Single and Twin Circuit Scroll Compressors Chiller

Parametric Controllers

User Manual

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The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Safety Information

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NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** equipment damage.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

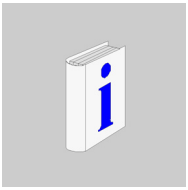
A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved.

Important Notice

This Instruction Manual should be read carefully before installation and before use, and all warnings relating to installation and electrical connections should be observed; the Manual should then be kept for future reference.

All devices must be disposed of in accordance with local regulations governing the disposal of electrical and electronic devices.

About the Book



At a Glance

Document Scope

This document describes various applications using SoHVAC, the M168 and associated hardware. The following diagrams and products specified in this document have been tested under actual service conditions. Your specific application requirements may be different from those assumed for this and any related examples described herein. In that case, you will have to adapt to the information provided in this and related documents to your particular needs. To do so, you will need to consult the specific product documentation of the components that you add or substitute in this architecture. Pay particular attention and conform to any safety information, different electrical requirements and normative standards that would apply to your adaptation.

Some major components used in this architecture and related documents are described in this document. They cannot be substituted without significantly compromising or completely invalidating the architecture, descriptions, instructions, wiring diagrams and compatibility between the various software and hardware components specified herein and in related documentation. You must be aware of the consequences of component substitutions and additions. A residual risk, as defined by EN/ISO 12100-1, Article 5, will remain if:

- it is necessary to modify the recommended circuit and if the added or modified components are not properly integrated in the control circuit.
- the user does not follow the required standards applicable to the operation of the machine, or if the adjustments to and the maintenance of the machine are not properly made (it is essential to strictly follow the prescribed machine maintenance schedule).
- the devices connected to the safety outputs do not have mechanically-linked contacts.

⚠ CAUTION

EQUIPMENT INCOMPATIBILITY

Read and thoroughly understand all device and software documentation before attempting any component substitutions or other changes related to the application examples provided in this document.

Failure to follow these instructions can result in injury or equipment damage.

Validity Note

This document is valid for SoHVAC V1.0.

Related Documents

M168 Hardware Guide	EIO0000000533 00
Introduction Manual for the C Programming Language	EIO0000000536 00
SoHVAC Software User Manual	EIO0000000537 00
SoHVAC Standard library User Guide	EIO0000000538 00
SoHVAC Application Program library User Guide	EIO0000000539 00
Network Connectivity Modules for M168 controllers	S1A42781 00

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Product Related Information

The application of this product requires expertise in the design and programming of control systems. Only the user or integrator can be aware of all the conditions and factors present during installation and setup, operation, and maintenance of the application, and can therefore determine the automation and associated equipment and the related safeties and interlocks which can be effectively and properly used. When selecting automation and control equipment, and any other related equipment or software, for a particular application, the user or integrator must also consider any applicable local, regional or national standards and/or regulations.

⚠ WARNING

REGULATORY INCOMPATIBILITY

Be sure that all equipment applied and systems designed comply with all applicable local, regional and national regulations and standards.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Start-up and Test

Before using electrical control and automation equipment after design and installation, the application and associated functional safety system must be subjected to a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such testing be made and that enough time is allowed to perform complete and satisfactory testing.

⚠ CAUTION

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters and debris from equipment.

Failure to follow these instructions can result in injury or equipment damage.

Verify that the completed system, including the functional safety system, is free from all short circuits and grounds, except those grounds installed according to local regulations. If high-potential voltage testing is necessary, follow recommendations in equipment documentation to help prevent injury or equipment damage.

Operation and Adjustments

Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly installed and operated.

It is sometimes possible to adjust the equipment incorrectly and thus produce unsatisfactory or unsafe operation. Always use the manufacturer instructions as a guide to functional adjustments. Personnel who have access to these adjustments must be familiar with the equipment manufacturer instructions and the machinery used with the electrical equipment.

Only those operational adjustments actually required by the machine operator should be accessible to the operator. Access to other controls should be restricted to help prevent unauthorized changes in operating characteristics.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@schneider-electric.com.

1 Introduction

Parametric controllers are programmable controllers with pre-loaded application programs. The application programs are created with SoHVAC. This application program can manage air-to-water and water-to-water chillers made of single or twin circuits with scroll compressors.

Parametric controllers are used to configure standard machines with the help of pre-programmed functions.

The main control functions do the following:

- manage up to 2 scroll compressors for each circuit
- manage compressors with cooling/heating mode
- manage fans with phase-cut module
- enable double set-point from external contact
- compensate dynamic set-point
- manage pump-down
- provide built-in schedule with 2 programs per day
- control condensing pressure, linear or stepped evaporation
- use 1, 2, or no circulating pumps

2 Description

2.1 Controller Hardware

For the controller hardware description, refer to *M168 Hardware Guide*.

2.2 Parameter Key

The Parameter Key TM168APARAKEY allows you to transfer your controller configuration parameters rapidly to several machines:

- copy parameters and data from the controller to the Parameter Key (upload)
- copy parameters from Parameter Key to the controller (download)

Note: The download of parameters from the key to the controller is allowed only if data in the controller and the key match.

The controller needs to be connected to a power supply to use the Parameter Key.

Note:

- The copying of parameters from the key to the controller (download) is allowed only if data in the controller and the key match.
- A remote display is required for controllers that do not have a built-in display to use the parameter key.
- You can perform upload/download operations using the standard upload/download page present on the main controller.
- Information of upload/download completed is available in the controller page.

2.3 User Interfaces

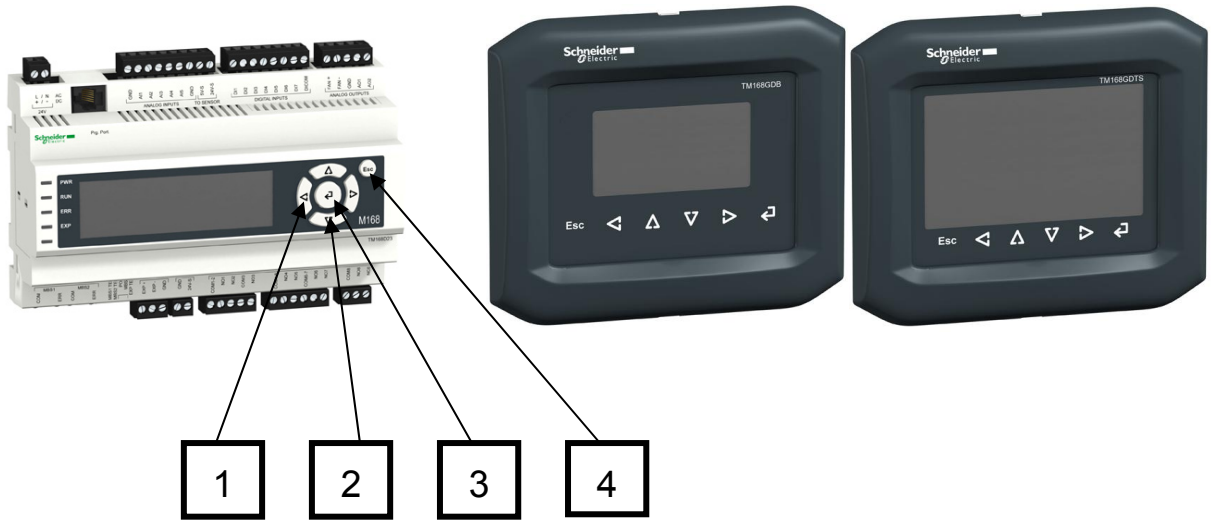
2 types of user interface are available:

1. built-in graphic LCD display (120 x 32 pixels)
2. optional remote graphic display:
   - graphic LCD display (128 x 64 pixels), or
   - touch screen graphic LCD display (240 x 140 pixels)

Note: The behavior of buttons and icons used in the built-in graphic LCD display and the remote graphic display is the same.

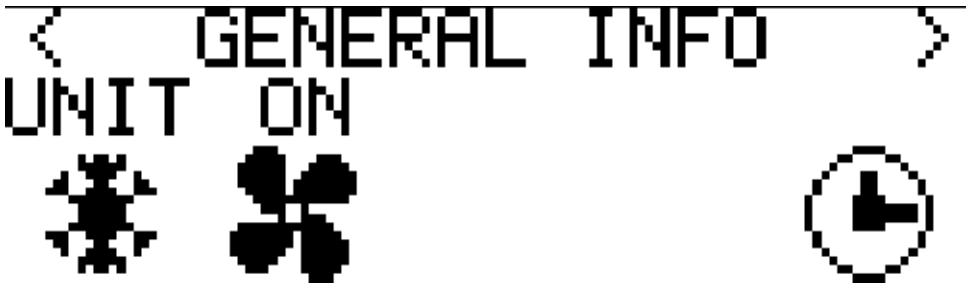
2.3.1 Buttons

All the interfaces feature 6 buttons for navigation/page editing and differ in their display mode by certain associated status (through icons).



Label	Button picture	Function	Description
1		LEFT and RIGHT	display the pages of the same level in succession
2		UP and DOWN	Editing mode: parameters modification Other modes: cursor displacement
3		ENTER	Editing mode: parameters confirmation Other modes: editing mode is enabled. The parameter value blinks indicating that you can change the value using UP and DOWN buttons. Press ENTER button again to confirm the new values. Press ESC button to cancel the modifications. If held down for 2 seconds, the ENTER button enables access to the main menu. If held down during display of an alarm page, this button enables resetting the alarm. If alarm pages are displayed, press the ENTER button to scroll all alarms (1 alarm displayed at the time).
4		STAND-BY/ ESC	Editing mode: value cancellation Other modes: requests any default page that might be associated with the current page. If held down for 2 seconds, the ESC button enables on/off switching of the controller. If pressed in the main page, this button displays the list of all active alarms.

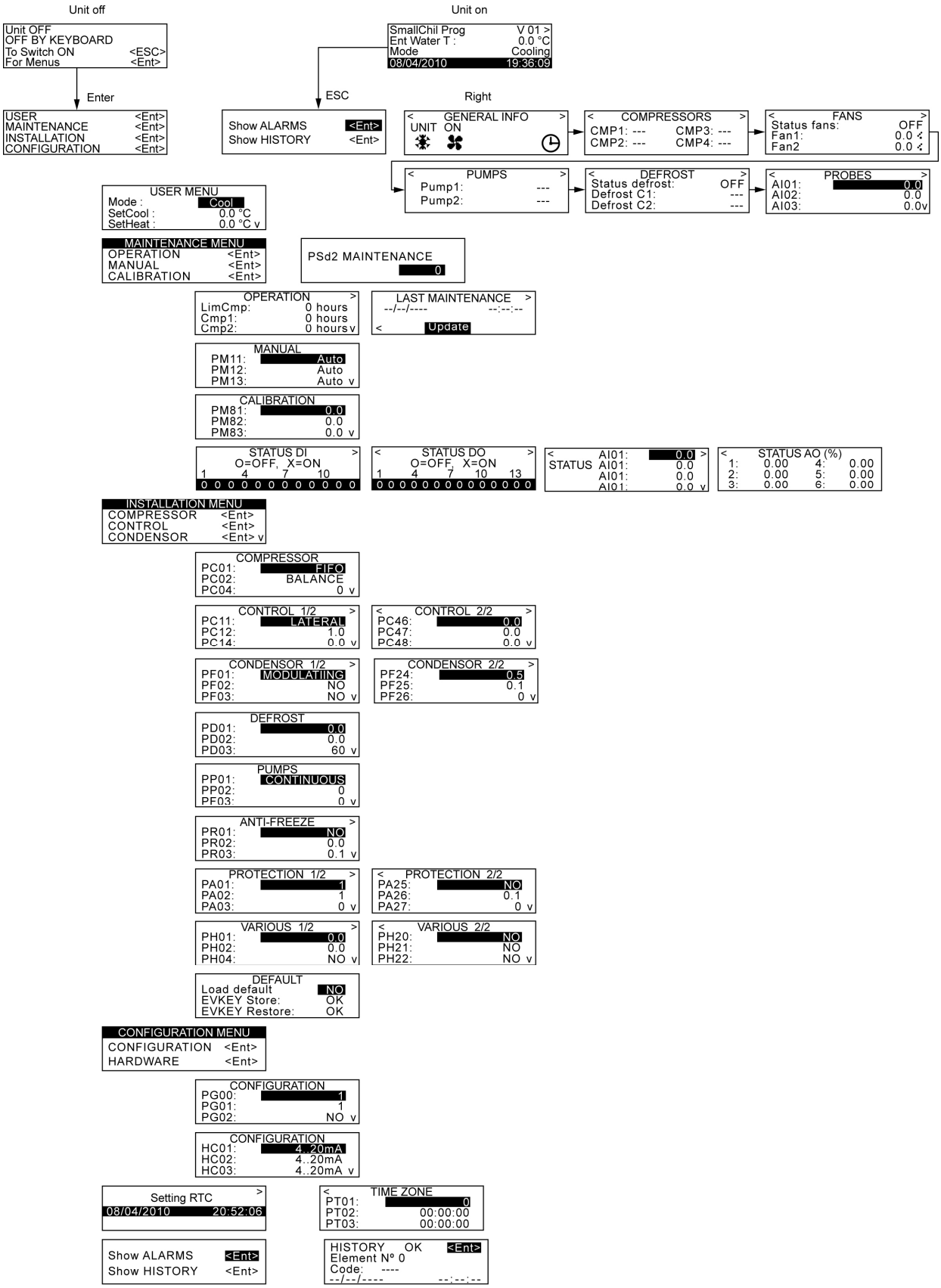
2.3.2 Icons Description



Icon picture	Function	Description
	Cooling mode icon	Invisible: cooling operating mode (chiller) inactive Visible: cooling operating mode (chiller) active **Note**: The meaning of the cooling and heating mode icons can be changed by the parameter *PH53*.
	Heating mode icon	Invisible: heating operating mode (heat pump) inactive Visible: heating operating mode (heat pump) active **Note**: The meaning of the summer and winter icons can be changed by the parameter *PH53*.
	Fan icon	Invisible: fans are off Visible: at least one fan is on Reverse: at least one fan is in manual mode and is on
	Alarm icon	Visible: at least one alarm is active
	Anti-freeze heater icon	Invisible: off Visible: the anti-freeze heater is active
	Defrost icon	Invisible: defrosting is inactive Visible: defrosting cycle is in progress
	Scheduler icon	Invisible: scheduler is inactive Visible: scheduler is active
	°C/°F icon	indicates the temperature measurement unit of the selected sensor

2.3.3 Menus

2.3.3.1 Menus Overview



2.3.3.2 Detail Description of the Menus

The general menu is divided into 4 sub menus:

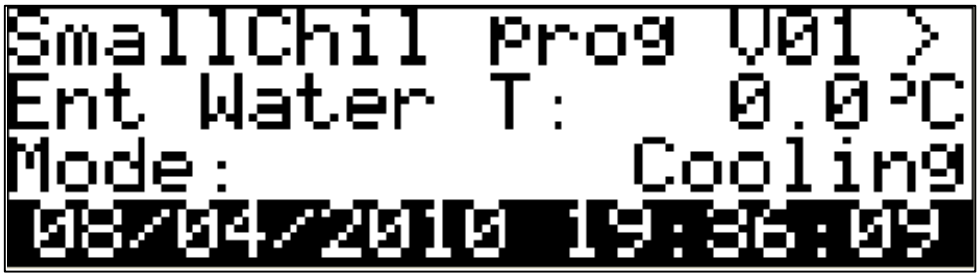
1. User menu
2. Maintenance menu
3. Installation menu
4. Configuration menu

2.3.3.3 General Menu

The main display page varies according to the machine status (on or off).

If the machine is switched off, **Unit OFF** is displayed along with the cause for shutdown (dedicated key, lack of consensus from digital input, supervisor, scheduler, and so on).

If the machine is switched on, the inlet or the outlet temperature value is displayed based on the setting type (parameter *PC11*). In twin-circuit units, the average value of the two chilled water leaving temperatures is displayed. If the sensor is inoperable or disconnected, ---- is displayed.



By pressing the RIGHT or LEFT buttons in this page, it is possible to display other information like circuit status, RTC, or all the configured sensors. In case of the inoperable status of the sensors, the value field of the corresponding sensor displays ---- if the sensor is enabled else displays …. if the sensor is disabled.

Pressing ESC button when the machine is on takes the user to the Alarm page.

2.3.3.4 Menu Navigation Principles

The general menu has no levels and represents the access point for all other system menus.

You can view this menu at any point of time within the user interface by holding down the ENTER button for 2 seconds.

Press the UP and DOWN buttons to select the menu you want to view and press the ENTER button for confirmation.

A **v** (down arrow) sign appears in the upper right hand corner of the display indicating the focus. This indication specifies that additional information is contained therein and can be viewed by pressing the DOWN button (or UP button depending on the focus direction) to view the content that is not visible in the current page.

In this specific case, when the focus is on **CONFIGURATION**, press DOWN button to proceed to the subsequent page.

2.3.3.5 Password Principles

Each menu is assigned a level which affects the accessibility of various menus.

Each level is assigned a password, which enables access to the various functions featured in that menu. Once you enter the correct password, protected functions become accessible. Entering a correct password has two consequences:

1. unlocking the related level
2. unlocking its sublevels

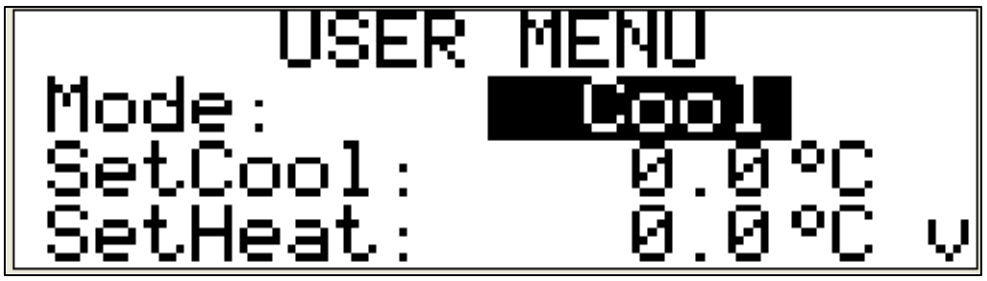
Passwords of all the lower levels can be modified from the same level or from a higher level. For example, from the constructor level, it is possible to modify all the passwords of lower levels by using the appropriate page.

The range of values that can be set for a password is -999...9999.

While entering a password, if you do not press any button within 4 minutes, the password expires and you need to reset it.

2.3.3.6 User Menu

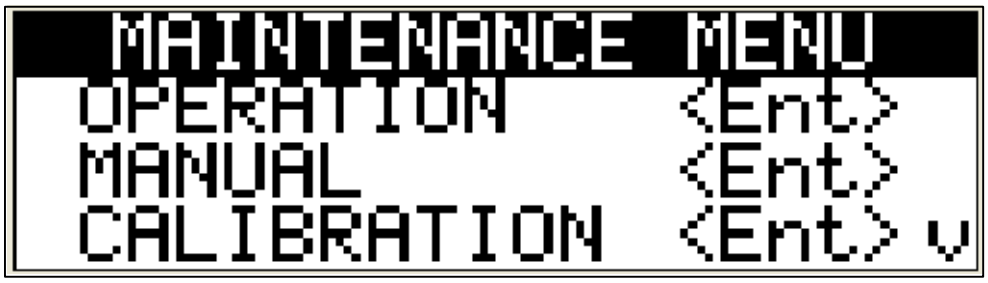
The **USER MENU** is a level 1 menu. Enter the user level (or higher) password to display/modify the parameters contained in this branch.



2.3.3.7 Maintenance Menu

The **MAINTENANCE MENU** is a level 2 menu. Enter the maintenance operator level (or higher) password to display/modify the parameters contained in this branch.

This menu displays the status of the various devices, inputs, and outputs utilized by the application.



Sub menus:

OPERATION sub menu allows you to view/enable the features related to the operation of compressors, fans, and pumps. Examples for these features are the hours of operation, enabling of the corresponding alarm, and threshold of maximum allowable hours.

MANUAL sub menu allows you to set the compressors and fans to manual/ automatic operation, whose outputs can be forced in order to test their functionality.

CALIBRATION sub menu allows you to set the corrections to be applied to analog inputs to compensate the offsets due to cabling and sensor positioning.

I/O STATUS sub menu allows you to view the controller physical inputs and outputs.

2.3.3.8 Installation Menu

The **INSTALLATION MENU** is a level 3 menu. Enter the installation level (or higher) password in order to display/modify the parameters contained in this branch.

The Installation operator menu contains all the parameters concerned with the configuration of functionalities (alarms, settings, logic, rotation type, and so on).

Sub menus:

CONTROL sub menu allows you to set the parameters related to the lateral band and zero energy band temperature control of compressors.

COMPRESSOR sub menu allows you to set the parameters related to the management of devices such as:

- rotation
- timings
- maximum number of start-ups

CONDENSOR sub menu allows you to set the parameters related to the control of condensation pressure, through the fans.

DEFROSTING sub menu allows you to set the parameters related to the activation and the duration of heat pump defrosting.

PUMP sub menu allows you to set the parameters related to the operation and protection of pumps.

ANTI-FREEZE sub menu allows you to set the parameters related to the thermal control of heating and control of the anti-frost alarm.

PROTECTION DEVICES sub menu contains all the parameters related to alarms and the management of safety devices which protect the refrigerating circuit. Few of these functionalities are:

- activations
- reporting delays
- type of resetting

VARIOUS PARAMETERS sub menu contains general parameters related to the management of Modbus communications, transducer full-scale values and other configurable activations.

From the **DEFAULT PARAMETER** sub menu, you can restore default values of all the parameters of the application and save or download from the Parameter key. This menu is only accessible when the device is off.

2.3.3.9 Configuration Menu

The **CONFIGURATION MENU** is a level 4 menu. Enter the configuration level password in order to display/modify the parameters contained in this branch.

Note: This level is accessible only with the machine in off mode.

The **CONFIGURATION MENU** contains the following:

- configuration parameters which determine the operation mode of the machine and the functionalities that are to be enabled or disabled.
- machine configuration wizard that sets the number of circuits, compressors, fans, and protection devices that are to be used.

Once the configuration is complete, a summary page is displayed showing the configured relays and digital inputs with an indication of any need to use an expansion.

The **HARDWARE** menu allows you to configure the type of sensors for analog inputs.

2.3.3.10 RTC Menu

This menu contains Real Time Clock functionality of the system.

2.3.3.11 Alarms Menu

This menu allows you to view and acknowledge the alarms.

The **Show ALARMS** sub menu shows you the active alarms. Each time you press the DOWN button, the next active alarm is shown. If no alarm is present, the message **NO ALARMS** is displayed.

The alarm can be acknowledged by holding down the ENTER button for 2 seconds when the alarm condition is no more active.

The Alarm History page shows the latest alarm. To view the preceding alarm, press ENTER button. You can repeat this till the first alarm is displayed. The history is visible in a circular manner.

By pressing the ESC button or after 60 seconds of no button activity, the main page is displayed.

2.3.3.12 Project and Firmware Versions

To view the project and firmware versions, hold down the UP and DOWN buttons simultaneously for about 2 seconds. Then press the ENTER button on the **InFo** label.

Information on the project and controller firmware versions is displayed sequentially:

Project Number <-> Project Version <-> Project Revision <->

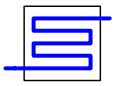
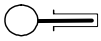
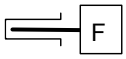
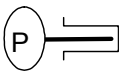
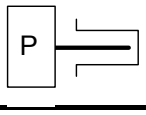
Firmware Number <-> Firmware Version <-> Firmware Revision <->

To view this information, use the UP and DOWN buttons. To return to the application pages, press ESC button.

3 Applications

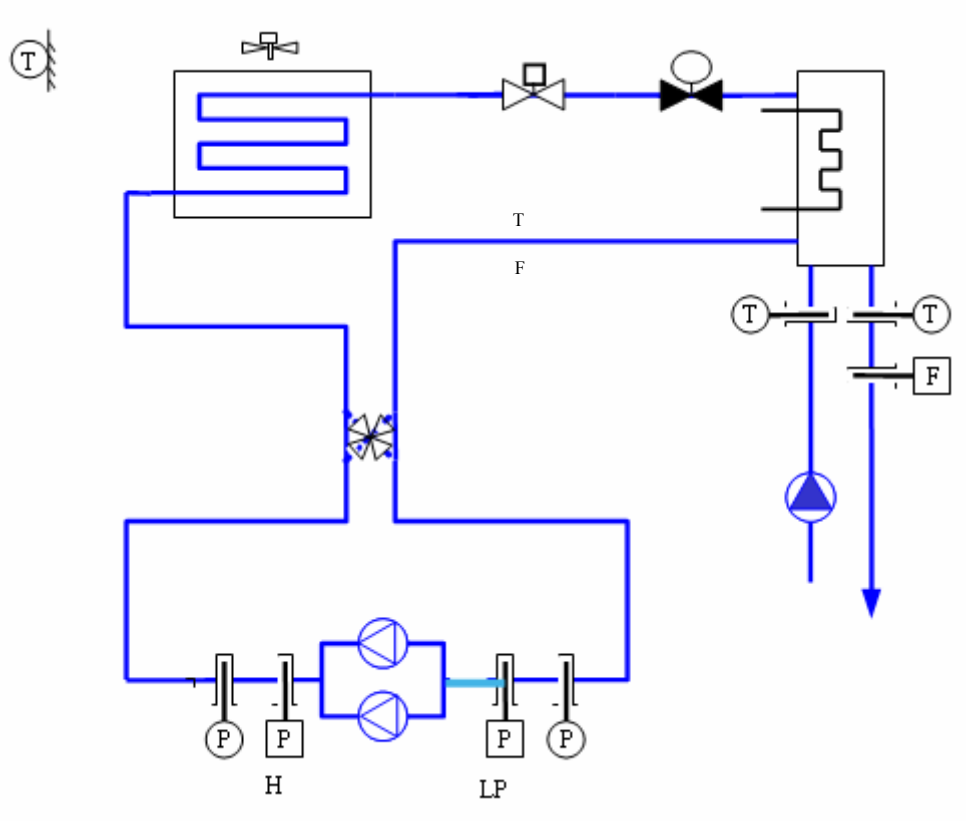
The managed machines are described below with their respective input and output assignments.

Machine functional diagram symbols description:

Symbol	Description
	**External air temperature**
	**Air cooled condenser fan**
	**Liquid line electric valve**
	**Expansion valve**
	**Evaporator**
	**Condenser**
	**Water temperature sensor**
	**Water Flow switch**
	**Water circulating pump**
	**Compressor**
	**4 way-valve**
	**Refrigerant pressure sensor**
	**Refrigerant pressure switch**

3.1 Air-Single-Circuit Air-to-Water Chiller or Chiller-HP Units I/O Configuration

3.1.1 Machine Functional Diagram



3.1.2 I/O Configuration

Implementing I/O configuration through controller parameters:

Single-circuit air-to-water units (*PG01 = 1*)

Program modifications in a controller that is in operation can have serious consequences to the operation of a machine or process. Only those who understand the implications in the intended modifications, and who understand the consequences of those modifications on the machine or process should attempt to use this function. Programming a controller in operation can present hazards to both equipment and personnel.

When the machine type is changed (by modifying parameter *PG00* or *PG01*), it is necessary to remove power from the controller and then reapply power to the controller. This enables the unit to reconfigure itself correctly.

CAUTION

LOSS OF CONFIGURATION

- Thoroughly identify and understand all implications and consequences of program modifications before attempting them with a controller in a live application.
- Remove power from the controller for at least 3 seconds after modifying machine configuration parameters.

Failure to follow these instructions can result in equipment damage.

		CHILLER AIR WATER **PG00 = 1**	**CHILLER + HP AIR WATER** **PG00 = 2**
Board	**Terminal**	**Analog Inputs**	
Controller	AI 1 (4…20 mA, 0…5 V, 0…10 V)	HP1 pressure sensor	HP1 pressure sensor
	AI 2 (4…20 mA, 0…5 V, 0…10 V)	LP1 pressure sensor	LP1 pressure sensor
	AI 3 (NTC)	Circ#1 Evap Leaving Temp	Circ#1 Evap Leaving Temp
	AI 4 (NTC)	Evap Entering Temp	Evap Entering Temp
	AI 5 (NTC)	Outdoor Air Temp	Outdoor Air Temp
Board	**Terminal**	**Digital Inputs**	
Controller	DI 1 (NO, NC)	Comp1 alarm #1	Comp1 alarm #1
	DI 2 (NO, NC)	Comp2 alarm #1	Comp2 alarm #1
	DI 3 (NO, NC)	HP alarm #1	HP alarm #1
	DI 4 (NO, NC)	LP alarm #1/HW Fan VSD #1 alarm	LP alarm #1/HW Fan VSD #1 alarm
	DI 5 (NO, NC)	Evaporator flow switch	Evaporator flow switch
	DI 6 (NO, NC)	-	Cooling/Heating
	DI 7 (NO, NC)	Remote start-stop	Remote start-stop

Board	Terminal	Digital Outputs	
Controller	DO 1	Comp1 #1	Comp1 #1
	DO 2	Comp2 #1	Comp2 #1
	DO 3 (NO, NC)	-	4 way inverter valve #1
	DO 4	Liquid line #1 / Evaporator pump #2	Liquid line #1 / Evaporator pump #2
	DO 5	Heater #1	Heater #1
	DO 6	HW Fan VSD #1	HW Fan VSD #1
	DO 7	Evaporator pump #1	Evaporator pump #1
	DO 8 (NO, NC)	General alarm	General alarm
Board	**Terminal**	**Analog Outputs**	
Controller	FAN+/FAN- (PWM*)	Fan	Fan
	AO 1 (0...10 V)	-	-
	AO 2 (0...10 V)	HW Fan Drive #1	HW Fan Drive #1

By selecting the above units, the default values for the parameters *PC11 = 1* and *HC07 = 1* are automatically set. Refer to *Parameters List,* page *38*.

Note: A value 0 is set to all the input/output position parameters not specified in the above configuration.

*Limitation for PWM Fan output:

- The controller must be powered by an alternating current supply. The controller powering phase must be the same as the one that supplies the fan module.
- PWM output can be used only with TM168EFAN device.

PGO2 must be set to 0 in case no expansion I/O is used.

CAUTION

INOPERABLE EQUIPMENT

Use the same power line circuit for both the controller and the single phase fan driver as described in the related documentation.

Failure to follow these instructions can result in equipment damage.

CONFIGURATION MENU:

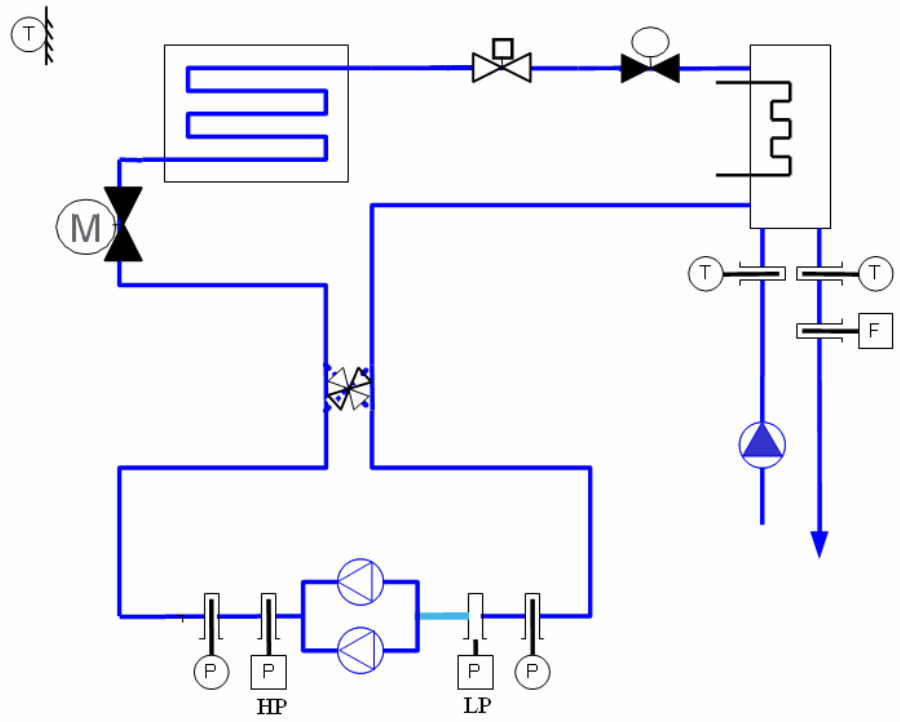
MACHINE CONFIGURATION sub menu indicates:

- the number of compressors in *PG03* (maximum 2). (Default value: 2)
- the number of pumps in *PG09* (maximum 2). (Default value: 1)

Also see the *Generic Start-up*, page *38*.

3.2 Water-to-Water Single-Circuit Chiller Units + Heat Pump

3.2.1 Machine Functional Diagram



3.2.2 I/O Configuration

Implementing I/O configuration through controller parameters:

Single-circuit water-to-water units (*PG01 =1*)

Program modifications in a controller that is in operation can have serious consequences to the operation of a machine or process. Only those who understand the implications in the intended modifications, and who understand the consequences of those modifications on the machine or process should attempt to use this function. Programming a controller in operation can present hazards to both equipment and personnel.

When the machine type is changed (by modifying parameter *PG00* or *PG01*), it is necessary to remove power from the controller and then reapply power to the controller. This enables the unit to reconfigure itself correctly.

CAUTION

LOSS OF CONFIGURATION

- Thoroughly identify and understand all implications and consequences of program modifications before attempting them with a controller in a live application.
- Remove power from the controller for at least 3 seconds after modifying machine configuration parameters.

Failure to follow these instructions can result in equipment damage.

		CHILLER AIR WATER PG00 = 3	CHILLER + HP AIR WATER PG00 = 4
Board	**Terminal**	**Analog Inputs**	
Controller	AI 1 (4…20 mA, 0…5 V, 0…10 V)	HP1 pressure sensor	HP1 pressure sensor
	AI 2 (4…20 mA, 0…5 V, 0…10 V)	LP1 pressure sensor	LP1 pressure sensor
	AI 3 (NTC)	Circ#1 Evap Leaving Temp	Circ#1 Evap Leaving Temp
	AI 4 (NTC)	Evap Entering Temp	Evap Entering Temp
	AI 5 (NTC)	Outdoor Air Temp	Outdoor Air Temp
Board	**Terminal**	**Digital Inputs**	
Controller	DI 1 (NO, NC)	Comp1 alarm #1	Comp1 alarm #1
	DI 2 (NO, NC)	Comp2 alarm #1	Comp2 alarm #1
	DI 3 (NO, NC)	HP alarm #1	HP alarm #1
	DI 4 (NO, NC)	LP alarm #1	LP alarm #1
	DI 5 (NO, NC)	Evaporator flow switch	Evaporator flow switch
	DI 6 (NO, NC)	-	Cooling/Heating
	DI 7 (NO, NC)	Remote start-stop	Remote start-stop
Board	**Terminal**	**Digital Outputs**	
Controller	DO 1	Comp1 #1	Comp1 #1
	DO 2	Comp2 #1	Comp2 #1
	DO 3 (NO, NC)	-	4 way inverter valve #1
	DO 4	Liquid line #1 / Evaporator pump #2	Liquid line #1 / Evaporator pump #2
	DO 5	Heater #1	Heater #1
	DO 6	-	-
	DO 7	Evaporator pump #1	Evaporator pump #1
	DO 8 (NO, NC)	General alarm	General alarm
Board	**Terminal**	**Analog Outputs**	
Controller	FAN+/FAN- (PWM)	-	-
	AO 1 (0...10 V)	Condensor valve #1	Condensor valve #1
	AO 2 (0...10 V)	-	-

By selecting the above units, the default values for the parameters *PC11 = 1* and *HC07 = 1* are automatically set. Refer to *Parameters List*, page *38*.

Note: A value 0 is set for all input/output position parameters not specified in the above configuration.

PGO2 must be set to 0 in case no expansion I/O is used.

CONFIGURATION MENU:

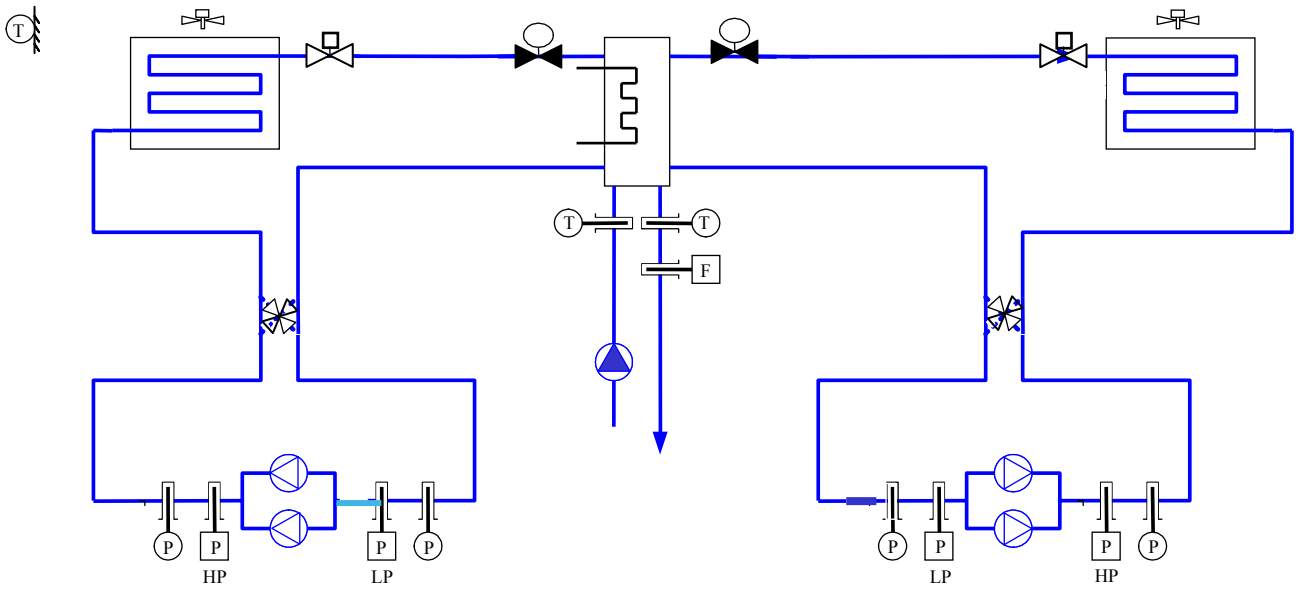
MACHINE CONFIGURATION sub menu indicates:

- the number of compressors in PG03 (maximum 2). (Default value: 2)
- the number of pumps in PG09 (maximum 2). (Default value: 1)

Also see the *Generic Start-up*, page *38*.

3.3 Air-to-Water Twin-Circuit Chiller Units + Heat Pump

3.3.1 Machine Functional Diagram



3.3.2 I/O Configuration Using TM168D23 and TM168E17

Implementing I/O configuration through controller parameters:

Twin-circuit air-to-water units (*PG01 = 2*)

Program modifications in a controller that is in operation can have serious consequences to the operation of a machine or process. Only those who understand the implications in the intended modifications, and who understand the consequences of those modifications on the machine or process should attempt to use this function. Programming a controller in operation can present hazards to both equipment and personnel.

When the machine type is changed (by modifying parameter *PG00* or *PG01*), it is necessary to remove power from the controller and then reapply power to the controller. This enables the unit to reconfigure itself correctly.

CAUTION

LOSS OF CONFIGURATION

- Thoroughly identify and understand all implications and consequences of program modifications, before attempting them with a controller in a live application.
- Remove power from the controller for at least 3 seconds after modifying machine configuration parameters.

Failure to follow these instructions can result in equipment damage.

		CHILLER AIR WATER **PG00 = 1**	**CHILLER + HP AIR WATER** **PG00 = 2**
Board	**Terminal**	**Analog Inputs**	
Controller	AI 1 (4…20 mA, 0…5 V, 0…10 V)	HP1 pressure sensor	HP1 pressure sensor
	AI 2 (4…20 mA, 0…5 V, 0…10 V)	LP1 pressure sensor	LP1 pressure sensor
	AI 3 (NTC)	Circ#1 Evap Leaving Temp	Circ#1 Evap Leaving Temp
	AI 4 (NTC)	Evap Entering Temp	Evap Entering Temp
	AI 5 (NTC)	Outdoor Air Temp	Outdoor Air Temp
Expansion	AI 6 (4…20 mA, 0…5 V, 0…10 V)	HP2 pressure sensor	HP2 pressure sensor
	AI 7 (4…20 mA, 0…5 V, 0…10 V)	LP2 pressure sensor	LP2 pressure sensor
	AI 8 (NTC)	Circ#1 Evap Leaving Temp	Circ#1 Evap Leaving Temp

		CHILLER AIR WATER **PG00 = 1**	**CHILLER + HP AIR WATER** **PG00 = 2**
Board	**Terminal**	**Digital Inputs**	
Controller	DI 1 (NO, NC)	Comp1 alarm #1	Comp1 alarm #1
	DI 2 (NO, NC)	Comp2 alarm #1	Comp2 alarm #1
	DI 3 (NO, NC)	HP alarm #1	HP alarm #1
	DI 4 (NO, NC)	LP alarm #1/HW Fan VSD #1 alarm	LP alarm #1/HW Fan VSD #1 alarm
	DI 5 (NO, NC)	Evaporator flow switch	Evaporator flow switch
	DI 6 (NO, NC)	-	Cooling/Heating
	DI 7 (NO, NC)	Remote start-stop	Remote start-stop
Expansion	DI 1 (NO, NC)	Comp1 alarm #2	Comp1 alarm #2
	DI 2 (NO, NC)	Comp2 alarm #2	Comp2 alarm #2
	DI 3 (NO, NC)	HP alarm #2	HP alarm #2
	DI 4 (NO, NC)	LP alarm #2/HW Fan VSD #2 alarm	LP alarm #2/HW Fan VSD #2 alarm
	DI 5 (NO, NC)	Common alarm input	Common alarm input
Board	**Terminal**	**Digital Outputs**	
Controller	DO 1	Comp1 #1	Comp1 #1
	DO 2	Comp2 #1	Comp2 #1
	DO 3 (NO, NC)	-	4 way inverter valve #1
	DO 4	Liquid line #1/Evaporator pump #2	Liquid line #1/Evaporator pump #2
	DO 5	Heater #1	Heater #1
	DO 6	HW Fan VSD #1	HW Fan VSD #1
	DO 7	Evaporator pump #1	Evaporator pump #1
	DO 8 (NO, NC)	General alarm	General alarm
Expansion	DO 1	Comp1 #2	Comp1 #2
	DO 2	Comp2 #2	Comp2 #2
	DO 3 (NO, NC)	-	4 way inverter valve #2
	DO 4	Liquid line #2	Liquid line #2
	DO 5	Heater #2	Heater #2
	DO 6	HW Fan VSD #2	HW Fan VSD #2

		CHILLER AIR WATER PG00 = 1	CHILLER + HP AIR WATER PG00 = 2
Board	**Terminal**	**Analog Outputs**	
Controller	FAN+/FAN- (PWM)	Fan1	Fan1
	AO 1 (0...10 V)	-	-
	AO 2 (0...10 V)	HW Fan Drive #1	HW Fan Drive #1
Expansion	FAN+/FAN- (PWM*)	Fan2	Fan2
	AO 1 (0...10 V)	-	-
	AO 2 (0...10 V)	HW Fan Drive #2	HW Fan Drive #2

By selecting the above units, the default values for the parameters *PC11 = 1* and *HC07 = 1* are automatically set. Refer to *Parameters List*, page *38*.

Note: A value 0 is set for all input/output position parameters not specified in the above configuration.

*Limitation for PWM Fan output:

- The controller must be powered by an alternating current supply. The controller powering phase must be the same one that supplies the fan module.
- PWM output can be used only with TM168EFAN device.

PGO2 must be set to 0 in case expansion I/O is used.

CAUTION

INOPERABLE EQUIPMENT

Use the same power line circuit for both the controller and the single phase fan driver as described in the related documentation.

Failure to follow these instructions can result in equipment damage.

CONFIGURATION MENU:

MACHINE CONFIGURATION sub menu indicates:

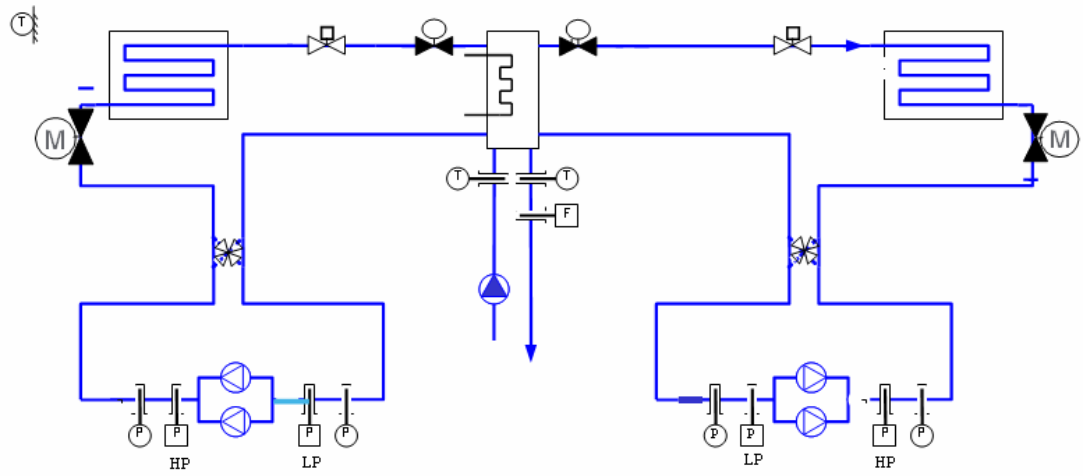
- the number of compressor in PG03 (maximum 2). (Default value: 2)
- the number of pumps in PG09 (maximum 2). (Default value: 1)

For cabling in case of Controller and I/O Expansion Configuration, refer to the *M168 Hardware Guide* and the *Instruction sheet (S1A71258)*.

Also see the *Generic Start-up*, page *38*.

3.4 Water-to-Water Twin-Circuit Chiller Units + Heat Pump

3.4.1 Machine Functional Diagram



3.4.2 I/O Configuration

Implementing I/O configuration through controller parameters:

Twin-circuit water-to-water units (*PG01* = *2*)

Program modifications in a controller that is in operation can have serious consequences to the operation of a machine or process. Only those who understand the implications in the intended modifications, and who understand the consequences of those modifications on the machine or process should attempt to use this function. Programming a controller in operation can present hazards to both equipment and personnel.

When the machine type is changed (by modifying parameter *PG00* or *PG01*), it is necessary to remove power from the controller and then reapply power to the controller. This enables the unit to reconfigure itself correctly.

CAUTION

LOSS OF CONFIGURATION

- Thoroughly identify and understand all implications and consequences of program modifications before attempting them with a controller in a live application.
- Remove power from the controller for at least 3 seconds after modifying machine configuration parameters.

Failure to follow these instructions can result in equipment damage.

		CHILLER AIR WATER PG00 = 3	CHILLER + HP AIR WATER PG00 = 4
Board	**Terminal**	**Analog Inputs**	
Controller	AI 1 (4…20 mA, 0…5 V, 0…10 V)	HP1 pressure sensor	HP1 pressure sensor
	AI 2 (4…20 mA, 0…5 V, 0…10 V)	LP1 pressure sensor	LP1 pressure sensor
	AI 3 (NTC)	Circ#1 Evap Leaving Temp	Circ#1 Evap Leaving Temp
	AI 4 (NTC)	Evap Entering Temp	Evap Entering Temp
	AI 5 (NTC)	Outdoor Air Temp	Outdoor Air Temp
Expansion	AI 1 (4…20 mA, 0…5 V, 0…10 V)	HP2 pressure sensor	HP2 pressure sensor
	AI 2 (4…20 mA, 0…5 V, 0…10 V)	LP2 pressure sensor	LP2 pressure sensor
	AI 3 (NTC)	Circ#2 Evap Leaving Temp	Circ#2 Evap Leaving Temp
Board	**Terminal**	**Digital Inputs**	
Controller	DI 1 (NO, NC)	Comp1 alarm #1	Comp1 alarm #1
	DI 2 (NO, NC)	Comp2 alarm #1	Comp2 alarm #1
	DI 3 (NO, NC)	HP alarm #1	HP alarm #1
	DI 4 (NO, NC)	LP alarm #1	LP alarm #1
	DI 5 (NO, NC)	Evaporator flow switch	Evaporator flow switch
	DI 6 (NO, NC)	-	Cooling/Heating
	DI 7 (NO, NC)	Remote start-stop	Remote start-stop
Expansion	DI 1 (NO, NC)	Comp1 alarm #2	Comp1 alarm #2
	DI 2 (NO, NC)	Comp2 alarm #2	Comp2 alarm #2
	DI 3 (NO, NC)	HP alarm #2	HP alarm #2
	DI 4 (NO, NC)	LP alarm #2	LP alarm #2
	DI 5 (NO, NC)	Common alarm input	Common alarm input

		CHILLER AIR WATER **PG00 = 1**	**CHILLER + HP AIR WATER** **PG00 = 2**
Board	**Terminal**	**Digital Outputs**	
Controller	DO 1	Comp1 #1	Comp1 #1
	DO 2	Comp2 #1	Comp2 #1
	DO 3 (NO, NC)	-	4 way inverter valve #1
	DO 4	Liquid line #1/Evaporator pump #2	Liquid line #1/Evaporator pump #2
	DO 5	Heater #1	Heater #1
	DO 6	-	-
	DO 7	Evaporator pump #1	Evaporator pump #1
	DO 8 (NO, NC)	General alarm	General alarm
Expansion	DO 1	Comp1 #2	Comp1 #2
	DO 2	Comp2 #2	Comp2 #2
	DO 3 (NO, NC)	-	4 way inverter valve #2
	DO 4	Liquid line #2	Liquid line #2
	DO 5	Heater #2	Heater #2
	DO 6	-	-
Board	**Terminal**	**Analog Outputs**	
Controller	FAN+/FAN- (PWM)	-	-
	AO 1 (0...10 V)	Condensor valve #1	Condensor valve #1
	AO 2 (0...10 V)	-	-
Expansion	FAN+/FAN- (PWM*)	-	-
	AO 1 (0...10 V)	Condensor valve #2	Condensor valve #2
	AO 2 (0...10 V)	-	-

By selecting these units, default values for the parameters *PC11 = 1* and *HC07 = 1* are automatically set. Refer to *Parameters List*, page *38*.

A value 0 is set for all input/output position parameters not specified in this configuration.

PGO2 must be set to 0 in case expansion IO is used.

CONFIGURATION MENU:

MACHINE CONFIGURATION sub menu indicates:

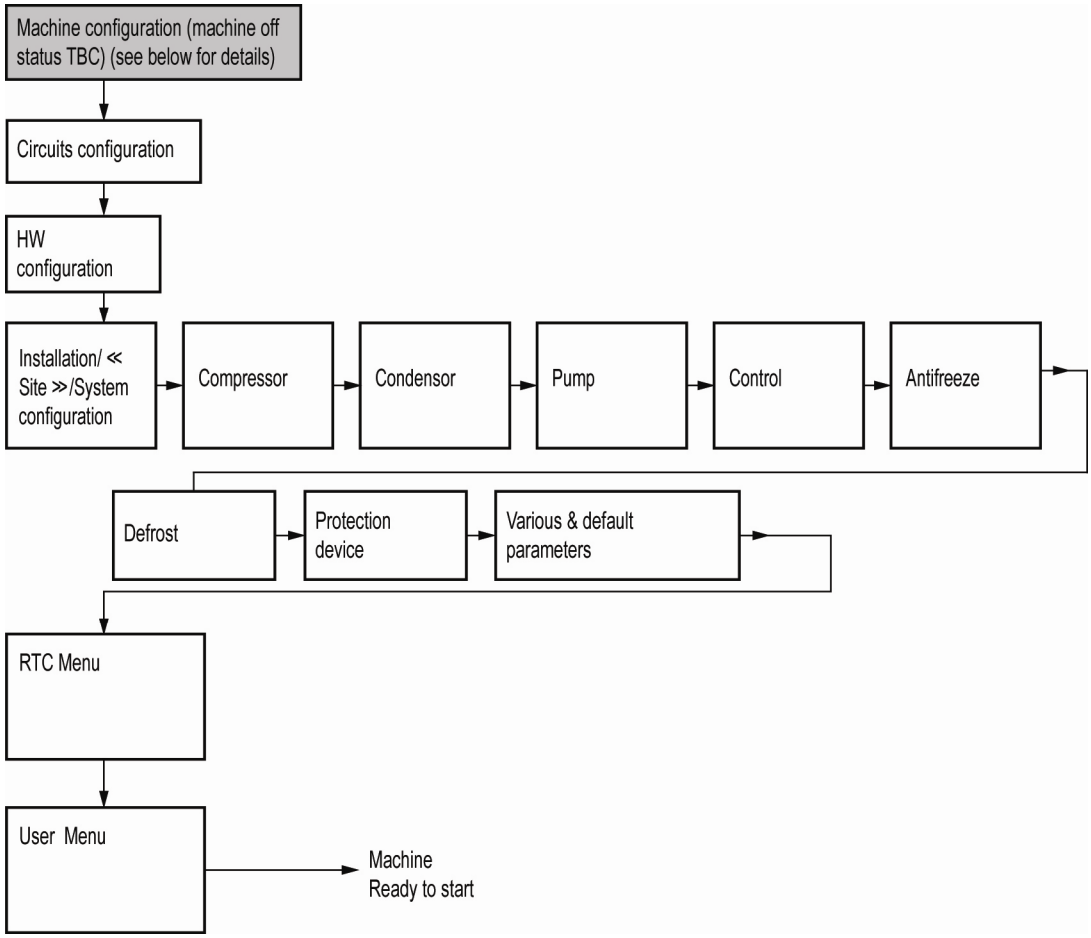
- the number of compressor in PG03 (maximum 2). (Default value: 2)
- the number of pumps in PG09 (maximum 2). (Default value: 1)

For cabling in case of Controller + I/O Expansion Configuration, refer to the *M168 Hardware Guide* and the *Instruction sheet (S1A7125)*.

Also see the chapter below.

4 Generic Start-up

4.1 Generic Start-up Overview



4.2 Generic Start-up Detailed Menus

4.2.1 Parameters List

The parameters managed by the application are listed below. Each parameter is accompanied by a brief description, the range of admissible values, units of measure, the assigned default value, and the menu containing the parameter.

Menus are structured on the basis of the following logic:

1. OR : RTC menu
2. UT : User menu

3. MA : Maintenance menu
   - MA-F : Maintenance menu – operating branch
   - MA-M : Maintenance menu – manual branch
   - MA-CA : Maintenance menu – calibration branch
   - MA-IO : Maintenance menu – input/output branch
4. IS : Installation menu
   - IS-R : Installation menu – control branch
   - IS-C : Installation menu – compressor branch
   - IS-F : Installation menu – condenser fan branch
   - IS-D: Installation menu – defrosting branch
   - IS-P: Installation menu – pump branch
   - IS-A: Installation menu – anti-freeze branch
   - IS-S: Installation menu – protection device branch
   - IS-V: Installation menu – various and default parameter branch
5. CO: Configuration menu
   - CO-W: Configuration menu – Configuration parameters (Plant branch)
   - CO-HW: Configuration menu – HW Configuration parameters

4.2.1.1 Machines and Circuits Configuration Parameters

The basic features of dual refrigerant circuits (*PG01 = 2*) are defined below:

1. Single or dual condensing units (parameter *PG11*)

The effect of this configuration is described below for machines with a single fan:

- In condenser, the control is based on the highest value of the condenser pressure/temperature.
- In heat pump units during defrost control, it is not possible to carry out separate defrosting of each circuit.

2. In a Zero Energy Band control (*PC11 = 1*), the compressor control is based on the average value of the two evaporate leaving temperature sensors. You can select the distribution of chilling steps, through the parameter PC02, for controlling the 2 compressor circuits.
   a. PC02 = 0, the two circuits are balanced.
   b. PC02 = 1, saturates the steps of one circuit before requesting the other.

3. If no compressor is running, the two evaporate temperature sensors will decide which compressor circuit must be started first.
   c. If mode = Cool (chiller), the circuit with the highest evaporate leaving temperature starts first.
   d. If mode = Heat (heat pump), the circuit with the lowest evaporate leaving temperature starts first.
4. Evaporating single or separated (*PG12*)

If evaporating single (*PG12* = *1*), the management, heating, and alarm of anti-frost are single. The temperature control is based on the maximum temperature of the evaporator leaving and enter temperature values.

Level 4	**Configuration Menu**				
Submenu	**Configuration Parameters**				
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Menu**
PG00	It sets the unit type: 1: Air-to-water chiller 2: Air-to-water chiller + heat pump 3: Water-to-water chiller 4: Water-to-water chiller + heat pump	1	1	4	CO-W
PG01	Number of circuits	2	1	2	CO-W
PG02	It enables the presence of the IO expansion.	Yes (1)	No (0)	Yes (1)	CO-W
PG03	It sets the number of compressors per circuit.	2	1	2	CO-W
PG04	Enable Real Time Clock-RTC	1	0	1	CO-W
PG09	It sets the number of pumps.	1	1	2	CO-W
PG11	It enables unique condensing: 0: No (2 fans) 1: Yes (1 fan)	No (0)	No (0)	Yes (1)	CO-W
PG12	It enables single evaporating: 0: No (2 evaporator) 1: Yes (1 evaporator)	No (0)	No (0)	Yes (1)	CO-W
PSd4	Constructor level password	0	-999	9999	CO

4.2.1.2 H/W Configuration Parameters

Level 4	Configuration Menu				
Submenu	Hardware Configuration				
Code	Parameter Description	Default	Min.	Max.	Menu
HC01	Input type low pressure sensor #1 1: Enabled with sensor 4...20 mA 2: Enabled with sensor 0...5 V 3: Enabled with sensor 0...10 V	1	1	3	CO-HW
HC02	Input type high pressure sensor #1 1: Enabled with sensor 4...20 mA 2: Enabled with sensor 0...5 V 3: Enabled with sensor 0...10 V	1	1	3	CO-HW
HC03	Input type low pressure sensor #2 1: Enabled with sensor 4...20 mA 2: Enabled with sensor 0...5 V 3: Enabled with sensor 0...10 V	1	1	3	CO-HW
HC04	Input type high pressure sensor #2 1: Enabled with sensor 4...20 mA 2: Enabled with sensor 0...5 V 3: Enabled with sensor 0...10 V	1	1	3	CO-HW
HC05	Select function of Digital Output 4 (also expansion) 0: liquid line 1 1: evaporator pump 2	0	0	1	CO-HW
HC06	Set position of the analog output for condensation	2	1	3	CO-HW
HC07	Select function of Digital output 4 (also expansion) 0: Low pressure alarm 1: HW fan VSD alarm	1	0	1	CO-HW

When the machine type is changed (by modifying parameter *PG00* or *PG01*), it is necessary to remove power from the controller and then reapply power to the controller. This enables the unit to reconfigure itself correctly.

CAUTION

LOSS OF CONFIGURATION

- Thoroughly identify and understand all implications and consequences of program modifications before attempting them with a controller in a live application.
- Remove power from the controller for at least 3 seconds after modifying machine configuration parameters.

Failure to follow these instructions can result in equipment damage.

4.2.1.3 Installation- Compressors Configuration Parameters

Level 3	**Installation Menu**						
Submenu	**Compressor**						
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**	**Notes**
PC01	Rotation type used for compressor management: 0: FIFO 1: LIFO 2: FIFO + hours 3: LIFO + hours	0	0	3	-	IS-C	-
PC02	Enabling mode of compressors in the two circuits: 0: Circuit balancing 1: Circuit saturation	0	0	1	-	IS-C	Only on twin circuits
PC04	Minimum time for which the compressor must remain on, even if a shutdown has been requested.	20	0	999	Sec.	IS-C	-
PC05	Minimum time for which the compressor must remain off, even if a start-up has been requested.	120	0	999	Sec.	IS-C	-
PC06	Minimum time which must elapse between two start-ups of the same compressor.	360	0	999	Sec.	IS-C	-
PC07	Minimum time which must elapse between start-ups of two different compressors.	10	0	999	Sec.	IS-C	-
PC08	Minimum time which must elapse between shutdowns of two different compressors.	20	0	999	Sec.	IS-C	-
PC09	Maximum number of start-ups for every hour (only for adaptive control).	8	4	12	-	IS-C	-
PC10	Number of compressors per circuit which will be forced in case of a regulating-sensor alarm.	1	0	PG03	-	IS-C	-

4.2.1.4 Installation- Condenser Configuration Parameters

Level 3	Installation Menu						
Submenu	**Condenser**						
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**	**Notes**
PF01	Condenser control type	0	0	1	-	IS-F	0 = Modulating control 1 = Single stage control
PF02	Enables fan control only if at least one compressor is on.	No (0)	No (0)	Yes (1)	-	IS-F	-
PF03	Sets whether or not fans must switch off during defrosting cycles.	No (0)	No (0)	Yes (1)	-	IS-F	-
PF07	Minimum time which must elapse between the start-ups of two different fans.	10	0	999	Sec.	IS-F	-
PF08	Minimum time which must elapse between the shutdowns of two different fans.	20	0	999	Sec.	IS-F	-
PF09	Forces the fans if there is a condensing sensor alarm	No (0)	No (0)	Yes (1)		IS-F	With PF01 = 0 (Single stage Control)
PF10	Forces the fans if there is a condensing sensor alarm	0.0	0.0	100.0	%	IS-F	With PF01 = 1 (Modulating Control)
PF11	Condensing control set point for summer operation (chiller)	20.0	5.0	45.0	Bar	IS-F	-
PF12	Linear control band for condensation in summer operation (chiller)	12.0	0.1	15.0	Bar	IS-F	-
PF13	Enabling of forcing to maximum	Yes (1)	No (0)	Yes (1)		IS-F	-
PF14	Maximum forcing enabling set point in summer operation (chiller)	26.0	15.0	45.0	Bar	IS-F	-
PF15	Disabling differential for maximum forcing in summer operation (chiller)	2.0	0.1	5.0	Bar	IS-F	-
PF16	Integral time for control of valves (cooling)	0	0	999	Sec	IS-F	If PF16 = 0 integral action not present
PF21	Condensing control set point in winter operation (heat pump)	9.0	0.5	15.0	Bar	IS-F	-

Level 3	Installation Menu						
Submenu	**Condenser**						
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**	**Notes**
PF22	Linear control band for condensation in winter operation (heat pump)	2.0	0.1	15.0	Bar	IS-F	-
PF24	Maximum forcing activation set point in winter operation (heat pump, inverter)	3.2	0.5	20.0	Bar	IS-F	-
PF25	Maximum forcing de-activation differential in winter operation (heat pump, inverter)	0.5	0.1	5.0	Bar	IS-F	-
PF26	Integral time for control of valves (heat pump)	0	0	999	Sec	IS-F	If PF26 = 0 integral action not present
PF27	Minimum value for condenser forcing (inverter)	0.0	0.0	100.0	%	IS-F	-
PF28	Speed-up time at fan start-up (inverter)	4	0	999	Sec.	IS-F	-
PF31	Lower limit for condensing linear control (inverter)	30.0	0	PF32	%	IS-F	-
PF32	Upper limit for condensing linear control (inverter)	100.0	PF31	100.0	%	IS-F	-
PF33	Enabling of control under the minimum condensing limit (inverter)	Yes (1)	No (0)	Yes (1)	-	IS-F	-
PF34	Switch-off differential under the minimum condensing limit (inverter)	2.0	0.0	5.0	Bar	IS-F	-
PF41	Value x1 of fan linearization table	25.0	0.0	PF42	%	IS-F	-
PF42	Value x2 of fan linearization table	50.0	PF41	PF43	%	IS-F	-
PF43	Value x3 of fan linearization table	75.0	PF42	100.0	%	IS-F	-
PF45	Value y1 of fan linearization table	25.0	0.0	PF46	%	IS-F	-
PF46	Value y2 of fan linearization table	50.0	PF45	PF47	%	IS-F	-
PF47	Value y3 of fan linearization table	75.0	PF46	100.0	%	IS-F	-

4.2.1.5 Installation- Pump Configuration Parameters

Level 3	Installation Menu					
Submenu	Pumps					
Code	Parameter Description	Default	Min.	Max.	Units	Menu
PP01	Pump operation: 0 = Continuous operation 1 = Operation at thermostat's request 2 = Cyclical operation	0	0	2		IS-P
PP02	on time in cyclical operation	120	1	999	Sec.	IS-P
PP03	off time in cyclical operation	120	1	999	Sec.	IS-P
PP04	Minimum interval which must elapse between pump start-up and first compressor	60	1	999	Sec.	IS-P
PP05	Minimum interval which must elapse between circuit shutdown and pump	60	1	999	Sec.	IS-P
PP07	Shutdown of pump during defrosting	No (1)	No (0)	Yes (1)		IS-P
PP08	Difference in operating hours between the two pumps, requiring their being swapped.	4	1	240	Hours	IS-P
PP09	Pump operating time at low water flow (flow alarm)	15	0	999	Sec.	IS-P
PP10	Pump operating time at low temperature of outflow water (anti-frost alarm)	15	0	999	Sec.	IS-P

4.2.1.6 Installation - Control Configuration Parameters

Level 3	Installation Menu					
Submenu	Control					
Code	Parameter Description	Default	Min.	Max.	Units	Menu
PC11	It sets the control type for compressor management: 0: Lateral band 1: Zero energy band	1	0	1	-	IS-R
PC12	Proportional band for lateral-band control of compressors	2.5	1.0	20.0	°C	IS-R
PC14	Zone value for neutral-zone control of compressors	3.0	PC15	PC16	°C	IS-R
PC15	Minimum value of compressor zero energy band	1.0	0.1	10.0	°C	IS-R
PC16	Maximum value of compressor zero energy band	5.0	0.1	10.0	°C	IS-R
PC17	Enabling/release time for subsequent compressor step outside the zero energy band	20	0	999	Sec.	IS-R

Level 3	Installation Menu					
Submenu	**Control**					
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**
PC18	Enabling for auto-adaptive control of the compressors' zero energy band	No (0)	No (0)	Yes (1)	-	IS-R
PC21	Minimum value of summer set point (chiller)	5.0	-15.0	SPC1	°C	IS-R
PC22	Maximum value of summer set point (chiller)	20.0	SPC1	23.0	°C	IS-R
PC23	Minimum value of winter set point (heat pump)	30.0	23.0	SPH1	°C	IS-R
PC24	Maximum value of winter set point (heat pump)	44.0	SPH1	70.0	°C	IS-R
PC31	Power limiting for summer	50	0	100	%	IS-R
PC32	Power limiting for winter	50	0	100	%	IS-R
PC35	Enabling of forced shutdown of compressors	No (0)	No (0)	Yes (1)		IS-R
PC36	Summer forced shutdown set point	3.5	-30.0	23.0	°C	IS-R
PC37	Winter forced shutdown set point	52.0	26.0	75.0	°C	IS-R
PC41	Enabling of pump-down 0 : No 1 : Yes, with timing 2 : Yes, with relative threshold	0	0	2	-	IS-R
PC42	Compressor shutdown time in pump-down	5	0	240	Sec.	IS-R
PC43	Relative threshold for pump-down disabling	1.5	0.0	5.0	Bar	IS-R
PC45	Enabling of high-temperature pressure-switch control (chiller)	No (0)	No (0)	Yes (1)	-	IS-R
PC46	Pressure set point for high-temperature pressure-switch control	27.0	0.0	45.0	Bar	IS-R
PC47	Pressure differential for high-temperature pressure-switch control	2.0	0.0	5.0	Bar	IS-R
PC48	External high temperature threshold for pressure-switch control	12.0	-30.0	23.0	°C	IS-R
PC49	Minimum time for maintaining pressure-switch partialization	10	0	99	Min.	IS-R
PC50	Enabling of low-temperature pressure-switch control (heat pump)	No (0)	No (0)	Yes (1)	-	IS-R

Level 3	Installation Menu					
Submenu	**Control**					
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**
PC51	Pressure setpoint for low-temperature pressure-switch control	3.2	0.0	10.0	Bar	IS-R
PC52	Pressure differential for low-temperature pressure-switch control	2.0	0.0	10.0	Bar	IS-R
PC53	External low temperature threshold for pressure-switch control	-5.0	-10.0	5.0	°C	IS-R
PC54	Outlet water high-temperature threshold for pressure-switch control	48.0	30.0	70.0	°C	IS-R
PC55	Delay for partialization from low pressure alarm	900	0	999	Sec.	IS-R
PC61	Summer commutation set point	20.0	PC62	70.0	°C	IS-R
PC62	Winter commutation set point	10.0	0.0	PC61	°C	IS-R
PC64	Maximum dynamic offset compared to summer set point (chiller)	-10.0	-20.0	20.0	°C	IS-R
PC65	Compensation start temperature for dynamic summer set point	30.0	-15.0	PC66	°C	IS-R
PC66	Compensation stop temperature for dynamic summer set point	60.0	PC65	70.0	°C	IS-R
PC67	Maximum dynamic offset compared to winter set point (heat pump)	10.0	-20.0	20.0	°C	IS-R
PC68	Compensation start temperature for dynamic winter set point	0.0	-15.0	PC69	°C	IS-R
PC69	Compensation stop temperature for dynamic winter set point	30.0	PC68	70.0	°C	IS-R
PC70	Function limit management: 0 = Disable 1 = Only heat pump	0	0	1	-	IS-R
PC71	Function limit set point	-7.0	-30.0	30.0	°C	IS-R
PC72	Function limit differential	4.0	0.1	10.0	°C	IS-R

4.2.1.7 Installation- Anti-Freeze Configuration Parameters

Level 3	Installation Menu					
Submenu	Anti-Freeze					
Code	Parameter Description	Default	Min.	Max.	Units	Menu
Pr01	Enabling of anti-frost heating elements	Yes (1)	No (0)	Yes (1)		IS-AF
Pr02	Anti-frost heating element set point	5.0	Pr11	10.0	°C	IS-AF
Pr03	Anti-frost heating element differential	2.0	0.1	10.0	°C	IS-AF
Pr04	Forcing of anti-frost heating elements with inoperative sensor	No (0)	No (0)	Yes (1)		IS-AF
Pr11	Anti-frost alarm threshold	3.0	-30.0	Pr01	°C	IS-AF
Pr12	Anti-frost alarm differential	2.0	0.1	10.0	°C	IS-AF

4.2.1.8 Installation- Defrost Configuration Parameters

Level 3	Installation Menu					
Submenu	Defrost					
Code	Parameter Description	Default	Min.	Max.	Units	Menu
Pd01	Pressure set point at defrosting start	6.0	0.0	Pd02	Bar	IS-D
Pd02	Pressure set point at defrosting stop	12.0	Pd01	45.0	Bar	IS-D
Pd03	Waiting interval at defrosting start	1200	60	Pd23	Sec.	IS-D
Pd05	Maximum duration of defrosting	300	10	600	Sec.	IS-D
Pd06	Duration of dripping	120	0	600	Sec.	IS-D
Pd07	Minimum defrost waiting interval after compressor re-start	60	0	600	Sec.	IS-D
Pd20	Enabling of defrosting cycle compensation	No (0)	No (0)	Yes (1)	-	IS-D
Pd21	Outdoor air temperature set point for defrosting compensation start	5.0	Pd22	70.0	-	IS-D
Pd22	Outdoor air temperature set point for defrosting compensation stop	0.0	-30.0	Pd21	-	IS-D
Pd23	Maximum waiting interval at defrosting stop	3600	Pd03	9600	-	IS-D

4.2.1.9 Installation- Protection Devices Configuration Parameters

Level 3	Installation Menu					
Submenu	Protection Device					
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**M.U.**	**Menu**
PA01	Flow alarm delay from machine start-up	10	1	999	Sec.	IS-S
PA02	Flow alarm by-pass time during normal operation	1	1	999	Sec.	IS-S
PA03	Number of triggered flow alarms with auto-reset before the alarm becomes manual	3	0	9	-	IS-S
PA04	Delay interval for notification of sensor inoperable	10	0	240	Sec.	IS-S
PA05	High-temperature alarm threshold during summer operation (chiller)	30.0	10.0	40.0	°C	IS-S
PA06	Low-temperature alarm threshold during winter operation (heat pump)	15.0	10.0	40.0	°C	IS-S
PA07	Triggering delay for temperature alarm	30	1	999	Sec.	IS-S
PA08	Consequent time for a temperature alarm: 0 = Notification only 1 = Machine stop	0	0	1	Sec.	IS-S
PA09	Reset differential for temperature alarm	0.5	0.1	10.0	°C	IS-S
PA10	Temperature alarm inhibition interval from system start-up	15	0	999	Sec.	IS-S
PA11	Low-pressure alarm threshold during winter operation (heat pump)	3.0	0.1	9.9	Bar	IS-S
PA12	Low-pressure alarm reset differential during winter operation (heat pump)	1.0	0.1	4.0	Bar	IS-S
PA13	Low-pressure alarm by-pass interval from start-up of first compressor	120	0	999	Sec.	IS-S
PA14	Number of triggered low-pressure alarms with auto-reset before the alarm becomes manual	3	0	5	-	IS-S
PA16	Enabling of low-pressure control at start-up and at low temperatures	Yes (1)	No (0)	Yes (1)	-	IS-S
PA17	Low-pressure alarm threshold at start-up and at low temperatures	1.0	0.1	9.9	Bar	IS-S

Level 3	Installation Menu					
Submenu	**Protection Device**					
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**
PA18	Low-pressure alarm reset differential at start-up and at low temperatures	0.5	0.1	4.0	Bar	IS-S
PA19	Control duration at triggering of low-pressure alarm at low temperatures	120	10	PA13	Sec.	IS-S
PA20	Minimum duration of alarm delay for triggering of low-pressure alarm at compressor start-up	240	0	999	Sec.	IS-S
PA21	High-pressure alarm threshold	28.0	0.0	45.0	Bar	IS-S
PA22	High-pressure alarm reset differential	5.0	0.1	30.0	Bar	IS-S
PA25	Enabling of primary exchanger efficiency alarm	No (0)	No (0)	Yes (1)	-	IS-S
PA26	Minimum difference threshold for primary exchanger	2.0	0.1	20.0	°C	IS-S
PA27	By-pass time for primary exchanger efficiency alarm	120	0	999	Sec.	IS-S
PA30	Enable RTC alarm	Yes (1)	No (0)	Yes (1)		IS-S
PA31	It sets the type of reset of RTC alarm restoration 0: Auto – Automatic 1: Manu - Manual	M	A (0)	M (1)	-	IS-S
PA32	Enable common alarm input	Yes (1)	No (0)	Yes (1)	-	IS-S
PA33	Common alarm input delay	30	0	999	Sec.	IS-S
PA34	It sets the type of reset of common alarm input restoration 0: Auto – Automatic 1: Manu - Manual	M	A (0)	M (1)	-	IS-S
PA40	It enables the alarm connected with operating hours of compressors	Yes (1)	No (0)	Yes (1)	-	IS-S
PA41	It sets the triggering delay connected with the compressor thermal alarm	10	0	999	Sec.	IS-S
PA42	It sets the type of reset for the compressor thermal alarm 0: A – Automatic 1: M – Manual	M	A (0)	M (1)	-	IS-S
PA60	It enables the alarm connected with operating hours of pumps	Yes (1)	No (0)	Yes (1)	-	IS-S

Level 3	Installation Menu					
Submenu	**Protection Device**					
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**
PA71	It sets the type of reset of high pressure alarm restoration 0: Auto – Automatic 1: Manu - Manual	M	A (0)	M (1)	-	IS-S
PA80	It enables the alarm connected with operating hours of condensing fans	Yes (1)	No (0)	Yes (1)	-	IS-S
PA81	It sets the triggering delay connected with the condensing fan thermal alarm	10	0	999	Sec.	IS-S
PA82	It sets the type of reset for the condensing fan thermal alarm 0: A – Automatic 1: M – Manual	M	A (0)	M (1)	-	IS-S
PA99	Notification delay interval for expansion alarm	5	0	999	Sec.	IS-S

4.2.1.10 Installation- Various and Default Parameters

Level 3	Installation Menu						
Submenu	**Various Parameters**						
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**	**Notes**
PH01	It sets the minimum full-scale value for the condensing sensor.	0.0	-10.0	PH02	Bar	IS-V	-
PH02	It sets the maximum full-scale value for the condensing sensor.	30.0	PH01	45.0	Bar	IS-V	-
PH04	It enables the start-up/shutdown of the machine by the schedule	No (0)	No (0)	Yes (1)	-	IS-V	-
PH05	It enables the start-up/shutdown of the machine by pressing the ESC/Stand-By button.	Yes (1)	No (0)	Yes (1)	-	IS-V	-
PH06	It enables the change of summer/winter operating mode: automatic change-over.	No (0)	No (0)	Yes (1)	-	IS-V	-
PH07	It enables the start-up/shutdown of the machine from a digital input.	No (0)	No (0)	Yes (1)	-	IS-V	-
PH08	It enables the change of summer/winter operating mode from digital input.	No (0)	No (0)	Yes (1)	-	IS-V	-
PH09	It enables the start-up/shutdown of the machine by supervisor.	No (0)	No (0)	Yes (1)	-	IS-V	-
PH10	It enables the change of summer/winter operating mode via supervisor.	No (0)	No (0)	Yes (1)	-	IS-V	-

Level 3	Installation Menu						
Submenu	Various Parameters						
Code	Parameter Description	Default	Min.	Max.	Units	Menu	Notes
PH15	It resets the factory-set parameter defaults.	No (0)	No (0)	Yes (1)	-	IS-V	Wait for the 0 value to be re-read at the end of resetting.
PH16	It sets the logic used for the inverting valve. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)	-	IS-V	-
PH17	It sets the logic of digital inputs used in alarm management. 0: NO – Normally open 1: NC – Normally closed	NC	NO (0)	NC (1)	-	IS-V	-
PH18	It sets the logic of the relay used for alarms. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)	-	IS-V	-
PH19	It sets the logic of the digital input used for the summer/winter commutation. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)	-	IS-V	-
PH20	It sets the logic of the digital input used for flow control. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)	-	IS-V	-
PH21	It sets the enabling of the sensor for entering water temperature detection (incoming).	Yes (1)	No (0)	Yes (1)	-	IS-V	
PH22	It sets the enabling of the sensor for leaving water temperature detection (outgoing) in Circuit # 1.	Yes (1)	No (0)	Yes (1)	-	IS-V	-
PH23	It sets the enabling of the sensor for leaving water temperature detection (outgoing) in Circuit # 2.	Yes (1)	No (0)	Yes (1)	-	IS-V	-
PH24	It sets the enabling of the sensor for outdoor air temperature detection.	No (0)	No (0)	Yes (1)	-	IS-V	-
PH27	It sets the enabling of the dynamic set point function.	No (0)	No (0)	Yes (1)	-	IS-V	-

Level 3	Installation Menu						
Submenu	**Various Parameters**						
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**	**Notes**
PH28	It sets the enabling of the secondary set point function by scheduler.	No (0)	No (0)	Yes (1)	-	IS-V	-
PH30	Cancel alarm history	NO (0)	NO (0)	YES (1)	-	IS-V	Set SI (1) and wait for value NO (0)
PH31	It sets the type of refrigerant used (temperature-pressure conversion). 0: No refrigerant 1: R22 2: R134a 3: R404A 4: R407C 5: R410A 6: R507	3 R404A	0	6	-	IS-V	-
PH32	It sets the temperature measurement unit: 0: ° Celsius 1: ° Fahrenheit	0 (°C)	0	1	-	IS-V	-
PH33	It sets the pressure measurement unit: 0: Bar 1: psi	0 (Bar)	0	1	-	IS-V	-
PH53	It sets the meaning of the Summer and Winter icons. 0: Summer = Cooling (chiller mode) Winter = Heating (heat pump mode) 1: Summer = Heating (heat pump mode) Winter = Cooling (chiller mode)	0	0	1	-	IS-V	-
PH61	It sets the logic of the digital input used for remote on/off control. 0: NO – Normally open 1: NC – Normally closed	NO	NO (0)	NC (1)	-	IS-V	-
PSd3	It sets the Installation Operator level password.	0	-999	9999	-	IS-V	-

Level 3	Installation Menu						
Submenu	**Modbus Parameters**						
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**	**Notes**
PH11	Controller Modbus address	1	1	247	-	IS-V	-
PH12	Controller communication baud rate (1 = 2400, 2 = 4800, 3 = 9600, 4 = 19200)	3	1	4	--	IS-V	-
PH13	Modbus parity (0 = none, 1 = Odd, 2 = Even)	2	0	2	-	IS-V	-
PH14	Modbus stop bit (0 = 1 bit, 1 = 2 bits)	0	0	1	-	IS-V	-

4.2.1.11 Scheduler Configuration Parameters

RTC MENU

This menu is accessible if PG03 = 1

Code	Parameter Description	Default	Min.	Max.	Units	Menu	Notes
PT01	Working day 1 enable zone 1	0	0	1	-	OR	-
PT02	Working day 1 zone 1 start time	0	00:00:00	23:59:59	-	OR	-
PT03	Working day 1 zone 1 stop time	0	00:00:00	23:59:59	-	OR	-
PT04	Working day 1 zone 1 cooling offset	0	-20.0	20.0	°C	OR	-
PT05	Working day 1 zone 1 heating offset	0	-20.0	20.0	°C	OR	-
PT06	Working day 1 enable zone 2	0	0	1	-	OR	-
PT07	Working day 1 zone 2 start time	0	00:00:00	23:59:59	-	OR	-
PT08	Working day 1 zone 2 stop time	0	00:00:00	23:59:59	-	OR	
PT09	Working day 1 zone 2 cooling offset	0	-20.0	20.0	°C	OR	-
PT10	Working day 1 zone 2 heating offset	0	-20.0	20.0	°C	OR	-

RTC MENU

This menu is accessible if PG03 = 1

Code	Parameter Description	Default	Min.	Max.	Units	Menu	Notes
PT11	Working day 2 enable zone 1	0	0	1	-	OR	-
PT12	Working day 2 zone 1 start time	0	00:00:00	23:59:59	-	OR	-
PT13	Working day 2 zone 1 stop time	0	00:00:00	23:59:59	-	OR	-
PT14	Working day 2 zone 1 cooling offset	0	-20.0	20.0	°C	OR	-
PT15	Working day 2 zone 1 heating offset	0	-20.0	20.0	°C	OR	-
PT16	Working day 2 enable zone 2	0	0	1	-	OR	-
PT17	Working day 2 zone 2 start time	0	00:00:00	23:59:59	-	OR	-
PT18	Working day 2 zone 2 stop time	0	00:00:00	23:59:59	-	OR	-
PT19	Working day 2 zone 2 cooling offset	0	-20.0	20.0	°C	OR	-
PT20	Working day 2 zone 2 heating offset	0	-20.0	20.0	°C	OR	-
PT21	Monday schedule	1	0	2	-	OR	0 = none working day 1 = working day1 2 = working day2
PT22	Tuesday schedule	1	0	2	-	OR	0 = none working day 1 = working day1 2 = working day2
PT23	Wednesday schedule	1	0	2	-	OR	0 = none working day 1 = working day1 2 = working day2
PT24	Thursday schedule	1	0	2	-	OR	0 = none working day 1 = working day1 2 = working day2

RTC MENU This menu is accessible if PG03 = 1							
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**	**Notes**
PT25	Friday schedule	1	0	2	-	OR	0 = none working day 1 = working day1 2 = working day2
PT26	Saturday schedule	0	0	2	-	OR	0 = none working day 1 = working day1 2 = working day2
PT27	Sunday schedule	0	0	2	-	OR	0 = none working day 1 = working day1 2 = working day2

4.2.1.12 User Menu Configuration Parameters

Level 1	**USER MENU**						
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**	**Notes**
MODE	It sets the operating mode: 0: Cool, (Chiller/summer) 1: Heat (Heat pump/winter)	0	0	1		UT	Modifiable only if the units is a chiller + heat pump: (PG00 = 2,4)
SPC1	It sets the value of the summer set point (chiller)	8.5	PC21	PC22	°C	UT	-
SPH1	It sets the value of the winter set point (heat pump).	44.0	PC23	PC24	°C	UT	-
PSd1	It modifies the password at User level.	0	-999	9999		UT	-

4.3 Maintenance Menus

4.3.1 Maintenance – Operation Sub Menu

Level 2	Maintenance Menu					
Submenu	Operation					
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**
PM00	It sets the maximum number of operating hours of compressors. When this limit is exceeded, the connected alarm is triggered.	2000	0	100000	Hrs.	MA-F
PM01 PM02 PM03 PM04	It shows the number of operating hours of compressors. One parameter for each compressor.	0	0	100000	Hrs.	MA-F
PM30	It sets the maximum number of operating hours of pumps. When this limit is exceeded, the connected alarm is triggered.	2000	0	100000	Hrs.	MA-F
PM31	It shows the number of operating hours of the first pump.	0	0	100000	Hrs.	MA-F
PM32	It shows the number of operating hours of the second pump.	0	0	100000	Hrs.	MA-F
PM40	It sets the maximum number of operating hours of fans. When this limit is exceeded, the connected alarm is triggered.	2000	0	100000	Hrs.	MA-F
PM41	It shows the number of operating hours of the first fan or of the inverter in Circuit # 1.	0	0	100000	Hrs.	MA-F
PM42	It shows the number of operating hours of the second fan or of the inverter in Circuit # 2.	0	0	100000	Hrs.	MA-F
PM90	Last maintenance date	-	-	-	-	MA-F

4.3.2 Maintenance – Manual Sub Menu

Level 2	Maintenance Menu						
Submenu	**Manual**						
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**	**Notes**
PM11 PM12 PM13 PM14	It enables the manual/automatic operation of the compressor. 0: Auto – normal operation 1: Manu – manual operation One for each compressor.	0	0	1	-	MA-M	-
PM21 PM22 PM23 PM24	During manual operation, it forces the start-up/shutdown of the compressor. 0: switches the compressor off 1: switches the compressor on One for each compressor.	0	0	1	-	MA-M	-
PM51	It enables the manual/automatic operation of the condensing fan in Circuit # 1. 0: Auto – normal operation 1: Manu – manual operation	0	0	1	-	MA-M	-
PM52	It enables the manual/automatic operation of the condensing fan in Circuit # 2. 0: Auto – normal operation 1: Manu – manual operation	0	0	1	-	MA-M	-
PM61	During manual operation, it forces the value of the condensing fan in Circuit # 1.	0	0	100	%	MA-M	With PF01 = 1 (Modulating Control)
PM62	During manual operation, it forces the value of the condensing fan in Circuit # 2.	0	0	100	%	MA-M	With PF01 = 1 (Modulating Control)
PM63	During manual operation, it forces the value of the condensing fan in Circuit # 1.	0	0	1		MA-M	With PF01 = 0 (Single stage Control)
PM64	During manual operation, it forces the value of the condensing fan in Circuit # 2.	0	0	1		MA-M	With PF01 = 0 (Single stage Control)

4.3.3 Maintenance – Calibration Sub Menu

Level 2	**Maintenance Menu**					
Submenu	**Calibration**					
Code	**Parameter Description**	**Default**	**Min.**	**Max.**	**Units**	**Menu**
PM81	Calibration of condensing high pressure sensor in Circuit # 1	0.0	-20.0	20.0	°C	MA-CA
PM82	Calibration of evaporator low pressure sensor in Circuit # 1	0.0	-20.0	20.0	°C	MA-CA
PM83	Calibration of chilled water leaving temperature sensor # 1	0.0	-20.0	20.0	Bar	MA-CA
PM84	Calibration of the chilled water entering temperature sensor	0.0	-20.0	20.0	°C	MA-CA
PM85	Calibration of outdoor air temperature sensor	0.0	-20.0	20.0	°C	MA-CA
PM86	Calibration of condensing high pressure sensor in Circuit # 2	0.0	-20.0	20.0	°C	MA-CA
PM87	Calibration of evaporator low pressure sensor in Circuit # 1	0.0	-20.0	20.0	Bar	MA-CA
PM88	Calibration of chilled water leaving temperature sensor # 2	0.0	-20.0	20.0	Bar	MA-CA
PSd2	It modifies the password at Maintenance Operator level.	0	-999	9999		MA-F

5 Control Functions

5.1 Machine Status

Several procedures exist for switching the unit on and off:

1. Using the dedicated on/off button (this function is enabled through the parameter *PH05*).
   - Switching on: Hold down the dedicated button for 2 seconds. If all other enabled functions are present, the machine switches itself on.
   - Switching off: Hold down the dedicated button for 2 seconds. The machine switches itself off.
2. Using the on/off command from digital input (this function is enabled through the parameter *PH07*).
   - Switching on: Closes the remote on/off contact. If all other enabled functions are present, the machine switches itself on.
   - Switching off: If the remote on/off contact reveals itself to be open, the machine switches itself off from *digital input*, which is indicated by OFF D.
3. Using a supervisory protocol (this function is enabled through the parameter *PH09*).
   - Switching on: Activated through the protocol. If all other enabled functions are present, the machine switches itself on.
   - Switching off: If the on status is disabled through the protocol, the machine switches itself off by *supervisory protocol*, which is indicated by OFF S.
4. Using a schedule (this function is enabled through the parameter *PH04*).
   - Switching on: If the date and time of the RTC indicates an on status, if all other enabled functions are present, the machine switches itself on.
   - Switching off: If the date and time of the RTC indicates an off status, the machine switches itself off.

Note: The off status from digital input, supervisory protocol, and schedule are only accessible if the machine is enabled by button press.

The ESC button acts as the machine on/off button.

5.2 Operating Mode Control

The operating mode can take the following values:

MODE parameter	Operating mode	Description
0 = Cool	Chiller	Summer operation
1 = Heat	Heat pump (*)	Winter operation

(*) Heat pump operation is possible only if the machine has been configured as chiller + heat pump (parameter *PG00 = 2, 4*).

If the machine has only been configured as chiller (parameter *PG00 = 1, 3*), the *MODE* parameter is no longer modifiable. Thus the operating mode is fixed at 0 (that is, Cool).

There are several procedures to configure operating mode of the machine:

1. Using *MODE* parameter, accessible from the **User** menu.

Select the parameter, press ENTER button, modify the value using UP and DOWN buttons. Confirm by pressing ENTER once again. The corresponding icon confirms that modification is successful.

2. Using the command **Summer/winter from digital input** (this function is enabled by the parameters *PH08*).

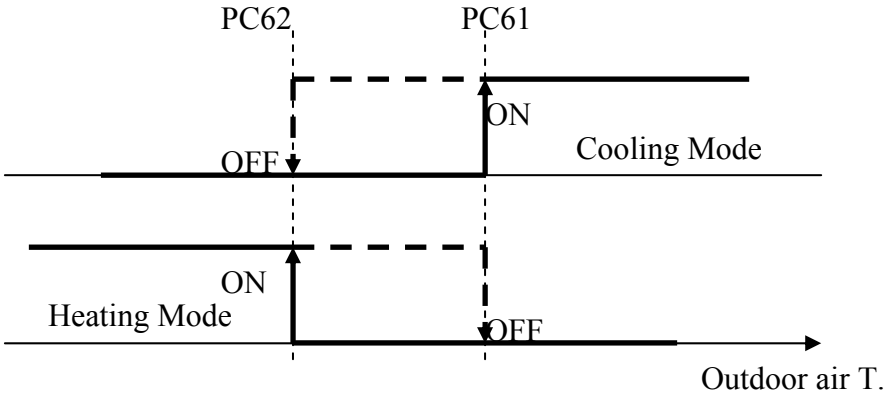
The unit is set for winter operation with open contact and it is set for summer operation with closed contact. Commutation of the digital input switches the unit off, changes its operating mode, and switches the unit back to on.

3. Using a **Supervisory protocol** (this function is enabled by the parameter *PH10*).

Send the operating-mode change command through the protocol. The corresponding operating mode icon confirms that modification is successful.

4. Using the automatic **Change-over** function (this function is enabled by the parameter *PH06*).

When the outdoor air temperature value exceeds the *Summer Commutation Set Point PC61*, the unit commutates to summer operating mode. Similarly, when the outdoor air temperature value falls below the *Winter Commutation Set Point PC62*, the unit commutates to winter operating mode.



Note: In order to enable this function, the outdoor air temperature sensor (*PH24*) must be enabled.

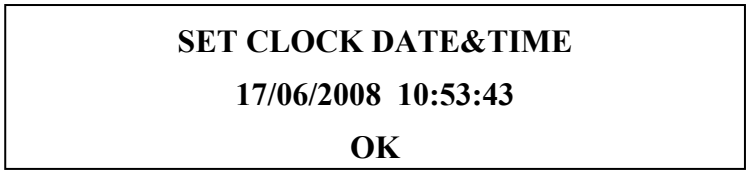
Note: The operating mode changeover can also happen while the machine is on. In this case, the machine switches itself off complying with all its timings, then changes mode and thereafter switches itself back on automatically.

Note: During the change, high and low temperature controls are enabled.

Note: Mode changing is disabled during defrosting cycles.

5.3 Setting the RTC

When the power supply is disconnected from the controller for a few days, the RTC (Real Time Clock) system clock loses its time. When the controller power is switched on again, you need to reset the RTC alarm (enabled by *PA30* = *1*). The following page appears and allows you to set the time:



After you configure the clock, press **OK** to update the RTC time. The main application page is displayed. Press **OK** to confirm the resetting of clock alarm (*ERTC*) at which point the conditions of the alarm has been restored.

If the alarm does not disappear, remove and reconnect the controller power, then reset the alarm manually.

Note: This function is enabled only if the parameter *PG04* = *1*, that is, if the system clock is enabled.

5.4 Compressor Control

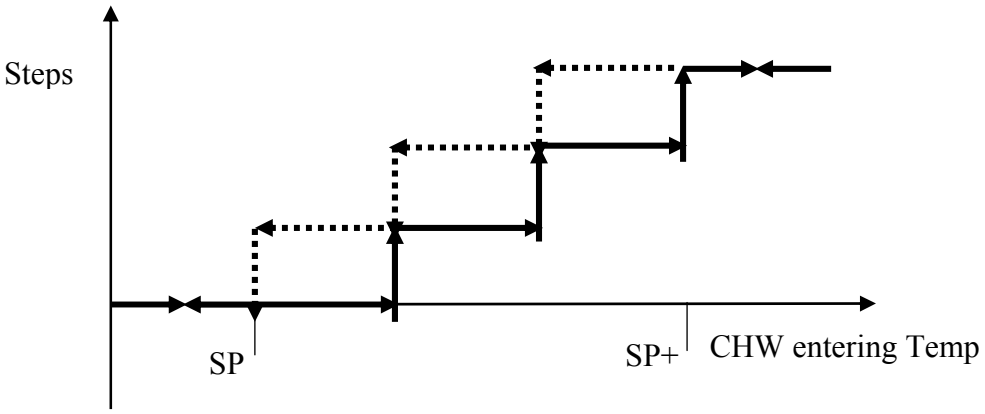
The water temperature control (air-to-water or water-to-water machines) is carried out through the control of mechanical components, that is, compressors and/or fans. 2 types of controls are provided:

1. **lateral-band control** on entering chilled water temperature
2. **zero energy band** control on leaving chilled water temperature

5.4.1 Lateral-Band (LB) Control

Lateral-band is a proportional control function. The chilled water temperature is controlled by switching the compressors on or off.

The following figure illustrates the behavior of lateral band control (Set point, Set point + Proportional band) for summer operation (chiller). Depending on the chilled water entering temperature, the number of compressors (steps) is either increased or decreased. In this control mode, the entire band is shifted above the set point.



Mode = Operating mode (0 = summer)

SPC1 = LB summer set point

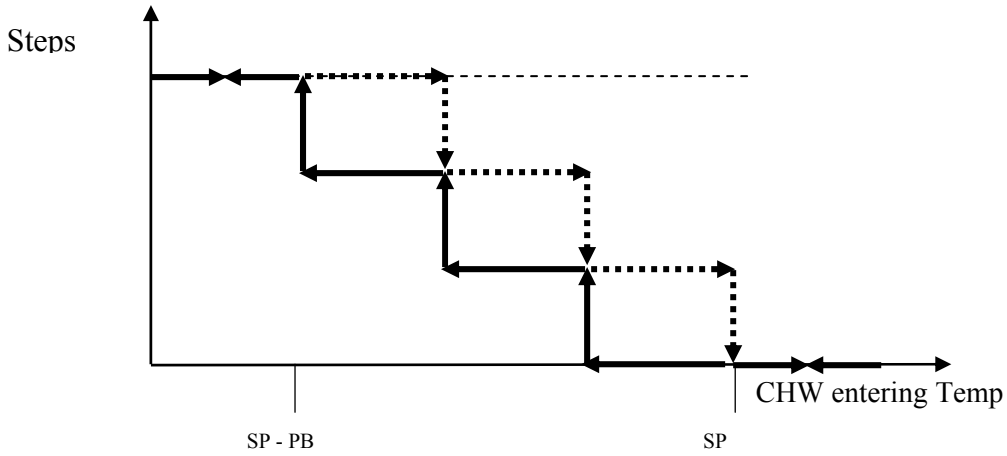
PC11 = Control type (0 = Lateral band)

PC12 = Proportional band

PC21 = Chiller set point lower limit

PC22 = Chiller set point upper limit

Conversely, in winter operating mode (heat pump), the entire band is shifted below the set point:



Mode = Operating mode (1 = winter)

SPH1 = LB winter set point

PC11 = Control type (0 = Lateral band)

PC12 = Proportional band

PC23 = Heat pump set point lower limit

PC24 = Heat pump set point upper limit

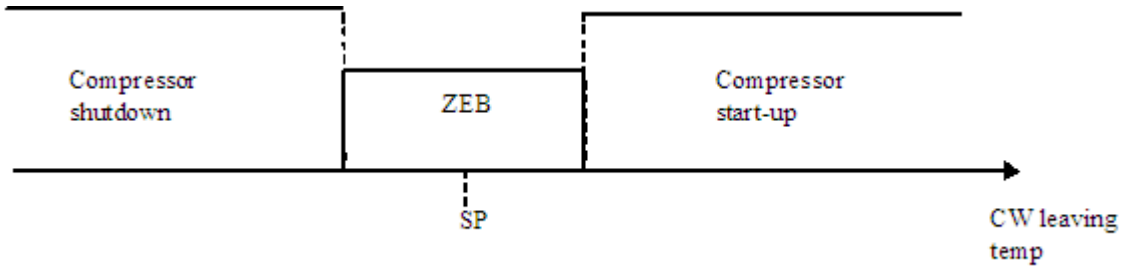
5.4.2 Zero Energy Band (ZEB) Control

This control type requires the definition of a zero energy band (ZEB) around the set point. Compressors are not be switched on or off within the zero energy band.

If the CHW leaving temperature is beyond the zero energy band, the compressors are activated/de-activated in order to bring the CHW leaving temperature value back into the zero energy band.

The requests for switching on/off the various power steps, provided by compressors in summer operating mode (chiller), follow the logic given below.

- Switching on: when the CHW leaving temperature exceeds the zero energy band.
- Switching off: when the CHW leaving temperature falls below the zero energy band.



Mode = Operating mode (0 = summer)

SPC1 = NZ summer set point

PC11 = Control type (1 = Zero energy band)

PC14 = Zero energy band

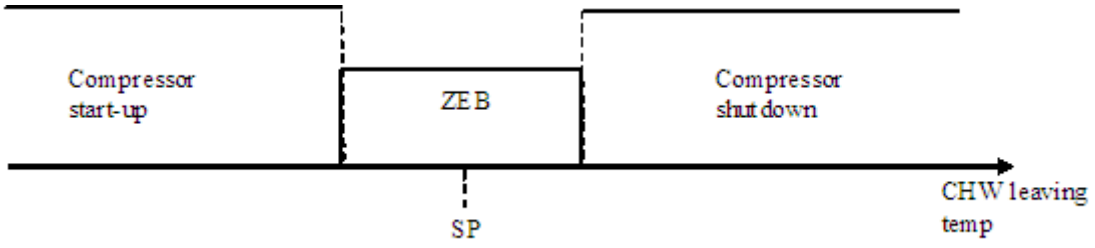
PC17 = Extra time for out-of-zone request

PC21 = Chiller set point lower limit

PC22 = Chiller set point upper limit

The requests for switching on/off the various power steps, provided by compressors in winter operating mode (heat pump), follow the logic given below.

- Switching on: when the CHW leaving temperature falls below the zero energy band.
- Switching off: when the CHW leaving temperature exceeds the zero energy band.



Mode = Operating mode (1 = winter)

SPH1 = NZ winter set point

PC11 = Control type (1 = Zero energy band)

PC14 = Zero energy band

PC17 = Extra time for out-of-zone request

PC23 = Heat pump set point lower limit

PC24 = Heat pump set point upper limit

5.4.3 Auto Adaptive Control

If the CHW leaving temperature remains beyond the zero energy band even after the extra interval time set in parameter *PC17* has elapsed, the switching on or off of a further power step is requested.

The setting of parameter *PC18* = *1* activates an output-temperature auto-adaptive control function in which the zero energy band is calculated based on the dynamic properties of plant and load variations. In particular, the zero energy band can vary based on compressor timings and the number of start-ups per hour. In this case, the value of parameter *PC14* (zero energy band) makes sense only at unit start-up. It is recalculated, within the minimum *PC15* limit and maximum *PC16* limit, to adapt to an intermediate operating situation, as compared with the maximum number of hourly start-ups (parameter *PC09*).

PC09 = Maximum number of hourly start-ups

PC14 = Zero energy band

PC15 = Minimum limit

PC16 = Maximum limit

PC17 = Extra time for out-of-zone request

PC18 = Enable auto-adaptive control

Note: In the case of a twin-circuit system (*PG01* = *2*), control is carried out on the average value of the 2 chilled water leaving-temperature sensors.

If one sensor fails, the control function is based on the other healthy sensor.

If both sensors fail, controlling is no longer possible. Parameter *PC10* defines the number of compressors which are activated in each circuit.

5.5 Compressor Management

The program is capable of managing a maximum of 2 compressors of the same power for each circuit, thus there are a total of 4 compressors. Each compressor has a digital input for protection devices and a digital output for on/off switching.

The compressors are controlled by lateral-band or zero energy band control (see previous chapter) with respect to the compressor timings.

5.5.1 Compressor Status

The status of each compressor is visualized in the operator HMI. A compressor has the following status:

Disabled: The compressor has not been configured, the display shows -.

On: The status display shows **ON**.

Waiting to switch on: The compressor is waiting for protection timings, before switching on. The status display shows **WON**.

Off: The status display shows **OFF**.

Waiting to switch off: The compressor is waiting for protection timings before switching off. The status display shows **WOFF**.

Alarm: The compressor is in alarm status. The status display shows **ALARM**.

Manual: The compressor is in manual operating mode. The status display shows **MANUAL**.

It is possible to read the number of operating hours of each compressor, from the maintenance operator menu, with the help of parameters *PM01, PM02, PM03* and *PM04*. To delete these timings, enter the value 0 using ENTER button.

5.5.2 Rotation of Compressors

Rotation of compressors is a procedure which enables balancing, as far as possible, of the number of operating hours and start-ups of each compressor.

In case of twin circuits, rotation must balance the operation hours of both circuits. Rotation does not affect a compressor in alarm status or manual operation mode. It is capable of dynamically switching on other compressors in case one or more of them need to be in alarm status.

The program is capable of managing 4 types of rotation with the help of parameter *PC01*: FIFO, LIFO, FIFO + number of hours, LIFO + number of hours.

1. FIFO

This method follows the First In First Out logic. The first compressor to be switched on is the first to be switched off again. This operating logic can initially lead to a great difference in the number of operating hours between the various compressors, but after the initial phase, the timing may equalize more or less.

This type of rotation is different in situations where all the configured compressors within the plant are not switched on. For example, if the first compressor is switched on and then switched off, the next compressor to be switched on is the second one. The information about which compressor needs to be switched off is stored in the memory and the next compressor in the sequence is then switched on. This method avoids using the same compressor again, thus exploiting all the configured elements in a better manner.

2. LIFO

This method follows the Last In First Out logic. The last compressor to be switched on will be the first to be switched off.

3. FIFO + Number of operating hours

This type of rotation compares the number of operating hours of various compressors. During the switch on, the compressor with the least number of operating hours is given preference. During switch off, priority is given to the compressor with largest operating hours.

To choose between compressors with the same operating hours, a FIFO rotation is triggered (see the previous FIFO case).

4. LIFO + Number of operating hours

This type of rotation compares the number of operating hours of various compressors. During the switch on, the compressor with the least number of operating hours is given preference. During switch off, priority is given to the compressor with largest operating hours.

To choose between compressors with the same operating hours, a classic LIFO rotation is triggered.

On twin-circuit machines, you can decide how the steps requested by thermal control are to be shared between the two circuits, based on parameter *PC02*.

- **PC02 = 0, Circuit balancing:** The system requests a step per circuit alternatively, so as to balance loads between the two circuits, provided no alarms have been activated.
- **PC02 = 1, Circuit saturation: T**he system requests all the available steps from the first circuit and then all those available from the second circuit, so as to always have one circuit under full load, provided no alarms have been activated.

5.5.3 Pump-Down Switch-Off Procedure

On machines with power above a certain limit and where there is a substantial amount of refrigerant, the pump-down procedure is necessary to partially empty the evaporator of excess refrigerant. Therefore, the solenoid valve situated upstream from the related evaporator is controlled in such a way that the compressor remains on for the time interval *Compressor switch-off delay in pump-down* (parameter *PC42*). The solenoid valve is opened precisely at the same instant as the compressor start-up. In order to enable this function, the following parameters must be set:

- PC41 = 1: Function enable
- PC42: Pump-down time

Note: In case of alarm, the system must ignore the compressor switch-off delay.

5.5.4 Relative-Threshold Pump-Down

If low-pressure transducers are available, you can carry out the pump-down procedure leaving the compressor on only for the time necessary to empty a correct part of the refrigerant. At the end of the request by the last compressor to be on, from the affected evaporator, the evaporation pressure value is stored, the fluid solenoid valve is disabled, and once the evaporation pressure value has fallen by the *Pump-down pressure differential PC43*, the compressor is switched off.

There is always a compressor switch-off delay in pump-down, either because the switch-off pressure threshold has not been reached or the evaporation sensors are inoperable.

In order to enable this function, the following parameters must be set:

- PC41 = 2: Function enable
- PC42: Pump-down time
- PC43: Pump-down differential

Note: In case of alarm, the system must ignore the compressor shutdown delay.

5.5.5 Protection Timings

The purpose of these timings is to protect the mechanical units from various start-up stresses to which they are subjected.

- *PC04 = Compressor minimum ON time.* Once activated, a compressor must remain on for this time interval before it can be switched off again.
- *PC05 = Compressor minimum OFF time.* This is the minimum time interval that must elapse before the compressor can be switched on again.
- *PC06 = Minimum time between switching-ON of the same compressor.* It determines the minimum time which must elapse between two switching-on of the same compressor.
- *PC07 = Minimum time between switching-ON of different compressors.* It determines the minimum time which must elapse between the switching-on of a compressor and that of the next one.
- *PC08 = Minimum time between switching-OFF of different compressors.* It determines the minimum time which must elapse between the switching-off of a compressor and that of the next one.
- *PC09 = Maximum number of compressor start-ups within one hour.* This determines the maximum number of switching-on within a time span of one hour. If this limit is reached, the regulator waits until the conditions are satisfied before switching that compressor on again.

Neutral-zone timings

These parameters are used to time the request for switching on/off various compressors.

- *PC17* = Extra time for on/off switching request.

5.5.6 Thermal Protection Inputs

This program manages the compressor thermal error detection switch input for each compressor. You can set the type of reset (manual or automatic) as well as the triggering delay through parameters.

5.6 Condenser Control

Condenser control manages the condensing pressure by modulating the air flow through an analog output (inverter or phase-cut) or with a single stage fan for each circuit. Condenser control is set by parameter *PF01*:

- *PF01 = 0*: Single stage control
- *PF01 = 1*: Modulating control.

If parameter *PF02* is set to 0, the control is independent of temperature control. Otherwise, fans are activated only if the controller requests the switching on of at least one compressor.

The parameter *PF03* sets whether or not fans must switch off during the defrosting cycles. If *PF03* is set to 1, fans stop during defrosting.

If parameters *PF09* is set to 1, fans are forced in case of condensing sensor alarm with single stage control. If the control is modulated, the parameter *PF10* sets the value to force.

5.6.1 Modulating Fan Control

Due to the continuous control of fans, a proportional (or proportional/integral) control of condensation is performed through an inverter (output A03, 0-10 V type) or a phase-cut module (pulsed output A01).

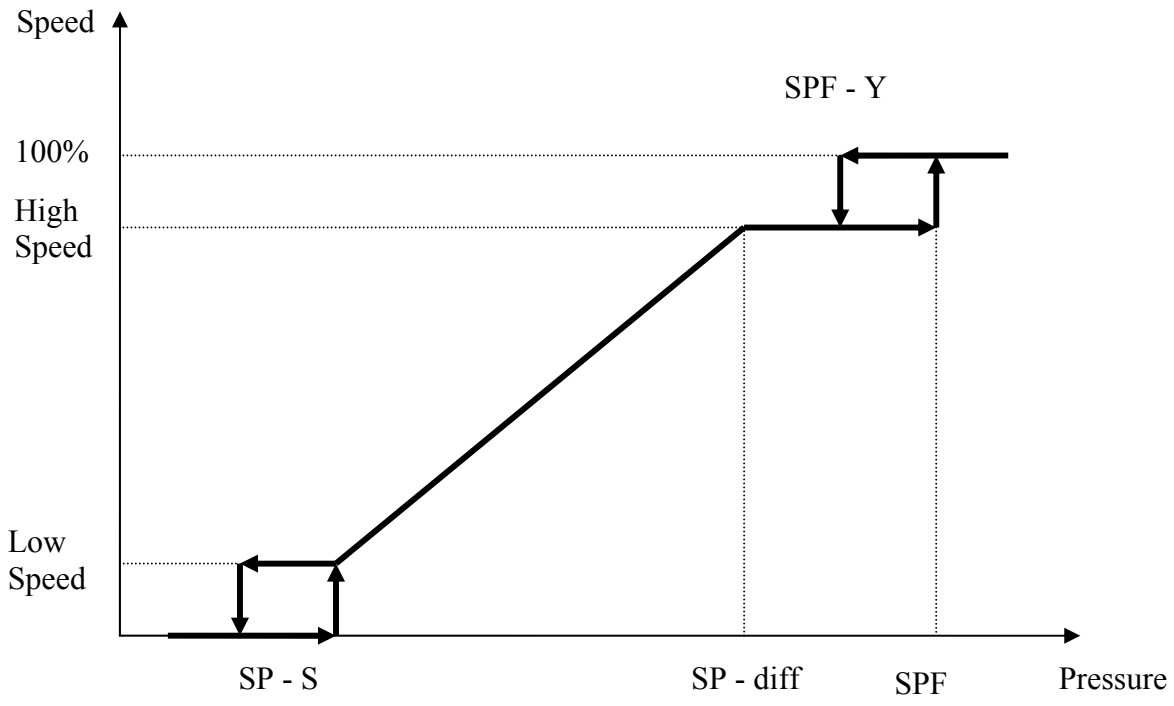
Fan speed control provides for a minimum speed value to manage start-ups in such a way as to avoid operating fan motors at an excessively low rpm rate. In addition, it is possible to set a *Speed-up time PF28* at start-up, during which the fan reaches maximum speed.

The possibility is provided for, of maintaining the fans at minimum speed, a value even below the set point. If the pressure decreases further below the set point of a given threshold, fan is forced to switch off.

There is a high-speed value beyond which velocity remains constant. If maximum forcing is enabled, and if pressure exceeds the given threshold, fan speed is forced to 100%.

The following figure illustrates the behavior of continuous control in the case of summer operation (chiller). In this particular control, the proportional band is completely shifted above the set point.

Note: Both outputs *A01* and *A03* contain the same control signal. Output *A01* has a PWM output type and can be used with the single phase cutting module TM168EFAN. The output *A03* has a 0...10V output type and can be used with Schneider Electric ATV drive.



Mode = Operating mode (0 = Summer)

PF11 = Summer condensation control set point (SP)

PF12 = Summer condensation control differential

PF13 = Maximum speed forcing enable

PF14 = Summer maximum speed forcing set point (SPF)

PF15 = Summer maximum speed forcing differential (Y)

PF16 = Integral time PI regulator

PF27 = Inverter forcing minimum value

PF28 = Speed-up time

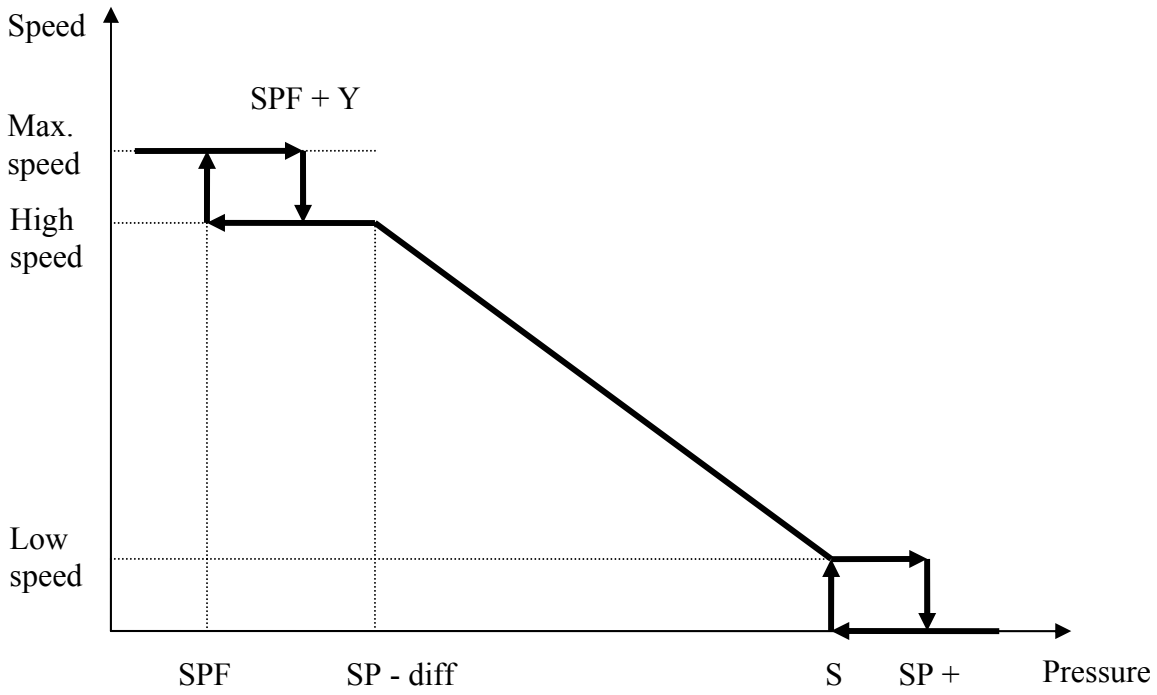
PF31 = Fan low-speed limit

PF32 = Fan high-speed limit

PF33 = Fan control enable below set point

PF34 = Fan switching off differential below set point (X)

The following figure illustrates the behavior of continuous control in the case of winter operation (heat pump). In this particular control, the proportional band is completely shifted below the set point.



Mode = Operating mode (1 = Winter)

PF21 = Winter condensation control set point (SP)

PF22 = Winter condensation control differential

PF13 = Maximum speed forcing enable

PF24 = Winter maximum speed forcing set point (SPF)

PF25 = Winter maximum speed forcing differential (Y)

PF26 = Integral time PI regulator

PF27 = Inverter forcing minimum value

PF28 = Speed-up time

PF31 = Fan low-speed limit

PF32 = Fan high-speed limit

PF33 = Fan control enable above set point

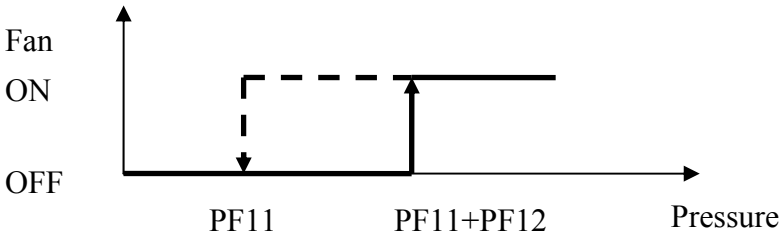
PF34 = Fan switching off differential above set point (X)

Note. With parameters PF41, PF42, PF43, PF45, PF46 and PF47 it is possible to linearize the analog output.

5.6.2 Single Stage Fan Control

This control manages a single stage control of condenser fans by a digital output for each fan.

The condenser fan is switched on when the condenser pressure exceeds condenser *set point + condenser pressure differential*. The condenser fan is switched off when the condenser pressure falls below the condenser set point. This is evident in the graph below.



PF11 = Summer condensation control set point

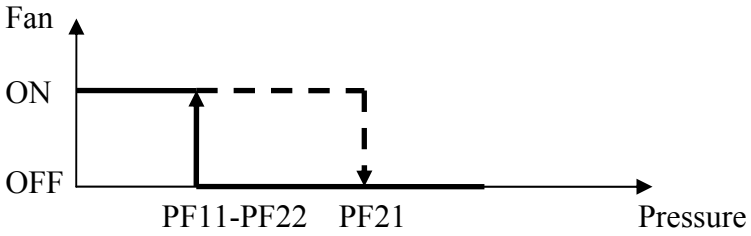
PF12 = Summer condensation control differential

Mode = Operating mode (0 = Summer)

PF11 = Summer condenser control set point (SP)

PF12 = Summer condenser control differential

The condenser fan is switched on when the condenser pressure falls below condenser *set point - condenser pressure differential*. The condenser fan is switched off when the condenser pressure exceeds the condenser set point.



PF21 = Winter condensation control set point

PF22 = Winter condensation control differential

Mode = Operating mode (1 = Winter)

PF21 = Winter condenser control set point (SP)

PF22 = Winter condenser control differential

5.6.3 Condenser Valve Control

During summer operation on water-to-water machines, the water feeding in the condensing circuit is controlled based on the condensing pressure through a valve. (This can be a 2-way solenoid or motor- operated pressure-switch valve modulating with a 0-10 V control-generated signal.) Similarly the condenser control is performed to control the fan speed. The condenser valve belongs to a proportional integral control type.

In order to utilize only a proportional control, you need to set only the integral time to zero (*PF16 = 0, PF26 = 0*). Setting an integral time greater than zero provides a more precise control. The integral part is to bring the output up to speed, reducing the detected error introduced by the sole proportional component (by default, the integral component is disabled).

5.6.4 Single Condenser

On twin-circuit machines, you can choose only one circuit to manage condensation. In order to enable this function, it is necessary to set *PG11=1*. Condensing is performed by the fan in Circuit #1, using the highest of the condensing pressure/temperature values acquired from the respective transducers.

The activated analog/digital output is always the one related to Circuit #1.

5.7 Fan Management

This program manages up to 2 fans, that is, one for each circuit. You can associate a diagnostic digital input to each fan and a digital output for on/off switching.

5.7.1 Fan Status

Each fan has an associated operating status in the status template of the main menu. A fan can have the following status:

- Disabled: The fan has not been configured, the status display shows -.
- On: The status display shows **ON**.
- Waiting to switch On: The fan is waiting for protection timings before switching On. The status display shows **WON**.
- Off: The status display shows **OFF**.
- Waiting to switch Off: The fan is waiting for protection timings before switching Off. The status display shows **WOFF**.
- Alarm: The fan is in alarm status. The status displays shows **ALARM**.
- Manual: The fan is in manual operating mode. The status display shows **MANUAL**.

In the **Maintenance Operator** menu, through the parameters *PM41* and *PM42*, it is possible to read the number of operating hours of the two fans. To initialize these timings to 0, enter the value 0 using ENTER button.

5.7.2 Fan Timings

Below is a list of timings concerned with the management of fans.

Protection Timings

The purpose of these delays is that of protecting fans from the various start-up stresses to which they are subjected and of avoiding simultaneous start-ups.

- *PF07 = Minimum time between start-ups of different fans.* It determines the minimum time which must elapse between the start-up of a fan and that of the next one.
- *PF08 = Minimum time between shutdowns of different fans.* It determines the minimum time which must elapse between the shutdown of a fan and that of the next one.

5.7.3 Thermal Protection Inputs

The program allows you to manage thermal protection for each of the fans configured within the application.

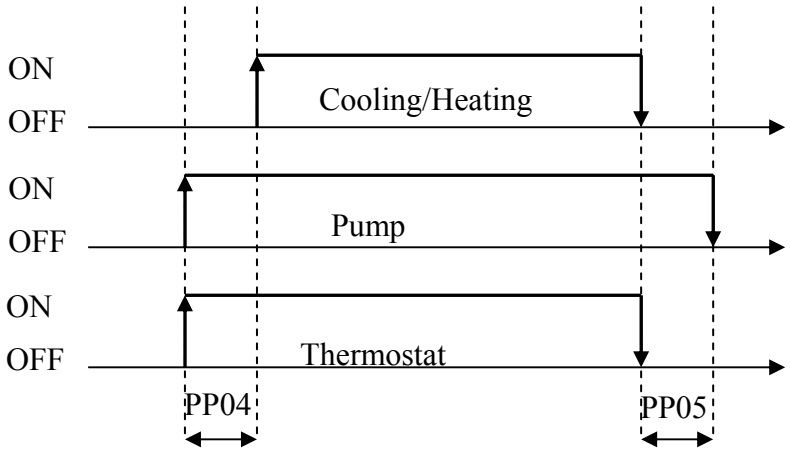
5.8 Circulating Pump Management

On air-to-water or water-to-water machines, 1 or 2 water-circulating pumps can be controlled, which are defined by the parameter *PG09*. The *Pump operation PP01* parameter defines how the pump will operate:

- PP01 = 0: continuous operation
- PP01 = 1: operation at thermostat's request
- PP01 = 2: cyclic operation

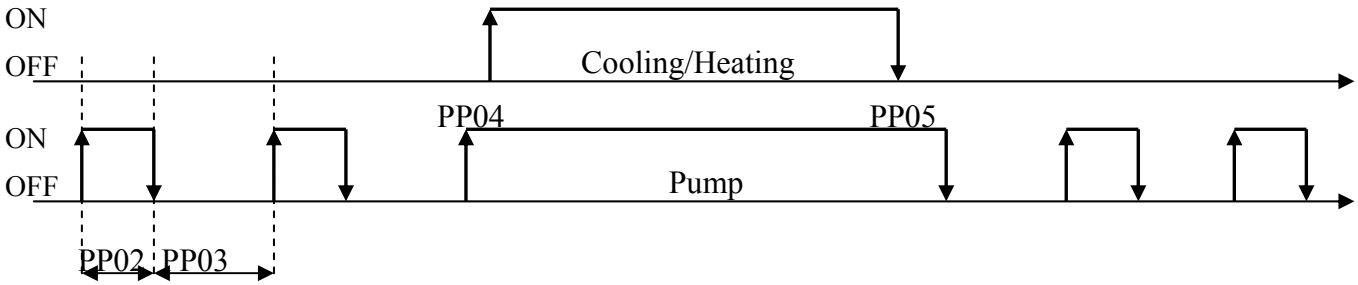
In *continuous operation,* the circulating pump is activated when the unit is switched on, and after expiration of the time delay interval (parameter *PP04*), the compressors can be energized. When the unit is switched off, the pump is deactivated after the time delay interval (parameter *PP05*).

In *operation at thermostat's request*, the pump is operated as a result of a request for heat or cold. Upon such a request, first the pump output is activated and then, after the delay of PP04, the chilling/heating compressor is switched on.



In a similar fashion, on a thermostat switch-off request, the compressor switches off, while the pump remains on for the duration of *PP05*.

In *cyclical operation*, the pump is controlled by the definition of start-up/shutdown times. If the thermostat function triggers a chilling or heating request during the pump activation time, the pump remains activated for the whole duration of this request plus any delay interval between compressor shutdown and pump shutdown.



PP02 = Pump on cycle time

PP03 = Pump off cycle time

Parameter *PP07* defines the pump behavior during a defrosting cycle. After modification of *PP01* and *PP07*, it is necessary to power down the machine and then power it up again to avoid the risk of malfunctions.

It two pumps have been configured (*PG09* = 2), both their operating hours must be equalized. Therefore, for every *PP08* number of operating hours, shutdown is ordered for the active pump and start-up of the other pump.

In case of thermal alarm on one of the pumps, the control must activate the second pump. On the other hand, if both pumps are inoperable or if the only configured pump is inoperable, the alarm stops the unit.

5.8.1 Pump Status

For each pump, an operating status is associated, which is visible from the associated LED or in the status template from the main menu. Each pump can have the following status:

- Disabled: The pump has not been configured, the status display shows -.
- On: The status display shows **ON**.
- Off: The status display shows **OFF**.
- Alarm: The pump is in alarm status. The status display shows **ALARM**.

In the Maintenance Operator menu, through the parameters *PM31* and *PM32*, it is possible to read the number of operating hours of the corresponding pumps. To initialize these timings to 0, enter the value 0 using ENTER button.

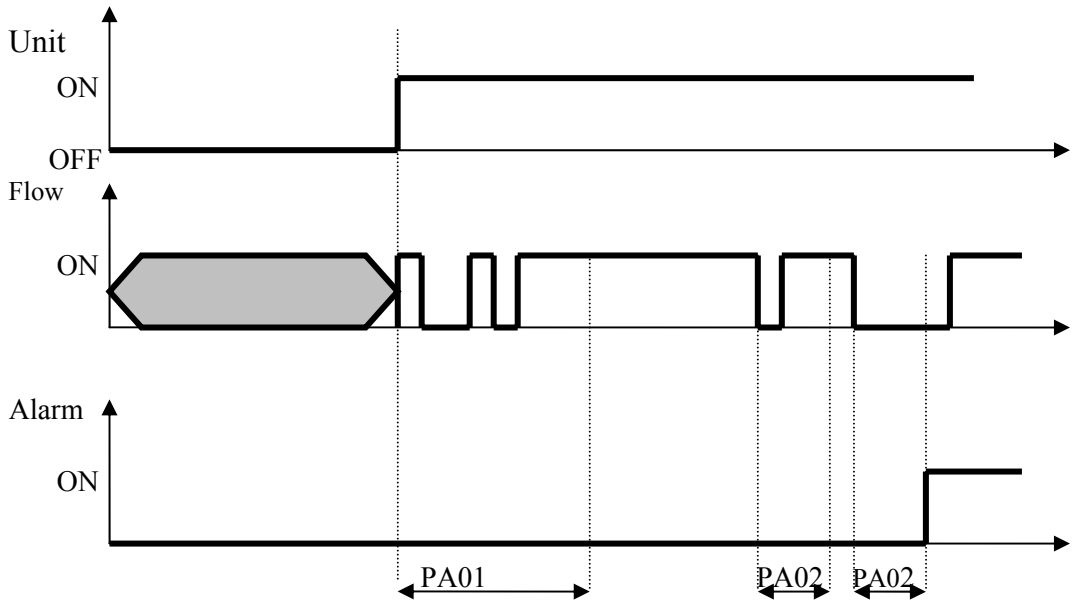
5.8.2 Flow Meter Management

The flow meter is continuously monitored after the chiller is started and the *Flow meter start delay PA01* has expired. If the contact indicates a lack of flow, the flow meter alarm is immediately triggered. The compressors are not commanded when there is a flow meter alarm.

During normal operation, the flow meter is constantly monitored. If the contact signals a lack of flow for a period exceeding the value of parameter *Flow-meter alarm by-pass PA02*, the associated alarm is immediately triggered and all active compressors are switched off.

If the alarm persists for a time equal to the value of parameter *Pump operating time at low water level PP09*, the pump is switched off and the alarm becomes a manual reset. The pump is thus protected against potential operation without water. The pump is restarted when the alarm is reset.

The flow-meter alarm is an automatic-reset alarm. If it exceeds a given number of events within one hour (Maximum *number of flow alarms with auto-reset PA03*), it becomes a manual reset.



5.9 Defrosting Management

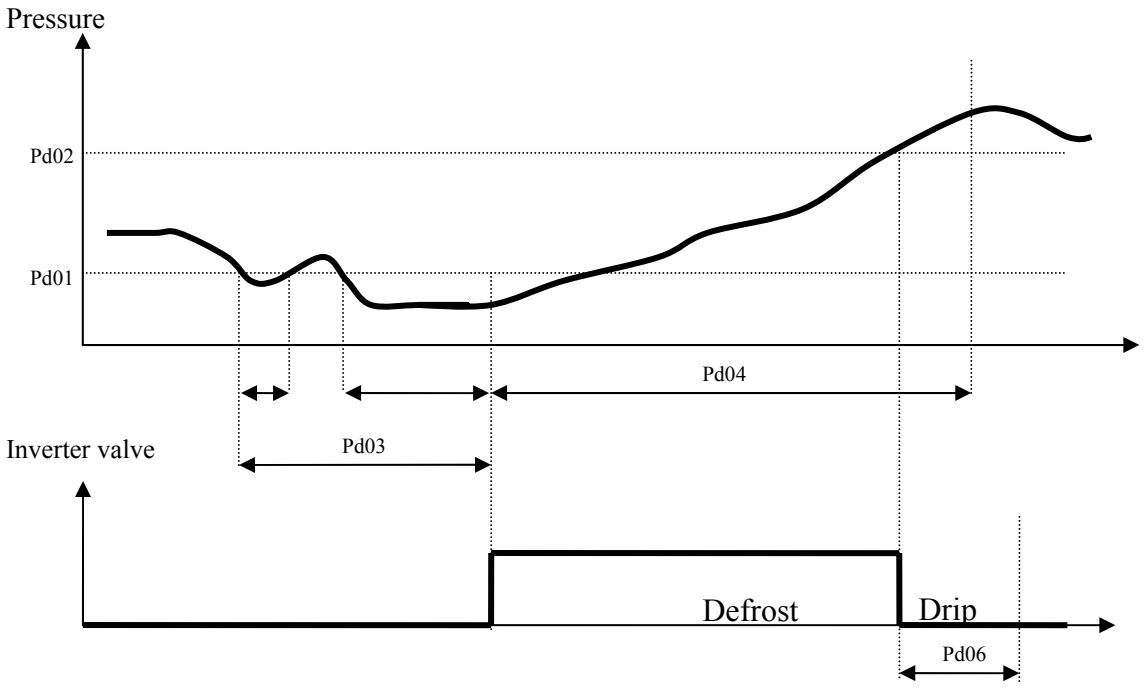
This procedure is only activated in the winter operating mode (heat pump) and when at least one compressor is switched on. Defrosting is performed by intervening on the refrigerating-circuit inverter valve.

If evaporation pressure/temperature remains (even if not continuously) for a time interval equal to the value of parameter *Defrosting enable delay Pd03*, below the threshold of the *Defrosting start set point Pd01,* and at least one compressor is in operation, the inverter valve is commutated and the defrosting cycle is started. During this phase, compressors are forced to maximum power and the low-pressure alarm is bypassed.

Defrosting is interrupted for one of the following causes:

- when pressure reaches the *End of defrosting set point* Pd02
- when the *Defrosting duration maximum time* Pd05 has elapsed
- when machine or circuit alarms are triggered
- when the unit is switched off

At the end of the defrosting cycle, the unit remains stationary for the whole duration of *Dripping time Pd06*.

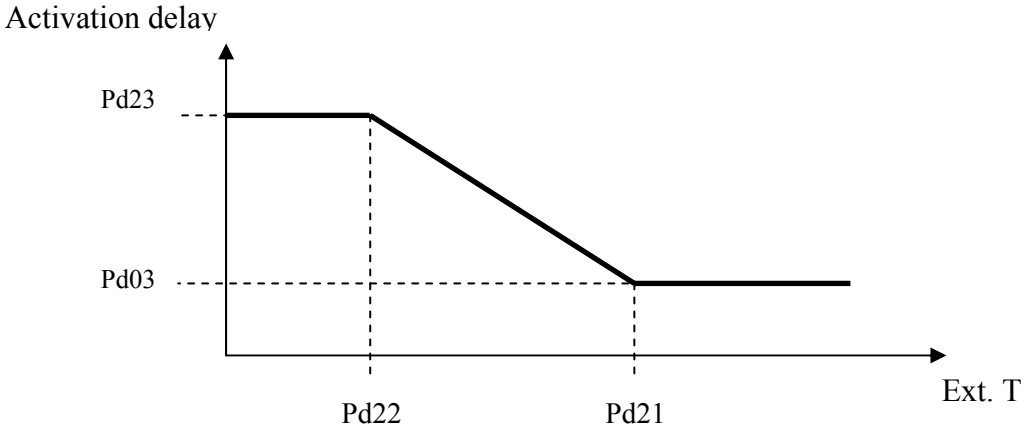


In order to avoid the immediate start of a defrosting cycle after all compressors have been stopped, a *Minimum circuit restart delay Pd07* is used. This provides at least a period of heat-pump operation before entering the defrosting cycle.

Note: In the case of twin-circuit units, defrosting cannot be simultaneous. Thus, if one circuit is defrosting, the other circuit cannot start a defrosting cycle until the defrosting circuit has completely finished its cycle.

5.9.1 Defrosting Cycle Compensation

With the decreasing outdoor air temperature, the water vapor content in the air (which causes the formation of frost on the evaporation battery, thus creating a need for defrosting) decreases. Therefore, it may be advantageous to increase the defrosting-activation delay in relation to the decrease in the outdoor air temperature so as to improve the overall efficiency of the system. If enabled by parameter *Pd20*, this function is activated at an *Outdoor air temperature set point for defrosting compensation start Pd21*, below which the set point compensation starts with the increment of the defrosting activation delay, up to a maximum value (*Maximum defrosting delay Pd23*) on reaching the *Outdoor air temperature set point for defrosting compensation stop Pd22*.



In order to enable this function, the outdoor air temperature sensor (*PH24*) must be enabled.

5.10 Anti-Freeze Management/Chilling-Support Heating Coils

On air-to-water or water-to-water machines, anti-frost control is active even when the machine is switched off.

Two thresholds are provided with their related differential: one is used to activate the heating coils and the other to signal the alarm and stop compressors within the associated circuit.

If the anti-frost alarm persists for the duration of *Pump operation time at low temperature PP10*, the pump is switched off until the next alarm reset.

In the case of anti-frost, in off status, only the heating coils are activated, whereas the alarm is not notified.

In order to enable the heating coils, in addition to setting the associated parameter (*Pr01 = 1*).

5.11 Single Evaporation

On twin-circuit machines, you can choose only one circuit to manage evaporation. In order to enable this function, set the parameter *PG12 = 1*. Evaporation is performed by anti-frost and heating in Circuit #1 using the largest of the evaporating temperature values acquired from respective transducers.

The activated heating and anti-frost alarm are always related to Circuit #1.

5.12 Temperature Alarm Control

5.12.1 Low and High Temperature Alarm Management

According to the operating mode, a check is carried out on the exchanger inlet temperature, triggering an alarm where appropriate.

In winter operation (heat pump), if the temperature falls below a given threshold for a settable lapse of time, a *low temperature* alarm is generated (*AL01*).

In summer operation (chiller), if the inlet temperature exceeds a given threshold for a settable lapse of time, a *high temperature* alarm is generated (*AL02*).

Through a configuration parameter, alarms can be set to display-only alarms or to stop the machine.

It is also possible to set a temperature-alarm inhibition delay from system start-up so as to give the machine a chance to reach full power.

PA05 = High-temperature alarm set point

PA06 = Low-temperature alarm set point

PA07 = Temperature alarm enable delay

PA08 = Temperature alarm management mode (display-only / machine stop)

PA09 = Temperature alarm differential

PA10 = System start-up alarm inhibition time

These alarms are only detected when the machine is switched on.

5.12.2 Management of Primary Exchanger Efficiency Alarm

If the alarm *AL03* (and *AL13* for Circuit #2) is enabled (*PA25 = 1*), the difference between entering and leaving chilled water temperatures at the primary exchanger is checked. This checking is to find out if the temperature difference is below a *Primary exchanger difference minimum threshold PA26* for a *By-pass time for primary exchanger efficiency alarm PA27*.

This alarm is not managed during defrosting if sensors are in alarm status and the alarm is a manual-reset alarm.

This alarm is detected only when the machine is on.

5.13 Pressure Alarm Control

5.13.1 Management of High-Pressure Pressure-Switch Alarm

It is possible to monitor an excess of a maximum condensing pressure with the help of a digital input connected to an external pressure switch. The *high-pressure alarm AL11* (and *AL12* for Circuit #2) causes the immediate stopping of the refrigerating circuit, also shutting down any compressors which may be on and inhibiting the start-up of others.

This alarm is detected only when the machine is on.

This is a manual-reset alarm.

5.13.2 Management of High-Pressure Transducer Alarm

If condensing pressure exceeds a given threshold, a *high-pressure alarm AL31* (and *AL32* for Circuit #2) is generated. The alarm causes immediate stopping of the refrigerating circuit, also shutting down any compressors which may be on and inhibiting the start-up of others.

This alarm is only detected when the machine is on.

This is a manual-reset alarm and it can be reset if the pressure has fallen below the maximum threshold of a given differential value.

- PA21 = High-pressure alarm set point
- PA22 = High-pressure alarm differential

5.13.3 Management of Low-Pressure Pressure-Switch Alarm (Chiller Mode)

You can monitor the presence of a minimum intake pressure in the refrigerating circuit with the help of a digital input connected to an external pressure switch. The *low-pressure alarm **AL41*** (and ***AL42*** for Circuit # 2) immediately stops the refrigerating circuit, and also shuts down any compressors which may be on and inhibits the start-up of other compressors.

At the start-up of the first compressor, the alarm is delayed for a given interval to enable the compressors to take the refrigerating circuit to full pressure.

The alarm is initially auto-resetting unless it exceeds a given number of events within one hour (*PA14*), in which case it becomes a manual-reset alarm.

- PA13 = Low-pressure alarm by-pass time
- PA14 = Maximum number of auto-reset low-pressure alarms

If a low pressure is detected when the machined is switched on and the request for chill from the controller is present, the compressor start-up is inhibited and a *Start-up low-pressure alarm AL21* (and AL22 for Circuit #2) is displayed. The purpose of this condition is to inhibit compressor start-up in the absence of Freon® gas in the circuit (there can be a refrigerant leak from the piping system).

5.13.4 Management of Low-Pressure Transducer Alarm (Heat Pump Mode)

If the intake pressure falls below a given threshold, a *low-pressure alarm AL41* (and *AL42* for Circuit # 2) is generated. The alarm immediately stops the refrigerating circuit, shutting down any compressors which may be on, and inhibiting the start-up of others.

At the start-up of the first compressor, the alarm is delayed for a given interval to enable the compressors to take the refrigerating circuit to full pressure.

The alarm is initially auto-resetting, unless it exceeds a given number of events within one hour (*PA14*), in which case it becomes a manual-reset alarm. The alarm can be reset, if in the meantime, pressure has risen above the minimum threshold by a certain differential value.

- PA11 = Low-pressure alarm set point
- PA12 = Low-pressure alarm differential
- PA13 = Low-pressure alarm by-pass time
- PA14 = Maximum number of auto-reset low-pressure alarms

In the presence of *low temperatures of external air*, intake pressure could fall below the minimum-pressure threshold, thus inhibiting compressor start-up. In such a situation, it is possible to activate a control which shifts the alarm-control threshold to a higher value, for a given interval from start-up of the first compressor, leaving in place all protection devices and pre-start checks.

- PA16 = Low-pressure control enable at low outdoor air temperature
- PA17 = Low-pressure alarm set point at low outdoor air temperature
- PA18 = Low-pressure alarm differential at low outdoor air temperature
- PA19 = Low-pressure alarm control duration at low outdoor air temperature

This control can only be enabled in heat-pump operating mode.

5.13.5 Low Start-up Pressure Alarm

In a low-pressure condition (pressure switch or transducer-induced) and in the impossibility to activate any of the compressors at the request of the same, there is a *Low-pressure start-up alarm AL51 (*and *AL52* for Circuit #2). This is an auto-reset alarm and thus disappears, unless there is a leak of Freon® gas from the circuit.

At compressor shutdown following a low-pressure alarm, this alarm is delayed by a given interval *PA20* to give the refrigerating circuit the chance to enable compressor start-up.

5.14 Time Schedule

The real time clock allows you to define a weekly schedule for the unit.

You can define 2 different daily schedules. Each daily schedule can have two zones with separate heating and cooling offset values.

Each day of the week can be assigned to daily schedule 1, daily schedule 2, or can be identified as non-working day.

Following are the parameters referred to this function:

- PT01 = working day 1 enable zone 1
- PT02 = working day 1 zone 1 start time
- PT03 = working day 1 zone 1 stop time
- PT04 = working day 1 zone 1 cooling offset
- PT05 = working day 1 zone 1 heating offset
- PT06 = working day 1 enable zone 2
- PT07 = working day 1 zone 2 start time
- PT08 = working day 1 zone 2 stop time
- PT09 = working day 1 zone 2 cooling offset
- PT10 = working day 1 zone 2 heating offset
- PT11 = working day 2 enable zone 1
- PT12 = working day 2 zone 1 start time
- PT13 = working day 2 zone 1 stop time
- PT14 = working day 2 zone 1 cooling offset
- PT15 = working day 2 zone 1 heating offset

- PT16 = working day 2 enable zone 2
- PT17 = working day 2 zone 2 start time
- PT18 = working day 2 zone 2 stop time
- PT19 = working day 2 zone 2 cooling offset
- PT20 = working day 2 zone 2 heating offset
- PT21 = Monday schedule
- PT22 = Tuesday schedule
- PT23 = Wednesday schedule
- PT24 = Thursday schedule
- PT25 = Friday schedule
- PT26 = Saturday schedule
- PT27 = Sunday schedule
- PH04 = Enable start-up/shutdown of the machine by the schedule

5.15 Miscellaneous Management

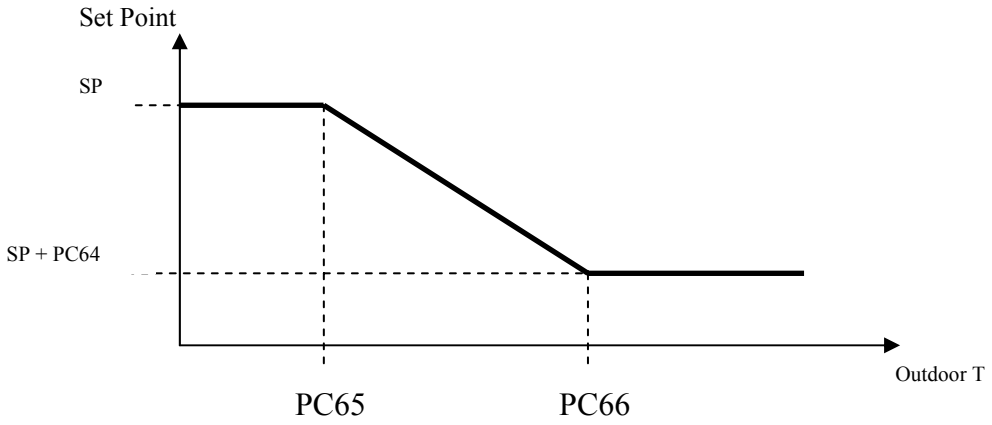
5.15.1 Set Point Variation by Schedule Timer

You can adjust the set point by the schedule timer through parameter *PH28* (set relative parameters of the scheduler). The actual control set point depends on the working day and relative offset.

5.15.2 Dynamic Set Point

It is possible to perform compensation of the dynamic set point on outdoor air temperature through the parameter *Dynamic set point enable PH27*. In this case, the control set point takes a value between the standard set point (equivalent to *External-temperature initial threshold*) and the set point plus a *Dynamic offset* (equivalent to *External-temperature final threshold*) both for chiller and heat pump operation. Movement is linear between the two compensation points and the curve takes on a different meaning according to the offset sign.

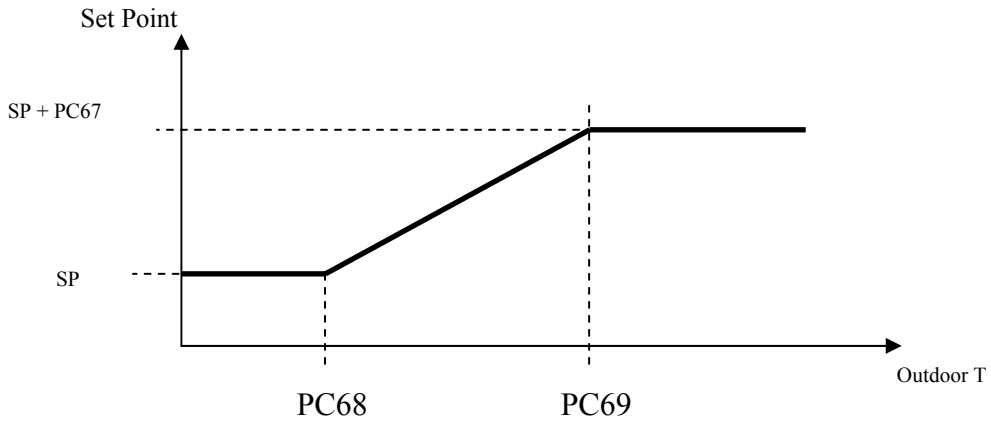
With offsets of less than 0 value, the set point behavior is as follows:



The following are the parameters referred to this function:

- PC64 = Maximum dynamic offset for summer operation (chiller)
- PC65 = Compensation start temperature for dynamic summer set point
- PC66 = Compensation stop temperature for dynamic summer set point

With offsets greater than zero, behavior is as follows:



The parameters referred to this function are the following:

- PC67 = Maximum dynamic offset for winter operation (heat pump)
- PC68 = Compensation-start temperature for dynamic winter set point
- PC69 = Compensation- stop temperature for dynamic winter set point

5.15.3 Forced Shutdown

This function enables the forced shutdown of all compressors when CHW leaving temperature falls below the *Summer forced-shutdown set point* (in the case of chiller operation) or exceeds the *Winter forced-shutdown set point* (in the case of heat-pump operation). Compressors can be restarted only when the temperature crosses the set point once again.

- PC35 = Forced-shutdown enable
- PC36 = Summer forced-shutdown set point
- PC37 = Winter forced-shutdown set point

5.15.4 High-Pressure Reduction at High Temperatures (Chiller)

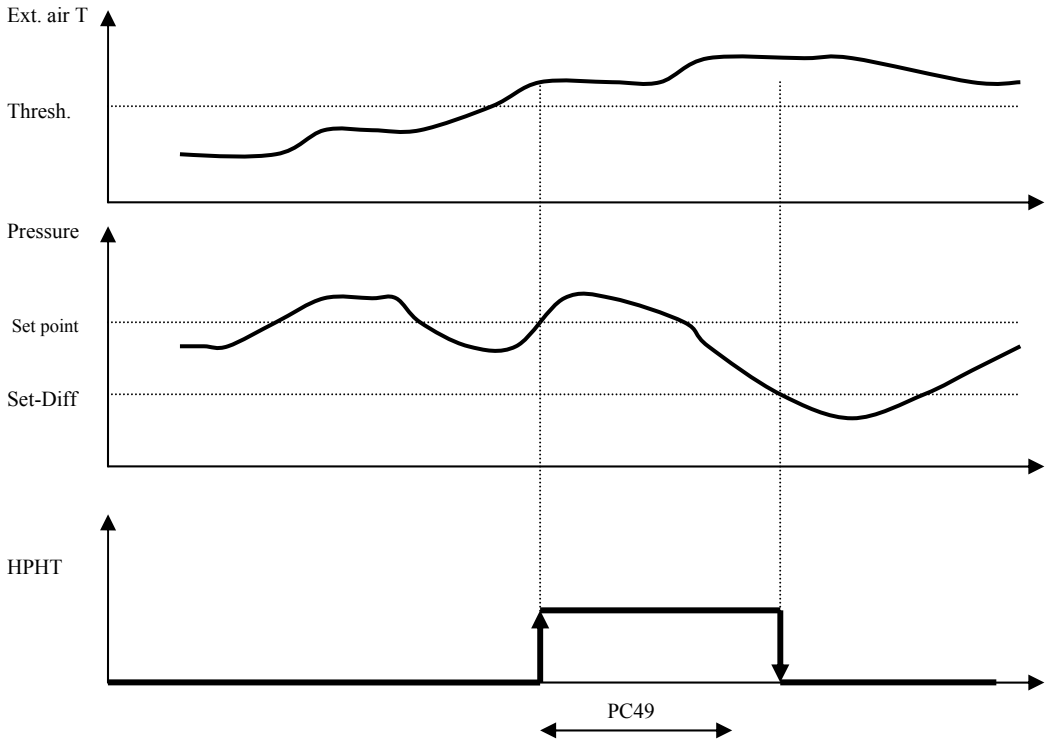
This control makes it possible for the refrigerating circuit to operate at a high outside air temperature. The change of the high-pressure alarm is carried out by the reduction of active power of the circuit.

- PC45 =Pressure reduction enable at high temperatures
- PC46 = Pressure reduction set point at high temperatures
- PC47 = Pressure reduction differential at high temperatures
- PC48 = High external air temperature threshold
- PC49 = Minimum time for maintaining pressure reduction

According to the number of configured compressors, the power-limiting percentage is calculated on the basis of this parameter:

- PC31 = Power limiting for summer operation

In order to enable this control, the outdoor air temperature sensor (*PH24*) must be enabled.



This control can only be enabled in summer operating mode (chiller).

5.15.5 Low-Pressure Partialization at Low Temperatures (Heat Pump)

This control makes it possible to partialize the refrigerating circuit power when the outdoor air temperature and refrigerated water temperature conditions lead to the triggering of minimum-pressure alarms. If *less than 15 minutes* have elapsed since the triggering of a minimum-pressure alarm and pressure falls below a given threshold, circuit active-power partialization is forced till the pressure climbs back over the threshold by a certain differential.

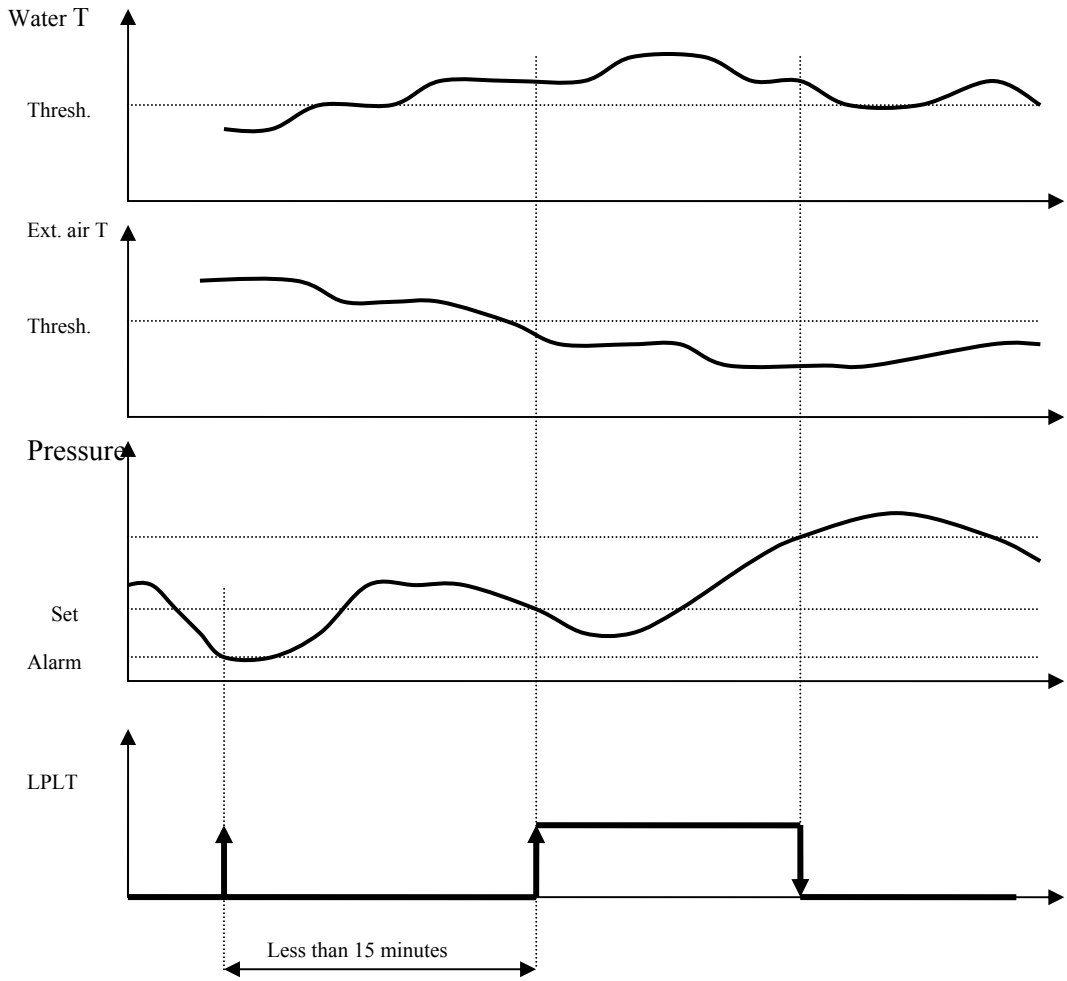
- PC50 = Pressure partialization enable at low temperatures

- PC51 = Pressure partialization set point at low temperatures
- PC52 = Pressure partialization differential at low temperatures
- PC53 = Low external air temperature threshold
- PC54 = Refrigerated-water high-temperature threshold
- PC55 = Delay for partialization from low pressure alarm

According to the number of configured compressors, the power-limiting percentage is calculated on the basis of the following parameter:

- PC32 = Power limiting for winter operation

In order to enable this control, the outdoor air temperature sensor (*PH24*) must be enabled.

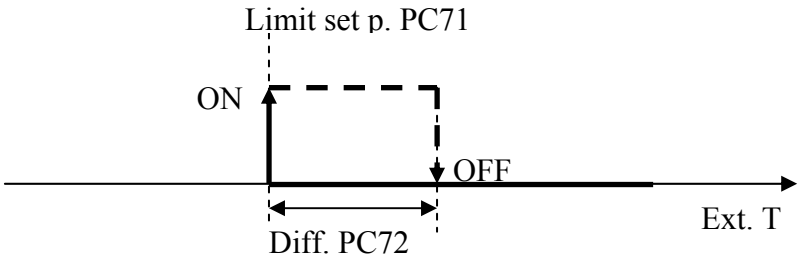


This control can only be enabled in winter operating mode (heat pump).

5.15.6 Operating Limit Management (Heat Pump)

When the external air temperature falls below a particular low level, it may no longer be convenient or sufficient to use the heat pump.

The *Limit set point PC17* on outdoor air temperature is used to disable the heat pump. Reactivation happens when the outdoor air temperature exceeds the *limit set point* plus a configurable *Limit differential PC72*.



In order to enable this function, the outdoor air temperature sensor (*PH24*) must be enabled.

5.16 Manual Operation

This program allows setting the manual operation for compressors and fans. In this condition, the devices are neither involved in rotations nor in thermo control calculations though they remain sensitive to any alarm.

Manual operation of devices proves to be useful when functional tests are to be carried out on the machine to ascertain its integrity and correct functionality.

5.16.1 Compressors

The manual operation of compressors is guaranteed by the parameter *Compressor enable PM1x*:

- If set to *Auto*, it defines the normal behavior of the device.
- If set to *Manu*, it disables the compressor, switching it to manual operation.

A compressor in manual operation mode does not take part in controls and can be forced to provide its steps by acting on the property *Compressor forcing PM2x* (present in the *MAin->MAnu* menu).

As previously mentioned, however, the compressor remains sensitive to any alarm and related consequences.

In order to bring the compressor back to normal operation, parameter *Compressor enable PM1x* must be reset to *Auto* (Automatic) value.

Otherwise, the compressor continues to operate manually, thus failing to comply with any start/stop requests calculated by the configured control.

5.16.2 Fans

The manual or automatic operation of the two condensing fans is guaranteed by the parameters *PM51* (Circuit #1) and *PM52* (Circuit #2):

- If set to *Auto*, it defines the normal behavior of the device.
- If set to *Manu*, it disables the fan, switching it to manual operation.

A manually operated fan does not take part in controls. A fan is forced to switch on/off based on parameters *PM63* and *PM64* and modulated based on parameters *PM61* and *PM62*.

As previously mentioned, however, the fan remains sensitive to any alarm and related consequences.

To bring the fan back to normal operation, the parameter *PM51/PM52* must be reset to *A* (Automatic) value. Otherwise, the fan continues to operate manually, thus failing to comply with any start/stop requests calculated by the configured control.

5.17 Resetting Default Parameters

Using the *Parameter resetting* procedure, all the system parameters can be reset to their default values.

After entering the **InSt**->**MAP** menu, which is accessible only when the machine is switched off, set the parameter *PH15* = *1* and wait for the value 0 to reappear on the display.

The system automatically resets all the parameters back to their default value.

After this operation, you need to switch off the machine and then switch on again to avoid the risk of malfunction.

6 Diagnostics

The application is capable of managing a complete set of alarms related to compressors, fans, circuits, and plant functions. Depending on the various types of alarms, it is possible to configure their resetting (whether manual or automatic), a possible notification delay, and the actions to be taken in that specific case, if any.

When one or more alarms are active, the alarm icon flashes on the display.

In order to view the various alarms, the **Alarm** menu must be displayed from the main page, using ESC button, followed by the ENTER button. By pressing the ESC button from an alarm page or waiting for the 60-second timeout, you are brought back to the application main page.

To scroll the various active alarms, you must press the ENTER button again. Alarms are listed in their order of priority as they are listed in the Alarm Table of chapter 7.2.

All digital inputs related to the alarms are managed by an *Alarm Logic* parameter which has the following significance:

- If set to *NO*, inputs will normally be de-energized (i.e. *open*): N.O. logic.
- If set to *NC*, inputs will normally be energized (i.e. *closed*): N.C. logic.

6.1 Manual and Automatic Alarms

There are 2 types of alarms: those that are manually reset and those that are automatically reset. These alarms offer you the choice of selecting, through the associated parameter, the resetting mode that better reflects your own requirements.

6.2 Manual-Reset Alarms

When a manual-reset alarm is triggered, the alarm icon starts flashing.

By pressing ENTER button from the **ALARM** menu, code of the first active alarm is displayed. Once the conditions which had triggered the alarm are back to normal, the alarm can be manually reset. To carry out this operation:

1. Go to the page of the alarm to be reset.
2. Hold down the ENTER button for about 2 seconds.

At this point, in the absence of any further alarms, the page showing *none* is displayed, the alarm icon is switched off, and the machine goes back to normal operation. Otherwise, the code relating to the next active alarm will be displayed.

The operational result of an active manual reset type of alarm continues until you delete the alarm message.

6.3 Automatic-Reset Alarms

When an auto-reset alarm is triggered, the alarm icon starts flashing.

By pressing ENTER button from the **ALARM** menu, code of the first active alarm is displayed.

After the conditions that had triggered the alarm are back to normal, resetting and deletion of the alarm message automatically take place without your intervention.

The operational result from an active auto-reset alarm continues until you clear or reset the conditions that triggered the alarm.

6.4 Alarm Table

The alarms managed by the application are listed below. The listing order is the same as the one in which alarms are listed when active.

Code	Alarm description	Type	Consequence	Notes
AL01	Input low temperature	S/A	Notification only, or compressors and pump off	Heat pump only Settable delay
AL02	Input high temperature	S/A	Notification only, or compressors and pump off	Chiller only Settable delay
AL03	Primary exchanger efficiency Circuit # 1	Manu	Keeps all circuit compressors off	Settable delay
AL13	Primary exchanger efficiency Circuit # 2	Manu	Keeps all circuit compressors off	
AL05	Evaporator flow meter	A/M	Compressors off Pump on for T sec.	Settable delay In manual stop, pump off
AL11	High-pressure pressure switch Circuit # 1	Manu	All circuit compressors off	-
AL12	High-pressure pressure switch Circuit # 2	Manu	All circuit compressors off	-
AL21	Low-pressure pressure switch Circuit # 1	A/M	All circuit compressors and fans off	Settable start-up delay and rpm
AL22	Low-pressure pressure switch Circuit # 2	A/M	All circuit compressors and fans off	
AL31	Transducer high pressure Circuit # 1	Manu	All circuit compressors off	-
AL32	Transducer high pressure Circuit # 2	Manu	All circuit compressors off	-
AL41	Transducer low pressure Circuit # 1	A/M	All circuit compressors off	Settable start-up delay and rpm
AL42	Transducer low pressure Circuit # 2	A/M	All circuit compressors off	
AL51	Failed start-up for low pressure Circuit # 1	Auto	Keeps all circuit compressors off	-
AL52	Failed start-up for low pressure Circuit # 2	Auto	Keeps all circuit compressors off	-
AL81	Evaporator anti-frost Circuit # 1	Manu	Circuit compressors off and Pump on for T sec.	-
AL82	Evaporator anti-frost Circuit # 2	Manu	Circuit compressors off, and Pump on for T sec.	-

Code	Alarm description	Type	Consequence	Notes
AL90	Common alarm input	Auto	All circuit compressors off.	-
AC21	Thermal switch compressor # 1	A/M	Compressor # 1 off	Settable delay
AC22	Thermal switch compressor # 2	A/M	Compressor # 2 off	
AC23	Thermal switch compressor # 3	A/M	Compressor # 3 off	
AC24	Thermal switch compressor # 4	A/M	Compressor # 4 off	
AP21	Thermal switch pump # 1	A/M	Pump # 1 off (*)	Not implemented
AP22	Thermal switch pump # 2	A/M	Pump # 2 off (*)	Not implemented
AF21	Thermal switch fan Circuit # 1	A/M	Fan # 1 off	Settable delay
AF22	Thermal switch fan Circuit # 2	A/M	Fan # 2 off	
AC01	Operating hours compressor # 1	Auto	Display only	-
AC02	Operating hours compressor # 2	Auto	Display only	-
AC03	Operating hours compressor # 3	Auto	Display only	-
AC04	Operating hours compressor # 4	Auto	Display only	-
AP01	Operating hours pump # 1	Auto	Display only	-
AP02	Operating hours pump # 2	Auto	Display only	-
AF01	Operating hours fan Circuit # 1	Auto	Display only	-
AF02	Operating hours fan Circuit # 2	Auto	Display only	-
ES01	Condensing high pressure transducer C1 inoperable or not connected	Auto	Settable fan forcing	Settable delay
ES02	Condensing low pressure transducer C1 inoperable or not connected	Auto	Inhibits functions using it	
ES03	Leaving chilled water temperature sensor #1 inoperable or not connected	Auto	Settable number of on compressors	
ES04	Entering chilled water temperature sensor inoperable or not connected	Auto	Settable number of on compressors	
ES05	Outdoor sensor inoperable or not connected	Auto	Inhibits functions using it	
ES06	Condensing high pressure transducer C2 inoperable or not connected	Auto	Settable fan forcing	
ES07	Condensing low pressure transducer C2 inoperable or not connected	Auto	Inhibits functions using it	
ES08	Leaving chilled water temperature sensor #2 inoperable or not connected	Auto	Settable number of on compressors	
ERTC	RTC Alarm broken or discharged	A/M	Inhibits management of RTC	-
EN01	Expansion communication alarm	Auto	Display only	Settable delay

Note: (*) If this is the only pump, it switches off all compressors and fans. Otherwise, it switches on the other pump.

S/A = Notification-only or auto-reset alarm (that can be set through a parameter).

A/M = Auto or manual-reset alarm (that can be set through the parameter or by the number of events/hour).

6.5 Alarm Relay

The program offers the possibility of managing a cumulative alarm relay.

Through the parameter *Alarm DO logic-{}- PH18*, it is possible to establish the polarity (NO or NC) of the alarm output.

6.6 Alarms History

The controller memorizes the ALARM HISTORY in a suitable (non volatile) memory zone (organized like the FIFO queue). This Alarm History can rather be a list of the last alarms verified.

In order to view the alarm history, choose **Show HISTORY** from the **GENERAL** menu or from the main page by pressing ESC in order to view the following page:

You may press ENTER on **Show HISTORY>>**.

Each element of the history is associated with the following information:

- progressive number for the alarm
- mnemonic code of the alarm (AL01, AL03, …)
- date and hour in which alarm is verified

The code for each alarm is the same as presented in the alarm table. The storage capacity of the history is 100 events.

Using the parameter *PH30 (Cancel Alarm History)* it is possible to eliminate all the elements memorized in the history. Set the parameter to *YES* (*1*) and wait a couple of seconds till the re-reading of the default value *NO* (*0*).

Note: In case the memory capacity has reached its full limit (100 events recorded) and you wish to memorize/record another event, the first event initially stored in memory is overwritten with the new event. The same rule applies for other elements.

Note: The history is enabled only if the parameter *PG04 = 1* or if the system clock is enabled.

7 List of Modbus Variables

The application can be controlled through a supervisor using the Modbus protocol. Communication takes place through an RS485 serial interface which is incorporated into the controller.

The various status/parameters exported by the application are listed below.

7.1 Modbus registers for TM168D23CHIL101 (with BMS)

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
1	CLOCK_RTC (Low)	0	0	2147483 647	Real Time Clock	R/W
2	CLOCK_RTC (High)	-	-	-	-	-
3	Packed_DI	0	0	65535	bit00 = DI01, bit01 = DI02, bit02 = DI03, bit03 = DI04, bit04 = DI05, bit05 = DI06, bit06 = DI07, bit07 = DI08, bit08 = DI09, bit09 = DI10, bit10 = DI11, bit11 = DI12.	R/W
4	Packed_DO	0	0	65535	bit00 = DO01, bit01 = DO02, bit02 = DO03, bit03 = DO04, bit04 = DO05, bit05 = DO06, bit06 = DO07, bit07 = DO08, bit08 = DO09, bit09 = DO10, bit10 = DO11, bit11 = DO12, bit12 = DO13, bit13 = DO14.	R/W
5	AI1_PressureHP_C1	0.0	-3276.8	3276.7	High pressure condenser circuit 1	R/O
6	AI2_PressureLP_C1	0.0	-3276.8	3276.7	Low pressure Condenser circuit 1	R/O
7	AI3_TempLeaving	0.0	-3276.8	3276.7	Evaporator leaving temperature	R/O
8	AI4_TempEntering	0.0	-3276.8	3276.7	Evaporator entering temperature	R/O

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
9	AI5_OutDoorProbe	0.0	-3276.8	3276.7	Outdoor air temperature	R/O
10	AI1_remotePressureHP_C2	0.0	-3276.8	3276.7	High pressure condenser circuit 2	R/O
11	AI2_RemoteLP_C2	0.0	-3276.8	3276.7	Low pressure condenser circuit 2	R/O
12	AI3remote_TempLeavingC2	0.0	-3276.8	3276.7	Evaporator leaving temperature circuit 2	R/O
13	AO1	0.00	0.00	100.00	Analog out 1	R/O
14	AO2	0.00	0.00	100.00	Analog out 2	R/O
15	AO3	0.00	0.00	100.00	Analog out 3	R/O
16	AO4	0.00	0.00	100.00	Analog out 4	R/O
17	AO5	0.00	0.00	100.00	Analog out 5	R/O
18	AO6	0.00	0.00	100.00	Analog out 6	R/O
19	PackedAlarm1	0	0	65535	Alarm 1…16	R/W
20	PackedAlarm2	0	0	65535	Alarm 17…32	R/W
21	PackedAlarm3	0	0	65535	Alarm 33…48	R/W
22	SetpointSummer_Actual	8.5	-15.0	23.0	Actual setpoint summer	R/W
23	SetpointWinter_Actual	44.0	23.0	70.0	Actual setpoint winter	R/W
24	PowerRequested	0	0	100	Requested power [%]	R/W
25	PowerSupplied	0	0	100	Supplied power [%]	R/W
26	PT02_StartDay1TZ_1 (Low)	0	0	86399	PT02 - Start time day 1 zone 1	R/W
27	PT02_StartDay1TZ_1 (High)	-	-	-	-	-
28	PT03_EndDay1TZ_1 (Low)	0	0	86399	PT03 - End time day 1 zone 1	R/W
29	PT03_EndDay1TZ_1 (High)	-	-	-	-	-
30	PT04_day1_OffsetCoolingDay1TZ_1	0.0	-36.0	36.0	PT04 - Offset cooling day 1 zone 1	R/W
31	PT05_OffsetHeatingDay1TZ_2	0.0	-36.0	36.0	PT05 - Offset heating day 1 zone 1	R/W
32	PT07_StartDay1TZ_2 (Low)	0	0	86399	PT07 - Start time day 1 zone 2	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
33	PT07_StartDay1TZ_2 (High)	-	-	-	-	-
34	PT08_EndDay1TZ_2 (Low)	0	0	86399	PT08 - End time day 1 zone 2	R/W
35	PT08_EndDay1TZ_2 (High)	-	-	-	-	-
36	PT09_OffsetCoolingDay1TZ_2	0.0	-36.0	36.0	PT09 - Offset cooling day 1 zone 2	R/W
37	PT10_OffsetHeatingDay1TZ_2	0.0	-36.0	36.0	PT10 - Offset heating day 1 zone 2	R/W
38	PT12_StartDay2TZ_1 (Low)	0	0	86399	PT12 - Start time day 2 zone 1	R/W
39	PT12_StartDay2TZ_1 (High)	-	-	-	-	-
40	PT13_EndDay2TZ_1 (Low)	0	0	86399	PT13 - End time day 2 zone 1	R/W
41	PT13_EndDay2TZ_1 (High)	-	-	-	-	-
42	PT14_OffsetCoolingDay2TZ_1	0.0	-36.0	36.0	PT14 - Offset cooling day 2 zone 1	R/W
43	PT15_OffsetHeatingDay2TZ_1	0.0	-36.0	36.0	PT15 - Offset heating day 2 zone 1	R/W
44	PT17_StartDay2TZ_2 (Low)	0	0	86399	PT17 - Start time day 2 zone 2	R/W
45	PT17_StartDay2TZ_2 (High)	-	-	-	-	-
46	PT18_EndDay2TZ_2 (Low)	0	0	86399	PT18 - End time day 2 zone 2	R/W
47	PT18_EndDay2TZ_2 (High)	-	-	-	-	-
48	PT19_OffsetCoolingDay2TZ_2	0.0	-36.0	36.0	PT19 - Offset cooling day 2 zone 2	R/W
49	PT20_OffsetHeatingDay2TZ_2	0.0	-36.0	36.0	PT20 - Offset heating day 2 zone 2	R/W
50	SPC1_SetpointSummer	8.5	-15.0	73.0	SPC1 - Setpoint summer (Chiller)	R/W
51	SPH1_SetpointInverno	44.0	23.0	158.0	SPH1 - Setpoint winter (HP)	R/W
52	PM00_Limit_HourCmp (Low)	2000	0	100000	PM00 - Maintenance interval compressors	R/W
53	PM00_Limit_HourCmp (High)	-	-	-	-	-

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
54	PM01_OperatingHoursComp1 (Low)	0	0	100000	PM01 - Operating hours comp 1	R/W
55	PM01_OperatingHoursComp1 (High)	-	-	-	-	-
56	PM02_OperatingHoursComp2 (Low)	0	0	100000	PM02 - Operating hours comp 2	R/W
57	PM02_OperatingHoursComp2 (High)	-	-	-	-	-
58	PM03_OperatingHoursComp3 (Low)	0	0	100000	PM03 - Operating hours comp 3	R/W
59	PM03_OperatingHoursComp3 (High)	-	-	-	-	-
60	PM04_OperatingHoursComp4 (Low)	0	0	100000	PM04 - Operating hours comp 4	R/W
61	PM04_OperatingHoursComp4 (High)	-	-	-	-	-
62	PM30_Limit_HourPump (Low)	2000	0	100000	PM30 - Maintenance interval pumps	R/W
63	PM30_Limit_HourPump (High)	-	-	-	-	-
64	PM31_OperatingHoursPump1 (Low)	0	0	100000	PM31 - Operating hours pump 1	R/W
65	PM31_OperatingHoursPump1 (High)	-	-	-	-	-
66	PM32_OperatingHoursPump2 (Low)	0	0	100000	PM32 - Operating hours pump 2	R/W
67	PM32_OperatingHoursPump2 (High)	-	-	-	-	-
68	PM40_Limit_HourFan (Low)	2000	0	100000	PM40 - Maintenance interval fans	R/W
69	PM40_Limit_HourFan (High)	-	-	-	-	-
70	PM41_OperatingHoursFan1 (Low)	0	0	100000	PM41 - Operating hours fan 1	R/W
71	PM41_OperatingHoursFan1 (High)	-	-	-	-	-
72	PM42_OperatingHoursFan2 (Low)	0	0	100000	PM42 - Operating hours fan 2	R/W
73	PM42_OperatingHoursFan2 (High)	-	-	-	-	-
74	PM90_Last_maintenance (Low)	0	0	2147483 647	PM90 - Last maintenance	R/W
75	PM90_Last_maintenance (High)	-	-	-	-	-
76	PM61_ForzaturaInvFan_C1	0.00	0.00	100.00	PM61 - Manual frequency condensing fan circuit # 1	R/W
77	PM62_ForzaturaInvFan_C2	0.00	0.00	100.00	PM62 - Manual frequency condensing fan circuit # 2	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
78	PM81_CalbrationPressureProbeHP_C1	0.0	-36.0	36.0	PM81 - Calibration HP pressure	R/W
79	PM82_CalbrationPressureProbeLP_C1	0.0	-36.0	36.0	PM82 - Calibration LP Sensor C1	R/W
80	PM83_CalibrationAI03	0.0	-290.0	290.0	PM83 - Calibration AI03	R/W
81	PM84_CalibrationAI04	0.0	-36.0	36.0	PM84 - Calibration AI04	R/W
82	PM85_calibrationAI05	0.0	-36.0	36.0	PM85 - Calibration AI05	R/W
83	PM86_CalbrationPressureProbeHP_C2	0.0	-36.0	36.0	PM86 - Calibration HP pressure C2	R/W
84	PM87_CalbrationPressureProbeLP_C2	0.0	-290.0	290.0	PM87 - Calibration LP sensor C2	R/W
85	PM88_CalibrationAI3remote	0.0	-290.0	290.0	PM88 - Calibration AI03 remote	R/W
86	PC04_Cmp_TminOn	20	0	999	PC04 - Compressor minimum on time	R/W
87	PC05_Cmp_TminOff	120	0	999	PC05 - Compressor minimum off time	R/W
88	PC06_Cmp_TonOn	360	0	999	PC06 - Minimum time between 2 start-up of same comp	R/W
89	PC07_Cmp_TonOther	10	0	999	PC07 - Minimum time between 2 start-up of different comp	R/W
90	PC08_Cmp_ToffOther	20	0	999	PC08 - Minimum time between 2 shutdown of different comp	R/W
91	PC12_ProportionalLateralBand	2.5	1.0	36.0	PC12 - Proportional band lateral control	R/W
92	PC14_DeadZone	3.0	0.1	18.0	PC14 - Neutral zone	R/W
93	PC15_DeadZone_Min	1.0	0.1	18.0	PC15 - Minimum value of compressor zero energy band	R/W
94	PC16_DeadZone_Max	5.0	0.1	18.0	PC16 - Maximum value of compressor zero energy band	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
95	PC17_DeadZoneOutsideTime	20	0	999	PC17 - Release time compressor neutral zone control	R/W
96	PC21_MinValueSetChiller	5.0	-15.0	73.0	PC21 - Minimum value setpoint summer (Chiller)	R/W
97	PC22_MaxValueSetChiller	20.0	15.0	73.0	PC22 - Maximum value setpoint summer (Chiller)	R/W
98	PC23_MinValueSetHP	30.0	23.0	158.0	PC23 - Minimum setpoint winter (HP)	R/W
99	PC24_MaxValueSetHP	44.0	23.0	158.0	PC24 - Maximum setpoint winter (HP)	R/W
100	PC31_PowerLimitedSummer	50	0	100	PC31 - Power limited summer	R/W
101	PC32_PowerLimitedWinter	50	0	100	PC32 - Power limited winter	R/W
102	PC36_SetForceSummer	3.5	-30.0	73.0	PC36 - Summer force shutdown setpoint	R/W
103	PC37_SetForceWinter	52.0	26.0	167.0	PC37 - Winter force shutdown setpoint	R/W
104	PC42_CompShutDownTime	5	0	240	PC42 - Compressor shutdown time in pump-down	R/W
105	PC43_DiffPumpDown	1.5	0.0	72.5	PC43 - Threshold for pump-down disabling	R/W
106	PC46_SetpointHPTC	27.0	0.0	652.5	PC46 - Pressure set point for high-temperature pressure-switch control	R/W
107	PC47_DiffHPTC	2.0	0.0	72.5	PC47 - Pressure differential for high-temperature pressure-switch control	R/W
108	PC48_ThresholdAirExtHPTC	12.0	-30.0	73.0	PC48 - External high temperature threshold for pressure-switch control	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
109	PC49_MinTimeHPTC	10	0	99	PC49 - Minimum time for maintaining pressure-switch partialization	R/W
110	PC51_SetControlPressostaticLP	3.2	0.0	145.0	PC51 - Pressure setpoint for low-temperature pressure-switch control	R/W
111	PC52_DiffControlPressostaticLT	2.0	0.0	145.0	PC52 - Differential pressure for pressostatic control at low temperature	R/W
112	PC53_SetMinAirExt	-5.0	-10.0	41.0	PC53 - Setpoint low external temperature for pressure control	R/W
113	PC54_SetMaxTempOut	48.0	30.0	158.0	PC54 - Setpoint low external temperature for pressostatic control	R/W
114	PC55_DelayPartialization	900	0	999	PC55 - Delay for partialization from low pressure alarm	R/W
115	PC61_SetCommutationSummer	20.0	0.0	158.0	PC61 - Setpoint commutation summer	R/W
116	PC62_SetCommutationWinter	10.0	0.0	158.0	PC62 - Setpoint commutation winter	R/W
117	PC64_offsetDynamicSetSummer	-10.0	-36.0	36.0	PC64 - Offset dynamic setpoint summer (Chiller)	R/W
118	PC65_StartTempDynamicSPSummer	30.0	-27.0	126.0	PC65 - Start temperature dynamic setpoint summer (Chiller)	R/W
119	PC66_EndTempDynamicSPSummer	60.0	-27.0	126.0	PC66 - End temperature dynamic setpoint summer (Chiller)	R/W
120	PC67_offsetDynamicSetWinter	10.0	-36.0	36.0	PC67 - Offset dynamic setpoint winter (HP)	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
121	PC68_StartTempDynamicSPWinter	0.0	-27.0	126.0	PC68 - Start temperature dynamic setpoint winter (HP)	R/W
122	PC69_EndTempDynamicSPWinter	30.0	-27.0	126.0	PC66 - End temperature dynamic setpoint winter (HP)	R/W
123	PC71_FunctionLimitSetPoint	-7.0	-54.0	54.0	PC71 - Function limit setpoint	R/W
124	PC72_FunctionLimitDiff	4.0	0.1	18.0	PC72 - Function limit differential	R/W
125	PF07_Fan_TonOther	10	0	999	PF07 - Fan minimum time between 2 starts	R/W
126	PF08_Fan_ToffOther	20	0	999	PF08 – Minimum time between 2 fan shutdown	R/W
127	PF10_ForceInErrorProbe	0.00	0.00	100.00	PF10 - Fan frequency in case of condensing sensor alarm	R/W
128	PF11_SetCond_Chiller	20.0	5.0	652.5	PF11 - Setpoint condensation summer (Chiller)	R/W
129	PF12_DiffCond_Chiller	12.0	0.1	217.5	PF12 - Differential condensation summer (Chiller)	R/W
130	PF14_SetForcingMaxCond_Chiller	26.0	15.0	652.5	PF14 - Setpoint maximum condensation summer (Chiller)	R/W
131	PF15_DiffForcingMaxCond_Chiller	2.0	0.1	72.5	PF15 - Differential maximum condensation summer (Chiller)	R/W
132	PF16_CoolingPI	0	0	999	PF08 - Integral time for control of valves (cooling)	R/W
133	PF21_SetRegCond_HP	9.0	0.5	217.5	PF21 - Setpoint condensation winter (HP)	R/W
134	PF22_DiffRegCond_HP	2.0	0.1	217.5	PF22 - Differential condensation winter (HP)	R/W
135	PF24_SetForcingMaxCond_HP	3.2	0.5	290.0	PF24 - Setpoint maximum condensation winter (HP)	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
136	PF25_DiffForcingMaxCond_HP	0.5	0.1	72.5	PF25 - Differential maximum condensation winter (HP)	R/W
137	PF26_HeatingPI	0	0	999	PF08 - Integral time for control of valves (heating)	R/W
138	PF27_MinVal_InverterFan	0.00	0.00	100.00	PF27 - Minimum value inverter for condensing forcing	R/W
139	PF28_SpeedUp_InverterFan	4	0	999	PF28 - Speedup inverter condenser	R/W
140	PF31_LimitMinCondensationLinear	30.00	0.00	100.00	PF31 - Minimum limit regulation inverter condensation	R/W
141	PF32_LimitMaxCondensationLinear	100.00	0.00	100.00	PF32 - Maximum limit regulation inverter condensation	R/W
142	PF34_DiffCutOff	2.0	0.0	72.5	PF34 - Switch-off differential under the minimum condensing limit (inverter)	R/W
143	PF41_LinInverterFan	25.00	0.00	100.00	PF41 - Value X1 fan linearization table	R/W
144	PF42_LinInverterFan	50.00	0.00	100.00	PF42 - Value X2 fan linearization table	R/W
145	PF43_LinInverterFan	75.00	0.00	100.00	PF43 - Value X3 fan linearization table	R/W
146	PF45_LinInverterFan	25.00	0.00	100.00	PF45 - Value Y1 fan linearization table	R/W
147	PF46_LinInverterFan	50.00	0.00	100.00	PF46 - Value Y2 fan linearization table	R/W
148	PF47_LinInverterFan	75.00	0.00	100.00	PF47 - Value Y3 fan linearization table	R/W
149	Pd01_SetStartDefrost	6.0	0.0	652.5	Pd01 - Setpoint start defrost	R/W
150	Pd02_SetStopDefrost	12.0	0.0	652.5	Pd02 - Setpoint stop defrost	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
151	Pd03_WaitTimeStartDefrost	1200	60	9600	Pd03 - Waiting interval at defrost start	R/W
152	Pd05_MaxTimeDefrost	300	10	600	Pd05 - Maximum duration of defrost	R/W
153	Pd06_DrippingTime	120	0	600	Pd06 - Dripping time	R/W
154	Pd07_MinTimeWaitAfterCmp	60	0	600	Pd07 - Minimum time to wait after compressor restart	R/W
155	Pd21_SetStartCompensation	5.0	-30.0	70.0	Pd21 - Setpoint for defrosting compensation start	R/W
156	Pd22_SetStopCompensation	0.0	-30.0	70.0	Pd22 - Setpoint for defrosting compensation stop	R/W
157	Pd23_MaxTimeCompensation	3600	0	9600	Pd23 - Maximum waiting time at defrosting compensation stop	R/W
158	PP02_TOnCyclic	120	1	999	PP02 - Pump on time in cyclic working	R/W
159	PP03_TOffCyclic	120	1	999	PP03 - Pump off time in cyclic working	R/W
160	PP04_TMinPumpComp	60	1	999	PP04 - Minimum time between on pump and on comp	R/W
161	PP05_DelayShutdownPumps	60	1	999	PP05 - Delay shutdown pumps	R/W
162	PP08_DeltaHoursSwap	4	1	240	PP08 - Delta hours to swap pumps	R/W
163	PP09_PumpOperatingTimeLowWater	15	0	999	PP09 - Operating time pump low water flow	R/W
164	PP10_PumpOperatingTimeLowTemp	15	0	999	PP10 - Pump operating time at low temperature	R/W
165	Pr02_SetpointHeater	5.0	-30.0	50.0	Pr02 - Setpoint heater	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
166	Pr03_DiffHeater	2.0	0.1	18.0	Pr03 - Differential heater	R/W
167	Pr11_SetpointAlarmAntifreeze	3.0	-30.0	50.0	Pr11 - Setpoint alarm antifreeze	R/W
168	Pr12_DiffAlarmAntifreeze	2.0	0.1	18.0	Pr12 - Differential alarm antifreeze	R/W
169	PA01_FlowStartup_AlarmDelay	10	1	999	PA01 - Delay alarm flow from start-up	R/W
170	PA02_FlowRunning_AlarmDelay	1	1	999	PA02 - Delay flow running alarm	R/W
171	PA04_DelayErrorProbe	10	0	240	PA04 - Delay inoperable sensor	R/W
172	PA05_SetpointAlarmHighTemp	30.0	10.0	104.0	PA05 - Setpoint alarm high temperature	R/W
173	PA06_SetpointAlarmLowTemp	15.0	10.0	104.0	PA06 - Setpoint alarm low temperature	R/W
174	PA07_DelayTempAlarm	30	1	999	PA07 - Delay for temperature alarm	R/W
175	PA09_DifferentialAlarmTemp	0.5	0.1	18.0	PA09 - Differential alarm high/low temperature	R/W
176	PA10_DelayAfterUnitOn	15	0	999	PA10 - Delay temperature alarm after unit on	R/W
177	PA11_SetAlarmLowPress	3.0	0.1	143.5	PA11 - Setpoint alarm low pressure	R/W
178	PA12_DiffAlarmLowPress	1.0	0.1	58.0	PA12 - Differential alarm low pressure	R/W
179	PA13_TimeByPassAlarmLowPress	120	0	999	PA13 - Delay alarm low pressure	R/W
180	PA17_SetAlarmLPwithLT	1.0	0.1	143.5	PA17 - Setpoint alarm low pressure with low temperature	R/W
181	PA18_DiffAlarmLowPressWithLowTemp	0.5	0.1	58.0	PA18 - Differential alarm low pressure with low temperature	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
182	PA19_TimeActiveControlLPwithLT	120	10	999	PA19 - Time activation control low pressure with low temperature	R/W
183	PA20_DelayAlarmLPatStartUpCmp	240	0	999	PA20 - Delay alarm low pressure at start-up first compressor	R/W
184	PA21_SetHPal	28.0	0.0	652.5	PA21 - Setpoint high pressure alarm	R/W
185	PA22_DiffHPal	5.0	0.1	435.0	PA22 - Differential for reset high pressure alarm	R/W
186	PA26_MinDiffPrimaryExchanger	2.0	0.1	36.0	PA26 - Minimum difference threshold for primary exchanger	R/W
187	PA27_ByPassAllPrimaryExchanger	120	0	999	PA27 - By-pass timer for primary exchanger efficiency alarm	R/W
188	PA33_CommonAlarmInput_Delay	30	0	999	PA33 - Delay common alarm input	R/W
189	PA41_ThermalCmp_Delay	10	0	999	PA41 - Delay of compressor thermal alarm	R/W
190	PA81_ThermalFan_Delay	10	0	999	PA81 - Delay of fan thermal alarm	R/W
191	PA99_DelayExpAlarm	5	0	999	PA99 - Delay for expansion alarm	R/W
192	PH11_Modbus_Address	1	1	247	PH11 - Modbus address	R/W
193	PN01_BACnetMSTP_MacID	1	1	127	PN01 - BACnet MacId	R/W
194	PN03_BACnetMSTP_DeviceInstance (Low)	108	1	4194303	PN03 - BACnetMSTP DeviceInstance	R/W
195	PN03_BACnetMSTP_DeviceInstance (High)	-	-	-	-	-
196	PN04_BACnetMSTP_InfoFrames	3	1	127	PN04 - BACnetMSTP InfoFrames	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
197	PN05_BACnetMSTP_MaxMaster	127	1	127	PN05 - BACnetMSTP MaxMaster	R/W
198	PH01_Pressure_Min	0.0	-145.0	652.5	PH01 - Minimum pressure	R/W
199	PH02_Pressure_Max	30.0	-145.0	652.5	PH02 - Maximum pressure	R/W
200	PSd1_Password_User	0	-999	9999	PSd1 - User password	R/W
201	PSd2_Password_Maintenance	0	-999	9999	PSd2 - Maintain Password	R/W
202	PSd3_Password_Installation	0	-999	9999	PSd3 - Installer password	R/W
203	PSd4_Password_Configuration	0	-999	9999	PSd4 - Constructor password	R/W
500	UIunitStatus	0	0	8	Unit status	R/W
501	UI_defrost_C1 or C2	0	0	2	Status defrost (circuit)	R/W
502	UI_defrost	0	0	2	Status defrost (machine)	R/W
503	StatusCompressors[0]	0	0	6	Status compressor	R/W
504	StatusCompressors[1]	0	0	6	Status compressor	R/W
505	StatusCompressors[2]	0	0	6	Status compressor	R/W
506	StatusCompressors[3]	0	0	6	Status compressor	R/W
507	UIstatusFan_C1	0	0	6	Status fan C1	R/W
508	UIstatusFan_C2	0	0	6	Status fan C2	R/W
509	Pump1_Status	0	0	3	Status pump 1	R/W
510	Pump2_status	0	0	3	Status pump 2	R/W
511	PT21_typeDay_Monday	1	0	2	PT21 - Daily program Monday	R/W
512	PT22_typeDay_Tuesday	1	0	2	PT22 - Daily program Tuesday	R/W
513	PT23_typeDay_Wednesday	1	0	2	PT23 - Daily program Wednesday	R/W
514	PT24_typeDay_Thursday	1	0	2	PT24 - Daily program Thursday	R/W
515	PT25_typeDay_Friday	1	0	2	PT25 - Daily program Friday	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
516	PT26_typeDay_Saturday	0	0	2	PT26 - Daily program Saturday	R/W
517	PT27_typeDay_Sunday	0	0	2	PT27 - Daily program Sunday	R/W
518	PC01_Cmp_Rotation_Type	0	0	3	PC01 - Compressor rotation: 0 = FIFO, 1 = LIFO, 2 = FIFO+Hr, 3 = LIFO+Hr.	R/W
519	PC02_CompressorsMode	0	0	1	PC02 - Compressors mode (twin circuit): 0 = balancing, 1 = saturation	R/W
520	PC09_MaxNumEvHour	8	4	12	PC09 - Maximum number of start-ups for every hour	R/W
521	PC10_CompressorInErrorProbe	1	0	3	PC10 - Number of compressors on for circuit during sensor inoperable	R/W
522	PC41_EnabPumpDown	0	0	2	PC41 - Enable pump-down	R/W
523	PC70_FunctionLimitManagement	0	0	2	PC70 - Function limit management	R/W
524	PP01_PumpOperation	0	0	2	PP01 - Pump Operation	R/W
525	PA03_NumberFlowAlarmaToManual	3	0	9	PA03 - Number flow alarm to became manual	R/W
526	PA14_NumEvHourLP	3	0	5	PA14 - Number of alarms for manual restore type	R/W
527	PH12_Modbus_Baud	3	0	7	PH12 - Modbus baud: 0 = 1200, 1 = 2400, 2 = 4800, 3 = 9600, 4 = 19200, 5 = 28800, 6 = 38400, 7 = 57600.	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
528	PH13_Modbus_Parity	0	0	2	PH13 - Modbus parity: 0 = NONE, 1 = ODD, 2 = EVEN.	R/W
529	PN02_BACnetMSTP_BaudRate	0	0	3	PN02 - BACnetMSTP BaudRate: 0 = 9600; 1 = 19200; 2 = 38400; 3 = 76800.	R/W
530	PH31_RefrigerationType	3	0	6	PH31 - Refrigerant type: 0 = none, 1 = R22, 2 = R134a, 3 = R404A, 4 = R407C, 5 = R410A, 6 = R507.	R/W
531	PG00_UnitType	1	1	4	PG00 - Unit Type: 1: Air-to-water chiller 2: Air-to-water chiller + HP 3: Water-to-water chiller) 4: Water-to-water chiller + HP	R/W
532	PG01_NumberCircuit	2	1	2	PG01 - Number of circuits	R/W
533	PG03_NumberCompCirc	2	1	2	PG03 - Number of compressors per circuit	R/W
534	PG09_PumpsNumber	1	0	2	PG09 - Pumps number	R/W
535	HC01_InputTypeLowPressC1	1	1	3	HC01 - Input type low pressure sensor C1	R/W
536	HC02_InputTypeHighPressC1	1	1	3	HC02 - Input type high pressure sensor C1	R/W
537	HC03_InputTypeLowPressC2	1	1	3	HC03 - Input type low pressure sensor C2	R/W
538	HC04_InputTypeHighPressC2	1	1	3	HC04 - Input type high pressure sensor C2	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
539	HC06_AnalogOut	2	1	3	HC06 - It sets the position of the analog output for condenser	R/W
1000	OnOffBySuperv	0	0	1	On/off machine by supervisor	R/W
1001	FuncModeBySuperv	0	0	1	Operating mode by supervisor	R/W
1002	UI_scheduler	0	0	1	Active time zone	R/W
1003	UI_Mode	0	0	1	Operation mode	R/W
1004	PT01_enabWorkingDay1Zone1	0	0	1	PT01 - Enable zone 1 of working day 1	R/W
1005	PT06_enabWorkingDay1Zone2	0	0	1	PT06 - Enable zone 2 of working day 1	R/W
1006	PT11_enabWorkingDay2Zone1	0	0	1	PT11 - Enable zone 1 of working day 2	R/W
1007	PT16_enabWorkingDay2Zone2	0	0	1	PT16 - Enable zone 2 of working day 2	R/W
1008	MOdE_OperatingMode	0	0	1	0 = Cool (Chiller), 1 = Heat (PdC)	R/W
1009	PM11a14_EnabManual_Comp[0]	0	0	1	PM11 – Enable manual operation of the compressor	R/W
1010	PM11a14_EnabManual_Comp[1]	0	0	1	PM11 - Enable manual operation of the compressor	R/W
1011	PM11a14_EnabManual_Comp[2]	0	0	1	PM11 - Enable manual operation of the compressor	R/W
1012	PM11a14_EnabManual_Comp[3]	0	0	1	PM11 - Enable manual operation of the compressor	R/W
1013	PM21a24_forceManualComp[0]	0	0	1	PM21 - Manual operation compressor	R/W
1014	PM21a24_forceManualComp[1]	0	0	1	PM21 - Manual operation compressor	R/W
1015	PM21a24_forceManualComp[2]	0	0	1	PM21 - Manual operation compressor	R/W
1016	PM21a24_forceManualComp[3]	0	0	1	PM21 - Manual operation	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
					compressor	
1017	PM51_EnabManual_FanC1	0	0	1	PM51 - Enable the manual/automatic operation of the condensing fan in circuit # 1	R/W
1018	PM52_EnabManual_FanC2	0	0	1	PM52 - Enable the manual/automatic operation of the condensing fan in circuit # 2	R/W
1019	PM63_ForzaturaInvFan_C1	0	0	1	PM63 - Manual operation condensing fan circuit # 1	R/W
1020	PM64_ForzaturaInvFan_C2	0	0	1	PM64 - Manual operation condensing fan circuit # 2	R/W
1021	PC11_TypeRegulation	0	0	1	PC11 - Type of control	R/W
1022	PC18_DeadZoneAdaptive	0	0	1	PC18 - Enable adaptive control neutral zone control	R/W
1023	PC35_EnabForceShutDown	0	0	1	PC35 - Enable force shutdown of the compressor	R/W
1024	PC45_EnabHPTC	0	0	1	PC45 - Enable high-temperature pressure-switch control	R/W
1025	PC50_EnabPressControlLT	0	0	1	PC50 - Enable low-temperature pressure-switch control (heat pump)	R/W
1026	PF01_CondenserControlType	0	0	1	PF01 - Condenser control type	R/W
1027	PF02_EnFanWithCmp	0	0	1	PF02 - Enable fan control only if at least one compressor is on	R/W
1028	PF03_StopFan_Defrost	0	0	1	PF03 - Stop fan during defrost	R/W
1029	PF09_ForceInErrorProbe	0	0	1	PF09 - Fan operation in case of condensing sensor alarm	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
1030	PF13_EnabForceMax	1	0	1	PF13 - Enable force maximum condensation	R/W
1031	PF33_EnabCutOff	1	0	1	PF33 - Enable fan control under minimum condensing limit	R/W
1032	Pd20_EnabDefrostCompensation	0	0	1	Pd20 - Enable defrost compensation	R/W
1033	PP07_ShotdownPumpInDefrost	0	0	1	PP07 - Shutdown pump during defrost	R/W
1034	Pr01_EnableAntiFreezeHeater	1	0	1	Pr01 - Enable antifreeze heater	R/W
1035	Pr04_ForceHeaterErrorProbe	0	0	1	Pr04 - Forcing of anti-frost heating elements when sensor inoperable	R/W
1036	PA08_consequentTimeForTempAlarm	0	0	1	PA08 - Enable temperature alarm	R/W
1037	PA16_EnabLPcontrolLowTemp	1	0	1	PA16 - Enable low pressure alarm at start-up with low temperature	R/W
1038	PA25_EnAllPrimaryExchanger	0	0	1	PA25 - Enable primary exchanger efficiency alarm	R/W
1039	PA30_EnableAlarmRTC	1	0	1	PA30 - Enable alarm RTC	R/W
1040	PA31_ResetType_AlarmRTC	1	0	1	PA31 - Reset type alarm RTC	R/W
1041	PA32_Enable_CommonAlarmInput	1	0	1	PA32 - Enable common alarm input	R/W
1042	PA34_ResetType_CommonAlarmInput	1	0	1	PA34 - Common alarm input reset type	R/W
1043	PA40_En_Alarm_HourCmp	1	0	1	PA40 - Enable alarm of operating hours of compressors	R/W
1044	PA42_ThermalCmp_ResetType	1	0	1	PA42 - Type of reset for thermal alarm of the compressor	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
1045	PA60_En_Alarm_HourPump	1	0	1	PA60 - Enable alarm operating hours pumps	R/W
1046	PA71_RestoreTypeHighPressAl	1	0	1	PA71 - Type of reset for high pressure alarm	R/W
1047	PA80_En_Alarm_HourFan	1	0	1	PA80 - Enable operating hour alarm fan	R/W
1048	PA82_ThermalFanResetType	1	0	1	PA82 - Type of reset for fan thermal alarm	R/W
1049	PH14_Modbus_StopBit	1	0	1	PH14 - Modbus stop bit: 0 = 1stop bit, 1 = 2 stop bits.	R/W
1050	PH04_En_bySchedule	0	0	1	PH04 - Enable on/off machine by schedule	R/W
1051	PH05_En_OnOffByKey	1	0	1	PH05 - Enable on/off machine by key	R/W
1052	PH06_En_ModeByChangeOver	0	0	1	PH06 - Enable automatic switchover summer/winter operating mode	R/W
1053	PH07_En_OnOffByDI	0	0	1	PH07 - Enable on/off machine by DI	R/W
1054	PH08_En_ModeByDI	0	0	1	PH08 - Enable switchover summer/winter operating mode by DI	R/W
1055	PH09_En_OnOffBySuperv	0	0	1	PH09 - Enable on/off machine by supervisor	R/W
1056	PH10_En_ModeBySup	0	0	1	PH10 - Enable switchover summer/winter operating mode by supervisor	R/W
1057	PH15_FactoryDefault	0	0	1	PH15 - Reset parameter to factory defaults	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
1058	PH16_LogicReverseValve	0	0	1	PH16 - Logic DO reverse valve: 0 = NO, 1 = NC.	R/W
1059	PH17_Logic_DI_Alarm	1	0	1	PH17 - Logic DI alarm: 0 = NO, 1 = NC.	R/W
1060	PH18_LogicReleAlarm	0	0	1	PH18 - Logic DO alarm: 0 = NO, 1 = NC.	R/W
1061	PH19_Logic_DI_Mode	0	0	1	PH19 - Logic DI mode: 0 = NO, 1 = NC.	R/W
1062	PH20_Logic_DI_Flow	0	0	1	PH20 - Logic DI flow: 0 = NO, 1 = NC.	R/W
1063	PH21_EnabSensorEnteringWater	1	0	1	PH21 - Enable entering water temperature sensor	R/W
1064	PH22_EnabLeavingTemperatureProbe	1	0	1	PH22 - Enable leaving temperature sensor	R/W
1065	PH23_EnabLeavingTemperatureProbeC2	1	0	1	PH22 - Enable leaving temperature sensor circuit 2	R/W
1066	PH24_EnabOutdoorProbe	0	0	1	PH24 - Enable outdoor temperature sensor	R/W
1067	PH27_EnabDynamicSetPoint	0	0	1	PH27 - Enable dynamic setpoint	R/W
1068	PH28_EnabsecSetbySched	0	0	1	PH28 - Enable secondary setpoint by scheduler	R/W
1069	PH30_HistoryReset	0	0	1	PH30 - Reset alarm log	R/W
1070	PH32_Temp_UM	0	0	1	PH32 - Temperature unit: 0 = C, 1 = F.	R/W

REGISTER VARS LIST						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
1071	PH33_Press_UM	0	0	1	PH33 - Pressure unit: 0 = Bar, 1 = psi.	R/W
1072	PH53_Icon_Cool_Heat	0	0	1	PH53 - Mode icon cool/heat	R/W
1073	PH61_Logic_DI_Remote_OnOff	0	0	1	PH61 - Logic DI remote on-off: 0 = NO, 1 = NC.	R/W
1074	PG02_En_Expansion	1	0	1	PG02 - Enable expansion	R/W
1075	PG04_En_RTC	1	0	1	PG04 - Enable real time clock (RTC)	R/W
1076	PG11_EnabUniqueCondensing	0	0	1	PG11 - Enable unique condensing;	R/W
1077	PG12_enabSingleEvap	0	0	1	PG12 - Enable single evaporation	R/W
1078	HC05_DigitalOutput4	0	0	1	HC05 - Function of DO4 0 = liquid line 1, 1 = pump 2.	R/W
1079	HC07_LPorFanAlarm_C2	0	0	1	HC07 - Enable LP or fan alarm switch	R/W

Note: Double word Modbus registers are listed as 2 registers. Ranges are specified for the complete double word register only.

7.2 Modbus registers for TM168D23CHIL101 (without BMS)

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
1	CLOCK_RTC (Low)	0	0	2147483647	Real Time Clock	R/W
2	CLOCK_RTC (High)	-	-	-	-	-
3	Packed_DI	0	0	65535	bit00 = DI01, bit01 = DI02, bit02 = DI03, bit03 = DI04, bit04 = DI05, bit05 = DI06, bit06 = DI07, bit07 = DI08, bit08 = DI09, bit09 = DI10, bit10 = DI11, bit11 = DI12.	R/W
4	Packed_DO	0	0	65535	bit00 = DO01, bit01 = DO02, bit02 = DO03, bit03 = DO04, bit04 = DO05, bit05 = DO06, bit06 = DO07, bit07 = DO08, bit08 = DO09, bit09 = DO10, bit10 = DO11, bit11 = DO12, bit12 = DO13, bit13 = DO14.	R/W
5	AI1_PressureHP_C1	0.0	-3276.8	3276.7	High pressure condenser circuit 1	R/O
6	AI2_PressureLP_C1	0.0	-3276.8	3276.7	Low pressure condenser circuit 1	R/O
7	AI3_TempLeaving	0.0	-3276.8	3276.7	Evaporator leaving temperature	R/O
8	AI4_TempEntering	0.0	-3276.8	3276.7	Evaporator entering temperature	R/O
9	AI5_OutDoorProbe	0.0	-3276.8	3276.7	Outdoor air temperature	R/O
10	AI1_remotePressureHP_C2	0.0	-3276.8	3276.7	High Pressure condenser circuit 2	R/O
11	AI2_RemoteLP_C2	0.0	-3276.8	3276.7	Low Pressure condenser circuit 2	R/O
12	AI3remote_TempLeavingC2	0.0	-3276.8	3276.7	Evaporator leaving temperature circuit 2	R/O
13	AO1	0.00	0.00	100.00	Analog out 1	R/O

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
14	AO2	0.00	0.00	100.00	Analog out 2	R/O
15	AO3	0.00	0.00	100.00	Analog out 3	R/O
16	AO4	0.00	0.00	100.00	Analog out 4	R/O
17	AO5	0.00	0.00	100.00	Analog out 5	R/O
18	AO6	0.00	0.00	100.00	Analog out 6	R/O
19	PackedAlarm1	0	0	65535	Alarm 1…16	R/W
20	PackedAlarm2	0	0	65535	Alarm 17…32	R/W
21	PackedAlarm3	0	0	65535	Alarm 33…48	R/W
22	SetpointSummer_Actual	8.5	-15.0	23.0	Actual setpoint summer	R/W
23	SetpointWinter_Actual	44.0	23.0	70.0	Actual setpoint winter	R/W
24	PowerRequested	0	0	100	Requested power [%]	R/W
25	PowerSupplied	0	0	100	Supplied power [%]	R/W
26	PT02_StartDay1TZ_1 (Low)	0	0	86399	PT02 - Start time day 1 zone 1	R/W
27	PT02_StartDay1TZ_1 (High)	-	-	-	-	-
28	PT03_EndDay1TZ_1 (Low)	0	0	86399	PT03 - End time day 1 zone 1	R/W
29	PT03_EndDay1TZ_1 (High)	-	-	-	-	-
30	PT04_day1_OffsetCoolingDay1TZ_1	0.0	-36.0	36.0	PT04 - Offset cooling day 1 zone 1	R/W
31	PT05_OffsetHeatingDay1TZ_2	0.0	-36.0	36.0	PT05 - Offset heating day 1 zone 1	R/W
32	PT07_StartDay1TZ_2 (Low)	0	0	86399	PT07 - Start time day 1 zone 2	R/W
33	PT07_StartDay1TZ_2 (High)	-	-	-	-	-
34	PT08_EndDay1TZ_2 (Low)	0	0	86399	PT08 - End time day 1 zone 2	R/W
35	PT08_EndDay1TZ_2 (High)	-	-	-	-	-
36	PT09_OffsetCoolingDay1TZ_2	0.0	-36.0	36.0	PT09 - Offset cooling day 1 zone 2	R/W
37	PT10_OffsetHeatingDay1TZ_2	0.0	-36.0	36.0	PT10 - Offset heating day 1 zone 2	R/W
38	PT12_StartDay2TZ_1 (Low)	0	0	86399	PT12 - Start time day 2 zone 1	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
39	PT12_StartDay2TZ_1 (High)	-	-	-	-	-
40	PT13_EndDay2TZ_1 (Low)	0	0	86399	PT13 - End time day 2 zone 1	R/W
41	PT13_EndDay2TZ_1 (High)	-	-	-	-	-
42	PT14_OffsetCoolingDay2TZ_1	0.0	-36.0	36.0	PT14 - Offset cooling day 2 zone 1	R/W
43	PT15_OffsetHeatingDay2TZ_1	0.0	-36.0	36.0	PT15 - Offset heating day 2 zone 1	R/W
44	PT17_StartDay2TZ_2 (Low)	0	0	86399	PT17 - Start time day 2 zone 2	R/W
45	PT17_StartDay2TZ_2 (High)	-	-	-	-	-
46	PT18_EndDay2TZ_2 (Low)	0	0	86399	PT18 - End time day 2 zone 2	R/W
47	PT18_EndDay2TZ_2 (High)	-	-	-	-	-
48	PT19_OffsetCoolingDay2TZ_2	0.0	-36.0	36.0	PT19 - Offset cooling day 2 zone 2	R/W
49	PT20_OffsetHeatingDay2TZ_2	0.0	-36.0	36.0	PT20 - Offset heating day 2 zone 2	R/W
50	SPC1_SetpointSummer	8.5	-15.0	73.0	SPC1 - Setpoint summer (Chiller)	R/W
51	SPH1_SetpointInverno	44.0	23.0	158.0	SPH1 - Setpoint winter (HP)	R/W
52	PM00_Limit_HourCmp (Low)	2000	0	100000	PM00 - Maintenance interval compressors	R/W
53	PM00_Limit_HourCmp (High)	-	-	-	-	-
54	PM01_OperatingHoursComp1 (Low)	0	0	100000	PM01 - Operating hours comp 1	R/W
55	PM01_OperatingHoursComp1 (High)	-	-	-	-	-
56	PM02_OperatingHoursComp2 (Low)	0	0	100000	PM02 - Operating hours comp 2	R/W
57	PM02_OperatingHoursComp2 (High)	-	-	-	-	-
58	PM03_OperatingHoursComp3 (Low)	0	0	100000	PM03 - Operating hours comp 3	R/W
59	PM03_OperatingHoursComp3 (High)	-	-	-	-	-
60	PM04_OperatingHoursComp4 (Low)	0	0	100000	PM04 - Operating hours comp 4	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
61	PM04_OperatingHoursComp4 (High)	-	-	-	-	-
62	PM30_Limit_HourPump (Low)	2000	0	100000	PM30 - Maintenance interval pumps	R/W
63	PM30_Limit_HourPump (High)	-	-	-	-	-
64	PM31_OperatingHoursPump1 (Low)	0	0	100000	PM31 - Operating hours comp 1	R/W
65	PM31_OperatingHoursPump1 (High)	-	-	-	-	-
66	PM32_OperatingHoursPump2 (Low)	0	0	100000	PM32 - Operating hours comp 2	R/W
67	PM32_OperatingHoursPump2 (High)	-	-	-	-	-
68	PM40_Limit_HourFan (Low)	2000	0	100000	PM40 - Maintenance interval fans	R/W
69	PM40_Limit_HourFan (High)	-	-	-	-	-
70	PM41_OperatingHoursFan1 (Low)	0	0	100000	PM41 - Operating hours fan 1	R/W
71	PM41_OperatingHoursFan1 (High)	-	-	-	-	-
72	PM42_OperatingHoursFan2 (Low)	0	0	100000	PM42 - Operating hours fan 2	R/W
73	PM42_OperatingHoursFan2 (High)	-	-	-	-	-
74	PM90_Last_maintenance (Low)	0	0	2147483647	PM90 - Last maintenance	R/W
75	PM90_Last_maintenance (High)	-	-	-	-	-
76	PM61_ForzaturaInvFan_C1	0.00	0.00	100.00	PM61 - Manual frequency condensing fan circuit # 1	R/W
77	PM62_ForzaturaInvFan_C2	0.00	0.00	100.00	PM62 - Manual frequency condensing fan circuit # 2	R/W
78	PM81_CalbrationPressureProbeHP_C1	0.0	-36.0	36.0	PM81 - Calibration HP pressure sensor C1	R/W
79	PM82_CalbrationPressureProbeLP_C1	0.0	-36.0	36.0	PM82 - Calibration LP sensor C1	R/W
80	PM83_CalibrationAI03	0.0	-290.0	290.0	PM83 - Calibration AI03	R/W
81	PM84_CalibrationAI04	0.0	-36.0	36.0	PM84 - Calibration AI04	R/W
82	PM85_calibrationAI05	0.0	-36.0	36.0	PM85 - Calibration AI05	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
83	PM86_CalbrationPressureProbeHP_C2	0.0	-36.0	36.0	PM86 - Calibration HP pressure C2	R/W
84	PM87_CalbrationPressureProbeLP_C2	0.0	-290.0	290.0	PM87 - Calibration LP sensor C2	R/W
85	PM88_CalibrationAI3remote	0.0	-290.0	290.0	PM88 - Calibration AI03 remote	R/W
86	PC04_Cmp_TminOn	20	0	999	PC04 - Compressor minimum on time	R/W
87	PC05_Cmp_TminOff	120	0	999	PC05 - Compressor minimum off time	R/W
88	PC06_Cmp_TonOn	360	0	999	PC06 - Minimum time between 2 start-up of same comp	R/W
89	PC07_Cmp_TonOther	10	0	999	PC07 - Minimum time between 2 start-up of different comp	R/W
90	PC08_Cmp_ToffOther	20	0	999	PC08 - Minimum time between 2 shutdown of different comp	R/W
91	PC12_ProportionalLateralBand	2.5	1.0	36.0	PC12 - Proportional band lateral control	R/W
92	PC14_DeadZone	3.0	0.1	18.0	PC14 - Neutral zone	R/W
93	PC15_DeadZone_Min	1.0	0.1	18.0	PC15 - Minimum value of compressor zero energy band	R/W
94	PC16_DeadZone_Max	5.0	0.1	18.0	PC16 – Maximum value of compressor zero energy band	R/W
95	PC17_DeadZoneOutsideTime	20	0	999	PC17 - Release time compressor neutral zone control	R/W
96	PC21_MinValueSetChiller	5.0	-15.0	73.0	PC21 - Minimum value setpoint summer (Chiller)	R/W
97	PC22_MaxValueSetChiller	20.0	15.0	73.0	PC22 - Maximum value setpoint summer (Chiller)	R/W
98	PC23_MinValueSetHP	30.0	23.0	158.0	PC23 - Minimum setpoint winter (HP)	R/W
99	PC24_MaxValueSetHP	44.0	23.0	158.0	PC24 - Maximum setpoint winter (HP)	R/W
100	PC31_PowerLimitedSummer	50	0	100	PC31 - Power limited summer	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
101	PC32_PowerLimitedWinter	50	0	100	PC32 - Power limited winter	R/W
102	PC36_SetForceSummer	3.5	-30.0	73.0	PC36 - Summer force shutdown setpoint	R/W
103	PC37_SetForceWinter	52.0	26.0	167.0	PC37 - Winter force shutdown setpoint	R/W
104	PC42_CompShutDownTime	5	0	240	PC42 - Compressor shutdown time in pump-down	R/W
105	PC43_DiffPumpDown	1.5	0.0	72.5	PC43 - Threshold for pump-down disabling	R/W
106	PC46_SetpointHPTC	27.0	0.0	652.5	PC46 - Pressure set point for high-temperature pressure-switch control	R/W
107	PC47_DiffHPTC	2.0	0.0	72.5	PC47 - Pressure differential for high-temperature pressure-switch control	R/W
108	PC48_ThresholdAirExtHPTC	12.0	-30.0	73.0	PC48 - External high temperature threshold for pressure-switch control	R/W
109	PC49_MinTimeHPTC	10	0	99	PC49 - Minimum time for maintaining pressure-switch partialization	R/W
110	PC51_SetControlPressostaticLP	3.2	0.0	145.0	PC51 - Pressure setpoint for low-temperature pressure-switch control	R/W
111	PC52_DiffControlPressostaticLT	2.0	0.0	145.0	PC52 - Differential pressure for pressostatic control at low temperature	R/W
112	PC53_SetMinAirExt	-5.0	-10.0	41.0	PC53 - Setpoint low external temperature for pressure control	R/W
113	PC54_SetMaxTempOut	48.0	30.0	158.0	PC54 - Setpoint low external temperature for pressostatic control	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
114	PC55_DelayPartialization	900	0	999	PC55 - Delay for partialization from low pressure alarm	R/W
115	PC61_SetCommutationSummer	20.0	0.0	158.0	PC61 - Setpoint commutation summer	R/W
116	PC62_SetCommutationWinter	10.0	0.0	158.0	PC62 - Setpoint commutation winter	R/W
117	PC64_offsetDynamicSetSummer	-10.0	-36.0	36.0	PC64 - Offset dynamic setpoint summer (Chiller)	R/W
118	PC65_StartTempDynamicSPSummer	30.0	-27.0	126.0	PC65 – Start temperature dynamic setpoint summer (Chiller)	R/W
119	PC66_EndTempDynamicSPSummer	60.0	-27.0	126.0	PC66 - End temperature dynamic setpoint summer (Chiller)	R/W
120	PC67_offsetDynamicSetWinter	10.0	-36.0	36.0	PC67 - Offset dynamic setpoint winter (HP)	R/W
121	PC68_StartTempDynamicSPWinter	0.0	-27.0	126.0	PC68 – start temperature dynamic setpoint Winter (HP)	R/W
122	PC69_EndTempDynamicSPWinter	30.0	-27.0	126.0	PC66 - End temperature dynamic setpoint winter (HP)	R/W
123	PC71_FunctionLimitSetPoint	-7.0	-54.0	54.0	PC71 - Function limit setpoint	R/W
124	PC72_FunctionLimitDiff	4.0	0.1	18.0	PC72 - Function limit differential	R/W
125	PF07_Fan_TonOther	10	0	999	PF07 - Fan minimum time between 2 starts	R/W
126	PF08_Fan_ToffOther	20	0	999	PF08 - Minimum time between 2 fan shutdown	R/W
127	PF10_ForceInErrorProbe	0.00	0.00	100.00	PF10 - Fan frequency in case of condensing sensor alarm	R/W
128	PF11_SetCond_Chiller	20.0	5.0	652.5	PF11 - Setpoint condensation summer (Chiller)	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
129	PF12_DiffCond_Chiller	12.0	0.1	217.5	PF12 - Differential condensation summer (Chiller)	R/W
130	PF14_SetForcingMaxCond_Chiller	26.0	15.0	652.5	PF14 - Setpoint maximum condensation summer (Chiller)	R/W
131	PF15_DiffForcingMaxCond_Chiller	2.0	0.1	72.5	PF15 - Differential maximum condensation summer (Chiller)	R/W
132	PF16_CoolingPI	0	0	999	PF08 - Integral time for control of valves (cooling)	R/W
133	PF21_SetRegCond_HP	9.0	0.5	217.5	PF21 - Setpoint condensation winter (HP)	R/W
134	PF22_DiffRegCond_HP	2.0	0.1	217.5	PF22 - Differential condensation winter (HP)	R/W
135	PF24_SetForcingMaxCond_HP	3.2	0.5	290.0	PF24 - Setpoint maximum condensation winter (HP)	R/W
136	PF25_DiffForcingMaxCond_HP	0.5	0.1	72.5	PF25 - Differential maximum condensation winter (HP)	R/W
137	PF26_HeatingPI	0	0	999	PF08 - Integral time for control of valves (heating)	R/W
138	PF27_MinVal_InverterFan	0.00	0.00	100.00	PF27 - Minimum value inverter for condensing forcing	R/W
139	PF28_SpeedUp_InverterFan	4	0	999	PF28 – Speed-up inverter condenser	R/W
140	PF31_LimitMinCondensationLinear	30.00	0.00	100.00	PF31 - Minimum Limit regulation inverter condensation	R/W
141	PF32_LimitMaxCondensationLinear	100.00	0.00	100.00	PF32 - Maximum limit regulation inverter condensation	R/W
142	PF34_DiffCutOff	2.0	0.0	72.5	PF34 - Switch-off differential under the minimum condensing limit (inverter)	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
143	PF41_LinInverterFan	25.00	0.00	100.00	PF41 - Value X1 fan linearization table	R/W
144	PF42_LinInverterFan	50.00	0.00	100.00	PF42 - Value X2 fan linearization table	R/W
145	PF43_LinInverterFan	75.00	0.00	100.00	PF43 - Value X3 fan linearization table	R/W
146	PF45_LinInverterFan	25.00	0.00	100.00	PF45 - Value Y1 fan linearization table	R/W
147	PF46_LinInverterFan	50.00	0.00	100.00	PF46 - Value Y2 fan linearization table	R/W
148	PF47_LinInverterFan	75.00	0.00	100.00	PF47 - Value Y3 fan linearization table	R/W
149	Pd01_SetStartDefrost	6.0	0.0	652.5	Pd01 - Setpoint start defrost	R/W
150	Pd02_SetStopDefrost	12.0	0.0	652.5	Pd02 - Setpoint stop defrost	R/W
151	Pd03_WaitTimeStartDefrost	1200	60	9600	Pd03 - Waiting interval at defrost start	R/W
152	Pd05_MaxTimeDefrost	300	10	600	Pd05 - Maximum duration of defrost	R/W
153	Pd06_DrippingTime	120	0	600	Pd06 - Dripping time	R/W
154	Pd07_MinTimeWaitAfterCmp	60	0	600	Pd07 - Minimum time to wait after compressor restart	R/W
155	Pd21_SetStartCompensation	5.0	-30.0	70.0	Pd21 - Setpoint for defrosting compensation start	R/W
156	Pd22_SetStopCompensation	0.0	-30.0	70.0	Pd22 - Setpoint for defrosting compensation stop	R/W
157	Pd23_MaxTimeCompensation	3600	0	9600	Pd23 - Maximum waiting time at defrosting compensation stop	R/W
158	PP02_TOnCyclic	120	1	999	PP02 - Pump on time in cyclic working	R/W
159	PP03_TOffCyclic	120	1	999	PP03 - Pump off time in cyclic working	R/W
160	PP04_TMinPumpComp	60	1	999	PP04 - Minimum time between on pump and on comp	R/W
161	PP05_DelayShutdownPumps	60	1	999	PP05 - Delay shutdown pumps	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
162	PP08_DeltaHoursSwap	4	1	240	PP08 - Delta hours to swap pumps	R/W
163	PP09_PumpOperatingTimeLowWater	15	0	999	PP09 - Operating time pump low water flow	R/W
164	PP10_PumpOperatingTimeLowTemp	15	0	999	PP10 - Pump operating time at low temperature	R/W
165	Pr02_SetpointHeater	5.0	-30.0	50.0	Pr02 - Setpoint heater	R/W
166	Pr03_DiffHeater	2.0	0.1	18.0	Pr03 - Differential heater	R/W
167	Pr11_SetpointAlarmAntifreeze	3.0	-30.0	50.0	Pr11 - Setpoint alarm antifreeze	R/W
168	Pr12_DiffAlarmAntifreeze	2.0	0.1	18.0	Pr12 - Differential alarm antifreeze	R/W
169	PA01_FlowStartup_AlarmDelay	10	1	999	PA01 - Delay alarm flow from start-up	R/W
170	PA02_FlowRunning_AlarmDelay	1	1	999	PA02 - Delay flow running alarm	R/W
171	PA04_DelayErrorProbe	10	0	240	PA04 - Delay inoperable sensor	R/W
172	PA05_SetpointAlarmHighTemp	30.0	10.0	104.0	PA05 - Setpoint alarm high temperature	R/W
173	PA06_SetpointAlarmLowTemp	15.0	10.0	104.0	PA06 - Setpoint alarm low temperature	R/W
174	PA07_DelayTempAlarm	30	1	999	PA07 - Delay for temperature alarm	R/W
175	PA09_DifferentialAlarmTemp	0.5	0.1	18.0	PA09 - Differential alarm high/low temperature	R/W
176	PA10_DelayAfterUnitOn	15	0	999	PA10 - Delay temperature alarm after unit on	R/W
177	PA11_SetAlarmLowPress	3.0	0.1	143.5	PA11 - Setpoint alarm low pressure	R/W
178	PA12_DiffAlarmLowPress	1.0	0.1	58.0	PA12 - Differential alarm low pressure	R/W
179	PA13_TimeByPassAlarmLowPress	120	0	999	PA13 - Delay alarm low pressure	R/W
180	PA17_SetAlarmLPwithLT	1.0	0.1	143.5	PA17 - Setpoint alarm low pressure with low temperature	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
181	PA18_DiffAlarmLowPressWithLowTemp	0.5	0.1	58.0	PA18 - Differential alarm low pressure with low temperature	R/W
182	PA19_TimeActiveControlLPwithLT	120	10	999	PA19 - Time activation control low pressure with low temperature	R/W
183	PA20_DelayAlarmLPatStartUpCmp	240	0	999	PA20 - Delay alarm low pressure at start-up first compressor	R/W
184	PA21_SetHPal	28.0	0.0	652.5	PA21 - Setpoint high pressure alarm	R/W
185	PA22_DiffHPal	5.0	0.1	435.0	PA22 - Differential for reset high pressure alarm	R/W
186	PA26_MinDiffPrimaryExchanger	2.0	0.1	36.0	PA26 - Minimum difference threshold for primary exchanger	R/W
187	PA27_ByPassAllPrimaryExchanger	120	0	999	PA27 - By-pass timer for primary exchanger efficiency alarm	R/W
188	PA33_CommonAlarmInput_Delay	30	0	999	PA33 - Delay common alarm input	R/W
189	PA41_ThermalCmp_Delay	10	0	999	PA41 - Delay of compressors thermal alarm	R/W
190	PA81_ThermalFan_Delay	10	0	999	PA81 - Delay of fan thermal alarm	R/W
191	PA99_DelayExpAlarm	5	0	999	PA99 - Delay for expansion alarm	R/W
192	PH11_Modbus_Address	1	1	247	PH11 - Modbus address	R/W
193	PH01_Pressure_Min	0.0	-145.0	652.5	PH01 - Minimum pressure	R/W
194	PH02_Pressure_Max	30.0	-145.0	652.5	PH02 - Maximum pressure	R/W
195	PSd1_Password_User	0	-999	9999	-	R/W
196	PSd2_Password_Maintenance	0	-999	9999	-	R/W
197	PSd3_Password_Installation	0	-999	9999	-	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
198	PSd4_Password_Configuration	0	-999	9999	-	R/W
500	UIunitStatus	0	0	8	Unit status	R/W
501	UI_defrost_C1 or C2	0	0	2	Status defrost (circuit)	R/W
502	UI_defrost	0	0	2	Status defrost (machine)	R/W
503	StatusCompressors[0]	0	0	6	Status compressor	R/W
504	StatusCompressors[1]	0	0	6	Status compressor	R/W
505	StatusCompressors[2]	0	0	6	Status compressor	R/W
506	StatusCompressors[3]	0	0	6	Status compressor	R/W
507	UIstatusFan_C1	0	0	6	Status fan C1	R/W
508	UIstatusFan_C2	0	0	6	Status fan C2	R/W
509	Pump1_Status	0	0	3	Status pump 1	R/W
510	Pump2_status	0	0	3	Status pump 2	R/W
511	PT21_typeDay_Monday	1	0	2	PT21 - Daily program Monday	R/W
512	PT22_typeDay_Tuesday	1	0	2	PT22 - Daily program Tuesday	R/W
513	PT23_typeDay_Wednesday	1	0	2	PT23 - Daily program Wednesday	R/W
514	PT24_typeDay_Thursday	1	0	2	PT24 - Daily program Thursday	R/W
515	PT25_typeDay_Friday	1	0	2	PT25 - Daily program Friday	R/W
516	PT26_typeDay_Saturday	0	0	2	PT26 - Daily program Saturday	R/W
517	PT27_typeDay_Sunday	0	0	2	PT27 - Daily program Sunday	R/W
518	PC01_Cmp_Rotation_Type	0	0	3	PC01 - Compressor rotation: 0 = FIFO, 1 = LIFO, 2 = FIFO+Hr, 3 = LIFO+Hr.	R/W
519	PC02_CompressorsMode	0	0	1	PC02 - Compressors mode (twin circuit): 0 = balancing, 1 = saturation.	R/W
520	PC09_MaxNumEvHour	8	4	12	PC09 - Maximum number of start-ups for every hour	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
521	PC10_CompressorInErrorProbe	1	0	3	PC10 - Number of compressors on for circuit during sensor inoperable	R/W
522	PC41_EnabPumpDown	0	0	2	PC41 - Enable pump-down	R/W
523	PC70_FunctionLimitManagement	0	0	2	PC70 - Function limit management	R/W
524	PP01_PumpOperation	0	0	2	PP01 - Pump operation	R/W
525	PA03_NumberFlowAlarmaToManual	3	0	9	PA03 - Number flow alarm to became manual	R/W
526	PA14_NumEvHourLP	3	0	5	PA14 - Number of alarms for manual restore type	R/W
527	PH12_Modbus_Baud	3	0	7	PH12 - Modbus baud: 0 = 1200, 1 = 2400, 2 = 4800, 3 = 9600, 4 = 19200, 5 = 28800, 6 = 38400, 7 = 57600.	R/W
528	PH13_Modbus_Parity	0	0	2	PH13 - Modbus parity. 0 = NONE, 1 = ODD, 2 = EVEN.	R/W
529	PH31_RefrigerationType	3	0	6	PH31 - Refrigerant type: 0 = none, 1 = R22, 2 = R134a, 3 = R404A, 4 = R407C, 5 = R410A, 6 = R507.	R/W
530	PG00_UnitType	1	1	4	PG00 - Unit Type: 1: Air-to-water chiller 2: Air-to-water chiller + HP 3: Water-to-water chiller) 4: Water-to-water chiller + HP	R/W
531	PG01_NumberCircuit	2	1	2	PG01 - Number of circuits	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
532	PG03_NumberCompCirc	2	1	2	PG03 - Number of compressors per circuit	R/W
533	PG09_PumpsNumber	1	0	2	PG09 - Pumps number	R/W
534	HC01_InputTypeLowPressC1	1	1	3	HC01 - Input type low pressure sensor C1	R/W
535	HC02_InputTypeHighPressC1	1	1	3	HC02 - Input type high pressure sensor C1	R/W
536	HC03_InputTypeLowPressC2	1	1	3	HC03 - Input type low pressure sensor C2	R/W
537	HC04_InputTypeHighPressC2	1	1	3	HC04 - Input type high pressure sensor C2	R/W
538	HC06_AnalogOut	2	1	3	HC06 - It sets the position of the analog output for condenser	R/W
1000	OnOffBySuperv	0	0	1	On/off machine by supervisor	R/W
1001	FuncModeBySuperv	0	0	1	Operating mode by supervisor	R/W
1002	UI_scheduler	0	0	1	Active time zone	R/W
1003	UI_Mode	0	0	1	Operation mode	R/W
1004	PT01_enabWorkingDay1Zone1	0	0	1	PT01 - Enable zone 1 of working day 1	R/W
1005	PT06_enabWorkingDay1Zone2	0	0	1	PT06 - Enable zone 2 of working day 1	R/W
1006	PT11_enabWorkingDay2Zone1	0	0	1	PT11 - Enable zone 1 of working day 2	R/W
1007	PT16_enabWorkingDay2Zone2	0	0	1	PT16 - Enable zone 2 of working day 2	R/W
1008	MOdE_OperatingMode	0	0	1	0 = Cool (Chiller), 1 = Heat (PdC)	R/W
1009	PM11a14_EnabManual_Comp[0]	0	0	1	PM11 - Enable manual operation of the compressor	R/W
1010	PM11a14_EnabManual_Comp[1]	0	0	1	PM11 - Enable manual operation of the compressor	R/W
1011	PM11a14_EnabManual_Comp[2]	0	0	1	PM11 - Enable manual operation of the compressor	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
1012	PM11a14_EnabManual_Comp[3]	0	0	1	PM11 - Enable manual operation of the compressor	R/W
1013	PM21a24_forceManualComp[0]	0	0	1	PM21 - Manual operation compressor	R/W
1014	PM21a24_forceManualComp[1]	0	0	1	PM21 - Manual operation compressor	R/W
1015	PM21a24_forceManualComp[2]	0	0	1	PM21 - Manual operation compressor	R/W
1016	PM21a24_forceManualComp[3]	0	0	1	PM21 - Manual operation compressor	R/W
1017	PM51_EnabManual_FanC1	0	0	1	PM51 - Enable the manual/automatic operation of the condensing fan in circuit # 1	R/W
1018	PM52_EnabManual_FanC2	0	0	1	PM52 - Enable the manual/automatic operation of the condensing fan in circuit # 2	R/W
1019	PM63_ForzaturaInvFan_C1	0	0	1	PM63 - Manual operation condensing fan circuit # 1	R/W
1020	PM64_ForzaturaInvFan_C2	0	0	1	PM64 - Manual operation condensing fan circuit # 2	R/W
1021	PC11_TypeRegulation	0	0	1	PC11 - Type of control	R/W
1022	PC18_DeadZoneAdaptive	0	0	1	PC18 - Enable adaptive control neutral zone control	R/W
1023	PC35_EnabForceShutDown	0	0	1	PC35 - Enable compressors force shutdown	R/W
1024	PC45_EnabHPTC	0	0	1	PC45 - Enable high-temperature pressure-switch control	R/W
1025	PC50_EnabPressControlLT	0	0	1	PC50 - Enable low-temperature pressure-switch control (heat pump)	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
1026	PF01_CondenserControlType	0	0	1	PF01 - Condenser control type	R/W
1027	PF02_EnFanWithCmp	0	0	1	PF02 - Enable fan control only if at least one compressor is on	R/W
1028	PF03_StopFan_Defrost	0	0	1	PF03- Stop fan during defrost	R/W
1029	PF09_ForceInErrorProbe	0	0	1	PF09 - Fan operation in case of condensing sensor alarm	R/W
1030	PF13_EnabForceMax	1	0	1	PF13 - Enable force maximum condensation	R/W
1031	PF33_EnabCutOff	1	0	1	PF33 - Enable fan control under minimum condensing limit	R/W
1032	Pd20_EnabDefrostCompensation	0	0	1	Pd20 - Enable defrost compensation	R/W
1033	PP07_ShotdownPumpInDefrost	0	0	1	PP07 - Shutdown pump during defrost	R/W
1034	Pr01_EnableAntiFreezeHeater	1	0	1	Pr01 - Enable antifreeze heater	R/W
1035	Pr04_ForceHeaterErrorProbe	0	0	1	Pr04 - Forcing of anti-frost heating elements when sensor inoperable	R/W
1036	PA08_consequentTimeForTempAlarm	0	0	1	PA08 - Enable temperature alarm	R/W
1037	PA16_EnabLPcontrolLowTemp	1	0	1	PA16 - Enable low pressure alarm at start-up with low temperature	R/W
1038	PA25_EnAllPrimaryExchanger	0	0	1	PA25 - Enable primary exchanger efficiency alarm	R/W
1039	PA30_EnableAlarmRTC	1	0	1	PA30 - Enable alarm RTC	R/W
1040	PA31_ResetType_AlarmRTC	1	0	1	PA31 - Reset type alarm RTC	R/W
1041	PA32_Enable_CommonAlarmInput	1	0	1	PA32 - Enable common alarm input	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
1042	PA34_ResetType_CommonAlarmInput	1	0	1	PA34 - Common alarm input reset type	R/W
1043	PA40_En_Alarm_HourCmp	1	0	1	PA40 - Enable alarm of operating hours of compressors	R/W
1044	PA42_ThermalCmp_ResetType	1	0	1	PA42 - Type of reset for compressors thermal alarm	R/W
1045	PA60_En_Alarm_HourPump	1	0	1	PA60 - Enable alarm operating hours pumps	R/W
1046	PA71_RestoreTypeHighPressAl	1	0	1	PA71 - Type of reset for High pressure alarm	R/W
1047	PA80_En_Alarm_HourFan	1	0	1	PA80 - Enable operating hour alarm fan	R/W
1048	PA82_ThermalFanResetType	1	0	1	PA82 - Type of reset for fan thermal alarm	R/W
1049	PH14_Modbus_StopBit	1	0	1	PH14 - Modbus stop bit: 0 = 1 stop bit, 1 = 2 stop bits.	R/W
1050	PH04_En_bySchedule	0	0	1	PH04 - Enable on/off machine by schedule	R/W
1051	PH05_En_OnOffByKey	1	0	1	PH05 - Enable on/off machine by key	R/W
1052	PH06_En_ModeByChangeOver	0	0	1	PH06 - Enable automatic switchover summer/winter operating mode	R/W
1053	PH07_En_OnOffByDI	0	0	1	PH07 - Enable on/off machine by DI	R/W
1054	PH08_En_ModeByDI	0	0	1	PH08 - Enable switchover summer/winter operating mode by DI	R/W
1055	PH09_En_OnOffBySuperv	0	0	1	PH09 - Enable on/off machine by supervisor	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
1056	PH10_En_ModeBySup	0	0	1	PH10 - Enable switchover summer/winter operating mode by supervisor	R/W
1057	PH15_FactoryDefault	0	0	1	PH15 - Reset parameter to factory defaults	R/W
1058	PH16_LogicReverseValve	0	0	1	PH16 - Logic DO reverse valve: 0 = NO, 1 = NC.	R/W
1059	PH17_Logic_DI_Alarm	1	0	1	PH17 - Logic DI alarm: 0 = NO, 1 = NC.	R/W
1060	PH18_LogicReleAlarm	0	0	1	PH18 - Logic DO alarm: 0 = NO, 1 = NC.	R/W
1061	PH19_Logic_DI_Mode	0	0	1	PH19 - Logic DI mode: 0 = NO, 1 = NC.	R/W
1062	PH20_Logic_DI_Flow	0	0	1	PH20 - Logic DI flow: 0 = NO, 1 = NC.	R/W
1063	PH21_EnabSensorEnteringWater	1	0	1	PH21 - Enable entering water temperature sensor	R/W
1064	PH22_EnabLeavingTemperatureProbe	1	0	1	PH22 - Enable leaving temperature sensor	R/W
1065	PH23_EnabLeavingTemperatureProbeC2	1	0	1	PH22 - Enable leaving temperature sensor circuit 2	R/W
1066	PH24_EnabOutdoorProbe	0	0	1	PH24 - Enable outdoor temperature sensor	R/W
1067	PH27_EnabDynamicSetPoint	0	0	1	PH27 - Enable dynamic Setpoint	R/W
1068	PH28_EnabsecSetbySched	0	0	1	PH28 - Enable secondary setpoint by scheduler	R/W
1069	PH30_HistoryReset	0	0	1	PH30 - Reset alarm log	R/W

REGISTER VARS						
Addr Base 1	**Name**	**Value**	**Min.**	**Max.**	**Description**	**Mode**
1070	PH32_Temp_UM	0	0	1	PH32 - Temperature unit: 0 = C, 1 = F.	R/W
1071	PH33_Press_UM	0	0	1	PH33 - Pressure unit 0 = Bar, 1 = psi	R/W
1072	PH53_Icon_Cool_Heat	0	0	1	PH53 - Mode icon cool/heat	R/W
1073	PH61_Logic_DI_Remote_OnOff	0	0	1	PH61 - Logic DI remote on-off: 0 = NO, 1 = NC.	R/W
1074	PG02_En_Expansion	1	0	1	PG02 - Enable expansion	R/W
1075	PG04_En_RTC	1	0	1	PG04 - Enable real time clock (RTC)	R/W
1076	PG11_EnabUniqueCondensing	0	0	1	PG11 - Enable unique condensing	R/W
1077	PG12_enabSingleEvap	0	0	1	PG12 - Enable single evaporation	R/W
1078	HC05_DigitalOutput4	0	0	1	HC05 - Function of DO4: 0 = liquid line 1, 1 = pump 2.	R/W
1079	HC07_LPorFanAlarm_C2	0	0	1	HC07 - Enable LP or fan alarm switch	R/W

Note: Double word Modbus registers are listed as 2 registers. Ranges are specified for the complete double word register only.

Glossary

Chiller: A device that removes heat from a liquid via a vapour-compression or absorption refrigeration cycle. This cooled liquid flows through pipes in a building and passes through coils in air handlers, fan-coil units, or other systems, cooling and usually dehumidifying the air in the building. Chillers are of two types; air-cooled or water-cooled. Air-cooled chillers are usually outside and consist of condenser coils cooled by fan-driven air. Water-cooled chillers are usually inside a building, and heat from these chillers is carried by recirculation of water to outdoor cooling towers.

Coil: Equipment that performs heat transfer when mounted inside an Air Handling unit or ductwork. It is heated or cooled by electrical means or by circulating liquid or steam within it. Air flowing across it is heated or cooled.

Compressor: Mechanical device for increasing a gas pressure.

Controller: A device that senses changes in the controlled variable (or receives input from a remote sensor) and derives the proper correction output.

Expansion valve: (Metering device) is the section of the refrigerator that separates the high and low pressures. Its job is to hold one side of the refrigerator at a high pressure, while allowing just enough refrigerant to pass through to the low pressure side to do its job in the evaporator. The 2 popular types of Metering Device used on modern refrigeration are Thermostatic Expansion Valve and Capillary tubes. The Capillary tube is a fixed metering device which acts as a restricting device and cannot be altered to effect performance from the evaporator. It is used in both residential and commercial systems and commonly used on domestic refrigeration. Made from thin copper tubing its length and internal dimension cause the liquid to back-up creating a high pressure side, while dropping to a low pressure side at its outlet.

Saturation: A condition at which the air is unable to hold any more moisture at a given temperature.

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