Thermometers and temperature electronic controllers

Devices designed to display, control and regulate cooling generators (manual or automatic programmable defrosting by stopping the compressor) or heating generators.

1- Versions and References

<table>
<thead>
<tr>
<th>MODEL</th>
<th>FUNCTION</th>
<th>RELAY 250 V, cos (q)=1</th>
<th>POWER SUPPLY, 50/60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKO-14012</td>
<td>Thermostat</td>
<td>12°C/24°C v/°c ± 2%</td>
<td></td>
</tr>
<tr>
<td>AKO-14023</td>
<td>Thermostat</td>
<td>230 V ± 10%</td>
<td></td>
</tr>
<tr>
<td>AKO-14112</td>
<td>Controller</td>
<td>12°C/24°C v/°c ± 2%</td>
<td>230 V ± 10%</td>
</tr>
<tr>
<td>AKO-14120</td>
<td>Controller</td>
<td>12°C/24°C v/°c ± 2%</td>
<td>230 V ± 8% - 12%</td>
</tr>
<tr>
<td>AKO-14123</td>
<td>Controller</td>
<td>12°C/24°C v/°c ± 2%</td>
<td>230 V ± 8% - 12%</td>
</tr>
<tr>
<td>AKO-14125</td>
<td>Controller</td>
<td>12°C/24°C v/°c ± 2%</td>
<td>230 V ± 8% - 12%</td>
</tr>
<tr>
<td>AKO-14129</td>
<td>Controller</td>
<td>30 A (4) A s/EN60730-1</td>
<td>230 V ± 10%</td>
</tr>
</tbody>
</table>

2- Technical data

Temperature range according to type of sensor configured:
- NTC..............-50.0 °C to 999.9 °C (-58.0 °F to 211 °F)
- PTC...................0.1 °C/°F configurable by parameter P7

Input for probe:
- NTC....AKO-149XX
- PTC....AKO-1558XX

Thermometric accuracy:..................± 1 %

Probe tolerance at 25 °C:..................± 0.4 °C

Maximum input power:..................3 VA

Working ambient temperature:..................5 °C to 105 °C

Storage ambient temperature:..................-30 °C to 70 °C

Control device classification: Independent mounting, with characteristic of automatic operation Type 1.8 action, to be used in a clean situation, logical medium (software) class A and continuous operation. Degree of contamination 2: UN-EN 60730-1.

Double insulation between the power supply, the secondary circuit and the relay output.

Allocated pulse temperature:..................2500 V

Power output test temperature:..................75 °C

Accessible parts:..................75 °C

Parts that position active elements:..................125 °C

Voltage and current declared by the EMC tests:
- AKO-14012: 9.6 V - 182 mA
- AKO-14023: 207 V, 8 mA
- AKO-14112: 9.6 V - 182 mA
- AKO-14120: 105 V - 30 mA
- AKO-14123: 207 V, 9 mA
- AKO-14129: 207 V, 13 mA
- AKO-14139: 105 V - 34 mA

Current of radio jamming suppression test:..................270 mA

3- Installation

The controller should be installed in a place protected from vibrations, water and corrosive gases, and where ambient temperature does not surpass the value specified in the technical data. In order the controllers to be suitable having IP65 protection, the gasket should be installed properly between the apparatus and the perimeter of the panel cut-out where it is to be fixed. In order to give a correct reading, the probe should be installed in a place without heat influences other than the temperature that is to be measured or controlled.

3.1 Fastening:

To fix the unit, place the fasteners 1 over the sliders 2 as shown in the figure. Move the fasteners in the direction of the arrow. By pressing tab 3 fasteners may be moved in the opposite direction of the arrow.

3.2 Connection:

The probe and its lead should NEVER be installed in ducting along with power control or power supply wiring.

The power supply circuit should be connected with a minimum 2 A, 230 V switch located close to the unit. Power supply cables should be H05VV-F 2x0.5 m² or H05V-K 2x0.5 m². Section of connecting wires for relay contacts should be 2.5 mm².

AKO-14129, AKO-14139: Relay contact wires should be H07V2 or H07Z 2.5 mm².

4- Front Panel Functions

LED Compressor (Controllers function).
- Permanent: Relay (compressor) energized if control operates in cold.
- Flashing: Because of the temperature detected by Sensor, the Compressor relay should be energised, but is none to a programmed parameter.

LED Heat °C (Controllers function).
- Permanent: Relay energized if control operates in heat.
- Flashing: Because of the temperature detected by Sensor, the relay should be energised, but no to a programmed parameter.

LED Defrost °F (Controllers function).
- Permanent: Indicates defrost in operation.

LED °F
- Permanent: Degrees °F indicator.
- Flashing: Programming phase.

5- Adjustment and Configuration

It should only be programmed or modified by persons who are fully conversant with the equipment operation and parameters.

5.1 Set point temperature

The factory SET POINT default value is 0.0 °C.

- Press the key for at least 5 seconds to DISPLAY SET POINT. It displays the CURRENT SET POINT value and LED °C or °F starts flashing.
- Press the keys to CHANGE SET POINT to the required value.
- Pressing the keys simultaneously will ACCEPT THE NEW SET POINT. The display returns to the CURRENT TEMPERATURE display status and LED °C or °F stops flashing.

When the PA is displayed, PASSWORD programmed in LS parameter of tid menu should be entered to access the CURRENT SET POINT.

Press the keys simultaneously. 0 will be displayed to ENTER PASSWORD.

Press the keys to CHANGE NUMBER and DISPLAY PROGRAMMED password.

Press the keys simultaneously to ACCEPT PASSWORD. The CURRENT SET POINT value will be displayed and it can be already modified.

5.2 Parameters configuration

Level 1 Menus

- Press simultaneously the keys for at least 10 seconds. LED °C or °F will be flashing, as we are in the programming LEVEL 1 MENUS and the first menu “RE” is displayed.
- Press the key to access the next menu and the key to return to previous one.
- Pressing the keys simultaneously in the last parameter EP, the controller returns to the CURRENT TEMPERATURE display status and LED °C or °F will stop flashing.

When the PA is displayed, PASSWORD programmed in LS parameter of tid menu should be entered to access programming LEVEL 1 MENUS.

- Press the keys simultaneously. 0 will be displayed to ENTER PASSWORD.

- Press the keys to CHANGE NUMBER and DISPLAY PROGRAMMED.

- Press the keys simultaneously to ACCEPT PASSWORD. The first menu “RE” will be displayed.

Level 2 Parameters

In the desired menu of LEVEL 1 MENUS, press the keys simultaneously. LEVEL 2 PARAMETERS programming is accessed. The first parameter of the selected menu is displayed on the screen.

- Press the key to access the next parameter and the key to return to the previous one.

- Pressing the keys simultaneously in the last parameter EP, the controller returns to the LEVEL 1 MENUS.

Level 3 Values

- To DISPLAY the CURRENT VALUE of any parameter, select the required one and press the keys simultaneously. Once it is displayed, you can CHANGE VALUE, pressing the or the key.

- Press the keys simultaneously to ACCEPT THE NEW. The programming returns to LEVEL 2 PARAMETERS.
**Remark:** If no key is pressed for 25 seconds in either of the previous steps, the controller will automatically return to the CURRENT TEMPERATURE display status without modifying any of the parameters values.

6- Description of parameters and messages

Values in the Def. column are factory-set.

**AKO-14012, AKO-14023**

**AKO-14112, AKO-14120, AKO-14123, AKO-14125, AKO-14129, AKO-14139**

<table>
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<th>Level 2</th>
<th>Control</th>
<th>Level 3</th>
<th>Description</th>
<th>Values</th>
<th>Min</th>
<th>Def</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP</td>
<td>Set Point temperature</td>
<td>(°C/°F)</td>
<td>58.0/135</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO</td>
<td>Sensor calibration (Offset)</td>
<td>(°C/°F)</td>
<td>120.0</td>
<td>0.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CD</td>
<td>Sensor differential (Hysteresis)</td>
<td>(°C/°F)</td>
<td>20.0</td>
<td>20.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>Set Point upper limit (in cannot be set above this value)</td>
<td>(°C/°F)</td>
<td>350.0</td>
<td>99.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>Set Point lower limit (in cannot be set below this value)</td>
<td>(°C/°F)</td>
<td>350.0</td>
<td>50.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C4</td>
<td>Relay protection delay time Type 0=OFF from the last switch-off 1=ON at switch-on</td>
<td>(min)</td>
<td>255.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C5</td>
<td>Protection delay time for the option selected in parameter C4</td>
<td>(min)</td>
<td>255.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C6</td>
<td>Relay timer in ON in case of faulty sensor If C1=0 and C2=0, the relay will always be OFF disconnected</td>
<td>(min)</td>
<td>255.0</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C7</td>
<td>Relay timer in OFF in case of faulty sensor If C1=0 and C2=0, the relay will always be ON connected</td>
<td>(min)</td>
<td>255.0</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**dEF** Level 2 | DEFROST control (If P0=0 Direct, Cold) | Level 3 | Description | Values | Min | Def | Max |
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>d0</td>
<td>Defrost frequency</td>
<td>(h)</td>
<td>120.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d1</td>
<td>Defrost maximum duration</td>
<td>(min)</td>
<td>255.0</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d2</td>
<td>Type of message during defrost: (1=Current temperature display) (2=Defrost start temperature display) (3=Defrost display message)</td>
<td></td>
<td>255.0</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d3</td>
<td>Message maximum duration (Time added at the end of defrost)</td>
<td>(min)</td>
<td>255.0</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CnF** Level 2 | GENERAL STATUS | Level 3 | Description | Values | Min | Def | Max |
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>P0</td>
<td>Type of operation (0=Direct, Cold) (1=Reverse, Heat)</td>
<td></td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>Delay of all functions on power supply switch on</td>
<td>(min)</td>
<td>255.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P2</td>
<td>Allocation of password to set point (0=Without allocation) (1=With allocation of L5 password)</td>
<td></td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td>Initial parameters: (1=YES, configure to “Def” and exit programming)</td>
<td></td>
<td>255.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P5</td>
<td>Address for units with communication</td>
<td></td>
<td>255.0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P7</td>
<td>Temperature display mode: (1=Outliers in °C) (2=Integers in °C) (3=One decimal in °C)</td>
<td></td>
<td>3</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P9</td>
<td>Sensor type selection: (1=NTC) (2=PRT)</td>
<td></td>
<td>255.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**tid** Level 2 | ACCESS AND INFORMATION control | Level 3 | Description | Values | Min | Def | Max |
<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>L5</td>
<td>Access to password parameters and information</td>
<td></td>
<td>99.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L6</td>
<td>Parameters transfer: (0=Disabled) (1=Send) (2=Receive)</td>
<td></td>
<td>255.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PU</td>
<td>Program version (Information)</td>
<td></td>
<td>255.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P5</td>
<td>Program revision (Information)</td>
<td></td>
<td>255.0</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remark:** When time parameters are modified, the new values are applied when the current cycle is completed. In order for it to have an immediate effect, switch the controller off and then on again.

**Messages**

**PA**
Password request to enter programming parameters or SET POINT

**dEF**
It indicates defrosting is being carried out. In order to display “dEF” during defrosting, it is essential that parameter d2 is set to option 2.

**CPY**
Parameters received from the parameter server.

**E1**
Sensor failure (Open circuit, crossed, NTC: temp. > 110°C or temp. < -55°C PTc: temp. > 150°C or temp. < -58°C)

**EEE**
Memory failure

7- Parameters transfer

**Portable server**

AKO-14918 portable server, with no power supply, in which parameters programmed in a powered controller can be copied by transfer. Parameters can be transferred again from the server to other identical powered controllers.

Storage dump or fast copy of the parameters entered in the portable server to the controller: Press the key while the controller is being connected to the power supply until the display shows CPY, indicating that the transfer was made correctly. Disconnect the controller and reconnect it to the power supply. Storage dump can also be done from parameter L6=2.

8- Relay operation and control

**Operation for COLD (P0=0)**

**Operation for HEAT (P0=1)**

9- Maintenance

Clean the controller surface with a soft cloth, soap and water. Do not use abrasive detergents, petrol, alcohol or solvents.

10- Warnings

The use of the unit without observing the manufacturer’s instructions may alter its safety qualification.

To ensure correct operation of the apparatus, only NTC or PTC type probes supplied by AKO should be used.

Between -40°C and +20°C, when the NTC probe is extended up to 1,000 m with minimum 0.5 m² cable, deviation will be less than 0.25 °C (Probe extension cable ref. AKO-15586).