Series TSDIN DIN Rail Mount Temperature Switch

Specifications - Installation and Operating Instructions

The SERIES TSDIN DIN Rail Mount Temperature Switch is ideally designed to control the compressor, defrost, and fan cycles in refrigeration applications. The TSDIN series has the selectable engineering units and temperature probe types in order to eliminate the combination of parts that need to be stocked. The digital input can be used to remotely trigger a defrost cycle, monitor cooler door status, or act as an external alarm. The other three probe inputs are for measuring cabinet, defrost, and product temperature. An additional power button on the 6 button keypad allows the user to disable the outputs when the refrigerated cabinet is not in use. A built-in real time clock is used for HACCP logging of temperature alarms caused by temperatures out of their set limits or loss of power. The Intelligent Defrost parameters manage the defrost cycle in order to save energy cost. For programming multiple units, the Model TS2-K configuration key can be used to quickly download parameter settings.

OPERATING INSTRUCTIONS

INSTALLATION

• DIN rail mounting.
• Wiring diagram is displayed on top of the control.

WIRING

Avoid installing the temperature probe cables and the digital input wires in close proximity to power cables. If the length of the probe cables is longer than 100 meters, a recalibration adjustment may be made using the P1, P2, and P3 parameters.

SPECIFICATIONS

| Probe Range: | PTC: -58 to 302°F (-50 to 150°C); NTC: -58 to 230°F (-50 to 110°C). |
| Output: | Output 1: SPST relay rated 16A @ 240 VAC resistive, 10 FLA, 1HP @ 240 VAC inductive; Output 2: SPDT relay rated 8A @ 240 VAC resistive; Output 3: SPST relay rated 8A @ 240 VAC resistive; Output 4: SPDT relay rated 8A @ 240 VAC resistive; Output 5: SPST relay rated 16A @ 240 VAC resistive, 10 FLA, 1HP @ 240 VAC inductive. |
| Control Type: | On/off. |
| Power Requirement: | 115 VAC, 230 VAC, 12 VAC/VDC, 24 VAC/VDC (±10%) depending on model. |
| Power Consumption: | 6 VA. |
| Accuracy: | Better than 1% of full-scale. |
| Resolution: | 0.1°. |
| Memory Backup: | Non-volatile memory. |
| Temperature Limits: | Operating: 32 to 131°F (0 to 55°C); Storage: -4 to 176°F (-20 to 80°C). |
| Weight: | 10.8 oz (306 g). |
| Agency Approvals: | CE, cURus. |

MODEL CHART

<table>
<thead>
<tr>
<th>Model</th>
<th>Supply Power</th>
<th># of Outputs</th>
<th>Display Color</th>
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</thead>
<tbody>
<tr>
<td>TSDIN-013</td>
<td>115 VAC</td>
<td>1, 2, 3</td>
<td>Red</td>
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<tr>
<td>TSDIN-015</td>
<td>115 VAC</td>
<td>1, 2, 3, 4, 5</td>
<td>Red</td>
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<td>TSDIN-023</td>
<td>230 VAC</td>
<td>1, 2, 3</td>
<td>Red</td>
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<td>TSDIN-025</td>
<td>230 VAC</td>
<td>1, 2, 3, 4, 5</td>
<td>Red</td>
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<tr>
<td>TSDIN-033</td>
<td>12 VAC/VDC</td>
<td>1, 2, 3</td>
<td>Red</td>
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<td>TSDIN-043</td>
<td>24 VAC/VDC</td>
<td>1, 2, 3</td>
<td>Red</td>
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<tr>
<td>TSDIN-213</td>
<td>115 VAC</td>
<td>1, 2, 3</td>
<td>Blue</td>
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<tr>
<td>TSDIN-215</td>
<td>115 VAC</td>
<td>1, 2, 3, 4, 5</td>
<td>Blue</td>
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<tr>
<td>TSDIN-223</td>
<td>230 VAC</td>
<td>1, 2, 3</td>
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<td>TSDIN-225</td>
<td>230 VAC</td>
<td>1, 2, 3, 4, 5</td>
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<tr>
<td>TSDIN-233</td>
<td>12 VAC/VDC</td>
<td>1, 2, 3</td>
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<tr>
<td>TSDIN-243</td>
<td>24 VAC/VDC</td>
<td>1, 2, 3</td>
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NOTICE

Unit must be mounted away from vibration, impacts, water and corrosive gases.
<table>
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<th>Parameter List</th>
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<td>Defrost (DEF)</td>
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<td>Alarm (ALA)</td>
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PARAMETER DESCRIPTION

Compressor / Set Point Menu (CON)
Set Sets the Temperature set point between r1 and r2
r0 Differential or hysteresis for set point (For d0 = re)
  Temperature ≥ SET + r0: Output On
  Temperature ≤ SET: Output Off (For d0 = in)
  Temperature ≤ SET - r0: Output On
  Temperature ≥ SET: Output Off
r1 Minimum value for set point
r2 Maximum value for set point
r4 Set point deviation from Set value during night setting
r6 Fan Relay Operation
  On = Fan is always on while temperature < F0
  Off = Fan is always off during regulation
  CON = Fan is on when compressor is on
F0 Temperature ≥ F0: Fan off
Temperature ≤ F0 + A0: Fan on
F1 Door Open Override
  No = Fan and compressor do not stop when door is open
  Yes = Both fan and compressor stop when door is open
  Con = Only the compressor stops when door is open
  Fan = Only the fan stops when door is open
c0 Minimum time compressor must remain off before being restarted
c1 Duration of continuous cold cycle
c2 During probe error, time that output is engaged
c3 During probe error, time that output is disengaged
c4 Minimum time compressor must stay on
c5 Minimum time between compressors starts
c6 Time from the first compressor is turned on until the second compressor is turned on

Defrost Menu (DEF)
d0 Cold/Heat (single output models only)
  re = Cold
  in = Heat
d0 Type of Defrosting
  re = Defrosting without connecting the compressor
  in = Defrosting by connecting compressor
d1 Defrosting stops when defrost probe temperature is above this value
d2 Maximum time the control will be in defrost cycle. If set to zero, control will not defrost
d3 Hour of the day for the first defrost. No defrost cycles will take place before this time
d4 Upon powering on the control, delay time before first defrost cycle
d5 Display during defrost cycle
  Off = Current temperature displayed
  On = Temperature at start of defrost cycle displayed until defrost cycle ends and the temperature is less than or equal to starting temperature or after the time is set in d6.
  def = At the start of defrost cycle “-d-” is displayed until defrost cycles ends and the temperature is less than or equal to the starting temperature or after the time set in d6 elapses.
d6 Maximum time before the display returns to normal reading after a defrost cycle
d7 Time after defrost cycle before the compressor can be started
d8 Time between defrost cycles. If set to 0, defrost must be manually actuated

d9 Determines if fan operates during defrost
d10 Amount of time after defrost before the fan can restart
d11 Minimum duration the control remains in defrost cycle
d12 Determines which temperature probe to use to control the defrost cycle
d13 Selection of Intelligent Defrost Method
  off = turns off intelligent defrost
  JrP = Skips defrost cycles as necessary
  CiC = Adjusts time of defrost cycle as necessary
d14 Units to count the defrost cycle
  rt = according to the time the controller was on
  ct = according to the time the compressor was on
d15 The time of the defrost cycle will not be counted if the evaporator temperature is above this value
d16 Sets the normal defrost time as a percentage of d2
d17 Value that d8 will be incremented or decremented during intelligent defrost when d13 = CiC
Hde Hours until next defrost cycle
Mde Minutes until next defrost cycle
JdF Displays the adjustments to the defrost cycle during intelligent defrost
  When d13 = JrP, displays number of defrost cycles to skip
  When d13 = CiC, displays increments of d8

Display Menu (Pro)
P0 Selection of Engineering Unit (F or C)
P1 Ambient Probe Calibration Adjustment
P2 Defrosting Probe Calibration Adjustment
P3 Degrees shift of the product probe
P4 Decimal Point Present
P5 Probe to display
P6 Probe 2 Present
P7 Probe 3 Present

Alarm Menu (ALA)
A0 Alarm Differential or Hysteresis
A1 High Alarm Set Point (Deviation Value)
  On when temperature reaches Set + A1 and off at Set + A1 - A0
A2 Low Alarm Set Point (Deviation Value)
  On when temperature reaches Set - A2 and off as Set - A2 + A0
A3 Time of Alarm Inhibit after Continuous Cool Cycle
A4 Time of Alarm Inhibit after Continuous Defrost Cycle
A5 Time of Alarm Inhibit after Power Up
A7 Time since Alarm Initiated until Validated
A8 Probe to be used for Alarm Settings

Initial Setup Menu (INI)
Hor Real Time Hours
Min Real Time Minutes
E0, E1 Assignment of Digital Inputs
  Off = Digital Input disabled
  A1 = External alarm condition when short circuited
  In = Door open if short circuited
  DEF = Defrost Cycle initiated when short circuited (E0 only)
  Ndf = Defrost Cycle will be bypassed when short circuited
  RST = Night Set Points used when short circuited
H0 Restore Factory Configuration
H1 Assign Master/Slave for Defrost Cycles
  Mst = Sends signal through digital input to initiate slave controls to start defrost
  Slv = Performs defrost when receives defrost signal through digital input
  E0 = DEF when using master/slave operation
H2 Keypad Password Protected
  Yes = code is necessary to start/stop defrost or continuous cold cycle
  No = Keypad not protected
H3 Compressor delay time upon power up
H4 Address for serial communications (Need Model TS485 communication module)
H5 Input code to Parameters (factory set at 0)
H6 Input Probe Types: PTC or NTC
H7 Assignment for Relay 2
  Lit = Light
  Fan = Fan
  ALA = Alarm
  DEF = Defrost
H8 Assignment for Relay 3 (only available on 3 output models)
  Lit = Light
  Fan = Fan
  ALA = Alarm
  DEF = Defrost
H9 Assignment for relay 4
  Lit = Light
  Fan = Fan
  ALA = Alarm
  DEF = Defrost
H10 Assignment for relay 5
  Lit = Light
  Fan = Fan
  ALA = Alarm
  DEF = Defrost
H11 HACCP Alarm recording enabled or disabled
  Defrost Cycle initiated when short circuited (E0 only)
  In = Door open if short circuited
  A1 = External alarm condition when short circuited
  Off = Digital Input disabled
  HACCP = Set points used when short circuited
H12 Assignment for relay 6
  Lit = Light
  Fan = Fan
  ALA = Alarm
  DEF = Defrost
H13 Assignment for relay 7
  Lit = Light
  Fan = Fan
  ALA = Alarm
  DEF = Defrost

Set Point Setup
  • Press the [ ] key once and Set will be displayed.
  • Press the [ ] key again and set point value appears blinking.
  • Use the [ ] and [ ] arrows to adjust set point.
  • Press the [ ] key to confirm the new set point.
  • Press the [ ] and [ ] arrow at same time to exit.

FRONT PANEL OPERATION
Time Setup
- Press the \( \text{Set} \) key once and the Set label will be displayed.
- Use the \( \text{A} \) and \( \text{V} \) arrows to go to Hour or Minute.
- Press the \( \text{Set} \) key to view the current value.
- Use the \( \text{A} \) and \( \text{V} \) arrows to adjust to current time.
- Press the \( \text{Set} \) key for 8 seconds to save the new time. Pro will appear on the display when done correctly.
- Press the \( \text{Set} \) and \( \text{V} \) arrow at the same time to exit.

Parameter Programming
The parameters are organized into 6 programming menus (COM, DEF, PRO, ALA, HAC, and INI).
- Press the \( \text{Set} \) key for 8 seconds until 00 is displayed.
- Use the \( \text{A} \) and \( \text{V} \) arrows to reach the assigned security code (factory setting for this code is 0).
- Press the \( \text{Set} \) key to accept the code.
- Use the \( \text{A} \) and \( \text{V} \) arrows to select programming menu to enter.
- Press the \( \text{Set} \) key to view the parameters under each programming menu.
- Use the \( \text{A} \) and \( \text{V} \) arrows to scroll through the parameters.
- Press the \( \text{Set} \) key to view the value of the parameters.
- Use the \( \text{A} \) and \( \text{V} \) arrows to change the values of the parameters.
- Press the \( \text{Set} \) key to save the changes.
- Press the \( \text{Set} \) and \( \text{V} \) arrow to go back to the programming menu selection.
- Press the \( \text{Set} \) and \( \text{V} \) arrow a second time to exit.

Manual Default
Press the \( \text{A} \) key for 8 seconds to activate/deactivate defrost cycle.

Continuous Cold Cycle
Press the \( \text{V} \) arrow key for 8 seconds to activate or deactivate a continuous cold cycle.

Resetting Keypad Security Code
Press the \( \text{Set} \) key during power up to reset the security code to 0.

Alarm Validation
An active alarm can be silenced by pressing the \( \text{Set} \) and the \( \text{V} \) arrow keys simultaneously.

On/Off
Pressing the \( \text{O} \) key for 5 seconds will turn the thermostat on or off.

On/Off Lights
If one of the relays is set up to control a light, pressing the \( \text{A} \) button for 5 seconds will turn on or off the light.

LED Indicators
- \( \square \) Indicates that the compressor is engaged. It will blink when there is a call for the compressor to turn on during minimum compressor stoppage.
- \( \text{OUT2} \) Indicates that compressor 2 is engaged. It will blink when there is a call for the compressor to turn on during minimum compressor stoppage.
- \( \text{A} \) Indicates defrost cycle is active.
- \( \text{HAC} \) Indicates the fan in engaged.
- \( \text{AEL} \) Indicates an error or alarm or error condition.
- \( \text{HACCP} \) Indicates a HACCP event is being recorded.

Display Messages
In normal operation the probe temperature will be displayed. The display blinks when waiting for a parameter to be saved or when there is an error saving a parameter to memory. The following messages can also appear:
- \( \text{Err} \) Memory Reading Error
- ERP1, ERP2, ERP3: Probe Error (check wiring or replace probe)
- Eri: Internal Parameter Error (factory default programming)
- ALH: High Temperature Alarm
- ALL: Low Temperature Alarm
- ALE: External Alarm Condition
- AHE: High Temperature and External Alarm
- AEL: Low Temperature and External Alarm
- ooo: Open Probe Error
- ---: Short Circuit Error
- DON: Defrosting Activated
- DOF: Defrosting Finished
- CON: Continuous Cold Cycle Activated
- COF: Continuous Cold Cycle Finished
- -d-: Defrosting Cycle
- OFF: Thermostat Off

During memory error, the compressor will be cycled 5 minutes on and 5 minutes off. Manual defrosting and manual continuous cold cycle operations can not be activated.

HACCP
If this option is activated, the digital temperature switch can register up to 5 alarms which could be high, low, or blackout. These alarms can be seen in the menu registry of alarms (HAC).

This first value that appears is the number of registered alarms. Afterwards, for each alarm (if any have occurred), the value of the temperature and time the alarm occurred will be displayed. Once the alarm returns to normal state, the temperature will be recorded along with the amount of time it took to return to this temperature will be displayed.

When the elapsed time is shown, it will appear as hxx (hour). Pressing the \( \text{A} \) arrow, the nxx (minutes) will be shown, pressing again, dxx (day), pressing again, Mxx (month), pressing again, Yxx (year). When located over a temperature of alarm or time, pressing the \( \text{A} \) and \( \text{V} \) arrows for 2 seconds, both recorded data of the alarm (time and temperature value) are deleted.

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Intelligent Defrost
By turning on the intelligent defrost, the time between defrosts will vary. This time is only counted if the evaporator temperature is below the value of d15. Selecting d13 = JuP, some of the defrosts may be skipped. After a defrost, the next defrost(s) will be skipped based on the value of JdF. JdF is initially 0 and increments if a defrost ends before a time d16*d2, otherwise it is decremented until the value is 0.

Maximum value for JdF is 3. After JdF = 3, if the next defrost ends before d16*d2, JdF will be set to 1. Otherwise, JdF will be set to 0.

Selecting d13 = CiC, the defrosting cycle may vary. If a defrost ends before d16*d2, then defrosting cycles will be skipped based on the value of JdF. JdF is initially 0 and increments if a defrost ends before a time d16*d2, otherwise it is decremented until the value is 0.

In the HAC menu, pressing the \( \text{A} \) and \( \text{V} \) arrow keys for 2 seconds, both recorded data alarms are deleted.

Defrosting Cycles
The amount of time between defrost can be based off the total time that the instrument is on or it can be limited to the amount of time the compressor is running. The first defrost will be performed at the hour of the day set with d3 and the following cycles will occur in intervals of d8 after the initial defrost.

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The initial and minimum value for the time between defrosts is set by parameter d8. The number of times that the time between defrosts has been incremented can be viewed in parameter JdF.

TS2-K Communication
The communication connector can be used with the TS2-K to read or write the parameter configuration to the Series TSDIN.

MAINTENANCE
After final installation of the Series TSDIN Rail Mount Temperature Switch, no routine maintenance is required. Clean the surface of the display with a soft and damp cloth. Never use abrasive detergents, petrol, alcohol or solvents. A periodic check of the system calibration is recommended. The Series TSDIN is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.