

TERMCDINAMICA

MARINE INVERTER AIR CONDITIONING



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COMPANY PROFILE

Termodinamica is a company that operates in the marine air conditioning industry with cutting edge technology.

Founded in 2010 by three partners that had been working in the conditioning refrigeration and industrial mechanics sector since the early 80's.

The great passion for the sea led the 3 partners to transform their vision into reality and start promoting their idea of comfort on board.

The use of only the highest quality products and the finest technology are the hallmarks of Termodinamica that guarantees the highest excellence of its plants and products, structuring itself in three main divisions: mechanics, electronics, and refrigeration.

Termodinamica is based in the province of Varese, Italy. The factory is spread over an area of 2000 square meters and employs highly skilled technicians that produce only the finest quality products. The company offers the latest industry technologies from robotic arc welding, white argon chambers for titanium welding in protected atmosphere and a production area organized according to the highest quality standards.

Termodinamica offers a full range of services for the naval HVAC sector; Cooling and heating with inverter heat pumps, cold rooms and chilled rooms, construction of cold room in stainless steel (on demand), titanium heat exchangers hand made for every needs. Engine rooms and car parking ventilation for commercial ferries. It also manufactures steel air ducts.

Termodinamica counts on a team of highly skilled technicians all over the world. Ready to assist with any kind of project and to the most demanding customer.

Besides Italian, Termodinamica offers service in English, Spanish and Russian.

Termodinamica systems guarantee superior comfort, energy efficiency and reliability by offering a 5 years warranty on almost every system.





TERMCODINAMICA

MARINE INVERTER AIR CONDITIONING

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TROPICAL SEAS

Termodinamica is the only manufacturer of marine inverter HVAC systems in the industry based on titanium sea water exchanger grade 2. Patented architecture allows full resistance against corrosion and fouling.

The special condensing circuit work perfectly in 38°C (100°F) of sea water. We can offer maximum comfort in any tropical sea where the medium temperature is 32°C (90°F).

The smart software is able to obtain the optimal refrigerant evaporation from all the air handlers offering an extremely high cooling capacity with air output from diffuser of up to 2°C (35°F).

This level would be impossible to reach with chilled water system.

With a very low working temperature on the air handlers, Termodinamica is able to offer superior dehumidification capacity allowing a healthier environment, increasing on board comfort (up to 20% RH reduction in 20 minutes). The electronic control assures a perfect temperature control, keeping the humidity level stable with a power consumption reduced between 50% (minimum guaranteed) and 70%, compared to all other systems in the market.



POLAR WATER

Titanium heat exchanger offers high mechanical resistance thanks to a special patented construction that increase flexibility. In colder seas, we can reach excellent heat exchange performance to exalt heating capacity of our HVAC systems.

Termodinamica offer excellent systems for marine heating based on inverter heat pump able to reach COP 7. It means that instead of the electric heater with COP 1 an inverter heat pump uses a power consumption of 1kw and release 7kw of heating capacity! This system provides important savings on board (as well as fuel consumption) and its also the most eco-friendly system for polar vessels.

The advanced use of electronic expansion valve EEV and a smart management software that control the refrigerant evaporation, also with sea water at -5°C (23°F) allows to produce 50°C of hot air in any conditions.

SAILING RACING YACHT

Termodinamica uses special materials for the production of the components they offer. This enables them to provide systems that are extremely performing and ultralight.

Typically a 60.000 btu system for a 100ft carbon fiber sail yacht approximately only weight 80kg (175 lb).

The compressor box is made by an aviation grade aluminum frame. Air Handlers offer a carbon fiber option to reduce the weight.

Inverter compressor allows reduced displacement and related reduced weight keeping same cooling capacity.

Termodinamica's Titanium condenser weight an average of 3 times less compared to standard copper-nickel.

Higher system efficiencies allows use of smaller and lighter gensets. Power source range for a 100ft is 500 watt to 2,0kw.

REMOTE CONTROL

Termodinamica uses telemetry system for HVAC able to control the yacht via Internet in every corner of the world.

For professional customers 24/7 monitoring systems are available that constantly communicating with Termodinamica's operating center to alert in case that a system begins to work in harsh conditions.

On board the software is based on smart fault prevention system.

It survey every components of the system, (temperatures, pressures, voltage etc) and before a components can breakdown for continuos work in harsh conditions the software will analyze the anomalies and will control it.

Termodinamica marine remote control system makes happy every crew member guaranteeing a superior level of service.





INVERTER COMPRESSOR WITH CAPACITY ON DEMAND



Boat 40-60 ft - VRV10E1

100%



60%



40%



20%



Electric line

BUS IN

Touch OUT

- 24 V
+ 24 V
BUS B
BUS A

V - OUT
V + OUT
BUS B
BUS A

Air Handler - Electronic panel



Touch Screen



Refrigerant line with small thermoplastic hoses, light, flexible and with fast connection made in stainless steel

ELECTRONIC EXPANSION VALVE - EEV



EEV are a very important component of the system. These valves allows you to get extremely precise temperature outputs from air diffusers. EEV's offers an accurate electronic control with 500 steps allowing for precise operation of the air handler to the tenth of degree (0.1°)!

Compared to a hydraulic line, a refrigerant line, allows you to optimize performance. This allows you to minimizes the wait time in getting desired temperature into the cabins.

With this system its possible to maintain one room at a working temperature of 77°F(25°C) and another at 68°F(20°C). This is done by adjusting air handlers coils at different temperatures. Each valve has a dedicated microprocessor that manage and communicates with central CPU.

On the contrary, chillers have the same water temperature for all of its air handlers and the thermostat only controls fan speed.

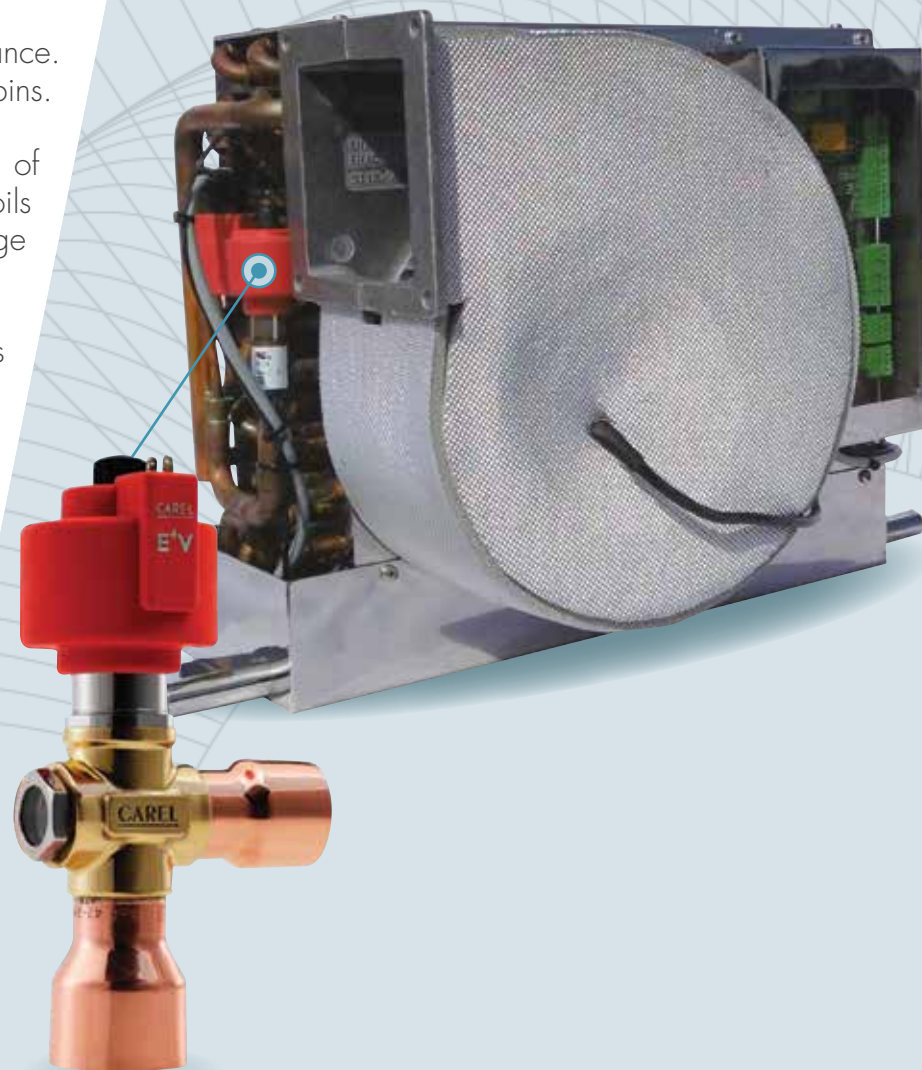
This technology, with use of inverter compressors, is exclusive to Termodinamica which holds worldwide patents for the marine industry.

These valves allows also CPU control of superheat and condensation of refrigerant to comes up to the physical limit of its operating curve.

Catalogue includes machines that heat the yacht with sea water temperatures down to 23°F (-5°C)! With Termodinamica's system on board there's no needs to install additional heating systems.

Thanks to this evolved management of the electronic valve we obtain values of COP (Coefficient of Performance) of up to 7.

1 kw electricity consumed, 7 kw heating capacity produced.
It's possible to accomadate custom made systems for heat pump boilers and pools.



TOUCH SCREEN 4.3" CONTROL

An advanced air conditioning system needs advanced controllers.

The system is equipped with 4.3" wide touchscreen, bright and very sensitive to touch.

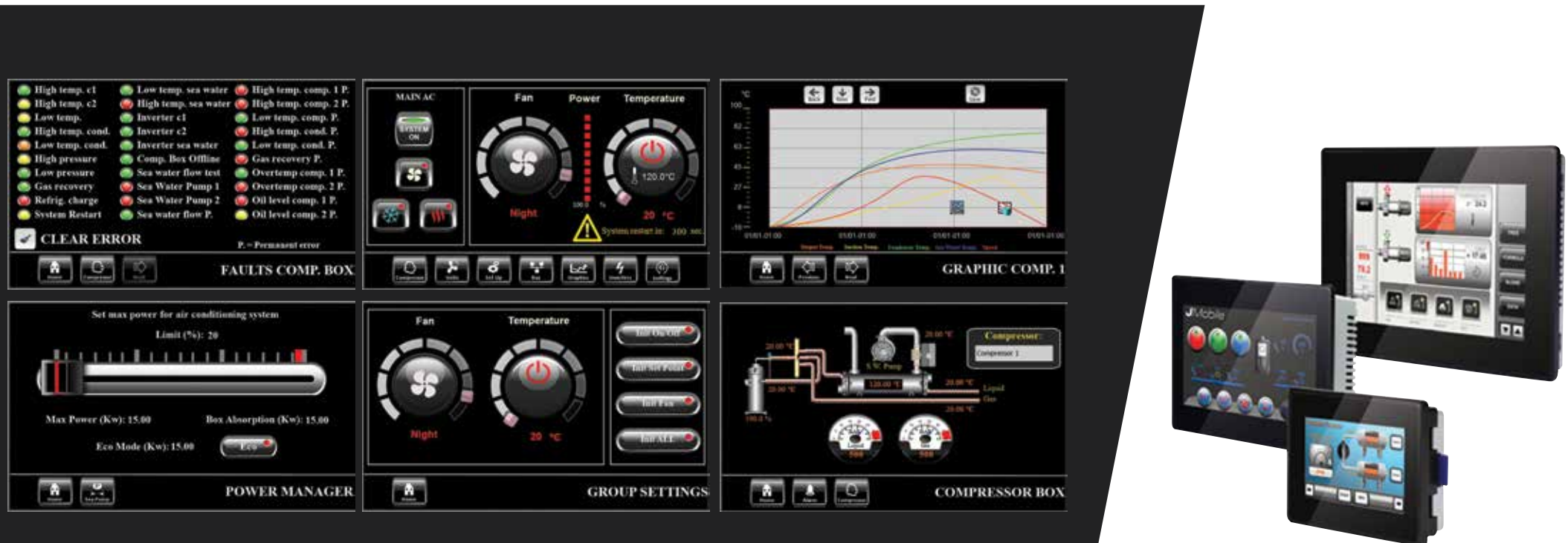
The touchscreen display can also be customized and offered in a larger size, up to a max size of 15" with glass surface.

The user has the option of choosing from a different set of parameters, such as the 7-speed ventilation over night mode and the automatic.

The Power Manager software has a dedicated area where you can set the maximum power consumption of the HVAC system.

The service mode area displays the working conditions of the system, records in several graphics the working data up to 3 months. The fault prevention system contains a series of indicators that help the user with easy troubleshooting problems in case that system is facing any type of issues.

From the master display you can remotely control a single or groups of cabins. The system can also be controlled from any smartphone or tablet in wifi.



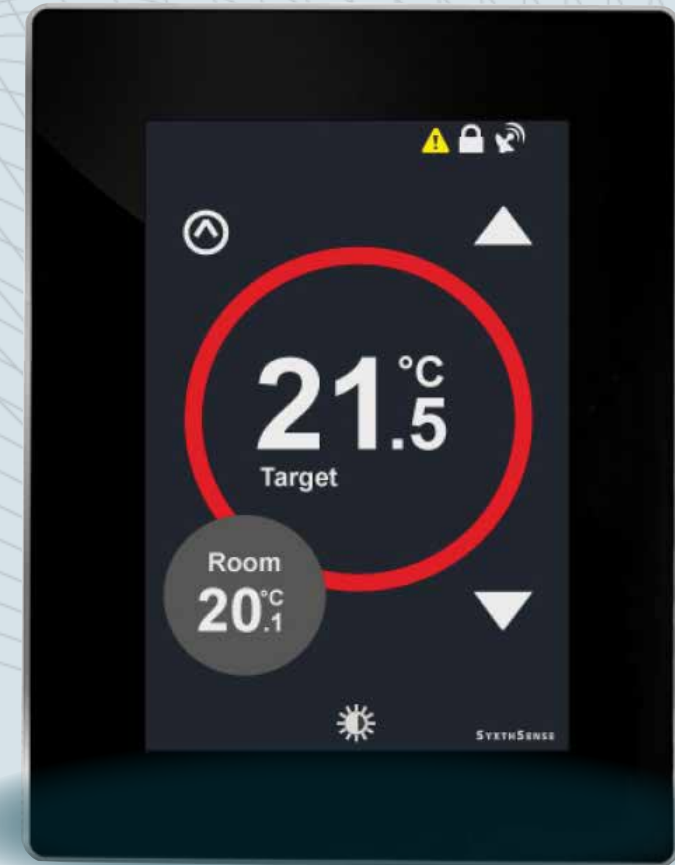
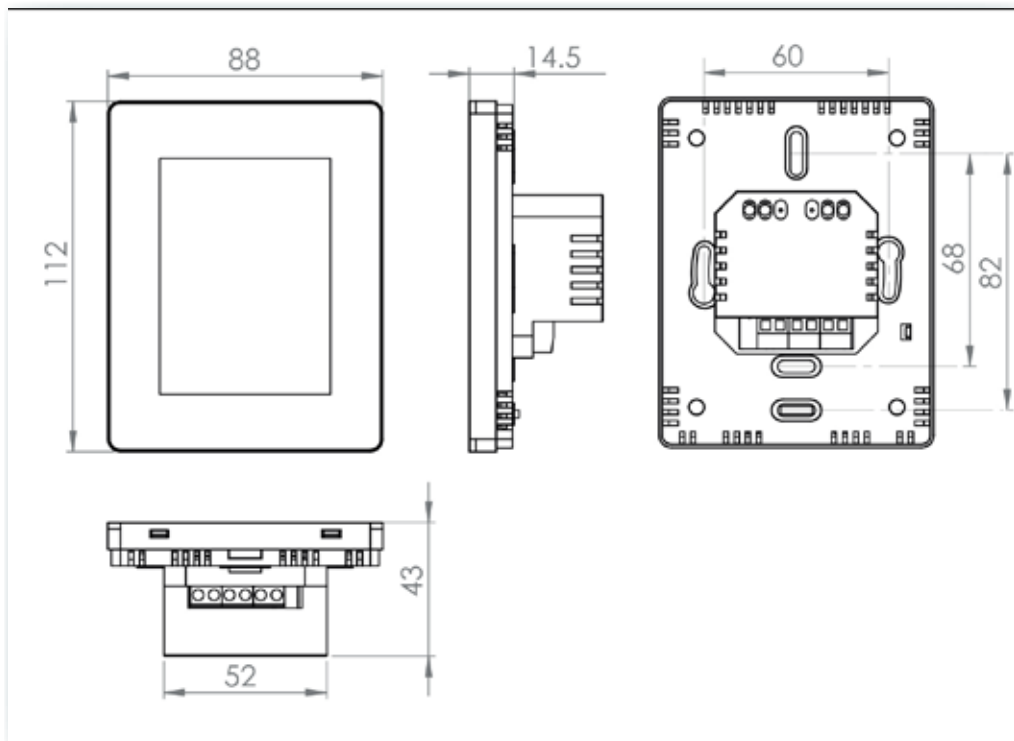
CABIN CONTROL – TOUCH SCREEN 3,5"



The display is user friendly and it's extremely easy to adjust the temperature and set the preferred speeds of the fans.

This unit offers a screen saver able to turn off the backlight to avoid to disturb the guests during night.

It work at low voltage 24VDC for maximum operating safety.





ROBUST & RELIABLE

TITANIUM CONDENSER - Totally different from the old co-axial tubes in standard systems, which has low efficiency. Termodinamica's condenser consists of a fully TIG welded pure titanium cylinder with gas flow inside a flooded tube. This special condenser eliminates problems of maximum power absorption with the changing of sea water temperatures like co-axial condensers. Thanks to a special construction architecture, improves the gas condensation process and increase the efficiency of the system in an average of 62%. Has a weight reduction of around 3 times compared to Copper-Nickel. Titanium is virtually corrosion and fouling proof to assure everlasting reliability and efficiency.

SEA WATER PUMPS - Pumps are normally another critical chapter in the reliability of the yacht. Termodinamica designed special pumps that fix definitely the corrosion problems. The main issues are related to the shaft that connect the motor and the impeller. With the contact of different material, flooded in salt water, the shaft is the first part to be subjected to corrosion. Termodinamica fixed definitely this problem with a magnetic drive impeller with no shaft and no needs of sealings. The impeller is sealed inside the pump head and the propulsion power is transmitted through a magnetic field. Thanks to the use of powerful magnet, neodymium based, this kind of magnetic pumps offer also a good electric efficiency. Pumps range go from 100 liters/minute to 2000 liters/minute.

ELECTRONICS - Often this item is synonymous of problems and complexities. Termodinamica is convinced that the electronics are essential to simplify the management, operation, and also the installation of a device. The spirit that drove the design of the system was just to streamline and make it more reliable. Each component is combined with a small intelligent microprocessor that manages it. Each board communicates with another by 2 wire bus (rs485). In order to wire an entire yacht you need only 4 wires that start from the compressor box to the touch screen. (2 x 24Vdc power + 2 data bus) A considerable saving of time during the cable installation, greater repair simplicity in case of failure. Furthermore, the integrated system of diagnosis displays on the touch screen the parameters of machine operation and allows to identify and fix, easily and shortly, the operating problems.

TITANIUM GRADE 2

INNOVATIVE ENGINE BOX

LIGHT AND COMPACT

Each component has been carefully selected for its construction quality, but also for its weight. The final result is impressive. Compared to the older systems, weight is reduced by 3 to 5 times. For example, a 100ft sail yacht with Termodinamica has a compressor box weight of 88lb (40kg) versus a 264lb (120kg) of a standard chiller. A 40 mt motor yacht has a 352lb (160kg) Termodinamica compressor versus an 1100lb (500kg) chiller.

A serious gain in efficiency and fuel consumption, even a great help for designers in shipyards. The frame is made of high-strength aviation grade aluminum, appropriately treated and salt corrosion proof. On average, the overall dimensions are half of a chiller of equal power, this result can be achieved thanks to the use of high speed compressors and with accurate study of the heat exchangers that help to reduce the system size. In some cases is possible to adapt the shape of the box to the specific needs of the shipyard.

HIGH PERFORMANCE

The energy efficiency of Termodinamica systems is unrivaled compared to traditional systems. Compressors have no in-rush current at startup and accelerate gently on digital ramp. It avoids the needs of oversized generators for the air conditioning system. The Inverter compressor is interfaced with a microprocessor system that analyzes every millisecond the best working conditions to obtain the maximum performance.

System offers surrounding cooling capacity with fast cooling and perfect set point temperature keeping. Capacity on demand helps to manage the system power and direct it where it is really needed, without energy waste. The final result is an important energy saving with 50% off as minimum guaranteed compared to all other systems in the market, but often, Termodinamica is able to do more, with energy savings up to 75%. Termodinamica in the last years, was the reference point, for the owners and yards focused to reach the highest yacht efficiency.



Termodinamica					
YACHT	mt	30	45	60	90
POWER	kw	8	15	25	50
WEIGHT	kg	130	180	250	400
Competitors					
YACHT	mt	30	45	60	90
POWER	kw	30	60	90	250
WEIGHT	kg	450	600	800	3000



COMPRESSOR UNITS

Modelli				VRV10E1	VRV20E1	VRV35E2	VRV50E2	VRV100E2	VRV200E4
Capacity	Cooling		Btu	50.000	120.000	160.000	240.000	500.000	1.000.000
	Heating		Btu	50.000	120.000	160.000	240.000	50.000	1.000.000
Power source	Cooling		kw	0,2 – 2,2	1 - 4	2 – 7	2 - 12	5 - 25	5 – 50
	Heating		kw	0,6 – 2,2	1 - 5	as cooling mode or custom program			
EER/COP				5/6	6/7	6/7	6/7	5/6	5/6
Size	W x H x D		mm	450x450x500	850x550x550	100x700x700	100x700x700	1350x750x750	850x1900x850
Weight			kg	45	55	125	155	190	300
Noise			db	40-60	40-60	50-60	50-65	-	-
Power supply	Volt	Phase	Hz	180-250/ 1ph/50-60hz	320-460V/3ph/50-60hz - under request DC 705V				
Insulation				500VDC 100MΩ for 220V model					
Vibration				10~500Hz, 2G for 10min, 1 cicle, Period 60 minute, Axis x y z					
Working temp.				29°F/104°F water side -4°F/140°F cabin air 20~90% RH					
Certification				CE, TUV, PED, ASME, ABYC					
Note	Competitor’s Chillers install more nominal power due to loss in water, in gas condensation and distribution. Sizing: v (ft3) x 15btu or v (m3) x 110 watt								



SUPERLIGHT AIR HANDLERS – CARBON FIBER



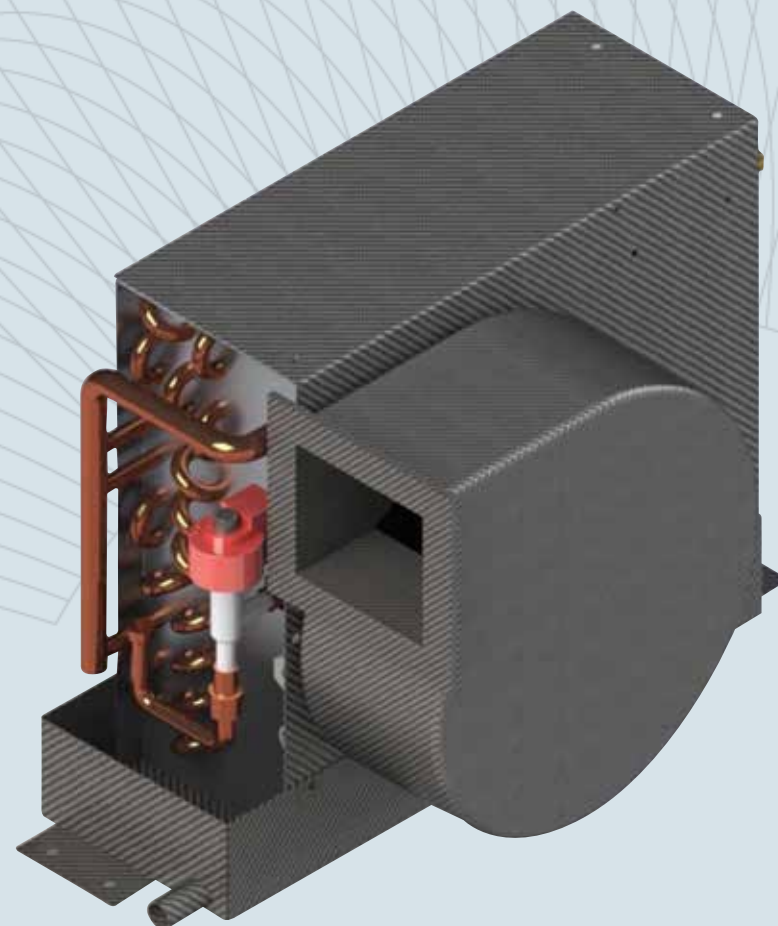
Thanks to the extensive experience gained working and assisting the racing yachts Termodinamica was able to develop a unique range of products made in carbon fiber that offer incredible weight savings.

Obtained through advanced design criteria this type of coil offer the advantages of high cooling and heating capacity in a small footprint and with incredible low weight.

Termodinamica offer custom production of carbon fiber units on demand.

Actual range of air handlers includes the model MINI 12 EVO and the Mr. Slim.

MODEL	CAPACITY	WEIGHT
Mr. Slim	30.000 btu/h	6,2 kg
Mr. Slim	18.000 btu/h	5,3 kg
Mr. Slim	12.000 btu/h	4,8 kg
MINI 12 EVO	12.000 btu/h	3,5 kg





AIR HANDLER MINI 12 EVO

It was designed to fit everywhere! It is suitable to fit the needs of small sail boats, catamarans and crew cabins. It offers incredible space saving without compromising comfort.

The unit is capable of 14.000 btu/h and 400 m³/h of air flow and it's incredibly small.

It is designed to be connected to a flexible duct of 82mm, smaller than common 102mm or 127mm widely used on board to favor the installation of the duct in roof with limited space.

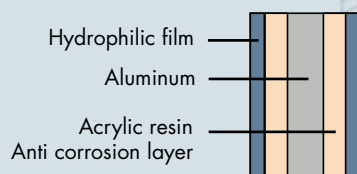
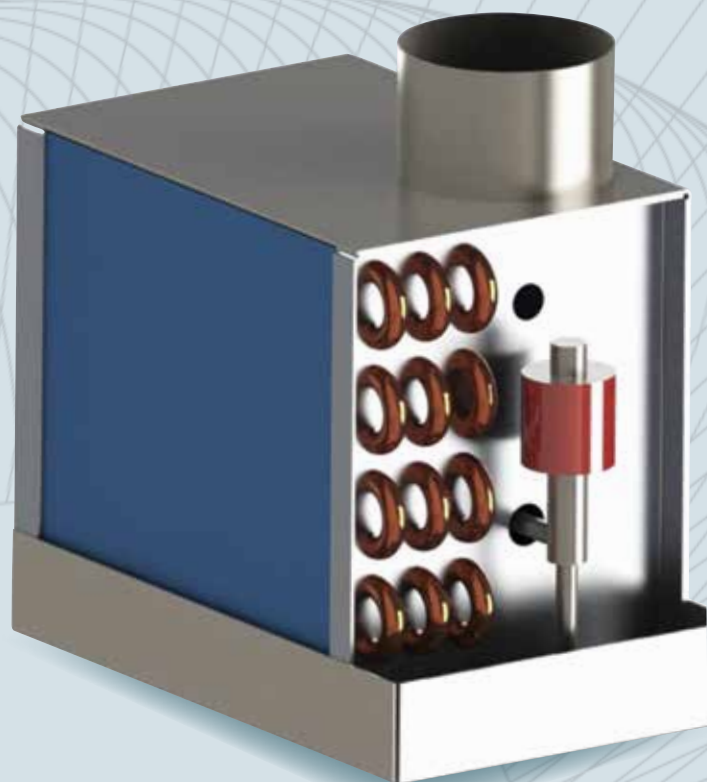
The special blower designed in Germany, utilizes the backward fan technology able to offer good air flow with limited rpm speed. This means almost no noise and very good performance.

The other features of the construction are the same that distinguish all Termodinamica's air handlers like blue coil finish to avoid bacteria growth and stainless steel 316 for the frame and drain panel that

assure everlasting reliability.

The electronic expansion valve ensure maximum comfort with accurate temperature control, thanks to the 500 capacity control steps.

It can be interfaced with all the thermostats in the range.



Modello MINI12		
Mode	Cooling	Heating
Power	16.000btu	14.000btu
Air flow	400m ³ / h	400m ³ / h
Pressure	150pa	150pa
Consumption	35watt	35watt
Drain	Pipe Diam. 5/8"	
Connection	1/4" + 3/8"	
Size (inch/mm)	260W x 160D x 200H	
Material	Stainless Steel AISI 316	

AIR HANDLER Mr. Slim



Powered by careful design criteria is definitely the flagship model. Very compact and extremely powerful at the same time. The special coil design took 8 months and involved the work of many european experts in refrigeration.

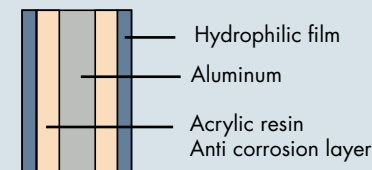
The turbolenced fin and the special geometry allows an incredible capacity of 30.000 btu in cooling mode.

Blu finish prevent the salt corrosion and allows for better condensation drainage to produce dryer air.

This special features combined with the electronic humidity control allows to offer an accurate humidity control of 55% also in very humid climate like the Carribean.

An healthier environment is offered also by the stainless steel 316L frame and drain panel mirror polished. This metal, specially used for food processing, avoid the bacteria growth and being everlasting against rust offer also increased durability with no needs of maintenance. The powerful fan, driven by a BLDC motor offer a maximum air flow of 650 m³/h and a reduced noise in night mode of 20dB. It's ideal to manage alone surface up to 15 m² (160 ft²).

Air Handler Mr. Slim		
Mode	Cooling	Heating
Power	30.000btu	30.000btu
Air flow	650m3 / h	650m3 / h
Presure	200pa	200pa
Consupcion	80watt	80watt
Drain	Free - Pipe Diam. 5/8"	
Connection	1/4" + 1/2" brass	
Size (inch/mm)	W 15 x H 12 x D 10 in. W 380 x H 300 x D 250	
Material	Stainless Steel AISI 316	





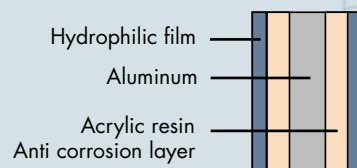
AIR HANDLER HT12 - LOW PROFILE

Special model designed to fit in very limited space with just 200mm of height but capable of 16.000 btu of maximum cooling capacity.

The special blower designed in Germany uses the backward fan technology able to offer good air flow with limited rpm speed. It mean low noise and good performances.

The other features of the construction are the same that distinguish all Termodinamica's air handlers like blue coil finish to avoid bacteria growth and stainless steel 316 for the frame and drain panel that assure everlasting reliability.

The electronic expansion valve guaranteed maximum comfort with accurate temperature control, thanks to the 500 capacity control steps. It can be interfaced with all the thermostats in the range.



Modello HT12		
Mode	Cooling	Heating
Power	16.000btu	16.000btu
Air flow	400m3 / h	400m3 / h
Pressure	150pa	150pa
Consumption	35watt	35watt
Drain	Pipe Diam. 5/8"	
Connection	1/4" + 3/8"	
Size (inch/mm)	350W x 385D x 200H	
Material	Stainless Steel AISI 316	

REMOTE CONTROL GSM – GPS

To be constantly close to all of its owners, Termodinamica adopts a precise telemetry system, which in exploiting the GSM 4G / UMTS network transmits to the central command center to support all the operating parameters of the machine and notifies in advance the possibility of failure.

The GSM modem constantly communicates with the CPU of the system that controls each instant the state of the machine. The control software processes all the information received and if the system detect an issue, security staff are alerted who will then contact the technical support center nearest to the boat, even before the owner may require service.

The GPS system built into the modem lets you know at all times where the boat is without needs that owner must provide additional information. In case of smaller problems, the service center can work directly from the support center. Controlling the air conditioning system in order to do a diagnostic mode check.

The malfunction can be diagnosed and fixed in a few minutes with the engineer/owner/captain. If it should be necessary to send a technician on site you have the advantage of knowing in advance what need to be done and the spare parts in inventory required to repair the malfunction, preventing any time being wasted.

Termodinamica builds in series its products, but offers high degree of customization. If after installation the shipowner wishes to have further adjustments on the speed of the ventilation or on the control of the working temperature it is possible to set it directly from remote adjusting in real time the operating parameters of the machine.

We work to fulfill every desire, even those of the most demanding owners!





CRUISE SHIP - REFRIGERATION

Termodinamica is a new player in the cruise industry. The company entered this market just in 2017 and since the beginning demonstrated strong skills with important projects and a surrounding technological success.

Applying the VRV + Capacity on demand technology we can offer energy savings up to - 80% compared to all other companies in the market. For a cruise ship it mean more than a Million USD per year in fuel saving. Very important for the energy management on board and for the planet that saves tons of CO2 per year.

The use of the EEV combined with advanced software allows the crew to improve the food quality trough a better cold chain. Temperature control with resolution up to 0,1° and humidity control up to 1% RH combined with customized programs for meat, fish, fruit and vegetables are just fews of the advanced features that Termodinamica can offer. Compressor unit can be built with custom engineering and offer titanium sea water condenser or interface with LT water.

All the compressors in the range are inverter controlled to offer variable cooling capacity

from 20% to 100% with step at 0,1%.

System offer rs485 modbus interface with other on board management systems and internet connection for remote service.

Termodinamica offers high efficiency solution with natural and high performance refrigerants.



CRUISE SHIP - AIR CONDITIONING

The air conditioning on a cruise ship is one of the most important elements. Termodinamica offer cutting-edge solutions for the cruise industry with patented technologies.

Hereunder a brief summary of the main features that makes a Termodinamica chiller the most advanced in the world.

Compressor: Multiple compressor system with variable speed drive (IEER up to 7)

Condenser: Advanced piping architecture hand made in Titanium. No corrosion and no fouling from salt. It reduces the machine stop time and related maintenance time.

Evaporator: Higher exchanging surface and ratio with twisted pipes with special geometry.

Electronic expansion valve:

Very important for the system with high capacity, it control accurately the refrigerant flow into the evaporator and keep the superheat level constant to optimize the chemical performances of the refrigerant.

Inverter drive: It monitor continuously the electric signal supplied to the electric motor and protect it against overvoltage, undervoltage, voltage spike and overcurrent.

With accurate tuning the inverter is able to provide the right level of torque, reducing the heating of electric motor and saving energy.







TECHNICAL SUPPORT AND MAINTENANCE

Termodinamica provides extensive support spread to every corner of the world. In areas with intense concentration of nautical tourism we offer a TAC (Technical Assistance Center) every 50km along the coastline.

We can further intensify the level of service provided in a desired area, should the the dealer request it. In the choice of TAC, the company used its strategic partnership with a Japanese multinational corporation that has been operating in the field of air conditioning since 1928. This gives us a TAC portfolio unimaginable compared to large groups of marine air conditioning.

All our TAC technicians have at least a high school degree and all have been trained to install and repair. All **have a professional license or certificate for refrigeration**. Their training means that people must be educated, friendly and polite, also the strict and thorough training of Termodinamica means that every owner, can be fully satisfied with the speed, skill and professionalism that will carry out the work.

Our TAC are already in possession of all types of parts necessary to rebuild a machine entirely. If failures occur due to abnormal tampering or particular problems to the electrical plants Termodinamica Italy is able to send on the next day each type of component of up to 220 lb of weight in every part of the world with delivery directly from the dealer or the TAC. This is possible thanks to appropriate agreements with DHL and FEDEX that ensures rapid air transport and care of the package.

Remember also that the cutting-edge electronics that we have on the air handlers lets you know in every moment where the boat is at via the built-in GPS; transmitted to the support center, **with this evolved assistance even most demanding owner will be satisfied!**



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