

Temperature Controller Installation Instructions

ATTENTION: To ensure safe and proper performance, read these instructions carefully before attempting to install or operate this Fenwal product. Please retain for future reference.

The shell of each THERMOSWITCH® Controller contains the catalog number, the current rating, the temperature range, and the contact arrangement.

Controllers that are component recognized or listed by Underwriter's Laboratories (UL) or certified by the Canadian Standards Association (CSA) will also bear the symbol of the approving agency. In addition, UL component recognized units with temperature ranges up to 500°F will have a "4" as the first digit of the Catalog Number.

If the fourth digit of the catalog number is "2" or "7" (e.g., 17021, 17071), the controller is compression operated. Compression units that close on temperature rise are recommended if overranging is anticipated. Low temperature units [- 100 to +400°F (-73 to +204°C)] can be overranged to 500°F (260°C) and high temperature units [-100 to +600°F (-73 to +316°C)] overranged to 700°F for intervals not exceeding one hour.

The fifth digit of the catalog number describes whether contacts open or close on temperature rise. If contacts are open on temperature rise, the fifth digit of the number is an even number (17000, 17002, etc.). If contacts close on temperature rise, the fifth digit is an odd number (17021, 17023, etc.).

INSTALLATION

MOUNTING

THERMOSWITCH Controllers are supplied in five basic head configurations - Cartridge, Block Head, Hex Head, Coupling Head and Circular Flange. See Figure 1.

To avoid restricting shell expansion when making installations in solid metal blocks, a 0.625 in. diameter reamed hole for 5/8 in. standard units or a 0.812 in. diameter reamed hole for 13/16 in. heavy duty units is recommended. See the following specific controller style listing for additional installation instructions.

Cartridge (Style 1) - Hole should have a short spline to receive the 0.125 in. diameter locating pin. This prevents the unit from rotating when the adjusting sleeve is turned. The cartridge style may be used for surface control if inserted into a Fenwal surface mounting well (Cat. No. 11100-2).

Block Head (Style 2) - Mounted in a similar manner to the cartridge type. If the unit is to be inserted into a reamed hole, mount two short pins on either side of the hole. The pins should rest against the sides of the block head to prevent rotation of the unit.

Hex and Coupling Head (Styles 3 and 4) - Installed like any pipe fitting. If installed in a pipe tee, the tee should be large enough to allow adequate circulation of the fluid around the temperature-sensitive section of the controller. See Table 1 for maximum torque values.



Excessive torque applied to units may change temperature settings.

Circular Flange (Style 5) - Three holes in flange allow easy mounting on any flat surface.

Table 1:

THERMOSWITCH Controller	Maximum Torque
Standard (5/8 in. diameter)	35 ft·lb* (47.5 N·m)
Heavy Duty (13/16 in. diameter)	70 ft·lb** (94.9 N·m)

*4 ft·lb (5.4 N·m) when Teflon tape lubricant is used.
**8 ft·lb (10.8 N·m) when Teflon tape lubricant is used.

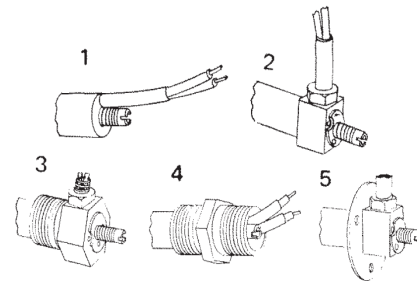
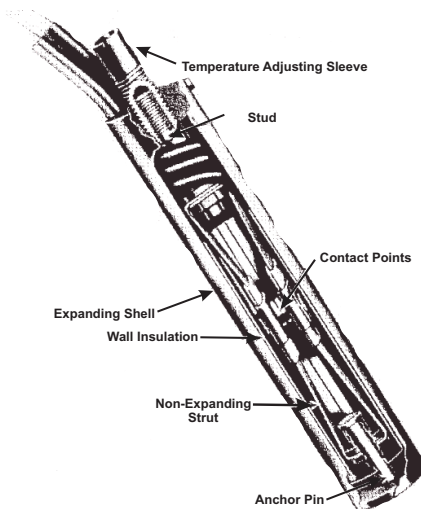


Figure 1. Head Configurations

TENSION OR COMPRESSION OPERATED CONTROLLERS CAUTION STATEMENTS



- Certain gases and liquids (including water at elevated temperature) could be corrosive and/or cause electrolytic action which could severely shorten life of controller. Rate of corrosion or electrolysis is influenced by many system parameters such as chemical makeup, temperature of solution, stray electrical currents, etc. Consult supplier of your chemicals or Fenwal for application suggestions. Also, note that Fenwal offers various platings and Type 321 Stainless steel, heliarc welded thermowells for added protection.
- Be sure that there is sufficient but not excessive room for the installed controller to expand in diameter and length.
- Insulate head of controller when large ambient temperature variations may occur. This precaution is not necessary on junction box type controllers (Series 17800).
- DO NOT immerse controller into liquids or gases unless it was specified for that job.
- DO NOT seal controller head with silicone materials.
- DO NOT thermally shield controller from medium being controlled.
- DO NOT remove adjusting sleeve or turn it in farther than necessary for desired operation. This action may permanently damage controller.
- DO NOT oil controller. Oil around adjusting sleeve will flow inside controller, contaminating contacts.
- DO NOT handle unit with pliers or force it into position either by hand or with tools.
- DO NOT subject shell of controller to deformation.

TENSION OPERATED CONTROLLERS

Tension operated THERMOSWITCH controllers are identified by having a number other than 2 or 7 as the fourth digit of their Catalog Number.

Applying excess tension on the element of a tension operated controller may permanently warp the element, and in extreme cases, tear the anchor pin loose. To avoid over-tension, pay close attention to the following cautions:



- **Do not expose controller to temperatures above its upper range limit.**
- **Do not expose controller to more than 100°F (55°C) above its calibration point. Therefore, pretest controller to approximate required elevate temperature before inserting it into the process. Preset by turning adjusting sleeve in direction of arrow on head of controller. See Table 3.**
- **If necessary to decrease temperature of a tension operated controller in a heated system, it may be necessary to do this in several increments. Do not turn adjusting sleeve to achieve more than 100°F (55°C) temperature drop at a time. Wait until controller stabilizes (begins to cycle). Then repeat until desired setting is reached.**

COMPRESSION OPERATED CONTROLLERS

Compression operated THERMOSWITCH controllers are identified by having a 2 or 7 as the fourth digit of their Catalog Number. Applying excess compression on the element of a compression operated controller may result in warping or crushing it.

To avoid over-compression, pay close attention to the following cautions:



- **When rotating adjusting sleeve, do not exceed upper range limit of controller.**
- **When removing controller from a heated system, never plunge it into a colder medium or use an air blast for rapid cooling.**

WIRING

Connect controller leads in series with the load and power supply.



DO NOT exceed the ratings indicated on the controller shell.

Capacitors are not required under average conditions. However, for smoother control at small loads or to prevent contact bounce due to vibration, the capacitance listed in Table 2 is recommended.

Wire capacitors in parallel with controller lead connections. use capacitors rated for a minimum of 600 VDC with 120 VAC circuits and a minimum of 1000 VDC for 240 VDC circuits.

Table 2:

Voltage	Service	Capacitance (µF) (non polarized)
120 VAC	Resistance	None Required
240 VAC	Resistance	0.1
120 VAC	Relays	0.001 to 0.01
240 VAC	Relays	0.001 to 0.01
15-25 VAC	Relays	0.02
120 VAC	Motor	Use Relay
240 VAC	Motor	Use Relay

TESTING AND ADJUSTMENT

The arrow on the head of the controller indicates the direction to turn the adjusting screw to increase the temperature setting. Each full turn of the adjusting sleeve will change the temperature the approximate amount shown in Table 3.

After the controller has been installed, allow the controller to operate for several cycles to permit the controlled system to stabilize. Then adjust to the desired temperature. Check the setting by cooling the system to ambient temperature, reheating it, and rechecking the temperature. Where extremely accurate control is desired, several adjustments may be necessary. However, once adjusted, the accuracy of the setting will be maintained.

TESTING TEMPERATURE SET POINT

The set point temperature is the temperature at which the contacts on a THERMOSWITCH Controller just "make" (close). All controllers are set at room temperature [75± 15°F (24 ±8°C)] unless ordered with a specific factory setting (MOD 3).

Testing the temperature set point in an application, under conditions where the heat source is remotely located from the controller, or when ambient temperature conditions are far below or above 75°F (24°C), may give misleading results. In some cases, this has led to rejection of controllers that were within proper setting tolerance. If you require temperature set point testing, Fenwal recommends that Model 80001-0 Test Kit. If you choose to build your own test equipment, we recommend that you contact your Fenwal representative for guidance in setting up a good thermal test system.

Table 3:

Tension Operated		Compression Operated	
Catalog Number	Approx. °F per Full Turn of Adj Sleeve	Catalog Number	Approx. °F Per Full Turn of Adj Sleeve
17000 to 17352	80-115	17021 to 17323	70-100
17800	125	17821	75
17802	160	17823	90
18000 to 18002	80-100	18021 to 18023	75-90



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