Product Presentation
Centrifugal Chiller
New water cooled liquid chiller – Inverter technology
WCH-i Series
Hydronic Line up 2019 – Water source

<table>
<thead>
<tr>
<th>1 CIRCUIT</th>
<th>CENTRIFUGAL CHILLER</th>
<th>DF19D015GB-00 2</th>
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<tbody>
<tr>
<td>1 CIRCUIT</td>
<td>CO</td>
<td></td>
</tr>
<tr>
<td>2 CIRCUITS</td>
<td>CO</td>
<td></td>
</tr>
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<td>HP</td>
<td></td>
</tr>
<tr>
<td>2 CIRCUITS</td>
<td>SCREWLINE 3</td>
<td></td>
</tr>
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<td>KNIGHTLINE 3</td>
<td></td>
</tr>
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<td>SPINCHILLER 3</td>
<td></td>
</tr>
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<td>2 CIRCUITS</td>
<td>NON EU</td>
<td>* Condenserless available</td>
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Nominal capacity, kW

5, 30, 50, 90, 130, 180, 270, 330, 500, 700, 1000, 1500, 2000

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Seasonal Efficiency – SEER (Tier2 2021)

Only some technologies will comply requirements of 2021

- **SCREW FIXED SPEED DRY EXPANSION**: 6.00
- **SCREW FIXED SPEED FLOODED**: 6.50
- **SCREW INVERTER FLOODED**: 7.50
- **MAGNETIC FLOODED STD EFFICIENCY**: 8.30
- **MAGNETIC FLOODED HIGH EFFICIENCY**: 9.00

**CLIVET WCH-i**

- **Tier2 SEER > 7.0 (> 1500 kW)**
- **Tier2 SEER > 6.5 (400 - 1500 kW)**
## Centrifugal chiller – Range

<table>
<thead>
<tr>
<th>Series</th>
<th>WCH-i 250-550</th>
</tr>
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<tbody>
<tr>
<td><strong>Size</strong></td>
<td>250</td>
</tr>
<tr>
<td><strong>Cooling Capacity [kW]</strong> (A35/W7)</td>
<td>879</td>
</tr>
<tr>
<td><strong>EER</strong></td>
<td>5,84</td>
</tr>
<tr>
<td><strong>SEER</strong></td>
<td>7,66</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>n°compressors / n°circuits</strong></td>
<td>1 / 1</td>
</tr>
<tr>
<td><strong>Refrigerant</strong></td>
<td>R-134a</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>400/3/50</td>
</tr>
</tbody>
</table>
Centrifugal chiller – Technology

- Control panel
- Direct-Drive Inverter Compressor
- Falling Film Evaporator
- Economizer
- Inverter stand alone
- Condenser

DF19D015GB-00
CENTRIFUGAL CHILLER
Proprietary technology

- Horizontal back-to-back self-balanced impeller
- Keyless joint system thanks to a profile connection between impeller and shaft
- Inlet guide vane regulating mechanism with rolling element
- Integration design of thrust plate and rotation axis
- Refrigerant flow motor cooling system
- Inlet guide vane correcting algorithm
- Gas-inlet regulation mechanism for centrifugal compressor

7 Patents
How does the centrifugal compressor work?

- Rotational speed ~ 15000 rpm
- The pressure increase occurs by the acceleration of the steam inside the impeller and the subsequent conversion of the energy accumulated under pressure
- The impeller is composed by a series of blades, whose bending is designed according to the working conditions (properties of the refrigerant, speed, working pressures)
- IGV (Inlet Guide Vane) regulates the direction of the steam entering the impeller: it is used to regulate the refrigerant flow and therefore the absorbed power and the cooling capacity
Distinguishing features

• **Two stages:** higher compression efficiency

• **Back to back impellers:** balance the thrust forces

• **Direct drive motor coupling:** no gear losses

• **Economizer:** further increases efficiency

• **Oil circulation system:** optimal lubrication

• **Very low vibration levels**

• **High silence**
Two stage compression

- Higher compression efficiency
Horizontally back to back impellers

- Balanced load on the bearings
- Low mechanical stress
- Higher reliability
Direct drive motor coupling

- 2 bearings instead of 4 = More compact structure and smaller size
- No gear losses
- Higher silence
Economizer

Two stage compression:
1) Higher compression efficiency
2) Lower discharge temperature

1) Economizzatore
2) Doppia laminazione

+6% Higher efficiency with the economizer
Oil circulation system

- Oil flows only in the bearings housing, almost no oil through the refrigerant circuit
- Higher exchange efficiency at evaporator and condenser
- Improved compressor reliability
Inverter control

The use of inverter technology ensures the rotation speed of the compressor matches the real demand of the plant:

- Capacity control from 100% to 15%
- SEER up to 9,06
- Linear in-rush current
- Management of compressor working conditions
Capacity control and Operating range

- Capacity control is performed by combining 2 settings: (1) inverter frequency (2) IGV opening / closing
- Usually capacity control is done by inverter because it is more efficient. When it is no longer possible to reduce the capacity, by decreasing the frequency of the inverter, the IGV comes into action, reducing the flow of refrigerant in suction
- When the compressor is switched on, the IGV is partially closed and the frequency of the inverter is at minimum to reduce the in-rush current

Maximum source side inlet water temperature: + 37°C
Falling film evaporator

- **Technology:** water passes inside the copper pipes, the refrigerant, injected through a distribution system, comes down from above on the pipes creating a continuous turbulence
- **Heat exchange comparable to a flooded evaporator:** (evaporation at 6°C, superheating close to 0 K, with no risk of liquid return to the compressor). The high exchange efficiency and the low superheat allow to reach an evaporation temperature of 6°C with outlet water at 7°C
- **Less refrigerant content**
Sound pressure level @1 m
Touch screen display

- Settings
- Alarms
- Evaporator and Condenser temperatures
- Detailed operation of the various subsets
INSTALLATION
MAIN INSTALLATION - UNIT

- **INDOOR UNIT**

- **TO BE PLACED IN FLOOR, WITH**
  **ANTI-VIBRATION OR NEOPRENE STRIPS**

- **INSTALL FLEXIBLE JOINTS ON**
  **HYDRAULIC CONNECTIONS**

- **INSTALLATION SPACES TO BE**
  **RESPECTED, EVEN IN HEIGHT**
MAIN INSTALLATION - INVERTER

• AIR COOLED INVERTER, SEPARATELY SUPPLIED

• MAXIMUM AIR OPERATION TEMPERATURE +43°C

• INVERTER COOLING MUST BE GUARANTEED

• MAXIMUM HEAT REJECTION BY INVERTER = 2% OF POWER INPUT AT FULL LOAD
HYDRAULIC CONNECTIONS

TO GUARANTEE PROPERLY OPERATION IT’S NECESSARY TO INSTALL THE FOLLOWING COMPONENTS (SOURCE SIDE AND USER SIDE):

- WATER FILTER
- FLOW SWITCH
## CONFIGURATION OPTIONS - EVAPORATOR

The choice of the evaporator is consequent to the user side water flow.

<table>
<thead>
<tr>
<th>WATER FLOW</th>
<th>N° PASSES</th>
<th>WATER CONNECTION</th>
<th>SCHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Two pass</td>
<td>Left (Std)</td>
<td>STD</td>
</tr>
<tr>
<td>(4°C &lt;= DT &lt;= 7°C)</td>
<td></td>
<td>Right (Option)</td>
<td></td>
</tr>
<tr>
<td>High (DT &lt; 4°C)</td>
<td>One pass</td>
<td>Opposed</td>
<td></td>
</tr>
<tr>
<td>Low (DT &gt; 7°C)</td>
<td>Three pass</td>
<td>Opposed</td>
<td></td>
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## Configuration Options - Condenser

The choice of the condenser is consequent to the source side water flow.

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CONFIGURATION OPTIONS - BY PASS VALVES

ON/OFF MOTORIZED BY-PASS VALVE – ACCESSORY
• Separately supplied
• To be installed between the water inlet and outlet on the condenser side
• Minimum water source temperature = + 19°C in input
• It keeps the unit running, reducing the water flow rate, by raising the condensing pressure

HOT GAS BY PASS – OPTION
• Installed on the refrigerant side between evaporator and condenser
• It allows to increase the turndown up to 10%, bypassing a part of the refrigerant
• It also provides additional protection against surges, in case the temperature of the condensation water is beyond the operating limits
WCH-i centrifugal chillers are supplied complete with refrigerant charge. The inverter is supplied separately and must be installed on site by the Customer.

Maximum allowed distance between inverter and unit = 10 meters (cable length)

CLIVET recommends to install the inverter as shown in the following figure:
Clivet can supply a cable kit for the connection between inverter and compressor (CSIC option). The cables are shielded, 4.5 meters long.

The cables are sent already connected to the compressor.

The connection to the inverter must be made on site after its placement by the Customer.
ISTALLATION - Part 3

Chiller and Inverter have two separate power supplies.

It is necessary to provide a main switch to allow the interruption of the power supply to the whole system.

Clivet can provide an electrical panel with main switch (QSGX option). This panel is supplied separately and must be installed on site by the Customer.
Clivet can supply a cable kit for connecting the main switch to the inverter and to the panel on board the unit (CCSQX option). Kit is supplied separately and must be installed on site by the Customer.

Cables are long enough to allow the main switch to be positioned next to the inverter.

The cable kit also includes a steel support for positioning the main switch.
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