TERMODINAMICA

MARINE INVERTER AIR CONDITIONING

ENG

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. All possible work is done internally.

Termodinamica is based in the province of Varese, Italy. The factory is spread over an area of 4000 square meters and employs highly skilled technicians that produce only the finest quality products. The company offers the latest industry technologies from robotic laser 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 ventilation and cooling. It also designs and install 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.

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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. Whit 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 8. It means that instead of the electric heater with COP 1 an inverter heat pump uses a power consumption of 1 kW and release 8 kW of heating capacity! This system provides important savings on board (as well as fuel consumption) and it's 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 100 ft carbon fiber sail yacht approximately only weight 80 kg (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 allow use of smaller and lighter gensets. Power source range for a 100 ft is 500 W to 2,0 kW.

REMOTE CONTROL

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

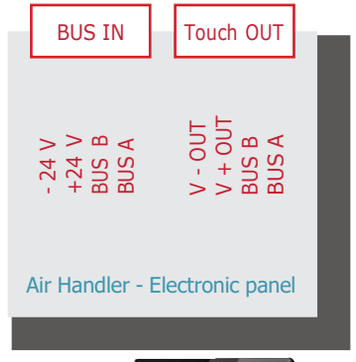
For professional customers 24/7 monitoring systems are available that constantly communicating with Termodinamica's operating center to alert in case that a system begins to work in harsh conditions. On board the software is based on smart fault prevention system.

It surveys every component of the system, (temperatures, pressures, voltage etc.) and before a component can breakdown for continuous work in harsh conditions the software will analyze the animalities and will control it.

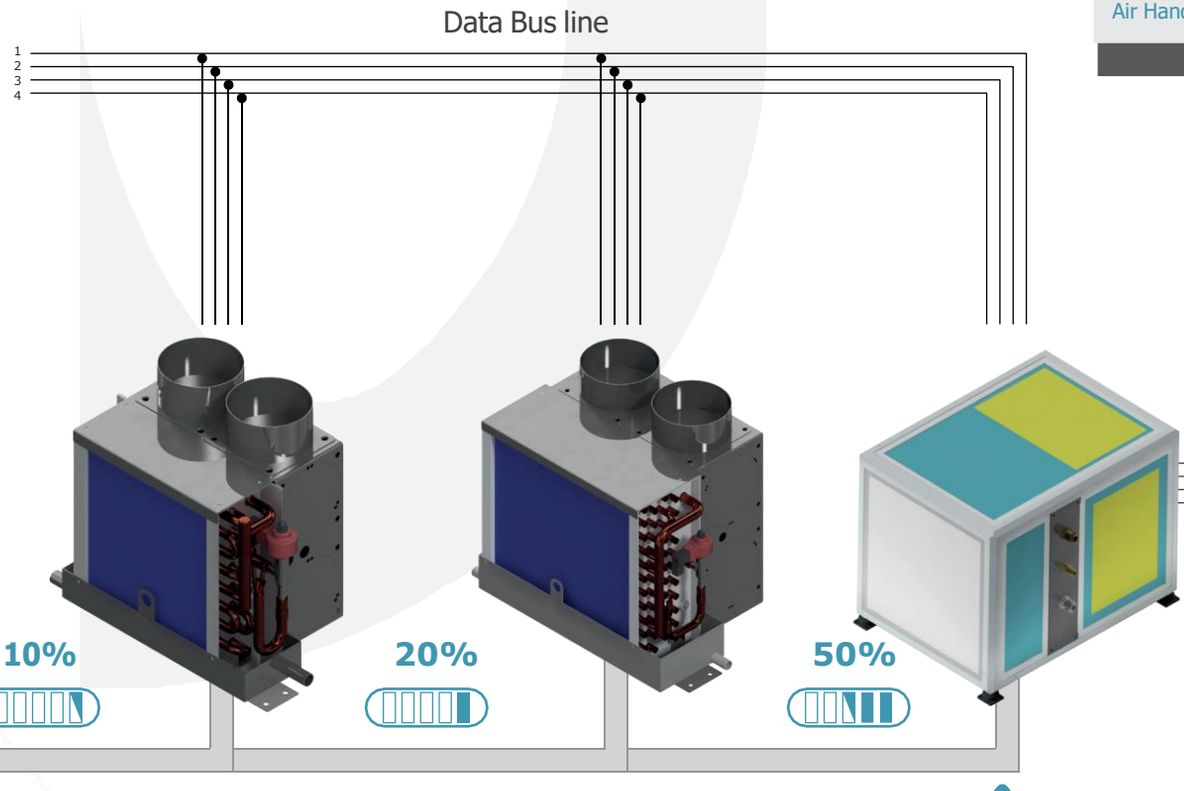
Termodinamica marine remote-control system makes happy every crew member guaranteeing a superior level of service.

INVERTER COMPRESSOR WITH CAPACITY ON DEMAND

VRV18E1



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 allow 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 it's 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.

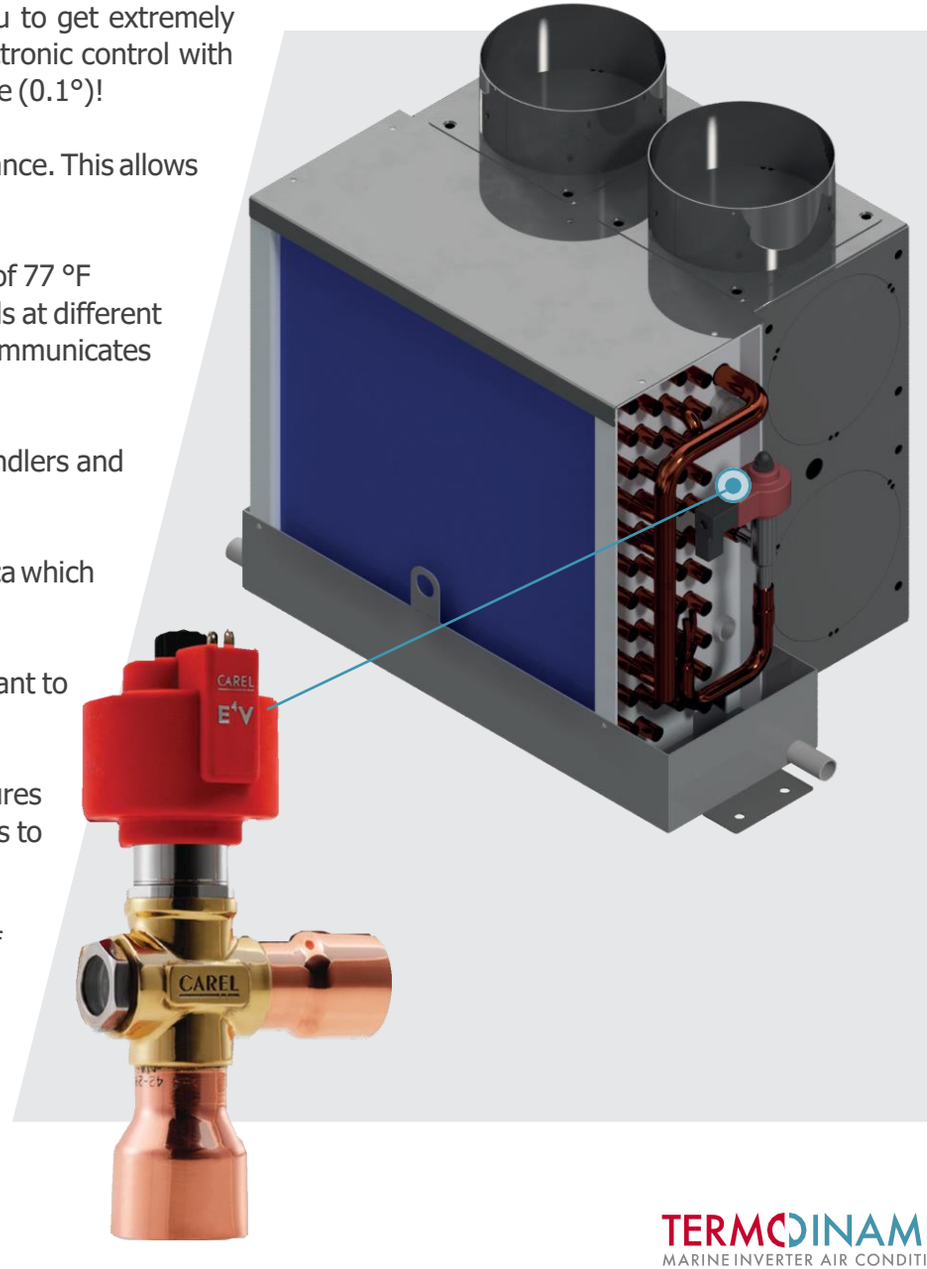
This technology, with use of inverter compressors, is exclusive to Termodinamica which holds worldwide patents for the marine industry.

These valves allow 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 36 °F (2 °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 accommodate custom made systems for heat pump boilers and pools.



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TOUCH SCREEN 4.3” CONTROL

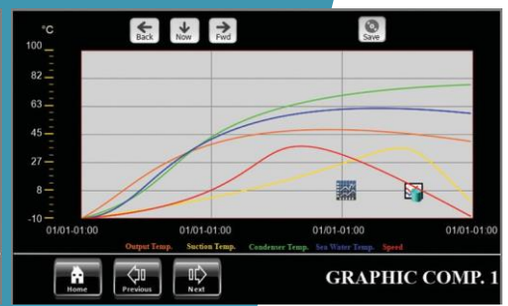
An advanced air conditioning system needs advanced controllers.
The system is equipped with 4.3” wide touchscreen, bright and very sensitive to touch.
The touchscreen display can also be customized and offered in a larger size, up to a max size of 15” with glass surface.

The user has the option of choosing from a different set of parameters, such as the 7-speed ventilation overnight 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 Wi-Fi.

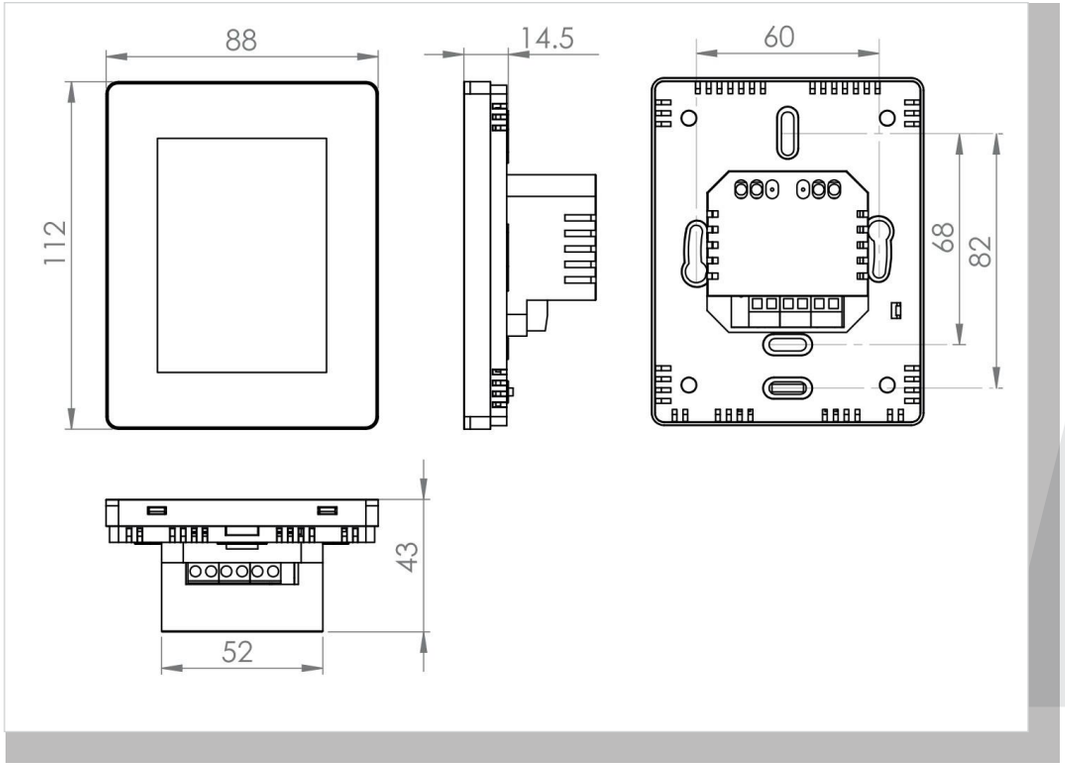


CABIN CONTROL - TOUCH SCREEN 3,5”

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 works at low voltage 24 VDC for maximum operating safety.



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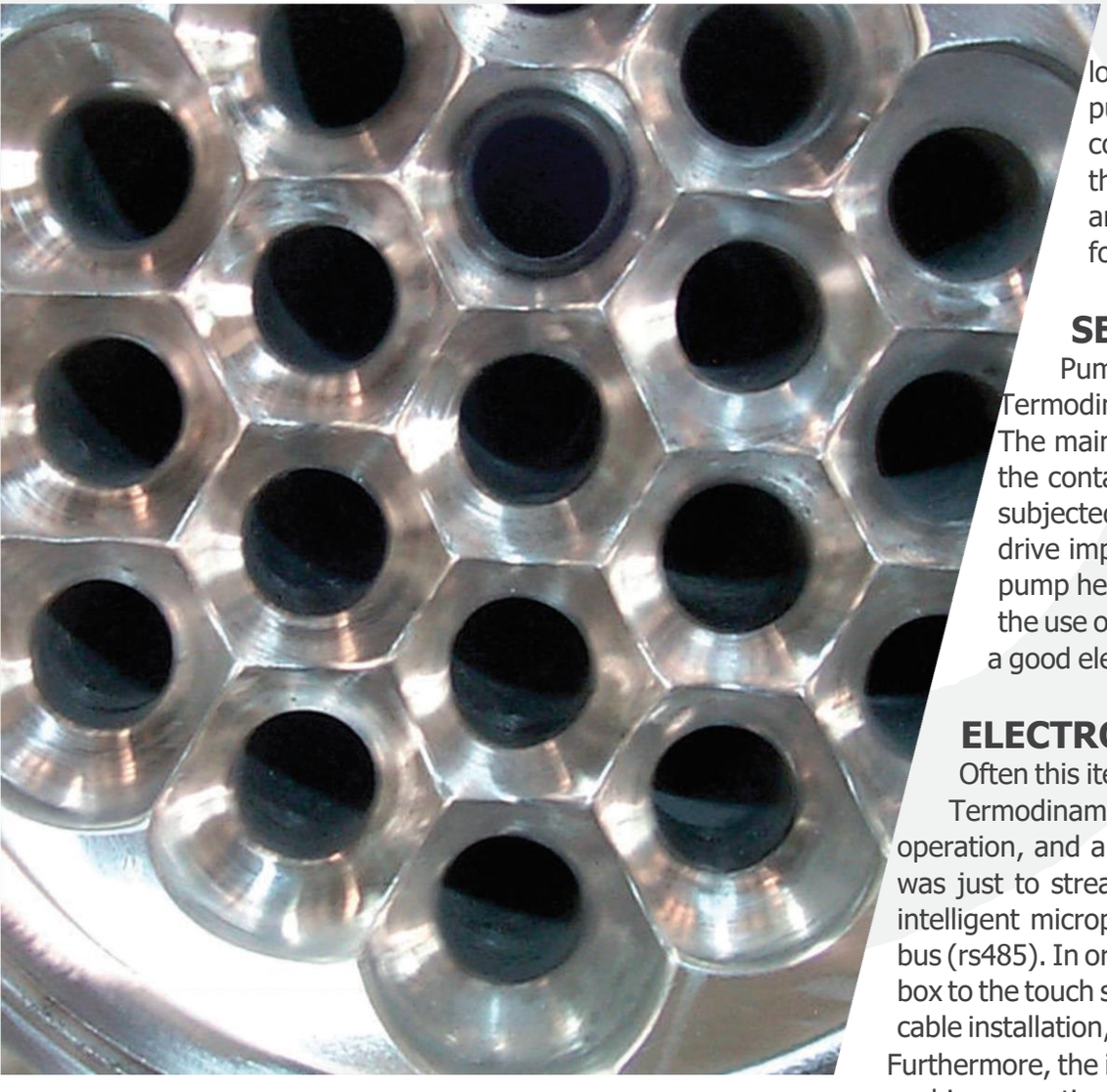
ROBUST & RELIABLE



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 parts with gas flow inside a flooded tube. 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 24 VDC 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.

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 100 ft sail yacht with Termodinamica has a compressor box weight of 88 lb (40 kg) versus a 264 lb (120 kg) of a standard chiller. A 40 m motor yacht has a 352lb (160 kg) Termodinamica compressor versus an 1100 lb (500 kg) 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 analyze 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 help to manages 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	100
POWER	kW	8	15	25	50
WEIGHT	kg	130	180	250	2000
COMPETITORS					
YACHT	mt	30	45	60	90
POWER	kW	30	60	90	450
WEIGHT	kg	450	600	800	6000

TERMODINAMICA
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COMPRESSOR UNITS

MODELLI				VRV8E1	VRV12E1	VRV30E1	VRV50E2	VRV120E2
CAPACITY	COOLING		BTU/h	35.000	55.000	135.000	230.000	500.000
	HEATING		BTU/h	35.000	55.000	135.000	230.000	500.000
POWER SOURCE	COOLING		kW	1,5	2,6	5,8	14	30
	HEATING		kW	1,5	2,6	5,8	14	30
EER/COP								
SIZE	W x H x D		mm	515 x 406 x 247	540 x 443 x 483	688 x 479 x 528	1106 x 650 x 670	1556 x 830 x 720
WEIGHT			kg	22	48	75	169	209
NOISE	MIN / MAX		dB	45/70	45/70	45/70	35/60	35/60
POWER SUPPLY	VOLT	PHASE	Hz	180-250 V 1 Phase 50-60 Hz	180-250 V 1 Phase 50-60 Hz	180-250 V 1 Phase 50-60 Hz	180-250 V 1 Phase 380-440 VAC 3 Phase 700 VDC on request	380 - 440 VAC 3 Phase 700 VDC on request
INSULATION				1500 VDC 100 MΩ FOR 220 V MODEL				
WORKING TEMP.				(0°C / 40°C) 32°F / 104°F WATER SIDE - (20°C / 50°C) -4°F / 122°F CABIN AIR 20 - 90% RH				
CERTIFICATION				CE, TUV, PED, ASME, ABYC				

NOTE:
Compressors range includes many models and Termodinamica is open to customizations.
Ask technical office the right product to fit your needs.

SUPERLIGHT AIR HANDLERS - CARBON FIBER

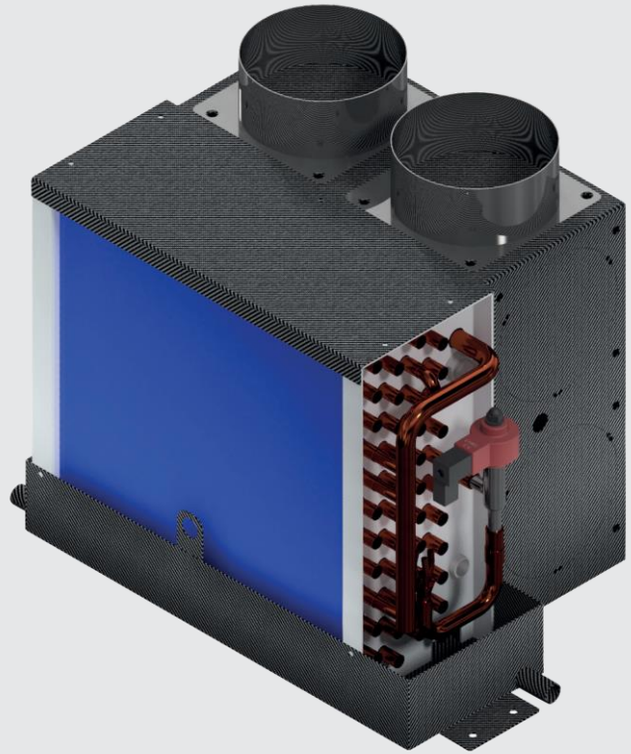
Thanks to the extensive experience gained working and assisting the racing yachts Termodinamica was able to develop a unique range of products made in carbon fiber that offer incredible weight savings.

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

Termodinamica offer custom production of carbon fiber units on demand.

Actual range of air handlers includes the "MrMaxi" series.

MODEL	CAPACITY	WEIGHT
MRMAXI30I	30.000 BTU/H	7,9 kg
MRMAXI24I	24.000 BTU/H	7,9 kg
MRMAXI18I	18.000 BTU/H	6,5 kg
MRMAXI12I	12.000 BTU/H	3,5 kg



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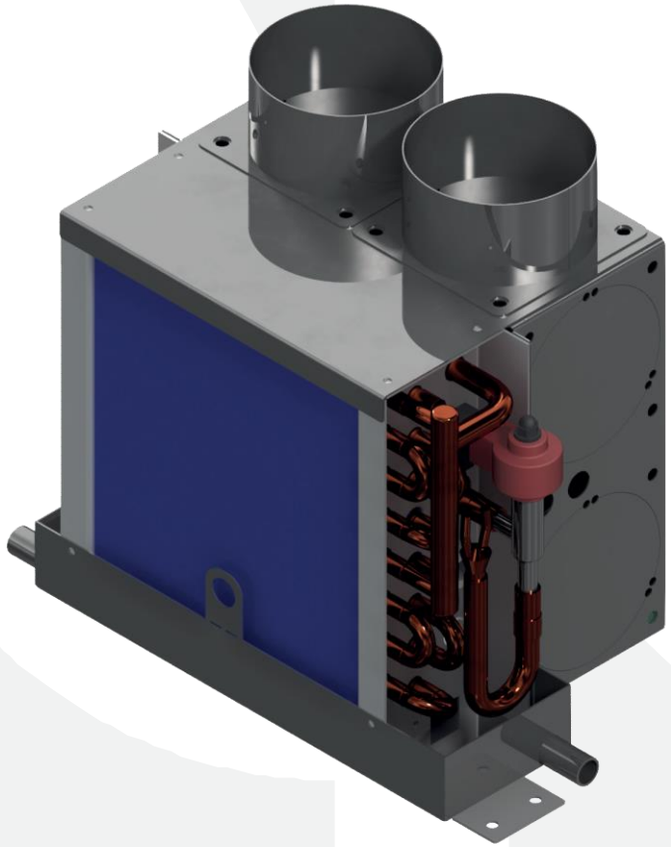
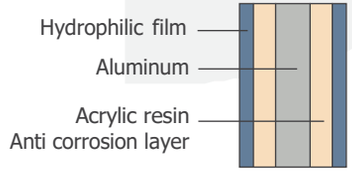
AIR HANDLER MRMAXI12I





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 12.000 BTU/h and 500 m^3/h of air flow and it's incredibly small. It is designed to be connected to a flexible duct of 82 mm, smaller than common 102 mm or 127 mm 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 ensures 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 MRMAXI12I		
MODE	COOLING	HEATING
POWER	12.000 BTU/h	12.000 BTU/h
AIR FLOW	500 m^3/h	500 m^3/h
PRESSURE	900 Pa	900 Pa
CONSUPTION	70 W	70 W
DRAIN	PIPE DIAM. 5/8"	
CONNECTION	1/2" + 3/8" BRASS	
SIZE (inch/mm)	W 13.8 x H 11.5 x D 8 in. W 351 x H 292 x D 207	
MATERIAL	STAINLESS STEEL AISI 316	

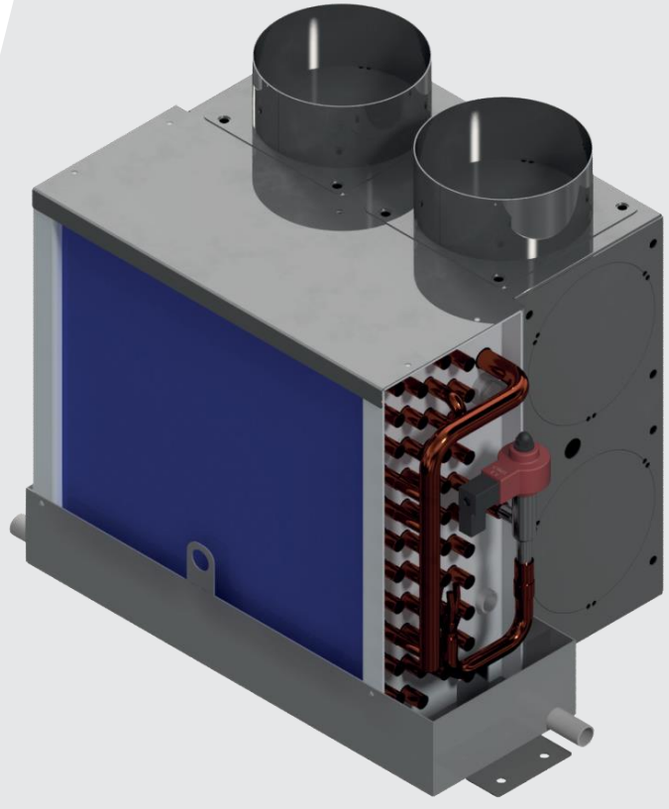
AIR HANDLER MRMAXI30I

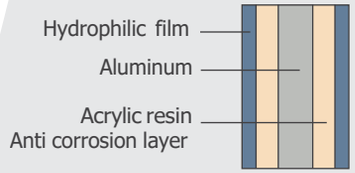
Powered by careful design criteria is definitely the flagship model. Very compact and extremely powerful at the same time. The special coil design took 8 months and involved the work of many European experts in refrigeration.

The corrugated and louvered fin and the special geometry allows to reach the incredible capacity of 30.000 BTU/h in cooling mode.

Blue finish prevents the salt corrosion and allows for better condensation drainage to produce dryer air.
This special feature combined with the electronic humidity control allows to offer an accurate humidity control. Termodinamica guarantees 55% of relative humidity even in very humid climates like the Caribbean.

A 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 1200 m^3/h and a reduced noise in night mode of 20 dB. It's ideal to manage alone surface up to 15 m^2 (160 ft^2).





AIR HANDLER MRMAXI30I		
MODE	COOLING	HEATING
POWER	30.000 BTU/h	30.000 BTU/h
AIR FLOW	1200 m^3/h	1200 m^3/h
PRESURE	800 Pa	800 Pa
CONSUPTION	170 W	170 W
DRAIN	PIPE DIAM. 5/8"	
CONNECTION	1/2" + 3/8" BRASS	
SIZE (inch/mm)	W 17.5 x H 14 x D 11 in. W 444 x H 362 x D 286	
MATERIAL	STAINLESS STEEL AISI 316	

TERMODINAMICA
MARINE INVERTER AIR CONDITIONING

GALLEY VENTILATION

Termodinamica designs and builds advanced hood solutions for megayachts.

Our technical office designs custom made hoods suitable to fit the customer's needs and space requirements.
Special architectural shapes can be designed and produced (or manufactured).

A smart software coordinates the input of pressure sensor in order to automatically manage the work of the exhaust fans and the make-up air fans.

The galley will work in a controlled depression, so as to avoid for the smell to go into the accommodation.
This function achieves significant energy savings, avoiding for the system to take conditioned air from the close environments.

Our hoods can have built-in exhaust fans with fire dampers, thus saving precious space outside the hood structure.

Speed control can be incorporated in the wall plates or with a dedicated touch screen.

REMOTE CONTROL GSM

To be constantly close to all of its owners, Termodinamica adopts a precise telemetry system, which in exploiting the GSM 4G / Satellite 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 detects 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.

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 means 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 through 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 few 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

Full titanium grade 2, no copper, no iron, for everlasting reliability.
Allow to load glycol in every percentage and go down to -5 °C of loop temperature.

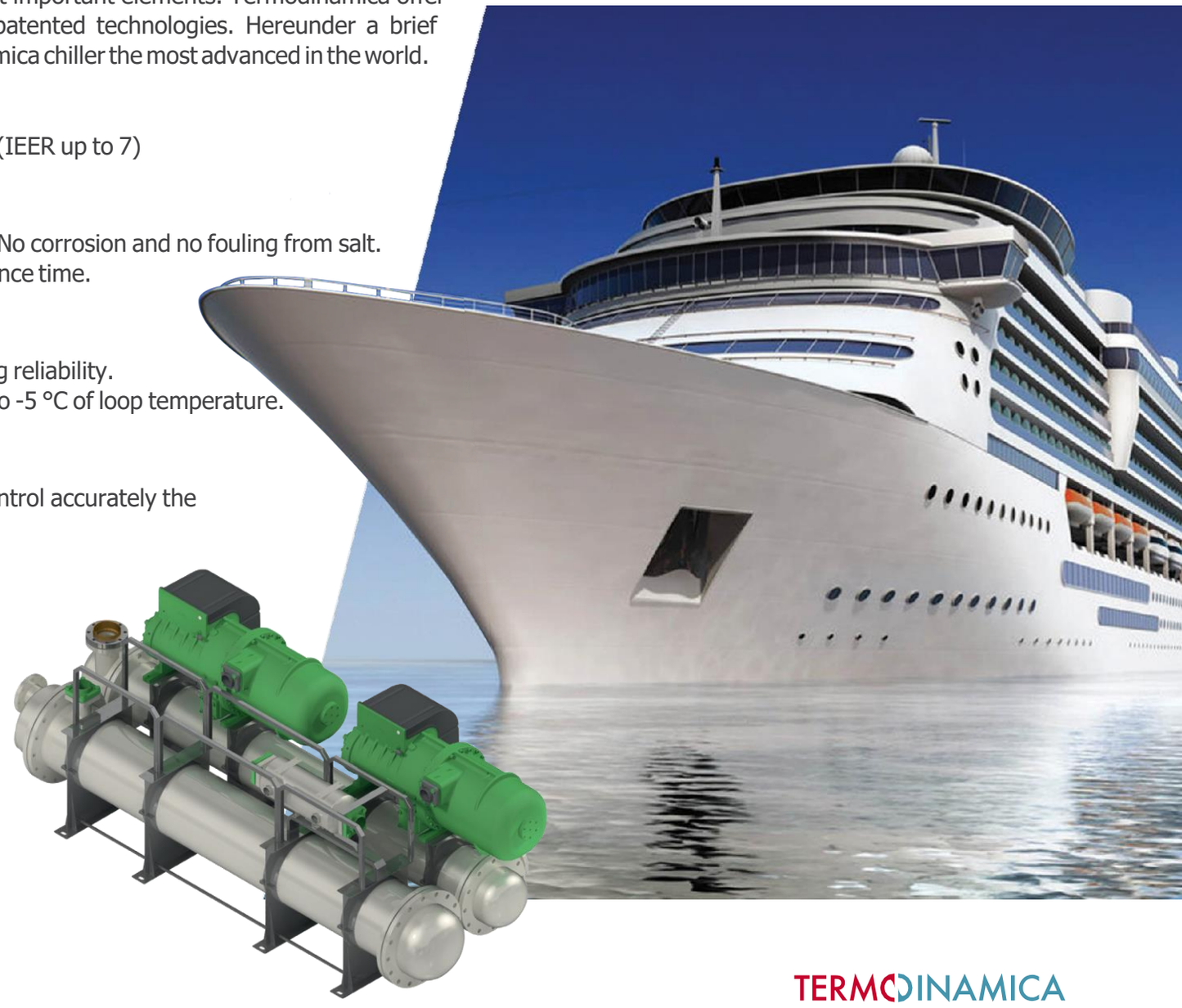
ELECTRONIC EXPANSION VALVE

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.

WASTE HEAT RECOVERY

It monitors continuously the electric signal supplied to the electric motor and protect it against overvoltage, undervoltage, voltage spike and overcurrent.

System allows to recovery up to 100 kW heat with a gas / water exchanger.
Temp. out = 67 °C
1 kW electricity consumed, 7 kW cooling capacity produced.
It's possible to accommodate custom made systems for heat pump boilers and pools.



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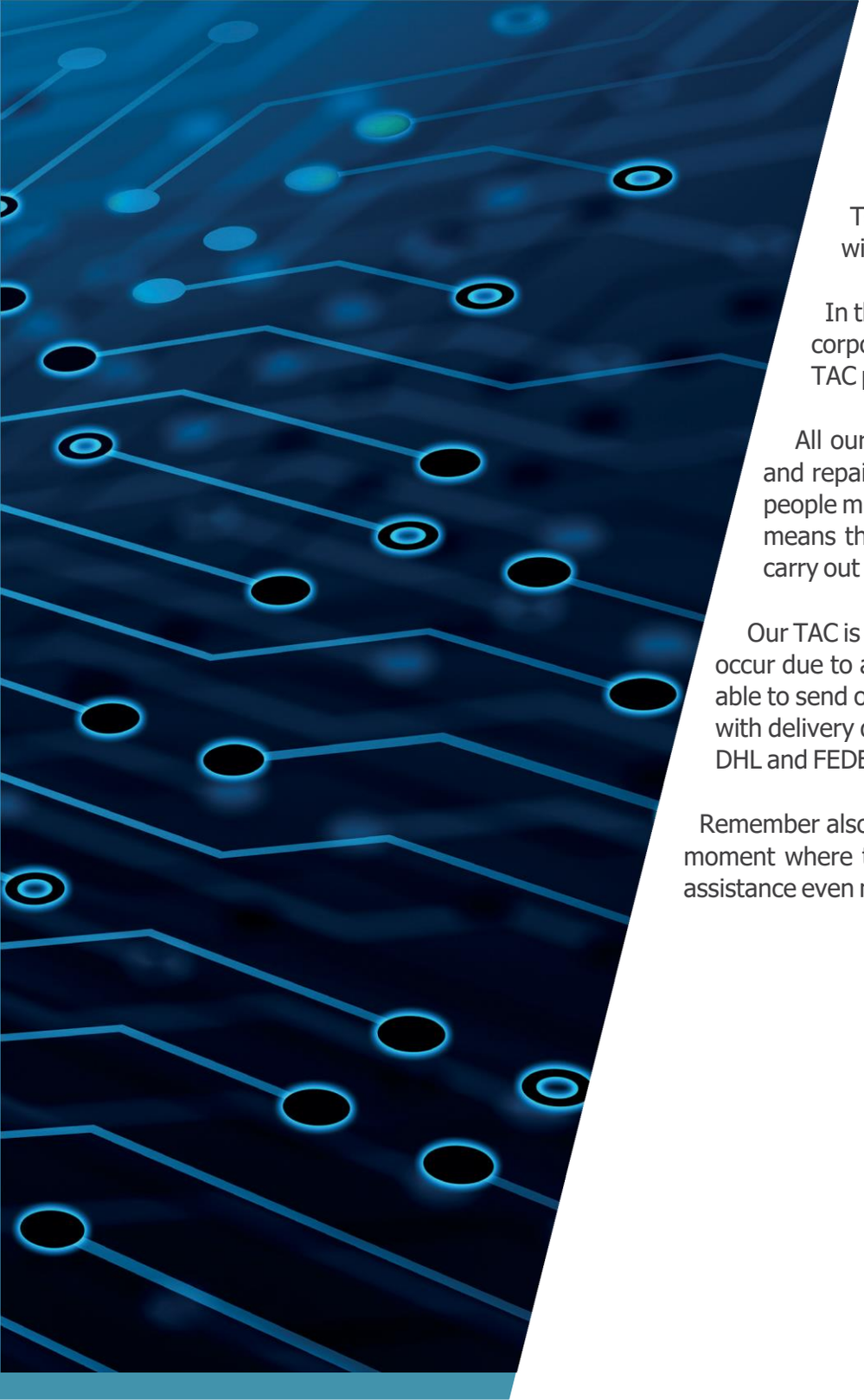

TECHNICAL SUPPORT AND MAINTENANCE

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).

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 is 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!

TERMODINAMICA
MARINE INVERTER AIR CONDITIONING

ITALY - VARESE

HOLLAND - AMSTERDAM

FLORIDA - FORT LAUDERDALE

ITALY

TERMODINAMICA
Via Pasubio, 50 - 21020 Mornago (VA)
info@termodinamicamarine.com
+39 0331 1704609

HOLLAND

TERMODINAMICA HOLLAND - SEPSYS BV
Starnmeerstraat 13 2131 AE Hoofddorp, The Netherlands
willem@sepsys.nl - Vraets Willem
+31 63 19 00 742

FLORIDA

TERMODINAMICA USA LLC
999 Eller drive bay - Fort Lauderdale
a.fracas@termodinamicausa.com
+ 1 (768)238-3160

www.termodinamicamarine.com
info@termodinamicamarine.com

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