Instructions for the electronic controller:
MAESTRO 22

ORIGINAL INSTRUCTIONS

C E

c UL us
LISTED

(INDUSTRIAL CONTROL EQUIPMENT)
39UG
FILE: E316817

INDEX

CAUTION

THE MAESTRO 22 IS AN INDUSTRIAL CONTROL EQUIPMENT (NOT A SAFETY INSTRUMENT) FOR THE OPERATION OF A SCREW COMPRESSOR WITH SOFTWARE CLASS A (see EN 60730-1 and EN 60335-1.)

THE INSTALLATION MUST BE MADE IN ACCORDANCE WITH LOCAL AND INTERNATIONAL STANDARDS AND REGULATIONS WHERE THE COMPRESSOR IS MANUFACTURED.

THE INSTALLATION AND START UP OF THE CONTROLLER MUST BE CARRIED OUT BY TRAINED PERSONNEL WHO HAVE READ AND UNDERSTAND THIS MANUAL.

THE CONTROLLER HAS TO BE USED IN A STANDARD INDUSTRIAL ENVIRONMENT AND IT CAN NOT BE USED IN EXPLOSION RISK ENVIRONMENT, MARITIME, OR MILITARY PURPOSE.

THIS MANUAL IS SUBJECT TO CHANGES. PLEASE CONTACT THE OZEN AIR TECHNOLGY TECHNICAL OFFICE IN CASE OF DOUBT OF THE LATEST VERSION.

TECHNICAL FEATURES

- Industrial control equipment for the operation and management of screw compressors only, pollution degree 2.
- In accordance to **EC** Directives:
- Directive:
- LVD: 2014/35/UE
- EMC: 2014/30/UE
- RHOS: 2011/65/EU
- based on the following harmonized standards applied:
- SAF-EMC: EN 60730-1
- RHOS: EN 50581
- In accordance to **UL 508 (FILE #: E316817)**.
- Black auto-extinguishing box in ABS:
- a) **according EC**: IP64 for the front panel and IP20 for the other parts.
- b) **according UL**: type 1 and Type 12 for front panel mounting , installation in pollution degree 2 for the other parts
- Inputs and outputs via terminal-block board to wires (250V, 10A, 12 - 24AWG) tightening torque: 8 Nm.
- Working temperature: 0°C (32°F) - 50°C (122°F) 90% RH (non condensing)
- Storage temperature: -20 (-4°F) - +70 °C (158°F)
- Power supply: 12VAC ± 10% 50 - 60 Hz. (power of the transformer's secondary: ~ 9 VA) from safety transformer
- Max. current absorbed = ~ 350 mA
- Visualization through back light alphanumerical LCD 20 digits x 2 rows and nr. 1 led for alarm status
- Messages selectable in 8 languages: Italian – English – French – German – Spanish – Portuguese – Turkish – Russian
- nr. 6 key buttons: increase, decrease, enter, reset, start, stop
- nr. 1 input for temperature probe KTY13.5/NTC 10KOhm@25°C, ß (25/85) = 3977
- nr. 1 input for pressure transducer (working pressure P117
-)
- nr. 1 input for auxiliary pressure transducer (internal pressure P2) or analog information from inverter
- nr. 1 input for PTC or Klicson for motor protection (IN8).
- nr. 7 opto isolated digital inputs from 12/24VAC to detect:
  - IN 1 = emergency stop button
  - IN 2 = thermal motor
  - IN 3 = thermal fan
  - IN 4 = remote start/stop
  - IN 5 = air filter pressure switch
  - IN 6 = separator filter differential pressure switch
  - IN 7 = settable as: door of the electrical cabinet open – control phase relay – generic alarm
- nr. 3 digital inputs for connection to OZEN phases unit.
- nr. 7 outputs via relay with contact 1.5A AC1 250VAC – 6 A AC1 250VAC total
  - RL1 = line contactor
  - RL2 = delta contactor
  - RL3 = star contactor
  - RL4 = load solenoid valve
  - RL5 = fan contactor
  - RL6 = settable as fan contactor, condensate drain, compressor status
  - RL7 = settable as: alarm, fan contactor, condensate drain, compressor status
- nr. 1 real time clock with buffer battery, around 10 years electrical life
- nr. 1 24VDC power supply input for PNP outputs
- nr. 1 24VDC input from inverter to detect inverter fault
- nr. 2 PNP digital output to control the inverter (run and jog command)
- nr. 1 analog output 4-20 mA for inverter operation
- nr. 2 serial output RS485 for:
  - connection to other compressor for Master/Slave operation and/or Multi-unit operation
  - inverter communication
- Check min. and max. power supply to the controller
- Non volatile memory to store setting data, working hours, compressor status, alarm list
- The controller switches OFF due to micro interruption longer than ~ 300 ms
  Weight: 470 g (16.6 oz.)

Accessories:
- nr. 1 temperature probe KTY 13.5 for detection of the air end temperature: cable in silicone rubber, length 2.5 m, working range –10 - 130°C, resolution 1°C.
- nr. 1 pressure transducer 4-20 mA for working pressure control: 2 wires, AISI 316L stainless steel membrane, working range 0 - 15 bar, resolution 0.1bar, precision ± 0.1 bar.
- nr. 1 OZEN phase control unit for power supply 230 - 460V three phase

MOUNTING

Use the drawing below for overall dimensions in order to mount the controller.

106 mm
4.17 in

DRILLING TEMPLATE

161 mm
6.34 in

Alarm/Warning
LED (DL1)

Maestro 22
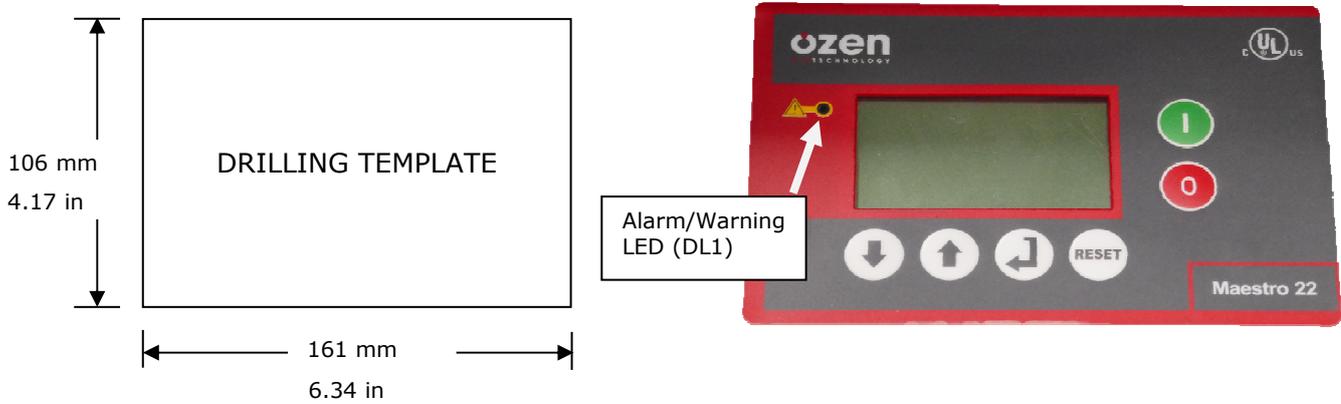
WARNINGS FOR THE WIRING OF THE CONTROLLER

1) Heed the working technical features and instructions on the electrical wiring. Cables for both the temperatures probe and pressure transducer must be isolated from the power cables and proper RC filters must be placed on the contactors' coils.
2) On the back side of the controller, there must be enough space for wiring and connectors.
3) The rear side of the controller must be protected against condensation, oil, and dust.
4) Don't wash the front panel by water injection. Clean the front panel with a soft cloth using mild soap and water.
5) Route low voltage and high voltage cable runs on separate trunks.
6) The connection cables for temperature probe and pressure transducer must be run in a trunk separate from the power cables.
7) The connections cables for the digital inputs must be placed in a trunk separate from the power cables.
8) The power cable of controller must not be placed in the same trunk as the machine power cables.

ELECTRICAL DRAWING AND LEGEND OF THE CONNECTIONS
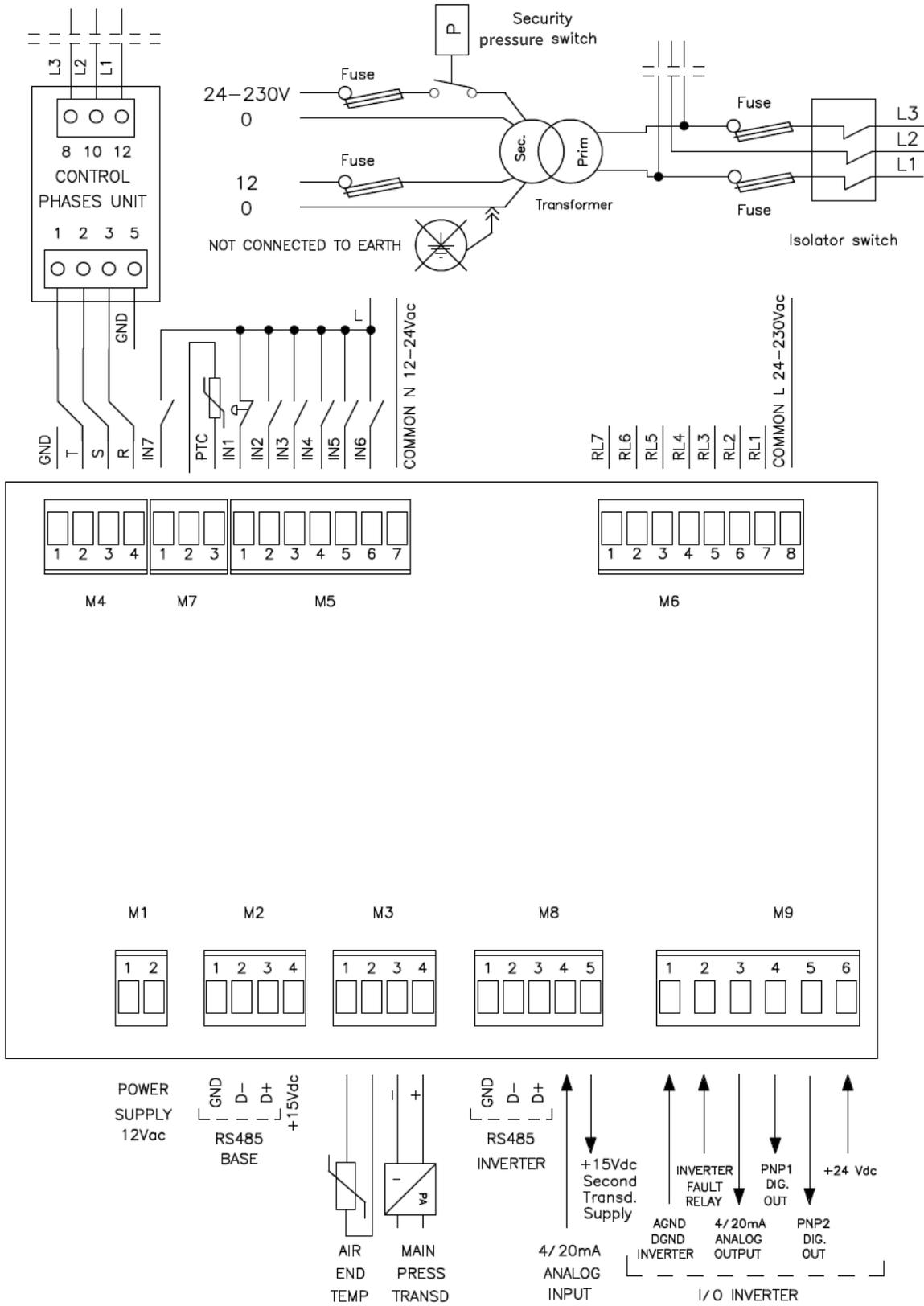
LEGEND

Terminal M1
Pole 1-2 = power supply 12VAC

Terminal M2 – RS485 FOR CONNECTION MASTER/SLAVE – MULTIUNIT
Pole 1 = 0
Pole 2 = D-
Pole 3 = D+
Pole 4 = +15VDC (As power supply for the Maestro (optional))

Terminal M3
Pole 1-2 = air end temperature probe
Pole 3-4 = pressure transducer (pole 3 = negative, pole 4 = positive)

Terminal M4
Pole 1 = pole 5 of the control phases (GND)
Pole 2 = pole 1 of the control phases (T)
Pole 3 = pole 2 of the control phases (S)
Pole 4 = pole 3 of the control phases (R)

NOTE: The ground from the control phases unit must not be connected to earth ground.
Connect the ground of the control phases unit to the ground of the controller.

Terminal M5
Pole 1 = IN 1 = emergency stop button (L)
Pole 2 = IN 2 = thermal motor overload relay (L)
Pole 3 = IN 3 = thermal fan motor overload relay (L)
Pole 4 = IN 4 = remote start/stop (L)
Pole 5 = IN 5 = air filter pressure switch (L)
Pole 6 = IN 6 = separator filter differential pressure switch (L)
Pole 7 = neutral = N

NOTE: The unused digital inputs must be connected directly to 12-24V. Otherwise, they generate the related alarm. The exception is IN5, which must not be connected if it is to be left unused.

Terminal M6
Pole 1 = RL7 = alarm (configurable)
Pole 2 = RL6 = condensate drain solenoid valve (configurable)
Pole 3 = RL5 = fan contactor (configurable)
Pole 4 = RL4 = solenoid valve
Pole 5 = RL3 = star contactor
Pole 6 = RL2 = delta contactor (configurable)
Pole 7 = RL1 = line contactor
Pole 8 = common = 24 - 230VAC

Terminal M7
Pole 1 = IN 7 = settable as electrical cabinet door open alarm, control phase relay, or generic alarm (L)
Pole 2-3 = IN 8 = PTC or Klicson for motor protection.

Terminal M8 – RS485 FOR DRIVE CONNECTION
Pole 1 = 0
Pole 2 = D-
Pole 3 = D+
Polo 4 = 2nd 4 - 20mA analog input configurable as internal pressure transducer or as analog data coming from the drive:
　　1.　internal pressure transducer: connect to the negative pole of the transducer.
　　2.　analog data from drive: connect to a 4 - 20mA analog output on the drive control board (drive must be set correctly to give the correct information to this output.)
Pole 5 = +15V power supply for the internal pressure transducer (first of the above cases.) Connect to positive pole of the transducer (not to be connected in the instance of analog data coming from the drive.)

Terminal M9
These terminals are to be connected only to a drive controlled by a 4 - 20mA analog output.
Pole 1 = Analog and/or digital GND and DGND from drive
Pole 2 = Inverter fault input - 24VDC signal coming from drive (normally connected to drive alarm relay)
Pole 3 = 4 - 20mA analog output computed by MAESTRO 22 PID (when activated)
Pole 4 = PNP1 digital output from 24VDC from drive (when analog output is active, this is the run command for the drive)
Pole 5 = PNP2 digital output from 24VDC from drive (when analog output is active, this is the jog command for the drive)
Pole 5 = 24VDC from drive

EXAMPLE OF CONNECTION TO SAFETY PRESSURE SWITCH

A security pressure switch can be installed for high pressure detection. This is a shut off alarm. Below, you will find the connection drawing to contactors, both 24VAC and/or 230VAC.

Contactors 24VAC

If the operation of the contactors and solenoid valves come through 24VAC, the digital inputs have to be connected to 24VAC (*see drawing on the right.*) Subsequently, when the pressure switch opens due to high pressure, 24VAC is lost and deenergizes all the contactors, the solenoid valve, and opens the digital inputs. The controller detects all the digital inputs open, which triggers the alarm: "**SAFETY PRESSURE SWITCH**".
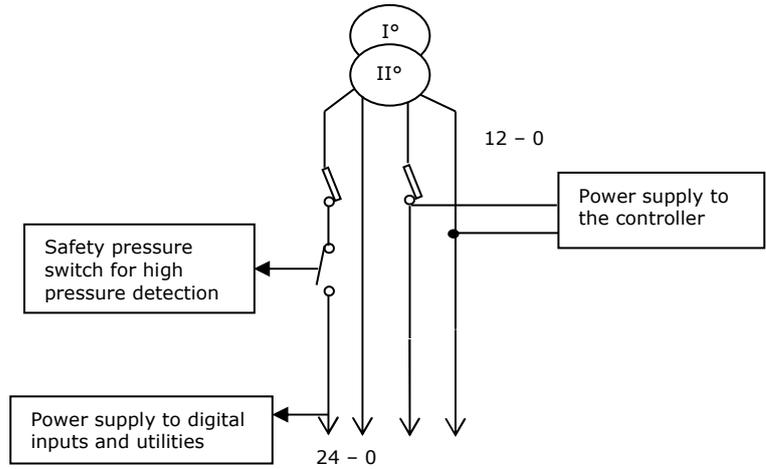
Contactors 230Vac

If the operation of the contactors and solenoid valves comes through 230VAC, the digital inputs have to be connected to 12VAC. Next to the contact of the pressure switch, place and energize an auxiliary relay and put the contact in series to 12VAC (L) (*see drawing on the right*). When the pressure switch is closed, the auxiliary relay with contact closed supply power to the digital inputs. The power supply of the controller is connected before the contact of the relay.
When the pressure switch opens, the auxiliary relay opens power to the digital inputs. The controller detects all the digital inputs open, which triggers the alarm: "**SAFETY PRESSURE SWITCH**".
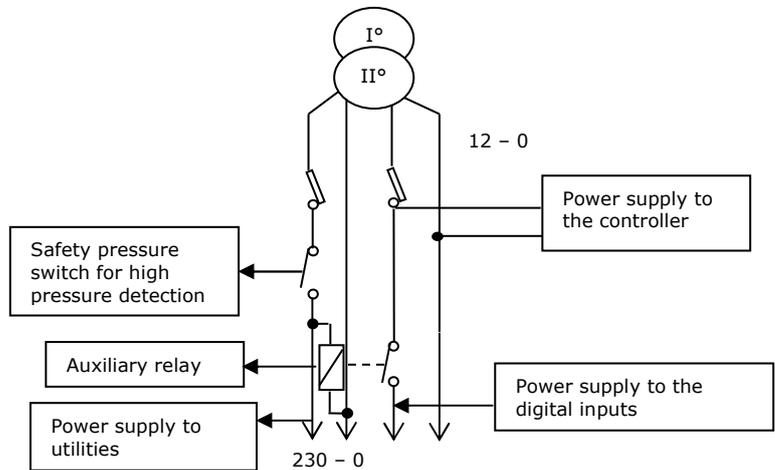
Note: Although Ozen Air Technology does not use a safety pressure switch in conjunction with the Maestro 22, it is important to note that the "**SAFETY PRESSURE SWITCH**" alarm (A21) is still active and will be issued if all the digital inputs are open.

CONNECTION SERIAL NET RS485

To connect a serial connection, you must pay careful attention to some important instructions:
1) Use flexible cable. It must be shielded, twisted 22 AWG type.
2) Connect D- and D+ to two conductors of same pair and 0 to a third one (if available) or both conductors of a second pair. Do not leave unconnected wires.
3) Connect the cable's shield to only one end of 0.
4) DO NOT connect the cable's shield to the electrical ground of the plant.
5) The connection MUST NOT be longer than 400 meters 1312 ft.)
6) The maximum connectable units through serial net RS 485 is 32.
7) In case of connection of more compressors via serial line RS485, you set parameter C08 in menu 04 (compressor setup) to assign each compressor their own unique MODBUS number.
8) The units on serial net RS485 must be connected without any polarity reversal: pole D+ to D+, pole D- to D-, pole 0 to 0.
9) If connecting more than 2 units, it is necessary to wire them in parallel. At the terminal both starting and ending the net, it is permissible to place (in parallel to D- and D+,) a termination resistor of 120 Ohm, as shown below.

In the picture below, you can see the connection of 4 units on serial net RS485 by use of a shielded cable with two twisted pairs.
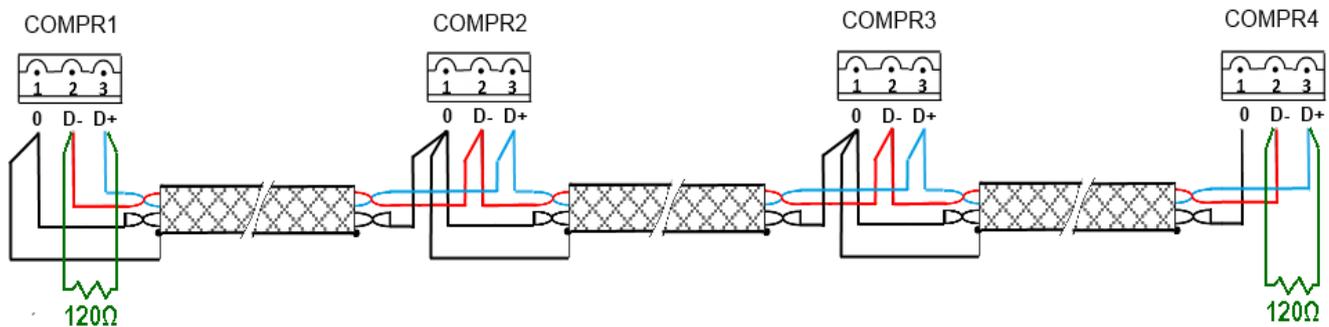
IMPORTANT! Incorrect wiring can damage both the controller and any other devices connected on the serial net.

WARNINGS TO THE WIRING RS485
1) The cable must be placed into a trunk separate from power cables and any potentially dangerous cables, such as plant lighting, etc.
2) Do not place signal cables next to bus bars, lamps, antennas, transformers, or any other component that may cause interference.
3) Keep signal cables far (at least 2m or 6.6 ft) from units with heavy inductive properties (distribution cabinets, motors, inverters, welding machines, heaters, etc.)
4) Don't pull the cables with a strength over 12 Kg (26 lbs.) Doing so can damage the wires and reduce the signal transmission on the line.
5) Do not twist, knot, crush, or fray the conductors.
6) Do not make any splices between lengths of cable. Always use only one cable to connect any single unit to each other. Strip the end carefully. Do not crush the cable next to core-hitches or safety supports.
7) Always respect the position of the colors at the both ends of the connection to ensure correct polarity.
8) Once the wiring is complete, visually and physically check the cables are undamaged, properly run and terminated.

MAIN VISUALIZATION

Power on and the display visualizes the message "**OZEN AIR TECHNOLOGY**" "**MAESTRO 22**" for about 3 seconds, then it shifts to the main visualization with the compressor in OFF status.

The figure below shows the main visualization[1].
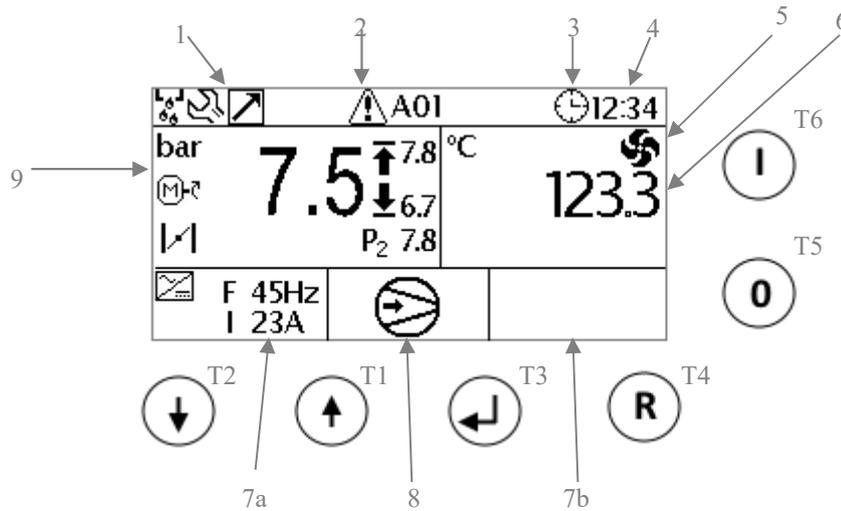
In reference to the above figure, the main visualization is described as below:

1. General icons:
   - I01, Condensate drain in operation
   - I02, Multiunit operation
   - I03, Master/slave operation
   - I04, Maintenance messages
2. Alarm or maintenance messages: If an alarm is detected, the display visualizes the icon I05. If maintenance timer is over, the Maestro visualizes icon I04.
3. Start/stop by timer activated.
4. Time (hours and minutes.)
5. Icon I14 when fan is ON
6. Air end temperature.
7. Inverter area: Data is visualized when output 4 - 20mA or RS485 inverter are enabled. If output 4 - 20mA is activated, the display shows the PID frequency set (F) and data set on the input 4-20mA (parameter C19.) If the inverter is connected via RS485, all of the data from the inverter are visualized: frequency (F,) current (I,) power (P,) and temperature (T.) Data are visualized on the right side (7b) or left side (7a,) according to the inverter configuration.
8. Compressor status: Icons I07 to I13 as shown below:
   - Compressor OFF
   - Waiting for safety timer
   - Pressure set
   - Remote start/stop open
   - Compressor ON
   - Waiting for start/stop by timer: The display visualizes the day of the week and time of the next ON timer.
   - Waiting for internal pressure P_2 to be lower than parameter AP4.
9. Pressure area:
   - Working pressure (large display) and stop/start pressures.
   - Aux pressure transducer (if enabled.)
   - Icon I17, motor run
   - Icon I18, load solenoid valve open

If there is an alarm, the below section of the display (7a, 7b and 8) visualizes the alarm message.

Referring to the figure above, the controller has with six function buttons with the following purposes:

- T1, decrease, scroll down
- T2, increase, scroll up
- T3, change or confirm
- T4, reset or back
- T5, stop compressor
- T6, start compressor

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[1] In a normal operation status, all the icons will not be visualized at the same time. They are shown in this manner for illustrative purposes only.

Meaning of icons

		Main visualization: Icons located in the upper row
I01		Condensate drain activated
I02		Multi-unit operation activated
I03	MS	Master/slave operation activated
I04		Maintenance timer over
I05		Alarm
I06		Weekly start/stop timer activated
		Main visualization: Icons related to compressor status, located in the lower row (center)
I07		Compressor OFF
I08		Waiting for safety timer
I09		Pressure set, compressor running unloaded or stand-by
I10		Remote start/stop input open
I11		Compressor running
I12	MON 12:34	Stopped by timer. The display visualizes day and time of the next start.
I13	P₂	Internal pressure (P2) too high
		Main visualization: Left square = pressure, Right square = temperature
I14		Fan ON
I15		PID and output 4-20mA enabled
I16		Stop pressure
I17		Start pressure
I18		Motor running
I19		Compressor running loaded (load solenoid valve activated)
		Menu setting: Date, time, contrast, units of measurement
I20		Unit of measurement activated
I21		Contrast
I22		Language
I23		Date and time

QUICK SETTING START/STOP PRESSURES

To change the START pressure, push ↓ and the data starts blinking. Change the value by using ↓ and/or ↑ and confirm the new setting by ↵ . The setting stops blinking. By pressing the RESET button, you can abort the modification.

To change the STOP pressure, push ↑ and the data starts blinking. Change the value by using ↓ and/or ↑ and confirm the new setting by ↵ . The setting stops blinking. By pressing the RESET button, you can abort the modification.

GENERAL NOTES TO THE PROGRAMMING

FLOW AND MODIFICATION OF THE PARAMETERS

To select a menu or parameter value, use the arrow keys to scroll and confirm by pressing ↵ to enter the related parameters and/or data.

After you select the data and/or parameter to change by the arrow buttons, push ↵ to edit. Set the new value by use of the arrow buttons and confirm it by pressing ↵ .

After reaching the last menu or parameter (or by pressing the RESET button,) you can will return to the main visualization screen.

ESC FUNCTION

You can return to the main visualization screen by pushing ↵ for about 5 seconds while in any part of navigation.

ANTIPANIC FUNCTION

After two minutes of idle operation (the last press of a button,) the controller will return to the main visualization screen without saving any change you have not confirmed.

LCD ENERGY SAVING

After one minute from the last press of any button, the backlight of the display switches off. It will turn on again by pushing any button on the controller.

M1   MAIN MENU

To enter the setting menus, push ↵ and the display will visualize the main menu as shown in the table below.

Pressing ↵ for 3 seconds will cause the display to enter the password menu, allowing password level access to the parameters, as noted in the table below (1-service 1, 2-service 2, 3-factory):

Id	Submenu	Password level
01	Info	0
02	Password	1
03	Visualizations	0
04	Compressor setup	1
05	Pressures	0
06	Temperatures	2
07	Timer	1
08	Drive on RS485	3
09	Analog output	3
10	Maintenance	0
11	Maintenance list	0
12	Alarms list	0
13	Timer start/stop	1
14	Reset	1

M2 ENTER PASSWORD

Enter passwords by pressing and holding (3 seconds) ↵ on the main visualization screen.

To select the password level, use the arrow buttons and confirm by pressing ↵ .
Next, enter the password code (2, 4 or 6 digits, according to the desired level.)

Use the arrow buttons to change any digit of the code. Press the ↵ button to shift to the next digit on the right and the RESET button to shift back to the previous digit. The current digit to be entered is indicated by "**-**" while the digit already entered is indicated by the symbol "*****". Once the password is accepted, you will be taken to the main menu according the level selected. If an incorrect password code is entered, the display visualizes the message: "ERROR".

```
Password _____ 1-2

        Service 1

           0-
```
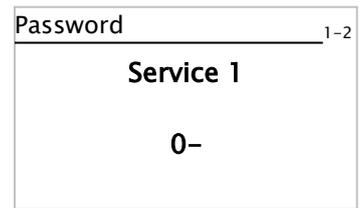
PASSWORD FORGOTTEN

In the case of a forgotten password, cycle power to the controller. Upon power-up, press and hold ↵ for more than 5 seconds. During this time, the display visualizes the blinking message: "Reset Password". Release the button when the message changes to: "Password reset". The password codes will them be reset to the defaults.

M1-1 INFO

This sub-menu visualizes the following info:
1. Working hours
2. Loaded hours
3. Load % during last 100 working hours (updated every 5 hours)
4. Frequency set on output 4-20mA (if enabled)
5. Starts/hour
6. Flow Air Delivered
7. Serial number
8. Software release

NOTE ON WORKING HOURS:
It is possible to modify the counters (only by increasing).
To modify counters:
- enter the factory password
- navigate to the INFO menu
- hold the ↵ button for 2.5 seconds
- the first row of the INFO list (running hours) is highlighted.
- in this state, it is possible to select running or working (loaded) hours (using the UP/DOWN buttons,) or to begin to edit the selected counter (↵ button,) or to go back to the list with no selection made (RESET button.)
- by pressing ↵ , the selected digit of the counter begins to blink. It is possible to change it using the UP/DOWN buttons. Step over to the right digit with ↵ or go back to left digit with RESET button. When the digit is selected and ↵ is pressed, the new value is stored. If the RESET button is pressed when the digit is selected, then you go back to the previous menu.
- the maximum value is 19,999,999 hours

M1-2 PASSWORD

This sub-menu allows the change of the saved password codes.
Parameters, setting range, defaults, and password levels are shown in the table below:

Function	Description	Setting range	Default	Password level
PW1	Password service 1	00 - 99	22	1
PW2	Password service 2	0000 - 9999	6936	2
PW3	Password factory	000000 - 999999	426936	3

M1-3 VISUALIZATIONS SETUP

This sub-menu allows for the setting of the parameters related to the visualization of the controller.

By use of the arrow buttons, select the parameter you need to change and confirm by pressing ↵ to enter the change.

Use the arrow buttons to change the value and confirm the new one by pressing ↵ .

- 🔳 language set (default ITALIAN)
- 🔳 Units of measure - °C-bar, °C-psi, °F-bar, °F-psi – (default °C-bar)
- 🔳 LCD contrast
- 🔳 date/time and automatic shift between DLS and summer time

1-4   COMPRESSOR SETUP

In this menu you can change the general setting of the compressor.
Parameters, setting range, default and password level are reported in the table below:

Code	Description	Value	Meaning	Default	Level
C01	Restart	MAN-AUT	Restart after power off: MAN (manual) – AUT (automatic)	MAN	1
C02	Starts/hour	0 - 60	Starts/hour of the motor allowed	0	2
C03	Timer Wt4	YES-NO	Wt4 timer operation: YES = fixed, NO = variable	YES	2
C04	Control phases	YES-NO	OZEN phase reversal/loss unit: YES = enabled, NO = disabled	YES	1
C05	Safety	YES-NO	Safety operation: YES = enabled, NO = disabled	NO	3
C06	Low voltage	YES-NO	Alarm low voltage: YES = enabled, NO = disabled	YES	1
C07	Multiunit operation	0 - 3	Multiunit options: 0 = stand alone, 1 = Master/Slave 2 = Master/Slave new, 3 = Multiunit Slave	0	2
C07.1	Timer Master/Slave	00 - 200 h	Balancing working hours: If set to "00", balancing is not allowed. Master is the compressor with address = 1	100 h	2
C07.2	Timer slave	1 - 99 min	Slave support: After power on, if Master unit has not reached stop set pressure at the time set in this parameter, the slave starts to support	5 min	2
C07.3	Maintenance mode	YES/NO	In Multiunit Slave, the compressor works on stand-alone and Multiunit Master is informed that this compressor is out of order	NO	2
C07.4	Inverter twin	YES/NO	Both inverters modulating in Master/slave operation new YES = both inverters modulating NO = master max speed if both units are running	0	1
C08	Compressor #	1 - 32	Enter MODBUS address of the compressor	1	2
C09	Serial #	15 alphanumerical characters	Serial number of the compressor		3
C10	Flow Air Delivered	100 / 99990	Capacity: nominal air flow of the compressor (liters/min.)	1000 l/min	3
C11	Input PTC	YES/NO	Input PTC configuration: NO = disabled, YES = enabled	0	3
C12	Input IN 7	0 - 3	Input IN7 configuration: 0 = disabled – 1 = door open 2 = control phases relay – 4= alarm	0	3
C13	Output RL2	0 - 6	Relay RL2 setting: 0=default (star contactor) 1 = fan 2 = condensate drain 3 = compressor status 4 = alarm 5 = motor activated 6 = load valve on 7 = lubricating 8 = off 9 = activation on power on for the time Wt5 10 = activation on power on for the time Wt5 and activation in case of alarm	0	3
C14	Output RL5	0 - 6	See C13	0	3
C15	Output RL6	0 - 6	See C13	0	3
C16	Output RL7	0 - 6	See C13	0	3
C17	Shut-off C—h	NO/YES	Compressor stop once the timer "Check compressor" is over: NO = disabled – YES = shut-off alarm	NO	3
C18	Output 4 - 20mA	0 - 2	Operation output 4 - 20mA and PID: 0= disabled 1 = enabled on working pressure control 2 = enabled on air end temperature control	0	3

C19	4-20mA Input	0 - 4	Configuration auxiliary input 4 - 20mA: 0=disabled – 1= relative pressure (delta in relation to the working pressure) – 2=power inverter – 3=current inverter 4=inverter temperature	1	3
C19.1	Timer separator filter	1 - 600 sec.	Delay timer separator filter alarm	30s	3
C19.2	Top range AI	10 - 999	Enabled if C19 is set from 2 to 4. This is the top range related to the current 20mA used to read the data from the invertor on the main visualization screen.	100	3
C20	Temperature probe	0 - 1	0=All the alarms related to the temperature are disabled. Ventilation is operated by ON/OFF fixed cycles managed by the next parameters C20.1 and C20.2 1=KTY 2=NTC	1	3
C20.1	Time Fan ON	10 - 9999s	Time ON fan in case of temperature probe disabled	500	3
C20.2	Time fan OFF	10 - 9999s	Time OFF fan in case of temperature probe disabled	500	3
C21	Drive Fault Input	0 - 2	0=Disabled 1=Input enabled, managed normally open 2=Input enabled, managed normally closed	0	3
C22	Lubricating time	1 - 999s	Activation time of lubricating relay – **NOT USED FOR OZEN**	2	3
C23	Interval lubricating	0 - 99990m	Time to lubricate – **NOT USED FOR OZEN**	11000	3

NOTES:

C01–RESTART: Upon loss of power, by selecting "MAN", the compressor will not start automatically, and the display visualizes "POWER OFF". By selecting "AUT", the compressor will restart automatically according to delay time set in Wt5. During this time, the display visualizes "WAIT". If you modify the setting, it is recorded into the alarm history and it can only be cleared by a GENERAL RESET.

C05–SAFETY: If you set to "YES", once the timer "CAF" is satisfied, the display visualizes the message "Shut-off for safety". If this parameter is set to "NO", the alarm code issued will be "Change air filter".

C07–MULTIUNIT OPERATION: If set to "0", the compressor works as a stand-alone unit. If set to "1", the compressor communicates with a second unit via serial RS232 as Master/Slave (see related working program,) and the controller visualizes the parameters 07.1 and 07.2.

C07.1–TIMER MASTER / SLAVE: This is the time to rotate Master into Slave. If the difference in working hours between the two compressors is bigger than the setting of this parameter, the unit with more hours will not be Master until the other unit reaches first unit's working hour total.

C07.2–TIMER SLAVE: After power ON, if the Master unit has not reached the stop pressure until the time setting in this parameter, the Slave will start in order to support.

C08–COMPRESSOR Nr.: If Master/Slave is enabled, the compressor set as 1 will be the Master unit.

C09–SERIAL NUMBER: The display visualizes the serial number on the right-side row, third from the bottom. Push ◄⌐ to edit. You can select the characters by the arrows buttons. Pressing ◄⌐ will shift the selection forward to the next character. Pressing RESET will shift back to the previous character. You can escape the editing by pressing the RESET button when the cursor in on the first character. Entering two characters in a row or reaching the maximum number of characters (15) will cause the serial number to be saved.

C17–Shut-off for C—h: Alarm related to the maintenance timer C--h (check compressor.) If "YES" is selected, 100 hours before the timer is over, the compressor shuts down, issuing alarm: "STOP FOR AL32 – CHECK COMPRESSOR".

The alarm can be reset, and the compressor restarted. The compressor will then run for the next 100 hours, but the display will show a reminder every 50 working minutes.

Once the residual 100 working hours are complete, the compressor will shut down again. The alarm can be reset only by resetting the maintenance timer.

NOTE: This is disabled (by default) for Ozen compressors.

C18–Output 4 - 20mA: Allow the upload of factory default parameters into menu M1-9. Two different default sets are provided according to whether the regulation is related to the working pressure or air end temperature.

C22-C23: These parameters are enabled if one of the output relays is configured as value 7 (lubricating) in parameters C13 to C16. If activated, the relay allows automatic lubricating in accordance with the settings on C22 and C23. The time to lubricate is calculated on the BL timer.

M1-5 PRESSURES

In this menu you can change the setting related to the working pressure.
Parameters, setting range, defaults, and password levels are shown in the table below:

Function	Description	Setting range	Default	Password level
WP1	Top range transducer	15 - 60	16 bar	3
WP2	High pressure alarm	(WP3+0.2) - (WP1-0.5)	11.0 bar	2
WP3	Stop pressure	(WP4+0.2) - (WP2-0.2)	10.0 bar	2
WP4	Start pressure	3 - (WP3-0.2)	8.5 bar	2
WP5	Slave start pressure	2.8 - (WP4-0.2)	8.3 bar	2
WP6	Offset	-2.0 - +2.0	0 bar	2
AP1	Separator filter alarm	(AP2+0.2) - (WP1-0.5)	1.7 bar	3
AP2	Separator filter warning	0.1 - (AP1-0.2)	1.2 bar	3
AP3	Offset	-2.0 - +2.0	0 bar	3
AP4	Max internal P	(WP1-0.5) – 1.0	2.0 bar	3

NOTE: WP5 is visualized in case the compressor has been set to Master/Slave operation (see menu 4 Compressor SETUP).
Parameters AP1 to AP4 are visualized only if the security transducer has been configured in COMPRESSOR SETUP and if the parameter C19 is set 1 or 2.
AP4 is the maximum internal pressure allowed in order to run the motor (see icon I13, page 11).

M1-6 TEMPERATURES

This menu allows the changing of the settings related to temperature.
Parameters, setting range, defaults, and password levels are shown in the table below:

Function	Description	Setting range	Default	Password level
WT1	High Temp. alarm	(WT2+2°C) - 125°C	110 °C	3
WT2	High Temp. warning	(WT3+2°C) - (WT1-2°C)	105 °C	3
WT3	Start fan	30°C - (WT2-2°C)	85 °C	2
WT4	ΔT fan stop	5°C - 15°C	5 °C	2
WT5	Low Temp	-10°C - +15°C	-10 °C	2
WT6	Offset	-10°C - +10°C	0 °C	3

M1-7 TIMER

This menu allows the changing of the timer settings.
Parameters, setting range, defaults, and password levels are shown in the table below:

Function	Description	Setting range	Default	Password level
Wt1	Star	2 - 20 sec	5 sec	3
Wt2	Star/Delta	10 - 50 ms	20 ms	3
Wt3	Delta	1 - 900 sec	2 sec	3
Wt4	Unload	0 - 600 sec	120 sec	2
Wt5	Safety	0 - 240 sec	10 sec	3
Wt6	RL6 On	1 - 10 sec	2 sec	1
Wt7	RL6 Off	1 - 10 min	3 min	1

NOTE: When changing the set value, the new one is loaded once the counting in progress is completed.

M1-8 INVERTER RS485 (DANFOSS)

This menu allows to visualize/set the parameters related to the inverter in case of connection via RS485 (Danfoss available only).

The parameters you can set, related setting range, default and password level necessary to the visualization and modification are described in the table below:

Function	Description	Setting	Default	Password level
DR0	Drive Model	0 - 3	0	3
DR1	Min frequency	0Hz - (DR2-5Hz)	30Hz	3
DR2	Max frequency	(DR1+5Hz) - 300Hz	85Hz	3
DR3	Accel. time	0.0s - 300.0s	40.0s	3
DR4	Decel. time	0.0s - 300.0s	4.0s	3
DR5	PID prop. gain	0.00 - 99.99	4.40	3
DR6	PID int. time	0.00s - 99.99s	2.00s	3
DA0	Motor Power	0.00KW - 400.'KW	57.6KW	3
DA1	Motor Voltage	0V - 2000V	415V	3
DA2	Motor Frequency	8Hz - 200Hz	87Hz	3
DA3	Motor Current	0.1A- 999.9A	106.0A	3
DA4	Motor Speed	0RPM - 9999RPM	2575RPM	3
DA5	Current Limit	0.0% - 200.0%	100.0%	3
DA6	PID Diff. Time	0.00s - 99.99s	0.00s	3
DA7	Reset Energy Meter	0 - 1	0	3
DA8	Jog Ramp Time	0.0s - 300.0s	20.0s	3
DA9	PID int. mult.	0.10 - 4.00	1.00	3
Setup Drive				

NOTE:

DR0:

0 = No inverter via RS485

1 = Vacon NXL

2 = Vacon NXS

3 = Danfoss

If you set the parameter to a value different from 0 on parameter DR0, you enable inverter operation via RS485 and related alarms 60, 61, and 62.

After the last parameter, DA9, "Setup Drive" is visualized. This allows parameters DR1 to DA9 to be sent to the inverter. Additionally, all other relevant inverter settings, such as drive PID enable, drive PID setpoint, feedback source, etc., are programmed into the drive.

After confirming "Setup Drive", the LCD visualizes the following screen:

Setup Drive
Drive ready
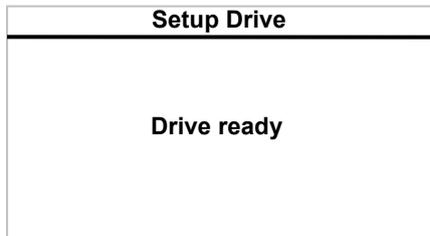
The drive status is visualized in the middle of the LCD display.

When the parameter download is in progress, progress status (in percentage) of the setup will also be visualized.

Pressing ◄┘ will start the programming of the drive. Setup requires approximately 5 minutes.

Pressing RESET will abort the setup. This will cause the display to return to menu M1-8.

M1-9 ANALOG OUTPUT

This menu is visualized only if the safety pressure transducer has been configured in the menu COMPRESSOR SETUP (parameter C18 different from 0.)

The analog output is determined by a PID calculation.

The analog output can be connected to the electrical motor inverter or fan motor inverter. Parameter C18 must be set 1 for electric motor or 2 for fan motor.

In the case of electric motor, the regulation is made by pressure. The setpoint of the PID calculation is placed in the middle of the interval between start pressure (WP3,) and stop pressure (WP4.) Example: WP3 = 7 bar and WP4 = 8 bar, setpoint will be 7.5 bar and PID will try to keep the working pressure near the reference value by increasing the inverter output (frequency) if the pressure is lower than the start set point and decreasing the output if the pressure is higher than the stop pressure.

In the case of the fan motor, regulation is made by temperature. The set point of the PID calculation is the value set on WT3 (fan start.) PID will try to keep the air end temperature around such reference value by increasing the inverter output (frequency) if the temperature is higher than the set value and decreasing the output if the temperature is lower than the set value.

Menu M1 - 9 allows visualization and setting of the parameters related to the PID regulator.

The figure below shows the PID calculation.
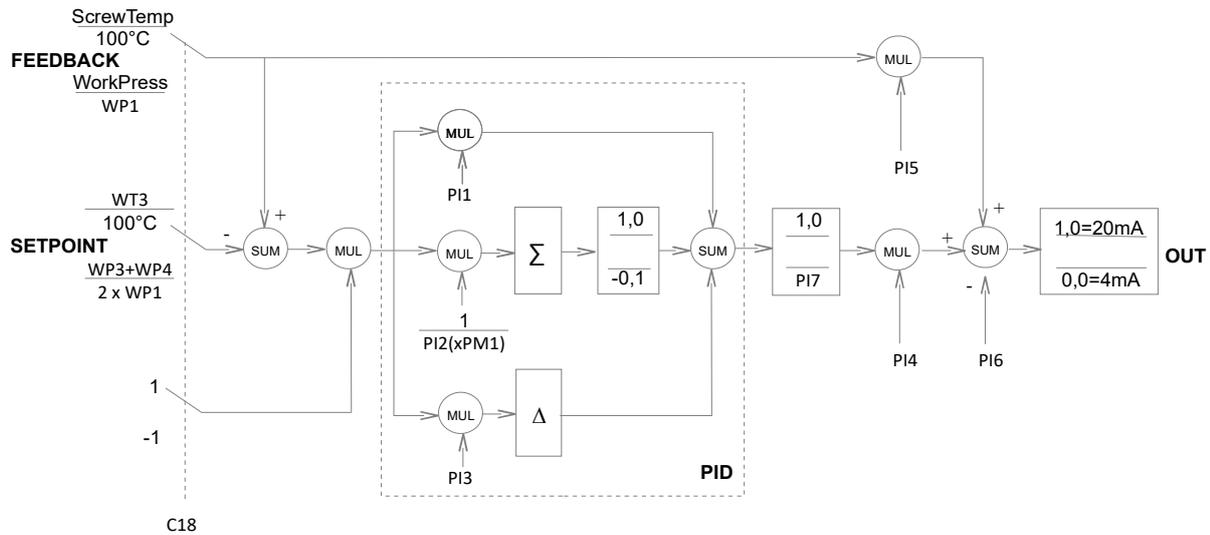
Parameters, setting ranges, defaults, and password levels are shown in the table below:

Function	Description	Setting range	Default Press/Temp	Password level
PI1	PID prop. gain	-99.99s - 99.99s	2.50/5.00	3
PI2	PID int. time	-99.99s - 99.99s	10.00s/15.00s	3
PI3	PID der. time	-99.99s - 99.99s	0.00s/0.01s	3
PI4	PID out scaling	-99.99s - 99.99s	1.00/2.30	3
PI5	Adder multipl.	-99.99s - 99.99s	0.00/0.05	3
PI6	Adder offset	-2.00 - 2.00	0.00/0.76	3
PI7	PID low limit	-2.00 - 1.00	0.00/-100	3
FR1	Min. Freq.	0Hz - (FR2 – 5Hz)	25Hz/25Hz	3
FR2	Max. Freq.	(FR1 + 5Hz) - 500Hz	50Hz/50Hz	3
PT1	Ramp up time	0.1s – 99.9s	5.0s	3
PT2	Ramp down time	0.1s – 99.9s	5.0s	3
PT3	Jog Ramp time	0.1s – 99.9s	5.0s	3
PM1	PID I gain multiplier	0.01 – 9.99	1.00	3

NOTE:

For all the above parameters, two default sets are provided according to the method of control, pressure or temperature (set on parameter C18.)

PID output (limited to a value of 0 to 1) is proportional to output current: frequency FR1 (PID output=0) corresponds 4mA and frequency FR2 (PID output=1) correspond 20mA.

The frequency reference on the inverter must be set so that the 4 - 20mA input corresponds to the frequency range you require. The range must be set on both parameters, FR1 and FR2.

PT3 (jog ramp time) only applies upon startup of the machine. It is the amount of the time that is allowed for the motor to reach minimum frequency, FR1. After that, PT1 will apply to any further ramp up.

When the compressor loads and the motor speeds up, the ramp up time is limited to the set point of PT1, while the ramp down speed is limited to the set point of PT2.

In the case of pressure regulation, PM1 alters the integrating effect of the error of the setpoint (reaction time or over-shoot.) Specifically, integral time PI2 is multiplied by PM1 when the pressure is over setpoint. If PI2 or PI3 are set to zero, the related integration or derivative action is disabled.

M1-10HOURS FILTERS/OIL

This menu shows the maintenance timers. Entering by a password level above 1 allows entry into the sub-menu to change the values and/or reset the timer.

Function	Description	Setting range	Counter	Reset	Default	Password level
S-A	Service Plan A	0 – 10,000 h	xxxxxx h	NO	2,000	1-2-3
C-b	Service Plan B	100 – 10,000 h	xxxxxx h	NO	4,000	1-2-3
S-C	Service Plan C	100 – 10,000 h	xxxxxx h	NO	8,000	1-2-3
S-D	Service Plan D	100 – 10,000 h	xxxxxx h	NO	24,000	1-2-3
S--	Security	0 – 32,000 h	xxxxxx h	NO	10,000	1-2-3

The counting is related to the ON time of the line contactor (RL1) and counts backward. When the count reaches 0, the display shows the related message and continues as negative counting.
The storage of the hours occurs every 15 minutes. If power is lost during the count, the unfinished time (up to 15 minutes) are lost.
By changing the set value, the residual time is recalculated.
Example: S-A is set to 2000 hours. The counter is 1600, meaning that 400 hours has passed from reset. If you change the setting to 3000, for example, the counter will change to 2600.

M1-11MAINTENANCE LIST

Memory related to resets of the maintenance timer with related date.
If the memory is empty of maintenance resets, the display visualizes the message "Memory empty".
The memory retains the data for 20 maintenance resets. The twenty-first erases the first (oldest) set of data.

Once the maintenance has been completed, the related timer must be reset. If not reset, the display will visualize the related maintenance message every 50 working minutes or every power up of the compressor.

M1-12ALARMS LIST

This menu provides a list of the alarms detected with related progressive number, date, time, and cause.
For the maintenance alarm, the display shows the icon I04 and the icon I05 for shut-off alarm.
The memory has a capacity of 20 alarms. Each subsequent alarm past 20 will erase the oldest alarm. If the memory is empty, the display visualizes the message "**Memory empty**".

M1-13 TIMER START/STOP

This menu allows the management of the compressors start and stop times by a weekly timer (sequencing.)

When editing the timer, the display visualizes the parameter T01 "Enable timer". If YES is selected, the display shows the link to the sub-menu, which is where programming of the start/stop program occurs and T02 ("Weekly timer",) is located.

This sub-menu allows the setting and modification of three working bands for every day of the week.

Initially, the day of the week is selected.

Use the arrow buttons to select a day. Scrolling past the last day (Sunday) will cause the display to shift back to the previous menu.

Pressing ↵ will navigate to the start time of the first interval, T1.

Use the arrow buttons to change the time and confirm it by pressing ↵ or arrow back to select the previous data.

The next press of the ↵ button allows selection of the hours and minutes of all start/stop events visualized.

When the stop minutes of the last interval of the day are selected, pressing ↵ will navigate to the setting of the next day.

Pressing and holding the RESET button will navigate back to the previous menu, ending the visualization/setting of the weekly timer.

Timer start/stop	1-13
T01 Enable timer	YES
T02 Weekly program	

Weekly timer		1-13-1
Mon	Start	Stop
T1	00:00	00:00
T2	00:00	00:00
T3	00:00	00:00

M1-14 RESET

Description	Password level
Working hours	3
Alarms list	2-3
Maintenance list	2-3
Weekly timer	1-2-3
Compressor Setup	3
General	3

Select the message desired to be reset and press the ↵ button. The display will visualize a confirmation message.

To start the reset, select YES.

The display will visualize the blinking message "RESETTING" for a few seconds and then the reset will be complete.

NOTE:

GENERAL reset is allowed only when the compressor is "OFF". The controller will load all factory default values.

ALARMS

ALARMS WITH IMMEDIATE COMPRESSOR SHUT-OFF

Code	Description	Cause
01	EMERGENCY STOP	Emergency stop button open (IN1)
02	MOTOR OVERLOAD	Thermal motor overload open (IN2)
03	THERMAL FAN	Thermal fan motor overload open (IN3)
04	NO PHASE	One or more phase missing for over 300 ms
05	WRONG PHASE	Phase inverted
07	DOOR OPEN	IN7 open (only active if parameter C12 = 1)
09	DRIVE FAULT	Input relay fault drive open/closed (alarm managed with input enabled only (C21 = 1/2))
11	HIGH PRESSURE	Working pressure over set WP2
12	T. PROBE FAILURE	Air end temperature probe failure
13	HIGH TEMP.	Air end temperature over set WT1
14	LOW TEMP.	Air end temperature lower than set WT5
15	SEPARATOR FILTER	Delta P (internal pressure – working pressure) over shut off set AP1 once the timer C19.1 is over and air end temperature is over 45°C / 113°F (alarm managed when the aux pressure transducer is enabled into differential operation (C19 = 2))
18	POWER OFF	Loss of power and compressor set to manual restart
20	TEMP. MOTOR	PTC input open
21	SAFETY PRESSURE SWITCH	Safety pressure switch open (missing power to all digital inputs)
22	INPUT IN7	Parameter C12 = 3 (generic alarm)
25	SEPARATOR FILTER	Separator filter differential pressure switch open (IN6)

ALARMS WITH COMPRESSOR SHUT-OFF AFTER 30 SECONDS OF UNLOADED RUNNING

Code	Description	Cause
26	PRESS. TRANSD. FAILURE	Working pressure transducer failure
27	AUX. TRANSD. FAILURE	Aux. pressure transducer failure
28	LOW VOLTAGE	Power supply to the controller is lower than 9.5VAC. Reset is only accepted when the power is above 10.6VAC. It is not visualized if it has been disabled in menu 4 COMPRESSOR SETUP
29	SAFETY	Timer CAF elapsed. This alarm is detected if the parameter "Safety" is set YES
30	HIGH TEMP. WARNING	Air end temperature over set WT2. Reset once temperature is lower than WT2 - 5°C (41°F)
32	CHECK COMPRESS.	Timer C—h elapsed. Reset the related maintenance timer – disabled by default
33	RS 485 FAILURE	When compressor start/stop is operated via RS232 and the watchdog function is enabled (see MODBUS protocol communication)
60	INVERTER FAILURE	When inverter is operated via RS485, shut off alarm detected (managed by inverter connected via RS485 only (DR0>0))
62	COMMUNICATION INVERTER	No communication to inverter in the case of connection via RS485 (managed by inverter via RS485 only (DR0>0))

NOTE:
Shut-off alarms will cause the alarm LED (DL1) to illuminate. The alarm message is stored into the alarm list. Once the cause of the alarm has been eliminated, push the RESET button to reset the message and start the compressor.

WARNINGS (VISUAL ALARMS)

Code	Description	Cause
30	HIGH TEMPERATURE WARNING	Air end temperature over set WT2. Reset while temperature below WT2 - 5°C (41°F)
35	DATA LOST	Lost default data
36	AIR FILTER	Air filter pressure switch closed (IN5)
37	MULTIUNIT FAILURE	No communication or Master failure. Each Slave works as a stand-alone unit.
38	SEPARATOR FILTER	Delta P (internal pressure – working pressure) over warning set AP2 when the timer C19.1 is over and the air end temperature is over 45°C / 113°F (alarm managed by aux pressure transducer set into differential operation (C19=1)
39	LOW VOLTAGE	Power supply to the controller lower than 11.6VAC. Automatic reset when the voltage rises over 12VAC.
40	HIGH VOLTAGE	Power supply to the controller over 14.5VAC
41	CLOCK FAILURE	Cycle power to the controller. If the problem persists, contact Ozen Air Technology.
42	RS485 FAILURE	Master/slave communication was lost. Auto reset when communication is restored.
43	ORA LEGALE/SOLARE	Automatic change DLS/Summer time
47	STARTS/HOUR	Starts/hour over set on parameter "Starts/hour" (menu 4). The compressor will not stop and continue running load/unload according the pressure set points until the end of one hour from the first start.
61	ALLARME INVERTER	Inverter failure detected in the case of inverter connected via RS485 (managed in case of inverter communication via RS485 enabled (DR0>0))

NOTE:
- Warnings will cause the LED (DL1) on the controller to blink. The alarm message is stored into the alarms list.
- If the alarm does not allow automatic reset, it can be manually reset by pressing the RESET button.

MESSAGES VISUALIZED INTO ALARM LIST ONLY

Code	Description	Cause
48	MAN RESTART	Restart changed from automatic into manual
49	AUTO RESTART	Restart changed from manual into automatic

MAINTENANCE MESSAGES

Code	Description	Cause
50	Service Plan - A	Timer S-A in menu 10 elapsed
51	Service Plan - b	Timer S-b in menu 10 elapsed
52	Service Plan - C	Timer S-C in menu 10 elapsed
53	Service Plan - D	Timer S-D in menu 10 elapsed
54	Security	Timer S-- in menu 10 elapsed

The message is shown with the ⚒ symbol and related code.
If you reset the alarm only, the ⚒ icon will remain in the left upper corner of the display until you reset the counter, too.

HOW MAESTRO 22 CONTROLS THE COMPRESSOR

Management of the compressor
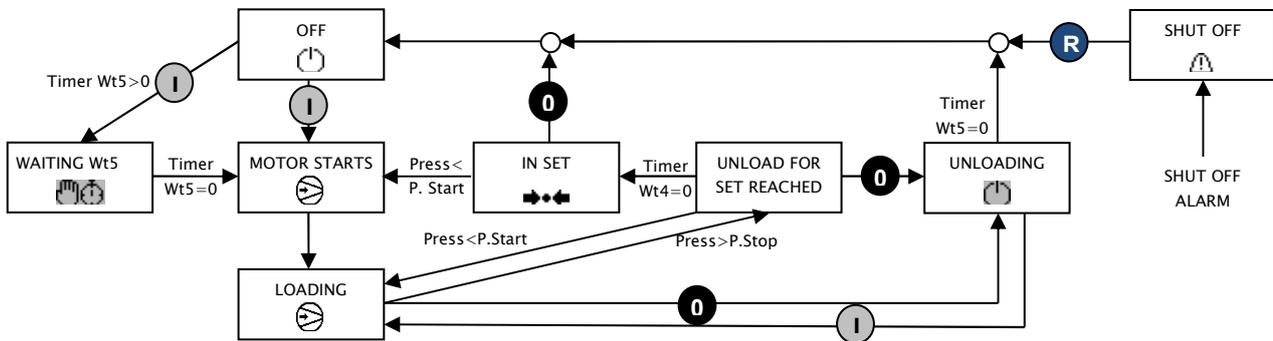
The symbols in the above squares indicate the compressor status showed on the main visualization of the LCD.
The back is grey while the symbol is blinking.

Motor start
When the motor is activated, the ⌷ icon is visualized on the section related to the pressures.
The motor starts according the following procedure:
1. Line contactor and star contactor are activated for the time set on Wt1.
2. Star contactor deactivates and there's a pause for the time set on Wt2.
3. Delta contactor activation.
4. Wait for time on Wt3, activation of load solenoid valve by energizing RL4.

Safety time Wt5

Pressing **0** will cause the compressor to shut down according the following procedure:
1. If the compressor is loaded at the time, it unloads and runs unloaded for the time set on Wt5. While the timer is in progress, restart can be achieved by pressing the start button.
2. If the compressor is running unload and the value of Wt4 is higher than the Wt5 setting, the compressor shuts down.
3. If the value of Wt4 is lower than the Wt5 setting, Wt5 continues counting and the compressor will stop once the Wt5 timer is satisfied.

If the compressor shuts down after reaching the stop pressure set point, timer Wt5 starts. If the start button is pressed during that time, the display visualizes ⌷ and the compressor will not start until the Wt5 timer is satisfied.
If the compressor stops due to alarm detection, timer Wt5 starts. During that time, if you reset the alarm and press the start button, the symbol ⌷ starts blinking and the compressor will not start until timer Wt5 is satisfied.

Stop the compressor through remote start/stop input - IN4 (status symbol ⊡)
When input IN4 opens, the compressor shuts down according the following procedure:
1. If the compressor is loaded at the time, it unloads and continues to run unloaded for the time set on Wt4 and the display visualizes the blinking symbol ⊡ (instead of ⌷.) If IN4 is still open once the time is satisfied, the compressor shuts down and the symbol ⊡ stops blinking. If IN4 closes during the countdown of Wt4, the compressor shifts back to pressure transducer control.
2. If the compressor is running unloaded when Wt4 is satisfied, it shuts down and the display visualizes ⊡.
3. If the compressor is in stand-by status due to the pressure set point being reached, the display visualizes the symbol ⊡.

Solenoid valve operation (RL4)

The ⼂ symbol indicates that the load solenoid valve is ON (energized.)

The unload timer, Wt4, can be managed according two different ways (settable on C03):

1. _Wt4 set as fixed timer_: When the pressure reaches the stop set point, the load solenoid valve (RL4) switches OFF (deenergized,) and timer Wt4 starts. If the pressure has not yet gone below the start pressure once the timer is satisfied, the compressor shuts down. If the pressure goes down below the start set point while the timer is active, the load solenoid valve (RL4) switches to ON and Wt4 is zeroed and ready for the next count upon unloading.

2. _Wt4 set as variable timer_: At the first start, the compressor follows the same cycle as number 1. During the next cycle, the controller counts the amount of time the pressure takes to go down from stop set point to start set point. If this time (tx,) is longer than the Wt4 set point, the next Wt4 time will be shorter (1 minute less.) This continues for each subsequent cycle until a minimum time of 2 minutes is achieved. If tx ends up being lower than Wt4 (after the change,) the unload time will revert back to the Wt4 set point again.

ATTENTION: **An RC filter (22 ηF + 100 Ω,) sized for a power of 4.7W, is mounted on the solenoid valve relay contact. If a solenoid valve with less power is used, the RC filter must be removed if the solenoid valve chatters or remains energized while the contact is open. The filter can be removed by cutting the terminal of the resistor R11.**

Thermoregulation of the fan (default RL5)

The ✿ symbol indicates that the fan is on.

When the delta contactor is closed:

❖ air end temperature equal or higher than WT3 = fan is ON
❖ air end temperature lower than (WT3 - WT4) = fan is OFF

Operation of the condensate drain solenoid valve (default RL6)

The ↳ symbol indicates that the condensate drain is activated (energized.)

During the operation of the load solenoid valve (RL4,) the condensate drain solenoid valve (RL6) operates in accordance with parameters Wt6 and Wt7. It is OFF (deenergized) whenever the load solenoid valve is OFF (deenergized.)

Compressor status (settable on RL5, RL6, or RL7)

When the compressor is ON, the relay is activated. When the compressor is OFF due to the stop pressure set point being reached, the relay is OFF.

Compressor start/stop under weekly timer control

When the compressor is operated by a weekly timer, the display visualizes the symbol 🕐 with day and time of the next ON period when it is in an OFF status. During operation, the same symbol is visualized at the top right corner of the display.

When the compressor is in operation under timer control, it can be stopped by simply pressing the STOP button. Operation under timer control can be restored by pressing the START button.

When the compressor is stopped by the timer, it can be started by pressing and holding the START button for 5 seconds. It can be restored to timer control by pressing the STOP button.

INVERTER OPERATION

INVERTER CONTROLLED VIA ANALOG OUTPUT 4-20mA
If the 4-20mA output is activated (parameter C18,) the display visualizes the ⌁ symbol.
It is visualized below the pressure or temperature area if parameter C18 is set to 1 (regulation by working pressure) or 2 (regulation by air end temperature).

The 4-20mA output must be connected to the analog speed reference on the inverter.

If parameter C18 = 1, the start procedure changes because the star/delta sequence does not apply. Relay RL2 is activated directly (C13 must be configured to 5), timer Wt3 (load time) must be satisfied, and then RL4 (load solenoid valve) is activated. Activation steps for star and star/delta are by-passed. In this configuration, RL3 is always deenergized.

The inverter run command is given from output PNP1.
If it is required to provide the inverter a digital input to force a pre-fixed frequency while the compressor is running unloaded, use the output PNP2.

For the run command you can use also relay outputs RL2, RL5, RL6 or RL7 through external relays. These outputs must be set through parameters C13, C14, C15, and C16 (value 5 if C18 = 1 and value 1 if C18 = 2).

Refer to the PID operating drawing shown in the programming menu section of this manual (see M1-9 ANALOG OUTPUT) for the calculation made by the controller.

INVERTER CONTROLLED VIA RS485
The controller can start and stop the inverter through the RS485 MODBUS interface.

When the compressor is loaded, the inverter PID is enabled. Pressure set points and feedback are communicated through MODBUS.
When the compressor is running unloaded, the controller forces the motor to run at a constant frequency equal to the minimum frequency of the range provided for the motor.

The controller can reset failures or alarms from the inverter through the MODBUS interface.

The controller provides the user with some working data from the inverter, such as frequency, power, current, voltage, and IGBT temperature and, in case of failure or warnings, the alarm/fault message and code.

The controller also reads the working frequency range from the inverter when in this operating condition.

Use of an inverter bypasses the motor start and star/delta steps of the controller.

MASTER/SLAVE OPERATION

The two compressors must be connected through serial connection RS232 BASE (crossing RX and TX) with a cable length no longer than 10 m (32.8 ft.) For longer distances, use interface RS 232/485.

Set C07 as 1 (2 in case of protocol Master/Slave new which allows the connection of two inverter machines.) In the same menu, set the time to switch Master into Slave (parameter C07.1) and the timer for when the Slave comes into operation in case the Master cannot pressurize the system quickly enough upon first start (parameter C07.2.)

Pushing ⓘ on one of the 2 compressors to put both units in operation.
During power up, there is a 5 second wait before the connection between the two compressors is established.

Pushing ⓞ on one of the 2 compressors will place both units in OFF.
If IN4 (remote start/stop) opens on one of the two compressors, it will stop both machines.

If one of parameters WP2-WP5 is modified on one of the two compressors, these parameters are copied on the other compressor. These parameters are date and time, restart (automatic or manual,) weekly timer, and DLS/Summer time.

The Slave compressor starts only if:
1. during the first start by button or timer, the Master has not reached the stop pressure before the timer setting (C07.2.)
2. the pressure decreases below the setting of WP5.

The Master into Slave change occurs:
1. when the timer for Master/Slave is satisfied (working hours)
2. if the Master shuts down for any reason
3. if one of the 2 compressors have more working hours than the time set on the parameter Timer Master/Slave (working hours,) the second compressor keeps on working until it reaches the same working hours of the other plus the hours set on Timer Master/Slave. Only after this time, will the Master change into Slave and the Slave into Master.

NOTE: If maintenance needs to be performed on one of the two compressors, both units must be set as stand-alone units before either one is shut down. Be sure to restore Master/Slave operation after maintenance is completed.

If there is a serial connection failure, both compressors will be Master.

MASTER/SLAVE INVERTER (ONLY FOR MAESTRO 22, MAESTRO 30)

If the controllers connected as Master/Slave are Maestro 22, Maestro 22+, or Maestro 30, it is possible to set the parameter master/slave (C07 on Maestro 22) as 2 on both units. In this case, the system takes into consideration that both machines have a variable air flow (inverter use.)
If the compressors have different nominal air flows, one compressor becomes master if:
a) both units are loaded, and the total air flow is higher than the flow of the current Master machine but lower than the Slave's flow (condition valid for 60 seconds.) After an additional 60 seconds, the Master compressor will switch to the Slave and continue to run unloaded if this conditions continues.
b) the average flow over the last 10 minutes is lower than half of the flow of the Master but between half and full flow of the Slave. This means that controller has determined that the Master is oversized in relation to air demand and it would be more efficient to switch the Slave into the new Master.

If both units are controlled by an inverter, set parameter C07.4 (Inverter Twin,) to determine if both compressors modulate the speed according to the pressure or if the Master unit works 100% (max speed) and the Slave will modulate.

MULTIUNIT OPERATION

Connect a maximum of four (4) compressors through RS485 net and designate one as the Master unit. This is done by assigning the Master as compressor #1 in parameter C08 in COMPRESSOR SETUP. If more than four compressors are to be run in a multi-unit configuration, a Maestro 200 (sequencer) will be needed.

The following parameters must be set:
1. Parameter C07=3
2. Compressor MODBUS address C08: #1 is reserved for the Master unit. The rest of the units must be assigned their own unique number, other than #1.
3. Compressor air flow, parameter C10.

Pressing ⓘ on one of the Multi-unit compressors switches all the units to ON.

Pressing ⓞ on one of the Multiunit compressors switches all the units to OFF.

If maintenance needs to be performed on the compressor, set parameter C07.3 = YES to shift it into stand-alone operation. The Master is automatically informed and will consider this compressor out of order.

WARRANTY TERMS

12 (twelve) months from the production date printed on the label of the serial number.

<u>Temperature probe is not included in the warranty terms</u>.

Both the working and technical features of the controller must be fully respected and understood. The warranty will be voided if the controller has been opened or repaired by unauthorized personnel.

Improper operation or any modifications, incorrect electrical wiring, or improper installation or assembling can cause failures or malfunction of the controller. In these cases, the warranty may be voided, and the technical features of the controller will be degraded.

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OZEN AIR TECHNOLOGY reserves the authority to modify the product to improve operation and performance up to, and including, the right to withdraw the product from the production, at any time and without prior notice.

REVISION INDEX
Revision 0 = Issue
Revision 1 = Upgrade to modify working hours
Revision 2 = Upgrade to modify default values and setting range of some parameters
Revision 3 = Upgrade to Vacon inverter
Revision 4 = Corrected English grammar and spelling. Corrected settings and service plans: S.G. 09/2019