**TSS Series Dual Stage Temperature Switch**

**Specifications and Operating Instructions**

**DESCRIPTION**

Regulate temperatures for heating or cooling control with Series TSS Dual Stage Temperature Switch. The Series TSS is designed to accept two inputs (thermistor or RTD) with independent 8 A relay output for dual stage temperature control. The unit also features a 30 mA TTL alarm output for activating an external buzzer.

The Series TSS offers 34 programmable parameters to customize control functions. Access to all parameters, except setpoint, can be secured with a password code. The TSS Series includes a rear terminal cover, and instruction manual. Input sensors are sold independently.

**INSTALLATION**

*NOTE: Unit must be mounted away from vibration, impacts, water, and corrosive gases.*

- Cut hole in panel 71 x 29mm (2.8 x 1.14 inches).
- Apply silicone (or rubber gasket) around the perimeter of the hole to prevent leakage.
- Insert unit into hole of panel.
- Slide removable fitting clips onto unit from the back until secure to panel.
- Remove back cover to wire unit.
- Wiring diagram is displayed on the top of the unit.
- Temperature Probe 1 (Sd1) in terminals 7-9
- Temperature Probe 2 (Sd2) in terminals 7-8

*Note: DO NOT INSTALL PROBE CABLES NEAR POWER CABLES.*

*Replace cover once wiring is complete.*

**SPECIFICATIONS**

- **Probe Range:** -58 to 302°F (-50 to 150°C).
- **Input:** PTC thermistor (1000Ω @ 25°C), or RTD (PT100Ω @ 0°C).
- **Outputs:** One 8A SPDT relay @ 250VAC, resistive; One 8A SPST relay @ 250VAC resistive; Alarm: TTL 30mA @ 12VDC.
- **Horsepower Rating (HP):** 1/3 HP.
- **Power Requirements:** 12 VAC/DC.
- **Accuracy:** 0.5% of full scale.
- **Display:** 3-digit and sign, red.
- **Resolution:** 0.1° (3 digits).
- **Memory Backup:** Nonvolatile memory.
- **Ambient Operating Temperature:** 32 to 158°F (0 to 70°C).
- **Storage Temperature:** -4 to 176°F (-20 to 80°C).
- **Dimensions:** 76 x 34 x 60 mm (3 x 1.3 x 2.4 in).
- **Front Panel Rating:** IP64.
- **Weight:** 2.3 oz (65 g).
- **Agency Approvals:** CE, UR.
PARAMETERS

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(*) Time format: hh:mm, where "m" are tenths of minutes.

TEMPERATURE PARAMETER PROGRAMMING

Set Points (Set 1, Set 2) are the only parameters the user can access without code protection.

• Press SET. Current value of Set 1 appears flashing and LED OUT flashes.
• The value can be modified with the UP and DOWN arrows.
• Press SET again to confirm Set 1. Current value of Set 2 appears flashing and LED DEF flashes.
• The value can be modified with the UP and DOWN arrows.
• Press SET to enter Set 2 value and exit.

Access to all code protected parameters

• Press SET for 8 sec. The access code value 0 is shown on the display (unit comes with codes set at 0 from factory).
• Select the correct code with the UP and DOWN arrows.
• Press SET to enter the code. If the code is correct, the first parameter label is shown on the display (Set 1).
• Move to the desired parameter with the UP and DOWN.
• Press SET to view the value on the display.
• The value can be modified with the UP and DOWN arrows.
• Press SET to enter the value.
• Repeat until all necessary parameters are modified.
• Press SET and DOWN at the same time to quit programming or wait one minute and the display will automatically exit programming mode.

*The keyboard code can be reset to ZERO by turning off the controller and turning it on again while keeping the SET key depressed.

TEMPEATURE CONTROL PROCESS

Independent ON/OFF control (1 probe)

If r8=ON1 and r0=Ind, each output is associated to a particular Setpoint.

If c1=dir, output 1 will connect when TS1>=Set1+r1 (where TS1 is the temperature of probe 1) and will disconnect when TS1<=Set1.

The output 2 is handled in the same manner but controlled by Set 2, using r2 as differential, c2 as indicator of direct or reverse connection, and c0 as minimum stop time.

Dependent ON/OFF control (1 probe)

If r8=ON1 and r0=Dep, output 1 works as an independent ON/OFF control, but output 2 works as follows:

If c2=dir, output 2 will connect when TS1>=Set1 + Set2 + r2 (where TS1 is the temperature of probe 1) and will disconnect when TS1<=Set1 + Set2.

The output 2 is handled in the same manner but controlled by Set 2, using r2 as differential, c2 as indicator of direct or reverse connection, and c0 as minimum stop time.

Two Regulations (2 probes):

If r8=ON2, output 1 works as an independent ON/OFF control, and output 2 also works as an independent control. Parameter r0 is voided.
Neutral Zone Control
If \( r8 = \text{NEu} \) output 1 connects when \( TS1 \geq \text{Set 1} + r3 \) and disconnect when \( TS1 \leq \text{Set 1} - r3 \), while output 2 connects when \( TS1 \leq \text{Set 1} \) and disconnects when \( TS1 \geq \text{Set 1} \).

Control with probe errors
If reading of probe 1 fails, the output 1 works following 10 minute cycles, with a percentage of connection time given by \( c3 \). Output 2 is carried out in the same way with parameter \( c4 \).

Temperature alarms
If \( TS1 \geq \text{Set 1} + A1 \), the thermostat will indicate maximum temperature alarm for probe 1 (Ah) and the alarm will remain activated until temperature \( TS1 \leq \text{Set 1} + A1 - A0 \). If \( TS1 \leq \text{Set 1} - A3 \), the thermostat will activate minimum temperature alarm for probe 1 (AL), and it will remain activated until temperature \( TS1 \geq \text{Set 1} - A3 - A0 \). In the same way for probe 2 (TS2) with \( A2 \) and \( A4 \).

Setup \( A5 \) to indicate the alarm check time between alarm event and indication of an alarm event. The alarm is indicated by a message on the display and activating the alarm output if present (alarm can be silenced pressing SET + DOWN keys or CLEAR in the remote control).

Probe options
Set \( P3 \) to select if the decimal point is shown or not in the display.
Set \( P0 \) to set temperature units (Celsius or Fahrenheit).
If the probe is not placed in the exact point to control, use a standard thermometer to determine the offset and set it by \( P1 \) (for probe 1) and \( P2 \) (for probe 2).
Set \( P5 \) to select if 1 or 2 temperature probes are used.

GENERAL PARAMETERS
H1, H4, H4 general parameters
Setting H1 to YES, the set points (Set 1, Set 2) cannot be changed. To unblock this protection, press SET for 8 seconds and introduce the code in the same way as is done when entering parameters.

H4 sets the communication address for the controller.

H5 sets the access code to parameters.

LED INDICATION AND DISPLAY MESSAGES
OUT LED indicates relay 1 ON or OFF depending on parameter \( H2 \). If \( H2 = \text{dir} \), when relay 1 is ON LED is ON; and if \( H2 = \text{rev} \), when relay 1 is ON, LED is OFF.

Def LED indicates relay 2 ON or OFF depending on parameter \( H3 \), as previous one.

In normal operation, the display will show the temperature measure by probe selected by \( P4 \) parameter. In order to display the temperature measured by the other probe, press SET + UP keys.

In case of alarm error, the following messages can be shown:
- \( \text{Err} \) = Memory reading error
- \( \text{ErP} \) = Error in probe not shown on display
- \( \text{AH1} \) = High temperature alarm (probe 1)
- \( \text{AL1} \) = Low temperature alarm (probe 2)
- \( \text{AH2} \) = High temperature alarm (probe 1)
- \( \text{AL2} \) = Low temperature alarm (probe 2)
- \( \text{ooo} \) = Open probe error
- \( \text{---} \) = Short circuit probe error

MAINTENANCE, CLEANING, AND REPAIR
After final installation of the unit, no routine maintenance is required.
Clean the surface of the display controller with a soft and damp cloth. Never use abrasive detergents, petrol, alcohol, or other solvents.
All repairs must be made by authorized personnel.