AKO
we make it easy

CE **PROMet** Three-Phase Panels
User Manual

AKO-1760x, AKO-1761x, AKO-1762x

Index

AKO Electromecànica thanks you and congratulates you on the purchase of our product, the development and manufacture of which involved the most innovative technologies, as well as rigorous production and quality control processes.

Our commitment to achieving customer satisfaction and our continuous efforts to improve day by day are confirmed by the various quality certificates obtained.

This is a high performance, technologically advanced product. Its operation and the final performance achieved will depend, to a great extent, on correct planning, installation, configuration and commissioning. Please read this manual carefully before proceeding to install it and respect the instructions in the manual at all times.

Only qualified personnel may install the product or carry out technical support.

This product has been developed for its use in the applications described in its manual, **AKO** Electromecànica does not guarantee its operation in any use not foreseen in this document, and will not take any responsibility in any event for damage of any type that might be caused by incorrect use, configuration, installation or start-up.

Complying with and enforcing the regulations applying to installations where our products are destined to be used is the responsibility of the installer and the customer. **AKO** Electromecànica accepts no liability for damage which may occur due to failure to comply with these regulations. Rigorously follow the instructions described in this manual.

In order to extend the lifetime of our products to the maximum, the following points must be observed:

Do not expose electronic equipment to dust, dirt, water, rain, moisture, high temperatures, chemical agents or corrosive substances of any type.

Do not subject equipment to knocks or vibrations or attempt to handle them in any way differently to that indicated in the manual.
Do not under any circumstances exceed the specifications and limitations indicated in the manual.
Respect the indicated environmental conditions for operation and storage at all times.
During installation and on completion of this, avoid the presence of loose, broken or unprotected cables or cables in poor condition. These may constitute a risk for the equipment and its users.

AKO Electromecànica reserves the right to make any modification to the documentation and the product without prior notification.

1.- 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.

Panel installation:
It is advisable to leave a clean safety space without obstacles around the panel.
Do not knock or move the panel abruptly.
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 overcurrent.
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 have been tested using European standard IEC 60439-1.

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 current breaker.
Before starting the installation up, we recommend preheating the compressor's housing (Page 15).

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.

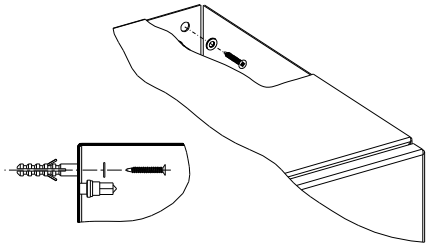
Periodical preventive maintenance:
The panel should remain closed using its lock.
Retighten the power connections once a year.
Check the wear of the switchgear once a year.
Clean the outer surface of the panel with a soft cloth, water and detergent. Do not use abrasive detergents, petrol, white spirits or solvents.

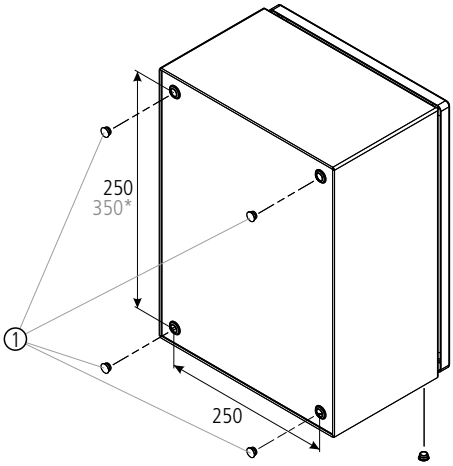
Technical data:
Working ambient temperature: -5 ºC to 40 ºC
Rated isolation voltage Ui = 440 V~
Electrical panels with degree of protection Ext./Int.: IP 54/20
CEM 1 Environment
Terminals for copper conductors
Resistance to short-circuits Icc=6 kA

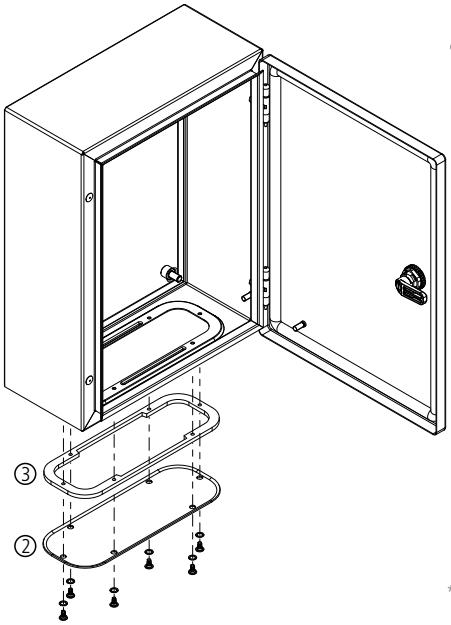
Cable isolation voltage:
Operation: 500V (Halogen free)
Power: 750V (Halogen free)

2.- INSTALLATION

- Remove the four silicone protections (1).
- Make 4 holes on the wall with the dimensions indicated in the drawing.
- Fasten the panel to the wall using 4 suitable screws, washers and plugs.
- Before making the wiring, remove the bottom cover (2) and make suitable holes in it for the cable entry. Use a gland to maintain the indicated degree of protection.
- Assemble the cover again with the glands. Do not forget to install the sealing gasket correctly (3).
- Wire all the elements, passing the cables through the glands and following the diagrams in the "Wiring" chapter.
- Correctly adjust the maximum current of the Q1 current breaker.



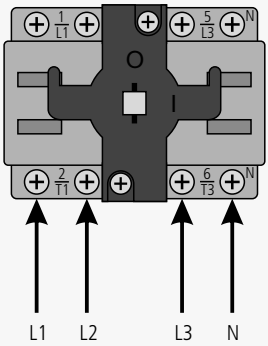




*Only panels with output for defrost resistor

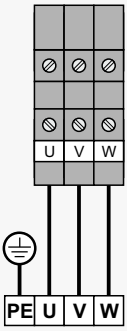
3.- WIRING

POWER SUPPLY INPUT



TT 400 Vac - 50Hz

COMPRESSOR

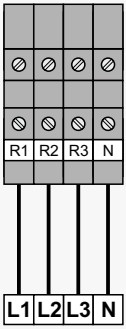


COMPRESSOR

Maximum consumption is indicated in the table on page 9.

According to model, see table on page 9.

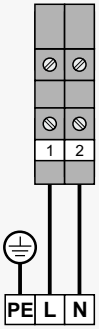
DEFROST RESISTORS



Max. 20A

DEFROST RESISTOR

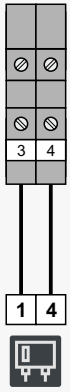
FAN 1
CONDENSER



Max. 1.5A (2.8A if not using the second fan, terminals 5 and 6)

CONDENSER FAN

FAN CONTROL PRESSOSTAT
CONDENSER

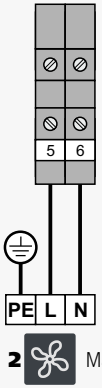


PRESSOSTAT
FAN CONTROL

Terminal equivalence table

Manufacturers	Input	Output	Alarm
DANFOS	1	4	2
ALCO	1	4	2
PENN	A	C	B
RANCO	1	4	2

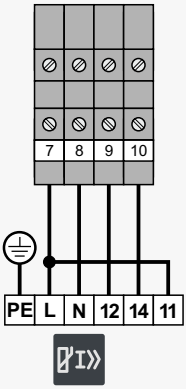
FAN 2
CONDENSER



Max. 1.5A

FAN
CONDENSER

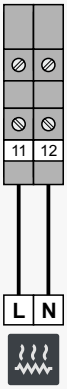
THERMISTORS



THERMISTORS

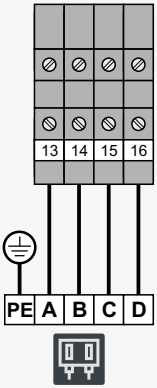
If the installation does not have a thermistor a bridge should be made between terminals 7 and 10, while terminals 8 and 9 will remain free. The bridge can be replaced by an external command.

CRANKCASE RESISTOR



CRANKCASE
RESISTOR

HIGH / LOW PRESSOSTAT



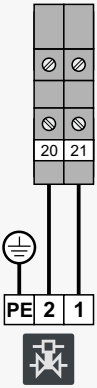
HIGH / LOW
PRESSOSTAT

Terminal equivalence table

Manufacturers	Input	Output	L. Pres. Alarm	H. Pres. Alarm
	Terminals			
DANFOS	A	C	B	D
ALCO	21	14	12	24
PENN	A	C	B	D
RANCO	1	4	2	3

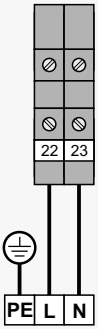
In ALCO pressostats a bridge has to be made between terminals 22 and 11, to follow the protection series.

LIQUID SOLENOID VALVE



LIQUID SOLENOID
VALVE

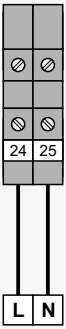
EVAPORATOR FAN



230Vac / Max. 3A

EVAPORATOR
FAN

AUXILIIARY OUTPUT



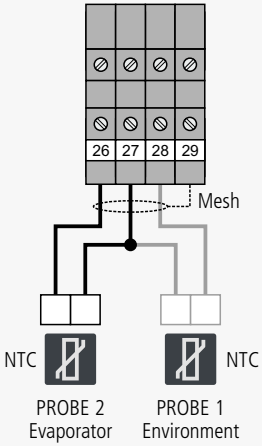
AUX.

230Vac /
Max. 1500W

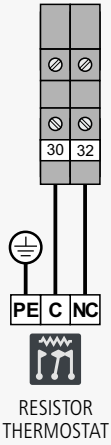
AUXILIARY
POWER SUPPLY OUTPUT

According to model, see table on page 9.

PROBES



RESISTOR THERMOSTAT



In models with **AKO-14323** microcontroller (see table), if the installation does not have a resistor thermostat, make a bridge between terminals 30 and 32.

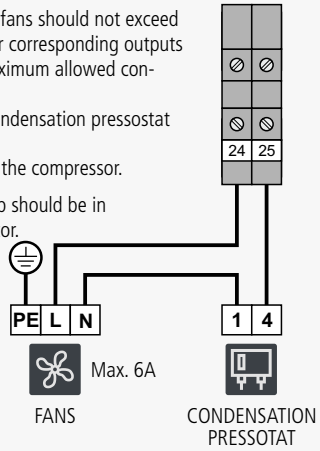
CONDENSOR AND EVAPORATOR FANS

-The sum of the consumption of the condenser and evaporator fans should not exceed 5A. If this is exceeded, the fans will be distributed among their corresponding outputs and the auxiliary output (Terminals 24 and 25) so that the maximum allowed consumption is not exceeded in any of them.
The fans connected to the auxiliary output should include a condensation pressostat for control, as shown in the following diagram.
-If the fan does not have a pressostat, connect it together with the compressor.

The maximum consumption of the Compressor-Fan group should be in accordance with the adjustment of the Q1 motor protector.

Terminal equivalence table

Manufacturers	Input	Output	Alarm
DANFOS	1	4	2
ALCO	1	4	2
PENN	A	C	B
RANCO	1	4	2



4.- COMPARATIVE TABLE

	Condenser unit power	Controller	Defrost resistors	Defrost resistor thermostat	I max. fans (Comp. + Evap.)	I max. defrost resistors	I max. auxiliary output
AKO-17609	1 to 1.6 A	AKO-D14223	No	No	5 A		6 A
AKO-17610	1.6 to 2.5 A	AKO-D14223	No	No	5 A		6 A
AKO-17611	2.5 to 4 A	AKO-D14223	No	No	5 A		6 A
AKO-17612	4 to 6.3 A	AKO-D14223	No	No	5 A		6 A
AKO-17613	6.3 to 10 A	AKO-D14223	No	No	5 A		6 A
AKO-17614	10 to 16 A	AKO-D14223	No	No	5 A		6 A
AKO-17615	16 to 20 A	AKO-D14223	No	No	5 A		6 A
AKO-17616	20 to 25 A	AKO-D14223	No	No	5 A		6 A
AKO-17617	1 to 1.6 A	AKO-D14323	Yes	Yes	5 A	20 A	6 A
AKO-17618	1.6 to 2.5 A	AKO-D14323	Yes	Yes	5 A	20 A	6 A
AKO-17619	2.5 to 4 A	AKO-D14323	Yes	Yes	5 A	20 A	6 A
AKO-17620	4 to 6.3 A	AKO-D14323	Yes	Yes	5 A	20 A	6 A
AKO-17621	6.3 to 10 A	AKO-D14323	Yes	Yes	5 A	20 A	6 A
AKO-17622	10 to 16 A	AKO-D14323	Yes	Yes	5 A	20 A	6 A
AKO-17623	16 to 20 A	AKO-D14323	Yes	Yes	5 A	20 A	6 A
AKO-17624	20 to 25 A	v	Yes	Yes	5 A	20 A	6 A

5.- PARAMETER CONFIGURATION

The **AKO** microcontroller has been factory configured for optimum operation in most refrigerated installations. Refer to the following table to check that this configuration is adapted to your needs. If you want to change a parameter, refer to the microcontroller's manual.

The unit operating parameters are organised in different groups or families according to their function.

The **Default values** column indicates the factory configured default parameter. The "PARAMETERS ACCORDING TO APPLICATION" indicates the variable parameters depending on the application chosen in parameter P3.

Unless otherwise indicated, the temperature values are expressed in °C. (Equivalent temperature in °F)

IMPORTANT: The **AKO** microcontroller is factory configured to obtain the best operation in combination with the panel, therefore, its configuration is slightly different to the one shown in its manual. Refer to the following table to know its real configuration.

DEFAULT PARAMETERS, DEPENDING ON APPLICATION (P3)								
	1 Multipurpose	**2** Frozen foods	**3** Fruits and vegetables	**4** Fresh fish	**5** Soft drinks	**6** Bottle racks	**7** Cold	**8** Heat/ Incubators
SP	2	-18	10	0	3	12	21	37
d0	4	4	4	4	24	24	96	-
d1	20	20	20	20	20	20	0	-
F0	8	0	30	8	8	30	99	-
F3	1	0	1	1	1	1	1	-

Level 1.- Control

Level 2	Description	Units	Min.	Default values		Max.
				AKO-17609 to 17616	AKO-17617 to 17624	
SP	Temperature Adjustment (Set Point) (limits depending on probe type)	(°C/°F)	-50	2	-18	99
C0	Calibrating probe 1 (Offset)	(°C/°F)	-20.0	0.0		20.0
C1	Probe 1 differential (Histeresis)	(°C/°F)	0.1	2.0		20.0
C2	Upper blocking of the set point (cannot be set above this value)	(°C/°F)	C3	99		99
C3	Lower blocking of the set point (cannot be set below this value)	(°C/°F)	-50	-50		C2
C4	Type of delay for protection of the compressor: **0**=OFF/ON (since the last disconnection); **1**=ON (since start-up/reset); **2**=OFF-ON/ON-OFF (since the last shut-down /start-up)		0	0		2
C5	Protection delay time (value of the option selected in parameter C4)	(min.)	0	0		120
C6	Status of COOL 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 (in heat mode always OFF)		0	0		3
C7	Time relay ON in case of faulty probe (If C7=0 and C8≠0, the relay will always be OFF deenergised)	(min.)	0	10		120
C8	Time relay OFF in case of fault of probe 1 (If C8=0 and C7≠0, the relay will always be ON energised)	(min.)	0	5		120
C9	Maximum duration of fast freezing mode. (**0**=off)	(h.)	0	0		48
C10	Change set point (SP) in fast freezing mode, when it reaches this point (SP + C10) returns to normal. (SP+C10 ≥ C3) (**0**=OFF)	(°C/°F)	0	0		C3-SP
C11	Length of inactivity at digital input to activate ECO mode (Only if P10 or P11=1 and P0=0) (**0**=OFF)	(h.)	0	0		24
C12	Change set point (SP) in ECO mode (SP+C12 ≤ C2) (**0**=off)	(°C/°F)	0	0		C2-SP
EP	Exit to Level 1					

Level 1.- DEFROST Control

Level 2	Description	Units	Min.	Default values AKO-17609 to 17616	Default values AKO-17617 to 17624	Max.
d0	Defrost frequency (Time between two starts)	(h.)	0	6		96
d1	Maximum defrost duration (**0**=defrost deactivated)	(min.)	0	30		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)	(min.)	0	5		255
d4	Defrost end temperature (probe 2) (If P4 ≠ 1)	(°C/°F)	-50	8		99,9
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
d7	Defrost type: **0**=Resistors **1**=Inverted cycle **2**=Fan / air **3**=Compressor off		0	0		3
d8	Calculated time between defrost periods: **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	0	1	255
EP	Exit to Level 1					

Level 1.- Fan control (Evaporator)

Level 2	Description	Units	Min.	Default values AKO-17609 to 17616	Default values AKO-17617 to 17624	Max.
F0	Fan shut-down temperature as per probe 2 (if P4 ≠ 1)	(°C/°F)	-50	50		99,9
F1	Probe 2 differential (If P4 ≠ 1)	(°C/°F)	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	1	0	1
F4	Starting delay after defrost (if F3=0) Will only operate if it is higher than d9	(min.)	0	0	3	99
F5	Stop fans on opening the door **0**=No, **1**=Yes (Requires a digital input configured as port P10 or P11=1)		0	0		1
EP	Exit to Level 1					

Level 1.- ALARMS control

Level 2	Description	Units	Min.	Default values AKO-17609 to 17616	Default values AKO-17617 to 17624	Max.
A0	Configuration of temperature alarms: **0**=Relative to SP; **1**=Absolute		0	0		1
A1	Maximum alarm probe 1 (must be greater than SP)	(°C/°F)	A2	99,9		99,9
A2	Minimum alarm probe 1 (must be less than SP)	(min.)	-50	-50		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	Desactivation 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)	(°C/°F)	0,1	1,0		20,0
A12	Door open alarm delay (if P10 or P11=1)	(min.)	0	2		120
EP	Exit to Level 1					

Level 1.- General status

Level 2	Description	Units	Min.	Default values AKO-17609 to 17616	Default values AKO-17617 to 17624	Max.
P1	Delay of all functions on receiving electrical power	(min.)	0	0		255
P2	Access code (password) functions **0**=Inactive; **1**=Block access to parameters; **2**=Keyboard lock		0	0		2
P3	Set the default parameters according to the type of application **1**=Multipurpose **2**=Frozen **3**=Fruit and Vegetables **4**=Fresh Fish **5**=Soft Drinks **6**=Bottle Racks **7**=AC **8**=Heat/Incubators		0	0		8

Level 1.- General status (Continuación)

Level 2	Description	Units	Min.	Default values AKO-17609 to 17616	Default values AKO-17617 to 17624	Max.
P4	Selection of type of input **1**=1 probe + 2 digital inputs, **2**=2 probes +1 digital input		1	2		2
P5	MODBUS Address		1	1		225
P6	Configuration of AUX relay **0**=Fan (only 2-relay equipment) **1**=defrost **2**=Alarm **3**=Light		0	0	1	3
P7	Temperature display mode **0**=Whole in °C **1**=One decimal in °C **2**=Whole in °F **3**=One decimal in °F		0	1		3
P8	Probe to be displayed (as per parameter P4) **0**=visualization of all the probes in sequence **1**=Probe 1; **2**=Probe 2 **3**=Probe 3		1	1		2
P10	Configuring digital input 1 **0**= Off **1**=Door contact **2**=External alarm **3**=Severe external alarm **4**=Slave defrost **5**=Act. modo ECO **6**=Act. Fast Freezing (If C9 ≠0)		0	0		6
P11	Configuring digital input 2 **0**= Off **1**=Door contact **2**=External alarm **3**=Severe external alarm **4**=Slave defrost **5**=Act. modo ECO **6**=Act. Fast Freezing (If C9 ≠0)		0	0		6
P12	Digital input polarity 1 **0**=Energised on closed contact, **1**=Energised on open contact		0	0		1
P13	Digital input polarity 2 **0**=Energised on closed contact, **1**=Energised on open contact		0	0		1
EP	Exit to Level 1					

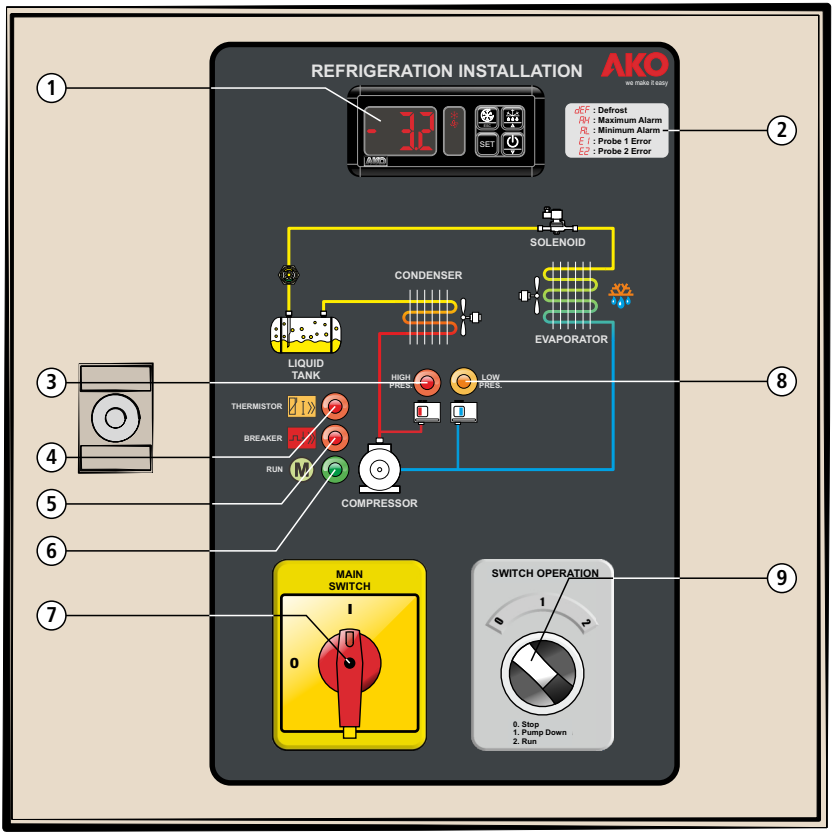
Level 1.- Access and information control (tid)

Level 2	Description	Units	Min.	Default values AKO-17609 to 17616	Default values AKO-17617 to 17624	Max.
L5	Access code (Password)		0	-		99
PU	Program version (Information)			-		
Pr	Program revision (Information)			-		
EP	Exit to Level 1					

6.- OPERATION

6.1- Description

- **1. AKO** microcontroller.
- **2.** Microcontroller messages help.
- **3.** High pressure switch indicator.
- **4.** Thermistor indicator (Cond. U.).
- **5.** Current breaker indicator (Cond. U.).
- **6.** Compressor operating indicator.
- **7.** Main switch.
- **8.** Low pressure switch indicator.
- **9.** Control selector.



6.2- Controls

AKO Microcontroller (1)[1]
Refer to the attached microcontroller manual about this device operation.
Main switch (7)
Starts up (pos.1) or stops (pos. 0) the control panel.
As a safety measure, the door cannot be opened when the panel is operating.
Control selector (9)
It allows selecting the compressor control.

- Position 0 (Stop): In this position the compressor will never start to operate. The crankcase's resistor always activates when the main switch is in position 1.
- Position 1 (Pump down): The compressor starts to operate pump down (closed liquid solenoid) until the low pressure switch stops it.
- Position 2 (Run): The installation will operate autonomously controlled by the panel.

6.3- Indicators

High pressure switch indicator (3)
Indicates the activation of the high pressure switch.
Low pressure switch indicator (8)
Indicates the activation of the low pressure switch.
Thermistor alarm indicator (4)
Indicates the activation of the compressor's thermistor.
Current breaker alarm indicator (5)
Indicates the activation of the compressor's current breaker.
Compressor operating indicator (6)
Indicates the activation of the compressor.

IMPORTANT: Before starting up the installation, we recommend preheating the compressor's crankcase, and to do so, first turn the control selector (9) to position 0 and then the main switch (7) to position 1. After ten minutes you can start-up the installation turning the control selector to position 2.

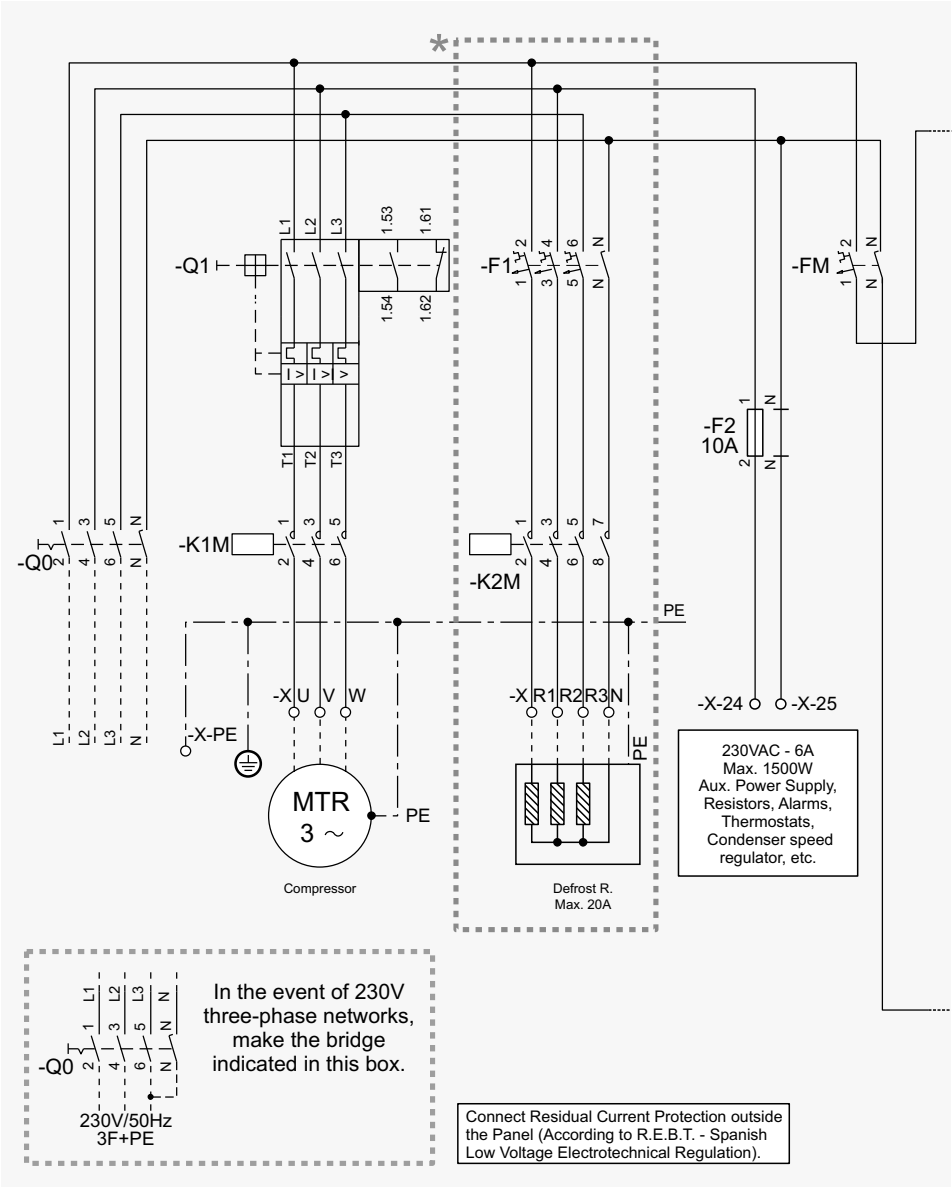
7.- WIRING DIAGRAMS

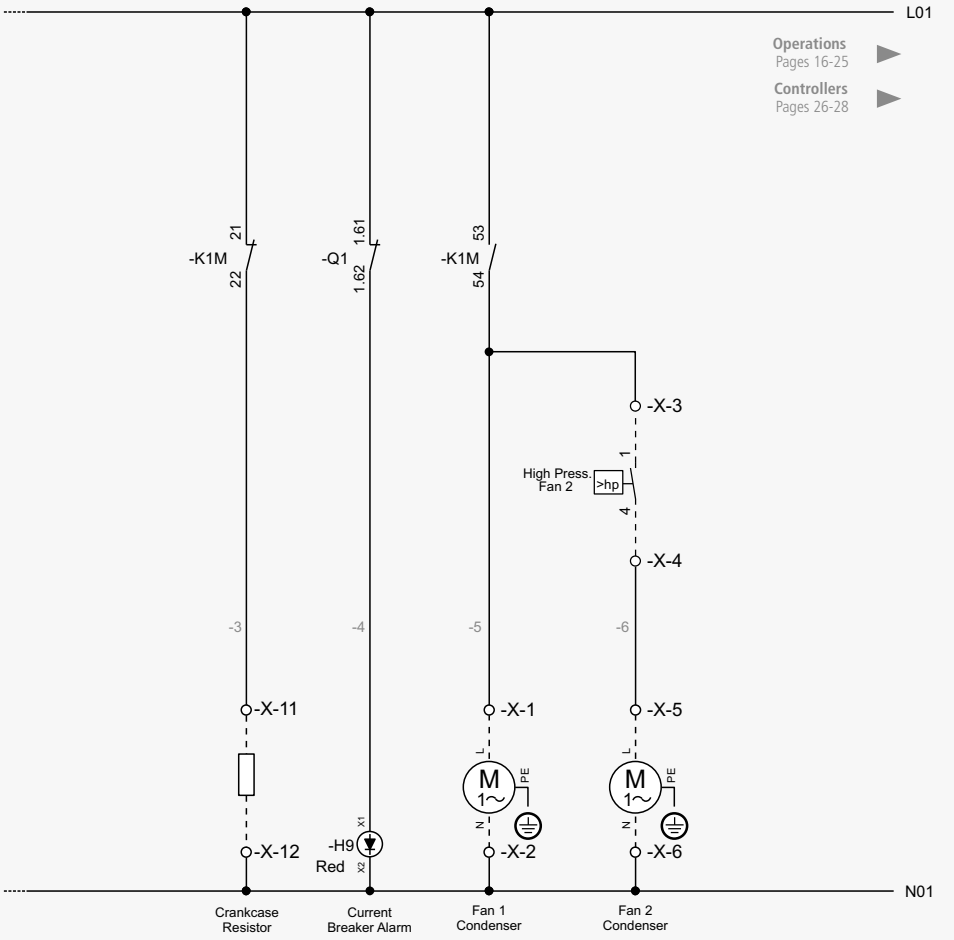
Nomenclature

-X(n): .....Connection terminals
-D3/-D4: .....AKO Controller
-FI: .....Defrost resistor protective circuit breaker
-FM: .....Control protection circuit breaker
-H(n): .....Indicator LEDs
-K1: .....Auxiliary relay
-K1M: .....Compressor contactor (or condenser unit)
-K2M: .....Defrost resistor contactor
-Q1: .....Compressor protector
-S1: .....Operating mode selector

7.1- General input (Power)

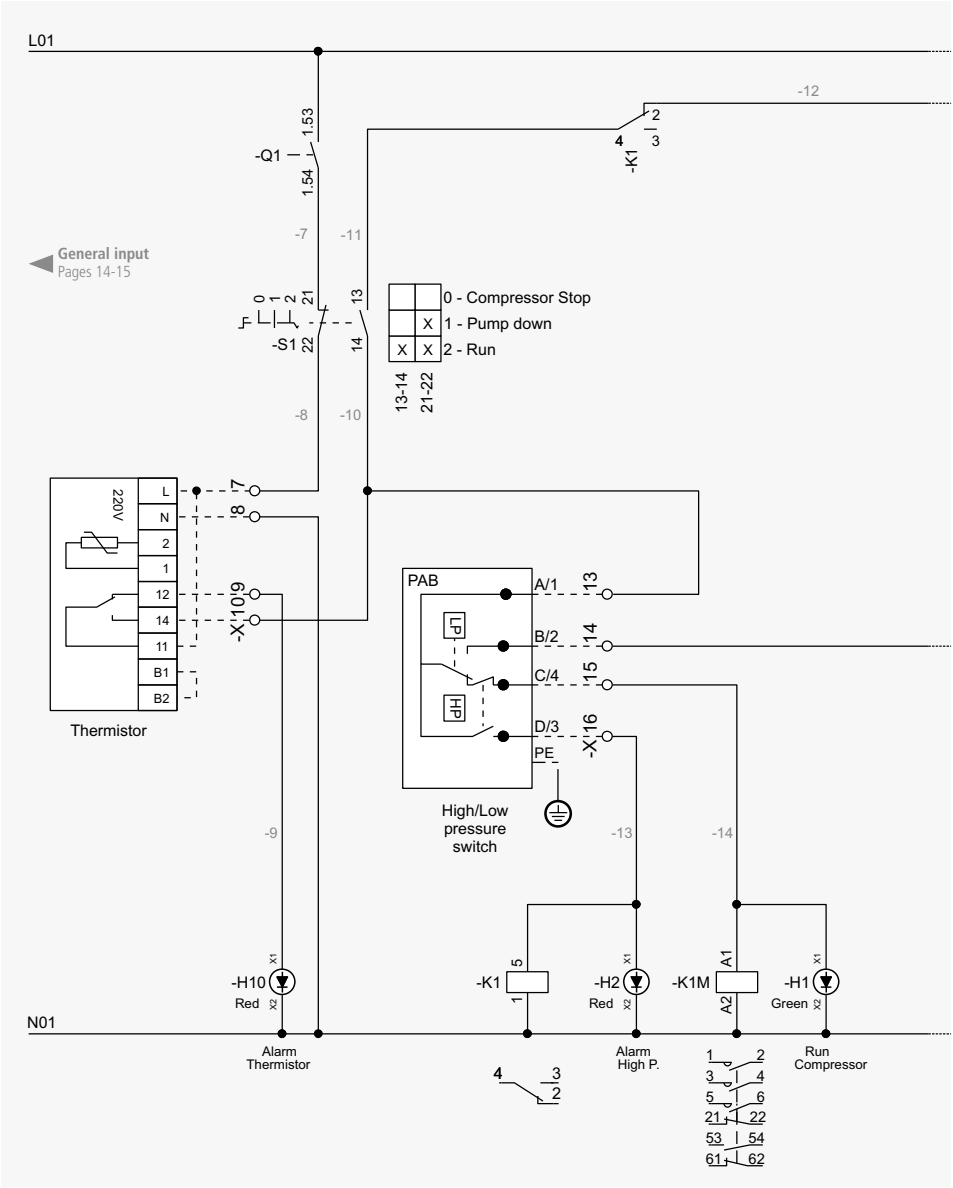
* According to model, refer to table on page 9.



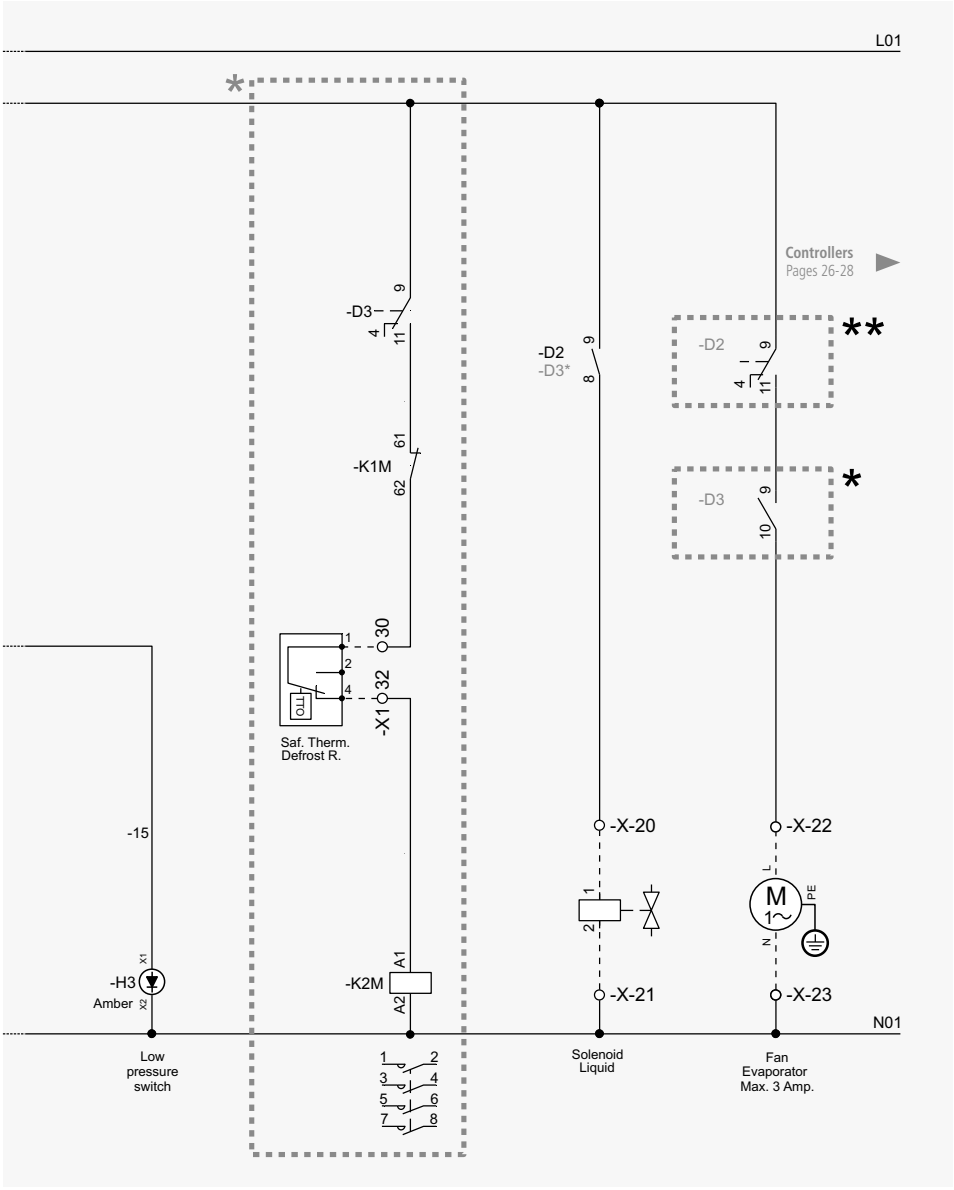


If a speed regulator is used for the condenser's fans, power it from the auxiliary output (Terminals X-24 and X-25).

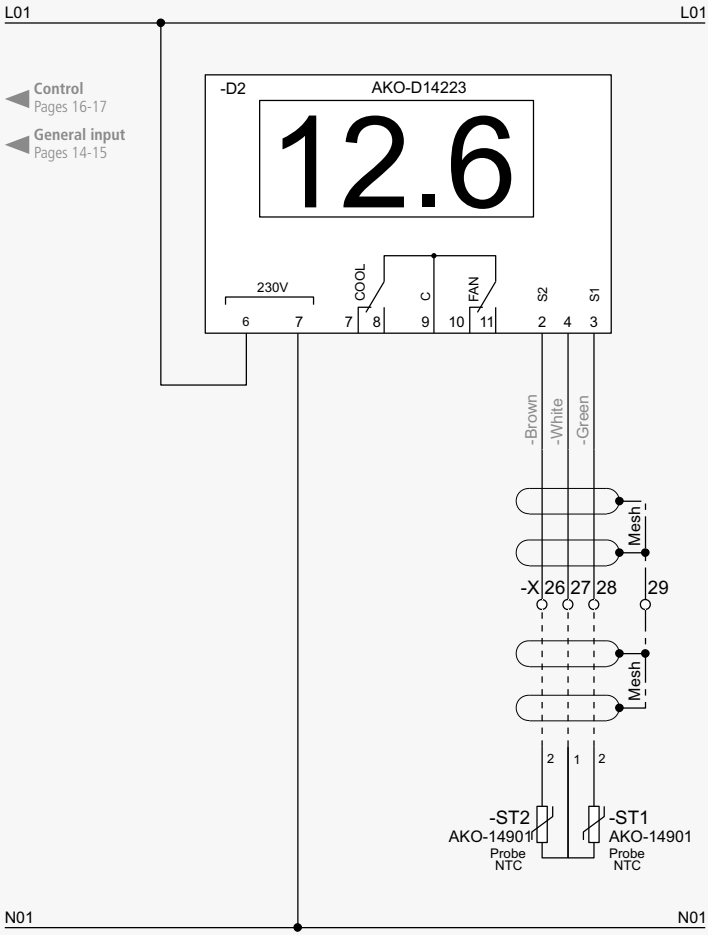
7.2- Control


L01
-12
-Q1
1.53
1.54
-K1
2
4
3
-7
-11
General input
Pages 14-15
0
1
2
21
13
-S1
22
14
0 - Compressor Stop
X 1 - Pump down
X X 2 - Run
13-14
21-22
-8
-10
220V
L
N
2
1
12
14
11
B1
B2
-X1
7
8
9
10
Thermistor
PAB
LP
HP
A/1
B/2
C/4
D/3
PE
13
14
15
16
-X1
High/Low
pressure
switch
-9
-13
-14
-H10
Red
-K1
5
1
-H2
Red
-K1M
A1
A2
-H1
Green
x1
x2
N01
Alarm
Thermistor
Alarm
High P.
Run
Compressor
1
2
3
4
5
6
21
22
53
54
61
62

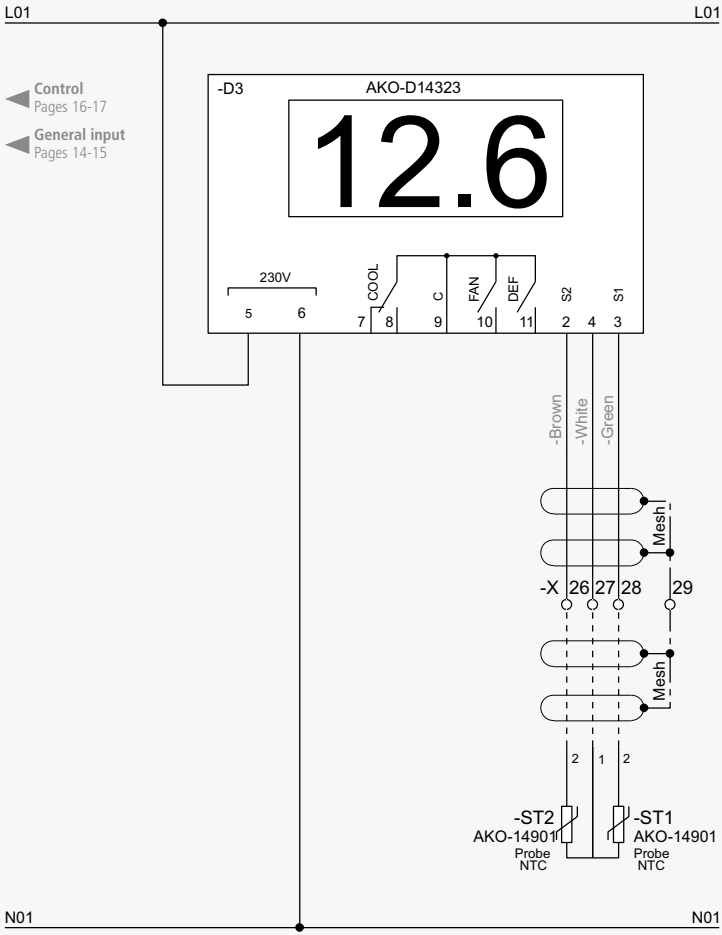
*** Only AKO-17617/17618/17619/17620/17621/17622/17623/17624**
**** Only AKO-17609/17610/17611/17612/17613/17614/17615/17616**



7.3.1- Controller (Only AKO-17609/610/611/612/613/614/615/616)



7.3.2- Controller (Only AKO-17617/618/619/620/621/622/623/624)



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NOTES:

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