CAMCtrl Plus Temperature Controller

Controller with magnetic switch for service operation.
Electric panels for controlling and operating evaporator for refrigeration services with condenser equipments that already include an electric panel for power and operating of the compressor and condenser.
To control refrigeration services with the following elements: liquid solenoid, single-phase evaporator fans, air or electric defrosting.
Temperature register incorporated (1 channel), Switch for refrigerator interior light.
Buzzer and relay alarm signal. Graphic display.

1- Warnings
Using the controller without following the manufacturer’s instructions may alter its safety requirements.
To ensure correct operation of the apparatus, only NTC type probes supplied by AKO should be used. Between –40 °C and +20 °C, when the probe is extended up to 1000 m with minimum 0.5 mm² cable, deviation will be less than 0.25 °C (probe extension cable ref. AKO-15586).
The AKO-5004 software will identify any of the 3 models as “AKO-15633”.

2- Versions and References

<table>
<thead>
<tr>
<th>Model</th>
<th>Fan</th>
<th>Solenoid</th>
<th>Air</th>
<th>Defrosting</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>AKO-15641</td>
<td>475W</td>
<td>230V</td>
<td>Si</td>
<td>-</td>
<td>230V~ +10% -15% 50/60Hz ± 3Hz</td>
</tr>
<tr>
<td>AKO-15642</td>
<td>475W</td>
<td>230V</td>
<td>-</td>
<td>2.500W</td>
<td>230V~ +10% -15% 50/60Hz ± 3Hz</td>
</tr>
<tr>
<td>AKO-15643</td>
<td>475W</td>
<td>230V</td>
<td>-</td>
<td>5.500W</td>
<td>230V~ +10% -15% 50/60Hz ± 3Hz</td>
</tr>
</tbody>
</table>

3- Installation
The controller should be installed in a place protected from vibrations, water and corrosive gases, and where ambient temperature does not exceed the value specified in the technical data. In order for the controllers to have IP65 protection degree, the gasket should be properly installed between the apparatus and the perimeter of the panel cut-out where it is to be fitted. 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 Wall Mounting
- Remove cover T from the equipment (Fig.1).
- Open the equipment and separate the front part of the housing (Fig.2).
- Drill the holes for the glands that are necessary for the cables to pass through, guided by the pre-cut centres on the sides of the housing.
- Drill 3 holes for anchoring the housing at the centres indicated 1, 2, 3 (Fig.3).
- Drill 3 holes in the wall, in accordance with the anchoring holes made previously in the equipment.
- Anchor the glands to the equipment.
- Insert and tighten the 3 screws+plug through the housing, on the 3 holes drilled in the wall.
- Pass the cable through the glands.
- Connect to connector strip B.
- Attach the front to the housing, through the panel and tighten the 45 mm screws through holes D, E, F, G, H, J (Fig.1 and Fig.3).
- Connect to connector strip A.
- To facilitate installation, part of the internal wiring is supplied disconnected: connect according to Figure 5.
- Close cover T, insert and tighten screws A and C (Fig.1).

3.2 Panel Mounting (maximum panel thickness: 3mm)
- Remove cover T from the equipment (Fig.1).
- Open the equipment and separate the front part of the housing (Fig.2).
- Replace the joint installed at the front by the panelling joint, ensuring that it is in the right position.
- Make an opening in the panel with the dimensions indicated (Fig.4).
- Drill the holes for the glands that are necessary for the cables to pass through, guided by the pre-cut centres on the sides of the housing.
- Finish drilling holes G and J with a 4 mm bit. (Fig.3).
- Anchor the glands to the equipment.

3.4 Connection

CONNECT THE BATTERIES PRIOR TO STARTING UP THE equipment
The probe and its lead should NEVER be installed in the same ducting as power or control cables. Always disconnect the power supply when making the connections.
The power-supply circuit should be fitted with a main switch and residual current protection outside the panel (as per E.E.E.T.).
Power supply cables should be H05VV-F 2x2.5 mm² or H05V-K 2x2.5 mm².

IMPORTANT: The function of every probe entry depends on its configuration (See table “Assignment of entries”).
To obey EN12830 you must configure the control probe and the register probe separately.

- Pass the cable through the glands.
- Connect to connector strip B.
- Attach the front to the housing, through the panel and tighten the 45 mm screws through holes D, E, F, G H, J (Fig.1 and Fig.3).
- Connect to connector strip A.
- To facilitate installation, part of the internal wiring is supplied disconnected: connect according to Figure 5.
- Close cover T, insert and tighten screws A and C (Fig.1).
4.4 Status
View the status of the functions performed by the control.

- **COOL (Compressor)**
  - Permanent: Cooling relay COOL (compressor) energised.
  - Flashing: Because of the temperature detected by probe 1, the COOL relay should be energised, but is not due to a programmed parameter.

- **FAN**
  - Permanent: FAN relay energised
  - Flashing: FAN relay energised.

- **DEFROST**
  - Permanent: Indicates defrosting in operation.
  - Flashing: Indicates last defrost ended.

- **CONTINUOUS CYCLE**
  - Permanent: Indicates that the continuous cycle is active.
  - Flashing: Indicates that the continuous cycle is active.

- **ALARM ON**
  - Permanent: Alarm indicator activated.
  - Flashing: Indicates the alarm is on.

- **ALARM MUTED**
  - Permanent: Indicates last defrost ended by time.

- **DEFROST ENDED BY TIME**
  - Permanent: Indicates the defrost cycle is active.

- **ALARM MUTED**
  - Permanent: Indicates that the continuous cycle is active.

- **ENERGY SAVING**
  - Permanent: Indicates that energy saving function is on.
  - Flashing: HACCP (Hazard Analysis and Critical Control Point) alarm stored.

- **AUX (Auxiliary)**
  - Flashing: AUX relay activated by digital input.
  - Flashing: AUX relay operating as a second defrosting device.

- **AUX (Auxiliary)**
  - Flashing: AUX relay operating as a second defrosting device.

- **AUX (Auxiliary)**
  - Flashing: AUX relay active copying relay status for compressor.

4.5 Browser
The key function help screen appears after any key on the browser is pressed.

- **UP key]**
  - When pressed for 5 seconds, manual de-frost is activated/deactivated for the programmed duration.
  - In programming, it moves the selection downwards.
  - In programming, it moves the selection upwards.
  - In programming, it makes the displayed value increase.

- **LEFT key]**
  - Press to activate / deactivate the AUX relay.
  - In programming, it makes the selection to the left.
  - In programming, it moves the selection downwards.
  - In programming, it makes the displayed value reduce.

- **RIGHT key]**
  - When pressed for at least 5 seconds, the SP Set Point temperature is displayed.
  - In programming, it moves the selection downwards.
  - In programming, it makes the displayed value reduce.

- **DOWN key]**
  - When pressed for at least 5 seconds, the SP Set Point temperature is displayed.
  - In programming, it makes the selection to the right.

- **SET + keys (CONTRAST)**
  - When pressed for at least 5 seconds, the screen contrast can be adjusted. Once inside the contrast adjustment screen, press ] or [ to increase or reduce the contrast.

- **SET + keys (HACCP)**
  - When pressed for at least 5 seconds, the HACCP (Hazard Analysis and Critical Control Point) alarm is displayed.

4- Front Panel Functions

- **Time and Battery**
  - View time in format: YY/MM/DD HH:MM:SS day of the week
  - Configurable in menu: [ ] (CLOCK)

- **Temperatures**
  - View the temperatures of the selected probes in °C or in °F
  - Configurable in menu: [ ] (GENERAL STATUS)

4.3 Description
This allows a brief description of the facility to be inserted or a name to be given to the equipment.

- **Configuration**
  - Configurable by pressing the SET + keys for 5 seconds.

- **Peaking**
  - When pressed for at least 5 seconds, the ALARM indicator flashes.

- **ESCAPE**
  - Accepts the alarms and disconnects alarm outputs.
  - When pressed for 5 seconds, it turns off the unit leaving it in STAND-BY. The display shows 0 when the unit is disconnected.
  - In programming, it permits leaving a parameter without accepting the changes, return to the previous menu and exit programming.

- **? key**
  - When pressed for 5 seconds, manual defrost is activated/deactivated for the programmed duration.
  - In programming, it moves the selection downwards.
  - In programming, it moves the selection upwards.
  - In programming, it makes the displayed value increase.

- **? key**
  - By pressing, it turns on/off the defrosting relay. The lighting relay continues operating even if the unit is on OFF mode.
  - In programming, the parameter or selected function help screen is displayed.

- **SET + keys (CONTRAST)**
  - When pressed for at least 5 seconds, the screen contrast can be adjusted. Once inside the contrast adjustment screen, press ] or [ to increase or reduce the contrast.

- **SET + keys (HACCP)**
  - When pressed for at least 5 seconds, the HACCP (Hazard Analysis and Critical Control Point) alarm is displayed.

- **Screen cutout**
  - The screen cutout can be adjusted. Once inside the contrast adjustment screen, press ] or [ to increase or reduce the contrast.

- **Description of event**
  - Date and time of event
  - Duration of event in hours
  - Recording event
  - Maximum temperature value

- **Power failure**
  - The power failure can be adjusted. Once inside the contrast adjustment screen, press ] or [ to increase or reduce the contrast.
5- Adjustment and Configuration

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

5.1 Set Point temperature

The factory SET POINT default value is 0.0 °C. - Press ▼ key for 5 seconds to display SET POINT. It displays the current SET POINT value.
- Press the browser keys to change the Set Point to the required value.
- Press SET key to accept the new SET POINT. The display returns to the current temperature display status.

When PASSWORD is displayed, PASSWORD programmed in PASSWORD parameter of menu should be entered to access the current SET POINT.
- Press the browser keys to enter the programmed (Password).
- Press SET key to accept password. The current SET POINT value will be displayed and it can be already modified.

5.2 Parameter configuration

Level 1 Menus
- Press the SET key for 5 seconds to view the MENUS.
- Press the browser keys to select the menu.
- Press the SET key to access the parameters of the selected menu. If PASSWORD appears, enter the access code (password) programmed in the ACCESS CODE parameter of the menu to access the current adjustment (Set Point).
- Press the browser keys to enter the programmed code (Password).
- Press the SET key to accept the code. The menus that can be modified are displayed.

Level 2 Parameters
- In the desired menu of level 1 MENUS, press SET key. Level 2 PARAMETERS programming is accessed. The first parameter of the selected menu is displayed on the screen.
- Press the navigation keys to select the parameter.

Level 3 Values
- To display the current value of any parameter, select the required one and press SET key simultaneously. Once it is displayed, press the browser keys to change the value.
- Press SET key to accept the new value. 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.

Level 1 Menus and Description

<table>
<thead>
<tr>
<th>Level 2</th>
<th>REFRIGERATION control (Compressor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 3 Description</td>
<td>Values</td>
</tr>
<tr>
<td>Set Point</td>
<td>(ºC/ºF)</td>
</tr>
<tr>
<td>Probe1 differential (Hysteresis)</td>
<td>(ºC/ºF)</td>
</tr>
<tr>
<td>Calibration of probe</td>
<td>(ºC/ºF)</td>
</tr>
<tr>
<td>Set Point upper limit (ºC/ºF)</td>
<td>(ºC/ºF)</td>
</tr>
<tr>
<td>Set Point lower limit (ºC/ºF)</td>
<td>(ºC/ºF)</td>
</tr>
<tr>
<td>Compressor protection delay type: OFF/ON (from the last switch-off to switch-on)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressor protection delay time</td>
<td>(min)</td>
</tr>
<tr>
<td>COOL&quot; (compressor) relay in ON in case of faulty probe 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;COOL&quot; (compressor) relay in ON in case of faulty probe 1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressor starts when opening door?</td>
<td>(NO= Connected) (YES=Disconnected)</td>
</tr>
</tbody>
</table>

Level 2 - DEFROST control

<table>
<thead>
<tr>
<th>Level 3 Description</th>
<th>Values</th>
<th>Min</th>
<th>Def.</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defrost type</td>
<td>EH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defrost count</td>
<td>(Frequency)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressor operation sum</td>
<td>(RTC: Real time clock)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defrost frequency</td>
<td></td>
<td>1</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Defrost maximum duration</td>
<td></td>
<td>0</td>
<td>30</td>
<td>255</td>
</tr>
<tr>
<td>Type of message during defrost:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Current temperature display)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Display DIFROST message)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Message maximum duration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time added at the end of defrost</td>
<td>(min)</td>
<td>0</td>
<td>5</td>
<td>255</td>
</tr>
<tr>
<td>Defrost time temperature by probe 2</td>
<td>(ºC/ºF)</td>
<td>-40.0</td>
<td>8.0</td>
<td>99.9</td>
</tr>
<tr>
<td>Defrost start-up when equipment switched on:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Defrost start-up delay on equipment switch-on</td>
<td>(min)</td>
<td>0</td>
<td>1</td>
<td>255</td>
</tr>
<tr>
<td>Signals if defrost ends due to maximum time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Drip time, compressor stops and FAN relay-off when defrost ends</td>
<td>(min)</td>
<td>0</td>
<td>1</td>
<td>255</td>
</tr>
</tbody>
</table>

Level 2 - FANS control (Evaporator)

<table>
<thead>
<tr>
<th>Level 3 Description</th>
<th>Values</th>
<th>Min</th>
<th>Def.</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fans stop temperature by probe 2</td>
<td>(ºC/ºF)</td>
<td>-40.0</td>
<td>4.0</td>
<td>99.9</td>
</tr>
<tr>
<td>Probe 2 differential</td>
<td>(ºC/ºF)</td>
<td>0.1</td>
<td>1.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Stop fans when compressor stops?</td>
<td>(NO= connected) (YES=disconnected)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Level 2: FANS Control (Evaporator)

**Level 2 Description**

<table>
<thead>
<tr>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start-up delay after defrost (min.)</td>
<td>0</td>
<td>3</td>
<td>255</td>
</tr>
<tr>
<td>Compressor stops when door opened? (No=connected) (Yes=disconnected)</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

### Level 2: ALARM Control (Visual)

**Level 2 Description**

<table>
<thead>
<tr>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration of temperature alarms (Relative to SP) (Absolute)</td>
<td>5ºF</td>
<td>5ºF</td>
<td>5ºF</td>
</tr>
<tr>
<td>Maximum alarm in probe 1 (ºC/ºF)</td>
<td>40.0</td>
<td>50.0</td>
<td>320.0</td>
</tr>
<tr>
<td>Minimum alarm in probe 1 (ºC/ºF)</td>
<td>-40.0</td>
<td>50.0</td>
<td>320.0</td>
</tr>
<tr>
<td>Temperature alarm delay from moment at which they should operate due to temperature (min.)</td>
<td>0</td>
<td>30</td>
<td>255</td>
</tr>
<tr>
<td>Temperature alarm delay from the end of a defrost (min.)</td>
<td>0</td>
<td>0</td>
<td>255</td>
</tr>
<tr>
<td>Temperature alarm delay from digital input disabling</td>
<td>(if programmed as 'Door contact')</td>
<td>(if programmed as 'Door contact')</td>
<td>(if programmed as 'Door contact')</td>
</tr>
<tr>
<td>Temperature alarm delay from digital input enabling</td>
<td>(if programmed as 'Door contact')</td>
<td>(if programmed as 'Door contact')</td>
<td>(if programmed as 'Door contact')</td>
</tr>
</tbody>
</table>

### Level 2: DIGITAL INPUTS

**Level 2 Description**

<table>
<thead>
<tr>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital input N°1 configuration (Disabled) (Door Contact) (External alarm)</td>
<td>Disc.</td>
<td>Disc.</td>
<td>Disc.</td>
</tr>
<tr>
<td>Digital input N°2 configuration (Disabled) (Door Contact) (External alarm)</td>
<td>Disc.</td>
<td>Disc.</td>
<td>Disc.</td>
</tr>
<tr>
<td>Digital input N°3 configuration (Disabled) (Door Contact) (External alarm)</td>
<td>Disc.</td>
<td>Disc.</td>
<td>Disc.</td>
</tr>
<tr>
<td>Alarm delay of digital input N°1</td>
<td>(in)</td>
<td>(in)</td>
<td>(in)</td>
</tr>
<tr>
<td>Polarity of digital input N°1 (Normal open) (Normal closed)</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Polarity of digital input N°2 (Normal open) (Normal closed)</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Alarm delay of digital input N°2</td>
<td>(min.)</td>
<td>(min.)</td>
<td>(min.)</td>
</tr>
<tr>
<td>Pump down On delay</td>
<td>(min.)</td>
<td>(min.)</td>
<td>(min.)</td>
</tr>
</tbody>
</table>
| **NOTE:** 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.

### Level 2: AUX RELAY

**Level 2 Description**

<table>
<thead>
<tr>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defrost 2 maximum duration</td>
<td>(min.)</td>
<td>(min.)</td>
<td>(min.)</td>
</tr>
<tr>
<td>Defrost 2 final temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defrost 2 Final Temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Defrost 2 Probe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Disabled) (probe 2) (probe 3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump down duration</td>
<td>(min.)</td>
<td>(min.)</td>
<td>(min.)</td>
</tr>
<tr>
<td>Pump down On delay</td>
<td>(sec.)</td>
<td>(sec.)</td>
<td>(sec.)</td>
</tr>
</tbody>
</table>

### Level 3: CONTINUOUS CYCLE

**Level 3 Description**

<table>
<thead>
<tr>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous cycle duration</td>
<td>(h)</td>
<td>(h)</td>
<td>(h)</td>
</tr>
</tbody>
</table>

### LEVEL 3: ENERGY SAVING

**Level 3 Description**

<table>
<thead>
<tr>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Point during energy saving (ºC/ºF)</td>
<td>40.0</td>
<td>0</td>
<td>320.0</td>
</tr>
<tr>
<td>Energy saving duration</td>
<td>(h)</td>
<td>(h)</td>
<td>(h)</td>
</tr>
</tbody>
</table>
Mounting warnings and electrical diagrams

WARNING!!

Disconnect mains power before performing any operation inside the electric panel.
All wiring must comply with the regulations in force and must be performed by authorized personnel.
Perform only the connections described in the electrical diagrams.
Use of the electrical panel contrary to the manufacturer’s instructions may affect its safety requirements.

Working ambient temperature: +5 ºC to + 50 ºC
Assigned insulation voltage Ui = 440 V~
Electric panels with IP65 protection degree
CEM 1 environment
Connectors for copper conductors
Resistance to short circuits Isc=6 kA

Panel installation:
Do not knock or perform rough movements in the panel.
Perform connections according to installation manual.
The probe and its lead should NEVER be installed in the same ducting as power or control cables.
The earth connectors in the panels are installed to ensure continuity of the earth connection; however, the earth connection is not made by the connector and should be made outside the panel.
The neutral systems are TT or TNS type. The IT system cannot be used. The magneto-thermal protection cutout switches are phase/s + neutral, C curve, ensuring sectioning and protection against voltage spikes.
Close panel when not working on it.

Connection of main switch and residual current protection outside the electric panel as per the electrotechnical regulations for low voltage.

Verifications before panel start-up:
The power voltages and frequencies must be those shown in the table and diagram corresponding to each panel model.
Check that there are no loose parts or foreign bodies on the connections or components.
Check that there is no dust or moisture inside the panel.
Check that all components are properly fastened.
Check that power connection screws are properly tightened.
Check that power conductors are properly connected.
Check that outside lines are properly insulated and do not exert mechanical force on the connections inside the panel.

Verifications during panel start-up:
Check that electric arcing does not occur.
Check that relays and contacts do not produce rattles.
Check that cables, controllers and the rest of the equipment do not overheat.

Verification after first 24 hours of operation:
Check that overheating does not occur.
Tighten screws and power connections.

Periodic preventive maintenance:
The panel should always be kept closed using the fasteners.
Tighten power connections annually.
Check for wear of the equipment annually.
Clean the panel outside surface with a soft cloth, soap and water.
Do not use abrasive detergents, petrol, alcohol or solvents.

IMPORTANT: The function of every probe entry depends on its configuration (See table “Assignment of entries”)

Electrical diagrams

AKO-15641