area Cooling Solutions

iCOOL

iCOOL **G3i**
Condensing Unit

Appendix A

Smart Solutions
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1. Introduction

This manual contains the most important information on the commissioning, parameterization and diagnostics of the **iCOOL G3i** series chillers and above all on the operation of the chiller controller.

1.1. Description of the unit's operation

iCOOL G3i is equipped with a programmable logic controller (PLC) Eliwell Free Smart (with AREA software), which controls the operation of the unit and allows for more efficient and optimized operation of the cooling system.

The AREA ACV inverter is responsible for powering the main compressor (inverter - with adjustable capacity), it is fully controlled by the PLC via Modbus RTU communication (RS-485 bus). Compressor speed is determined by the unit suction pressure (-Psuc) and evaporation setpoint (the correct pressure is determined based on the selected refrigerant type and evaporation setpoint in °C). The second compressor (on tandem units) starts when the suction pressure is above the setpoint despite the inverter compressor running at its highest speed, the second compressor will also run in the case of an inverter failure.

The speed of the EC fan of the unit is also regulated by the PLC controller with a 0-10V signal (selected models are controlled via the RS-485 bus). The fan speed depends on the measured discharge pressure (-Pdis) and the condensing temperature setpoint (typically around 40 ° C). The condensing setpoint can be lowered at low ambient temperatures (ECO mode and -Tamb measurement).

Description of standard work:

1) The unit under normal conditions (no alarms, the device is on - the diode ⏻ is constantly on), controls the pressure at the suction (compressor / s capacity) and compressor discharge (fan speed).
   a) The correct pressure is determined from the selected medium and the evaporation temperature setting.
2) The cooling start-up is delayed for about 3 minutes after power-up and each time the main compressor is switched off (5 minutes delay between compressor starts is also kept).
3) If the pressure value is about 0.4 bar greater than the set value, the compressor will start after 10 seconds (after compressor rest period).
   a) Compressor 2 (-Cp2, if present) will also start under this condition, but after the 1st compressor has reached its maximum capacity.
4) Compressor 1 (inverter), after switching on, works at about 50% of its capacity for 60 seconds and then switches to the pressure regulation mode.
5) The unit is switched off in case of:
   a) Persistent pressure is about 0.3 bar lower than the set pressure, and the main compressor operates at minimum speed.
   b) 2nd compressor (if present and running) will be stopped first when the above condition is met.
   c) The compressors will stop immediately if the pressure drops below the pumpdown setting.

2. Safety notes

Take special care when handling and operating iCOOL G3i unit. The device is equipped with several protections that reduce to a minimum the risks that may appear during the working of the device. Incorrect operation, unskillful change of parameters, removing or bypassing safety protections may lead to unforeseen events.

1. **iCOOL is a device that should not be accessed by unqualified persons.**
2. **There is life-threatening voltage inside the device. Any manipulation next to the electric board as well cooling devices may be performed only by qualified and authorized personnel with appropriate professional qualifications and in compliance with the health and safety rules.**

2.1. Commissioning notes

1. **The commissioning team is fully responsible for the correct and safe operation of the device after commissioning.**
2. **Commissioning of the device should be entrusted to a person with refrigeration qualifications and experience, as well as appropriate electrical qualifications.**
3. **Check the timer setting, if present (setting> 5 minutes).**
4. **The motor starter protector, if present, has been set to FLA value (maximum current reading from the work envelope for the factor that requires the greatest load). It is recommended to decrease the setpoint for R134A and R513A by measuring the compressor current at a condensing pressure of at least 12 bar for R134A and at least 16 bar for R513A, adding 20%. Do not set the motor circuit breaker higher than the MCC value (Maximum Compressor Continuous Current).**
5. **Regularly check if screw connections are tightened**.

Only careful commissioning of the cooling system guarantees its safe and long-term operation.

2.2. Installation evaporation settings notes

To take full advantages of smooth regulation and the efficiency of inverter compressors in multi-evaporator systems, the evaporator regulators should be set to maintain the temperature with the lowest possible hysteresis (1-2 ° C). This will ensure a more consistent refrigerant flow and minimize compressor downtime that will occur if most evaporators close at the same time. This recommendation is not valid for 1: 1 (1 unit + 1 evaporator) systems.

3. Power supply and preparation for commission

The electrical connection should be made by a specialist - an electrician.

The cables and protections used must comply with the regulations and relevant safety standards.

3.1. Degree of protection of unit (IP)

The complete unit is made in the protection degree: **IP44**.

3.2. Protection class

The unit was made in **"Class I"** protection.

- iCOOL units have a complete electrical installation and were factory tested.
- The installer, among other things, needs to properly connect the electric power supply suitable for the TN-S network system.

Leakage current:
Due to the fact that the unit's inverter has a leakage current exceeding 3.5mA, it is necessary to provide (in accordance with IEC 61800-5-1) a PE protective conductor (yellow-green) with a minimum cross-section of 10mm2, or additional protective connection of the condensing unit in the form of a separate PE conductor with cross-section not less than that of the power supply cables, connected to a separate terminal (or the housing, if such a connection is provided).

Residual Current Device (RCD):
If a residual current device (RCD) must be used as an additional protection against electric shock (requirement due to the installation site of the condensing unit), only **a type B (delayed) RCD** may be used on the power supply side of the condensing unit.

If a type A residual current device is present in the supply circuit, but is not used as additional protection against electric shock, it may be necessary to use a circuit breaker with a higher **operating current (100mA or 300mA).**

3.3. Electromagnetic Compatibility (EMC)

iCOOL units must be installed by trained personnel and in an appropriate manner to ensure the required electromagnetic compatibility for the respective working environment (industrial/commercial/residential).

iCOOL G3i units are normally intended for installation in a commercial environment (class C2 according to IEC 61800-3:2018).

Adapting the condensing unit to a residential environment (C1) may require the usage of an additional RFI filter, which reduces radio interference (to select a solution, please contact our technical department).

3.4. Power connection

The power cord must be connected to the terminals marked **–Xz** (L1, L2, L3, N, PE) on the unit electrical board.

Note: The use of electric wires with a cross-section that is too small may result in voltage drops, increased current consumption and incorrect operation of short-circuit and overload protections. This can lead to the destruction of the compressor, condenser fans and danger to health and life.

Before the first start-up or after a longer standstill of the unit, check if the electric cables supplying the device are not damaged and that the screw connections of the electric components are not loosened.

ATTENTION: The device has capacitors which remain live after disconnecting the power supply (they discharge slowly). Wait 15 minutes after disconnecting the power supply before carrying out repair or service work.

3.5. Power phase sequence control

Selected units are equipped with a phase rotation presence and direction relay (marked -R0). Two types of relays are used and the meaning of the signalled states are presented below. In the event of a condition other than correct, it is necessary to check the presence of voltages on each of the phases, the sequence of their connection and the effectiveness of the neutral conductor connection, in the case of RN-35.

Finder F70.61.8.400

The light is flashing: **INCORRECT WORK**
The light is fixed: **CORRECT WORK**

Novatek RN-35

The lights are off: **NO VOLTAGE OR ASYMMETRY**
Red light on: **INCORRECT PHASE ORDER**
Green light on: **CORRECT WORK**

3.6. Unit activation switch

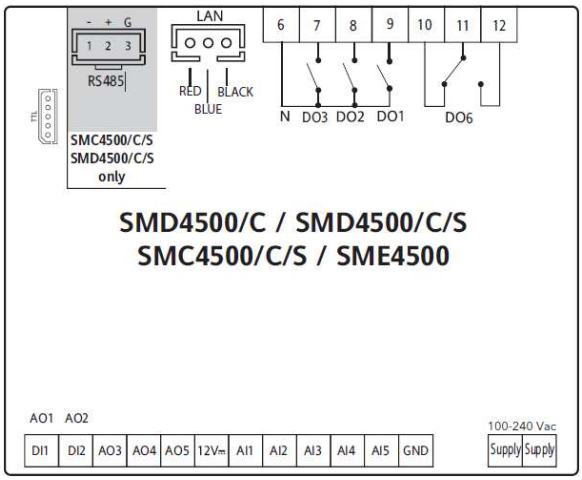
iCOOL G3i units in the standard version do not have a physical switch for switching the unit on. A dedicated controller parameter is used for activation, additionally switched using arrow buttons held for 3 seconds (see section 5.1).

Selected models have a 3-position switch with the option of switching the unit on in safety mode - operation bypassing the inverter. **The unit will only start with the selected operating mode using the switch –S1 .**

1 – Inverter operation mode (default)
2 – Safety mode

3.7. Controller – I/O

Below, there is a picture of the controller with the designation of the functions of individual terminals.



4. Inverter

The device is equipped with the AREA ACV inverter. It is used to power the main compressor, performing the function of changing the cooling capacity of the unit.

4.1. Communication

The inverter communicates with the Eliwell controller using the Modbus RTU network in the RS485 standard. It is fully managed and controlled by the controller. All parameters of the inverter operations are available from the level of the controller. For more information, see section 11. Communication.

4.2. Description of the inverter LED indicators

The inverter is equipped with two LEDs that indicate the operating status of the device.

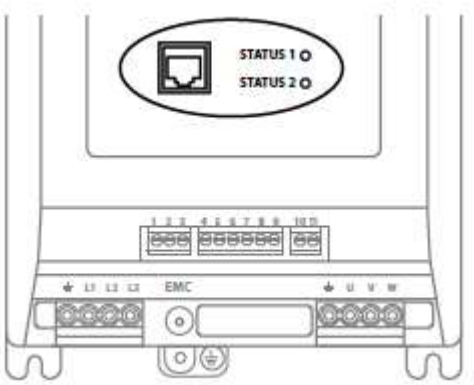


Figure 1: Inverter diagnostic LEDs

Inverter status	LED 1 status		LED 2 status
	Green	Red	Yellow
Stop (waiting for start)	Slow flashing	OFF	OFF
STO (active HP/LP pressure switch)	Slow flashing	OFF	Slow flashing alternate
Running	Constant ON	OFF	Slow flashing in case of overload
Compressor carter heater ON	Slow flashing	OFF	ON
Waiting	ON	OFF	Flashing every 3s
Error	OFF	ON	OFF
Internal communication error	OFF	Flashing every 3s	OFF
Optistick transfer succeed	Fast flashing every 2s	OFF	OFF
Optistick transfer failure	OFF	Fast flashing every 2s	OFF
Optistick error - other	OFF	OFF	Fast flashing every 2s
DSP Firmware update	All LED's in order: Green, Yellow, Red, Yellow		
IO Firmware update	All LEDs are dimly lit		

Table 1: Description of the inverter LEDs

5. Unit controller interface

5.1. Buttons

Built-in buttons of the Eliwell Free Smart controller allow you to navigate through the menu and change parameter values.

Figure 2: Description of the controller buttons

The table below provides a detailed description of the controller buttons:

No.	Button	Description
1.	F1 (Up arrow)	Navigate in the menu / Increase the value of a parameter
2.	F2 (Esc)	Exit the menu / Go up in the menu / Cancel the parameter setting
3.	F3 (Down arrow)	Navigate in the menu / Decrease the value of a parameter
4.	F4 (Set)	Enter the “Set” menu from the default view / Enter a submenu / Set parameter values
5.	F1 + F3 (F5)	Enter the Bios menu (pressing both buttons at the same time)
6.	F2(Esc) + F4 (Set)	Enter the “Prg” menu from the default view (pressing both buttons at the same time)

Table 2: Description of the controller buttons

Special buton functions:

- **Turning on the device:** Press and hold F1 (⏫) button for 3sec in the default view,
- **Turning off the device:** Press and hold F3 (⏬) button for 3sec in the default view,
- **Error reset:** Press the F2 (esc) button in the default view.

Useful functions:

- **Exit to the default view (Menu exit):** Press the F2 (esc) button until " -- " appear on the display,
- **Preview of measurements (enter ACt menu):** Press F4 (set) -> ACt -> F4 (set).

5.2. Display

The screen of the Eliwell Free Smart controller is divided into several elements. These are LED symbols and a seven-segment display. They indicate the current operating status of the refrigeration unit by displaying the most important information such as: information from sensors, operating modes as well as failures and errors. They also allow you to change the operating parameters of the device.

Figure 3: Controller display

No.	Symbol	Description	OFF (○)	Blink (●/○)	ON (●)
1.		**Permission to start**	OFF	ON, but no ext. perm. to work	ON
2.		**Error status**	No error / warning	**Warning**	**ERROR**
3.		**Cooling status**	Not active	Compressor waiting for start	Active (compressor running)
4.		ECO mode	Not active	Second setpoint active	ECO mode active
5.	1	**Compressor 1** status	OK	**Compressor 1 error (inverter)**	OK, running
6.	2	**Compressor 2** status	OK	**Compressor 2 error**	OK, running
7.	3	**Fan** status	OFF	N/A	ON
8.	4	Ready to start or working	Not ready	N/A	Ready or running
9.	5	High / low pressure switch (STO)	Pressure switch OK	HP / LP pressure switches circuit open!	N/A
10.	6	Pressure sensors error	Pressure sensors OK	Pressure sensors error!	High discharge / suction pressure!
11.	7	Temperature sensors error	Temperature sensors OK	Temperature sensors error!	Very high discharge temperature!
12.		Timer function	Function OFF	Second setpoint active (DI, timer, ambient temp.)	Second setpoint activated
13.		Compressor 1 carter heater	OFF	ON, despite compressor operation (oil low temp.!)	ON
14.		Injection valve	Closed	N/A	Opened
15.	ABC	Menu status	Out of menu, default screen	N/A	Menu active
16.		Gauge pressure	N/A	N/A	Pressure display
17.	%	Percentage value	N/A	N/A	Values display
18.		Temperature °C/K	N/A	N/A	Temperature display
19.	1234	Display	N/A	N/A	Values display

Table 3: Description of the display indications

5.2.1. Display – default view

The most important information about the operation of the device is displayed in the default view of the display depending on the current operating status.

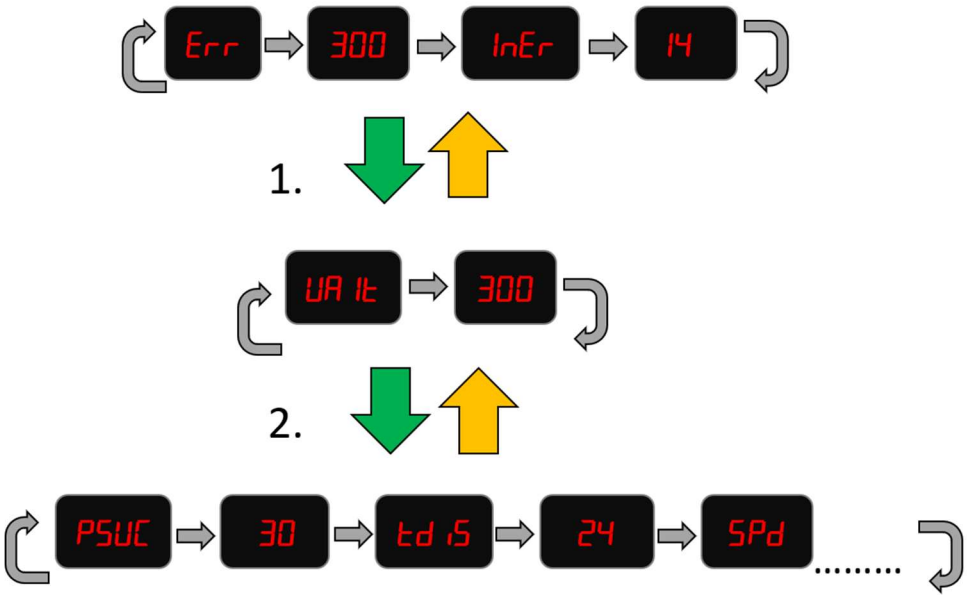


Figure 4: Change of the default view

1. When an error occurs, the view changes to display only error information. When an auto reset or manual reset occurs by pressing the F2 (esc) button, the controller returns to displaying the time remaining to start the device.
2. When the external start signal is present and the time to start is 0 seconds, it changes to the main view.

Parameters that appear in the default view:

- SPd (spd): compressor speed [RPS],
- PSUC (psuc): suction pressure [bar],
- Pdi S (pdis): discharge pressure [bar],
- tdi S (tdis): discharge temperature [°C],
- OFF (off): unit OFF,
- StOP (stop): unit stopped by pressure switch (HP or LP),
- rUn (run): unit ON / compressor running,
- Stb (stb): unit ON, no cooling required,
- uAi t (wait): unit ON, countdown to start (time remaining to boot will be displayed after uAi t),
- tLOu (tlow): unit ON, compressor carter temperature low,
- Err (err): unit stopped with error (error number will be displayed after Err),
- InEr (inER): inverter error (code displayed after InEr),
- InAL (inAL): inverter alarm/warning (code displayed after InAL).

In the case of parameters such as: pressure, speed, temperature after displaying the parameter name, the measured value of the given parameter will be displayed.

Entering any of the controller menu (exit from the default view) is signalled by the ABC symbol on the display. When the symbol is inactive, the default view of the display is displayed.

5.3. External work permit

The units are equipped with the option of connecting an external unit operation permit. Most often, the permission is implemented in the form of a potential free contact (e.g. standard relay contacts). The place of connection of the permission can be recognized by the jumper on the electrical board connectors - standard terminals **-Xc: 1-2**.

Lack of permission is manifested by blinking of the diode ⏻.

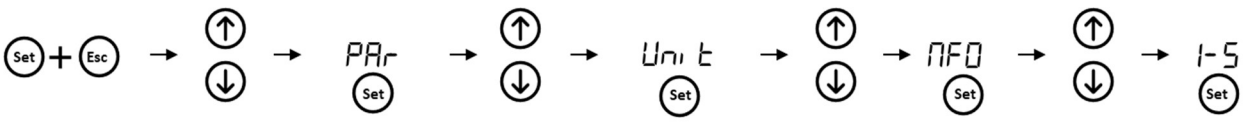
Note: In selected models of units, voltage is present on the above-mentioned terminals! If the connection described above is open, the condensing unit will not start!

5.4. Multifunctional digital output

The units are equipped with an optional digital output in the form of a potential-free contact. As a standard, the output is connected to terminals **-Xc: 3-4**.

The default output function is "2: Ready to Run or Running" which means that the compressor is running or the unit is ready to start the compressor (the compressor will definitely start if the pressure rises). This function was created to protect the unit against non-evaporated refrigerant on the suction side of the compressor - this signal is used to allow the expansion valves of the evaporators to open.

Possible output functions set via menu „Unit”:



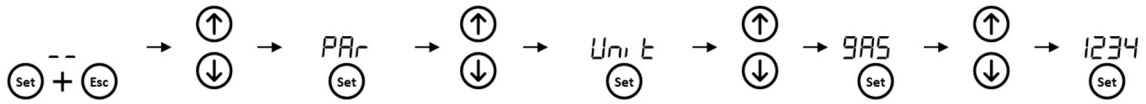
Possible digital output settings:

0.	**OFF**	(output forced to open state)
1.	**ON**	(output forced to closed state)
2.	**Ready to Run or Running**	(closed when the compressor is running, or the unit is ready to start the compressor)
3.	**No Error**	(closed when the unit reports no failures)
4.	**No Warning/Error**	(closed when the unit reports no warnings or failures)
5.	**Cp Running**	(closed, when at least one compressor is running)
6.	**Oil Return Active**	(closed when oil return mode has been activated)

6. Quick start procedure

The procedure should be performed after completing the installation of the device, in particular: verification of the completeness of the installation, charging the refrigerant, electrical connection with verification of the power supply parameters (phase control relay - if present).

A. Make sure the device is **turned off**.
B. Check that all shutoff valves are **open**.
C. **Turn on** the power of the unit.
D. Wait for the controller to turn on. The controller will be ready for operation when the word FrEE disappears from the display.
E. If a refrigerant other than **449A** (default) is used, its type should be changed using the parameter 9A5 in accordance with the table and instruction below:



No.	No. par. 9A5	Description
1.	0	404A
2.	1	134A
5.	4	507A
6.	5	448A
7.	6	449A
8.	7	513A

Table 4: Factor types

F. After selecting the unit type, the device initialization procedure will start Information LOAd and the type of the selected refrigerant will appear on the controller's screen. After completing the procedure, the controller will display the default information (default display).
G. **Set** the required **evaporating temperature** (**-10.0 °C** by default) using the parameter tES in accordance with below instruction:

H. **Set** the required **compressor stop temperature** - "**pumpdown**" (**-20.0 ° C** by by default) with the parameter tEPd in accordance with below instruction **(the default value is correct for most applications)**:

I. Activate the external enable signal if connected.
J. **Turn on the device** by pressing and holding the F1 (↑) button for 3 seconds in default menu.

K. Confirmation of starting the device will be the appearance of the symbol on the display:

NOTE! After all the start conditions are met, the **device will start automatically**.

7. Controller menu

7.1. Menu structure

There are three types of menu in the controller:

- Menu **BIOS** – contains the hardware settings of the controller.
- Menu **Set** – contains the most important information on the operation of the device. This information is always available to the user.
- Menu **Prog** – contains a login window and provides access to advanced settings.

Entering each of the menus is signalled by an appropriate symbol on a display (15) described in the table no. 1. When the symbol is inactive, the **default display** is shown.

The block diagram below shows the menu layout available in the Eliwell Free Smart controller:

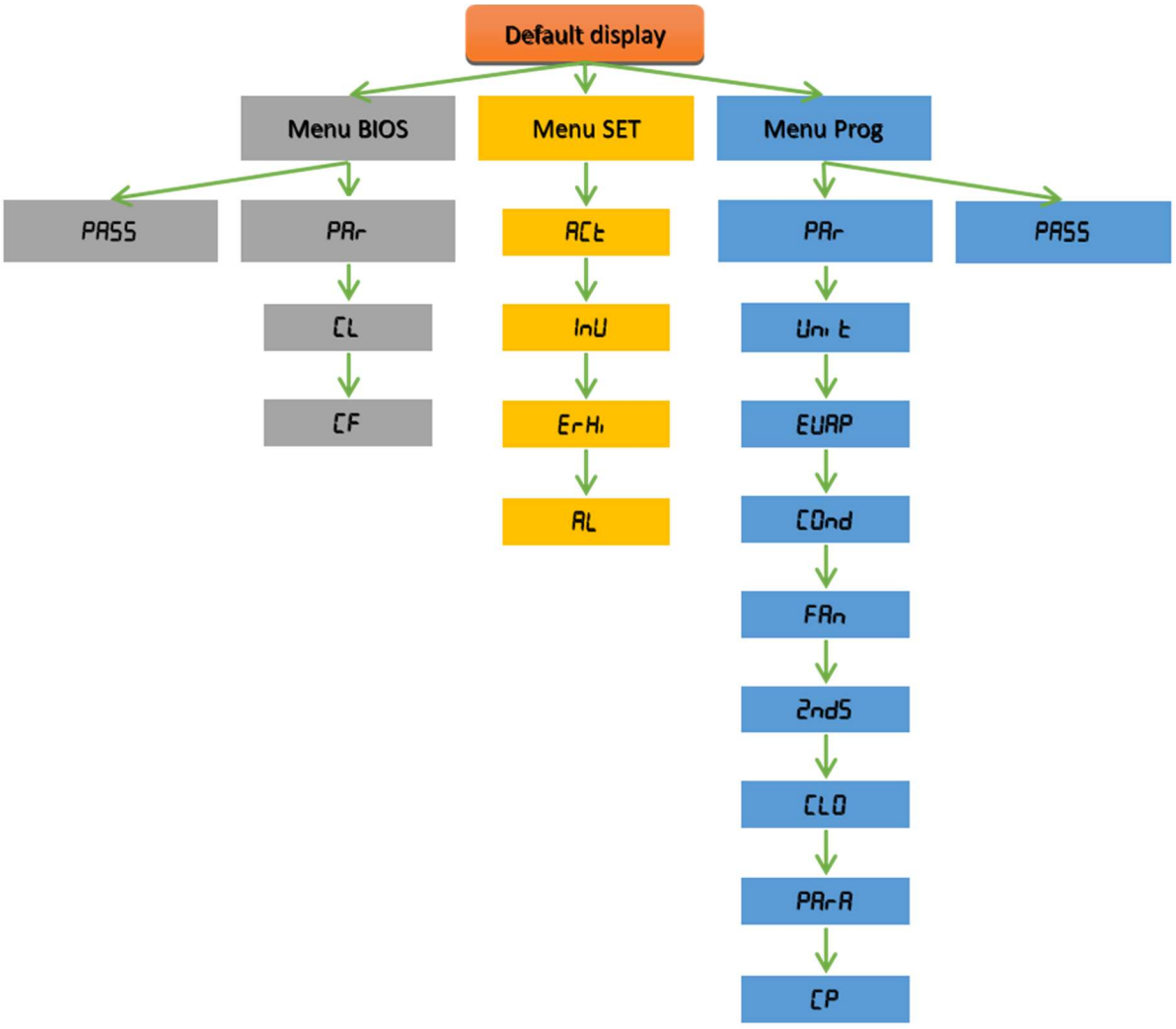


Figure 5: Menu structure

7.2. User login

The parameters in the menu are available from three access levels:

- **Always visible** – parameters are always available, do not require logging in,
- **Level 1** – parameters available after logging in with the installer password (11),
- **Level 2** – parameters available after logging in with the manufacturer's password.

Logging in to the desired level allows you to unlock the visibility of a given parameter in the menu. If the parameter is not visible, the user is not logged in. After a few minutes, the controller will automatically return to the main screen and log the user out.

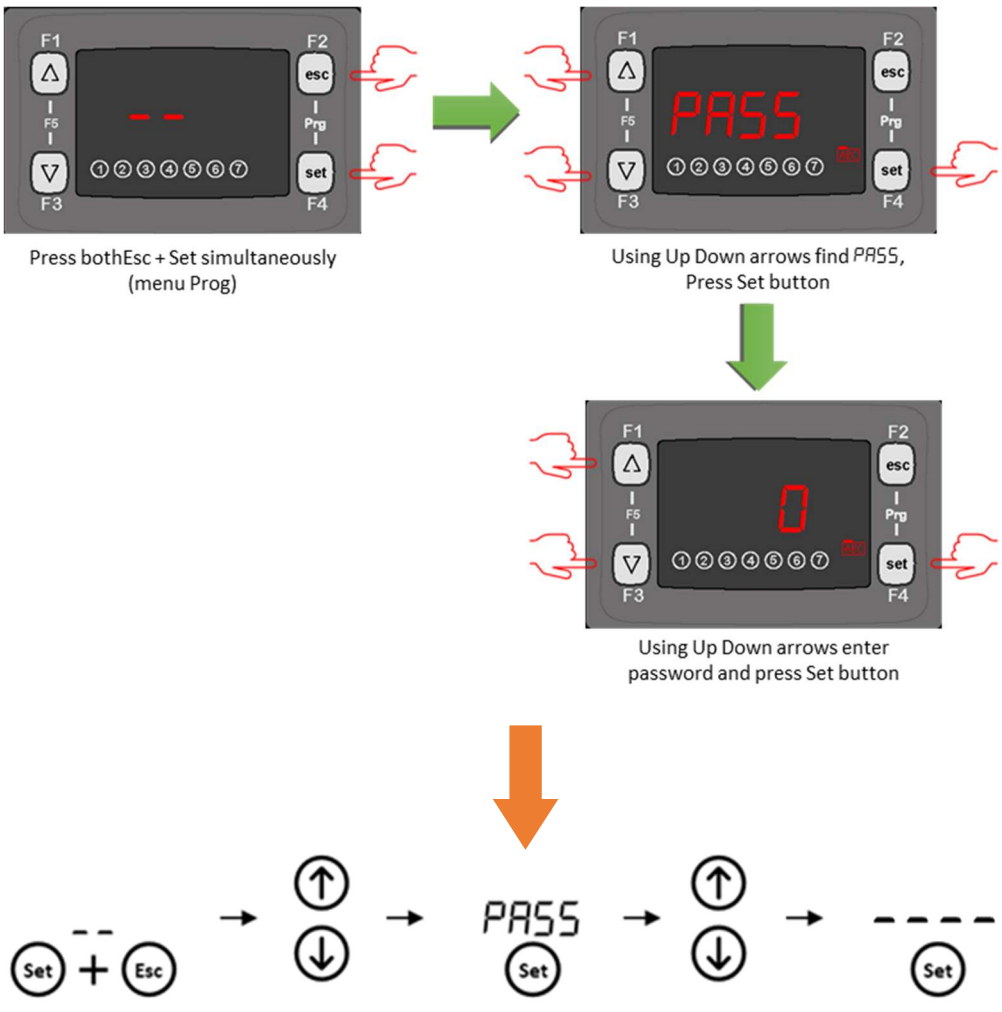


Figure 6: The order of operations in the login process

8. Current operating parameters

The current operating parameters of the device can be found in the Set menu. They show the current measurement values from sensors and the inverter. The menu structure is presented in the figure no. 5.

8.1. Menu ACt (Act) – device operating parameters

Menu ACt shows the current measurement values of the sensors and their setpoint values for the device operation.

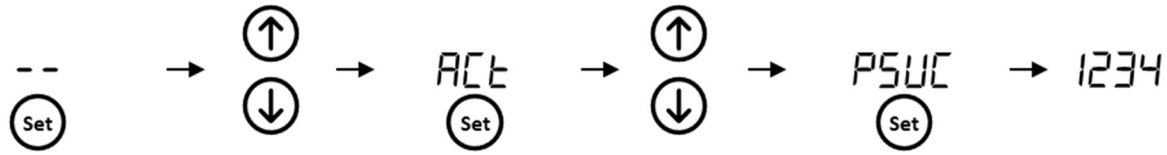


Figure 7: An example of reading the current parameter from a suction pressure sensor

The table below shows the menu parameters ACt available for reading:

No.	Label	Description	Unit	Scale
1.	PSUC	Current suction pressure	bar	0,01
2.	PSSt	Suction pressure setpoint	bar	0,01
3.	Pd, S	Discharge pressure	bar	0,01
4.	PdSt	Discharge pressure setpoint	bar	0,01
5.	td, S	Discharge temperature	°C	0,1
6.	tAMb	Ambient temperature	°C	0,1
7.	tCC	Compressor carter temperature	°C	0,1
8.	tEUA	Evaporation temperature	°C	0,1
9.	tES	Evaporation temperature setpoint	°C	0,1
10.	tCnd	Current condensing temperature	°C	0,1
11.	tCSt	Condensing temperature setpoint	°C	0,1
12.	PSLL	Lower suction pressure limit (compressor stop)	bar	0,01
13.	CCSH	Compressor overheat (tCC - tEUP)	°C	0,1
14.	CACt	Compressor speed	%	0,1
15.	FACt	Fan speed	%	0,1

Table 4: List of the menu parameters ACt

8.2. Menu InU (Inv) – inverter operating parameters

The menu InU shows the current values of the inverter operating parameters.

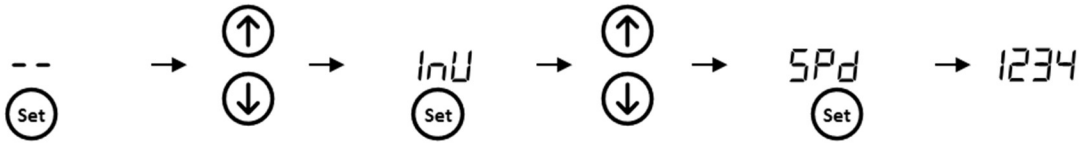


Figure 8: An example of reading the current operating parameters of the inverter

The table below shows the menu InU parameters available for reading:

No.	Label	Description	Unit	Scale
1.	SPd	Current compressor speed	RPS	0,1
2.	CUrr	Current inverter current	A	0,1
3.	POUE	Current inverter power	kW	0,01
4.	UOLt	Current inverter voltage	V	1
5.	rt_H	Total inverter working time – in hours	H	1
6.	dC_U	Inverter DC bus voltage	V	1
7.	tdr1	Inverter temperature - power side	°C	0,1
8.	tPCb	Inverter temperature - electronics	°C	0,1
9.	1_St	Inverter status	N/A	N/A
10.	1_Er	Inverter error number	N/A	N/A

Table 5: List of the menu parameters InU

9. Changing the unit operating parameters settings

During operation, it may be necessary to change the adjustment parameters of the device. The parameters responsible for this can be found in the Prog menu. The menu structure is presented in the figure no. 5.

9.1. Menu Unit (Unit) – main settings

Menu Unit contains the main parameters related to the operation of the device. The most important is the parameter OnOF, which decides whether the unit is turned on (change also in the default view through the up-ON, down-OFF arrows held for 3 seconds).

The following table shows the menu Unit parameters:

No.	Label	Access level	Description	Setting range
1.	OnOF	Always visible	Unit operation status (OFF - turned off, ON - turned on)	OFF/ON
2.	gAS	Level 1	Refrigerant type: 0 - 404A 1 - 134A 4 - 507A 5 - 448A 6 - 449A 7 - 513A	0-7
3.	nF0	Always visible	Multi-function digital output function selection: 0 - OFF (output forced to open state) 1 - ON (output forced to closed state) 2 - Ready to Run or Running (closed when the cp is running or ready to start the cp) 3 - No Error (closed when the unit does not report any errors) 4 - No Warning/Error (closed when the unit reports no warnings or errors) 5 - Cp Running (closed when at least one compressor is working) 6 - Oil Return Active (closed when oil return mode was activated)	0-6
4.	nF1	Always visible	Multi-function digital output selection (2nd evaporation setpoint): 0 – Off (compressor readiness -Cp2 on tandem units), 1 – Input closed: 2nd setpoint active, 2 – Input opened: 2nd setpoint is inactive.	1-2
5.	dEF1	Level 1	Setting the default values of the inverter operation: (OFF - no changes, ON - forcing default values)	OFF/ON
6.	dEFL	Level 1	Setting the default values of the EEPROM parameters: (OFF - no changes, ON - forcing default values)	OFF/ON
7.	n_S	Level 2	Type of operation of the controller's RS485 port selection (0 – Slave, 1 – Master)	0-1
8.	PuEr	Always visible	PLC software version	1-255
9.	n1nS	Level 1	Installer password setting (default 11)	1-255
10.	nMAn	Level 2	Setting a manufacturer password	1-255

Table 6: List of the menu parameters Unit

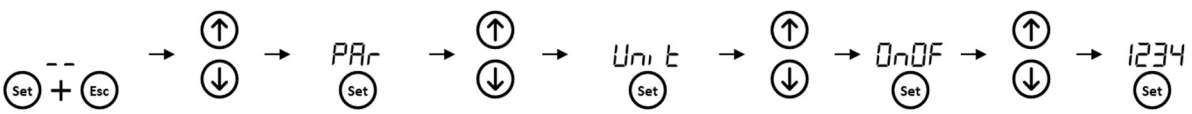


Figure 9: An example of the OnOF parameter change in the menu Unit

9.2. Menu EVAP (Evap) – evaporation settings

Menu EVAP contains parameters for the evaporation settings. The most important parameter is tES - it defines the evaporating temperature (appropriate suction pressure depending on the refrigerant), which is required for the correct operation of the evaporators (the capacity of the compressors will be regulated to keep this pressure at the given level). Default evaporating temperature setpoint for MHP units is -10°C and -27°C for MP.

The following table shows the menu EVAP parameters:

No.	Label	Access level	Description	Unit	Scale
1.	tES	Always visible	Evaporation temperature setpoint (for compressors)	°C	0,1
2.	tEPd	Always visible	Evaporation temperature - compressor stop limit	°C	0,1
3.	Sr_P	Always visible	Proportional band (P) of the suction pressure regulator	bar	0,01
4.	Sr_I	Always visible	I factor of the suction pressure regulator (integral time)	s	1
5.	ESt,	Level 1	Evaporation temperature maximum limit delay	s	1
6.	tEH3	Level 2	Maximum evaporation temperature	°C	0,1
7.	tEH2	Level 2	Warning evaporation temperature	°C	0,1
8.	FSLt	Level 2	Fast slowdown duration time	s	0,1
9.	FSLU	Level 2	Fast slowdown delay time	s	1
10.	SrSU	Level 1	Acceleration ramp of the suction pressure regulator	%/s	0,1
11.	SrSd	Level 1	Deceleration ramp of the suction pressure regulator	%/s	0,1
12.	Srdb	Level 1	Dead band of the suction pressure regulator	bar	0,01
13.	SrMA	Level 1	Maximum value of the suction pressure regulator output	%	0,1
14.	SUdb	Level 1	Dead band of low limit of suction pressure regulation	bar	0,01
15.	SrdU	Level 1	Pressure difference to force an increase in capacity	bar	0,01
16.	Srdd	Level 1	Pressure difference to force a reduction in capacity	bar	0,01
17.	PSbO	Level 1	Permission to work with a defective pressure sensor	OFF/ON	N/A

Table 7: List of the menu parameters EVAP

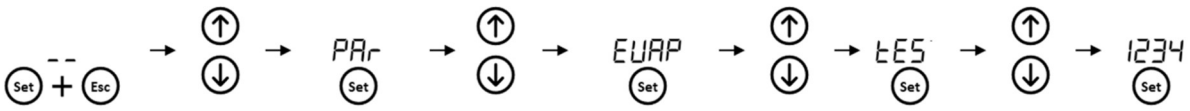


Figure 9: An example of changing the tES parameter in menu Evap

9.3. Menu COnd (Cond) – condensing settings

Menu COnd contains the parameters for the condensing settings. The parameters influence the operation of the fan, the speed, which is regulated based on the discharge pressure (liquid). The most important parameter is tCS - it defines the condensing temperature setpoint (appropriate liquid pressure depending on the refrigerant), at which the fan runs at maximum speed.

The following table shows the COnd menu parameters:

No.	Label	Access level	Description	Unit	Scale
1.	tCS	Always visible	Condensing temperature setpoint (for the fan, default ~ 45 ° C)	°C	0,1
2.	ECO	Always visible	Floating condensing temperature (ECO mode) - activation (enabled by default)	OFF/ON	N/A
3.	ECOt	Always visible	ECO mode - Minimum condensing temperature setpoint	°C	0,1
4.	ECO1	Always visible	ECO mode - ambient temperature at which the condensing setpoint starts to be reduced	°C	0,1
5.	ECO2	Always visible	ECO mode – ambient temperature where the condensing temperature setpoint is reduced	°C	0,1

No.	Label	Access level	Description	Unit	Scale
6.	dr_P	Always visible	Proportional band of the condensing controller (default 4.0 bar)	bar	0,1
7.	drdP	Always visible	Pressure delta (discharge - liquid line) of the condensing regulator (default 0.5 bar)	bar	0,01
8.	drdb	Level 1	Dead band of the condensing controller	%	0,1
9.	dr5U	Level 1	Acceleration ramp of the condensing controller	%/s	0,1
10.	dr5d	Level 1	Deceleration ramp of the condensing controller	%/s	0,1
11.	d5tA	Level 1	Differential discharge pressure to start the fan	bar	0,1
12.	d5tP	Level 1	Differential discharge pressure to stop the fan	bar	0,1
13.	tHHH	Level 2	Discharge temperature - device stopping limit	°C	0,1
14.	tdL	Level 2	Discharge temperature - injection valve opening limit	°C	0,1
15.	tdLL	Level 2	Discharge temperature - injection valve closing limit	°C	0,1
16.	PdbO	Always visible	Permission to work with a broken discharge pressure sensor	OFF/ON	N/A

Table 8: List of the menu parameters Cond

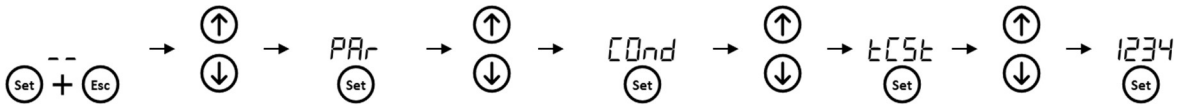


Figure 10: An example of changing the tcst parameter in the menu Cond

9.3.1. ECO mode – floating condensation setpoint

ECO mode provides a reduction of the condensing temperature setpoint if the ambient temperature is lower. This ensures an increase in the efficiency of the unit, while maintaining the parameters of the average loudness of the unit. It allows the tCS condensing temperature setpoint to be reduced linearly in proportion to the ECOt minimum condensing temperature setpoint when the ambient temperature is below 20°C (start setback) ECO1 to 5°C ECO2 (end setback). The list of parameters is in table 8 above.

9.4. Menu FAn (Fan) – fan parameter settings

Menu FAn contains parameters related to fan settings.

The following table shows the menu FAn parameters:

No.	Label	Access level	Description	Unit	Scale
1.	F_Li	Always visible	Fan Silent Mode – activation (enabled by default)	OFF/ON	N/A
2.	F_LS	Always visible	Fan speed in Silent mode	%	0,1
3.	F_SS	Always visible	Fan speed in safe mode (operation without discharge pressure sensor)	%	0,1
4.	F_MA	Level 1	Maximum fan speed	%	0,1
5.	F_Mi	Level 1	Minimum fan speed	%	0,1
6.	FSnC	Level 1	Manual fan mode - on / off	OFF/ON	N/A
7.	FSOn	Level 1	Fan speed in manual mode	%	0,1
8.	, FAn	Level 2	Fan type	0-1	N/A

Table 9: List of the menu parameters FAn

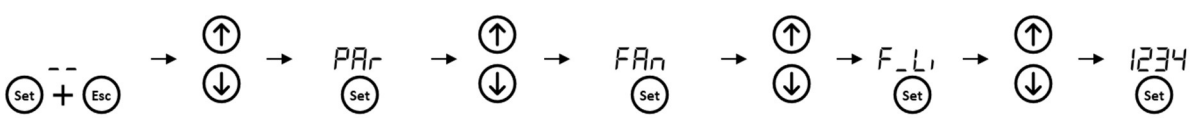


Figure 11: An example of changing the F_li in the menu Fan

9.5. Menu 2nd5 (2ndS) – evaporating temperature 2 (suction pressure 2 – 2nd setpoint)

The unit has the function of a second evaporating temperature setpoint (suction pressure). It is possible to activate the setting with:

- Time of day - Timer (change at a specified time to a given time), RTC setting in section 9.6.,
- Ambient temperature (change when the temperature drops below a certain value),
- Digital inputs DI2 (single compressor units only).

Menu 2nd5 contains the parameters for setting the second suction pressure threshold.

The following table shows the 2nd5 menu parameters:

No.	Label	Access level	Description	Unit	Scale
1.	tES2	Always visible	Evaporation temperature setpoint 2	°C	0,1
2.	2SAC	Always visible	Activate evaporation temperature mode 2: 0 - Disabled 1 - Time of day (Timer) 2 - Ambient temperature 3 - Digital input (DI2)	N/A	0-3
3.	tASL	Always visible	Activation ambient temperature (activation below this setting)	°C	0,1
4.	2S0H	Always visible	Time of day of activation - hour	h	1
5.	2S0M	Always visible	Time of day of activation - minute	min.	1
6.	2SdH	Always visible	Duration - hours	h	1
7.	2SdM	Always visible	Duration - minutes	min.	1

Table 10: List of the menu parameters2nd5

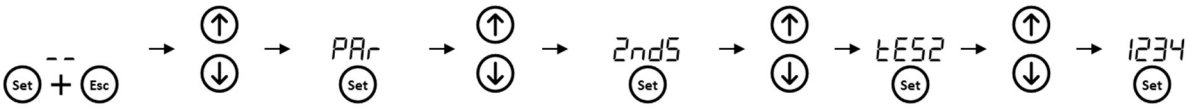


Figure 12: An example of changing the tes2 parameter in the menu 2ndS

9.6. Menu CLO (Clo) – real time settings (RTC)

Menu CLO contains parameters related to the controller time settings.

The following table shows the menu CLO parameters:

No.	Label	Access level	Description	Unit	Scale
1.	CAH	Always visible	Current controller time	h	1
2.	CAM	Always visible	Current controller time	min.	1
3.	CAS	Always visible	Current controller time	sek.	1
4.	CSH	Always visible	Controller time to update - hours	h	1
5.	CSM	Always visible	Controller time to update - minutes	min.	1
6.	CUPd	Always visible	System time of the controller update	OFF/ON	N/A

Table 11: List of the menu parameters CLO

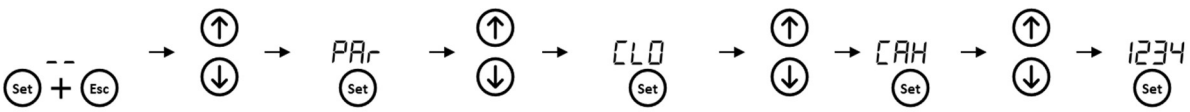


Figure 13: An example of changing the CAH in the menu CLO

9.7. Menu CP (Cp) – compressor settings

Menu CP contains parameters for changing the compressor operating parameter settings.

The following table shows the menu CP parameters:

No.	Label	Access level	Description	Unit	Scale
1.	CUtF	Always visible	Enable the option of skipping the set frequency (enabled by default)	OFF/ON	N/A
2.	FUAL	Always visible	Skip Frequency - Center	RPS	0,1
3.	Fd, F	Always visible	Skip Frequency - Dead Band (+/- Center)	RPS	0,1
4.	tStb	Always visible	Time until the compressor stops once the stop conditions are met	s	1
5.	C2t I	Level 1	Time to turn on the second compressor (-Cp2) after meeting start conditions	s	1
6.	tbtS	Level 2	Minimum time between compressor starts (between starts time)	s	1
7.	tCCd	Level 1	Ambient and compressor temperature difference	K	0,1
8.	CCnA	Level 1	Compressor's highest temperature limit	°C	0,1
9.	CCHH	Level 1	Compressor temperature limit high	°C	0,1
10.	tCCb	Level 2	Compressor dead band	°C	0,1

Table 12: List of the menu parameters CP

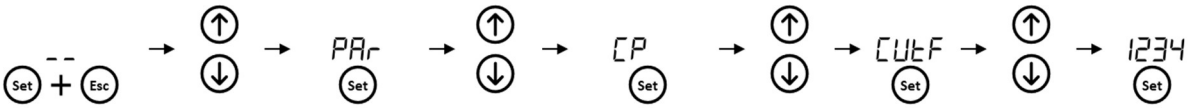


Figure 14: Access to the menu parameters CP

9.8. Menu PAr-A (Para) – access to all parameters (advanced)

Menu PAr-A contains parameters that allow you to access and change the settings of all controller parameters - **only for the needs of advanced service**.

The following table shows the menu PAr-A parameters:

No.	Label	Access level	Description
1.	EnUn	Level 1	EEPROM parameter offset selection
2.	EUAL	Level 1	View and change the value of the EEPROM parameter
3.	SnUn	Level 1	Offset selection of the Status parameter
4.	SUAL	Level 1	View and change the value of the Status parameter

Table 13: List of the menu parameters PAr-A

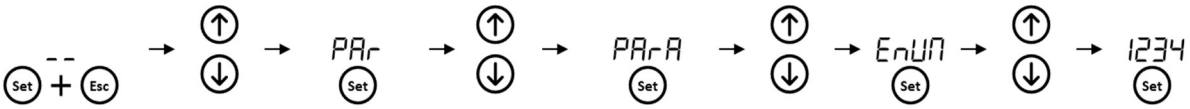


Figure 15: An example of changing the EnUn parameter in the menu Para

9.9. Menu **BIOS** (Bios) – types and scaling settings of analog sensors

In the Eliwell Free Smart controller, it is possible to set the types of sensors connected to it as well as to set the operating ranges - scaling.

- Press the F1 + F3 buttons simultaneously to enter the BIOS menu. FrEE will appear on the screen.
- Then press the F2 + F4 buttons simultaneously to enter the parameter change menu. PAr will appear on the screen.
- Using the arrows, find the PASS parameter and confirm with the Set button.
- Enter the installer password and confirm with the Set button.
- Using the arrows, find the PAr parameter and confirm with the Set button.
- Using the arrows, find the CL parameter group and confirm with the Set button.
- Using the arrows, find the required parameter and confirm with the Set button.
- Change the parameter according to needs and confirm with the Set button.

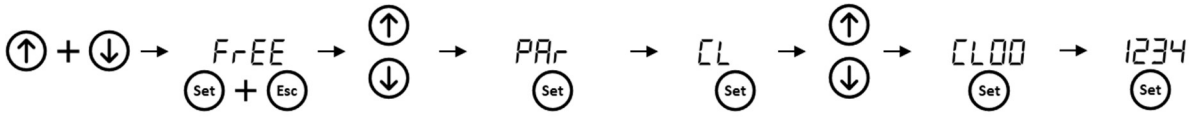


Figure 16: An example of changing the CL00 parameter in the menu Bios

No.	Label	Setting	Description
1.	CL00	8 = PT1000	AI1: Type of temperature sensor: 2 = NTC / 8 = PT1000
2.	CL01	8 = PT1000	AI2: Type of temperature sensor: 2 = NTC / 8 = PT1000
3.	CL02	3 = 4-20mA	AI3: Type of pressure sensor: 3 = 4-20mA / 4 = 0-10V / 5 = 0-5V / 6 = 0-1V / 7 = 0-20mA
4.	CL03	3 = 4-20mA	AI4: Type of pressure sensor: 3 = 4-20mA / 4 = 0-10V / 5 = 0-5V / 6 = 0-1V / 7 = 0-20mA
5.	CL04	8 = PT1000	AI5: Type of temperature sensor: 2 = NTC / 8 = PT1000
6.	CL 10	1820	High scale range of the AI3 suction pressure sensor (1820 = 18.2 bar)
7.	CL 11	0	Low scale range of the AI3 suction pressure sensor (0 = 0 bar)
8.	CL 12	3000	High scale range of the AI4 discharge pressure sensor (3000 = 30.0 bar)
9.	CL 13	0	Low scale range of the AI4 discharge pressure sensor (0 = 0 bar)

Table 14: List of parameters for the types and range of analog sensors

10. Alarms, troubleshooting

In case of an error, this situation will be appropriately signaled with an error code that will appear on the display in the default view. The error number is also saved in the error history (last 4 occurrences).

10.1. List of active warnings and errors - AL (Al)

When an alarm (warning) or error occurs, it is possible to check the list of current errors and alarms in the **Set** menu under AL position. The alarm list (AL) appears dynamically when any alarm occurs, while inside only the active alarm or error is visible.

Figure 17: Alarm access in the menu AL

No.	Label	Description
1.	Err	Active error (unit stop)
2.	UArn	Active warning
3.	PS_b	Suction pressure sensor error (-Psuc)
4.	PS H	High limit of the suction pressure reached
5.	PS L	Low limit of the suction pressure reached
6.	tE H	High limit of the evaporation temperature reached
7.	tE L	Low limit of the evaporation temperature reached
8.	Pd_b	Discharge pressure sensor error (-Pdis)
9.	Pd H	High limit of discharge pressure reached
10.	Pd L	Low limit of discharge pressure reached
11.	tcoH	High condensing temperature limit reached
12.	tcoL	Low condensing temperature limit reached
13.	td_b	Discharge temperature sensor error (-Tdis)
14.	td H	High limit of the discharge temperature reached
15.	tA_b	Ambient temperature sensor error (-Tamb)
16.	tA H	High limit of the ambient temperature reached
17.	tA L	Low limit of the ambient temperature reached
18.	tc5b	Compressor carter temperature sensor error (-Tcc)
19.	tccH	High limit of the carter temperature reached
20.	tccL	Low limit of the carter temperature reached
21.	ıErr	Active error - inverter
22.	ıUAr	Active warning - inverter
23.	cP2E	Compressor 2 error
24.	UL_P	Unit stopped by too frequent STO error
25.	ULPd	Unit stopped by too many the highest limits reached
26.	ULPS	Unit locked by inverter
27.	UcP2	Unit blocked due to too many compressor 2 errors
28.	ULPd	Unit stopped due to too frequent high discharge temperature
29.	MbrE	Modbus reading error
30.	Mb'tE	Modbus sending error

Table 15: List of the menu alarms AL

In case of reaching high and low limits, the error number (to view the value, enter the given warning with the Set button) means the level of the limit reached:

- 3 – 9 : level 1 (warning),
- 10-99 : level 2 (serious warning),
- 100 – 254 : level 3 (error - unit stopped).

In case of a sensor error, the value of the parameter in the table above indicates the status of the chiller relative to the status of the sensor:

- 10 – off,
- 99 – damaged but does not lock the operation of the unit,
- 254 – damaged (unit stopped).

10.2. Error history – ErH1 (ErHi)

If it is necessary to check the history of errors or temporary error or power failure - it is possible to read the last error value that was saved in the controller memory. The controller remembers the last four errors, as well as the operating parameters of the unit at the time of its occurrence.

The history can be found in the menu **ErH1**.

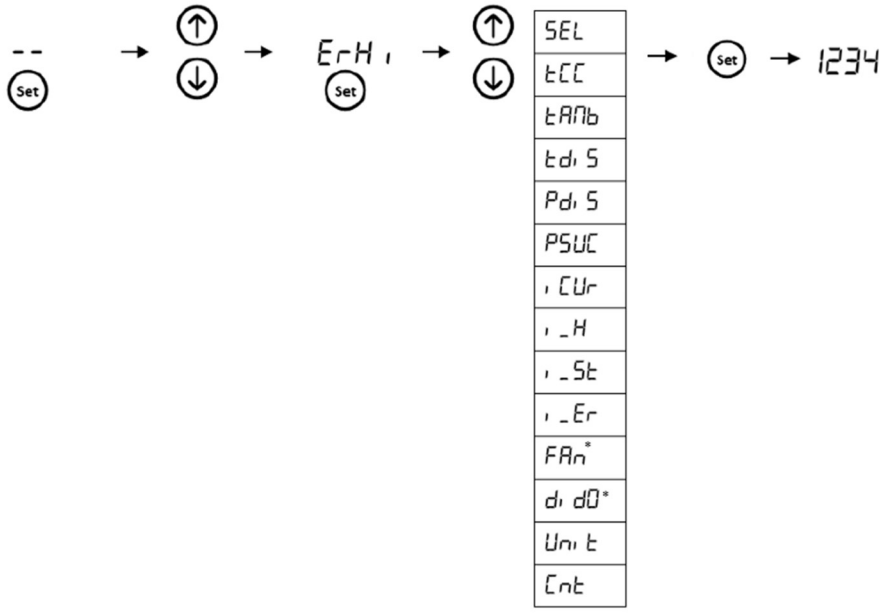


Figure 18: Error history menu access ErHi

To check the historical values, first select index from 1 to 4 – parameter **SEL**.

No.	Label	Access level	Description
1.	SEL	Always visible	Fault index to be displayed 1-4 (4 = oldest fault)
2.	Cnt	Always visible	Number of the last alarm (counted from the unit leaving production)
3.	Un1 t	Always visible	Device error (**ERR** - table no. 17)
4.	FAn	Always visible	Fan speed during error*
5.	1 _Er	Always visible	Inverter error (1 nU - table no. 18)
6.	1 _St	Always visible	Inverter status when the error occurred
7.	1 _H	Always visible	Inverter working time when the error occurred
8.	1 CUr	Always visible	Inverter current when the error occurred
9.	PSUC	Always visible	Suction pressure value when the error occurred
10.	Pd1 S	Always visible	Discharge pressure value when the error occurred
11.	td1 S	Always visible	Discharge temperature value when the error occurred
12.	tAMb	Always visible	Ambient temperature value when the error occurred
13.	tCC	Always visible	Compressor carter temperature value while the error occurred

Table 16: List of available errors in the menu ErHi

* displayed parameters may differ depending on the software version

10.3. Unit errors – Err (Err)

Errors preceded by the information Err on the display concern the operation of the device (the error number is also saved in the error history).

No.	Error number	Alarm name	Possible reason	Solution
1.	E00	Suction pressure sensor error (Psuc)	Pressure transducer disconnected	Check the sensor cable plug. Check the correct connection of the sensor.
			Defective pressure transducer	Replace of the suction pressure sensor.
2.	E02	Suction pressure too low (Psuc)	No refrigerant in the system	Check the amount of refrigerant in the system. Verify if the chiller shutoff valves are open.
			Incorrect system settings (pumpdown too deep with low system volume)	Increase the pumpdown setpoint (tEPd) to 2 °C higher and test the system again.
3.	E04	Evaporation temperature too high (Tevap)	Too much refrigerant in the system	Check the amount of refrigerant in the system. Check the settings (evaporation setting tES).
			Too much cold reception	Oversized evaporator (too many evaporators). Reduce cold pick-up. The cold room is just being cooled down. Clear the error and verify the operation of the chiller after reaching lower temperatures. Overheat control at the outlet of the evaporators.
4.	E05	Evaporation temperature too low (Tevap)	Incorrect system settings (pumpdown too deep with low system volume)	Increase the pumpdown setting (tEPd) to 2 °C higher and test the system again.
5.	E06	Defective discharge pressure sensor (Pdis)	Pressure transducer disconnected	Check the sensor cable plug. Check the correct connection of the sensor.
			Defective discharge pressure transducer	Replace the discharge sensor.
6.	E07	Discharge pressure too high (Pdis)		Check the amount of refrigerant in the system. Check the settings.
7.	E08	Discharge pressure too low (Pdis)		Check the amount of refrigerant in the system. Check the settings.
8.	E09	Condensing temperature too high (Tcond)		Check the amount of refrigerant in the system. Check the settings. Check the operation of the fan. Check the patency and cleanliness of the condenser.
9.	E10	Condensing temperature too low (Tcond)		Check the amount of refrigerant in the system. Check the settings.
10.	E12	Defective input temperature sensor (Tdis)		Check the correct connection of the sensor. Replace the sensor.
11.	E13	Input temperature too high (Tdis)		Check the amount of refrigerant in the system. Check the settings.
12.	E00	Defective ambient temperature sensor (Tamb)		Check the correct connection of the sensor. Replace the sensor.
13.	E01	Ambient temperature too high (Tamb)		Check the condition of the temperature sensor and its location.
14.	E02	Ambient temperature too low (Tamb)		Check the condition of the temperature sensor and its location

No.	Error number	Alarm name	Possible reason	Solution
15.	203	Damaged compressor base temperature sensor(Tcc)		Check the condition of the temperature sensor and its location
16.	204	Compressor base temperature too high (Tcc / Csh)		Stop the chiller. Check the cause of compressor overheating.
17.	205	Compressor base temperature too low (-Tcc/ Csh)	Compressor watering. Incorrect location of the compressor base sensor.	Wait for the compressor to warm up. Check the operation of the crankcase heater.
18.	300	Main inverter error - **Check the error number in table 18 (section 10.4.)**		
19.	301	STO (HP/LP pressure switch open during operation)		Increase / decrease pressure in the refrigeration system. Cool down the compressor, see point 4 and 8 of the table. Check the electrical connection of the pressure switches. Check the fuse.
20.	302	PTC (compressor housing temperature thermostat open)		Stop the unit. Cool down the compressor. Check the filling level of the system. Check the evaporator overheating settings. Check the oil level.
21.	303	Inverter overload		Pump down the refrigerant from the system on the suction side of the compressor. Try to restart with refrigerant on the suction side.
22.	304	Communication error		Check the communication cable.
23.	305	The mains voltage fluctuates too much or one phase of the inverter is missing	Incorrect mains voltage	Check the quality of the mains voltage.
24.	307	Unspecified inverter error (not ready or communication lost)	Cord damage. Loose plug.	Check the connections to the inverter.
25.	400	Device blocked by too frequent inverter errors		Check the cause of the error and follow the instructions above.
26.	401	Device blocked by frequent high sensor limits		Check the cause of the error and follow the instructions above.
27.	402	Device blocked by too frequent STO errors		Check the cause of the error and follow the instructions above.
28.	403	Device blocked by too frequent high discharge temperature		Check the cause of the error and follow the instructions above.
29.	404	Unit blocked by second compressor errors		Check the cause of the error and follow the instructions above. Check the condition of the oil, the setting of the motor switch and the resistance of the motor windings.

Table 17: List of error codes in the default view of the display

10.4. Inverter errors – ı nU (inV)

Errors preceded on the display (default view) by the information ı nU and are related to the operation of the inverter:

No.	Error number	Alarm name	Possible reason	Solution
1.	3	Inverter current overload	Compressor blocked	Pumpdown refrigerant from the system on the suction side of the compressor. Attempt to restart with refrigerant on the suction side.
2.	4	Engine overheating	Work above the maximum current for a long time	Check the refrigeration system.
3.	5	Inverter power unit error	Inverter failure	Diagnosis / replacement of the inverter.
4.	6	Inverter DC bus voltage too high	Incorrect inverter parameter settings for the given compressor	Check the correct wiring of the inverter and the compressor. Check the connection of the inverter plugs.
5.	7	Inverter DC bus voltage too low	Incorrect mains voltage	Check the quality of the mains voltage.
6.	13	DC bus ripple too high - phase-to-phase power instability	Phase-to-phase power instability	Check the quality of the mains voltage.
7.	14	One of the supply phases is missing	Damage to the condensing unit power circuit	Check the quality of the mains voltage. Check the condensing unit power connection. Check the protection and power cables of the inverter.
8.	15	Instantaneous over current on drive output	Hardware overcurrent on drive output	Check the protection and power cables of the inverter.
9.	21	Inverter PTC error (compressor thermostat)	Compressor overheating	Stop the unit. Cool down the compressor. Check the filling level of the system. Check the evaporator overheating settings. Check the oil level.
10.	22	Inverter cooling fan error	Fan failure	Diagnosis / replacement of the inverter.
11.	29	STO error (inverter safety loop, HP/LP)	Activation of the low/high pressure switch or compressor housing thermostat	Increase / decrease the pressure in the refrigeration system. Cool down the compressor. Check the correct operation of the fan. Check the electrical pressure switches.
12.	49	Phase loss at inverter output	Damage to the compressor or the compressor supply cable	Check the compressor connection. Wind resistance measurement.
13.	50	Modbus communication error	Communication error / inverter error - incorrect inverter settings	Check the correct wiring of the inverter and the compressor. Check the connection of the inverter plugs. Change the type of refrigerant to any other than required and return to the required one (point E of the quick start guide).
14.	90	Other inverter communication error	Communication error / inverter error - incorrect inverter settings	

Table 18: Description of the inverter error codes

11. Communication

The device can be equipped with a remote communication module - access to the cloud as well as local communication with other devices within the cooling system. The Eliwell SMALAN4850400 module (**installed in RMS versions of the units**) is responsible for communication with the Eliwell Free Smart controller, which enables communication using the Modbus RTU communication protocol (RS485 electrical standard).

11.1. Modbus communication parameters

To enable communication with the controller, the device must be connected to the MODBUS network in accordance with the attached wiring diagram, keeping the principles of the RS485 serial communication standard.

Default settings of MODBUS communication parameters:

- Address: 1,
- Communication speed: 19200, Number of bits: 8, No parity bit, Number of stop bits: 1 (19.2bps 8N1)

Communication parameters can be changed to adapt the device to the existing network. To do this, change the parameters in the menu BIOS:

- Press the F1 + F3 buttons simultaneously to enter the menu BIOS. FrEE will appear on the screen.
- Then press the F2 + F4 buttons simultaneously to enter the parameter change menu. PAr will appear on the screen.
- Using the arrows, find the PASS parameter and confirm with the Set button.
- Enter the installer password and confirm with the Set button.
- Using the arrows, find the PAr parameter and confirm with the Set button.
- Using the arrows, find the CF parameter group and confirm with the Set button.
- Using the arrows, find the required parameter and confirm with the Set button.
- Change the parameter as needed and confirm with the Set button.

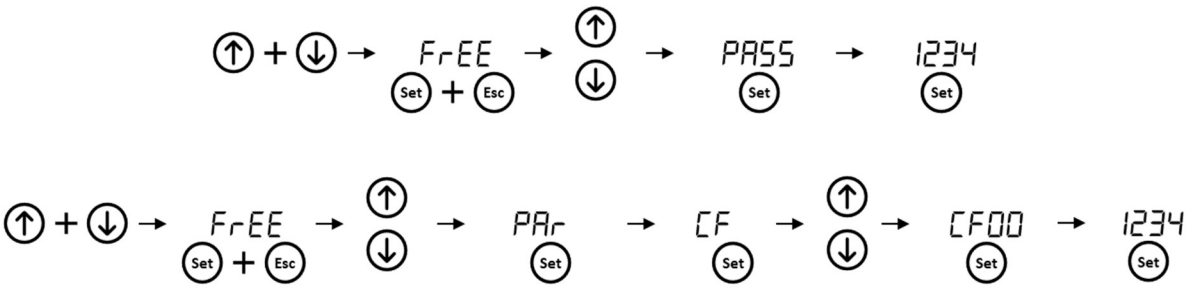


Figure 19: The procedure for changing the menu BIOS parameters

The list of parameters is shown in the table below:

No.	Label	Description	Default
1.	CF00	Communication method: 2 = Modbus, 3 = LAN (DISPLAY)	2 (Modbus)
2.	CF35	Modbus address of the controller: 1 - 127	1
3.	CF36	Communication speed: 3 = 9600 / 4 = 19200 [bps]	4 (19200)
4.	CF37	Parity bit: 1 = Even, 2 = None, 3 = Odd	2 (None)

Table 19: List of Modbus RTU parameters

11.2. List of direct addresses and Modbus memory parameters of the controller

Direct access to parameters in the controller's memory allows them to be changed and the device operation can be adapted to the requirements of the installation. Changing the parameter values is possible from the level of the Modbus network by sending the appropriate command, using the variable address or from the level of the menu PAr A described in section 9.8. The controller supports Slave Modbus RTU communication. By using the command "03 Read Multiple Holding Registers" and "06 Write Single Holding Register", it is possible to read / write variables in registers. Many Master devices treat the first register address as 0, so there might be a need to convert the register numbers by subtracting 1 to get the correct register number.

The memory of the controller is divided into two areas:

- Volatile memory **Status** – contains actual parameters of operating unit,
- Non-volatile **EEPROM** memory – contains parameters that do not lose their values in the event of a power failure.

11.3. Status memory list (STATUS)

No.	Name	Description	R/W	Type	Index	Scaling	Unit	Modbus Address
	Inverter parameters							
1.	5_R_inv1_SpeedRef	Speed Reference (IDL format)	6	INT	8	3000 = 50	Hz	8967
2.	7_R_inv1_OutputFrq	Output Frequency (Motor Speed)	R	INT	10	600 = 60.0	rps	8969
3.	8_R_inv1_ActMotorCurr	Output Current	R	INT	11	100 = 10.0	A	8970
4.	9_R_inv1_TripCode	Trip Code	R	INT	12	N/A	N/A	8971
5.	10_R_inv1_OutputPower	Output Power	R	INT	13	1000 – 10.00	kW	8972
6.	23_R_inv1_DCbusVoltage	DC bus Voltage	R	INT	26	600 = 600	V	8985
7.	24_R_inv1_DriveTemperature	Drive Temperature	R	INT	27	40 = 40	°C	8986
8.	32_R_inv1_kWh	kWh Meter	R	INT	35	100 = 10.0	kWh	8994
9.	33_R_inv1_MWh	MWh Meter	R	INT	36	100 = 100	MWh	8995
10.	34_R_inv1_RunningTimeHr	Running Time – hour	R	INT	37	N/A	N/A	8996
11.	35_R_inv1_RunningTimeMinSec	Running Time – min/sec	R	INT	38	N/A	N/A	8997
12.	39_R_inv1_TambPCB	Room (Control PCB) Temperature	R	INT	42	40 = 40	°C	9001
13.	42_R_inv1_MotorSpeed	Motor Speed (IDL Format)	R	INT	45	3000 = 50Hz	Hz	9004
14.	43_R_inv1_MotorOutputVoltage	Motor output voltage	R	INT	46	100 = 100	V (AC)	9005
	Error history							
15.	ErrorActive	Error Active ! (main signal)	R	BOOL	66	true/false	N/A	9025
16.	WarningActive	Warning active ! (main signal)	R	BOOL	67	true/false	N/A	9026
17.	UnitError	Unit error number	R	UINT	69	1	N/A	9028
18.	Err_Index	Error Index to be displayed (last 4 errors available values 1 - 4)	R/W	UINT	72	1-4	N/A	9031
19.	ErrorCnt	Error counter number (from EEPROM history)	R	UINT	73	1	N/A	9032
20.	Error_Unit	Unit Error	R	INT	74	1	N/A	9033
21.	Error_UnitDiDo	State of DI and DO of unit	R	INT	75	1	N/A	9034
22.	Error_InvErr	Inverter Error	R	INT	76	1	N/A	9035
23.	Error_InvStat	Inverter Status	R	INT	77	1	N/A	9036
24.	Error_InvRTimeH	Inverter running hours	R	INT	78	1	N/A	9037
25.	Error_InvCurr	Inverter Current	R	INT	79	1	N/A	9038
26.	Error_Psuc	Psuc at error	R	INT	80	0,01	bar	9039
27.	Error_Pdis	Pdis at error	R	INT	81	0,01	bar	9040
28.	Error_Tdis	Tdis at error	R	INT	82	0,1	°C	9041
29.	Error_Tamb	Tamb at error	R	INT	83	0,1	°C	9042
30.	Error_Tcc	Tcc at error	R	INT	84	0,1	°C	9043
	Digital							
31.	UnitErrNetworkReset	Unit error reset from Modbus	R/W	INT	90	1	N/A	9049

No.	Name	Description	R/W	Type	Index	Scaling	Unit	Modbus Address
32.	UnitReadyToStart	Unit ready to start !	R	BOOL	100	true/false	N/A	9059
33.	UnitReadyToStartOrRuning	Unit ready to start or running signal	R	BOOL	101	true/false	N/A	9060
34.	UnitPermissionToWork	Unit permit to work (safe to start compressor)	R	BOOL	102	true/false	N/A	9061
	Measurements							
35.	Psuc	Suction pressure	R	INT	131	0,01	bar	9090
36.	Pdis	Discharge pressure	R	INT	132	0,01	bar	9091
37.	Tdis	Cp1 Discharge Temperature [0.1°C]	R	INT	133	0,1	°C	9092
38.	Tamb	Ambient temperature	R	INT	134	0,1	°C	9093
39.	Tcc	Compressor carter temperature [0.1°C]	R	INT	135	0,1	°C	9094
40.	Tevap	Calculated evaporation temp. (from Psuc) [0.1°C]	R	INT	136	0,1	°C	9095
41.	TevapStp	Currently active Evaporation setpoint	R	INT	137	0,1	°C	9096
42.	Tcond	Condensing setpoint (for FAN) [0.1°C]	R	INT	138	0,1	°C	9097
43.	TcondStp	Actual Condensing setpoint (for FAN) after limits and other logic	R	INT	139	0,1	°C	9098
44.	PsucStp	Measured suction pressure [0.01 bar]	R	INT	146	0,01	bar	9105
45.	Tsuc	Suction temperature	R	INT	175	0,1	°C	9134
46.	PdisStp	Discharge Pressure (Condensing) setpoint [0.01 bar]	R	INT	184	0,01	bar	9143
47.	TfloActive	Floating temperature setpoint active	R	BOOL	223	true/false	N/A	9182
48.	TfloStp	Floating temperature setpoint value	R	INT	224	0,1	°C	9183
49..	CcSh	Compressor carter Superheat (Tcc -Tevap) [0.1°C]	R	INT	273	0,1	°C	9232
	Status							
50.	FanSpdOut	Actual speed from regulator	R	INT	290	1	%	9249
51.	FanSpeedManComm	Auto / manual fan control command	R	BOOL	292	true/false	N/A	9251
52.	FanSpeedManualVal	Output for Fan speed in manual mode	R	INT	293	1	%	9252
53.	CpRunning	Compressor running	R	BOOL	305	true/false	N/A	9264
54.	Cp1Ready	Compressor ready	R	BOOL	306	true/false	N/A	9265
55.	Cp1Running	Confirmation that one of the compressors is running	R	BOOL	307	true/false	N/A	9266
56.	Cp1Startup	First compressor startup	R	BOOL	308	true/false	N/A	9267
57.	Cp1Waiting	First compressor waiting	R	BOOL	309	true/false	N/A	9268
58.	Cp1FullSpd	Cp1 (Inverter) at full available speed	R	BOOL	310	true/false	N/A	9269
59.	Cp1MinSpd	Cp1 (Inverter) at min available speed	R	BOOL	311	true/false	N/A	9270
60.	ChOn	Carter heater on	R	BOOL	312	true/false	N/A	9271
61.	InjValveOpen	Injection valve (OFF/ON)	R	BOOL	313	true/false	N/A	9272
62.	OilRetActive	Oil return active	R	BOOL	314	true/false	N/A	9273
63.	OilRetTimeLeft	Oil return time left	R	UINT	315	1	S	9274
64.	RestTimeLeft	Compressor rest time left	R	UINT	316	1	S	9275
65.	FSLactive	Fast slowdown active	R	BOOL	317	true/false	N/A	9276
66.	Cp2ReadyToStart	Cp2 is ready for starting (OK and resting time counted)	R	BOOL	318	true/false	N/A	9277
67.	Cp2Start	Second Compressor signal start - For inverter to slowdown	R	BOOL	319	true/false	N/A	9278
68.	Cp2Ready	Second Compressor signal ready	R	BOOL	320	true/false	N/A	9279
69.	Cp2Running	Second Compressor RUNING (signal for Contactor)	R	BOOL	321	true/false	N/A	9280
70.	Cp2StatusReady	Cp2 ready - signal from input	R	BOOL	322	true/false	N/A	9281
71.	Cp2ToBeStarted	Cp2 should be started (conditions), start delayed by time	R	BOOL	323	true/false	N/A	9282
72.	Cp2ToBeStopped	Cp2 should be stopped (conditions), stop delayed by time	R	BOOL	324	true/false	N/A	9283
73.	Cp1PermissionToWork	Permission to start Cp1 - Inverter	R	BOOL	325	true/false	N/A	9284
74.	Cp2PermissionToWork	Permission to start Cp2 - FIX speed (contactor)	R	BOOL	326	true/false	N/A	9285
75.	Cp2Startup	Cp2 startup process (slowdown of Cp1)	R	BOOL	327	true/false	N/A	9286
76.	Cp2Stopping	Cp2 stopping process (speed Up Cp1)	R	BOOL	328	true/false	N/A	9287

No.	Name	Description	R/W	Type	Index	Scaling	Unit	Modbus Address
77.	Cp2LockUnit	Unit locked by second compressor	R	BOOL	329	true/false	N/A	9288
	Inverter							
78.	InvStandby	Standby - status from Inverter	R	BOOL	333	true/false	N/A	9292
79.	InvDriveOK	Drive OK - signal from Inverter	R	BOOL	335	true/false	N/A	9294
80.	InvDriveTherMngActive	Thermal (Driver) Reduction of power - signal from Inverter	R	BOOL	336	true/false	N/A	9295
81.	InvInhibit	STO - signal from Inverter	R	BOOL	337	true/false	N/A	9296
82.	InvComOK	Inverter Communication OK	R	BOOL	338	true/false	N/A	9297
83.	InvReady	Ready - signal from Inverter (with conditions)	R	BOOL	339	true/false	N/A	9298
84.	InvDriveTripped	Fault (Tripped) - signal from Inverter	R	BOOL	340	true/false	N/A	9299
85.	InvStartupActive	Startup - signal from Inverter	R	BOOL	352	true/false	N/A	9311
86.	InvActSpeed	Actual inverter speed	R	INT	353	0,1	rps	9312
87.	InvCurr	Inverter current	R	INT	354	0,1	A	9313
88.	InvRegLimMax	Active limit of Max Inverter Speed	R	INT	355	0,1	rps	9314
89.	InvRegLimMin	Active limit of Min Inverter Speed	R	INT	356	0,1	rps	9315
90.	InvSpeedCmd	Inverter speed command	R	INT	357	0,1	rps	9316
91.	InvWarn	Inverter Warning number (>0 Warning active)	R	UINT	358	1	N/A	9317
92.	InvErr	Inverter Error number	R	UINT	359	1	N/A	9318
93.	InvStat	Inverter status	R	UINT	360	1	N/A	9319
	Clock							
94.	UpdateTimeTrig	Update system time trigger	R/W	BOOL	391	true/false	N/A	9350
95.	ClockSetYear	Clock set year	R/W	UINT	392	00-99	year	9351
96.	ClockSetMonth	Clock set month	R/W	UINT	393	1-12	month	9352
97.	ClockSetDaymonth	Clock set day month	R/W	UINT	394	1-31	day	9353
98.	ClockSetDayweek	Clock set day week	R/W	UINT	395	1-7	day week	9354
99.	ClockSetHrs	Clock set hour	R/W	UINT	396	0-24	hour	9355
100.	ClockSetMin	Clock set minute	R/W	UINT	397	0-59	minute	9356
101.	ClockSetSec	Clock set second	R/W	UINT	398	0-59	second	9357
102.	ClockActYear	Actual clock year	R	UINT	399	00-99	year	9358
103.	ClockActMonth	Actual clock month	R	UINT	400	1-12	month	9359
104.	ClockActDaymonth	Actual clock day month	R	UINT	401	1-31	day	9360
105.	ClockActDayweek	Actual clock day week	R	UINT	402	1-7	day week	9361
106.	ClockActHrs	Actual clock hour	R	UINT	403	0-24	hour	9362
107.	ClockActMin	Actual clock minute	R	UINT	404	0-59	minute	9363
108.	ClockActSec	Actual clock second	R	UINT	405	0-59	second	9364
109.	SecondStpOnTimeHr	Second setpoint on hour	R	UINT	409	0-23	hour	9368
110.	SecondStpOnTimeMin	Second setpoint on minute	R	UINT	410	0-59	minute	9369
	Digital							
111.	DO2Output	Digital output type	R	BOOL	421	true/false	N/A	9380
112.	MultiFcnOutput	Multi-function output	R	BOOL	422	true/false	N/A	9381
113.	ExtPermToWork	Hardware on off switch	R	BOOL	423	true/false	N/A	9382

Table 20: Status memory list

11.4. EEPROM memory list

No.	Name	Description	R/W	Type	Index	Default	Scaling	Unit	Modbus address
1.	UnitOnController	Unit ON / OFF	R/W	BOOL	151	false	true/false	N/A	16534
2.	PsucRegOffset	Suction pressure regulator offset	R/W	BOOL	172	0	1	N/A	16555
3.	PsucRegSpdUp	Reg. Psuc - max Speed Up	R/W	INT	173	8	0,1	%/s	16556
4.	PsucRegSpdDown	Reg. Psuc - max Speed Down	R/W	INT	174	50	0,1	%/s	16557
5.	PsucRegDB	Psuc Regulator Dead Band	R/W	INT	175	3	0,01	bar	16558
6.	PsucRegP	Reg. Psuc - P band	R/W	UINT	176	25	0,1	bar	16559
7.	PsucRegI	Reg. Psuc - I time	R/W	UINT	178	65	1	s	16561
8.	PsucRegD	Reg. Psuc - D time	R/W	UINT	179	0	0,1	s	16562
9.	PsucRegMaxOut	Reg. Psuc - Output MAX!	R/W	INT	182	100	0,1	%	16565
10.	PsucDb	Psuc Dead Band	R/W	INT	183	2	0,01	bar	16566
13.	PsucBrokenAllowOp	Allow operation when Psuc broken	R/W	BOOL	189	false	true/false	N/A	16572
14.	PdisRegDb	Reg. Pdis - Output Dead Band	R/W	INT	213	10	0,1	%	16596
15.	PdisRegP	Reg. Pdis - P band	R/W	INT	214	40	0,01	bar	16597
16.	PdisRegDeltaP	Reg. Pdis - Press delta Pdis to P liquid	R/W	INT	215	0	0,01	bar	16598
17.	PdisRegSpdUp	Reg. Pdis - max Speed Up	R/W	INT	216	500	0,1	%/s	16599
18.	PdisRegSpdDown	Reg. Pdis - max Speed Down	R/W	INT	217	5	0,1	%/s	16600
20.	PdisRegStartSpd1	FAN startup speed At PdisRegStartTamb1	R/W	INT	219	20	x10	%	16602
21.	PdisRegStartSpd2	FAN startup speed At PdisRegStartTamb2	R/W	INT	220	50	x10	%	16603
22.	PdisRegStartTamb1	Tamb for FAN start point 1	R/W	INT	221	50	0,1	°C	16604
23.	PdisRegStartTamb2	Tamb for FAN start point 2	R/W	INT	222	350	0,1	°C	16605
24.	PdisBrokenOperation	Allow operation when discharge pressure broken	R/W	BOOL	223	true	true/false	N/A	16606
25.	TdisHHH	Discharge temperature HHH threshold (STOP)	R/W	INT	240	1300	0,1	°C	16623
26.	TdisL	Discharge temperature L threshold	R/W	INT	243	850	0,1	°C	16626
27.	TdisLL	Discharge temperature LL threshold	R/W	INT	244	700	0,1	°C	16627
28.	TfloEn	Floating condensing (ECO) - enabled	R/W	BOOL	258	true	true/false	N/A	16641
29.	TfloStpLow	Condensing setpoint at iTfloTextLow	R/W	INT	259	300	0,1	°C	16642
30.	TfloTextHigh	External temp to start lowering the Cond. Stp.	R/W	INT	260	200	0,1	°C	16643
31.	TfloTextLow	External temp with lowest condensing Stp.	R/W	INT	261	50	0,1	°C	16644
32.	TevapStp	Suction Setpoint (main)	R/W	INT	268	-100	0,1	°C	16651
33.	TevapStp2	2nd Suction Setpoint (switched by logic)	R/W	INT	269	-130	0,1	°C	16652
34.	TevapOverLimitTime	Evaporation temperature HHH threshold delay time	R/W	INT	270	180	0,1	s	16653
36.	TevapHHH	Tevap HHH - Max Evaporation Temperature	R/W	INT	272	180	0,1	°C	16655
37.	TevapDiffHH	Tevap for Warning - high pressure during work	R/W	INT	273	70	0,1	°C	16656
38.	TevapDiffH	Tevap H threshold	R/W	INT	274	20	0,1	°C	16657
39.	TevapDiffL	Tevap L threshold	R/W	INT	275	30	0,1	°C	16658
40.	TevapLL	Tevap LL threshold - Pump down	R/W	INT	276	-200	0,1	°C	16659
41.	TevapLLL	Tevap LLL - Vacuum Detect temperature	R/W	INT	277	-240	0,1	°C	16660
42.	TcondStp	Condensing setpoint (for FAN)	R/W	INT	285	430	0,1	°C	16668
43.	TcondHHH	Tcond HHH - Max Condensing temp. (ALARM)	R/W	INT	286	590	0,1	°C	16669
44.	TcondHH	Tcond HH - V. High Condensing temp. - Cp fixed speed (WARNING)	R/W	INT	287	560	0,1	°C	16670
45.	TcondH	Tcond H - high condensing temp - Cp speed limit	R/W	INT	288	540	0,1	°C	16671
46.	TcondL	TcondL - Min. condensing temp. (envelope)	R/W	INT	289	300	0,1	°C	16672
47.	TcondLL	TcondLL - Low condensing temp. (envelope)	R/W	INT	290	240	0,1	°C	16673
48.	TcondLLL	Tcond LL- Critical low condensing temp. (envelope)	R/W	INT	291	190	0,1	°C	16674
49.	TcondDb	Tcond Dead Band- for Dead bands	R/W	INT	292	20	0,1	K	16675
51.	TambSecondStpL	Second setpoint activation low threshold	R/W	INT	306	-50	0,1	°C	16689
52.	TambHHH	Ambient temperature HHH threshold	R/W	INT	307	430	0,1	°C	16690
53.	TambHH	Ambient temperature HH threshold	R/W	INT	308	380	0,1	°C	16691
54.	TambLL	Ambient temperature LL threshold	R/W	INT	309	-100	0,1	°C	16692
55.	TambLLL	Ambient temperature LLL threshold	R/W	INT	310	-150	0,1	°C	16693
56.	TambDb	Ambient temperature dead band	R/W	INT	311	20	0,1	°C	16694
57.	TccTambDiff	Carter heater - CcSH and ambient temp difference (TccH)	R/W	INT	323	50	0,1	K	16706
58.	TccCorection	Carter heater temperature diff	R/W	INT	324	20	0,1	°C	16707

No.	Name	Description	R/W	Type	Index	Default	Scaling	Unit	Modbus address
59.	TccHHH	Carter heater HHH threshold	R/W	INT	326	75	1	°C	16709
60.	TccHH	Carter heater HH threshold	R/W	INT	327	65	1	°C	16710
61.	TccH	Carter heater H threshold	R/W	INT	328	20	1	°C	16711
62.	TccDb	Carter heater dead band	R/W	INT	329	30	0,1	°C	16712
63.	FanMaxSpd	FAN max speed	R/W	INT	336	100	x10	%	16719
64.	FanMinSpd	FAN minimum speed	R/W	INT	337	12	x10	%	16720
65.	FSLdurationTime	Fast slowdown duration time	R/W	INT	359	25	0,1	s	16742
66.	FSLwaitTime	Fast slowdown waiting time	R/W	INT	360	180	1	S	16743
67.	Cp2TimeToStart2ndCp	Time to START 2nd Cp, IF xPsucH and Finv ~ FinvMax	R/W	INT	367	30	1	s	16750
68.	SecondSetpointActivate	Activate second setpoint	R/W	BOOL	416	false	true/ false	N/A	16799
70.	DI1TypeSelect	Input type select NO NC	R/W	BOOL	424	false	true/ false	N/A	16807
72.	DI2TypeSelect	Input type select NO NC	R/W	BOOL	426	false	true/ false	N/A	16809
74.	DI3TypeSelect	Input type select NO NC	R/W	BOOL	428	false	true/ false	N/A	16811
76.	DI4TypeSelect	Input type select NO NC	R/W	BOOL	430	false	true/ false	N/A	16813
78.	DI5TypeSelect	Input type select NO NC	R/W	BOOL	432	false	true/ false	N/A	16815
80.	DI6TypeSelect	Input type select NO NC	R/W	BOOL	434	false	true/ false	N/A	16817
81.	MultiFncInputSel	Multi-function input selection	R/W	INT	435	1	1	N/A	16818
83.	DO1TypeSelect	Output type select NO NC	R/W	BOOL	443	false	true/ false	N/A	16826
85.	DO2TypeSelect	Output type select NO NC	R/W	BOOL	445	false	true/ false	N/A	16828
86.	DO2OutputSel	Output source selection	R/W	INT	446	1	1	N/A	16829
88.	DO3TypeSelect	Output type select NO NC	R/W	BOOL	448	false	true/ false	N/A	16831
90.	DO4TypeSelect	Output type select NO NC	R/W	BOOL	450	false	true/ false	N/A	16833
92.	DO5TypeSelect	Output type select NO NC	R/W	BOOL	452	false	true/ false	N/A	16835
94.	DO6TypeSelect	Output type select NO NC	R/W	BOOL	454	false	true/ false	N/A	16837
95.	MultiFcnOutputSel	Multi-function output selection	R/W	INT	455	2	1	N/A	16838
96.	SecondStpDurHr	Duration of second setpoint in hours	R/W	INT	462	6	1	hour	16845
97.	SecondStpDurMin	Duration of second setpoint in minutes	R/W	INT	463	0	1	minute	16846
98.	SecondStpOnTimeHr	Second setpoint activate hour	R/W	INT	465	23	1	hour	16848
99.	SecondStpOnTimeMin	Second setpoint activate minute	R/W	INT	466	30	1	minute	16849

Table 21: Eeprom memory list

12. Tables and figures

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