caring for the environment

GAHP product line

Gas absorption heaters and heat pumps for heating and cooling medium-large areas

Renewable energy and gas fired

Robur turns the love for beauty and well-made things
into innovative heating and cooling systems
that are especially designed and developed to answer
the specific customer needs.

Robur Vision

Robur is dedicated to dynamic progression
in research, development and promotion
of safe, environmentally-friendly, energy-efficient products,
through the commitment and caring
of its employees and partners.

Robur Mission

Robur, founded in 1956, researches, develops and produces natural gas heating and air conditioning systems with high efficiency and low environmental impact.
An exclusive feature of Robur products is their use of renewable energy sources, meaning that less pollutants are released into the atmosphere and that notable energy savings are guaranteed.

Robur key values

Innovation
in researching and developing technologically advanced products and in offering qualified services, directed towards total customer satisfaction

Corporate social responsibility and industrial vocation
in developing and manufacturing safe, environmentally-friendly and energy-efficient products

Value of human resources
in involving all of its human resources, both inside and outside the company, through constant training and sharing of vision, strategy and objectives

Testimony

> "Robur wants to be a workplace
> stimulated by Progress, sustained by Passion,
> enlivened by Humanity, guided by Justice,
> guaranteed by Quality, inspired by Beauty"

Robur figures

36 million Euro of sales in 2005
249 employees
7% ongoing investment in Research & Development

AWARDS and RECOGNITION

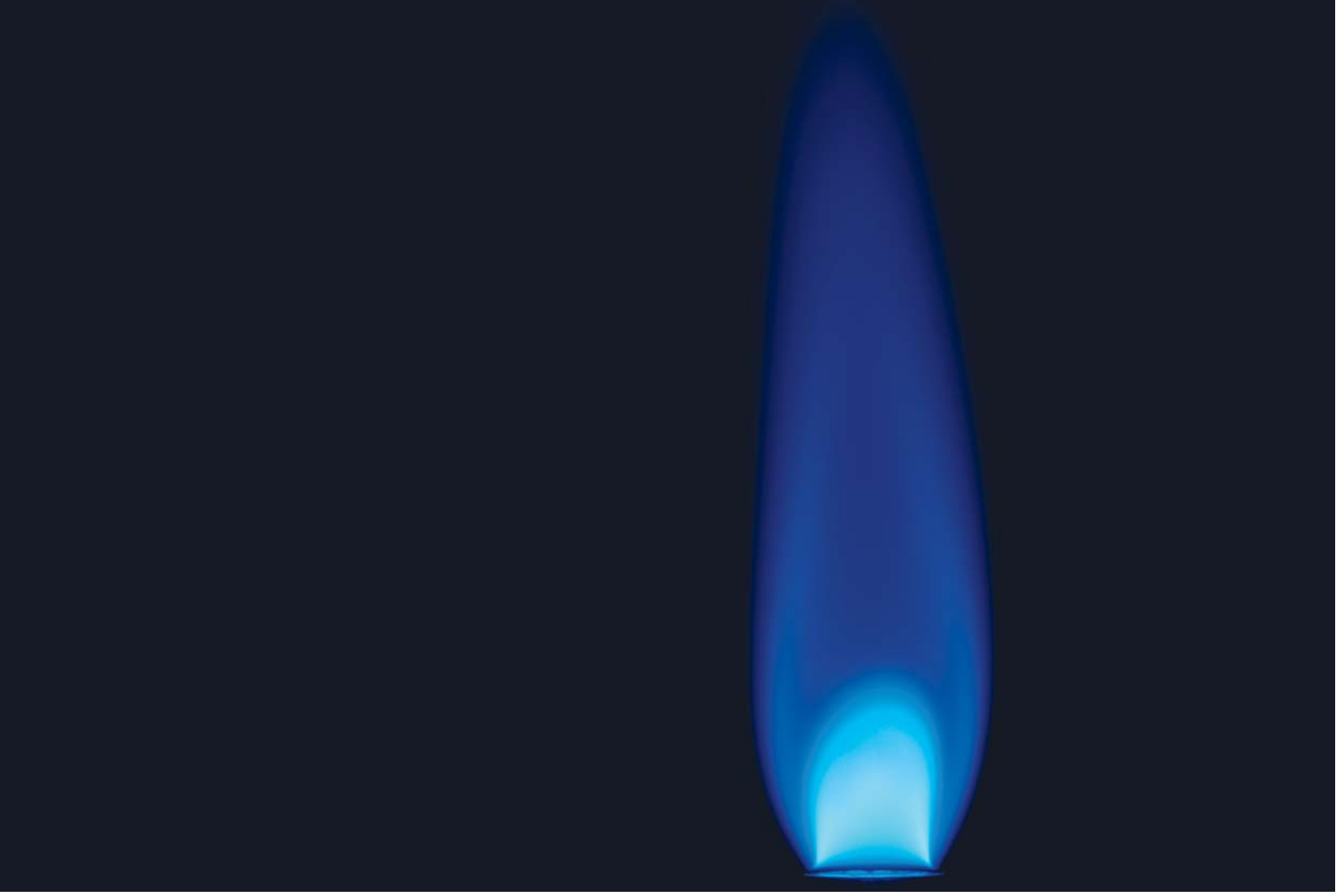
1995 ISO 9001 certification
2000 1st Prize in the REGIONAL QUALITY AWARD
2001 First in Europe to obtain the ISO 9001:2000 certification (Vision 2000), in the heating and cooling sector.
1st Prize NATIONAL QUALITY AWARD
2003 Special Prize Winner of "European Quality Award"
The Gas Absorption Heat Pumps were included in the group of "recommended designs" of the "ENVIRONMENTALLY FRIENDLY INNOVATION AWARD"
Robur, with its reversible gas absorption heat pump GAHP-AR, claimed the Technological Innovation Award
2004 Benito Guerra, president of Robur S.p.A., has received a nomination as finalist in the "Quality of life" category of the National Businessman of the Year, promoted by Ernst & Young.
2005 ISO 14001: 2004 certification
Gas fired heaters K and the gas absorption heat pump GAHP-W won the honourable mention of the HVAC&R Innovation Preize sponsored by Costruire Impianti
2006 Honourable mention at AHR Expo Innovation sponsored by ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers - USA)

The Robur absorption heat pumps are the right result of a forefront research and the capacity of plan and produce with a low environmental impact.

An innovation answer for air conditioning: because energy is a precious goods

The water/ammonia-based absorption technology was successfully developed by Robur for the production of water chillers now extends to the production of heat energy, by means of air-water and water-water heat pumps, which ensure levels of energy efficiency that cannot be matched by any other gas-fuelled heating appliances.
Robur's absorption heat pumps are able to produce alternately and simultaneously hot and cold water via a thermodynamic cycle that is fuelled by a burner running on natural gas, and are available in several versions with different heating and cooling output ratings.
Robur heat pumps are units for the production of heating and cooling energy with high efficiency, and are ideal for:

- heating and air conditioning residential and commercial buildings and hotels, as well as industrial and tertiary premises;
- heating water for manufacturing, processing, and sanitary/hygiene applications;
- producing heating and cooling energy simultaneously for process and technological applications.



Natural gas for the best ratio between the energy provided and energy consumed, with total respect for the world we live in.

GAHP absorption heat pumps fired by gas and renewable energy

The heat pumps running can be convenient in different sort of plants, using as cold source:

- air, at negative temperature too;
- water (from ground, lake, sea);
- ground, with geothermal drills.

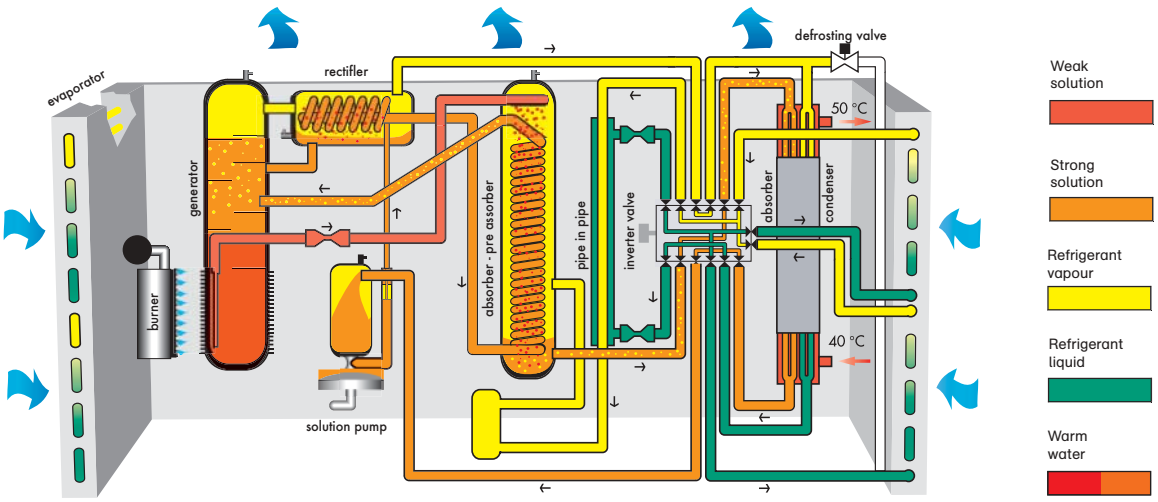
The absorption heat pumps are available in 4 different versions:

- **GAHP-A Type.**
  Gas absorption heater for the production of hot water up to 60 °C with high efficiency.
- **GAHP-AR Type.**
  Reversible gas fired absorption heat pump that alternately produces hot water up to 60 °C and chilled water down to 3 °C, thanks to the inversion of the thermodynamic cycle.
- **GAHP-W LB Type.**
  Gas absorption heat pump designed for geothermal systems.
- **GAHP-W Type.**
  Gas absorption heat pump that simultaneously produces hot water up to 65 °C and down to 3 °C.

Inside the technology

The strength of Robur GAHP high-efficiency heat pumps: a flame that heats… and cools.

Thermodynamic cycle in heating mode of the GAHP-AR reversible heat pumps.



A heat pump is a unit that is able to transfer heat energy from a low temperature to a higher temperature (hot source), by inverting the natural thermal flow (in which heat is carried from warm mediums towards cooler ones). This feature therefore is useful whether one wishes to provide heating where, with a single unit, hot water up to a temperature of 60 °C and summer air-conditioning are required. In heating mode, the heat pump becomes a significant energy-saver, as it supplies to the room heat "pumped" from the outside and the heat energy that fuels the heat pump itself, thus obtaining high energy efficiency. The natural gas absorption heat pump in the GAHP range sets itself apart from traditional electrical heat pumps because of the different energy that it uses; in fact, instead of consuming energy to operate a compressor, it uses natural gas (or LPG), which feeds a premixing burner, which in turn heats a solution of water and ammonia in a completely sealed absorption circuit. In terms of their manufacturing characteristics, Robur's absorption heat pumps are of the hydronic type, that is, they heat and/or cool the water that is required. One of the many advantages of this characteristic is that it allows the heating and cooling input temperature to be managed better, making for precise adjustments to indoor comfort and thus increasing the operating efficiency of the entire system.

Air-water absorption heater running on gas and renewable energies for outdoor installation to produce hot water to 60 °C.

GAHP product line A Type
High efficiency heating

Absorption heater for heating in heat pump mode for the production of hot water up to 60 °C, using an absorption thermodynamic cycle with a water/ammonia solution, able to recover heat from outside air down to temperature of -20 °C.
It is suitable for heating systems where the highest gas efficiency available appliance is required.
GAHP-A units are available individually and in modular thermal groups premounted on frames and supply by a controller, with thermal input from 36.2 to 181 kW.

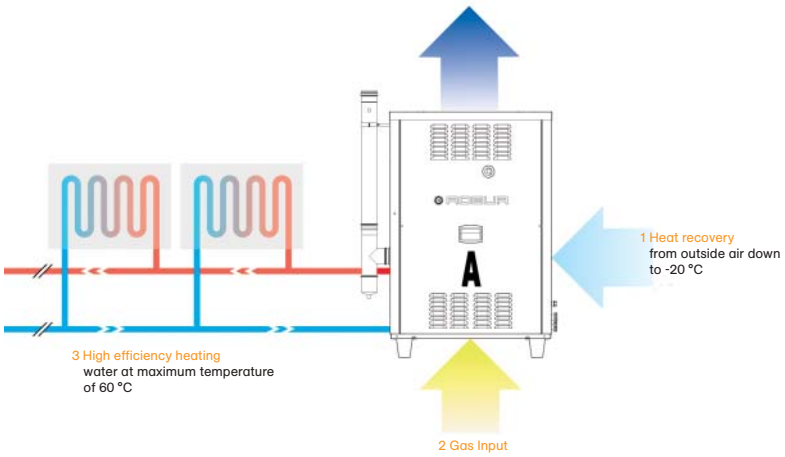
How it works

Robur GAHP-A produces hot water up to 60 °C with very high efficiency (144%), saving additional electricity requirements by around 40% (1) in comparison to the best boilers, thank to the possibility of recovery thermal energy from outside air.

Even in winter, external air contains thermal energy that can be exploited using a thermodynamic cycle.
The Robur GAHP-A uses a gas fired water-ammonia absorption refrigerant cycle, with inverted cycle, i.e. a water cooled condenser/absorber and an air heated evaporator.
The absorption refrigerant cycle recovers through the evaporator the thermal energy from the external ambient air (1) .

This “heat input”, added to the one produced by the gas combustion (2), allows the cycle to run so that the condenser/absorber heat production can be transferred to the heating circuit water (3).
Low temperature heat recovered from outside air allows the GAHP-A unit to reach higher gas efficiencies than any other boiler or condensing boiler. Robur GAHP-A unit heating performances depend

on external conditions (they are proportional to external temperatures) and can be improved up to 160%!
Hot water outlet temperature is relevant for GAHP-A unit efficiency: higher performances are obtained with lower value of hot water outlet temperature (note that this value is perfect to be combined with fan-coils, radiant heating systems or AHU coils).



(1) Value by ENEA certificated (technical report available on demand).

Advantages

- **High efficiency.** Recovering part of the thermal energy from the external air, it is possible to reach an efficiency higher than 144% (at nominal conditions)! They provide hot water for heating, as in the case of current condensing boilers, ensuring substantially higher energy performance, up to 40% [1]. In comparison to traditional electric heat pumps, the GAHP-A efficiency is scarcely affected by external temperature.
- **Combination with lower-efficiency boilers**, improving the global efficiency of the system.
- **Reduction in electric power consumption.** The Robur GAHP-A unit uses just 0.0025 electrical kW to produce 1 kW of hot water.
- **High efficiency under extremely low external temperatures.** The Robur GAHP-A unit assures efficiency higher than 100% also at very low external ambient temperature (-20 °C).
- **It does not require indoor space.** The GAHP-A unit is designed for outdoor installation only, thus it does not take up valuable indoor space or require a boiler room.
- **Defrosting mode.** Even during the coil defrosting process, the GAHP-A unit supplies over 50% of its nominal heating capacity with no need for additional primary energy input.
- **Additional advantages of the whole GAHP product line:**
  - high reliability thanks to just a few moving components;
  - easy maintenance, similar to gas boilers;
  - environmental-friendly refrigerants (the unit do not require topping up with refrigerant) (Italian DPR 147/2006).

Main Applications

The Robur GAHP-A unit makes available a wide variety of convenient applications, for example:

- suitable for increasing the average efficiency in heating hydronic systems. For those systems running with low water temperature, for example fan coils and floor heating;
- combination with heating systems, which improves the seasonal efficiency of 25% [2];
- all systems where hot water, up to 60 °C, is required, such as for manufacturing and processing applications;
- systems where large heating time amount is required or 24 h running industry application (hospitals, hotels, shopping centres, etc.).

[1] Value by ENEA certificated (technical report available on demand).

[2] Value by ENEA certificated (publication available on demand).

GAHP-A to make higher the traditional systems efficiency.

The Robur GAHP-A unit is suitable for heating systems where the highest gas efficiency available appliance is required; the gas efficiency at rating conditions is 144%. In temperate climate areas, using both the Robur GAHP-A unit (to supply about 25-30% of the heating load), and a standard heater (for the remaining load), this will increase the average efficiency of the overall heating system up to about 125-135% [1].

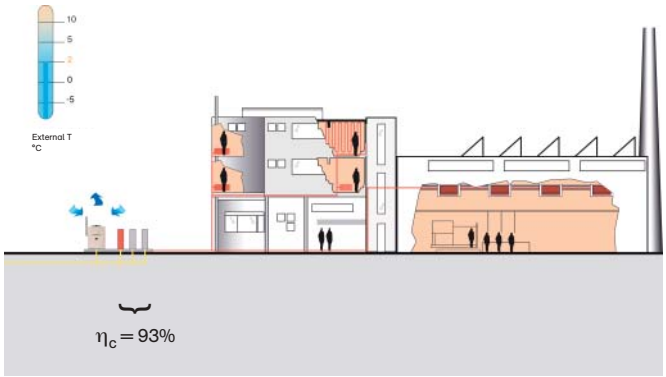
As shown below, the utilization of a GAHP- A unit combined with 3 conventional boilers allows to reach a energy efficiency of 93%.

Total system efficiency: [2] 101%

The project temperature requires the maximal thermal energy (GAHP-A unit and heaters).

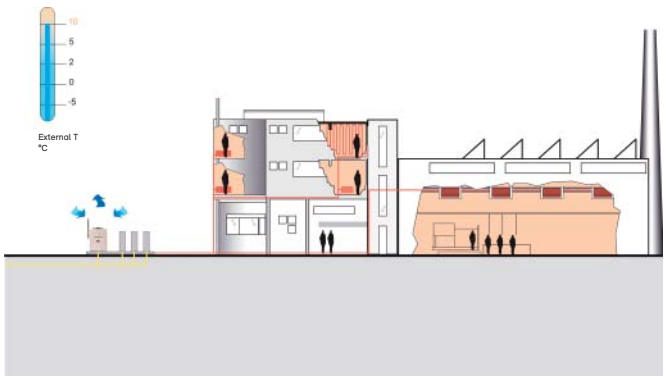
Total system efficiency: [2] 107%

When the outdoor temperature increases, the thermal energy request decreases (an heater is switched off). Energy efficiency is increased thanks to the GAHP-A unit.



Total system efficiency: [2] 117%

The external temperature allows to switch off another heater, increasing the system efficiency.



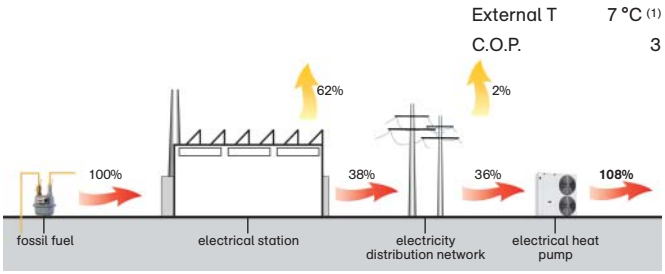
Total system efficiency: [2] 156%

The GAHP-A unit power is enough to satisfy the thermal energy requested, highly increasing the energy efficiencies.

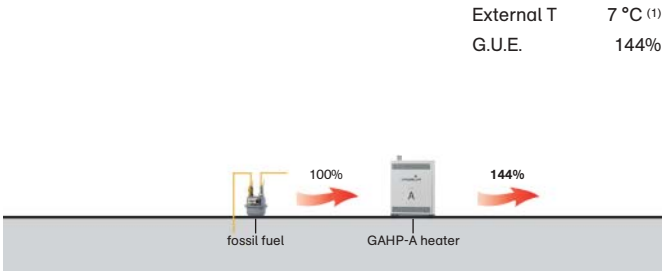
[1] Value by ENEA certificated (publication available on demand).

[2] In temperate climate area, at the normal season temperatures, in function conditions when the maximal thermal energy is required.

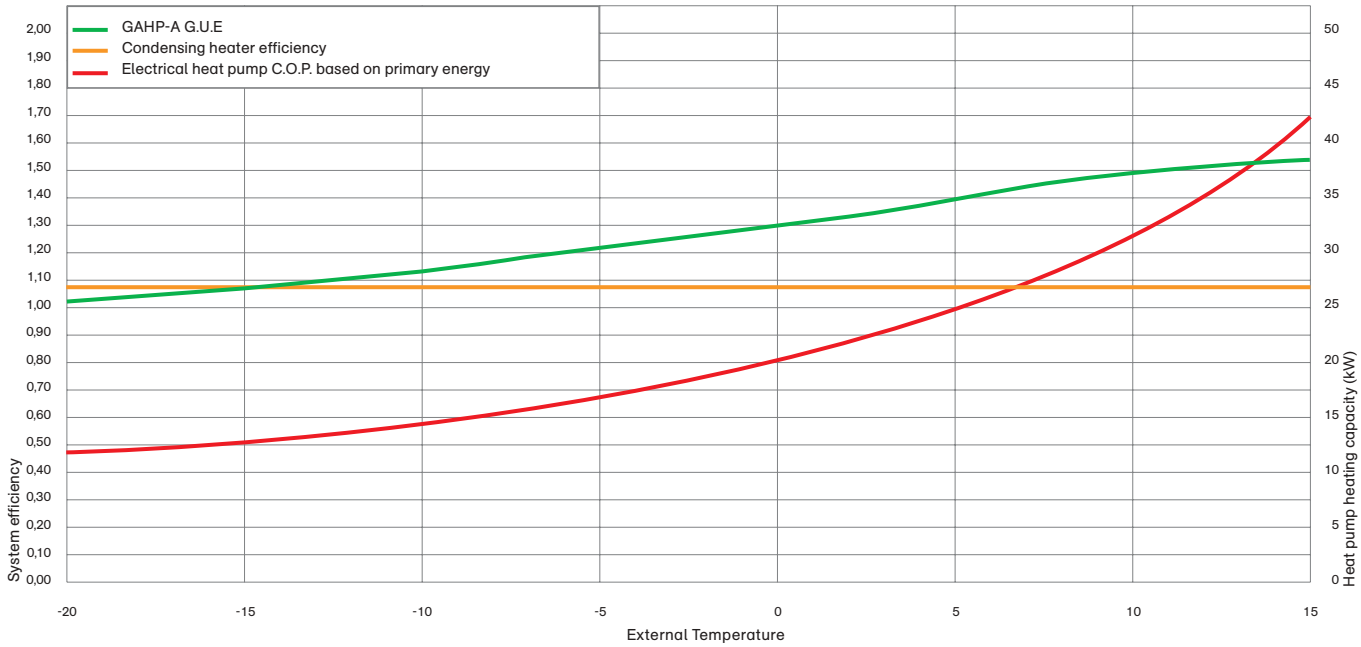
Advantages of Robur's GAHP-A unit in comparison to other systems



Electric heat pump: efficiency-primary energy ratio



GAHP-A heat pump: efficiency-primary energy ratio



GAHP-A gas utilization efficiency (G.U.E.) in comparison to condensing boilers and electric pumps (electrical/primary energy conversion factor 0,36%) (2) at the average winter temperature and at the average water temperature of 50 °C.

	Moscow	Berlin	New York	Tokyo	Paris	Rome
Winter avarage T (°C)	-3.7	3.6	4.3	7	7	10.6
Project T (°C)	-20	-12.4	-10	0	-6	0

alternative systems		GAHP-A economic advantages	GAHP-A energy advantages	GAHP-A plant advantages
Electric air-water heat pump for only heating		Coverage of project temperature, thanks to high efficiency when external temperature is down to –20°C.	They reduce additional electricity requirements and CO_2 emissions. Suitable for every continental climate (see table and graph above).	They do not require back up systems such as additional heaters or electric resistance.
Electric geothermal heat pump for heating		No additional borehole exchanger is required, thanks to utilization of air as renewable energy.	Reduced CO_2 emissions, for high temperature systems (55 °C - 60 °C).	Outdoor installation, no borehole exchanger, no heating central.
Condensing boilers		They are particularly cost-effective when combined to traditional plants, since they cover 30% project heating capacity (3).	Combined with traditional boilers they can increase plant season efficiency up to 20 - 30% (max values 125 - 135%).	Outdoor installation, no heating central for plant with heating capacity over 35 kW.

(1) Nominal conditions. For further information, see the table.

(2) Italian DL192, Attachment I, Article 11.

(3) Value by ENEA certificated (publication available on demand).

OPERATION IN HEATING MODE [1]

Heating capacity [2]		kW	36.2
G.U.E. heating efficiency based on gas consumption			1.44
Water flow rate	nominal (ΔT = 10 °C)	m³/h	3.1
	maximum	m³/h	5.0
	minimum	m³/h	1.4
Pressure drop at nominal flow rate		kPa	33
Outside air temperature dry bulb	maximum	°C	45
	minimum	°C	-20
Inlet water temperature	maximum	°C	50
	minimum	°C	2
Maximal outlet water temperature (ΔT = 10 °C)		°C	60

BURNER FEATURES

Nominal heating input		kW	25.2
Gas consumption	natural gas G20 [3]	m³/h	2.67
	natural gas G25 [4]	m³/h	3.10
	LPG G30/G31 [5]	kg/h	1.96

ELECTRICAL DATA

Required voltages			230 V – 50 Hz
Nominal electrical power [6]	standard version	kW	0.9
	low noise version	kW	0.93

INSTALLATION DATA

Weight in operation		kg	350
Sound pressure at 10 meters [7]	standard version	dB(A)	54
	low noise version	dB(A)	49
Connections	water	" F	1 1/4
	gas	" F	3/4
	flue exhausted pipe	mm	80
Dimensions	width	mm	850
	depth	mm	1240
	height - standard version	mm	1290
	height - low noise version	mm	1540

HEATING PERFORMANCES AT DIFFERENT USE CONDITIONS

Outside air temperature dry bulb (°C)	Outlet water temperature (°C)							
	30 °C (ΔT = 10 °C)		45 °C (ΔT = 10 °C)		50 °C (ΔT = 10 °C)		60 °C (ΔT = 10 °C)	
	P_T	G.U.E.	P_T	G.U.E.	P_T	G.U.E.	P_T	G.U.E.
-20	29.20	1.16	26.60	1.06	25.50	1.01	25.10	1.00
-15	29.90	1.19	27.40	1.09	26.40	1.05	25.90	1.03
-10	32.70	1.30	30.00	1.19	28.10	1.12	27.20	1.08
-7	34.30	1.36	31.70	1.26	29.30	1.16	28.20	1.12
2	37.20	1.48	35.80	1.42	33.40	1.33	31.00	1.23
7	38.80	1.54	38.30	1.52	**36.20**	1.44	33.80	1.34
15	40.00	1.59	40.00	1.59	38.80	1.54	36.20	1.44
20	40.50	1.61	40.50	1.61	39.20	1.56	37.30	1.48
25	40.80	1.62	40.80	1.62	39.50	1.57	37.50	1.49

[1] Nominal conditions according to EN 12309-2 norm, table 12.
[2] Characteristics under nominal conditions: outside air temperature dry/wet bulb 7/6 °C - outlet water 50 °C.
[3] Lower heating value 34.02 MJ/m³ (9.45 kWh/m³) at 15 °C - 1013 mbar.
[4] Lower heating value 29.25 MJ/m³ (8.13 kWh/m³) at 15 °C - 1013 mbar.
[5] Lower heating value 46.34 MJ/kg (12.87 kWh/kg) at 15 °C - 1013 mbar.
[6] ±10% tolerance to allow for different electrical voltage and power absorption of the electrical motors.
[7] Free field, frontally, directivity factor 2.

P_T Heating output (kW)
G.U.E. Gas utilization efficiency calculate on real thermal input (EN 12309-2 norm).

Due to continuous product innovation and development, Robur reserves the right to change product specifications without prior notice.

Gas reversible absorption heat pump for outdoor installation to alternately produce hot water to 60 °C and chilled water to 3 °C.

GAHP product line AR Type
Heating and cooling

Absorption heat pump for winter heating and summer cooling fired by natural gas or renewable energies. This unit can supply alternately hot water, up to 60 °C, and cold water, down to 3 °C, by inverting the absorption cycle. For this reason it is suited for any kind of cooling plant because it heats and cools with very high efficiency.
The GAHP-AR units are available in modular thermal groups, premounted on frames and supplied by a controller, with heating capacity from 35,3 kW to 176,5 kW and cooling capacity from 16,9 kW to 84,5 kW (RTAR units).
They are also available in the CC (with independent circulation pump) and in the SC version (without independent circulation pump).

How it works

Robur GAHP-AR can be used to produce hot water for heating, saving up to 40% energy costs in comparison to traditional boilers, as well as alternately cold water for cooling.

Winter use

The Robur GAHP-AR reverses the absorption cycle to recover heat from the outside air (renewable energy) (3).
This “heat input”, added to the heat produced from the gas combustion (4), allows the cycle to run so that the condenser/absorber heat production can be transferred to the heating circuit water (5).
The efficiency of the unit is raised over 150%. In cold climates, where outside temperature can drop down to -20 °C, the Robur GAHP-AR always supplies an efficiency around 100%, value higher than any other traditional or condensing boiler.

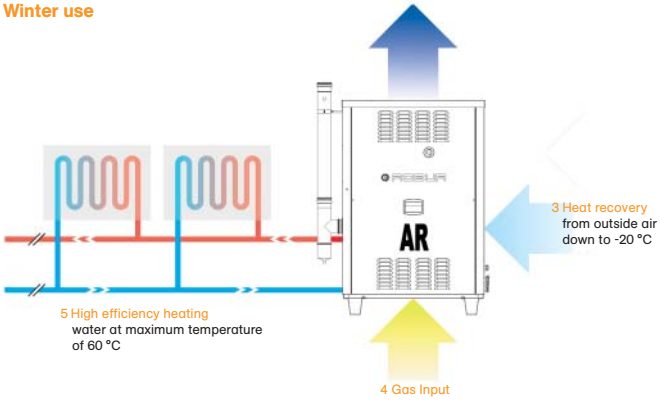
Defrosting mode

One of the technical feature of the GAHP-AR unit respect of other heat pumps is the defrosting mode.
Even during the coil defrosting process, the GAHP-AR unit supplies over 50% of its nominal heating capacity with no need for additional primary energy input. This is the differens from an electric heat pump in which the defrosting is done by inverting the thermodynamic cycle and taking warm from the inside space.

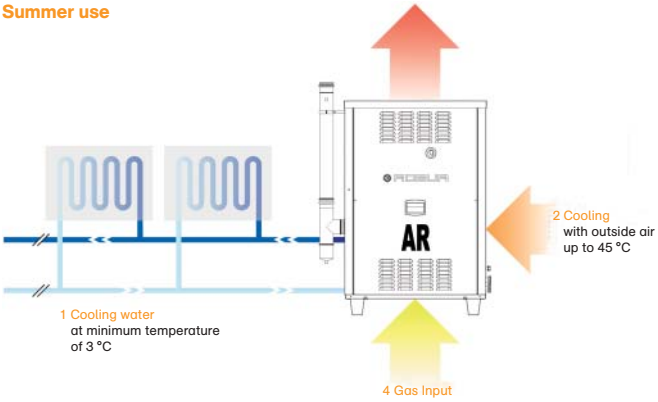
Summer use

The Robur GAHP-AR works as an absorption chiller.
The absorber and condenser heat (1) is rejected to the outside air (2).

Winter use



Summer use



Advantages

The use of GAHP-AR unit allows several technical and economical advantages.

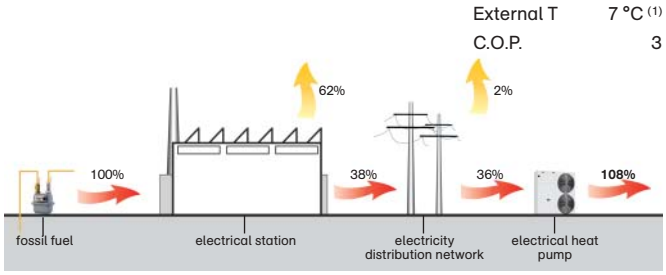
- **High efficiency.** In winter, due to heat pumping mode, heating gas efficiencies up to 140% are possible (at rating condition), saving up to 40% of energy costs.
- **A single unit, a single plant** and single fuel element to produce hot or cold water alternately.
- **Reduced electric power consumption up to 86%.** The GAHP-AR gas fired unit draws less than 0.9 electrical kW to produce 35.3 kW of hot water and 16.9 kW of chilled water.
- **Consistent operation with extreme outdoor temperatures.** The GAHP-AR unit guarantees stable operation even in extreme outdoor ambient and attains gas efficiency around 100% even down to -20 °C in heating mode. In cooling mode the GAHP-AR unit can produces at outdoor temperatures cold water up to 45 °C.
- **Defrosting mode.** Even during the coil defrosting process, the unit still supplies heating capacity with no need for additional primary energy input.
- **Additional advantages of the whole GAHP product line:**
  - high reliability thanks to just a few moving components;
  - easy maintenance, similar to gas boilers;
  - no water consumption;
  - environmental-friendly refrigerants (the unit do not require topping up with refrigerant) (Italian DPR 147/2006).

Main Applications

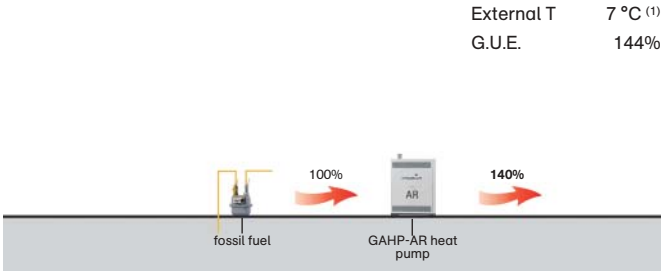
The Robur GAHP-AR unit makes available a wide variety of convenient applications, for example:

- all hot water heating systems and chilled water air conditioning for light commercial, industrial and residential use;
- single unit systems for summer cooling and heating with invariable electrical power consumption;
- all systems where a full-time heating and cooling are required, for example hotels, malls, office buildings;
- systems where heating and cooling are based on gas, so that electric power supply is kept to a minimum and not increased during summer electric power demand peaks.

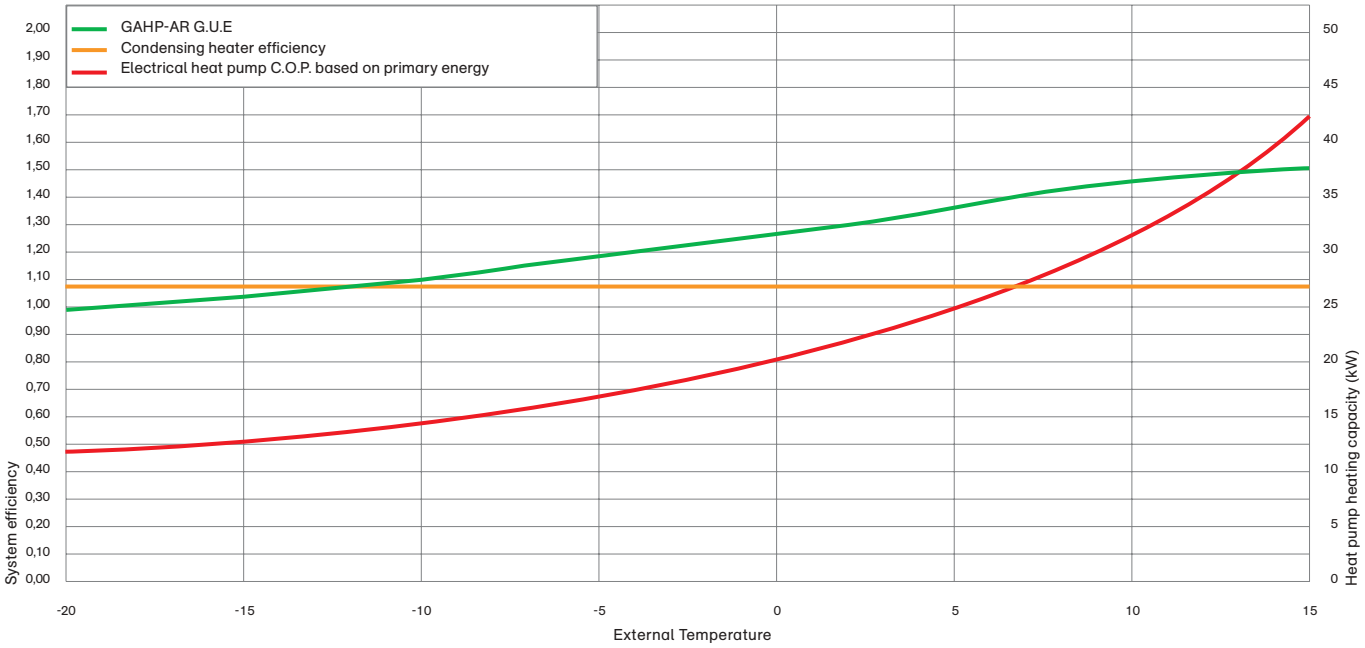
Energie efficiency of Robur's GAHP-AR unit in comparison to other alternative systems



Electric heat pump: efficiency-primary energy ratio.



GAHP-AR heat pump: efficiency-primary energy ratio.



GAHP-AR gas utilization efficiency (G.U.E.) in comparison to condensing boilers and electric (electrical/primary energy conversion factor 0,36%) (2) at the average winter temperature and at the average water temperature of 50 °C.

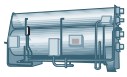
	Moscow	Berlin	New York	Tokyo	Paris	Rome
Winter average T (°C)	-3.7	3.6	4.3	7	7	10.6
Project T (°C)	-20	-12.4	-10	0	-6	0

(1) Nominal conditions. For further information, see the table.

(2) Italian DL192, Attachment I, Article 11.

Due to continuous product innovation and development, Robur reserves the right to change product specifications without prior notice.

Advantages of Robur's GAHP-AR absorption heaters in comparison to other alternative systems

alternative systems	GAHP-AR economic advantages	GAHP-AR energy advantages	GAHP-AR plant advantages
Electric heat pumps 	Coverage of project temperature, thanks to high efficiency when external temperature is down to -20 °C.	They reduce additional electricity requirements and CO_2 emissions in every continental climate (see table 17).	They do not require back up systems such as addition heaters or electric resistance. No additional power application is required.
Traditional boilers + chiller  	They avoid additional electricity requirements and the need to install extra electrical cabinets and/or transformer rooms for medium-to-high power requirements during the summer.	They offer higher efficiency in heating mode (as much as 50% higher or more).	They do not require hydraulic or electrical connections between boiler and chiller.
Heat pumps with endothermic motors 	They require less maintenance as they do not use either compressors or engines (of the automotive conception).	They offer greater efficiency in heating mode.	They do not require a hydronic kit for distributing energy by means of hydraulic piping.
LiBr absorbers  	Electricity supply is limited to periods of actual use. They therefore do not require a permanent power supply during the months in which they are not used.	They provide greater efficiency in heating mode.	They use an air-based battery and therefore do not require an evaporative tower and the relative water purification and treatment plants.
VRV air conditioning systems 	They reduce additional electricity requirements thanks to high efficiency when external temperature down to -20 °C.	They are particularly economical when heating needs are greater than cooling needs (efficiency in heating mode of over 150%).	They do not require periodic topping up with refrigerant. They use water for distributing heat in rooms and not refrigerant directly.

			GAHP-AR	RTAR [1] 120-240	RTAR [1] 180-360	RTAR [1] 240-480	RTAR [1] 300-600
OPERATION IN HEATING MODE [2]							
Heating capacity [3]		kW	35.30	70.60	105.90	141.20	176.50
G.U.E. heating efficiency based on gas consumption			1.40	1.40	1.40	1.40	1.40
Water flow rate	nominal (ΔT = 10 °C)	m³/h	3.04	6.08	9.12	12.16	15.20
	maximum	m³/h	5	10	15	20	25
	minimum	m³/h	1.4	2.8	4.2	5.6	7.0
Pressure drop at nominal flow rate		kPa	29	31	31	31	31
Outside air temperature dry bulb	maximum	°C	35	35	35	35	35
	minimum	°C	-20	-20	-20	-20	-20
Inlet water temperature	maximum	°C	50	50	50	50	50
	minimum	°C	2	2	2	2	2
Maximal outlet water temperature (ΔT = 10 °C)		°C	60	60	60	60	60
OPERATION IN COOLING MODE [4]							
Cooling capacity [5]		kW	16.9	33.80	50.70	67.60	84.50
G.U.E. cooling efficiency based on gas consumption			0.67	0.67	0.67	0.67	0.67
Water flow rate	nominal (ΔT = 5 °C)	m³/h	2.9	5.8	8.7	11.6	14.5
	maximum	m³/h	3.2	6.4	9.6	12.8	16.0
	minimum	m³/h	2.5	5.0	7.5	10.0	12.5
Pressure drop at nominal flow rate		kPa	31	33	33	33	33
Outside air temperature	maximum	°C	45	45	45	45	45
	minimum	°C	0	0	0	0	0
Inlet water temperature	maximum	°C	45	45	45	45	45
	minimum	°C	6	6	6	6	6
Minimum outlet water temperature		°C	3	3	3	3	3
BURNER FEATURES							
Nominal heating input		kW	25.2	50.4	73.6	100.8	126.0
Gas consumption	natural gas G20 [6]	m³/h	2.67	5.34	8.01	10.68	13.35
	natural gas G25 [7]	m³/h	3.10	6.20	9.05	12.40	15.50
	LPG G30/G31 [8]	kg/h	1.96	3.92	5.88	7.84	9.80
ELECTRICAL DATA							
Required voltages			230 V – 50 Hz		400 V 3N - 50 HZ		
Nominal electrical power [9] GAHP-AR and RTAR SC	standard version	kW	0.9	1.8	2.7	3.6	4.5
	low noise version	kW	0.93	1.86	2.79	3.72	4.65
Nominal electrical power [9] RTAR CC	standard version	kW	- -	2.14	3.21	4.28	5.35
	low noise version	kW	- -	2.2	3.3	4.4	5.5
INSTALLATION DATA							
Weight in operation GAHP-AR and RTAR SC		kg	380	940	1.390	1.860	2.320
Weight in operation RTAR CC		kg	- -	950	1.450	1.880	2.345
Sound pressure at 10 meters [10]	standard version	dB(A)	54	57	59	60	61
	low noise version	dB(A)	49	52	54	55	56
Connections	water	"	1 1/4 F	2 M	2 M	2 M	2 M
	gas	" F	3/4	1 1/2	1 1/2	1 1/2	1 1/2
	flue exhausted pipe	mm	80	80	80	80	80
Dimensions	width	mm	850	2315	3610	4940	6490
	depth	mm	1240	1240	1240	1240	1240
	height - standard version	mm	1290	1400	1400	1400	1400
	height - low noise version	mm	1540	1650	1650	1650	1650

[1] Values for SC and CC versions

[2] Nominal conditions according to EN 12309-2 norm, table 12.

[3] Features under nominal conditions: outside air temperature dry/wet bulb 7/6 °C - outlet water 50 °C.

[4] Nominal conditions according to EN 12309-2 norm, table 5.

[5] Features under nominal conditions: outside air temperature 35 °C - outlet water 7 °C.

[6] Lower heating value 34.02 MJ/m³ (9.45 kWh/m³) at 15 °C - 1013 mbar.

[7] Lower heating value 29.25 MJ/m³ (8.13 kWh/m³) at 15 °C - 1013 mbar.

[8] Lower heating value 46.34 MJ/kg (12.87 kWh/kg) at 15 °C - 1013 mbar.

[9] ±10% tolerance to allow for different electrical voltage and power absorption of the electrical motors.

[10] Free field, frontally, direction factor 2.

Due to continuous product innovation and development, Robur reserves the right to change product specifications without prior notice.

PERFORMANCES AT DIFFERENT USE CONDITIONS *

HEATING CAPACITY (KW) AR-RTAR

Outside air temperature dry bulb (°C)	Outlet water temperature (°C)							
	30 °C (ΔT = 10 °C)		45 °C (ΔT = 10 °C)		50 °C (ΔT = 10 °C)		60 °C (ΔT = 10 °C)	
	P_T	G.U.E.	P_T	G.U.E.	P_T	G.U.E.	P_T	G.U.E.
-20	27.30	1.08	24.90	0.99	24.90	0.99	24.30	0.96
-15	28.50	1.13	26.20	1.042	25.80	1.02	25.10	1.00
-10	30.90	1.23	27.70	1.10	27.00	1.07	26.40	1.05
-7	32.80	1.30	29.40	1.17	28.40	1.13	28.00	1.11
2	36.30	1.44	34.80	1.38	32.20	1.28	30.00	1.19
7	37.90	1.50	37.50	1.49	**35.30**	1.40	33.00	1.31
10	38.60	1.53	38.40	1.52	36.40	1.44	34.50	1.37
15	39.30	1.56	39.10	1.55	37.60	1.49	35.80	1.42
20	39.50	1.57	39.40	1.56	37.90	1.50	36.30	1.44
25	39.50	1.57	39.40	1.56	38.00	1.51	37.00	1.47

P_T Heating output (kW)

G.U.E. Gas utilization efficiency calculate on real thermal input (EN 12309-2 norm)

*** NOTE:** To obtain performance values of RTAR, multiply as follows:

RTAR 120-240 value AR x 2

RTAR 180-360 value AR x 3

RTAR 240-480 value AR x 4

RTAR 300-600 value AR x 5

Gas absorption heat pump for geothermal plants for indoor installation.

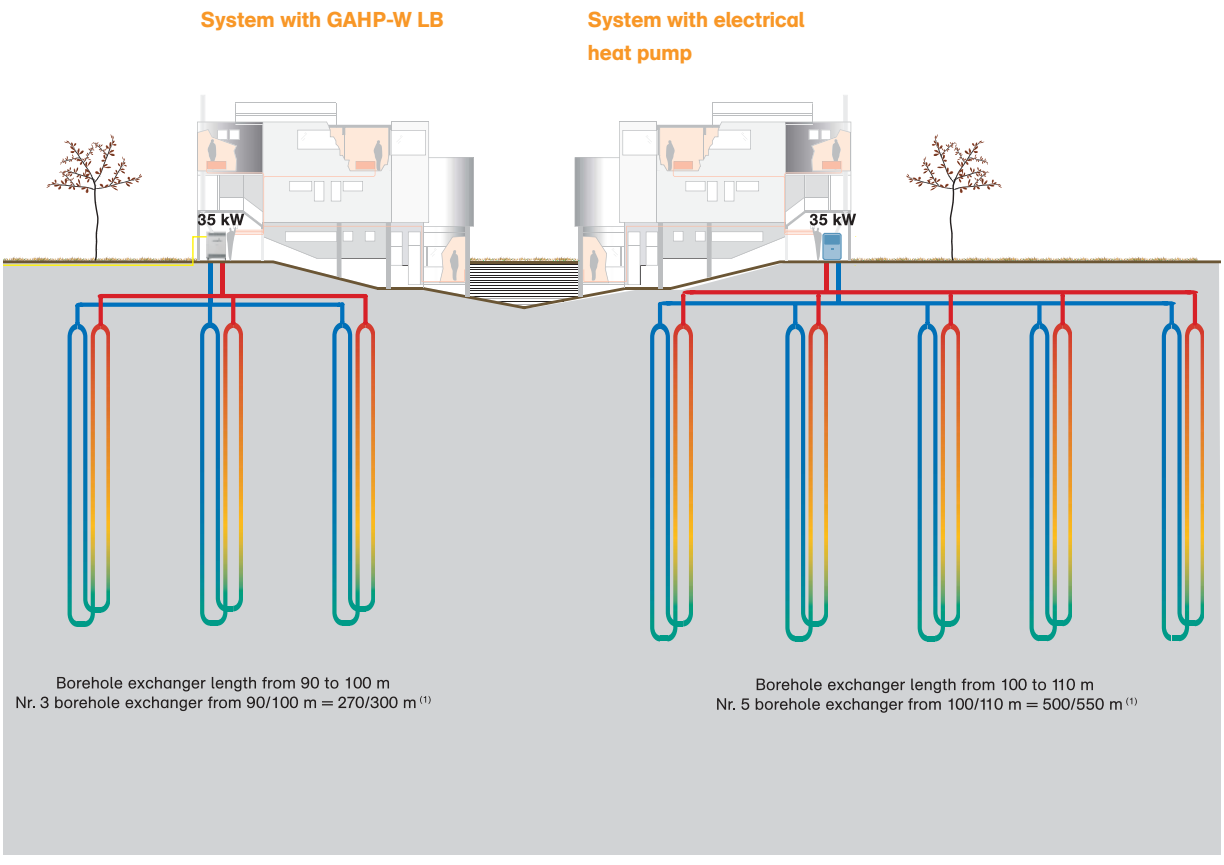
GAHP product line W LB Type
For geothermal systems

Absorption heat pump, for highly efficient heating.
The GAHP-W LB units can be used to produce hot water up to 60 °C and they can provide heating capacity from 35 to 175 kW.
The GAHP-AR units are available in modular thermal groups, premounted on frames and supplied by a controller.

How it works

This version is designed to recover renewable energy from geothermal systems.

The GAHP-W LB can recover underground heat thanks to the borehole exchanger. The unit is connected to two separate hydronic circuits: one at low temperature (evaporator) and one at high temperature (condenser and absorber). This allows high efficiency performances. The GAHP-W LB unit, when combined to a geothermal system, can reduce to 40% the borehole exchanger length in comparison to other electrical heat pumps. Although the thermal energy is the same, a smaller and cheaper geothermal system is required.



(1) Value for guidance only. Values depend on electrical heat pump C.O.P. and on the linear thermal exchange coefficient of vertical loop.

Due to continuous product innovation and development, Robur reserves the right to change product specifications without prior notice.

Advantages

- **Reduction in geothermal borehole exchanger size up to 40%**, in comparison to the best electric heat pumps.
- **High energy efficiency. Reduction in energy demand of 90%** (0.54 kWe required to produce 35 kW heating capacity).
- **Environmental friendly refrigerants.** A small amount of refrigerant fluid, about 2/3 of water and 1/3 of ammonia, is environmentally friendly. It is not subject to any international limit.
- **No additional energy source is required.**
- **Combination with ice storage system.**
- **Additional advantages of the whole GAHP product line:**
  - high reliability thanks to just a few moving components;
  - easy maintenance, similar to gas boilers;
  - no water consumption;
  - environmental-friendly refrigerants (the unit do not require topping up with refrigerant) (Italian DPR 147/2006).

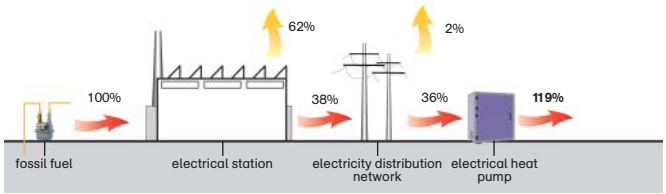
Main applications

The Robur GAHP-W LB gas fired absorption heat pump gets heat from a low temperature source, such as ground.

The ground heat can be recovered by using a geothermal system.
The GAHP-W LB unit can be used to heat from a low temperature source obtaining very high efficiency.

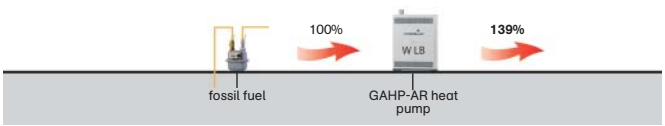
Advantages of Robur's GAHP-W LB absorption heaters in comparison to other alternative systems

External T 50 °C
C.O.P. 3,3



Electric heat pump: efficiency-primary energy ratio.

External T 50 °C
G.U.E. 139%



GAHP-W LB heat pump: efficiency-primary energy ratio.

alternative systems		GAHP-W LB economic advantages	GAHP-W LB energy advantages	GAHP-W LB plant advantages
Electrical heat pumps		They require smaller geothermal borehole exchangers (up to 40%) in comparison to the best electrical heat pumps.	They reduce primary energy demand and CO_2 emissions. Designed for systems working at higher temperatures (45 °C- 60 ° C).	Reduction in energy demand of 90% (0.54 kWe required to produce 35 kW heating capacity). No additional power source is required.

OPERATION IN HEATING MODE (1)

Heating capacity (W10/W50)		kW	35.0
Recovered heating capacity		kW	13.5
G.U.E. - gas utilization efficiency			1.39
Water flow rate	nominal (ΔT = 10 °C)	m³/h	3.0
	maximum	m³/h	5.0
	minimum	m³/h	1.4
Pressure drop at nominal flow rate		kPa	32
Inlet water temperature	maximum	°C	50
	minimum	°C	2
Outlet water temperature	maximum	°C	60
Chilled water flow (ΔT = 5 °C)		m³/h	2.5

BURNER FEATURES

Nominal heating input		kW	25.2
Gas consumption	natural gas G20 (2)	m³/h	2.67
	natural gas G25 (3)	m³/h	3.10
	LPG G30/G31 (4)	kg/h	1.96

ELECTRICAL DATA

Required voltages			230 V – 50 Hz
Nominal electrical power (5)		kW	0.54

INSTALLATION DATA

Weight on operation		kg	286
Sound pressure (6)	at 10 meters	dB(A)	47
Connections	water	" F	1 1/4
	gas	" F	3/4
	flue exhausted pipe	mm	80
Dimensions	width	mm	842
	depth	mm	655
	height	mm	1310

PERFORMANCES AT DIFFERENT USE CONDITIONS

Inlet water temperature evaporator (°C)		Outlet water temperature consenser (°C)									
		25 °C (ΔT = 10 °C)		30 °C (ΔT = 10 °C)		40 °C (ΔT = 10 °C)		50 °C (ΔT = 10 °C)		60 °C (ΔT = 10 °C)	
		P_T	G.U.E.	P_T	G.U.E.	P_T	G.U.E.	P_T	G.U.E.	P_T	G.U.E.
-2	ΔT = 3 °C	38.8	1.54	38.6	1.53	37.3	1.48	34.5	1.37	31.8	1.26
0	ΔT = 5 °C	39.0	1.55	38.9	1.54	38.0	1.50	**35.0** (1)	1.39	32.8	1.30
5	ΔT = 5 °C	39.2	1.55	39.2	1.55	38.6	1.53	36.2	1.44	34.1	1.35
10	ΔT = 5 °C	39.2	1.55	39.2	1.55	39.0	1.55	37.6	1.49	36.0	1.43
12	ΔT = 5 °C	39.2	1.55	39.2	1.55	39.0	1.55	37.6	1.49	36.0	1.43
15	ΔT = 5 °C	39.2	1.55	39.2	1.55	39.2	1.55	38.4	1.52	37.3	1.48

P_T Heating output (kW)
G.U.E. Gas utilization efficiency calculate on real thermal input (EN 12309-2 norm).
(1) Performances according to the unit at nominal conditions.

(1) Nominal conditions according to EN 12309-2 norm, table 12.
(2) Lower heating value 34.02 MJ/m³ (9.45 kWh/m³) at 15 °C - 1013 mbar.
(3) Lower heating value 29.25 MJ/m³ (8.13 kWh/m³) at 15 °C - 1013 mbar.
(4) Lower heating value 46.34 MJ/kg (12.87 kWh/kg) at 15 °C - 1013 mbar.
(5) ±10% tolerance to allow for different electrical voltage and power absorption of the electrical motors.
(6) Free field, frontally, directivity factor 2.

Note: Performances achieved with 25% anti-freezing fluid in the chilled water-evaporator circuit.

Due to continuous product innovation and development, Robur reserves the right to change product specifications without prior notice.

Gas absorption heat pump, for indoor installation, to provide simultaneously hot and chilled water.

GAHP product line W Type

Gas absorption heat pump provides simultaneously hot and chilled water

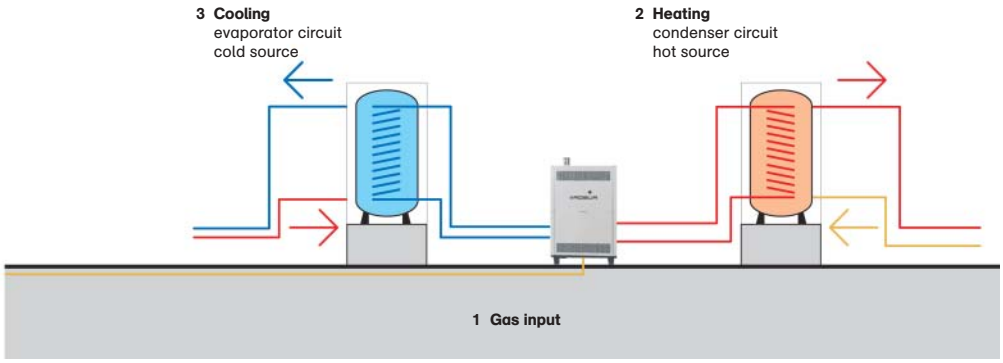
The absorption heat pump can provide simultaneously hot water up to 65 °C and chilled water down to 3 °C.
The GAHP-W unit supplies heating capacity from 38.8 kW to 194 kW and at the same time cooling capacity from 18.4 kW to 92 kW.

GAHP-W units are available individually and in modular thermal groups premounted on frames and supplied by a controller.

How it works

This version is designed to heat and cool simultaneously, thanks to 2 different hydronic loops.

This unit has two different circuit: one at low temperature (evaporator) down to 3 °C and one at high temperature (condenser) up to 65 °C. The Robur GAHP-W unit uses only 2.72 m³/h of natural gas (25.2 kW) (1) and supplies heating capacity up to more than 38 kW (2) and at the same time cooling capacity up to 16 kW (3) for a total of 54 kW.



How it works

Depending upon needs, the Robur GAHP-W unit can be used for simultaneously heating and cooling.
The Robur GAHP-W gas fired absorption heat pump can be used in process applications (fig.1) for the simultaneous use of hot and chilled water with efficiency over 227%.
The unit can be use for heating and cooling in large plant.
According to the needs, hot water can be used in winter, recovering heating capacity from a low temperature source.
In summer, the Robur GAHP-W unit can be used for air-conditioning. The exceeding thermal energy will be accumulated in the condenser or used again (for example water preheating) (fig.2).

fig. 1

thermal input (gas)	100%
thermal capacity	154%
cooling capacity	73%
total efficiency	227%

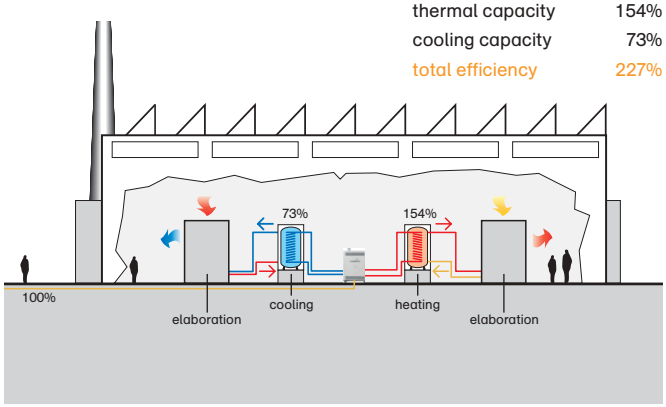
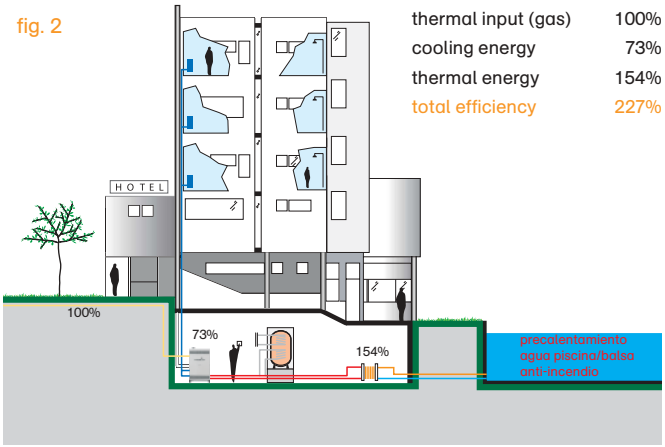


fig. 2

thermal input (gas)	100%
cooling energy	73%
thermal energy	154%
total efficiency	227%



Advantages

- When using simultaneously hot and chilled water, **no additional energy source is required.**
- **Reduction in energy demand of 90%** (0.54 kWe required to produce 38.8 kW heating capacity and 18.4 kW cooling capacity).
- **High energy efficiency.** The Robur GAHP-W unit gets gas energy efficiency up to over 227%, powered by the heat of gas combustion and by recovering free renewable energy.
- **No additional power application is required.**
- **Additional advantages of GAHP product line:**
  - high reliability thanks to just a few moving components;
  - easy maintenance, similar to gas boilers;
  - no water consumption;
  - environmental-friendly refrigerants (the unit do not require topping up with refrigerant) (Italian DPR 147/2006).

Main Applications

The Robur GAHP-W unit is designed for systems requiring heating and cooling capacity simultaneously.
This version can simultaneously produce hot water up to 65 °C and chilled water down to 3 °C.

CONDENSER PERFORMANCE CONDITIONS (1)

Heating capacity (W10/W50)		kW	38.8
Water flow rate	nominal (ΔT = 10 °C)	m³/h	3.3
	maximum	m³/h	5.0
	minimum	m³/h	1.4
Pressure drop at nominal flow rate		kPa	38
Inlet water temperature	maximum	°C	50
	minimum	°C	2
Outlet water temperature	maximum	°C	65
Chilled water flow (ΔT = 5 °C)		m³/h	2.8

EVAPORATOR PERFORMANCE CONDITIONS (2)

Cooling capacity (W7/W40) (3)		kW	18.4
Water flow rate	nominal (ΔT = 5 °C)	m³/h	3.2
	maximum	m³/h	4.7
	minimum	m³/h	2.3
Pressure drop at nominal flow rate		kPa	37
Inlet water temperature	maximum	°C	45
	minimum	°C	6
Outlet water temperature	minimum	°C	3
Hot water flow (ΔT = 10 °C)		m³/h	3.6

BURNER FEATURES

G.U.E. cooling efficiency based on gas consumption (4)			2.27
Nominal heating input		kW	25.2
Gas consumption	natural gas G20 (5)	m³/h	2.67
	natural gas G25 (6)	m³/h	3.10
	LPG G30/G31 (7)	kg/h	1.96

ELECTRICAL DATA

Required voltages	230 V – 50 Hz	
Nominal electrical power (8)	kW	0.54

INSTALLATION DATA

Weight on operation		kg	286
Sound pressure (9)	at 10 meters	dB(A)	47
Connections	water	" F	1 1/4
	gas	" F	3/4
	flue exhausted pipe	mm	80
Dimensions	width	mm	842
	depth	mm	655
	height	mm	1310

Evaporator inlet temperature (°C)		Condenser outlet temperature (°C)											
		25 °C (ΔT = 10 °C)		30 °C (ΔT = 10 °C)		40 °C (ΔT = 10 °C)		50 °C (ΔT = 10 °C)		60 °C (ΔT = 10 °C)		65 °C (ΔT = 15 °C)	
		P_T	P_F	P_T	P_F	P_T	P_F	P_T	P_F	P_T	P_F	P_T	P_F
6	ΔT = 3 °C	41.7	19.0	41.6	18.5	40.6	17.5	36.6	14.2	34.5	12.1	33.4	11.2
10	ΔT = 5 °C	42.0	19.1	41.8	18.8	41.3	18.2	**38.8** (10)	16.0	36.7	14.6	35.5	13.4
12	ΔT = 5 °C	42.0	19.1	41.8	18.8	41.4	**18.4** (10)	39.5	16.8	37.8	15.6	36.6	14.5
15	ΔT = 5 °C	42.0	19.1	41.8	18.8	41.5	18.7	40.3	17.7	39.1	16.7	38.0	15.4
20	ΔT = 5 °C	42.0	19.1	41.8	18.8	41.5	18.8	40.9	18.3	40.3	17.8	39.4	17.0
45	ΔT = 5 °C	- -	- -	- -	- -	- -	- -	40.9	18.3	40.7	18.1	40.2	17.6

(1) Nominal conditions according to EN 12309-2 norm, table 12.
(2) Nominal conditions according to EN 12309-2 norm, table 5.
(3) Characteristics under nominal conditions: outside air temperature 30 °C - outlet water 7 °C.
(4) Simultaneous utilization of thermal and cooling energy.
(5) Lower heating value 34.02 MJ/m³ (9.45 kWh/m³) at 15 °C - 1013 mbar.
(6) Lower heating value 29.25 MJ/m³ (8.13 kWh/m³) at 15 °C - 1013 mbar.
(7) Lower heating value 46.34 MJ/kg (12.87 kWh/kg) at 15 °C - 1013 mbar.
(8) ±10% tolerance to allow for different electrical voltage and power absorption of the electrical motors.
(9) Free field, frontally, directivty factor 2.
(10) Performances according to the unit at nominal conditions.

P_T Heating output (kW)
P_F Cooling output (kW)

Due to continuous product innovation and development, Robur reserves the right to change product specifications without prior notice.

Standard equipment and accessories

Standard equipment

All Robur GAHP units are supplied as standard with:
- base in galvanised steel;
- combustion exhaust duct complete with terminal to be installed on the left-hand side of the unit.

Accessories

Direct Digital Control (DDC)
A single device for the regulation, control and complete management of the unit's operation.
Its functions include the following:
- management of up to 16 modules (single or preassembled) connected to the same hydraulic circuit, and up to 48 modules connected to another two DDCs;
- programming of operation in heating and/or cooling mode using 4 time bands and with differentiated water temperatures;
- constant control of inlet and outlet temperatures of hot and cold water to and from the plant;
- sequential management of units;
- switching on and off of the plant via an external command;
- visual and acoustic warnings of operating alarms of each individual unit;
- chronological display of previous alarms;
- ready to connect to remote alarm systems;
- compatibility with communication protocol Mod-Bus RTU, interfacing BMS systems (building management system). (1)

Can bus connecting cable
For connecting the direct digital control to the GAHP units (supplied by the metre).

Anti-vibration mount kit
Consisting of 4 elastic rubber feet to install under the base of the units.

"Mosé" hydraulic separator
For equilibration of hydraulic circuits, complete with automatic air bleed valve, discharge valve and insulation.

Anti-vibration joints for hydraulic connections (2)
Length 400 mm, suitable for cold and hot water.

(1) Available on demand (firmware DDC 4.0 type).

(2) While stocks last.

Robur also produces

Gas fired absorption chiller and chiller-heaters for heating, cooling, refrigeration and process applications.

Outdoor modular gas fired thermal links for hot water production.

Natural gas/LPG absorption systems for cooling and heating.

Gas-fired unit heaters for commercial and industrial areas.

Combined gas heating system. This two-piece heater comprising boiler and ventilation unit provides rapid solutions for countless heating requirements.

Forced draught gas-fired radiators ideal for small/medium areas.

Air barriers to decrease heat loss due to frequent opening of industrial and commercial doors.

Codice: X-DPL190 - Rev. 01 - 02/2007

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caring for the environment

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