AERMEC

air conditioning

ELECTRONIC REGULATION

SERVICE MANUAL

MODUCONTROL

- SOFTWARE VERSION SW 4.4 date 26/01/2012
- SOFTWARE VERSION SW 4.4.1 date 26/06/2012
- SOFTWARE VERSION SW 4.4.2 date 18/09/2012

EN

Modu_Control software update versions 4.4.0- 4.4.1- 4.4.2

1 Index and revisions

17	34164 .00	02900 im 00 pan1_0_1.s19	34163. 20	mc43_0.s19	13-06-2011	**Version 4.3.0** - Control WRL cooling only (water/water unit). Read condenser input sensor in place of condenser coil sensor and read condenser outlet sensor in place of outdoor air sensor. - The outdoor air temperature (optional Kit KSAE) is read from sensor 25°C 10 kOhm connected in place of the low pressure transducer (ratiometric).
18	34164 .00	02900 im 00 pan1_0_1.s19	34163. 20	mc44_0.s19	26-01-2012	4.4.0 - Management of ANLI021, ANLI026,ANLI040ANLI045,ANLI071,ANLI075,ANLI080 - Maximum time between defrosting cycle (parameter (Y) in reference to the air exthernal temperature (parameter (U) Menu psw 72). - BP Low alarm never in bypass (always active) (parameter (L) Menu psw 125) - Low pressure value that change the discharge gas temperature threshold alarm (parameter (n) Menu psw 125) - New discharge gas threshold alarm in reference to the low pressure (parameter (o) Menu psw 125) - New parameteter to select the type of compressor (inverter Carel). - New parameter to select the maximum voltage from DCP (for CL unit) - NO2 Carel uPC electronic board digital output used to manage the three way water valve (plant/sanitary tank) to produce sanitary water - Visualization of remaining time before the next defrosting cycle - Visualization of DCP output in volt value - New parameter to select the maximum voltage to DCP (for CL unit) - Sliding setpoint calculation every 30 minuts - Optional transducers management: parameter (u) Menu psw 125. If this parameter is setted 1, are enable the transducers into only cooling units
19	34164 .00	02900 im 00 pan1_0_1.s19	34163. 20	mc44_1.s19	26-06-2012	4.4.1 Solved problem with transducers absent in only cooling units in case are present disturbs. Addition of parameter (Y) menu = 125. From this version are present two parameters to control the presence of the transducers on only cooling units. If are present the transducers into the units where normally aren't provided, is necessary to modify the parameter (U) = 1 for the high pressure transducer and the parameter (Y) = 1 for the low pressure transducer into the menu with password = 125.

20	34164 .00	02900 im 00 pan1_0_1.s19	34163. 20	mc44_2.s19	18-09-2012	4.4.2 Modified the maximum deltaP during the startup to 3.0 bar. Bypass of low pressure and low pressure LOW (1.6 bar) during defrosting cycle and after 3 min from the end (time parameter to bypass the low pressure). Bypass initialization of the defrost threshold of low pressure for 3 minutes (time parameter bypass the low pressure) after the end of the inversion cycle. Now the threshold of low pressure that forces the defrost cycle by inversing cycle, does not wait the minimum time between two reversals. Insert of software Version 1.0B47 for Carel uPC in case of ANLI units.

2 Introduction

The Moducontrol electronics was introduced in 2006, to need to control the new range of air-water chillers ANL series with refrigerant R410A and also to have a new electronic controller designed and produced by Aermec. Since then this controller has been used on two compressor units and the ANZ (high performance heat pump unit with R407C, sometimes accompanied with accessories like supplementary electric heating and soft start) that were call ANR
Then the control logic for inverter units was added, known as ANLI and the condensing version ANL-C, moreover the control logic was added for ANK units and next to last for the water-water series WRL cooling only (software version 4.3).

The last update software version 4.4.0, 4.4.1 and 4.4.2 of this electronic is born in particular for the ANLI new inverter Carel series and for some managements of new CL (new air-water chiller with centrifugal fan unit); moreover to optimize other things already present in the precedent versions.

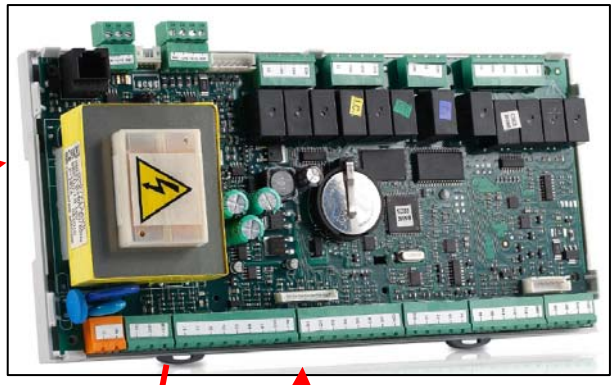
The control logic of the Moducontrol board is practically the same for the ANL,ANR, ANLI, ANF, ANK, SRP SRA and for the WRL (water-water cooling only) series.
This document shows only the parameters relating to the control of the units ANLI new inverter Carel series and other managements described above, then only the relevant new parameters and features were introduced, as listed in the following paragraphs.

For the complete document of the Moducontrol electronic controller please refer to the specific control manual ANL version 4.1.
About the particular value of parameters and dip-switches settings, check the Software Configuration in reference to the type of unit.

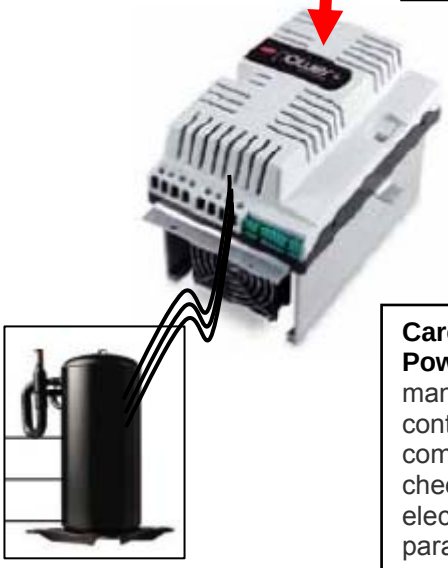
3 ANLI inverter CAREL logic

Aermec Moducontrol board: It is the main board that contains the algorithms to control the unit.
It manage the safety controls and the defrosting cycles

RS485 bus comunication from Moducontrol and Carel µPC:
With this comunication, the Moducontrol board reads the pressure and temperature values, the EEV and compressor status from the Carel µPC board. Then the Moducontrol transfer the the signals to Carel µPC in function of the power requested from the thermostat.

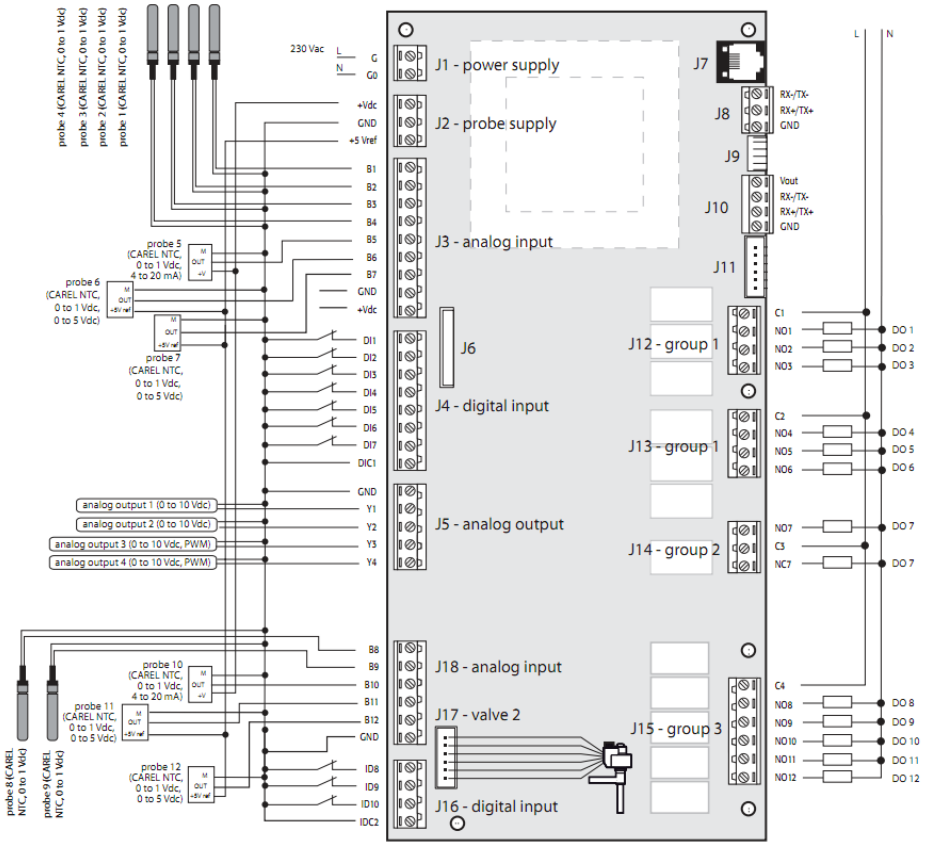


Carel µPC board:. With the bus RS485, it manage the communication with the inverter module Power Plus and manage the EEV electronic expansion valve. It contains the algorithms to protect the compressor and operation limits.



Carel Inverter Power Plus: It manages and controls the compressor, check the electrical parameters of the compressor. (current, voltage and rotor speed)

3.1 Carel µPC electronic board

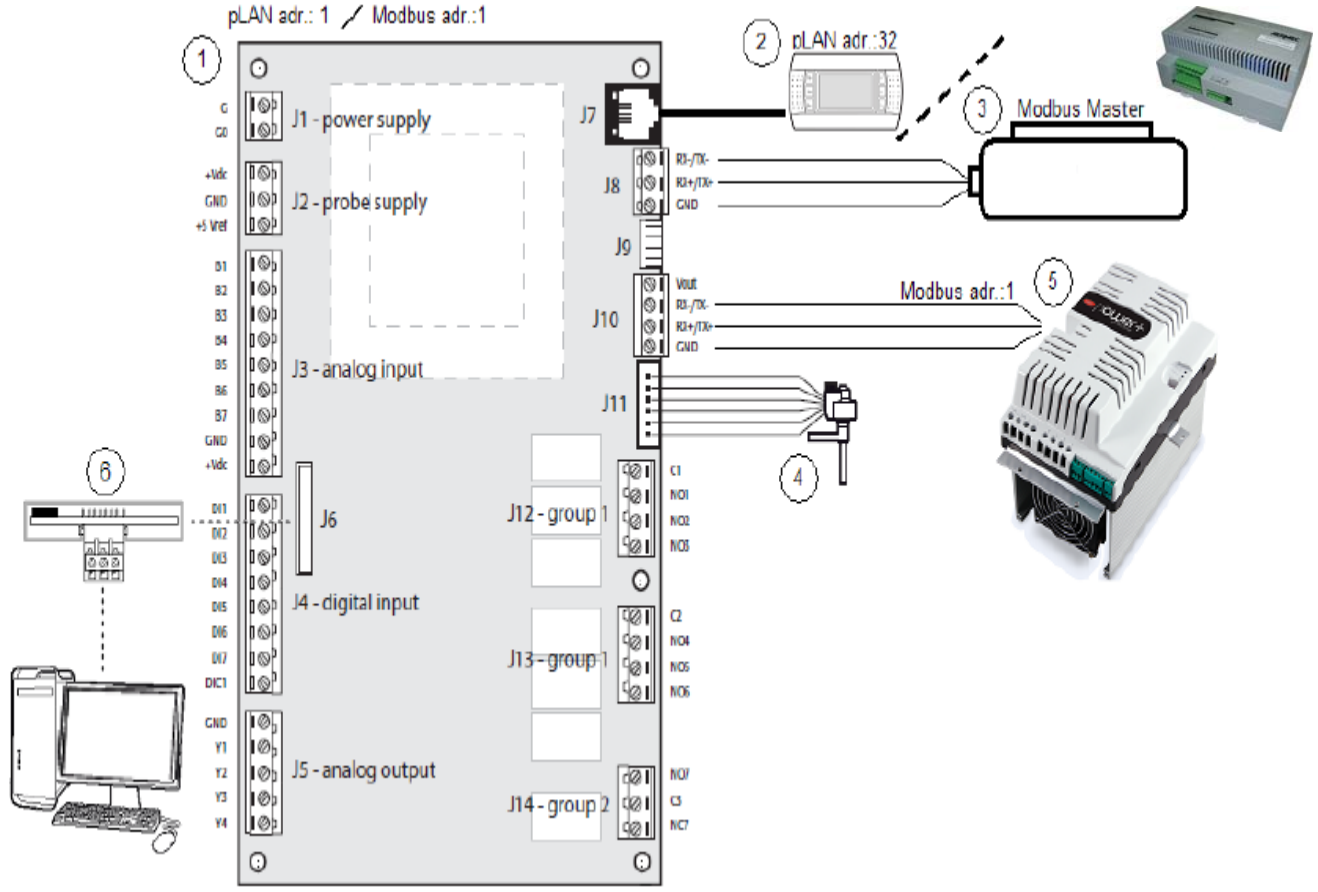


Carel µPC small	
DIGITAL Outputs	Description
NO1	Not used
NO2	3way sanitary valve (plant/sanitary tank)
NO3	Not used
NO4	Not used
NO5	Not used
NO6	Not used
NO7	General alarm
DIGITAL Input	Description
ID1	Not used
ID2	Not used
ID3	Not used
ID4	Compressor Start/Stop (with ramp)
ID5	Compressor shut off (without ramp)
ID6	Not used
ID7	Serial comunication selection: Open = pLAN., Closed= Modbus to comunication with Moducontrol
ANALOG Outputs	Description
Y1 (0-10V)	Not used
Y2 (0-10V)	Not used
Y3 (0-10V)	Not used

ANALOG Inputs *Max length 30m*	Description
B1 (NTC)	Not used
B2 (NTC)	Not used
B3 (NTC)	Suction temperature probe
B4 (NTC)	Discharge temperature probe- *Carel HT* probe
B5 (NTC; 4-20 mA)	Not used
B6 (NTC)	Low pressure transducer – Ratiometric transducer 0 - 5V / 0 -17.3 bar
B7 (NTC)	High pressure transducer – Ratiometric transducer 0 - 5V / 0 – 50 bar

3.2 Components and accessories

The following figure illustrates the architecture of the system made up of the uPC programmable platform running the Combo Drive application, plus all the components and accessories.



Description Code

1 µPC Small
2 pDG1, panel or wall-mounted + telephone cable (disabled if Modbus connection with 3rd part controller present)
3 3rd part controller provided with RS485 Modbus serial port, in our case is connected the Moducontrol electronic board.
4 Unipolar electronic expansion valve
5 Inverter Power+ to drive BLDC compressors
6 BMS serial card, depends on the supervisor connected

4 Software version 4.4.0- 4.4.1- 4.4.2 new features

With the software versions 4.4.0, 4.4.1 and 4.4.2 some new features were introduced as listed below:

4.1 Advanced reading Menu (pwd 10)

N	Description	Name	Meaning
6	ASP	Suction temperature probe value (°C)	Temperature value reading from the suction compressor probe. Parameter visualized only with inverter CAREL (see the 2nd Compressor Menu parameter 0). **Specific parameter for the ANLI units with inverter CAREL.**

4.2 Compressor and Water Pump Menu (pwd 72)

N	Description	Name	Min	Default	Max	Meaning
U	t dF	Defrosting cycle extensive temperature threshold	-30.0	-30.0	10.0	Outside air temperature below which uses a maximum time between defrost cycles longer. See the next parameter. Below the -4°C the humidity contains into the air decrease. **Actually this parameter is used for the ANLI units with inverter CAREL only.**
y	t d2	Extended time between defrosts	0	90	120	Maximum time interval between defrost cycles if the outside air temperature is lower than the value of the parameter (U) above. **Actually this parameter is used for the ANLI units with inverter CAREL only.**

4.3 2nd Compressor Menu (pwd 73)

N	Description	Name	Min	Default	Max	Meaning
0	I nU	Inverter type	0	0	**2**	Type of inverter used: 0- Inverter type Longertek. 1- Inverter type APY . Having inverter APY the frequencies setted on menu compressor (password 72) are the frequencies generated from inverter modul. The frequencies showed on readings menu parameter(P) e parameter(q) are the frequence (rpm per second) of compressor. These are 1/3 of frequencies generated from inverter modul. (from software version SW3.9). **2 – Inverter type Carel, Specific parameter for the ANLI units with inverter CAREL.**

3	BdC	Baudrate comunication with inverter Carel	0	0	1	0 – Bauderate setted to 38400 to comunicate with serial 0 of Carel µPC control board. 1 - Bauderate setted to 9600 to comunicate with serial 1 of BMS expansion board. It is utilized to connect the PGD1 control panel when is necessary check the system with a particular diagnostic (disconnect the wire bridge on ID7 digital input of Carel uPC electronic board to utilize the control panel PGD1). **Specific parameter for the ANLI units with inverter CAREL.**
4	SHC	Superheating setpoint in cooling mode	1.0	4.0	15.0	Superheating setpoint calculate by EEV in cooling mode **Specific parameter for the ANLI units with inverter CAREL.**
5	SHH	Superheating setpoint in heating mode	1.0	7.0	15.0	Superheating setpoint calculate by EEV in heating mode **Specific parameter for the ANLI units with inverter CAREL.**
6	CPt	Type of compressor	0	0	2	*Type of compressor combined with inverter Carel.* This parameter influenced the parameters of the inverter Carel directly. **Specific parameter for the ANLI units with inverter CAREL.** **Is necessary contact the factory before modifications**
7	SAL	Set-point inverter frequency to "jump" over	0	0	120	The inverter will stop work in the frequencies range setted between this set + the band "jump over" frequency (next parameter). This parameter and the next, are used to eliminate ("jump over") frequencies that after our test in factory could be generate vibrations (in reference to the type and size of unit where it is installed) and consequently could be cause breakage of some critical points in the refrigerant system. **Specific parameter for the ANLI units with inverter CAREL.** **Is necessary contact the factory before modifications**
8	BSA	"Jump over" inverter frequency band	0	0	100	Frequency band refering the precedent parameter. **Specific parameter for the ANLI units with inverter CAREL.** **Is necessary contact the factory before modifications**

4.4 Maintenance Menu 2 (pwd 84)

N	Name	Min	Default	Max	Meaning
4	Maximum Volt DCP	2.0	9.9	9.9	Maximum voltage to control the DCP or inverter fan. **Used in particular for CL units (new air-water chiller with centrifugal fan unit)**

4.5 Factory Menu (pwd 125)

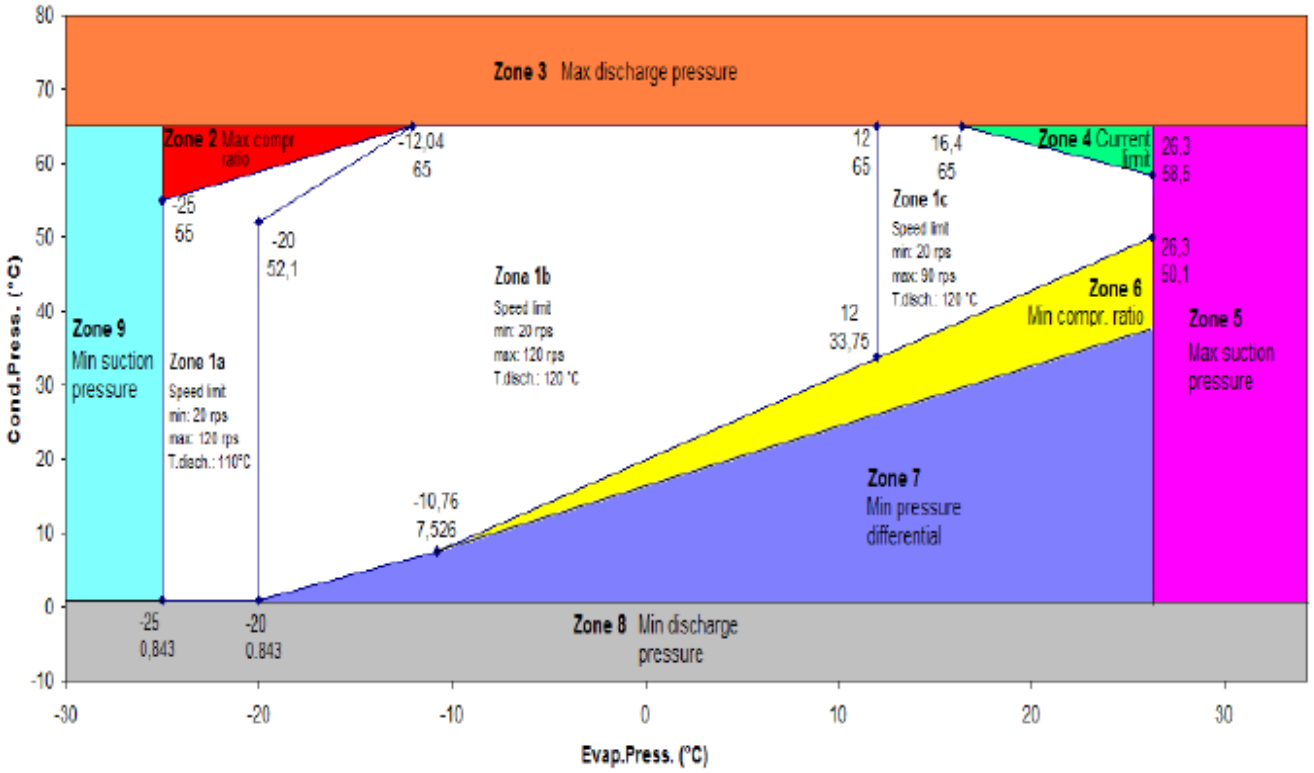
N	Name	Min	Default	Max	Meaning
L	Low pressure threshold limit (LOW)	0	1.6	10.0	Threshold of low pressure limit. This threshold is never bypassed during the compressor start. Below this threshold, the unit is considered discharge (without or lower presence)of refrigerant gas, the compressor start is inhibited. This limit put in off the system directly.
n	Threshold low pressure to change the high compressor discharge temperature alarm	0	0	10.0	- If the low pressure is equal or less than this threshold, is used the following discharge gas temperature alarm, parameter (o). - If the low pressure reading is greater than this threshold parameter, will be use (6) like discharge gas temperature alarm. - With setting 0 value is only active parameter (6) as discharge gas temperature alarm. Remind parameter (6): Discharge gas temperature alarm (°C)
o	Discharge temperature threshold alarm refering to the parameter (n)	80.0	112.0	145.0	Discharge temperature value that replace the value on the parameter (6) into this menu, refering to the parameter (n) into this menu.
P	**Discharge temperature limit zone 1a**	80.0	112.0	145.0	Threshold temperature of the discharge compressor gas over which are reduced the speed of the compressor. **See the compressor envelope diagram below.** **Specific parameter for the ANLI units with inverter CAREL.**
q	**Discharge temperature alarm zone 1a**	80.0	118.0	145.0	Threshold temperature of the discharge compressor gas over which the high-temperature discharge gas alarm is generated. **See the compressor envelope diagram below.** **Specific parameter for the ANLI units with inverter CAREL.**
r	**Discharge temperature limit zone 1b**	80.0	112.0	145.0	Threshold temperature of the discharge compressor gas over which are reduced the speed of the compressor. **See the compressor envelope diagram below.** **Specific parameter for the ANLI units with inverter CAREL.**
t	**Discharge temperature alarm 1b**	80.0	118.0	145.0	Threshold temperature of the discharge compressor gas over which the high-temperature discharge gas alarm is generated. **See the compressor envelope diagram below.** **Specific parameter for the ANLI units with inverter CAREL.**
U	High pressure transducer present on the only cooling unit.	0	0	1	1= Presence of transducer into only cooling units. More than to manage the low and high pressure alarms, it is manage the transducers alarms like broken or not present. Compared to software version 4.4.0 this parameter changes of meaning and refers only to the high pressure transducer. The next parameter is refer to the low pressure transducer.
y	Optional low pressure transducer presence	0	0	1	1= Presence of optional transducer into only cooling units. More than to manage the low and high pressure alarms, it is manage the transducers alarms like broken or not present.

4.6 Maintenance reading Menu (pwd 334)

This menu contains further informations about the unit functions over the informations present into the Reading Menu.

N	Description	Name	Meaning
0	dCP	Output in voltage (V) to control the DCP	Voltage otput from Moducontrol electronic board to manage the DCP, refer to the refrigerant high pressure and outdoor temperature measures.
1	SBr	Countdown defrosting cycle time	Remaning time of next defrosting cycle. It is visualized in minutes. The -1 value indicate that is suspend or no active causes by outdoor temperature or condenser temperature values.
2	Sur	Superheating	Superheating value calculate by the EEV expansion valve. See the parameter (0) into the 2nd Compressor Menu. **Specific parameter for the ANLI units with inverter CAREL.**
3	UAL	Electronic expansion valve opening percentage	Electroni expansion valve opening in percentage. See the parameter (0) into the 2nd Compressor Menu. **Specific parameter for the ANLI units with inverter CAREL.**
4	St P	Electronic expansion valve opening in steps	Electronic expansion valve opening in steps See the parameter (0) into the 2nd Compressor Menu. **Specific parameter for the ANLI units with inverter CAREL.**
5	I nU	**Compressor envelope zone**	Zones meaning: 0= Null; 1= OK; 2= Max. comp. ratio; 3= Max.disch. press.; 4= High curr.; 5= Max.suct. press.; 6= Min. comp. ratio; 7= Low Delta press.; 8= Min. disch. press.; 9= Min. suct. press. **See the compressor envelope diagram below.** See the parameter (0) into the 2nd Compressor Menu. **Specific parameter for the ANLI units with inverter CAREL.**
6	CPP	Motor power	Electric power of motor (KW) measured by inverter See the parameter (0) into the 2nd Compressor Menu. **Specific parameter for the ANLI units with inverter CAREL.**
7	CPS	Rotor speed of compressor	Rotor speed of compressor in rpm See the parameter (0) into the 2nd Compressor Menu. **Specific parameter for the ANLI units with inverter CAREL.**

Compressor envelope diagram for ANLI units with inverter CAREL



5 Regulation

5.1 Kind of Defrost

SOFTWARE 4.4.0 NEWS:

From the 4.4.0 software version for the new ANLI inverter sizes ANLI021, ANLI026, ANLI040, ANLI045, ANLI071, ANLI075, ANLI080, it is introduced an exthenal air temperature threshold that permit to extend the defrosting cycle in case to have low humidity conditions (low exthernal air temperature). The exthernal air temperature threshold is possible setted on the parameter (U) into the Compressor and Water Pump Menu (pwd 72), the interval time between the defrosting cycle in case the exthernal air temperature is below this threshold, it is possible setted on the parameter (y) still in the same Compressor and Water Pump Menu (pwd 72).

6 Alarms

6.1 New alarms for ANLI with Inverter Carel

Alarm code	Prealarm code	Meaning
61	161	*Overcurrent (Inverter Carel)*
62	162	*Compressor overload (Inverter Carel)*
63	163	*Overvoltage (Inverter Carel)*
64	164	*Undervoltage (Inverter Carel)*
65	165	*Drive overtemperature (Inverter Carel)*
66	166	*Drive undertemperature (Inverter Carel)*
67	167	*Hardware overcurrent (Inverter Carel)*
68	168	*Compressor overtemperature (Inverter Carel)*
69	169	*Reserved (Inverter Carel)*
70	170	*CPU error (Inverter Carel)*
71	171	*Default parameters (Inverter Carel)*
72	172	*DC bus ripple. (Inverter Carel)*
73	173	*Comunication between Inverter and Carel uPC electronic board absent (Inverter Carel error)*
74	174	*Temperature drive sensor broken (Inverter Carel)*
75	175	*Autoconfiguration failed (Inverter Carel)*
76	176	*Drive inverter enabled (Inverter Carel). Check the wire bridge on the Inverter Power Plus terminal*
77	177	*Motor phases error (Inverter Carel)*
78	178	*Cooling fan of Inverter broken (Inverter Carel)*
79	179	*Speed fault (Inverter Carel). Check the type of compressor setted*
80	180	PFC fault (appear if the PFC is enable but the DC bus voltage is very lower)
81	181	PFC overload trip (this alarm will not present with new software firmware)
82	182	Input voltage error (appear when the power supply go down below 170 volt when the compressor running)
83	183	*Generic inverter error (Inverter Carel)*
84	184	*B1 probe broken (Carel uPC electronic board)*
85	185	*B2 probe broken (Carel uPC electronic board)*
86	186	*B3 probe broken (Carel uPC electronic board)*
87	187	*B4 probe broken (Carel uPC electronic board)*
88	188	*B5 probe broken (Carel uPC electronic board)*
89	189	*B6 probe broken (Carel uPC electronic board)*
90	190	*B7 probe broken (Carel uPC electronic board)*
91	191	*High pressure alarm (Carel uPC electronic board)*
92	192	*Low pressure alarm (Carel uPC electronic board)*
93	193	*High discharge gas temperature alarm (Carel uPC electronic board)*
94	194	*High-Low differential pressure lower respect the minimum requested (0,3 bar in 60sec) (Carel uPC electronic board)*

Alarm code	Prealarm code	Meaning
95	195	Compressor starting failed (Carel uPC electronic board)
96	196	Exceed time of operative limits alarm (Carel uPC electronic board)
97	197	Low Super Heat alarm (Carel uPC electronic board)
98	198	MOP alarm (Carel uPC electronic board)
99	199	Low suction temperature alarm (Carel uPC electronic board)
200	300	EVD EVO evotunes alarm (Carel uPC electronic board)
201	301	EVD EVO regulation alarm (Carel uPC electronic board)
202	302	EVD EVO system alarms probe errors (Carel uPC electronic board)
203	303	Reserved (Carel uPC electronic board)
204	304	Comunication between Inverter and Carel uPC electronic board absent (Errore Carel uPC electronic board)
205	305	Inverter model not compatible with the compressor selected (Carel uPC electronic board)
206	306	Start fail due to high DeltaP (default = 20bar) (Carel uPC electronic board
207	307	Low pressure limit. Unit discharge of refrigerant gas

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