eneren
your future-proof choice

USER MANUAL

ENP

MULTIFUNCTION HEAT PUMPS
40 – 420 kW

EN

TRANSLATION OF THE ORIGINAL INSTRUCTIONS

HF61GJ0655A / 10_20

INTRODUCTION

ENP

☞ **WARNING**

CAREFULLY READ THIS MANUAL BEFORE USING THE UNIT.

☞ DECLARATION OF CONFORMITY

The declaration of conformity is attached separately to the documents on board the unit, usually placed inside the electrical compartment.

Dear Customer,

whilst thanking you for having chosen a product of ours, we are pleased to provide this manual for optimal use of our product for better work results.

Please read the recommendations described in the following pages carefully and keep the manual available to personnel who will be responsible for managing and maintaining the unit.

Our company is at your complete disposal for any and all questions that you should require both in the unit starting phase and at any time of its utilization.

Should scheduled and unscheduled maintenance be necessary, please contact our After-sales Technical Service for assistance and spare parts.

Please find our contact details below for a more rapid service:

ENEREN S.r.l.
Viale Spagna, 31/33
35020 Tribano (Pd) ITALY
Tel + 39 049 9271513
Fax + 39 049 9588522
e-mail : info@eneren.it

049-9271513

support@eneren.it

START-UP INSTRUCTIONS

1 YOUR INSTALLATION

All the tips required for a perfect installation of the equipment can be found in the installation manual.
It is important to place a net filter at all water circuit inlets.

The filter must be made of stainless steel with a mesh that does not exceed 1 mm.

2 REQUIRED ACCESSORIES FOR A PROPER INSTALLATION OF THE UNIT

For the proper operation of the unit and for the validity of the warranty, the installation of the following hydraulic components will be necessary:

— Y-strainers in the inlet pipes to the unit;
— anti-vibration couplings in each pipe connected to the unit;
— appropriately dimensioned safety valves on each circuit of the system;
— appropriately dimensioned expansion vessels on each circuit of the system.

3 FIRST START-UP

With at least 15 working days in advance, send the machine start request via email or fax to the following contact ENEREN:

Fax. 049 9588522

e-mail: support@eneren.it

Tel. 049 9271513

ENEREN Assistance will organize the intervention by putting you in contact with Authorized Technical Assistance Center of the area.
All the preliminary checks and testing of the machine will be carried out together with your staff.
Your staff will be given instructions for the correct running of the machine.

4 WARRANTY ISSUE

For the warranty to be valid, the first start-up by an Authorized Technical Assistance Center is mandatory
After testing, the Authorized Technical Assistance Center will issue a valid test certificate for the machine warranty.

Each unit has an identification plate that is located on its frame and inside the electrical control panel, which shows all the data necessary for the installation, maintenance and traceability of the machine.

THE LABEL SHOWS THE FOLLOWING DATA:

- Manufacturer/Marketing body
- CE mark, possibly accompanied by a subscript that identifies the certifying body for the Pressure Equipment Directive 2014/68/EU (PED). The number of the certifying body must be indicated for units of a PED category equal to or greater than class 2.
- Series and size of the unit
- Date of manufacture
- Main technical data

Note the model, the serial number, the final refrigerant charge and the machine reference diagrams attached to this manual so that they can be easily found in case of data plate damaging and system maintenance.

ATTENTION

Never remove the label. This shows the serial number of the unit from which it is possible to obtain information about the technical features and the components installed, to then identify the unit correctly.

Modello - Model	
Matricola - Serial number	
Codice identificativo - ID code	
Data di produzione - Date of production	
Categoria PED/ 2014/68/EU - Category PED/ 2014/68/EU	
Procedura di valutazione conformità PED - PED conformity module	
Max pressione ammissibile (PS) lato alta pressione - Max allowable pressure (PS) high pressure side [bar-r]	
Max pressione esercizio (PS) lato bassa pressione - Max allowable pressure (PS) low pressure side [bar-r]	
Max/min temperatura di stoccaggio - Max/min storage temperature [°C]	
Max/min temperatura ambiente di funzionamento - Max/min ambient working temperature [°C]	
Potenza frigorifera* - Cooling capacity* [kW]	
EER*	
Potenza termica* - Heating capacity* [kW]	
COP*	
Refrigerante - Refrigerant [Ashrae 15/1992] / GWP	
Carica refrigerante - Refrigerant charge [kg]	C1 C2 C3 C4
Refrigerante aggiunto - Added refrigerant [kg]	C1 C2 C3 C4
Carica totale refrigerante - Total charge refrigerant [kg]	
CO2 equivalenti - CO2 equivalent [t]	
Taratura pressione lato alta - High pressure switch set [bar-r]	
Taratura pressione lato bassa - Low pressure switch set [bar-r]	
Taratura valvola sicurezza refrigerante lato alta/bassa pressione - Safety valve refrigerant high/low pressure side set [bar-r]	
Massima pressione esercizio circuito acqua - Max working pressure water circuit [bar-r]	
Taratura valvola sicurezza acqua - Safety valve water side set [bar-r]	
Alimentazione elettrica - Power supply	
Potenza massima assorbita - Max absorbed power [kW]	
Corrente massima - Full load ampere FLA [A]	
Corrente di spunto - Starting current LRA [A]	
Schema elettrico - Wiring diagram	
Schema frigorifero - Refrigeration diagram	
Peso a vuoto - Empty weight [kg]	
* EN14511-2 Contiene gas fluorurati ad effetto serra disciplinati dal protocollo di Kyoto/ Contains fluorinated greenhouse gases governed by the Kyoto protocol Ermeticamente sigillato/Hermetically sealed	

SAFETY SYMBOLS	
WARNING	With reference to additions or recommendations for the correct use of the unit.
DANGER	With reference to dangerous situations that may occur with the use of the unit to guarantee personal safety.
ATTENTION	With reference to dangerous situations that may occur with the use of the unit to prevent damage to property and to the unit itself.

GENERAL CAUTIONARY NOTES

The operating rules contained in this manual are an integral part of the unit supply and are valid exclusively for the units covered by this manual. They contain all the useful and necessary information for safe operation and ideal, recommended use of the unit. The declaration of conformity is attached individually to the literature kept on the machine, usually inside the control cabinet.
Please follow the instructions given below:

- Read carefully the instruction manual which should be considered an integral part of the unit. Every operator and the personnel in charge of unit maintenance must read the manual throughout carefully and observe its prescriptions.
- The employer is requested to make sure that the operator has the necessary aptitude requirements for operating the unit and has carefully read the manual.
- The instruction manual must be easily available to the operation and maintenance personnel. Keep the manual for the entire working life of the unit. Make sure any updates that are received are integrated into the text.
- Hand over the manual to any other user or subsequent owner.
- Use the manual so that the contents are not damaged - entirely or in part. Do not remove, tear off or rewrite parts of the manual for any reason.
- Keep the manual with care; it must be available at the unit, stored in a special container, to protect it from moisture and heat, until final scrapping of the machine. The location where the manual is kept must be known to the user of the unit, to the managers, to the persons in charge of transportation, installation, use, maintenance, repairs, and end-of-life dismantling and scrapping. If the manual is lost or partially damaged, so that it is no longer possible to read all of its contents, it is advisable to request a new one from the manufacturer.
- Avoid hasty and incomplete preparation that lead to improvisation and cause many accidents.

Pay close attention to the safety symbols shown in the table on the previous page and to their meaning.
Before starting to work, read through and strictly observe the following suggestions:

- the operator must always have the instruction manual readily available at any time;
- plan each action carefully;
- before beginning to work, make sure that the safety devices work properly and you have no doubts about their operation; otherwise, do not under any circumstances start the unit;
- carefully observe the warnings relating to special hazards contained in this manual;
- constant and accurate preventive maintenance always guarantees high operational safety of the unit. Never postpone necessary repairs and have them carried out exclusively by skilled personnel, by only using original spare parts.

THE MANUFACTURER shall not be liable for any accident to persons or property which may occur due to:

- failure to comply with the instructions in this manual regarding the operation, use and maintenance of the unit;
- violent actions or incorrect operations during the maintenance of the unit;
- changes made to the unit without a prior written authorisation obtained from the MANUFACTURER;
- events that are, in any case, unrelated to the normal and correct use of the unit;
- in any case, should the user attribute an incident that may have occurred to a unit fault, he or she must prove that the resulting damage occurred has a main and direct consequence of such “fault”.

This manual reflects the state of the art at the time of unit sale: The MANUFACTURER reserves the right to update its products and manuals without any obligation to update earlier products and manuals, except in special circumstances. These may not be considered inadequate only because they have been subsequently updated based on new experience.

⚠ ATTENTION

- The installer must provide adequate documentation that must comply with EN 378-3 if applicable in the country of installation; otherwise, reference should be made to the local regulations in force.
- When installing or when working on the chiller unit, it is necessary to strictly comply with the regulations contained in this manual, observe the instructions provided on-board the unit and in any case, adopt all the necessary precautions.
- The presence of pressurised fluids in the refrigerant circuit and of electrical components can create hazardous situations during installation and maintenance.
- Any action on the unit must be carried out by qualified and authorised personnel. In the event of a fault, do not attempt repairs on your own and do not let unauthorised technicians carry out repairs, or the guarantee will no longer be valid.
- The initial start-up must be carried out exclusively by qualified personnel authorised by the marketing entity (see annex).
- Before performing any work on the unit, be sure to have disconnected power supply.
- For maintenance service or repairs always and exclusively use original spare parts. THE MANUFACTURER declines all responsibility for damages that may occur due to non-compliance with the above.
- The unit is guaranteed according to the contractual agreements entered into upon its sale: however, failure to comply with the rules and instructions contained in this manual and any modification in the unit not previously authorised, will cause an immediate loss of guarantee validity.
- This manual describes the intended use of the unit and provides instructions for its handling, installation, assembly, adjustment and use. It supplies information on the maintenance schedule, how to order spare parts, the presence of residual risks, and staff training. Therefore, before handling, installing, using or carrying out any maintenance on the unit, read the manual very carefully.
- Please note that the use and maintenance manual is not intended to be a substitute for adequate user experience. For particularly complex maintenance operations, this manual serves as a reminder of the main tasks to carry out for operators having received specific training, for example, in the form of training courses delivered by the manufacturer.
- Please ensure that all users have fully understood the directions for use and the meaning of any symbols provided on the unit.
- Possible accidents can be avoided by following these technical instructions drafted in accordance with the Machinery Directive 2006/42/EC and subsequent additions.
- In any case, always comply with national safety regulations.
- Do not remove or damage guards, decals, stickers and wording, especially any that are required by law. Adhesive plates are applied to the unit to make it safer to use, therefore, it is very important to replace them if they are no longer legible.

☞ WARNING

- The electrical wiring, hydraulic and refrigeration diagrams and the technical data shown in this manual are supplied for guidance only and may be changed without prior notice for the purpose of improving the product range. For detailed information on specific models, refer to the specific documentation attached to the each product.

Any updates or additions to this use and maintenance manual are to be considered an integral part of the manual and may be requested via the contact phone numbers listed in this manual. Contact the MANUFACTURER for additional information and to share any feedback and recommendations aimed at improving the manual.
If the unit is transferred to a new owner, the MANUFACTURER expects you to please notify the address where to send any manual additions for the new user.

TABLE OF CONTENTS

1 INTRODUCTION . . . . . p. 3

2 START-UP INSTRUCTIONS. . . . . p. 4

3 GENERAL DESCRIPTION . . . . . p. 8
3.1 SERIES . . . . . p. 8
3.2 STRUCTURE. . . . . p. 8
3.3 FIELD OF APPLICATION . . . . . p. 8
3.4 GENERAL THERMODYNAMIC CIRCUIT LAYOUTS . . . . . p. 11
3.5 MODELS AND VERSIONS . . . . . p. 15

4 SAFETY PRESCRIPTIONS . . . . . p. 16
4.1 GENERAL SAFETY RULES. . . . . p. 16
4.2 LOCATION OF SAFETY DATA PLATES . . . . . p. 17
4.3 PRECAUTIONS. . . . . p. 18

5 TECHNICAL SPECIFICATIONS. . . . . p. 21
5.1 CHARACTERISTIC CURVES OF THE HYDRAULIC PUMPS ASSOCIATED TO THE ENP UNITS. . . . . p. 24
5.2 NOISE EMISSIONS . . . . . p. 34
5.3 OVERALL DIMENSIONS AND WEIGHTS. . . . . p. 34
5.4 ASSEMBLY DRAWINGS . . . . . p. 36

6 PRELIMINARY PROCEDURES . . . . . p. 41
6.1 TRANSPORT. . . . . p. 41
6.2 INSPECTION ON RECEIPT . . . . . p. 41
6.3 CONVEYANCE . . . . . p. 42
6.4 UNPACKING. . . . . p. 43
6.5 SITING . . . . . p. 43
6.6 INSTALLATION CLEARANCE REQUIREMENTS . . . . p. 43

7 HYDRAULIC CONNECTIONS . . . . . p. 44
7.1 GENERAL GUIDELINES FOR PLUMBING CONNECTIONS . . . . . p. 44
7.2 WATER CONNECTION TO THE EVAPORATOR . . . . . p. 44
7.3 INSTRUCTIONS FOR THE FILLING UP OF THE TANK AND/OR THE PUMP(S) (IF PRESENT) . . . . . p. 45
7.4 REFRIGERANT CHARGE . . . . . p. 45

8 ELECTRICAL CONNECTIONS. . . . . p. 46
8.1 MAIN FEATURES . . . . . p. 46
8.2 ELECTRICAL WIRING OF THE CIRCULATION PUMP . . . . . p. 46
8.3 REMOTE CONTROLS. . . . . p. 46
8.4 SUMMER WINTER REMOTE SWITCHING [HEAT PUMP AND MULTIFUNCTION VERSIONS] . . . . . p. 46
8.5 ELECTRIC CONTROL BOARD . . . . . p. 46
8.6 MICROPROCESSOR CONTROLLER. . . . . p. 47

9 START-UP . . . . . p. 48
9.1 PRELIMINARY CHECKS . . . . . p. 48
9.2 START-UP INSTRUCTIONS FOR ENP WATER CHILLERS. . . . . p. 48
9.3 START-UP. . . . . p. 49
9.4 CHECKS . . . . . p. 49
9.5 GROUP STOP . . . . . p. 50

10 OPERATING LIMITS. . . . . p. 51
10.1 GLYCOL SOLUTIONS . . . . . p. 51
10.2 OPERATING LIMITS. . . . . p. 52
10.3 WATER FLOW TO THE EVAPORATOR . . . . . p. 52
10.4 WATER QUALITY . . . . . p. 53

11 SETTING OPERATING PARAMETERS . . . . p. 54
11.1 MAIN FEATURES . . . . . p. 54
11.2 SETTING OPERATING PARAMETERS . . . . . p. 54
11.3 REFRIGERANT SENSORS (IF "A2L-READY" AND "R454B" REFRIGERANT OPTIONS PRESENT) . . . . . p. 55

12 MAINTENANCE . . . . . p. 56
12.1 WARNINGS. . . . . p. 56
12.2 MAIN FEATURES . . . . . p. 56
12.3 REFRIGERATION CIRCUIT REPAIRS. . . . . p. 58
12.4 LEAK TEST. . . . . p. 58
12.5 REFRIGERANT SENSORS MAINTENANCE (ONLY IF A2L-EADY AND R454B REFRIGERANT OPTIONS SELECTED). . . . . p. 58
12.6 EXCHANGE OF SENSOR CARTRIDGE (ONLY IF R454B REFRIGERANT OPTION SELECTED). . . . . p. 58
12.7 HIGH VACUUM AND REFRIGERATION CIRCUIT DRYING . . . . . p. 59
12.8 RECHARGING WITH REFRIGERANT R410A. . . . . p. 59

13 SUBSTITUTION OF R410A WITH R454B REFRIGERANT . . . . . p. 60

14 TROUBLESHOOTING . . . . . p. 61

15 RETIRING THE UNIT . . . . . p. 62
15.1 WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT MANAGEMENT. . . . . p. 62
15.2 ENVIRONMENT PROTECTION . . . . . p. 62
15.3 PACKAGING DISPOSAL. . . . . p. 63

16 SAFETY DATA SHEET OF REFRIGERANT . . . . . p. 64

3 GENERAL DESCRIPTION

3.1 Series

ENP multifunction units are air conditioning and domestic hot water (DHW) production units conceived for both residential and industrial use and designed to operate 24 hours a day. They cover a wide range of heating capacities, from 40 to 420 kW, guaranteeing a high thermodynamic efficiency and broad configurability, both in terms of accessories and cooling circuits.
ENP machines have been built in a fully faired framework making the assembly extremely silent. They can therefore be installed in open environments without needing to be closed off. The all-new new rounded-off shape enhances their outward appearance. The exclusive use of R410A refrigerant and of high-quality components in the chiller, hydraulic and electrical parts makes the ENP units state of the art chillers in terms of efficiency, reliability and emitted sound output.
All versions are available in sizes referred to in the table below. The sizes of the ENP units are expressed in the X coordinates of the table in terms of rated chilling output [kW], obtained in conditions with chilled water produced at 7°C and combined with the evaporative turret with dissipation circuit water at 29° inlet and 35° outlet.

» Table summarising the range of ENP products in its sizes and Efficiency Packs

Sizes:	040	050	060	070	080	090	110	130	140	160	180	200	210	240	280	310	340	370	420
Efficiency pack 2	F1	F1	F1	F1	F1	F1	F2	F2	F2	F2	F2								
Efficiency pack 4									F3	F3	F3	F4	F4	F4	F4	F4	F4	F4	F4

The ordinates of table identify the available “Efficiency Pack” which determines the configuration of the cooling circuit; for further details, see paragraph 3.4 General thermodynamic circuit layouts p. 11. For example, the size “ENP2 090” develops a 90 kW chiller output and is implemented with Efficiency Pack 2 (two compressors, one cooling circuit). The dimensions of the “Frames” of the units are specified in the cells, by means of reference symbols F1 F2 F3 (with increasing dimensions); all the information concerning the weight of the machines and the dimensions corresponding to each frame is available in paragraph 5.3 Overall dimensions and weights p. 34.

3.2 Structure

All of the ENP series units are constructed with a support base and panelling made of galvanised sheet metal painted with black polyester epoxy powders oven-polymerised at 180°C. The unit features an exclusive design which lends it an attractive appearance as well as ensuring that all components will be completely inaccessible when the unit is closed. This characteristic, together with the extensive use of soundproofing material inside the compartment – an optional feature of low-noise models – reduces noise to exceptionally low levels. The plumbing/cooling connections are situated at the top to reduce the technical spaces required for installation. All panels are removable, thus enabling complete access to all components of the chiller, though only access from the front is required for routine servicing.

3.3 Field of Application

ENP units are intended for cooling-heating water and glycol solutions up to a maximum of 30% the weight, in civil, industrial and technological air conditioning environments.

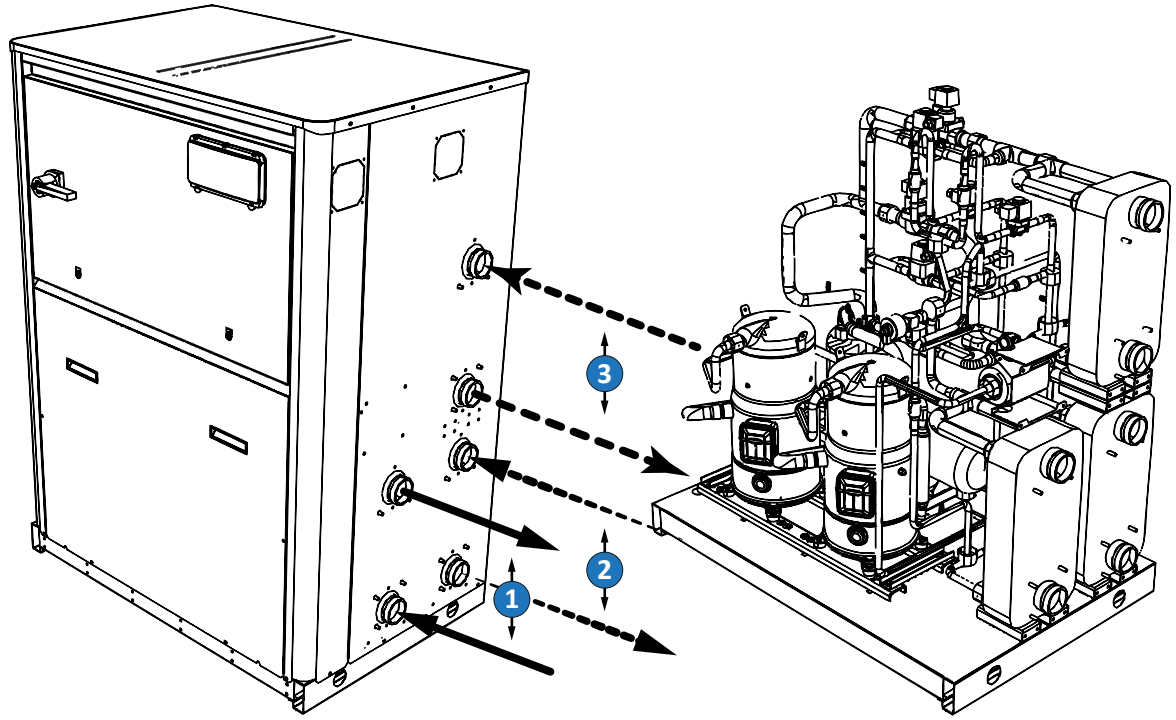
The use of ENP units is recommended within the functioning limits carried in this document, or else the warranty attached to the sales contract would cease.

ENP multifunction units have 6 water connections referring to three different hydraulic circuits for 2-pipe systems:
— Circuit 1, production of cold or hot water for utility;
— Circuit 2, production of hot or cold water for dissipation in opposition to the utility;
— Circuit 3, production of domestic hot water (DHW).

The multifunction units consequently have 3 distinct heat exchangers:
— Plate heat exchanger 1 with both evaporation and condensation function, intended for the utility circuit;
— Plate heat exchanger 2 with both evaporation and condensation function, intended for the dissipation circuit;
— Plate heat exchanger 3 for DHW circuit which acts as a condenser.

For the correct direction of the connections, always refer to the dimensional drawing attached to the documentation.

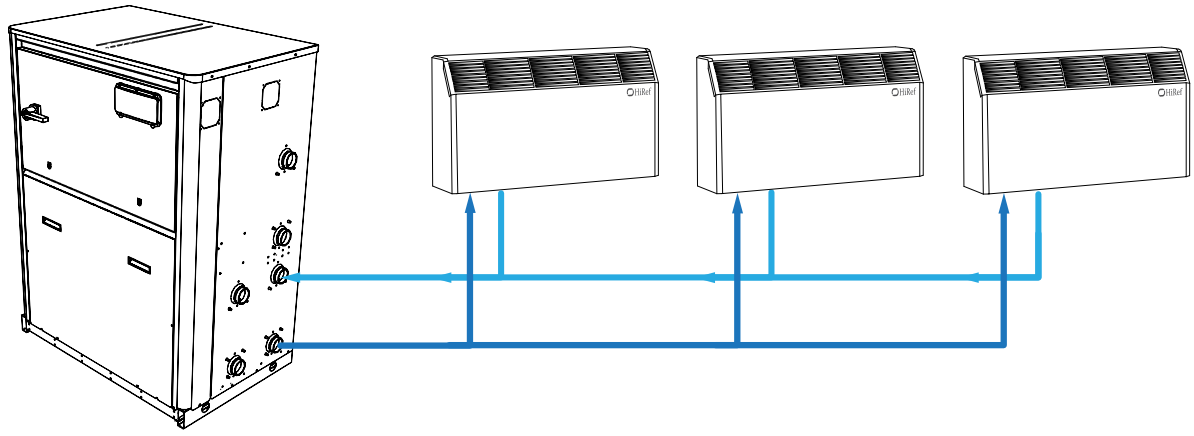
» ENP multifunction unit: display of water connections and thermodynamic circuit



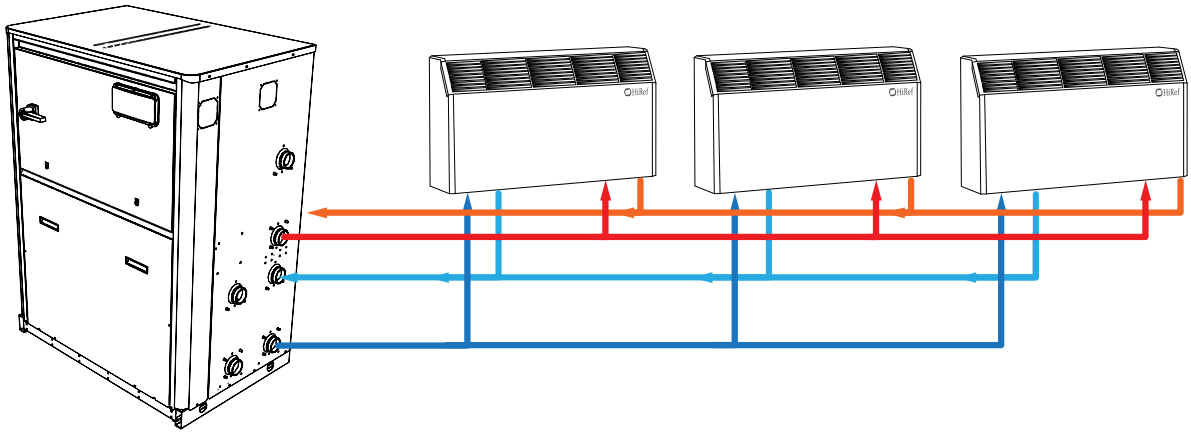
1 Sanitary hot water (DHW);
2 Utility;
3 Dissipation.

ENP units make it possible to install indifferently a simple 2 or 4 pipe air conditioning system. The two or four pipe designation refers to a water distribution system supplying each air conditioning appliance of a building. A 2-pipe system (ENP M) includes one supply line and one return line to the unit. The terminals supplied by a 2-pipe system have only one heat exchanger which acts alternately as a heating and cooling coil, depending on the operating mode. The 4-pipe system (ENP P) includes a distribution system which supplies both hot water (with relative return lines) and cold water (with relative return lines).

» 2-pipe air conditioning system layout



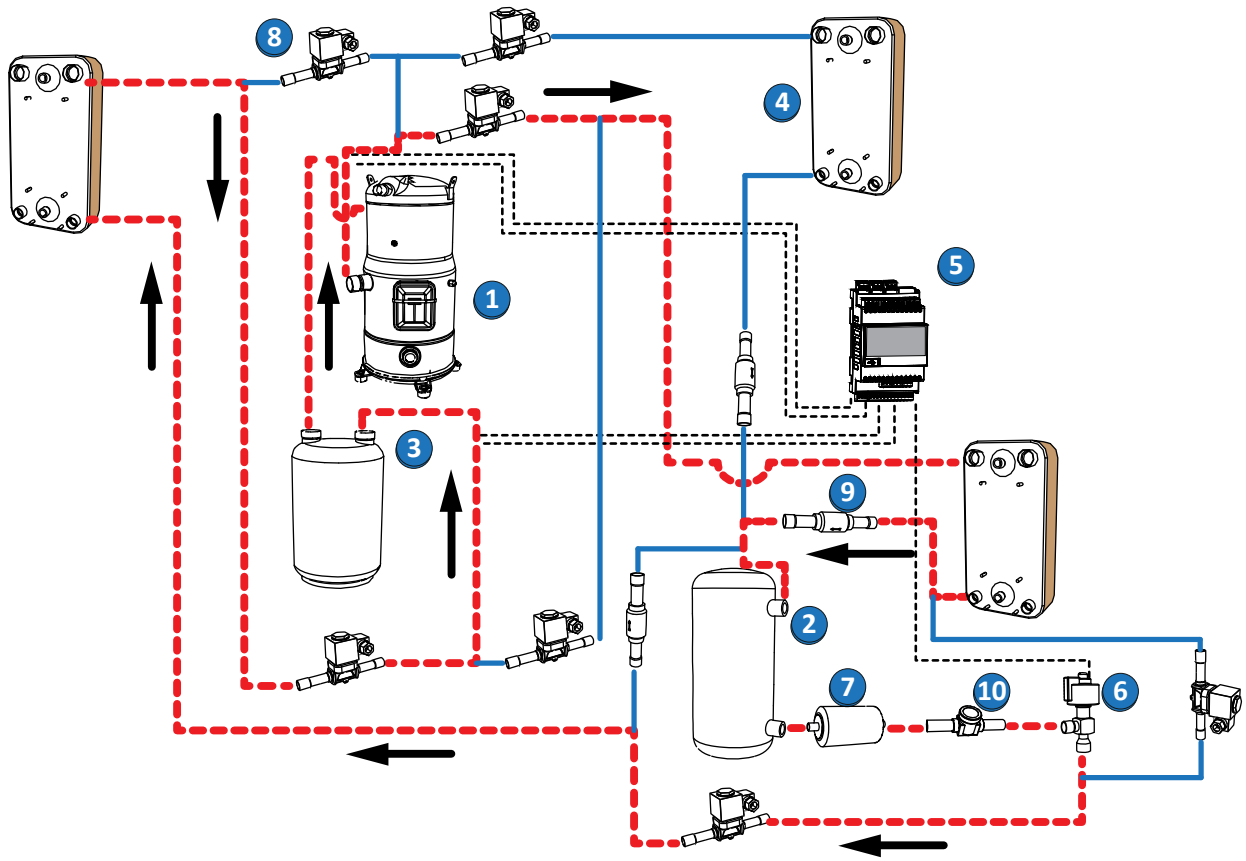
» 4-pipe air conditioning system layout



The 2-pipe systems are less flexible than 4-pipe systems because the entire building is either heated or cooled, though the installation greatly saves energy.
If the design requires a 4-pipe system, the ENP range provides, on demand, the P units which are compatible with this configuration.

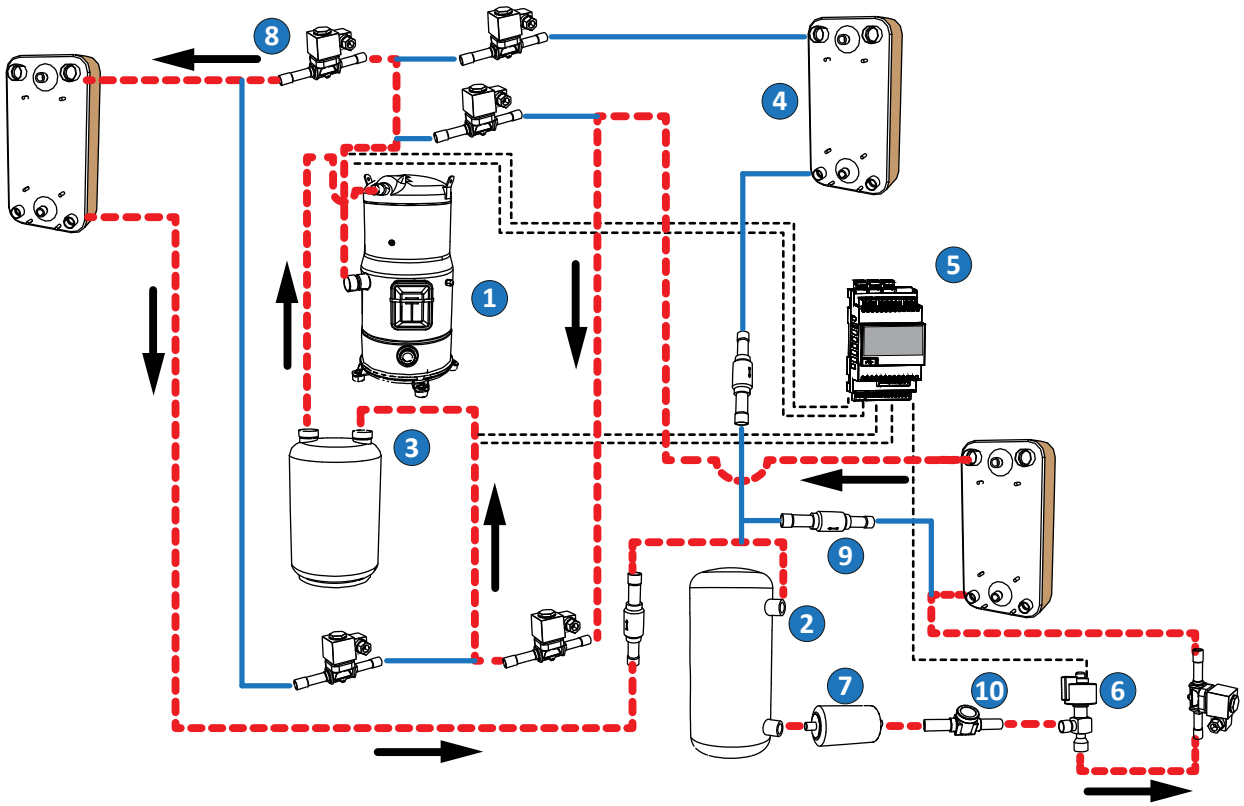
3.4 General thermodynamic circuit layouts

» Standard layout of thermodynamic circuit in cooling mode



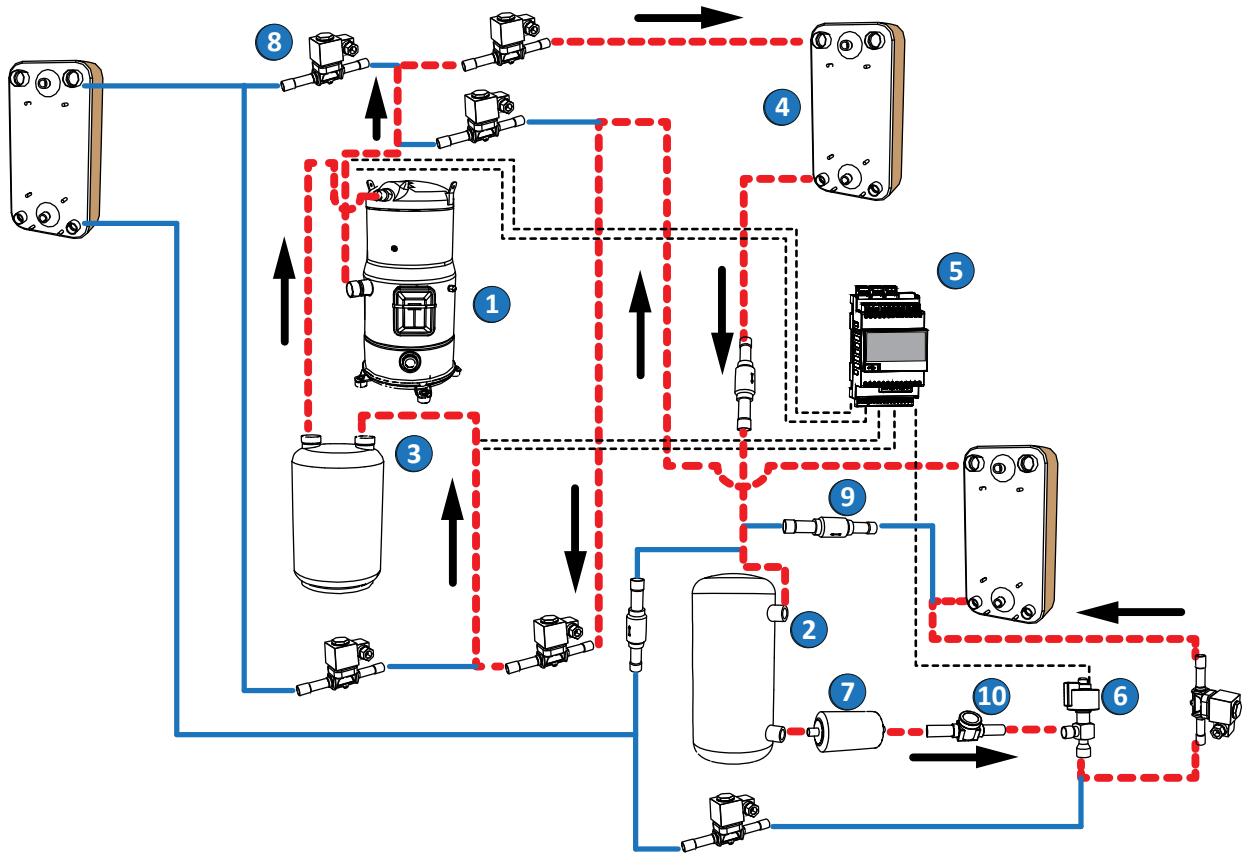
1	Compressor	6	Expansion valve
2	Liquid receiver	7	Filter
3	Liquid separator	8	Solenoid valve
4	Plate exchanger	9	Check valve
5	Control processor	10	Liquid indicator

» Standard layout of thermodynamic circuit in heating mode



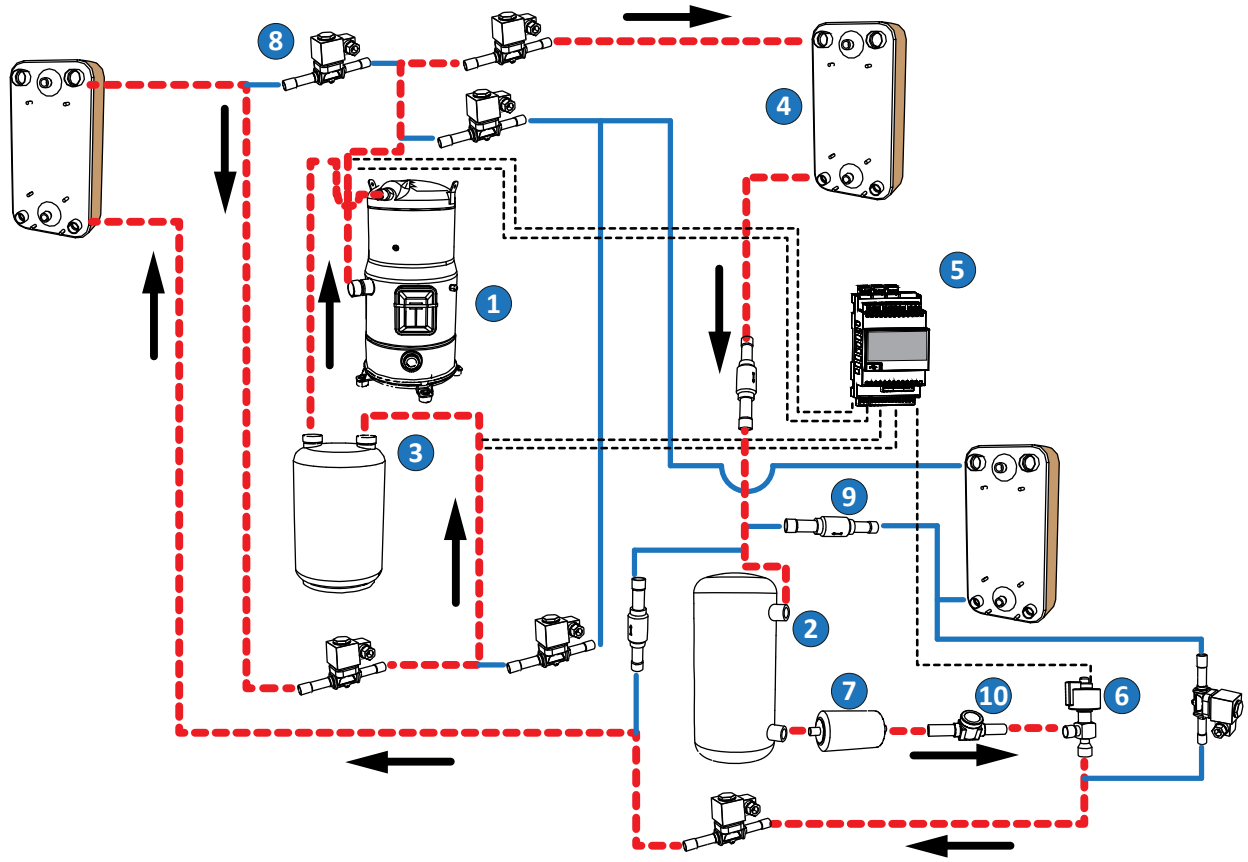
1	Compressor	6	Expansion valve
2	Liquid receiver	7	Filter
3	Liquid separator	8	Solenoid valve
4	Plate exchanger	9	Check valve
5	Control processor	10	Liquid indicator

» Standard layout of thermodynamic circuit for DHW production



1	Compressor	6	Expansion valve
2	Liquid receiver	7	Filter
3	Liquid separator	8	Solenoid valve
4	Plate exchanger	9	Check valve
5	Control processor	10	Liquid indicator

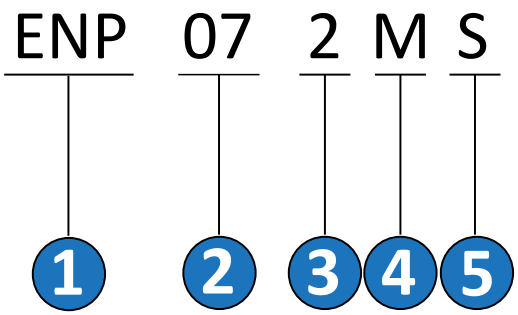
» Standard layout of thermodynamic circuit in cooling mode with simultaneous DHW production



1	Compressor	**6**	Expansion valve
2	Liquid receiver	**7**	Filter
3	Liquid separator	**8**	Solenoid valve
4	Plate exchanger	**9**	Check valve
5	Control processor	**10**	Liquid indicator

3.5 Models and versions

The naming methods and the unit configuration options are shown below:



1 Identification symbol of HiRef Model (e.g.: "ENP" units)
2 Unit sizes expressed in rated chilling output x10 [kW] (e.g.: 70 kW)
3 Efficiency Pack: layout of cooling circuit and compressors (e.g.: Efficiency Pack 2)
4 Unit version (e.g.: "M", Multifunction)
5 Unit execution (e.g.: "S", no optional soundproofing present)

Variants of ENP product:

Soundproofing:
- Standard unit not equipped with sound insulation;
- Low-noise unit through sound-absorbing housing for each compressor and insulation of frame panels with sound-absorbing textured material;
- Base rubber or spring anti vibration dampers.

Thermal distribution system (software set-up):
- 2 pipes: Single distribution circuit;
- 4 pipes (on demand): namely two separate circuits, hot and cold;
- Downgrade to mechanical expansion valve, on demand (the electronic controlled expansion valve is standard).

Options of ENP product:

Thermodynamic circuit:
- Condensation control via 0-10 V signal of external modulating device (2-way valve, 3-way valve, variable speed circulation pump);
- Outdoor temperature probe for set-point compensation;
- Analogue pressure gauges.

Electrical control board:
- Power supply in 400/3+N/50 Hz with motor circuit breakers;
- Rephasing capacitors;
- Soft-starter kit for reduction of starting currents for each compressor;
- Clock board;
- ON-OFF status of compressors;
- Remote contact to limit compressor switch-on;
- Configurable digital alarm board.

Filter cut-off kit (solenoid and cock on liquid line).

External module with recirculation pumps for dissipation circuits, utility and DHW (multifunction versions).

Four-way valves for water-side flow inversion (maintaining counterflow); four-way valves can also be included in supply, without the optional hydronic module.

Pair of Vic-Taulic joints for IN/OUT water connection.

Paddle flow switch (included).

4 SAFETY PRESCRIPTIONS

4.1 General safety rules

4.1.1 Thoroughly know the unit

The unit must only be used by qualified personnel, who are expected to know the arrangement and function of all controls, instruments, indicators, indicator lights and various data plates.

4.1.2 Wear protective clothing

Each operator must use personal protective equipment such as gloves, headgear, safety goggles, safety shoes, and hearing protection.

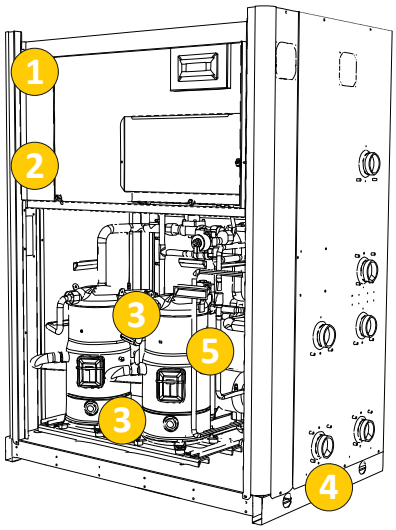
4.1.3 Use safety equipment

A first aid kit and a fire extinguisher must be placed near the unit.
The extinguisher must always be fully loaded. Use it according to the Standards in force.

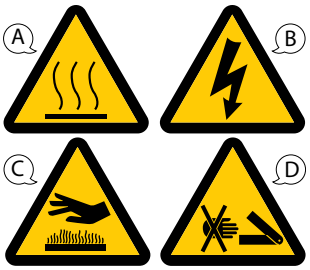
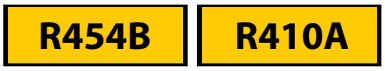
4.1.4 Warnings for inspections and maintenance

Display a sign with the warning: “INSPECTION IN PROGRESS” on all sides of the unit.
Check the unit carefully following the list of operations contained in this manual.

4.2 Location of safety data plates



4.2.1 Description of the safety symbols

1 **A.** Warning: danger due to poor familiarity with all the functions of the unit and the resulting risks. **B.** Read the use and maintenance manual carefully before operating the unit.	
2 Electric power supply data plate	
3 **A.** Danger: hot parts. **B.** Danger: live parts. **C.** Danger of burns. **D.** Danger of cutting injuries in the finned exchangers area.	
4 Anchor points for lifting	
5 Refrigerating liquid (example)	

4.3 Precautions

4.3.1 General precautions

The Machinery Directive 2006/42/EC provides the following definitions (Annex 1.1.1.1):
DANGER ZONE: any area next to and/or inside a machine, where the presence of an exposed person constitutes a risk for the safety and health of said person.
EXPOSED PERSON: any person found entirely or partially within a danger zone.
OPERATOR: the person (or persons) appointed to install, set up, adjust, maintain, clean, repair and transport the machine.

☞ **WARNING**

— Before carrying out any operation or maintenance on the unit it is mandatory to read and follow the instructions given in the use and maintenance manual. During the actual work, it would be too late: any not recommended or wrong operation could then cause serious damage to people or property;
— The employer must inform in detail all operators about the risks of accidents and particularly about risks related to noise, required personal protective devices and general accident prevention rules provided by laws or international standards and national standards in the Country of destination of the unit;
— All operators must comply with the international accident prevention standards and standards in force in the country of destination of the unit;
— Please be reminded that the European Union has issued some directives concerning the safety and health of workers, among which the directives 89/391/EEC, 89/686/EEC, 89/654/EEC, 2009/104/EC, 89/656/EEC, 2003/10/EC, 92/58/EEC and 92/57/EEC that each employer has an obligation to observe and to enforce. In the event that the unit is installed outside the European union, always refer to the regulations in force in the country of installation;
— Before starting any work on the unit, each operator must be perfectly familiar with its operation and its controls, and have read and understood all the information contained in this manual.

⚠ **ATTENTION**

It is forbidden to tamper with or replace parts of the unit unless this has been expressly authorised by the MANUFACTURER.
The use of accessories, tools, consumables or spare parts other than those recommended by the MANUFACTURER and/or specified in this manual may be a hazard to operators and/or damage the unit.
Any alteration of the unit not expressly authorised by the MANUFACTURER shall not imply any civil or criminal liability for the manufacturing company.

☞ **WARNING**

— It is strictly forbidden to remove or tamper with any safety devices;
— Any installation, ordinary and extraordinary maintenance operations must be carried out with the unit stopped and without power supply;
— Once the unit has been cleaned, the operator must check that there are no worn or damaged parts or parts that are not safely fixed, or if this is the case, ask the maintenance staff to fix the problem;
— Special attention must be paid to the state of repair of the pressurised pipes or other parts exposed to wear. It must also be ensured that there are no leaks of fluid, or other dangerous substances;
— In these cases, it is forbidden for the operator to restart the unit before the situation has been remedied;
— If any of these occurrences are detected, the operator, before leaving the unit unattended, must display a warning sign indicating that maintenance is in progress and it is forbidden to start the unit;
— The use of flammable fluids in cleaning operations is prohibited;
— Periodically check the condition of the data plates and arrange, if necessary, for them to be restored;
— The operator work place must be kept clean, tidy and free from any objects that may limit unhindered movement;
— Operators should avoid operating the device from unsafe, uncomfortable positions that may affect their balance;
— Operators must be aware of possible risks of entrapment and entanglement of clothes and/or hair in moving parts; it is recommended to wear caps over long hair;
— Wearing chains, bracelets and rings can also be dangerous;
— The workplace must be adequately lit for the intended operations. Insufficient or excessively bright lighting can imply safety risks;
— Ensure adequate ventilation to the installation room to protect against any refrigerant leaks;
— The instructions, accident-prevention rules and warnings contained in this manual must be observed at all times.

4.3.1.1 Safety information

The units have been designed and built according to the current state of the art and the technical rules currently applicable to fluid chillers and heat pumps intended for cooling water or water and anti-freezing agent mixtures, for housing air conditioning and industrial cooling systems. Compliance with the laws, provisions, prescriptions, orders and directives in force for these machines has been ensured.
The materials and the equipment parts used, as well as the production, quality assurance and control processes meet the highest safety and reliability requirements.
By using them for the purposes specified in this user manual, by operating them with the required diligence and performing accurate maintenance and overhauling in a workmanlike manner, consistent performance and functionality and durability can be ensured.

4.3.1.2 Accident prevention

The MANUFACTURER cannot be held liable for accidents caused when using the unit, due to the user not complying with laws, provisions, regulations and standards in force regarding fluid chillers and heat pumps.

4.3.1.3 Operational safety

The MANUFACTURER will not be responsible in case of malfunctions and damage if the unit:
— is used for purposes other than those intended;
— Is not handled and maintained according to the operating rules specified in this manual;

— It does not regularly and consistently receive maintenance as prescribed or non-original spare parts are used;
— Is modified or some components are replaced without the MANUFACTURER's written authorisation, especially when the effectiveness of the safety systems has been altered or minimised on purpose;
— It is used outside the permissible temperature range.

4.3.1.4 Residual risk areas

⚠ DANGER

In some areas of the unit there are some residual risks that could not be eliminated during the design phase nor isolated with guards due to the unit's operating characteristics. Each operator must be aware of the residual risks present in this unit in order to prevent any accidents.

4.3.2 Maintenance precautions

4.3.2.1 Tools

Personal injury is prevented by not using worn or damaged, low quality or makeshift tools.

⚠ ATTENTION

If tools not recommended or modified without authorisation are used, the manufacturer will no longer be liable for damages caused.

4.3.2.2 Personnel

Ordinary maintenance prescribed in this manual must only be performed by authorised and trained personnel.
For the maintenance or overhauling of components not specified in this manual, contact the MANUFACTURER.

4.3.2.3 Keep the unit clean

Oil and grease stains, misplaced tools or broken pieces are harmful to people as they can cause slipping or falls. Always keep the area where the unit is installed clean and tidy.
Do not use diesel fuel, oil or solvents to clean the unit as the first two leave an oily film that makes it easier for dust to stick, while solvents (even milder ones) damage the paint finish and cause rusting.
If a water jet hits the inside of electrical equipment, in addition to causing contact oxidation, it may cause the unit malfunction.
For this reason, do not use water or steam jets on sensors, connectors or any electrical parts.

4.3.2.4 Care and maintenance

The cause of damages and accidents is often attributable to wrong maintenance, such as:
— No water in the circuit;
— Incorrect percentage of anti-freezing agent in the hydraulic circuit;
— Inadequate refrigerant;
— Poor cleaning in the unit setting;
— Circuit inefficiency (damage to the exchangers, pipe connections, tightening of pipes, screws, etc.).

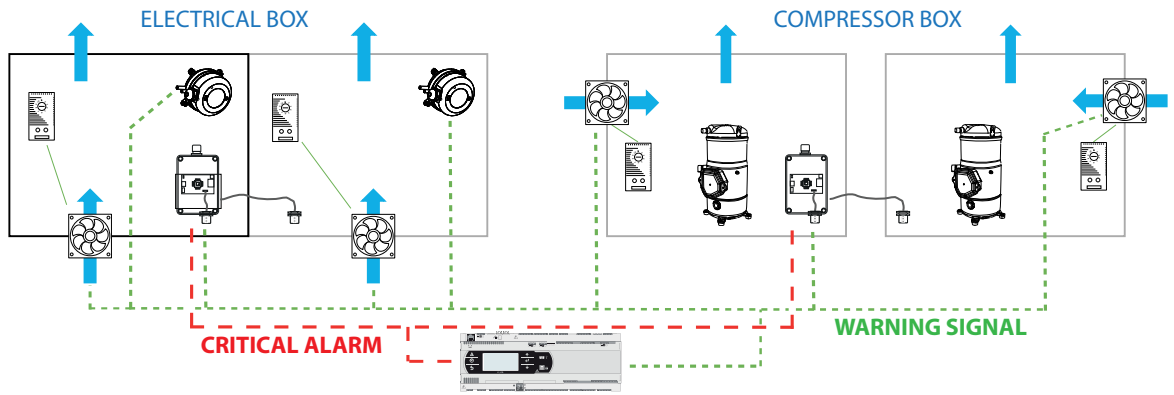
Carry out maintenance work as required: this is also critical for your own safety.
Never postpone scheduled repairs.
Only assign skilled or authorised personnel to repair tasks.
Always observe the following safety rules, even when you are thoroughly familiar with the operations involved:
— Always keep the unit and the surrounding area clean;
— Before beginning to work, check the perfect efficiency of protective devices;
— Make sure that no unqualified or not specially appointed persons enter the unit operating area.

4.3.3 Precautions in case of refrigerant leakage

In case the unit is charged with an A2L classified refrigerant, (low flammable refrigerant), the unit is provided with one refrigerant leakage sensor inside each compressor box (if present) and inside all separated sections of the electrical box.
The following safety chain is applied: EVENT - ACTION - SIGNAL
Each sensor is set on two different concentration thresholds. The threshold is depending on refrigerant type, and listed in the table below:

Refrigerant	Classification	Low level threshold	High level threshold
R454B	A2L	900 ppm	1800 ppm

The following image and table describe the safety chain EVENT - ACTION - SIGNAL



Critical alarm Sensor high level alarm, sensor breakdown
Warning signal Sensor low level alarm, air pressure switch alarm/breakdown, compressor box/auxiliary box fan breakdown

EVENT	ACTION	SIGNAL
Compressor box fan alarm fault	Electrical box fans activation (when Tair <= T limit)	Dedicated warning signal
Underpressure inside electrical panel alarm/fault	Compressor box fans activation	Dedicated warning signal
Low level alarm	Compressor box fans activation Electrical box fans activation (when Tair <= T limit)	Dedicated warning signal
Refrigerant sensor fault	Switch off all the unit (electrical supply still present)	General serious alarm + Dedicated serious alarm
High level alarm	Switch off all the unit (electrical supply still present)	General serious alarm + Dedicated serious alarm

⚠ DANGER

Refrigerant safety devices are not active when the unit is not powered: risk of refrigerant presence in the electrical panel. Check any refrigerant leaks with a suitable device before starting the unit.

☞ WARNING

Follow the instructions below in the event of a refrigerant leak signal from the sensors installed on the machine or possibly present near the machine:
— In case of low level alarm, contact technical support;
— Do not stand in the vicinity of the machine.

It is necessary to have a remote refrigerant alarm signal, so that it is not necessary to approach the machine in the event of an alarm. This remote signal can be performed:
— Via remote display, available as an option and available at any time by contacting the After-sales center;
— By reading the unit alarms via remote communication (e.g. via Modbus or Ethernet) and by remotely setting up a specific danger signal far from the unit to activate in the event of an alarm.

⚠ ATTENTION

In case of serious alarm:
— Remove voltage from the unit, keeping the dedicated alarm signal via wired contact active (see wiring diagram);
— Call a service centre for assistance.

Technical assistance must:
— Well ventilate all the closed compartments of the machine well for at least 5 minutes, before energizing;
— Check the cooling circuit for leaks;
— Once the circuit is set up and the refrigerant charge is restored, close the compartments and power up the chiller, if there are no alarms, the machine can be restarted.

⚠ DANGER

The safety of the installation environment outside unit boundaries is entrusted to the technical manager of teh system.

The installation site must comply with the design requirements of EN378-1. If classified as a “machinery room” or in any case “closed environment” according to the definition of the legislation, the following points must be respected:
— Ensure the quality and minimum quantity of ventilation air to the machine, for example by installing a leak detector to monitor the presence of flammable gas in air. In the event that the concentration of the refrigerant exceeds 25% of the LFL (low flammability limit), an alarm must be activated together with mechanical ventilation and system shutdown;
— Installation of an emergency ventilation system which is activated in the event of leakage detection inside the room; if the fan is on suction side, it must comply with the requirements for installation in areas at risk of fire;
— Avoid any contact between the refrigerant and surfaces that exceed 80% of its auto-ignition temperature.

5 TECHNICAL SPECIFICATIONS

» ENP models from ENP042 to ENP164 in standard operating conditions for vertical probe geothermic application

Main technical data for the series ENP		042	052	062	072	082	092	111/2	131/2	141/2	144	161/2	164
Cooling @ B22/W7													
Cooling capacity	[kW]	52,3	60,4	70,2	79,0	91,1	101,6	122,9	140,1	160,8	160,3	178,8	180,1
Power input	[kW]	9,1	11,0	12,0	13,8	15,1	17,1	19,8	22,8	26,6	27,5	30,5	30,4
Absorbed current	[A]	19,6	24,9	25,8	29,0	29,9	41,8	44,9	48,3	57,0	57,7	65,8	60,0
EER	[-]	5,75	5,49	5,85	5,72	6,03	5,94	6,21	6,15	6,05	5,83	5,86	5,93
Water flow on user side	[kg/h]	9035	10455	12127	13619	15716	17552	21244	24203	27704	27615	30892	31066
Water temperature on user side	[°C]	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°
Water pressure drop on user side	[kPa]	38	51	52	50	39	49	43	52	50	49	54	54
Water flow on dissipation side	[kg/h]	10517	12247	14073	15865	18166	20330	24459	27908	32021	32080	35848	35994
Water temperature on dissipation side	[°C]	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°
Water pressure drop on dissipation side	[kPa]	57	78	60	77	60	74	61	78	73	73	80	81
Cooling + DHW @ 12/7°C ; 45/50°C													
Cooling capacity	[kW]	40,3	47,5	54,1	61,6	70,3	78,2	94,9	107,7	124,1	125,1	138,7	139,2
Heating capacity	[kW]	53,7	63,4	71,7	81,9	92,9	104,0	125,1	142,9	164,1	165,5	183,6	184,6
Power input	[kW]	14,1	16,7	18,5	21,4	23,8	27,2	31,8	37,1	42,1	42,6	47,3	47,8
Absorbed current	[A]	25,3	31,2	33,3	38,1	40,7	51,7	58,2	65,5	75,2	75,7	85,3	81,6
COP	[-]	6,67	6,64	6,80	6,71	6,86	6,70	6,92	6,76	6,85	6,82	6,81	6,77
Water flow on user side	[kg/h]	6860	8190	9327	10633	12142	13529	16367	18630	21434	21570	23944	23996
Water temperature on user side	[°C]	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°
Water pressure drop on user side	[kPa]	23	31	31	30	23	29	26	31	29	30	33	32
Water flow on DHW side	[kg/h]	9052	10904	12338	14117	16010	17941	21542	24654	28276	28492	31647	31778
Water temperature on DHW side	[°C]	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°
Water pressure drop on DHW side	[kPa]	44	62	46	61	46	57	47	61	56	58	62	63
Heating @ B0/W35 20% ethylene glycol													
Heating capacity	[kW]	44,0	51,4	58,9	67,6	76,7	85,5	102,6	117,6	135,4	136,4	152,0	152,2
Power input	[kW]	10,2	12,1	13,3	15,5	17,0	19,8	22,9	26,4	30,5	30,8	34,8	34,3
Absorbed current	[A]	20,8	26,2	27,3	31,0	32,2	44,1	48,1	52,5	61,6	61,7	70,8	64,6
COP	[-]	4,33	4,25	4,43	4,36	4,51	4,32	4,48	4,45	4,44	4,43	4,37	4,44
Water flow on user side	[kg/h]	7519	8771	10049	11538	13111	14601	17537	20096	23142	23319	25985	25986
Water temperature on user side	[°C]	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°
Water pressure drop on user side	[kPa]	30	41	31	41	32	39	32	41	38	39	43	43
Water flow on dissipation side	[kg/h]	10706	12406	14382	16444	18862	20758	25188	28829	33163	33386	37078	37239
Water temperature on dissipation side	[°C]	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°
Water pressure drop on dissipation side	[kPa]	46	61	63	62	48	59	52	63	60	61	66	67
DHW @ B0/W50 20% ethylene glycol													
Heating capacity	[kW]	41,5	49,3	55,3	63,8	72,3	80,8	97,0	111,4	127,4	128,7	142,6	143,7
Power input	[kW]	13,7	16,3	18,0	20,9	23,6	27,2	31,7	36,8	41,7	41,5	46,8	47,4
Absorbed current	[A]	24,9	30,8	32,8	37,4	40,4	51,8	58,1	65,1	74,8	74,5	84,7	81,1
COP	[-]	3,03	3,02	3,07	3,05	3,06	2,97	3,06	3,03	3,06	3,10	3,05	3,03
Water flow on user side	[kg/h]	7088	8426	9454	10920	12364	13805	16579	19011	21794	22002	24405	24586
Water temperature on user side	[°C]	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°

Water pressure drop on user side	**[kPa]**	27	37	28	37	28	35	28	37	34	35	38	38
Water flow on dissipation side	**[kg/h]**	8874	10556	11902	13723	15561	17112	20822	23775	27390	27813	30634	30791
Water temperature on dissipation side	**[°C]**	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°
Water pressure drop on dissipation side	**[kPa]**	31	44	43	43	33	40	35	43	41	42	45	45

» ENP models from ENP042 to ENP164 in standard operating conditions for vertical probe geothermic application

Main technical data for the series ENP		181/2	184	204	214	243	244	283	284	314	344	374	424
Cooling @ B22/W7													
Cooling capacity	[kW]	213,7	208,2	225,3	246,7	274,5	291,2	321,6	325,1	359,5	393,0	426,4	474,1
Power input	[kW]	35,3	33,8	36,9	39,6	45,2	45,0	53,6	53,0	61,1	65,9	70,9	77,1
Absorbed current	[A]	67,1	83,5	86,7	89,8	76,8	95,8	91,0	113,8	131,6	133,1	134,6	144,9
EER	[-]	6,05	6,16	6,11	6,23	6,07	6,47	6,00	6,13	5,89	5,96	6,01	6,15
Water flow on user side	[kg/h]	36826	35912	38901	42522	47983	50131	55433	56102	61872	67736	73427	81776
Water temperature on user side	[°C]	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°
Water pressure drop on user side	[kPa]	48	47	53	51	53	36	42	43	52	51	50	49
Water flow on dissipation side	[kg/h]	42548	41411	44880	48942	55299	57453	64046	64711	71801	78455	84950	94313
Water temperature on dissipation side	[°C]	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°	22°/27°
Water pressure drop on dissipation side	[kPa]	72	69	80	77	80	48	60	62	76	74	73	72
Cooling + DHW @ 12/7°C ; 45/50°C													
Cooling capacity	[kW]	165,2	160,4	173,8	190,4	213,0	224,2	248,5	251,6	278,4	303,7	329,0	366,9
Heating capacity	[kW]	217,5	211,4	229,8	250,8	279,8	296,6	327,1	331,4	368,7	401,3	434,1	481,4
Power input	[kW]	55,0	53,7	58,9	63,6	70,3	76,2	82,7	84,0	95,0	102,7	110,6	120,5
Absorbed current	[A]	93,2	102,6	109,8	116,3	115,0	129,4	140,0	150,2	170,9	178,9	187,1	204,6
COP	[-]	6,96	6,92	6,85	6,94	7,01	6,83	6,96	6,94	6,81	6,86	6,90	7,04
Water flow on user side	[kg/h]	28483	27729	30015	32831	37338	38650	42870	43454	48107	52348	56878	63295
Water temperature on user side	[°C]	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°	12°/7°
Water pressure drop on user side	[kPa]	29	28	32	30	32	21	25	26	31	30	30	29
Water flow on DHW side	[kg/h]	37431	36456	39588	43169	48740	50538	56324	57111	63549	69073	74859	82905
Water temperature on DHW side	[°C]	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°	40°/45°
Water pressure drop on DHW side	[kPa]	55	53	62	60	62	37	46	48	60	57	56	56
Heating @ B0/W35 20% ethylene glycol													
Heating capacity	[kW]	180,3	173,6	188,6	205,9	231,4	241,5	271,5	273,6	305,2	333,5	360,6	398,5
Power input	[kW]	40,1	39,2	42,6	45,8	51,6	52,0	60,2	60,8	69,6	75,2	80,5	85,0
Absorbed current	[A]	73,4	87,7	92,1	96,1	87,6	104,1	110,2	123,2	141,6	144,3	147,2	155,3
COP	[-]	4,50	4,43	4,43	4,50	4,48	4,64	4,51	4,50	4,39	4,43	4,48	4,69
Water flow on user side	[kg/h]	30803	29659	32244	35131	43540	41281	51094	46797	52247	57078	61686	68158
Water temperature on user side	[°C]	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°	30°/35°
Water pressure drop on user side	[kPa]	38	36	42	40	43	25	32	33	41	40	39	38
Water flow on dissipation side	[kg/h]	44293	42470	46166	50502	52261	59881	61424	67312	74647	81831	88600	99120
Water temperature on dissipation side	[°C]	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°
Water pressure drop on dissipation side	[kPa]	59	56	64	61	65	43	52	53	64	63	61	61
DHW @ B0/W50 20% ethylene glycol													
Heating capacity	[kW]	168,9	163,6	178,0	194,0	216,8	227,4	254,3	257,3	286,8	308,2	338,2	375,9
Power input	[kW]	54,1	53,8	58,8	63,4	69,6	72,5	81,3	83,1	93,9	101,1	108,8	116,6
Absorbed current	[A]	92,2	102,9	109,8	116,1	118,2	128,8	138,4	149,4	169,7	177,2	185,1	198,7
COP	[-]	3,12	3,04	3,03	3,06	3,11	3,14	3,13	3,10	3,05	3,05	3,11	3,22
Water flow on user side	[kg/h]	28883	27967	30437	33171	37498	38937	43535	44020	49114	52720	57830	64296
Water temperature on user side	[°C]	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°	45°/50°
Water pressure drop on user side	[kPa]	33	32	37	36	37	22	28	29	36	34	34	34
Water flow on dissipation side	[kg/h]	36624	35047	38056	41698	47815	49480	55272	55607	61713	66116	73209	82661

Water temperature on dissipation side	[°C]	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°	0°/-3°
Water pressure drop on dissipation side	[kPa]	40	38	43	42	44	30	35	36	43	41	42	42

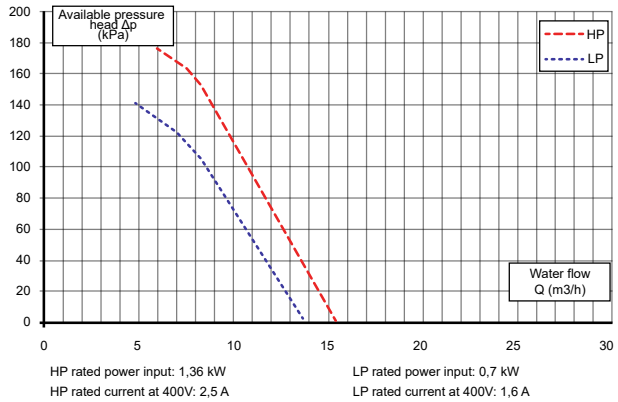
5.1 Characteristic curves of the hydraulic pumps associated to the ENP units

The graphics displayed in this paragraph show the useful head expressed (the net value of the internal losses of the units) of the HP pumps and LP pumps in the optional hydronic module. Refer to the paragraph 10.1 Glycol solutions p. 51 to assess the effect of glycol on the useful head offered by the pumps; the corrective coefficients to be applied to the curves, calculated in pure water, are carried here to facilitate consultation.

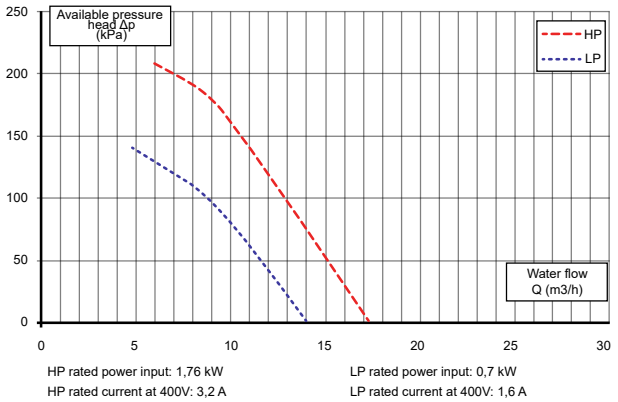
Minimum temperature of water produced	5 °C	2°C	-1 °C	-5°C	-10 °C
Percentage by weight of glycol	0 %	10 %	15%	25 %	30 %
Mixture freezing temperature	0 °C	-4 °C	- 8 °C	-14 °C	-18 °C

At the nominal flow rates listed in Tables Dati tecnici modelli ENP da ENP042 a ENP164 , Dati tecnici modelli ENP M da ENP181 a ENP424 in this chapter, the low-pressure LP pumps provide 60 kPa of useful head on the utility and DHW side and 70 kPa on the dissipation side. The high-pressure HP pumps provide 140 kPa useful head for the dissipation side and utility side.

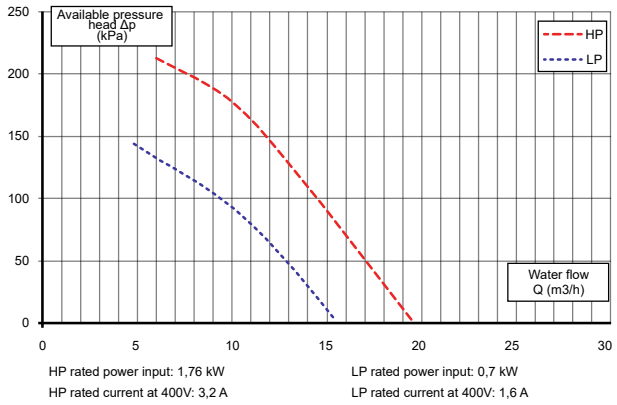
5.1.1 Available pressure head for pumps on user side



Available pressure head for pumps on user side ENP 042



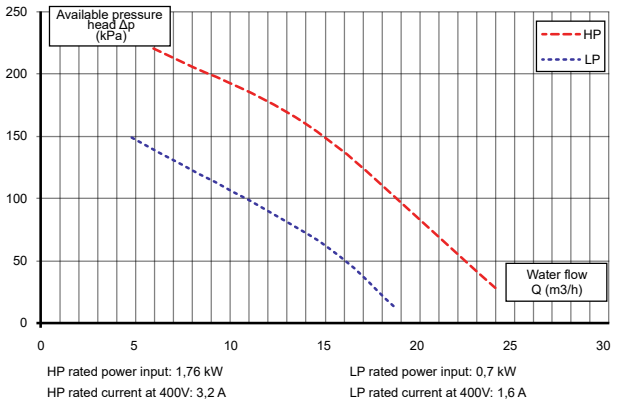
Available pressure head for pumps on user side ENP 052



HP rated power input: 1,76 kW
HP rated current at 400V: 3,2 A

LP rated power input: 0,7 kW
LP rated current at 400V: 1,6 A

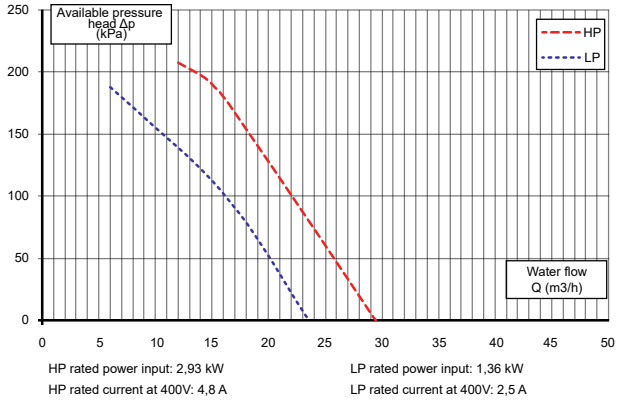
Available pressure head for pumps on user side ENP 062, 072



HP rated power input: 1,76 kW
HP rated current at 400V: 3,2 A

LP rated power input: 0,7 kW
LP rated current at 400V: 1,6 A

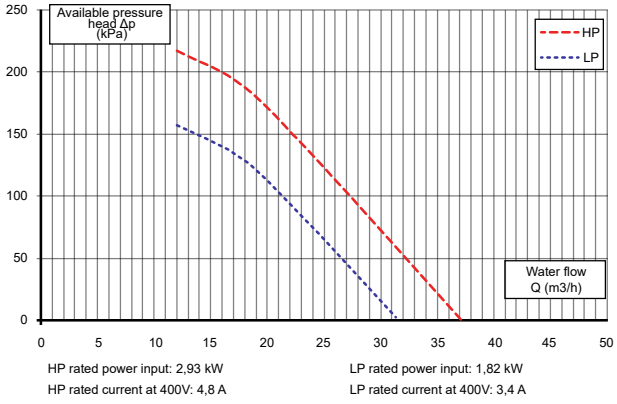
Available pressure head for pumps on user side ENP 082



HP rated power input: 2,93 kW
HP rated current at 400V: 4,8 A

LP rated power input: 1,36 kW
LP rated current at 400V: 2,5 A

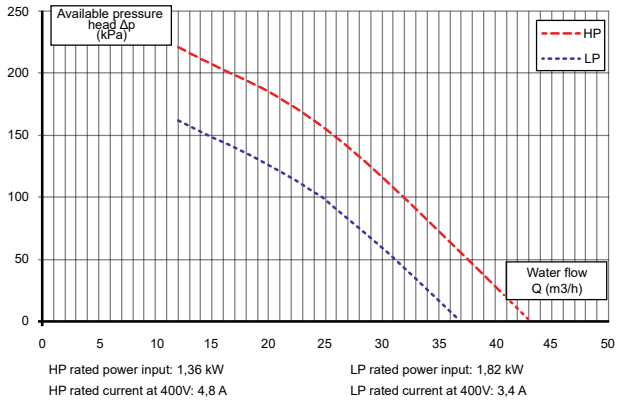
Available pressure head for pumps on user side ENP 092



HP rated power input: 2,93 kW
HP rated current at 400V: 4,8 A

LP rated power input: 1,82 kW
LP rated current at 400V: 3,4 A

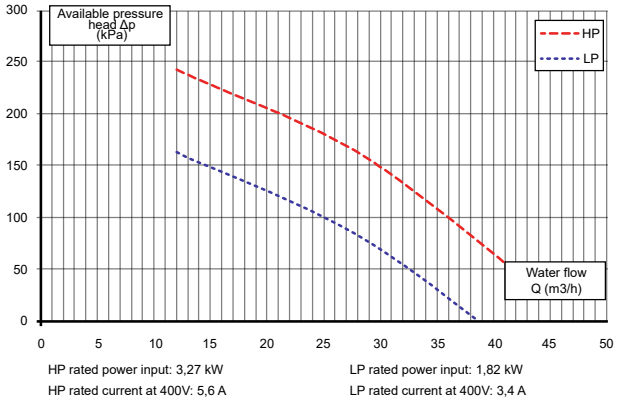
Available pressure head for pumps on user side ENP 111, 112, 131, 132



HP rated power input: 1,36 kW
HP rated current at 400V: 4,8 A

LP rated power input: 1,82 kW
LP rated current at 400V: 3,4 A

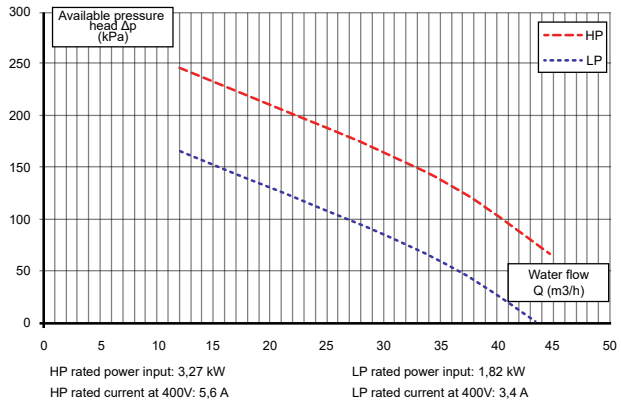
Available pressure head for pumps on user side ENP 141, 142, 144



HP rated power input: 3,27 kW
HP rated current at 400V: 5,6 A

LP rated power input: 1,82 kW
LP rated current at 400V: 3,4 A

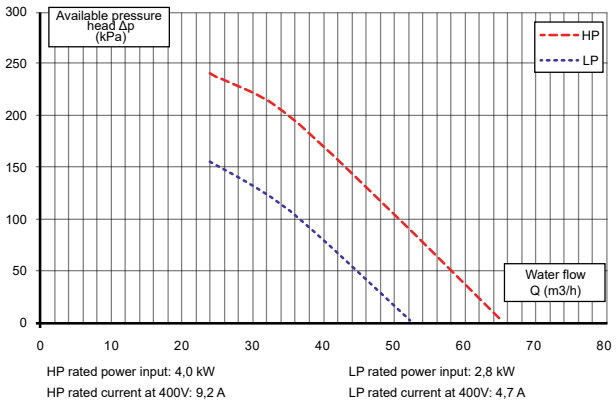
Available pressure head for pumps on user side ENP 161, 162, 164



HP rated power input: 3,27 kW
HP rated current at 400V: 5,6 A

LP rated power input: 1,82 kW
LP rated current at 400V: 3,4 A

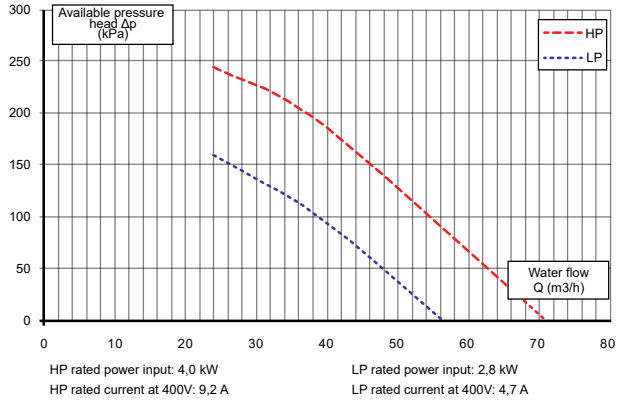
Available pressure head for pumps on user side ENP 181, 182, 184



HP rated power input: 4,0 kW
HP rated current at 400V: 9,2 A

LP rated power input: 2,8 kW
LP rated current at 400V: 4,7 A

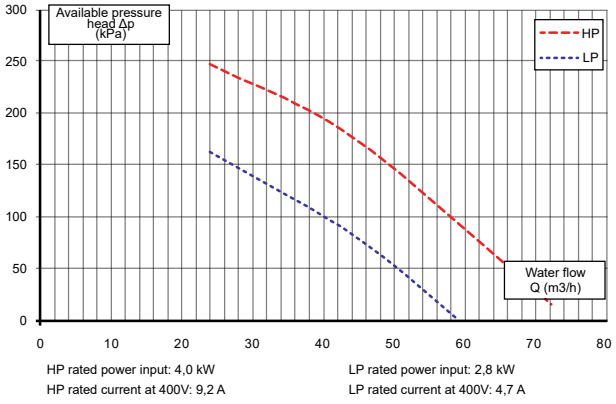
Available pressure head for pumps on user side ENP 204



HP rated power input: 4,0 kW
HP rated current at 400V: 9,2 A

LP rated power input: 2,8 kW
LP rated current at 400V: 4,7 A

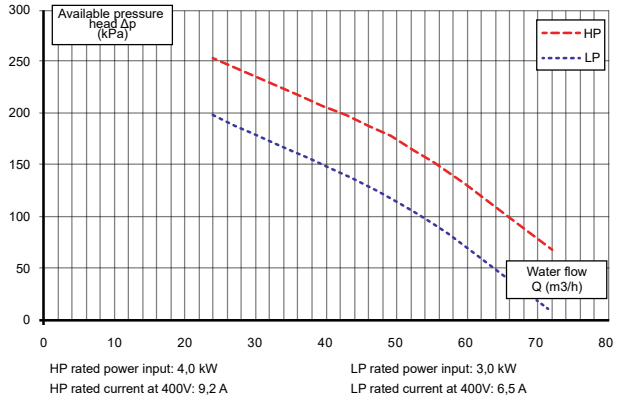
Available pressure head for pumps on user side ENP 214



HP rated power input: 4,0 kW
HP rated current at 400V: 9,2 A

LP rated power input: 2,8 kW
LP rated current at 400V: 4,7 A

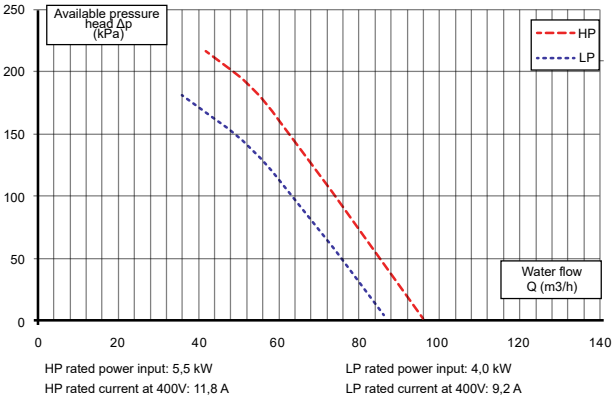
Available pressure head for pumps on user side ENP 243, 244



HP rated power input: 4,0 kW
HP rated current at 400V: 9,2 A

LP rated power input: 3,0 kW
LP rated current at 400V: 6,5 A

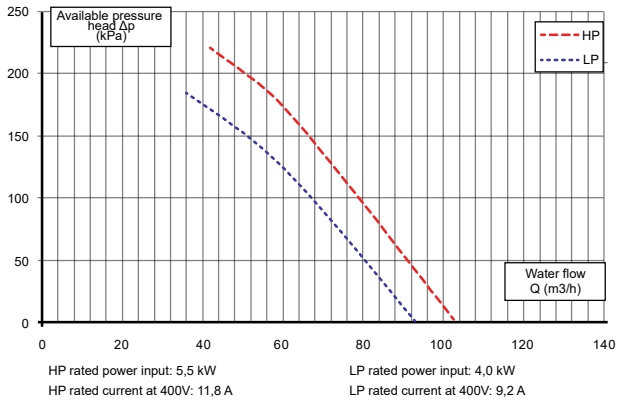
Available pressure head for pumps on user side ENP 283, 284



HP rated power input: 5,5 kW
HP rated current at 400V: 11,8 A

LP rated power input: 4,0 kW
LP rated current at 400V: 9,2 A

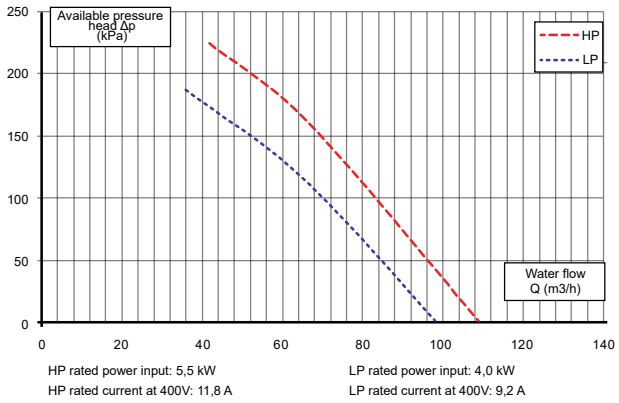
Available pressure head for pumps on user side ENP 314



HP rated power input: 5,5 kW
HP rated current at 400V: 11,8 A

LP rated power input: 4,0 kW
LP rated current at 400V: 9,2 A

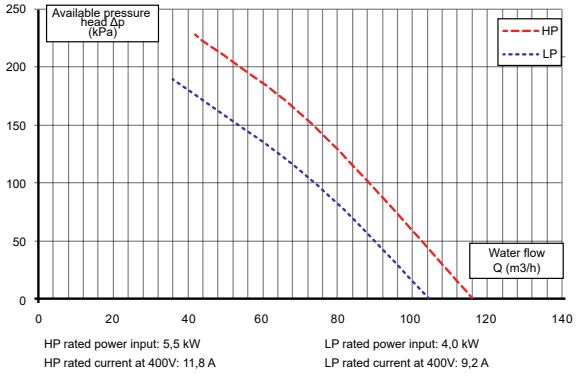
Available pressure head for pumps on user side ENP 344



HP rated power input: 5,5 kW
HP rated current at 400V: 11,8 A

LP rated power input: 4,0 kW
LP rated current at 400V: 9,2 A

Available pressure head for pumps on user side ENP 374

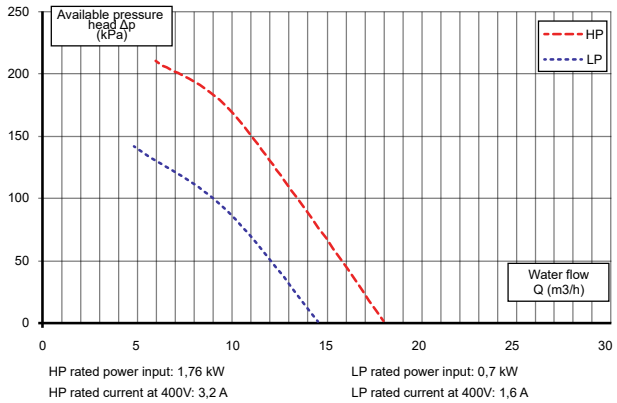


HP rated power input: 5,5 kW
HP rated current at 400V: 11,8 A

LP rated power input: 4,0 kW
LP rated current at 400V: 9,2 A

Available pressure head for pumps on user side ENP 424

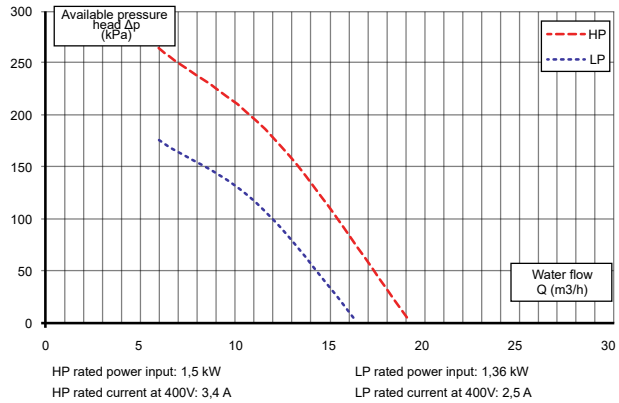
5.1.2 Available pressure head for pumps on dissipation side



HP rated power input: 1,76 kW
HP rated current at 400V: 3,2 A

LP rated power input: 0,7 kW
LP rated current at 400V: 1,6 A

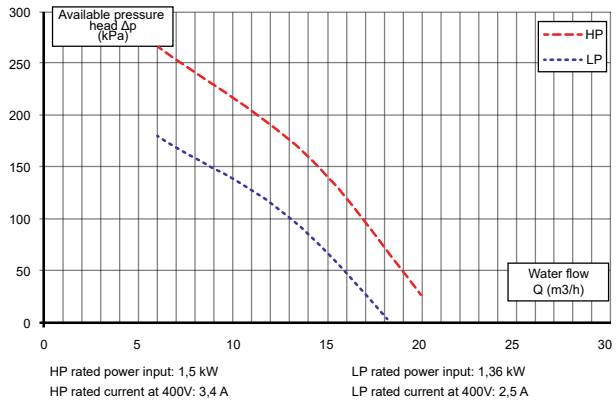
Available pressure head for pumps on dissipation side ENP 042



HP rated power input: 1,5 kW
HP rated current at 400V: 3,4 A

LP rated power input: 1,36 kW
LP rated current at 400V: 2,5 A

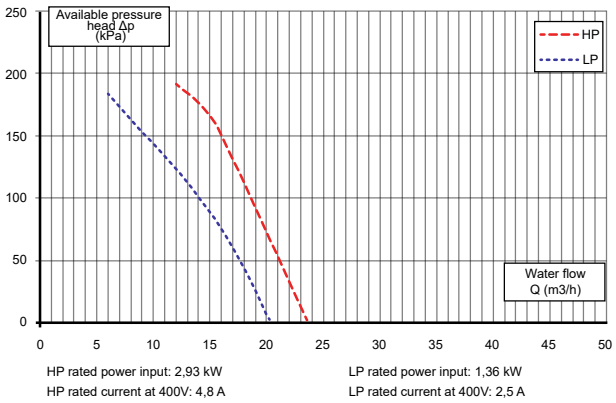
Available pressure head for pumps on dissipation side ENP 052



HP rated power input: 1,5 kW
HP rated current at 400V: 3,4 A

LP rated power input: 1,36 kW
LP rated current at 400V: 2,5 A

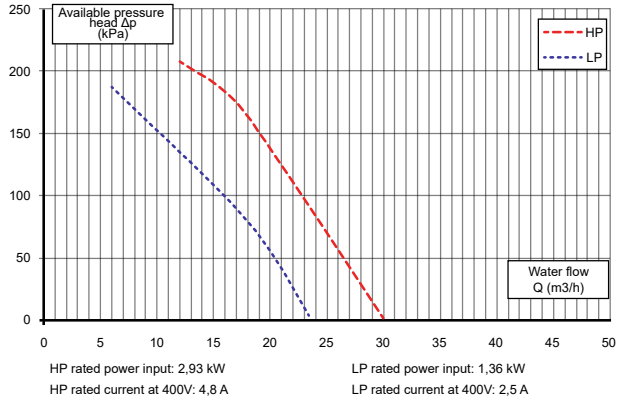
Available pressure head for pumps on dissipation side ENP 062



HP rated power input: 2,93 kW
HP rated current at 400V: 4,8 A

LP rated power input: 1,36 kW
LP rated current at 400V: 2,5 A

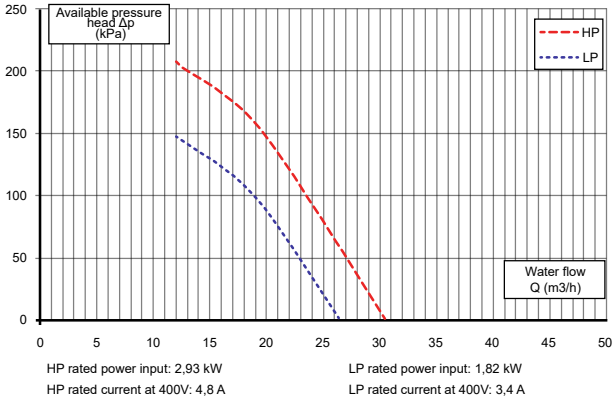
Available pressure head for pumps on dissipation side ENP 072



HP rated power input: 2,93 kW
HP rated current at 400V: 4,8 A

LP rated power input: 1,36 kW
LP rated current at 400V: 2,5 A

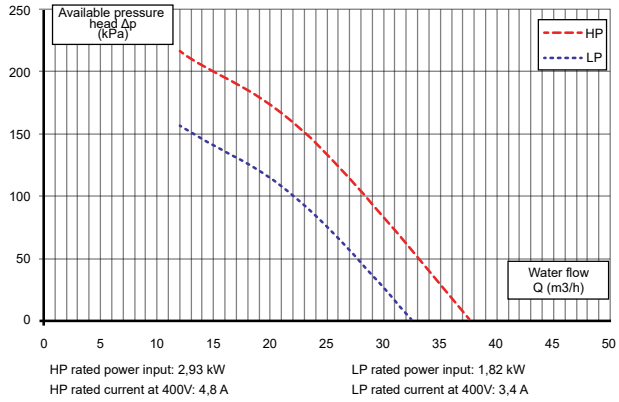
Available pressure head for pumps on dissipation side ENP 082



HP rated power input: 2,93 kW
HP rated current at 400V: 4,8 A

LP rated power input: 1,82 kW
LP rated current at 400V: 3,4 A

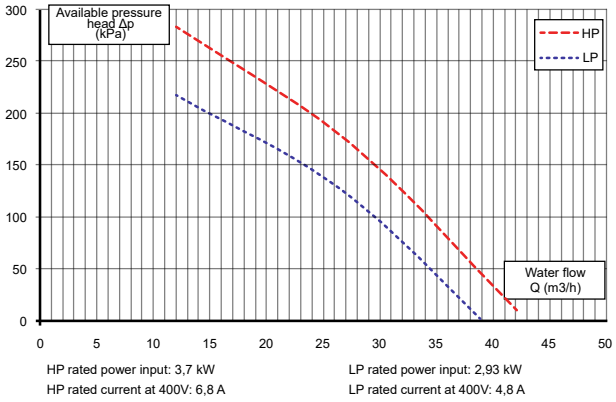
Available pressure head for pumps on dissipation side ENP 092



HP rated power input: 2,93 kW
HP rated current at 400V: 4,8 A

LP rated power input: 1,82 kW
LP rated current at 400V: 3,4 A

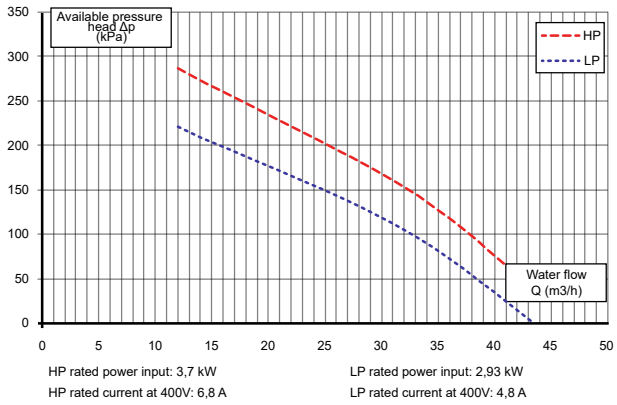
Available pressure head for pumps on dissipation side ENP 111, 112



HP rated power input: 3,7 kW
HP rated current at 400V: 6,8 A

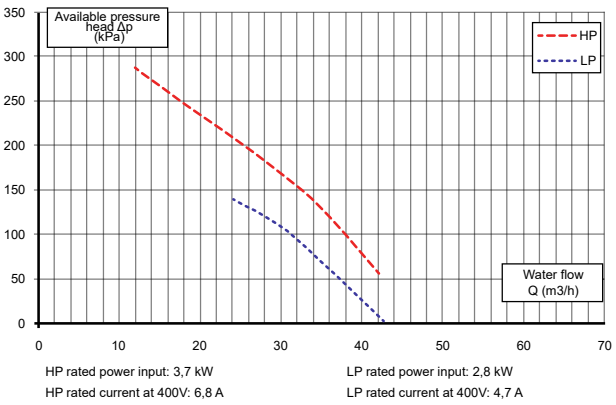
LP rated power input: 2,93 kW
LP rated current at 400V: 4,8 A

Available pressure head for pumps on dissipation side ENP 131, 132



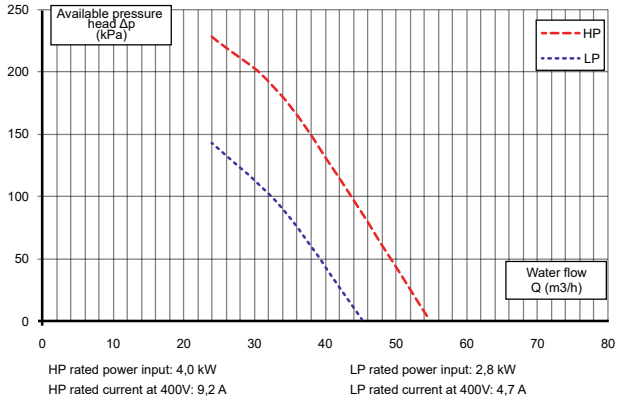
HP rated power input: 3,7 kW
HP rated current at 400V: 6,8 A
LP rated power input: 2,93 kW
LP rated current at 400V: 4,8 A

Available pressure head for pumps on dissipation side ENP 141, 142



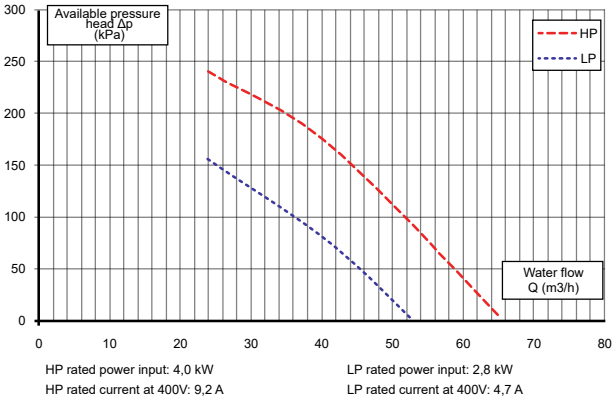
HP rated power input: 3,7 kW
HP rated current at 400V: 6,8 A
LP rated power input: 2,8 kW
LP rated current at 400V: 4,7 A

Available pressure head for pumps on dissipation side ENP 144



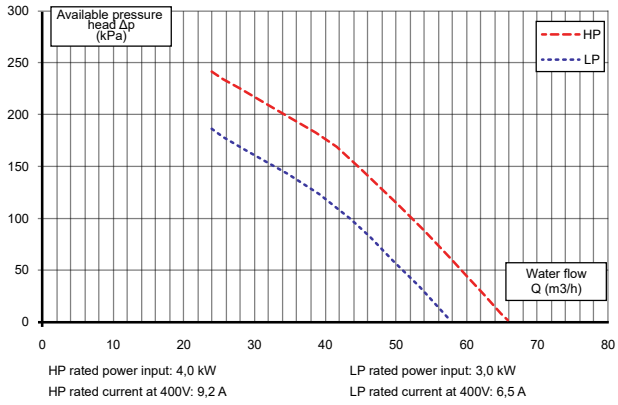
HP rated power input: 4,0 kW
HP rated current at 400V: 9,2 A
LP rated power input: 2,8 kW
LP rated current at 400V: 4,7 A

Available pressure head for pumps on dissipation side ENP 161, 162, 164



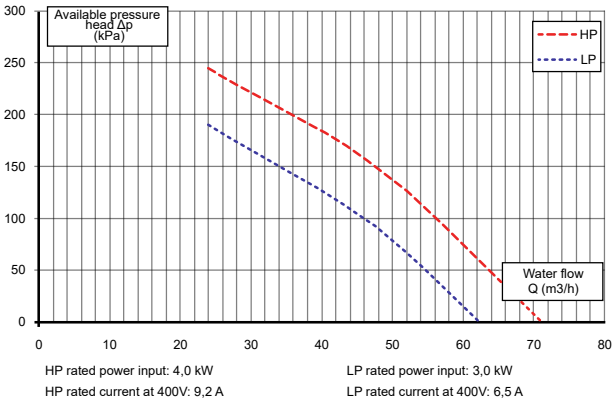
HP rated power input: 4,0 kW
HP rated current at 400V: 9,2 A
LP rated power input: 2,8 kW
LP rated current at 400V: 4,7 A

Available pressure head for pumps on dissipation side ENP 181, 182, 184



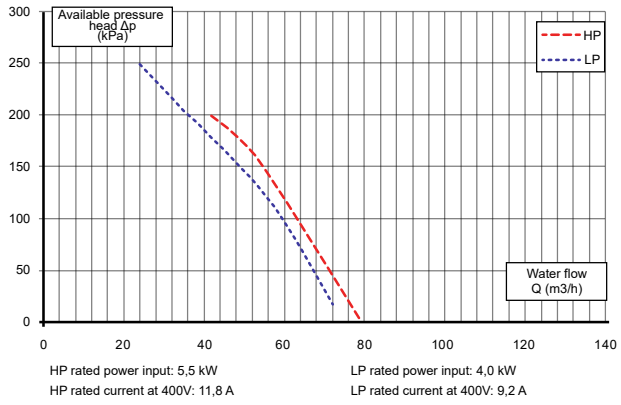
HP rated power input: 4,0 kW
HP rated current at 400V: 9,2 A
LP rated power input: 3,0 kW
LP rated current at 400V: 6,5 A

Available pressure head for pumps on dissipation side ENP 204



HP rated power input: 4,0 kW
HP rated current at 400V: 9,2 A
LP rated power input: 3,0 kW
LP rated current at 400V: 6,5 A

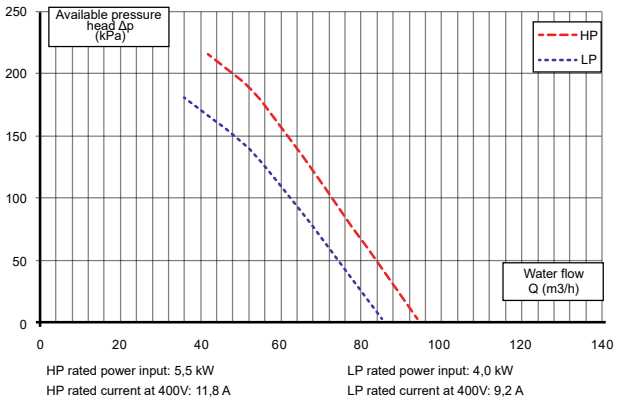
Available pressure head for pumps on dissipation side ENP 214



HP rated power input: 5,5 kW
HP rated current at 400V: 11,8 A

LP rated power input: 4,0 kW
LP rated current at 400V: 9,2 A

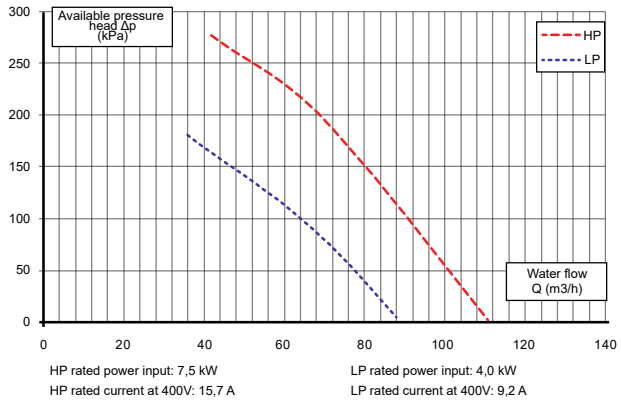
Available pressure head for pumps on dissipation side ENP 243



HP rated power input: 5,5 kW
HP rated current at 400V: 11,8 A

LP rated power input: 4,0 kW
LP rated current at 400V: 9,2 A

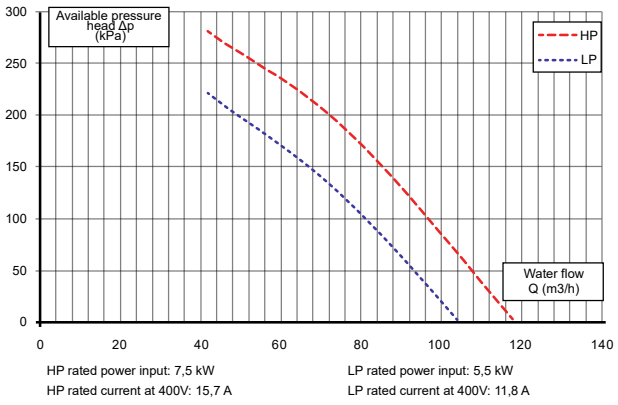
Available pressure head for pumps on dissipation side ENP 244, 283, 284



HP rated power input: 7,5 kW
HP rated current at 400V: 15,7 A

LP rated power input: 4,0 kW
LP rated current at 400V: 9,2 A

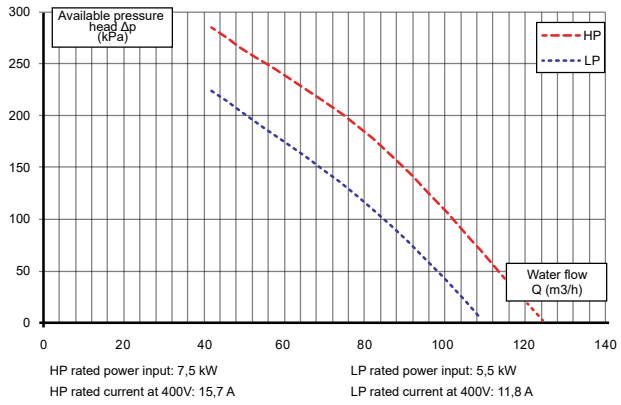
Available pressure head for pumps on dissipation side ENP 314



HP rated power input: 7,5 kW
HP rated current at 400V: 15,7 A

LP rated power input: 5,5 kW
LP rated current at 400V: 11,8 A

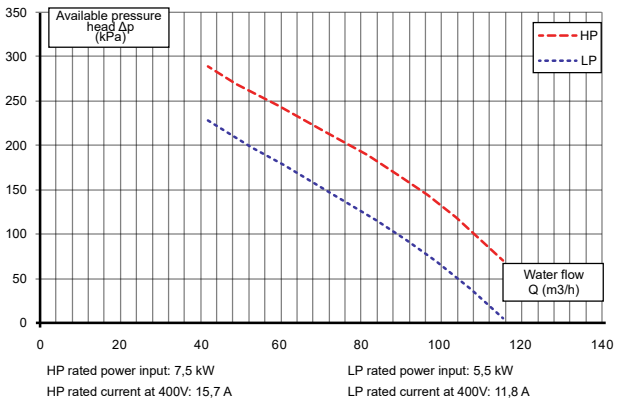
Available pressure head for pumps on dissipation side ENP 344



HP rated power input: 7,5 kW
HP rated current at 400V: 15,7 A

LP rated power input: 5,5 kW
LP rated current at 400V: 11,8 A

Available pressure head for pumps on dissipation side ENP 374

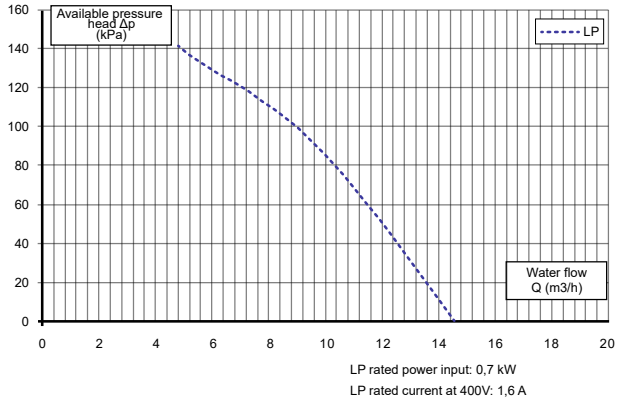


HP rated power input: 7,5 kW
HP rated current at 400V: 15,7 A

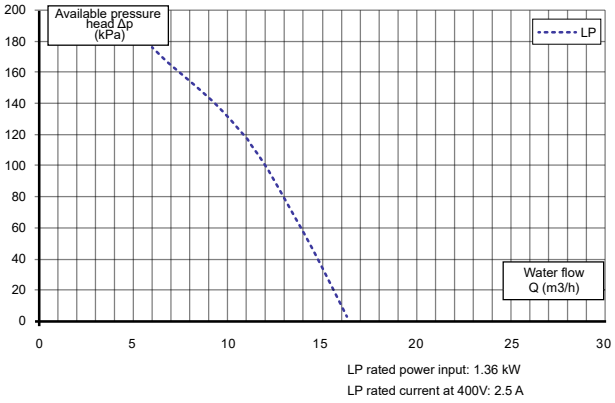
LP rated power input: 5,5 kW
LP rated current at 400V: 11,8 A

Available pressure head for pumps on dissipation side ENP 424

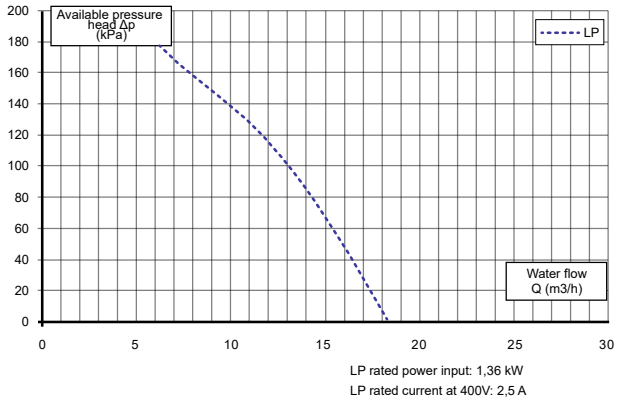
5.1.3 Available pressure head for pumps on DHW side



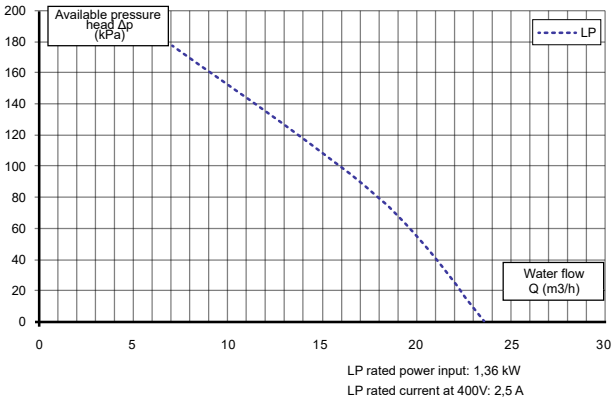
Available pressure head for pumps on DHW side ENP 042



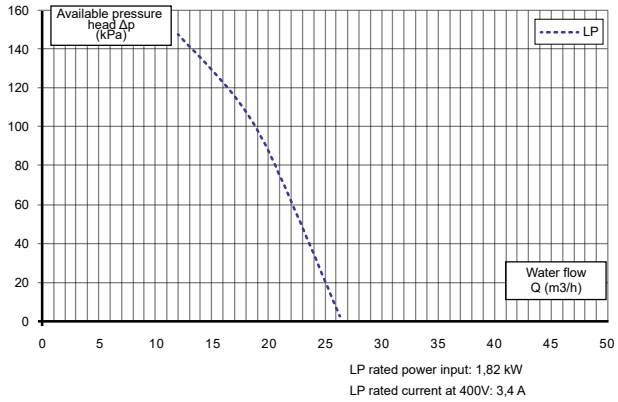
Available pressure head for pumps on DHW side ENP 052



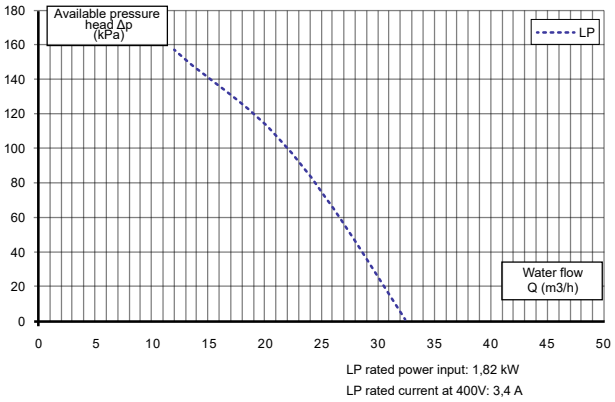
Available pressure head for pumps on DHW side ENP 062, 072



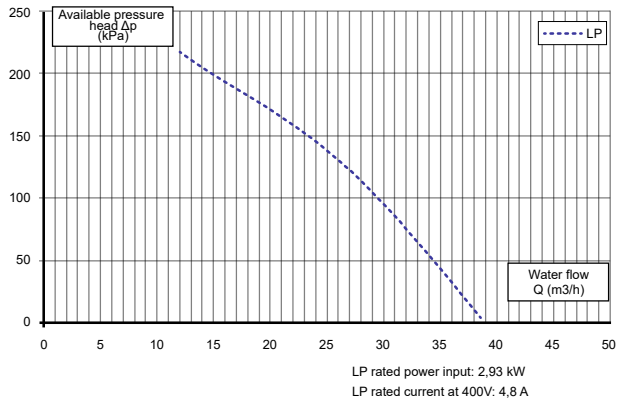
Available pressure head for pumps on DHW side ENP 082



Available pressure head for pumps on DHW side ENP 092

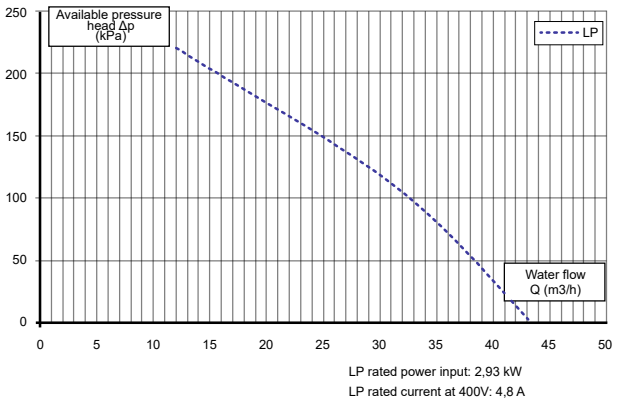


Available pressure head for pumps on DHW side ENP 111, 112



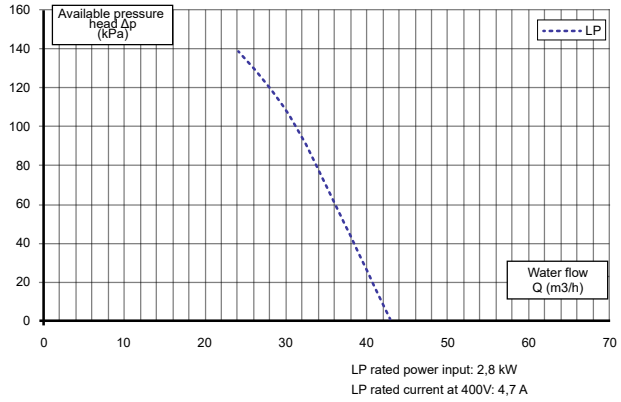
LP rated power input: 2,93 kW
LP rated current at 400V: 4,8 A

Available pressure head for pumps on DHW side ENP 131, 132



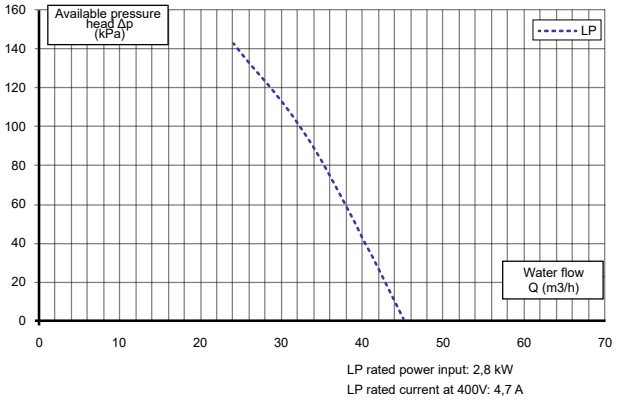
LP rated power input: 2,93 kW
LP rated current at 400V: 4,8 A

Available pressure head for pumps on DHW side ENP 141, 142



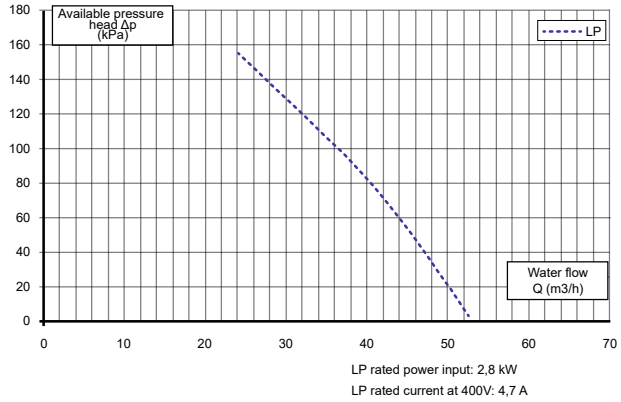
LP rated power input: 2,8 kW
LP rated current at 400V: 4,7 A

Available pressure head for pumps on DHW side ENP 144



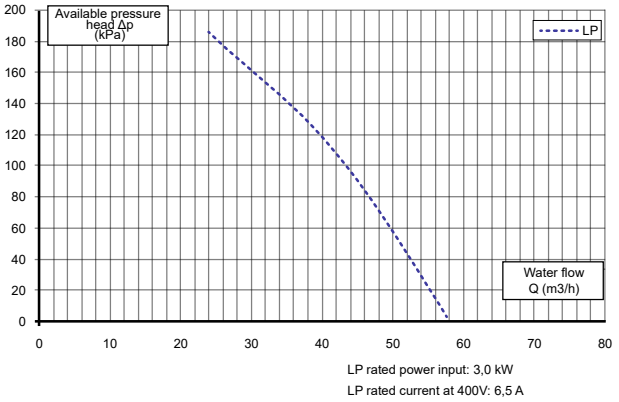
LP rated power input: 2,8 kW
LP rated current at 400V: 4,7 A

Available pressure head for pumps on DHW side ENP 161, 162, 164



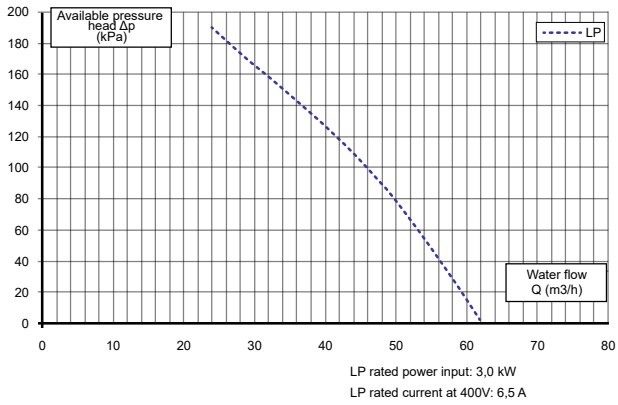
LP rated power input: 2,8 kW
LP rated current at 400V: 4,7 A

Available pressure head for pumps on DHW side ENP 181, 182, 184



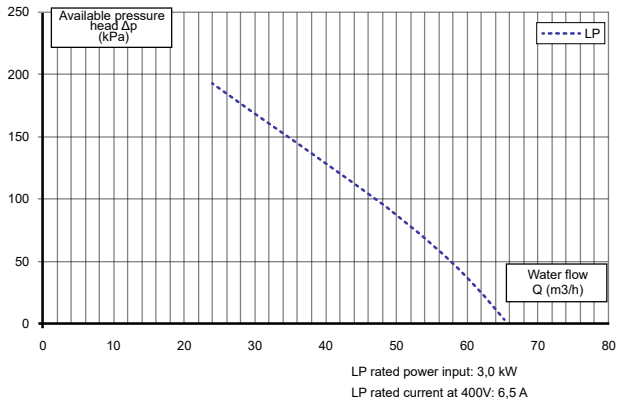
LP rated power input: 3,0 kW
LP rated current at 400V: 6,5 A

Available pressure head for pumps on DHW side ENP 204



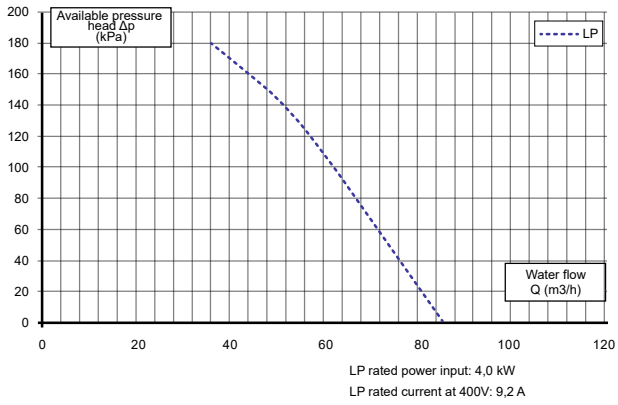
LP rated power input: 3,0 kW
LP rated current at 400V: 6,5 A

Available pressure head for pumps on DHW side ENP 214



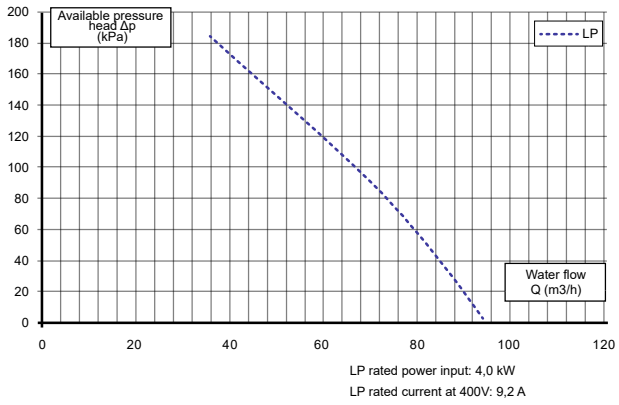
LP rated power input: 3,0 kW
LP rated current at 400V: 6,5 A

Available pressure head for pumps on DHW side ENP 243



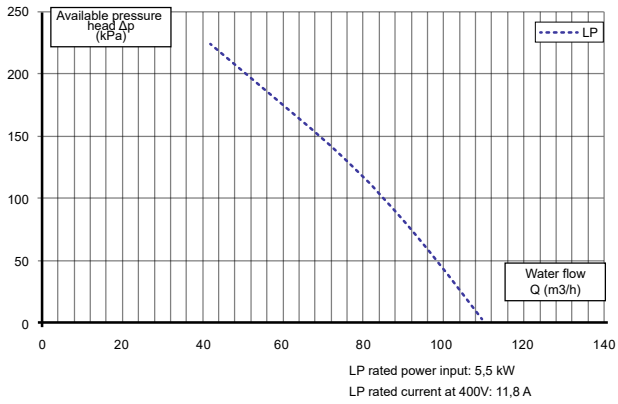
LP rated power input: 4,0 kW
LP rated current at 400V: 9,2 A

Available pressure head for pumps on DHW side ENP 244, 283, 284, 314



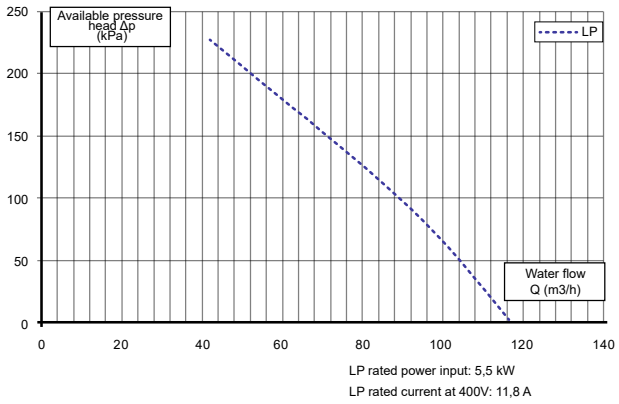
LP rated power input: 4,0 kW
LP rated current at 400V: 9,2 A

Available pressure head for pumps on DHW side ENP 344



LP rated power input: 5,5 kW
LP rated current at 400V: 11,8 A

Available pressure head for pumps on DHW side ENP 374



LP rated power input: 5,5 kW
LP rated current at 400V: 11,8 A

Available pressure head for pumps on DHW side ENP 424

5.2 Noise emissions

ENP units have been built in a fully faired framework making the assembly extremely silent. They can therefore be installed in open environments without needing to be closed off. All sizes of the ENP series are available in the standard "S" set-up or the "L" (Low-noise) soundproof set-up, covering the compressor and outer panelling with soundproof material.

» Noise emissions of the units ENP

Sizes:		040	050	060	070	080	090	110	130	140	160	180	200	210	240	280	310	340	370	420
Lw [db(A)]	Standard execution	69	69	69	70	70	70	71	71	73	73	73	73	73	73	73	73	75	75	75
	Low noise execution	67	67	67	68	68	68	69	69	71	71	71	71	71	71	71	71	73	73	73
Lp [db(A)] @ 10 m	Standard execution	41	41	41	42	42	42	43	43	45	45	45	45	45	45	45	45	47	47	47
	Low noise execution	39	39	39	40	40	40	41	41	43	43	43	43	43	43	43	43	45	45	45
Lp [db(A)] @ 5 m	Standard execution	47	47	47	48	48	48	49	49	51	51	51	51	51	51	51	51	53	53	53
	Low noise execution	45	45	45	46	46	46	47	47	49	49	49	49	49	49	49	49	51	51	51

Lw: Sound power level
Lp: Sound pressure level

5.3 Overall dimensions and weights

The ENP product range consists in different frames. In the paragraph " 5.4 Assembly drawings p. 36 ", the overall drawings of the ENP models and their optional modules are attached. They can be referred to directly when consulting the identification codes carried in the tables in this paragraph. The tables below list the weights, reference drawings and overall dimensions of all the ENP models as well as their optional hydraulic modules. The overall drawings of reference are displayed in the following paragraph.

» Overall dimensions of frames of main units (F) and optional hydraulic modules (M) used in ENP range

Frame optional module	Frame of main unit	Height (H)	Width (L)	Depth (P)
M1	F1	1594	1174	772
M2	F2	1594	1644	772
M3		1854	1644	877
M4	F3	1854	2374	877
	F4	1854	3130	877

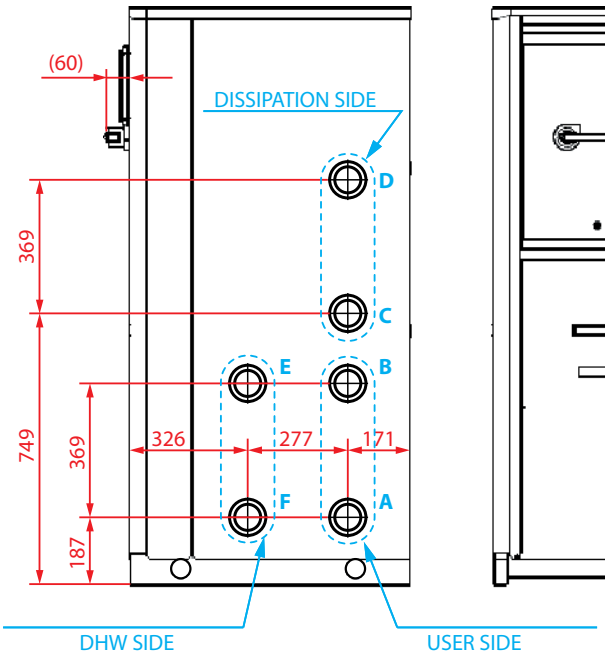
» Weight and reference drawings of main units and optional hydraulic modules of the ENP range

		ENP Multifunction		Optional hydraulic module with pumps			Optional hydraulic module with pumps and reversing valves		
Frame	Model	Weight [kg]	Assembly Drawing	Frame optional module	Weight [kg]	Assembly Drawing	Frame optional module	Weight [kg]	Assembly Drawing
F1	ENP 042	410	HF64000835	M1	291	HF64000836	M2	341	HF64000900
	ENP 052	420	HF64000835	M1	300	HF64000836	M2	350	HF64000900
	ENP 062	450	HF64000835	M1	300	HF64000836	M2	350	HF64000900
	ENP 072	460	HF64000835	M1	295	HF64000836	M2	345	HF64000900
	ENP 082	490	HF64000835	M1	295	HF64000836	M2	345	HF64000900
	ENP 092	510	HF64000835	M1	299	HF64000836	M2	349	HF64000900
F2	ENP 112	690	HF64000848	M1	299	HF64000836	M2	349	HF64000900
	ENP 132	700	HF64000848	M1	312	HF64000836	M2	362	HF64000900
	ENP 142	770	HF64000848	M1	312	HF64000836	M2	383	HF64000900
	ENP 162	830	HF64000848	M1	333	HF64000836	M2	404	HF64000900
	ENP 182	890	HF64000848	M1	443	HF64000836	M2	514	HF64000900
F3	ENP 111	900	HF64000894	M3	323	HF64000901	M4	384	HF64000900
	ENP 131	910	HF64000894	M3	323	HF64000901	M4	384	HF64000903
	ENP 141	980	HF64000894	M3	323	HF64000901	M4	394	HF64000900
	ENP 161	1040	HF64000894	M3	333	HF64000901	M4	404	HF64000903
	ENP 181	1100	HF64000894	M3	343	HF64000901	M4	414	HF64000903
	ENP 144	1010	HF64000894	M3	323	HF64000901	M4	394	HF64000900
	ENP 164	1050	HF64000894	M3	333	HF64000901	M4	404	HF64000903
	ENP 184	1130	HF64000894	M3	343	HF64000901	M4	414	HF64000903
F4	ENP 204	1280	HF64000899	M3	459	HF64000902	M4	530	HF64000903
	ENP 214	1350	HF64000899	M3	459	HF64000902	M4	530	HF64000904
	ENP 243	1850	HF64000871	M3	476	HF64000902	M4	562	HF64000904
	ENP 244	1840	HF64000871	M3	487	HF64000902	M4	573	HF64000904
	ENP 283	1880	HF64000871	M3	487	HF64000902	M4	573	HF64000904
	ENP 284	1940	HF64000871	M3	487	HF64000902	M4	573	HF64000904
	ENP 314	2040	HF64000871	M3	514	HF64000902	M4	600	HF64000904
	ENP 344	2110	HF64000871	M3	514	HF64000902	M4	625	HF64000904
	ENP 374	2180	HF64000871	M3	526	HF64000902	M4	637	HF64000904
	ENP 424	2380	HF64000871	M3	526	HF64000902	M4	637	HF64000904

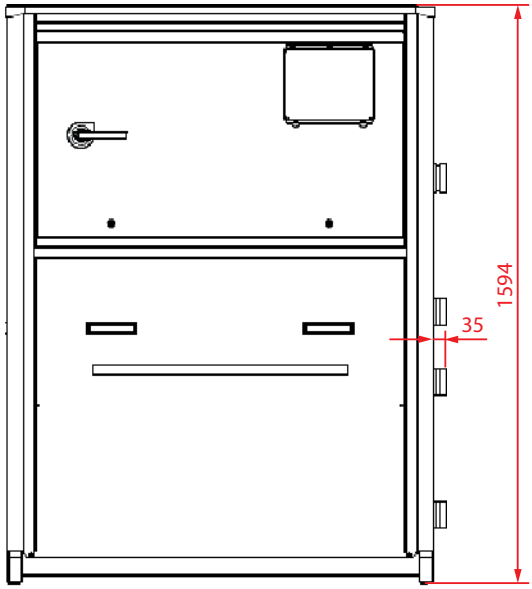
5.4 Assembly drawings

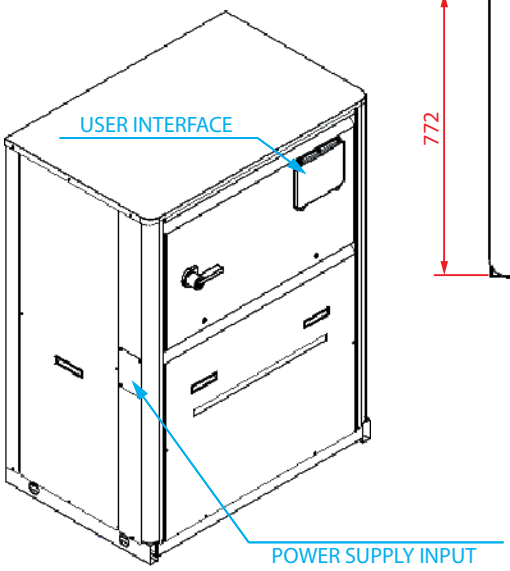
5.4.1 Assembly Drawing HF64000835

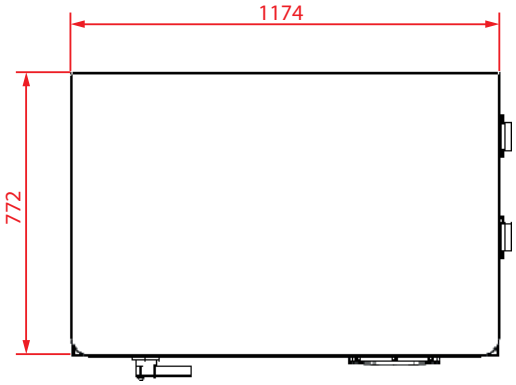
RIGHT SIDE



FRONT VIEW



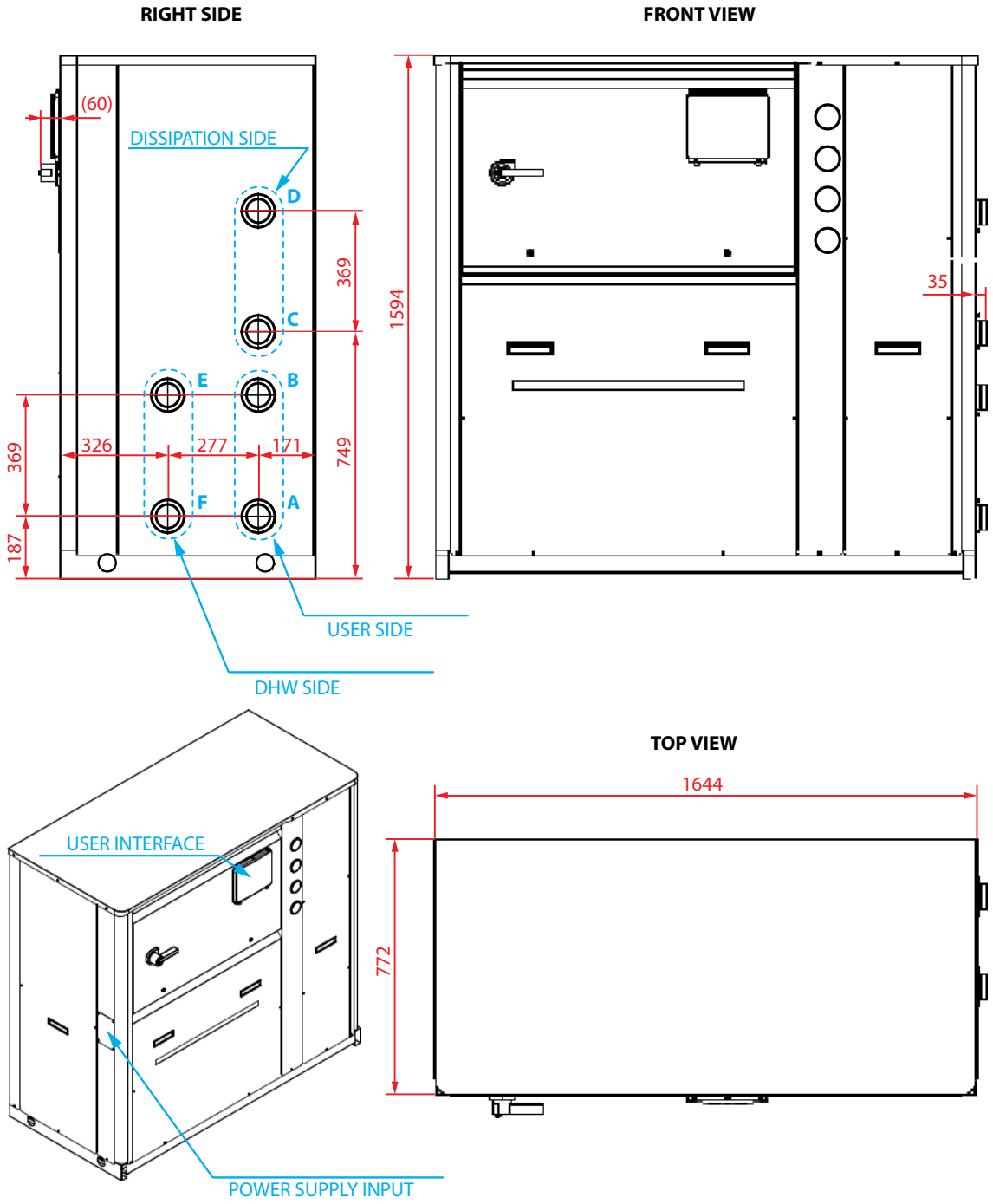




TOP VIEW

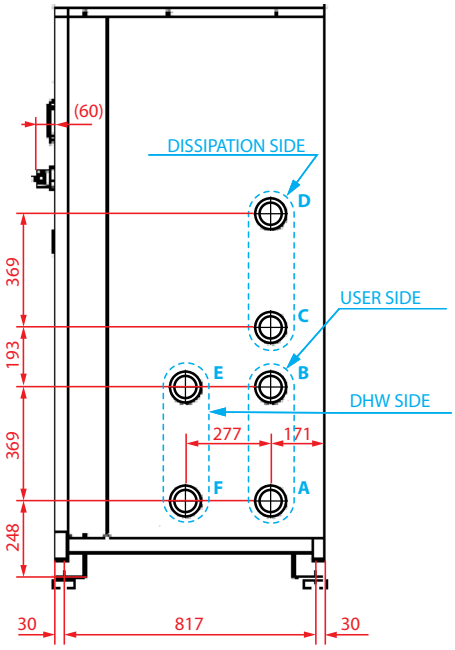
MULTI-PURPOSE GEOTHERMAL UNITS		
USER SIDE	A = Water outlet	B = Water inlet
DISSIPATION SIDE	C = Water outlet	D = Water inlet
DHW SIDE	E = Water outlet	F = Water inlet
PLUMBING CONNECTIONS	2"1/2 VICTAULIC	

5.4.2 Assembly Drawing HF64000848

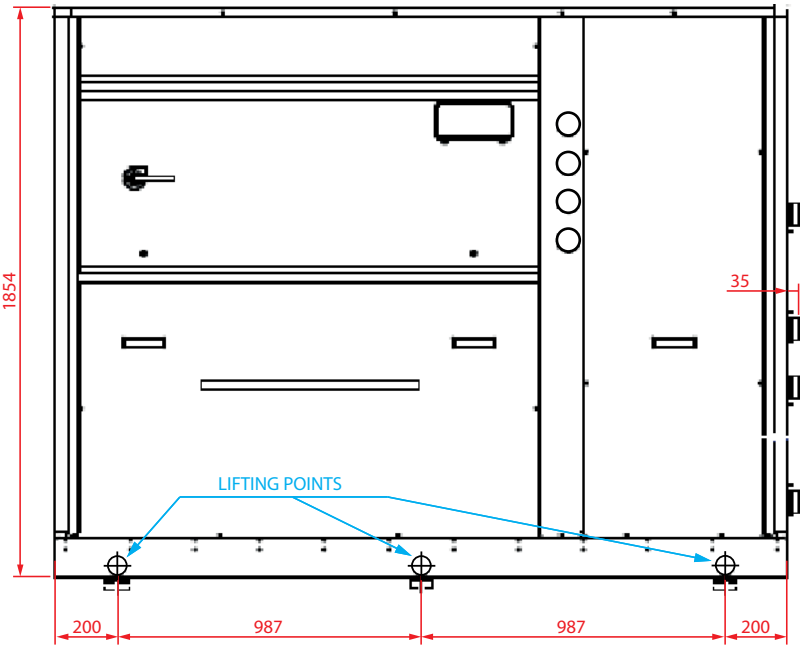


MULTI-PURPOSE GEOTHERMAL UNITS		
USER SIDE	A = Water outlet	B = Water inlet
DISSIPATION SIDE	C = Water outlet	D = Water inlet
DHW SIDE	E = Water outlet	F = Water inlet
PLUMBING CONNECTIONS	2"1/2 VICTAULIC	

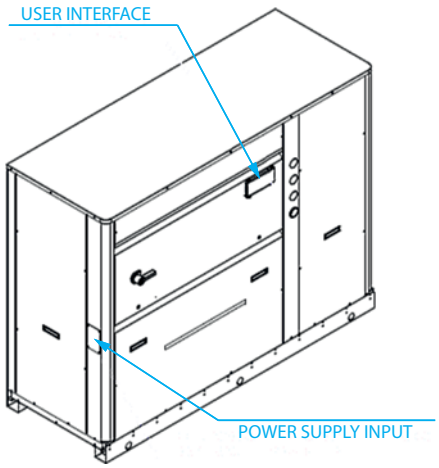
5.4.3 Assembly Drawing HF64000894

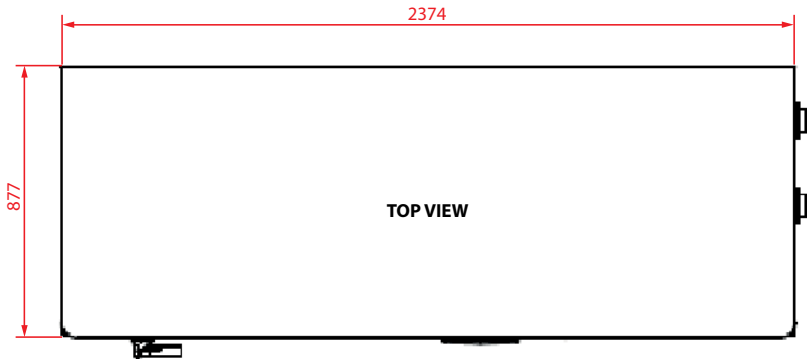


RIGHT SIDE



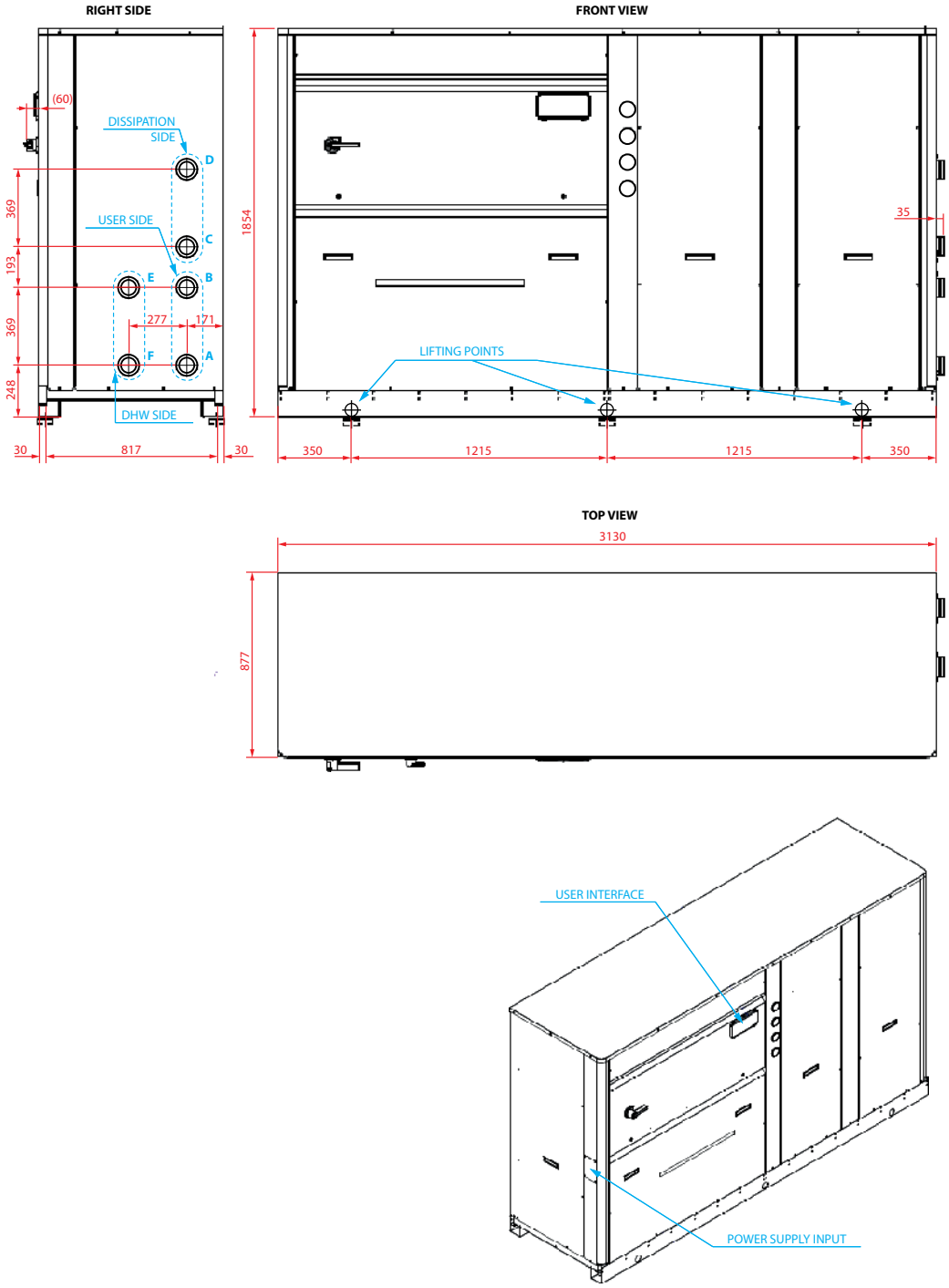
FRONT VIEW





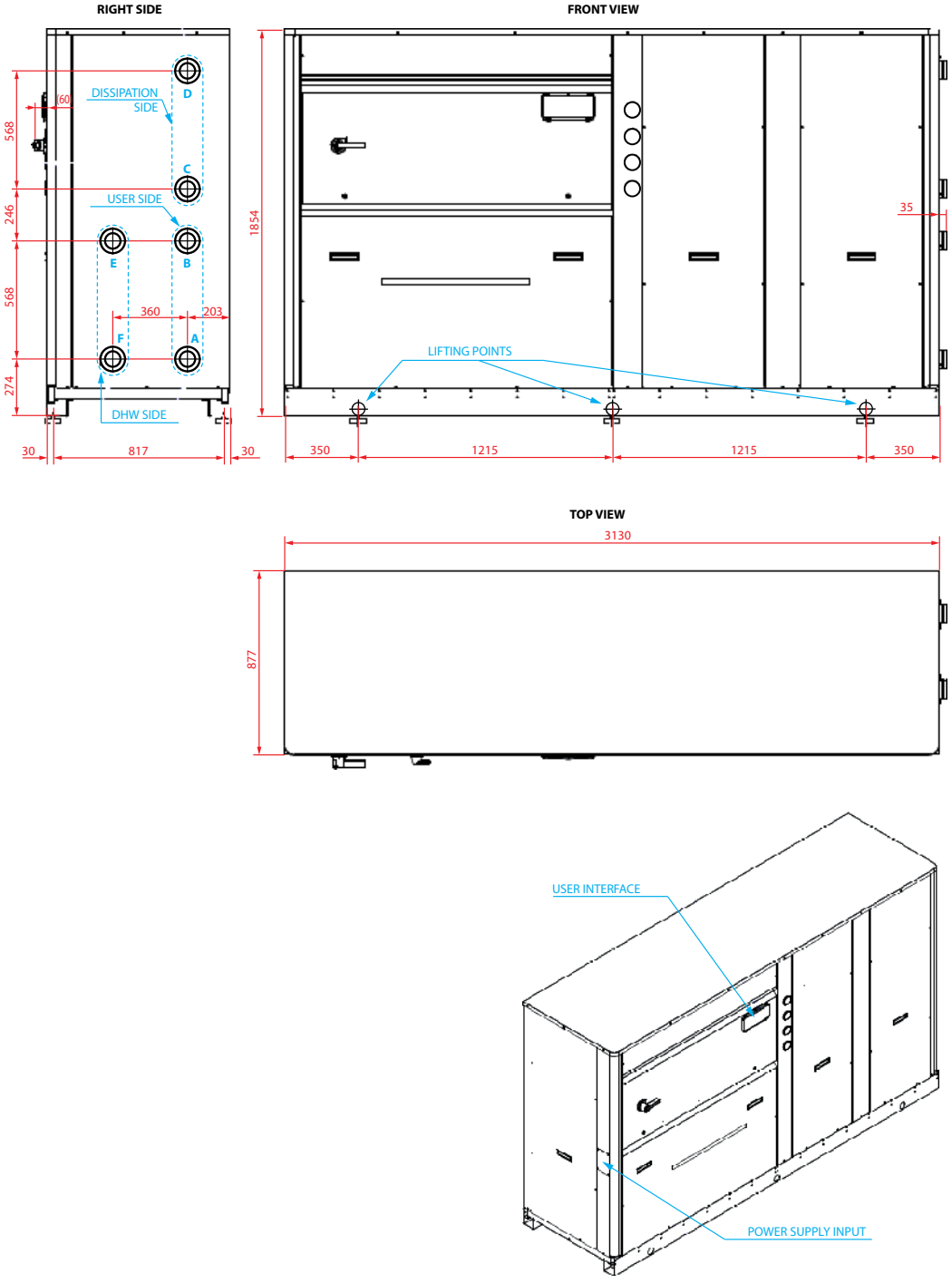
MULTI-PURPOSE GEOTHERMAL UNITS		
USER SIDE	A = Water outlet	B = Water inlet
DISSIPATION SIDE	C = Water outlet	D = Water inlet
DHW SIDE	E = Water outlet	F = Water inlet
PLUMBING CONNECTIONS	3" VICTAULIC	

5.4.4 Assembly Drawing HF64000894 (preliminary)



MULTI-PURPOSE GEOTHERMAL UNITS		
USER SIDE	A = Water outlet	B = Water inlet
DISSIPATION SIDE	C = Water outlet	D = Water inlet
DHW SIDE	E = Water outlet	F = Water inlet
PLUMBING CONNECTIONS	3" VICTAULIC	

5.4.5 Assembly Drawing HF64000871

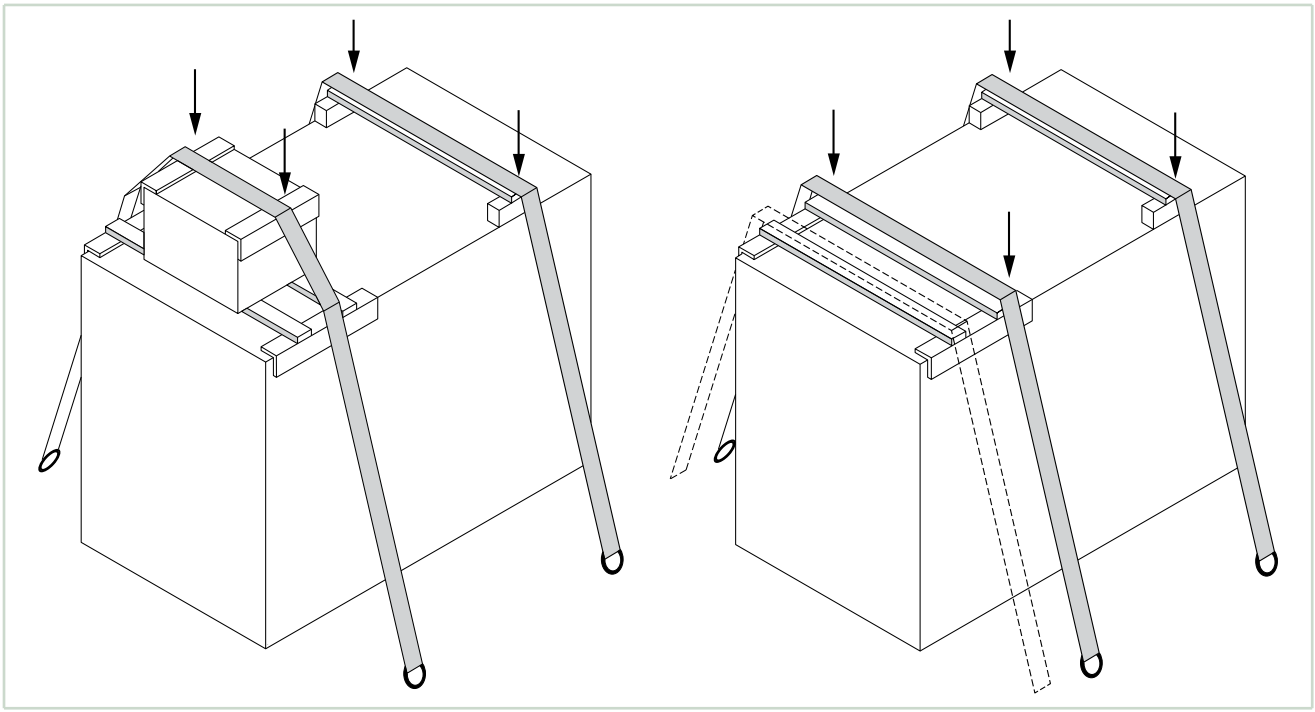


MULTI-PURPOSE GEOTHERMAL UNITS		
USER SIDE	A = Water outlet	B = Water inlet
DISSIPATION SIDE	C = Water outlet	D = Water inlet
DHW SIDE	E = Water outlet	F = Water inlet
PLUMBING CONNECTIONS	3" VICTAULIC	

6 PRELIMINARY PROCEDURES

6.1 Transport

In order not to damage the structure and components, the units ENP must be fixed to the transport vehicle using the supports shown in the following figure. The image on the left refers to cases including accessories.

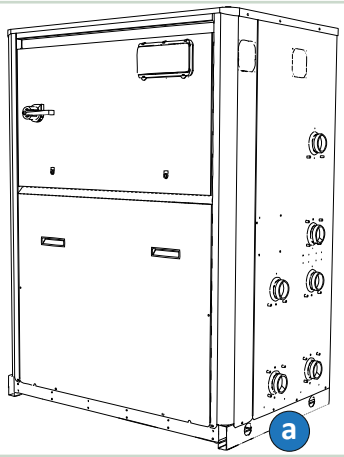


6.2 Inspection on receipt

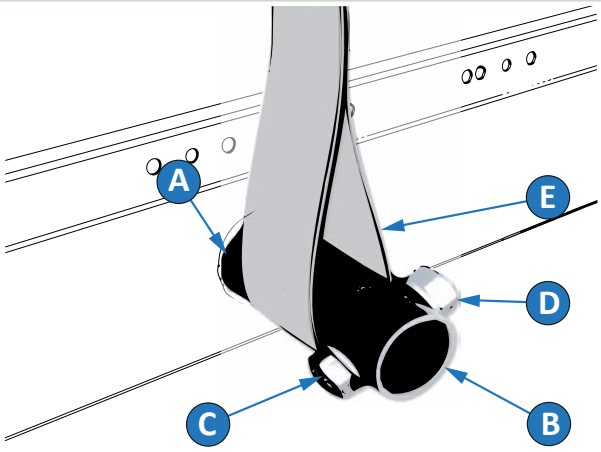
Upon receiving the unit, check its integrity: the machine has left the factory in perfect condition; any damage must be immediately reported to the forwarder and noted on the Delivery report before signing it.
The manufacturers or their agents must be informed as soon as possible about the extent of the damage. The Customer must submit a written report for any significant damage.
Upon receiving the unit, check its integrity: the machine has left the factory in perfect condition; any damage must be immediately reported to the forwarder and noted on the Delivery report before signing it.
The manufacturer or its agent must be promptly notified of the extent of the damage.
The Customer must submit a written report describing every significant sign of damage.

6.3 Conveyance

During the unloading and positioning of the unit, be extremely careful to avoid bumps and knocks or sudden movements. Handling must be carried out carefully and gently, avoiding to apply pressure to any machine components.
The unit shall be lifted using seamless pipes - ref. EN10255 S195T - in steel Ø1½" GAS at least 3 mm thick inserted into the round holes provided in the base rails (a) and marked with the special stickers.

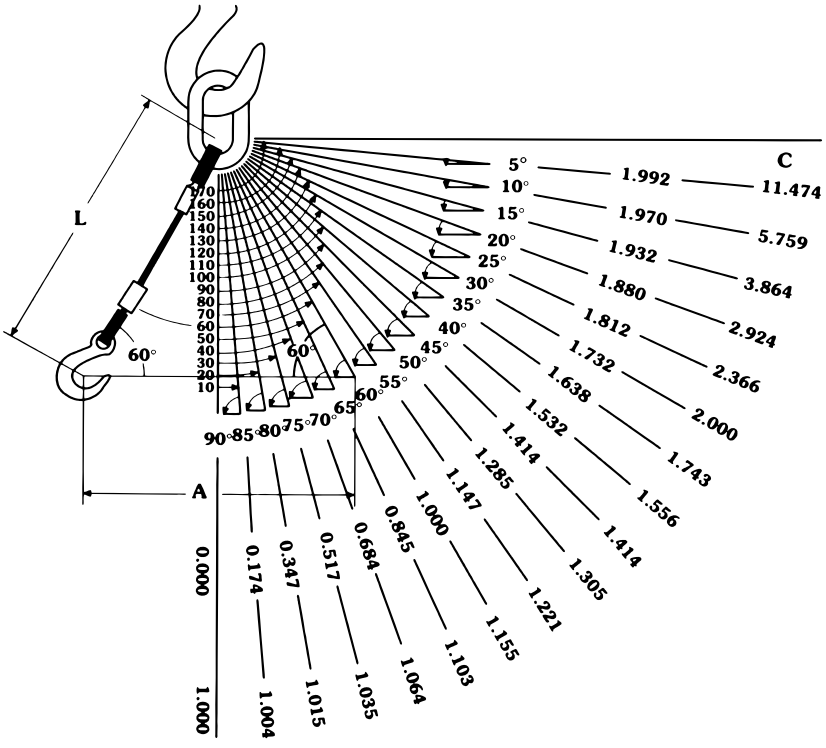


The pipes that must protrude by at least 300 mm from each end will be harnessed with identical ropes, secured to the lifting hook (provide fasteners at the ends of the pipes in order to avoid that, due to the applied weight, the rope slips off the pipe).



A. Hole on the basement
B. Lifting tube without welding Ø 1½" - S195T
C. Safety bolt
D. Locking nut
E. Rope - Belt

Use ropes or belts of adequate length and strength and spacer bars to avoid damaging the sides and top of the unit.



Vertex Angle (°)	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
Load increase factor	1	1.004	1.015	1.035	1.064	1.103	1.155	1.221	1.305	1.414	1.556	1.743	2.000	2.336	2.924	3.864	5.759	11.474

ATTENTION

During all lifting operations make sure the unit is firmly anchored, to prevent it from tilting or falling.

ATTENTION

The use of tie rods having a vertex angle with respect to the vertical line greater than 60° is not recommended; beyond this limit, the capacity of the tie rod varies considerably for each small change in the angle or according to general conditions of use.

6.4 Unpacking

The unit packaging must be carefully removed avoiding possible damage to the machine; the materials that make up the packaging are of a different kinds: wood, cardboard, nylon, etc.
It is good practice to collect them separately and deliver them for disposal or recycling to specialised disposal companies - thus reducing their environmental impact.

6.5 Siting

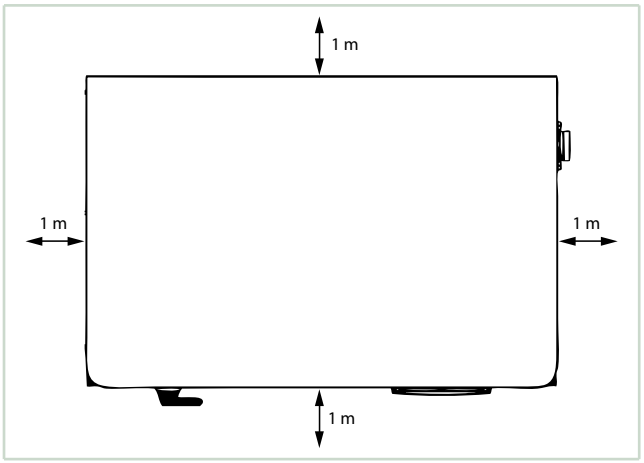
Check the following points to select the best installation setting for the unit and its connections:
— Size and origin of hydraulic pipes;
— Location of the power supply;
— Accessibility for maintenance or repairs;
— Solidity of the supporting surface.
All models belonging to the ENP series are designed and built for indoor or outdoor installation. As special care has been taken in the sound insulation and sealing of the components and hot parts in general, they need not be installed in dedicated rooms.

ATTENTION

It is advisable to place a rigid rubber strip between the base frame and the supporting surface.

6.6 Installation clearance requirements

In the case of units with a remote condenser, the plumbing and cooling connections are provided on the top of the unit. This allows the chiller to be placed practically against the rear wall. It is nonetheless of fundamental importance to assure the following service spaces:
— Rear side: min. 1,0 meter;
— Electric control board side: min. 1.0 meter to guarantee access for inspection and/or maintenance of components;
— Lateral side: min. 1,0 meter for adequate connection to the hydraulic piping and extraordinary maintenance;
— Top side: min. 1,0 meter.



These distances refer to the basic ENP units; the same considerations hold true for the optional hydronic modules.

ATTENTION

For safety reasons, adequate measures and precautions must be taken regarding installation, to prevent ambient temperature - when the machine is switched on or off - exceeding the provisions of paragraph “ 10.2 Operating limits p. 52 “.

7 HYDRAULIC CONNECTIONS

7.1 General guidelines for plumbing connections

When you are getting ready to set up the water circuit for the evaporator you should follow the directions below and in any case make sure you comply with national or local regulations (use the diagrams included in this manual as your reference).

⚠ ATTENTION

Connect the pipes to the chiller using flexible couplings to prevent the transmission of vibrations and to compensate thermal expansions. For the types and size of the water and cooling connections (versions with remote condenser only) refer to the table of technical data.

Install the following components on the piping:
- Temperature and pressure indicators for routine maintenance and monitoring of the unit. Checking the pressure on the water side will enable you to verify whether the expansion tank is working efficiently and to promptly detect any water leaks within the equipment;
- Traps on incoming and outgoing pipes for temperature measurements, which can provide a direct reading of the operating temperatures. Temperature readings can in any case be obtained from the microprocessor installed on the unit (if pCO);
- Shut-off valves (gate valves) to isolate the unit from the water circuit for maintenance;
- Metal mesh filter (incoming pipes), with a mesh not to exceed 1 mm, to protect the exchanger from scale or impurities present in the pipes. This prescription is particularly important at first start-up;
- Air vent valves, to be placed at the highest points of the water circuit for the purpose of bleeding air. [The internal pipes of the unit are fitted with small manual air vent valves for bleeding the unit itself: **this operation may only be carried out when the unit is disconnected from the power supply**];
- Drainage valve and, where necessary, a drainage tank for emptying out the equipment for maintenance purposes or when the unit is taken out of service at the end of the season;
- For process applications, it is recommended to install a decoupling heat exchanger to avoid the probable dirtying of the heat exchangers.

7.2 Water connection to the evaporator

☞ WARNING

All ENP units are not provided with an internal water group, but it will be installed on the outside of the unit.

⚠ ATTENTION

It is critically important that water inlet occurs at the connection marked with the words “Water Inlet”.

Otherwise the evaporator would be exposed to the risk of freezing since the antifreeze thermostat would not be able to perform its function; moreover the reverse cycle would not be respected in the cooling mode, resulting in additional risks of malfunctioning. This position does not enable the operation of the water flow control device.
The dimensions and position of the water connections are provided in the dimensional tables and overall drawings.

☞ WARNING

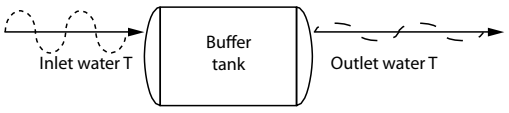
The water circuit must be set up in such a way as to guarantee that the nominal flow rate of the water supplied to the evaporator remains constant (+/- 15%) in all operating conditions.

The compressors work intermittently, since the chilling requirements of the user generally do not coincide with the compressor output. In systems containing little water, where the thermal inertia of the water is lower, it is a good idea to check that the water content in the section delivering to users satisfies the condition below:

$$V = \frac{Cc \times \Delta\tau}{\rho \times Sh \times \Delta T \times Ns}$$

V	water content in the user section [m3]
Sh	fluid specific heat [J/(kg/°C)]
ρ	fluid density [kg/m3]
Δτ	minimum time between 2 restarts of the compressors [s]
ΔT	permitted waterT differential [°C]
Cc	refrigerating power [W]
Ns	No. of partial loading steps

The following figure shows the integrated and balanced effect of the storage tank. Its function helps ensure accurate temperature control according to the environmental parameters of the connected groups.



⚠ ATTENTION

A standard feature of ENP units is a device for controlling the water flow rate (paddle flow switch included in supply).

ATTENTION

Any tampering with said device will immediately invalidate the warranty.

ATTENTION

It is advisable to install a metal mesh filter on the inlet water pipe.

ATTENTION

When making the plumbing connections, make sure there are no open flames in proximity to or inside the unit.

7.3 Instructions for the filling up of the tank and/or the pump(s) (if present)

ATTENTION

The tank is not planned to resist to a depression greater than -0,15 Bar, so pay attention to the fact that the suction pressure of the pump, where the expansion tank is positioned, has to be always greater than 0,5 Bar with the pump in operation: this fact also contributes to reduce any risks concerning the cavitation of the pump.

It is of fundamental importance for the installer to follow and check the instructions written below stepwise, so as to avoid every kind of risks concerning the implosion of the tank or the cavitation of the pump:

A. Empty the expansion tank until the pressure is 0,5 Bar;
B. Charge the system and pressurize it until about + 1 Bar in suction, pump side (with pump not working);
C. Allow air to escape from the system;
D. Check the suction pressure of the pump (about 1 Bar) and start the system;
E. Stop the pump after 15-30 minutes and repeat point from point **C.** until you hear no more noise due to the presence of air in the system.

7.4 Refrigerant charge

DANGER

Before carrying out any operation with the refrigerant, it is recommended to read the special safety data sheet (MSDS). The refrigerants used in the entire product range are R410A, R454B.
These have the following characteristics:

— **TOXICITY,** the refrigerants mentioned above all belong to group A according to the standard 34 ASHRAE; this group includes all refrigerants that are found not toxic for concentrations equal to or lower than 400 ppm.
— **FLAMMABILITY,** according to the standard 34 ASHRAE, refrigerant R410A is classified in the safety group A1, i.e. non-flammable at a pressure of 1 atm (101.3 kPa) and 18°C. R454B is classified in the A2L safety group, i.e. mildly flammable at 1 atm pressure (101.3 kPa) and 18°C.
— **CATEGORY,** the refrigerants used are fluids of category II according to the PED 2014/68/EU directive and therefore, they are not dangerous.

In the event of substantial refrigerant vapour release, the area must be immediately evacuated. Vapour concentration is higher at floor level, limiting the availability of oxygen. After evacuation, it is necessary to ventilate the area with fans or blowers to ensure air circulation at floor level.

For loading operations, follow the procedure described below:

— Connect the refrigerant gas cylinder to the 1/4 SAE male filler outlet located on the liquid line, making sure that there are no impurities, moisture and/or incondensable gases in the inlet pipes;
— Fill with refrigerant in liquid form until you reach 75% of the total charge;
— then connect to the intake on the suction line and complete liquid charge loading until no more bubbles appear on the liquid viewer and the operating values are reached that are indicated in the paragraph 9.4.2 Refrigerant charge checks p. 49.

ATTENTION

A unit originally filled at the factory with a refrigerant type cannot be filled with different refrigerants without a written permission from manufacturer.

ATTENTION

If the (mildly flammable) R454B is used, it is recommended to provide all the safety devices required by law during installation. In case of indoor installation, contact the manufacturer.

ATTENTION

Refer to paragraph 15.2 Environment protection p. 62 contained in this document.

8 ELECTRICAL CONNECTIONS

8.1 Main features

ATTENTION

Before carrying out any operation on electrical parts, make sure that there is no applied voltage.

Check that the mains electricity supply is compatible with the specifications (voltage, number of phases, frequency) shown on the unit rating plate.
The power connection for single-phase loads is to be made with a three-pole cable and "N" wire at the centre of the star (optional: power supply w/o neutral).

ATTENTION

The size of the cable and line protections must conform to the specifications provided in the wiring diagram.

The supply voltage may not undergo fluctuations exceeding ±5% and the unbalance between phases must always be below 2%.

ATTENTION

Operation must occur within the above voltage value range, otherwise, the guarantee will no longer be valid.

Carry out the electrical connections following the wiring diagram provided with the unit, as well as current regulations.

ATTENTION

An earth connection is **mandatory**. The installer must connect the earthing wire using the earthing terminal situated on the electric control board (yellow and green wire).

The power supply to the control circuit is shunted from the power line through an insulating transformer situated on the electric control board.
The control circuit is protected by suitable fuses or automatic breakers depending on the unit size.

8.2 Electrical wiring of the circulation pump

For all ENP units a clean contact is provided on the electric board for powering a low-voltage remote control used to start the pump.

ATTENTION

If it is an integral part of the supply, the pump must be started before the chiller and stopped after the latter (minimum recommended delay: 60 seconds). If it is connected to the terminal in the electric control board, this function is carried out by the built-in microprocessor.

8.3 Remote controls

WARNING

If you wish to include a remote control for switching the unit on and off, you must remove the bridge between the contacts indicated in the wiring diagram and connect the remote ON/OFF control to the terminals themselves [see annexed wiring diagram], then enable the "REMOTE" function by means of the switch provided in the electric board.

8.4 Summer Winter Remote Switching [heat pump and multifunction versions]

If you wish to include a remote control for summer/winter switching of the unit, you must remove the bridge between the contacts indicated in the wiring diagram and connect the remote ON/OFF control to the terminals themselves [see annexed wiring diagram], then enable the "REMOTE" function by means of the switch provided in the electric board.

8.5 Electric control board

WARNING

— The electrical control board is implemented and wired in compliance with standard EN 60204-1;
— The control board can be accessed directly from the front of the unit and the components can only be accessed after the unit has been disconnected from the mains by means of the general disconnection switch with the door-locking function;
— All the remote controls are implemented with low voltage signals at 24 V, powered by an isolation transformer positioned inside the control board;
— All the control boards have an air circulation system with auxiliary fans;
— The position and orientation of the main disconnection switch have been studied to facilitate wiring operations in the work site without the power cords needing to perform difficult passages and improbable bends;
— All the utilities are protected against overloads and short-circuits and the fitting circuit breakers switches can be configured for each load (optional): however

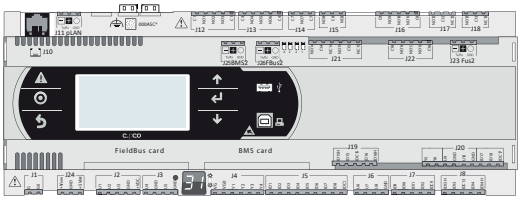
thermal protection is always implemented by thermistor chains plunged in the windings of each electric motor and adequately controlled by on-board electronics;
— The phase sequence relay is fitted as per standard on all the units inhibiting operation of the compressor should the phase sequence not be respected: only one rotation direction is possible for the scroll compressors, just like the screw and Rotary compressors;
— The unit is rated IP43 which makes it suitable for outdoor installation. The control board with the open panel maintains an IP20 rating;
— Inside the electrical control board of the Basic control there are two manual selectors to enable remote switching On-Off, seasonal changeover (only heat pumps) and to select local or remote control: remote consents are implemented by low voltage contacts placed on the terminal board.

8.6 Microprocessor controller

On ENP series machines microprocessor control is available.

Advanced - Carel pCO series.

»



In addition to the functions described below, this microprocessor offers the option of custom software features to ensure optimal satisfaction of all system requirements, including control of the unit with step-control or cascade logic.

The microprocessor built into the unit allows the different operating parameters to be controlled from a set of pushbuttons situated on the electric control board:
— Switching on/off of compressor to maintain the temperature set point of the chiller inlet water temperature;
— Alarm management;
— High / low pressure;
— Antifreeze;
— Flow switch;
— Pump alarm;
— Alarm signalling;
— Displaying of operating parameters;
— Evaporator antifreeze protection;
— Management of maximum number of compressor start-ups;
— Serial output management (optional) RS232, RS485;
— Incorrect phase sequence (not displayed, but disables compressor start).

As regards remote communication options, the controls are set up for connection to advanced BMS systems and the HSD (Software Department) structure is designed to assist customers in integration operations. The interconnectivity options offered by the system are summed up below:
— Serial ports available;
— RS232;
— RS485
— Ethernet (“HiWeb” board);
— GSM modem: with prepaid card and machine on-board antenna for autonomous bidirectional management of the alarms and/or set point variation;
— Protocols;
— Carel [Built In];
— Modbus® [Built-In with Advanced Controls];
— Modbus® [With external gateway with Basic controls];
— LonWorks® [Dedicated serial board to be requested when ordering the machine];
— BACnet™ [With external gateway];
— TCP-IP [With external gateway];
— TREND® [Dedicated serial board to be requested when ordering the machine].

(please refer to the dedicated microprocessor control manual for more details.)

9 START-UP

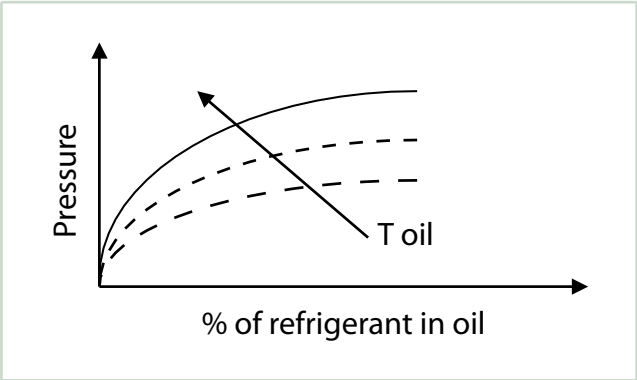
9.1 Preliminary checks

— Check that the cocks of cooling circuit, if present, are open;
— Check that the electrical connections have been made properly and that all the terminals **are securely tightened**. This check should also be included in a periodic six-month inspection;
— Check that the voltage at the RST terminals is 400 V ± 5% and make sure the yellow indicator light of the phase sequence relay is on. The phase sequence relay is positioned on the electric control board; if the sequence is not duly observed, it will not enable the machine to start;
— Make sure there are no refrigerant leaks that may have been caused by accidental impacts during transport and/or installation;
— Check the power supply to the crankcase heating elements, where present.

⚠ **ATTENTION**

The heating elements must be turned on at least 12 hours before the unit is started. This function is carried out automatically when the main switch is off. Their function is to raise the T of the oil in the sump and limit the quantity of refrigerant dissolved in it.

To ensure the correct operation of the heating elements, check that the lower part of the compressors is hot and in any case, that it is at a temperature 10-15°C higher than ambient temperature.



The diagram above illustrates a specific property [Charles' Law] of gases. which are more soluble in liquids as the pressure increases but less soluble as the temperature increases: if the oil in the sump is held at a constant pressure, an increase in oil temperature will significantly reduce the amount of refrigerant dissolved in it, thus ensuring that the lubricating function desired is maintained.

☞ **WARNING**

Check that the plumbing connections have been properly made according to the indications given on the plates to be found on the unit itself (proper inlet and outlet connections).

☞ **WARNING**

Check that the hydraulic system has been vented, bleeding any residual air, filling it gradually and opening the venting devices at the top - which the installer must have prepared in advance.

9.2 Start-up instructions for ENP water chillers

Water connections:
— Warning: The chiller is charged with HFC R410A – Group II EN 378 refrigerant (non-hazardous substances) conforming to the requirements of EEC regulation 2037/00.
— When making the plumbing connections, be sure to apply the inlet and outlet connections as indicated. In particular, be very careful not to invert condenser and evaporator circuits.
— Apply gate valves on the water side so that the chiller may be isolated from the plumbing system and install a mesh filter (accessible for inspection) on both the evaporator and condenser sides.
— Fill the hydraulic circuit, making sure to expel all the air present inside.

Electrical connections:
— Put on the main switch, turn the ½-turn locking screws of the electric enclosure and open it.
— Introduce the power cable 400/3/50+N through the hole provided on the left side of the unit and secure it in place with the cable holder.
— Connect the power supply and the earth cable to the terminals of the main disconnector switch.
— Put off switch "QF" of the compressor so as to be sure it will not start running in the wrong direction in the case of a phase sequence error.
— Only with basic control mCH2 – Position the Local/Remote selector (SLR) situated at the top middle of the electric board on LOCAL and switch on the power by turning the main switch (IG) to ON.
— Verify whether the phase sequence R-S-T is correct by checking, on the phase sequence relay situated in the middle of the electrical panel, that the green power on LED and yellow LED indicating the correct sequence both light up; if this does not occur, disconnect the power supply from the external distribution panel and swap over two phases; then repeat the operation. IN NO CASE SHOULD YOU TAMPER WITH THE WIRING DOWNSTREAM FROM THE MAIN SWITCH since this may alter the correct sequence of other devices, e.g. pump(s).
— Put the compressor switch "QF" back on

— Close the electric control board and lock it by means of the ½- turn locks.

Starting up:
— Check that all external cocks of the water circuit are open and water flows properly (the flow alarm should not be triggered);
— Put the main switch on the ON position;
— The (external) pump will start immediately;
— After 60 seconds the compressor will start;
— Check the water thermal differential (12-7°C to be detected by means of a thermometer on the inlet and outlet water pipes of the unit);
— Check that there are no leaks on the refrigerant side and water side;
— Using all the screws supplied, close the unit.

Use:
— Always consult the USER manual and the µChiller or pCO1 manual provided with the unit when undertaking maintenance and/or advanced set-ups.

9.3 Start-up

Before starting the unit, turn the main switch on, select the operating mode desired from the control panel and press the "ON" button on the control panel.

The group will start if an enabling signal is received:
— By the safety devices of the water circulation pump/s;
— By the flow switch (or differential pressure switch);
— By the T sensor measuring the temperature of the water returning from the system [chiller inlet];
— And no alarms have been triggered.

☞ **WARNING**

If the unit fails to start up, check whether the service thermostat has been set at the rated calibration values.

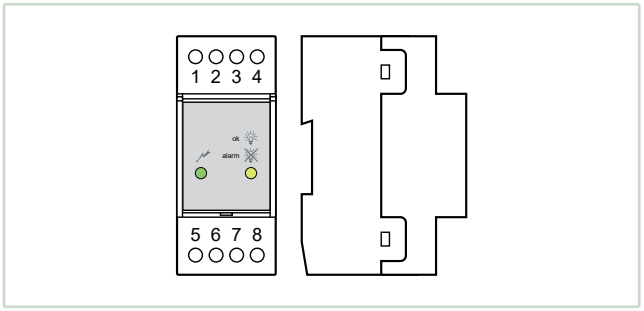
⚠ **ATTENTION**

You should not disconnect the unit from the power supply during periods when it is idle but only when it is to be taken out of service for a prolonged period (e.g. at the end of the season).

9.4 Checks

9.4.1 Inspections during operation

— Check the phase sequence relay on the control board to verify whether the phases occur in the correct sequence: if they do not, disconnect the unit from power supply and invert two phases of the incoming three-pole cable. Never attempt to modify internal electrical connections: any undue modifications will render the warranty null and void.



— Check that the temperature of the water entering the evaporator is close to the value set on the service thermostat.

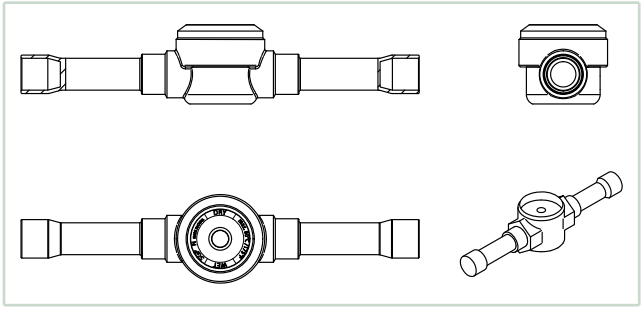
9.4.2 Refrigerant charge checks

— After a few hours of operation, check whether the liquid level indicator has a green crown: a yellow colour indicates the presence of humidity in the circuit. In such a case the circuit must be dehumidified by qualified personnel.
— Large quantities of bubbles should not appear through the liquid level indicator. A constant passage of numerous bubbles may indicate that the refrigerant level is low and needs to be topped up. The presence of a few bubbles is however allowed, especially in the case of high-glide ternary mixtures such as HFC R410A.
— Also check that the end-of-evaporation temperature shown on the pressure gauge (refer to the pressure gauge scale for the refrigerant R410A) is about 4°C lower than the temperature of the water leaving the evaporator.
— Make sure the overheating of the cooling fluid is limited to between 5 and 8 °C. To this end:
1. detect the temperature indicated by a contact thermometer placed on the compressor intake pipe;
2. read the temperature indicated on the scale of a pressure gauge likewise connected to the intake side; refer to the pressure gauge scale for the refrigerant R410A.

The difference between the temperatures determined in this way indicates the overheating value.

— Make sure that the undercooling of the cooling fluid is limited to between 3 and 5°C. To this end:
1. detect the temperature indicated by a contact thermometer placed on the compressor outlet pipe;
2. read the temperature indicated on the scale of a pressure gauge connected to the liquid inlet at the condenser outlet; refer to the pressure gauge scale for the refrigerant R410A.

The difference between the temperatures determined in this way indicates the undercooling value.



ATTENTION

All units of the ENP series are charged with R410A refrigerant except the versions with remote condenser which are charged with nitrogen. Any top-ups must be made using the same type of refrigerant. This operation is to be considered extraordinary maintenance work and must be performed by qualified personnel.

ATTENTION

The refrigerant R410A requires “POE” polyolester oil of the type and viscosity indicated on the compressor rating plate.

For no reason should oil of a different type be introduced into the oil circuit.

9.5 Group stop

To stop the unit press the “OFF” button on the front panel.

ATTENTION

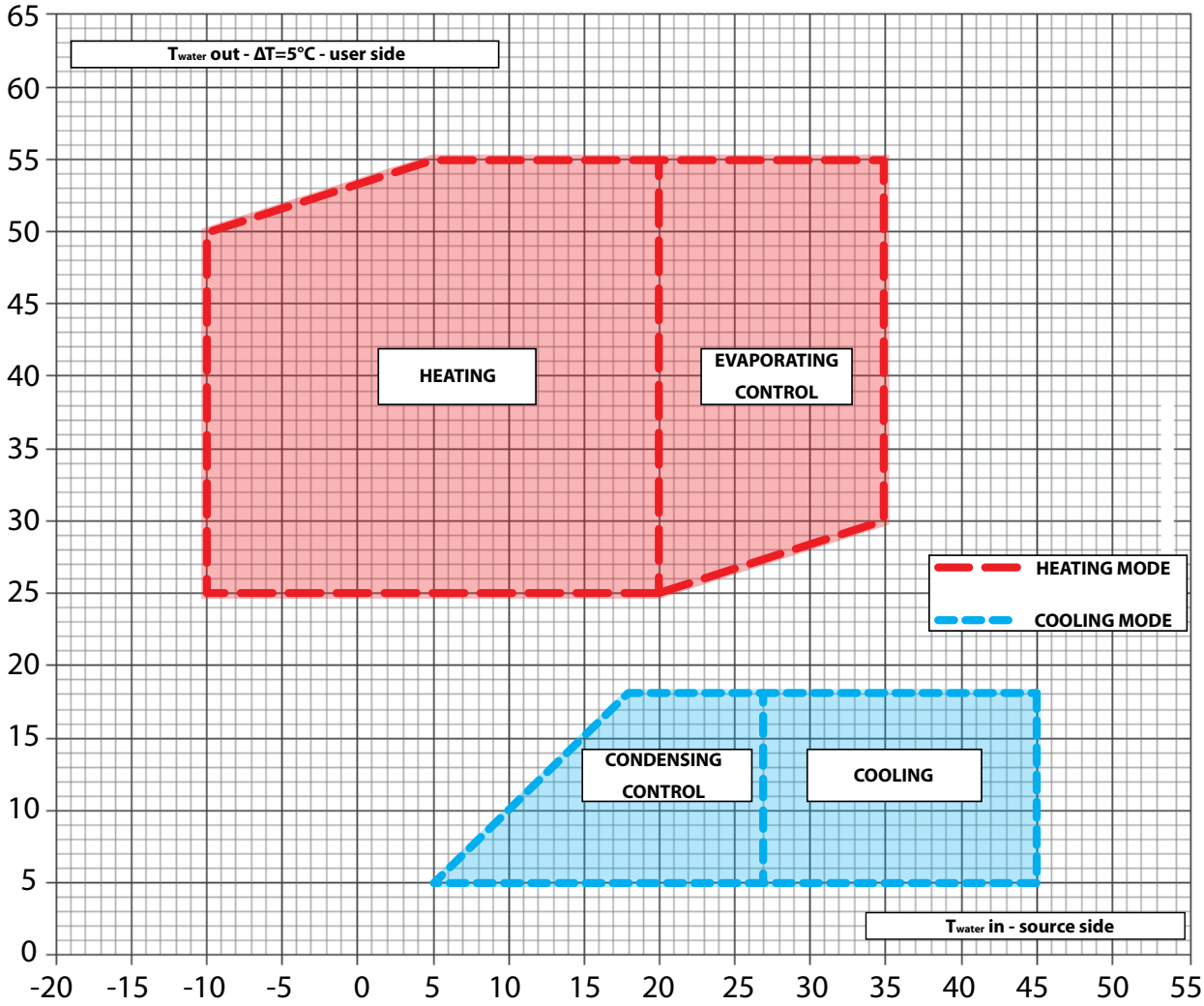
To stop the unit do not disconnect it using the main switch: this device must only be used to disconnect the unit from the power supply without current flow, i.e. when the unit is switched OFF.

Moreover, if you completely disconnect the unit from the electricity supply, the crankcase heating elements (where present) will receive no power, thereby jeopardising the integrity of the compressor the next time the unit is started.

10 OPERATING LIMITS

Operating limits of ENP chillers in relation to the outlet water temperature and water dew point.

» ENP unit operating range



Applications with water T above the specified limits require the use of R134a refrigerant fluid (on request). For details please contact the local HiRef dealer.

Water temperature	Minimum	Maximum	Notes
Evaporator inlet (cooling mode)	10	20	Without antifreeze products
Condenser inlet (cooling mode)	25	45	Below 15°C the condensation pressure control is required
Evaporator inlet(*) (heating mode)	9	35	Without antifreeze products
Condenser inlet(*) (heating mode)	25	50	Without antifreeze products

(*) in heat pump operation heat exchangers work on reverse function.

10.1 Glycol solutions

It is possible to produce water at temperatures below 5°C and as low as -10°C using glycol solutions that lower the freezing point according to the following table:

Minimum temperature of water produced	**5 °C**	**2°C**	**-1 °C**	**-5°C**	**-10 °C**
Percentage by weight of glycol	0 %	10 %	15%	25 %	30 %
Mixture freezing temperature	0 °C	-4 °C	- 8 °C	-14 °C	-18 °C

Given an equal volumetric flow rate of water, pressure drops will depend on the percentage of glycol, as shown in the following table:

Percentage by weight of ethylene glycol	0 %	10 %	15%	25 %	30 %
Reduction percentage of useful flow rate	0 %	-5 %	-8 %	-12 %	-15 %

Performance loss of the thermodynamic circuit is minor with up to 30% of glycol in the solution.

10.2 Operating limits

Thermal carrying fluid	water or mixture of water and max 30% glycol antifreeze
Maximum water side pressure	3 bars
Maximum pressure on high pressure side	42 bar-r
Maximum operating T	45 °C
Minimum operating T	-10°C
Maximum pressure on low pressure side	29 bar-r (*)
Supply voltage	+/- 10% compared to plate voltage
Maximum stocking T	+ 50 °C
Minimum stocking T	-20 °C (limit imposed by the built-in electronic components)

(*) this value can be reached only in storage conditions and determines the refrigerant saturation pressure of 30 bar-r on the low pressure side of the circuit, a value which in fact defines the limits.

10.3 Water flow to the evaporator

ATTENTION

The nominal flow rate is based on a thermal differential of 5° C between inlet and outlet water, in relation to the cooling capacity provided at the nominal water temperatures (12/7 °C).

WARNING

The maximum allowed flow rate is associated with a thermal differential of 3 °C. Higher flow rate values cause too big pressure drops.

WARNING

The minimum allowed flow rate is associated with a thermal differential of 8 °C. Lower flow rates could cause excessively low evaporation temperatures, which would trigger the safety devices and cause the unit to stop.

10.4 Water quality

The quality and chemical composition of the cooling and heat transfer medium have a great influence on the Lifetime and on heat transfer and thus on the performance of the ENP. Basically, all types of Avoid floating matter in the cooling and heat transfer medium. When the suspended matter accumulates in the heat exchanger the heat transfer and thus the performance of the ENP deteriorate. Below are the values of the dissolved substances and the water properties recommended by the manufacturer listed. The information refers to the use of exchangers made of copper, AISI 304 or AISI 316. If the concentration of some components will be out of range, the customer has to introduce a correction, otherwise the system will be out of warranty.

WATER CONTENT	CONCENTRATION
Alkalinity (HCO_3^-)	70 - 300 ppm
Sulphate (SO_4^{2-})	< 70 ppm
HCO_3^- / SO_4^{2-}	> 1.0 ppm
Electrical conductivity	10 - 500 µS/cm
pH*	7.5 - 9.0
Ammonium (NH_4^+)	< 2 ppm
Chloride (Cl^-)	< 30 ppm
Free chlorine (Cl_2)	< 0.5 ppm
Hydrogen sulphide (H_2S)	< 0.05 ppm
Carbon dioxide (CO_2)	< 5 ppm
Total hardness (°dH)	4.5 - 8.5
Nitrate (NO_3^-)	< 100 ppm
Iron (Fe)**	< 0.2 ppm
Aluminium (Al)	< 0.2 ppm
Manganese (Mn)**	< 0.05 ppm
Calcium carbonate ($CaCO_3$)	< 200 ppm
Phosphate (PO_4^{3-})	< 2 ppm
Ammonia (NH_3)	< 0.5 ppm
Temperature (°C)	< 65 °C
Oxygen content	< 0.1 ppm

*Generally a low pH value (less than 6) increases the risk of corrosion and a high pH (above 7.5) decreases the risk of corrosion
**Fe^{3+} and Mn^{4+} are powerful oxidants and may increase the risk of localized corrosion on stainless steel

11 SETTING OPERATING PARAMETERS

11.1 Main features

All the control devices are set and tested in the factory before the unit is dispatched. However, after the unit has been in service for a reasonable period of time you can perform a check on the operating and safety devices. The setting values are shown in the following Tables.

ATTENTION

All servicing of the equipment is to be considered extraordinary maintenance and may be carried out SOLELY BY QUALIFIED TECHNICIANS: incorrect settings may cause serious damage to the unit and injury to persons.

WARNING

The operating parameters and control system settings configurable by means of the microprocessor control are password protected if they have a potential impact on the integrity of the unit.

» Setting of ENP operating parameters

Control device	Set Point °C	Differential °C
Service thermostat - C	12	2
Service thermostat - H	40	2

» Setting of ENP safety device settings

Control device	Unit of measurement	Start up	Differential	Re-activation
Antifreeze thermostat	°C	+4	2	Automatic
Maximum pressure switch IV PED	bar	42,0	-	Manual
Security valve low pressure, IV PED	bar	29,0	-0 / +10%	-
Minimum pressure switch	bar	1,5	1,0	Automatic
Modulating condensation control device [optional]	bar	18	10	-
Time lapse between two starts of the same compressor	s	480	-	-
Flow switch alarm delay	s	20	-	-
Low pressure alarm delay	s	1	-	-

11.2 Setting operating parameters

11.2.1 Maximum pressure switch

The high pressure switch stops the compressor when the delivery pressure exceedsthe set value.

ATTENTION

Do not attempt to change the setting of the maximum pressure switch. Should the latter fail to trip in the event of a pressure increase, the pressure relief valve will open.

Resetting the high pressure switch must be done manually and only when the pressure has fallen below the value indicated by the set differential value (see Table " Setting of ENP safety device settings ").

11.2.2 Minimum pressure switch

The low pressure switch stops the compressor when the intake pressure falls below the set value for more than 120 seconds.
The switch is automatically reset when the pressure rises above the set differential (see Table " Setting of ENP safety device settings ").

11.2.3 Service thermostat

This device permits to enable and disable the compressors' operation as a function of the reading of the inlet water temperature of the chilling unit [return from the system].
For further details, refer to the microprocessor control manual.

11.2.4 Anti-freeze thermostat function

The antifreeze probe is located at the evaporator outlet and stops the compressor when the temperature goes below the set limit value. Together with the flow switch and low pressure switch, this device protects the evaporator from the risk of freezing as a result of faults in the water circuit.
For further details, refer to the microprocessor control manual.

11.2.5 Anti-recycle timer

The function of the timer is to prevent excessively frequent compressor starts and stops. This device imposes a minimum time lapse of 480 seconds between two compressor starts.
For further details, refer to the microprocessor control manual.

ATTENTION

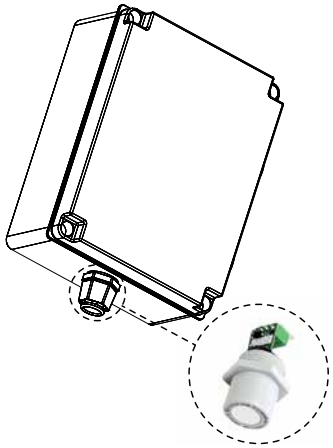
Never attempt to change the delay set in the factory: wrong settings could cause serious damage to the unit.

11.3 Refrigerant sensors (if “A2L-ready” and “R454B” refrigerant options present)

When the unit is provided with A2L-ready or R454B refrigerant options, refrigerant sensors are installed in all compressor boxes and in all separated sections of the electrical box.
The refrigerant sensor is composed by:
— A main and a remote control board
— One sensor cartridge for each control board (only for “R454B” refrigerant option)

Pay attention that in the “A2L-ready” configuration the refrigerant sensor cartridge is not present. For this reason, the unit can’t be operated with R454B refrigerant charge. If needed to charge the unit with R454B refrigerant, please see chapter 7.4 Refrigerant charge p. 45.
For the units provided with R454B refrigerant, the unit is equipped with sensor cartridges.
In addition to the gas sensor element and the measuring amplifier, the sensor cartridge also contains a processor for measured value processing. All data and measured values of the sensor element are stored in the processor fail-safe and are transmitted digitally via the digital interface to the control board.
The control board functions are communication and supply of the gas sensors.
In normal operating mode (measuring mode) there are no faults present, the gas concentration of the active sensors is continuously polled and checked for plausibility.
The device continuously monitors itself, the measurement signal, the alarm relay and the communication to the sensor head.
When the alarm evaluation is activated, the gas signal is checked with each measurement cycle, if ≥ or ≤ alarm threshold and if exceeding, the alarm LED and the alarm relay are triggered. If the value falls again below the alarm threshold minus the set hysteresis, the alarm is automatically cancelled.

» Refrigerant sensor A2L



12 MAINTENANCE

The only tasks to be performed by the end user are turning the chillers on and off and switching them between the cooling and heating functions as the seasons change.
All other operations are maintenance tasks and must be performed by qualified personnel who are able to operate according to the laws and regulations in force.

12.1 Warnings

ATTENTION

All the operations described in this chapter MUST ALWAYS BE PERFORMED BY QUALIFIED PERSONNEL.

ATTENTION

Before carrying out any work on the unit or accessing internal parts, make sure you have disconnected it from the mains power supply.

ATTENTION

The top part and the supply piping of the compressor are at high temperatures. Be especially careful when working close by with open panelling.

ATTENTION

Be especially careful when working in proximity to finned coils of the units since the 0.11 mm-thick aluminium fins can cause superficial injuries due to cuts.

ATTENTION

After completing maintenance jobs, always replace the panels enclosing the units and secure them with the fastening screws provided.

12.2 Main features

To make sure performance remains constant in time, it is recommended to respect the following maintenance and control schedule.

ACTION		MAINTENANCE FREQUENCY			
		1 month	3 months	6 months	1 year
UNIT	Check that no unusual noise is emitted by the machine and in particular, that there are no vibrations and/or beating.			✓	
AIR FILTERS	Check for dirt, damage, corrosion, and wear.	✓			
	Check the filter condition.	✓			
	Clean or replace if necessary.	✓			
	Perform checks more frequently in dusty environments.	✓			
	Check the efficiency of the differential pressure switch for dirty filters.			✓	
CONTROL SYSTEM	Check the correct installation and the wiring conditions.	✓			
	Check the operation of the LEDs of the display control system and of the alarms.		✓		
	Check the connections for electrical and mechanical operation.			✓	
	Check the functional elements (e.g. operating controls and display devices).			✓	
	Check electrical/electronic and pneumatic input signals (e.g. sensors, remote controllers, control variables) to conform to normal values.			✓	
	Check the valuesin the parameter list (see the Microprocessor Manual).				✓
	Adjust the control function and control signals. Check the software cycle running (see the Microprocessor Manual).			✓	

SWITCH BOOTH POWER SUPPLY CIRCUITS Caution: the electric cables and electrical components of the air conditioner are live.	Check the power supply in all phases.			✓	
	Check the electrical connections and the mechanical function. Restore if not properly tightened.			✓	
	Check the power supply of all the terminals.			✓	
	Measure power consumption at all connected devices.			✓	
	Check, adjust and tighten the functional elements (e.g. operating controls and display devices).			✓	
	Check the safety equipment, e.g. thermal switch. Replace every 2 years.				✓
	Check the protective covers.				✓
	Check the tightening of the electrical terminals both inside the electrical panel and in the compressor terminal blocks. The mobile and fixed contacts of the contactors must be periodically cleaned and, if they show signs of deterioration, they must be replaced.				✓
REFRIGERATION CIRCUIT Fluoride based refrigerants increase the greenhouse effect and are expected to conform to restrictions and regulations, according to national and European standards.	Measure the pressures and working temperatures (to be performed by a refrigeration technician).			✓	
	Check the energy consumption, measure the heat temperature and check for unusual noise during operation.			✓	
	Make sure there is no frost formation in the evaporator and in the compressor.		✓		
	Check the operation of all the adjustment devices (power regulators, valves, etc.).	✓			
	Check the efficiency of the actuators.				✓
	Check the operation of the safety devices.			✓	
	Check the refrigerant charge, the liquid level indicator and the operating parameters (undercooling, overheating, high and low pressure, degree of valve opening). If the amount of refrigerant is not sufficient, it must be restored by refilling with fresh refrigerant.			✓	
	Check the oil level through the appropriate viewing windows.		✓		
	Perform a test to check the oil internal humidity level.				✓
	Check the enclosure heater operation.			✓	
	Check the humidity indicator on the liquid indicator (green = dry, yellow = wet); if the indicator is not green, as shown by the indicator sticker, replace the filter.			✓	
CHILLED WATER CIRCUIT	Check the filling of the hydraulic circuit, by venting it from the valves placed at the highest points.			✓	
	Make sure that there are no water leaks.			✓	
	Check for any air in the circuit: bleed air from the cooling water circuit using the special valve in the top part of the circuit.			✓	
	Check that chilled water supply is guaranteed.			✓	
	Check the water temperature and pressure at the inlet and outlet using thermometers and pressure gauges - if installed.			✓	
	Check the efficiency of the actuators.				✓
	Make sure that the system is filled with the prescribed amount of glycol and that there is no ice in the hydraulic circuit.			✓	
	In the event that there is a water leak and the circuit must be filled, make sure that the glycol concentration is correct.			✓	
	Check that the water circulation is as required.			✓	
	If the unit is expected not to be in operation for a long time, drain the water from the pipes and the machine. This operation is mandatory if ambient temperatures are expected to fall below the freezing point of the fluid used, during the unit down time.				
	Clean the external metal filters in the hydraulic lines.			✓	
	Check the efficient operation of the flow switch or differential pressure switch.			✓	
REFRIGERANT SENSORS (only if “A2L-ready” and “R454B” refrigerant options selected)	Check for maintenance.		✓		
	Visual inspection of the device including cable for damage, vandalism etc.		✓		
	Remove dust deposits etc. with a dry cloth, especially at the gas inlet.		✓		
	Clean of the gas inlet filter.		✓		
	Sensor cartridge replacement.				✓

12.3 Refrigeration circuit repairs

ATTENTION

During any repairs to the refrigeration circuit or compressor maintenance, minimise the opening time of the circuit. Even short exposure times of the ester oil to ambient air will cause the absorption of large amounts of moisture by the oil with the resulting formation of weak acids.

If the refrigeration circuit has been repaired, the following operations must be carried out:
— Leak test;
— Vacuum and drying of cooling circuit;
— Refrigerant charge.

ATTENTION

If the system needs to be drained, always collect all the refrigerant present in the circuit using suitable equipment, by working exclusively in the liquid phase.

12.4 Leak test

Fill the circuit with anhydrous nitrogen supplied from a tank with a pressure-reducing valve until the pressure rises to 28 bars.

ATTENTION

During the pressurisation phase, do not exceed a pressure of 28 bars-r on the low pressure side.

The presence of any leaks must be determined using special leak detectors. Should any leaks be detected during the test, empty out the circuit before repairing the leaks with suitable alloys.

DANGER

Do not use oxygen in the place of nitrogen as a test agent, since this would cause a risk of explosion.

12.5 Refrigerant sensors maintenance (only if A2L-eady and R454B refrigerant options selected)

It is obligatory to perform maintenance regularly in order to maintain safety, measuring and warning functions of the device. The maintenance includes visual, functional and system inspections and must only be carried out by appropriately qualified personnel.

When carrying out maintenance and repair work according to the user manual, only use original spare parts from MSR-Electronic. Repairs or changes of the warning devices not complying with the maintenance manual or carried out by unauthorized persons can affect proper equipment and safety features and always result in a termination of the manufacturer's warranty and certificates.
For regular maintenance und calibration of the sensor by trained technicians we recommend contacting Eneren Technical Support.
According to EN 45544-4, inspection and service has to be executed at regular intervals. The maximum intervals have to be determined and observed by the person responsible for the gas warning system according to the legal requirements. It is recommended to apply the inspection and maintenance intervals as prescribed in the general regulations of the gas measuring technique like EN50545, VDI-2053, EN 60079-29-1 etc. The inspection interval normally is three months.

During inspection it has to be checked in particular:
— Maintenance / calibration interval not exceeded;
— Visual inspection of the device including cable for damage, vandalism etc;
— Remove dust deposits etc. with a dry cloth, especially at the gas inlet;
— The filter at the gas inlet has to be replaced if extremely dirty.

Calibration of the sensor cartridge during commissioning/ inspection is only required if the calibration date is no longer current.
When the calibration period exceeds, it is recommended to contact Eneren Technical Support to have a new sensor cartridge.

12.6 Exchange of Sensor Cartridge (only if R454B refrigerant option selected)

The replacement of an old sensor cartridge with a new and calibrated one has to be performed every 12 months.
The substitution of the sensor cartridge has to be done by Eneren authorized technicians.

ATTENTION

The communication of the local bus (Sensor Cartridge <> control board) is continuously monitored during operation and results in an immediate error message on the gas controller in case of fault or interruption.

When replacing the sensor unit, the communication of the local bus is also interrupted when unplugging the sensor cartridge connector which leads to an immediate triggering of the error message.
— Disconnect the SC connector from the Base control board (BCB) or the Remote control board (RCB) (error message will be activated).
— Loosen the locknut.
— Remove used Sensor cartridge.

— Take calibrated Sensor cartridge out of the original packaging, check for gas type, measuring range and valid calibration date.
— Insert the Sensor cartridge and retighten with lock nut.
— Insert the Sensor cartridge plug into the socket at the BCB or RCB. Check plug for proper engagement.

The local bus communication is automatically established and tested. At the same time the gas type and the measuring range of the “new” Sensor cartridge are compared with the data stored in the BCB. If they match and the communication is correct, the error message will be automatically reset at the controller.
The date for the next maintenance has to be affixed to the sensor.

12.7 High vacuum and refrigeration circuit drying

To achieve a hard vacuum in the cooling circuit it is necessary to use a pump capable of generating a high degree of vacuum, i.e. 150 Pa of absolute pressure with a capacity of approximately 10 m3/h. If such a pump is available, one evacuation will normally suffice to achieve an absolute pressure of 150 Pa.
When a suitable vacuum pump is not available or when the circuit has been open for long periods of time, it is strongly recommended to follow the triple draining method. This method is also indicated when there is moisture in the circuit.

☞ **WARNING**

The vacuum pump should be connected to the inlets.

The procedure to be carried out is as follows:
— Evacuate the circuit until you reach an absolute pressure of at least 350 Pa. At this point inject nitrogen into the circuit until you reach a relative pressure of about 1 bar;
— Repeat the step described above;
— Repeat the operation described in the point here above for the third time, now trying to achieve the hardest possible vacuum condition.

Using this procedure you can easily remove up to 99% of pollutants.

12.8 Recharging with refrigerant R410A

— Connect the tank of refrigerant gas to the male 1/4 SAE inlet situated on the liquid line after discharging a little gas to eliminate air in the connection pipe;
— Fill with refrigerant in liquid form until you reach 75% of the total charge;
— Then connect to the inlet on the pipe between the thermostatic valve and evaporator and complete the charging process with the refrigerant in liquid form until no more bubbles can be seen on the liquid level indicator and the operating parameters specified in this manual have been reached.

☞ **WARNING**

Introduce refrigerant through the inlet in the liquid line.

⚠ **ATTENTION**

A unit that was originally charged with R410A in the factory cannot be charged with R22 or other refrigerants without the written authorisation of manufacturer.

13 SUBSTITUTION OF R410A WITH R454B REFRIGERANT

In the units provided with A2L-ready option, it is possible to substitute the R410A refrigerant with the new generation refrigerant R454B.

All the actions connected to the refrigerant substitution must be performed by authorized technicians, who will:
— certify the correct execution of the charging process;
— check for the correct start-up and operation of the refrigerant sensors;
— provide a new silver label to replace the old one.

Please contact Eneren Support Team to organize the substitution process.

14 TROUBLESHOOTING

On the next pages you will find a list of the most common causes that may cause the chilling unit to fail or malfunction. These causes are broken down according to easily identifiable symptoms.

ATTENTION

You should be extremely careful when attempting to implement any of the possible remedies suggested: overconfidence can result in injuries, even serious ones, to inexpert individuals. Therefore, once the cause has been identified, you are advised to contact the manufacturer or a qualified technician for help.

FAULT	ANALYSIS OF POSSIBLE CAUSES	CORRECTIVE ACTIONS
The unit does not start	No electrical power supply.	Check its presence both on the primary and auxiliary circuit.
	The circuit board is not powered.	Check the fuses.
	There are alarms present.	Check the microprocessor panel for the presence of alarms, eliminate their cause and restart the unit.
	The phase sequence is wrong.	Invert two phases in the primary power line after disconnecting them upstream from the unit.
The compressor is noisy	The compressor is rotating in the wrong direction.	Check the phase sequence relay. Invert the phases on the terminal board after disconnecting the unit and contact the manufacturer.
Presence of abnormally high pressure	Insufficient flow of water to the condenser.	Check for any clogging in the water circuit.
		Check the compressor inlet water T.
		Check the condensation control device [optional].
	Presence of air in the refrigerant circuit, as revealed by the presence of bubbles in the flow indicator also with undercooling values exceeding 5 °C.	Drain and pressurise the circuit and check for leaks. Evacuate slowly [for more than 3 hours] until reaching a pressure of 0,1 mBar and then recharge in the liquid phase.
	Unit overcharged. As revealed by an undercooling of more than 8 °C.	Drain the circuit.
	Clogged thermostatic valve and /or filter. Such faults may occur in the presence of low pressure.	Check the temperatures upstream and downstream from the valve and filter and replace them if necessary.
	Insufficient water flow rate if heat pump is operating.	Check the water circuit for pressure drops and/or whether the pump is working properly [direction of rotation]. Check the outgoing water T and make sure it is less than or equal to 50°C.
Low condensation pressure	Faulty transducers.	Check the setting of the condensation control device [optional].
	Water T too low.	Install the condensation control device.
Low evaporation pressure	Low water flow rate.	Check whether the pumps are rotating in the right direction. Check the water system for pressure drops.
	Malfunctioning of thermostatic valve.	Warming the bulb with your hand, check whether the valve opens and adjust it if necessary. If it does not respond, replace it.
	Filter clogged.	Pressure drops upstream and downstream from the filter should not exceed 2°C. If they do, replace the filter.
	Low condensing temperatures	Check the efficiency of the condensation control device [where present].
	Low level of refrigerant	Check the refrigerant level by measuring the degree of undercooling; if it is below 2°C replenish the charge.
The compressor does not start	The internal thermal protection has tripped.	Check the status of the thermal contact in models equipped with protection modules. Identify the causes after restarting.
	Tripping of circuit breakers or fuses in line after short circuit.	Check the cause by measuring the resistance of the individual coils and the isolation towards the chassis before re-connecting the power.
	Intervention of HP or LP switches.	Check on the microprocessor, eliminate the causes.
	The phases in the distribution cabin have been inverted.	Check the phase sequence relay, then invert the phases upstream from the main switch.
High evaporation pressure	Too high water temperature.	Check the thermal load and/or efficiency of the thermostat function.
		Check the efficiency of the thermostatic valve.

15 RETIRING THE UNIT

When the unit has reached the end of its working life and needs to removed and replaced, a series of operations should be carried out:
— the refrigerant gas it contains should be recovered by specialised personnel and sent to a waste collection facility;
— The lubricating oil in the compressors should also be recovered and sent to a waste collection facility;
— If the framework and components cannot be reused, they must be separated and scrapped according to the type of material: this applies especially for the considerable quantities of copper and aluminium present in the unit.

This will make the job of waste collection, disposal and recycling facilities easier and minimise the environmental impact of the dismantling.

⚠ **ATTENTION**

The unit, or a part of it, should be decommissioned. The parts liable to cause any hazard must be rendered harmless.

Special and toxic-harmful waste must be collected by authorised companies.

Disposal of special and toxic or harmful waste must be carried out in compliance with the law provisions in force in the user's country.

Dismantling, disposal and scrapping operations must be carried out by qualified personnel.

☞ **WARNING**

Remember that whenever a part is replaced and the used part must be disposed of separately, always refer to the relative laws in force.

Please note that it is mandatory to record the loading and unloading of special and toxic-harmful waste.

Dismantle the unit according to the requirements imposed by law in force in the user's country. Before demolishing the unit, ask the relative Authority to perform an inspection and issue a report.
Lastly, scrap the unit in compliance with the applicable laws in the user's country.

15.1 Waste electrical and electronic equipment management

This product falls within the application scope of the Directive 2012/19/EU concerning the management of waste electrical and electronic equipment (WEEE).

⚠ **ATTENTION**

Equipment must not be disposed of with household waste as it is made of different materials that can be recycled at special facilities. Please inquire through your municipal authorities as to the location of the eco-friendly waste management sites where waste can be received for disposal and its subsequent recycling as recommended.

Read the instructions carefully before using the equipment for the first time. It is strongly recommended not to use the product for any purpose other than that for which it was designed, to prevent the risk electric shock if the product is used incorrectly.

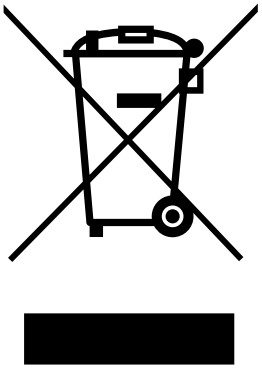
Furthermore, please note that, when an equivalent appliance is purchased, the seller is expected to collect free of charge the old product to be disposed of.

☞ **WARNING**

The product is not potentially dangerous for human health and the environment, as it does not contain any harmful substances according to the Directive 2011/65/EU (RoHS), but if disposed of freely in the environment, it might adversely affect the ecosystem.

The crossed-out wheelie bin symbol on the equipment label indicates that the equipment is compliant with the Waste Electrical and Electronic Equipment (WEEE) Directive.

Disposing of the equipment freely in the environment or illegally disposing of the equipment are punishable by law.



15.2 Environment protection

The law implementing the regulations [reg. EEC 2037/00] which govern the use of ozone-depleting substances and greenhouse gases bans the dispersal of refrigerant gases in the environment and requires whoever is in their possession to recover them and, at the end of their useful life, either to return them to the dealer or take them to a suitable waste disposal facility.
The refrigerant, although not harmful to the ozone layer, is listed among the substances responsible for the greenhouse effect and must therefore be used in compliance with the above obligations.

⚠ **ATTENTION**

Therefore, special care should be taken when carrying out maintenance work to minimise refrigerant leaks.

15.3 Packaging disposal

The QR Code below is shown on a label on the packaging of the machine, which allows the user to identify the nature of the packaging used in order to follow the correct disposal procedure.

ATTENTION

For disposal of packaging, always refer to local laws that implement Directives 2018/851/UE and 2018/852/UE.

16 SAFETY DATA SHEET OF REFRIGERANT

For refrigerant fluid safety data sheet, please refer to the documents supplied with the unit.

Viale Spagna, 31/33 - 35020 Tribano (Padova) - Italy
Ph. +39 049 9588511 - Fax: +39 049 9588522 - info@eneren.it
- www.eneren.it