Dwyer®

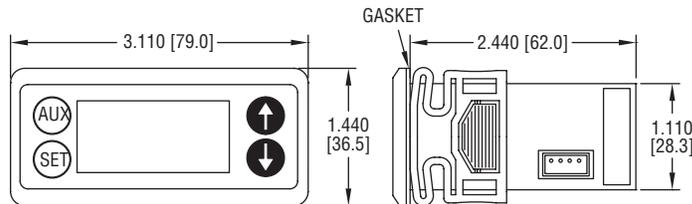## Series TSXT Digital Temperature Switch

Specifications - Installation and Operating Instructions

Panel cutout 2-51/64˝ x 1-9/64˝ (71 x 29 mm)

The **Series TSXT Digital Temperature Switch** is designed with many refrigeration applications in mind. It accepts up to 3 temperature inputs, of either PTC or NTC temperature probe types and can control the compressor, defrost, fan, alarm, and light in a refrigeration system. These switches allow master/slave configuration to synchronize the defrost cycle between different units. The Series TSXT programming performed by the front keypad, the TS2-K programming key, or by RS485 module communication. Standard features include capacitive buttons, real time clock, HACCP alarm logging, temperature alarms, and password protected parameter settings.

MODEL CHART

Model	Supply Power	Outputs	Model	Supply Power	Outputs
TSXT-211	115 VAC	1	**TSXT-232**	12 VAC/VDC	2
TSXT-221	230 VAC	1	**TSXT-242**	24 VAC/VDC	2
TSXT-231	12 VAC/VDC	1	**TSXT-213**	115 VAC	3
TSXT-241	24 VAC/VDC	1	**TSXT-223**	230 VAC	3
TSXT-212	115 VAC	2	**TSXT-233**	12 VAC/VDC	3
TSXT-222	230 VAC	2	**TSXT-243**	24 VAC/VDC	3

INSTALLATION

Note: Unit must be mounted away from vibration, impacts, water, and corrosive gases.
• Cut hole in panel 2.80 x 1.14 inches (71 x 29 mm).
• Use the included gasket, or apply silicone around the perimeter of the hole to prevent leakage.
• Insert the unit into the hole in panel.
• Slide removable fitting clips onto unit from back until secure to panel.
• Wire the unit per the wiring diagram on the product label or by figures below. Avoid installing temperature probe and digital input wiring in the proximity of power cables.

SPECIFICATIONS

Probe Range: PTC: -58 to 302°F (-50 to 150°C); NTC: -58 to 230°F (-50 to 110°C).
Input: PTC (1000 Ω @ 25°C) or NTC (10 KΩ @ 25°C) thermistor.
Output: Relay 1: SPST relay rated 16 A @ 240 VAC resistive, 10 FLA, 60 LRA; Relay 2: SPST relay rated 5 A @ 240 VAC resistive; Relay 3: SPST relay rated 8 A @ 240 VAC resistive.
Horsepower Rating (HP): 1 HP (Relay 1).
Control Type: On/off with defrost options.
Power Requirements: 115 VAC, 230 VAC, 24 VAC/VDC, or 12 VAC/VDC.
Power Consumption: 3.6 VA @ 115/230 VAC; 1.5 VA @ 12/24 VAC/VDC.
Accuracy: ±1% FS.
Display: 3-digit, plus sign.
Resolution: 0.1°.
Memory Backup: Nonvolatile memory.
Ambient Operating Temperature: 32 to 131°F (0 to 55°C).
Storage Temperature: -4 to 176°F (-20 to 80°C).
Weight: 115 and 230 V models: 7.2 oz (204 g); 12 and 24 V models: 4.8 oz (136 g).
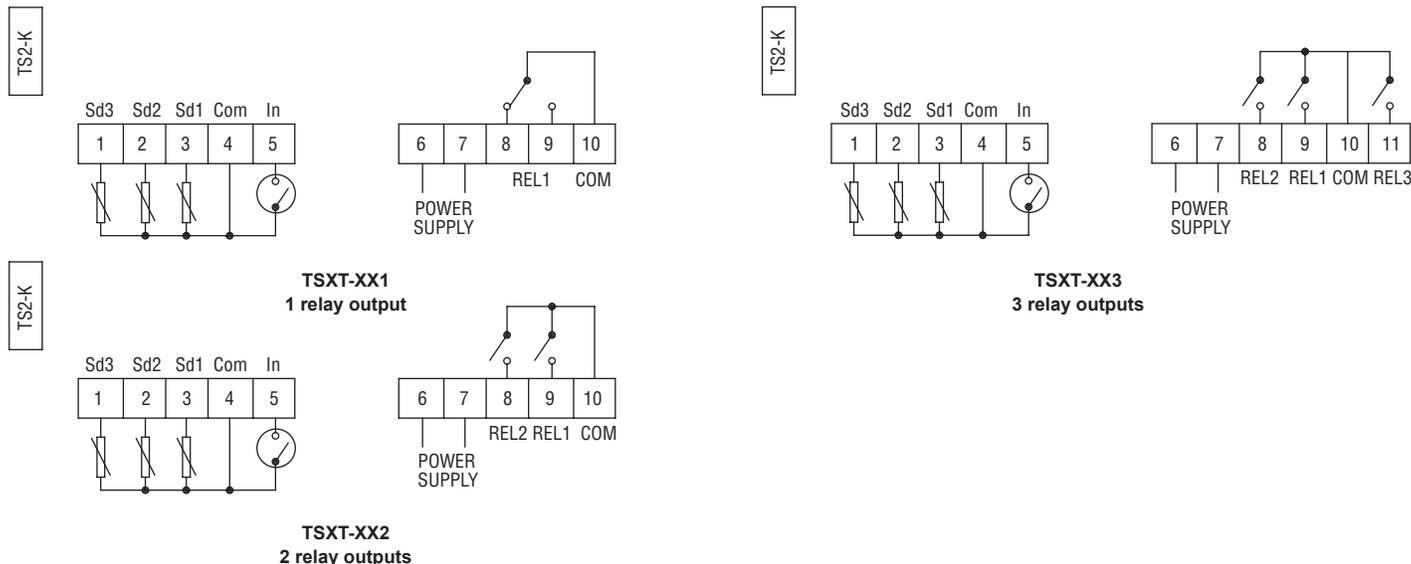**Front Panel Rating:** IP65.
Agency Approvals: CE, cURus.

Wiring Diagram

TSXT-XX1
1 relay output

TSXT-XX2
2 relay outputs

TSXT-XX3
3 relay outputs

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Parameter Programming

Note: Set Point and the time programming are the only parameters accessible without access code.

Set Point
• Press SET. Set Point value will appear on the display.
• Press SET again. The real value is shown on the display and can be modified with the UP and DOWN arrows.
• Press SET to confirm any new values.
• Press SET and DOWN simultaneously to quit programming or wait one minute for the display to automatically exit programming mode.

Real Time Clock
• Press SET. The Set Point value will appear on the display.
• Press the UP or DOWN arrow to change to Hour or Minute.
• Press SET to see the assigned value.
• Use the UP and DOWN arrows to set the desired value.
• Press and hold SET for 8 seconds to program value. The word "Pro" should appear on the screen if the value has been programmed correctly.
• Press SET and DOWN simultaneously to exit or wait for the timeout.

Protected Parameters
• Press and hold SET for 8 seconds. The access code value 00 is shown on the display.
• Using the UP and DOWN arrows, set the code (factory-set code is 00).
• Press SET to enter the code. If correct, the first parameter label will be shown on the display (SP).
• Use the UP and DOWN arrows to move to desired parameter and SET to view parameter value.
• While viewing a parameter value, use the UP and DOWN arrows to modify parameter value. Use SET to enter value and exit parameter.
• The display will blink when there is an error recording a parameter in memory or when awaiting confirmation of a value.
• Press SET and DOWN simultaneously to quit programming or wait one minute to automatically exit programming mode.

LED Indication and Display Messages
❄ : Indicates if the load is connected. If continuous cool cycle is being performed, this LED flashes (90% ON, 10% OFF). If the unit is waiting the stopping time value stored in c0 to start a cool cycle the LED flashes (10% ON, 90% OFF).
♦ : Indicates if defrosting is active.
((•)): Indicates an active alarm. The LED will flash if the alarm is cleared, but the alarm condition persists.
❅ : Indicates when fan control relay is active. Either H7 or H8 must be set to one of the fan control modes (FAN or FAI).
HACCP: Indicates HACCP alarm recording feature is active.

If an alarm or error occurs, the following messages will be shown and an internal buzzer will sound.

The alarm can be cleared and buzzer silenced by pressing the SET and DOWN buttons simultaneously. The alarm message will not be shown, but the alarm LED will flash while the alarm condition persists.

Err = Memory error
ErP1 = Probe 1 error
ErP2 = Probe 2 error
ErP3 = Probe 3 error
Eri = Internal parameter error. In this case enter the factory default configuration, as described in the Resetting to Factory Defaults section.
ALH = High temperature alarm
ALL = Low temperature alarm
ALE = External alarm
AEH = High temperature and external alarm
AEL = Low temperature and external alarm
ooo = Open probe error
- - - = Short circuit probe error
DON = Defrosting activated
DOF = Defrosting deactivated or cannot be done
CON = Continuous cold cycle activated
COF = Continuous cold cycle deactivated
-d- = Defrosting (when d5 set to -d-)

Setting Keyboard Code to Zero
• Turn unit off and back on. Press and hold SET for 8 seconds. Value 00 should flash on the display.
• Set the code to 123 using the UP and DOWN arrows.
• Press SET to confirm the code. The code is now set to 00.

Activating and Deactivating Manual Defrost Cycle
Press and hold the AUX button for 2 seconds to activate defrosting. Repeat this process to stop the defrosting. If a cool cycle is activated, the defrosting is disabled.

Activating and Deactivating Cool Cycle
Press and hold the DOWN arrow for 8 seconds to activate a continuous cool cycle. Repeat this process to stop the cool cycle. If defrosting is activated, the cool cycle is disabled.

Fault Cycle
If the probe fails, the load is connected for the time set in c2 and then disconnected for the time set in c3.
In case of memory error, the load is connected for 5 minutes and then disconnected for 5 minutes.

On/Off Mode
This option is used to turn the control into an OFF or stand by mode, disabling the display and outputs.
• Press and hold SET and DOWN for 8 seconds. The display will read OFF.
• Press and hold SET and DOWN for 8 seconds to return the control to normal operation.

On/Off Light
The 2nd or 3rd relay can be configured as a lighting switch by setting the H7 or H8 parameter to Li. To activate or deactive the light relay, press and hold AUX and UP for 3 seconds.

Probe View
To view the probe not chosen in P5, press the SET and UP buttons.

HACCP
If this option is activated, the thermostat registers up to 5 high, low, and power loss alarms. These alarms can be seen in the menu Registry of Alarms (HAC). To access this menu, proceed to the parameters menu.

The first value (nAt) that appears is the number of registered alarms. Next, the value of the temperature (Adx) and the time of each alarm that exists (tdx) are displayed. For the disconnection alarm, the temperature when returning the connection is registered, as well as the time until the correct value is reached. (Probe<Set+A1-A0)

When the elapsed time is shown it will appear dxx (days). Pressing UP, hxx (Hours) will be shown, and pressing UP again, nxx (Minutes) will be displayed. When located over a temperature of alarm or time, pressing AUX + UP for 3 seconds, both recorded data of the alarm (time and temperature value) are deleted.

In the HAC menu, pressing AUX + UP keys for 3 seconds, all the recorded alarm data is deleted.

Resetting to Factory Defaults
• Access to parameter H0 as explained in parameter programming.
• Choose desired configuration.
• For Series TSXT-xx1: H0 is set to 0
• For Series TSXT-xx2: H0 is set to 1
• For Series TSXT-xx3: H0 is set to 2
• Press SET for 8 seconds, and the thermostat will be reset.

List of Parameters

COn	Description	Units	Range
SET	Set point	Degrees	r1 to r2
r0	Differential or hysteresis	Degrees	0.1 to 20
r1	Minimum value for set point	Degrees	-99.9 to r2
r2	Maximum value for set point	Degrees	r1 to 302
r6	Fan operation	Option	off/on/con
F0	Fan stoppage temperature	Degrees	-99.9 to 302
F1	Stop compressor & fan with door open	Option	no/yes/con/fan
c0	Minimum compressor stoppage time	Minutes	0 to 240
c1	Continuous cycle time	h - m	0.0 to 18
c2	ON time of fault cycle	Minutes	0 to 999
c3	OFF time of fault cycle	Minutes	0 to 999
c4	Minimum ON time of the compressor	Minutes	0 to 240
c5	Minimum time between two connections of the compressor	Minutes	0 to 240

dEF	Description	Units	Range
d0	Cool/Heat mode (ST13)	Option	re/in
d0	Type of defrosting (ST23 & 33)	Option	re/in
d1	Temperature at which defrosting will stop	Degrees	-99.9 to 302
d2	Maximum defrosting time	Minutes	0 to 240
d3	First hour of day for defrosting	h - m	00.0 to 18.0
d4	Delay of first defrosting	Minutes	0 to 999
d5	Display on defrosting	Option	off/on/-d-
d6	Display return limit	Minutes	0 to 240
d7	Compressor drip time	Minutes	0 to 240
d8	Interval between defrosting	h - m	00.0 to 99.0
d9	Fan works on defrosting	Option	no/yes
d10	Fan drip time	Minutes	0 to 240
d11	Minimum defrosting time	Minutes	0 to 240
d12	Fan/defrosting control probe	Option	sd1/sd2/sd3
d14	Units to count the defrosting cycle	Option	rt/ct

Pro	Description	Units	Range
P0	Temperature scale	Option	°C/°F
P1	Ambient probe 1 calibration	Degrees	-20.0 to 20.0
P2	Defrosting probe 2 calibration	Degrees	-20.0 to 20.0
P3	Product probe 3 calibration	Degrees	-20.0 to 20.0
P4	Decimal point	Option	no/yes
P5	Probe to display	Option	sd1/sd2/sd3
P6	Probe 2 present	Option	no/yes
P7	Probe 3 present	Option	no/yes

ALA	Description	Units	Range
A0	Fan and alarm differential	Degrees	0.1 to 20.0
A1	Maximum alarm temperature	Degrees	0.1 to 99.9
A2	Minimum alarm temperature	Degrees	0.1 to 99.9
A3	Time validation open door or external alarm	Minutes	0 to 999
A4	Time without alarm after defrosting	h - m	0.0 to 18.0
A5	Time without alarm after opening the door	h - m	0.0 to 18.0
A6	Time without alarm after connection	h - m	0.0 to 18.0
A7	Alarm verification time	h - m	0.0 to 18.0
A8	Probe for alarm	Option	sd1/sd2/sd3

Ini	Description	Units	Range
Hor	Hour	Hours	0 to 23
Min	Minutes	Minutes	0 to 59
E0	Configure digital input	Option	all/AI/In/def/ndf
H0	Factory settings	Option	0 to 3
H1	Master slave	Option	Mst/Slv
H2	Keypad protection	Option	no/yes
H3	Delay time on connecting	Seconds	0 to 240
H5	Keyboard code	Numeric	0 to 999
H6	Type of probe	Option	PTC/NTC
H7	Relay 2 setup	Option	lit/FAn/ALA/dEF/FAI
H8	Relay 3 setup	Option	lit/FAn/ALA/dEF/FAI
H10	HACCP activated	Option	no/yes
HdE	Next defrost time	Hours	(only read)
MdE	Next defrost time	Minutes	(only read)

Note: For parameter settings described as h-m, the first 2 digits represent hours, and the third represents tens of minutes. (Example: 4.2 is 4 hours and 20 minutes).

Parameter Descriptions

Compressor (COn)

SET = Working Set Point. Temperature the system trys to maintain. Variable between r1 and r2.

r0 = Differential. When primary probe temperature >= Set+r0 Compressor ON
When primary probe temperature <= Set Compressor OFF

r6 = Fan operation on regulation.
Off = Fan does not connect on regulation.
On = Fan is always connected on regulation.
Con = Fan linked to compressor start-up.
(Fan ON if allowed by the temperature set in F0)

F0 = Fan temperature limit.
Direct mode. Relay selected as FAN. Fan OFF on regulation when probe temperature set in d12 is >= F0. Fan ON on regulation, when temperature is =< F0 - A0.
Reverse mode. Relay selected as FAI. Fan OFF on regulation when probe temperature set in d12 is < F0. Fan ON on regulation, when temperature is >= F0 + A0.

F1 = Stop compressor and Fan if door opened (Circuit closure between input terminal 5 and common terminal 4).
No = the fan and compressor do not stop on regulation and continuous cycle when opening the door.
Yes = the fan and compressor stop on regulation and continuous cycle when opening the door.
Con = the compressor stop but the fan do not stop on regulation and continuous cycle when opening the door.
Fan = the fan stop but the compressor do not stop on regulation and continuous cycle when opening the door.

c0 = Minimum compressor stop time. Minimum time since compressor stops until it is starts again.

c1 = Continuous cycle time. Duration of a continuous cold cycle.

c2 = ON time of fault cycle, when ambient probe is broken

c3 = OFF time of fault cycle, when ambient probe is broken

c4 = Minimum time since compressor starts until it stops.

c5 = Minimum time since compressor starts until it starts again.

Defrost (dEF)

d0 = Cool / Heat mode (ST13). re = cool; In = heat

d0 = Type of defrosting (ST23, ST33)
re = defrosting without connecting the compressor.
in = defrosting by connecting the compressor.

d1 = End of defrosting temperature. When this temperature is reached the defrosting will end.

d2 = Maximum defrosting time. The defrosting will stop when this time is reached. If it is zero there will be no defrosting.

d3 = First hour defrosting of the day. From 00:00 hours the first defrosting is at d3 hours. Until this time no defrosting is performed.

d4 = Delay first defrosting.
Time to carry out the first defrosting if d3 = yes.

d5 = Display during the defrosting.
Off = the current temperature will be shown during defrosting.
On = the temperature at defrost beginning is frozen on display until the end of defrosting and until the current temperature is equal or lower than the initial one, or until d6 time elapses.
-d- = Label -d- is displayed during defrosting, until the end of defrosting and until the current temperature is equal or lower than the initial one, or until d6 time elapses.

d6 = Display return limit. Maximum time before viewing the current temperature again after defrosting.

d7 = Compressor drip time. Time since defrosting ends until the compressor can be connected.

d8 = Interval between defrosting. Time between the start of a defrosting and the start of the following one. If it is zero defrosting is not done automatically by time.

d9 = Fan operation during defrosting time. It determines if the fan is connected or not during defrosting.

d10 = Fan drip time. Time since defrosting ends until fan can be connected.

d11 = Minimum Time duration defrosting. Once defrosting begins it stays at least during this time

d12 = Fan & defrosting control probe.
sd1 = primary probe
sd2 = defrosting probe
sd3 = product probe

d14 = Units to count the defrosting cycle.
rt = according to the working time of the controller
ct = according to the working time of the compressor

PROBES (Pr0)

P0 = Temperature scale. Select between °F and °C.
P1 = Primary probe calibration. Degrees shift of the primary probe display value.
P2 = Defrost probe calibration. Degrees shift of the defrosting probe display value.
P3 = Product probe calibration. Degrees shift of the product probe display value.
P4 = Decimal point
P5 = Probe to display. Probe to be viewed normally on the display.
P6 = Probe 2 present. If there is a probe 2 connected to thermostat.
P7 = Probe 3 present. If there is a probe 3 connected to thermostat.

ALARMS (ALA)

A0 = Fan & alarm differential.
This is the temperature difference between the on and off cycle of the alarms and fan.
A1 = Maximum alarm. High alarm ON at Set+A1. High alarm OFF at Set+A1-A0.
A2 = Minimum alarm. Low alarm ON at Set-A2. Low alarm OFF at Set-A2+A0.
A3 = Time validation open door or external alarm. If open door or external alarm is maintained during this time, alarm will be indicated. (Depending on the E0 configuration of digital input).
A4 = Alarm exclusion time after defrosting. During the defrosting and this time after it, temperature alarms will be ignored.
A5 = Alarm exclusion time after opening the door. While the door is open (if A5>0) and time A5 after closing it, alarms will be ignored.
A6 = Alarm exclusion after connection. Until this time has elapsed since the connection, temperature alarms will be ignored.
A7 = Temperature alarm time validation. Time since the alarm situation occurs, until it is given.
A8 = Probe Alarm.
  sd1 = primary probe
  sd2 = defrosting probe
  sd3 = product probe

INITIALIZATION (Ini)

Hor = Hour
Min = Minutes
E0 = Digital input configuration.
  Off = Digital input disabled.
  Al = External alarm. There is an alarm if input is short-circuited.
  In = Door open if input is short-circuited.
  def = Order to initiate a defrost if input is short-circuited.
  ndf = No defrosting will be made if input is short-circuited.
H0 = Factory Configuration. Record Factory Configuration.
H1 = Master/Slave
  H1 = Master. The thermostat issues defrosting orders to slave connected thermostats through the digital input.
  H1 = Slave. The thermostat performs defrosting ordered by the master connected to its digital input.
  In both cases the input must be E0=def.
H2 = Keyboard protection.
  Yes = Keyboard protected. To modify Set, activate/de-activate defrosting and activate/de-activate continuous cycle we have to enter the code and then quit. The protection is removed momentarily. It is activated again 1 minute after the last key is pressed.
  No = Keyboard not protected.
H3 = Delay time on connecting. Until this time has elapsed since turning-on power, the compressor will not start-up.
H5 = Input code to parameters. This code is set to 0 from factory.
H6 = Type of Probe. PTC or NTC.
H7 = Configuration Relay 2.
H8 = Configuration Relay 3. We can choose that it is light (Li), fan (Fan), alarm (ALA), defrosting (dEF), or reverse fan (FAI).
H10 = HAACP activated. Yes or no.
HdE = Hours (HdE) portion of the time the defrost will begin at.
MdE = Minutes (MdE) portion of the time the defrost will begin at.
HACCP (HAC): (Only appears when H10 is set to yes).
nAt = # of recorded alarms.
Adx = Temperature of alarm point where x can be 1 through 5.
tdx = Time of alarm point where x can be 1 through 5.
  dxx = days
  hxx = hours
  nxx = minutes

MAINTENANCE/REPAIR

Upon final installation of the Series TSXT no routine maintenance is required. The Series TSXT is not field serviceable and should be returned if repair is needed. Field repair should not be attempted and may void warranty.

CLEANING & REPAIR

Clean the surface of the display controller with a soft, damp cloth. Never use abrasive detergents, petrol, alcohol, or solvents.

WARRANTY/RETURN

Refer to "Terms and Conditions of Sale" in our catalog and on our website. Contact customer service to receive a return authorization number before shipping the product back for repair. Be sure to include a brief description of the problem plus any additional application notes.