

# AKODUO User Manual

The new generation of controllers for compressor racks



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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 indications in the manual at all times.

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

This product has been developed for use in the applications described in the manual. AKO Electromecànica does not guarantee its operation in any use not foreseen in this document and accepts no liability in the case of damage of any type which may result from incorrect use, configuration, installation or commissioning.

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.- INTRODUCTION

The **AKODUO** controller family forms part of the new generation of electronic controls for regulating the capacity of refrigerating plant.

**AKODUO** CE

La nueva generación de controladores para centrales de compresores  
The new controllers generation for compressor racks and condenser fans

**DUOVision** **DUOControl**

- AKO-21006:** Control unit with 6 outputs
- AKO-21012:** Control unit with 12 outputs
- AKO-21018:** Control unit with 18 outputs
- DUOVision:** User terminal

**AKO**  
we make it easy

DUOControl carries out the **management** of the installed components, the **detection of alarms** and the **recording of events** (historical log of alarms and hours of operation of the compressors).

As display units, **DUOControl** enables the use of the **DUOVision** terminal and **AKO-5004** Server Software.

## GENERAL CHARACTERISTICS

**Usability:** A family of products especially designed to make configuration and monitoring of refrigeration plant easy.

**Modularity:** Model selection according to current and future needs.

**Reliability:** Use of automation technology as Control Hardware.

**Unlimited number of operations:** Control with transistor outputs (TRT).

**Connectivity:** Enables MODBUS connection for remote control / monitoring (AKO-5004).

## DUOControl

**Designed for refrigerating plant with compressors of equal characteristics**

**Flexible wiring:** Multiple compressor – fan configurations

**Up to 6 compressors (with up to 4 stages each)**

**Up to 8 fans**

**Compressor ON/OFF control**

**Fan ON/OFF or inverter control:** 4-20 mA output with built in PI Control

**Algorithms for compressor rotation:** Sequential or by hours of operation

**Algorithm for fan rotation:** Sequential

**Selectable algorithm for compressor control:** Neutral Zone or Proportional Band

Selectable algorithm for fan control: Neutral Zone or Proportional Band

**3 Inputs for 4-20 mA probes:** Evaporation pressure, Condensation pressure and Air ambient temperature

**Floating condensation**

**Pump-Down:** By time or level

**Energy saving:** Programmable interval synchronised with the internal real time clock

**Options for working with any refrigerant gas in bar, and in bar and °C with R404A - R134A - R717 - R22 - R410A - R507A - R744 (CO<sub>2</sub>)**

**Reading of probes in the analogue input module itself**

**Safety circuit for each element controlled (compressors, fans and inverter)**

**3 Fixed digital Inputs:** General high pressure switch, General low pressure switch and Manual/Automatic selector.

**Alarm RY Output (provided an output is available depending on configuration)**

**DIN rail mounting**

**2 User terminals: DUOVision or AKO-5004**

## DUOVision

**Programming assistant:** Basic installation configuration.

**Input/Output test:** Wizard for checking input/output wiring.

**Dual multicolour graphic screen:** Provides more information than conventional Displays.

**Dynamic display of compressor and fan status**

**Intuitive menus with on-screen help:** System programming without the instruction manual.

**7-key navigator**

**Password for access to configuration parameters**

## 2.- Control unit: DUOControl



The family of **DUOControl** controllers is made up of:

**AKO-21006** Controller with 6 outputs made up of:

1 **AKO-21801** Module: Control unit with 8 digital inputs and 6 digital outputs

1 **AKO-21802** Module: Extension unit with 3 inputs and 1 output at 4-20 mA

**AKO-21012** Controller with 12 outputs made up of:

1 **AKO-21801** Module: Control unit with 8 digital inputs and 6 digital outputs

1 **AKO-21802** Module: Extension unit with 3 inputs and 1 output at 4-20 mA

1 **AKO-21803** Module: Extension unit with 2 digital inputs and 6 digital outputs

**AKO-21018** Controller with 18 outputs made up of:

1 **AKO-21801** Module: Control unit with 8 digital inputs and 6 digital outputs

1 **AKO-21802** Module: Extension unit with 3 inputs and 1 output at 4-20 mA

2 **AKO-21803** Modules: Extension unit with 2 digital inputs and 6 digital outputs

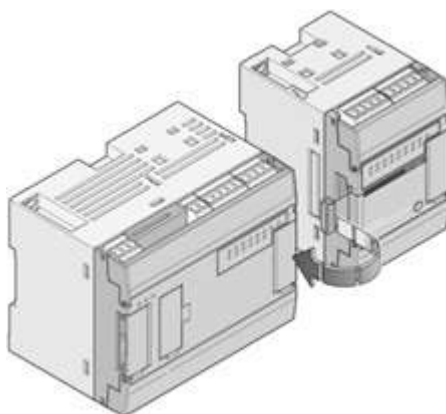
When you purchase an AKO-21006/12/18 you receive all the modules which make them up, although each of the modules can also be purchased separately.

The following table summarises the composition of the three **DUOControl** models.

	<b>AKO-21006</b>	<b>AKO-21012</b>	<b>AKO-21018</b>
<b>CONTROL UNIT</b>	AKO-21801		
<b>4-20 mA UNIT</b>	AKO-21802		
<b>DIGITAL UNIT</b>		1 x AKO-21803	2 x AKO-21803
<b>DIGITAL INPUTS</b>	8	10	12
<b>DIGITAL OUTPUTS</b>	6	12	18
<b>4-20 mA INPUTS</b>	3		
<b>4-20 mA OUTPUTS</b>	1		

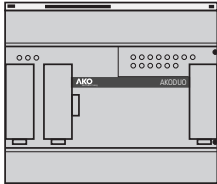
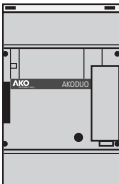
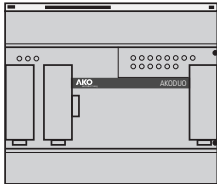
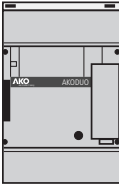
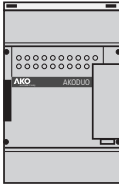
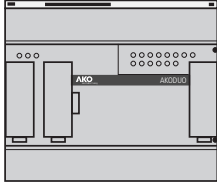
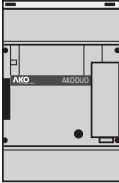
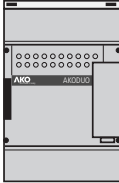
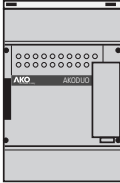
## 2.1.- INTERCONNECTION OF THE MODULES

The modules are connected together using the side connector on each module:



It is recommended that the connection be made when all the modules have been fixed to the DIN rail to prevent breakage of the flat cables.

The position each of the modules needs to occupy is shown below:

Equipment / Modules	AKO-21801	AKO-21802	AKO-21803	AKO-21803
AKO-21006				
AKO-21012				
AKO-21018				

The modular design of DUOControl enables a controller to be expanded by adding a new **AKO-21803** module to its right, up to a maximum of 2. Likewise, it is also possible to remove one of the **AKO-21803** modules.



Example: By adding 1 x **AKO-21803** module, the **AKO-21006** controller becomes an **AKO-21012**. If one more of these modules is added (2 in total), this controller becomes an **AKO-21018**.



## 2.2.- TECHNICAL DESCRIPTION OF THE MODULES

### **AKO-21801**

Module responsible for carrying out the following tasks:

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#### SOFTWARE

Control of Inputs / Outputs.

Algorithm for compressor and fan control.

Alarm management.

Recording of events (Alarm log).

MODBUS communication in slave mode.

Communication with the user terminal (DUOVision and AKO-5004).

#### HARDWARE

DUOVision communication interface.

MODBUS communication interface.

Interface for connecting to other modules.

8 Insulated Digital Inputs.

6 Insulated transistor Digital Outputs.

**Appendix A** includes the technical specifications for this module.

- 1.- Position of the DIN rail.
- 2.- Module earth connector.
- 3.- DIN rail clamp.
- 4.- Upper terminal block.
- 5.- Interface for communication with other modules.
- 6.- Lower terminal block.
- D1.- Module status display.

**POWER LED** always ON in normal operation.

**RUN LED** always ON in normal operation.

**ERR LED** always OFF in normal operation.

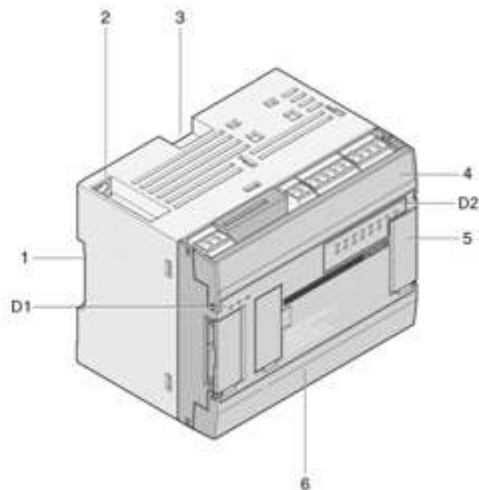
**D2.-** Status LEDs for the digital Inputs and Outputs.

INPUT with **LED ON**: +24 V in the corresponding terminal.

INPUT with **LED OFF**: 0 V in the corresponding terminal.

OUTPUT with **LED ON**: +24 V in the corresponding terminal.

OUTPUT with **LED OFF**: 0 V in the corresponding terminal.

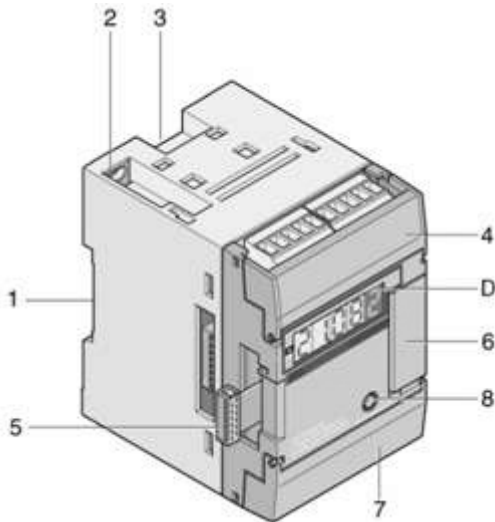


**Appendix A** includes the technical specifications for this module. The purpose of each of the terminals is described in **Section 2.3**.

## AKO-21802

Module for managing 4-20 mA inputs and outputs.

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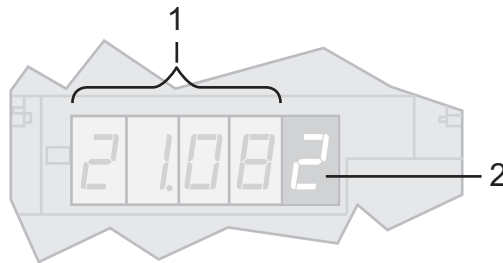
- 1.- Position of the DIN rail.
- 2.- Module earth connector.
- 3.- DIN rail clamp.
- 4.- Upper terminal block (3 x 4-20 mA Inputs).
- 5/6.- Interface for communication with other modules.
- 7.- Lower terminal block (1 x 4-20 mA Output).
- 8.- Button to select the input to be shown on the module Display.

The Display (D) makes it possible to see the current flowing through each of the inputs and outputs. The input or output desired is selected using the button (8).

1.- 4-digit display with one decimal.

2.- Digit to indicate the input or output to which the value corresponds. The value of this will increase on pressing the button (8).

- 0 — 4-20 mA input current from the evaporation pressure probe.
- 1 — 4-20 mA input current from the condensation pressure probe.
- 2 — 4-20 mA input current from the Ambient air temperature probe.
- 4 — 4-20 mA output current to control the fan inverter.



Do not take the values on Display (D) into account when this digit is any other than the values mentioned.



**Appendix A** includes the technical specifications for this module. The purpose of each of the terminals is described in **Section 2.3**.

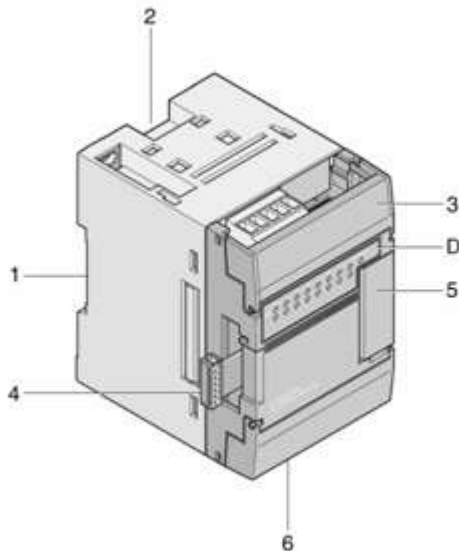
## AKO-21803

Extension module for digital inputs and outputs.

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2 Digital Inputs

6 Digital Outputs



1.- Position of the DIN rail.

2.- DIN rail clamp.

3.- Upper terminal block (2 Digital Inputs and 2 Digital Outputs).

4/5.- Interface for communication with other modules.

6.- Lower terminal block (4 Digital Outputs).

D.- 8 LEDs representing the voltage present in each terminal:

**LED ON:** +24 V present in the corresponding terminal.

**LED OFF:** 0 V present in the corresponding terminal.

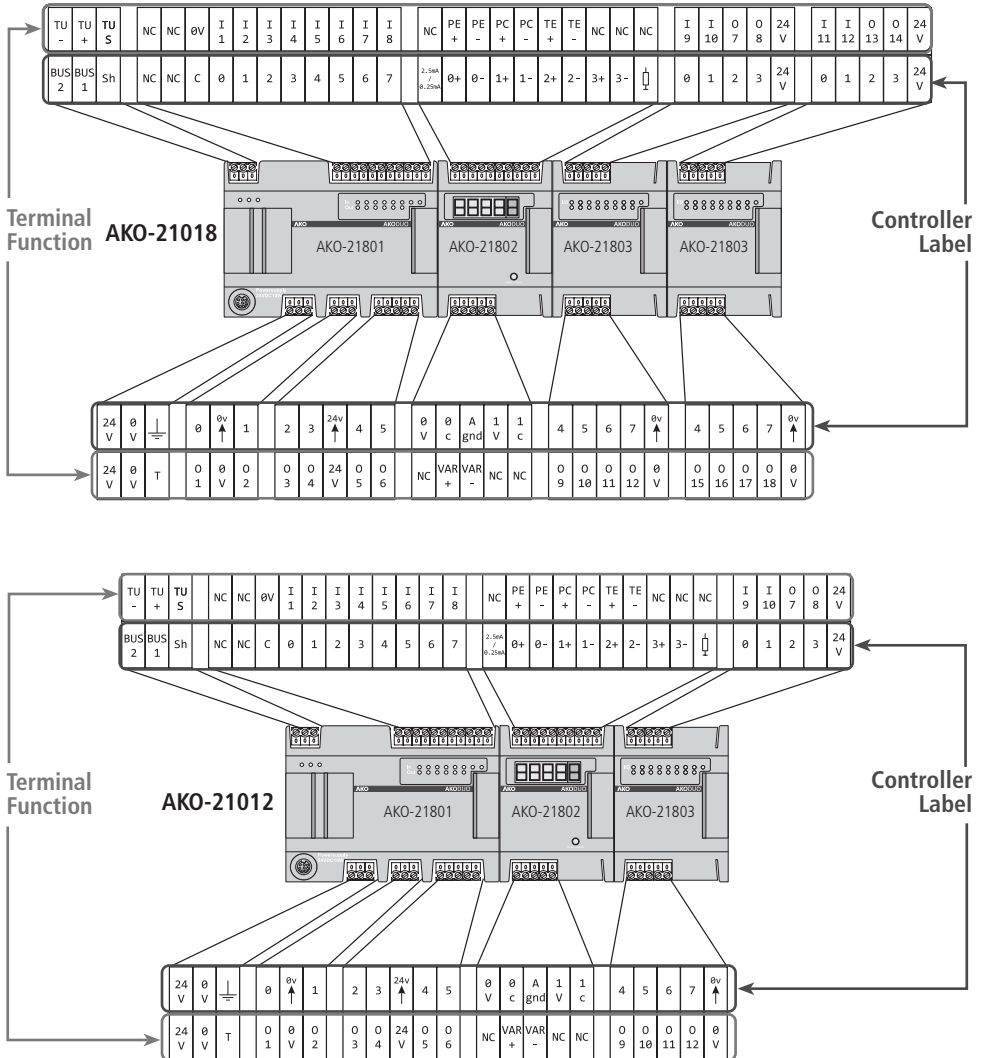
**SUPPLY LED:** Lit when the module is connected and correctly supplied with power.

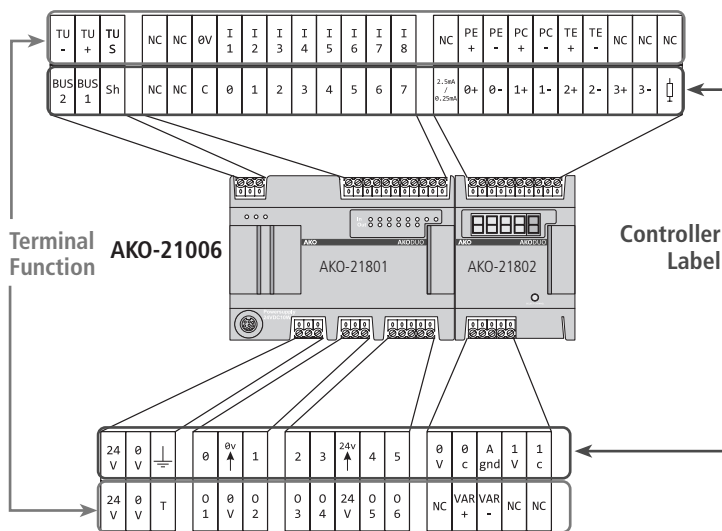
**Appendix A** includes the technical specifications for this module.

The purpose of each of the terminals is described in **Section 2.3**.

### 2.3.- WIRING TERMINALS

The following figure shows the layout of the terminals and their labelling.





The terminals for the **AKO-21801** and **AKO-21802** modules always have the same notation. In the case of **AKO-21803** modules, the notation of the terminals depends on the position occupied.

### Terminals can be classified as follows, according to their function:

**Fixed wiring terminals:** Not depending on the installation.

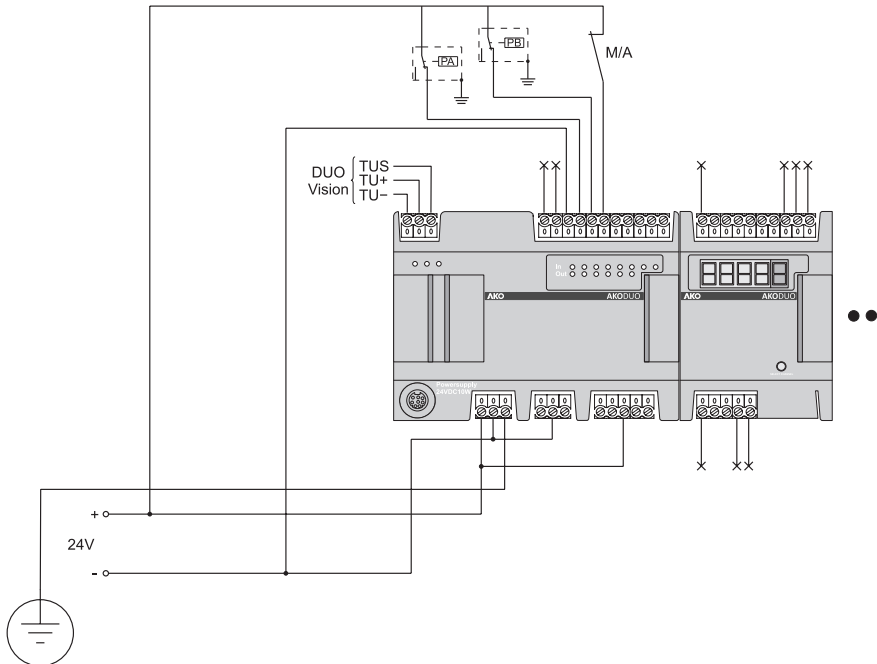
- NC:** Not connected
- TU+:** Connection to the DUOVision user terminal
- TU-:** Connection to the DUOVision user terminal
- TUS:** Connection to the DUOVision user terminal
- 24V:** +24 V supply from the control panel
- 0V:** 0 V line from the control panel
- T:** Earth from the control panel
- I1:** General high pressure switch
- I2:** General low pressure switch
- I3:** MANUAL/AUTOMATIC selector from the control panel

**Variable wiring terminals:** Vary according to the installation.

- I4 – I12:** Connection depends on the installation
- O1 – O18:** Connection depends on the installation
- 4-20 mA input and output terminals:**
  - VAR+ / VAR-:** Inverter for the fans
  - PE+ / PE-:** Suction probe
  - PC+ / PC-:** Discharge probe
  - TE+ / TE-:** Ambient air temperature probe

### 2.3.1.- FIXED WIRING TERMINALS

The recommended wiring for the fixed wiring terminals is shown below:



The general high and low pressure switches are connected to terminals **I1** and **I2** respectively. The type of contact for each of these inputs can be configured by means of the user parameters **ENTR\_1** and **ENTR\_2**. For further information, see **Section 3.3.6**.

The **MANUAL/AUTOMATIC** selector is connected to terminal **I3**.

MANUAL: Voltage of +24 V in terminal I3.

AUTOMATIC: Voltage of 0 V in terminal I3.

Their function is described in **Section 7.4**.

Terminals connected to a cross have no function allocated and are not connected.  
The terminals not yet connected are dealt with in the next section.



### 2.3.2.- VARIABLE WIRING TERMINALS (I4-I12 and O1-O18)

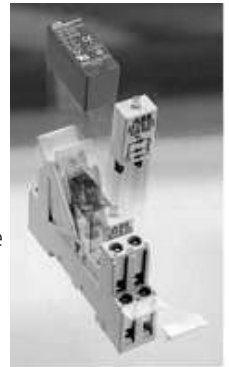
The wizard (**Section 3.1.**) allocates the function to each of the variable wiring terminals. This allocation depends on the following parameters of the refrigeration installation:

- No. of Compressors (user parameter **CONF\_1**)
- No. of Stages per compressor (user parameter **CONF\_2**).
- No. of Fans or inverter use (user parameters **CONF\_5** and **CONF\_6**).
- Alarm output (parameter **CONF\_4**).

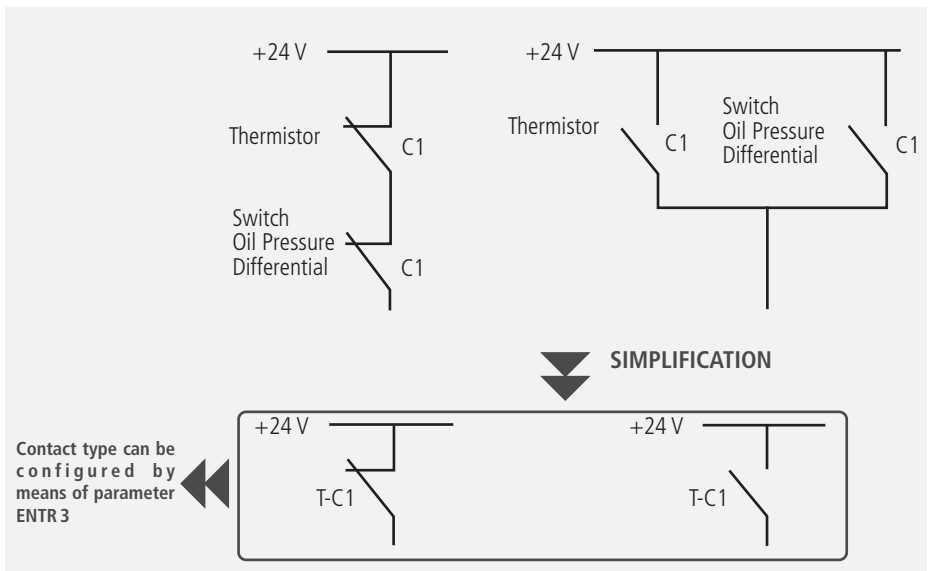
All the variable wiring terminals are via transistors to permit an unlimited number of operations.

Therefore, it is necessary to connect a 24 V relay to each of these terminals. The use of plug-in relays is recommended to make replacement easier in the case of failure.

The compressors, fans and the inverter (if used) have a safety circuit to protect the installation against anomalous situations. All these are connected to the digital input terminals (I4 – I12) as defined in the tables on pages 23 to 27.



Examples of a safety circuit for a compressor:



The tables on pages **23** to **27** show the maximum number of fans which can be controlled in each type of refrigerating plant.



Example: Consider a refrigerating facility with:

- No. of Compressors = 2
- No. of Stages per compressor = 2

With an **AKO-21012** controller, it is possible to control up to 5 fans.  
 With an **AKO-21018** controller, the number of fans can be increased

Detail of the table of inputs for the **AKO-21012**

		FANS CONTROLLED ON/OFF							
Compressors	Stages	I/4	I/5	I/6	I/7	I/8	I/9	I/10	
1	1	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	
1	2	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	
1	3	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	
1	4	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	
2	1	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5	
2	2	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5	
2	3	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5	

Maximum number of fans when using the controller AKO-21012

Detail of the table of inputs for the **AKO-21018**

		FANS CONTROLLED ON/OFF									
Compressors	Stages	I/4	I/5	I/6	I/7	I/8	I/9	I/10	I/11	I/12	
1	1	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	T-V8	
1	2	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	T-V8	
1	3	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	T-V8	
1	4	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	T-V8	
2	1	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	
2	2	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	
2	3	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	
2	4	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	

Maximum number of fans when using the AKO-21018 controller



Example: Consider a refrigerating facility with:

No. of Compressors = 2

No. of Stages per compressor = 2

No. of Fans = 3 (ON/OFF control)

**DUOControl Model: AKO-21012**

Terminals I9 and I10 are left unconnected.

Detail of the table of inputs for the **AKO-21012**

FANS CONTROLLED ON/OFF

Compressors	Stages	I 4	I 5	I 6	I 7	I 8	I 9	I 10
1	1	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6
1	2	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6
1	3	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6
1	4	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6
2	1	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5
2	2	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5
2	3	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5

(A) Unconnected terminals

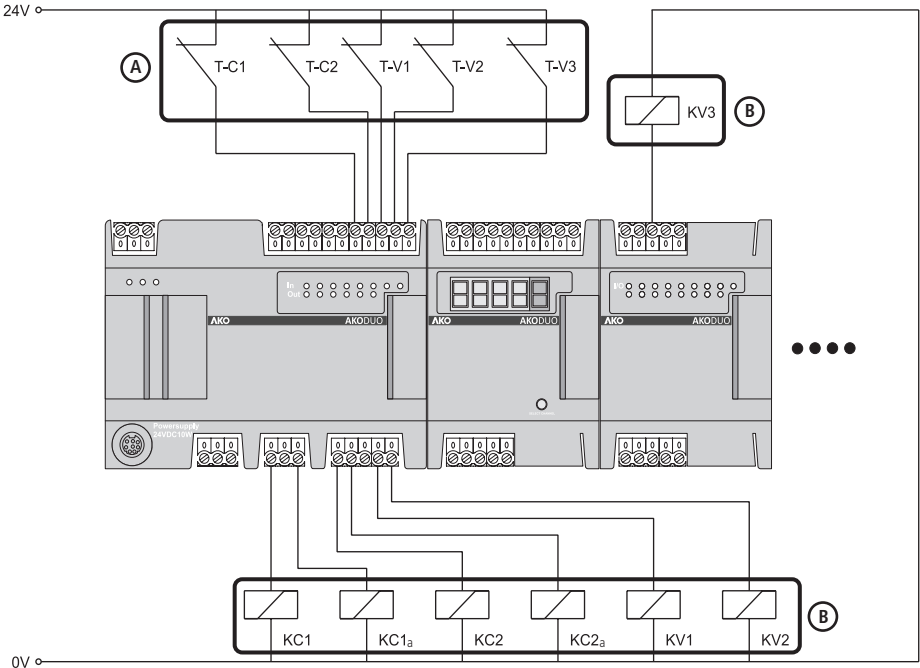
Detail of the table of outputs for the **AKO-21012**

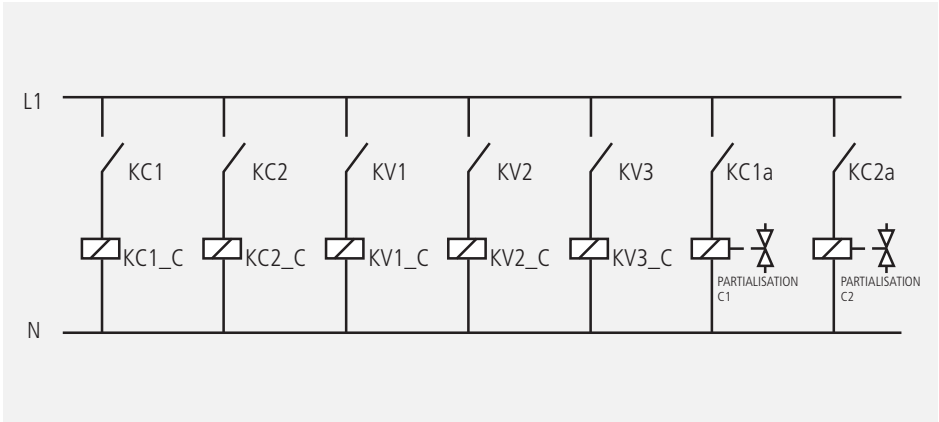
FANS CONTROLLED ON/OFF

Compressors	Stages	O 1	O 2	O 3	O 4	O 5	O 6	O 7	O 8	O 9	O 10	O 11	O 12
1	1	C1	V1	V2	V3	V4	V5	V6					Ry_A
1	2	C1	C1a	V1	V2	V3	V4	V5	V6				Ry_A
1	3	C1	C1a	C1b	V1	V2	V3	V4	V5	V6			Ry_A
1	4	C1	C1a	C1b	C1c	V1	V2	V3	V4	V5	V6		Ry_A
2	1	C1	C2	V1	V2	V3	V4	V5					Ry_A
2	2	C1	C1a	C2	C2a	V1	V2	V3	V4	V5			Ry_A
2	3	C1	C1a	C2	C2a	V1	V2	V3	V4	V5			Ry_A

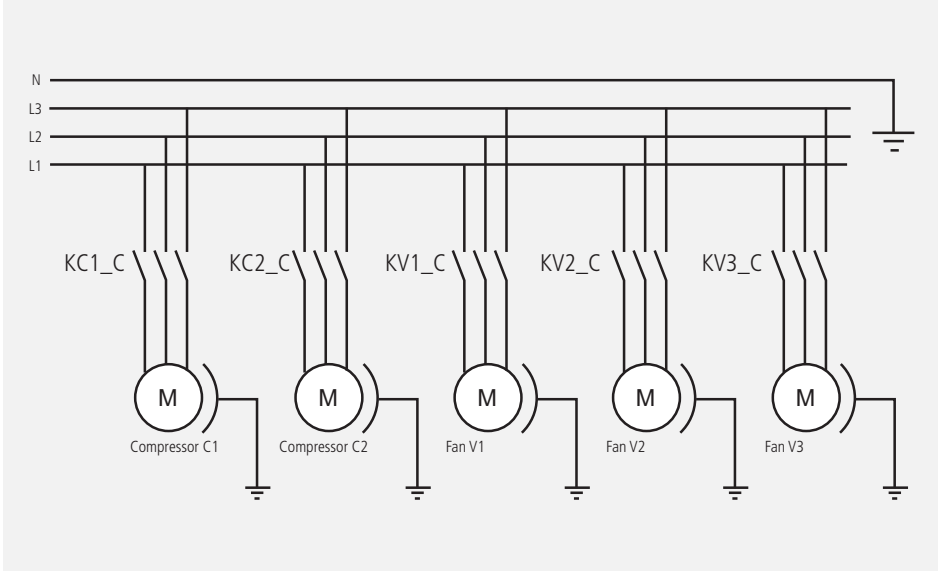
(B) Unconnected terminals

The digital inputs and outputs from the above example are connected as follows:





In this wiring example, the terminals with fixed function and the 4-20mA inputs/outputs are absent (Section 2.3.1.).



Function of each Terminal:

<b>T-CX</b>	Safety circuit for Compressor X
<b>T-VX</b>	Safety circuit for Fan X
<b>T-VAR</b>	Inverter safety circuit
<b>CX</b>	Start/Stop of the first stage of Compressor X
<b>CXa</b>	Start/Stop of the second stage of Compressor X
<b>CXb</b>	Start/Stop of the third stage of Compressor X
<b>CXc</b>	Start/Stop of the fourth stage of Compressor X
<b>VX</b>	Start/Stop for Fan X
<b>RY_A</b>	Alarm Outputs (*)

(\*) The following configurations have no terminal for alarm output:

**AKO-21006** with 1 compressor of 2 stages and 4 fans  
 with 1 compressor of 3 stages and 3 fans  
 with 1 compressor of 4 stages and 2 fans  
 with 2 compressors of 2 stages and 2 fans  
 with 2 compressors of 3 stages and inverter  
 with 3 compressors of 2 stages and inverter

**AKO-21012** with 2 compressors of 4 stages and 4 fans  
 with 3 compressors of 3 stages and 3 fans  
 with 5 compressors of 2 stages and 2 fans

**AKO-21018** with 3 compressors of 4 stages and 6 fans  
 with 4 compressors of 4 stages and 2 fans  
 with 5 compressors of 3 stages and 3 fans  
 with 6 compressors of 3 stages and inverter

**AKO-21006**

**Inputs**

FANS CONTROLLED ON/OFF

Compressors	Stages	I4	I5	I6	I7	I8
1	1	T-C1	T-V1	T-V2	T-V3	T-V4
1	2	T-C1	T-V1	T-V2	T-V3	T-V4
1	3	T-C1	T-V1	T-V2	T-V3	
1	4	T-C1	T-V1	T-V2		
2	1	T-C1	T-C2	T-V1	T-V2	T-V3
2	2	T-C1	T-C2	T-V1	T-V2	
3	1	T-C1	T-C2	T-C3	T-V1	T-V2
4	1	T-C1	T-C2	T-C3	T-C4	T-V1

FANS CONTROLLED BY INVERTER

Compressors	Stages	I1	I2	I3	I4	I5	I6	I7	I8
1	1	D1	D-2	D-3	T-C1	T-VAR			
1	2	D1	D-2	D-3	T-C1	T-VAR			
1	3	D1	D-2	D-3	T-C1	T-VAR			
1	4	D1	D-2	D-3	T-C1	T-VAR			
2	1	D1	D-2	D-3	T-C1	T-C2	T-VAR		
2	2	D1	D-2	D-3	T-C1	T-C2	T-VAR		
2	3	D1	D-2	D-3	T-C1	T-C2	T-VAR		
3	1	D1	D-2	D-3	T-C1	T-C2	T-C3	T-VAR	
3	2	D1	D-2	D-3	T-C1	T-C2	T-C3	T-VAR	
4	1	D1	D-2	D-3	T-C1	T-C2	T-C3	T-C4	T-VAR

**Outputs**

FANS CONTROLLED ON/OFF

Compressors	Stages	O1	O2	O3	O4	O5	O6
1	1	C1	V1	V2	V3	V4	RY_A
1	2	C1	C1a	V1	V2	V3	V4
1	3	C1	C1a	C1b	V1	V2	V3
1	4	C1	C1a	C1b	C1c	V1	V2
2	1	C1	C2	V1	V2	V3	RY_A
2	2	C1	C1a	C2	C2a	V1	V2
3	1	C1	C2	C3	V1	V2	RY_A
4	1	C1	C2	C3	V1	V1	RY_A

FANS CONTROLLED BY INVERTER

Compressors	Stages	O1	O2	O3	O4	O5	O6
1	1	C1					RY_A
1	2	C1	C1a				RY_A
1	3	C1	C1a	C1b			RY_A
1	4	C1	C1a	C1b	C1c		RY_A
2	1	C1	C2				RY_A
2	2	C1	C1a	C2	C2a		RY_A
2	3	C1	C1a	C1b	C2	C2a	C2b
3	1	C1	C2	C3			RY_A
3	2	C1	C1a	C2	C2a	C3	C3a
4	1	C1	C2	C3	C4		RY_A

**AKO-21012**

**Inputs**

FANS CONTROLLED ON/OFF

Compressors	Stages	I4	I5	I6	I7	I8	I9	I10
1	1	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6
1	2	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6
1	3	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6
1	4	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6
2	1	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5
2	2	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5
2	3	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5
2	4	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	
3	1	T-C1	T-C2	T-C3	T-V1	T-V2	T-V3	T-V4
3	2	T-C1	T-C2	T-C3	T-V1	T-V2	T-V3	T-V4
3	3	T-C1	T-C2	T-C3	T-V1	T-V2	T-V3	
4	1	T-C1	T-C2	T-C3	T-C4	T-V1	T-V2	T-V3
4	2	T-C1	T-C2	T-C3	T-C4	T-V1	T-V2	T-V3
5	1	T-C1	T-C2	T-C3	T-C4	T-C5	T-V1	T-V2
5	2	T-C1	T-C2	T-C3	T-C4	T-C5	T-V1	T-V2
6	1	T-C1	T-C2	T-C3	T-C4	T-C5	T-C6	T-V1

**Outputs**

FANS CONTROLLED ON/OFF

Compressors	Stages	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	O11	O12
1	1	C1	V1	V2	V3	V4	V5	V6					RY_A
1	2	C1	C1a	V1	V2	V3	V4	V5	V6				RY_A
1	3	C1	C1a	C1b	V1	V2	V3	V4	V5	V6			RY_A
1	4	C1	C1a	C1b	C1c	V1	V2	V3	V4	V5			RY_A
2	1	C1	C2	V1	V2	V3	V4	V5					RY_A
2	2	C1	C1a	C2	C2a	V1	V2	V3	V4	V5			RY_A
2	3	C1	C1a	C1b	C2	C2a	C2b	V1	V2	V3	V4		RY_A
2	4	C1	C1a	C1b	C1c	C2	C2a	C2b	C2c	V1	V2	V3	V4
3	1	C1	C2	C3	V1	V2	V3	V4					RY_A
3	2	C1	C1a	C2	C2a	C3	C3a	V1	V2	V3	V4		RY_A
3	3	C1	C1a	C1b	C2	C2a	C2b	C3	C3a	C3b	V1	V2	V3
4	1	C1	C2	C3	C4	V1	V2	V3					RY_A
4	2	C1	C1a	C2	C2a	C3	C3a	C4	C4a	V1	V2	V3	RY_A
5	1	C1	C2	C3	C4	C5	V1	V2					RY_A
5	2	C1	C1a	C2	C2a	C3	C3a	C4	C4a	C5	C5a	V1	V2
6	1	C1	C2	C3	C4	C5	C6	V1					RY_A



**AKO-21012**

**Inputs**

FANS CONTROLLED BY INVERTER

Compressors	Stages	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12
1	1	D1	D2	D3	T-C1	T-VAR							
1	2	D1	D2	D3	T-C1	T-VAR							
1	3	D1	D2	D3	T-C1	T-VAR							
1	4	D1	D2	D3	T-C1	T-VAR							
2	1	D1	D2	D3	T-C1	T-C2	T-VAR						
2	2	D1	D2	D3	T-C1	T-C2	T-VAR						
2	3	D1	D2	D3	T-C1	T-C2	T-VAR						
2	4	D1	D2	D3	T-C1	T-C2	T-VAR						
3	1	D1	D2	D3	T-C1	T-C2	T-C3	T-VAR					
3	2	D1	D2	D3	T-C1	T-C2	T-C3	T-VAR					
3	3	D1	D2	D3	T-C1	T-C2	T-C3	T-VAR					
4	1	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-VAR				
4	2	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-VAR				
5	1	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-C5	T-VAR			
5	2	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-C5	T-VAR			
6	1	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-C5	T-C6	T-VAR		

**Outputs**

FANS CONTROLLED BY INVERTER

Compressors	Stages	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	O11	O12
1	1	C1											RY_A
1	2	C1	C1a										RY_A
1	3	C1	C1a	C1b									RY_A
1	4	C1	C1a	C1b	C1c								RY_A
2	1	C1	C2										RY_A
2	2	C1	C1a	C2	C2a								RY_A
2	3	C1	C1a	C1b	C2	C2a	C2b						RY_A
2	4	C1	C1a	C1b	C1c	C2	C2a	C2b	C2c				RY_A
3	1	C1	C2	C3									RY_A
3	2	C1	C1a	C2	C2a	C3	C3a						RY_A
3	3	C1	C1a	C1b	C2	C2a	C2b	C3	C3a	C3b			RY_A
4	1	C1	C2	C3	C4								RY_A
4	2	C1	C1a	C2	C2a	C3	C3a	C4	C4a				RY_A
5	1	C1	C2	C3	C4	C5							RY_A
5	2	C1	C1a	C2	C2a	C3	C3a	C4	C4a	C5	C5a		RY_A
6	1	C1	C2	C3	C4	C5	C6						RY_A

**AKO-21018**

**Inputs**

FANS CONTROLLED ON/OFF

Compressors		Stages		I4	I5	I6	I7	I8	I9	I10	I11	I12
1	1	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	T-V8		
1	2	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	T-V8		
1	3	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	T-V8		
1	4	T-C1	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7	T-V8		
2	1	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7		
2	2	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7		
2	3	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7		
2	4	T-C1	T-C2	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6	T-V7		
3	1	T-C1	T-C2	T-C3	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6		
3	2	T-C1	T-C2	T-C3	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6		
3	3	T-C1	T-C2	T-C3	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6		
3	4	T-C1	T-C2	T-C3	T-V1	T-V2	T-V3	T-V4	T-V5	T-V6		
4	1	T-C1	T-C2	T-C3	T-C4	T-V1	T-V2	T-V3	T-V4	T-V5		
4	2	T-C1	T-C2	T-C3	T-C4	T-V1	T-V2	T-V3	T-V4	T-V5		
4	3	T-C1	T-C2	T-C3	T-C4	T-V1	T-V2	T-V3	T-V4	T-V5		
4	4	T-C1	T-C2	T-C3	T-C4	T-V1	T-V2					
5	1	T-C1	T-C2	T-C3	T-C4	T-C5	T-V1	T-V2	T-V3	T-V4		
5	2	T-C1	T-C2	T-C3	T-C4	T-C5	T-V1	T-V2	T-V3	T-V4		
5	3	T-C1	T-C2	T-C3	T-C4	T-C5	T-V1	T-V2	T-V3			
6	1	T-C1	T-C2	T-C3	T-C4	T-C5	T-C6	T-V1	T-V2	T-V3		
6	2	T-C1	T-C2	T-C3	T-C4	T-C5	T-C6	T-V1	T-V2	T-V3		

**Outputs**

FANS CONTROLLED ON/OFF

Compressors		Stages		O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	O11	O12	O13	O14	O15	O16	O17	O18		
1	1	C1	V1	V2	V3	V4	V5	V6	V7	V8												RY_A	
1	2	C1	C1a	V1	V2	V3	V4	V5	V6	V7	V8												RY_A
1	3	C1	C1a	C1b	V1	V2	V3	V4	V5	V6	V7	V8											RY_A
1	4	C1	C1a	C1b	C1c	V1	V2	V3	V4	V5	V6	V7	V8										RY_A
2	1	C1	C2	V1	V2	V3	V4	V5	V6	V7													RY_A
2	2	C1	C1a	C2	C2a	V1	V2	V3	V4	V5	V6	V7											RY_A
2	3	C1	C1a	C1b	C2	C2a	C2b	V1	V2	V3	V4	V5	V6	V7									RY_A
2	4	C1	C1a	C1b	C1c	C2	C2a	C2b	C2c	V1	V2	V3	V4	V5	V6	V7							RY_A
3	1	C1	C2	C3	V1	V2	V3	V4	V5	V6													RY_A
3	2	C1	C1a	C2	C2a	C3	C3a	V1	V2	V3	V4	V5	V6										RY_A
3	3	C1	C1a	C1b	C2	C2a	C2b	C3	C3a	C3b	V1	V2	V3	V4	V5	V6							RY_A
3	4	C1	C1a	C1b	C1c	C2	C2a	C2b	C2c	C3	C3a	C3b	C3c	V1	V2	V3							V6
4	1	C1	C2	C3	C4	V1	V2	V3	V4	V5													RY_A
4	2	C1	C1a	C2	C2a	C3	C3a	C4	C4a	V1	V2	V3	V4	V5									RY_A
4	3	C1	C1a	C1b	C2	C2a	C2b	C3	C3a	C3b	C4	C4a	C4b	V1	V2	V3	V4	V5					RY_A
4	4	C1	C1a	C1b	C1c	C2	C2a	C2b	C2c	C3	C3a	C3b	C3c	C4	C4a	C4b	C4c	C4d	V1	V2			V2
5	1	C1	C2	C3	C4	C5	V1	V2	V3	V4													RY_A
5	2	C1	C1a	C2	C2a	C3	C3a	C4	C4a	C5	C5a	V1	V2	V3	V4								RY_A
5	3	C1	C1a	C1b	C2	C2a	C2b	C3	C3a	C3b	C4	C4a	C4b	C5	C5a	C5b	V1	V2					V3
6	1	C1	C2	C3	C4	C5	C6	V1	V2	V3													RY_A
6	2	C1	C1a	C2	C2a	C3	C3a	C4	C4a	C5	C5a	C6	C6a	V1	V2	V3							RY_A

**AKO-21018**

**Inputs**

FANS CONTROLLED BY INVERTER

Compressors	Stages	FANS CONTROLLED BY INVERTER														
		I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11	I12			
1	1	D1	D2	D3	T-C1	T-VAR										
1	2	D1	D2	D3	T-C1	T-VAR										
1	3	D1	D2	D3	T-C1	T-VAR										
1	4	D1	D2	D3	T-C1	T-VAR										
2	1	D1	D2	D3	T-C1	T-C2	T-VAR									
2	2	D1	D2	D3	T-C1	T-C2	T-VAR									
2	3	D1	D2	D3	T-C1	T-C2	T-VAR									
2	4	D1	D2	D3	T-C1	T-C2	T-VAR									
3	1	D1	D2	D3	T-C1	T-C2	T-C3	T-VAR								
3	2	D1	D2	D3	T-C1	T-C2	T-C3	T-VAR								
3	3	D1	D2	D3	T-C1	T-C2	T-C3	T-VAR								
3	4	D1	D2	D3	T-C1	T-C2	T-C3	T-VAR								
4	1	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-VAR							
4	2	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-VAR							
4	3	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-VAR							
4	4	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-VAR							
5	1	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-C5	T-VAR						
5	2	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-C5	T-VAR						
5	3	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-C5	T-VAR						
6	1	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-C5	T-C6	T-VAR					
6	2	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-C5	T-C6	T-VAR					
6	3	D1	D2	D3	T-C1	T-C2	T-C3	T-C4	T-C5	T-C6	T-VAR					

**Outputs**

FANS CONTROLLED BY INVERTER

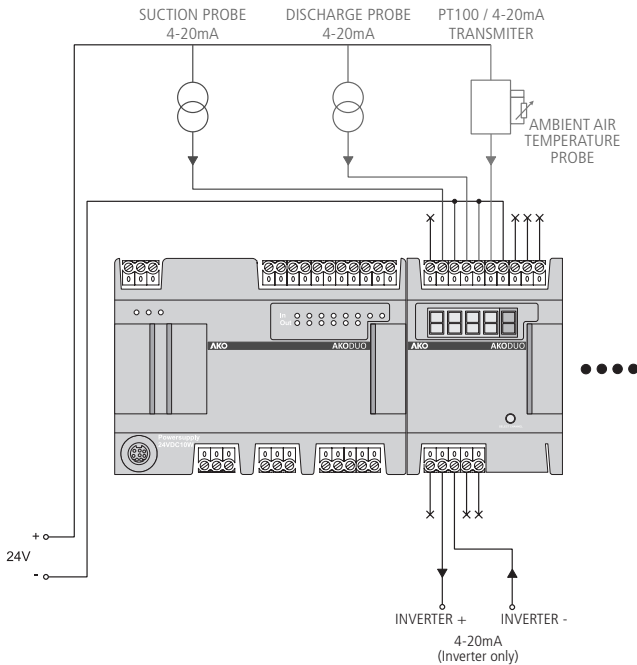
Compressors	Stages	FANS CONTROLLED BY INVERTER																	
		O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	O11	O12	O13	O14	O15	O16	O17	O18
1	1	C1																	RY_A
1	2	C1	C1a																RY_A
1	3	C1	C1a																RY_A
1	4	C1	C1a	C1b															RY_A
2	1	C1	C2																RY_A
2	2	C1	C1a	C2	C2a														RY_A
2	3	C1	C1a	C1b	C2														RY_A
2	4	C1	C1a	C1b	C1c	C2	C2a												RY_A
3	1	C1	C2	C3															RY_A
3	2	C1	C1a	C2	C2a	C3	C3a												RY_A
3	3	C1	C1a	C1b	C2	C2a	C2b	C3	C3a										RY_A
3	4	C1	C1a	C1b	C1c	C2	C2a	C2b	C2c	C3	C3a								RY_A
4	1	C1	C2	C3	C4														RY_A
4	2	C1	C1a	C2	C2a	C3	C3a	C4	C4a										RY_A
4	3	C1	C1a	C1b	C2	C2a	C2b	C3	C3a	C3b	C4	C4a	C4b						RY_A
4	4	C1	C1a	C1b	C1c	C2	C2a	C2b	C2c	C3	C3a	C3b	C3c						RY_A
5	1	C1	C2	C3	C4	C5													RY_A
5	2	C1	C1a	C2	C2a	C3	C3a	C4	C4a	C5	C5a								RY_A
5	3	C1	C1a	C1b	C2	C2a	C2b	C3	C3a	C3b	C4	C4a	C4b	C5	C5a	C5b			RY_A
6	1	C1	C2	C3	C4	C5	C6												RY_A
6	2	C1	C1a	C2	C2a	C3	C3a	C4	C4a	C5	C5a	C6	C6a						RY_A
6	3	C1	C1a	C1b	C2	C2a	C2b	C3	C3a	C3b	C4	C4a	C4b	C5	C5a	C5b	C6	C6a	C6b

### 2.3.3.- 4-20 mA INPUT AND OUTPUT TERMINALS

The controllers have:

- 3 x 4-20 mA inputs for suction, discharge and Ambient air temperature probes
- 1 x 4-20 mA output to control a Inverter

The wiring for all these 4-20 mA inputs/outputs is as follows:



The Ambient air probe measures the ambient temperature of the air flowing through the condenser to cool the refrigerant. This information is necessary to control the condensation pressure/temperature when using floating condensation.

It is recommended that the probe be located near the condenser in a protected place.

### 2.3.4.- ALARM OUTPUT

If there is an output available, the assistant assigns a digital output as the alarm output.

The terminal allocated as the alarm output depends on the controller used:

For the **AKO-21006** controller, the alarm output is connected to **O6**.

For the **AKO-21012** controller, the alarm output is connected to **O12**.

For the **AKO-21018** controller, the alarm output is connected to **O18**.

The alarm conditions are:

No alarm active: +24 V at the alarm terminal.

An alarm active: 0 V at the alarm terminal.



If all the outputs terminals are used to control compressors and fans, it will not be possible to connect an alarm output. In this case the wizard will inform the user.



Example: Consider a refrigerating facility with the following characteristics:

No. of Compressors = 2

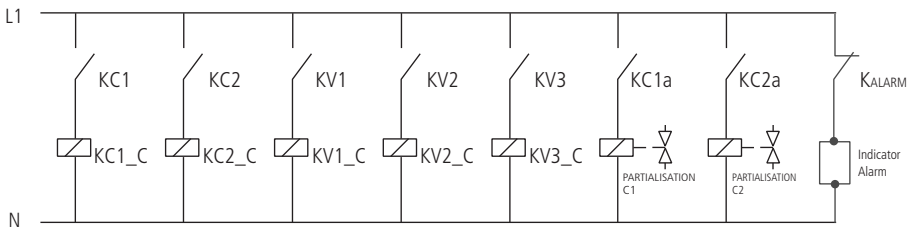
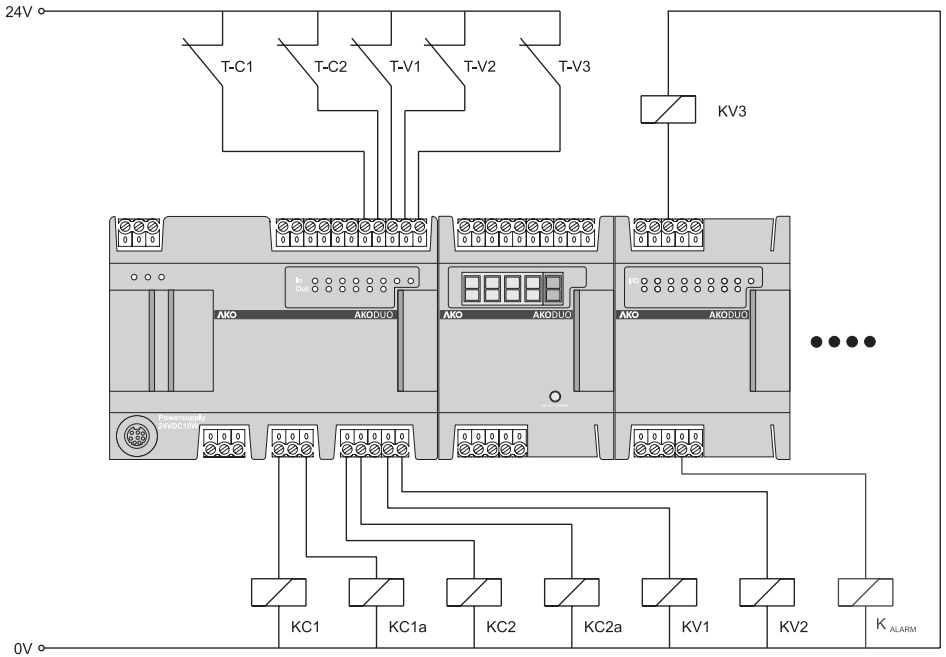
No. of Stages per compressor = 2

No. of Fans = 3 (ON/OFF control)

**DUOControl** Model: **AKO-21012**

(See next page)

Wiring of the inputs and outputs for the previous example:



### 3.- User terminal: DUOVision (AKO-21701).

The **DUOVision** terminal allows the user to:

**Start up an installation:** Wizard and entry of values into the user parameters

**Monitor the installation:** Dynamic graphic display

**Adjust the operation of the installation:** HELP to facilitate the adjustment of user parameters

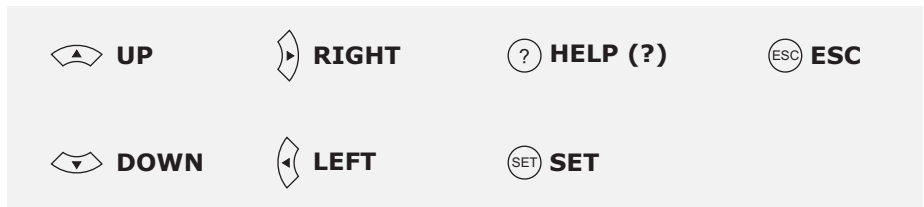
**Display logs:** Log of alarms and accumulated operation of the compressors

DUOVision is made up of the DISPLAY and the NAVIGATOR.



The DISPLAY is made up of 2 screens. The background colour of each of these can be configured by means of user parameters.

The NAVIGATOR has 7 keys. The function of each of these depends on the screen.



The power supply and communication connector for DUOVision is at the rear.

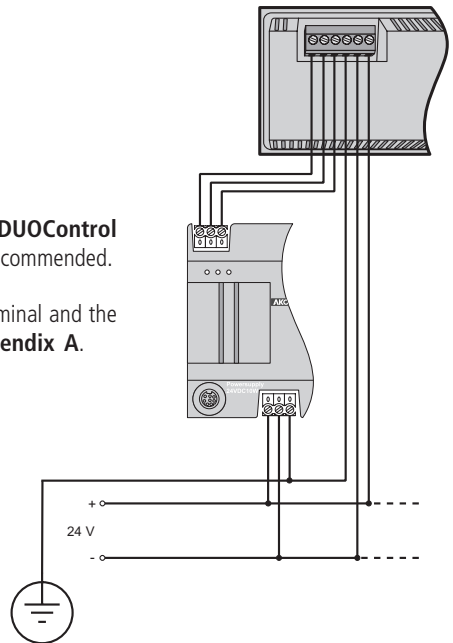


Wiring of DUOVision:



The use of the same power supply lines for the **DUOControl** controller and the **DUOVision** user terminal is recommended.

The technical specifications of the **DUOVision** user terminal and the steps to follow to mount it in the panel are detailed in **Appendix A**.





### 3.1.- WIZARD


The WIZARD guides the user through the process of configuring and starting up the refrigerating facility. It enables you to:

- Check the wiring for the control panel.
- Inform the DUOControl of the installation characteristics.
- Adjust essential parameters for the initial start up of the installation.

#### The WIZARD runs:

When the **DUOVision** is connected to the **DUOControl** with no prior configuration (default parameters).

When the **DUOVision** is connected to the **DUOControl** after a change of model brought about by expansion or contraction of the DUOControl (for further information see Section 2.1).

On pressing the **RIGHT+SET+LEFT** keys on the DUOVision when the  icon is shown on the screen. This icon appears for a few seconds when the equipment is started up or when the MANUAL/AUTOMATIC selector is moved to the MANUAL position, provided no compressor or fan is operating.

The WIZARD asks a series of questions to which the user needs to respond.

#### SCREEN W-0: LANGUAGE

<p><b>WIZARD</b></p> <p>Language</p> <p><b>AKO- 21018</b></p>	<p>VALUE</p> <p>→Español</p> <p>English</p> <p>Francais</p> <p>Deutsch</p> <p>Italiano</p>
---	--

Select the desired language.

#### NAVIGATOR function:

- UP and DOWN:** Move the cursor through the possible responses
- SET:** Confirm the preselected response
- ESC:** Return to SCREEN W-0
- OTHERS:** No function

**SCREEN W-1: REINSTATE PARAMETERS TO THEIR DEFAULT VALUES?**

<p><b>WIZARD</b></p> <p>DEFAULT parameters</p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p>→ No</p> <p>Yes</p>
--	-------------------------------------

Select **YES** when you wish all the user parameters to be returned to their default values.



For example: Select **NO** when a controller is expanded by adding a new **AKO-21803** module and you wish to change a configuration parameter while retaining the other parameters.

**NAVIGATOR function:**

**UP and DOWN:** Move the cursor through the possible responses

**SET:** Confirm the preselected response

**ESC:** Return to SCREEN W-0

**OTHERS:** No function

**SCREEN W-2: WHICH TYPE OF FAN CONTROL?**

<p><b>WIZARD</b></p> <p>Type of Fan Control</p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p>→ ON/OFF</p> <p>Inverter</p>
---	--

Select the type of fan control between **ON/OFF** and **INVERTER**.

**NAVIGATOR function:**

**UP and DOWN:** Move the cursor through the possible responses

**SET:** Confirm the preselected response

**ESC:** Return to SCREEN W-0

**OTHERS:** No function

**SCREEN W-3: HOW MANY COMPRESSORS IN THE INSTALLATION?**

<p><b>WIZARD</b></p> <p>No. compressors</p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p><b>1</b></p> <p>MAX. = 6 SET = 1 MIN. = 1</p>
---	---

**NAVIGATOR function:**

**UP and DOWN:** Enter the number of compressors in the facility

**SET:** Confirm the entered value and go on to the next screen

**ESC:** Return to SCREEN W-0

**OTHERS:** No function

**SCREEN W-4: HOW MANY STAGES PER COMPRESSOR?**

<p><b>WIZARD</b></p> <p>No. Compressor stages</p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p><b>1</b></p> <p>MAX. = 4 SET = 1 MIN. = 1</p>
---	---

**NAVIGATOR function:**

**UP and DOWN:** Enter the number of stages for each compressor

**SET:** Confirm the entered value and go on to the next screen

**ESC:** Return to SCREEN W-0

**OTHERS:** No function



The number of stages per compressor coincides with the number of outputs reserved for each compressor.

**SCREEN W-5: WHAT TYPE OF PARTIAL LOADING ACTIVATION?**

<p><b>WIZARD</b></p> <p>Compr. capacity reduction</p> <p><b>AKO-21018</b></p>	<p style="text-align: center;">VALUE</p> <p style="text-align: center;">→ Active when powered Active when not powered</p>
---	---

Select **“Active when powered”** or **“Active when not powered”** considering the type of compressors used. For further information, see **Section 3.3.1**.

**UP and DOWN:** Move the cursor through the possible responses

**SET:** Confirm the preselected response

**ESC:** Return to SCREEN W-0

**OTHERS:** No function

**SCREEN W-6: HOW MANY FANS IN THE INSTALLATION?**

<p><b>WIZARD</b></p> <p>No. Fans</p> <p><b>AKO-21018</b></p>	<p style="text-align: center;">VALUE</p> <p style="text-align: center; font-size: 2em;"><b>1</b></p> <p>MAX. = 8 SET = 1 MIN. = 1</p>
--	---

**NAVIGATOR function:**

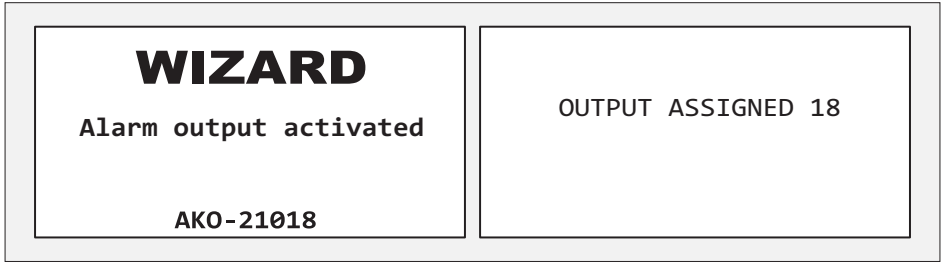
**UP and DOWN:** Enter the number of fans in the facility

**SET:** Confirm the entered value and go on to the next screen

**ESC:** Return to SCREEN W-0

**OTHERS:** No function

**SCREEN W-7: ALARM OUTPUT**



Notification of whether it has been possible to allocate a terminal as an alarm output will appear on the screen. To understand in which cases it is not possible to have such an output available, see **Section 2.3.2**.

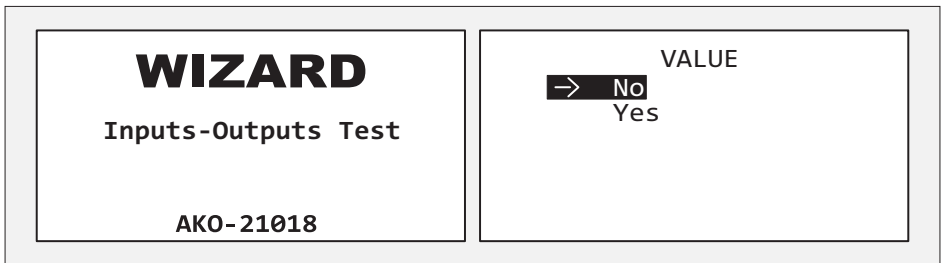
**NAVIGATOR function:**

**SET:** Confirm the preselected response

**ESC:** Return to SCREEN W-0

**OTHERS:** No function

**SCREEN W-8: TESTING OF INPUT/OUTPUT WIRING**



This screen allows you to choose the action to carry out in the WIZARD:

Select the **YES** option to check the control panel wiring.

Select the **NO** option to continue with the W-9 assistant screen without checking the wiring.

**NAVIGATOR function:**

**UP and DOWN:** Move the cursor through the possible responses

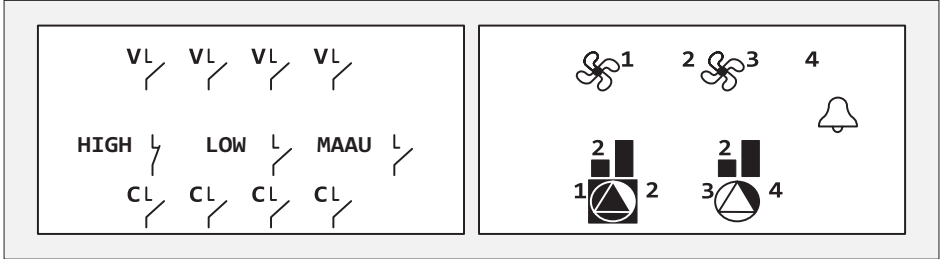
**SET:** Confirm the preselected response

**ESC:** Return to SCREEN W-0

**OTHERS:** No function

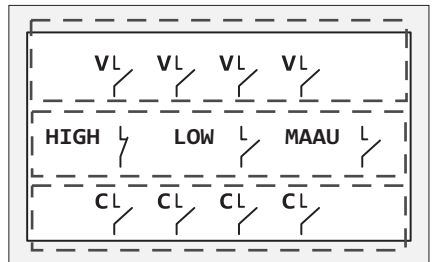
**SCREEN W-I/O**



In the case that **YES** is selected, the display screen will be similar to that below:



The status of the inputs is shown in the area on the left of the Display.

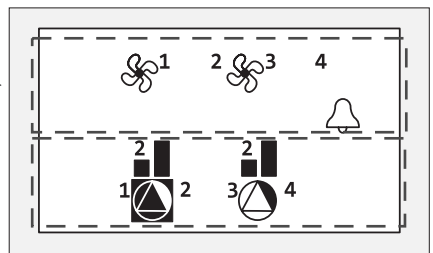
- Safety circuits for the fans (or inverter) —
- General high pressure switch ]
- General low pressure switch ]
- MANUAL/AUTOMATIC selector ]
- Safety circuit for the compressors —



The open contact icon  means that there is a voltage of 0 V in the corresponding terminal. On the other hand, if the icon shows a closed contact , this means that there is a voltage of +24 V in the terminal.

The area to the right of the Display enables the output terminals to be controlled:

- Fans (or inverter) —
- Alarm Output —
- Compressors ]
- Partial loadings ]



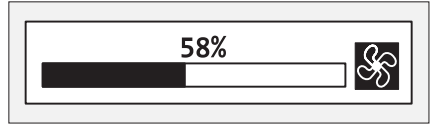
Move the cursor using the **UP, DOWN, RIGHT** and **LEFT** keys to select the element in the installation you wish to control. The SET key allows you to:

Apply a voltage of +24 V to the control terminal for a compressor, partial loading or fan.

In this case, the corresponding icon will appear indicating that the output is active.

Apply a voltage of 0 V to the control terminal for a compressor, partial loading or fan.

In the case of using an inverter, it is possible to change the current by selecting the fan icon and using the **LEFT** and **RIGHT** keys.



To activate a compressor's stages, press **SET** as many times as the compressor has stages.

The alarm output is indicated by the bell icon. Press **SET** to activate it  or deactivate it .

Press **ESC** to exit from I/O TESTING and return to SCREEN W-1.

Chapter 2 explains how to identify the control function of each of the terminals.



Example: Consider the following refrigerating facility:

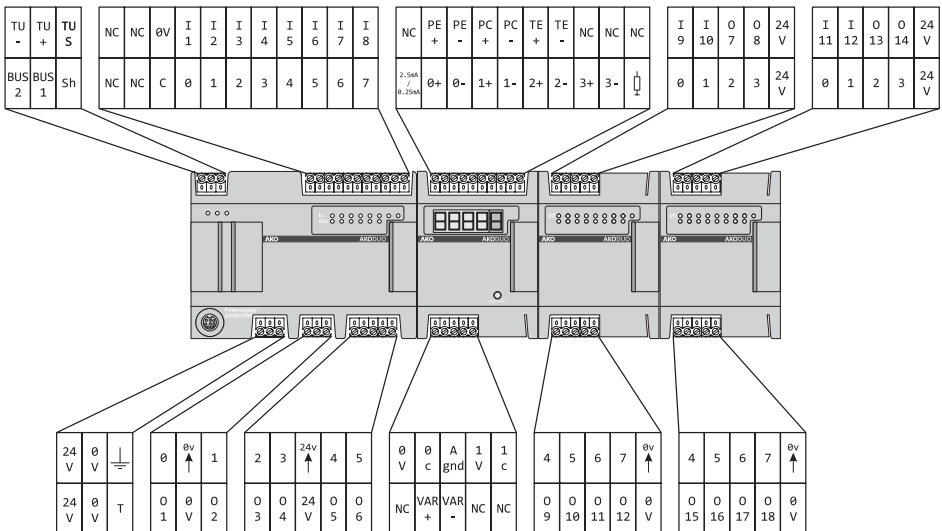
**Controller Model:** AKO-21018

**No. of Compressors:** 3

**No. of Stages per Compressor:** 2

**No. of Fans:** 5 (ON/OFF Control)

The functions of all the **DUOControl** controller terminals are defined using the tables included in Chapter 2.



Terminal	Function
I1	General High Pressure switch Input
I2	General Low Pressure switch Input
I3	MANUAL/AUTOMATIC Selector Input
I4	Safety circuit Input for Compressor 1
I5	Safety circuit Input for Compressor 2
I6	Safety circuit Input for Compressor 3
I7	Safety circuit Input for Fan 1
I8	Safety circuit Input for Fan 2
I9	Safety circuit Input for Fan 3
I10	Safety circuit Input for Fan 4
I11	Safety circuit Input for Fan 5
I12	Unused
O1	Control Output for Compressor 1
O2	Control Output for partial loading of Compressor 1
O3	Control Output for Compressor 2
O4	Control Output for partial loading of Compressor 2
O5	Control Output for Compressor 3
O6	Control Output for partial loading of Compressor 3
O7	Control Output for Fan 1
O8	Control Output for Fan 2
O9	Control Output for Fan 3
O10	Control Output for Fan 4
O11	Control Output for Fan 5
O12	Unused
O13	Unused
O14	Unused
O15	Unused
O16	Unused
O17	Unused
O18	Alarm Output

Continuing with the previous example, when Fan 3 is active, terminal **O9** is at +24 V. Similarly, on deactivating it terminal **O9** changes to 0 V.



**SCREEN W-9: WHICH TYPE OF REFRIGERANT GAS?**

<p><b>WIZARD</b> Refrigerant type</p> <p><b>CHANGING VALUE INVOLVES DEFAULT VALUES</b></p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p>GENERIC</p> <p>→R404A</p> <p>R134A</p> <p>R717</p> <p>R22</p> <p>R410A</p> <p>R507</p>
--	--

Select the refrigerant gas used in the installation. If it is not in the list, choose GENERIC. In this case the DUOControl will only be able to work in **bar** as the working unit.

**NAVIGATOR function:**

**UP and DOWN:** Move the cursor through the possible responses

**SET:** Confirm the preselected response

**ESC:** Return to SCREEN W-8

**OTHERS:** No function

**SCREEN W-10: WHICH WORKING UNITS?**

<p><b>WIZARD</b> Units</p> <p><b>CHANGING VALUE INVOLVES DEFAULT VALUES</b></p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p>→Bar</p> <p>°C</p>
---	------------------------------------

**DUOControl** controllers can work by temperature (°C) or pressure (**bar**).

The unit selected affects some of the user parameters.

For further information on the user parameters affected, see **Appendix C**.

**NAVIGATOR function:**

**UP and DOWN:** Change the value of the selected digit

**SET:** Confirm the preselected response

**ESC:** Return to SCREEN W-8

**OTHERS:** No function

**SCREEN W-11: SUCTION PROBE – PRESSURE VALUE (bar) FOR A CURRENT OF 4 mA**

<p><b>WIZARD</b></p> <p><b>Suction Probe - 4mA</b></p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p><b>-0.5</b> BAR</p> <p>MAX. = 8.0 SET = -0.7 MIN. = -1.0</p>
--	--

Enter the pressure equivalent to an output current of 4 mA from the suction probe.

**NAVIGATOR function:**

- UP and DOWN:** Change the value of the selected digit
- LEFT and RIGHT:** Move the digit selection
- SET:** Confirm the preselected response
- ESC:** Return to SCREEN W-8
- OTHERS:** No function

**SCREEN W-12: SUCTION PROBE – PRESSURE VALUE (bar) FOR A CURRENT OF 20 mA**

<p><b>WIZARD</b></p> <p><b>Suction Probe - 20mA</b></p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p><b>8.0</b> BAR</p> <p>MAX. = 40.0 SET = 8.0 MIN. = -0.7</p>
---	---

Enter the pressure equivalent to an output current of 20 mA from the suction probe.

**NAVIGATOR function:**

- UP and DOWN:** Change the value of the selected digit
- LEFT and RIGHT:** Move the digit selection
- SET:** Confirm the preselected response
- ESC:** Return to SCREEN W-8
- OTHERS:** No function

**SCREEN W-13: DISCHARGE PROBE – PRESSURE VALUE (bar) FOR A CURRENT OF 4 mA**

<p><b>WIZARD</b></p> <p>Discharge Probe - 4mA</p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p><b>0.0</b> BAR</p> <p>MAX. = 30.0 SET = 0.0 MIN. = -1.0</p>
---	---

Enter the pressure equivalent to an output current of 4 mA from the discharge probe.

**NAVIGATOR function:**

- UP and DOWN:** Change the value of the selected digit
- LEFT and RIGHT:** Move the digit selection
- SET:** Confirm the preselected response
- ESC:** Return to SCREEN W-8
- OTHERS:** No function

**SCREEN W-14: DISCHARGE PROBE – PRESSURE VALUE (bar) FOR A CURRENT OF 20 mA**

<p><b>WIZARD</b></p> <p>Discharge Probe - 20mA</p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p><b>30.0</b> BAR</p> <p>MAX. = 40.0 SET = 30.0 MIN. = 0.0</p>
--	--

Enter the pressure equivalent to an output current of 20 mA from the discharge probe.

**NAVIGATOR function:**

- UP and DOWN:** Change the value of the selected digit
- LEFT and RIGHT:** Move the digit selection
- SET:** Confirm the preselected response
- ESC:** Return to SCREEN W-8
- OTHERS:** No function

**SCREEN W-15: EVAPORATION SET POINT VALUE**

<p><b>WIZARD</b></p> <p><b>Evap. Setpoint (SP)</b></p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p><b>5.0</b> BAR</p> <p>MAX. = 40.0 SET = 5.0 MIN. = -1.0</p>
--	---

Evaporation pressure set point.

**NAVIGATOR function:**

- UP and DOWN:** Change the value of the selected digit
- LEFT and RIGHT:** Move the digit selection
- SET:** Confirm the preselected response
- ESC:** Return to SCREEN W-8
- OTHERS:** No function

**SCREEN W-16: CONDENSATION SET POINT VALUE**

<p><b>WIZARD</b></p> <p><b>Condensation SP</b></p> <p><b>AKO-21018</b></p>	<p>VALUE</p> <p><b>19.5</b> BAR</p> <p>MAX. = 40.0 SET = 19.5 MIN. = -1.0</p>
--	---

Condensation pressure set point.

**NAVIGATOR function:**

- UP and DOWN:** Change the value of the selected digit
- LEFT and RIGHT:** Move the digit selection
- SET:** Confirm the preselected response
- ESC:** Return to SCREEN W-8
- OTHERS:** No function

**SCREEN W-17: CONFIRMING THE CONFIGURATION**

<p><b>WIZARD</b></p> <p>SAVE DATA</p> <p>AKO-21018</p>	<p>VALUE</p> <p>→ No Yes</p>
--	----------------------------------

Select **YES** to confirm ALL the data entered and transfer them to the DUOControl.

Select **NO** to delete the data and return to the initial wizard screen.

If the data is confirmed, the wizard will close and proceed to **MONITORING THE INSTALLATION**.

**NAVIGATOR function:**


**UP and DOWN:** Move the cursor through the possible responses

**SET:** Confirm the preselected response

**ESC:** Return to SCREEN W-0

**OTHERS:** No function



**IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration.

### 3.2.- MONITORING THE INSTALLATION

The **MONITORING SCREEN** shows all the information required for determining the status of the refrigerating facility:

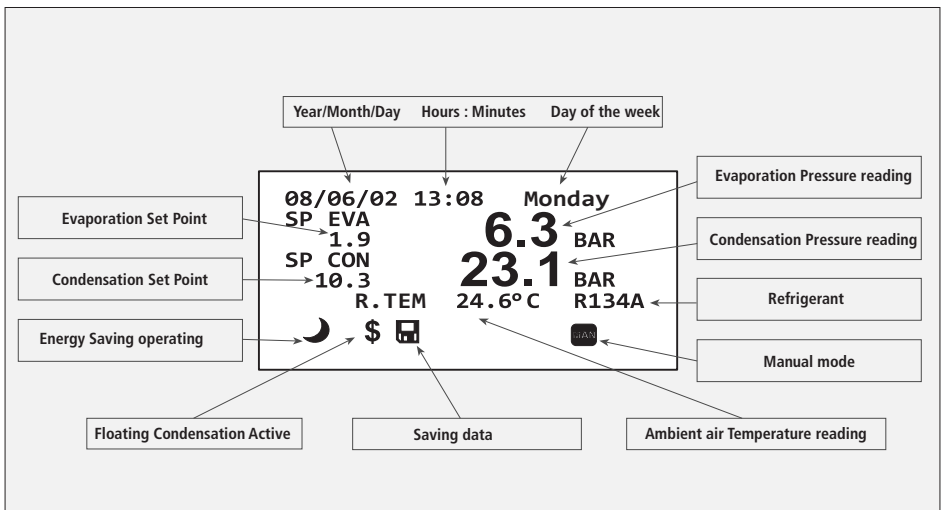
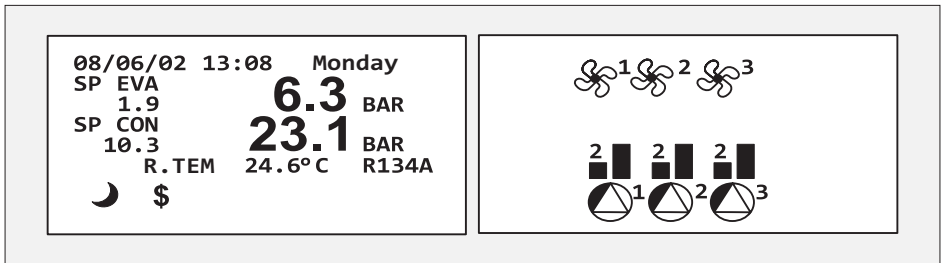
The **MONITORING SCREEN** appears:

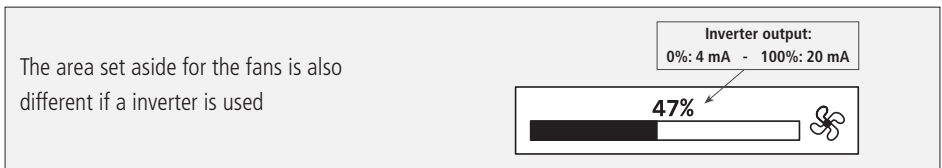
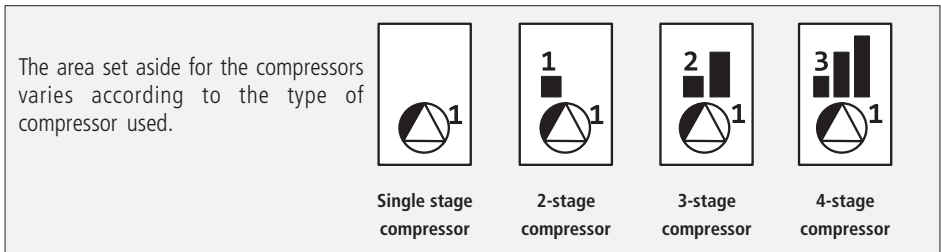
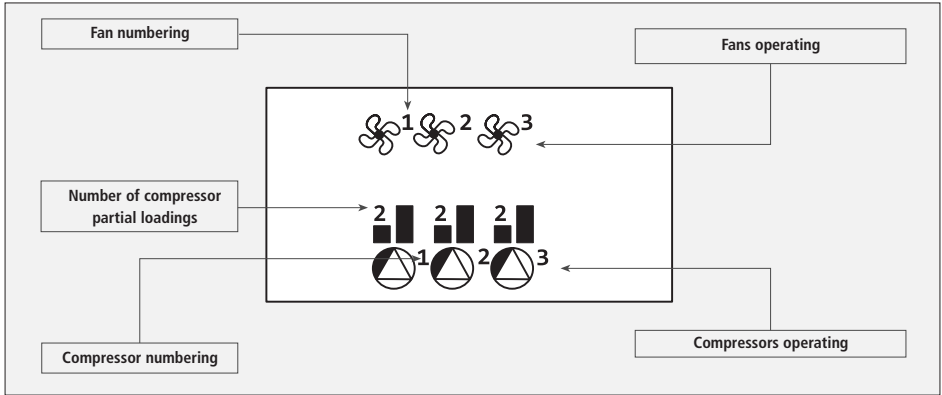
When the wizard closes.

On starting up a previously configured **DUOControl** controller.

On returning from the **USER PARAMETER AND LOGS MENU**.


#### MONITORING SCREEN









The background colour for the two areas of the DISPLAY is configurable by means of user parameters (Section 3.3.11.).


The Energy Saving  and Floating Condensation  icons only appear when these are active.



The Communication Error icon  appears when there is an error in the communication between the DUOControl and the DUOVision.

The manual mode icon  appears when there is 24 V present at input I3.

 This icon indicates that the DUOControl is shut down and so is not regulating the refrigerating installation.

 **IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration when it restarts.

The ALARM icon  appears when there is an alarm active. In this case the background colour of the left-hand side area flashes red. To see which alarms are active, press the **HELP** (?) key. The list of active alarms is shown in real time on the right-hand side of the Display.

<p>08/06/02 13:08 Monday          SP EVA 1.9          SP CON 10.3          R. TEM 24.6° C R134A   </p>	<p>6.3 BAR          23.1 BAR</p>	<p>COMPR. 1 SAFETY CIRCUIT          COMPR. 2 SAFETY CIRCUIT          FAN 2 SAFETY CIRCUIT</p>
--	--------------------------------------	---

Press the **ESC** key to go back to displaying the status of the fans and compressors.

Within the **MONITORING SCREEN**, the function of the keys is as follows:

**NAVIGATOR function:**

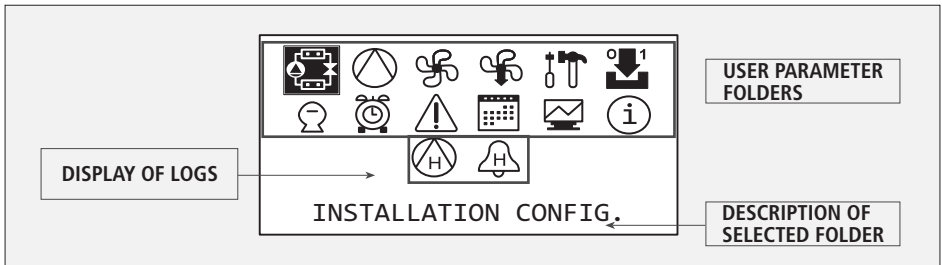
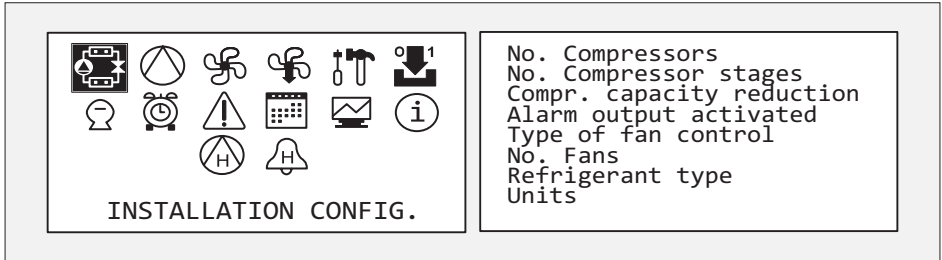
- UP and DOWN:** Change the display units
- SET:** Press for 3 seconds to enter the user parameter and logs menu.
- HELP (?):** See the list of active alarms
- ESC:** Clear the list of active alarms
- OTHERS:** No function



### 3.3.- USER PARAMETERS AND LOGS

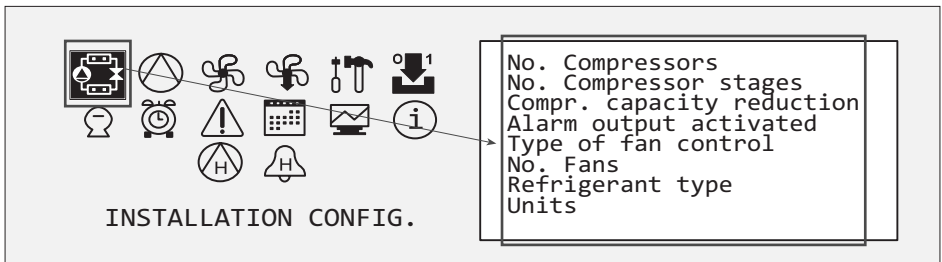
When the **SET** key is pressed for 3 seconds on the **MONITORING SCREEN**, the **USER PARAMETER AND LOGS MENU** is displayed. It is possible to activate **PASSWORD** protection in the **TERM\_1** parameter.

#### CONFIGURATION AND LOG SCREEN:



The user parameter and logs are grouped into folders depending on their function.

To make it easier to find a user parameter, all the parameters included in the selected folder are listed in the right-hand area of the DISPLAY.



#### NAVIGATOR function:

**UP, DOWN, RIGHT and LEFT:** Select the desired folder

**SET:** Confirm the selected folder to proceed to adjusting some of its parameters

**ESC:** Return to the MONITORING SCREEN

**OTHERS:** No function

### 3.3.1.- CONFIGURING THE INSTALLATION



User parameters related to the structure of the refrigerating installation. As a change in these parameters would involve a change in the behaviour of the installation, it is only possible to modify the parameters in this folder by means of the WIZARD (See Section 3.1.).

No. Compressors  
No. Compressor stages  
Compr. capacity reduction  
Alarm output activated  
Type of fan control  
No. Fans  
Refrigerant type  
Units

**Within this folder the function of the NAVIGATOR is as follows:**

**UP and DOWN:** Select the desired parameter

**HELP (?):** Display the help window for the parameter selected in the area on the right of the Display. Press ESC to exit.

**ESC:** Return to the CONFIGURATION AND LOGS SCREEN

**OTHERS:** No function

**Parameter:** No. of Compressors  
**Code:** CONF\_1  
**Description:** Number of compressors present in the installation

**Parameter:** No. of Stages per Compressor  
**Code:** CONF\_2  
**Description:** Number of stages per compressor

**For a compressor without partial loadings, the number of stages is 1.**

**For a compressor with 1 partial loading, the number of stages is 2.**

**For a compressor with 2 partial loadings, the number of stages is 3.**

**For a compressor with 3 partial loadings, the number of stages is 4.**

**Parameter:** Compressor capacity reduction contact

**Code:** CONF\_3

**Description:** Type of activation for compressor partial loadings.  
This can be selected between:

**Active when powered:** The DUOControl activates partial loading with +24 VDC to increase refrigerating power.

**Active when not powered:** The DUOControl activates partial loading with +0 VDC to increase refrigerating power.

**For a compressor without partial loadings:**

**Active when powered**

Compressor	Stages ON
0 VDC	0 of 1
24 VDC	1 of 1

**Active when not powered**

Compressor	Stages ON
0 VDC	0 of 1
24 VDC	1 of 1

**For a compressor with 1 partial loadings (2 stages):**

**Active when powered**

Compressor	Partial loading-a	Stages ON
0 VDC	0 VDC	0 of 2
24 VDC	0 VDC	1 of 2
24 VDC	24 VDC	2 of 2

**Active when not powered**

Compressor	Partial loading-a	Stages ON
0 VDC	24 VDC	0 of 2
24 VDC	24 VDC	1 of 2
24 VDC	0 VDC	2 of 2

**For a compressor with 2 partial loadings (3 stages):**

**Active when powered**

Compressor	Partial loading-a	Partial loading-b	Stages ON
0 VDC	0 VDC	0 VDC	0 of 3
24 VDC	0 VDC	0 VDC	1 of 3
24 VDC	24 VDC	0 VDC	2 of 3
24 VDC	24 VDC	24 VDC	3 of 3

**Active when not powered**

Compressor	Partial loading-a	Partial loading-b	Stages ON
0 VDC	24 VDC	24 VDC	0 of 3
24 VDC	24 VDC	24 VDC	1 of 3
24 VDC	0 VDC	24 VDC	2 of 3
24 VDC	0 VDC	0 VDC	3 of 3

For a compressor with 3 partial loadings:

Active when powered

Compressor	Partial loading-a	Partial loading-b	Partial loading-c	Stages ON
0 VDC	0 VDC	0 VDC	0 VDC	0 of 4
24 VDC	0 VDC	0 VDC	0 VDC	1 of 4
24 VDC	24 VDC	0 VDC	0 VDC	2 of 4
24 VDC	24 VDC	24 VDC	0 VDC	3 of 4
24 VDC	24 VDC	24 VDC	24 VDC	4 of 4

Active when not powered

Compressor	Partial loading-a	Partial loading-b	Partial loading-c	Stages ON
0 VDC	24 VDC	24 VDC	24 VDC	0 of 4
24 VDC	24 VDC	24 VDC	24 VDC	1 of 4
24 VDC	0 VDC	24 VDC	24 VDC	2 of 4
24 VDC	0 VDC	0 VDC	24 VDC	3 of 4
24 VDC	0 VDC	0 VDC	0 VDC	4 of 4

**Parameter:** Alarm Output Activated

**Code:** CONF\_4

**Description:** Notifies whether it has been possible to use a controller terminal as an alarm output. **Section 2.3.2.** shows in which cases this functionality is not available.

**Parameter:** Fan Control Type

**Code:** CONF\_5

**Description:** Type of condenser fan control  
**ON/OFF:** ALL/NOTHING control  
**INVERTER:** INVERTER control

**Parameter:** No. of Fans

**Code:** CONF\_6

**Description:** Number of condenser fans  
 Modification of this parameter is only permitted by means of the Programming Assistant.

**Parameter:** Refrigerant Type  
**Code:** CONF\_7  
**Description:** Type of refrigerant used in the installation.  
R404A  
R134A  
R717  
R22  
R410A  
R507  
R744  
GENERIC

Select **GENERIC** when any other refrigerant is used. In this case the controller can only work in bar as the working unit.

**Parameter:** Units  
**Code:** CONF\_8  
**Description:** Reference unit for the installation adjustment parameters.  
**bar** : Select this option to make user parameter adjustments in **bar**.  
**°C** : Select this option to make user parameter adjustments in **°C**.

### 3.3.2.- EVAPORATION



User parameters relating to the adjustment of the evaporation circuit.

Evap. Setpoint (SP)  
Upper limit Evap. SP  
Lower limit Evap. SP  
Compressors rotation  
Compressor Control  
Positive Diff. Slow Zone  
Negative Diff. Slow Zone  
Positive Diff. Fast Zone

Negative Diff. Fast Zone  
Activate Pump-Down  
Pump-Down Delay  
Pump-Down SetPoint

**With the cursor in the left-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** Select the desired parameter

**SET:** Confirm the selected user parameter to modify its value (right-hand area of the Display)

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display

**ESC:** Return to the CONFIGURATION AND LOGS SCREEN

**OTHERS:** No function

**With the cursor in the right-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** To adjust the value of the selected digit or select the desired option

**LEFT and RIGHT:** Move the digit selection (only for numeric user parameters)

**SET:** Confirm the numeric value or the option selected

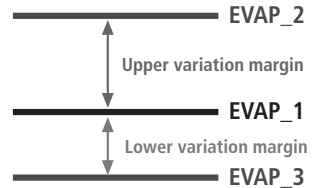
**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display.

Press **ESC** to clear.

**Parameter:** Evaporation SP  
**Code:** EVAP\_1  
**Units:** According to CONF\_8 parameter  
**Description:** Adjustment of evaporation Set Point

**Parameter:** Upper limit Evap. SP  
**Code:** EVAP\_2  
**Units:** According to CONF\_8 parameter  
**Description:** Maximum permitted value for the parameter EVAP\_1

**Parameter:** Lower limit Evap. SP  
**Code:** EVAP\_3  
**Units:** According to CONF\_8 parameter  
**Description:** Minimum value permitted for parameter EVAP\_1.



**Parameter:** Compressor Rotation  
**Code:** EVAP\_4  
**Description:** Type of compressor rotation.

**DUOControl** controllers have 2 algorithms implemented for selecting the compressors to start and/or stop.  
**OPERATING HOURS:** Always starts the available compressor with the least accumulated operating time and always stops the compressor with the most accumulated operating time.

**SEQUENTIAL:** The order in which the compressors are started/stopped is set by the connection to the **DUOControl**. For further information, see **Chapter 4**.

**Parameter:** Compressor Control  
**Code:** EVAP\_5  
**Description:** To define the algorithm used to control the compressors.

**NEUTRAL ZONE**

**PROPORTIONAL BAND**

For further information, see **Chapter 4**.

**Parameter:** Positive Differential Slow Zone  
**Code:** EVAP\_6  
**Units:** According to CONF\_8 parameter  
**Description:** Bandwidth of the POSITIVE SLOW ZONE used in the definition of the algorithms for controlling the compressors.  
 For further information, see **Chapter 4**.

**Parameter:** Negative Differential Slow Zone  
**Code:** EVAP\_7  
**Units:** According to CONF\_8 parameter  
**Description:** Bandwidth of the NEGATIVE SLOW ZONE used in the definition of the algorithms for controlling the compressors.  
 For further information, see **Chapter 4**.

**Parameter:** Positive Differential Fast Zone  
**Code:** EVAP\_8  
**Units:** According to CONF\_8 parameter  
**Description:** Bandwidth of the POSITIVE FAST ZONE used in the definition of the algorithms for controlling the compressors.  
 For further information, see **Chapter 4**.


**Parameter:** Negative Differential Fast Zone  
**Code:** EVAP\_9  
**Units:** According to CONF\_8 parameter  
**Description:** Bandwidth of the NEGATIVE FAST ZONE used in the definition of the algorithms for controlling the compressors.  
 For further information, see **Chapter 4**.

**Parameter:** Activate Pump-Down  
**Code:** EVAP\_10  
**Description:** Activates the Pump-Down functionality.  
**NO:** Do not activate Pump-Down.  
**YES:** Activate the Pump-Down process.  
 For further information, see **Chapter 7**.

**Parameter:** Pump-Down Delay  
**Code:** EVAP\_11  
**Units:** Seconds  
**Description:** Maximum operating time of the last active stage.  
 For further information, see **Chapter 7**.

**Parameter:** Pump-Down SetPoint  
**Code:** EVAP\_12  
**Units:** According to CONF\_8 parameter  
**Description:** Set Point for Pump-Down.  
 For further information, see **Chapter 7**.



**IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration.



### 3.3.3.- CONDENSATION



User parameters relating to the adjustment of the condensation circuit.

Condensation SP  
Upper limit Cond. SP  
Lower limit Cond. SP  
Fan Control  
Positive Diff. Slow Zone  
Negative Diff. Slow Zone  
Positive Diff. Fast Zone  
Negative Diff. Fast Zone

Activate Floating Cond.  
Proportional value  
Integrative value

**With the cursor in the left-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** Select the desired parameter

**SET:** Confirm the selected user parameter to modify its value (right-hand area of the Display)

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display

**ESC:** Return to the CONFIGURATION AND LOGS SCREEN

**OTHERS:** No function

**With the cursor in the right-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** To adjust the value of the selected digit or select the desired option

**LEFT and RIGHT:** Move the digit selection (only for numeric user parameters)

**SET:** Confirm the numeric value or the option selected

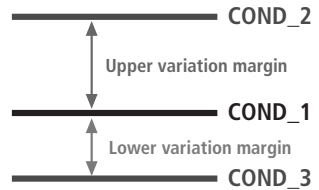
**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display.

Press **ESC** to clear.

**Parameter:** Condensation SetPoint  
**Code:** COND\_1  
**Units:** According to CONF\_8 parameter  
**Description:** Adjustment of condensation Set Point

**Parameter:** Upper limit Condensation SetPoint  
**Code:** COND\_2  
**Units:** According to CONF\_8 parameter  
**Description:** Maximum permitted value for the parameter COND\_1

**Parameter:** Lower limit Condensation SetPoint  
**Code:** COND\_3  
**Units:** According to CONF\_8 parameter  
**Description:** Minimum value permitted for parameter COND\_1



**Parameter:** Fan Control  
**Code:** COND\_4  
**Description:** Type of algorithm for condenser fan control.  
**NEUTRAL ZONE**  
**PROPORTIONAL BAND**  
 For further information, see **Chapter 5**.

**Parameter:** Positive Differential Slow Zone  
**Code:** COND\_5  
**Units:** According to CONF\_8 parameter  
**Description:** Bandwidth of the POSITIVE SLOW ZONE used in the definition of the algorithms for controlling the condensation circuit.  
 For further information, see **Chapter 5**.

**Parameter:** Negative Differential Slow Zone  
**Code:** COND\_6  
**Units:** According to CONF\_8 parameter  
**Description:** Bandwidth of the NEGATIVE SLOW ZONE used in the definition of the algorithms for controlling the condensation circuit.  
 For further information, see **Chapter 5**.

**Parameter:** Positive Differential Fast Zone  
**Code:** COND\_7  
**Units:** According to CONF\_8 parameter  
**Description:** Bandwidth of the POSITIVE FAST ZONE used in the definition of the algorithms for controlling the condensation circuit.  
 For further information, see **Chapter 5**.


**Parameter:** Negative Differential Fast Zone  
**Code:** COND\_8  
**Units:** According to CONF\_8 parameter  
**Description:** Bandwidth of the NEGATIVE FAST ZONE used in the definition of the algorithms for controlling the condensation circuit. For further information, see **Chapter 5**.

**Parameter:** Activate Floating Cond.  
**Code:** COND\_9  
**Description:** Activation/Deactivation of floating condensation. To activate this functionality it is essential to have the Ambient air temperature probe installed.  
**NO:** Do not activate floating condensation  
**YES:** Activate floating condensation  
 For further information, see **Chapter 5**.

**Parameter:** Proportional value  
**Code:** COND\_10  
**Description:** Adjustment of the PI control proportional value to regulate the 4-20 mA output for the inverter for the condenser fans. For further information, see **Chapter 5**.

**Parameter:** Integrative value  
**Code:** COND\_11  
**Description:** Adjustment of the PI control integrative value to regulate the 4-20 mA output for the inverter for the condenser fans. For further information, see **Chapter 5**.



**IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration.

### 3.3.4.- FLOATING CONDENSATION



Parameters relating to the adjustment of the algorithm used for floating condensation.

Min. Condensation Temp.  
Condenser Temp. Differ.

**With the cursor in the left-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** Select the desired parameter

**SET:** Confirm the selected user parameter to modify its value (right-hand area of the Display)

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display

**ESC:** Return to the CONFIGURATION AND LOGS SCREEN

**OTHERS:** No function

**With the cursor in the right-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** To adjust the value of the selected digit or select the desired option

**LEFT and RIGHT:** Move the digit selection (only for numeric user parameters)

**SET:** Confirm the numeric value or the option selected

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display.  
Press **ESC** to clear.

**Parameter:** Minimum Condensation Temp.

**Code:** CONDF\_1

**Units:** °C

**Description:** Minimum condensation temperature. Depends on the type of expansion valve and the refrigerant used in the refrigerating installation.  
Parameter used to adjust floating condensation.  
For further information, see **Chapter 7**.


**Parameter:** Condenser Temperature Difference

**Code:** CONDF\_2

**Units:** °C

**Description:**  $\Delta T$  for the Condenser used.  
Parameter used to adjust floating condensation.  
For further information, see **Chapter 7**.



**IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration.

### 3.3.5.- CONFIGURING THE PROBES



User parameters relating to the calibration and scaling of the probes used: Suction Probe, Discharge Probe and Ambient air Temperature Probe.

Suction Probe - 4mA  
 Suction Probe - 20mA  
 Suction Probe - Offset  
 Discharge Probe - 4mA  
 Discharge Probe - 20mA  
 Discharge Probe - Offset  
 Amb. air probe Connected  
 Amb. air probe - 4mA

Amb. air probe - 20mA  
 Amb. air probe - Offset

**With the cursor in the left-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** Select the desired parameter

**SET:** Confirm the selected user parameter to modify its value (right-hand area of the Display)

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display

**ESC:** Return to the CONFIGURATION AND LOGS SCREEN

**OTHERS:** No function

**With the cursor in the right-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** To adjust the value of the selected digit or select the desired option

**LEFT and RIGHT:** Move the digit selection (only for numeric user parameters)

**SET:** Confirm the numeric value or the option selected


**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display. Press **ESC** to clear.

**Parameter:** Suction Probe - 4 mA  
**Code:** SOND\_1  
**Units:** Bar  
**Description:** Pressure equivalent to an output current of 4 mA from the suction probe.

**Parameter:** Suction Probe - 20mA  
**Code:** SOND\_2  
**Units:** Bar  
**Description:** Pressure equivalent to an output current of 20 mA from the suction probe.

<b>Parameter:</b>	Suction Probe - Offset
<b>Code:</b>	SOND_3
<b>Units:</b>	Bar
<b>Description:</b>	Suction probe offset.
<b>Parameter:</b>	Discharge Probe - 4 mA
<b>Code:</b>	SOND_4
<b>Units:</b>	Bar
<b>Description:</b>	Pressure equivalent to an output current of 4 mA from the discharge probe.
<b>Parameter:</b>	Discharge Probe - 20mA
<b>Code:</b>	SOND_5
<b>Units:</b>	Bar
<b>Description:</b>	Pressure equivalent to an output current of 20 mA from the discharge probe.
<b>Parameter:</b>	Discharge Probe - Offset
<b>Code:</b>	SOND_6
<b>Units:</b>	Bar
<b>Description:</b>	Discharge probe offset.
<b>Parameter:</b>	Ambient air probe Connected
<b>Code:</b>	SOND_7
<b>Description:</b>	Activation/deactivation of the Ambient air temperature probe. <b>NO:</b> Do not activate the Ambient air temperature probe. <b>YES:</b> Activate the Ambient air temperature probe. The Ambient air probe measures the temperature of the air flowing through the condenser to cool the refrigerant. This value is needed for the calculation of the Set Point for the condensation circuit when floating condensation is active. It is also possible to activate the Ambient air temperature probe if floating condensation is NOT active.
<b>Parameter:</b>	Ambient air Probe - 4 mA
<b>Code:</b>	SOND_8
<b>Units:</b>	°C
<b>Description:</b>	Temperature equivalent to an output current of 4 mA from the Ambient air temperature probe.
<b>Parameter:</b>	Ambient air Probe - 20mA
<b>Code:</b>	SOND_9
<b>Units:</b>	°C
<b>Description:</b>	Temperature equivalent to an output current of 20 mA from the Ambient air temperature probe.
<b>Parameter:</b>	Ambient air Probe - Offset
<b>Code:</b>	SOND_10
<b>Units:</b>	°C
<b>Description:</b>	Ambient air temperature probe offset.



**IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration.

### 3.3.6.- CONFIGURING THE DIGITAL INPUTS



User parameters relating to digital inputs:  
General High Pressure switch, General Low  
Pressure switch and Safety circuits for the  
inverter, Compressors and Fans.

High Pressure Switch  
Low Pressure Switch  
Compressor safety circuit  
Fan safety circuit

**With the cursor in the left-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** Select the desired parameter

**SET:** Confirm the selected user parameter to modify its value (right-hand area of the Display)

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display

**ESC:** Return to the CONFIGURATION AND LOGS SCREEN

**OTHERS:** No function

**With the cursor in the right-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** To adjust the value of the selected digit or select the desired option

**LEFT and RIGHT:** Move the digit selection (only for numeric user parameters)

**SET:** Confirm the numeric value or the option selected

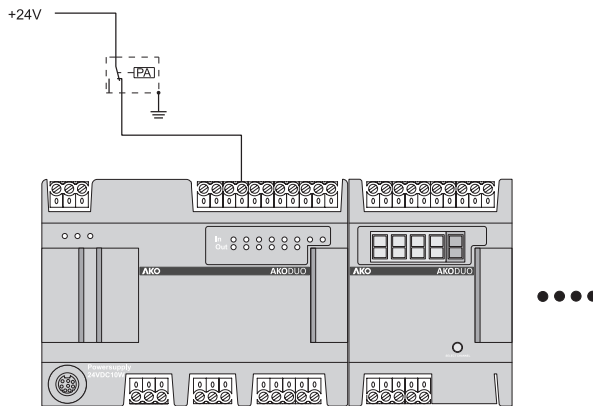
**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display.  
Press **ESC** to clear.

**Parameter:** High Pressure Switch  
**Código:** ENTR\_1  
**Descripción:** Type of contact for the general high pressure switch.

**Open contact error:** The relay for the general high pressure switch is closed in normal operation

**Normal operation:** +24 V in terminal I1.

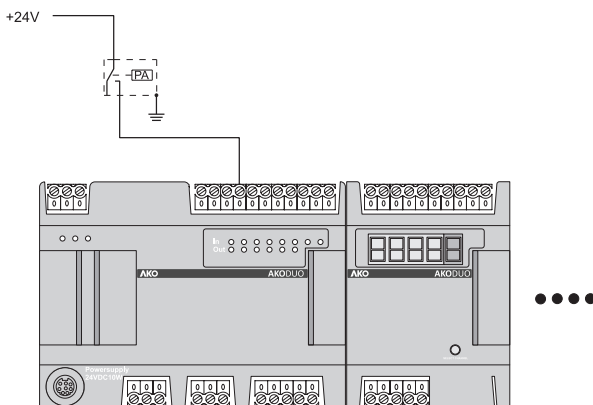
**General high pressure switch active:** 0 V in terminal I1.



**Closed contact error:** The relay for the general high pressure switch is open in normal operation

**Normal operation:** 0 V in terminal I1.

**General high pressure switch active:** +24 V in terminal I1.



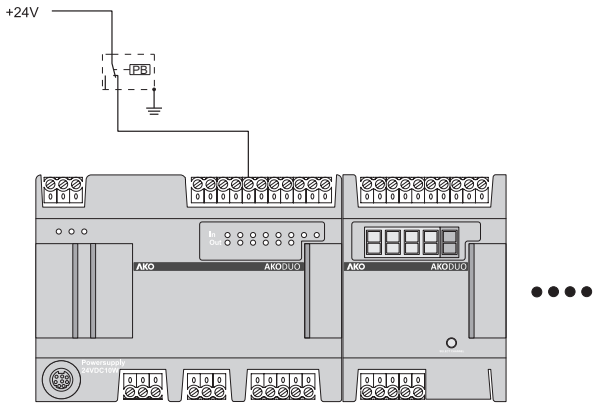


**Parameter:** Low Pressure Switch  
**Code:** ENTR\_2  
**Description:** Type of contact for the general low pressure switch.

**Open contact error:** The relay for the general low pressure switch is closed in normal operation

**Normal operation:** +24 V in terminal I2.

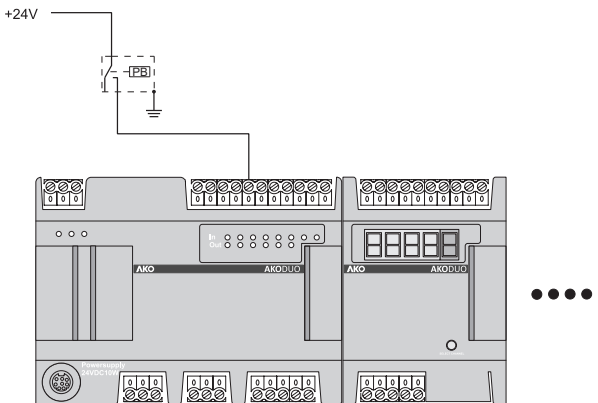
**General low pressure switch active:** 0 V in terminal I2.



**Closed contact error:** The relay for the general low pressure switch is open in normal operation

**Normal operation:** 0 V in terminal I2.

**General low pressure switch active:** +24 V in terminal I2.

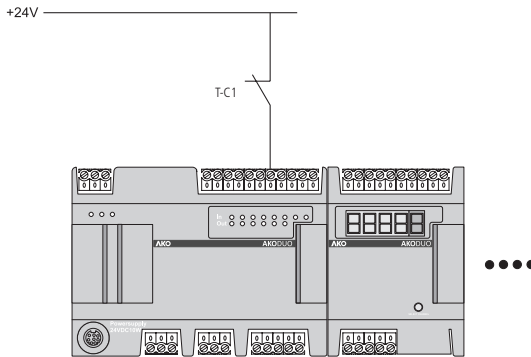


**Parameter:** Compressor Safety Circuit  
**Code:** ENTR\_3  
**Description:** Type of safety circuit for the compressors.

**Open contact error:** The safety circuit for the compressors is closed in normal operation

**Normal operation:** +24 V in the input terminals for the compressor safety circuits

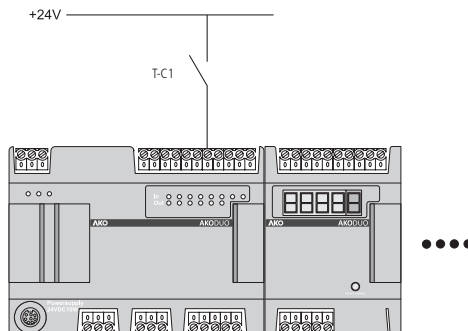
**Safety circuit activated:** 0 V in the input terminals for the compressor safety circuits



**Closed contact error:** The safety circuit for the compressors is open in normal operation

**Normal operation:** 0 V in the input terminals for the compressor safety circuits

**Safety circuit activated:** +24 V in the input terminals for the compressor safety circuits

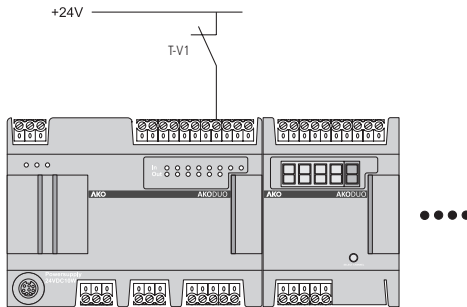


**Parameter:** Fan Safety Circuit  
**Code:** ENTR\_4  
**Description:** Type of safety circuit for the fans.

**Open contact error:** The safety circuit for the fans is closed in normal operation

**Normal operation:** +24 V in the input terminals for the fan safety circuits

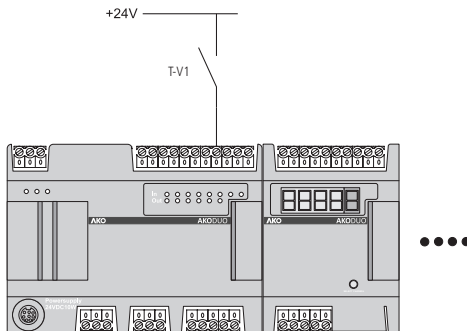
**Safety circuit activated:** 0 V in the input terminals for the fan safety circuits




**Closed contact error:** The safety circuit for the fans is open in normal operation


**Normal operation:** 0 V in the input terminals for the fan safety circuits

**Safety circuit activated:** +24 V in the input terminals for the fan safety circuits



**IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration.

### 3.3.7.- ENERGY SAVING

	<p>User parameters for configuring the Energy Saving function.</p> <p>For further information on this functionality, see <b>Section 7.3.</b></p>	<p>Day(s) of the week          Start - Hour          Start - Minute          Energy Saving Duration          Evap. Diff. Energy Saving</p>
---	--	--

**With the cursor in the left-hand area of the Display, the function of the NAVIGATOR is as follows:**

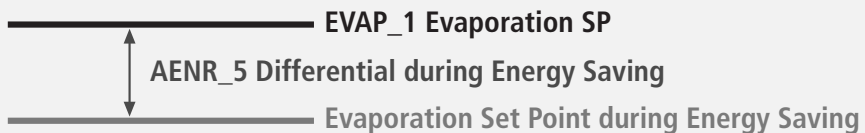
- UP and DOWN:** Select the desired parameter
- SET:** Confirm the selected user parameter to modify its value (right-hand area of the Display)
- HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display
- ESC:** Return to the CONFIGURATION AND LOGS SCREEN
- OTHERS:** No function

**With the cursor in the right-hand area of the Display, the function of the NAVIGATOR is as follows:**

- UP and DOWN:** To adjust the value of the selected digit or select the desired option
- LEFT and RIGHT:** Move the digit selection (only for numeric user parameters)
- SET:** Confirm the numeric value or the option selected
- HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display. Press **ESC** to clear.

- Parameter:** Day(s) of the week
- Code:** AENR\_1
- Description:** Days of the week on which the energy saving process is to be run.
  - DEACTIVATED:** Function deactivated
  - MONDAY:** Only on Mondays
  - TUESDAY:** Only on Tuesdays
  - WEDNESDAY:** Only on Wednesdays
  - THURSDAY:** Only on Thursdays
  - FRIDAY:** Only on Fridays
  - SATURDAY:** Only on Saturdays
  - SUNDAY:** Only on Sundays
  - MONDAY - SUNDAY:** From Monday to Sunday
  - MONDAY - SATURDAY:** From Monday to Saturday
  - MONDAY - FRIDAY:** From Monday to Friday

- Parameter:** Start - Hour  
**Code:** AENR\_2  
**Units:** Hours  
**Description:** Hour for starting the Energy Saving function.
- Parameter:** Start - Minutes  
**Code:** AENR\_3  
**Units:** Minutes  
**Description:** Minutes for starting the Energy Saving function.
- Parameter:** Energy Saving Duration  
**Code:** AENR\_4  
**Units:** Hours  
**Description:** Duration of the Energy Saving function.
- Parameter:** Evap. Diff. Energy Saving  
**Code:** AENR\_5  
**Units:** According to CONF\_8 parameter  
**Description:** The value of this parameter added to the Evaporation Set Point (EVAP\_1) gives the Set Point during the Energy Saving function.



**Example:** Let us consider an installation with an:

**EVAPORATION SP = -10°C (EVAP\_1)**


where we wish to configure Energy Saving functionality in the following way: To start the Energy Saving function on Fridays at 10:15 pm for a duration of 20 hours.

**Evaporation Set Point during Energy Saving: 0°C**

With these requirements, the related user parameters will be configured using the following values:

- AENR\_1 = Friday**
- AENR\_2 = 22 hours**
- AENR\_3 = 15 minutes**
- AENR\_4 = 20 hours**
- AENR\_5 = +10°C**



**IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration.

### 3.3.8.- TIMING



User parameters relating to the configuration of timing protection for the compressors and fans.

```
Fan MIN. time ON
Fan MIN. time OFF
Fan ON-ON Delay Slow
Fan OFF-OFF Delay Slow.
Fan ON-ON Delay Fast
Fan OFF-OFF Delay Fast
Compressor T. MIN. ON
Compressor T. MIN. OFF
```

```
Compr. ON-ON Delay Slow
Compr. OFF-OFF Delay Slow
Compr. ON-ON Delay Fast
Compr. OFF-OFF Delay Fast
```

**With the cursor in the left-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** Select the desired parameter

**SET:** Confirm the selected user parameter to modify its value (right-hand area of the Display)

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display

**ESC:** Return to the CONFIGURATION AND LOGS SCREEN

**OTHERS:** No function

**With the cursor in the right-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** To adjust the value of the selected digit or select the desired option

**LEFT and RIGHT:** Move the digit selection (only for numeric user parameters)

**SET:** Confirm the numeric value or the option selected

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display. Press **ESC** to clear.

**Parameter:** Fan MIN. time ON

**Code:** TEMP\_1

**Units:** Seconds

**Description:** Minimum operating time for the condenser fans after each start up. This parameter is useful for preventing an excessive number of fan starts and stops.

**Parameter:** Fan MIN. time OFF  
**Code:** TEMP\_2  
**Units:** Seconds  
**Description:** Minimum stop time for the condenser fans.  
This parameter is useful for preventing an excessive number of fan starts and stops.

**Parameter:** Fan ON-ON Delay Slow  
**Code:** TEMP\_3  
**Units:** Seconds  
**Description:** Minimum time between start ups of different fans within the slow control zone.  
Adjustment of this parameter is very important in defining dynamic control of the fans: **Neutral Zone or Proportional Band**  
For further information, see **Chapter 5**.

**Parameter:** Fan OFF-OFF Delay Slow  
**Code:** TEMP\_4  
**Units:** Seconds  
**Description:** Minimum time between shutdowns of different fans within the slow control zone.  
Adjustment of this parameter is very important in defining dynamic control of the fans: **Neutral Zone or Proportional Band**  
For further information, see **Chapter 5**.

**Parameter:** Fan ON-ON Delay Fast  
**Code:** TEMP\_5  
**Units:** Seconds  
**Description:** Minimum time between start ups of different fans within the fast control zone.  
Adjustment of this parameter is very important in defining dynamic control of the fans: **Neutral Zone or Proportional Band**  
For further information, see **Chapter 5**.

**Parameter:** Fan OFF-OFF Delay Fast  
**Code:** TEMP\_6  
**Units:** Seconds  
**Description:** Minimum time between shutdowns of different fans within the fast control zone.  
 Adjustment of this parameter is very important in defining dynamic control of the fans: **Neutral Zone or Proportional Band**  
 For further information, see **Chapter 5**.

**Parameter:** Compressor T. MIN. ON  
**Code:** TEMP\_7  
**Units:** Seconds  
**Description:** Minimum operating time for the compressors.  
 This parameter is useful for preventing an excessive number starts and stops of the compressors.

**Parameter:** Compressor T. MIN. OFF  
**Code:** TEMP\_8  
**Units:** Seconds  
**Description:** Minimum stop time for the compressors.  
 This parameter is useful for preventing an excessive number starts and stops of the compressors.

**Parameter:** Compr. ON-ON Delay Slow  
**Code:** TEMP\_9  
**Units:** Seconds  
**Description:** Minimum time between the starting of different compressor stages in the slow control zone.  
 Adjustment of this parameter is very important in defining dynamic control of the compressors: **Neutral Zone or Proportional Band**  
 For further information, see **Chapter 4**.




**Parameter:** Compr. OFF-OFF Delay Slow  
**Code:** TEMP\_10  
**Units:** Seconds  
**Description:** Minimum time between shutdowns of different compressor stages in the slow control zone.  
 Adjustment of this parameter is very important in defining dynamic control of the compressors: **Neutral Zone or Proportional Band**  
 For further information, see **Chapter 4.**

**Parameter:** Compr. ON-ON Delay Fast  
**Code:** TEMP\_11  
**Units:** Seconds  
**Description:** Minimum time between the starting of different compressor stages in the fast control zone.  
 Adjustment of this parameter is very important in defining dynamic control of the compressors: **Neutral Zone or Proportional Band**  
 For further information, see **Chapter 4.**

**Parameter:** Compr. OFF-OFF Delay Fast  
**Code:** TEMP\_12  
**Units:** Seconds  
**Description:** Minimum time between shutdowns of different compressor stages in the fast control zone.  
 Adjustment of this parameter is very important in defining dynamic control of the compressors: **Neutral Zone or Proportional Band**  
 For further information, see **Chapter 4.**



**IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration.

### 3.3.9.- PROTECTIONS AND ALARMS



User parameters defining the behaviour of the installation in case of error or alarm.

```
Stgs.ON Aspir. Probe Fail
Fans ON Disch.Probe Fail
HP circuit Pre-Alarm
HP circuit Pre-Alarm Diff
LP circuit Pre-Alarm
LP circuit Pre-Alarm Diff
MAX T. Comp. Mainten.
Start-up Alarms Delay
```

**With the cursor in the left-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** Select the desired parameter

**SET:** Confirm the selected user parameter to modify its value (right-hand area of the Display)

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display

**ESC:** Return to the CONFIGURATION AND LOGS SCREEN

**OTHERS:** No function

**With the cursor in the right-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** To adjust the value of the selected digit or select the desired option

**LEFT and RIGHT:** Move the digit selection (only for numeric user parameters)

**SET:** Confirm the numeric value or the option selected

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display. Press **ESC** to clear.

**Parameter:** Stgs.ON Aspir. Probe Fail

**Code:** PROT\_1

**Description:** Number of compressor stages operating when there is a suction probe error.

**Parameter:** Fans ON Disch.Probe Fail

**Code:** PROT\_2

**Description:** Number of fans operating when there is a discharge probe error.  
In the case of using a inverter to control the fans, enter the value as a percentage (%) between 0 and 100.

**Parameter:** HP circuit Pre-Alarm  
**Code:** PROT\_3  
**Units:** Bar  
**Description:** Maximum value for high pressure in normal operation.  
The objective of this alarm is to prevent activation of the general high pressure switch, which would lead to the immediate shutdown of the installation.  
For further information, see **Chapter 6**.  
The value of this parameter must be set below the activation pressure for the general high pressure switch.  
If the discharge pressure exceeds the value defined by this parameter, the compressor stages will gradually be shut down with a time period defined by the parameter **TEMP\_12**.  
If the high pressure pre-alarm occurs 5 times or more within one hour, the installation will remain shutdown until it is reset manually.

**Parameter:** HP circuit Pre-Alarm Diff  
**Code:** PROT\_4  
**Units:** Bar  
**Description:** High pressure pre-alarm differential.  
For further information, see **Chapter 6**.

**Parameter:** LP circuit Pre-Alarm  
**Code:** PROT\_5  
**Units:** Bar  
**Description:** Minimum value for the suction pressure in normal operation.  
If the pressure falls below this value, the Low Circuit Pre-Alarm will appear.  
It is recommended that this parameter be set at a value above the activation pressure for the general low pressure switch so as to inform the user that there is an anomaly in the installation before the general low pressure switch acts.


**Parameter:** LP circuit Pre-Alarm Diff  
**Code:** PROT\_6  
**Units:** Bar  
**Description:** Low pressure pre-alarm differential.  
 For further information, see Chapter 6.

**Parameter:** MAX T. Comp. Mainten.  
**Code:** PROT\_7  
**Units:** Hours  
**Description:** Maximum number of accumulated operating hours for a compressor between two consecutive maintenance operations.  
 If a compressor exceeds the value of this parameter, an alarm appears.  
 If the parameter is 0, the alarm remains deactivated.


**Parameter:** Start-up Alarms Delay  
**Code:** PROT\_8  
**Units:** Seconds  
**Description:** Delay for the pre-alarms for the high and low circuits.  
 Defines a period of time for the installation to stabilise after starting the DUOControl until high and low pre-alarms are detected and handled.

**Parameter:** Alarm Output Delay  
**Code:** PROT\_9  
**Units:** Seconds  
**Description:** Delay between the activation of an alarm and the change of state in the Alarm output.



**IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration.

### 3.3.10.- DATE AND TIME



User parameters for entering the date and time.

Minute  
Hour  
Day of the week  
Day  
Month  
Year

**With the cursor in the left-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** Select the desired parameter

**SET:** Confirm the selected user parameter to modify its value (right-hand area of the Display)

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display

**ESC:** Return to the CONFIGURATION AND LOGS SCREEN

**OTHERS:** No function

**With the cursor in the right-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** To adjust the value of the selected digit or select the desired option

**LEFT and RIGHT:** Move the digit selection (only for numeric user parameters)

**SET:** Confirm the numeric value or the option selected

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display. Press **ESC** to clear.

This folder enables the date and time to be set in the DUOControl.

The summer/winter clock change needs to be carried out manually by the user.

**Parameter:** Minutes  
**Code:** FECH\_1

**Parameter:** Hour  
**Code:** FECH\_2


**Parameter:** Day of the week  
**Code:** FECH\_3

**Parameter:** Day  
**Code:** FECH\_4

**Parameter:** Month  
**Code:** FECH\_5

**Parameter:** Year  
**Code:** FECH\_6



**IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration.

### 3.3.11.- CONFIGURING DUOVision



Configuration of the **DUOVision** user terminal.

```

Password
MODBUS address
Adj. Contrast and Colour
Language
    
```

**With the cursor in the left-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** Select the desired parameter

**SET:** Confirm the selected user parameter to modify its value (right-hand area of the Display)

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display

**ESC:** Return to the CONFIGURATION AND LOGS SCREEN

**OTHERS:** No function

**With the cursor in the right-hand area of the Display, the function of the NAVIGATOR is as follows:**

**UP and DOWN:** To adjust the value of the selected digit or select the desired option

**LEFT and RIGHT:** Move the digit selection (only for numeric user parameters)

**SET:** Confirm the numeric value or the option selected

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display.  
Press **ESC** to clear.

**Parameter:** Password

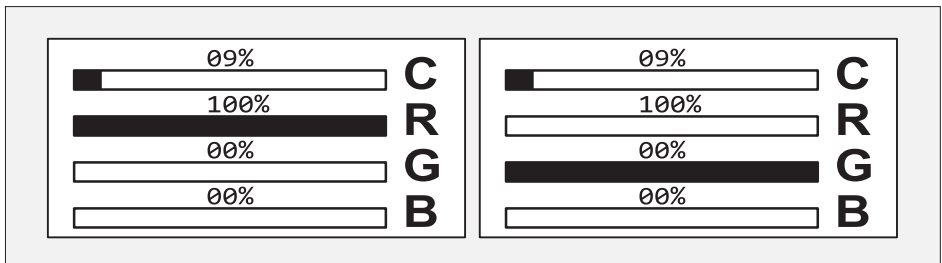
**Code:** TERM\_1


**Description:** Access code for modifying user parameters.

If the value of the access code is 0, this protection is deactivated.

**Parameter:** MODBUS address  
**Code:** TERM\_2  
**Description:** Setting the address of the **DUOControl** controller within a local MODBUS network.

**Parameter:** Adjusting Contrast and Colour  
**Code:** TERM\_3  
**Description:** Configuration of the contrast and background colour for the two Display zones when showing the **MONITORING SCREEN**.



**IMPORTANT:** The  icon indicates that the data is being saved. If the equipment is disconnected or the power supply fails while this icon is showing, the equipment will return to the last saved configuration.

### 3.3.12.- MODEL AND SOFTWARE VERSIONS



Displaying the DUOControl model and the Software versions.

```
DUO Control Model
DUO Control SW Version
DUO Vision SW Version
```

**Within this folder the function of the NAVIGATOR is as follows:**

**UP and DOWN:** Select the desired parameter

**HELP (?):** Display the help window for the parameter selected in the right-hand area of the Display. Press **ESC** to clear.

**ESC:** Return to the CONFIGURATION AND LOGS SCREEN

**OTHERS:** No function

**Parameter:** **DUOControl** Model  
**Code:** MODE\_1  
**Description:** Displaying the model of **DUOControl** used.

**Parameter:** **DUOControl** SW version  
**Code:** SWC\_1  
**Description:** Displaying the Firmware version of the **DUOControl** controller.

**Parameter:** **DUOVision** SW version  
**Code:** SWC\_2  
**Description:** Displaying the Firmware version of the **DUOVision** user terminal.



### 3.3.13.- ALARM LOG

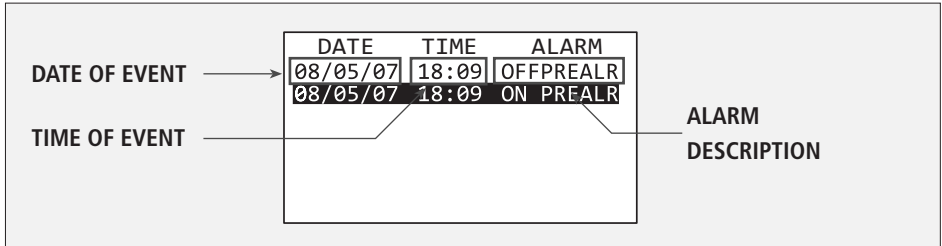


The **DUOControl** controllers record the activation and deactivation of the alarms. The alarm log holds a record of the last 50 alarm events. For further information regarding the detection of alarms, see **Chapter 6**.

ALARM LOG  
DISPLAY  
ERASE LOG

There is a text string corresponding to each of the alarms, as shown in the following table:

ALARM TYPE	DISPLAY MESSAGE	
	ALARM ACTIVATION	ALARM DEACTIVATION
Safety circuit for compressor 1	ON CSCMP1	OFFCSCMP1
Safety circuit for compressor 2	ON CSCMP2	OFFCSCMP2
Safety circuit for compressor 3	ON CSCMP3	OFFCSCMP3
Safety circuit for compressor 4	ON CSCMP4	OFFCSCMP4
Safety circuit for compressor 5	ON CSCMP5	OFFCSCMP5
Safety circuit for compressor 6	ON CSCMP6	OFFCSCMP6
Safety circuit for fan 1	ON CSFAN1	OFFCSFAN1
Safety circuit for fan 2	ON CSFAN2	OFFCSFAN2
Safety circuit for fan 3	ON CSFAN3	OFFCSFAN3
Safety circuit for fan 4	ON CSFAN4	OFFCSFAN4
Safety circuit for fan 5	ON CSFAN5	OFFCSFAN5
Safety circuit for fan 6	ON CSFAN6	OFFCSFAN6
Safety circuit for fan 7	ON CSFAN7	OFFCSFAN7
Safety circuit for fan 8	ON CSFAN8	OFFCSFAN8
General low pressure switch	ON PRESOSE	OFFPRESOSE
General high pressure switch	ON PRESOSC	OFFPRESOSC
High pressure pre-alarm	ON PREALRME	OFFPREALRME
Low pressure pre-alarm	ON PREALRMC	OFFPREALRMC
Discharge probe error	ON SDESCAR	OFFSDESCAR
Suction probe error	ON SASPIRA	OFFSASPIRA
Ambient air temperature probe error	ON STEXT	OFFSTEXT
Inverter safety circuit	ON CSVAR	OFFCSVAR
Installation blocking due to frequent high pressure	ON BLOQINST	OFFBLOQINST
Compressor maintenance	ON MANTCMP	OFFMANTCMP



**Parameter:** DISPLAY  
**Code:** ALRM\_1  
**Description:** Displaying the list of alarms in date and time order.  
 The **UP** and **DOWN** keys are used to scan through the list.

**Parameter:** ERASE LOG  
**Code:** ALRM\_2  
**Description:** Initialize the alarm memory by erasing all the previous information.  
**NO:** Do not erase the alarm log  
**YES:** Erase the alarm log

### 3.3.14.- ACCUMULATED OPERATION OF THE COMPRESSORS



Timer display for the compressors.

```
OPERATING TIME
RESET TOTAL TIMERS
RESET MAINT. TIMERS
```

**DUOControl** controllers have timers for each compressor:

**Accumulated operating time for the compressors:** Shows the time the compressor has run since its commissioning. It is advisable to set this to zero only when it is first put into service.

**Time since the last service:** Shows the time the compressor has run since its last maintenance operation. It is advisable to reset this to zero after each service.

Each of the individual timers can be set to zero.

COMP	HOURS	TOTAL	MAINT
01	00000229	00004	
02	00000093	00093	
03	00000228	00228	

**Parameter:** RESET TOTAL TIMERS

**Code:** TCOMP\_1

**Description:** Enables the resetting of the “accumulated operating time” for a compressor. The timer to be reset to zero is selected using the **UP** and **DOWN** keys. Press the **SET** key to reset the selected timer.

**Parameter:** RESET MAINT. TIMERS

**Code:** TCOMP\_2

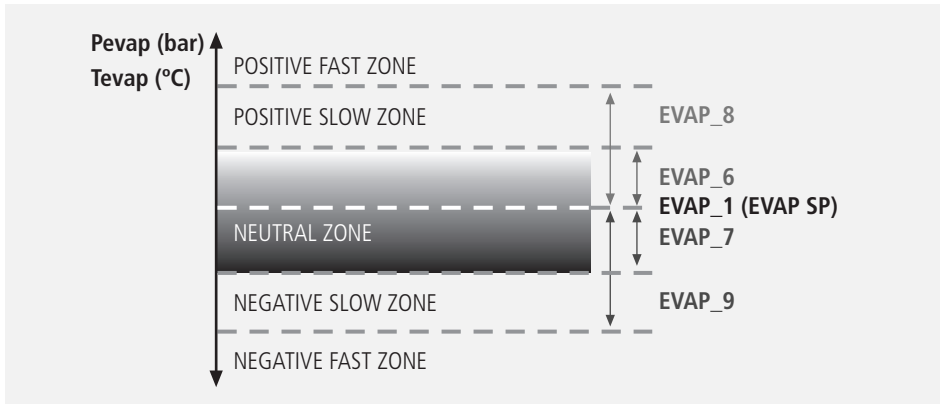
**Description:** Enables the resetting of the “*maintenance*” timer for a compressor. The timer to be reset to zero is selected using the **UP** and **DOWN** keys. Press the **SET** key to reset the selected timer.

## 4.- Compressor regulation

The user parameter **EVAP\_5** permits the selection of the type of compressor control:

### 4.1.- NEUTRAL ZONE (EVAP\_5=0):

Five operating zones are defined.



The parameters which delimit each of the 5 zones (**EVAP\_6**, **EVAP\_7**, **EVAP\_8** and **EVAP\_9**) are defined in **bar** or **°C** according to the parameter **CONF\_8** (in the case of using a GENERIC refrigerant, only in **bar**). The control action depends on the suction probe reading in the following way:

**Within the NEUTRAL ZONE:** No action is carried out on the compressors (no compressors or compressor stages are started or stopped).

**Within the POSITIVE SLOW ZONE:** Compressors or stages are started in a time period defined by the parameter **TEMP\_9**.

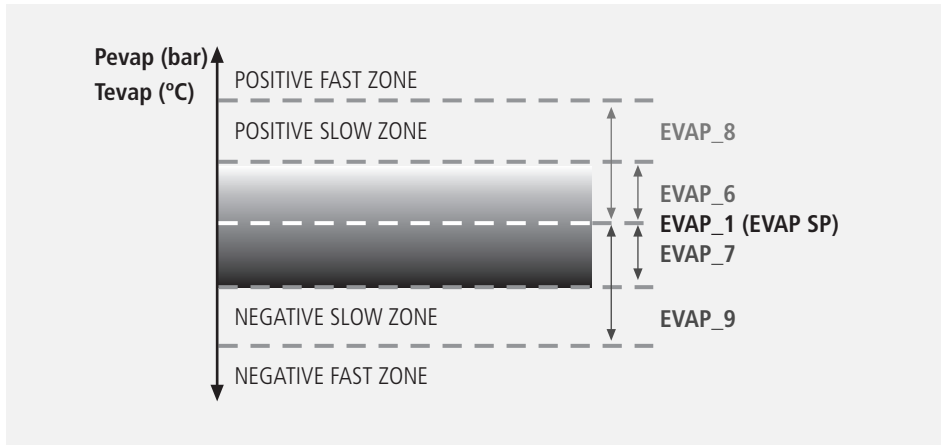
**Within the POSITIVE FAST ZONE:** Compressors or stages are started in a time period defined by the parameter **TEMP\_11**.

**Within the NEGATIVE SLOW ZONE:** Compressors or stages are stopped in a time period defined by the parameter **TEMP\_10**.

**Within the NEGATIVE FAST ZONE:** Compressors or stages are stopped in a time period defined by the parameter **TEMP\_12**.

#### 4.2.- PROPORTIONAL BAND (EVAP\_5=1):

Five operating zones are defined.



The parameters which delimit each of the 5 zones (**EVAP\_6**, **EVAP\_7**, **EVAP\_8** and **EVAP\_9**) are defined in **bar** or **°C** according to the parameter **CONF\_8** (in the case of using a GENERIC refrigerant, only in bar). The **PROPORTIONAL BAND** is divided into as many levels as there are stages in the installation. These levels determine the start or stop points for the stages.



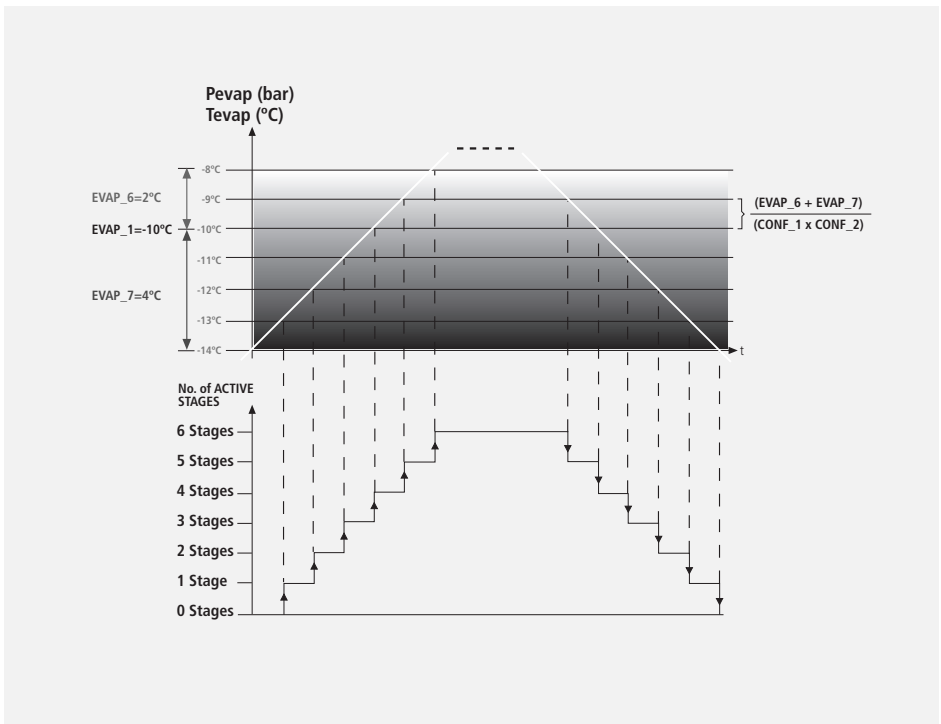
**Example:** Compressor facility with 3 x 2-stage compressors.

**EVAPORATION SP (EVAP\_1):** -10°C

**POSITIVE SLOW ZONE DIFFERENTIAL WITH RESPECT TO EVAP\_SP (EVAP\_6):** 2°C

**NEGATIVE SLOW ZONE DIFFERENTIAL WITH RESPECT TO EVAP\_SP (EVAP\_7):** 4°C

The start/stop points for the compressors or stages will be located at the following evaporation pressure levels:



The activation/deactivation points for the compressors or stages are:

Stage	Start	Stop
1 <sup>a</sup>	-13°C	-14°C
2 <sup>a</sup>	-12°C	-13°C
3 <sup>a</sup>	-11°C	-12°C
4 <sup>a</sup>	-10°C	-11°C
5 <sup>a</sup>	-9°C	-10°C
6 <sup>a</sup>	-8°C	-9°C

The control action depends on the suction probe reading in the following way:

**Within the PROPORTIONAL BAND:** the minimum time interval between startups of compressors or stages is defined by the parameter **TEMP\_9**, while the minimum time interval between shutdowns of compressors or stages will be defined by the parameter **TEMP\_10**.

**Within the POSITIVE SLOW ZONE:** the time between startups of compressors or stages is defined by the parameter **TEMP\_9**.

**Within the POSITIVE FAST ZONE:** the time between startups of compressors or stages is defined by the parameter **TEMP\_11**.

**Within the NEGATIVE SLOW ZONE:** the time between shutdowns of compressors or stages is defined by the parameter **TEMP\_10**.

**Within the NEGATIVE FAST ZONE:** the time between shutdowns of compressors or stages is defined by the parameter **TEMP\_12**.

### 4.3.- MANAGEMENT OF COMPRESSOR STARTUP/SHUTDOWN

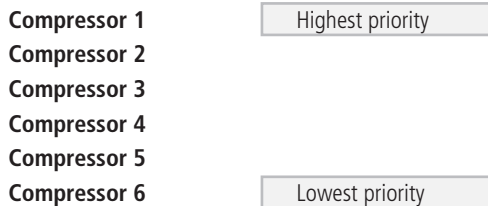
The parameter **EVAP\_4** defines the management of compressor startups/shutdowns:

**OPERATING HOURS:** Method based on the compressor's accumulated operating times.

**Selection of the compressor to start up:** The compressor with the least accumulated operating time starts.

**Selection of the compressor to shutdown:** The compressor with the most accumulated operating time stops.

**SEQUENTIAL:** Method based on the priority level of the compressors. The level of priority of each compressor is defined in the following way during the wiring of the control panel:



**Selection of the compressor to start up:** The highest priority compressor starts.

The management of the compressors does not take into account those which have been temporarily disabled (safety circuit activated, timed protections, etc).



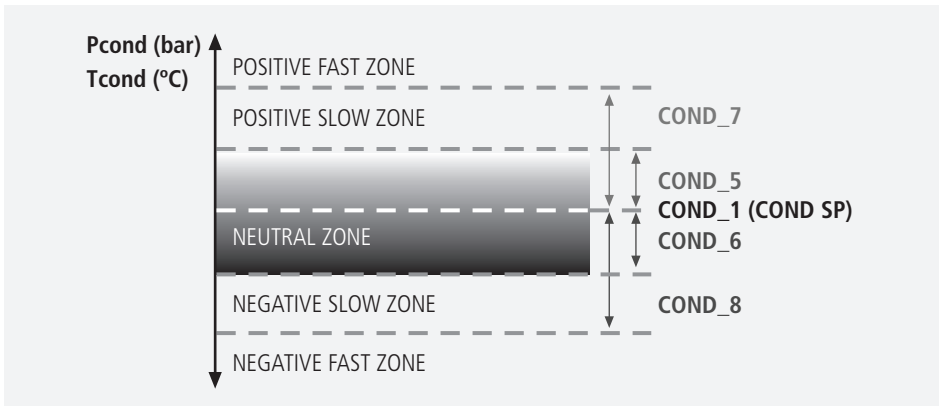
## 5.- Fan regulation

Fans can be controlled ON/OFF or via a 4-20 mA signal by means of an inverter.

### 5.1.- MANAGEMENT OF ON/OFF FANS (CONF\_5=0).

The parameter **COND\_4** defines the type of regulation for fans controlled ON/OFF.

**NEUTRAL ZONE (COND\_4=0):** Five operating zones are defined.



The parameters which delimit each of the 5 zones (**COND\_5, COND\_6, COND\_7 and COND\_8**) are defined in **bar** or **°C** according to the parameter **CONF\_8** (only in **bar** in the case that CONF\_7 = GENERIC). The control action depends on the discharge probe reading in the following way:

**Within the NEUTRAL ZONE:** No action is carried out on the fans (fans are neither started nor stopped).

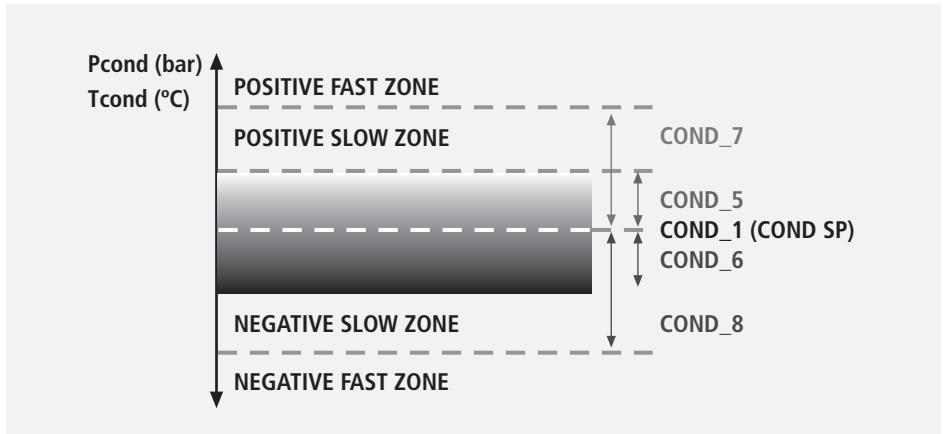
**Within the POSITIVE SLOW ZONE:** Fans are started in a time period defined by the parameter **TEMP\_3**.

**Within the POSITIVE FAST ZONE:** Fans are started in a time period defined by the parameter **TEMP\_5**.

**Within the NEGATIVE SLOW ZONE:** Fans are stopped in a time period defined by the parameter **TEMP\_4**.

**Within the NEGATIVE FAST ZONE:** Fans are stopped in a time period defined by the parameter **TEMP\_6**.

**5.1.2.- PROPORTIONAL BAND (COND\_4=1):** Five operating zones are defined.



The parameters which delimit each of the 5 zones (**COND\_5, COND\_6, COND\_7 and COND\_8**) are defined in **bar** or **°C** according to the parameter **CONF\_8** (only in **bar** in the case that CONF\_7 = GENERIC).

The **PROPORTIONAL BAND** is divided into as many levels as there are fans in the installation. These levels determine the start or stop points for the fans.



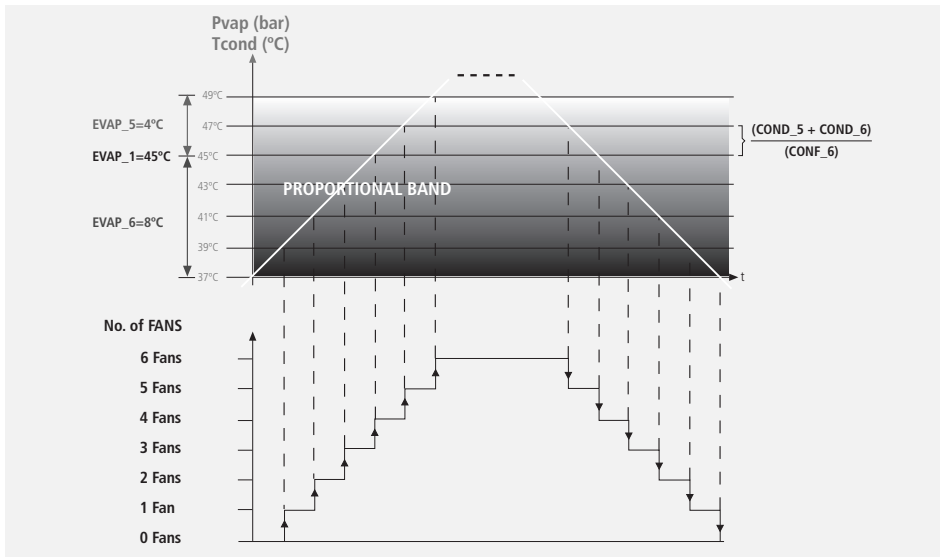
**Example:** Condenser with 6 fans.

**CONDENSATION SP (COND\_1):** + 45°C

**POSITIVE SLOW ZONE DIFFERENTIAL WITH RESPECT TO COND\_SP (COND\_5):** 4°C

**NEGATIVE SLOW ZONE DIFFERENTIAL WITH RESPECT TO COND\_SP (COND\_6):** 8°C

The start/stop points for the stages are located at the following evaporation pressure levels:



The activation/deactivation points for the different fans are:

Fan	Start	Stop
1	39°C	37°C
2	41°C	39°C
3	43°C	41°C
4	45°C	43°C
5	47°C	45°C
6	49°C	47°C

The control action depends on the discharge probe reading in the following way:

**Within the PROPORTIONAL BAND:** the minimum time interval between startups of fans is defined by the parameter **TEMP\_3**, while the minimum time interval between shutdowns of fans will be defined by the parameter **TEMP\_4**.

**Within the POSITIVE SLOW ZONE:** the time between startups of different fans is defined by the parameter **TEMP\_4**.

**Within the POSITIVE FAST ZONE:** the time between startups of different fans will be defined by the parameter **TEMP\_6**.

**Within the NEGATIVE SLOW ZONE:** the time between shutdowns of different fans is defined by the parameter **TEMP\_3**.

**Within the NEGATIVE FAST ZONE:** the time between shutdowns of different fans is defined by the parameter **TEMP\_5**.

### 5.1.3.- MANAGEMENT OF FAN STARTUP/SHUTDOWN

The management of fan startups/shutdowns is based on levels of priority. The level of priority of each fan is defined during the wiring of the control panel.



**Need to start a fan:** The highest priority fan starts.

**Need to stop a fan:** The lowest priority fan stops.

The management of the fans does not take into account those which have been temporarily disabled (safety circuit activated, timed protections active, etc).

### 5.2.- MANAGEMENT OF FANS BY INVERTER (CONF\_5=1)

The DUOControl has a 4-20 mA output to control the inverter for the fans.

The regulation of the 4-20 mA signal is carried out using a PI (Proportional-Integral) algorithm adjusted by means of the following user parameters:

**PROPORTIONAL ACTION (COND\_10):** is the proportional coefficient for the PI. The higher the parameter, the faster is the PI response.

## 6.- Alarm management

**DUOControl** controllers enable the following alarms to be detected:

- Safety circuit for the compressors**
- Safety circuit for the fans (or inverter)**
- General high pressure switch**
- General low pressure switch**
- High pressure pre-alarm**
- Low pressure pre-alarm**
- Suction probe error**
- Discharge probe error**
- Ambient air probe error**
- Compressor maintenance**

The **DUOVision** user terminal shows each of the active alarms on screen and records them in the alarm log.

### **SAFETY CIRCUIT FOR THE COMPRESSORS**

A compressor stops automatically when its safety circuit activates and starts normal operation again when this deactivates.

### **SAFETY CIRCUIT FOR THE FANS**

A fan stops automatically when its safety circuit activates and starts normal operation again when this deactivates.

### **SAFETY CIRCUIT FOR THE INVERTER**

All the compressors stop in turn when the safety circuit for the inverter activates. They return to normal operation again when this deactivates.

### **GENERAL HIGH PRESSURE SWITCH**

**DUOControl** controllers gradually shutdown all the compressors when the general high pressure switch is activated. The regulation of the compressors returns to normal when the pressure switch is reset (manually or automatically).



The installation is blocked when the general high pressure switch is activated 5 times or more in one hour. There are two options for unblocking it:

- Disconnecting the **DUOControl** power supply and reconnecting it.
- Changing the status of the **I3** input from **AUTOMATIC** to **MANUAL** and back to **AUTOMATIC** again.

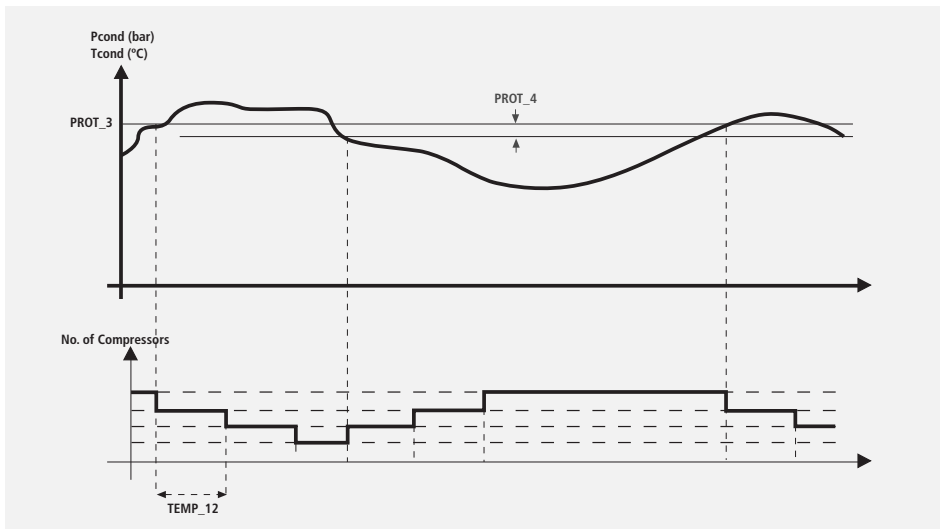
## GENERAL LOW PRESSURE SWITCH

All the compressors stop automatically when the general low pressure switch is activated. They start to work normally again when the pressure switch is reset (manually or automatically).

## HIGH PRESSURE PRE-ALARM

The parameter **PROT\_3** defines the maximum condensation pressure/temperature value in normal operation.

When the condensation pressure/temperature exceeds the value specified by **PROT\_3**, compressor stages are shutdown in turn with a time interval defined by the parameter **TEMP\_12**. The deactivation of the compressor stages ends when condensation pressure/temperature falls below the differential **PROT\_4**.

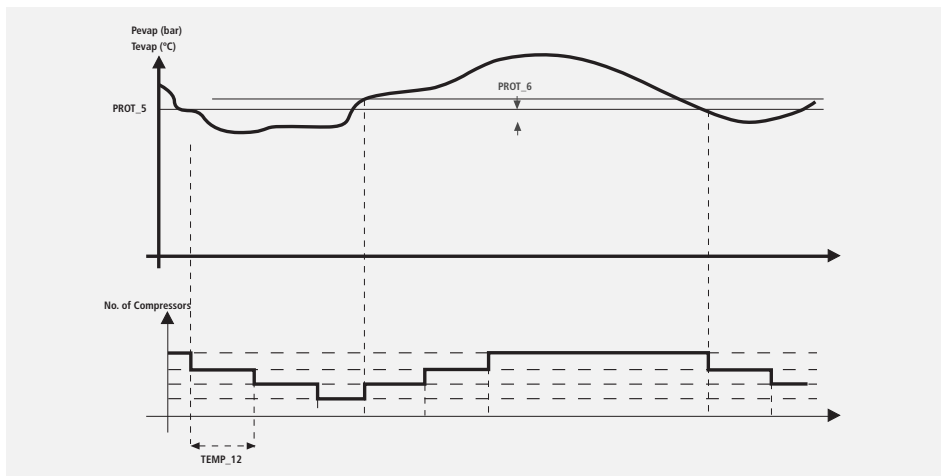


The installation is blocked when the general high pressure switch is activated 5 times or more in one hour. There are two options for unblocking it:

- Disconnecting the **DUOControl** power supply and reconnecting it.
- Changing the status of the **I3** input from **AUTOMATIC** to **MANUAL** and back to **AUTOMATIC** again.

## LOW PRESSURE PRE-ALARM

The parameter **PROT\_5** defines the minimum evaporation pressure/temperature value in normal operation. When the evaporation pressure/temperature exceeds the value specified by **PROT\_5**, compressor stages are shutdown in turn with a time interval defined by the parameter **TEMP\_12**. The deactivation of the compressor stages ends when evaporation pressure/temperature falls below the differential **PROT\_6**.



## SUCTION PROBE ERROR

A suction probe error occurs when the measured value is outside the probe's range. While this error exists, as many compressor stages are activated as there are specified in the parameter **PROT\_1**. A delay of 2 minutes is fixed from the detection of this error to the initiation of the function.

## DISCHARGE PROBE ERROR

A discharge probe error occurs when the value to be measured is outside the probe's range. While this error exists, as many fans are activated as there are specified by the parameter **PROT\_2**.

## AMBIENT AIR PROBE ERROR

An ambient air probe error occurs when the value to be measured is outside the probe's range. While this error exists, floating condensation is deactivated and the condensation value becomes the value specified in the parameter **COND\_1**.

## PREVENTIVE MAINTENANCE OF THE COMPRESSORS

This alarm is activated when one of the compressors exceeds the hours of operation defined in parameter **PROT\_7**. Once preventive maintenance has been carried out, setting the compressor's timer for accumulated hours of operation to zero is recommended to deactivate the alarm.

## 7.- Other functionalities

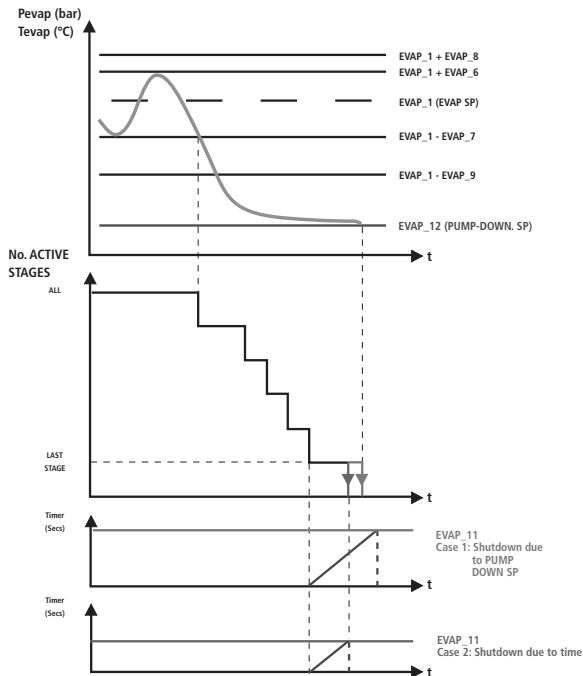
### 7.1.- Pump-Down (EVAP\_10).

This function controls the shutdown of the last operating compressor stage.

Pump-Down starts when there is only one compressor operating. The shutdown of this stage takes place when:

This single stage operates for a period of time in excess of that defined by the user parameter **EVAP\_11**.

The suction pressure/temperature falls below the Pump-Down Set Point (**EVAP\_12**).



The graphs above show the two shutdown modes. In case 1, the final stage is shutdown when the evaporation pressure/temperature falls below the Set Point for Pump-Down (**EVAP\_12**), even though the interval defined by the parameter **EVAP\_11** has not been exceeded.

On the other hand, the last compressor shuts down in case 2 because the time is exceeded.



### 7.2.- Floating Condensation (COND\_9)

Unlike constant condensation, Floating Condensation adjusts the condensation Set Point according to the Ambient air temperature and other installation parameters. The aim of this is to reduce the installation's electricity consumption. To achieve efficient regulation of the discharge pressure, the user needs to enter the  $\Delta T$  for the condenser used (**COF\_2**) and the minimum condensation temperature (**COF\_1**). Both parameters are closely linked to the installation: condenser type, expansion valve, refrigerant, etc.

If there is an error in the Ambient air probe reading, a constant condensation pressure/temperature will be used, defined by parameter **COND\_1**.

This function cannot be enabled if the type of refrigerant selected is GENERIC (parameter **CONF\_7**).

### 7.3.- Energy Saving (AENR\_1)

The Energy Saving function enables the Evaporation SET POINT to be adjusted during a specified time period in order to reduce electricity consumption.

Examples of applications:

**ELECTRICITY TARIFF:** To lower the evaporation Set Point when kWh costs are at their lowest.

**INACTIVITY OF COLD ROOMS:** To increase the evaporation Set Point in those periods when there is little activity in the installation.

It is necessary to set the following user parameters to adjust this function:

**AENR\_1, AENR\_2, AENR\_3:** Schedules for activation of Energy Saving

**AENR\_4:** Duration of Energy Saving

**AENR\_5:** Evaporation Set Point variation during Energy Saving

### 7.4.- MANUAL/AUTOMATIC selector

The operation of the DUOControl controller depends on the status of this selector. When it is in the AUTOMATIC position the controller regulates the compressors and fans (or inverter) automatically according to the control algorithms and the specified user adjustments.

When this is switched to the MANUAL position, all the compressors and fans are progressively stopped until the refrigerating facility is shutdown. This function enables:

The installation to be shutdown in a controlled manner to permit modification of critical setting parameters (programming assistant).

The operation of the compressors and fans to be checked manually.

## Appendix A:- Technical Specifications

### A.1.- AKO-21801 Technical Specifications

<b>Ambient temperature for operation</b>	0°C to 50°C
<b>Ambient temperature for storage</b>	-30°C to 70°C
<b>Power Supply</b> <ul style="list-style-type: none"> <li>- Power supply voltage <ul style="list-style-type: none"> <li>Rated value 24 VDC</li> <li>Permissible range 19.2 V to 30 V</li> </ul> </li> <li>- Current drawn <ul style="list-style-type: none"> <li>typical value 120 mA</li> <li>maximum configuration (typ.) 400 mA</li> </ul> </li> <li>- Protection against change of polarity Yes</li> <li>- Insulated 24 V power supply for inputs No</li> <li>- Power consumption 6W</li> </ul>	
<b>No. of Inputs/Outputs</b> <ul style="list-style-type: none"> <li>- Built in digital inputs 8</li> <li>- Built in digital outputs 6</li> </ul>	
<b>Interfaces</b> <ul style="list-style-type: none"> <li>- Display Interface DUOVision</li> <li>- MODBUS Interface RS-485</li> </ul>	
<b>Memory</b> <ul style="list-style-type: none"> <li>- Memory for user programs and constants Flash EPROM</li> <li>- Memory for data SRAM</li> <li>- Data backup: Yes, with battery <ul style="list-style-type: none"> <li>Backup duration 40 days at 25°C</li> <li>Charging time connected 100% in 12 hours</li> </ul> </li> </ul>	

<p><b>Built in digital inputs</b></p> <ul style="list-style-type: none"> <li>- Number of inputs</li> <li>- Electronic insulation of the inputs</li> <li>- Input types</li> <li>- Input voltage <ul style="list-style-type: none"> <li>Rated value</li> <li>Signal at 0 (IEC 1131-2)</li> <li>Signal at 1 (IEC 1131-2)</li> </ul> </li> <li>- Input current at 24 VDC <ul style="list-style-type: none"> <li>%IX 1062.02 (E 62.02) inputs</li> <li>%IX 1062.07 (E 62,07) inputs</li> </ul> </li> </ul>	<p>8</p> <p>1,500 VAC</p> <p>PNP and NPN</p> <p>24 VDC</p> <p>0 to +5 V</p> <p>+15 to +30</p> <p>7 mA</p> <p>9 mA</p>
<p><b>Built in outputs</b></p> <ul style="list-style-type: none"> <li>- Number of outputs</li> <li>- Electronic insulation of the outputs</li> <li>- Total load current with voltage of 24 VDC <ul style="list-style-type: none"> <li>Resistive load / inrush current</li> <li>L / R = 20 ms</li> <li>L / R = 30 ms</li> <li>L / R = 40 ms</li> <li>L / R = 60 ms</li> </ul> </li> <li>- Total load current</li> <li>- Output leakage current</li> <li>- Minimum cut-off value</li> <li>- Short-circuits and overload protection</li> <li>- Protection against transient overvoltage</li> </ul>	<p>6 transistors</p> <p>1,500 VAC</p> <p>1 A for outputs O1 and O2, 0.5 A for the other outputs</p> <p>4 x 0.5 A + 2 x 1 A</p> <p>&lt;200 <math>\mu</math>A</p> <p>12 V</p> <p>Yes, thermal</p> <p>Yes</p>
<p><b>Weight</b></p>	<p>400 g</p>

## A.2.- AKO-21802 Technical Specifications

Power is supplied from the central unit to the analogue extensions at 5 V and 24 VDC.

The analogue value is shown in a customised format for each channel in a 4-digit display. The channel number is selected using the button on the front.



**Notice:** The extensions must be connected and disconnected without power supply.

**Notice:** In the 4-20 mA current configuration, the probe must be capable of supplying 20 mA with 10 VDC (min). On the other hand, the input is not protected against voltages between 10 VDC and 18 VDC and these may cause errors or damage the input.

<b>Ambient temperature for operation</b>	0°C to 50°C
<b>Ambient temperature for storage</b>	-30°C to 70°C
<ul style="list-style-type: none"> <li>- No. of analogue inputs</li> <li>- No. of analogue outputs</li> <li>- Scale of values shown</li> <li>- 50 / 60 Hz filtering</li> <li>- Maximum power consumption</li> </ul>	<p>4</p> <p>2</p> <p>+/- 9999</p> <p>YES</p> <p>3 W</p>
<p><b>Analogue inputs</b></p> <ul style="list-style-type: none"> <li>- Rated range</li> <li>- Maximum values</li> <li>- Electronic insulation of the inputs</li> <li>- Resolution</li> <li>- Minimum resolution at the input (<math>\pm</math> 1LSB)</li> <li>- Precision at full scale</li> <li>- Range of word values read by the central unit</li> <li>- Error amplification between two channels</li> <li>- Input impedance</li> </ul>	<p><b>Current</b></p> <p>4 — 20 mA</p> <p>+/- 25 mA</p> <p>500 V</p> <p>12 bits</p> <p>+/- 5<math>\mu</math>A</p> <p><math>\leq \pm</math> 0.8 %</p> <p>0 - 32767</p> <p>70 dB</p> <p>100 <math>\Omega</math></p>
<p><b>Analogue outputs</b></p> <ul style="list-style-type: none"> <li>- Rated value</li> <li>- Maximum current</li> <li>- Electronic insulation of the outputs</li> <li>- Resolution</li> <li>- Minimum output resolution (<math>\pm</math> 1 LSB)</li> <li>- Range of word values</li> <li>- Total error at full-scale</li> <li>- Acquisition delay</li> <li>- Maximum resistance</li> </ul>	<p><b>Current</b></p> <p>0 — 20 mA</p> <p>20 mA</p> <p>500 V</p> <p>12 bits</p> <p>+/- 5<math>\mu</math>A</p> <p>0 - 32767</p> <p>1.3%</p> <p>50 ms</p> <p>400 <math>\Omega</math></p>
<b>Weight</b>	200 g

### A.3.- AKO-21803 Technical Specifications

Power is supplied to the binary extension units at 5 V from the central unit.



**Notice:** The extensions must be connected and disconnected without power supply.

<b>Ambient temperature for operation</b>	0°C to 50°C
<b>Ambient temperature for storage</b>	-30°C to 70°C
Built in binary inputs - No. of inputs - Electronic insulation of the inputs - Input types - Input voltage Rated value Signal at 0 (IEC 1131-2) Signal at 1 (IEC 1131-2) - Input current at 24 VDC - Filtering time for one input	2 1,500 VAC PNP 24 VDC 0 to +5 V +15 to +30 V 4 mA 5 ms
<b>Built in outputs</b> - No. of outputs - Electronic insulation of the outputs - Total load current under voltage: Resistive load / inrush current L/R = 20 ms L/R = 30 ms L/R= 40 ms L/R= 60 ms - Total load current - Output leakage current - Output loss voltage - Minimum cut-off voltage	6 transistors 1,500 VAC 0.5 A 0.5 A / 0.5 Hz 0.5 A / 0.3 Hz 0.5 A / 0.2 Hz 0.5 A / 0.1 Hz 6 x 0.5 A <200 µA 0.5 V to 500 mA (max) 12 V
<b>Weight</b>	220 g

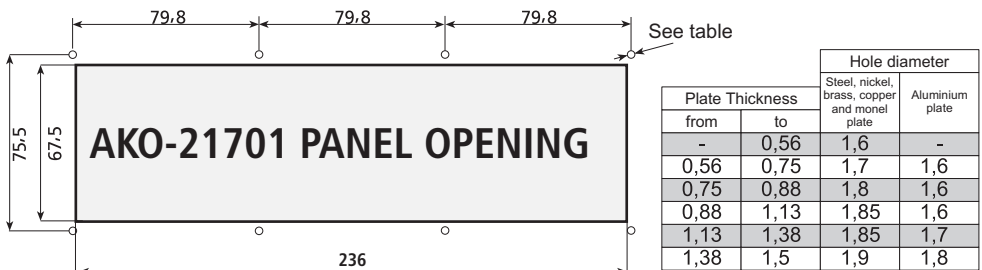
#### A.4.- Technical specifications and mounting instructions for the DUOVision user terminal

<b>Ambient temperature for operation</b>	0°C to 50°C
<b>Ambient temperature for storage</b>	-30°C to 70°C
<b>Terminals</b> - Terminal 1 - Terminal 2 - Terminal 3 - Terminal 4 - Terminal 5 - Terminal 6	<b>Description</b> - TU - (RS-485 communication with DUOControl controller) - TU + (RS-485 communication with DUOControl controller) - TU S (RS-485 communication with DUOControl controller) - PE - 0 V - +24 V +/- 10% 3 W
<b>Weight</b>	400 g

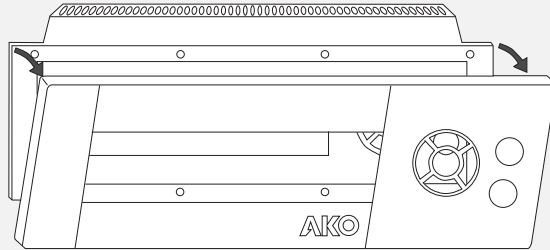


Steps to be followed for mounting in the panel:

**STEP 1:** Make the opening in the panel and the eight holes for the screws (dimensions in millimetres):

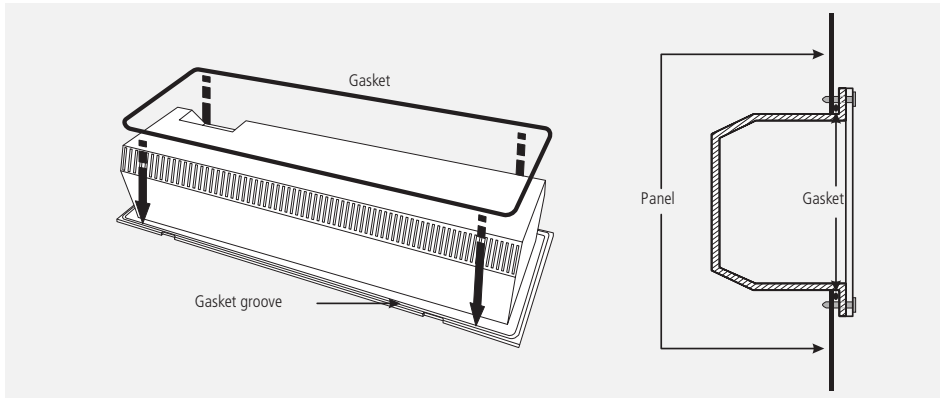


**STEP 2:** Remove the front cover.

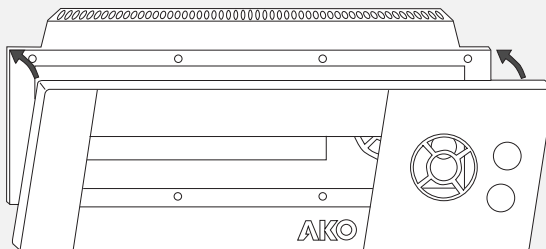


**STEP 3:** Place the user interface inside the space in the panel and fix it into place using the 8 screws supplied.

**Remark:** If an IP65 installation is desired, rubber gasket should be installed correctly between DUOVision and Plate as it is shown in next picture.

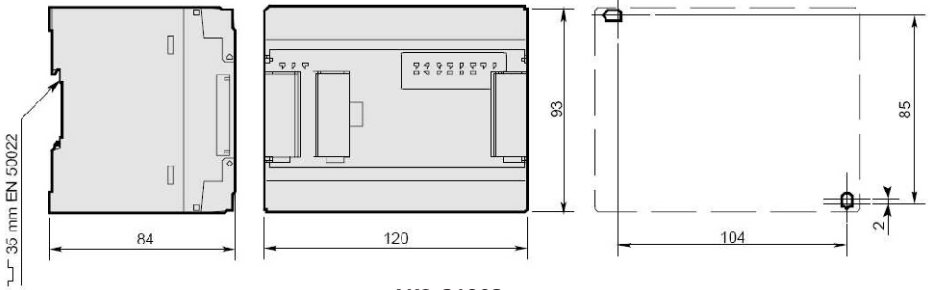


**STEP 4:** Replace the front cover.

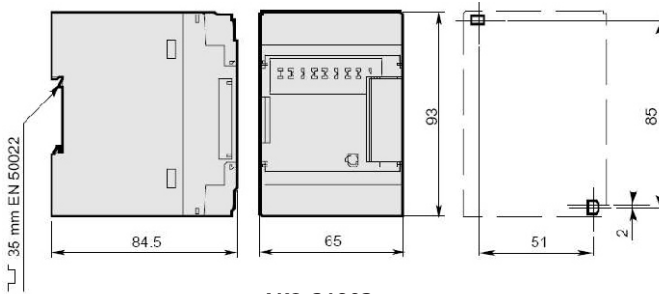


**A.5.- Physical dimensions**

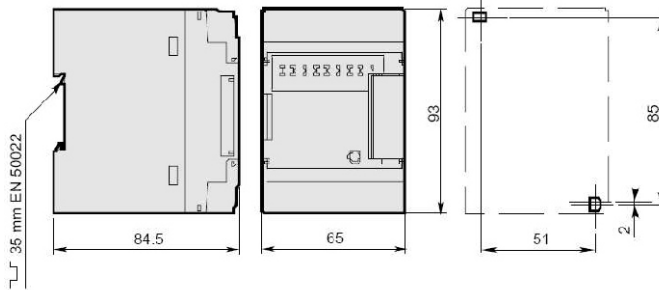
**AKO-21801**



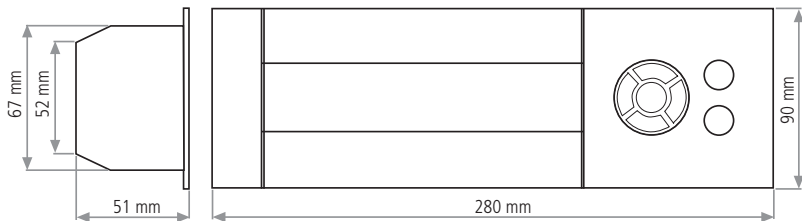
**AKO-21802**



**AKO-21803**



**DUOVision**





## Appendix B:- Selection of the **DUOControl** controller

Steps to select the appropriate DUOControl:

- 1.- Choose the type of control for the fans (**ON/OFF** or via **INVERTER**):  
One table or the other is used depending on this information.
- 2.- Decide the **No. of compressors** to be used and the **No. of stages** per compressor:  
This information defines the row in the table.
- 3.- Decide whether an **alarm output** is needed:  
This defines whether the left- or right-hand side of the table is used.
- 4.- Decide the **No. of fans** for the installation (only necessary for **ON/OFF** control):  
This information defines the column in the table.

### FANS CONTROLLED ON/OFF

COMPRESSORS	STAGES	WITHOUT ALARM OUTPUT							
		No. OF FANS							
		1	2	3	4	5	6	7	8
1	1	21006		21012		21018			
	2	21006		21012		21018			
	3	21006		21012		21018			
	4	21006		21012		21018			
2	1	21006		21012		21018			
	2	21006		21012		21018			
	3	21012		21018					
	4	21012		21018					
3	1	21006		21012		21018			
	2	21012		21018					
	3	21012		21018					
	4	21018							
4	1	21006	21012	21018					
	2	21012		21018					
	3	21018							
	4	21018							
5	1	21012		21018					
	2	21012		21018					
	3	21018							
	4								
6	1	21012	21018						
	2	21018							
	3								
	4								

COMPRESSORS	STAGES	WITH ALARM OUTPUT							
		No. OF FANS							
		1	2	3	4	5	6	7	8
1	1	21006		21012		21018			
	2	21006		21012		21018			
	3	21006		21012		21018			
	4	21006	21012		21018				
2	1	21006		21012		21018			
	2	21006	21012		21018				
	3	21012		21018					
	4	21012		21018					
3	1	21006		21012		21018			
	2	21012		21018					
	3	21012		21018					
	4	21018							
4	1	21006	21012	21018					
	2	21012		21018					
	3	21018							
	4	21018							
5	1	21012		21018					
	2	21012		21018					
	3	21018							
	4	21018							
6	1	21012	21018						
	2	21018							
	3								
	4								

## FANS CONTROLLED BY INVERTER

COMPRESSORS	STAGES	WITHOUT ALARM OUTPUT		WITH ALARM OUTPUT	
1	1	21006			
	2	21006			
	3	21006			
	4	21006			
2	1	21006			
	2	21006			
	3	21006		21012	
	4	21012			
3	1	21006			
	2	21006		21012	
	3	21012			
	4	21018			
4	1	21006			
	2	21012			
	3	21018			
	4	21018			
5	1	21012			
	2	21012			
	3	21018			
	4				
6	1	21012			
	2	21018			
	3	21018			
	4				

As an example, consider a refrigerating facility with the following characteristics:



- 3 equal compressors with 1 part loading (2 stages)
- 2 fans with ON/OFF control

The **DUOControl** model which meets the requirements of the installation is the **AKO-21012**.  
If control is carried out using **inverter**, the controller to select would be the **AKO-21006**.

**NOTE:** Any of the controllers can carry out the same functions as the one immediately inferior to it in the series, but not the other way around.

## Appendix C:- User Parameters

A list of all the user parameters used to configure the operation of **DUOControl** controllers. The following table contains the following fields:

**Register Code:** User parameter coding used within this manual.

**Parameter:** Text which appears on the screen

**Description:** Description of the parameter

**R/W?:** Type of parameter

R: Read only (can be modified within the programming assistant)

R/W: Read and Write


**Maximum Value:** Maximum value of the parameter depending on the working units

**Minimum Value:** Minimum value of the parameter depending on the working units


**Default Value:** Default value of the parameter depending on the working units



**Units:** Measurement units depending on the parameter

**Comments:** Useful information for interpreting the value of each user parameter

PARAMETER CODE	USER PARAMETER	DESCRIPTION	RW?	Bar		°C		UNITS	OTHERS
				MAX	MIN	MAX	MIN		
 <b>INSTALLATION CONFIGURATION</b>									
CONF_1	No. of Compressors	NUMBER OF COMPRESSORS	R	6	1	6	1	-	
CONF_2	No. of Stages per Compressor	NUMBER OF STAGES PER COMPRESSOR	R	4	1	4	1	-	
CONF_3	Capacity Reduction Contact	COMPRESSOR CAPACITY REDUCTION CONTACT	R					-	
CONF_4	Alarm Output Activated	ALARM OUTPUT ACTIVATED?	R					-	Active when powered/Active when not powered
CONF_5	Control Type	CONTROL TYPE	R	1	0	1	0	-	ON/OFF / INVERTER
CONF_6	No. of Fans	NUMBER OF FANS	R	8	1	8	1	-	MAXIMUM NUMBER OF FANS
CONF_7	Refrigerant Type	TYPE OF REFRIGERANT	R	7	0	7	0	-	GENERIC R404A R134A R22 R410A R507 R744
CONF_8	Units	UNITS	R	1	0	1	0	-	Bar / °C


PARAMETER CODE	USER PARAMETER	DESCRIPTION	RW?	Bar		°C		UNITS	OTHERS
				MAX	MIN	DEFAULT VALUE	MAX		
<b>EVAPORATION</b>									
EWAP_1	Evaporation SP	EVAPORATION SET POINT	RW	EWAP_2	EWAP_3	EWAP_2	EWAP_3	CONF_8	GENERIC (Default Value R404A)
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R404A
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R134A
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R717
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R22
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R410
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R507
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R744
				EWAP_2	EWAP_3	EWAP_2	EWAP_3	CONF_8	GENERIC (Default Value R404A)
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R404A
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R717
EWAP_2	Upper Limit Evap. SP	UPPER LIMIT FOR THE EVAPORATION SET POINT	RW	EWAP_2	EWAP_3	EWAP_2	EWAP_3		R22
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R410
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R507
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R744
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		GENERIC (Default Value R404A)
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R404A
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R717
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R22
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R410
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R507
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R744
EWAP_3	Lower Limit Evap. SP	LOWER LIMIT FOR THE EVAPORATION SET POINT	RW	EWAP_2	EWAP_3	EWAP_2	EWAP_3	CONF_8	GENERIC (Default Value R404A)
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R404A
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R134A
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R717
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R22
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R410
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R507
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R744
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		GENERIC (Default Value R404A)
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R404A
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R717
EWAP_4	Compressor Rotation	TYPE OF COMPRESSOR ROTATION	RW	EWAP_2	EWAP_3	EWAP_2	EWAP_3		R22
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R410
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R507
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R744
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		GENERIC (Default Value R404A)
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R404A
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R134A
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R717
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R22
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R410
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R507
EWAP_5	Compressor Control	TYPE OF COMPRESSOR CONTROL	RW	EWAP_2	EWAP_3	EWAP_2	EWAP_3		R22
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R410
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R507
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R744
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		GENERIC (Default Value R404A)
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R404A
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R134A
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R717
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R22
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R410
				EWAP_2	EWAP_3	EWAP_2	EWAP_3		R507
EWAP_6	Positive Diff. Slow Zone	POSITIVE DIFFERENTIAL SLOW ZONE WITH RESPECT TO EVAPORATION SET POINT	RW	EWAP_8	EWAP_9	EWAP_8	EWAP_9	CONF_8	GENERIC (Default Value R404A)
				EWAP_8	EWAP_9	EWAP_8	EWAP_9		R404A
				EWAP_8	EWAP_9	EWAP_8	EWAP_9		R134A
				EWAP_8	EWAP_9	EWAP_8	EWAP_9		R717
				EWAP_8	EWAP_9	EWAP_8	EWAP_9		R22
				EWAP_8	EWAP_9	EWAP_8	EWAP_9		R410
				EWAP_8	EWAP_9	EWAP_8	EWAP_9		R507
				EWAP_8	EWAP_9	EWAP_8	EWAP_9		R744
				EWAP_8	EWAP_9	EWAP_8	EWAP_9		GENERIC (Default Value R404A)
				EWAP_8	EWAP_9	EWAP_8	EWAP_9		R404A
				EWAP_8	EWAP_9	EWAP_8	EWAP_9		R134A
EWAP_7	Negative Diff. Slow Zone	NEGATIVE DIFFERENTIAL SLOW ZONE WITH RESPECT TO EVAPORATION SET POINT	RW	EWAP_6	EWAP_7	EWAP_6	EWAP_7	CONF_8	GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R717
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R22
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R410
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R507
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R744
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A
EWAP_8	Positive Diff. Fast Zone	POSITIVE DIFFERENTIAL FAST ZONE WITH RESPECT TO EVAPORATION SET POINT	RW	EWAP_6	EWAP_7	EWAP_6	EWAP_7	CONF_8	GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R717
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R22
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R410
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R507
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R744
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A
EWAP_9	Negative Diff. Fast Zone	NEGATIVE DIFFERENTIAL FAST ZONE WITH RESPECT TO EVAPORATION SET POINT	RW	EWAP_6	EWAP_7	EWAP_6	EWAP_7	CONF_8	GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R717
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R22
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R410
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R507
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R744
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A
EWAP_10	Activates Pump-Down	PUMP-DOWN ACTIVATION	RW	EWAP_6	EWAP_7	EWAP_6	EWAP_7	CONF_8	GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R717
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R22
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R410
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R507
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R744
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A
EWAP_11	Pump-Down Delay	PUMP-DOWN DELAY	RW	EWAP_6	EWAP_7	EWAP_6	EWAP_7	CONF_8	GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R717
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R22
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R410
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R507
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R744
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A
EWAP_12	PUMP-DOWN SP	SET POINT FOR PUMP-DOWN	RW	EWAP_6	EWAP_7	EWAP_6	EWAP_7	CONF_8	GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R717
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R22
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R410
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R507
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R744
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		GENERIC (Default Value R404A)
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R404A
				EWAP_6	EWAP_7	EWAP_6	EWAP_7		R134A

PARAMETER CODE	USER PARAMETER	DESCRIPTION	RW?	Bar		°C		UNITS	OTHERS
				MAX	MIN	DEFAULT VALUE	MAX		
<b>CONDENSATION</b>									
									
COND_1	Condensation SP	CONDENSATION SET POINT	R/W	COND_2 COND_3	COND_3 COND_3	COND_2 COND_3	COND_2 COND_3	COND_3 CONF_8	GENERIC (Default Value R404A) R404A R194A R177 R410 R507 R744
COND_2	Upper Limit Cond. SP	UPPER LIMIT FOR THE CONDENSATION SET POINT	R/W	99.9 35.8 40.4 35.6 44.2 34.6 74.3	COND_3 COND_3 COND_3 COND_3 COND_3 COND_3 COND_3	99.0 72.0 60.0 80.0 68.0 32.0	COND_3 COND_3 COND_3 COND_3 COND_3 COND_3 COND_3	CONF_8 GENERIC (Default Value R404A) R404A R194A R177 R22 R410 R507 R744	
COND_3	Lower Limit Cond. SP	LOWER LIMIT FOR THE CONDENSATION SET POINT	R/W	COND_2 COND_2 COND_2 COND_2 COND_2 COND_2 COND_2	-1.0 -0.4 -0.7 -0.6 -0.3 -0.4 3.4	COND_2 COND_2 COND_2 COND_2 COND_2 COND_2 COND_2	-99.9 -60.0 -60.0 -60.0 -60.0 -60.0 -60.0	CONF_8 GENERIC (Default Value R404A) R404A R194A R177 R22 R410 R507 R744	
COND_4	Fan Control	TYPE OF FAN CONTROL	R/W						PROPORTIONAL BAND
COND_5	Positive Diff. Slow Zone	POSITIVE DIFFERENTIAL SLOW ZONE WITH RESPECT TO CONDENSATION SET POINT	R/W	COND_7	0.0	COND_7	0.0	CONF_8	
COND_6	Negative Diff. Slow Zone	NEGATIVE DIFFERENTIAL SLOW ZONE WITH RESPECT TO CONDENSATION SET POINT	R/W	COND_8	0.0	COND_8	0.0	CONF_8	
COND_7	Positive Diff. Fast Zone	POSITIVE DIFFERENTIAL FAST ZONE WITH RESPECT TO CONDENSATION SET POINT	R/W	20.0	COND_5	40.0	COND_5	CONF_8	
COND_8	Negative Diff. Fast Zone	NEGATIVE DIFFERENTIAL FAST ZONE WITH RESPECT TO CONDENSATION SET POINT	R/W	20.0	COND_6	40.0	COND_6	CONF_8	
COND_9	Activate Floating Cond.	ACTIVATE FLOATING CONDENSATION?	R/W					-	No Yes
COND_10	Proportional Value	ADJUSTMENT OF INVERTER PI CONTROL - PROPORTIONAL VALUE P	R/W	100	1	100	1	%	
COND_11	Integral Value	ADJUSTMENT OF INVERTER PI CONTROL - INTEGRAL VALUE I	R/W	30	1	30	1	Secs	

PARAMETER CODE	USER PARAMETER	DESCRIPTION	RW?	Bar		°C		UNITS	OTHERS
				MAX	MIN	MAX	MIN		
<b>FLOATING CONDENSATION</b>									
									
CODE_1	Minimum Condensation Temp.	MINIMUM CONDENSATION VALUE	R/W	99.0 72.0 80.0 80.0 68.0 68.0 32.0	-40 -60 -60 -60 -60 -60 -60	28 -60 -60 -60 -60 -60 -60		°C	GENERIC (Default Value R404A) R404A R134A R717 R744 R410 R507 R744
CODE_2	Condenser temp. difference	CONDENSER ΔT	R/W	20	6	6			°K
<b>PROBE CONFIGURATION</b>									
									
SOND_1	Suction Probe - 4 mA	4 mA CONFIGURATION OF THE SUCTION PROBE	R/W	SOND_2	-1.0	SOND_2	-1.0		Bar
SOND_2	Suction Probe - 20mA	20 mA CONFIGURATION OF THE SUCTION PROBE	R/W	40.0	SOND_1	40.0	SOND_1		Bar
SOND_3	Suction Probe - Offset	CALIBRATION OF THE SUCTION PROBE	R/W	1.0	-1.0	1.0	-1.0		Bar
SOND_4	Discharge Probe - 4mA	4 mA CONFIGURATION OF THE DISCHARGE PROBE	R/W	SOND_5	-1.0	SOND_5	-1.0		Bar
SOND_5	Discharge Probe - 20mA	20 mA CONFIGURATION OF THE DISCHARGE PROBE	R/W	40.0	SOND_4	40.0	SOND_4		Bar
SOND_6	Discharge Probe - Offset	CALIBRATION OF THE DISCHARGE PROBE	R/W	1.0	-1.0	1.0	-1.0		Bar
SOND_7	Ambient air Probe Connected	PROBE CONNECTED	R/W						- No Yes
SOND_8	Ambient air Probe - 4mA	4 mA CONFIGURATION FOR THE AMBIENT AIR TEMPERATURE PROBE	R/W	SOND_9	-50.0	SOND_9	-50.0		°C
SOND_9	Ambient air Probe - 20mA	20 mA CONFIGURATION FOR THE AMBIENT AIR TEMPERATURE PROBE	R/W	150.0	SOND_8	150.0	SOND_8		°C
SOND_10	Ambient air Probe - Offset	CALIBRATION OF THE AMBIENT AIR TEMPERATURE PROBE	R/W	10.0	-10.0	10.0	-10.0		°C

PARAMETER CODE	USER PARAMETER	DESCRIPTION	RW?	Bar		°C		UNITS	OTHERS
				MAX	MIN	DEFAULT VALUE	MAX		
<b>INPUTS</b>									
ENTR_1	High Pressure switch	TYPE OF CONTACT FOR THE HIGH PRESSURE SWITCH	R/W						Open contact error
ENTR_2	Low Pressure switch	TYPE OF CONTACT FOR THE LOW PRESSURE SWITCH	R/W						Closed contact error
ENTR_3	Compressor Safety circuit	TYPE OF CONTACT FOR THE COMPRESSORS SAFETY CIRCUIT FOR THE SAFETY CIRCUIT FOR THE FANS (or INVERTER)	R/W						Open contact error
ENTR_4	Fan Safety circuit	TYPE OF CONTACT FOR THE SAFETY CIRCUIT FOR THE FANS (or INVERTER)	R/W						Closed contact error
<b>ENERGY SAVING</b>									
AENR_1	Day(s) of the week	ENERGY SAVING START - DAY OF THE WEEK	R/W						Deactivated Monday - Sunday Monday - Sunday Monday - Friday Monday - Friday Saturday - Sunday
AENR_2	Start - Hour	ENERGY SAVING START - HOURS	R/W	23	0		23	0	Hours
AENR_3	Start - Minutes	DURATION OF ENERGY SAVING - MINUTES	R/W	59	0		59	0	Minutes
AENR_4	Energy Saving Duration	DURATION OF ENERGY SAVING - HOURS	R/W	24	0		24	0	Hours
AENR_5	Evap. Dif Energy Saving	EVAPORATION DIFFERENTIAL (WITH RESPECT TO EVAPORATION SET POINT) DURING ENERGY SAVING		10.0	-10.0		20.0	-20.0	CONF_8
				10.0	-10.0		20.0	-20.0	R404A
				10.0	-10.0		20.0	-20.0	R134A
				10.0	-10.0		20.0	-20.0	R717
				10.0	-10.0		20.0	-20.0	R22
	10.0	-10.0		20.0	-20.0	R502			
	10.0	-10.0		20.0	-20.0	R404A			



PARAMETER CODE	USER PARAMETER	DESCRIPTION	RW?	Bar		°C		UNITS	OTHERS
				MAX	MIN	MAX	MIN		
									
TEMP_1	Fan MIN. time ON	MINIMUM FAN OPERATING TIME	R/W	3600	1		1	Secs	
TEMP_2	Fan MIN. time OFF	MINIMUM FAN STOP TIME	R/W	3600	1		1	Secs	
TEMP_3	Fan ON-ON Delay Slow	MINIMUM TIME BETWEEN STARTUPS OF DIFFERENT FANS IN THE SLOW ZONE	R/W	3600	1		1	Secs	
TEMP_4	Fan OFF-OFF Delay Slow	MINIMUM TIME BETWEEN SHUTDOWNS OF DIFFERENT FANS IN THE SLOW ZONE	R/W	3600	1		1	Secs	
TEMP_5	Fan ON-ON Delay Fast	MINIMUM TIME BETWEEN STARTUPS OF DIFFERENT FANS IN THE FAST ZONE	R/W	3600	1		1	Secs	
TEMP_6	Fan OFF-OFF Delay Fast	MINIMUM TIME BETWEEN SHUTDOWNS OF DIFFERENT FANS IN THE FAST ZONE	R/W	3600	1		1	Secs	
TEMP_7	Compressor T. MIN. ON	MINIMUM COMPRESSOR OPERATING TIME	R/W	3600	1		1	Secs	
TEMP_8	Compressor T. MIN. OFF	MINIMUM COMPRESSOR STOP TIME	R/W	3600	1		1	Secs	
TEMP_9	Compr. ON-ON Delay Slow	MINIMUM TIME BETWEEN STARTUPS OF DIFFERENT COMPRESSORS AND STAGES IN THE SLOW ZONE	R/W	3600	1		1	Secs	
TEMP_10	Compr. OFF-OFF Delay Slow	MINIMUM TIME BETWEEN SHUTDOWNS OF DIFFERENT COMPRESSORS AND STAGES IN THE SLOW ZONE	R/W	3600	1		1	Secs	
TEMP_11	Compr. ON-ON Delay Fast	MINIMUM TIME BETWEEN STARTUPS OF DIFFERENT COMPRESSORS AND STAGES IN THE FAST ZONE	R/W	3600	1		1	Secs	
TEMP_12	Compr. OFF-OFF Delay Fast	MINIMUM TIME BETWEEN SHUTDOWNS OF DIFFERENT COMPRESSORS AND STAGES IN THE FAST ZONE	R/W	3600	1		1	Secs	

PARAMETER CODE	USER PARAMETER	DESCRIPTION	RW?	Bar		°C		UNITS	OTHERS
				MAX	MIN	MAX	MIN		
<b>PROTECTIONS AND ALARMS</b>									
PROT_1	Stgs ON Aspir. Probe Fail	NUMBER OF COMPRESSOR STAGES OPERATING IF THERE IS A SUCTION PROBE FAIL	R/W	CONF_1 x CONF_2	0.0	CONF_1 x CONF_2	0.0	Stages	
PROT_2	Fans ON Disch. Probe Fail	NUMBER OF FANS (% IF VARIABLE FREQ. DRIVE) OPERATING IF THERE IS A DISCHARGE PROBE FAIL	R/W	(*)	0.0	(*)	0.0	Stages	(*) IF NO INVERTER -> CONF_6 IF INVERTER -> 100
PROT_3	HP Circuit Pre-Alarm	HIGH PRESSURE CIRCUIT PRE-ALARM	R/W	99.9	-1.0	99.9	-1.0	Bar	GENERIC (Default Value R404A)
				35.8	-0.4	35.8	-0.4	R404A	
				25.0	-0.8	25.0	-0.8	R134A	
				40.4	-0.7	40.4	-0.7	R717	
				35.6	-0.6	35.6	-0.6	R22	
				34.6	-0.4	34.6	-0.4	R507	
PROT_4	HP Circuit Pre-Alarm Dif.	HIGH PRESSURE PRE-ALARM DIFFERENTIAL	R/W	74.3	3.4	74.3	3.4	Bar	GENERIC (Default Value R404A)
				10.0	0.0	10.0	0.0	R404A	
				10.0	0.0	10.0	0.0	R134A	
				10.0	0.0	10.0	0.0	R717	
				10.0	0.0	10.0	0.0	R22	
				10.0	0.0	10.0	0.0	R410	
PROT_5	LP Circuit Pre-Alarm	LOW PRESSURE CIRCUIT PRE-ALARM	R/W	10.0	0.0	10.0	0.0	Bar	GENERIC (Default Value R404A)
				99.9	-1.0	99.9	-1.0	R404A	
				35.8	-0.4	35.8	-0.4	R134A	
				25.0	-0.8	25.0	-0.8	R717	
				40.4	-0.7	40.4	-0.7	R507	
				35.6	-0.6	35.6	-0.6	R22	
PROT_6	LP Circuit Pre-Alarm Dif.	LOW PRESSURE PRE-ALARM DIFFERENTIAL	R/W	44.2	-0.3	44.2	-0.3	Bar	GENERIC (Default Value R404A)
				34.6	-0.4	34.6	-0.4	R410	
				74.3	3.4	74.3	3.4	R507	
				10.0	0.0	10.0	0.0	R744	
				10.0	0.0	10.0	0.0	R404A	
				10.0	0.0	10.0	0.0	R134A	
PROT_7	MAX T. Comp. Mainten.	COMPRESSOR MAINTENANCE PERIOD	R/W	32000	0	32000	0	Hours	0: Deactivated
				3600	1	3600	1	Secs	
				3600	1	3600	1	Secs	
				3600	1	3600	1	Secs	
				3600	1	3600	1	Secs	
				3600	1	3600	1	Secs	
PROT_8	Startup Alarm Delay	ALARM DELAY AT STARTUP TIME	R/W						
PROT_9	Alarm Output Delay	ALARM OUTPUT DELAY	R/W						



PARAMETER CODE	USER PARAMETER	DESCRIPTION	RW?	Bar		°C		UNITS	OTHERS
				MAX	MIN	MAX	MIN		



**DATE**

FECH_1	Minutes	MINUTES	R/W	59	0		0	-	
FECH_2	Hour	HOUR	R/W	23	0		0	-	
FECH_3	Day of the week	DAY OF THE WEEK	R/W					-	MONDAY TUESDAY WEDNESDAY THURSDAY FRIDAY SATURDAY SUNDAY
FECH_4	Day	DAY	R/W	31	1		1	-	
FECH_5	Month	MONTH	R/W	12	1		1	-	
FECH_6	Year	YEAR	R/W	99	8		8	-	



**TERMINAL CONFIGURATION**

TERM_1	Password	PASSWORD	R/W	99	0		0	-	0: DEACTIVATED
TERM_2	MODBUS address	MODBUS ADDRESS	R/W	247	1		1	-	

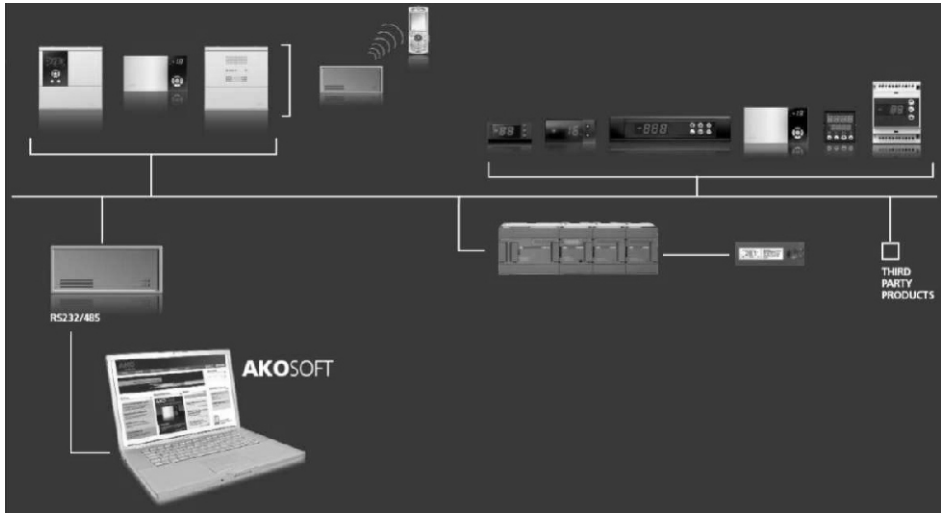


**MODEL AND SW VERSION**

MODE_1	DUOControl model	DUOCONTROL MODEL	R					-	
SWC_1	DUOControl SW Version	DUOCONTROL SOFTWARE VERSION	R					-	
SWT_1	DUOvision SW Version	DUOVISION SOFTWARE VERSION	R					-	

## Appendix D:- Cable for connection to the local **MODBUS** network

**DUOControl** controllers have a MODBUS communication interface to enable them to be controlled and monitored by means of the **AKO-5005** Web server or **AKO-5004** equipment management software.



It is necessary to use the **AKO-21904** cable (not supplied) to connect to the local MODBUS network.

### Function of each wire:

**Black:** TR+ (MODBUS +)

**Red:** TR- (MODBUS-)

**Grey:** Earth (Shielding)

**Yellow:** Not connected

**Blue:** Not connected

**White:** Not connected

