

## GUIDELINES TO SELECT YOUR AIR-CONDITIONING OR CLIMA SYSTEM

### Introduction;

An air-conditioning or clima system will provide you a pleasant climate on board and at the same time removes moisture from the air making the air feel more comfortable. This also reduces moisture problems to protect your precious interior and equipment.

MAR-IX air-conditioning systems consist out of 2 basic principles. This are the direct and indirect systems and work according a basic principle where the heat of the cabin is transferred to the refrigerant gas (direct) or chilled water system (indirect) which then releases the heat into the seawater.

### Direct system;

This are the so-called Self Contained units. This compact system includes all technical components, such as the seawater cooled condenser, compressor and evaporator.

Self contained units are an excellent choice to cool 1 single cabin. The unit needs to be placed in the area you want to cool, usually in a locker or under a bench or bed. These units are easy to install by any “do it himselfer” and need no cool-technical know-how.

### Indirect system;

This are the so-called chiller units. This chiller unit supplies a tubing circuit through the boat with cold water (Glycol) from approximate 3 tot 8C°. This fluid flows through the fan coil units (through which air is drawn) and as a result it cools any selected cabin. This system makes it possible to select and control any cabin separately. The sum of the capacity of the fan coil units which have to function at the same time result in the total needed capacity of the chiller unit. This unit is mostly placed in the motor space and need no cool-technical know-how for installation. A complete chiller system consists out of the chiller unit, fan coil units and thermostats.

### Cooling;

When cooling only is required our Self contained units (**SCU-serie**) and air-conditioning (**A-serie**) chiller units can be considered. Often air-conditioning chiller units are combined with a Central Heating system. For easy use and maximum overview our digital thermostats can be linked with most known central heating systems.

### Cooling and heating;

A combination of cooling and heating in one system is possible in two ways;

1. The clima chiller units (**C-serie**) cool or heat the same watertubing system through the boat by using an integrated eberspächer diesel heater. This way of heating is preferred in

**North-European** waters.

2. The reversed cycle chiller units (**RC-serie**) cool or heat the same watertubing system through the boat. By this way of heating the cooling process is reversed and the necessary heat will be strained out of the outside (sea) water. When the outside (sea) water temperature will be lower than 5 tot 7C° this heating system will not function properly and this way makes it the best choice for **South-European** waters.

**Air distribution;**

The cabin air is drawn into the self contained unit or fan coil unit through a return air grill. Then it will be cooled or warmed and blown back into the cabin through an air hose which is mounted onto a duckting air box and covered by an air return grill. The returned air should be discharged high into the cabin and away from the air return grill to ensure good circulation. Always insulate the air hose to prevent condensation. Airhoses and other duckting materials should always be mounted with a minimum of length and bends to keep the efficiency and to prevent air noise.

**CALCULATION AND DETAILS**

To decide the needed capacity we will have to calculate a cooling capacity. Many details are often needed such as an isolation value, heat guiding coefficient, glass surface et cetera. Because it is difficult to gather this information we use a simple guideline.

- Step 1. : Determine the volume of the area(s) you choose to cool.
- Step 2. : Determine the basic load area.
- Step 3. : Determine the climate.

<b>Capacity tabel</b>		
Load area	Normal climate	Tropical climate
Above deck	170 W/m <sup>3</sup> (580Btu)	195 W/m <sup>3</sup> (665Btu)
Mid deck	140 W/m <sup>3</sup> (475Btu)	165 W/m <sup>3</sup> (565Btu)
Below deck	95 W/m <sup>3</sup> (325Btu)	130 W/m <sup>3</sup> (445Btu)

- Above Deck – areas with large glass surfaces and direct sunlight.
- Mid Deck – areas on the main deck with smal lor shaded windows.
- Below Deck – cabins where the hull slopes inward and there are minimal port lights.

Now the total needed capacity can be calculated. Determine the volume of every selected cabin/space in m<sup>3</sup> and multiply by above value. If one end of the cabin/space is narrower than the other, than calculate with an average width. The sum of each cabin/space results in the total needed capacity. Select a system that meets the total needed capacity. When this system is under or above this capacity, detail as glass surfaces, type of windows, isolation of the boat et cetera decide your final choice.

## CALCULATION EXAMPLE

Following cabins/areas for cooling only;

Area	Measurement (LxWxH)	Load area
1. Saloon	6,5 x 3,5 x 2,2 mtr	Above Deck
2. Guest cabin	3,2 x 3,0 x 2,0 mtr	Mid Deck
3. Owner cabin	4,0 x 3,0 x 2,0 mtr	Below Deck

The ship will be used in a 'Normal Climate'.

The needed capacity is:

Area 1.	Volume = $6,5 \times 3,5 \times 2,2 = 50,05\text{m}^3$ Needed capacity = $50,05\text{m}^3 \times 170\text{W}/\text{m}^3$	→ 8,51kw
Area 2.	Volume = $3,2 \times 3,0 \times 2,0 = 19,20\text{m}^3$ Needed capacity = $19,20\text{m}^3 \times 140\text{W}/\text{m}^3$	→ 2,69kw
Area 3.	Volume = $4,0 \times 3,0 \times 2,0 = 24\text{m}^3$ Needed capacity = $24\text{m}^3 \times 95\text{W}/\text{m}^3$	→ 2,28kw
	Total needed cooling capacity	→ <u>13,48kw</u>

## SYSTEM CHOISE

When you demand comfort in every single cabin/space at the same time :

**A15-50 system** (15kw / 51.200Btu cooling capacity)

When you compromise on the use, like for example you cool the saloon during the day and the owner cabin and guest cabin at night :

**A10-50 system** (10kw / 34.100Btu cooling capacity)