Bell & Gossett
a xylem brand

INSTRUCTION MANUAL
HS-606E

511612

Hoffman Specialty®
Pneumatic Temperature Pilot
Model 315

PLEASE READ INSTRUCTIONS COMPLETELY BEFORE STARTING WORK. ALL WORK MUST BE PERFORMED BY QUALIFIED PERSONNEL IN ACCORDANCE WITH ALL APPLICABLE CODES AND ORDINANCES.

⚠ **This product can expose you to chemicals including Lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm.**
For more information go to: www.P65Warnings.ca.gov.

Specifications

Temperature range	50°-300°F and 200°F- 450°F
Air supply (normal)	18 psig
Air supply (max.)	36 psig
Air supply (min.)	12 psig
Sensitivity (direct action)	.50 psig/°F
Sensitivity (reverse action)	.30 psig/°F
Air consumption (direct action)	.50 CFM @ 9 psig signal
Air consumption (reverse actions)	.60 CFM @ 9 psig signal
Response time (10°F step temperature change)	3.0 sec
Reset rate (pilot with 25 in. ^{2} actuator)	6 cycles/min.
Max. operating temperature	450°F
Max. operating non-shock pressure	600 psig
Max. ambient temperature	180°F
Min. ambient temperature*	-20°F

* Dry air supply required at low ambient temperature to prevent icing

Installation Requirements

HANDING

The Model 315 Pneumatic Temperature Pilot is a precision unit. As such, it must be handled with care during installation. Follow the procedures listed below to avoid damaging the unit or changing its calibration. When installing or removing the pilot, turn the unit with a wrench on the hex provided on the thermal element. Do not turn the unit by any part of the body.

> ⚠ **CAUTION: DO NOT LOOSEN THE KNURLED LOCKNUT THAT HOLDS THE THERMAL ELEMENT IN PLACE.**

Failure to observe these precautions may put the unit out of calibration.

Units fitted with PTFE-coated thermal elements must be treated with care. If the coating is scratched or chipped, the corrosion-resistant properties of the element will be ruined. Do not be concerned with scratching or chipping of the coating on the wrenching surface (hex) as it will not be exposed to corrosive media. Protect the pipe threads with PTFE tape before installing.

LOCATION

The location of the Model 135 Pneumatic Temperature Pilot is vitally important for the proper operation of the unit. The thermal element (bulb) must be located at a point of truly representative temperature where it is not unduly influenced by hot or cold inputs. On tank installations, the thermal element should be located approximately two-thirds of the way up and off to one side of the tube nest. The thermal element should be located in the water outlet of instantaneous heaters and as far into the heater as possible. For use with 3-way valves, the thermal element should be located as close as possible to the outlet in the mixed water line.

The full length of the thermal element must be exposed to the controlled medium or the calibration and sensitivity of the unit will be adversely affected. The thermal element must not be positioned where it will be vulnerable to mechanical damage or where it will restrict flow. It is good practice to enlarge the pipe around the thermal element to ensure free flow.

The orientation (vertical, horizontal, etc.) of the Model 315 Pneumatic Temperature Pilot will not affect its performance. However, it is suggested that the unit be installed so that the control knob is easily accessible. The response time of the control system is affected by the length of capillary tubing between the pilot and the final control element (control valve). Therefore, the pilot should be located as close to the valve as practical.

AIR SUPPLY

The Model 315 Pneumatic Temperature Pilot requires a supply of regulated, filtered air. If regulated, filtered air is not available, install a combination filter-regulator ahead of the unit.

The Model 315 Pneumatlc Temperature Pilot is calibrated at the factory for an 18 psig supply pressure. However, the unit will work satisfactorily with supply pressures from 12 to 36 psig. Refer to the **OPERATION** section for more details.

CAPILLARY TUBING

Either 1/4" or 5/16" copper tubing is suitable to connect the Model 315 Pneumatic Temperature Pilot with the filter/regulator and the control valve. The capillary tubing can be fastened permanently to a rigid location but a loop of tubing next to both the pilot and control valve is recommended to absorb vibrations. The capillary tubing must never be cut, kinked, crushed or twisted. If desired, rubber or plastic hose (1/4" minimum I.D.) may be substituted for copper tubing. Make sure that the rubber or plastic hose selected is compatible with the environmental conditions (ambient temperatures, corrosive vapors, etc.).

DIRECT/ REVERSE ACTION

The Model 315 Pneumatic Temperature Pilot can be used in either a direct (a rise in temperature increases signal pressure) or reverse (a rise in temperature decreases signal pressure) acting mode of operation with no disassembly or adjustment required. However, the action of the pilot must be matched with the action of the control valve to fit the application. Check the table below, to ensure that the proper pilot action is selected.

Pilot Action	Application		
	Heating	**Cooling**	**Mixing**
	Normally Open Valve	Normally Closed Valve	Hot Piped to Normally Open Port of Valve
Direct	Valve Opens on Failure	Valve Closes on Failure	Valve Opens to Hot Flow on Failure
Reverse	Normally Closed Valve	Normally Open Valve	Hot Piped to Normally Closed Port of Valve
	Valve Loses on Failure	Valve Opens on Failure	Valve Opens to Cold Flow on Failure

Installation Procedure

Outlined below Is a step-by-step installation procedure for the Model 315 Pneumatic Temperature Pilot. Before installing unit, read the I**NSTALLATION REQUIREMENTS** section for handling instructions, location recommendations, air supply requirements, etc.

Step 1 - Wrap PTFE tape around the 1/2" NPT male pipe thread on the thermal bulb. Remove thread protectors.

Step 2 - Screw the unit into the mounting socket (or well) by wrenching on the hex provided on the thermal bulb. A separate well should be filled with oil or grease to improve heat transfer.

Step 3 - Install the filter/regulator per the manufacturer's instructions.

Step 4 - Connect the outlet of the filter/regulator to the appropriate pilot supply port (DIRECT port for direct acting applications or REVERSE port for reverse acting applications). **IMPORTANT: Do not plug the un-used supply port as it becomes the exhaust port.**

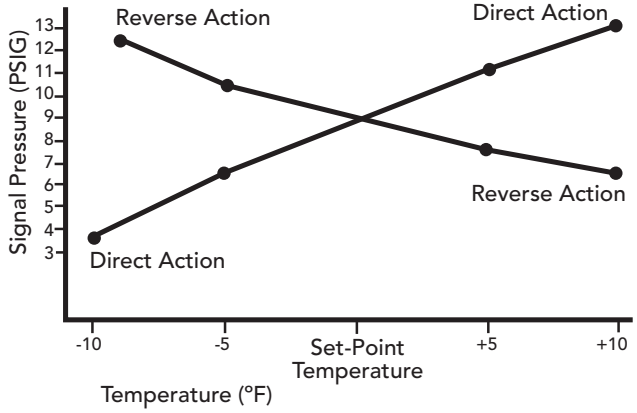
Step 5 - Connect the pilot signal port to the inlet of the control valve.

Operation

During operation, air flows continuously through the Model 315 Pneumatic Temperature Pilot. The supply air is throttled down to atmospheric pressure in two steps by two internal flow restrictions; a fixed orifice and a flat-plate variable flow restriction. The signal pressure produced by the Model 315 is the intermediate pressure between the two flow restrictions.

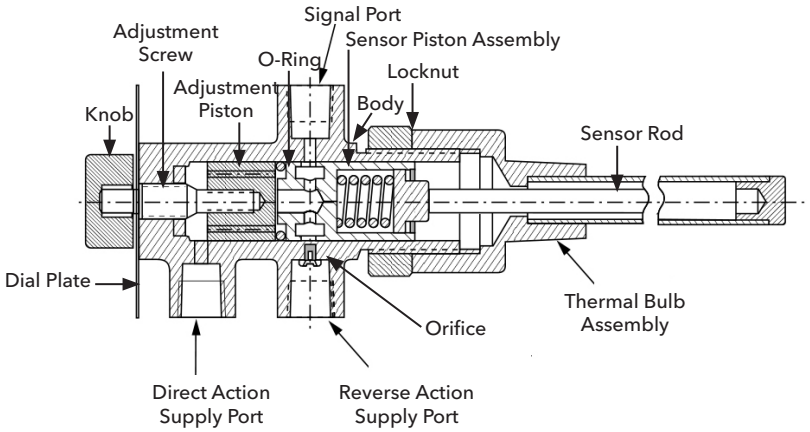
A change in temperature at the bulb results in a small movement of the sensor piston (the only moving part in the Model 315) relative to the adjustment piston because of the differential thermal expansion between the bulb and the sensor rod. This relative movement controls the variable flow restriction and, therefore, the signal pressure produced by the Model 315.

The Model 315 Pneumatic Temperature Pilot can be used in both direct acting (a rise in temperature at the bulb increases signal pressure) or reverse acting (a rise in temperature at the bulb decreases signal pressure) modes. Only the selection of the appropriate air supply port is needed to set or change the mode of operation. No disassembly or adjustment of the Model 315 is required.



A precision differential screw mechanism is used to adjust the set-point temperature. The differential screw converts the large rotational motion of the adjustment knob into a very small translational movement of the adjustment piston. In this manner, the set-point temperature Is easily and accurately adjusted with the adjustment knob. The Model 315 Pneumatic Temperature Pilot is designed to produce a 9 psig signal from an 18 psig supply at the set-point temperature. This does not necessarily mean that the system temperature will be controlled at the set-point temperature. In order for the system temperature to be controlled at the set-point temperature, the control valve must be adjusted to control with a 9 psig signal. (Because there is no direct linkage between the set-point temperature and the control temperature, it is recommended that an accurate thermometer be used in all applications).

Although an 18 psig supply pressure is standard, the Model 315 Pneumatic Temperature Pilot will operate satisfactorily with supply pressures from 12 to 36 psig. In all cases,the signal at the set-point temperature will be half the supply pressure. For example, if a 36 psig supply pressure is used, the Model 315 will produce an 18 psig signal at the set-point temperature.



Temperature Adjustments

As explained in the **OPERATION** section, there is no direct connection between the position of the adjustment knob on the Model 315 Pneumatic Temperature Pilot and the system temperature. It is recommended that an accurate thermometer be used in all applications. The Model 315 is designed and calibrated to produce a 9 psig signal pressure at the set-point temperature with the normal 18 psig supply. However, for the system temperature to be controlled at the set-point temperature, the control valve must be adjusted to control with a 9 psig signal. Follow the step-by-step procedure outlined below to start up the system and to adjust the temperature.

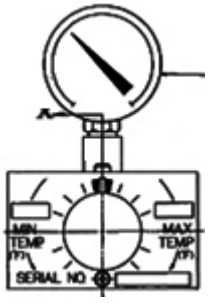
Step 1 - Adjust the control valve per the manufacturer's instruction manual

Step 2 - Nominally set the system temperature with the control knob on the Model 315

Step 3 - Slowly increase the supply pressure to the Model 315. Allow steam systems time to heat up and drain. Check for leaks.

Step 4 - Set supply pressure at 18 psig. Allow system to stabilize.

Step 5 - After the system has staqbilized, note the output signal of the Model 315. If the output signal is 9 ± 1 psig, the control valve is adjusted properly and the system temperature can be set with the adjustment knob on the Model 315. If the output signal is not 9 ± 1 psig, adjust the control valve as required before setting the system temperature.



Once the control valve is adjusted property, all subsequent adjustments can be made with the adjustment knob on the Model 315 Pneumatic Temperature Pilot. Always allow the system time to stabilize when making any adjustments.

Maintenance

The Model 315 Pneumatic Temperature Pilot contains only one moving part and is virtually maintenance-free. However, to ensure top pilot performance, other system components should be checked and serviced periodically.

Filter/Regulator - The Model 315 requires a steady supply of clean air. The filter/regulator must be kept

in good working order. Follow the manufacturer's maintenance recommendations.

Capillary Tubing - Periodically inspect the capillary tubing. Replace If crushed or kinked. Check all fittings for leaks.

Troubleshooting

If a Model 315 Pneumatic Temperature Pilot does not perform satisfactorily, the problem could be in a number of different areas. A list of potential problem areas is provided below to assist troubleshooting.

Air Supply: The Model 315 Pneumatic Temperature Pilot requires a steady supply of filtered air between 12 and 36 psig. In most applications, the air supply should be set at 18 psig. If problems are suspected with the air supply, service the filter/regulator per the manufacturer's instruction manual.
Capillary Tubing: Inspect the capillary tubing for damage, blockage, or leaks. Repair/replace as required.
Location: The Model 315 Pneumatic Temperature Pilot must be located at a point of truly representative temperature. Refer to the **INSTALLATION REQUIREMENTS** section for more details.
Installation: Other system components can affect temperature control and therefore, the performance of the Model 315 Pneumatic Temperature Pilot.
Control Valve: Confirm that the control valve has been properly selected for the application, properly adjusted, and operating normally. Refer to the manufacturer's instruction manual.
Strainers: A clogged strainer will result in restricted flow and low inlet pressure. Clean as required.
By-Pass-Lines: Make sure all by-pass lines are closed.
Piping: Bends and long runs of small diameter piping reduce flow due to friction. Calculate flow velocity and friction loss. If excessive, correct.
Boiler: Verily that boiler output pressure is correct.
Internal Clogging: The Model 315 Pneumatic Temperature Pilot is a constant bleed device and therefore will not function property if any internal clogging exists. With the control knob turned all the way counterclockwise, air should flow freely through the unit. To clean the Model 315, back flush the unit with an alcohol solvent and compressed air at 60 psi. In order to prevent clogging from becoming a recurring problem eliminate the source of dirt in the air supply or add an additional filter.

Calibration

If it is necessary to recalibrate the Model 315 Pneumatic Temperature Pilot, follow the step-by-step procedure outlined below. In order to calibrate the Model 315, a constant temperature source within the range stamped on the dial plate and an 18 psig air supply are required. If a constant temperature can be maintained in the system and the unit is not far out of calibration, it maybe possible to calibrate the Model 315 in place. Otherwise it will have to be removed.
Step 1 - Loosen the locknut and insert the thermal bulb into the constant temperature source.
Step 2 - Nominally set the adjustment knob at the calibration temperature.
Step 3 - Wait 3 minutes to allow the thermal bulb to reach equilibrium. Then rotate the thermal bulb relative to the housing (or vice versa if the bulb is still mounted in the system) until the output signal Is 9 psig.
Step 4 - Lock the calibration setting in place with the locknut.

xylem
Let's Solve Water

Xylem Inc.
8200 N. Austin Avenue
Morton Grove, Illinois 60053
Phone: (847) 966-3700 Fax: (847) 965-8379
www.xylem.com/bellgossett