

## 6.00 PARAMETER LIST

#	MEANING	SETTING	FACTORY SETTING
SEt	Main Set Point	Range between «LoS» & «HiS»	75 °F
HYS	Thermostat main differential (Hysteresis 1)	Range 0 .. 17.9 °F (0 .. 10 °C)	1 °F
HY2	Thermostat secondary differential (Hysteresis 2) only DST-922	Range 0 .. 17.9 °F (0 .. 10 °C)	1 °F
LoS	Minimum value for SET POINT parameter	Range -55 .. +211 °F (-50 .. 100 °C)	-39 °F
HiS	Maximum value for SET POINT parameter	Range -21 .. +308 °F (-30 .. 154 °C)	238 °F
Act	Action main output	0: cold; 1: heat	1
Ac2	Action secondary output only DST-922	0: cold; 1: heat	1
OFS	Offset, temperature calibration for probe	Range -8.4 .. +7.6 °F (-9.9 .. 9.9 °C)	0
AcY	Anticycling time main output	Range 0 .. 254 (see tis)	0
dl2	Anticycling time secondary output only DST-922	Range 0 .. 254 (see tis)	0 sec
dPt	Defrost pause time	Range 1 .. 254 (see tis)	1
ddt	Defrost duration time	Range 0 .. 99 (see tis)	0 (disabled)
unt	Temperature displayed unit	0: Celsius; 1: Fahrenheit	1
rES	Resolution	0: decimal point resolution; 1: unit resolution	1
utd	Display update time delay	Range 0 .. 60 sec	1 sec
tiS	Defrost time scale	0: ddt minutes, dpt hours, acy/dl2 seconds; 1: ddt seconds, dpt minutes, acy/dl2 seconds; 2: ddt minutes, dpt hours, acy/dl2 minutes; 3: ddt seconds, dpt minutes, acy/dl2 minutes	0
Si2	Secondary set point only DST922	Range between «LoS» & «HiS»	75 °F
Pt	Sensor Probe Type	0: NTC (10Kohm thermistor; range -39...+248°F) (-40... +120 °C) 1: PTC (1Kohm thermistor; range -55...+302°F) (-48... +150 °C)	0

## 7.00 ANOMALIES SIGNALING

MSG	CAUSE	OUTPUT
PF1	The probe input line is open or short circuited. The measured temperature is out of range.	- output K1 will switch-off; - output K2 does not change.

## 8.00 SPECIFICATIONS

**DISPLAY:** 3 digit, 13.2 mm, high intensity green;

**INPUTS:** one PTC or NTC sensor;

**MEASURING RANGE:** -55 ... +302 °F for PTC probe;  
(-48... +150 °C)  
-39 ... +248 °F for NTC probe;  
(-40... +120 °C)

**ACCURACY AT 77°F (25°C):**

With Res=0 (resolution 0.1C), the accuracy is +/- 1.1 °C  
With Res=1 (resolution 1C), the accuracy is +/- 2 °C

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With Res=1 (resolution 1F), the accuracy is +/- 2 °F

**RESOLUTION:** 0.2 or 2 °F (0.1 or 1°C)

**OUTPUTS:** 1 spdt 250Vac 16A max resistive (1hp),  
+ 1 spdt 250Vac 8A max resistive (0.5hp) only for DST-9x2;

**POWER SUPPLY:** 115 Vac ±10% 50/60Hz;

**POWER CONSUMPTION:** 0.03A

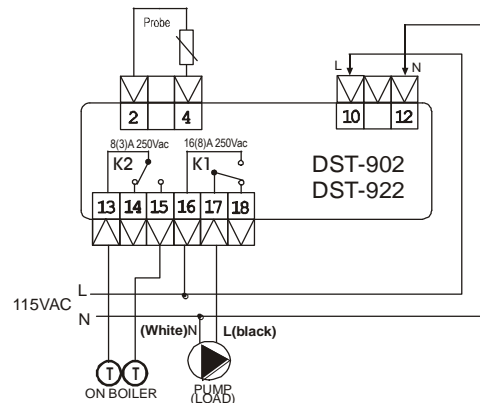
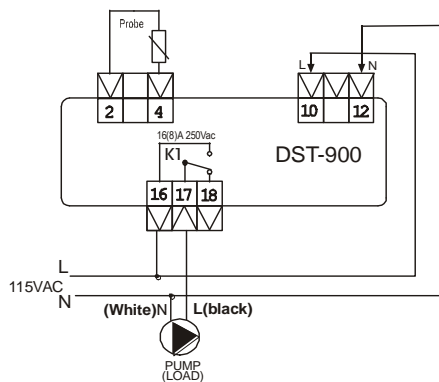
**ENVIRONMENTAL CONDITIONS:**

- operating temperature: 23... 122 °F (-5 ... +50 °C);  
- storage temperature: -4... 158 °F (-20 ... +70 °C);  
- relative humidity: 30 ... 90 % non condensing;  
- no shocks or vibrations;

**MECHANICAL DATA:**

- plastic housing self extinguishing type UL94V0;  
- connections through terminal block for 2.5mm<sup>2</sup> gauge wire;  
- protection degree: IP64 for the frontal panel (enclosure IP31).

**Typical terminal connections** (See the label close to the terminals for the right power supply diagram connection).



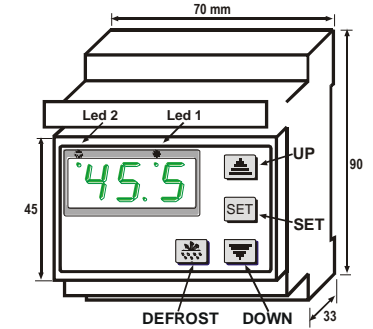
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FRONTAL PANEL LAYOUT AND FUNCTIONS



**Up:** 1) To increase the value of the selected parameter; 2) To scroll the parameters in SET mode; 3) During defrost action, to update the probe 1 temperature.

**Down:** 1) To decrease the value of the selected parameter; 2) To scroll the parameters in SET mode.

**Set:** To access the parameter menu to view and change the values. It is also the "Enter" key to confirm the new values.

**Defrost:** Used to start/stop a manual defrost.

## Installation and operating instructions

### DST-900/DST-902 DST-922

#### One or Two stage digital setpoint controller

Rev.: 27-04-2018 Cod.: 00990259

### 1.00 GENERAL DESCRIPTION AND INSTALLATION NOTICE

The DST-900/DST-902/DST-922 models are suitable for a wide range of applications. The DST-900 is a One Stage Digital Setpoint Control to drive a relay in order to reach a set point temperature value. The DST-902 is also a One Stage Setpoint Control but with two relay outputs. The DST-922 is a Two Stage Digital Setpoint Control to drive two relays according two different temperature values. The controllers are available with off cycle defrost (compressor switching OFF, see "ddt" and "dpt" parameters). The access to the operating parameters can be prevented by a combination of keys.

The controller must be installed in a place protected from extreme vibration, impact, water, corrosive gases, and where temperatures and moisture do not exceed the maximum rating levels indicated in the specifications. The same directions are valid for the probe installation.

#### 1.10 THE THERMOSTAT PROBE

The probe must be installed in a place protected from direct air flow particularly far from fans and doors, so a better average temperature of the room will be measured. The probe is not waterproof, it should be placed with its head upward, so that drops would not penetrate into the bulb and damage the sensor. Maintain the length of the electrical wires as short as possible in order to keep the noise picked by them at low level, otherwise a shielded wire will be needed, where the shield will be connected to the ground.

#### 1.20 ELECTRICAL WIRING

We recommend to protect the power supply of the controller from electrical noise, spikes, and especially from voltage surges and drops. This can be easily done following these recommendations:

-separate the power supply of the loads (compressor, heaters, fans, etc) from the power supply of the controller. This can alleviate problems related to voltage dips that can arise during the switch-on of the loads, that may interfere with the controller's microprocessor causing unexpected resets.

-the cables of the probes and the ones of the controller supply or the loads must be separated and not close, to reduce spikes and noise on the sensor. This improves the stability of the reading and it also makes the commutation of the device more accurate.

#### 1.30 CRITICAL ENVIRONMENT

For applications in heavy industrial environment these rules should be followed.

- After having identified the source of noise spikes, it is recommended to apply a line filter to the source in question of the type specifically designed to solve EMC (Electromagnetic compatibility) related problems. Sometimes it may be sufficient an RC type filter, also called «snubber», connected in parallel to the external relay coils, or circuit breakers.

- An independent power supply should be used to power the device in extreme conditions.

#### 1.40 MOUNTING

The controller is a DIN rail mounting instrument which can be mounted onto the wall or panels. For easily mounting, remove the DIN rail by sliding it out first. Use screws to mount the DIN rail onto the wall/panel. Then snap on the control to the DIN rail by pulling black trigger on the bottom with a screw driver.

## 2.00 HOW THE DEVICE WORKS (overview)

The DST-900 is a thermostat, it has one output relay and it switches on when the temperature goes above or below (see "act") the Set point value. DST-902 is the same as DST-900 except that it has two output relays: both relay will switch on and off at the same time. The DST-922 is a two independent outputs, one related to the main set point and the other to the second set point. Both outputs can be driven according to the temperature of only one probe, the main probe – fig. 2. The DST-900/DST-922 can perform also defrost cycles. Every "dpt" hours it will switch off both outputs K1 and K2 for "ddt" minutes.

### 2.10 DST900 - One stage with one probe controller (fig. 1 - supposed act=1):

K1 - Heater START temperature: temp Probe  $\leq$  SET - HyS; K1 - Heater STOP temperature: temp Probe  $>$  SET.  
To avoid any damages it is possible to set an anticycling time against OFF – ON cycles (see "acy" parameters).

K1 - Cooler START temperature: temp Probe reaches (and greater than) SET + HyS; K1 - Heater STOP temperature: temp Probe  $<$  SET.  
To avoid any damages it is possible to set an anticycling time against OFF – ON cycles (see "acy" parameters).

### 2.20 DST922 - Two independent stages with one probe controller (fig. 2 - supposed act=1 and ac2=1):

K1 - Heater START temperature: temp Probe  $\leq$  SET - HyS; K1 - Heater STOP temperature: temp Probe  $>$  SET.  
K2 - Heater START temperature: temp Probe  $\leq$  St2 - Hy2; K2 - Heater STOP temperature: temp Probe  $>$  St2.

The cooling for DST-922 operates in a similar manner as DST-900. To avoid any damages it is possible to set an anticycling time against OFF – ON cycles (see "acy" and "dl2" parameters).

### 2.30 Fault tolerance:

In case of probe failure the DST-900/DST-902/DST-922 controllers display a message PF1 and switch off the output K1 (as per table 7).

Fig. 1 - DST-900/DST-902 example one stage output

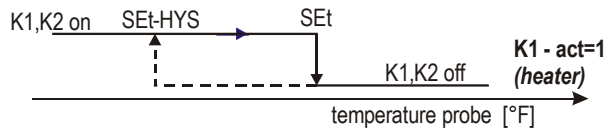
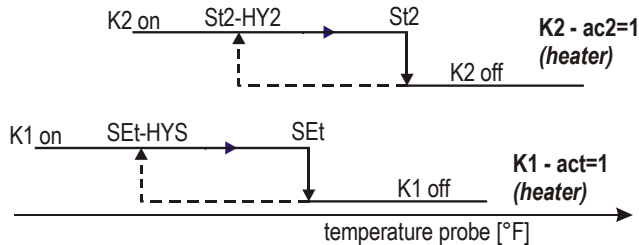


Fig. 2 - DST-922 example two stage outputs



## 3.00 DISPLAY FUNCTIONS

The display has three digits available, of the seven segment type. During normal working it shows the value of the probe temperature, while in an alarm condition it shows the proper indication as described in the «anomalies signalling» table (7.00).

The leds have the following functions: LED 1 lights on when the output K1 is activated; LED 2 lights on when the output K2 is switched on. The led 2 blinks during the setting operations and when a defrost cycle is activated (on DST-900 and DST-902 the led 2 switch on during defrost action).

## 4.00 HOW TO DISPLAY AND ADJUST THE MAIN SET POINT

**Note:** The internal mathematic calculation of the thermostat works in °C. When adjusting the temperature with temperature display unit set as °F, it may increment/decrement by 2°F instead of 1°F. This is for conversion rounding off purpose, so not all the values of °F will be represented" - EXAMPLE: SET= 73, 75, 77, 78, 80, 82... (for rES = 1). If more accuracy is desired, decimal point resolution (rES=0) can be set. Then all the values of °F will be displayed and the increment/decrement is changed by 0.1/0.2 °F.

- 1) Press "SET" and hold it for 3s. SET is displayed;
- 2) Press "SET" to view the Set Point value, adjust it by using "▲" or "▼";
- 3) Press "SET" to confirm the data, after few seconds the controller will leave the set mode and the data will be stored in the memory.

**WARNING:** the instrument must not be reset before leaving the set mode, otherwise the new setting will be lost.

**Note:** it is only possible to choose values for the set point inside the «Los» and «His» range.

### 4.10 HOW TO ADJUST OPERATING PARAMETERS

- 1) Press "SET" and hold it for 10s, the code of the first variable "HyS" will appear;
- 2) Press "▲" or "▼" to scroll all the parameter codes;
- 3) While a code is displayed press "SET" to view its content, adjust it by pressing "▲" or "▼";
- 4) Press "SET" to confirm the data, after 10s the controller will leave the set mode and the data will be stored in the memory.

**WARNING:** the instrument must not be reset before leaving the set mode, otherwise the new setting will be lost.

**Note:** In every case the controller automatically interrupts any setting operation if any push-button isn't pressed for at least 10 seconds. The new values for time parameters will be active only after the start of the following time cycle.

### 4.20 HOW TO ACTIVATE MANUALLY A DEFROST CYCLE

Press and hold for 5s the "Defrost" key, the led 2 switch on (for DST-922: led 2 blink) and the controller's outputs (K1 and K2) will switch off for "dpt" minutes. During a defrost action, modify any parameter value can cause a wrong indication of the led 2.

### 4.30 KEYBOARD LOCKING

Press and hold "▼" + "SET" for 10s, in order to lock and unlock the keyboard

(pay attention to do not modify the set point value, press first "▼" and then "SET" immediately and keep pressed for 10 seconds).

Code displayed for one second: "Pof" – keyboard locked; "Pon" – keyboard unlocked.

When the keyboard is locked it is not possible change any parameters value (can change only the main Set Point).

## 5.0 GENERAL PARAMETERS DESCRIPTION

**SET - main Set Point:** it's the required temperature for the main control relay K1.

**HYS - main differential (hysteresis 1):** the value that controls the output relay K1, moving the value of the main set point in such a way that the system does not oscillate. (see the figures)

**HY2 - secondary differential (hysteresis 2):** the value that controls the output relay K2, moving the value of the set point (or the secondary set) in such a way that the system does not oscillate. (see the figures)

**LoS - low limit of set point:** a limit below which it is not possible to move the set point value.

**HiS - High limit of set point:** a limit above which it is not possible to move the set point value.

**Act - main output action:** describes the way by which the controller manages the main output - K1. 0: direct/cold action, good for refrigerating units, 1: inverse/heat action, usable for boilers.

**Ac2 - secondary output action:** describes the way by which the controller manages the secondary output - K2. 0: direct/cold action, good for refrigerating units, 1: inverse/heat action, usable for boilers.

**OFS - offset of temperature:** it is the variation temperature added or subtracted to the temperature measured by the main probe to compensate for any deviation from the real value.

**AcY - main anticycling delay time:** it is the minimum time between two successive output maneuvers (off – on cycle) for the main relay: when the output K1 is switched-off, the controller wait at least "AcY" seconds (or minutes – see "tis" value) to switch on the relay. It is also the delay for the first activation of the relay K1 at the start-up.

**dl2 – secondary anticycling delay time:** it is the minimum time between two successive output maneuvers (off – on cycle) for the secondary relay: when the output K2 is switched-off, the controller wait at least "dl2" seconds (or minutes – see "tis" value) to switch on the relay. It is also the delay for the first activation of the relay K2 at the start-up.

**dPt - defrost period time:** it is the period of time between the start of two defrost cycles. Note: when a manual defrost is called, the time counter is reloaded to "0"

**ddt - defrost duration time:** it is the time elapsed during the defrost. Usually during this interval the compressor is switched-off to allow a deicing process and, by manufacturer setting, it is possible to switch on other output relay (K2 or K3). If ddt = 0 the defrost function is disabled. During the defrost action, the display does not update the probe measured temperature.

**unt - displayed unit:** it switches the temperature unit between Celsius and Fahrenheit (internal calculations are made in Celsius and then converted to Fahrenheit - see point 4.00 note).

**rES – resolution:** it allows to display the measured value with decimal or unitary resolution.

**utd – update Time delay:** it is the time delay that determines the display updating of the temperature (the min update time of the display is 5 sec.). The switching over of the relay is related only to the acy not to utd values.

**tiS – time scale:** it is possible change the base time of the defrost cycles and of the anticycling delay. Setting tiS=0 the ddt is measured in minutes, dpt in hours and acy in seconds.

**St2 - secondary set point:** it's the required temperature for the secondary control. (only for two stages controller)

**Pt – Sensor probe type:** choice of either 10K ohm NTC sensor or 1K ohm PTC sensor