

PROPlus electronic control panel

Electronic power control panel with a magneto-thermal protection cutout switch for electrical control and operation of refrigeration services consisting of a single-phase condensing unit, single-phase evaporator fans, solenoid valve, air or electric defrost (single phase), interior light and electrical compressor sump heating resistance.

Incorporates graphic display, temperature register (1 channel), switch for interior light, buzzer and relay alarm signal.



AKO-15640

1- Warnings

Using the AKO-15640 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**)

2- Installation

The AKO-15640 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.

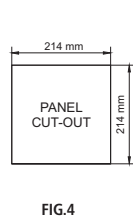
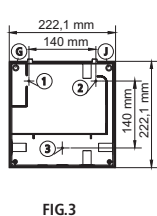
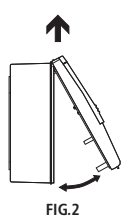
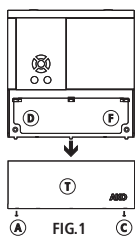
In order to give a correct reading, the probe should be installed in a place without heat influences other than the temperature that is to be measured or controlled.

2.1 Wall Mounting

- Remove cover T from the unit (Fig. 1)
- Open the unit and separate the front part of the housing (Fig.2).
- Drill the holes for the glands required for the cables to pass through, guided by the pre-cut centres in the sides of the housing.
- Drill 3 holes in the wall to match anchoring holes 1, 2 and 3 on the housing (Fig. 3).
- Insert the glands in the unit.
- Insert and tighten the 3 screws + plugs through the housing, into the 3 holes drilled in the wall.
- Pass the cable through the glands.
- Connect wiring specified on paragraph 2.3.1.
- Mount the front part on the housing (Fig.2).
- Insert and tighten screws D and F (Fig. 1).
- Connect wiring specified on paragraph 2.3.2.
- Close cover T, insert and tighten screws A and C (Fig. 1).

2.2 Panel Mounting (maximum panel thickness: 3mm)

- Remove cover T from the unit (Fig. 1)
- Open the unit and separate the front part of the housing (Fig.2).
- Replace the seal installed at the front with the panelling seal, ensuring that it is in the right position.
- Cut a hole in the panel with the described dimensions. (Fig.4)
- Drill the holes for the glands required for the cables to pass through, guided by the pre-cut centres in the sides of the housing.
- Finish drilling holes G and J using a 4-mm bit. (Fig.3)
- Insert the glands in the unit.
- Pass the cable through the glands.
- Connect wiring specified on paragraph 2.3.1.
- 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 wiring specified on paragraph 2.3.2.
- Close cover T, insert and tighten screws A and C (Fig. 1).



2.3 Connection

CONNECT THE BATTERIES PRIOR TO STARTING UP THE UNIT

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.

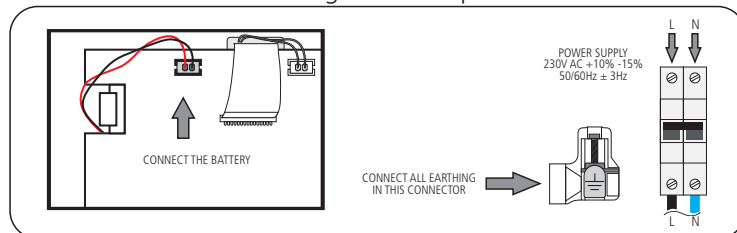
Power supply cables should be H05VV-F 2x2.5 mm² or H05V-K 2x2.5 mm².

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.

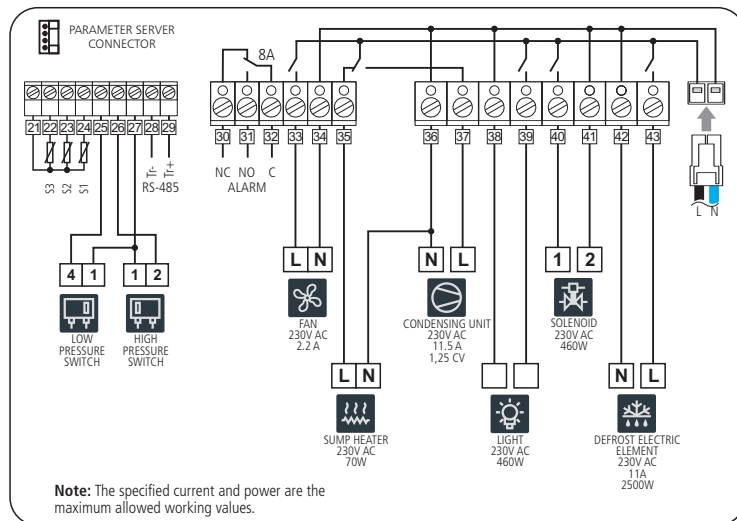


2.3.1 Connect before closing the front part



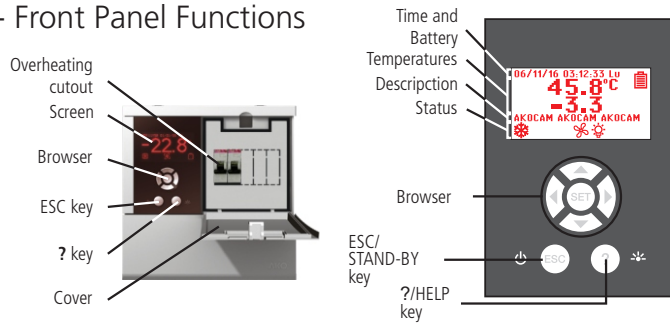
2.3.2 Connect after closing the front part

WARNING: Be sure to disconnect mains power before performing any operation in these terminal strips; connectors from 33 to 43 may contain voltage.



Note: The specified current and power are the maximum allowed working values.

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**

View the status of the unit's battery:

- ☐ Battery flat
- 🔋 Battery charging
- 🔌 Battery charged

Temperatures: View the temperatures of the selected probes in °C or °F configurable in menu: **GENERAL STATUS**

Description: This allows a brief description of the facility to be entered or a name to be given to the unit, configurable by pressing the **SET** + **▶** keys for 5 seconds.

Status: View the status of the functions performed by the control:

❄️ COOL (Compressor)

Permanent: Cooling relay COOL (compressor) activated.

Flashing: According to the temperature detected by Probe 1, the COOL relay should be activated, but is not due to a programmed parameter.

🌀 FAN

Permanent: FAN relay activated.

Flashing: According to the temperature detected by Probe 2, the FAN relay should be activated, but is not due to a programmed parameter.

☀️ DEFROST

Permanent: Indicates defrosting in operation.

❄️ DEFROST ENDED BY TIME

Permanent: Indicates last defrost ended by time.

🔄 CONTINUOUS CYCLE

Permanent: Indicates that the continuous cycle is active.

🔔 ALARM ON

Permanent: Alarm indicator activated.

🔕 ALARM MUTED

Flashing: Alarm detected but signal maintained. Alarm relay disconnected.

💡 LIGHTING

Permanent: LIGHT relay indicator activated by key.

ENERGY SAVING

Permanent: Indicates that energy saving function is activated.

HACCP (Hazard Analysis and Critical Control Point)

Permanent: Indicates that HACCP function is activated.

Flashing: HACCP alarm stored.

AUX (Auxiliary)

Flashing: AUX relay activated by key.

AUX (Auxiliary)

Flashing: AUX relay activated by digital input.

AUX (Auxiliary)

Flashing: AUX relay indicating whether the unit is connected or disconnected.

AUX (Auxiliary)

Flashing: AUX relay operating as a second defrosting device.

AUX (Auxiliary)

Flashing: AUX relay operating as gas collection valve.

- The record stores the information inside 366 blocks of 96 information records each block. There must be at least one probe configured as record probe (see table "Assignment of entries")

- Select the desired block using the browser keys. The block is selected by *.

Notes: Only consecutive blocks with the same register interval can be selected (maximum of 7). The register interval is configured using the parameters menu, specifically, the Recorder Frequency parameter.

- Select to view the 96 data registers.

- Select to view the graph of the 96 data registers.

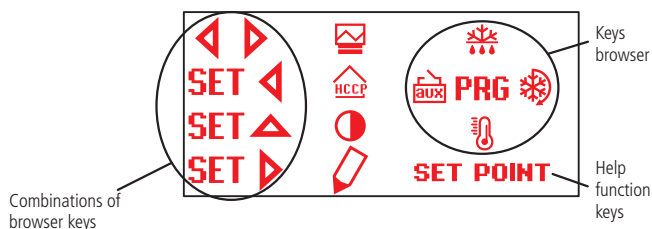
- Press the key to add the block to be displayed to the selection.

- Press the key to eliminate the block that is not required to be displayed from the selection.

- Press the **SET** key to accept the block selection.

3.1 Browser

Pressing any key on the browser brings up the key function help screen:



UP key

- When pressed for 5 seconds, manual defrost is activated/deactivated for the programmed duration.

- In programming, it moves the selection upwards.

- In programming, it increases the programmed value.

LEFT key

- Press to activate / deactivate the AUX relay.

- In programming, it moves the selection to the left.

DOWN key

- When pressed for 5 seconds, the Set Point temperature is displayed.

- In programming, it moves the selection downwards.

- In programming, it reduces the programmed value.

RIGHT key

- When pressed for 5 seconds, it activates/deactivates the CONTINUOUS CYCLE for the programmed duration.

- Pressing for 5 seconds with the CONTINUOUS CYCLE activated interrupts the process immediately.

- In programming, it moves the selection to the right.

SET key / PRG

- When pressed for 5 seconds the parameters folder screen is displayed.

- In programming, it accepts the programmed value.

ESC key

- Deactivates alarm but leaves signal active (turns off acoustic alarm signal).

- When pressed for 5 seconds it turns the unit off/on, leaving it in STAND-BY mode.

The display shows when the unit is disconnected.

- In programming, it exits a parameter without saving changes, returns to the previous menu and exits programming.

? key

- Turns lighting relay on/off. The lighting key continues operating even if the unit is in STAND-BY mode.

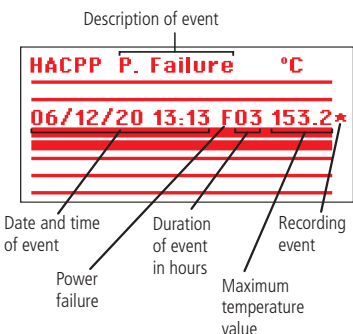
- In programming, it displays the parameter or selected function help screen.

SET + (CONTRAST) keys

- When pressed for 5 seconds, the screen contrast can be adjusted. Once in the contrast adjustment screen, press or to increase or reduce the contrast.

SET + (HACCP) keys

- When pressed for 5 seconds, the HACCP (Hazard Analysis and Critical Control Point) events register is accessed.



SET + (DESCRIPTION) keys

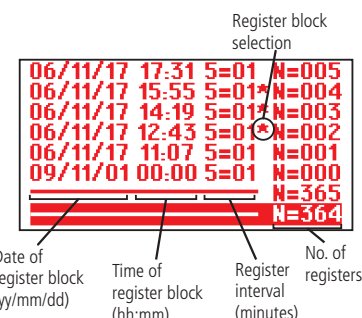
- When pressed for at least 5 seconds, it permits the user to enter a brief description of the facility or give a name to the unit. To edit the description, select the character to be entered using the browser keys and press **SET**. Press the key to move the character to be entered to the right and to move it to the left.

Select the key to erase a character that has been incorrectly entered.

Press to save the description.

+ (REGISTER) keys

- When pressed for 5 seconds, the data register is accessed.



4- Adjustment and Configuration

This should only be performed by personnel with knowledge of the unit's operation and limitations.

4.1 Set Point temperature.

The factory SET POINT default value is 0.0 °C.

- Press the key for 5 seconds to display SET POINT.

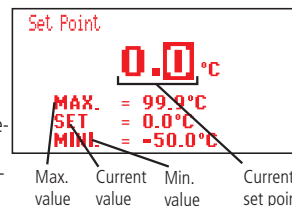
- Press the browser keys to change the Set Point to the required value.

- Press the **SET** key to accept the new Set Point. The display returns to the current temperature display status.

If **PASSWORD** appears, enter the access code (password) programmed in the **ACCESS CODE** parameter of the menu to access the current set point.

- Press the browser keys to enter the programmed code (Password).

- Press the **SET** key to accept the code. The current SET POINT value will be displayed and can be already modified.



4.2 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 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.

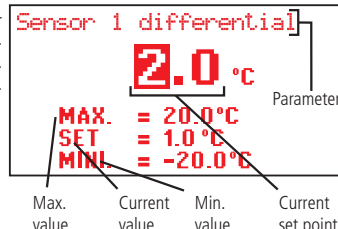
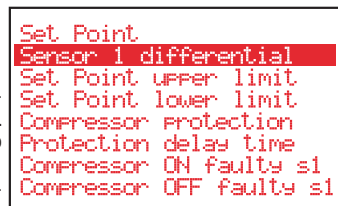
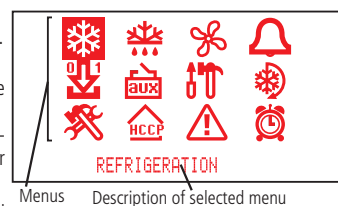
- Press the browser keys to select the parameter.

Level 3 Values

- To display the current value of any parameter, select the required parameter and press **SET** key. 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.

NOTE: 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.



5- Description of Parameters and Messages

Values in the **Def.** column are factory-set.

Level 1	Menus and Description						
❄️	Level 2	REFRIGERATION control (Compressor)					
	Level 3	Description	Values	Min.	Def.	Máx.	
		Set temperature (SP) (no locks)	(°C/°F)	-40.0	0.0	320	
		Probe 1 differential (Hysteresis)	(°C/°F)	0.1	1.0	20.0	
		Set Point upper limit (It cannot be set above this value)	(°C/°F)	-40.0	99.9	320	
		Set Point lower limit (It cannot be set below this value)	(°C/°F)	-40.0	-40.0	320	
		Compressor protection delay type: OFF/ON (From the last switch-off) ON (At switch-on)		off/on	off/on	on	
		Compressor protection delay time.	(min.)	0	0	255	
		"COOL" (Compressor) relay time in ON in event of faulty probe 1 (If 0, the relay is always OFF)	(min.)	0	10	255	
		"COOL" (Compressor) relay time in OFF in event of faulty probe 1 (If 0, the relay is always ON)	(min.)	0	5	255	
		Compressor stops when opening door? (NO= connected) (YES=disconnected)		No	No	Yes	
	❄️	Level 2	DEFROST control				
		Level 3	Description	Values	Min.	Def.	Máx.
		Defrost type: (Electrical heater) (Hot gas by-pass)			EH		
		Defrost count (Frequency) (Compressor operation sum) (RTC: Real time clock)			Fre.		
		Defrost frequency: Elapsed time between 2 starts		0	6	120	
		Defrost maximum duration		0	30	255	
		Type of message during defrost: (Current temperature display) (Defrost start temperature display) (Display DEFROST message)			Def.		
		Message maximum duration Time added at the end of defrost	(min.)	0	5	255	
		Defrost final temperature on probe 2 If probe 2 is programmed	(°C/°F)	-40.0	8.0	99.9	
		Defrost start-up on equipment switch-on:		No	No	Yes	
		Defrost start-up delay on equipment switch-on	(min.)	0	0	255	
		Signals if defrost ends due to maximum time		No	No	Yes	
		Drip time, compressor stops and FAN relay off when defrost ends	(min.)	0	1	255	
🌀	Level 2	FANS control (Evaporator)					
	Level 3	Description	Values	Min.	Def.	Máx.	
		Fans stop temperature by probe 2. If probe 2 is programmed	(°C/°F)	-40.0	4.0	99.9	
		Probe 2 differential	(°C/°F)	0.1	1.0	20.0	
		Stop fans when compressor stops? (NO= connected) (YES=disconnected)		No	No	Yes	
		Fans status during defrost (Connected) (Disconnected)			Disc.		
		Start-up delay after defrost Operates if it is higher than Drip Time	(min.)	0	3	255	
	Stop fans if the door opens? (No=Connected) (Yes=Disconnected)		No	No	Yes		
🔔	Level 2	ALARM control (Visual)					
	Level 3	Description	Values	Min.	Def.	Máx.	
		Configuration of temperature alarms (Relative to SP) (Absolute)			Rel.		
		Maximum alarm in probe 1	(°C/°F)	-40.0	50.0	320	
		Minimum alarm in probe 1	(°C/°F)	-40.0	50.0	320	
		Temperature Alarms Differential	(°C/°F)	0.1	1.0	20.0	
		Temperature alarm delay from moment at which they should operate due to temperature	(min.)	0	30	255	
		Temperature alarm delay on start-up	(min.)	0	0	255	
		Temperature alarm delay from the end of a defrost	(min.)	0	0	255	
		Temperature alarm delay from digital input disabling If programmed as "Door contact"	(min.)	0	0	255	
		Temperature alarm delay from digital input enabling If programmed as "Door contact"	(min.)	0	0	255	
		Alarm relay status (Connected) (Disconnected)			Conn.		
	🔑	Level 2	DIGITAL INPUTS				
Level 3		Description	Values	Min.	Def.	Máx.	
		Digital Input N°1 configuration (Disabled) (Door Contact) (External alarm) (Severe external alarm) (Remote defrost) (Remote Energy saving) (AUX relay activation) (Low-pressure in)				Dis.	
		Alarm delay of digital input N°1	(min.)	0	0	255	

🔑		Polarity of digital input N°1 (Normally open) (Normally closed)			NC.	
		Digital input N°2 configuration (Disabled) (Door Contact) (External alarm) (Severe external alarm) (Remote defrost) (Remote Energy saving) (AUX relay activation) (Low-pressure in)			Dis.	
		Alarm delay of digital input N°2 (Normally open) (Normally closed)	(min.)	0	0	255
		Polarity of digital input N°2 (Normally open) (Normally closed)			NC.	
	Level 2	AUX RELAY				
	Level 3	Description	Values	Min.	Def.	Máx.
		AUX relay configuration (Disabled) (Activated by key) (Activated by input) (Equal state of equipment) (Second Defrost) (Pump down control)				Dis.
		Defrost 2 maximum duration	(min.)	0	30	255
		Defrost 2 final temperature		-58.0	8.0	99.9
		Defrost 2 probe (Disabled) (Probe 2) (Probe 3)				Dis.
		Pump-down duration	(sec.)	1	180	1800
		Pump-down On delay	(sec.)	0	5	60
	Level 2	GENERAL STATUS				
Level 3	Description	Values	Min.	Def.	Máx.	
	Access code (password) to parameters and set point		0	0	99	
	Allocation of password to Set Point				No	
	Initial parameters: (YES, configure in "Def" and exit programming)				No	
	Register interval	(min.)	0	15	60	
	Address for units with communication		0	1	255	
	Parameters transfer (Disabled) (Send) (Receive)				Dis.	
	Connected probes (Probe 1), (Probe 1 and 2) (Probe 1 and 3) (Probe 1, 2 and 3)				1	
	Probe to be displayed		1	1	3	
	Display mode (1 probe + clock) (1 probe + text) (Connected probes + clock + text)				1PC	
	Temperature display unit		°C	°C	°F	
	Decimal point				Yes	
	Probe setting (TEM at S1/REG at S3), (TEM and REG at S3) (See table "Assignment of entries")				TEM at S1	
	Delay of all functions on power supply switch on	(min.)	0	0	255	
	Type of operation: Not selectable (always cold)				Cold	
	Program version (Information)					
Level 2	CONTINUOUS CYCLE					
Level 3	Description	Values	Min.	Def.	Máx.	
	Continuous cycle duration	(h.)	0	1	24	
Level 2	ENERGY SAVING					
Level 3	Description	Values	Min.	Def.	Máx.	
	Set Point during energy saving	(°C/°F)	-40.0	0	320	
	Duration of energy saving	(h.)	0	0	24	
Level 2	HACCP					
Level 3	Description	Values	Min.	Def.	Máx.	
	Delay in registering an event after a temperature alarm	(min.)	0	0	255	
Level 2	LANGUAGE					
Level 3	Description	Values	Min.	Def.	Máx.	
	English					
Level 2	CLOCK					
Level 3	Description	Values	Min.	Def.	Máx.	
	Date (Year Month Day)					
	Time (Week_Day Hour Minute)					
	Defrost 1 (Day Hour Minute)					
	Defrost 2 (Day Hour Minute)					
	Defrost 3 (Day Hour Minute)					
	Defrost 4 (Day Hour Minute)					
	Defrost 5 (Day Hour Minute)					
	Defrost 6 (Day Hour Minute)					
	Defrost 7 (Day Hour Minute)					
	Defrost 8 (Day Hour Minute)					
	Energy saving Start (Day Hour Minute)					

NOTE: When time parameters are modified, the new values are applied when the current cycle is completed. To apply values immediately, switch the controller off and then on again.

MESSAGES	
ACCESS CODE	Access code (password) request to enter programming of parameters or Set Point
DEFROST	Indicates defrosting is in progress.
EXTERNAL ALARM	Flashing with temperature
SEVERE EXT. ALARM	Flashing with temperature
HIGH TEMP. ALARM	Flashing with temperature - Temperature of Probe 1 exceeds maximum Probe 1 Alarm parameter.
LOW TEMP. ALARM	Flashing with temperature - Temperature of Probe 1 is below minimum programmed Probe 1 Alarm parameter.
LOW PRESSURE ALARM	Flashing with temperature - Low-pressure pressostat error with compressor in operation.
PROBE 1, 2, or 3 ALARM	Probe 1, 2 or 3 failure (Open, crossed circuit; NTC: temp.> 110 °C or temp.<-55 °C; PTC: temp.> 150 °C or temp.<-58 °C)

ASSIGNMENT OF ENTRIES ACCORDING TO CONFIG. OF PROBE				
PROBE CONFIGURATION	TEM at S1/REG at S3 (According to EN12830)			Connectors
	Probe 1	Control, alarms and HACCP probe	Input S1	21 and 24
	Probe 2	Defrost probe (or 2 ^o defrost)	Input S2	21 and 23
	Probe 3	Registry probe (or 2 ^o defrost)	Input S3	21 and 22
	TEM+REG at S3			Connectors
	Probe 1	Control, alarms, HACCP and registry probe	Input S3	21 and 22
Probe 2	Defrost probe (or 2 ^o defrost)	Input S2	21 and 23	
Probe 3	Product core probe (or 2 ^o defrost)	Input S1	21 and 24	

6- Accessories

PORTABLE SERVER

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

COMMUNICATIONS

The units provided with a communications connector, permit data transmission and reception using the standard **MODBUS** protocol and to carry out management from PC software. This makes a centralised system for display, logging, alarms, remote teleprocessin...

AKO-5004

Software for controllers and data loggers using a PC type computer.

7- Maintenance

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



Equipment including rechargeable electrical batteries:

This unit includes batteries which must be replaced when the device's autonomy time is below the indicated in the specifications. At the end of the unit's service life, the batteries should be disposed of at a selective refuse collection site or returned to the manufacturer.

8- Technical Data

Power	230V AC +10% -15% 50/60Hz ± 3Hz
Maximum total intensity	16A
Relay features (check maximum authorised working current)	
COMPRESSOR Relay	20A to 250V, cosφ =1
AUX Relay	16A to 250V, cosφ =1
LIGHT Relay	16A to 250V, cosφ =1
FAN Relay	8A to 250V, cosφ =1
DEFROST Relay	30A to 250V, cosφ =1
ALARM Relay	8A to 250V, cosφ =1
Temperature range of the probe	-40.0 °C to 99.9 °C
Resolution, Set Point and differential	0,1 °C
Thermometric accuracy	± 1 °C as per EN 12830 and EN 13485
Denomination	EN 12830, S, A, 1, -40 °C +40 °C; EN 13485, S, A, 1, -40 °C +40 °C
Probe tolerance at 25 °C (NTC)	± 0,4 °C
Input for NTC probe	AKO-149XX
Maximum input power	24 VA
Working ambient temperature	0 °C to 50 °C
Ambient storage temperature	-30 °C to 70 °C
Installation category	II as per EN 61010-1
Pollution degree	II as per EN 61010-1
Double insulation between the power supply, the secondary circuit and the relay output.	
Recorder autonomy in the event of a power failure	48 Hours
Battery	Li-Polymer for recorder
Internal buzzer	

9- 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: 0 °C to +50 °C
Assigned insulation voltage $U_i = 440V\sim$
Electric panels with IP65 protection degree
CEM 1 environment
Connectors for copper conductors
Resistance to short circuits $I_{sc} = 4,5 kA$

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

