



2017/2018

## Industrial Chiller's construction

**Chiller's description: Class WecoSpar – EcoSpar - Spar**



**Chiller with or without inverter in the compressors**

## The construction

### A chiller forever concept



Economizer, increase 15% of capacity, with less energy

### Industrial high temperature chiller

#### For extreme conditions, with or without adiabatic systems

Discharge pressure and temperature control to cold areas or countries, with inverters and antifreeze systems, to avoid and prevent formation of ice in the fins of the condensers.

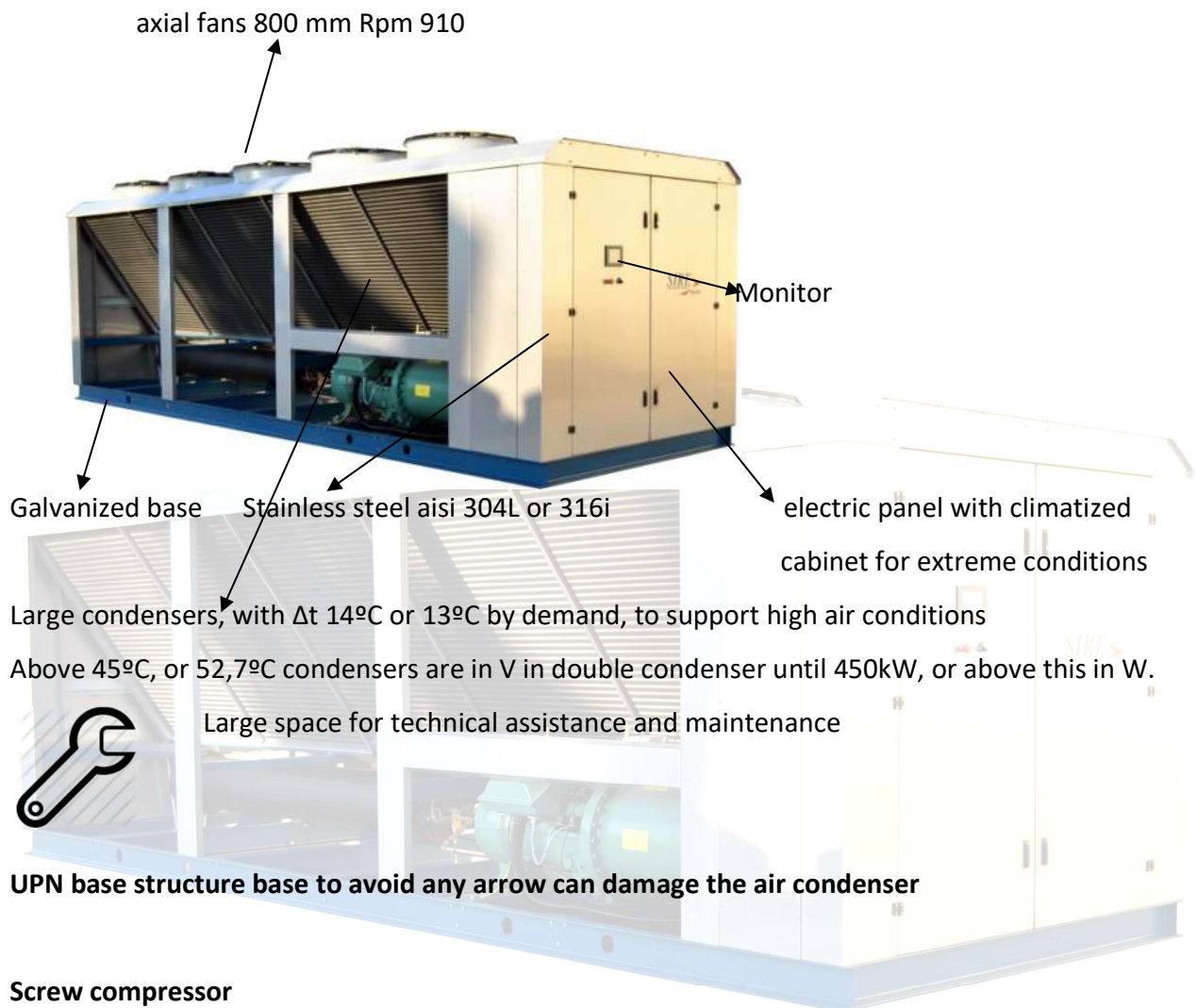


Fans speed with inverter or direct DC fans, to control the pressure on condensers

Large condensers  $\Delta t$  13°C or 14°C

Thermic protections for all motors including compressors

Part winding start or star delta can use also soft stars



## Compressors

They are semi hermetically screw compressors, of high volumetric efficiency, with 3-phase (two-pole) motors.

The compressors shall have internal thermal contacts, for protection against overload, locked motor or extreme high discharge pressure. In addition they are be equipped with crankcase oil heater.

the construction is made on the basis of obtaining low noise and low vibration

the structure of the chiller provides a solid base for the positioning of the compressors avoiding in the future any damage caused by structural displacement or even vibration of the compressor to the rest equipment, the compressors are mounted in a separate noise insulated space of the Unit when necessary and order by the client. They are also installed appropriate vibration absorbing supports, in order to ensure a noise-free operation. the compressors in the SIRE are judiciously chosen based on some fundamental points; reliability of durability, capacity, absorbed power and capacity produced, volume shifted and its choice is also determined by the ambient temperature factor and evaporation temperature.

SIRE provide equipment according to the needs of our customers by adapting or going directly to the client's project needs, and can even customize the equipment, as in this case the compressor according to the needs of its customer, such as the chiller itself

Compressors can provide inverters or just working by steps or continuousness control capacities the universal compact screw compressors can also be used with the economizer circuit to further increase refrigerating capacity and efficiency. They're fitted with dual capacity control and can be adjusted infinitely or according to scale. The level of energy efficiency is a benchmark in this compressor technology in both full-load and part-load operation. Compressors demonstrate their strength particularly in air cooled liquid chillers for comfort air conditioning and in heat pumps.

SIRE uses and works with extremely reliable manufacturers

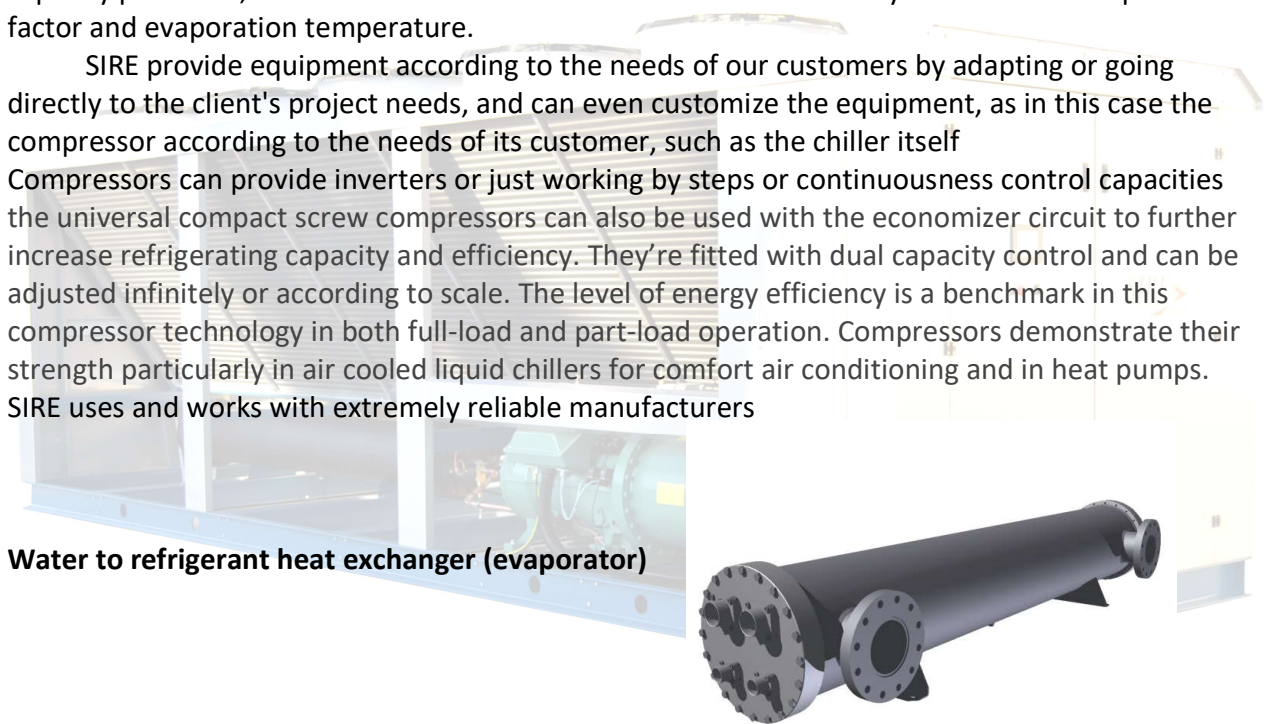
## Water to refrigerant heat exchanger (evaporator)

## SIRE

uses evaporators in the range of class SPAR chillers, produced in our factory and with a great care in the choice of the products used for their construction:

copper

internal spiral or flat construction copper, made in Europe production at 0.40mm or 0.80mm thickness with large surface created by more copper tube inside, and not resorting to thinner thicknesses avoiding more material in quality deterioration and transfer coefficient, SIRE still produces its shell and tubes in such a way that they guarantee to our clients a great longevity and enormous coefficient of exchange





the construction of the shell and tube evaporator, is made of treated carbon steel or stainless steel with tempered and rectified steel expansion plates to allow a good expansion of the copper housed therein, all of the copper tubing being mounted on spacers made in, pvc or pp in order to avoid galvanic currents that quickly destroy the evaporators, these plastics gates, allow the passage of water without attrition in the copper tubes.

### Fans

Sire can provide 2 types of fans, AC or DC,

Specially designed for applications with low pressure loss

Protection class IP55 and coated blade for extreme conditions

Low operating costs due to optimum efficiency with minimum noise emissions as a result of bionic blade design

High flexibility due to 100% speed controlled volume flow rate

Very smooth running and high durability due to dynamic balancing on 2 levels

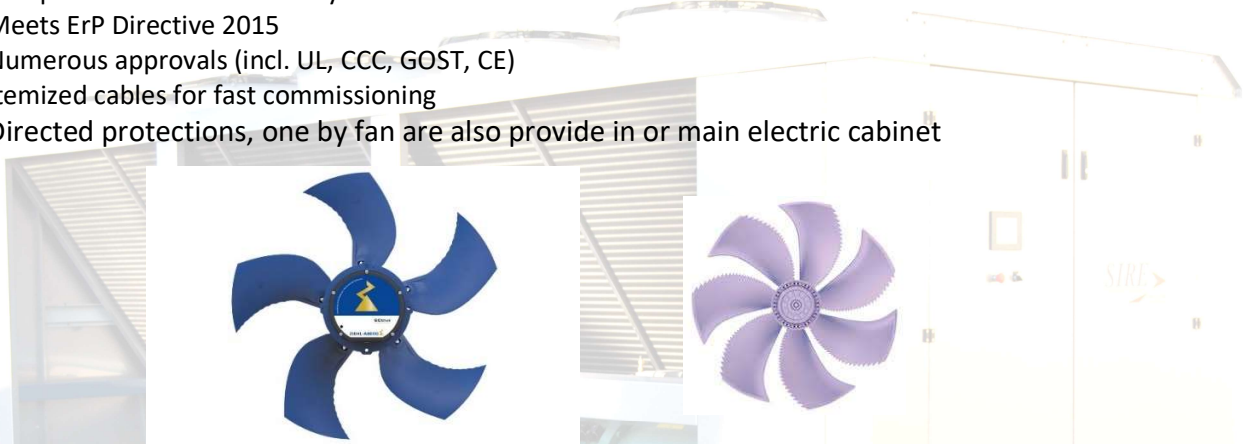
Compact dimensions for every installation situation

Meets ErP Directive 2015

Numerous approvals (incl. UL, CCC, GOST, CE)

Itemized cables for fast commissioning

Directed protections, one by fan are also provide in or main electric cabinet



### Filter-drier

Consisting of a blend of highly effective desiccants. The quality features built into it assure years of service on any refrigeration system. Are also installed in the liquid line, line Rota lock valves at the in the liquid line, before for in case of maintenance be facilitated the removal of the dryer's charges inside the filters. The filters are chosen so as to avoid to the maximum any upper or desired loss of charge

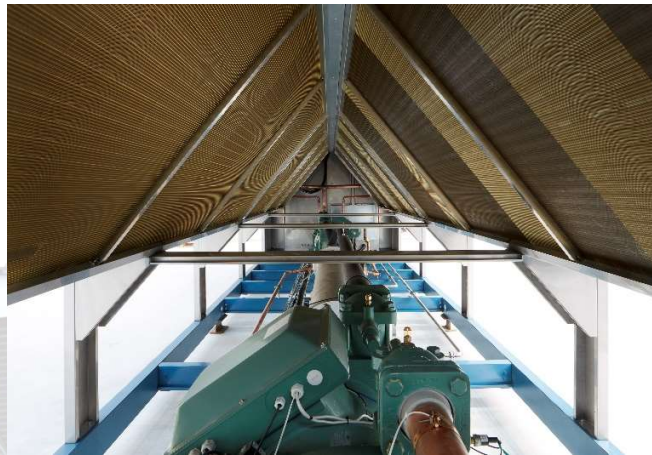


### Air to refrigerant heat exchanger (condensers)

They are manufactured from seamless copper tubes and aluminium fins with properly formed surface for high heat transfer efficiency. Copper tubes are mechanically expanded into the aluminium fins accomplishing a good contact thus maximum heat transfer. **Adiabatic** system is also being providing with more than +48C on air. The chillers with +50C they add a tropical condenseur.



Are used in the construction of our condensers two types of assembly: or 3 rows or 4 rows, of passages usually a 1/2 inch  
the aluminium fins may have spacing of 2.2mm or 2.5mm depending on the area where they are placed, whenever the SIRE performs a project, it is always necessary to take into account the country to which the equipment is destined and the unit at room temperature, as well as the factor of the capacity to which the equipment is subject  
the positioning and assembly of the air condensers is restricted, both in terms of obtaining the best air intake as well as the positioning of the air condenser, taking into account factors external to the assembly of the equipment. Internal fan separators, prevents short-circuit of air as well as any loss by failure or stop of the air fan.



**The very new microchannel** condenser is also provided, by demand in this model. However, we advise the use of this condenser only in clean places or far away from the sea are.

#### **Expansion control device**

It shall be a thermostatic expansion valve with external pressure equalizer. Heat pumps shall be equipped with an additional capillary tube expansion device and others when required  
Electronic expansion valves are also used.

#### **SIRE**

##### **Expansion valves**

##### **Electronic expansion valves**

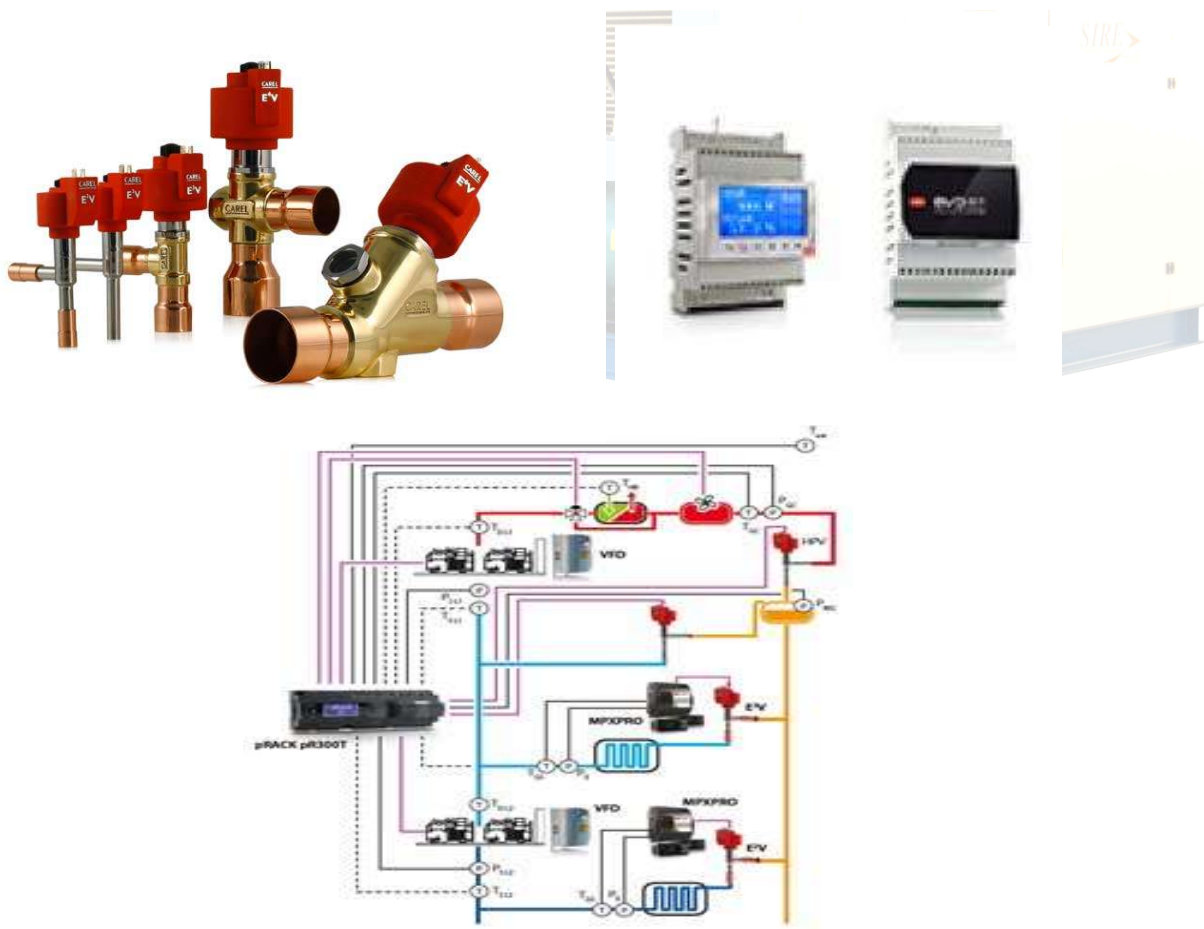
**Electronic expansion valves** are designed to meet any cooling capacity requirements up to 2000 kW in air-conditioning and refrigeration applications, and stand out above all for their excellent flow control, even at lower flow-rates.

Carel expansion valves have three main strengths:

**1. Reliability over time:** the standard design process used for the ExV valves includes accelerated life testing of  $1 \times 10^6$  cycles; the valves are certified in accordance with the main national and international standards; compliance with these standards guarantees maximum quality of both the products and the manufacturing process, as well as continuous commitment to improving the environmental management system.

**2. Very precise control:** this is guaranteed by Carel electronic controllers, designed especially to optimize management of air-conditioning and refrigeration systems, with special focus on energy saving. In addition, highly precise control is also assured by the special shape of the movable elements, guaranteeing flow with an equal percentage characteristic, the stroke length, achieved by using stainless steel ball-bearings, and the use of high precision mechanical components.

**3. Perfect refrigerant tightness:** despite the rotary motion of the motor, the movable element does not rotate during movement. This allows the use of a high-quality Teflon seal, which rests gently on the valve seat, without any sliding. To improve tightness of the seal, an elastic steel spring is fitted that pushes the movable element against the seat when the system is closed: this moreover allows the motor to complete a number of extra turns before stopping. The energy accumulated by the spring in this stage gives additional energy to close the valve, meaning tightness values that are comparable to those provided by a traditional solenoid valve. Finally, testing of 100% of the valves manufactured provides a further guarantee of reliability over time and valve tightness, and helps ensure operations with a reduced environmental impact.



### **Réfrigérant pressure gauges**

to prevent any possibility of gas leakage

SIRE does not use any type of external pressure gauge for checking pressures or oil differentials, all readings are ported from our console and the system implemented in our equipment control program

### **Refrigerant**

The chillers of classes Spar

3 types of refrigerant gases:

R134A

R1234ze

R407C

### **Housing**

**The structure base of the chiller is made in UPN steel with 160 at 220 mm x 6mm thickness**

This strong structure avoids any sharp arrows in the center of the machine after lifting

To avoid any arrow when the equipment is lifted by mechanical lifting means

The unit housing shall consist of a frame construction of galvanized our **stainless steel**, profiles at least 1,5mm thick assembled with bolts and cast stainless steel, our galvanized corner joints. The outer panels shall be galvanized our stainless steel and internally noise insulated in the compressors department (when demanded).

Frame panels shall be finished in stainless steel or dry powder epoxy resin paint, to provide an additional weather-proof protection.

### **Electrical cabinet**

The package shall include an electrical panel in a water proof enclosure, mounted inside the Unit. It shall contain:

- Compressor and fan motors contactors;
- Auto-fuse for the control circuit, magnetic break circuits in every compressor;
- Low and high-pressure switches; pression transducers
- Phase asymmetry and under-voltage relay;
- Selection for summer or winter operations (in heat pumps);
- Terminals for external electric heater (in heat pumps);
- Indicating lamps for crankcase heater;
- Indicating lamps for phase asymmetry and under voltage;
- in electrical cabinets subject to high external air temperatures they are



The electrical cabinets, contain; contactors, phase asymmetries and under voltage relay, (in some models) thermal protections, fuses, control circuit breakers, INT relays, switch breaker, and the microprocessor our PLC controller. The electrical panel is in a water proof enclosure system.

SIRE has as control equipment, one of the most advanced types of Microprocessor (several).

This equipment in the series is based on some of the following items:

The controller, checking all the parameters, control systems, and functions of the unit, and protects when necessary.



### **SIRE controller**

one of the most thoughtful control systems you can find in the market

The package shall include microprocessor based controller, which should provide the following functions:

- Temperature control (heating, cooling);
- Freeze-up protection;
- Compressor starting delay;
- Operation of the fans and of the water pump;
- Selection of the compressor starting order;
- Protection against high and low refrigerant pressure as well as low flow (connection with relevant switches);



### **System P + I or P**

Control of adjustable temperature...

Several step points...

Control of water pumps...

Delays to the start of compressors (part. wending) conform capacity...

Control of capacity...

Protection against high and low pressure, oil, ice, etc....

Display for reading codes, errors, failures...

remote controls when requested

Modbus system

All kind of diagnostic codes

Monitoring of fuses control

Under /over voltage protection

Compressor alarm prevention

Prevention actions

*Prevention for high compression ratio*

*Controlled compressor shutdown*

*Startup-Running delay of the compressor*

Condenser fans

Modulating fans

Control in chiller mode

Dynamic gain of FC Regulation

real-time overheating and subcooling monitoring

Test functions



MP-BUS card serie  
Konnex interface Card opcional  
CAN-bus serial Card  
tLAN and PST serial card  
LonWorksR interface Card opcional  
CAN-bus serial card opcional  
RS485 serial card opcional  
Ethernet serial card

### **SIRE Chiller capacity control**

The system is prepared to give different work conditions in the chiller, is possible choose continuous capacities or steps capacities.

#### **Stepped capacity control with control at inlet**

All compressors and the relevant capacity control steps will be proportionally positioned in the band. Increasing temperature values will cause the control steps to be subsequently input. Each step will be input according to the set delay times. The compressors will be started at the first entered capacity control stage. If special management of the first capacity control stage was selected, control will be affected according to the description in the dedicated section. In any event, the times for the capacity controls will be applied as described.

#### **Stepped capacity control with control at outlet**

A description of stepped capacity control of 4 compressors with four capacity control steps each:

##### **Activation of compressors**

if the water temperature measured by the probe located at the evaporator outlet exceeds the threshold of Control Set-point + Control Band the number of power stages will be increased - the power stages were input according to the set parameter known as "delay between power-up of different devices"

#### **Continuous capacity control**

A maximum number of four compressors are managed, with continuous capacity control. The compressor's capacity is controlled by two relay outputs, which, when suitably controlled, enable compressor power to be increased or reduced, varying the capacity of the compression chamber. Compressor power is controlled by sending impulses to the outputs of the capacity control relays. These impulses command the compressor to be charged or discharged. These impulses are at a constant frequency, settable, and of variable duration between two minimum and maximum limits, also settable. As there is no acquisition regarding the absolute position of the compressor 's capacity control valve, and, consequently, as no direct verification is possible of the power percentage input in the circuit, a time based control is run. With this control, when a set time threshold is reached, the compressor is considered fully charged/discharged and thus control of the capacity control impulses is suspended.

### **The Eco Booster Sire System**

a new component used by SIRE in the discharge line of the compressor named Eco Booster recently applied in our machines and designed, not only for lowers energy consumption as well as reduces the discharge temperature allowing to obtain strong gains in both work and equipment performance, including in areas with air temperatures above +45°C. The Eco Booster is recommended for extreme air conditions.

**Chilled Water Pump Control** — Unit controls provide an output to control the chilled water pump(s). One contact closure to the chiller is all that is required to initiate the chilled water system.

### **Series Chiller Arrangements**

Another energy-saving strategy is to design the system around chillers arranged in series. The actual savings possible with such strategies depends on the application dynamics and should be researched by consulting your SIRE chiller. Systems Solutions Representative and applying the SIRE System analyzer program. It is possible to operate a pair of chillers more efficiently in a series chiller arrangement than in a parallel arrangement. It is also possible to achieve higher entering-to-leaving chiller differentials, which may, in turn, provide the opportunity for lower chilled water design temperature, lower design flow, and resulting installation and operational cost savings. The SIRE screws compressor also has excellent capabilities for “lift,” which affords an opportunity for savings on the evaporator water loop.

**SIRE provide to our costumer the possibility of cooperation to building all kind of chiller situation by client design and by their demand**

**Sire chiller at Algeciras TA 44, 3°C at summer  
R407c**

**Delivery pression: 19,7Bar**

**Evaporation pression: 4,2Bar**

**Water temperature: +3C**



## Long life chillers Calculated Durability of this chiller 25 Years

SIRE, wanting to make a point of difference, launches a new idea and concept in the market, reliability, profitability, equipment life, always allowing upgrades, updating an equipment without throwing it away. In view of this situation, all the chillers in this series above are strictly produced according to the most demanding durability standards, so that they can satisfy the needs of the customers, avoiding excessive and unnecessary expenses with the regular purchase of lower quality equipment, which in turn and in a short time prove to be more expensive.

So we think that the equipment must be made to last and to monetize the service to which they are proposed.

### Eco device System – ECOSPAR

**Increase more 15% of capacity in the chiller**

**Sire... chillers between 24 at 36 months of guarantee**

**The best guarantee in Market**

[Applicative Norms](#)

[Normativas aplicadas](#)

[CE Norms](#)

Declare under our sole responsibility that the product ranges DTD.

to which this declaration relates is in conformity with the following standards or another normative document(s).

EN 60529 (2000) Degrees of protection provided by enclosures (IP code)

EN 60335-2-40 (2006) Household and similar electrical appliances, Part 2-40

EN 61000-6-2 (2006) Electromagnetic compatibility (EMC), Part 6-2

EN 61000-6-3 (2007) Electromagnetic compatibility (EMC), Part 6-3

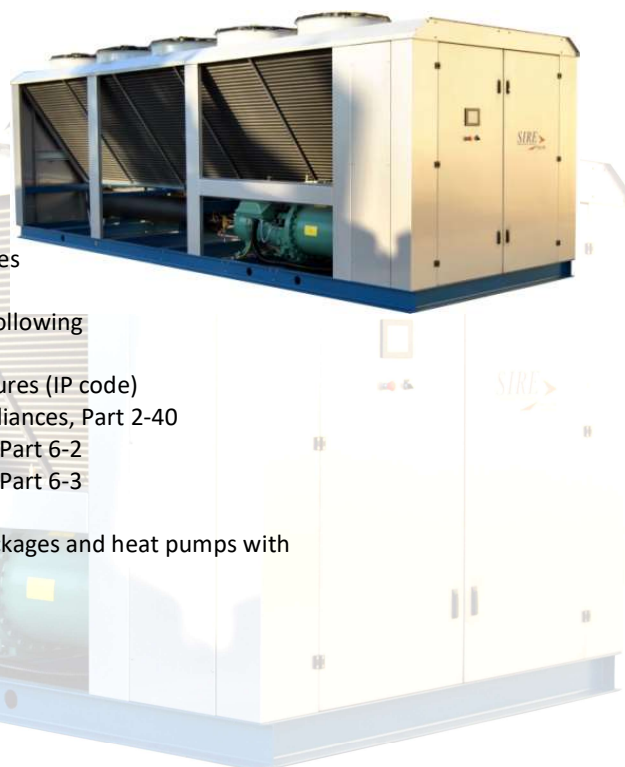
ISO 12100-2 (2004) Safety of machinery, Part 2.

EN 14511-1,2,3,4 (2008) Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space

Machinery 2006/42/EC

Electromagnetic compatibility 2004/108/EC

Low voltage 2006/95/EC



**Chiller certification by  
TUV**



**CERTIFICADO**

TÜV Rheinland Iberica Inspection, Certification & Testing, S.A.

## ***A CHILLER FOREVER***

*some make great brands  
we only know make great machines*



