AKO-16524A  AKO-16525A
Advanced temperature controller for cold rooms

User manual
AKO Electromecánica reserves the right to make any non-metrology modification to the documentation or the equipment without previous notice.

To maximise the service life of our equipment, these recommendations should be followed:

- Do not expose electronic equipment to dust, dirt, water, rain, humidity, high temperatures, chemicals or corrosive substances of any sort.
- Do not submit the equipment to blows or vibrations nor try to manipulate it differently from shown in the manual.
- Never exceed the specifications and limitations indicated in the manual.
- Always respect the specified ambient working and storage conditions.
- During and after installation, avoid leaving loose, broken, unprotected or damaged wiring, since they might constitute a risk for the equipment and its users.

AKO Electromecánica reserves the right to make any non-metrology modification to the documentation or the equipment without previous notice.

AKO Electromecánica thanks and congratulates you for purchasing our product, in whose development and manufacture the most innovative technology has been used, as well as strict production and quality control processes.

Our commitment to satisfy our customers and our continuous efforts to improve every day can be seen in the various quality certifications we have obtained.

This is a high performance, high technology product. The operation and final performance of the equipment depend on proper planning, installation, configuration and commissioning. Read this manual carefully before installation, and always follow its instructions.

Only qualified personnel should install or perform technical assistance on this product.

This product is designed to be used in the applications described in the product manual. AKO Electromecánica gives no guarantee of its operation in any use not foreseen in the manual, and is not responsible for any damage resulting from improper use, configuration, installation or commissioning.

It is the responsibility of the installer and the customer to comply with and ensure others comply with all regulations applicable to installations incorporating our products. AKO Electromecánica is not responsible for any damage caused by non-compliance with regulations. Follow strictly the instructions given in this manual.
Presentation

The AKO-16524A / 16525A advanced controller for cold room stores has a SELFDRIVE operating mode that automatically controls (without parametrisation) the fans and adaptively minimises defrosts to optimise the performance of the cold room store: maximising time in set point and minimising costs linked to energy consumption and wear of components.

In order to evaluate the performance of the refrigeration facility in detail, the CAMM (AKO-58500) module and the applications for the AKO CAMM Tool and AKO CAMM Fit mobile devices (available in App Store and in Google Play) are included with the AKO-16524A controller. These applications provide several indicators on the actual operation of the cold room that allow diagnosing possible design, usage or maintenance problems in the installation.

Warnings

- If the equipment is used without adhering to the manufacturer’s instructions, the device safety requirements could be compromised. Only probes supplied by AKO must be used for the unit to operate correctly.
- From -40 °C to +20 °C, if the NTC probe is extended to 1000 m with at least a 0.5 mm² cable, the maximum deviation will be 0.25 °C (cable for probe extension ref. AKO-15586. Earth the cable mesh at one end only).
- Only NTC type probes supplied by AKO must be used for the appliance to operate correctly.
- It must be installed in a place protected from vibrations, water and corrosive gases, where the ambient temperature does not exceed the value indicated in the technical data.
- For the reading to be correct, the probe must be used in a place without thermal influences apart from the temperature you want to measure or control.
- IP65 protection degree is only valid with the protection cover closed.
- The IP65 protection degree is only valid if the cables enter the device through a tube for electric conduits + gland with IP65 or above. The size of the glands must be suitable for the diameter of the tube used.
- Do not spray the unit directly with high-pressure hoses, as this could damage it.

Maintenance

Clean the surface of the unit with a soft cloth, water and soap.
Do not use abrasive detergents, petrol, alcohol or solvents, as this might damage the unit.
Description

Display

Keypad

Indicators

**Constant:** Stand-By Mode activated. Regulation is paused.
**Flashing:** Controlled stop process for the regulation in progress.

**Constant:** Cold room door open.
**Flashing:** The door has been open for a longer time than defined in parameter A12.

There is an active alarm, but not an active HACCP alarm.

**Constant:** HACCP alarm active.
**Flashing:** HACCP alarm recorded and unconfirmed. Press the key to confirm an HACCP alarm.

**Constant:** The SELFDRIVE mode is active.
**Flashing:** An error has been detected in the SELFDRIVE mode.

**Constant:** Evaporator fans active.
**Flashing:** The evaporator fans should be active but a delay is preventing this.

**Constant:** The cold solenoid is active.
**Flashing:** The solenoid should be active but a delay or protection is preventing this.

**Constant:** Compressor active.
**Flashing:** The compressor should be active but a delay or protection is preventing this.

Defrost relay active.
Continuous cycle mode active.
Cold room light active.
Alarm in progress muted.

°F °C Temperature displayed in °Fahrenheit / °Centigrade.

**PRG** Programming mode active.

**Constant:** CAMM module in operation.
**Flashing:** Malfunction in CAMM module.

Bluetooth activated (only with CAMM module).
Keypad

Pressing it for 3 seconds activates/deactivates the Stand-By mode. In this mode, regulation is paused and the icon is displayed.
In the programming menu, it exits the parameter without saving changes, returns to the previous level or exits programming.

Pressing once without holding displays the temperature of probe S2 for 2 seconds (if it is enabled).
Pressing it for 3 seconds starts/stops the defrost.
In the programming menu, it allows scrolling through the different levels, or during the setting of a parameter, changing its value.

A brief press shows the SELFDRIVE mode operating alerts.
Pressing it for 3 seconds activates/deactivates the continuous cycle mode.
In the programming menu, it allows scrolling through the different levels, or during the setting of a parameter, changing its value.

Pressing once without holding activates/deactivates the cold room light.
Pressing it for 3 seconds accesses the condensed programming menu.
Pressing it for 6 seconds accesses the expanded programming menu.
In the programming menu, it accesses the level shown on the display or, during the setting of a parameter, accepts the new value.

Pressing once without holding displays the current effective value of the Set Point, taking into consideration temporary modifications by other parameters (C10 or C12).
When an alarm is in progress, pressing once without holding mutes the acoustic alarm.
Pressing for 3 seconds accesses the Set Point setting.

STAND-BY
If the regulation cannot be instantly stopped due to its configuration, a controlled stop process starts and the icon flashes. To stop the controlled stop process and force the step to Stand-by, press the Stand-by key again for 3 seconds.
Installation

- Remove the bezels (1)
- Make a 1/4 turn of the screws (2) anti-clockwise and open the door (3).
- Install the necessary glands (4 / 5) by drilling holes in the points indicated on the box.
- Mark and make the holes in the wall with the aid of the template included.
- Fix the device to the wall. If it is a brick wall, use the screws and plugs supplied; if the wall is made of sheet metal (cold room store), use the screws provided without plugs (6).
- Wire the device by following the recommendations indicated on p. 7.
- Close the cover (3), tighten the screws (2) and replace the bezels (1).
Wiring

Always disconnect the power supply to do the wiring. The probes and their cables must NEVER be installed in a conduit together with power, control or power supply cables.

For disconnection, the power supply circuit must be equipped with at least a 2 A, 230 V switch, located near the device. The power supply cable shall be of the H05VV-F or NYM 1x16/3 type. The cross-section to be used will depend on the local regulations in force, but must never be less than 1.5 mm$^2$.

Cables for relay or contactor outputs must have a cross-section of 2.5 mm$^2$ and allow working temperatures equal to or over 70 °C and must be installed with as little bending as possible.

The 120/230 V– wiring area must be kept clear of any other external element.

The wiring to be undertaken depends on the option selected in the initial configuration wizard (see p. 10). Use the appropriate diagram based on the option selected.

Check the available options on the diagram sheet included with your device.

The AKO-16523D model has a contactor which allows for the connection of three-phase defrost resistors, a three-phase compressor or three-phase fans, according to your installation’s requirements. Check how to connect it on the diagram sheet included with your device.

IMPORTANT:
- The AUXILIARY relays are programmable, and their operation depends on the configuration.
- The function of the digital inputs depends on the configuration.
- The recommended currents and powers are the maximum working currents and powers.
Installation of the probes

To achieve maximum performance from the advanced controller, the correct installation of the probes is key, as they are responsible for calculating the evaporator’s thermal transfer coefficient, evaluating the start and end of the defrosts and diagnosing problems in the evaporator.

Material included
- 4 mm hermetic evaporator probe, 1.5 m of cable.
- Ambient probe
- 1 mounting clip for 10-13 mm coil
- 1 mounting clip for 14-18 mm coil
- 1 mounting clip for 19-21 mm coil
- 1 mounting clip for 22-25 mm coil

Location of the ambient probe
The probe should be located in a place that does not directly receive the flow of cold air from the evaporator. Preferably in its air aspiration area.

Location of the evaporator probe
The probe must be located as near as possible to the inlet of refrigerant from the evaporator (close to the expansion valve) in the finned area.
In certain evaporators, for example cubic ones, this inlet may be located on the front part of the battery, just behind the fan.
If defrost is done by electric heat, the probe must be located far away from them and, if possible, in the area of the evaporator where defrosting is slower, in other words, in the last area to defrost.
If the two conditions are not possible, the best possible compromise must be looked for.

Select the appropriate clip depending on the size of its evaporator pipe.
Attach the probe to the pipe using the clip, making sure that its end is in direct contact with the tube.
Bend the fins of both ends of the probe to increase the fixing and contact surface.
Installation of the CAMM AKO-58500 module included

Insert the CAM **AKO-58500** module in the pre-installed base as shown in the picture.

In combination with the application for AKO CAM Tool mobile devices, the CAM module provides the device with multiple functions:

- Data logging
- Activity summaries
- Logging of configuration changes
- Logging of events and alerts
- Remote configuration
- Remote control of functions
- Clock functions in real time
- Energy efficiency indicators

**Link with the AKO CAMM Tool / AKO CAMM Fit application**

The use of both applications requires logging in with a valid email.

- After 1 minute without activity between the application and the CAMM module, communication is disconnected, to re-establish it, return to screen "Device list" and press the button.

- Open app AKO CAMM Tool / AKO CAMM Fit in your mobile and enter the access data.

- The app makes a device search and displays the results on screen.

- Choose the device you want, in a few seconds the app requests the Bluetooth link code (by default 123456).

- Some Android devices, during the linking process, may tell the user to access settings / Bluetooth and link from there, looking for the device via its serial number.
Initial configuration (wizard)

The first time the unit receives the power supply, it will enter into ASSISTANT mode. The display will show the message \textit{In1} flashing at 0.

\textbf{Step 1:}
Select the most suitable In1 option based on the type of installation to be carried out and press \textbf{SET}. The available options will be shown in the following table:

<table>
<thead>
<tr>
<th>In1</th>
<th>Type of installation</th>
<th>Parameters</th>
<th>Diagram to be used</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Cold regulation: demo mode: it displays the temperature but does not regulate the temperature or activate relays.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Solenoid</td>
<td>No</td>
<td>Electric</td>
</tr>
<tr>
<td>2</td>
<td>Solenoid + compressor</td>
<td>Yes</td>
<td>Electric</td>
</tr>
<tr>
<td>3</td>
<td>Solenoid + compressor</td>
<td>No</td>
<td>Electric</td>
</tr>
<tr>
<td>4</td>
<td>Solenoid</td>
<td>No</td>
<td>Air</td>
</tr>
<tr>
<td>5</td>
<td>Solenoid + compressor</td>
<td>Yes</td>
<td>Air</td>
</tr>
<tr>
<td>6</td>
<td>Solenoid + compressor</td>
<td>No</td>
<td>Air</td>
</tr>
<tr>
<td>7</td>
<td>Solenoid + compressor</td>
<td>Yes</td>
<td>Hot gas</td>
</tr>
<tr>
<td>8</td>
<td>Solenoid + compressor</td>
<td>No</td>
<td>Hot gas</td>
</tr>
</tbody>
</table>

If options 2, 5, or 7 are chosen, check the configuration of parameter I11 according to the pressure switch type used. (See diagram included with the device).

\textbf{Step 2:}
Use keys \textbf{▲} and \textbf{▼} to enter the desired Set Point value and press \textbf{SET}. The configuration wizard has finished. The unit will begin to regulate the temperature.

If this is not the first time you run the wizard, after completing the last step the display will show the message \textit{dFP} (default parameters). You may choose between two options:

- \textbf{0}: Only change the parameters which affect the wizard. The other parameters will remain the same.
- \textbf{1}: All parameters return to their factory setting except those which have been modified by the wizard.

The configuration wizard will not reactivate. To reactivate it, activate the Stand-By mode (by pressing the \textbf{Ω} key for 3 seconds) and wait until the unit completely halts regulation (the \textbf{Ω} indicator will light up permanently) and press in this order the following keys (one after the other, not at the same time) \textbf{▲}, \textbf{▼} and \textbf{SET}.

**STAND-BY**
If the regulation cannot be instantly stopped due to its configuration, a controlled stop process starts and the \textbf{Ω} icon flashes. To stop the controlled stop process and force the step to Stand-by, press the Stand-by key again for 3 seconds.

* o00=2 in AKO-16523 / 16520, o00=0 in AKO-16523P / 16520P / 16523D.
### Operation

#### MESSAGES

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Message Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDi</td>
<td>Pump down malfunction error (stop), the time configured in parameter C20 has been exceeded (see p. 17). Only displayed on screen.</td>
</tr>
<tr>
<td>LPe</td>
<td>Pump down malfunction error (start-up), the time configured in parameter C19 has been exceeded (see p. 17). Only displayed on screen.</td>
</tr>
<tr>
<td>E/e2/e3</td>
<td>Probe 1/2/3 failure (open circuit, crossed circuit or temperature outside the limits of the probe) (Equivalent limits in °F). Only E2 and E3: Damp evaporator probe (see p. 25). Activates the alarm relay and the audible alarm. Flashing with temperature: Probe error 1/2/3 in SELFDRIVE mode. Flashing with CRL: Probe error 1/2/3 during the calibration.</td>
</tr>
<tr>
<td>ADO</td>
<td>Open door alarm. Only if the door remains open for a longer time than defined in parameter A12 (see p. 26). Activates the alarm relay and the audible alarm.</td>
</tr>
<tr>
<td>AHe</td>
<td>Maximum temperature in control probe alarm. The temperature value programmed in A1 has been reached (see p. 25). Activates the alarm relay and the audible alarm.</td>
</tr>
<tr>
<td>AlA</td>
<td>Minimum temperature in control probe alarm. The temperature value programmed in A2 has been reached (see p. 25). Activates the alarm relay and the audible alarm.</td>
</tr>
<tr>
<td>AeS</td>
<td>External alarm activated (by digital input) (see p. 25). Activates the alarm relay and the audible alarm.</td>
</tr>
<tr>
<td>AeS</td>
<td>Severe external alarm activated (by digital input) (see p. 25). Activates the alarm relay and the audible alarm.</td>
</tr>
<tr>
<td>Adt</td>
<td>Alarm for defrost completed due to time-out. The time set in d1 has been exceeded (see p. 27). Activates the alarm relay and the audible alarm.</td>
</tr>
<tr>
<td>HCP</td>
<td>HACCP alarm. The temperature has reached the value of parameter h1 during a longer period than established in h2 (see p. 26). Activates the alarm relay and the audible alarm.</td>
</tr>
<tr>
<td>HCPF</td>
<td>HACCP alarm due to a power supply failure. The temperature established in h1 has been reached, following a power supply failure (see p. 26). Activates the alarm relay and the audible alarm.</td>
</tr>
<tr>
<td>DEF</td>
<td>Indicates that a defrost is being performed (see p. 20). Only displayed on screen.</td>
</tr>
<tr>
<td>PAS</td>
<td>Password request. See parameters b10 and PAS (see p. 27). Only displayed on screen.</td>
</tr>
<tr>
<td>STS</td>
<td>Shown sequentially with the temperature: The controller is in demo mode, the configuration has not been made.</td>
</tr>
</tbody>
</table>
MESSAGES

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAL</td>
<td>Calibration ongoing, therefore, avoid, as far as possible, opening the cold room during the process. For further information, see page 13.</td>
</tr>
<tr>
<td>E16</td>
<td><strong>Flashing with temperature:</strong> Configuration has been changed from 1 to 2 evaporators or vice versa.</td>
</tr>
</tbody>
</table>

SELFDRIVE MODE ALERT MESSAGES (Only shown pressing the ▼ key)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E10/20</td>
<td>Defrost end error in 1/2 evaporator during the calibration, defrost has not ended due to temperature.</td>
</tr>
<tr>
<td>E11/21</td>
<td>Error during calibration in 1/2 evaporator. There is not enough difference in temperature between the cold room probe and the evaporator probe.</td>
</tr>
<tr>
<td>E12/22</td>
<td>It has not been possible to carry out the calibration due to a lack of stability in the system (Excessive door opening, excessive oscillations in the lower pressure, etc.).</td>
</tr>
<tr>
<td>E13/23</td>
<td>Error during normal operation (SELFDRIVE Mode active) in 1/2 evaporator. There is not enough difference in temperature between the cold room probe and the evaporator probe.</td>
</tr>
<tr>
<td>E14/24</td>
<td>A lack of stability has been detected in the system (Excessive door opening, excessive oscillations in the low pressure, etc.) during normal operation (SELFDRIVE Mode active).</td>
</tr>
<tr>
<td>E15/25</td>
<td>The persistent lack of stability has led to the deactivation of the SELFDRIVE mode.</td>
</tr>
<tr>
<td>E17</td>
<td>Excessive door openings have been detected during calibration and it has not been possible to calibrate.</td>
</tr>
<tr>
<td>E18</td>
<td>Excessive door openings have been detected and the device cannot regulate in SELFDRIVE mode.</td>
</tr>
</tbody>
</table>
SELFDRIVE mode

SELFDRIVE mode If the SELFDRIVE mode is activated (default configuration), the device periodically evaluates the evaporator’s heat transfer, managing the available resources to maximise it. The defrosts are minimised, adapting to the changing conditions of the cold room, reducing heat input into the refrigerated space, thermal stress in the evaporator and energy consumption. Operation of the evaporate fans is optimised taking into account the compressor status, evaporate temperature, frost level, opening of the door, etc. The control function of the drainage resistor minimises its activation (moments before starting a defrost), thereby reducing energy consumption. To achieve correct operation of the SELFDRIVE mode, it is very important for the probes to be correctly installed, as described on page 8.

Calibration

During the first hours of operation, the device performs two calibrations automatically, during which the display shows the CAL message. Calibration may take several hours and include several refrigeration and defrost cycles.

**IMPORTANT:**
During the calibration processes, the following should be avoided:  
- Opening the cold room door  
- Turning the controller off or putting it on stand-by  
- Changing controller parameters, including the set point

**Information:**
While the calibration process is active:  
- Manual defrost cannot be activated (H key)  
- The continuous cycle cannot be activated  
- The set point change function cannot be activated

If calibration cannot be performed, or if an important part of the installation is replaced (compressor, evaporator, etc.) it is advisable to perform a manual calibration. It is also recommended (not essential) to perform a manual calibration, once the installation has completed its commissioning, with a load inside it and when its operating temperature has been stabilised, after several days of operation, in this way calibration is optimal.

In the event of changing the set point or hysteresis, the device performs a calibration again automatically, except if the set point change is made using the “set point change mode” function (see page 16).

To perform a manual calibration, access the parameter menu (see page 31) and follow the sequence indicated below:

- Access parameter b30
- A security code is requested, enter code 63
  -- Using keys ▲ and ▼, select option 1 and press SET
Cold regulation

**Solenoid control (COOL Relay)**
Cold production is regulated by means of opening / closing the solenoid valve.
When the temperature in probe S1 reaches the set point (SP) value plus the probe’s differential (C1), the solenoid opens and causes the temperature to drop. Once the set point (SP) value is reached, the solenoid closes.

**Compressor control (Relay AUX 1)**
**With Pump Down (Inl: 2, 5, 7)**
Requires the connection of a low pressure switch in digital input 1.
When the temperature in probe S1 reaches the set point (SP) value plus the probe’s differential (C1), the solenoid opens, causing the pressure in the evaporator to increase and, therefore, the low pressure switch deactivates and the compressor starts up.
Once the set point (SP) value is reached, the solenoid closes, causing the pressure in the evaporator to decrease, triggering the low pressure switch and stopping the compressor.
For further details of the process, see the next page.

**Without Pump Down (Inl: 3, 6, 8)**
The compressor operates simultaneously with the solenoid valve, starting up when the latter opens and stopping when it closes.

**Operation in the event of a fault in probe S1**
If probe S1 fails (fault, disconnection, etc.), compressor behaviour will depend on parameter C6, with one of 3 options available:
- C6=0: The compressor is stopped until probe S1 begins to operate again.
- C6=1: The compressor is started-up until probe S1 begins to operate again.
- C6=2: The compressor operates in line with the average operation during the 24 hours prior to the error, taking into account the number of start-ups and stops and the average time in each state (stop-start). If 24 hours have not elapsed without a probe error, the device moves to C6=3 mode.
- C6=3: The compressor operates in line with the times programmed in C7 (ON) and C8 (OFF).
Regulation of cold with two temperature probes (S1 + S3)

This requires configuration of digital input 2 as cold room temperature (I20=10).
The device regulates the temperature of the cold room taking into account the reading of both probes. Using parameter C25, the influence of probe S3 is determined in the regulation.

<table>
<thead>
<tr>
<th>Examples:</th>
<th>C25=0</th>
<th>(S1: 100 %  S3: 0 %)</th>
<th>C25=75</th>
<th>(S1: 25 %  S3: 75 %)</th>
<th>C25=60</th>
<th>(S1: 40 %  S3: 60 %)</th>
<th>C25=95</th>
<th>(S1: 5 %  S3: 95 %)</th>
</tr>
</thead>
</table>

This mode is particularly useful in large volume cold room stores, where there may be significant variations of temperature.

In the event of an error in probe 3 (E3), the controller only uses the reading of probe 1. If both probes break (E1 + E3), the controller acts according to parameter C6.

Continuous cycle mode

This is used to quickly cool the cold room stores before products are loaded and is activated by pressing the \( \text{key} \) for 3 seconds.

Upon activating this mode, the compressor begins to operate until the temperature in probe S1 reaches the set point value, minus the variation indicated in parameter C10. The value of C10 is always negative, unless it is 0.

The unit will immediately return to normal operation. Should it not be possible to reach this point, the device will return to normal operation once the time configured in C9 has elapsed, or by pressing the \( \text{key} \) again for 5 seconds.

Calibration of probe 1

Parameter C0 allows for correction of the temperature detected by probe 1; this is particularly useful when the probe cannot be located in the ideal place.

Set Point locking

Parameters C2 and C3 allow for an upper and lower limit to be established for the set point (SP), to protect the product or installation from Set Point manipulation.

Product temperature

This function allows using a temperature probe to display the product temperature. To activate it, input 2 must be configured as "Product temperature" (I20=11), and the display of all the probes activated sequentially (C21=0).
Set Point change mode
This allows for quick alternation between two working temperatures in the cold room store, modifying the Set Point in line with the value indicated in parameter C12. The aforementioned value may be negative or positive, which allows for the Set Point to be reduced or increased. If it is configured in 0, the mode is disabled.
It is activated in three possible ways:

- By means of an external switch connected to one of the digital inputs. The digital input should be configured as “Set Point change (I10 or I20=4). Activation through this method cancels any other activation and can only be deactivated using the same method.
- By means of the AKONet application. This requires the device to be connected to a Modbus network (see p. 36).
- By means of the CAMM module and the AKO CAMM tool application.

EXAMPLE:

If the SELFDRIVE mode is active:
It is recommended for calibration to be performed with the lowest set point value.
It is recommended that the difference between set points is not greater than 5 °C in negative cold rooms and 2 °C in positive cold rooms.

Compressor protection timing
Parameter C4 allows for selection of the type of timing to be applied to protect the compressor. These delays prevent continuous compressor starts and stops.
These timings affect the COOL and AUX 1 relays (if o00=1)

**OFF-ON** (C4=0): Minimum time in OFF mode before each start-up.
**OFF-ON / ON-OFF** (C4=1): Minimum time in ON and OFF mode for each cycle.
The delay time is defined by means of parameter C5; if C5=0, timing is disabled.
**Pump down function**
This function foresees problems in the compressor caused by movements of coolant, using a stop/start technique for the installation, controlled via the liquid solenoid, the low pressure switch and the compressor itself.

This function is only available for *In1* options 2, 5 and 7 and requires the connection of a low pressure switch in digital input 1. *(I10=7)*

**STOP**
When the temperature in probe S1 reaches the set point (SP) value, the COOL relay deactivates, closing the liquid solenoid.
Because the compressor continues to operate, pressure in the evaporator quickly drops. Upon reaching a given value, the low pressure switch activates, changing the status of digital input 1, which stops the compressor (relay AUX 1).
This manoeuvre isolates all of the coolant in the high-pressure line, far from the compressor crankcase, preventing serious faults upon start-up.
Should the low pressure switch fail, the controller stops the compressor once the safety interval defined in C20 has elapsed, displaying the message “Pd” (an informative message that does not affect the unit’s operation).
If C20 time is 0 (default value), the compressor will not stop until the low pressure switch is activated, but it will display the “Pd” message after 15 minutes.

**START**
When the temperature in probe S1 reaches the set point value plus the differential (SP+C1), the COOL relay activates, opening the liquid solenoid. This increases the pressure in the evaporator, deactivating the low pressure switch, which turns the compressor on.
If, some time (determined by C19) after the liquid solenoid is opened (COOL relay set to ON), the low pressure switch does not deactivate, the controller will once again close the solenoid (COOL relay set to OFF) and the “LP” message will be displayed. This manoeuvre will be repeated every 2 minutes, indefinitely, until the pressure switch is deactivated and the installation reverts to its normal operation.
If C19 time is 0 (default value), the solenoid will remain open until the low pressure switch deactivates, but it will display the “LP” message after 5 minutes.

### STAND-BY
If the pump down function is active, a certain amount of time may elapse between starting the stand-by function and the controller stopping; this is because certain installation control phases cannot be interrupted.

To force the stop of the controller, press the Stand-by key again for 3 seconds.
Door management
Door management requires configuring one of the digital inputs as “Door contact” (I10 \( \lor \) I20=1).

Standard operating mode (CE=0)
Door management allows for the installation’s behaviour to be controlled, should the cold room door open through parameters C22 and C23.
Parameter C22 defines whether cold production should be stopped if the door opens. If C22=1, when the door opens, the fans stop and, 15 seconds later, the solenoid closes (COOL relay).
Parameter C23 defines the maximum time, in minutes, that the installation can remain without producing cold whilst the door is open. If C23=0, cold is not produced with the door open.

SELFDRIVE operating mode (CE=1)
If the SELFDRIVE mode is active, in the case of opening the door, the fans stop, or do not stop, depending on parameter C22. If the door does not close, when the time set in parameter C24 has passed, cold production stops and does not activate again until the time set in C23 has passed.
If, when the door is opened, cold is not being produced, only parameter C23 is taken into account.

Management of door frame resistor
If the Set Point is equal to or below -4°C and the relay AUX 2 has been configured as “door frame resistor” (\( o10=4 \)), the resistor is activated (relay ON) when the temperature of the cold room drops below -3°C, and is deactivated (relay OFF) when 0°C is reached.
Defrost

Types of defrost
There are 3 possible defrost types, depending on the option selected in the wizard (InI):

Electric (InI=1, 2 and 3) (d7=0)
Defrost is performed through electrical resistors, supplying the evaporator with heat. The operation of fans in this mode depends on parameter $F_3$; the compressor and solenoid are stopped.

By air (InI=4, 5 and 6) (d7=1)
Usually used in positive cold rooms (> 3°C), since the inside temperature of the cold room is sufficient to melt evaporator ice. By default, the fans are activated so that air may circulate through the evaporator; to stop them, change parameter $F_3$ to 0. The compressor and solenoid are stopped.

Hot gas (InI=7 and 8) (d7=2)
The hot gas from compressor discharge is used to melt evaporator ice and, to this end, two valves are necessary: one at the condenser input (A) (SSV relay) and another between the compressor output and the evaporator input (B) (DEF relay).
During the process, the liquid solenoid valve (C) and the condenser input valve are closed and the evaporator input valve is opened, forcing hot gas to pass through the latter and melting the ice.
Optionally, a high pressure switch (D) can be added to control the solenoid valve (digital input D2, I20=9) during the defrost process using hot gas. If the pressure decreases, the solenoid opens to allow liquid into the tank; when the pressure rises again, the solenoid closes.
Control of defrost in standard mode (CE=0)

**Defrost start**
Defrost will start if:
- The time programmed in parameter d0 has elapsed since the start of the last defrost.
- We press the H key for 3 seconds.
- By means of an external push-button (I10 / I11=5).
- Through the app or through AKONet.

**Defrost completion**
Defrost will complete if:
- The temperature programmed in parameter d4 has been reached in probe 2. This requires a 2nd probe (l00=2) to be available, located in the evaporator.
- The time configured in parameter d1 has elapsed (maximum defrost duration).
- We press the H key for 5 seconds.
- By means of an external push-button (I10 / I11=5).
- Through the app or through AKONet.
Control of defrost in SELFDRIVE mode (CE=1)

Defrosts in SELFDRIVE mode are not programmed, but rather the device evaluates the operation of the cold room and manages defrosts depending on the needs of the installation.

If a drop in the performance of the cold room is detected due to formation of ice in the evaporator, defrost is activated and it is supervised until its completion.

Using parameter **d30**, the defrost strategy is defined, a lower value allows less formation of frost in the evaporator, while a higher value acts with lower frequency allowing more frost to accumulate in the evaporator.

As a rule, a more aggressive strategy provides the system with greater efficiency allowing more frost to accumulate.

Adapting the value of this parameter to the type of evaporator used and to the type of defrost configured according to the following table is recommended:

<table>
<thead>
<tr>
<th>Fin spacing of the evaporator in mm</th>
<th>TYPE OF DEFROST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ELECTRIC</td>
</tr>
<tr>
<td>&lt; 3</td>
<td>0   1   2</td>
</tr>
<tr>
<td>3.5</td>
<td>0   1   2</td>
</tr>
<tr>
<td>4</td>
<td>1   2   3</td>
</tr>
<tr>
<td>4.5</td>
<td>2   3   4</td>
</tr>
<tr>
<td>5</td>
<td>2   3   5</td>
</tr>
<tr>
<td>5.5</td>
<td>2   3   5</td>
</tr>
<tr>
<td>6</td>
<td>3   4   6</td>
</tr>
<tr>
<td>6.5</td>
<td>3   4   6</td>
</tr>
<tr>
<td>7</td>
<td>4   5   7</td>
</tr>
<tr>
<td>7.5</td>
<td>4   6   7</td>
</tr>
<tr>
<td>8</td>
<td>4   6   8</td>
</tr>
<tr>
<td>8.5</td>
<td>5   7   8</td>
</tr>
<tr>
<td>9</td>
<td>5   7   8</td>
</tr>
<tr>
<td>9.5</td>
<td>5   8   9</td>
</tr>
<tr>
<td>10</td>
<td>6   8   9</td>
</tr>
<tr>
<td>10.5</td>
<td>6   8   10</td>
</tr>
<tr>
<td>≥ 11</td>
<td>6   9   10</td>
</tr>
</tbody>
</table>

Strategy: 🍃 Conservative 🍃 🍃 Moderate 🍃 🍃 🍃 Aggressive

Parameter **d31** allows establishing a time limit without making defrosts, if the cold room does not require defrosts set it to 0, if the cold room can generate frost it is recommended to set a security time of between 2 and 7 days.

Parameter **d32** defines the maximum time permitted of the cold room without reaching the Set Point, after which an emergency defrost starts to unlock the evaporator.

Parameter **d4** defines the final defrost temperature.

*It is advisable to configure all the parameters relating to defrost since, in the event of a calibration or operating error of the SELFDRIVE mode, the controller then temporarily regulates in standard mode.*
Other defrost parameters (They affect in standard and SELFDRIVE mode)

**Drip time**
This is established through parameter \( \text{d9} \) and sets the time added at the end of defrost to allow for the removal of surplus water from melted evaporator ice, during which there is no cold regulation.

**Fan start-up delay**
This is established through parameter \( \text{F4} \) and allows for the possible drops left in the evaporator to freeze before the fans activate, preventing them from being projected into the cold room. It also prevents heat being supplied to the cold room due to defrost in the evaporator.

- If defrost is cancelled before 1 minute has elapsed, the drip time (\( \text{d9} \)) is not applied and the fans are activated without taking into account the start-up delay (\( \text{F4} \)).
- If defrost is by air or is static, the drip time (\( \text{d9} \)) and fan start-up delay (\( \text{F4} \)) are deactivated.

**Message displayed during defrost**
This is established using parameter \( \text{d2} \), and you can choose between displaying the real temperature captured by probe 1 (\( \text{d2}=0 \)), showing the temperature captured by probe 1 at the start of the defrost (\( \text{d2}=1 \)), or displaying the \( \text{dEF} \) (\( \text{d2}=2 \)) message. Parameter \( \text{d3} \) defines the time during which the aforementioned message will be displayed once the drip time (\( \text{d9} \)) and fan stop time (\( \text{F4} \)) are complete.

**Remote defrost**
This function allows defrost of the unit to be activated using an external button, connecting it to one of the digital inputs that must be configured as remote defrost (\( \text{I10} \) or \( \text{I20}=5 \)).

**Defrost locking**
This prevents defrost starting at unusual points by means of an external switch, which may be useful for ensuring that the installation's load does not excessively increase, exceeding the permitted limits.

- The external switch must be connected to one of the digital inputs, which should be configured as “Defrost locking” (\( \text{I10} \) or \( \text{I20}=6 \)).

**Miscellaneous**
Using parameter \( \text{d5} \), you can configure whether the unit performs a defrost (\( \text{d5}=1 \)) or not (\( \text{d5}=0 \)) when it receives power (first start-up or after a power supply failure). Should the option YES (\( \text{d5}=1 \)) be selected, defrost will begin once the delay time defined in \( \text{d6} \) has elapsed.

- Using parameter \( \text{d8} \), we define the time tally established in \( \text{d0} \), choosing between total time elapsed (\( \text{d8}=0 \)) or the sum of compressor operation time (\( \text{d8}=1 \)).

**REMARK:** If parameter \( \text{d1} \) is configured to 0, no defrosts are performed.

**Management of the drainage resistor**
Activates the drainage resistor before the start of defrost and deactivates it one hour after finishing, avoiding unnecessary energy consumption in the absence of defrosts.

For this function to be active, parameter \( \text{o10} \) (Relay AUX 2) should be set to 8.
Defrost of a second evaporator

This function allows for defrost to be controlled in a second evaporator, provided that defrost is by electric heat, by air or is static. The same type of defrost should be used for the first and second evaporators.

This requires configuration of input 2 as a 2nd evaporator probe \((I20=8)\). In the event of an error in the 2nd evaporator probe, defrost completes once the time defined in \(d1\) has elapsed.

**Electric defrosting**

This requires configuration of relay AUX 2 as 2nd evaporator defrost \((o10=5)\).

Defrost begins simultaneously in both evaporators. When the probe of evaporator 1 reaches the temperature defined in \(d4\), the DEF relay deactivates, completing defrost of evaporator 1. Defrost of evaporator 2 is completed when the evaporator 2 probe reaches the temperature defined in \(d4\). Drip time begins when both defrosts are complete.

**Defrost by air**

The fans of both evaporators are connected in parallel to the FAN relay.

Defrost begins simultaneously in both evaporators and does not complete until both probes reach the temperature defined in \(d4\). Drip time subsequently begins.
Evaporator fans

Control of fans in standard mode (CE=0)
Fans are controlled through probe 2 (evaporator) and parameters F0 (stop temperature) and F1 (probe differential).
If probe 2 is not connected or an error in the probe (E2) is detected, the fans continuously operate without taking into account parameters F0 and F1, but taking the remaining parameters (F2 to F4) into account.
Using parameter F2, the status of the fans during compressor stops is defined.
Using parameter F3, the status of the fans during defrost is defined.
Parameter F4 defines the fan start-up delay time after defrost (see p. 20).
Parameter C22 defines whether fans stop when the door is opened.

Control of fans in SELFDRIVE mode (CE=1)
With the SELFDRIVE mode active, fan control is performed taking into account the evaporator temperature, compressor, frost level, the cold room temperature and if the door is open or not, optimising its operation in this way its operation is optimised to obtain the greatest energy efficiency of the cold room. With this mode active, only parameters F0, F1 and F4 need to be configured.

It is advisable to configure all parameters relating to the fans since, in the event of a calibration or operating error of the SELFDRIVE mode, the controller then temporarily regulates in standard mode.
Alarms
The device warns the user through an on-screen message, activation of a relay (only if $o_{10}=1$) and a sound alarm when the criteria programmed in the parameters are met.

**Maximum / minimum temperature alarm**
It shows the message "RH" or "RL" when the temperature in probe 1 reaches the value configured in parameters $A_1$ (maximum temperature) and $A_2$ (minimum temperature).
This value may be:
- Absolute ($A_0=1$): The temperature at which the alarm should activate must be indicated in $A_1/A_2$.
- Relative to the SP ($A_0=0$): The increase or decrease in the number of degrees necessary for the alarm to activate, in relation to the set point, must be indicated in $A_1/A_2$. This option enables us to change the set point without having to reset the maximum and minimum alarms.

Parameter $A_{10}$ establishes the differential of both parameters (Hysteresis).

**Example**
We configure the following parameters in a controller: $SP=2$, $A_1=10$, $A_{10}=2$
- If $A_0=0$ (Relative to the SP), the maximum temperature alarm will activate when 12 degrees are reached in probe 1, and will deactivate when 10 degrees are reached.
- If $A_0=1$ (Absolute), the maximum temperature alarm will activate when 10 degrees are reached in probe 1, and will deactivate when 8 degrees are reached.

**External alarm / severe external alarm**
The message $EA$ (External alarm) or $SEA$ (Severe external alarm) is displayed when the digital input configured as external alarm or severe external alarm is activated.
The severe external alarm also deactivates all the loads and, therefore, temperature regulation stops. When this alarm disappears, the device returns to its normal operation.
At least one of the digital inputs must be configured as an external alarm ($I_{10}$ or $I_{20}=2$) or as a severe external alarm ($I_{10}$ or $I_{20}=3$).

**Probe error alarm**
If one of the enabled probes is crossed, in open circuit or out of range, the message $E_1$, $E_2$ or $E_3$ will be shown, depending on whether probe $S_1$, $S_2$ or $S_3$ is involved.

**Evaporator probe error alarm due to moisture ingress**
If, at the start of defrost, the temperature in probe $S_2$ is 20°C higher than the temperature in probe $S_1$, the defrost ignores probe $S_2$ and completes due to time-out.
The display shows the message $E_2$, activates the alarm relay (only devices with 5 relays and if $o_{10}=1$) and sound alarm.
The alarm can be silenced, but the $\Delta$ alarm icon will not disappear until:
- The controller is switched off and then on again.
- Defrost without error is started in probe $S_2$.

If the 2nd evaporator probe ($I_{20}=8$) has been enabled, it will behave in the same way, but displaying the message $E_3$. 
Open door alarm
The door has been open for a longer time than defined in parameter A12, the open door alarm is activated.
In order to detect the open door, configuration is required of one of the digital inputs as “door contact” (I10 or I20 = 1).
Activates alarm relay (only if o10 = 1) and sound alarm.

HACCP alarm
The alarm is activated should situations be detected which could endanger the integrity of the products stored in the cold room.
If the temperature of the cold room is higher than that defined in parameter h1 for a length of time exceeding that defined in parameter h2, the alarm activates, displaying the message hCP on screen.
Upon pressing the mute key, the sound alarm switches off, but the alarm remains.
Once the temperature drops below parameter h1, if the mute key has been pressed, the alarm disappears. If the mute key has not been pressed, the audible alarm deactivates but the HACCP indicator remains in flashing mode, indicating than a non-confirmed HACCP alarm has occurred.
Press the mute key to confirm an HACCP alarm.
If, during a power failure, a HACCP alarm occurs, when the power supply returns, the HACCP alarm is activated and the display shows the messages hCP and PF (power failure) alternately.

Alarm delays
These delays prevent certain alarms from being shown, to allow the installation to recover its normal operation after certain events.
- Delays in start-up (A3): This delays the activation of the temperature alarms upon receiving power (at start-up or after a power supply failure) or when exiting Stand-by mode. This allows for the installation to start up avoiding alarms.
- Delay after a defrost (A4): This delays the activation of the temperature alarms when a defrost completes.
- Delay to minimum and maximum temperature alarm (A5): This delays the activation of the maximum (A1) and minimum (A2) temperature alarms, from when the temperature in probe 1 reaches the programmed value.
- Delay to activation of external alarm (A6): This delays the activation of the external alarm, from when the digital input becomes active.
- Delay to deactivation of external alarm (A7): This delays the deactivation of the external alarm, from when the digital input becomes active.
- Delay to open door alarm (A12): This delays the activation of the alarm upon detecting that the door is open.

Configuration of alarm relay (only devices with 5 relays)
Should relay AUX 2 have been configured as an alarm (o10 = 1), parameter A9 allows for the relay status to be defined when an alarm is triggered:
A9 = 0 Relay active (ON) in the event of an alarm (OFF without alarm)
A9 = 1 Relay inactive (OFF) in the event of an alarm (ON without alarm)
Alerts

The device alerts the user through an on-screen message when an event occurs which requires his/her attention. However, it does not activate the sound alarm or the alarm relay (if active).

**Defrost finished by time alarm**
The message **Adt** is displayed when a defrost has completed due to time-out, if parameter **A8** = 1.

**Pump down malfunction error (stop)**
The message **Pd** is displayed if a malfunction is detected when the installation is stopped using the pump down manoeuvre. (See p. 17).

**Pump down malfunction error (start-up)**
Displays the **LP** message if a malfunction is detected when the installation is started up using the pump down manoeuvre. (See p. 17).

**Light control**
Relay AUX 1 or AUX 2 must be configured as “Light” (o00 or o10 = 2).
Switching the lights on or off is controlled using:
The **»** push-button: One press switches the lights on or off.
The cold room door: When the door is opened, the lights remain on for the time defined by parameter **b01**. If the value is 0, when the door closes the lights go out. (One of the digital inputs must be configured as door contact (I10 or I20 = 1).
The control even occurs with the equipment in Stand-by.

**Password**
It allows protecting the configuration of the unit using a 2 digit code (from 01 to 99). If it is active a code is requested when you try to access the programming menu. This menu cannot be accessed if a wrong value is entered. The code is set via the **PAS** parameter.
Parameter **b10** defines the operation of this code.

**Remote Stand-by mode**
This allows activating Stand-by mode using a switch connected to one of the digital inputs. Said digital input must be set to Stand-by remote activation (I10 = 8 or I20 = 12).
Operation of the auxiliary relays
Depending on the controller model, it may have 1 or 2 auxiliary relays. The function of these relays is configurable through the parameters menu.

AUX 1 relay
- **Deactivated** (o00=0): It does not carry out any function.
- **Compressors / crankcase resistor** (o00=1): Controls compressor operation. When the compressor is not in operation, it powers the crankcase resistor. This function can only be selected via the initial wizard (In1).
- **Light** (o00=2): This regulates the operation of cold room light (see p. 27).
- **Virtual control** (o00=3): The relay can be remotely activated and deactivated by means of AKONet software.

AUX 2 relay
- **Deactivated** (o10=0): It does not carry out any function.
- **Alarm** (o10=1): This activates the relay every time that an alarm occurs (see p. 26).
- **Light** (o10=2): This regulates the operation of cold room light (see p. 27).
- **Virtual control** (o10=3): The relay can be remotely activated and deactivated by means of AKONet software.
- **Door frame resistor** (o10=4): This controls the operation of the cold room’s door frame resistor (see p.18).
- **Defrost 2º evaporator** (o10=5): This controls the defrost resistors of a second evaporator (see p. 23).
- **Same as solenoid status** (o10=6): Imitates solenoid status: active if the solenoid is in ON mode, inactive if the solenoid is in OFF mode.
- **Same as unit status** (o10=7): Indicates the unit’s status: active if the unit is in ON mode, inactive if the unit is in Stand-by mode.
- **Drainage resistor** (o10=8): Controls the activation/deactivation of the evaporator drainage resistor (see page 22).
Core Index (Only with CAMM module installed)

The Core index is an indicator of the integral efficiency of the cold room store that can be consulted in the AKO CAMM Tool app, available in the App Store and in Google Play.

Provides weighted information on:

- **Effectiveness of the cold**: Percentage of time that the cold room is in the configured operating range (between SP and SP+C1).

- **Energy efficiency**: Percentage of the operating time of the main system loads (compressor, defrost, etc.) compared to the value considered as reasonable.

- **Maintenance rate**: Number of activations by hour of the compressor and the defrost, compared to the value considered as reasonable.

Dashboard

The Dashboard provides general operating indicators of the device to facilitate analyzing its operation. The indicators can be displayed in three ways, daily, weekly or monthly summary.

- **Average temperature**: Indicates average temperature of the cold room.

- **Time in set point**: Indicates percentage of time the cold room has been between SP and SP+C1.

- **Time ON**: Indicates percentage of time the cold room has been operating.

- **Cooling time**: Indicates percentage of activation time for the cold solenoid valve.

- **HACCP Alarms**: Indicates number of HACCP alarms registered.

- **Alarms**: Indicates number of alarms registered.

- **Door open time**: Indicates percentage of time with the cold room door open.

- **Defrost time**: Indicates percentage of time with defrost activated.
Configuration

Condensed programming menu
This allows for the most-used parameters to be quickly configured. Press the SET key for 3 seconds to access it.

### Condensed programming menu

![Diagram](image)

### Parameters

<table>
<thead>
<tr>
<th>Description</th>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SP</strong> Temperature setting (Set Point)</td>
<td>°C/°F</td>
<td>-50</td>
<td>0.0</td>
<td>99</td>
</tr>
<tr>
<td><strong>CE</strong> SELFDRIVE Mode 0=Deactivated 1=Activated</td>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>C1</strong> Probe 1 differential (Hysteresis)</td>
<td>°C/°F</td>
<td>0.1</td>
<td>2.0</td>
<td>20.0</td>
</tr>
<tr>
<td><strong>d0</strong> Defrost frequency (Time between 2 starts)</td>
<td>H.</td>
<td>0</td>
<td>6</td>
<td>96</td>
</tr>
<tr>
<td><strong>d1</strong> Maximum defrost duration (0=defrost deactivated)</td>
<td>Min.</td>
<td>0</td>
<td>*</td>
<td>255</td>
</tr>
<tr>
<td><strong>d4</strong> Final defrost temperature (by probe) (if P4 ≠ 1)</td>
<td>°C/°F</td>
<td>-50</td>
<td>8.0</td>
<td>C2</td>
</tr>
<tr>
<td><strong>F3</strong> Status of the fans during the defrost 0=Shut down; 1=Running</td>
<td></td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>A1</strong> Alarm for maximum in probe 1 (It should be higher than the SP)</td>
<td>°C/°F</td>
<td>A2</td>
<td>99</td>
<td>99</td>
</tr>
<tr>
<td><strong>A2</strong> Alarm for minimum in probe 1 (It should be lower than the SP)</td>
<td>°C/°F</td>
<td>-50</td>
<td>-50</td>
<td>A1</td>
</tr>
<tr>
<td><strong>d30</strong> Defrost strategy in SELFDRIVE mode</td>
<td></td>
<td>0</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

* According to wizard.
Extended programming menu

Use the extended programming menu to configure all of the unit’s parameters in order to adapt it to your installation requirements. Press the SET key for 6 seconds to access it.

**IMPORTANT:** If the password function has been configured as a keypad lock (b10=2), or as an access to parameters block (b10=1), you will be requested to enter the password programmed in PAS when attempting to access either of the two functions. If the entered password is not correct, the unit will go back to showing the temperature.

**IMPORTANT:** Certain parameters or menus may not be visible depending on the configuration of the rest of the parameters.

Extended programming menu

<table>
<thead>
<tr>
<th>OUT OF PROGRAMMING</th>
<th>IN PROGRAMMING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature indication</td>
<td>Level 1 Menus</td>
</tr>
<tr>
<td>Level 2 Parameters</td>
<td>Level 3 Values</td>
</tr>
<tr>
<td>Change menu</td>
<td>Change parameter</td>
</tr>
<tr>
<td>6 sec.</td>
<td>20 sec.</td>
</tr>
<tr>
<td>Change value</td>
<td>Save changes</td>
</tr>
<tr>
<td>OK</td>
<td>OK</td>
</tr>
</tbody>
</table>

Temperature indication

- 5.0

Level 1 Menus

- :E

Level 2 Parameters

- :P

Level 3 Values

- :S

Change menu

- :D

Change parameter

- :T

OK

Save changes

- :K

Do not save changes

- :U
## Parameters

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Regulation and control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SP</strong></td>
<td></td>
<td>Temperature setting (Set Point)</td>
</tr>
<tr>
<td><strong>CE</strong></td>
<td></td>
<td>SELFDRIVE Mode 0=Deactivated 1=Activated</td>
</tr>
<tr>
<td><strong>CO</strong></td>
<td></td>
<td>Probes 1 &amp; 2 calibration (Offset)</td>
</tr>
<tr>
<td><strong>C1</strong></td>
<td></td>
<td>Probe 1 differential (Hysteresis)</td>
</tr>
<tr>
<td><strong>C2</strong></td>
<td></td>
<td>Set Point top locking (it cannot be set above this value)</td>
</tr>
<tr>
<td><strong>C3</strong></td>
<td></td>
<td>Set Point bottom locking (it cannot be set below this value)</td>
</tr>
<tr>
<td><strong>C4</strong></td>
<td></td>
<td>Type of delay for the protection of the compressor: 0=Minimum time of compressor in OFF 1=Minimum time of compressor in OFF and in ON in each cycle</td>
</tr>
<tr>
<td><strong>C5</strong></td>
<td></td>
<td>Protection delay time (Value of the option selected in parameter C4)</td>
</tr>
<tr>
<td><strong>C6</strong></td>
<td></td>
<td>COOL relay status with fault in probe 1: 0=OFF; 1=ON; 2=Average according to last 24h prior to probe error 3=ON-OFF according to prog. C7 and C8</td>
</tr>
<tr>
<td><strong>C7</strong></td>
<td></td>
<td>Relay time in ON in the event of probe 1 failure (If C7=0 and C8=0, the relay will always be disconnected in OFF)</td>
</tr>
<tr>
<td><strong>C8</strong></td>
<td></td>
<td>Relay time in OFF in the event of probe 1 failure (If C8=0 and C7=0, the relay will always be connected in ON)</td>
</tr>
<tr>
<td><strong>C9</strong></td>
<td></td>
<td>Maximum duration of the continuous cycle mode. (0=deactivated)</td>
</tr>
<tr>
<td><strong>C10</strong></td>
<td></td>
<td>Variation of the Set Point (SP) in continuous cycle mode. When it reaches this point (SP+C10), it reverts to the normal mode. (SP+C10 ≥ C3). The value of this parameter is always negative, unless it is 0. (0=OFF)</td>
</tr>
<tr>
<td><strong>C12</strong></td>
<td></td>
<td>Variation of the Set Point (SP) when the change Set Point function is active. (SP+C12≤ C2) (0= deactivated)</td>
</tr>
<tr>
<td><strong>C13</strong></td>
<td></td>
<td>Maximum start time from Pump Down (Values between 1 and 9 seconds will not be accepted) (0=deactivated)</td>
</tr>
<tr>
<td><strong>C14</strong></td>
<td></td>
<td>Maximum time for pump down (0= deactivated)</td>
</tr>
<tr>
<td><strong>C15</strong></td>
<td></td>
<td>Probe to be displayed 0=All probes (sequential) 1=Probe 1 (Chamber) 2=Probe 2 (Evaporator) 3=Probe 3 (According to I20) 4=Weighted temperature of the cold room</td>
</tr>
<tr>
<td><strong>C16</strong></td>
<td></td>
<td>Stop fans and compressor on opening door 0=No 1=Yes</td>
</tr>
<tr>
<td><strong>C17</strong></td>
<td></td>
<td>Start-up delay for fans and compressor with door open</td>
</tr>
<tr>
<td><strong>C18</strong></td>
<td></td>
<td>Delay time of cold stop with door open.</td>
</tr>
<tr>
<td><strong>C19</strong></td>
<td></td>
<td>Influence of probe S3 when regulating with two temperature probes (I20=10) (See page 15)</td>
</tr>
<tr>
<td><strong>C20</strong></td>
<td></td>
<td>Probe 3 calibration (Offset)</td>
</tr>
<tr>
<td><strong>EP</strong></td>
<td></td>
<td>Exit to level 1</td>
</tr>
</tbody>
</table>

### Parameters Descriptions

**SP**
- **Description**: Temperature setting (Set Point)
- **Values**: °C/ºF
- **Min.**: -50
- **Def.**: 0.0
- **Max.**: 99

**CE**
- **Description**: SELFDRIVE Mode
- **Values**: 0=Deactivated 1=Activated

**CO**
- **Description**: Probes 1 & 2 calibration (Offset)
- **Values**: °C/ºF
- **Min.**: -4.0
- **Def.**: 0.0
- **Max.**: 4.0

**C1**
- **Description**: Probe 1 differential (Hysteresis)
- **Values**: °C/ºF
- **Min.**: 0.1
- **Def.**: 2.0
- **Max.**: 20.0

**C2**
- **Description**: Set Point top locking (it cannot be set above this value)
- **Values**: °C/ºF
- **Min.**: C3
- **Def.**: 99
- **Max.**: 99

**C3**
- **Description**: Set Point bottom locking (it cannot be set below this value)
- **Values**: °C/ºF
- **Min.**: -50
- **Def.**: -50
- **Max.**: C2

**C4**
- **Description**: Type of delay for the protection of the compressor:
  - 0=Minimum time of compressor in OFF
  - 1=Minimum time of compressor in OFF and in ON in each cycle

**C5**
- **Description**: Protection delay time (Value of the option selected in parameter C4)
- **Values**: Min.
- **Min.**: 0.0
- **Def.**: 1
- **Max.**: 120

**C6**
- **Description**: COOL relay status with fault in probe 1:
  - 0=OFF
  - 1=ON
  - 2=Average according to last 24h prior to probe error
  - 3=ON-OFF according to prog. C7 and C8

**C7**
- **Description**: Relay time in ON in the event of probe 1 failure
  - If C7=0 and C8=0, the relay will always be disconnected in OFF
- **Values**: Min.
- **Min.**: 0.0
- **Def.**: 10.0
- **Max.**: 120

**C8**
- **Description**: Relay time in OFF in the event of probe 1 failure
  - If C8=0 and C7=0, the relay will always be connected in ON
- **Values**: Min.
- **Min.**: 0.0
- **Def.**: 5.0
- **Max.**: 120

**C9**
- **Description**: Maximum duration of the continuous cycle mode. (0=deactivated)
- **Values**: H.
- **Min.**: 0.0
- **Def.**: 48

**C10**
- **Description**: Variation of the Set Point (SP) in continuous cycle mode. When it reaches this point (SP+C10), it reverts to the normal mode. (SP+C10 ≥ C3). The value of this parameter is always negative, unless it is 0. (0=OFF)
- **Values**: °C/ºF
- **Min.**: 0.0
- **Def.**: -50
- **Max.**: C3-SP

**C12**
- **Description**: Variation of the Set Point (SP) when the change Set Point function is active. (SP+C12≤ C2) (0= deactivated)
- **Values**: °C/ºF
- **Min.**: C3-SP
- **Def.**: 0.0
- **Max.**: C2-SP

**C13**
- **Description**: Maximum start time from Pump Down
  - (Values between 1 and 9 seconds will not be accepted) (0=deactivated)
- **Values**: Sec.
- **Min.**: 0.0
- **Def.**: 120

**C14**
- **Description**: Maximum time for pump down (0= deactivated)
- **Values**: Min.
- **Min.**: 0.0
- **Def.**: 15

**C15**
- **Description**: Probe to be displayed
  - 0=All probes (sequential)
  - 1=Probe 1 (Chamber)
  - 2=Probe 2 (Evaporator)
  - 3=Probe 3 (According to I20)
  - 4=Weighted temperature of the cold room

**C16**
- **Description**: Stop fans and compressor on opening door
  - 0=No
  - 1=Yes

**C17**
- **Description**: Start-up delay for fans and compressor with door open
- **Values**: Min.
- **Min.**: 0.0
- **Def.**: 999

**C18**
- **Description**: Delay time of cold stop with door open.
- **Values**: Seg.
- **Min.**: 0.0
- **Def.**: C23

**C19**
- **Description**: Influence of probe S3 when regulating with two temperature probes (I20=10) (See page 15)
- **Values**: %
- **Min.**: 0.0
- **Def.**: 95

**C20**
- **Description**: Probe 3 calibration (Offset)
- **Values**: °C/ºF
- **Min.**: -4.0
- **Def.**: 0.0
- **Max.**: 4.0

**EP**
- **Description**: Exit to level 1
### Defrost

<table>
<thead>
<tr>
<th>Description</th>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>dE</td>
<td>d0</td>
<td>Defrost frequency (Time between 2 starts)</td>
<td>H.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d1</td>
<td>Maximum defrost duration (0=defrost deactivated)</td>
<td>Min.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d2</td>
<td>Type of message during the defrost:</td>
<td>0=Displays the real temperature; 1=Displays the temperature at the start of the defrost; 2=Displays the dE message</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d3</td>
<td>Maximum duration of the message (Time added at the end of the defrost process)</td>
<td>Min.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d4</td>
<td>Final defrost temperature (by probe) (If I00 ≠ 1)</td>
<td>°C/ºF</td>
<td>-50</td>
</tr>
<tr>
<td></td>
<td>d5</td>
<td>Defrost on connecting the unit:</td>
<td>0=NO First defrost according to d0; 1=YES, First defrost according to d6</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d6</td>
<td>Delay of the defrost start on connecting the unit</td>
<td>Min.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d7</td>
<td>Type of defrost:</td>
<td>0=Resistors; 1=Air/fans; 2=Hot gas; 3=Reversal of cycle</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d8</td>
<td>Count of time between defrost periods:</td>
<td>0=Total real time 1=Sum of compressor connected time</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d9</td>
<td>Drip time when completing defrost (Shutdown of compressor and fans)</td>
<td>Min.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d10</td>
<td>Defrost strategy in SELFDRIVE mode (See table on page 21)</td>
<td>Min.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d11</td>
<td>Maximum time without defrosting (0=Deactivated)</td>
<td>H.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>d32</td>
<td>Maximum time of cold room outside the temperature regulation range (0=Deactivated)</td>
<td>H.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>EP</td>
<td>Exit to level 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Evaporator fans

<table>
<thead>
<tr>
<th>Description</th>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAn</td>
<td>F0</td>
<td>Shutdown temperature of fans</td>
<td>°C/ºF</td>
<td>-50</td>
</tr>
<tr>
<td></td>
<td>F1</td>
<td>Probe 2 differential if fans are shut down</td>
<td>°C/ºF</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>F2</td>
<td>Shut down fans when the compressor shuts down</td>
<td>0=No 1=Yes</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>F3</td>
<td>Status of the fans during the defrost</td>
<td>0=Shut down; 1=Running</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>F4</td>
<td>Delay of start-up after defrost (If F3=0)</td>
<td>It will only actuate if it is higher than d9</td>
<td>Min.</td>
</tr>
<tr>
<td></td>
<td>EP</td>
<td>Exit to level 1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* According to wizard.

It can only be modified using the configuration wizard (InI).
### Alarms

<table>
<thead>
<tr>
<th>Description</th>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R0</strong></td>
<td>Configuration of the temperature alarms 0=Relative to SP 1=Absolute</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>R1</strong></td>
<td>Alarm for maximum in probe 1 (It should be higher than the SP)</td>
<td>°C/°F</td>
<td>A2</td>
<td>99</td>
</tr>
<tr>
<td><strong>R2</strong></td>
<td>Alarm for minimum in probe 1 (It should be lower than the SP)</td>
<td>°C/°F</td>
<td>-50</td>
<td>-50</td>
</tr>
<tr>
<td><strong>R3</strong></td>
<td>Delay of temperature alarms in the start-up</td>
<td>Min.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>R4</strong></td>
<td>Delay of temperature alarms from the end of a defrost</td>
<td>Min.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>R5</strong></td>
<td>Delay of temperature alarms from when the A1 or A2 value is reached</td>
<td></td>
<td></td>
<td>30</td>
</tr>
<tr>
<td><strong>R6</strong></td>
<td>Delay of the external alarm/Severe external alarm on receiving a signal in digital input (I10 or I20=2 or 3)</td>
<td>Min.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>R7</strong></td>
<td>Delay of external alarm deactivation/Severe external alarm deactivation when the signal in digital input disappears (I10 or I20=2 or 3)</td>
<td>Min.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>R8</strong></td>
<td>Show warning if the defrost ends for maximum time 0=No 1=Yes</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>R9</strong></td>
<td>Relay alarm polarity 0=Relay ON in alarm (OFF without alarm); 1=Relay OFF in alarm (ON without alarm)</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>R10</strong></td>
<td>Differential of temperature alarms (A1 and A2)</td>
<td>°C/°F</td>
<td>0.1</td>
<td>1.0</td>
</tr>
<tr>
<td><strong>R12</strong></td>
<td>Delay of open door alarm (if I10 or I20=1)</td>
<td>Min.</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

### Basic configuration

<table>
<thead>
<tr>
<th>Description</th>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>b00</strong></td>
<td>Delay of all functions on receiving power supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>b01</strong></td>
<td>Cold room light timing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>b10</strong></td>
<td>Function of password 0=Inactive 1=Block access to parameters 2=Block keypad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>p15</strong></td>
<td>Access code (Password)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>b20</strong></td>
<td>MODBUS address</td>
<td>1</td>
<td>1</td>
<td>247</td>
</tr>
<tr>
<td><strong>b21</strong></td>
<td>Communication speed: 0=9600 bps 1=19200 bps 2=38400 bps 3=57600 bps</td>
<td>bps</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>b22</strong></td>
<td>Acoustic alarm enabled 0=No 1=Yes</td>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>b30</strong></td>
<td>Activation of manual calibration 0=Deactivated 1=Activated Requires security code, see page 13.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>unt</strong></td>
<td>Work units 0=ºC 1=ºF</td>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

* According to wizard.
### Inputs and outputs

<table>
<thead>
<tr>
<th>Description</th>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In0</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connected probes</td>
<td>1=Probe 1 (Cold room)</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2=Probe 1 (Cold room) + Probe 2 (Evaporator)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>In1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuration of digital input 1</td>
<td>0=Deactivated</td>
<td>0</td>
<td>*</td>
<td>8</td>
</tr>
<tr>
<td>1=Door contact</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2=External alarm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3=Severe external alarm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4=Change of SP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5=Remote defrost</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6=Defrost block</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7=Low pressure switch</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8=Remote Stand-by</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>In2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polarity of the digital input 1</td>
<td>0=Activates on closing contact; 1=Activates on opening contact</td>
<td>0</td>
<td>*</td>
<td>1</td>
</tr>
<tr>
<td><strong>In2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuration of relay AUX1</td>
<td>0=Deactivated</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>1=Compressor/Resistor sump</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2=Virtual control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>In2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polarity of the digital input 2</td>
<td>0=Activates on closing contact; 1=Activates on opening contact</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td><strong>In2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configuration of relay AUX2</td>
<td>0=Deactivated</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1=Alarm</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2=Light</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3=Virtual control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4=Door frame resistance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5=Defrost 2° evaporator **</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6=Same as solenoid status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7=Same as unit status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8=Drainage resistor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### HACCP alarm

<table>
<thead>
<tr>
<th>Description</th>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>h1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum temperature of HACCP alarm</td>
<td>°C/°F</td>
<td>-50</td>
<td>99</td>
<td>99</td>
</tr>
<tr>
<td><strong>h2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum permitted time for activation of the HACCP alarm (0=Disabled)</td>
<td>H.</td>
<td>0</td>
<td>0</td>
<td>255</td>
</tr>
<tr>
<td><strong>EP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exit to level 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Information (Reading only)

<table>
<thead>
<tr>
<th>Description</th>
<th>Values</th>
<th>Min.</th>
<th>Def.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In1</strong></td>
<td></td>
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</tr>
<tr>
<td>Option chosen in the configuration wizard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pd</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump down active?</td>
<td>0=No 1=Yesi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pu</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Programme version</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Pr</strong></td>
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<tr>
<td>Programme revision</td>
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<tr>
<td><strong>Bu</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bootloader version</td>
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<tr>
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<tr>
<td>Bootloader revision</td>
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<td><strong>Pnr</strong></td>
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<tr>
<td>Parameter map revision</td>
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<td><strong>EP</strong></td>
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<tr>
<td>Exit to level 1</td>
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</tbody>
</table>

* According to wizard.

It can only be modified using the configuration wizard (In1).
Connectivity

The controllers are equipped with a port for connection of RS485 (MODBUS) data, which allows for remote management of these using an AKO-5012 web-server.

The MODBUS address is factory-set and is indicated on the rating plate located on the left side of the controller. This address must be different for each unit within the same network. The address can be changed using parameter b20. Once modified, the old address indicated on the plate will not be valid.

*AKO controller with communication

**AKO-80024 Use if connecting more than 25 units

Terminating resistors are not required.
Technical specifications

Power supply: 100 - 240 V~ 50/60 Hz
Maximum input power in the operation: 6.3 VA
Maximum nominal current: 15 A
Relay AUX 2 - SPDT - 16 A: NO (EN60730-1: 12 (9) A 250 V~), NC (EN60730-1: 10 (8) A 250 V~)
Relay DEF - SPDT - 20 A: NO (EN60730-1: 15 (15) A 250 V~), NC (EN60730-1: 15 (13) A 250 V~)
Relay COOL - SPST - 16 A: (EN60730-1: 12 (9) A 250 V~)
Relay FAN - SPST - 16 A: (EN60730-1: 12 (9) A 250 V~)
Relay AUX 1 - SPDT - 20 A: NO (EN60730-1: 15 (15) A 250 V~), NC (EN60730-1: 15 (13) A 250 V~)
No. of relay operations: EN60730-1:100,000 operations
Probe temperature range: -50.0 ºC to 99.9 ºC
Resolution, setting and differential: 0.1 ºC
Thermometric precision: ±1 ºC
Loading tolerance of the NTC probe at 25 ºC: ±0.4 ºC
Input for NTC probe: AKO-14901
Working ambient temperature: -10 ºC to 50 ºC
Storage ambient temperature: -30 ºC to 60 ºC
Protection degree: IP 65
Installation category: II s/ EN 60730-1
Pollution degree: II s/ EN 60730-1
Control device classification: Built-in assembly, with Type 1.B automatic operation action feature, for use in clean situations, logical support (Software) class A and continuous operation. Degree of contamination 2 acc. to UNE-EN 60730-1.

Double isolation between power supply, secondary circuit and relay output.
Temperature during ball-pressure test: Accessible parts: 75 ºC, Parts which position active elements: 125 ºC
Current of radio jamming supression tests: 270 mA
Voltage and current as per EMC tests: 207 V, 17 mA
Type of assembly: Fixed internal
MODBUS address: Shown on label
Dimensions: 290 mm (W) x 141 mm (H) x 84.4 mm (D)
Internal buzzer
## Troubleshooting

### Errors during calibration

The error message is displayed alternately with the CAL message. The 🟢 icon flashes.

<table>
<thead>
<tr>
<th>Error</th>
<th>Description</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1/E2/E3</td>
<td>Probe error 1 / 2 / 3</td>
<td>Check condition and wiring of affected probe</td>
</tr>
<tr>
<td>E10</td>
<td>Evaporator defrost error</td>
<td>Check defrost operation, it must end by temperature (d4)</td>
</tr>
<tr>
<td>E20</td>
<td>Idem for E10 but relating to the second evaporator</td>
<td></td>
</tr>
<tr>
<td>E11</td>
<td>Similar temperature in probes S1 and S2</td>
<td>Check position of both probes following recommendations on page 8</td>
</tr>
<tr>
<td>E20</td>
<td>Idem for E11 but relating to probe S3</td>
<td></td>
</tr>
<tr>
<td>E12</td>
<td>It has not been possible to carry out the calibration due to a lack of stability in the system</td>
<td>Avoid opening cold room door during calibration. Check main components of the refrigeration circuit, in particular the aspiration part</td>
</tr>
<tr>
<td>E22</td>
<td>Idem for E12 but relating to the second evaporator</td>
<td></td>
</tr>
<tr>
<td>E17</td>
<td>Excessive door openings have been detected during calibration and it has not been possible to calibrate.</td>
<td>Avoid opening cold room door during calibration.</td>
</tr>
</tbody>
</table>

### Errors during operation

The error message is displayed alternately with the temperature. The 🟢 icon flashes.

<table>
<thead>
<tr>
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</tr>
<tr>
<td>E23</td>
<td>Idem for E11 but relating to probe S3</td>
<td></td>
</tr>
<tr>
<td>E14</td>
<td>A lack of stability has been detected in the system</td>
<td>Check main components of the refrigeration circuit, in particular the aspiration part</td>
</tr>
<tr>
<td>E24</td>
<td>Idem for E14 but relating to the second evaporator</td>
<td></td>
</tr>
<tr>
<td>E15</td>
<td>Persistent lack of system stability has led to deactivation of the SELFDRIVE mode</td>
<td>Check main components of the refrigeration circuit, in particular the aspiration part and the position of probe 2 or 3. To return to the SELFDRIVE mode restart the device</td>
</tr>
<tr>
<td>E25</td>
<td>Idem for E15 but relating to the second evaporator</td>
<td></td>
</tr>
<tr>
<td>E16</td>
<td>Configuration has been changed from 1 to 2 evaporators or vice versa.</td>
<td>If the configuration change is correct, start a manual calibration</td>
</tr>
<tr>
<td>E18</td>
<td>Excessive door openings have been detected and the device cannot regulate in SELFDRIVE mode.</td>
<td>Check that the door has not been left open or that it does not open more than necessary</td>
</tr>
</tbody>
</table>