Specification guide

High temperature air-to-water heat pump
for outdoor installation

Nominal heating capacity: 21 to 102 kW

aquaCIAT caleo

TD 70B – 300B

1 General information

Hot water will be produced by a **CIAT AQUACIAT^{CALEO} TD-type** , high temperature air-to-water heat pump, which is a single unit assembly designed for outdoor installation

The heat pump will use environmentally-friendly **R407C** refrigerant. It will include 1 to 2 independent cooling circuits and will be equipped with 1 to 2 SCROLL compressors, depending on the model

The unit will be designed, produced and tested at a production plant with a quality-assurance system which is certified according to **ISO 9001, 14001 and 50001**. Performance levels will be certified by the association **EUROVENT.**

The machine will be covered by an EC declaration of conformity and will comply with the following European regulations and standards:

- Machinery directive 2006/42/EC and EN 60-204 -1
- Electromagnetic compatibility directive 2014/30/EU
- EMC immunity and emissions EN 61800-3 'C3'
- Low Voltage Directive 2014/35/EU
- RoHS 2011/65/EU
- Pressure equipment directive (PED) 2014/68/EU
- Refrigerating systems and heat pumps EN 378-2

2 Performance levels (Insert the simplified description from the COC software)

Heating capacity (kW): ……
Total electrical power used: …… kW
Minimum COP coefficient of performance at full load according to the EN14511:3-2013 standard:….
Minimum SCOP coefficient of performance at full load according to the EN14825:3-2013 standard, with average climate conditions:….
Hot water entering/leaving temperature: …/…°C
Pressure drops for the condenser: ....
Secondary fluid: ....
Outdoor air temperature: .... °C
Sound power levels at full load: ... dB(A)
Refrigerant type: …. (ODP=0/GWP=….)
CO_2 equivalent tonne: ….
Dimensions (length x width x height): ……x…..x….. mm
Unit operating weight: …. kg

The environmental report including the analysis of the life cycle of the unit must be supplied by the manufacturer

Possible hot water production at outdoor temperatures of **-20°C to +40°C**
The range of use will enable a leaving water temperature to **+65°C** at full load
The heat pump will enable a hot water production up to **+55°C** at outdoor temperature of **-20°C**
The heat pump will enable a hot water production up to **+65°C** at outdoor temperature of **-10°C**

3 Compressors

These components are high efficiency SCROLL-type compressors with vapour injection allowing efficiency improvement of the compressor and its cooling as well
All the compressors in a cooling circuit will be identical to ensure a high level of reliability

They will include the following standard components:

- two-pole motor (2900 rpm) built into the compressor (direct drive)
- built-in motor protection by internal winding thermostat
- pressurised lubrication controlled by a centrifugal oil pump
- oil sight glass for monitoring the oil level on each compressor
- maximum discharge temperature control
- oil pressure control
- crankcase heater

Compressor electric motor

- large motor to reduce the start-up current of each compressor. If the start-up current on site must be significantly reduced, the manufacturer may fit a "soft start" type of electronic system near the compressor
- motor protected by an internal thermostat

The compressors are fitted on anti-vibration dampers to ensure a low level of vibration.

3.1 Sound level reduction (optional)

Compressors with a noise-absorbing jacket with soundproofing material to minimise the sound level of the compressor **(Low Noise version)**

Compressors with a noise-absorbing jacket with soundproofing material and low speed fans to minimise the sound level of the machine **(Xtra Low Noise version sizes 100B to 300B)**

4 Water heat exchanger

High-performance direct-expansion **brazed-plate** heat exchanger.
Two entering and leaving water temperature sensors on the exchanger are used to regulate the 'return water' or 'leaving water'. The evaporator is fully heat insulated and will be equipped with frost protection (pure water operation) to protect the exchanger at external temperature down to –20°C.
The heat insulation is made from shaped cellular foam, at least 19 mm thick.
The hydraulic unions will be **"VICTAULIC"**-type unions to ensure quick connection between the unit and hydraulic system.

4.1 Flexible evaporator sleeves (optional)

The manufacturer will supply flexible connection sleeves to insulate the unit and limit the transmission of vibrations to the hydraulic network.

5 Air heat exchanger

Copper tube coils and aluminium fins providing increased corrosion resistance.
Axial fans with composite blades offering an optimised profile,

5.1 Anti-corrosion protection (optional)

For aggressive and corrosive environments, an anti-corrosion treatment with aluminium fins **pre-treated with polyurethane and epoxy** can be offered as an option:

5.2 High static pressure fan Xtra Fan (optional)

Fans allowing available static pressure up to **100 Pa** for the duct. Each fan will be equipped with flange and sleeve for connection to duct system. **Option available for sizes 100A to 300A**

6 Refrigerant components - Safety components

Each cooling circuit will include the following accessories as a minimum:

- One fluid duct service valve
- One 4-way cycle inversion valve for defrosting
- One electronic expansion valve
- One liquid sight glass to show the refrigerant level
- One filter dryer
- Low- and high-pressure sensors
- Safety valves
- Exchanger frost protection sensor
- **Factory-fitted water flow rate controller**

7 Electrical cabinet

The electrical cabinet is made from painted steel sheet metal with an **IP44 protection** rating
The power supply is 400 V (+10/-10%) 3-ph 50 Hz + earth without neutral.
The electrical cabinet includes a main external safety switch and a 24-V control circuit supply transformer

8 Connect Touch electronic control, regulation and display module

The control module features a 4.3-inch touchscreen with a user-friendly operator interface enabling intuitive navigation using icons.

User interface

- 4.3-inch colour screen
- Display of all machine parameters (3 access levels, User/Maintenance/Factory, password-protected)
- Display of trend curves for main values
- **5 languages available**
- Possibility to load a custom translation file
- Access to the interface through the web browser

Control

This performs the following functions:

- Regulation of the water temperature (at the return or at the outlet)
- Option of varying the set point according to the outdoor temperature
- Second set point management
- Management of compressors with start-up sequence, metering and operating time balancing
- Self-regulating and proactive functions with adjustment of drift control for parameters
- Management of compressor short-cycle protection
- Protection against phase inversion
- Weekly and hourly time schedule for the machine, including 16 periods of absence
- Management of the machine operation limit according to outdoor temperature
- **Sound level reduction device (night mode according to user program) with machine power limitation**
- Diagnostics of fault and operating statuses
- Management of a fault memory allowing a log of the last 50 incidents to be accessed, with operating readings taken when the fault occurs
- Master/slave management of the two machines in parallel with operating time balancing and automatic changeover if a fault occurs on one machine
- **Pump standby based on demand (energy saving)**
- Pump operating time balancing (unit equipped with a hydronic module)
- Calculation of the water flow rate and operating pressure (unit equipped with a hydronic module)
- **Electronic adjustment of the pump speed and the water flow (unit equipped with hydronic module with variable-speed pump)**

Maintenance function

The controller will have two maintenance reminder functions as standard, making the user aware of the need to regularly perform maintenance operations and to guarantee the service life and performance of the machine

- **Periodic reminder:** this function is used to select the period between two maintenance checks. This period may be set by the operator in either days, months or operating hours, depending on the application
- **Mandatory F-GAS sealing check reminder:** this function is activated by default in the factory and is used to select the period between two sealing checks depending on the refrigerant charge of the machine in accordance with F-GAS regulations

Remote control

- Communication with CMS via RS485 MODBUS/JBS or TC/IP output as standard.
- **Control via built-in web server to remotely access all HMI functions via a PC with alarm notification via email alerts**

8.1 Communication gateway for other protocols (optional)

LON communication gateway

Factory-fitted bi-directional communication board enabling the machine to be connected via communication bus to a centralised LonWorks management system.

BACnet/IP communication gateway

Factory-fitted bi-directional communication using the BACnet over Ethernet IP network protocol. This option is used to integrate the machine into a BACnet IP centralised building management system.

Volt-free contacts available as standard for remote control of the machine

- Automatic operation control: (switches machine on/off)
- Selection of set point 1/set point 2: activates a second set point
- Sanitary hot water demand
- Fault reporting: indicates the presence of a major fault which has caused unit to stop
- On/off control for a boiler
- 4-stage on/off management for additional heaters

8.2 Volt-free contacts available as an option

- Set point adjustable via 4-20 mA signal: used to adjust the control set point

8.3 Master/slave operation (optional)

Unit equipped with an additional leaving water temperature sensor to be fitted on site, to optimise the operation of two units with operating time balancing

8.4 1 - 3 M2M supervision units (optional)

Remote supervision solution enabling customers to track monitor and optimise the operation of one or more machines.
Operating data is available in real time from the CIAT M2M supervision website (overview screen, control panel for the controllers, events and temperature curves)
Any event can be configured to trigger an email alert. Monthly and annual reports are available with analysis and recommendations from CIAT experts.
Choosing this solution combined with a maintenance contract enables customers to optimise the performance of their installation, reduce their operating costs and extend the service life of their equipment.

9 Hydraulic module

The hydronic module will be built into the unit and will include the following:

- One variable speed pump
- Pressure sensor on the pump inlet and exchanger outlet
- A safety valve (4-bar rating)
- An air vent
- A drain valve
- Water filter

The pump shall be protected against cavitation through electronic pressure control at pump inlet

Specifications for hydraulic module equipped with variable-speed pump

A variable frequency drive will regulate the speed of the pump.

The variable drive will be able to vary the speed of the pump within a frequency range of 30 to 50 Hz
The nominal water flow rate for the desired pressure will be set by the pump's electronic control, reducing its electrical consumption and saving energy. **Using a water flow control valve is not permitted.**

Users can choose to control the water flow rate based on the **constant pressure difference or the constant temperature difference**

9.1 Frost protection for pump & pipework (optional)

Frost protection down to -20°C shall be guaranteed by optional electric trace-heating and the water pump shall be automatically started by the controller safety logic in case of a risk of frost formation

The hydraulic piping and pump shall be fully insulated to prevent any condensation (pump insulation using polyurethane foam and painted steel casing)

10 Frame and casing

The frame and casing are made from panels painted in RAL 7035 and 7024
The machine will be fitted as standard with metal grilles to protect the coils from impacts

10.1 Anti-vibration mounts (optional)

The manufacturer will supply anti-vibration mounts to insulate the unit and limit vibrations and associated noise transmitted to the building.