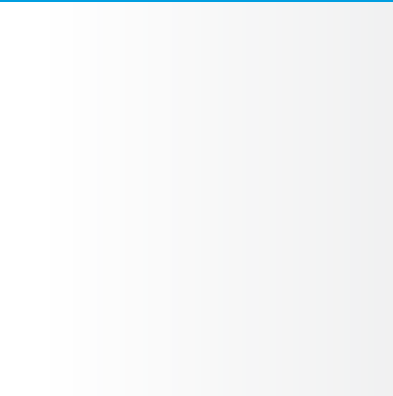
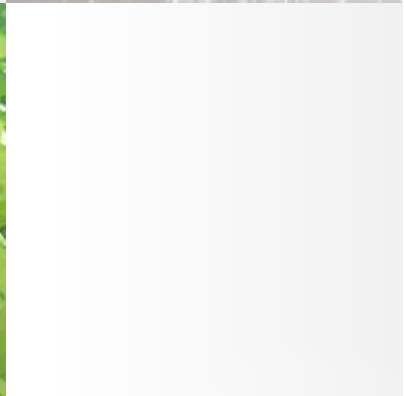
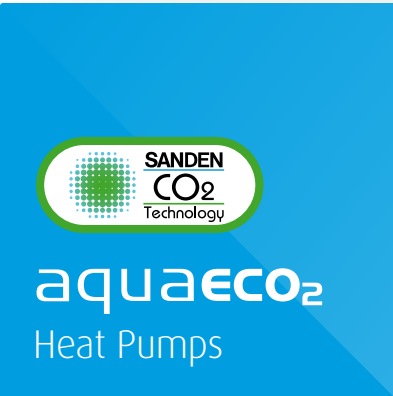
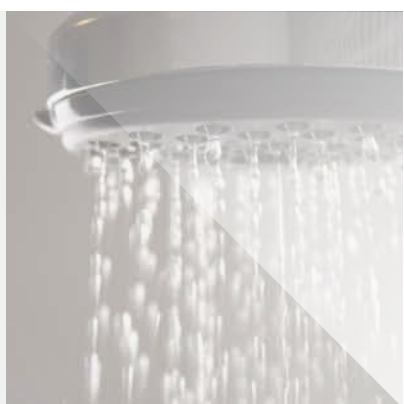
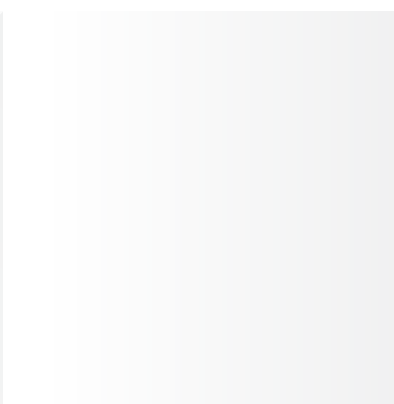




LEADER IN CO₂ TECHNOLOGY – THERMAL COMFORT EXPERT



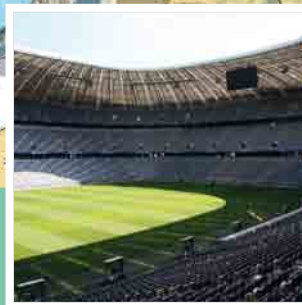
FOR HOUSEHOLDS AND PROFESSIONALS

The SANDEN group

Your partner for life



AT HOME
Aquaeco, heat pumps
for hot water supply
and/or space heating



AT THE STADIUM
CO₂ G-Drink
vending machine



AT THE HOTEL
Aquaeco, Max
for hot water supply



CITY BUS
Scroll compressor
for air-conditioning
+ HVAC system



AT THE SUPERMARKET
HFC + CO₂ retail refrigeration



IN YOUR CAR
Mechanical or electric
compressor for air-conditioning
+ HVAC system

25% OF CARS WORLDWIDE
equipped with a SANDEN compressor!



The SANDEN Group: Your partner for life

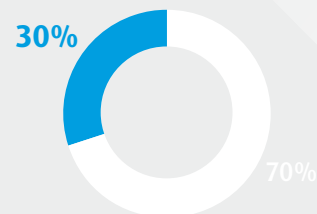
SANDEN, global expert in thermodynamics, is recognized as one of the leading manufacturers of heating & cooling solutions.

With 54 locations in 23 countries, SANDEN develops and manufactures:

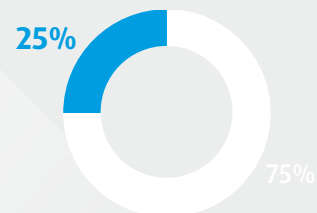
- » complete systems for automotive air conditioning
- » heating equipment based on natural CO₂ refrigerant
- » snack & drink vending machines
- » refrigerated showcases

SANDEN's market shares

World's No 1 in vending



World's No 2 in automotive air-conditioning



"Let us develop with wisdom and prosper in harmony"

(SANDEN's founding spirit)

Since its creation in 1943, SANDEN has successfully committed to providing environmentally friendly solutions. Both finished products and manufacturing processes are designed respecting future generations' needs. As an example, the "Sanden Forest" plant has been awarded by the OECD (The Organization for Economic Co-operation and Development) as **one of the 7 best manufacturing sites worldwide in terms of sustainable manufacturing practices.**

SANDEN Environmental Solutions

SANDEN Environmental Solutions aims to provide extended CO₂ technology solutions for buildings energy efficiency and other types of heating and cooling applications.

We work closely with SANDEN Manufacturing Europe, the biggest SANDEN subsidiary located out of Japan. It includes large production facilities for the manufacturing of automotive compressors and CO₂ heat pumps (800 employees). An engineering centre with over 60 people in R&D has been involved in developing Aquaeco₂ heat pump range.



SANDEN Manufacturing Europe in Brittany, France

SANDEN Manufacturing Europe Certifications

- » ISO/TS 16949: 2009
- » ISO 9001: 2008
- » ISO 14001: 2004
- » OHSAS 18001: 2007

Some SANDEN Awards

2013

- » "Quality award" by Renault
- » Supplier Award" by PSA Group
- » Excellence Level "Consistent TPM Commitment"
- » EFQM prize "Recognized for Excellence"
- » "Best Quality award" by Honda

2011

- » "Core supplier" by Renault
- » "Core supplier" by PSA Peugeot Citroën

2010

- » "5 star excellence" EFQM award

2006

- » "Global Excellence Award" by Ford

2005

- » "Supplier of the year" by General Motors

They have chosen SANDEN

AUTOMOTIVE AIR CONDITIONING

Renault Group, Volkswagen Group, PSA Peugeot Citroën, Ford, BMW-Mini...

VENDING & RETAIL SYSTEMS

7-Eleven, Coca-Cola Company, Red Bull, Nestlé, Danone, Maas International, Mars, Autobar...

SANDEN CO₂ technology made in Europe

Natural refrigerant

Non-flammable, non-toxic

CO₂ is one of the safest refrigerants. In case of accidental leak, there is no risk for the end-users or for the technician.

Reduced global warming potential

(GWP = 1)

Contrary to F-gases that are commonly used in the heat pump industry, CO₂ refrigerant has a minimal environmental impact (less green housing effect). Its global warming potential of 1 is at least 1,300 times smaller than HFCs. For instance, 1 kg of R410a = 2,100 tons of CO₂!



CO₂ refrigerant: Up to 1,300 times less greenhouse than commonly-used refrigerants!

SANDEN-made components

SANDEN designs and manufactures CO₂ compressors & exchangers used in our heat pumps.

Efficient systems require efficient components. We design and manufacture the CO₂ compressors, gas coolers and evaporators that are assembled in Aquaeco₂ heat pumps. That is how we ensure the best quality standards.



Re-designed and manufactured in Europe

For optimized performance in real-life conditions

With 55 locations in 24 countries, SANDEN is committed to providing the most optimized solutions to local markets. Aquaeco₂ heat pump range results from an intense collaboration between Japanese and European engineers.

Expertise in CO₂ technology

Strong experience in multiple applications

The SANDEN group has developed unique knowledge in CO₂ technology encompassing a large panel of applications. SANDEN manufactures CO₂ Eco-Cute heat pump water heaters in Japan, vending machines and retail refrigeration systems worldwide.



SandenVendo G-Drink vending machine based on SANDEN CO₂ technology

Quality is our priority

Multiple controls made to ensure the best performance to each end-user

Aquaeco₂ heat pumps are manufactured in our ISO 9001 accredited site SANDEN Manufacturing Europe.

Nine safety and performance checks are achieved on Aquaeco₂ heat pumps as part of the production process, including a COP test before delivery.

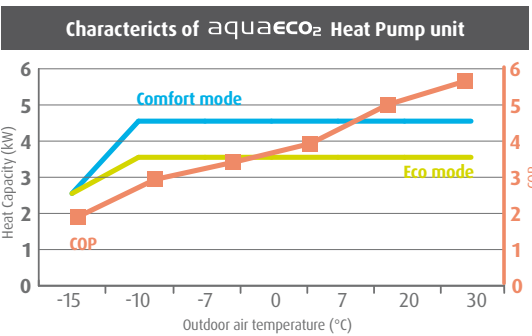


1 heat pump unit, 3 systems Which one is best for you?

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PRODUCT	aquaECO ₂ Smart	aquaECO ₂ Max	aquaECO ₂ Heat
APPLICATION	Domestic hot water (150L at 65°C) <i>Residential use</i>	Domestic hot water (200 to 750L at 65°C) <i>Residential & professional use</i>	Domestic hot water (200L at 65°C) & space heating <i>Residential use</i>
INSTALLATION	Indoor single-bloc (horizontal or vertical position)	Indoor – Distant DHW tank	Indoor – Distant DHW tank

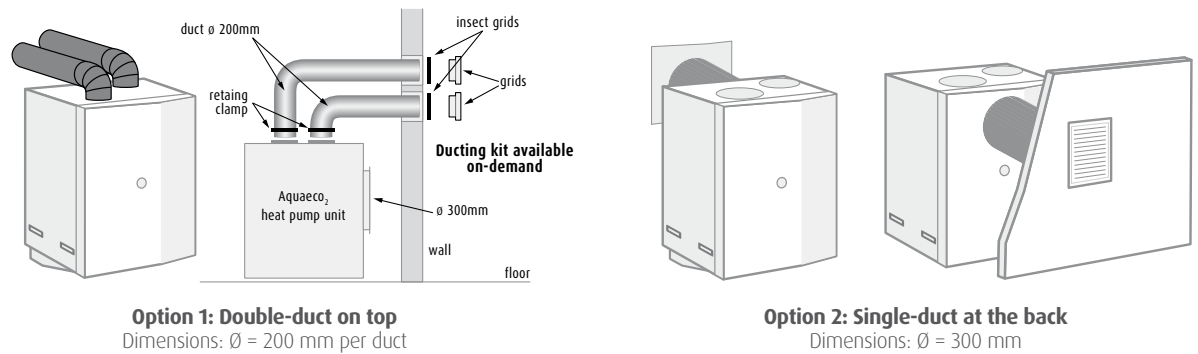
aquaECO₂ range benefits

- » **Operating at 65°C output** without electric back-up down to -15°C outdoor
- » **Whisper quiet operation:** only 40 dB(A) at 1 meter
- » **Easy control:** 1 button to press to switch Eco/Comfort mode
- » **Little maintenance required:** no refrigerant refill
- » Connection to the grid available for **operation during off-peak time**
- » **Indoor installation** extracting energy from the outdoor air



Flexible ducting

Depending on the room configuration, two options to duct Aquaeco₂ heat pump unit to the outdoor are available to installers.



aquaECO₂ Heat Pump unit specifications

Dimensions (height* width* depth)	950 * 780 * 680 mm	Capacity	3.5 kW ECO mode 4.5 kW COMFORT mode
Weight	76 kg	Operating temperature	-15°C to +43°C
Operating sound level (1 meter)	40 dB(A) (ENV 12102 & EN ISO 3746)	Refrigerant	CO ₂ (R744)
Electric supply	~230V, single-phased, 50Hz, max 16A	Compressor type	Scroll
Installation type	Indoor (possible in non-heated space)	Technology	Inverter

aquaECO₂ Smart - Indoor Monobloc Heat Pump Water Heater (150 L)



Minimal maintenance

- » **Quick installation and easy operation** thanks to a two-piece structure (heat pump and tank).
- » **Modularity:** can be installed vertically or horizontally as needed thanks to its two separate modules.
- » **Maintenance-free** thermodynamic loop: replacement of the heat pump unit in case of failure.
- » **High quality, pressure-resistant,** anticorrosion AISI 444 stainless steel tank.
- » CE and NF Electrical Performance **certified**.
- » **Standard equipment:** safety block unit, pressure reducer, lift pump.

Specifications

Heat capacity ECO mode	3.5 kW
Heat capacity COMFORT mode	4.5 kW
Tank capacity	150 L (stainless steel)
Sound pressure	40 dB(A) at 1 meter
Heating up time	2h33
V _{MAX} at 40°C	278.8 L
COP (EN16147) A7/W65°C	3.42 (certified NF)
Weight	Tank unit: 50 kg Heat pump unit: 76 kg

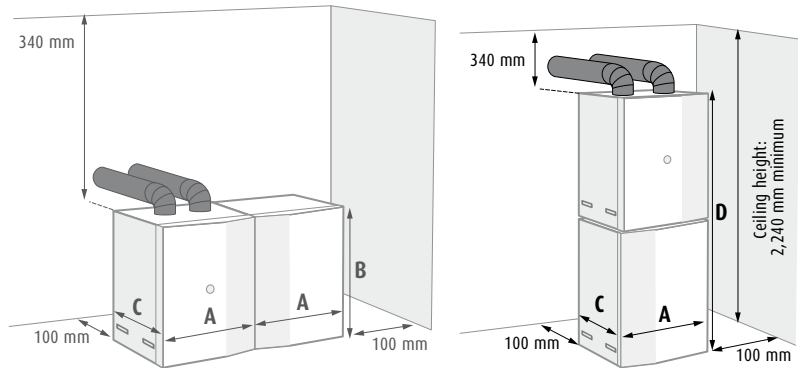
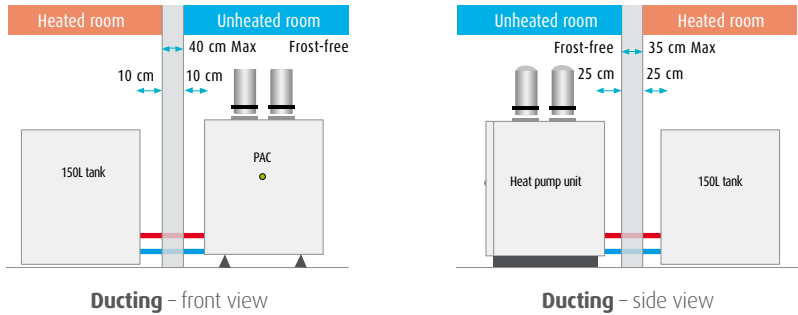
Aquaeco₂ Smart is a top-of-the-class water heater heat pump designed especially for the European market. Resulting from collaboration between Japanese and French based engineers, the performance of this product in terms of energy-efficiency and comfort is outstanding.



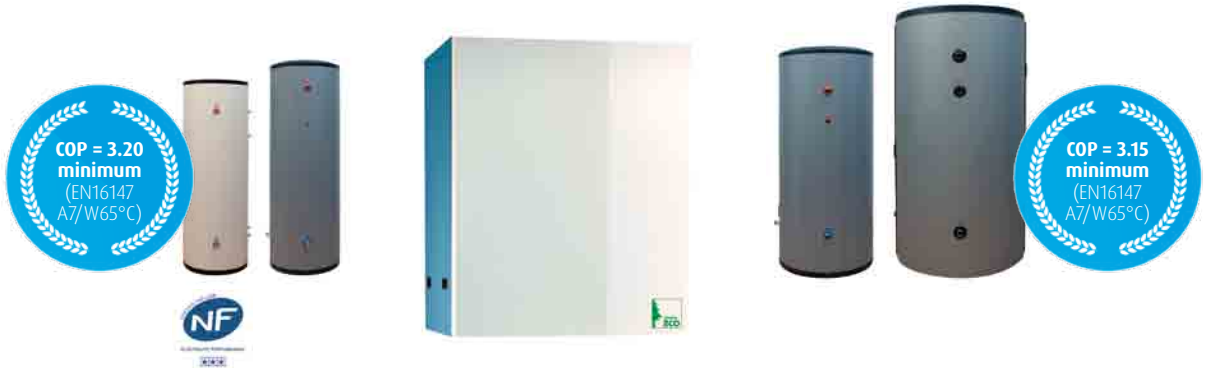
aquaECO₂ Smart Advantages

- » **Efficient all year long,** even on cold, wintery days, with outside temperatures as low as -15°C
- » **Whisper quiet operation:** only 40 dB(A) at 1 metre
- » **65°C domestic hot water** available at all times
- » Can operate during off-peak electric tariff period only
- » Particularly **recommended** for single-family houses, new build or retrofit
- » **Intuitive** control panel for end user: one button to press!
- » SANDEN CO₂ technology: **non-toxic, non-flammable**

A	780 mm
B	950 mm
C	680 mm
D	1,900 mm



aquaeco₂ Max - Indoor Heat Pump Water Heater with distant tank (200, 300, 450, 750L)



Aquaeco₂ Max is a versatile solution adapted to households and professional use. Extremely flexible, the heat pump unit can be installed up to 12 metres away and/or on a different floor from the hot water tank unit.

Smart & responsible investment for hot water consuming businesses

Hotel, restaurant, car wash, retirement home, sport centre, farm...

Aquaeco₂ Max was inspired from a simple fact: CO₂ technology being the most efficient for DHW production, the return on investment will be achieved even faster when the hot water demand is higher!

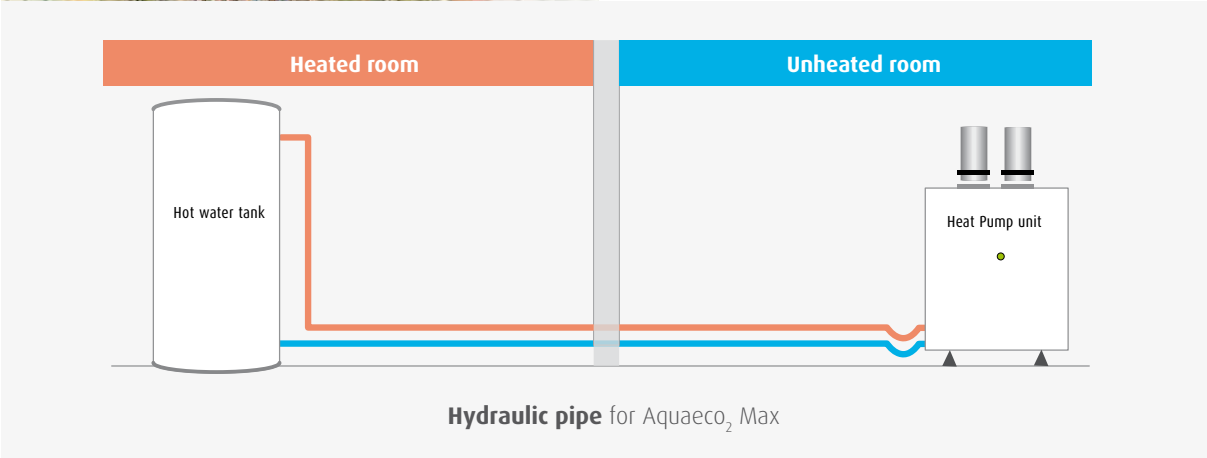
- » **Energy-savings** generated all year long
- » **Guaranteed safety:** CO₂ is non-toxic and non-flammable
- » **No noise disturbance,** extremely quiet operation
- » **Compliance to existing and future regulation** thanks to the use of a natural refrigerant
- » **Reduced maintenance costs:** no need for refrigerant refill

- » **4 DIFFERENT CAPACITIES AVAILABLE** (200, 300, 450 & 750 LITRES)
- » **UP TO 12 METRES DISTANT INSTALLATION**
- » **1 BEST SOLUTION TO YOUR NEEDS!**

Specifications

For all capacities

Refrigerant	CO ₂ (R744)
Installation	Indoor
Electrical supply	~230V, single-phased, 50Hz, max 16A
Compressor type	Scroll Inverter
DHW temp. setting	65°C
Heat capacity	3.5 kW ECO mode 4.5 kW COMFORT mode
Sound pressure	40 dB(A) at 1 metre
Operating temp. range	-15°C to +43°C



For each capacity (existing tanks*)

	200L	300L	450L	750L
Heating up time	3h36	5h59	8h47	15h10
COP (EN16147) A7/W65°C	3.64 (certified)	3.20	3.15	3.22
V _{MAX} at 40°C	355 L	445 L	690.7 L	1,027 L
Electric back-up (kW)	3	3	6**/9**	6**/9**
Tank Dimensions (Height *Ø in mm)	1,594*555	1,775*603	1,671*734	1,849*995 (Ø = 750 without insulation option)

*Aquaeco₂ heat pump unit can be connected to other types of tanks (contact us for further information). ** Optional.

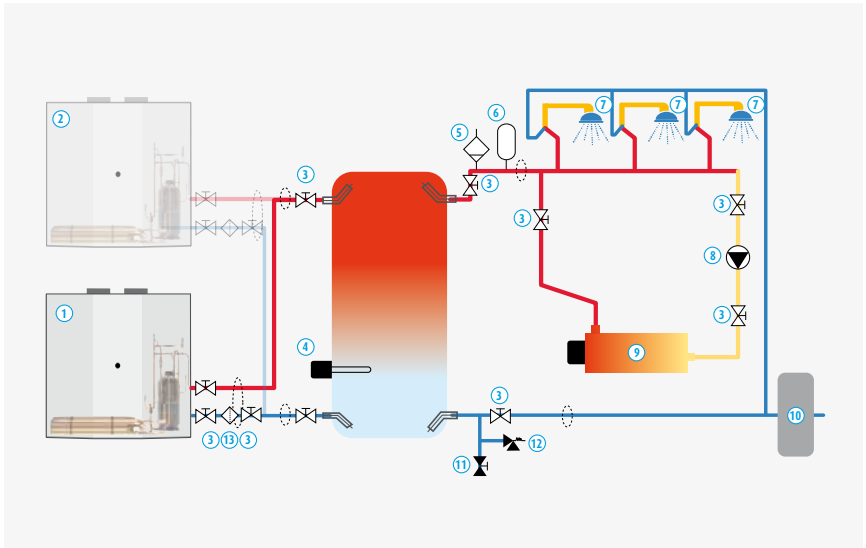
Energy savings for businesses (examples)

Business description	Traditional restaurant (Grenoble, France) <i>140 seats / 4 hand-washing sinks / closed 30 days per year</i>	Retirement home (Saint Omer, France) <i>43 residents / breakfast serving service / 100% occupancy rate</i>	Recreation centre (Nantes, France) <i>6 shower units</i>
DHW demand per day	787 L at 65°C including 501 L in morning shift and 286 L in evening shift	1,935 L at 65°C including 1354 L in morning peak and 581 L in evening peak	764 L at 65°C including 469 L during evening peak (from 6 p.m. to 10 p.m.)
Aquaeco ₂ Max installation	2 heat pump units (2*4.5 kW) 1*450L hot water tank	4 heat pump units (4*4.5 = 18 kW) 2*750L hot water tanks	heat pump unit (4.5 kW) 1*450L hot water tank
Savings***	More than 1,050€ saved every year (before: 1,864€ spent with electric system, now 810€ with Aquaeco ₂ Max)	More than 2,420€ saved every year (before: 4,038€ spent with electric system, now 1,615€ with Aquaeco ₂ Max)	More than 1,310€ saved every year (before: 1,970€ spent with electric system, now 656€ with Aquaeco ₂ Max)

*** Assumption: Electricity price is €0.11/kWh excl. tax.



Example of installation chart for professional use



1. Aquaeco₂ Max heat pump
2. Aquaeco₂ Max second heat pump unit (optional)
3. Insulation valve
4. Back-up immersion heater
5. Airvent Valve
6. Water hammer arrestor
7. Water tapping
8. Loop pump
9. Loop heater
10. Water softener
11. Drain valve
12. Safety valve
13. Filter 3/10

aquaECO₂ Heat - Indoor combi-type heat pump (DHW & space heating)

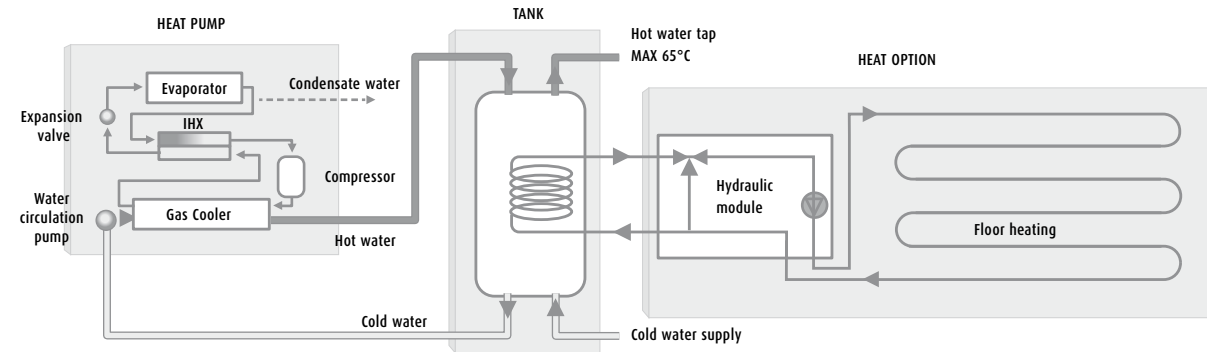


Aquaeco₂ Heat is the most innovative CO₂ solution for the thermal comfort of households in Europe. The system is made of three units:

- » Aquaeco₂ heat pump unit
- » 200 litres water tank
- » Hydraulic module for space heating regulation.

The ideal solution for well-insulated houses

- » Exceptional **energy savings** in DHW production, and now in space heating
- » Suitable **for low temperature and medium temperature heaters** or floor heating
- » **Reduced needs of maintenance** due to the use of natural, non-toxic and non-flammable CO₂ refrigerant
- » Up to 12 metres **distant installation between HP and tank**
- » Indoor and **quiet**, no noise disturbance to the user and neighbour
- » No buffer tank needed, **less space required**



Example of energy savings in a well insulated house

- » Surface area: 100 m² / 3 bedrooms
- » Location: Strasbourg, France (average European climate)
- » No of inhabitants: family of 4 persons



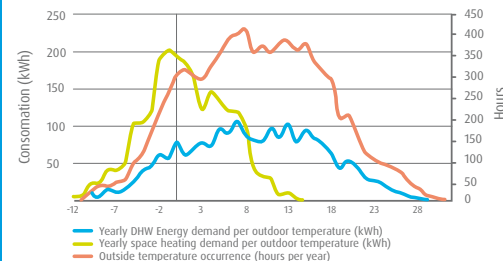
Yearly DHW demand (48%)

- * 2,133 kWh
- * 168L of DHW at 40°C used per day

Yearly heating demand (52%)

- * 2,315 kWh
- * heating period: 189 days from Oct. to April (below 16°C outside)
- * low temperature heating (return water at 30°C)

In a year:
1,169 kWh consumed
4,448 kWh produced



100% of demand covered with Aquaeco₂ without use of electric back-up

Specifications

Tank capacity	200 L
Heating up time	3h36
COP (EN16147) A7/W65°C	3.64 (certified NF)
V _{max} at 40°C	355 L
Electric back-up	3 kW
Tank dimensions (Height *Ø in mm)	1,594*555
Refrigerant	CO ₂ (R744)
Electrical supply	~230V, single-phased, 50Hz, max 16A
Compressor type	Scroll Inverter
DHW temp. setting	65°C
Heating capacity	3.5 kW ECO mode 4.5 kW COMFORT mode
Sound pressure	40 dB(A) at 1 metre
Operating temp. range	-15°C to +43°C
Space heating output	30-35°C or 40-45°C

Specifications Summary

aquaECO₂ Smart

DHW production	TANK CAPACITY	150 L / stainless steel
	HEATING CAPACITY	3.5 kW in ECO mode - 4.5kW in COMFORT mode
	DHW TEMPERATURE OUTPUT	65°C
	COP (EN16147)	3.42 (certified NF)
	V _{max} AT 40°C	273,8 L
	OPERATING TEMPERATURE RANGE	-15°C to +43°C
	HEATING TIME (AIR: 7°C, DHW 10-65°C)	2h33
	DIMENSIONS (HEIGHT*WIDTH*DEPTH)	Horizontal: 950*1,560*680 mm - Vertical: 1,900*780*680 mm
	WEIGHT - DRY	126 Kg
	SOUND PRESSURE LEVEL @ 1 METRE	40 dB(A) - (ENV 12102 & EN ISO 3746)
	DUCT TO OUTDOOR DIMENSIONS	2 * Ø 200 mm (on top) - 1 * Ø 300 mm (at the back)
	VOLTAGE / FREQUENCY	~230V, single-phased, 50Hz, max 16A
	OUTDOOR AIR FLOW	Variable from 200 to 800 m3/h
	INSTALLATION	Indoor (possible in non-heated space) - Single-block, horizontal or vertical

aquaECO₂ Max

DHW production	TANK CAPACITY	200 L	300 L	450 L	750 L
	HEATING CAPACITY	3.5 kW in ECO mode - 4.5kW in COMFORT mode			
	DHW TEMPERATURE OUTPUT	65°C			
	SOUND PRESSURE LEVEL @ 1 METRE	40 dB(A) (ENV 12102 & EN ISO 3746)			
	DUCT TO OUTDOOR DIMENSIONS	2 * Ø 200 mm (on top) OR 1 * Ø 300 mm (at the back)			
	VOLTAGE / FREQUENCY	~230V, single-phased, 50Hz, max 16A			
	OUTDOOR AIR FLOW	Variable from 200 to 800 m3/h			
	DISTANCE ALLOWED BETWEEN HP UNIT AND TANK	Up to 12 metres			
	COP (EN16147)	3.64 (certified NF)	3.20	3.64	3.62
	V _{max} AT 40°C	355 L	445 L	690.7 L	1,027 L
	HEATING TIME (AIR 7°C, DHW 10-65°C)	3h36	5h59	8,53	15h45
	DIMENSIONS / HP UNIT (H*W*D)	950 * 780 * 680 mm			
	DIMENSIONS/ TANK (HEIGHT*Ø)	1,594*555 mm	1,775*603 mm	1,671*734 mm	1,849*995 mm 1,849*750 mm (w/o insulation option)

aquaECO₂ Heat

HEATING CAPACITY	3.5 kW in ECO mode 4.5 kW in COMFORT mode	DHW PRODUCTION	TANK CAPACITY	200L
OPERATING TEMPERATURE RANGE	-15°C to +43°C		DHW TEMPERATURE OUTPUT	65°C
DIMENSIONS / HP UNIT (H*W*D)	950 * 780 * 680 mm		COP (EN16147)	3.64 (certified NF)
SOUND PRESSURE LEVEL @ 1 METRE	40 dB(A) (ENV 12102 & EN ISO 3746)		V _{max} AT 40°C	355 L
VOLTAGE / FREQUENCY	~230V, single-phased, 50Hz, max 16A	SPACE HEATING	HEATING TIME (AIR 7°C, DHW 10-65°C)	3h36
OUTDOOR AIR FLOW	Variable from 200 to 800 m3/h		SPACE HEATING TEMPERATURE OUTPUT	Low-temperature : 30-35°C OR Medium-temperature : 40-45 °C
DIMENSIONS/ TANK (HEIGHT*Ø)	1,594*555 mm		ELECTRIC BACK-UP (INSIDE THE TANK)	3 kW

