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RHOSS
CREATING YOUR COMFORT

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THAETY 234 H.T.
POKER range

Reversible heat pumps for very hot water production, with air evaporation/ condensation and axial fans. Range with hermetic Scroll compressors and R410A ecological refrigerant.ù

Index

Pluses

Modular
POKER allows combining 4 units with a design studied to minimise space and, therefore, the overall dimensions of the units.

Silent
Maximum silence levels thanks to the use of axial fans with EC low sound emission brushless motor.

Flexible
POKER allows adapting the installation to the implementation requirements of the system. Power can be increased simply and economically over time.

Efficient
POKER guarantees the minimum energy consumption both with full and partial loads. In fact, the units reach class A nominal efficiency (COP≥3.2) within the Eurovent certification program.
On the other hand, the partial load efficiency is awarded by the capacity steps, which increase together with the installed modules, ensuring continuous adaptation to the real thermal load trend.

Reliable
The presence of an electric panel on each module and the implemented management logic, which allows the modules to operate in synergy one with the other, guarantee non-stop service even if one of the units does not work properly.
Modularity is then essential in systems requiring total redundancy: this characteristic provides the systems a safer design and also a matchless comfort quality and energy efficiency.

Successful
POKER enhances the system:
- elevated seasonal efficiency allows greater saving over the year than that which can be achieved with units with equal power but with a traditional design;
- it is an excellent combination of performance - reliability - price;
- it is always available on stock with quick delivery times due to its modular features

General Features

Declared conditions of use

THAETY units are reversible modular heat pumps on the cooling cycle with air evaporation/condensation and axial fans.

A unit is a complete, independent module and is set to be coupled to other equal modules up to a maximum of 4 modules to increase the installed capacity.

They are intended to be used in conditioning/heating systems, where water is required not for human consumption.

The machine is designed for outdoor installation.

The units comply with the following Directives:

- 2006/42/EC Machinery Directive;
- Low voltage Directive 2006/95/EC;
- Electromagnetic compatibility Directive 2004/108/EC
- Pressure equipment directive 97/23/EEC (PED)

Guide to reading the code

"SERIES" code						**"MODEL" code**		
T	**H**	**A**	**E**	**T**	**Y**	**2**	**34**	**H.T.**
Water production unit	Heat pump	Air cooling	Scroll-type hermetic compressors	High efficiency	R410A refrigerant gas	Number of compressors	Approximate heating capacity (in kW)	High temperature

Available Installations

Pump P1	Installation with pump
Pump P1 V3V	Set up with pump and 3-way diverter valve installed on board to divert water during domestic hot water production
Pump P1 DS	Set up with pump on main heat exchanger and desuperheater equipped with antifreeze heater

Example: THAETY 234 HT P1 V3V
- Hot and cold water production unit;
- air condensed;
- n° 2 Scroll-type hermetic compressors;
- R410A refrigerant fluid;
- approximate nominal cooling capacity 34 kW;
- with R410A refrigerant gas;
- with pump and 3-way diverter valve installed on board

AdaptiveFunction Plus

The new AdaptiveFunction Plus adaptive control logic is an exclusive RHOSS patent and the result of a long collaboration with the University of Padua. The various algorithm processing and development operations have been implemented and tested on the POKER range of units in the RHOSS Research&Development Laboratory by means of numerous test campaigns.

Objectives

- To always guarantee optimal unit operation in the system in which it is installed. ***Evolved adaptive logic***.
- To achieve the best performance from a chiller and a heat pump in terms of energy efficiency with full and partial loads. ***Low consumption chiller***.

Operating logic

In general, the actual control logics on chillers/heat pumps do not consider the features of the system in which the units are installed; they usually control the return water temperature and there aim is to guarantee the operation of the chillers, giving less priority to the system requirements.

The new **AdaptiveFunction Plus** adaptive logic contrasts these logics with the objective of optimising chiller operation according to the system characteristics and the actual thermal load. The controller regulates the flow water temperature and adjusts itself according to the operating conditions using:

- the information contained in the return and flow water temperature to estimate the load conditions, thanks to a particular mathematical function;
- a special adaptive algorithm that uses this estimate to vary the start- up and switch-off threshold values and position of the compressors; optimised compressor start-up control guarantees maximum precision in the water supplied to the utility, thereby reducing the fluctuation around the Set-point value.

Main functions

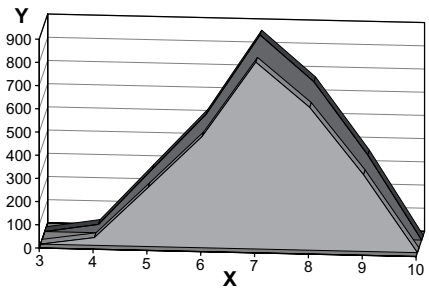
Efficiency or Precision

Thanks to the advanced control, the chiller can run on two different control settings in order to obtain the best possible performance in terms of energy efficiency and therefore, significant seasonal savings or high water delivery temperature precision:

1. Low consumption chiller*:*"Economy"

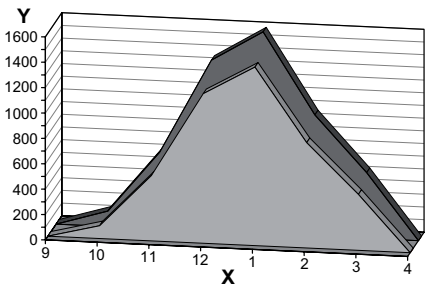
Option It is known that chillers work at full load for only a very small percentage of their operating time and at partial load for most of the season. Therefore, the power they must supply generally differs from the nominal design power, and partial load operation significantly affects seasonal energy performance and consumption.
This makes it necessary for the unit to run as efficiently as possible with partial loads. The controller therefore ensures that the water flow temperature is as high as possible (when operating as a chiller) or as low as possible (when operating as a heat pump) whilst being compatible with the thermal loads, which means it shifts, unlike traditional systems.
This prevents energy waste associated with the unnecessarily onerous chiller temperature levels being maintained, thereby guaranteeing that the ratio between the power to be supplied and the energy to be used to produce it is always optimised. The right level of comfort is finally available to everyone!

Summer season: a unit working with a sliding set-point allows seasonal energy savings of about 8% compared to a traditional unit that operates with a fixed set-point.



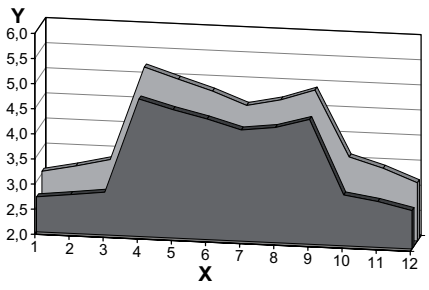
X	Year divided into months (1 January, 2 February, etc.)
Y	Power consumption (kWh)
	Unit with fixed set-point
	Unit with sliding set-point

Winter season: a unit working with a sliding set-point allows seasonal energy savings of about 13% compared to a traditional unit that operates with a fixed set-point. Calculations show that seasonal consumption is equivalent to that of a CLASS A machine.



X	Year divided into months (1 January, 2 February, etc.)
Y	Power consumption (kWh)
	Unit with fixed set-point
	Unit with sliding set-point

Year-round: efficiency during the annual operation of the unit in heat pump mode. **AdaptiveFunction Plus, with the "Economy"** function, allows the chiller to run on energy- saving programmes while still providing the required level of service.



X	Year divided into months (1 January, 2 February, etc.)
Y	Energy efficiency kWh supplied/kWh absorbed
	Unit with fixed set-point
	Unit with sliding set-point

Analysis carried out by comparing the operation of a POKER heat pump unit with AdaptiveFunction Plus logic working with a fixed set-point (7°C in the summer and 45°C in the winter) or with a sliding set-point (range between 7 and 14 °C in the summer and between 35 and 45°C in the winter) for an office building in Milan.

PLUS Seasonal Efficiency Index

The University of Padua has developed the ESEER+ seasonal efficiency index which takes into account the adaptation of the chiller's set-points to different partial loads. This index characterizes the seasonal behaviour of a chiller with Adaptive Function Plus better than the traditional ESEER index.

The ESEER+ index can therefore be used for a quick evaluation of seasonal energy consumption of units with Adaptive Function Plus instead of the more complex analyses on the building/installation system, which are usually difficult to carry out.

Simplified method for calculating energy savings with Adaptive Function Plus

The dynamic analyses used to calculate the energy consumption of chillers in a building/installation system are usually too complicated to use for a quick comparison of different cooling units, since they require a range of data that is not always available. For a quick estimate of what the energy savings could be with a unit equipped with Adaptive Function Plus software compared, to a machine with traditional control, we suggest using a simplified method based on the following formulae:

$$\mathbf{E} = \frac{0{,}54 \times N \times C}{ESEER+}$$

E	power absorbed by chiller equipped with Adaptive Function Plus software (kWh)
N	number of chiller operating hours
C	nominal cooling capacity of chiller (kW)
ESEER+	average seasonal efficiency of chiller equipped with Adaptive Function Plus software

$$\mathbf{E} = \frac{0{,}54 \times N \times C}{ESEER}$$

E	average seasonal efficiency of chiller equipped with traditional control (kWh)
N	number of chiller operating hours
C	nominal cooling capacity of chiller (kW)
ESEER	European seasonal EER (European average seasonal energy efficiency)

Model THAETY 234 equipped with traditional control:
Nominal cooling capacity = 28,3 kW
N = 8 hours/day x (5 months x 30 days/month) = 1200 hours
ESEER = 4,02

$$\mathbf{E} = \frac{0{,}54 \times 1200 \times 28{,}3}{4{,}02} = \mathbf{4.561{,}8\ kW/h}$$

Model THAETY 234 equipped with Adaptive Function Plus control:
Nominal cooling capacity = 28,3 kW
N = 8 hours/day x (5 months x 30 days/month) = 1200 hours
ESEER+ = 4,50

$$\mathbf{E} = \frac{0{,}54 \times 1200 \times 28{,}3}{4{,}50} = \mathbf{4.075{,}2\ kW/h}$$

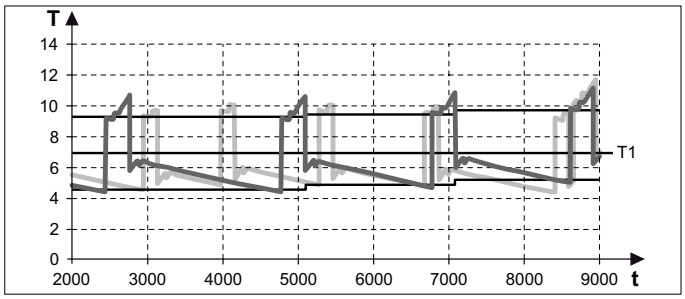
The energy saved with Adaptive Function Plus is therefore **11%**.

***2. High precision:* "Precision"**

Option In this operating mode, the unit works at a fixed set-point and, thanks to the water flow temperature control and the advanced control logic, at loads ranging between 50% and 100%, it is possible to guarantee an average fluctuation from the utility water supply temperature of approximately ± 1.5°C with respect to the set-point value compared to an average fluctuation of approximately ± 3°C, which is normally obtained with standard return control.
Therefore, the "Precision" option guarantees precision and reliability in all applications that require a controller that guarantees a more accurate constant water supply temperature, and where particular humidity control is required.
However, it is always recommended to use a storage tank with greater system water content in process applications to guarantee high system thermal inertia.

Virtual Tank

Low water content in the system can cause chiller/heat pump units to work inconsistently, causing system instability and poor performance. Thanks to the Virtual Tank function, the unit can operate in systems with low water content, as the control can compensate the lack of inertia of a storage tank, "muffling" the control signal and preventing untimely activations and deactivations of the compressor and reducing the average fluctuation of the set-point value.



T	Water temperature (°C)
t	Time (s)
T1	Set-point temperature
	Delivery temperature with Virtual Tank
	Delivery temperature without Virtual Tank

The chart shows the various chiller outlet temperatures referred to an operating capacity of 80%. We can see how the temperatures of the unit with AdaptiveFunction Plus logic and Virtual Tank function is far less varied and more stable over time, with average temperatures closer to the working set-point compared to the unit without the Virtual Tank function. We can also see how the unit with AdaptiveFunction Plus logic and Virtual Tank function switches the compressor on less often over the same period of time, with obvious advantages in terms of energy consumption and system reliability.

ACM Autotuning compressor management

AdaptiveFunction Plus enables the POKER units to adapt to the system they are serving, so as to always identify the best compressor operating parameters in the different load conditions. During the initial operating phases, the special “Autotuning” function enables the POKER units with AdaptiveFunction Plus to learn the thermal inertia characteristics that regulate the system dynamics. The function, which is automatically activated when the unit is switched on for the first time, performs a number of preset operating cycles, during which it processes the information relative to the water temperatures. It is then possible to estimate the physical characteristics of the system and thereby identify the optimal value of the control parameters to be used. At the end of this initial estimate phase, the “Autotuning” function remains active, thereby allowing the control parameters to be promptly adapted to every change in the water circuit and therefore, in the water content of the system.

"DEFROST PLUS" evolved defrost logic

With AdaptiveFunction Plus, the defrost logic is also adaptive and is based on the variation of the evaporation pressure over time. By using this information, the unit controller can detect when there is substantial formation of ice on the coils, minimising the number of defrost cycles in less extreme outdoor temperature conditions, while in more extreme outdoor temperature and humidity conditions, the controller activates defrost cycles in a timely manner, optimising their times and durations. This way, ice is removed completely from the heat exchangers. This system guarantees significant benefits in terms of reduced consumption and greater temperature stability of the produced water, thereby increasing comfort.

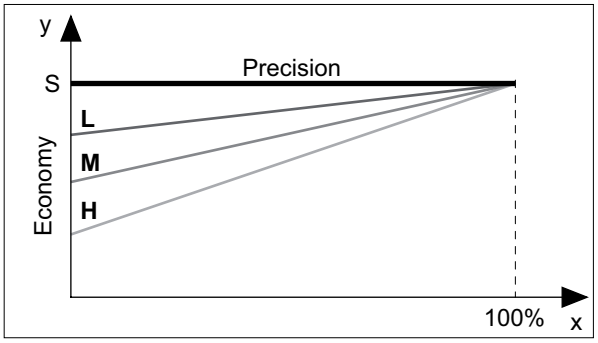
Set-point Compensation

The Economy function allows the chiller to run on energy-saving programmes while still providing the required level of comfort.

This function controls the maximum delivery temperature with sliding set-points, changing the set-point according to the system's actual heat load; when the summer load decreases, the set-point increases, and when the winter load decreases, the set-point decreases.

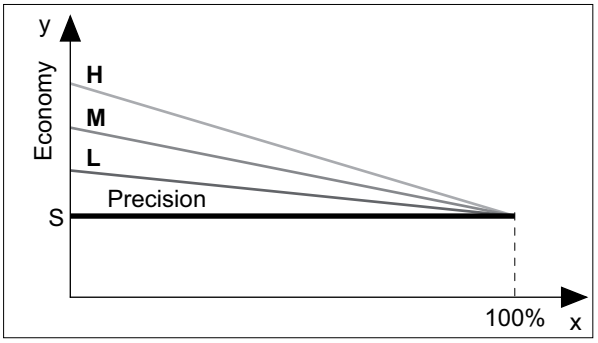
This function is intended for cooling applications, and is designed to control energy consumption while always respecting the actual demands on the system's capacity. Within the Economy function it is possible to select one of three different set-point adaptation curves depending on the type of system.

"Economy" function in Winter mode



x	Load percentage (%)
y	Set-point (°C)
S	Set-point entered by user
L	Buildings with very unbalanced loads
M	Intermediate situation between L and H (default)
H	Buildings with well-distributed loads. High efficiency.

"Economy" function in Summer mode



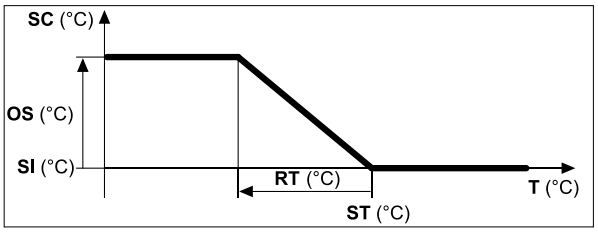
x	Load percentage (%)
y	Set-point (°C)
S	Set-point entered by user
L	Buildings with very unbalanced loads
M	Intermediate situation between L and H (default)
H	Buildings with well-distributed loads. High efficiency.

As an alternative to modification of the Set-point according to the real system load (Economy option), it is possible to compensate the set-point based only on the temperature of the outdoor air.

This function modifies the Set-point value based on the temperature of the outdoor air. Based on this value, the set-point is calculated by adding (winter cycle) or subtracting (summer cycle) an offset value to the set-point used (see examples below).

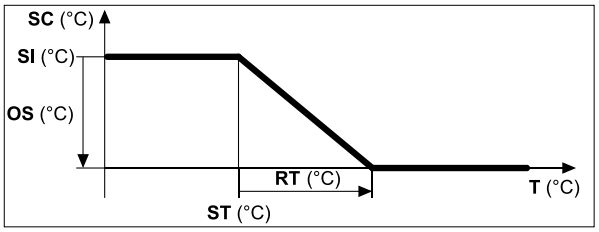
This function is active both in winter mode and summer mode.

Winter cycle



OS	15°C
RT	25°C
ST	20°C

Summer cycle



OS	8°C
RT	15°C
ST	15°C

T (°C)	Outdoor air temperature
SC (°C)	Calculated set-point temperature
OS (°C)	Offset set-point (calculated value)
SI (°C)	Entered set-point
RT (°C)	Outdoor air temperature set-point compensation
ST (°C)	Outdoor temperature set-point

The user can decide whether to activate the function in both operating modes or in one only. If set-point compensation to outdoor temperature is enabled, the Economy function will be automatically disabled.

Additionally, set-point compensation can be enabled in one cycle and the Economy function in the other.

Structural features

- Load-bearing structure and panels in galvanised and RAL 9018 painted sheet metal; galvanised steel sheet metal base.
- Heating electric resistance on condensation drain tray.
- Hermetic Scroll-type rotary compressors with vapour injection, complete with external circuit breaker protection and crankcase heater activated automatically when the unit stops (as long as the power supply to the unit is preserved).
- Adequately insulated, braze-welded plate water side heat exchange in stainless steel complete with anti-freeze heater.
- Air side heat exchanger: featuring finned coil with copper pipes and aluminium fins, with hydrophilic surface treatment.
- Electric axial fan with permanent magnet motor for the electronic control of speed.
- 1”1/2 male threaded hydraulic fittings.
- Differential pressure switch that protect the unit from any water flow interruptions. In units equipped with RAE 20 or RAE 20_4, the water flow is controlled by a flow switch.
- Refrigerant circuit in annealed copper pipe (EN 12735-1-2) complete with drier filter, charge connections, safety pressure switch on the high pressure side, safety valve, mechanical thermostatic expansion valve 2 winter and 1 summer type, cycle inversion valve, liquid receiver, check valve and gas separator. Braze welded plate economiser, electronic thermostatic valve for managing ECO and 3 solenoid valves for vapour injection.

- Outdoor air temperature probe as per standard.
- Unit with IP24 protection rating.
- Ecological R410A refrigerant fluid load.

Electrical Control Board

Electric control board in compliance with IEC Standards, in waterproof casing complete with:

- electrical wiring arranged for power supply 400V-3ph-50Hz;
- 230V-1ph-50Hz auxiliary power supply drawn from a transformer installed on board;
- manoeuvre isolator switch, with door interlocking isolator;
- automatic compressor protection switch;
- auxiliary circuit protection fuse;
- compressor power contactor;
- remote unit controls: remote on/off (SCR), remote summer/winter (SEI), CGA auxiliary generator control (boiler), KRIT integrative generator control, unit forced drain (FDL), lock lamp (LBG) and compressor operation lamps (LFC1-2).

- Programmable electronic board with microprocessor, controlled by the keyboard inserted in the unit (KTOB) or remote control up to 50 metres by using the remote keyboard (KTR).

This electronic board performs the following functions:

- regulation and control of the machine outlet water temperature settings; of the cycle inversion; of the safety timers; of the circulation pump; of the system compressor and pump hour-run meter; of the pressurised defrost cycles; electronic anti-freeze protection that is automatically activated when the unit is off; and of the functions that control the operations of the individual parts making up the machine;
- complete protection of the unit, possible shutdown and display of all the triggered alarms;
- compressor protection phase sequence monitor;
- Multi-language management (Italian, English, French, German) of displays;
- management of the ECO electronic expansion valve (EEV);
- management of the compressor discharge temperature and vapour injection;
- in case of parallel units, view of the serial network status;
- desuperheater pump on/off control (not supplied);
- desuperheater inverter pump analogue control (not supplied);
- visual indication of the programmed set points on the display; of the in/out water temperature via the display; of work pressures (both high and low pressure), of the alarms via the display; and of chiller/heat-pump operating mode via display;
- self-diagnosis with continuous monitoring of the unit functioning status.
- user interface menu;
- management of alarms log.

In particular, for every alarm, the following are memorised:

- date and time of intervention (card serial clock);
- alarm code and description;
- inlet/outlet water temperatures values when the alarm intervened;
- alarm delay time from the switch-on of the connected device;
- compressor status at moment of alarm;
- displaying the values of high pressure and low pressure.

Advanced functions:

- set-up for serial connection (KRS485, KFTT10, KBE, KBM, KRS232, KUSB accessory);
- possibility to have a digital input for remote management of double set point (DSP);
- possibility to have a digital input for managing domestic hot water (DHW);
- possibility to have an analogue input for the shifting Set-point (CS) via a 4-20mA remote signal;
- management of time bands and operation parameters with the possibility of daily/weekly functioning programs;
- check-up and monitoring of scheduled maintenance status;
- computer-assisted unit testing;
- self-diagnosis with continuous monitoring of the unit functioning status.

Set-point regulation via the **AdaptiveFunction Plus** with two options:

- fixed set-point (Precision **option**);
- set-point sliding (Economy **option**).

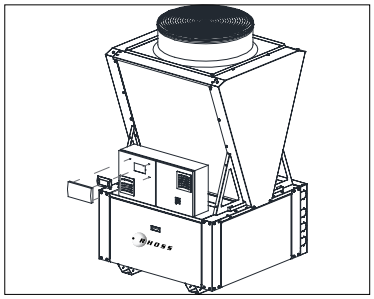
Available Installations

Pump P1	Installation with pump
Pump P1 V3V	Set up with pump and 3-way diverter valve installed on board to divert water during domestic hot water production
Pump P1 DS	Set up with pump on main heat exchanger and desuperheater equipped with antifreeze heater

The POKER units can be installed individually or connected between them, up to 4 units, by means of a hydraulic parallel.
A hydraulic, mechanical and electric connection kits that complete the unit and facilitate carrying out the connections.
Only units with identical set-up can be connected.

Kits supplied separately MANDATORY

KTR	Remote keyboard for remote control; it can be wall-mounted with backlit LCD display (alternatively to KTOB keyboard)
KTOB	Keyboard that can be installed on the unit with backlit LCD display (alternatively to KTR keyboard)
KTL	Side infill panels



POKER units must be equipped with control keyboard, available in two versions :

KTOB: keyboard suitable for being installed on board the unit on the electrical panel door. Moreover, a door is supplied as protection against bad weather and solar radiation.

KTR: wall-mounted remote control keyboard to be installed inside environments.

Only one KTR (or alternatively KTOB) control keyboard must be mounted regardless of whether one single unit is installed or several ones.

Kits supplied separately, MANDATORY in the event several modules are installed

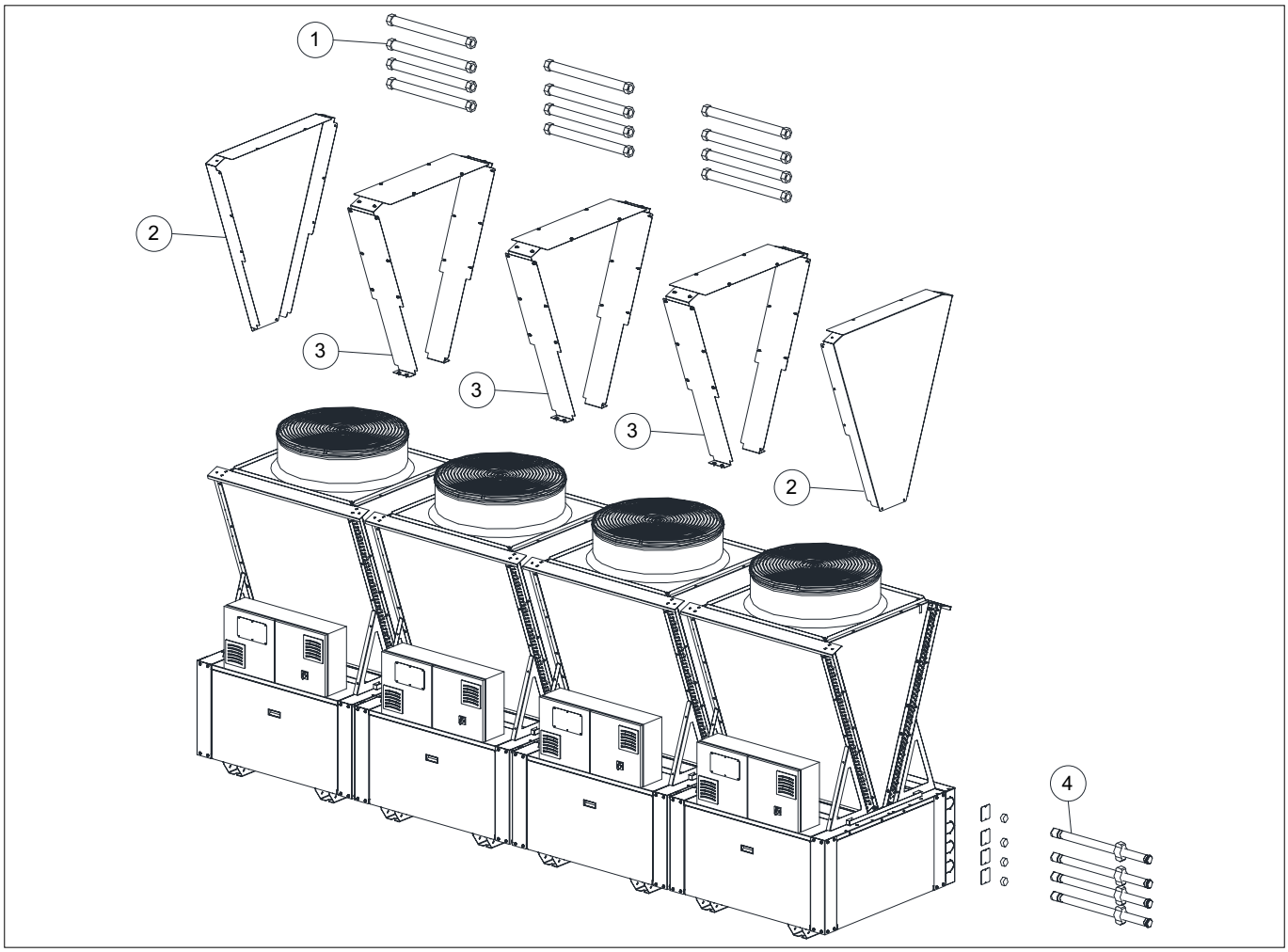
KFLX	Connection flexible pipes between modules made with NPT rubber and covered by a stainless steel mesh. All the fittings are 1”1/2G threaded.
KCLM	Panels for module connection equipped with telephone cable for serial connection and clamp for stroke checking for positioning the unit.

Factory Fitted Accessories

P2	Increased static pressure pump Available for all types of set up
SFS	Soft-Starter Device
RAP	Unit with copper/pre-painted aluminium condensation coils
BRR	Unit with copper/copper condensation coils
RAE 20	Flow switch and hot wire heater protecting heat exchanger pumps and piping up to -20°C outdoor air
RAE 20_4	Flow switch and hot wire heater protecting heat exchanger pumps and piping up to +20°C outdoor air For units with DS and V3V set up
SIL	Silenced unit (compressor hood)
DSP	Double set-point via digital consensus (incompatible with the CS accessory) with Precision option. When several modules are connected in parallel, a KCSC signal concentrator must be purchased in order to enable this signal
CS	Shifting set point via 4-20 mA analogue signal (incompatible with the DSP accessory) with Precision option. When several modules are connected in parallel, a KCSC signal concentrator must be purchased in order to enable this signal
FDL	Forced Download Compressors, partialisation or compressors switch-off to limit the absorbed current and power (Digital Input). When several modules are connected in parallel, a KCSC signal concentrator must be purchased in order to enable this signal
GM	High and low pressure gauges

Accessories supplied separately

KSA	Rubber anti-vibration mountings
KVDEV	3-way diverter valve for managing the production of domestic hot water. The kit includes a protective bonnet for the valve and flexible pipes connected to the unit. Incompatible with Pump P1 V3V units
KRIT	Supplementary electric heater for 12 kW 400-3-50 heat pump
KADX	Right fitting kit. It makes the position of the water fittings reversible from left (standard) to right, even in the event of several connected units
KFA	Water filter
KCSC	Digital input and output concentrator. Facilitates installation for remote management of the group of units
KRS485	RS485 serial interface card to create interconnection networks between cards (max. 200 units at max. distance of 1000 m) and building automation, external supervision systems or RHOSS supervision systems (supported protocols: proprietary protocol; Modbus® RTU)
KFTT10	LON serial interface for connection to BMS with standard LON FTT10 protocol.
KBE	Bacnet Ethernet interface
KBM	Bacnet-MS/TP interface
KRS232	RS485/RS232 serial converter for interconnection between RS485 serial network and supervision systems, with serial connection to PC via RS232 serial port (RS232 cable supplied)
KUSB	RS485/USB serial converter for interconnection between RS485 serial network and supervision systems, with serial connection to PC via USB port (USB cable supplied)
KRSE	RHOSS supervision software advanced for remote unit monitoring and management.



1	Kit of KFLX connection flexible pipes (mandatory if several modules are installed)
2	Kit of KTL side infill panels (mandatory)
3	Kit of KCLM module connection panels (mandatory if several modules are installed)
4	Right fitting KADX pipe accessory (optional)

The unit and KCSC accessory (if supplied) are connected in local serial network via telephone cables supplied with the KCLM kit.

The serial maximum length using a telephone cable is 50 m. For greater distances, use specific shielded cables (see paragraph *"Electric and serial connection"*).

Technical Data

Table "A": Technical Data

THAETY H.T.		**234**
Applications with fan coils		
B.S. heating capacity 7 / B.U. 6°C@40/45°C (2)	kW	34,3
Total absorbed power B.S. 7 / B.U. 6°C@40/45°C (1)	kW	10,36
COP B.S. 7 / B.U. 6°C@40/45°C		3,31
Heating capacity B.S. 7 / B.U. 6°C@40/45°C (2) EN 14511:2011	kW	33,79
COP B.S. 7 / B.U. 6°C@40/45°C (2) EN 14511:2011		3,43
Cooling capacity 35°C@12/7°C	kW	28,3
Total absorbed power 35°C@12/7°C (1)	kW	10,3
EER 35°C@12/7°C		2,75
Cooling capacity 35°C@12/7°C (2) EN 14511:2011	kW	28,79
EER 35°C@12/7°C (2) EN 14511:2011		2,93
E.S.E.E.R.		4,02
E.S.E.E.R.+		4,50
Heat exchanger nominal flow water side 35°C@12/7°C	l/h	4900
Residual head P1 35°C@12/7°C	kPa	137
Radiant applications		
B.S. heating capacity 7 / B.U. 6°C@30/35°C	kW	34.4
Total absorbed power B.S. 7 / B.U. 6°C@30/35°C (1)	kW	8,6
COP B.S. 7 / B.U. 6°C@30/35°C		4
COP B.S. 7 / B.U. 6°C@30/35°C (2) EN 14511:2011		4,18
Cooling capacity 35°C@23/18°C	kW	38,8
Total absorbed power 35°C@23/18°C (1)	kW	10,56
EER 35°C@23/18°C		3,67
EER 35°C@23/18°C (2) EN 14511:2011		3,85
Sound pressure (□)	dB(A)	43
Sound power (*)	dB(A)	74,5
Scroll/step compressor	n°	2/2
Fans	n° x kW	1 x 0,83
Heat exchanger water content	l	2,8
R410A refrigerant indicative amount (3)	Kg	9,2
Polyvinyl oil indicative amount (3)	Kg	2 x 1,7
Electrical data		
Pump absorbed power 400/3/50 P1	kW	0,55
Pump absorbed power 400/3/50 P2	kW	0,89
Electrical power supply	V-ph-Hz	400-3-50
Auxiliary power supply	V-ph-Hz	230-1-50
Nominal current P1 / P2	A	19,36 / 19,98
Maximum current P1 / P2	A	23,08 / 23,68
Starting current P1 / P2	A	86 / 86
Starting current with SFS accessory P1 / P2	A	56 / 57
Pump absorbed current P1 / P2	A	1,06 / 1,45
Dimensions		
Width (L)	mm	1224
Height (H)	mm	2152
Depth (P)	mm	1224
Water connections	Ø	1"1/2 GM

(□) Sound pressure level in dB(A) referring to a 10 m distance from the unit, in directionality factor equal to Q=2.

(*) Total sound power level in dB(A) on the basis of the measurements made in compliance with the UNI EN-ISO9614 and Eurovent 8/1 Standards

(1) Total absorbed power: power consumed by compressors, fan and pump P1

(2) Data calculated in accordance with EN 14511:2011

(3) Indicative values. To detect accurate values, always refer to the serial number plate on the unit

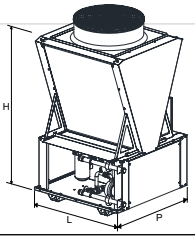


Table “A”: Technical Data

THAETY H.T.		**234**		
		2 modules	**3 modules**	**4 modules**
Applications with fan coils				
B.S. heating capacity 7 / B.U. 6°C@40/45°C (2)	kW	68,6	102,9	137,2
Total absorbed power B.S. 7 / B.U. 6°C@40/45°C (1)	kW	20,7	31,1	41,4
COP B.S. 7 / B.U. 6°C@40/45°C		3,31	3,31	3,31
Heating capacity B.S. 7 / B.U. 6°C@40/45°C (2) EN 14511:2011	kW	67,58	101,37	135,16
COP B.S. 7 / B.U. 6°C@40/45°C (2) EN 14511:2011		3,43	3,43	3,43
Cooling capacity 35°C@12/7°C	kW	56,6	84,9	113,2
Total absorbed power 35°C@12/7°C (1)	kW	20,6	30,9	41,2
EER 35°C@12/7°C		2,75	2,75	2,75
Cooling capacity 35°C@12/7°C (2) EN 14511:2011	kW	57,58	86,37	115,16
EER 35°C@12/7°C (2) EN 14511:2011		2,93	2,93	2,93
E.S.E.E.R.		4,17	4,32	4,40
E.S.E.E.R.+		4,71	4,86	4,97
Total nominal air flow 35°C@12/7°C	l/h	9.700	14.600	19.500
Residual head P1 35°C@12/7°C	kPa	137	137	137
Radiant applications				
B.S. heating capacity 7 / B.U. 6°C@30/35°C	kW	68,8	103,2	137,6
Total absorbed power B.S. 7 / B.U. 6°C@30/35°C (1)	kW	17,2	25,8	34,4
COP B.S. 7 / B.U. 6°C@30/35°C		4	4	4
COP B.S. 7 / B.U. 6°C@30/35°C (2) EN 14511:2011		4,18	4,18	4,18
Cooling capacity 35°C@23/18°C	kW	77,6	116,4	155,2
Total absorbed power 35°C@23/18°C (1)	kW	21,1	31,7	42,2
EER 35°C@23/18°C		3,67	3,67	3,67
EER 35°C@23/18°C (2) EN 14511:2011		3,85	3,85	3,85
Sound pressure (□)	dB(A)	46	47	48
Sound power (*)	dB(A)	77,5	79,3	80,5
Scroll/step compressor	n°	4/4	6/6	8/8
Fans	n° x kW	2 x 0,83	3 x 0,83	4 x 0,83
Heat exchanger water content	l	2 x 2,8	3 x 2,8	4 x 2,8
R410A refrigerant indicative amount (3)	Kg	2 x 9,2	3 x 9,2	4 x 9,2
Polyvinyl oil indicative amount (3)	Kg	4 x 1,7	6 x 1,7	8 x 1,7
Electrical data				
Pump absorbed power 400/3/50 P1	kW	2 x 0,55	3 x 0,55	4 x 0,55
Pump absorbed power 400/3/50 P2	kW	2 x 0,89	3 x 0,89	4 x 0,89
Electrical power supply	V-ph-Hz		400-3-50	
Auxiliary power supply	V-ph-Hz		230-1-50	
Total nominal current P1 / P2	A	38,74 / 39,96	58 / 59,9	77,5 / 79,9
Total maximum current P1 / P2	A	46,14 / 47,36	69,2 / 71	92,3 / 94,7
Total starting current P1 / P2	A	109 / 109	132 / 133	155 / 157
Starting current with SFS accessory P1 / P2	A	79 / 81	102 / 105	125 / 128
Pump absorbed current P1 / P2	A	2 x 1,06 / 2 x 1,45	3 x 1,06 / 3 x 1,45	4 x 1,06 / 4 x 1,45
Dimensions			**See "Dimensions"**	

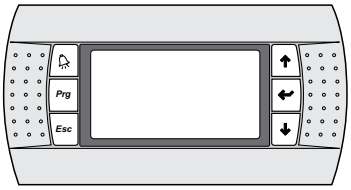
(□)	Sound pressure level in dB(A) referring to a 10 m distance from the unit, in directionality factor equal to Q=2.
(*)	Total sound power level in dB(A) on the basis of the measurements made in compliance with the UNI EN-ISO9614 and Eurovent 8/1 Standards
(1)	Total absorbed power: power consumed by compressors, fan and pump P1
(2)	Data calculated in accordance with EN 14511:2011
(3)	Indicative values. To detect accurate values, always refer to the serial number plate on the unit

Attention: the required capacity cannot be reached by using modules with different set-ups. Parallel modules must have the same set up.

Electronic controls

KTR and KTOB - Remote keyboard and keyboard on board the unit

The keyboard with display allows the control and display of all of the unit's digital and analogue process variables. It allows monitoring the operation status of the unit, regardless of whether it is a single (standalone) unit or belonging to a group. It is therefore possible to control all the unit functions.
In presence of a group of units, the keyboard allows assigning the serial address to each one for the proper connection to the network.



DISPLAY: displays the numbers and the values of all the parameters (i.e. outlet water temperature etc.), any alarm codes and resource status by means of strings.

ALARM key: makes it possible to display the code and reset any alarms

PROGRAM key: makes it possible to programme the machine's fundamental functioning parameters

ESC key: makes it possible to switch the unit on and off

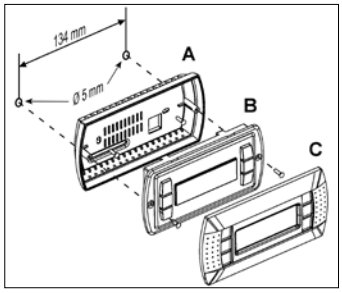
UP key: used to scroll through the list of parameters, statuses and any alarms; makes it possible to modify set points

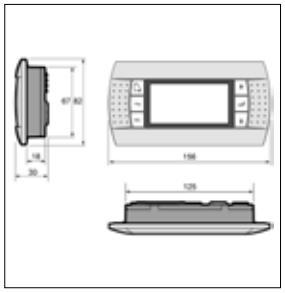
ENTER key:allows confirmation of the selected parameters

DOWN key: used to scroll through the list of parameters, statuses and any alarms; makes it possible to modify set points

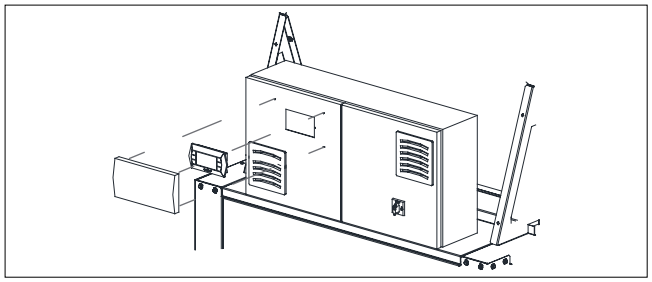
Two versions are available:

KTR - Wall-mounted remote control keyboard with backlit LCD display.





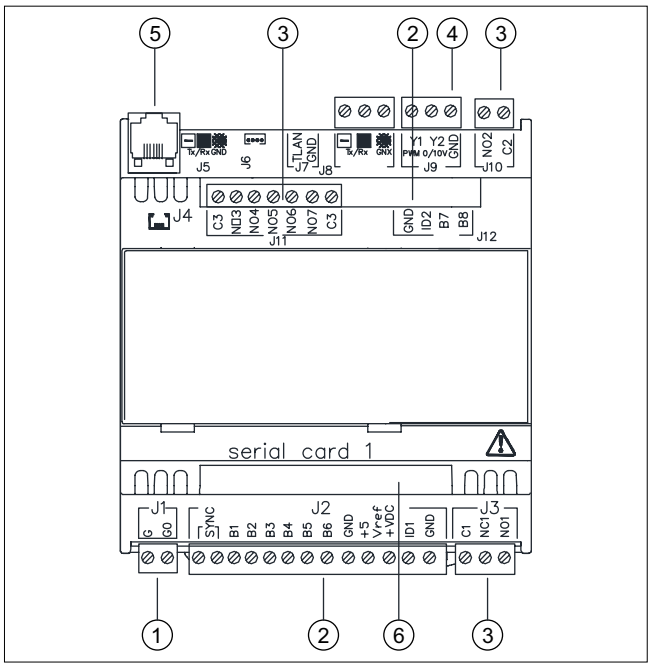
KTOB - Keyboard that can be installed on board the unit with backlit LCD display.



KCSC – Signal concentrator

The KCSC device is recommended when several units a connected in parallel and if they are controlled remotely. The KCSC allows collecting all the inputs and outputs simplifying the electrical connections; it also allows coordinating the activations and deactivations with all the units installed in parallel.

The status of the inputs and outputs are shown on the KCSC accessory display.



1	Power supply connection section 24Vac (+10/-15%), 50/60Hz.
2	Input connection section: - analogue (NTC ACS temperature probe and 4-20mA signal for dynamic set-point modification) - digital (DSP double set-point selector switch, SCR ON/OFF selector switch, DHW request, SEI summer/winter selector switch and FDL unit discharge selector switch)
3	Digital output connection section: - external heat source control (e.g. boiler), KRIT integrative heater control, DHW valve control and ON/OFF desuperheater pump control
4	Analogue output connection section: - control with 0-10 Vdc signal desuperheater inverter pump
5	Connector for the telephone cable and terminal connection and (via derivation board supplied)
6	Section for inserting the optional serial boards (KRS485, KFTT10, KBE, KBM)

Once the concentrator has been installed, it provides the remote controls and reads all the external signals. This is valid for both the single unit and multi-unit.

Electric and serial connection

The THAETY 234 Modular heat pump is equipped with an electronic control that manages automatically the single unit and the units connected in hydraulic parallel. Up to 4 identical units can be connected (group of units installed differently are not allowed).

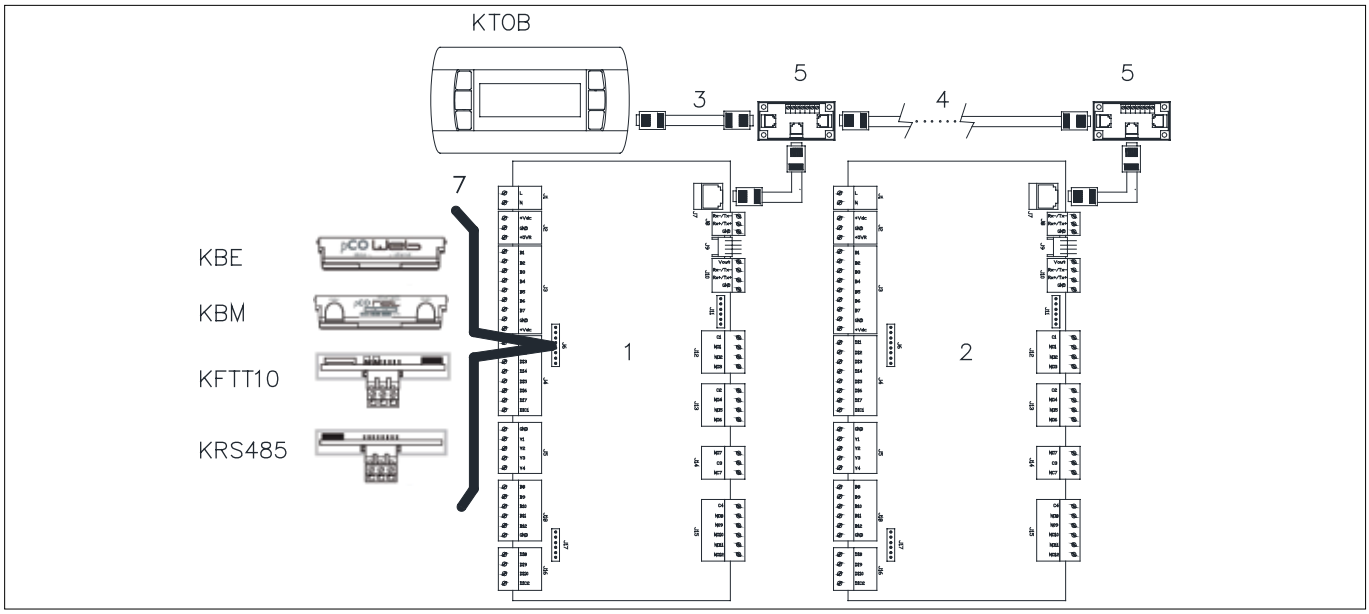
The keyboard with display that can be mounted on board (KTOB) or remote (KTR) allows viewing all the process variables of all the connected units and the access to the work setting parameters and relative modification; at a technical assistance level, it allows modifying the unit management parameters by entering a password (access allowed only to authorised personnel).

Type of standard Master/Slave local serial network

The units are connected in local serial network by means of a simple telephone cable supplied with the KCLM kit. Every unit is equipped with a derivation board inside the electrical panel with connectors for the connection to the network.
The system can be easily configured from the user terminal KTOB or KTR. The serial addresses of each unit and enabling the network are sufficient.
The Master unit is always identified with serial address 1 and the user terminal KTOB or KTR should be connected to it. The Master unit manages the thermoregulation, coordinating the activation of the units necessary to meet the thermal load required. The compressor rotation is always guaranteed, balancing the operation hours.
In the event the Master unit fails, the control system automatically assigns the Master role to another unit and the entire system keeps running normally, including the user terminal but excluding the failed unit.
The status of the network and single units can be monitored any time from the user terminal. E.g., the status of the compressors, circulation pump and the load percentage required by the utility, operating temperatures and other information are displayed.
For an electro-mechanical management of the cooling unit by means of consents (digital inputs) and controls (digital and analogue outputs) available, the intervention of the installer is required with an external system that drives all the units by means of a parallel connection.
Some controls and consents are different from the previous ones, as they must always be connected to the Master unit. The first is the control that modifies the set point (CS) via 4-20 mA analogue signal, used to modify the set point in a linear way. The second one is the 0-10V analogue signal for driving the desuperheater inverter pump, should this mode of DS hydraulic management be selected. (see paragraph set up with DS). The third analogue signal is the temperature probe for the request of domestic hot water to be positioned in the storage tank of the plumbing technology.
In the event the original Master unit fails, all the above-mentioned signals must be re-wired on the new Master unit.

Independent management of the desuperheater for the groups of unit P1DS and production request of domestic hot water for groups of P1V3V unit.

P1DS units connected to one group can manage a desuperheater external pump with fix speed for each unit installed. This way, every desuperheater works independently from the others and the nominal flow rate is always guaranteed. The installed pumps are connected to the digital output of the board on the unit to which it is assigned. For further details refer to the paragraph "Set up with desuperheater".
The P1V3V units connected to one group can manage the DHW request for each unit independently, connecting their digital inputs to the relative external request device. E.g., in presence of 3 P1V3V units, the DHW request can be carried out with a 3-step thermostat and each step assigns the control to one unit assigned to it.



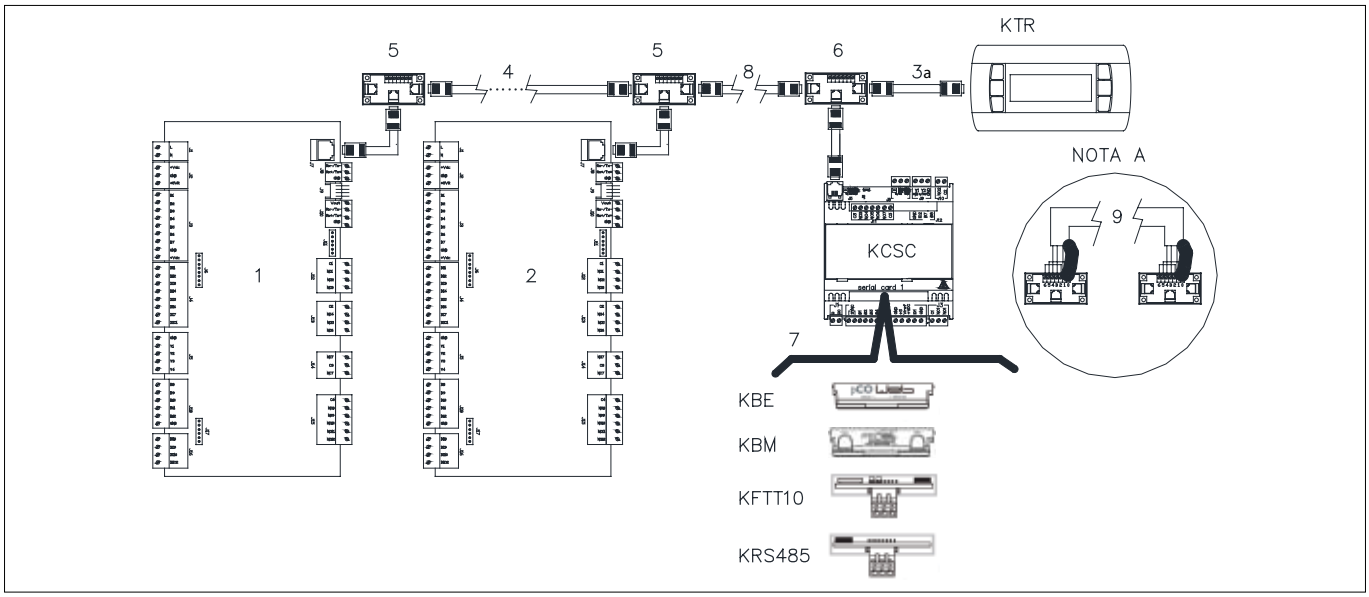
1	Unit 1
2	Unit 2 (up to maximum 4 units)
3	Telephone cable attached to the KTOB
4	Telephone cable attached to the KTL
5	Branching boards attached to the unit
7	Serial board options for external BMS (on Master unit)

Type of Master/Slave local serial network with network concentrator (KCSC accessory)

The signal concentrator (KCSC accessory) facilitates the POKER unit external control and consent management. The concentrator avoids repeating (by means of an electric panel) the signals of each unit, as each of them is connected to the specific clamps of the KCSC, considerably simplifying the system. Another benefit is that all those signals that should be connected only to the Master unit can be wired (4-20mA for set point modification, 0-10V for DS inverter pump and DHW temperature probe).

The KCSC is connected to the serial network of the POKER unit by means of telephone cable or shielded cable if distance exceeds 50 m. The KCSC is an independent board and must be installed and wired in the thermal system or anyway remote controlled in a protected environment.

Depending on the system, the system flexibility allows managing the desuperheater independently, even in presence of a concentrator for P1DS units and request of DHW for P1V3V, as described in the specific paragraph.



1	Unit 1
2	Unit 2 (up to maximum 4 units)
3a	Telephone cable supplied by the installer
4	Telephone cable attached to the KTL
5	Branching boards attached to the unit
6	Branching board attached to KCSC
7	Serial board options for external BMS (on Master unit)
8	Telephone cable supplied by the installer with 50 metres maximum length. For larger dimensions see NOTE A
9	AWG 20/22 shielded cable (up to 200 m long)

Synthesis of the consents and controls

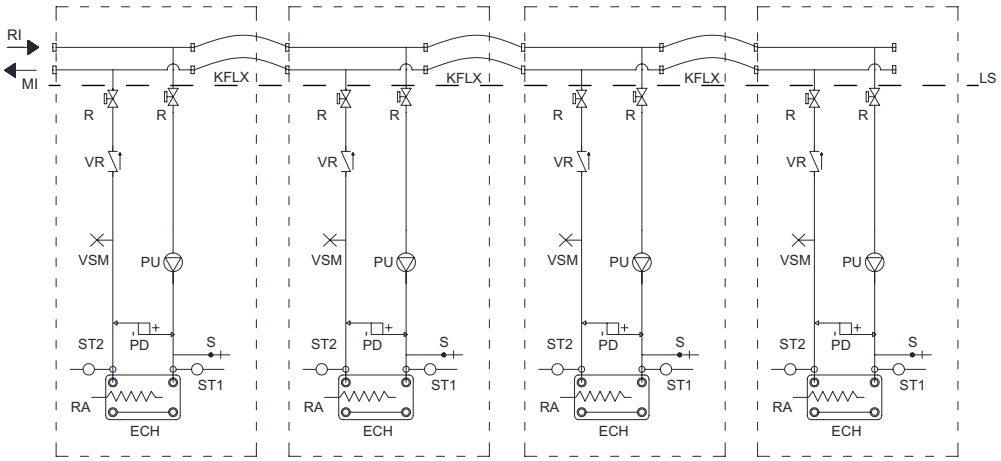
Consents (digital inputs)
SCR remote ON/OFF consent
Winter-summer season change consent (operation carried out from the chiller for summer and operation from SEI heat pump for winter)
DSP double set point control signal
Request of domestic hot water production.
Recovery requirest via desuperheater
FDL forced partialisation request. It must be connected to the concentrator
Analog inputs
Temperature probe to be inserted in the storage tank for domestic hot water request. It must be connected to the master unit or concentrator
4-20mA current signal to modify the CS set point linearly. It must be connected to the master unit or concentrator

Controls (digital outputs)
3-way valve control if outside KVDEV
Desuperheater ON/OFF pump control
Activation and deactivation control of the KRIT integrative heater
Activation and deactivation control of the CGA auxiliary generator (boiler)
In the event of unit alarm, a remote signal can be poweredr
Analog output
Desuperheater inverter pump 0-10Vdc control. It must be connected to the Master unit or concentrator

Failure management and system reliability

The Master & Slave management controls also failures of one of the units of the group, always ensuring service continuity.
In the event a unit fails, Master or Slave, the control will indicate that the systems is operating with reduced speed. The failed unit is automatically excluded from regulation and the group will keep meeting the system requirements, ensuring service continuity even if partially. Moreover, the control selects a new master unit that coordinates the Slave units left.

The internal hydraulic circuit coordinates the electronic control, as it has been made for allowing disconnecting the failed unit, keeping service continuity and possibility to perform ordinary or special maintenance operations required by the single unit at the same time. By closing the its internal cocks R, the unit can be separated hydraulically from the entire circuit, allowing maintenance and keeping providing service to the system with the units left.



RI	System return
MI	System delivery
LS	Line disassembly

POKER system applications

Overview

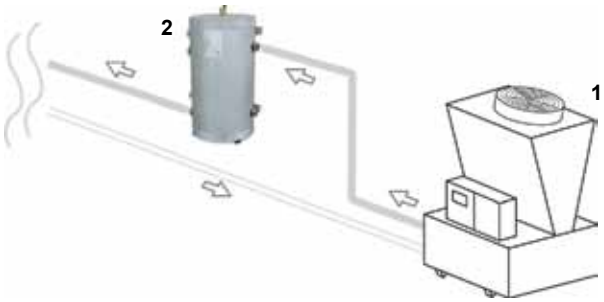
The following information is indicative. The provided diagrams are not complete and are used only to provide guidelines that allow a better use of the unit. The main rule to comply with for the Rhoss modular units is that only units installed in the same way can be connected. The installer and/or designer must assess the dimensions and assembly the expansion tank and safety valve protecting the entire hydraulic circuit, depending on the type of system.

System structure with single unit

The base diagram of the cooling system made with POKER installed individually for every available set up is represented in the following figures. Generally, for the proper operation of the unit, a 150 l water of the entire system must be ensured.

The installer and/or designer must assess the dimensions and assembly the expansion tank and safety valve protecting the entire hydraulic circuit, depending on the type of system.

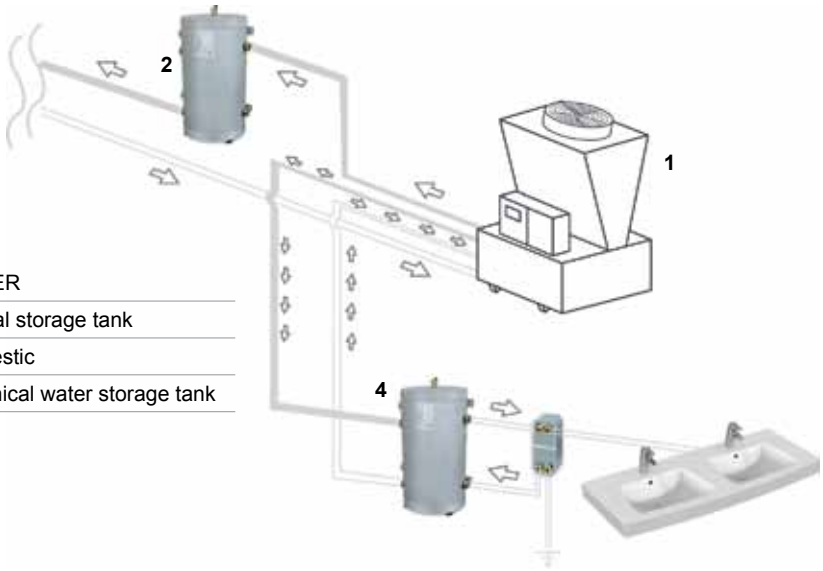
PUMP P1 installation



1	POKER
2	Inertial storage tank

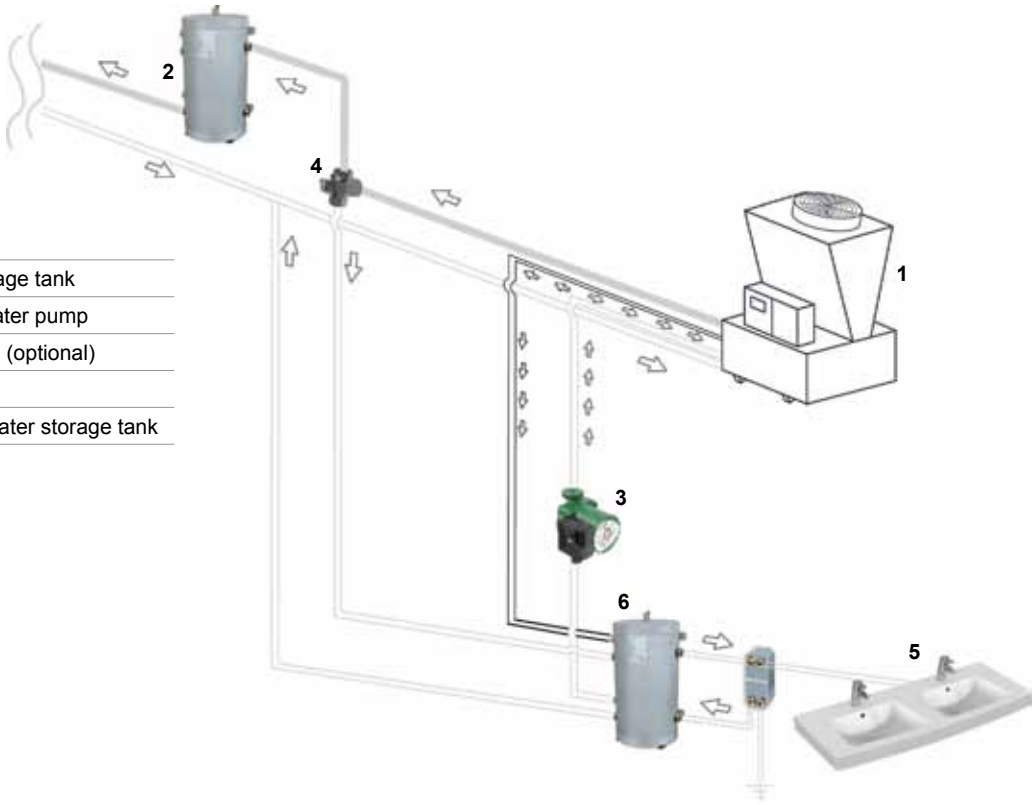
ATTENTION
It must be ensured:
- minimum 150 l of water in the circuit
- pressure water safety valve maximum operating pressure 6 bar
- expansion tank of suitable capacity

Pump P1 V3V installation



1	POKER
2	Inertial storage tank
3	Domestic
4	Technical water storage tank

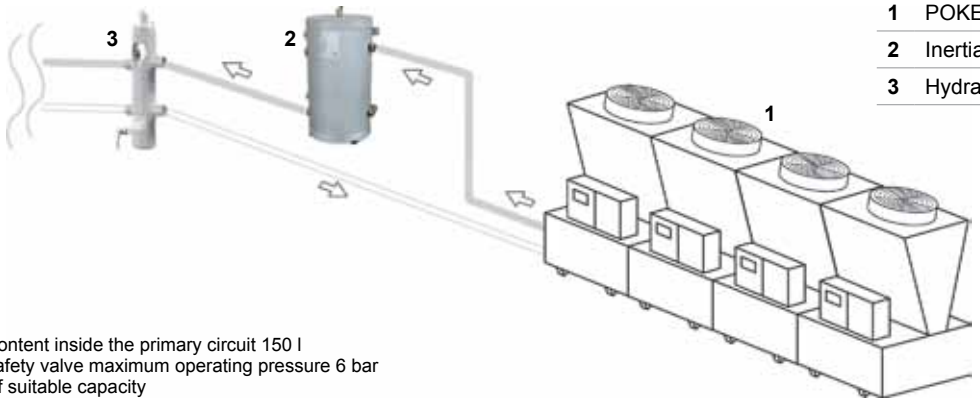
Pump P1 DS installation



1	POKER
2	Inertial storage tank
3	Desuperheater pump
4	3-way valve (optional)
5	Domestic
6	Technical water storage tank

System structure with units placed in parallel

The base diagram of the cooling system made with POKER units has a primary and secondary circuit, separated by a hydraulic circuit breaker. The POKER heat pumps, connected in parallel under a hydraulic point of view, are inserted inside the primary circuit, together with an inertial storage tank of suitable capacity (150 l) and the hydraulic circuit breaker, besides all the auxiliary and safety accessories required.
The parallel connection of the units is facilitated by the inner structure of each single unit. Every unit is equipped with cocks on the delivery and return and check valve that allows disconnecting the unit in parallel when it is off, due to a failure or for maintenance operations; this way, parasitic circulations is prevented and service continuity is ensured.
The following figure shows a set up example for Pump P1.



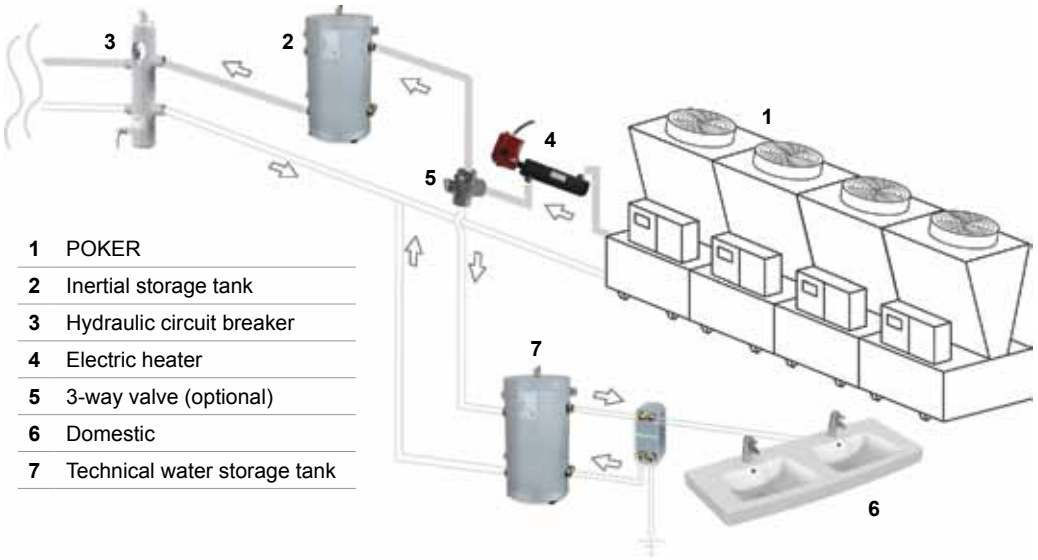
1	POKER
2	Inertial storage tank
3	Hydraulic circuit breaker

ATTENTION
It must be ensured:
- minimum water content inside the primary circuit 150 l
- pressure water safety valve maximum operating pressure 6 bar
- expansion tank of suitable capacity

Any other auxiliary components that must be included inside the primary circuit and managed by the unit group can be:

◦ 3-way valve shared for the production of DHW (not required for Pump P1 V3V)

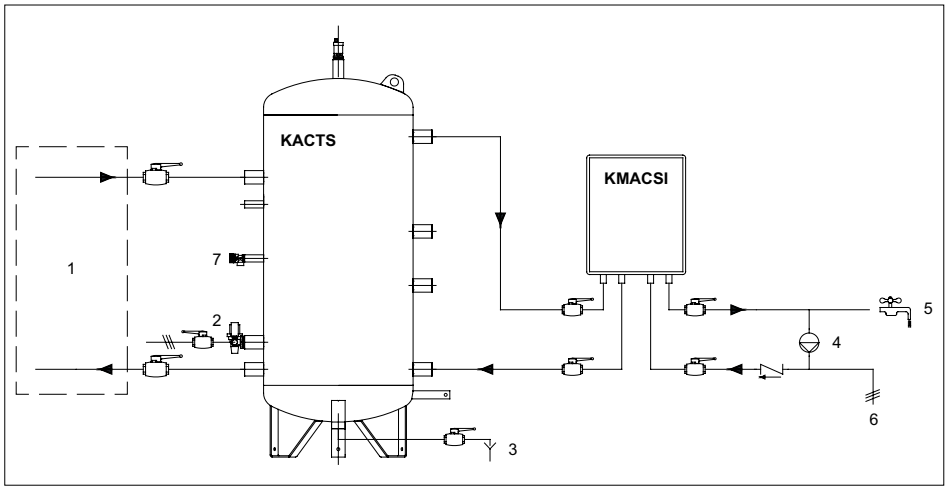
◦ electric heater as integrative source.



1	POKER
2	Inertial storage tank
3	Hydraulic circuit breaker
4	Electric heater
5	3-way valve (optional)
6	Domestic
7	Technical water storage tank

Production of DHW

The solutions provided by the POKER system to meet the domestic hot water request are several, depending on the configuration of the system. For the production of DHW by using the heat pump, use a technical water storage, which cannot be used directly for human consumption, and combine it to a DHW producer.
The figure shows an example:



KACTS	technical water storage tank
KMACSI	instantaneous domestic hot water producer
1	from heat pump
2	from the mains
3	drain
4	recirculation pump
5	DHW utility
6	from the mains
7	safety valve

Management of the priorities and domestic hot water request

The priority between DHW and system can be set directly from the control panel.

How to manage the DHW request:

◦ by means of the digital input: the request is assigned by a thermostat assembled by the installer. When the thermostat closes, the unit understands that there is a DHW request and, once the conditions have been verified, the procedure is activated to meet the DHW requirements;

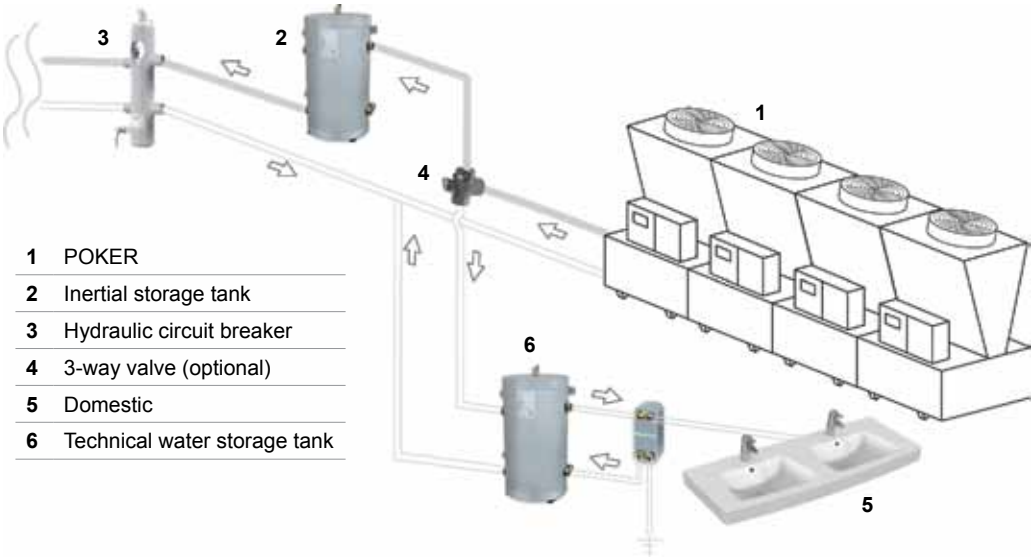
◦ by means of temperature probe in the storage tank: a temperature probe is placed inside the storage tank, which is directly connected to the unit board. The required set point can be configured from the panel together with the relative activation differential. In this case, the probe must be accurately positioned and the maximum distance allowed respected due to the type of probes used.

Type of probe

description	type of probe	features	β (25/85)
NTC150	NTC OT150	50kΩ@25°C	3977 (±1%)

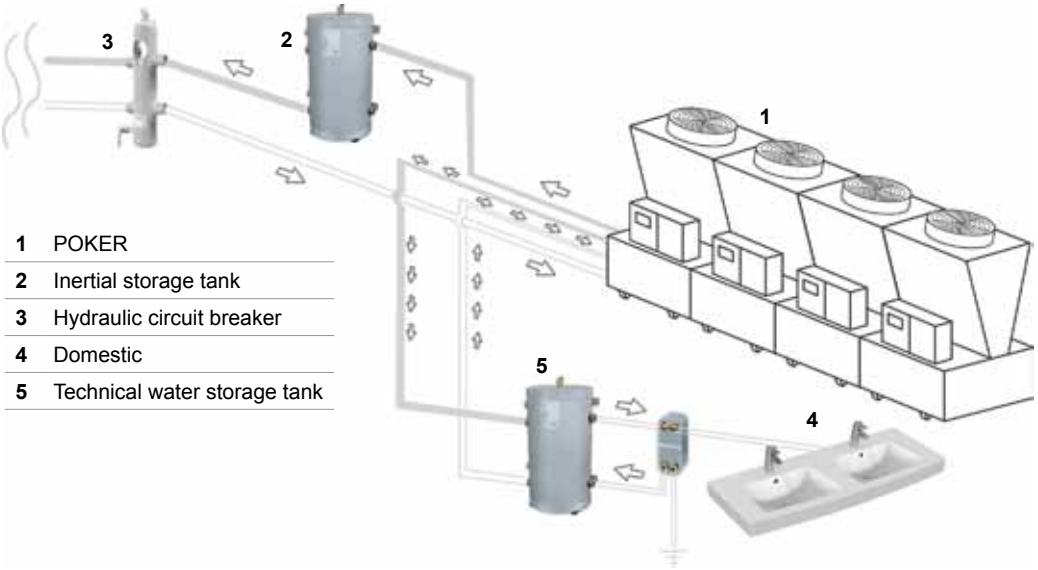
DHW production with different installations available

Mode A - DHW production with Pump P1 units.
The DHW production is ensured by the KVDEV kit installed downstrean the single unit or group of units. The 3-way valve of the KVDEV kit deviates water flow from the system to the technical water storage tank for the system producing domestic hot water.



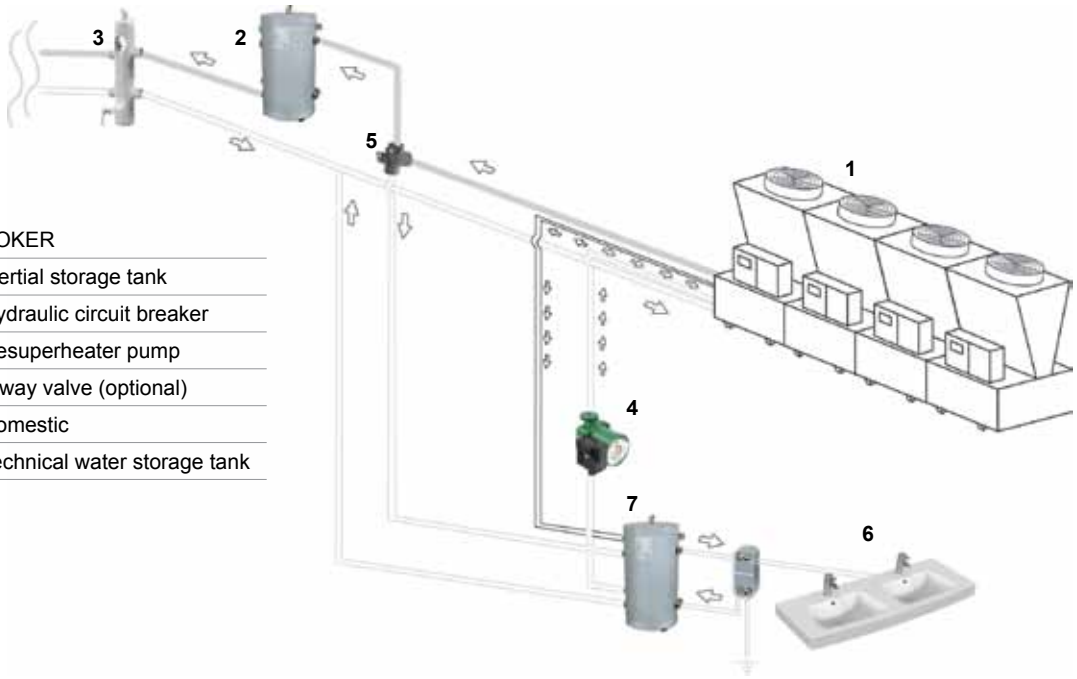
1	POKER
2	Inertial storage tank
3	Hydraulic circuit breaker
4	3-way valve (optional)
5	Domestic
6	Technical water storage tank

Mode B - DHW production with Pump P1 V3V units.
The DHW production is ensured directly by the 3-way valve assembled on board the unit. Additional kits are not required. The valve on board the unit guarantees a complete lack of system water mixture from domestic water and the step management of the DHW request, facilitating the simultaneous production of DHW and system heating/cooling.



1	POKER
2	Inertial storage tank
3	Hydraulic circuit breaker
4	Domestic
5	Technical water storage tank

Mode C - DHW production with machine in Pump P1 DS set-up.
The production of DHW is ensured by the KVDEV kit installed downstream the single machine or multi-unit. The thermal energy recovered by the desuperheater helps maintaining the heat capacity of the DHW storage tank, even when the units are activated to meet the system requirements. This complete solution meets both the system and DHW requirements. The 3-way valve of the KVDEV kit allows deviating the water flow from the system to the technical water storage tank for the DHW production, providing full capacity. When activated, the desuperheater keeps the heat level of the DHW storage tank high. This way, the system allows maximum service continuity to the DHW and system, regardless of the operation mode (summer or winter).



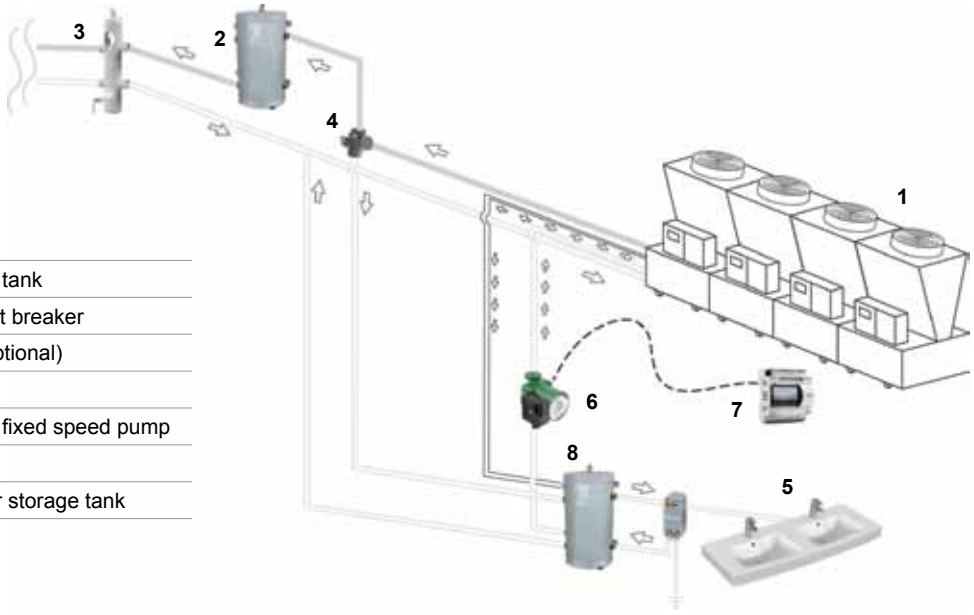
1	POKER
2	Inertial storage tank
3	Hydraulic circuit breaker
4	Desuperheater pump
5	3-way valve (optional)
6	Domestic
7	Technical water storage tank

Set-up with desuperheater

POKER units with desuperheater allow recovering a fraction of thermal energy both during summer operation and winter operation. The units are equipped with a standard brazed heat exchanger on the compressor flow. The desuperheater hydraulic connection is independent; therefore, the unit has 4 connections, 2 for the main heat exchanger electrical supply and 2 for the desuperheater electrical supply. The connections are standard on the left. However, reversibility is ensured by 2 KADX kits with right connections. The supply pump of the desuperheater circuit is provided by the supplier. The pump must be selected depending on the pressure drops to overcome in the entire circuit at the required capacity. The desuperheater hydraulic pump is managed by the unit. Considering parallel modules, some hydraulic configurations are allowed in order to have constant flows or constant temperature difference.

◦ Fixed speed pump for all the units

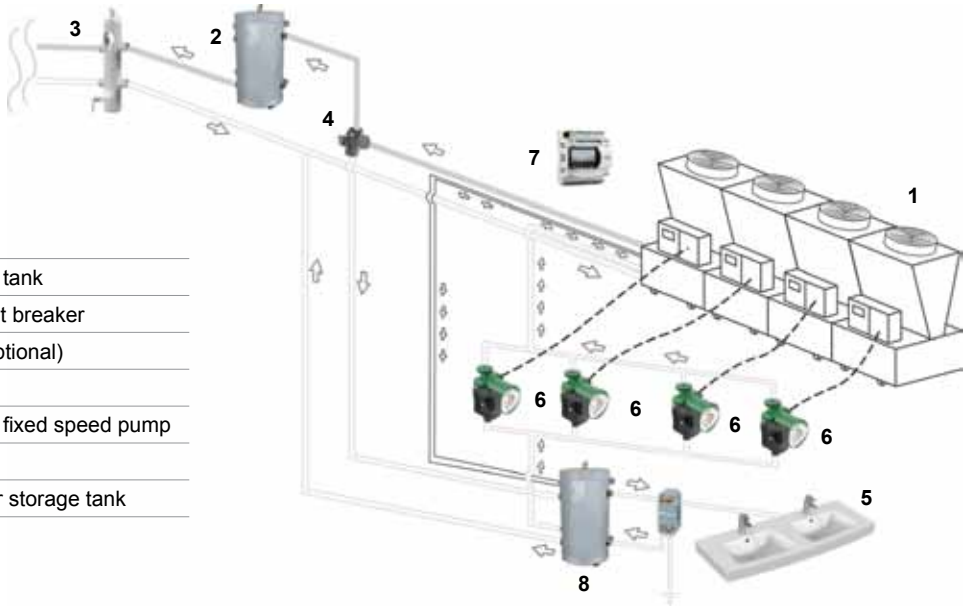
This simple mode ensures always a constant recovery total flow; however, in partialisation operation of the units, the temperature difference of the inlet and outlet water decreases.



1	POKER
2	Inertial storage tank
3	Hydraulic circuit breaker
4	3-way valve (optional)
5	Domestic
6	Desuperheater fixed speed pump
7	KCSC
8	Technical water storage tank

◦ Fixed speed pump for each unit installed

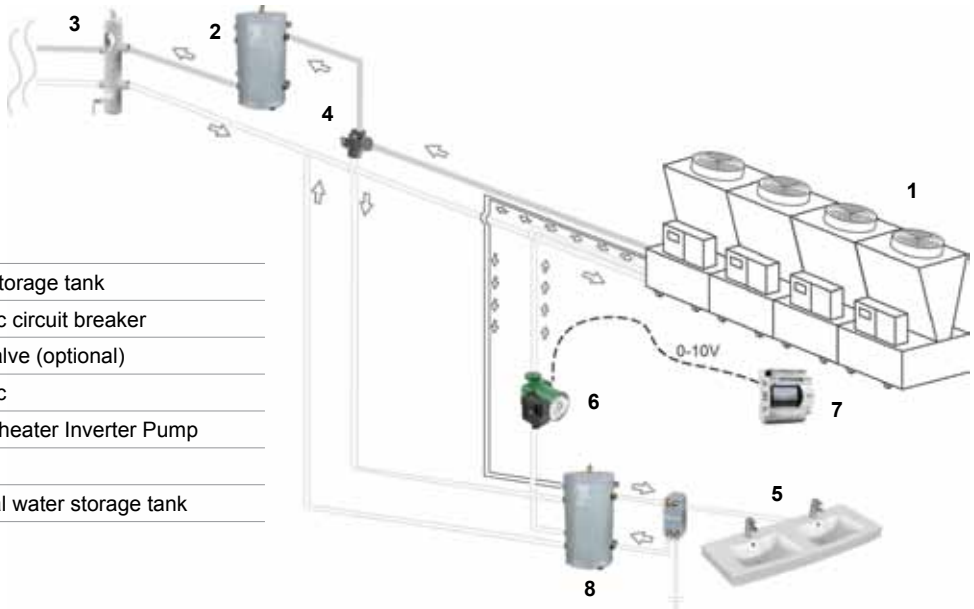
Another simple mode is installing a pump for each unit. This way, the flow rate is constant for each desuperheater, as well as the temperature difference between water inlet and outlet.



1	POKER
2	Inertial storage tank
3	Hydraulic circuit breaker
4	3-way valve (optional)
5	Domestic
6	Desuperheater fixed speed pump
7	KCSC
8	Technical water storage tank

◦ Variable speed pump

This solution is possible as the control on board the machine allows assessing a number of steps for the pump equal to the number of machines installed. The signal modulates the pump speed gradually; this allows the desuperheater flow rate to be constant and maintain the temperature difference between water inlet and outlet.



1	POKER
2	Inertial storage tank
3	Hydraulic circuit breaker
4	3-way valve (optional)
5	Domestic
6	Desuperheater Inverter Pump
7	KCSC
8	Technical water storage tank

Activation and deactivation of the desuperheater for Pump P1 DS units.

The units installed with Pump P1 DS desuperheater can activate the thermal recovery by means of an external digital consensus. Moreover, the criterion to stop the thermal recovery can be established from the panel:

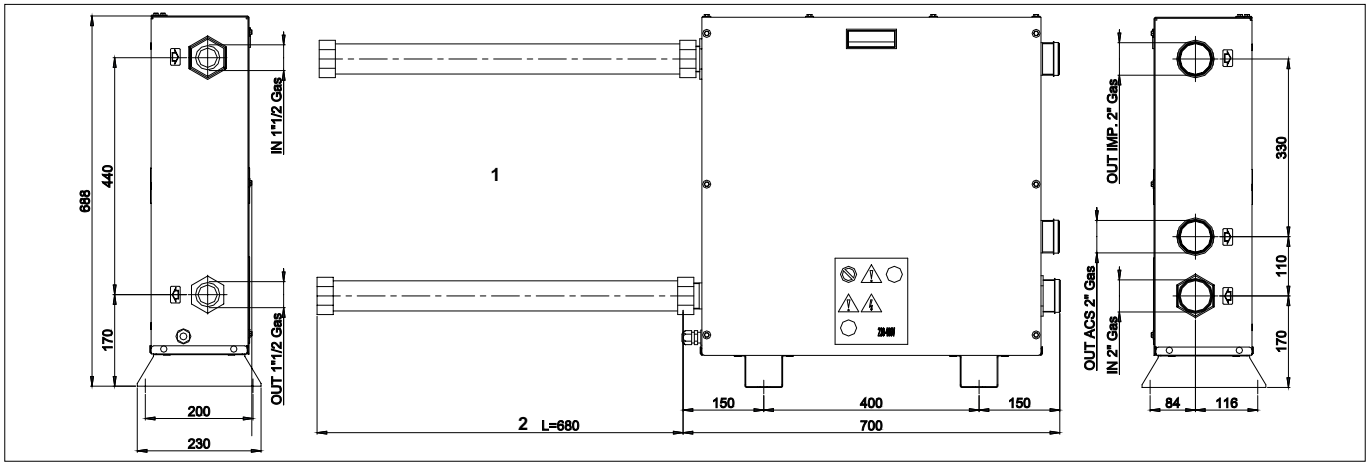
- or for digital contact: if the consensus is interrupted, the thermal recovery stops as well. This mode meets the requirement to carry out a temperature control system of the tank connected to the desuperheater;
- or for return maximum temperature: this limit can be set from the KTOB / KTR panel. The recovery keeps operating until the return temperature is lower than the configured set point. This mode is suitable for maximising the use of the thermal recovery.

The operation of a group of units with Pump P1 DS set up and desuperheater on board and KVDEV accessory mounted downstream the group of units for managing the domestic hot water production is the following:
with the request signal of DHW production activated, the control rotates the KVDEV 3-way valve towards the domestic hot water, activates the heat pump and simultaneously the heat recovery by means of the desuperheater.
When the domestic hot water request stops, the system is placed in such a way that is the system to be served; therefore, the valve rotates towards the system and the POKER units operate in the mode required (cooling or heating mode). The desuperheater, instead, keeps recovering thermal energy integrating and/or maintaining the thermal level inside the technical tank of domestic hot water and only the maximum return temperature is interrupted.

This way, the maximum thermal recovery is favoured enhancing also the thermal level inside the storage tank. In that case, depending on the set point configured on the maximum return temperature, the storage can be taken to very high temperatures that can also reach 70°C. Therefore, it is important that the domestic hot water production system for human consumption has all the devices required for mixing and preventing the water terminals to receive too hot water.

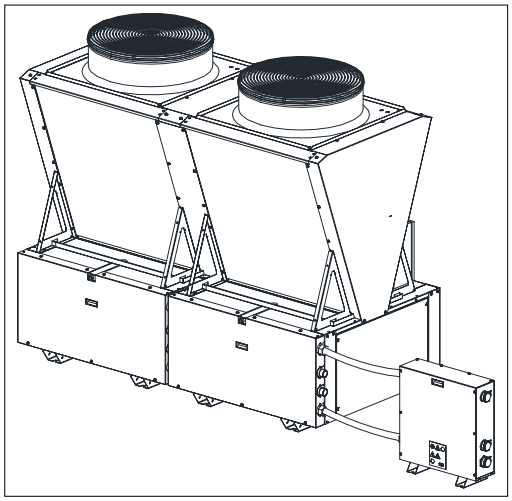
The installer and/or designer must assess the dimensions and assembly the expansion tank and safety valve protecting the entire hydraulic circuit of the desuperheater, depending on the type of system.

Accessory KVDEV



1 From heat pump

2 Flexible pipes



For units assembled with Pump P1 or Pump P1DS, the KVDEV kit can be installed for managing the domestic hot water production. The 3-way valve allows deviating the water flow from the system to the technical water tank for the production of domestic hot water.

The kit includes two flexible pipes to connect the delivery and return of the unit. The flexible pipes compensate the misalignment between the system delivery and return fittings of the unit and the corresponding KVDEV fittings even if the unit is equipped with KSA anti-vibration supports.

The accessory must be mounted the closest possible to the POKER heat pumps, in order to prevent a transfer of cold water inside the domestic hot water storage, during the passage between heat pump chiller operation to produce domestic hot water.

The delivery and return fittings towards the system are available with 2" connections.

The kit is equipped with RAL9018 painted bonnet.

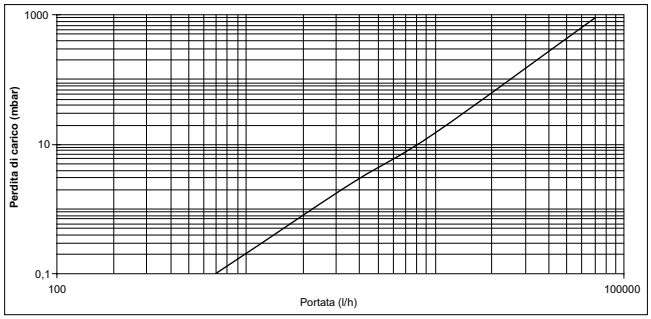
Cable gland for wiring the power supply.

IP 54 rate

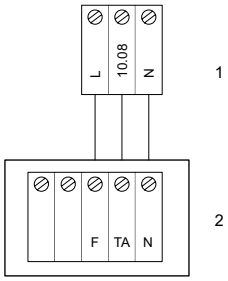
Valve body technical characteristics and servomotor technical data

The diverter valve with nickel-plated bass body, chrome-plated brass ball, PTFE ball seat seal and HNBR manoeuvre rod seal, synthetic fibre (Fasit) bar hold gaskets.
Maximum differential pressure is: 6 bar
Working pressure: PN 40
Flow temperature limits: -40÷100°C
Ball manoeuvre time with 180° angle: 120 s.
The passage of fluid is always guaranteed during the manoeuvre.
The actuator is contained in a sealed box fixed to the valve body via a split pin.
Tensione di alimentazione nominale 230 V/50Hz
Absorbed power 4 VA
Isolation class II
Maximum torque: 28 Nm (230V)
Auxiliary contact: 6 A 230V (on-off)

KVDEV pressure drops



Electrical connection



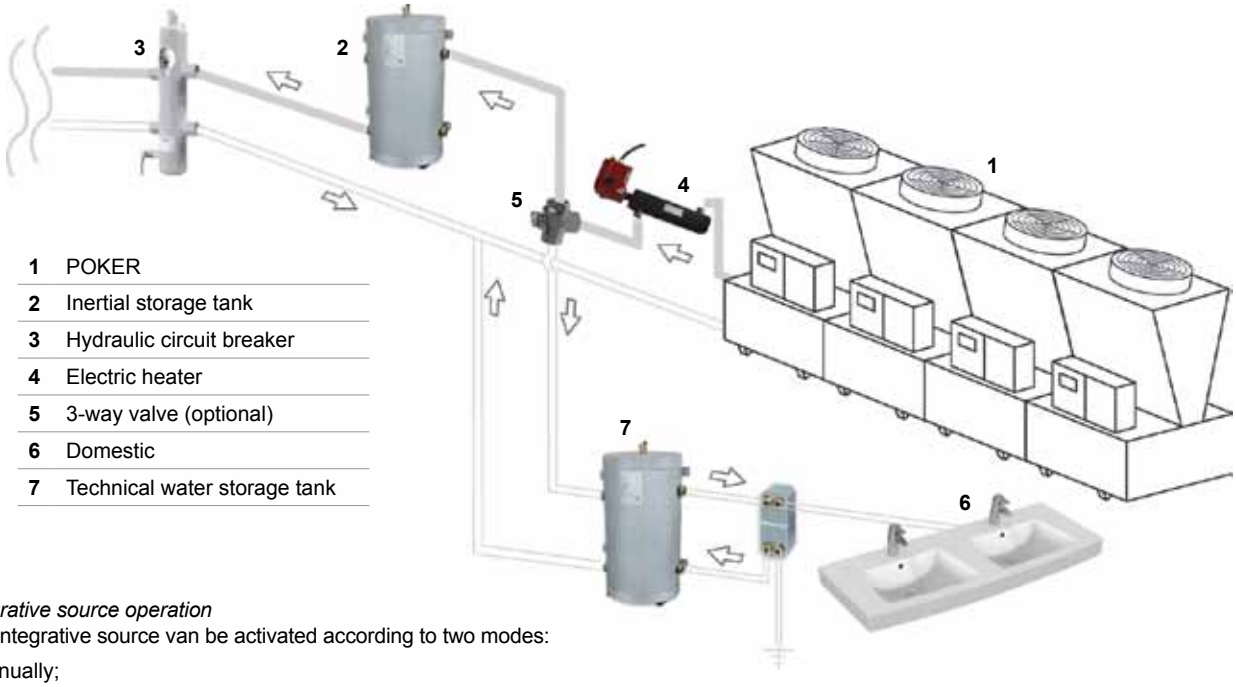
1	Electrical panel terminal board
2	KVDEV valve

Connection of KVDEV valve to unit terminal board

Management of an integrative source and auxiliary generator

The integrative heat source (electric heater) or an auxiliary thermal source (boiler) can be managed from the unit board.

Integrative thermal source
An integrative thermal source is an electric heater that runs together with the POKER heat pump in winter mode. Via the unit control, the activation or deactivation can be controlled, on the basis of the outdoor temperature and temperature difference between the produced water and relative set point. As the control is single, one resistance only can be managed. For the PUMP P1 V3V set-up, the system flow resistance or DHW flow must be set from the panel. If available, the KVDEV must be placed upstream the 3-way valve.



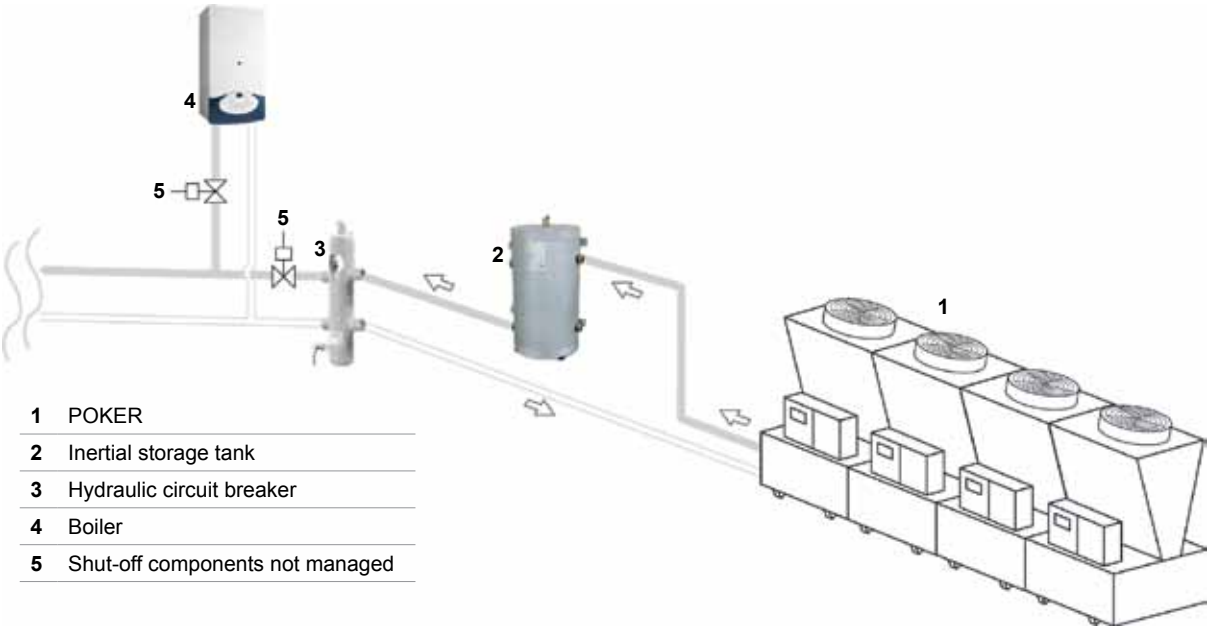
1	POKER
2	Inertial storage tank
3	Hydraulic circuit breaker
4	Electric heater
5	3-way valve (optional)
6	Domestic
7	Technical water storage tank

Integrative source operation
The integrative source van be activated according to two modes:

◦ manually;
◦ for an outdoor temperature set point.

Auxiliary generator

An auxiliary generator is a heat generator that runs alternatively to the heat pump; typically, it is a boiler. When the alternative generator is activated, the heat pump and all its auxiliaries are off, even if powered. The auxiliary generator can be enabled only for heating the systems.



1	POKER
2	Inertial storage tank
3	Hydraulic circuit breaker
4	Boiler
5	Shut-off components not managed

Operation of the auxiliary source

The auxiliary generator can be activated according to three modes:

- manually;
- for an outdoor temperature set point;
- for a convenience criterion based on the costs of electricity and fuel (methane and butane)

Perfomance

Choice of machine and use of the performance tables

- Table **"B"** supplies the cooling capacity (QF) and the absorbed electric power (P), depending on the temperature of the evaporator outlet water with constant temperature differentials ∆t =5°C and of the temperature of the outdoor air.
- Table **"C"** supplies the thermal capacity (QT) and the absorbed electric power (P), depending on the temperature of the condenser outlet water with constant temperature differentials ∆t =5°C and of the temperature of water.
- Table **"D"** provides the technical data of the desuperheater.
- Table **"E"** provides the load conditions and ESEER index temperatures.
- Tables **"F"** provide the summer and winter partial load performance.

Table "B": cooling capacity THAETY (ΔT = 5°C all'evaporatore)

Model	Tue (°C)	Ta											
		20 (°C)		25 (°C)		30 (°C)		35 (°C)		40 (°C)		45 (°C)	
		QF	P	QF	P	QF	P	QF	P	QF	P	QF	P
		kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
234	4	29,1	7,2	27,9	8,2	26,7	9,2	25,5	10,2	24,3	11,2	23,1	12,3
	5	30,1	7,2	28,8	8,2	27,6	9,2	26,4	10,2	25,2	11,3	24,0	12,3
	7	31,9	7,3	30,7	8,3	29,5	9,3	28,3	10,3	27,1	11,3	25,9	12,3
	10	34,8	7,4	33,6	8,4	32,4	9,4	31,1	10,4	29,9	11,4	28,7	12,4
	12	36,7	7,4	35,5	8,4	34,3	9,4	33,0	10,4	31,8	11,4	-	-
	15	39,6	7,5	38,4	8,5	37,1	9,5	35,9	10,5	34,7	11,5	-	-
	18	42,5	7,6	41,3	8,6	40,0	9,6	38,8	10,6	37,6	11,5	-	-

Ta	Outdoor air temperature (dry bulb).
Tue	Evaporator water output temperature (Δt input/output 5 K).
QF	Cooling capacity (fouling factor equal to 0.35 x 10-4 m2 K/W).
P	Total electrical power absorbed (for Pump P1 installation).

Table "C": Thermal yield THAETY (ΔT = 5°C to the condenser)

Model	Ta (°C)	UR %	Tuc (°C)											
			35		40		45		50		55		60	
			QT	P	QT	P	QT	P	QT	P	QT	P	QT	P
			kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW	kW
234	-20	90	14,1	8,7	14,4	9,7	-	-	-	-	-	-	-	-
	-15	90	17,8	8,7	18,0	9,6	18,2	10,5	-	-	-	-	-	-
	-10	90	21,6	8,7	21,7	9,6	21,8	10,5	22,0	11,3	-	-	-	-
	-7	90	23,8	8,7	23,9	9,6	24,0	10,5	24,1	11,3	-	-	-	-
	-5	90	25,3	8,7	25,4	9,6	25,5	10,5	25,5	11,3	25,6	12,0	-	-
	0	90	29,1	8,6	29,1	9,6	29,2	10,4	29,2	11,2	29,1	12,0	29,1	12,7
	2	90	30,6	8,6	30,6	9,5	30,6	10,4	30,6	11,2	30,6	12,0	30,5	12,7
	5	90	32,9	8,6	32,9	9,5	32,8	10,4	32,8	11,2	32,7	11,9	32,6	12,6
	7	90	34,4	8,6	34,4	9,5	34,3	10,4	34,2	11,2	34,1	11,9	34,1	12,6
	10	90	36,7	8,6	36,6	9,5	36,5	10,3	36,4	11,1	36,3	11,9	36,2	12,6
	15	90	40,5	8,6	40,4	9,5	40,2	10,3	40,1	11,1	39,9	11,8	39,7	12,5
	20	90	44,3	8,5	44,1	9,4	43,9	10,3	43,7	11,0	43,5	11,8	43,3	12,4
	25	90	48,1	8,5	47,9	9,4	47,7	10,2	47,4	11,0	47,1	11,7	46,9	12,4
	30	90	52,0	8,5	51,7	9,4	51,4	10,2	51,1	10,9	50,8	11,7	50,4	12,3
	35	90	55,9	8,5	55,5	9,3	55,2	10,1	54,8	10,9	54,4	11,6	54,0	12,2
	40	90	59,7	8,4	59,4	9,3	58,9	10,1	58,5	10,8	58,1	11,5	57,7	12,2

Tuc	Condenser water outlet temperature (Δt inlet/outlet = 5°C).
Ta	Outdoor air temperature (dry bulb).
UR	Relative humidity (%).
QT	Heating capacity (evaporator fouling factor equal to 0.35 x 10-4 m2C/W).
P	Total electrical power absorbed (for Pump P1 installation).

Performances and pressure drops accessory DS

Table "D": Technical data of the desuperheater

Model THAETY		**234**	
DS - Desuperheater			
Inlet/outlet water temperature	°C	50/60	60/70
Nominal heating capacity (*)	kW	6	5
Desuperheater nominal air flow	l/h	516	430
Desuperheater nominal pressure drops	kPa	1	0,09
Desuperheater water content	l	0,45	
Desuperheater water fittings	Ø	2	

(*)

◦ Thermal capacity with recovery unit and desuperheater fouling factor equal to 0.35 x 10-4 m² K/W. Performance referred to summer operation nominal conditions, air temperature 35°C, refrigerated water temperature 7°C and temperature differential at the evaporator 5K and also to the winter operation nominal conditions, air temperature 7°C, temperature of the water produced 45°C and condenser temperature differential 5k.

Functioning limits:

DS

◦ Produced hot water temperature 50÷70°C with admitted water temperature differential 5÷10 K

◦ The minimum inlet water temperature admitted is equal to 40°C

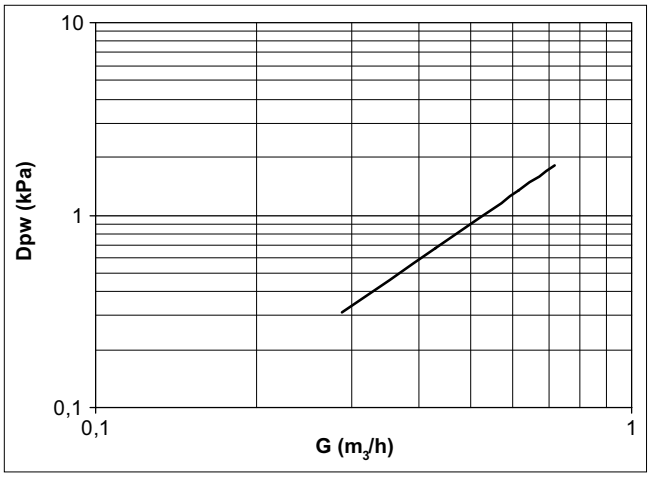
Maximum working pressure 6 bar. The installer and/or designer is in charge of dimensioning and installing the expansion tank and safety valve.

Recovery by means of the desuperheater is allowed both in summer and winter operation. In that case, the desuperheater capacity is subtracted to the condenser, which will provide less thermal capacity.
In the heat pump operation, the thermal capacity to the condenser with active desuperheater is determined by subtracting the desuperheater capacity to the thermal capacity provided without desuperheater.

$QT_{DS\_on} = QT_{DS\_off} - Q_{DS}$

Attention: The units equipped with recovery unit permanently placed in series to compressor must be started in conformity with the dispositions of Ministerial Decree 1/12/2004 n. 329. This law is only valid in Italy, for installation in other countries, please abide by the local laws in force. The DHW can only be produced with the use of a further heat exchanger suitable for the purpose. Refer to the current laws and Standard in the place of installation.

Desuperheater pressure drops



Δpw (kPa)	Desuperheater nominal pressure drop
G (l/h)	Desuperheater water flow

Seasonal efficiency index and partial load performance

◦ The E.E.R. index represents an estimate of the energy efficiency of the cooling unit in nominal design conditions. In reality, the operating time of a chiller in nominal conditions is usually less than the operating time in partial load conditions.

◦ E.S.E.E.R. energy index (European Seasonal E.E.R.), introduced by the European Community (E.E.C.C.A.C. project) - Energy Efficiency and Certification of Central Air Conditioners), it is characterised by the air temperatures in the air condense units (see table B) and energy weights provided to the four load conditions considered for calculation: 100%, 75%, 50% e 25%.

$$\textbf{ESEER} \quad \frac{3*EER_{100\%} + 33*EER_{75\%} + 41*EER_{50\%} + 23*EER_{25\%}}{100}$$

where $EER_{100\%}EER_{75\%}EER_{50\%}EER_{25\%}$ represent the efficiencies of the cooling unit in the four load conditions and at the temperatures indicated in table "**E**

Table "E": load and temperatures conditions

Condenser inlet air temperature					
Load	**Temperature**	**$EER_{\%}$**			
		1 module	**2 modules**	**3 modules**	**4 modules**
100%	35°C	2,93	2,93	2,93	2,93
75%	30°C	3,57	3,57	3,73	3,81
50%	25°C	4,26	4,33	4,45	4,54
25%	20°C	4,39	4,91	5,10	5,19

The high values of energy efficiency with partial loads were achieved thanks to optimisation of the heat exchanger. The values are to be considered net of height, due to the presence of the pump, in compliance with standard UNI EN 14511-2011.

EER-ESEER for THAETY

Model		EER	ESEER
THAETY 234 H.T.	**1 module**	2,93	4,02
	2 modules	2,93	4,17
	3 modules	2,93	4,32
	4 modules	2,93	4,40

Table "F": Partial load performance for the calculation of the seasonal efficiency indexes

Recent amendments, both in a national and European context, are consolidating some methods for the seasonal efficiency index calculations. These indexes depend on the type of system made, thermal load, project conditions and unit performance data.
As manufacturer, Rhoss S.p.a. provides designers and performance data experts commonly required to calculate the seasonal efficiency indexes. All the following data refer to the POKER P1 set up, according to standard UNI EN 14511-2011.

Yield thermal capacity and COP at full load and partial load during winter operation due to the conditions of the low temperature terminals.

1 module	Constant outlet water temperature from condenser			
	35			
Partialisation	**50%**		**100%**	
	QT	COP	QT	COP
Ta B.S. / Ta B.U.				
-7 / -8	11,97	2,88	23,29	2,91
2 / 1	15,71	3,75	30,11	3,73
7 / 6	17,80	4,24	33,91	4,18
12 / 11	19,89	4,72	37,72	4,63

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

2 modules	Constant outlet water temperature from condenser							
	35							
Partialisation	**25%**		**50%**		**75%**		**100%**	
	QT	COP	QT	COP	QT	COP	QT	COP
Ta B.S. / Ta B.U.								
-7 / -8	11,97	2,88	23,94	2,88	35,26	2,90	46,58	2,91
2 / 1	15,71	3,75	31,42	3,75	45,82	3,74	60,22	3,73
7 / 6	17,80	4,24	35,60	4,24	51,71	4,20	67,82	4,18
12 / 11	19,89	4,72	39,78	4,72	57,61	4,66	75,44	4,63

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

3 modules	Constant outlet water temperature from condenser											
	35											
Partialisation	**16,6%**		**33,3%**		**50%**		**66,6%**		**83,3%**		**100%**	
	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP
Ta B.S. / Ta B.U.												
-7 / -8	11,97	2,88	23,94	2,88	35,91	2,88	47,23	2,89	58,55	2,90	69,87	2,91
2 / 1	15,71	3,75	31,42	3,75	47,13	3,75	61,53	3,74	75,93	3,73	90,33	3,73
7 / 6	17,80	4,24	35,60	4,24	53,40	4,24	69,51	4,21	85,62	4,19	101,73	4,18
12 / 11	19,89	4,72	39,78	4,72	59,67	4,72	77,50	4,68	95,33	4,65	113,16	4,63

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

4 modules	Constant outlet water temperature from condenser															
	35															
Partialisation	**12,5%**		**25%**		**37,5%**		**50%**		**62,5%**		**75%**		**87,5%**		**100%**	
	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP
Ta B.S. / Ta B.U.																
-7 / -8	11,97	2,88	23,94	2,88	35,91	2,88	47,88	2,88	59,20	2,89	70,52	2,90	81,84	2,91	93,16	2,91
2 / 1	15,71	3,75	31,42	3,75	47,13	3,75	62,84	3,75	77,24	3,74	91,64	3,74	106,04	3,73	120,44	3,73
7 / 6	17,80	4,24	35,60	4,24	53,40	4,24	71,20	4,24	87,31	4,22	103,42	4,20	119,53	4,19	135,64	4,18
12 / 11	19,89	4,72	39,78	4,72	59,67	4,72	79,56	4,72	97,39	4,68	115,22	4,66	133,05	4,64	150,88	4,63

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

Yield thermal capacity and COP at full load and partial load during winter operation due to the conditions of the medium temperature terminals.

1 module	Constant outlet water temperature from condenser			
	45			
Partialisation	**50%**		**100%**	
	QT	COP	QT	COP
Ta B.S. / Ta B.U.				
-7 / -8	11,98	2,38	23,47	2,39
2 / 1	15,61	3,10	30,10	3,06
7 / 6	17,64	3,50	33,79	3,43
12 / 11	19,68	3,90	37,49	3,80

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

2 modules	Constant outlet water temperature from condenser							
	45							
Partialisation	**25%**		**50%**		**75%**		**100%**	
	QT	COP	QT	COP	QT	COP	QT	COP
Ta B.S. / Ta B.U.								
-7 / -8	11,98	2,38	23,96	2,38	35,45	2,39	46,94	2,39
2 / 1	15,61	3,10	31,22	3,10	45,71	3,07	60,20	3,06
7 / 6	17,64	3,50	35,28	3,50	51,43	3,45	67,58	3,43
12 / 11	19,68	3,90	39,36	3,90	57,17	3,83	74,98	3,80

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

3 modules	Constant outlet water temperature from condenser											
	45											
Partialisation	**16,6%**		**33,3%**		**50%**		**66,6%**		**83,3%**		**100%**	
	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP
Ta B.S. / Ta B.U.												
-7 / -8	11,98	2,38	23,96	2,38	35,94	2,38	47,43	2,38	58,92	2,39	70,41	2,39
2 / 1	15,61	3,10	31,22	3,10	46,83	3,10	61,32	3,08	75,81	3,07	90,30	3,06
7 / 6	17,64	3,50	35,28	3,50	52,92	3,50	69,07	3,47	85,22	3,44	101,37	3,43
12 / 11	19,68	3,90	39,36	3,90	59,04	3,90	76,85	3,85	94,66	3,82	112,47	3,80

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

4 modules	Constant outlet water temperature from condenser															
	45															
Partialisation	**12,5%**		**25%**		**37,5%**		**50%**		**62,5%**		**75%**		**87,5%**		**100%**	
	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP
Ta B.S. / Ta B.U.																
-7 / -8	11,98	2,38	23,96	2,38	35,94	2,38	47,92	2,38	59,41	2,38	70,90	2,39	82,39	2,39	93,88	2,39
2 / 1	15,61	3,10	31,22	3,10	46,83	3,10	62,44	3,10	76,93	3,08	91,42	3,07	105,91	3,07	120,40	3,06
7 / 6	17,64	3,50	35,28	3,50	52,92	3,50	70,56	3,50	86,71	3,47	102,86	3,45	119,01	3,44	135,16	3,43
12 / 11	19,68	3,90	39,36	3,90	59,04	3,90	78,72	3,90	96,53	3,86	114,34	3,83	132,15	3,81	149,96	3,80

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

Yield thermal capacity and COP at full load and partial load during winter operation due to the conditions of the high temperature terminals or domestic hot water.

1 module	Constant outlet water temperature from condenser			
	55			
Partialisation	**50%**		**100%**	
	QT	COP	QT	COP
Ta B.S. / Ta B.U.				
-7 / -8	-	-	-	-
2 / 1	15,50	2,68	30,03	2,64
7 / 6	17,47	3,02	33,62	2,95
12 / 11	19,44	3,37	37,21	3,27

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

2 modules	Constant outlet water temperature from condenser							
	55							
Partialisation	**25%**		**50%**		**75%**		**100%**	
	QT	COP	QT	COP	QT	COP	QT	COP
Ta B.S. / Ta B.U.								
-7 / -8	-	-	-	-	-	-	-	-
2 / 1	15,50	2,68	31,00	2,68	45,53	2,65	60,06	2,64
7 / 6	17,47	3,02	34,94	3,02	51,09	2,97	67,24	2,95
12 / 11	19,44	3,37	38,88	3,37	56,65	3,30	74,42	3,27

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

3 modules	Constant outlet water temperature from condenser											
	55											
Partialisation	**16,6%**		**33,3%**		**50%**		**66,6%**		**83,3%**		**100%**	
	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP
Ta B.S. / Ta B.U.												
-7 / -8	-	-	-	-	-	-	-	-	-	-	-	-
2 / 1	15,50	2,68	31,00	2,68	46,50	2,68	61,03	2,66	75,56	2,65	90,09	2,64
7 / 6	17,47	3,02	34,94	3,02	52,41	3,02	68,56	2,99	84,71	2,96	100,86	2,95
12 / 11	19,44	3,37	38,88	3,37	58,32	3,37	76,09	3,32	93,86	3,29	111,63	3,27

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

4 modules	Constant outlet water temperature from condenser															
	55															
Partialisation	**12,5%**		**25%**		**37,5%**		**50%**		**62,5%**		**75%**		**87,5%**		**100%**	
	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP	QT	COP
Ta B.S. / Ta B.U.																
-7 / -8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2 / 1	15,5	2,68	31	2,68	46,5	2,68	62	2,68	76,53	2,66	91,06	2,65	105,59	2,65	120,12	2,64
7 / 6	17,47	3,02	34,94	3,02	52,41	3,02	69,88	3,02	86,03	2,99	102,18	2,97	118,33	2,96	134,48	2,95
12 / 11	19,44	3,37	38,88	3,37	58,32	3,37	77,76	3,37	95,53	3,33	113,3	3,30	131,07	3,28	148,84	3,27

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Ta B.S. Air temperature dry bulb

Ta B.U. Humid bulb air temperature

Cooling power and EER at full load and partial load during summer operation at low and high temperature conditions for POKER unit module 1.

	Constant outlet water temperature x2/>from evaporator			
	7			
Partialisation	**50%**		**100%**	
	QF	EER	QF	EER
Air temperature				
35	15,97	3,35	28,79	2,93
30	16,38	3,78	29,86	3,40
25	16,80	4,31	30,92	3,98
20	17,22	4,98	31,99	4,75

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

	Constant outlet water temperature x2/>from evaporator			
	18			
Partialisation	**50%**		**100%**	
	QF	EER	QF	EER
Air temperature				
35	21,73	4,65	39,21	3,86
30	22,16	5,20	40,33	4,40
25	22,58	5,87	41,45	5,06
20	23,01	6,70	42,56	5,91

The condition that defines the water flow with a temperature gradient equal to 5k is highlighted

Residual head and pressure drops THAETY

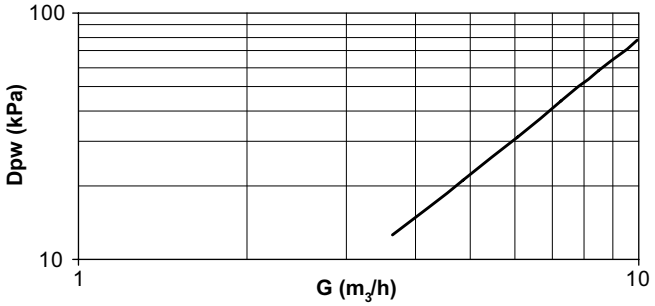
Calculation of Pressure Drops
The water flow rate at the exchanger is calculated according to the following formula: **G = (Q x 860) : ΔT**

where:
G (l/h) = water flow rate at the exchanger;
Q (kW) = exchanged power, which could be QF (for the evaporator) or QT (for the condenser), according to the given heat exchanger;
ΔT (°C) = temperature differential;

The pressure drops can be achieved from the selection software or estimated with the following approximate formula:
$\mathbf{\Delta pw = \Delta pw_{nom} \times (G : G_{nom})^2}$

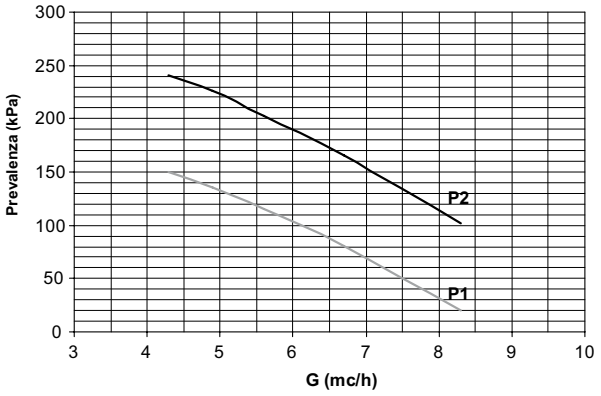
"N.B.:
For all machines, refer to the admissible operating limits and thermal differences (ΔT).

Graph "1"
condenser/evaporator pressure drops THAETY 234



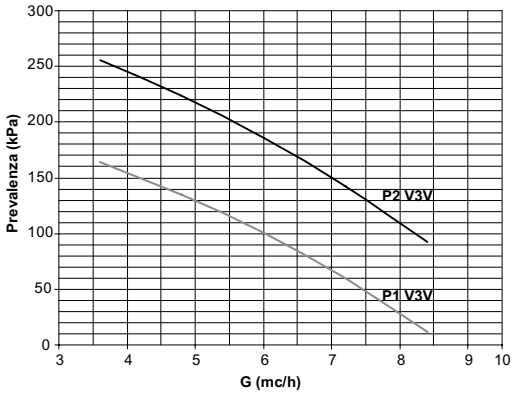
Δpw (kPa)	nominal pressure drop at the heat exchanger (Technical data table);
G (l/h)	water flow rate at the given heat exchanger

Graph "2"
residual head THAETY 234 P1 - P2 installation



ΔPr	Pressure drop
G	Water flow rate

Graph "2"
residual head THAETY 234 P1 V3V - P2 V3V installation



ΔPr	Pressure drop
G	Water flow rate

Sound power and pressure

Table "**H**": Sound power levels in dB for octave bands.

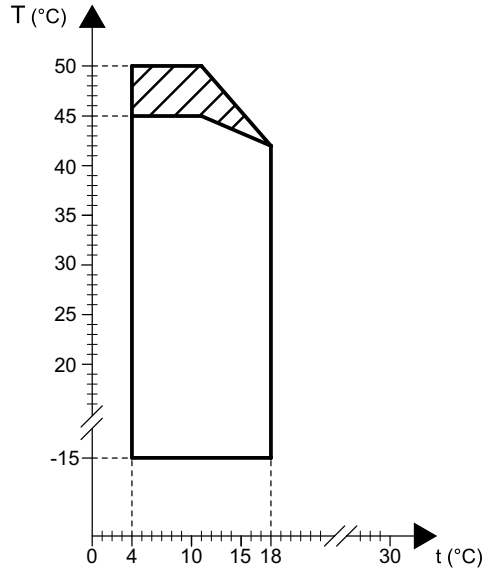
Model		Sound power level in dB for octave bands								Sound pressure level in dB(A)		
		125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	Lw dB(A)	Lp 10m	Lp 5m	Lp 1m
THAETY 234 H.T.	**1 module**	83	77	71	68	63	57	48	**74,5**	43	48	57
	2 modules	88	81	73	70	65	58	49	**77,5**	46	51	59
	3 modules	90	82	75	71	66	59	50	**79,3**	47	52	61
	4 modules	93	83	75	72	67	60	51	**80,5**	48	53	61

Lw	Sound power level in dB(A) on the basis of measurements taken in accordance with UNI EN-ISO9614 and Eurovent 8/1 Standards. The noise data refers to the units with the pump.
Lp	Sound pressure level in dB(A) referring to the measurements at the distance from the unit indicated in the table, with a directionality factor equal to 2. The noise data refers to the units with the pump.

N.B.:
If the SIL accessory is supplied, the sound power decreases by 2 dB(A).
The unit decreases its noise below the nominal value indicated in the table when the outdoor air temperature is below 35°C. It is not possible to extrapolate sound pressure values for distances less than 10m.

Functioning limits

Summer mode



Standard functioning

Functioning with partialised cooling capacity

T (°C)	Outdoor air temperature (D.B.)
t (°C)	Temperature of the water produced

In summer mode:
Maximum water inlet temperature 25°C.

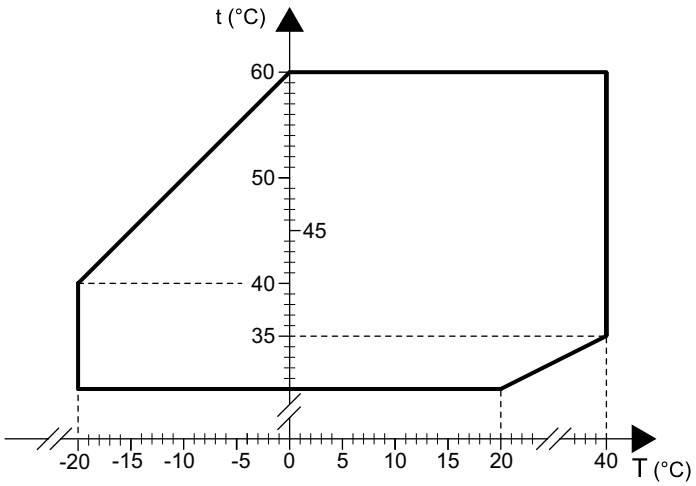
Permitted temperature differentials through the heat exchangers

◦ Temperature differential at the evaporator: ΔT = 4 ÷ 8°C.

◦ Minimun water pressure 0,5 Barg

◦ Maximum water pressure 6 Barg

Winter mode



Standard functioning

T (°C)	Outdoor air temperature (D.B.)
t (°C)	Temperature of the water produced

In winter mode:
Maximum water inlet temperature 55°C

Permitted temperature differentials through the heat exchangers

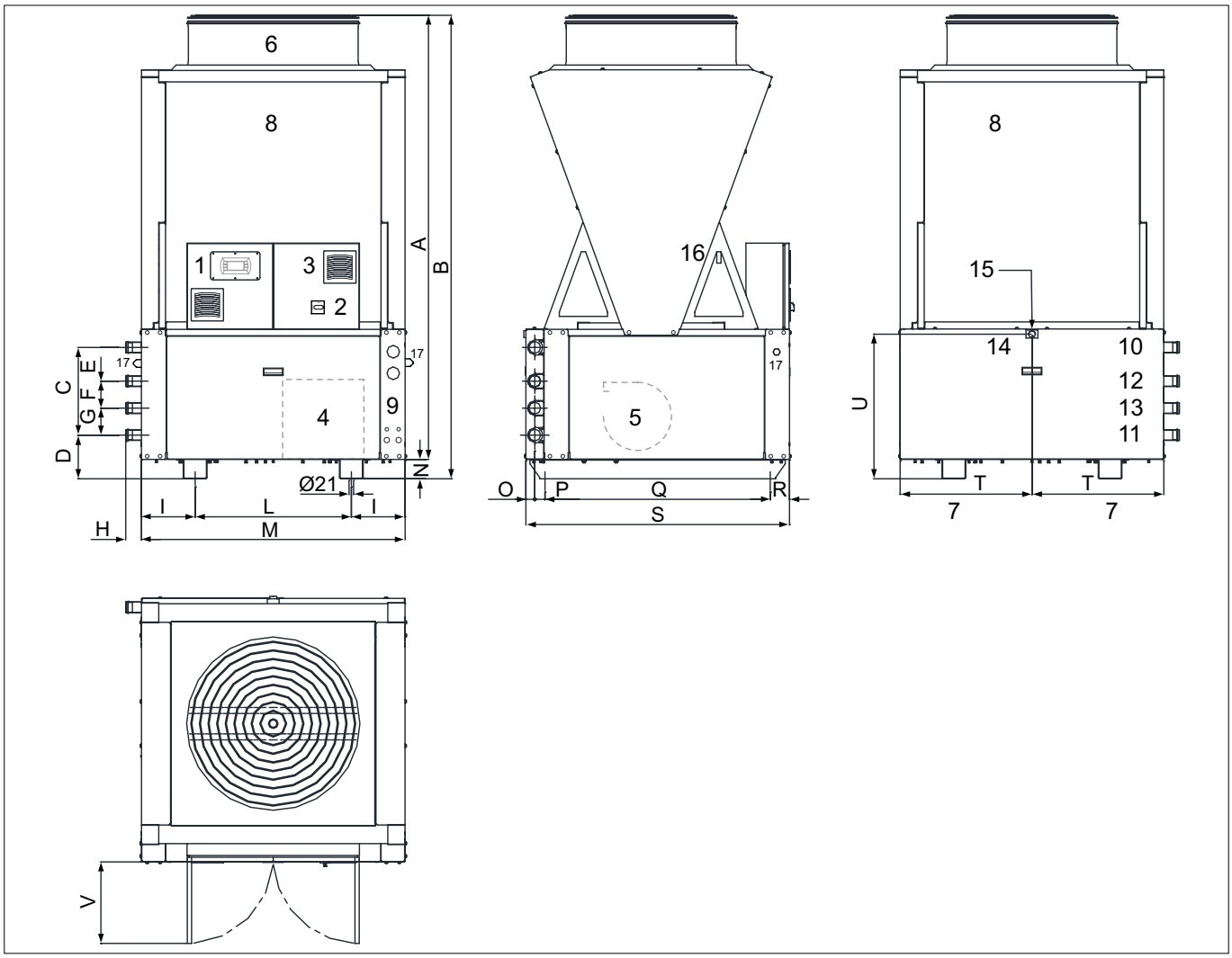
◦ Temperature gradient on the condenser ΔT = 4 ÷ 8°C

◦ Minimun water pressure 0,5 Barg

◦ Maximum water pressure 6 Barg

N.B.:
For evaporator outlet water at a temperature below 4°C, please contact the RHOSS S.p.A. pre-sales service before ordering.

Dimensions and clearances

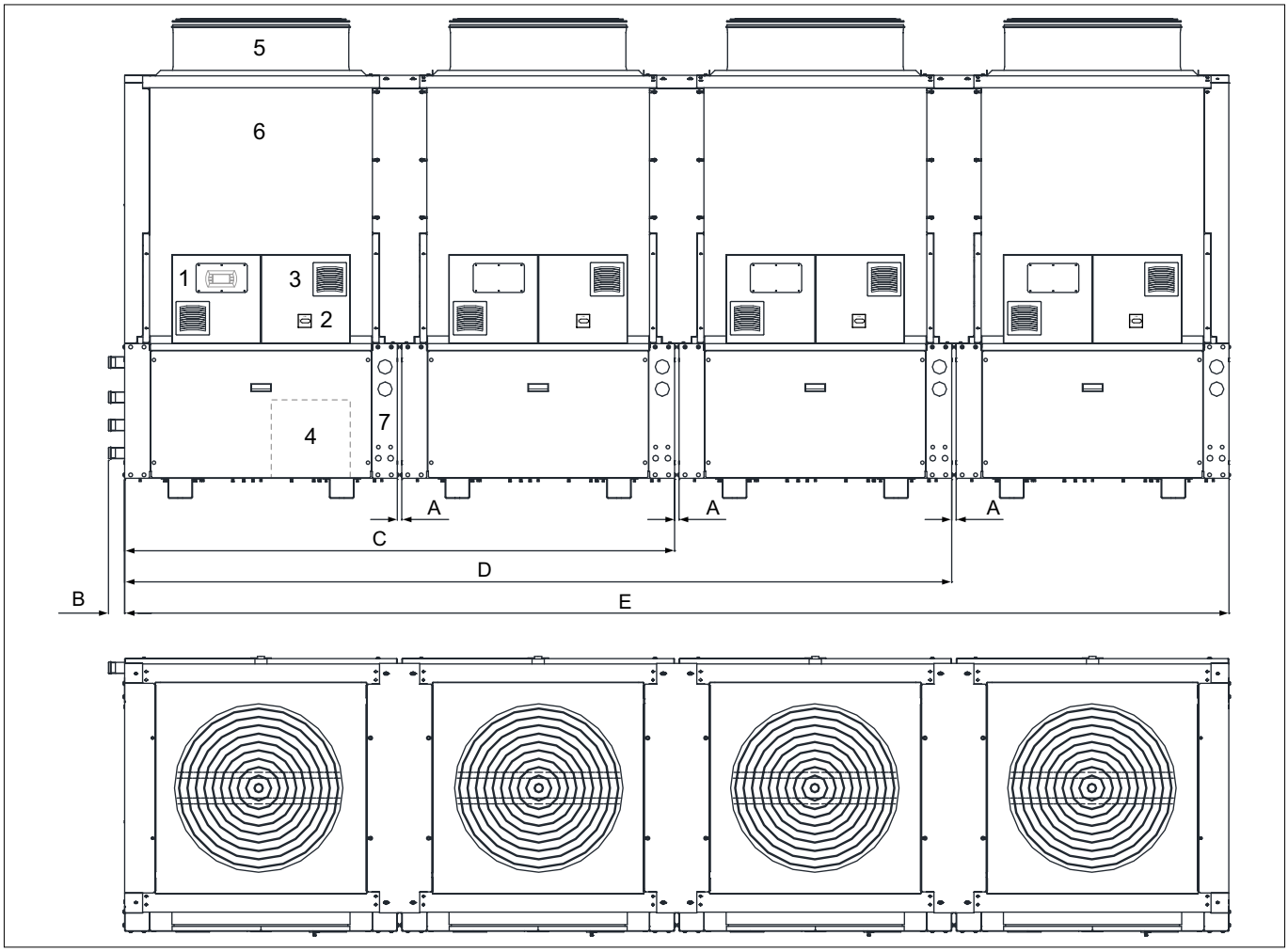


1	KTOB kit positioning	9	Power supply inlet
2	Isolator	10	Water outlet
3	Electrical Control Board	11	Water inlet
4	Compressor	12	Water outlet P1 DS - P1 V3V
5	Pump	13	Water inlet P1 DS - P1 V3V
6	Fan	14	Condensate drain
7	Anti-vibrating (accessory)	15	Condensation drain tray
8	Coil	16	Outdoor air probe
		17	Serial network cable input/output

Model		A	B	C	D	E	F	G	H	I	L
234	mm	2062	2152	407	203	157	125	125	73	249	725

M	N	O	P	Q	R	S	T	U	V
1224	90	42	47	1046	89	1224	612	671	380

THAETY 234 HT coupled



1	KTOB kit positioning
2	Isolator
3	Electrical Control Board
4	Compressor
5	Fan
6	Coil
7	Power supply inlet

Model		A	B	C	D	E
234	mm	20	73	2468	3712	4956

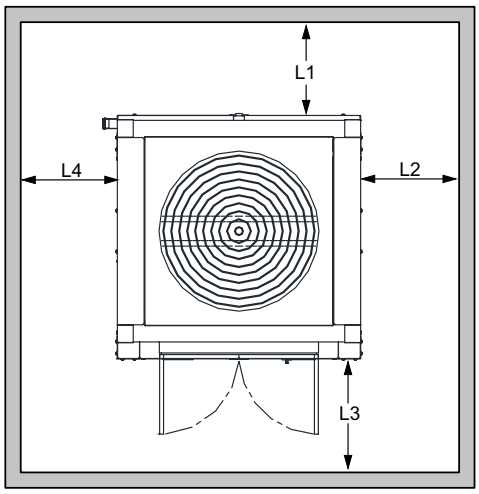
Weights

Model		THAETY
		234
P1	kg	480
P1 DS	kg	510
P1 V3V	kg	500

The weights refer to packed units without water.

The weights are the reference for the handling of individual units.

Clearance and positioning



Model		THAETY			
		L1	L2	L3	L4
234	mm	1000	1000	1000	1000

Installation

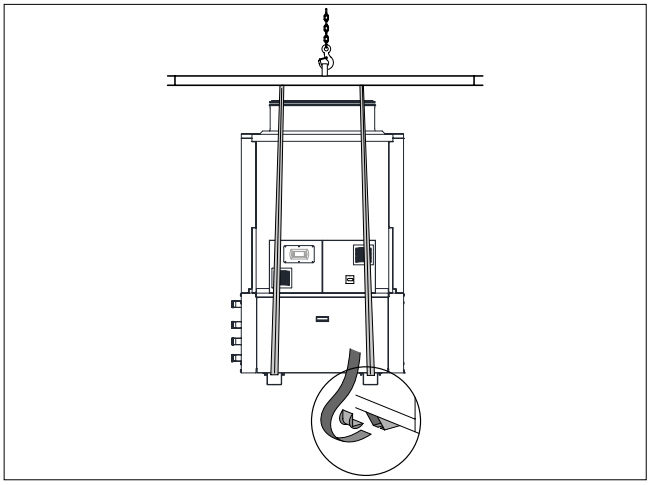
- The unit is designed for outdoor installation.
- The unit is equipped with male threaded water connections.
- The unit should be positioned to comply with the minimum recommended clearances, bearing in mind the access to water and electrical connections.
- The unit can be equipped with anti-vibration mountings on request (KSA).
- We recommend installing shut-off valves that isolate the unit from the rest of the system.
- It is mandatory to install a square metal mesh filter (longest side = 0.8 mm) on the unit return pipes.
- The safety devices must be installed to protect the unit on the hydraulic circuit.
- The unit cannot be installed on brackets or shelving.
- Correct installation and positioning includes levelling the unit on a surface capable of bearing its weight.

Lifting and Handling

Lifting and movement of the unit must be performed with care, in order to avoid damages to the external structure and to the internal mechanical and electrical components.

The unit can only be handled and/or lifted from the specific attachments provided on the basic framework.

Use suitably long chains to guarantee stable lifting.

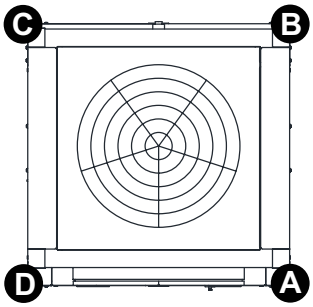


Storage

- The units cannot be stacked.
- The temperature limits for storage are -9÷45°C.
- During lifting and handling operations, ensure that the unit remains always in vertical position.

Distribution of the weights of the units in operation

Table provides indications concerning weight distribution on the unit. Knowing these values is of the utmost importance for dimensioning the surface upon which the unit will be installed. The unit is intended for installation both at ground floor and at the top of buildings. Correct installation and positioning includes levelling the unit on a surface capable of bearing its weight. The weights take into account the unit heavier (P1 DS) installed includes the weight of the kit KTL and water in the tubes.



Model		THAETY
		234
A	kg	182
B	kg	134
C	kg	112
D	kg	152

Water connections

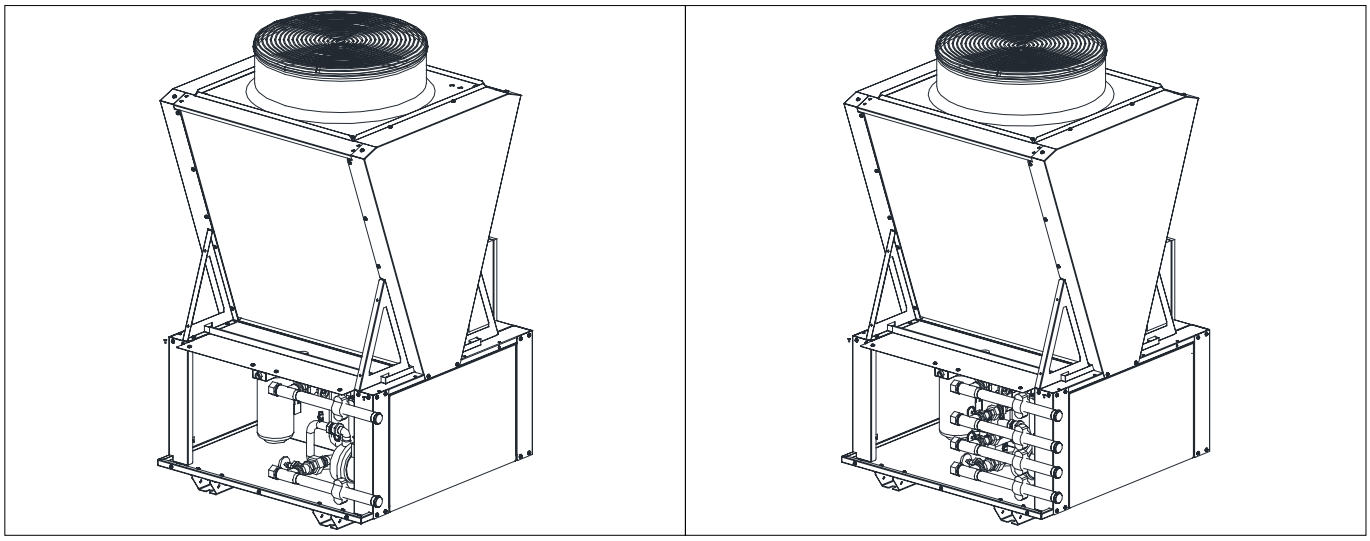
The installer and/or designer must assess the dimensions and assembly the expansion tank and safety valve protecting the entire hydraulic circuit, depending on the type of system.

System minimum content	150 l
Maximum working pressure	6 bar
Water safety valve	By installer
Expansion vessel	By installer

Water connections

THAETY 234 modules are equipped with male threaded 1”1/2 water connections.

- For set up P1, the connections are 2: water inlet and outlet.
- For set up P1 V3V, the connections are 4: system outlet inlet and domestic hot water outlet inlet.
- For set up P1 DS, the connections are 4: system outlet inlet and desuperheater outlet inlet.



Use of antifreeze solutions

- The use of inhibited ethylene glycol is recommended if you do not wish to drain the water from the hydraulic system during the winter break or if the unit must supply chilled water at temperatures lower than 5°C. The addition of glycol changes the physical properties of the water and consequently the performance of the unit. The proper percentage of glycol to be added to the system can be obtained from the most demanding functioning conditions from those shown below.

Protection from freezing for seasonal stoppage

- Table “**H**” indicates the multipliers that allow the unit performance changes to be determined in proportion to the required percentage of inhibited ethylene glycol.
- The multipliers refer to the following conditions: condenser inlet water temperature 30°C; refrigerated water temperature 7°C; temperature differential at evaporator and condenser 5°C.
- For different functioning conditions, the same coefficients can be used as their variations are negligible.

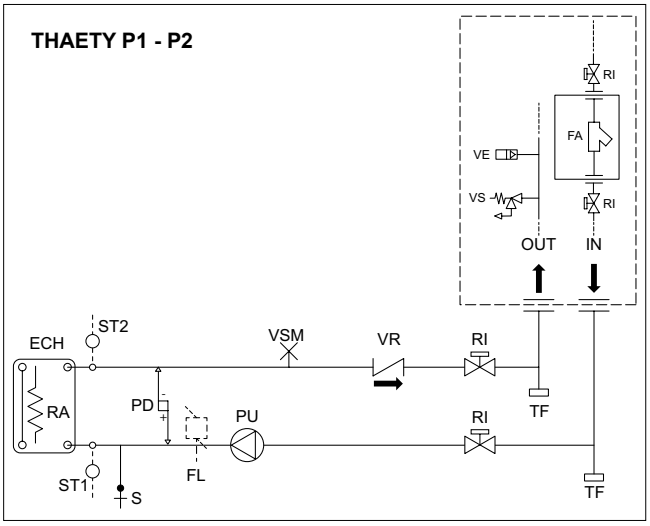
Table "H"

Minimum outdoor air temperature °C	2	0	-3	-6	-10	-15	-20
% inhibited glycol in weight	10	15	20	25	30	35	40
Freezing temperature °C	-5	-7	-10	-13	-16	-20	-25
fc G	1.025	1.039	1.054	1.072	1.093	1.116	1.14
fc Δpw	1.085	1.128	1.191	1.255	1.319	1.383	1.468
fc QF	0.975	0.967	0.963	0.956	0.948	0.944	0.937
fc P	0.993	0.991	0.99	0.988	0.986	0.983	0.981

fc G	Correction factor of the glycol water flow to the evaporator
fc Δpw	Correction factor of the pressure drops in the evaporator
fc QF	Cooling capacity correction factor
fc P	Correction factor for the total absorbed electrical current

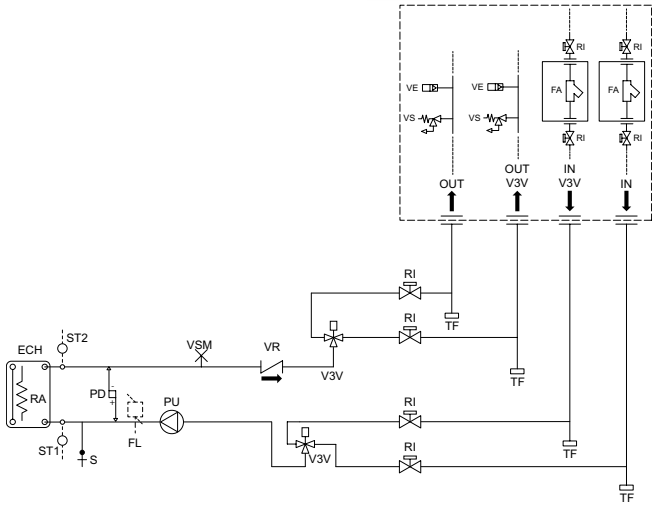
Water circuits

THAETY P1 - P2

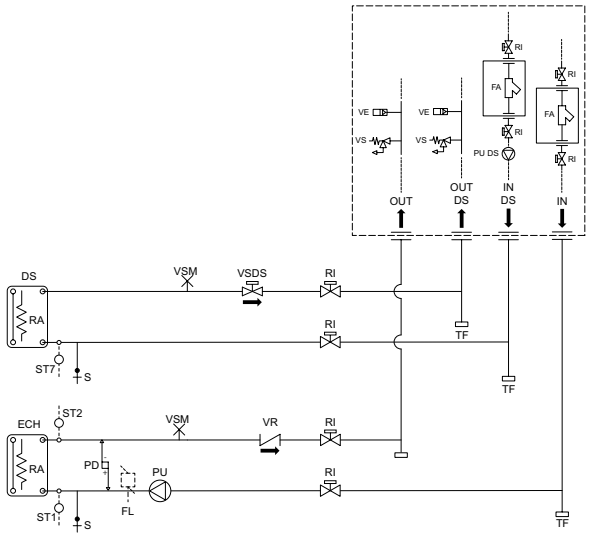


ECH	Plates exchanger
DS	Desuperheater heat exchanger
FL	Flow switch (it replaces the DP if kit RAE20 or RAE20_4 is available)
MI	System delivery
MR	Recovery delivery
PD	Water differential pressure switch
PU	User pump
RI	Cock
RA	Evaporator anti-freeze resistance
RR	Recovery return
RIM	System return
ST1	Primary inlet temperature probe
ST2	Primary outlet temperature probe
ST7	Desuperheater inlet probe
S	Water drain
TF	Threaded cap
VR	Check Valve
VSM	Manual bleed valve
VSDS	Desuperheater solenoid valve
VE	Expansion tank (set up by the installer)
VS	Water safety valve (by installer)
V3V	3-way diverter valve
FA	Water mesh filter (set up by the installer)
PU DS	Desuperheater user pump (set up by the installer)
- - -	Mandatory installation set up by the installer

THAETY P1 V3V - P2 V3V

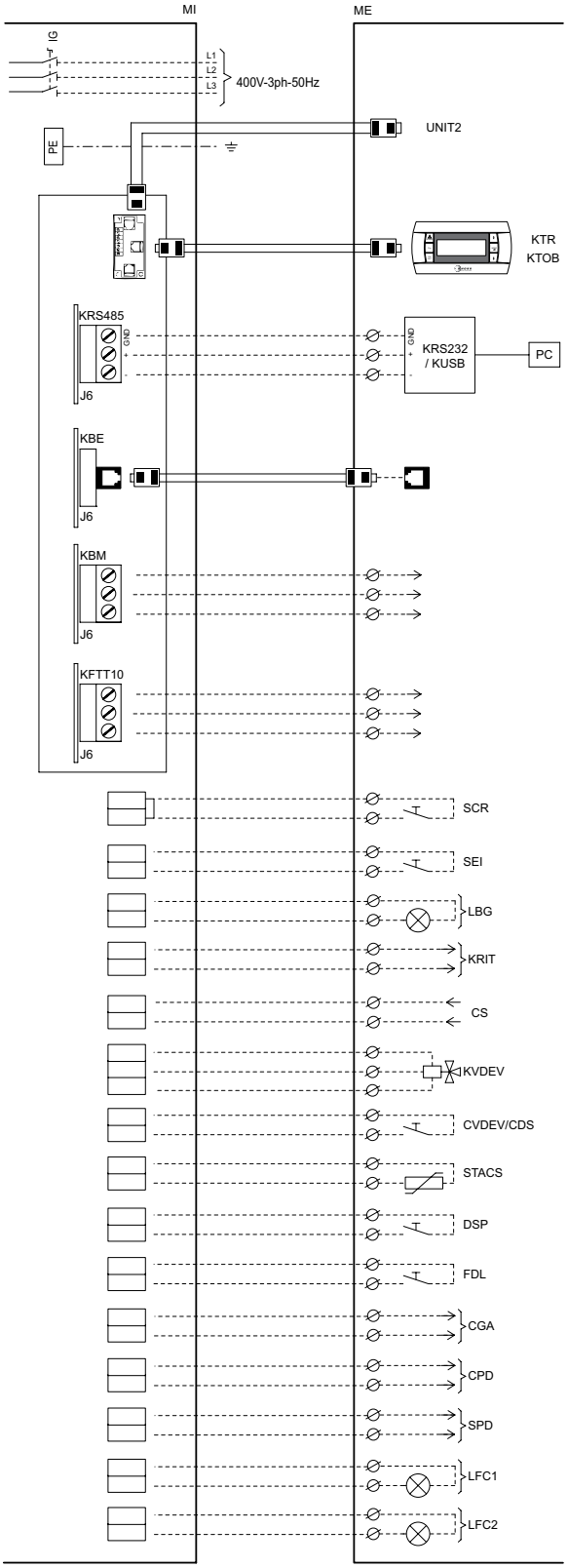


THAETY P1DS - P2DS



Electrical connections of the single unit

MI	Internal terminal board
ME	External terminal board
IG	Main isolator switch
L	Line
PE	Earth connection
J13	6-way telephone connector (RJ12)
KTR	Remote keyboard (accessory)
KTOB	Keaboard on board the unit (alternative to KTR)
KRS485	RS485 serial interface (accessory)
KRS232	RS485/RS232 converter (accessory)
KUSB	RS485/USB converter (accessory)
PC	Personal computer
KBE	Bacnet Ethernet interface (accessory) (**)
KBM	Bacnet-MS/TP interface (accessory) (**)
KFTT10	LONWORKS serial interface (accessory) (**)
SCR	Remote control selector (control with clean contact)
SEI	Summer/winter selector (control with potential free contact)
LBG	Machine general lock light (consensus in voltage 230 Vac, maximum load 0,5A AC1)
KRIT	KRIT control (integrative electric heater for heat pump) (consensus in voltage 230 Vac, maximum load 0,5A AC1)
CS	Shifting Set-point (CS accessory) (signal 4÷20 mA) (**)
KVDEV	Domestic hot water diverter valve control (consensus in voltage 230 Vac, maximum load 0,5A AC1)
CVDEV	Domestic hot water production consent with KVDEV accessory installed and for P1V3V set-up
CDS	DS activation request consensus. Available only for Pump P1 DS without KVDEV set up
STACS	Domestic hot water temperature probe (not supplied, set up by the installer); an alternative to domestic hot water consensus (CVDEV)
DSP	Double set-point via digital consensus (incompatible with the CS accessory)
FDL	Forced download compressors (FDL accessory) (control with clean contact)
CGA	Auxiliary generator control (consensus in voltage 230 Vac, maximum load 0,5A AC1)
CPD	Desuperheater ON/OFF pump control (consensus in voltage 230 Vac, maximum load 0,5A AC1)
SPD	Desuperheater inverter pump analogue signal (0-10Vdc) (**)
LFC1	Compressor 1 functioning light (consensus in voltage 230 Vac, maximum load 0,5A AC1)
LFC2	Compressor 2 functioning light (consensus in voltage 230 Vac, maximum load 0,5A AC1)
- - -	Connection by installer
▬▬	6-wire telephone cable (maximum distance 50m, for greater distances contact RHOSS S.p.A. customer service)



(**) For units in parallel wire ONLY the MASTER unit

- Always install a main automatic switch or fuses with adequate capacity and blackout power in a protected area or near the machine.
- The electrical panel is accessible from the front panel of the unit.
- Connections must be made in compliance with current standards and with the diagrams provided with the machine.
- Machine earthing is legally compulsory.

ATTENTION!
The following diagrams only show the connections to be made by the installer.
For electrical connections to the unit and the accessories, follow the wiring diagrams which are supplied with them.

Models		Line Section	PE section	Commands and controls section
234	mm²	6	6	1,5

K20122EN ed.3 08.13- 000 - Stampa:

THAETY 234 H.E.
POKER range

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