free Evolution

eliwell

Quick Chill Application

Quick Chill PLC application

invensys

CONTENTS

1 USE OF THE DEVICE

1.1 Permitted use

For safety reasons, the device must be installed and used in accordance with the instructions provided. In particular, parts carrying dangerous voltages must not be accessible under normal conditions.

The device must be adequately protected from water and dust with regard to the application, and must only be accessible using tools (with the exception of the front panel).

The device is suitable for use in household and/or similar air conditioning appliances or installations and has been tested for safety aspects in accordance with harmonized European reference standards.

Improper Use

Any use other than that expressly permitted is prohibited.

The relay contacts supplied are of the functional type and subject to fault (since they are electronically controlled they are prone to short-circuiting or remaining open). Any protection devices specified in product standards or suggested by common sense for obvious safety requirements must be installed externally to the device.

1.2 Residual risks and responsibilities

Eliwell is not liable for damage caused by:

- installations/uses other than the intended ones and, in particular, uses that do not conform to the safety requirements laid down by current laws and/or specified in this document;
- use on equipment which does not provide adequate protection against electric shocks, water and dust in the actual installation conditions;
- use on equipment in which dangerous components can be accessed without the use of specific tools;
- installation/use on equipment which does not comply with current regulations and laws.

1.3 Disclaimer

This document is the exclusive property **Eliwell Controls srl** and may not be reproduced or circulated unless expressly authorised by **Eliwell Controls srl** itself.

Every care has been taken over preparing this document. However **Eliwell Controls srl** can take no responsibility for its use.

1.4 Disposal

The equipment (or product) must be subjected to separate waste collection in compliance with the local legislation on waste disposal.

2 HOW TO USE THIS MANUAL

For quick, easy reference, the manual has been designed with the following features:

References

References column:

A column to the left of the text contains references to subjects discussed in the text to help you locate the information you need quickly and easily.

Cross references

Cross references

All the words in blue italics are listed in the analytical index together with the page number where the related topic is dealt with in more detail; we have, for example, the following text:

"the outputs of the *compressor*, *evaporator fans* and *defrost* are disabled and manual resetting of the alarm requested"

The formatting in blue italics indicates that the in analytical index, under the items "compressor", "evaporator fans" and "defrost" there are references to the pages dealing with the respective topics.

In the "on-line" (computer) manual, the words in italics are "hyperlinks" (i.e. mouse-clickable links), connecting up the different parts of the manual and making it "navigable".

Icons for emphasis

Some text passages are marked by icons in the references column, which have the following meanings:

Warning!: highlights information that users must be aware of to prevent any damage to the system or hazards for people, devices, data, etc. Users MUST read and take note of these sections.

Indication/Highlighted text: further information on the topic in question that the user should be aware of.

Suggestion: a suggestion that could help users understand and make better use of the information provided.

3 INTRODUCTION

3.1 General description

The Quick Chill Application is an application for the range of FREE Evolution programmable controllers which manages the functionality of a ventilated cabinet, and which guarantees the control of *temperature* both in the cabinet and in the core of the food contained in it.

Quick chill devices are the efficient answer to toxic food infections due to the proliferation of bacteria during the cooling of food at ambient temperatures. The quick chill process is an extremely delicate moment during which the foodstuff must be cooled rapidly, avoiding any damage to it and preserving its quality intact.

The system is similar to a fridge in which a special motor condensing unit eliminates the condensate created by the elements that are still hot. It is an indispensable device for vacuum cooking.

Each foodstuff cooked and allowed to cool on its own at ambient temperature loses its qualities due to the high proliferation of bacteria. The use of the quick chill device **makes it possible to rapidly lower**, in a controlled and protected environment, **the temperature** at the core of the product just cooked, **reducing the bacterial proliferation and dehydration of the product**. The final result is the optimal preservation of the sensory characteristics of the product in comparison to normal cooling of the product.

In practical terms, quick chilling means lowering the temperature of the core of the product from +70°C to +3°C as quickly as possible, following HACCP hygiene standards. From the quality standpoint of the preparation, rapidly lowering of the temperature in a cooked food does not only prevent the proliferation of bacteria, but it also increases the shelf life of the product and helps maintain its original quality.

The basic principle of operation of quick chilling is its capacity to **quickly cool** food products immediately after cooking, **thereby preventing bacterial proliferation and enzymatic degradation**, maintaining the food's original taste, aroma and natural softness intact.

It is suitable for the management of commercial and industrial refrigerators, and, thanks to the wide range of outputs available, it guarantees control of all of the associated functions, such as for example, lights, *alarms*, fans, sterilisation, heating, probe.

Six cycles can be programmed and they can be fully customised by the client. The combined control of *temperature* (cabinet or food core) and the *defrost cycles* make the 'Quick Chill Application' on FREE Evolution the best electronic solution for the quick chilling and holding (preservation) of foods.

The *user interface* has a backlit LCD graphic display.

User-friendly navigation of the menus and immediate displaying of the parameters thanks to the large display area of the screen.

Applications:

- Bread-making;
- Ice-cream making;
- Pastry-making;
- Gastronomy in general;

In this manual we refer to quick chill devices; actually we describe quick chill and hold cycles. Quick chill and hold depend on type of cycle selected.

4 QUICK CHILL FOR GASTRONOMIC PRODUCTS. USER INTERFACE

The user interface, comprising the front cover of the controller, allows you to perform all operations needed to use the device.

4.1 Keys

The FREE Evolution programmable controller has 5 keys. Each key has:

- a direct action, triggered by simply pressing the key;
- an associated function associated with pressing and holding down the key.

Actions/Functions associated with the keys

The actions/functions associated with a key depend on the menu displayed, in accordance with the indications provided in the table below.

Key	Short press	Long press	Edit Mode (Edit Mode)
UP	Selects previous element		Increase the value of the figure selected
DOWN	Select next element	**Entry menu password** Logout	Decrease the value of the figure selected
		Other menus no function	
LEFT/ESC	**States menu/parameters** Go back to previous page	Go back to previous page	Select the next figure / Exit without saving setting
	Program control menu quick chill / hold cycles Return to main page menu		
	Other menus Selects previous element		
RIGHT	**States menu/parameters:** key not active	**Fundamental state display** Open main menu	Select previous figure
	Program control menu climate profiles key not active	**Other menus** no function	
	Other menus Selects next element		
ENTER	Enter edit mode / Enter a sub-menu / Activate a function associated with a key	Rapid entry Parameters Menu quick chill cycle profile	

4.2 LED

Meaning of LEDs

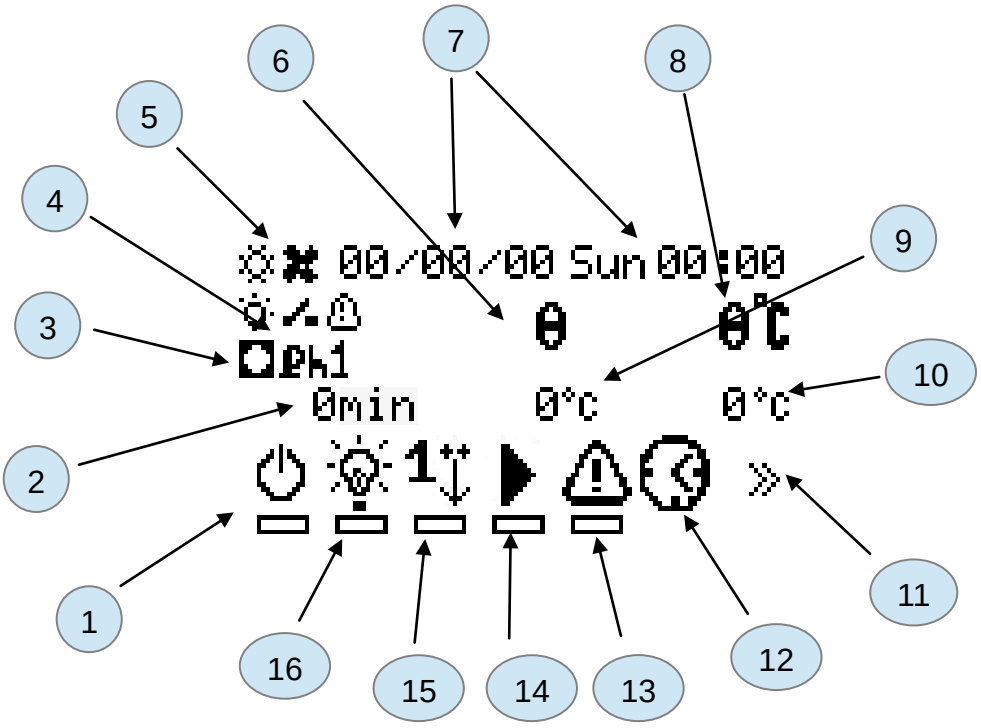
The FREE Evolution programmable controller has 3 LEDs, two of which are used by the application, with the meanings shown in the table below.

LED	Meaning	Permanently on	Flashing
Red	Alarms present	At least one alarm is active	No alarm is active, but at least one alarm with manual resetting is waiting to be reset.
Yellow	-	-	-
Green	ON/OFF status	The application is ON	

4.3 Main Screens

When the device is switched on, the main screen is displayed. From here it is possible to move to the second main screen, monitor the operating status of the application, carry out certain commands and access the sub-menus.

Overview of the main screen

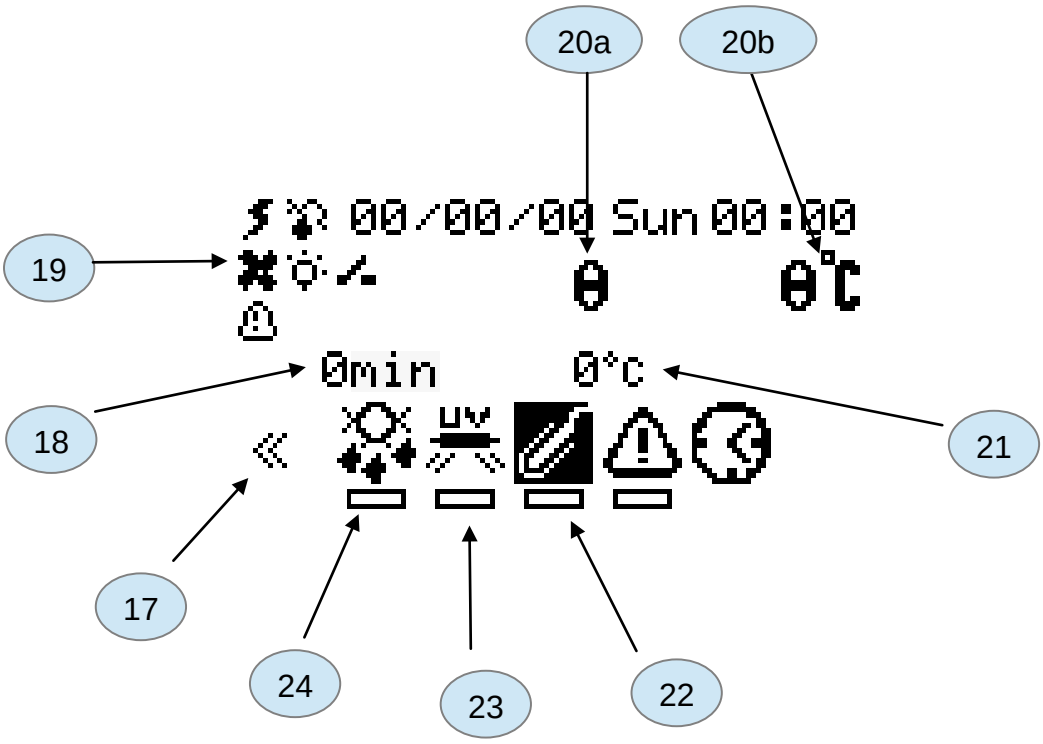


Elements of the main screen

The elements of the main screen are described as follows:

1. Quick Chill ON/OFF
2. Quick chill by time indicates the minutes remaining till the end of the phase in course.
3. Flashing indicates a quick chill cycle in course.
4. Quick chill phase in course
5. Fan, Compressor, Light, Alarm, Door Contact Icons
6. Probe Temperature
7. Date and Time
8. Cabinet Room Temperature
9. Probe Set Point
10. Cabinet Set Point
11. Key for accessing the second main page (see page 9);
12. Icon for Timer operation or Probe
13. Alarm Key
14. Start / Stop Quick Chill Key
15. Quick Chill Cycle selection key
16. Light ON/OFF Key

The second main screen also allows the performing of a variety of actions/Functions including that of returning to the first screen when the device is ON and no functions are in course.



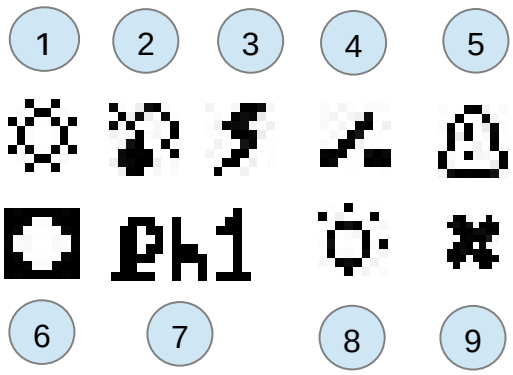
Elements of the second main screen

The elements of the second screen are described as follows:

17. Previous page key
18. Time elapsed of Sterilisation or Probe heating phase
19. Defrost, fan, light etc. icons
20. Insert Probe (20 a) and Cabinet (20 b) Temperature
21. Set end of Probe Heating
22. Probe heating start key
23. Sterilisation start key
24. Defrost Start Key

4.3.1 Status of utilities and active functions

In the two main screens, in the form of icons, the activation status of the utilities is displayed together with some operating modes of the application.



The meaning of the individual icons is described in the following table.

Ref.	Description	Permanently on	Flashing
1	Compressor relay activation request	Compressor relay active (except for exclusion at power-on, see parameter **1014: ODO**)	Compressor activation request active but relay de-energised due to safety timing
2	Defrost status	Defrost active	Defrost request
3	Electric defrost relay activation request	Electric defrost relay active (except for exclusion at power-on, see parameter **1014: ODO**)	-
4	Relay activation door switch	Door open	
5	Alarms present	At least one alarm is active	No alarm is active, but at least one alarm with manual resetting is waiting to be reset.
6	Quick Chill Request	-	Indicates that a Quick Chill cycle is in course
7	Phase of quick chilling or storage	Indicator for quick chill cycle in course	-
8	Light relay activation request	Light relay active (except for exclusion at power-on, see parameter **1014: ODO**)	-
9	Evaporator fan relay activation request	Evaporator fan relay active (except for exclusion at power-on, see parameter **1014: ODO**)	-

4.3.2 Virtual key action

To make the keypad more versatile, both of the main screens contain virtual keys that can be activated as follows:

to select the key, move around the screen using the UP/DOWN/RIGHT/LEFT keys, then briefly press the “OK” button on the keypad. In this way the action associated with the key is activated.

4.3.3 Switching on the Quick Chill device

After supplying power to the device, switch it “ON” in order to start a quick chill cycle. To do this, position the ON/OFF switch to ON (“1”) on the first main screen and activate it by pressing the “OK” button. The pressing of the virtual key in this way generates a toggle of the machine status, which is highlighted by the lighting of the green LED and by the change in the status of the icon above the virtual key. Moreover, if there is a digital output set as a remote ON/OFF control, in order for the quick chill to be considered “ON”, both controls, i.e. remote (digital input) and local (virtual key) must be in the “ON” status.

4.3.4 Switching on the light

To select the Light (“17”) key, move around the screen using the UP/DOWN/RIGHT/LEFT keys. Press it virtually to obtain the manual activation of the relay associated with the light.

4.3.5 Setting the quick chill / hold cycle

The cycle can only be selected when the machine is ON and no quick chill cycles are in course. The application has 6 different quick chill cycles the selection of which is made by virtually pressing the Cycle Selection key (“15”) on the first main screen. Each type the key is pressed the cycle selected will change, with an increasing trend in a circular queue. So starting from the cycle in use, each press causes an increase of 1 until cycle 6 is reached, after which it starts again from “1”.

4.3.6 Start / Stop Quick Chill / hold

The virtual pressure of the Start Quick Chill key (“14”) starts up the quick chill cycle. The function of the key is indicated by an icon just above the key and it changes according to whether quick chilling is in course or not. When quick chilling is in course, the key assumes the Stop Quick Chill function. So a quick chill cycle can be launched and stopped manually by using the same virtual key (“14”) in toggle mode. Stopping quick chill cycle or quick chill / hold phase forces fans stop as well.

4.3.7 Alarms

When an alarm triggers, a key (“13”) appears on the main screen. When selected and virtually pressed, it opens a page where all the alarms in course can be viewed by scrolling with the UP and DOWN keys.

4.3.8 Timer/Probe icon

Once a quick chill cycle has been launched, it can proceed in two ways:

1. By time
2. By Probe temperature

The icon “12” indicates which quick chill mode is active. If the icon depicting a clock starts flashing, this means that the quick chill cycle had started in temperature mode and then, following the emergence of problems (see later) proceeded in time mode.

4.3.9 Selection and quick access to the editing of quick chill / hold cycle parameters

Setting the setpoint from the main screen

The editing **only** of the parameters that enter into operation in each quick chill cycle takes place on the first main screen, by pressing and holding down the OK button. A page will appear on which it is possible, with the aid of the UP, DOWN and OK keys, to scroll and edit all and only the parameters of the cycle selected at that particular moment.

4.3.10 Scrolling of main pages

To move back and forward between the two main pages, select and press virtual keys “11” and “17”. These keys are active when the device is ON but no operation (quick chilling, defrost, sterilisation, probe heating or any other) is in course.

4.3.11 Defrost start-up

On the second main page, the virtual pressure of key “24” launches the Defrost procedure. This procedure will conclude in the modes described later in this document.

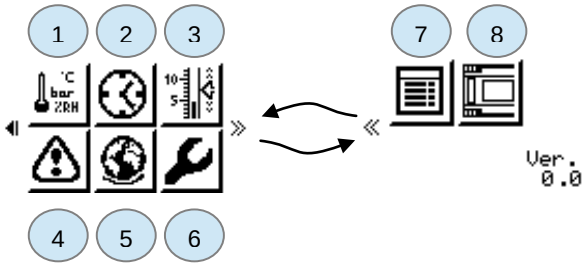
4.3.12 Sterilisation and Probe Heating

From the second main screen, another two very important functions can be launched, i.e. Sterilisation (key “23”) and Probe Heating (key “22”). The operating modes of the device during the running of these two functions will be explained in detail later in this manual.

4.4 Main menu

Access to the main menu takes place via the first main screen, by pressing and holding down the RIGHT key.

From the main menu it is possible to access various sub-menus and, after authentication by entering the password, the parameters menu.



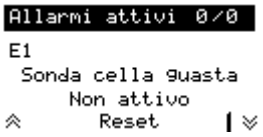
Elements of the main menu

The elements of the main menu that allow access to the sub-menus are described in the table below.

Ref.	Icon	Description	Password
1		Probes menu	
2		Clock menu	
3		Setpoint menu	
4		Active alarms menu	
5		Language selection	
6		Parameters menu User or Installer Level	
7		States Menu	
8		BIOS Parameters Menu Installer Level	

4.5 Active Alarms Menu

The Alarms Menu displays the list of all and only the alarms currently active or waiting to be reset. If there is more than one active alarm, scroll the elements by pressing the UP and DOWN keys.



Alarms reset command

From the active Alarms Menu, it is possible to send an alarm reset command, by pressing the dedicated key.

4.6 Language selection menu

All menus are available in English and Italian.

Changing the language

To change the menu navigation language, simple select the desired language from the Language Menu.

If the language selected is different from the one currently in use, the device will switch off and then switch on again, with the new language set by default

4.7 Parameters menu

Entering access credentials

Access to the Parameters Menu and to the BIOS Parameters Menu is protected by a password. The password may be entered in the home page of these menus: if the password entered corresponds to the values of parameters **1122: PA1** or **1123: PA2**, all the access rights at user or installer level are acquired, respectively.

Logout

The access rights acquired remain until the user exits the Main Menu (return to Main Screen) or until an explicit logout command, which may be sent by pressing and holding down the DOWN key on the password entry screen.

User Menu

The viewing of the parameters menu depends on the access level acquired: the User Menu

enables access to a subset of the elements available in the Installer Menu.

Also the contents of the individual parameter sub-menus depends on the access level.

5 CONFIGURATION OF INPUTS AND OUTPUTS

For important information concerning the electrical connection of the FREE Evolution programmable controller to the devices attached at its inputs and outputs, please refer to the FREE Evolution Installation Manual.

The configuration of the device is determined by the values assumed by the input and output configuration *parameters*, available in the *Configuration Menu*.

5.1 Configuration of analogue inputs

Association of probes and analogue inputs

The assigning of the probes **Pb1** ... **Pb4** to the analogue inputs of the FREE Evolution controller takes place through parameters **1180: H41** ... **1183: H44**.

It is possible to assign the same physical analogue input to several logical probes. For example, it is possible to use the same feedback for both *temperature control* (**Pb1**) and *regulator cut-off* which controls *analogue output* (**Pb4**).

The preset configuration (default) includes the values for parameters **1180: H41** ... **1183: H44** shown in the table below.

Parameter	Meaning	Range
1180: H41 (Probe 1)	Cabinet temperature (*temperature control*)	AI1...AI6
1181: H42 (Probe 2)	Evaporator temperature (*defrost*)	AI1...AI6
1182: H43 (Probe 3)	Probe Temperature (*temperature control*)	AI1...AI6

It is also possible to disable one or more probes, thereby inhibiting the associated regulation, setting the corresponding parameter at the value Disabled.

Configuration of analogue inputs

The configuration of the physical parameters of the analogue inputs of the programmable controller FREE Evolution (type- NTC/in voltage/in current, start and full scale, calibration) is performed through the BIOS parameters of the same, illustrated in the FREE Evolution Installation Manual and accessible from the BIOS menu available in the *Main menu*.

5.2 Configuration of digital inputs

The application uses the first seven digital inputs of the FREE Evolution programmable controller, the logical meaning of which is determined by parameters **1159: H11 ... 1165: H17**.

Digital input configuration table

The following table describes the association between parameter and digital input.

Parameter	Description	Index	Description	Default value
1159: H11	Configuration of digital input 1 (**DIL1**)	-7...+7	See following tables	+1=NO: Device ON/OFF
1160: H12	Configuration of digital input 2 (**DIL2**)	-7...+7	See following tables	+4=NO: Start Quick Chill cycle
1161: H13	Configuration of digital input 3 (**DIL3**)	-7...+7	See following tables	+6=NO: Insert Probe Parking
1162: H14	Configuration of digital input 4 (**DIL4**)	-7...+7	See following tables	+5=NO: Compressor thermal switch
1163: H15	Configuration of digital input 5 (**DIL5**)	-7...+7	See following tables	+7=NO: Fan Thermal Switch
1164: H16	Configuration of digital input 6 (**DIL6**)	-7...+7	See following tables	+3=NO: External alarm
1165: H17	Configuration of digital input 7 (**DIL7**)	-7...+7	See following tables	+2=NO: Door microswitch
1166: H18	Configuration of digital input 8 (**DIL8**)	-7...+7	See following tables	Not used

The values that can be associated with the digital input configuration parameters are listed in the table below.

Index	Description	Notes
0	Disabled	
±1	Device ON/OFF	
±2	Door microswitch	
±3	External alarm	
±4	Start/Stop Quick Chill in toggle mode	Operates on the front and not on the level of the signal
±5	Compressor Thermal Switch	
±6	Insert Probe Parking	
±7	Fan Thermal Switch	

Polarity of digital inputs

Polarity is defined as indicated below:

		Value	Description
+	NO	Positive	Active for contact open (Normally Open)
-	NC	Negative	Active for contact closed (Normally Closed)

5.3 Digital output configuration (relay)

See the section of the FREE Evolution Installation Manual for the number and capacity of the relays and for information on the symbols used on labels supplied with the device.

Digital output configuration table

The following table describes the meaning that the application assigns to the digital outputs of the FREE Evolution programmable controller and the *parameters* used to configure them. Configuration ofanalogue output

The application manages an analogue output as the output of a *cut-off regulator* the behaviour of which can be largely parametrised.

The following table describes the association between parameter and digital output.

Parameter	Description	Index	Description	Default value
1168: H21	Configuration of digital output 1 (**DOL1**)	-7...+7	See following tables	+1=NO: Compressor ON/OFF
1169: H22	Configuration of digital output 2 (**DOL2**)	-7...+7	See following tables	+2=NO: Fan
1170: H23	Configuration of digital output 3 (**DOL3**)	-7...+7	See following tables	+3=NO: Defrost Heater
1171: H24	Configuration of digital output 4 (**DOL4**)	-7...+7	See following tables	+4=NO: Buzzer:
1172: H25	Configuration of digital output 5 (**DOL5**)	-7...+7	See following tables	+5=NO: Light
1173: H26	Configuration of digital output 6 (**DOL6**)	-7...+7	See following tables	+6=NO: Sterilisation
1174: H27	Configuration of digital output 7 (**DOL7**)	-7...+7	See following tables	+7=NO: Probe Heating

The values that can be associated with the digital output configuration parameters are listed in the table below.

Index	Description	Notes
0	Disabled	
±1	Compressor ON/OFF	
±2	Fan	
±3	Defrost Heater	
±4	Buzzer	
±5	Light	
±6	Sterilisation	
±7	Probe Heating	

Polarity is defined as indicated below:

		Value	Description
+	NO	Positive	Active for contact open (Normally Open)
-	NC	Negative	Active for contact closed (Normally Closed)

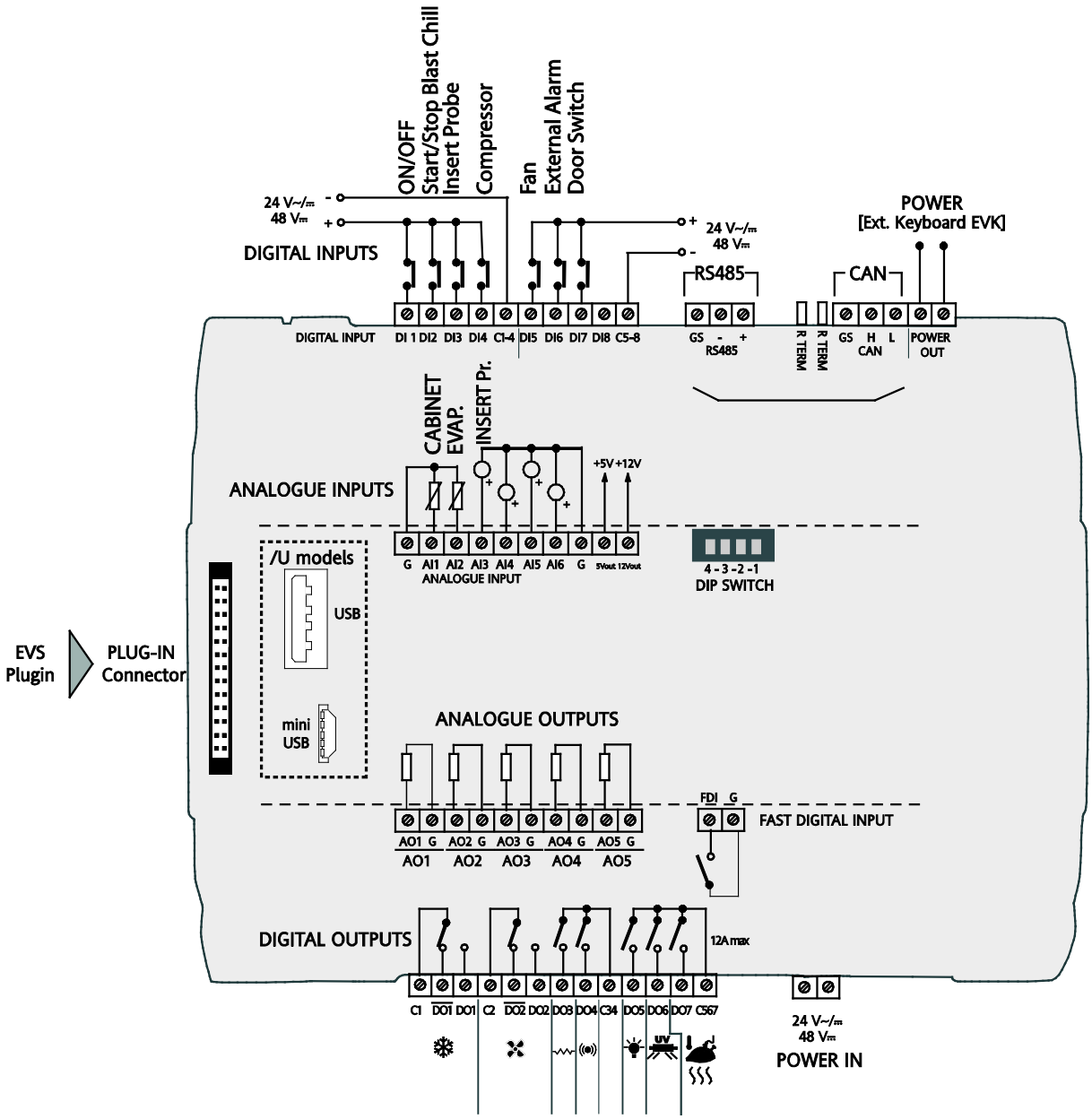
5.4 Summary table and I/O configuration

Summary table and I/O configuration

The following table describes the meaning that the application assigns to the I/Os of the FREE Evolution programmable controller and the *parameters* used to configure them.

Description	Meaning	Configurable from parameter	Default
Analogue input 1 (**Pb1**)	Cabinet temperature (*temperature control*)	Programmable by parameter **1180: H41**	AI1
Analogue input 2 (**Pb2**)	Evaporator temperature (*defrost*)	Programmable by parameter **1181: H42**	AI2
Analogue input 3 (**Pb3**)	Insert Probe Temperature (*temperature control*)	Programmable by parameter **1182: H43**	AI3
Digital input 1 (**DIL1**)	0 = Disabled; ±1 =ON/OFF ±2 =Door Microswitch ±3 =External alarm ±4 = Start / Stop Quick Chill Key ±5= Compressor Thermal Switch ±6 = Probe Parking ±7= Fan Thermal Switch	Programmable by parameter **1159: H11**	Device ON/OFF
Digital input 2 (**DIL2**)		Programmable by parameter **1160: H12**	Start / Stop Quick Chill
Digital input 3 (**DIL3**)		Programmable by parameter **1161: H13**	Probe Parking
Digital input 4 (**DIL4**)		Programmable by parameter **1162: H14**	Compressor Thermal Switch
Digital input 5 (**DIL5**)		Programmable by parameter **1163: H15**	Fan Thermal Switch
Digital input 6 (**DIL6**)		Programmable by parameter **1164: H16**	External alarm
Digital input 7 (**DIL7**)		Programmable by parameter **1165: H17**	Door microswitch
Digital input 8 (**DIL8**)		Programmable by parameter **1166: H18**	Not used
Digital output 1 (**DO1**)	0 = Disabled; ±1 =Compressor ±2 =Fan ± 3 = Defrost Heater ±4 = Buzzer ±5 = Light ±6 = Sterilisation ±7 = Probe Heating	Programmable by parameter **1168: H21**	Compressor
Digital output 2 (**DO2**)		Programmable by parameter **1169: H22**	Fan
Digital output 3 (**DO3**)		Programmable by parameter **1170: H23**	Defrost Heater
Digital output 4 (**DO4**)		Programmable by parameter **1171: H24**	Buzzer
Digital output 5 (**DO5**)		Programmable by parameter **1172: H25**	Light
Digital output 6 (**DO6**)		Programmable by parameter **1173: H26**	Sterilisation
Digital output 7 (**DO7**)		Programmable by parameter **1174: H27**	Probe Heating

5.5 Default wiring diagram



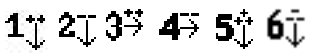
6 QUICK CHILL / HOLD CYCLES

The device manages 6 different quick chill/hold cycles.

During all the cycles, the temperature of the cabinet is controlled.

The Insert Probe temperature and the timer come into operation to determine, in a mutually exclusive manner, the duration of the quick chill cycle and its intermediate phases, if any.

During the selection phase, each of these is identified by a specific icon:



Of these, the 3rd and the 4th are pure hold cycles associated with setpoints 1001_SE1 and 1001_SE2, respectively. These two cycles are only distinguished by the fact that the 3rd is nominally associated with holding at a positive temperature, while the 4th is associated with holding at a negative temperature.

Cycles 1 and 2 are purely quick chill cycles, at the end of which the control device does not perform any further action (**no hold phase**).

Cycles 5 and 6 are positive and negative quick chill cycles, respectively, **with a hold cycle after quick chilling**.

Cycle 1 identifies a quick chill process at positive temperature, while cycle 2 manages the negative temperature one.

For cycle 1, there are 4 parameters:

1007_SCA: cabinet temperature setpoint

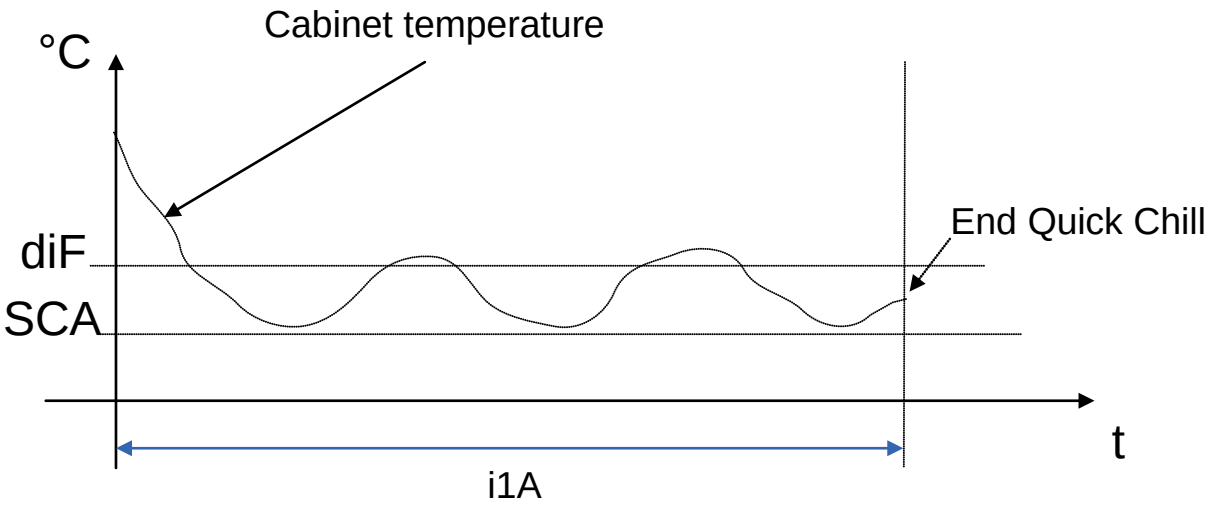
1008_SSA: End of quick chill insert probe temperature threshold

1015_i1A: Timeout time cycle 1 and 5.

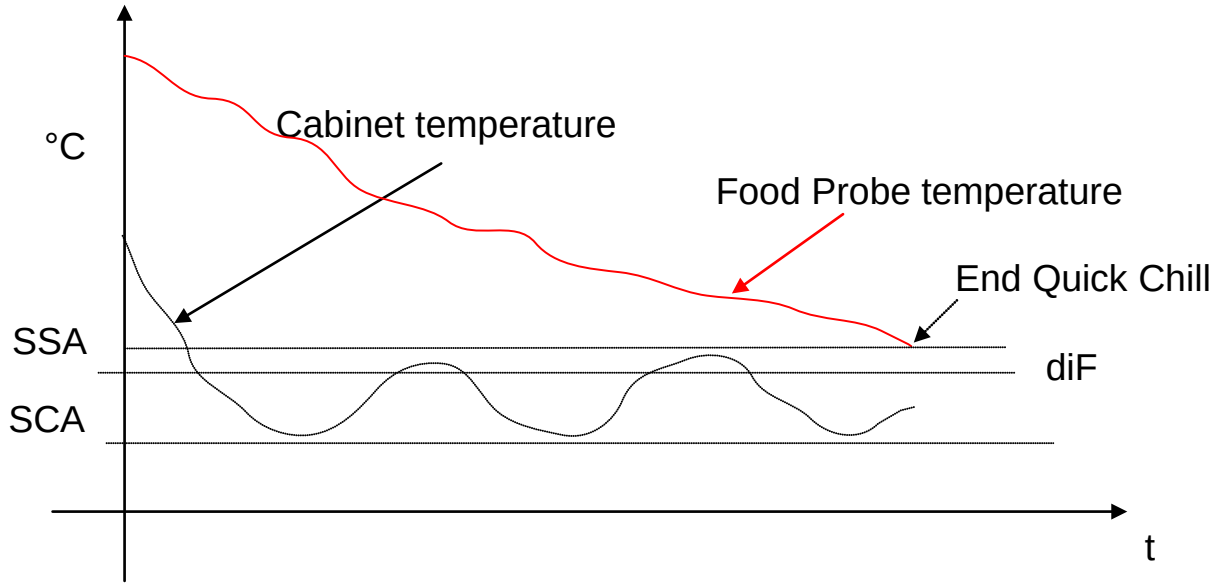
1002_diF: cabinet temperature hysteresis.

A graphic explanation of some typical situations of the various quick chill cycles follows.

Quick chill at positive temperature with control of cabinet temperature control and hysteresis differential



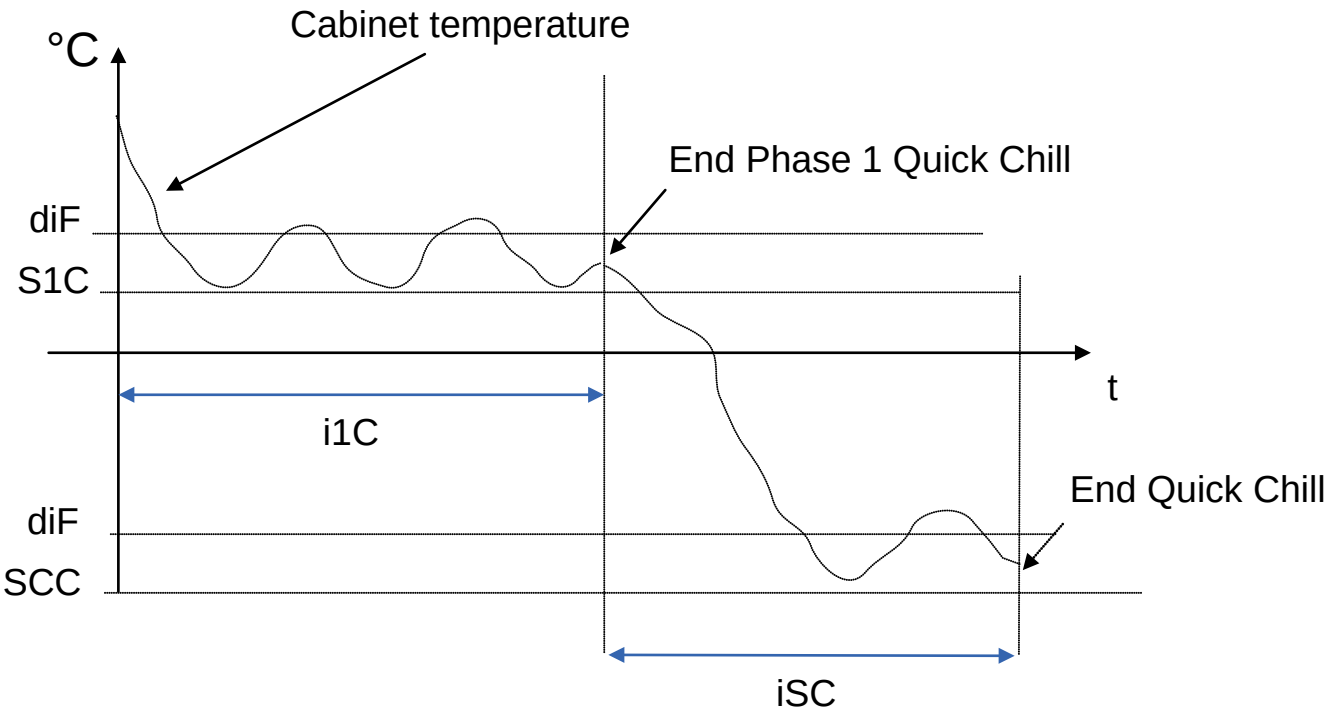
Positive quick chill with insert probe temperature



For cycle 2, the parameters involved are:

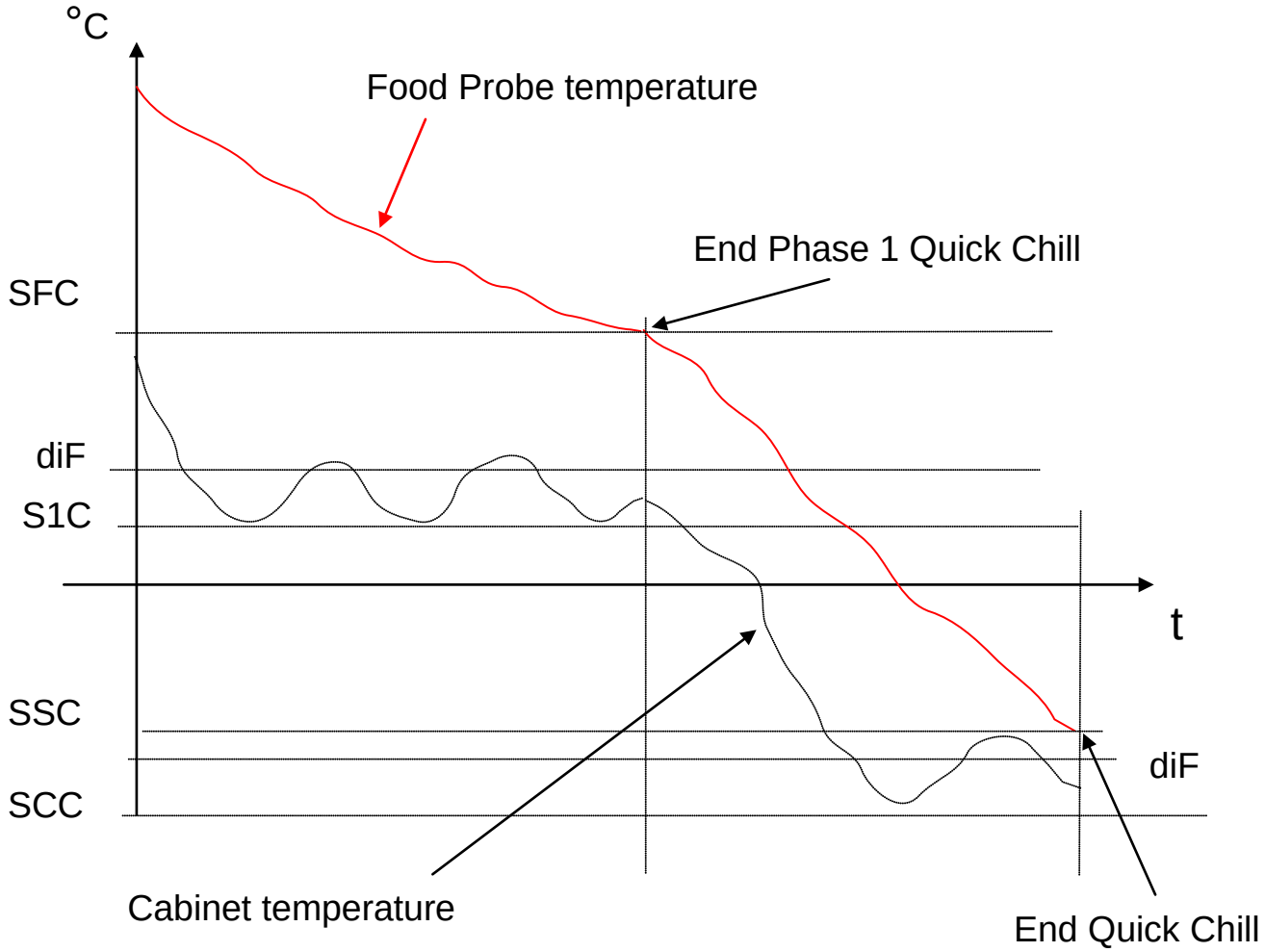
- S1C: setpoint phase 1 of quick chill (cabinet temperature)
- SCC: cabinet temperature final setpoint
- SFC: Threshold for end of phase 1 of quick chill (insert probe temperature)
- SSC: End of quick chill insert probe temperature threshold
- i1C: Timeout time phase 1 for quick chill cycle 2 and 6.
- isC: Timeout time phase 2 for quick chill cycle 2 and 6.
- diF: cabinet temperature hysteresis.

Negative quick chill by time



Negative quick chill with insert probe

Observe how the temperature control during the two quick chill phases is carried out on two sets of cabinet temperature (S1C and SCC), while the transition from one phase to another is controlled by the sets of probe temperature (SFC, SSC).

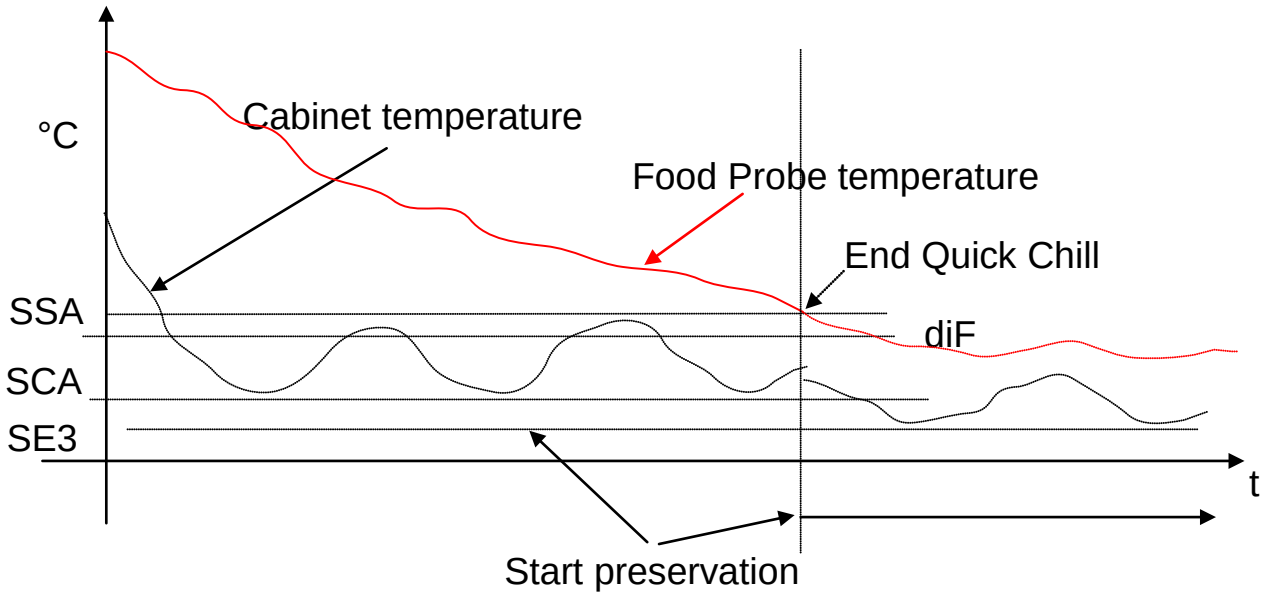


Cycles 5 and 6 are in fact a repetition of cycles 1 and 2 respectively, as far as quick chilling is concerned. They also have a final hold phase which is carried out by setting two new cabinet temperature setpoints:

- SE3: cabinet temperature setpoint for final hold phase cycle 5
- SE4: cabinet temperature setpoint for final hold phase cycle 6

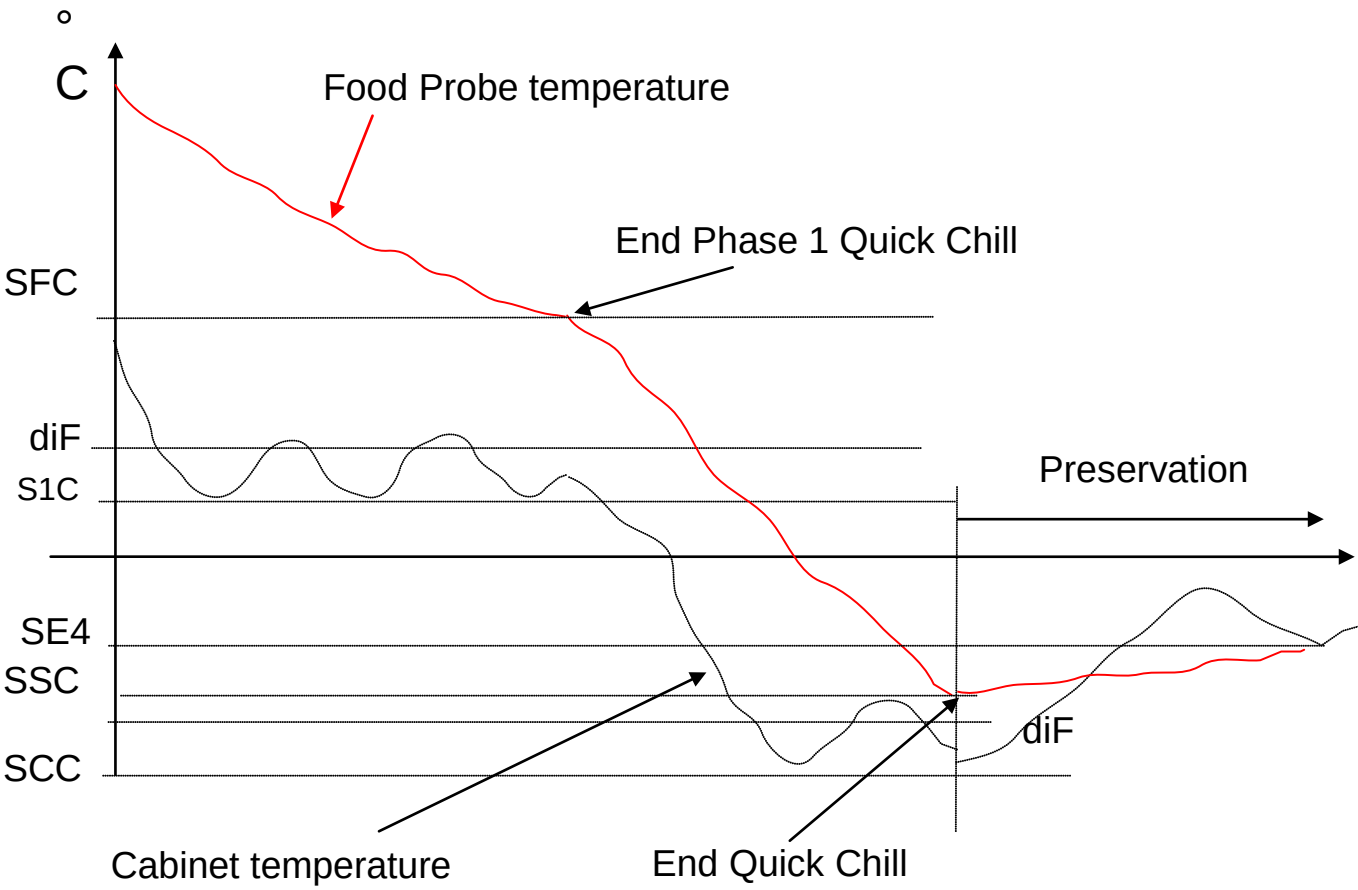
Cycle 5

Quick chill at positive temperature with insert probe at the end of which the cabinet is set at setpoint SE3



Cycle 6

Quick chill at negative temperature with probe at the end of which the cabinet is set at setpoint SE4



7 COMPRESSOR

The compressor is driven by one of the *digital outputs* of the device. It will be switched on or off depending on:

- at the temperature detected by the cabinet *probe* **Pb1**;
- of the *temperature control* functions set;
- of the *defrost*/coil drainage functions.

7.1 Compressor configuration

For the connection diagrams of the compressor to the device, refer to the FREE Evolution Installation Manual.

Compressor relay

The relay associated with the compressor is **DO1 by default** even although it can be programmed differently. Relay polarity can also be programmed.

7.2 Compressor operating conditions

the regulator is active when:

- the device is ON;
- *alarm* **E1** is not in course (cabinet probe **Pb1** failure);
- elapse of the time set in parameter **1014: ODO**;
- no *defrost* is in course.

The parameters that control this regulator are:

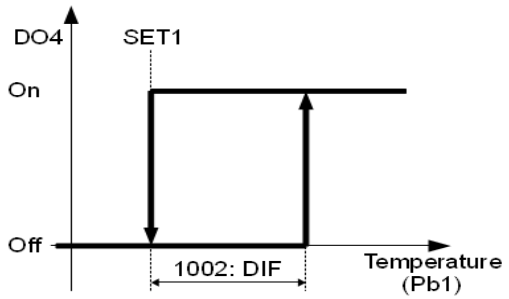
- the various setpoints that trigger for various reasons in the different cycles selectable:

1001:SE1, 1001:SE2, 1001:SE3, 1001:SE4, 1007:SCA, 1007:SCC, 1008:SSA, 1008:SSC, settable from the keypad within an interval of values included between the minimum setpoint and maximum setpoint (parameters **1004: LSE** and **1003: HSE**);

- the differential (parameter **1002: DIF**).

Compressor regulation diagram

The diagram below indicates the compressor activation mode for cooling based on parameters **1001: SE1** and **1002: DIF** > 0.



7.2.1 Compressor protections due to probe failure (duty cycle)

Parameters 1009: ONT and 1010: OFT

If the cabinet probe **Pb1** fails (*alarm* **E1**), the output configured as compressor output adjusts according to the times set in parameters **1009: ONT** and **1010: OFT**. The first time to consider is **1009: ONT**. When the value is **1009: ONT** > 0 it is essential in any case to respect the protection programmed with parameters **1011: DON** / **1012: DOF** / **1013: DBI** (see *Compressor safety timing*).

The table below lists the ways the compressor relay output can be managed:

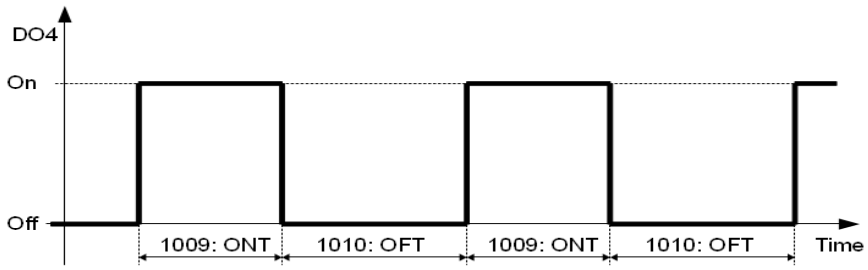
1009: ONT	1010: OFT	DO4
0	0	Off
0	>0	Off
>0	0	On
>0	>0	Duty Cycle

Compressor regulation during operating cycle

If 1009: ONT > 0 and 1010: OFT > 0, the compressor regulator activates in operating cycle mode irrespective of the values read by the probes (cabinet probe failure) and of requests from other utilities (Duty Cycle mode).

If the cabinet probe is working properly, the Duty Cycle mode does not activate as it does not have priority over normal compressor regulator settings.

Compressor duty cycle diagram



It is important to remember that parameter **1014: ODO** inhibits, for its entire duration, the activation of any outputs controlling a relay (compressor, defrost, fans, etc.).

7.2.2 Compressor safety timing

Compressor on-off operations must respect the safety times that you can set using the specific parameters as described below. The compressor *LED* will flash to indicate when an activate compressor request has been received but a safety protection exists.

Switch-on/switch-off

A safety time (compressor On... Off safety time) must be respected between a switch-off and switch-on of the same compressor, regulated by the parameter **1012: DOF**. This waiting time also occurs at switch-on of the device.

Switch-on/switch-on

A safety time (compressor On... On safety time) must be respected between one switch-on and the next) regulated by the parameter **1013: DBI**.

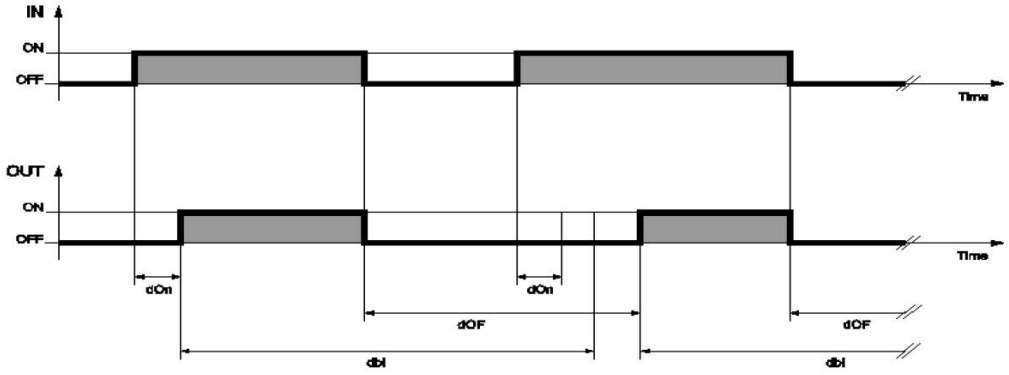
Delay

Between a start-up request and actual start-up a safety time must elapse: that set by parameter **1011: DON**.

The timing set with parameters **1011: DON** / **1012: DOF** / **1013: DBI** if active, are not summed but run parallel.

Diagram of compressor safety times

Operating diagram of compressor protection with parameters **1011: DON** / **1012: DOF** / **1013: DBI** set.



IN	input state for compressor regulator.
OUT	output state for compressor regulator.

8 TEMPERATURE CONTROL

The *parameters* relating to temperature regulation (cooling control) are visible and settable in the following parameter menus:

- *Compressor Menu* (parameter **1002: DIF**);
- *Configuration Menu* (parameters **1168:H21, 1169:H22, 1170:H23, 1171:H24, 1172:H25, 1173:H26, 1174: H27**).
- *Quick Menu by pressing and holding down the OK button on the main screen* (parameters **1001: SE1, SE2, SE3, SE4, 1002:DIF, 1007: SCA, SCC, 1008: SSA, SSC, 1019: S1C**)

Heat regulation diagram

8.1 Cooling

The quick chill device is designed in such a way that there is only one type of temperature control: cooling control.

While the differential (1002:DIF) always stays the same, the setpoints change depending on the cycle currently underway (see chapter 6)

The type of cooling regulation is shown below assuming that the setpoint used is generically **SET1** and the relay set to control the compressor is DO4.

Compressor relay		Note
ON	OFF	
Temperature ≥ **SET1** + **1002: DIF**	Temperature < **SET1**	Differential = **1002: DB** always positive

Cooling regulation diagram

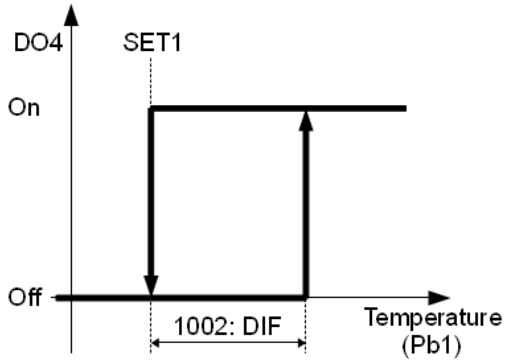


Diagram of Heat/Cooling regulation by digital input

9 DEFROST

Defrost is used to stop ice from forming on the surface of the evaporator.

The way in which defrosting is carried out is basically by heating the evaporator by means of:

- electrical heaters;
- simply stopping the *compressor* and hence the cooling cycle.

Coil drainage

On completion of defrost, given that there will be water on the evaporator, it is better not to start cooling right away as this would ruin the effect of the defrost by creating ice immediately.

The drainage interval is regulated via parameter **1044: DT**.

Many parameters that enter into play during the defrost cycle are duplicated because there are two hold cycles in a quick chill and hold device (positive and negative), so defrosting may require different settings. For example parameters 1034: DEA and 1034: DEC have the same ID number (1034), indicating that the parameter type is the same, but they are distinct because they refer to a positive and a negative hold cycle, respectively.

9.1 Defrost conditions and operation

Defrosting is enabled if:

- The evaporator temperature is lower than the defrost end setpoint configured in parameter **1034: DEA if the cycle in course is at positive temperature (3,5) or 1034:DEC if the cycle in course is at negative temperature (4,6)**
- a Quick Chill phase is not underway
- manual defrosting has not already been activated, in which case the request for automatic defrost will be cancelled.

Defrost request

Defrost requests can be made in the following ways:

Event	Conditions
Device power-on	If parameter **1036: DPO** (defrost at power-on) envisages it.
Time intervals	If the hold phase is underway during the elapse of the defrost time interval set in parameter **1029: DIA (positive cycle) or 1029: DIC (negative cycle) which must be > 0 to produce an effect.**
Manual	Manual request by virtual pressing of the key on the main screen.

Request to start up automatic defrost

The starting of the defrost cycle is programmed at fixed intervals determined by the parameters **1029: (DIA, DIC)** > 0. The counting of the interval may be associated with different time units by means of the parameter **1032: DCT**.

To disable the automatic defrost cycle, set **1029: DIA, DIC** = 0.

1032: DCT	Description	Notes
Compressor ON hours	**Compressor running time (DIGIFROST® method)**	**In this case, the counter runs only if the compressor is on.** A new count starts when the defrost interval elapses and a new defrost cycle starts if conditions permit. NOTE: compressor running time is counted separately from the evaporator temperature. If the evaporator probe were missing or faulty, the count would still be active for the period of activity of the compressor.
Unit ON hours	**Device running time**	**The defrost time interval is counted continuously when the device is on and starts at each power-on.** When the defrost interval elapses (indicated by **1029: DIT**) starts a defrost cycle if conditions permit and the device immediately starts counting a new defrost interval.
Compressor OFF	**Compressor Stop**	**Each time the compressor stops, a defrost cycle is run according to the mode set by parameter 1028: DTY.**
Time	**With RTC (DEFAULT)**	**At the times set by the Time Bands.**

Automatic defrost start-up conditions

Regardless of how the interval is counted, the following conditions apply:

- if the temperature of the evaporator probe is higher than**1034: DEA, DEC** defrost will not be permitted: a new interval will be counted and only at the end of this subsequent count will conditions be tested for the start of a defrost cycle.

Exclusion of defrost times

9.1.1 Manual defrost

Manual defrost request

When the manual defrosting key is pressed, the device enters defrost mode.

The defrost interval will now be counted as described for Automatic Defrost (the time**1189: TCA, TCC** is not reset but continues).

Request rejected signal on display

If the required conditions do not exist (evaporator temperature higher than the parameter **1034: DEA, DEC**) this will be signalled on the display (screen flashes) and defrost will stop.

Defrost is activated at the level front. Hence you can only activate a defrost, NOT stop one that is underway. Defrost or coil drainage currently underway and the defrost or coil drainage interval count cannot be suspended

9.2 Defrost cycle

Defrost can be activated in 2 ways, as set by parameter **1028: DTY**.

Defrost termination conditions

In all cases, defrost is terminated:

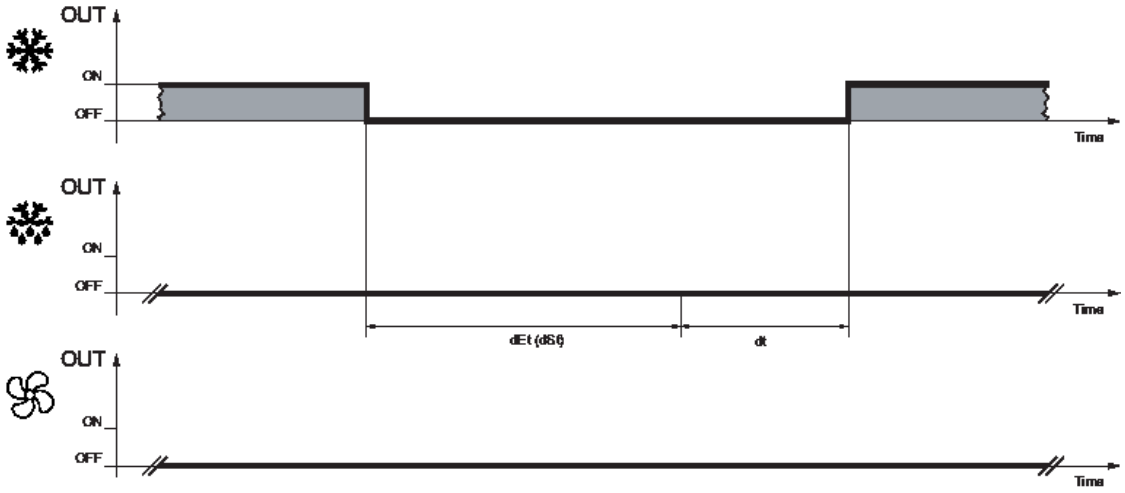
1181: H42	Termination condition
= Disabled (no evaporator probe)	Due to timeout set in parameter 1189: TCA, TCC (defrost timeout)
≠ Disabled (evaporator probe present)	Due to reaching of end of defrost temperature setpoint set in parameter 1034: DEA, DEC. If this set is not reached within the time set in parameter 1189: DEA, DEC (defrost timeout) it terminates due to timeout.

9.2.1 Defrost with compressor stopped

The defrost cycle with the compressor stopped is configured by setting parameter 1028: DTY = FREE.

The *compressor* remains still for the duration of the defrost cycle and there is no defrost relay.

On completion of defrost, the *compressor* relay stays de-energised the during coil drainage time set in parameter **1044: DT** if different from zero.

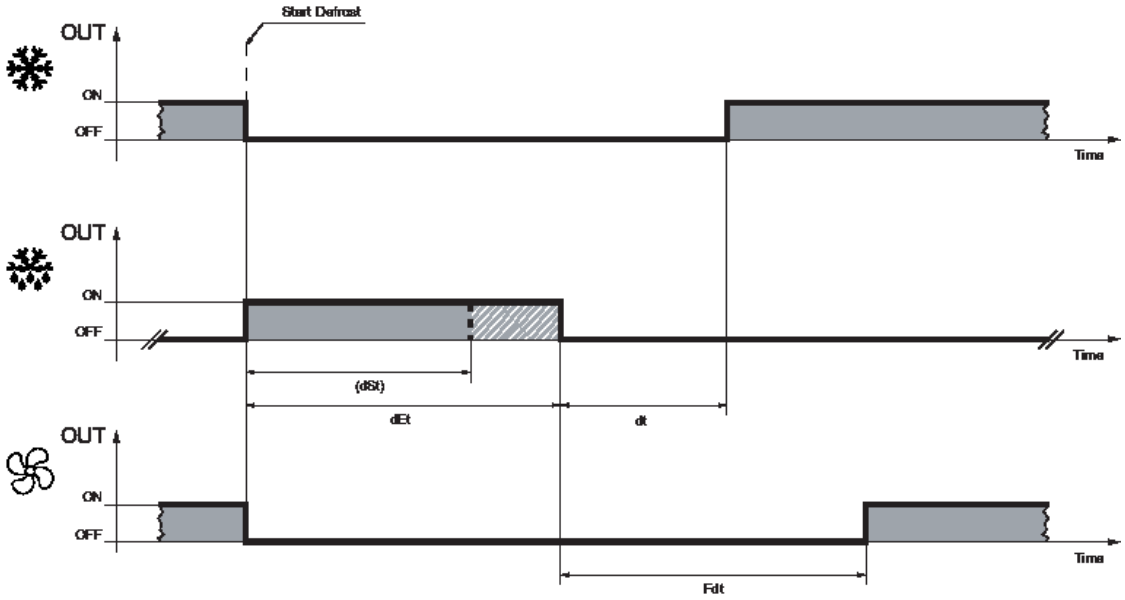


9.2.2 **Defrost with electric heaters** (DEFAULT)

Defrost with electric heaters is configured by setting parameter **1028: DTY** = Electric.

The *compressor* remains still for the duration of the defrost cycle and the relay configured as defrost regulator output, to which the electrical heaters are connected, activates.

On completion of defrost, the electrical heaters are switched off and the *compressor* remains off for the coil drainage time set in parameter **1044: DT** if different from zero.



With **1034: DST** the end of defrost condition due to temperature being reached is shown in the diagram. If **1034: DST** intervenes before**1189: DET**, coil drainage (**1044: DT** and **1043: FDT**) moves to**1034: DST**. If **1043: FDT** < **1044: FDT** the setting used is **1043: FDT** = **1044: DT**.

So as not to have to duplicate the diagram unnecessarily, two generic parameters are used (**1034: DST and 1189: DET**) which will assume different values depending on whether the hold cycle is positive or negative. Specifically **1034:DEA, DEC and 1189:TCA, TCC.**

During the defrost cycle, the fans are always OFF

9.2.3 Protections and constraints for the defrost regulator

Defrost timeout.

If the defrost cycle does not terminate on reaching the end of defrost temperature set in parameter **1034**, a maximum defrost time interval can be set in parameter **1189**. If the defrost cycle ends due to timeout, an alarm can be activated by configuring parameter **1095: DAT** (see *alarms* for end of defrost due to timeout).

Defrost can only be terminated manually by switching the device on and off again using the ON/OFF function.

Additionally, certain alarms can be excluded for a given time subsequent to the termination of the defrost cycle.

In the event of an error **E1** (cabinet probe **Pb1** failure) defrost cycles will still be run.

10 EVAPORATOR FANS

10.1 Physical configuration

Evaporator fan relay

The *digital output* (relay) associated with the evaporator fans is **DO5** (not configurable). The polarity of the relay is not configurable.

10.2 Operating conditions

Enabling of evaporator fan regulation

Regulation of the evaporator fans is enabled when:

- the application is ON;
- during *defrost* it is not excluded by the parameter **1045: DFD**;
- the fan delay is not active after *defrost* (parameter **1043: FDT**);
- the digital input alarm is not active and the parameter **1096: RLO** requests its inhibition;

Inhibition of evaporator fan relay

The energising of the relay associated with the evaporator fans could be inhibited in the following cases:

- if the door is open and parameter **1047: FOD** = Not active;
- non-elapse of the time set in parameter **1014: ODO**.
- If the evaporator probe enabled (and no error on probe) in the evaporator temperature is less than **1040: FSA** (positive cycles) or **1040: FSC** (negative cycles)
- Depends on FQC parameter for Quick Chill
- Depends on the FHC parameter, and eventually FCO for conservation Hold

10.3 Operating mode

During cooling, the fans operate as shown in this diagram:

Quick Chill

	Compressor on	Compressor off
FQC = OFF	OFF	OFF
FQC = Compressor	ON	OFF
FQC = Always ON	ON	ON

Hold

	Compressor on	Compressor off
FHC = OFF	OFF	OFF
FHC = Normal	Depends on FCO and evaporator probe (see next table)	
FHC = Always ON	ON	ON

Quick Chill if **FHC = Normal**

	Compressor on	Compressor off
Evaporator probe **Pb2** not present(**1181: H42** = Disabled)	ON	OFF
Evaporator fan **Pb2** in error status	ON	OFF
Evaporator probe present (**1181: H42** ≠ Disabled) and **1046: FCO** = Temperature controlled	TEMPERATURE CONTROLLED	TEMPERATURE CONTROLLED
Evaporator probe present (**1181: H42** ≠ Disabled) and **1046: FCO** = Compressor	ON	OFF

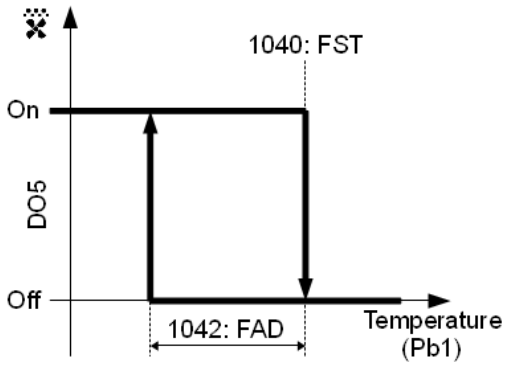
Temperature control of evaporator fans

The temperature control of fans will be carried out at the values set in parameters **1040: FSA** (positive cycles) and **1040: FSC** (negative cycles) with **1042: FAD** fan differential. The fan stopping temperature is absolute (real temperature value).

When the evaporator temperature, if probe Pb2 enabled, is higher than the fan block temperature, fans are disabled regardless of the cycle and working cycle.

1040: FST (threshold temperature control in hold) and **1042: FAD** (fans differential). The fans block temperature is absolute (real temperature value).

The fan regulator operates as indicated in the diagram below.



11 ALARMS AND DIAGNOSTICS

The application has the capacity to run full diagnostics on the system, reporting any operating errors with specific alarms.

Signalling of an alarm condition

The alarm condition is always signalled by:

- the alarm *icon* shown on the display;
- the alarm *LED* of the FREE Evolution programmable controller.

11.1 Probe errors

Probe errors are caused by:

- measured values outside the nominal range;
- probe faulty/short-circuited/open.

All active probe errors are displayed in the alarm menu.

The probe errors are listed in the table below:

Error code	Probe error	Effect
E1	Probe error **Pb1** (cabinet temperature)	• compressor regulation during operating cycle as indicated by parameters **1009: ONT** and **1010: OFT** • disabling of high/low temperature alarms
E2	Probe error **Pb2** (evaporator temperature)	• end of defrost due to timeout and not to the reaching of the temperature setpoint
E3	Probe error **Pb3** (Insert Probe)	• disabling of **insert probe temperature control**

11.2 Alarms

The following table lists all the alarms managed by the application not due to probe errors.

Error code	Alarm	Cause	Effect	Solution
01	External alarm	For the activation of the corresponding digital input (**1159: H11** / **1165: H17** = ±3)	Blocks the regulators indicated by parameter **1096: RLO**	The regulators resume normal operation after the next deactivation of the digital input
02	Compressor Thermal Switch Alarm	For the activation of the corresponding digital input (**1159: H11** / **1165: H17** = ±5)	Blocks compressor regulator	The alarm remains active until the next deactivation of the digital input
03	Door open alarm	Elapse of delay **1086: TDO** since opening of door	No effect on regulation (only an indication).	The alarm remains active until the door is closed.
04	Fan Thermal Switch	For the activation of the corresponding digital input (**1159: H11** / **1165: H17** = ±7)	Blocks Fan	The alarm remains active until the next deactivation of the digital input
08	High temperature	See Maximum and Minimum Alarms	No effect on regulation (only an indication).	Wait until the value read by the probe **Pb1** (cabinet temperature) drops below **1081:**
09	Low temperature	See Maximum and Minimum Alarms	No effect on regulation (only an indication).	Wait until the value read by the probe **Pb1** (cabinet temperature) rises above **1082: LAA, LAC**
13	Timeout Defrost	Interruption of Defrost due to timeout rather than to the reaching of end of Defrost temperature (read by the probe **Pb2**, evaporator temperature)	No effect on regulation (only an indication).	Manual Reset Request
RTC	Clock error	RTC error (see FREE Evolution Installation Manual)	Deactivation of any functions associated with the clock	see FREE Evolution Installation Manual

11.2.1 Maximum/minimum temperature alarms

The maximum and minimum alarms signal that the limits of a temperature interval defined by the user have been exceeded.

Maximum/minimum temperature alarms

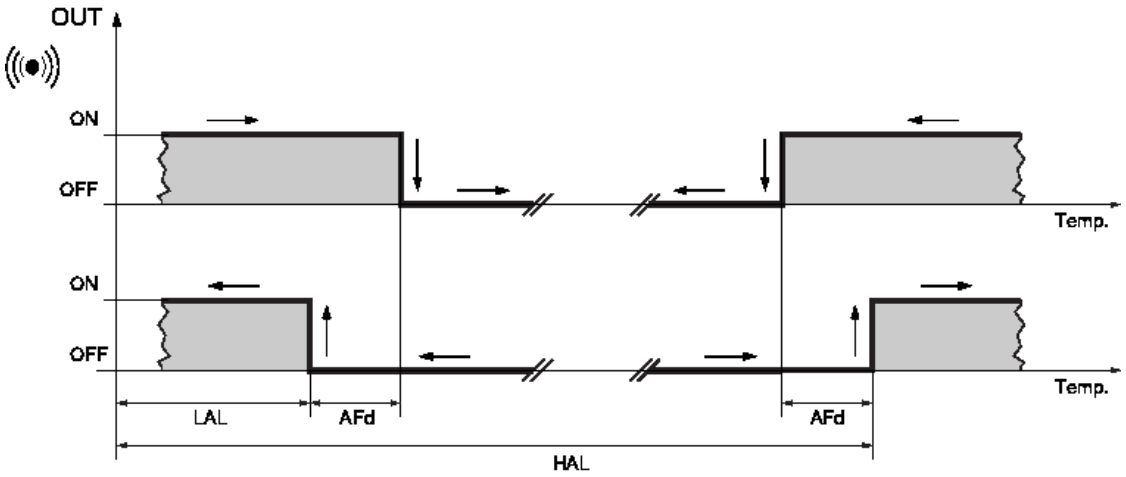
The maximum and minimum alarms signal that the limits of a temperature interval defined by the user have been exceeded.

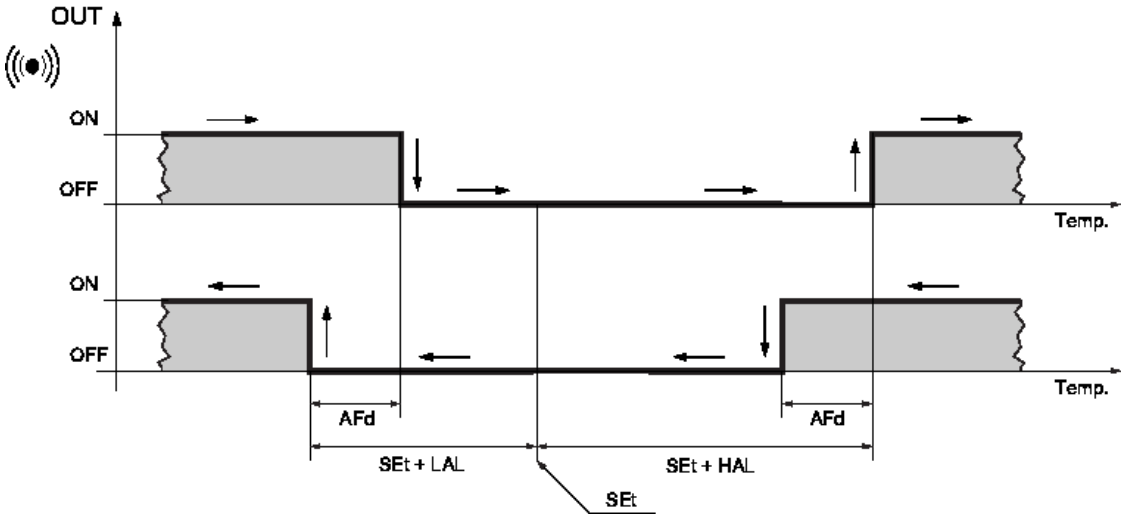
Configuration of high/low temperature alarms

The regulation of maximum and minimum temperature alarms refers to the probe **Pb1** (cabinet temperature).

High/low temperature thresholds

Temperature limits are defined by parameters **1081: HAA, HAC** and **1082: LAA, LAC**. The parameter **1079: ATT** specifies whether they represent the absolute temperature value (**1079: ATT** = Absolute) or a differential compared to the current setpoint (**1079: ATT** = Relative).





In order to obtain the minimum alarm below the setpoint in the case of **1079: ATT** = Relative, set **1082: LAL** at a negative value.

Alarm exclusion at

With parameter **1083: PAO** it is possible to set, when switching on the device, a high/low temperature alarm exclusion time.

Alarm exclusion after defrost

With parameter **1084: DAO** it is possible to set a delay for the signalling of high/low temperature alarms after the defrost cycle has finished.

Alarm exclusion after door closing

With parameter **1085: DAO** it is possible to set a delay for the signalling of high/low temperature alarms after door closing.

During the intervals defined by **1083: PAO** / **1084: DAO** / **1085: OAO** the regulator is disabled and any temperature alarms are not signalled.

Delay for alarm signal

With parameter **1087: ATA** it is possible to set a delay for the signalling of the alarm when it occurs.

Note: during a defrost cycle, high and low temperature alarms are excluded.

12 PARAMETERS

Parameter setting allows the full configuration of the application.

They can be modified through:

- *user interface*;
- Personal Computer using FREE Studio Device.

The following sections provide a detailed analysis of each parameter, divided into categories (folders). It is followed by list of the parameters in table form.

Each parameter is identified on the display as follows:

where:

- `Compressor` indicates the folder;
- `(1/11) 1` indicates the parameter inside the folder, `11` the total number of parameters visible in the folder (this number varies depending on whether it is accessed from the User Menu or from the Installer Menu);
- `1002: DIF` is the unique identifier of the parameter;
- `Differential` is the description of the parameter;
- `0 °C` is the value of the parameter.

Certain parameters are only visible at installer level: refer to the parameter table at the end of the chapter for this distinction.

12.1 Quick Chill / Hold Parameters

This folder can be accessed without having to enter programming mode, simply by pressing and holding down the OK button when on the main page.

The parameters listed below are visible depending on the quick chill or hold cycle selected by the user on the main page. So specific parameters that refer to quick chill cycle "1" will not be visible if a quick chill cycle other than "1" has been selected.

Refer to the illustrations of the various quick chill cycles.

1002: DIF

Temperature control differential.

Compressor relay activation differential; the compressor stops on reaching the Setpoint value (as indicated by the control probe) and restarts at a temperature value equal to the Setpoint plus the value of the differential.

1001: SE1

Hold Phase Setpoint cycle 3

"Positive" hold phase setpoint cycle 3. Cabinet temperature is set at this setpoint as in a normal refrigerator.

1001: SE2

Hold Phase Setpoint cycle 4

"Negative" hold phase setpoint cycle 4. As above except that here the Setpoint is assumed negative.

1001: SE3

Hold Phase Setpoint cycle 5

"Positive" hold phase setpoint at end of quick chill cycle 5. Once a "positive" quick chill cycle by time or by Insert Probe temperature has been concluded, the temperature of the cabinet is set at this setpoint.

1001: SE4

Hold Phase Setpoint cycle 6

"Negative" hold phase setpoint at end of quick chill cycle 6. As per SE3 with the only difference that the hold phase setpoint is negative and referred to quick chill cycle 6.

1007: SCA

Quick Chill Setpoint cycle 1

"Positive" setpoint for quick chill cycle 1 (cabinet temperature). This is the setpoint that the cabinet must reach and at which all the temperature control activities are carried out until the end of the quick chill cycle.

1007: SCC

Quick Chill Setpoint cycle 2

Final "**negative"** setpoint for quick chill cycle 2 (cabinet temperature). This is the setpoint that the cabinet must reach and at which the final temperature control phase is carried out. Being a negative setpoint, it is reached by passing through an intermediate phase (based either on time or on the temperature of the Insert Probe) characterised by a temperature control with a "positive" setpoint (see **1019:S1C**).

1019: S1C

Intermediate phase Setpoint Quick Chill cycle 2

Intermediate setpoint of cabinet temperature during a negative quick chill cycle (cycle 2 and 6). It defines the temperature control setpoint in the first phase of a negative quick chill cycle. This phase concludes either on a time basis or when the Insert Probe temperature threshold is reached (see parameters **1016: i1C** and **1018: SFC**)

1008: SSA

Insert probe temperature threshold cycle 1 and 5.

Insert Probe temperature threshold at end of quick chill cycle 1 and 5. When the insert probe is active, this threshold is used to determine the end of the quick chill cycle and, in the case of cycle 5, the start of the subsequent hold phase.

1008: SSC

Insert probe temperature threshold cycle 2 and 6.

Insert Probe temperature threshold at end of quick chill cycle 2 and 6. As above except that the Insert Probe threshold refers to a negative quick chill cycle.

1018: SFC

Insert probe intermediate temperature threshold cycle 2 and 6.

Threshold (insert probe temperature) that defines the end of the intermediate phase of the quick chill process for "negative" cycles 2 and 6. When the Insert Probe is active and a negative quick chill cycle is in progress (2, 6), this Threshold defines the temperature at the core of the food product, and once this has been reached the temperature control setpoint changes and the final quick chill phase begins.

1040: FSA

Evaporator temperature threshold cycles 3 and 5.

Evaporator temperature threshold beyond which **during a positive hold phase** the fan does not activate.

1040: FSC

Evaporator temperature threshold cycles 4 and 6.

Evaporator temperature threshold beyond which **during the negative hold phase** the fan does not activate.

1015: i1A

Timeout time cycle 1 and 5.

End of "positive" quick chill time cycle 1 and 5. When the insert probe is not active, this parameter defines the timeout time after which the end of the quick chill phase is forced.

1016: i1C

Timeout time phase 1 for quick chill cycle 2 and 6.

Time of end of phase 1 of a "negative" quick chill cycle 2 and 6. When the insert probe is not active, this parameter defines the timeout time after which the end of the first phase of a negative quick chill cycle (setpoint S1C) is forced and phase 2 begins, assuming as a new setpoint the value of parameter SCC and as a new timeout parameter iSC

1015: iSC

Timeout time phase 2 for quick chill cycle 2 and 6.

Time of end of phase 2 of a "negative" quick chill cycle 2 and 6. When the insert probe is not active, this parameter defines the timeout time after which the end of the second and last phase of a negative quick chill cycle (setpoint SCC) is forced. If the cycle in course is cycle 2, at the end of this phase all the regulators stop working. If, on the other hand, it is cycle 6, a hold phase starts with setpoint SE4.

Insert Probe Setting Parameters.

1020: DSR

Delay timeout after launching of the quick chill cycle for the evaluation of the difference between the cabinet temperature and the insert probe temperature. When a quick chill cycle is launched a counter starts counting and when this timeout elapses the difference between the insert probe temperature and the cabinet temperature is evaluated. If this difference is inferior to a threshold defined by parameter **1021: dPS**, all the quick chill phases will proceed on a time basis, without considering the values of the Insert Probe.

1021: DPS

Temperature threshold under which the control of the phases of a quick chill cycle will automatically change over from the insert probe to a timer. See **1020: DSR**

12.2 Compressor

1002: DIF

Differential

Compressor relay activation differential; the compressor stops on reaching the Setpoint value (as indicated by the control probe) and restarts at a temperature value equal to the Setpoint plus the value of the differential.

1003: HSE

MAX Setpoint

Maximum value that can be assigned to temperature setpoints.

1004: LSE

MIN Setpoint

Minimum value that can be assigned to temperature setpoints.

NOTE: The two setpoints are interdependent: **1003: HSE** (maximum setpoint) cannot be less than **1004: LSE** (minimum setpoint) and vice versa.

1009: ONT

Time ON probe KO

Switching on time (in minutes) of the compressor due to probe failure (see *compressor regulation during operating cycle*).

1010: OFT

Time OFF probe KO

Switching off time (in minutes) of the compressor due to probe failure (see *compressor regulation during operating cycle*).

1011: DON

ON Delay

Switch-on delay. The parameter indicates that a protection is active on the compressor relay actuations At least the indicated time must elapse between the request and the actual activation of the compressor relay.

1012: DOF

OFF-ON delay

Delay after switching off. The parameter indicates that a protection is active on the compressor relay actuations The delay time indicated must elapse between deactivation of the compressor relay and its next actuation.

1013: DBI

ON-ON delay

Delay between switch-ons. The parameter indicates that a protection is active on the compressor relay actuations The delay time indicated must elapse between two consecutive switch-ons of the compressor relay.

1014: ODO

Delay at start-up

Delay in activating digital outputs (relays) after the instrument is switched on or after a power failure.

If **1014: ODO** = 0, the delay is not active.

12.3 Defrost

1028: DTY

Type

Defrost mode.

If **1028: DTY** = Stopped, defrost in compressor stopped mode (**compressor off without heating**).

If **1028: DTY** = Electric, electric defrost (defrost cycle OFF), or compressor not running during defrost). NOTE: electrical defrost + air defrost, in the case of fans connected in parallel to the defrost output relay.

1029: DIA

Time interval with defrost in positive hold phase

Interval between the start of two consecutive defrosts when the cycles are 3 or 5. Time units expressed in hours. The parameter is used for automatic defrost at fixed intervals. If **1029: DIA** = 0 automatic defrost is excluded: defrosting will never be carried out.

1029: DIC

Time interval with defrost in negative hold phase

Interval between the start of two consecutive defrosts when the cycles are 4 and 6. Time units expressed in hours. The parameter is used for automatic defrost at fixed intervals. If **1029: DIC** = 0 automatic defrost is excluded: defrosting will never be carried out.

1032: DCT

Type of count

Selects the count mode for the defrost interval.

If **1032: DCT** = Compressor running hours (DIGIFROST® method), the count is only active when the compressor is ON. The compressor's running hours are counted on the status of the relay associated with the compressor, irrespective of the compressor regulation mode (e.g. the count is also active during compressor regulation during operating cycle, when the relay is ON).

If **1032: DCT** = Unit running hours, the defrost count is active if the application is ON.

If **1032: DCT** = compressor OFF, each time the compressor stops, a defrost cycle is performed according to parameter **1028: DTY**.

1033: DOH

Delay at start-up

Delay prior to start of first defrost cycle after changeover to ON status.

1189: TCA

Timeout cycles 1, 3, 5

Defrost timeout. Determines the maximum duration, in minutes, of defrosting for positive cycles.

1189: TCC

Timeout cycles 2, 4, 6

Defrost timeout. Determines the maximum duration, in minutes, of defrosting for positive cycles.

1034: DEA

Temperature for stopping cycles 1, 3, 5

End of defrost temperature for positive cycles. Temperature measured by defrost probe.

1034: DEC

Temperature for stopping cycles 2, 4, 6

End of defrost temperature for negative cycles. Temperature measured by defrost probe.

1036: DPO

At start-up

Determines whether a defrost cycle should be run when the device is switched on.

If **1036: DPO** = Not required, defrost not activated at start-up.

If **1036: DPO** = Required, defrost activated at start-up.

1044: DT

Coil drainage time

Coil drainage time After a defrost cycle, the fans and compressor remain off for the time set in this parameter.

12.4 Evaporator fans

1040: FST

Stop temperature

Fan block temperature; if the evaporator probe reads a higher value than the set value, the fans are stopped. The value can be positive or negative.

The temperature value is absolute.

1040: FSA

Evaporator temperature threshold cycles 3 and 5.

Evaporator temperature threshold beyond which **during a positive hold phase** the fan does not activate.

1040: FSC

Evaporator temperature threshold cycles 4 and 6.

Evaporator temperature threshold beyond which **during the negative hold phase** the fan does not activate.

1042: FAD

Differential

Fan activation differential, with reference to the stop temperature given by parameter **1040: FST**.

1043: FDT

Delay

Fan activation delay after a defrost cycle.

1046: FCO

Hold phase fans behaviour: if FHC = normal (see Table chp. 10.3)

Selects or deselects fan deactivation at compressor OFF.

If **1046: FCO** = OFF, the evaporator fans are off if the compressor is off and temperature controlled if compressor is on.

If **1046: FCO** = Temperature controlled, the evaporator fans are independent of the status of the compressor.

If **1046: FCO** = Compressor, the evaporator fans are dependent of the status of the compressor (ON when compressor ON, OFF when compressor OFF).

1047: FOD

If the door is open

Allows fan block to be selected when the door is open and fan restart when the door is shut (if they were running).

If **1047: FOD** = Not active, the fans are excluded when the door is open.

If **1047: FOD** = Active, evaporator fan regulation is active also with the door open.

1048: FDC

Compressor OFF delay

Delay, in minutes, for the switching off of the evaporator fans after the compressor stops If **1048: FDC** = 0 the function is disabled.

1049: FQC

Fan mode during quick chill phase (not hold phase).

If **1049: FQC** = OFF, the evaporator fans are always off.

If **1049: FQC** = It follows the compressor, the evaporator fans “follow” the compressor.

If **1049: FQC** = ON, the evaporator fans are always on.

1049: FHC

Fan mode during hold phase.

If **1049:FHC** = OFF, the evaporator fans are always off.

If **1049:FHC** = Compressor mode, the evaporator fans "follow" the compressor, depending on **1046**:**FCO** parameter.

If **1049:FHC** = ON, the evaporator fans are always on.

12.5 Sterilisation

1190: STT

Sterilisation Timeout in seconds

1191: S_T

Min. temperature threshold for Sterilisation

Temperature Threshold under which the sterilisation process is stopped.

12.6 Insert Probe Heating

1192: IPT

Heating Timeout in seconds

1193: I_T

Max. temperature threshold.

Temperature Threshold above which the heating process stops.

12.7 Alarms

1079: ATT

Type of temperature threshold

Mode of parameters **1081: HAL** and **1082: LAL**, either as absolute temperature values or as differentials compared to the setpoint.

If **1079: ATT** = Absolute, the values given by parameters **1081: HAL** and **1082: HAL** are absolute temperature values.

If **1079: ATT** = Relative, the values given by parameters **1081: HAL** and **1082: HAL** refer to the setpoint.

1080: AFD

Temperature differential

High/low temperature alarm activation differential (compared to the respective thresholds).

1081: HAA

High temperature threshold for positive quick chill and hold cycles (1,3,5)

High temperature alarm threshold.

Temperature value (distance from setpoint or absolute value in relation to **1079: ATT**) value which if exceeded in an upward direction triggers the activation of the alarm signal.

1081: HAC

High temperature threshold for negative quick chill and hold cycles (2,4,6)

High temperature alarm threshold.

Temperature value (distance from setpoint or absolute value in relation to **1079: ATT**) value which if exceeded in an upward direction triggers the activation of the alarm signal.

1082: LAA

Low temperature threshold for positive quick chill and hold cycles (1,3,5)

Low temperature alarm threshold.

Temperature value (distance from setpoint or absolute value in relation to **1079: ATT**) value which if exceeded in a downward direction triggers the activation of the alarm signal.

1082: LAC

Low temperature threshold for negative quick chill and hold cycles (2,4,6)

Low temperature alarm threshold.

Temperature value (distance from setpoint or absolute value in relation to **1079: ATT**) value which if exceeded in a downward direction triggers the activation of the alarm signal.

1083: PAO

Delay at start-up

High/low temperature alarm exclusion time after switching on the device.

1084: DAO

Delay after defrost

High/low temperature alarm exclusion time after defrost.

1085: OAO

Delay after door closing

High/low temperature alarm signalling delay after door closing.

1086: TDO

Door open alarm

Door open alarm delay after door opening.

1087: TAO

Temperature alarm delay

High/low temperature alarm signalling delay.

1095: DAT

At defrost timeout

Alarm indicating end of defrost as a result of timeout.

If **1095: DAT** = No alarm, alarm not enabled.

If **1095: DAT** = Alarm, alarm enabled.

1096: RLO

External alarm blocks

Regulators blocked by external alarm:

If **1096: RLO** = None, the external alarm does not block any resources.

If **1096: RLO** = Comp/Defrost, the external alarm blocks compressor and defrost.

If **1096: RLO** = Comp/Defrost/Fan, the external alarm blocks compressor, defrost and evaporator fan.

12.8 Lights and digital inputs

1104: DSD

Light if the door is open

Enabling of light relay if door open:

If **1104: DSD** = Off, light OFF: light does not come on with door open.

If **1104: DSD** = On, light ON: light comes on with door open (if off).

1105: DLT

Light OFF delay

Delay for switching off of relay configured as light after door closing

Valid if **1104: DSD** light comes on when door is opened.

1106: OFL

Light OFF by key

Disabling of light relay from key even when disable delay is enabled in **1105: DLT**.

12.9 Display

1122: PA1

User password

Access key for user level parameters (USR level)/for User Menu.

1123: PA2

Installer password

Access key for user level parameters (USR level)/for User Menu.

12.10 Configuration

1159: H11

Digital input 1

Configuration of digital input 1.

See digital input configuration table.

1160: H12

Digital input 2

Configuration of digital input 2.

See digital input configuration table.

1161: H13

Digital input 3

Configuration of digital input 3.

See digital input configuration table.

1162: H14

Digital input 4

Configuration of digital input 4.

See digital input configuration table.

1163: H15

Digital input 5

Configuration of digital input 5.

See digital input configuration table.

1164: H16

Digital input 6

Configuration of digital input 6.

See digital input configuration table.

1165: H17

Digital input 7

Configuration of digital input 7.

See digital input configuration table.

1166: H17

Digital input 8

Configuration of digital input 8.

See digital input configuration table.

1168: H21

Digital output 1

Configuration of digital output 1

See digital output configuration table.

1169: H22

Digital output 2

Configuration of digital output 2

See digital output configuration table.

1170: H23

Digital output 3

Configuration of digital output 3

See digital output configuration table.

1171: H24

Digital output 4

Configuration of digital output 4

See digital output configuration table.

1172: H25

Digital output 5

Configuration of digital output 5

See digital output configuration table.

1173: H26

Digital output 6

Configuration of digital output 6

See digital output configuration table.

1174: H27

Digital output 7

Configuration of digital output 7

See digital output configuration table.

1180: H41

Probe 1

Probe configuration **Pb1** (cabinet temperature).

See analogue input configuration table.

1181: H42

Probe 2

Probe configuration **Pb2** (evaporator temperature).

See analogue input configuration table.

1182: H43

Probe 3

Probe configuration **Pb3** (Insert Probe temperature).

See analogue input configuration table.

12.11 Programming reference

The following tables contain, in summary form, a description of all the parameters listed in the previous paragraphs accompanied by information on the admissible value range, the default value and unit of measure. Moreover, all the information required for reading and writing them through communication protocol is provided.

12.11.1 Parameters menu

The following table indicates the visibility of the parameters, divided by folder/menu, depending on the user or installer access level.

Folder	Displayed menu name	User Menu		Installer menu	
		● = Visible N.O. = Not available	Parameter number	● = Visible N.O. = Not available	Parameter number
Compressor	Compressor	●	5/9	●	11/9
Defrost	Defrost	●	8/11	●	11/11
Evaporator fans	Evaporator fans	●	7/9	●	9/9
Alarms	Alarms	N.O.	0/12	●	12/12
Lights and digital inputs	Lights and D.I.	N.O.	0/3	●	3/3
Display	Display	●	1/2	●	2/2
Configuration	Configuration	N.O.	0/12	●	12/12

12.11.2 Table of parameters

The following table lists all the configuration parameters for the device saved in the instrument's non-volatile memory, including visibility with respective ModBUS addresses

Description of columns:

<table>
<tr><th>Column</th><th>Meaning</th></tr>
<tr><td>Menu</td><td>This indicates the menu containing the parameter in question.</td></tr>
<tr><td>Access</td><td>Indicates the access rights required to view the parameter:
<table>
<tr><th>Initials</th><th>Access rights required</th></tr>
<tr><td>-</td><td>None: the parameter is visible in one of the main menus.</td></tr>
<tr><td>USR/INS</td><td>The parameter is visible in both the User and Installer menus.</td></tr>
<tr><td>INS</td><td>Parameter visible from Installer Menu only.</td></tr>
</table></td></tr>
<tr><td>ID</td><td>This indicates the unique index (or identifier) used to display the parameter in the menu of the instrument</td></tr>
<tr><td>Label</td><td>This indicates the label used to display the parameter in the menu of the instrument</td></tr>
<tr><td>Address</td><td>Only for direct access via communication protocol (with tools other than Eliwell FREE Studio).
Indicates the address of the parameter for read/write access through communication protocol (Modbus or CANopen or Modbus TCP).
The Modbus and Modbus TCP addresses are HOLDING REGISTERS accessible through commands 3H and 10H</td></tr>
<tr><td>Description</td><td>Description of the parameter.</td></tr>
<tr><td>Values</td><td>Indicates the parameter data type: this determines the maximum set of values that it can assume (narrowed down further by the information shown in the columns Min and Max) and the need or otherwise for a conversion, only for direct access through communication protocol (with tools other than Eliwell FREE Studio), so the value represents a number with a sign.
For example, in the case of access via communication protocol to a 16-bit integer with sign, proceed as follows to make the conversion:
if the value in the register is between 0 and 32767, the result is the value itself (zero and positive values);
if the value in the register is between 32,768 and 65,535, the result is the value of the register – 65,536 (negative values).</td></tr>
<tr><td>Min</td><td>Minimum value that can be assigned to the parameter.</td></tr>
<tr><td>Max</td><td>Maximum value that can be assigned to the parameter.</td></tr>
<tr><td>Default</td><td>Default value of the parameter (set by FREE Studio Device on installation of the application in the FREE Evolution programmable controller).</td></tr>
<tr><td>U.M.</td><td>Unit of measure of the values.</td></tr>
<tr><td>EXP</td><td>Only for direct access via communication protocol (with tools other than Eliwell FREE Studio).
If EXP = -1, the value read by the communication protocol is divided by 10 (value/10) to convert it to the values indicated in the Values/Min/Max/Default columns using the unit of measurement in the U.M. column.
Example: parameter HSE = 50.0. Column EXP = -1:
the value displayed or read by the FREE Studio Device is 50.0;
the value read by the register is 500 --> 500/10 = 50.0.</td></tr>
<tr><td>Format</td><td>Display format for Default Value /Min/Max. - XXX.Y display of whole number with decimal point (shown in FREE Studio Device)</td></tr>
</table>

Menu	Access	ID	Label	Address	Description	Values	Min	Max	Default	U.M.	EXP	Format
Setpoint	-	1001	SE1	16384	Temperature setpoint 1	Signed 16-bit	1004: LSE	1003: HSE	2,0	°C	-1	XXX.Y
Setpoint	-		SE2	16385	Temperature setpoint 2	Signed 16-bit	1004: LSE	1003: HSE	-15,0	°C	-1	XXX.Y
Setpoint	-		SE3	16459	Temperature setpoint 3	Signed 16-bit	1004: LSE	1003: HSE	4,0	°C	-1	XXX.Y
Setpoint	-		SE4	16460	Temperature setpoint 4	Signed 16-bit	1004: LSE	1003: HSE	-20,0	°C	-1	XXX.Y
Setpoint / Compressor	-	1002	DIF	16386	Setting differential	Signed 16-bit	0,0	30,0	2,0	°C	-1	
Setpoint	-	1007	SCA	16414	Cabinet setpoint cycles 1,5	Signed 16-bit	1004: LSE	1003: HSE	5,0	°C	-1	XXX.Y
Setpoint	-		SCC	16415	Cabinet setpoint cycles 2.6	Signed 16-bit	1004: LSE	1003: HSE	-22,5	°C	-1	XXX.Y
Setpoint	-	1008	SSA	16419	Insert Probe setpoint cycles 1,5	Signed 16-bit	1004: LSE	1003: HSE	10,0	°C	-1	XXX.Y
Setpoint	-		SSC	16421	Insert Probe setpoint cycles 2,6	Signed 16-bit	1004: LSE	1003: HSE	-22,0	°C	-1	XXX.Y
Setpoint	-	1018	SFC	16437	end of quick chill phase 1 setpoint (insert probe temperature)	Signed 16-bit	1004: LSE	1003: HSE	5,0	°C	-1	
Setpoint	-	1019	S1C	16439	quick chill phase 1 setpoint (cabinet temperature)	Signed 16-bit	1004: LSE	1003: HSE	1,0	°C	-1	
Setpoint	-	1040	FSA	16409	Evaporator temperature threshold cycles 1,3, 5.	Signed 16-bit	1004: LSE	1003: HSE	10,0	°C	-1	
Setpoint	-	1040	FSC	16410	Evaporator temperature threshold cycles 2,4, 6.	Signed 16-bit	1004: LSE	1003: HSE	10,0	°C	-1	
Rapid Entry		1015	i1A	16422	Max Interval Time cycle1 and chilling phase of cycle 5 (min)	Unsigned 16-bit	1	1200	120	min		
Rapid Entry		1015	iSC	16422	Timeout phase2 of cycle 2 and 6	Unsigned 16-bit	1	1200	120	min		
Rapid Entry		1016	I1C	16423	Max Interval Time cycle2 and chilling phase of cycle 6 (min)	Unsigned 16-bit	1	1200	120	min		
Rapid Entry		1020	dSr	16433	delay time for difference between insert and Cabinet probe	Signed 16-bit	1	60	1	min		
Rapid Entry		1021	dPS	16434	minimum Temperture between insert and	Signed 16-bit	0	500	100	°C	-1	

Menu	Access	ID	Label	Address	Description	Values	Min	Max	Default	U.M.	EXP	Format
					cabinet probe							
Rapid Entry		1005	Cyc	16440	Selection Cycle	Signed 16-bit	1	6	1	num		
Compressor	INS	1003	HSE	16387	Maximum limit for temperature setpoints	Signed 16-bit	1004: LSE	110,0	50,0	°C	-1	
Compressor	INS	1004	LSE	16388	Minimum limit for temperature setpoints	Signed 16-bit	-50,0	1003: HSE	-50,0	°C	-1	
Compressor	INS	1009	ONT	16393	Compressor ON time in the event of probe error	Unsigned 16-bit	0	255	10	min		
Compressor	INS	1010	OFT	16394	Compressor OFF time in the event of probe error	Unsigned 16-bit	0	255	10	min		
Compressor	USR/INS	1011	DON	16395	Compressor switch-on delay	Unsigned 16-bit	0	1000	10	s		
Compressor	USR/INS	1012	DOF	16396	Safety timer for compressor switch-on/switch-off	Unsigned 16-bit	0	1000	0	s		
Compressor	USR/INS	1013	DBI	16397	Safety timer for compressor switch-on/switch-on	Unsigned 16-bit	0	255	2	min		
Compressor	USR/INS	1014	ODO	16398	Relay activation delay at power-on	Unsigned 16-bit	0	255	0	min		
Defrost	INS	1028	DTY	16412	Defrost mode	(0) = Electric; (1) = Stop (Free)			0			
Defrost	USR/INS	1029	DIA	16413	Interval between the start of two consecutive defrost cycles (1,3,5)	Signed 16-bit	0	255	6	h		
Defrost	USR/INS	1029	DIC	16413	Interval between the start of two consecutive defrost cycles (2,4,6)	Signed 16-bit	0	255	6	h		
Defrost	INS	1032	DCT	16416	Selection of count mode for defrost interval	(0) = Compressor uptime; (1) = Unit uptime; (2) = On compressor stop; (3) = No defrost			3			
Defrost	INS	1033	DOH	16417	Delay prior to start of first defrost cycle after changeover to ON status	Unsigned 16-bit	0	59	0	min		
Defrost	USR/INS	1034	DEA	16402	Temperature at end of defrost cycles (1,3,5)	Signed 16-bit	-302,0	1472,0	6,0	°C	-1	XXX.Y

Menu	Access	ID	Label	Address	Description	Values	Min	Max	Default	U.M.	EXP	Format
Defrost	USR/INS	1034	DEC	16404	Temperature at end of defrost cycles (2,4,6)	Signed 16-bit	-302,0	1472,0	6,0	°C	-1	XXX.Y
Defrost	USR/INS	1189	TCA	16392	Timeout of defrost cycles (1,3,5)	Unsigned 16-bit	1	255	30	min		
Defrost	USR/INS	1189	TCC	16399	Timeout of defrost cycles (2,4,6)	Unsigned 16-bit	1	255	30	min		
Defrost	USR/INS	1036	DPO	16420	Determines whether a defrost cycle should be run when the device is switched on.	(0) = Not required; (1) = Required			0			
Defrost	USR/INS	1044	DT	16428	Coil drainage time	Unsigned 16-bit			0	255	0	
Evaporator fans	USR/INS	1040	FSA	16409	Fan disabling temperature cycles (1,5)	Signed 16-bit	1004: LSE	1003: HSE	10,0	°C	-1	XXX.Y
Evaporator fans	USR/INS	1040	FSC	16410	Fan disabling temperature cycles (2,6)	Signed 16-bit	1004: LSE	1003: HSE	10,0	°C	-1	XXX.Y
Evaporator fans	USR/INS	1040	FST	16424	Fan disabling temperature in hold phase	Signed 16-bit	1004: LSE	1003: HSE	6,0	°C	-1	XXX.Y
Evaporator fans	USR/INS	1042	FAD	16426	Fan activation differential.	Signed 16-bit	1,0	50,0	1,0	°C	-1	XXX.Y
Evaporator fans	USR/INS	1043	FDT	16427	Fan activation delay after a defrost cycle	Unsigned 16-bit	0	255	0	min		
Evaporator fans	USR/INS	1046	FCO	16430	Selects or deselects fan deactivation at compressor OFF	(0) = Off; (1) = Thermostat controlled; (2) = Compressor			1			
Evaporator fans	USR/INS	1047	DOD	16425	Selects or deselects fan deactivation when the door is open and fan restart when the door is shut (if they were running).	(0) = Not active; (1) = Active			1			
Evaporator fans	INS	1048	FDC	16432	Evaporator fan switching off delay after the compressor stops	Unsigned 8-bit	0	99	0	min		
Evaporator fans	INS	1049	FQC	16413	Behaviour of Fans during quick chill phase	(0) = Always OFF; (1) = Follows Compressor; (2) = Always ON			2			
Evaporator fans	INS	1049	FHC	16418	Behaviour of Fans during hold phase	(0) = Always OFF; (1) = Follows Compressor; (2) = Always ON			2			
Alarms	INS	1079	ATT	16463	Type of temperature threshold	(0) = Absolute; (1) = Relative			1			
Alarms	INS	1080	AFD	16464	Temperature differential	Signed 16-bit	1,0	50,0	1,0	°C	-1	XXX.Y

Menu	Access	ID	Label	Address	Description	Values	Min	Max	Default	U.M.	EXP	Format
Alarms	INS	1081	HAA	16465	High temperature threshold cycles (1,3, 5)	Signed 16-bit	1082: LAL		50,0	°C	-1	XXX.Y
Alarms	INS	1082	LAA	16466	Low temperature threshold cycles (1,3, 5)	Signed 16-bit		1081: HAL	-50,0	°C	-1	XXX.Y
Alarms	INS	1081	HAC	16389	High temperature threshold cycles (2,4, 6)	Signed 16-bit	1082: LAC		50,0	°C	-1	XXX.Y
Alarms	INS	1082	LAC	16391	Low temperature threshold cycles (2,4, 6)	Signed 16-bit		1081: HAC	-50,0	°C	-1	XXX.Y
Alarms	INS	1083	PAO	16467	Delay at start-up	Unsigned 16-bit	0	10	1	h		
Alarms	INS	1084	DAO	16468	Delay after defrost	Unsigned 16-bit	0	999	60	min		
Alarms	INS	1085	OAO	16469	Delay after door closing	Unsigned 16-bit	0	10	30	min		
Alarms	INS	1086	TDO	16470	Door open alarm	Unsigned 16-bit	0	255	10	min		
Alarms	INS	1087	ATA	16471	Temperature alarm delay	Unsigned 16-bit	0	255	1	min		
Alarms	INS	1095	DAT	16479	Alarm signalling for end of defrost due to timeout	(0) = No alarm; (1) = Alarm			0			
Alarms	INS	1096	RLO	16480	Regulators blocked by external alarm	(0) = None; (1) = Compressor and defrost; (2) = Compressor, defrost, and fans			0			
Lights and D.I.	INS	1104	DSD	16488	Enabling of light relay if door open	Boolean			1			
Lights and D.I.	INS	1105	DLT	16489	Delay for switching off of light relay due door closing	Unsigned 8-bit	0	31	0	min		
Lights and D.I.	INS	1106	OFL	16490	Disabling of light relay by key during delay 1105: DLT	Boolean			1			
Sterilization	USR/INS	1190	Stt	16406	Sterilization time	Unsigned 16-bit	1	600	15	sec		
Sterilization.	USR/INS	1191	S_T	16407	Min. temperature threshold for Sterilisation	Signed 16-bit	0	200	50	°C	-1	
Insert probe Heating	USR/INS	1192	ipT	16408	Insert probe Heating Time	Unsigned 16-bit	0	30	2	min		
Insert probe Heating	USR/INS	1193	I_T	16411	Insert Probe Max Temperture during heating phase	Signed 16-bit	0	100	40	°C	-1	
Display	USR/INS	1122	PA1	16506	User password	String			***10			

Menu	Access	ID	Label	Address	Description	Values	Min	Max	Default	U.M.	EXP	Format
Display	INS	1123	PA2	16509	Installer password	String			***20			
Configuration	INS	1156	H07	16544	Type of temperature control	(0) = Disabled; (1) = Neutral zone; (2) = Heating only; (3) = Cooling only; (4) = Heating and cooling from DI			1			
Configuration	INS	1159	H11	16547	Configuration of digital input 1.	0 = Disabled; ±1 =ON/OFF ±2 =Door Microswitch ±3 =External alarm ±4 = Start / Stop Quick Chill ±5= Compressor Thermal Switch ±6 = Insert Probe Parking ±7= Fan Thermal Switch When sign is + it indicates Normally Open When sign is – it indicates Normally Closed			1			
Configuration	INS	1160	H12	16548	Configuration of digital input 2.	See 1159 H11			4			
Configuration	INS	1161	H13	16549	Configuration of digital input 3.	See 1159 H11			6			
Configuration	INS	1162	H14	16550	Configuration of digital input 4.	See 1159 H11			5			
Configuration	INS	1163	H15	16551	Configuration of digital input 5.	See 1159 H11			7			
Configuration	INS	1164	H16	16552	Configuration of digital input 6.	See 1159 H11			3			
Configuration	INS	1165	H17	16553	Configuration of digital input 7.	See 1159 H11			2			
Configuration	INS	1168	H21	16557	Configuration of digital output 1	0 = Disabled; ±1 =Compressor ±2 =Fan ±3 = Defrost Heater ±4 = Buzzer ±5 = Light ±6 = Sterilisation ±7 = Insert Probe Heating When sign is + it indicates Normally Open When sign is – it indicates Normally Closed			1			
Configuration	INS	1170	H22	16558	Configuration of digital output 2	See 1168 H21			2			
Configuration	INS	1171	H23	16559	Configuration of digital output 3	See 1168 H21			3			

Menu	Access	ID	Label	Address	Description	Values	Min	Max	Default	U.M.	EXP	Format
Configuration	INS	1172	H24	16560	Configuration of digital output 4	See 1168 H21			4			
Configuration	INS	1173	H25	16561	Configuration of digital output 5	See 1168 H21			5			
Configuration	INS	1174	H26	16562	Configuration of digital output 6	See 1168 H21			6			
Configuration	INS	1175	H27	16563	Configuration of digital output 7	See 1168 H21			7			
Configuration	INS	1180	H41	16569	Probe 1 configuration	(0) = Disabled; (1) = Analog input 1; (2) = Analog input 2; (3) = Analog input 3; (4) = Analog input 4; (5) = Analog input 5; (6) = Analog input 6			1			
Configuration	INS	1181	H42	16570	Probe 2 configuration	See 1180 H41			2			
Configuration	INS	1182	H43	16571	Probe 3 configuration	See 1180 H41			3			

12.11.3 BIOS resources table

Type	Address	Name	Description	Min	Max	UM	Default Value
BIOS	15780	Addr_CAN_OB	CAN On Board address	1	127	num	125
BIOS	15781	Baud_CAN_OB	CAN On Board baud rate protocol	2	6	num	2
BIOS	15716	Par_TAB	Tab (map code)	0	65535	num	0
BIOS	15717	Par_POLI	Polycarbonate code	0	65535	num	1025
BIOS	15725	Temp_UM	Unit of temperature measurement	0	1	num	0
BIOS	15726	Cfg_AI1	Type of analogue input AI1	0	2	num	2
BIOS	15727	Cfg_AI2	Type of analogue input AI2	0	2	num	2
BIOS	15728	Cfg_AI3	Type of analogue input AI3	0	8	num	3
BIOS	15729	Cfg_AI4	Type of analogue input AI4	0	8	num	3
BIOS	15730	Cfg_AI5	Type of analogue input AI5	0	8	num	3
BIOS	15731	Cfg_AI6	Type of analogue input AI6	0	8	num	3
BIOS	15736	FullScaleMin_AI3	First value analogue input AI3 scale	-9999	9999	digit	0
BIOS	15737	FullScaleMax_AI3	Last value analogue input AI3 scale	-9999	9999	digit	1000
BIOS	15738	FullScaleMin_AI4	First value analogue input AI4 scale	-9999	9999	digit	0
BIOS	15739	FullScaleMax_AI4	Last value analogue input AI4 scale	-9999	9999	digit	1000
BIOS	15740	FullScaleMin_AI5	First value analogue input AI5 scale	-9999	9999	digit	0

Type	Address	Name	Description	Min	Max	UM	Default Value
BIOS	15741	FullScaleMax_AI5	Last value analogue input AI5 scale	-9999	9999	digit	1000
BIOS	15742	FullScaleMin_AI6	First value analogue input AI6 scale	-9999	9999	digit	0
BIOS	15743	FullScaleMax_AI6	Last value analogue input AI6 scale	-9999	9999	digit	1000
BIOS	15748	Calibration_AI1	Analogue input AI1 differential	-180	180	°C-°F/10	0
BIOS	15749	Calibration_AI2	Analogue input AI2 differential	-180	180	°C-°F/10	0
BIOS	15750	Calibration_AI3	Analogue input AI3 differential	-1000	1000	digit	0
BIOS	15751	Calibration_AI4	Analogue input AI4 differential	-1000	1000	digit	0
BIOS	15752	Calibration_AI5	Analogue input AI5 differential	-1000	1000	digit	0
BIOS	15753	Calibration_AI6	Analogue input AI6 differential	-1000	1000	digit	0
BIOS	15758	Cfg_AO1_AO5	Type of analogue output AO1/AO5	0	2	num	0
BIOS	15759	Cfg_AO2	Type of analogue output AO2	0	2	num	0
BIOS	15760	Cfg_AO3	Type of analogue output AO3	0	2	num	0
BIOS	15761	Cfg_AO4	Type of analogue output AO4	0	2	num	0
BIOS	15762	SubCfg_AO5	Subtype of analogue output AO5	0	1	num	0
BIOS	15774	Addr_RS485_OB	RS485 On Board address	0	255	num	1
BIOS	15775	Proto_RS485_OB	Select RS485 On Board protocol	2	3	num	3
BIOS	15776	DataBit_RS485_OB	RS485 On Board Data bit number	8	8	num	8
BIOS	15777	StopBit_RS485_OB	RS485 On Board stop bit number	1	2	num	1

Type	Address	Name	Description	Min	Max	UM	Default Value
BIOS	15778	Parity_RS485_OB	RS485 On Board parity protocol	0	2	num	2
BIOS	15779	Baud_RS485_OB	RS485 On Board baud rate protocol	0	5	num	2
BIOS	15782	Addr_RS485_PI	RS485 passive Plug-In address	0	255	num	1
BIOS	15783	Proto_RS485_PI	Select RS485 passive Plug-In protocol	2	3	num	3
BIOS	15784	DataBit_RS485_PI	RS485 passive Plug-In Data bit number	8	8	num	8
BIOS	15785	StopBit_RS485_PI	RS485 passive Plug-In stop bit number	1	2	num	1
BIOS	15786	Parity_RS485_PI	RS485 passive Plug-In parity protocol	0	2	num	2
BIOS	15787	Baud_RS485_PI	RS485 passive Plug-In baud rate protocol	0	5	num	2
BIOS	15788	Addr_CAN_PI	CAN passive Plug-In address	1	127	num	1
BIOS	15789	Baud_CAN_PI	CAN Passive Plug-In baud rate protocol	2	6	num	2
BIOS	15790	Addr_RS232_PI	RS232 passive Plug-In address	0	255	num	1
BIOS	15791	Proto_RS232_PI	Select RS232 passive Plug-In protocol	2	3	num	3
BIOS	15792	DataBit_RS232_PI	RS232 passive Plug-In Data bit number	7	8	num	8
BIOS	15793	StopBit_RS232_PI	RS232 passive Plug-In stop bit number	1	2	num	1
BIOS	15794	Parity_RS232_PI	RS232 passive Plug-In parity protocol	0	2	num	2
BIOS	15795	Baud_RS232_PI	RS232 passive Plug-In baud rate protocol	0	5	num	2
BIOS	15772	Port_TFTP_IP	TFTP Port number 0 is equal to deafult port 69	0	65535	num	0
BIOS	15796	Port_HTTP_PI	HTTP Port number 0 is equal to default port 80	0	65535	num	0

Type	Address	Name	Description	Min	Max	UM	Default Value
BIOS	15797	Port_ETH_PI	TCP/IP Port number	0	65535	num	502
BIOS	15798	Ip_1_ETH_PI	Ethernet passive Plug-In IP address (1 st part)	0	255	num	10
BIOS	15799	Ip_2_ETH_PI	Ethernet passive Plug-In IP address (2 nd part)	0	255	num	0
BIOS	15800	Ip_3_ETH_PI	Ethernet passive Plug-In IP address (3 rd part)	0	255	num	0
BIOS	15801	Ip_4_ETH_PI	Ethernet passive Plug-In IP address (4 th part)	0	255	num	100
BIOS	15802	DefGtwy_1_ETH_PI	Default Gateway (1 st part)	0	255	num	192
BIOS	15803	DefGtwy_2_ETH_PI	Default Gateway (2 nd part)	0	255	num	168
BIOS	15804	DefGtwy_3_ETH_PI	Default Gateway (3 rd part)	0	255	num	0
BIOS	15805	DefGtwy_4_ETH_PI	Default Gateway (4 th part)	0	255	num	1
BIOS	15806	NetMsk_1_ETH_PI	Net mask (1 st part)	0	255	num	255
BIOS	15807	NetMsk_2_ETH_PI	Net mask (2 nd part)	0	255	num	255
BIOS	15808	NetMsk_3_ETH_PI	Net mask (3 rd part)	0	255	num	255
BIOS	15809	NetMsk_4_ETH_PI	Net mask (4 th part)	0	255	num	0
BIOS	15810	PriDNS_1_ETH_PI	Primary DNS server (1 st part)	0	255	num	194
BIOS	15811	PriDNS_2_ETH_PI	Primary DNS server (2 nd part)	0	255	num	25
BIOS	15812	PriDNS_3_ETH_PI	Primary DNS server (3 rd part)	0	255	num	2
BIOS	15813	PriDNS_4_ETH_PI	Primary DNS server (4 th part)	0	255	num	129
BIOS	15814	SecDNS_1_ETH_PI	Secondary DNS server (1 st part)	0	255	num	194

Type	Address	Name	Description	Min	Max	UM	Default Value
BIOS	15815	SecDNS_2_ETH_PI	Secondary DNS server (2 nd part)	0	255	num	25
BIOS	15816	SecDNS_3_ETH_PI	Secondary DNS server (3 rd part)	0	255	num	2
BIOS	15817	SecDNS_4_ETH_PI	Secondary DNS server (4 th part)	0	255	num	130
BIOS	15818	EnableDHCP_ETH_PI	Enable DHCP	0	1	flag	0
BIOS	15820	Modem_RS232_PI	Modem Enable	0	1	flag	0
BIOS	15821	Modem_InitStr1	Init String (1st part)	0	0	0	0
BIOS	15831	Modem_InitStr2	Init String (2nd part)	0	0	0	0

12.11.4 Client table (Status Variables)

The following table lists all of the device's configuration statuses with respective ModBUS addresses

Format: display format for **Default Value /Min/Max. - XXX.Y** display of whole number with decimal point

Read only enables/disables editing of Status variables.

Device Type type of data displayed on **FREE Studio Device**

Address	Name	Device type	Unit	Format	ReadOnly	Description
8960	CurrentState	USINT				Current ON/OFF state
8961	CurrentMode	USINT				Current HEAT/COOL mode
8962	CurrentTemperatureSetpoint	INT	°C	XXX.Y		Current temperature setpoint
8966	ThermoregulationType	USINT				Thermoregulation type
8971	PasswordEntry	STRING			False	Password entered
8974	PasswordLevel	USINT				Current password level
8975	ResetPassword	BOOL			False	Reset password request
8976	ResetAlarm	BOOL			False	Reset alarm request
8977	Pb1Enabled	BOOL				Probe 1 enable status (if TRUE, it is enabled)
8978	Pb1	INT	°C	XXX.Y		Probe 1 = thermoregulation feedback
8979	Pb1Error	USINT				Probe 1 error
8980	Pb2Enabled	BOOL				Probe 2 enable status (if TRUE, it is enabled)
8981	Pb2	INT	°C	XXX.Y		Probe 2 = evaporator temperature

Address	Name	Device type	Unit	Format	ReadOnly	Description
8982	Pb2Error	USINT				Probe 2 error
8983	Pb3Enabled	BOOL				Probe 3 enable status (if TRUE, it is enabled)
8984	Pb3	INT	°C	XXX.Y		Probe 3 = Insert Probe
8985	Pb3Error	USINT				Probe 3 error
8989	ExternalAlarm	USINT				External alarm
8990	ThermalCompAlarm	USINT				Thermal Compressor alarm
8991	DoorOpenAlarm	USINT				Door open alarm
8992	ThermalFanAlarm	USINT				Thermal Fan alarm
8993	HighTemperatureAlarm	USINT				High temperature alarm
8994	LowTemperatureAlarm	USINT				Low temperature alarm
8995	DefrostTimeoutAlarm	USINT				Defrost timeout alarm
8998	ClockError	USINT				System clock error
8999	GlobalAlarmStatus	USINT				Global alarm status
9002	DoorSwitchEnabled	BOOL				Door switch configuration status (if TRUE, it is enabled)
9003	DoorSwitch	BOOL				Door switch
9004	AlarmDIEnabled	BOOL				Alarm DI configuration status (if TRUE, it is enabled)
9005	AlarmDI	BOOL				Alarm DI
9006	StateDIEnabled	BOOL				State (ON/OFF) DI configuration status (if TRUE, it is enabled)

Address	Name	Device type	Unit	Format	ReadOnly	Description
9007	RemoteState	USINT				Remote ON/OFF state setting (from digital input)
9008	QuickChillDIEnabled	BOOL				Light DI configuration status (if TRUE, it is enabled)
9009	QuickChillDI	BOOL				Light DI
9010	ThermalCompDIEnabled	BOOL				Ventilation DI configuration status (if TRUE, it is enabled)
9011	ThermalCompDI	BOOL				Ventilation DI
9012	ThermalFanEnabled	BOOL				Pressure switch configuration status (if TRUE, it is enabled)
9013	ThermalFanSwitch	BOOL				Pressure switch
9014	ParckingProbeEnabled	BOOL				Panic DI configuration status (if TRUE, it is enabled)
9015	ParckingProbeDI	BOOL				Panic DI
9018	CompressorDO	BOOL				Compressor DO
9021	DefrostDOEnabled	BOOL				Defrost DO configuration status (if TRUE, it is enabled)
9022	DefrostDO	BOOL				Defrost DO
9024	EvaporatorFansDO	BOOL				Evaporator fans DO
9026	LightDOEnabled	BOOL				Light DO configuration status (if TRUE, it is enabled)
9027	LightDO	BOOL				Light DO
9028	EvaporatorFanDOEnabled	BOOL				Ventilation fan DO configuration status (if TRUE, it is enabled)
9030	sysClock_seconds_RW	USINT			False	Second value to update
9031	sysClock_minutes_RW	USINT			False	Minute value to update

Address	Name	Device type	Unit	Format	ReadOnly	Description
9032	sysClock_hours_RW	USINT			False	Hour value to update
9033	sysClock_dayweek_RW	USINT			False	Day of the week value to update
9034	sysClock_daymonth_RW	USINT			False	Day of the month value to update
9035	sysClock_month_RW	USINT			False	Month value to update
9036	sysClock_year_RW	USINT			False	Year value to update
9037	sysClock_update	USINT			False	Confirm update
9038	ThermoregulationEnabled	BOOL				Thermoregulation configuration status (if TRUE, it is enabled)
9039	CompressorRequest	BOOL				Request to switch on the compressor
9044	CoolingRequest	BOOL				Active request for cooling
9051	CoolingEnabled	BOOL				Cooling enable status
9055	CompressorConsensus	BOOL				Consensus to switch on the compressor
9058	DefrostRequest	BOOL				Request to switch on Defrost
9059	DefrostEnabled	BOOL				Defrost Status (if true it is enabled)
9060	DefrostActive	BOOL				Flag Defrost Phase Active
9080	DefrostRequestDiscardedWarning	BOOL				Discarded defrost request warning
9065	ToggleLightRequest	BOOL			False	Request to toggle Light
9066	DefrostHMIRequest	BOOL			False	Defrost request from HMI
9067	ResetCountersHMIRequest	BOOL			False	Reset counters request

Address	Name	Device type	Unit	Format	ReadOnly	Description
9068	CompressorUptimeHours	INT	h			Compressor uptime hours
9069	CompressorUptimeFraction	UDINT	s			Compressor uptime hour fraction (in seconds)
9070	UnitUptimeHours	INT	h			Unit uptime hours
9071	UnitUptimeFraction	UDINT	s			Unit uptime hour fraction (in seconds)
10000	PACKED_Status01	WORD				Packed BOOL status variables (to optimize remote HMI communication) - Part 1
10001	PACKED_Status02	WORD				Packed BOOL status variables (to optimize remote HMI communication) - Part 2
9100	TelevisId	INT				Televis Identification
9101	Version1	UINT				Main Version
9102	Version2	UINT				Minor Version
9090	BuzzerDOEnabled	BOOL				Ventilation fan DO configuration status (if TRUE, it is enabled)
9091	BuzzerDO	BOOL				Ventilation fan DO
8967	ElectricDefrost_Enabled	BOOL				Electric Defrost Enabled
9016	Preservation_mode	BOOL				If true Preservation mode is active
8996	QuickChillPhase	BOOL				Quick Chill cycle
9040	cycle_step	INT				Cycle Step
9053	Switch2Timed_QuickChill	BOOL				Flag of switch from temperture to timer Quick Chill
9061	QuickChillState	BOOL				Quick Chill State (if true Quick Chill is Active)

Address	Name	Device type	Unit	Format	ReadOnly	Description
9062	QuickChillTimed	BOOL				Quick Chill Timed
9076	StartQuickChill	BOOL				Flag of Start Quick Chill
9077	Running	BOOL				
9020	hmiQuickChill	BOOL			False	Flaf of Quick Chill Request by HMI
9089	SetInsertProbe	INT		XXX.Y		Actual Set of Insert Probe
9092	ActiveCycle	INT				Active Cycle
9093	TimeStep	UINT				Count Down of Time of active Step
9094	CurrentTimeStep	UINT				Time of active Step
9096	Setpoint1	INT		XXX.Y		Final Cabinet Setpoint in Quick Chill
9097	Setpoint2	INT		XXX.Y		Intermediate Cabinet Setpoint in cycle 2,6
9098	Setpoint3	INT		XXX.Y		Preservation Cabinet Setpoint
8968	defrostExclusion	BOOL				Flag of Defrost Exclusion (if true the defrost is inhibited)
8969	silence	BOOL				Silence Buzzer
8970	End_QuickChill	BOOL				Signal Flag of Quick Chill End
9099	QuickChillState_old	BOOL				
9103	DefrostTimeElapsed	UINT	min			Defrost Time Elapsed
9104	SterilRequest	BOOL				Request to switch on the Sterilization
9105	SterilEnabled	BOOL				Sterilization Status (if true it is enabled)

Address	Name	Device type	Unit	Format	ReadOnly	Description
9106	SterilActive	BOOL				Flag Sterilization Phase Active
9107	SterilRequestDiscardedWarning	BOOL				Discarded Sterilization request warning
9108	SterilHMIRequest	BOOL				Sterilization request from HMI
9109	SterilTimeElapsed	UINT	min			Sterilization Time Elapsed
9113	SterilTimeoutAlarm	USINT				Defrost timeout alarm
9114	SterilDOEnabled	BOOL				Defrost DO configuration status (if TRUE, it is enabled)
9115	SterilDO	BOOL				Defrost DO
9116	HeatingProbeRequest	BOOL				Request to switch on the Heating Probe
9117	HeatingProbeEnabled	BOOL				Heating Probe Status (if true it is enabled)
9118	HeatingProbeActive	BOOL				Flag Heating Probe Phase Active
9119	HeatingProbeRequestDiscardedWarning	BOOL				Discarded Sterilization request warning
9134	HeatingProbeHMIRequest	BOOL				Sterilization request from HMI
9135	HeatingProbeTimeElapsed	UINT	min			Sterilization Time Elapsed
9137	HeatingProbeTimeoutAlarm	USINT				Defrost timeout alarm
9138	HeatingProbeDOEnabled	BOOL				Defrost DO configuration status (if TRUE, it is enabled)
9139	HeatingProbeDO	BOOL				Defrost DO
9140	DrainageTimeElpsed	UINT	min			Drainage Time Elapsed

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