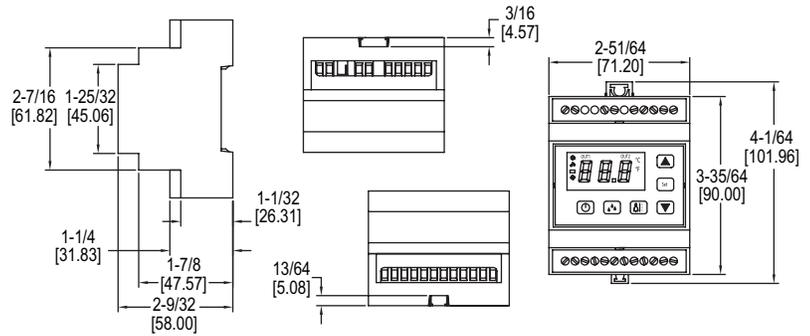




Series TSDIN DIN Rail Mount Temperature Switch

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.

MODEL CHART			
Model	Supply Power	# of Outputs	Display Color
TSDIN-013	115 VAC	1, 2, 3	Red
TSDIN-015	115 VAC	1, 2, 3, 4, 5	Red
TSDIN-023	230 VAC	1, 2, 3	Red
TSDIN-025	230 VAC	1, 2, 3, 4, 5	Red
TSDIN-033	12 VAC/VDC	1, 2, 3	Red
TSDIN-043	24 VAC/VDC	1, 2, 3	Red
TSDIN-213	115 VAC	1, 2, 3	Blue
TSDIN-215	115 VAC	1, 2, 3, 4, 5	Blue
TSDIN-223	230 VAC	1, 2, 3	Blue
TSDIN-225	230 VAC	1, 2, 3, 4, 5	Blue
TSDIN-233	12 VAC/VDC	1, 2, 3	Blue
TSDIN-243	24 VAC/VDC	1, 2, 3	Blue

SPECIFICATIONS

Probe Range: PTC: -58 to 302°F (-50 to 150°C); NTC: -58 to 230°F (-50 to 110°C).
Input: PTC/NTC.
Output: Output 1: SPST relay rated 16A @ 240 VAC resistive, 10 FLA, 60 LRA, 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, 60 LRA, 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.
Display: 3-digits plus sign.
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.

OPERATING INSTRUCTIONS

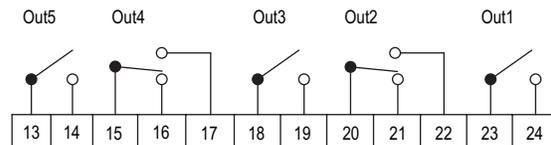
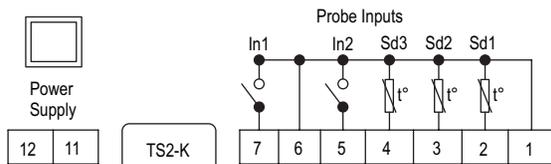
INSTALLATION

NOTICE Unit must be mounted away from vibration, impacts, water and corrosive gases.

- 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.



Note: Wiring for models with 5 outputs shown. Other models will follow the same structure, but will be limited to the number outputs available on the device.

PARAMETER LIST					
Operation	Parameter	Description	Units	Range	Factory Setting
Compressor/Set Point (Con)	Set	Set point	Degrees	R1 to R2	3.0
	r0	Differential or hysteresis	Degrees	0.1 to 20	1.0
	r1	Minimum value for set point	Degrees	-99.9 to R2	-50.0
	r2	Maximum value for set point	Degrees	R1 to 302	150
	r4	Night set point variation	Degrees	-20.0 to 20.0	0.0
	r6	Fan operation	Option	On/Off/COn	COn
	F0	Fan stoppage temperature	Degrees	-99.9 to 302	28.0
	F1	Fan stops when door open	Option	no/yes/Con/Fan	Yes
	c0	Minimum compressor stoppage time	Minutes	0 to 240	1
	c1	Continuous cycle time	H-M	0.0 to 18	1.0
	c2	On time of fault cycle	Minutes	0 to 999	5
	c3	Off time of fault cycle	Minutes	0 to 999	5
	c4	Minimum on time of compressor	Minutes	0 to 240	0
	c5	Minimum time between compressor starts	Minutes	0 to 240	1
c6	Time delay for 2nd compressor	Seconds	0 to 999	30	
Defrost (DEF)	d0	Heating or cooling (single output models only)	Option	Re/In	Re
	d0	Type of Defrosting	Option	Re/In	Re
	d1	Temperature to Stop Defrosting	Degrees	-99.9 to 302	80.0
	d2	Maximum Defrosting Time	Minutes	0 to 240	30
	d3	First Hour of Day for Defrost	H-M	00.0 to 18.0	00.0
	d4	Delay of First Defrost	Minutes	0 to 999	0
	d5	Display During Defrost	Option	Off/on/-d-	-d-
	d6	Display Return Limit	Minutes	0 to 240	15
	d7	Compressor Drip Time	Minutes	0 to 240	0
	d8	Interval Between Defrosts	H-M	00.0 to 18.0	8.0
	d9	Fan works while Defrosting	Option	Yes/No	No
	d10	Fan Drip Time	Minutes	0 to 240	0
	d11	Minimum Defrosting Time	Minutes	0 to 240	0
	d12	Fan/Defrosting Control Probe	Option	sd1/sd2/sd3	sd2
	d13	Intelligent Defrosting	Option	Off/JuP/CiC	Off
	d14	Units to Count Defrost Cycle	Option	CT/RT	RT
	d15	Evaporator Set	Degrees	-50.0 to 20.0	-10.0
d16	D2 Maximum Time %.	%	0 to 100	50	
d17	CiC Time Variation	Minutes	0 to 120	10	
HdE	Next Defrost Time (hours)	Hours	Read Only		
ndE	Next Defrost Time (minutes)	Minutes	Read Only		
JdF	Defrosts to Skip	Number	Read Only		
Display (Pro)	P0	Temperature scale	Option	F/C	C
	P1	Ambient probe adjustment	Degrees	-20.0 to 20.0	0.0
	P2	Defrosting probe adjustment	Degrees	-20.0 to 20.0	0.0
	P3	Product probe 3 calibration	Degrees	-20.0 to 20.0	0.0
	P4	Decimal point	Option	Yes/No	Yes
	P5	Probe to display	Option	sd1/sd2	sd1
	P6	Probe 2 present	Option	Yes/No	Yes
P7	Probe 3 present	Option	No/Yes	No	
Alarm (ALA)	A0	Alarm differential	Degrees	0.1 to 20.0	4.0
	A1	Maximum alarm temperature	Degrees	0.1 to 99.9	8.0
	A2	Minimum alarm temperature	Degrees	0.1 to 99.9	8.0
	A3	Time without alarm after continuous cycle	H-M	0.0 to 18.0	1.1
	A4	Time without alarm after defrost	H-M	0.0 to 18.0	1.1
	A5	Time without alarm after opening door	H-M	0.0 to 18.0	1.1
	A6	Time without alarm after power on	H-M	0.0 to 18.0	1.1
	A7	Alarm verification time	H-M	0.0 to 18.0	1.1
A8	Probe for alarm	Option	sd1/sd2/sd3	sd1	
Initial Setup (Ini)	Hor	Real time hours	Hours	0 to 23	0
	nin	Real time minutes	Minutes	00 to 59	00
	E0	Configure digital input 1	Option	Off/A1/In/DEF/Rst	Off
	E1	Configure digital input 2	Option	Off/A1/In/Rst	Off
	H0	Factory default	Range	0 to 2	0
	H1	Assign master/slave	Option	Mst/Slv	Mst
	H2	Keypad protection	Option	Yes/No	No
	H3	Delay time on connecting	Seconds	0 to 240	0
	H4	Serial communication address	Range	0 to 999	0
	H5	Keypad code	Range	0 to 999	0
	H6	Type of probe	Option	PTC/NTC	PTC
	H7	Relay 2 setup	Option	Lit/Fan/ALA/DEF	dEF
	H8	Relay 3 setup	Option	Lit/Fan/ALA/DEF	Fan
	H9	Relay 4 setup	Option	Au/Lit/Fan/ALA/DEF	Lit
	H10	Relay 5 setup	Option	Au/Lit/Fan/ALA/DEF/Con	ALA
	H11	HAACP activated	Option	Yes/No	No
dAt	Real time date	Range	dxx, nxx, yxx	d01, n01, y00	
td	Display refresh rate	Seconds	0-999	0	

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 \geq SET + r0: Output On
Temperature \leq SET: Output Off (For d0 = in)
Temperature \leq SET - r0: Output On
Temperature \geq 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 \geq F0: Fan off
Temperature \leq 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
JuP = 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 = JuP, 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
- A6** 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
One minute after entering the code, keypad is locked again
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
Con = Compressor
- H11** HACCP Alarm recording enabled or disabled
- dAT** Date in real time clock
- td** Display refresh time

FRONT PANEL OPERATION

Set Point Setup

- Press the  key once and Set will be displayed.
- Press  key again and set point value appears blinking.
- Uses the  and  arrows to adjust set point.
- Press the  key to confirm the new set point.
- Press  and  arrow at same time to exit.

Time Setup

- Press the  key once and the Set label will be displayed.
- Use the  and  arrows to go to Hour or Minute.
- Press the  key to view the current value.
- Use the  and  arrows to adjust to current time.
- Press the  key for 8 seconds to save the new time. Pro will appear on the display when done correctly.
- Press the  and  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  key for 8 seconds until 00 is displayed.
- Use the  and  arrows to reach the assigned security code (factory setting for this code is 0).
- Press the  key to accept the code.
- Use the  and  arrows to select programming menu to enter.
- Press the  key to reach the parameters under each programming menu.
- Use the  and  arrows to scroll through the parameters.
- Press the  key to view the value of the parameters.
- Use the  and  arrows to change the values of the parameters.
- Press the  key to save the changes.
- Press the  and  arrow to go back to the programming menu selection.
- Press the  and  arrow a second time to exit.

Manual Default

Press the  key for 8 seconds to activate/deactivate defrost cycle.

Continuous Cold Cycle

Press the  arrow key for 8 seconds to activate or deactivate a continuous cold cycle.

Resetting Keypad Security Code

Press the  key during power up to reset the security code to 0.

Alarm Validation

An active alarm can be silenced by pressing the  and the  arrow keys simultaneously.

On/Off

Pressing the  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  button for 5 seconds will turn on or off the light.

LED Indicators

-  Indicates that the compressor is engaged. It will blink when there is a call for the compressor to turn on during minimum compressor stoppage.
- 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.
-  Indicates defrost cycle is active.
-  Indicates that the fan is engaged.
-  Indicates an error or alarm or error condition.

HACCP Indicates that 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:

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
AEH	High Temperature and External Alarm
AEL	Low Temperature and External Alarm
ooo	Open Probe Error
---	Short Circuited Probe 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  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  and  arrows for 2 seconds, both recorded data of the alarm (time and temperature value) are deleted.

In the HAC menu, pressing the  and  arrow keys for 2 seconds, all the 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.

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 the time between defrosts is incremented d17 minutes, otherwise it is decremented d17 minutes. 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.