AKO PROPlus 3PH BASIC Electronic Panel User Guide

Contents

AKO PROPlus 3PH BASIC Electronic Panel

Presentation

PROPlus 3PH is the global electronic solution to manage positive and negative cold room stores, in combination with:

- Standard condensing units
- Streamlined condensing units
- Or as a service panel in decentralised systems.

It offers a high degree of IP65 protection for installation in damp environments. It is easy to install thanks to its new connection strip.

Maintenance
Clean the surface of the unit with a soft cloth, water and detergent. Do not use abrasive detergents, petrol, white spirits or solvents.

Precautions
Using the equipment without following the manufacturer's instructions may affect the device's safety requirements. To ensure that the device operates correctly, only probes supplied by AKO should be used. Between -40 ºC and +20 ºC, if the NTC probe is extended up to 1,000 m with minimum 0.5 mm² wire, the maximum deviation will be 0.25 ºC (Wire for probe extension ref. AKO-15586).

IMPORTANT:

- The AUX 1, AUX 2 and AUX 3 relays are programmable, and their operation depends on the configuration (see page 25).
- The function of the digital inputs depends on the configuration (See page 26).
- The recommended currents and powers are the maximum working currents and powers.

Versions and references

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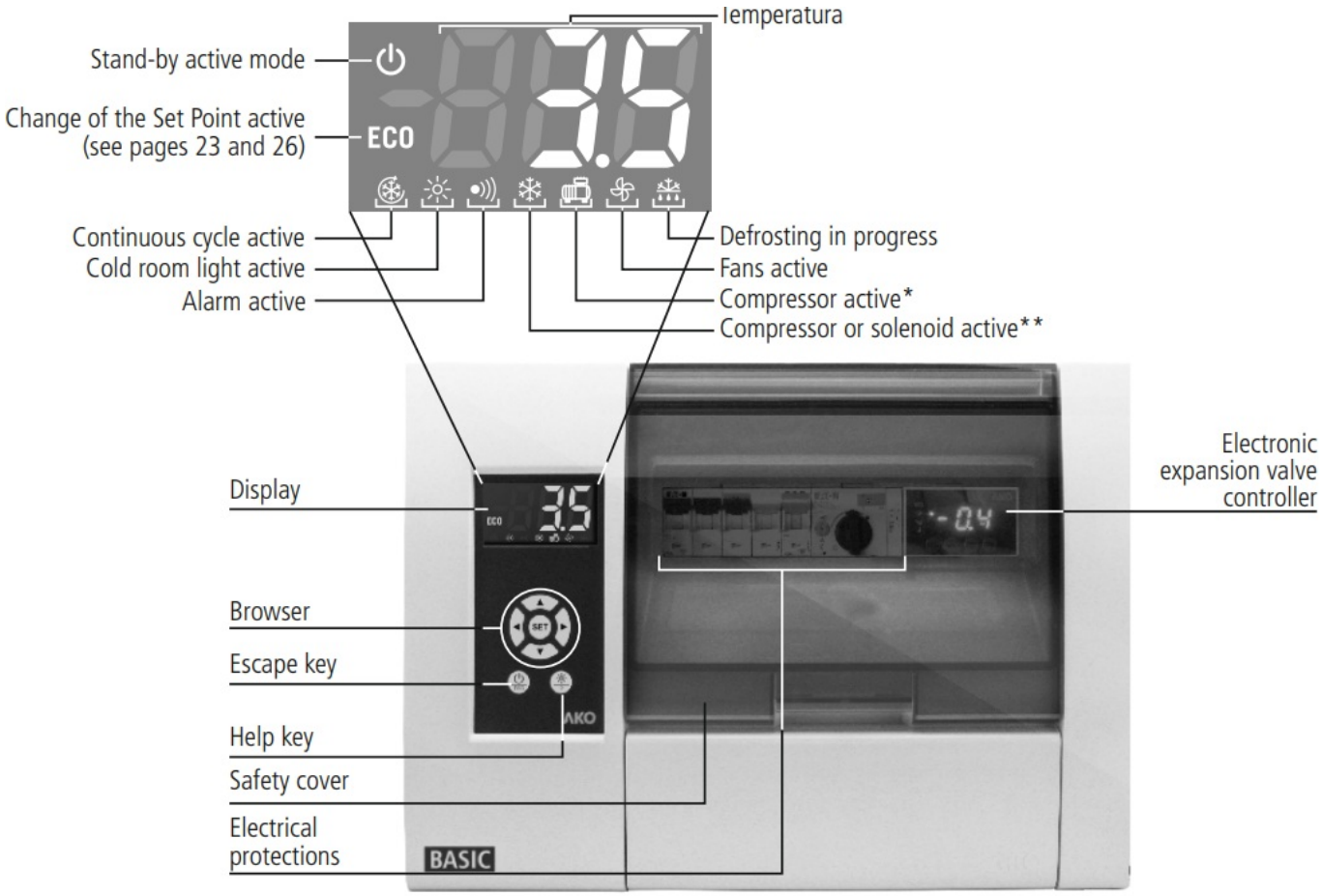
Recommendations

Disconnect the voltage before carrying out any operations inside the electrical panel. All wiring should be according to current standards and should be carried out by authorised staff. Only carry out the wiring foreseen in the wiring diagrams. Using the electrical panel not observing the manufacturer’s instructions may alter the appliance’s safety requirements. A tool is needed to remove any fixed part.

- **Panel installation:**
  - It is advisable to leave a clean safety space without obstacles around the panel.
  - Do not knock or make sudden movements on the panel.
  - Carry out the wiring according to the installation manual.
  - The probes and their cables should NEVER be installed in a conduit together with power, control or feeder cables.
  - The earth terminals that the panels contain are installed to guarantee the continuity of earthing, however, earthing is not carried out by the terminal and should be carried out outside the panel.
  - The neutral ratings are of the TT type. The IT rating should not be used.
  - Circuit breakers (protective switches) are of the phase/s + neutral, curve C type, guaranteeing switching and protection against overcurrents.
  - Close the panel when your are not working on it.
  - Residual current protection outside the electrical panel according to low voltage electrotechnical

regulations.
    - The panels meet European standard EN 61439-1 / EN 61439-2.
    - Terminals for copper external conductors.
- **Checks before starting the panel up:**
    - Power supply voltages and frequencies will be the ones that figure in the “Technical specifications” section.
    - Check that there are no loose parts or foreign bodies on connections or switchgear.
    - Check that there is no dust or damp inside the panel.
    - Check the correct fastening of the switchgear and components.
    - Check the correct tightening of the screws and power connections.
    - Check the correct connection of the power conductors.
    - Check the correct insulation of the outer lines and that they do not mechanically force the inner connections of the panel. Check that the maximum current of the Q1 and Q3 current breaker (according to model) has been set correctly. Before starting the installation up, we recommend preheating the compressor’s housing.
- **Checks during the panel start-up:**
    - Check that no electric arcs occur.
    - Check that the relays or contactors do not produce ratios.
    - Check that there is no overheating in cables, controllers and the rest of the switchgear.
- **Checks after the first 24 hours of operation:**
    - Check that no overheating occurs.
    - Retighten screws and power connections.
- **Periodical preventive maintenance:**
    - The panel should remain closed using its lock.
    - Retighten the power connections once a year.
    - Check the wear of the switchgear once a year.
    - Clean the outer surface of the panel with a soft cloth, water and detergent. Do not use abrasive detergents, petrol, white spirits or solvents.
- **Technical data:**
    - **Working ambient temperature:** –5 ºC to 40 ºC
    - **Rated isolation voltage** Ui = 440 V~
    - **Electrical panels with degree of protection:** IP 65
    - **CEM B** environment
    - Terminals for copper conductors
    - Resistance to short-circuits Icc=6 kA
    - Rated pulse voltage (Vimp) 2,5 KV
- **Cable isolation voltage:**
    - **Operation:** 500V (Halogen free)
    - **Power:** 750V (Halogen free)

Description



If pump down is active, it indicates the operation of the compressor.
If pump down is active, it indicates that the solenoid is open, otherwise it indicates that the compressor is in operation.

Quick access to functions

Pressing it for 5 seconds activates or deactivates the defrost.

Pressing it for 5 seconds allows changing the SET POINT temperature.

If probe 1 is displayed by default, the value of probe 2 will be displayed by pressing and vice versa. (see parameter P8)

Pressing it for 5 seconds, activates or deactivates the CONTINUOUS CYCLE.

Pressing it for 5 seconds, the quick setup menu is accessed.

Pressing it for 10 seconds, the advanced setup menu is accessed.

Silences the alarms (they are indicated on the display).

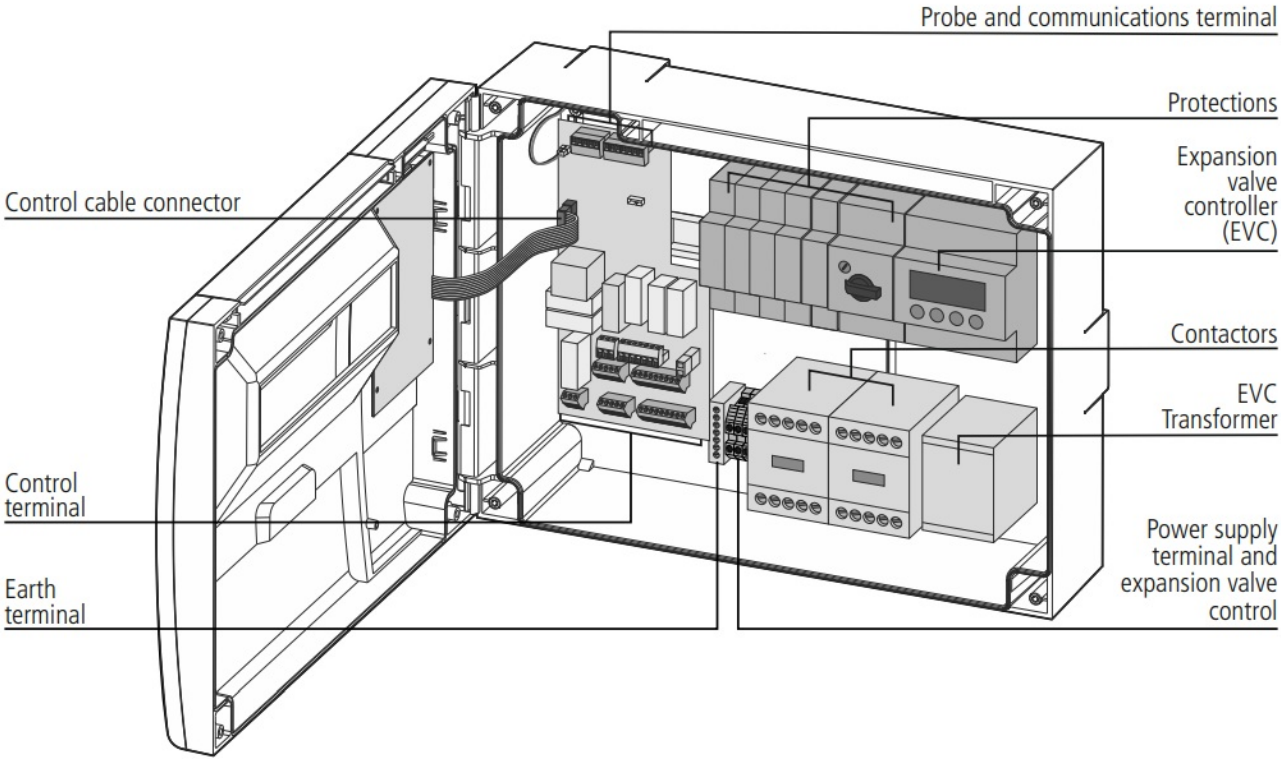
Pressing it for 5 seconds activates or deactivates the Stand-By mode. The display shows the ⏻ symbol in this mode.

Pressing it for 2 seconds, activates or deactivates the cold room light (if P63=1). This function stays active although the unit is in the ⏻ mode.

Messages

	Flashing 0: Access code (Password) request You must enter the access code configured on L5 to execute the requested function. See also parameter P2 (p. 25)
	Probe 1 or 2 faulty (open circuit, crossover or temperature outside the probe limits; **NTC**: -50 To 99 °C). (Activates alarm relay and sound alarm) *
	Indicates a defrost is underway. When the defrost process has finished, the message will continue to be displayed during the time defined in parameter d3.
	Alternating with temperature: Maximum temperature in control probe alarm. Temperature set in A1 has been reached. (Activates alarm relay and sound alarm) *
	Alternating with temperature: Minimum temperature in control probe alarm. Temperature set in A2 has been reached. (Activates alarm relay and sound alarm) *
	Alternating with temperature: External alarm activated (by digital input). (Activates alarm relay and sound alarm) *
	Alternating with temperature: Severe external alarm activated (by digital input). (Activates alarm relay and sound alarm) *
	Alternating with temperature: Defrost alarm time-out. Displayed when a defrost ends after the maximum time elapsed as defined in parameter d1. (Message only displayed on screen)
	Alternating with temperature: Door open alarm. Shown if the door remains open longer than specified in parameter A12. (Activates alarm relay and sound alarm) *
	Alternating with temperature: The maximum pump down stop time has been exceeded (**P15**) (Message only displayed on screen)
	Alternating with temperature: The maximum pump down start-up time has been exceeded (**P14**) (Message only displayed on screen)
	It indicates that a component in the compressor's safety chain has triggered (compressor motor guard, thermistors or high pressure controller).

Component location



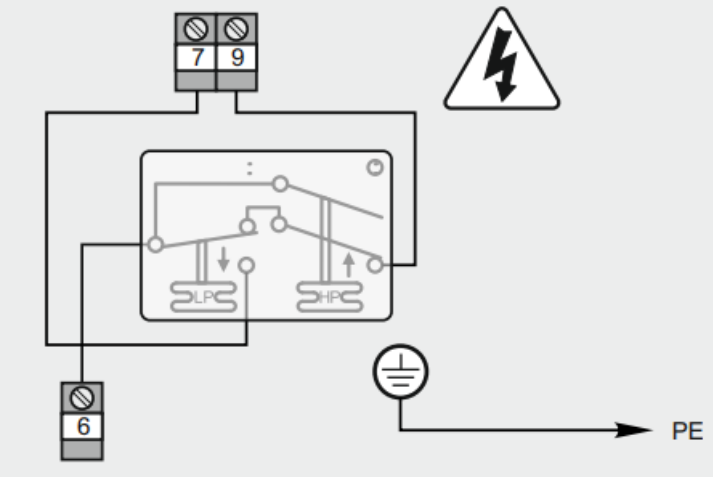
ATTENTION: Make sure to turn of the equipment's power supply before handling it, as different areas may be energised.
IMPORTANT: The availability of the elements described depends on the panel model.

Identification

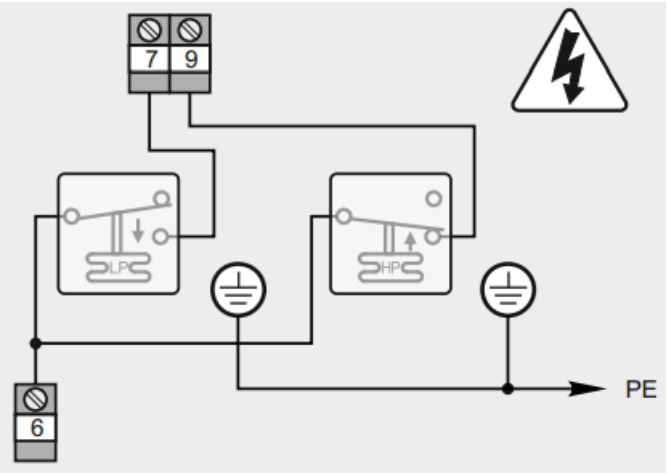
- **F1:** Defrost circuit breaker
- **FM:** Operation circuit breaker
- **Q1:** Compressor motor guard
- **Q3:** Evaporator fan motor guard
- **K1M:** Compressor contactor
- **K2M:** Defrost contactor
- **K4M:** Evaporator fan contactor
- **T2:** EVC Transformer
- **EVC1:** Controller for expansion valve

Pressure switch wiring options

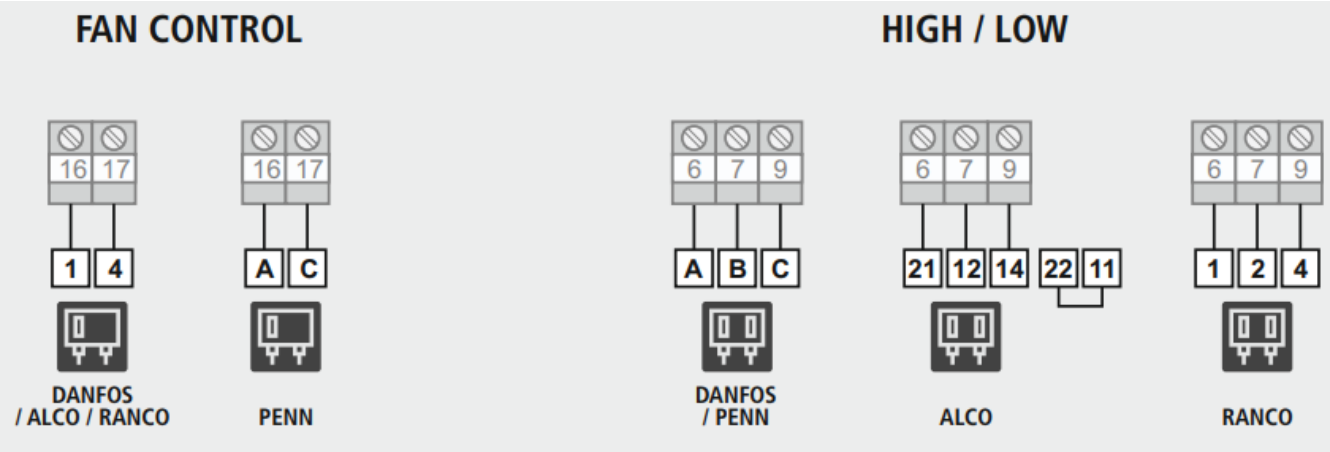
- **Combine high-low pressure controller** (AKO-15690/1/2/3 – AKO-15690/1/2/3-EVC)



- **Separate Low pressure controller per AC input** (AKO-15690/1/2/3 – AKO-15690/1/2/3-EVC)



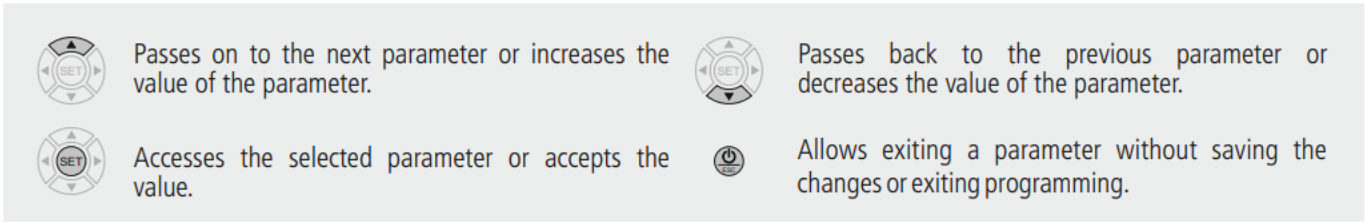
- **Pressure controller equivalence**



Basic configuration

The basic configuration menu allows the equipment to be configured for the most common applications. Press the SET key for 5 seconds to access it. If the access code is activated, a 2 digit code is requested, if the code entered is not correct the unit will not enter programming. If more specific configuration is required use the advanced configuration menu (See user manual on www.ako.com) After 20 seconds without touching any key, the unit returns to the previous level without saving changes or it will exit programming.

Function of the keys in programming



- **SP: Set point**

  It defines the temperature that should be inside the cold storage room:

  - **Minimum:** –45.0 *
  - **Maximum:** 99 *

    *(Depends on the bottom/top locking of the set point).
- **d0: Defrost frequency**

  Time that must elapse between the starting of each defrost.
- **d1: Maximum defrost duration**

  The defrost will end after this time has elapsed since it started.
- **F3: Fan status during defrost**

  It defines the status of the fans during defrost. 0= OFF 1= ON
- **A1: Maximum alarm probe 1**

  Defines the temperature at which the maximum alarm will be triggered. Only affects probe 1.

  - **Minimum:** –45.0 *
  - **Maximum:** 99 *

    *(Depends on the bottom/top locking of the set point).
- **A2: Minimum alarm probe 1**

  Defines the temperature at which the minimum alarm will be triggered. Only affects probe 1.

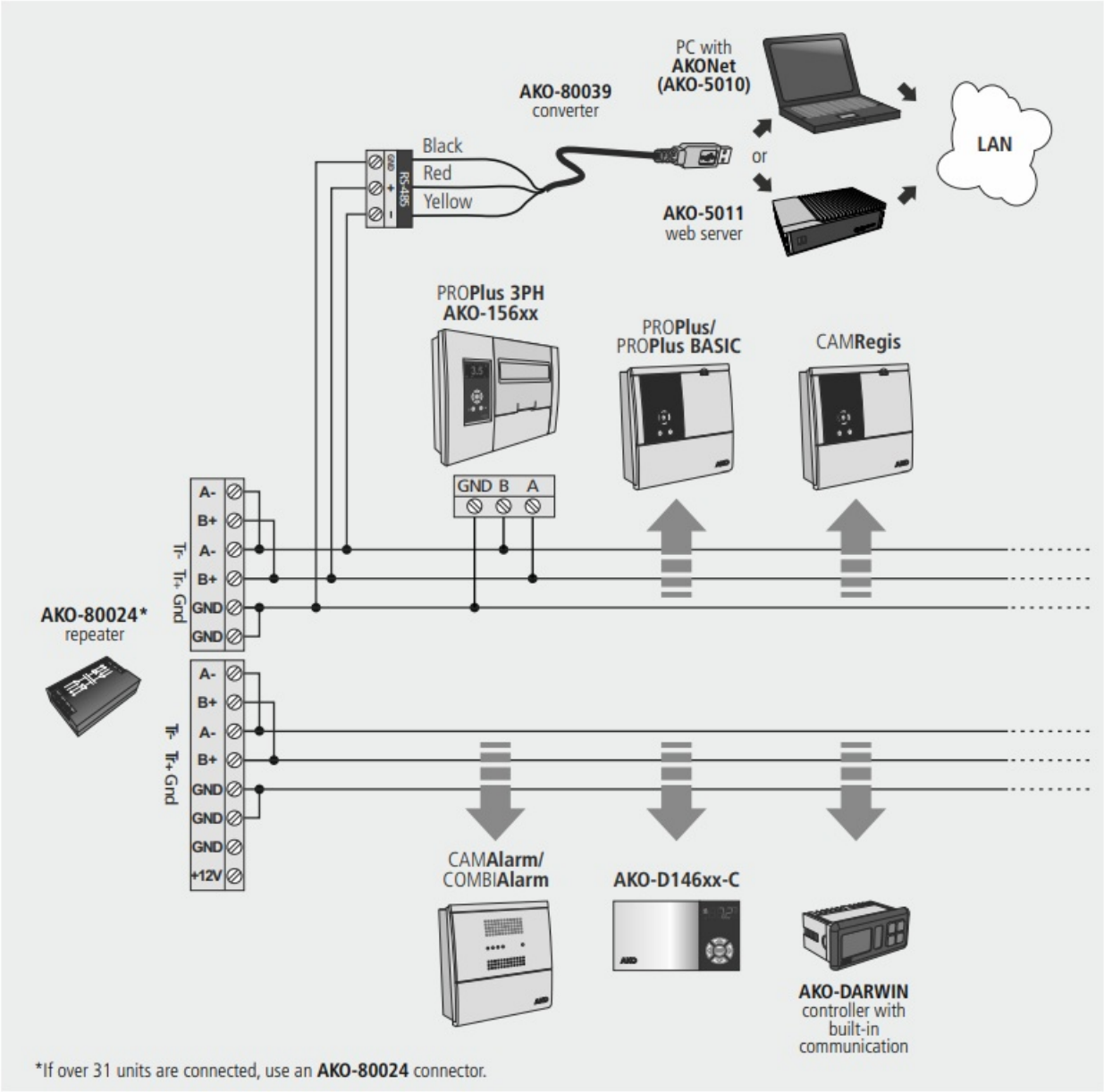
  - **Minimum:** –45.0 *
  - **Maximum:** 99 *

    *(Depends on the bottom/top locking of the set point).

Connectivity

The unit has a port for RS485 date connection (MODBUS), which can be managed using a PC. Up to 127 units can be connected to a PC with AKONet (AKO-5010), or to the AKO-5011 web server. Each of these units should have a different MODBUS address, that is defined using the P5. Using the AKONet software it is possible to display and capture the data of any connected unit, and configure its parameters.

- **AKONet:** Management software for AKO units with RS485 (MODBUS) communication. If it is installed in a server the software can be accessed from any PC in the network or even from Internet (it requires the server having connection to Internet and fixed IP).
- **AKO-5011:** Web server that includes the AKONet software. It can carry out the same functions as the PC, with the advantage of having a server dedicated to communication with the units.



Parameters

The parameters are grouped into 6 sections depending on their function. Press the ▲ + ▼ keys for 10 seconds to access it. The Def. column shows factory-set default parameters. Temperature values are expressed in ºC. (Equivalent temperature in ºF)

Level 1.- REGULATION AND CONTROL 

	Description	Units	Min	Def	Max.
SP	Temperature Adjustment (Set Point)	(ºC/ºF)	-45	0.0	99
C0	Calibrating probe 1 (Offset)	(ºC/ºF)	-20.0	0.0	20.0
C1	Probe 1 differential (Histeresis) (Histéresis)	(ºC/ºF)	0.1	2.0	20.0
C2	Upper blocking of the set point (cannot be set above this value)	(ºC/ºF)	C3	99	99
C3	Lower blocking of the set point (cannot be set below this value)	(ºC/ºF)	-45	-45	C2
C4	Type of delay for protection of the compressor **0**=OFF/ON (since the last disconnection); **1**=OFF-ON/ON-OFF (since the last shut-down /start-up)		0	0	1
C5	Protection delay time (value of the option selected in parameter C 4)	(min.)	0	0	120
C6	Status of COMP. relay with probe fault : **0**=OFF; **1**=ON; **2**=Average based on last 24 hours prior to probe fault; **3**=ON-OFF as prog. C7 and C8		0	2	3
C7	Time relay ON in case of faulty probe: (If C7=0 and C8:;0, the re lay will always be OFF deenergised)	(min.)	0	10	120
C8	Time relay OFF in case of fault of probe 1: (If C8=0 y C7:;0, the relay will always be ON energised)	(min.)	0	5	120
C9	Maximum duration of the continuous cycle mode. (**0**=disabled)	(h.)	0	0	48
C10	Variation of the set point (SP) in continuous cycle mode, when it reac hes this point (SP+C10), it reverts to the normal mode. (SP+C10 ;: C 3) (**0**=OFF) The value of this parameter is always negative, except if i t is 0	(ºC/ºF)	0	-50	C3-S P
C11	Idle time of the digital input for the change Set Point function to be ac tivated (Only if P10 or P11 =1) (**0**=OFF)	(h.)	0	0	24
C12	Variation of the set point (SP) when the change set point function is a ctive. (SP+C12 > C2) (**0**= disabled)	(ºC/ºF)	C3-S P	0,0	C2-S P
EP	Exit to Level 1				

Level 1.- DEFROST CONTROL 

Level 2

	Description	Units	Min	Def	Max.
d0	Defrost frequency (Time between two starts)	(h.)	0	6	96
d1	Maximum defrost duration (**0**=defrost deactivated)	(min.)	0	15	255
d2	Type of message during defrost: **0**=Current temperature; **1**=Temperature at start of defrost; **2**=Display dEF message		0	2	2
d3	Maximum duration of message (Time added at the end of the defrost process)	(min.)	0	5	255
d4	Defrost end temperature (probe 2) (If P4 ≠ 1)	(°C/°F)	-45	8.0	99,0
d5	Defrost on equipment start-up : **0**=NO, First defrost as per d0 **1**=YES, First defrost as per d6		0	0	1
d6	Defrost start delay on equipment start-up	(min.)	0	0	255
d8	Calculated time between defrost period : **0**=Total actual time; **1** =Sum of times the compressor is on		0	0	1
d9	Drip time at end of defrost (compressor and fans off) (if P4 ≠ 1)	(min.)	0	1	255
EP	Exit Level 1				

Level 1.- FAN CONTROL 

	Description	Units	Min	Def	Max.
F0	Fan shut-down temperature as per probe 2 (if P4 :; 1)	(ºC/ºF)	-45	45	99,0
F1	Probe 2 differential (If P4 :; 1)	(ºC/ºF)	0,1	2,0	20,0
F2	Stop fans when stopping compressor **0**=No, **1**=Yes		0	1	1
F3	Fan status during defrost: **0**=Off; **1**=On		0	0	1
F4	Starting delay after defrost (if F3=0) Will only operate if it is higher th an d9	(min.)	0	3	99
EP	Exit Level 1				

Level 1.- ALARM CONTROL 

Level 2

	Description	Units	Min	Def	Max.
A0	Configuration of temperature alarms : **0**=Relative to SP **1**=Absolute		0	1	1
A1	Maximum alarm probe 1 (must be greater than SP)	(ºC/ºF)	A2	99,0	99,0
A2	Minimum alarm probe 1 (must be greater than SP)	(min.)	-45	-45	A1
A3	Temperature alarm delay during start-up	(min.)	0	0	120
A4	Temperature alarm delay after completion of a defrost	(min.)	0	0	99
A5	Temperature alarm delay after reaching the value of A1 or A2	(min.)	0	30	99
A6	External alarm delay when receiving digital input signal (P10 or P11=2 or 3)	(min.)	0	0	120
A7	Deactivation delay of the external alarm when the signal of the digital input disappears (P10 or P11=2 or 3)	(min.)	0	0	120
A8	Show warning if defrost is terminated by time-out **0**=No, **1**=Yes		0	0	1
A9	Alarm relay polarity **0**= Relay ON in alarm (OFF no alarm); **1**= Relay OFF on alarm (ON with no alarm)		0	0	1
A10	Temperature Alarm Differential (A1 and A2)	(ºC/ºF)	0,1	1,0	20,0
A12	Door open alarm delay (if P10 or P11=1)	(min.)	0	10	120
EP	Exit Level 1				

Level 1.- GENERAL STATUS 

	Description	Units	Min	Def	Max.
P1	Delay of all functions on receiving electrical power	(min.)	0	0	255
P2	Función del código de acceso (password) **0**= Inactivo; **1**= Bloqueo ac ceso a parámetros; **2**= Bloqueo del teclado		0	0	2
P3	Configures the default factory settings **0**= No changes **1**=Return to d efault settings		0	0	1
P4	Selection of type of inputs **1**=1 probe **2**=2 probes		1	2	2
P5	MODBUS address		1	1	225
P6	AUX 1 relay configuration** **0**=Deactivated **1**=Pump down **2**= Same compressor status		0	*	2
P62	AUX 2 relay configuration** **0**=Deactivated **1**=Alarm **2**= S ame compressor status **3**=Same unit status **4**=Pump down		0	*	4
P63	AUX 3 relay configuration** **0**=Deactivated **1**=Light **2**=Sa me unit status		0	1	2
P7	Temperature display mode **0**=Integers in ºC **1**=One decimal in ºC **2**=Integers in ºF **3**=One decimal in ºF		0	1	3
P8	Probe to be displayed (as per parameter P4) **0**=visualization of all t he probes in sequence; **1**=Probe 1 **2**=Probe 2		0	1	2

The options available in each setting can vary depending on the model.

Level 2	Description	Units	Min	Def	Max.
P10	Configuring digital input 1 **0**= Off **1**= Door contact **2**= External alarm **3**= Severe external alarm **4**= Change Set Point **5**= Continuous cycle act. **6**= Remote defrost		0	0	6
P11	Configuring digital input 2 **0**= Off **1**= Door contact **2**= External alarm **3**= Severe external alarm **4**= change Set Point **5**= Continuous cycle act. **6**= Remote defrost		0	*	6
P12	Digital input polarity 1 **0**=Energised on closed contact, **1**=Energised on open contact		0	1	1
P13	Digital input polarity 2 **0**=Energised on closed contact, **1**=Energised on open contact		0	0	1
P14	Maximum start-up time after pump down (Values between 1 and 9 seconds are not accepted) (**0**=Disabled)	(sec.)	0	0	120
P15	Maximum pump down time (**0**=Disabled)	(min.)	0	0	15
P22	Cold room light timer	(min.)	0	0	999
P23	Stop fans and compressor on opening door **0**=No **1**=Si		0	0	1
P24	Start up delay for fans and compressor with door open	(min.)	0	0	999
EP	Exit Level 1				

Nivel 1.- ACCESS CONTROL AND INFORMATION (tid) 

Lev	Description	Units	Min	Def	Max.
L5	Access code (Password)		0	0	99
PU	Program version (Information)			–	
Pr	Program revision (Information)			–	
EP	Exit Level 1				

Default parameters according to models

	Parameter		
	P11	**P6**	**P62**
AKO-15690/1/2/3	**0**=Deactivated	**1**=Pump down	**1**=Alarm
AKO-15697	**0**=Deactivated	**2**=Same compressor status	**1**=Alarm
AKO-15699/699-1	**2**=External alarm	**2**=Same compressor status	**1**=Alarm
AKO-15690/1/2/3-EVC	**0**=Deactivated	**0**=Deactivated	**4**=Pump down
AKO-15697-EVC	**0**=Deactivated	**0**=Deactivated	**2**=Same compressor status
AKO-15699-EVC	**2**=External alarm	**0**=Deactivated	**2**=Same compressor status

Technical specifications

- **Rated voltage Un**……400 V~ ±10 % 50/60 Hz ±5 %
- **Rated voltage Ue**……230 V~ ±10 % 50/60 Hz ±5 %
- **ALARM relay** …… 8A at 250V, cosj=1
- **Probe temperature range**……..– 45.0 ºC to 99.9 ºC
- **Resolution, setting and differential** ……0.1 ºC
- **Thermometric precision**……± 1 ºC
- **Precision of the NTC probe at 25 ºC** ……..± 0.4 ºC
- **Input for NTC probe** ……..AKO-14901
- **Maximum input power in the operation** ……30 VA
- **Working ambient temperature**……-5 ºC to 40 ºC
- **Storage ambient temperature** ……–30 ºC to 70 ºC
- **Overvoltage category**……II s/ EN 61439-1 / EN 61439-2
- **Degree of pollution** ……II s/ EN

61439-1 / EN 61439-2

- **Degree of protection** ……IP65
- **Dimensions** ……400(An) x 300(Al) x 135(P) mm
- **Double isolation between power supply, secondary circuit and relay output.**
- **Type of assembly**……..Fixed internal/Internal buzzer/Encapsulated assembly

For further information, please refer to the user manual available on our website **www.ako.com**.

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Documents / Resources

	**AKO PROPlus 3PH BASIC Electronic Panel** [pdf] User Guide PROPlus 3PH BASIC Electronic Panel