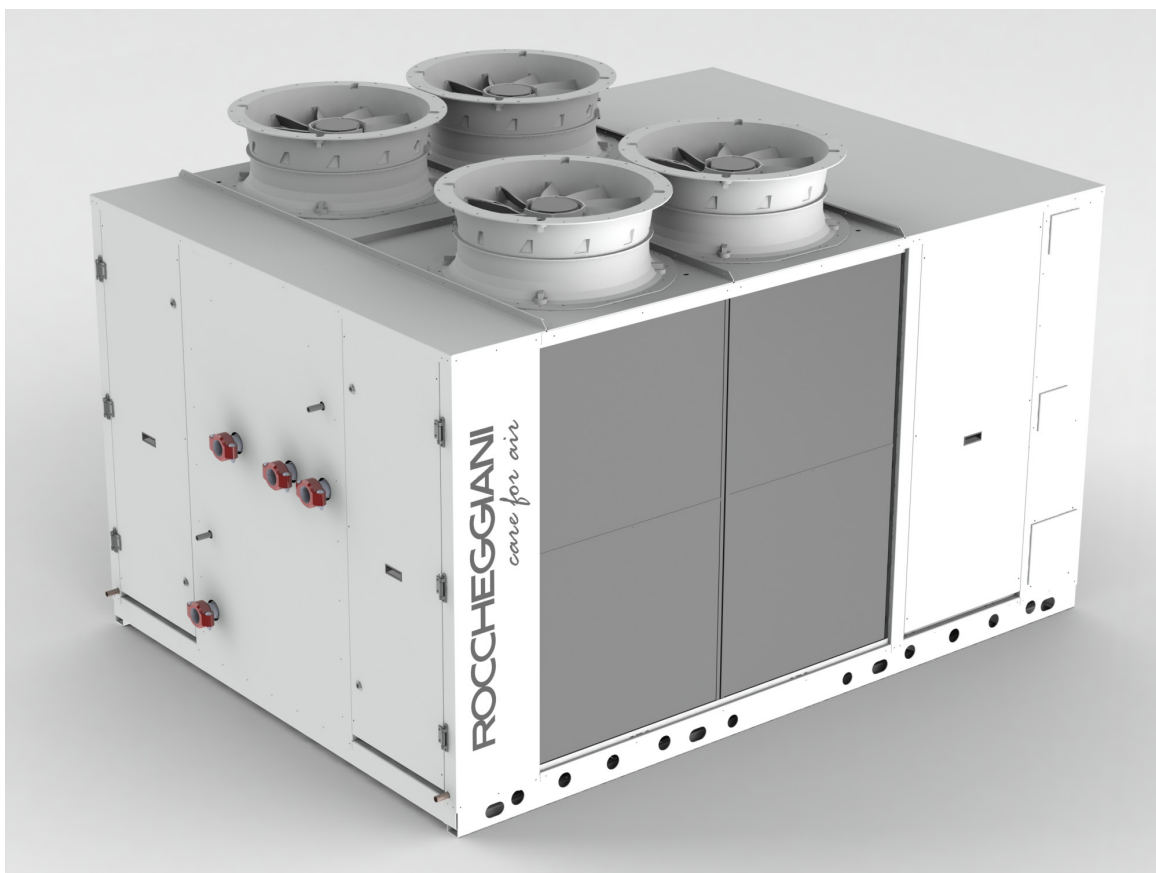


NRE-MPU

MULTI-PURPOSE UNITS WITH R290 NATURAL REFRIGERANT FOR 4-TUBE HYDRONIC SYSTEMS

- Air-to-Water type heat pump
- Independent, hot and cold production at the same time
- Cooling capacities from 63 to 413 kW
- Heating capacities from 59 to 508 kW



The multi-purpose Units with R290 natural coolant for 4-tube hydronic systems in Roccheggiani NRE-MPU range are units designed to ensure (based on the chosen configuration and accessories) the efficient and independent contemporary production of fluids suitable for winter heating and summer air conditioning of buildings, maximising heat recovery and ensuring maximum seasonal yield. The Units are designed for all commercial applications, multifamily housing and service industries requiring simultaneous loads for heating and cooling, even with ratios that may differ and vary over time.

The multi-purpose units in the NRE-MPU range enable reduced consumption of primary energy from non-renewable sources with minimum impact on global warming.

Maximum efficiency is achieved through the smart use of heat pump technology, exploiting the request for contemporary loads to ensure heating and cooling demands from the various areas in the building. In high-efficiency buildings, often characterised by opposing, concurrent thermal loads, the multi-purpose units in NRE-MPU range are the most efficient solution compared to conventional systems (e.g. Chillers and Boilers). The distinctive feature which makes the Multi-purpose units by Roccheggiani a truly "long-term green solution" is the use of R290 natural refrigerant. In compliance with the EU F-gas regulations (that have for some time opened the way, in commercial refrigeration, to natural coolants such as R290, NH3 and CO2), this coolant is highly efficient and also future-proof because, with a GWP value of 3 and an ODP of 0, it is already in line with the deadline of 2025 as regards F-gas.

The multi-purpose Units with R290 natural coolant for 4-tube hydronic systems in Roccheggiani NRE-MPU range are manufactured in compliance with the UNI EN 12100 Standard and the CE mark directives, according to an ISO 9001-certified quality assurance system.

Publication: Multi-purpose heat pumps (NRE-MPU)

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Regulatory Compliance

All the multi-purpose units in the NRE-MPU range are assembled, tested under pressure, dehydrated, loaded and tested at a running test standard level before shipment.

The Company's Quality System has been certified UNI EN ISO 9001 since 1996. In 2014 the Company was awarded UNI EN ISO 14001 Environmental Management certification. Over the years numerous certifications have been obtained for the various Roccheggiani product ranges from the most important European bodies (EUROVENT, Achilles).

More specifically, the multi-purpose units in the NRE-MPU range are designed and manufactured in accordance with the following reference regulations:

- Directive 2006/42/EU - Machinery.
- Directive 2014/30/EU - Electromagnetic Compatibility (EMC).
- Directive 2014/35/EU Low Voltage Directive (LVD).
- Directive 2014/68/EU - PED.
- ECODESIGN Regulation (EU) No. 2016/2281 – ENER LOT 21 (ERP).
- Directive 2014/34/EC.
- Standard UNI EN 1127-1:2011.

Distinctive features of the NRE-MPU range compared to conventional Multi-purpose units

The Multi-purpose units in the NRE-MPU range by Roccheggiani are high-efficiency, annual-cycle, air-conditioning units for buildings and/or plant engineering applications that require hot water and cold water independently and at the same time, using the maximum level of energy possible from renewable sources. They differ from conventional Multi-purpose units on the market that normally operate with R410A, for the following two reasons:

1 - They use R290 NATURAL COOLANT (European Regulation 517/2014)

By using R290 natural coolant with zero ODP (0) and nearly zero GWP (3), the Multi-purpose units in the NRE-MPU range are not subject to the restrictions in the F-Gas Directive which the synthetic coolants such as R410A, R134A and the brand new R32 need to comply with; even though the latter have zero ODP values (like R290), their GWP values are 2088 (R410A), 1430 (R134A) and 675 (R32).

The Multi-purpose units in the NRE-MPU range are designed to respect ECODESIGN Regulation (EU) no. 2016/2281 with minimum efficiency levels according to ErP 2021 both for the cooling and heating functions.

2 - They meet ErP 2021 Requirements (Regulation ECODESIGN (EU) no. 2016/2281)

The Multi-purpose units in the NRE-MPU range are designed to respect ECODESIGN Regulation (EU) no. 2016/2281 with minimum efficiency levels according to ErP 2021 both for the cooling and heating functions.

Presentation of the scope of application: HVAC&R installations which require independent heating and cooling both at the same time

The units have been designed to respond in a specialised manner to a wide spectrum of applications:



Tertiary



Hotel



Hospitals, clinics and nursing homes



Schools and Colleges



Multifamily housing



Offices



Medium-to-large sized shopping centres

Roccheggiani offers the perfect solution for cooling, heating and changing the air inside buildings, through a system that uses multi-purpose units in the NRE-MPU series connected to an RRU-FA air handling unit and chilled beams or fan-coils from the TCU series, used as room terminal units.

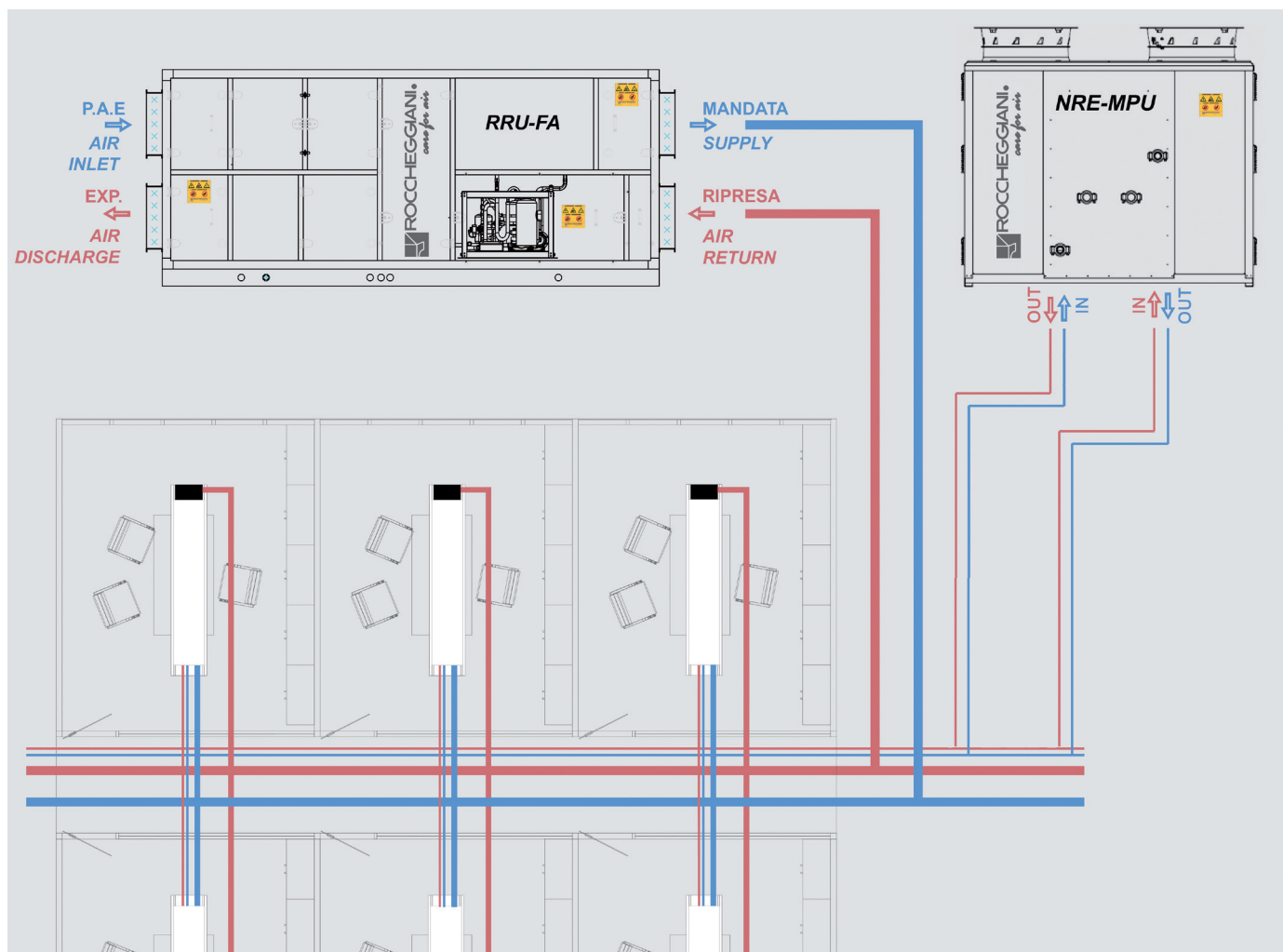
Presentation of the plant engineering system Example of 4-tube system with an NRE-MPU Multi-purpose unit

The Multi-purpose units in the NRE-MPU range are particularly suitable for high-efficiency, annual-cycle air conditioning in buildings, where you may find that different rooms/zones within the same building, require heating and conditioning independently at the same time. In such conditions the use of water as the carrier fluid often provides both monetary and energy savings (in terms of TLC) compared with conventional, decentralised and centralised, hydronic or direct expansion technologies.

The Multi-purpose units in the NRE-MPU range have an extremely wide scope of use and can be a system component in number of different plant engineering solutions. They can be used in conjunction with chilled beams, radiant floor heating/cooling, fan-coils and AHUs in both comfort and process applications.

For air conditioning in buildings, especially those that are divided up into different areas and different floors, with modern, high energy-efficiency facilities or even n-ZEB (Nearly Zero Energy Buildings), the ideal solution proposed by Roccheggiani is a system that has Multi-purpose units from the NRE-MPU series as the high-efficiency generator of hot and cold fluids, serving a primary air handling unit with a high-efficiency RRU-FA heat recovery unit and serving chilled beams (or fan-coils from the TCU series) used as room terminal units that provide cooling, heating and changes of air.

Each area is managed independently and the Multi-purpose unit from the NRE-MPU series guarantees the correct energy level to the terminal units, thanks to the hot and cold fluid flow-rate modulation ranging from 40% to 100%, optimising the generation of heat and cold as required, and always ensuring maximum overall energy efficiency.



Picture showing an example of where Multi-purpose units from the NRE-MPU range are used to serve a 4-pipe system fitted with chilled beams and RRU-FA primary air handling units.

Transition of coolants pursuant to F-gas Regulation no. 517/2014

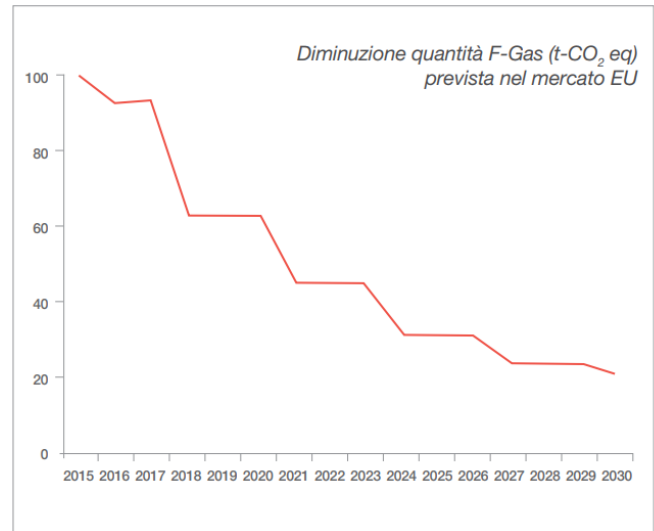
The European Regulation 517/2014 envisages a 79% reduction in the use of F-Gases with high GWP by 2030. In order to achieve this objective, certain restrictions are required.

EU law is leading our markets towards greater efficiency and a reduction in greenhouse gas emissions. This is possible thanks to a plan signed by various European countries, namely the EU 2050 Roadmap towards a low carbon-emissions economy.

The F-gas Regulation no. 517/2014 is part of this roadmap and came into force with the first practical implications in January 2015.

Pointing towards a gradual 80% reduction in the use of hydro-fluorocarbons (HFCs) by 2030, the F-gas Regulation will have enormous repercussions in relation to coolants within our industry.

In order to sustain these gradual reduction objectives, certain specific GWP (Global Warming Potential) thresholds have been introduced.



Graph illustrating the gradual reduction of HFC coolants that will be allowed on the market and the related Time-Frame.

NRE-MPU Multi-purpose Units: Distinctive features of R290

The Multi-purpose units in the NRE-MPU range are a "long-term green solution" due to the use of R290 natural coolant. In compliance with the EU F-gas regulations, this coolant is highly efficient and also future-proof because (with a GWP value of 3 and an ODP of 0) it is already in line with the 2025 deadline as regards F-gas (F-gas Regulation no. 517/2014).

Unlike ammonia (which is considered a toxic gas that requires special permits for its storage, handling and use) and carbon dioxide (which, due to its high operating pressures, requires meticulous checks in accordance with the PED - Pressure Equipment Directive - 68/2014/EU), R290 is intended for use at low operating pressures and, once the safety standards for hydrocarbons have been met (ATEX - Directive on Explosive Atmospheres - 2014/34/EC), it can be used in many units in a safe and reliable manner.

R290 enjoys the following characteristics:

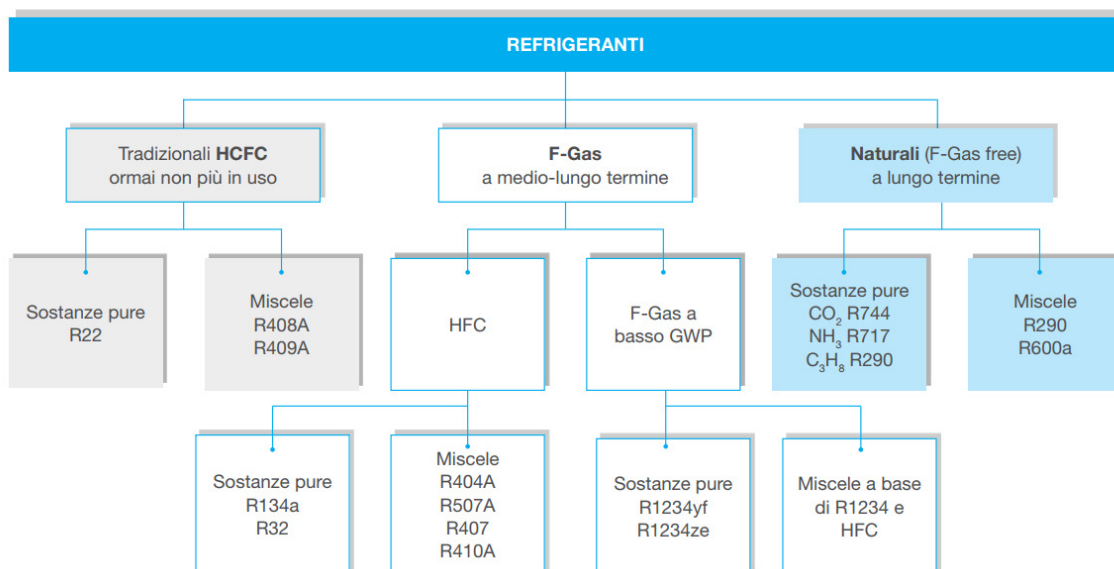
- it is natural and not subject to F-GAS restrictions;
- it has an extremely low GWP of 3 (a figure much lower compared to R410A (2088), R134A (1430) or R32 (675));
- it is efficient thanks to its excellent heat transfer properties;
- it is simple to use and does not have glide, ensuring greater efficiency;
- if located externally, it does not require any provisions other than those for a normal air-conditioning unit. The only difference is that a limited space is required around the unit to make sure that no untoward effects will occur if there are any gas leaks.

Most commonly-used natural coolants: R290-R717-R744 The decisive advantage compared to conventional coolants

Natural coolants are the really green alternative to F-Gases due to their low environmental impact, excellent energy performance and easy availability.

The three natural coolants R290 – R717 – R744 are widely used in the commercial refrigeration and food industries and have zero ODP values, like synthetic coolants (so-called F-Gases) such as R410A, R134A and the brand new R32. Conversely, in terms of GWP, the R290 – R717 – R744 coolants are considerably better than synthetic coolants because they have GWP values of zero or nearly zero.

- In addition to excellent heat transfer properties, hydrocarbons such as Propane (R290) allow the use of mineral lubricant oils, which avoids the moisture issues encountered with synthetic lubricants. All hydrocarbons are inflammable and so the main applications (for installation inside buildings) have up to now envisaged sealed circuits and limited charges (under 150 g according to the previous, recently-revised EN378 standard). Applications with high gas charges, specially-designed for installation on the outside of buildings (like new indirect chillers, for example) are also gaining popularity.
- Ammonia (R717) is used in industrial applications because its high evaporation heat provides high efficiency levels. Nevertheless, ammonia is a toxic gas that is inflammable in certain concentrations and incompatible with copper and its alloys. Due to these characteristics, direct expansion technology is normally avoided, giving preference to systems with secondary fluid, normally glycol-water. In new systems, one can use two cascaded cooling circuits: a primary circuit working with ammonia or another coolant gas and a second circuit using carbon dioxide.
- Carbon dioxide (R744) is used as the GWP benchmark for all other gases (the GWP of CO₂ ≡ 1). It is not toxic or inflammable (the A1 rating indicates the highest safety level) and it is not subject to any patents, and there are no restrictions on its use. It requires high-pressure cylinders and higher operating pressures compared to other coolants, so systems need to be purpose-designed, but it is a widely-available product with stable costs. In addition to its good heat transfer properties, its high volumetric cooling capacity allows the use of small capacity compressors with excellent yields at low and medium temperatures.



Carbon dioxide, ammonia and main hydrocarbons (including R290) are normally considered to be natural coolants.

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NRE-MPU Multi-purpose Units with R290 natural coolant: strictest compliance with safety rules

Since R290 (Propane) is a natural coolant, its use in NRE-MPU series is certainly decisive in making this a high-efficiency series, capable of exceeding the minimum efficiency values, according to the Erp 2021 standards, and the limitations imposed by the F-Gas Directive.

A few assessment factors are expressed below which can more effectively explain why R290 can be used safely inside units for HVAC&R applications provided there is proper design and compliance with the relevant regulations, offering advantages in terms of energy efficiency and ecology, often unattainable with synthetic coolants even those of the latest generation.

The new synthetic, low-GWP coolants have, in most cases, higher levels of inflammability compared to older generation coolants

The issue of inflammability is quite common with new, low or zero GWP coolants and so inflammability is an element that needs to be taken into account in the plant design, also when R290 is used. Generally speaking, the main low-GWP coolants (like R32 and R1234ze) normally have increasing inflammability properties compared to past ones like the highly popular R410A and R134A.

Coolant	Replacement	GWP	Volumetric cooling power capacity	Field of application
	(Filling for Retrofit)		kJ/m3	kW
	(1)	(2)	(3)	(4)
Synthetic liquid coolant stable in air				
R32		675	5300	from 1
R134a		1430	2050	from 100
R407C		1770	3000	from 10
R410A		2090	4600	from 2
R447A	R410A	583		
R448A	R404A	1386	2900	from 10
R450A	R134a	601	1760	
R513A	R134a	631	2050	from 5
Synthetic liquid coolant unstable in air				
R1234ze		7	1550	from 50
R1234yf		4	1900	from 50
Natural coolant fluid				
R290 (Propane)		3	2750	from 5
R717 (Ammonia)		0	3650	from 200
R1270 (Propene, Propylene)		3	3350	from 5
R744 (CO2)		1	8500	from 5

Coolant	Source temp.	Practical limit value	Safety class	Inflammable	Toxic
	° C	kg/m3	kg/m3		
	(5)	(6)	(7)		
Synthetic liquid coolant stable in air					
R32	35-40	0.061	A2L	yes	yes
R134a	35-40	0.25	A1		yes
R407C	35-40	0.31	A1		yes
R410A	35-40	0.44	A1		yes
R447A	35-40	0.034	A2L	yes	yes
R448A	35-40	0.39	A1		yes
R450A	35-40	0.32	A1		yes
R513A	35-40	0.35	A1		yes
Synthetic liquid coolant unstable in air					
R1234ze	35-40	0.061	A2L	yes	yes
R1234yf	35-40	0.058	A2L	yes	yes
Natural coolant fluid					
R290 (Propane)	40-60	0.008	A3	yes	yes
R717 (Ammonia)	40-80	0.00035	B2L	yes	yes
R1270 (Propene, Propylene)	40-60	0.008	A3	yes	yes
R744 (CO2)	40-80	0.1	A1		yes

Italian Presidential Decree no. 151 of 1 August 2011

Decree no. 151 is the valid regulation in Italy for simplified fire prevention procedures, in accordance with Art. 49, paragraph 4-quater) of Italian Law Decree no. 210 of 31 May 2010, as amended by Italian Law no. 122 of 30 July 2010.

To ensure it is properly applied, the project manager and/or the person in charge of plant engineering and safety should contact the Fire Brigade, pursuant to Decree no. 151 of 1 August 2011, and it may be enough to apply for a CPI (fire prevention certificate) from the Fire Brigade, in line with the deadlines and procedures laid down in the Decree.

In foreign countries, one must refer to the locally-applicable regulations and laws.

UNI EN 378-3 2016 : Refrigeration systems and heat pumps, Safety and environmental requirements

The UNI EN 378-3 2016 standard provides instructions on the installation of outdoor units, so our recommendation is that the project manager and/or the person in charge of plant engineering and safety should refer to this standard to establish the correct installation point.

In particular, we recommend a careful analysis of the following points.

Part 1: basic requirements, definitions, classification criteria and selection.

The 378-1 in Table C.2, for OPEN AIR units and only where authorised persons have access (roofs, fenced areas with access limited to authorised personnel, etc.).

Part 3: installation site and protection of people.

For NRE-MPU units installed on the outside of buildings, in areas with no risk of fire or explosion, there are no specific load limits.

UN 3358: Refrigerating machines containing inflammable liquefied gases

The transport of new and used refrigerating machines has recently gained particular importance because of the dangerous substances contained in the cooling circuit.

Refrigerating machines can be classified according to UN 3358: Refrigerating machines containing inflammable, non-toxic liquefied gases (R290) Spec. Prov. 291 (**). We recommend referring to this standard to ensure correct application and proper handling of NRE-MPU units, which will, in any case, always be supplied without the gas being loaded.

Design safety criteria

The NRE-MPU units provide three operating types:

- cooling only;
- heating only;
- cooling and heating at the same time.

The NRE-MPU units have three alarm levels according to the LEL (lower explosive limit) i.e. the percentage of coolant present in the air. Therefore, the alarms trigger when the formation of an explosive mixture is still a distant possibility, thus ensuring a wide safety margin and coefficient.

The alarm levels are as follows:

- alarm Level C - 5% LEL;
- alarm Level B - 15% LEL;
- alarm Level A - 25% LEL.

At each level (from C to A), the system intervenes with increasingly effective actions in order to ensure maximum safety at all times and try to restore the correct operation of the unit. Safety is therefore guaranteed by a series of components managed by control such as:

- coolant detection sensor, made exclusively for Propane;
- ATEX evacuation fan which allows the compressor chamber to be evacuated and "washed out" in the event of an alarm;
- air differential pressure switch, to ensure constant operation of the evacuation fan;
- Yellow lamp, to warn that there is a first level alarm;
- Red lamp, to warn that there is a second level and final level alarm.

The table below shows all synchronous actions of the various components:

Function	Normal operation	>5% of LEL		>15% of LEL		>25% of LEL	
Gas detector	ON	Alarm C		Alarm B		Alarm A	
Evacuation fan	OFF	ON		ON		ON	
Differential pressure control	OFF	>20Pa	<20Pa	>20Pa	<20Pa	>20Pa	<20Pa
Fan lamp (yellow)	OFF	OFF	ON	OFF	ON	OFF	OFF
Pre alarm lamp (yellow)	OFF	OFF		ON		ON	
Red lamp	OFF	OFF		OFF		ON	
Refrigeration System	ON	ON		OFF		OFF	

the method used in the design was chosen to ensure maximum safety;

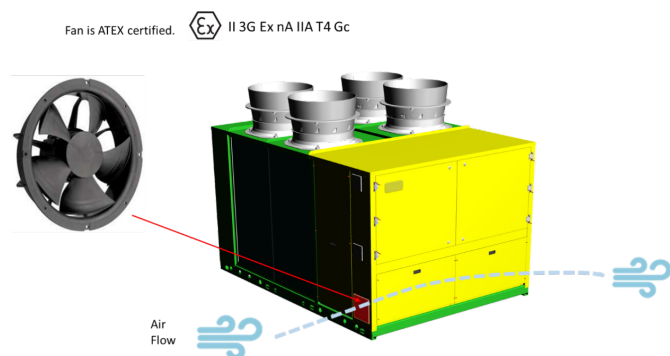
- the coolant pipes have a minimum number of joints, to avoid possible leaks;
- all the selected materials are compatible with R290;
- all selected components are designed to minimise the risk of coolant leaks;
- an accurate test for leaks is performed before and after the functional testing.

Careful analysis, using the UNI EN 1127-1:2011 "Explosive atmospheres - Explosion prevention and protection", has allowed us to ensure that no possibility of ignition can occur. The 13 possible causes of ignition and explosion have been checked (directly from EN 1127-1), namely:

- 5.3.2 hot surfaces;
- 5.3.3 flames and hot gases (including hot particles);
- 5.3.4 mechanically generated sparks;
- 5.3.5 electrical apparatus;
- 5.3.6 stray electric currents, cathodic corrosion protection;
- 5.3.7 static electricity;
- 5.3.8 lightning;
- 5.3.9 radio frequency (RF) electromagnetic waves from 104 Hz to 3×10^{12} Hz;
- 5.3.10 electromagnetic waves from 3×10^{11} Hz to 3×10^{15} Hz;
- 5.3.11 ionizing radiation;
- 5.3.12 ultrasonics;
- 5.3.13 adiabatic compression and shock waves;
- 5.3.14 exothermic reactions, including self-ignition of dusts.

Components and devices used specifically for units using R290

The evacuation fan is ATEX certified



The safety pressure switches are ATEX certified



NRE-MPU Multi-purpose Units: Description of main components

Structure

In galvanised sheet metal, powder-coated using polyester powders. Careful cleaning of the metal sheets and the subsequent coating ensures high resistance to weathering. The side panels are easy to remove to allow full access to the internal components for routine maintenance. The electronic controls are visible and can be operated without having to go inside the unit. The base is equipped with holes for inserting vibration dampers or for anchoring to the bed. The units are suitable for installation outdoors, directly on the roof of the building or at ground level.

“Heating section” heat exchanger

Stainless Steel AISI 316 brazed plate insulated with closed-cell foam insulation which reduces heat loss. The heat exchanger is equipped with a temperature probe in the supply line and a probe for measuring the temperature of incoming and outgoing water. A flow switch supplied as standard ensures the protection of the unit from system failures and lack of water flow. The heat exchanger was selected to minimise pressure losses and therefore to reduce pumping power.

“Cooling section” heat exchanger

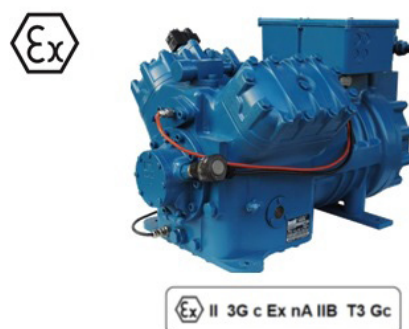
Stainless Steel AISI 316 brazed plate insulated with closed-cell foam insulation which reduces heat loss and prevents the formation of condensation. The heat exchanger is equipped with a temperature probe for freeze protection in the supply line and a probe for measuring the temperature of incoming and outgoing water. A flow switch supplied as standard ensures the protection of the unit from system failures and lack of water flow. The heat exchanger was selected to minimise pressure losses and therefore to reduce pumping power.

Defrosting

Defrosting occurs independently for the two cooling circuits. The air system section, in fact, separates the airflow of the two circuits. This feature ensures that every circuit is defrosted only when conditions require it and not based on the other circuit, ensuring at all times the production of heat in the circuit that is not defrosting. All this means an increase in seasonal efficiency.

Compressor

Semi-hermetic reciprocating compressors, complete with thermal protection included in the electric motor windings, housing heater and rubber shock absorbers to reduce the vibrations transmitted to the structure. The compressors used are designed to maximise performance when using R290 coolant. They are equipped with an efficient system for dealing with the lubricating oil internally. The high quality of the compressors ensures that the unit will have a long useful life. The compressor is ATEX certified.



External heat exchanger (source side)

Consisting of a coil of copper tubes and aluminium fins with high heat exchange surface area with the fin spacing, sized to maximise heat transfer and reduce noise impact.

The geometry used is specifically designed for this coolant because it maximises its heat exchange and at the same time significantly reduces the coolant charge.

The flat structure of the coil ensures a perfectly-distributed air stream over the surface, improving heat exchange. The thicknesses used ensure maximum reliability and useful life.

At the base of the coil there is a sub-cooler, i.e. an auxiliary circuit that keeps the lower part of the coil constantly warm. This has a dual effect: it prevents the formation of ice and thus reduces the number of defrosts; by sub-cooling the liquid, it improves the intrinsic efficiency of the cooling cycle.

Fans

Axial fan, made from high-strength polymer, directly coupled to the electric motor. A special dual-angle nozzle ensures noise reduction and recovery of the dynamic static pressure. The fan is housed in a special nozzle which is shaped in such a way as to optimise the air-handling and sound performance.

All fans (that vary in number according to the size) are fitted with a Brushless (EC) motor and are controlled with a 0-10V signal. The extreme flexibility of the fans allows the air flow to be regulated from 20% to 100%. Regulation makes it possible to operate the unit with particularly low temperatures. The speed controller ensures considerable noise reduction in the unit by adjusting the fan speed at night and in the middle seasons. This means that, whenever possible, the control system will reduce the fan speed to a minimum and similarly the noise.

The fans are helical type directly coupled to the EC electric motors with IP 54 protection rating, shaped nozzles and safety protection grille in accordance with UNI EN 294.

Control

The electronic control system ensures total management of the units. The microprocessor control system allows the following functions to be managed:

- water temperature regulation with control of incoming water on both the hot and cold sections;
- antifreeze protection;
- compressor timing, to avoid switching the unit ON/OFF frequently;
- management of the high pressure pre-alarm allows the unit not to be blocked definitively in exacting or transitory situations;
- alarm reporting;
- alarm resetting;
- digital input for external ON/OFF.

The control system enables the following information to be displayed:

- temperature of outgoing cold water;
- temperature of incoming cold water;
- temperature of outgoing hot water;
- temperature of incoming hot water;
- condensation or evaporation pressure;
- temperature setting and set differentials;
- description of alarms;
- compressor and pump operation meter.

Some functions are available only with the drive properly configured. Some functions must be enabled by control.

Hydraulic circuit

Standard elements include:

- primary cold section pump;
- secondary cold section pump;
- primary hot section pump;
- secondary hot section pump;
- cold section tank;
- flow switch;
- bypass system for defrosting.

Testing

The units are tested in the production facility and are supplied complete with lubricating oil. Testing aims to check the cooling, air-system, hydraulic and electric circuits and also to check safety and energy performance and to limit the start-up operations. During testing the control system is programmed with the specifications or instructions provided by the customer: set points, differentials, functions etc.

The units are supplied without coolant gas.

Cooling circuit

Standard elements include:

- Schrader service charge sockets (1/4 SAE) in the supply, liquid and suction line;
- liquid and moisture indicator;
- double solenoid valve, to prevent migration of coolant into the compressor;
- dehydrator and molecular filter;
- double electronic expansion valve;
- high pressure transducer for operation control and safety;
- low pressure transducer for operation control and safety;
- high and low pressure safety pressure switches;
- safety valve;
- suction separator and receiver in a single component that also acts as a heat exchanger.

Controls and safety systems

The following controls and safety systems are included:

- mains water temperature control probe (located on entry to the heat exchanger);
- antifreeze probe which activates the antifreeze alarm (with manual reset);
- high pressure safety pressure switch (with automatic reset with limited interventions);
- low pressure safety pressure switch (with automatic reset with limited interventions);
- double flow switch: one on the hot side and one on the cold side (with manual reset);
- condensation pressure control via speed regulator for operation with low outdoor temperatures;
- high pressure safety valve;
- compressor overheating protection;
- Propane gas sensor. The sensor allows any coolant gas leaks to be intercepted and dealt with in order to ensure maximum safety.

Standard equipment

The units include:

- general isolation switch device;
- protection of the auxiliary and power circuits;
- microprocessor control;
- condensation and evaporation control via fan speed regulator;
- water flow switch;
- certification under Directive 2014/68/EU (PED);
- Remote ON/OFF from standard digital input.

Some materials may be ATEX certified.

Electric panel

The electric panel consists of:

- main isolation switch;
- general automatic switch and fuses protecting the auxiliary and power circuits;
- compressor remote control switch;
- fan speed regulator for fans used to control condensation and evaporation;
- remote control switch and pump motor protection switch (in version with pumps);
- clean general alarm contacts;
- microprocessor control system.

The standard power supply is 400V/3~/50Hz

NRE-MPU Multi-purpose Units: Description of the main accessories

All units can be configured with various accessories according to the type of installation and we recommend that checks regarding any requirements should be made with the project manager and installer. Not all accessories can be installed once the unit has been positioned. Therefore, it is essential that correct choices are made right at the start.

CODE	ACCESSORY	SUPPLY	DESCRIPTION
ONF	Remote ON/OFF from digital input	Standard	This function consists of a remote contact that enables the unit to be switched ON/OFF through a signal that can be located inside the building via a switch or piloted by a BMS (Building Management System).
CCE	Condensation Control	Standard	The electronic speed Regulator is designed to control the speed of the fan motors. The speed is controlled by condensation pressure in cooling mode and evaporation pressure in heating mode.
CAD	Self-adapting Control	Standard	The control logic enables the unit to be used even with extremely low water content, by changing the actual set point on the basis of the real instantaneous thermal loads. The control system notices the large number of compressor starts and stops and changes the set points in order to increase the length of time that the compressor is shut down and remains in operation. This ensures a longer life for the unit and reduced power consumption
FAM	Water Filter	Standard	Water filters, positioned at the unit water inlet point are intended to prevent processing residues, impurities or other things clogging up the heat exchangers. It is essential that a filter with a 400 or 500 µm mesh is positioned at the entrance of each circuit. Failure to fit a filter will automatically nullify the validity of the warranty.
VTE	Electronic thermostatic valve	Standard	The use of this accessory is particularly suitable for units that have to operate under extremely variable thermal-load conditions, with significant outside-air temperature differences or when there is a double set point. Using an electronic thermostatic valve enables you to: <ul style="list-style-type: none"> • maximise heat transfer with the utility heat exchanger by controlling overheating; • reduce response times of the cooling circuit to load variations and external conditions; • have a more precise control over the cycle operation.
VEC	EC Fans	Standard	These motors with permanent magnet rotors ensure high levels of efficiency in all working conditions and allow savings to be achieved, normally within a few years of operation.
GCI	Loading unit	Accessory	The automatic filling unit is a device consisting of a pressure reducer in a compensated seat, an inlet filter, a stop cock and a check valve. It must be installed on the water supply pipe in closed-circuit cooling or heating systems and its main function is to maintain system pressure at a stable, pre-set level, by automatically filling up with water to make up any water losses. After installation, during the filling or refilling phases, the supply will be stopped once the set pressure has been reached.
RAG	Antifreeze heating element	Accessory	Accessory consisting of electric heating elements of various shapes, placed on the utility heat exchanger, on the pump spiral and in the tank (depending on the configuration of the machine) to prevent damage to the hydraulic components due to ice formation in the periods of machine shutdown if it has not been properly emptied. The power of the antifreeze heating elements goes from 20 to 60 watts depending on the model of the unit. Operating principle: to prevent component failure, the control system checks the temperature of the probe at the outlet from the heat exchanger (even when the unit is in stand-by mode) and when it detects a water temperature of less than or equal to 5°C (or 2°C below the temperature set point, with a differential of 1°C) it switches on the pump (if any) and activates the antifreeze heating element. If the outlet water temperature should reach 4°C (or 3°C below the set point) the antifreeze alarm will also trigger and stop the compressor, while leaving the heating elements ON. When the measured temperature exceeds 14°, the control system switches off the antifreeze heating elements and the pump.

DSP	Double setpoint from digital input	Accessory	The double set point allows two different working temperatures to be set for the cooling function. The set point temperatures must be specified when ordering. The set point can be changed via the keyboard or digital input.
IS	Serial interface RS485	Accessory	The control system can be equipped with an RS485 serial card with MODBUS Protocol.
TUR	Remote user terminal	Accessory	This accessory consists of a replica of the remote control panel, which can be used to perform complete configuration of the unit and to display all its parameters on a screen. The accessory is recommended if the unit is installed in a place that is difficult to reach. The accessory can be located up to 100 m away.
SST	Soft-starter	Accessory	To reduce electricity consumption and noise levels, respectively when the compressor is switched on and then starts up, the unit can be fitted with a soft-starter accessory that provides electronic control over the start-up of the electric motors and enables a reduction in the normal inrush power of the compressor of about 40%.
CSP	Compensation of the set point based on outdoor temperature	Accessory	The controller (if enabled) allows the set point of the unit to be changed according to the outdoor temperature. Compensation may be positive or negative: with positive compensation due to an increase in outdoor air temperature, the summer set temperature will also increase, whereas with negative compensation due to an increase in air temperature, the set temperature will decrease.
RMM	Maximum and minimum voltage relay	Accessory	This device continuously monitors the supply voltage of the unit, making sure that it is always within a permissible range. If the voltage value goes above or below this range, the device will stop the unit to avoid damage to the electric motors. The same device also monitors the phase sequence.
MA	Water pressure gauges	Accessory	There is a pressure gauge positioned on the supply side to the primary pumps so as to calibrate the flow rate and check the static pressure.
FLU	Mechanical, vane-type flow switch	Standard	Accessory to be installed in the water outlet line of the unit. It checks whether there is a reduction or absence of water so as to prevent possible freezing inside the heat exchanger. There are 2 standard ones: one for the hot circuit and one for the cold circuit.
VIA	Water shut-off valves	Standard	Two valves to be inserted in the inlet and outlet points of the 2 hydraulic circuits in order to shut off the water when performing maintenance on the hydronic system.
FPB	Coil protection filter	Standard	Galvanised netting filter with metal mesh in aluminium on the inside. Avoids clogging on the outdoor heat exchanger (coil) from leaves, dust and anything else.
ANU	Vibration dampers	Accessory	The rubber anti-vibration dampers can significantly reduce the transmission of vibrations from the unit to the supporting base. They are fixed to the base of the unit and are blocked onto the base.
BTW	Low water temperature kit	Accessory	In order to operate efficiently even when the water or glycol-water set points are very low (from 4° to -8°) it is a good idea to use this kit. The kit consists of top heat insulation for the exchanger, and the replacement of the low pressure safety pressure switch with one that has variable calibration.

General technical data

Model NRE-MPU	61	74	86	114	138
Natural Refrigerant	R290	R290	R290	R290	R290
Independent Hot/Cold Storages	Dual	Dual	Dual	Dual	Dual
Water flow rate Modulation Hot side (Min-Max)	40-100%	40-100%	40-100%	40-100%	40-100%
Water flow rate Modulation Cold side (Min-Max)	40-100%	40-100%	40-100%	40-100%	40-100%
Compliance with Reg. EU 2016/2281 - ENER LOT 21 - TIER 2	ERP 2021	ERP 2021	ERP 2021	ERP 2021	ERP 2021

Total recovery (W15-W30) (7)

Total Cooling Capacity	(3)	kW	63.9	77.3	90.0	119.9	145.0
Total Heating Capacity	(3)	kW	77.0	92.8	107.6	145.9	175.8
TCOP			10.79	11.02	11.24	10.23	10.43
Absorbed power		kW	13.1	15.4	17.6	26.0	30.8

Cooling (W15-A35)

Total Cooling Capacity	(1)	kW	61.0	73.6	86.2	114.5	138.0
Absorbed power	(1)	kW	14.9	17.5	20.0	29.6	34.7
EER EN 14511			4.05	4.17	4.27	3.81	3.92
ESEER			4.70	4.70	4.56	4.67	4.56
IPLV			4.64	4.83	4.37	4.60	4.69
SEER Seasonal Energy Efficiency Ratio	(2)		4.21	4.18	4.13	4.52	4.37
Energy Efficiency $\eta_{s,c}$	(3)	%	165.4	164.2	162.4	177.6	170.4

Heating (W30-A7)

Total Heating Capacity	(4)	kW	50.4	60.6	70.1	100.8	121.2
Absorbed power	(4)	kW	12.8	14.9	16.9	25.5	29.7
COP EN 14511			3.87	3.99	4.07	3.89	4.01
SCOP Seasonal Coefficient of Performance	(5)		4.12	4.78	4.60	4.44	4.40
Energy Efficiency $\eta_{s,c}$	(6)	%	162.0	188.0	181.0	175.0	172.0

Compressors

Compressor		Semi-herm.	Semi-herm.	Semi-herm.	Semi-herm.	Semi-herm.
Total Compressor Number	no.	1	1	1	2	2
Number of Refrigeration Circuit	no.	1	1	1	2	2
Capacity step	no.	30-65	30-65	30-65	30-65	30-65
Refrigerant GWP	no.	3	3	3	3	3

Cold hydronic circuit

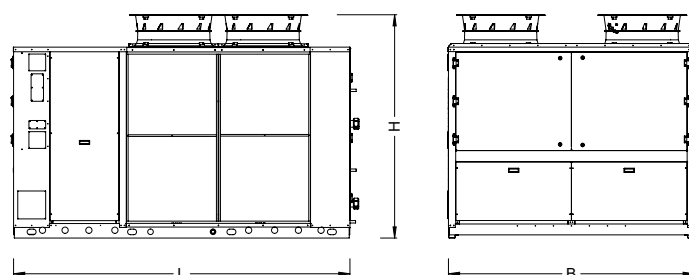
Chilled Water Storage Volume	l	200	200	200	200	200
Waterflow	m³/h	10.50	12.66	14.82	19.69	23.73
Coil ΔP	kPa	7.6	7.9	8.1	20.1	21.2
Heat Exchanger	no.	Mono circuit plates			Dual circuit plates	
Heat Exchanger Number	no.	1	1	1	1	1

Hot hydronic circuit

Chilled Water Storage Volume	l	200	200	200	200	200
Waterflow	m³/h	8.67	10.42	12.05	17.34	20.85
Coil ΔP	kPa	49.4	49.3	51.9	49.0	50.5
Heat Exchanger	no.	Mono circuit plates			Dual circuit plates	
Heat Exchanger Number	no.	1	1	1	1	1

Dimensions

B	mm	1700	1700	1700	2200	2200
H	mm	2000	2000	2000	2000	2000
L	mm	3500	3500	3500	3500	3500
Weight	kg	1445	1474	1500	2363	2384



NOTES: (1) Water evaporator (in/out) = 20/15°C; Air condenser (in) = 35°C; (2) According to EN 14825:2019; (3) According to ECODESIGN Regulation (EU) no. 2016/2281 – ENER LOT 21 (ERP); (4) Water condenser (in/out) = 30/35°C; Air evaporator (in) = 7°C RH 87%; (5) According to EN 14825:2019; (6) According to ECODESIGN Regulation (EU) no. 2016/2281 – ENER LOT 21 (ERP); (7) Water evaporator (in/out) = 20/15°C; Water heat recovery unit (in/out) = 30/35°C.

General technical data

Model NRE-MPU	170	194	246	272	335	402
Natural Refrigerant	R290	R290	R290	R290	R290	R290
Independent Hot/Cold Storages	Dual	Dual	Dual	Dual	Dual	Dual
Water flow rate Modulation Hot side (Min-Max)	40-100%	40-100%	40-100%	40-100%	40-100%	40-100%
Water flow rate Modulation Cold side (Min-Max)	40-100%	40-100%	40-100%	40-100%	40-100%	40-100%
Compliance with Reg. EU 2016/2281 - ENER LOT 21 - TIER 2	ERP 2021	ERP 2021	ERP 2021	ERP 2021	ERP 2021	ERP 2021

Total recovery (W15-W30) (7)

Total Cooling Capacity	(3)	kW	175.8	201.2	255.3	282.2	342.6	413.4
Total Heating Capacity	(3)	kW	214.7	244.7	312.0	344.8	426.1	508.3
TCOP			10.05	10.25	10.01	10.00	9.20	9.71
Absorbed power		kW	38.9	43.5	56.7	62.7	83.5	94.9

Cooling (W15-A35)

Total Cooling Capacity	(1)	kW	170.1	194.1	246.4	272.4	334.6	402.2
Absorbed power	(1)	kW	44.8	49.9	65.0	71.4	97.7	108.6
EER EN 14511			3.75	3.84	3.74	3.76	3.38	3.65
ESEER			4.60	4.53	4.50	4.32	4.33	4.01
IPLV			4.65	4.56	4.46	4.16	4.53	4.17
SEER Seasonal Energy Efficiency Ratio	(2)		4.52	4.49	4.48	4.29	4.33	4.10
Energy Efficiency $\eta_{s,c}$	(3)	%	177.6	177.7	176.1	168.4	170.2	161.1

Heating (W30-A7)

Total Heating Capacity	(4)	kW	148.4	168.0	213.8	236.4	291.2	343.0
Absorbed power	(4)	kW	38.4	42.3	55.3	60.7	82.8	97.4
COP EN 14511			3.81	3.91	3.82	3.85	3.48	3.48
SCOP Seasonal Coefficient of Performance	(5)		4.27	4.22	4.21	4.11	3.97	3.75
Energy Efficiency $\eta_{s,c}$	(6)	%	168.0	166.0	165.0	161.0	156.0	147.0

Compressors

Compressor		Semi-herm.	Semi-herm.	Semi-herm.	Semi-herm.	Semi-herm.	Semi-herm.
Total Compressor Number	no.	2	2	2	2	2	2
Number of Refrigeration Circuit	no.	2	2	2	2	2	2
Capacity step	no.	30-65	30-65	30-65	30-65	30-65	30-65
Refrigerant GWP	no.	3	3	3	3	3	3

Cold hydronic circuit

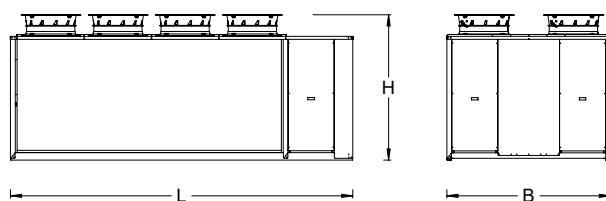
Chilled Water Storage Volume	l	400	400	600	600	800	800
Waterflow	m³/h	29.26	33.39	42.39	46.85	57.56	69.18
Coil ΔP	kPa	22.6	23.9	29.8	31.3	32.4	34.4
Heat Exchanger	no.	Dual circuit plates					
Heat Exchanger Number	no.	1	1	1	1	1	1

Hot hydronic circuit

Chilled Water Storage Volume	l	400	400	600	600	800	800
Waterflow	m³/h	25.53	28.90	36.78	40.65	50.09	58.99
Coil ΔP	kPa	50.4	52.5	52.2	50.6	52.3	52.1
Heat Exchanger	no.	Dual circuit plates					
Heat Exchanger Number	no.	1	1	1	1	1	1

Dimensions

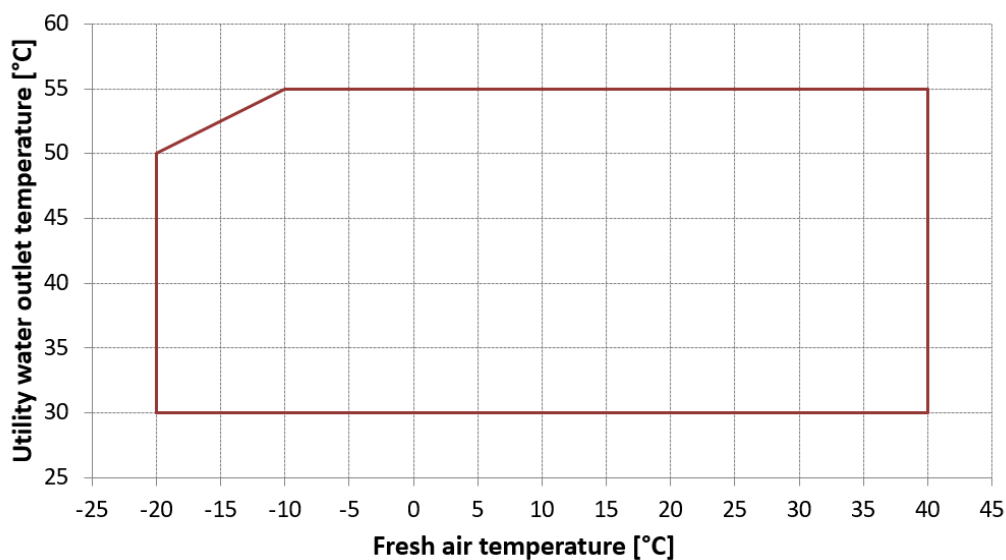
B	mm	2200	2200	2200	2200	2200	2200
H	mm	2000	2000	2000	2000	2450	2450
L	mm	4500	4500	5500	5500	7300	7300
Weight	kg	2677	2755	3344	3397	5320	5500



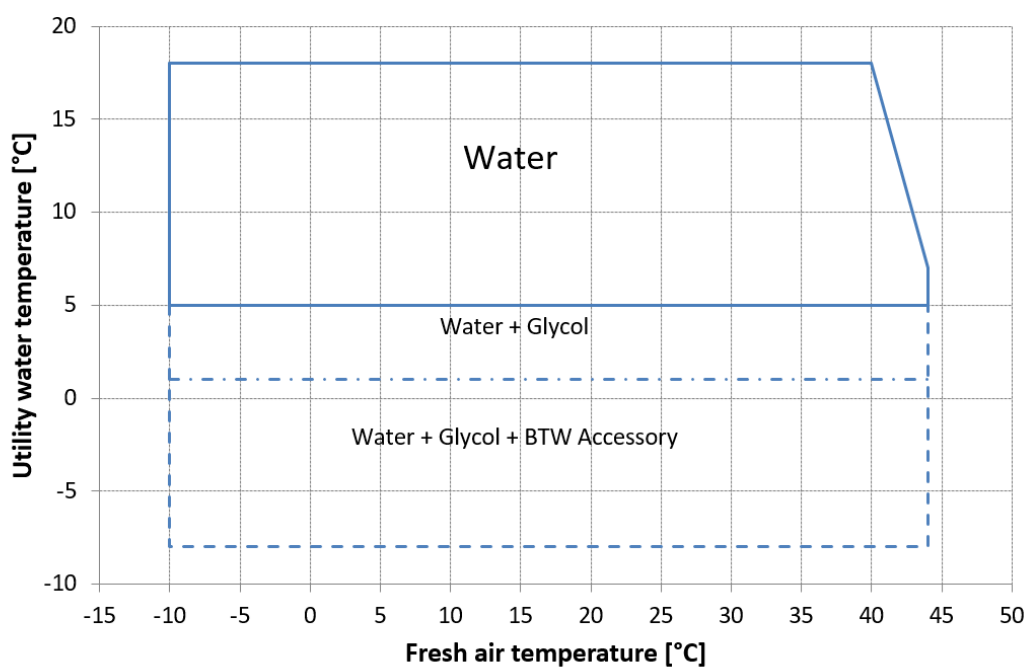
NOTES: (1) Water evaporator (in/out) = 20/15°C; Air condenser (in) = 35°C; (2) According to EN 14825:2019; (3) According to ECODESIGN Regulation (EU) no. 2016/2281 – ENER LOT 21 (ERP); (4) Water condenser (in/out) = 30/35°C; Air evaporator (in) = 7°C RH 87%; (5) According to EN 14825:2019; (6) According to ECODESIGN Regulation (EU) no. 2016/2281 – ENER LOT 21 (ERP); (7) Water evaporator (in/out) = 20/15°C; Water heat recovery unit (in/out) = 30/35°C.

Operating Limits

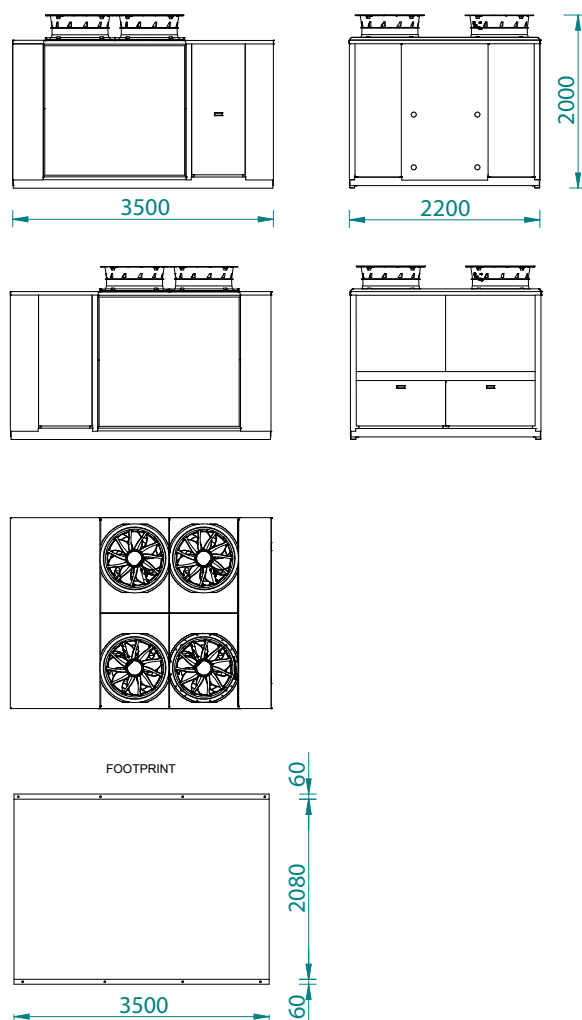
Heating



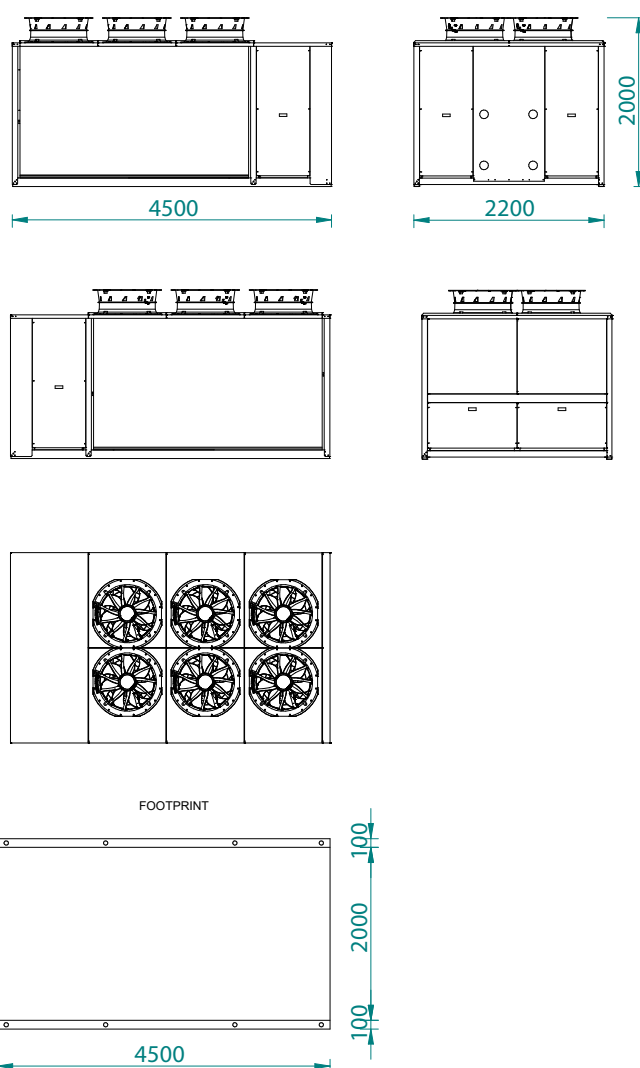
Cooling



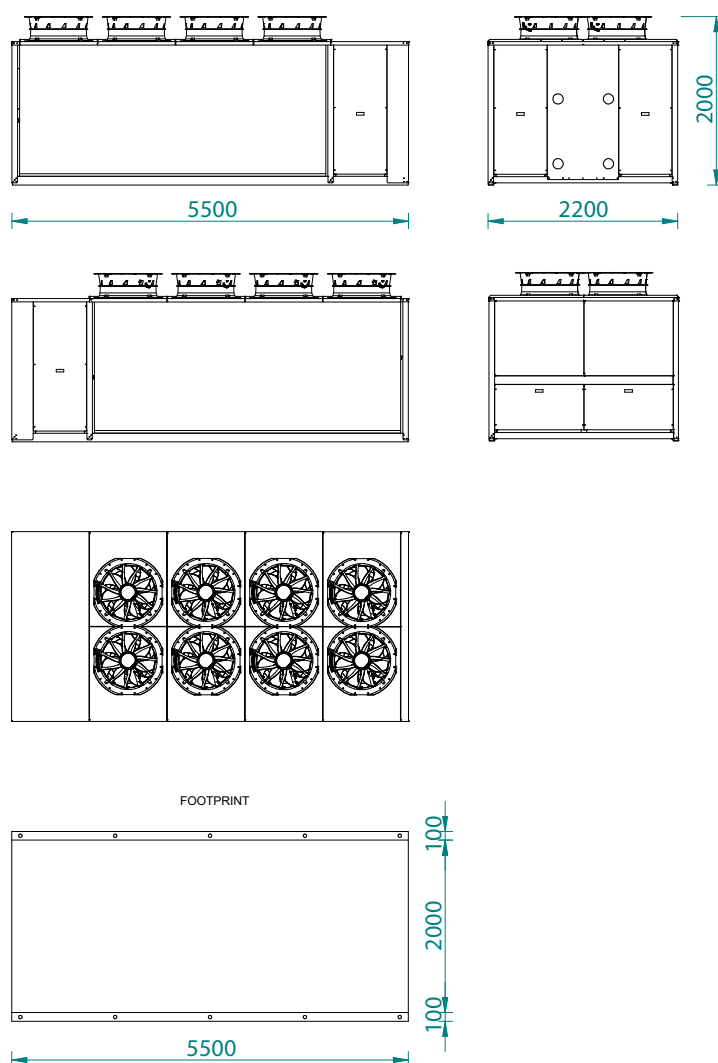
General Dimensions and Construction Form: Sizes 50-75



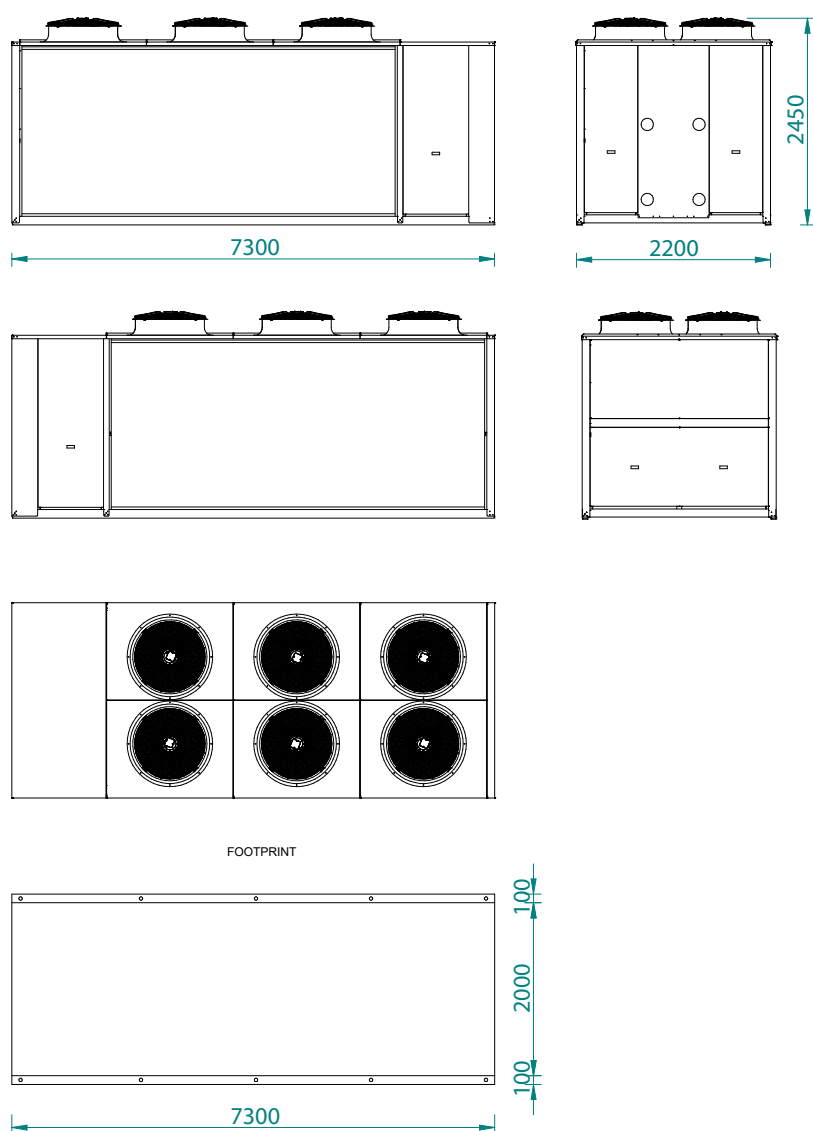
General Dimensions and Construction Form: Sizes 95-120



General Dimensions and Construction Form: Sizes 156-176



General Dimensions and Construction Form: Sizes 200-230





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