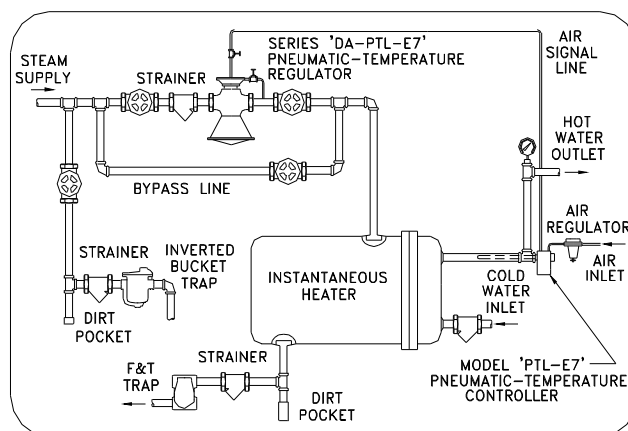Controller should normally be installed in the horizontal position.

Always locate controller as close to controlled device as possible.

SENSITIVITY

The sensitivity of the controller is adjusted by turning the restriction screw. Factory set adjustments are 1/8 turn from closed for PTL and 1/4 turn from closed for the PTR unit. The restriction screw should never be fully closed. Make adjustments slowly, allowing about two minutes after each adjustment for the controller to balance. If sensitivity is changed, controller must be recalibrated. See Calibration Instructions.

### MAX. OPERATING CONDITIONS:

Maximum temperature . . . . 400°F
Maximum pressure . . . . 200 psig

LOCAL CONTROLLER—MODEL PTL

REMOTE CONTROLLER—MODEL PTR

OPERATION

The controller uses a bi-metallic bar in the sensing element to sense temperature variations and produce pneumatic output signals that operate a regulator.

The sensing element is mounted directly in the liquid to be controlled and the controller's response to temperature change is an instant transmission of a proportional air signal to the air pilot controlled main valve. The changing air signal positions the air pilot and main valve to maintain temperature setting.
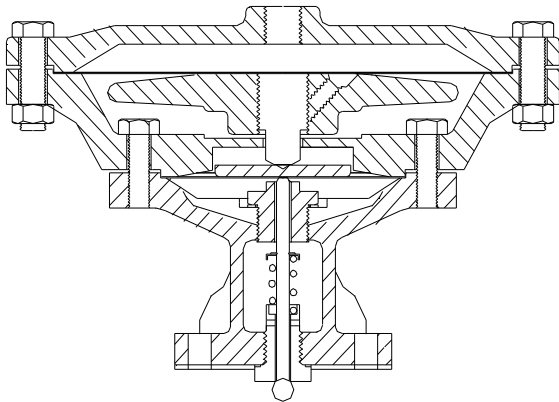
AIR PILOT

AIR PILOT SIZES AVAILABLE

3 TO 35 PSIG. . . . . 1:1 PILOT
3 TO 100 PSIG. . . . . 4:1 PILOT
20 TO 200 PSIG. . . . . 6:1 PILOT

AIR PILOT BALANCING FORCE
('DA' valve with PTL or PTR controller)

The maximum steam flow through any given valve is governed by its maximum rated Cv and critical pressure drop. Critical pressure drop occurs when the outlet pressure is reduced to 58% of the inlet pressure (psia) or less. When the drop across the valve reaches this critical value, the maximum steam flow is achieved At critical pressure drop the steam flow reaches sonic velocity in the seat orifice which produces a condition called choked flow. This means the steam flow can not increase even if the outlet pressure is further reduced. Therefore, when the DA valves are used in heating applications they reach their highest heat capacity (max. flow) at the critical pressure drop. Consequently, the highest balancing force that an air pilot has to provide for maximum heat output is equal to 58% of the inlet steam pressure (psia) to the DA valve.

AIR PILOT SELECTION EXAMPLES

#1 **Supply pressure to DA** = 75 psia x .58 = 43.5 psia outlet @ critical pressure drop.
Balance force output required from pilot = 43.5 psia 14.5 = 29 psig.
Use the 1:1 pilot with 3 to 35 psig range with 29 psig output air signal from the PTL/PTR controller. The balance force of pilot will be 29 psig.

#2 **Supply pressure to DA** = 100 psia x .58 = 58 psia outlet @ critical pressure drop.
Balance force output required from pilot = 58 psia - 14.5 = 43.5 psig.
Use the 4:1 pilot with 3 to 100 psig range with 10.9 psig output air signal from the PTL/PTR controller. The balance force of pilot will be 43.5 psig. (4x 10.9 = 43.6)
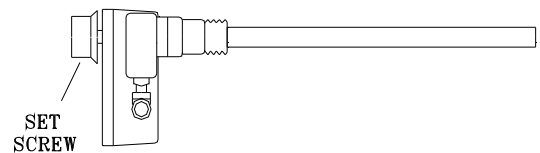
'LOCAL' PRESSURE-TEMPERATURE CONTROLLER
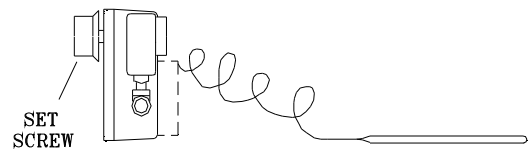
'REMOTE' PRESSURE-TEMPERATURE CONTROLLER

CALIBRATION INSTRUCTIONS

With the output air pressure range calculated the PTL or PTR controller can then be properly calibrated. Using the above 1:1 example, the controller output will be 0 to 29 psig. To calibrate the Accritem temperature adjustment knob, turn knob until mid range value (14.5) registers on the controller output gage. Allow enough time for the process temperature to stabilize and take a reading of the temperature at the bulb location with an accurate thermometer. Loosen set screw on the knob and dial the temperature to match the reading at the bulb. Tighten set screw. Set controller for the desired process temperature. Again, wait for the process to stabilize and check the temperature at the bulb location. If necessary, repeat the last step. Refer to the Accritem manual for full illustrations (reverse acting models) of the above procedure.