MBC Marine

Marine air conditioning solutions

INSTALLATION AND USER MANUAL FOR VSC UNITS

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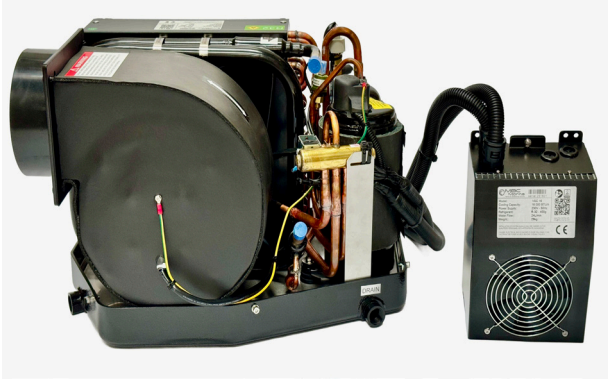


VSC 13
MBC Marine
Marine air conditioning solutions

THANK YOU FOR CHOOSING MBC MARINE PRODUCT!

Before starting the installation, make sure that the shipping box and the air conditioner are intact. DO NOT use a broken or damaged product.

Package Contents – Check After Unboxing

Make sure the package includes the following components:

- 1 air conditioning unit
- 1 display
- 1 LAN data cable (5 meters) – for connecting the controller
- 1 temperature sensor – for AI1 socket
- 4 L-shaped mounting brackets – for securing the unit

If any item is missing or damaged, do not begin the installation – contact your distributor or MBC Marine representative.

EXPLANATION OF SYMBOLS:

ATTENTION!!

Ignoring this information may cause material damage and may have adverse impact to the operation of this product.

WARNING!

Safety information: Ignoring these instructions could result in death or serious injury.

CAUTION!

Safety information: Ignoring this instruction can cause serious injury.

WARNING:

Installation of the system should only be carried out by qualified personnel with appropriate knowledge. The following information is intended for technicians who are familiar with applicable guidelines and relevant safety regulations and precautions. For warranty professional and proper installation specifications are essential. If you do not have the necessary knowledge, entrust the installation to a specialist! It is important to use the appliance only for its intended purpose and in compliance with the relevant regulations.

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PART 1. **SAFETY AND FIRE PROTECTION WARNINGS**

1.1. SAFETY INFORMATION:

The manufacturer assumes no liability for damage to the device in the following cases:

- Installation or connection failure
- Damage to the product due to mechanical impact and over voltage
- Modification of the product without the express written permission of the manufacturer
- Unusual use, differing from standards

1.2. FIRE PROTECTION WARNING:

Installation and maintenance of the unit may be dangerous due to pressurized copper pipes and electrical equipment. When working on the unit, always take the safety precautions into account and wear protective goggles during installation, use work gloves and place a fire extinguisher near the work area!

1.3. SAFETY WARNING:

It is strictly forbidden to install the air conditioning unit in a place where it is possible for the equipment to deliver carbon monoxide, harmful gas of the engine or any other toxic substance inside the boat.

1.4. ELECTRICAL SCHOCK WARNING:

There are components of the unit that are powered by 230 V AC during operation. If the device is connected to a power source, disconnect the power supply at the main switchboard or at the power source before opening the electric box. Failure to do so may result in personal injury or even death!

To minimise the risk of electric shock and personal injury, ground the equipment properly! The equipment meets the relevant fire protection requirements. The device must not be installed in premises where petrol engines, tanks, LPG / CPG cylinders, regulators, valves, fuel lines or connectors can be found!

PART 2. **INSTALLATION GUIDE**

2.1. PURPOSE OF THIS MANUAL

This manual provides guidance for the proper installation and operation of MBC Marine VSC series 230V self-contained direct expansion marine air conditioning systems. Its purpose is to offer installers and maintenance personnel detailed, step-by-step, clear, and practical support throughout the entire lifecycle of the system – from installation to troubleshooting and maintenance.

2.2. SYSTEM OPERATING LOGIC

This unit is based on the balance of three key subsystems:

1. Seawater Circuit – Responsible for cooling the heat exchanger. Without proper water flow, the compressor will overheat.
2. Airside Circuit – Ensures the circulation of cooled or heated air. Insufficient airflow may cause the evaporator to freeze, overheat, or result in poor comfort levels.
3. Electrical System – Covers voltage and current supply, communication, and safety circuits. Faults in this system may damage the electronics or prevent the unit from starting**.**

2.3. CONCEPTUAL WARNING FOR ALL INSTALLERS:

No two boats or installations are the same. Do not copy the installation of another boat – the correct setup is determined by the physical characteristics of the specific vessel.

The system will only operate properly if all components – water, air, and electrical – are installed professionally and according to specifications.

Most common issues are not caused by the unit itself but by installation deficiencies: incorrect tilt angle, poor ventilation, clogged filter, improper ducting, etc.

Proper installation, as detailed in this manual, is a requirement

WARNING!

Start the installation only if the location of each unit complies with the relevant regulations. At planning, make sure that there is enough space for subsequent installation and maintenance work.

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2.4. ADVANTAGES OF INVERTER TECHNOLOGY – WHAT YOU SHOULD KNOW

The MBC VSC inverter-based marine air conditioning system uses advanced technology that allows the compressor to continuously adjust its speed between 35–60 Hz, depending on the cooling or heating demand.

This solution offers significant advantages over traditional ON/OFF systems:

- Continuous performance regulation – The compressor does not switch on and off repeatedly; instead, it gently increases or decreases its speed to maintain the desired cabin temperature precisely.
- Lower energy consumption – The system only uses as much energy as needed to maintain comfort.
- Quieter operation – The inverter compressor runs more quietly since it doesn't start at full power each time.

2.5. HOW DOES IT WORK?

The controller continuously adjusts the compressor's speed—typically between 35 Hz and 60 Hz—based on the required cooling or heating output. This means the system:

- Operates continuously rather than cycling on and off, simply adjusting its power output as needed.
- Provides gradual temperature control, avoiding sudden fluctuations.
- Uses energy more efficiently, as the unit works only as much as necessary.
- Operates more quietly, maintaining comfort even at lower speeds.
- Offers extended service life by avoiding mechanical stress caused by frequent high-power starts.

2.6. OPTIMIZED PERFORMANCE IN VARIABLE MARINE ENVIRONMENTS

One of the key advantages of inverter technology in marine environments is its ability to adapt more effectively to fluctuating seawater temperatures, which directly impact system performance. In traditional systems, fixed-speed compressors cannot react to such variations efficiently—often leading to energy waste, thermal discomfort, or even performance issues.

The MBC VSC system uses a variable-speed compressor that adjusts its frequency based on real-time thermal load. As seawater temperature rises or falls, the system automatically increases or decreases compressor speed to maintain consistent indoor comfort and optimal efficiency.

This dynamic response allows the system to better match the actual cooling or heating demand, even under rapidly changing conditions. Some of this adjustment happens automatically through internal logic, while other parameters can be fine-tuned through system settings—offering both intelligence and control.

2.7. SELECTING A SUITABLE INSTALLATION LOCATION

Choosing the right placement for the unit is critical.
Before the installation consider the following guidelines:

Requirements:

- A dry, well-ventilated enclosed space
- Minimum 60 mm clearance from surrounding furniture (on all sides)
- A stable, level surface, preferably with a slight 1–2 cm slope to allow condensate drainage
- Easily accessible for maintenance
- Isolated from heat sources and exhaust gases

Avoid the Following Locations:

- Engine room or machinery space
- Directly next to ventilation ducts
- Wet or damp floor areas
- In the path of exhaust fumes or carbon monoxide
- Poorly ventilated enclosed compartments

PART 3. UNIT PLACEMENT AND FIRTS STEPS BEFORE INSTALLING

3.1 General Placement Guidelines

- Install the unit on a stable, horizontal surface.
- Provide a slight tilt of 1–2 cm towards the condensate drain.
- Do not enclose the unit in a tight compartment! Ensure at least 60 mm of free space around it for proper airflow.
- Position the compressor as far as possible from the air intake opening to minimize noise.
- Choose the unit's location so that the electrical box can also be mounted securely on a dry, well-ventilated surface
- Ensure the air filter remains accessible for future maintenance – do not install the unit inside closed furniture or in areas that are difficult to disassemble.

3.2. Mounting

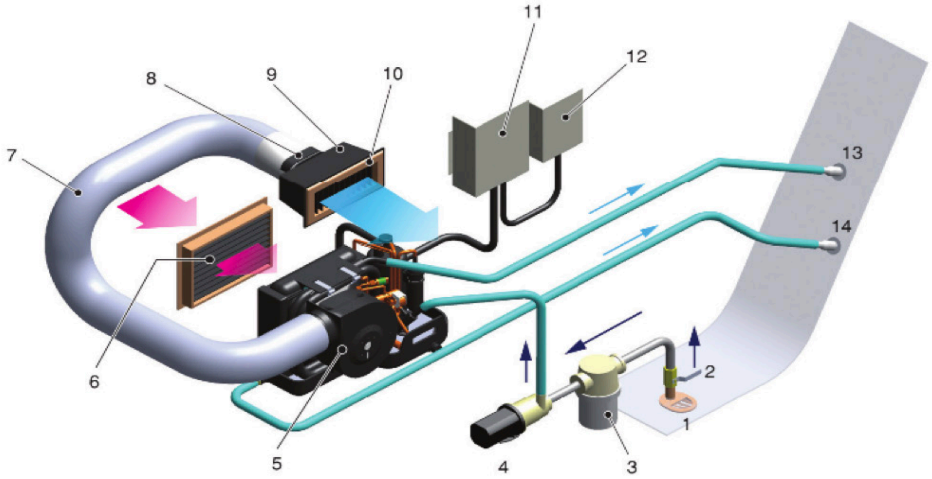
- Use the 4 metal brackets provided in the package.
- Secure the unit along the edge of the tray firmly, but not too tightly.

SAFETY WARNING!

IDo not install the air conditioner in the bilge or engine compartment of the boat and make sure that the selected place is properly blocked from gases and vapours coming from these spaces.

3.3. TYPICAL INSTALLATION:

See the picture below for the installation of a self-contained air conditioner unit.



1. Scoop Type Thru-Hull
2. Ball Valve
3. Sea Water Strainer
4. Sea Wtaer pump
5. A/C unit
6. Return Air Grille
7. Flexible Duct
8. Duct Ring
9. Transistion Box
10. Supply Air Grille
11. Control Box
12. Starting Booster Outlet
13. Sea Water Outlet
14. Drain Outlet

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3.4. INSTALLING DISPLAY

Before installing the display, observe the following guidelines:

Install the control panel only on a surface located higher than the centerline of the cabin, in a location protected from both external and internal sources of heat and light.

Do not install the display in locations where it may be exposed to:

- Direct sunlight
- Nearby heat-producing appliances or devic
- Partition walls with potential heat accumulation behind the panel
- Directly above or below air intake or outlet vents
- Ensure that the display is easily accessible for operation

3.5. INSTALLING THE ROOM TEMPERATURE SENSOR

Although the display includes a built-in thermostat, always use the included room temperature sensor with a 5-meter cable, as it provides more accurate readings of the cabin temperature.

Connect the temperature sensor to the PCB's A1 (white) slot.

3.6. CONDENSATE DRAINAGE

The unit produces condensate during COOLING mode, which is collected in the unit's drain pan. The installation location of the marine A/C unit must ensure that proper condensate drainage is always possible.

The water collected in the drain pan must be discharged through a drain pipe into the bilge of the boat, ideally close to the automatic bilge pump.

If the unit is installed in a location where direct drainage into the bilge is not possible, the condensate must be collected and pumped out using a dedicated drain pump.

WARNING!

When installing a drain pump, do not connect its outlet to the discharge line of any other system.

WARNING!

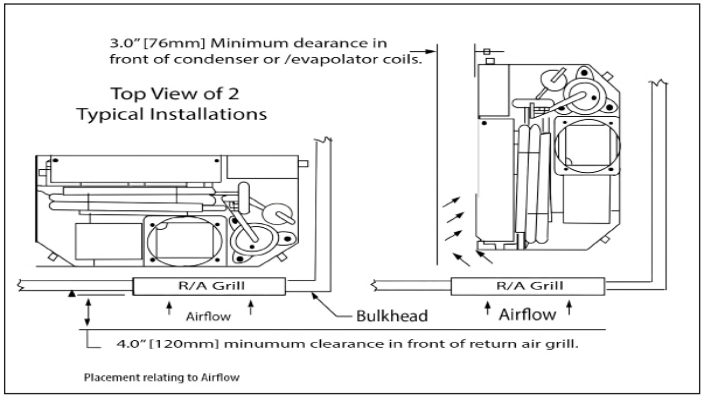
Do not direct the drain pipe to such part of the boat that does not have a water intake. The method of condensate discharge differs by ship type therefore removing the drain water from the boat is not part of the standard marine air conditioning unit.

PART 4. **AIR SYSTEM INSTALLATION**

4.1. RETURN AIR

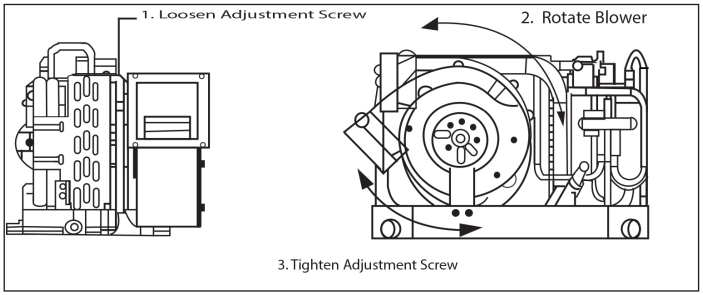
During operation, the air conditioning unit draws in room air through the return side, where it passes over the evaporator coil and is then discharged cooled (or heated) through the supply side. The volume and quality of the return air have a direct impact on the unit's cooling/heating performance and safe operation.

Choosing the correct size for the return grille is essential. If the grille is too small, the fan cannot circulate enough air, which may cause the evaporator to overcool and freeze. This can result in cooling failure, an error code (e.g., Error 9), or compressor overload. The minimum grille size required for each unit type must always be verified in the technical specifications table.



4.2. BLOWER ROTATION

Before installation (if necessary) set the fan in the direction which allows the most direct airflow through the air pipes. The air outlet direction of the unit's fan can be adjusted horizontally or vertically. Adjust the air outlet position by loosening the fixing screw and tightly fasten the fixing screw after positioning the outlet to the optimum position. See Figure 3.



WARNING!

Lack of air supply leads to malfunction or even failure of the unit!

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4.3. SUPPLY AIR SYSTEM

Supply air is the cooled or heated air that enters the cabin after passing through the evaporator.

Supply grilles should always be installed as high as possible in the cabin, since cold air naturally sinks and warm air rises. When adjusting the direction of the grille louvers, make sure the air is not directed toward the return grille, as this can create a short air cycle.

The most common mistake on the supply side is restricting the airflow – for example, using undersized grilles, closed louvers, or overly narrow branches. In such cases, the unit essentially "chokes," the fan is unable to push air through the system, and the unit becomes overloaded. This may cause the evaporator to freeze in cooling mode (Error 9), or the compressor to overheat in heating mode (Error 4).

The supply duct must always be made of thermal and acoustic insulated ducting, suitable for the unit's output capacity. The duct diameter must never be reduced below the manufacturer's specifications – for example, a 150 mm outlet must not be reduced to 100 mm. The system is highly sensitive to reduced airflow: even a 30–40% loss can cause performance issues and trigger error codes.

The total duct length should not exceed 4 meters. Avoid 90° or sharp bends, as they can reduce airflow by up to 25%.

Ducts must be installed tightly and without creases, ensuring they are not compressed later by furniture or structural components.

WARNING!

The air outlet must not be directed towards the air intake as short circulating cycles can lead to a loss of performance!

PART 5. **SEA WATER SYSTEM**

The seawater cooling circuit is responsible for dissipating heat from the condenser of the ESC unit, making its proper operation essential. Any malfunction or insufficient water flow can lead to compressor overheating, the appearance of error codes (e.g., Error 6, Error 12), and even complete system shutdown.

When designing the seawater system, it is critical to ensure an unobstructed, continuous, and air-free water flow. Every component along the water path – thru-hull fitting, ball valve, strainer, pump, and piping – must be installed precisely and in the correct order. Improper sequencing or height differences can cause air pockets, vibration, or suction problems.

5.1. SEA WATER INTAKE

The water intake (scoop-type thru-hull fitting) must be positioned on the lower part of the hull, preferably near the keel. The deeper it is placed, the cooler the seawater the system can draw in – which is especially important in warm climates. The ball valve must be connected directly to the intake over a short distance, followed by the strainer, then the pump, and finally the inlet to the A/C unit's condenser.

5.2. SEA WATER PUMP AND STRAINER

The circulating pump (magnetic driven pump) and the seawater strainer must always be installed below the waterline, at least 30–50 cm lower, to allow the system to be gravity-filled with water. This ensures air-free pump operation and reliable water delivery.

WARNING!

MBC Marine is not responsible for any malfunctions resulting from improper installation or operation of the seawater pump.

The seawater pump will only function properly if the water line is free of air pockets, does not contain negative loops, high points, or sharp bends, and if the hoses rise continuously and evenly to the condenser inlet of the unit.

The system must be completely leak-free, and all suction-side components (thru-hull fitting, strainer, pump) must be airtight.

The seawater outlet must be installed above the waterline, but no more than 150 mm above it. If the outlet is placed too close to the intake, the system may draw in its own heated water, significantly reducing cooling efficiency. The minimum distance between the seawater inlet and outlet must therefore be 150 cm.

5.3. SEA WATER

Only spiral-reinforced, pressure-resistant hoses should be used for the water system. These hoses must not collapse when bent and must maintain their full internal flow diameter. Damaged, kinked, overly long, or improperly routed hose sections can result in reduced water flow, overheating, compressor overload, or error codes.

5.4. CHECKLIST FOR CORRECT SEA WATER

The system is only considered properly installed if the following conditions are met:

- All connections and threads are sealed with appropriate marine-grade sealing materials (e.g., Loctite 55 or Sika 291i).
- The ball valve is fully operable and easily accessible.
- The seawater strainer is installed in an easily accessible location, and its transparent housing is intact and not degraded.
- The suction side is completely airtight, and the water hose rises continuously, allowing air bubbles to escape naturally.
- All metal parts in contact with seawater – including the intake fitting, pump, and A/C tray – are connected to the boat's central bonding system.
- The system includes a built-in zinc or aluminum sacrificial anode for galvanic protection of the condenser and pump.
- Before starting the seawater system, always check for leak-free connections, a clean strainer, and verify that the pump delivers sufficient water flow to the unit.

SAFETY NOTICE!

Do not operate the system without a water strainer! Running the system without a strainer will result in water pump failure and may ultimately lead to complete system failure.

The seawater circuit must be able to be shut off during malfunction or maintenance. Failure to install a ball valve is considered a safety hazard and may pose a life-threatening risk.

5.5. GALVANIC CORROSION AND PROTECTION

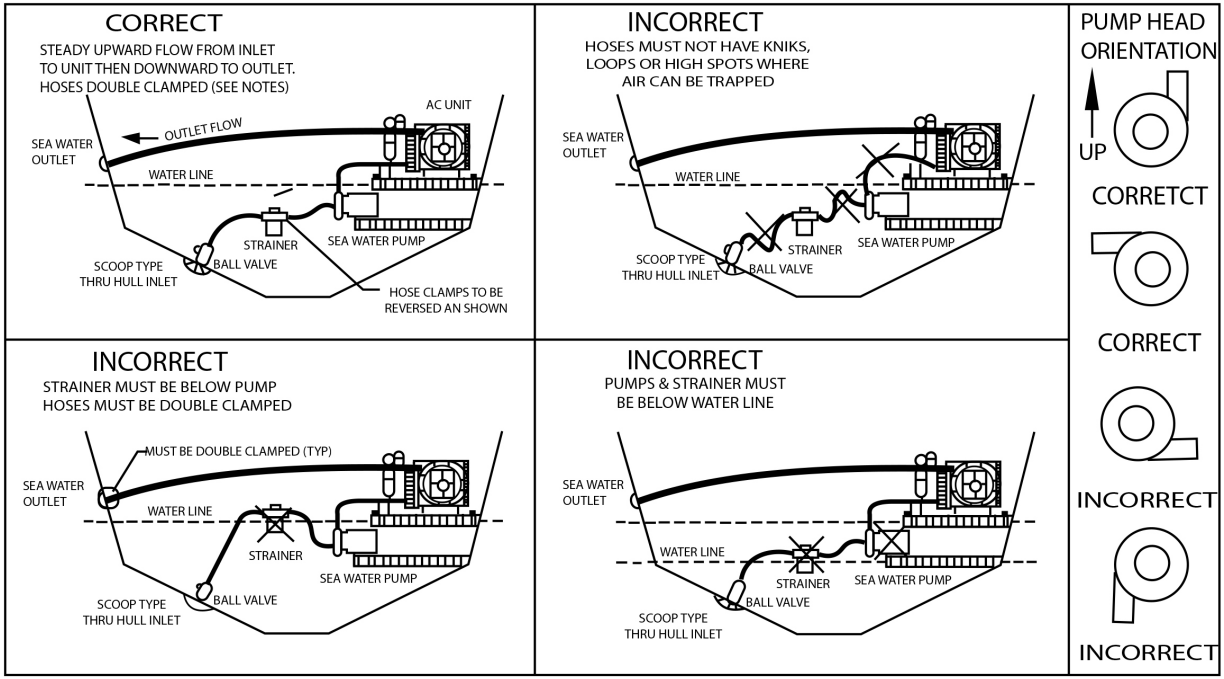
All metal parts in contact with seawater — including the inlet fitting, pump, and A/C tray must be connected to the boat's grounding system. A sacrificial anode should be installed before the pump to protect the system from corrosion.

WARNING! MBC Marine assumes no liability for any damage caused by electrolysis or corrosion if no sacrificial anode or grounding protection is installed in the system.

SAFETY NOTICE!

If you do not have sufficient training to install the water system of the unit consult a qualified boat technician.. In saltwater environment - in case of longer stops - it is recommended to remove seawater from the system.

Follow the guidelines below to properly install the water system of the marine air conditioner unit.See pictures below:



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PART 6. **POWER SUPPLY**

6.1. ELECTRICAL REQUIREMENTS FOR SAFE OPERATION

VSC units operate on 1Ph 230V / 50Hz power. The current draw depends on the unit type (see technical specifications), but the following are always required:

Proper cable cross-section (minimum 3x1.5–2.5 mm², depending on model)

A dedicated circuit breaker for the unit only

A 30 mA residual current device (RCD) for personal safety

Grounding of the system is mandatory. The yellow-green wire must always be used as the protective earth and must never be used for any other purpose (e.g., neutral).

WARNING!

Undersized wiring or loose connections can cause overheating, contact failures, and may lead to damage of the control board or compressor.

WARNING!

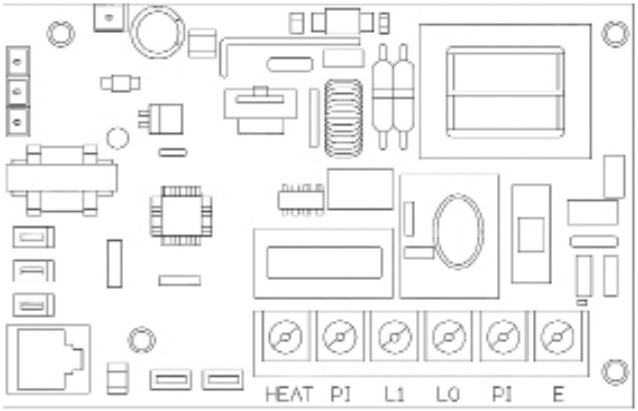
Cable ends must be fitted with ferrules when connecting to the terminal block.

6.2. ELECTRICAL CONNECTION CHECKLIST

- The power supply is 230V / 50Hz and stable.
- Cable cross-sections are appropriate.
- The 230V shore power phase wire is connected to terminal L1.
- The 230V shore power neutral wire is connected to terminal L0.
- The 230V pump phase wire is connected to terminal P1.
- The 230V pump neutral wire is connected to terminal L1.
- Ground wires for both shore power and pump are connected to the grounding point.
- All connections are tight and undamaged.
- Grounding is connected at the terminal block for both pump and shore power.
- Circuit breaker and RCD (FI relay) are installed.
- The electrical box is located in a well-ventilated area.
- The display is operational and communicates with the controller.
- The temperature sensor is connected (AI1).

PART 7. **WIRING CONNECTIONS VSC UNITS**

7.1 TERMINAL CONNECTIONS OVERVIEW



WIRING CONNECTIONS FOR VSC UNIT

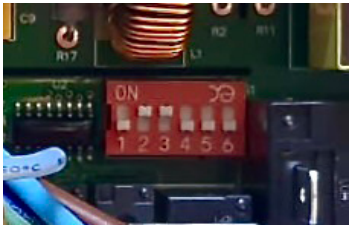
- **HEAT**: **Not used** – leave unconnected.
- **PI:** Seawater pump **PHASE**
- **L1:** Shore power **PHASE** input
- **L0:** Shore power **NEUTRAL** input
- **PO:** Seawater Pump **NEUTRAL**
- **E:** **GROUND** - Mandatory for safety.

7.2. DIP Switch Settings

DIP switches are used to configure key operational modes of the unit, such as cooling/heating settings, pump behavior, and sensor logic. Correct switch positioning is essential for proper and safe system operation. Please refer to the descriptions below before changing any factory settings.

Factory default configuration on VSC:

SW1: OFF
SW2: ON
SW3: ON
SW4: OFF
SW5: OFF
SW6: OFF



Changing these settings without proper understanding may result in malfunction or reduced performance.

SW1 + SW2 – Operation Mode Selection:

SW1 OFF + SW2 OFF – Cooling and heating mode with electric heating

SW1 OFF + SW2 ON – Cooling and heating mode only

SW1 ON + SW2 OFF – Cooling mode with electric heating

SW1 ON + SW2 ON – Cooling mode only

SW3 – Power-On State After Power Failure:

1 – Restores last operating state (memory)
0 – Remains shut down after power failure

SW4 – Sensor Functions:
ON – Disables all evaporator and condenser sensor functions
OFF – Sensors remain active

SW5 – Seawater Pump Operation:
ON – Pump switches on/off together with the compressor
OFF – Pump runs continuously after startup

SW6 – Ventilation Mode:
ON – Ventilation mode is available
OFF – No ventilation mode

PART 8 DISPLAY

The control panel of the MBC marine air conditioning systems is equipped with an intuitive display that provides real- time information about various operational parameters of the system. The data displayed allows users to easily monitor the system's status and performance, as well as quickly make any necessary adjustments.

MBC Marine VSC units are available with LCD display.
The standard display is included as part of the basic package.
Below are the functions of the display.

The unit is in sleep mode.

Tap the screen to access the main display.

This screen appears immediately after the unit is powered on.

8.1. DISPLAY FUNCTIONS AND SETTINGS

This screen is the default control interface of the MBC Marine air conditioning system. It allows the user to set the temperature, select the operating mode, adjust the fan speed, and access both the menu and alarm functions.

By pressing the temperature buttons, the display will show the desired temperature settings.

WARNING!

Wait at least 10 seconds to switch between each mode because the coolant flowing in the system needs time to return to the normal pressure volume.

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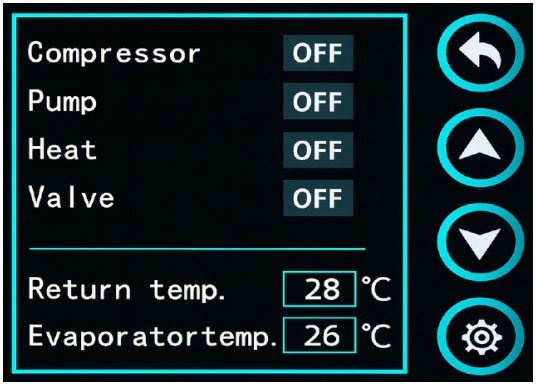
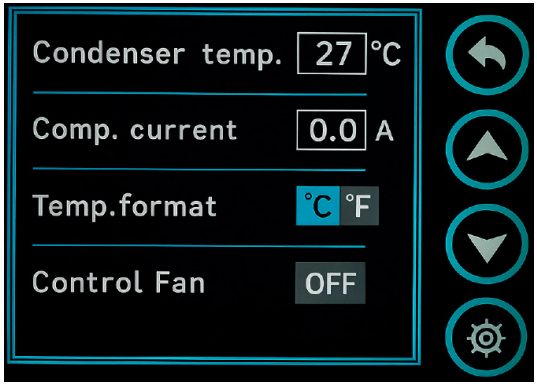
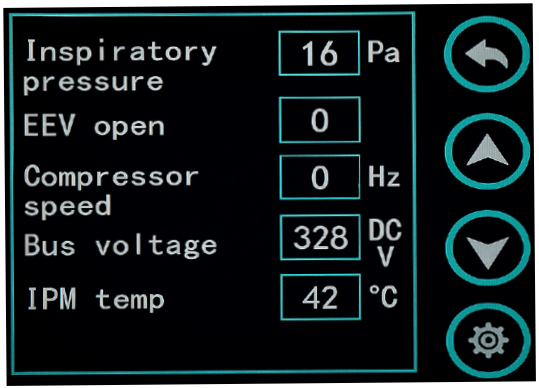




PARAMETER	EXPLANTATION
COMP-. RESSOR	Indicates the current operational status of the compressor. OFF: The compressor is not running; no active cooling or heating is taking place ON: The compressor is running, and the refrigerant is circulating in the system.
PUMP	Indicates seawater pump status. OFF: No seawater flow – system cannot cool or heat. ON: Seawater is circulating.
HEAT	This function applies only to units equipped with electric heating. Electric heating is not available on VSC models.
VALVE	Indicates the status of the 3-way valve. OFF in cooling mode, ON in heating mode.
RETURN TEMP.	Temperature of air returning from the cabin/sensor
Evaporator temp.	Temperature at the evaporator coil, approximately equal to the air temperature of the fan air.

PARAMETER	EXPLANTATION
CON-DENSER	Condenser temp.: Temperature of the condenser
COMP. CURRENT	Real-time compressor current draw
TEMP. FORMAT.	Select between °C and °F display.
CONTROL FAN	Determines whether the fan operation follows the compressor status automatically. OFF: The fan runs continuously, regardless of whether the compressor is active. ON: The fan only runs when the compressor is operating – this allows for more energy-efficient and quieter operation.



PARAMETER	EXPLANTATION
INSPIRATORY PRESSURE	Suction-side pressure Displays the pressure on the suction side of the compressor.
EEV OPEN	Electronic Expansion Valve status Indicates the opening level of the EEV (Electronic Expansion Valve) in steps or percentage. This valve regulates how much refrigerant flows into the evaporator.
COMPRESSOR SPEED	Displays the current operating speed of the compressor in Hertz..
BUS VOLTAGE	Shows the DC voltage level within the inverter power supply.
IPM TEMP	Displays the temperature of the IPM (Intelligent Power Module), which is part of the inverter's power electronics..

PARAMETER	EXPLANTATION
BRIGHT-NESS TIME	Sets how long the screen stays at full brightness after the last user interaction.
NORMAL	Active Brightness Level This top bar shows the brightness level when the display is active (being used).
SCREEN SAVER	Activates a low-brightness mode after the set time to extend screen life and reduce power consumption.

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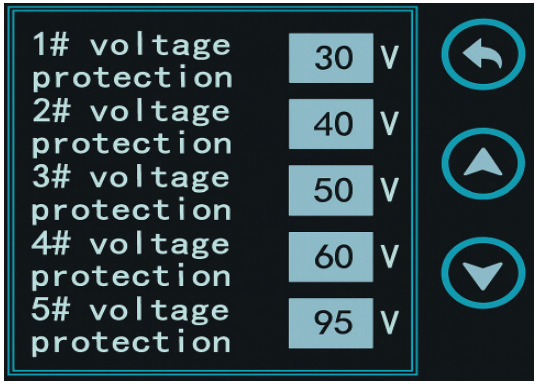


IMPORTANT WARNING:

The PIN-protected menu provides access to fine settings and advanced configuration options of the unit.

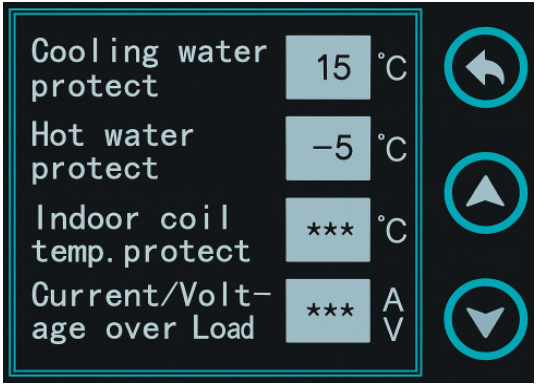
We recommend that only qualified personnel make adjustments to factory settings, as improper changes may affect system performance.

PARAMETER	EXPLANTATION
Parameter Settings	The screen displays the fan speed settings in 5 steps. Each level can be individually adjusted between 20V and 99V, corresponding to the fan's power output. The screen shows the default factory settings.

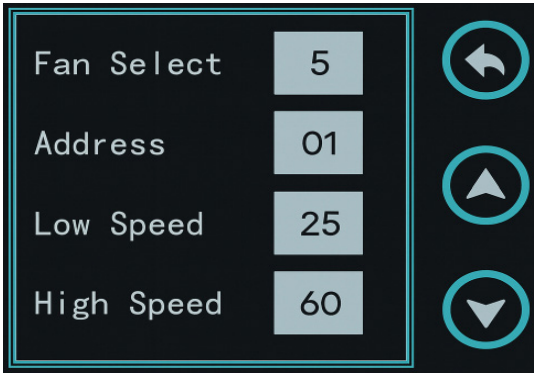
NOTE:

Adjusting the factory fan speed levels may be necessary in the following cases:

- To reduce airflow noise in compact or quiet cabin spaces
- To improve comfort in areas with unique ventilation characteristics.



PARAMETER	EXPLANTATION
Cooling Water Protect	This function defines the lower temperature limit for seawater cooling during cooling mode. If the incoming seawater temperature drops below the set value, the unit will automatically stops the compressor to prevent freezing or excessive cooling
Hot Water Protect	In heating mode, this setting defines the minimum seawater temperature. If seawater gets too cold, the system stops heating to protect the condenser from freezing or damage.
Indoor Coil Protect	This parameter is not adjustable on VSC units
Current Overload	This parameter is not adjustable on VSC units



PARAMETER	EXPLANTATION
FAN SELECT	Defines the number of fan speed steps available for operation. Depending on system configuration and requirements, 1-, 3-, or 5-step fan control can be selected.
ADDRESS	This parameter is not adjustable on VSC units
LOW SPEED	Sets the low-speed voltage for compressor operation, defined in Volts (DC). This value also determines the minimum compressor frequency during low-load conditions. Adjustable range: 10–35 V Default value: 25 V
HIGH SPEED	Defines the maximum compressor speed under full load. Higher voltage increases compressor frequency, enabling faster cooling or heating—especially useful in extreme conditions Adjustable range: 40–85 V | Default: 60 V

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8.2. WARING FOR COMRESSOR SPEED SETTINGS

IMPORTANT WARNING

LOW SPEED COMPRESSOR SPEED ADJUSTING:

If the seawater temperature is too low, the compressor may freeze the water inside the condenser during heating mode, causing the seawater flow to stop. By reducing the Low Speed value, the system lowers the compressor's operating

IMPORTANT WARNING!

HIGH SPEED COMPRESSOR SPEED ADJUSTING:

It is not recommended to set the High Speed value above 70 V for extended periods, as prolonged high-speed operation may lead to compressor damage or system failure over time.

PART 9. **TROUBLESHOOTING**

The electronic control of the unit detects possible errors and categories them as follows:

9.1 UNDERSTANDING ERROR CODES

The MBC VSC units are equipped with intelligent control systems that automatically shut down the operation in case of a fault, displaying a specific error code on the display screen. These error codes help identify the type of malfunction and guide users toward a quick resolution.

Check the ERROR CODE TALBE 1 and the corresponding detailed explanations, the user or installer can determine the cause of the issue and take the appropriate steps to restore normal system operation.

Some faults are temporary, while others may require professional intervention.

Please read the descriptions in the table carefully, and only attempt corrective actions if you are confident in the procedure.

9.2. ERROR CODE TABLE 1

ERROR CODE	ERROR DESCRIPTIONS	ISSUE	TREATMENT	RESUMES
1	Return air temperature sensor error	The temperature sensor is broken	Turn off the system	The device shall restart automatically
2	Evaporator temperature sensor error	The temperature sensor is broken	Turn off the system	The device shall restart automatically
3	Condenser temperature sensor error	The temperature sensor is broken	Turn off the system	The device shall restart automatically
4	Overheated evaporator protection	Compressor stops due to high temperature of evapo-rator in heating mode	The compressor turns off	After resolving the system restarts automatically
5	Coolant leak malfunction	Breakage of gas piping	Turn off the system	Do not use the system, contact a technician
6	Error message from main board (based on red light flashing)	All this malfunction are electrical issues on inverter module	Check on the LED blinking on PCB	Check the red lights flashes
8	High pressure protection	Refrigerant high-pressure protection	The compressor turns off	Check the cooling water flow Check the air flow volume Check the gas in the unit"
9	Evaporator temperature protection	The evaporator is icing	The compressor turns off	After the defrosting, the com-pressor restarts automatically
10	Sea water temperature protection	High water temp. in cooling mode Low water temp. in heating mode"	The compressor turns off	Increase the cooling water flow Do not use the unit in 7c sea water degree below
11	Low pressure protection	The refrigeration pressure drops below a specified threshold.	The compressor turns off	Check the cooling water flow Check the air flow volume Check the gas in the unit"
12	Return gas temperature sensor error	Temperature sensor is fault, or disconnected, shorted, or not communicating.	Turn off the system	Check the sensor connection and wiring. Ensure proper attachment to the copper pipe Replace the sensor if malfunc-tion is suspected.
13	IPM overteperature protection	The IPM module is overheated.	Turn off the system	Check ventilation, clean components, and ensure proper airflow
14	Communication Error Between Driver and Main PCB	The data connection lost between of the PCB and the inverter driver	Turn off the system	Check the communication cable connections and shield-ing, and ensure the power supply is stable. Replace the main PCB if necessary.
15	Communication Failure Between Display and Main PCB	The system shuts down, but will automatically restart once communication is restored.	Turn off the system	Check all cable connections and wiring integrity Verify power supply stability Replace the LAN cable Replace the display panel or main PCB if necessary

9.3. ERROR 1 - Room Temperature Sensor Error

The white connector + white slot error is related to an issue where the room temperature sensor cable connected to the white con-nector and white slot is disconnected or faulty. This interruption triggers an error message on the display.

Troubleshooting Steps:

- Check the connection between the white connector and the white slot:
- Ensure that the connection is secure and stable.
- Inspect the cables for any damage or disconnection.
- If the cable is damaged or the sensor is faulty:
- Replace the sensor with a new, compatible room tempera-ture sensor.

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9.4. ERROR 2 - Evaporator Temperature Sensor Error

The blue connector + blue slot error indicates an issue with the evaporator temperature sensor connected to the blue connector and blue slot. This sensor is responsible for measuring the evaporator temperature.

Most Common Causes:

- Broken wire: If the wire is disconnected, the system detects an infinite OHM value, indicating a malfunction.
- Incorrect connection: The sensor is not properly connected to the main PCB (Printed Circuit Board).

Troubleshooting Steps:

- Inspect the wiring for any damage or disconnection.
- Ensure that the connector is securely attached to the PCB.
- Sensor Replacement:
- If the wire is damaged or the sensor is faulty, replace the sensor with a new one.
- Make sure the new sensor is compatible with the system.

9.5. ERROR 3 - Condenser Temperature Sensor Error

The black connector + black slot error indicates a malfunction in the condenser temperature sensor, which is responsible for measuring the condenser's temperature. This sensor is located at the bottom of the condenser.

Most Common Causes:

- Broken wire: If the wire is disconnected, the system detects an infinite OHM value, leading to incorrect readings.
- Incorrect connection: The sensor is not properly connected to the main PCB (Printed Circuit Board), preventing the system from detecting the temperature.

- Troubleshooting Steps:
- Check the black connector is securely and correctly connected to the black slot.
- Inspect the wires for any breaks or damage.

Sensor Replacement:

If the wire is broken or the sensor is malfunctioning, replace it with a compatible sensor.

9.6. ERROR 4 – Overheated Evaporator Protection

ERROR 4 occurs in HEAT mode when the evaporator temperature reaches the default 70°C (or a user-defined limit between 50–70°C). To prevent overheating, the system automatically shuts down.

Most Common Causes:

- The compressor will restart automatically once the evaporator cools.
- If this error occurs only once every 20–30 minutes, it is not considered critical.

Recommended Actions:

- Check the air system (intake/supply grilles and ducting) for proper sizing and unobstructed airflow.
- Ensure that air duct length does not exceed 4 meters.
- Avoid undersized supply grilles, which restrict airflow and cause excess heat buildup at the evaporator.
- Follow the installation manual's airflow guidelines.

Solution:

- Perform an air ducting check and adjust grilles or ducts as needed. Proper airflow ensures effective heat dissipation from the evaporator.

9.7. ERROR 5 - Refrigerant Leak Malfunction

ERROR 5 appears when a pressure drop occurs due to a refrigerant leak in the system.

Symptoms and Diagnosis:

- Pressure drop detected in the system.
- Oil in the base tray (typically in cases of severe pressure loss).

Solution:

- A qualified technician is required for troubleshooting and repairs.
- Pressure test with nitrogen: If the leak is significant, the escaping nitrogen will help locate the exact point of leakage.

Leak Detection:

- If the leak is not visible to the naked eye, use a leak detector tool while the system is pressurized with nitrogen to identify the issue.

Repair Process:

- The leak must be sealed by brazing (soldering) the hole to restore system integrity.

System Restoration:

- Repeat nitrogen pressure test to confirm the repair.
- Vacuum the system to remove moisture and air.
- Recharge the system with the specified type and amount of refrigerant.

Dirty or Clogged Condenser

- If the condenser is covered in salt deposits, algae, or debris, water circulation becomes restricted, preventing effective heat dissipation and leading to overheating.

Excessive Load or Poor Installation

- The compressor may overheat due to:
- Incorrect system settings.
- Undersized components.
- Extreme external conditions (e.g., excessively high ambient temperature).

Troubleshooting and Solutions:

- Refrigerant Pressure Check:
- Measure the system's refrigerant pressure. If it is low, perform a nitrogen pressure test and leak detection.
- After identifying and repairing leaks, recharge the system with the correct type and amount of refrigerant.
-

Water Flow Inspection:

- Verify that the water pump is functioning properly and check for blockages or leaks in the system.
- Inspect the seawater filter and heat exchanger, ensuring they are clean and unobstructed.

Reducing System Load:

- Evaluate the installation setup to ensure the system is not overloaded.
- Check that the operating conditions are within the acceptable range for the unit.

9.8. ERROR 6 – Communication Error: Further Diagnostic Required

When Fault Code 6 appears on the display, it indicates a communication error between the main controller and the inverter module. However, the number “6” alone does not specify the exact cause of the failure.

Inside the electrical box, the unit’s control PCB features a red LED indicator.

In standby mode, the LED blinks with a 1-second on / 1-second off pattern, indicating the system is in standby. During normal compressor operation, the LED remains steadily on.

If a fault occurs, the LED blinks in a pattern of 0.5 seconds on / 0.5 seconds off, repeated according to the fault code number.

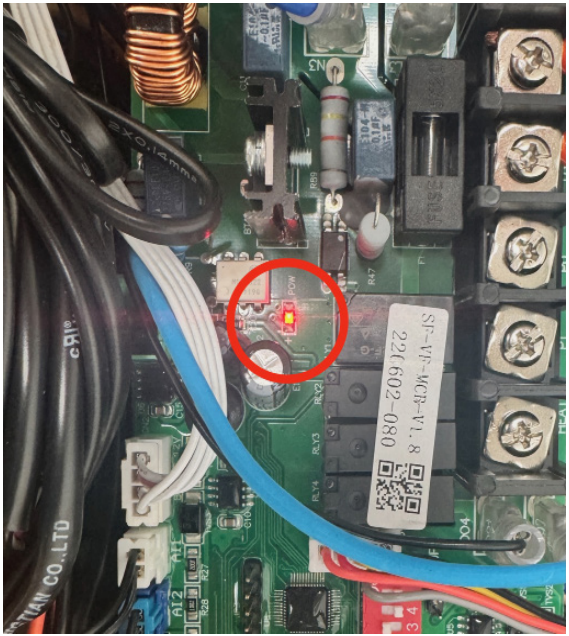
- For example, 9 blinks indicate Fault Code 9, which corresponds to “Input Current Overcurrent Shutdown.” -

After the blinks, there is a 3-second pause, then the cycle repeats until the fault is resolved.

To accurately diagnose the issue, count the number of LED blinks and compare it with the inverter fault table.

This cross-reference helps identify the root cause and ensures the correct troubleshooting actions are applied.

You must compare the number of blinks with the detailed fault table provided in the table.



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ERROR CODE	ERROR DESCRIPTIONS	ISSUE	TREATMENT	RESUMES
1	IPM protection	The inverter's IPM has shut down due to a critical internal fault	Turn off the system	Automatically resumes after temperature drops and system reset.
2	Phase current/overcurrent protection	Inverter shut down due to compressor overcurrent	Turn off the system	Inspect wiring, cooling, voltage; delay restarts; service compressor if needed
3	Compressor Running Stall or Startup Failure	Compressor fails to start or stalls shortly after running.	Turn off the system	After reset and once startup conditions are stabilized.
4	Phase Current Sampling Fault	Inverter cannot read compressor phase current accurately.	Turn off the system	Inspect current sensor and signal wiring; check for damage, interference; replace sensor or inverter if needed.
5	Overpower Protection	Power draw exceeded inverter module's safe limit.	Turn off the system	Allow cooldown; check seawater cooling, refrigerant charge, power supply, ventilation, and cable sizing.
6	Communication Failure with Upper Controller	Lost connection between inverter and main control board.	Turn off the system	Check and clean communication cables and connectors; inspect for corrosion, EMI, or control board faults.
7	Bus Voltage Undervoltage Shutdown	DC bus voltage dropped below minimum operating level.	Turn off the system	Check input voltage under load; inspect AC wiring, terminals, and cable sizing; ensure stable shore or generator power.
8	Bus Overvoltage Shutdown	DC bus voltage exceeded maximum safe limit.	Turn off the system	Check AC input for surges; verify generator/inverter regulation; inspect internal components; avoid switching power sources while unit is running.
9	Input Current Overcurrent Shutdown	Excessive current draw at AC input terminals.	Turn off the system	Check input voltage, cable sizing, and seawater cooling; inspect for compressor faults or electrical shorts; measure startup and running current
11	Input Voltage Sampling Fault	Inverter cannot read AC input voltage correctly	Turn off the system What You Should Do:	Inspect AC input wiring and terminals; verify voltage level; check sensing circuit; ensure clean signal without EMI or grounding issues
12	Input Voltage Undervoltage Protection	AC input voltage dropped below safe operating threshold.	Turn off the system	Check voltage at terminals; verify shore/generator stability
13	OHB Sensor Failure	Inverter temperature sensor is faulty or disconnected	Turn off the system	Power off system; inspect sensor wiring and connector; check for corrosion or mechanical damage; replace sensor or PCB if necessary.
14	OHB Failure	Overheat protection sensor not detected or sending invalid signal.	Turn off the system	Check sensor connection and wiring; inspect for damage, oxidation, or loose contacts; verify airflow and cooling; replace sensor or PCB if necessary.
15	IPM Over-Temperature Protection Shutdown	Inverter's power module exceeded maximum safe temperature.	Turn off the system	Shut down and allow cooldown; check electrical box ventilation, fan operation, and seawater cooling; inspect IPM and thermal hardware if issue persists.
16	EEPROM Failure	Inverter memory corrupted or unreadable.	Turn off the system	Power cycle system; if error returns, inspect for moisture or board damage; contact service for control board replacement or EEPROM reprogramming.

ERROR 6 - 1 BLINK = IPM Protection

The inverter's Intelligent Power Module (IPM) has detected an internal fault and shut down to protect the system. This protection is triggered by overcurrent, over temperature, or a hardware failure within the power module. It is one of the most critical errors and should not be ignored..

Possible Causes:

- Overheating due to poor ventilation – If the electrical enclosure is installed in a confined space without airflow, the internal fan cannot cool the IPM adequately.
- Faulty or blocked cooling fan – A failed fan or dust buildup reduces airflow and cooling efficiency.
- Seawater cooling failure – Blocked strainer, pump failure, or airlock in the condenser circuit causes the compressor to overheat, which increases the load on the IPM.
- Excessive current draw – Caused by low refrigerant, compressor malfunction, or operation under low voltage.
- Low or unstable AC supply voltage – The system compensates for low voltage by increasing current, which overloads the IPM.
- Aging or failing compressor – Internal wear causes higher resistance and thermal load.
- Internal inverter fault – A damaged or defective IPM module, sensor, or PCB fault can falsely trigger protection.

What You Should Do:

- Power off the unit completely and allow 10 minutes for full cooling.
- Inspect the electrical box installation – Ensure it is in a ventilated area, ideally in the return air path of the evaporator, but without airflow obstruction.
- Check the cooling fan operation inside the box and clean any dust or debris.
- Inspect seawater cooling system – Ensure proper flow, clean strainer, check pump function, and confirm water exits from the outlet.
- Measure input voltage under load – it should remain between 220–240V. Avoid operating if voltage drops below 210V.
- Listen to compressor behavior – If it struggles, vibrates excessively, or does not start easily, it may be overloaded or faulty.
- Have a technician check refrigerant charge and inspect for leaks or low pressure.
- If the error persists, the IPM module may be damaged and require professional servicing or board replacement.

Tip:

This error often follows poor installation or overload situations. Always ensure proper ventilation, seawater circulation, and power supply stability to prevent IPM protection shutdowns.

ERROR 6 - 2 BLINKS - Phase Current Overcurrent

The inverter has detected excessive current on one or more motor phases of the DC compressor and shut down the system to prevent damage. This is a safety response to abnormal load, restricted cooling, or electrical faults.

Possible Causes:

- Compressor overload or blockage – A mechanically jammed or internally damaged compressor may draw excessive current during operation.
- Insufficient seawater cooling – A clogged strainer, weak pump, or fouled condenser limits heat rejection, causing pressure and current to rise.
- Low refrigerant charge – Leads to abnormal suction/discharge pressures, forcing the compressor to work harder.
- Low or unstable AC input voltage – Affects the inverter's DC output stability, increasing phase current draw.
- Wiring issues – Loose, undersized, or corroded cables increase resistance and trigger overcurrent protection.
- Frequent restarts (short cycling) – Insufficient delay between stops and starts can overload the compressor windings.
- Inverter sensing fault – In rare cases, the current sensor on the inverter board may give false readings.

What You Should Do:

- Shut down the system and allow a full reset.
- Inspect compressor wiring and terminals – tighten and clean if necessary.
- Check seawater flow – clean the strainer, verify pump function, and ensure water exits freely.
- Measure AC voltage under load – should remain within 220–240V.
- Observe compressor startup – hesitation or vibration may indicate internal mechanical faults.
- Wait at least 2–3 minutes between restarts to allow pressure equalization.
- Have a technician verify refrigerant charge and system performance.
- If the fault persists, the compressor or inverter PCB may need service or replacement.

Tip:
Overcurrent errors in DC inverter systems are often linked to poor cooling or unstable power supply. Always check heat rejection and electrical connections before replacing major components.

Phase Current Sampling Fault

ERROR 6 - 3 BLINKS - Compressor Stall or Startup Failure

Possible Causes:

- Mechanical failure inside the compressor – A seized piston, damaged bearing, or internal blockage prevents the rotor from turning.
- Unstable or low input voltage – If the shore power drops below 200–210V during startup, the inverter cannot deliver enough torque.
- Incorrect installation or reversed wiring – Faulty wiring can prevent the compressor from receiving proper phase signals.
- Excessive system pressure – Restarting too quickly can trap high pressure in the system, making the compressor harder to start (short cycling).
- Faulty inverter output – The inverter may not be delivering correct drive signals due to internal faults or failed IGBTs.
- Low refrigerant – In rare cases, poor lubrication or abnormal pressure conditions can cause startup failure..

What You Should Do:

- Power down the system and wait at least 5–10 minutes to allow pressure to equalize.
- Check input voltage at the AC terminals during startup – ensure it's stable above 210V.
- Inspect wiring to the compressor – look for loose, corroded, or overheated connections.
- Verify seawater cooling is functioning properly (pump, flow, strainer).
- Ensure a startup delay is configured – avoid restarting within 2–3 minutes of shutdown.
- If the compressor hums but does not run, or clicks off quickly, suspect internal damage.
- Have a qualified technician inspect the inverter board and compressor windings.

Tip:
Compressor startup problems are often linked to power supply issues, short cycling, or mechanical faults.

Always address electrical stability and proper cooling before assuming compressor failure.

ERROR 6 - 4 BLINK S- Phase Current Sampling Fault

The inverter cannot accurately measure the current passing through one or more phases of the compressor. This fault is typically caused by a malfunction in the current sensing circuit and leads to immediate system shutdown to avoid damage.

Possible Causes:

- Faulty current sensor (e.g., CT or Hall-effect sensor) on the inverter board.
- Loose or corroded sensor connections due to vibration or humidity.
- Damaged signal lines (cut, oxidized, or disconnected).
- Interference or electrical noise on the signal lines.
- Failure in the inverter's analog-to-digital converter (ADC) or microcontroller input.
- Real overcurrent conditions exceeding sensor limits (rare but possible).

What You Should Do:

- Power down the system completely and restart after 10 minutes.
- Visually inspect wiring and connectors between the sensor and inverter board.
- Ensure all terminals are secure, clean, and corrosion-free.
- If the fault persists, the sensor or inverter board may require professional testing or replacement.

ERROR 6 - 5 BLINKS - Overpower Protection

The inverter has shut down because the power drawn by the system has exceeded the safe limits of the internal power module (IPM). This is a protective mechanism to prevent thermal or electrical damage.

Possible Causes:

- Excessive compressor current draw due to restricted seawater cooling (e.g., clogged heat exchanger, failing pump, or airlock in the circuit).
- Low refrigerant charge causing poor heat exchange, which increases compressor workload and power demand.
- Undersized or excessively long power cables causing voltage drop and higher current draw.
- Unstable or low shore power voltage (e.g., below 210V), increasing current demand on the inverter.
- Poor ventilation in the electrical box, leading to internal overheating and reduced inverter efficiency.
- Extended operation under heavy thermal load, such as in tropical climates or during long cooling cycles.

What You Should Do:

- Shut off the system and allow 10–15 minutes for cooldown.
- Inspect seawater cooling system: check strainer, pump, and water flow.
- Verify the power supply voltage is within 220–240V during load.
- Ensure electrical box is installed in a ventilated area, and the internal fan is working.
- Have a technician check refrigerant pressure and compressor current draw.
- Confirm that correct cable gauge is used between the power source and the unit.

Tip:

Use voltmeter and ammeter near the unit during commissioning. Logging real-time voltage and current values under load can help diagnose overpower events quickly, especially in remote marinas with unstable power.

ERROR 6 - 6 BLINKS - Loss of Communication with Main PCB

The inverter has lost communication with the upper controller or main PCB (typically the logic/control board that manages the overall air conditioning system). This interrupts coordinated operation and forces the inverter to shut down as a safety measure.

Possible Causes:

- Disconnected or loose communication cable (usually a signal wire or serial data line).
- Corroded or oxidized connectors, especially in marine environments.
- Electrical interference or faulty shielding in the communication cable.
- Control board malfunction – the main controller may not be sending/receiving signals correctly.
- Software mismatch or firmware error – incompatible or outdated firmware versions may prevent proper communication.
- Voltage drop on the communication supply line, causing data loss.

What You Should Do:

- Power off the entire system and inspect all data cables and connectors.
- Clean and secure all terminals related to communication wiring.
- Check for visible damage, salt corrosion, or bent pins in the connectors.
- If available, update or reflash the control board's firmware.
- Ensure that cable runs are kept away from AC power lines to reduce EMI (electromagnetic interference).
- Replace damaged communication lines if needed.

Tip:

Use shielded twisted-pair cable for communication lines (LAN cable) and ground the shield properly to reduce data noise, especially on boats with inverters, chargers, or radio equipment that may cause interference.

ERROR 6 - 7 BLINKS - Voltage Undervoltage Shutdown (VDC dropped below safe level)

The inverter has shut down because the DC bus voltage (VDC) dropped below its minimum safe operating threshold. This voltage powers the compressor motor, and if it's too low, the inverter cannot operate reliably and must shut down to protect internal components.

Possible Causes:

- Low input AC voltage (e.g. < 200V from shore power), which fails to charge the DC bus adequately.
- Voltage drop across long or undersized power cables from the breaker or shore supply.
- Loose or corroded terminals causing additional resistance in the power circuit.
- Weak or unstable generator/shore power source that cannot deliver enough current.
- Sudden large load on the AC supply, briefly reducing input voltage.

What You Should Do:

- Check shore or generator power voltage while the unit is running. Ensure it stays within 220–240V.
- Use a multimeter to monitor voltage at the unit input and identify possible drops.
- Inspect and tighten all electrical terminals in the supply circuit.
- Ensure that cable size and length meet MBC Marine specifications (for 230V units).
- If using an extension cable, ensure it is marine-grade and appropriately rated.

Tip:

Install a voltage monitoring relay at the power inlet to prevent operation under undervoltage conditions. This protects both the inverter and the compressor from operating in unstable power environments.

ERROR 6 - 8 BLINKS - Bus Overvoltage Shutdown

The inverter has shut down because the internal DC bus voltage (VDC) exceeded its maximum safe threshold. This condition is dangerous for the inverter's power electronics and must be avoided to prevent damage.

Possible Causes:

- Sudden voltage surge from shore power or generator.
- Incorrectly rated or malfunctioning voltage regulator/inverter in the power supply system.
- Abrupt disconnection of compressor load while the inverter is still active, causing voltage rebound (back EMF).
- Internal inverter malfunction, such as failed snubber circuits or capacitor charging faults.
- Use of unregulated or incompatible external power sources (e.g., unstable inverters or improperly adjusted power supplies).

What You Should Do:

- Turn off the unit and wait at least 10 minutes before restarting.
- Check the voltage at the input terminals – it should be steady between 220–240V.
- If a generator or power inverter is used, confirm it has proper voltage regulation.
- Avoid switching between power sources (e.g., shore/generator) while the unit is running.
- If the issue recurs, an internal component of the inverter (e.g., capacitor, rectifier) may be faulty and requires professional service.

Tip:

Consider installing a surge protector or voltage stabilizer at the AC input to guard the system against sudden voltage spikes from shore or generator sources.

ERROR 6 - 9 BLINKS - Input Current Overcurrent Shutdown Excessive AC input current detected

The system has detected excessive current draw at the AC input terminals and shut down to protect the inverter and power supply components. This is a critical safety measure to prevent overheating or electrical damage.

Possible Causes:

- Severely low voltage at input (e.g. <200V): The unit compensates by drawing higher current, leading to overload.
- Undersized or excessively long AC power cables, causing voltage drop and increased current at the source.
- Electrical short circuit or ground fault in the wiring or components.
- Compressor malfunction: A locked rotor or internal mechanical fault causes high startup or running current.
- Poor seawater cooling - results in high condenser pressure and increased compressor current draw.
- Unstable shore or generator power: Unregulated sources may deliver erratic current.
- Overloaded system operating in extreme heat for prolonged periods.

What You Should Do:

- Power off the system completely and let it cool down.
- Check shore/generator voltage and confirm it's stable (ideally 220–240V).
- Inspect the AC input cable size and length. Upgrade if undersized.
- Ensure proper seawater cooling: clean the strainer, verify pump operation and flow.
- Monitor compressor operation: loud or delayed startup may signal a mechanical fault.
- Use a clamp meter to measure current draw at startup and running.

Tip:
Always use properly sized AC wiring for marine installations. For long cable runs, increase cable diameter to prevent voltage drop and current overload.

ERROR 6 -11 BLINKS - Input Voltage Sampling Fault
AC voltage detection failed

The inverter has detected a fault in the AC voltage sensing circuit. While the DC bus voltage (VDC) is present and within the normal range, the system cannot detect or sample the AC input voltage (VAC). This indicates a problem not with the power supply itself, but with how the inverter reads or interprets the input voltage.

Possible Causes:

- AC voltage sensing circuit failure – The voltage divider, opto-isolator, or ADC (analog-to-digital converter) on the control board may be malfunctioning.
- Loose or corroded AC input terminals – One of the input wires may be poorly connected, causing intermittent or no voltage detection despite physical connection.
- Input voltage too low to register – If shore power supplies less than ~170V, the system may not recognize it as valid input.
- Control board malfunction – The microcontroller may fail to interpret the AC voltage signal even if it is present.
- Electrical interference or grounding issues – High-frequency noise, poor grounding, or EMI can disrupt the voltage sensing circuit.

What You Should Do:

- Power off the unit completely, wait 5–10 minutes, then restart to clear temporary errors.
- Verify AC input connections:
- Ensure terminals are tight and not oxidized.
- Confirm both Line (L) and Neutral (N) are properly wired.
- Measure actual voltage at the unit input:
- Ensure it is within 220–240V.
- If below 170V, try switching to a different shore power outlet or generator.
- Inspect grounding and electrical noise sources – Poor grounding or interference from nearby high-current cables can distort sensing.
- Check internal connections on the control board, especially where the AC voltage sensing components are located.
- If possible, test the unit on another known good power source to rule out supply issues.

Tip:

This error often reflects a monitoring or sensing problem, not an actual power loss. If the issue persists even after all external checks, the inverter control board or its voltage sampling circuitry may need professional inspection or replacement.

ERROR 6 - 12 BLINKS - Input Voltage Undervoltage Protection - AC input voltage too low

The inverter has shut down because the input AC voltage dropped below the minimum operating threshold. This is a protective feature that prevents damage to the system from running under unstable or weak voltage conditions, which can cause overcurrent or overheating.

Possible Causes:

- Low shore power supply voltage – Some marina shore connections may be overloaded or undersized, resulting in input voltage dropping below 200V, or even under 180V.
- Undersized or excessively long AC cable – Voltage drop across a long or thin wire can reduce the effective voltage reaching the unit.
- Temporary power dips or instability – Short power fluctuations can cause undervoltage detection even if the average voltage seems acceptable.
- Loose terminal connections – Poor contact at the AC terminals increases resistance and reduces voltage under load.
- Weak or poorly maintained generator – If using a genset, it may not maintain a stable 230V output under compressor load.

What You Should Do:

- Power off the system completely and allow a short reset period.
- Measure the input voltage directly at the unit terminals using a multimeter:
- Acceptable range: 220V–240V.
- If below 210V, the system may trigger this error during startup or under load.
- Check AC cable specifications:
- Ensure wire gauge is suitable for the current draw and length (e.g., 3×2.5 mm² or larger for longer runs).
- Inspect all terminal screws and connectors for tightness and signs of corrosion or discoloration.
- Try a different shore power outlet or generator, if available.
- If undervoltage persists, use a voltage stabilizer or isolation transformer to maintain a consistent 230V supply.

Tip:

Prolonged undervoltage can lead to excessive current draw, which may cause overheating, compressor startup failure, or IPM protection errors. Addressing input voltage quality is essential for reliable operation in marine environments, especially during peak summer usage in crowded marinas.

ERROR 6 - 13 BLINKS - Over temperature Protection (Heat Sink/IPM Overheat Shutdown)

The inverter has shut down because the internal heat sink (typically where the Intelligent Power Module – IPM – is mounted) has exceeded the safe operating temperature limit. This protection prevents thermal damage to the power electronics and is triggered when the cooling system cannot adequately dissipate heat.

Possible Causes:

- Poor ventilation around the electrical box – Enclosed or confined installation space prevents heat dissipation.
- Faulty or blocked internal cooling fan – Dust, corrosion, or fan failure reduces airflow and causes overheating.
- Inadequate seawater cooling – Fouled heat exchanger, blocked strainer, airlock, or failed pump increases compressor load and heat output.
- High ambient temperatures – Prolonged operation in hot climates causes internal temperature buildup.
- Continuous heavy load – Long cooling cycles in tropical conditions or under oversized demand increase IPM temperature.
- Sensor is working correctly but detecting true overheat – Not a sensor fault, but a real thermal condition.

What You Should Do:

- Power off the unit completely and allow 10–15 minutes to cool down.
- Ensure the electrical box is installed in a ventilated space, preferably in the airflow path of the return air.
- Check the internal fan: confirm it's running properly and clean out any dust or debris.
- Verify seawater cooling performance: clean the strainer, ensure pump is primed and water is exiting at the outlet.
- Reduce thermal load where possible (e.g., shorten duty cycles or improve cabin insulation).
- Check for mechanical faults in the compressor that might cause excessive heat.
- If the issue recurs, the IPM may be overheating due to degraded thermal paste, sensor miscalibration, or advanced component aging.

Tip:
This protection often triggers due to installation or cooling deficiencies, not component failure. Always check ventilation and seawater flow first before assuming an electronic fault. Installing a temperature logger inside the electrical box can help monitor heat buildup over time.

ERROR 6 - 14 BLINKS - OHB Sensor Failure (Temperature Sensor Fault)

The inverter has detected a fault with the Over Heat Block (OHB) sensor – the component responsible for monitoring the internal temperature of the inverter or its heat sink. Unlike Error 13, which indicates actual overheating, this error signals that the sensor itself is malfunctioning or is no longer sending valid temperature data to the inverter.

Possible Causes:

- The temperature sensor is dislodged, damaged, or oxidized.
- Wiring or connector issues between the sensor and the inverter PCB.
- Short circuit or open circuit in the sensor wiring.
- The control board (PCB) cannot read the OHB sensor due to internal faults, such as a failed ADC input.
- In rare cases, a manufacturing defect or incorrect sensor calibration.

What You Should Do:

- Power off the unit and wait 5–10 minutes before restarting.
- Check whether the temperature sensor is firmly connected and free of corrosion.
- Inspect the sensor wiring for mechanical damage or insulation failure due to salt crystals or vibration.
- Ensure the cooling fan is operating and that no airflow obstructions are present in the electrical box.
- If the error persists, the sensor or entire control board may need to be replaced.

ERROR 6 - 15 BLINKS - IPM Over-Temperature Protection Shutdown

The inverter's Intelligent Power Module (IPM) has exceeded its maximum allowable operating temperature. To prevent permanent damage, the system initiates an immediate shutdown. This is a critical thermal protection mechanism, indicating that the cooling of the electrical unit is insufficient under current conditions.

Possible Causes:

- Poor ventilation of the electrical enclosure – If the electrical box is installed in a confined or stagnant space, internal heat cannot dissipate, even with the fan running.
- Blocked or failing internal fan – If the inverter fan is malfunctioning or the air vents are obstructed (by dust, debris, or corrosion), airflow is reduced and temperature rises.
- High ambient temperature in machinery room – Especially in small engine compartments without forced ventilation.
- Poor seawater cooling performance – When the condenser does not reject heat properly (due to strainer blockage, air bubbles, pump failure, or fouling), the compressor load increases, heating the IPM.
- Sustained high compressor workload – Hot weather, poorly insulated cabins, or undersized units cause the compressor to run at high duty cycles, increasing heat generation.
- Aging thermal paste or internal hardware degradation – Over time, the thermal connection between the IPM and heatsink may deteriorate, reducing cooling efficiency..

What You Should Do:

- Shut down the system completely and allow it to cool for at least 10–15 minutes.
- Ensure the electrical enclosure is mounted in a ventilated space, ideally in the return air path near the evaporator, but not obstructing it.
- Check that the inverter fan is operational and air passages are clear.
- Inspect the seawater circuit: clean the strainer, verify pump function, and check for strong water flow through the condenser.
- Measure input voltage to ensure it is within 220–240V. Low voltage increases current and thermal load.
- If the error occurs repeatedly even under normal conditions, the inverter's thermal hardware (sensor, fan, IPM)may be degraded and should be inspected by a technician.

Tip:

During installation, always provide cool airflow access to the inverter enclosure. Even with an internal fan, the IPM relies on ambient ventilation to maintain safe operating temperatures.

ERROR 6 - 16 BLINKS - EEPROM Failure

The inverter's onboard EEPROM (Electrically Erasable Programmable Read-Only Memory) is reporting a malfunction. This non-volatile memory stores system settings, calibration data, and key operational parameters. If it becomes unreadable or corrupted, the inverter may be unable to operate safely and shuts down to prevent further issues.

Possible Causes:

- Power surge or voltage spike during startup or while connected to unstable shore power or an unregulated generator.
- Physical failure of the EEPROM chip – internal defect or memory cell degradation over time.
- Controller board malfunction – communication between the main microcontroller and the EEPROM is disrupted.
- Corrosion, salt exposure, or moisture on the circuit board, especially in humid marine environments.
- Improper grounding or electrostatic discharge – especially during service or installation.

What You Should Do:

Power off the entire system completely (including circuit breaker), wait at least 1–2 minutes, then power it back on.

– This clears any temporary data access issue.

If the error returns immediately after reboot:

The control board (upper board) or entire inverter PCB may need replacement.

Contact technical support or a qualified marine HVAC technician.

Inspect the installation area for signs of moisture ingress, corrosion, or salt contamination.

Verify shore power stability – consider using a voltage regulator or surge protector to prevent future EEPROM damage.

If possible, check with the supplier if a firmware reset or re-flashing procedure is available for your unit.

Note:
This is one of the most critical faults in the system. Since it affects saved configuration and system memory, it is not user-serviceable. Persistent EEPROM faults require professional diagnosis and board-level repair or replacement.

9.9 - ERROR 8 - High Gas Temperature Error

ERROR 8 occurs due to high gas pressure and temperature, indicating a disruption in the condensation process. As a result, refrigerant pressure rises to critical levels, leading to compressor overload and a safety shutdown.

Possible Causes:

- Seawater Flow Issues: If seawater flow decreases or stops, the condenser cannot dissipate heat properly. This leads to inadequate refrigerant condensation and increasing sea water flow.

Potential Causes of Seawater Flow Issues:

- Malfunctioning or air-locked seawater pump.
- Clogged seawater filter.
- Blocked water intake or piping system.

Insufficient Air Circulation:

- If the fan cannot generate sufficient airflow, the heat exchanger fails to dissipate heat effectively, leading to excessive refrigerant pressure.

Possible Causes of Insufficient Air Circulation:

- Overly long air ducts (>4 m)
- Increased airflow resistance leads to pressure drops and reduced efficiency.
- Undersized intake and exhaust grilles - If the grilles are too small, the fan cannot circulate enough air, causing the condenser to overheat.

Faulty high pressure sensor

- High pressure sensor In rare cases, the high-pressure
- Sensor may fail, causing a false alarm.

Testing the Sensor:

- Short-Circuit Test: Temporarily short the two sensor wires—if the system restarts, the sensor is faulty.
- Mechanical Sticking: Gently tap the sensor with a screwdriver handle to see if it resets.

WARNING! Shorting the sensor is for testing purposes only! Operating the system without a functional pressure sensor is not recommended.

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9.10 - ERROR 9 - Evaporator Temperature Protection: DEFROSTING

ERROR 9 indicates the beginning of evaporator icing. To prevent damage, the system automatically activates the Defrosting process, temporarily stopping the compressor. Once defrosting is complete, the system will restart within a few minutes.

Possible Causes:

- Cold sea water temperature:
- When seawater is still cold (bearly summer (13-16°C) but the interior temperature of the boat is high, ice formation may occur on the evaporator. This phenomenon disappears in summer as seawater temperatures and air humidity rise up.
- Low Refrigerant Level: If the issue persists even in hot summer conditions, a refrigerant leak or insufficient refrigerant charge is likely the cause.
- Inadequate Airflow: Low fan speed, insufficient intake air, or restricted airflow prevents proper heat dissipation from the evaporator, leading to icing.

Undersized Supply Air Grilles:

- If the grilles at the end of the air duct system are too small, cold air cannot escape efficiently, causing frost buildup on the evaporator surface.
- Undersized Supply Air Grilles, If the grilles at the end of the air duct system are too small, cold air cannot escape efficiently, causing frost buildup on the evaporator surface.

What You Should Do:

- Turn off the system and allow the evaporator to defrost fully.
- Check the return air path: ensure filters are clean and nothing blocks airflow.
- Inspect fan operation and confirm airflow across the coil is strong.
- Have a technician verify refrigerant charge and rule out leaks.
- Check the temperature sensor and replace if readings are inconsistent.

Tip:

If Error 9 occurs frequently even in warm weather, (24-26°C) have a technician check refrigerant levels and air distribution. Also, ensure air grilles are properly sized and not obstructed—poor airflow is a common cause of evaporator icing.

9.11 - ERROR 10 - Sea Water Temperature Protection

ERROR 10 is triggered when the seawater temperature is too cold (in heating mode) or too hot (in cooling mode). To protect the condenser, the system automatically shuts down if seawater temperature falls below 2-3°C in heating mode or exceeds 35°C in cooling mode.

Possible Causes:

- Tropical conditions where seawater exceeds 32–34 °C (cooling mode).
- Operation in cold seasons or shallow harbors with water below ~7 °C (heating mode).
- Fouled condenser or poor seawater circulation.
- Blocked or partially clogged seawater strainer or heat exchanger.

What You Should Do:

- Increase seawater flow by cleaning strainer and verifying pump function.
- Avoid using the system when seawater temperature is out of range.
- Use only in suitable seasonal conditions (e.g., cooling above 7 °C seawater).
- Inspect for biofouling or scale inside condenser tubes.

Tip

Ensure the seawater cooling system is operating at full capacity — a clean strainer, unobstructed water flow, and proper pump sizing are essential to avoid compressor overheating and prevent overload shutdowns.

9.12 - ERROR 11 - Low Refrigerant Pressure Protection

The system detected that the suction pressure is too low, typically indicating refrigerant-related issues or poor heat exchange. The compressor is locked out or shut down to prevent damage.

Possible Causes:

- Refrigerant leakage or insufficient charge.
- Clogged air filter or blocked airflow across the evaporator.
- Frozen evaporator coil reducing suction pressure.
- Low cabin load in mild weather conditions.

What You Should Do:

- Have a technician inspect refrigerant pressure and top up if needed.
- Check for refrigerant leaks (oil stains on joints or copper lines).
- Ensure all air filters are clean and the blower is operational.
- Let the system defrost fully and recheck pressure values.

Tip:

This is a refrigerant circuit protection. Never attempt to add refrigerant without confirming system integrity and leak testing. system to clear the error.

9.13 - ERROR 12 - Return gas Temperature error

The sensor monitoring return refrigerant gas temperature (usually on the suction line) is disconnected, shorted, or giving invalid readings. Accurate temperature sensing is essential for proper system control.

Possible Causes:

- Sensor wire damaged by vibration or corrosion.
- Poor sensor contact with suction pipe.
- Sensor has failed due to age, salt, or moisture.
- Loose connector on the PCB.

What You Should Do:

- Inspect the sensor and verify it is tightly clamped to the suction line.
- Check wiring continuity and connector condition.
- Replace the sensor if readings are unstable or out of expected range.
- Use a multimeter to measure NTC resistance at ambient temperature.

Tip:

Use thermal paste or proper clamp for firm sensor contact with the pipe. Poor sensor contact may lead to unnecessary shutdowns.

9.14 - ERROR 13 - IPM Overtemperature Protection

The inverter's Intelligent Power Module (IPM) has exceeded its safe operating temperature. The compressor is stopped immediately to prevent thermal damage.

Possible Causes:

- Poor ventilation in the electrical enclosure.
- Malfunctioning internal fan or blocked vents.
- High ambient temperature in machinery room.
- Overloaded system – long runtime, dirty filters, poor seawater cooling.

What You Should Do:

- Allow the unit to cool completely.
- Verify the inverter fan is working and air vents are unobstructed.
- Improve ambient airflow around the electrical box.

Tip

Install the electrical box in a well-ventilated space with at least 10 cm clearance on all sides. Keep the fan and air vents clean to ensure proper airflow. For improved heat dissipation, consider adding an internal aluminum or copper heat spreader below the electrical box

9.15 - ERROR 14 - Communication Error Between Driver and Main PCB

The inverter driver and the main control board have lost communication. Without valid signal exchange, the compressor cannot operate safely.

Possible Causes:

- Damaged or corroded communication cable.
- Loose or miswired terminal on the driver board.
- Electrical interference from nearby high-voltage wires.
- Control board fault or driver board fault.

What You Should Do:

- Turn off the power and inspect all communication cables and connectors.
- Check shielding and grounding of the signal cables.
- Replace cable if it shows signs of oxidation or physical damage.
- Reboot the system and monitor for reconnection.

Tip

Keep communication wires separated from AC mains cables to reduce EMI that may disrupt inverter-display communication.

9.16 - ERROR 15 - Communication Failure Between Display and Main PCB

The system display panel cannot communicate with the main control PCB. While not directly dangerous, this disrupts user control and must be resolved for full functionality.

Possible Causes:

- Loose or broken display communication cable (LAN or RS485).
- Moisture intrusion or salt corrosion on RJ-type connectors.
- Faulty display module or control board.
- Software hang or reset condition.

What You Should Do:

- Inspect the display cable from panel to main board.
- Reseat connectors and clean with contact cleaner if needed.
- Replace the display cable if frayed or oxidized.
- Try replacing the display panel if issue persists.

Tip:

Use high-quality, marine-rated RJ485 cable and avoid sharp bends or kinks to prevent signal loss and long-term damage.

PART 10. **WARRANTY**

10.1. MBC Marine – Limited Warranty

MBC Marine provides a limited warranty for its marine air conditioning systems, covering defects in materials and workmanship.

The purpose of this warranty is to ensure the reliable and proper operation of the unit for the original end-user within the defined warranty period.

If a product is found to have a verified defect in material or workmanship during the warranty period, MBC Marine, at its sole discretion, may repair or replace the defective component(s), or refund the purchase price partially or in full.

In the case of a refund, the contractual relationship is considered terminated and no further claims may be made by the owner

10.2. Warranty Period

The warranty duration is as follows:

For registered units installed by an official MBC partner: 2 years full warranty.

For unregistered units or those not installed by an MBC partner: 1 year (first 6 months include parts and labor; last 6 months cover parts only).

The warranty period begins on the date of purchase, the date of installation, or—if part of an OEM installation—the date the vessel is delivered to the end-user. However, under no circumstances shall the warranty period exceed 3 years from the manufacturing date.

The manufacturing date can be verified via the serial number through MBC Marine's customer service.

10.3. Product Registration

To fully benefit from the warranty coverage, product registration is recommended. Registration can be completed online at www.mbc-marine.com. If the product is not registered, a valid proof of purchase must be provided to initiate any warranty claim.

NOTE!

Failure to properly ground and connect the unit to the water system or the electrical system and improper installation work will void the warranty.

10.4. Warranty Exclusions

This warranty does not apply in the following cases:

- Normal wear and tear (e.g., filters, fuses).
- Additional labor costs for the removal or reinstallation of the system.
- Damage occurring during transportation or improper storage.
- Improper installation that does not follow official MBC Marine installation guidelines.
- Corrosion, improper maintenance, misuse, or external damage.
- Unauthorized modifications, use of non-genuine parts, or repairs by non-authorized personnel.
- Water damage to electrical components such as control boards or displays.
- Failures due to insufficient winterization.
- Use of unauthorized refrigerant types.
- Any indirect, incidental, or consequential damages (including travel costs, lost time, financial loss, or personal injury).

10.5. Final Provisions

MBC Marine reserves the right to amend this warranty policy at any time without prior notice, especially to comply with national or EU legislation governing warranty rights.

PART 11. KEY INSTALLATION NOTES

- Free airflow – Ensure unobstructed airflow in and out of the unit during installation.
- Seawater system – Follow all seawater system installation guidelines to avoid errors caused by insufficient water flow.
- Always raise one side of the indoor unit by at least 1–2 cm to ensure proper condensate drainage from the drain pan.
- Install the seawater strainer in an easily accessible location, at least 30 cm below the waterline. This helps reduce the risk of airlock and prevents the pump from running dry.
- Drain test – After installation, pour 2–3 liters of water into the drain pan to verify that the condensate drains properly. Observe the flow to ensure there are no blockages or backflow.
- Do not share the seawater circuit with other systems (e.g. toilet or engine cooling). Doing so can cause serious flow issues and system error codes.
- Install a zinc or aluminum sacrificial anode upstream of the pump to protect the condenser and other metal components from electrolysis and corrosion.
- Do not share the seawater circuit with other systems (e.g. toilet or engine cooling). Doing so can cause serious flow issues and system error codes
- Install a zinc or aluminum sacrificial anode upstream of the pump to protect the condenser and other metal components from electrolysis and corrosion.
- Connect all metal parts in contact with seawater to the boat's grounding system, including the seawater inlet fitting, the pump, and the chassis of the air conditioning unit.
- Avoid 90° or 180° bends in the air ducting, as these can reduce airflow by up to 25%.
- Do not install the display in direct sunlight, near heat sources, or in walls with heat behind them. Improper placement can cause inaccurate temperature readings.
- Errors related to refrigerant pressure and temperature (e.g. ERROR 8, ERROR 10) are often caused by insufficient seawater flow or pump failure — always check the seawater system first.

PART 12. TECHNICAL DATA

TECHNICAL PARAMETERS OF THE A/C UNIT		VSC 08	VSC 13	VSC 16	VSC24
Cooling capacity	Btu/h	8000	13000	16000	24000
Heating capacity	Btu/h	8700	13800	17600	26400
Power supply		230V/50-60Hz 1 Ph			
Power Input (kW)	Cooling	0,74	1,01	1,17	1.75
	Heating	0,86	1,28	1,56	2.2
Load Anps (A)	Cooling	3,3	4,2	5,1	7.9
	Heating	3,7	5,2	6,5	9.9
Ventilation (m3/h)	High	420	580	730	1200
	Medium	350	495	610	1080
	Low	280	410	520	900
Refrigerant type			R32		
Sizes	Height	320	350	360	430
	Width	420	500	510	690
	Depth	255	305	320	449
Size of air duct (mm)		100	125	150	200
Size of return air grills (cm2)		300	450	510	720
Sizes of supply air grills(cm2)		750	800	1030	1400
Drain water outlets		DN20	DN20	DN20	DN20
Size of condenser's water connection		5/8"	5/8"	5/8"	5/8"
Weight (kg)		20	26,5	29,5	58

PART 13. LEGAL DISCLAIMERS AND LIABILITY

MBC Marine has prepared this installation and user guide based on the most current information available.

However, due to the nature of its use, the guide does not cover all possible user needs or questions.

We recommend contacting our experts for any specific inquiries or unique requirements.

While every precaution has been taken to ensure the accuracy of this guide, MBC Marine is not liable for any errors or omissions, nor for any damages arising from the proper or improper use of the product or the information provided herein.

CE MANUFACTURER'S DECLARATION OF CONFORMITY

Name and address of manufacturer:
MBC Marine Ltd., Petőfi Sándor 39/A Diósd, 2049
08 November 2019.

We hereby certify that the designing and manufacturing of

Marine air conditioning units

were performed in accordance with the following specifications of the following standards:

EN 55014-1 2011/65/EC (RoHS), EN 55022, EN 55024,, EN 61000, EN 60950-1, EN 301 489-1, EN 301 489-18.

According to the above, the product :
Marine air conditioner: **VSC08 - VSC10 - VSC13 - VSC16 - VSC24**

CONFORMS

to the specifications of standards and directives and to the conditions of healthy and safe use indicated below:

NUMBER, ABBREVIATED NAME OF DIRECTIVE	TITLE
EN 55014-1	Electromagnetic compatibility. Requirements for household appliances, electric tools and similar apparatus. Part 1: Emission
EN 61000-3-2	Electromagnetic compatibility (EMC). Part 3-2: Limits. Limits for harmonic current emissions (equipment input current ≤16 A per phase).
EN 61000-3-3	Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤16 A per phase and not subject to conditional connection
IEC 61000-4/2/3/4/5/6/11	Electrostatic discharge, radiated electromagnetic field, electrical fast transients, surge immunity, conducted disturbances, voltage dips immunity.
2011/65/EC (RoHS)	Use of certain hazardous substances in electrical and electronic equipment

Manufactured and marketed fixture conform to the specifications indicated above as the following:

PRODUCT FEATURES	RESULT	TESTING/EVALUATION METHOD
Disturbance power emission	Pass	EN 55014-1
Harmonic current emission	Pass	EN 61000-3-2:2006 + A1: 2009 +A2:2009
Voltage fluctuations and flicker	Pass	EN 61000-3-3:2008
Electrostatic discharge, radiated electromagnetic field, electrical fast transients, surge immunity, conducted disturbances, voltage dips immunity.	Pass	IEC 61000-4-2/3/4/5/6/11
Hazardous substances contents	Pass	Chemical quantitative analysis

These directives apply to full compliance with the installation and operating instructions issued by MBC Marine.

The data here in above are verified by:
MBC Marine Ltd., Petőfi Sándor 39/A Diósd, 2049

Last two digits of the year of CE marking: **19**

MBC MARINE KFT.
1028 Budapest
Vízesés u. 8/A

Executive Director

CE