eliwell

EWCM 400 (412-415-418)
Controllers for Compressor Pack Units

CONTENTS

1 USE OF MANUAL

To facilitate the use and review of the manual, customers may use the following aids:

Callouts

Callout column
The left section of the text contains *callouts* on the topics described to allow the user to rapidly find the desired information.

Cross references

Cross references
All the words in *italics* are listed in the analytical index along with the page where they are described more in detail.
Example: supposing the user is looking for the following:
"The activation of an alarm stops the *compressors*"
The text in italics indicates that section *Compressors* in the analytical index provides information on the page where *compressors* are described in greater detail.
If the online Help on the PC is used, the customer may use the words in italics as hyperlinks (automatic links that can be activated with a mouse click) to view the single sections of the manual and scroll through the document.

Highlights

Some parts of the text are highlighted in the column of *callouts* by means of icons that can have the following meanings:

Warning It draws the attention on a specific aspect of the topic that users should take into account.

Tip It provides a hint that helps users to understand and use the information on the topic described.

Attention! **It *highlights* information that is essential to preserve the integralness of the system and ensure the safety of people, equipment, data, etc. These sections must always be read prior to use.**

2   INTRODUCTION

The EWCM 400 Family is a series of compact electronic units designed to control compressor sets that is highly reliable, versatile and easy to use.
The EWCM 400 family consists of three models:
*   EWCM 412
*   EWCM 415
*   EWCM 418

All units control:
*   up to 4 ordinary *compressors* or 2 *compressors* with capacity steps
*   2 analogue temperature or pressure inputs to control intake and condensation
*   7*digital inputs* for control of thermal *alarms*, low and high pressure *alarms* and generic shutdown *alarms* on *compressors*.

The three versions vary according to the type of *outputs* used, as shown in the table below.

Unit	Compressor relay	*Analogue inputs*	Digital inputs	Alarm relay	12-24 Vac Triac *alarm output*	Triac output for *condensing fan*s	Output for external module with *condensing fan*s	Analogue output for *condensing fan*s	Serial port (TTL)
EWCM412	4	2	7	-	1	1	1	-	1
EWCM415	4	2	7	1	-	-	-	-	1
EWCM418	4	2	7	1	-	-	-	1	1

The TTL *serial output* can be used to connect the unit to the Televis supervision system or for quick programming using the *Copy Card*. This output can also be used to connect the unit to other systems using a ModBUS protocol (parameter-selectable).

3   INSTALLATION

Before proceeding, make sure that you have connected the power supply using a suitable external *transformer*.
Cards must be connected as follows:
- do not apply loads to the *outputs* exceeding those indicated in this specification;
- when connecting the loads, carefully observe the *wiring diagram*s;
- always use separate cables for high and low voltage loads.

3.1   Wiring diagrams for EWCM 400 devices

There are 3 EWCM 400 models:
- EWCM 412: with integrated fan control
- EWCM 415: with relay output for *alarms*
- EWCM 418: with relay output for *alarms* and 0...10V/4...20mA output for the control of *condensing fan*s

The *wiring diagram*s for the models grouped according to input type (temperature or current) are shown below.

Wiring diagram for EWCM 412 with temperature and current input
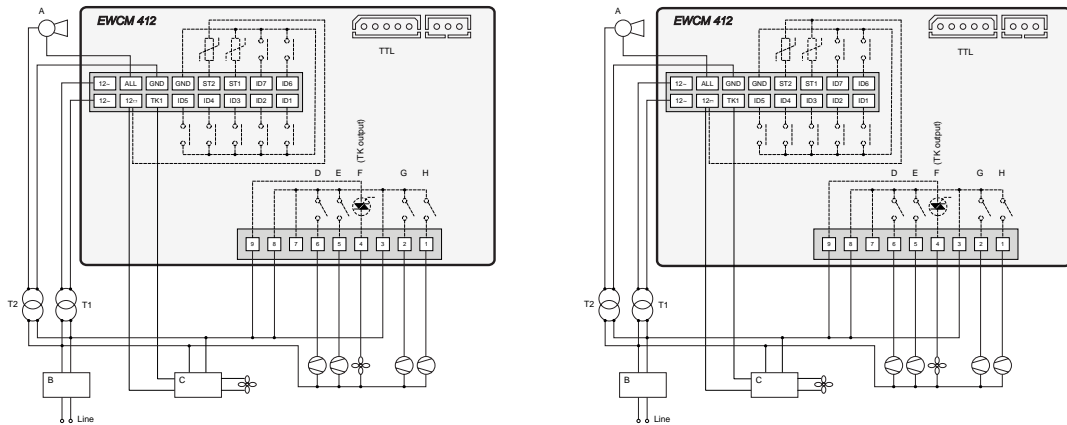
Diagram A: Temperature input   Diagram B: Current input

A: alarm (ALL output)	
B: EMI filter (only when the condensation control is used with phase cut-off)	
C: module for control of external fans (optional)	
T1: unit power *transformer*	
T2: alarm power *transformer*	
D: relay RL01 for control of first compressor	
E: relay RL02 for control of second compressor	
G: relay RL03 for control of third compressor	
H: relay RL04 for control of fourth compressor	
F: Triac for direct control of *condensing fan*s up to 2A (TK output)	
TTL: TTL serial port for connection to *Copy Card* or PC	

Note: *Condensing fan*s can be controlled using the direct output (terminal no. 4) or the external fan module (labelled C in the figure) connected to output TK1.
The use of one method automatically excludes the other.

EWCM 415 wiring diagram with temperature and current input
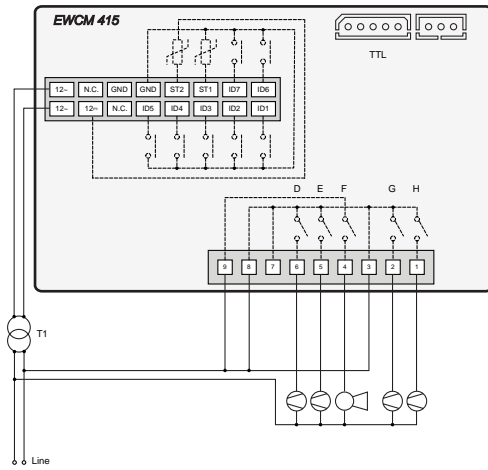
Diagram A: Temperature input

Diagram B: Current input

T1: unit power *transformer*
D: relay RL01 for control of first compressor
E: relay RL02 for control of second compressor
G: relay RL03 for control of third compressor
H: relay RL04 for control of fourth compressor
F: relay RL05 for alarm control
TTL: TTL serial port for connection to *Copy Card* or PC

EWCM 418 wiring diagram with temperature and current input
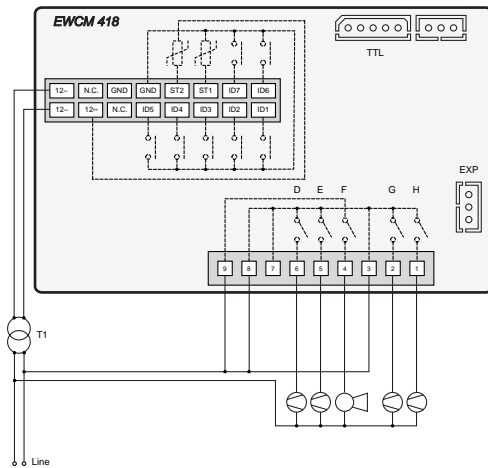
Diagram A: Temperature input

Diagram B: Current input
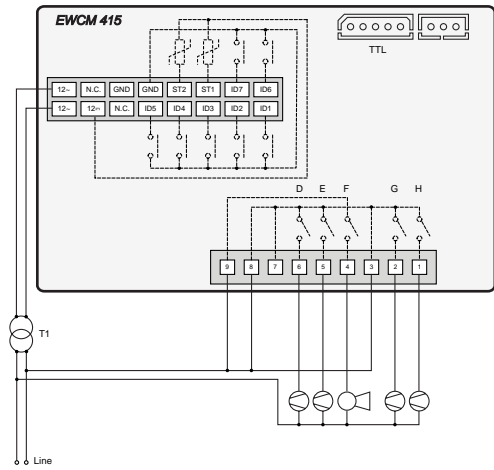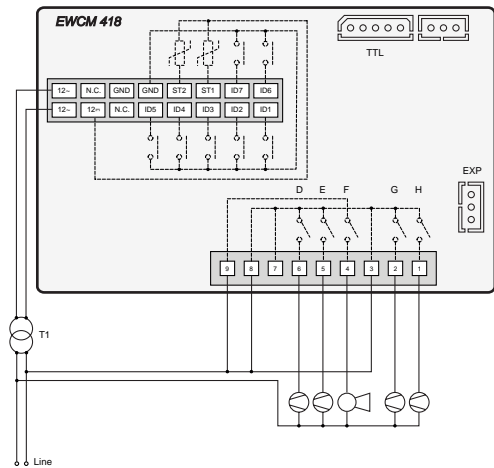
T1: unit power *transformer*
D: relay RL01 for control of first compressor
E: relay RL02 for control of second compressor
G: relay RL03 for control of third compressor
H: relay RL04 for control of fourth compressor
F: relay RL05 for alarm control
TTL: TTL serial port for connection to *Copy Card* or PC
EXP: analogue output for *condensing fan*s

The unit is configured according to the values of the *parameters* for the inputs and *outputs*.

3.2 Configuration of analogue inputs

Analogue inputs

There are 2 *analogue inputs*:
- input ST1 – for inlet - configurable for NTC probe or 4...20mA signal.
- ST2 input - for condensation - 4...20mA signal.

The inputs can be configured as in the following table.

Configuration table for analogue inputs

Parameter	Description	Value		
		0	1	2
H05	Configuration of analogue input ST1	No probe	Temperature input	Pressure input
H06	Configuration of analogue input ST2	No probe	Not defined	Pressure input

Decimal point value

If the ST1 input is defined as a 4...20mA input, the following *parameters* are significant:
H07, the top scale value for input ST1, is used to set a value that corresponds to a current of 4mA
H09, the bottom scale value for input ST1, is used to set a value that corresponds to a current of 20mA
H29, number of decimal places; it moves the point on these values; main *display*, menu tP / t01, and *parameters H07-H09*.
Note: with *H05* set to 1 (ST1 input configured as temperature input) parameter *H29* = 1 must be set. If this is the case, *display* resolution (main *display* in menu tP / t01) is always with a decimal point (or whole number if "F" reading is set)

Input ST2 is always a current input:
H08, the top scale value for input ST2, is used to set a value that corresponds to a current of 4mA
H10, the bottom scale value for input ST2, is used to set a value that corresponds to a current of 20mA
Resolution of the P / t02 menu *display* and *parameters H08-H10* is always with a decimal point.

3.3 Configuration of digital inputs

Digital inputs

There are 7 voltage-free *digital inputs* identified as ID1....ID17.

Polarity of digital inputs

The digital input polarity is defined by the *parameters* listed here below:

Parameter	Description	Value	
		0	1
H11	Polarity of digital input ID1	Active if closed	Active if open
H12	Polarity of digital input ID2	Active if closed	Active if open
H13	Polarity of digital input ID3	Active if closed	Active if open
H14	Polarity of digital input ID4	Active if closed	Active if open
H15	Polarity of digital input ID5	Active if closed	Active if open
H16	Polarity of digital input ID6	Active if closed	Active if open
H17	Polarity of digital input ID7	Active if closed	Active if open

Description of digital inputs

All inputs are fixed. They are described in the following table:

Inputs	Description
ID1	Thermal switch compressor 1
ID2	Thermal switch compressor 2
ID3	Thermal switch compressor 3
ID4	Thermal switch compressor 4
ID5	Machine shutdown (remote ON/OFF)
ID6	High pressure alarm
ID7	Low pressure alarm

3.4 Configuration of outputs

Outputs

The *outputs* on the device are:
- 4 relay contacts (5 for EWCM 415 and EWCM 418)
- 1 12-24 Vac Triac *alarm output* (for EWCM 412 only)
- 1 output for direct phase cut-off control (TRIAC, marked with TK) of *condensing fan*s with a maximum current of 2A (for EWCM 412 only)
- 1 analogue output (PWM marked as TK1) for control of fan modules with currents above 2A (for EWCM 412 only)
- 1 4...20mA/0...10V analogue output for control of *condensing fan*s (for EWCM 418 only)

The *outputs* described above are summarized in the following table:

Unit	Relay for compressor control	Relay for alarm management (RL5)	12-24 Vac Triac *alarm output*	Output for fan control (TK)	Output for control of external fan module (TK1)	Analogue output for *condensing fan*s
EWCM 412	4	-	1	1	1	-
EWCM 415	4	1	-	-	-	-
EWCM 418	4	1	-	-	-	1

3.4.1 Relays (RL)
--->All models
- RL1 - Compressor 1, 2A 250V~ (1/4HP a 240V~ , 1/8HP 120V~).
- RL2 - Compressor 2, 2A 250V~ (1/4HP a 240V~ , 1/8HP 120V~).
- RL3 - Compressor 3, 2A 250V~ (1/4HP a 240V~ , 1/8HP 120V~).
- RL4 - Compressor 4, 2A 250V~ (1/4HP a 240V~ , 1/8HP 120V~).

---> Models 415-418 only
- RL5 (for models EWCM 415 and EWCM 418) - Alarm, 2A 250V~ (1/4HP a 240V~ , 1/8HP 120V~).

Polarity of relays

The polarity of the compressor relays can be defined using specific *parameters* as listed below:

Parameter	Description	Value	
		0	1
H18	Polarity of relay compressor 1	Relay closed if output active	Relay closed if output inactive
H19	Polarity of relay compressor 2	Relay closed if output active	Relay closed if output inactive
H20	Polarity of relay compressor 3	Relay closed if output active	Relay closed if output inactive
H21	Polarity of relay compressor 4	Relay closed if output active	Relay closed if output inactive

3.4.2 Condensing fan Triac (TK) ---> 412 models only

The TK output can be configured as described in par. 5.2.1

The parameter is displayed on all models but only valid for EWCM 412

3.4.3 Fan module control (TK1) ---> 412 models only
- TK1 – Low voltage output (PWM) for control of external modules used to drive fans (for EWCM 412 only).
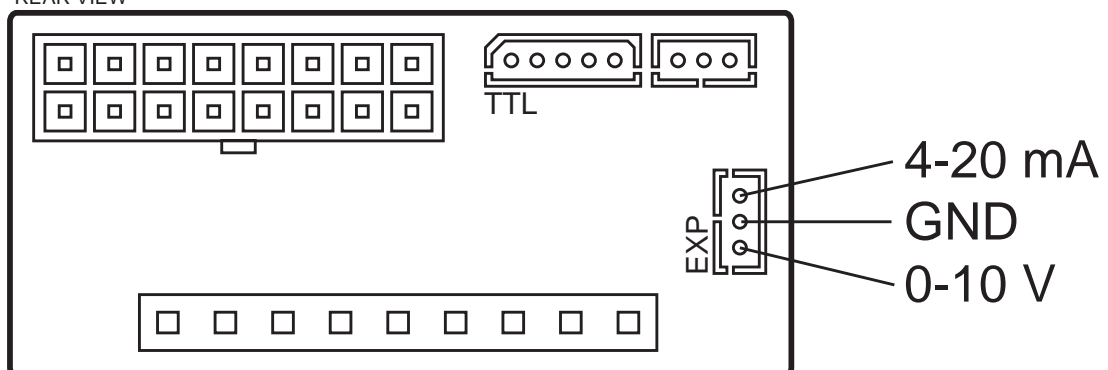
The TK output can be configured as described in par. 5.2.1

The parameter is displayed on all models but only valid for EWCM 412

3.5 Condensing fan analogue output ---> 418 models only

REAR VIEW

The unit has a 0...10V/4...20mA analogue output (the mode is parameter-selectable) for direct control of inverter modules.

3.6 Serial output

The unit has an asynchronous *serial output* that enables the unit to be connected to a PC via an interface module.
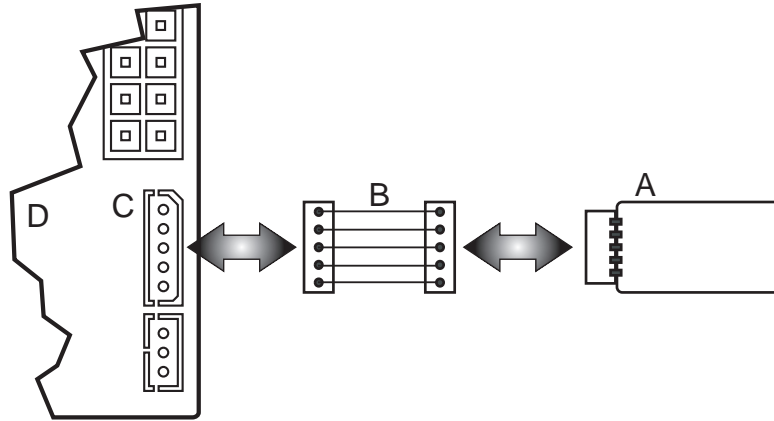
Parameter *H22* is used to select the type of communication protocol
- *H22* = 0 Televis protocol
- *H22* = 1 Modbus protocol

3.6.1 Copy Card

The same connector for serial connection can also be used to connect the *Copy Card* for quick programming of the unit *parameters*. The connection diagram is shown here below:
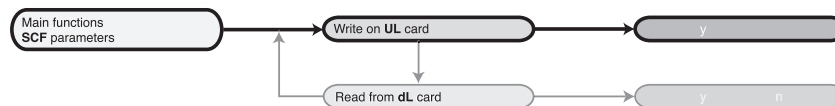
Connecting the Copy Card

| A: *Copy card* |
| B: Connection using TTL cable |
| C: serial communication channel |
| D: EWCM 400 (rear view) |

Copying the parameter map

The parameter map stored in the internal memory of the *Copy Card* (upload) can be copied by accessing the relevant menu, as shown in the figure below:

- select the relevant menu item;
- "SCF" is displayed;
- press and release both *buttons* (the *buttons* have to be held down for less than 2 seconds);
- "UL" is displayed;
- press and release both *buttons* (the *buttons* have to be held down for less than 2 seconds);
- "y" appears;
- press and release both *buttons* (the *buttons* have to be held down for less than 2 seconds);
- "UL" is displayed again but in two different ways and therefore with two different meanings:
  - *display* empty for a second followed by UL reappearing = upload successful
  - UL appears immediately on *display* = upload not successful
- in both cases, to quit hold down both *buttons* (*buttons* have to be held down for more than 2 seconds);
- "y" appears on the *display*;
- hold down both *buttons* (*buttons* have to be held down for more than 2 seconds);
- "UL" appears on the *display*;
- hold down both *buttons* (*buttons* have to be held down for more than 2 seconds);
- "SCF" appears on the *display*;
- hold down both *buttons* (*buttons* have to be held down for more than 2 seconds);
- go back to the main level

Downloading the parameter map

To program the parameter map from the *Copy Card* to the internal memory (download), select the relevant menu as shown in the figure below:
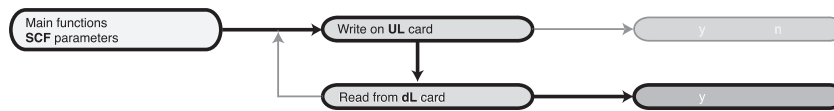
- select the relevant item in the SCF menu;
- press and release both *buttons* (the *buttons* have to be pressed for less than 2 seconds);
- "UL" appears on the *display*;
- press and release the down button;
- "dL" appears on the *display*;
- press and release both *buttons* (the *buttons* have to be pressed for less than 2 seconds);
- "y" appears on the *display*;
- press and release both *buttons* (the *buttons* have to be pressed for less than 2 seconds);
- downloading can be effected in 2 different ways:
  - o when downloading, the *display* is unsteady for 1 second and "Occ" then appears on the *display*;
  - o If downloading fails, "Err" immediately appears on the *display*;
- in both cases, to quit hold down both *buttons* (*buttons* have to be held down for more than 2 seconds);
- "y" appears on the *display*;
- hold down both *buttons* (*buttons* have to be held down for more than 2 seconds);
- "dL" appears on the *display*;
- hold down both *buttons* (*buttons* have to be held down for more than 2 seconds);
- "SCF" appears on the *display*;
- hold down both *buttons* (*buttons* have to be held down for more than 2 seconds);
- go back to the main level
- once the operation has been completed, the *Copy Card* must be disconnected;
- after modifying the *configuration parameters*, we strongly recommend that you switch the instrument off and on again.

If the operation is successful, Occ appears on the *display*.
After completing the operation, the *Copy Card* must be disconnected. We strongly recommend that you switch the unit off and on again each time *configuration parameters* are changed.

Once downloading or uploading has been confirmed, select 'y' to continue or 'n' to cancel the operation.

3.7 Physical quantities and units of measurement

3.7.1 Units of measurement
Control temperature can be displayed in:
- °C with decimal point*
- °F without decimal point*

*See paragraph 5.2 Setting the decimal point

To convert from one unit of measurement to the other: °F=°C x 9/5 + 32

The unit of measurement can be set using parameter *H33*:

H33	Unit of measurement
0	Degrees °C
1	Degrees °F

4   USER INTERFACE

The interface, consisting of the instrument keypad, can be used to perform all the operations required to operate the instrument including:
- Setting the operating mode
- Managing alarm situations
- Monitoring the state of resources

Keyboard

4.1   Buttons

Band

Sets the regulation *band*.

Hold this button down (2 seconds) for direct access to the regulation *band*. When the key is pressed, the letters BND appear on the displays followed by the value set by the regulation *band* (corresponding to parameter *H04*).

In Menu mode, this button becomes the SCROLL UP or UP (value increase) button.

Alarm Set/Reset

Sets the control set point.

Hold this button down (1.5 seconds) for direct access to the control set point. When the key is pressed, the letters SET appear on the displays followed by the value set by the regulation *band* (corresponding to parameter *H01*).
Press once to reset all inactive *alarms* that can be reset manually;

In Menu mode, this button becomes the SCROLL DOWN or DOWN (value decrease) button.

Band/Set combination

The "*band*" and "*set*" *buttons* are pressed at the same time.

If you press both *buttons* at the same time and then release them within 2 seconds, you go down one level in the *display* menu.
If you press both *buttons* for more than 2 seconds, you move one level up.
If the last level of a menu is displayed, press the button and release it within two seconds to go up one level.

4.1.1   Display

In Normal mode, the unit displays:
- the control temperature in °C (resolution expressed in tenths of a degree) or in °F (whole number).
- the control pressure with resolution specified by parameter *H29*
- the alarm code, if at least one is active. If several *alarms* are active, the Alarm Table is displayed for one second.
- In Menu mode, displaying varies according it the position. Special labels and codes are used to help users identify the function that has been set.
- Decimal point: when displaying the operating hours, it indicates that the value must be multiplied x 100.

4.1.2   LEDs

LED 1 compressor 1
- ON if compressor 1 is active
- OFF if compressor 1 is inactive
- BLINK if *safety timing* is in progress

Compressor 2 (or capacity step) LED
- ON if compressor (capacity step) is on
- OFF if compressor (capacity step) is off
- BLINK if *safety timing* is in progress

Compressor 3 (or capacity step) LED
- ON if compressor (capacity step) is on
- OFF if compressor (capacity step) is off
- BLINK if *safety timing* is in progress

Compressor 4 (or capacity step) LED
- ON if compressor (capacity step) is on
- OFF if compressor (capacity step) is off
- BLINK if *safety timing* is in progress

Menu LED
- BLINK if the menu levels are being displayed
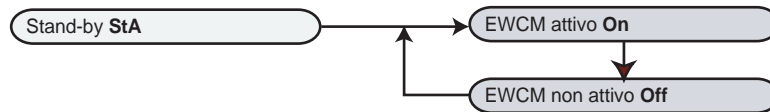- OFF in Normal *display* mode

STAND-BY LED
- ON if the unit is operating
- OFF if the unit is in *STAND-BY* mode

4.2   Device status

The EWCM 400 *device status* can be selected
- using the digital input
- using the function programming menu

The sequence of commands to be performed to modify EWCM 400 status using the *keyboard* menu is shown below:

**Modifying status
of On-Off device**

```
  Stand-by StA   ─────────────▶   EWCM attivo On
                        ▲                    │
                        │                    ▼
                        └──────────  EWCM non attivo Off
```

1. press and release both *buttons* (within 2 seconds) to access the menu
2. go to "StA" in the menu using the SCROLL DOWN and SCROLL UP *buttons*;
3. press and release both *buttons* (within 2 seconds);
4. "On" appears on the *display*
5. select the status ("On", "Off") using the SCROLL DOWN and SCROLL UP *buttons*;
6. once the required status has been displayed, press and release both *buttons* (within 2 seconds):
7. the *STAND-BY* LED goes on or off according to the status that has been selected.
8. press and release both *buttons* (the *buttons* have to be pressed for less than 2 seconds) to *display* "StA" and reset the status as in point 2;
9. hold both *buttons* down (*buttons* have to be held down for more than 2 seconds) to quit the menu;

**Attention: when the *STAND-BY* LED is turned off, the instrument does not regulate the *outputs*.
In this phase, the temperature/pressure values detected by the device are displayed.**

4.3   Programming parameters and displaying unit status: menu levels

Access to the *parameters* and machine inputs is structured in sublevels that can be accessed by pressing the "mode" and "on-off" *buttons* simultaneously (see above).
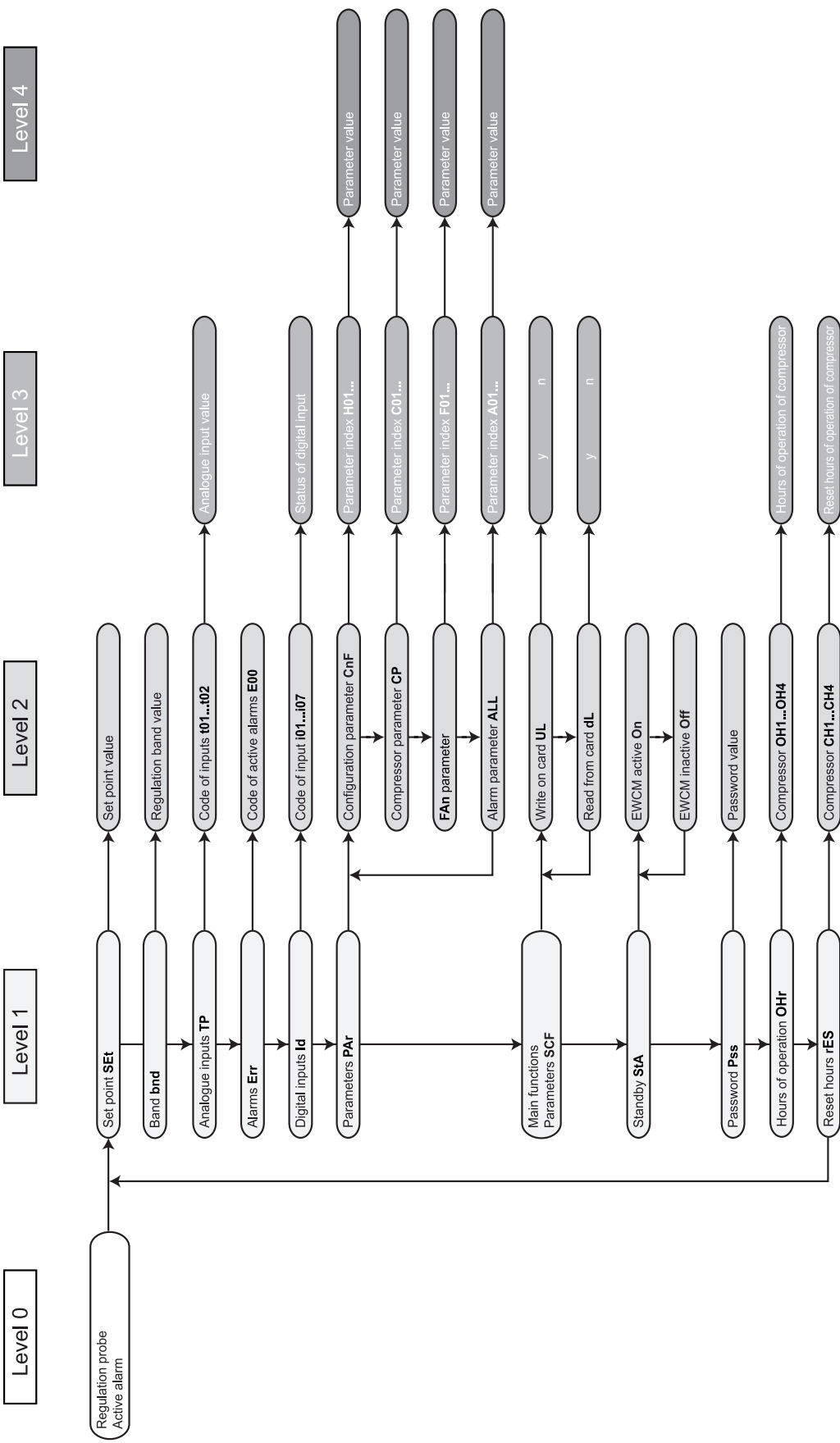Each menu level is identified by a mnemonic code which appears on the *display*.
It is structured as shown in the following diagram (see following page):

The following diagram shows the *menu structure*:

Level 0	Level 1	Level 2	Level 3	Level 4
Regulation probe / Active alarm	Set point **SEt**	Set point value		
	Band **bnd**	Regulation band value		
	Analogue inputs **TP**	Code of inputs **t01...t02**	Analogue input value	
	Alarms **Err**	Code of active alarms **E00**		
	Digital inputs **Id**	Code of input **i01...i07**	Status of digital input	
	Parameters **PAr**	Configuration parameter **CnF**	Parameter index **H01...**	Parameter value
		Compressor parameter **CP**	Parameter index **C01...**	Parameter value
		FAn parameter	Parameter index **F01...**	Parameter value
		Alarm parameter **ALL**	Parameter index **A01...**	Parameter value
	Main functions Parameters **SCF**	Write on card **UL**	y	
			n	
		Read from card **dL**	y	
			n	
	Standby **StA**	EWCM active **On**		
		EWCM inactive **Off**		
	Password **Pss**	Password value		
	Hours of operation **OHr**	Compressor **OH1...OH4**	Hours of operation of compressor	
	Reset hours **rES**	Compressor **CH1...CH4**	Reset hours of operation of compressor	

5   SYSTEM CONFIGURATION

This section explains how to configure the *parameters* for the different loads according to the type of system to be controlled.

5.1   Compressors

EWCM 400 can control systems with a cooling circuit comprising a maximum of 4 *compressors*
Capacity steps, when present, are considered *compressors*.
Each *compressors* is driven by a device relay.
Compressors are switched on or off according to the temperatures measured and the *temperature control functions* set (see paragraph "Control of *compressors* – temperature controller").

5.1.1   Compressor configuration

Number of power steps

The *compressors* must always be connected to *outputs* RL1-RL4. Parameter *H30* selects the number of *compressors* in the system.

Polarity RL1-RL4

The polarity of the compressor *outputs* can be selected using *parameters H18* and *H21*:
- 0= Relay ON if compressor/capacity step ON
- 1= Relay ON if compressor/capacity step OFF

5.1.2   Compressor start/stop sequence

The order in which the *compressors* are started can be changed with parameter *H31*. This parameter determines the start sequence of *compressors* as described below.
- *H31* = 0 *Compressors* are started according to operating hours (*balancing of operating hours*).
- *H31* = 1 The first compressor to be started is the one with the lowest value (followed by the compressor (or capacity step) with the highest value (*fixed sequence*).

Balancing of operating hours

If *H31* = 0, the first compressor to be started is the one with the lowest number of operating hours unless:
- an active compressor block alarm is present (see *Alarms* table).
- *safety timing* in progress.
If *H31* = 0, the first compressor to be switched off is the one with the highest number of operating hours.

Fixed sequence

If *H31* = 1:
- the compressor (capacity step) with the highest value is only started if the compressor with the lowest value is already running (except when the compressor with the lowest value is in alarm mode).
- The compressor with the lowest value is only switched off if all the *compressors* with the highest values are already off.

5.1.3   Compressor timing

Safety timing

Compressor start-up and shut-down operations must comply with the safety times set by the user using the *parameters* described below.

On/off timing

A safety period must elapse between the start-up and shut-down of a compressor (compressor OFF-ON safety time) controlled by parameter *C01*;
This delay also applies to start-up of the EWCM 400 unit.

On/on timing

A safety period must elapse between two subsequent start-up operations (compressor ON-ON safety time) controlled by parameter *C02*.

OFF-ON and ON-ON sequence compressor 1
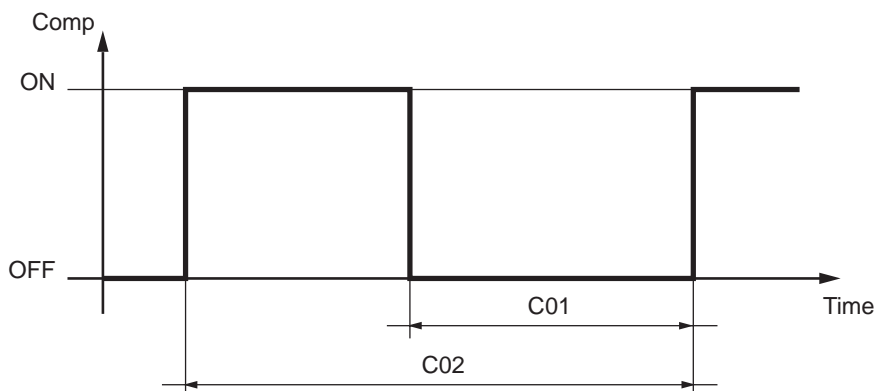
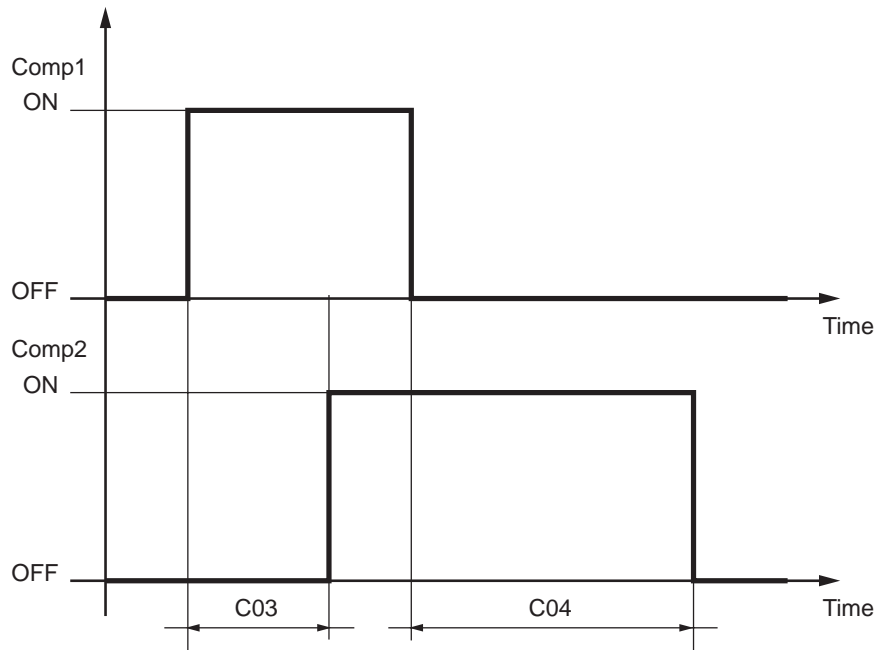| Comp: compressor |
|---|
| Time: time |
| *C01 safety timing* between start-up and shut-down |
| *C02*: *safety timing* between two subsequent start-ups |

ON-ON and OFF-OFF compressor timing

If the systems consists of several *compressors* (or capacity steps), the following must also be checked: the start-up time between 2 *compressors* (*C03*) and the shut-down time between *compressors* (*C04*).
The stop time between *compressors* is not observed if a compressor shut-down alarm is generated. If this is the case, the *compressors* are shut down immediately.

ON-ON and OFF-OFF sequence compressor 2

Comp1: compressor 1
Comp2: compressor 2
Time: time
C03: Period of time elapsing between start-up of two *compressors*
C04: period of time elapsing between shut-down of two *compressors*

5.2 Condensing fan

The EWCM 412 controller has 2 *outputs* for fans:
- TK: 230V~ output for fans with a maximum current of 2A
- TK1: Control signal for CF modules (500w, 1500w, 2200w).

5.2.1 Configuration of condensing fan

The fan must be properly connected to the corresponding output (see *wiring diagram*s).

Proportional or ON-OFF output

The fan output can be configured to operate in *proportional or* ON-OFF mode.
Parameter *F01* is used to select the Triac output mode (TK and TK1):
- 0 = proportional fan output.
- 1 = ON-OFF fan output (complying with hysteresis Diagram 2 – par.. 6.2)
- 2 = ON-OFF fan output in response to request from compressor. In this mode, the fan is started and stopped according to compressor status.

If the output is configured as a proportional TK, the *PICK-UP*, *PHASE SHIFT* AND *IMPULSE DURATION parameters* are significant.

Pick-up

Every time the external fan is started, the heat exchanger fan is powered at maximum voltage and the fan is set to the value of parameter *F17* for a period of time that is equivalent to the value of parameter *F02* (in tenths of seconds). When this period of time has elapsed, the fan continues running at the speed set by the controller.
The speed specified by parameter *F17* can be reached in two ways depending on the value set with parameter *F16*:
- 0 = the controller sets the proportional output to the speed specified with parameter *F17* and maintains it for the period of time set with parameter *F02*.
- 1 = the controller sets the proportional output according to a ramp that is used to reach the speed specified by parameter *F17* within the time set with parameter *F02*.

Phase shift

If defines the delay that can be used to compensate for the different electric characteristics of the fan motors: Parameter *F03* determines the duration, in microseconds * 200, of the fan *phase shift*.

Impulse duration

It defines the duration, in microseconds * 200, of the TK output control impulse and can be set with parameter *F04*.

5.3 Alarm output

Depending on the model type, the *alarm output* is controlled as follows using different *outputs*:
ALL - 12-24 Vac Triac *alarm output* (for EWCM 412 only).
RL - RL05 relay output for alarm control (for models EWCM 415 – EWCM 418)

Polarity

H36 = determines the polarity of the *alarm output*:

0 = the output is active (contact closed) when an alarm is active and the machine is off
1 = the contact is open with the same conditions

Alarm OFF
H38 = establishes whether the alarm is active in Standby mode
0 = inactive *alarm output* in *Stand-by* mode
1 = active *alarm output* in *Stand-by* mode

⚠ **The power supply of the *alarm output* must be kept separate from the power supply of the controller.**

6 TEMPERATURE CONTROL FUNCTIONS

Once the EWCM 400 has been configured, it is ready to control the loads according to the temperature and pressure conditions measured by the *probes* and the *temperature control functions* defined by special *parameters*.

Operating modes

The following *operating modes* are available:
*   cooling/direct.
*   heating/inverse.
*   *stand-by*.

Selection of operating mode

The operating mode is selected using parameter *H37*:
0= cooling/direct function.
1= heating/inverse function.

Stand-by

Stand-by: in this mode the unit does not perform *temperature control functions* and all *alarms* remain active.
The section below describes the menu items:

6.1 Control of compressors – cooling/direct controller

The controller calculates the load to be supplied via the *compressors*.
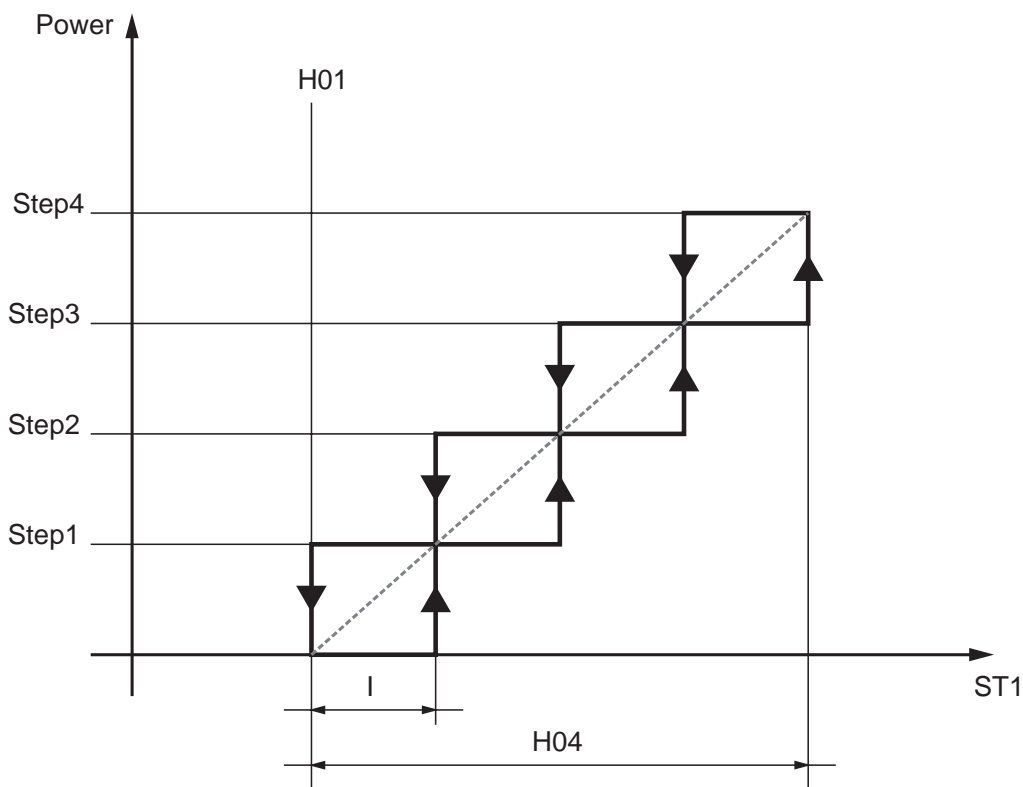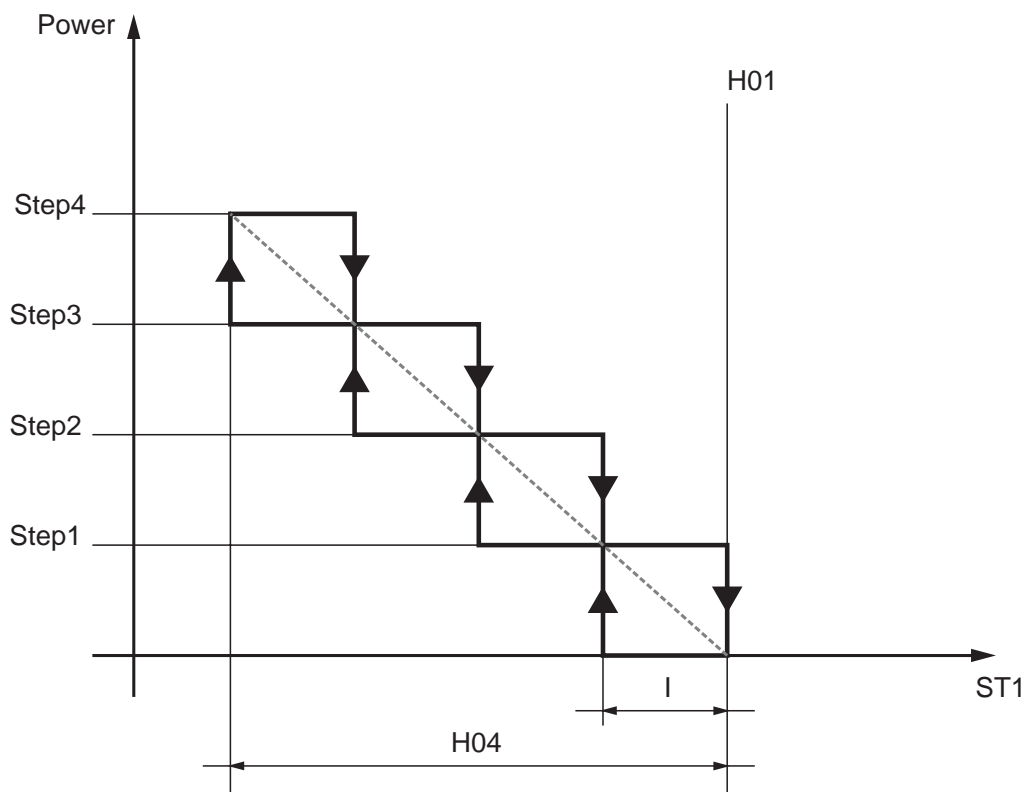Temperature control with regulation *band* around set point in Cooling mode.

Figure 1

Power: power	Step1: 1st step
ST1: ST1 probe	Step2: 2nd step
I: hysteresis	Step3: 3rd step
H04: *band*	Step4: 4th step
H01: set point	

Compressor start-up is controlled by the analogue input ST1. The temperature control function has an adjustable *band* and is set using a maximum of 4 steps. Probe ST1 reads the temperature or pressure of the gas before it is compressed and is shown in the abscissas in the graph in the figure. Axis Y shows the number of steps (depending on configuration).
The intervention points for each step are determined by the set point, *band* value, number of steps. The distance between the intervention points is: (*band H04*)/(number of steps *H30*). This corresponds to the hysteresis for each step.

6.2 Heating/inverse controller

Temperature control with regulation *band* around set point in Heating mode (as alternative to cooling mode).

Power: power	Step1: 1st step
ST1: ST1 probe	Step2: 2nd step
I: hysteresis	Step3: 3rd step
H04: band	Step4: 4th step
H01: set point	

6.3   Condensing fan control

Control of the *condensing fan* depends on condensation pressure.
The controller is active if ST2 is present; if not, the fan goes ON and OFF in response to the *compressors*.

Fan control may be carried out independently of the compressor or when a request is received from the compressor;
The operating mode is set with parameter *F05*:

Parameter	Value	
	0	1
F05	If compressor is off, the fan is off	Condensation control is carried out independently of compressor

If the proportional control requests fan cut-off, this cut-off may be excluded for a period of time equal to *F12* from when the compressor is turned on. If the controller requests cut-off during this period, the fan will run at minimum speed.
The fan control output may be:

Outputs	Model	Description of output signal
Triac output for *condensing fan*s	EWCM 412	Variable voltage (% value, see fan diagram)
Output for *condensing fan* external module	EWCM 412	PWM signal for external module; variable voltage (value corresponds to voltage supplied by module)
Analogue output for *condensing fan*s	EWCM 418	Analogue signal (% value, see fan diagram)

If parameter *F05* is set to 1, condensation control depends on condensation pressure and how the following *parameters* are set:
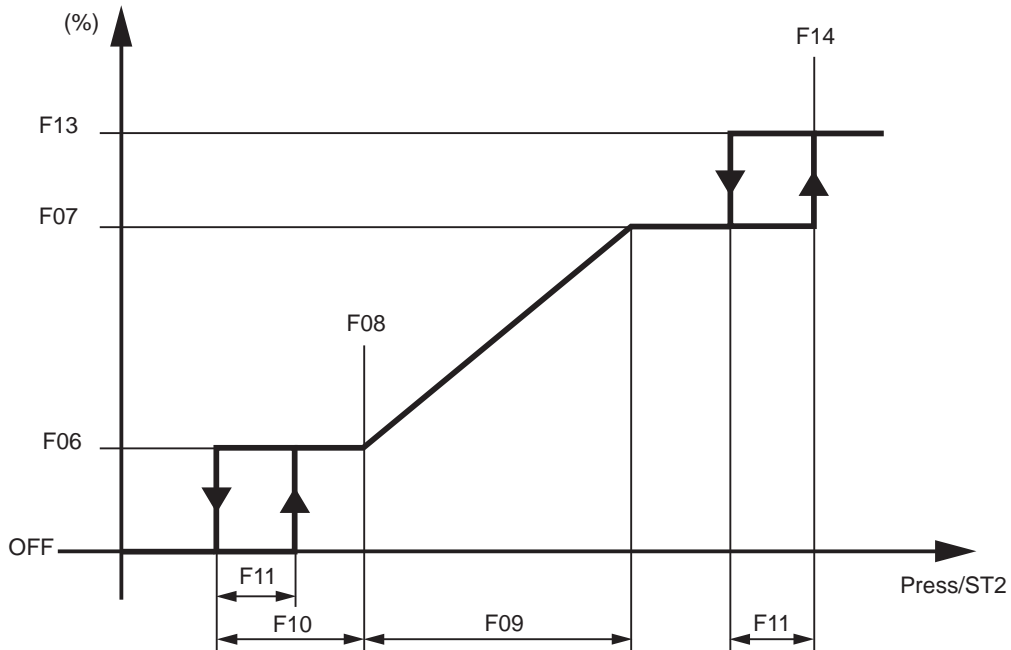
Silent speed

A minimum, maximum and "silent" speed (that corresponds to a "silent" operating mode, for example at night-time) and a proportional *band* within the same range can be set for the fan unit.

The fan is always off if:
*   an alarm indicating that a *condensing fan* has been switched off is present (refer to table of *alarms*).
*   EWCM 400 is in *Stand-by* mode.

Ventilation chart

(%) :Control Value
Press: pressure
F06: minimum fan speed
F07: maximum silent fan speed
F08: minimum fan speed pressure set point
F09: fan proportional *band*
F10: fan cut-off delta
F11: cut-off hysteresis
F13: maximum fan speed
F14: maximum fan speed pressure set point

ON-OFF sequence
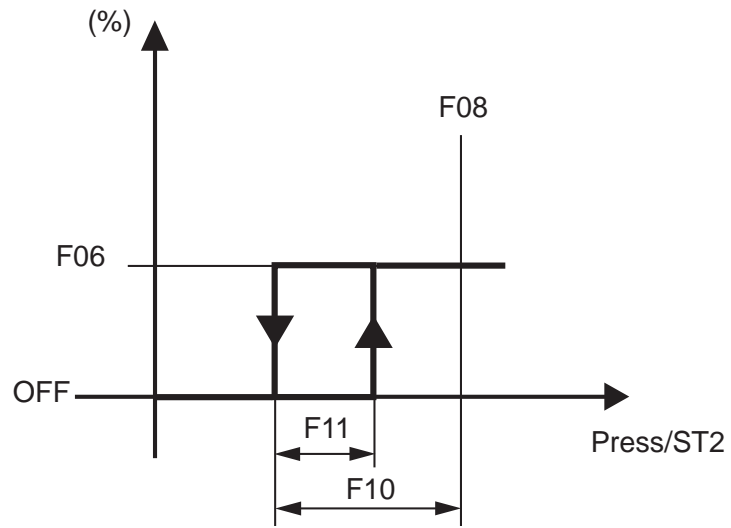
(%) :Control Value
Press: pressure
F08: minimum fan speed pressure set point
F10: fan cut-off delta
F11: cut-off hysteresis

7   FUNCTIONS

7.1   Registration of working hours

The unit stores in the non volatile memory the hours of operation of the 4 *compressors*.
Internal resolution is in minutes.
To *display* the values, it is necessary to access the related menu labeled Ohr (see menu tree).
The integer value is displayed for values below 999, while the hours/100 value along with the decimal point is displayed for values above 999.
1234 hours are displayed as follows:

To reset the hours, it is necessary to access the related menu labeled rES (see menu tree).
In the event of power failure, the last fraction of hour recorded is set to 0, thus the duration is rounded by default:
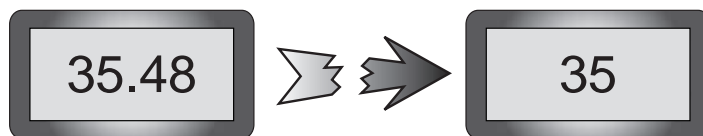
8   PARAMETERS

Parameters can be set to make the EWCM 400 fully configurable.
Parameters can be changed using:
- *keyboard*
- *Copy Card*
- PC (using special connection and software)

8.1   Description of parameters

All the *parameters* are described in detail in the following sections and divided into categories.

8.1.1   Configuration parameters

These *parameters* define the characteristics of the machine. If one or more *parameters* in this category is changed, the controller must be turned off and on again after the change is made in order to operate correctly.

H01	**Set point**
	Used to set the control set point.
H02	**Maximum set point**
	Used to set the maximum set point limit.
H03	**Minimum set point**
	Used to set the minimum set point limit.
H04	**Regulation *band***
	Sets the regulation *band*.
H05	**ST1 configuration**
	Used to configure analogue input ST1.
	0= No probe
	1= Temperature input
	2= Pressure input (4-20mA signal)
H06	**ST2 configuration**
	0= No probe
	1= N.A.
	2= Pressure input (4-20mA signal)
H07	**Pressure top scale value ST1**
H08	**Pressure top scale value ST2**
	Used to set a value that corresponds to a current of 4mA.
H09	**Pressure bottom scale value ST1**
H10	**Pressure bottom scale value ST2**
	Used to set a value that corresponds to a current of 20mA.
H11	**Polarity ID1**
H12	**Polarity ID2**
H13	**Polarity ID3**
H14	**Polarity ID4**
H15	**Polarity ID5**
H16	**Polarity ID6**
H17	**Polarity ID7**
	0= Active with closed contact
	1= Active with open contact
H18	**Configuration of polarity for compressor 1**
H19	**Configuration of polarity for compressor 2**
H20	**Configuration of polarity for compressor 3**
H21	**Configuration of polarity for compressor 4**
	0= Closed relay for active output
	1= Closed relay for inactive output
H22	**Configuration of serial protocol**
	0= Televis protocol
	1= Modbus protocol
H23	**Offset ST1**
H24	**Offset ST2**
	This parameter can be used to compensate for the error that may occur between the temperature (or pressure) reading and the actual value.
H25	**Mains frequency**
	0= mains frequency: 50 Hz
	1= mains frequency: 60 Hz
H26	**Family serial address**
H27	**Device serial address**
	Used to select the serial address. Both normally set to 0.
H28	**User password**
	Can be used to enter the password required to access second level *parameters*.
	0= Password deactivated (all *parameters* can be viewed)
	>0= Password activated
H29	**Position of decimal point**
	0= decimal point not present
	1= decimal point after first decimal digit (i.e. 13.5)
	2= decimal point after second decimal digit (i.e. 1.35)
H30	**Number of *compressors***
	1= 1 compressor
	2= 2 *compressors* (or 2 steps)
	3= 3 *compressors* (or 3 steps)
	4= 4 *compressors* (or 4 steps)

H31	**Compressor start-up sequence** 0= *balancing of operating hours* (recommended for ordinary *compressors*) 1= *fixed sequence* (MANDATORY for *compressors* with capacity steps)

If *H31* = 1, the temperature control alarm on compressor 1 switches all the compressor loads off; generally speaking, the alarm associated to digital input N switches loads N,N+1,N+2,... off (see Alarm section).

H32	**Number of *compressors* ON with ST1 error** Used to set the number of *compressors* that should continue running when a probe ST1 error occurs.
H33	**Selection of degrees °C or °F** 0= degrees °C 1= degrees °F
H34	**Customer code 1** This is a number from 0 to 999 that the user can set for internal use.
H35	**Customer code 2** This is a number from 0 to 999 that the user can set for internal use.
H36	**Polarity of alarm relay** 0 = the output is active (contact closed) when an alarm is active and the machine is off 1 = the contact is open with the same conditions

If *H36* = 0, the contact is closed as soon as the unit is started for the whole duration of the lamp test.

H37	**Cooling/Heating regulation mode** 0 = Cooling mode regulation 1 = Heating mode regulation
H38	**Enable output *alarms* in off mode** 0 = inactive *alarm output* in OFF or *stand-by* mode 1 = active alarm mode in OFF or *stand-by* mode
H39	**Configuration of optional card** 0 = N.A. 1 = 4-20mA fan speed output 2 = 0-10V fan speed output

8.1.2 Alarm parameters

A01	**Low pressure pressure switch by-pass time.** It determines the delay between start-up of the compressor and start-up of the low pressure digital alarm *diagnostics*. It is expressed in seconds.
A02	**Number of low pressure events per hour** Used to set the number of low pressure digital alarm events per hour. If the number is exceeded, the alarm is switched from automatic to manual reset.
A03	**Compressor activated compressor alarm by-pass time** Used to set a delay for activating the compressor alarm triggered by start-up of compressor. It is expressed in seconds.
A04	**Number of alarm events/hour for *compressors* 1-4** Used to set the number of compressor alarm events per hour. If the number is exceeded, the alarm is switched from automatic to manual reset.
A05	**Not used**
A06	**High pressure activation set point on analogue input** Used to set a condensation pressure value above which the high pressure alarm is activated.
A07	**High pressure hysteresis on analogue input** Used to set the differential for the high pressure alarm on the analogue input.
A08	**Low pressure activation bypass time on analogue input** Used to set a delay for activation of low pressure analogue alarm triggered by start-up of the compressor. It is expressed in seconds.
A09	**Low pressure activation set point on analogue input** Used to set a temperature/pressure value below which the low pressure alarm is activated.
A10	**Low pressure hysteresis on analogue input** Used to set the differential for the low pressure analogue alarm.
A11	**Number of low pressure events/hour on analogue input** Used to set the number of low pressure analogue alarm events per hour. If the number is exceeded, the alarm is switched from automatic to manual reset.
A12	**Number of analogue input high pressure events/hour** Used to set the number of high pressure analogue alarm events per hour. If the number is exceeded, the alarm is switched from automatic to manual reset.
A13	**Number of digital input high pressure events/hour** Used to set the number of high pressure digital alarm events per hour. If the number is exceeded, the alarm is switched from automatic to manual reset.

8.1.3 Compressor parameters

C01	**OFF-ON safety time** The minimum period of time that must elapse between turning off the compressor and turning it on again. It is expressed in tens of seconds.
C02	**ON-ON safety time** The minimum period of time that must elapse between two subsequent switch-ons of the compressor. It is expressed in tens of seconds.
C03	**Interval between compressor 1 – compressor 2 start-up (step)** Used to set a delay between one compressor start-up and the next.
C04	**Interval between compressor 1 – compressor 2 shut-down (step)** Used to set a delay between one compressor shut-down and the next.

8.1.4 Fan parameters

F01 **Fan output configuration**
0 = proportional TK output
1 = ON-OFF TK output (without capacity step)
2 = ON-OFF TK output in response to request from compressor

F02 **Fan *pick-up* time**
Time the fan runs at maximum speed (*F17*) after a restart (*pick-up*).

F03 **Fan *phase shift***
Used to adapt output to different types of fans.

F04 **Duration of Triac activation impulse**
Used to vary the length of the Triac impulse.

If external DRV control boards are used, set *F04* = 30.

F05 **Operation in response to compressor request**
0 = if all the *compressors* are off and fan is off
1 = if the condensation control is carried out independently from the *compressors*

F06 **Minimum speed**
Minimum value for proportional regulation of fans. It is expressed as a percentage, from 0 to 100%, of the maximum permitted voltage.

F07 ***Silent speed***
Maximum value for proportional regulation of fans. It is expressed as a percentage, from 0 to 100%, of the maximum permitted voltage.

F08 **Minimum fan speed pressure set point**
Pressure condensation value that corresponds to the minimum speed.

F09 **Proportional *band***
Pressure differential corresponding to a change from minimum to maximum fan speed.

F10 **Cut-off differential**
Condensation pressure differential within which fan continues at minimum speed.

F11 **Cut-off hysteresis**
Condensation pressure differential for fan shut-down.

F12 **Cut-off bypass time**
Used to select a delay between activation of the cut-off function and fan start-up. It is expressed in seconds.

F13 **Maximum speed**
Used to set a speed step for a specific pressure value.

F14 **Maximum fan speed pressure set point**
Condensation pressure value that corresponds to the fan speed set with parameter *F13*.

F15 **Pre-ventilation**
Used to set a pre-ventilation time before compressor start-up.

F16 **Way to reach maximum *pick-up* speed**
Specifies how to reach the maximum *pick-up* speed (*F17*):
0 = maximum speed is reached immediately
1 = maximum speed is reached proportionally at the end of the time set for parameter *F02*

F17 **Maximum pickup speed**
Used to set the maximum *pick-up* speed (as a percentage).

8.2   Table of parameters

The following table summarizes all the EWCM 400 *parameters*.

Configuration (CNF) parameter table

CONFIGURATION PARAMETERS*				
Par.	Description	Value	Limits	Unit
H01	Set point	45	*H03* ÷ *H02*	°C--kPa*10
H02	Maximum set point	700	*H03* ÷ *H09*	°C/10--kPa*10
H03	Minimum set point	-100	*H07* ÷ *H02*	°C/10--kPa*10
H04	Regulation *band*	20	0 ÷ 900	°C/kPa*10
H05	ST1 configuration	2	0 ÷ 2	Num
H06	ST2 configuration	2	0 ÷ 2	Num
H07	Pressure top scale value ST1	-100	-99.9 ÷ *H09* **	Num **
H08	Pressure top scale value ST2	0.0	-99.9 ÷ *H10*	kPa*100
H09	Pressure bottom scale value ST1	700	*H07* ÷ 999 **	Num **
H10	Pressure bottom scale value ST2	30.0	*H08* ÷ 99.9	kPa*100
H11	Polarity ID1	0	0 ÷ 1	Flag
H12	Polarity ID2	0	0 ÷ 1	Flag
H13	Polarity ID3	0	0 ÷ 1	Flag
H14	Polarity ID4	0	0 ÷ 1	Flag
H15	Polarity ID5	0	0 ÷ 1	Flag
H16	Polarity ID6	0	0 ÷ 1	Flag
H17	Polarity ID7	0	0 ÷ 1	Flag
H18	Configuration of polarity compressor 1	0	0 ÷ 1	Flag
H19	Configuration of polarity compressor 2	0	0 ÷ 1	Flag
H20	Configuration of polarity compressor 3	0	0 ÷ 1	Flag
H21	Configuration of polarity compressor 4	0	0 ÷ 1	Flag
H22	Configuration of serial protocol	0	0 ÷ 1	Flag
H23	Offset ST1	0	-12.7 ÷ 12.7	°C--kPa*10
H24	Offset ST2	0	-12.7 ÷ 12.7	kPa*10
H25	Mains frequency	0	0 ÷ 1	Flag
H26	Family serial address	0	0 ÷ 14	Num

H27	Device serial address	0	0 ÷ 14	Num
H28	User password	***	0 ÷ 255	Num
H29	Position of decimal point	2	0 ÷ 2	Num
H30	Number of *compressors*	4	1 ÷ 4	Num
H31	Compressor start-up sequence	0	0 ÷ 1	Flag
H32	Number of *compressors* ON with error on ST1	0	0 ÷ *H30*	Num
H33	Selection of degrees °C or °F	0	0 ÷ 1	Flag
H34	Customer code 1	0	0 ÷ 999	Num
H35	Customer code 2	0	0 ÷ 999	Num
H36	Polarity of *alarm output*	0	0 ÷ 1	Flag
H37	Cooling/Heating regulation mode	0	0 ÷ 1	Flag
H38	Enable output *alarms* in off state	1	0 ÷ 1	Flag
H39	Configuration of optional board	2	0 ÷ 2	Flag

- * If the *parameters* in this category are changed, the controller must be turned off and then on again after the change in order to operate correctly.
- ** The range also depends on the value of *parameters H29* and *H33*
- ***See paragraph 6.4 Password

Alarm (ALL) parameter table

ALARM PARAMETERS				
Par.	Description	Value	Limits	Unit
A01	Low pressure pressure switch bypass time from compressor	0	0 ÷ 255	Seconds
A02	Number of low pressure events per hour	0	0 ÷ 255	Num
A03	Compressor activated compressor alarm bypass time	0	0 ÷ 255	Seconds
A04	Number of alarm events/hour for compressor 1-4	0	0 ÷ 255	Num
A05	Not used	-	-	-
A06	High pressure activation set point on analogue input	90	0 ÷ 90.0	kPa*100
A07	High pressure hysteresis on analogue input	10	0 ÷ 25.5	kPa*100
A08	Low pressure activation bypass time on analogue input	0	0 ÷ 255	Seconds
A09	Low pressure activation set point on analogue input	-10	-50.0 ÷ 80.0	kPa*100
A10	Low pressure hysteresis on analogue input	10	0 ÷ 25.5	kPa*100
A11	Number of low pressure events per hour on analogue input	0	0 ÷ 255	Num
A12	Number of high pressure events per hour on analogue input	0	0 ÷ 255	Num
A13	Number of high pressure events per hour on digital input	0	0 ÷ 255	Num

Compressor (CP) parameter table

COMPRESSOR PARAMETERS				
Par.	Description	Values	Limits	Unit
C01	ON-OFF safety time	6	0 ÷ 255	Seconds*10
C02	ON-ON safety time	6	0 ÷ 255	Seconds*10
C03	Interval between compressor 1 – compressor 2 start-up	30	0 ÷ 255	Seconds
C04	Interval between compressor 1 – compressor 2 shut-down	10	0 ÷ 255	Seconds

→ *Fan parameters*

Fan (FAN) parameter table

FAN PARAMETERS				
Par.	Description	Value	Limits	Unit
F01	Fan output mode	0	0 ÷ 3	Num
F02	Fan *pick-up* time	50	0 ÷ 255	Seconds/10
F03	Fan *phase shift*	5	0 ÷ 100	%
F04	Duration of Triac activation impulse	5	0 ÷ 255	μs/10
F05	Operation in response to compressor request	1	0 ÷ 1	Flag
F06	Minimum speed	40	0 ÷ 100	%
F07	*Silent speed*	90	0 ÷ 100	%
F08	Minimum fan speed pressure set point	20	-50.0 ÷ 80.0	kPa*100
F09	Proportional *band*	20	0 ÷ 25.5	kPa*100
F10	Cut-off differential	30	0 ÷ 25.5	kPa*100
F11	Cut-off hysteresis	10	0 ÷ 25.5	kPa*100
F12	Cut-off bypass time	80	0 ÷ 255	Seconds
F13	Maximum speed	100	0 ÷ 100	%
F14	Maximum fan speed pressure set point	25	-50.0 ÷ 80.0	kPa*100
F15	Pre-ventilation	0	0 ÷ 255	Seconds
F16	Way to reach maximum *pick-up* speed	0	0 ÷ 1	Flag
F17	Maximum pickup speed	100	0 ÷ 100	%

9   DIAGNOSTICS

Alarms

EWCM units can perform full system *diagnostics* by reporting a series of *alarms*.
Alarms can be activated and reset using *parameters A01 – A13*.
Some *alarms* can be de-activated for a period of time determined by the relative parameter.

Number of events per hour

Units are also able to count the number of events for specific *alarms*: if the number of *alarms* in the last hour exceeds the threshold set with parameter *A04*, the alarm switches from automatic to manual reset mode.
Alarms are sampled every 225 seconds.

If parameter *A04* = 0, automatic resetting is inactive. If this is the case, resetting can only be performed manually.

Example: if the number of events is set to 3, the alarm must last from 2*225 seconds to 3*225 seconds so that is can switch from automatic to manual reset.

| A: automatic reset |
| M: manual reset |
| Alarm: alarm |
| Sampling: sampling |
| Time: time |
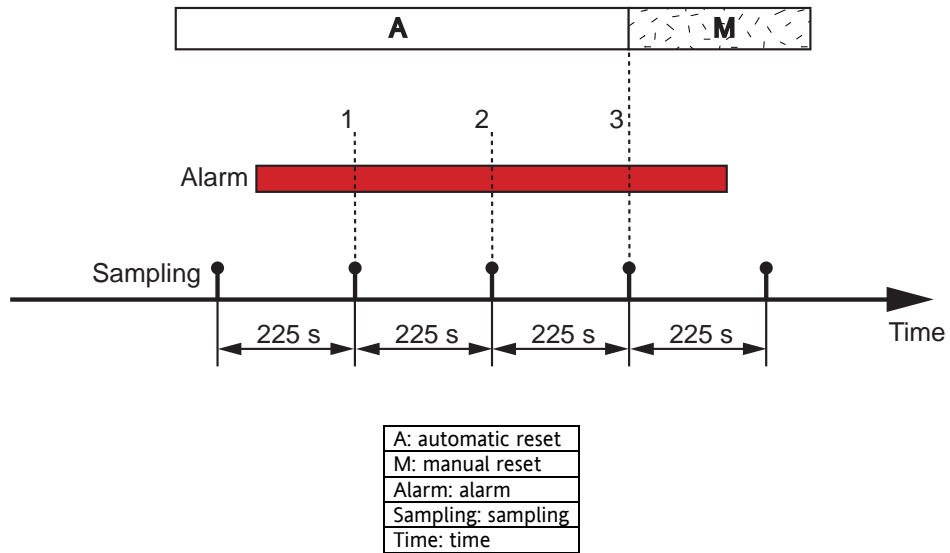
If an alarm is triggered more than once in one sampling period (225 seconds), it will only be counted once.

To reset *alarms* configured for manual reset, press and release the "Set" button.

Manual resetting stops the corresponding loads and prompts the operator to take the necessary corrective action (resetting the alarm using the "Set" button). Manually reset *alarms* are used to signal potential problems that could damage the system.

9.1   List of alarms

When an alarm is triggered, it has two effects:
• The corresponding loads are shut down
• The alarm appears on the *keyboard display*

The alarm message consists of an "Enn" code (where nn stands for a two digit number that identifies the type of alarm; i.e. E00, E13 E23....).
The following table lists all possible *alarms* with their codes and the loads that are shut down:

CODE	RESOURCE	SIGNAL	DESCRIPTION	LOADS SHUT DOWN					BY-PASS	RESET
				COMP1	COMP2	COMP3	COMP4	FAN		
E00	ID5	Remote ON-OFF		OFF	OFF	OFF	OFF	OFF		
E01	ID6	Maximum pressure		OFF	OFF	OFF	OFF			Reset is automatic if *number of events per hour* is equal to value set in parameter *A13*. If exceeded, it switches to manual.
E02	ID7	Minimum pressure		OFF	OFF	OFF	OFF	OFF	Not active while *A01* time is counted from compressor start-up.	Reset is automatic if *number of events per hour* is equal to value set in parameter *A02*. If exceeded, it switches to manual.
E11	ST2	Maximum pressure (analogue)	Activated when condensation probe ST2 reads a value exceeding value in *A06*.	OFF	OFF	OFF	OFF		Deactivated when pressure is below *A06 – A07*.	Reset is automatic if *number of events per hour* is equal to value set in parameter *A12*. If exceeded, it switches to manual.
E12	ST2	Minimum pressure (analogue)	Activated when condensation probe reads a value below value in *A09*.	OFF	OFF	OFF	OFF	OFF	Deactivated when temperature/pressure is above *A09 + A10*. Alarm is inactive while *A08* time is counted from compressor start-up.	Reset is automatic if *number of events per hour* is equal to value set in parameter *A11*. If exceeded, it switches to manual.
E06	ST2	ST2 probe fault	Activated if probe ST2 shorts or is switched off or if probe thresholds are exceeded (2mA-22mA).					(**)		
E40	ST1	ST1 probe fault	Activated if probe ST1 shorts or is switched off or if probe thresholds are exceeded (-50°C.. 100°C if it has been configured as temperature input, 2mA-22mA if configured as current input).	OFF(*)	OFF(*)	OFF(*)	OFF(*)			
E03	ID1	Alarm compressor 1 (*H31* = 0)		OFF					Not active while *A03* time is counted from compressor start-up.	Reset is automatic if *number of events per hour* is equal to value set in parameter *A04*. If exceeded, it switches to manual.
E03	ID1	*Alarms* compressor 1 (*H31* = 1)		OFF	OFF	OFF	OFF		Not active while *A03* time is counted from compressor start-up.	Reset is automatic if *number of events per hour* is equal to value set in parameter *A04*. If exceeded, it switches to manual.

CODE	RESOURCE	SIGNAL	DESCRIPTION	LOADS SHUT DOWN					BY-PASS	RESET
				COMP1	COMP2	COMP3	COMP4	FAN		
E13	ID2	Alarm compressor 2 (*H31* = 0)			OFF				Not active while *A03* time is counted from compressor start-up.	Reset is automatic if *number of events per hour* is equal to value set in parameter *A04*. If exceeded, it switches to manual.
E13	ID2	Alarm compressor 2 (*H31* = 1)			OFF	OFF	OFF		Not active while *A03* time is counted from compressor start-up.	Reset is automatic if *number of events per hour* is equal to value set in parameter *A04*. If exceeded, it switches to manual.
E23	ID3	Alarm compressor 3 (*H31* = 0)				OFF			Not active while *A03* time is counted from compressor start-up.	Reset is automatic if *number of events per hour* is equal to value set in parameter *A04*. If exceeded, it switches to manual.
E23	ID3	Alarm compressor 3 (*H31* = 1)				OFF	OFF		Not active while *A03* time is counted from compressor start-up.	Reset is automatic if *number of events per hour* is equal to value set in parameter *A04*. If exceeded, it switches to manual.
E33	ID4	Alarm compressor 4 (*H31* = 0)					OFF		Not active while *A03* time is counted from compressor start-up.	Reset is automatic if *number of events per hour* is equal to value set in parameter *A04*. If exceeded, it switches to manual.
E33	ID4	Alarm compressor 4 (*H31* = 1)					OFF		Not active while *A03* time is counted from compressor start-up.	Reset is automatic if *number of events per hour* is equal to value set in parameter *A04*. If exceeded, it switches to manual.

(*) The number of *compressors* running when an alarm is generated (probe ST1) varies according to the value set for parameter *H32*.
(**) If an alarm occurs (probe ST2), the fan runs at the maximum speed if at least one compressor is on.

The following tables summarize the *alarms*. They are divided into two groups (digital and analogue).

TABLE OF *DIGITAL ALARMS*

Digital alarms

Name of alarm	Bypass trigger event	Bypass time	Number alarm events/hour
High pressure alarm	None	Not present	*A13*
Low pressure alarm	Compressor start-up	*A01*	*A02*
Protection of compressor 1,2,3,4	Compressor start-up	*A03*	*A04*

Analogue alarms

TABLE OF *ANALOGUE ALARMS*

Name of alarm	Event	Bypass time	Trigger SET POINT	Hysteresis	Number alarm events/hour	Control probe
High condensation pressure alarm	None	Not present	*A06*	*A07* negative	*A12*	ST2
Low condensation pressure alarm	Compressor start-up	Par *A08*	*A09*	*A10* positive	*A11*	ST2

10 TECHNICAL DATA

10.1 Technical data

	Typical	Min.	Max.
Supply voltage	12V~	10V~	14V~
Supply frequency	50Hz/60Hz	---	---
Power	5VA	---	---
Class of insulation	1	---	---
Operating ambient temperature	25°C	-5°C	60°C
Operating ambient humidity (non condensing)	30%	10%	90%
Ambient storage temperature	25°C	-20°C	85°C
Ambient storage humidity (non condensing)	30%	10%	90%

10.2 Electromechanical data

Digital *outputs* 120/240 V	• Up to 5 2A ¼ hp 240V~; 1/8 hp 120V~ • 1 TRIAC 2A **(only for EWCM 412)**
Analogue output 0...10 V/ 4...20mA	• For the direct management of an inverter module **(only for EWCM 418)**
Outputs 24 V~	• 1 TRIAC output, non optic insulation, 500 mA max.
Analogue inputs	• 1 4...20 mA transducer • 1 configurable input: 4...20 mA transducer or temperature sensor, range -30°C ÷ 90°C
Digital inputs	• 7 voltage free *digital inputs*
Terminals and connectors	• 1 9-way snap-on high voltage connector AWG 16-28 • 1 16-way snap-on high voltage connector, pitch 4.2, AWG 16-28 • 1 5-way p2,5 5 connector with remote control and *copy card*, AWG 24-30 • 1 3-way p2,5 connector for the direct management of an inverter module **(only for EWCM 418)**
Display and *LEDs*	• 3 digits + sign • 5 red *LEDs*
Keys	• 2 keys
Serial terminals	• 1 serial TTL terminal

Transformer The unit must be powered by means of an adequate *transformer* with the following characteristics:

- Primary voltage: 230V~±10%; 110V~±10%
- Secondary voltage: 12V~
- Supply frequency: 50Hz; 60Hz
- Power: 5VA;

10.3 Dimensions

Dimensions: Front panel 32x74 mm, depth: (see layout)
Casing: PC+ABS plastic resin with UL94-V0 fire retardant class
Mounting: Panel, on 71x29 mm hole
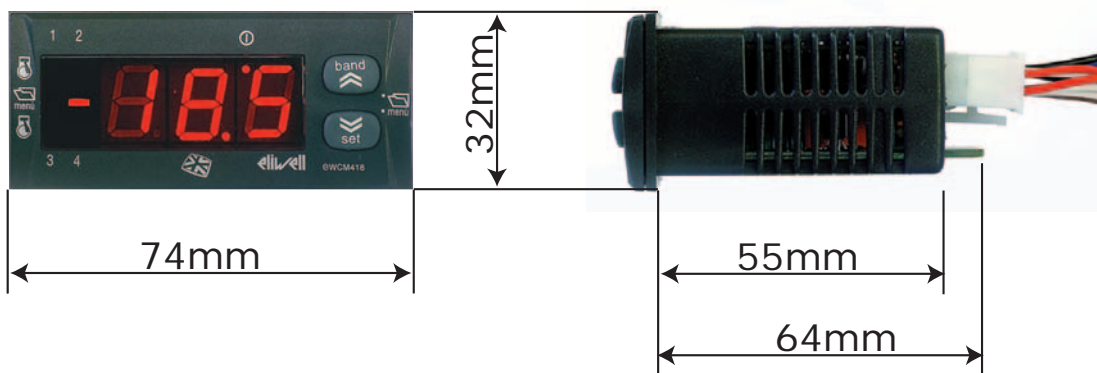
10.4 Standards

The unit complies with the following European Union Directives:
- EU Directive 73/23/EEC and subsequent amendments
- EU Directive 89/336/EEC and subsequent amendments

And is compliant with the following harmonized *standards*
- LOW VOLTAGE: EN60730-2-6 and EN60730-2-9

10.5 Approvals

UL approvals | UL E206120

11 USE OF DEVICE

11.1 Recommended use

This unit is designed to control chillers and heat pumps with 1 circuit.

For safety purposes, it is important to make sure that the control device is installed and used in accordance with the instructions supplied and that no parts subject to dangerous voltage are accessible to users during ordinary operation. The unit must be resistant to water and dust, depending on the application, and be accessible only by means of tools. This unit is suitable to be fitted on domestic appliances and/or equivalent units employed for air conditioning.
In accordance with reference standard, this unit is classified as:
- Electronic automatic control suited to be installed in standalone configuration or to be mounted on other units, in relation to its manufacturing characteristics.
- As a Type 1 control unit, in relation to its operating characteristics, manufacturing tolerances and derivatives.
- As Class 2 device, in relation to its resistance to electric shocks
- As Class A device, in relation to its class and the structure of its software

11.2 Forbidden use

The use of the unit for applications other than those described is forbidden.
It is worth remembering that the supplied relay contacts are functional and may be subject to failures (as the electronics controlling them may short circuit these relays or leave them open). For this reason, it is advisable to install the protection devices recommended in product specifications or other equivalent devices on the outside of the unit.

12 RESPONSIBILITIES AND RESIDUAL RISKS

Eliwell shall not be liable for any damages deriving from:

- *installation*/use other than that prescribed and, in particular, that which does not comply with safety *standards* anticipated by regulations and/or those given herein;
- use on boards which do not guarantee adequate protection against electric shock, water or dust under the conditions of assembly applied;
- use on boards which allow access to dangerous parts without the use of tools;
- tampering with and/or alteration of the products;
- *installation*/use on boards not complying with the *standards* and provisions of current legislation.

13 DISCLAIMER

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Although all possible measures have been taken by **Eliwell Controls srl l.** to guarantee the accuracy of this document, it does not accept any responsibility arising out of its use.

Name	Code	Description
EWCM 412	EM4A150300	Compressor set controller: • power supply 12V~ 50/60Hz; • power 5VA; • IP65-rated front protection; • plastic casing 32x74 mm; • panel holes 29x71 mm; • 1 NTC or 4...20mA analogue input for inlet • 1 4...20mA analogue input for condensation; • 7 *digital inputs* for *alarms*; • 4 relay *outputs* for *compressors*; • 1 TTL serial port; • 1 Triac output with phase step; • 1 12-24Vac Triac output for alarm management • 1 PWM output for connection to fan modules.
EWCM 415	EM4A150350	Same as EWCM 412, but with the following differences: • 1 relay output for additional *compressors* (for a total of 5 *outputs*) **NOT PRESENT** • not equipped with Triac and PWM *outputs*.
EWCM 418	EM4A150370	Same as EWCM 415, but with the following differences: • not equipped with 4...20mA/0...10V inverter output.
TRANSFORMER	TF411200([1])	230V~/12A 5.6 VA VDE *transformer*.
COPY CARD (optional)	MW320500	Parameter programming key.
WIRING	COHV0100([1])	Load control cable (connector + 1 m long cables)
	COLV0100([1])	Cable (connector + 1 m long cables) to connect low voltage inputs and *outputs*.
	CORK0100([2])	Cable for 0...10V or 4...20mA analogue output
FILTER	FT111201	LC filter, mains filter, recommended for applications with fan speed modulation.
PROBE([3])	SN691150	NTC temperature probe 103AT 1.5 m (plastic).
	SN8S0A1500	NTC temperature probe, 6X40 1.5m SILICON (metal).
	SN8S0A3000	NTC temperature probe, 6X40 3m SILICON (metal).
PRESSURE TRANSDUCER	TD200130([4])	EWPA 030 4 pressure transducer...20mA 0/30bar
	TD200107([5])	EWPA 007 pressure transducer 4...20mA -5/8bar.
THREE-PHASE FAN CONTROLLER (DRV 300) ([6])	LD312420T1S00	*Technical data*: • power supply 12A, 420V~ • casing: IP55.
	LD320420T1S00	*Technical data*: • power supply 20A, 420V~; • casing: IP55.
	LD312420T1G00	*Technical data*: • power supply 12A, 420V~; • casing: IP22.
	LD320420T1G00	*Technical data*: • power supply 20A, 420V~; • casing: IP22.
FAN MODULES CFS ([6])	For p/n (part numbers) **--> see instructions sheet 8FI40014 CFS - Fan Speed Modules GB-I-E-D-F**	
FAN MODULE CF-REL	MW991300	Open board to switch *condensing fan*s ON/OFF. The card is controlled by a PWM signal. Characteristics of this model: • on-board relay; • maximum current of 6A; • Faston connectors.
RS 232 cable	1500128	Length 1.8 m ([7])
TTL cable	1500180	Length 0.3 m (30 cm) ([8])
Param Manager + PCIInterface2150	SLP05XX000100 + PCI5A3000000	Software used to control unit from a PC Param Manager + Interface module also called PCI
Bus Adapter 150	BA10000R3700	Interface module for multipoint ModBus

([1]) Needed for all models

(²) Needed for model EWCM 418
(³) Used as alternative to pressure transducer: for inlet inputs
(⁴) Needed for condensation input
(⁵) Recommended for condensation input as an alternative to temperature probe
(⁶) As alternative to other fan control modules
(⁷) Other lengths available. We recommend using a 1.8 m long cable. The maximum length varies according to data transmission speed.
(⁸) Other lengths available. We recommend using a 0.3 m long cable. Longer lengths may be used depending on electromagnetic disturbance in the environment.

GENERAL NOTES:
  • COHV and COLV cables are not required if they are supplied directly by the manufacturer.
  • Eliwell also offers several types of NTC *probes* that vary according to the type or length of cable (PVC or silicone) installed.

NOTE: EWCM 400 must be used with a *transformer*, cabling and relative *probes*.

14.1   CFS modules

CFS series units are optional modules that when connected to main control modules allow the speed of single-phase fans to be adjusted with currents
ranging from 2 A to 9 A.
They have an "open board" format and several different models are available.
--> see instructions sheet 8FI40014 CFS - Fan Speed Modules GB-I-E-D-F

14.2   DRV modules

If you use a DRV three-phase fan module, refer to the following diagram:

Wiring diagram for DRV modules
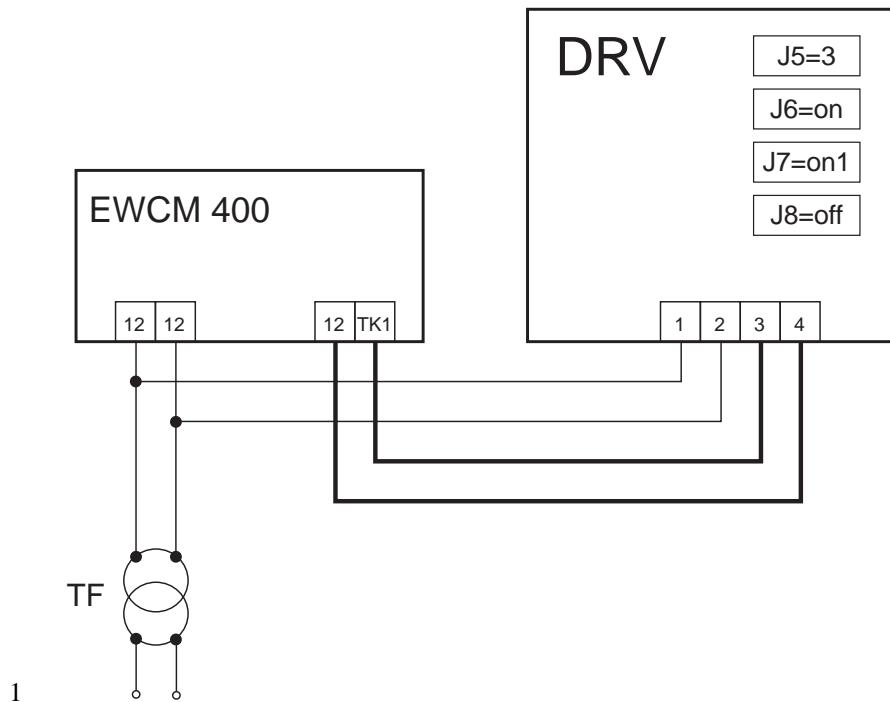
| TF: *transformer* |
| DRV: three-phase fan controller |
| EWCM 400: EWCM family controller |

14.3   Transformer

14.4   Copy Card

Copy Card

This device can be used to upload and download the EWCM 400 parameter map.

Copy Card, ¾ view

The following conventions apply:
- UPLOAD involves copying *parameters* from a unit to the COPYCARD
- DOWNLOAD involves copying the *parameters* from the *COPY CARD* to a unit

14.5   Probes

A

B

C: Pressure probe EWPA007
D: NTC temperature probe

14.6   Param Manager + PCInterface2150

If you have a Personal Computer running Windows 95 or higher, Param Manager software, the PCI 2150 interface module and suitable wiring, you can control all the EWCM 400 *parameters* from a PC.

-->   **see instruction sheet 9IS43083 PCInterface 2150 series 5 languages**
-->   **see user manual 8MA10006 Param Manager GB**

15 ANALITIC INDEX