The compact dual-energy solution
High energy efficiency with R410A
Natural GAS condensation boiler
Self-adjusting electronic control

Cooling capacity: 45 to 80 kW
Heating capacity: 50 to 85 kW

Cooling and Heating

USE

A water chiller or water heater, the **AQUACIAT2HYBRID** ILDC-ILDH series is a packaged machine with air-cooled condenser, designed for room heating or cooling applications. It is particularly well-adapted to Offices, Shopping Centres, Industry and the Healthcare and Administration sectors.

These packaged units are designed for outdoor installation and require no special protection against adverse weather conditions.

To operate in thermodynamic HEATING or COOLING mode, these units use the outdoor air as the external source; this either allows heat to be evacuated in summer or acts as a thermal energy source for heating in winter.

In winter HEATING mode, a second heating operation is possible with a gas condensation boiler using natural gas, located in a technical compartment, which extends the machine to form a packaged assembly.

This allows the AQUACIAT2HYBRID to guarantee heating, either thermodynamically or with the gas boiler, according to a primary energy ruling, or according to the scenario chosen by the system user to manage gas or electrical energy.

Connected to an underfloor heating or cooling system, comfort units or an air handling unit, the reversible AQUACIAT2HYBRID ILDC or ILDH series is an extremely easy way to heat and air condition buildings.

Each unit is delivered fully assembled, wired (control and power), charged with refrigerant and factory tested.
Set-up has been simplified: the only on-site installation required is to assemble the gas modules on the heat pump, and set up the natural gas supply, hydraulic and electrical connections.

RANGE

AQUACIAT2HYBRID ILDC/ILDH series

Reversible air-to-water models with hydraulic system (circulation pump only or pump and buffer tank).

DESCRIPTION

Series ILDC and ILDH AQUACIAT2HYBRID models are reversible air-to-water heat pumps, delivered as standard with the following components:
- air-cooled condenser with axial fan motor assembly,
- chilled-water evaporator in cooling mode, or hot water condenser in heating mode,
- refrigerating circuit with Scroll compressors,
- condensation gas boiler with modulating burner, built into in a technical module attached to the heat pump,
- chilled water or hot water capacity control,
- control, automatic operation and startup box:
  - Power supply: 3~50Hz 400V (+10%/-10%) + earth
  - 1~50Hz 230V control circuit (transformers fitted as standard on the machine),
- casing for outdoor installation.

Complies with European EC directives

- Machinery 2006/42/EC
- EMC directive (2004/108 EC)
- Pressure equipment PED 97/23 EC:
  - Category 2 for ILDC - ILDH 180V to 300V
- Low voltage (2006/95/EC)
- Boiler efficiency directive 92 / 42 / EWG
- Gas devices directive 2009 / 142 / EWG

Compliance with European standards

- EN 60-204, EN 378-2 and C1500
- EN 298
- EN 483
- EN 15420
- EN 55014-1 / -2
- EN 61000-3-2 /-3
- EN 60 335-1/ -2

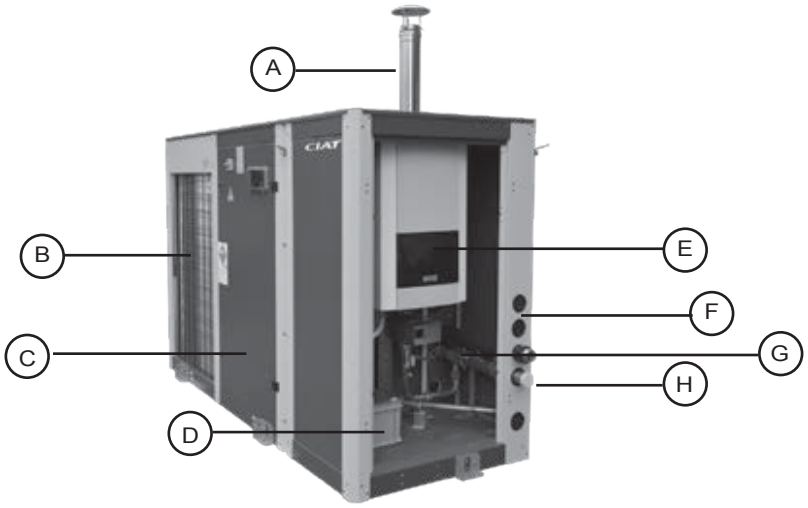
DESIGNATION

Example of AQUACIAT2HYBRID designation, 180V - 300V

ILD 240V - MG65

ILDC	reversible version with pump
ILDH	reversible version with pump and buffer tank
240	unit size
V	R410A refrigerant
MG65	65 kW gas boiler module

DESCRIPTION OF THE MAIN COMPONENTS



- (A) Chimney
- (B) Heat pump outdoor air exchanger
- (C) Heat pump technical compartment
- (D) Condensate neutralisation pan (option)
- (E) Gas boiler
- (F) DHW heating 4-tube option
- (G) Boiler accelerator pump
- (H) Chilled/hot water inlet/outlet

DESCRIPTION OF THE MAIN COMPONENTS

Casing
- Removable galvanised metal panels,
- RAL 7024 and RAL 7035 lacquer coating

Hermetic SCROLL compressors
- Built-in electric motor cooled by suction gases
- Motor protected by internal winding thermostat
- Placed on anti-vibration mounts

Evaporator
- Brazed-plate exchanger(s)
- End and inside plates in AISI 316 stainless steel
- High-performance, optimised plate patterns
- Thermal insulation

Condenser
- High efficiency air-cooled exchanger, aluminium fins with optimised profiles and grooved copper tubes
- Condenser or evaporator mode heat exchanger on ILDC-ILDH reversible heat pump versions
- Axial fan(s) with aluminium airfoil blades
- 2-speed motors - IP 54, class F

Natural gas boiler module

- Packaged casing for outdoor installation
- Removable panels fitted on latches
- Hinged module access door with bolt
- GAS condensation boiler with modulating burner
- Scroll heat exchanger in stainless steel
- Stainless flue gas discharge duct
- Gas supply flexible connection (delivered not fitted)
- Gas filter (delivered not fitted)
- Gas shut-off valve (delivered not fitted)
- Condensate draining flexible connection with siphon
- Boiler loop accelerator pump
- Boiler circuit hydraulic compensator
- Hydraulic accessories:
  - Boiler circuit closing motorised valve,
  - Boiler shut-off valves
  - Boiler input/output pressure gauges
  - Safety hydraulic valves
  - Automatic air bleed valve,
  - Drain valves
  - Flexible connection to the heat pump
  - Antifreeze protection heater cable

Control functions and safety devices
- Water flow control
- Thermostatic expansion valve
- Refrigerant high and low pressure safety devices
- Safety valves on refrigeration circuit
- Temperature and pressure sensors
- Evaporator water flow controller fitted
- Unit start-up sequence

Electrics box
The fully-wired electrics box, which houses all the electrical components and the electronic CPU board, controls the entire unit, monitors its operation, adjusts water setpoints and interfaces with an external control system.
It comprises:
- Control and power circuits,
- Wire numbering,
- Main safety switch with handle on front,
- Control circuit transformer,
- Circuit breakers on the power and control circuits,
- Compressor and motor switches,
- Main earth connection,
- Microprocessor-controlled electronic control unit,
- Alarm or information signals on free terminals.

CONNECT2 electronic control module
CIAT electronic control module with microprocessor and CPU, with central automatic operation and access to internal operation states.

Features:
- Start, stop, reset or remote control,
- COOLING or HEATING mode selector,
- Outputs:
  - RS485 output for GTC link (ModBus-JBus),
  - Ethernet output for CMS link (ModBus – TCP),
- Potential-free (dry) contact card adapter (option),
- Remote control adapter (option),
- Multilingual analogue LCD and LEDs

Functions:
- Display of operating information with multilingual clear-text messages, direct temperature and pressure readings
- complete management of compressors with start-up sequence, timer and runtime balancing
- Self-adjusting and proactive functions with adjustment of settings drift control
- In series staged capacity-reduction system on multiple compressors, based on refrigerating and heating demands controlled using the water temperatures,
- Monitoring of internal operation parameters
- Pump standby based on demand
- Second setpoint management
- Direct display of water temperature and pressure
- Fault and operating status diagnostic: HP/LP, water flow rate, compressor motor(s), antifreeze protection
- Short-cycle protection
- Remote management and remote monitoring
- Master/Slave Management allows two machines to be controlled on a single water loop, by alternating the Master and Slave according to the running time.
- Setpoint adjustable by 4-20 mA signal
- Weekly programming
- Management of switchover from operation in heat pump mode and use of the gas boiler based on the outdoor temperature and the hot water setpoint.

OPTIONS (KIT FOR INSTALLATION ON SITE)

Heat pump options only

- Additional potential-free (dry) contact board,
- Remote control unit,
- Phase controller = direction of rotation, absence of phase
- Energy meter,
- Gradual start-up (Soft Start),
- Frost protection,
- Fan speed regulator,
- Evaporator or condenser flexible couplings,
- Hydraulic control kit including manifold pressure gauges, control valve and shut-off valve,
- Double pump,
- MULTICONNECT management of up to 8 units,
- LONWORKS® protocol (gateway),
- BACNET™ protocol (gateway).

Options for gas boiler module

- Boiler condensate neutralisation pan,
- GAS shut-off valve (delivered separately),
- 300 mbar gas pressure controller (delivered separately),
- 4-tube system for DHW gas heating,
- Gas minimum pressure switch (delivered separately).

4-TUBE OPTION FOR DOMESTIC HOT WATER (DHW) HEATING

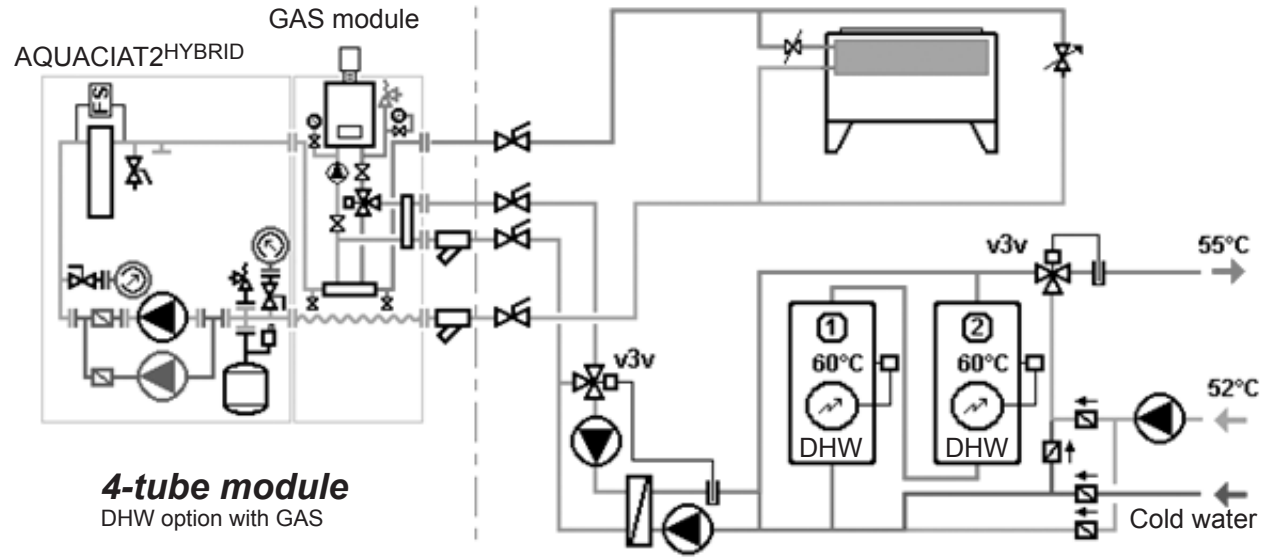
An optional application, mainly designed for the hotel industry, high-temperature hot water produced on a primary circuit and sent to a domestic hot water (DHW) preparer can be guaranteed solely by the GAS module boiler
During use, this primary water circuit, independent of the heating or air conditioning circuit, will be entirely devoted to producing DHW using natural gas, in "accumulation" or "semi accumulation" mode, with the heat pump continuing to run during when its control is switched between COOLING and HEATING mode.

The integration of a hydraulic compensator inside the module helps eliminate pressure drops in the primary network between the gas module and the DHW preparer:
- the boiler accelerator pump guarantees operation between the boiler and the hydraulic compensator,
- on the installation side, an accelerator pump guarantees the primary water flow between the DHW preparer and the gas module.

Note:
- The water temperature at the mixer tank outlet to the DHW preparer will be hotter the closer the primary accelerator pump flow rate is to that of the boiler.
- Obtaining a hot water temperature at the heat pump outlet as close as possible to that at the boiler outlet will therefore be conditioned by having the lowest possible difference between these two flow rates.

Gas module (MG)	MG50	MG65	MG85
Max boiler water flow rate m³/h	2.7	3.5	4.5

Schematic diagram with Saniciat 2 DHW production module



4-tube module
DHW option with GAS

Operating principle

The production of high temperature water by the Hybrid heat pump is controlled by an on/off input or via a BUS link provided by the operator, and switches the 3-way valve on the primary circuit to DHW production.
The user can activate a parameter to enable the control to order the DHW cycle to stop, in cooling mode or heating mode, according to the following criteria:

- **Priority DHW:** priority is given to the DHW cycle within the cycle's maximum time limit,
- **Comfort DHW:** the DHW cycle is started whilst monitoring the minimum water return temperature for the heating circuit, to reheat it if necessary.

AQUACIAT2HYBRID	HYBRID heat pump ILDC-MG / ILDH-MG	
Power supply: 400 V, 3-Phase, 50 Hz, without neutral, with trans-former	•	
Coil protection screen	•	
Resilient mounts	•	○
All-season operation (min. outdoor temp +10°C as standard)	•	
Condenser ventilation variable speed drive (all-season operation to outdoor temp. of -20°C in cooling mode)		○
- 800 µm water filter	•	○
MODBUS/JBUS communication interface on RS485 and MODBUS/ TCP Ethernet	•	
Gas supply flexible connection	•	○
Boiler gas filter	•	○
Boiler water circuit inlet/outlet pressure gauges	•	
Additional voltage-free contacts board	▲	○
Remote control	▲	○
Phase controller (rotation direction, missing phases)	▲	○
Soft start	▲	○
Frost protection	▲	○
ALTENA coil coating	▲	
Polyurethane coated coil fins	▲	
Hydraulic control kit (manifold, control & shut-off valve)	▲	
Hydraulic hoses	▲	○
Double pump	▲	
Pump suction minimum safety device	▲	○
Refrigerant leak detection	▲	○
MULTICONNECT multiple unit management	▲	○
LONWORKS/BACNET gateway	▲	○
Gas shut-off valve	▲	○
300 – 20 mbar gas pressure controller	▲	○
Boiler condensate neutralisation pan	▲	○
4 high-temperature primary heating tubes for DHW production	▲	
Minimum gas pressure switch	▲	○
Energy meter	▲	○

• Standard supply ▲ Option Factory fitted ○ Kit for installation on site

Note: Some technical options not listed above may be added on special request (please contact us).

POSSIBLE CONFIGURATIONS

Depending on the volumes of water in the installations or the buffer capacity requirements, two different versions of AQUACIAT2HYBRID are available:
- an ILDC version comprising a heat pump and an MG gas module,
- an ILDH version including an additional buffer tank module.

ILDC180V-200V-240V-300V MG 50-65-85 GAS module

ILDC180V-200V-240V-300V MH hydraulic module MG 50-65-85 GAS module

POSSIBLE COMBINATIONS OF AQUACIAT2 HEAT PUMP AND GAS MODULES

Several assemblies between "MG" GAS boiler and AQUACIAT2 modules are possible to meet the needs of different installations. Four AQUACIAT2 models and three boiler capacities provide eight AQUACIAT2HYBRID combinations from 46 to 85 kW.

Heat pump only			180V Cooling capacity=46.7 Heating capacity= 48.7	200V Cooling capacity=53.1 Heating capacity= 55.2	240V Cooling capacity=61.5 Heating capacity = 64.1	300V Cooling capacity=75.2 Heating capacity = 81.7
Gas boiler	MG50 Gas Module	48 kW	ILDC/ILDH 180V-MG50			
	MG65 Gas Module	63 kW	ILDC/ILDH 180V-MG65	ILDC/ILDH 200V-MG65	ILDC/ILDH 240V-MG65	
	MG85 Gas Module	85 kW	ILDC/ILDH 180V-MG85	ILDC/ILDH 200V-MG85	ILDC/ILDH 240V-MG85	ILDC/ILDH 300V-MG85

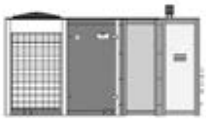
TECHNICAL CHARACTERISTICS - AQUACIAT2HYBRID ASSEMBLIES

Possible combinations			No.1	No.2	No.3	No.4	No.5	No.6	No.7	No.8
AQUACIAT2HYBRID			180V MG50	180V MG65	180V MG85	200 MG65	200 MG85	240 MG65	240 MG85	300 MG85
Heat pump	Net cooling capacity	kW	46.77	46.77	46.77	53.16	53.16	61.50	61.50	75.29
	Thermodynamic power	kW	48.74	48.74	48.74	55.25	55.25	64.12	64.12	81.75
Gas module	Boiler heating capacity	kW	48.00	63.90	85.30	63.90	85.30	63.90	85.30	85.30

ILDC version without buffer tank

Height without accessories	mm	1768	1768	1768	1768	1768	1768	1768	1768
Height with chimney	mm	2293	2293	2293	2293	2293	2293	2293	2293
Length	mm	2677	2677	2677	2677	2677	2677	2677	2677
Depth	mm	1055	1055	1055	1055	1055	1055	1055	1055
Weight (empty)	kg	868	868	878	871	881	876	886	1019
Total water capacity	l	11	11	12	11	12	11	12	12
Weight (in operation)	kg	879	879	890	882	893	887	898	1031

ILDH version with buffer tank



Height without accessories	mm	1768	1768	1768	1768	1768	1768	1768	1768
Height with chimney	mm	2293	2293	2293	2293	2293	2293	2293	2293
Length	mm	3358	3358	3358	3358	3358	3358	3358	3358
Depth	mm	1055	1055	1055	1055	1055	1055	1055	1055
Weight (empty)	kg	1065	1065	1075	1068	1078	1073	1083	1216
Total water capacity	l	211	211	212	211	212	211	212	212
Weight (in operation)	kg	1276	1276	1287	1279	1290	1284	1295	1428

AQUACIAT2HYBRID		ILDC 180V	ILDC 200V	ILDC 240V	ILDC 300V
Net cooling capacity (1)	kW	**47.0**	**53.4**	**61.9**	**75.5**
Net power input (1)	kW	15.4	18.4	20.7	27.9
EER / ESEER Efficiency (1)		3.06/4.06	2.90/4.04	2.99/3.74	2.71/3.69
Lw / Lp (High Performance version) (4)	dB(A)	79/47	79/47	84/52	87/55
Lw / Lp (Low Noise version) (4)	dB(A)	77/45	76/44	80/48	81/49
Net heating capacity (2) (3)	kW	**48.5/50.4**	**55/57**	**63.7/66.6**	**81.5/84.1**
Net power input (2) (3)	kW	15.5/12.6	18/14.4	20.9/17.2	26.5/21.8
Net COP performances (2) (3)		3.12/4.01	3.05/3.96	3.05/3.87	3.08/3.86
Compressor		Hermetic SCROLL (2 900 rpm)			
Start-up mode		Direct in line in series			
Number		2			
Power control	%	100-50-0			
Refrigerant oil type		Polyol ester POE 3MAF (32cSt)			
Oil capacity	l	6.50	6.50	6.50	8.30
Number of cooling circuits		1			
Refrigerant (GWP)		R410A (GWP = 2088)			
Refrigerant charge	kg	12.5	12.7	13.1	13.1
Tonne of CO_2 equivalent	TCO_2Eq	26	26.5	27.3	27.3
Power supply	ph/Hz/V	3~50Hz 400V (+10%/-10%) + Earth			
Unit protection		IP 44			
Control circuit voltage	ph/Hz/V	1~50 Hz 230V (+10%/-10%) - Transformer fitted			
Evaporator		Brazed-plate heat exchanger			
Water content	l	3.55	4.22	4.77	7.71
Chilled water outlet	°C	-10/+18			
Hot water outlet	°C	+30/+50			
Minimum water flow rate	m^3/h	5.8	6.9	7.8	10.4
Maximum water flow rate	m^3/h	15.4	17.6	20.4	24.5
Hydraulic connection	Dia.	2" G male			
Max. pressure. water end	bar	4 bars			
Air-cooled condenser		Finned heat exchanger			
Fan	Dia.	800			
No. x Motor output. High Performance version	kW	1 x 0.9	1 x 0.9	1 x 1.7	1 x 1.7
No. x Motor output. Low Noise version	kW	1 x 0.46	1 x 0.46	1x 1.2	1 x 1.2
High Performance Air flow rate	m^3/h	16100	16100	24000	24000
Low Noise Air flow rate	m^3/h	10800	10800	18000	18000
Minimum system water volume	l	131	149	173	209
Unit water capacity	l	4	4	4	4
Expansion vessel	l	18	18	18	18
Standard pump	no.	40	40	40	41
Height (excluding mounts)	mm	1768			
Length (version C)	mm	1995			
Depth	mm	1055			
Weight (empty. version C)	kg	648	651	656	789
Storage temperature	°C	+50°C			

(1) Net capacity for chilled water mode 12°C/7°C and condenser air inlet temperature 35°C - EN 14511 - 2013 EUROVENT conditions
(2) Net capacity for hot water mode 40°C/45°C and outdoor air temperature +7°C - EN 14511 - 2013 EUROVENT conditions
(3) Net capacity for hot water temperature 30°C/35°C and outdoor air temperature +7°C - EN 14511 - 2013 EUROVENT conditions
(4) Lw: overall power level as per standard ISO3744, for cooling mode under nominal EN 14511 operating conditions
Lp: overall pressure level at 10 metres in a free field calculated using the formula Lp=Lw-10logS

TECHNICAL CHARACTERISTICS - GAS BOILER MODULES ONLY

AQUACIAT2HYBRID		MG 50	MG 65	MG 85
Nominal capacity 75-60°C	**kW**	**45.8**	**60.9**	**81.3**
Nominal capacity 40-30°C	**kW**	**48.0**	**63.9**	**85.3**
Efficiency at 100% 80-60°C NCV	%	97.6	97.4	97.4
Efficiency at 100% 40-30°C NCV	%	104.4	102.4	102.4
Modulating accelerator pump power input	W	130	130	130
Gas category		I2Er		
Condensate max. flow rate	l/h	6	7	10
H gas max. consumption (G20)	10.9 kWh / m^3/h	4.3 m3/h	5.7 m3/h	7.6 m3/h
H gas max. consumption (G25)	8.34 kWh / m^3/h	5.6 m3/h	7.5 m3/h	10 m3/h
H (G20) and L (G25) gas pressure	mbar	20 and 25		
Maximum gas pressure	mbar	50 mbar		
Sound power level	dB(A)	56		
Boiler		Condensation/Modulating forced draught burner		
Burner modulation range	%	100% at 17%		
Combustion gas connections		Chimney (B23; B23P)		
Flue gas connection	mm	100	100	100
Boiler gas connection	mm	3/4 " male		
Flue gas max temp. 80-60°C (max/min)	°C	76/63	76/63	76/65
Flue gas max temp. 40-30°C (max/min)	°C	55/39	55/39	55/41
Max. flue gas volume max./min.	m^3/h	89/14	119/19	159/25
Max. fan pressure	Pa	150	150	150
Max./min. NOX level	mg/kWh	< 45/25	< 45/25	< 45/25
CO2 level G20/G25 natural gas at Cn	%	8.5	8.5	8.5
Fan max./min. operating pressure	Pa	150/15	150/15	150/15
Module power supply	ph/Hz/V	1~50Hz 230V (+10% / -10%) + Earth		
Unit protection		IP44		
Condensate outlet diameter	mm	22	22	22
Heating hot water outlet	°C	+ 60°C Max.		
DHW hot water outlet	°C	+ 80°C Max.		
Boiler min water flow rate	m^3/h	0.6	0.8	1.0
Boiler max water flow rate	m^3/h	2.7	3.5	4.5
Boiler water connections	"	R1.1/4"	R1.1/4"	R1.1/4"
Module water connections	Ø	2" G male		
Max. pressure, water end	bar	4 bars		
Module water capacity	l	7	7	8
Weight of boiler only	kg	60	60	68
Height without accessories	mm	1671		
Height with chimney	mm	2293		
Length	mm	681		
Depth	mm	1055		
GAS module weight (empty)	kg	220	220	230
Storage temperature	°C	+50°C		

ELECTRICAL CHARACTERISTICS

■ ILDC-ILDH basic unit (excluding pump and gas module)

AQUACIAT2HYBRID		180V	200V	240V	300V
Power supply	ph/Hz/V	3~50Hz 400V (+10%/-10%) + Earth			
Monitor circuit voltage	ph/Hz/V	1~50Hz 230V (+10%/ -10%), transformer fitted			
Starting current (excluding pump)	A	129	139	160	205
Starting current, SOFT START option	A	70	76	93	91
TN-TT neutral system breaking capacity	kA	15	15	15	10
Max. wire cross-section	mm^2	35	70	70	70
Max. nominal current ILDC- ILDH (1)	A	40	47	52	68

(1) Pump current not included

■ Gas module (MG) only

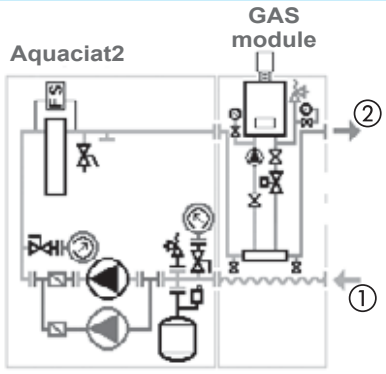
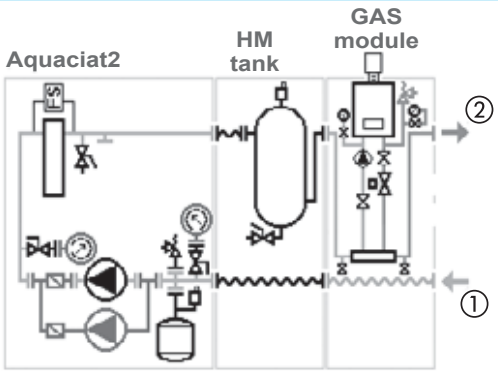
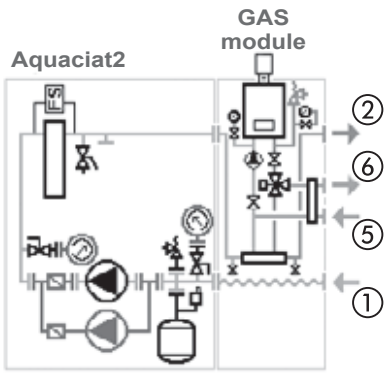
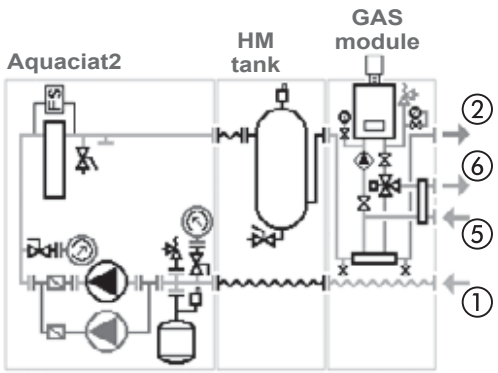
AQUACIAT2HYBRID		MG 50	MG 65	MG 85
Power supply	ph/Hz/V	1~50Hz 230V (+10%/-10%) + Earth		
Max./min. power input	W	198/151	228/156	297/168

HYDRAULIC CONFIGURATIONS

AQUACIAT2HYBRID reversible air-to-water heat pumps are available in 2 versions:
- Hydraulic unit equipped with a single or dual pump: AQUACIAT2HYBRID ILDC
- Hydraulic unit equipped with a single or dual pump and buffer capacity: AQUACIAT2HYBRID ILDH

■ AQUACIAT2HYBRID 180V – 300V models

180 → 300

"C" versions ILDC - MG	"H" versions ILDH - MG
 **2-TUBE MODULE** **Basic version** With 1 or 2 single internal pumps no. 40 to 41	 **2-TUBE MODULE** **Basic version** With 1 or 2 single internal pumps no. 40 to 41
 **4-TUBE MODULE** **DHW option with GAS** With 4-tube option for DHW pre-heating	 **4-TUBE MODULE** **DHW option with GAS** With 4-tube option for DHW pre-heating

HYDRAULIC PUMPS

Pump specifications

SINGLE PUMP (I)LDC - (I)LDH ONLY							
Number		40	51	52	41	42	43
Power	**kW**	0,75	0,75	0,75	1,1	1,5	2,2
Maximum nominal current	**A**	1,91	1,91	1,91	2,36	3,15	5,2
DUAL PUMP (I)LDC - (I)LDH ONLY							
Number		2 x 40	2 x 51	2 x 52	2 x 41	2 x 42	2 x 43
Capacity	**kW**	2 x 0.75	2 x 0.75	2 x 0.75	2 x 1.1	2 x 1.5	2 x 2.2
Maximum nominal current	**A**	2 x 1.91	2 x 1.91	2 x 1.91	2 x 2.36	2 x 3.15	2 x 5.2

In accordance with regulation No. 640/2009 and directive 2005/32/EC relating to eco-design requirements for electric motors, the pumps are equipped with IE2 (P<7.5 kW) or IE3 (P>7.5 kW) efficiency class motors.
Current for voltage 400V/3Ph/50 Hz (+10%/-10%)
Cable selection nominal current = sum of maximum nominal currents given in the tables.

Standard or Optional installation

The water circulation pumps below relate to units factory-fitted with hydraulic equipment, versions C or H.

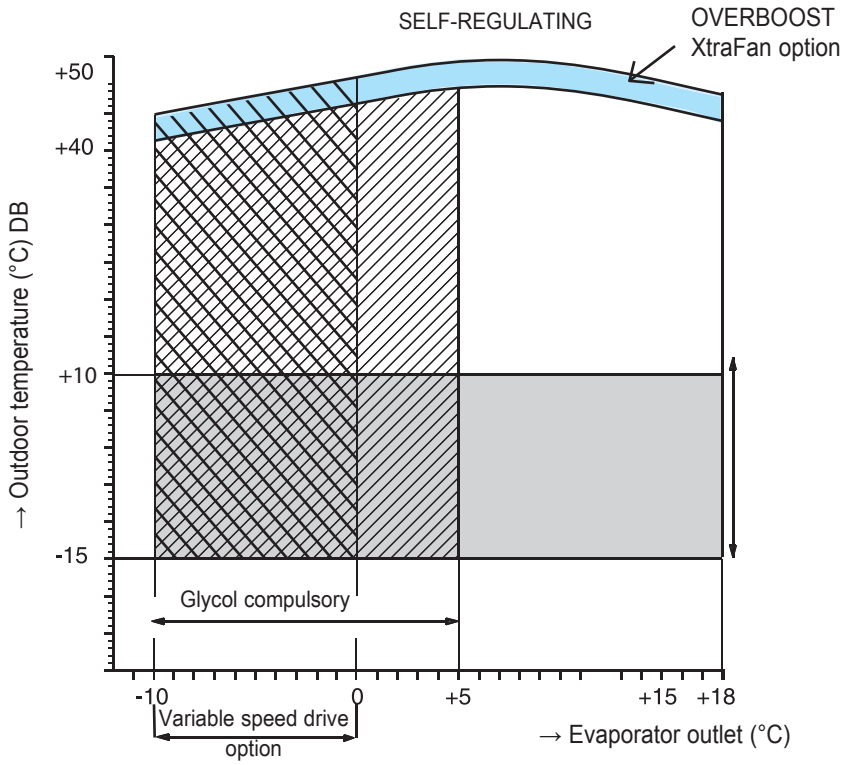
AQUACIAT2HYBRID	Single pumps						Dual pumps					
							 + 					
Models	**no.51**	**no.52**	**no.40**	**no.41**	**no.42**	**no.43**	**2 x no.51**	**2 x no.52**	**2 x no.40**	**2 x no.41**	**2 x no.42**	**2 x no.43**
180V	▲		•	▲	▲	▲	▲		▲	▲	▲	▲
200V	▲		•	▲	▲	▲	▲		▲	▲	▲	▲
240V	▲	▲	•	▲	▲	▲	▲	▲	▲	▲	▲	▲
300V	▲	▲		•	▲	▲	▲	▲		■	▲	▲

• Standard factory supply **▲ Factory-fitted on request** **■ Option delivered in a separate kit for standard equipment**

OPERATING RANGE (AT FULL LOAD)

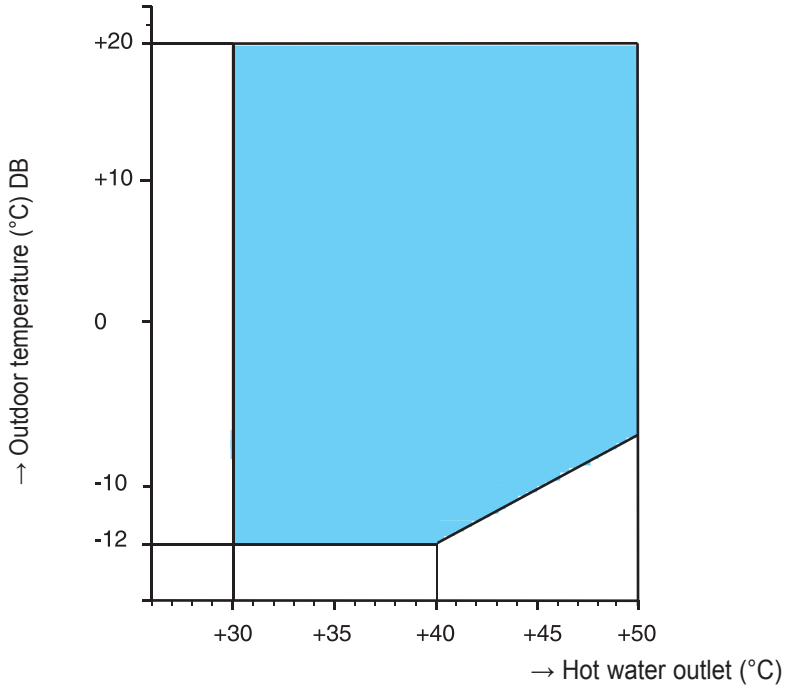
ILDC - ILDH

Operation in COOLING mode



Operation with variable fan speed control option

Operation in thermodynamic HEATING mode
(Heat pump only, without the gas boiler)



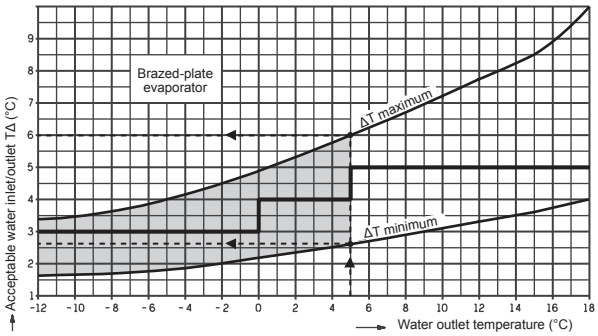
Note
In HEATING operating mode with the GAS boiler module, the hot water return temperature on the heat pump must not exceed +60°C.

EVAPORATOR LIMITS

The curves show the minimum and maximum allowable temperature differences for chilled water or glycol/water solution based on the outlet temperature.

Example:

For a water outlet temperature of +5°C
Minimum difference: 2.6°C Water temperature: 7.6/5°C
Maximum difference: 6°C Water temperature: 11/5°C
If the temperature difference calculated is outside the two curves, contact us.



CORRECTION COEFFICIENTS FOR ETHYLENE GLYCOL

- 30% concentration by weight of glycol (MEG)
- Solution freezing point: - 17.5°C.

K: correction factors, values read in the instructions
Cc: cooling capacity based on selection tables
Pi: compressor power input based on selection tables
ΔP: water pressure drop based on the curves, for the corresponding corrected flow rate (Qc)
Values corrected using the above calculations:
Ccc: corrected cooling capacity
Qc: corrected flow rate (chilled water or hot water)
ΔHc: corrected water pressure drop, evaporator or condenser

CORRECTION		POSITIVE TEMP.		NEGATIVE TEMP.	
		k	calculation method	k	calculation method
Evaporator	cooling capacity	**0,98**	Ccc = Cc x 0.98	**1,00**	see selection table
	chilled water flow rate	**1,05**	$Qc = \frac{Ccc \times 0.66}{\Delta T} \times 1.05$	**1,10**	$Qc = \frac{Ccc \times 0.66}{\Delta T} \times 1.05$
	water pressure drop	**1,15**	ΔHc = ΔP x 1.15	**1,30**	ΔHc = ΔP x 1.30
	average temperature conditions	**12 / 7°C**		**see operating limits**	
Condenser	cooling capacity	0,97	Ccc = Cc x 0.97		
	hot water flow rate	**1,05**	$Qc = \frac{(Ccc + Pi) \times 0.86}{\Delta T} \times 1.06$		
	water pressure drop	**1,10**	ΔHc = ΔP x 1.10		
	average temperature conditions	**35/40°C**			
Evaporator + condenser	Cooling capacity	**0,95**	Ccc = Cc x 0.95	**0,97**	Ccc = Cc x 0.97
	chilled water flow rate	**1.05**	$Qc = \frac{Ccc \times 0.86}{\Delta T} \times 1.05$	**1,10**	$Qc = \frac{Ccc \times 0,86}{\Delta T} \times 1.10$
	Water pressure drop in the evaporator	**1.15**	ΔHc = ΔP x 1.15	**1,30**	ΔHc = ΔP x 1.30
	Hot water flow rate	**1,05**	$Qc = \frac{(Ccc + Pi) \times 0.86}{\Delta T} \times 1.05$	**1,05**	$Qc = \frac{(Ccc + Pi) \times 0.86}{\Delta T} \times 1.05$
	Water pressure drop in the condenser	**1,10**	ΔHc = ΔP x 1.10	**1,10**	ΔHc = ΔP x 1.10

% Volume concentration of ethylene glycol	Multiplier correction factor		
	Cooling capacity	Water flow rate	Pressure drop
10	0.99	1.05	1.05
20	0.985	1.10	1.10
30	0.98	1.15	1.15
40	0.97	1.20	1.23

■ Glycol concentration required

Volume concentration in %		0	10	20	30	40
Ethylene glycol	Freezing point °C	0	-4	-10	-18	-27
	Minimum water outlet °C	5	3	-1	-7	-14
Propylene glycol	Freezing point °C	0	-4	-9	-16	-25
	Minimum water outlet °C	5	4	1	-4	-9

MINIMUM WATER VOLUME

The Connect2 controller uses anticipation logic making it particularly flexible in adjusting operation to changes in settings, particularly on low-volume hydraulic systems.
Adjusting compressor running times prevents short-cycle protection cycles from starting and, in most cases, eliminates the need for a buffer tank.
The calculation of the minimum water volume is given for EUROVENT rated conditions, in cooling mode only.

AQUACIAT2HYBRID	180V	200V	240V	300V
Min. system capacity (litres)	131	149	173	209

This value is applicable for most air conditioning applications (unit with fan coil units)
Note:
For installations running with a low volume of water (assembly with air handling unit) or for industrial processes, the buffer tank is a required component.
For heat pump applications, we recommend the use of a buffer tank to ensure a stable temperature is maintained during the defrosting cycles.

SOUND LEVELS

The distinguishing feature of the AQUACIAT2HYBRID range is its rigorous design incorporating "noiseless" assembly techniques to reduce vibrations and sources of noise:
- Scroll compressor fitted outside of the air stream
- Compressor(s) installed on anti-vibration mounts
- Pipes uncoupled from unit structure
- Low-speed fan(s)
- Automatic air flow adjustment
- Anti-vibration mounts underneath the units, supplied as standard

HIGH-PERFORMANCE (HP) version

Sound power levels ref 2x10-12 Pa ±3 dB (Lw)

AQUACIAT2HYBRID	Power level spectra (dB)							Overall level dB(A)
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
180V	83	83	78	77	70	66	63	81
200V	83	82	80	79	72	66	62	83
240V	88	88	81	82	76	70	65	86
300V	84	90	85	85	79	72	66	89

Sound pressure levels ref 2x10-5 Pa ±3 dB (Lp)

Measurement conditions: free field, 10 metres from machine, 1.50 metres above floor level, directivity 2

AQUACIAT2HYBRID	Pressure level spectra (dB)							Overall level dB(A)
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
180V	51	51	46	45	38	34	31	49
200V	51	50	48	47	40	34	30	51
240V	56	56	49	50	44	38	33	54
300V	52	58	53	53	47	40	34	57

LOW NOISE (LN) version

Sound power levels ref 2x10-12 Pa ±3 dB (Lw)

AQUACIAT2HYBRID	Power level spectra (dB)							Overall level dB (A)
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
180V	82	82	76	73	66	64	62	79
200V	81	79	77	73	67	65	62	78
240V	87	87	77	75	68	65	63	82
300V	82	87	80	78	72	64	58	83

Sound pressure levels ref 2x10-5 Pa ±3 dB (Lp)

Measurement conditions: free field, 10 metres from machine, 1.50 metres above floor level, directivity 2

AQUACIAT2HYBRID	Pressure level spectra (dB)							Overall level dB(A)
	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	
180V	50	50	44	41	34	32	30	47
200V	49	47	45	41	35	33	30	46
240V	55	55	45	43	36	33	31	50
300V	50	55	48	46	40	32	26	51

Note: Sound pressure levels depend on the installation conditions of each system. As such, the levels listed above are given for information only. We remind you that only sound power levels are comparable and certified in accordance with ISO 3744.

MANAGING THE GAS BOILER

In HEATING mode, two usage profiles are possible to govern the operating priority between the heat pump and the gas boiler:

- Either according to a primary energy performance criterion based on a minimum COP for the heat pump.
- Or according to an economic criterion based on the ratio between the cost of electricity and the cost of gas.

Operation based on primary energy

The principle relies on determining the outdoor temperature at which the heat pump's minimum COP value will be obtained (2.58 for France), based on the required hot water outlet temperature.

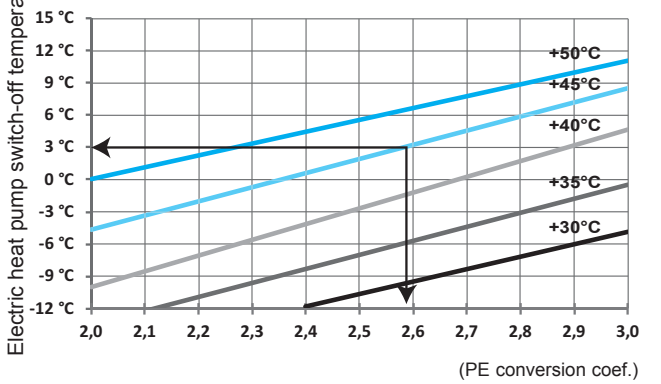
Below this temperature, the boiler will be switched on and the heat pump stopped.

Applied to electricity, this conversion coefficient means that in France, 2.58 kWh of primary energy are required to supply 1 kWh of electrical energy, with natural gas having a value of 1.00.
Therefore:1 kWh of electricity = 2.58 kWh of primary energy (gas)

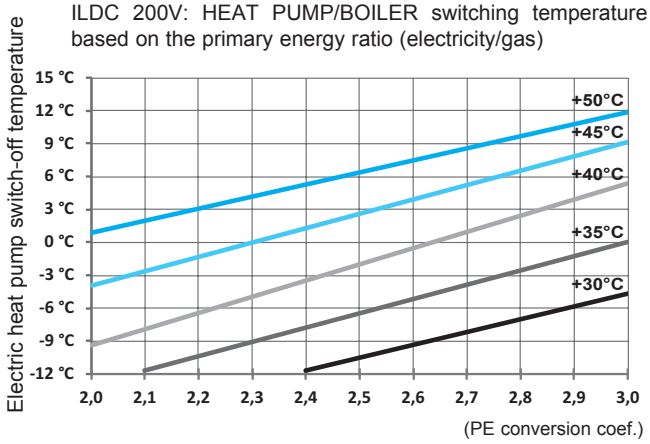
Determining the outdoor temperature for activating the boiler (primary energy)

In the example below, for a hot water production temperature setpoint of +45°C, the gas boiler will be activated in France at an outdoor temperature of approximately 3°C with a coefficient of 2.58.

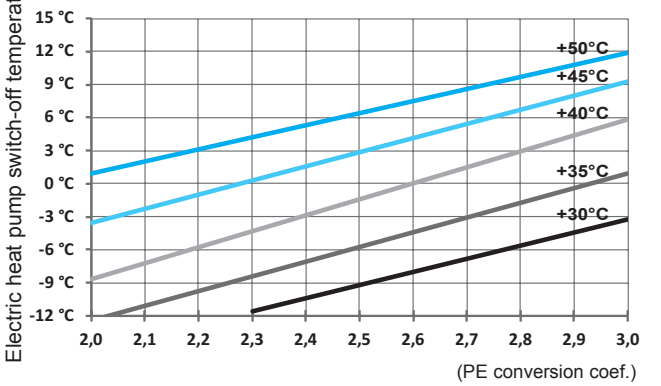
ILDC 180V: HEAT PUMP/BOILER switching temperature based on the primary energy ratio (electricity/gas)



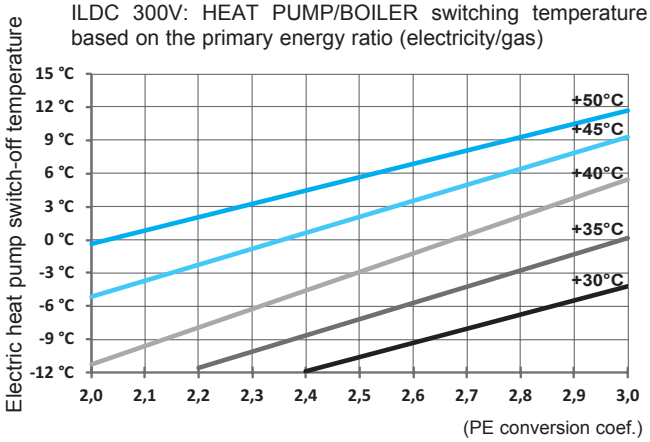
ILDC 200V: HEAT PUMP/BOILER switching temperature based on the primary energy ratio (electricity/gas)



ILDC 240V: HEAT PUMP/BOILER switching temperature based on the primary energy ratio (electricity/gas)



ILDC 300V: HEAT PUMP/BOILER switching temperature based on the primary energy ratio (electricity/gas)



Operation based on energy costs

This involves determining the outdoor temperature at which a COP value for the heat pump corresponding to the equilibrium point between electricity and gas will be reached, in terms of energy consumption level costs.

$$\text{COP equilibrium} = \frac{\text{Price of kWh of electricity x Boiler output}}{\text{Price of kWh of gas}}$$

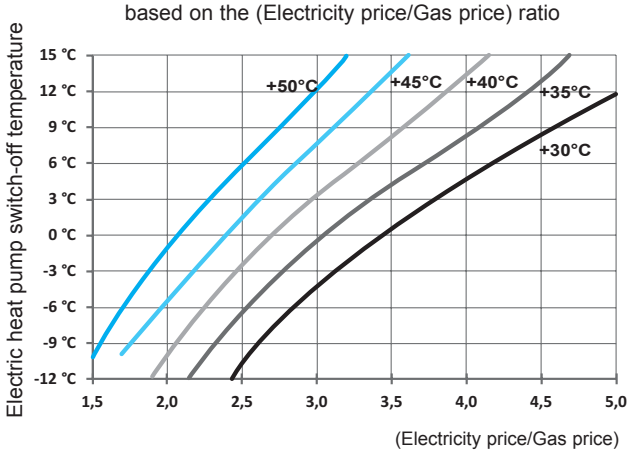
This coefficient of performance depends on the required hot water temperature setpoint for a given outdoor temperature and corresponds to the ratio between the cost of a kWh of electricity and of a kWh of gas.

Below this COP equilibrium value, the gas boiler will be switched on and the heat pump stopped. Above this value, the operating priority will be given to the heat pump, as the cost of its electricity consumption will be less than that of gas.

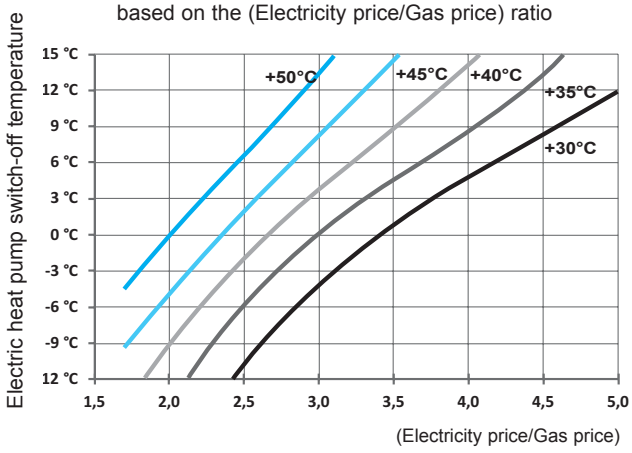
Determining the outdoor temperature for activating the boiler (energy cost)

In the example below, for a hot water production temperature setpoint of +45°C, and a price for electricity which is 2.5 times the price of natural gas, the gas boiler will be activated at an outdoor temperature of approximately +3°C.

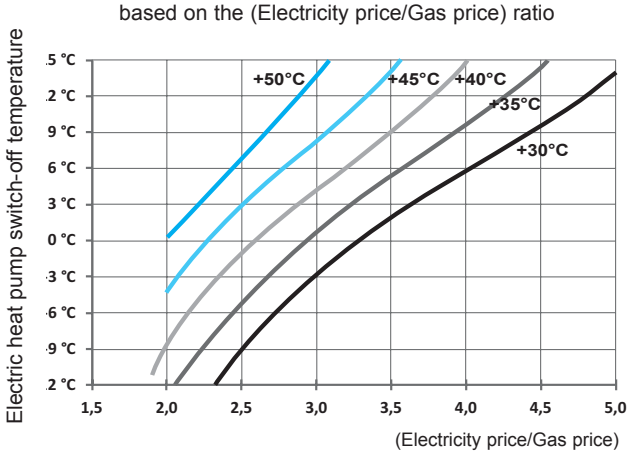
ILDC 180V: HEAT PUMP/BOILER switching temperature based on the (Electricity price/Gas price) ratio



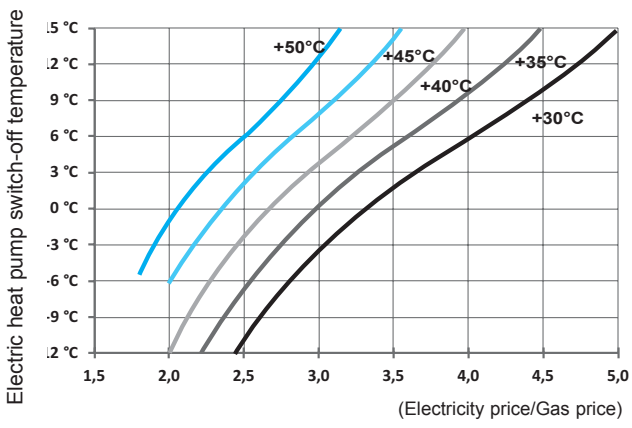
ILDC 200V: HEAT PUMP/BOILER switching temperature based on the (Electricity price/Gas price) ratio



ILDC 240V: HEAT PUMP/BOILER switching temperature based on the (Electricity price/Gas price) ratio



ILDC 300V: HEAT PUMP/BOILER switching temperature based on the (Electricity price/Gas price) ratio



COOLING CAPACITIES

REVERSIBLE units

R410A HIGH PERFORMANCE

ILDC - ILDH		Evaporator water outlet temperature °C		CONDENSER AIR INLET TEMPERATURE (°C)									
				25		30		35		40		46	
				Cc kW	Pi kW	Cc kW	Pi kW	Cc kW	Pi kW	Cc kW	Pi kW	Cc kW	Pi kW
180V		Glycol/ water mix	-10	27,7	11,2	25,9	12,5	23,9	13,9	21,5	15,7		
			-8	30,1	11,3	28,3	12,5	26,3	14	23,9	15,6		
			-4	35,2	11,5	33,3	12,7	31,1	14,1	28,8	15,7	25,5	17,9
			0	40,6	11,8	38,5	13	36,3	14,4	33,7	15,9	30,5	18,1
		Pure water	+5	49,2	12,3	46,7	13,5	44	14,9	41,3	16,4	37,7	18,5
			+7	52,6	12,5	50	13,8	47,1	15,2	44,3	16,7	40,6	18,8
			+12	61,1	13,2	57,9	14,5	54,8	15,8	51,6	17,3	47,6	19,4
			+15	66,4	13,7	63,1	15	59,6	16,3	56,2	17,8	52	19,8
			+18	71,7	14,3	68,3	15,6	64,4	16,9	60,8	18,4	56,4	20,2
200V		Glycol/ water mix	-10	31,9	13,1	29,8	14,6	27,5	16,3				
			-8	34,7	13,3	32,4	14,8	30	16,4	27,5	18,3		
			-4	40,5	13,7	38	15,2	35,4	16,8	32,7	18,7	29	21,1
			0	46,6	14,1	43,9	15,6	41	17,3	38,1	19,1	34,4	21,6
		Pure water	+5	56	14,8	52,8	16,3	49,5	18,1	46,4	19,9	42,1	22,2
			+7	60,3	15,1	57	16,6	53,5	18,3	49,9	20,2	45,5	22,5
			+12	69,9	15,9	66,1	17,5	62,2	19,1	58,2	21	53,3	23,3
			+15	75,9	16,5	71,9	18	67,8	19,7	63,4	21,5	58,1	23,9
			+18	81,9	17,2	77,7	18,6	73,4	20,4	68,6	22,1	62,9	24,6
240V		Glycol/ water mix	-10	36,1	15,7	33,7	17,3	31,1	19,1	28	21,2		
			-8	39,4	15,8	36,8	17,4	34,1	19,2	31,2	21,3		
			-4	46,2	16	43,5	17,6	40,5	19,4	37,5	21,5	33,3	24,2
			0	53,6	16,4	50,6	18	47,3	19,8	43,9	21,8	39,6	24,5
		Pure water	+5	64,9	17	61,3	18,6	57,7	20,4	53,7	22,4	48,8	25
			+7	69,6	17,3	65,8	18,9	61,9	20,7	57,7	22,7	52,6	25,3
			+12	80,8	18,1	76,6	19,7	72,2	21,5	67,6	23,4	61,9	26
			+15	88,1	18,6	83,6	20,2	78,8	21,9	73,8	23,9	67,8	26,4
			+18	95,4	19,2	90,6	20,8	85,4	22,3	80	24,5	73,7	26,8
300V		Glycol/ water mix	-10	45,4	19,7	43	21,6	40,4	23,5	37,3	25,7		
			-8	49,2	20	46,6	21,9	43,9	23,9	40,8	26,1		
			-4	57	20,7	54,2	22,7	51	24,8	47,7	27,1	43,2	30
			0	65,6	21,4	62,3	23,5	58,8	25,7	55	28,1	50,3	31,1
		Pure water	+5	78,8	22,5	74,9	24,7	70,7	27,1	66,3	29,6	61	32,6
			+7	84,5	23,1	80,1	25,2	75,6	27,6	71	30,1	65,4	33,2
			+12	97,6	24,2	92,6	26,5	87,5	28,9	82,3	31,4	76,2	34,6
			+15	106	25,1	100,6	27,3	95	29,7	89,4	32,3	83,2	35,5
			+18	114,4	26,1	108,6	28,2	102,5	30,6	96,5	33,3	90,2	36,5

Cc: Acceptable gross cooling capacity for temperature difference, based on operating limits
Pi: Gross power input

Glycol/water mix mandatory
Calculated fouling 0.00005 m² °C/W

Standard air conditioning conditions

COOLING CAPACITIES

REVERSIBLE units

R410A

LOW NOISE

ILDC - ILDH		Evaporator water outlet temperature °C		CONDENSER AIR INLET TEMPERATURE (°C)									
				25		30		35		40		46	
				Cc kW	Pi kW	Cc kW	Pi kW	Cc kW	Pi kW	Cc kW	Pi kW	Cc kW	Pi kW
180V		Glycol/ water mix	-10	27,1	11,2	25,4	12,4	23,4	13,9	21,1	15,5		
			-8	29,3	11,4	27,6	12,6	25,6	14,0	23,3	15,6		
			-4	34,1	11,7	32,2	13,0	30,0	14,4	27,7	16,0	24,6	18,2
			0	39,2	12,1	37,1	13,4	34,8	14,8	32,3	16,4	29,1	18,6
		Pure water	+5	47,1	12,9	44,6	14,2	42,0	15,6	39,3	17,2	35,9	19,2
			+7	50,2	13,2	47,6	14,5	44,9	15,9	42,0	17,5	38,6	19,5
			+12	57,9	14,1	54,9	15,4	51,8	16,8	48,7	18,3	45,0	20,3
			+15	62,7	14,6	59,4	16,0	56,2	17,4	53,0	18,9	49,1	20,9
200V		Glycol/ water mix	-10	30,8	13,4	28,7	14,9	26,5	16,6	24,0	18,3		
			-8	33,4	13,6	31,2	15,1	29,0	16,8	26,5	18,6		
			-4	38,8	14,2	36,4	15,7	33,9	17,4	31,3	19,2		
			0	44,6	14,8	41,9	16,4	39,1	18,1	36,2	19,9	32,6	22,3
		Pure water	+5	53,4	15,8	50,2	17,4	47,0	19,1	43,7	21,0	39,8	23,3
			+7	56,9	16,2	53,6	17,8	50,2	19,6	46,8	21,4	42,7	23,7
			+12	65,5	17,3	61,7	18,9	58,0	20,6	54,2	22,4	48,8	24,3
			+15	70,8	18,0	66,9	19,6	62,9	21,3	58,9	23,1	52,7	24,8
240V		Glycol/ water mix	-10	35,7	15,4	33,2	17,0	30,7	18,8	27,8	20,8		
			-8	38,7	15,6	36,2	17,2	33,6	19,0	30,8	21,0		
			-4	45,3	16,0	42,6	17,6	39,7	19,4	36,7	21,4	32,6	24,1
			0	52,3	16,4	49,3	18,1	46,0	19,9	42,8	21,9	38,5	24,6
		Pure water	+5	63,1	17,2	59,5	18,9	55,8	20,7	52,0	22,7	47,3	25,3
			+7	67,5	17,6	63,8	19,2	59,9	21,1	55,8	23,0	50,9	25,6
			+12	78,1	18,5	73,9	20,1	69,5	21,9	64,9	23,9	59,6	26,4
			+15	84,9	19,1	80,4	20,7	75,7	22,5	70,9	24,5	65,1	27,0
300V		Glycol/ water mix	-10	44,6	19,9	42,2	21,7	39,6	23,7	36,4	25,8		
			-8	48,1	20,3	45,5	22,2	42,8	24,2	39,7	26,4		
			-4	55,5	21,2	52,6	23,2	49,6	25,4	46,2	27,6	41,9	30,4
			0	63,6	22,1	60,3	24,3	56,8	26,5	53,2	28,8	48,5	31,7
		Pure water	+5	76,3	23,4	72,3	25,7	68,2	28,0	63,9	30,5	58,8	33,4
			+7	81,4	24,0	77,1	26,3	72,8	28,7	68,2	31,1	63,0	34,1
			+12	93,7	25,5	88,8	27,8	83,7	30,2	78,8	32,7	72,8	35,1
			+15	101,5	26,5	96,1	28,8	90,8	31,2	85,6	33,7	79,6	35,9

Cc: Acceptable gross cooling capacity for temperature difference, based on operating limits
Pi: Gross power input

Glycol/water mix mandatory
Calculated fouling 0.00005 m² °C/W

Standard air conditioning conditions

HEATING CAPACITIES

REVERSIBLE units

R410A HIGH PERFORMANCE

ILDC - ILDH		Outdoor air temperature °C DB (1)		CONDENSER AIR INLET TEMPERATURE (°C)									
				30		35		40		45		50	
				Cc kW	Pi kW	Cc kW	Pi kW	Cc kW	Pi kW	Cc kW	Pi kW	Cc kW	Pi kW
	180V	Pure water	-12	30,7	11,1	30,4	12,4	30,1	13,9				
			-10	32,8	11,1	32,5	12,4	32,0	13,9	31,3	15,7	30,5	17,6
			-5	37,6	11,1	37,2	12,4	36,7	13,9	36,1	15,6	35,4	17,5
			0	42,9	11,2	42,4	12,4	41,8	13,8	41,2	15,5	40,4	17,4
			+5	48,6	11,2	47,9	12,4	47,1	13,8	46,3	15,4	45,4	17,3
			+7	50,7	11,2	50,2	12,4	49,3	13,8	48,4	15,4	47,5	17,3
			+10	54,8	11,3	54,0	12,5	52,8	13,8	51,9	15,4	50,8	17,2
			+15	61,5	11,4	60,3	12,6	59,0	13,9	57,7	15,5	56,4	17,2
			+20	68,4	11,5	66,9	12,7	65,3	14,1	63,8	15,6	62,1	17,3
	200V	Pure water	-12	34,8	12,7	34,3	14,3	33,9	16,0				
			-10	37,3	12,7	36,9	14,3	36,1	16,0	35,7	18,0		
			-5	42,8	12,7	42,3	14,3	41,8	16,0	40,8	17,9	39,8	20,1
			0	48,8	12,7	48,2	14,3	47,5	16,0	46,5	17,9	44,8	20,1
			+5	55,2	12,8	54,4	14,3	53,5	16,0	52,5	17,9	51,6	20,1
			+7	57,9	12,8	56,9	14,3	55,9	16,0	54,9	17,9	53,9	20,1
			+10	62,1	12,8	61,0	14,3	60,0	16,0	58,8	17,9	57,5	20,1
			+15	69,5	12,9	68,3	14,4	66,9	16,0	65,4	17,9	63,9	20,0
			+20	77,3	13,1	75,7	14,5	74,1	16,1	72,3	17,9	70,4	20,0
	240V	Pure water	-12	41,1	15,6	40,7	17,2						
			-10	43,5	15,6	43,3	17,2	42,7	19,0				
			-5	50,3	15,6	49,5	17,2	48,7	19,0	48,0	21,0		
			0	57,3	15,5	56,4	17,1	55,4	18,9	54,4	21,0	53,4	23,4
			+5	64,7	15,5	63,5	17,1	62,3	18,9	60,9	20,9	59,6	23,3
			+7	67,9	15,5	66,5	17,1	65,2	18,9	63,7	20,9	62,3	23,3
			+10	72,9	15,5	71,4	17,1	69,8	18,9	68,2	20,9	66,5	23,2
			+15	81,4	15,6	79,7	17,2	77,9	18,9	75,9	20,9	73,8	23,2
			+20	90,1	15,8	88,3	17,3	86,0	19,0	83,7	20,9	81,2	23,1
	300V	Pure water	-12	52,5	18,8	52,0	20,5	51,4	22,5				
			-10	55,7	18,9	55,3	20,7	54,1	22,6				
			-5	63,6	19,2	63,1	21,1	62,4	23,2	60,3	25,4	58,0	27,9
			0	72,2	19,4	71,5	21,3	70,7	23,5	69,3	25,9	66,5	28,4
			+5	81,2	19,5	80,4	21,5	79,2	23,8	78,0	26,2	76,6	29,0
			+7	85,2	19,6	83,9	21,6	82,8	23,9	81,4	26,3	79,9	29,1
			+10	91,0	19,6	89,7	21,7	88,4	24,0	87,1	26,5	85,3	29,2
			+15	101,8	19,8	100,2	21,8	98,5	24,1	96,5	26,7	94,4	29,5
			+20	112,7	20,1	110,7	22,0	108,6	24,2	106,1	26,8	103,6	29,6

Cc: Acceptable gross cooling capacity for temperature difference, based on operating limits
Pi: Gross power input

(1) Relative humidity variation for calculations:
-20°C 95% RH / +7°C 85% RH / +27°C 50% RH

Standard air conditioning conditions Calculated fouling 0.00005 m² °C/W

Standard underfloor heating system conditions

HEATING CAPACITIES

REVERSIBLE units

R410A — LOW NOISE mode

ILDC - ILDH		Outdoor air temperature °C DB (1)		CONDENSER AIR INLET TEMPERATURE (°C)									
				30		35		40		45		50	
				Hc kW	Pi kW	Hc kW	Pi kW	Hc kW	Pi kW	Hc kW	Pi kW	Hc kW	Pi kW
	180V	Pure water	-12	29,3	10,7	29,0	12,0						
			-10	30,7	10,7	30,4	12,0	30,2	13,4				
			-5	34,6	10,7	34,4	12,0	34,0	13,4	33,8	15,1		
			0	38,9	10,7	38,5	12,0	38,2	13,4	37,7	15,1	37,4	16,8
			+5	46,0	10,7	45,5	12,0	44,9	13,4	44,3	15,0	43,7	16,8
			+7	48,4	10,8	47,7	12,0	47,1	13,4	46,3	15,0	45,7	16,8
			+10	51,7	10,8	51,0	12,0	50,3	13,4	49,5	15,0	48,8	16,8
			+15	58,0	10,9	57,1	12,1	56,2	13,4	55,1	15,0	54,1	16,9
			+20	64,5	11,0	63,3	12,2	62,1	13,5	60,8	15,1	59,6	16,9
	200V	Pure water	0	32,9	12,3	32,8	13,9	32,6	15,6				
			-10	35,5	12,3	35,2	13,8	35,0	15,6	34,6	17,6		
			-5	40,4	12,3	40,1	13,8	39,9	15,6	39,6	17,6		
			0	46,1	12,3	45,6	13,8	45,2	15,5	44,8	17,5	44,3	19,7
			+5	52,0	12,3	51,4	13,8	50,8	15,5	50,1	17,5	49,5	19,7
			+7	54,5	12,4	53,8	13,8	53,1	15,5	52,4	17,5	51,6	19,7
			+10	58,4	12,4	57,6	13,9	56,7	15,6	55,8	17,5	55,0	19,7
			+15	65,2	12,4	64,3	13,9	63,3	15,6	62,1	17,5	61,0	19,6
			+20	72,4	12,5	71,2	14,0	69,9	15,6	68,6	17,5	67,1	19,6
	240V	Pure water	-12	40,0	15,0	39,7	16,7						
			-10	42,8	15,0	42,3	16,7	41,8	18,6				
			-5	48,9	15,0	48,3	16,7	47,7	18,5	47,0	20,6		
			0	55,8	15,0	55,0	16,6	54,1	18,5	53,2	20,6	52,3	22,9
			+5	62,9	15,0	61,8	16,6	60,8	18,4	59,6	20,5	58,5	22,8
			+7	65,9	15,1	64,7	16,6	63,5	18,4	62,3	20,5	61,0	22,8
			+10	70,6	15,1	69,3	16,6	68,0	18,4	66,6	20,5	65,1	22,8
			+15	78,9	15,2	77,6	16,7	75,8	18,5	74,1	20,5	72,2	22,7
			+20	87,5	15,3	85,7	16,8	83,8	18,5	81,7	20,5	79,4	22,7
	300V	Pure water	-12	50,4	18,2	49,9	19,8	49,2	21,9				
			-10	53,9	18,4	53,6	20,1	53,1	22,1				
			-5	61,4	18,6	61,1	20,5	60,5	22,5	59,8	24,8	58,6	27,4
			0	69,6	18,8	69,1	20,8	68,5	23,0	67,7	25,3	66,7	27,9
			+5	78,3	18,9	77,5	21,0	76,8	23,2	75,7	25,7	74,6	28,3
			+7	82,0	19,0	81,1	21,0	80,1	23,3	79,1	25,8	77,8	28,4
			+10	87,6	19,1	86,5	21,1	85,5	23,4	84,2	25,9	82,8	28,7
			+15	97,7	19,2	96,5	21,3	95,1	23,5	93,4	26,1	91,7	28,9
			+20	108,3	19,5	106,6	21,4	104,9	23,7	102,7	26,3	100,5	29,1

Cc: Acceptable gross cooling capacity for temperature difference, based on operating limits
Pi: Gross power input

(1) Relative humidity variation for calculations:
-20°C 95% RH / +7°C 85% RH / +27°C 50% RH

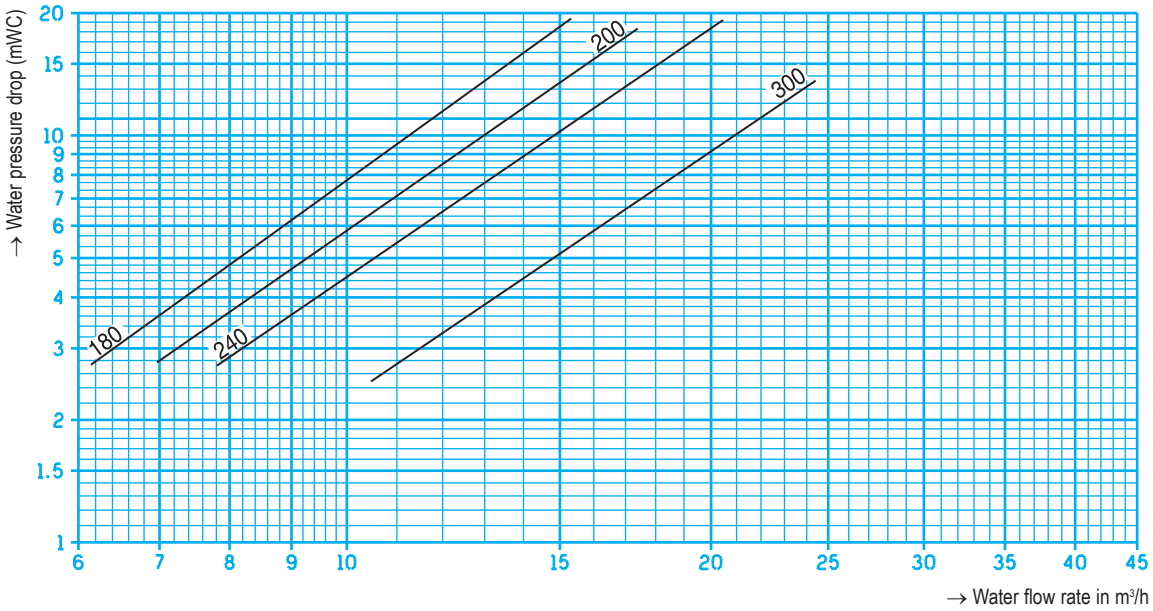
Standard air conditioning conditions Calculated fouling 0.00005 m² °C/W

Standard underfloor heating system conditions

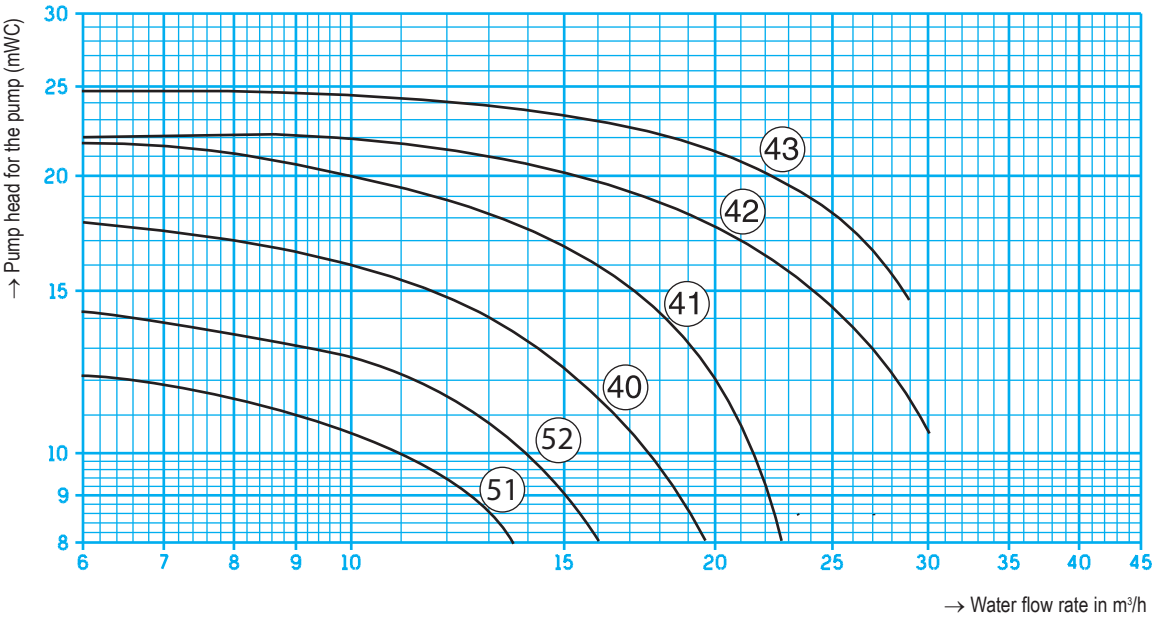
EXCHANGER PRESSURE DROPS

ILDC-ILDH

■ Evaporator and hydraulic circuit (do not extrapolate)



■ Single pumps or 2 single pumps in parallel



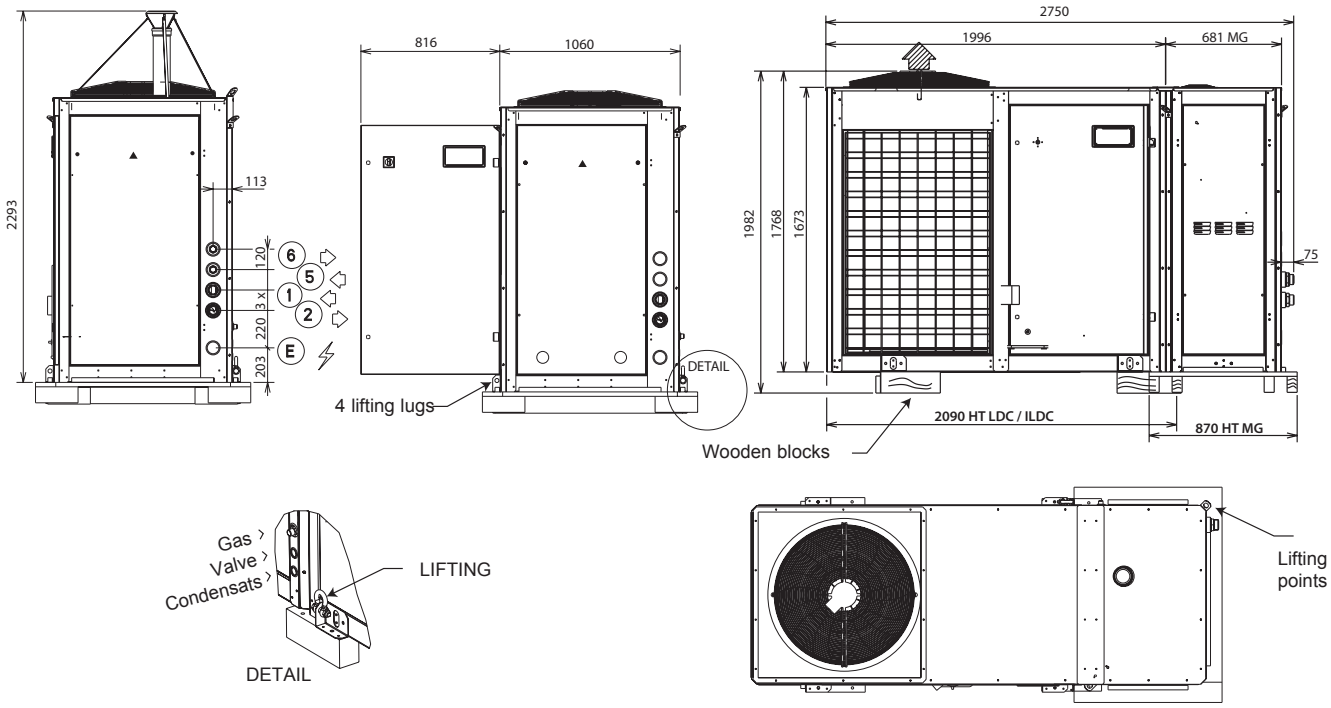
Unit conversion formulae

kPa	= bar x 100
bar	= mWC x 0.0981
kg/cm²	= bar x 1.0197
Pound per square inch (lbf/in2)	= bar x 14.504
Inch (in)	= mm x 0.0394
Foot (ft)	= mm x 0.0032808
Pound (lb)	= kg x 2.205
Cubic feet per minute (cfm)	= m³/h x 0.5885
US gallons	= m³ x 264.2
UK gallons	= m³ x 220

DIMENSIONS

AQUACIAT2HYBRID HYDRAULIC WITH PUMPS

ILDC 180 - 300 models



1. Chilled water or hot water outlet
2. Chilled water or hot water inlet
5. DHW High Temperature primary inlet (option)
6. DHW High Temperature primary outlet (option)

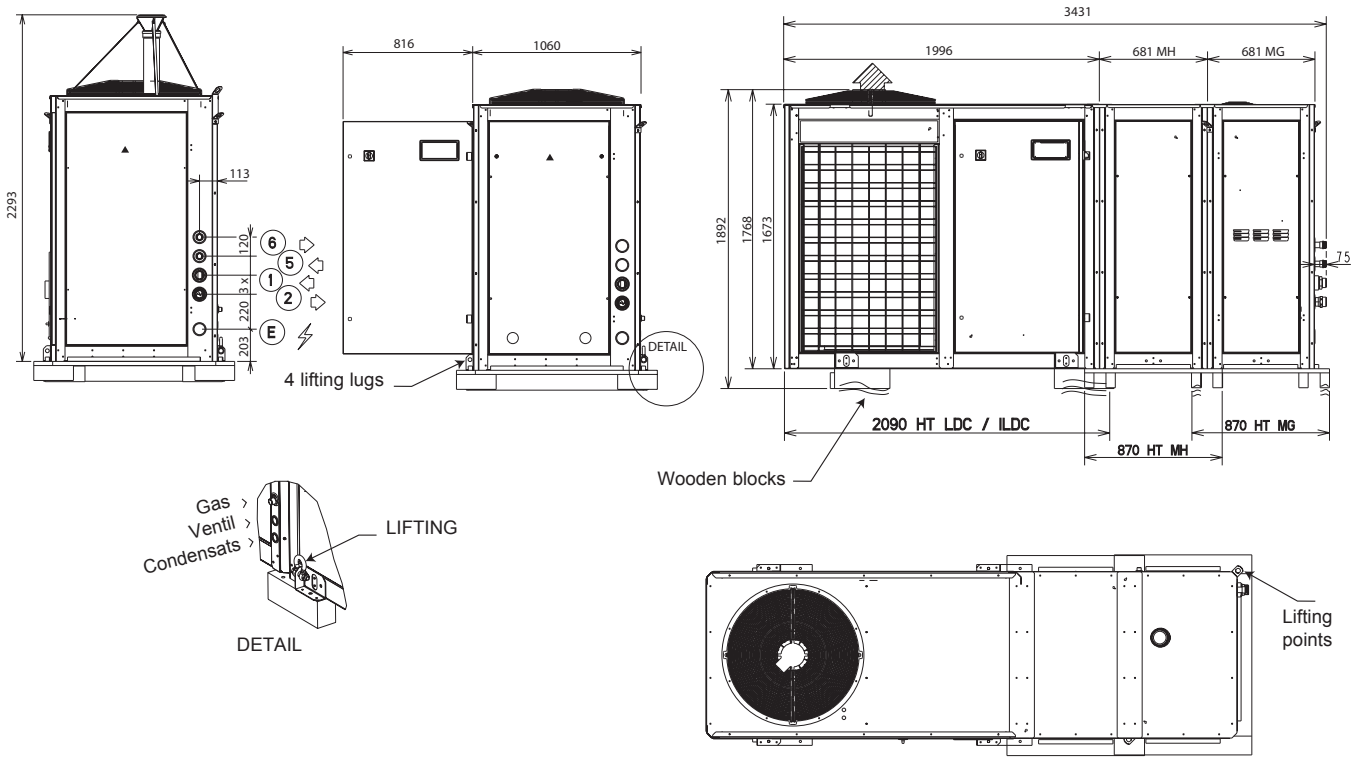
E. Power supply

AQUACIAT2HYBRID	Sizes		180V	180V	180V	200V	200V	240V	240V	300V
	Boiler		MG50	MG65	MG85	MG65	MG85	MG65	MG85	MG85
ILDC + MG	Weight (empty)	kg	868	868	878	871	881	876	886	1019
	Weight (in operation)	kg	879	879	890	882	893	887	898	1031
	Water volume	l	11	11	12	11	12	11	12	12
ILDC only	Weight (empty)	kg	648	648	648	651	651	656	656	789
	Weight (in operation)	kg	652	652	652	655	655	660	660	793
	Water volume	l	4	4	4	4	4	4	4	4
MG GAS module only	Weight (empty)	kg	220	220	230	220	230	220	230	230
	Weight (in operation)	kg	227	227	238	227	238	227	238	238
	Water volume	l	7	7	8	7	8	7	8	8

DIMENSIONS

AQUACIAT2HYBRID HYDRAULIC WITH PUMPS AND BUFFER TANK

ILDH 180 - 300 models



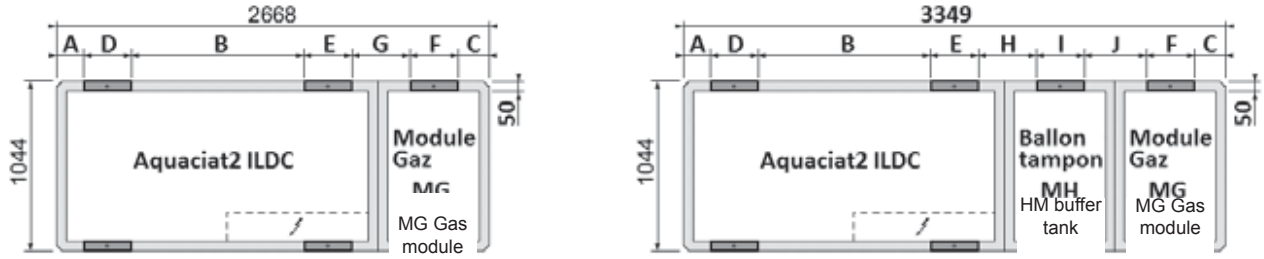
1. Chilled water or hot water outlet
2. Chilled water or hot water inlet
5. DHW High Temperature primary inlet (option)
6. DHW High Temperature primary outlet (option)
E. Power supply

AQUACIAT2HYBRID	Sizes		180V	180V	180V	200V	200V	240V	240V	300V
	Boiler		MG50	MG65	MG85	MG65	MG85	MG65	MG85	MG85
ILDC + MH + MG	Weight (empty)	kg	1065	1065	1075	1068	1078	1073	1083	1216
	Weight (in operation)	kg	1276	1276	1287	1279	1290	1284	1295	1428
	Water volume	l	211	211	212	211	212	211	212	212
ILDC only	Weight (empty)	kg	648	648	648	651	651	656	656	789
	Weight (in operation)	kg	652	652	652	655	655	660	660	793
	Water volume	l	4	4	4	4	4	4	4	4
MH module only	Weight (empty)	kg	197	197	197	197	197	197	197	197
	Weight (in operation)	kg	397	397	397	397	397	397	397	397
	Water volume	l	200	200	200	200	200	200	200	200
MG GAS module only	Weight (empty)	kg	220	220	230	220	230	220	230	230
	Weight (in operation)	kg	227	227	238	227	238	227	238	238
	Water volume	l	7	7	8	7	8	7	8	8

POSITIONING MACHINES ON THE GROUND

The units are equipped as standard with anti-vibration mounts supplied in strips and designed to be positioned under the frame as shown in the diagram below.
This type of strip does not allow the frame to be affixed mechanically to the floor.

AQUACIAT2HYBRID ILDC and ILDH

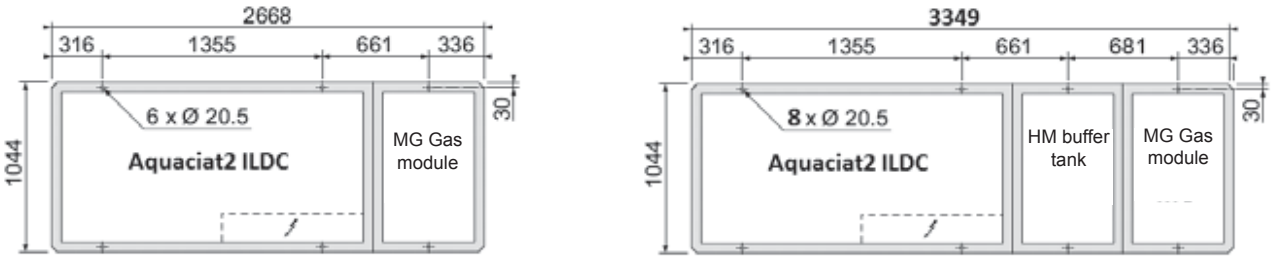


Sizes	A	B	C	D	E	F	G	H	I	J
180V - G50	196	1126	196	P25 50x150	P25 50x200	P25 50x200	600	600	P25 50x200	481
180V - G65	196	1126	196	P25 50x150	P25 50x200	P25 50x200	600	600	P25 50x200	481
180V - G85	196	1126	196	P25 50x150	P25 50x200	P25 50x200	600	600	P25 50x200	481
200V - G65	196	1126	196	P25 50x150	P25 50x200	P25 50x200	600	600	P25 50x200	481
200V - G85	196	1126	196	P25 50x150	P25 50x200	P25 50x200	600	600	P25 50x200	481
240V - G65	196	1126	196	P25 50x150	P25 50x200	P25 50x200	600	600	P25 50x200	481
240V - G85	196	1126	196	P25 50x150	P25 50x200	P25 50x200	600	600	P25 50x200	481
300V - G85	196	1076	196	P25 50x200	P25 50x200	P25 50x200	600	600	P25 50x200	481

GROUND MOUNTING OF FRAMES

The frames can be affixed mechanically to the mounts using bolts (NOT supplied by CIAT).
Six drilled holes for the ILDC and 8 drilled holes for the ILDH, of a diameter of 20.5 mm, are provided for this purpose underneath the frames.
The hardness is defined by the unit's weight distribution and centre of gravity.

AQUACIAT2HYBRID ILDC and ILDH



Note: One metre of free space must be provided around the unit for maintenance operations

ON-SITE INSTALLATION

The AQUACIAT2HYBRID must be positioned outside in a location inaccessible to the public, or which has an enclosure that complies with local regulations relating to the installation of a combustion unit operating in the open air.
Several regulations relating to fire protection and the location of machines must be complied with, depending on the country in which the equipment is installed.
The units must be placed on a floor constructed from M0 class incombustible material with the characteristics of a two-hour fire protection rated component.

In accordance with the local statutory constraints relating to boiler condensate discharge, a neutralisation device may be required (option).

Note: compliance with the local installation rules remains the strict responsibility of the machine installer.

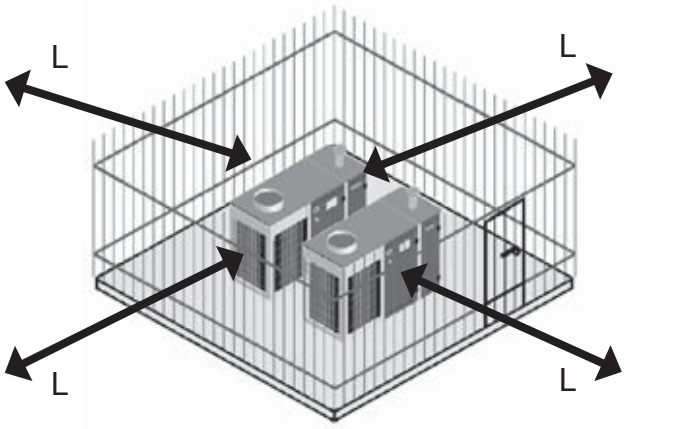
ON-SITE INSTALLATION

Outdoor installation rules (France)

The unit must be installed outdoors, on the ground or on a terrace, on an M0 incombustible base.
Depending on the purpose of the building (Residential, offices, EOP) and the heating capacity or output power, a fire safety distance must be ensured between the unit(s) and the property boundary, a third-party property and the serviced building.

If the min. safety distance (L) is respected:

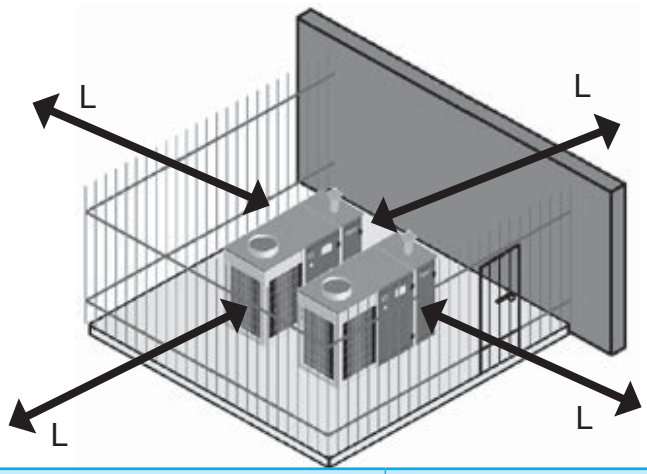
The unit may be installed in a location inaccessible to the public or rendered inaccessible by an enclosure at least 2 metres high.



Residential buildings	Non-EOP residential and office buildings	Establishments open to the public EOP (Group 1)
Statutory instrument CCH AFG 2010-01	Statutory instrument CCH AFG 2006-02	Statutory instrument CH5 or CH6
If heating capacity > 35 kW and ≤ 85 kW Min. distance L= 4 metres	If heating capacity > 35 kW and ≤ 85 kW Min. distance L= 5 metres	If output power > 35 kW and ≤ 70 kW Min. distance L= 5 metres
If heating capacity > 85 kW Min. distance L= 8 metres	If heating capacity > 85 kW Min. distance L= 10 metres	If heating capacity > 70 kW Min. distance L= 10 metres

If a min. safety distance (L) cannot be respected:

If the safety distance cannot be respected, a fire wall may be constructed, the dimensions and technical characteristics of which will depend on the building use.
For EOP buildings, and depending on the proximity of the neighbouring buildings or public thoroughfares, fire resistance specifications will also be applicable to neighbouring façades (comply with the regulations)



Residential buildings	Non-EOP residential and office buildings	Establishments open to the public EOP (Group 1)
Statutory instrument CCH AFG 2010-01	Statutory instrument CCH AFG 2006-02	Statutory instrument CH5 or CH6
If heating capacity > 35 kW and ≤ 85 kW Fire protection rating= 1 hour	If heating capacity > 35 kW and ≤ 85 kW Fire protection rating= 1 hour	If output power > 35 kW and ≤ 70 kW Fire protection rating= 1 hour
If heating capacity > 85 kW Fire protection rating= 2 hours	If heating capacity > 85 kW Fire protection rating= 2 hours	If heating capacity > 70 kW Fire protection rating= 2 hours

Note: the schematic diagrams herein are provided for information only. Under no circumstances do they constitute actual installation diagrams.

ON-SITE INSTALLATION

① Discharge of combustion products

In accordance with the local regulations in force, and to prevent any return of air contaminated by the boiler's combustion emissions, the gas module's chimney outlet must be oriented vertically or facing away from any window, ventilation orifice or air intake for buildings in the vicinity.

The unit must not evacuate its combustion products in a confined place such as a courtyard, a U-shaped building, underneath a canopy, etc.

Depending on the dilution factor for the combustion products, particularly for a value ≤ 100, and based on the total heating capacity of the gas modules, a minimum horizontal distance is required between the axis of the chimney and the closest point, located at the height of an opening window or ventilation orifice in a building or above.

Note : Always comply with local applicable regulations.

② Gas intake pipes

The AQUACIAT2^{HYBRID} gas boiler module is exclusively designed for use with natural gas at a pressure of 20 mbar.

The gas supply must comply fully with applicable local standards and regulations.

The maximum gas inlet pressure is measured under standard machine operating conditions.

A second gas shut-off valve must be provided in the gas module, inside the boiler.

③ Condensate drainage

A drain for the boiler's condensates will be placed at the gas module's outlet, at the edge of the casing.

In accordance with local regulations, it can be drained onto a gravel bed, or connected to the sewer via a drain pipe with frost protection.

④ Hydraulic connections on site

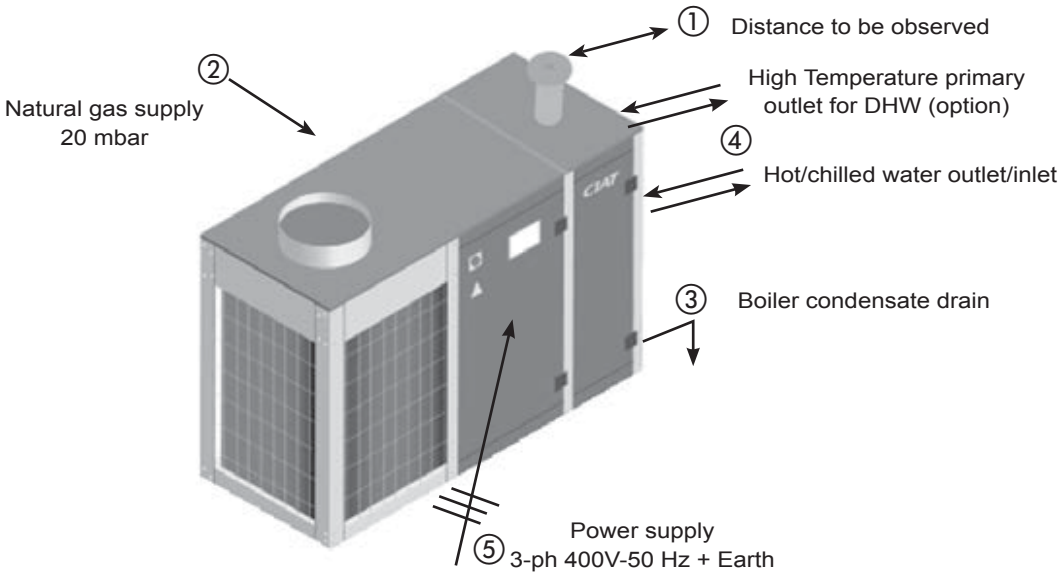
In the standard "2-tube" version, two hot water or chilled water outlet/inlet pipes with thermal insulation must be connected to the unit using flexible connections.

The "4-tube DHW" option requires two further primary high temperature hot water pipes to supply the water-to-water domestic hot water production exchanger

⑤ Electrical connections on site

The wiring for the power supply must be 3-ph 400V-50Hz + Earth and connected on-site to the heat pump terminal.

The wiring for the gas module supply must be 1-ph 230V-50Hz pre-wired on the module, and connected to the AQUACIAT2 terminal.

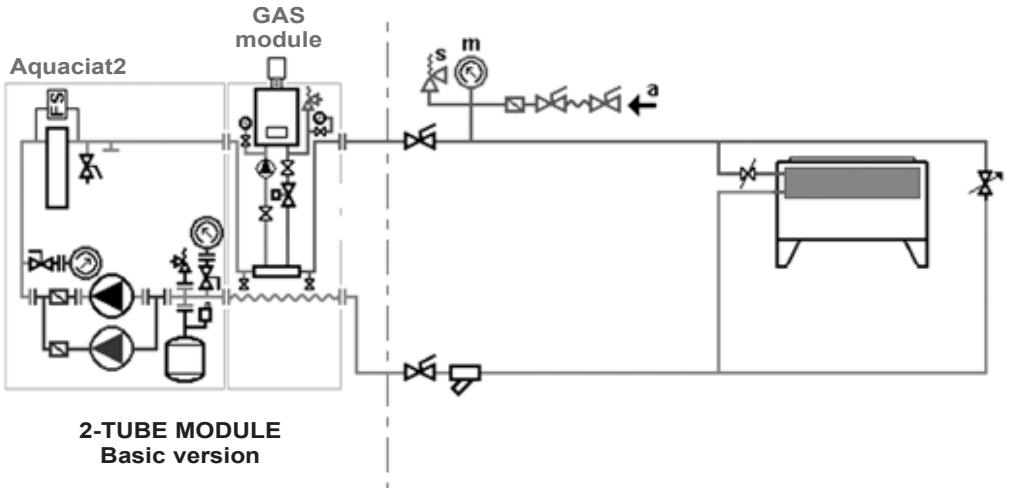


Note: the installation recommendations or regulations are included for information only and under no circumstances engage CIAT's liability.
Compliance with the local installation rules remains the strict responsibility of the machine installer.

EXAMPLES OF HYDRAULIC CONNECTION DIAGRAMS

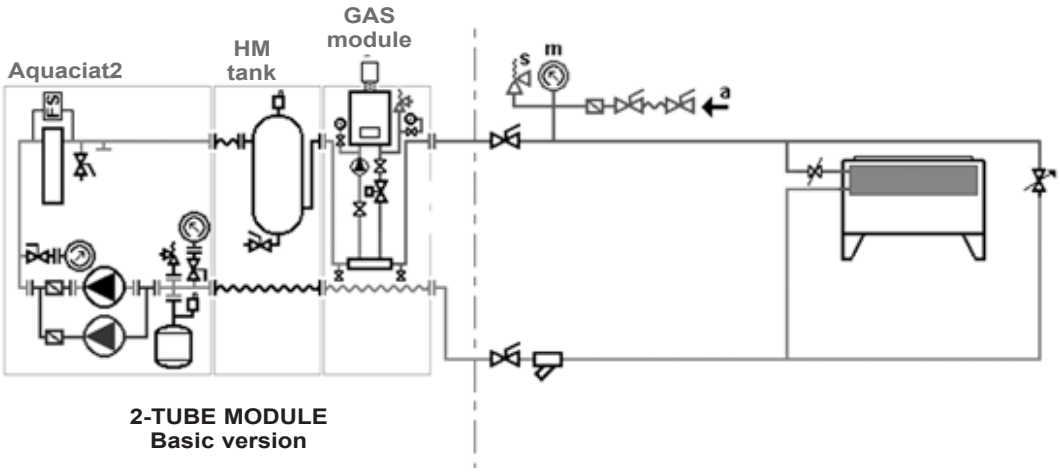
CHILLED WATER - HOT WATER HYDRAULIC CIRCUIT
Standard 2-tube version

ILDC models with pump only



2-TUBE MODULE
Basic version

ILDH models with pump and buffer tank



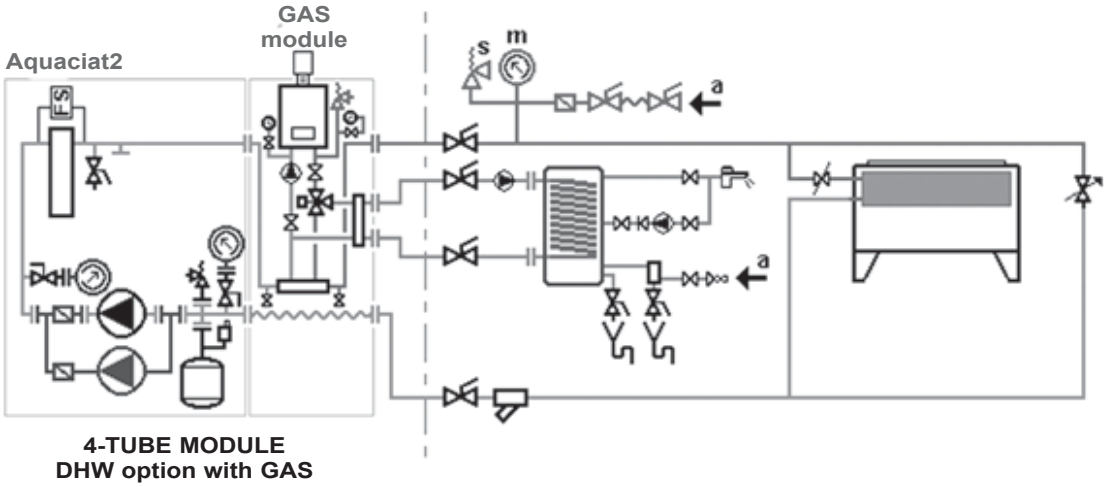
2-TUBE MODULE
Basic version

Note: the schematic diagrams herein are provided for information only. Under no circumstances do they constitute actual installation diagrams

EXAMPLES OF HYDRAULIC CONNECTION DIAGRAMS

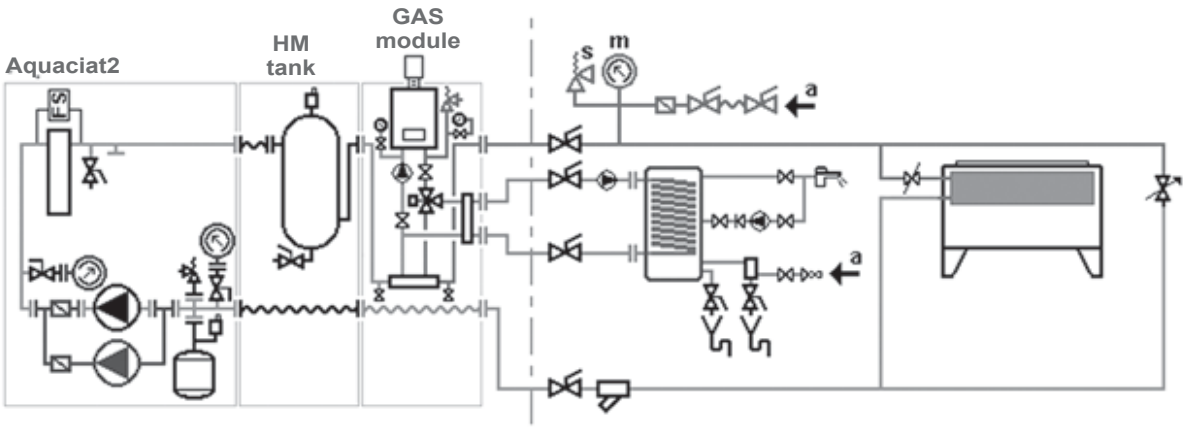
HIGH-TEMPERATURE PRIMARY HYDRAULIC CIRCUIT FOR DHW HEATING
4-tube version (option)

■ **ILDC models with pump only**



4-TUBE MODULE
DHW option with GAS

■ **ILDH models with pump and buffer tank**



4-TUBE MODULE
DHW option with GAS

Note: the schematic diagrams herein are provided for information only. Under no circumstances do they constitute actual installation diagrams

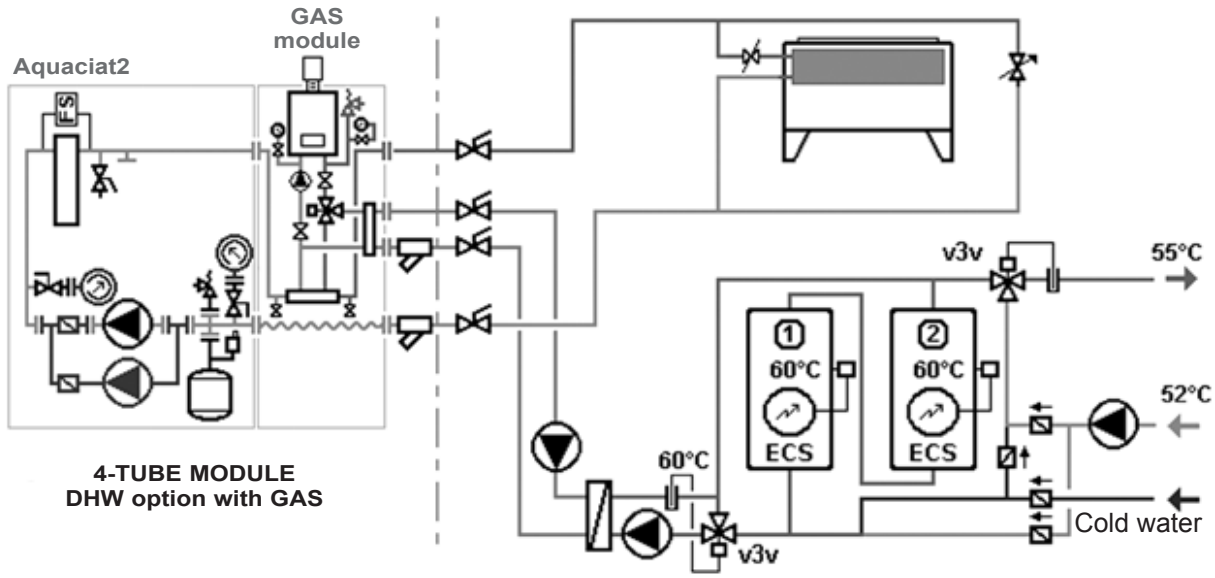
EXAMPLES OF HYDRAULIC CONNECTION DIAGRAMS

HIGH-TEMPERATURE PRIMARY HYDRAULIC CIRCUIT FOR DHW HEATING

Hotel applications

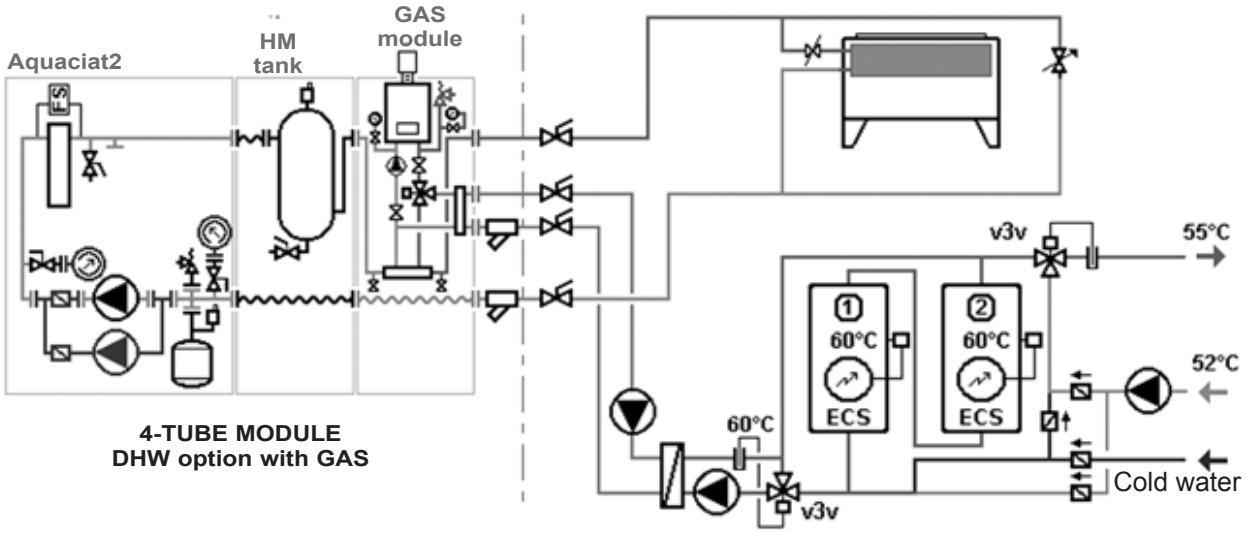
4-tube version (option)

■ **ILDC models with pump only**



4-TUBE MODULE
DHW option with GAS

■ **ILDH models with pump and buffer tank**



4-TUBE MODULE
DHW option with GAS

Note: the schematic diagrams herein are provided for information only. Under no circumstances do they constitute actual installation diagrams

INSTALLATION RECOMMENDATIONS

Water quality criteria to be respected

Warning: it is essential that an 800-micron water filter be placed on the unit's water inlet during installation. The quality of the water used has a direct impact on the correct operation of the water heater/chiller and its service life. This is particularly true if the water used clogs or corrodes components or promotes the growth of algae or micro-organisms.

The permanent introduction of oxygen into the system must be avoided. To ensure this, the pressure in the system must be above atmospheric pressure throughout the installation.
To protect parts of the installation made from "ordinary" steel, it is recommended to ensure a pH of above 8 and a chloride level of no more than 50 mg/l.
The water must be tested to determine whether it is suitable for the unit and whether chemical treatment will suffice to make it of acceptable quality and if a water softening/demineralising system should be installed.

The results of the analysis must confirm whether the site's water is compatible with the various materials used on the CIAT unit's circuit:
- 99.9% copper tubes brazed with copper and silver,
- threaded bronze couplings or flat steel flanges, depending on the unit model,
- plate heat exchangers and connections made of AISI 316/ DIN 1.4401 stainless steel brazed with copper and silver.

The machine guarantee shall be void if these instructions are not followed.

Lifting and handling operations

The utmost safety precautions must be taken when lifting and handling the unit.
Always follow the lifting diagram affixed to the unit and the installation, operation, system start-up and maintenance manual.
Before attempting to lift the unit, make sure the path leading to its intended location is free from obstacles.
Always keep the unit vertical when moving it. Never tip it or lie it on its side.

Choosing a location for the unit

The standard version of the AQUACIAT2HYBRID is designed for outdoor installation.
Precautions should be taken to protect it from freezing temperatures.
Special attention should be paid to ensure sufficient free space (including at the top) to allow maintenance.
The boiler's condensing water must be drained to outside the gas module, including in periods of frost.
The unit must be placed on a perfectly level, fireproof surface strong enough to support it when ready for operation.

Noise pollution from auxiliary equipment such as pumps should be studied thoroughly.
Potential noise transmission routes should be studied, with assistance from an acoustical engineer if necessary, before installing the unit.
Flexible couplings must be placed over pipes (available as options).

Reversible units installed in areas of snowfall or heavy frost should be raised approx. 300 mm off the floor or ground.
On these reversible heat pumps, the steam and defrosted water must be properly evacuated during the defrosting phases.

Indoor installation is prohibited, even in a machine room.

Assembly of separately supplied accessories

A number of optional accessories may be delivered separately and installed on the unit on site.
Always follow the instructions in the installation, operation, system start-up and maintenance manual

Electrical connections

Always follow the instructions in the installation, operation, system start-up and maintenance manual.
All information concerning electrical connections is stated on the wiring diagrams provided with the unit. Always follow this information to the letter.
Electrical connections must be made in accordance with best current practices and applicable standards and regulations.

Electrical connections to be made on site:
- electrical power supply to unit,
- outdoor operation authorisation (optional)
- information feedback (option)

It should be noted that the unit's electrical system is not protected against lightning strikes.
Therefore devices to protect against transient voltage surges must be installed on the system and inside the power supply unit.
The frame of the unit must be earthed.

Hydraulic pipe connections

Always follow the instructions in the installation, operation, system start-up and maintenance manual.
All pipes must be correctly aligned and slope toward the system's drain valve.
Pipes must be installed to allow sufficient access to the panels and fitted with heat insulation.
Pipe mountings and clamps must be separate to avoid vibrations and placing pressure on the unit.
Water shut-off and control valves must be fitted when the unit is installed.
Pipe connections to be made on site:
- water supply with pressure-reducing valve,
- evaporator, condenser and drain,
- boiler condensing water drain.

Accessories essential to any hydraulic circuit must also be installed, such as:
- a thermostatic valve on the condenser water inlet or outlet to regulate the flow of cooling water (heat pump in HEATING mode).
- water expansion vessel,
- nozzles at pipe low points for drainage,
- exchanger shut-off valves equipped with filters,
- air vents at pipe high points,
- check the system's water capacity (install a buffer water tank if necessary),
- flexible couplings on exchanger inlets and outlets,
- manual water flow rate control valves,
- thermometers on each water inlet and outlet to allow all the necessary checks during start-up and maintenance.

Warning:
- Pressure in the water circuits below 4.0 bar.
- Place the expansion vessel before the pump.
- Do not place any valves on the expansion vessel.
- Make sure the water circulation pumps are placed directly at the exchanger inlets.
- Make sure the pressure of the water drawn in by the circulation pumps is greater than or equal to the required minimum NPSH, particularly if the water circuits are "open".
- Test the water quality in accordance with the relevant technical requirements.
- Take the necessary precautions to protect the unit and hydraulic system from freezing temperatures (e.g. allow for the possibility of draining the unit). If glycol is added to prevent freezing, check its type and concentration before system start-up.
- Before making any final hydraulic connections, flush the pipes with clean water to remove any debris.

Natural gas pipe connections

The boiler module must be connected to a natural gas supply pipe with a pressure of 20 mbar.
This operation must comply with local regulations governing the connection of a boiler to the gas system.

System start-up

AQUACIAT2HYBRID units must be commissioned by CIAT or a CIAT-approved firm.
Always follow the instructions in the installation, operation, system start-up and maintenance manual.
Partial list of precommissioning checks:
- Correct positioning of unit,
- Power supply protections,
- Phases and direction of rotation,
- Wiring connections on unit,
- Direction of water flow in unit,
- Check of the gas supply and its specifications,
- Measurement of the gas supply pressure,
- Adjustment of the burner depending on the different power levels
- Cleanliness of water circuit,
- Adjusting water flow rate to specified value,
- Pressure in the refrigeration circuit,
- Direction of rotation of compressors,
- Water pressure drops and flow rates,
- Operating and combustion readings.

Maintenance operations

Specific preventive maintenance operations must be carried out regularly on the unit by CIAT-approved firms.
The operating parameters are read and noted on a "CHECK LIST" form to be returned to CIAT.
For this, it is essential to comply with the Instructions, Installation, Operation, System Start-up and Maintenance Manual.
You must take out a maintenance contract with a CIAT-approved boiler and refrigeration equipment specialist. Such a contract is required even during the warranty period.

CONECT2 CONTROL

USER-FRIENDLY INTERFACE CONSOLE

- LCD display (4 lines of 24 characters each)
- Pressure and temperature readings
- Diagnosis of operation and fault states
- Master/slave control of two machines in parallel
- Fault memory management
- Pump management
- Time schedules
- Remote control

MULTICONNECT MULTI-UNIT MANAGEMENT (option)

Main functions available:

- Management of up to 8 units on a single water loop
- Management in COOLING mode (water chiller) or HEATING mode (heat pump)
- Management of chilled-water or hot-water pumps
- Centralised management of a backup unit
- Machine load shedding
- System time programming
- Energy storage mode management
- Machine running time balancing

PRODUCT FUNCTIONALITY

Via dry contact

Customer CMS COMMUNICATION

Via BUS communication

POTENTIAL-FREE (DRY) CONTACTS AVAILABLE AS STANDARD

Inputs:
- Automatic operation control
- Selection of setpoints 1 / 2
- Setpoint adjustable by 4-20 mA signal
- Heating/cooling mode selection
- Compressor load shedding

Outlets:
- General fault reporting
- Pump control

Additional outlets available as options:
- Water flow fault
- Frost protection fault
- Pump fault
- Fan fault (air-to-water machine)
- Low and high pressure fault
- Compressor safety fault
- Discharge temperature fault
- Compressor operating status

OUTLET AS STANDARD

- Open ModBus-JBUS RS 485 protocol (standard)
- ModBus-ETHERNET TC/IP protocol (standard)
- LONWORKS protocol (option)
- BACNET protocol (option)

CIAT SYSTEM FUNCTIONALITY

Communication with Hysys® system (generator, transmitter, air handling unit), controlled by an Easy CIATControl or Smart CIATControl touch tablet.

- **Logging** of consumption data and temperatures
- **Optimal Water®**: optimisation of producer performance based on building requirements
- **Optimal Stop and Start**: optimisation of the building restart time

Smart CIATControl

Communication with CIAT Energy Pool controlled by Power'Control.

Integrated Power'Control:
- Energy optimisation of refrigeration and heating using several generators,
- Manages free cooling capacity
- Uses heat recovery to supply domestic hot water.

Power'Control

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