

clausius

COP

AIT Austria

1

5.

New generation of ground source heat pumps

Domestic, high power and high temperature ranges



Rudolf CLAUSIUS (1822-1888)

German physicist who enunciated the 2nd Law of Thermodynamics applied to Heat Pumps and Refrigeration Systems. He is considered to be one of the first ecologists, soon in 1885 predicted, "...the future of humanity depends on being able to feed our industries and machines with the only contest of renewable energy..."

CLAUSIUS

CLAUSIUS is a new generation of ground source heat pumps that emerged after many years of serious and rigorous research at the University of Vigo.

At CLAUSIUS we design and develop only ground source heat pumps, which has allowed us to achieve a high degree of especialisation in this type of equipment. In these years we have managed to make CLAUSIUS a synonym of continuous innovation and incorporation of the latest technology in ground source heat pumps. We work every day with the sole objective of developing the most reliable and efficient ground source heat pumps on the market.

At CLAUSIUS the reliability of our heat pumps has become our obsession, with an awareness that it is only possible for us to deliver this reliability by using the best available components and testing our heat pumps one by one ourselves. All our heat pumps are fully tested in our laboratory before being shipped to any customer. We believe that only by testing each heat pump one by one is it possible for us to guarantee its reliability once installed.

At CLAUSIUS we control the brain... another important lesson learned through many years of experience is that the control system in a heat pump is what really makes the difference, that is why we develop and improve the control software of our heat pumps day by day, considering the opinions and requirements of our customers.

At CLAUSIUS we do not care if they follow us... it means that we are ahead...

Universida_{de}Vigo





Bundesamt für Wirtschaft und Ausfuhrkontrolle



Netherlands Enterprise Agency



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CLAUSIUS GROUND SOURCE HEAT PUMPS

Advantages

- **COP of 5.01.** The highest COP reached by an inverter ground source heat pump since 2015.
- Domestic Hot Water (DHW) up to 80 °C. New DHW production system with desuperheater that allows reaching DHW temperatures up to 80 °C depending on the heat pump operating conditions.
- High power with inverter system. Up to 150 kW with the new Copeland Inverter Technology.
- Accessibility. New lift opening system that allows an easy access to all components inside the unit.
- **Customised configuration.** CLAUSIUS ground source heat pumps can be configured according to the requirements of each installation, being able to integrate the production of active cooling, passive cooling and/or desuperheater for production of DHW at high temperature, as well as simultaneous production of heating-DHW, cooling-DHW, heating-swimming pool and cooling-swimming pool.
- Internet connection, solar photovoltaic integration and Smart Grid. All our heat pumps can be connected to the Internet and are prepared for their integration with photovoltaic installations and Smart Grid.
- Premium quality. We incorporate only premium brand European components of the best existing manufacturers.
- Integrated climate control and DHW production. They integrate heating, cooling and domestic hot water services in one compact unit.
- **Passive cooling.** They allow passive cooling production with an extremely low cost and low energy consumption, exceeding Air Source heat pumps technologically.
- Silent. They do not require noisy fans and do not generate air drafts, as all their components are silent and sound insulated inside the case.
- Comfort for users. They are controlled with simple thermostats and do not require any user interaction, providing great comfort.
- Clean and safe. They do not require any type of fuel and do not generate flames or smoke, so they do not need fuel storage tanks or chimneys.
- No visual impact. They do not require any elements on the outside, all components are buried or inside the house.
- Reliable. Twenty years 'fit and forget' lifespan. Installations with ground source heat pumps require minimal maintenance and have a long life by using a simple, proven, well-known and very reliable technology
- Efficiency. Market leading ErPA+++ rating. Energy efficiency and economic savings. They provide a far more energy efficiency than traditional systems and other types of heat pumps, so the cost of heating is drastically reduced, achieving significant savings.





CLAUSIUS TECHNOLOGY

Inverter technology, with three power ranges, 1 to 10 kW, 3 to 15 kW and 5 to 25 kW.

INVERTER 1-10 kW 3-15 kW 5-25 kW

The highest COP in the market for ground source heat pumps with inverter technology since 2015, certified by the Austrian Institute of Technology, according to EN14511.



Copeland inverter technology and scroll compressors, the best inverter technology available in the market. We incorporate Inverter heat recovery that improves efficiency and reliability.



Alfa Laval asymmetric plate heat exchangers, the most efficient heat exchange technology currently available.

R410A refrigerant, maximum efficiency with low environmental impact.

Carel electronic expansion valve for an accurate control of the refrigerant flow in the evaporator.

Wilo high efficiency variable speed pumps (Class A), for an optimum flow control in both brine and heating circuits.



R410A

Connection to photovoltaic installations. Energy surpluses management, control of the power produced by the heat pump, control of periods with different electricity rates and compatible with Smart Grid systems.



CLAUSIUS TECHNOLOGY

New DHW production system up to 80 °C without electrical heaters (patented system). No specific antilegionella treatment is required. Built in on Elite models with a tank capacity of 200 l and optional in Classic models with tank storage capacities of 250 l, 300 l and 500 l. Customised configuration. Our heat pumps are customised for each application, being able to select between heating and DHW production, active cooling, passive cooling and the incorporation of a desuperheater for the production of DHW at high temperature and the simultaneous production of heating and cooling with DHW or swimming pool. Minimum acoustic level. Specific acoustic insulation system for the compressor and the refrigeration module. Use of different insulation materials to attenuate a higher frequency range. Accessibility. New lift opening system (patented), that allows an easy access to all components inside the unit. Easy and compact installation. With an inverter system, the use of buffer tanks is not required, so that the installation is very simple and requires less space, reducing installation and assembly costs. New control strategies. More efficient, reliable and secure installations. Online monitoring and inspection. Remote access, preventive maintenance and higher reliability.

Connection to photovoltaic installations. Energy surpluses management, control of the power produced by the heat pump, control of periods with different electricity rates and compatible with Smart Grid systems.





CLASSIC CONFIGURATION

clausius

- POWER ranges from 1 to 10 kW / 3 to 15 kW / 5 to 25 kW
- COPs 4.63 / 4.61 / 5.01, according to EN14511
- EERs 6.5 / 6.4 / 6.8, according to EN14511
- Single phase and three phases electrical power supply in all ranges
- R410A refrigerant
- Electronic expansion valve
- Built in Class A variable speed circulation pumps
- Built in expansion vessels and security valves
- Built in 3-way valve for DHW production
- Built in energy counters, COP, EER and SPFs
- Built in pressure sensors in both brine and heating circuits
- Market leading noise reduction enabling flexible plant room location
- New control strategies
- Control through climate regulation
- Control for 2 climate zones
- Swimming pool control
- Special programs, floor drying, air venting program, etc
- Limitation of maximum powers through software
- Possibility of cascading up to 9 units
- Tested one by one on the test bench

CUSTOMISED CONFIGURATION

The highest COP in the market with inverter technology since 2015.

Copeland inverter technology.



CLASSIC COMPONENTS



WE MANUFACTURE WITH THE BEST COMPONENTS IN THE MARKET



• Optional integration of a desuperheater system for high temperature DHW production and simultaneous production of heating and DHW or swimming pool, and cooling with DHW or swimming pool

• Optional integration of a passive cooling system

• Optional use of a DHW tank with built-in desuperheater for the production of DHW at high temperature Optional control with "Clausius Advance Control"

MODELS IN THREE POWER RANGES, 1-10 KW, 3-15 KW AND 5-25 KW

Н	Heating
HC	Heating and active cooling
H PC	Heating and passive cooling
HC PC	Heating, active cooling and built-in passive cooling
H DS	Heating and desuperheater
HC DS	Heating, active cooling and desuperheater
H PC DS	Heating, built-in passive cooling and desuperheater
HC PC DS	Heating, active cooling, built-in passive cooling and desuperheater

ELITE CONFIGURATION

clausius

• 200 I DHW tank made of stainless steel AISI 316

• DHW production system up to 80 °C without electric heaters, through a built-in desuperheater

- Power ranges from 1 to 10 kW / 3 to 15 kW / 5 to 25 kW
- COPs 4.63 / 4.61 / 5.01, according to EN14511
- EERs 6.5 / 6.4 / 6.8, according to EN14511
- Single phase and three phases electrical power supply in all ranges
- R410A refrigerant
- Electronic expansion valve
- Built in expansion vessels and security and drainage valves
- Built in Class A variable speed circulation pumps
- Built in energy counters, COP, EER and SPFs
- Built in pressure sensors in both brine and heating circuits
- Market leading noise reduction enabling flexible plant room location
- New control strategies
- Control through climate regulation
- Control of 2 climate zones
- Swimming pool control
- Special programs, floor drying, air venting program, etc
- Limitation of maximum powers through software
- · Possibility of cascading up to 9 units
- Tested one by one on the test bench

CUSTOMISED CONFIGURATION

- Optional integration of a passive cooling system
- Optional control with "Clausius Advance Control"

MODELS IN THREE POWER RANGES, -10 KW, 3-15 KW AND 5-25 KW

Н	Heating and DHW production with a built-in tank
HC	Heating, DHW production with a built-in tank and active cooling
H PC	Heating, DHW production with a built-in tank and passive cooling
HC PC	Heating, DHW production with a built-in tank, active and passive cooling

NEW SYSTEM

New DHW production system up to 80 °C, patented system.

200 liters of hot water up to 80 °C without electric heaters.



ELITE COMPONENTS



WE MANUFACTURE WITH THE BEST COMPONENTS IN THE MARKET



wild Danfoss Honeywell

TECHNICAL SPECIFICATIONS

		H 1-10 (classic / elite)	HC 1-10 (classic / elite)	H 3-15 (classic / elite)	HC 3-15 (classic / elite)	H 5-25 (classic / elite)	HC 5-25 (classic / elite)		
Applications	Heating and DHW	•	•	•	•	•	•		
	Active cooling		•		•		•		
Power	Heating (kW)	1 - 10	1 - 10	3 - 15	3 - 15	5 - 25	5 - 25		
	Active cooling (kW)		2 - 11 4 - 16.5						
	Electrical consumption (kW)	0.4 - 2.1	0.4 - 2.1	0.8 - 3.3	0.8 - 3.3	1.3 - 5.6	1.3 - 5.6		
Power supply	230 V 1/N/PE ⁻	•	•	•	•	•	•		
	400 V 3/N/PE~	•	•	•	•	•	•		
Performance	COP ¹	4.63	4.63	4.61	4.61	5.01	5.01		
	EER		6.5		6.4		6.8		
DHW Tank		External / Integrated (200 l)	External / Integrated (200 l)	External / Integrated (200 l)	External / Integrated (200 l)	External / Integrated (200 l)	External / Integrated (200 l)		
Refrigerant	Туре	R410A							
	Load (kg)	1.1 / 1.25	1.0 / 1.5	1.5 / 1.75	1.5 / 1.75	1.8 / 2.1	1.8 / 2.1		
Dimensions	Height x Width x Depth (mm)		Classic 1040 x 600 x 800 / Elite 1850 x 600 x 800						
Connections	Brine and heating	1"							
	DHW	1" / 3/4"							
Weight	(kg)	147 / 227	158 / 238	163 / 243	174 / 254	168 / 248	179 / 259		
Sound level	(dB)	42							

¹According to EN14511 under conditions 0/-3 °C and 30/35 °C

Energy labelling, product sheets and technical documentation according to Delegated Regulation (UE) N° 811/2013.

A+++

OPTIONAL EQUIPMENT

Passive cooling in CLASSIC & ELITE

In CLASSIC and ELITE configurations and in all H and HC models, we can integrate a passive cooling production system.

The passive cooling system consists of one heat exchanger and its corresponding 3-way valves in both brine and heating circuits.



Simplified scheme of the passive cooling production system.

In all models, activation and control of passive cooling production is carried out by the heat pump itself. In models HC PC, it is possible to select between different options, only passive cooling production, only active cooling production, or both. In case of using both systems (passive and active cooling), the heat pump always decides the optimal production system, giving priority to passive cooling.

Built-in desuperheater in CLASSIC models

In CLASSIC configuration and in all H and HC models, a system with desuperheater can be integrated.



Simplified scheme of a CLASSIC HC with desuperheater

25 25 25 4208

R





The system with desuperheater allows the production of DHW at high temperature as well as a simultaneous production of heating and DHW or swimming pool and cooling with DHW or swimming pool in HC DS models.

The desuperheater system consists of one heat exchanger (desuperheater), a circulation pump and the corresponding valves and control system. Our desuperheater system allows:

· Simultaneous production of heating and DHW at high temperature. • Simultaneous production of cooling and DHW at high temperature.

- · Simultaneous production of heating and swimming pool.
- · Simultaneous production of cooling and swimming pool.

· Production of only DHW using the condenser and desuperheater simultaneously, which increases the efficiency of the heat pump in these processes.

DHW tanks with built-in desuperheater in CLASSIC models

In CLASSIC configuration, all H and HC models can be combined with a DHW tank with desuperheater to produce DHW at high temperature.



Simplified scheme of a CLASSIC combined with an external tank with built-in desuperheater

Combination of CLASSIC models with DHW tank with desuperheater allows DHW production at temperatures up to 80 °C without electric heaters.

CLASSIC models combined with DHW tanks with desuperheater include all connection and control elements of the DHW production system and are supplied preloaded with refrigerant and with quick connections.

The capacities of CLAUSIUS DHW tanks with desuperheater available are 250, 300 and 500 liters. The use of these tanks enables to considerably increase the amount of DHW available. The use of a 500 liters tank with DHW at 80 °C would allow to obtain more than 1000 liters of DHW for domestic use at 38 °C.

OPTIONAL EQUIPMENT

CLAUSIUS Advance Control

In CLASSIC and ELITE configurations and in all models, we can integrate the CLAUSIUS Advance Control system.

The unique CLAUSIUS "Advance Control System" has been specifically designed by CLAUSIUS, allowing the control of complex installations, CLAUSIUS Air Source and CLAUSIUS Hybrid Systems, as well as the integration of the heat pumps with photovoltaic installations.

CLAUSIUS Advance Control incorporates all the functionalities of the CLAUSIUS Standard control system. Furthermore, adds the features that are detailed below.

• Control of 5 mixing groups.

• Independent control of 6 zones with heating and cooling thermostats.

- Control of the DHW recirculation system by temperature.
- Control of 3 in-line electric heaters.
- Control with flow switches in both brine and heating circuits.
- Simultaneous use of Th-tunes, Internet Kit and Data Acquisition Kit.
- Indoor temperature and humidity measurements.
- Control of bivalent systems through on-off of the complementary system.
- Control of secondary circuits from the buffer tank.
- Control of the CLAUSIUS ground-air source hybrid system.
- Control of the heat pump combined with photovoltaic systems

White finish, TULIP WHITE

All models in CLASSIC and ELITE configurations are also available in white finish.









CUSTOMISED CONFIGURATION

You can customise your CLAUSIUS domestic heat pumps for each application.

1º.- Choose configuration

CLASSIC, without built-in DHW tank

ELITE, with built-in DHW tank

2º.- Choose base model

- 🗌 H, heating and DHW
- ☐ HC, heating, DHW and active cooling

3º.- Choose power range and power supply

- 1-10, power range from 1 to 10 kW single phase
- □ 1-10 T, power range from 1 to 10 kW three phases
- □ 3-15, power range from 3 to 15 kW single phase
- □ 3-15 T, power range from 3 to 15 kW three phases
- 5-25, power range from 5 to 25 kW single phase
- 5-25 T, power range from 5 to 25 kW three phases

4°.- Add optional equipment

- □ PC, built-in passive cooling in all models and power ranges
- DS, desuperheater in CLASSIC models and all power ranges
- DHW tank with desuperheater

5°.- Choose finishes

- Red CLAUSIUS finish
- Tulip White finish

6º.- Choose accessories

- Advance control
- Internet connection kit
- Data acquisition kit
- ☐ Th-Tune control thermostat
- Replacement of circulation pump model Stratos Para 25/1-11 by model Stratos Para 25/1-12
- Temperature sensor
- 1500 W or 2000 W electric heater with thermostat for DHW tanks



CLAUSIUS STRONG 7-50 & 12-75 TECHNOLOGY

Inverter with the widest power range in the market, from 7 to 50 kW and from 12 to 75 kW.



We are the first manufacturer to use the new high power Copeland scroll compressors and inverters.



Customised configuration. Our heat pumps are customised for each application, being able to select between heating and DHW production, active cooling, passive cooling and the incorporation of a desuperheater for the production of DHW at high temperature and the simultaneous production of heating and cooling with DHW or swimming pool.

High power in a minimum space. Up to 75 kW in a 600 mm x 800 mm x 1140 mm case (width x depth x height).



Accessibility. New lift opening system (patented) that allows an easy access to all components inside the unit.



New control strategies. More efficient, reliable and secure installations.



Online monitoring and inspection. Remote access, preventive maintenance and higher reliability.



Connection to photovoltaic installations. Energy surpluses management, control of the power produced by the heat pump, control of periods with different electricity rates and compatible with Smart Grid systems.



CLAUSIUS STRONG DOUBLE 7-100 & 12-150 TECHNOLOGY

Inverter with the widest power range in the market, from 7 to 100 kW and from 12 to 150 kW.

Double refrigerant circuit, double reliability. STRONG DOUBLE units consist of 2 totally independent refrigerant circuits, each one equipped with its own inverter system, so that each of them can work completely independent, which gives the unit double reliability.

Maximum efficiency by controlling the optimal operating point. At any time, the control system establishes the optimal operational conditions considering the operation of a single refrigerant circuit or both simultaneously.

Customised configuration. Our heat pumps are customised for each application being able to select between heating and DHW production, active cooling, and the integration of a desuperheater.

Built-in desuperheater for high temperature DHW production (optional). Independent DHW production circuit. New control system with flow regulation in the desuperheater for DHW production up to 70/75 °C.

Accessibility. New lift opening system that allows an easy access to all components inside the unit.

New control strategies. More efficient, reliable and secure installations.

Online monitoring and inspection. Remote access, preventive maintenance and higher reliability.

Connection to photovoltaic installations. Energy surpluses management, control of the power produced by the heat pump, control of periods with different electricity rates and compatible with Smart Grid systems.

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STRONG 7-50 & 12-75 CONFIGURATION

clausius

- Power ranges from 7 to 50 kW and from 12 to 75 kW
- COP 4.8 according to EN14511
- EER 6.5 according to EN14511
- Three phases electrical power supply
- Active cooling integrated
- Refrigerant R410A
- Electronic expansion valve
- Energy meters integrated, COP, EER and SPFs
- Built in pressure sensors in both brine circuit and heating circuit
- Market leading noise reduction
- Control with double microcontroller
- New control strategies
- Swimming pool control
- Control of 5 mixing groups and 6 climate zones
- External passive cooling control
- Control of DHW production in two independent tanks
- Possibility of cascading up to 9 units
- Tested one by one on the test bench

CUSTOMISED CONFIGURATION

- Built-in passive cooling, optional
- Built-in desuperheater for high temperature DHW production, optional



MODELS IN TWO POWER RANGES, 7-50 KW AND 12-75 KW

Н	Heating
HC	Heating & active cooling
H PC	Heating & passive cooling
HC PC	Heating, active & passive cooling
H DS	Heating & desuperheater
HC DS	Heating, active cooling & desuperheater
H PC DS	Heating, passive cooling & desuperheater
HC PC DS	Heating, active cooling, passive cooling & desuperheater

HIGH POWER *High power with the new* Copeland inverter technology.

STRONG 7-50 & 12-75 COMPONENTS



WE MANUFACTURE WITH THE BEST COMPONENTS IN THE MARKET



STRONG DOUBLE 7-100 & 12-150 CONFIGURATION

clausius

- Power ranges from 7 to 100 kW and 12 to 150 kW
- COP 4.7, according to EN14511
- EER 6.5, according to EN14511
- Three phases electrical power supply
- Active cooling integrated
- R410A refrigerant
- Electronic expansion valve
- Energy meters integrated, COP, EER and SPFs
- Built in pressure sensors in both brine circuit and heating circuit
- Market leading noise reduction
- New control strategies
- Control with double microcontroller
- Control of 5 mixing groups and 6 climate zones
- Swimming pool control
- External passive cooling control
- Control of DHW production in 2 independent tanks
- Possibility of cascading up to 9 units
- Tested one by one on the test bench

HIGH POWER

Two totally independent refrigerant circuits, double reliability.

Inverter system in each circuit, maximum efficiency at any time.



STRONG DOUBLE 7-100 & 12-150 COMPONENTS



CUSTOMISED CONFIGURATION

• Built-in desuperheater for high temperature DHW production, optional

MODELS IN TWO POWER RANGES, 7-100 KW AND 12-150 KW

Н	Heating
HC	Heating & active cooling
H DS	Heating & desuperheater
HC DS	Heating, active cooling & desuperheater

WE MANUFACTURE WITH THE BEST COMPONENTS IN THE MARKET



expansion valve

TECHNICAL SPECIFICATIONS 7-50

TECHNICAL SPECIFICATIONS STRONG 12-75

		H 7-50	H 7 - 50 PC	H 7 - 50 DS	H 7 - 50 PC DS	HC 7-50	HC 7 - 50 PC	HC 7 - 50 DS	HC 7 - 50 PC DS
Applications	Heating and DHW	•				•		•	
	Active cooling					•	•	•	•
Optional	Passive cooling		•		•		•		•
applications	High temperature DHW with desuperheater			•	•			•	•
External components	Circulation pumps control	•	•	•	•	•	•	•	•
control	DHW control	•	•	•	•	•	•	•	•
	External passive cooling control	•		•		•		•	
	Swimming pool control	•	•	•	•	•	•	•	•
	Mixing groups control	•	•	•	•	•	•	•	•
	Electric heaters control	•	•	•	•	•	•	•	•
Power	Heating (kW)	7-50	7-50	7-50	7-50	7-50	7-50	7-50	7-50
	Active cooling (kW)					9-52	9-52	9-52	9-52
	Passive cooling (kW)		20		20		20		20
Electrical supply				3 ph -	400 V				
Performance	COP ⁽¹⁾	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
	EER					6.7	6.7	6.7	6.7
Refrigerant	Туре				R410A	4			
	Load (kg)	3.6	3.6	3.8	3.8	3.6	3.6	3.8	3.8
Dimensions	Height x Width x Depth (mm)				1140 x 600	x 800			
Connections	Brine and heating				2"				
	High temperature DHW			1 1/4″	1 1/4"			1 1/4"	1 1/4"
Weight	(kg)	238	256	246	264	240	248	258	268
Sound level	(dB)	52 dB							

 $^{(1)}$ According to EN14511 under conditions 0/ -3 °C and 30/35 °C, certification pending.



		H 12-75	H 12 - 75 PC	H 12 - 75 DS	H 12 - 75 PC DS	HC 12-75	HC 12-75 PC	HC 12-75 DS	HC 12-75 PC DS
Applications	Heating and DHW	•	•	•	•	•	•	•	•
	Active cooling				•	•	•	•	•
Optional	Passive cooling		•		•		•		•
applications	High temperature DHW with desuperheater			•	•			•	•
External components	Circulation pumps control	•	•	•	•	•	•	•	•
control	DHW control	•	•	•	•	•	•	•	•
	External passive cooling control	•		•		•		•	
	Swimming pool control	•	•	•	•	•	•	•	•
	Mixing groups control	•	•	•	•	•	•	•	•
	Electric heaters control	•	•	•	•	•	•	•	•
Power	Heating (kW)	12-75	12-75	12-75	12-75	12-75	12-75	12-75	12-75
	Active cooling (kW)					14-78	14-78	14-78	14-78
	Passive cooling (kW)		20		20		20		20
Electrical supply				3 ph -	400 V				
Performance	COP ⁽¹⁾	4.8	4.8	4.8	4.8	4.8	4.8	4.8	4.8
	EER					6.7	6.7	6.7	6.7
Refrigerant	Туре				R410A	N			
	Load (kg)	3.8	3.8	4	4	3.8	3.8	4	4
Dimensions	Height x Width x Depth (mm)				1140 x 600	x 800			
Connections	Brine and heating				2"				
	High temperature DHW			1 1/4"	1 1/4"			1 1/4"	1 1/4"
Weight	(kg)	252	270	261	279	267	284	275	293
Sound level	(dB)				52B				

⁽¹⁾ According to EN14511 under conditions 0/ -3 °C and 30/35 °C, certification pending.



A+++

High power range, STRONG

Energy labelling, product sheets and technical documentation according to **Delegated Regulation (UE) N° 811/2013**

A+++

TECHNICAL SPECIFICATIONS STRONG DOUBLE 7-100

TECHNICAL SPECIFICATIONS STRONG DOUBLE 12-150

		H 7-100	H 7 - 100 DS	HC 7-100	HC 7 - 100 DS	
Applications	Heating and DHW	•	•	•	•	
	Active cooling			•	•	
Optional application	High temperature DHW with desuperheater		•		•	
External	Circulation pumps control	•	•	•	•	
components control	DHW control	•	•	•	•	
	External passive cooling control	•	•	•	•	
	Swimming pool control	•	•	•	•	
	Mixing groups control	•	•	•	•	
	Electric heaters control	•	•	•	•	
Power	Heating (kW)	7-100	7-100	7-100	7-100	
	Active cooling (kW)			9-112	9-112	
	Desuperheater (kW)		60		60	
Electrical supply	3	ph - 400 V				
Performance	COP ⁽¹⁾	4.7	4.7	4.7	4.7	
	EER			6.5	6.5	
Refrigerant	Туре		R410A			
	Load (kg)	7	7.3	7	7.3	
Dimensions	Height x Width x Depth (mm)		1140 x 7	787 x 1150		
Connections size	Brine and heating		3"			
	Desuperheater (kW)		1 1/4"		1 1/4"	
Weight	(kg)	444	463	450	468	
Sound level (2)	(dB)		65			

 $^{(1)}$ Pending certification according to EN14511, under conditions 0/-3 °C y 30/35 °C. $^{(2)}$ Pending certification according to EN12102.

		DS	HC 12-150	DS	
Heating and DHW	•	•	•	•	
Active cooling			•	•	
High temperature DHW with desuperheater	•	•	•	•	
Circulation pumps control	•	•	•	•	
DHW control	•	•	•	•	
External passive cooling control	•	•	•	•	
Swimming pool control	•	•	•	•	
Mixing groups control	•	•	•	•	
Electric heaters control	•	•	•	•	
Heating (kW)	12-150	12-150	12-150	12-150	
Active cooling (kW)			14-156	14-156	
Desuperheater (kW)		60		60	
3	ph - 400 V				
COP ⁽¹⁾	4.7	4.7	4.7	4.7	
EER			6.5	6.5	
Туре		R4	110A		
Load (kg)	8.2	8.5	8.2	8.5	
Height x Width x Depth (mm)		1140 x 7	787 x 1150		
Brine and heating		3"			
Desuperheater (kW)		1 1/4"		1 1/4″	
(kg)	475	493	503	522	
(dB)		68			
	Heating and DHWActive coolingHigh temperature DHW with desuperheaterCirculation pumps controlDHW controlExternal passive cooling controlSwimming pool controlMixing groups controlElectric heaters controlHeating (kW)Active cooling (kW)Desuperheater (kW)EERTypeLoad (kg)Height x Width x Depth (mm)Brine and heatingDesuperheater (kW)(dB)	Heating and DHW.Active cooling.High temperature DHW with desuperheater.Circulation pumps control.DHW control.External passive cooling control.Swimming pool control.Mixing groups control.Electric heaters control.Heating (kW)12-150Active cooling (kW).Desuperheater (kW)3 ph - 4COP ⁽¹⁾ 4.7EER.Type.Load (kg)8.2Height x Width x Depth (mm).Brine and heating.(kg)475(dB).	Heating and DHW··Active cooling··High temperature DHW with desuperheater··Circulation pumps control··DHW control··External passive cooling control··Swimming pool control··Swimming pool control··Heating (kW)12-150·Active cooling (kW)12-150·Desuperheater (kW)d60COP ⁽¹⁾ 4.74.7EER··TypeR41140 x7Load (kg)8.28.5Height x Width x Depth (mm)1140 x7Desuperheater (kW)1140 x7Gesuperheater (kW)1140 x7Height x Width x Depth (mm)1140 x7Gioling (kW)·Copering (kW) </td <td>Heating and DHW··Active coolingIIIHigh temperature DHW with desuperheater···Circulation pumps control···DHW control····External passive cooling control···Swimming pool control···Mixing groups control···Betterric heaters control···Heating (kW)12-15012-15012-150Active cooling (kW)I12-15012-150Desuperheater (kW)I60-COP⁽¹⁾4.74.74.7ER···TypeR8.28.2Ideidy (kg)8.28.28.2Height x Width x Depth (mm)II140 × T + 1150Brine and heating···Icag (kg)475493503(dB)(dB)··</td>	Heating and DHW··Active coolingIIIHigh temperature DHW with desuperheater···Circulation pumps control···DHW control····External passive cooling control···Swimming pool control···Mixing groups control···Betterric heaters control···Heating (kW)12-15012-15012-150Active cooling (kW)I12-15012-150Desuperheater (kW)I60-COP ⁽¹⁾ 4.74.74.7ER···TypeR8.28.2Ideidy (kg)8.28.28.2Height x Width x Depth (mm)II140 × T + 1150Brine and heating···Icag (kg)475493503(dB)(dB)··	

⁽¹⁾Pending certification according to EN14511, under conditions 0/-3 °C ⁽²⁾Pending certification according to EN12102.



Energy labelling, product sheets and technical documentation according to **Delegated Regulation (UE) N° 811/2013**

A+++



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A+++





HIGH TEMPERATURE HEAT PUMPS

CLAUSIUS HT high temperature heat pumps are specially designed for the use of heat sources at high temperatures, up to 45 °C (evaporating temperature up to 40 °C), and for delivering heat at very high temperatures, up to 80 °C (condensing temperature up to 85 °C). These heat pumps can cover operating ranges between source and sink temperatures higher than those of traditional heat pumps.



CLAUSIUS HT heat pumps applications.

Due to their wide operating range, CLAUSIUS HT heat pumps can be used, among others, for the following applications:

• Production of domestic hot water at high temperature.

• Applications where heat at high temperature is required such as heating systems with radiators, district heating, washing, cleaning or disinfection processes, etc.

• Applications with high source temperatures (up to 40 °C), such as the use of geothermal resources at high temperatures, springs or ground water, etc.

• Applications for the recovery of waste heat such as, machinery cooling processes, exhaust gases from combustion processes, condensing heat from refrigerating installations, etc.

• Cascade systems with traditional heat pumps at the lower temperature stage.

CLAUSIUS high temperature heat pumps are customised to each application, both in its configuration and in the control system.

Its design is based on the use of the following components:

- Copeland scroll compressors specially designed for high temperature applications.
- Alfa Laval heat exchangers.
- Electronic expansion valve.
- Control system specially designed by CLAUSIUS and adapted to each application.

Standard models are manufactured in STRONG or STRONG DOUBLE model casings depending on the heating power.

Standard models

High temperature applications with heating temperatures up to 80 °C and source temperatures up to 45 °C.

STANDARD MODELS	Power 40/37 and 80/75 [kW]*	Power 0/-3 and 30/35 [kW]**
Clausius HT 40	40	16
Clausius HT 50	50	22
Clausius HT 75	75	32
Clausius HT 100	100	42
Clausius HT 125	125	52
Clausius HT 150	150	65

*Heating power with source 40/37 °C and sink 80/75 °C **Heating power 0/-3 °C and 30/35 °C, according to EN 14511.

For special applications, contact CLAUSIUS

Given the wide range of operating conditions that may be required in high temperature heat pump applications, we recommend contacting CLAUSIUS for advice on the sizing and selection of the required heat pump model.

In addition to the standard models and for special applications, CLAUSIUS can design and manufacture tailored solutions with high temperature heat pumps. In these cases, the control system will be adapted and the heat pump will be tested on a test bench according to the specific requirements for each application. CLAUSIUS will provide all the technical documentation for these customised heat pumps.







CLAUSIUS AIR SYSTEM

Heating and cooling systems with ground source heat pumps have many advantages over the systems with air source heat pumps and are more efficient and reliable. However, in some cases, it may not be possible to install a ground collector due to space limitations or other types of legislative restrictions, due to which, and only in these cases, CLAUSIUS recommends the use of air source heat pumps.

The CLAUSIUS Air System is based on keeping all the advantages of the ground source systems, replacing only the ground collector by a simple, efficient, reliable, robust and long-lasting air source unit.

CLAUSIUS Air System uses the same CLAUSIUS ground source heat pumps combined with an external air unit (CLAUSIUS Air Source), specially designed and tested by CLAUSIUS, in which the energy that is available in the air is extracted for its input to the heat pump.



CLAUSIUS Air System

CLAUSIUS Air Source unit transfers the energy captured from the outside air to the heat pump through a closed circuit in which glycol is recirculated using the circulation pumps integrated in the heat pumps, the same as in the ground source systems. Therefore, CLAUSIUS Air System is based on a very simple and reliable installation since the circulation of refrigerant between the outside air unit and the heat pump inside de house is not required. Consequently, it does not require the installation by highly qualified personnel and increases the reliability of the system due to it avoids possible leaks of high pressure refrigerant in the pipes.

Furthermore, compared to systems with compact air source heat pumps, which components are outdoors exposed to weather elements, and therefore, subject to inclement weather, CLAUSIUS air system has the advantage that only the air unit is on the outside meanwhile all the other components are located inside the house protected from the elements and weather exposure, which, with no doubt, increases considerably its reliability and service life.





CLAUSIUS HYBRID SYSTEM

CLAUSIUS ground source heat pumps can be used in hybrid geothermal-aerothermal systems, in which both a ground collector and an air collector are used simultaneously and integrated in the same installation. Hybrid systems allow to obtain the advantages of both energy collection systems and avoid their major drawbacks, which are the low efficiency of the air systems at low outside temperatures and the high cost of the ground collectors.



Simplified scheme, CLAUSIUS Hybrid System.

CLAUSIUS heat pumps incorporate a specific control for hybrid systems. The control system choose the operating conditions that provide maximum possible energy efficiency by an optimum glycol flow distribution between the ground and the air collectors, obtaining the maximum efficiency of the heating and cooling system at all times.

Ground recharging

CLAUSIUS hybrid systems allow to recharge energy in the ground when the outside temperature is high and heating the house is not required, by transferring the heat energy extracted from the air in the air collector to the ground through the ground collector.

Recharging the ground is carried out at a very low cost and allows to use it as an energy storage system. The energy stored is subsequently recovered through the ground collector and the heat pump, which allows to reuse it to heat the house through the heating system.

CLAUSIUS AIR UNITS

CLAUSIUS Air Units used in the CLAUSIUS Air and Hybrid Systems have been specially designed by CLAUSIUS in collaboration with a well-known heat exchanger manufacturer.

CLAUSIUS Air Units are equipped with the exclusive defrosting system "CLAUSIUS Local Defrosting System" specially designed and validated by CLAUSIUS. The CLAUSIUS Local Defrosting System consists of heating the glycol inside the Air Unit and its recirculation only inside the Air Unit tubes, thus preventing its circulation through the connection loop between the Air Unit and the heat pump. This feature allows to reduce the defrosting times and to increase considerably the efficiency of the heating system.



Air Unit 12



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This exclusive CLAUSIUS Local Defrosting System allows obtaining the advantages listed below comparing to other traditional defrosting systems.

- The heat is supplied from inside the Air Unit tubes, so a faster and more efficient defrosting process is achieved by minimizing the heat losses to the environment.

- The heating and recirculation of the glycol is carried out only inside the Air Unit, thus avoiding its circulation through the connecting circuit between the Air Unit and the heat pump. This feature avoids significant heat losses, as well as the expansion-contraction processes due to the strong temperature changes of the elements and junctions of the circuit during the defrosting proceses, which provides the system a reliability and efficiency much higher than the systems in which the heating of the glycol is carried out in the heat pump.

The CLAUSIUS Local Defrosting System is installed in the CLAUSIUS Air Units and tested by CLAUSIUS.

Air Unit 20



Technical specifications

MODEL	AIR UNIT 12	AIR UNIT 20	AIR UNIT 40	AIR UNIT 60	AIR UNIT 80	AIR UNIT 120
Power (kW)	12	17.6	40	60	80	119.4
Air flow (m³/h)	6000	10000	22800	44000	42000	63000
Inlet air temperature (°C)	7.0	7.0	7.0	7.0	7.0	7.0
Outlet air temperature (°C)	1.3	2.0	1.9	3.2	1.6	1.6
Glycol flow inside tubes (m³/h)	3.6	5.3	11.9	17.8	23.9	35.5
Inlet glycol temperature (°C)	-3.0	-3.0	-3.0	-3.0	-3.0	-3.0
Outlet glycol temperature (°C)	0.0	0.0	0	0.0	0.0	0.0
Pressure losses in tubes (kPa)	22	27	37.6	18.5	41.0	40.8
Electrical power supply	1ph / 230) V / 50 Hz	3ph / 400 V / 50 Hz			
Electrical power (W)	720	1440	1800	3600	3600	5400
Fan velocity (rpm)	1240	1240	900	900	900	900
Sound pressure (10 m) (dBA)	43	46	42	45	45	47
Tubes	cooper					
Fins	aluminium					
Air flow		Horizontal	Vertical, V configuration			ation
Surface (m ²)	82.25	108.48	268	361	541	812
Fans number	1	2	1	2	2	3
Fans diamenter (mm)	500	500	800	800	800	800
Fins separation (mm)	2,5	2,8	2.5	3.2	3.2	3.2
Inlet connection	1 1/2"		2″	2 ½"	3″	3″
Outlet connection	1 1/2"		2″	2 1⁄2″	3"	3″
Weight (kg)	117	200	631	760	880	1250
Dimensions (length x height x width) (mm)	1260 x 850 x 565	1750 x 850 x 565	1575x1390 x1875	2400x1390 x1875	2400x1390 x1875	3400x1390 x1875



Air Unit 40 - 60 - 80 and 120



CLAUSIUS INTERNET CONNECTION

All CLAUSIUS heat pumps can be connected to the Internet, allowing immediate access from any mobile phone, tablet or computer to their status, operating conditions, efficiency values, alarms display and configuration, as well as modifying their settings and their remote switching on and off.

The Internet connection also allows access to the data records of the operating and efficiency parameters of the heat pump, as well as obtaining these data through a SD card.



CLAUSIUS Internet connection

This Internet connection system has been specifically developed by CLAUSIUS and is based on the use of a resident web page in the control system and on the incorporation of its own router in the heat pump, which allows wired internet access (no Wi-Fi) regardless of the client's router type. Wired connection allows easy installation, no configurations, as well as avoid connectivity problems common in systems based on Wi-Fi connections.

Access to the heat pump through the Internet connection can be carried out from any mobile phone, tablet or computer using any type of browser, thus avoiding the installation of any specific software or App. The CLAUSIUS Internet connection allows access to all the configuration and operating parameters of the user and installer menu.

The Internet connection is very useful to evaluate the correct behaviour of the heat pump, as well as to detect any type of anomaly and to be able to determine the necessary actions for its correction without having to physically access the heat pump.





CLAUSIUS Internet connection

CONNECTION TO PHOTOVOLTAIC SYSTEMS

CLAUSIUS heat pumps can be combined with photovoltaic systems in such a way that they can adapt their operation to the photovoltaic energy available at all times and take into account the electricity rates according to the time slot in order to minimize operating costs.



Connection to photovoltaic systems







The availability of photovoltaic energy is evaluated by connecting the heat pump with the PV inverter, from which information on the energy available at all times is obtained. All CLAUSIUS heat pumps are prepared for communication with any of the brands of PV inverters available on the market.

Information on the different time slots and the corresponding electricity rates is entered in the heat pump configuration, which makes it possible to give priority to its operation in those time slots with lower rates.

Taking into account the available photovoltaic solar energy and the electricity tariff in each time slot, the heat pump can modify its operating conditions by changing the settings of the DHW, buffer or heating water temperatures, as well as the rpm limits of the compressor to accumulate excess solar energy available as thermal energy and minimize operating costs at all times.





GROUND SOURCE HEAT PUMPS INSTALLATIONS

Geothermal energy is the thermal energy available in the ground that can be extracted as heat. If the temperature level of this energy is less than 30 °C, Ground Source Heat Pumps (GSHPs) can be used to extract ground heat for space heating and domestic hot water (DHW) production. Moreover, GSHPs can also be used for active and passive cooling. The geothermal energy is renewable, as recognised explicitly by the EU Directive 2009/28/EC.



The use of geothermal energy through GSHPs requires the use of collector systems to extract heat from the ground. Commonly used collecting systems are vertical boreholes, horizontal ground collectors and groundwater systems.





Borehole

Horizontal ground collector

Fan-coil



Ground water collector

Heating and cooling installations with GSHPs consist of the ground heat collector system, the heat pump itself and the heat distribution system inside the building. Commonly used distribution systems are underfloor heating and radiant surfaces, fan coil units and low temperature radiators.



Underfloor heating





Low temperature radiator

CLAUSIUS GROUND SOURCE HEAT PUMPS INSTALLATIONS









With DHW tank with desuperheater, 300 l capacity







o clausius

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