8.00 SPECIFICATIONS

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

INPUTS: two NTC sensors or two PTC sensors;

MEASURING RANGE: -55 ... +302 °F for PTC probe;
-39 ... +248 °F for NTC probe;

ACCURACY AT 25°C: ±1 °F ± 1 digit;

RESOLUTION: 0.2 or 2 °F;

OUTPUTS: 1 spdt 250Vac 16A max resistive (1hp);

POWER SUPPLY: 115 Vac ±10% 50/60Hz;

ENVIRONMENTAL CONDITIONS:
- operating temperature: –5 ... +50 °C;
- storage temperature: –20 ... +70 °C;
- relative humidity: 30 ... 90 % non condensing;
- no shocks or vibrations;

MECHANICAL DATA:
- protection degree: IP64 for the frontal panel (enclosure IP31).

Installation and operating instructions

DST-932
Differential Temperature Control for Solar Heating System

Azel Technologies Inc.

PD BOX 53138
10 Royal Orchard Blvd.
THORNHILL, ONTARIO
CANADA L3T 7R9
Ph: 905-223-3557
Fax: 905-223-3778
web: www.azeltec.com
e-mail: info@azeltec.com

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7.00 ANOMALIES SIGNALING - ONLY IN AUTOMATIC MODE -

MSG| CAUSE| OUTPUT
---|---|---
H1| The temperature of probe 1 (storage water tank) is higher than the OP value (over-temperature)| - output K1 will switch-off.
PP1| The probe input line 1 is open or short circuited. The storage tank measured temperature is out of range.| - output K1 will switch-off.
PPF2| The probe input line 2 is open or short circuited. The collector measured temperature is out of range.| - output K1 will switch-off.

Note: - output K1 will switch-off.

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

1.00 GENERAL DESCRIPTION AND INSTALLATION NOTICE

The DST-932 model is conceived to control the Solar Heating Systems. The DST-932 drives a pump in order to warm up the water into a storage tank (by the sun energy). The controller reads the temperatures of the storage tank (T1) and of the collector (T2), when this differential temperature (T2-T1) is higher than a set value (dt) it will switch on the water pump. It is possible to limit the maximum temperature of the storage tank and also activate a freeze protection function. By switching to manual mode it allows the test of the heating system. 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 PROBES

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 (boilers, 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 easy 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-932 is a differential temperature controller. In automatic mode it drives the relay output checking the difference of the temperatures from the collector T2 and the storage tank T1. In order to store the solar energy, it switches on a circulator pump as soon as T2-T1 is greater than a Delta T set point (dt). Also, there are over temperature and freeze alarm.

To verify the whole heating system it is possible to toggle to manual mode and switching on or off the circulator pump. In manual mode the controller does not read any probe value, so no alarm function is active.

2.00 HOW TO ADJUST THE OPERATING PARAMETERS

1) Press "SET" and hold it for 10s, the code of the first variable "dtd" 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.

4.00 HOW TO DISPLAY AND ADJUST THE "DELTA T" 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=7.3, 7.5, 7.7, 8.0, 8.2… (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 0.10°F.

1) Press "SET" and hold it for 3s, "dt" is displayed;
2) Press "SET" to view the dt 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.

3.00 DISPLAY FUNCTIONS

The display has three digits available, of the seven segment type. During Automatic mode working it shows the value of the storage tank probe temperature T1. Pushing the upper button, it shows for 3 seconds the collector probe temperature T2. In an over-temperature alarm condition it blinks the “Hit” message (as described in the «anomalies signalling» table 7.00).

In manual mode the display shows the current selected mode: on or off. No one alarm or temperature is checked and showed. The leds have the following functions: LED 1 lights on when the output K1 (water pump) is activated. The led 2 blinks during the setting operations.

5.0 GENERAL PARAMETERS DESCRIPTION

1) dt – Delta T Set Point: it’s the maximum differential temperature, between the collector and the storage tank, to switch on the water pump (relay K1). The controller switch on the output K1 when T2-T1>dt. 
2) dtd – Delta T hysteresis: the value that controls the output relay K1, moving the value of the dt set point in such a way that the system does not oscillate. The controller switch off the output K1 when T2-T1<dt-dtd.
3) OFS – temperature offset for storage tank: it is the variation temperature added or subtracted to the temperature measured by the collector probe to compensate for any deviation from the real value.
4) OP – over temperature protection: it is the maximum temperature T1 of the storage tank, above it the controller will active the over heat alarm protection, switching off the pump and blinking “Hit” on the display. Regardless of the temperature difference T2-T1, when T1>OP the circulation pump stops. This function is priority to the other functions. (only in automatic mode)
5) OPd – over temperature hysteresis: the value that controls the ending of the over temperature alarm protection: when T1<OP-OPd the controller can switch on the output again, as per T2-T1 value.
6) AdF – over temperature hysteresis: the value that controls the ending of the anti freeze protection: when T2>AF+AdF the controller stops the pump and it can drive the output again as per T2-T1 value.
7) 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).
8) rES – resolution: it allows to display the measured value with decimal or unitary resolution.
9) udT – 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 udT values.
10) Pt – Sensor probe type: choice of either 10K ohm NTC sensor or 1K ohm PTC sensor.