Installation, operation and maintenance manual

CWS MODUL

Rev. 210514

CLIMMA®
MARINE AIR CONDITIONING

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1. IMPORTANT PRECAUTIONS

1.1. Phase sequence

The control box is correctly phased for the phase sequence. This means that if the power supply is connected respecting the correct phase sequence, all connected consumers will be correctly phased up to the terminal box. Pumps and modules must then be connected respecting the sequence, only then will all consumers be phased.

If the sequence is wrong, the scroll compressor runs in reverse, is much noisier and has little efficiency. Furthermore, it can be damaged if it runs in reverse for a few minutes.

Both sea and freshwater pumps will not circulate water if they run in reverse. The direction of rotation of the pump can be checked from the side of the motor where there is a grille protecting the cooling fan.

If the modules are equipped with inverters, the direction of rotation is still guaranteed because the inverter-compressor connection is made at the factory.

For systems with modules without inverters, the switchboard is equipped with a phase sequence relay that prevents operation when the sequence is wrong

1.2. Corrosion

To avoid galvanic corrosion problems (electrolysis) The chiller is equipped with grounding sockets on each sea water condenser. It is mandatory that each condenser is correctly connected to the sea pump and sea socket to keep these components equipotential.

Failure to comply with this specification voids the product warranty and seriously jeopardises the integrity and life of the system and all components in contact with seawater.

1.3. Sea water speed

The seawater condensers of our modules are made of special material (Cu.Ni 90-10Fe) perfectly resistant to the marine environment. However, it is extremely important to observe the maximum flow rate through each exchanger to avoid excessive fluid velocity damaging the tube walls.

To assess the flow rate, it is necessary to measure the temperature difference (delta T) between the outlet and inlet of seawater in the exchanger. The temperature difference must not be less than 6 °C, which ensures that the water velocity does not exceed the safety value.

Failure to comply with this specification invalidates the condenser warranty and puts the modules at serious risk.

1.4. Safety Precautions

Failure to follow all instructions and warnings in this manual can lead to material damage and cause even fatal accidents.

· Improper installation, modification or adjustment can lead to material damage and cause even fatal accidents.

· Electrical connections must be carried out by experienced and certified personnel.

· Electrical connections and earthing must comply with standard coding rules as well as national rules. Failure to comply with these rules can lead to material damage and cause even fatal accidents.

· Before connecting the system to the power supply, check that it corresponds to the chiller's nameplate on the switchboard door. Failure to comply with these rules can lead to material damage and cause even fatal accidents.

· This system must be connected to a permanent, metal-grounded electrical system. Failure to comply with these rules can lead to material damage and cause even fatal accidents.

2. INTRODUCTION

2.1. General information

Thank you for purchasing a Climma CWS system!
This manual will provide necessary information for the proper installation, operation, and maintenance of your Climma system.
Climma chiller and products are designed and produced to the highest standards and they are all tested in the factory. If your Climma system is used according to the guidelines in this manual, it will guarantee you trouble free operation for many years.

2.2. System features

Following the main features of the Climma CWS chillers:
A Climma centralized air-conditioning system includes different products: the Climma chiller, fan coils installed in each cabin, fresh water piping that connects the chiller to the fan coils, sea water piping bringing sea water to the chiller condenser, the fresh and the sea water pumps.
While the Climma system is running in cool mode, the Climma CWS chiller is cooling the fresh water that circulates in the fresh water circuit to the fan coils; heat is removed from the cabins through fan coils, blowing fresh air into the cabins.
While in heat mode (reverse cycle mode), the Climma CWS chiller is heating the fancoil water circuit that brings heated water to the fan coils, allowing them to blow heated air in the cabins.
Special features of Climma CWS chillers:
Modular design with individual compressor modules connected in parallel to obtain the specified capacity.
Water Cooled Inverter Compressor. Climma's water cooled inverter permits a 30% of capacity reduction and zeroes the start amperage. In addition has a complete control on the compressor running, monitoring all the safety devices. Water cooling allows it to be installed in the engine room without additional ventilation. The inverter gives the possibility to run the system in low voltages situation adapting the compressor speed to the voltage available.

2.3. Installation

The unit must be installed by an authorized Climma service center and in compliance with the instructions given in this manual.

2.4. Transport and handling

When loading or unloading the unit, use a fork lift equipped with forks at least 2/3 the length of the shipping base.

Use an overhead lift if the unit is equipped with lifting eyebolts.

Select lifting equipment suited to the weight and overall dimensions of the packaged unit or components.

Take every precaution to prevent damage, when handling the unit or components keeping in compliance with the information given on the packaging material.

2.5. Unpacking

Remove all cardboard, wood or other materials from the wood base. Lift the unit or components by suitable means (e.g. lift truck), remove the wood base, then set the unit or components into position.

Once all packing material has been removed, check that the unit has not been damaged in any way.

Caution: Wear protective gloves when handling any packing materials and the wood base. Dispose of all packaging materials appropriately in accordance with local codes.

2.6. Directives

Climma CWS chillers respect the following directives.

- CE
- Low voltage: 2006/95/EC
- Electromagnetic Compatibility: 2004/108/EC
- Machinery Directive: 2006/42/CE
- Manufacturing quality Standards UNI EN ISO 9001:2008

2.7. General safety

Injuries or accidents caused by failure to comply with the recommendations of this manual are solely the responsibility of the unit operator.

Basic Rules for Safe Operation:

- do not touch the unit with moist or wet hands or feet;
- never operate the unit while barefoot;
- before installation and maintenance operations, disconnect the unit from the power supply. failure to comply may result in injury or death;
- installation and maintenance of this system can be hazardous due to system working pressure and electrical components. Only a Climma certified service center should install and maintain the system;
- to minimize the hazard of electrical shock and personal injury, this component must be effectively grounded;
- during installation and maintenance follow safety codes, wear safety glasses and work gloves;

2.8. Condensate drain

Each CWS Modul is equipped with a stainless steel condensate pan which is designed to take any possible condensate drop developed while running either in cool or in heat mode. This condensate pan is equipped with a central drain threaded port and other holes in the sides of the pan. The central threaded (1/2" BSP) drain must be connected to a proper drain hose. This is a must in case the modules are in a vertical rack configuration, to prevent that any condensate water drops on the module underneath.
The modules are shipped with the central drain and the side holes closed by plastic plugs. The central drain can be plugged and its fitting used to connect one of the side drains.

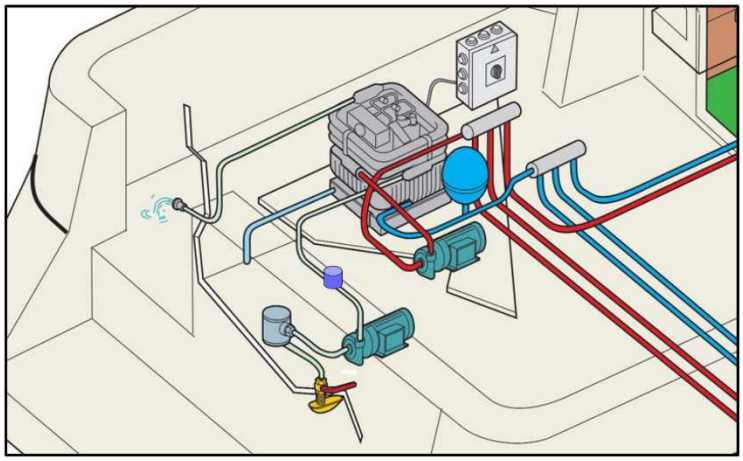
3. INSTALLATION

3.1. SEA WATER CIRCUIT

The sea water circuit must always rise from the sea water intake to the heat exchanger. It is important to avoid ups and downs which will create syphons and prevent the circuit to run properly.

IMPORTANT

The sea water outlet must be installed close to the sea level considering the water out should not make noise for
the boat itself and for the neighbors

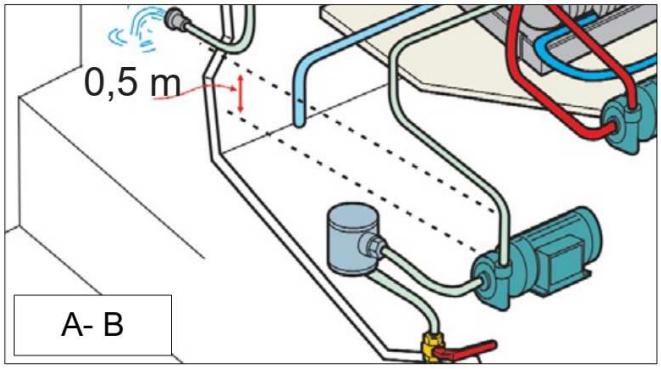


3.1.1. SEA WATER PUMP

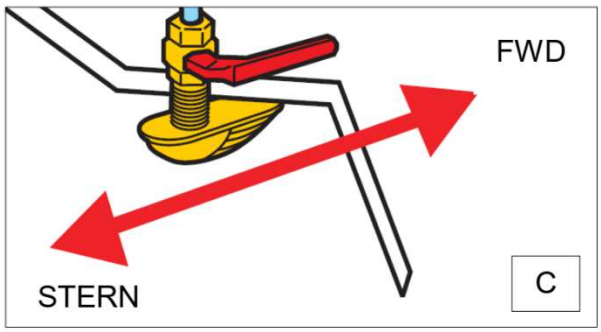
The seawater pump is needed to circulate the given water quantity thru the refrigerant-sea water exchanger. The seawater pump should also be quiet, continuous duty rated, marine grade material construction.

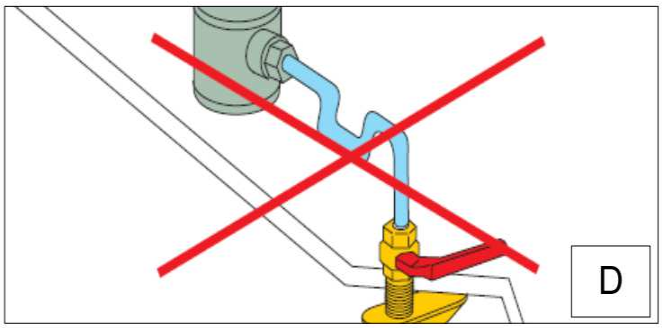
3.1.1.1. Sea water pump positioning

Choose the pump position as per the following rules:
A) The pump should be installed with the shaft in horizontal position and the water outlet at top
B) The centrifugal pump must be installed at least 0.50 m below the water line

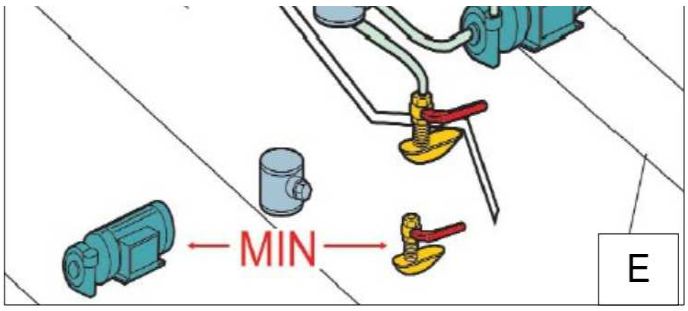


C) The water intake must be "scoop type" oriented forward.
D) Seacock, strainer and pump intake should be connected without siphoning; the piping should always rise from seacock to the pump

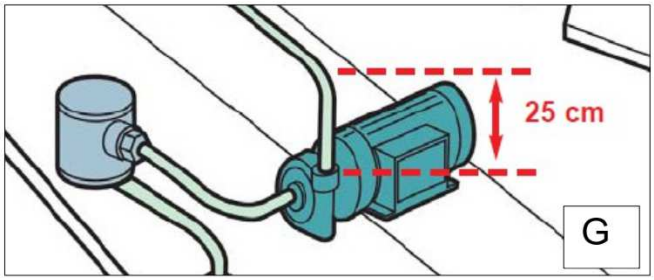




E) The intake line should be as short as possible (it is very difficult to run a good circuit with an intake piping longer than 1 m).
F) The delivery side of the circuit should have the same characteristics as intake so that the circuit will be self bleeding.

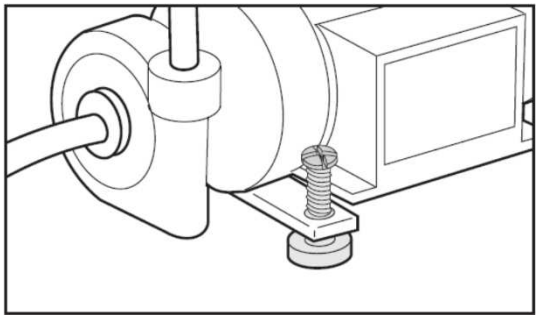


G) The outlet line of the pump should rise at least for 25 cm. (10 in.) just after the pump outlet in order to keep the pump primed at all times.



3.1.1.2. Pump installation

The pump should be fastened with adequate screws using the holes in its base or the special fixing base (available for small models). For larger pumps, the original quiet and smooth running can be improved by using a silent block mounting.



3.1.2. CALIBRATING VALVE

The sea water condensers of our units are made in Cu.Ni special material perfectly resistant to the marine environment. Nevertheless we specify a value for the maximum flow thru the condenser in order not to enter in the danger of damaging the condenser due to high speed.
The measure must be made with the modules running and measuring the temperature difference between the IN and OUT of each condenser.
The temperature difference **SHOULD NOT BE LESS THAN 6 °C** which guarantees that the water flow doesn't exceed the safe speed value.
For this scope it is compulsory to install a calibrating valve on the pump outlet. The calibrating valve will then be set to supply the correct cooling flow to the condenser(s).

Calibrating valve

3.2. FRESH WATER CIRCUIT

3.2.1. Fresh water circuit connections

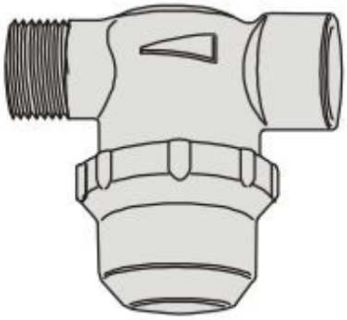
Follow the installation diagrams. It's important to follow the instruction about the orientation and position of all the system components.
To allow an easy maintenance, make sure all the components are accessible. For all the components strictly follow the indication about the water flow direction. Fresh water circuit has to be the shortest and the simplest possible; each single “top” point in the circuit should have a bleeding valve. Leave access to the air bleeding device on the fresh water circuit.
For the lines respect the nominal diameter of the manifolds and leave it accessible, with the air bleeding valve on the top.
Follow the schematics for the expansion tank. The connection port has to be on the top to allow air bleeding.
Follow the schematics for the fresh water pump.
The automatic air bleeder must be installed on the pump outlet. This will prevent that any air in the circuit keeps circulating after the initial air bleeding.
For each fancoil, follow the water flow direction as marked on each unit. Each fan coil has an air bleeding valve that must remain accessible for maintenance.

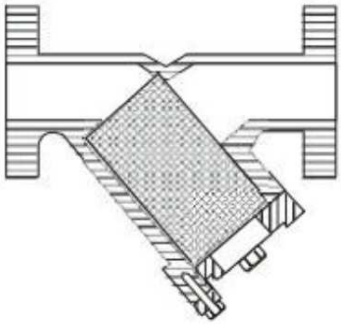
3.2.2. Flow switch

The flow switch is an additional safety equipment that will stop the system whenever the fresh water flow stops or if it is not enough.
The flow switch has to be installed on the fresh water circuit. It has to be accessible for maintenance and for calibration.
The flow switch has to be electrically connected (two wires) to the main electrical box of the unit as specified in the electrical schematic (terminals 1-3 opens on low flow).

3.2.3. Fresh water circuit strainer

It is extremely important that the fresh water circuit contains clean water with antifreeze liquid as specified. Any kind of particles or dirty water is a danger for the circuit components.
For this reason it is compulsory to install a good quality strainer in the fresh water circuit just before the inlet to the modules. The strainer must be of sufficient size not to reduce the water flow and must be installed between valves. The strainer must be not less than 20 mesh or max 0,5 mm passage





3.2.4. Automatic air bleeder

This device makes much simpler both the bleeding of the new system and the following routine maintenance. It must be installed vertically on the outlet of the fresh water pump.

The automatic air-bleeder, once the fresh water pump is primed, bleeds any air which has been trapped inside the circuit automatically. It will be necessary only to bleed the fan coils installed in the highest position as all the remaining air will be bled automatically by this device.

3.2.5. Pressure test

The fresh water circuit has 2 service ports. Each port has a manual valve with check valve to prevent the water in the circuit to go back to the sanitary water circuit.
Use one of the 2 valves and the pressure gauge in order to pressurize the circuit with fresh water at 1,5 Bar; this valve must be connected to the water sanitary circuit in the boat.
Check that the fresh water circuit keeps the pressure over the time, which means that it has no leaks. See also 3.2.6 for the antifreeze mixture.

3.2.6. Antifreeze liquid

The fresh water circuit needs to be filled with water (80%) and antifreeze (20%). Antifreeze will prevent water from freezing in case there is an anomaly in the circulation of the fresh water loop. Antifreeze also reduces the corrosion inside the fresh water circuit.
Always check that the pressure gauge shows 1.5 Bar in the fresh water circuit.
We suggest two methods for filling the fresh water circuit with antifreeze:
1. Calculate approximately the circuit capacity; Fill the circuit with water and add to it 20% of antifreeze, using the second charging valve by gravity or using a pressure pump. Then connect the circuit to the sanitary water circuit of the vessel, pressurize up to 1.5 Bar and start purging the air. It is obvious that if purging will be difficult the percentage of antifreeze will decrease, as more water will be needed to fill the circuit, therefore more antifreeze must be added to the circuit.
2. Empty the circuit from the water used for leak test. Prepare an antifreeze solution of the quantity needed to fill the circuit, made with 20% of antifreeze liquid; fill the circuit using a pressure pump. Then proceed with purging air and topping up the pressure using the solution.

3.2.7. Air bleeding

We strongly recommend that a special “Automatic Air bleeding vessel” be installed in the fresh water circuit, just after the pump outlet. This device will dramatically reduce the bleeding procedure and will also keep the system free of air during its life. The “air-bleeding vessel” is available in several sizes. See 3.2.4.
When the circuit is under pressure with the antifreeze solution, purge the air as follows:
Bleed the entire circuit (manifold, fan coils, and all the other purging points) starting from the lowest level and keeping the circuit pressure at 1.5 Bars.
This bleeding must be done without running the pump. Repeat all points, until no more air comes out from the bleeding valves, still keeping the pressure at 1.5 Bars.
Then...
Set to “off “ position each compressor switch.
Check that seawater intake is open and start the unit in “Cool “ mode; both pumps will run (see also 4.2.7).
Let the fresh water pump run for 30 seconds then stop the system and bleed again all points, keeping the pressure at 1.5 Bars.
During this filling procedure it is normal that the red alarm light (flow switch alarm) sometimes comes on, indicating that there is no flow in the circuit.
Bleeding can be considered over when no more air is coming off the purging points and the fresh water circulation pump runs even and quiet.

3.2.8. Condensate drain of CWS modules

Each CWS Modul is equipped with a stainless steel condensate pan which is designed to take any possible condensate drop developed while running either in cool or in heat mode. This condensate pan is equipped with a central drain threaded port and other holes in the sides of the pan. The central threaded (1/2” BSP) drain must be connected to a proper drain hose. This is a must in case the modules are in a vertical rack configuration, to prevent that any condensate water drops on the module underneath.
The modules are shipped with the central drain and the side holes closed by plastic plugs. The central drain can be plugged and its fitting used to connect one of the side drains.

3.3. ELECTRICAL CIRCUIT

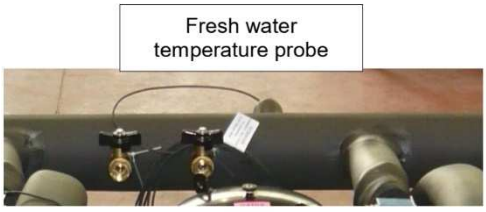
3.3.1. Safety first

AVOID THE RISK OF THE ELECTROCUTION !!!
Only qualified staff can execute the troubleshooting and the repair. Keep isolated from the ground during the execution of the electrical operations, wearing dry clothes, rubber shoes, rubber carpets, etc.... Don’t check wires under voltage if none can bring help.
IMPORTANT NOTE
To avoid possible electrical shocks, that can cause harm or death to people, execute the grounding of the air conditioning system, as indicated:
1- Use a suitable electrical cable with ground wire section and isolation to give the charge from the switch on the control board of the boat to the electrical box of the system. The ground wire must be correctly connected to the ground terminal of the panel.
2- Check that the ground connection between the electrical box and the air-conditioner hasn’t suffer any damage during the transport.
3- Check that the connection of the water pump to the suitable terminal of the electrical box includes also the ground connection.
4- Check the ground continuity before switching off the air-conditioner.

3.3.2. General

Electrics are composed by:
a) Main electrical box
b) Individual connection box (1 per each module)
already connected to the module controls and safeties
c) Fresh water temperature probe (installed in the return fresh water manifold)
d) Flow switch supplied separate and installed at the end of the fresh water manifolds (see 3.2.2)
The unit must be installed on a dedicated circuit with a rated circuit breaker. The circuit breaker and

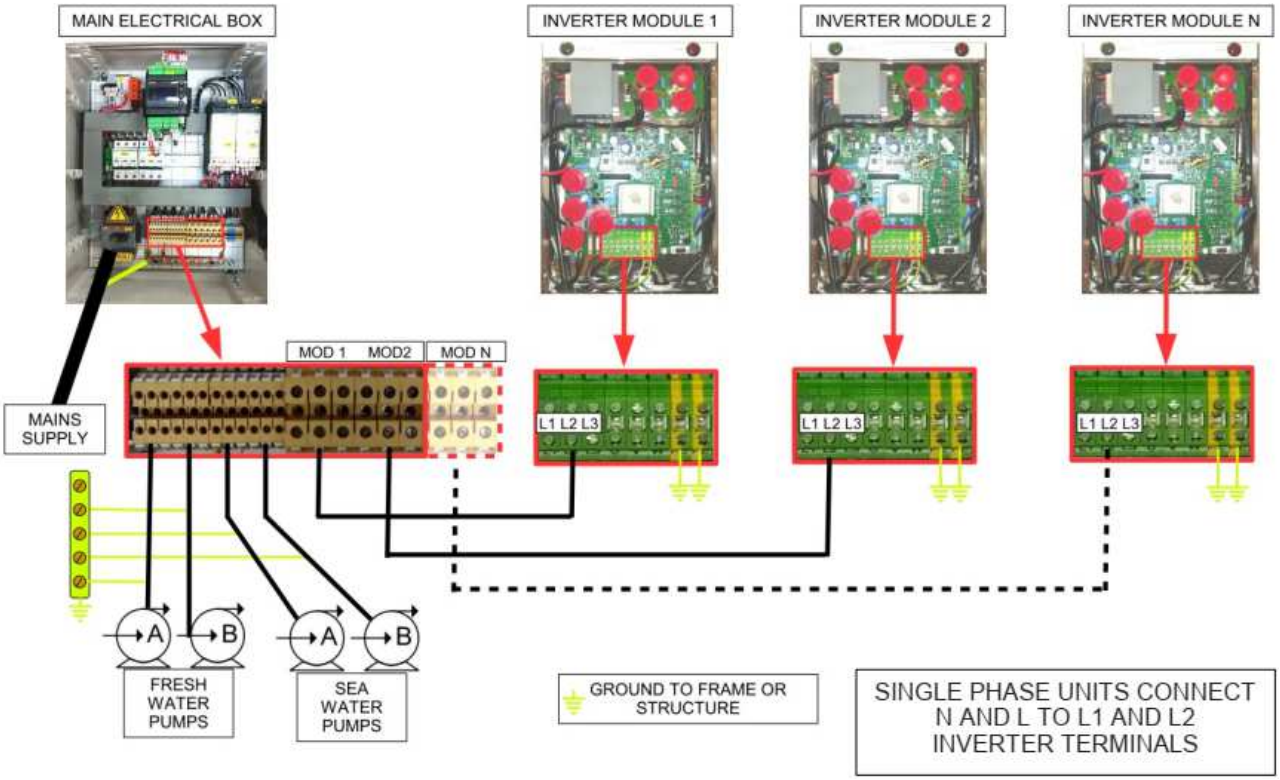
electric cable (power supply) must be rated for the unit and comply with all local and national rules.
Connect the main control box to each module, as shown in the electrical schematic, using an adequate cable, respecting the marking in the main electrical box and in the module box. The numbering must follow the electrical schematic supplied.
The flow switch (no polarity) must also be connected to the terminal board of the main electrical box as indicated in the electrical schematic.
Never run the system without connecting the safety flow switch (see 3.2.2).



- All the electrical connections must be made by electrical engineers observing the specific rules of the country where the system is installed.
- The system bust be grounded with a properly dimensioned wire. The ground must be connected to the unit frame with a single wire of the proper size.
- The supply cable must be dimensioned to the system maximum power Tthesame for the pumps cables.
- The system supply must be protected by a circuit breaker. Before any intervention on system components the power supply must be cut.

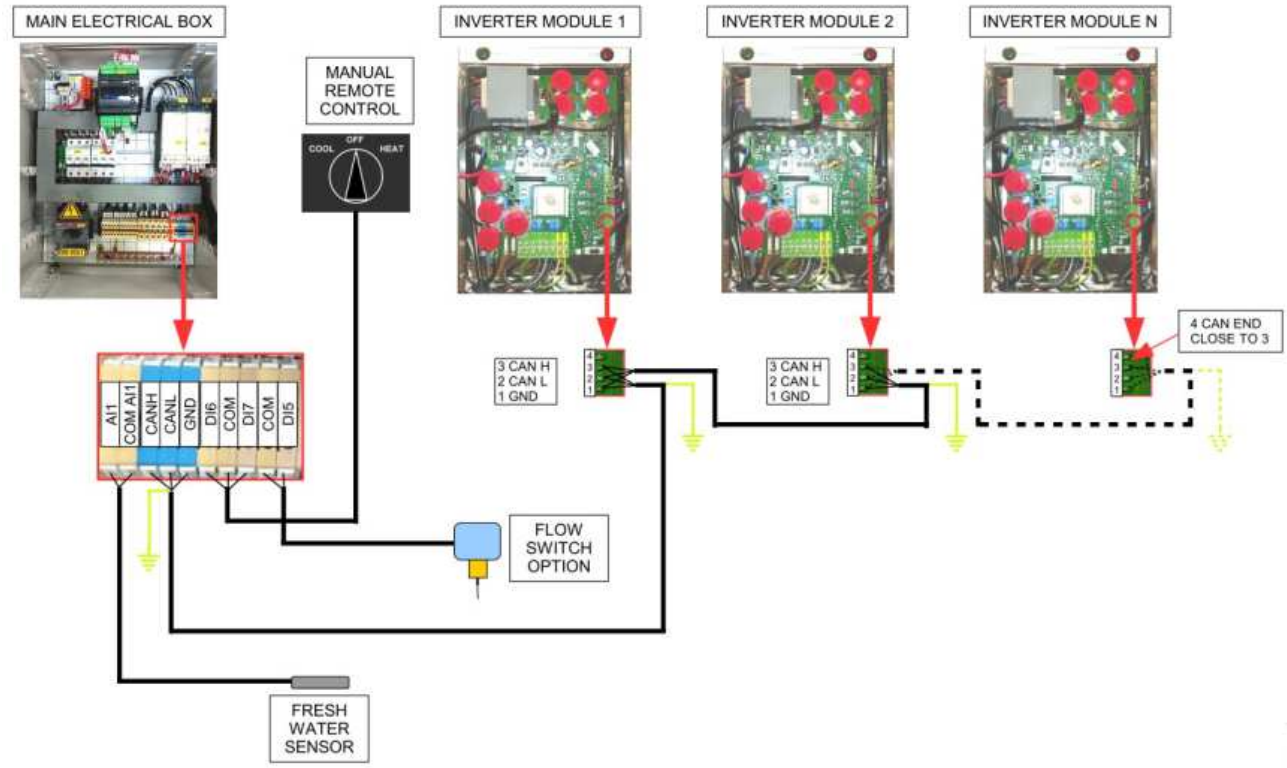
3.3.2.1. Electrical power connections for modules with inverter

The unit must be connected to dedicated circuit with a rated circuit breaker. The circuit breaker and electric cable (power supply) must be rated for the unit and comply with all local and national rules.
Connect the main control box to each module, as shown in the electrical schematic, using an adequate cable, respecting the marking in the main electrical box and in the module box. The numbering must follow the electrical schematic supplied.
The flow switch (no polarity) must also be connected to the terminal board of the main electrical box as indicated in the electrical schematic.
Never run the system without connecting the safety flow switch (see 3.2.2).

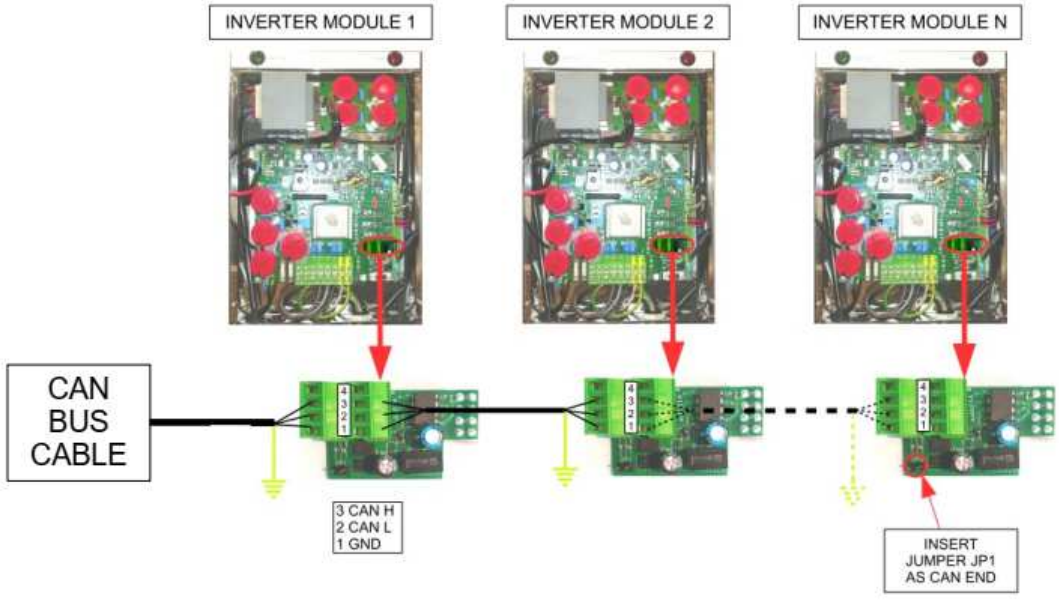


3.3.2.2. Electrical control and CAN bus connections schematic with integrated CAN processor (inverters produced before 06/2020)

Check that the available supply corresponds to the label on the unit, on the box and on the electrical pump.
The electrical box of the air-conditioner must be connected to mains supply thru a suitable circuit breaker.

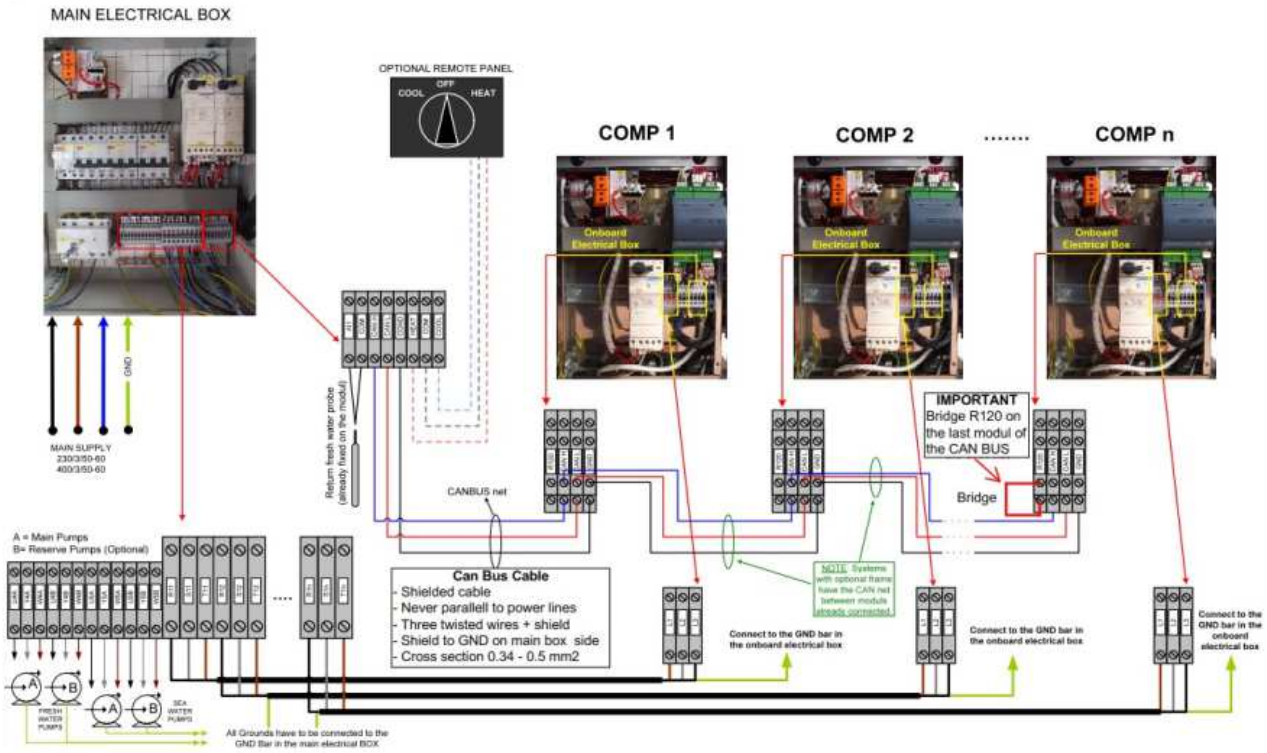


3.3.2.3. Electrical control and CAN bus connections schematic with CAN processor on a separate PCB (inverters produced from 06/2020)



3.3.3. Electrical power connections for modules without inverter

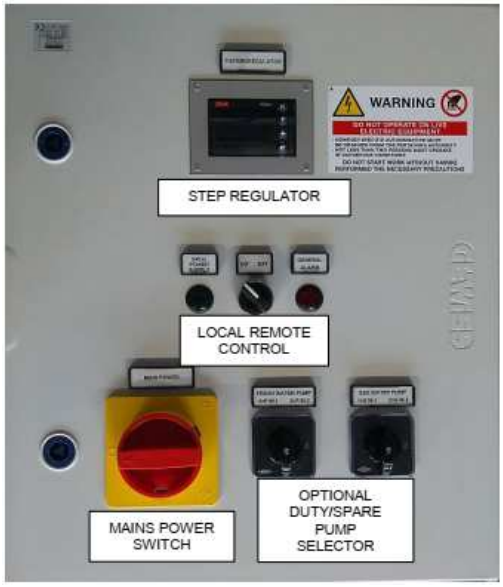
It is extremely important with a system not equipped with inverters to double check the phase sequence to the main electrical box as all our electrics is phase properly but both the power line to the main box and the lines to the pumps must be checked at installation.



4. OPERATION

4.1. MAIN ELECTRICAL BOX

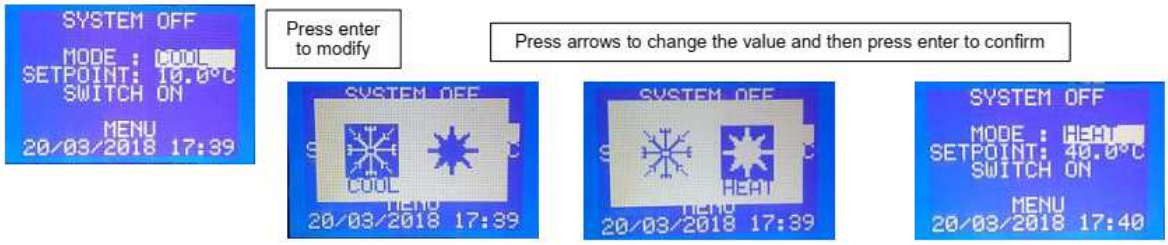
The main electrical box has a “mains power switch” which powers the system, compressors and pumps. It is also useful when a general reset is required. The switch has also a safety function to lock the door when it is in ON position.
There is a “INT / EXT” switch which permits to toggle from the local Step regulator screen to a remote COOL/ OFF/HEAT selector to be connected to the terminal board.
The green light confirms the internal 24V supply to the step regulator while the red alarm light is controlled by the step regulator and will come on when the system needs attention.
As option for the sea water pump and also for the fresh water pump there is a selector from duty/spare pump.



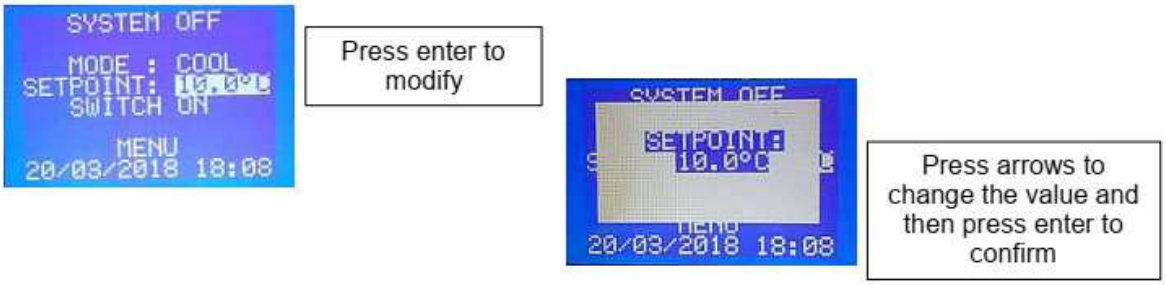
4.2. DANFOSS STEP REGULATOR

The system is controlled by the Danfoss step regulator.
At power up it will prompt the main screen like this.
The highlighted row is the actual choice as you press enter.
Scroll the highlighted row using the arrows to reach the other actions.

System mode choice



4.2.1. Set point



4.2.2. System run

Move the highlighted bar to “SWITCH ON and press “ENTER”

The display will show you that the 2 pumps (SWP : ON – FWP : ON) are running and in a short time 10-30 seconds) the compressor(s) will start in sequence. The highlighted row is automatiucally positioned on the “SHUT DOWN” action.

4.2.3. Fresh water flow check

Move the highlighted bar to “WATER FLOW” and press “ENTER”. The display will show you the flow values of each module

4.2.4. Module data

Move the highlighted bar to “COMP” and press “ENTER”. The display will show you the temperatures values of each module. You can reach all the modules by scrolling with arrows

4.2.5. System STOP

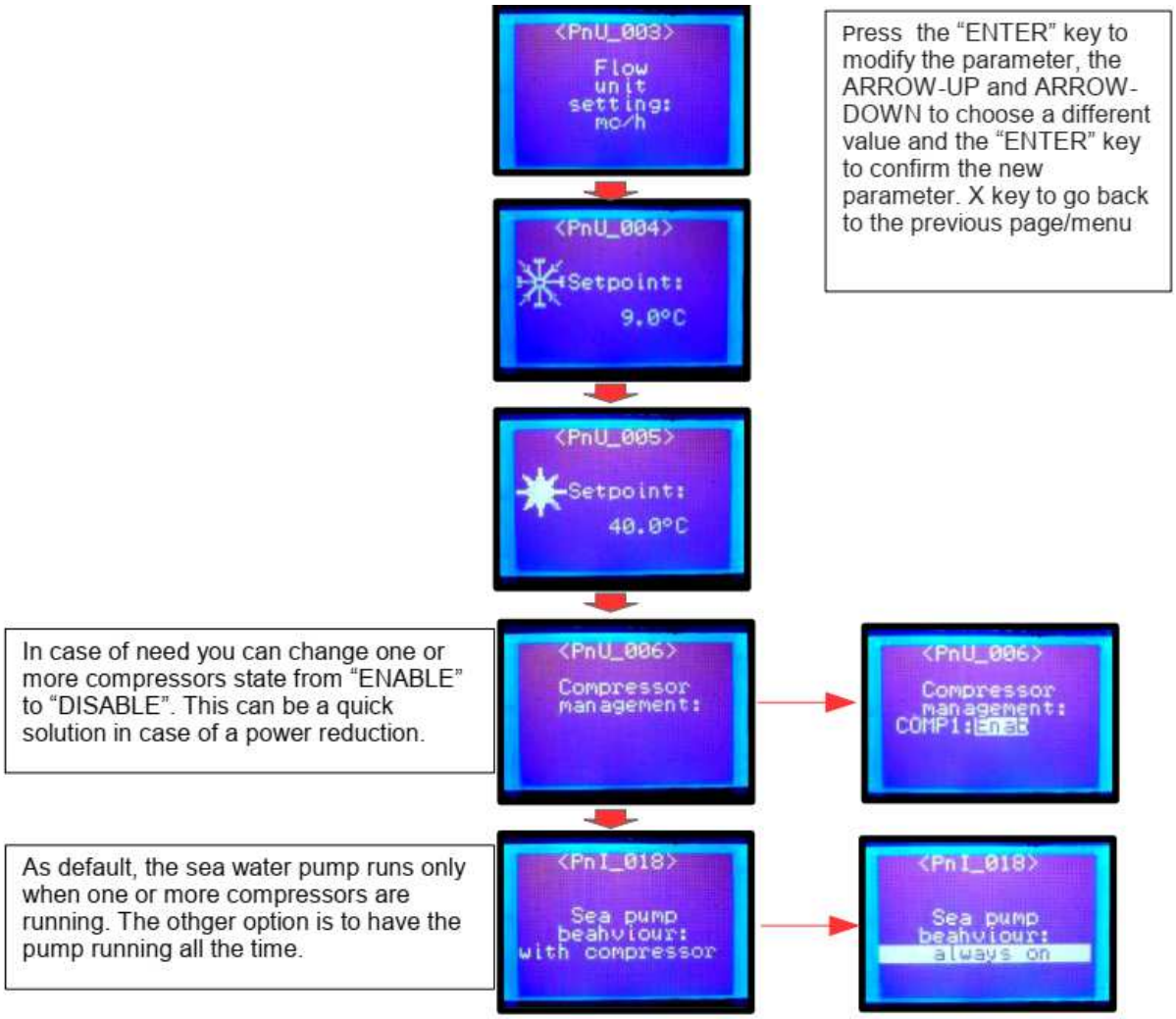
Move the highlighted bar to “SHUTDOWN” and press “ENTER”

The display will then prompt the shutting down procedure. It will automatically shut down the compressors in a short sequence. Unless it is needed, do not force the quick shutdown.

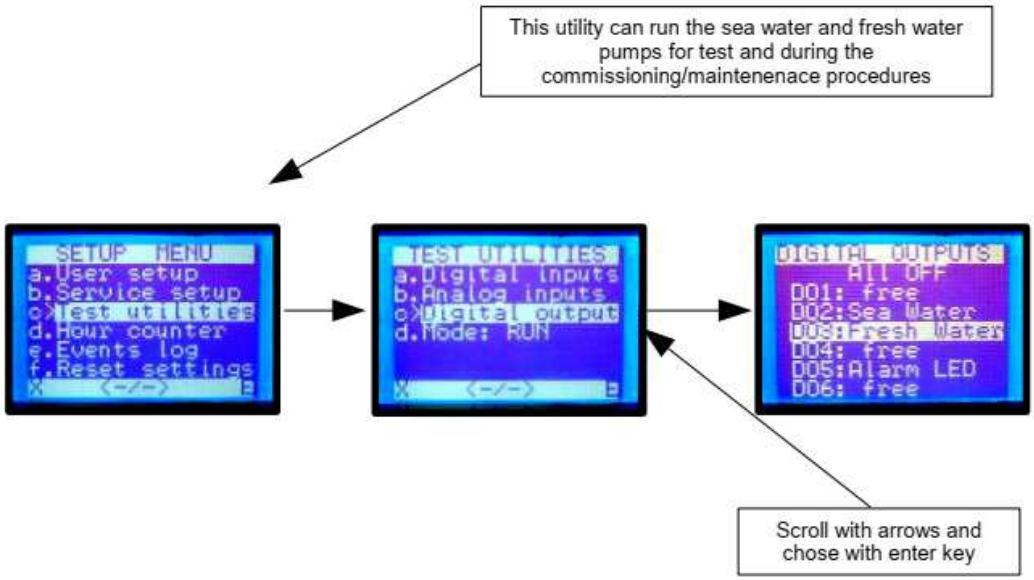
4.2.6. User menu

Move the highlighted bar to “MENU” and press “ENTER”

Press the “ENTER” key to confirm the choice, the ARROW-UP and ARROW-DOWN to scroll and the X key to go back to the previous page/menu



4.2.7. Test utilities



5. MAINTENANCE

5.1. Important monthly checks

In order to prevent any problem it is VERY IMPORTANT to check every month:
a) that every condenser is properly linked in the correct way to the sea water pump and sea water intake, in order to keep these points equipotential.
b) that the temperature difference between the IN and OUT of each condenser **SHOULD NOT BE LESS THAN 6 °C**, the value which guarantees that the water flow doesn't exceed the safe speed value.

5.2. Routine checks

Every time the unit is operated check that:
1 – The Step Regulator doesn't show any alarm warning.
2 - The fresh water pressure in the circuit is between 1 and 2 bars as indicated by the gauge on the unit. If the pressure drops frequently the circuit must be repaired and the leak(s) fixed as continuous topping up the pressure will dilute the antifreeze reducing the unit safety. The antifreeze solution of the fresh water (Fan Coil) circuit must be checked at least every year.
The solution to refill the circuit must be composed 80% water and 20% glycol or a good antifreeze product.
Clean monthly the strainer of the circuit.
3 - Check frequently the efficiency of the seawater circuit, inspecting daily the seawater strainer.
4 - Clean or better replace the air filters on each fan coil. A dirty air filter is dramatically reducing the fan coil efficiency as it reduces the airflow.
5 - At the beginning of the summer season, check that the condensate drain from each fan coil is clean and discharges freely.
6 - If the system is not operated for a while (over a week), we suggest turning both pumps manually for few turns before running the system.

5.3. Hour counter

The running time of the compressors and pumps is recorded by the step regulator. Go to the MENU and choose the “Hour counter”.
The Step regulator records in its memory in hours. The hour is made also by short running times unless the power is cut before reaching the complete hour running.

The hour counter records the running times, rounded off to the hour. The running time of each component is noted and recorded only if the total reaches 60 minutes before a power-off

Scroll with arrows to following page

5.4. Sea water and fresh water pump maintenance

Check at least weekly that there are no leaks for the pump body and rotary seal. The rotary seals of both sea water and fresh water pumps must be replaced every 12 months, or earlier if there is a leak. Failing to do this maintenance could cause the pumps to be deteriorated and corroded, voiding any warranty.
Pump impellers must be checked at least yearly and replaced if they show any sign of deterioration.

6. TROUBLESHOOTING

The system has several safety protections. When a value goes beyond the prescribed limit the Danfoss stops the module which is involved and prompts an Alarm or Master Alarm warning.

Press enter to open the detail of the alarm. There are two types of alarm:
AUTORESET
MASTER ALARM
The autoreset will make 3 consecutive auto resets once the alarm contact closes. At the fourth attempt the module will be locked out until a manual rest is made.

The MASTER ALARM needs instead a manual reset.
In one case of MASTER ALARM (DEW RISK) the system is shut down automatically.

6.1. HP ALARM – CODE 6 AND 51 (AFTER 3 AUTORESETS)

In case of lack of sea water (COOL MODE) the system is protected by a high pressure switch. Its intervention will stop the module where the pressure switch has opened its contact. The Danfoss will show this screen.

The HP safety is installed on each module of the system. This means that the lack of sea water cooling will likely affect all the running modules.
REMEDY: restore the sea water flow veryfing the pump functioning, the sea water intake and strainer.

6.2. FLOW ALARM – CODE 7 AND 51 (AFTER 3 AUTORESETS)

In case of lack of fresh water water flow (COOL MODE) the system is protected by a flow-meter device. Its intervention will stop the module where the flow is lower than the minimum value for that unit. The Danfoss will show this screen.

The FLOW safety is installed on each module of the system. This means that the lack of fresh water flow might affect all the modules.
REMEDY: restore the correct fresh water flow inspecting the circulation pump. Make sure that the fresh water circuit is in pressure (1,5 Bar). Clean the strainer.
Do not insist in manual resetting aslow fresh water flow is very dangerous.

6.3. FLOW SWITCH ALARM – CODE 45 AND 55 (AFTER 3 AUTORESETS)

In case of lack of fresh water water flow (COOL MODE) the system is protected by a flow-switch device. Its intervention will stop the system. The Danfoss will show this screen.

The FLOW safety is installed on the fresh water out manifold of the system.
REMEDY: restore the correct fresh water flow inspecting the circulation pump. Make sure that the fresh water circuit is in pressure (1,5 Bar). Clean the strainer installed on the fresh water circuit.
Do not insist in manual resetting as a low fresh water flow can be very dangerous.

6.4. ANTIFREEZE ALARM – CODE 16 AND 53 (AFTER 3 AUTORESETS)

In case of lack of fresh water water flow (COOL MODE) the system is also protected by a sensor which will detect a risk of freezing of the evaporator. Its intervention will stop the module where the temperature is lower than the minimum value.
The Danfoss will show this screen.

This alarm could also happen in particular circumstances like very cold sea water and also if the set point has been set very low.
In any case, make the necessary checks before doing the manual reset
REMEDY: check the values of the fresh water flow; check the COOL mode set point and rise it to 10°C. Do not insist in manual restting as freezing is very dangerous.

6.5. CANBUS ALARM – CODE 22 - 29

If the communication between the module and the Danfoss MCX is interrupted or not working the module will be disconnected and stops. The Danfoss tries to re-connect it for 1 minute and then it will need a manual reset in order to get it back, once the communication is restored. The message with the code # tells which module is not communicating.
REMEDY: check that the module is powered. Check the Can bus connections

6.6. LP ALARM – CODE 50 MASTER ALARM – MANUAL RESET ONLY

If the module has a leak and looses its refrigerant there is a low pressure switch which will stop the unit. This control is active also before starting the compressor, so in case the unit is very low in refrigerant it will not start. This safety is ONE OFF, so it needs a manual reset. We warn to be very careful before resetting this alarm as the module could be in risk of being flooded if the leak is in its internal circuit.
REMEDY: the refrigerant pressure must be chacked by a specilized engineer. Do not run the module until its pressure has been verified with gauges.

6.7. DEW RISK ALARM – CODE 44 MASTER ALARM – UNIT STOPS

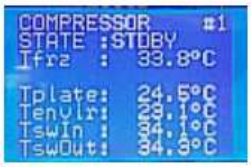
The inverter is water cooled and its temperature is monitored. In case of subcooling there is the risk of condensation which is very dangerous. This alarm stops the entire system. Cut off the main power to the system and then isolate the module from its circuit breaker to prevent any short circuit.
Do not reset until you have checked that the inverter back plate (heat exchanger) is warm or tepid which means that the alarm is due to weird circumstances (very high engine room temperature)

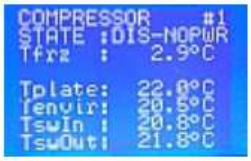
The inverter power module temperature is controlled with a water valve. This valve could get jammed by debris and leak causing subcooling of the inverter power module.
REMEDY: If the dew alarm has stopped the system, first of all cut the power to the module and then check if the inverter heat exchanger is cold. If it is cold, it means that the water valve is not tight. The valve body must be cleaned carefully.
Before powering up, wait until the inverters have been warmed up and there is no more risk of condensation.

6.8. LOW VOLTAGE – INSUFFICIENT POWER SUPPLY

In this table are listed the minimum voltage values accepted in order to start the compressor and also the minimum value to keep it running. If the voltage supply falls below these values, the compressor will not start or will stop when it is already running, showing the STDBY or DIS-NOPWR state.
Under a certain minimum the system will simply consider the compressor "disabled" .
REMEDY: check the voltage supply at the inverter terminals. On case of three phase supply, check that all the phases are present. In this case we suggest to stop the chiller and restart it only when the powerr supply is restored.

	threephase			singlephase		state
Nominal voltage	400	230	208	230	208	ON
Min voltage to start	>352	>202	>183	>191	>173	ON
Min voltage to run	>340	>196	>177	>184	>166	DIS-NOPWR
disabled	<280	<161	<146	<161	<146	DIS-UVOLT





6.9. FRESH WATER PROBE FAULT – CODE 1 MASTER ALARM -SYSTEM OFF

If the fresh water probe is not connected to main control board or it is faulty (broken or shorted) the Danfoss will immediately show this screen.
It will not start if it is not running and it will go OFF if the system is running.
REMEDY: check the fresh water sensor; connect it if not yet done or replace if it is faulty

6.10. SLAVE INVERTER ANTIFREEZE PROBE FAULT – CODE 2 MASTER ALARM - MANUAL RESET ONLY

Press enter to open the detail of the alarm.

Code 2 on inverter module #1
REMEDY: Check and/or replace the probe NTC. It needs a manual reset.
The module remains OFF until you reset it manually

6.11. SLAVE INVERTER SW-IN PROBE FAULT – CODE 46 MASTER ALARM - MANUAL RESET ONLY

The probe installed on Sea water IN is monitored. In case of failure it triggers its specific alarm.
REMEDY: Check and/or replace the probe which is causing the alarm.
The module remains OFF until you reset it manually.

6.12. SLAVE INVERTER SW-OUT PROBE FAULT – CODE 47 MASTER ALARM - MANUAL RESET ONLY

The probe installed on Sea water OUT is monitored. In case of failure it triggers its specific alarm.
REMEDY: Check and/or replace the probe which is causing the alarm.
The module remains OFF until you reset it manually.

6.13. SLAVE INVERTER TENVIR PROBE FAULT – CODE 48 MASTER ALARM - MANUAL RESET ONLY

The probe installed for the ENVIR is monitored. In case of failure it triggers its specific alarm.
REMEDY: Check and/or replace the probe which is causing the alarm.
The module remains OFF until you reset it manually.

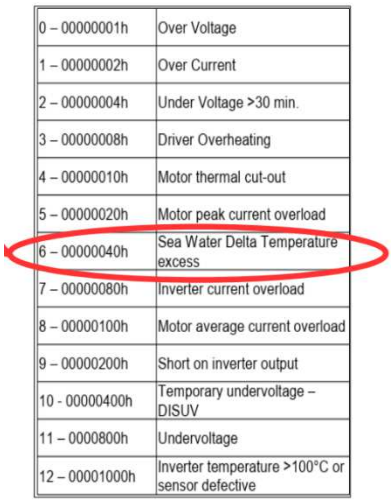
6.14. DANFOSS STEP REGULATOR ALARM LIST

Error code	Description – Description	Individual module ALM	Individual module STOP	Auto Reset	Manual reset	System goes off	general alarm	notes
1	Fresh water temp error – master unit Guasto sensore temperatura acqua dolce unità master			N	Y	Y	Y	Only for master unit
2	Antifreeze sensor error – Guasto sensore antigelo	Y	Y	N	Y			Short or open circuit – Unit #
6	High pressure alarm –Allarme alta pressione	Y	Y	Y				
7	Low fresh water flow alarm – Allarme flussimetro	Y	Y	Y				
9	Compressor thermal cut-out – Allarme klixon compressore	Y	Y	N	Y		Y	
10	Fresh water pump thermal cut-out – Allarme klixon pompa acqua dolce			N		Y	Y	
11	Sea water pump thermal cut-out – Allarme klixon pompa mare			N		Y	Y	
12	Missing CAN with BOILER module – Allarme comunicazione boiler	Y	Y	Y				
16	Anti-freeze alarm – Allarme sensore antigelo	Y	Y	Y				
22	Missing CAN slave n.1 – Allarme comunicazione modulo#1	Y	Y	Y*	N	N	N	Y* = Autoreset if communication is lost while running. If there is no communication at start the system must be re-powered once the communication is restored
23	Missing CAN slave n.2 – Allarme comunicazione modulo#2	Y	Y	Y*	N	N	N	
24	Missing CAN slave n.3 – Allarme comunicazione modulo#3	Y	Y	Y*	N	N	N	
25	Missing CAN slave n.4 – Allarme comunicazione modulo#4	Y	Y	Y*	N	N	N	
26	Missing CAN slave n.5 – Allarme comunicazione modulo#5	Y	Y	Y*	N	N	N	
27	Missing CAN slave n.6 – Allarme comunicazione modulo#6	Y	Y	Y*	N	N	N	
28	Missing CAN slave n.7 – Allarme comunicazione modulo#7	Y	Y	Y*	N	N	N	
29	Missing CAN slave n.8 – Allarme comunicazione modulo#8	Y	Y	Y*	N	N	N	
30	General inverter alarm-check subcode – Allarme generico inverter-verificare sub-code	Y	Y	N			Y	see detail exadecimal sub-code
33	Boiler #1 thermal cut-out – Allarme klixon boiler #1	Y**	Y	N	Y		N	N.C. when boiler is ON- If the contact remains open it means that the boiler klixon is open. Y** = it lights the boiler general alarm
34	Boiler #2 thermal cut-out – Allarme klixon boiler #2	Y**	Y	N	Y		N	
35	Boiler #3 thermal cut-out – Allarme klixon boiler #3	Y**	Y	N	Y		N	
36	Boiler #4 thermal cut-out – Allarme klixon boiler #4	Y**	Y	N	Y		N	
37	Boiler #1 power relay error – Errore teleruttore boiler #1	Y**		N	Y		Y	N.O. When boiler is OFF. If the contact is closed it means that the power relay is jammed closed. Y** = it lights the boiler general alarm
38	Boiler #2 power relay error – Errore teleruttore boiler #2	Y**		N	Y		Y	
39	Boiler #3 power relay error – Errore teleruttore boiler #3	Y**		N	Y		Y	
40	Boiler #4 power relay error – Errore teleruttore boiler #4	Y**		N	Y		Y	
42	All boilers in alarm – Allarme di tutti i boiler	Y		N	N	Y	Y***	Y*** general alarm and then system goes OFF and ALM OFF
44	Dew risk on inverter – Rischio condensa per l'inverter	Y	Y			Y	Y	system goes OFF and ALM ON
45	Flow switch alarm – Allarme Flussostato	Y	Y****	Y				**** ALL MODULES
46	Sea water In temperature probe error – Guasto sensore temperatura acqua mare IN	Y	Y		Y			
47	Sea water OUT temperature probe error – Guasto sensore temperatura acqua mare OUT	Y	Y		Y			
48	Inverter box temperature probe error – Guasto sensore temperatura scatola inverter	Y	Y		Y			
50	Low pressure alarm – Allarme bassa pressione	Y	Y	N	Y		Y	manual reset
51	Repeated high pressure alarm – 3° allarme alta pressione	Y	Y	N	Y		Y	manual reset
52	Repeated fresh water flow alarm – 3° allarme flussimetro	Y	Y	N	Y		Y	manual reset
53	Repeated anti-freeze alarm – 3° allarme antigelo	Y	Y	N	Y		Y	manual reset
55	Flow switch repeated alarm – Allarme ripetuto Flussostato	Y	Y	N	Y		Y	manual reset

THIS TABLE IS BASED ON DANFOSS SW v.431 AND INVERTER FIRMWARE v.4_01

6.15. DRIVE ALARM CODE 30

There is also a series of alarms monitored by the inverter. These alarms appear with the same alarm code 30.
In order to have the correct information move the highlighted bar to the alarm message and press enter.
The Danfoss will then show the details of that alarm

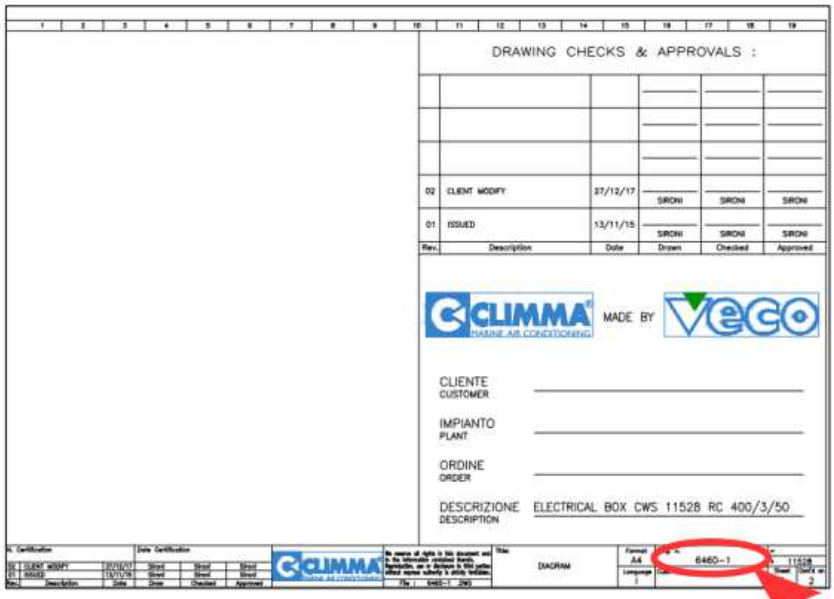


0 – 00000001h	Over Voltage
1 – 00000002h	Over Current
2 – 00000004h	Under Voltage >30 min.
3 – 00000008h	Driver Overheating
4 – 00000010h	Motor thermal cut-out
5 – 00000020h	Motor peak current overload
6 – 00000040h	Sea Water Delta Temperature excess
7 – 00000080h	Inverter current overload
8 – 00000100h	Motor average current overload
9 – 00000200h	Short on inverter output
10 - 00000400h	Temporary undervoltage – DISUV
11 – 0000800h	Undervoltage
12 – 00001000h	Inverter temperature >100°C or sensor defective

Sub-code	**Description**	Detail
0 – 00000001h	Over Voltage	Supply voltage to high. Risk to damage the inverter. Voltage exceeding the inverter limit can damage permanently the components. Cut the power off immediately and verify that the design voltage of the inverter corresponds to the supply voltage.
1 – 00000002h	Inverter over current	The amperage draw of the compressor went beyond the maximum amperage accepted by the inverter. This could be caused by a problem with the compressor. Check the inverter model first. Then check the compressor windings.
2 – 00000004h	Under Voltage >30 min.	The voltage has been below the minimum value for a very long time. For 30 minutes the inverter remains in stand-by and ready to run the compressor in case the voltage rises to the normal value. Complete missing of power supply is interpreted by the inverter as a condition of compressor disabled without further warnings. The compressor state becomes DIS-UV.
3 – 00000008h	Inverter Overheating	The inverter power module temperature exceeds 70°. This means that its water cooling is not working properly. Check the water valve which supplies the cooling water to the inverter heat exchanger.
4 – 00000010h	Motor thermal cut-out	This alarm is generated by the inverter if the compressor connection is found “OPEN”
5 – 00000020h	Motor maximum current overload	Current overload of the compressor. The compressor has been drawing in excess of its set maximum value for more than the maximum set time (15 seconds).
6 – 00000040h	Sea Water Delta Temperature excess	The 2 temperature probes installed on IN and OUT of the sea water condenser are measuring a difference exceeding 20°C. This is caused by lack of cooling water, even before that the HP alarm trips. Check the sea water flow veryfing the sea water pump, intake and strainer.
7 – 00000080h	Inverter overload	Inverter thermal cut-out. This is due to overheating of the inverter power module. Check that the inverter model corresponds to the compressor power draw.
8 – 00000100h	Motor average current overload	The compressor has been drawing in excess of its maximum current for a time sufficient to saturate the maximum average power value I2xT. The inverter has a maximum nominal compressor current. When this limit is exceeded, the inverter makes a calculation of the excess and the time. When the limit is reached the inverter gives this alarm. There is also a maximum compressor current which will cause the alarm 00000020h.
9 – 00000200h	Short on inverter output	In this case there is a real short circuit on the inverter output. This alarm is the attempt to protect the inverter from a damage. Several attempts to reset this alarm might cause the complete failure of the inverter power module.
10 - 00000400h	Temporary undervoltage 3 times – DISUV	This is the case which happens if the mains supply is not sufficient to run the compressor(s). The inverter starts the compressor because the voltage is correct but after the start, due to insufficient power, the voltage drops below the minimum. After three times the inverter stops the compressor and waits a manual reset. Make sure that the power supply is sufficient. If not you could disable temporary one or more compressors from the Danfoss user menu.
11 – 0000800h	Undervoltage	The voltage is not less than 30%of the nominal voltage but lower than the safety inverter protection
12 – 00001000h	Inverter temp >100°C	The inverter power module temperature exceeds 100°C or the probe is defective

7. ELECTRICAL SCHEMATIC

Each system is designed to the customer specifications.
This means that the electrical schematic is tailor made to each system, developed from our standard design.
The main electrical box is manufactured under the CE rules with all the necessary safeties.
In the chapter 3.3.2.1 – Installation there are samples of the general schematic.



The complete drawing of the main electrical box and module control boxes is supplied with the system and it is identified by a drawing number. The electrical schematic can be also identified with the unit serial number.