# 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

BIM READY

ErP 2021 COMPLIANT

R290


The multi-purpose Units with R290 natural refrigerant for 4-tube hydronic systems in the NRE-MPU range by Roccheggiani are units designed (based on the chosen configuration and accessories) to guarantee the efficient and independent contemporary production of fluids suitable for winter heating and summer air conditioning in buildings, maximising heat recovery and ensuring maximum seasonal yield. The Units are designed for all commercial applications, multifamily housing and service industriesrequiring 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 the 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 refrigerants such as R290, NH3 and CO2), this refrigerant is also highly efficient and future-proof, since it is free from any limitations regarding the quantities that can be used and marketed, at least from the point of view of environmental impact.
The multi-purpose Units with R290 natural refrigerant for 4-tube hydronic systems in the NRE-MPU range by Roccheggiani are manufactured in compliance with the UNI EN 12100 Standard and the CE marking directives, following an ISO 9001-certified quality assurance system.

Publication: Sales technical information sheet for NRE-MPU Multi-purpose Units

## 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 in the various product ranges, issued by important 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:
- Machinery Directive 2006/42/EU
- Electromagnetic Compatibility Directive 2014/30/EU (EMC)
- Low Voltage Directive 2014/35/EU (LVD)
- Pressure Equipment 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.

### They use R290 NATURAL COOLANT (European Regulation 2024/573)

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.

### They meet and exceed 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

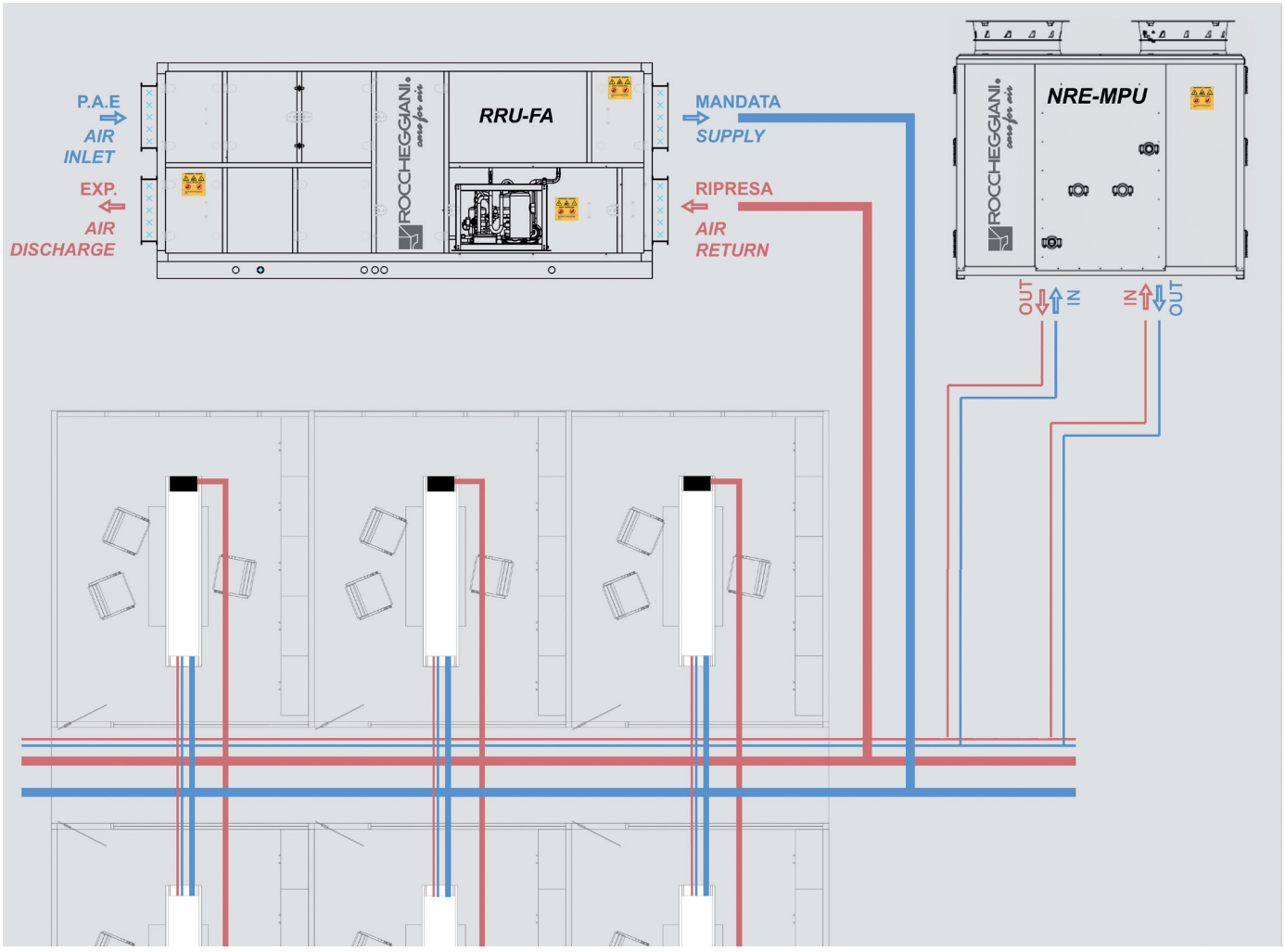
The units have been designed to respond in a specialised manner to a wide spectrum of applications:

- Tertiary sector
- Hotels
- 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

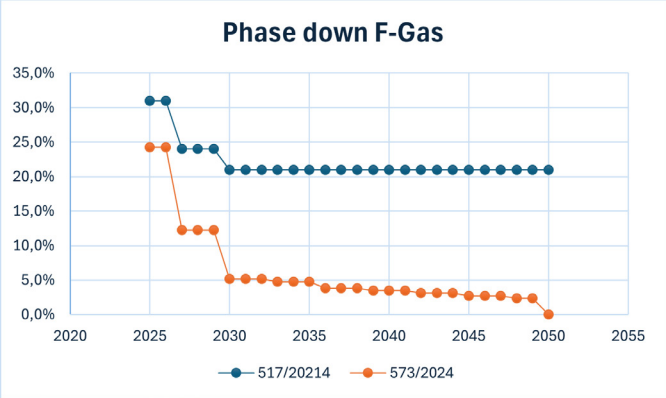
The Multi-purpose units in the NRE-MPU range are particularly suitable for high-efficiency, annual-cycle air conditioning in buildings, where you may find that different rooms/zones within the same building, require heating and conditioning independently at the same time. In such conditions the use of 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. 573/2024

European Regulation 573/2024 provides for a complete elimination of fluorinated refrigerants by 2050. Regulation (EU) 573/2024 is an even more restrictive amendment to the previous one in force – Regulation (EU) 517/2014 – which applied reductions in the maximum quantity of fluorinated gases that could be marketed within the European Community up to the year 2030. To achieve this objective, increasingly greater restrictions are expected over the years and this makes the use of a natural refrigerant such as R290, which is effectively excluded from this Regulation, even more interesting than in the past.
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 and its successor 573/2024, are part of this roadmap with the first practical implications starting in 2015.
Pointing towards a gradual, but highly important reduction in the use of hydro-fluorocarbons (HFCs) leading to a total ban by 2050, the F-gas Regulation will have enormous repercussions in relation to coolants within our industry.
Regulation 573/2024 implements the reduction of refrigerant gas availability on the basis of CO2 equivalent tonnes. This means that the availability of synthetic refrigerants will be lower, the greater their GWP, i.e. the impact expressed in CO2 equivalent tonnes of 1kg of refrigerant. R290 is not involved in all of this.




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

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

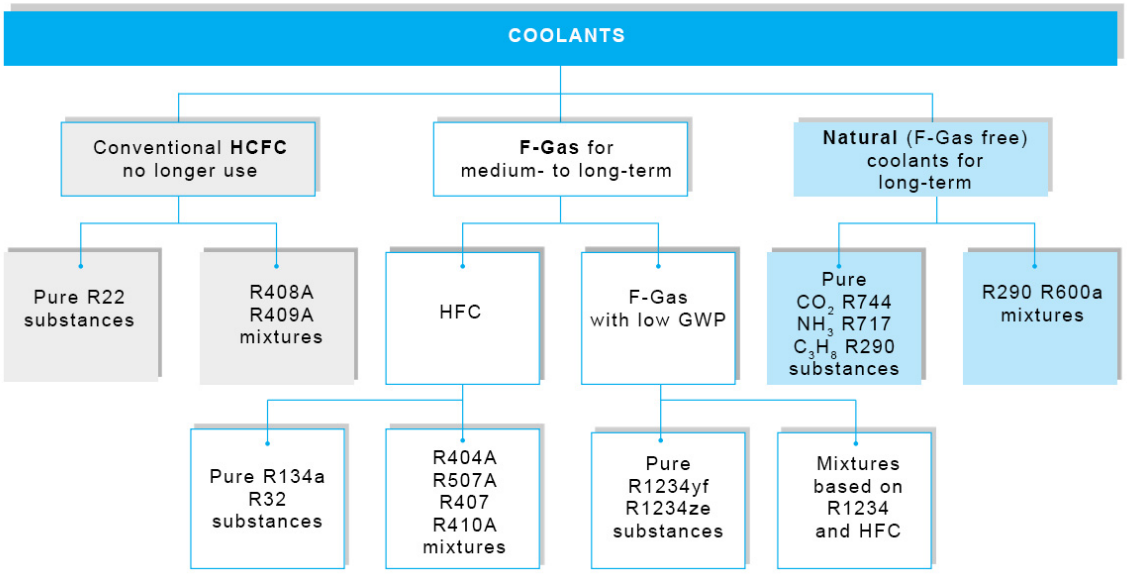
The Multi-purpose units in the NRE-MPU range are a “long-term green solution” due to the use of R290 natural coolant. In accordance with the EU F-gas regulations, this refrigerant is also highly efficient and future-proof, since it is free from any limitations regarding the quantities that can be used and marketed, at least from the point of view of environmental impact.
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 - 2014/68/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 0.02 (value not even comparable with 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 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 envisaged sealed circuits and limited charges (usually under 150 g but also up to 500 g according to the 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 due to its high evaporation heat, which provides high efficiency levels. However 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.



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

Since R290 (Propane) is a natural coolant, its use in the 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 coolant fluid stable in air | | | | |
| R32 | | 675 | 5300 | from 1 |
| R134a | | 1430 | 2050 | from 100 |
| R407C | | 1774 | 3000 | from 10 |
| R410A | | 2088 | 4600 | from 2 |
| R447A | R410A | 583 | | |
| R448A | R404A | 1386 | 2900 | from 10 |
| R450A | R134a | 601 | 1760 | |
| R513A | R134a | 629 | 2050 | from 5 |
| Synthetic liquid coolant unstable in air | | | | |
| R1234ze | | 1.37 | 1550 | from 50 |
| R1234yf | | 0.5 | 1900 | from 50 |
| Natural coolant fluid | | | | |
| R290 (Propane) | | 0.02 | 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 coolant fluid 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 Article 49(4-quater) of Italian Decree Law no. 78 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, but it may be enough to apply for a CPI (fire prevention certificate) from the Fire Department, in line with the deadlines and procedures indicated 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 come in three operating types:
- cooling only;
- heating only;
- cooling and heating at the same time.

The NRE-MPU units are equipped with a gas detector that allows work to be done in safe conditions. The machine is allowed to work or otherwise, based on the concentration value of the refrigerant in air, expressed in terms of the LEL (Lower Explosive Limit). The alarm intervenes when any possible explosive mixture is still far from being reached, ensuring a significant safety margin and coefficient. If the detected LEL value actually exceeds 20%, the machine is stopped while ventilation continues to operate to clean the compressor compartment from the presence of refrigerant.

Safety is therefore guaranteed by a series of components managed by control such as:
- coolant detection sensor, made exclusively for detecting Propane. The chosen sensor:
  - » does not require any calibration in the field
  - » is immune against “poisoning” from any other substances in the air
  - » is selective on Propane gas. No false alarms
  - » has a useful service life of at least 15 years
  - » is equipped with internal diagnostics which blocks the machine in the event of any malfunction
  - » has ATEX and SIL certification
- ATEX evacuation fan which allows the compressor chamber to be evacuated and “scrubbed”;
- air differential pressure switch, to ensure constant operation of the evacuation fan;
- Red lamp, to warn of the presence of any detected gas.

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

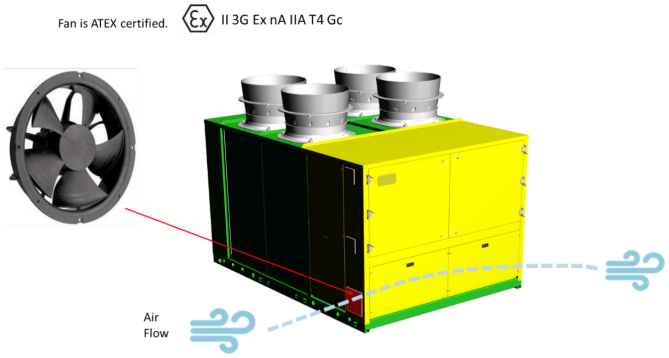
| Function | Normal operation | >20% of LEL |
|---|---|---|
| Gas detector | ON | Alarm A |
| Evacuation fan | ON | ON |
| Differential pressure control | ON | ON |
| Red lamp | OFF | ON |
| Refrigeration System | ON | OFF |

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 x 1012 Hz;
- 5.3.10 electromagnetic waves from 3 x 1011 Hz to 3. x 1015 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 ensure high resistance to weathering. The side panels are easy to remove to allow full access to the internal components for routine maintenance. All 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

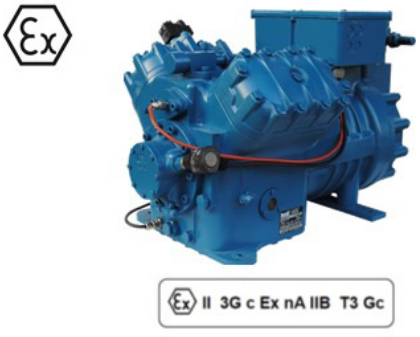
Stainless Steel AISI 316 brazed plate insulated with closed-cell foam insulation which reduces heat loss and prevents the formation of condensation. The heat exchanger is equipped with a temperature probe for freeze protection in the supply line and a probe for measuring the temperature of incoming and 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 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 lubricating oil internally. The high quality of the compressors ensures that the unit will have a long useful service 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 charging.
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 prolonged useful service 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 directly coupled to the electric motor, made from high-strength polymer. 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 at 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;
- hot 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 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

## 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.
- The standard power supply is 400V/3~+ N/50Hz

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

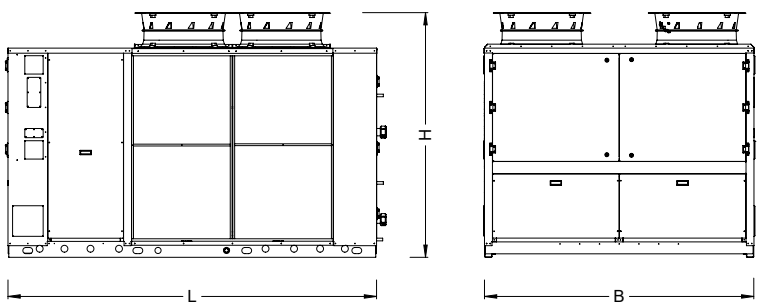
All units can be configured with various accessories according to the type of installation and we recommend that checks regarding any requirements should be made with the project manager and installer. Not all accessories can be installed once the unit has been positioned. Therefore, it is essential 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. |
| **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.<br>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 in or when there is a double set point. Using an electronic thermostatic valve enables you to:<br>• maximise heat transfer with the utility heat exchanger by controlling overheating;<br>• reduce response times of the cooling circuit with respect to load variations and external conditions;<br>• have more precise control over the operation of the cycle. |
| **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 unit model.<br>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.<br>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. |
| **CSP** | **Compensation of the set point based on outdoor temperature** | Standard | 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 set temperature will also increase, whereas with negative compensation due to an increase in air temperature, the set temperature will decrease. Compensation can be implemented on both the hot and cold setpoints. |
| **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 permitted 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) due to 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 bed. They are fixed to the base of the unit and are secured to the bed. |
| **BTW** | **Low water temperature kit** | Accessory | In order to operate efficiently even when the water or glycoled 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 specifications

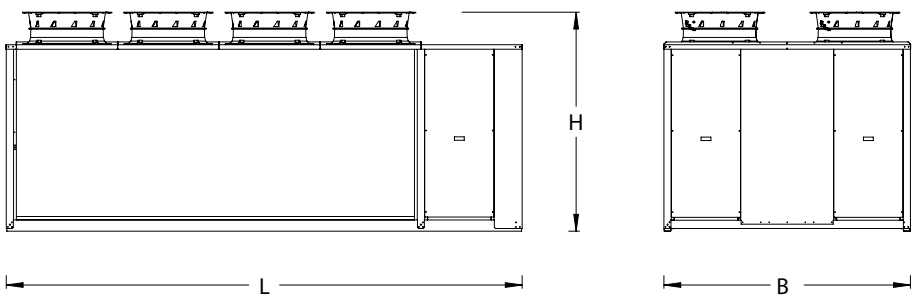
| **Model NRE-MPU** | | | **61** | **74** | **86** | **114** | **138** |
|---|---|---|---|---|---|---|---|
| Natural Refrigerant | | | R290 | R290 | R290 | R290 | R290 |
| Independent Hot/Cold Storages | | | Dual | Dual | Dual | Dual | Dual |
| Water flow rate Modulation Hot side (Min-Max) | | | 40-100% | 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-W35) (7)** | | | | | | | |
| Total cooling capacity | (3) | kW | 63.9 | 77.3 | 90.0 | 119.9 | 145.0 |
| 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 electrical 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 electrical 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 |
| Seasonal Performance Coefficient SEER | (2) | | 4.21 | 4.18 | 4.13 | 4.52 | 4.37 |
| Energy efficiency ηsc | (3) | % | 165.4 | 164.2 | 162.4 | 177.6 | 170.4 |
| **Heating (W35-A7)** | | | | | | | |
| Heating capacity | (4) | kW | 50.4 | 60.6 | 70.1 | 100.8 | 121.2 |
| Absorbed electrical 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 |
| Seasonal Performance Coefficient SCOP | (5) | | 4.12 | 4.78 | 4.60 | 4.44 | 4.40 |
| Energy efficiency ηsc | (6) | % | 162.0 | 188.0 | 181.0 | 175.0 | 172.0 |
| **Compressors** | | | | | | | |
| Compressor type | | | Semi-herm. | Semi-herm. | Semi-herm. | Semi-herm. | Semi-herm. |
| Tot. number of compressors | | no. | 1 | 1 | 1 | 2 | 2 |
| Number of cooling circuits | | no. | 1 | 1 | 1 | 2 | 2 |
| Capacity steps | | no. | 30-65 | 30-65 | 30-65 | 30-65 | 30-65 |
| GWP coolant | | no. | 3 | 3 | 3 | 3 | 3 |
| **Cold hydronic circuit** | | | | | | | |
| Cold tank capacity | | l | 200 | 200 | 200 | 200 | 200 |
| Water rate | | $m^3/h$ | 10.50 | 12.66 | 14.82 | 19.69 | 23.73 |
| DP heat exchanger | | kPa | 7.6 | 7.9 | 8.1 | 20.1 | 21.2 |
| Type of heat exchanger | | no. | Mono circuit plates | | | Dual circuit plates | |
| Number of heat exchangers | | no. | 1 | 1 | 1 | 1 | 1 |
| **Hot hydronic circuit** | | | | | | | |
| Cold tank capacity | | l | 200 | 200 | 200 | 200 | 200 |
| Water rate | | $m^3/h$ | 8.67 | 10.42 | 12.05 | 17.34 | 20.85 |
| DP heat exchanger | | kPa | 49.4 | 49.3 | 51.9 | 49.0 | 50.5 |
| Type of heat exchanger | | no. | Mono circuit plates | | | Dual circuit plates | |
| Number of heat exchangers | | 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 - R.H. 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.

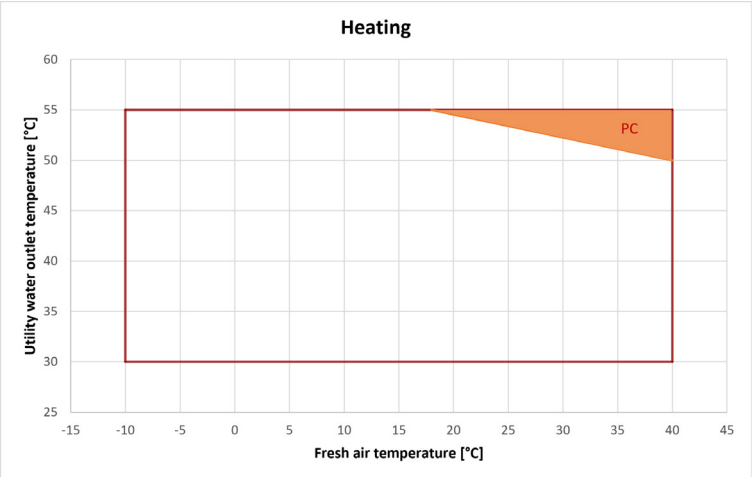
# General technical specifications

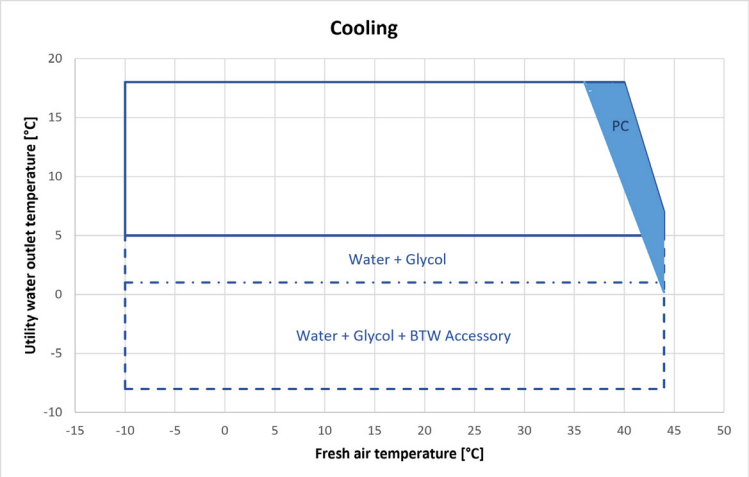
| **Model NRE-MPU** | | | **170** | **194** | **246** | **272** | **335** | **402** |
|---|---|---|---|---|---|---|---|---|
| Natural Refrigerant | | | R290 | R290 | R290 | R290 | R290 | R290 |
| Independent Hot/Cold Storages | | | Dual | Dual | Dual | Dual | Dual | Dual |
| Water flow rate Modulation 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-W35) (7)** | | | | | | | | |
| Total cooling capacity | (3) | kW | 175.8 | 201.2 | 255.3 | 282.2 | 342.6 | 413.4 |
| 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 electrical 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 electrical 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 |
| Seasonal Performance Coefficient SEER | (2) | | 4.52 | 4.49 | 4.48 | 4.29 | 4.33 | 4.10 |
| Energy efficiency ηsc | (3) | % | 177.6 | 177.7 | 176.1 | 168.4 | 170.2 | 161.1 |
| **Heating (W35-A7)** | | | | | | | | |
| Heating capacity | (4) | kW | 148.4 | 168.0 | 213.8 | 236.4 | 291.2 | 343.0 |
| Absorbed electrical 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 |
| Seasonal Performance Coefficient SCOP | (5) | | 4.27 | 4.22 | 4.21 | 4.11 | 3.97 | 3.75 |
| Energy efficiency ηsc | (6) | % | 168.0 | 166.0 | 165.0 | 161.0 | 156.0 | 147.0 |
| **Compressors** | | | | | | | | |
| Compressor type | | | Semi-herm. | Semi-herm. | Semi-herm. | Semi-herm. | Semi-herm. | Semi-herm. |
| Tot. number of compressors | | no. | 2 | 2 | 2 | 2 | 2 | 2 |
| Number of cooling circuits | | no. | 2 | 2 | 2 | 2 | 2 | 2 |
| Capacity steps | | no. | 30-65 | 30-65 | 30-65 | 30-65 | 30-65 | 30-65 |
| GWP coolant | | no. | 3 | 3 | 3 | 3 | 3 | 3 |
| **Cold hydronic circuit** | | | | | | | | |
| Cold tank capacity | | l | 400 | 400 | 600 | 600 | 800 | 800 |
| Water rate | | m3/h | 29.26 | 33.39 | 42.39 | 46.85 | 57.56 | 69.18 |
| DP heat exchanger | | kPa | 22.6 | 23.9 | 29.8 | 31.3 | 32.4 | 34.4 |
| Type of heat exchanger | | no. | Dual circuit plates | | | Piastre-Doppio circuito | | |
| Number of heat exchangers | | no. | 1 | 1 | 1 | 1 | 1 | 1 |
| **Hot hydronic circuit** | | | | | | | | |
| Cold tank capacity | | l | 400 | 400 | 600 | 600 | 800 | 800 |
| Water rate | | m3/h | 25.53 | 28.90 | 36.78 | 40.65 | 50.09 | 58.99 |
| DP heat exchanger | | kPa | 50.4 | 52.5 | 52.2 | 50.6 | 52.3 | 52.1 |
| Type of heat exchanger | | no. | Dual circuit plates | | | Piastre-Doppio circuito | | |
| Number of heat exchangers | | 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 |

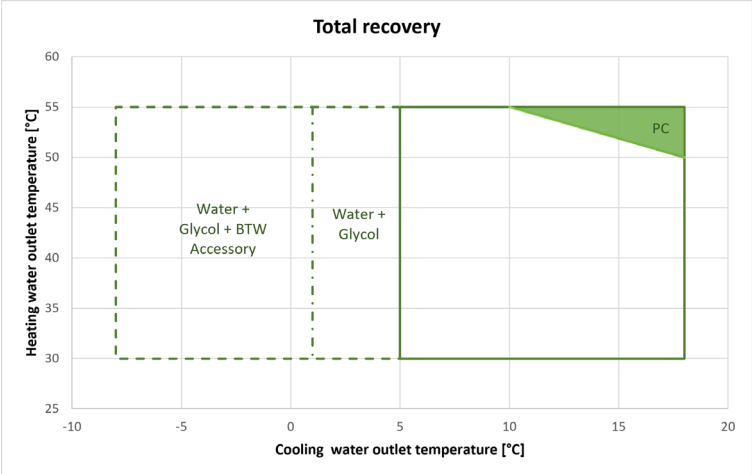



NOTES: **(1)** Water evaporator (in/out) = 20/15°C; Air condenser (in) = 35°C; **(2)** According to EN 14825:2019; **(3)** According to ECODESIGN Regulation (EU) no. 2016/2281 – ENER LOT 21 (ERP); **(4)** Water condenser (in/out) = 30/35°C; Air evaporator (in) = 7°C - R.H. 87%; **(5)** According to EN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

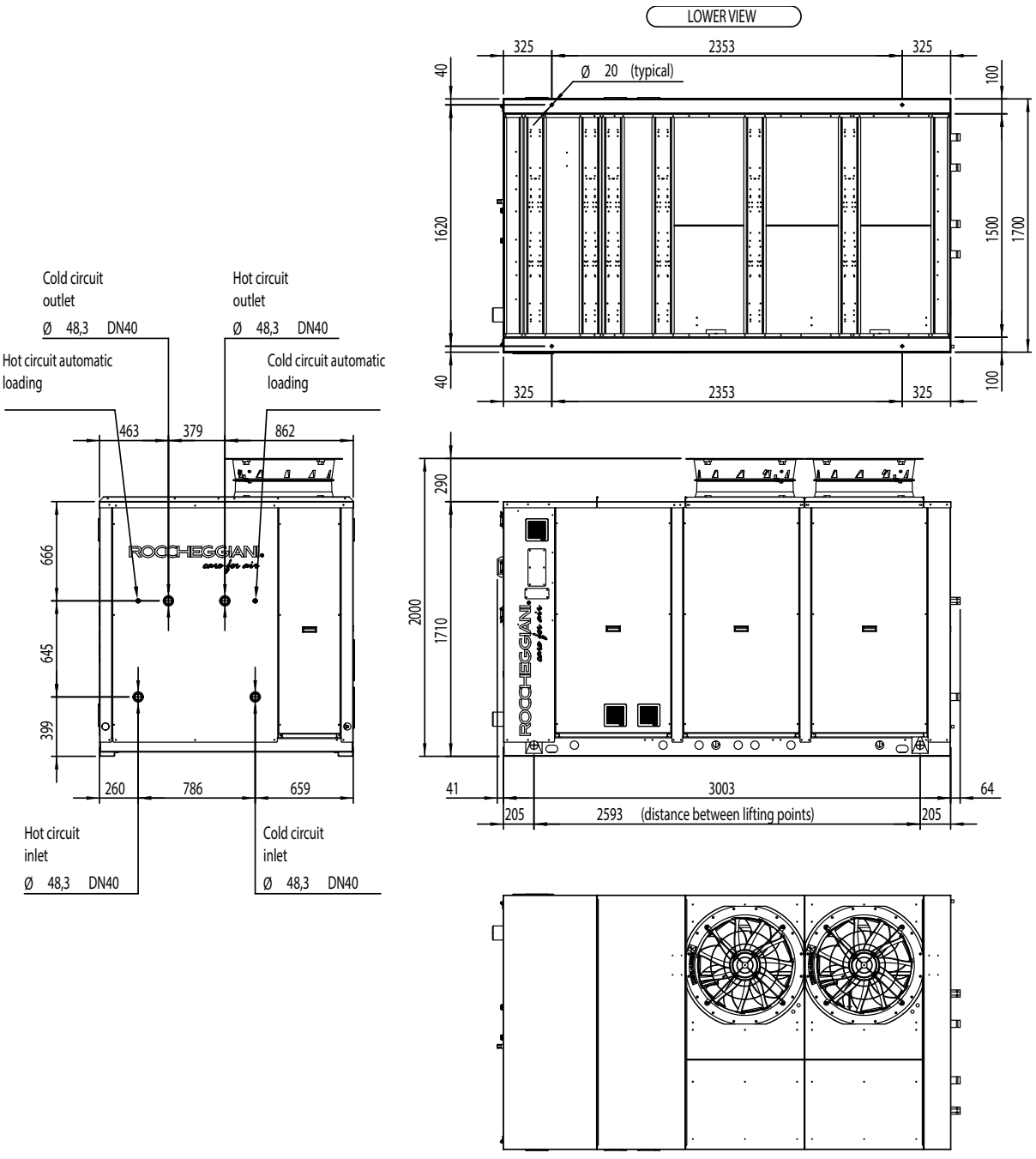


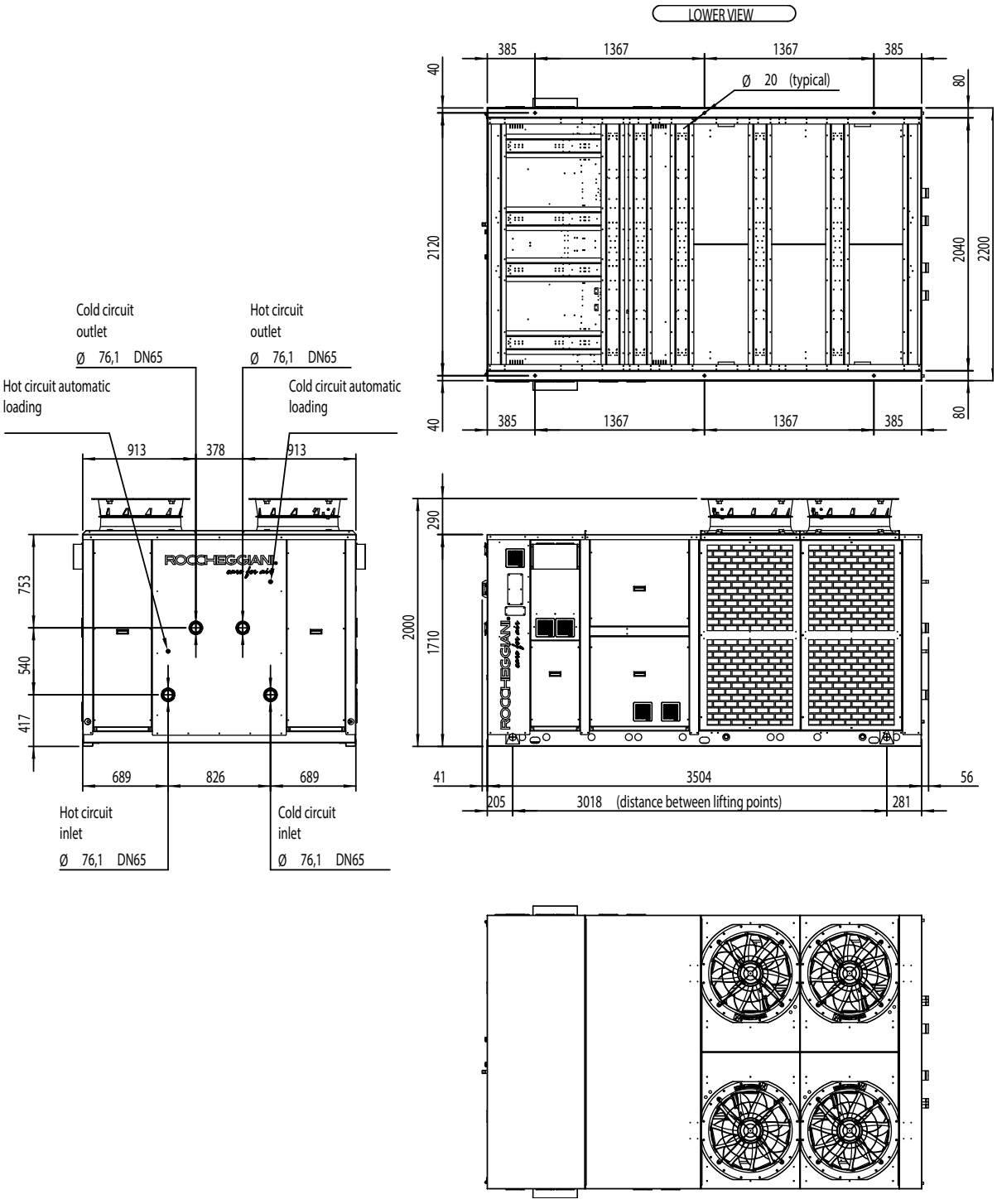




The temperature difference at the water exchangers must be between 3 and 6K.
Operating outside these limits may cause the safety devices to trigger.
The inlet temperature of hot water cannot be lower than 20°C. The inlet temperature of cold water cannot be higher than 25°C.
PC: area of the operating range in which the control could operate a partialisation to avoid triggering of the safety devices.

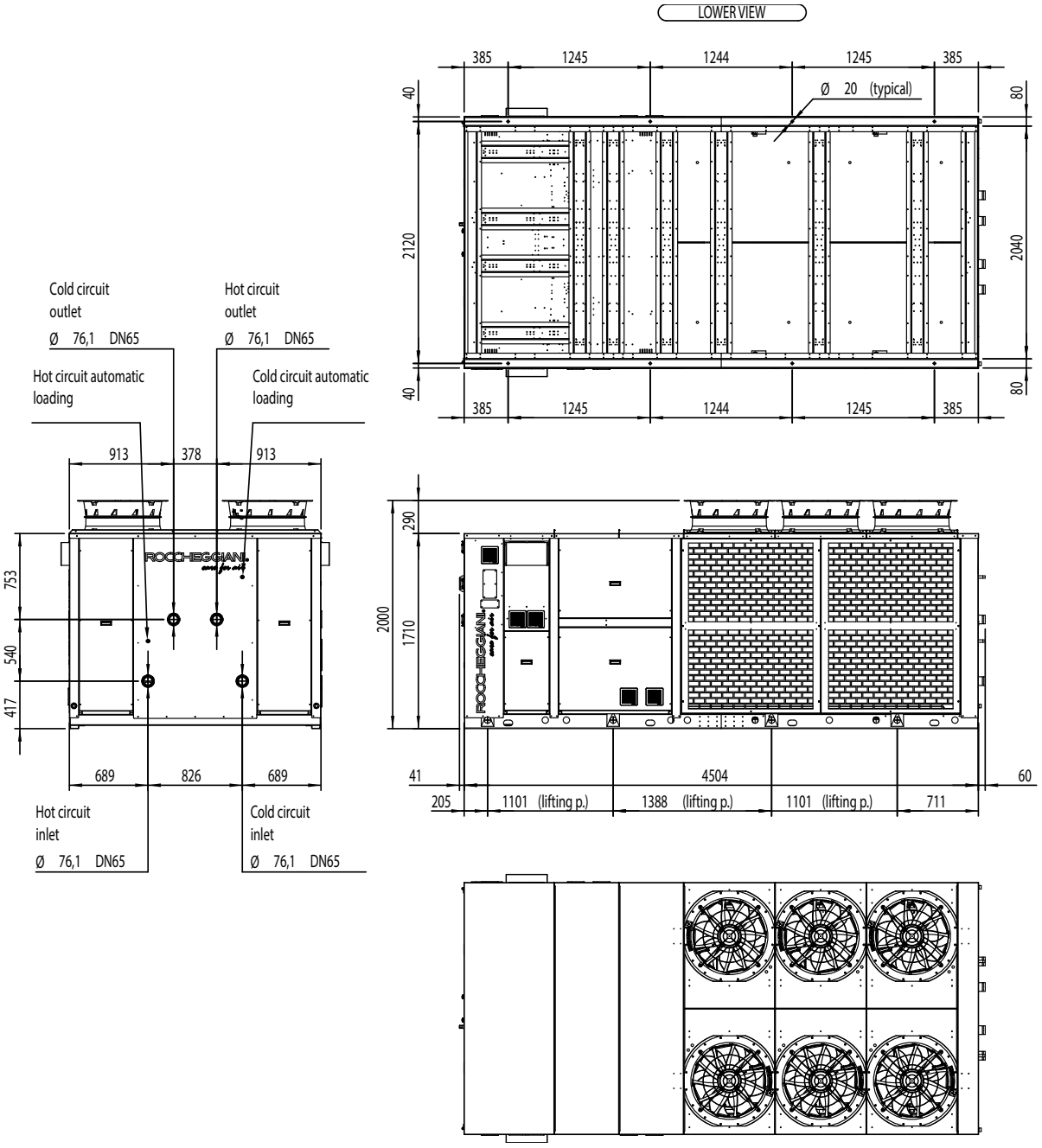
## Dimensions and construction form sizes 61-74-86



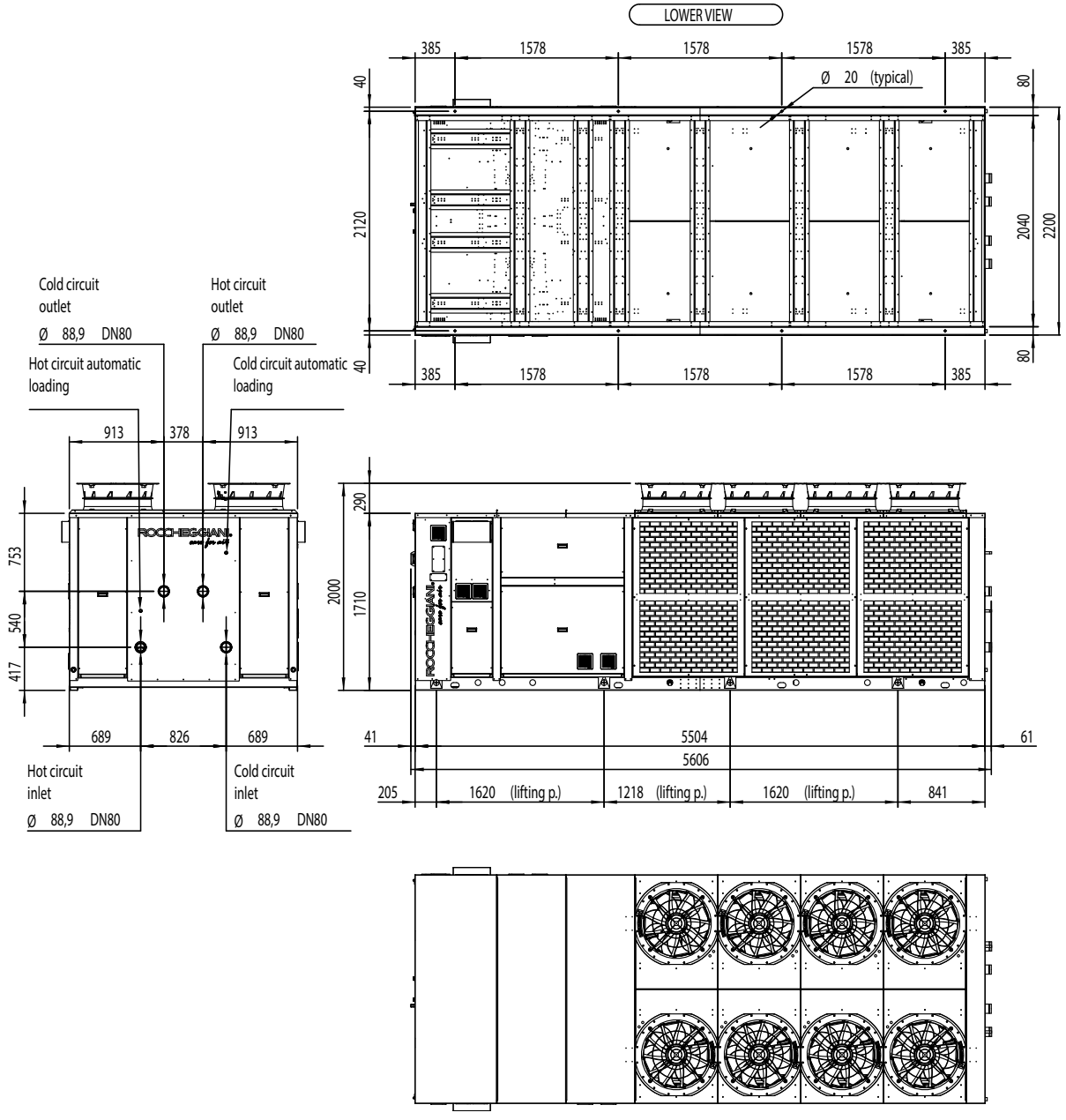
## Dimensions and construction form sizes 114-138



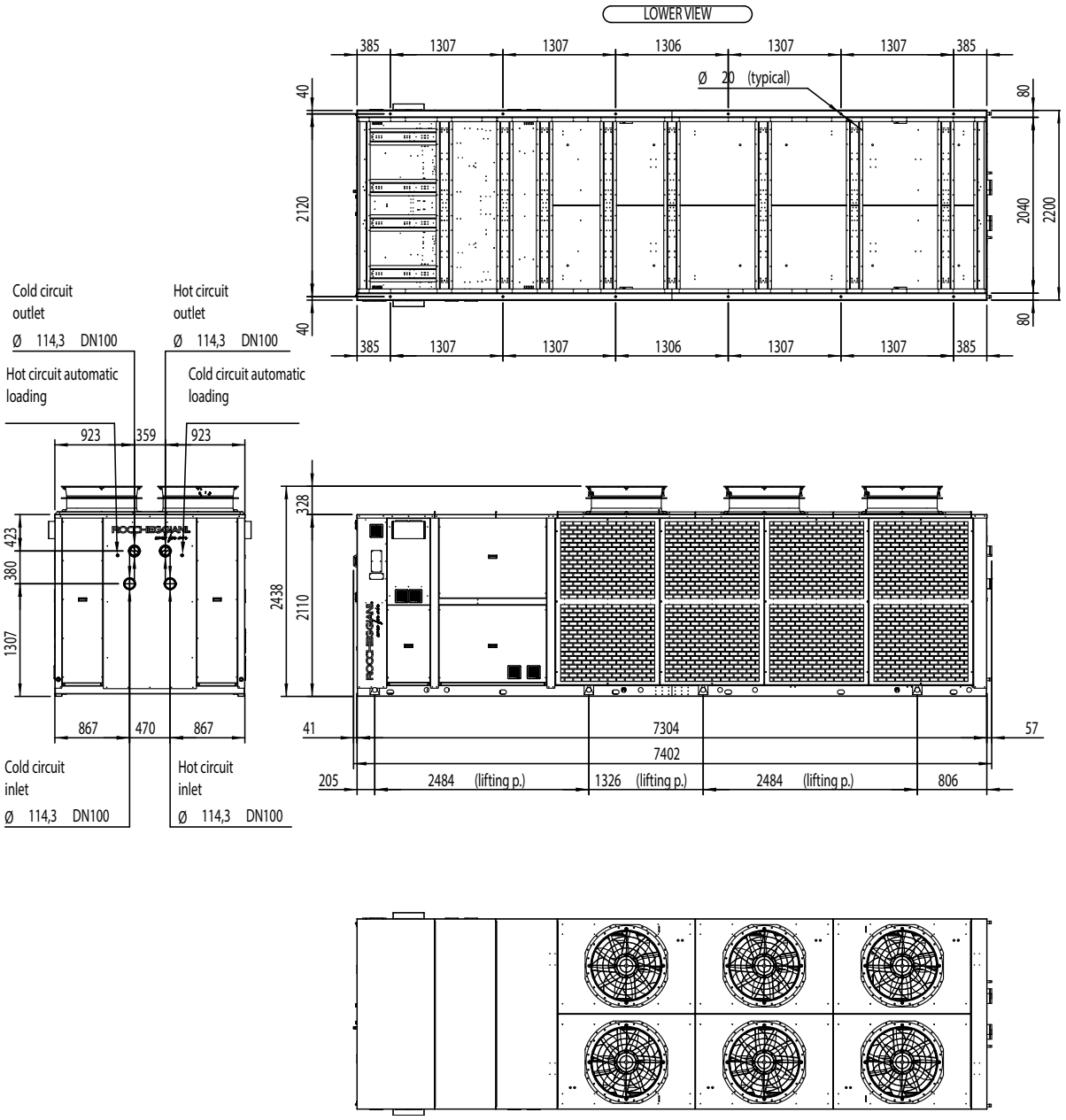
## Dimensions and construction form sizes 170-194



## Dimensions and construction form sizes 246-272



## Dimensions and construction form sizes 335-402



**Roccheggiani S.p.a.**
Via 1° Maggio, 10 - 60021 Camerano (An) Italy
Tel +39 071 730 00 23
Fax +39 071 730 40 05
info@roccheggiani.it

www.roccheggiani.it

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*care for air*