AERMEC

PRECISION AIR CONDITIONERS

USER MANUAL

R410A

EN

P-G-R-TMC

CE

20.11 - 5895970_01

SYMBOLS

NOTE!
This symbol is used to indicate helpful hints for the operator.

ATTENTION! DANGER!
This symbol is used to indicate situations or operations that may be potentially dangerous or that require the operator's attention.

The Manufacturer adopts a policy of continuous development and therefore reserves the right to make changes and improvements to any product described in this document without prior notice. Technical data and dimensions are not binding.

CLOSE CONTROL
AIR CONDITIONERS

TECHNICAL MANUAL

USE AND MAINTENANCE
SURVEY³
ELECTRONIC REGULATOR

Software version 3.0

List of revisions				
Revision	**Date**	**Author**	**Chapters**	**Descriptions**
A	05/2015	AF	All	First version
B	10/2017	AF	All	Revision for software version 2.1
D	04/2018	AF	All	Revision for software version 2.1.4
E	10/2018	AF	All	Revision for software version 2.2
F	03/2020	AF	All	Revision for SURVEY³ software version 3.0

CONTENTS

WARRANTY CONDITIONS

All Products of the Manufacturer or bearing the trademark of the Manufacturer are built according to the state of the art techniques, in compliance with the current reference standards, as stipulated in the certificate of conformity provided together with the products.

All Products of the Manufacturer or bearing the trademark of the Manufacturer are designed to be installed inside a system that controls them. The designer or installer of the product assumes all liability and risk relating to its installation in the destination system.

The Manufacturer and its Branches/Affiliates do not guarantee that all aspects of the product and any software included will comply with the requirements of the destination system. In this case, following specific agreements, the Manufacturer can act as a consultant for the successful start-up of the product, but will not be held liable, under any circumstances, for the smooth operation of the destination system.

All Products of the Manufacturer or bearing the trademark of the Manufacturer are subject to the following warranty which is deemed as entirely accepted and signed at the time of placing the order.

The warranty on the Products is valid for (1 year) starting from the bill date.

WARRANTY RESTRICTIONS

The above mentioned warranty conditions are valid as long as the Customer has fulfilled all obligations according to the contract and in particular those relating to payment. A delayed payment or non-payment of the supply, even if partial, suspends any warranty. The warranty does not give the Customer any right to suspend or delay payments, which must be paid in any case according to the stipulations of the order and specified in the written order confirmation.

Without precluding due compliance with other instructions provided in the technical documentation supplied with the product, it must be noted that the following instructions must be complied with accordingly, in order for the warranty to be valid:

Transport and positioning

- Do not remove the product from its original packaging until it has reached the installation site.
- Do not drop, knock or shake the product, as the internal circuits and mechanisms may be irreparably damaged.
- Store the product in an environment that complies with the temperature and humidity limits specified in the technical documentation.

Installation

1) The product must be installed by skilled personnel who fulfil the adequate requisites for the task as defined by the regulations in the country where positioning and installation take place.
2) The system that will control the product must be implemented according to professional standards, according to the instructions provided in the technical documentation and the regulations of the country where positioning and installation take place, with particular attention to the setting up of:

- Water or cooling lines serving the product and the relevant components.
- Electrical power and connection lines of the product and the relevant components.
- Aeraulic lines of the product and the relevant components.

3) Do not install the product outdoors or in areas that are subject to adverse weather.
4) Do not install the product in areas where there is oil, or where there are oil vapours or various kinds of aerosols, and where there are flammable vapours.
5) Do not install the product in environments where there is equipment that generates electromagnetic waves, and where the line voltage is subject to great fluctuations.
6) Do not install the product in environments where the air contains corrosive pollutants, a high dust or salt content.
7) Do not install the product on vehicles or boats.

First start-up

1) The product must be started up by skilled personnel who fulfil the qualification requisites for the task as defined by the regulations in the country where positioning and installation take place.
2) The system controlling the units must be started up according to professional standard, according to the instructions provided in the technical documentation and the regulations of the country where positioning and installation take place.
3) A copy of the technical start-up report of the product must be delivered to the Manufacturer.

Use and maintenance

1) Do not use the product for applications other than those specified in the technical documentation.
2) Do not use the product in an environment that does not comply with the temperature and humidity limits specified in the technical documentation.
3) Perform maintenance cycles according to the schedules specified in the technical documentation.
4) Clean the product with neutral detergents. Do not use corrosive chemicals and solvents or aggressive detergents.

Furthermore, the Manufacturer reserves the right to void the warranty of the products sold if:

A) The labels or plates bearing the trademark of the Manufacturer and the serial number or the registration number of the product have been deleted and/or removed.
B) The product has been subjected to alterations or mechanical processes not specifically authorised by the Manufacturer.
C) The product has been used inconsistently with the instructions provided in the technical documentation and regulations of the country where positioning and installation take place, or for purposes other than what it was designed for.
D) The defects are due to negligence, incompetence, poor maintenance, carelessness and inability of the End-user, damage caused by third parties, unforeseeable circumstances or force majeure or for any other reason not attributable to defects in the construction quality.

The following are henceforth considered excluded from the warranty:

A) All parts with marginal defects that have a negligible effect on the value or function of the product.
B) All parts typically subject to sliding or rolling friction (bearings, brushes, etc.).
C) All parts typically subject to consumption (filters, humidifier cylinders, etc.).
D) All parts typically subject to oxidation or corrosion if not properly used or serviced (headers, wires and copper contacts or metal alloys, internal or external parts of the units, etc.).
E) All parts not supplied by the Manufacturer, even if these are an integral part of the system that controls the product.

1 INTRODUCTION

1.1 SURVEY³ ELECTRONIC REGULATION SYSTEM

SURVEY³ is an electronic regulation system developed for integrated control of Close Control conditioning units in the direct expansion (A) or chilled water (U), Free Cooling (FC) and Two Sources (TS) versions and of the relevant related accessories.

The system consists of:

- One basic I/O C-PRO3 control board, in plastic container the size of 8 DIN modules, for installation on DIN guide inside the electrical panel:
- An EPJgraph user terminal with LCD graphic display, resolution 320 x 240 pixel, 16 colour, integrated font and 6-key touch-screen (with pre-set functions).
- One or more electronic EC fans with integrated electronic regulation board.
- One or two EVDrive electronic valve control boards, in a plastic container measuring 4 DIN modules, for installation on a DIN guide inside the electrical panel (direct expansion unit only).

Additional control boards may be installed according to the type of unit and installed accessories:

- CPY humidifier control board, in plastic container the size of 6 DIN modules, for installation on DIN guide inside the electrical panel.
- DC compressor regulation inverter, in plastic container, for installation outside the electrical panel (direct expansion unit only).

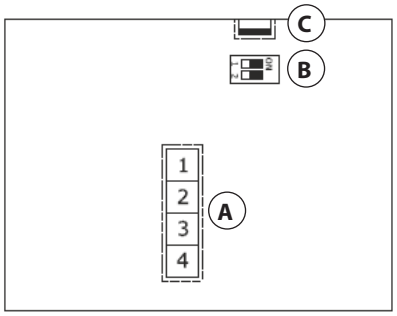
Thanks to the high degree of interfacing of the unit's main components, with the SURVEY³ electronic control system it is possible to monitor and control any operational aspect of the system, assuring the user has real time access via the display at the front of the machine or via a supervision system or BMS (Building Management System).

Constant monitoring of the system's general status affords a high degree of reliability. Integrated management of the alarms of the unit's main components allows the user to act promptly for maintenance, reducing system downtime to a minimum.

2 DESCRIPTION OF SURVEY³ SYSTEM INPUTS-OUTPUTS

2.1 DESCRIPTION OF EPJGRAPH USER INTERFACE INPUTS-OUTPUTS

Below is a description of the meanings of the inputs and outputs of the EPJgraph user interface.



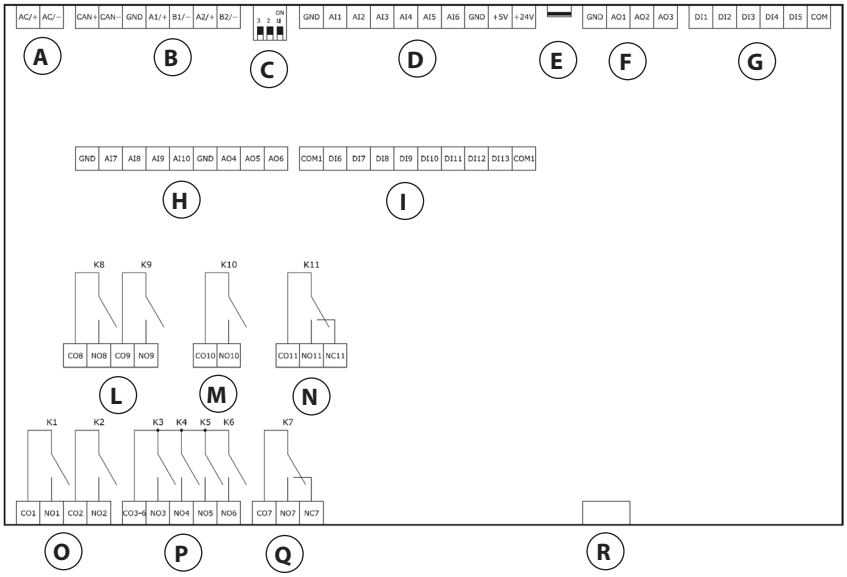
A - Power supply - CANbus Port			
Name		**Type**	**Description**
1	**Vac / +**	24 V AC	Power supply input
2	**Vac / -**	24 V AC	Power supply input - CANbus port ground
3	**CAN +**	-	Signal + CANbus port
4	**CAN -**	-	Signal - CANbus port

B - Termination heater micro-switches			
Name		**Type**	**Description**
1	**N.C.**	-	Reserved
2	**CANLT**	-	CANbus port termination

C - USB port		
Name	**Type**	**Description**
USB 2.0	A	Interfacing and programming port

2.2 DESCRIPTION OF INPUTS-OUTPUTS ON BASIC I/O C-PRO3 CONTROL BOARD

Below is a description of the meanings of the inputs and outputs of the basic I/O C-PRO3 control board.



A - Power supply - Modbus Slave RS485 port - CANbus port		
Name	**Type**	**Description**
AC/+	24 V AC	Power supply input
AC/-	24 V AC	Power supply input

B - Modbus Slave RS485 port - Modbus Master RS485 port - CANbus port		
Name	**Type**	**Description**
CAN +	-	Signal + CANbus port
CAN -	-	Signal - CANbus port
GND	-	CANbus port ground, Modbus Master RS485 and Modubs Slave RS485
A1/+	-	Signal + Modbus Master RS485 port
B1/-	-	Signal - Modbus Master RS485 port
A2/+	-	Signal + Modbus Slave RS485 port
B2/-	-	Signal - Modbus Slave RS485 port

C - Termination heater micro-switches		
Name	**Type**	**Description**
CAN LT	-	CANbus port termination
RS485 LT1	-	Modbus Slave RS485 port termination
RS485 LT2	-	Modbus Master RS485 port termination

D - Analogue inputs 1... 6		
Name	**Type**	**Description**
GND	-	Analogue inputs common
AI 1	0-5 V DC	Air pressure sensor / Water temperature probe IN 2
AI 2	4-20 mA	Air humidity sensor IN (Ambient)
AI 3	4-20 mA	Air humidity sensor OUT (Supply) / Water Temperature Probe OUT 2
AI 4	NTC	Air temperature sensor IN (Ambient)
AI 5	NTC	Air temperature sensor OUT (Supply)
AI 6	NTC	Water Temperature Sensor IN 1 / Free Cooling Temperature
GND	-	Analogue inputs common
+5 V	5 V DC	Stabilised ratiometric transducer power supply 0-5 V (5 VDC, 60 mA max.)
VS	12 V DC	Power supply to 0-20 mA / 4-20 mA / 0-10 V transducers (12 VDC, 120 mA max.)

E - USB port		
Name	**Type**	**Description**
USB 2.0	A	Interfacing and programming port

F - Analogue outputs 1... 3		
Name	**Type**	**Description**
GND	-	Analogue input and analogue output common
AO 1	0-10 V	Supply fan modulation / Dry cooler modulation
AO 2	0-10 V	Cooling water valve modulation / Free Cooling / Compressor inverter
AO 3	0-10 V	Heating water valve modulation / Modulating electric coil

G - Digital inputs 1... 5		
Name	**Type**	**Description**
DI 1	N.O.	Motorised damper opening status
DI 2	N.O.	Clogged air filter alarm
DI 3	N.O.	Remote OFF
DI 4	N.C.	General electric coil alarm
DI 5	N.C.	Condensate discharge pump alarm
COM	-	Digital input common

H - Analogue inputs 7... 10 and analogue outputs 4... 6		
Name	**Type**	**Description**
GND	-	Analogue input and analogue output common
AI 7	0-10 V DC	Water temperature probe OUT 1
AI 8	0-10 V DC	Water flow rate measuring device 1 / Liquid temperature 1 (RH)
AI 9	0-10 V DC	Water flow rate measuring device 2 / Liquid temperature 2 (RH)
AI 10	NTC	Water detection alarm probe
GND	-	Analogue input and analogue output common
AO 4	0-10 V DC	Two Sources water valve modulation
AO 5	0-10 V DC	Modulation condenser 1
AO 6	0-10 V DC	Condenser 2 / Humidification modulation

I - Digital inputs 6... 13		
Name	**Type**	**Description**
COM1	-	Digital input common
DI 6	N.C.	Configurable input 1
DI 7	N.C.	Configurable input 2
DI 8	N.C.	Configurable input 3
DI 9	N.C.	Configurable input 4
DI 10	N.C.	Configurable input 5
DI 11	-	Reserved
DI 12	-	Reserved
DI 13	-	Reserved
COM1	-	Digital input common

L - Digital outputs 8 and 9		
Name	**Type**	**Description**
CO 8	-	Digital output common 8
NO 8	N.O.	Electric heating coil stage 1 control
CO 9	-	Digital output common 9
NO 9	N.O.	Electric heating coil stage 2 control

M - Digital output 10		
Name	**Type**	**Description**
CO 10	-	Digital output common 10
NO 10	N.O.	Reserved

N - Digital output 11		
Name	**Type**	**Description**
CO 11	-	Digital output common 11
NO 11	N.O.	Reserved
NC 11	N.C.	Reserved

O - Digital outputs 1 and 2		
Name	**Type**	**Description**
CO 1	-	Digital output common 1
NO 1	N.O.	Ventilation control
CO 2	-	Digital output common 2
NO 2	N.O.	Motorised dampers control

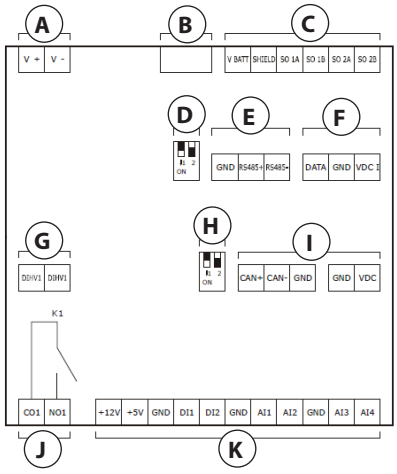
P - Digital outputs 3 ... 6		
Name	**Type**	**Description**
CO 3-6	-	Digital outputs common 3 - 6
NO 3	N.O.	Configurable digital output 1
NO 4	N.O.	Configurable digital output 2
NO 5	N.O.	Configurable digital output 3
NO 6	N.O.	Configurable digital output 4

Q - Digital output 7		
Name	**Type**	**Description**
CO 7	-	Digital output common 7
NO 7	N.O.	Configurable digital output 5
NC 7	N.C.	Configurable digital output 5

R - RJ45 port		
Name	**Type**	**Description**
RJ45	RJ45	Ethernet RJ45 port

2.3 DESCRIPTION OF EVDRIVE REGULATOR INPUTS-OUTPUTS

Below is a description of the meanings of the inputs and outputs of the EVDrive regulator.



A - Power supply		
Name	**Type**	**Description**
V ≈ +	24 V AC	Power supply input
V ≈ -	24 V AC	Power supply input

B - Programming port		
Name	**Type**	**Description**
Prog.	TTL	Programming port

C - Bipolar stepper motor output		
Name	**Type**	**Description**
V BATT	-	Backup power supply input
SHIELD	-	Bipolar stepper motor cable shielding input
SO 1A	-	Bipolar stepper motor coil 1
SO 1B	-	Bipolar stepper motor coil 1
SO 2A	-	Bipolar stepper motor coil 2
SO 2B	-	Bipolar stepper motor coil 2

D - Termination heater micro-switches		
Name	**Type**	**Description**
MBS LT	-	Modbus Slave RS485 port termination
2	-	Reserved

E - Modbus RS485 port		
Name	**Type**	**Description**
GND	-	Modbus Slave RS485 port ground
A / +	-	Signal + Modbus Slave RS485 port
B / -	-	Signal - Modbus Slave RS485 port

F - Reserved port		
Name	**Type**	**Description**
DATE	-	Reserved
GND	-	Reserved
VDC I	-	Reserved

G - High voltage digital input		
Name	**Type**	**Description**
DIHV1	-	High voltage digital input common
DIHV1	N.C.	Compressor low pressure alarm

H - Termination heater micro-switches		
Name	**Type**	**Description**
CAN LT	-	CANbus port termination
2	-	Reserved

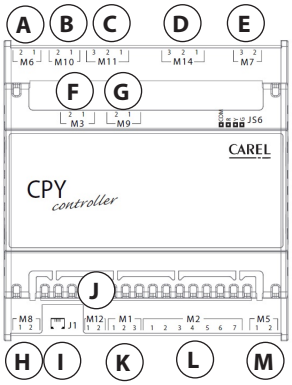
I - CANbus port for remote interface		
Name	**Type**	**Description**
CAN +	-	Signal + CANbus port
CAN -	-	Signal - CANbus port
GND	-	CANbus port ground
GND	-	Remote interface power supply ground
VDC	22-35 VDC	User terminal power supply (22-35 VDC, 100 mA max.)

J - Digital output		
Name	**Type**	**Description**
CO 1	-	Digital output common
NO 1	N.C.	Compressor control

K - Analogue inputs and dry digital inputs		
Name	**Type**	**Description**
+12 V	12 VDC	Power supply to 0-20 mA / 4-20 mA / 0-10 V transducers (12 VDC, 120 mA max.)
+5 V	5 VDC	Stabilised ratiometric transducer power supply 0-5 V (5 VDC, 60 mA max.)
GND	-	Analogue inputs and dry digital inputs common
DI 1	N.C.	Compressor breaker alarm
DI 2	N.C.	Compressor high pressure alarm
GND	-	Analogue inputs and dry digital inputs common
AI 1	NTC	Compressor discharge temperature probe
AI 2	0-5 V Rat.	Compressor condensation pressure probe
GND	-	Analogue inputs and dry digital inputs common
AI 3	NTC	Compressor suction temperature probe
AI 4	0-5 V Rat.	Compressor evaporation pressure probe

2.4 DESCRIPTION OF CPY HUMIDIFIER BOARD INPUTS-OUTPUTS

Below is a description of the meanings of the CPY humidifier board inputs and outputs.



A - M6 - Discharge pump activation		
Name	**Type**	**Description**
1	-	Digital output common
2	N.O.	Discharge pump activation control

B - M10 - Contactor activation contact for submerged electrode voltage		
Name	**Type**	**Description**
1	-	Digital output common
2	N.O.	Contactor activation control for submerged electrode voltage

C - M11 - Water charging and discharging solenoid valve control		
Name	**Type**	**Description**
1	N.O.	Charging solenoid valve activation control
2	-	Digital output common
3	N.O.	Discharging solenoid valve activation control

D - M14 - Relay indicating humidifier in production		
Name	**Type**	**Description**
1	N.O.	Humidifier in production indication activation control
2	-	Digital output common
3	N.O.	Humidifier in production indication activation control

E - M7 - Submerged electrode current measuring amperometric transformer input (TAM)		
Name	**Type**	**Description**
1	-	Common
2	0-2V DC	Amperometric transformer (TAM)

F - M3 - Conductivity meter		
Name	**Type**	**Description**
1	-	Common
2	-	Conductivity measuring device

G - M9 - High water level sensor		
Name	**Type**	**Description**
1	-	Common
2	-	Cylinder level sensor

H - M8 - Electrical power supply connection		
Name	**Type**	**Description**
1	24 V AC	Power supply input
2	24 V AC	Power supply input

I - J1 - Connection for CPY terminal		
Name	**Type**	**Description**
1	RJ12	Connection for CPY terminal

J - M12 - tLAN network connection		
Name	**Type**	**Description**
1	-	tLAN data line
2	-	tLAN data line common

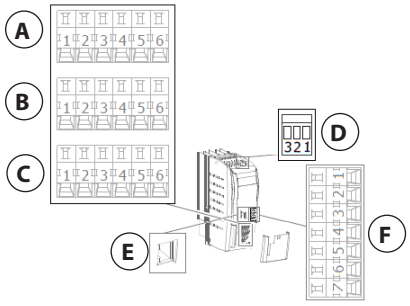
K - M1 - Modbus RS485 network connection		
Name	**Type**	**Description**
A / +	-	Signal + Modbus RS485 port
B / -	-	Signal - Modbus RS485 port
GND	-	Modbus RS485 port ground

L - M2 - Control signals		
Name	**Type**	**Description**
1	+15 V DC	Active probe power supply
2	-	Control signal input
3	-	Active probe power supply and control signal input common
4	N.C.	Enable for operation
5	-	Digital input common
6	N.C.	Manual discharge
7	N.C.	Reset operating hour counter.

M - M5 - Alarm		
Name	**Type**	**Description**
1	-	Digital output common
2	N.O.	General humidifier alarm

2.5 DESCRIPTION OF AGILE INVERTER INPUTS-OUTPUTS

Below is a description of the meanings of the Agile inverter inputs and outputs.



A - X13 - Control terminals		
Name	**Type**	**Description**
1	24 V DC	24 V dc power supply input
2	-	24 V dc power supply ground
3	N.C.	Operation digital input
4	0-10 V DC	0-10 V output
5	N.O.	Digital inverter operation indicator output
6	-	Multi-function output

B - X12 - Control terminals		
Name	**Type**	**Description**
1	N.C.	Digital work set editing input
2	N.C.	Digital error confirmation input
3	-	Multi-function input
4	-	Multi-function input
5	CAN H	Signal + CANbus port
6	CAN L	Signal - CANbus port

C - X11 - Control terminals		
Name	**Type**	**Description**
1	24 V DC	24 V dc power supply output
2	-	24 V dc power supply ground
3	N.C.	Operation digital input
4	N.C.	Clockwise start-up digital input
5	N.C.	Anti-clockwise start-up digital input
6	N.C.	Digital work set editing input

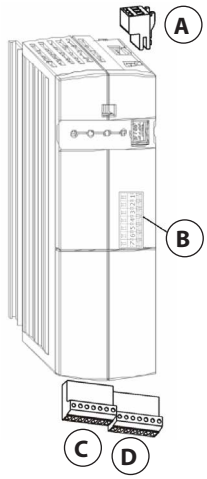
D - Alarm terminal		
Name	**Type**	**Description**
1	N.C.	Digital inverter alarm indicator output
2	-	Digital output common
3	N.O.	Digital inverter alarm indicator output

E - X21 - RJ45 communication interface		
Name	**Type**	**Description**
1	RJ45	PC communication interface

F - X10 - Control terminals		
Name	**Type**	**Description**
1	-	Signal + Modbus RS485 port
2	-	Signal + Modbus RS485 port
3	-	Signal - Modbus RS485 port
4		Signal - Modbus RS485 port
5	5 V DC	5 V dc power supply output
6	-	Ground
7	-	Shielding

2.5.1 DESCRIPTION OF ACTIVE INVERTER INPUTS-OUTPUTS

Below is a description of the meanings of the Active inverter inputs and outputs.



A - X10 - Alarm terminal		
Name	**Type**	**Description**
1	N.C.	Digital inverter alarm indicator output
2	-	Digital output common
3	N.O.	Digital inverter alarm indicator output

B - X310 - Modbus communication terminals		
Name	**Type**	**Description**
1	A	Signal + Modbus RS485 port
2	A'	Signal + Modbus RS485 port
3	B	Signal - Modbus RS485 port
4	B'	Signal - Modbus RS485 port
5	5 V DC	5 V DC power supply output
6	GND	Ground
7	PE	Shielding

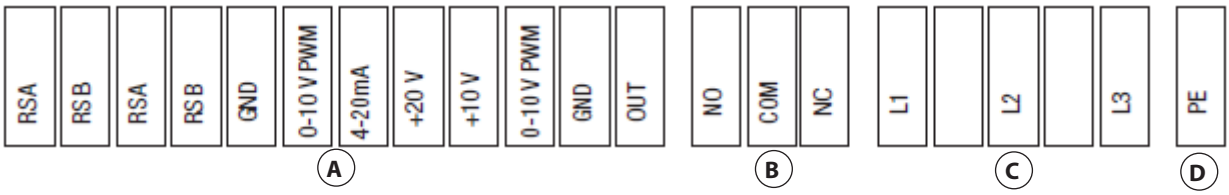
C - X210A - Control terminals		
Name	**Type**	**Description**
1	20 V DC	20 V DC power supply output
2	GND	20 V DC power supply ground
3	N.C.	STOA (Safety Torque Off) operation digital input
4	N.C.	S2IND digital input
5	N.C.	S3IND digital input
6	N.C.	S4IND digital input
7	N.C.	S5IND digital input

D - X210B - Control terminals		
Name	**Type**	**Description**
1	N.C.	S5IND digital input
2	N.C.	STOA (Safety Torque Off) operation digital input
3	N.O.	S1OUT digital output
4	-	MFO1 multi-function output
5	0-10V DC	0-10 V DC output
6	-	MFI1 multi-function input
7	GND	0-10 V DC Output Ground

2.6 DESCRIPTION OF ELECTRONIC FAN INPUTS-OUTPUTS

2.6.1 ELECTRONIC FANS MODEL 1

Below is a description of the meanings of the inputs and outputs of electronic fans model 1.



A - Analogue inputs and Modbus Slave RS485 port		
Name	**Type**	**Description**
RSA	-	Signal + Modbus Slave RS485 port
RSB	-	Signal - Modbus Slave RS485 port
RSA	-	Signal + Modbus Slave RS485 port
RSB	-	Signal - Modbus Slave RS485 port
GND	-	Modbus Slave RS485 port ground
0-10 V PWM	0-10 V/PWM	Analogue control input
4-20 mA	4-20 mA	Analogue control input
+20 V	20 V DC	Power supply to transducers (50 mA max.)
+ 10 V	10 V DC	Power supply for potentiometer (10 mA max.)
0-10 V PWM	0-10 V/PWM	Analogue control input
GND	-	Analogue inputs ground
OUT	0-10V DC	Analogue output for slave fan control

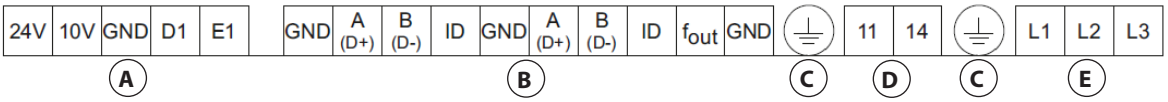
B - Alarm relay		
Name	**Type**	**Description**
NO	N.O.	General fan alarm
COM	-	Digital output common
NC	N.C.	General fan alarm

C - Electrical power supply		
Name	**Type**	**Description**
L1	400 V	Electronic motor power supply
L2	400 V	Electronic motor power supply
L3	400 V	Electronic motor power supply

D - Connecting terminal to earth		
Name	**Type**	**Description**
PE	-	Earthing cable connection

2.6.2 ELECTRONIC FANS MODEL 2

Below is a description of the meanings of the inputs and outputs of electronic fans model 2.



A - Analogue and digital inputs		
Name	**Type**	**Description**
24 V	24 V DC	Digital input power supply (70 mA max.)
10 V	10 V DC	Power supply for potentiometer (10 mA max.)
GND	-	Analogue inputs ground
D1	-	Operation digital input
E1	0-10 V DC	Analogue control input

B - Modbus Slave RS485 port		
Name	**Type**	**Description**
GND	-	Modbus Slave RS485 port ground
A (D+)	-	Signal + Modbus Slave RS485 port
B (D-)	-	Signal - Modbus Slave RS485 port
ID	-	Reference for auto-addressing
GND	-	Modbus Slave RS485 port ground
A (D+)	-	Signal + Modbus Slave RS485 port
B (D-)	-	Signal - Modbus Slave RS485 port
ID	-	Reference for auto-addressing
FOUT	Hz	Output in frequency
GND	-	Output ground in frequency

C - Connecting terminal to earth		
Name	**Type**	**Description**
PE	-	Earthing cable connection

D - Alarm relay		
Name	**Type**	**Description**
NO	N.O.	General fan alarm
COM	-	Digital output common

E - Electrical power supply		
Name	**Type**	**Description**
L1	400 V	Electronic motor power supply
L2	400 V	Electronic motor power supply
L3	400 V	Electronic motor power supply

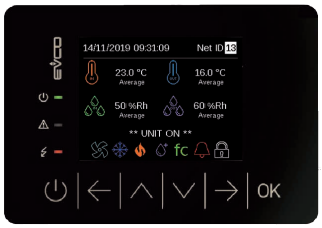
3 SURVEY³ SYSTEM USER INTERFACE

3.1 EPJGRAPH USER TERMINAL

The user terminal features an LCD graphic display with resolution 320 x 240 pixels, 16 colours, integrated font and 6-key touch-screen (with pre-set functions).

3.1.1 EPJGRAPH USER TERMINAL KEYPAD

There are keys on the User terminal with special functions as shown in the table below.



Key	Name	Description
⏻	**ESC**	Press to exit the menus and parameter editing procedures.
	ON-OFF	Hold down to turn the unit on and off.
←	**LEFT**	Press to scroll the unit's status pages to the left.
	ALARM	Hold down to access to the active alarms menu.
∧	**UP**	Press to scroll up through the pages associated with a specific group; if the cursor is in a setting field, the user can increase the value.
∨	**DOWN**	Press to scroll down through the pages associated with a specific group; if the cursor is in a setting field, the user can decrease the value.
→	**RIGHT**	Press to scroll the unit's status pages to the right.
	HOME	Hold down to go back to the Home page.
OK	**OK**	Press to edit a parameter and confirm the setting. In the active alarms menu, press to scroll through the alarms, hold down to delete active alarms.
	MENU	Hold down to access to the Main menu page.
∧ | ∨	**UP + DOWN**	Hold down to unlock the user terminal keyboard.

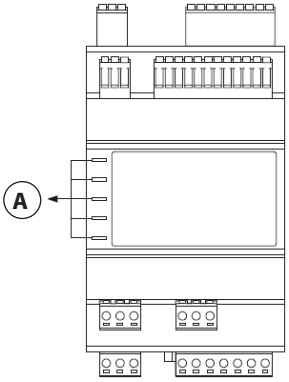
3.1.2 VGRAPH USER TERMINAL SIGNAL LED

There are LEDs on the User terminal with special functions as shown in the table below.

Key	Colour	Description
⏻	Green	Operation LED: • If on, the unit is ON • If it is flashing, the unit is turned off from remote control or due to critical alarm/Unit in standby (Local Network) • If off, the unit is OFF
⚠	Red	Alarm LED: • If it is on, an alarm is in progress that has already been viewed • If it is flashing a new alarm is in progress • If it is off, no alarm is in progress
ϟ	Orange	Power supply LED: • If on, the device is powered • If off, the device is not powered

3.2 I/O C-PRO3 BASE CONTROL BOARD SIGNAL LEDS

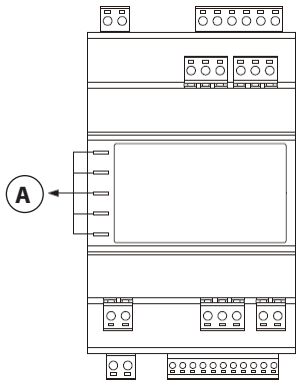
The I/O C-PRO3 base control board features LEDs with special functions as shown in the table below.



A - Signal LED		
Name	**Colour**	**Description**
ON	Green	Power supply LED: • If on, the device is powered • If off, the device is not powered
RUN	Green	Operation LED: • If on, the application software is running • If off, the application software is not running
⚠	Red	System alarm LED: • If on, the clock battery is charging or the clock is not set • If it is flashing very slowly, access in external flash memory (USB) is in progress • If it is flashing slowly, a system alarm is in progress with automatic reset • If it is flashing quickly, a system alarm is in progress with manual reset • If it is off, no system alarm is in progress
CAN	Red	CANbus communication LED: • If on, CANbus communication has not been established • If it is flashing slowly, CANbus communication has communication errors • If it is flashing quickly, CANbus communication is correct • If it is off, there is no CANbus communication
L1	-	Not used

3.3 EVDRIVE REGULATOR SIGNAL LEDS

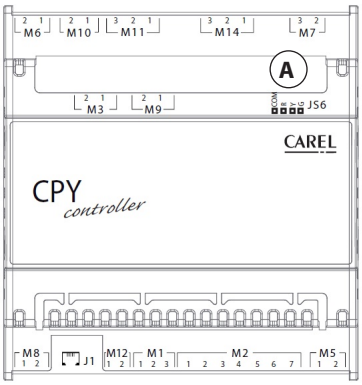
There are LEDs on the EVDrive regulator with special functions as shown in the table below.



A - Signal LED		
Name	**Colour**	**Description**
ON	Green	Power supply LED: • If on, the device is powered • If off, the device is not powered
STEP 1	Green	Stepper motor output LED: • If it is on, the valve closes completely • If it is flashing slowly, the valve opens completely • If it is flashing quickly, the valve is moving • If it is off, the valve is not moving
STEP 2	Green	Operation LED: • If on, superheat control is running • If off, superheat control is not running
⚠	Red	Alarm LED: • If it is on, an alarm is in progress • If it is flashing slowly, device operation must be disabled/enabled, in order for the configuration change to be effective • If it is flashing quickly, the device power supply must be turned off/on in order for the configuration change to be effective • If it is off, no alarm is in progress
COM	Green	Communication LED: • If on, communication is in alarm mode and the device is locked • If it is flashing slowly, there are communication errors • If it is flashing quickly, communication is in alarm mode and the device is in stand-alone operation • If it is off, communication is OK

3.4 CPY HUMIDIFIER BOARD SIGNAL LEDS

There are LEDs on the CPY humidifier board with special functions as shown in the table below.

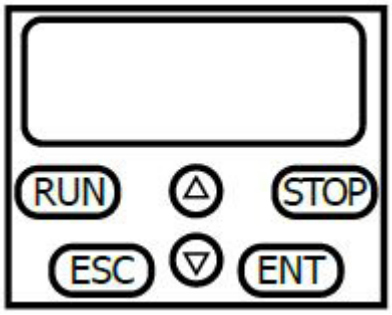


A - Signal LED		
Name	**Colour**	**Description**
	Red	Alarm LED: • If it is flashing an alarm is in progress • If it is off, no alarm is in progress
	Yellow	Steam production LED: • If it is on, production is at 100% • If it is flashing, the number of blinks indicates the production percentage • If it is off, the humidifier is off
	Green	Power supply LED: • If on, the device is powered • If off, the device is not powered

3.5 DC COMPRESSOR INVERTER OPERATOR PANEL

3.5.1 AGILE COMPRESSOR INVERTER OPERATOR PANEL

On the Agile inverter there is an operator panel with a screen and 6 keys with special functions, as shown in the table below.



Key	Name	Description
RUN	**RUN**	No function.
STOP	**STOP**	If pressed, it deletes the active alarms.
△	**UP**	Press to scroll the parameters up; if the cursor is in a setting field, the user can increase the value.
▽	**DOWN**	Press to scroll the parameters down; if the cursor is in a setting field, the user can decrease the value.
ESC	**ESC**	Press to exit the menus and parameter editing procedures.
ENT	**ENTER**	Press to edit a parameter and confirm the setting.

3.5.2 ACTIVE COMPRESSOR INVERTER OPERATOR PANEL

On the Active inverter there is an operator panel with a screen and 6 keys with special functions, as shown in the table below.

Key	Name	Description
RUN	**RUN**	No function.
STOP	**STOP**	If pressed, it deletes the active alarms.
∧	**UP**	Press to scroll the parameters up; if the cursor is in a setting field, the user can increase the value.
∨	**DOWN**	Press to scroll the parameters down; if the cursor is in a setting field, the user can decrease the value.
ESC	**ESC**	Press to exit the menus and parameter editing procedures.
ENT	**ENTER**	Press to edit a parameter and confirm the setting.
FUN	**FUNCTION**	No function.

4 USE OF SURVEY³ MICROPROCESSOR

ATTENTION!

The example icons indicated below are shown in black and white for simplification.

The icons and text may assume different colours on the display depending on the position and their function.

Access to information regarding the unit's management and adjustment parameters is organised in the following order:

1) **MAIN PAGE:** This makes it possible to rapidly access the unit's general status.

2) **UNIT AND COMPONENTS STATUS PAGE:** It displays the status of every component installed in the unit, or controlled by it.

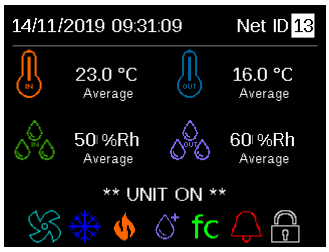
3) **MAIN MENU:** This lets you access the software management **MENUS**. The **MENUS** divide the parameters into categories for easier user interaction.

4) **MENU:** The main menu contains various **MENUS**. Every **MENU** contains **PARAMETER GROUPS** that can be viewed or edited.

- **OPEN MENUS:** these display the alarms, device operating hours, time and date, and enable the entry of temperature and humidity set-points and internal clock setting.
- **PASSWORD**-PROTECTED MENUS: to set the unit's regulation and configuration parameters.

5) **PARAMETER GROUPS:** The **PARAMETERS** are collected in specific **GROUPS**, making it easier to access and edit them.

4.1 MAIN, UNIT AND COMPONENTS STATUS PAGES



This group of pages represents the primary view of the regulation software. Access to the status pages of the unit and components is gained by simply pressing the **LEFT** (←) and **RIGHT** (→) keys. Parameters relative to components that are not installed will not be displayed, accordingly some pages might not be visible.

4.1.1 SYMBOLS AND ICONS OF THE MAIN, UNIT AND COMPONENTS STATUS PAGES

Various types of icons are used in the software pages. The meanings of the icons are provided in the table below.

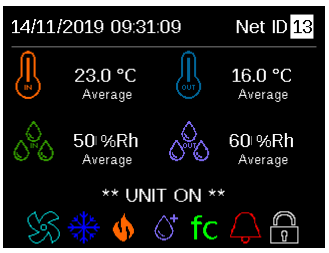
Software icons			
Probes			
Return temperature	Supply temperature	Return humidity	Supply humidity

Statuses				
Motorised damper	Unit fans	Cooling	Modulating compressor	Compressor 1
Compressor 2	Compressor 1 + 2	Stage electric coil Stage 1	Stage electric coil Stage 2	Stage electric coil Stage 1 + 2
Modulating electric coil	Water heating	Dehumidification	Humidification	Active Free Cooling
Two Sources source 1	Two Sources source 2	Active alarm	Active key block	

Components regulation and status					
Probes - Real values	Remote probes	Unit fans	Air filters	Chilled Water	Free Cooling
Two Sources source 1	Two Sources source 2	Water circuit 1	Water circuit 2	Direct expansion	DC inverter compressor
Compressor 1	Compressor 2	Expansion valve 1	Expansion valve 2	Condenser fans	Stage electric coil
Modulating electric coil	Water heating	Humidification/ Dehumidification	Dry cooler fans	Configurable digital inputs	Configurable digital outputs

4.1.2 MAIN SCREEN

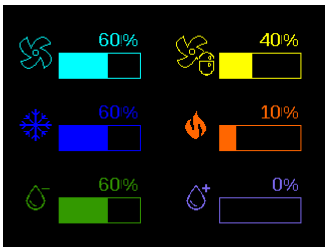
This page represents the view of the primary software. The following can be displayed on this page:



- The set time and date.
- The unit's network address.
- Return temperature (average value, if active).
- Supply temperature (average value, if active).
- Return humidity, if any (average value, if active).
- Supply humidity, if any (average value, if active).
- The status of the unit.
- The presence of any active alarms.
- The icons of the main active components (see previous chapter).

4.1.3 PROGRESS BAR

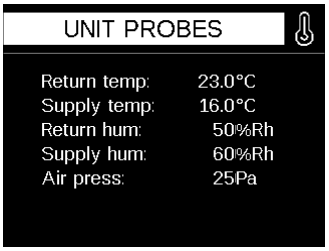
This page summarises the status of the main regulation components, representing them through progress bars that indicate the percentage of regulation. The following can be displayed on this page:



- The status of the supply fans.
- The status of the condenser fans or dry coolers (if any).
- The status of the cooling components.
- The status of the heating components (if present).
- Dehumidification status (if present).
- Humidification status (if present).

4.1.4 UNIT PROBES

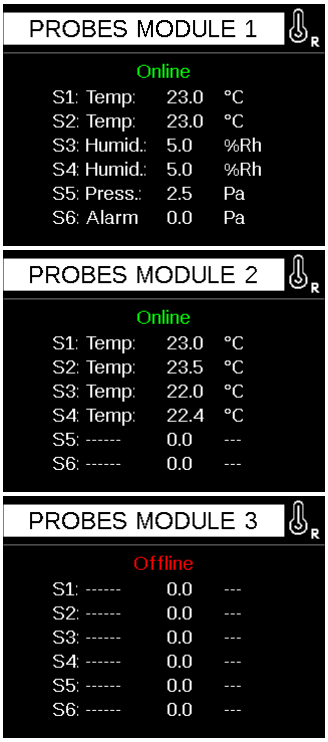
In local network units with the calculation of average values, the actual values of the probes can be viewed on a specific page. The following can be displayed on this page:



- The actual value of the supply temperature.
- The actual value of the return temperature.
- The actual value of the supply humidity (if present).
- The actual value of the return humidity (if present).
- The actual value of the supply air pressure in Pa.

4.1.5 PROBE MODULE

Up to 3 remote probe modules can be connected to the units and the values of the connected probes can be viewed on specific pages. The following can be displayed on this page:



- The type of probe configured for each input
- The value measured for each probe
- Any alarm status of a connected probe

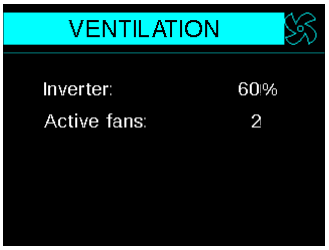
The probes may have the following statuses:

- --- : No probe
- Temperature: Temperature probe
- Humidity: Humidity probe
- Pressure: Pressure probe
- Alarm: Alarm on probe

4.1.6 VENTILATION

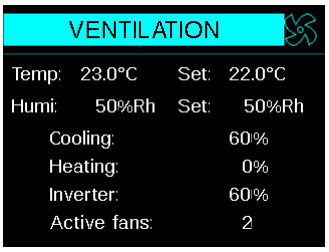
The ventilation status pages show different views depending on the set type of regulation.

If fixed speed regulation is on, the following will be displayed:



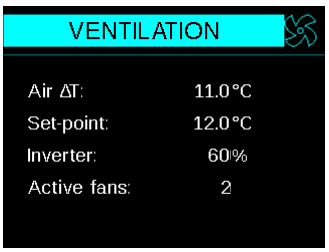
- Fan speed in percentage.
- Number of active fans.

If regulation is running in proportion to the cooling or heating regulation, the following will be displayed:



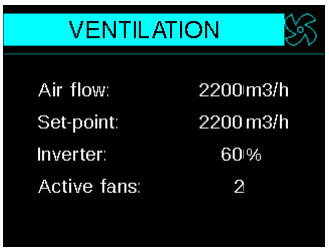
- The controlled temperature and relevant set-point.
- The controlled humidity and relevant set-point (if there is humidity control).
- The cooling and heating demand.
- The fan speed demand in percentage.
- Number of active fans.

If regulation is active for control of the constant temperature ΔT, the following is displayed:



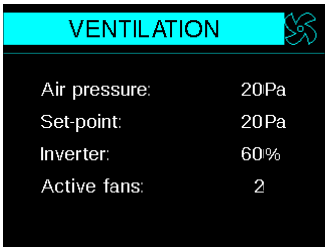
- The current temperature ΔT and relative set-point.
- The fan speed demand in percentage.
- Number of active fans.

If constant air flow regulation is on, the following will be displayed:



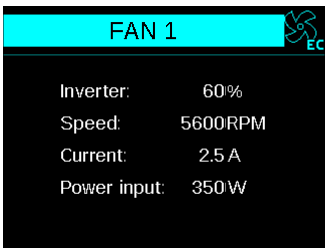
- The current air flow rate in m^3/h.
- The air flow rate set-point in m^3/h.
- The fan speed demand in percentage.
- Number of active fans.

If constant air pressure regulation is on, the following will be displayed:



- The current air pressure in Pa.
- The air pressure set-point in Pa.
- The fan speed demand in percentage.
- Number of active fans.

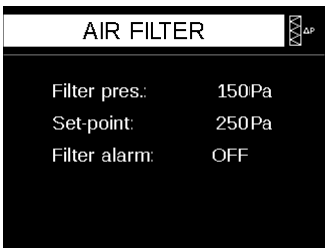
The operating values of each fan (up to 10) in the unit will also be displayed:



- Fan speed in percentage.
- Fan speed in revs per minute (RPM).
- Absorbed current in Ampere.
- Used electrical power in Watt.

4.1.7 DIRTY FILTER MANAGEMENT

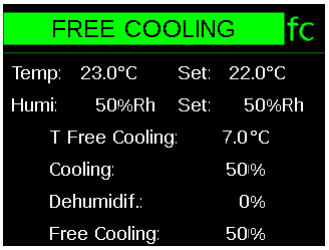
If the unit comes with an analogue air filter differential pressure sensor, the following will be displayed:



- Air filter differential pressure.
- Filter clogging alarm set-point.
- Dirty filter alarm status.

4.1.8 FREE COOLING

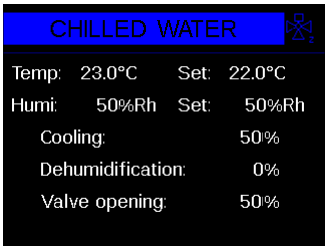
On free cooling units there will be a page displaying the status of the free cooling circuit. The free cooling page will display:



- The controlled temperature and relevant set-point.
- The controlled humidity and relevant set-point (if there is humidity control).
- The free cooling temperature.
- The cooling demand.
- The dehumidification demand (if there is humidity control).
- The free cooling percentage.

4.1.9 CHILLED WATER

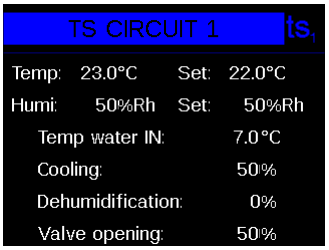
The chilled water regulation status pages may differ depending on the type of accessories the unit is fitted with. It will therefore be possible to view:



- The controlled temperature and relevant set-point.
- The controlled humidity and relevant set-point (if there is humidity control).
- The cooling demand.
- The dehumidification demand (if there is humidity control).
- Water valve opening percentage.

4.1.10 TWO SOURCES - PRIMARY WATER CIRCUIT

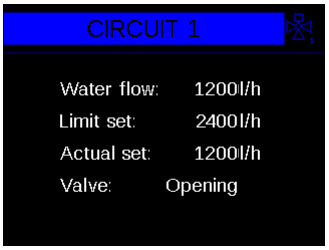
Two sources units with primary water circuit will display a primary circuit status page. The primary water circuit page will display:



- The controlled temperature and relevant set-point.
- The controlled humidity and relevant set-point (if there is humidity control).
- Inlet water temperature.
- The cooling demand.
- The dehumidification demand (if there is humidity control).
- Water valve opening percentage.

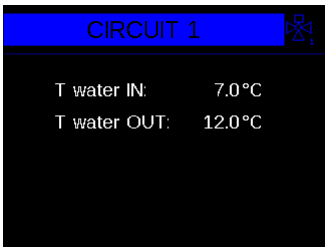
4.1.11 PRIMARY WATER CIRCUIT REGULATION

If there is water flow rate control, it will be possible to view:



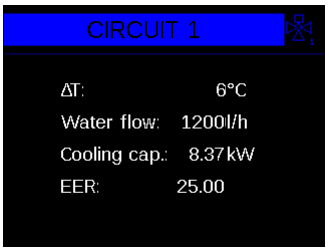
- Current water flow rate in l/h.
- The maximum set water flow rate limit, in l/h.
- The current water flow rate set-point, in l/h.
- The valve regulation status.

If the inlet and outlet water temperature probes are present, it will be possible to view:



- The inlet water temperature value.
- The outlet water temperature value.

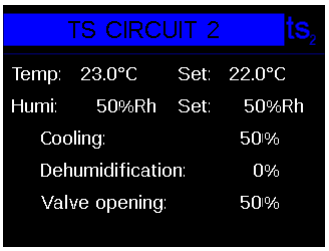
If there is a cooling capacity detection system, it will be possible to view:



- The difference between inlet and outlet temperature.
- The current water flow rate, in l/h.
- The total water side cooling capacity, in Kw.
- The water side energy efficiency ratio (EER) value.

4.1.12 TWO SOURCES - SECONDARY WATER CIRCUIT

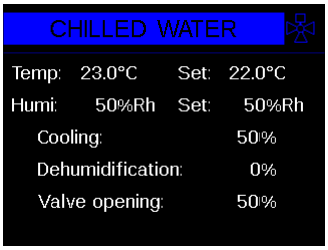
Two sources units with secondary water circuit will display:



- The controlled temperature and relevant set-point.
- The controlled humidity and relevant set-point (if there is humidity control).
- The cooling demand.
- The dehumidification demand (if there is humidity control).
- Water valve opening percentage.

4.1.13 FREE COOLING - CHILLED WATER SECONDARY CIRCUIT

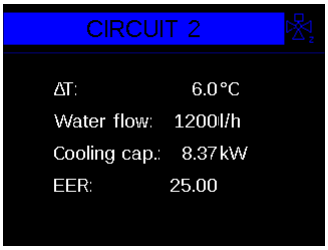
The free cooling system's secondary water circuit page will display:



- The controlled temperature and relevant set-point.
- The controlled humidity and relevant set-point (if there is humidity control).
- The cooling demand.
- The dehumidification demand (if there is humidity control).
- The valve opening percentage.

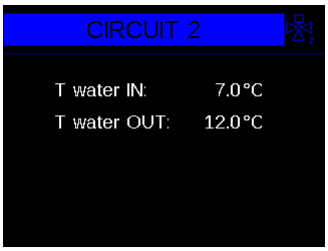
4.1.14 SECONDARY WATER CIRCUIT REGULATION

If there is water flow rate control, it will be possible to view:



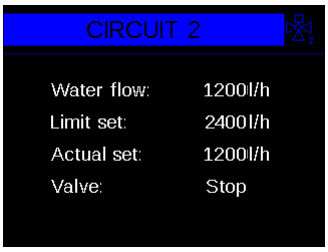
- Current water flow rate in l/h.
- The maximum set water flow rate limit, in l/h.
- The current water flow rate set-point, in l/h.
- The valve regulation status.

If the inlet and outlet water temperature probes are present, it will be possible to view:



- The inlet water temperature value.
- The outlet water temperature value.

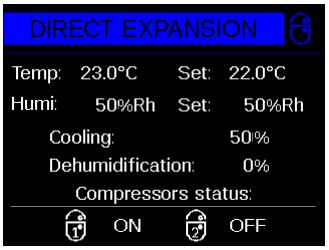
If there is a cooling capacity detection system, it will be possible to view:



- The difference between inlet and outlet temperature.
- The current water flow rate, in l/h.
- The total water side cooling capacity, in Kw.
- The water side energy efficiency ratio (EER) value.

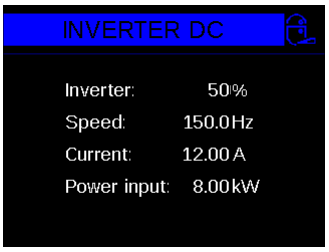
4.1.15 DIRECT EXPANSION

The direct expansion regulation status pages may show different views depending on the type of accessories and number of cooling circuits the unit is fitted with. It will therefore be possible to view:



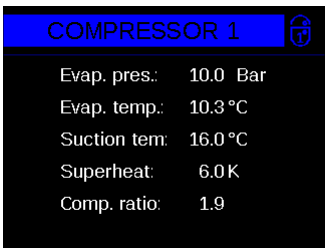
- The controlled temperature and relevant set-point.
- The controlled humidity and relevant set-point (if there is humidity control).
- The cooling demand.
- The dehumidification demand (if there is humidity control).
- Activation status of the compressors.

If the compressor 1 inverter is present, it will be possible to view:



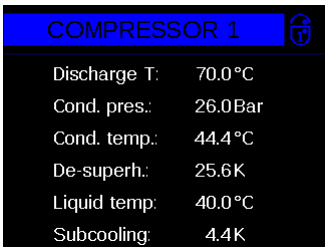
- Compressor speed in percentage.
- Compressor speed in Hertz.
- The current absorbed by the compressor in Ampere.
- The compressor's electrical power in kW.

On the cooling circuit (low pressure) operating page of compressor 1, it will be possible to view:



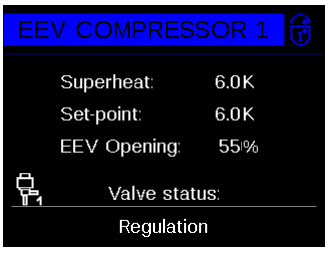
- Current evaporation pressure.
- Current evaporation temperature.
- Current suction temperature.
- Current superheating.
- Current compression ratio

On the cooling circuit (high pressure) operating page of compressor 1, it will be possible to view:



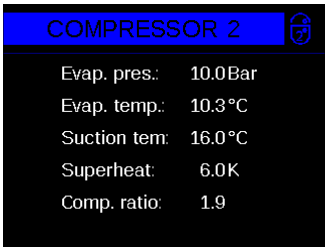
- Current discharge temperature.
- Current condensation pressure.
- Current condensation temperature.
- Current de-superheating.
- Current liquid temperature.
- Current sub-cooling.

On the expansion valve operating page of compressor 1, it will be possible to view:



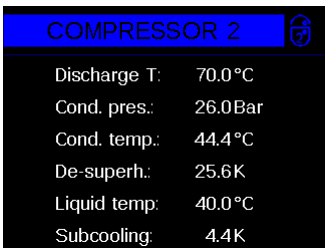
- Current superheating.
- Current superheating set-point.
- Valve opening in percentage.
- Valve regulation status.

On the cooling circuit (low pressure) operating page of compressor 2, it will be possible to view:



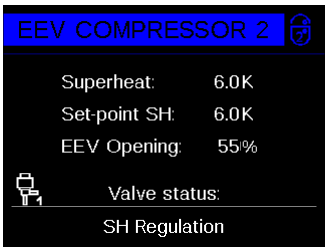
- Current evaporation pressure.
- Current evaporation temperature.
- Current suction temperature.
- Current superheating.
- Current compression ratio

On the cooling circuit (high pressure) operating page of compressor 2, it will be possible to view:



- Current discharge temperature.
- Current condensation pressure.
- Current condensation temperature.
- Current de-superheating.
- Current liquid temperature.
- Current sub-cooling.

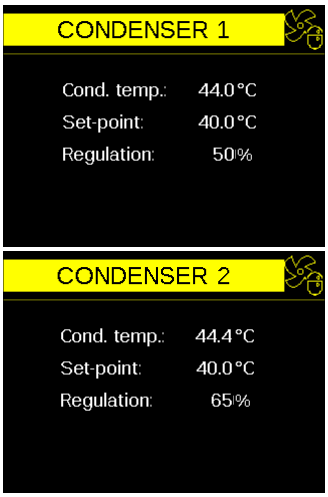
On the expansion valve operating page of compressor 2, it will be possible to view:



- Current superheating.
- Current superheating set-point.
- Valve opening in percentage.
- Valve regulation status.

4.1.16 CONDENSER REGULATION

On the condenser regulation pages the following information may be viewed for each condenser:

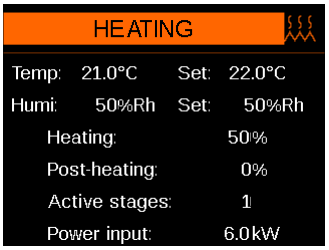


- Current condensation temperature.
- The current condensation set-point.
- The regulation demand in percentage.

4.1.17 HEATING

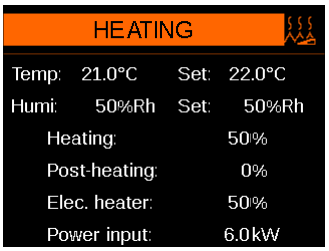
The heating status pages may show different views depending on the type of accessories the unit is fitted with.

If there is a stage-heating electric coil, it will be possible to view:



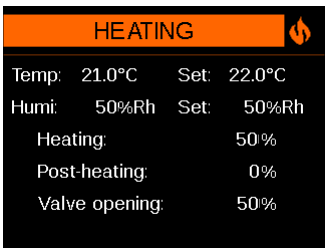
- The controlled temperature and relevant set-point.
- The controlled humidity and relevant set-point (if there is humidity control).
- The heating demand.
- The post-heating demand (if there is humidity control).
- Number of active stages.
- Used electrical power in Kw.

If there is a modulating heating electric coil, it will be possible to view:



- The controlled temperature and relevant set-point.
- The controlled humidity and relevant set-point (if there is humidity control).
- The heating demand.
- The post-heating demand (if there is humidity control).
- The heating electric coil regulation percentage.
- Used electrical power in Kw.

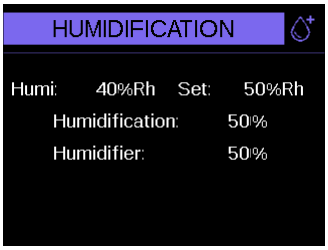
If there is a water heating valve, it will be possible to view:



- The controlled temperature and relevant set-point.
- The controlled humidity and relevant set-point (if there is humidity control).
- The heating demand.
- The post-heating demand (if there is humidity control).
- The heating circuit water valve opening percentage.

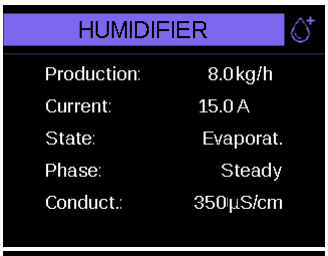
4.1.18 HUMIDIFICATION

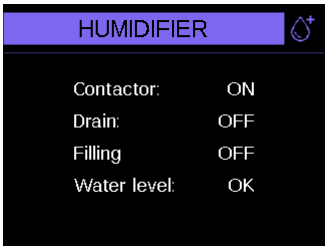
In units with humidification system, the following information will be displayed:



- Controlled humidity and relative set-point.
- The humidification demand.
- The humidifier operation percentage.

Unit with internal submerged electrode humidifier:

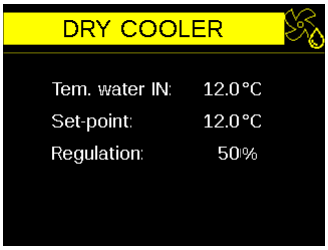




- The requested steam production.
- The current absorbed by the humidifier in Ampere.
- The humidifier operation status.
- The humidification regulation phase.
- The water conductivity of the humidifier in µS/cm.
- The humidifier power contactor status.
- The humidifier discharge valve status.
- The humidifier filling valve status.
- The water level in the humidifier cylinder.

4.1.19 DRY COOLER

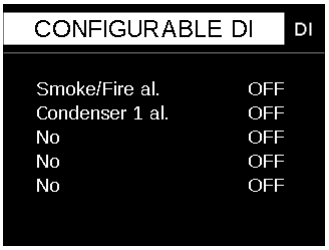
In units with dry cooler control system, the following information will be displayed:



- The unit's inlet water temperature.
- The dry cooler regulation set-point.
- The dry cooler regulation percentage.

4.1.20 CONFIGURABLE DIGITAL INPUTS

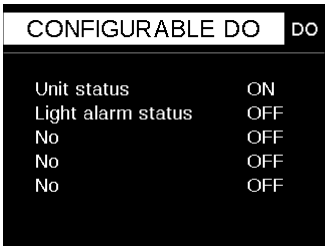
The following information will be displayed depending on configurable digital input settings:



- Description and status of configurable digital input 1.
- Description and status of configurable digital input 2.
- Description and status of configurable digital input 3.
- Description and status of configurable digital input 4.
- Description and status of configurable digital input 5.

4.1.21 CONFIGURABLE DIGITAL OUTPUTS

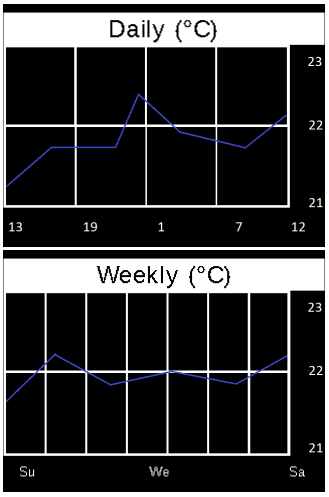
The following information will be displayed depending on the configurable digital output settings:



- Description and status of configurable digital output 1.
- Description and status of configurable digital output 2.
- Description and status of configurable digital output 3.
- Description and status of configurable digital output 4.
- Description and status of configurable digital output 5.

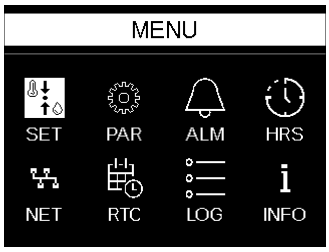
4.1.22 GRAPHS

These pages will display graphs related to:



- **Daily controlled temperature trend:** The trend represents the average temperature of the day.
- **Weekly controlled temperature trend:** The trend represents the average temperature of the 6 previous days.
- **Daily controlled humidity trend:** The trend represents the average humidity of the day.
- **Weekly controlled humidity trend:** The trend represents the average humidity of the 6 previous days.

4.2 MAIN MENU



To access the **MAIN MENU** simply press and hold down the **OK** key (OK). It is possible to select the **MENUS** on the **MAIN MENU** by moving the cursor with the **UP** (∧) and **DOWN** (∨) keys. Press the **OK** (OK) key to access the selected menu.

4.2.1 SYMBOLS AND ICONS THAT CAN BE DISPLAYED IN THE MAIN MENU

Various types of icons are used in the main menu. The meanings of the icons are provided in the table below.

Main menu							
SET	NETWORK	PAR	RTC	ALM	LOG	HOURS	INFO

Alarms and alarm log menu	
OK	OK
Press OK key	Press and hold OK key

4.2.2 CHANGES TO PARAMETERS

To change the parameters, proceed as follows:

- Select the **PARAMETER** that needs to be changed using the **UP** (∧) and **DOWN** (∨) keys and press the **OK** (OK) key to enable the changed parameter; the parameter will start to flash.
- Change the parameter using the **UP** (∧) and **DOWN** (∨) keys. Holding the keys pressed will speed up the increments of the value being changed. If the parameter contains multiple editable fields, switch between fields using the **LEFT** (←) and **RIGHT** (→) keys.
- To memorise the entered value, simply press **OK** (OK). However, should you not wish to save the parameter, just press **ESC** (⏻).

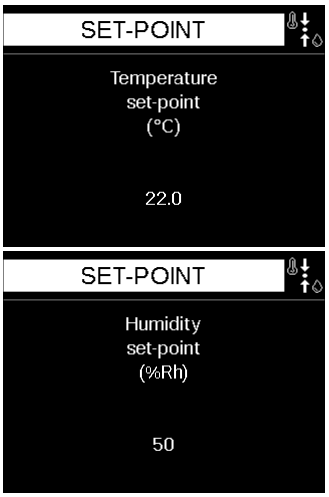
4.2.3 CHECK AND CLEARANCE OF ACTIVE ALARMS

From the **ALM - Active alarms** menu it is possible to view the alarms that are active on the unit. Access this menu by holding down the **LEFT/ALARM** (←) key.

Use the **OK** (OK) key to scroll through all active alarm signals. Hold the **OK** (OK) key pressed to reset the displayed alarm.

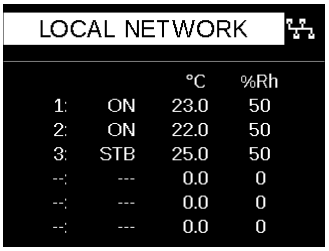
Press **ESC** (⏻) to return to the main program page.

4.2.4 SET - SET-POINT MENU



Within the **SET - Set-point** menu it is possible to modify the ambient temperature and ambient humidity regulation set-points. These parameters can be modified so that the user is able to select his/her preferred ambient conditions.

4.2.5 NETWORK - CANBUS LAN STATUS MENU



The general status of all units of the local network may be viewed within the **NETWORK - Local network status** menu. The unit are you accessing from will be displayed with an L (Local) while the other units bill be displayed with their network address (from 1 to 12).

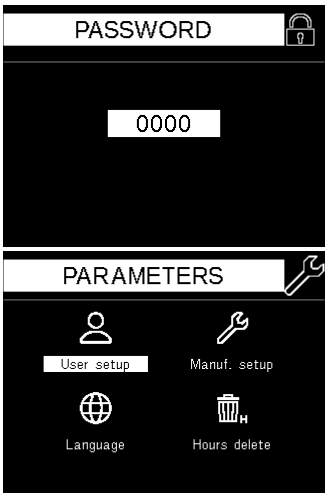
The units may have the following statuses:

- --- : Unit not on the network.
- OFF: Unit off.
- ON: Unit on.
- STB: Unit in stand-by.
- ALM: Unit in alarm.
- OFL: Unit off-line.

In addition to the status, for each unit it will be possible to view the current temperature and humidity value (if applicable). The displayed value refers to the controlled temperature and humidity.

To scroll the units in the network, simply press the **DOWN** ( ) key.

4.2.6 PAR - REGULATION PARAMETERS MENU

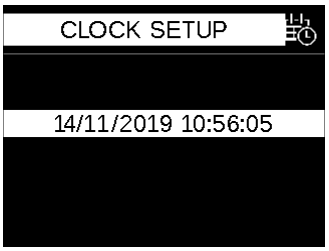


Within the **PAR - Parameters** menu, after gaining access by entering the correct login password, it is possible to edit the unit regulation parameters and the unit configuration parameters. The group is divided into the following sections:

- **USER SETUP:** Modification of the unit regulation and operation parameters.
- **FACTORY SETUP:** Unit operating parameter configuration.
- **LANGUAGE:** To change the software language.
- **DELETE HOURS:** To clear the hours of operation.

For more information see the following chapters.

4.2.7 RTC - CLOCK MENU

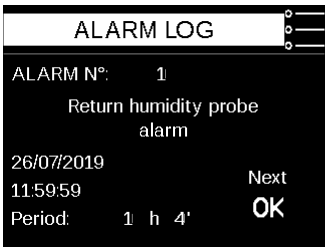


From the **RTC - Clock** menu, it is possible to change the current time and date.

4.2.8 ALM - ACTIVE ALARMS MENU

From the **ALM - Active alarms** menu it is possible to view the alarms that are active on the unit.

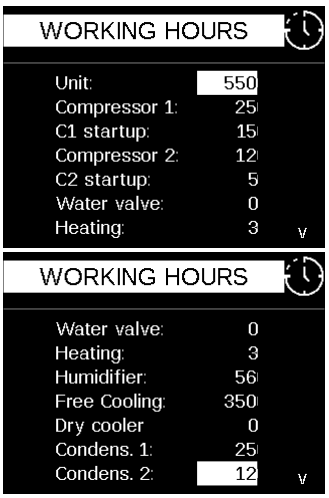
4.2.9 LOG - ALARM LOG MENU



Within the **LOG - Alarms log** menu it is possible to display the unit's alarm log. The alarms are stored in chronological order. The page displays the date, time and duration of the alarm.

Press the **OK** (OK) key to scroll through the stored alarms.

4.2.10 HOURS - WORKING HOURS LOG MENU

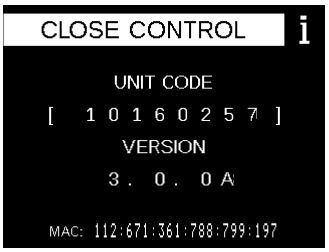


Within the **HOURS - Working hours log** menu it is possible to display the working hours of the following components of the unit:

- **Working hours:** This tells you the total hours of unit operation (Unit ON).
- **Compressor 1:** This tells you the total hours of operation of compressor 1.
- **Compressor 2:** This tells you the total hours of operation of compressor 2.
- **Water valve:** This tells you the total operating hours of the chilled water valve.
- **Heating:** This tells you the total hours of heating operation.
- **Humidifier:** This tells you the total hours of humidifier operation.
- **Free Cooling:** This tells you the total hours of operation of the free cooling system.
- **Dry cooler:** This tells you the total hours of operation of the dry cooler.
- **Condenser 1:** This tells you the total hours of operation of condenser 1.
- **Condenser 2:** This tells you the total hours of operation of condenser 2.

To scroll the working hours, simply press the **DOWN** (∨) key.

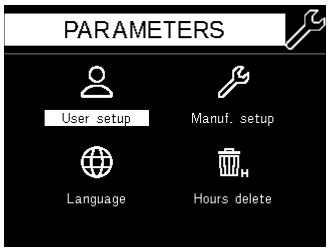
4.2.11 INFO - INFORMATION MENU



Within the **INFO - Information** menu it is possible to display:

- The serial number of the unit.
- The software version installed in the unit.
- The MAC address of the controller.

4.3 PARAMETERS MENU



4.3.1 SYMBOLS AND ICONS THAT CAN BE SHOWN ON THE DISPLAY

Various types of icons are used in the software pages. The meanings of the icons are provided in the table below.

Parameters menu				
				
User setup	Factory setup	Language	Delete log	Delete hours

User menu parameter groups					
					
Ventilation	Temperature	Limit temperature	Humidity	Humidifier	Free cooling & Two sources
					
Condensers	Dry cooler	Air filters	Probe calibration	Modbus	Ethernet
					
BACnet		Datalog		Password	

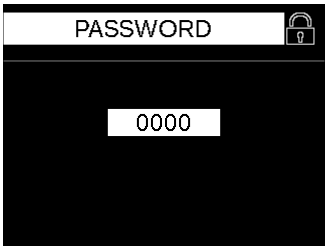
Manufacturer menu parameter groups					
					
Probes	Remote probes	Digital inputs	Digital outputs	Ventilation	Machine type
					
Direct expansion	Chilled Water	Heating	Humidity	Condensers	Dry cooler
					
Water pump	Set-point limits	Dead zone	Local network	Alarm management	Key lock
					
Factory settings reset			Password		

4.3.2 ACCESS TO PASSWORD-PROTECTED MENUS

To access the parameters in the **PAR - Parameters** menu, it is necessary to insert the **LOGIN** password.

To enter the password proceed as follows:

- Press **OK** (OK) to enable password changes. The field will start flashing and the first digit of the password will be selected.
- Change the value of the digit using the **UP** (∧) and **DOWN** (∨) keys. To switch between the digits press the **LEFT** (←) and **RIGHT** (→) keys.
- To memorise the entered value, simply press **OK** (OK). To exit the password change without saving, simply press **ESC** (⏻).



Default password (Editable) USER PARAMETERS:

0123

Default password (Editable) FACTORY PARAMETERS:

0694

4.3.3 ACCESS TO GROUPS AND REGULATION PARAMETERS

The **PARAMETERS MENU** is divided into various **MENUS**. A different number of **MENUS** will be available depending on the level of the inserted password.

The **MENUS** can be selected by scrolling the cursor using the **UP** (∧) and **DOWN** (∨) keys. Press the **OK** (OK) key to access the **MENU**.

The **MENUS** are in turn divided into different **GROUPS,** the name of which describes the function of the parameters it contains.

To switch between the pages of the various **MENUS** press the **LEFT** (←) and **RIGHT** (→) keys.

The **GROUPS** can be selected by scrolling the cursor using the **UP** (∧) and **DOWN** (∨) keys. Press the **OK** (OK) key to access the **MENU**.

Some of the groups may be inaccessible, this means the components to which they refer are not included in the unit.

4.3.4 CHANGES TO PARAMETERS

To change the parameters, proceed as follows:

- Select the **PARAMETER** that needs to be changed using the **UP** (∧) and **DOWN** (∨) keys and press the **OK** (OK) key to enable the changed parameter; the parameter will start to flash.
- Change the parameter using the **UP** (∧) and **DOWN** (∨) keys. Holding the keys pressed will speed up the increments of the value being changed. If the parameter contains multiple editable fields, switch between fields using the **LEFT** (←) and **RIGHT** (→) keys.
- To memorise the entered value, simply press **OK** (OK). However, should you not wish to save the parameter, just press **ESC** (⏻).

4.3.5 USER SETUP

The following parameter groups can be displayed in the **USER SETUP**:

- **Ventilation:** Contains the fan regulation parameters.
- **Temperature:** Contains the temperature regulation parameters.
- **Limit temperature:** Contains the limit temperature regulation parameters.
- **Humidity:** Contains the humidity regulation parameters.
- **Humidifier:** Contains the humidifier regulation parameters.
- **FC & TS:** Contains the Free Cooling and Two Sources system regulation parameters.
- **Condenser:** Contains the condenser regulation parameters.
- **Dry cooler:** Contains the dry cooler regulation parameters.
- **Air filters:** Contains the air filters regulation parameters.
- **Probe calibration:** Contains the parameters for the unit's probe calibration.
- **Modbus:** Contains the parameters of the Modbus protocol.
- **Ethernet:** Contains the parameters of the Ethernet protocol.
- **Bacnet:** Contains the parameters of the BACnet protocol.
- **Datalog:** Contains the parameters relative to the saving of operating parameters.
- **Password:** Allows the access password to be modified.

4.3.6 FACTORY SETUP

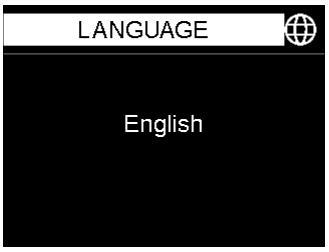
The following parameter groups can be displayed in the **FACTORY SETUP**:

- **Probes:** Contains the probe configuration parameters.
- **Remote probes:** Contains the remote probe module configuration parameters.
- **Digital inputs:** Contains the digital input configuration parameters.
- **Digital outputs:** Contains the digital input configuration parameters.
- **Ventilation:** Contains the ventilation configuration parameters.
- **Machine type:** Contains the unit type configuration parameters.
- **Direct expansion:** Contains the direct expansion configuration parameters.
- **Chilled water:** Contains the chilled water configuration parameters.
- **Heating:** Contains the heating configuration parameters.
- **Humidity:** Contains the humidity configuration parameters.
- **Condensers:** Contains the condenser configuration parameters.
- **Dry cooler:** Contains the dry cooler configuration parameters.
- **Water pump:** Contains the water pump configuration parameters.
- **Set-point limits:** Contains the set-point limit configuration parameters.
- **Dead zone:** Contains the dead zone configuration parameters.
- **Local network:** Contains the local network configuration parameters.
- **Alarm management:** Contains the alarm management configuration parameters.
- **Key lock:** Contains the key lock configuration parameters.
- **Parameters:** Contains the parameters relative to parameter management.
- **Password:** Allows the access password to be modified.

4.3.7 LANGUAGE SETUP

ATTENTION!

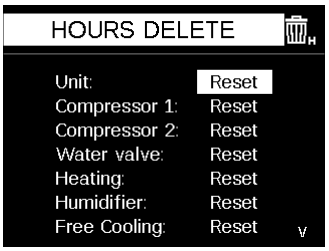
Language changes require the controller to be rebooted in order to be confirmed.

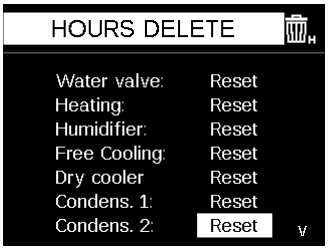


The regulation software lets you configure several languages. From the **LANGUAGE SET-UP** it is possible to select one of the following languages:

1) Italian
2) English
3) French
4) German
5) Spanish
6) Dutch
7) Russian
8) Polish

4.3.8 CLEAR WORKING HOURS





Within **CLEAR WORKING HOURS** it is possible to clear the log of working hours of the main components.

To scroll the working hours, simply press the **DOWN** (∨) key.

5 REGULATION LOGICS AND UNIT PARAMETERIZATION

5.1 REGULATION SOFTWARE VERSION

The regulation software can be supplied in three different versions, each distinguished by a capital letter at the end of the progressive number. The different software versions differ in regards to the type of serial communication available.

Following is a list of the differences between the various software versions:

- **Software version A:**

This versions makes the following serial protocols available:

1) Modbus RTU Slave on RS485 port
2) Modbus IP Slave on RJ45 port

- **Software version B:**

This versions makes the following serial protocols available:

1) Modbus RTU Slave on RS485 port
2) Modbus IP Slave on RJ45 port
3) BACnet IP on RJ45 port

- **Software version C:**

This versions makes the following serial protocols available:

1) BACnet MS/TP on RS485 port
2) Modbus IP Slave on RJ45 port

5.2 REGULATION SOFTWARE LANGUAGE CHANGE

ATTENTION!

Language changes require the controller to be rebooted in order to be confirmed.

The regulation software lets you configure several languages. With the "**Language**" parameter (Language Menu) it is possible to select one of the following languages:

1) Italian
2) English
3) French
4) German
5) Spanish
6) Dutch
7) Russian
8) Polish

Once the parameter has been changed, reboot the controller in order to confirm the change and allow the selected language to be applied.

5.3 KEY LOCK

The regulation software lets you configure a key lock function, which is automatically activated if the keypad is not touched for 120 s.

With the "**Enable Key Lock**" parameter (Factory Setup - Key lock) it is possible to select one of the following types of key lock:

1) **No:** Key lock is not active.
2) **Yes:** The keys will lock after inactivity.
3) **Password:** The keys will lock after inactivity and the user password will be required to unlock the keypad.

When the keys are locked the display shows the relevant icon (). When the keys are locked it will **NOT** be possible to:

- Turn the unit on and off from the keypad.
- Access the main menu.
- Delete active alarms.

It will nevertheless be possible to:

- Display the component status by pressing the **LEFT** (←) and **RIGHT** (→) keys.
- Display active alarms by pressing and holding down **ALARM** (←).

To remove the key lock just press the **UP + DOWN** (∧ | ∨) keys at the same time for a few seconds. An unlock password might be required; this would be the **USER** password.

5.4 TURNING THE UNIT ON

The unit may be switched on and off by pressing the **ON/OFF** (⏻) button for a few seconds. The unit's status may be viewed on the display's main page.

If the units are installed in local network, depending on the configuration of the "**Dynamic ON-OFF**" parameter (Factory set-up - Local network), it will be possible to simultaneously switch all the units in a local network on or off.

When it is on (**Unit ON**), the unit may be controlled remotely from the digital **OFF input** and from the supervision/BMS Modbus system.

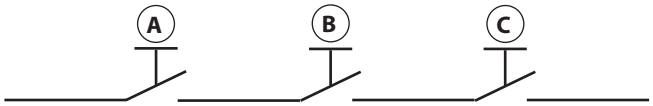
5.4.1 OFF FROM REMOTE AND FROM SUPERVISION/BMS MODBUS SYSTEM

ATTENTION!

If the supervision/BMS system sets the unit at OFF, and it is not possible to restore the ON status (for example due to lack of communication), the OFF condition can be reset by interrupting the power supply of the unit 3 consecutive times in 1 minute.

After being started from the terminal, the unit may be turned off and on remotely from a digital **OFF input** and from the supervision/BMS Modbus system.

For reasons of operator safety, should the unit be set to OFF from the display, the unit may not be started in any way via the digital OFF input remotely and via the supervision/BMS Modbus system. The unit's switch-on priority is therefore as follows:



A On/Off from display
B Off from remote
C Off from supervision/BMS Modbus system

5.4.2 AUTOMATIC RE-START DUE TO POWER FAILURE

ATTENTION! DANGER!

Risk of immediate start-up after resetting the main switch if used as an emergency stop!

The main switch can be used as an emergency stop when the operator is near the machine (during start-up, operation and maintenance). In this case, resetting the main switch will allow the machine to immediately restart, without any additional action by the operator.

The control software features an automatic re-start function in case of power supply failure. Should there be an outage on the power supply line, when it is restored SURVEY³ will resume the operation that was running prior to the problem.

Resuming previous operation will only be possible if, upon restarting, the unit has no shut-down alarms that prevent it from switching back on.

5.4.3 POWER SUPPLY FAILURE ALARM

The control software features an automatic notification function for shut-down in case of power supply failure. If there is a power outage, when the power comes back on SURVEY³ will display an alarm to notify the user of the problem.

From the "**No electrical power supply alarm**" (Factory setup - Alarm management) parameter it is possible to enable the alarm for re-start due to power outage.

The parameter makes it possible to choose the alarm triggering type:

1) **No:** No alarm is generated in the event of restart due to power failure.
2) **Unit ON**: The alarm will be generated at the next SURVEY³ restart only if the unit was running (**Unit ON**). If the unit was off (**Unit OFF**), no alarm will be generated.
3) **Yes:** The alarm will **ALWAYS** be generated the next time SURVEY³ is restarted.

When it is configured, a SURVEY³ restart following a power failure will generate the "**Electrical power supply failure alarm**" to alert the user to the problem.

5.4.4 MAINTENANCE SYSTEM OF POWER TO UPS - ULTRACAP

The regulation software features a function that keeps the regulation active in case of a power outage, of the control micro-processor only, through a preferential line (UPS).

The Ultracap function (from the word Ultracapacitor) freezes unit regulation as long as the main power supply line is down. When Ultracap is enabled, the unit does not generate alarms relative to inactive components (fans, inverter compressors), perfectly maintaining the rest of the regulation.

To enable this function you need to configure one of the configurable digital inputs to manage Ultracap mode activation.

From the "**Configurable input (1-2-3-4-5)**" (Factory setup - Digital inputs) parameter it is possible to configure "**Ultracap**" management (see chapters below for more information).

5.5 MOTORISED DAMPER CONTROL

The regulation software is able to control motorised dampers, with the function to isolate the unit from the environment when it is switched off.

When it is switched on (Unit ON) SURVEY³ will start opening the dampers. When the digital damper status input (ID2) is **OPEN (Damper open)** the fans will start.

With "**Damper status alarm delay**" (Factory set-up - Alarm management) parameter it is possible to set an alarm trigger delay at switch-on, to allow the motor to open the damper.

If the digital damper status input is **CLOSED (Damper closed),** at the end of the opening periods or during normal unit operation, the "**Motorised damper status alarm**" will be triggered, stopping unit operation.

5.6 AIR SUPPLY FAN REGULATION

SURVEY³ has the possibility of controlling one or more air supply fans with various types of control. The type of control is connected to the fan's features and the environment requiring climate-control.

With the "**Number of fans**" parameter (Factory Setup - Ventilation) it is possible to configure the number of fans installed in the unit.

With the "**Type of fans**" parameter (Factory Setup - Ventilation) it is possible to configure fan control choosing from the following types.

1) **On-off:** The fans will be controlled by a digital output.
2) **Analogue:** The fans will be controlled by a digital output and a 0-10V analogue output.
3) **Modbus EBM 3PH:** This controls EBM PAPST fans with three-phase power supply through Modbus Master communication protocol.
4) **Modbus EBM 1PH:** This controls EBM PAPST fans with single-phase power supply through Modbus Master communication protocol.
5) **Modbus ZIEHL 3PH:** This controls ZIEHL ABEGG fans with three-phase power supply through Modbus Master communication protocol.
6) **Modbus ZIEHL 1PH:** This controls ZIEHL ABEGG fans with single-phase power supply through Modbus Master communication protocol.

With the "**Regulation type**" parameter (Factory Setup - Ventilation) it is possible to configure fan regulation choosing from the following types:

1) **Set speed:** The fans will be adjusted to a set operating speed.
2) **Cold/Hot reg.:** The fans will the adjusted to variable operating speeds proportionally to the cooling or heating demand.
3) **Constant flow rate:** The fans will be adjusted to variable operating speeds based on the air flow, so as to keep it constant.
4) **Constant pressure:** The fans will be adjusted to variable operating speeds based on the ambient air pressure, so as to keep it constant.

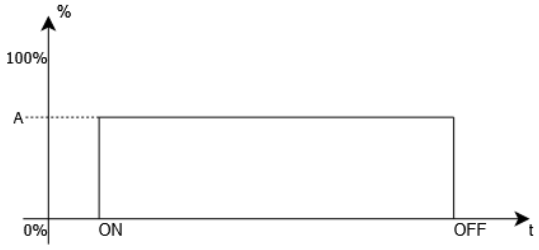
5.6.1 FIXED SPEED MODULATING FAN REGULATION

The control software is able to manage fan regulation by a fixed speed value, which is configured through the parameters.

With the "**Regulation type**" parameter (Factory Setup - Ventilation) it is possible to configure the fan regulation by setting a fixed operating speed.

With the "**Maximum fan speed**" parameter (Factory Setup - Ventilation) it is possible to configure the operation speed you wish to maintain.

ATTENTION: Setting the speed at a value below 30% is not recommended because this might prevent correct ambient temperature and humidity readings. With direct expansion and electric coil units the fan speed must be high enough to guarantee optimal operation of the components.



A Maximum speed (Factory setup - Ventilation)

5.6.2 REGULATION OF MODULATING FANS PROPORTIONALLY TO THE COOLING OR HEATING DEMAND

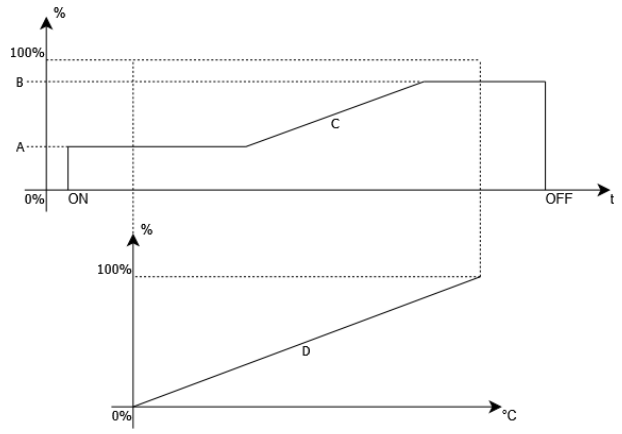
The control software is able to manage fan regulation at a speed value that is proportional to the cooling or heating demand. This can result in significant energy savings and a reduction in noise levels, particularly with partial loads.

With the "**Regulation type**" parameter (Factory Setup - Ventilation) it is possible to configure the fan regulation so as to modulate the speed according to the cooling or heating demand.

With the "**Minimum speed**" parameter (Factory Setup - Ventilation) it is possible to configure the minimum operation speed at which the fan may regulate.

With the "**Maximum speed**" parameter (Factory Setup - Ventilation) it is possible to configure the maximum operation speed that the fan can regulate at.

ATTENTION: Setting the minimum speed at a value below 30% is not recommended because this might prevent correct ambient temperature and humidity reading. With direct expansion units with electric coils the fan speed will be maintained at maximum speed until the component switches off, in order to guarantee optimal operation of the components.



A **Minimum speed (Factory setup - Ventilation)**
B **Maximum speed (Factory setup - Ventilation)**
C **Fan modulation area**
D **Cooling or heating demand**

5.6.3 MODULATING FAN REGULATION WITH CONSTANT TEMPERATURE DELTA

With the "**Regulation type**" parameter (Factory setup - Ventilation) it is possible to configure fan regulation so as to modulate the speed according to the **temperature delta** (**ΔT = Return air temperature - Supply air temperature**), so as to keep it constant with respect to the parameter "**Air temperature delta set-point**" (User Setup - Ventilation).

Fan speed will be increased or decreased, in order to reach the set-point. A 1.0°C dead zone will make it possible to stabilise the fan speed.

With the "**Minimum speed**" parameter (Factory Setup - Ventilation) it is possible to configure the minimum operation speed at which the fan may regulate.

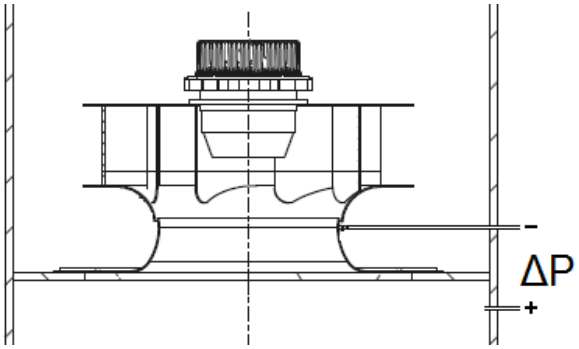
With the "**Maximum speed**" parameter (Factory Setup - Ventilation) it is possible to configure the maximum operation speed that the fan can regulate at.

ATTENTION: In order to avoid fan speed fluctuations, regulation will be stopped when the compressor starts for a start-up period (default 60 s); at the end of this compressor start-up period, regulation will automatically resume. For compressors with inverter regulation, fan regulation will also be stopped if the compressor is forced for the oil return; at the end of the compressor forcing period, regulation will automatically resume.

5.6.4 REGULATION OF MODULATING FANS AT CONSTANT AIR FLOW

With the "**Regulation type**" parameter (Factory setup - Ventilation) it is possible to configure fan regulation so as to modulate the speed according to the air flow, in order to keep it constant with respect to parameter "**Flow set-point**" (User setup - Ventilation).

In order to calculate air flow rate, the unit requires an analogue differential air pressure probe installed inside the machine and connected to the fan nozzle.



With the "**Differential air pressure**" parameter (Factory setup - Probes) it is possible to configure the presence of the analogue differential air pressure probe.

Flow rate will be calculated based on the following mathematical function:

$$V = \sqrt{\Delta P} * k$$

Where:

- **V** is the flow rate (volume) in m^3/h
- **ΔP** is the measured pressure difference
- **K** is the fan's characteristic coefficient, the "**Air flow calculation coefficient**" parameter (Factory set-up - Ventilation)

Fan speed will be increased or decreased, in order to reach the set-point. A 100 m^3/h dead zone makes it possible to stabilise fan speed.

With the "**Minimum speed**" parameter (Factory Setup - Ventilation) it is possible to configure the minimum operation speed at which the fan may regulate.

With the "**Maximum speed**" parameter (Factory Setup - Ventilation) it is possible to configure the maximum operation speed that the fan can regulate at.

This type of regulation is optimal to assure constant flow rate even in the event of variable system load losses (ex. dirty filters) which might reduce it considerably.

5.6.5 REGULATION OF MODULATING FANS AT CONSTANT PRESSURE

With the "**Regulation type**" parameter (Factory setup - Ventilation) it is possible to configure fan regulation so as to modulate the speed according to the ambient pressure, in order to keep it constant with respect to the "**Pressure set-point**" parameter (User setup - Ventilation).

In order to calculate air pressure, the unit requires an analogue differential air pressure probe installed inside the machine.

With the "**Differential air pressure**" parameter (Factory setup - Probes) it is possible to configure the presence of the analogue differential air pressure probe.

Fan speed will be increased or decreased, in order to reach the set-point. A 2 Pa dead zone makes it possible to stabilise fan speed.

With the "**Minimum speed**" parameter (Factory Setup - Ventilation) it is possible to configure the minimum operation speed at which the fan may regulate.

With the "**Maximum speed**" parameter (Factory Setup - Ventilation) it is possible to configure the maximum operation speed that the fan can regulate at.

This regulation is ideal for rooms with air distribution from the raised floor, especially in the following cases:

- Rooms intended for future expansion: In these cases the floor is "opened up" during expansion steps and pressure will tend to drop as a consequence. The unit will be able to compensate the reduction by increasing fan speed, thereby assuring optimal air distribution.
- Rooms subject to constant maintenance: In these cases the floor is opened up during maintenance work and the pressure will tend to drop as a consequence. The unit will therefore be able to compensate the pressure drop by increasing fan speed, thereby assuring optimal air distribution.

5.6.6 STARTING SPEED CONTROL

If fan regulation is set as modulating, it will be possible to configure a start-up period. During the set start-up period the fans will be overridden to the start-up speed. At the end of the start-up time the fans will start regulating normally.

With the "**Start-up speed**" parameter (Factory set-up - Ventilation) it is possible to configure the operation speed at which the fan is regulated during the start-up period.

With the "**Start-up time**" parameter (Factory set-up - Ventilation) it is possible to configure the duration of the fans' startup period.

This function is optimal for reaching the work condition at the unit's start more rapidly, with no need to wait for the modulation period required for reaching the set-point.

5.6.7 OPERATING SPEED SAVING SYSTEM

In units with constant air flow or constant air pressure regulation, in order to further optimise achieving optimal operating conditions, the control algorithm has an **operating speed saving system**.

As soon as the system reaches the set-point, it saves the speed demand value that made it possible to achieve the set-point. The next time the fans start-up again, they will start up at this saved value.

If start-up speed management is set, the fans will start up at the saved value, ignoring the start-up speed parameter.

If there is no saved value, or if the set-point was never reached, the fans will observe the normal regulation algorithm.

5.6.8 FAN ALARM MANAGEMENT

If the fans are controlled via digital 0-10V or On/Off signal, the alarm will be managed via the relevant digital input. If there is an alarm on one or more fans, SURVEY³ will trigger the "**General supply fans alarm**", which will stop unit operation

If the fans are controlled via the Modbus connection, SURVEY³ is able to detect the following alarm conditions of each fan installed in the unit, triggering the "**Fan inverter alarm (1-2-3-4-5)**" specifying the nature of the problem. The following alarm causes are possible:

- **Communication down:** SURVEY³ constantly monitors correct communication with the fans' control module in order to assure their correct operation.
- **No phase alarm:** The fan control electronics constantly check for motor power supply. The check is carried out on every individual motor phase.
- **High inverter temperature:** The fan control electronics constantly check the control module temperature in order to prevent damage due to excessively high temperatures.
- **High motor temperature:** The fan control electronics constantly check the motor temperature in order to prevent damage due to excessively high temperatures.
- **Inverter error:** The fan control electronics constantly check control module status and report any damage.
- **Motor overload:** The fan control electronics constantly check the motor status and report any overload.
- **Low voltage:** The fan control electronics constantly check the control module's status and report any DC power supply reduction.
- **No master-slave communication:** The fan control electronics constantly check the communication status with the slave fans and report any communication failure.
- **Hall sensor error:** The fan control electronics constantly check the status of the Hall sensor and report any damage.

5.6.9 ANALOGUE DIFFERENTIAL AIR PRESSURE PROBE ALARM

If the unit is fitted with analogue differential air pressure probe for fan control, said pressure will be constantly monitored.

If the analogue differential air pressure probe is broken or disconnected SURVEY³ will trigger the "**Differential air pressure probe alarm**".

If the analogue differential air pressure probe is broken or disconnected SURVEY³ will stop speed regulation at the last value recorded by the set-point. If the set-point has never been reached the speed is blocked at 50% or at start-up speed, if set.

5.7 TEMPERATURE REGULATION

5.7.1 TEMPERATURE CONTROL TYPE

All units are fitted with two operating temperature reading probes. One probe is located in the ambient air intake section and is defined as "**Return temperature probe"**, while another probe is placed in the ambient air supply compartment and is defined as "**Supply temperature probe".**

With the "**Regulation sensor**" parameter (User setup - Temperature) it is possible to configure which probe is designated for temperature control. The type of control is normally connected to the type of system one wishes to implement. The following controls may be selected:

- **Return temperature regulation:** SURVEY^3 will use the return temperature value to regulate the temperature. This setting is ideal for rooms where the thermal loads are uniformly distributed.

- **Supply temperature regulation:** SURVEY^3 will use the supply temperature value to regulate the temperature. This setting is ideal for rooms where the thermal loads are not uniform, and the return temperature might not be correct.

5.7.2 SETTING THE TEMPERATURE SET-POINT LIMITS

Should it be required to limit the setting field of the temperature regulation set-point, it is possible to configure its minimum and maximum limit:

With the "**Minimum temperature set-point limit**" parameter (Factory setup - Set-point limits) it is possible to configure the minimum setting limit of the temperature set-point.

With the "**Maximum temperature set-point limit**" parameter (Factory setup - Set-point limits) it is possible to configure the maximum setting limit of the temperature set-point.

This function is ideal for preventing excessively high or low regulation values to be set, which might create problems in the system.

5.7.3 TEMPERATURE REGULATION DEAD ZONE SETTING

In order to prevent continuous fluctuations in the cooling or heating demand near the regulation set-point, it is possible to configure a regulation dead zone which will deviate the regulation start point from the set-point. See the following chapters for further information.

With the "**Temperature dead zone**" parameter (Factory setup - Dead zone) it is possible to configure the temperature regulation dead zone.

This function is ideal for systems where the thermal loads are highly variable and there might be over-regulation near the set-points.

5.7.4 PROPORTIONAL TEMPERATURE REGULATION

With the "**Regulation type**" parameter (User setup - Temperature) it is possible to configure the "**P**" (Proportional) regulation type for controlled temperature.

This type of regulation is ideal in cases where the "force" of actuators should be directly proportional to the "distance" of the regulation value from the ideal setting (Set-point), with respect to the maximum setting that should be obtained (Proportional band).

This type of regulation will always tend to have a **regulation error in full production**, i.e. a deviation of the temperature from the set-point. The extent of the deviation will vary according to the correctness of the unit's sizing with respect to the system's thermal load: the more over-sized the unit, the greater the deviation in full production.

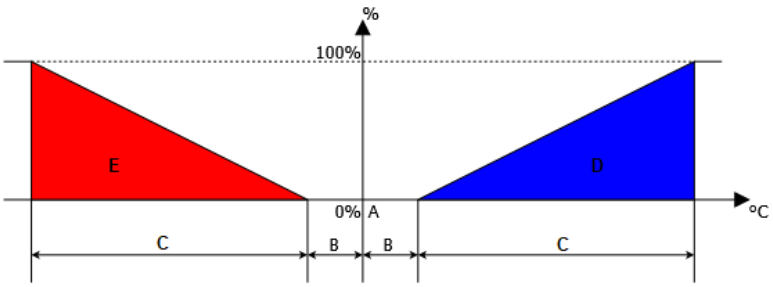
The control output of the components is therefore regulated according to the following function:

$$Out_p = \frac{100}{Bp} * (In - Set)$$

Where:

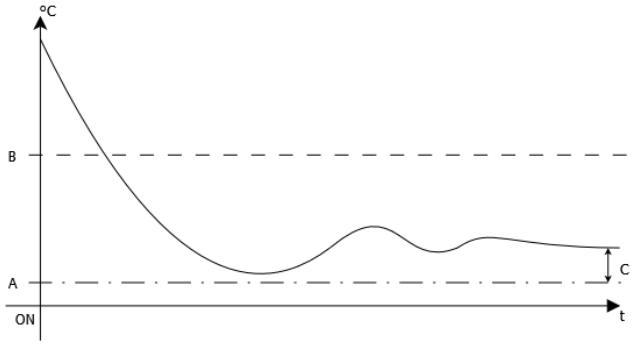
- **Out_p** is the proportional error.
- **Bp** is the "**Proportional band**" parameter (User setup - Temperature)
- **In** is the controlled temperature value
- **Set** is the "**Temperature set-point**" parameter (Main menu - Set-point)

The following graph shows proportional regulation, with and without dead zone:



A **Temperature set-point (Main menu - Set-point)**
B **Temperature dead zone (Factory setup - Dead zone configuration)**
C **Proportional band (User setup - Temperature regulation)**
D **Cooling regulation**
E **Heating regulation**

The following graph shows the system's response to Proportional regulation in cooling. The heating response will be the mirror opposite.



A **Temperature set-point (Main menu - Set-point)**
B **Proportional band (User setup - Temperature regulation)**
C **Regulation error at full production**

5.7.5 PROPORTIONAL + INTEGRAL TEMPERATURE REGULATION

With the "**Regulation type**" parameter (User setup - Temperature) it is possible to configure the "**PI**" (Proportional + Integral) regulation type for temperature control.

This type of regulation is ideal in cases where one wishes to reduce to the minimum the **Regulation error in full production**, thus increasing regulation precision over time.

Proportional + Integral regulation adds to the "**Proportional error**" (previous chapter) the so-called "**Integral Error**", which allows the controller to retain the memory of past "**Proportional error**" values. This property gives "**PI**" regulation the ability to make the process as close as possible to the required point of reference.

The control output of the components is therefore regulated according to the following function:

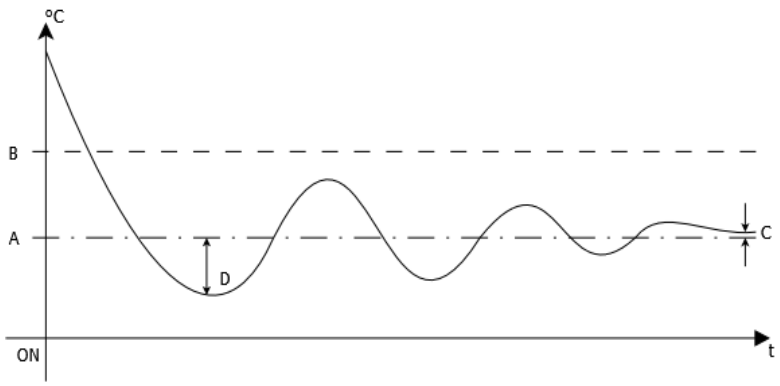
$$Out_{pi} = Out_p + \frac{100}{Bp * Ti} \int (In - Set)\, dt$$

Where:

- **Out_{pi}** is the proportional + Integral error
- **Out_p** is the proportional error (previous chapter)
- **Bp** is the "**Proportional band**" parameter (User setup - Temperature)
- **Ti** is the "**Integration time**" parameter (User setup - Temperature)
- **In** is the controlled temperature value
- **Set** is the "**Temperature set-point**" parameter (Main menu - Set-point)

Unlike Proportional regulation, where the control output is 0% upon reaching the Set-point, in Proportional + Integral regulation the control output will tend to be subject to **Over-regulation** due to integral action. Hence there may be **Out_{pi}** values higher than 0% even when the controlled value is lower than the Set-point. **Over-regulation** will tend to decrease over time until it is close to 0%.

The following graph shows the system's response to Proportional + Integral regulation in cooling. The heating response will be the mirror opposite.



A **Temperature set-point (Main menu - Set-point)**
B **Proportional band (User setup - Temperature regulation)**
C **Regulation error at full production**
D **Over-regulation**

If, after 30 minutes have elapsed, the system still appears to be very unstable, the parameters will need to be changed again and tests started again. If, after 30 minutes have elapsed, the system still appears to be very unstable, the parameters will need to be changed again and tests started again.

In order to reduce test times we suggest entering the following values:

- "**Proportional band**" parameter (User setup - Temperature regulation): **10.0 °C**
- "**Integration Time**" parameter (User setup - Temperature regulation: **180 s**

5.7.6 PROPORTIONAL + INTEGRAL + DERIVATIVE TEMPERATURE REGULATION

With the "**Regulation type**" parameter (User setup - Temperature) it is possible to configure the "**PID**" (Proportional + Integral + Derivative) regulation type for the controlled temperature.

This type of regulation is ideal in cases where one wishes to reduce the **Regulation error in full production** and **Over-regulation** to a minimum, thus making temperature control more stable and precise.

To Proportional + Integral regulation, "PID" regulation adds the so-called "**Derivative error**", which makes it possible to take into account the "speed" that the magnitude changes at, and therefore to correct the control output more quickly.

The control output of the components is therefore regulated according to the following function:

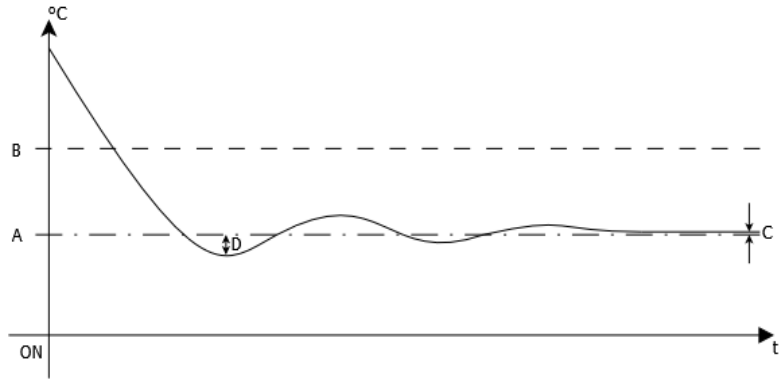
$$Out_{pid} = Out_p + Out_{pi} + \frac{100}{Bp} * Td \ \frac{d(In - Set)}{dt}$$

Where:

- **Out_{pid}** is the proportional + Integral + derivative error
- **Out_p** is the proportional error (previous chapter)
- **Out_{pi}** is the proportional + Integral error (previous chapter)
- **Bp** is the "**Proportional band**" parameter (User setup - Temperature)
- **Td** is the "**Derivation time**" parameter (User setup - Temperature)
- **In** is the controlled temperature value
- **Set** is the "**Temperature set-point**" parameter (Main menu - Set-point)

As with Proportional + Integral regulation, the control output in the Proportional + integral + Derivative regulation will tend to undergo an **Over-regulation**. Hence there may be **Out_{pi}** values higher than 0% even when the controlled value is lower than the Set-point. **Over-regulation** will tend to decrease over time until it is close to 0%.

The following graph shows the system's response to Proportional + Integral + Derivative regulation in cooling. The heating response will be the mirror opposite.



A **Temperature set-point (Main menu - Set-point)**
B **Proportional band (User setup - Temperature regulation)**
C **Regulation error at full production**
D **Over-regulation**

If, after 30 minutes have elapsed, the system still appears to be very unstable, the parameters will need to be changed again and tests started again. If, after 30 minutes have elapsed, the system still appears to be very unstable, the parameters will need to be changed again and tests started again.

In order to reduce test times we suggest entering the following values:

- "**Proportional band**" parameter (User setup - Temperature regulation): **40.0 °C**
- "**Integration Time**" parameter (User setup - Temperature regulation: **60 s**
- "**Derivation time**" parameter (User setup - Temperature regulation): **1 s**

5.7.7 HIGH AND LOW TEMPERATURE ALARMS

With "**High temperature alarm offset**" (User setup - Temperature) and "**Low temperature alarm offset**" (User setup - Temperature regulation) parameters it is possible to configure two alarm thresholds for temperature control.

Exceeding these thresholds will trigger the "**High regulation temperature alarm**" or the "**Low regulation temperature alarm**" to alert the operator to any problems.

High and low temperature alarm triggering does not pose a shutdown problem for the unit that will continue operating regularly. With the "**Temperature and humidity alarms delay**" parameter (Factory setup - Alarms management) it is possible to delay alarm triggering.

Alarm triggering is defined by the following formulas:

$$Al_{Ht} = In > Set + Offset_{Ht}$$

$$Al_{Lt} = In < Set - Offset_{Lt}$$

Where:

- $\mathbf{Al_{Ht}}$ is the high temperature alarm
- $\mathbf{Al_{Lt}}$ is the low temperature alarm
- **In** is the controlled temperature value
- **Set** is the "**Temperature set-point**" parameter (Main menu - Set-point)
- $\mathbf{Offset_{Ht}}$ is the "**High temperature alarm offset**" parameter (User set-up - Temperature)
- $\mathbf{Offset_{Lt}}$ is the "**Low temperature alarm offset**" parameter (User setup - Temperature)

5.7.8 AIR TEMPERATURE PROBES ALARM MANAGEMENT

If the return temperature probe is broken or disconnected SURVEY³ will trigger the "**Broken return temperature probe alarm**".

In the same way, in the event the supply temperature probe should be broken or disconnected SURVEY³ will trigger the "**Broken supply temperature probe alarm**".

In order not to interrupt temperature regulation, SURVEY³ will use the working sensor as the valid value. In the event both probes should be broken, temperature regulation will stop.

5.8 LIMIT TEMPERATURE REGULATION

5.8.1 LIMIT TEMPERATURE

With the "**Regulation sensor**" parameter (User setup - Temperature) it is possible to configure which probe is designated for temperature control. The probe not designated for regulation may be used in order to set a limit to regulation (limit temperature) to prevent system issues. Therefore:

- **Supply limit temperature:** If the return temperature is controlled, limits to the supply temperature may be set in order to ensure the intake air into the room is neither too hot nor too cold.

- **Return limit temperature:** If the supply temperature is controlled, limits for the return temperature may be set in order to ensure that the air in the room is neither too hot nor too cold.

5.8.2 HIGH AND LOW LIMIT TEMPERATURE MANAGEMENT

With the "**Limit temperature high alarm limit**" (User setup - Limit temperature) and "**Limit temperature low alarm limit**" (User setup - Temperature limit) parameters it is possible to configure two alarm thresholds for the limit temperature.

Exceeding these thresholds will trigger the "**High limit temperature alarm**" or the "**Low limit temperature alarm**" to alert the operator to any problems.

High and low limit temperature alarm triggering does not pose a shutdown problem for the unit that will continue operating regularly. With the "**Temperature and humidity alarms delay**" parameter (Factory setup - Alarms) it is possible to delay alarm triggering.

Alarm triggering is defined by the following formulas:

$$Al_{Hlt} = In > Limit_{Hlt}$$

$$Al_{Llt} = In < Limit_{Llt}$$

Where:

- **Al_{Hlt}** is the high limit temperature alarm
- **Al_{Llt}** is the low limit temperature alarm
- **In** is the limit temperature value
- **$Limit_{Hlt}$** is the "**Limit temperature high alarm limit**" parameter (User setup - Limit temperature)
- **$Limit_{Llt}$** is the "**Limit temperature low alarm limit**" parameter (User setup - Limit temperature)

In order to improve limit temperature management it is possible to actively intervene on regulation parts in various ways. With parameters "**High limit temperature management**" (User setup - Limit temperature) and "**Low limit temperature management**" (User setup - Limit temperature) it is possible to configure the following actions:

- **Alarm only:** When the thresholds are exceeded a warning alarm is triggered.

- **Component stop**: When the thresholds are exceeded the cold or hot component is disabled for the limit temperature to return within the alarm threshold. If the limit temperature remains over the thresholds a warning alarm is triggered.

- **Reduction**: Upon exceeding the thresholds, the regulation signal of the regulation components is reduced proportionally to maintain the limit temperature within the alarm threshold. If the limit temperature remains over the thresholds a warning alarm is triggered.

- **Cold/hot activation**: When the alarm threshold is exceeded, the cold or hot component is activated proportionally to maintain the temperature below the alarm threshold. If the limit temperature remains over the thresholds a warning alarm is triggered.

5.9 HUMIDITY REGULATION

5.9.1 SUPPLY AND RETURN HUMIDITY PROBE CONFIGURATION

The units may be fitted with a return humidity probe, "**Return humidity**" parameter (Factory setup - Probes), that lets you view the return air humidity reading.

The units may also be fitted with a return humidity probe, "**Supply humidity**" (Factory setup - Probes) parameter, that lets you view the supply air humidity reading.

Humidity regulation will also apply to the return humidity value, which is usually equal to that of the room being controlled. The supply humidity value is only used as a means to control the unit's operation status and cannot be used to control the components designated for humidification and dehumidification operations.

5.9.2 SETTING THE RETURN HUMIDITY SET-POINT LIMITS

Should it be required to limit the setting field of the humidity regulation set-point, it is possible to configure its minimum and maximum limit:

With the "**Minimum humidity set-point limit**" parameter (Factory setup - Set-point limits) it is possible to configure the minimum setting limit of the humidity set-point.

With the "**Maximum humidity set-point limit**" parameter (Factory setup - Set-point limits) it is possible to configure the maximum setting limit of the humidity set-point.

This function is ideal for preventing excessively high or low regulation values to be set, which might create problems in the system.

5.9.3 RETURN HUMIDITY REGULATION DEAD ZONE SETTING

In order to prevent continuous fluctuations in the dehumidification and humidification demand near the regulation set-point, it is possible to configure a regulation dead zone which will deviate the regulation start point from the set-point. See the following chapters for further information.

With the "**Humidity dead zone**" parameter (Factory setup - Dead zone) it is possible to configure the humidity regulation dead zone.

This function is ideal for systems where the thermal loads are highly variable and there might be over-regulation near the set-points.

5.9.4 PROPORTIONAL DEHUMIDIFICATION REGULATION

With the "**Dehumidification**" parameter (Factory setup - Humidity) it is possible to enable dehumidification mode. Dehumidification is regulated with the Proportional system.

The control output of the components is therefore regulated according to the following function:

$$Out_p = \frac{100}{Bp} * (In - Set)$$

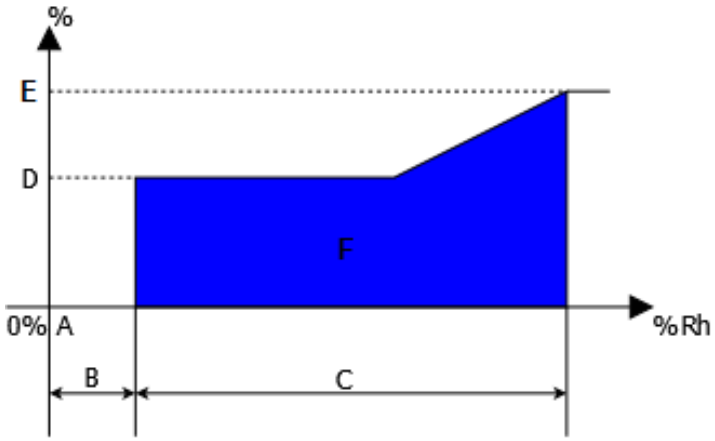
Where:

- **Out$_p$** is the proportional error
- **Bp** is the "**Proportional dehumidification band**" parameter (User set-up - Humidity regulation)
- **In** is the controlled humidity value
- **Set** is the "**Humidity set-point**" parameter (Main menu - Set-point)

Dehumidification is only activated when the control output reaches the "**Dehumidification trigger threshold**" parameter (Factory setup - Humidity).

With the "**Minimum dehumidification limit**" parameter (Factory setup - Humidity) it will be possible to limit regulation to prevent the demand from being too low, and therefore the dehumidification effect not being sufficient. This is because the dehumidification effect is only possible with a very low air temperature, therefore with very high cooling demand.

The following graph shows proportional regulation, with and without dead zone:



A **Humidity set-point (Main menu - Set-point)**
B **Humidity dead zone (Factory setup - Dead zone)**
C **Dehumidification proportional band (User setup - Humidity)**
D **Dehumidification triggering threshold (Factory setup - Humidity)**
E **Minimum dehumidification limit (Factory setup - Humidity)**
F **Cooling regulation**

5.9.5 PARTIAL DEHUMIDIFICATION

With the "**Partial dehumidification**" parameter (Factory setup - Humidity) it is possible to inhibit activation of both compressors in dehumidification.

This function is ideal in systems where the ambient thermal load and any unit heating triggering, is not enough to offset the activation of both compressors, excessively cooling the room.

When this function is enabled the set-point might be reached in a longer amount of time than with conventional regulation.

5.9.6 DEHUMIDIFICATION LOCK

With the "**Dehumidification lock offset**" parameter (Factory setup - Humidity) it is possible to enter a temperature offset which, when exceeded, interrupts the dehumidification demand to prevent the ambient temperature from dropping too low.

This function is ideal in systems where the ambient thermal load and any unit heating triggering, is not enough to offset dehumidification activation, excessively cooling the room.

When this function is enabled the set-point might be reached in a longer amount of time than with conventional regulation.

Dehumidification lock triggering is defined by the following formula:

$$Dh_{stop} = In < Set - Offset_{dh}$$

Where:

- **Dhstop** is the dehumidification lock
- **In** is the controlled temperature value
- **Set** is the "**Temperature set-point**" parameter (Main menu - Set-point)
- **Offset$_{dh}$** is the "**Dehumidification lock offset**" (Factory setup - Humidity) parameter

5.9.7 HUMIDIFIER PRESENCE SETTING

With the "**Humidifier**" parameter (Factory setup - Humidity) it is possible to configure the presence of a humidification system for room humidification regulation.

The parameter makes it possible to select the following humidification regulation types:

1) **No:** There is no type of humidification regulation in the unit, hence it will be disabled.
2) **Internal (Modbus):** The unit features an internal humidifier driven by CPY board. CPY board interfacing will take place with Modbus Master protocol.
3) **External (Analogue):** The unit or system features an external humidifier (not integrated with the controller). Humidifier interfacing will take place with 0-10V analogue signal.

5.9.8 HUMIDIFICATION PRODUCTION PERCENTAGE

With the "**Humidification production percentage**" parameter (Factory setup - Humidity) it is possible to configure the maximum limit of the humidifier control output, in order to reduce steam production.

This function is ideal in systems where maximum humidifier production is too high and there may be steam over-production issues and possible formation of condensate inside the unit.

5.9.9 STEAM PRODUCTION DURING COOLING

With the "**Joint humidification and cooling**" parameter (Factory setup - Humidity) it is possible to enable steam production at the same time as cooling.

During cooling, steam production should normally be stopped in order to prevent the formation of condensate inside the unit, owing to low air temperature.

This function makes it possible, in systems where steam production is required even during cooling (areas with very cold climate), to prevent issues due to a drastic drop in ambient humidity.

This function is not recommended in direct expansion units, as the supply air temperature may be very low and lead to the formation of condensate.

5.9.10 HUMIDIFICATION PROPORTIONAL REGULATION

With the "**Enable humidification**" parameter (User setup - Humidifier) it is possible to enable humidification operation. Humidification is regulated with the Proportional system.

Proportional humidification regulation offers a modulation effect on the amount of steam produced by the humidification system.

With the integrated humidifier, regulation may vary from 8% to 100% of total production. Below 8% of the control output steam production might not be linear.

For humidification systems other than integrated humidifier, please refer to their features with regards to steam production linearity.

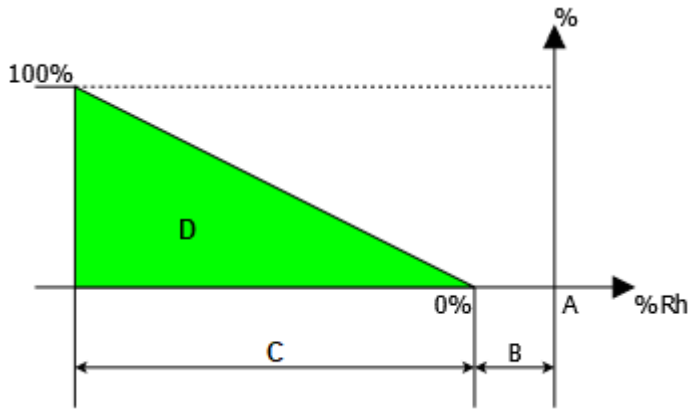
The control output of the components is therefore regulated according to the following function:

$$Out_p = \frac{100}{Bp} * (In - Set)$$

Where:

- **Out_p** is the proportional error
- **Bp** is the "**Proportional humidification band**" parameter (User set-up - Humidity regulation)
- **In** is the controlled humidity value
- **Set** is the "**Humidity set-point**" parameter (Main menu - Set-point)

The following graph shows proportional regulation, with and without dead zone:



A **Humidity set-point (Main menu - Set-point)**
B **Humidity dead zone (Factory setup - Dead zone)**
C **Humidification proportional band (User setup - Humidity)**
D **Humidification regulation**

5.9.11 MANUAL HUMIDIFIER WATER DISCHARGE

In order to carry out routine humidifier maintenance, it might be necessary to empty water forcibly from the cylinder.

With the "**Manual cylinder discharge**" parameter (User setup - Humidifier) it is possible to manually discharge water from the steam cylinder to remove it for maintenance.

5.9.12 LINES AND HUMIDIFIER CYLINDER PRE-WASHING MANAGEMENT

The pre-washing function allows cleaning the cylinder and water lines, in particular after having set up the hydraulic connections and/or replaced the cylinder. During washing, the cylinder is filled (with closed contactor) and emptied 3 times to remove any impurities contained inside the cylinder and the pipes.

With the "**Cylinder pre-washing**" parameter (User setup - Humidifier) it is possible to enable the pre-washing function.

The humidifier will automatically go back to normal operation at the end of the pre-washing function.

5.9.13 HIGH AND LOW RETURN AND SUPPLY HUMIDITY ALARMS

With the "**High return humidity alarm offset**" (User set-up - Humidity) and "**Low return humidity alarm offset**" (User set-up - Humidity) parameters it is possible to configure two alarm thresholds for humidity control.

Exceeding these thresholds will trigger the "**High return humidity alarm**" or the "**Low return humidity alarm**" to alert the operator to any problems.

In units with supply humidity probe, with the "**High supply humidity alarm limit**" (User setup - Humidity) and "**Low supply humidity alarm limit**" (User setup - Humidity) parameters it is possible to configure two alarm thresholds for supply humidity.

Exceeding these thresholds will trigger the "**High supply humidity alarm**" or the "**Low supply humidity alarm**" to alert the operator to any problems.

High and low humidity alarm triggering does not pose a shutdown problem for the unit that will continue operating regularly. With the "**Temperature and humidity alarms delay**" parameter (Factory setup - Alarms management) it is possible to delay alarm triggering.

Alarm triggering is defined by the following formulas:

$$Al_{Hh} = In > Set + Offset_{Hh}$$

$$Al_{Lh} = In < Set - Offset_{Lh}$$

$$Al_{Hsh} = In > Limit_{Hsh}$$

$$Al_{Lsh} = In < Limit_{Lsh}$$

Where:

- **Al_{Hh}** is the high return humidity alarm
- **Al_{Lh}** is the low return humidity alarm
- **Al_{Hsh}** is the high supply humidity alarm
- **Al_{Lsh}** is the low supply humidity alarm
- **In** is the return humidity value.
- **Set** is the "**Humidity set-point**" parameter (Main menu - Set-point)
- **$Offset_{Hh}$** is the "**High return humidity alarm offset**" parameter (User setup - Humidity)
- **$Offset_{Lh}$** is the "**Low return humidity alarm offset**" parameter (User setup - Humidity)
- **$Limit_{Hsh}$** is the "**High supply humidity alarm limit**" parameter (User setup - Humidity)
- **$Limit_{Lsh}$** is the "**Low supply humidity alarm limit**" parameter (User setup - Humidity)

5.9.14 AIR HUMIDITY PROBES ALARM MANAGEMENT

If the return humidity probe is broken or disconnected SURVEY³ will trigger the "**Broken return humidity probe alarm**". In the same way, if the supply humidity probe is broken or disconnected SURVEY³ will trigger the "**Broken supply humidity probe alarm**".

The return humidity probe alarm stops humidity regulation, whereas the supply probe has no effects on regulation.

5.9.15 HUMIDIFIER ALARM MANAGEMENT

The CPY humidifier board controls the internal humidifier's alarm detection. With the Modbus Master protocol, SURVEY³ receives the humidifier's alarm statuses, triggering the "**Humidifier alarm**" and providing the type of alarm. See the chapter on alarm management for further information.

With the "**Configurable output (1-2-3-4-5)**" parameter (Factory setup - Digital outputs) it is possible to configure one of the five digital outputs in order to provide the "**General external humidifier alarm**".

Both alarms stop humidifier regulation.

5.10 DIRECT EXPANSION UNIT REGULATION

With the "**Machine type**" parameter (Factory setup - Machine type) it is possible to configure the type of temperature regulation with direct expansion system (**Direct Expansion**).

Direct expansion units exploit the properties of R410a refrigerant gas to cool air. The main regulation component of direct expansion units is the compressor (or compressors in the event of multi-circuit units).

5.10.1 COMPRESSOR ON/OFF AND OPERATION TIMES

For the correct operation of the compressors, they must operate within certain on/off times.

These times must be able to guarantee proper motor cooling, oil return and the balancing of the circuit during the shutdown of the motor.

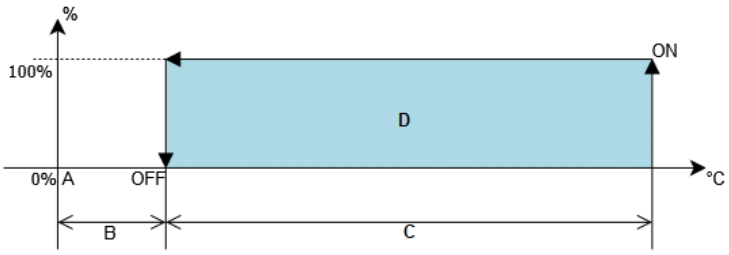
The compressors must therefore respect the following operation times:

- **Compressor operation time**: The compressors must remain on for **7 minutes (420 s)**.
- **Time between compressor starts**: The compressors must remain off for **3 minutes (180 s)**
- **Activation delay between two compressors**: The compressors will be activated with a **5-second** delay between each of their start times, if simultaneous operation is requested.

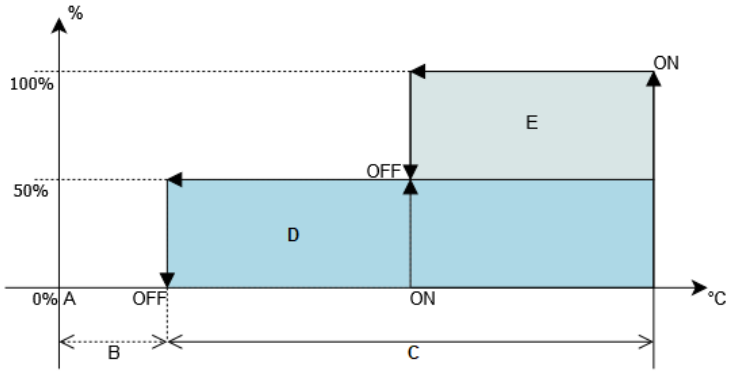
5.10.2 COMPRESSOR ON/OFF MANAGEMENT

SURVEY³ is able to control up to 2 compressors on 2 separate cooling circuits. The following pictures show the start-up diagram of the compressors with Proportional temperature regulation:

With the "**Number of compressors**" parameter (Factory setup - Direct expansion) it is possible to configure the number of compressors installed in the unit.



Regulation with 1 compressor



Regulation with 2 compressors

A **Temperature Set-point (Main menu - Set-point)**
B **Temperature dead zone (Factory setup - Dead zone)**
C **Proportional band (User setup - Temperature)**
D **Compressor 1**
E **Compressor 2**

5.10.3 AUTOMATIC NON REGULATED COMPRESSOR ROTATION

With the "**Type of rotation**" parameter (Factory setup - Direct expansion) it is possible to configure the rotation type of non-regulated compressors.

Rotation of non-regulated compressors makes it possible to choose the compressor actuation logic in order to balance the hours of compressor operation as much as possible. Two different types of rotation can be set:

- **FIFO + HS: FIFO** (First In - First Out) rotation ensures that the first compressor to switch on is always the first to switch off. The first compressor to be switched on is defined with **HS** logic (Hours and Start-up). **HS** logic takes into account hours of operation as well as number of compressor start-ups. The compressor with the lowest number of operating hours + start-ups will be the first the start.

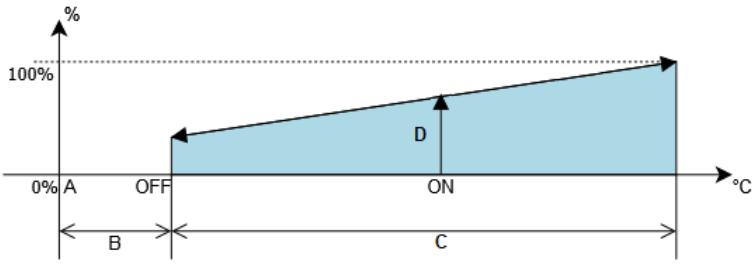
- **LIFO + HS: LIFO** (Last In - First Out) rotation ensures that the last compressor to switch on is always the first to switch off. The first compressor to be switched on is defined with **HS** logic (Hours and Start-up). **HS** logic takes into account hours of operation as well as number of compressor start-ups. The compressor with the lowest number of operating hours + start-ups will be the first the start.

5.10.4 COMPRESSOR MANAGEMENT WITH INVERTER REGULATION

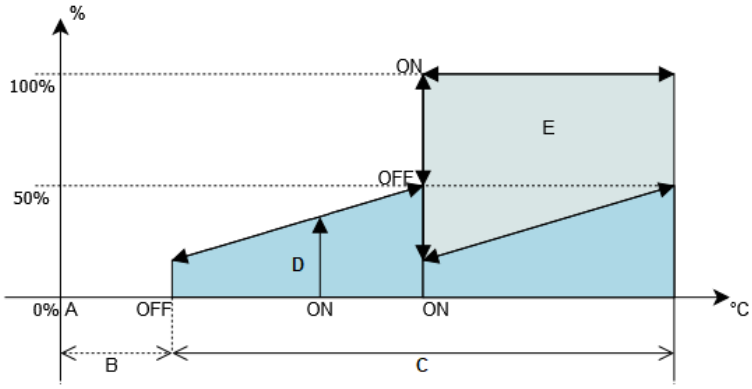
With the "**Enable compressor inverter**" parameter (Factory setup - Direct expansion) it is possible to configure the type of inverter compressor regulation. You can choose between the following types of regulation:

1) **No:** There is no type of compressor regulation in the unit, hence it will be disabled.
2) **Internal (Agile):** The unit features internal Agile inverter interfaced by Modbus Master protocol.
3) **Internal (Active):** The unit features internal Active inverter interfaced by Modbus Master protocol.
4) **External (Analogue):** The unit or system features an external inverter (not integrated with the controller). Inverter interfacing will take place with 0-10V analogue signal.

The inverter compressor will always be installed on **Circuit 1**, therefore with 2-compressor regulation rotation will be disabled. The following pictures show the start-up diagram of the compressors with Proportional temperature regulation:



Regulation with 1 compressor



Regulation with 2 compressors

A **Temperature Set-point (Main menu - Set-point)**
B **Temperature dead zone (Factory setup - Dead zone)**
C **Proportional band (User setup - Temperature)**
D **Compressor 1**
E **Compressor 2**

5.10.5 SPEED MANAGEMENT OF COMPRESSORS WITH INVERTER REGULATION FOR OIL RETURN

The return of oil to the compressor is tied to the optimal execution of the cooling circuit. However, in inverter compressors, speed regulation may reduce the quantity of oil returned to the compressor.

To rectify this problem, the software manages an automated compressor forcing system in order to facilitate the oil return to the compressor. The inverter compressor will therefore be regulated as follows:

- **Compressor start:** The compressor will be started at a start-up speed (Default 50%) and will not allow regulation below this speed for a period of 60 s.

- **Normal operation**: If the compressor needs to work below the start-up speed (Default 50%) for more than 30 minutes, the compressor will be stopped to force a restart at higher speeds.

5.10.6 SUPERHEAT REGULATION WITH ELECTRONIC EXPANSION VALVE

Optimal operation of cooling circuits depends mainly on the refrigerant **Superheat** value regulation on the evaporator outlet. **Superheat**(**SH**) refers to the **difference between compressor evaporation temperature and suction temperature.**

A correct Superheat (**SH**) value not only assures that the compressor is protected from damage due to sudden liquid refrigerant backflow, but also ensures that the compressor always operates at the best possible condition, reducing the electrical current absorbed by the compressor motor.

In order to achieve optimal **Superheat** (**SH**) regulation all direct expansion units are fitted with **electronic expansion valves** (**EEV**), whose positioning precision assures constant modulation of the refrigerant flow into the evaporation coil.

Valve modulation is controlled by the EVDrive control module through a specific algorithm. The **Superheat** (**SH**) value is calculated through the readings transmitted by the probes installed on the suction section of the compressor. Two probes are used for calculation:

- **Suction pressure probe:** This probe detects the pressure of the evaporation coil, through which it is possible to calculate the **evaporation temperature**.
- **Suction temperature probe:** This probe reads the compressor suction temperature.

The **Superheat** (**SH**) value is compared with the **superheat set-point (6.0 K)** and the valve opening percentage is calculated, through a PID algorithm, to maintain **Superheat** (**SH**) constant near the set-point.

The EVDrive control module, in addition to superheat regulation, is also able to control some safety algorithms used to protect the compressor. These algorithms will be explained in the following chapters.

5.10.7 CONDENSATION PRESSURE AND TEMPERATURE READING

The condensation pressure and temperature reading is indispensable for cooling circuit operation. Using a pressure sensor, the SURVEY^3 microprocessor constantly reads the condensation pressure value and calculates the equivalent temperature.

5.10.8 LIQUID TEMPERATURE DETECTION AND SUB-COOLING CALCULATION

For optimal operation of cooling circuits the liquid refrigerant flowing into the EEV valve must have an optimal **Subcooling (SC)** value. **Subcooling** refers to the **difference between the condensation temperature and the liquid refrigerant temperature**. The SURVEY^3 microprocessor constantly reads the liquid refrigerant value and subsequently calculates the relative subcooling value.

5.10.9 DE-SUPERHEAT MANAGEMENT

De-superheat (**De-superheat - DSH**) refers to the **difference between the compressor discharge temperature and the compressor condensation temperature**.

In a correctly operating unit the de-superheat value should be between **20.0K and 30.0 K**. SURVEY^3 constantly monitors the de-superheat value and implements the following regulations:

- **Should de-superheat drop below 20 K, liquid may flow back to the compressor.** To counter this phenomenon the superheating set-point will be raised to 12.0 K.
- **Should de-superheat rise above 30 K, there is no risk of liquid backflow.** Therefore, in view of the "favourable" condition in relation to compressor safety, it is possible to reduce the superheat set-point to increase system efficiency (condensation pressure decrease and evaporation pressure increase) up to a minimum of 5.0 K.

5.10.10 VALVE OPENING CONTROL AT COMPRESSOR START-UP

In order to reduce the compressor load at start-up (ΔP between suction and supply), and consequently electrical motor breakaway, the expansion valve control driver manages an early valve opening algorithm.

With a compressor start-up request, the expansion valve will open at 100% for 5 seconds in order to balance circuit pressures, after which the compressor will start up.

Following compressor start-up, the expansion valve stays open by 50% for 30 seconds to stabilise the operating conditions of the cooling circuit. At the end of the stabilisation time, the control algorithm goes back to regulating the valve normally.

5.10.11 LOW SUPERHEAT (LoSH) MANAGEMENT

A **Low Superheat** (**LoSH**) value may indicate a less than optimal operating condition of the cooling circuit, which might cause liquid to flow back to the compressor.

The expansion valve control driver manages an algorithm to monitor low superheat. If the superheat value exceeds the limit value of **3.0 K**, the low superheat status will appear on the controller and the control algorithm will be accelerated to eliminate the problem in the shortest possible amount of time.

5.10.12 HIGH SUPERHEAT (HiSH) MANAGEMENT

A **high superheat** (**HiSH**) value may indicate a low refrigerant charge, which does not allow optimal regulation of the **Superheat** (**SH**) value.

The expansion valve control driver manages an algorithm to monitor high superheat. If the superheat value exceeds the limit value of **15.0 K**, the high superheat status will appear on the controller and the control algorithm will be accelerated to eliminate the problem in the shortest possible amount of time.

5.10.13 HIGH COMPRESSOR EVAPORATION PRESSURE MANAGEMENT (MOP)

Scroll compressors installed in the units entail the need to work at evaporation pressures that do not exceed the values set by the manufacturer. Exceeding the constructive limit may involve mechanical damage to the compressor.

In order to protect the compressor, the expansion valve control driver manages an algorithm for high evaporation pressure regulation (**Maximum Operating Pressure - MOP**).

Should the evaporation pressure reading exceed the limit of **11.5 Barg (15.0 °C)**, the Superheat set-point (see previous chapters) will be raised in order to reduce valve opening and consequently evaporation pressure. After restoring an acceptable evaporation pressure value, the control algorithm will go back to regulating the valve normally.

5.10.14 LOW COMPRESSOR EVAPORATION PRESSURE MANAGEMENT (LOP)

Scroll compressors installed in the units entail the need to work at evaporation pressures that do not exceed the values set by the manufacturer. Exceeding the constructive limit may involve mechanical damage to the compressor.

In order to protect the compressor, the expansion valve control driver manages an algorithm for low evaporation pressure regulation (**Low Operating Pressure - LOP**).

Should the evaporation pressure reading exceed the limit of **7.0 Barg (0.0°C)**, valve opening will be locked at the current value to prevent the pressure from continuing to drop, triggering a low pressure alarm. After restoring an acceptable evaporation pressure value, the control algorithm will go back to regulating the valve normally.

5.10.15 LOW EVAPORATION PRESSURE ALARM

Suction pressure below the standard readings involves a work overload for the compressor. The refrigerant will be highly superheated on the evaporator outflow and will reach the compressor at a temperature above its standard value. This causes abnormal overheating of the motor windings in particular, and of the compressor's mechanical parts in general.

In order to improve compressor protection, SURVEY³ constantly monitors evaporation pressure. Should the evaporation pressure reading drop below **6,0 Barg (-4.0 °C)**, the compressor will be stopped to prevent damaging it and the "**Low compressor pressure alarm (1-2)**" will be triggered.

Low outside air temperature might lead to the refrigerant migrating into the condenser. This phenomenon would result in a low pressure condition during the first few minutes of compressor operation.

To avoid false alarms, in low outdoor temperature conditions, the low pressure alarm is delayed for 60 seconds when the compressor is turned on. With the "**Low compressor pressure delay**" parameter (Factory setup - Alarms management) it is possible to delay alarm triggering.

5.10.16 HIGH COMPRESSOR DISCHARGE TEMPERATURE MANAGEMENT

High discharge temperature of the compressor might lead to several problems with the compressor and cooling circuit. In order to improve compressor protection, all units are fitted with a compressor discharge temperature probe installed on every circuit. This probe has the purpose of ensuring that the discharge temperature does not exceed the compressor's damage threshold.

The discharge temperature is managed through two different trigger thresholds:

1) **Discharge temperature protection limit (Default 85.0 °C):** Should the discharge temperature exceed this threshold, the compressor demand would be reduced in order to maintain the temperature below this threshold. No alarm is triggered by the controller and the unit continues operating regularly. This option is only valid for compressors controlled by inverter.

2) **Discharge temperature alarm limit (Default 90.0°C):** Should the discharge temperature exceed this threshold, the compressor would be immediately stopped with the "**High compressor discharge temperature alarm (1-2)**".

In order to prevent false alarms in transient situations, the high discharge temperature alarm is delayed. With the "**High compressor discharge temperature alarm delay**" parameter (Factory setup - Alarm management) it is possible to delay alarm triggering.

5.10.17 LOW COMPRESSION RATIO ALARM

Excessively low compression ratio, i.e. the ratio between circuit pressures indicates that the compressor is not compressing the refrigerant correctly. Possible causes are the mechanical rupture of the compressor, incorrect compressor direction of rotation or incorrect operating condition. This causes abnormal overheating of the motor windings in particular, and of the compressor's mechanical parts in general.

In order to improve compressor protection, SURVEY³ constantly controls the compression ratio value, with the following calculation:

$$CR = \frac{P_c}{P_e}$$

Where:

- **CR** is the compression ratio
- $\mathbf{P_c}$ is the condensation pressure in Absolute Bars
- $\mathbf{P_e}$ is the evaporation pressure in Absolute Bars

Should the compression ratio **CR** be less than **1.6**, the compressor will be stopped and the "**Low compression compressor alarm (1-2)**" will be triggered.

In order to prevent false alarms in transient situations, the low compression ratio alarm is delayed. With the "**Low compressor compression alarms delay**" parameter (Factory setup - Alarms management) it is possible to delay alarm triggering.

5.10.18 HIGH INVERTER COMPRESSOR CONDENSATION PRESSURE MANAGEMENT

Condensation pressure above the standard readings involves a work overload for the compressor. Its absorption will tend to rise, with the risk of damaging the motor. Furthermore, as the pressure rises so does the risk of damaging the cooling circuit components, due to the high pressure.

In order to protect the compressor and avoid downtime due to an alarm, when SURVEY³ reaches the limit of **38 BarG (61.0 °C)** it will reduce the compressor speed in order to reduce its load.

The normal compressor speed will be gradually restored as soon as the operating conditions return to below **36 BarG (58.5 °C)**.

5.10.19 HIGH CONDENSATION PRESSURE ALARM

In order to improve compressor protection, SURVEY³ constantly monitors the condensation pressure. A manual reset pressure sensor is installed on the circuit and will open the digital input to lock the compressor in the event of high pressure, triggering the "**High compressor pressure alarm (1-2)"**.

5.10.20 COMPRESSOR THERMAL MAGNETIC PROTECTION ALARM

All compressors are electrical fixtures and are therefore protected by thermal magnetic switches in order to preserve the motor and the power line in the event of electrical motor short circuit and overload.

In the event of failure, the thermal magnetic switch will break the power line and open the digital alarm input, triggering the "**Compressor breaker alarm (1-2)**".

5.10.21 ELECTRONIC VALVE ALARM MANAGEMENT

The EVDrive valves regulation driver manages all alarms concerning electronic valves, triggering the "**EEV alarm (1-2)**". Driver alarms stop cooling circuit operation. Below is the list of valve alarms:

- **Communication:** The alarm indicates failed communication with the SURVEY³ regulator.
- **Evaporation pressure probe:** If the evaporation pressure probe is broken or disconnected, the driver will signal the fault to the SURVEY³.
- **Condensation pressure probe:** If the condensation pressure probe is broken or disconnected, the driver will signal the fault to the SURVEY³.
- **Suction temperature probe:** If the suction temperature probe is broken or disconnected, the driver will signal the fault to the SURVEY³.
- **Discharge temperature probe:** If the discharge temperature probe is broken or disconnected, the driver will signal the fault to the SURVEY³.

5.10.22 LIQUID TEMPERATURE PROBE ALARM MANAGEMENT

The SURVEY³ microprocessor constantly monitors the liquid temperature probe status, triggering the "**Liquid temperature probe alarm (1-2)**". The broken liquid temperature probe alarm does not stop compressor operation.

5.10.23 COMPRESSOR INVERTER ALARM MANAGEMENT

With the Modbus Master protocol SURVEY³ receives the compressor inverter's alarm statuses, triggering the "**DC inverter alarm**" and providing the type of alarm. See the chapter on alarm management for further details.

With an external inverter, the alarm must be connected to the digital input dedicated to compressor thermal protection (See previous chapter).

5.10.24 COMPRESSOR ALARM SEVERITY MANAGEMENT

With the "**Compressor alarm severity**" (Factory setup - Alarm management) parameter it is possible to define whether the compressor alarms should stop the unit or not.

If configured as **CRITICAL**, one or more triggered alarms of the compressor, or a cooling circuit component, will stop the unit due to critical alarm. In case of unit with 2 circuits, both circuits must be in alarm status for the unit to stop.

If configured as **NON CRITICAL**, one or more triggered alarms of the compressor, or a cooling circuit component, will not stop the unit but only the compressor.

5.11 CONDENSER REGULATION

With the "**Condenser regulation**" parameter (Factory setup - Condensation) it is possible to enable condenser regulation of the direct expansion units. The following options may be selected:

1) **No:** There is no type of condenser regulation in the unit, hence it will be disabled.
2) **Fixed set-point:** The condensers must be regulated with a fixed set-point.
3) **Autoset-point:** The condensers must be regulated with a variable set-point. The regulation set-point will be calculated automatically based on operating conditions (see following chapters).

With the "**Regulation type**" parameter (Factory setup - Condensation) it is possible to configure the type of condenser regulation of the direct expansion units. You can select from the following types of regulation:

1) **Proportional:** The condensers will be regulated by a proportional 0-10V signal (see chapters below).
2) **Dead zone:** The condensers will be regulated by an increasing 0-10V signal (see chapters below).

5.11.1 CONDENSER PROPORTIONAL REGULATION

This type of regulation is ideal in cases where the condensation demand needs to be inversely proportional to the "distance" of the regulation magnitude from the ideal setting (Set-point), with respect to the maximum setting that you wish to obtain (Proportional band).

To avoid condensation temperature over-regulation issues, the condenser is only regulated with the compressor on. The control output of the condensers is therefore regulated according to the following function:

$$Out_p = \frac{100}{B_p} * (In + B_p - Set)$$

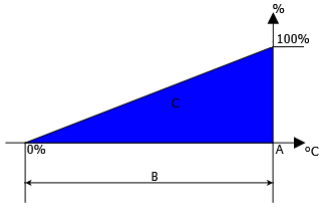
Where:

- **Out_p** is the proportional error
- **Bp** the "**Condensation proportional band**" parameter (User setup - Condensers)
- **In** is the condensation temperature value
- **Set** is the "**Condensation set-point**" parameter (User setup - Condensers)

With the "**Minimum condensation demand**" (Factory setup - Condensation) parameter it is possible to configure the minimum operating demand that the condenser may be regulated to.

With the "**Maximum condensation demand**" (Factory setup - Condensation) parameter it is possible to configure the maximum operating demand that the condenser may be regulated to.

The following graph shows proportional regulation:

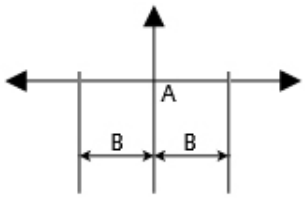


A **Condensation set-point (User setup - Condensers)**
B **Condensation proportional band (User setup - Condensers)**
C **Condenser regulation**

5.11.2 CONDENSER DEAD ZONE REGULATION

This type of regulation is excellent for damping any oscillation due to system reactivity, thereby maintaining the condensation temperature within an acceptable regulation margin (dead zone) in relation to the established set-point.

The regulation margin is equal to the **Condensation set-point** (User setup - Condensers) +/- **Condensation proportional band** (User setup - Condensers), as shown in the figure below.



A **Condensation set-point (User setup - Condensers)**
B **Condensation proportional band (User setup - Condensers)**

The value of the condenser control output will be increased (or decreased) based on the value of the condensation temperature in relation to the regulation margin, according to the following logic:

- If the condensation temperature is within the regulation margin, then the output value will not change.
- If the condensation temperature is higher than the regulation margin, then the output value will be increased by 1% every 5 seconds (default) until it reaches the maximum regulation value. The increment time is defined by the "**Standard modulation speed**" (Factory setup - Condensation) parameter.
- If the condensation temperature is lower than the regulation margin, then the output value will be decreased by 1% every 5 seconds (default) until it reaches the minimum regulation value. The increment time is defined by the "**Standard modulation speed**" (Factory setup - Condensation) parameter.

With the "**Minimum condensation demand**" (Factory setup - Condensation) parameter it is possible to configure the minimum operating demand that the condenser may be regulated to.

With the "**Maximum condensation demand**" (Factory setup - Condensation) parameter it is possible to configure the maximum operating demand that the condenser may be regulated to.

To avoid condensation temperature over-regulation issues, the condenser is only regulated with the compressor on.

5.11.3 CONDENSER REGULATION WITH AUTOSET-POINT

Low condensation temperature makes it possible to achieve compressor energy savings. Condensation temperature regulation is tied to outdoor temperature (ex. Air or water condensers with dry cooler), therefore during the cold season it is possible to reduce the regulation set-point in order to increase energy savings.

Through condenser regulation with **Autoset-point** it is possible, with a suitable algorithm, to achieve the best possible regulation set-point for condenser operating conditions.

For optimal Autoset-point system regulation it is recommended to set the "**Condensation set-point**" (User set-up - Condensers) parameter at the minimum value that you want the condensers to work at (ex. 35°C).

The set-point is regulated in the following manner:

- **OUTDOOR LOW TEMPERATURE CONDITIONS:** As long as the temperature of the outdoor air (or water) is such that the condenser regulation demand is lower than the "**Maximum condensation demand**" (Factory setup - Condensation), the set-point will not change.

- **INCREASE IN OUTDOOR TEMPERATURE:** When there is an increase in the outdoor air (or water) temperature, the condensation temperature also starts increasing. When the condenser regulation demand reaches the "**Maximum condensation demand**" (Factory setup - Condensation), a timer will start. As soon as the timer exceeds the value of the "**AutoSet-point time**" (Factory setup - Condensation) parameter, the "**Condensation set-point**" (User set-up - Condensers) parameter will be summed with the "**Condensation set increase delta**" (User set-up - Condensers) parameter. The set-point will be increased until the condensation temperature falls within the new regulation range, up to a maximum of the "**Maximum condensation set increase**" (User set-up – Condensers) parameter.

- **REGULATION WITH RAISED SET-POINT:** For as long as the set-point is increased, the condensation demand will be overridden to a minimum value equal to the "**Minimum Autoset-point demand**" (Factory setup - Condensers) parameter. This stops the condensation temperature value from being affected if the set-point is reached.

- **DROP IN OUTDOOR TEMPERATURE:** With a drop in the outdoor air temperature, the condensation temperature tends to fall below the changed set-point. In this case, as soon as the condensation temperature drops below the set-point value, a timer will start. As soon as the "**AutoSet-point time**" parameter is exceeded (Factory setup - Condensers), the "**Condensation set increase delta**" (User set-up – Condensers) parameter will be subtracted from the modified set-point. The set-point will decrease until the condensation temperature falls within the regulation range, or until it reaches the "**Condensation set-point**" (User setup – Condensers) parameter.

5.11.4 START-UP DEMAND MANAGEMENT

In order to improve condenser regulation it is possible to configure a start-up period. During the set start-up period, regulation will be overridden at start-up request. At the end of the start-up time, regulation will go back to normal operation.

With the "**Condensation start-up demand**" (Factory setup - Condensation) parameter it is possible to configure the demand that the condenser will be regulated to during the start-up period.

With the "**Condensation start-up time**" parameter (Factory setup - Condensation) it is possible to configure the duration of the condensation regulation start-up period.

This function is optimal to reach the work condition at condenser start-up more quickly, with no need to wait for the modulation period required for reaching the set-point.

5.11.5 REGULATION DEMAND SAVING SYSTEM

With the "**Condensation demand memory**" (Factory setup - Condensation) parameter it is possible to enable the regulation demand saving system.

As soon as the system reaches the set-point, it saves the regulation demand value. At the next start-up, regulation will start from the saved value. If start-up demand management is set, the condensers will start up at the saved regulation value, ignoring the start-up demand parameter.

5.11.6 QUICK MODULATION MANAGEMENT AT START-UP

In order to improve condenser regulation it is possible to configure a quick modulation period for the demand signal. During the quick modulation period, the increment (or decrement) time of the signal will be quicker. At the end of the quick modulation period, the increment time will go back to the value defined by the "**Standard modulation speed**" parameter (Factory setup - Condensation).

With the "**Quick modulation speed**" parameter (Factory set-up - Condensation) it is possible to configure the quick modulation period increment time.

With the "**Quick modulation time**" parameter (Factory set-up - Condensation) it is possible to configure the duration of the quick modulation period.

This function is excellent for rapidly reaching the operating condition more quickly, at condenser start-up.

5.11.7 CONDENSER REGULATION MANAGEMENT WITH BROKEN PROBE

In order not to interrupt condenser regulation, in the event of breakdown of the condensation pressure sensor it is possible to override the request to a pre-set value.

With the "**Override with probe error**" parameter (Factory setup - Condensation) it is possible to configure the percentage that the demand will be overridden at with "**Condensation pressure sensor EEV (1-2) Alarm**".

5.11.8 CONDENSER ALARM MANAGEMENT

In order to detect any issues to do with the condensers, it is possible to configure a digital input as condenser alarm.

With the "**Configurable input (1-2-3-4-5)**" parameter (Factory setup - Digital inputs) it is possible to configure one of the five digital inputs in order to detect the condenser 1 or 2 alarm.

When configured, the digital input opening will trigger the "**General condenser alarm (1-2)**" which will stop regulation of the condensers and compressors connected to them.

Depending on the setting of the "**Compressor alarms severity**" parameter (Factory setup - Alarm management), triggering may also stop the unit.

5.11.9 WATER-COOLED CONDENSER FLOW ALARM MANAGEMENT

If the unit is equipped with a water-cooled condenser, it is possible to configure the management of the water flow alarm. This system allows the compressor to be stopped for as long as there is no water, and to automatically restart it as soon as the water flow is restored.

With the "**Configurable input (1-2-3-4-5)**" parameter (Factory setup - Digital inputs) it is possible to configure one of the five digital inputs in order to detect the condenser 1 or 2 water flow alarm.

If the flow contact detects an alarm condition and the refrigerant pressure is higher than 28 BarG (47.5°C), the "**Condenser (1-2) water flow alarm**" is generated, which stops the compressors and forces the opening of the adjustment valve at 100%.

As soon as the flow sensor contact is restored and the refrigerant pressure falls below 28 BarG (47.5°C), the alarm is automatically reset and the compressors are made to resume operation.

5.12 EVAPORATING UNIT REGULATION FOR CONNECTION TO REMOTE CONDENSING UNIT

With the "**Machine type**" parameter (Factory setup - Machine type) it is possible to configure the type of temperature regulation with direct expansion system for connection to remote condensing unit (**Evaporator**).

The units for connection to remote condensing units are supplied without compressors and without expansion valve, as these components are installed in the condensing unit.

5.12.1 CONFIGURATION FOR OPERATION WITH REMOTE CONDENSING UNIT

In order to assure system operation with remote condensing unit the unit's control outputs must be configured.

With the "**Configurable output (1-2-3-4-5)**" parameter (Factory setup - Digital outputs) it is possible to configure one of the five digital outputs in order to provide the condensing unit start-up contact.

The 0-10 V modulating cooling demand regulation output (AO 2 - External inverter) will make it possible to drive a condensing unit with inverter compressor.

The cooling demand will take place as explained in the previous chapters (Direct expansion).

5.12.2 CONDENSING UNIT ALARM MANAGEMENT

In order to supply the unit with information on the condensing unit's status, it is possible to configure a digital input as general condensing unit alarm.

With the "**Configurable input (1-2-3-4-5)**" parameter (Factory setup - Digital inputs) it is possible to configure one of the five digital inputs in order to detect the condensing unit alarm.

When configured, digital input opening will trigger the "**General condensing unit alarm**" which will stop condensing unit regulation.

Depending on the setting of the "**Compressor alarms severity**" parameter (Factory setup - Alarm management), triggering the alarm may also stop the unit.

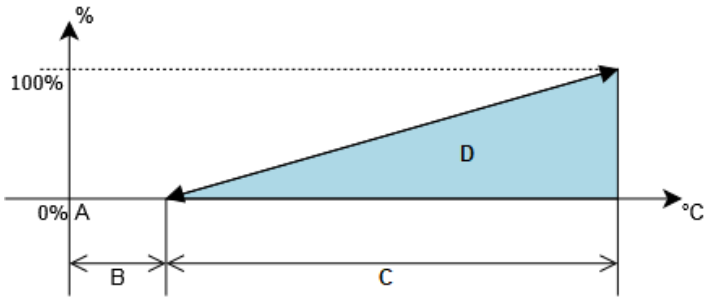
5.13 CHILLED WATER UNITS REGULATION

Chilled water units use a water system for temperature regulation. The unit's cooling power is modulated by regulating a valve with 0-10V control signal.

With the "**Machine type**" parameter (Factory setup - Machine type) it is possible to configure the type of temperature regulation with chilled water system (**Chilled water**)

5.13.1 CHILLED WATER CIRCUIT MANAGEMENT

SURVEY³ is able to manage a water circuit with 0-10 V control signal regulation. The figures below illustrate the diagram of valve control with Proportional temperature regulation:



A **Temperature Set-point (Main menu - Set-point)**
B **Temperature dead zone (Factory setup - Dead zone)**
C **Proportional band (User setup - Temperature)**
D **Valve Regulation**

5.14 TWO SOURCES UNIT REGULATION

ATTENTION!

The two sources units cannot have both cooling sources with direct expansion.

With direct expansion circuits, one of the circuits will always be chilled water.

Units with two sources system have two separate cooling sources inside, a primary one for normal regulation and a secondary emergency one in case of any problems with the primary source.

The two sources with chilled water primary cooling source is controlled by detecting the water temperature of the primary circuit inlet.

With the "**IN 1/ Free cooling water temperature**" parameter (Factory setup - Probe configuration) it is possible to configure the water temperature detection probe on the chilled water circuit inlet.

With the "**Machine type**" parameter (Factory setup - Machine type) it is possible to configure the type of temperature regulation with water or direct expansion two sources system (**Two Sources**).

With the "**Primary source selection**" parameter (Factory setup - Machine type) it is possible to configure the type of primary cooling by choosing between Chilled water and Direct expansion.

With the "**Secondary source selection**" parameter (Factory setup - Machine type) it is possible to configure the type of secondary cooling by choosing between Chilled water and Direct expansion.

5.14.1 TWO SOURCES SYSTEM REGULATION WITH CHILLED WATER PRIMARY COOLING

The two sources with chilled water primary cooling source is controlled by detecting the water temperature of the primary circuit inlet.

With the "**IN 1/ Free cooling water temperature**" parameter (Factory setup - Probes) it is possible to configure the water temperature detection probe on the primary circuit inlet.

SURVEY³ will use the primary source for temperature regulation, for as long as the inlet water temperature remains below the "**Two sources water set-point**" parameter (User set-up - FC & TS) plus the "**Two sources water proportional band**" parameter (User set-up - Free cooling & Two sources).

If the temperature of the inlet water is higher than the "**Two sources water set-point**" parameter (User set-up - FC & TS), plus the "**Two sources water proportional band**" parameter (User set-up - FC & TS), SURVEY³ stops the primary source to switch to the secondary source.

It will go back to the primary source when the water temperature is equal to the "**Two sources water set-point**" (user setup - FC & TS) parameter.

The operating logic of the chilled water and/or direct expansion circuits are described in the chapters above.

5.14.2 WATER TEMPERATURE PROBE ALARM MANAGEMENT

If the primary circuit water temperature probe is broken or disconnected SURVEY³ will trigger the "**Broken IN 1/ Free cooling water temperature probe alarm**".

This alarm stops primary circuit operation and activates the components of the secondary circuit.

5.14.3 TWO SOURCES SYSTEM REGULATION WITH DIRECT EXPANSION PRIMARY COOLING

The two sources system with direct expansion primary cooling source is managed by detecting the alarms of the direct expansion circuit.

SURVEY³ will use the primary source for temperature regulation, for as long as there are no alarms affecting cooling circuit operation.

Should the cooling circuit no longer be operative, SURVEY³ will stop the primary source to switch to the secondary one. The secondary source will remain active until the cooling circuit conditions have been restored.

The operating logic of the chilled water and/or direct expansion circuits are described in the chapters above.

5.14.4 MANUAL FORCING OF SECONDARY COOLING SOURCE

Through the "**Two sources source exchange**" parameter (User setup - FC & TS) it is possible to manually force the switch to the secondary cooling source.

It is also possible to set a digital input as the forced switching input between the two sources. With the "**Configurable input (1-2-3-4-5)**" parameter (Factory setup - Digital inputs) it is possible to configure one of the five digital inputs in order to override operation with secondary source.

5.14.5 FORCING OF SECONDARY COOLING SOURCE DUE TO HIGH RETURN TEMPERATURE

Through the "**Switch due to high ambient temperature**" parameter (User setup - FC & TS) it is possible to force the operation of the secondary source if the return temperature exceeds a settable limit (Default 25.0°C).

Through the "**Ambient temperature set-point**" parameter (User setup - FC & TS) it is possible to configure the secondary source switching set-point.

5.15 WATER CIRCUIT ACCESSORY MANAGEMENT

SURVEY³ is able to manage some water circuit accessories, such as water temperature reading, water flow reading and power valve system.

Some accessories may not be available for all types of units.

5.15.1 WATER CIRCUIT TEMPERATURE READING

This accessory is only available in chilled water or two sources units with chilled water primary or secondary water circuit.

Through the installation of two temperature probes, SURVEY³ is able to read the water circuit inlet and outlet water temperatures.

With the "**IN 1/ Free cooling water temperature**" parameter (Factory setup - Probes) it is possible to configure the water detection probe on the water circuit inlet.

With the "**Outlet water temperature 1**" parameter (Factory setup - Probes) it is possible to configure the water detection probe on the water circuit outlet.

For units with double water circuit it is possible to enable temperature reading on the secondary circuit as well.

With the "**Water temperature inlet 2**" parameter (Factory setup - Probes) it is possible to configure the water detection probe on the water circuit inlet.

With the "**Outlet water temperature 2**" parameter (Factory setup - Probes) it is possible to configure the water detection probe on the water circuit outlet.

5.15.2 WATER CIRCUIT FLOW RATE READING

This accessory is only available in chilled water or two sources units with chilled water primary or secondary water circuit.

By installing a water flow rate measurement device, SURVEY³ is able to detect the instantaneous water flow rate on water circuit outlet.

With the "**Water flow rate 1**" parameter (Factory setup - Probe configuration) it is possible to configure the water flow rate detection sensor on the water circuit outlet.

With very large water circuits, water flow rate is measured with the installation of two water flow rate measuring devices, in this case the "**Water flow rate 2**" (Factory setup - Probes) parameter also needs to be enabled. The water flow rate will be the result of the sum of the flow rates of both sensors.

For units with double water circuit it is possible to enable the water flow reading of the secondary circuit from the "**Water flow rate 2**" parameter (Factory setup - Probes).

From the "**Water flow sensor diameter 1**" (Factory setup - Chilled water) and "**Water flow sensor diameter 2**" (Factory setup - Chilled water) parameters is it possible to configure the diameter of the water flow reading sensor installed on the water circuits.

From the "**Water flow measurement**" (Factory setup - Chilled water) parameter, which is only available if both water flow measuring devices are enabled, it is possible to configure whether the measured water flow needs to be summed (**unit control**) or separated (**separate control**).

5.15.3 CALCULATION OF TOTAL COOLING CAPACITY OF THE WATER CIRCUIT AND UNIT EER

This accessory is only available in chilled water or two sources units with chilled water primary or secondary water circuit.

If both the water temperature probes and the water flow sensor should be installed in the unit, SURVEY³ will be able to calculate the **ΔT water** value and the total cooling capacity value of the water circuit in kW.

By reading the electrical power absorbed by the fans, SURVEY³ is also able to provide the **EER** (**Energy Efficiency Ratio**) reading

5.15.4 WATER CIRCUIT FLOW RATE MANAGEMENT OF THE WATER CIRCUIT WITH POWER VALVE SYSTEM

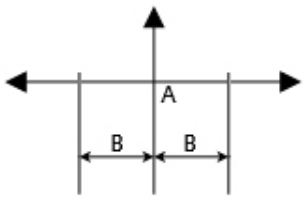
This accessory is only available in chilled water or two sources units with chilled water primary or secondary water circuit.

Through the water flow rate meter, SURVEY³ is able to ensure that the water circuit flow rate does not exceed the unit's nominal one. This type of control, referred to as power valve, makes it possible to avoid an excessive water flow rate which might cause issues with valve operation and lead to problems on the water circuit.

With the "**Water flow rate regulation**" parameter (Factory setup - Chilled water) it is possible to enable the unit's water flow rate regulation. For units with double water circuit, the regulation parameters will be separate for each circuit.

With flow rate regulation enabled, SURVEY³ will modulate valve opening to maintain the water flow rate within an acceptable margin (dead zone) in relation to the established set-point.

The regulation margin is equal to "**Set-point (1-2)**" (Factory setup - Chilled water) parameter +/- the "**Dead zone (1-2)**" (Factory setup - Chilled water) parameter, as shown in the figure below.



A **Set-point (1-2) (Factory setup - Chilled water)**
B **Dead zone (1-2)" (Factory setup - Chilled water)**

The value of the valve opening output will be increased (or decreased) based on the value of the water flow rate in relation to the regulation margin, according to the following logic:

- If the water flow rate is within the regulation margin, then the output value will not change.
- If the water flow rate is lower than the regulation margin, then the output value will be increased by 1% every 3 seconds (default) until it reaches the maximum regulation value. The increment time is defined by the "**Modulation time (1-2)**" parameter (Factory setup - Chilled water).
- If the water flow rate is higher than the regulation margin, then the output value will be decreased by 1% every 3 seconds (default) until it reaches the minimum regulation value. The increment time is defined by the "**Modulation time (1-2)**" parameter (Factory setup - Chilled water).

5.15.5 WATER TEMPERATURE AND FLOW RATE PROBES ALARMS MANAGEMENT

If the temperature probe for the circuit 1 inlet water is broken or disconnected SURVEY³ will trigger the "**IN 1/ Free cooling water temperature probe alarm**".

If the temperature probe for the circuit 1 outlet water is broken or disconnected SURVEY³ will trigger the "**Broken OUT 1 water temperature probe alarm**".

If the temperature probe for the circuit 2 inlet water is broken or disconnected SURVEY³ will trigger the "**Broken IN 2 water temperature probe alarm**".

If the temperature probe for the circuit 2 outlet water is broken or disconnected SURVEY³ will trigger the "**Broken OUT 2 water temperature probe alarm**".

If the water flow rate sensor 1 is broken or disconnected SURVEY³ will trigger the "**Water flow rate sensor 1 alarm**".

If the water flow rate sensor 2 is broken or disconnected SURVEY³ will trigger the "**Water flow rate sensor 2 alarm**".

These alarms stop cooling capacity and EER calculation and water flow rate regulation, if enabled.

5.16 WATER PUMP MANAGEMENT

SURVEY³ is able to control the activation of a water circulation pump feeding the unit's circuits.

With the "**Pump regulation type**" parameter (Factory setup - Water pump) it is possible to configure the type of pump activation. You can select from the following types of regulation:

1) **No:** There is no type of water pump regulation in the unit, hence it will be disabled.
2) **Unit ON:** The pump will be activated at the same time that the unit is switched ON.
3) **Cooling demand:** The pump will only be activated with cooling demand.

With the "**Configurable output (1-2-3-4-5)**" parameter (Factory setup - Digital outputs) it is possible to configure one of the five digital outputs in order to control the water pump.

5.16.1 WATER PUMP SWITCH OFF DELAY MANAGEMENT

In some cases the water pump might need to operate for a few seconds after the switch off request.

With the "**Pump switch off delay**" parameter (Factory setup - Water pump) it is possible to configure a pump switch-off delay.

5.16.2 WATER PUMP ALARM MANAGEMENT

In order to supply the unit with information on the water pump's status, it is possible to configure a digital input as a general water pump alarm.

With the "**Configurable input (1-2-3-4-5)**" parameter (Factory setup - Digital inputs) it is possible to configure one of the five digital inputs in order to detect the water pump alarm.

When configured, digital input opening will trigger the "**General water pump alarm**" which will stop water pump regulation.

Depending on the setting of the "**Water pump alarm severity**" parameter (Factory setup - Alarm Management), triggering the alarm may also stop the unit.

5.17 FREE COOLING UNIT REGULATION

With the "**Machine type**" parameter (Factory setup - Machine type) it is possible to configure the type of temperature regulation with water or air cooled free cooling system (**Free Cooling**).

The units with free cooling system use outdoor air to cool the room free of charge, when possible, and ensure safe operation through a secondary cooling circuit.

The Free Cooling system can be direct (outdoor air intake) or indirect (via water circuit). The secondary circuit can be direct expansion with integrated air-cooled or water-cooled condenser (**Free Cooling DX**) or with chilled water with modulating regulation valve (**Free Cooling CW**).

5.17.1 FREE COOLING SYSTEM REGULATION

The free cooling system is managed through the temperature reading of outdoor air or water flowing into the unit. With the "**IN 1/ Free cooling water temperature**" parameter (Factory setup - Probes) it is possible to configure the free cooling temperature detection probe.

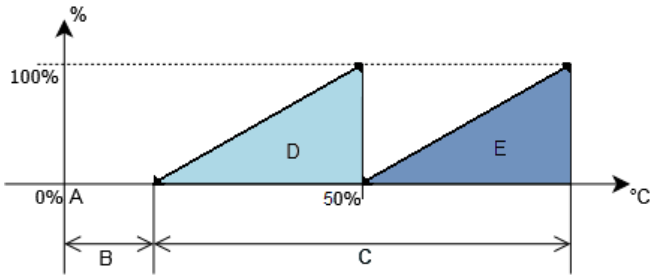
Regulation will activate free cooling operation when the following function is valid:

$$T_{Reg} - T_{Fc} \geq \Delta_{Fc}$$

Where:

- T_{Reg} is the regulated temperature
- T_{Fc} is the free cooling temperature
- Δ_{Fc} is the "**Free cooling activation delta**" (User setup -FC & TS) parameter

When the free cooling system is active, temperature is regulated by regulating the damper or free cooling valve with 0-10 V control signal. The following pictures show the control diagram of the free cooling component with Proportional temperature regulation:



A **Temperature Set-point (Main menu - Set-point)**
B **Temperature dead zone (Factory setup - Dead zone)**
C **Proportional band (User setup - Temperature)**
D **Free cooling regulation**
E **Secondary source regulation**

If the free cooling system is not sufficient for temperature regulation, and the cooling demand reaches 50%, SURVEY[3] will activate the secondary circuit. Once it is activated, the secondary circuit will regulate the temperature as detailed in the previous chapters (direct expansion or chilled water), while the free cooling signal remains at 100%.

In case of supply temperature regulation, if the Free Cooling temperature is very close to the temperature set-point (Default 1.0 °C), then Free Cooling regulation will occur between 0% and 40% of the proportional band, bringing forward the start of the secondary components.

Should the outdoor temperature no longer be able to provide free cooling operation, and therefore the function should no longer be valid, the unit will only operate by adjusting the secondary circuit. See the previous chapters for further information (direct expansion or with chilled water).

5.17.2 FREE COOLING SYSTEM OVERRIDING

In order for the free cooling system to always be active, it is possible to set a digital input as free cooling system overriding input.

With the "**Configurable input (1-2-3-4-5)**" parameter (Factory setup - Digital inputs) it is possible to configure one of the five digital inputs in order to override free cooling operation, both always on and always off.

5.17.3 FREE COOLING TEMPERATURE PROBE ALARM MANAGEMENT

In the event the free cooling temperature probe should be broken or disconnected SURVEY³ will trigger the "**IN 1/ Free cooling water temperature probe alarm**".

This alarm stops free cooling operation and activates the secondary circuit components.

5.18 DRY COOLER REGULATION

In units with water circuit, and especially in units with free cooling system, it is possible to have speed regulation for the dry cooler fans (liquid cooler) to supply water to the unit.

With the "**IN 1/ Free cooling water temperature**" parameter (Factory setup - Probes) it is possible to configure the water detection probe on the water circuit inlet.

With the "**Dry cooler regulation**" parameter (Factory setup - Dry cooler) it is possible to enable dry cooler regulation. The following options may be selected:

1) **No:** There is no type of dry cooler regulation in the unit, hence it will be disabled.
2) **Fixed set-point:** The dry cooler will be regulated with a fixed set-point.
3) **Autoset-point:** The dry cooler will be regulated with a variable set-point. The regulation set-point will be calculated automatically based on operating conditions (see following chapters).

With the "**Regulation type**" parameter (Factory setup - Dry cooler) it is possible to configure the type of dry cooler regulation. You can select from the following types of regulation:

1) **Proportional:** The dry cooler will be regulated by a proportional 0-10V signal (see chapters below).
2) **Dead zone:** The dry cooler will be regulated by an incremental 0-10V signal (see chapters below).

5.18.1 DRY COOLER PROPORTIONAL REGULATION

This type of regulation is ideal in cases where the fan speed needs to be inversely proportional to the "distance" of the regulation magnitude from the ideal setting (Set-point), with respect to the maximum setting that should be obtained (Proportional band).

The control output of the dry cooler is regulated according to the following function:

$$Out_p = \frac{100}{B_p} * (In + B_p - Set)$$

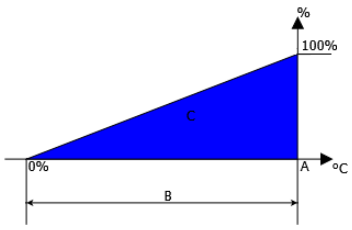
Where:

- **Out**$_p$ is the proportional error
- **Bp** the "**Proportional dry cooler band**" parameter (User set-up - Dry cooler)
- **In** is the unit inlet water temperature value
- **Set** is the "**Dry cooler set-point**" parameter (User set-up - Dry cooler)

With the "**Minimum fan speed**" parameter (Factory setup - Dry cooler) it is possible to configure the minimum operating demand that the dry cooler will be regulated to.

With the "**Maximum fan speed**" parameter (Factory setup - Dry cooler) it is possible to configure the maximum operating demand that the dry cooler will be regulated to.

The following graph shows proportional regulation:

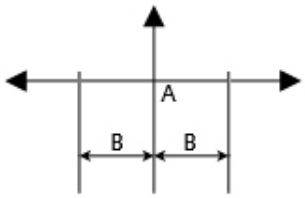


A **Dry cooler set-point (User setup - Dry cooler)**
B **Dry cooler Proportional band (User setup - Dry cooler)**
C **Dry cooler regulation**

5.18.2 DRY COOLER DEAD ZONE REGULATION

This type of regulation is excellent for damping any oscillation due to system reactivity, thereby maintaining the water temperature within an acceptable regulation margin (dead zone) in relation to the established set-point.

The regulation margin is equal to the **Dry cooler set-point** (User setup - Dry cooler) +/- **Dry cooler proportional band** (User setup - Dry cooler), as shown in the figure below.



A **Dry cooler set-point (User setup - Dry cooler)**
B **Dry cooler proportional band (User setup - Dry cooler)**

The value of the dry cooler control output will be increased (or decreased) based on the value of the water temperature in relation to the regulation margin, according to the following logic:

- If the water temperature is within the regulation margin, then the output value will not change.
- If the water temperature is higher than the regulation margin, then the output value will be increased by 1% every 5 seconds (default) until it reaches the maximum regulation value. The increment time is defined by the "**Standard modulation speed**" parameter (Factory setup - Dry cooler).
- If the water temperature is lower than the regulation margin, then the output value will be increased by 1% every 5 seconds (default) until it reaches the maximum regulation value. The increment time is defined by the "**Standard modulation speed**" parameter (Factory setup - Dry cooler).

With the "**Minimum fan speed**" parameter (Factory setup - Dry cooler) it is possible to configure the minimum operating demand that the dry cooler will be regulated to.

With the "**Maximum fan speed**" parameter (Factory setup - Dry cooler) it is possible to configure the maximum operating demand that the dry cooler will be regulated to.

5.18.3 DRY COOLER REGULATION WITH AUTOSET-POINT

Low water temperature makes it possible to achieve system energy savings. Water temperature regulation is tied to outdoor temperature, therefore during the cold season it is possible to reduce the regulation set-point in order to increase energy savings.

Through dry cooler regulation with **Autoset-point** it is possible, with a suitable algorithm, to achieve the best possible regulation set-point for dry cooler operating conditions.

For optimal Autoset-point system regulation it is recommended to set the "**Dry cooler set-point**" parameter (User set-up - Dry cooler) at the minimum value that one wants the dry coolers to work at (ex. 7.0 °C).

The set-point is regulated in the following manner:

- **OUTDOOR LOW TEMPERATURE CONDITIONS:** As long as the temperature of the outdoor air is such that the dry cooler regulation demand is lower than the "**Maximum fan speed**" (Factory setup - Dry cooler), then the set-point will not change.
- **INCREASE IN OUTDOOR TEMPERATURE:** When there is an increase in the outdoor air temperature, the water temperature also starts increasing. When dry cooler regulation demand reaches "**Maximum fan speed**" (Factory setup - Dry cooler), a timer will start up. As soon as the timer exceeds the "**AutoSet-point time**" parameter (Factory setup - Dry cooler), the "**Dry cooler set-point**" parameter (User set-up - Dry cooler) will be added to the "**Dry cooler set- increase delta**" parameter (User set-up - Dry cooler). The set-point will be increased until the water temperature falls within the new regulation range, up to the maximum equal to the "**Maximum dry cooler set increase**" parameter (User setup – Dry cooler).

- **REGULATION WITH RAISED SET-POINT:** For as long as the set-point is increased, the dry cooler demand will be overridden to a minimum value equal to the "**Minimum Autoset-point demand**" parameter (Factory setup - Dry cooler). This stops the water temperature value from being affected if the set-point is reached.

- **DROP IN OUTDOOR TEMPERATURE:** With a drop in the outdoor air temperature, the water temperature tends to fall below the changed set-point. In this case, as soon as the water temperature drops below the set-point value, a timer will start. As soon as the "**Autoset-point time**" parameter is exceeded (Factory setup - Dry cooler), the "**Dry cooler set increase delta**" (User setup – Dry cooler) parameter will be subtracted from the modified set-point. The set-point will decrease until the water temperature falls within the regulation range, or until it reaches the "**Set-point dry cooler**" parameter (User setup - Dry cooler).

5.18.4 START-UP DEMAND MANAGEMENT

In order to improve dry cooler regulation it is possible to configure a start-up period. During the set start-up period, regulation will be overridden at start-up request. At the end of the start-up time, regulation will go back to normal operation.

With the "**Fan start-up speed**" (Factory setup - Dry cooler) parameter it is possible to configure the demand that the dry cooler will be regulated to during the start-up period.

With the "**Fan start-up time**" parameter (Factory setup - Dry cooler) it is possible to configure the duration of the dry cooler regulation start-up period.

This function is optimal for reaching the operating condition at dry cooler start-up more quickly, without having to wait for the modulation period required to reach the set-point.

5.18.5 REGULATION DEMAND SAVING SYSTEM

In order to further optimise achieving optimal operating conditions, the control algorithm has a **regulation demand saving system**.

With the "**Fan speed memory**" parameter (Factory setup - Condensation) it is possible to enable the regulation demand saving system.

As soon as the system reaches the set-point, it saves the regulation demand value that made it possible to achieve the set-point. At the next start-up, regulation will start from the saved value.

If start-up demand management is set, the dry cooler will start up at the saved value, ignoring the start-up demand parameter.

If there is no saved value, or if the set-point was never reached, the dry cooler will observe the normal regulation algorithm.

5.18.6 QUICK MODULATION MANAGEMENT AT START-UP

In order to improve dry cooler regulation it is possible to configure a quick modulation period for the regulation signal. During the quick modulation period, the increment (or decrement) time of the signal will be quicker. At the end of the quick modulation period, the increment time will go back to the value defined by the "**Standard modulation speed**" parameter (Factory setup - Dry cooler).

With the "**Quick modulation speed**" parameter (Factory set-up - Dry cooler) it is possible to configure the quick modulation period increment time.

With the "**Quick modulation time**" parameter (Factory set-up - Dry cooler) it is possible to configure the duration of the quick modulation period.

This function is excellent for rapidly reaching the operating condition more quickly, at dry cooler start-up.

5.18.7 DRY COOLER FANS CUT-OFF REGULATION

To avoid issues with water temperature over-regulation, it is possible to set a cut-off value for dry cooler regulation.

With the "**Fans cut-off**" parameter (Factory setup - Dry cooler) it is possible to configure a cut-off temperature for the dry cooler fans. When water temperature reaches the set-point - cut-off, dry cooler regulation stops.

5.18.8 DRY COOLER REGULATION MANAGEMENT WITH BROKEN PROBE

In order not to interrupt dry cooler regulation, if a water temperature sensor breaks it is possible to override the demand to a pre-set value.

With the "**Speed with probe error**" parameter (Factory setup - Dry cooler) it is possible to configure the percentage that the demand will be overridden at when there is "**IN1/Free cooling water sensor alarm**".

5.18.9 DRY COOLER ALARM MANAGEMENT

In order to detect any issues to do with the dry coolers, it is possible to configure a digital input as the dry cooler alarm.

With the "**Configurable input (1-2-3-4-5)**" parameter (Factory setup - Digital inputs) it is possible to configure one of the five digital inputs in order to detect the dry cooler alarm.

When configured, digital input opening will trigger the "**General dry cooler alarm**" which will stop dry cooler regulation.

5.19 HEATING COMPONENTS REGULATION

With the "**Heating**" parameter (Factory setup - Heating) it is possible to configure the type of temperature regulation during winter heating and summer post-heating (with dehumidification enabled). You can select from the following types of regulation:

1) **No:** There is no type of heating regulation in the unit, hence it will be disabled.
2) **Stage electric coil:** The unit is fitted with a stage heating electric coil, which is controlled by the relevant digital outputs.
3) **Modulating electric coil:** The unit is fitted with a modulating heating electric coil, which is controlled by a 0-10 V signal.
4) **Water valve:** The unit is fitted with a water-heating electric coil, which is controlled by a 0-10 V signal.

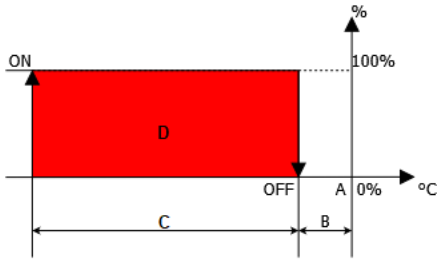
5.19.1 HEATING WITH STAGE ELECTRIC COILS

SURVEY³ is able to control electric stage coils with a maximum of 2 stages. The following pictures show the start-up diagram of the stages with Proportional temperature regulation:

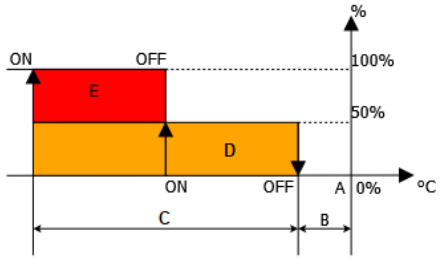
With the "**Number of electric coil stages**" parameter (Factory setup - Heating) it is possible to configure the number of stages that the unit's electric coil consists of (Maximum 2).

With the "**Type of stage activation**" parameter (Factory setup - Heating) it is possible to configure the type of stage switch-on by choosing between **Linear** and **Stepped**. See the following graphs for further information.

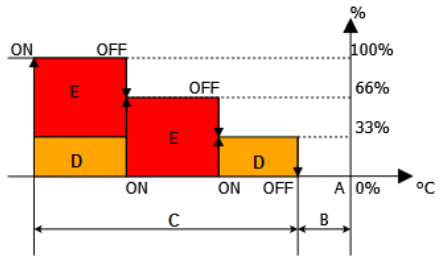
With the "**Electric coil power**" parameter (Factory setup - Heating) it is possible to configure the electrical power of the installed coils.



Regulation with 1 stage



Regulation with 2 stages (Linear)



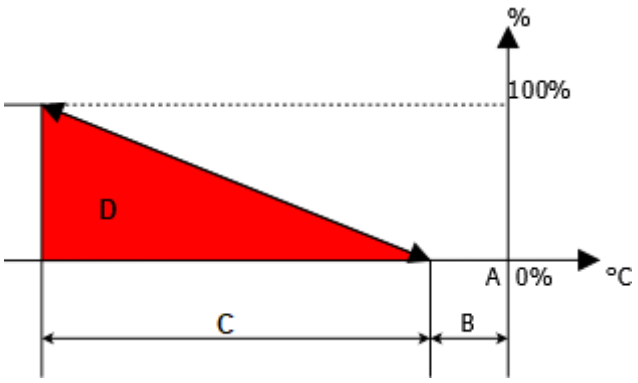
Regulation with 2 stages (Stepped)

A **Temperature set-point (Main menu - Set-point)**
B **Temperature dead zone (Factory setup - Dead zone)**
C **Proportional band (User setup - Temperature)**
D **Stage 1**
E **Stage 2**

5.19.2 HEATING WITH ELECTRIC OR WATER MODULATING COILS

SURVEY³ is able to manage modulating electric or water coils through a 0-10 V signal. The figures below illustrate the diagram of modulation with proportional temperature regulation:

With the "**Electric coil power**" parameter (Factory setup - Heating) it is possible to configure the electrical power of the installed coils.



A **Temperature set-point (Main menu - Set-point)**
B **Temperature dead zone (Factory setup - Dead zone)**
C **Proportional band (User setup - Temperature)**
D **Heating**

5.19.3 ELECTRIC COIL ALARMS MANAGEMENT

The electric coils provide active protection against overheating, through the installation of a safety thermostat placed inside the electric coil.

Should the safety thermostat detect a temperature exceeding 135 °C, it will stop coil operation.

Opening the alarm digital input will trigger the "**Electric coil thermostat alarm**" which will stop heating regulation. The thermostat is manually reset, therefore it will need to be reset to clear the alarm.

5.20 CONFIGURABLE DIGITAL INPUTS

SURVEY³ is able to control up to five digital inputs freely configurable by the user.

With the "**Configurable input (1-2-3-4-5)**" parameter (Factory setup - Digital inputs) it is possible to configure one of the five digital inputs according to system requirements.

With the "**Configurable input logic (1-2-3-4-5)**" parameter (Factory setup - Digital inputs) it is possible to configure the input wiring logic by choosing between **N.C. - Normally closed and N.O. - Normally open**.

5.20.1 CONFIGURABLE DIGITAL INPUTS MANAGEMENT

With the "**Configurable input (1-2-3-4-5)**" parameter (Factory setup - Digital inputs) it is possible to configure one of the following types of control:

TYPES OF CONFIGURABLE DIGITAL INPUTS	
Management	**Software reaction**
Smoke/Fire Alarm	Unit OFF
General water pump alarm	Pump and cooling OFF
External humidifier general alarm	Humidification OFF
General supply fans alarm	Unit OFF
Condenser 1 general alarm	Condenser 1 OFF and compressor 1 OFF
Condenser 2 general alarm	Condenser 2 OFF and compressor 2 OFF
Condenser 1 water flow alarm	Condenser 1 water flow alarm management activation
Condenser 2 water flow alarm	Condenser 2 water flow alarm management activation
Dry cooler general alarm	Dry cooler OFF and cooling OFF
Gas leak detector alarm	Alarm only
Condensing unit general alarm	Cooling OFF
Non-critical generic alarm	Alarm only
Critical generic alarm	Unit OFF
STOP Cooling	Cooling OFF
STOP Compressor 1	Compressor 1 OFF
STOP Compressor 2	Compressor 2 OFF
STOP Heating	Heating OFF
STOP Humidification	Humidification OFF
STOP Dehumidification	Dehumidification OFF
STOP Heating and humidification	Heating OFF and humidification OFF
STOP Cooling, heating and humidification	Cooling, heating and humidification OFF
STOP Free cooling	Free cooling OFF
Override free cooling	Free cooling ON
Override 2nd source of two sources	2nd Source of two sources ON
Ultracap	Ultracap function activation
Condenser 1 water flow alarm	Condenser 1 water flow alarm function activation
Condenser 2 water flow alarm	Condenser 2 water flow alarm function activation

5.21 CONFIGURABLE DIGITAL OUTPUTS

SURVEY³ is able to control up to four digital outputs freely configurable by the user.

With the "**Configurable output (1-2-3-4-5)**" parameter (Factory setup - Digital outputs) it is possible to configure one of the five digital outputs according to system requirements.

With the "**Configurable output logic (1-2-3-4-5)**" parameter (Factory setup - Digital outputs) it is possible to configure the output operation logic choosing between **N.C. - Normally closed and N.O. - Normally open**.

5.21.1 CONFIGURABLE DIGITAL OUTPUTS MANAGEMENT

With the "**Configurable output (1-2-3-4-5)**" parameter (Factory setup - Digital inputs) it is possible to configure one of the following types of control:

TYPES OF CONFIGURABLE DIGITAL OUTPUTS
Water pump control
Condensing unit control
Unit status signal
Cooling status signal
Heating status signal
Humidification status signal
Dehumidification status signal
Free cooling status signal
General alarm signal
Non-critical alarm signal
Critical alarm signal
Dirty filters alarm signal
Cooling alarm signal
Heating alarm signal
Fans alarm signal
Temperature alarm signal
Humidity alarm signal
Flooding / Condensate discharge alarm signal
No electrical power supply alarm

5.22 AIR FILTER MANAGEMENT

5.22.1 AIR FILTER ALARM MANAGEMENT WITH DIGITAL DIFFERENTIAL PRESSURE PROBE

SURVEY³ is able to manage an air filter alarm, to signal the presence of dirty filters, with a digital differential pressure probe with manually-calibrated trigger threshold.

If a filter is dirty, the differential pressure value will exceed the trigger threshold, accordingly the digital pressure probe will react by opening a contact located on the digital dirty filter alarm input.

The SURVEY³ regulator will then generate the "**Clogged air filter alarm**". The clogged air filters alarm does not stop normal unit operation.

5.22.2 AIR FILTER ALARM MANAGEMENT WITH ANALOGUE DIFFERENTIAL PRESSURE PROBE

SURVEY³ is able to manage an air filter alarm, to signal the presence of dirty filters, with an analogue differential pressure probe.

With the "**Filter differential pressure**" parameter (Factory setup - Probes) it is possible to configure the presence of the analogue dirty filter differential pressure probe.

Through the "**Dirty filter set-point**" (User setup - Dirty filters) parameter it is possible to set the dirty filter alarm trigger threshold.

Through the "**Dirty filter differential**" (User setup - Dirty filters) parameter it is possible to configure the dirty filter alarm reset differential.

If a filter is dirty, the differential pressure value will exceed the trigger threshold, the SURVEY³ regulator will generate the "**Clogged air filter alarm**". The clogged air filters alarm does not stop normal unit operation.

When the filter is changed, the differential pressure value will drop below the trigger threshold - filter differential, accordingly it will be possible to delete the dirty filter alarm.

5.22.3 ANALOGUE AIR FILTER DIFFERENTIAL PRESSURE PROBE ALARM MANAGEMENT

The analogue differential pressure probe is managed through Modbus Master communication, accordingly SURVEY³ is able to detect the probe condition, generating the "**Filter differential pressure probe alarm**" which specifies the nature of the problem. The following alarm causes are possible:

- **Communication down:** The alarm indicates failed communication with the SURVEY³ regulator.
- **Breakage:** The pressure probe is damaged.
- **Wiring:** The probe is wired incorrectly.
- **Pressure range:** The probe's pressure reading field is calibrated incorrectly.
- **ADC overload:** The probe's internal power supply module is damaged.
- **Calibration:** The pressure probe is calibrated incorrectly.
- **DCO:** There is an error inside the probe's electronic board.
- **Watchdog:** The probe has switched to watchdog mode due to communication problems.

5.23 INTERNAL COMPONENTS ALARMS MANAGEMENT

5.23.1 WATER PRESENCE ALARM MANAGEMENT

SURVEY³ is able to control a water presence alarm, to signal the presence of water in the unit or in the vicinity. The water alarm is managed by a water presence probe, which must be installed by the user.

With the "**Water alarm probe**" parameter (Factory setup - Probes) it is possible to configure the presence of the analogue water presence probe. If water presence or a pump alarm is detected, SURVEY³ generates the "**Water presence alarm**". Depending on the "**Water presence alarm severity**" (Factory setup - Alarm management) parameter setting, triggering the alarm may also stop the unit.

5.23.2 CONDENSATE DISCHARGE PUMP ALARM MANAGEMENT

SURVEY³ is able to manage the condensate discharge pump alarm through a specific digital input.

In case of a discharge pump alarm, by opening the contact, SURVEY³ generates the "**Condensate discharge pump alarm**". Depending on the setting of the "**Condensate discharge pump alarm severity**" parameter (Factory setup - Alarm Management), triggering the alarm may also stop the unit.

5.23.3 REFRIGERANT GAS LEAK DETECTION ALARM MANAGEMENT

SURVEY³ is able to manage a refrigerant gas leak detection alarm. The gas leak alarm is managed by a detector fitted with probe installed in the unit.

With the "**Configurable input (1-2-3-4-5**)" parameter (Factory setup - Digital inputs) it is possible to configure one of the five digital inputs in order to control the refrigerant gas leak alarm. Should a refrigerant gas leak occur, the relative sensor will act on the digital alarm input. SURVEY³ generates the "**Refrigerant gas leak detector alarm"**. The air filters alarm does not stop normal unit operation.

5.23.4 SMOKE/FIRE ALARM MANAGEMENT

SURVEY³ is able to control a smoke or fire presence alarm, to switch off the unit.

With the "**Configurable input (1-2-3-4-5**)" parameter (Factory setup - Digital inputs) it is possible to configure one of the five digital inputs in order to control the smoke/fire alarm. By acting on the alarm digital input, SURVEY³ will trigger the "**Smoke/fire presence alarm**" which stops normal unit operation. According to the "**Smoke/fire alarm reset type**" parameter setting (Factory setup - Alarms management), it is possible to select the type of alarm reset choosing between **Manual** or **Automatic**.

5.23.5 NON-CRITICAL AND CRITICAL GENERIC ALARM MANAGEMENT

SURVEY³ is able to control a generic non-critical or critical alarm, which may be intended for the user for different purposes.

With the "**Configurable input (1-2-3-4-5**)" parameter (Factory setup - Digital inputs) it is possible to configure one of the five digital inputs in order to control the generic critical or non-critical alarm. By acting on the digital alarm input, SURVEY³ will trigger the "**Non-critical generic alarm**" or the "**Critical generic alarm**". The non-critical generic alarm does not stop normal unit operation. The critical generic alarm stops normal unit operation.

5.23.6 ALARM SIGNAL BUZZER MANAGEMENT

In the presence of a new alarm, SURVEY³ emits a signal (Buzzer) to inform the user of the alarm condition.

If the (Buzzer) sound is featured in the "**Alarm buzzer**" parameter (Factory setup - Alarm management) it is possible to remove the alarm (Buzzer).

5.24 PROBE CALIBRATION MANAGEMENT

The value of the probes installed inside the unit might need to be changed depending on system requirements. To this end SURVEY³ is able to manage a probe calibration value to be added to the actual reading.

With the "**Return temperature**" parameter (User set-up - Probe calibration) it is possible to calibrate the return temperature probe.

With the "**Supply temperature**" parameter (User set-up - Probe calibration) it is possible to calibrate the supply temperature probe.

With the "**Return humidity**" parameter (User set-up - Probe calibration) it is possible to calibrate the return humidity probe.

With the "**Supply humidity**" parameter (User set-up - Probe calibration) it is possible to calibrate the supply humidity probe.

With the "**Differential air pressure**" parameter (User Set-up - Probe calibration) it is possible to calibrate the air differential pressure sensor.

With the "**Filter differential pressure**" parameter (User Set-up - Probe calibration) it is possible to calibrate the dirty filter differential pressure sensor.

With the "**IN 1 water/ Free cooling temperature**" parameter (User set-up - Probe calibration) it is possible to calibrate the inlet water 1/ free cooling temperature probe.

With the "**Outlet water temperature 1**" parameter (User set-up - Probe calibration) it is possible to calibrate the outlet water temperature probe 1.

With the "**Water flow rate sensor 1**" parameter (User set-up - Probe calibration) it is possible to calibrate the water flow rate sensor 1.

With the "**Water flow rate sensor 2**" parameter (User set-up - Probe calibration) it is possible to calibrate the water flow rate sensor 2.

With the "**Inlet water temperature 2**" parameter (User set-up - Probe calibration) it is possible to calibrate the inlet water temperature probe 2.

With the "**Outlet water temperature 2**" parameter (User set-up - Probe calibration) it is possible to calibrate the outlet water temperature probe 1.

5.25 MODBUS RTU OR TCP SLAVE SERIAL COMMUNICATION MANAGEMENT

ATTENTION!

Communication parameter changes require the controller to be rebooted in order to be confirmed.

The SURVEY³ regulator is equipped with an RS485 and RJ45 serial output for connection to the supervision/BMS systems through the Modbus RTU or TCP slave protocol. See the following chapters for further information.

With the "**Modbus address**" parameter (User set-up - Modbus) it is possible to set the unit's serial address for interfacing with the Modbus network.

With the "**Modbus Baudrate**" parameter (User set-up - Modbus) it is possible to set the unit's communication speed for interfacing with the Modbus network.

With the "**Modbus Parity**" parameter (User set-up - Modbus) it is possible to set the unit's parity for interfacing with the Modbus network.

With the "**Modbus Stop bit**" parameter (User set-up - Modbus) it is possible to set the unit's number of stop bits for interfacing with the Modbus network.

5.26 ETHERNET BOARD MANAGEMENT

ATTENTION!

Communication parameter changes require the controller to be rebooted in order to be confirmed.

The SURVEY³ regulator is equipped with an RJ45 serial output for connection to an Ethernet network. See the following chapters for further information.

With the "**IP address**" parameter (User set-up - Ethernet) it is possible to set the unit's IP address for Ethernet interfacing.

With the "**Subnet mask**" parameter (User set-up - Ethernet) it is possible to set the unit's subnet mask for Ethernet interfacing.

With the "**Gateway**" parameter (User set-up - Ethernet) it is possible to set the unit's gateway for Ethernet interfacing.

With the "**Web server IP port**" parameter (User set-up - Ethernet) it is possible to set the unit's IP port for Web Server Ethernet interfacing.

With the " **Modbus TCP port**" parameter (User set-up - Ethernet) it is possible to set the unit's IP port for Modbus TCP Ethernet interfacing.

With the " **BACnet IP port**" parameter (User set-up - Ethernet) it is possible to set the unit's IP port for BACnet IP Ethernet interfacing.

5.27 BACnet MS/TP OR IP SLAVE SERIAL COMMUNICATION MANAGEMENT

ATTENTION!

Communication parameter changes require the controller to be rebooted in order to be confirmed.

The SURVEY³ regulator is equipped with an RS485 and RJ45 serial output for connection to the supervision/BMS systems through the BACnet MS/TP or IP slave protocol. See the following chapters for further information.

With the "**Device ID**" parameter (User set-up - BACnet) it is possible to set the unit's BACnet address for interfacing with the BACnet MS/TP or IP slave network.

With the "**Baud rate**" parameter (User set-up - BACnet) it is possible to set the unit's BACnet baud rate for interfacing with the BACnet MS/TP or IP slave network.

With the "**Max master**" parameter (User set-up - BACnet) it is possible to set the unit's maximum number of masters for interfacing with the BACnet MS/TP slave network.

With the "**Mac ID**" parameter (User set-up - BACnet) it is possible to set the unit's Mac ID for interfacing with the BACnet MS/TP or IP slave network.

5.28 CLEARING OPERATING HOURS

5.28.1 CLEARING OPERATING HOURS

During unit maintenance operations it might be required to clear the operating hours of the main components, stored in the SURVEY³.

With parameter "**Unit hours**" (Clearing the hours) it is possible to delete the unit's operating hours.

With parameter "**Compressor 1**" (Clearing the hours) it is possible to delete compressor 1's operating hours.

With parameter "**Compressor 2**" (Clearing the hours) it is possible to delete compressor 2's operating hours.

With parameter "**Water valve**" (Clearing the hours) it is possible to delete the water valve's operating hours.

With parameter "**Heating**" (Clearing the hours) it is possible to delete the electrical heater's operating hours.

With parameter "**Humidifier**" (Clearing the hours) it is possible to delete the humidifier's operating hours. With an internal humidifier, the operating hours on the CPY board will also be cleared.

With parameter "**Free cooling**" (Clearing the hours) it is possible to delete the operating hours in free cooling.

With parameter "**Dry cooler**" (Clearing the hours) it is possible to delete the operating hours of the dry cooler.

With parameter "**Condenser 1**" (Clearing the hours) it is possible to delete the operating hours of condenser 1.

With parameter "**Condenser 2**" (Clearing the hours) it is possible to delete the operating hours of condenser 2.

Access to alarms log clearing is only possible with a **Manufacturer** log in.

5.29 FACTORY SETTINGS RESET MANAGEMENT

5.29.1 FACTORY SETTINGS RESET THROUGH SURVEY³ MEMORY

SURVEY³ saves the factory settings in its internal memory during the unit's commissioning operations.

If these parameters need to be restored, through the "**Factory settings reset**" parameter (Factory Setup - Parameters) it is possible to return to the unit's configuration during the factory commissioning stage.

5.29.2 FACTORY SETTINGS RESET THROUGH USB

SURVEY³ allows a specific configuration file to be uploaded through the USB port on the regulation board.

To perform this operation the relative file **parapp.ucjm** must be uploaded onto a USB. The USB must then be inserted in the USB port on the regulation board.

If the factory settings need to be restored using the USB port, through the "**USB factory settings reset**" parameter (Factory Setup - Parameters) it is possible to activate the upload of the file saved on the USB.

5.30 OPERATING PARAMETER RECORDING MANAGEMENT

SURVEY³ records the unit's operating parameters in its internal memory at regular intervals of 30 seconds for a maximum 10-day period. Once the maximum memory capacity is reached, the old data is cleared in order to save the more recent data.

The parameters recorded in the memory are:

- Return temperature.
- Supply temperature.
- Return humidity.
- Supply humidity.
- Air pressure.
- Compressor 1 evaporation pressure.
- Compressor 1 evaporation temperature.
- Compressor 1 suction temperature.
- Compressor 1 compression ratio.
- Compressor 1 discharge temperature.
- Compressor 1 condensation pressure.
- Compressor 1 condensation temperature.
- Compressor 1 liquid temperature.
- Compressor 2 evaporation pressure.
- Compressor 2 evaporation temperature.
- Compressor 2 suction temperature.
- Compressor 2 compression ratio.
- Compressor 2 discharge temperature.
- Compressor 2 condensation pressure.
- Compressor 2 condensation temperature.
- Compressor 2 liquid temperature.
- Water temperature IN 1.
- Water temperature OUT 1.
- Water flow rate 1.
- Water temperature IN 2.
- Water temperature OUT 2.
- Water flow rate 2.
- Unit status.
- Cooling demand.
- Heating demand.
- Dehumidification demand.
- Humidification demand.

5.30.1 PARAMETER RECORDING IN THE EVENT OF AN ALARM

In the event of an alarm the SURVEY³ immediately saves the above-listed parameters and a description of the generated alarm. This recording is independent of the regular time-based recordings, which continue to function regularly.

5.30.2 DOWNLOAD OF RECORDING VIA USB PORT

SURVEY³ allows a specific configuration file to be downloaded through the USB port on the regulation board.

In order to perform this operation, a USB needs to be inserted in the USB port on the regulation board. Once the USB has been inserted, the recorded data can be downloaded through the "**Print CSV**" parameter (User Setup - Datalog).

Once the data has been exported, a file will be saved on the USB in the **Comma-Separated Values** format (abbreviated to **CSV**), named "**Close Control_xxxx_xx_xx**" where "x" indicates the date on which the download was made (e.g. Close Control_2019_11_12). The **CSV** files can be viewed in any electronic spreadsheet management programme (E.g. Microsoft Excel).

5.31 CHANGING ACCESS PASSWORDS

The parameter management menus are password-protected. It is possible to change these passwords according to user requirements. If modified, the original passwords will no longer be valid.

With the "**User password**" parameter (User set-up - Password) it is possible to change the password to access the **User** menu.

With the "**Manufacturer password**" parameter (Factory setup - Password) it is possible to change the password to access the **Manufacturer** menu.

6 COMPONENT CONTROL MODBUS MASTER NETWORK

SURVEY³ microprocessors use a Modbus MASTER network to control the devices installed in the unit. The following devices are interfaced with the Modbus MASTER network:

- EC air supply fans.
- EVDrive electronic expansion valve control boards.
- CPY submerged electrode humidifier control board.
- DC compressor regulation inverter.

The Modbus Master control network is implemented during unit assembly in the production line (see wiring diagram for additional details):

6.1 MODBUS MASTER NETWORK DEVICE ADDRESSING

The components connected to the Modbus master network are addressed in the testing stage in the factory.

In case of replacement the components will be sent already configured for connection to the Modbus Master network. Only fans will be sent not pre-configured. Fans addressing configuration will take place through an auto-addressing function.

The following table sets out the addresses of individual components that might be included in the Modbus Master network:

Modbus Master network addressing	
Device	**Address**
EVDrive compressor 1	2
EVDrive compressor 2	3
CPY	4
AGILE inverter BLDC	5
Fan 1	6
Fan 2	7
Fan 3	8
Fan 4	9
Fan 5	10
Fan 6	20
Fan 7	21
Fan 8	22
Fan 9	23
Fan 10	24
Filter differential pressure	15

6.1.1 FAN AUTO-ADDRESSING IN CASE OF REPLACEMENT

In the event of fas replacement, the SURVEY³ microprocessor features a check and auto-addressing function of the Modbus master network. In the event of a communication alarm of one or more fans the SURVEY³ microprocessor will start checking whether there are new fans in the network.

If the SURVEY³ microprocessor finds a non configured fan (new) in the network, it will change the address to that of the faulty one. If there is an alarm on several fans, this fan will be given the first free address.

During the auto-addressing process the NEW FANS will have to be connected ONE AT A TIME.

7 UNIT CONTROL CANBUS NETWORK

SURVEY³ is able to control up to twelve connected units that form a local network. The local network allows information to be exchanged between the units that will be able to work in synch to control the conditioned premises, also assuring a higher safety level by sharing the thermal load.

Network management is **Multi-Master** type, i.e. there is no one unit that sets the actions of the others. All the units in the network have the task of monitoring the general condition, acting in synch in the required regulation.

7.1 ADDRESSING UNIT IN THE LOCAL NETWORK

All the units connected in local network must have a unique address that identifies them within the network. With parameter "**Network address**" (Factory setup - Local network) it is possible to select the unit's network address, according to the following logic:

SURVEY³ network addressing				
Unit Address	**Type**	**SURVEY ID**	**Display ID**	**Remote Display ID**
13	Stand alone	13	99	126
1	Unit 1	1	101	
2	Unit 2	2	102	
3	Unit 3	3	103	
4	Unit 4	4	104	
5	Unit 5	5	105	
6	Unit 6	6	106	
7	Unit 7	7	107	
8	Unit 8	8	108	
9	Unit 9	9	109	
10	Unit 10	10	110	
11	Unit 11	11	111	
12	Unit 12	12	112	

The network address may only be modified with the SURVEY³ not connected to other units.

Should the units be connected the network cables must first be disconnected.

For more details on network connection refer to the wiring diagram and the units' installation manual

7.2 LOCAL NETWORK TYPES

With the "**Local network operation**" (Factory setup - Local network) parameter it is possible to select the type of local network that you wish to manage. You can select from the following types of local networks:

1) **No:** There is no local network.
2) **Duty/Stand-by:** The network will be managed with Duty/Stand-by type of regulation.
3) **Smartnet:** The network will be managed with SmartNet system type of regulation.

7.3 LOCAL NETWORK REGULATION WITH DUTY/STAND-BY SYSTEM

Duty/Stand-by regulation is the conventional regulation method for units in a local network. The main feature of this type of local network is that a part of the units are operating (Duty) and a part of the units are in stand-by waiting to start up in case of need (Stand-by).

With parameter "**Number of local networked units**" (Factory setup - Local network) it is possible to select the total number of units in the local network.

With parameter "**Number of stand-by units**" (Factory setup - Local network) it is possible to select the number of units that will remain off in stand-by. It is not possible to set all units in stand-by, at least one unit will always need be running.

7.3.1 AUTOMATIC UNIT ROTATION WITH DUTY/STAND-BY SYSTEM

In order to balance the units' operating hours, in Duty/Stand-by operation it is possible to set an automatic rotation function to switch the role of the units.

With parameter "**Enable automatic unit rotation**" (Factory setup - Local network) it is possible to enable unit role rotation.

With parameter "**Rotation interval**" (Factory setup - Local network) it is possible to set the time interval between role rotations.

7.3.2 STAND-BY UNIT ACTIVATION IN CASE OF ALARM

The purpose of Stand-by units is that of being switched on to replace Duty units in the event of a critical problem.

Accordingly if one of the two Duty units stops due to a critical alarm, one of the Stand-by units will be switched on to make up for it.

Should there be several Stand-by units, the unit with the least number of operating hours will be switched on. Should the units have the same number of operating hours, the unit with the lowest network address will be switched on.

7.3.3 MANAGEMENT OF THE TEMPERATURE REGULATION SUPPORT SYSTEM

In Duty/Stand-by operation it is possible to set a temperature regulation support control function.

With parameter "**Enable support**" (Factory setup - Local network) it is possible to enable support switch-on of stand-by units.

With parameter "**Support activation time**" (Factory setup - Local network) it is possible to set the time interval for supporting unit activation.

Should the regulated temperature in one or more Duty units exceed the proportional band limit, the Stand-by units will be switched on in sequence so that the temperature goes back to the set-point. Switching on will occur after the set switch-on time.

Should there be several Stand-by units, the unit with the least number of operating hours will be switched on. Should the units have the same number of operating hours, the unit with the lowest network address will be switched on.

The switched on units will regulate the temperature according to their settings, regardless of the Duty units that requested activation. In order to improve regulation it is possible to use the operation described in the following chapters.

When the set-point is reached the units will stop and go back to Stand-by.

7.4 LOCAL NETWORK REGULATION WITH SMARTNET SYSTEM

A new type of network has been developed in order to improve local networked units management to keep on, where possible, all networked units evenly sharing the work load.

Case studies in important data centres have highlighted that this type of network offers three main advantages, compared to the Duty/Stand-by system:

- **High energy savings:** Splitting the load allows the units to work at reduced conditions, which significantly reduce the system's energy consumption.
- **Consistent and accurate regulation:** Thanks to the absence of stand-by units, temperature regulation will be consistent and precise, reducing the formation of Hot Spots due to units down.
- **Maximum operating safety:** Units in stand-by may feature problems upon start-up that might prevent them from actively working in regulation. As they are always on, Smartnet networked units are not subject to switching on issues.

With parameter "**Number of local networked units**" (Factory setup - Local network) it is possible to select the total number of units in the local network.

Unit regulation will be separate, according to their settings. In order to improve regulation it is possible to use the operation described in the following chapters.

7.5 ACTIVATION SYSTEM WITH DYNAMIC ON/OFF

All units in local network may be switched on or off individually, as is the case with stand-alone units. In order to reduce the switching on times of the entire local network it is possible to choose whether to switch all the units on or off simultaneously.

With parameter "**Dynamic On/Off**" (Factory setup - Local network) it is possible to enable simultaneous switching on and off of all networked units.

The Dynamic On/Off function is especially suited for local Duty/Stand-by networks to prevent any errors in switching on stand-by units.

7.5.1 UNIT NETWORK ENTRY

If the Dynamic On/Off system is not present, when one or more units enter the network, component regulation will be subject to a reset to prevent misalignment issues.

Therefore the fans will go back to minimum or start speed (only for constant pressure regulation), while temperature regulation will be recalculated if a proportional + integral + derivative system is set.

7.6 DYNAMIC SET-POINT SYSTEM

In all local network units, the temperature set-point may be individually changed, as is the case with stand-alone units. If all units need to regulate with the same set-point, it is possible to activate the dynamic set-point function which allows set-points to be changed simultaneously in all networked units.

With parameter "**Dynamic Set-point**" (Factory setup - Local network) it is possible to enable simultaneous set-point change in all networked units.

The dynamic set-point function is especially suitable to prevent incorrect network set-point settings which might create regulation conflicts.

7.7 AIR TEMPERATURE, HUMIDITY AND PRESSURE AVERAGES CONTROL SYSTEM

Local network units are usually used to manage a single room. In these cases it is possible to set a regulation control system by using average values read by the networked units.

Using the averaging function makes it possible to achieve consistent components regulation of the individual units, which will be activated simultaneously on all networked units.

This function also makes it possible to prevent regulation conflict issues, where two or more units regulate in the opposite way, for instance one heats and the other cools at the same time.

With parameter "**Temperature average**" (Factory setup - Local network) it is possible to enable the calculation of the average temperatures read by the unit, in relation to temperature regulation.

With parameter "**Humidity average**" (Factory setup - Local network) it is possible to enable the calculation of the average humidities read by the unit, in relation to humidity regulation.

With parameter "**Pressure average**" (Factory setup - Local network) it is possible to enable the calculation of the average ambient pressures detected by the unit, in relation to constant air pressure regulation.

7.7.1 EXCLUSION FROM AVERAGING CALCULATION

In order to prevent issues with the averaging calculation, it will automatically exclude the units that are:

- **OFF:** Units set to OFF will be automatically excluded from the averaging calculation.
- **In Stand-by**: Units in stand-by will actively participate in the averaging calculation only when they are active in replacement or support
- **With critical alarm**: Units in OFF FROM ALARM will be automatically excluded from the averaging calculation.
- **With alarms on the probes**: Units that have broken probes will be automatically excluded from the averaging calculation in relation to the probe in alarm.

When the unit's normal operating conditions are restored, it will automatically be included again in the averaging calculation.

7.8 DELAY SYSTEM FOR NETWORKED UNIT START-UP

To avoid simultaneously turning on all of the networked units, it is possible to set a start-up delay on the networked units.

With the "**Networked unit start-up delay**" (Factory setup - Local network) parameter it is possible to set the start-up delay for the units.

When set, the units will start up with a delay established by the parameter value. The delay will apply to every unit in the network.

7.9 FAILED LOCAL NETWORK COMMUNICATION ALARM MANAGEMENT

The units constantly monitor the local network communication status. Should there be a problem and should communication remain down for longer than 30 s, SURVEY^3 will trigger the "**Local network communication alarm"**.

If there is an alarm the unit will continue operating regularly as if it were in stand-alone, without interrupting component regulation at all.

When the network connection is restored the alarm is automatically reset and the unit starts regulating again according to the type of local network.

7.10 REMOTE PROBE MODULES MANAGEMENT

ATTENTION!

For further information on the probe module, see the relative technical installation, use and maintenance manual.

SURVEY³ is able to manage up to 3 remote probe modules, connected through the CANbus network, in order to monitor up to 16 configurable probes such as temperature, humidity or ambient pressure.

The parameter "**Number of remote modules**" (Manufacturer setup - Remote probes) allows you to set up to a maximum of 3 modules connected to the unit.

Local network units are usually used to manage a single room. In these cases it is possible to set a regulation control system by using the average values detected by the remote probe modules connected to the unit.

The parameter "**Temperature values for regulation**" (Manufacturer setup - Remote probes) allows you to use the average temperature values detected by the modules to regulate the units.

The parameter "**Humidity values for regulation**" (Manufacturer setup - Remote probes) allows you to use the average humidity values detected by the modules to regulate the units.

The parameter "**Pressure values for regulation**" (Manufacturer setup - Remote probes) allows you to use the average pressure values detected by the modules to regulate the units.

7.10.1 REMOTE PROBE MODULES ALARM MANAGEMENT

SURVEY³ is capable of detecting the alarm conditions of the connected probe modules, triggering the "**Module (1-2-3) alarm**" where the nature of the problem is specified. The following alarm causes are possible:

- **Communication down:** The alarm indicates failed communication between the module and the SURVEY³ regulator.
- **Probe 1:** Probe 1 is damaged.
- **Probe 2:** Probe 2 is damaged.
- **Probe 3:** Probe 3 is damaged.
- **Probe 4:** Probe 4 is damaged.
- **Probe 5:** Probe 5 is damaged.
- **Probe 6:** Probe 6 is damaged.

When a probe triggers an alarm, the relative value will be removed from the calculation of the average. If the entire probe module is disconnected, the values of all the probes connected to it will be removed from the calculation of the average.

If all the values of the modules are in alarm status, the unit will use the local probes to regulate temperature, humidity and pressure.

8 LIST OF REGULATION SOFTWARE PARAMETERS

8.1 SET-POINT MENU: SET-POINT EDITING

8.1.1 SET-POINT

Description	Limits	Default	Unit of measure
Temperature set-point	18.0 - 40.0	22.0	°C
Humidity set-point	20 - 75	50	%Rh

8.2 USER SETUP: OPERATING PROGRAM SETTINGS

8.2.1 LANGUAGE

Description	Limits	Default	Unit of measure
Language	Italian - Polish	English	-

8.2.2 VENTILATION SET-POINT

Description	Limits	Default	Unit of measure
Flow rate set-point	500 - 99,000	2,200	m^3/h
Pressure set-point	-900 - 900	20	Pa
Air temperature delta set-point	0.1 - 60.0	12.0	°C

8.2.3 TEMPERATURE

Description	Limits	Default	Unit of measure
Regulation sensor	Return - Supply	Return	-
Regulation type	P - PI - PID	P	-
Proportional band	0.1 - 60.0	2.0	°C
Integration time	0 - 9,999	0	s
Derivation time	0 - 9,999	0	s
High temperature alarm offset	0.0 - 20.0	10.0	°C
Low temperature alarm offset	0.0 - 20.0	10.0	°C

8.2.4 LIMIT TEMPERATURE

Description	Limits	Default	Unit of measure
High limit temperature alarm limit	-15.0 - 90.0	30.0	°C
High limit temperature management	*	Alarm Only	-
Low limit temperature alarm limit	-15.0 - 90.0	8.0	°C
Low limit temperature management	**	Alarm Only	-
* Alarm only - Stop component - Reduction - Cold activation			
** Alarm only - Stop component - Reduction - Hot activation			

8.2.5 HUMIDITY

Description	Limits	Default	Unit of measure
Dehumidification proportional band	1 - 50	10	%Rh
Humidification proportional band	1 - 50	10	%Rh
High return humidity alarm offset	0 - 100	20	%Rh
Low return humidity alarm offset	0 - 100	20	%Rh
High supply humidity alarm limit	0 - 100	95	%Rh
Low supply humidity alarm limit	0 - 100	20	%Rh

8.2.6 HUMIDIFIER

Description	Limits	Default	Unit of measure
Enable humidification	No - Yes	Yes	-
Manual cylinder discharge	No - Yes	No	-
Cylinder pre-wash	No - Yes	No	-

8.2.7 FREE COOLING AND TWO SOURCES

Description	Limits	Default	Unit of measure
Free cooling activation delta	1.0 - 30.0	4.0	°C
Two sources water set-point	1.0 - 30.0	7.0	°C
Two sources water proportional band	0.1 - 20.0	0.5	°C
Two sources source exchange	No - Yes	No	-
Switch due to high ambient temperature	No - Yes	No	-
Ambient temperature set-point	1.0 - 90.0	25.0	°C

8.2.8 CONDENSERS

Description	Limits	Default	Unit of measure
Condensation set-point	30.0 - 65.0	45.0	°C
Condensation proportional band	1.0 - 40.0	2.0	°C
Condensation set-point increase	0.1 - 50.0	1.0	°C
Maximum condensation set-point	30.0 - 65.0	55.0	°C

8.2.9 DRY COOLER

Description	Limits	Default	Unit of measure
Dry cooler set-point	1.0 - 65.0	10.0	°C
Dry Cooler proportional band	0.5 - 20.0	5.0	°C
Dry Cooler set-point increase	0.1 - 50.0	1.0	°C
Maximum dry Cooler set-point	0.1 - 65.0	50.0	°C

8.2.10 DIRTY FILTERS

Description	Limits	Default	Unit of measure
Dirty filter set-point	0 - 5000	250	Pa
Dirty filter differential	1 - 100	10	Pa

8.2.11 PROBE CALIBRATION

Description	Limits	Default	Unit of measure
Return temperature	-10.0 - 10.0	0.0	°C
Supply temperature	-10.0 - 10.0	0.0	°C
Return humidity	-10 - 10	0	%Rh
Supply humidity	-10 - 10	0	%Rh
Air differential pressure	-10 - 10	0	Pa
Filter differential pressure	-10 - 10	0	Pa
IN1 / Free cooling water temperature	-10.0 - 10.0	0.0	°C
Water temperature outlet 1	-10.0 - 10.0	0.0	°C
Water flow rate 1	-10 - 10	0	l/h
Water flow rate 2	-10 - 10	0	l/h
Water temperature inlet 2	-10.0 - 10.0	0.0	°C
Water temperature outlet 2	-10.0 - 10.0	0.0	°C

8.2.12 MODBUS

Description	Limits	Default	Unit of measure
Modbus Address	1 - 247	1	-
Modbus Baudrate	*	19200	Baud
Modbus Parity	Even - None	Even	-
Modbus Stop bit	1 - 2	1	Stop bit
* 1200 - 2400 - 4800 - 9600 - 19200 - 28800 - 38400 - 57600			

8.2.13 ETHERNET

Description	Limits	Default	Unit of measure
IP address	-	192.168.1.24	-
Subnet mask	-	255.255.255.0	-
Gateway	-	192.168.1.1	-
Webserver IP port	0 - 65535	80	-
Modbus TCP port	0 - 65535	502	-
BACnet IP port	0 - 65535	47808	-

8.2.14 BACNET

Description	Limits	Default	Unit of measure
Device ID	1 - 4194303	127	-
Baudrate	*	76800	Baud
Max Master	1 - 127	127	-
Mac ID	1 - 127	1	-
* 9600 - 19200 - 38400 - 76800			

8.2.15 PASSWORD

Description	Limits	Default	Unit of measure
User Password	0 - 9999	0123	-

8.3 FACTORY SETUP LOOP: COMPONENT CONFIGURATION

8.3.1 PROBES

Description	Limits	Default	Unit of measure
Return humidity	No - Yes	No	-
Supply humidity	No - Yes	No	-
Water alarm probe	No - Yes	No	-
Air differential pressure	No - Yes	No	-
Filter differential pressure	No - Yes	No	-
IN 1 / Free cooling water temperature	No - Yes	No	-
Water temperature outlet 1	No - Yes	No	-
Water flow rate 1	No - Yes	No	-
Water flow rate 2	No - Yes	No	-
Water temperature inlet 2	No - Yes	No	-
Water temperature outlet 2	No - Yes	No	-

8.3.2 REMOTE PROBES

Description	Limits	Default	Unit of measure
Number of remote modules	0 - 3	0	-
Temperature values for regulation	No - Yes	No	-
Humidity values for regulation	No - Yes	No	-
Pressure values for regulation	No - Yes	No	-

8.3.3 DIGITAL INPUTS

Description	Limits	Default	Unit of measure
Configurable input 1	*	No	-
Configurable input logic 1	N.O. - N.C.	N.O.	-
Configurable input 2	*	No	-
Configurable input logic 2	N.O. - N.C.	N.O.	-
Configurable input 3	*	No	-
Configurable input logic 3	N.O. - N.C.	N.O.	-
Configurable input 4	*	No	-
Configurable input logic 4	N.O. - N.C.	N.O.	-
Configurable input 5	*	No	-
Configurable input logic 5	N.O. - N.C.	N.O.	-
* No - Smoke/Fire - Water pump alarm - External humidifier alarm - General fan alarm - Condenser 1 alarm - Condenser 2 alarm - Dry Cooler alarm - Non-critical generic alarm - Critical generic alarm - Condensing unit alarm - Refrigerant gas leak alarm - No phase alarm - STOP cold - STOP Compressor 1 - STOP Compressor 2 - STOP hot - STOP humidify - STOP dehumidification - STOP hot + humidification - STOP cold+hot+humidification - STOP free cooling - Force free cooling - Force two sources - Ultracap - Condenser 1 water flow alarm - Condenser 2 water flow alarm			

8.3.4 DIGITAL OUTPUTS

Description	Limits	Default	Unit of measure
Configurable output 1	*	No	-
Configurable output logic 1	N.O. - N.C.	N.O.	-
Configurable output 2	*	No	-
Configurable output logic 2	N.O. - N.C.	N.O.	-
Configurable output 3	*	No	-
Configurable output logic 3	N.O. - N.C.	N.O.	-
Configurable output 4	*	No	-
Configurable output logic 4	N.O. - N.C.	N.O.	-
Configurable output 5	*	No	-
Configurable output logic 5	N.O. - N.C.	N.O.	-
* No - Water pump control - Condensing unit control - Unit status - Cold status - Hot status - Humidification status - Dehumidification status - Free cooling status - General alarm - Non-critical alarm - Critical alarm - Filter alarm - Cold alarm - Hot alarm - Fan alarm - Temperature alarm - Humidity alarm - Flooding alarm - No power supply alarm			

8.3.5 VENTILATION

Description	Limits	Default	Unit of measure
Number of fans	1 - 10	1	-
Fan type	*	Modbus EBM 3PH	-
Regulation type	**	Reg. Cold/Hote	-
Maximum speed	10 - 100	100	%
Minimum speed	10 - 100	50	%
Startup speed	0 - 100	60	%
Startup time	0 - 9999	0	s
Air flow calculation coefficient	0 - 1000	72	-
* On-off - Analogues - Modbus EBM 3PH - Modbus EBM 1PH - Modbus ZIEHL 3PH - Modbus ZIEHL 1PH			
** Fixed speed - Reg. Cold/Hot - ΔT constant air - Constant flow rate - Constant pressure			

8.3.6 MACHINE TYPE

Description	Limits	Default	Unit of measure
Machine Type	*	Direct Expansion	-
Primary source selection	DX - CW	CW	-
Secondary source selection	DX - CW	DX	-
* Direct expansion - Evaporator - Chilled water - Free Cooling DX - Free Cooling CW - Two Sources			

8.3.7 DIRECT EXPANSION

Description	Limits	Default	Unit of measure
Number of compressors	1 - 2	1	-
Enable compressor inverter	*	No	-
Rotation type	FIFO+HS - LIFO+HS	FIFO+HS	-
* No - Internal (Agile) - Internal (Active) - External (Analogue)			

8.3.8 CHILLED WATER

Description	Limits	Default	Unit of measure
Water flow rate sensor diameter 1	*	DN6	-
Water flow rate sensor diameter 2	*	DN6	-
Water flow rate measurement	Single - Sum	Single	-
Water flow rate regulation	No - Yes	No	-
Set-point 1	1 - 30000	2400	l/h
Dead zone 1	1 - 65000	50	l/h
Modulation time 1	1 - 100	3	s
Set-point 2	1 - 30000	2400	l/h
Dead zone 2	1 - 65000	50	l/h
Modulation time 2	1 - 100	3	s
* DN6 - DN8 - DN10 - DN15 - DN20 - DN25 - DN32			

8.3.9 HEATING

Description	Limits	Default	Unit of measure
Heating	*	No	-
Electric coil power	1.0 - 50.0	6.0	kW
Number of electric coil stages	1 - 2	1	-
Type of stage switch	Linear - Steps	Steps	-
* No - Stage-heaters - Modulating coil - Water valve			

8.3.10 HUMIDITY

Description	Limits	Default	Unit of measure
Humidifier	*	No	-
Humidification production percentage	0 - 100	100	%
Humidification and cold together	No - Yes	Yes	-
Dehumidification	No - Yes	Yes	-
Dehumidification trigger threshold	0 - 100	100	%
Minimum dehumidification limit	0 - 100	60	%
Partial dehumidification	No - Yes	No	-
Dehumidification lock offset	0.1 - 20.0	4.0	°C
* No - Internal (Modbus) - External (Analogue)			

8.3.11 CONDENSATION REGULATION

Description	Limits	Default	Unit of measure
Condenser regulation	*	No	-
Regulation type	**	Dead zone	-
Minimum condensation demand	0 - 100	0	%
Maximum condensation demand	0 - 100	100	%
Condensation startup request	0 - 100	50	%
Condensation startup time	0 - 999	30	s
Fast modulation speed	1 - 100	2	s
Fast modulation time	0 - 999	20	s
Standard modulation speed	1 - 100	5	s
Override with probe error	0 - 100	100	%
Autoset-point time	1 - 900	5	Min
Minimum Autoset-point demand	0 - 50	20	%
Condensation demand memory	No - Yes	No	-
* No - Fixed Set-point - Autoset-point			
** Proportional - Dead zone			

8.3.12 DRY COOLER REGULATION

Description	Limits	Default	Unit of measure
Dry cooler regulation	*	No	-
Regulation type	**	Dead zone	-
Minimum fan speed	0 - 100	0	%
Maximum fan speed	0 - 100	100	%
Fan startup speed	0 - 100	50	%
Fan startup time	0 - 999	30	s
Fast modulation speed	1 - 100	2	s
Fast modulation time	0 - 999	20	s
Standard modulation speed	1 - 100	5	s
Speed with probe error	0 - 100	100	%
Autoset-point time	1 - 900	5	Min
Minimum Autoset-point speed	0 - 50	20	%
Fan cut-off	0.0 - 50.0	2.0	°C
Fan speed memory	No - Yes	Yes	-
* No - Fixed Set-point - Autoset-point			
** Proportional - Dead zone			

8.3.13 WATER PUMP

Description	Limits	Default	Unit of measure
Regulation type	*	No	-
Pump switch off delay	0 - 999	60	s
* No - Unit ON - Cold Demand			

8.3.14 SET-POINT LIMITS

Description	Limits	Default	Unit of measure
Minimum temperature set-point limit	- 40.0 - 150.0	18.0	°C
Maximum temperature set-point limit	- 40.0 - 150.0	40.0	°C
Minimum humidity set-point limit	0 - 100	20	%Rh
Maximum humidity set-point limit	0 - 100	75	%Rh

8.3.15 DEAD ZONE

Description	Limits	Default	Unit of measure
Temperature dead zone	0.0 - 10.0	0.2	°C
Humidity dead zone	0 - 20	2	%

8.3.16 LAN

Description	Limits	Default	Unit of measure
Network address	1 - 13	13	-
Network operation	*	No	-
Number of networked units	2 - 12	2	-
Number of units in standby	0 - 99	0	-
Enable unit rotation	No - Yes	No	-
Time period for rotation	1 - 9999	12	h
Enable support	No - Yes	No	-
Support switch on time	0 - 9999	60	s
Dynamic On/Off	No - Yes	Yes	-
Dynamic set-point	No - Yes	Yes	-
Temperature average	No - Yes	No	-
Humidity average	No - Yes	No	-
Ambient pressure average	No - Yes	No	-
Networked unit startup delay	0 - 99	0	s
* No - Duty/Stand-by - Smartnet			

8.3.17 ALARMS

Description	Limits	Default	Unit of measure
Temperature and humidity alarm delay	0 - 9999	300	s
Damper status alarm delay	0 - 9999	150	s
Compressor low pressure alarm delay	0 - 9999	60	s
Compressor discharge high temperature alarms delay	0 - 9999	60	s
Compressor low compression alarms delay	0 - 9999	60	s
Smoke/fire alarm reset type	*	Manual	-
Compressor alarms severity	Critical - Non-critical	Critical	-
Condensate discharge pump alarm severity	Critical - Non-critical	Non-critical	-
Water detection alarm severity	Critical - Non-critical	Non-critical	-
Water pump alarm severity	Critical - Non-critical	Non-critical	-
No electrical power supply alarm	No - Unit ON - Yes	Unit ON	-
Alarm reset after power supply failure	No - Yes	No	-
Water flow rate sensor alarm delay	0 - 9999	150	s
Alarm buzzer	No - Yes	Yes	-
* Automatic - Manual			

8.3.18 KEY LOCK

Description	Limits	Default	Unit of measure
Enable key lock	*	No	-
* No - Yes - Password			

8.3.19 PARAMETERS

Description	Limits	Default	Unit of measure
Factory settings reset	-	Run	-
Factory settings from USB	-	Run	-

8.3.20 PASSWORD

Description	Limits	Default	Unit of measure
Factory password	0 - 9999	0694	-

8.3.21 DELETE OPERATING HOURS

Description	Limits	Default	Unit of measure
Unit	-	Reset	-
Compressor 1	-	Reset	-
Compressor 2	-	Reset	-
Water valve	-	Reset	-
Electric heater	-	Reset	-
Humidifier	-	Reset	-
Free cooling	-	Reset	-
Dry cooler	-	Reset	-
Condenser 1	-	Reset	-
Condenser 2	-	Reset	-

9 UNIT ALARMS MANAGEMENT

9.3.1 SYMBOLS AND ICONS THAT CAN BE SHOWN ON THE DISPLAY

Various types of icons are used in the software pages. The meanings of the icons are provided in the table below.

Alarms	
OK	OK 3 SEC
Press OK key	Press and hold OK key

9.1 SIGNALLING, CHECK AND CLEARANCE OF ALARM CONDITIONS

9.1.1 ALARM PRESENCE SIGNALLING

The presence of one or more active alarms is signalled by:

- Activation of the (**Buzzer**) incorporated in the user terminal.
- Illumination of the **RED LED** on the front panel of the user terminal ( );
- Alarm presence icon ( ) appears on the program's main page.
- If the alarm is **CRITICAL**, and therefore blocks unit operation, the **GREEN LED** ( ) starts flashing.

9.1.2 CHECK AND CLEARANCE OF ACTIVE ALARMS

From the **ALM - Active alarms** menu it is possible to view the alarms that are active on the unit. Access this menu by holding down the **LEFT/ALARM** ( ) key.

Use the **OK** (OK) key to scroll through all active alarm signals.

Hold the **OK** (OK) key pressed to reset the displayed alarm.

Press **ESC** ( ) to return to the main program page.

Example of active alarm display.

9.1.3 ALARM SIGNAL BUZZER MANAGEMENT

In the presence of a new alarm, SURVEY³ emits a signal (Buzzer) to inform the user of the alarm condition.

If the (Buzzer) sound is featured in the "**Alarm buzzer**" parameter (Factory setup - Alarm management) it is possible to remove the alarm (Buzzer).

9.2 DESCRIPTION OF SURVEY³ MICROPROCESSOR ALARMS

9.2.1 CRITICAL ALARMS

Name:	**Motorised damper status alarm**
Cause:	The unit's motorised dampers are closed
Delay:	At startup: Second parameter - In operation: 5 s
Effect:	Tripping causes the unit to shut off. All devices will stop without complying with the operating times
Solutions:	Check the damper motor Check the damper motor's electrical connection Check the damper status
Restore:	The alarm needs to be reset manually

Name:	**Smoke/fire detection alarm**
Cause:	The digital smoke/fire alarm input is open
Delay:	At startup: 10 - In operation: 5 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times.
Solutions:	Check for the presence of smoke or fire inside the room Check the electrical connection of the digital input
Restore:	Second parameter

Name:	**Critical generic alarm**
Cause:	The digital critical generic alarm input is open
Delay:	At startup: 10 s - In operation: 5 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check the electrical connection of the digital input
Restore:	The alarm needs to be reset manually

9.2.2 FAN ALARMS

Name:	**General supply fans alarm**
Cause:	The unit's fans are blocked by the tripped air flow sensor or the fan's electrical protection
Delay:	At startup: 40 s - In operation: 5 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check for any problems on the aeraulic circuit that might reduce the unit's air flow. Check the electrical connection of the air flow sensor and of the fan's electrical protection. Check fan speed Check the status of the fan
Restore:	The alarm needs to be reset manually

Name:	**Fan 1 alarm**
Cause:	The fan has one of the following problems: **Communication down** **No phase alarm** **High inverter temperature** **Inverter error** **Motor overload** **Low DC voltage** **No master-slave communication** **Hall sensor error** **High motor temperature**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check Modbus communication cable wiring Check the fan's electrical connection Check the power supply voltage of the electrical line Check the fan regulation module Check the status of the fan
Restore:	The alarm needs to be reset manually

Name:	**Fan 2 alarm**
Cause:	The fan has one of the following problems: **Communication down** **No phase alarm** **High inverter temperature** **Inverter error** **Motor overload** **Low DC voltage** **No master-slave communication** **Hall sensor error** **High motor temperature**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check Modbus communication cable wiring Check the fan's electrical connection Check the power supply voltage of the electrical line Check the fan regulation module Check the status of the fan
Restore:	The alarm needs to be reset manually

Name:	**Fan 3 alarm**
Cause:	The fan has one of the following problems: **Communication down** **No phase alarm** **High inverter temperature** **Inverter error** **Motor overload** **Low DC voltage** **No master-slave communication** **Hall sensor error** **High motor temperature**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check Modbus communication cable wiring Check the fan's electrical connection Check the power supply voltage of the electrical line Check the fan regulation module Check the status of the fan
Restore:	The alarm needs to be reset manually

Name:	**Fan 4 alarm**
Cause:	The fan has one of the following problems: **Communication down** **No phase alarm** **High inverter temperature** **Inverter error** **Motor overload** **Low DC voltage** **No master-slave communication** **Hall sensor error** **High motor temperature**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check Modbus communication cable wiring Check the fan's electrical connection Check the power supply voltage of the electrical line Check the fan regulation module Check the status of the fan
Restore:	The alarm needs to be reset manually

Name:	**Fan 5 alarm**
Cause:	The fan has one of the following problems: **Communication down** **No phase alarm** **High inverter temperature** **Inverter error** **Motor overload** **Low DC voltage** **No master-slave communication** **Hall sensor error** **High motor temperature**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check Modbus communication cable wiring Check the fan's electrical connection Check the power supply voltage of the electrical line Check the fan regulation module Check the status of the fan
Restore:	The alarm needs to be reset manually

Name:	**Fan 6 alarm**
Cause:	The fan has one of the following problems: **Communication down** **No phase alarm** **High inverter temperature** **Inverter error** **Motor overload** **Low DC voltage** **No master-slave communication** **Hall sensor error** **High motor temperature**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check Modbus communication cable wiring Check the fan's electrical connection Check the power supply voltage of the electrical line Check the fan regulation module Check the status of the fan
Restore:	The alarm needs to be reset manually

Name:	**Fan 7 alarm**
Cause:	The fan has one of the following problems: **Communication down** **No phase alarm** **High inverter temperature** **Inverter error** **Motor overload** **Low DC voltage** **No master-slave communication** **Hall sensor error** **High motor temperature**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check Modbus communication cable wiring Check the fan's electrical connection Check the power supply voltage of the electrical line Check the fan regulation module Check the status of the fan
Restore:	The alarm needs to be reset manually

Name:	**Fan 8 alarm**
Cause:	The fan has one of the following problems: **Communication down** **No phase alarm** **High inverter temperature** **Inverter error** **Motor overload** **Low DC voltage** **No master-slave communication** **Hall sensor error** **High motor temperature**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check Modbus communication cable wiring Check the fan's electrical connection Check the power supply voltage of the electrical line Check the fan regulation module Check the status of the fan
Restore:	The alarm needs to be reset manually

Name:	**Fan 9 alarm**
Cause:	The fan has one of the following problems: **Communication down** **No phase alarm** **High inverter temperature** **Inverter error** **Motor overload** **Low DC voltage** **No master-slave communication** **Hall sensor error** **High motor temperature**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check Modbus communication cable wiring Check the fan's electrical connection Check the power supply voltage of the electrical line Check the fan regulation module Check the status of the fan
Restore:	The alarm needs to be reset manually

Name:	**Fan 10 alarm**
Cause:	The fan has one of the following problems: **Communication down** **No phase alarm** **High inverter temperature** **Inverter error** **Motor overload** **Low DC voltage** **No master-slave communication** **Hall sensor error** **High motor temperature**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	Tripping causes the unit to shut off All devices will stop without complying with the operating times
Solutions:	Check Modbus communication cable wiring Check the fan's electrical connection Check the power supply voltage of the electrical line Check the fan regulation module Check the status of the fan
Restore:	The alarm needs to be reset manually

9.2.3 PROBE ALARMS

Name:	**Broken return temperature probe alarm**
Cause:	Broken or disconnected return temperature probe
Delay:	At startup: 10 s - In operation: 10 s
Effect:	See chapters above
Solutions:	Check the probe's electrical connection Check the probe signal
Restore:	The alarm resets automatically

Name:	**Broken supply temperature probe alarm**
Cause:	The supply temperature probe is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	See chapters above
Solutions:	Check the probe's electrical connection Check the probe signal
Restore:	The alarm resets automatically

Name:	**Broken return humidity probe alarm**
Cause:	The return humidity probe is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	Humidity regulation stops
Solutions:	Check the probe's electrical connection Check the probe signal
Restore:	The alarm resets automatically

Name:	**Broken supply humidity probe alarm**
Cause:	The supply humidity probe is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	Alarm limit regulation is stopped
Solutions:	Check the probe's electrical connection Check the probe signal
Restore:	The alarm resets automatically

Name:	**IN 1/Free cooling water temperature probe alarm**
Cause:	The IN 1/Free cooling water temperature probe is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	See chapters above
Solutions:	Check the probe's electrical connection Check the probe signal
Restore:	The alarm resets automatically

Name:	**Broken OUT 1 water temperature probe alarm**
Cause:	The OUT temperature probe is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	See chapters above
Solutions:	Check the probe's electrical connection Check the probe signal
Restore:	The alarm resets automatically

Name:	**Broken IN 2 water temperature probe alarm**
Cause:	The IN 2 water temperature probe is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	See chapters above
Solutions:	Check the probe's electrical connection Check the probe signal
Restore:	The alarm resets automatically

Name:	**Broken OUT 2 water temperature probe alarm**
Cause:	The OUT 2 temperature probe is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	See chapters above
Solutions:	Check the probe's electrical connection Check the probe signal
Restore:	The alarm resets automatically

Name:	**Water flow rate sensor alarm 1**
Cause:	The water flow rate sensor is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	See chapters above
Solutions:	Check the sensor's electrical connection Check the sensor signal
Restore:	The alarm resets automatically

Name:	**Water flow rate sensor alarm 2**
Cause:	The water flow rate sensor is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	See chapters above
Solutions:	Check the sensor's electrical connection Check the sensor signal
Restore:	The alarm resets automatically

Name:	**Liquid temperature probe alarm 1**
Cause:	The liquid temperature probe for compressor 1 is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	Signalling only. Sub-cooling calculation will stop.
Solutions:	Check the sensor's electrical connection Check the sensor signal
Restore:	The alarm resets automatically

Name:	**Liquid temperature probe alarm 2**
Cause:	The liquid temperature probe for compressor 1 is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	Signalling only. Sub-cooling calculation will stop.
Solutions:	Check the sensor's electrical connection Check the sensor signal
Restore:	The alarm resets automatically

Name:	**Differential air pressure probe alarm**
Cause:	The differential air pressure probe is broken or disconnected
Delay:	At startup: 10 s - In operation: 10 s
Effect:	See chapters above
Solutions:	Check the probe's electrical connection Check the probe signal
Restore:	The alarm resets automatically

Name:	**Filter differential pressure probe alarm**
Cause:	The filter differential pressure probe has one of the following problems: **Breakage** **Wiring** **Pressure Range** **ADC overload** **Calibration** **DCO** **Watchdog** **Communication**
Delay:	At startup: 60 s - In operation: 60 s
Effect:	See chapters above
Solutions:	Check the probe's electrical connection Check the probe signal Check probe calibration Check the position of the configuration dip-switches
Restore:	The alarm resets automatically

9.2.4 COMPRESSOR ALARMS

Name:	**Compressor 1 breaker alarm**
Cause:	There is an alarm on the compressor breaker
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the compressor's electrical connection Check the current absorbed by the compressor
Restore:	The alarm needs to be reset manually

Name:	**Compressor 2 breaker alarm**
Cause:	There is an alarm on the compressor breaker
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the compressor's electrical connection Check the current absorbed by the compressor
Restore:	The alarm needs to be reset manually

Name:	**Compressor 1 high pressure alarm**
Cause:	There is an alarm on the compressor's high pressure breaker
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the condensation pressure Check the status of the condenser Check the condenser regulator Check the condenser's power supply line
Restore:	The alarm needs to be reset manually

Name:	**Compressor 2 high pressure alarm**
Cause:	There is an alarm on the compressor's high pressure breaker
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the condensation pressure Check the status of the condenser Check the condenser regulator Check the condenser's power supply line
Restore:	The alarm needs to be reset manually

Name:	**Compressor 1 low pressure alarm**
Cause:	There is an alarm on the compressor's low pressure breaker
Delay:	At startup: Second parameter - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the evaporation pressure Check the status of the electronic expansion valve Check the cooling circuit
Restore:	The alarm needs to be reset manually

Name:	**Compressor 2 low pressure alarm**
Cause:	There is an alarm on the compressor's low pressure breaker
Delay:	At startup: Second parameter - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the evaporation pressure Check the status of the electronic expansion valve Check the cooling circuit
Restore:	The alarm needs to be reset manually

Name:	**Compressor 1 discharge high temperature alarm**
Cause:	There is an alarm on the compressor's discharge high temperature breaker
Delay:	At startup: Second parameter - In operation: Second parameter
Effect:	See chapters above
Solutions:	Check the compressor's discharge temperature Check the evaporation pressure Check the cooling circuit
Restore:	The alarm needs to be reset manually

Name:	**Compressor 2 discharge high temperature alarm**
Cause:	There is an alarm on the compressor's discharge high temperature breaker
Delay:	At startup: Second parameter - In operation: Second parameter
Effect:	See chapters above
Solutions:	Check the compressor's discharge temperature Check the evaporation pressure Check the cooling circuit
Restore:	The alarm needs to be reset manually

Name:	**Compressor 1 low compression alarm**
Cause:	The compressor's compression ratio is too low
Delay:	At startup: Second parameter - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the direction of rotation of the compressor Check the evaporation pressure Check the cooling circuit
Restore:	The alarm needs to be reset manually

Name:	**Compressor 2 low compression alarm**
Cause:	The compressor's compression ratio is too low
Delay:	At startup: Second parameter - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the direction of rotation of the compressor Check the evaporation pressure Check the cooling circuit
Restore:	The alarm needs to be reset manually

Name:	**DC inverter alarm**
Cause:	There is an alarm on the compressor inverter due to an anomaly The alarms are identified with an alphanumerical code (ex. F0102) See the chapters below for the description of the alarms
Delay:	At startup: 30 s - In operation: 30 s
Effect:	See chapters above
Solutions:	See the chapters below
Restore:	The alarm needs to be reset manually

Name:	**EEV 1 alarm**
Cause:	The valve driver has one of the following problems: **Communication** **Evaporation pressure probe** **Condensation pressure probe** **Suction temperature probe** **Discharge temperature probe**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	See chapters above
Solutions:	Check the valve drive connection Check the probe connection Check the probe signal
Restore:	The alarm needs to be reset manually

Name:	**EEV 2 alarm**
Cause:	The valve driver has one of the following problems: **Communication** **Evaporation pressure probe** **Condensation pressure probe** **Suction temperature probe** **Discharge temperature probe**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	See chapters above
Solutions:	Check the valve drive connection Check the probe connection Check the probe signal
Restore:	The alarm needs to be reset manually

9.2.5 CONDENSER ALARMS

Name:	**Condenser 1 water flow alarm**
Cause:	The water-cooled condenser 1 sensor has detected the absence of a flow and increase in pressure.
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the status of the condenser water supply
Restore:	The alarm resets automatically

Name:	**Condenser 2 water flow alarm**
Cause:	The water-cooled condenser 2 sensor has detected the absence of a flow and increase in pressure.
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the status of the condenser water supply
Restore:	The alarm resets automatically

Name:	**Condenser 1 general alarm**
Cause:	There is an alarm on the external condenser
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the status of the external condenser
Restore:	The alarm needs to be reset manually

Name:	**Condenser 2 general alarm**
Cause:	There is an alarm on the external condenser
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the status of the external condenser
Restore:	The alarm needs to be reset manually

9.2.6 INTERNAL HUMIDIFIER ALARMS

Name:	**Internal humidifier alarm**
Cause:	The internal humidifier has one of the following problems: **Communication** **Internal memory error** **Parameter error** **High electrode current** **Low steam flow rate** **Failed discharge** **Hours of maintenance** **No water** **Cylinder maintenance** **Cylinder burnt out** **Foam presence** **Life timer expired** **High water level** **High conductivity** **Connection error** See the chapters below for the description of the alarms
Delay:	At startup: 30 s - In operation: 30 s
Effect:	Humidification will stop
Solutions:	See the chapters below
Restore:	The alarm needs to be reset manually

9.2.7 COMPONENT ALARMS

Name:	**Water presence alarm**
Cause:	The probe has detected the presence of water
Delay:	At startup: 10 s - In operation: 10 s
Effect:	Second parameter
Solutions:	Check the connection of the water detection probe Check for water on the water detection probe
Restore:	The alarm needs to be reset manually

Name:	**Condensate discharge pump alarm**
Cause:	There is an alarm on the condensate discharge pump
Delay:	At startup: 10 s - In operation: 10 s
Effect:	Second parameter
Solutions:	Check the connection of the condensate discharge pump Check the status of the condensate discharge pump
Restore:	The alarm needs to be reset manually

Name:	**Electric coil thermostat alarm**
Cause:	The electric coil over-heated thereby tripping the safety thermostat
Delay:	At startup: 10 s - In operation: 5 s
Effect:	The electric coil stops
Solutions:	Check fan speed Check fan air flow Check the aeraulic circuit
Restore:	The alarm needs to be reset manually

Name:	**Clogged air filter alarm**
Cause:	The dirty filter differential pressure sensor detected excessive pressure
Delay:	At startup: 10 s - In operation: 5 s
Effect:	Signalling only
Solutions:	Check air filter status Check pressure sensor calibration Check the pressure sensor connection Check the aeraulic circuit
Restore:	The alarm needs to be reset manually

Name:	**Dry cooler general alarm**
Cause:	There is an alarm on the dry cooler
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the status of the dry cooler
Restore:	The alarm needs to be reset manually

Name:	**External humidifier general alarm**
Cause:	There is an alarm on the external humidifier
Delay:	At startup: 10 s - In operation: 5 s
Effect:	Humidification will stop
Solutions:	Check the status of the external humidifier
Restore:	The alarm needs to be reset manually

Name:	**General water pump alarm**
Cause:	There is an alarm on the water pump
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the status of the water pump
Restore:	The alarm needs to be reset manually

Name:	**Condensing unit general alarm**
Cause:	There is an alarm on the external condensing unit
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the status of the external condensing unit
Restore:	The alarm needs to be reset manually

Name:	**Refrigerant gas leak detector alarm**
Cause:	There is an alarm on the refrigerant gas leak detector
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the status of the refrigerant gas leak detector
Restore:	The alarm needs to be reset manually

Name:	**No electrical power supply alarm**
Cause:	There is an electrical power supply outage on the unit
Delay:	At startup: 10 s - In operation: 5 s
Effect:	See chapters above
Solutions:	Check the status of the unit's electrical power supply line
Restore:	The alarm needs to be reset manually

Name:	**Non-critical generic alarm**
Cause:	The digital generic non-critical alarm input is open
Delay:	At startup: 10 s - In operation: 5 s
Effect:	Signalling only
Solutions:	Check the status of the digital input
Restore:	The alarm needs to be reset manually

9.2.8 LAN ALARMS

Name:	**Local network communication alarm**
Cause:	The unit cannot find other units on the local network
Delay:	At startup: 30 s - In operation: 30 s
Effect:	See chapters above
Solutions:	Check the connection of the local network Check the configuration of the local network parameters
Restore:	The alarm resets automatically

9.2.9 TEMPERATURE AND HUMIDITY ALARMS

Name:	**High temperature regulation alarm**
Cause:	The regulated temperature has exceeded the alarm threshold
Delay:	At startup: Second parameter - In operation: Second parameter
Effect:	Signalling only
Solutions:	Check the unit's operating status
Restore:	The alarm resets automatically

Name:	**Low temperature regulation alarm**
Cause:	The regulated temperature has exceeded the alarm threshold
Delay:	At startup: Second parameter - In operation: Second parameter
Effect:	Signalling only
Solutions:	Check the unit's operating status
Restore:	The alarm resets automatically

Name:	**High limit temperature alarm**
Cause:	The limit temperature has exceeded the alarm threshold
Delay:	At startup: Second parameter - In operation: Second parameter
Effect:	Second parameter (See chapters above)
Solutions:	Check the unit's operating status
Restore:	The alarm resets automatically

Name:	**Low limit temperature alarm**
Cause:	The limit temperature has exceeded the alarm threshold
Delay:	At startup: Second parameter - In operation: Second parameter
Effect:	Second parameter (See chapters above)
Solutions:	Check the unit's operating status
Restore:	The alarm resets automatically

Name:	**Return high humidity alarm**
Cause:	The return humidity has exceeded the alarm threshold
Delay:	At startup: Second parameter - In operation: Second parameter
Effect:	Signalling only
Solutions:	Check the unit's operating status
Restore:	The alarm resets automatically

Name:	**Return low humidity alarm**
Cause:	The return humidity has exceeded the alarm threshold
Delay:	At startup: Second parameter - In operation: Second parameter
Effect:	Signalling only
Solutions:	Check the unit's operating status
Restore:	The alarm resets automatically

Name:	**Supply high humidity alarm**
Cause:	The supply humidity has exceeded the alarm threshold
Delay:	At startup: Second parameter - In operation: Second parameter
Effect:	Signalling only
Solutions:	Check the unit's operating status
Restore:	The alarm resets automatically

Name:	**Supply low humidity alarm**
Cause:	The supply humidity has exceeded the alarm threshold
Delay:	At startup: Second parameter - In operation: Second parameter
Effect:	Signalling only
Solutions:	Check the unit's operating status
Restore:	The alarm resets automatically

9.2.10 PROBE MODULE ALARMS

Name:	**Module 1 alarm**
Cause:	The probe module has one of the following problems: **Communication** **Probe 1 broken or disconnected** **Probe 2 broken or disconnected** **Probe 3 broken or disconnected** **Probe 4 broken or disconnected** **Probe 5 broken or disconnected** **Probe 6 broken or disconnected**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	See chapters above
Solutions:	Check the probe module connection Check the probe connection Check the probe signal
Restore:	The alarm resets automatically

Name:	**Module 2 alarm**
Cause:	The probe module has one of the following problems: **Communication** **Probe 1 broken or disconnected** **Probe 2 broken or disconnected** **Probe 3 broken or disconnected** **Probe 4 broken or disconnected** **Probe 5 broken or disconnected** **Probe 6 broken or disconnected**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	See chapters above
Solutions:	Check the probe module connection Check the probe connection Check the probe signal
Restore:	The alarm resets automatically

Name:	**Module 1 alarm**
Cause:	The probe module has one of the following problems: **Communication** **Probe 1 broken or disconnected** **Probe 2 broken or disconnected** **Probe 3 broken or disconnected** **Probe 4 broken or disconnected** **Probe 5 broken or disconnected** **Probe 6 broken or disconnected**
Delay:	At startup: 30 s - In operation: 30 s
Effect:	See chapters above
Solutions:	Check the probe module connection Check the probe connection Check the probe signal
Restore:	The alarm resets automatically

9.3 DESCRIPTION OF INTERNAL HUMIDIFIER CPY BOARD ALARMS

Name:	**High electrode current**
Cause:	Electrode overcurrent. The current is greater than the maximum limits due to: • Excessively high water conductivity. • Water level high due to leakage in filling valve. • Water level high due to malfunctioning of discharge valve/header. • Electrode malfunction (for example, a bridge of hard water build-up between electrodes or touching electrodes). • TAM electrical circuit not configured properly. • TAM electrical circuit failure.
Solutions:	• The conductivity level of the water must be between 125-1250 µS/cm. • Check for leakage in the filling valve and clean it or have it replaced. • Check that the discharge valve is working properly. • Replace the cylinder. • Refer to the wiring diagram. • Replace the TAM.

Name:	**Internal memory error**
Cause:	The software or configuration parameters are corrupted
Solutions:	Contact the Manufacturer

Name:	**Parameter error**
Cause:	The configuration parameters are corrupted
Solutions:	Contact the Manufacturer

Name:	**High water conductivity**
Cause:	High supply water conductivity. The possible cause could depend on: • Conductivity electrodes in short circuit (for example, a bridge of hard water build-up between electrodes or touching electrodes). • Water conductivity exceeding maximum limit.
Solutions:	• Clean the conductivity reading electrodes. • The conductivity level of the water must be between 125-1250 µS/cm.

Name:	**Maintenance time expired**
Cause:	Maintenance time expired
Solutions:	Replace/clean the cylinder, then reset operating hours to zero

Name:	**Life timer expired**
Cause:	Life timer expired
Solutions:	Replace/clean the cylinder, then reset operating hours to zero

Name:	**No water**
Cause:	No feed water; the humidifier is trying to introduce water but the level inside the cylinder does not increase at the intended speed. The problem could depend on low mains water pressure or no mains water.
Solutions:	The mains water pressure must be between 0.1 and 0.8 MPa (1-8 bar).

Name:	**Low steam flow rate**
Cause:	Low steam flow rate during reduced production. The steam flow rate is estimated by the current reading of the TAM amperometric transformer. The problem could depend on: • Network water conductivity too low. • Too much foam inside the cylinder. • High amount of limescale inside the cylinder. • TAM electrical circuit not configured properly. • TAM electrical circuit failure.
Solutions:	• The conductivity level of the water must be between 125-1250 µS/cm. • Clean the cylinder and restart. • Clean/replace the cylinder. • Refer to the wiring diagram to check the circuit. • Replace the TAM.

Name:	**Failed discharge**
Cause:	The water inside the cylinder is unable to flow away correctly. The problem could depend on: • Clogged/malfunctioning discharge valve. • Clogged header • Clogged cylinder filter
Solutions:	• Check that the discharge valve is working properly. • Remove the cylinder and the discharge valve and clean the header. • Replace the cylinder.

Name:	**Cylinder maintenance**
Cause:	The cylinder requires maintenance due to limescale build-up.
Solutions:	Unscheduled maintenance: make sure the cylinder works properly, and, if needed, replace it.

Name:	**Connection error**
Cause:	Control signal not connected correctly.
Solutions:	Check the wiring of the control signal.

Name:	**High water level**
Cause:	High water level without humidification demand. The alarm occurs if water reaches the high level electrodes when the humidifier is blocked or disabled.
Solutions:	Check for leakage in the filling valve and clean/ replace it.

Name:	**Foam presence**
Cause:	Presence of foam inside the cylinder due to lubricants, solvents, detergents in the feed water (sometimes present in the water pipes after installation because they are dirty).
Solutions:	• Wash the feed water pipes abundantly. • Check the quality of the water.

Name:	**Cylinder burnt out**
Cause:	Cylinder burnt out. The alarm is displayed when production does not meet the demand within 3 hours of the "Cylinder Maintenance" display.
Solutions:	Scheduled maintenance: change the cylinder.

9.4 DESCRIPTION OF BLDC COMPRESSOR INVERTER ALARMS

Code	F0000
Name:	Communication down
Cause:	Communication with inverter down.
Solutions:	Check the serial connection to the inverter.

Code	F0102
Name:	Inverter overload (60 s)
Cause:	During normal operation the current absorbed by the motor exceeded the rated current by 150% for more than 60 seconds. The compressor is working with an excessively high load (high condensation temperature - high discharge temperature).
Solutions:	Check the compressor's operating conditions.

Code	F0103
Name:	Brief inverter overload (1 s)
Cause:	During normal operation the current absorbed by the motor exceeded the rated current by 200% for more than 1 second. The compressor is working with an excessively high load (high condensation temperature - high discharge temperature-high compression ratio). The inverter is damaged and is not able to provide enough current to the motor.
Solutions:	Check the compressor's operating conditions. Check the starter circuit pressures. Change the inverter.

Code	F0200
Name:	Inverter heat sink over-temperature
Cause:	The temperature of the inverter heat sink has exceeded the alarm threshold. Heat sink ventilation has stopped.
Solutions:	Check inverter ventilation.

Code	F0300
Name:	Internal inverter over-temperature
Cause:	The internal temperature of the inverter has exceeded the alarm threshold. Heat sink ventilation has stopped.
Solutions:	Check inverter ventilation.

Code	F0303
Name:	Inverter condenser over-temperature
Cause:	The temperature of the inverter condenser has exceeded the alarm threshold. Heat sink ventilation has stopped.
Solutions:	Check inverter ventilation.

Code	F0401
Name:	Tripped magneto-thermal motor protection
Cause:	The inverter has detected a short circuit on the electrical connection to the compressor.
Solutions:	Check the electrical connection to the compressor. Check the compressor motor.

Code	F0402
Name:	No load to the inverter
Cause:	The inverter does not detect any connected load.
Solutions:	Check the electrical connection to the compressor.

Code	F0403
Name:	No phases
Cause:	The inverter has detected that one or more phases of the connection to the motor are missing.
Solutions:	Check the compressor's electrical connection.

Code	F0500
Name:	Overload
Cause:	At start-up, the current absorbed by the motor exceeded the rated current by 200% for less than 1 second. The compressor motor is mechanically locked.
Solutions:	Check the status of the compressor and change it.

Code	F0506
Name:	Motor phase overcurrent
Cause:	The motor phases are unbalanced. One or more of the motor phases is/are absorbing more current than the others. The compressor motor is damaged.
Solutions:	Check the status of the compressor and change it.

Code	F0507
Name:	No phase 1
Cause:	No motor phase 1.
Solutions:	Check the compressor's motor and electrical connection.

Code	F0508
Name:	No phase 2
Cause:	No motor phase 2.
Solutions:	Check the compressor's motor and electrical connection.

Code	F0509
Name:	No phase 3
Cause:	No motor phase 3.
Solutions:	Check the compressor's motor and electrical connection.

Code	F06XX
Name:	Internal inverter error
Cause:	There is an internal error on the inverter.
Solutions:	Contact the manufacturer.

Code	F0700
Name:	DC circuit surge
Cause:	The voltage on the DC circuit is too high. The compressor motor decelerated suddenly.
Solutions:	Check the temperature regulation settings and the compressor operating demand.

Code	F0701
Name:	DC circuit undervoltage
Cause:	The voltage of the DC circuit is too low. The voltage of the power supply line is too low.
Solutions:	Check the power supply line

Code	F0702
Name:	No power supply
Cause:	The power supply line is missing or down.
Solutions:	Check the power supply line

Code	F0703
Name:	No power supply phases
Cause:	The inverter has detected that one or more phases of the power supply is/are missing.
Solutions:	Check the power supply line

Code	F0806
Name:	Communication module undervoltage
Cause:	The communication module is not powered regularly. The connections to the communication module are not correct.
Solutions:	Check the connections to the communication module. Replace the communication module.

Code	F1100
Name:	Excessively high output frequency
Cause:	The inverter has detected an excessively high output frequency. The compressor motor decelerated suddenly.
Solutions:	Check the compressor regulation parameters. Check the temperature regulation settings and the compressor operating demand.

Code	F1201
Name:	STO shut-down error
Cause:	The inverter has detected an incorrect shut-down sequence on the STO (Safety Torque Off) module contacts. The STO contacts were not controlled to standard.
Solutions:	Check the control wiring of the STO contacts.

Code	F1202
Name:	STO diagnosis error
Cause:	The inverter has detected a diagnosis problem of the STO (Safety Torque Off) module.
Solutions:	Reset the inverter. If the problem persists, contact the manufacturer.

Code	F1204
Name:	Internal STO error
Cause:	The inverter has detected an internal error of the STO (Safety Torque Off) module.
Solutions:	Reset the inverter. If the problem persists, contact the manufacturer.

Code	F1205
Name:	STO activation error
Cause:	The inverter has detected an incorrect start-up sequence on the STO (Safety Torque Off) module contacts. The STO contacts were not controlled to standard.
Solutions:	Check the control wiring of the STO contacts.

Code	F1206
Name:	The power supply voltage of the STO contacts is too low
Cause:	The inverter has detected that the voltage on the contacts of the STO (Safety Torque Off) module is lower than 24 V
Solutions:	Check the control wiring of the STO contacts. Check the inverter's power supply line.

Code	F1207
Name:	STO control edge not read correctly.
Cause:	The inverter does not read the control edge on the contacts of the STO (Safety Torque Off) module. The 0-24V switch of the contacts is not clean or delectable.
Solutions:	Check the control wiring of the STO contacts. Check the inverter's power supply line.

Code	F1208
Name:	The STO module contacts present contrasting signals
Cause:	The inverter has detected that the voltage on the contacts of the STO (Safety Torque Off) module is not the same for both A and B contacts.
Solutions:	Check the control wiring of the STO contacts. Check the inverter's power supply line.

Code	F1209
Name:	The power supply voltage of the STO contacts is too high
Cause:	The inverter has detected that the voltage on the contacts of the STO (Safety Torque Off) module is higher than 24 V
Solutions:	Check the control wiring of the STO contacts. Check the inverter's power supply line.

Code	F1300
Name:	Fault on earth
Cause:	The inverter has detected a fault on earth on the compressor power supply line.
Solutions:	Check the compressor's electrical connection.

Code	F207X
Name:	Internal inverter error
Cause:	There is an internal error on the inverter.
Solutions:	Contact the manufacturer.

Code	F0BXX
Name:	Communication board error
Cause:	The inverter has detected a problem pertaining to serial communication
Solutions:	Check the serial connection. Contact the manufacturer.

10 SUPERVISION THROUGH SERIAL PROTOCOLS

10.1 SUPERVISION THROUGH MODBUS PROTOCOL

10.1.1 SUPERVISION THROUGH MODBUS RTU SLAVE PROTOCOL

The SURVEY³ microprocessors can be inserted in a supervision and/or BMS (Building Management System) network, which adopts the Modbus® RTU standard through the dedicated RS485 serial board. The serial communication protocol has the following characteristics:

Modbus RTU Slave	
Protocol	Modbus® Slave, RTU mode
Communication Std.	RS485 not isolated with respect to network
Baud Rate (default)	Variable between 1200, 2400, 4800, 9600, 19200, 28800, 38400 and 57600 (19200)
Word Length	8
Parity (default)	Variable between None, Odd and Even (Even)
Stop Bits (default)	Variable between 1 and 2 (1)
Function code	03 (03 hex) - Read analog output holding registers
	06 (06 hex) - Write single analog output holding registers
	16 (10 hex) - Write multiple analog output holding registers

10.1.2 SUPERVISION THROUGH MODBUS TCP SLAVE PROTOCOL

The SURVEY³ microprocessors can be inserted in a supervision and/or BMS (Building Management System) network, which adopts the Modbus® TCP standard through the dedicated Ethernet RJ45 serial board. The serial communication protocol has the following characteristics:

Modbus TCP Slave	
Protocol	Modbus® Slave, TCP mode
Communication standard	RJ45 Ethernet
IP Address (default)	192.168.1.24
Subnet Mask (default)	255.255.255.0
Predefined gateway (default)	192.168.1.1
Port (default)	502
Function code	03 (03 hex) - Read analog output holding registers
	06 (06 hex) - Write single analog output holding registers
	16 (10 hex) - Write multiple analog output holding registers

10.2 SUPERVISION THROUGH BACnet PROTOCOL

10.2.1 SUPERVISION THROUGH BACnet MS/TP SLAVE PROTOCOL (ACCESSORY)

The SURVEY³ microprocessors can be inserted in a supervision and/or BMS (Building Management System) network, which adopts the BACnet MS/TP standard through the dedicated RS485 serial board. The serial communication protocol has the following characteristics:

BACnet MS/TP	
Protocol	BACnet™ MS/TP
Communication standard	RS485 not isolated with respect to network
Baud Rate (default)	Variable between 9600, 19200, 38400 and 57600 (57600)

10.2.2 SUPERVISION THROUGH BACnet IP SLAVE PROTOCOL (ACCESSORY)

The SURVEY³ microprocessors can be inserted in a supervision and/or BMS (Building Management System) network, which adopts the BACnet IP standard through the dedicated Ethernet RJ45 serial board.

The serial communication protocol has the following characteristics:

BACnet IP	
Protocol	BACnet™ IP
Communication standard	RJ45 Ethernet
IP Address (default)	192.168.1.24
Subnet Mask (default)	255.255.255.0
Predefined gateway (default)	192.168.1.1
Port (default)	47808

10.3 CLOSE CONTROL SURVEY³ MICROPROCESSOR SUPERVISOR VARIABLES (SOFTWARE VERSION 3.0)

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Digital input status											
64	101	16 bit unsigned	1	Binary Input	DamperStatusDI	Motorised damper status	-	0	1	0	R
65	102	16 bit unsigned	2	Binary Input	DirtyFilterDI	Dirty filter alarm	-	0	1	0	R
66	103	16 bit unsigned	3	Binary Input	RemoteOffDI	Remote OFF	-	0	1	0	R
67	104	16 bit unsigned	4	Binary Input	ElecHeaterAlarmDI	General Electric Coil Alarm	-	0	1	0	R
68	105	16 bit unsigned	5	Binary Input	CondPumpAlarmDI	Condensate discharge pump alarm	-	0	1	0	R
781	1922	16 bit unsigned	1	Analog Value	ConfDI1Combo	Description of configurable input 1 *	-	0	26	0	R
69	106	16 bit unsigned	6	Binary Input	ConfigurableDI1	Configurable input 1	-	0	1	0	R
782	1923	16 bit unsigned	2	Analog Value	ConfDI2Combo	Description of configurable input 2 *	-	0	26	0	R
6A	107	16 bit unsigned	7	Binary Input	ConfigurableDI2	Configurable input 2	-	0	1	0	R
783	1924	16 bit unsigned	3	Analog Value	ConfDI3Combo	Description of configurable input 3 *	-	0	26	0	R
6B	108	16 bit unsigned	8	Binary Input	ConfigurableDI3	Configurable input 3	-	0	1	0	R
784	1925	16 bit unsigned	4	Analog Value	ConfDI4Combo	Description of configurable input 4 *	-	0	26	0	R
6C	109	16 bit unsigned	9	Binary Input	ConfigurableDI4	Configurable input 4	-	0	1	0	R
785	1926	16 bit unsigned	5	Analog Value	ConfDI5Combo	Description of configurable input 5 *	-	0	26	0	R
6D	110	16 bit unsigned	10	Binary Input	ConfigurableDI5	Configurable input 5	-	0	1	0	R
71	114	16 bit unsigned	11	Binary Input	Comp1ThermAlarmDI	Compressor 1 breaker alarm	-	0	1	0	R
72	115	16 bit unsigned	12	Binary Input	Comp1HPAlarmDI	Compressor 1 high pressure alarm	-	0	1	0	R
73	116	16 bit unsigned	13	Binary Input	Comp1LPAlarmDI	Compressor 1 low pressure alarm	-	0	1	0	R
74	117	16 bit unsigned	14	Binary Input	Comp2ThermAlarmDI	Compressor 2 breaker alarm	-	0	1	0	R
75	118	16 bit unsigned	15	Binary Input	Comp2HPAlarmDI	Compressor 2 high pressure alarm	-	0	1	0	R
76	119	16 bit unsigned	16	Binary Input	Comp2LowPresAlarmDI	Compressor 2 low pressure alarm	-	0	1	0	R

* 0 = No; 1 = Smoke/fire alarm; 2 = Water pump alarm; 3 = External humidifier alarm; 4 = General fan alarm; 5 = Condenser 1 alarm; 6= Condenser 1 alarm; 7 = Dry cooler alarm; 8 = Non-critical generic alarm; 9 = Critical generic alarm; 10 = Condensing unit alarm; 11 = Refrigerant leak alarm; 12 = Power supply failure alarm; 13 = Stop cold; 14 = Stop compressor 1; 15 = Stop compressor 2; 16 = Stop heating; 17 = Stop humidification; 18 = Stop dehumidification; 19 = Stop cooling and humidification; 20 = Stop cooling, humidification and heating; 21 = Stop free cooling; 22 = Force free cooling; 23 = Force secondary source TS; 24 =Utracapacitor; 25 = Condenser 1 flow alarm; 26 = Condenser 1 flow alarm;

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name						
Base 0	Base 1							Min	Max		
HEX	DEC										
Digital output status											
96	151	16 bit unsigned	1	Binary Output	FansDO	Fan control	-	0	1	0	R
97	152	16 bit unsigned	2	Binary Output	DamperDO	Damper control	-	0	1	0	R
78B	1932	16 bit unsigned	6	Analog Value	ConfDO1Combo	Description of configurable digital output 1	-	0	19	0	R
98	153	16 bit unsigned	3	Binary Output	ConfigurableDO1	Configurable digital output 1	-	0	1	0	R
78C	1933	16 bit unsigned	7	Analog Value	ConfDO2Combo	Description of configurable digital output 2	-	0	19	0	R
99	154	16 bit unsigned	4	Binary Output	ConfigurableDO2	Configurable digital output 2	-	0	1	0	R
78D	1934	16 bit unsigned	8	Analog Value	ConfDO3Combo	Description of configurable digital output 3	-	0	19	0	R
9A	155	16 bit unsigned	5	Binary Output	ConfigurableDO3	Configurable digital output 3	-	0	1	0	R
78E	1935	16 bit unsigned	9	Analog Value	ConfDO4Combo	Description of configurable digital output 4	-	0	19	0	R
9B	156	16 bit unsigned	6	Binary Output	ConfigurableDO4	Configurable digital output 4	-	0	1	0	R
78F	1936	16 bit unsigned	10	Analog Value	ConfDO5Combo	Description of configurable digital output 5	-	0	19	0	R
9C	157	16 bit unsigned	7	Binary Output	ConfigurableDO5	Configurable digital output 5	-	0	1	0	R
9D	158	16 bit unsigned	8	Binary Output	ElecHeaterStage1DO	Electric heating coil stage 1	-	0	1	0	R
9E	159	16 bit unsigned	9	Binary Output	ElecHeaterStage2DO	Electric heating coil stage 2	-	0	1	0	R
A1	162	16 bit unsigned	10	Binary Output	Compressor1DO	Compressor 1 control	-	0	1	0	R
A2	163	16 bit unsigned	11	Binary Output	Compressor2DO	Compressor 2 control	-	0	1	0	R
* 0 = No; 1 = Water pump; 2 = Conensing unit; 3 = Unit status; 4 = Cooling status; 5 = Heating status; 6 = Humidification status; 7 = Dehumidification status; 8 = Free Cooling status; 9 = General alarm; 10 = Non-critical alarm; 11 = Critical alarm; 12 = Filter alarm; 13 = Cooling alarm; 14 = Heating alarm; 15 = Ventilation alarm; 16 = Temperature alarm; 17 = Humidity alarm; 18 = Water presence alarm; 19 = Power supply failure alarm;											
Temperature											
C7	200	16 bit signed	1	Analog Input	ReturnTemperature	Return temperature	°C	-3276.8	3276.7	1	R
C8	201	16 bit signed	2	Analog Input	ReturnTempAvg	Return temperature (local network average)	°C	-3276.8	3276.7	1	R
C9	202	16 bit signed	3	Analog Input	SupplyTemperature	Supply temperature	°C	-3276.8	3276.7	1	R
CA	203	16 bit signed	4	Analog Input	SupplyTempAvg	Supply temperature (local network average)	°C	-3276.8	3276.7	1	R
CB	204	16 bit signed	5	Analog Input	TemperatureDelta	Temperature Delta	°C	-3276.8	3276.7	1	R
Humidity											
D1	210	16 bit unsigned	6	Analog Input	ReturnHumidity	Return humidity	%Rh	-32768	32767	0	R
D2	211	16 bit unsigned	7	Analog Input	ReturnHumidityAvg	Return humidity (local network average)	%Rh	-32768	32767	0	R
D3	212	16 bit unsigned	8	Analog Input	SupplyHumidity	Supply humidity	%Rh	-32768	32767	0	R
D4	213	16 bit unsigned	9	Analog Input	SupplyHumidityAvg	Supply humidity (local network average)	%Rh	-32768	32767	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Ventilation											
DB	220	32 bit unsigned (Low)	11	Analog Value	AirFlow	Air flow rate	m^3/h	0	4294967295	0	R
DC	221	32 bit unsigned (High)									
DD	222	16 bit unsigned	10	Analog Input	AirPressure	Air pressure	Pa	-32768	32767	0	R
DE	223	16 bit unsigned	11	Analog Input	AirPressureAvg	Air pressure (local network average)	Pa	-32768	32767	0	R
Remote probes module 1											
E5	230	16 bit unsigned	1	Multistate Value	netMod1Combo1	Probe 1 module 1 status *	-	0	4	0	R
E6	231	16 bit signed	12	Analog Input	netMod1Probe1	Probe 1 module 1 value	-	-3276.8	3276.7	1	R
E7	232	16 bit unsigned	2	Multistate Value	netMod1Combo2	Probe 2 module 1 status *	-	0	4	0	R
E8	233	16 bit signed	13	Analog Input	netMod1Probe2	Probe 2 module 1 value	-	-3276.8	3276.7	1	R
E9	234	16 bit unsigned	3	Multistate Value	netMod1Combo3	Probe 3 module 1 status *	-	0	4	0	R
EA	235	16 bit signed	14	Analog Input	netMod1Probe3	Probe 3 module 1 value	-	-3276.8	3276.7	1	R
EB	236	16 bit unsigned	4	Multistate Value	netMod1Combo4	Probe 4 module 1 status *	-	0	4	0	R
EC	237	16 bit signed	15	Analog Input	netMod1Probe4	Probe 4 module 1 value	-	-3276.8	3276.7	1	R
ED	238	16 bit unsigned	5	Multistate Value	netMod1Combo5	Probe 5 module 1 status *	-	0	4	0	R
EE	239	16 bit signed	16	Analog Input	netMod1Probe5	Probe 5 module 1 value	-	-3276.8	3276.7	1	R
EF	240	16 bit unsigned	6	Multistate Value	netMod1Combo6	Probe 6 module 1 status *	-	0	4	0	R
F0	241	16 bit signed	17	Analog Input	netMod1Probe6	Probe 6 module 1 value	-	-3276.8	3276.7	1	R
* 0 = Disabled; 1 = Temperature; 2 = Humidity; 3 = Pressure; 4 = Alarm											

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0	Base 1										
HEX	DEC										
Remote probes module 2											
F9	250	16 bit unsigned	7	Multistate Value	netMod2Combo1	Probe 1 module 2 status *	-	0	4	0	R
FA	251	16 bit signed	18	Analog Input	netMod2Probe1	Probe 1 module 2 value	-	-3276.8	3276.7	1	R
FB	252	16 bit unsigned	8	Multistate Value	netMod2Combo2	Probe 2 module 2 status *	-	0	4	0	R
FC	253	16 bit signed	19	Analog Input	netMod2Probe2	Probe 2 module 2 value	-	-3276.8	3276.7	1	R
FD	254	16 bit unsigned	9	Multistate Value	netMod2Combo3	Probe 3 module 2 status *	-	0	4	0	R
FE	255	16 bit signed	20	Analog Input	netMod2Probe3	Probe 3 module 2 value	-	-3276.8	3276.7	1	R
FF	256	16 bit unsigned	10	Multistate Value	netMod2Combo4	Probe 4 module 2 status *	-	0	4	0	R
100	257	16 bit signed	21	Analog Input	netMod2Probe4	Probe 4 module 2 value	-	-3276.8	3276.7	1	R
101	258	16 bit unsigned	11	Multistate Value	netMod2Combo5	Probe 5 module 2 status *	-	0	4	0	R
102	259	16 bit signed	22	Analog Input	netMod2Probe5	Probe 5 module 2 value	-	-3276.8	3276.7	1	R
103	260	16 bit unsigned	12	Multistate Value	netMod2Combo6	Probe 6 module 2 status *	-	0	4	0	R
104	261	16 bit signed	23	Analog Input	netMod2Probe6	Probe 6 module 2 value	-	-3276.8	3276.7	1	R
* 0 = Disabled; 1 = Temperature; 2 = Humidity; 3 = Pressure; 4 = Alarm											
Remote probes module 3											
10D	270	16 bit unsigned	13	Multistate Value	netMod3Combo1	Probe 1 module 3 status *	-	0	4	0	R
10E	271	16 bit signed	24	Analog Input	netMod3Probe1	Probe 1 module 3 value	-	-3276.8	3276.7	1	R
10F	272	16 bit unsigned	14	Multistate Value	netMod3Combo2	Probe 2 module 3 status *	-	0	4	0	R
110	273	16 bit signed	25	Analog Input	netMod3Probe2	Probe 2 module 3 value	-	-3276.8	3276.7	1	R
111	274	16 bit unsigned	15	Multistate Value	netMod3Combo3	Probe 3 module 3 status *	-	0	4	0	R
112	275	16 bit signed	26	Analog Input	netMod3Probe3	Probe 3 module 3 value	-	-3276.8	3276.7	1	R
113	276	16 bit unsigned	16	Multistate Value	netMod3Combo4	Probe 4 module 3 status *	-	0	4	0	R
114	277	16 bit signed	27	Analog Input	netMod3Probe4	Probe 4 module 3 value	-	-3276.8	3276.7	1	R
115	278	16 bit unsigned	17	Multistate Value	netMod3Combo5	Probe 5 module 3 status *	-	0	4	0	R
116	279	16 bit signed	28	Analog Input	netMod3Probe5	Probe 5 module 3 value	-	-3276.8	3276.7	1	R
117	280	16 bit unsigned	18	Multistate Value	netMod3Combo6	Probe 6 module 3 status *	-	0	4	0	R
118	281	16 bit signed	29	Analog Input	netMod3Probe6	Probe 6 module 3 value	-	-3276.8	3276.7	1	R
* 0 = Disabled; 1 = Temperature; 2 = Humidity; 3 = Pressure; 4 = Alarm											
Average probe module values											
121	290	16 bit signed	30	Analog Input	AvgModTemp	Remote module temperature probe average	°C	-3276.8	3276.7	1	R
122	291	16 bit unsigned	31	Analog Input	AvgModHumi	Remote module humidity probe average	%Rh	-32768	32767	0	R
123	292	16 bit unsigned	32	Analog Input	AvgModPress	Remote module pressure probe average	Pa	-32768	32767	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Analogue outputs											
12B	300	16 bit signed	1	Analog Output	UnitFansDryCoolerAO	Supply Fan / Dry cooler modulation	%	0.00	100.00	2	R
12C	301	16 bit signed	2	Analog Output	CoolingAO	Cold valve / Free cooling / Condensing unit	%	0.00	100.00	2	R
12D	302	16 bit signed	3	Analog Output	HeatingAO	Heating valve / Modulating electric coil	%	0.00	100.00	2	R
12E	303	16 bit signed	4	Analog Output	TwoSources2AO	Two sources water valve 2	%	0.00	100.00	2	R
12F	304	16 bit signed	5	Analog Output	Condenser1AO	Condenser 1	%	0.00	100.00	2	R
130	305	16 bit signed	6	Analog Output	Condenser2HumidifAO	Condenser 2 / External humidifier	%	0.00	100.00	2	R
Unit Status											
135	310	16 bit unsigned	19	Multistate Value	UnitStatus	Unit status*	-	0	6	0	R
* 0 = Unit OFF; 1 = Remote OFF; 2 = OFF from supervisor; 3 = OFF from alarm; 4 = Stand-by; 5 = Unit ON; 6 = Ultracapacitor											
Ventilation status											
13E	319	16 bit signed	12	Analog Value	FanSpeed	Fan speed	%	0.00	100.00	2	R
Fan 1 status											
13F	320	16 bit signed	12	Analog Value	fan1Actspeed	Fan 1 speed	%	0.00	100.00	2	R
140	321	16 bit unsigned	14	Analog Value	fan1ActRPM	Fan 1 speed	RPM	0	65535	0	R
141	322	16 bit signed	15	Analog Value	fan1Cur	Fan 1 absorbed current	A	0.0	6553.5	1	R
142	323	16 bit unsigned	16	Analog Value	fan1Power	Fan 1 absorbed electrical power	W	0	65535	0	R
Fan 2 status											
143	324	16 bit signed	17	Analog Value	fan2Actspeed	Fan 2 speed	%	0.00	100.00	2	R
144	325	16 bit unsigned	18	Analog Value	fan2ActRPM	Fan 2 speed	RPM	0	65535	0	R
145	326	16 bit signed	19	Analog Value	fan2Cur	Fan 2 absorbed current	A	0.0	6553.5	1	R
146	327	16 bit unsigned	20	Analog Value	fan2Power	Fan 2 absorbed electrical power	W	0	65535	0	R
Fan 3 status											
147	328	16 bit signed	21	Analog Value	fan3Actspeed	Fan 3 speed	%	0.00	100.00	2	R
148	329	16 bit unsigned	22	Analog Value	fan3ActRPM	Fan 3 speed	RPM	0	65535	0	R
149	330	16 bit signed	13	Analog Value	fan3Cur	Fan 3 absorbed current	A	0.0	6553.5	1	R
14A	331	16 bit unsigned	24	Analog Value	fan3Power	Fan 3 absorbed electrical power	W	0	65535	0	R
Fan 4 status											
14B	332	16 bit signed	25	Analog Value	fan4Actspeed	Fan 4 speed	%	0.00	100.00	2	R
14C	333	16 bit unsigned	26	Analog Value	fan4ActRPM	Fan 4 speed	RPM	0	65535	0	R
14D	334	16 bit signed	27	Analog Value	fan4Cur	Fan 4 absorbed current	A	0.0	6553.5	1	R
14E	335	16 bit unsigned	28	Analog Value	fan4Power	Fan 4 absorbed electrical power	W	0	65535	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Fan 5 status											
14F	336	16 bit signed	29	Analog Value	fan5Actspeed	Fan 5 speed	%	0.00	100.00	2	R
150	337	16 bit unsigned	30	Analog Value	fan5ActRPM	Fan 5 speed	RPM	0	65535	0	R
151	338	16 bit signed	31	Analog Value	fan5Cur	Fan 5 absorbed current	A	0.0	6553.5	1	R
152	339	16 bit unsigned	32	Analog Value	fan5Power	Fan 5 absorbed electrical power	W	0	65535	0	R
Fan 6 status											
153	340	16 bit signed	33	Analog Value	fan6Actspeed	Fan 6 speed	%	0.00	100.00	2	R
154	341	16 bit unsigned	34	Analog Value	fan6ActRPM	Fan 6 speed	RPM	0	65535	0	R
155	342	16 bit signed	35	Analog Value	fan6Cur	Fan 6 absorbed current	A	0.0	6553.5	1	R
156	343	16 bit unsigned	36	Analog Value	fan6Power	Fan 6 absorbed electrical power	W	0	65535	0	R
Fan 7 status											
157	344	16 bit signed	37	Analog Value	fan7Actspeed	Fan 7 speed	%	0.00	100.00	2	R
158	345	16 bit unsigned	38	Analog Value	fan7ActRPM	Fan 7 speed	RPM	0	65535	0	R
159	346	16 bit signed	39	Analog Value	fan7Cur	Fan 7 absorbed current	A	0.0	6553.5	1	R
15A	347	16 bit unsigned	40	Analog Value	fan7Power	Fan 7 absorbed electrical power	W	0	65535	0	R
Fan 8 status											
15B	348	16 bit signed	41	Analog Value	fan8Actspeed	Fan 8 speed	%	0.00	100.00	2	R
15C	349	16 bit unsigned	42	Analog Value	fan8ActRPM	Fan 8 speed	RPM	0	65535	0	R
15D	350	16 bit signed	43	Analog Value	fan8Cur	Fan 8 absorbed current	A	0.0	6553.5	1	R
15E	351	16 bit unsigned	44	Analog Value	fan8Power	Fan 8 absorbed electrical power	W	0	65535	0	R
Fan 9 status											
15F	352	16 bit signed	45	Analog Value	fan9Actspeed	Fan 9 speed	%	0.00	100.00	2	R
160	353	16 bit unsigned	46	Analog Value	fan9ActRPM	Fan 9 speed	RPM	0	65535	0	R
161	354	16 bit signed	47	Analog Value	fan9Cur	Fan 9 absorbed current	A	0.0	6553.5	1	R
162	355	16 bit unsigned	48	Analog Value	fan9Power	Fan 9 absorbed electrical power	W	0	65535	0	R
Fan 10 status											
163	356	16 bit signed	49	Analog Value	fan10Actspeed	Fan 10 speed	%	0.00	100.00	2	R
164	357	16 bit unsigned	50	Analog Value	fan10ActRPM	Fan 10 speed	RPM	0	65535	0	R
165	358	16 bit signed	51	Analog Value	fan10Cur	Fan 10 absorbed current	A	0.0	6553.5	1	R
166	359	16 bit unsigned	52	Analog Value	fan10Power	Fan 10 absorbed electrical power	W	0	65535	0	R
Dirty filter status (Modbus)											
169	362	16 bit unsigned	33	Analog Input	DiffFilterPressure	Dirty filter differential pressure	Pa	-32768	32767	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Regulation status											
16B	364	16 bit signed	53	Analog Value	CoolingRequest	Current cooling request	%	0.00	100.00	2	R
16C	365	16 bit signed	54	Analog Value	HeatingRequest	Current heating request	%	0.00	100.00	2	R
16D	366	16 bit signed	55	Analog Value	DehumidRequest	Current dehumidification request	%	0.00	100.00	2	R
16E	367	16 bit signed	56	Analog Value	HumidifRequest	Current humidification request	%	0.00	100.00	2	R
Free cooling & Two sources											
171	370	16 bit signed	34	Analog Input	TempFcTs	Free cooling/Two Sources temperature	°C	-3276.8	3276.7	1	R
172	371	16 bit unsigned	20	Multistate Value	FCTSStatus	Free cooling/Two Sources status *	-	0	3	0	R
173	372	16 bit signed	57	Analog Value	FCRequest	Current Free Cooling request	%	0.00	100.00	2	R
* 0 = Not active; 1 = Free Cooling active; 2 = TS Circuit 1 active; 3 = TS circuit 2 active											
Compressor status											
177	376	16 bit unsigned	58	Analog Value	ActiveComp	Compressors active	-	0	65535	0	R
178	377	16 bit unsigned	21	Multistate Value	Comp1Sts	Compressor 1 status *	-	0	65535	0	R
179	378	16 bit unsigned	22	Multistate Value	Comp2Sts	Compressor 2 status *	-	0	65535	0	R
17A	379	16 bit signed	59	Analog Value	InvComprReq	Inverter compressor request	%	0.00	100.00	2	R
0 = Disabled; 1 = OFF; 2 = Stand-by ON; 3 = ON; 4 = Stand-by OFF; 5 = Alarm;											
DC compressor inverter status											
17B	380	32 bit signed (Low)	60	Analog Value	InverterCompHz	Current compressor speed	Hz	-21474836.48	21474836.47	2	R
17C	381	32 bit signed (High)									
17D	382	32 bit signed (Low)	61	Analog Value	InverterCompPower	Current compressor electrical power	kW	-21474836.48	21474836.47	2	R
17E	383	32 bit signed (High)									
17F	384	32 bit signed (Low)	62	Analog Value	InverterCompCurrent	Current compressor input current	A	-21474836.48	21474836.47	2	R
180	385	32 bit signed (High)									

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name						
Base 0	Base 1							Min	Max		
HEX	DEC										
Cooling circuit 1 status											
185	390	16 bit signed	35	Analog Input	Comp1EvapPres	Compressor 1 evaporation pressure	BarG	-327.68	327.67	2	R
186	391	16 bit signed	36	Analog Input	Comp1EvapTemp	Compressor 1 evaporation temperature	°C	-3276.8	3276.7	1	R
187	392	16 bit signed	37	Analog Input	Comp1SuctionTemp	Compressor 1 suction temperature	°C	-3276.8	3276.7	1	R
188	393	16 bit signed	63	Analog Value	Comp1Superheat	Compressor 1 superheating	K	-3276.8	3276.7	1	R
189	394	16 bit signed	64	Analog Value	Comp1CompRatio	Compressor 1 compression ratio	-	-3276.8	3276.7	1	R
18A	395	16 bit signed	38	Analog Input	Comp1DischTemp	Compressor 1 discharge temperature	°C	-3276.8	3276.7	1	R
18B	396	16 bit signed	39	Analog Input	Comp1CondPress	Compressor 1 condensation pressure	BarG	-3276.8	3276.7	1	R
18C	397	16 bit signed	40	Analog Input	Compr1CondTemp	Compressor 1 condensation temperature	°C	-3276.8	3276.7	1	R
18D	398	16 bit signed	65	Analog Value	Comp1Desuperheat	Current compressor 1 de-superheating	K	-3276.8	3276.7	1	R
18E	399	16 bit signed	41	Analog Input	Comp1LiquidTemp	Compressor 1 liquid temperature	°C	-3276.8	3276.7	1	R
18F	400	16 bit signed	66	Analog Value	Comp1Subcooling	Compressor 1 subcooling	K	-3276.8	3276.7	1	R
Electronic expansion valve 1 status											
190	401	16 bit signed	67	Analog Value	EEV1SuperheatSet	EEV1 superheating set-point	K	-3276.8	3276.7	1	R
191	402	16 bit signed	68	Analog Value	EEV1Position	EEV1 Position	%	0.00	100.00	2	R
192	403	16 bit unsigned	23	Multistate Value	EEV1Status	EEV1 regulation status *	-	0	4	0	R
* 0 = Regulation; 1 = LoSH; 2 = HiSH; 3 = LOP; 4 = MOP;											
Condenser 1 status											
195	406	16 bit signed	69	Analog Value	Cond1ActualSet	Current condenser 1 set-point	°C	-3276.8	3276.7	1	R
196	407	16 bit signed	70	Analog Value	Cond1Req	Condenser 1 request	%	0.00	100.00	2	R
Cooling circuit 2 status											
199	410	16 bit signed	42	Analog Input	Comp2EvapPres	Compressor 2 evaporation pressure	BarG	-327.68	327.67	2	R
19A	411	16 bit signed	43	Analog Input	Comp2EvapTemp	Compressor 2 evaporation temperature	°C	-3276.8	3276.7	1	R
19B	412	16 bit signed	44	Analog Input	Comp2SuctionTemp	Compressor 2 suction temperature	°C	-3276.8	3276.7	1	R
19C	413	16 bit signed	71	Analog Value	EEV2Superheat	Compressor 2 superheating	K	-3276.8	3276.7	1	R
19D	414	16 bit signed	72	Analog Value	CompRatio2	Compressor 2 compression ratio	-	-3276.8	3276.7	1	R
19E	415	16 bit signed	45	Analog Input	Comp2DischTemp	Compressor 2 discharge temperature	°C	-3276.8	3276.7	1	R
19F	416	16 bit signed	46	Analog Input	Compr2CondPress	Compressor 2 condensation pressure	BarG	-3276.8	3276.7	1	R
1A0	417	16 bit signed	47	Analog Input	Comp2CondTemp	Compressor 2 condensation temperature	°C	-3276.8	3276.7	1	R
1A1	418	16 bit signed	73	Analog Value	EEV2Desuperheat	Compressor 2 de-superheating	K	-3276.8	3276.7	1	R
1A2	419	16 bit signed	48	Analog Input	Compr2LiquidTemp	Compressor 2 liquid temperature	°C	-3276.8	3276.7	1	R
1A3	420	16 bit signed	74	Analog Value	EEV2Subcooling	Compressor 2 subcooling	K	-3276.8	3276.7	1	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0	Base 1										
HEX	DEC										
Electronic expansion valve 2 status											
1A4	421	16 bit signed	75	Analog Value	EEV2SuperheatSet	EEV2 superheating set-point	K	-3276.8	3276.7	1	R
1A5	422	16 bit signed	76	Analog Value	EEV2Position	EEV2 Position	%	0.00	100.00	2	R
1A6	423	16 bit unsigned	24	Multistate Value	EEV2Status	EEV2 regulation status *	-	0	4	0	R
* 0 = Regulation; 1 = LoSH; 2 = HiSH; 3 = LOP; 4 = MOP;											
Condenser 2 status											
1A9	426	16 bit signed	77	Analog Value	Cond2ActualSet	Current condenser 2 set-point	°C	-3276.8	3276.7	1	R
1AA	427	16 bit signed	78	Analog Value	Cond2Req	Condenser 2 request	%	0.00	100.00	2	R
Water circuit 1 status											
1AD	430	16 bit signed	49	Analog Input	WaterINTemp1	Water inlet temperature 1	°C	-3276.8	3276.7	1	R
1AE	431	16 bit signed	50	Analog Input	WaterOUTTemp1	Water outlet temperature 1	°C	-3276.8	3276.7	1	R
1AF	432	16 bit signed	51	Analog Input	WaterDT1	Water temperature Delta 1	°C	-3276.8	3276.7	1	R
1B0	433	32 bit unsigned (Low)	52	Analog Input	WaterFlow1	Water flow rate 1	l/h	0	4294967295	0	R
1B1	434	32 bit unsigned (High)									
1B2	435	32 bit unsigned (Low)	79	Analog Value	ActWaterFlowSet1	Current water flow rate 1 set-point	l/h	0	4294967295	0	R
1B3	436	32 bit unsigned (High)									
1B4	437	32 bit signed (Low)	80	Analog Value	WaterCoolCap1	Chilled water 1 cooling capacity	kW	0.00	42949672.95	2	R
1B5	438	32 bit signed (High)									
1B6	439	16 bit signed	81	Analog Value	EER1	EER 1	-	0.00	655.35	2	R
1B7	440	16 bit signed	82	Analog Value	Valve1Position	Water 1 Valve position	%	0.00	100.00	2	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name						
Base 0	Base 1							Min	Max		
HEX	DEC										
Water circuit 2 status											
1C1	450	16 bit signed	53	Analog Input	WaterINTemp2	Water inlet temperature 2	°C	-3276.8	3276.7	1	R
1C2	451	16 bit signed	54	Analog Input	WaterOUTTemp2	Water outlet temperature 2	°C	-3276.8	3276.7	1	R
1C3	452	16 bit signed	55	Analog Input	WaterDT2	Water temperature Delta 2	°C	-3276.8	3276.7	1	R
1C4	453	32 bit unsigned (Low)	56	Analog Input	WaterFlow2	Water flow rate 2	l/h	0	4294967295	0	R
1C5	454	32 bit unsigned (High)									
1C6	455	32 bit unsigned (Low)	83	Analog Value	ActWaterFlowSet2	Current water flow rate 1 set-point	l/h	0	4294967295	0	R
1C7	456	32 bit unsigned (High)									
1C8	457	32 bit signed (Low)	84	Analog Value	WaterCoolCap2	Chilled water 2 cooling capacity	kW	0.00	42949672.95	2	R
1C9	458	32 bit signed (High)									
1CA	459	16 bit signed	85	Analog Value	EER1	EER 2	-	0.00	655.35	2	R
1CB	460	16 bit signed	86	Analog Value	Valve2Position	Water 2 Valve position	%	0.00	100.00	2	R
Internal humidifier status											
1D5	470	16 bit signed	87	Analog Value	HumidifSteamProd	Current humidifier production	kg/h	0.0	6553.5	1	R
1D6	471	16 bit unsigned	88	Analog Value	HumidifWaterConduct	Supply water conductivity	µS/cm	0	65535	0	R
1D7	472	16 bit signed	89	Analog Value	HumidifierCurrent	Absorbed humidifier current	A	0.0	6553.5	1	R
1D8	473	16 bit unsigned	25	Multistate Value	HumidifWorkingMode	Humidifier operating mode *	-	0	7	0	R
1D9	474	16 bit unsigned	26	Multistate Value	HumidifWorkStatus	Humidifier operating mode status **	-	0	11	0	R
1DA	475	16 bit unsigned	12	Binary Output	HumidifierPowerDO	Humidifier control	-	0	1	0	R
1DB	476	16 bit unsigned	13	Binary Output	HumidifDrainValveDO	Discharge valve	-	0	1	0	R
1DC	477	16 bit unsigned	14	Binary Output	HumidifFillValveDO	Charging valve	-	0	1	0	R
1DD	478	16 bit unsigned	17	Binary Input	HumidifWaterLevel	High water level	-	0	1	0	R

* 0 = Not active; 1 = Soft-start; 2 = Start full production after reduced production; 3 = Full production; 4 = Reduced production; 5, 6, 7 = Soft-start

** 0 = Not active (no demand or blocked or disabled); 1 = Start evaporation cycle; 2 = Water charging in progress; 3 = Evaporation in progress; 4 = DCW discharge; 5 = Water discharge (through dilution or manual); 6 = End of water discharge; 7 = Full discharge for long period of downtime; 8 = Full discharge from manual or network request; 9 = No water control; 10 = Pre-wash; 11 = Periodic discharge

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Heating component status											
1E9	490	16 bit signed	90	Analog Value	HeaterReq	Eelectric coil request	%	0.00	100.00	2	R
1EA	491	16 bit unsigned	91	Analog Value	HeaterActiveStages	Number of active stages	-	0	255	0	R
1EB	492	16 bit signed	92	Analog Value	ElecHeaterPower	Electrical power requirement	kW	0.0	6553.5	1	R
1EC	493	16 bit signed	93	Analog Value	HeatValveReq	Water heating valve request	%	0.00	100.00	2	R
Dry cooler status											
1EF	496	16 bit signed	94	Analog Value	DryCoolerActualSet	Current dry cooler set-point	°C	-3276.8	3276.7	1	R
1F0	497	16 bit signed	95	Analog Value	DryCoolerReq	Dry cooler request	%	0.00	100.00	2	R
Working hours											
1F3	500	32 bit unsigned (Low)	96	Analog Value	UnitWorkingHours	Unit	h	0	100000	0	R
1F4	501	32 bit unsigned (High)									
1F5	502	32 bit unsigned (Low)	97	Analog Value	Comp1WorkingHours	Compressor 1	h	0	100000	0	R
1F6	503	32 bit unsigned (High)									
1F7	504	32 bit unsigned (Low)	98	Analog Value	Comp1Startup	Compressor 1 startup	h	0	100000	0	R
1F8	505	32 bit unsigned (High)									
1F9	506	32 bit unsigned (Low)	99	Analog Value	Compr2WorkingHours	Compressor 2	h	0	100000	0	R
1FA	507	32 bit unsigned (High)									
1FB	508	32 bit unsigned (Low)	100	Analog Value	Comp2Startup	Compressor 2 startup	h	0	100000	0	R
1FC	509	32 bit unsigned (High)									
1FD	510	32 bit unsigned (Low)	101	Analog Value	CoolValveWorkHours	Cooling valve	h	0	100000	0	R
1FE	511	32 bit unsigned (High)									

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0	Base 1										
HEX	DEC										
1FF	512	32 bit unsigned (Low)	102	Analog Value	HeatingWorkingHours	Heating	h	0	100000	0	R
200	513	32 bit unsigned (High)									
201	514	32 bit unsigned (Low)	103	Analog Value	HumidifWorkingHours	Humidifier	h	0	100000	0	R
202	515	32 bit unsigned (High)									
203	516	32 bit unsigned (Low)	104	Analog Value	FreeCoolWorkHours	Free Cooling	h	0	100000	0	R
204	517	32 bit unsigned (High)									
205	518	32 bit unsigned (Low)	105	Analog Value	DryCoolerWorkHours	Dry cooler	h	0	100000	0	R
206	519	32 bit unsigned (High)									
207	520	32 bit unsigned (Low)	106	Analog Value	Cond1WorkingHours	Condenser 1	h	0	100000	0	R
208	521	32 bit unsigned (High)									
209	522	32 bit unsigned (Low)	107	Analog Value	Cond2WorkingHours	Condenser 2	h	0	100000	0	R
20A	523	32 bit unsigned (High)									

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
On/Off from supervision											
5FD	1534	16 bit unsigned	1	Binary Value	SupervOFF	On/Off from supervisor	-	0	1	0	R/W
Set-point											
600	1537	16 bit signed	108	Analog Value	TemperatureSetpoint	Temperature set-point	°C	-40.0	302.0	1	R/W
601	1538	16 bit unsigned	109	Analog Value	HumiditySetpoint	Humidity set-point	%Rh	0	100	0	R/W
Ventilation set-point											
602	1539	32 bit unsigned (Low)	110	Analog Value	AirFlowSetpoint	Air flow rate set-point	m^3/h	500	99000	0	R/W
603	1540	32 bit unsigned (High)									
604	1541	16 bit unsigned	111	Analog Value	AirPressureSetpoint	Air pressure set-point	Pa	-900	900	0	R/W
7A1	1954	16 bit signed	112	Analog Value	AirDTSetpoint	Air temperature delta set-point	°C	-40.0	302.0	1	R/W
Temperature Regulation											
606	1543	16 bit unsigned	27	Multistate Value	TempControlSel	Regulation sensor *	-	0	1	0	R/W
605	1542	16 bit unsigned	28	Multistate Value	TempControlType	Regulation type **	-	0	2	0	R/W
607	1544	16 bit signed	113	Analog Value	TProportionalBand	Proportional Band	°C	0.1	108.0	1	R/W
608	1545	16 bit unsigned	114	Analog Value	TIntagrativeTime	Integration Time	s	0	9999	0	R/W
609	1546	16 bit unsigned	115	Analog Value	TDerivativeTime	Derivative time	s	0	9999	0	R/W
60A	1547	16 bit signed	116	Analog Value	HighTempAlarmOffset	High temperature alarm offset	°C	0.0	36.0	1	R/W
60B	1548	16 bit signed	117	Analog Value	LowTempAlarmOffset	Low temperature alarm offset	°C	0.0	36.0	1	R/W
* 0 = Return; 1 = Supply											
** 0 = Proportional (P); 1 = Proportional + Integral (PI); 2 = Proportional + Integral + Derivative (PID)											
Limit temperature regulation											
613	1556	16 bit signed	118	Analog Value	HighLimitTempThr	Upper limit temperature limit	°C	-15.0	194.0	1	R/W
614	1557	16 bit unsigned	29	Multistate Value	HighLimitTempMng	High limit temperature management *	-	0	3	0	R/W
615	1558	16 bit signed	119	Analog Value	LowLimitTempThr	Lower limit temperature limit	°C	-15.0	194.0	1	R/W
616	1559	16 bit unsigned	30	Multistate Value	LowLimitTempMng	Low limit temperature management **	-	0	3	0	R/W
* 0 = Alarm only; 1 = Stop component; 2 = Reduction; 3 = Cold activation											
** 0 = Alarm only; 1 = Stop component; 2 = Reduction; 3 = Hot activation											

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0	Base 1										
HEX	DEC										
Humidity regulation											
60F	1552	16 bit unsigned	120	Analog Value	DehumidifPropBand	Dehumidification proportional band	%RH	1	50	0	R/W
60C	1549	16 bit unsigned	121	Analog Value	HumidifPropBand	Humidification proportional band	%RH	1	50	0	R/W
611	1554	16 bit unsigned	122	Analog Value	HighRetHumAlOffset	High return humidity alarm offset	%RH	0	100	0	R/W
612	1555	16 bit unsigned	123	Analog Value	LowRetHumAlOffset	Low return humidity alarm offset	%RH	0	100	0	R/W
729	1834	16 bit unsigned	124	Analog Value	HighSupHumThr	Upper supply humidity limit	%RH	0	100	0	R/W
72A	1835	16 bit unsigned	125	Analog Value	LowSupHumThr	Lower supply humidity limit	%RH	0	100	0	R/W
Humidifier regulation											
60E	1551	16 bit unsigned	2	Binary Value	EnableHumidifier	Humidification enabling	-	0	1	0	R/W
74F	1872	16 bit unsigned	3	Binary Value	HumidifManualDrain	Manual discharge	-	0	1	0	R/W
750	1873	16 bit unsigned	4	Binary Value	HumidifCylWashing	Cylinder pre-wash	-	0	1	0	R/W
Free cooling and two sources regulation											
618	1561	16 bit signed	126	Analog Value	FreeCoolingDelta	Free cooling delta	°C	1.0	54.0	1	R/W
619	1562	16 bit signed	127	Analog Value	TSWaterSetpoint	Two sources water set-point	°C	1.0	86.0	1	R/W
6D2	1747	16 bit signed	128	Analog Value	TSWaterPropBand	Two sources water band	°C	0.1	36.0	1	R/W
61A	1563	16 bit unsigned	5	Binary Value	TSManExchange	Two sources source exchange	-	0	1	0	R/W
795	1942	16 bit unsigned	6	Binary Value	TSTempExchEnab	Switch due to high ambient temperature	-	0	1	0	R/W
796	1943	16 bit signed	129	Analog Value	TSAirTempSet	Two sources high temperature set-point	°C	1.0	90.0	1	R/W
Condenser regulation											
645	1606	16 bit signed	130	Analog Value	CondSetpoint	Condensation set-point	°C	30.0	149.0	1	R/W
646	1607	16 bit signed	131	Analog Value	CondPropoBand	Condensation proportional band	°C	1.0	72.0	1	R/W
6D7	1752	16 bit signed	132	Analog Value	CondSetIncrease	Condensation set-point increase	°C	0.1	90.0	1	R/W
6D8	1753	16 bit signed	133	Analog Value	MaxCondSetpoint	Maximum condensation set-point	°C	0.1	149.0	1	R/W
Dry cooler regulation											
61B	1564	16 bit signed	134	Analog Value	DryCoolerSetpoint	Dry cooler set-point	°C	1.0	149.0	1	R/W
61C	1565	16 bit signed	135	Analog Value	DryCoolerPropBand	Dry Cooler proportional band	°C	0.5	36.0	1	R/W
61D	1566	16 bit signed	136	Analog Value	DryCoolerSetIncr	Dry Cooler set-point increase	°C	0.1	90.0	1	R/W
61E	1567	16 bit signed	137	Analog Value	MaxDryCoolerSet	Maximum dry Cooler set-point	°C	0.1	149.0	1	R/W
Dirty filter regulation											
76B	1900	16 bit unsigned	138	Analog Value	DirtyFiltersSet	Dirty filter set-point	Pa	0	5000	0	R/W
76C	1901	16 bit unsigned	139	Analog Value	DirtyFiltersDiff	Dirty filter differential	Pa	1	100	0	R/W

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Cumulative alarms											
275	630	16 bit unsigned	18	Binary Input	GeneralAlarms	General Alarm	-	0	1	0	R
276	631	16 bit unsigned	19	Binary Input	NotCriticalAlarms	Non-critical alarm	-	0	1	0	R
277	632	16 bit unsigned	20	Binary Input	CriticalAlarms	Critical alarm	-	0	1	0	R
278	633	16 bit unsigned	21	Binary Input	FansAlarms	Ventilation alarm	-	0	1	0	R
279	634	16 bit unsigned	22	Binary Input	CompAlarms	Compressor alarm	-	0	1	0	R
27A	635	16 bit unsigned	23	Binary Input	TemperatureAlarms	Temperature alarm	-	0	1	0	R
27B	636	16 bit unsigned	24	Binary Input	HumidityAlarms	Humidity alarm	-	0	1	0	R
Critical alarms											
27F	640	16 bit unsigned	25	Binary Input	DamperAl	Damper status alarm	-	0	1	0	R
280	641	16 bit unsigned	26	Binary Input	FireSmokeAl	Fire/Smoke presence alarm	-	0	1	0	R
281	642	16 bit unsigned	27	Binary Input	GenericSeriousAl	Critical generic alarm	-	0	1	0	R
General fan alarm (Digital)											
289	650	16 bit unsigned	28	Binary Input	FansGenAl	General supply fan alarm (Digital)	-	0	1	0	R
Fan 1 alarms											
293	660	16 bit unsigned	29	Binary Input	Fan1GeneralAl	General fan 1 alarm	-	0	1	0	R
294	661	16 bit unsigned	30	Binary Input	Fan1PowerAl	Fan 1 no phase/power supply alarm	-	0	1	0	R
295	662	16 bit unsigned	31	Binary Input	Fan1CommAl	Fan 1 communication down alarm	-	0	1	0	R
296	663	16 bit unsigned	32	Binary Input	Fan1HighTempAl	High fan 1 regulation module temperature	-	0	1	0	R
297	664	16 bit unsigned	33	Binary Input	Fan1NetComAl	No fan 1 master-slave communication	-	0	1	0	R
298	665	16 bit unsigned	34	Binary Input	Fan1InvRegAl	Fan 1 regulation module malfunction	-	0	1	0	R
299	666	16 bit unsigned	35	Binary Input	Fan1HighMotTempAl	Fan 1 high motor temperature	-	0	1	0	R
29A	667	16 bit unsigned	36	Binary Input	Fan1HallSensAl	Fan 1 Hall sensor error	-	0	1	0	R
29B	668	16 bit unsigned	37	Binary Input	Fan1OverloadAl	Fan 1 motor overload	-	0	1	0	R
29C	669	16 bit unsigned	38	Binary Input	Fan1LowDCAl	Fan 1 low DC power supply	-	0	1	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0	Base 1										
HEX	DEC										
Fan 2 alarms											
29D	670	16 bit unsigned	39	Binary Input	Fan2GeneralAl	General fan 2 alarm	-	0	1	0	R
29E	671	16 bit unsigned	40	Binary Input	Fan2PowerAl	Fan 2 no phase/power supply alarm	-	0	1	0	R
29F	672	16 bit unsigned	41	Binary Input	Fan2CommAl	Fan 2 communication down alarm	-	0	1	0	R
2A0	673	16 bit unsigned	42	Binary Input	Fan2HighTempAl	High fan 2 regulation module temperature	-	0	1	0	R
2A1	674	16 bit unsigned	43	Binary Input	Fan2NetComAl	No fan 2 master-slave communication	-	0	1	0	R
2A2	675	16 bit unsigned	44	Binary Input	Fan2InvRegAl	Fan 2 regulation module malfunction	-	0	1	0	R
2A3	676	16 bit unsigned	45	Binary Input	Fan2HighMotTempAl	Fan 2 high motor temperature	-	0	1	0	R
2A4	677	16 bit unsigned	46	Binary Input	Fan2HallSensAl	Fan 2 Hall sensor error	-	0	1	0	R
2A5	678	16 bit unsigned	47	Binary Input	Fan2OverloadAl	Fan 2 motor overload	-	0	1	0	R
2A6	679	16 bit unsigned	48	Binary Input	Fan2LowDCAl	Fan 2 low DC power supply	-	0	1	0	R
Fan 3 alarms											
2A7	680	16 bit unsigned	49	Binary Input	Fan3GeneralAl	General fan 3 alarm	-	0	1	0	R
2A8	681	16 bit unsigned	50	Binary Input	Fan3PowerAl	Fan 3 no phase/power supply alarm	-	0	1	0	R
2A9	682	16 bit unsigned	51	Binary Input	Fan3CommAl	Fan 3 communication down alarm	-	0	1	0	R
2AA	683	16 bit unsigned	52	Binary Input	Fan3HighTempAl	High fan 3 regulation module temperature	-	0	1	0	R
2AB	684	16 bit unsigned	53	Binary Input	Fan3NetComAl	No fan 3 master-slave communication	-	0	1	0	R
2AC	685	16 bit unsigned	54	Binary Input	Fan3InvRegAl	Fan 3 regulation module malfunction	-	0	1	0	R
2AD	686	16 bit unsigned	55	Binary Input	Fan3HighMotTempAl	Fan 3 high motor temperature	-	0	1	0	R
2AE	687	16 bit unsigned	56	Binary Input	Fan3HallSensAl	Fan 3 Hall sensor error	-	0	1	0	R
2AF	688	16 bit unsigned	57	Binary Input	Fan3OverloadAl	Fan 3 motor overload	-	0	1	0	R
2B0	689	16 bit unsigned	58	Binary Input	Fan3LowDCAl	Fan 3 low DC power supply	-	0	1	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Fan 4 alarms											
2B1	690	16 bit unsigned	59	Binary Input	Fan4GeneralAl	General fan 4 alarm	-	0	1	0	R
2B2	691	16 bit unsigned	60	Binary Input	Fan4PowerAl	Fan 4 no phase/power supply alarm	-	0	1	0	R
2B3	692	16 bit unsigned	61	Binary Input	Fan4CommAl	Fan 4 communication down alarm	-	0	1	0	R
2B4	693	16 bit unsigned	62	Binary Input	Fan4HighTempAl	High fan 4 regulation module temperature	-	0	1	0	R
2B5	694	16 bit unsigned	63	Binary Input	Fan4NetComAl	No fan 4 master-slave communication	-	0	1	0	R
2B6	695	16 bit unsigned	64	Binary Input	Fan4InvRegAl	Fan 4 regulation module malfunction	-	0	1	0	R
2B7	696	16 bit unsigned	65	Binary Input	Fan4HighMotTempAl	Fan 4 high motor temperature	-	0	1	0	R
2B8	697	16 bit unsigned	66	Binary Input	Fan4HallSensAl	Fan 4 Hall sensor error	-	0	1	0	R
2B9	698	16 bit unsigned	67	Binary Input	Fan4OverloadAl	Fan 4 motor overload	-	0	1	0	R
2BA	699	16 bit unsigned	68	Binary Input	Fan4LowDCAl	Fan 4 low DC power supply	-	0	1	0	R
Fan 5 alarms											
2BB	700	16 bit unsigned	69	Binary Input	Fan5GeneralAl	General fan 5 alarm	-	0	1	0	R
2BC	701	16 bit unsigned	70	Binary Input	Fan5PowerAl	Fan 5 no phase/power supply alarm	-	0	1	0	R
2BD	702	16 bit unsigned	71	Binary Input	Fan5CommAl	Fan 5 communication down alarm	-	0	1	0	R
2BE	703	16 bit unsigned	72	Binary Input	Fan5HighTempAl	High fan 5 regulation module temperature	-	0	1	0	R
2BF	704	16 bit unsigned	73	Binary Input	Fan5NetComAl	No fan 5 master-slave communication	-	0	1	0	R
2C0	705	16 bit unsigned	74	Binary Input	Fan5InvRegAl	Fan 5 regulation module malfunction	-	0	1	0	R
2C1	706	16 bit unsigned	75	Binary Input	Fan5HighMotTempAl	Fan 5 high motor temperature	-	0	1	0	R
2C2	707	16 bit unsigned	76	Binary Input	Fan5HallSensAl	Fan 5 Hall sensor error	-	0	1	0	R
2C3	708	16 bit unsigned	77	Binary Input	Fan5OverloadAl	Fan 5 motor overload	-	0	1	0	R
2C4	709	16 bit unsigned	78	Binary Input	Fan5LowDCAl	Fan 5 low DC power supply	-	0	1	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0	Base 1										
HEX	DEC										
Fan 6 alarms											
2C5	710	16 bit unsigned	79	Binary Input	Fan6GeneralAl	General fan 6 alarm	-	0	1	0	R
2C6	711	16 bit unsigned	80	Binary Input	Fan6PowerAl	Fan 6 no phase/power supply alarm	-	0	1	0	R
2C7	712	16 bit unsigned	81	Binary Input	Fan6CommAl	Fan 6 communication down alarm	-	0	1	0	R
2C8	713	16 bit unsigned	82	Binary Input	Fan6HighTempAl	High fan 6 regulation module temperature	-	0	1	0	R
2C9	714	16 bit unsigned	83	Binary Input	Fan6NetComAl	No fan 6 master-slave communication	-	0	1	0	R
2CA	715	16 bit unsigned	84	Binary Input	Fan6InvRegAl	Fan 6 regulation module malfunction	-	0	1	0	R
2CB	716	16 bit unsigned	85	Binary Input	Fan6HighMotTempAl	Fan 6 high motor temperature	-	0	1	0	R
2CC	717	16 bit unsigned	86	Binary Input	Fan6HallSensAl	Fan 6 Hall sensor error	-	0	1	0	R
2CD	718	16 bit unsigned	87	Binary Input	Fan6OverloadAl	Fan 6 motor overload	-	0	1	0	R
2CE	719	16 bit unsigned	88	Binary Input	Fan6LowDCAl	Fan 6 low DC power supply	-	0	1	0	R
Fan 7 alarms											
2CF	720	16 bit unsigned	89	Binary Input	Fan7GeneralAl	General fan 7 alarm	-	0	1	0	R
2D0	721	16 bit unsigned	90	Binary Input	Fan7PowerAl	Fan 7 no phase/power supply alarm	-	0	1	0	R
2D1	722	16 bit unsigned	91	Binary Input	Fan7CommAl	Fan 7 communication down alarm	-	0	1	0	R
2D2	723	16 bit unsigned	92	Binary Input	Fan7HighTempAl	High fan 7 regulation module temperature	-	0	1	0	R
2D3	724	16 bit unsigned	93	Binary Input	Fan7NetComAl	No fan 7 master-slave communication	-	0	1	0	R
2D4	725	16 bit unsigned	94	Binary Input	Fan7InvRegAl	Fan 7 regulation module malfunction	-	0	1	0	R
2D5	726	16 bit unsigned	95	Binary Input	Fan7HighMotTempAl	Fan 7 high motor temperature	-	0	1	0	R
2D6	727	16 bit unsigned	96	Binary Input	Fan7HallSensAl	Fan 7 Hall sensor error	-	0	1	0	R
2D7	728	16 bit unsigned	97	Binary Input	Fan7OverloadAl	Fan 7 motor overload	-	0	1	0	R
2D8	729	16 bit unsigned	98	Binary Input	Fan7LowDCAl	Fan 7 low DC power supply	-	0	1	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Fan 8 alarms											
2D9	730	16 bit unsigned	99	Binary Input	Fan8GeneralAl	General fan 8 alarm	-	0	1	0	R
2DA	731	16 bit unsigned	100	Binary Input	Fan8PowerAl	Fan 8 no phase/power supply alarm	-	0	1	0	R
2DB	732	16 bit unsigned	101	Binary Input	Fan8CommAl	Fan 8 communication down alarm	-	0	1	0	R
2DC	733	16 bit unsigned	102	Binary Input	Fan8HighTempAl	High fan 8 regulation module temperature	-	0	1	0	R
2DD	734	16 bit unsigned	103	Binary Input	Fan8NetComAl	No fan 8 master-slave communication	-	0	1	0	R
2DE	735	16 bit unsigned	104	Binary Input	Fan8InvRegAl	Fan 8 regulation module malfunction	-	0	1	0	R
2DF	736	16 bit unsigned	105	Binary Input	Fan8HighMotTempAl	Fan 8 high motor temperature	-	0	1	0	R
2E0	737	16 bit unsigned	106	Binary Input	Fan8HallSensAl	Fan 8 Hall sensor error	-	0	1	0	R
2E1	738	16 bit unsigned	107	Binary Input	Fan8OverloadAl	Fan 8 motor overload	-	0	1	0	R
2E2	739	16 bit unsigned	108	Binary Input	Fan8LowDCAl	Fan 8 low DC power supply	-	0	1	0	R
Fan 9 alarms											
2E3	740	16 bit unsigned	109	Binary Input	Fan9InverterAl	General fan 9 alarm	-	0	1	0	R
2E4	741	16 bit unsigned	110	Binary Input	Fan9PowerAl	Fan 9 no phase/power supply alarm	-	0	1	0	R
2E5	742	16 bit unsigned	111	Binary Input	Fan9CommAl	Fan 9 communication down alarm	-	0	1	0	R
2E6	743	16 bit unsigned	112	Binary Input	Fan9HighTempAl	High fan 9 regulation module temperature	-	0	1	0	R
2E7	744	16 bit unsigned	113	Binary Input	Fan9NetComAl	No fan 9 master-slave communication	-	0	1	0	R
2E8	745	16 bit unsigned	114	Binary Input	Fan9InvRegAl	Fan 9 regulation module malfunction	-	0	1	0	R
2E9	746	16 bit unsigned	115	Binary Input	Fan9HighMotTempAl	Fan 9 high motor temperature	-	0	1	0	R
2EA	747	16 bit unsigned	116	Binary Input	Fan9HallSensAl	Fan 9 Hall sensor error	-	0	1	0	R
2EB	748	16 bit unsigned	117	Binary Input	Fan9OverloadAl	Fan 9 motor overload	-	0	1	0	R
2EC	749	16 bit unsigned	118	Binary Input	Fan9LowDCAl	Fan 9 low DC power supply	-	0	1	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0	Base 1										
HEX	DEC										
Fan 10 alarms											
2ED	750	16 bit unsigned	119	Binary Input	Fan10GeneralAl	General fan 10 alarm	-	0	1	0	R
2EE	751	16 bit unsigned	120	Binary Input	Fan10PowerAl	Fan 10 no phase/power supply alarm	-	0	1	0	R
2EF	752	16 bit unsigned	121	Binary Input	Fan10CommAl	Fan 10 communication down alarm	-	0	1	0	R
2F0	753	16 bit unsigned	122	Binary Input	Fan10HighTempAl	High fan 10 regulation module temperature	-	0	1	0	R
2F1	754	16 bit unsigned	123	Binary Input	Fan10NetComAl	No fan 10 master-slave communication	-	0	1	0	R
2F2	755	16 bit unsigned	124	Binary Input	Fan10InvRegAl	Fan 10 regulation module malfunction	-	0	1	0	R
2F3	756	16 bit unsigned	125	Binary Input	Fan10HighMotTempAl	Fan 10 high motor temperature	-	0	1	0	R
2F4	757	16 bit unsigned	126	Binary Input	Fan10HallSensAl	Fan 10 Hall sensor error	-	0	1	0	R
2F5	758	16 bit unsigned	127	Binary Input	Fan10OverloadAl	Fan 10 motor overload	-	0	1	0	R
2F6	759	16 bit unsigned	128	Binary Input	Fan10LowDCAl	Fan 10 low DC power supply	-	0	1	0	R
Probe alarms											
301	770	16 bit unsigned	129	Binary Input	RetTempProbAl	Return temperature probe alarm	-	0	1	0	R
302	771	16 bit unsigned	130	Binary Input	SupTempProbAl	Supply temperature probe alarm	-	0	1	0	R
303	772	16 bit unsigned	131	Binary Input	RetHumProbAl	Return humidity probe alarm	-	0	1	0	R
304	773	16 bit unsigned	132	Binary Input	SupHumProbAl	Supply humidity probe alarm	-	0	1	0	R
305	774	16 bit unsigned	133	Binary Input	AirPrSensorAl	Differential air pressure sensor alarm	-	0	1	0	R
306	775	16 bit unsigned	134	Binary Input	WatIN1ProbAl	IN 1/Free cooling water temperature probe alarm	-	0	1	0	R
307	776	16 bit unsigned	135	Binary Input	WatOUT1ProbAl	OUT 1 water temperature probe alarm	-	0	1	0	R
308	777	16 bit unsigned	136	Binary Input	WatIN2ProbAl	IN 2 water temperature probe alarm	-	0	1	0	R
309	778	16 bit unsigned	137	Binary Input	WatOUT2ProbAl	OUT 2 water temperature probe alarm	-	0	1	0	R
30A	779	16 bit unsigned	138	Binary Input	WatFlw1ProbAl	Water flow rate/liquid temperature 1 sensor alarm	-	0	1	0	R
30B	780	16 bit unsigned	139	Binary Input	WatFlw2ProbAl	Water flow rate/liquid temperature 2 sensor alarm	-	0	1	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Dirty filter pressure sensor alarms											
315	790	16 bit unsigned	140	Binary Input	DFPSGenAl	Dirty filter pressure sensor general alarm	-	0	1	0	R
316	791	16 bit unsigned	141	Binary Input	DFPSBrokenAl	Broken dirty filter pressure sensor alarm	-	0	1	0	R
317	792	16 bit unsigned	142	Binary Input	DFPSCablingAl	Dirty filter pressure sensor wiring alarm	-	0	1	0	R
318	793	16 bit unsigned	143	Binary Input	DFPSRangeAl	Dirty filter pressure sensor pressure range alarm	-	0	1	0	R
319	794	16 bit unsigned	144	Binary Input	DFPSADCAl	Dirty filter pressure sensor overload ADC alarm	-	0	1	0	R
31A	795	16 bit unsigned	145	Binary Input	DFPSSettingAl	Dirty filter pressure sensor calibration alarm	-	0	1	0	R
31B	796	16 bit unsigned	146	Binary Input	DFPSDCOAl	Dirty filter pressure sensor DCO alarm	-	0	1	0	R
31C	797	16 bit unsigned	147	Binary Input	DFPSWatchdogAl	Dirty filter pressure sensor watchdog alarm	-	0	1	0	R
31D	798	16 bit unsigned	148	Binary Input	DFPSCommAl	Dirty filter pressure sensor communication alarm	-	0	1	0	R
DC compressor inverter alarm											
31F	800	16 bit unsigned	149	Binary Input	InverterCompGenAl	DC compressor inverter general alarm	-	0	1	0	R
320	801	16 bit unsigned	150	Binary Input	InvCompCommAlarm	DC compressor inverter communication alarm	-	0	1	0	R
321	802	16 bit unsigned	31	Multistate Value	InvCompAlCode1	DC compressor 1 inverter alarm code *	-	0	255	0	R
322	803	16 bit unsigned	32	Multistate Value	InvCompAlCode2	DC compressor 2 inverter alarm code*	-	0	255	0	R
323	804	16 bit unsigned	33	Multistate Value	InvCompAlCode3	DC compressor 3 inverter alarm code *	-	0	255	0	R
324	805	16 bit unsigned	34	Multistate Value	InvCompAlCode4	DC compressor 4 inverter alarm code *	-	0	255	0	R
325	806	16 bit unsigned	35	Multistate Value	InvCompAlCode5	DC compressor 5 inverter alarm code *	-	0	255	0	R
* 0 = 0; 1 = 1; 2 = 2; 3 = 3; 4 = 4; 5 = 5; 6 = 6; 7 = 7; 8 = 8; 9 = 9; 10 = A; 11 = B; 12 = C; 13 = D; 14 = E; 15 = F;											

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0	Base 1										
HEX	DEC										
Compressor 1 alarms											
329	810	16 bit unsigned	151	Binary Input	C1ThermAl	Compressor 1 thermal magnetic protection alarm	-	0	1	0	R
32A	811	16 bit unsigned	152	Binary Input	C1HighPresAl	Compressor 1 high pressure alarm	-	0	1	0	R
32B	812	16 bit unsigned	153	Binary Input	C1LowPresAl	Compressor 1 low pressure alarm	-	0	1	0	R
32C	813	16 bit unsigned	154	Binary Input	C1HighDischAl	Compressor 1 discharge high temperature alarm	-	0	1	0	R
32D	814	16 bit unsigned	155	Binary Input	C1LowComprRatioAl	Compressor 1 low compression alarm	-	0	1	0	R
32E	815	16 bit unsigned	156	Binary Input	Condenser1Al	Condenser 1 general alarm	-	0	1	0	R
32F	816	16 bit unsigned	157	Binary Input	C1WatFlowAl	Condenser 1 water flow alarm	-	0	1	0	R
Compressor 1 EEV alarms											
333	820	16 bit unsigned	158	Binary Input	EEV1GenAl	General EEV 1 alarm	-	0	1	0	R
334	821	16 bit unsigned	159	Binary Input	EEV1CommAl	EEV1 communication down alarm	-	0	1	0	R
335	822	16 bit unsigned	160	Binary Input	EEV1SuctProbAl	EEV1 suction temperature probe alarm	-	0	1	0	R
336	823	16 bit unsigned	161	Binary Input	EEV1EvapProbAl	EEV1 evaporation pressure probe alarm	-	0	1	0	R
337	824	16 bit unsigned	162	Binary Input	EEV1CondProbAl	EEV1 condensation pressure probe alarm	-	0	1	0	R
338	825	16 bit unsigned	163	Binary Input	EEV1DischProbAl	EEV1 discharge temperature probe alarm	-	0	1	0	R
Compressor 2 alarms											
33D	830	16 bit unsigned	164	Binary Input	C2ThermAl	Compressor 2 thermal magnetic protection alarm	-	0	1	0	R
33E	831	16 bit unsigned	165	Binary Input	C2HighPresAl	Compressor 2 high pressure alarm	-	0	1	0	R
33F	832	16 bit unsigned	166	Binary Input	C2LowPresAl	Compressor 2 low pressure alarm	-	0	1	0	R
340	833	16 bit unsigned	167	Binary Input	C2HighDischAl	Compressor 2 discharge high temperature alarm	-	0	1	0	R
341	834	16 bit unsigned	168	Binary Input	C2LowComprRatioAl	Compressor 2 low compression alarm	-	0	1	0	R
342	835	16 bit unsigned	169	Binary Input	Condenser2Al	Condenser 2 general alarm	-	0	1	0	R
343	836	16 bit unsigned	170	Binary Input	C2WatFlowAl	Condenser 2 water flow alarm	-	0	1	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Compressor 2 EEV alarms											
347	840	16 bit unsigned	171	Binary Input	EEV2GenAl	General EEV 2 alarm	-	0	1	0	R
348	841	16 bit unsigned	172	Binary Input	EEV2CommAl	EEV2 communication down alarm	-	0	1	0	R
349	842	16 bit unsigned	173	Binary Input	EEV2SuctProbAl	EEV2 suction temperature probe alarm	-	0	1	0	R
34A	843	16 bit unsigned	174	Binary Input	EEV2EvapProbAl	EEV2 evaporation pressure probe alarm	-	0	1	0	R
34B	844	16 bit unsigned	175	Binary Input	EEV2CondProbAl	EEV2 condensation pressure probe alarm	-	0	1	0	R
34C	845	16 bit unsigned	176	Binary Input	EEV2DischProbAl	EEV2 discharge temperature probe alarm	-	0	1	0	R
Internal humidifier alarms											
351	850	16 bit unsigned	177	Binary Input	InternalHumidGenAl	Internal humidifier general alarm	-	0	1	0	R
352	851	16 bit unsigned	178	Binary Input	CPYCommAl	CPY communication down alarm	-	0	1	0	R
353	852	16 bit unsigned	179	Binary Input	CPYMemoryAl	Internal memory error	-	0	1	0	R
354	853	16 bit unsigned	180	Binary Input	CPYParameterAl	Parameter error	-	0	1	0	R
355	854	16 bit unsigned	181	Binary Input	CPYHighCurrentAl	High electrode current	-	0	1	0	R
356	855	16 bit unsigned	182	Binary Input	CPYLowSteamAl	Low steam flow rate	-	0	1	0	R
357	856	16 bit unsigned	183	Binary Input	CPYDrainAl	Failed discharge	-	0	1	0	R
358	857	16 bit unsigned	184	Binary Input	CPYMaintAl	Maintenance time expired	-	0	1	0	R
359	858	16 bit unsigned	185	Binary Input	CPYNoWaterAl	No water	-	0	1	0	R
35A	859	16 bit unsigned	186	Binary Input	CPYCylMaintAl	Cylinder maintenance	-	0	1	0	R
35B	860	16 bit unsigned	187	Binary Input	CPYDirtyCylAl	Cylinder burnt out	-	0	1	0	R
35C	861	16 bit unsigned	188	Binary Input	CPYFoamAl	Foam presence	-	0	1	0	R
35D	862	16 bit unsigned	189	Binary Input	CPYLifeTimeAl	Life timer expired	-	0	1	0	R
35E	863	16 bit unsigned	190	Binary Input	CPYHighWatLevAl	High water level	-	0	1	0	R
35F	864	16 bit unsigned	91	Binary Input	CPYHighWatConductAl	High water conductivity	-	0	1	0	R
360	865	16 bit unsigned	192	Binary Input	CPYConnectionAl	Connection error	-	0	1	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0	Base 1										
HEX	DEC										
Component alarms											
365	870	16 bit unsigned	193	Binary Input	WatPresAl	Water presence sensor alarm	-	0	1	0	R
366	871	16 bit unsigned	194	Binary Input	DrainPumpAl	Condensate discharge pump alarm	-	0	1	0	R
367	872	16 bit unsigned	195	Binary Input	ElHeatAl	Electric coil safety thermostat	-	0	1	0	R
368	873	16 bit unsigned	196	Binary Input	FilterAl	Clogged air filter alarm	-	0	1	0	R
369	874	16 bit unsigned	197	Binary Input	DryCoolerAl	Dry cooler general alarm	-	0	1	0	R
36A	875	16 bit unsigned	198	Binary Input	ExternalHumidifAl	External humidifier general alarm	-	0	1	0	R
36B	876	16 bit unsigned	199	Binary Input	WaterPumpAl	General water pump alarm	-	0	1	0	R
36C	877	16 bit unsigned	200	Binary Input	CondUnitGeneralAl	Condensing unit general alarm	-	0	1	0	R
36D	878	16 bit unsigned	201	Binary Input	GasLeakAl	Refrigerant gas leak detector alarm	-	0	1	0	R
36E	879	16 bit unsigned	202	Binary Input	PowerSupplyAl	No power supply alarm	-	0	1	0	R
36F	880	16 bit unsigned	203	Binary Input	GenericSoftAl	Non-critical generic alarm	-	0	1	0	R
LAN alarm											
379	890	16 bit unsigned	204	Binary Input	LocalNetworkAl	Local network communication alarm	-	0	1	0	R
Temperature alarms											
383	900	16 bit unsigned	205	Binary Input	RegHighTempAl	High temperature regulation alarm	-	0	1	0	R
384	901	16 bit unsigned	206	Binary Input	RegLowTempAl	Low temperature regulation alarm	-	0	1	0	R
385	902	16 bit unsigned	207	Binary Input	HighLimTempAl	High limit temperature alarm	-	0	1	0	R
386	903	16 bit unsigned	208	Binary Input	LowLimTempAl	Low limit temperature alarm	-	0	1	0	R
Humidity alarms											
38D	910	16 bit unsigned	209	Binary Input	RetHighHumiAl	High return humidity alarm	-	0	1	0	R
38E	911	16 bit unsigned	210	Binary Input	RetLowHumiAl	Low return humidity alarm	-	0	1	0	R
38F	912	16 bit unsigned	211	Binary Input	SupHighHumiAl	High supply humidity alarm	-	0	1	0	R
390	913	16 bit unsigned	212	Binary Input	SupLowHumiAl	Low supply humidity alarm	-	0	1	0	R
Probe module 1 alarms											
397	920	16 bit unsigned	213	Binary Input	ProbeMod1COM	Module 1 communication alarm	-	0	1	0	R
398	921	16 bit unsigned	214	Binary Input	ProbeMod1err1	Probe 1 module 1 alarm	-	0	1	0	R
399	922	16 bit unsigned	215	Binary Input	ProbeMod1err2	Probe 2 module 1 alarm	-	0	1	0	R
39A	923	16 bit unsigned	216	Binary Input	ProbeMod1err3	Probe 3 module 1 alarm	-	0	1	0	R
39B	924	16 bit unsigned	217	Binary Input	ProbeMod1err4	Probe 4 module 1 alarm	-	0	1	0	R
39C	925	16 bit unsigned	218	Binary Input	ProbeMod1err5	Probe 5 module 1 alarm	-	0	1	0	R
39D	926	16 bit unsigned	219	Binary Input	ProbeMod1err6	Probe 6 module 1 alarm	-	0	1	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0 HEX	Base 1 DEC										
Probe module 2 alarms											
3A1	930	16 bit unsigned	220	Binary Input	ProbeMod2COM	Module 2 communication alarm	-	0	1	0	R
3A2	931	16 bit unsigned	221	Binary Input	ProbeMod2err1	Probe 1 module 2 alarm	-	0	1	0	R
3A3	932	16 bit unsigned	222	Binary Input	ProbeMod2err2	Probe 2 module 2 alarm	-	0	1	0	R
3A4	933	16 bit unsigned	223	Binary Input	ProbeMod2err3	Probe 3 module 2 alarm	-	0	1	0	R
3A5	934	16 bit unsigned	224	Binary Input	ProbeMod2err4	Probe 4 module 2 alarm	-	0	1	0	R
3A6	935	16 bit unsigned	225	Binary Input	ProbeMod2err5	Probe 5 module 2 alarm	-	0	1	0	R
3A7	936	16 bit unsigned	226	Binary Input	ProbeMod2err6	Probe 6 module 2 alarm	-	0	1	0	R
Probe module 3 alarms											
3AB	940	16 bit unsigned	227	Binary Input	ProbeMod3COM	Module 3 communication alarm	-	0	1	0	R
3AC	941	16 bit unsigned	228	Binary Input	ProbeMod3err1	Probe 1 module 3 alarm	-	0	1	0	R
3AD	942	16 bit unsigned	229	Binary Input	ProbeMod3err2	Probe 2 module 3 alarm	-	0	1	0	R
3AE	943	16 bit unsigned	230	Binary Input	ProbeMod3err3	Probe 3 module 3 alarm	-	0	1	0	R
3AF	944	16 bit unsigned	231	Binary Input	ProbeMod3err4	Probe 4 module 3 alarm	-	0	1	0	R
3B0	945	16 bit unsigned	232	Binary Input	ProbeMod3err5	Probe 5 module 3 alarm	-	0	1	0	R
3B1	946	16 bit unsigned	233	Binary Input	ProbeMod3err6	Probe 6 module 3 alarm	-	0	1	0	R

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0	Base 1										
HEX	DEC										
Critical alarms reset											
3E7	1000	16 bit unsigned	7	Binary Value	DamperAlRes	Damper status alarm reset	-	0	1	0	R/W
3E8	1001	16 bit unsigned	8	Binary Value	FireSmokeAlRes	Fire/Smoke presence alarm reset	-	0	1	0	R/W
3E9	1002	16 bit unsigned	9	Binary Value	GenericSeriousAlRes	Critical generic alarm reset	-	0	1	0	R/W
Fan alarms reset											
3EA	1003	16 bit unsigned	10	Binary Value	FansGenAlRes	General supply fans alarm reset	-	0	1	0	R/W
3EB	1004	16 bit unsigned	11	Binary Value	Fan1InverterAlRes	Fan 1 inverter alarm reset	-	0	1	0	R/W
3EC	1005	16 bit unsigned	12	Binary Value	Fan2InverterAlRes	Fan 2 inverter alarm reset	-	0	1	0	R/W
3ED	1006	16 bit unsigned	13	Binary Value	Fan3InverterAlRes	Fan 3 inverter alarm reset	-	0	1	0	R/W
3EE	1007	16 bit unsigned	14	Binary Value	Fan4InverterAlRes	Fan 4 inverter alarm reset	-	0	1	0	R/W
3EF	1008	16 bit unsigned	15	Binary Value	Fan5InverterAlRes	Fan 5 inverter alarm reset	-	0	1	0	R/W
3F0	1009	16 bit unsigned	16	Binary Value	Fan6InverterAlRes	Fan 6 inverter alarm reset	-	0	1	0	R/W
3F1	1010	16 bit unsigned	17	Binary Value	Fan7InverterAlRes	Fan 7 inverter alarm reset	-	0	1	0	R/W
3F2	1011	16 bit unsigned	18	Binary Value	Fan8InverterAlRes	Fan 8 inverter alarm reset	-	0	1	0	R/W
3F3	1012	16 bit unsigned	19	Binary Value	Fan9InverterAlRes	Fan 9 inverter alarm reset	-	0	1	0	R/W
3F4	1013	16 bit unsigned	20	Binary Value	Fan10InverterAlRes	Fan 10 inverter alarm reset	-	0	1	0	R/W
DC compressor inverter alarm reset											
3F5	1014	16 bit unsigned	21	Binary Value	InverterCompAlRes	Compressor 1 inverter alarm reset	-	0	1	0	R/W
Compressor 1 alarms reset											
3F6	1015	16 bit unsigned	22	Binary Value	C1ThermAlRes	Compressor 1 thermal magnetic protection alarm reset	-	0	1	0	R/W
3F7	1016	16 bit unsigned	23	Binary Value	C1HighPresAlRes	Compressor 1 high pressure alarm reset	-	0	1	0	R/W
3F8	1017	16 bit unsigned	24	Binary Value	C1LowPresAlRes	Compressor 1 low pressure alarm reset	-	0	1	0	R/W
3F9	1018	16 bit unsigned	25	Binary Value	C1HighDischAlRes	Compressor 1 discharge high temperature alarm reset	-	0	1	0	R/W
3FA	1019	16 bit unsigned	26	Binary Value	C1LoComprRatioAlRes	Compressor 1 low compression alarm reset	-	0	1	0	R/W
3FB	1020	16 bit unsigned	27	Binary Value	Condenser1AlRes	Condenser 1 general alarm reset	-	0	1	0	R/W
Compressor 1 EEV alarm reset											
3FC	1021	16 bit unsigned	28	Binary Value	EEV1AlRes	Compressor 1 EEV alarm reset	-	0	1	0	R/W

Modbus			BACnet			Description	Um	Limits		Dec	Mode
Holding register			Object								
Address		Data type	Instance	Type	Name			Min	Max		
Base 0	Base 1										
HEX	DEC										
Compressor 2 alarms reset											
3FD	1022	16 bit unsigned	29	Binary Value	C2ThermAlRes	Compressor 2 thermal magnetic protection alarm reset	-	0	1	0	R/W
3FE	1023	16 bit unsigned	30	Binary Value	C2HighPresAlRes	Compressor 2 high pressure alarm reset	-	0	1	0	R/W
3FF	1024	16 bit unsigned	31	Binary Value	C2LowPresAlRes	Compressor 2 low pressure alarm reset	-	0	1	0	R/W
400	1025	16 bit unsigned	32	Binary Value	C2HighDischAlRes	Compressor 2 discharge high temperature alarm reset	-	0	1	0	R/W
401	1026	16 bit unsigned	33	Binary Value	C2LoComprRatioAlRes	Compressor 2 low compression alarm reset	-	0	1	0	R/W
402	1027	16 bit unsigned	34	Binary Value	Condenser2AlRes	Condenser 2 general alarm reset	-	0	1	0	R/W
Compressor 2 EEV alarm reset											
403	1028	16 bit unsigned	35	Binary Value	EEV2AlRes	Compressor 2 EEV alarm reset	-	0	1	0	R/W
Internal humidifier alarm reset											
404	1029	16 bit unsigned	36	Binary Value	IntHumidifAlRes	Internal humidifier alarm reset	-	0	1	0	R/W
Component alarms reset											
405	1030	16 bit unsigned	37	Binary Value	WatPresAlRes	Water presence sensor alarm reset	-	0	1	0	R/W
406	1031	16 bit unsigned	38	Binary Value	DrainPumpAlRes	Condensate discharge pump alarm reset	-	0	1	0	R/W
407	1032	16 bit unsigned	39	Binary Value	ElHeatAlRes	Electr. coil safety thermostat alarm reset	-	0	1	0	R/W
408	1033	16 bit unsigned	40	Binary Value	FilterAlRes	Clogged air filter alarm reset	-	0	1	0	R/W
409	1034	16 bit unsigned	41	Binary Value	DryCoolerAlRes	Dry cooler general alarm reset	-	0	1	0	R/W
40A	1035	16 bit unsigned	42	Binary Value	ExtHumidifAlRes	External humidifier general alarm reset	-	0	1	0	R/W
40B	1036	16 bit unsigned	43	Binary Value	WaterPumpAlRes	General water pump alarm reset	-	0	1	0	R/W
40C	1037	16 bit unsigned	44	Binary Value	CondUnitGenAlRes	Condensing unit generic alarm reset	-	0	1	0	R/W
40D	1038	16 bit unsigned	45	Binary Value	GasLeakAlRes	Refrigerant gas leak detector alarm reset	-	0	1	0	R/W
40E	1039	16 bit unsigned	46	Binary Value	PowerSupplyAlRes	No power supply alarm reset	-	0	1	0	R/W
40F	1040	16 bit unsigned	47	Binary Value	GenericSoftAlRes	Non-critical generic alarm reset	-	0	1	0	R/W

11 SURVEY³ TROUBLESHOOTING

11.1 THE UNIT DOES NOT START

Check:

- That the mains power supply is on.
- That there is 24 Vac downstream of the supply voltage transformer.
- That the 24 Vac supply connector is properly plugged in.
- That the protection fuse is intact.
- That the cable connecting the terminal and the main board has been connected properly.

11.2 INCORRECT READING OF INPUT SIGNALS

Check:

- That the inputs have been calibrated correctly (from program).
- That the probe power supply is correct.
- That the probe connection is set up as per the wiring diagram.
- That the probe output signal is correct.
- That the probe wires are positioned at a suitable distance from potential sources of electromagnetic interference (power cables, contactors, high-voltage cables and cables connected to devices with high voltage consumption at start-up).
- That the thermal resistance level between the probe and any probe pocket is not too high. Place a little paste or conductive oil inside the pockets if necessary, in order to guarantee effective temperature transmission.

11.3 QUESTIONABLE ALARM SIGNALLING FROM DIGITAL INPUT

Check:

- That there is 24 Vac power supply on the alarm contact.
- That the terminal is fitted into its seat.
- That there are no breaks upstream of the terminal.

11.4 FAILED CLOSURE OF A DIGITAL OUTPUT

Check:

- That there is 24 Vac power supply on the digital contact.
- That the terminal is fitted into its seat.
- That there are no breaks downstream of the terminal.

11.5 NO ANALOGUE OUTPUTS

Check:

- That there is a 0-10Vcc analogue output signal.
- That the terminal is fitted into its seat.
- That there are no breaks downstream of the terminal.

11.6 THE SURVEY ACTIVATES THE WATCH-DOG FUNCTION

Check:

- That the power cables do not run near the main board microprocessors.
- That there are no sources of electromagnetic interference near the microprocessor or the data transmission cables.

11.7 THE SERIAL CONNECTION WITH THE SUPERVISOR/BMS IS NOT WORKING

Check:

- That the unit's serial address is set correctly.
- That the unit's baud rate (communication speed) is set correctly.
- What type of serial cables are used.
- That the serial cable connection is correct based on the wiring diagram.
- That the power cables do not run near the main board microprocessors.
- That there are no sources of electromagnetic interference near the microprocessor or the data transmission cables.

11.8 LOCAL NETWORK CONNECTION IS NOT WORKING

Check:

- That the unit's serial address is set correctly.
- That the unit's baud rate (communication speed) is set correctly.
- What type of serial cables are used.
- That the power cables do not run near the main board microprocessors.
- That there are no sources of electromagnetic interference near the microprocessor or the data transmission cables.

11.9 MODBUS MASTER CONNECTION IS NOT WORKING

Check:

- That the serial cable connection is correct based on the wiring diagram.
- That the power cables do not run near the main board microprocessors.
- That there are no sources of electromagnetic interference near the microprocessor or the data transmission cables.

12 NOTES

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