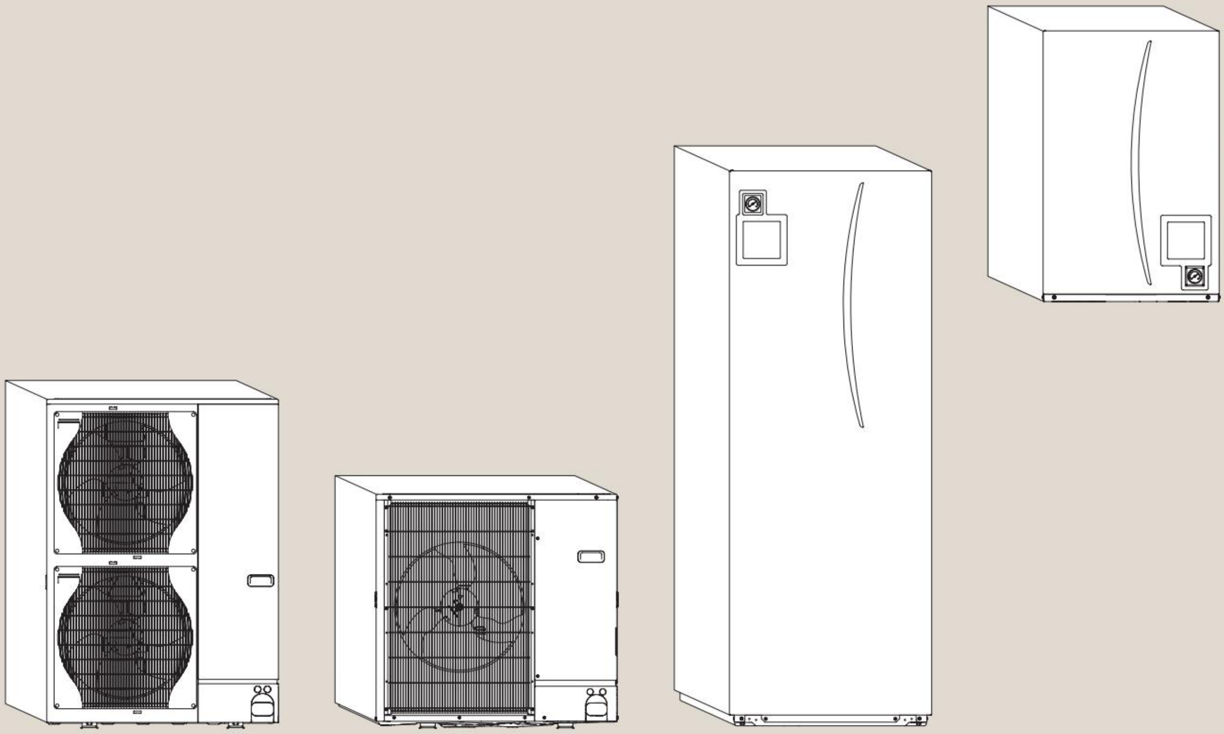
Living Environment Systems



Ecodan

Planning Guide 2021

mitsubishi-les.com

Knowledge at work.

Contents

1. Introduction

1.1 About this planning manual

In the Ecodan planning manual you will find important information for planning and designing a heat pump system from Mitsubishi Electric. In addition to the detailed description of the system components, you will receive comprehensive information about the functions and settings of the Ecodan heat pump controller. Electrical plans and hydraulic diagrams complement the design manual, making it a comprehensive collection of information that describes heat generation, storage, distribution and transfer as needed.

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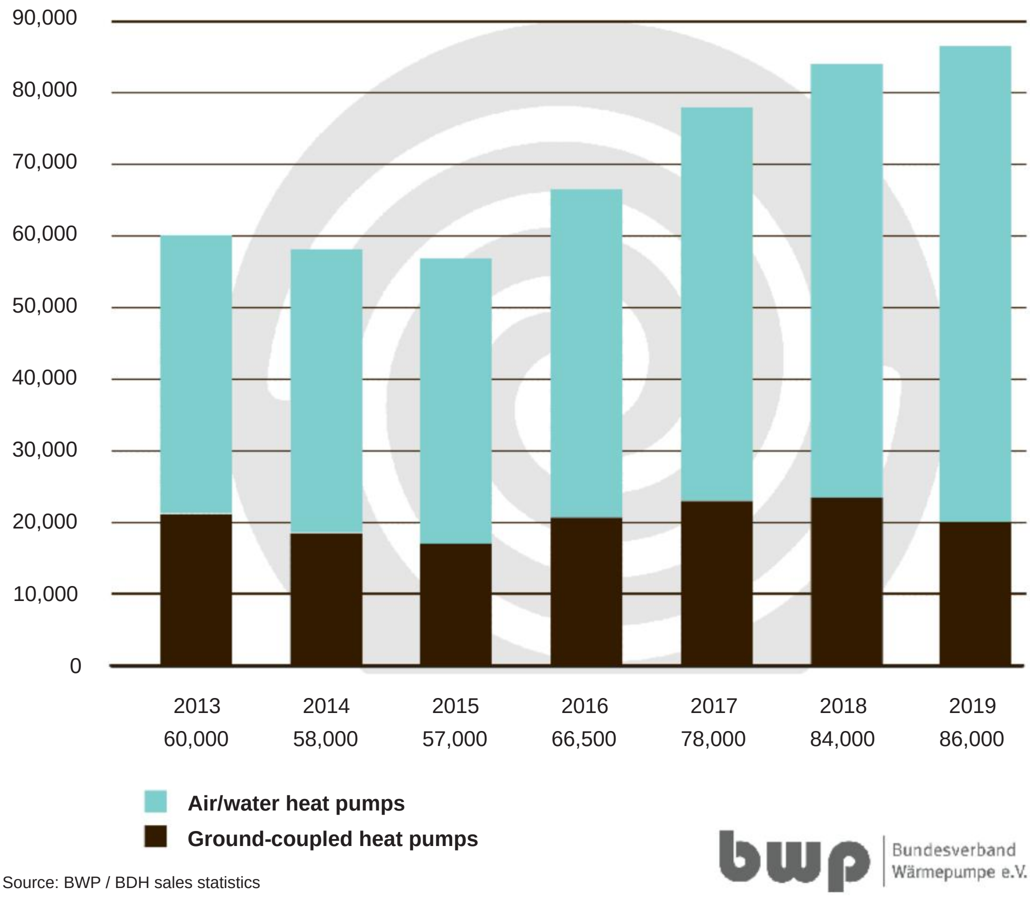
1.2 Potentials and opportunities of heating technology

In order to achieve the ambitious EU climate protection targets by 2030, energy consumption and greenhouse gas emissions must be significantly reduced. At the same time, the share of renewable energies in Germany is to be increased significantly - from around 25% today to 80% in 2050.
German households now consume around a quarter of the final energy in Germany, so the key to the success of this pioneering project largely lies in the modernization of heating systems. However, it is not just the individual components that need to be considered.
Only the entire system of heat generation, storage, distribution and transmission with optimally designed and coordinated components can fully exploit the savings potential.
The use of heating systems that do not use fossil fuels significantly reduces CO_2 emissions and thus contributes to achieving environmental protection goals. The progressive abandonment of the use of natural gas and heating oil to heat buildings will lead to ever lower carbon sales in the medium term. Under the heading of “decarbonization,” electricity-powered heating systems are becoming more and more important, which is becoming visible in the political context.

With a heat pump you are choosing innovative heating technology with a future.
Our environment is full of energy. In order to be able to use them for a heating system, heat pumps are increasingly being used. They draw energy directly from the environment and bring it to a temperature level at which space heating and hot water preparation can be achieved comfortably. In doing so, they obtain significantly more energy from the environment than is used for operation.
Excellent efficiency, trouble-free continuous operation and, last but not least, the price development for fossil fuels are convincing more and more people to use free environmental energy as a heat source.

With a heat pump you are choosing innovative heating technology with a future.

Sales figures for heating heat pumps in Germany 2013 to 2019



Source: BWP / BDH sales statistics

1.3 Ecodan – The technological advantage

Ecodan heat pumps can provide a total of 4/4 heating heat from 3/4 solar energy stored in the environment and 1/4 drive current or less. Modern technologies, such as the Zubadan inverter compressors, ensure highly efficient operation even under demanding climatic conditions. This advantage, which is unique on the market, makes Ecodan heat pumps an absolutely reliable heating solution with an almost unlimited range of uses in new buildings and modernization.

With the Ecodan systems, Mitsubishi Electric offers an all-round convincing offer for anyone who wants a sustainable Heating without ifs and buts is looking for:

- Highly efficient heat pump technology that reliably generates up to 75% of the energy required from the environment.
- Easy integration into the domestic heating and hot water circuit thanks to high flow temperatures and tailor-made hydro and storage modules.
- Maximum flexibility when setting up the outdoor unit and installing it for an almost unlimited range of applications New construction and modernization.

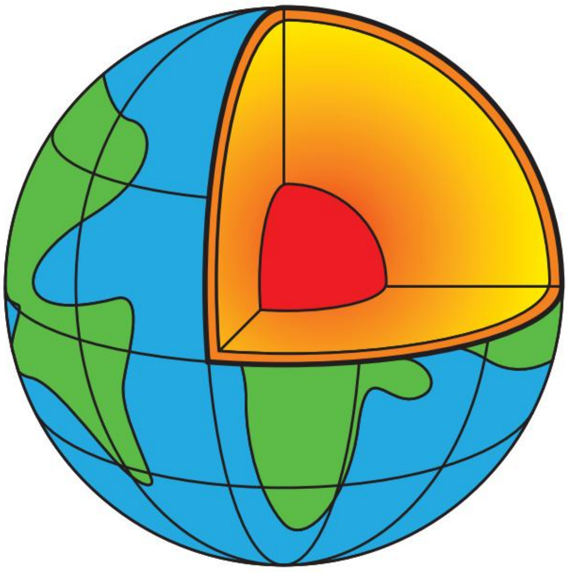
1.4 Energy source: outside air

The outside air is particularly easy to use as an energy source because it is a huge energy store that is always available in sufficient quantities almost everywhere. An air/water heat pump can easily use this energy - without any official approvals and without complex construction work, such as: B. Drilling or laying underground collectors. This saves significant investment costs, simplifies installation and accelerates amortization.

With significantly more than half of heat pump sales, the air/water variant has firmly established itself on the market.
This positive development will continue to grow in the coming years. On the one hand, because the efficiency advantages compared to conventional systems will become increasingly important. On the other hand, due to the easy handling, which enables the use of air/water heat pumps almost everywhere - in new buildings and modernizations. And finally thanks to the smooth, extremely low-maintenance operation, which ensures long-term security in the supply of heat.

1.5 Energy source soil

Our earth is a gigantic heat reservoir. Its core is hot up to 6,000 °C. Additionally, natural decay creates from radioactive elements in the Earth's mantle. Overall, the Earth radiates 2.5 times more energy into space every day than the entire human race needs. A geothermal heat pump takes advantage of this fact. Below 15 meters there are constant temperatures of around 10 °C at all times of the year, which increase by around 3 °C per 100 meters as depth increases. This is more than enough to heat buildings with a heat pump and supply them with hot water.



A geothermal heat pump collects the natural heat from the ground to supply buildings with energy. Thermal energy is extracted from the underground via a geothermal probe or a geothermal collector and used in the heat pump for the heating circuit.

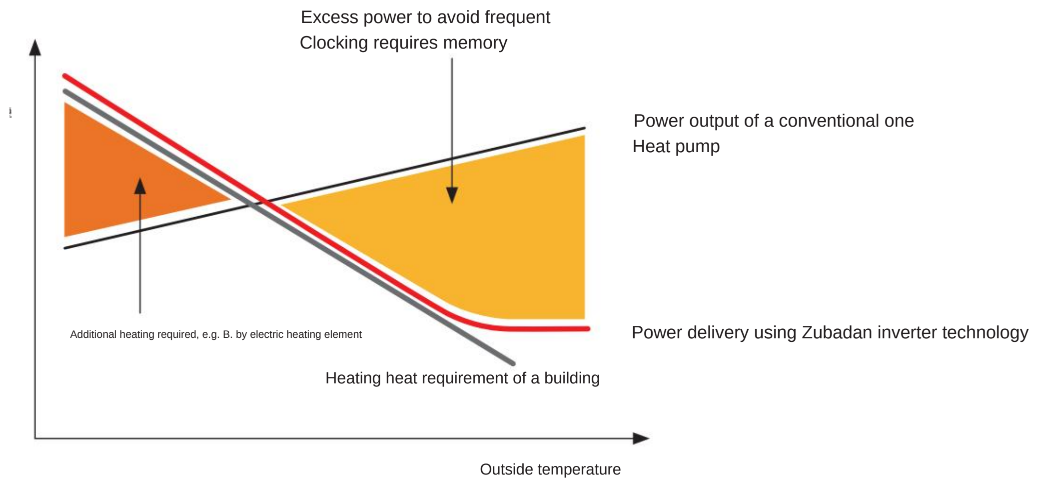
1.6 Advantage of inverter technology

1.6.1 Maximum efficiency through precise power dosing

In order for a heat pump to work efficiently, its output must be able to be regulated as precisely as possible. This is because it should work in the optimal performance range in the winter when there is a high heating load and still heat drinking water economically in the summer. Such different performance requirements cannot be achieved by simply switching the entire system on and off.

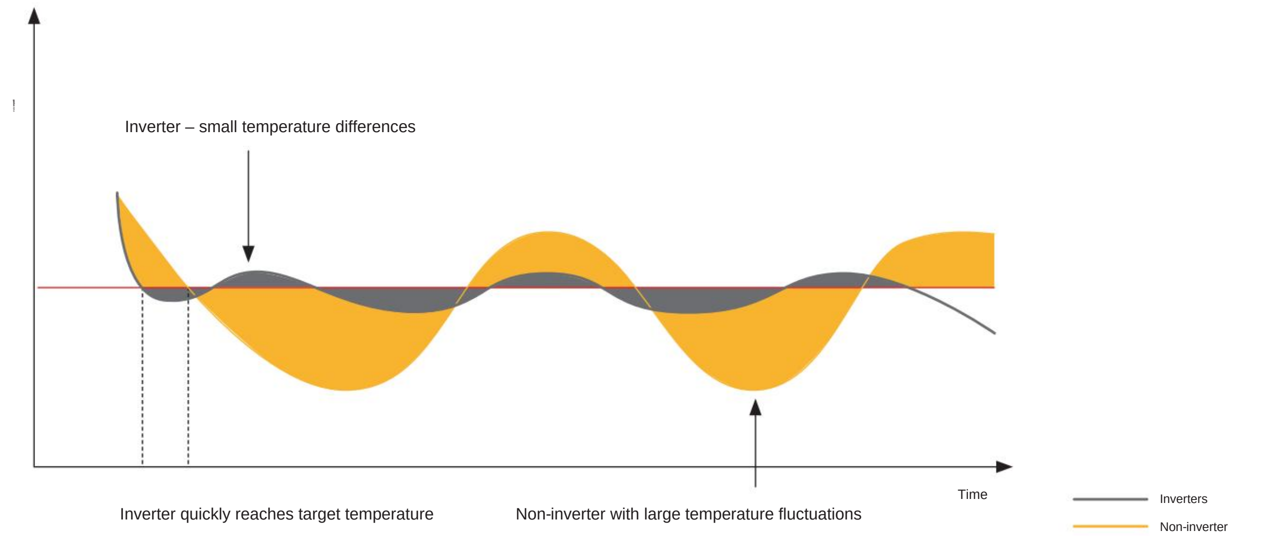
1.6.2 Inverter from technology leader Mitsubishi Electric

Modern heat pumps therefore have so-called inverter technology in order to adapt their performance as precisely as possible. Essentially, the compressor is continuously regulated. On the one hand, the power consumption of the compressor is influenced and, on the other hand, the heating output of the entire system is controlled. With over 35 years of experience in research, development and application, Mitsubishi Electric is the global technology leader in the field of inverter technology - and supplies the air conditioning, refrigeration and heat pump industries with components and products.



The Zubadan inverter technology ensures power output as needed.
In this way, inefficient additional heating and excess power or cycling can be prevented across the entire outside temperature spectrum.

The advantages of this special expertise are reflected directly in the Ecodan heat pumps: By using the latest generation of Mitsubishi Electric compressors, Ecodan heat pumps have a technological advantage that is unique on the market. There are currently three different heat pump product series in use.



Inverter technology ensures that the desired temperature is reached quickly and precisely. In this way, complex readjustments, large temperature fluctuations and the associated loss of efficiency are reliably minimized.

Power inverters

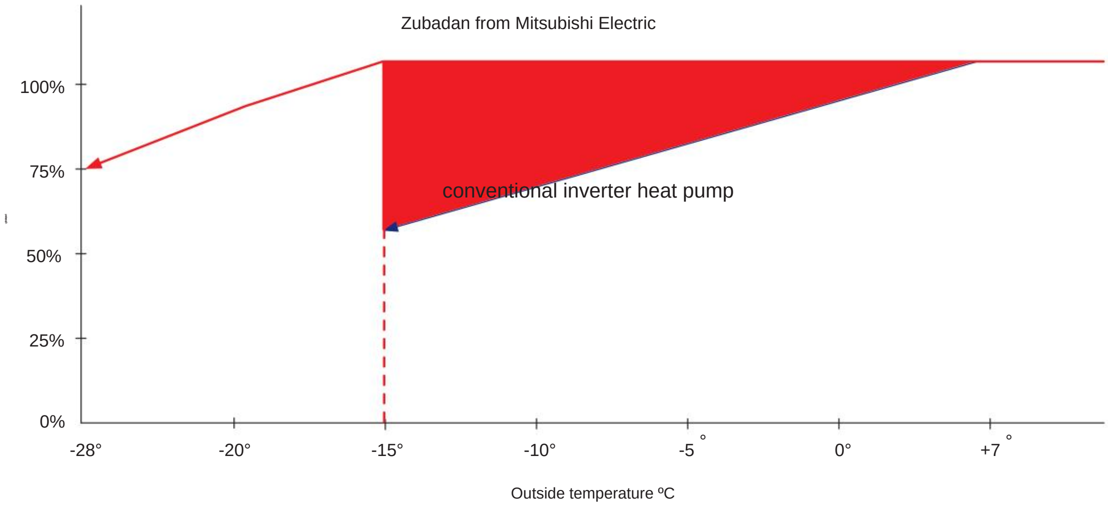
The Power Inverter series is specially designed for use down to -20 °C. With a max. 60 °C flow temperature down to -3 °C and a max. 55 °C up to -10 °C outside temperature, they offer a high level of heating comfort. A special power receiver for subcooling the refrigerant in combination with two individually controlled expansion valves achieves optimal heating performance with particularly energy-saving operation. Typical areas of application for the power inverter are new buildings and existing buildings with good insulation and large heating surfaces, such as underfloor heating.

Zubadan inverter

The patented Zubadan inverter technology represents the current optimum in heat pump technology. The Zu-badan refrigeration circuit with HIC subcooler and flash injection compressor can keep the refrigerant mass flow stable even at low outside temperatures. This means that the system can provide full heating output even at -15 °C. And even at -28 °C, the Zubadan heat pump can still be operated reliably and efficiently. This means that a complex dimensioning of the system with a buffer storage for heating operation is absolutely unnecessary thanks to Zubadan technology.

ECO inverter

The Eco Inverter is a heat pump specially optimized for new buildings with a large evaporator area for high performance figures. With a maximum flow temperature of 60 °C and a guaranteed application range of up to -20 °C outside temperature, the Eco Inverter is particularly suitable for low-energy houses. In combination with the Ecodan storage module, up to 500 liters* of drinking hot water (mixed water temperature 40 °C) can easily be provided and can therefore very comfortably supply four people in a single-family home. The compact design also allows for flexible installation, which is often required in densely built-up residential areas.



With reliable heat pump operation even at -28 °C and full heating output down to -15 °C, the patented Zubadan inverter technology has significantly greater performance potential than conventional systems.

Thanks to high flow temperatures of 60 °C, Ecodan heat pumps with Zubadan inverters achieve excellent efficiency values even with conventional radiator heaters. This makes Zubadan the first choice in the modernization segment. No matter what requirements a building has, Zubadan inverters deliver efficient peak performance at any outside temperature.

The optimized defrosting behavior also contributes to the extreme reliability of the Zubadan systems. The outside temperature, the surface temperature of the evaporator, the running time and the duration of the defrosting process are combined in an intelligent logic. This meant that the intervals between defrosting processes could be extended up to 150 minutes and the duration of each individual process could be reduced by up to 50% compared to conventional devices.

1.7 Zubadan technology in detail

The heating output and efficiency of a heat pump depend largely on the temperature difference between the heat source and the heating system. This is particularly true for heat pumps that draw their energy from the outside air. This has a significant influence on the pressure conditions in the refrigeration circuit and leads to a reduction in heating performance at low temperatures. However, using a process in which refrigerant is injected into the compression process via a bypass, the loss of performance can be prevented and thus solve the problem of pressure and, as a result, loss of performance at low outside temperatures.

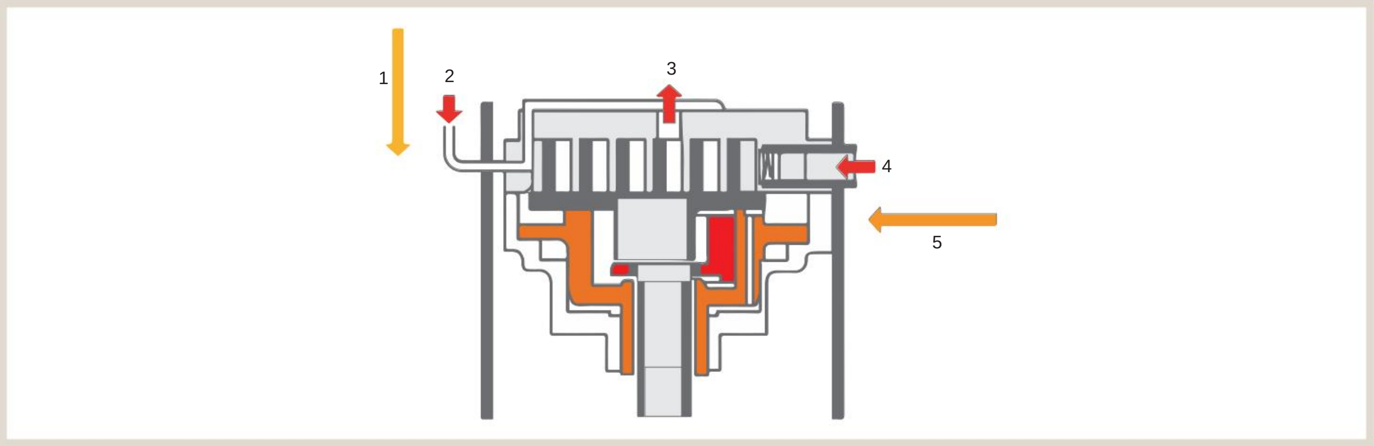
Commercial use at low outside temperatures with Zubadan technology

1.7.1 Technical implementation

The consequence of the temperature-related pressure drop is that less refrigerant is available on the suction side of the compressor for the compression process and for cooling the compressor. This increases the risk that the hot gas temperature will reach its critical range (approx. 120 °C), which can lead to damage to the system. To protect against excessively high hot gas temperatures, the compressor works at a constant maximum speed and thus causes the heating output to drop. The insufficient refrigerant mass flow and the overheating of the compressor lead to a significant drop in performance when outside temperatures fall.

A technically very complex but at the same time very effective method is the intermediate injection of refrigerant into the compression process. The refrigerant is injected directly into the compressor to compensate for the temperature-related pressure drop and to provide additional cooling of the compressor. Two different injection methods can be used for this.

Refrigerant injection



Legend
1 refrigerant stream
2 injection opening
3 exit opening
4 suction opening
5 Normal refrigerant flow

On the one hand, there is the possibility of injecting the refrigerant in a liquid state into the compression process. The advantage: This allows the hot gas temperature to be reduced, but the energy requirement of the compressor increases disproportionately. As a result, this leads to a constant heating output, but also to a lower efficiency.

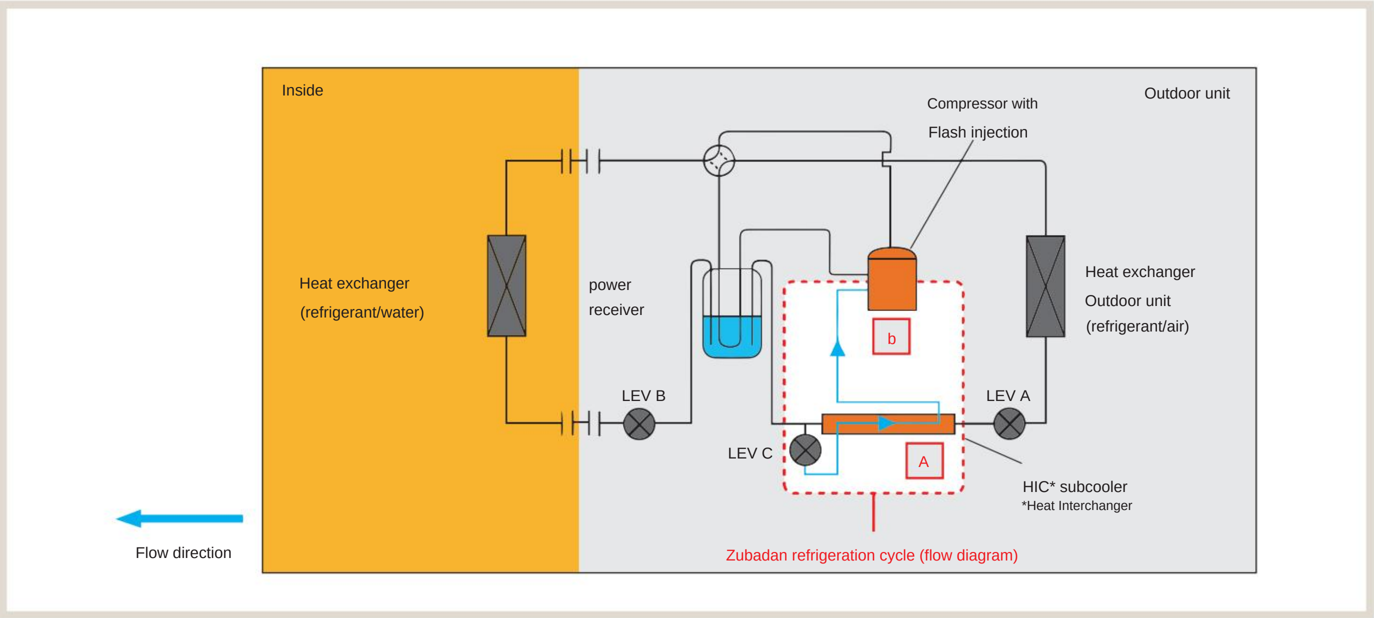
The other option is to inject the refrigerant in a gaseous state. This allows the temperature in the compression process to be reduced. As a result, the enthalpy of the refrigerant decreases, which reduces the overall heating output.

1.7.2 Principle of flash gas injection

The ideal solution is a combination of the two injection methods, which makes it possible to solve the problem of slowed refrigerant flow. This further developed injection process - the so-called flash gas injection - combines the advantages of these two processes by adapting the state of the injected refrigerant to the optimal operating point.

Flash gas injection (see figure below) is used in heat pumps that are equipped with Zubadan technology. With this globally patented process, the refrigerant is injected into the compressor depending on demand from an outside temperature of 3 °C and lower. In terms of technical structure, the system consists of a bypass with a heat exchanger, the so-called HIC circuit, which removes part of the liquid refrigerant from the process after condensation and partially evaporates it in the HIC subcooler. The refrigerant is sub-cooled and then fed into the compressor as flash gas. Both the volume and the ratio of gaseous and liquid portions of the injected refrigerant with a liquid portion can be dynamically adjusted to the actual requirements in the compressor between 20% and 100%.

Zubadan refrigeration cycle



1.7.3 Summary

Heat pumps are being used more and more frequently as part of the air conditioning of existing buildings. However, these often cannot provide enough heating power, especially when outside temperatures are low.

Using Zubadan technology, it is possible to inject part of the refrigerant into the compressor via a bypass, thereby ensuring further subcooling of the liquid refrigerant. The cooling of the compression process and the increase in the mass flow ensure an expansion of the working area as well as a constant heating output at low outside temperatures.

2. Basics

2.1 Framework conditions and legislation

Below you will receive an overview of all relevant legal framework conditions for the planning, design and installation of heat pumps in new buildings and existing buildings, some of which have already been touched on in the previous chapter. There is no claim to completeness. Rather, this information is intended to provide an initial picture of which regulations could apply in an individual case.
The information is based on the current data and facts that were available at the time this planning manual was created in November 2020. Since the framework conditions are discussed over time and the regulations are adopted in a new version, the content listed here may no longer be valid.

2.1.1 DIN EN 60335 and DIN EN 378

The standard DIN EN 60335 explicitly deals with the safety of air conditioning devices, heat pumps and room air dehumidifiers for domestic use and similar purposes. DIN EN 378 defines requirements for general refrigeration systems, but also the classification of installation areas. Both standards contain specifications for safety-related and environmentally relevant requirements for refrigeration systems and heat pumps. Plant safety and various aspects of occupational safety and construction law form the basis of the relevant content. The most important topics include the installation areas of the systems, limit values for refrigerants and protection of people based on the current state of the art.

2.1.2 VDI 4640 Thermal use of the subsoil

Sheet 1: Basics, approvals, environmental aspects
The guideline represents the correct design of thermal systems for the use of the subsoil according to the latest state of the art. It defines and explains the basics of heat flow in the subsoil and lists the permits required under water and mining law. It covers the environmentally friendly choice of materials and shows how to drill holes correctly. It also explains how such systems can be installed and integrated into systems. Application cases are shown: Mitsubishi Electric heat pumps that use groundwater or the subsoil with geothermal collectors and geothermal probes, or energy storage systems. The primary energy requirements and the CO_2 emissions are shown. Possible environmental impacts, e.g. B. due to leaks, and thermal and hydraulic effects are taken into account.

Sheet 2: Ground-coupled heat pump systems
The focus of the guideline is on the design and installation of Mitsubishi Electric heat pumps that use the underground as a heat source. The guideline considers the design and installation of the following application cases: Mitsubishi Electric heat pumps (HP systems) with use of groundwater through well systems, HP systems with use of the subsoil through geothermal collectors and geothermal probes, and systems with direct evaporation.
Other heat source systems such as energy piles, concrete components in contact with the ground or tunnel structures as heat exchangers, compact geothermal collectors and storage probes are also covered in the guideline.

2.1.3 VDI 4645 Heating systems with heat pumps in single- and multi-family houses – Planning, construction, operation

The guideline covers the steps required for planning heat pumps in single- and multi-family homes, from the preliminary investigation and concept creation to detailed planning. It provides information on recommended hydraulic circuits, the dimensioning of system components, documentation, commissioning the system and instructing the operator, as well as cost considerations. The appendix to the guideline contains checklists and examples to support the planning approach. The sensible interaction with other system components, such as other heat generators, heat storage, distribution and transfer, is also considered.

Sheet 1: Training, exams, proof of qualifications
This guideline provides a training concept to further educate professionals involved in the planning, construction and operation of hot water heating systems in single- and multi-family homes that are or are to be operated with heat pumps. The aim of the training is to avoid malfunctions, operational disruptions or damage. Target groups of the training courses described are, for example: planners, system manufacturers, skilled tradesmen, operators and product developers in the manufacturing industry. The focus of the training concept is the VDI 4640, VDI 4645 and VDI 4650 guideline series.

2.1.4 VDI 4650 Calculation of the annual performance factor of heat pumps

This VDI guideline describes an easy-to-use but sufficiently precise method for calculating energy efficiency that takes all technically significant influencing variables into account.

It deals with electric heat pumps, especially for supplying residential buildings with heat for space heating and drinking water heating, and provides information on room cooling.

The various user interventions, e.g. B. selected room temperature, ventilation habits and controller settings have a strong influence on the operating conditions of the heat pumps. As a result, the annual performance factor (JAZ) achieved in practice can deviate significantly from the calculated one.

The guideline accordingly provides information on the efficiency of your systems under standardized conditions. No statement can be made about energy consumption, as this is determined by the building, the weather and the user.
Likewise, no statements can be made about heating costs, especially since these depend not only on consumption but also on energy prices.

The annual performance figures calculated on the basis of this guideline are results that can be achieved in practice from well-functioning systems. The guideline is not intended to replace detailed simulation calculations, it does not assign the heat generator to the building and therefore cannot be used for dimensioning.

Both the Renewable Energy Heat Act (EEWärmeG) and the market incentive program (MAP) require a calculation of the JAZ in accordance with the provisions of VDI 4650 in order to receive funding or proof within the framework of the EEWärmeG to cover the share of renewable energies To provide heat supply.

The new VDI 4650-2019 has come into force since March 2019 and replaces the previously valid VDI 4650-2016.
Below is an overview of the most important changes:

- With Regulation (EU) No. 622/2012, the marketing of low-efficiency circulation pumps has been prohibited since August 1, 2015. They are no longer used in new installations and are no longer taken into account.
- The calculation of the annual performance factor for drinking water heating based on DIN EN 16147 has been adapted to the procedure for drinking water heating with heating heat pumps.
- The new appendix offers a calculation method with which the required performance figures of air/water heat pumps can be derived from the product data according to DIN EN 14825.

On the Mitsubsihi Electric website is at the address
https://www.ecodan.de/tools/jaz-rechner/ an annual performance calculator according to VDI 4650 is stored with the current models from Mitsubishi Electric.

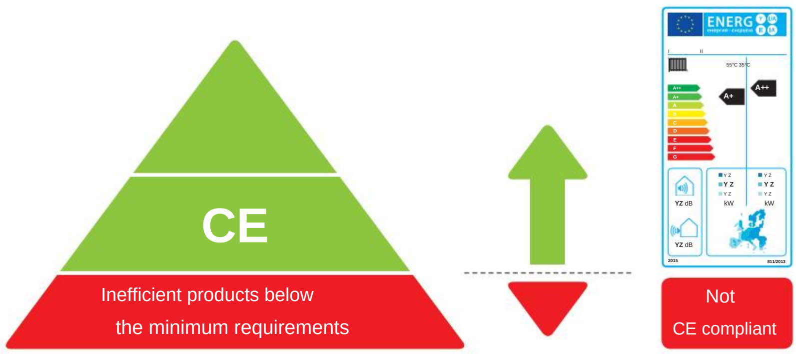
2.1.5 ErP directive

On September 26, 2013, as part of the ErP Directive, the implementing regulations for ecodesign and energy labeling of space and combination heaters and water heaters were published in the Official Journal of the EU.
The ErP Directive is intended to support consumers in choosing environmentally friendly products. The aim is to support resource-saving, energy-efficient product design through suitable political instruments.
Step by step, for example, PCs, tumble dryers, vacuum cleaners and boilers, but also windows, will also be affected. The framework directive determines which product groups can be affected and which framework conditions apply. Products relevant to energy consumption are affected if they meet the following criteria:

- annual sales volume in the EU of at least 200,000 units,
- significant environmental impact of the product and
- Clear potential for improving environmental compatibility at reasonable costs.

The various energy-related product groups are divided into 31 lots, which define the handling of energy-related products. For heat pumps, Lot 1 is relevant for space and combination heaters and Lot 2 for water heaters. Lot 1 concerns space and combination heaters as well as compound systems with a nominal output of up to 70 kW. The regulations in Lot 2, however, apply to water heaters with a nominal heat output of up to 70 kW and to hot water tanks with a storage volume of a maximum of 500 liters. Binding minimum requirements for energy efficiency are defined here for heating manufacturers. To implement the ErP Directive, there are two implementing regulations: the Ecodesign Regulation for CE marking and the Energy Labeling Regulation.

The CE marking
The Ecodesign Regulation sets so-called minimum efficiency and minimum emission standards. Only devices that meet them receive a CE marking. All others are no longer allowed to be imported into the EU.

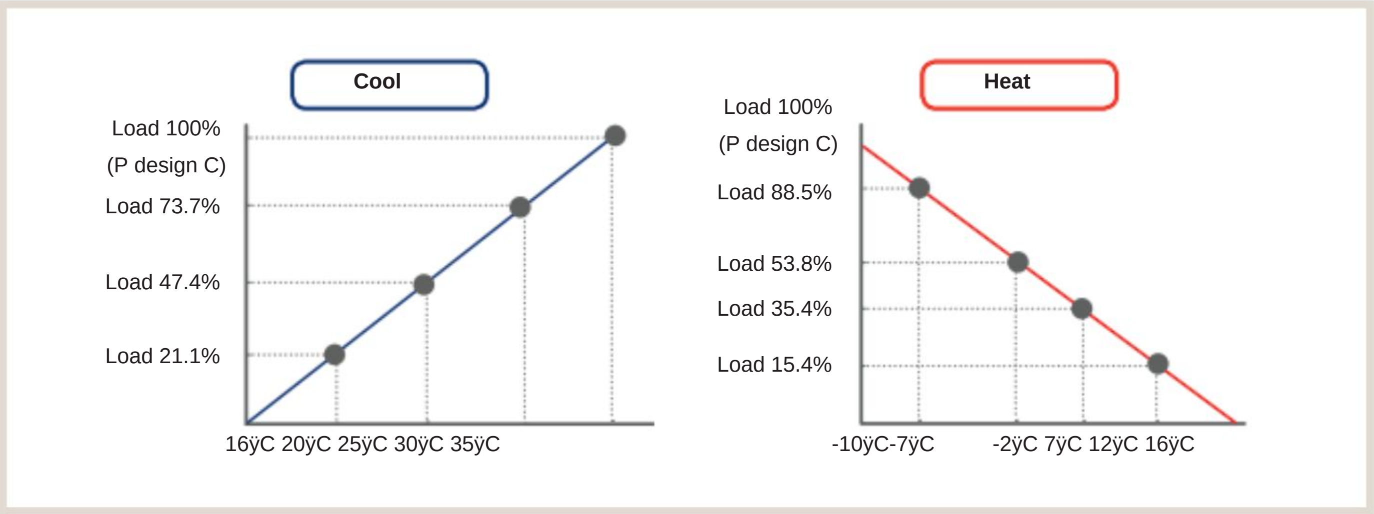


Products that do not meet the minimum requirements are not CE compliant.

The energy label
The Energy Labeling Ordinance describes what the new energy labels look like. It defines which values are necessary for classification in a certain efficiency class. The labels are primarily intended to help consumers compare products regardless of manufacturer and energy source and to select them based on their efficiency.
The Ecodesign Directive is made up of two individual conditions: Up to a heating output of 70 kW, all individual products or systems must have an efficiency label in accordance with the ErP Directive. Heaters with heating outputs of > 70 kW and < 400 kW must also meet minimum efficiency criteria, but do not require an efficiency label.

In general, heat pumps are classified in a higher efficiency class than conventional heat generators without taking a closer look at their actual cost-effectiveness. When it comes to heat pumps, the focus is on the minimum requirements for efficiency (seasonal space heating energy efficiency and hot water heating energy efficiency) and emissions (maximum sound power levels).

The final stage of the regulation came into force on September 26, 2019. The labeling makes it clear in a direct comparison with fossil systems: heat pumps that use electricity to draw energy from the environment achieve the best values. They are the only stand-alone heating system to achieve the highest efficiency class A+++, which applies from September 26, 2019. For the energy efficiency classification according to DIN EN 14825, the performance information for the SCOP is determined at four different measuring points. According to the temperature curves of the reference climate in Strasbourg, the measuring points are weighted differently in order to reflect the energy efficiency of the device under the most realistic conditions possible.



The following are also taken into account:
• Thermostat off consumption
• Standby consumption
• Crankcase heater

The determined SCOP value is included in the calculation of the seasonal space heating energy efficiency within Lot 1. Depending on the energy source used, space heating devices must meet certain minimum requirements. The bar for heat pumps is significantly higher than for all other technologies.

Assessment of sound radiation

The efficiency label of heat pumps also contains information about the sound power level (see chapter "2.7.2 Sound pressure and sound power level" on page 28) of indoor and outdoor devices. In particular, outdoor units of air/water heat pumps develop unavoidable noise emissions due to the running noise of the fan and the operating noise of the compressor. These radiations can be minimized through a variety of design options. The relevant facts can be found in the regulations for TA noise (see chapter "2.1.6 TA noise" on page 18) and the planning principles.

European climate zones

For a regionally different assessment of heat pumps, Europe was divided into three climate zones. This takes into account the significantly different average annual temperatures, for example in northern and southern Europe, which in turn is reflected in the achievable annual performance figures. Particularly when re-importing heat pumps, care must be taken to ensure that the efficiency classification may not be correct.

Energy efficiency rating in Lot 2

The water heating energy efficiency is relevant for the energy efficiency classification in Lot 2. This depends on the selected “load or tapping profile” – i.e. a specific hot water tapped over a 24-hour measuring cycle.
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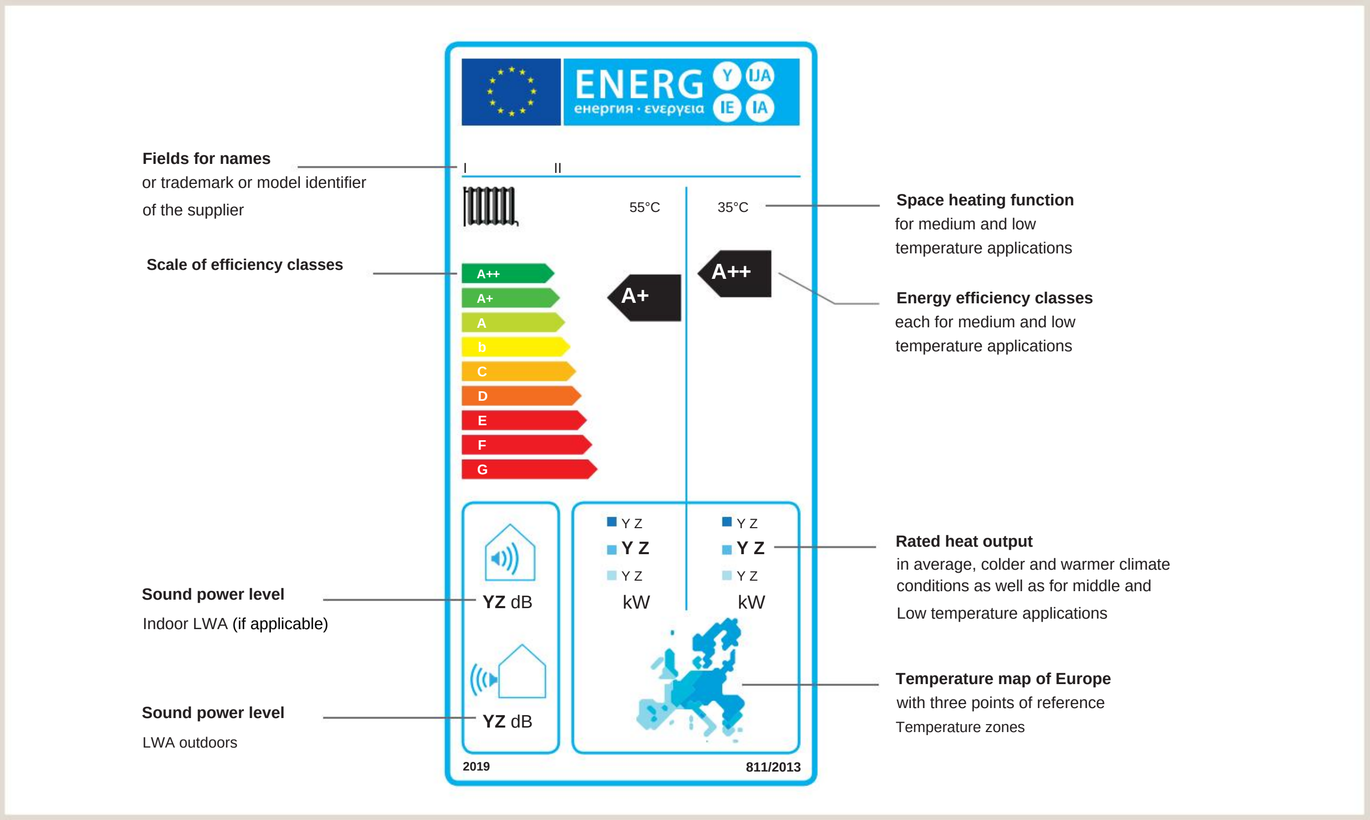
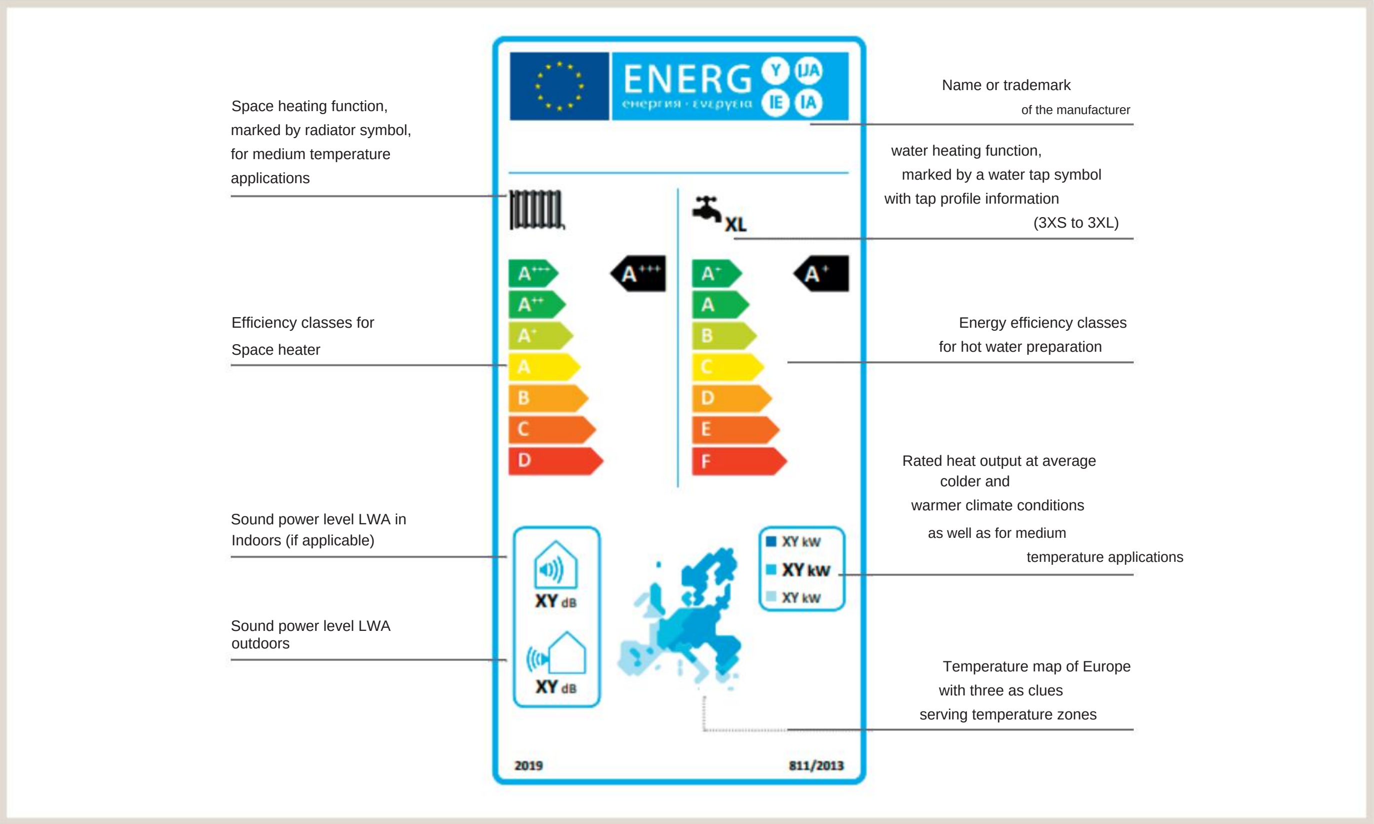


The energy label for heat pumps (from September 26, 2019)

The new energy label for heat pumps refers to devices with a nominal output of up to 70 kW. It is important that, unlike on a tumble dryer or refrigerator, the general indication of annual energy consumption does not work on the labels, because it depends to a large extent on the building in which the heater is installed.
In order to create comparability, the “seasonal space heating energy efficiency” is used as a basis.



The energy label for combination heaters (from September 26, 2019)

Combination heaters that, in addition to heating the space, also produce hot water, receive their own label. It is expanded to include a scale of efficiency classes that relate to hot water production.

Composite system labeling

For composite systems consisting of space and combination heaters and other components, there are special composite system labels that are issued by manufacturers, wholesalers or craftsmen. Temperature controllers, solar devices, storage and other heat generators are taken into account. The energy efficiency labels cover classes A+++ to G. Further explanations of the ErP directive and the energy efficiency label can be found at www.my-ecodesign.de and in the Mitsubishi Electric eco-design brochure for heat pumps.

2.1.6 TA noise

The “Technical Instructions for Protection Against Noise” (TA Rausch) is a general administrative regulation for the Federal Immission Control Act (BImSchG). The aim of the instructions is to protect “the general public and the neighborhood” from harmful effects caused by noise and to avoid such effects. Their scope of application extends to both systems that require approval and those that do not require approval.

The regulations are an important basis for planning a heat pump system, particularly with regard to the installation of the outdoor unit. According to this, it is one of the operator's fundamental obligations to take precautions to reduce noise and to prevent avoidable harmful environmental impacts, provided they can be avoided according to the current state of technology (Section 3, Paragraph 6 BImSchG). The physical principles of acoustics as well as the calculation formulas for sound pressure and power levels are explained in more detail in chapter “2.7 Sound” on page 26.

The TA noise sets specific sound emission guidelines for different areas - depending on their type of use. The total exposure of all noise sources affecting the point of immission must not exceed this value. Therefore, when planning a new system, the existing preload must always be taken into account. Compliance with the TA Noise is a fundamental condition for the use of air/ water heat pumps.

Immission guide values for immission locations outside of buildings can be found in the table in chapter “2.7 Sound”.
The values listed there always only apply to external, vulnerable rooms. Your own premises are not affected by the TA Noise.

Compressors and fans are the main components of Mitsubishi Electric heat pumps that generate sound. When making an immission forecast, all sound sources in a system must always be taken into account. The TA Noise, Appendix A 2.3.2, provides a complete overview of all necessary values.

The outdoor devices must also be structurally decoupled from the building in order to prevent the transmission of structure-borne noise. If there is noise transmission due to structure-borne noise or sound transmission within a building with external rooms in need of protection, the permissible immission value drops to 35 dB(A) during the day and to 25 dB(A) during the night. In these cases, the relevant point of immission is the most affected area in need of protection.

2.1.7 Energy Performance of Buildings Directive (EPBD)

The Energy Performance of Buildings Directive (EPBD) regulates the overall energy efficiency of new buildings and renovated existing houses across the EU. The EPBD is, among other things, the origin of the obligation to introduce energy certificates, which must be drawn up and presented when buildings are sold or properties are rented out. The energy certificates contain information about the building's energy consumption and a clear classification into energy efficiency classes. The aim is to increase the energy efficiency of buildings and at the same time expand the use of renewable energy sources. After 2020, only low-energy buildings will be built in the EU. Public buildings must meet this standard from 2018. The member states themselves can set the standards for low-energy buildings.

In Germany, the EPBD requirements were implemented for the first time within the Energy Saving Ordinance (EnEV 2007).

The Energy Saving Ordinance and the Renewable Energy Heat Act mentioned below were replaced by the GEG (Building Energy Act) on November 1st, 2020. The previous regulations apply to building applications submitted before this date.

2.1.8 Energy Saving Ordinance (EnEV)

The “Ordinance on energy-saving thermal insulation and energy-saving system technology in buildings”, better known as the Energy Saving Ordinance (EnEV), first came into force in 2002 as a replacement and summary of older regulations on structural thermal insulation and heating system technology. It is intended to help reduce greenhouse gas emissions, conserve valuable resources and reduce dependence on energy imports. It is also intended to provide impulses for the further development of innovative technologies for heat and cold generation. The aim of the regulation is to reduce the primary energy requirement for heating and hot water in buildings by around 30%. To this end, the legislature sets out in the regulation certain minimum requirements for residential and non-residential buildings for which a building application has been submitted or which have been significantly expanded since the current EnEV 2014 came into force. In order to implement the EU Building Efficiency Directive (2010/31/EC), the EnEV was tightened by an amendment from 2016. For new residential buildings that fall under the EnEV from 2016, the regulation reduces the calculated maximum value for the annual primary energy requirement by 25%. Due to their operating principle and their high efficiency, heat pumps are ideally suited to meeting the requirements of the regulation.

When the first Thermal Insulation Ordinance (WSchVO) came into force in 1979, rules for the energy efficiency of buildings came into force in Germany. With the introduction of the EnEV 2002, the primary energy requirements of new buildings and renovated houses in existing buildings were specifically regulated. In addition, the energy certificate for residential buildings became mandatory when renting, leasing or selling. From July 1, 2009, this obligation also applies to non-residential buildings.

The energy certificate can be calculated and issued in Germany using two different methods - either as a demand- or consumption-based variant. The needs-based certificate is based on a forecast of the likely energy requirements of a building. It includes the house's data such as insulation and heating system. It is required for buildings with fewer than five apartments and a building permit issued before November 1, 1977.

Houses that were built before this date but have been brought at least up to the level of the first thermal insulation regulation (WSchVO) are not affected. The consumption-based ID card can be created for these buildings. The data of the consumption-oriented energy certificate is based on the actual energy consumption of a building based on the consumption bills for the last three consecutive years.

The energy requirement or consumption is given in kWh/(m2 xa) and plotted on a colored scale that ranges from green (very efficient) to red (very inefficient). In order to better assess the ranking of the building being evaluated, the scale also includes the energy requirements of comparable buildings.

The most important technical aspect of the EnEV currently valid from 2016 is the limitation of the primary energy requirement (kWh/(m^2 xa)) of a building. This size takes into account all production, conversion and transport losses of an energy source up to the building boundary and must not exceed a maximum permissible value over the year. The annual primary energy requirement consists of the individual requirements for heating, cooling, ventilation and drinking water heating and is determined in accordance with DIN V 18599-1 (for residential buildings alternatively also in accordance with DIN EN 8321) in conjunction with DIN V 4701-10 and DIN V 4108-6). It results from the comparison with a reference building of the same size, geometry and orientation, the relevant parameters of which are defined in the EnEV appendices and refers to the building's usable area AN. Together with the maximum value for the specific transmission heat loss (residential buildings) or the average heat transfer coefficient (non-residential buildings), this value represents the energetic quality of a building.

Each energy source has a specific primary energy factor, which serves as an ecological quality feature for it
Heating system can be viewed:

- Heating oil: 1.1
- Natural gas: 1.1
- Current: 1.8
- Wood pellets: 0.2
- Renewable energy: 0.0

The primary energy factor is included in the calculation of the system expenditure figure (DIN V 4701-10, see chapter “2.6 System expenditure figure (eP)” on page 25). It also includes the losses incurred in the heat generator and the energy distribution in the building as well as auxiliary energy (e.g. for pumps). The lower this value is, the more efficiently a system works. In this context, the annual performance factor (JAZ) is crucial for Mitsubishi Electric heat pumps.
A high JAZ also means a low system cost figure and therefore high energy efficiency.

However, a single calculation of the system expenditure figure is usually not necessary, as the programs for creating proof of compliance with the EnEV or for issuing an energy certificate already contain the relevant expenditure figure for a Mitsubishi Electric heat pump. The building owner is generally responsible for compliance with the EnEV in new buildings. When working on existing buildings, the person carrying out work must immediately confirm in writing to the owner in an entrepreneur's declaration after completion that the requirements have been met.

1) replaced by DIN EN ISO 13790

2.1.9 Renewable Energy Heat Act (EEWärmeG)

With the law for the promotion of renewable energies in the heating sector, or EEWärmeG 2011, which came into force on January 1, 2009 and was last amended in 2011, the EU Directive 2009/28/EC is implemented into national law. The legislator is thus pursuing the goal of covering at least 14% of the final energy consumption of heating and cooling in buildings with renewable energies by 2020. Accordingly, the owners of new buildings are obliged, depending on the energy source, to provide a certain percentage of renewable energy for heating and drinking water heating or to carry out suitable replacement measures. The law affects all new buildings that are heated or cooled "using energy" and have a usable area of more than 50 m2 . Due to their role model function, existing public buildings that are undergoing fundamental renovation are also affected.

Highly efficient heat pumps have long been considered a suitable measure for meeting these legal requirements.

Heat pumps must basically have three properties in order to meet the legal requirements. These include:

- a high level of efficiency that can be understood in operation,
- an environmental or test mark as well
- a minimum coverage of 50% of the total amount of heat required for heating and domestic hot water (fundamentally renovated public buildings: at least 15%).

The efficiency is reflected by a high annual performance factor (JAZ) (see chapter "European climate zones" on page 15). It is at least 3.5 for air/water and air/air heat pumps, otherwise it is 4.0. If the building's hot water is heated by the heat pump or to a significant extent by other renewable energies, the law requires at least a JAZ of 3.3 for air/water and air/air heat pumps and 3.8 for all other heat pumps . It is reduced by 0.2 if the heat pump is installed in an existing public building (see EEWärmeG Annex III.1.b). In the calculation of these values according to

According to VDI 4650, the performance factor, the power requirement for the pumps and the design flow temperature must be taken into account. For air/water and air/air heat pumps, it must also be taken into account in which climatic region (cf. "European climate zones" on page 15) the respective building is located. According to VDI 4650, a heating flow temperature of 55 °C and a heating limit temperature of 15 °C must be set in existing buildings, unless lower values can be proven.

In order to transparently demonstrate efficiency at all times during operation, the EEWärmeG requires that heat pumps be equipped with a heat quantity and electricity meter with which the JAZ can be calculated. In addition, the devices must have the "European Quality Label for Heat Pumps" test mark or a comparable quality or Environmental labels such as the Blue Angel must be awarded. All of these requirements must be met even if the heat pump uses waste heat from other processes.

2.1.10 F-Gases Regulation

The EU Regulation No. 517/2014 of the European Parliament and of the Council of April 16, 2014 on fluorinated greenhouse gases - known as the F-Gases Regulation for short - replaced the previously valid Regulation (EC) No. 842/2006 . The new F-gas regulation came into force on June 9, 2014 and has been in force since January 1, 2015. It is intended to reduce emissions of fluorinated greenhouse gases in the EU by 60% to 35 million tons of CO_2 by 2030 . be reduced equivalently (from the status of 2005). This is to be achieved by gradually introducing a restriction on the quantities of partially fluorinated hydrocarbons available on the market to a fifth of current sales volumes by 2030, issuing bans on use and placing on the market as soon as possible and by expanding the existing regulations on leak testing and certification , disposal and labeling can be made possible. All systems that are not hermetically sealed (more than 3 grams of refrigerant loss per year) and contain more than ten tons of CO_2 equivalent must be subject to leak checks. Mitsubishi Electric provides you with a system logbook for leak testing/maintenance as well as the corresponding protocols for repair and service activities (see chapter "10.4 System logbook" on page 366).

2.1.11 Building Energy Act (GEG)

The Building Energy Act (GEG) was announced in the Federal Law Gazette on August 13th, 2020 and came into force on November 1st, 2020. At the same time, the Energy Saving Act (EnEG), the Energy Saving Ordinance (EnEV) and the Renewable Energy Heat Act (EEWärmeG) came into force. The GEG implements the coalition agreement, the resolutions of the 2018 Housing Summit and the decided measures of the 2030 climate protection program with regard to the energy saving law for buildings.

The GEG includes requirements for the energy quality of buildings, the creation and use of energy certificates and the use of renewable energies in buildings. It thus forms a uniform, coordinated set of rules for the energy requirements for new buildings, for existing buildings and for the use of renewable energies to supply heating and cooling to buildings.

The EU requirements for the overall energy efficiency of buildings have been fully implemented; The regulation of the lowest energy building was integrated into the standardized energy saving law. The previous energy requirements for new buildings and renovation measures in existing buildings have not been tightened. For this purpose, the requirements will be reviewed in 2023.

Overview of important content:

- The GEG introduced a new, equivalent procedure for proving compliance with energy requirements when constructing residential buildings (model building procedure for residential buildings).
- The obligation to use renewable energies in new buildings can now also be achieved through the use of energy generated close to the building. electricity from renewable energies must be adhered to.
- The primary energy factors are regulated directly by the GEG, which ensures the transparency and traceability of the primary energy factors. doors improved for builders and owners.
- Another new feature is the introduction of a temporary innovation clause. In individual cases this allows:
  - On the one hand, by the end of 2023 it will be possible, through an exemption from the responsible authority, to meet the requirements required under the GEG instead of the main requirement of the permissible annual primary energy demand via a system aimed at limiting greenhouse gas emissions and the permissible annual Final energy requirements must be proven, provided that the requirements are equivalent.
  - Secondly, until the end of 2025, it will be possible to ensure compliance with the requirements through joint fulfillment in the district, i.e. a majority of buildings, when making changes to existing buildings. This regulation and the possibility of agreements on a shared heat supply in the district serve to strengthen district-related concepts.

- The building energy certificate also contains information about the building's CO2 emissions, which result from: the primary energy requirement or primary energy consumption.
- The regulation restricting the installation of new oil heating systems from 2026 was standardized in accordance with the key points for the 2030 climate protection program. From 2026, this regulation will also apply to the installation of new boilers powered by solid fossil fuels (coal heating systems).
- When selling and certain larger renovations of single and two-family houses, an energy-related consideration is required. Advice from the buyer or owner is mandatory.
- The GEG created a declaration of compliance for new buildings and certain major renovations in the building sector. was introduced.

2.1.12 Federal funding for efficient buildings (BEG)

The federal funding for efficient buildings (BEG) will combine the existing funding programs (KfW and MAP) into a new, simplified program. Among other things, the plan is to introduce so-called EE classes for the installation of a primary heat generator based on renewable energies.

The BEG will contain three sub-programs with which: • energy-efficient new buildings and complete renovations of residential buildings,

• energy-efficient new buildings and complete renovations of non-residential buildings and • smaller-scale energy improvements are promoted with individual measures.

The use of efficient heating systems based on renewable energies, such as heat pumps, should be particularly promoted in the future. The concept of efficiency house and efficiency building funding, which is part of the CO_2 KfW's building renovation program, which has already been implemented, will be further developed through the introduction of so-called renewable energy classes. If an EE class is achieved, the funding rate for renovations should be increased by five percentage points and for new buildings by 2.5 percentage points and the maximum amount of eligible costs should be increased from 120,000 euros to 150,000 euros per residential unit.

The “BEG individual measures” sub-program is intended to further simplify the promotion of heating renewal. In principle, there should only be two funding rates in the BEG for the installation of heating systems based on renewable energies in existing buildings: 35 percent for heating systems that are based entirely on renewable energies and 30 percent for hybrid technologies. When replacing an oil heater, a bonus of 10% is due.

2.2 Circular process

A heat pump works in contrast to conventional heat generators such as: B. a gas or oil boiler, according to a thermodynamic cycle that uses the reversible conversion of power into heat. This theoretically ideal circular process was first described at the beginning of the 19th century by Nicolas Léonard Sadi Carnot, the so-called Carnot process. It represents the natural limit for the highest possible efficiency that can be achieved.

2.3 Coefficient Of Performance (COP)

When assessing refrigeration machines and heat pumps, the EER ("Energy Efficiency Ratio") and the COP ("Coefficient of Performance") are used as evaluation criteria. The COP (also coefficient of performance ÿ) represents the ratio of the heating output emitted to the electrical power consumed and is a dimensionless quantity.

$$\varepsilon_{WP} = \frac{\dot{Q}_H}{P_{el}}$$

QH heating output

Pel electrical power consumption

The coefficient of performance ÿ (COP) is determined for heat pumps in accordance with the European standard EN 14511 under stationary operating conditions in the laboratory. The performance figure is usually stated along with the operating conditions in order to enable a clear assignment. The following nomenclature is used:

	Sign	Unit	annotation
Heat source temperature at Heat pump evaporator	–	°C	
air	A	–	mostly outside air
Brine	b	–	for probes or ground collectors
water	W	–	often groundwater
Heat sink temperature at Heat pump condenser	–	°C	
water	W	–	water-based heating system e.g. B. Underfloor heating

Example: **COP 3.8 at A2/W35**

Since the performance factor is determined under constant operating conditions, it is only possible to draw conclusions about the efficiency of an entire heat pump system to a limited extent. Important factors such as ambient and system temperatures, hydraulic integration, device dimensioning and usage behavior of the end user play a major role here.

2.4 Calculated annual performance factor and SCOP

Calculating the annual performance factor according to the VDI 4650 guideline is an effective means of initially assessing the energetic efficiency of a heat pump system. Due to the complex dependencies, this guideline cannot replace a detailed simulation calculation. Due to the already mentioned complexity and user behavior, comparison with measured energy consumption is only possible with reservations. The annual performance factor is defined as "(...) calculated ratio of the useful heat released in the year based on the electrical energy used to drive the compressor, the auxiliary drives and the control" (VDI 4650 Sheet 1).

$$SCOP^{*} = \frac{Q_{WP}}{W_{el}}$$

QWP of useful heat released annually by the heat pump in kWh

Wel electrical work absorbed by the heat pump in kWh

* according to VDI 4650-2019

The SCOP (Seasonal Coefficient of Performance) according to Ecodesign Regulation No. 813/2013 is similar to the SCOP according to VDI 4650. However, the relevant standard for this is EN 14825, which, in contrast to VDI 4650, primarily covers testing and performance measurement under partial load conditions for different temperature zones taken into account in Europe. This results in improved "seasonal space heating energy efficiency", especially for heat pumps with variable power output. Further differences between EN 14825 and VDI 4650 are:

- Climate data in EN 14825 is on average 1 °C lower. • No consideration of power consumption in the respective operating mode ("temperature controller off", standby mode mode, in mode with crankcase heating and in mode "Off" in the VDI 4650.

$$SCOP^* = \frac{QH}{QHE}$$

QH reference annual heating load [kWh]
QHE annual electricity consumption [kWh]

* according to EN 14825

2.5 Producer effort figure (eg)

The producer expenditure figure eg is defined in the EnEV 2014 as the reciprocal of the annual utilization factor for boilers or Annual performance factor for heat pumps. It describes the ratio of the final energy required to the useful heat generated. Losses for the provision of the energy source, such as: B. Transport are not taken into account here. For an old gas boiler with an annual efficiency of 75%, the effort figure is 1/0.75 = 1.33 and for a heat pump with an annual performance factor (JAZ) of 3.0, the effort figure is 1/3.0 = 0.33. The lower the production cost figure, the better the energy rating.

2.6 Plant expenditure figure (eP)

The EnEV 2014 (see chapter "2.1.9 Renewable Energy Heat Act (EEWärmeG)" on page 21) limits the maximum permissible primary energy requirement QP for newly constructed buildings. The primary energy requirement consists of the heating requirement and the heat requirement for heating drinking water and is multiplied by the system expenditure figure.

$$Q_P = (Q_h + Q_{tw}) \cdot e_P$$

QP primary energy requirement
Qh heating demand
Qtw drinking water heat requirement

The system expenditure figure eP represents the ratio of the required primary energy to the useful heat generated. It is therefore a system-specific characteristic value that can vary depending on the type of building and the system technology used. In contrast to the producer expenditure figure, the system expenditure figure also takes into account losses for the provision of the energy source, such as: B. Transportation. Among other things, the heat generator's generator expenditure figure (eg) is also required for the calculation. DIN 4701-10 provides three methods to choose from:

- **Tabular method**

  Calculation based on standard values from the DIN 4701-10 tables, which is particularly suitable in the design phase for comparing different systems without having to determine specific heat generators.

- **Diagram method**

  Graphical determination using diagrams from the corresponding supplement to the standard for different system configurations. The system expenditure figure can be read based on the values for the annual heating requirement and the evaluation of the system technology.

- **Detailed procedure**

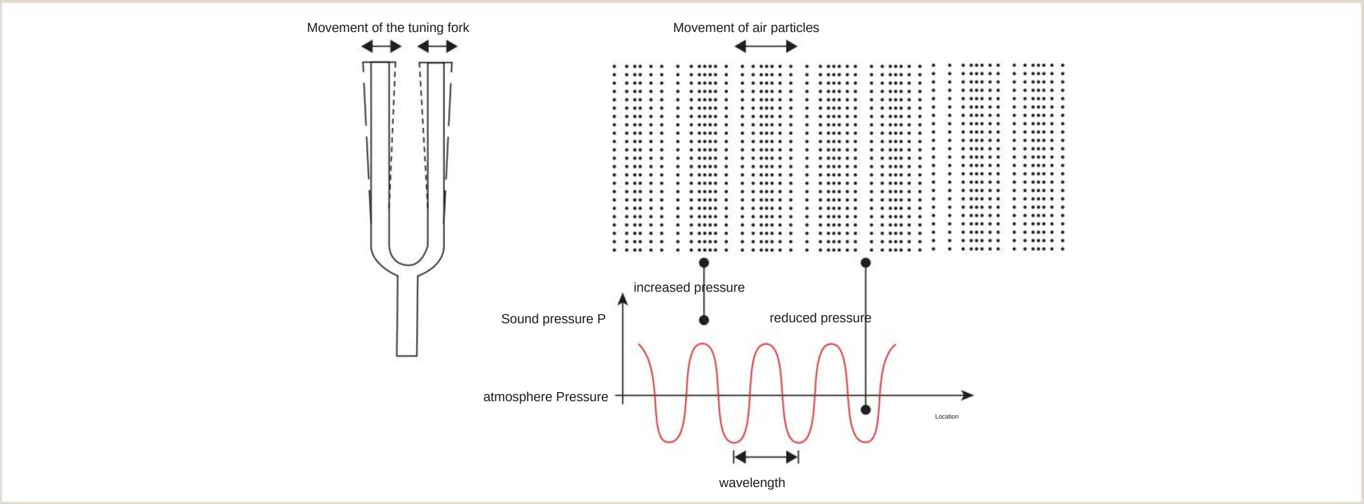
  Calculation of the effort figure based on specific product parameters, actual cable lengths, insulation thicknesses and different system temperatures.

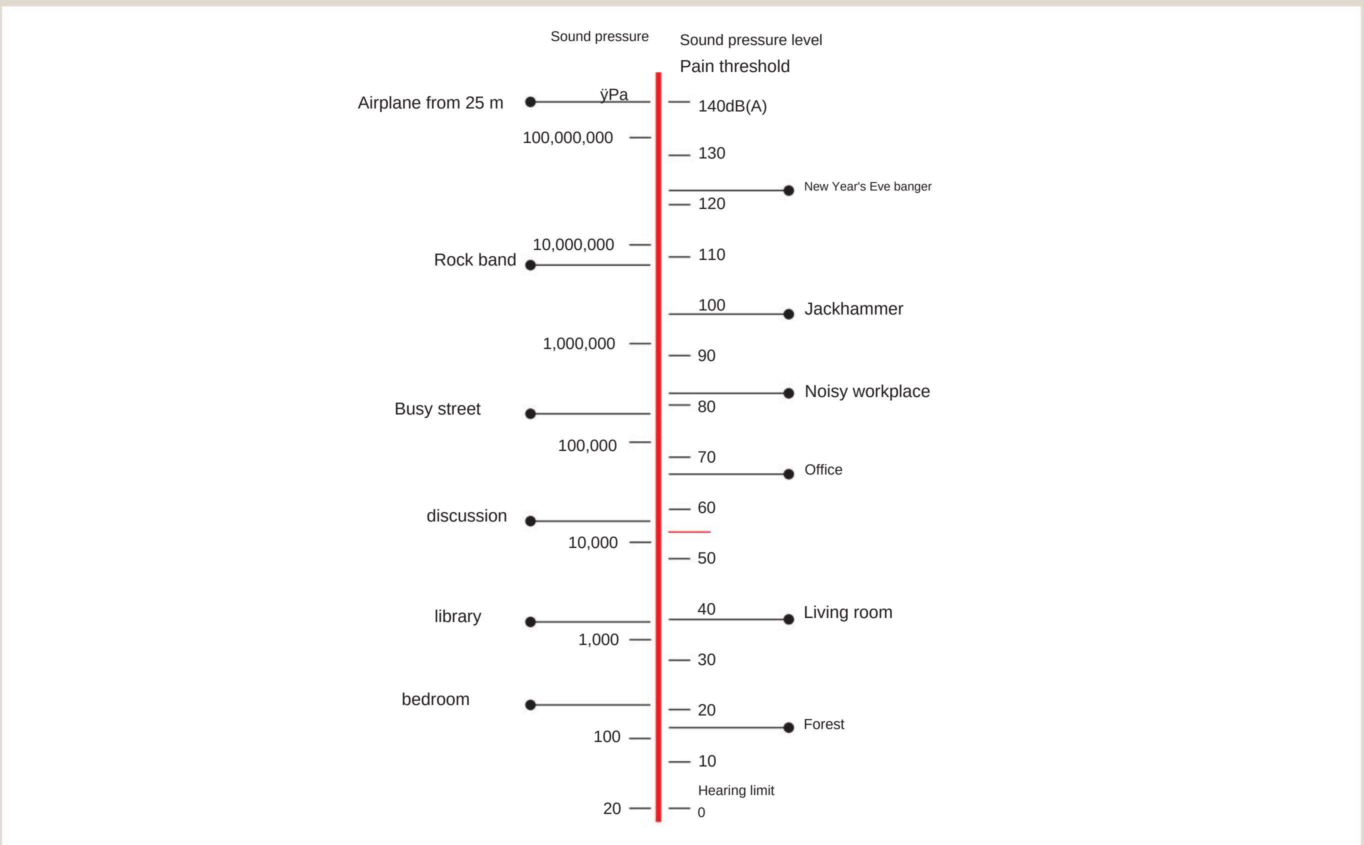
2.7 sound

2.7.1 Basics

All machines, facilities, people or animals produce a certain amount of sound. Sound travels in waves in the air and creates a certain pressure. This wave-like pressure, or pressure wave, creates a vibration in the human ear, which then produces audible sounds.

The technical terms sound pressure and sound power are used to describe sound. A distinction is made between airborne noise and structure-borne noise, which is caused by e.g. B. Foundations or pipes can transmit disturbing noises within the building. Therefore, special attention should be paid to separation here.





The technical instructions for protection against noise - TA noise (see chapter "2.1.6 TA noise" on page 18) - regulates the determination and assessment of noise emissions in Germany. The operator of the noise-causing system is responsible for compliance with the emission guidelines. The following table shows the guideline values that must not be exceeded by the total load of all systems:

2.7.1.1 Immission guidelines for immission locations outside of buildings according to TA Noise

Area	Immission guide values sound pressure level [dB(A)]	
	Day (6:00 a.m. – 10:00 p.m.)	Night (10 p.m. – 6 a.m.)
Spa areas, hospitals, care facilities, retirement homes, provided they are identified by signage	45	35
Purely residential areas; Impact locations in which only residential buildings are located	50	35
General residential areas and small settlement areas; Impact sites in whose surroundings there are predominantly apartments	55	40
mixed areas, core areas, village areas; where there are neither predominantly commercial facilities nor apartments	60	45
Urban areas	63	45
commercial areas; Impact locations in the vicinity of which predominantly commercial facilities are located	65	50
Industrial areas	70	70

The guidelines to be adhered to are to be determined outside the apartment/building at a distance of 0.5 m from the center of the open window. The window must belong to the most affected room in need of protection.

According to DIN 4109, rooms requiring protection are:

- Living and sleeping rooms
- Children's room
- Workspaces/offices
- Classrooms/seminar rooms

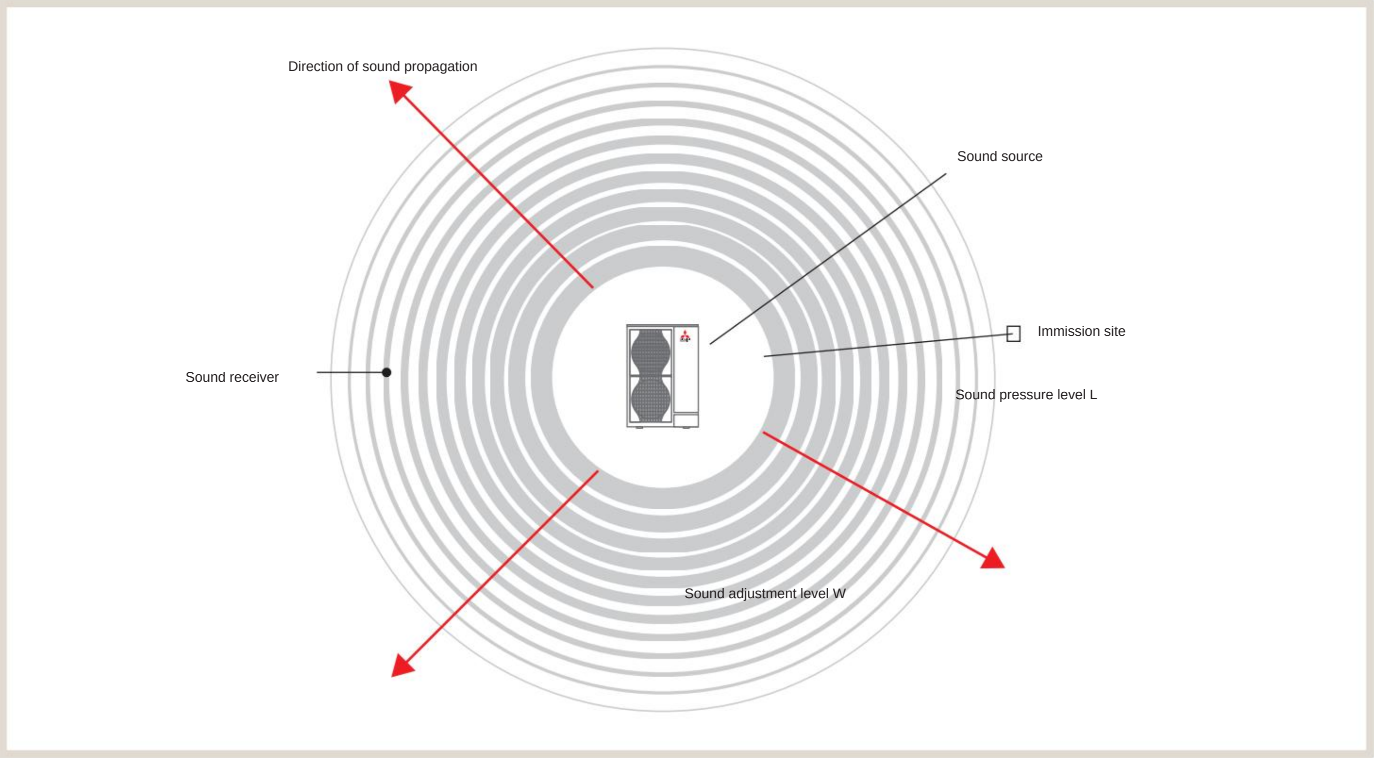
Preload:
In Chapter 2.4, TA Noise defines prior exposure as "the exposure of a location to noise emissions from all systems to which these technical instructions apply, without the emission contribution of the system being assessed."

In principle it applies according to Chap. 3.2.1. that "approval for the system to be assessed [...] may not be refused for reasons of noise protection even if the emission guideline values are exceeded due to the previous exposure, if the contribution to emissions caused by the system is in view "This is generally the case if the additional load emanating from the system being assessed is at least 6 dB(A) below the standard immission values in accordance with number 6 at the relevant immission location.

Since heat pumps are generally considered a "system that does not require approval" according to Section 22 Paragraph 1 Nos. 1 and 2 BIm SchG, the following simplified standard case test under 4.2 c) must be taken into account: "Taking into account the previous load is only necessary if it is foreseeable based on concrete evidence is that the system to be assessed, if it is put into operation, will contribute to exceeding the emission guideline values according to number 6 within the meaning of number 3.2.1 paragraph 2.

2.7.2 Sound pressure and sound power levels

The terms sound pressure and sound power levels (see figure below) are often confused and incorrectly compared. In acoustics, sound pressure is the measurable level caused by a sound source at a certain distance. The closer you are to the sound source, the greater the measured sound pressure level and vice versa. The measurable sound pressure level therefore depends on the distance and direction of the immission. This technical value is used to ensure compliance with the emission-related requirements in accordance with TA Noise.



The total sound energy generated, on the other hand, is referred to as sound power or sound power level. It spreads out in waves in all directions. The area-related sound power always remains the same and is therefore independent of the distance. The sound power cannot be measured exactly and must therefore be calculated from the result, the measured sound pressure. The sound power level is therefore independent of the direction or distance between the sound generator (emission) and the sound receiver (immission). Technically, different sound sources can be compared.

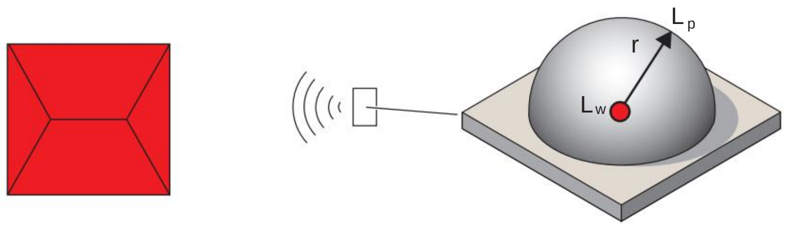
2.7.3 Rough determination of sound pressure and sound power levels

So that critical installation situations can be taken into account during the planning phase, the sound pressure level at the receiver must be determined. This sound pressure level is calculated from the sound power level of the device, the installation situation (directive factor Q) and the respective distance to the heat pump using the following formula.

$$L_{Aeq} = L_{WAeq} + 10 ÿ \log \left(\frac{Q}{4 ÿ ÿ\pi \; r}\right)^2$$

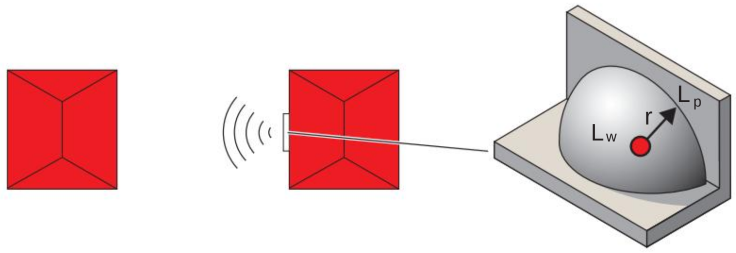
LAeq	Sound pressure level at the receiver
LWAeq	sound power level of the sound source
Q	Directivity factor (takes into account the spatial radiation conditions)
r	Distance between sound source and receiver

The directivity factor has a decisive influence on the sound pressure level.
The different installation conditions and their effects are explained below.



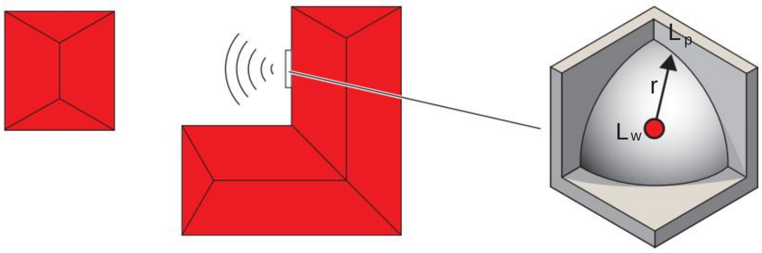
Freestanding heat pump in
Outdoor installation

Sound radiation into the half-space
Q = 2



Heat pump or air inlet/outlet (if installed indoors) on a house wall

Sound radiation into the quarter room
Q = 4

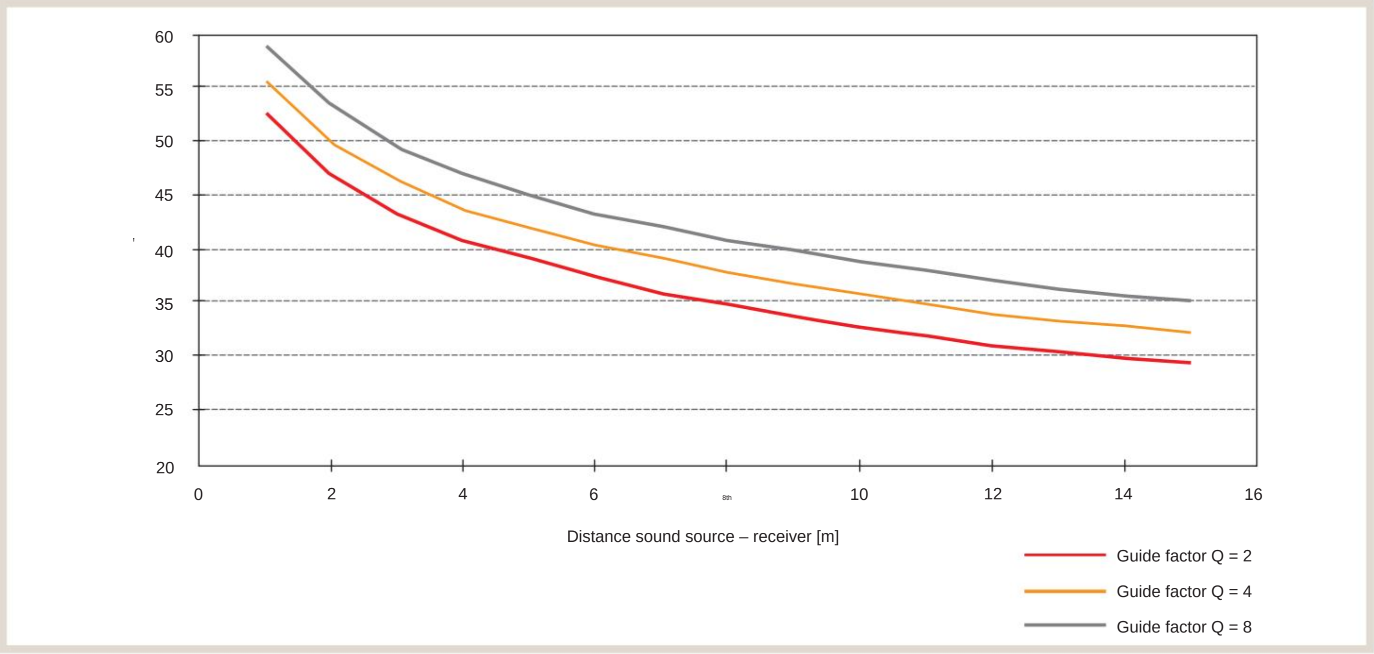


Heat pump or air inlet/outlet (for indoor installation) on a house wall with a recessed facade

Sound radiation into the eighth room
Q = 8

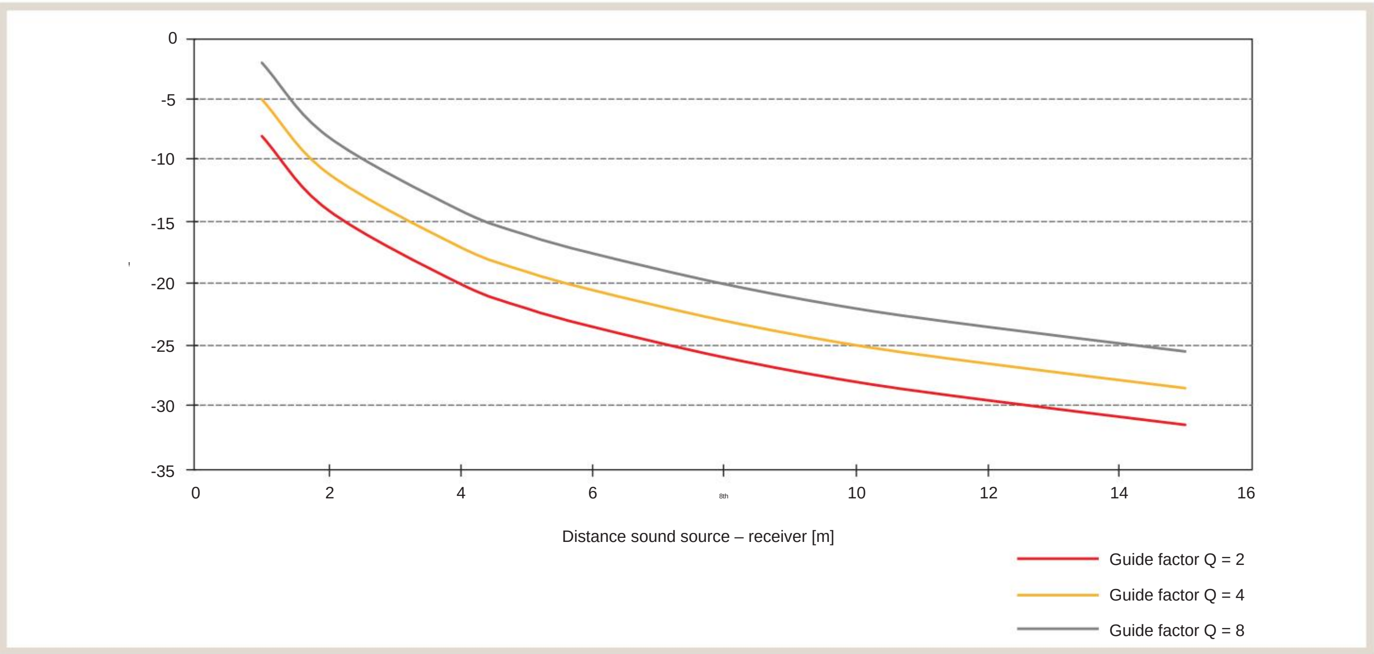
From the illustrations above it can be seen that structural changes have a strong impact on the directivity factor and thus on the sound pressure level.

As already described, the sound power is distributed over a larger area as the distance increases, so that the sound pressure level decreases as the distance increases.
The following exemplary diagram shows that at the same sound power level, depending on the directivity factor used, the necessary distance between the sound source and the receiver to comply with the standard values can more than double.



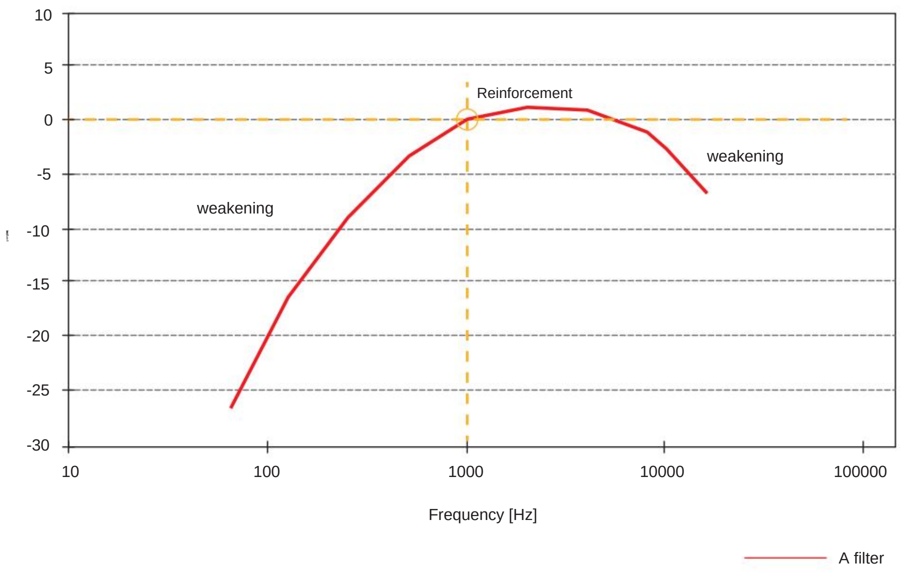
Therefore, when setting up the heat pump, care should be taken to reduce the propagation of sound as much as possible. This can be achieved by placing the heat pump near sound-absorbing surfaces, such as cherry laurel or similar. Flat roofs (garage roofs) are not a suitable location as sound can usually spread unhindered and may be reflected from surrounding walls.

The following diagram can be used to simplify the determination of the sound pressure level. Here, the sound power level of the air/water heat pump installed outside simply needs to be reduced by the value read from the diagram. This depends on the distance and the directivity factor Q.



2.7.4 A-weighting of sound levels

In practice, it has been found that human hearing is not equally sensitive to all pitches. In order to obtain the most realistic assessment of the sound level in terms of perception, an assessment of the frequency band is carried out. This is achieved with a so-called A filter and reduces or increases certain frequencies within the sound signal. The evaluation of the sound signal is indicated by the designation db(A). The diagram below shows the characteristics of the commonly used A filter.



2.7.5 Sound calculator

Sound calculator with example calculation

Assessment of the noise emissions of air/water heat pumps with a heating output of a maximum of 35 kW according to TA noise (see chapter "2.1.6 TA noise" on page 18) in daytime operation at times of increased sensitivity and during the night. The calculation makes it possible to estimate the noise emissions in rooms in need of protection (relevant immission locations) on adjacent properties or to determine the necessary distance from the heat pump.
The results result from the rough forecasting procedure of the TA noise from August 26, 1998 and can therefore not replace an individual noise report in the event of a dispute between neighbors.

Sample sound calculator

Information about the air/water heat pump	
Manufacturer	Mitsubishi Electric
Model/Type	PUD-SHWM60VAA with EHSD-YM9D
Performance	5.00kW
Sound power according to ErP	55.00 dB(A)
Max. sound power level in daytime operation	58.00 dB(A)
Max. sound power level in reduced night operation 55.00 dB(A)	
Tonality KT	not audible

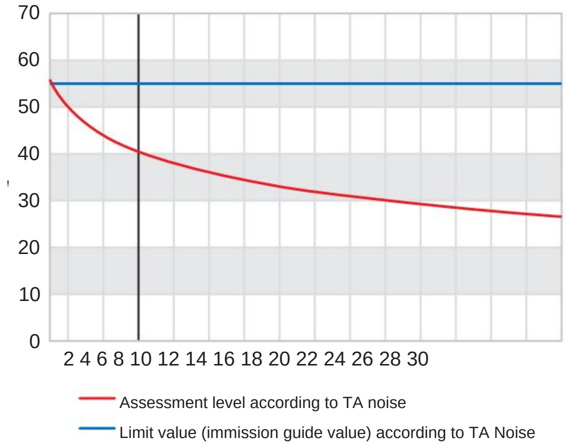
Immission guide value according to TA Noise	
Sensitivity level	general residential area/small settlement area

Lineup	
Directivity correction Dc	WP free-standing (+3 dB(A))
Distance (s) source – receiver	6 m
shielding	Visual contact: DI = 0 dB(A)

Assessment level according to TA noise

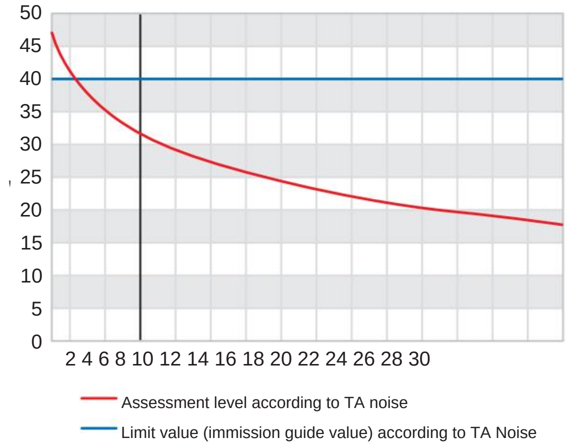
Daytime operation

Assessment level Lr: 50.4 dB(A)
4.6 dB(A) below the TA noise emission guideline value



Night operation (with noise reduction)

Assessment level Lr: 31.4 dB(A)
8.6 dB(A) below the TA noise emission guideline value



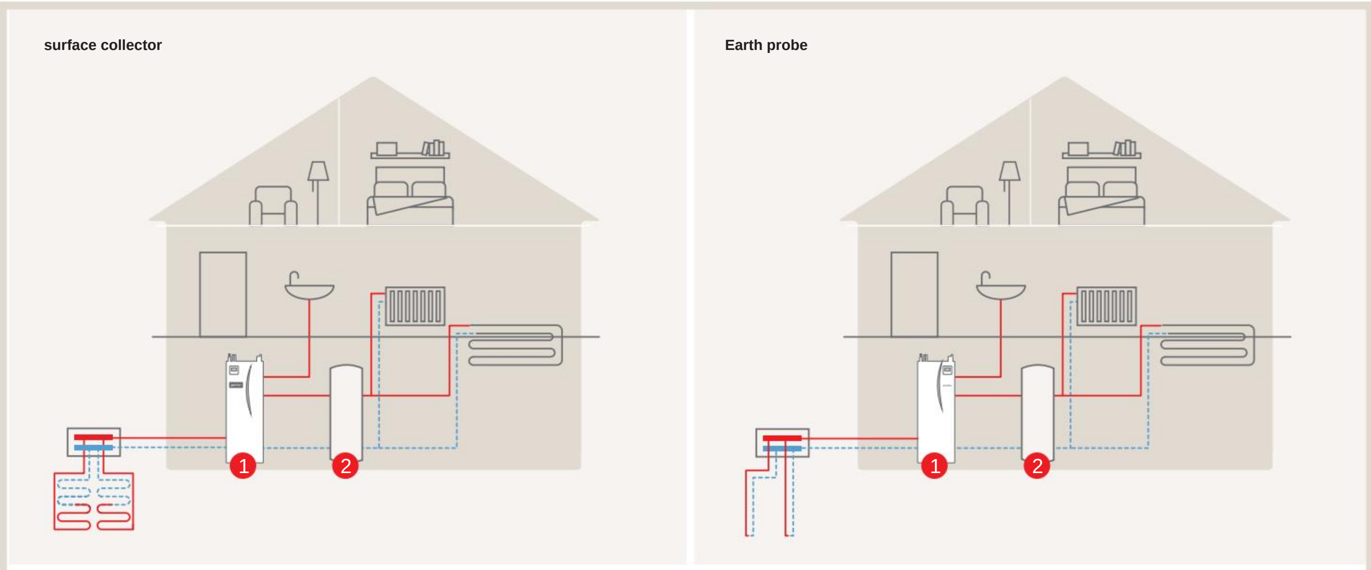
Attenuation due to the directivity of the source was not taken into account. The previous load was not included; the result is shown as the difference to the total load. All device data is manufacturer information; responsibility for accuracy lies with the respective company. Reduced operation can result in a reduction in the performance of the heat pump. Source: https://www.ecodan.de/tools/waermepumpen-schall-rechner/

2.8 Geothermal energy

Near-surface geothermal energy uses the subsurface up to a depth of approx. 400 m and temperatures of up to 25 °C for heating and cooling buildings, technical systems or infrastructure facilities.

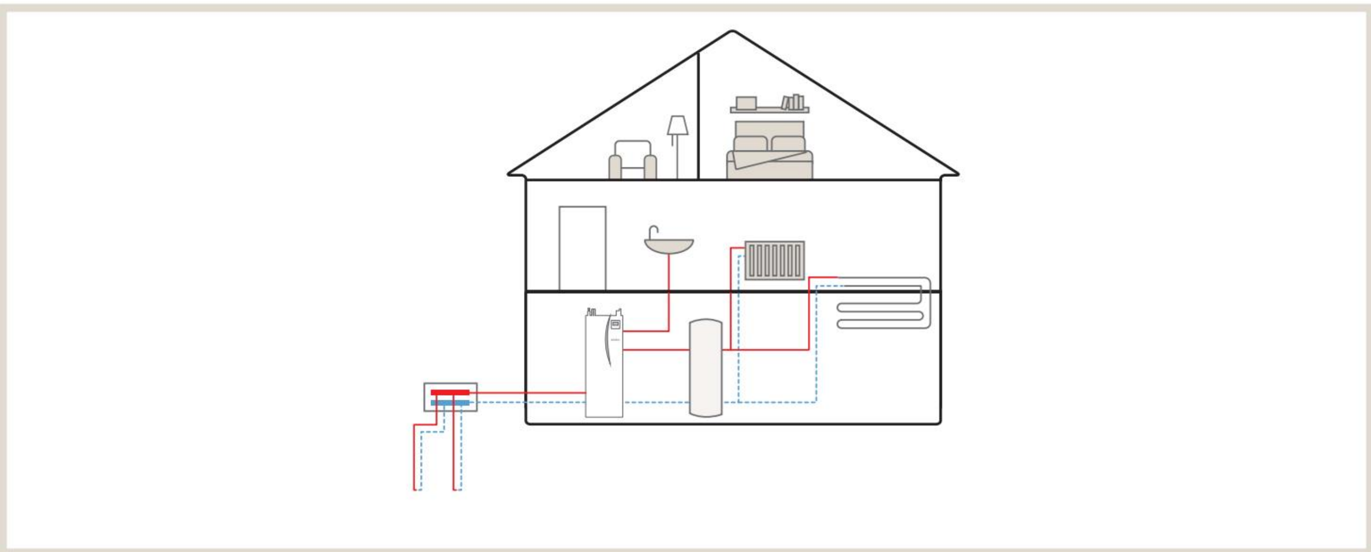
For this purpose, the heat is obtained from the soil and rock near the surface or from the groundwater.

A basic distinction is made between • closed systems (geothermal collectors, geothermal probes) and • open systems (well systems).



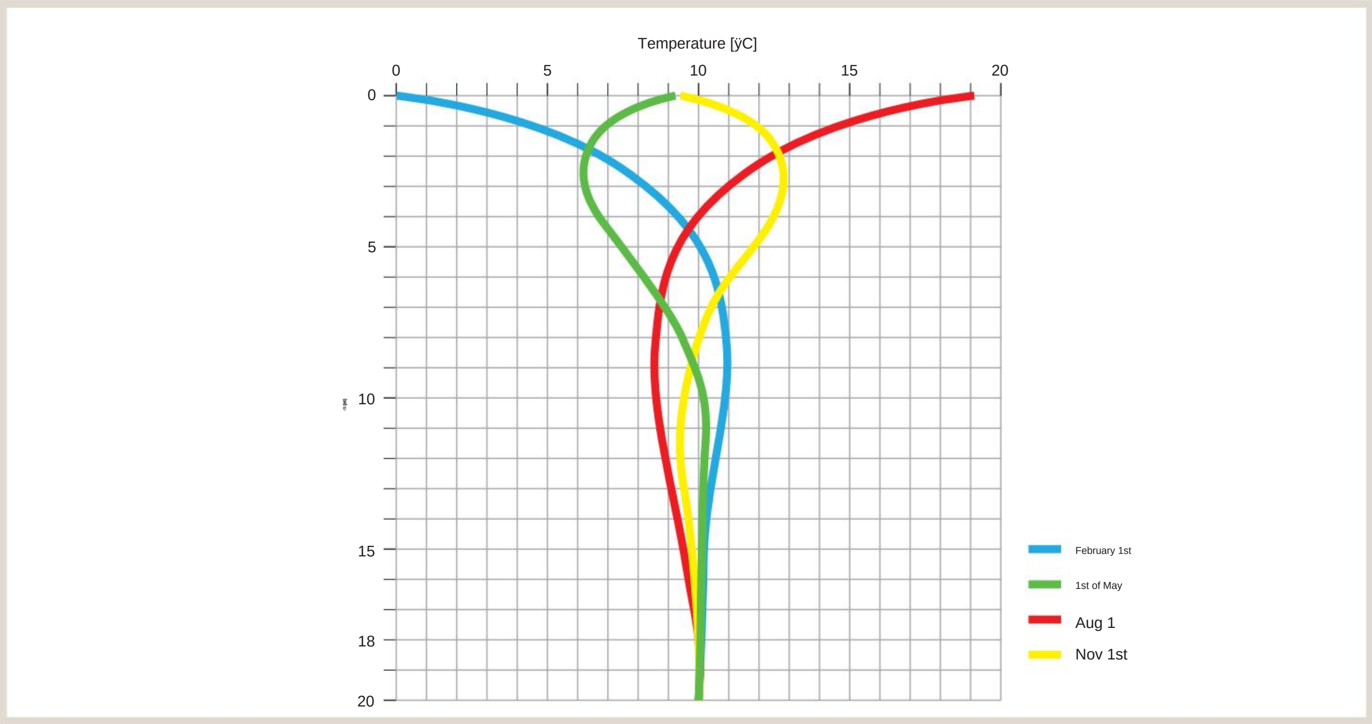
1 Ecodan Geodan 2 heating water buffer tanks

2.8.1 Geothermal probes



• The frost-proof liquid, the brine, circulates in a closed circuit through plastic pipes, absorbing the energy from the subsoil and transporting it to the heat pump, which extracts heat from the brine and heats the heating water.

• The extracted heat energy flows from the environment.



- Since from a depth of 10 meters the temperature is almost constant at around 10 °C all year round and is therefore independent of seasonal fluctuations, the geothermal probe is very effective, especially in winter at low temperatures, and is good for monovalent operation (without a heating element) suitable.
- The necessary length of the probe and thus the depth of the hole depends on the heat requirements of the building and the thermal conductivity of the substrate.
- Geothermal probes require approval.

Geothermal probes for the use of near-surface geothermal energy are installed in boreholes with depths of usually less than 100 meters. In Germany, the regulations of the BBergG (Federal Mining Act) apply to drillings that are intended to penetrate more than 100 meters into the ground; (see VDI 4640 Sheet 1, Section 5.2).

The most common type of probe, the double-U probe, consists of U-shaped tube loops bundled in pairs. The single-U probes consisting of just one pipe loop and those consisting of an inner and outer pipe are less common
Coaxial probes. The plastics PE 100, PE 100-RC and PE-X (PE: polyethylene) are almost exclusively used as pipe material.

The most important criteria for a system decision and preliminary planning are summarized below:

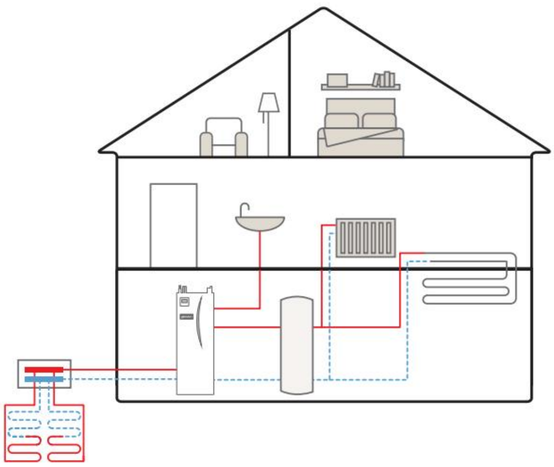
- Geothermal probes require approval from the lower water authority up to a drilling depth of 100 meters.
- Drilling depths over 100 meters require approval from the mining authority.
- Building over the probe is only permitted for frost-free operation.
- Required access width for the drilling rig: at least 1.5 m for crawlers or 2.5 m for trucks.
- Required work area for drilling rig, flushing tank, etc.: at least 6 m × 5 m for crawlers, at least 8 m × 5 m for trucks.
- The following minimum distances are recommended:
  – between the probe and buildings: 2 m (the statics must not be affected)
  – between probe and water-carrying pipes: 2 m to 3 m (locally regulated differently) – between connecting pipes and water-carrying pipes: 1.5 m
  – Distances to neighboring properties vary depending on the country (recommendation see VDI 4640 Sheet 2)
  – Distance between geothermal probes: 6 m
  – Distance to the neighbor's probe: 10 m (exceptions are possible in coordination with the neighbors)

The detailed design of geothermal probes should be carried out in accordance with guideline VDI 4640 Sheet 2. Further information on this can be found in the VDI 4640 series of guidelines “Thermal use of the subsoil”.

underground	Specific extraction power per m probe depth for heating outputs up to 30 kW in W/m	
	at 1800 h/a	at 2400 h/a
Bad ground	25	20
Normal bedrock and water-saturated sediment 60		50
Solid rock with high thermal conductivity	84	70

For longer terms, the specific annual withdrawal work must also be taken into account in addition to the specific withdrawal benefit. For geothermal probes this should be between 100 and 150 kWh/ma. Guidelines for geothermal probe design according to VDI 4640.

2.8.2 Geothermal collectors



- You work with a horizontal pipe system very close to the surface, which is similar to a foot pipe underground
  Floor heating is laid in a meandering pattern.
- The pipe system is located below the frost line at a depth of around 1.5 meters under a lawn or
  ground area.
- The area required by the collector depends mainly on the size of the area to be heated and the rain
  water permeability of the soil.
- The area above the collector must not be sealed, asphalted or even built on so that the ground can replenish its energy reservoir through sunlight or rainwater. Deep-rooted plants such as B. trees should not be planted there as they can damage the pipe system. • Unlike geothermal probes, collectors do not require approval, only notification.

Geothermal energy collectors extract seasonally stored energy from the subsoil up to a depth of around 5 meters below the free surface of the earth. In particular, the liquid/solid phase change of the water in the ground is used as a latent heat storage in winter. The maximum extraction performance and the annual extraction work are limited by the storage capacity, the heat transport properties and the thermal regeneration of the subsoil as well as the collector geometry and the operating mode of the system. When it comes to soil, water content is a key influencing factor.

Geothermal heat collectors are either indirectly connected to the heat pump using a brine circuit or can be part of the cooling circuit directly as an evaporator for the heat pump's refrigerant (direct evaporation).
Geothermal collectors for direct evaporation have different technical requirements and are covered in VDI 4640 Sheet 2.

The information in this section refers to brine-operated collectors, which consist of PE pipes and can be laid in the ground in different arrangements. The decisive factor for the performance of geothermal heat collectors is the connection to the earth's surface, as they are regenerated in the warmer months from the heat input from outside air, solar radiation and precipitation. The design guidelines and application limits mentioned below therefore apply exclusively to unbuilt geothermal collectors that are covered by natural soil.

Information on heat extraction performance of compact geothermal collectors, e.g. B. spiral or trench collectors can be found in VDI 4640 Sheet 2. Heat extraction services for other forms of ground heat exchangers, e.g. B. multi-layer geothermal collectors always require separate consideration and are not shown here.
The extraction performance of a collector, based on the evaporator performance, must be determined depending on the soil conditions, the climate zone and the annual operating hours in accordance with VDI 4640 Sheet 2.

For an initial rough determination, the following table “Possible area-related extraction services for geothermal heat collectors for 1800 to 2400 annual operating hours for basic determination” can be used.

underground	Possible area-related extraction power for geothermal collectors in W/m	
	at 1800 h/a	at 2400 h/a
Dry, non-cohesive soil	10	8th
Cohesive soil, moist	(20...30)	(16...24)
Water-saturated sand/gravel	40	32

The detailed planning is carried out according to VDI 4640 Sheet 2.

The most important criteria for a system decision and preliminary planning are summarized below:
- Geothermal heat collectors require notification or approval from the lower water authority in individual cases.
- Building over the geothermal collector is not permitted. • The ground surface above a collector system must not be sealed as this will impair regeneration.
- Deep-rooted vegetation above a collector should be avoided. In the worst case scenario, the delay in vegetation over a collector is around two weeks.
- The following minimum distances and guidelines are recommended:
  - between collector and buildings: 1.2 m
  - between the collector and the water pipes: 1.5 m
  - between collector and property line: 1 m
  - Installation depth of the collector: 1.2 m to 1.5 m (approx. 0.3 m below the frost line)
  - Laying distance of the collector pipes according to VDI 4640 Sheet 2
- Under favorable conditions, the space requirement can be reduced by using compact special forms of collectors, such as geothermal baskets and trench collectors. They reduce the space required, but require a greater installation depth.

2.9 Building cooling

An increasing ratio of transparent to opaque surfaces in the building envelope, significantly increasing thermal protection with increasing internal heat gains as well as increased requirements for thermal comfort and comfort are reasons for the increasing need for cooling in residential buildings. Heating systems with heat pumps generally offer the technical possibilities for cooling a building. Such systems are offered as completely coordinated solutions.

For the cooling concept, the following technical options, operating modes, resulting combination options and application limits must be taken into account:

Cool down

When cooling down, the room temperature is lowered without necessarily reaching a setpoint. This is possible with surface heating or fan coil units without a condensate drain if the heat is dissipated above the dew point temperature. The flow temperature must be kept above 18 °C; alternatively, a humidity sensor must be used, which will interrupt operation if necessary.

Cool

The room temperature should adhere to the planned setpoint.
Depending on the air condition and coolant temperature, cooling involves dehumidification, so condensate drainage must be ensured. This is possible with fan coil units or ceiling cassettes. Monitoring the dew point temperature is not necessary. However, this requires that all relevant supply lines, pumps, fittings and other installations are insulated in a vapor diffusion-tight manner.

Distribution systems

The efficiency of the cooling application essentially depends on the selection and design of the distribution system. In addition to thermoactive systems such as underfloor or wall heating, fan coil units or ceiling cassettes are practical systems.

Procedure for planning passive cooling

- Calculation of cooling load
    - according to VDI 2078
    - according to the form
    - according to m² of living space (factor)
- Determination of the cooling capacity of the heat source
    - Geothermal probe
    - groundwater
- Design distribution system
    - Underfloor heating
    - Fan coil units

3. Planning and design

3.1 General requirements

3.1.1 Heating technology

Installing a heat pump as a heating device requires compliance with applicable standards, regulations and laws for heat pump systems and heating systems.

- Observe the safety and expansion devices for closed heating systems according to DIN EN 12828.
- Maintain the water quality required by VDI 2035.
- The following maximum quantities of substances are required by Mitsubishi Electric:
  - Ca ÿ 100 mg/l
  - Cl ÿ 100 mg/l
  - Fe/Mn ÿ 0.5 mg/l
  - Cu ÿ 0.3 mg/l
  - pH value 6.5–10.0 (8.0*)
- If the listed substance concentration is exceeded, this can lead to malfunctions in the heating system and possibly... Failure of the air/water heat pump can occur.
- Check the pH value regularly as it can change. Check with the local utility company about the respective water quality.

*Please note for domestic hot water

3.1.2 Drinking water and hygiene

The subject area of drinking water heating includes many sub-areas that are covered in detail in various standards, laws and regulations. Therefore, the topic is only sketched out in this chapter and is only intended to serve as an impetus to deal sensitively with this important topic. The following list of the most important laws and regulations does not claim to be complete:

- Drinking Water Ordinance (TrinkwV) – Ordinance on the quality of water for human consumption,
- DIN 1988 – Technical rules for drinking water installations,
- VDI 6023 – Hygiene in drinking water installations – requirements for planning, execution, operation and maintenance,
- DVGW W 551 – Drinking water heating and drinking water pipeline systems – Technical measures to reduce legionella growth – Planning, construction, operation and renovation of drinking water installations.

In addition to the technical aspects in the area of drinking water heating, the hygienic aspect plays a special role, because drinking water is a foodstuff. The TrinkwV 2001 therefore defines the requirements for the quality of drinking water as follows:

"Drinking water must be such that its consumption or use is not likely to cause harm to human health, particularly through pathogens. It must be pure and fit for consumption." (TrinkwV 2001 § 4 General Requirements Paragraph 1)

One of the best-known pathogens in drinking water is the so-called Legionella (), which can lead to serious illnesses. The DVGW Legionella pneumophila worksheet W 551 offers technical measures for this

Reduction of legionella growth as well as for the planning, construction, operation and renovation of drinking water installations. There are various features to distinguish between drinking water installations in small and large systems.

Small systems are systems with storage drinking water heaters or central flow drinking water heaters, regardless of the contents of the drinking water heater and the contents of the pipeline. Setting the temperature to 60 °C is recommended and operating temperatures below 50 °C must be avoided in any case. The system operator must be informed of any possible health risks.

Large systems are all systems with storage drinking water heaters or central flow-through drinking water heaters, each with a content of more than 400 l and/or a content of more than 3 l in at least one pipe between the outlet of the drinking water heater and the tapping point. The contents of the circulation line are not taken into account.
Circulation systems must be installed in large systems with a pipe volume of more than 3 l.

The temperature of the water at the outlet of the drinking water heater must be at least 60 °C at all times. The entire drinking water content of preheating stages must be heated to 60 °C at least once a day.
Large facilities can include: residential buildings, hotels, retirement homes, hospitals, swimming pools, sports and industrial facilities or campsites.

The following table clarifies the differences between small and large systems as well as the requirements and necessary measures in accordance with DVGW W 551. The classification of a system into the appropriate category (small or large system) depends in the first step on the type of building.

System type	Building type	Volume storage TWE line volume outlet	Storage TWE to withdrawal point	Request temperature in storage TWE	Requirement TWW circulation
Small systems	Single and two-family houses k. A		k. A	50 – 60°C	–
	Other buildings	< 400 l	ÿ 3L	50 – 60°C	–
Large facilities	e.g. B. Hotels or residential buildings	> 400 l	ÿ 3L	> 60°C	–
	e.g. E.g. retirement homes, hospitals, swimming pools	< 400 l or > 400 l	> 3 l	> 60°C	Yes

Copper pipe dimension [Ø x mm]	Pipe length [m] with 3 l content
10 x 1.0	60.0
12x1.0	37.9
15x1.0	22.5
18x1.0	14.9
22x1.0	9.5
28x1.0	5.6

3.1.3 Security measures for R32 systems

When using the refrigerant R32, additional measures must be taken into account when planning and installing heat pumps. R32 is a refrigerant of safety class A2L and is therefore considered “flame-retardant”.
To ensure the safety of people inside buildings, the guidelines according to IEC 60335-2-40 or DIN EN 378 (parts 1-4) should be adhered to. The IEC 60335-2-40 standard explicitly deals with the safety of air conditioners, heat pumps and room dehumidifiers for domestic use and similar purposes. DIN EN 378 defines requirements for general refrigeration systems, but also the classification of installation areas.

A NOTICE!

This chapter is merely a summary of relevant content from the standards DIN EN 378 and IEC 60335 and does not guarantee fundamental conformity to the standard. It serves to provide information and contains recommendations that are intended to make the implementation of R32 projects easier. Special cases must always be considered in detail.

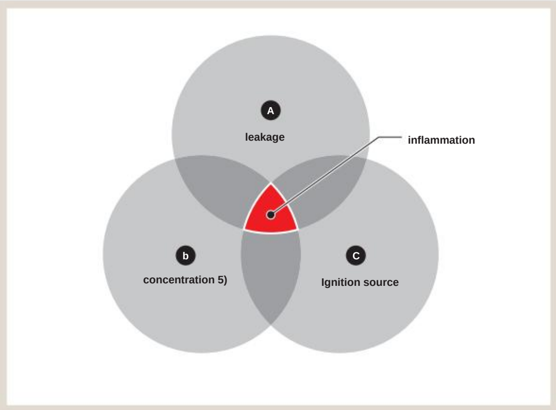
The standards IEC 60335 and DIN EN 378 contain specifications for safety and environmental requirements for refrigeration systems and heat pumps. Plant safety and various aspects of occupational safety and construction law form the basis of the relevant content. The most important topics include the installation areas of the systems, limit values for refrigerants and protection of people based on the current state of the art.

Refrigerant safety classes		
Flammability	**toxicity**	
	not toxic	**toxic**
highly flammable	A3	B3
flammable	A2	B2
flame retardant	A2L (R32)	B2L
non-flammable	A1 (R410A)	B1

3.1.3.1 Safe handling of R32

Properties of R32

There is a possibility that R32 is flammable under the conditions listed below.



	R32	R410A
chemical formula	CH2F2	CH2F2 / CHF2CF2
Composition (mixing ratio in wt.%)	Separate composition	R32 / R125 (50 /50 wt%)
Ozone depletion potential (ODP)	0	0
Global warming potential (GWP) 1)	675	2088
LFL (Vol.%) 2)	13.3	–
UFL (Vol.%) 3)	29.3	–
Flammability 4)	Low flammability No flame spread (1)	

1) Fourth IPCC assessment report
2) LFL: Lower flammability limit
3) UFL: Upper flammability limit
4) ISO 817:2014

Safety instructions:

CAUTION!

ÿWhen carrying out all work, observe the information from DIN EN 378 and the manufacturer's information.

ÿOnly carry out any work if you have the relevant information in accordance with BRG 500 and DIN EN 378.
have appropriate expertise.

ÿLike many refrigerants, R32 and R410A are heavier than air and therefore collect at the bottom. In certain circumstances, concentrations can be reached in rooms that create a suffocating or ignitable atmosphere. To avoid this, it is necessary to ensure sufficient ventilation of the working environment. If there is a leak in the refrigerant system in a room with inadequate ventilation, open flames or prolonged stays of people should be avoided until the working environment is properly ventilated.

ÿThe same precaution must be taken when brazing.

ÿBefore starting work, ensure there is sufficient ventilation if refrigerant is leaked during work.
occurs. If the refrigerant comes into contact with flames, toxic gases can be produced.

ÿWhen installing or servicing, keep ignition sources such as gas combustion devices or electrical ones away
Heaters away from the work area.

ÿWhen installing or moving a system, ensure that no foreign substances such as B. Air enters the refrigeration circuit. Mixing with air or other gases leads to unusually high pressure in the refrigeration circuit and can cause lasting damage to the system.

ÿAfter completing the installation work, it must be ensured that no refrigerant is leaked.
kicking is.

transport

The equipment must be transported in full compliance with local regulations. The maximum amount of refrigerant that may be transported is determined by the applicable transport regulations.
The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) applies to transport in Europe.
This regulation allows partial exemption if the total amount of refrigerant transported on the same truck does not exceed 1000 points (1 kg A2L corresponds to 3 points; 1 kg A1 corresponds to 1 point).
For example, a truck could be loaded as follows:
10 devices with 100 kg R-410 per device, total number of points: 1000

The partial exemption from ADR enables very simple countermeasures for risks during transport, such as: B. the presence of:

- A fire extinguisher in every vehicle
- An explosion-proof flashlight in every vehicle
- A red label on the outer packaging (already attached at the factory)

3.1.3.2 Classification of installation areas

Outdoor installation

The requirements for the classification of outdoor installation are defined in the DIN EN 378 standard.

Outdoor installation is the installation of refrigerant-carrying components in a room in which at least one of the longer walls is open to the outside. This also includes ventilation slots to the outside, which cover an area (A) of at least 75% of the external walls (see Figure 1).

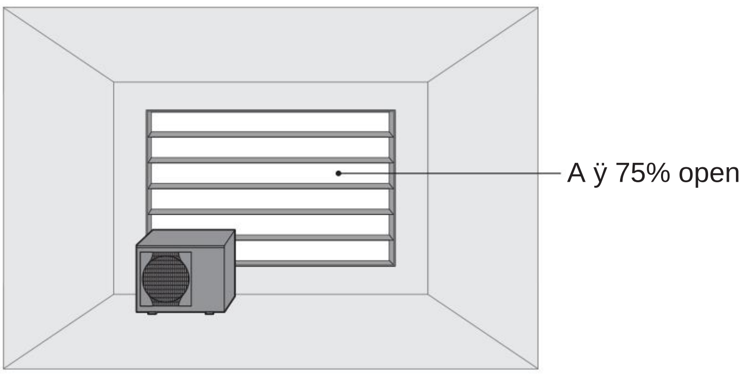


Image 1: opened wall

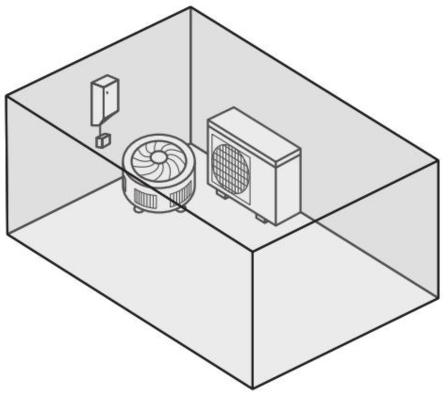


Image 2: Location of potential refrigerant accumulation

Requirements

- If system components are installed outdoors in a location where released refrigerant can accumulate (e.g. sink, see Figure 2), the requirements for gas detection systems and the ventilation of machine rooms must be met (see “Refrigeration components for installation in a machine room”; DIN EN 378-3, Section 4.3). It must be ensured that refrigerant cannot accumulate in large quantities. Refrigerant detectors and fans can help here.

- System components that are located outdoors must be arranged in such a way that no refrigerant can leak into the building or endanger people or property in any other way. Therefore, installation near ventilation openings for fresh air, door openings, floor flaps or similar openings should always be avoided.

Installation in people's lounge areas

This classification applies as soon as refrigerant-carrying system components are located in an area bounded by walls, floors and ceilings in which people stay for a longer period of time. If areas around the obvious people's stay area are clearly and permanently open to the people's stay area, then they can be viewed as part of it. Permissible openings include: E.g. suspended doors or open passageways, but also other permanent openings that extend to the floor (max. 100 mm above the floor) and ensure natural convection.

A NOTICE!

The exact boundary conditions in which cases there is a permissible opening between two adjacent rooms can be found in IEC 60335 Section GG1.3.

If refrigerant components are to be installed in an area where people are staying, the guidelines in accordance with IEC 60335 Annex GG must be adhered to.

Depending on the size of the room and the refrigerant charge, it is decided which requirements must be met for the installation area.

Installation in a separate machine room

This classification applies as soon as refrigerant-conducting components are located in a completely enclosed room or housing that is only accessible to authorized persons and is used to set up parts of the refrigeration system.

A machine room may contain additional components provided that the installation requirements are compatible with the safety requirements of the refrigeration system.

A NOTICE!

If all refrigerant-carrying components are located in a machine room or outdoors, there is no limit on the refrigerant charge quantity.

Refrigerant-carrying components in areas where people are staying

The necessary safety measures when installing refrigerant components in residential areas

areas are primarily based on the ratio of the refrigerant charge and the volume of the smallest affected room. For this purpose, the standard provides various limit values according to which the type and number of additional safety measures must be selected.

A NOTICE!

Consider the maximum area and maximum height of a room when calculating the volume.

ÿEven if the room has larger dimensions, a maximum is allowed when calculating the volume
Area of 250 m² and a height of 2.2 m cannot be exceeded.

The following illustrations show the individual limit values and safety zones depending on the room volume and refrigerant charge in areas occupied by people.

A NOTICE!

Note the different boundaries.

ÿIn the area where risk management is not necessary, the limits shift depending on the installation height of the device.

The following tables show the mathematical determination of the applicable zone and which safety measures must be taken in the corresponding zone.

Determination of the safety zone and determination of the necessary measures

without risk management			
Zone	**limit**	**Computational determination**	**Required security measures**
without Risk management		Filling quantity ÿ 1.8 kg or mmax = 2.5 × $LFL^{5/4}$ × h0 × $A^{1/2}$ • max. 15.96 kg	No security measures required

Note: All

Ecodan heat pumps in the series
- SUZ-SWM
- PUD-S(H)WM
- PUZ World Cup
- GEODAN EHGT17D

contain less than 1.8 kg refrigerant R32. This means that neither security measures nor risk management are necessary.

with risk management

In order for the additional risk management options to be applicable, the system must meet the following properties (according to IEC60335-2-40 Section 22.125):

- The outdoor unit must be located outside the relevant occupant area (e.g. outdoor installation or machine room).
- Only soldered connections are permitted (exception: direct connection between the refrigerant line and the indoor unit) - machine-made solder adapters are recommended.
- Cables must be protected against accidental damage.

Zone	limit	Computational determination	Required security measures
1	0.25 × LFL × V	mmax < 0.0768 kg/m³ × V • max. 15.96 kg (with single split)	No safety precautions required.
2	0.50 × LFL × V	mmax < 0.154 kg/m³ × V • max. 15.96 kg (with single split)	At least one safety measure (ventilation, shut-off valves or alarm) must be met. When installed in the deepest basement, at least two safety measures are required.
3		mmax > 0.154 kg/m³ × V • max. 15.96 kg (with single split)	At least two safety measures (ventilation, shut-off valves or alarm) must be met. Installations in the deepest basement are not permitted.

Legend:

mmax = total refrigerant charge quantity of the largest circuit [kg] (prefill quantity + refill quantity)

A = Room area [m²] (max. 250 m²)

V = room volume [m³]

h0 = Installation height [m] (ceiling mounting = 2.2 m; wall mounting = 1.8 m; floor mounting = 0.6 m)

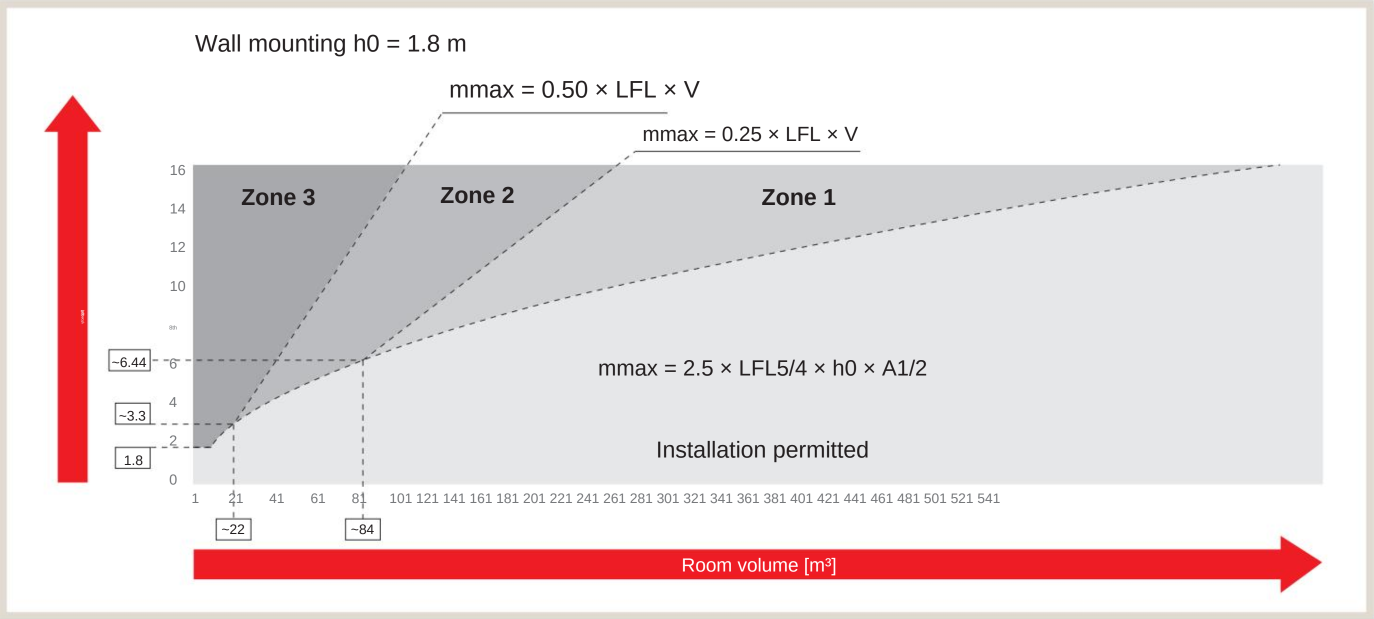
H = room height (max. 2.2 m)

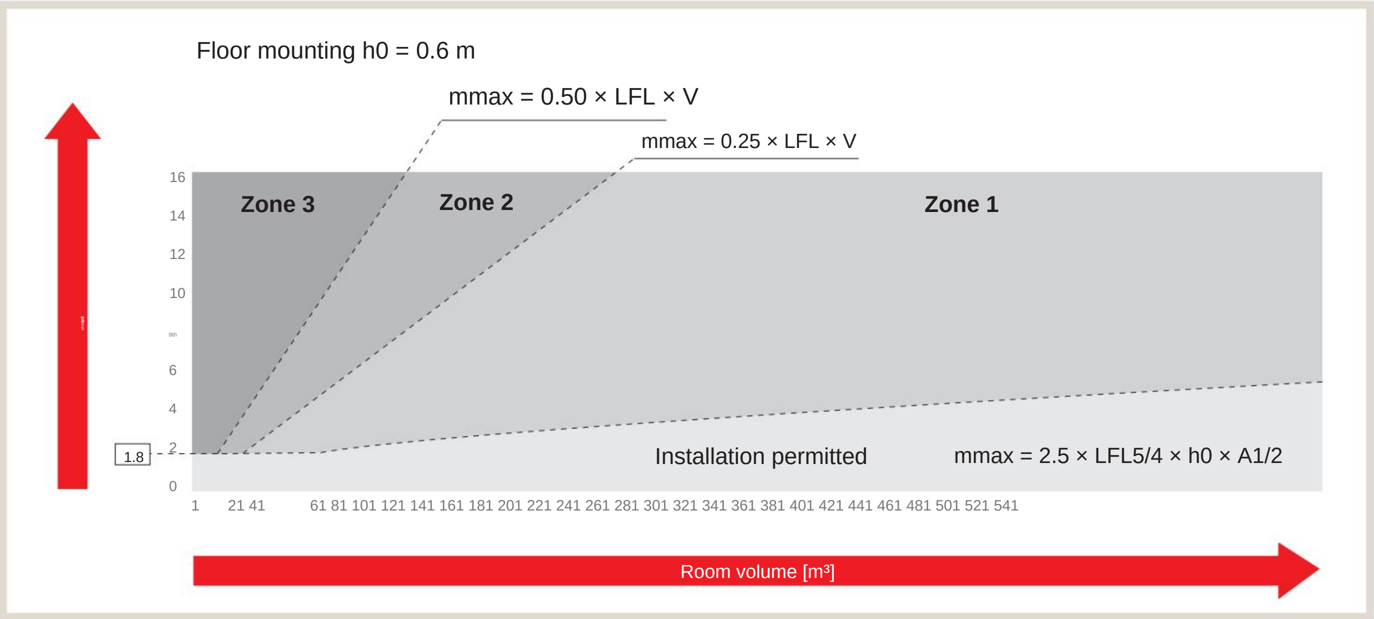
LFL = lower explosion limit (R32 = 0.307 [kg/m³])

CAUTION!

When installing refrigerant components below 1.8 m, a mechanical circulation device must be provided to avoid stagnation (accumulation of refrigerant). The device must be in continuous operation or switched on by a refrigerant detector. The minimum air flow is 240 m³/h and the air speed must be between 0.86 and 7.08 m/s (depending on the installation height and blow-out angle).

ÿThis only applies to security zones 1, 2 and 3.


Wall mounting h0 = 1.8 m
mmax = 0.50 × LFL × V
mmax = 0.25 × LFL × V
Zone 3
Zone 2
Zone 1
mmax = 2.5 × LFL5/4 × h0 × A1/2
Installation permitted
~6.44
~3.3
1.8
~22
~84
Room volume [m³]

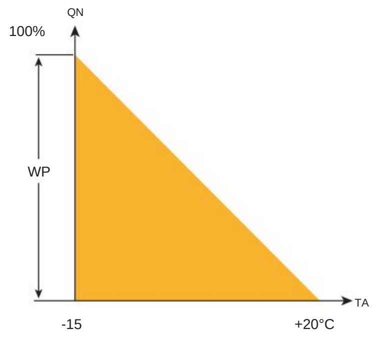

Floor mounting h0 = 0.6 m
mmax = 0.50 × LFL × V
mmax = 0.25 × LFL × V
Zone 3
Zone 2
Zone 1
Installation permitted
mmax = 2.5 × LFL5/4 × h0 × A1/2
1.8
Room volume [m³]

3.2 Modes of operation

There are different ways to heat a building with a heat pump. Depending on the application, different operating modes can make economic and/or ecological sense.

3.2.1 Monovalent mode of operation

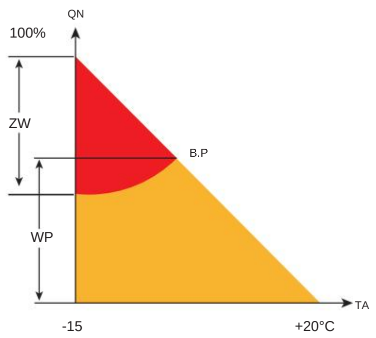
The monovalent mode of operation basically describes the use with a heat generator (e.g. heat pump) without additional support from e.g. B. Electric heating elements. The heat pump is used all year round for heating and/or drinking water.



3.2.2 Bivalent-parallel and mono-energetic operation

The bivalent mode of operation describes the simultaneous use of at least two different heat generators for heating and/or drinking water heating. As a rule, above a certain outside temperature (the bivalence point), another heat generator (e.g. oil/ gas boiler) is also used. The bivalence point is determined by the specialist installer. Other options for switching/connecting can be the CO_2 emissions or operating costs with the FTC6 heat pump controller (see chapter “6. The FTC6 heat pump controller” on page 174).

A mono-energetic operating mode is also a bivalent operating mode, but with the special feature that only electricity is used to drive the heat pump and an electric heating element. The proportion of the electric heating element in the total heating requirement should not exceed 5%. Here it is important to ensure that the setting makes economic sense.

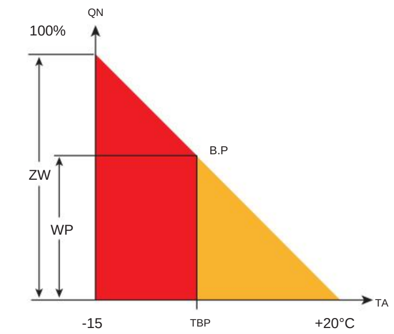


Legend

WP	Heat pump
B.P	Bivalence point
ZW	Second heat generator (electric heating element or boiler)

3.2.3 Bivalent-alternative mode of operation

The bivalent-alternative operating mode describes the alternating use of the heat pump and second heat generator (e.g. gas/oil boiler). Here the heat pump works up to a defined outside temperature (the bivalence point). If the outside temperature drops further, the heat pump switches off and the second heat generator takes over the entire heat pump task.



Legend

WP	Heat pump
B.P	Bivalence point
ZW	Second heat generator (electric heating element or boiler)
TBP	Temperature bivalence point

3.3 Dimensioning the heat pump system

3.3.1 Design of the heat pump system

Precise design and dimensioning of the required power is important for efficient and long-lasting operation of the heat pump. Over- or under-sizing often leads to operational disruptions and/or high heating costs. Basically, the design must be based on the general rules of technology. As with other heat generators, the performance determination of a heat pump system is based on a heating output calculation in accordance with.
EN 12831. This must be carried out both for the construction of new buildings and for modernization. Selecting a heat pump based on consumption values or existing heat generator output is not possible or only possible to a limited extent. The required heat pump output QWP is determined using the following values:

- Heating heat requirement of the building Qh (according to EN 12831)
- Power requirement for domestic hot water QTW
- Power requirement for special applications QS
- Power factor for bridging blocking times fBlock

The heat pump output QWP is calculated as follows:

$$\dot{Q}_{WP} = \left(\dot{Q}_h + \dot{Q}_{TW} + \dot{Q}_S\right) \cdot f_{Sperr}$$

Qh heating requirement of the building
QTW power requirement for domestic hot water
QS power requirements for special applications
fBlocking power factor to bridge blocking times

3.3.2 Heating heat requirement Qh of the building

The heating requirement Qh must be calculated in accordance with the applicable standards and guidelines. For one- and two-family houses, this can be roughly determined based on the living space A to be heated and the specific heating requirement qh :

$$\dot{Q}ÿ\,[\,kW\,] = [\,2]\,ÿm \qquad qÿ\ \left(\frac{kW}{m^2}\right)$$

A	Living space to be heated
qh	Specific heating requirements

Specific heating requirement (guide value) >	Building
0.12 kW/m²	Old building without thermal insulation
0.07-0.09 kW/m²	Building before 1980 with simple thermal insulation
0.05-0.06 kW/m²	Building from 1995 according to thermal insulation regulations
0.03-0.05 kW/m²	Buildings from 2000 according to EnEV
0.02–0.04 kW/m²	New building according to EnEV 2014
< 0.02 kW/m²	Passive house

If the existing boiler is to be exchanged for a heat pump as part of a modernization, then in addition to the heating requirements of the building, the actually required maximum flow temperature must be determined in order to be able to carry out further renovation measures if necessary, see chapter “3.4 System temperatures in modernization”. Page 51.

3.3.3 Power requirement for drinking water heating QTW

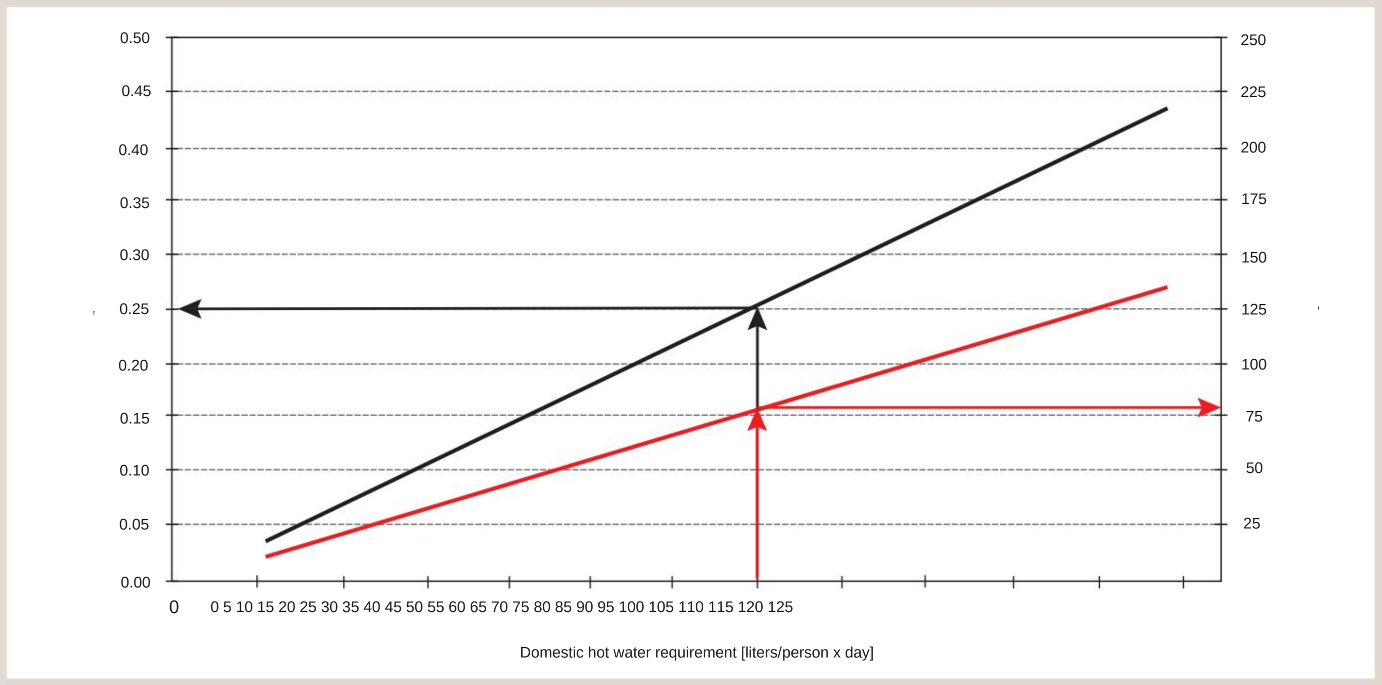
The power requirement for heating drinking water depends heavily on individual user behavior and comfort requirements. Furthermore, the demand is not evenly distributed over the entire day, but is characterized by so-called peaks (e.g. morning and evening). A large proportion of the drinking water requirement has a temperature of around 40 °C and only a small proportion of 50 °C.

The system must be dimensioned based on the maximum daily domestic hot water requirement and the individual user behavior. The following table shows guideline values for different domestic hot water requirements:

category	Hot water requirement at 45 °C [liter/(person x day)]	Specific useful heat [Wh/(person x day)]
Low demand	15 – 30	600 – 1200
Medium need	30 – 60	1200 – 2400
High demand	60 – 120	2400 – 4800

Based on the corresponding domestic hot water requirement, the additional power for the heat pump as well as the corresponding storage volume for one- and two-family houses can be determined in a simplified manner. For detailed planning, regional and national guidelines and standards (such as DIN EN 15450) must be taken into account.

Drinking water storage – power requirement and volume [45 °C]



A NOTICE!

The additional power requirement for DHW heating only needs to be taken into account if it corresponds to approx. 15% or more of the building's total heating load.

3.3.4 Power requirement for domestic hot water QTW

A flat rate of 0.2 kW per person can be expected with medium drinking water comfort.

A NOTICE!

If circulation lines are provided, these must be taken into account when determining the overall performance.

3.3.5 Power requirement for special applications Qs

Special applications include additional power requirements such as: E.g. swimming pools, ventilation or humidification systems. These have a significant influence and must be determined through a heat requirement calculation.

3.3.6 Power factor for bridging blocking times fBlock

Some energy supply companies offer special electricity tariffs for heat pumps. In return, the energy supply company reserves the right to interrupt the power supply for a maximum of 3 x 2 hours within 24 hours. These interruptions often occur during peak utility periods: morning, midday and/or evening.
The amount of energy missing at this time can be compensated for using buffer storage or the building's storage mass. To ensure that sufficient energy is available after the blocking period, this must be taken into account in the form of a blocking time factor as follows:

$$f_{Sperr} = \frac{24\ Stunden}{24\ Stunden - Sperrzeit[H]}$$

For blocking times of 2, 4 and 6 hours this results in a factor of 1.1/1.2/1.33.

3.3.7 Sample calculation and system selection

Example:

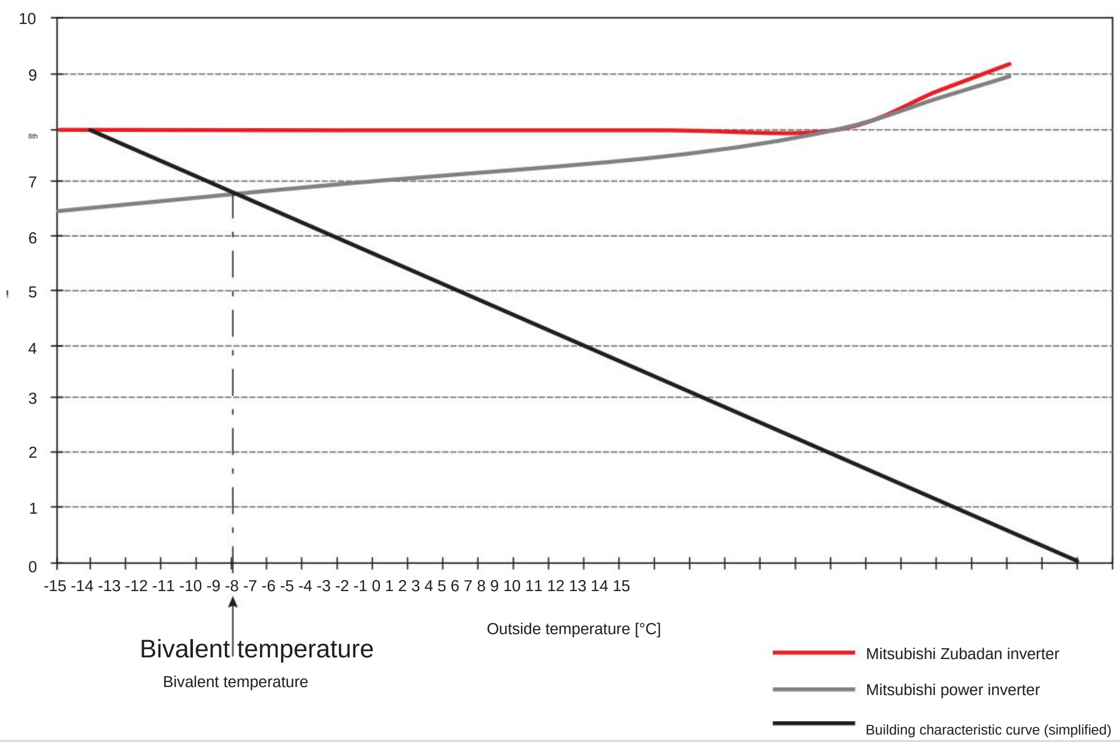
- Single-family house (built in 2010)
- Standard design temperature -14 °C
- Living area A = 200 m²
- Number of people = 4
- Drinking water requirement medium ~ 55 [l/(person x day)]
- Special applications = none
- Blackout times = 2 x 2 hours in 24 hours

Calculation:

Heating heat requirement	$\dot{Q}_{ÿ} = ÿ\ A \ q_{ÿ} = 200\ [m^2]\ ÿ\ 0.03[\frac{kW}{m^2}] = 6.0[kW]$
Drinking hot water	$\dot{Q}_{TW} = 0.2 [\frac{kw}{Pers.}]\ ÿ\ 4\ [Pers.] = 0.8[kW]$
Special application	$\dot{Q}_{S} = 0$
Blocking time factor	$f_{Sperr} = 1.2$
heating capacity	$\dot{Q}_{WP} = ÿ(\dot{Q}_{ÿ} + \dot{Q}_{TW} + \dot{Q}_{S})\ ÿ\ f_{Sperr} = (6.0 + 0.8 + 0)\ ÿ\ 1.2 = 8.16\ kW$

The required heat pump must provide 8.16 kW of heating output at the design point. This can result in air/water heat pumps only having to deliver the maximum heating output required for a relatively short period of time within a heating period. Significantly less heating power is required for the rest of the heating period. With non-inverter heat pumps and warmer outside temperatures, this means that they either deliver too much power or too little power in bivalent operation. Without a generously dimensioned buffer storage, the service life of non-inverter heat pumps can be drastically shortened due to frequent cycle behavior.

In this case, air/water heat pumps with inverter or Zubadan technology can reduce their output and adapt it to the building's heat requirements. This makes them significantly more efficient than non-inverter heat pumps. Air/water heat pumps with low output are often designed to be bivalently mono-energetic for cost reasons. The missing heating power is then provided by an electric heating element. This results in a bivalence point that indicates the outside temperature at which the electric heating element supports the heat pump. Air/water heat pumps with Zubadan technology do not require an electric heating element. The following diagram shows an example of the use of two air/water heat pumps with Power Inverter technology (gray) and Zubadan technology (red) in a building with 8 kW heating requirement, standard design temperature of -14 °C and a heating limit temperature of 14 °C.

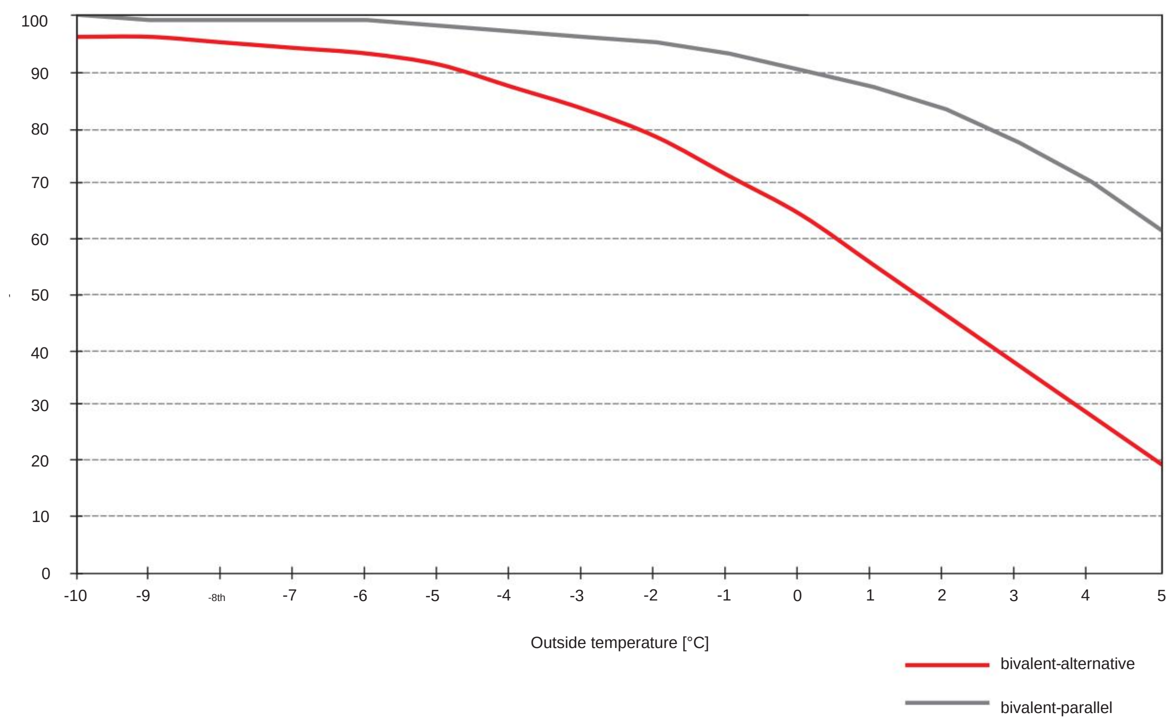


From the diagram above it can be seen that the bivalence point for a power inverter air/water heat pump is -10 °C outside temperature. With Zubadan technology, the full heating output is available even at standard design temperatures of -14 °C outside temperature.

As part of mono-energetic system planning, both investment and operating costs should always be taken into account. DIN 4701-10 provides precise information on the division of the annual heating work between the heat pump and additional heat generator. It has been shown that a heat pump share of 98% of the annual heating work is acceptable, which corresponds to a bivalence temperature of approx. -5 °C.

In addition to a mono-energetic/bivalent-parallel mode of operation, there is also the option of having the entire heating output up to the bivalent temperature provided by the heat pump and beyond by the additional heat generator with the bivalent-alternative mode of operation. The following diagram can roughly be used for both operating modes.

Heat pump coverage share for bivalent-parallel and bivalent-alternative operation mode



3.4 System temperatures in modernization

In older oil and gas boiler systems, the boiler temperature is set to a temperature of 70 °C to 75 °C. This high temperature is usually only required for heating drinking water. Downstream control systems such as mixing and thermostatic valves prevent the individual rooms and the building from overheating. If the existing boiler is to be converted to a heat pump as part of a modernization, the actually required maximum flow temperature must be determined in order to be able to take the correct renovation measures. It is often sufficient to replace existing radiators with new panel radiators.

There are two different ways to determine the maximum flow temperature:

1. The heat requirements of each individual room and the building are known.
2. Experimental method using the heating curve of the current heat generator.

3.4.1 Calculation based on the heat requirements of the rooms

Based on the heat requirement of the room or building, the performance and the associated flow/return temperature can be read using performance tables for different types of radiators.

A NOTICE!

The additional power requirement for DHW heating only needs to be taken into account if it corresponds to approx. 15% or more of the building's total heating load.

Basically, the information provided by the radiator manufacturer should be taken into account, which usually sets the heating output at 75/65°C and/or or 55/45°C. If no values are available for different temperature pairings, the tables in the appendix chapter “10.3 Radiator calculations” on page 362 or the following correction formula can be used.

$$f = \left(\frac{\Delta\vartheta_N}{\Delta\vartheta}\right)^n$$

$$\dot{Q}_{HN} = \dot{Q}_H \cdot f$$

f Conversion factor for different design temperatures

ÿÿN temperature difference norm
50 K (according to DIN EN 442-2: ((75+65)/2) – 20 = 70 – 20 K)

ÿÿ Temperature difference operation ÿm-
ÿL of the system in question

ÿm Average radiator temperature (ÿV+ÿR)/2

ÿL Air temperature

ÿV flow temperature

ÿR return temperature

n Radiator exponent

QHN standard heating output at ÿÿN = 50 K

QH Heating output under existing operating conditions or existing temperature difference

Conversion factors f for different design temperatures (exponent n = 1.3)

ÿV °C	ÿR °C	10	12	15	18	20	22	24
90	**85**	0.57	0.58	0.61	0.65	0.67	0.70	0.73
	80	0.59	0.61	0.64	0.68	0.71	0.74	0.77
	75	0.62	0.64	0.68	0.72	0.75	0.78	0.82
	70	0.65	0.67	0.72	0.76	0.80	0.83	0.87
	65	0.68	0.71	0.76	0.81	0.85	0.89	0.93
	60	0.71	0.76	0.81	0.87	0.91	0.96	1.01
85	**80**	0.62	0.64	0.67	0.72	0.75	0.78	0.81
	75	0.64	0.67	0.71	0.75	0.79	0.82	0.86
	70	0.68	0.70	0.75	0.80	0.84	0.88	0.92
	65	0.72	0.75	0.80	0.85	0.89	0.94	0.99
	60	0.76	0.79	0.85	0.91	0.96	1.01	1.07
80	**75**	0.68	0.70	0.75	0.79	0.83	0.87	0.91
	70	0.71	0.74	0.79	0.84	0.88	0.93	0.97
	65	0.75	0.78	0.84	0.90	0.94	0.99	1.05
	60	0.80	0.83	0.89	0.96	1.01	1.07	1.13
	55	0.83	0.89	0.96	1.04	1.10	1.16	1.24
75	**70**	0.75	0.78	0.93	0.89	0.94	0.98	1.04
	65	0.79	0.82	0.88	0.95	1.00	1.05	1.12
	60	0.84	0.88	0.94	1.02	1.08	1.14	1.21
	55	0.89	0.94	1.01	1.10	1.17	1.24	1.32
	50	0.96	1.01	1.10	1.20	1.28	1.37	1.47
70	**65**	0.68	0.87	0.94	1.01	1.07	1.13	1.19
	60	0.88	0.93	1.00	1.08	1.15	1.22	1.30
	55	0.94	0.99	1.08	1.17	1.25	1.33	1.42
	50	1.01	1.07	1.17	1.28	1.37	1.47	1.58
	45	1.07	1.16	1.28	1.42	1.52	1.64	1.79

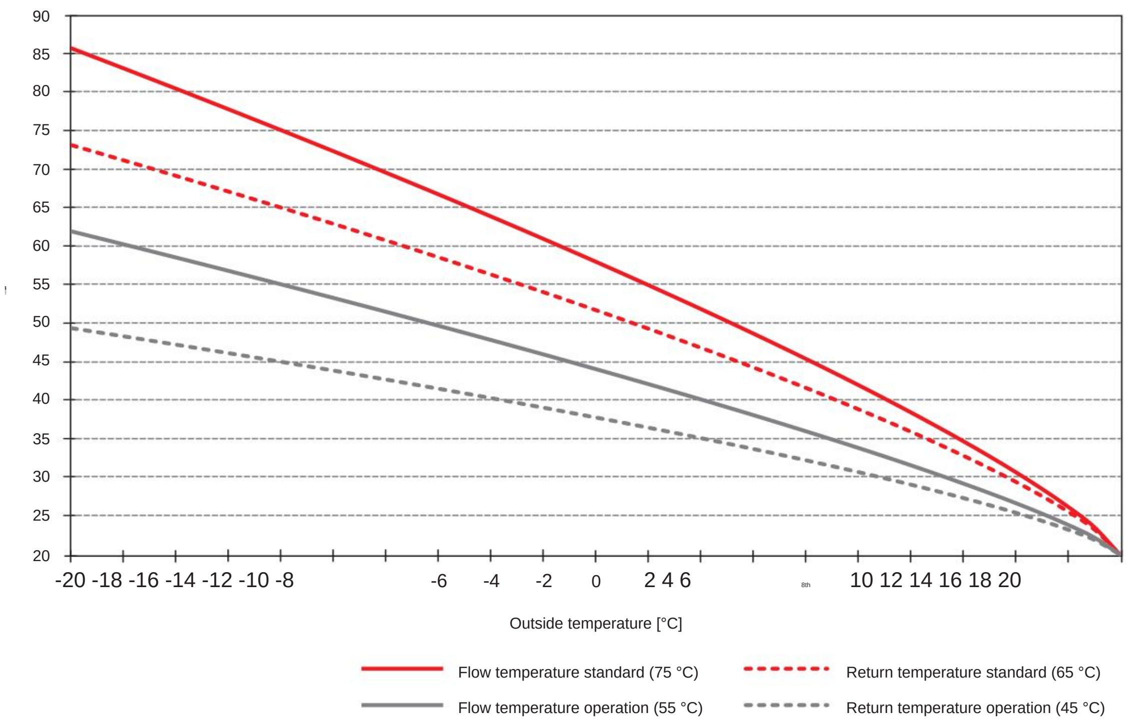
ÿV °C	ÿR °C	10	12	15	18	20	22	24
65	**60**	0.94	0.98	1.07	1.16	1.23	1.31	1.40
	55	1.00	1.05	1.15	1.26	1.37	1.43	1.54
	50	1.08	1.14	1.25	1.37	1.47	1.58	1.71
	45	1.17	1.24	1.37	1.52	1.64	1.78	1.94
	40	1.23	1.37	1.52	1.71	1.87	2.05	2.27
60	**55**	1.07	1.13	1.23	1.36	1.45	1.56	1.68
	50	1.15	1.22	1.34	1.48	1.60	1.73	1.87
	45	1.25	1.33	1.47	1.65	1.78	1.94	2.13
	40	1.37	1.47	1.64	1.86	2.03	2.24	2.50
	35	1.45	1.64	1.87	2.15	2.39	2.69	3.06
55	**50**	1.23	1.31	1.45	1.62	1.75	1.90	2.07
	45	1.34	1.43	1.60	1.80	1.96	2.15	2.37
	40	1.47	1.59	1.78	2.03	2.24	2.48	2.78
	35	1.64	1.78	2.03	2.36	2.64	2.99	3.43
	30	1.75	2.05	2.39	2.86	3.29	3.86	4.67
	25	1.94	2.44	2.96	3.75	4.60	6.03	9.62
50	**45**	1.45	1.56	1.75	1.98	2.17	2.40	2.67
	40	1.60	1.73	1.96	2.25	2.50	2.79	3.15
	35	1.78	1.94	2.24	2.63	2.96	3.38	3.92
	30	2.03	2.24	2.64	3.20	3.70	4.39	5.39
45	**40**	1.75	1.90	2.17	2.53	2.83	3.19	3.66
	35	1.96	2.15	2.50	2.96	3.37	3.89	4.58
	30	2.24	2.48	2.96	3.63	4.25	5.11	6.38
	25	2.64	2.99	3.70	4.84	6.08	8.26	13.9
40	**35**	2.17	2.40	2.83	3.41	3.93	4.62	5.54
	30	2.50	2.79	3.37	4.21	5.01	6.14	7.87
	25	2.80	3.37	4.25	5.68	7.28	10.20	17.90

Column headings 10–24: Room temperature ÿL in °C

3.4.2 Experimental method using the heating curve of the current heat generator

The heating curve of the existing heat generator is reduced during the heating period, with the thermostat valves fully open, until a satisfactory room temperature (of 20 - 22°C) is achieved. You can now use the heating curve to see what maximum flow temperature is required.

Example:
With a set heating curve of 75/65°C at -12°C outside temperature, a system temperature of 55/45°C can be selected.



A NOTICE!

Every degree Celsius reduction in the flow temperature results in a saving in energy consumption of approx. 2.5%.

A NOTICE!

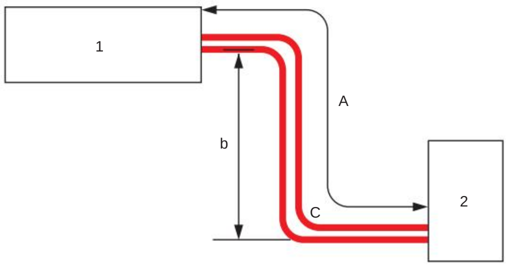
In order to set the heating curve correctly, hydraulic balancing is always necessary.

3.5 Air/water heat pumps

3.5.1 Planning of refrigerant lines for heat pump split systems

Make sure that the pipe length, height difference and number of elbows in the pipes between indoor unit (1) and outdoor unit (2) do not exceed the following.

Maximum cable lengths



	Device type	Maximum cable length (A) (one way) [m]	Maximum height difference (B) [m] 1)	Maximum number of Manifold (C)
Power inverters	**PUD-SWM60VAA**	30	30	10
	PUD-SWM80YAA	30	30	10
	PUD-SWM100YAA	30	30	10
	PUD-SWM120YAA	30	30	10
	PUHZ-SW160YKA	80	30	15
	PUHZ-SW200YKA	80	30	15
Zubadan inverter	**PUD-SHWM60VAA**	30	30	10
	PUD-SHWM80YAA	30	30	10
	PUD-SHWM100YAA	30	30	10
	PUD-SHWM120YAA	30	30	10
	PUD-SHWM140YAA	25	25	10
	PUHZ-SHW140YHAR5 75		30	15
	PUHZ-SHW230YKA2R2 80		30	15
Eco inverter	**SUZ-SWM40VA**	30	30	10
	SUZ-SWM60VA	30	30	10
	SUZ-SWM80VA	30	30	10

1) The limitation of height differences is mandatory, regardless of which system, indoor or outdoor, is in the higher position.

In principle, additional insulation of the refrigerant pipes between the outdoor and indoor units is recommended. Especially if they are laid underground to avoid excessive heat loss. Unnecessarily long pipes or distances between the outdoor and indoor units should also be avoided, as this also has a detrimental effect on the efficiency of the heat pump.

3.5.2 Adjustment of the refrigerant charge quantity

All Mitsubishi Electric air-to-water heat pumps are pre-charged with refrigerant at the factory. It may be necessary to correct the filling quantity during installation if the distance between the outdoor and indoor units differs significantly.

To improve performance, it is recommended to reduce the filling quantity of outdoor units with R410A if the pipe length is significantly shorter than 30 m. If the pipe length exceeds 30 m, additional refrigerant R410A must be filled into the system in accordance with the permissible pipe length specified in the following table.

Device	Refrigerant	Factory filling [kg]	Allowed Cable length [m]	Additional refrigerant charge						Maximum Refrigerant quantity [kg]
Power inverters				Up to 15m	Over 15 m	22m	25m	27m	30m	
PUD-SWM60VAA	R32	1.3	2-30	–	20g × (Refrigerant pipe length (m) - 15)				0.30kg	1.60
PUD-SWM80YAA	R32	1.3	2-30	–	20g × (Refrigerant pipe length (m) - 15)				0.30kg	1.60
PUD-SWM100YAA	R32	1.6	2-30	–	20g × (Refrigerant pipe length (m) - 15) 20g ×			0.23kg		1.83
PUD-SWM120YAA	R32	1.6	2-30	–	(Refrigerant pipe length (m) - 15)			0.23kg		1.83
Zubadan inverter										
PUD-SHWM60VAA	R32	1.4	2-30	–	20g × (Refrigerant pipe length (m) - 15)				0.30kg	1.70
PUD-SHWM80YAA	R32	1.4	2-30	–	20g × (Refrigerant pipe length (m) - 15)				0.30kg	1.70
PUD-SHWM100YAA	R32	1.7	2-30	–	20g × (Refrigerant pipe length (m) - 15) 20g ×	0.13kg				1.83
PUD-SHWM120YAA	R32	1.7	2-30	–	(Refrigerant pipe length (m) - 15) 20g ×	0.13kg				1.83
PUD-SHWM140YAA	R32	1.7	2-25	–	(Refrigerant pipe length (m) - 15)	0.13kg		–		1.83

Device	Refrigerant	Factory filling [kg]	Allowed Cable length [m]	Additional refrigerant charge		Maximum Refrigerant quantity [kg]
Eco inverter				Up to 10m	Over 10 m	
SUZ-SWM40VA	R32	1.2	5-30	–	20g × (Refrigerant pipe length (m) -10) 20g ×	1.60
SUZ-SWM60VA	R32	1.2	5-30	–	(Refrigerant pipe length (m) -10) 20g ×	1.60
SUZ-SWM80VA	R32	1.2	5-30	–	(Refrigerant pipe length (m) -10)	1.60

Device	Refrigerant	Factory filling [kg]	Cable length with Factory filling [m]	Filling quantity to be adjusted for different pipe routes (one direction) [kg]					
Power inverters				11-20m (8-15m)	21-30m	31-40m	41-50m	51-60m	61-75 m (61–80 m)
PUHZ-SW160YKA	R410A	7.1	30	-0.6	-0.3	0.9	1.8	2.7	3.6*
PUHZ-SW200YKA	R410A	7.7	30	-0.8	-0.4	1.2	2.4	3.6	4.8*
Zubadan inverter									
PUHZ-SHW140YHAR5	R410A	5.5	30	-0.4	-0.2	0.6	1.2	1.8	2.4
PUHZ-SHW230YKA2R2	R410A	7.1	30	-0.8	-0.4	1.2	2.4	3.6	4.8*

* The filling quantity applies to the cable length stated in brackets.

- Switch off the system.
- Create a vacuum in the pipe extensions and the indoor system.
- Refill the system with additional refrigerant through the liquid shut-off valve.
- If the system is running, add refrigerant via the shut-off valve using a safety filler.
  Refrigerant must not be filled directly into the shut-off valve.
- After filling the system with refrigerant, record the amount of refrigerant added in the system logbook.

If you want to reduce the amount of refrigerant, vacuum it professionally into a designated refrigerant bottle.
The “pump down” function on the outdoor unit supports you here.

3.5.3 Installation and setup

Please note the following information when setting up and installing the heat pump system.

3.5.4 Basic installation instructions

• Install mud separators in the heat pump return to protect the heat pump from sludge and to ensure long, trouble-free operation.
• Provide ventilation options at the highest points of the heating system or alternatively a high high-performance micro air bubble separator. • Provide drainage options at the lowest points of the heating system. • For monobloc air-to-water heat pumps, keep the heating water pipes as close to the building as possible and install ventilation options on the outdoor unit if the indoor unit is installed lower than the outdoor unit.

• Lay the heating water pipes in frost-free ground and insulate them in accordance with EnEV 2014. It may be possible Pipe heating or drainage options may be required.

3.5.5 Installation of outdoor units and condensate drainage

In principle, air/water heat pumps from Mitsubishi Electric should be installed outdoors. It is important to ensure that the ambient air is sucked in and blown out undisturbed. Since the air on the outlet side has significantly lower temperatures, it should not be directed directly at walls or areas frequently used by people (e.g. terraces, sidewalks, etc.).

• Avoid locations where the device is exposed to direct sunlight or other heat sources. • Choose a location where operating noises will not disturb the neighbors. • Select a location that provides easy cabling and line access to the power source. • Avoid locations where flammable gases may escape, generate, flow or accumulate. • Choose a level location that can withstand the weight and vibration of the device: Avoid locations where the device may become covered with snow. This can lead to a reduction in airflow. This may cause the device to not function properly. In areas where increased snowfall is expected, special precautions must be taken to prevent snow from blocking the air inlet, such as locating the unit at a higher elevation or installing a protective grille or grille Snow protection hood over the air inlet. • Avoid locations where the device is exposed to oil, steam or sulfur gas. • When transporting, be sure to hold the handles of the device. Do not hold the device by its bottom

firmly, otherwise there is a risk of hands or fingers being crushed.
• When installing the outdoor unit on a roof or other location where the unit is exposed to strong wind, the air outlet should not face directly into the wind. If strong wind enters the air outlet, the normal airflow may be affected and malfunction may occur. The installation of windshields is recommended for this purpose.

Drainage of condensate

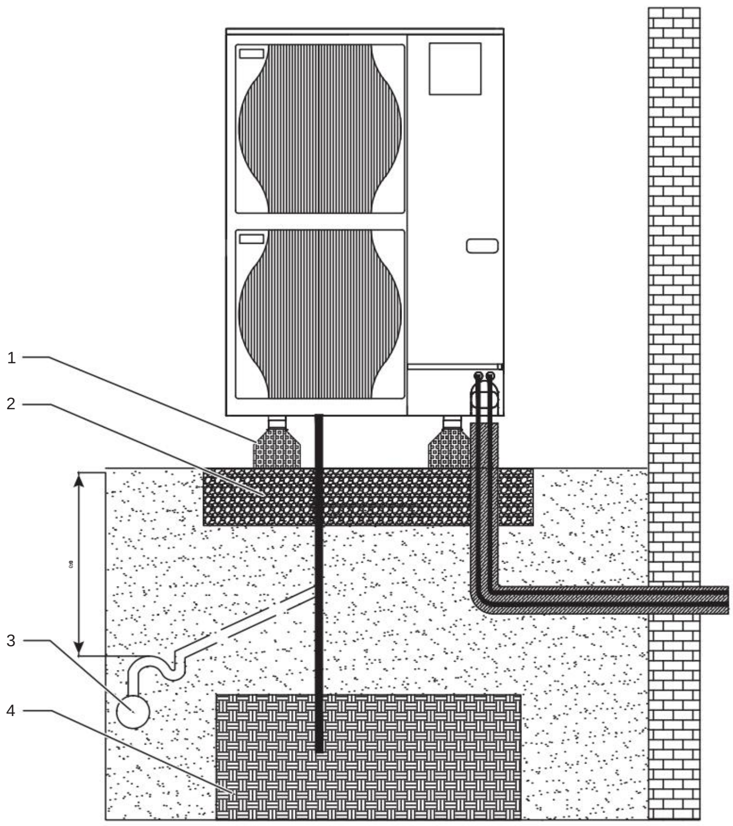
The condensate that occurs during operation must be drained away frost-free. Depending on the weather conditions, significant amounts (50–100 l) of condensate can accumulate, especially during the defrosting process. The following accessories can be used for this:

• Condensate drain set

• Connection plug set for condensate drain heating and •
drain heating (on site).

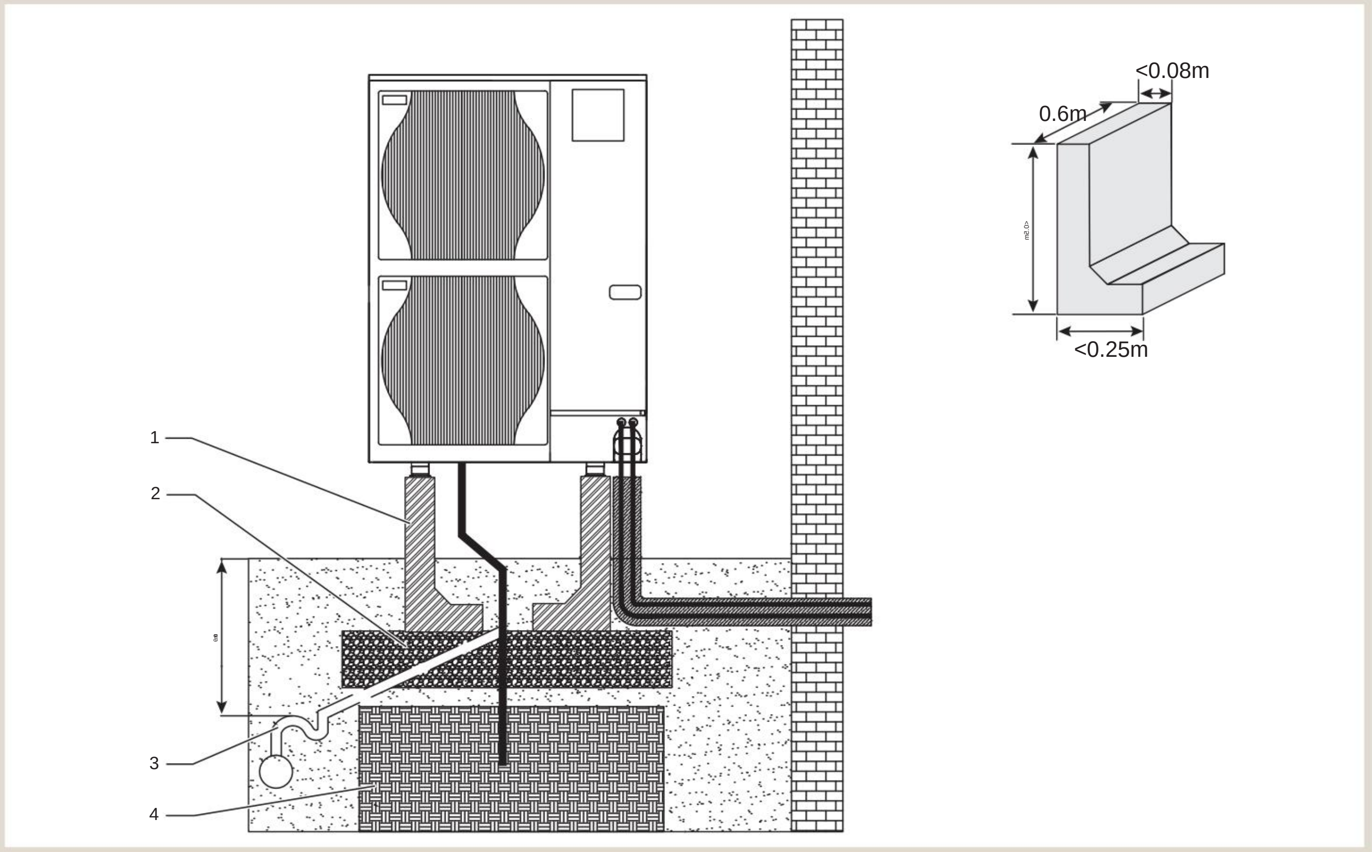
The condensate can either be discharged into the sewage system or a drainage system (3) or an appropriately large gravel bed (4). To ensure proper drainage into the sewage system, a siphon must be provided that is below the frost line. The gravel bed must also be below the frost line, but at least 0.9 m.
To avoid the transmission of structure-borne noise to the building, the damping base, L-stone or steel frame (1) must be installed in a sand bed (2). All pipes and wall penetrations must comply with standards, be thermally insulated, soundproof and frost-proof. The refrigerant pipe can be laid in the ground in empty pipes with subsequent foam filling in order to minimize heat losses.

Installation on a damping base



Legend
1 damping base
2 sand bed
3 sewage system or drainage
4 gravel bed

Set up on L-stones

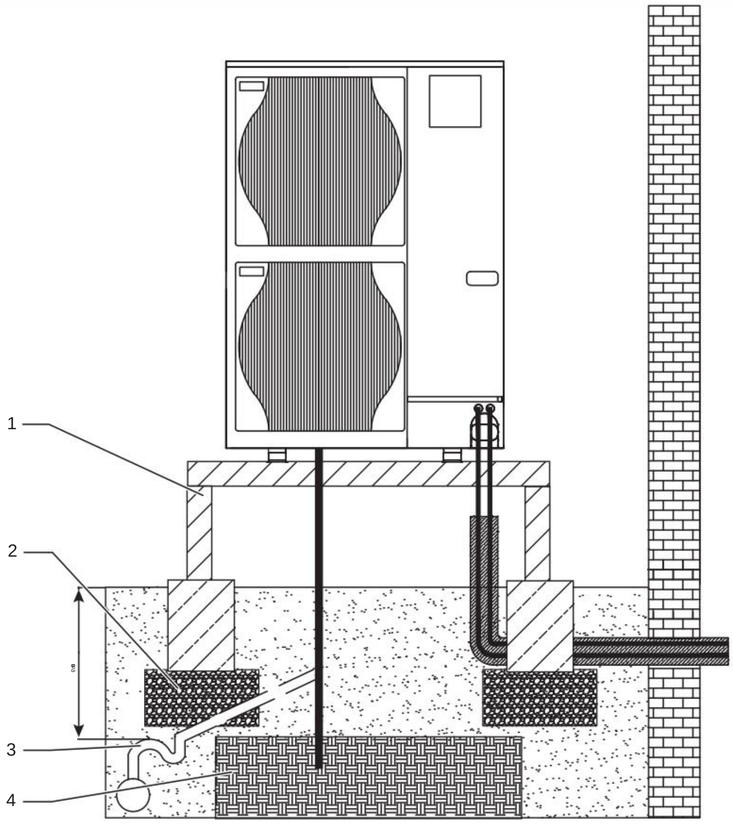


Legend

1 Steel frame 2
Sand bed 3

Sewage system or drainage 4 Gravel
bed

Installation on steel frame



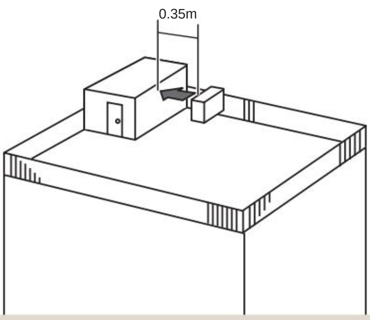
Legend

1 Steel frame 2
Sand bed 3

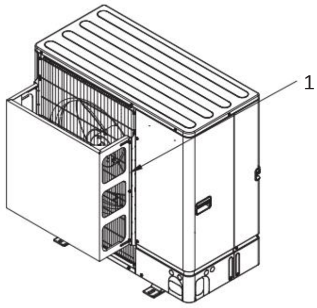
Sewage system or drainage 4 Gravel
bed

Precautions in case of strong winds

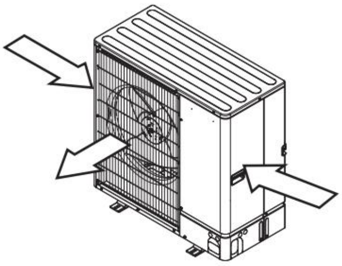
- In strong winds (e.g. when installing on a roof), position the air outlet so that it is closest to the wall at a distance of approx. 0.35 m.



• Install an optional windshield (1) if the device is placed in a location subject to strong wind
Winds can blow directly into the air outlet.



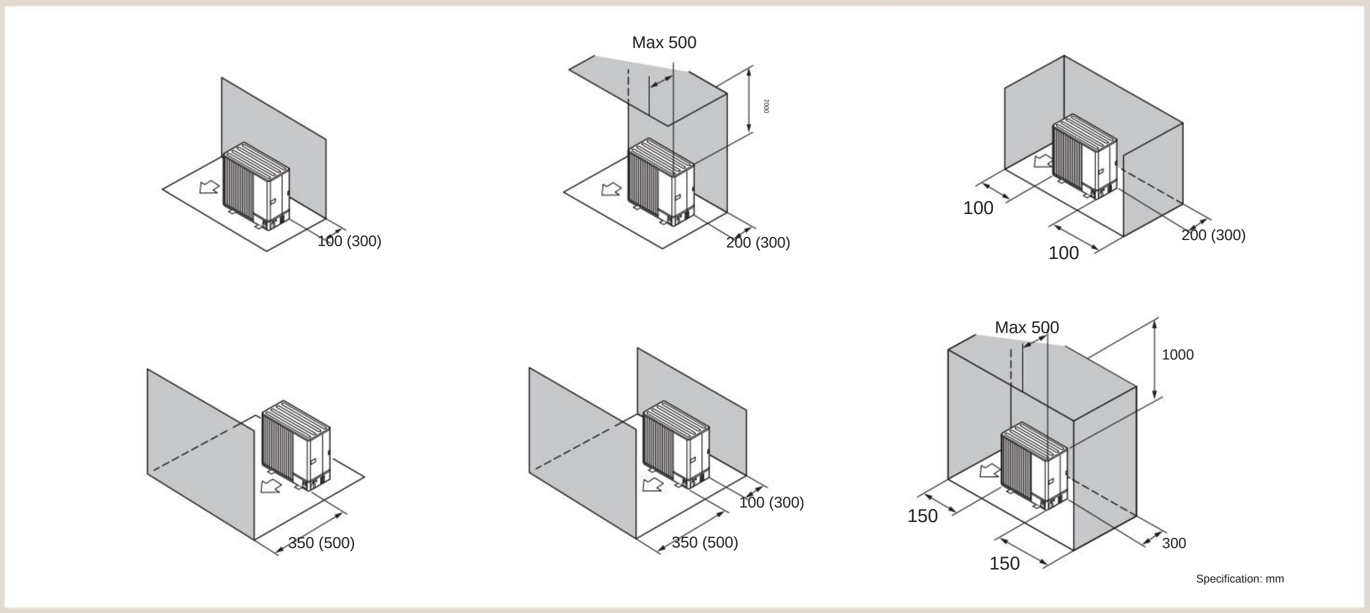
• If possible, position the device so that the exhaust air is at a right angle to the seasonal wind direction.
can flow.



3.5.6 Required minimum distances when installing outdoor units

3.5.6.1 Required minimum distances when installing a single device

The values in brackets are the values for the device types WM50.

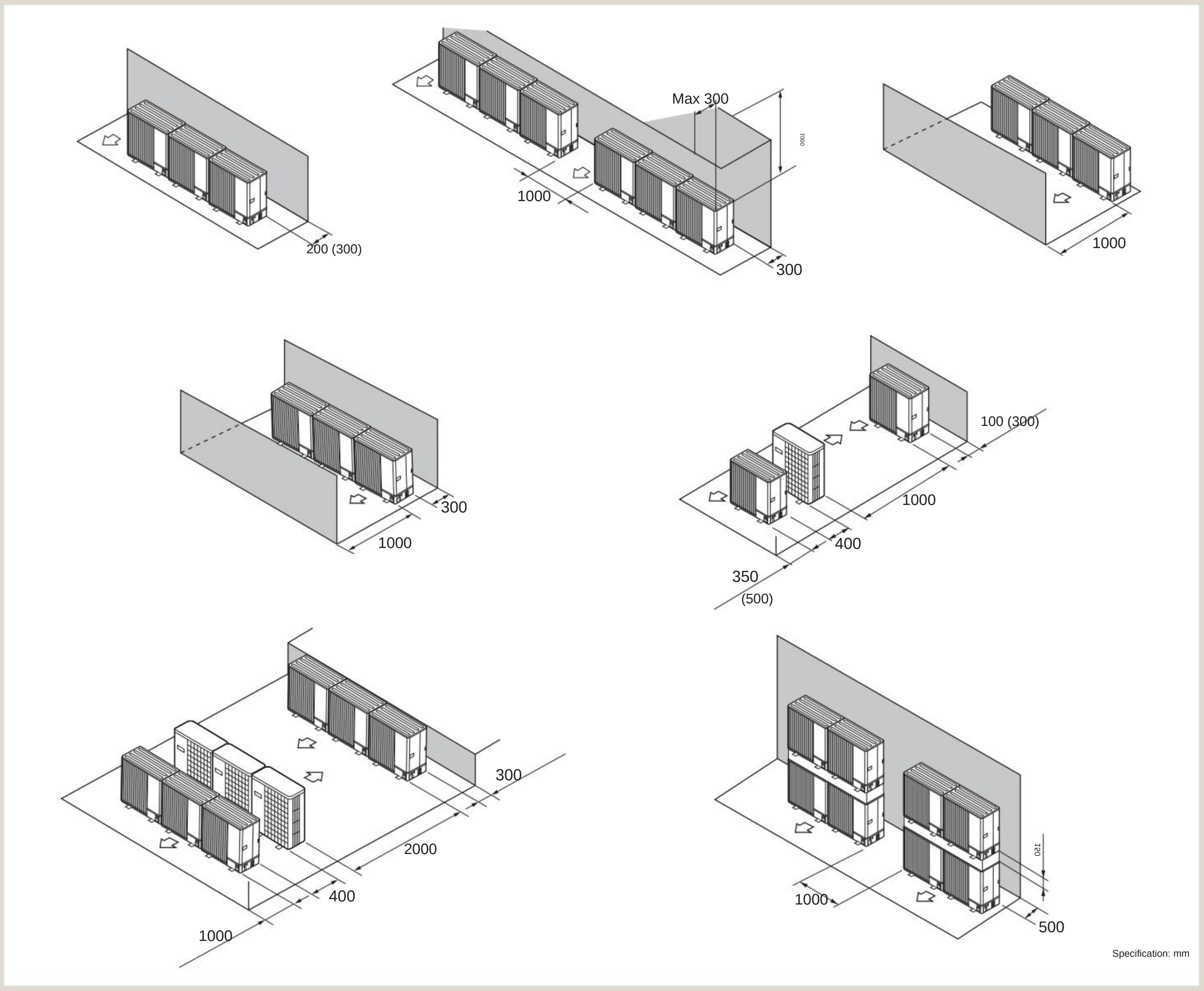


3.5.6.2 Required minimum distances when installing several devices

A NOTICE!

No more than three devices may be placed next to each other.
Leave the specified minimum distance between them.
Do not install an optional air baffle with an upward air outlet.

The values in brackets are the values for the device types WM50. The distance between the devices is at least 50 mm.



• If an optional air baffle is installed, the minimum distance for device types is HWM140, SW160/200 at least 1000 mm.

• If an optional air baffle with upward air outlet is installed, the minimum distance is when assembling several devices at least 500 (1000) mm.

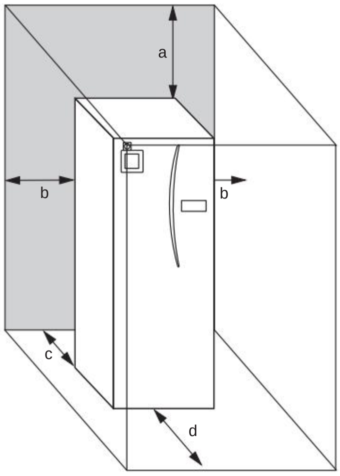
• If an optional air baffle with upward air outlet is installed, the minimum distance is when assembling several devices at least 1000 (1500) mm.

• Up to two devices can be stacked on top of each other. • No more than two stacked devices may be installed next to each other.

3.5.7 Installation of indoor units and condensate drainage

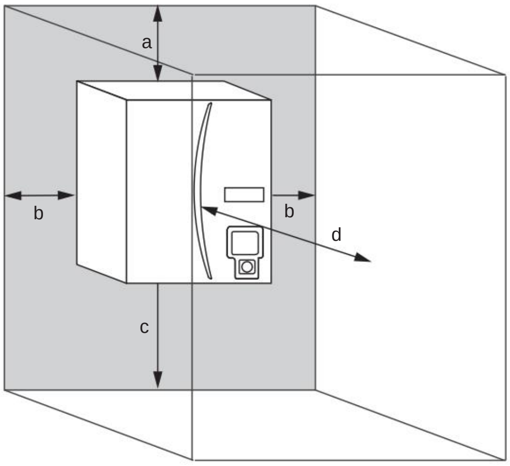
• When installing the indoor units, observe the following minimum clearances required for maintenance work.

3.5.7.1 Minimum distances between memory modules



position	Minimum distance [mm]
a	300
b	150
c	10
d	500

3.5.7.2 Minimum distances from hydro module



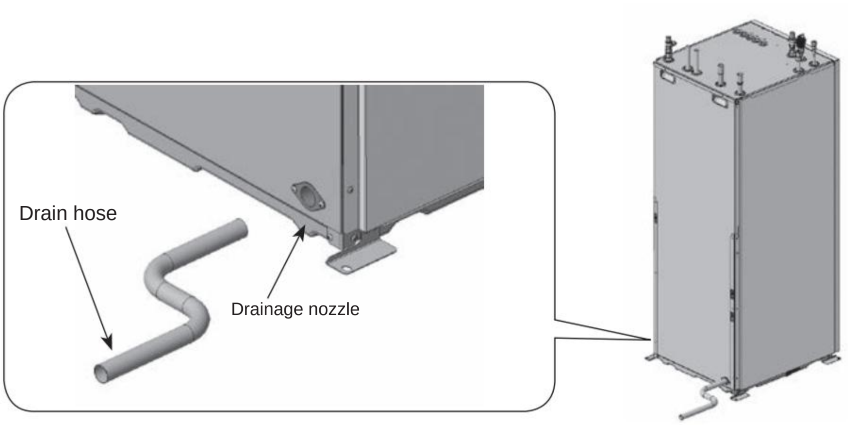
position	Minimum distance [mm]
a	200
b	150
c	500
d	500

3.5.7.3 Condensate drain line (ERS* type devices only)

The condensate drain and the condensate drain line must be installed so that the condensate can be drained away during cooling operation.

• To prevent dirty water from running directly onto the floor next to the storage module, close a
Provide suitable pipework for draining from the drain pan of the storage module.
• Install the condensate drain line securely to prevent leakage from the connection.
• Securely insulate the condensate drain line to prevent water from escaping from the on-site drain pipe.
line is dripping.
• Install the condensate drain line with a slope of 1/100 or more.
• Do not route the condensate drain line into a sewer where sulfur gases are present.
• After installation, check that the condensate drain line is properly connected to the designated sewer.

Condensate drain line installation



If necessary, it is advisable to attach the drain hose before finally installing the memory module.

• Insert the drain connection deep into the drain hose. • Fasten the drain
hose with the clamp.
• Apply adhesive tape to the hatched areas in the drain line and on the outside of the drain nozzle
made of PVC, as shown.
• Connect the drain hose and the on-site drain line.

A NOTICE!

Secure the on-site drain line so that it does not become detached from the drain hose.

Check the condensate drain line

• Remove the front cover and gradually pour one liter of water into the drain pan. • Check whether the drain line
drains water properly from the pipe outlet.
• Make sure there are no leaks at the connection points.

3.6 Brine/water heat pumps

If a sufficiently large undeveloped area of land is available, the brine/water heat pump is an ideal alternative. The Geodan heat pump installed in the building is connected to a geothermal probe or a geothermal collector. Inside the heat pump there is a hermetically sealed refrigeration circuit in which the refrigerant circulates.

This brine circuit absorbs the energy underground and transfers it to the refrigerant in the heat pump.
The refrigerant evaporates within the system and is passed on to the compressor. The gaseous refrigerant is compressed in the compressor - causing the temperature to rise.
In the next step, the energy is passed on to the heat distribution system in the building. The cooled refrigerant is pumped through the probe or collector again - the cycle begins again.

3.6.1 General planning information

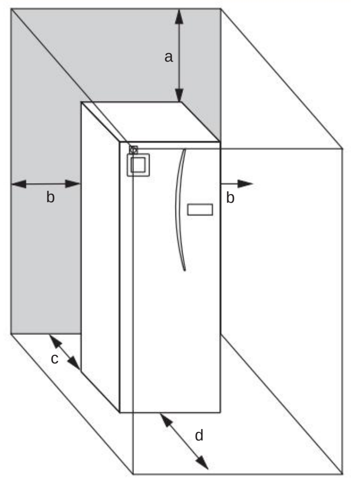
- A sufficiently large area of land must be available.
- Approval from the lower water authority must be obtained.
- Approval from the energy supply company must be obtained.
- VDI 4640 (thermal use of the subsurface) must be observed.
- The brine pipework in the building must be insulated in a vapor diffusion-tight manner to avoid condensation.
- A sufficiently large wall opening must be provided for the piping to the indoor unit, which is also insulated in a vapor-diffusion-tight manner.
- The piping must be made of corrosion-resistant material.
- The following antifreeze solution must be added when filling the brine circuit.
  – 38 wt% propylene glycol
  – 29 WT% bioethanol
  – 25 wt% ethylene glycol
  Note: Never use inorganic brine.
- Since the temperature of the brine system can fall below 0 °C, sufficient frost protection down to -15 °C must be ensured. be accomplished.
- For underground collectors, note the maximum pressure loss per collector circuit.
- It is recommended to connect several collector circuits of an earth collector system in parallel. Each collector circuit should-te have a separate valve for volume flow adjustment.
- A ground collector should be installed in accordance with applicable local regulations but at least 0.3 m below the frost line. boundaries. Laying distance of the collector pipes according to VDI 4640 Sheet 2 but at least 1 m.
- If there are multiple drill holes, the spacing must be carried out in accordance with applicable local regulations. See also VDI 4640.
- It is recommended to lay the ground collector with a slight gradient to avoid the accumulation of air bubbles. In any case, separate ventilation for each collector circuit is recommended.
- Attach the particle filter supplied to the brine supply line.
- ONLY use the heat pump in a closed brine system. The brine/water heat pump is not for direct use in “open” systems such as B. Suction/sipping wells and leads to damage to the plate heat exchanger (evaporator). For “open” systems, a separating heat exchanger system must be used.

3.6.2 Heat pump installation instructions

- The storage module must be located inside a building and in a frost-free environment, for example in a utility room, to minimize heat loss from the stored water to the environment.
- Install mud separators in the heat pump return to protect the heat pump from sludge and to ensure long, trouble-free operation.
- Provide ventilation options at the highest points of the heating system or alternatively a high high-performance micro air bubble

separator. • Provide drainage options at the lowest points of the heating system.

3.6.3 Required minimum distances



position	Minimum distance [mm]
a	300
b	150*
c	10
d	700**

* Additional space is required when connecting brine lines to the side
**Including space for dismantling.

3.6.4 Earth collector

A ground collector collects heat from the upper layer of the earth to a depth of approx. 2 m.

The actual heat source is the solar energy stored in the ground, which reaches the upper layers of the earth through direct radiation, but also through transfer from air and precipitation.
A heat transfer medium circulates in horizontally laid plastic pipe coils that transfers the heat extracted from the ground to the heat pump.

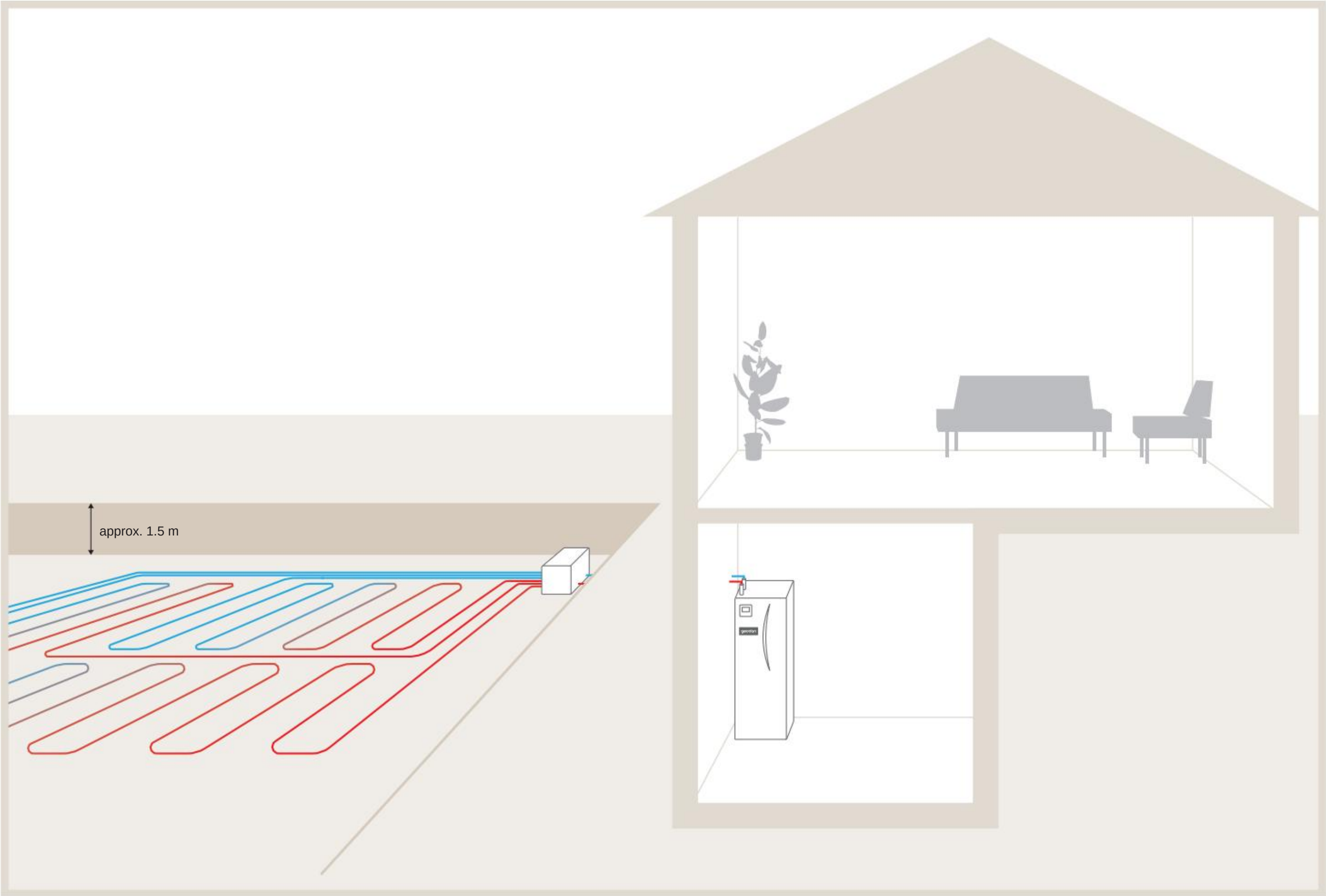
The required size of the collector depends primarily on the climatic conditions and the thermophysical properties of the soil.

Withdrawal service according to VDI 4640

Condition of the soil	Extraction power qE [W/m²]
dry, non-cohesive soil moist	0-15
cohesive soil very moist	15-20
and cohesive soil water-saturated	0-25
soil	25-30
groundwater-bearing soil	30-40

Depending on the nature of the soil and the heating load of the building, there is a corresponding soil area. The length of the pipes to be laid results from this area and a specified distance between the pipe coils.

The plastic pipes are laid at a depth of 1.2 m to 1.5 m. To ensure that the power consumption of the circulation pumps does not become too high, the plastic pipe coils should be laid in several circles with a maximum of 100 m per circle.



Design example of a ground collector

Example	
Location	Climate zone 13
Soil type	Clay
Max. flow temperature heating	35°C
Heating output B0/W35 (with DHW)	8kW
Brine flow rate	21 l/min
Extraction performance (evaporator performance)	6.3kW
COP (at nominal operating point)	4.5
Total annual performance factor of the heat pump system (SCOP)	5.2
Pipe material and nominal diameter	PE pipe 32 x 3.0 mm

Table A2 VDI 4640 shows the following limit values for climate zone 13:

climate zone	Limits	Clay
13	Extraction power [W/m²]	25
	Extraction energy [kWh/(m²*a)]	45
	Full load hours [h/a]	1800s
	Pipe spacing [m]	0.6...0.7

The collector area must be dimensioned in such a way that the two limit values for extraction power and extraction energy are included. will hold.

Minimum area from extraction performance (evaporator performance): $\frac{6.3\text{kW}}{25\text{W/m}^2} = 252\ \text{m}^2$

Minimum area from extraction energy: $$16000\ \text{kWh/a} \cdot \frac{\frac{\text{SCOP-1}}{\text{SCOP}}}{45\ \text{kWh/m}^2\ \text{a}} = 287.2\ \text{m}^2$$

The relevant collector area of **287.2 m²** and the pipe spacing of **0.7 m** results in a pipe length of at least 287.2 m² / 0.7 = **442** m, which are laid in 5 circles.

3.6.5 Earth probes

Earth probes collect heat from depths of up to 100 m. For depths > 100 m, approval from the mining authority is required. A heat transfer medium circulates in the probe tubes and transfers the heat extracted from the ground to the heat pump.

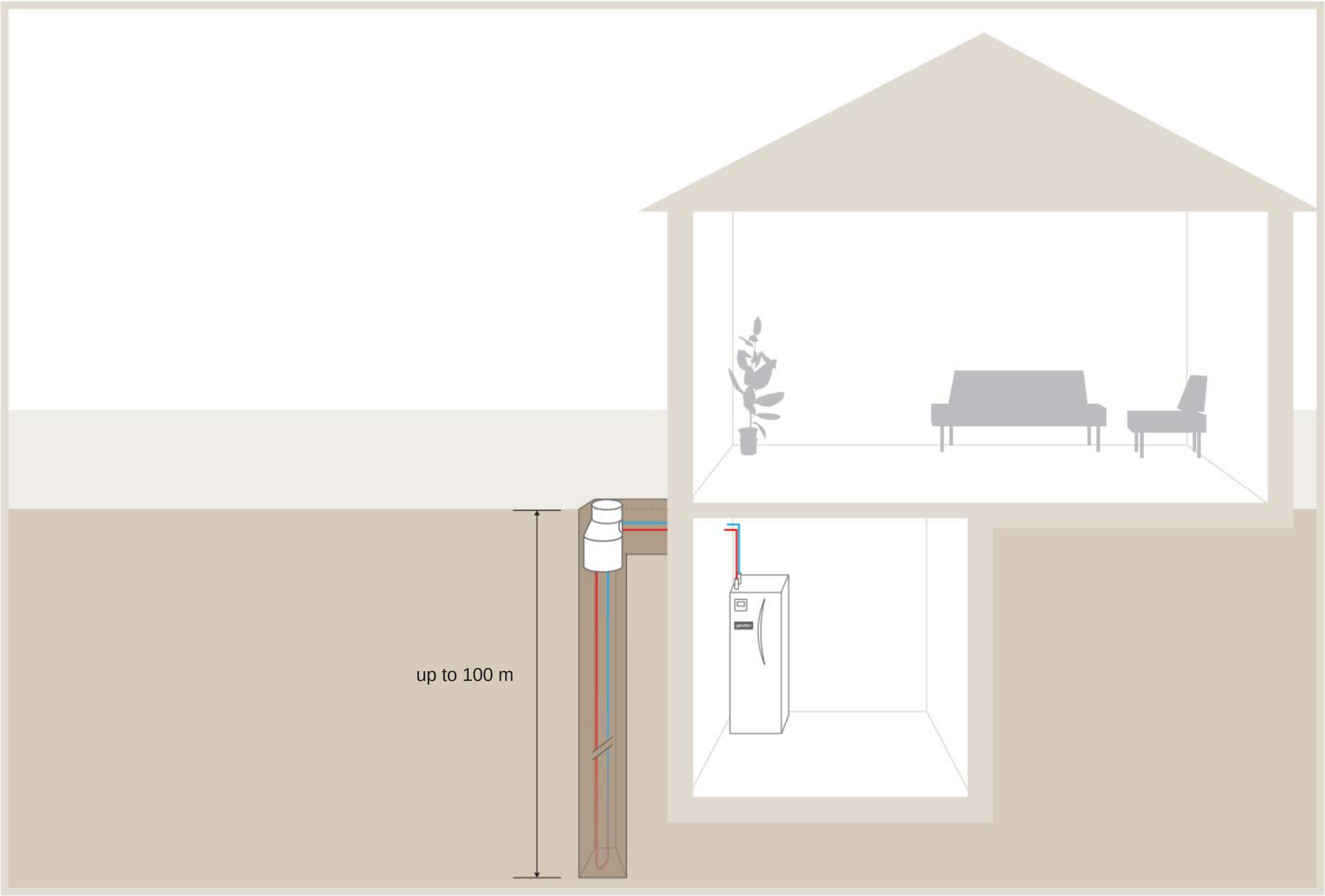
The required length of the probe depends primarily on the climatic conditions and on the groundwater flow and thermal conductivity of the soil.

Withdrawal service according to VDI 4640

Condition of the soil	Extraction power [W/m]
Subsoil with high groundwater flow	100
Solid rock with high thermal conductivity	80
Solid rock with normal subsoil	55
Poor subsoil, dry sediments	30

If the soil condition is not known, an average specific extraction power of 50 W/m can initially be expected. The exact design depends on the actual soil conditions and the water-bearing layers of earth and can only be done on site.

Depending on the nature of the soil and the heating load of the building, there is a corresponding probe length. After preparing a hole in the ground, the probe is inserted and then the holes are pressed with a suspension (e.g. bentonite) in order to permanently and stably integrate the probe into the soil or surrounding rock.



Earth probe design example

Example	
Max. flow temperature heating Heating	35°C
output B0/W35 (with DHW)	8kW
Extraction performance (evaporator performance)	6.3kW
Annual full load hours	2100 h/a
Volume flow brine	21 l/min
Thermal conductivity of the soil	3W/(m*K)
Maximum probe length of the double U-tube probes	99 m
Nominal diameter	32x3

First estimate of the probe length and number of probes: 6300W/43.5W/m = 145m
--> two earth probes are required

The thermal conductivity can be determined from the number of annual full load hours, the number of probes and the extraction power in Table B6, VDI 4640.

Annual full load hours	Number of probes	Thermal conductivity of the surrounding substrate			
		Extraction power with turbulent flow in W/m			
		1.0W/(m*K)	2.0W/(m*K)	3.0W/(m*K)	4.0W/(m*K)
2100 h/a	1	22.8	34.9	43.5	50.0
	2	20.2	31.6	**39.9**	46.4
	3	18.5	29.3	37.5	44.0
	4	17.3	27.7	35.6	42.0
	5	16.7	26.7	34.6	41.0

The values from Table B6 apply to turbulent flow conditions. For laminar flow conditions, the correction factor 0.80 from Table B1 must also be taken into account.

Required probe length: 6300 W / ((39.9 W/m*k)*0.8) = **198 m**

Table B8 Quick selection for small systems can be used for checking purposes, which gives an approximate indication of the geothermal probe length depending on the heat pump heating output, the number of probes and the thermal conductivity of the soil.

3.6.6 Passive cooling

With passive cooling, the comparatively lower temperature of the soil or groundwater is transferred to the heating/cooling system via an additional heat exchanger. The heat pump compressor remains switched off.

For passive cooling, surface heating or fan coil units can be used as a distribution system.

Surface heating/cooling

Buildings can be heated or cooled via water-carrying pipe systems in floors, ceilings and walls by circulating warm or cold water through the pipe systems. Due to the size of the areas, cooling or heating can be achieved with even very small temperature differences between the room and the surface.
Compared to fan coil units or ceiling cassettes, the transmission power of surface heating is lower.
Under certain circumstances, the power is not sufficient to cool the building down to the desired room temperature.
In this case, less relevant rooms can either be removed from the cooling system or additional fan coil units can be used.
Otherwise, the room can only be cooled and not completely air-conditioned.

Hints

- Make sure that the screed and, if necessary, the entire floor structure is suitable for cooling operation.
- Use reversible zone valves to switch between heating and cooling operation.
- The cooling water temperature may only be significantly above the dew point temperature in order to prevent condensation from forming on the cooling surfaces.

Cooling capacity underfloor heating

flooring	Tiles									
Flow temperature [°C]	15									
Return temperature [°C]	20									
Room temperature [°C]	27					23				
Laying distance [cm]	5	10	15	20	30	5	10	15	20	30
Cooling capacity [W/m2]	52	45	39	34	26	26	22	19	17	13

Notes on passive cooling from VDI 4640:

The characteristic values shown in Appendix B, Table B2 to Table B7, may also be used for systems with room cooling if the following limits regarding cooling (direct/passive cooling of residential buildings) are not exceeded:

- Cooling capacity maximum 75% of the heating capacity
- Annual full load hours of cooling up to 300 h/a

This requires direct/passive cooling, where the maximum temperature entering the building does not exceed 20 °C.

The heating and cooling load distribution of such a system is shown as an example in Figure 4.

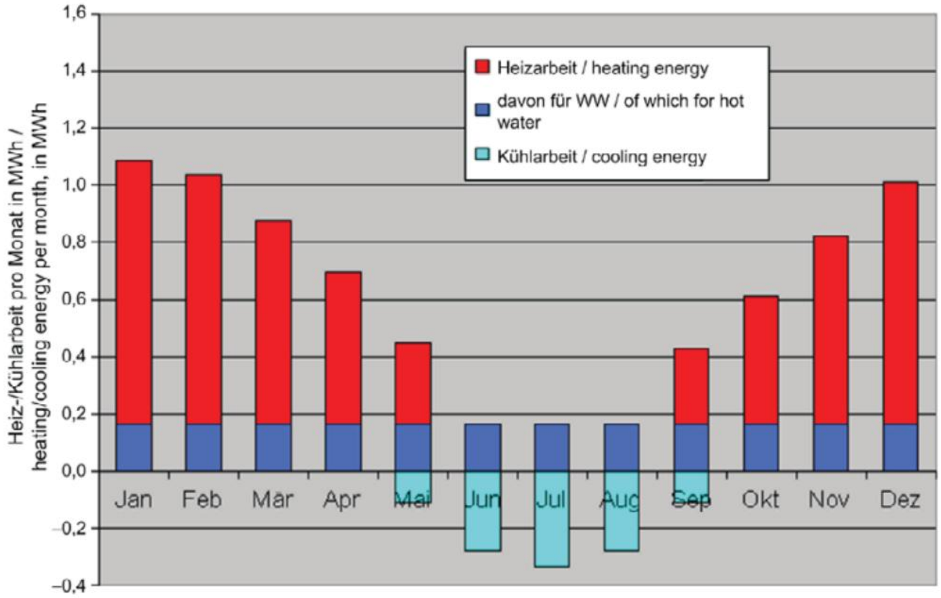


Bild 4. Heiz- und Kühllastverteilung über das Jahr für die Basisannahme Heizen, Trinkwassererwärmung und Kühlen, Beispiel für eine Anlage mit 5 kW Heizleistung und 1800 Jahresvolllaststunden

Figure 4. Heating and cooling load distribution over the entire year for the baseline assumption heating, domestic hot water production, and cooling; example of a system with heating capacity 5 kW and 1800 annual full-load hours

If such a system goes into operation at the beginning of a cooling period, the specified temperature may not be maintained in this first cooling period.

In cooling mode, the inlet temperature of the heat transfer medium into the geothermal probe(s) should not exceed the undisturbed subsurface temperature averaged over the probe depth by a maximum of 15 K on a monthly average (see VDI 4640 Sheet 1, Paragraph 8.3.1). At peak load, this difference should not exceed 20 K.
In general, when heat is introduced into the subsoil, other uses of groundwater in this area must not be impaired (VDI 4640 Sheet 3).
If it becomes apparent during the drilling work that the geological conditions are significantly different than assumed for the design, the probe design must be checked and adjusted if necessary.

Estimation of the possible cooling performance with passive cooling via geothermal probes

Geothermal probes are designed according to the heating output of the heat pump. The heat that has to be dissipated into the ground during passive cooling is approx. 70% of the extraction output (approx. 35 W/m geothermal probe).

Example	
Max. flow temperature heating Heating	35°C
output B0/W35 (with DHW)	8kW
Number of probes	2
depth	99 m
Extraction performance (evaporator performance)	6.3kW

The possible cooling capacity is:	6.3kW *0.7= **4.4kW**

Controlling passive cooling with PKS05

The cooling temperature is controlled via the flow temperature of the cooling circuit (secondary circuit).
Cooling mode is activated either manually via the passive cooling controller or via an external signal, for example via the additional module PT100 and a connected outside temperature sensor, as soon as a set outside temperature is exceeded.

Optionally, the cooling operation is monitored with a dew point temperature sensor. A brine pressure switch, which is also optionally installed, detects any leaks in the system.

Manual switching on (in conjunction with fan coil units): the cooling mode is activated manually on the ÿ2 control. There is no check whether the cooling circuit is open or closed. The output signal is “Closed”.

Switching on via external signal (in conjunction with underfloor heating systems whose actuators have a logic reversal): The signals from a PT100 outside temperature sensor are converted into an analog input signal via the additional module and interpreted by the cooling controller.

If cooling mode is switched on manually or via an external signal, the following process begins:
• The heating mode of the heat pump is deactivated (FTC6 connection via IN1 and IN6)
• The secondary circuit pump (14) starts
• The temperature sensor T55 is used to compare the setpoint and actual value of the temperature in the secondary circuit

parameter	Setting range	Factory setting
Setpoint flow temperature secondary circuit	5-20°C	+18°C
Recording period	–	120 seconds
restart after	–	5 minutes

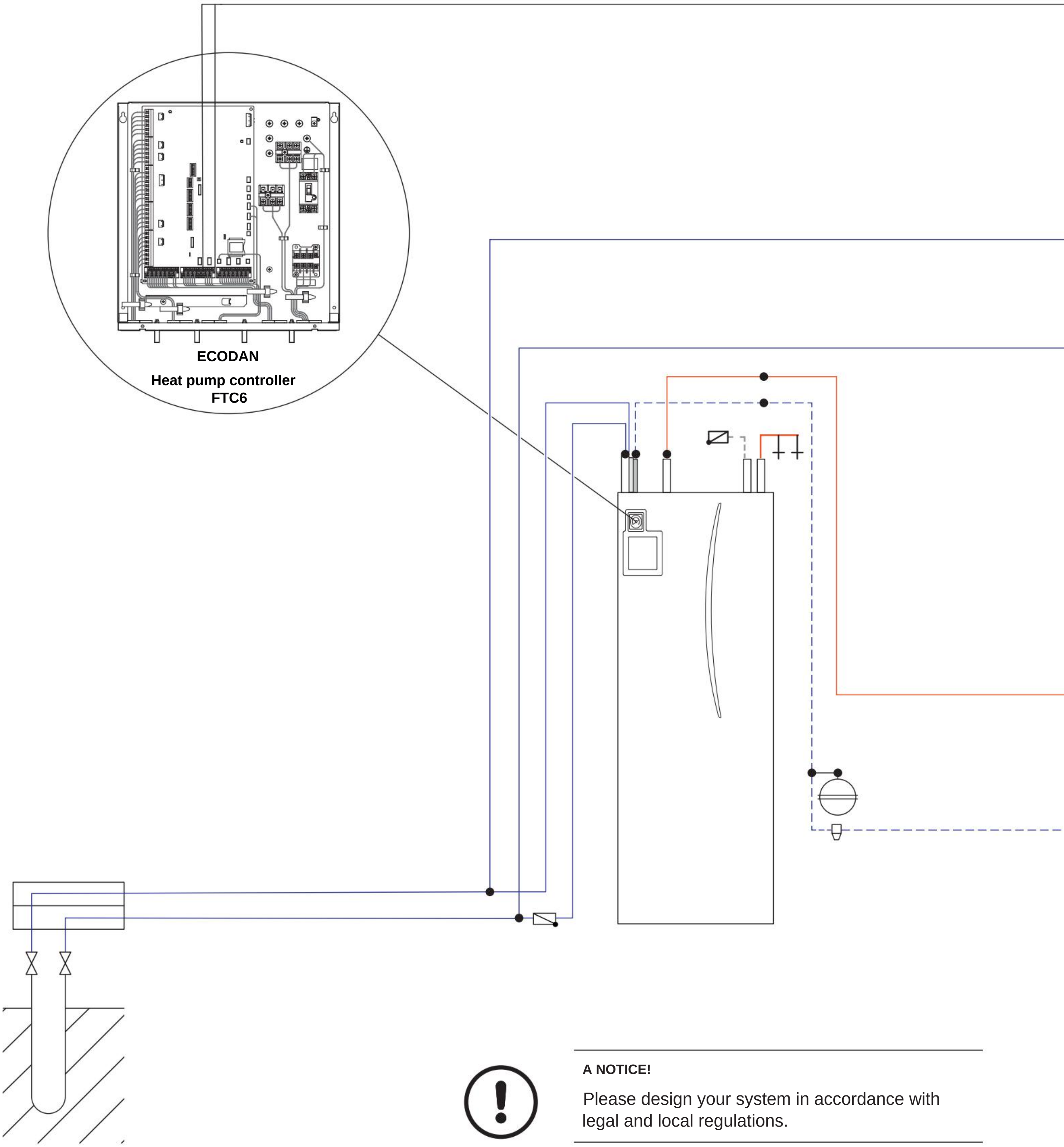
If the temperature in the secondary circuit is lower than the set setpoint for the set detection period, the secondary circuit pump switches OFF and automatically restarts after the set restart time.

• The primary circuit pump (46) starts (factory setting: constant curve CC = 7 m; nominal volume flow = 15.5 l/min) • The 3-way mixing valve (56) is opened for a running time of 3 minutes
• – From 0% to 10% if the temperature in the brine circuit is more than 1 K lower than the temperature in the secondary circuit is running (T59 +1K < T55)
• – Otherwise to 20%
• The 3-way mixing valve is then opened or closed step by step (1% step) until the temperature is reached. Temperature sensor secondary circuit (55) the setpoint flow temperature secondary circuit is reached.

Cooling mode switches off when one of the following criteria is met:
• Manual switch-off (in conjunction with fan coil units): the cooling operation is switched off manually on the ÿ2 control disabled. The output signal becomes “Open”.
• Switching off via external signal (in connection with underfloor heating, whose actuators require a logic reversal own).
• Cooling requirement too high: the 3-way mixing valve (56) is 100% open and the temperature in the secondary circuit is is consistently lower than the temperature in the brine circuit for more than 3 minutes (T55 < T59).
• Note: If the 3-way mixing valve (56) is 100% open and the secondary circuit flow temperature setpoint is not reached within the set time, a message appears on the display.

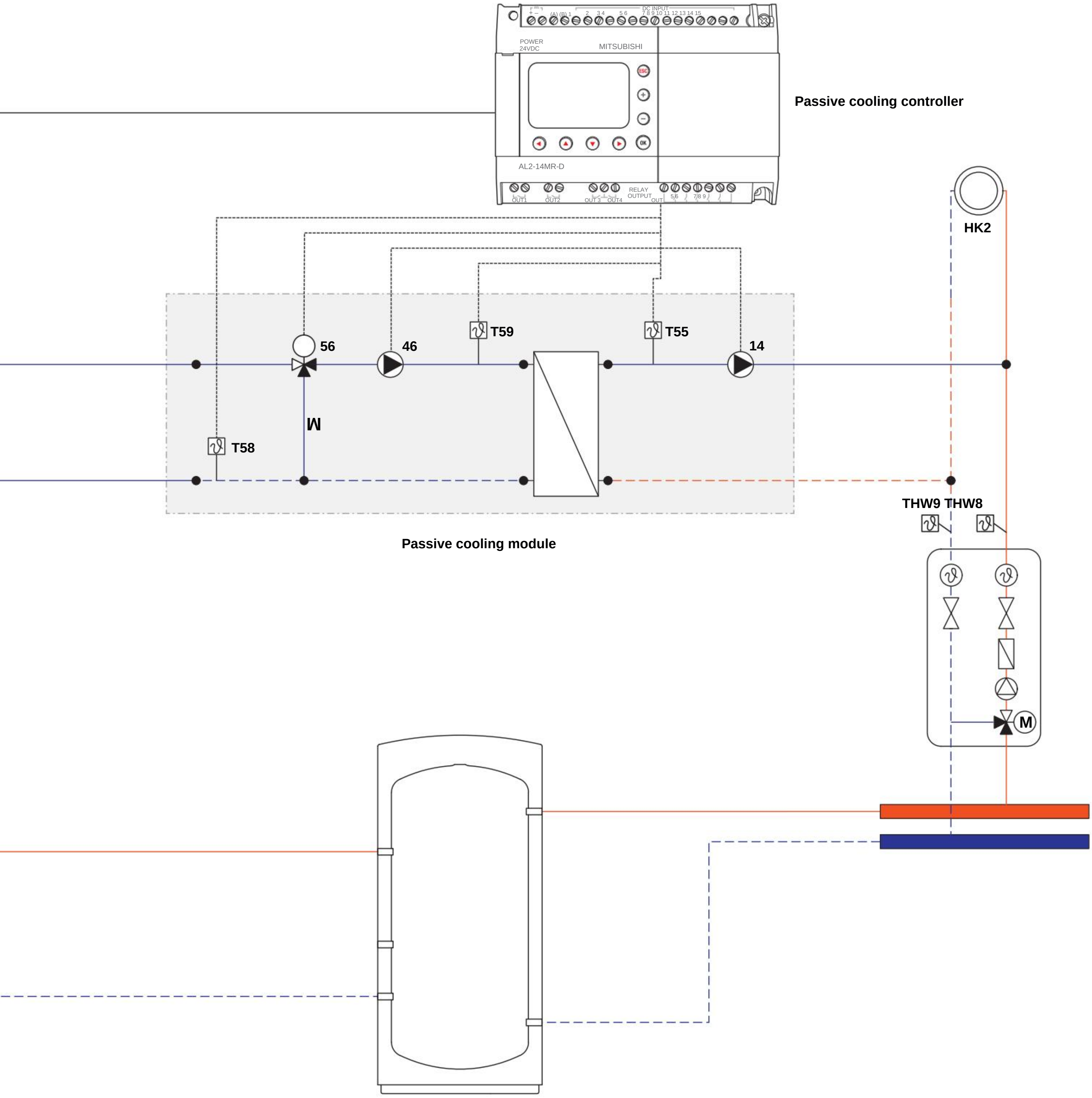
Limiting brine temperature return (optional): the temperature in the return of the primary circuit (58) is monitored via the temperature sensor (58). If the temperature is constantly above a set limit for more than 15 minutes (factory setting: +25 °C, setting range +20 - +30 °C), the pump (14) in the cooling circuit switches off and the 3-way mixing valve (56) opens to 100% for 5 minutes.

Simplified system scheme



A NOTICE!

Please design your system in accordance with legal and local regulations.



No.	Part name
14	Pump secondary circuit
46	Pump primary circuit
55	Secondary flow temperature sensor
56	3-way mixing valve (cooling)
58	Temperature sensor primary return (brine)
59	Temperature sensor primary flow (brine)

3.6.7 Fan coil units and cassette units

Fan coil units or ceiling cassettes are state of the art in building air conditioning. The cooling water temperature here can be below the dew point because fan coil units and ceiling cassettes are equipped with a condensation water drain. In this case, the distribution lines and components must be insulated so that they are vapor diffusion-tight.

The cooling capacity of a fan coil unit or a ceiling cassette depends on the device type, the air volume flow and the cooling water temperature.

An overview of the fan coil units can be found in chapter “9.6 DLRV fan coil unit” on page 326”.

4. Device description air/water heat pumps

4.1 General information

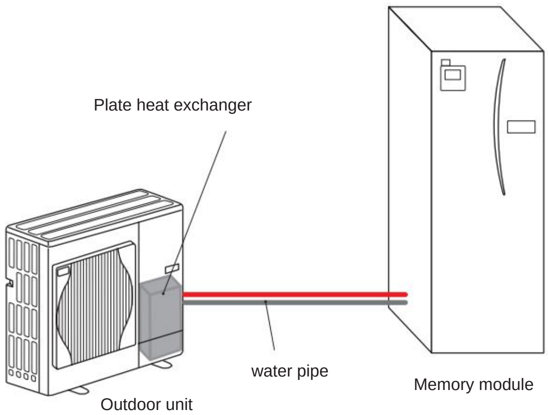
4.1.1 System structure

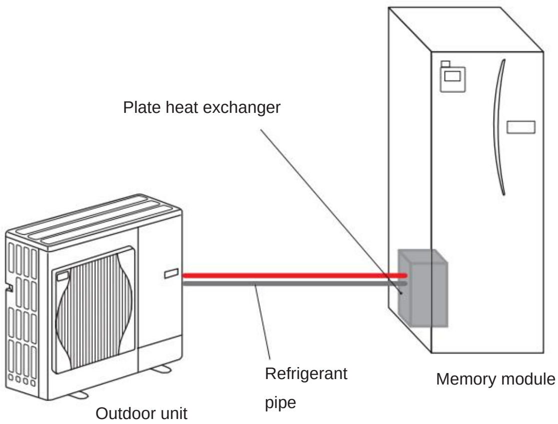
Mitsubishi Electric Ecodan air/water heat pumps always consist of an indoor and an outdoor unit.
The interaction between the indoor and outdoor units can take place using two different system variants:

Monoblock system
The monoblock system significantly simplifies the installation on the refrigeration side. Here the plate heat exchanger is located directly in the outdoor unit. This means that the energy is transferred from the outdoor unit to the indoor unit via well-insulated water pipes (flow and return).

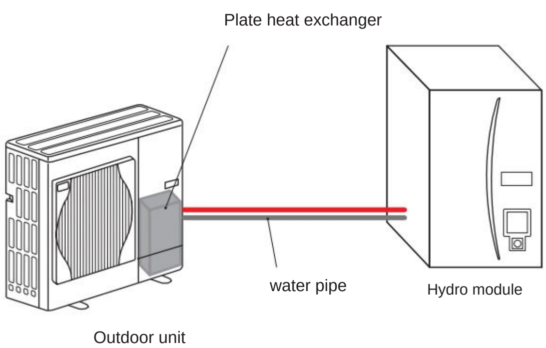
Split system
In the split system, the energy is transported into the building via refrigerant. The plate heat exchanger is located in the indoor unit, the outdoor unit is connected via a refrigerant line. The split principle increases the overall efficiency of the system. It is also the preferred solution when larger distances need to be bridged between the indoor and outdoor units. Depending on the output of the heat pump, line lengths of up to 80 m are possible.

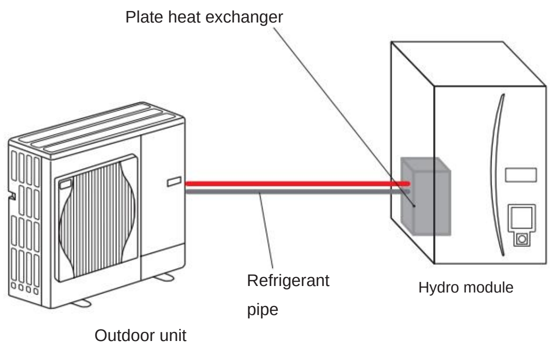
Monoblock system	Split system
E*PT20X and E*PT30X	E*HST20 and E*HST30





E*PX	IT*





4.1.2 Combination table

Mitsubishi Electric's Ecodan outdoor and indoor units can be combined as follows:

Refrigerant	R32					R744	R32												R410A			
Type	Monoblock						Split															
Model (inverter)	power				Zubadan		Eco			power				Zubadan					Power		Zubadan	
Device																						
Memory modules																						
EHST20D-YM9D							IIIIIIIIII															
FIRST20D-YM9D							II															
EHST30D-YM9ED							IIIIIIIIII															
FIRST30D-YM9ED							II															
EHPT20X-YM9D	IIIII																					
ERPT20X-VM2D	IIIII																					
EHPT30X-YM9ED			III																			
ERPT30X-VM2ED			III																			
EHPT20Q-VM2EA						I																
Hydromodules																						
EHSD-YM9D							IIIIIIIIII															
ERSD-YM9D							III															
EHSD-MED							IIIIIIIIII															
EHSC-YM9D																					I	
ERSC-YM9D																					I	
EHSC-MED																					I	
ERSC-MED																					I	
EHSE-YM9ED																			II			I
ERSE-YM9ED																			II			I
EHSE-MED																			II			I
ERSE-MED																			II			I
EHPX-YM9D	IIIII																					
ERPX-YM9D	IIIII																					
EHPX-MED	IIIII																					
ERPX MD	IIIII																					

I Combination permitted

4.1.3 Performance data for outdoor units

4.1.3.1 Power Inverters

Heat

PUZ-WM50VHA										
Outside temperature [°C]	2	2	2	Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	45	55	Water temperature [°C] 35		35	35	35	35	55
Power range heating output [kW]				Heating output [kW]	3.9	5.0	5.0	5.0	5.0	5.0
Minimum – Maximum	2.5 – 5.5	2.5 – 5.1	2.3 – 5.0	COP according to EN14511	2.60	3.00	3.70	5.00	5.30	3.08
Nominal water volume flow [l/min] 14.3										

PUZ-WM60VAA										
Outside temperature [°C]	2	2	2	Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	45	55	Water temperature [°C] 35		35	35	35	35	55
Power range heating output [kW]				Heating output [kW] 5.3		6.0	6.0	6.0	6.0	6.0
Minimum – Maximum	3.4 – 7.1	3.2 – 6.7	2.9 – 6.9	COP according to EN14511	2.70	3.20	3.75	5.06	5.36	2.98
Nominal water volume flow [l/min] 17.2										

PUZ-WM85YAA										
Outside temperature [°C]	2	2	2	Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	45	55	Water temperature [°C] 35		35	35	35	35	55
Power range heating output [kW]				Heating output [kW]	7.3	8.5	8.5	8.5	8.5	8.5
Minimum – Maximum	3.4 – 9.7	3.2 – 9.5	2.9 – 9.2	COP according to EN14511	2.15	2.60	3.51	4.80	5.10	2.82
Nom. Water volume flow [l/min] 24.4										

PUZ-WM112YAA										
Outside temperature [°C]	2	2	2	Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	45	55	Water temperature [°C] 35		35	35	35	35	55
Power range heating output [kW]				Heating power [kW] 8.4 COP		11.2	11.2	11.2	11.2	10.0
Minimum – Maximum	4.2 – 12.5 3.7 – 11.9 3.2 – 11.3			according to EN14511	2.55	3.00	3.44	4.70	5.00	3.00
Nominal water volume flow [l/min] 32.1										

PUD-SWM60VAA										
Outside temperature [°C]	2	2	2	Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	45	55	Water temperature [°C] 35		35	35	35	35	55
Power range heating output [kW]				Heating output [kW]	5.7	6.0	6.0	5.0	5.0	5.0
Minimum – Maximum	3.1 – 7.0	2.6 – 6.5 2.1 – 6.0		COP according to EN14511	2.60	3.15	3.60	4.76	5.06	2.65
Nominal water volume flow [l/min] 14.3										

PUD-SWM80YAA										
Outside temperature [°C]	2	2	2	Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	45	55	Water temperature [°C] 35		35	35	35	35	55
Power range heating output [kW]				Heating output [kW]	7.3	8.0	8.0	6.0	6.0	6.0
Minimum – Maximum	3.1 – 9.3	2.6 – 8.8 2.1 – 8.2		COP according to EN14511	2.50	3.10	3.55	4.76	5.06	2.65
Nominal water volume flow [l/min] 17.2										

PUD-SWM100YAA			
Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW]			
Minimum – Maximum	3.2 – 12.1	2.7 – 11.5	2.1 – 10.0
Nominal water volume flow [l/min] 22.9			

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C] 35		35	35	35	35	55
Heating output [kW] 9.0		10.0	10.0	8.0	8.0	8.0
COP according to EN14511	2.20	2.95	3.30	5.00	5.3	2.60

PUD-SWM120YAA			
Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW]			
Minimum – Maximum	3.2 – 12.7	2.7 – 12.4	2.1 – 12.0
Nominal water volume flow [l/min] 28.7			

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C] 35		35	35	35	35	55
Heating output [kW]	10.4	12.0	12.0	10.0	10.0	10.0
COP according to EN14511	2.10	2.70	3.24	4.70	5.00	2.65

PUHZ-SW160YKA			
Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW]			
Minimum – Maximum	10.6 – 19.9	3.9 – 18.9	9.0 – 17.7
Nominal water volume flow [l/min] 63.1			

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C] 35		35	35	35	35	55
Heating power [kW] 11.6		13.4	16.0	22.0	22.0	22.0
COP according to EN14511	2.37	2.80	3.11	4.21	4.51	2.47

PUHZ-SW200YKA			
Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW]			
Minimum – Maximum	10.5 – 21.5	9.8 – 20.8	9.0 – 20.1
Nominal water volume flow [l/min]	63.1		

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C] 35		35	35	35	35	55
Heating output [kW]	13.5	15.3	20.0	25.0	25.0	25.0
COP according to EN14511	2.30	2.67	2.80	4.00	4.3	2.45

Cool

PUZ-WM50VHA									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7		18	7	18
Performance range cooling capacity [kW]					Cooling capacity [kW]	4.0	4.0	4.5	4.5
Minimum – Maximum	2.1 – 4.8	2.8 – 6.2	1.9 – 4.5	2.6 – 6.9	COP according to EN14511	4.31	6.31	3.40	5.00
Nominal water volume flow [l/min]	12.9								

PUZ-WM60VAA									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7		18	7	18
Performance range cooling capacity [kW]					Cooling capacity [kW]	6.0	6.0	6.0	6.0
Minimum – Maximum	2.6 – 6.0	3.4 – 7.6	2.3 – 6.0 3.2 – 8.4		COP according to EN14511	3.02	5.93	3.30	4.45
Nominal water volume flow [l/min]	17.2								

PUZ-WM85YAA									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7 7.2		18	7	18
Performance range cooling capacity [kW]					Cooling capacity [kW]		7.5	7.5	7.5
Minimum – Maximum	2.6 – 7.2	3.4 – 9.5 2.3 – 7.5 3.2 – 10.5			COP according to EN14511	2.88	6.53	3.15	4.90
Nominal water volume flow [l/min]	21.5								

PUZ-WM112YAA									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7		18	7	18
Performance range cooling capacity [kW]					Cooling capacity [kW]	10.0	10.0	10.0	10.0
Minimum – Maximum	3.2 – 10.1 4.4 – 13.4 2.8 – 10.0 4.1 – 13.9				COP according to EN14511	3.49	5.48	3.30	4.90
Nominal water volume flow [l/min] 28.7									

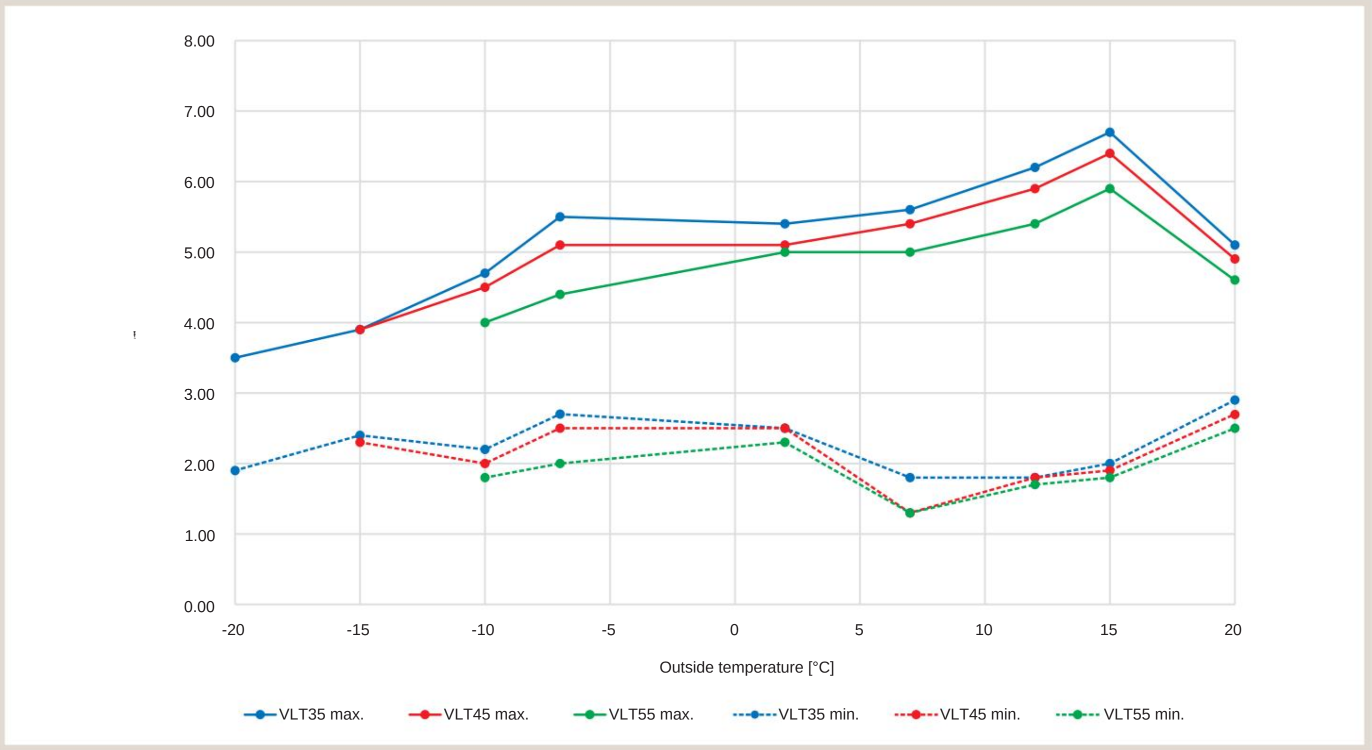
PUHZ-SW160YKA									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7 16.0		18	7	18
Performance range cooling capacity [kW]					Cooling capacity [kW]		18.0	16.0	18.0
Minimum – Maximum	9.1 – 20.1 11.7 – 22.3 7.7 – 19.3 11.1 – 26.6				COP according to EN14511	3.97	5.78	2.76	4.56
Nominal water volume flow [l/min] 45.9									

PUHZ-SW200YKA									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7		18	7	18
Performance range cooling capacity [kW]					Cooling capacity [kW]	20.0	22.0	20.0	22.0
Minimum – Maximum	9.1 – 22.7 11.7 – 27.4 7.7 – 20.3 11.1 – 27.8				COP according to EN14511	3.39	5.22	2.25	4.10
Nominal water volume flow [l/min] 57.3									

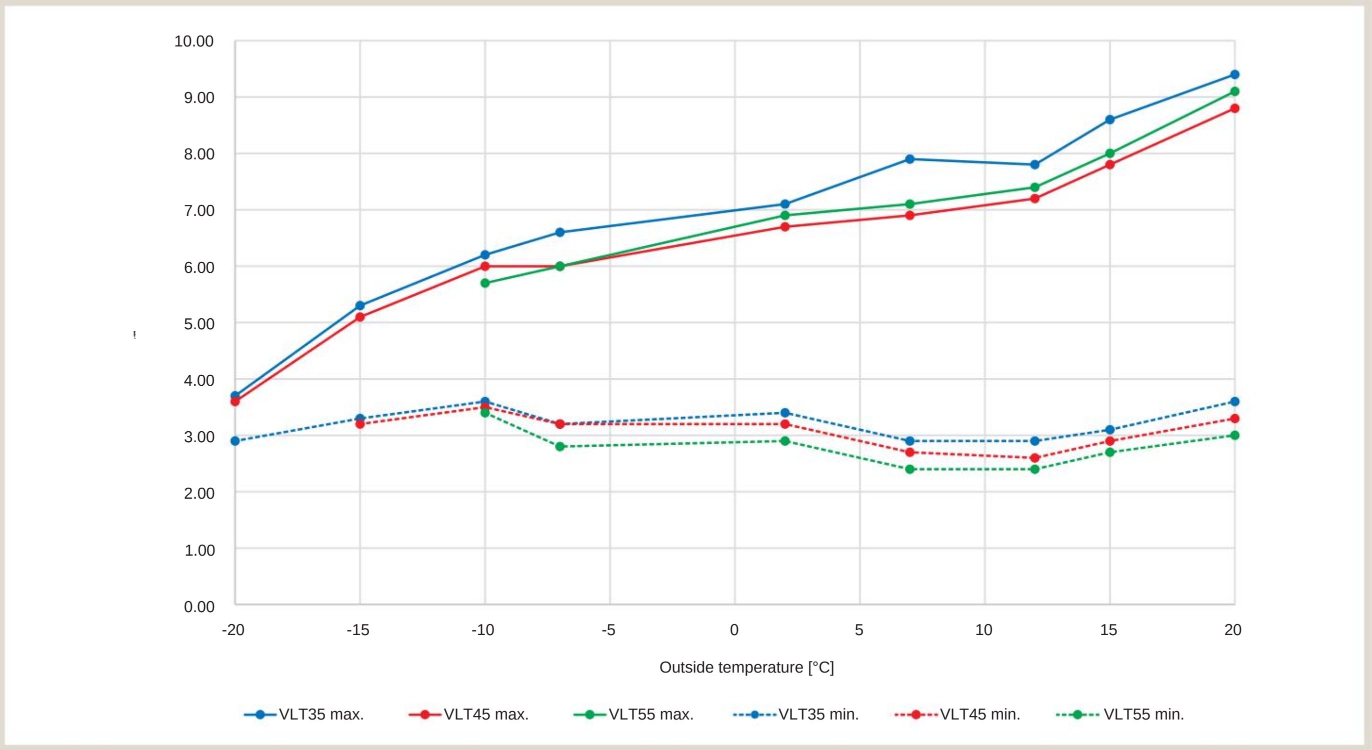
Performance diagrams power inverter

- VLT35/45/55 max.: Maximum possible heating output at a heating flow temperature of 35/45/55 °C
- VLT35/45/55 min.: Minimum possible heating output at a heating flow temperature of 35/45/55 °C

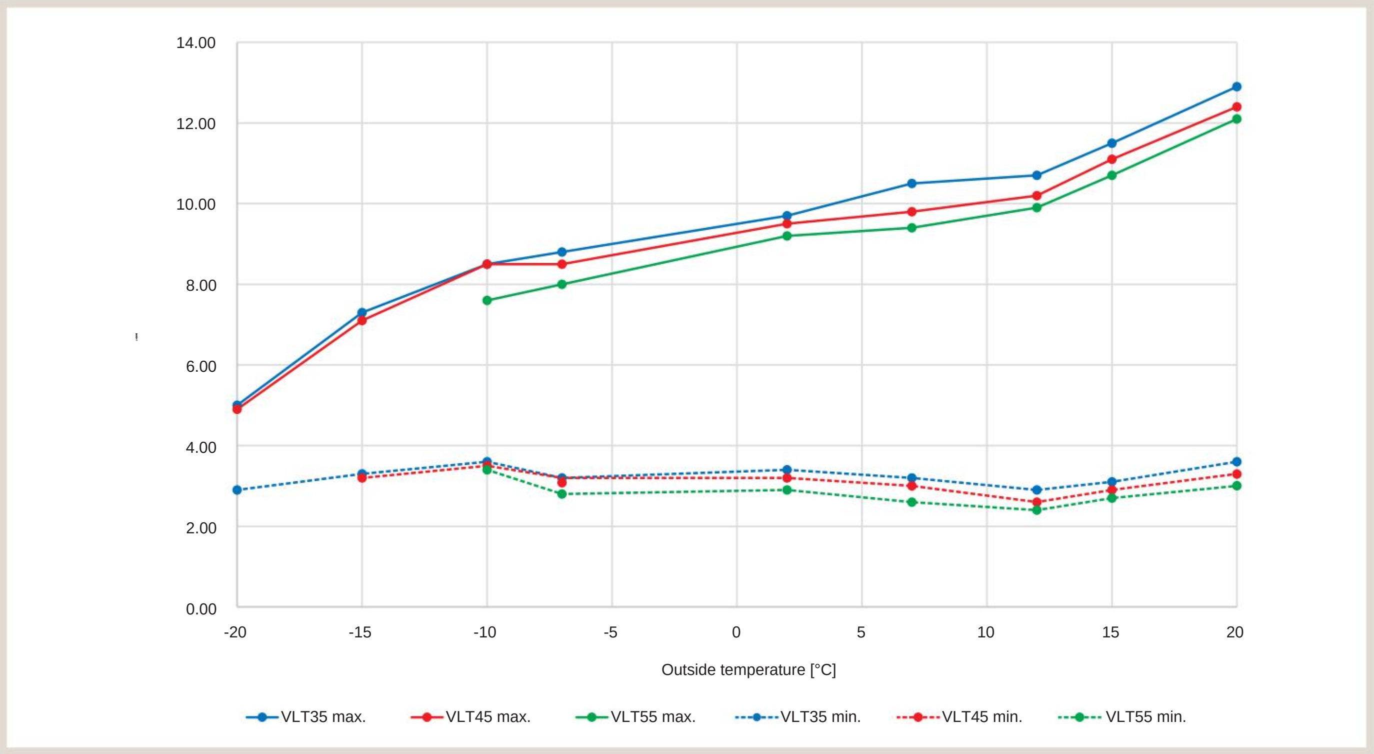
Monoblock
PUZ-WM50VHA



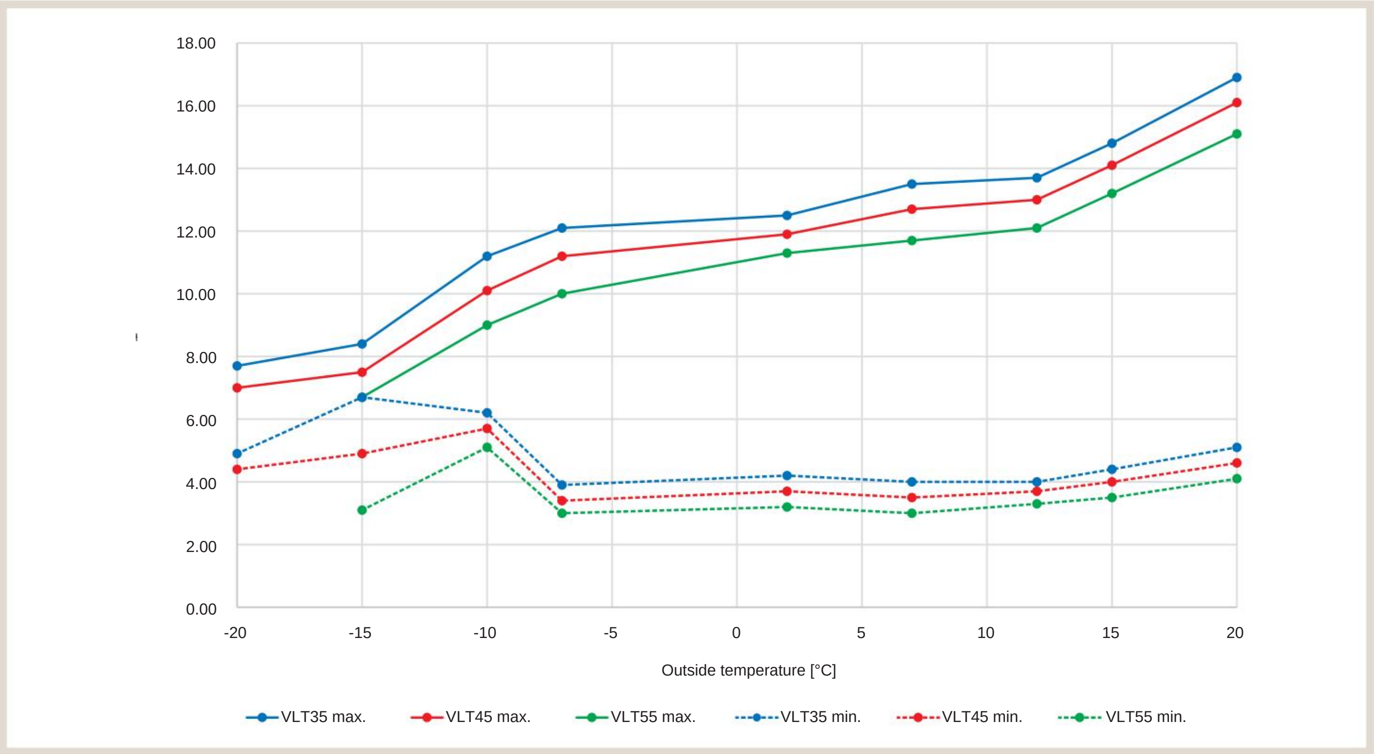
PUZ-WM60VAA



PUZ-WM85YAA

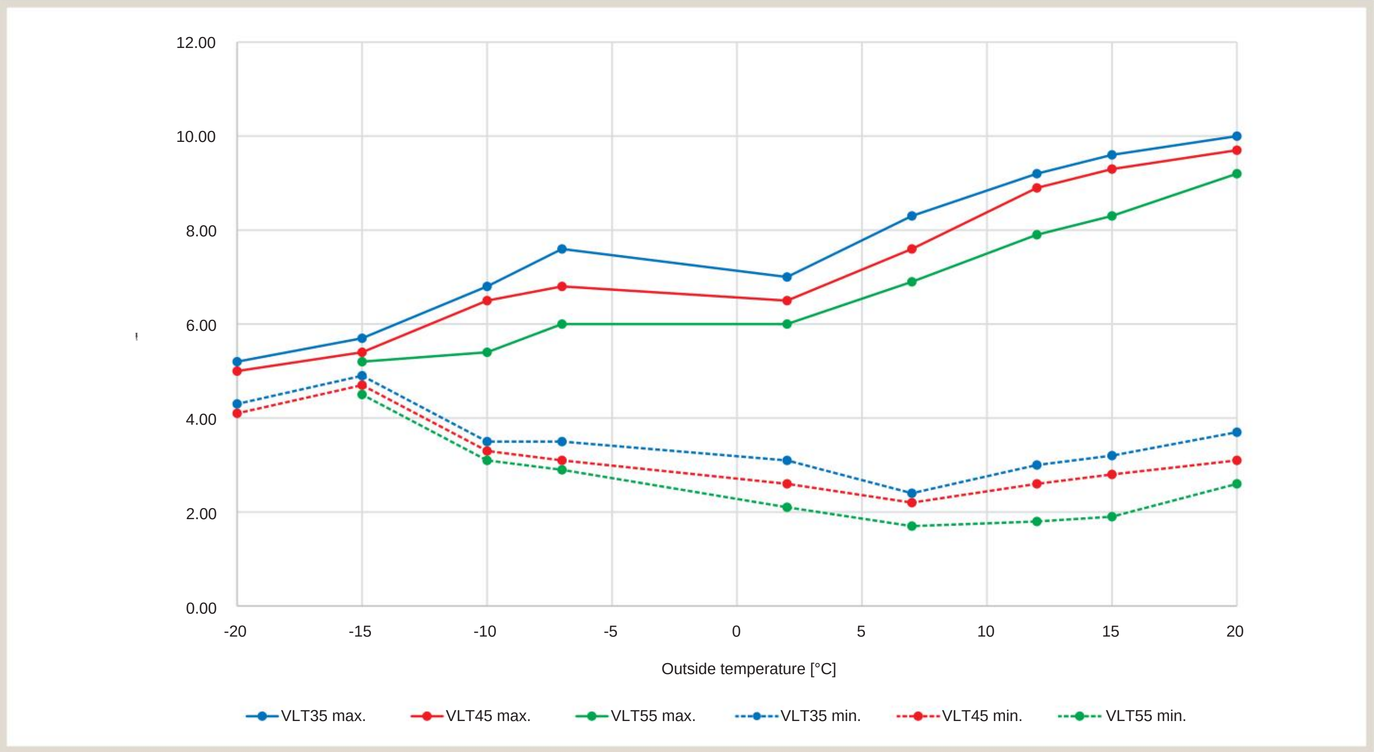


PUZ-WM112YAA

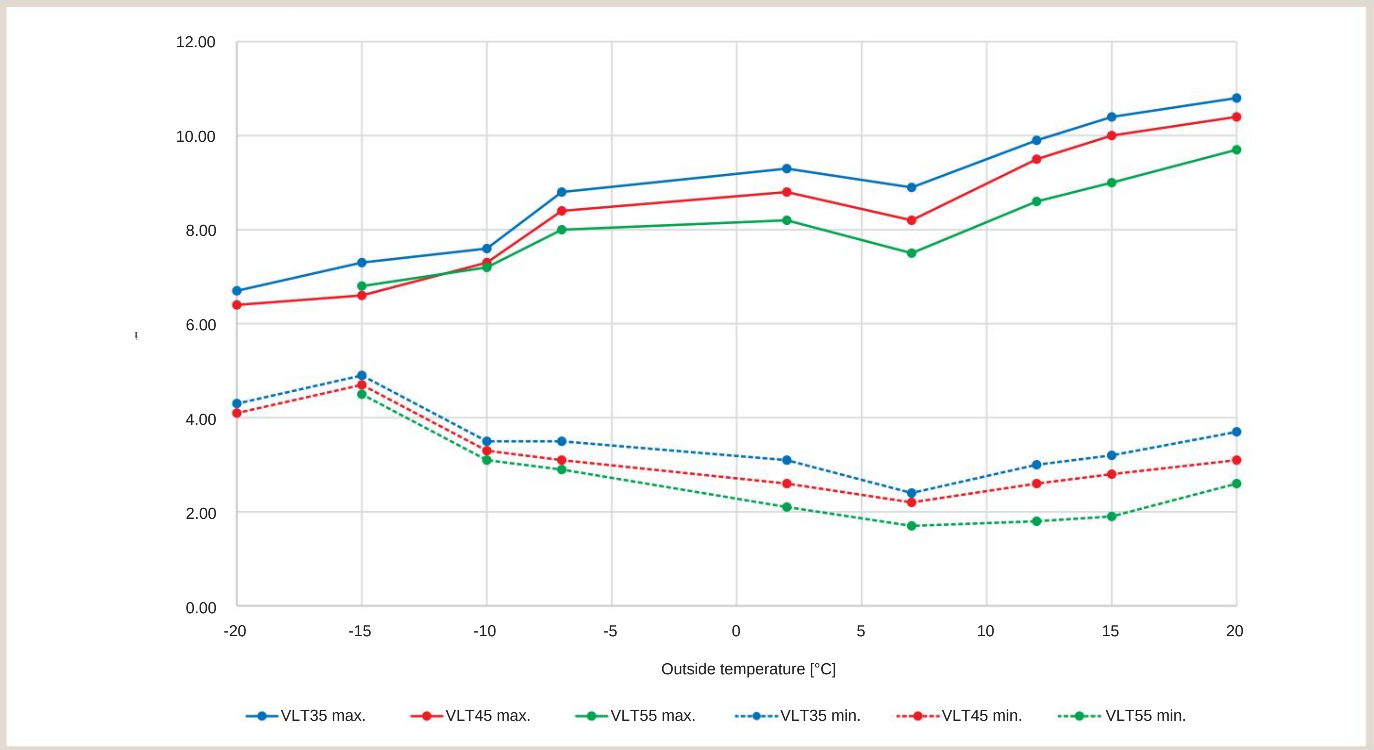


Split

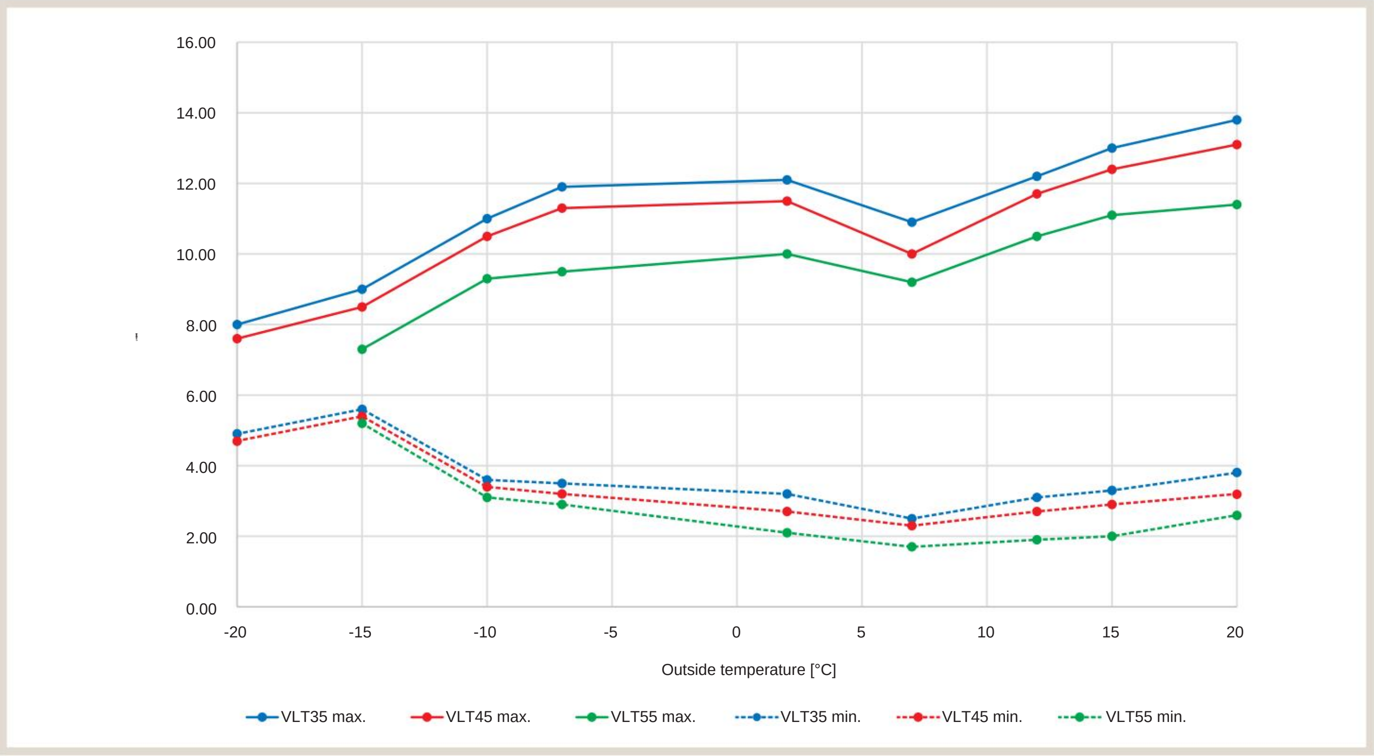
PUD-SWM60VAA



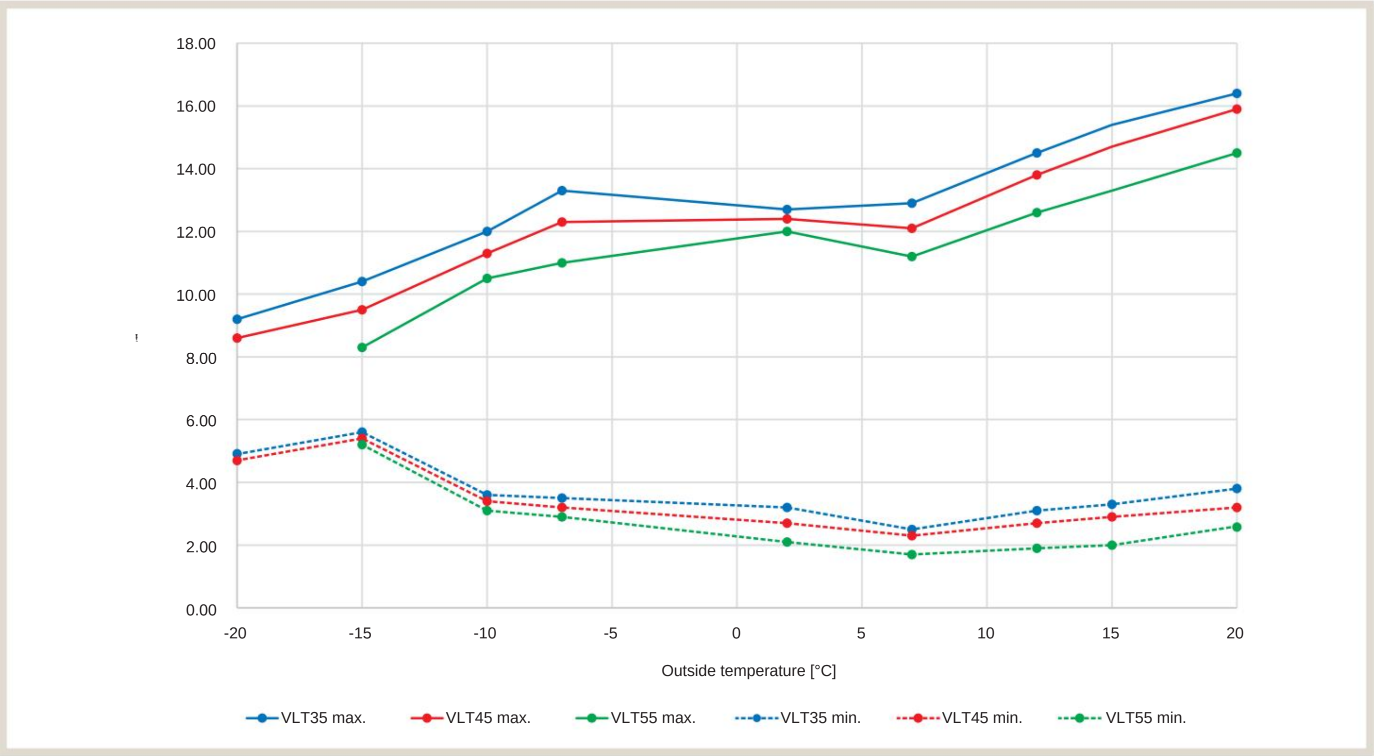
PUD-SWM80YAA



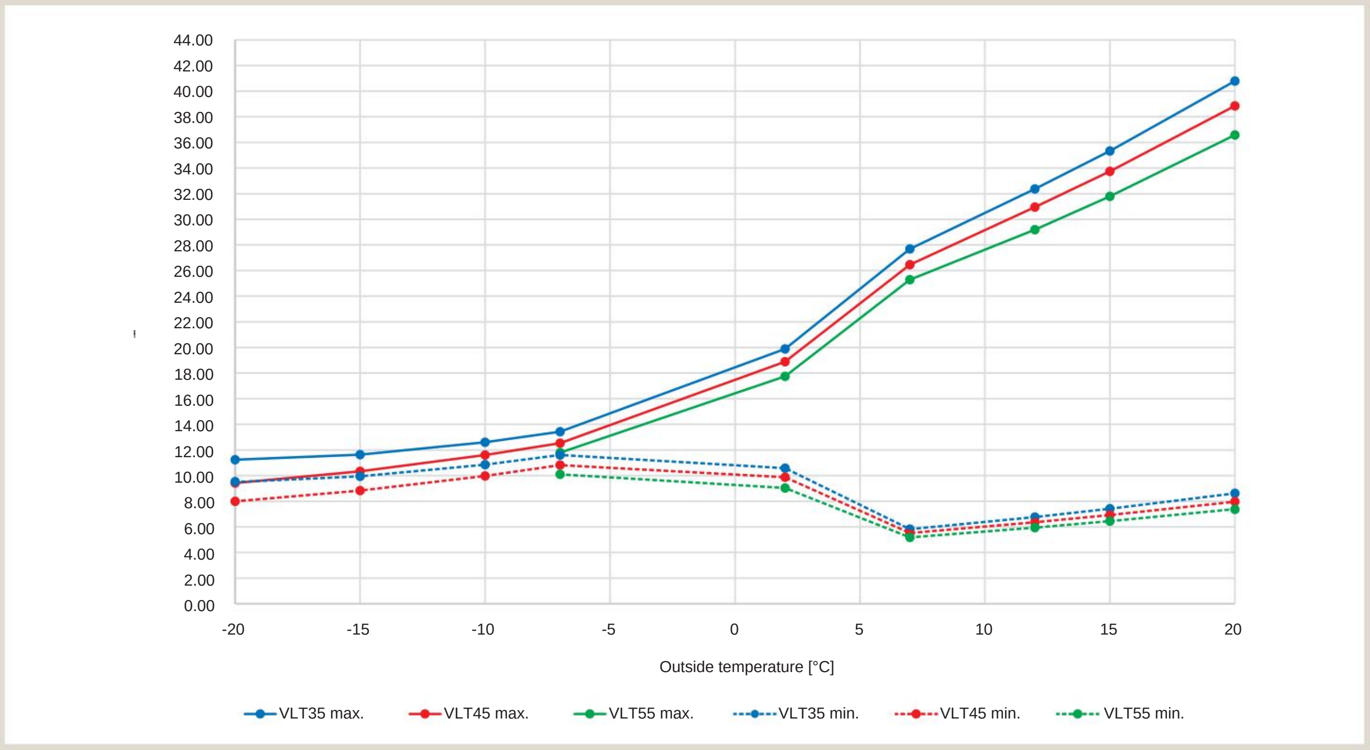
PUD-SWM100YAA



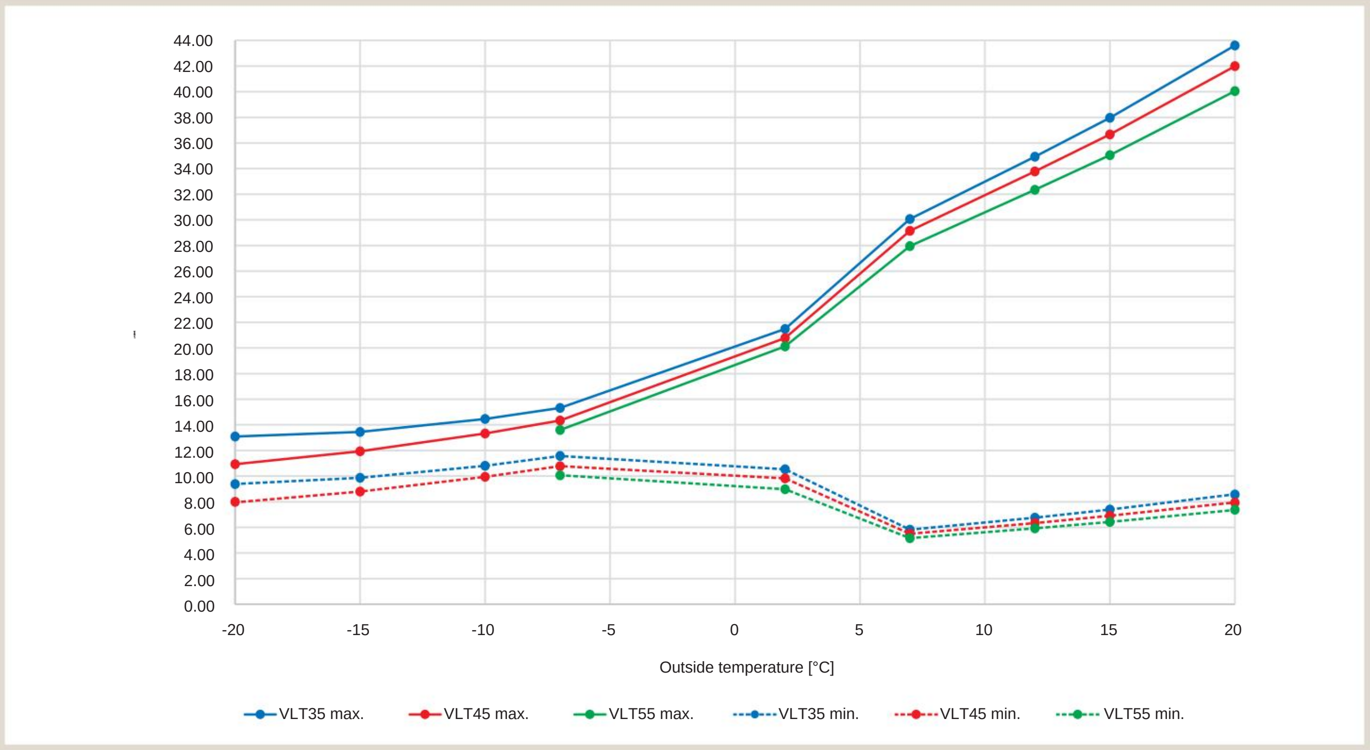
PUD-SWM120YAA



PUHZ-SW160YKA



PUHZ-SW200YKA



4.1.3.2 Zubadan inverter

Heat

PUZ-HWM140YHA

Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW] Minimum – Maximum	5.1 – 16.3	4.2 – 15.8	3.2 – 14.3
Nominal water volume flow [l/min]	40.1		

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	35	35	35	35	55
Heating power [kW]	11.0	14.0	14.0	14.0	14.0	14.0
COP according to EN14511	2.30	2.80	3.15	4.45	4.76	2.75

PUD-SHWM60VAA

Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW] Minimum – Maximum	3.1 – 7.0	2.6 – 6.5	2.1 – 6.0
Nom. Water volume flow [l/min]	14.3		

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	35	35	35	35	55
Heating power [kW]	6.0	6.0	6.0	5.0	5.00	5.0
COP according to EN14511	2.66	3.15	3.80	4.99	5.29	2.65

PUD-SHWM80YAA

Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW] Minimum – Maximum	3.1 – 9.5	2.6 – 9.0	2.1 – 8.4
Nominal water volume flow [l/min]	17.2		

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	35	35	35	35	55
Heating power [kW]	8.0	8.0	8.0	6.0	6.0	6.0
COP according to EN14511	2.66	3.14	3.75	5.03	5.33	2.65

PUD-SHWM100YAA

Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW] Minimum – Maximum	3.2 – 12.4	2.7 – 11.9	2.1 – 10.4
Nominal water volume flow [l/min]	22.9		

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	35	35	35	35	55
Heating power [kW]	10.0	10.0	10.0	8.0	8.0	8.0
COP according to EN14511	2.60	3.05	3.45	5.00	5.3	2.60

PUD-SHWM120YAA

Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW] Minimum – Maximum	3.2 – 13.2	2.7 – 12.6	2.1 – 12.0
Nominal water volume flow [l/min]	28.7		

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	35	35	35	35	55
Heating power [kW]	12.0	12.0	12.0	10.0	10.0	10.0
COP according to EN14511	2.45	2.85	3.30	4.80	5.10	2.65

PUD-SHWM140YAA

Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW] Minimum – Maximum	3.5 – 14.6	3.2 – 14.3	2.7 – 14.0
Nominal water volume flow [l/min]	34.4		

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	35	35	35	35	55
Heating power [kW]	14.0	14.0	14.0	12.0	12.0	12.0
COP according to EN14511	2.15	2.70	3.05	4.70	5.00	2.45

PUHZ-SHW140YHAR5

Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW] Minimum – Maximum	5.7 – 15.8	5.2 – 14.8	4.7 – 14.4
Nominal water volume flow [l/min]	40.1		

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	35	35	35	35	55
Heating power [kW]	14.0	14.0	14.0	14.0	14.0	14.0
COP according to EN14511	2.15	2.75	3.14	4.46	4.76	2.49

PUHZ-SHW230YKA2R2

Outside temperature [°C]	2	2	2
Water temperature [°C]	35	45	55
Power range heating output [kW] Minimum – Maximum	11.8 – 23.2	10.8 – 22.9	9.1 – 22.8
Nominal water volume flow [l/min]	65.9		

Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	35	35	35	35	55
Heating power [kW]	22.9	23.0	23.0	23.0	23.0	23.0
COP according to EN14511	2.20	2.85	2.37	3.65	3.95	2.47

Cool

PUZ-HWM140YHA									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7		18	7	18
Performance range cooling capacity [kW]					Cooling capacity [kW]	–	–	11.90	11.10
Minimum – Maximum	–	–	–	–	COP according to EN14511	–	–	3.00	4.10
Nominal water volume flow [l/min] 34.1									

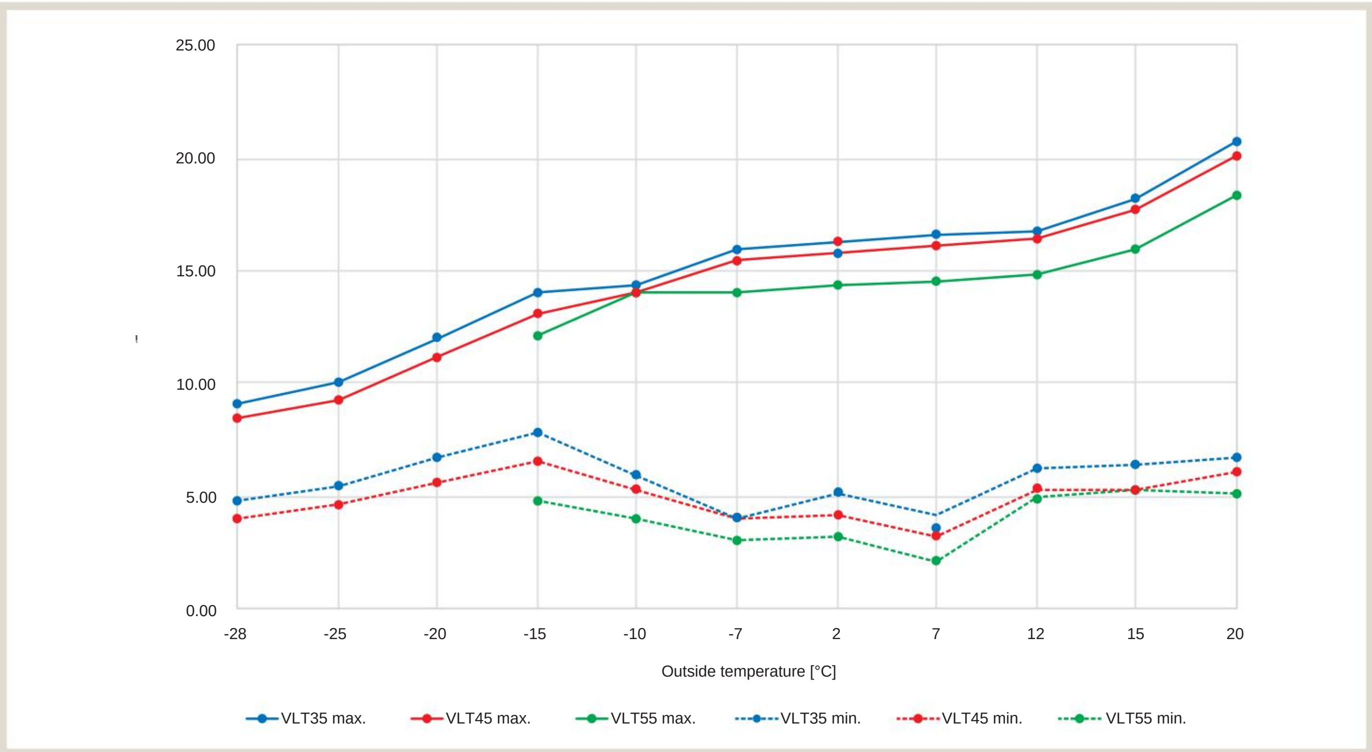
PUHZ-SHW140YHAR5									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7		18	7	18
Performance range cooling capacity [kW]					Cooling capacity [kW]	12.5	12.5	12.5	12.5
Minimum – Maximum	9.3 – 14.1	10.8 – 17.5	3.4 – 12.5	4.5 – 16.0	COP according to EN14511	3.38	6.35	2.17	4.26
Nominal water volume flow [l/min] 35.8									

PUHZ-SHW230YKA2R2									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7	20.0	18	7	18
Performance range cooling capacity [kW]					Cooling capacity [kW]		20.1	20.0	20.0
Minimum – Maximum	14.4 – 22.4	20.1 – 26.0	8.9 – 20.0	13.7 – 24.0	COP according to EN14511	3.35	3.90	2.22	3.55
Nominal water volume flow [l/min] 57.3									

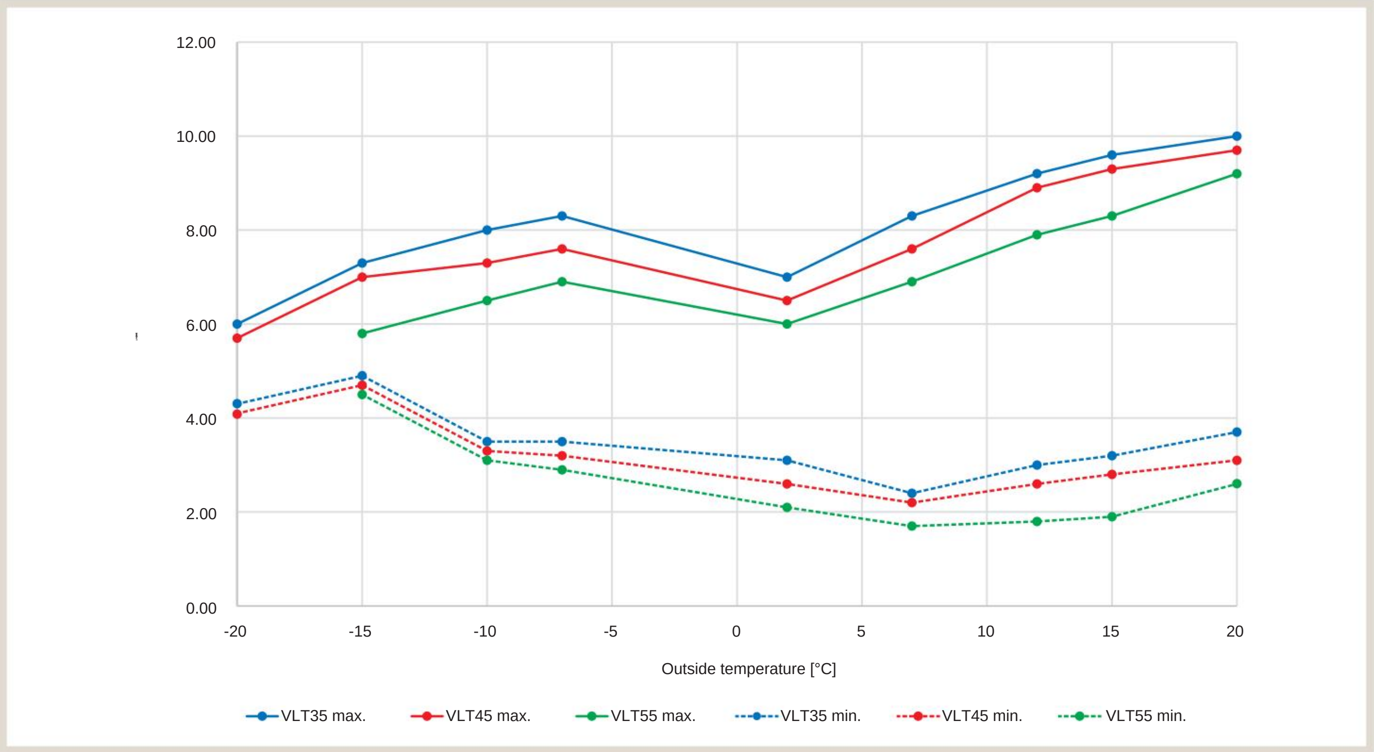
Zubadan Inverter performance diagrams

- VLT35/45/55 max.: Maximum possible heating output at a heating flow temperature of 35/45/55 °C
- VLT35/45/55 min.: Minimum possible heating output at a heating flow temperature of 35/45/55 °C

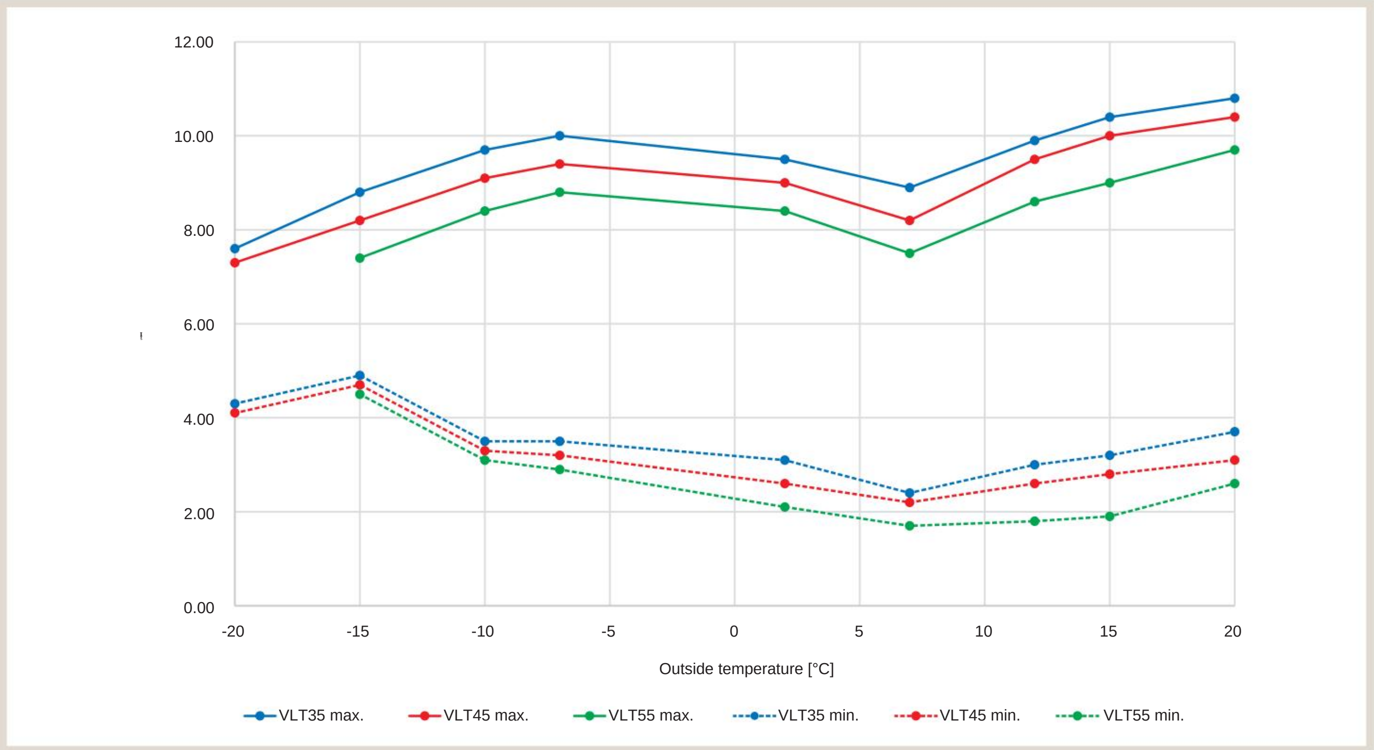
Monoblock
PUZ-HWM140YHA



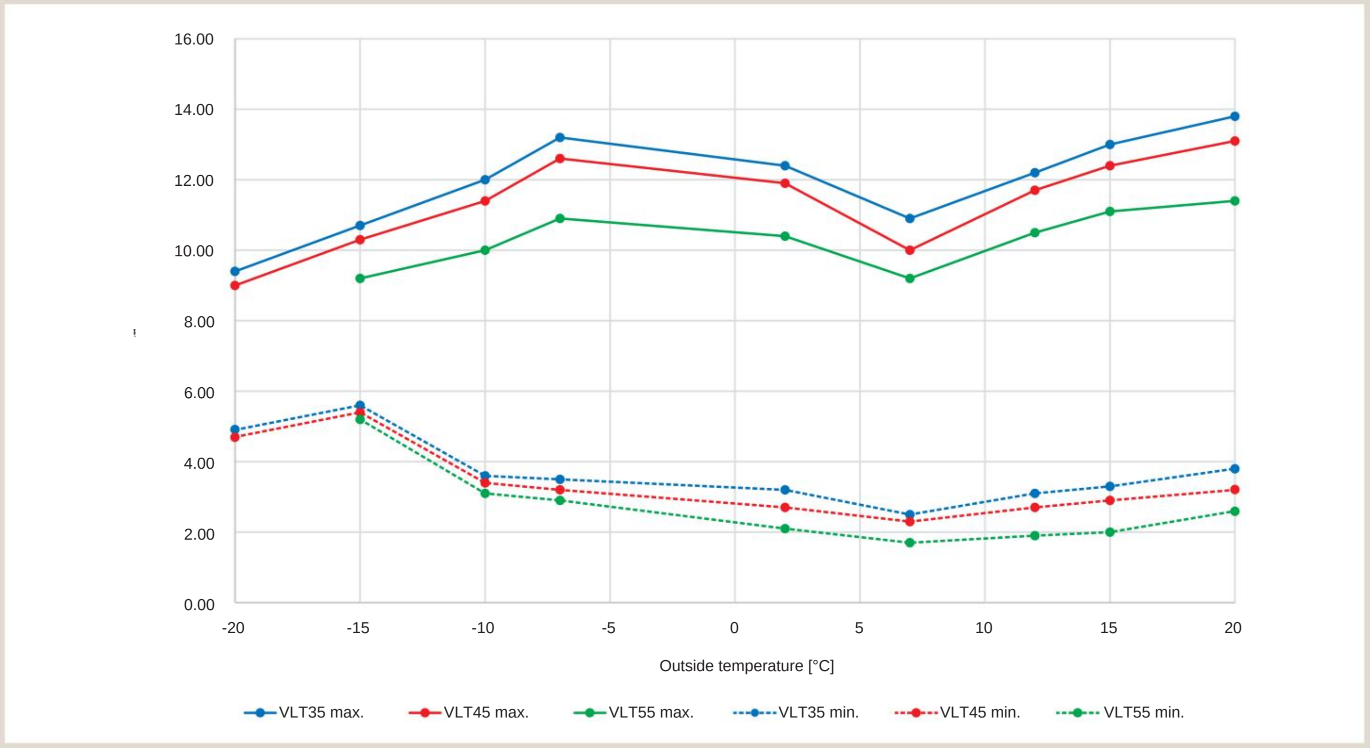
Split
PUD-SHWM60VAA



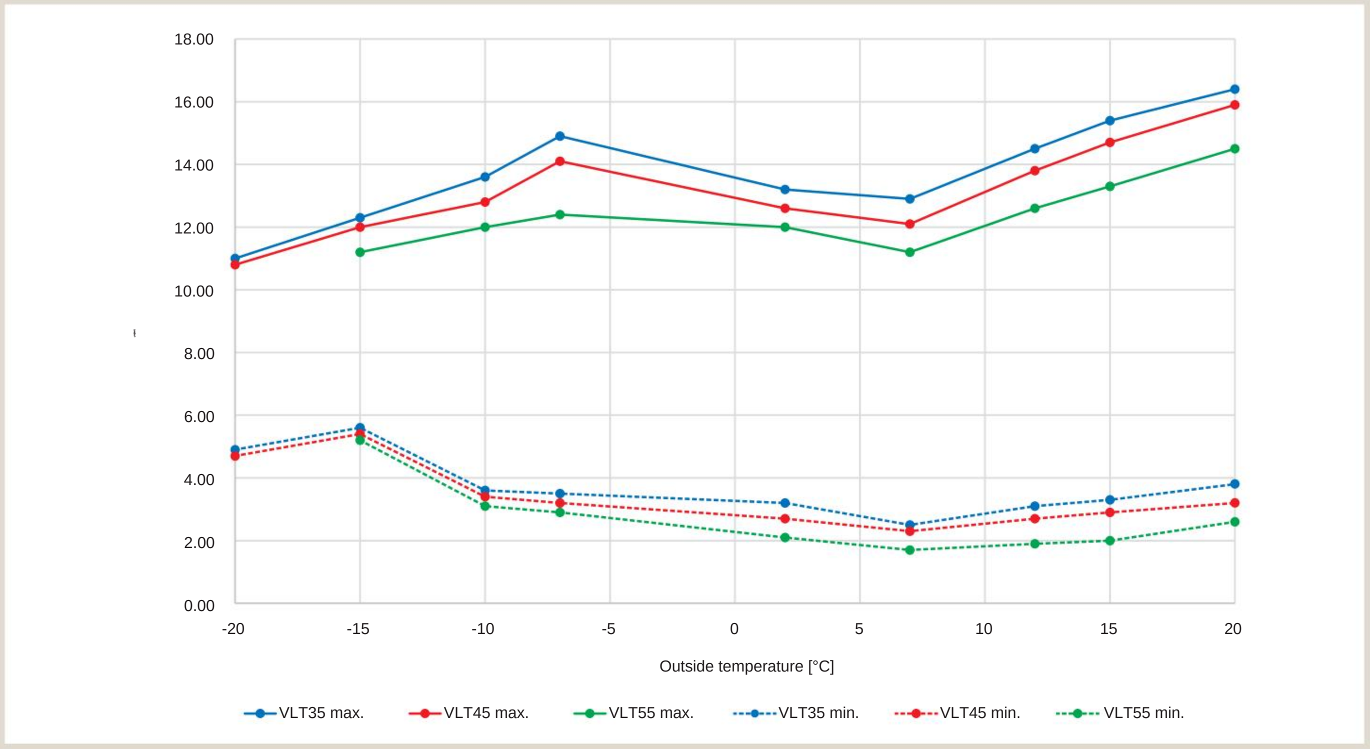
PUD-SHWM80YAA



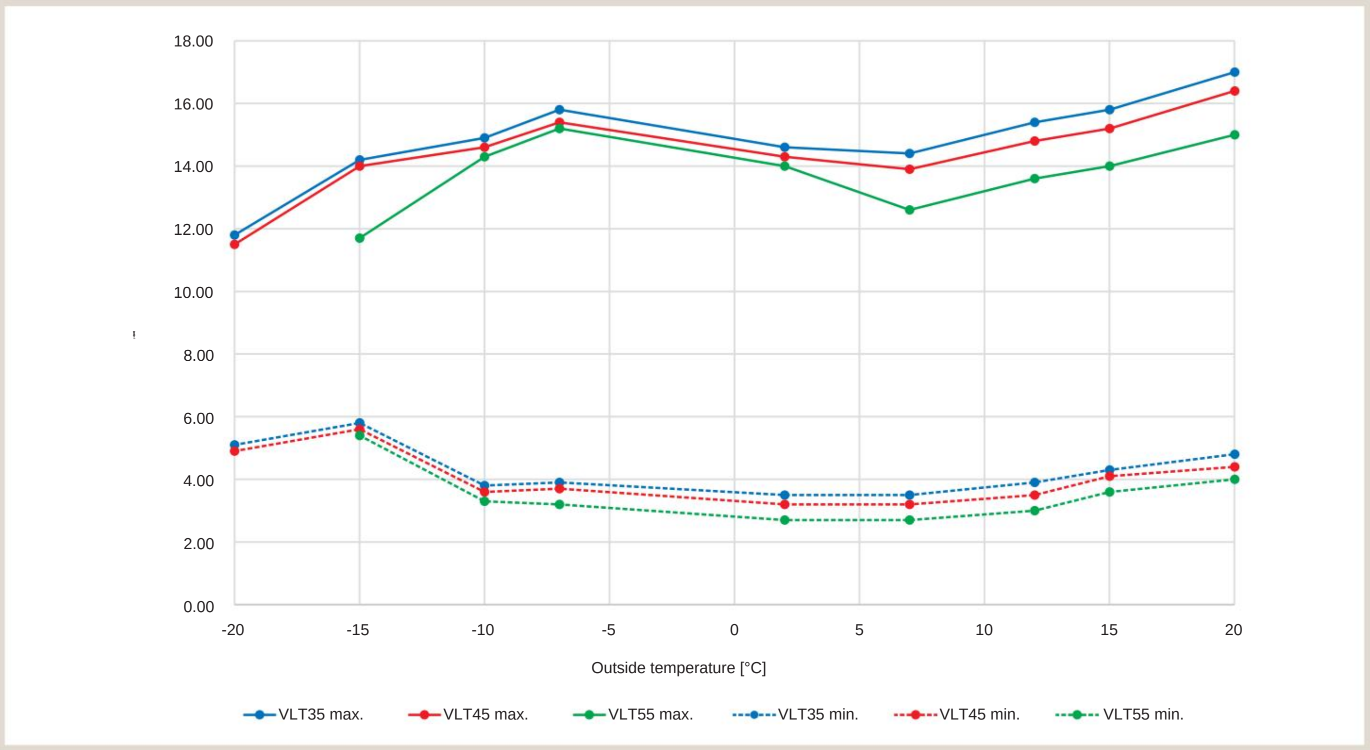
PUD-SHWM100YAA



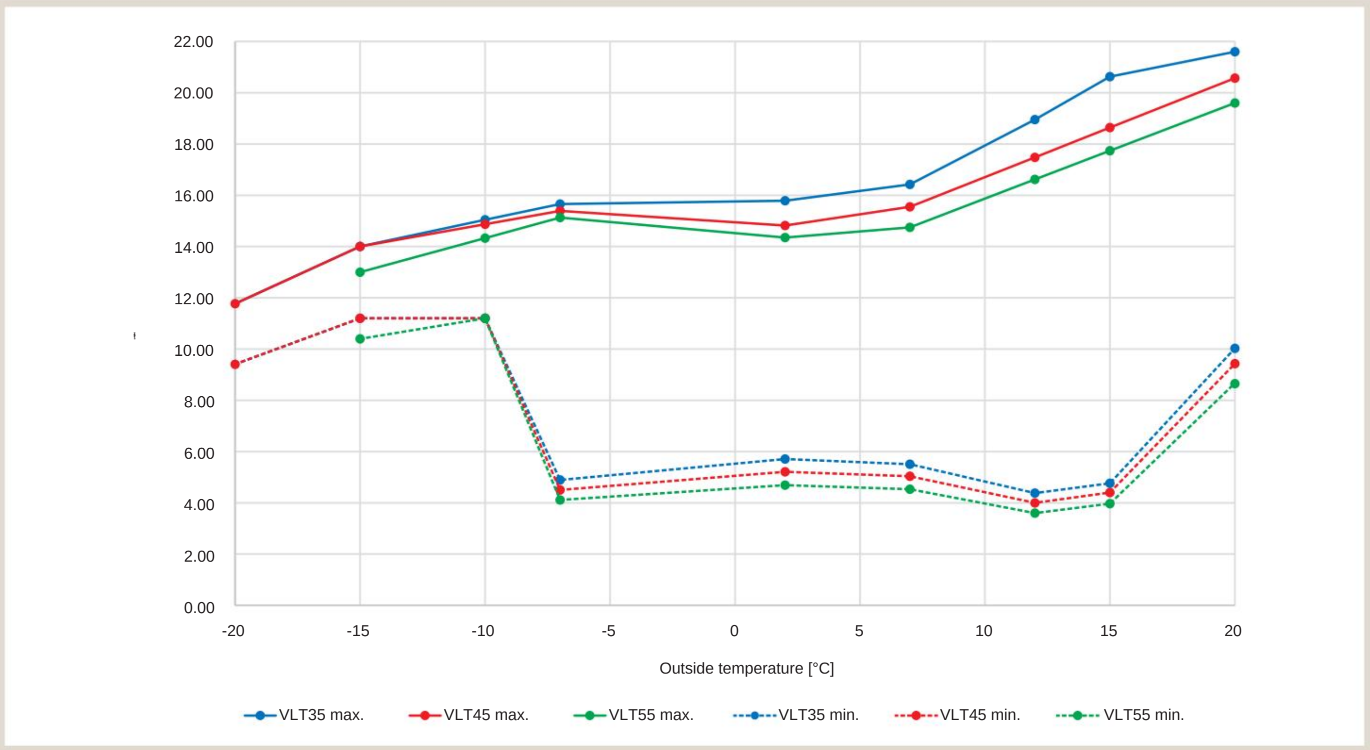
PUD-SHWM120YAA



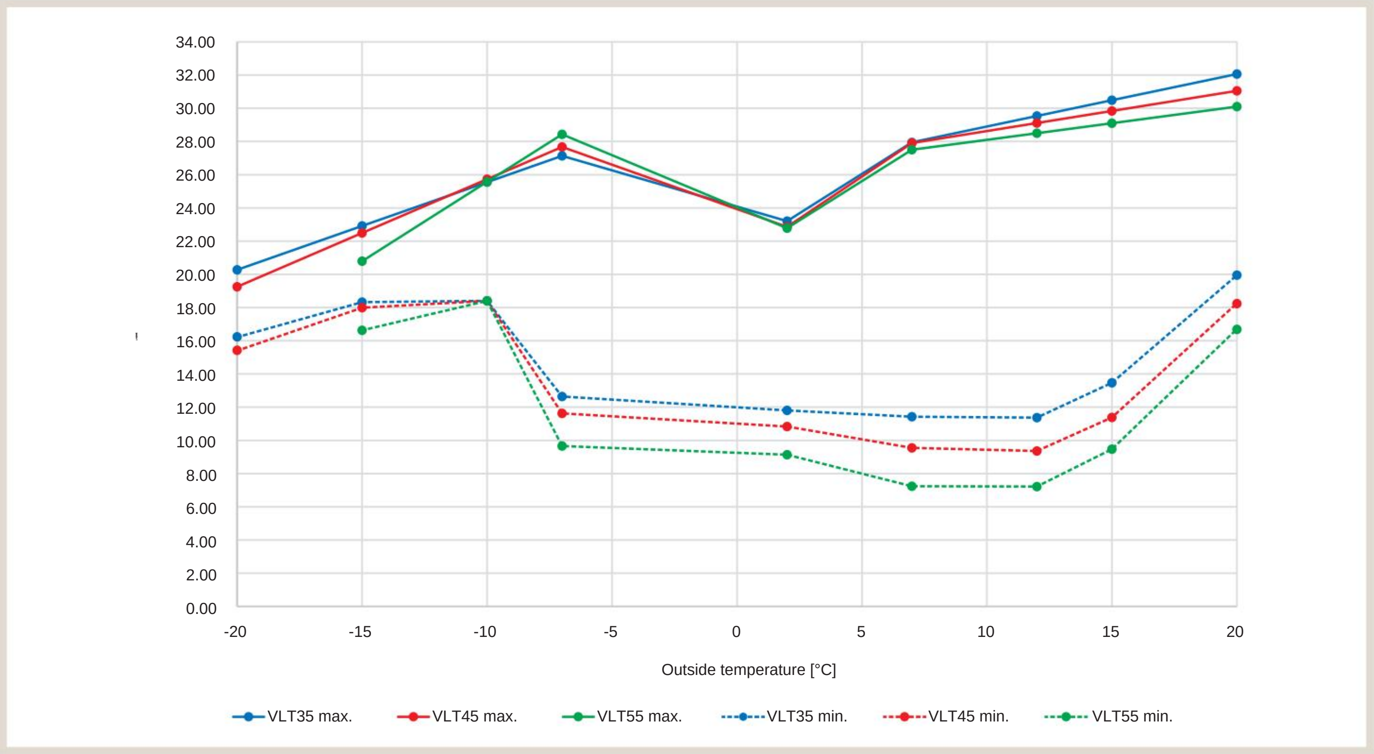
PUD-SHWM140YAA



PUHZ-SHW140YHAR5



PUHZ-SHW230YKA2R2



4.1.3.3 Eco Inverter

Heat

QUHZ-W40VA										
Outside temperature [°C]	2	2	2	Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	45	55	Water temperature [°C] 35		35	35	35	35	55
Power range heating output [kW]				Heating output [kW]	3.64	4.2	3.64	4.00	4.00	4.00
Minimum – Maximum	2.22 – 5.89 1.05 – 5.38 0.95 – 5.06			COP according to EN14511	2.65	2.55	3.41	3.36	3.66	2.56
Nominal water volume flow [l/min]	5.7									

SUZ-SWM40VA										
Outside temperature [°C]	2	2	2	Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	45	55	Water temperature [°C] 35		35	35	35	35	55
Power range heating output [kW]				Heating output [kW]	4.3	5.0	4.0	4.0	4.0	4.0
Minimum – Maximum	2.2 – 5.9	2.0 – 5.7	1.7 – 5.5	COP according to EN14511	2.45	2.84	4.02	5.20	5.5	2.61
Nominal water volume flow [l/min]	11.4									

SUZ-SWM60VA										
Outside temperature [°C]	2	2	2	Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	45	55	Water temperature [°C] 35		35	35	35	35	55
Power range heating output [kW]				Heating output [kW]	5.7	6.0	5.0	6.0	6.0	6.0
Minimum – Maximum	3.0 – 6.7	2.8 – 6.6	2.6 – 6.6	COP according to EN14511	2.48	2.96	4.01	4.86	5.16	2.68
Nominal water volume flow [l/min]	17.2									

SUZ-SWM80VA										
Outside temperature [°C]	2	2	2	Outside temperature [°C]	-15	-7	2	7	10	7
Water temperature [°C]	35	45	55	Water temperature [°C] 35 Heating		35	35	35	35	55
Power range heating output [kW]				power [kW] 6.0 COP according		6.8	6.5	7.5	7.5	7.5
Minimum – Maximum	3.0 – 7.1	2.8 – 7.1	2.6 – 7.1	to EN14511	2.40	3.27	3.68	4.97	5.27	2.80
Nominal water volume flow [l/min] 21.5										

Cool

SUZ-SWM40VA									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7		18	7	18
Performance range cooling capacity [kW]					Cooling capacity [kW]	4.5	5.6	4.5	5.6
Minimum – Maximum	1.6 – 5.7	2.1 – 7.8	1.2 – 5.1	1.8 – 7.0	COP according to EN14511	5.24	8.77	3.29	4.97
Nom. Water volume flow [l/min] 12.9									

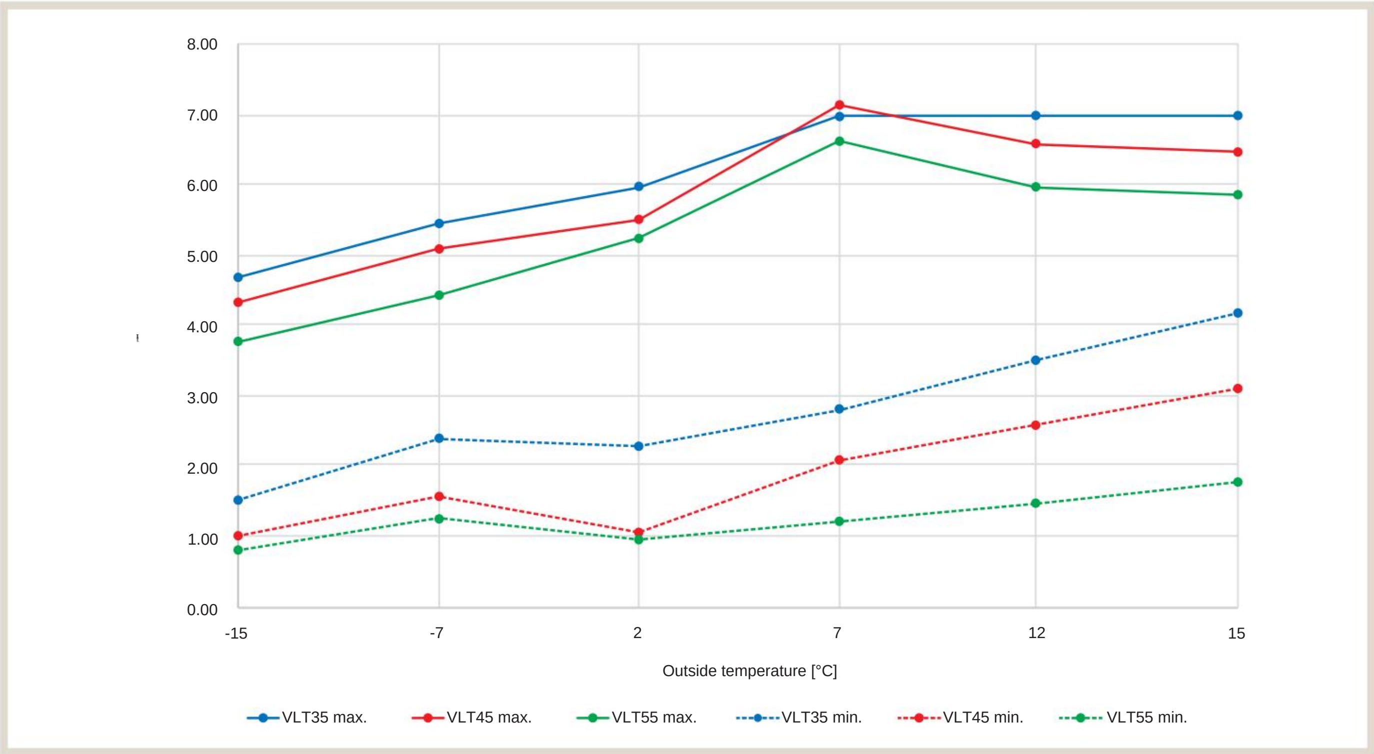
SUZ-SWM60VA									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7 Cooling		18	7	18
Performance range cooling capacity [kW]					capacity [kW]	5.0	6.0	5.0	6.0
Minimum – Maximum	2.1 – 6.7	2.8 – 9.3	1.6 – 5.9	2.4 – 8.3	COP according to EN14511	5.11	8.69	3.02	4.88
Nominal water volume flow [l/min] 14.3									

SUZ-SWM80VA									
Outside temperature [°C]	20	20	35	35	Outside temperature [°C] 20		20	35	35
Water temperature [°C]	7	18	7	18	Water temperature [°C] 7		18	7	18
Performance range cooling capacity [kW]					Cooling capacity [kW]	5.4	5.4	6.3	6.3
Minimum – Maximum	2.1 – 7.0	2.8 – 9.6	1.6 – 6.2 2.4 – 8.5		COP according to EN14511	5.01	3.00	8.21	4.80
Nominal water volume flow [l/min] 15.5									

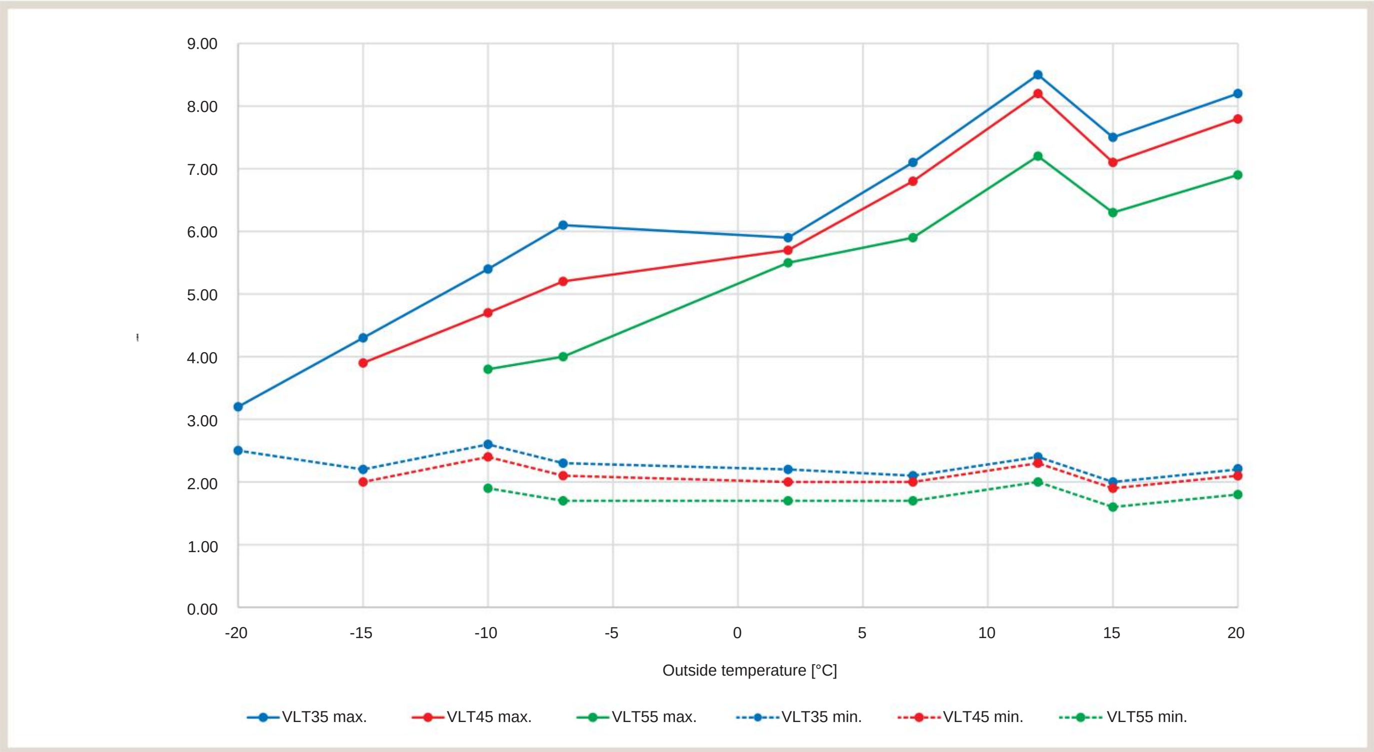
Performance diagrams Eco Inverter

- VLT35/45/55 max.: Maximum possible heating output at a heating flow temperature of 35/45/55 °C
- VLT35/45/55 min.: Minimum possible heating output at a heating flow temperature of 35/45/55 °C

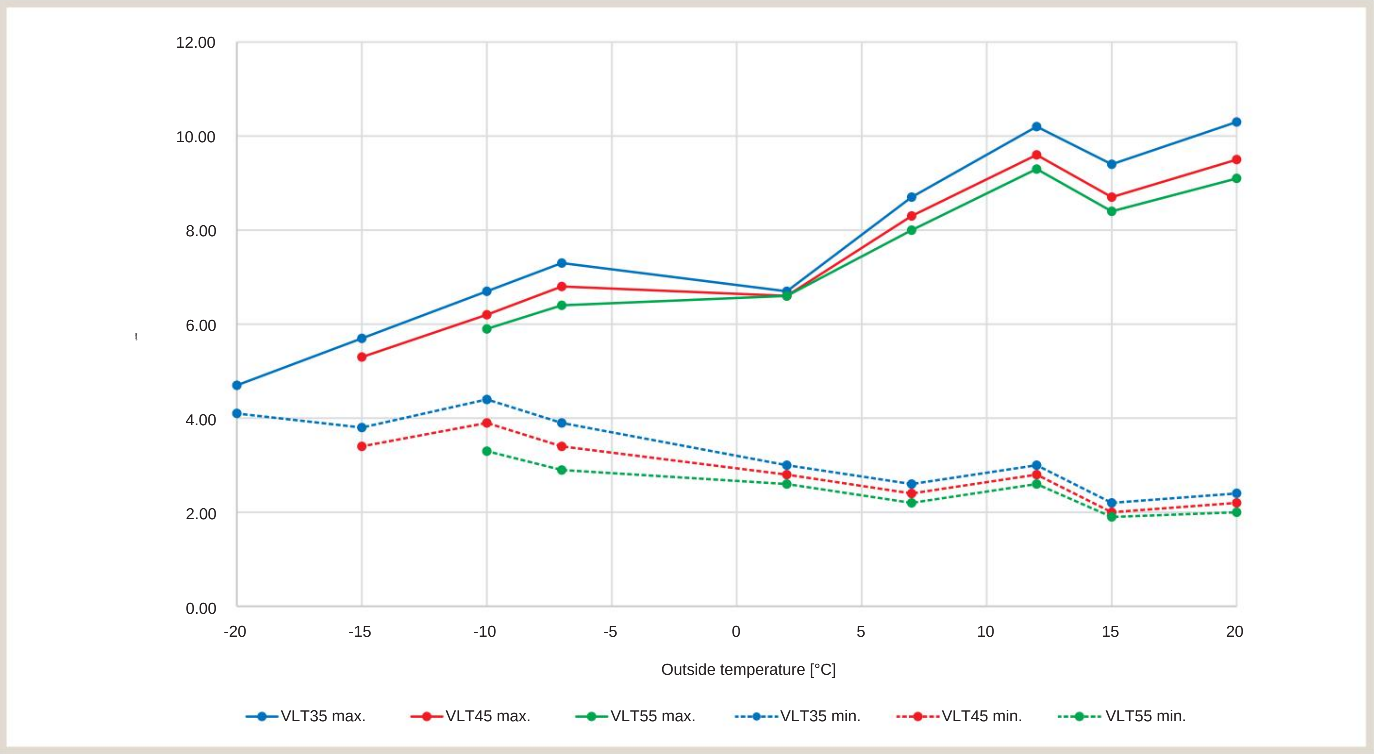
Monoblock
QUHZ-W40VA



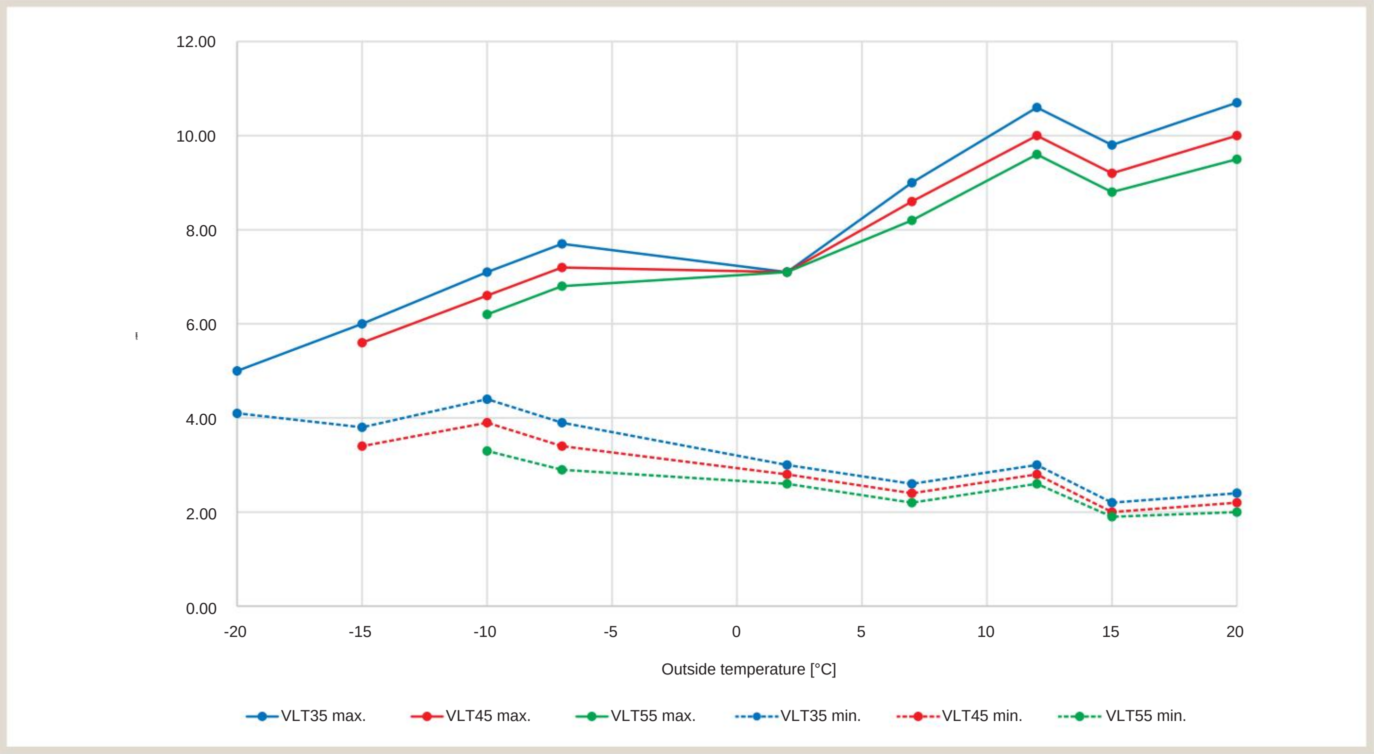
Split
SUZ-SWM40VA



SUZ-SWM60VA



SUZ-SWM80VA



4.1.3.4 Energy efficiency classes

Power inverter – monoblock					
Climatic conditions	**Average**				
Outdoor unit		PUZ-WM50VHA	PUZ-WM60VAA	PUZ-WM85YAA	PUZ-WM112YAA
Sound power level	Indoor unit [dB(A)] 40		40	40	40
	Outdoor unit [dB(A)] 61		58	58	60
Space heater					
Application Medium temperature (W55)	SCOP – 3.23		3.55	3.45	3.40
	ÿS [%] 129		142	138	133
	Efficiency class – A++		A++	A++	A++
Application Low temperature (W35)	SCOP – 4.58		4.75	4.75	4.73
	ÿS [%] 183		190	190	189
	Efficiency class – A+++		A+++	A+++	A+++
Combination heater					
Memory module EH(R)PT20X	ÿwh [%] 135		142	145	148
	Load profile – L		L	L	L
	Efficiency class – A+		A+	A+	A+
Memory module EH(R)PT30X	ÿwh [%] –		–	120	120
	Load profile --		–	XL	XL
	Efficiency class – –		–	A	A

SCOP seasonal performance factor
ÿS Seasonal space heating energy efficiency
ÿwh Water heating energy efficiency

Power Inverter - Split							
Climatic conditions	**Average**						
Outdoor unit		PUD-SWM60VAA	PUD-SWM80YAA	PUD-SWM100YAA	PUD-SWM120YAA	PUHZ-SW160YKA	PUHZ-SW200YKA
Sound power level	Indoor unit [dB(A)] 41		41	41	41	44	44
	Outdoor unit [dB(A)] 55		56	59	60	78	78
Space heater							
Application Medium temperature (W55)	SCOP – 3.25		3.25	3.25	3.20	3.2	3.26
	ÿS [%] 130		130	130	128	125	128
	Efficiency class – A++		A++	A++	A++	A++	A++
Application Low temperature (W35)	SCOP – 4.37		4.40	4.22	4.40	4.1	4.14
	ÿS [%] 175		176	177	176	161	162
	Efficiency class – A+++		A+++	A+++	A+++	A++	A++
Combination heater							
Memory module EHST20	ÿwh [%] 148		148	162	162	n/a	n/a
	Load profile – L		L	L	L	n/a	n/a
	Efficiency class – A+		A+	A+	A+	n/a	n/a
Memory module EHST30	ÿwh [%] 121		121	121	121	n/a	n/a
	Load profile – XL		XL	XL	XL	n/a	n/a
	Efficiency class – A		A	A	A+	n/a	n/a

SCOP seasonal performance factor
ÿS Seasonal space heating energy efficiency
ÿwh Water heating energy efficiency

Zubadan inverter – monoblock		
Climatic conditions	**Average**	
Outdoor unit		PUZ-HWM140YHA
Sound power level	Indoor unit [dB(A)]	40
	Outdoor unit [dB(A)]	67
Space heater		
Application Medium temperature (W55)	SCOP –	3.35
	ÿS [%]	131
	Efficiency class –	A++
Application Low temperature (W35)	SCOP –	4.45
	ÿS [%]	175
	Efficiency class –	A+++
Combination heater		
Memory module EH(R)PT20X	ÿwh [%]	130
	Load profile –	L
	Efficiency class –	A+
Memory module EH(R)PT30X	ÿwh [%]	118
	Load profile –	XL
	Efficiency class –	A

SCOP seasonal performance factor
ÿS Seasonal space heating energy efficiency
ÿwh Water heating energy efficiency

Zubadan Inverter – Split								
Climatic conditions	**Average**							
Outdoor unit		PUD SHWM60VAA	PUD SHWM80YAA	PUD SHWM100YAA	PUD SHWM120YAA	PUD SHWM140YAA	PUHZ-SHW140YHA	PUHZ-SHW230YKA2
Sound power level	Indoor unit [dB(A)]	41	41	41	41	41	40	44
	Outdoor unit [dB(A)]	55	56	59	60	62	70	75
Space heater								
Application Medium temperature (W55)	SCOP –	3.35	3.35	3.38	3.35	3.35	3.25	3.25
	ÿS [%]	134	134	135	134	134	127	127
	Efficiency class –	A++	A++	A++	A++	A++	A++	A++
Application Low temperature (W35)	SCOP –	4.45	4.45	4.45	4.45	4.45	4.16	4.18
	ÿS [%]	178	178	178	177	177	164	164
	Efficiency class –	A+++	A+++	A+++	A+++	A+++	A++	A++
Combination heater								
Memory module EHST20	ÿwh [%]	148	148	148	148	148	103	n/a
	Load profile –	L	L	L	L	L	L	n/a
	Efficiency class –	A+	A+	A+	A+	A+	A	n/a
Memory module EHST30	ÿwh [%]	121	121	121	121	121	n/a	n/a
	Load profile –	XL	XL	XL	XL	XL	n/a	n/a
	Efficiency class –	A	A	A	A	A	n/a	n/a

SCOP seasonal performance factor
ÿS Seasonal space heating energy efficiency
ÿwh Water heating energy efficiency

Eco Inverter – monoblock		
Climatic conditions	**Average**	
Outdoor unit		QUHZ-W40VA
Sound power level	Indoor unit [dB(A)] 40	
	Outdoor unit [dB(A)] 53	
Space heater		
Application Medium temperature (W55)	SCOP – 3.0	
	ÿS [%] 117	
	Efficiency class – A+	
Application Low temperature (W35)	SCOP – 3.73	
	ÿS [%] 146	
	Efficiency class – A+	
Combination heater		
Memory module EHPT20Q-VM2EA	ÿwh [%] 129	
	Load profile – L	
	Efficiency class – A+	

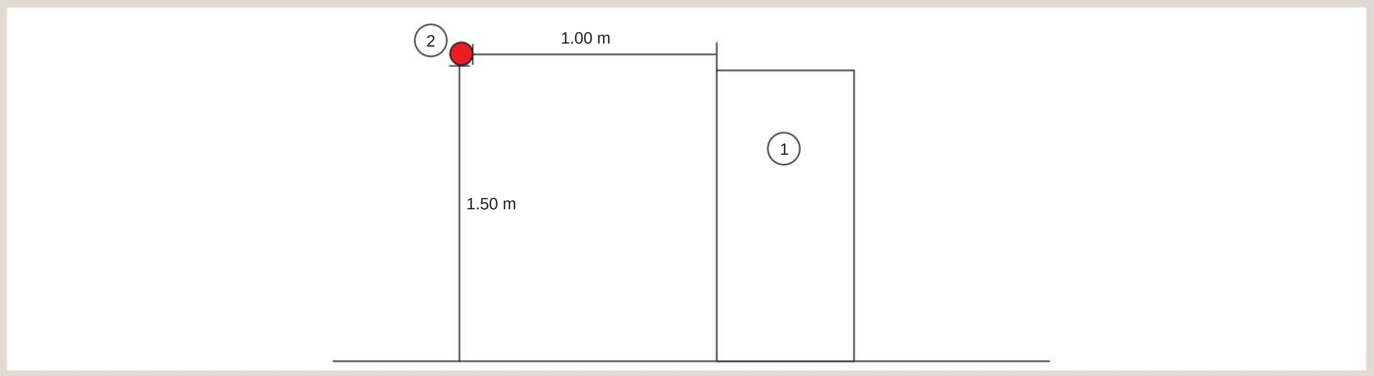
SCOP seasonal performance factor
ÿS Seasonal space heating energy efficiency
ÿwh Water heating energy efficiency

Eco Inverter – Split				
Climatic conditions	**Average**			
Outdoor unit		SUZ-SWM40VA	SUZ-SWM60VA	SUZ-SWM80VA
Sound power level	Indoor unit [dB(A)] 41		41	41
	Outdoor unit [dB(A)] 58		60	62
Space heater				
Application Medium temperature (W55)	SCOP – 3.23		3.25	3.28
	ÿS [%] 129		130	131
	Efficiency class – A++		A++	A++
Application Low temperature (W35)	SCOP – 4.50		4.53	4.55
	ÿS [%] 180		181	182
	Efficiency class – A+++		A+++	A+++
Combination heater				
Memory module EH(R)ST20	ÿwh [%] 159		148	148
	Load profile – L		L	L
	Efficiency class – A+		A+	A+
Memory module EH(R)ST30	ÿwh [%] 128		128	128
	Load profile – XL		XL	XL
	Efficiency class – A++		A++	A++

SCOP seasonal performance factor
ÿS Seasonal space heating energy efficiency
ÿwh Water heating energy efficiency

4.1.3.5 Sound data

Measuring point for sound pressure measurement



Legend
1 outdoor unit
2 microphone

		Sound pressure level [dB(A)] 1)		Sound power level [dB(A)]
		Heat	**Cool**	**Heat**
Monoblock				
Power inverter	PUZ-WM50VHA	52	52	61
	PUZ-WM60VAA	45	45	58
	PUZ-WM85YAA	45	45	58
	PUZ-WM112YAA	47	49	60
Zubadan inverter	PUZ-HWM140YHA	53	53	67
Eco inverter	QUHZ-W40VA	43	–	53
Split				
Power inverter	PUD-SWM60VAA	41	–	55
	PUD-SWM80YAA	42	–	56
	PUD-SWM100YAA	44	–	59
	PUD-SWM120YAA	46	–	60
	PUHZ-SW160YKA	62	58	78
	PUHZ-SW200YKA	62	60	78
Zubadan inverter	PUD-SHWM60VAA	41	–	55
	PUD-SHWM80YAA	42	–	56
	PUD-SHWM100YAA	44	–	59
	PUD-SHWM120YAA	46	–	60
	PUD-SHWM140YAA	48	–	62
	PUHZ-SHW140YHAR5	52	51	70
	PUHZ-SHW230YKA2R2	59	58	75
Eco inverter	SUZ-SWM40VA	44	49	58
	SUZ-SWM60VA	45	49	60
	SUZ-SWM80VA	46	49	62

Values measured according to DIN EN 12102
1) Free field measurement at 1 m distance

4.2 Power Inverters

4.2.1 Technical data

Monoblock

Device name			PUZ-WM50VHA	PUZ-WM60VAA
Power supply		[Ph], [V], [Hz]	1, 230, 50	1, 230, 50
Max. current		[A]	13.0	13.0
validation		[A]	16	16
Outer casing			Galvanized sheet steel	Galvanized sheet steel
Housing surface			Munsell N8.75; N2.75 (front cover)	Munsell N8.75; N2.75 (front cover)
Refrigerant injection			Electronic expansion valve	Electronic expansion valve
compressor	Type		Hermetic double roller piston	Hermetic double roller piston
	Model		SVB130FBBMC-L3	SVB220FEGMC-L1
	Motor power consumption	[kW]	0.9	1.5
	Performance control		Inverters	Inverters
	Protective devices		High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection	High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection
	Oil quantity (type)	[l]	0.6 (FW68S)	0.6 (FW68S)
Crankcase heater		[W]	–	–
Heat exchanger	Air		Fin heat exchanger	Fin heat exchanger
	Water		Plate heat exchanger	Plate heat exchanger
Fan	Type and number		Axial x 1 piece.	Axial x 1 piece.
	Motor power consumption	[kW]	0.074	0.074
	Air volume flow	m3/min	36	44
Defrosting method			Refrigerant reversal	Refrigerant reversal
Sound pressure level (SPL)	Heat	[dB(A)]	52	45
	Cool	[dB(A)]	52	45
Sound power level (PWL)	Heat	[dB(A)]	61	58
Dimensions	Height	[mm]	943	1020
	depth	[mm]	330+30	480
	Width	[mm]	950	1050
Weight		[kg]	71	98
Refrigerant	Type		R32	R32
	Crowd	[kg]	2.0	2.2
Pipe size (outside diameter) liquid		[mm]	–	–
	gas	[mm]	–	–
Connection technology			Water connection	Water connection
Between indoor and Outdoor unit	Height difference	[m]	–	–
	Pipe length	[m]	–	–
Guaranteed operating range (Outside)	Heat	[ÿC]	-20 ÿ +24	-20 ÿ +24
	Hot water	[ÿC]	-20 ÿ +35	-20 ÿ +35
	Cooling 1)	[ÿC]	+10 ÿ +46	+10 ÿ +46
Flow temperature (water) (Max. for heating, Min. for cooling)	Heat	[ÿC]	+60	+60
	Cool	[ÿC]	+5	+5
Return temperature (water)	Heat	[ÿC]	+9 ÿ +59	+9 ÿ +59
	Cool	[ÿC]	+8 ÿ +28	+8 ÿ +28
Water volume flow		[l/min]	6.5 ÿ 14.3	8.6 ÿ 17.2
Connection VL/RL		[Customs service]	G1"	G1"

1) In combination with a reversible storage/hydro module, the minimum temperature is +10 °C.

Device name			PUZ-WM85YAA	PUZ-WM112YAA	PUZ-HWM140YHA
Power supply		[Ph], [V], [Hz] 3,	400, 50	3, 400, 50	3, 400, 50
Max. current		[A] 11.5		13.0	13.0
validation		[A]	16	16	16
Outer casing			Galvanized sheet steel	Galvanized sheet steel	Galvanized sheet steel
Housing surface			Munsell N8.75; N2.75 (front cover)	Munsell N8.75; N2.75 (front cover)	Munsell 3Y 7.8 / 1.1 (front cover)
Refrigerant injection			Electronic expansion valve	Electronic expansion valve	Electronic expansion valve
compressor	Type		Hermetic double rotary piston	Hermetic double rotary piston	Hermetic scroll compressor
	Model		SVB220FEAMC-L1	DVB28FBBMT	AVB36FJCMT
	Motor power consumption	[kW]	1.5	2.2	2.8
	Performance control		Inverters	Inverters	Inverters
	Protective devices		High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection	High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection	High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection
	Oil quantity (type)	[l]	0.6 (FW68S)	0.9 (FW68S)	1.4 (FW68S)
Crankcase heater		[W]	–	–	–
Heat exchanger	Air		Fin heat exchanger	Fin heat exchanger	Fin heat exchanger
	Water		Plate heat exchanger	Plate heat exchanger	Plate heat exchanger
Fan	Type and number		Axial x 1 piece.	Axial x 1 piece.	Axial x 2 pcs.
	Motor power consumption	[kW]	0.074	0.200	0.074x2
	Air volume flow	m3/min	44	50	100
Defrosting method			Refrigerant reversal	Refrigerant reversal	Refrigerant reversal
Sound pressure level (SPL)	heating	[dB(A)]	45	47	53
	Cool	[dB(A)]	45	49	53
Sound power level (PWL)	Heat	[dB(A)]	58	60	
Dimensions	Height	[mm]	1020	1020	1350
	depth	[mm]	480	480	330+30
	Width	[mm]	1050	1050	1020
Weight		[kg]	111	132	143
Refrigerant	Type		R32	R32	R32
	Crowd	[kg]	2.2	3.0	3.3
Pipe size (Outer diameter)	liquid	[mm]	–	–	–
	gas	[mm]	–	–	–
Connection technology			Water connection	Water connection	Water connection
Between indoor and Outdoor unit	Height difference [m]		–	–	–
	Pipe length [m] [ÿC] [ÿC]		–	–	–
Guaranteed Operating area (outdoor)	Heat	[ÿC]	-20 ÿ +24	-25 ÿ +24	-28 ÿ +21
	Hot water		-20 ÿ +35	-25 ÿ +35	-28 ~ +35
	Cooling 1)		+10 ÿ +46	+10 ÿ +46	+10 ÿ +46
flow temperature (Water) (Max. for heating, Min. for cooling)	Heat	[ÿC]	+60	+60	+60
	Cool	[ÿC]	+5	+5	+5
return temperature (Water)	Heat	[ÿC]	+9 ÿ +59	+9 ÿ +59	+9 ÿ +59
	Cool	[ÿC]	+8 ÿ +28	+8 ÿ +28	+8 ÿ +28
Water volume flow		[l/min]	10.8 ÿ 24.4	14.4 ÿ 32.1	17.9 ÿ 40.1
Connection VL/RL		[Customs service]	G1"	G1"	G1"

1) In combination with a reversible storage/hydro module, the minimum temperature is +10 °C.

Split

Device name				PUD-SWM60VAA	PUD-SWM80YAA
Power supply			[Ph], [V], [Hz]	1, 230, 50	3, 400 , 50
Max. current			[A]	16.5	8.0
validation			[A]	20	16
Outer casing				Galvanized sheet steel	Galvanized sheet steel
Housing surface				Munsell N8.75; N2.75 (front cover)	Munsell N8.75; N2.75 (front cover)
Refrigerant injection				Electronic expansion valve	Electronic expansion valve
compressor	Type			Hermetic scroll compressor	Hermetic scroll compressor
	Model			DVB28FBAMT	DVB28FBBMT
	Motor power consumption		[kW]	2.2	2.2
	Performance control			Inverters	Inverters
	Protective devices			High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection	High pressure switch, compressor thermostat, thermostatic overpressure protection, Overcurrent detection
	Oil quantity (type)		[l]	0.9 (FW68S)	0.9 (FW68S)
Crankcase heater			[W]	–	–
Heat exchanger		Air		Fin heat exchanger	Fin heat exchanger
		Water		–	–
Fan	Type and number			Axial x 1 piece.	Axial x 1 piece.
	Motor power consumption		[kW]	0.074	0.074
	Air volume flow		m3/min	40	40
Defrosting method				Refrigerant reversal	Refrigerant reversal
Sound pressure level (SPL)		Heat	[dB(A)]	41	42
		Cool	[dB(A)]	–	–
Sound power level (PWL)		Heat	[dB(A)]	55	56
Dimensions		Height	[mm]	1020	1020
		depth	[mm]	480	480
		Width	[mm]	1050	1050
Weight			[kg]	101	114
Refrigerant		Type		R32	R32
		Crowd	[kg]	1.3	1.3
		Max.	[kg]	1.6	1.6
Pipe size (outside diameter) liquid			[mm]	6.35	6.35
		gas	[mm]	12.7	12.7
Connection technology				flanged	flanged
Between indoor and Outdoor unit		Height difference	[m]	30	30
		Pipe length	[m]	2-30	2-30
Guaranteed operating range (Outside)		Heat	[ÿC]	-25 ÿ +24	-25 ÿ +24
		Hot water	[ÿC]	-25 ÿ +35	-25 ÿ +35
		Cooling 1)	[ÿC]	–	–
Flow temperature (water) (Max. for heating, Min. for cooling)		Heat	[ÿC]	+60	+60
		Cool	[ÿC]	–	–
Return temperature (water)		Heat	[ÿC]	+10 ÿ +59	+10 ÿ +59
		Cool	[ÿC]	–	–
Water volume flow			[l/min]	9.0 ÿ 22.9	9.0 ÿ 22.9

1) In combination with a reversible storage/hydro module, the minimum temperature is +10 °C.

Device name			PUD-SWM100YAA	PUD-SWM120YAA
Power supply		[Ph], [V], [Hz]	3, 400, 50	3, 400, 50
Max. current		[A]	10.0	12.0
validation		[A]	16	16
Outer casing			Galvanized sheet steel	Galvanized sheet steel
Housing surface			Munsell N8.75; N2.75 (front cover)	Munsell N8.75; N2.75 (front cover)
Refrigerant injection			Electronic expansion valve	Electronic expansion valve
compressor	Type		Hermetic scroll compressor	Hermetic scroll compressor
	Model		DVB28FBBMT	DVB28FBBMT
	Motor power consumption	[kW]	2.2	2.2
	Performance control		Inverters	Inverters
	Protective devices		High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection	High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection
	Oil quantity (type)	[l]	0.9 (FW68S)	0.9 (FW68S)
Crankcase heater		[W]	–	–
Heat exchanger	Air		Fin heat exchanger	Fin heat exchanger
	Water		–	–
Fan	Type and number		Axial x 1 piece.	Axial x 1 piece.
	Motor power consumption	[kW]	0.200	0.200
	Air volume flow	m3/min	50	50
Defrosting method			Refrigerant reversal	Refrigerant reversal
Sound pressure level (SPL)	Heat	[dB(A)]	44	46
	Cool	[dB(A)]	–	–
Sound power level (PWL)	Heat	[dB(A)]	59	60
Dimensions	Height	[mm]	1020	1020
	depth	[mm]	480	480
	Width	[mm]	1050	1050
Weight		[kg]	120	120
Refrigerant	Type		R32	R32
	Crowd	[kg]	1.6	1.6
	Max.	[kg]	1.83	1.83
Pipe size (outside diameter) liquid		[mm]	6.35	6.35
	gas	[mm]	12.7	12.7
Connection technology			flanged	flanged
Between indoor and Outdoor unit	Height difference	[m]	30	30
	Pipe length	[m]	2-30	2-30
Guaranteed operating range (Outside)	Heat	[ÿC]	-25 ÿ +24	-25 ÿ +24
	Hot water	[ÿC]	-25 ÿ +35	-25 ÿ +35
	Cooling 1)	[ÿC]	–	–
Flow temperature (water) (Max. for heating, Min. for cooling)	Heat	[ÿC]	+60	+60
	Cool	[ÿC]	–	–
Return temperature (water)	Heat	[ÿC]	+10 ÿ +59	+10 ÿ +59
	Cool	[ÿC]	–	–
Water volume flow		[l/min]	14.3 ÿ 34.4	14.3 ÿ 34.4

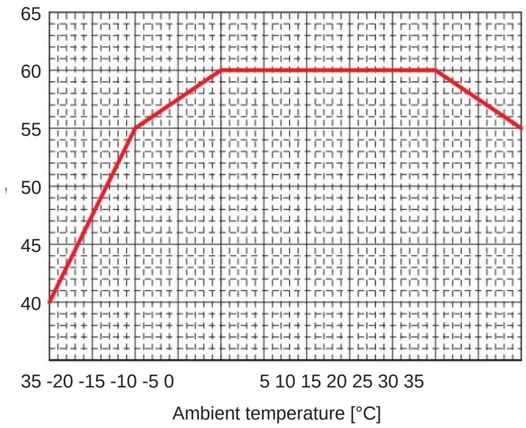
1) In combination with a reversible storage/hydro module, the minimum temperature is +10 °C.

Device name			PUHZ-SW160YKA	PUHZ-SW200YKA
Power supply		[Ph], [V], [Hz]	3, 400, 50	3, 400, 50
Max. current		[A]	19	21.0
validation		[A]	25	32
Outer casing			Galvanized sheet steel	Galvanized sheet steel
Housing surface			Munsell 3Y 7.8/1.1	Munsell 3Y 7.8/1.1
Refrigerant injection			Electronic expansion valve	Electronic expansion valve
compressor	Type		Hermetic scroll compressor	Hermetic scroll compressor
	Model		ANB52FRNMT	ANB52FRNMT
	Motor power consumption	[kW]	4.7	4.7
	Performance control		Inverters	Inverters
	Protection devices Oil		High pressure switch, compressor thermostat	High pressure switch, compressor thermostat
	quantity (type)	[l]	2.30 (FVC68D)	2.30 (FVC68D)
Crankcase heater		[W]	–	–
Heat exchanger	Air		Fin heat exchanger	Fin heat exchanger
	Water		–	–
Fan	Type and number		Axial x 2 pcs.	Axial x 2 pcs.
	Motor power consumption	[kW]	0.20×2	0.20×2
	Air volume flow	m3/min	8400	8400
Defrosting method			Refrigerant reversal	Refrigerant reversal
Sound pressure level (SPL)	Heat	[dB(A)]	62	62
	Cool	[dB(A)]	58	60
Sound power level (PWL)	Heat	[dB(A)]	78	78
Dimensions	Height	[mm]	1338	1338
	depth	[mm]	330 + 40	330 + 40
	Width	[mm]	1050	1050
Weight		[kg]	136	136
Refrigerant	Type		R410A	R410A
	Crowd	[kg]	7.1	7.7
Pipe size (outside diameter) liquid		[mm]	9.52	12.7
	gas	[mm]	25.4	25.4
Connection technology			Flare	Flare
Between indoor and Outdoor unit	Height difference	[m]	max. 30	max. 30
	Pipe length	[m]	max. 80	max. 80
Guaranteed operating range (Outside)	Heat	[ÿC]	-20 ÿ +21	-20 ÿ +21
	Hot water	[ÿC]	-20 ÿ +35	-20 ÿ +35
	Cooling 1)	[ÿC]	-15 ÿ +46	-15 ÿ +46
Flow temperature (water) (Max. for heating, Min. for cooling)	Heat	[ÿC]	60	60
	Cool	[ÿC]	5	5
Return temperature (water)	Heat	[ÿC]	+5 ÿ +59	+5 ÿ +59
	Cool	[ÿC]	+8 ÿ +28	+8 ÿ +28
Water volume flow		[l/min]	23.0 ÿ 63.1	28.7 ÿ 71.7

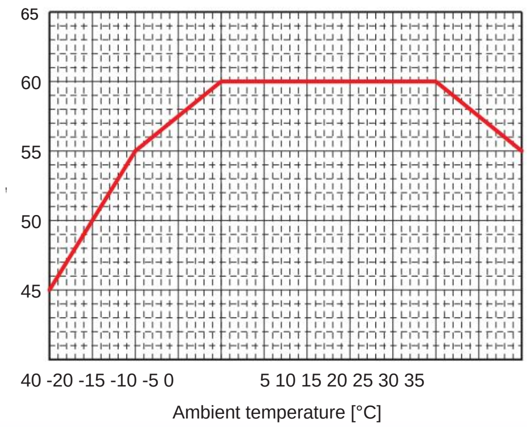
1) In combination with a reversible storage/hydro module, the minimum temperature is +10 °C.

4.2.2 Maximum flow temperatures

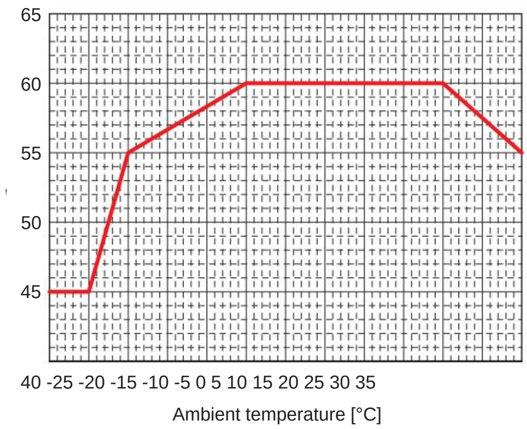
Monoblock
PUZ-WM50VHA



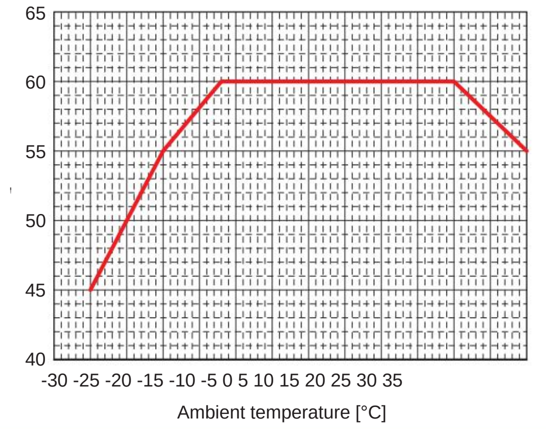
PUZ-WM60/85VAA/YAA



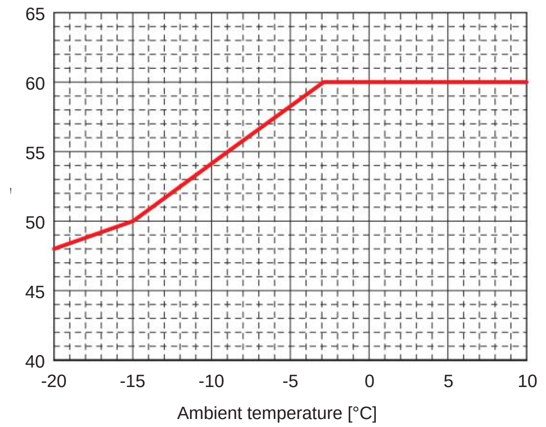
PUZ-WM112YAA



Split
PUD-SWM60/80/100/120VAA/YAA



PUHZ-SW160/200YKA



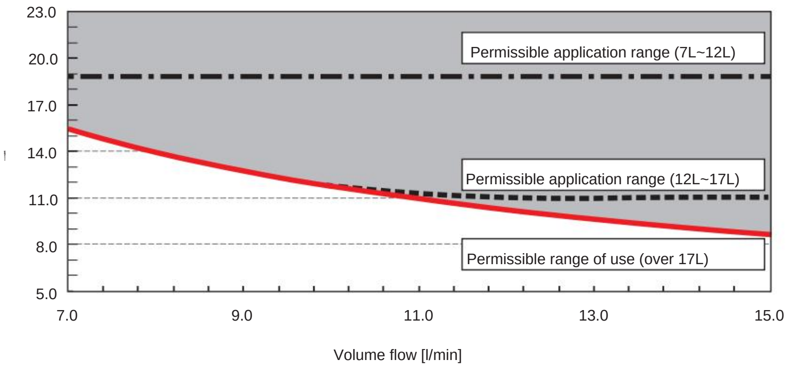
4.2.3 Cooling/defrosting application area (return temperature, volume flow)

Caution!

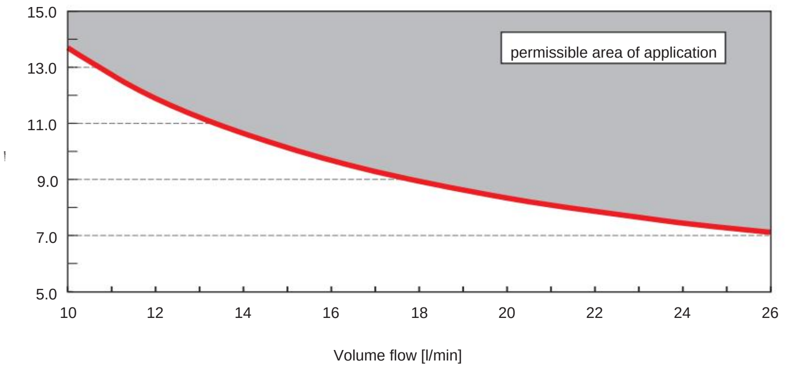
If the minimum return temperature or the minimum volume flow is not reached, the heat pump system will malfunction.

- When starting up the heat pump system for the first time or after a longer period of downtime, it is essential that you adhere to the permissible values on the plate heat exchanger.

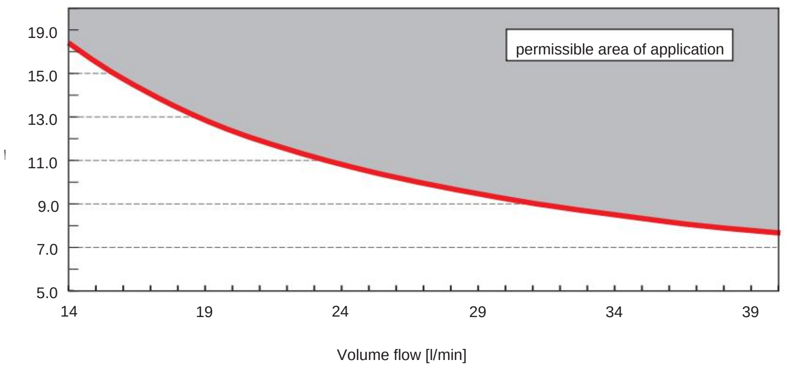
Monoblock
PUZ-WM50VHA



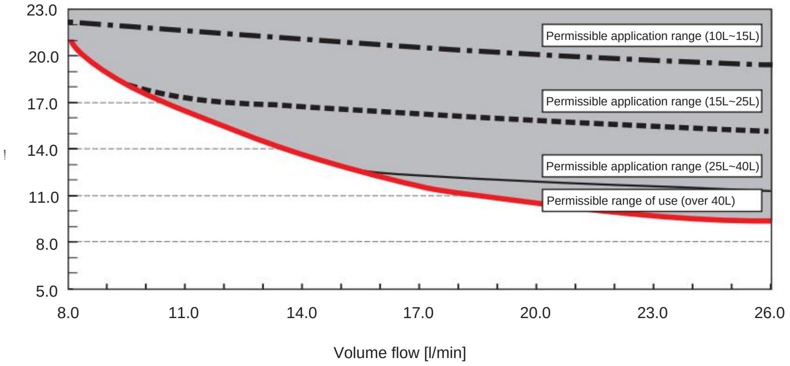
PUZ-WM60/85VAA/YAA



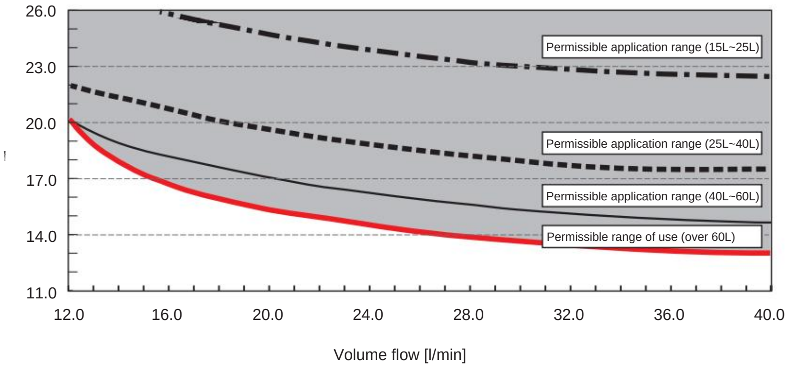
PUZ-WM112YAA



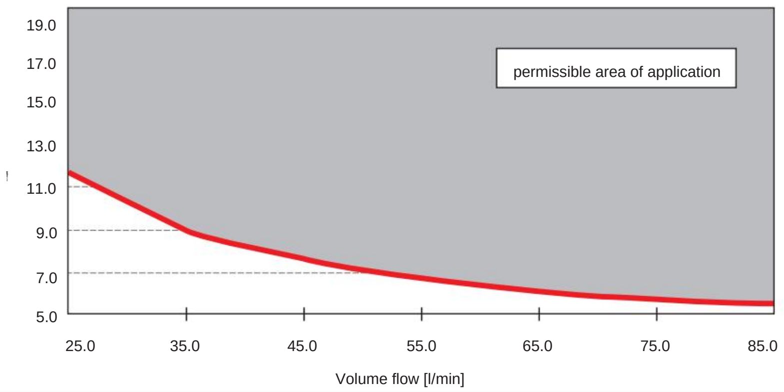
Split
PUD-SWM60/80VAA/YAA



PUD-SWM100/120YAA



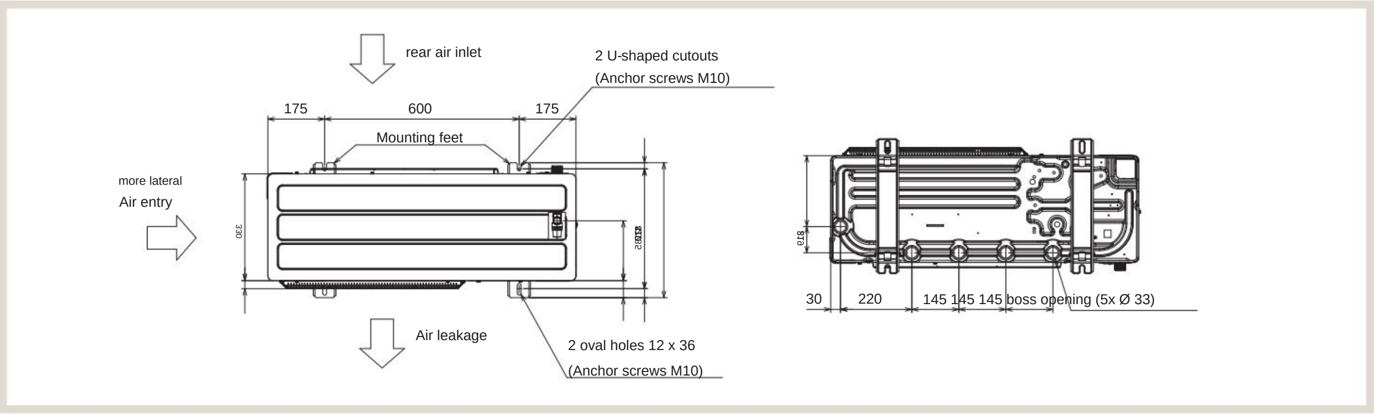
PUHZ-SW160/200YKA



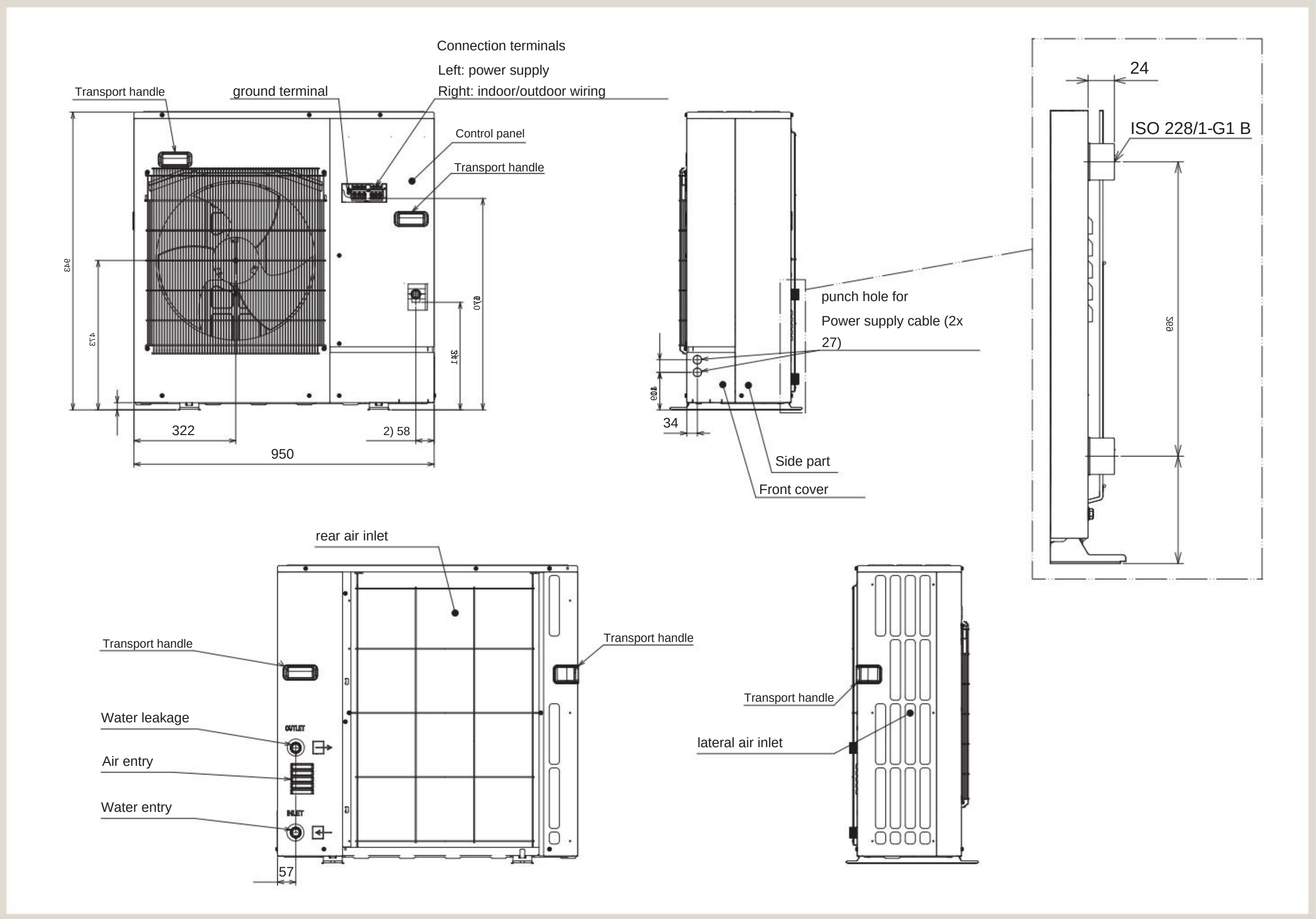
4.2.4 Dimensions

Monoblock
PUZ-WM50VHA

Top and bottom view



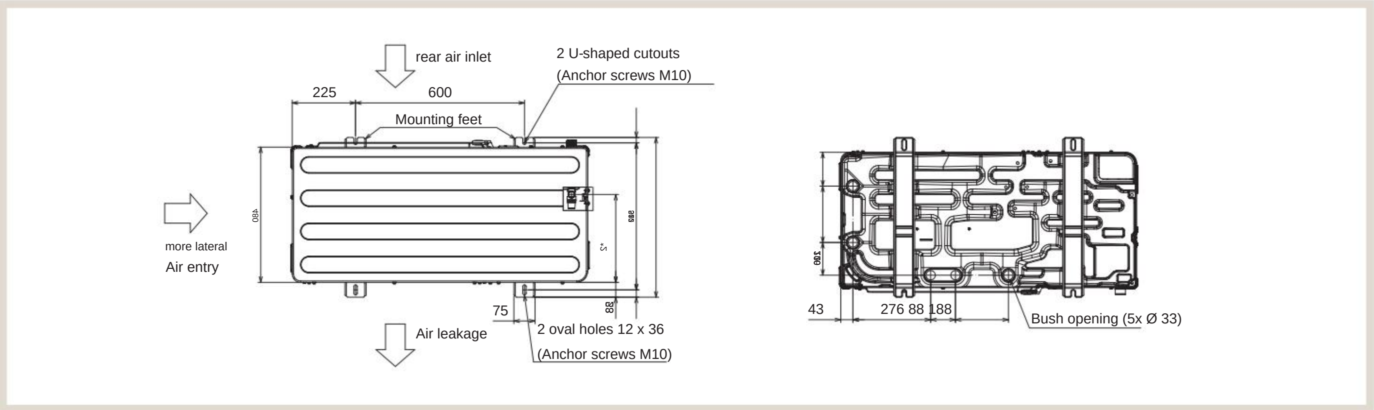
Front, back and side views



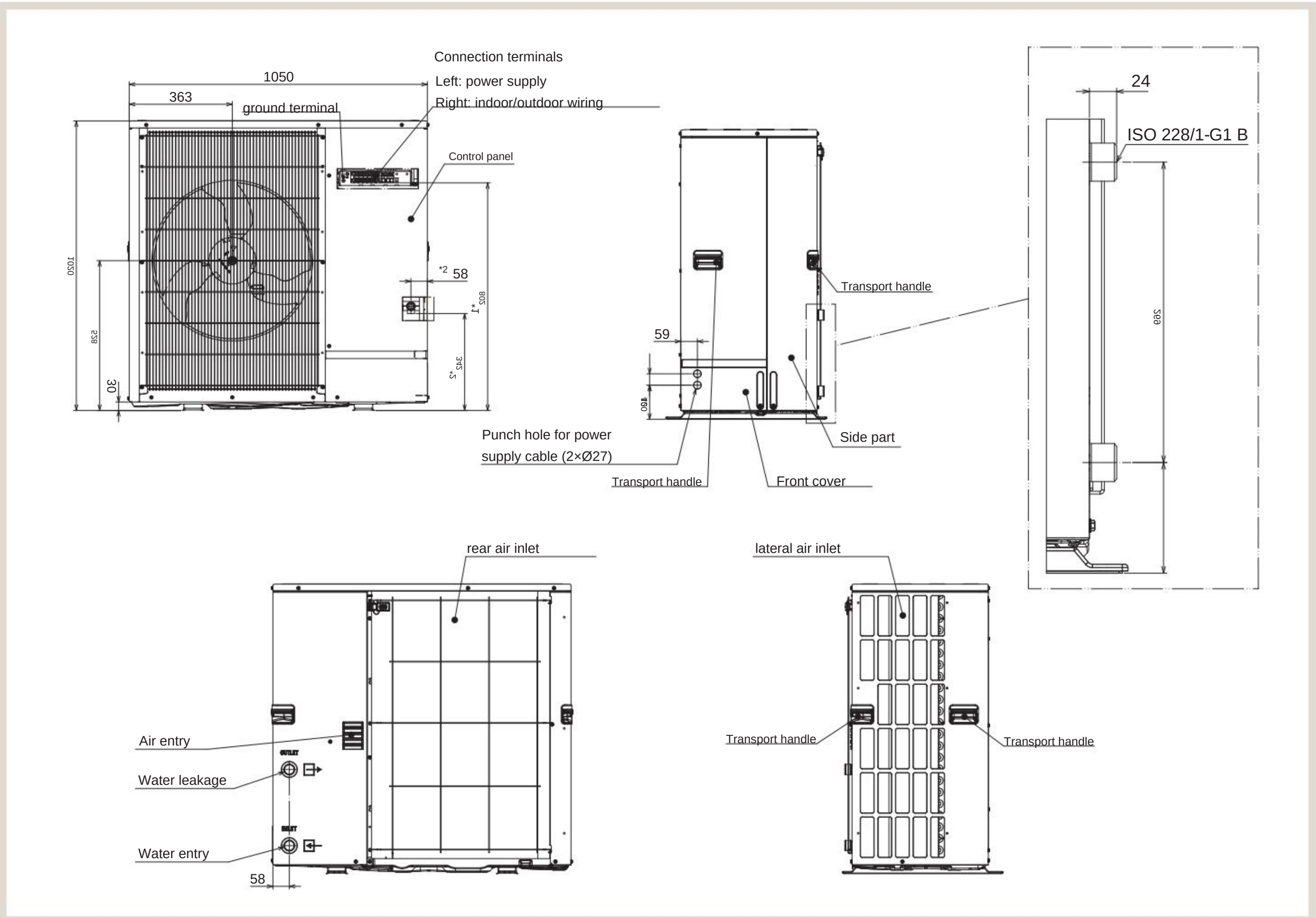
1) Display the connection location of the terminal.
2) Pressure relief valve drain port indicator.

PUZ-WM60/85/112VAA/YAA

Top and bottom view



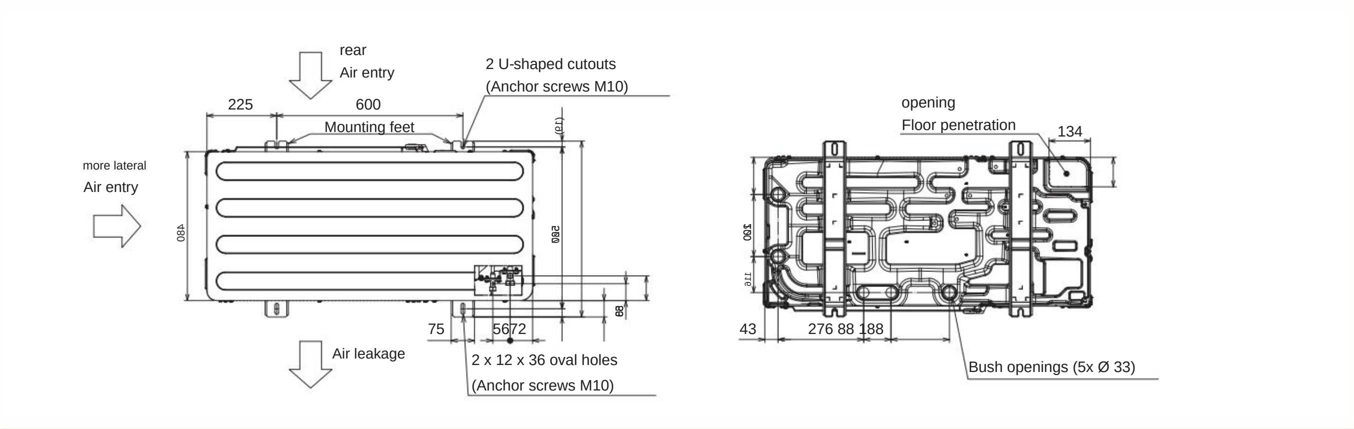
Front, back and side views



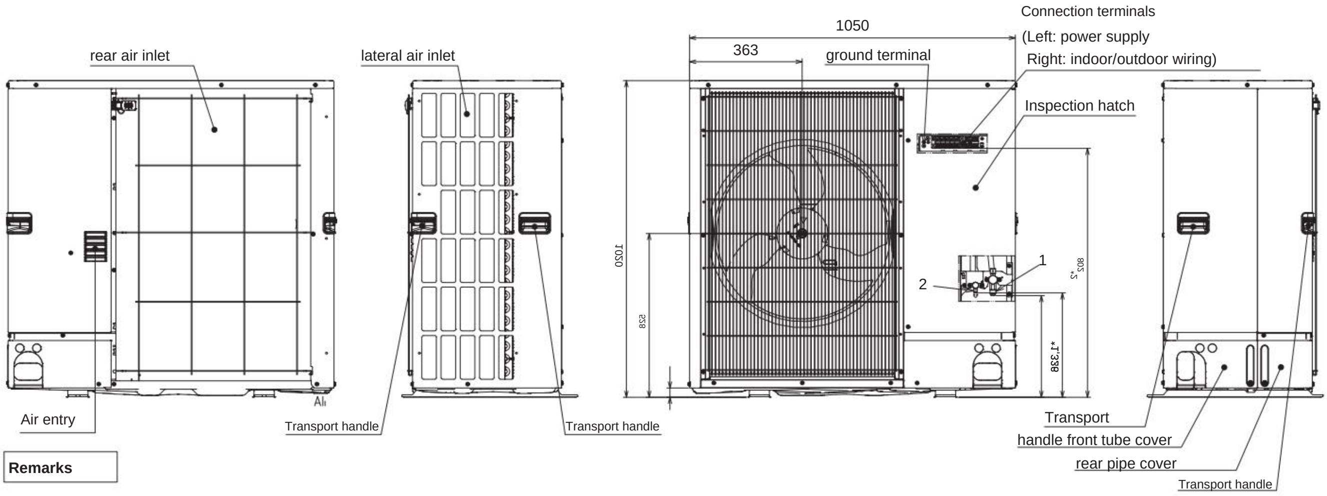
1) Display the connection location of the terminal.
2) Pressure relief valve drain port indicator.

Split
PUD-SWM60/80/100/120VAA/YAA

Top and bottom view



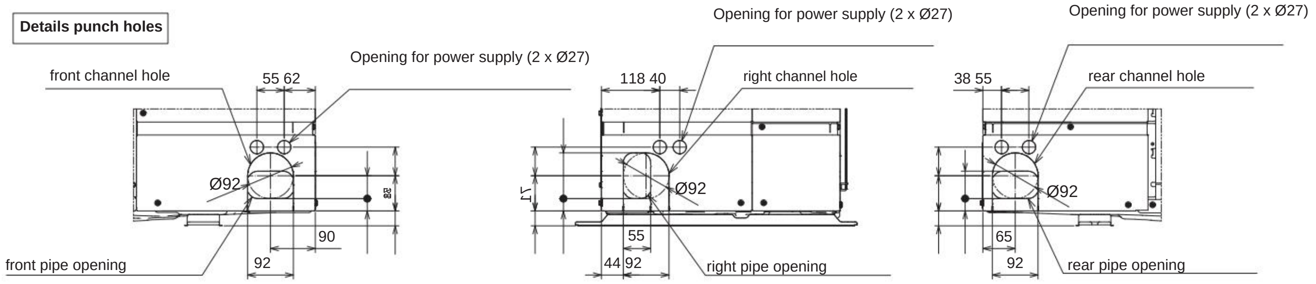
Front, back and side views



Remarks

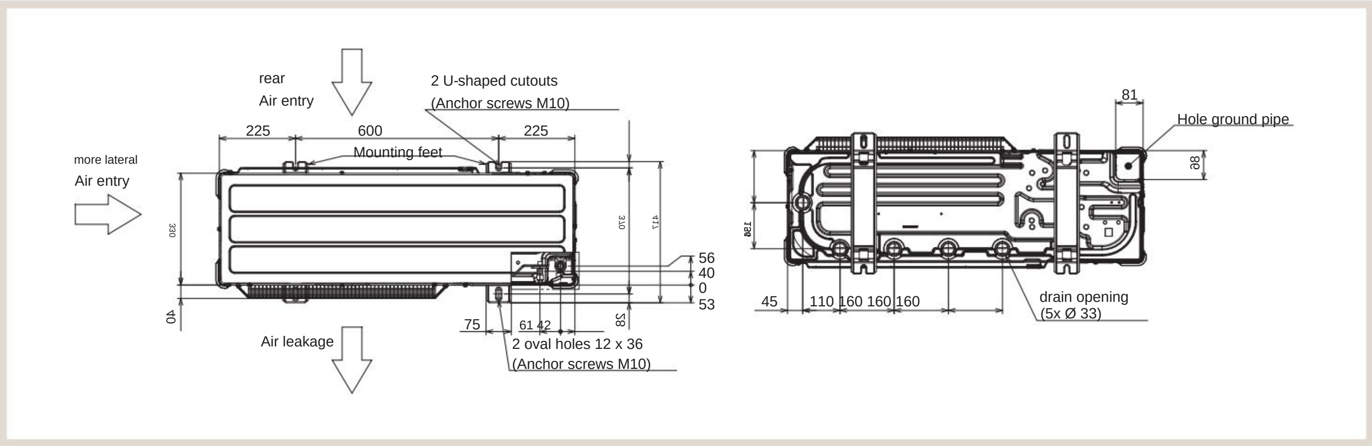
1 •••Refrigerant gas pipe connection (flare) ÿ 12.7 (1/2") 2
•••Refrigerant liquid pipe connection (flare) ÿ 6.35 (1/4") *1 •••Display -
Location of the shut-off valve *2 •••Display
– location of the connection terminals

Details punch holes

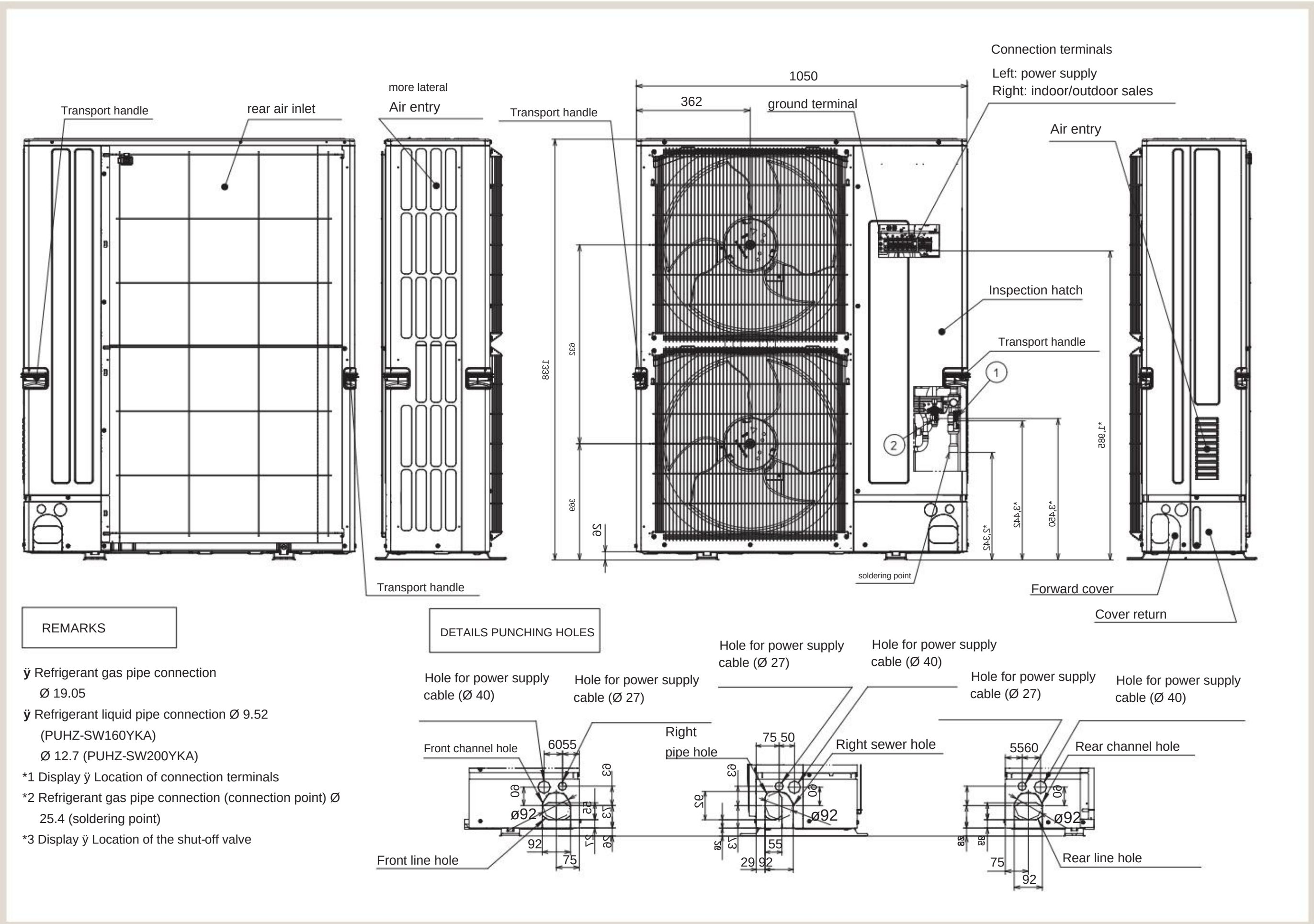


PUHZ-SW160/200YKA

Top and bottom view



Front, back and side views

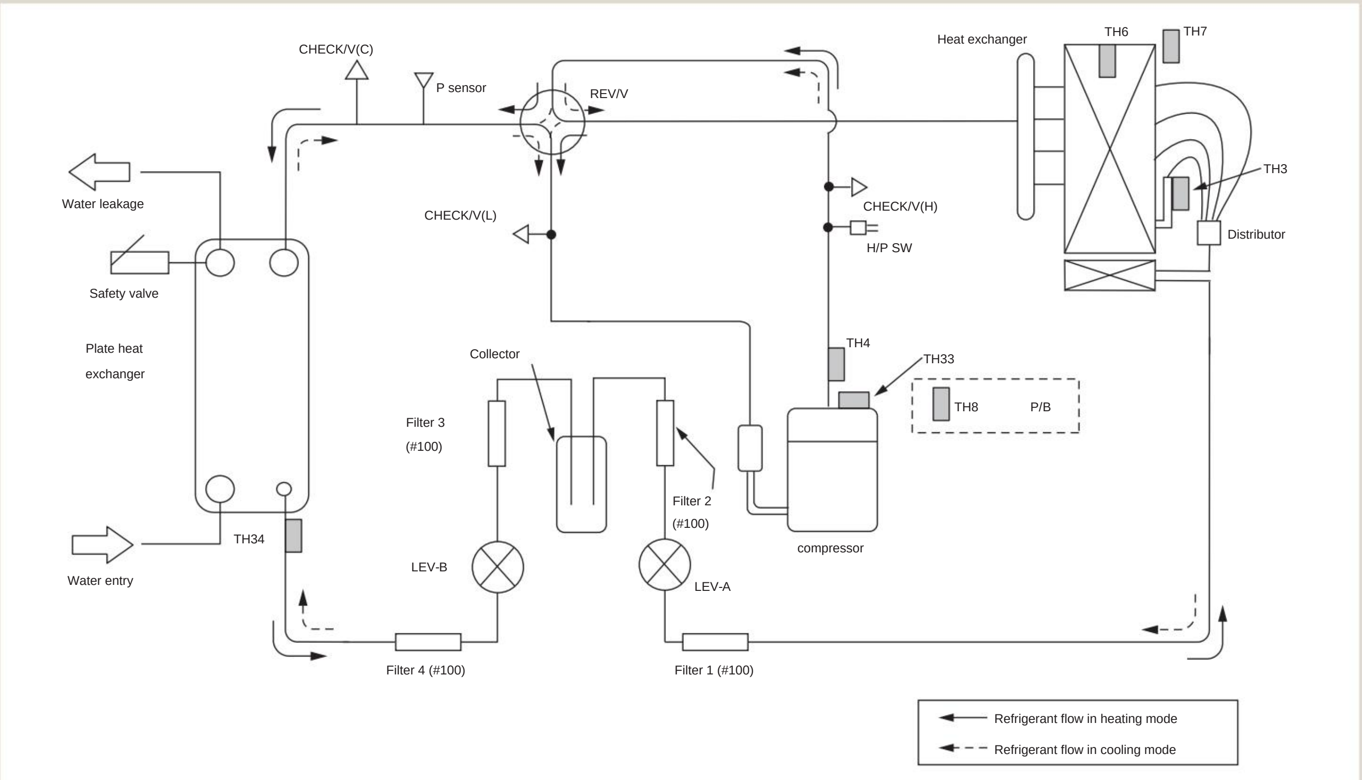


4.2.5 Refrigeration circuits

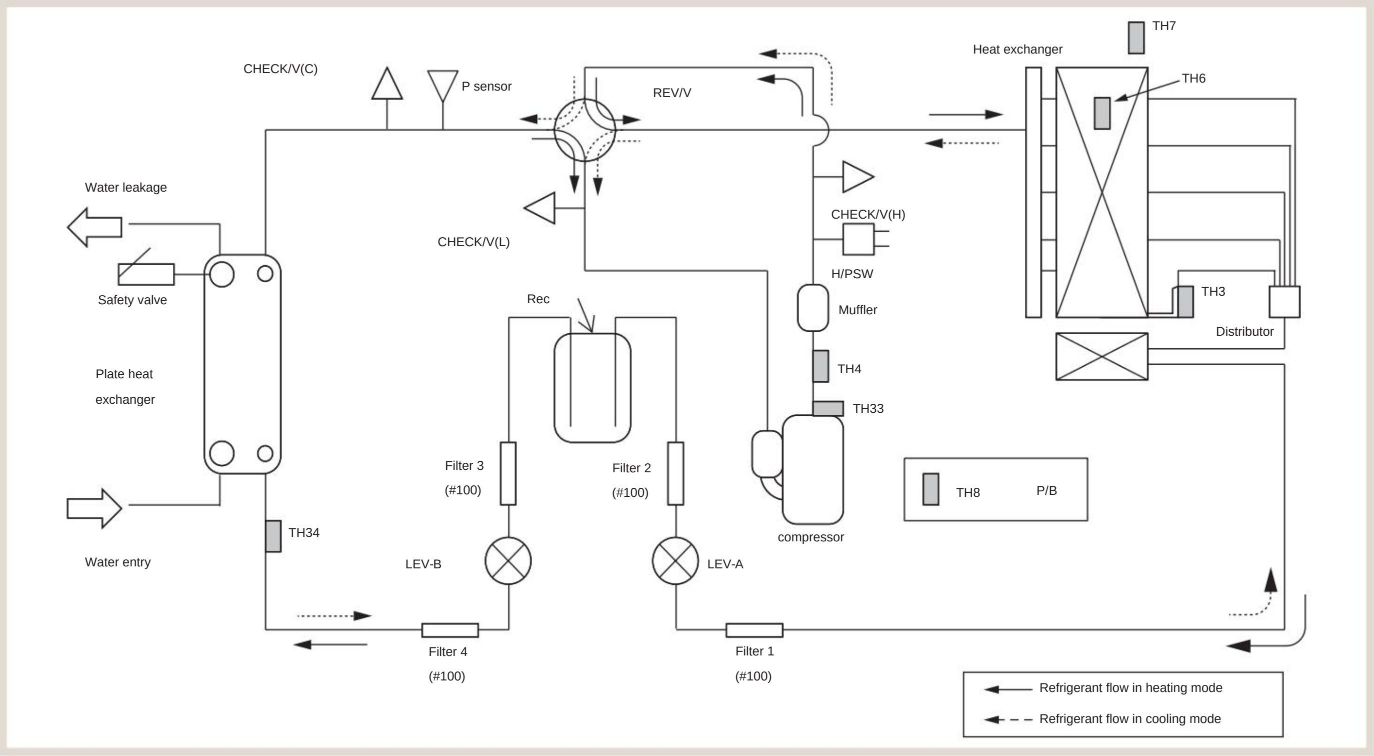
Legend

symbol	Part name	symbol	Part name
TB1	Terminal block <power supply>	PB	Power board
TB2	Terminal block <inside/outside>	NF	Suppression filter board
MC	Compressor motor	CONV. b.	converter board
MF1	Fan motor	CB	control board
21S4	Solenoid valve (4-way valve)	SW1	Switch <Manual defrost, incorrect history records, refrigerant address>
63H	High pressure switch		
63HS	High pressure sensor	SW4	<Function Setting> switch
TH3	Temperature sensor <liquid>	SW5	<Function Setting> switch
TH4	Temperature sensor <hot gas>	SW6	Switch <Select model>
TH6	Temperature sensor <2-phase pipeline>	SW7	<Function Setting> switch
TH7	Temperature sensor <outside air>	SW8	<Function Setting> switch
TH8	Temperature sensor <heat sink>	SW9	<Function Setting> switch
TH32	Temperature sensor <suction>	SWP	<Pump down> switch
TH33	Temperature sensor <compressor surface>	CNDM	<Accessories> connection
LEV-A, LEV-C	Linear expansion valve	SV1/CH	<Accessories> connection
ACL1, ACL2, ACL3, ACL4	reactor	SV3/SS	<Accessories> connection
CY1, CY2	capacitor	CNM	<Accessories> connection
C.K	capacitor	F1, F2, F3, F4	fuse (T6.3AL250V)
RS	Resistance		

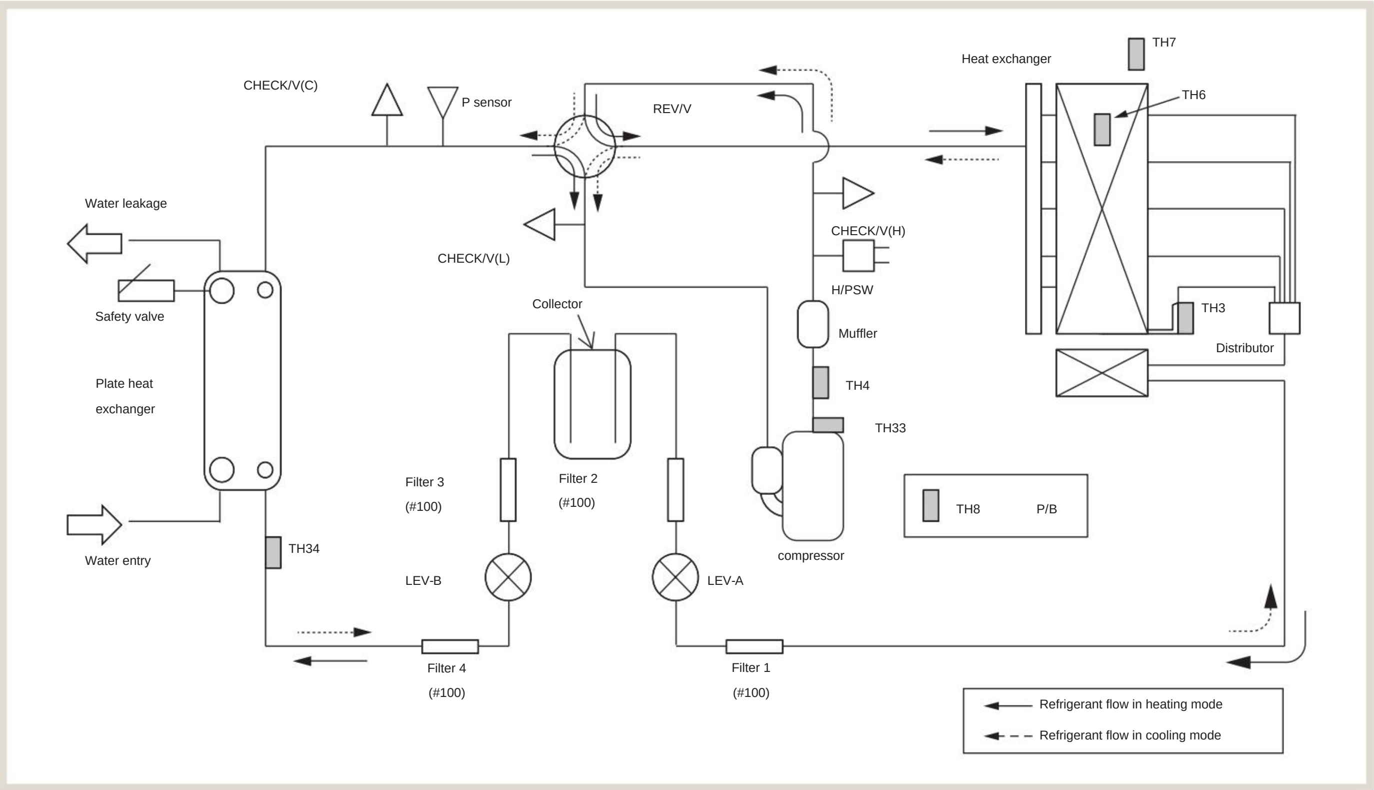
Monoblock
PUZ-WM50VHA



PUZ-WM60/85VAA/YAA

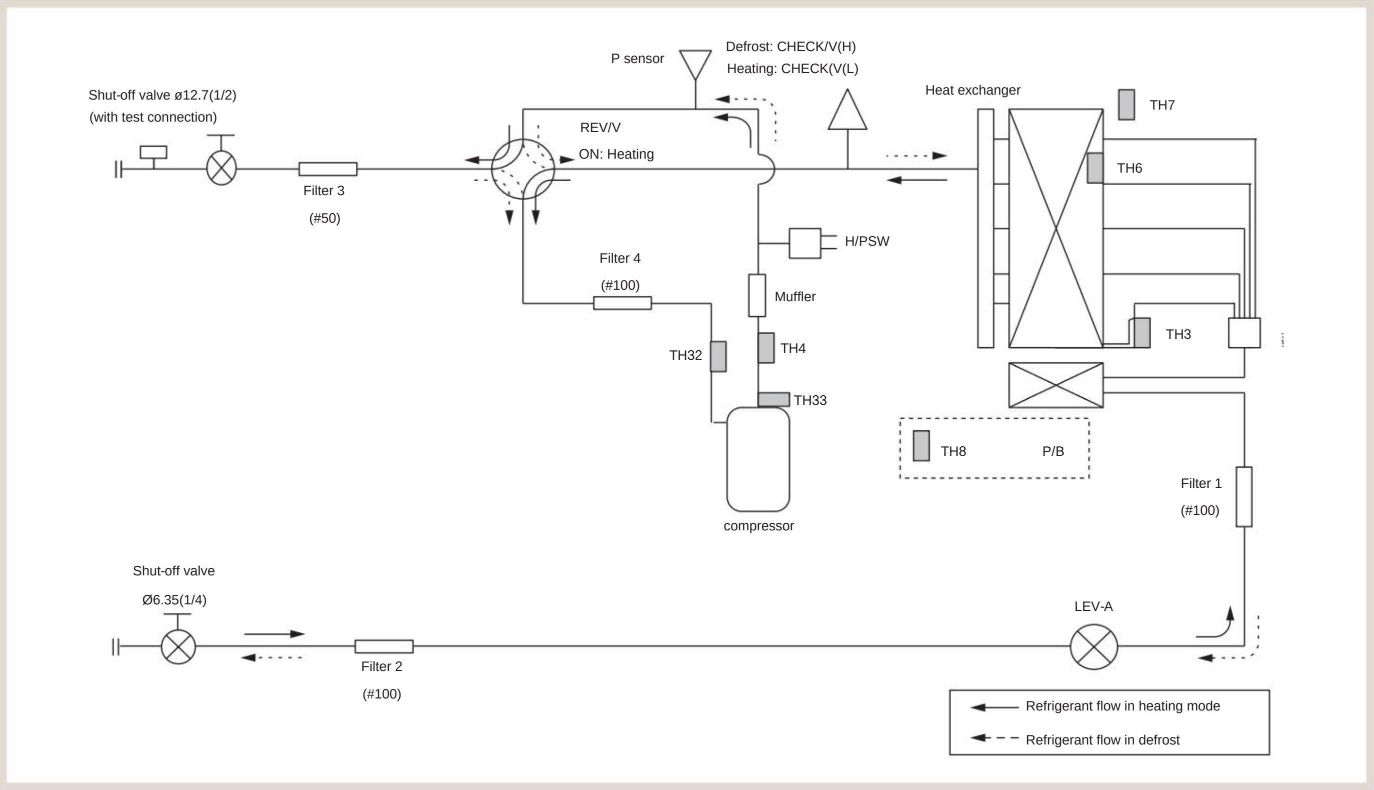


PUZ-WM112YAA

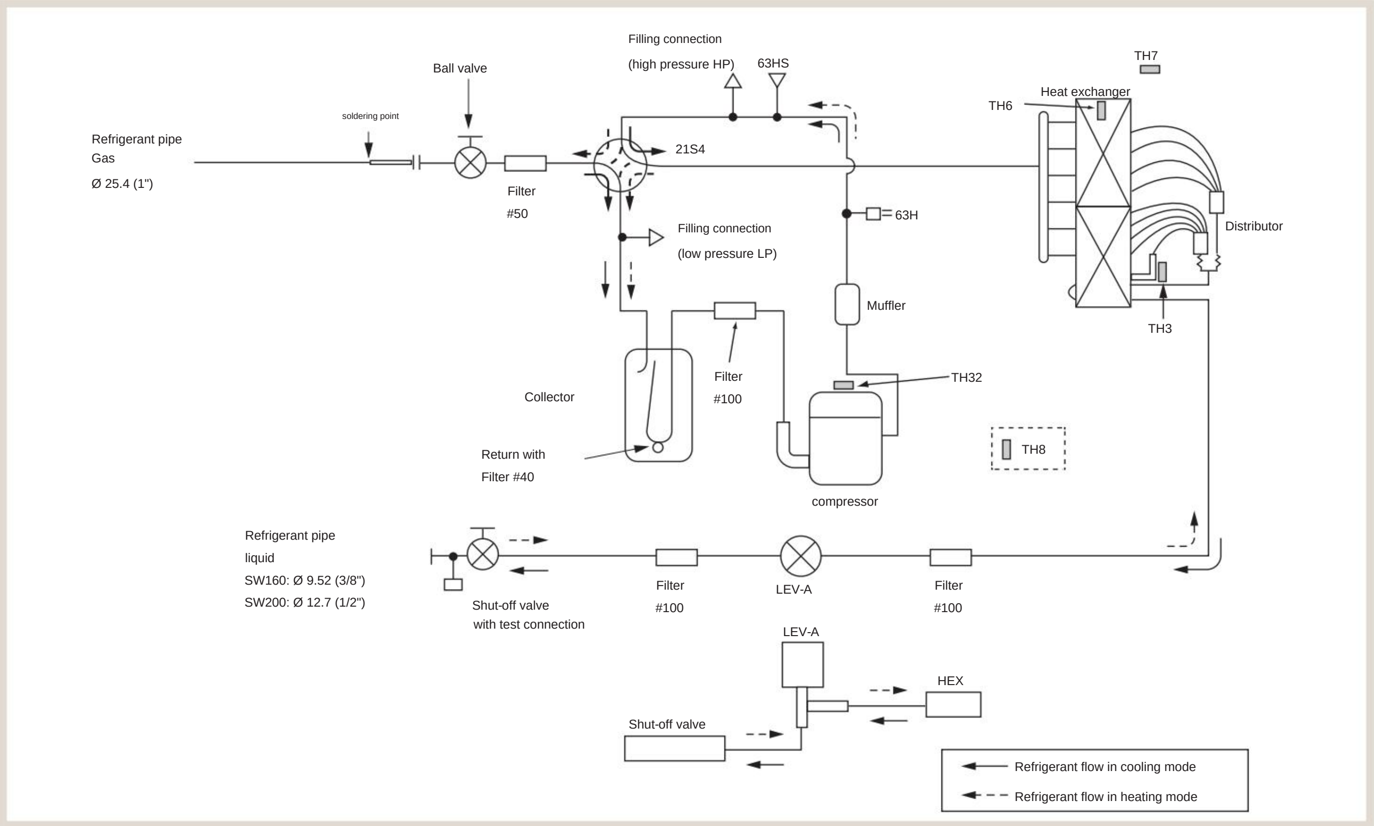


Split

PUD-SWM60/80/100/120VAA/YAA



PUHZ-SW160/200YKA



4.3 Zubadan inverter

4.3.1 Technical data

Monoblock

Device name			PUZ-HWM140YHA
Power supply		[Ph], [V], [Hz]	3, 400, 50
Max. current		[A]	13.0
validation		[A]	16
Outer casing			Galvanized sheet steel
Housing surface			Munsell 3Y 7.8/1.1 (front cover)
Refrigerant injection			Linear expansion valve
compressor	Type		Hermetic scroll compressor
	Model		AVB36FJCMT
	Motor power consumption	[kW]	2.8
	Performance control		Inverters
	Protection devices Oil		High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection
	quantity (type)	[l]	1.4 (FW68S)
Crankcase heater		[W]	–
Heat exchanger	Air		Fin heat exchanger
	Water		Plate heat exchanger
Fan	Type and number		Axial x 2 pcs.
	Motor power consumption	[kW]	0.074x2
	Air volume flow	m3/min	100
Defrosting method			Refrigerant reversal
Sound pressure level (SPL)	heating	[dB(A)]	53
	Cool	[dB(A)]	53
Sound power level (PWL)	Heat	[dB(A)]	67
Dimensions	Height	[mm]	1350
	depth	[mm]	330+30
	Width	[mm]	1020
Weight		[kg]	143
Refrigerant	Type		R32
	Crowd	[kg]	3.3
Pipe size (Outer diameter)	liquid	[mm]	–
	gas	[mm]	–
Connection technology			Water connection
Between indoor and Outdoor unit	Height difference [m]		–
	Pipe length [m] [ÿC] [ÿC]		–
Guaranteed Operating area (Outside)	Heat		-28 ÿ +21
	Hot water		-28 ~ +35
	Cooling 1)		+10 ÿ +46
flow temperature (Water) (Max. for heating, Min. for cooling)	Heat		+60
	Cool	[ÿC] [ÿC] [ÿC]	+5
return temperature (Water)	Heat	[ÿC]	+9 ÿ +59
	Cool	[ÿC]	+8 ÿ +28
Water volume flow		[l/min]	17.9 ÿ 40.1
Connection VL/RL		[Customs service]	G1"

1) In combination with a reversible storage/hydro module, the minimum temperature is +10 °C.

Split

Device name			PUD-SHWM60VAA	PUD-SHWM80YAA	PUD-SHWM100YAA
Power supply		[Ph], [V], [Hz]	1, 230, 50	3, 400, 50	3, 400, 50
Max. current		[A]	16.5	8.0	10.0
validation		[A]	20	16	16
Outer casing			Galvanized sheet steel	Galvanized sheet steel	Galvanized sheet steel
Housing surface			Munsell N8.75; N2.75 (front cover)	Munsell N8.75; N2.75 (front cover)	Munsell N8.75; N2.75 (front cover)
Refrigerant injection			Electronic expansion valve	Electronic expansion valve	Electronic expansion valve
compressor	Type		Hermetic scroll compressor	Hermetic scroll compressor	Hermetic scroll compressor
	Model		DVK28FBAMT	DVK28FBBMT	DVK28FBBMT
	Motor power consumption	[kW]	2.2	2.2	2.2
	Performance control		Inverters	Inverters	Inverters
	Protective devices		High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection	High pressure switch, compressor thermostat, overpressure protection thermostatic, overcurrent thermostatic,	High pressure switch, compressor thermostat, overpressure protection overcurrent detection recognition
	Oil quantity (type)	[l]	0.9 (FW68S)	0.9 (FW68S)	0.9 (FW68S)
Crankcase heater		[W]	–	–	–
Heat exchanger	Air		Fin heat exchanger	Fin heat exchanger	Fin heat exchanger
	Water		–	–	–
Fan	Type and number		Axial x 1 piece.	Axial x 1 piece.	Axial x 1 piece.
	Motor power consumption	[kW]	0.074	0.074	0.200
	Air volume flow	m3/min	40	40	50
Defrosting method			Refrigerant reversal	Refrigerant reversal	Refrigerant reversal
Sound pressure level (SPL)	Heat	[dB(A)]	41	42	44
	Cool	[dB(A)]	–	–	–
Sound power level (PWL)	Heat	[dB(A)]	55	56	59
Dimensions	Height	[mm]	1020	1020	1020
	depth	[mm]	480	480	480
	Width	[mm]	1050	1050	1050
Weight		[kg]	102	115	121
Refrigerant	Type		R32	R32	R32
	Crowd	[kg]	1.4	1.4	1.7
	Max.	[kg]	1.7	1.7	1.83
Pipe size (outer diameter) liquid [mm]			6.35	6.35	6.35
	gas	[mm]	12.7	12.7	12.7
Connection technology			flanged	flanged	flanged
Between indoor and Outdoor unit	Height difference [m]		30	30	30
	Pipe length [m] [ÿC] [ÿC]		2-30	2-30	2-30
Guaranteed Operating area (Outside)	Heat	[ÿC]	-28 ÿ +24	-28 ÿ +24	-28 ÿ +24
	Hot water	[ÿC]	-28 ÿ +35	-28 ÿ +35	-28 ÿ +35
	Cooling 1)	[ÿC]	–	–	–
Flow temperature (water) (Max. for heating, Min. for cooling)	Heat	[ÿC]	+60	+60	+60
	Cool	[ÿC]	–	–	–
Return temperature (water)	Heat	[l/	+10 ÿ +59	+10 ÿ +59	+10 ÿ +59
	Cool	min]	–	–	–
Water volume flow			9.0 ÿ 22.9	9.0 ÿ 22.9	14.3 ÿ 34.4

1) In combination with a reversible storage/hydro module, the minimum temperature is +10 °C.

Device name			PUD-SHWM120YAA	PUD-SHWM140YAA
Power supply		[Ph], [V], [Hz]	3, 400, 50	3, 400, 50
Max. current		[A]	12.0	12.0
validation		[A]	16	16
Outer casing			Galvanized sheet steel	Galvanized sheet steel
Housing surface			Munsell N8.75; N2.75 (front cover)	Munsell N8.75; N2.75 (front cover)
Refrigerant injection			Electronic expansion valve	Electronic expansion valve
compressor	Type		Hermetic scroll compressor	Hermetic scroll compressor
	Model		DVK28FBBMT	DVK36FBBMT
	Motor power consumption	[kW]	2.2	3.6
	Performance control		Inverters	Inverters
	Protective devices		High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection	High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection
	Oil quantity (type)	[l]	0.9 (FW68S)	0.9 (FW68S)
Crankcase heater		[W]	–	–
Heat exchanger	Air		Fin heat exchanger	Fin heat exchanger
	Water		–	–
Fan	Type and number		Axial x 1 piece.	Axial x 1 piece.
	Motor power consumption	[kW]	0.200	0.200
	Air volume flow	m3/min	50	50
Defrosting method			Refrigerant reversal	Refrigerant reversal
Sound pressure level (SPL)	Heat	[dB(A)]	46	48
	Cool	[dB(A)]	–	–
Sound power level (PWL)	Heat	[dB(A)]	60	62
Dimensions	Height	[mm]	1020	1020
	depth	[mm]	480	480
	Width	[mm]	1050	1050
Weight		[kg]	121	122
Refrigerant	Type		R32	R32
	Crowd	[kg]	1.7	1.7
	Max.	[kg]	1.83	1.83
Pipe size (outside diameter) liquid		[mm]	6.35	6.35
	gas	[mm]	12.7	12.7
Connection technology			flanged	flanged
Between indoor and Outdoor unit	Height difference	[m]	30	25
	Pipe length	[m]	2-30	2-25
Guaranteed operating range (Outside)	Heat	[ÿC]	-28 ÿ +24	-28 ÿ +24
	Hot water	[ÿC]	-28 ÿ +35	-28 ÿ +35
	Cooling 1)	[ÿC]	–	–
Flow temperature (water) (Max. for heating, Min. for cooling)	Heat	[ÿC]	+60	+60
	Cool	[ÿC]	–	–
Return temperature (water)	Heat	[ÿC]	+10 ÿ +59	+10 ÿ +59
	Cool	[ÿC]	–	–
Water volume flow		[l/min]	14.3 ÿ 34.4	14.3 ÿ 34.4

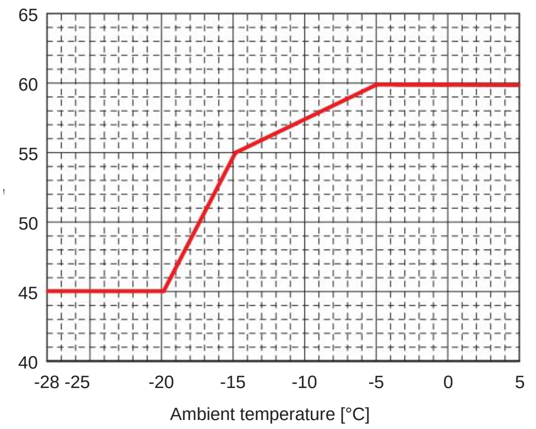
1) In combination with a reversible storage/hydro module, the minimum temperature is +10 °C.

Device name			PUHZ-SHW140YHAR5	PUHZ-SHW230YKA2R2
Power supply		[Ph], [V], [Hz]	3, 400, 50	3, 400, 50
Max. current		[A]	13.0	20.0
validation		[A]	16	25
Outer casing			Galvanized sheet steel	Galvanized sheet steel
Housing surface			Munsell 3Y 7.8/1.1	Munsell 3Y 7.8/1.1
Refrigerant injection			Electronic expansion valve	Electronic expansion valve
compressor	Type		Hermetic double roller piston	Hermetic double roller piston
	Model		ANB33FJQMT	ANB66FJNMT
	Motor power consumption	[kW]	2.5	4.7
	Performance control		Inverters	Inverters
	Protective devices		low pressure switch, high pressure switch, Compressor thermostat, overpressure protection thermostatic	low pressure switch, high pressure switch, Compressor thermostat, thermostatic overpressure protection, overcurrent detection
	Oil quantity (type)	[l]	1.40 (FVC68D)	1.70 (FV50S)
Crankcase heater		[W]	–	–
Heat exchanger	Air		Fin heat exchanger	Fin heat exchanger
	Water		–	–
Fan	Type and number		Axial × 2 pcs.	Axial × 2 pcs.
	Motor power consumption	[kW]	0.074 × 2	0.150 × 2
	Air volume flow	m3/min	6000	8400
Defrosting method			Refrigerant reversal	Refrigerant reversal
Sound pressure level (SPL)	Heat	[dB(A)]	52	59
	Cool	[dB(A)]	51	58
Sound power level (PWL)	Heat	[dB(A)]	70	75
Dimensions	Height	[mm]	1350	1338
	depth	[mm]	330+30	330+30
	Width	[mm]	950	1050
Weight		[kg]	134	143
Refrigerant	Type		R410A	R410A
	Crowd	[kg]	5.5	7.1
	Max.	[kg]	–	–
Pipe size (outside diameter) liquid		[mm]	9.52	12.7
	gas	[mm]	15.88	25.4
Connection technology			Flare	Flare
Between indoor and Outdoor unit	Height difference	[m]	30	30
	Pipe length	[m]	2-75	2-80
Guaranteed operating range (Outside)	Heat	[ÿC]	-28 ÿ +21	-25 ÿ +21
	Hot water	[ÿC]	-28 ÿ +35	-25 ÿ +35
	Cooling 1)	[ÿC]	-15 ~ +46	-15 ~ +46
Flow temperature (water) (Max. for heating, Min. for cooling)	Heat	[ÿC]	+60	+60
	Cool	[ÿC]	+5	+5
Return temperature (water)	Heat	[ÿC]	+10 ÿ +59	+10 ÿ +59
	Cool	[ÿC]	+8~ +28	+8~ +28
Water volume flow		[l/min]	17.9 ÿ 40.1	28.7 ÿ 65.9

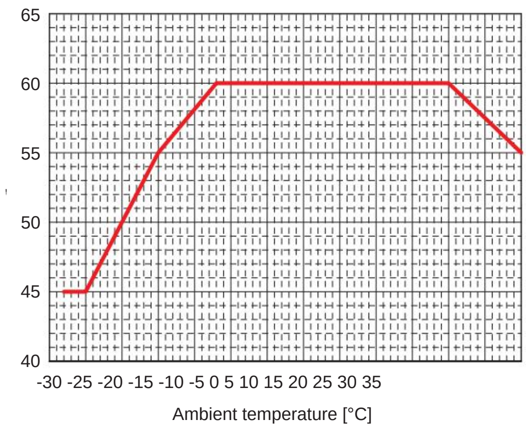
1) In combination with a reversible storage/hydro module, the minimum temperature is +10 °C.

4.3.2 Maximum flow temperatures

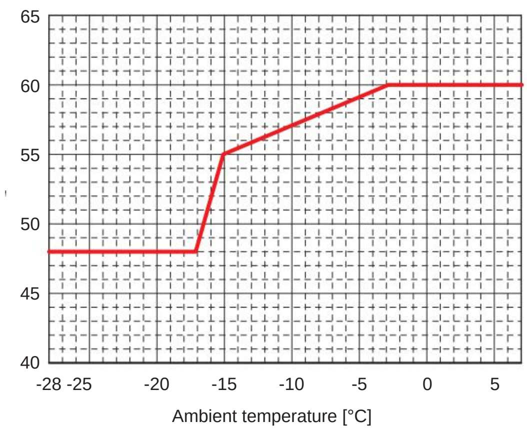
Monoblock
PUZ-HWM140YHA



Split
PUD-SHWM60/80/100/120/140VAA/YAA



PUHZ-SHW140/230YHA/YKA



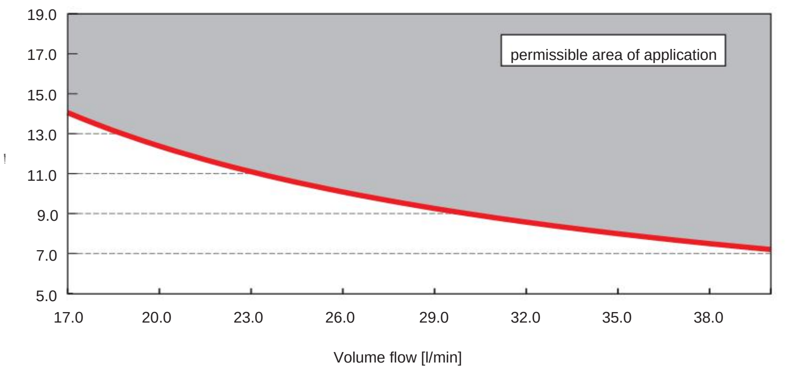
4.3.3 Cooling/defrosting application area (return temperature, volume flow)

Caution!

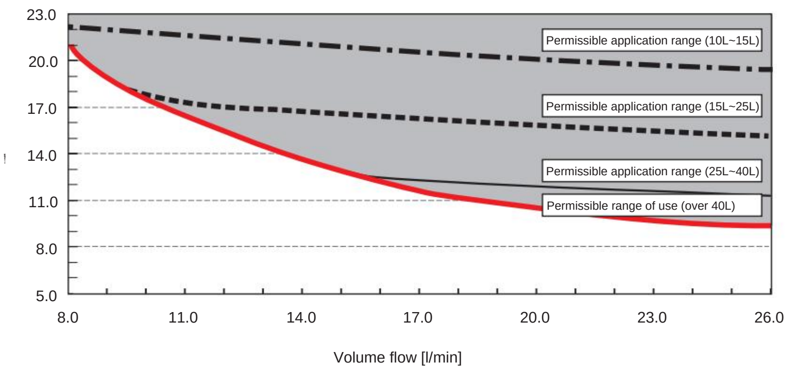
If the minimum return temperature or the minimum volume flow is not reached, the heat pump system will malfunction.

- When starting up the heat pump system for the first time or after a longer period of downtime, it is essential that you adhere to the permissible values on the plate heat exchanger.

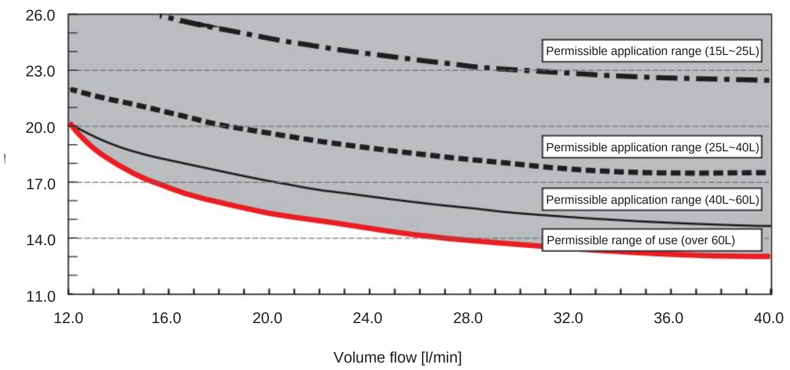
Monoblock
PUZ-HWM140YHA



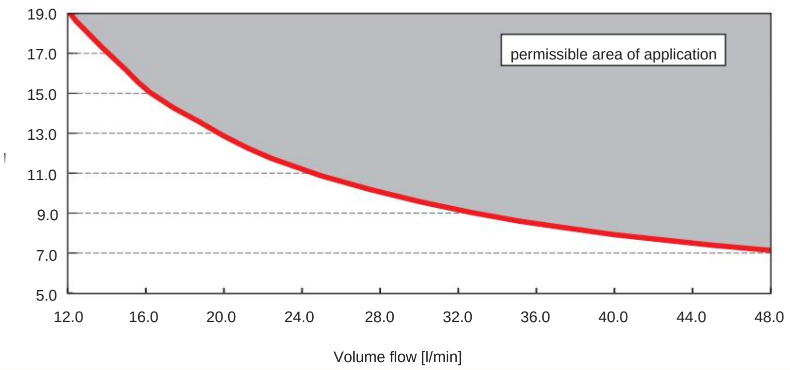
Split
PUD-SHWM60/80VAA/YAA



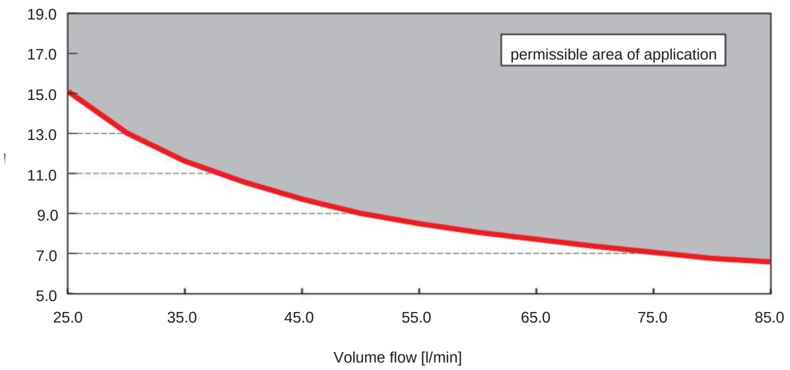
PUD-SHWM100/120/140YAA



PUHZ-SHW140YHAR5



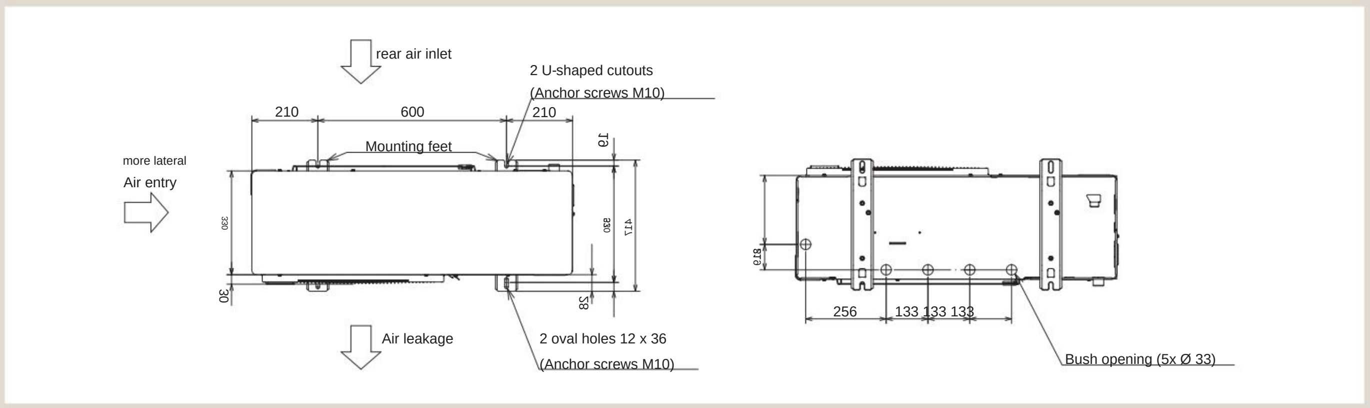
PUHZ-SHW230YKA2R2



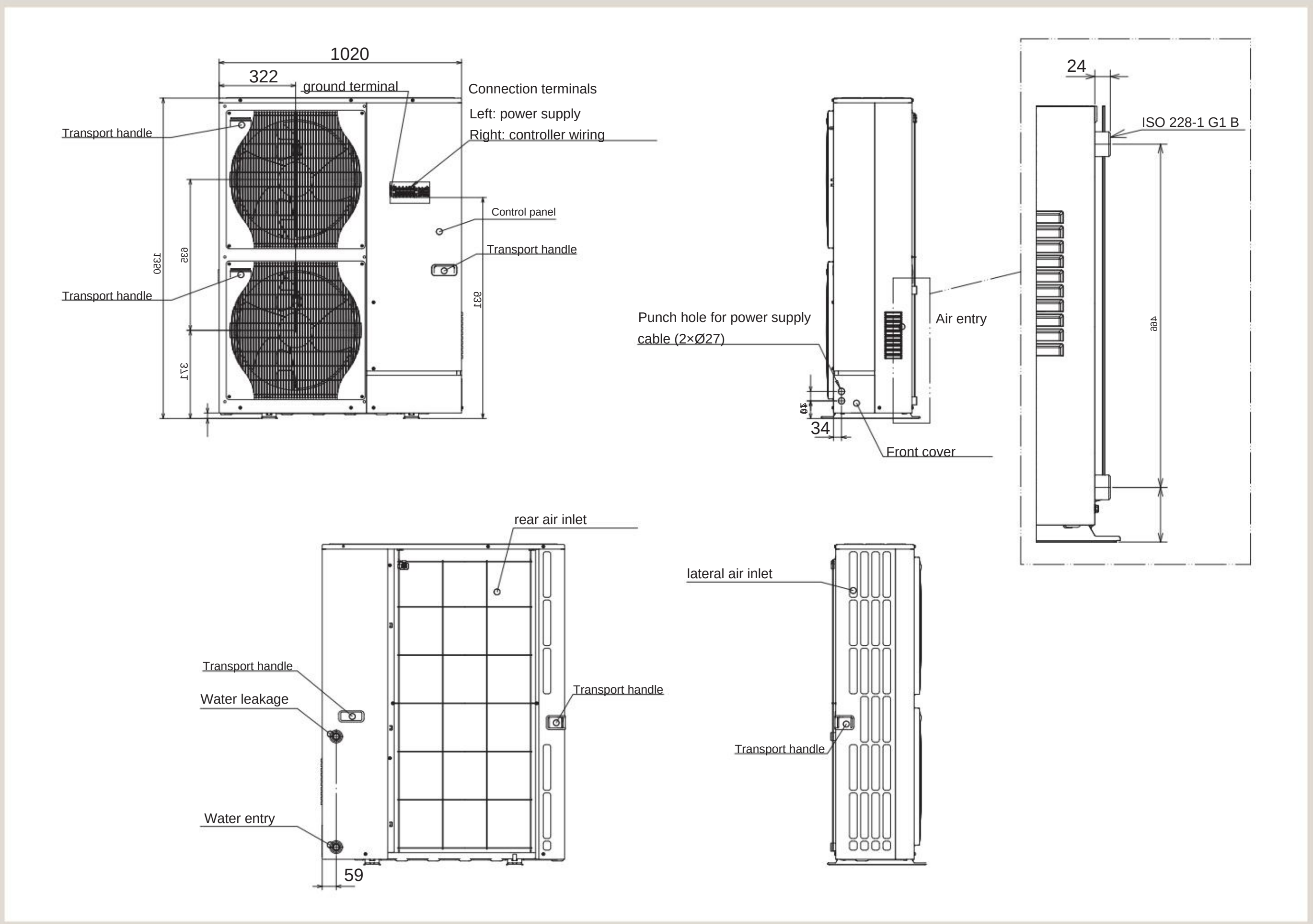
4.3.4 Dimensions

Monoblock
PUZ-HWM140YHA

Top and bottom view

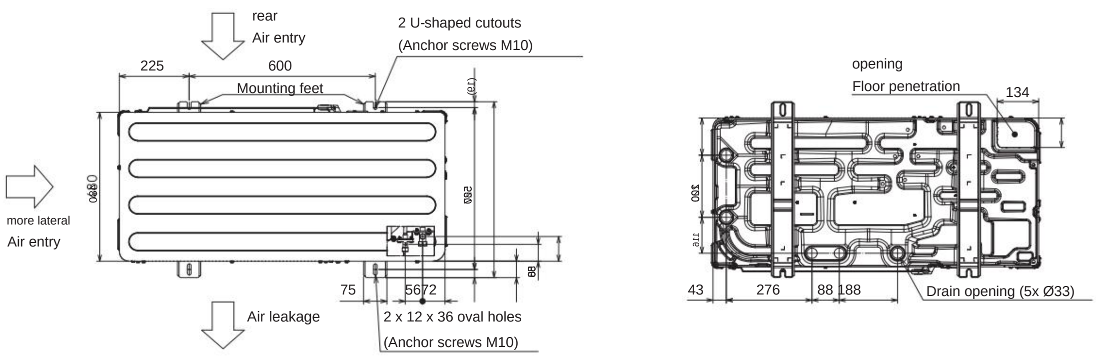


Front, back and side views

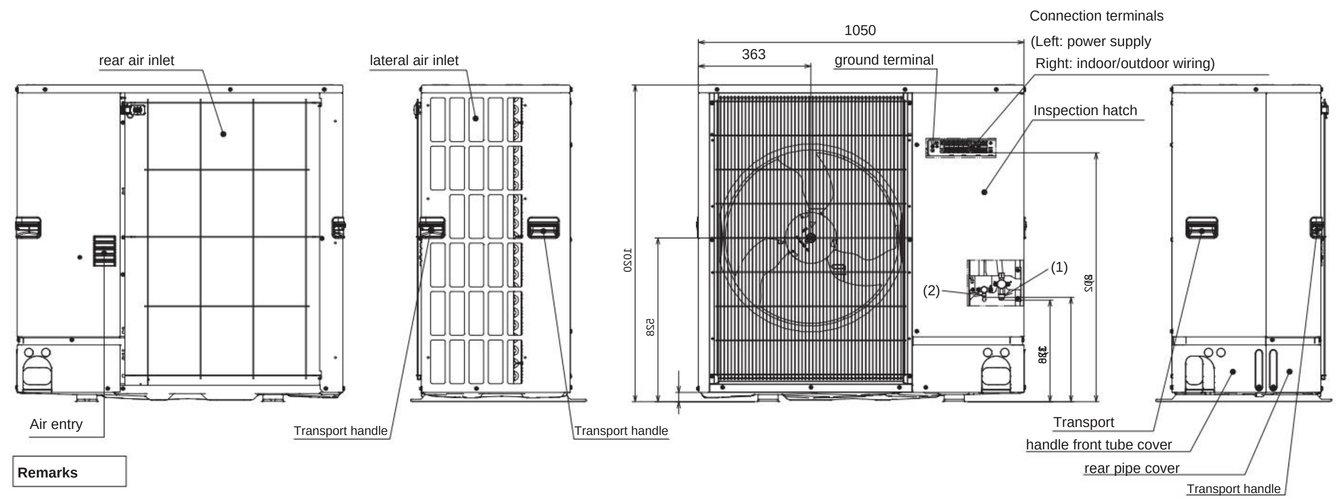


Split
PUD-SHWM60/80/100/120/140VAA/YAA

Top and bottom view



Front, back and side views



Remarks

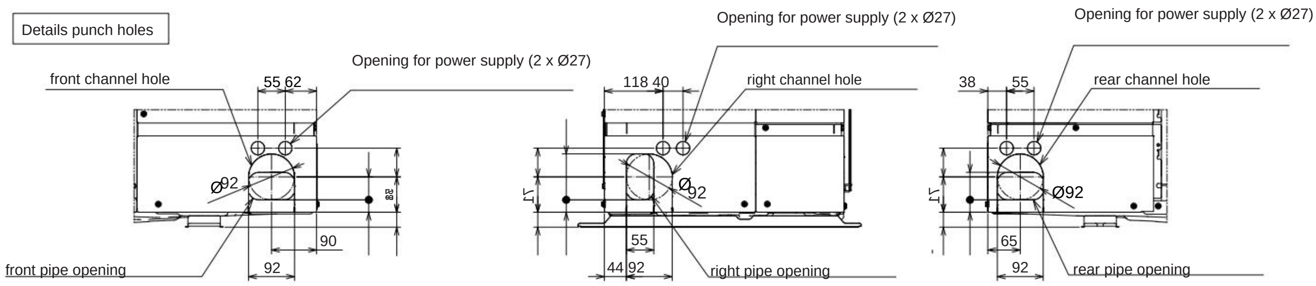
(1) Refrigerant gas pipe connection (flare) Ø15.88 (5/8F)

(2) Refrigerant liquid pipe fitting (flare) Ø9.52 (3/8F)

1) Indicator – Location of the shut-off valve

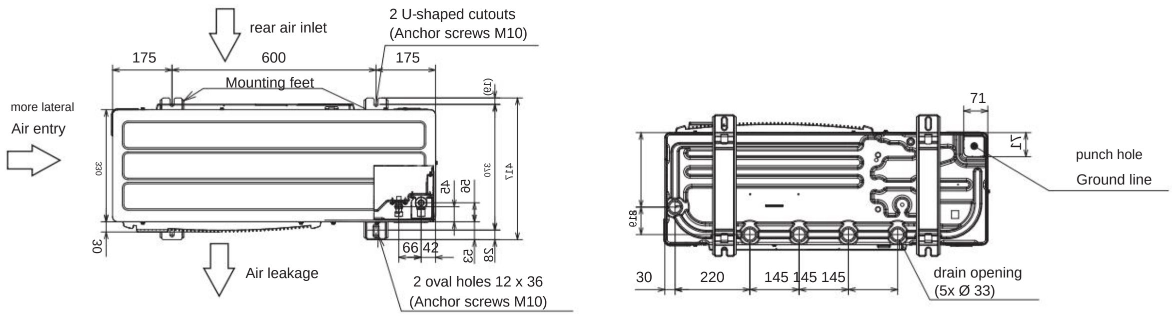
2) Display – location of connection terminals

Details punch holes

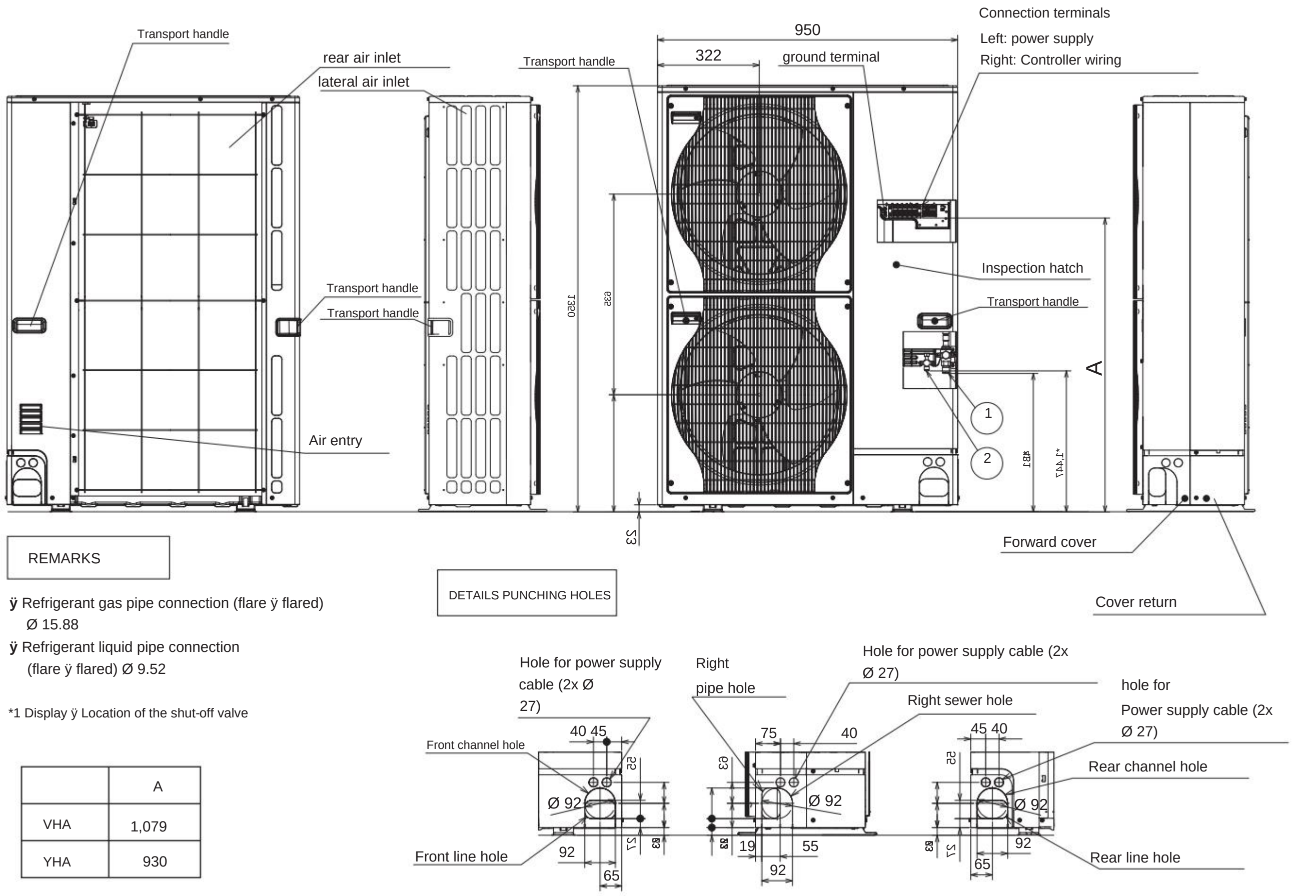


PUHZ-SHW140YHAR5

Top and bottom view



Front, back and side views



REMARKS

ÿ Refrigerant gas pipe connection (flare ÿ flared) Ø 15.88

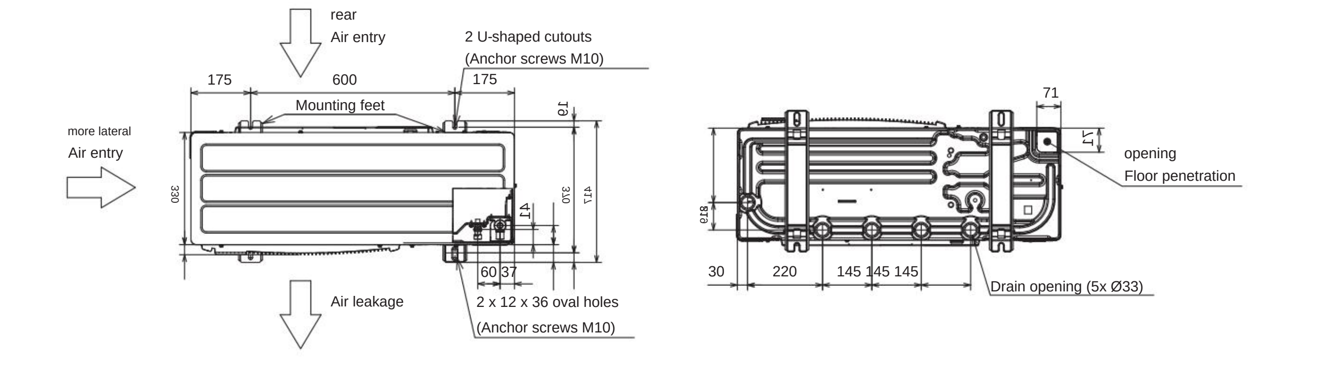
ÿ Refrigerant liquid pipe connection (flare ÿ flared) Ø 9.52

*1 Display ÿ Location of the shut-off valve

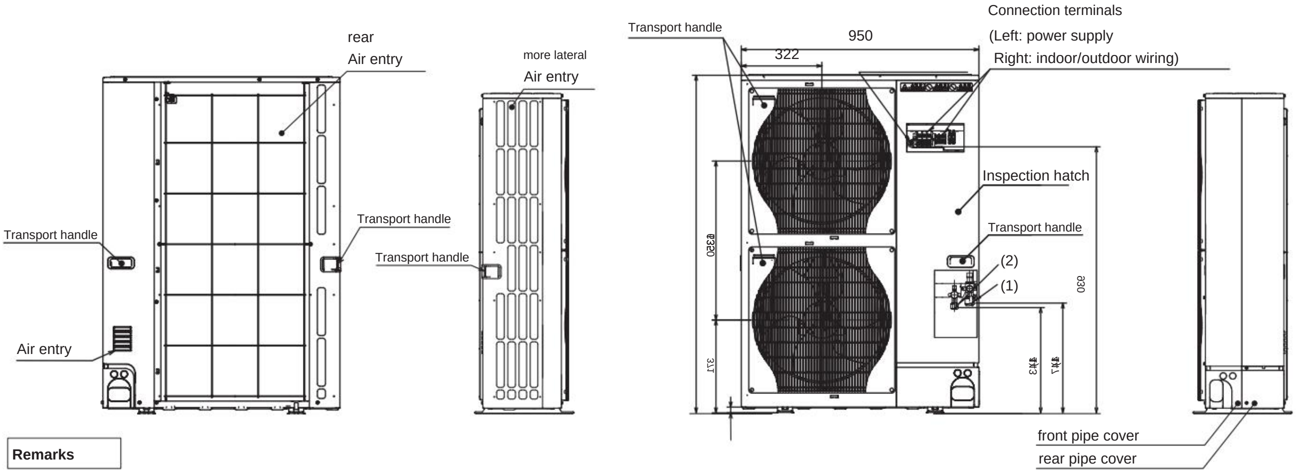
	A
VHA	1,079
YHA	930

PUHZ-SHW230YKA2R2

Top and bottom view



Front, back and side views



Remarks

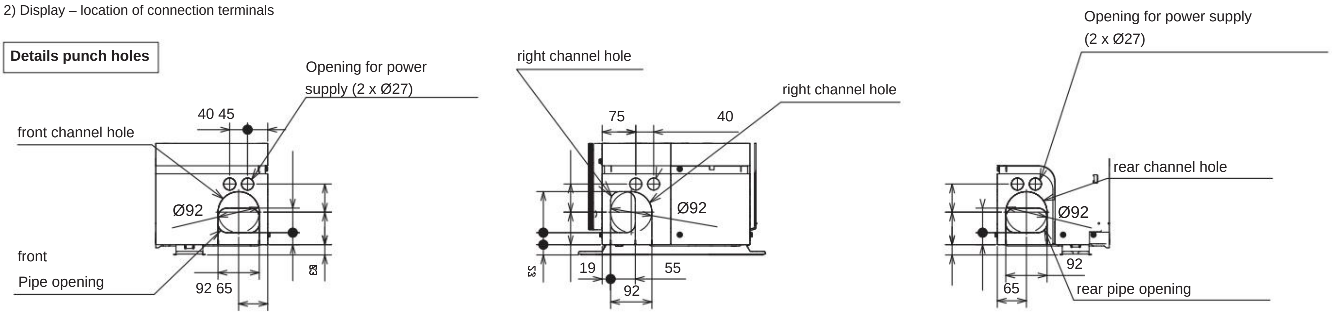
(1) Refrigerant gas pipe connection (flare) Ø15.88 (5/8F)

(2) Refrigerant liquid pipe fitting (flare) Ø9.52 (3/8F)

1) Indicator – Location of the shut-off valve

2) Display – location of connection terminals

Details punch holes

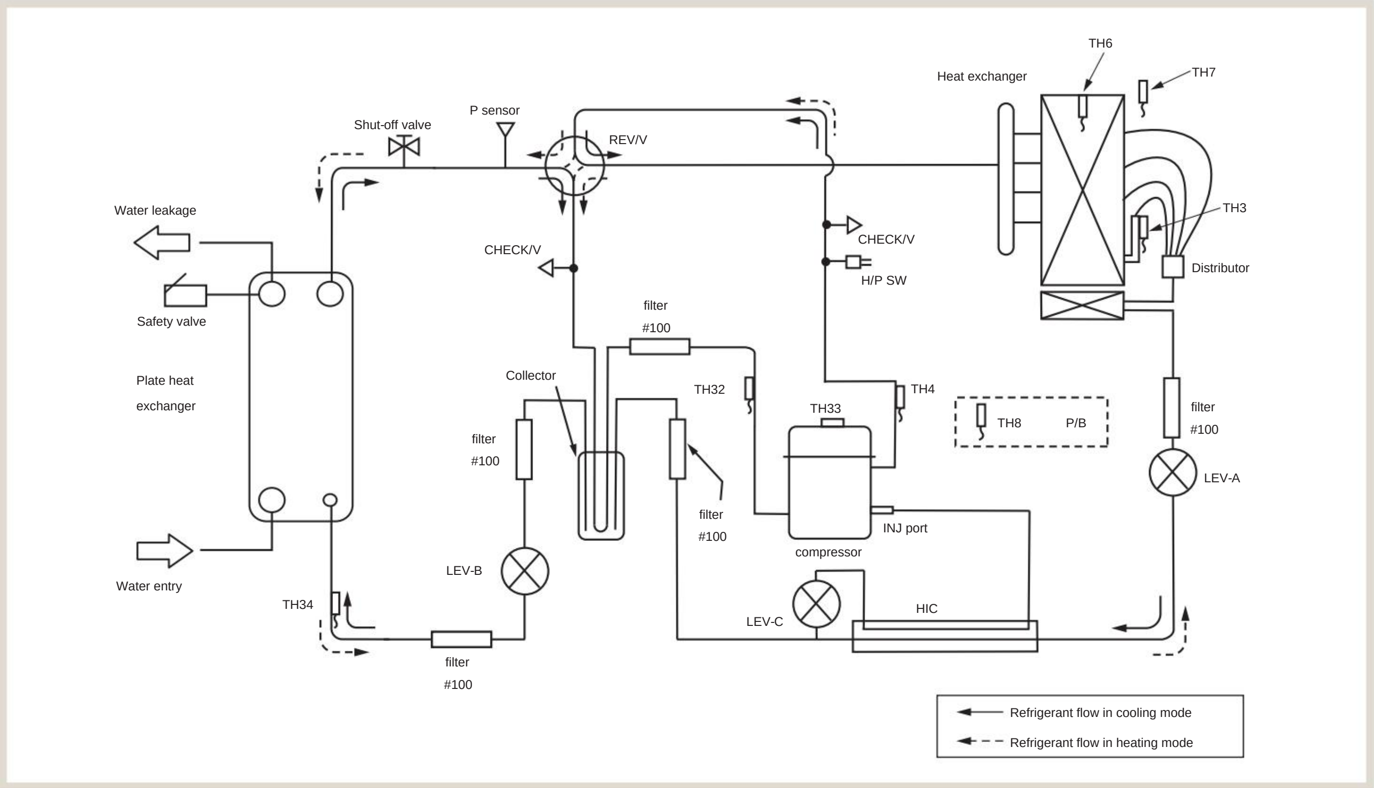


4.3.5 Refrigeration circuits

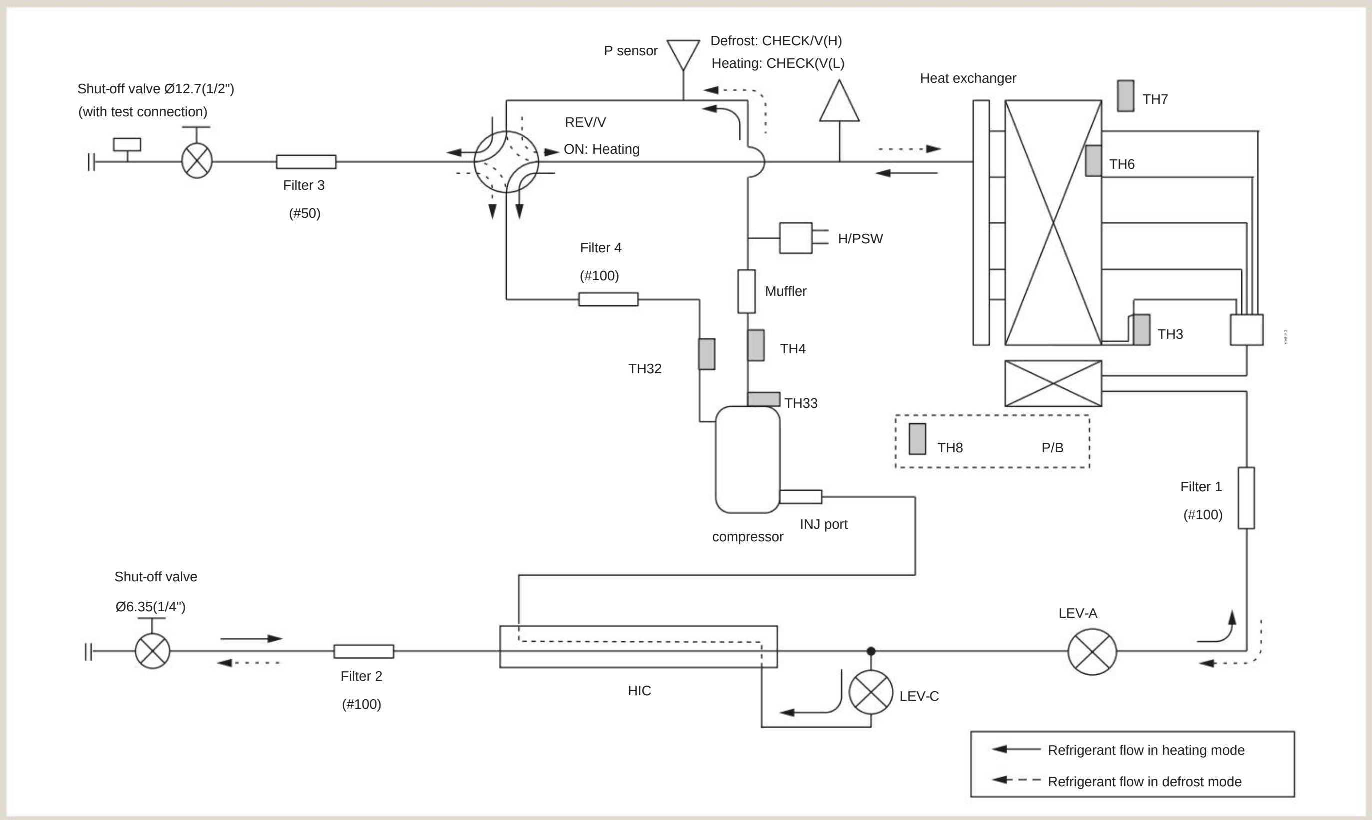
Legend

symbol	Part name	symbol	Part name
H/P SW	High pressure switch (63H)	**TH34**	Temperature sensor (compressor surface)
H/P SW	High pressure switch (63H2)	**TH33**	Temperature sensor (suction gas (HW))
L/P SW	Low pressure switch (63L)		Temperature sensor (SHW)
REV/V	4-way valve (21S4)	**TH32**	Compressor surface temperature sensor (SHW)
S/V	magnetic valve		Water inlet temperature sensor (HW)
CHECK/V	Test valve	**TH3**	Temperature sensor (refrigerant liquid)
P sensor	High pressure sensor (63HS)	**TH4**	Temperature sensor (hot gas temperature)
P/B	Power board	**TH6**	Temperature sensor (heat exchanger)
LEV-A	Linear Expansion Valve - A	**TH7**	Temperature sensor (outside air)
LEV-B	Linear Expansion Valve - B	**TH8**	Temperature sensor (heat sink)
LEV-C	Linear Expansion Valve - C	**Power receiver**	High performance collector
TH1	Temperature sensor (water outlet)	**HIC**	Refrigerant subcooler
TH2	Temperature sensor (refrigerant liquid)	**INJ port**	Injection port

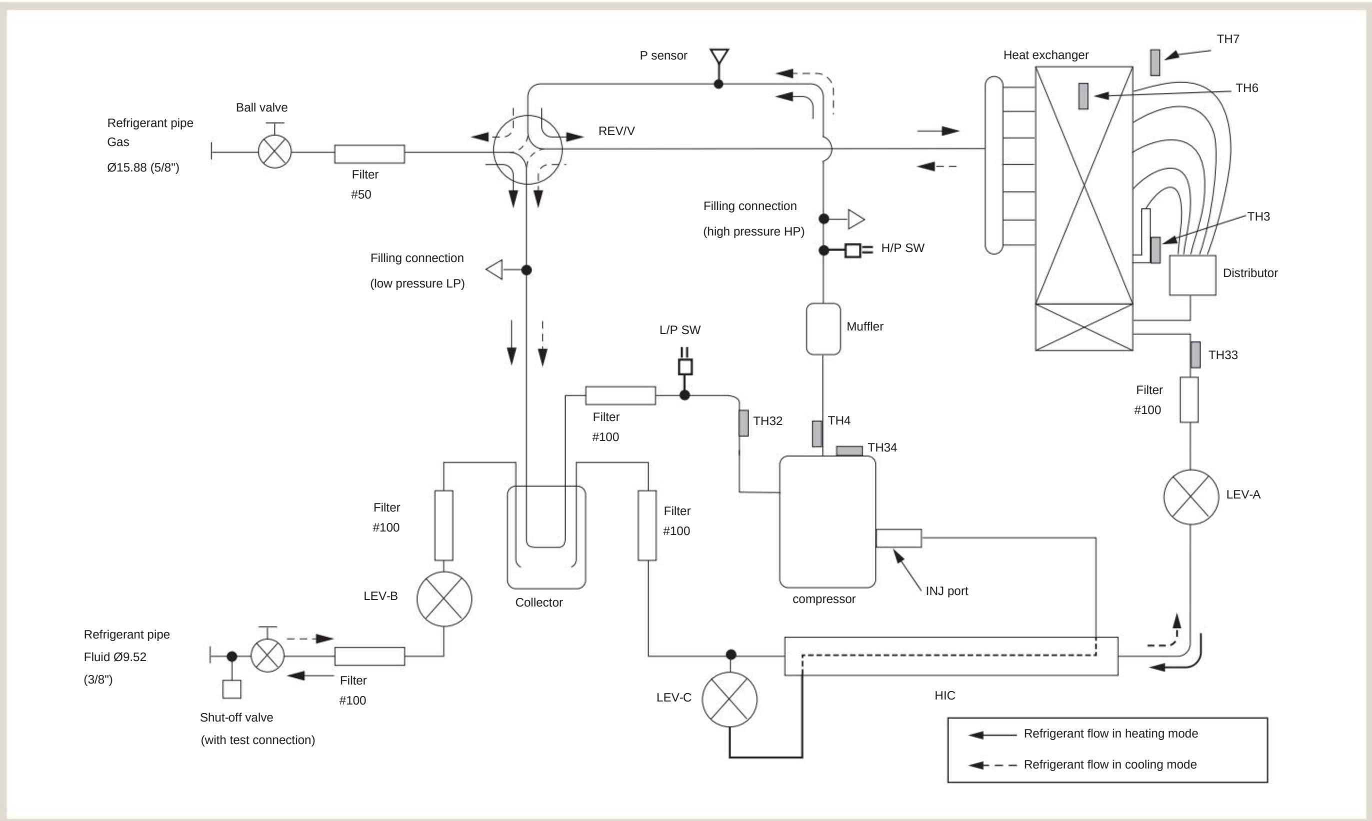
Monoblock
PUZ-HWM140YHA



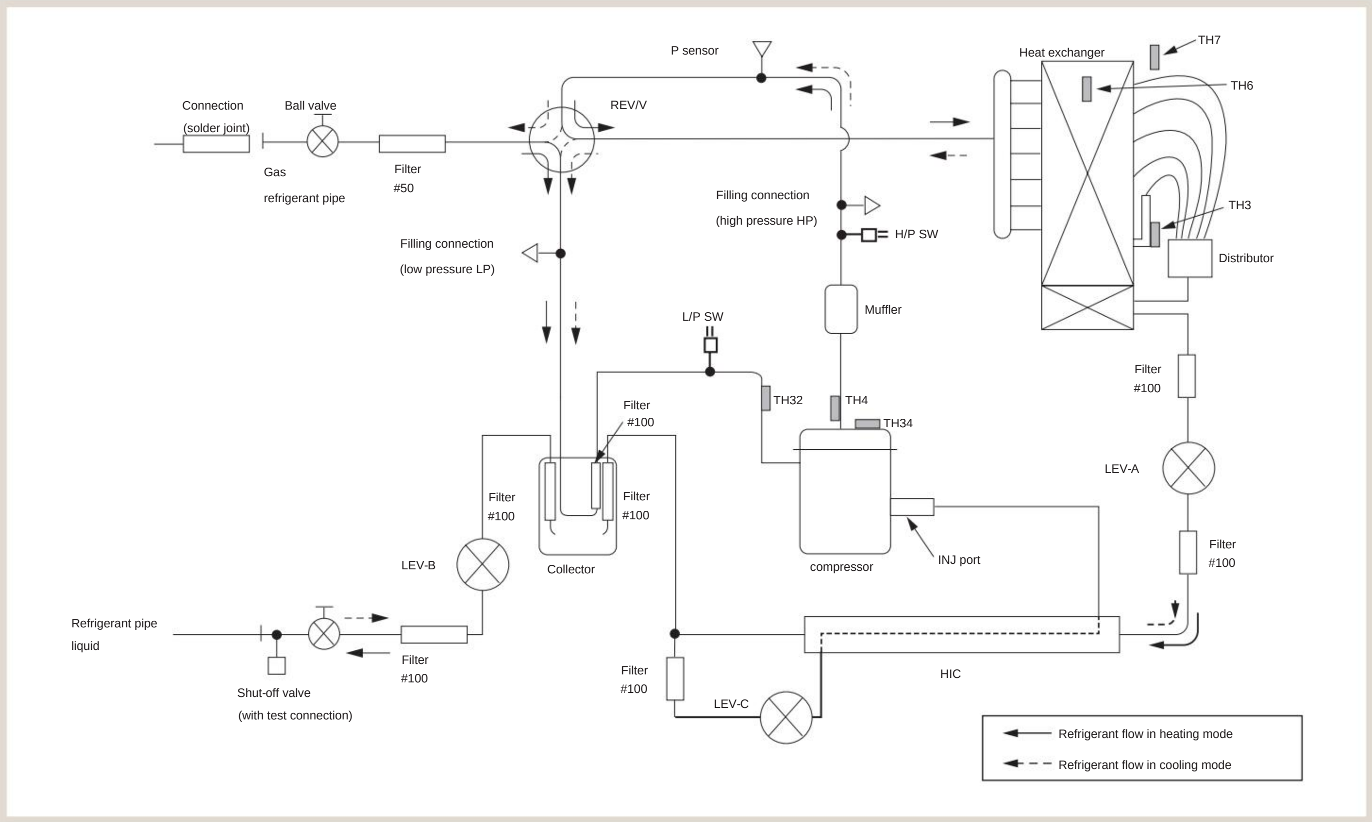
Split
PUD-SHWM60/80/100/120/140VAA/YAA



PUHZ-SHW140YHAR5



PUHZ-SHW230YKA2R2



4.4 Eco Inverters

4.4.1 Technical data

Monoblock

Device name			QUHZ-W40VA
Power supply		[Ph], [V], [Hz]	1, 230, 50
Max. current		[A]	12
validation		[A]	20
Outer casing			Galvanized sheet steel
Housing surface			Munsell 2.5Y 7/1
Refrigerant injection			Electronic expansion valve
compressor	Type		Hermetic scroll compressor
	Model		KXB045FJK
	Motor power consumption	[kW]	1.3
	Performance control		Inverters
	Protection devices Oil		High pressure switch, compressor thermostat
	quantity (type)	[l]	2.30 (FVC68D)
Crankcase heater		[W]	–
Heat exchanger	Air		Fin heat exchanger
	Water		–
Fan	Type and number		Axial x 1 piece.
	Motor power consumption	[kW]	0.050
	Air volume flow	m3/min	2040
Defrosting method			Hot gas
Sound pressure level (SPL)	Heat	[dB(A)]	43
Sound power level (PWL)	Heat	[dB(A)]	53
Dimensions	Height	[mm]	715
	depth	[mm]	300+20
	Width	[mm]	809+70
Weight		[kg]	57
Refrigerant	Type		R744
	Crowd	[kg]	1.15
Pipe size (outside diameter) liquid		[mm]	–
	gas	[mm]	–
Connection technology			Water connection
Between indoor and Outdoor unit	Height difference	[m]	–
	Pipe length	[m]	–
Guaranteed operating range (Outside)	Heat	[ÿC]	-15 ÿ +35
	Hot water	[ÿC]	-15 ÿ +35
	Cooling 1)	[ÿC]	–
Flow temperature (water) (Max. for heating, Min. for cooling)	Heat	[ÿC]	+60
	Hot water	[ÿC]	+72
Return temperature (water)	Heat	[ÿC]	+9 ÿ +55
	Hot water	[ÿC]	+9 ÿ +55
Water volume flow		[l/min]	3-8
Connection VL/RL		[Customs service]	G 1/2"

1) In combination with a reversible storage/hydro module, the minimum temperature is +10 °C.

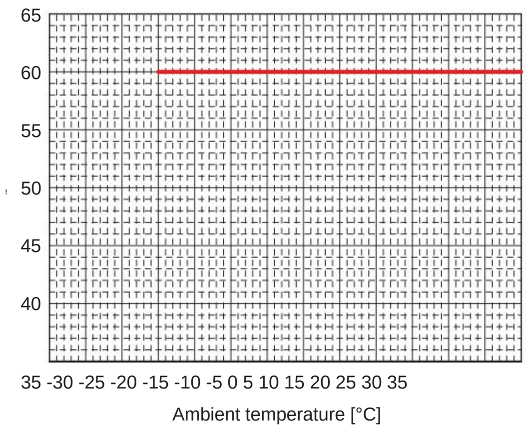
Split

Device name			SUZ-SWM40VA	SUZ-SWM60VA	SUZ-SWM80VA
Power supply		[Ph], [V], [Hz]	1, 230, 50	1, 230, 50	1, 230, 50
Max. current		[A] 13.9		13.9	13.9
validation		[A]	16	16	16
Outer casing			Galvanized sheet steel	Galvanized sheet steel	Galvanized sheet steel
Housing surface			Munsell 3Y 7.8/1.1	Munsell 3Y 7.8/1.1	Munsell 3Y 7.8/1.1
Refrigerant injection			Electronic expansion valve	Electronic expansion valve	Electronic expansion valve
compressor	Type		Hermetic double roller piston	Hermetic double roller piston	Hermetic double roller piston
	Model		SVB130FBBMT	SVB172FCKMT	SVB172FCKMT
	Motor power consumption	[kW]	0.9	1.2	1.2
	Performance control		Inverters	Inverters	Inverters
	Protective devices		High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection	High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection	High pressure switch, compressor thermostat, thermostatic overpressure protection, overcurrent detection
	Oil quantity (type)	[l]	0.35 (FW68S)	0.4 (FW68S)	0.4 (FW68S)
Crankcase heater		[W]	–	–	–
Heat exchanger	Air		Fin heat exchanger	Fin heat exchanger	Fin heat exchanger
	Water		Plate heat exchanger	Plate heat exchanger	Plate heat exchanger
Fan	Type and number		Axial x 1 piece.	Axial x 1 piece.	Axial x 1 piece.
	Motor power consumption	[kW]	0.060	0.060	0.060
	Air volume flow	m3/min	36	44	44
Defrosting method			Refrigerant reversal	Refrigerant reversal	Refrigerant reversal
Sound pressure level (SPL)	heating	[dB(A)]	44	45	46
	Cool	[dB(A)]	49	49	49
Sound power level (PWL)	Heat	[dB(A)]	58	60	62
Dimensions	Height	[mm]	880	880	880
	depth	[mm]	330	330	330
	Width	[mm]	840	840	840
Weight		[kg]	54	54	54
Refrigerant	Type		R32	R32	R32
	Crowd	[kg]	1.2	1.2	1.2
	Max.	[kg]	1.6	1.6	1.6
Pipe size (Outer diameter)	liquid	[mm]	6.35	6.35	6.35
	gas	[mm]	12.7	12.7	12.7
Connection technology			flanged	flanged	flanged
Between indoor and Outdoor unit	Height difference [m]		max. 30	max. 30	max. 30
	Pipe length [m] [ÿC] [ÿC]		5-30	5-30	5-30
Guaranteed Operating area (Outside)	Heat		-20 ÿ +24	-20 ÿ +24	-20 ÿ +24
	Hot water		-20 ÿ +35	-20 ÿ +35	-20 ÿ +35
	Cooling 1)	[ÿC]	+10 ÿ +46	+10 ÿ +46	+10 ÿ +46
flow temperature (Water) (Max. for heating, Min. for cooling)	Heat		+60	+60	+60
	Cool	[ÿC] [ÿC]	+5	+5	+5
return temperature (Water)	Heat	[ÿC]	+5 ÿ +54	+5 ÿ +54	+5 ÿ +54
	Cool	[ÿC]	+8 ÿ +28	+8 ÿ +28	+8 ÿ +28
Water volume flow		[l/min]	6.5 ÿ 11.4	7.2 ÿ 17.2	7.8 ÿ 21.5

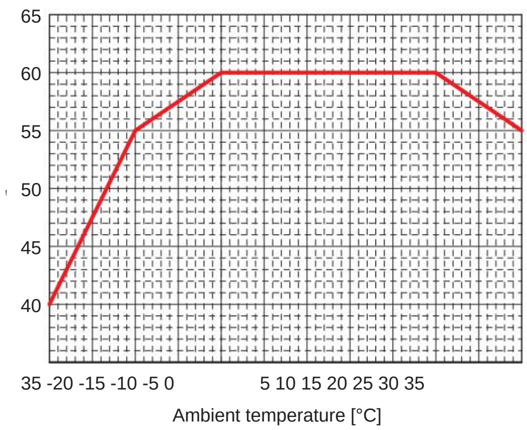
1) In combination with a reversible storage/hydro module, the minimum temperature is +10 °C.

4.4.2 Maximum flow temperatures

Monoblock
QUHZ-W40VA



Split
SUZ-SWM40/60/80VA



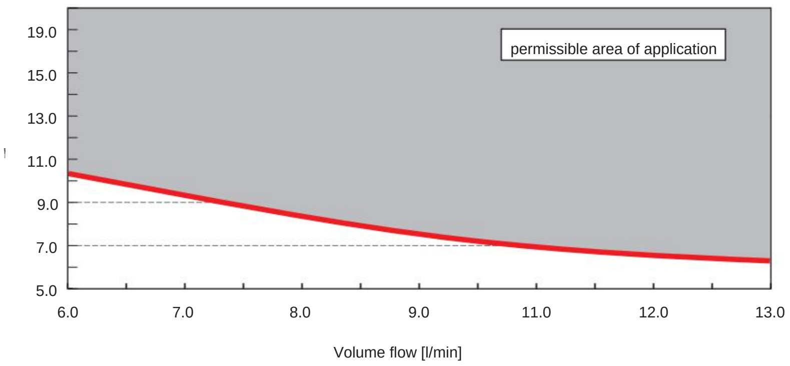
4.4.3 Cooling/defrosting application area (return temperature, volume flow)

Caution!

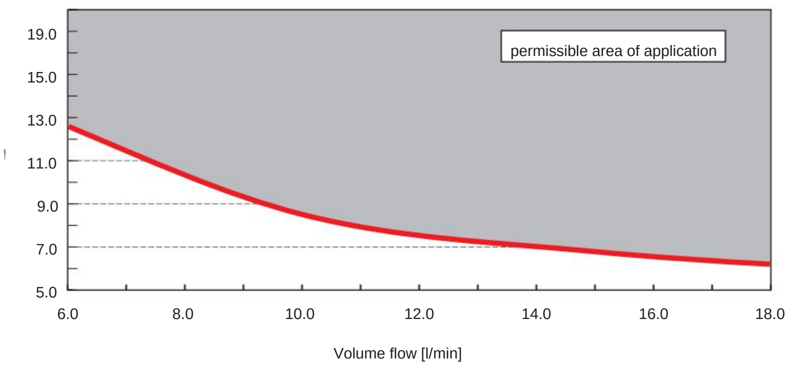
If the minimum return temperature or the minimum volume flow is not reached, the heat pump system will malfunction.

- When starting up the heat pump system for the first time or after a longer period of downtime, it is essential that you adhere to the permissible values on the plate heat exchanger.

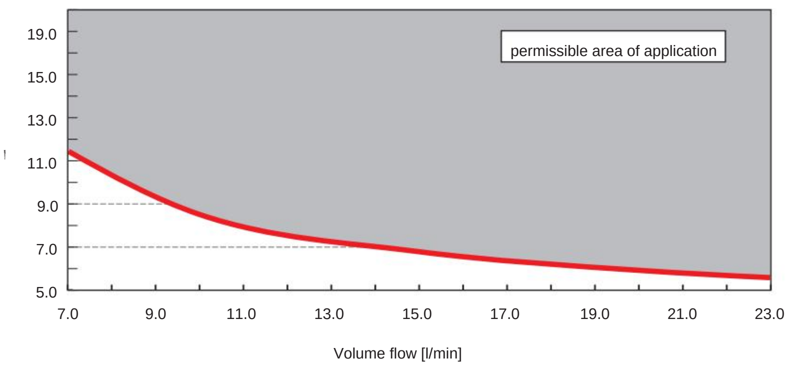
SUZ-SWM40VA



SUZ-SWM60VA



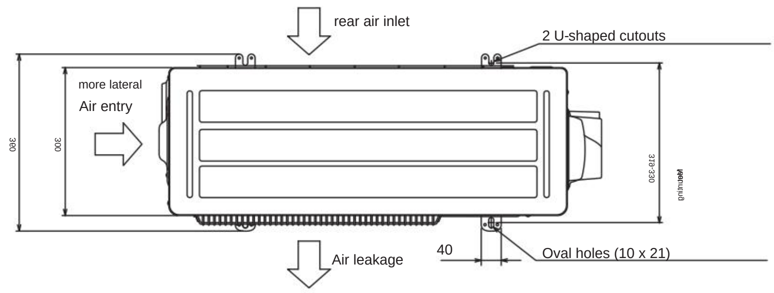
SUZ-SWM80VA



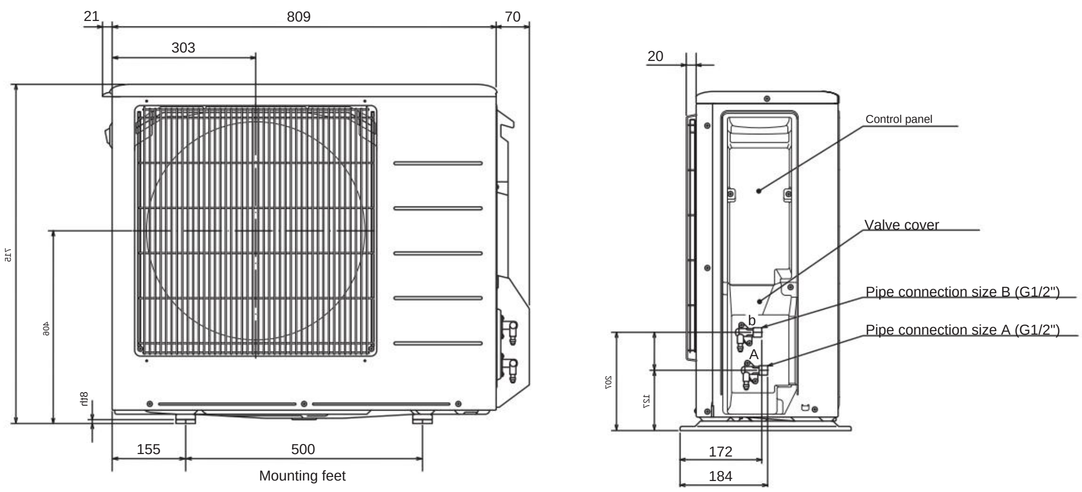
4.4.4 Dimensions

Monoblock
QUHZ-W40VA

Top and bottom view

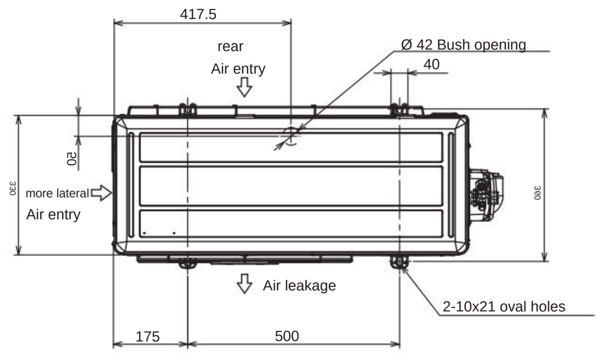


Front, back and side views

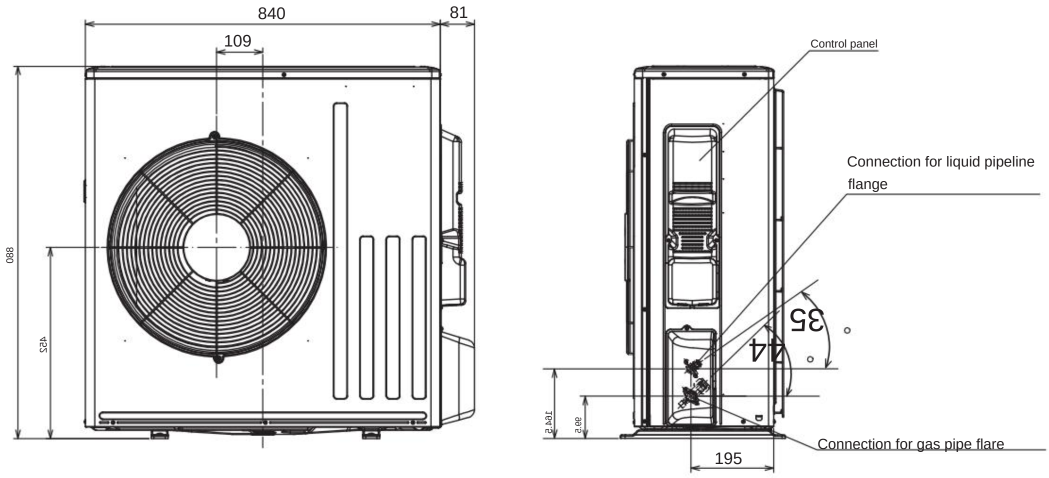


Split
SUZ-SWM40/60/80VA

View from above



Front and side view

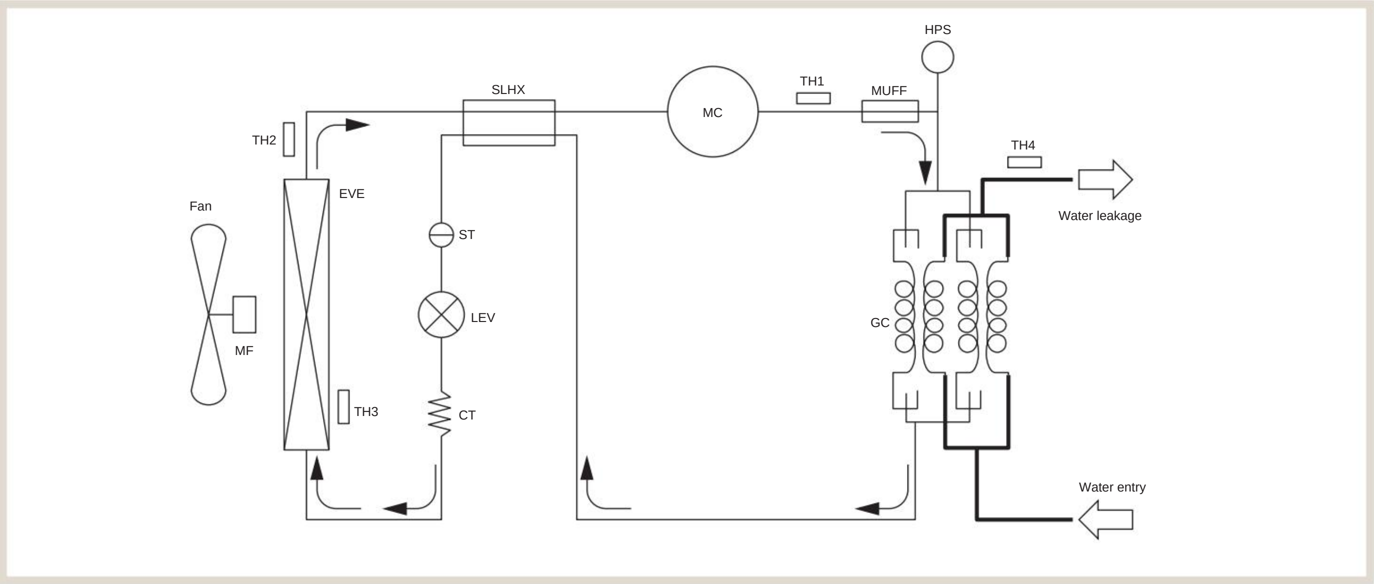


4.4.5 Refrigeration circuits

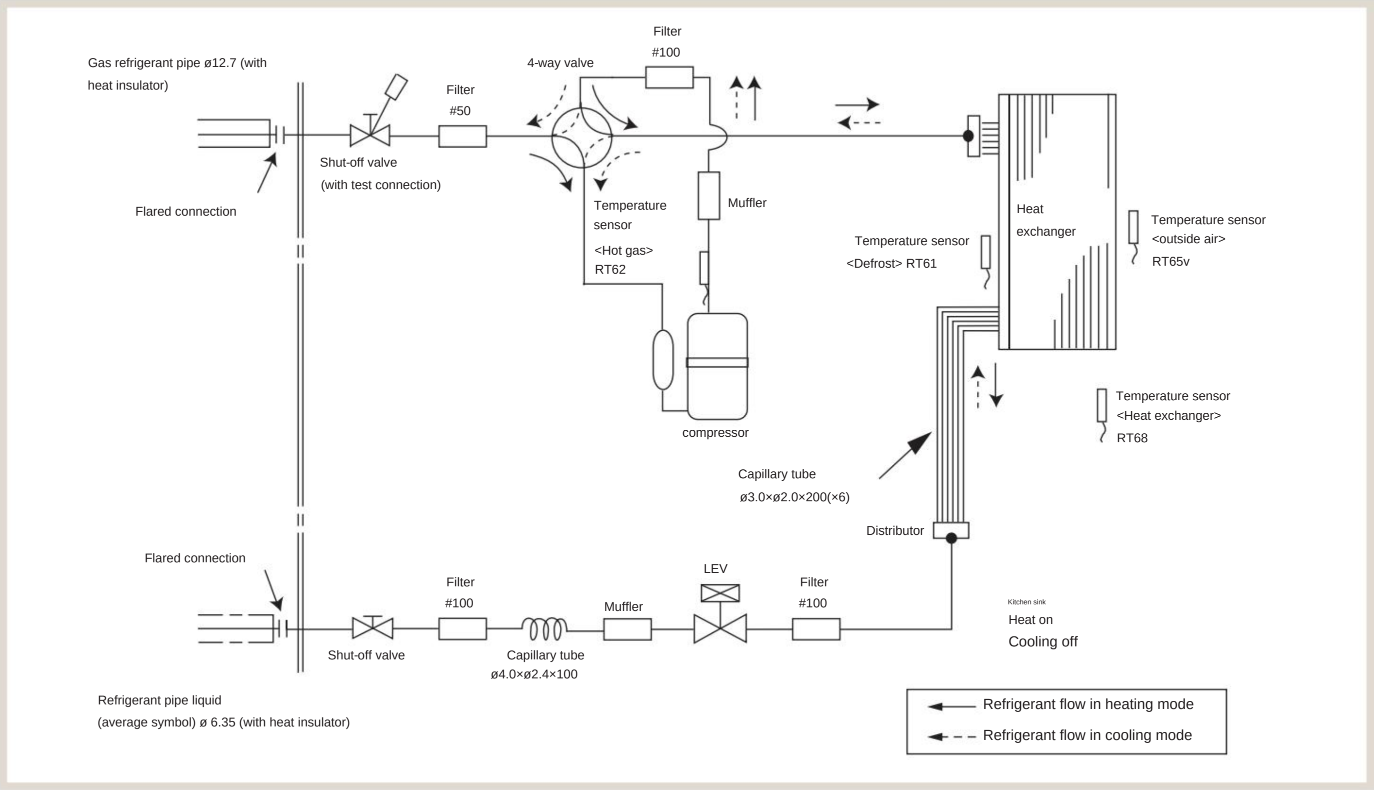
Legend

symbol	Part name	symbol	Part name
MC	compressor	EVE	Evaporator
HPS	High pressure switch	TH1	Temperature sensor <hot gas>
MUFF	Muffler	TH2	Temperature sensor <Defrost>
G.S	Gas cooler	TH3	Temperature sensor <ambient temperature>
SLHX	Heat exchanger suction line	TH4	Temperature sensor <hot water>
ST	Filter screen	MF	Fan motor
LEV	Linear expansion valve	FAN	Fan
CT	capillary tube		

Monoblock
QUHZ-W40VA



Split
SUZ-SWM40/60/80VA



4.5 Memory modules

4.5.1 Technical data

Device name without				EHST20D-YM9D	FIRST20D-YM9D	EHST30D-YM9ED	FIRST30D-YM9ED
Dimensions	packaging	Height	[mm]	1600	1600	2050	2050
		Width	[mm]	595	595	595	595
		depth	[mm]	680	680	680	680
	with packaging	Height	[mm]	1850	1850	2320	2320
		Width	[mm]	660	660	660	660
		depth	[mm]	800	800	800	800
Housing	Munsell		–	6.2PB 9/0.9	6.2PB 9/0.9	6.2PB 9/0.9	6.2PB 9/0.9
	RAL code		–	260 90 05	260 90 05	260 90 05	260 90 05
	material		–	pre-coated metal			
Weight (empty)			[kg]	106	102	116	117
Weight (full)			[kg]	314	310	425	426
Gross weight			[kg]	123	119	135	137
Water volume on the heating side (primary circuit) 1)			[l]	5.8	5.8	6.2	6.2
Type of installation			–	floor standing			
Electrical data control board 2)	(including 2 pumps)	Voltage supply	[ph]	~/N	~/N	~/N	~/N
			[V]	230	230	230	230
			[Hz]	50	50	50	50
		Power consumption	[kW]	0.30	0.30	0.30	0.30
		Current strength	[A]	1.95	1.95	1.95	1.95
		validation	[A]	10	10	10	10
	Electric heating element	Voltage supply	[ph]	3~	3~	3~	3~
			[V]	400	400	400	400
			[Hz]	50	50	50	50
		Performance	[kW]	3+6	3+6	3+6	3+6
		Heating step	–	3	3	3	3
		Current strength	[A]	13	13	13	13
		validation	[A]	16	16	16	16
pump (primary circuit)	Power consumption (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[W]	10/13/15	10/13/15	10/13/15	10/13/15
		Speed level 2 [W]		16/21/27	16/21/27	16/21/27	16/21/27
		Speed level 3 [W]		24/32/42	24/32/42	24/32/42	24/32/42
		Speed level 4 [W]		34/46/58	34/46/58	34/46/58	34/46/58
		Speed level 5 [W]		47/58/60	47/58/60	47/58/60	47/58/60
	Current strength (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[A]	0.2/0.2/0.3	0.2/0.2/0.3	0.2/0.2/0.3	0.2/0.2/0.3
		Speed level 2 [A]		0.2/0.3/0.4	0.2/0.3/0.4	0.2/0.3/0.4	0.2/0.3/0.4
		Speed level 3 [A]		0.3/0.4/0.5	0.3/0.4/0.5	0.3/0.4/0.5	0.3/0.4/0.5
		Speed level 4 [A]		0.4/0.5/0.6	0.4/0.5/0.6	0.4/0.5/0.6	0.4/0.5/0.6
		Speed level 5 [A]		0.5/0.6/0.6	0.5/0.6/0.6	0.5/0.6/0.6	0.5/0.6/0.6
	Delivery height volume flow of 0/20/Lmax)	Speed level 5 [m] (at		7.5/7, 2/4.9	7.5/7, 2/4.9	7.5/7, 2/4.9	7.5/7.2/4.9
	curve		–	see pump diagrams below			
pump (hot water)	Power consumption (Default setting: Speed level 2)	Speed level 1	[W]	55	55	58	58
		Speed level 2 [W]		69	69	72	72
		Speed level 3 [W]		80	80	83	83
	Current strength (Default setting: Speed level 2)	Speed level 1	[A]	0.25	0.25	0.27	0.27
		Speed level 2 [A]		0.31	0.31	0.33	0.33
		Speed level 3 [A] [l/min]		0.34	0.34	0.36	0.36
	Volume flow (Default setting: Speed level 2)	Speed level 1		13.5	13.5	14.5	14.5
		Speed level 2 [l/min]		19.0	19.0	21.0	21.0
		Speed level 3 [l/min]		22.9	22.9	25.2	25.2

Continued on next page

Device name				EHST20D-YM9D	FIRST20D-YM9D	EHST30D-YM9ED	FIRST30D-YM9ED
Volume flow primary circuit		max.4)	[l/min]	36.9	36.9	36.9	36.9
		min.5)	[l/min]	5.0	5.0	5.0	5.0
Heat exchanger refrigerant primary circuit				MWA1-44-DM	MWA1-44-DM	MWA1-44-DM	MWA1-44-DM
	Primary circuit drinking water		–	CBH18-18H	CBH18-18H	CBH18-24H	CBH18-24H
Domestic hot water tank	volume		[l]	200	200	300	300
	material		–	Duplex 2304 stainless Steel (EN10088)	Duplex 2101 stainless Steel (EN10088)	Duplex 2304 stainless Steel (EN10088)	Duplex 2101 stainless Steel (EN10088)
	tap profile			L	L	XL	XL
	Average climate	ÿwh	–	141~159	141~159	119~128	119~128
		Pes	[kW]	0.024~0.035	0.024~0.035	0.026~0.041	0.026~0.041
		Hot water Efficiency class	–	A+	A+	A-A+	A-A+
Expansion vessel	volume		[l]	12	12	12	–
Primary circuit pre-pressure			[MPa]	0.1	0.1	0.1	–
Safety device	Primary circuit	Temperature sensor [°C]		1~80	1~80	1~80	1~80
		Pressure relief valve [MPa]		0.3	0.3	0.3	0.3
		Flow monitor [l/min] (Min. flow)		5.0	5.0	5.0	5.0
		Safety temperature limiter (electric heating element)	[°C]	90	90	90	90
		Thermal validation (electric heating rod)	[°C]	121	121	121	121
	Hot water tank temperature sensor [°C]			75	75	75	75
		Safety temperature [°C] limiter (screw-in heater electric)		–	–	–	–
		temperature and	[°C]	–	–	–	–
		Pressure relief valve	[MPa] 1.0 [Ø mm]		1.0	1.0	1.0
connections	Water	Heating	28 [Ø mm] [Ø		28	28	28
		Hot water	mm]	22	22	22	22
	Refrigerant	gas	12.7 [Ø mm] 6.35		12.7	12.7	12.7
		liquid			6.35	6.35	6.35
Refrigerant 7)			–	R32/R410A	R32/R410A	R32/R410A	R32/R410A
Guaranteed Operating range 8)	Ambient temperature		[°C]	0~35	0~35	0~35	0~35
			[%RH]	ÿ 80	ÿ 80	ÿ 80	ÿ 80
	Outside temperature	Heat	[°C]	see technical data for outdoor units			
		Cool	[°C]	–	10~46 11)	–	10~46 11)
Heating **operating range**		Room temperature [°C]		10~30	10~30	10~30	10~30
		Flow temperature [°C]		20~60	20~60	20~60	20~60
	Cool	Room temperature [°C]		–	–	–	–
		Flow temperature [°C] [°C]		–	5~25	–	5~25
	Drinking water 10)		[°C]	40~60	40~60	40~60	40~60
	Anti-Legionella program			60~70	60~70	60~70	60~70
Sound power level (PWL)			[dB(A)]	41	41	41	41

1) Value does not include the volume of the domestic hot water circuit, primary circuit DHW (from the 3-way valve to the heating branch), piping to the expansion vessel.

2) If supplied via its own voltage source.
3) The possible volume flow depends on the connected outdoor unit.
4) If the maximum volume flow is exceeded, a flow velocity of > 1.5 m/s is achieved, which can lead to erosion corrosion.
5) If the volume flow falls below the minimum, the flow monitor is activated.
6) Hot water output varies depending on the outdoor unit connected.
7) Refrigerant circuit between outdoor unit and indoor unit (storage module).
8) The environment must be frost-free.
9) For device types without electric heating elements and electric screw-in heaters, the max. hot water temperature = max. flow temperature of the outdoor unit - 3°C.
For the maximum flow temperature of the outdoor unit, see the outdoor unit data table.
11) Refer to table in outdoor unit specification. (min. 10°C) Cooling mode is not available when the ambient temperature is low. If you use your system in cooling mode at low ambient temperatures (10°C or less), there is a risk of damage to the plate heat exchanger from frozen water.

Device name				EHPT20X-YM9D	ERPT20X-VM2D	EHPT30X-YM9ED	ERPT30X-VM2ED
Dimensions	without packaging	Height	[mm]	1600	1600	2050	2050
		Width	[mm]	595	595	595	595
		depth	[mm]	680	680	680	680
	with packaging	Height	[mm]	1850	1850	2320	2320
		Width	[mm]	660	660	660	660
		depth	[mm]	800	800	800	800
Housing	Munsell		–	6.2PB 9/0.9	6.2PB 9/0.9	6.2PB 9/0.9	6.2PB 9/0.9
	RAL code		–	260 90 05	260 90 05	260 90 05	260 90 05
	material		–	pre-coated metal			
Weight (empty)			[kg]	96	94	110	108
Weight (full)			[kg]	304	300	419	415
Gross weight			[kg]	113	110	129	127
Water volume on the heating side (primary circuit) 1)			[l]	6.0	3.7	6.7	4.4
Type of installation			–	floor standing			
Electrical data control board 2)	(including 2 pumps)	Voltage supply	[ph]	~/N	~/N	~/N	~/N
			[V]	230	230	230	230
			[Hz]	50	50	50	50
		Power consumption	[kW]	0.30	0.30	0.30	0.30
		Current strength	[A]	1.95	1.95	1.95	1.95
		validation	[A]	10	10	10	10
	Electric heating element	Voltage supply	[ph]	3~	~/N	3~	~/N
			[V]	400	230	400	230
			[Hz]	50	50	50	50
		Performance	[kW]	3+6	2	3+6	2
		Heating step	–	3	1	3	1
		Current strength	[A]	13	9	13	9
		validation	[A]	16	16	16	16
pump (primary circuit)	Power consumption (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[W]	10/13/15	10/13/15	10/13/15	10/13/15
		Speed level 2 [W]		16/21/27	16/21/27	16/21/27	16/21/27
		Speed level 3 [W]		24/32/42	24/32/42	24/32/42	24/32/42
		Speed level 4 [W]		34/46/58	34/46/58	34/46/58	34/46/58
		Speed level 5 [W]		47/58/60	47/58/60	47/58/60	47/58/60
	Current strength (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[A]	0.2/0.2/0.3	0.2/0.2/0.3	0.2/0.2/0.3	0.2/0.2/0.3
		Speed level 2 [A]		0.2/0.3/0.4	0.2/0.3/0.4	0.3/0.4/0.5	0.3/0.4/0.5
		Speed level 3 [A]		0.3/0.4/0.5	0.3/0.4/0.5	0.4/0.5/0.7	0.4/0.5/0.7
		Speed level 4 [A]		0.4/0.5/0.6	0.4/0.5/0.6	0.6/0.8/1.0	0.6/0.8/1.0
		Speed level 5 [A]		0.5/0.6/0.6	0.5/0.6/0.6	0.9/1.1/1.4	0.9/1.1/1.4
	Delivery head (at volume flow of 0/20/Lmax)	Speed level 5 [m]		7.5/7.2/4.9	7.5/7.2/4.9	7.5/7.2/4.9	7.5/7.2/4.9
	curve		–	see pump diagrams below			
pump (hot water)	Power consumption (Default setting: Speed level 2)	Speed level 1	[W]	58	58	58	58
		Speed level 2 [W]		72	72	72	72
		Speed level 3 [W]		83	83	83	83
	Current strength (Default setting: Speed level 2)	Speed level 1	[A]	0.27	0.27	0.27	0.27
		Speed level 2 [A]		0.33	0.33	0.33	0.33
		Speed level 3 [A]		0.36	0.36	0.36	0.36
	Volume flow (Default setting: Speed level 2)	Speed level 1	[l/min]	14.5	14.5	14.5	14.5
		Speed level 2 [l/min]		21.0	21.0	21.0	21.0
		Speed level 3 [l/min]		25.2	25.2	25.2	25.2

Continued on next page

Device name				EHPT20X-YM9D	ERPT20X-VM2D	EHPT30X-YM9ED	ERPT30X-VM2ED
Volume flow primary circuit		max. 4)	[l/min]	36.9	36.9	36.9	36.9
		at least 5)	[l/min]	5.0	5.0	5.0	5.0
Heat exchanger refrigerant primary circuit			–	–	–	–	–
	Primary circuit drinking water		–	CBH18-18H	CBH18-24H	CBH18-24H	CBH18-24H
Domestic hot water tank	volume		[l]	200	200	300	300
	material		–	Duplex 2304 stainless steel (EN10088)			
	tap profile			L	L	XL	XL
	Average climate	ÿwh	–	135~148	135~148	120	120
		Pes	[kW]	0.035~0.037	0.035~0.037	0.040~0.042	0.040~0.042
Expansion vessel		Hot water Efficiency class	–	A+	A+	A	A
Primary circuit pre-pressure			[MPa]	0.1	0.1	–	–
Safety device	Primary circuit	Temperature sensor [°C]		1~80	1~80	1~80	1~80
		Pressure relief valve	[MPa]	0.3	0.3	0.3	0.3
		Flow monitor (Min. flow)	[l/min]	5.0	5.0	5.0	5.0
		Safety temperature limiter (electric heating rod)	[°C]	90	90	90	90
		Thermal Fuse (electric heating element)	[°C]	121	121	121	121
	Hot water tank temperature sensor [°C] [°C]			75	75	75	75
		Safety temperature limiter (screw-in heater electric)		–	–	–	–
		temperature and	[°C]	–	–	–	–
		Pressure relief valve	[MPa] 1.0 [Ø mm]		1.0	1.0	1.0
connections	Water	Heating	28 [Ø mm] 22		28	28	28
		Hot water			22	22	22
	Refrigerant	gas	[Ø mm] – [Ø		–	–	–
		liquid	mm] –		–	–	–
Refrigerant 7)			–	R32	R32	R32	R32
Guaranteed Operating range 8)	Ambient temperature		[°C]	0~35	0~35	0~35	0~35
			[%RH]	ÿ 80	ÿ 80	ÿ 80	ÿ 80
	Outside temperature	Heat	[°C]	see technical data for outdoor units			
		Cool	[°C]	–	10~46 11)	–	10~46 11)
Heating **operating range**		Room temperature [°C]		10~30	10~30	10~30	10~30
		Flow temperature [°C]		20~60	20~60	20~60	20~60
	Cool	Room temperature [°C]		–	–	–	–
		Flow temperature [°C]		–	5~25	–	5~25
	Drinking water 9)		[°C]	40~60	40~60	40~60	40~60
	Anti-Legionella program 9)		[°C]	60~70	60~70	60~70	60~70
Sound power level (PWL)			[dB(A)]	40	40	40	40

1) Value does not include the volume of the domestic hot water circuit, primary circuit DHW (from the 3-way valve to the heating system branch), piping to the expansion vessel.

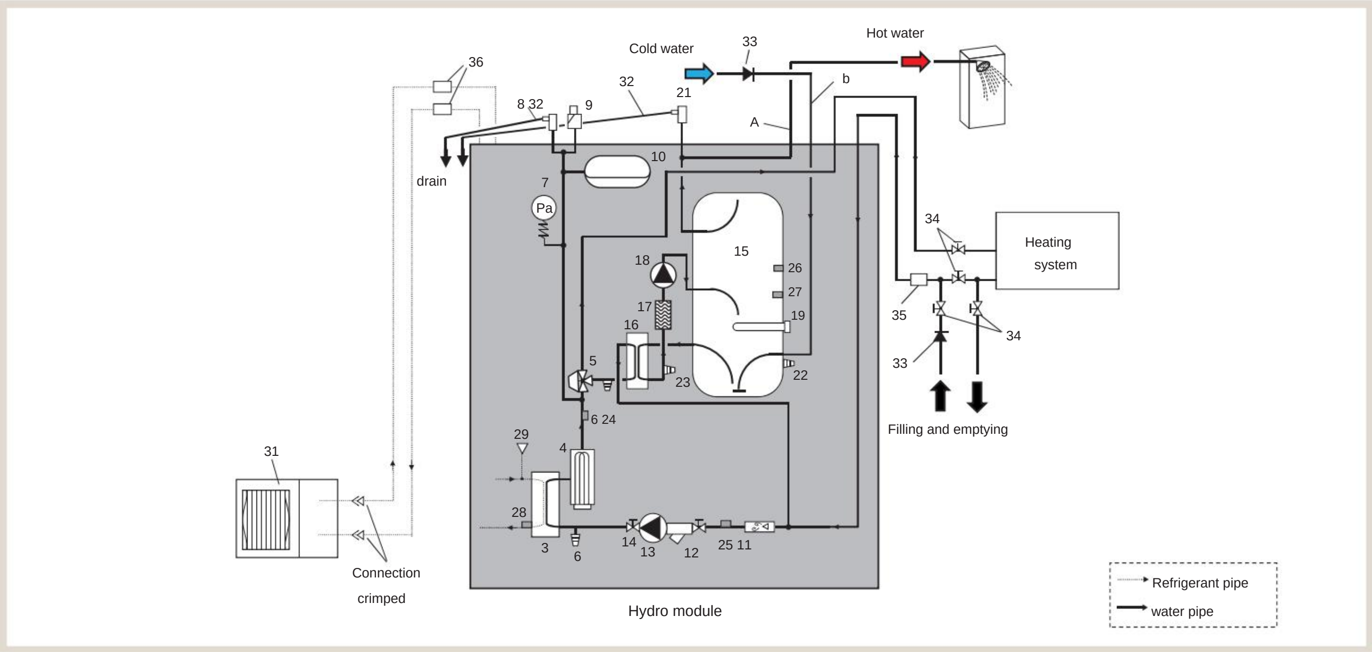
2) If supplied via its own voltage source.
3) The possible volume flow depends on the connected outdoor unit.
4) If the maximum volume flow is exceeded, a flow velocity of > 1.5 m/s is reached, which can lead to erosion corrosion.
5) If the volume flow falls below the minimum, the flow monitor is activated.
6) Hot water output varies depending on the outdoor unit connected.
7) Refrigerant circuit between outdoor unit and indoor unit (storage module).
8) The environment must be frost-free.
9) For device types without electric heating elements and electric screw-in heaters, the max. hot water temperature = max. flow temperature of the outdoor unit - 3°C.
For the maximum flow temperature of the outdoor unit, see the outdoor unit data table.

Device name				EHPT20Q-VM2EA
Modes				Space heating & DHW
Nominal volume of the heat accumulator			[l]	200
Overall dimensions		Width	[mm]	595
		depth	[mm]	680
		Height	[mm]	1600
Weight (empty)			[kg]	77
Weight (full)			[kg]	283
Primary Expansion vessel (Accesories)	Nominal volume		[l]	18 or 25
	form		[bar]	1.0
Safety devices	Water cycle (heat storage)	Temperature sensor (THW1)	[°C]	42 ~ 72
		Temperature sensor (THW3)	[°C]	80
		pressure relief valve (2 devices)	[bar]	3.0
		Flow sensor (minimum volume flow)	[l/min.]	1.3
		Manual thermostat Provision	[°C]	90
	Additional heating	Manual thermostat Provision	[°C]	90
		Safety temperature limiter STB (to prevent overheating of the electric heating element)	[°C]	121
Primary heating circuit pump	Heat storage and space heating			Grundfos Solar PML 25-145 180
	Hot water supply			Grundfos Solar PML 25-145 180
connections	Primary circuit		[mm]	ÿ 22.0
	Secondary circuit (drinking water)		[mm]	ÿ 22.0
Space heating **setting range**		Flow temperature 1)	[°C]	25 ~ 60
		Room temperature	[°C]	10 ~ 30
	Maximum DHW temperature		[°C]	40 ~ 70
More permissible Operating area	Environment 2)		[°C]	0 ~ 35 (80% RH)
	Outside temperature		[°C]	-15 ~ 35
Electrical Data	circuit board	Power supply	[Ph], [V], [Hz]	N, 230, 50
		Current strength	[A]	12.8
		Fuse (on site)	[A]	20
	Additional heating	Power supply	[Ph], [V], [Hz]	N, 230, 50
		Performance	[kW]	2
		Current strength	[A]	8.7
		Backup	[A]	16
Sound power level			[dB]	40
Max. drinking water supply pressure			[bar]	10
Max. working pressure (primary)			[bar]	2.5
Min. working pressure (primary)			[bar]	1.0

1) Depending on the environmental conditions, the set temperature may not be reached.
2) The area surrounding the module must be frost-free.

4.5.2 Hydraulic structure

EHST20D-YM9D / ERST20D-YM9D



Hot water outlet	Primary pump 1 heating circuit	temperature sensors (Top hot water tank) THW5A
B Cold water inlet	**14** Pump shut-off valve	
3 plate heat exchangers (refrigerant-drinking water)	**15** hot water tanks	**27** temperature sensors (Hot water tank below) THW5B
4 electric heating element 1, 2	**16** plate heat exchangers (water - water)	
5 3-way switching valve	**17** limescale separators	**28** TH2 refrigerant temperature sensor
6 Drain tap (primary circuit)	**18** Primary pump drinking water circuit	**29** pressure sensor
7 pressure gauges	**19** Screw-in heater **21**	**31** outdoor unit
8 pressure relief valve (3 bar)	Pressure relief valve (10 bar) (hot water tank)	**32** Drain pipe (provided by customer)
9 Automatic air vent	**22** Drain tap (hot water tank)	**33** backflow preventer (on site)
10 expansion tank	**23** Drainage tap (drinking water circuit)	**34** Shut-off valve (on site)
11 flow sensor	**24** temperature sensor flow THW1	**35** magnetic filters (provided by customer) (recommended)
12 mud flaps	**25** Temperature sensor return THW2	**36** filters (on site)

Installation

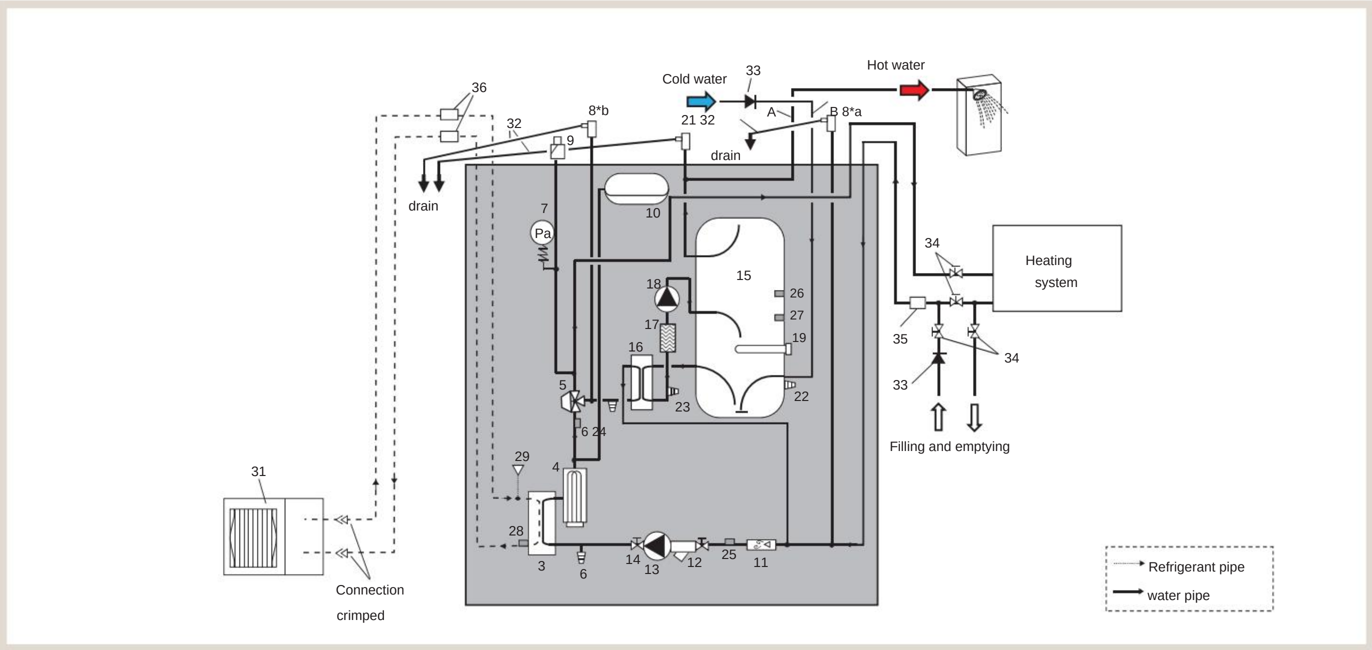
instructions • The connections for the domestic hot water are not included in the hydro module package and must be provided by the customer. • Observe local regulations for water connections.

• Install a filter in the inlet of the hydromodule. • Drain lines at

all relief valves must be routed in accordance with local regulations. • Install a backflow preventer according to IEC 61770 on the cold water inlet.

• If components or connecting pipes made of different metals are used, the connecting pieces must be insulated to prevent any damage caused by corrosion.

EHST30D-YM9ED / ERST30D-YM9ED



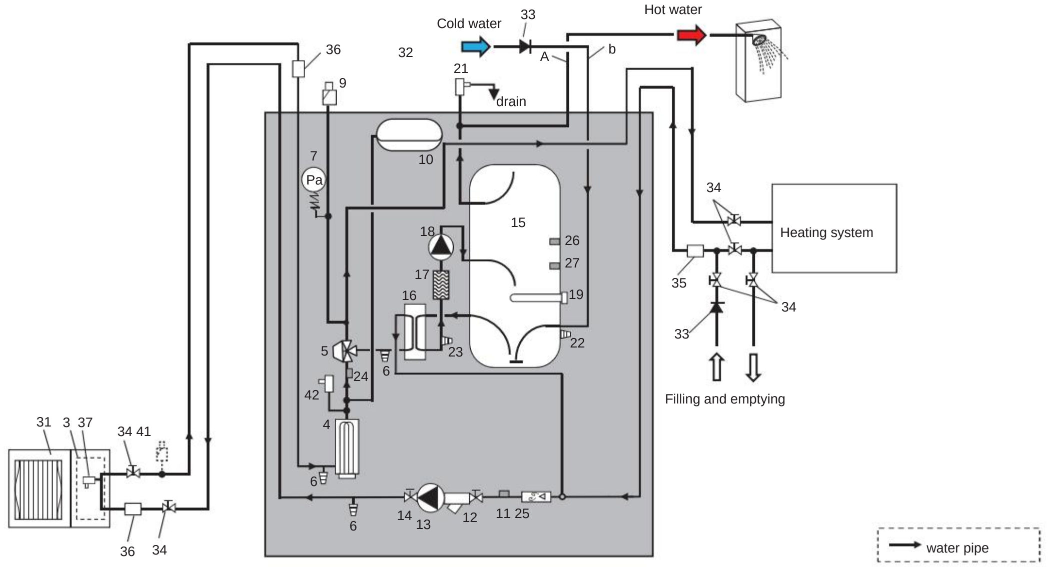
*a: only E**T20
*b: only E**T30

A NOTICE!

ÿInstall shut-off valves (32) on the filling and emptying of the storage module to ensure the filling to ensure delivery. ÿNo shut-off valve may be installed between the pressure relief valve (9) and the storage module. ÿMount a filter in the filling connection of the storage module. ÿThe drain lines on all pressure relief valves must be installed in accordance with local regulations. be placed. ÿInstall a backflow preventer according to IEC 61770 on the cold water inlet. ÿIf components or connecting pipes made of different metals are used, the connecting pieces must be insulated to prevent any damage caused by corrosion.

A Hot water outlet	**13** Primary pump 1 heating circuit	**26** temperature sensors (Top hot water tank) THW5A
B Cold water inlet	**14** Pump shut-off valve	
3 plate heat exchangers (refrigerant-drinking water)	**15** hot water tanks	**27** temperature sensors (Hot water tank below) THW5B
4 electric heating element 1, 2	**16** plate heat exchangers	
5 3-way switching valve	**17** limescale separators	**29** pressure sensor
6 Drain tap (primary circuit)	**18** Primary pump drinking water circuit	**31** outdoor unit
7 pressure gauges	**19** Screw-in heater **21**	**32** Drain pipe (provided by customer)
8 pressure relief valve (3 bar)	Pressure relief valve (10 bar) (hot water tank)	**33** backflow preventer (on site)
9 Automatic air vent	**22** Drain tap (hot water tank)	**34** Shut-off valve (on site)
10 expansion tank	**23** Drainage tap (drinking water circuit)	**35** magnetic filters (provided by customer) (recommended)
11 flow sensor	**24** temperature sensor flow THW1	**36** filters (on site)
12 mud flaps	**25** Temperature sensor return THW2	

EHPT20X-YM9D / EHPT30X-YM9ED / ERPT20X-VM2D / ERPT30X-VM2ED



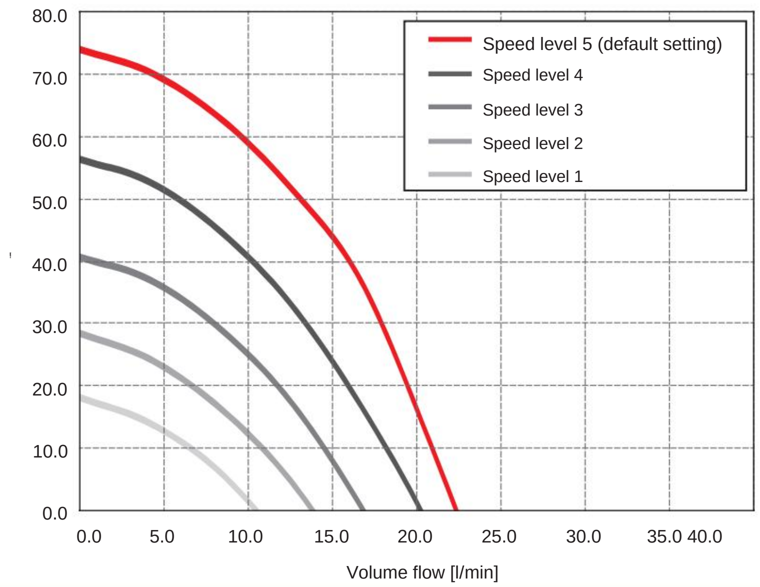
A NOTICE!

For E*PT**X model, do not connect an additional pressure relief valve to the heating/cooling circuit to ensure fire safety.

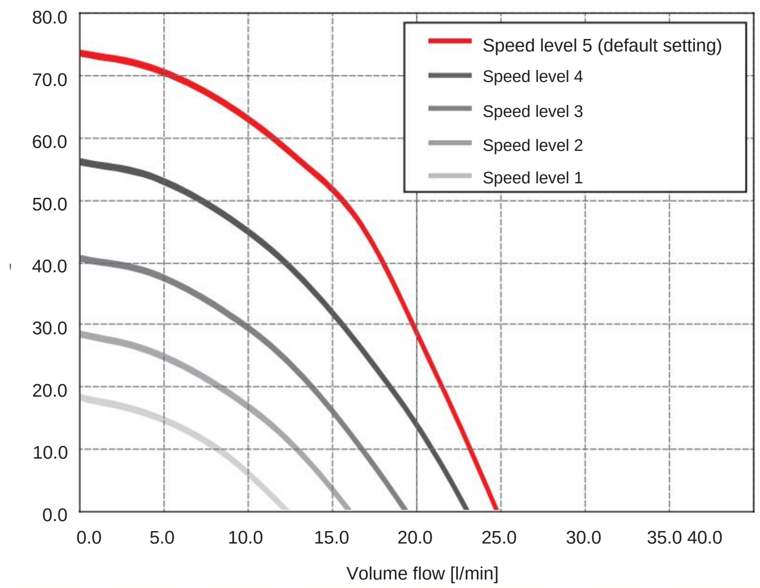
A	Hot water outlet	**21**	Pressure relief valve (10 bar) (hot water tank)
B	Cold water inlet	**22**	Drain tap (hot water tank)
3	plate heat exchangers (refrigerant-drinking water)	**23**	Drainage tap (drinking water circuit)
4	electric heating element 1, 2	**24**	temperature sensor flow THW1
5	3-way switching valve	**25**	Temperature sensor return THW2
6	Drain tap (primary circuit)	**26**	temperature sensors (top hot water tank) THW5A
7	pressure gauges	**27**	temperature sensors (bottom hot water tank) THW5B
9	Automatic air vent	**31**	outdoor unit
10	expansion tank	**32**	Drain pipe (provided by customer)
11	flow sensor	**33**	backflow preventer (on site)
12	mud flaps	**34**	Shut-off valve (on site)
13	Primary pump 1 heating circuit	**35**	magnetic filters (provided by customer) (recommended)
14	Pump shut-off valve	**36**	filters (on site)
15	hot water tanks	**37**	Pressure relief valve (outdoor unit)
16	plate heat exchangers	**41**	Air vent (to be provided by the customer if the outdoor unit is installed higher than the indoor unit, or if there is a risk of air collecting for other reasons)
17	limescale separators		
18	Primary pump drinking water circuit	**42**	pressure relief valve (5 bar)
19	screw-in heater		

4.5.3 Pump characteristics

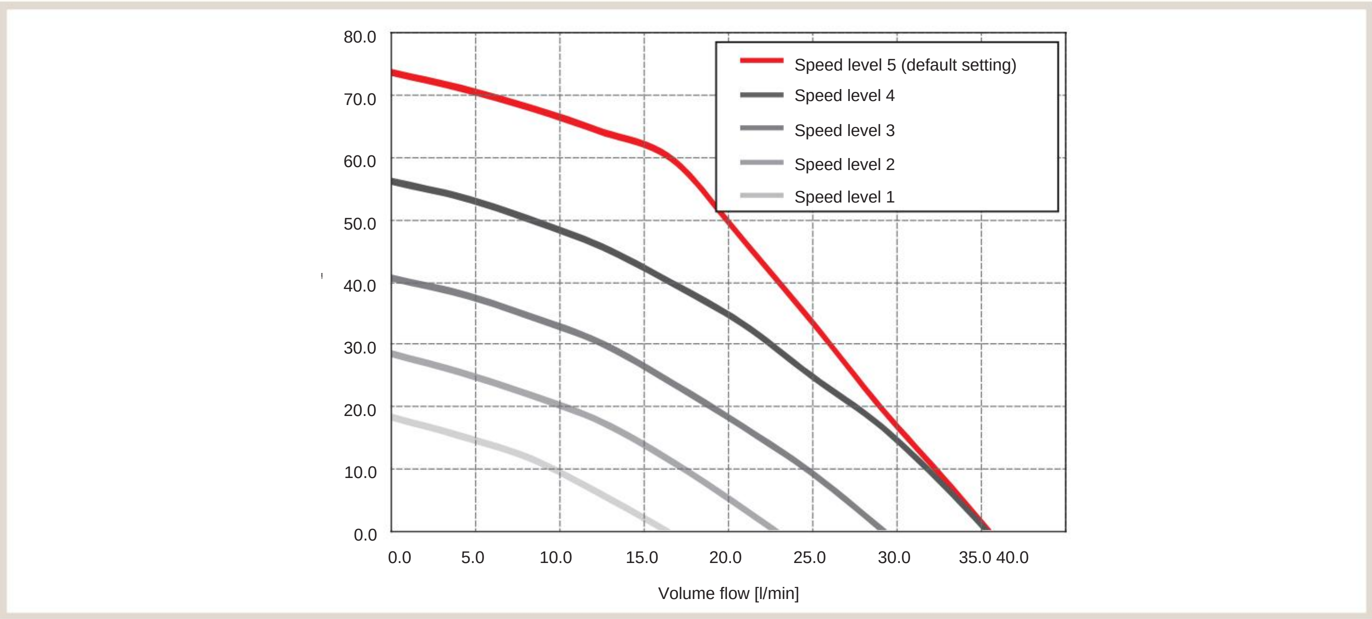
EHST20D-YM9D / ERST20D-YM9D



EHST30D-YM9ED / ERST30D-YM9ED



EHPT20X-YM9D / ERPT20X-VM2D / EHPT30X-YM9ED / ERPT30X-VM2ED



4.5.4 Recommended minimum volume flows

Setting the flow speed on the primary pump

The pump speed can be adjusted in 5 stages on the pump using the control unit. Adjust the pump speed so that the flow rate in the primary circuit is suitable for the installed outdoor unit.

Volume flow in the primary circuit	Outdoor unit	Volume flow [l/min]
Monoblock		
Power inverters	PUZ-WM50VHA	6.5 – 14.3
	PUZ-WM60VAA	8.6 – 17.2
	PUZ-WM85YAA	10.8 – 24.4
	PUZ-WM112YAA	14.4 – 32.1
Zubadan inverter	PUZ-HWM140YHA	17.9 – 40.1
ECO inverter	QUHZ-W40VA	3.0 – 8.0
Split		
Power inverters	PUD-SWM60VAA	9.0 – 22.9
	PUD-SWM80YAA	9.0 – 22.9
	PUD-SWM100YAA	14.3 – 34.4
	PUD-SWM120YAA	14.3 – 34.4
Zubadan inverter	PUD-SHWM60VAA	9.0 – 22.9
	PUD-SHWM80YAA	9.0 – 22.9
	PUD-SHWM100YAA	14.3 – 34.4
	PUD-SHWM120YAA	14.3 – 34.4
	PUD-SHWM140YAA	14.3 – 34.4
	PUHZ-SHW140YHAR5	17.9 – 36.9
ECO inverter	SUZ-SWM40VA	6.5 – 11.4
	SUZ-SWM60VA	7.2 – 17.2
	SUZ-SWM80VA	7.8 – 21.5

* If the volume flow falls below 5.0 l/min, the flow sensor is triggered.
If the volume flow exceeds 36.9 l/min and the flow velocity is higher than 2.0 m/s, this may lead to erosion corrosion of the pipes.

4.5.5 Heating times

Heating time [min]	Storage 200 l			Storage 300 l		
	Ambient temperature [°C]			Ambient temperature [°C]		
	2	7	14	2	7	14
PUZ-WM50VHA(-BS)	130	120	120	-	-	-
PUZ-WM60VAA(-BS)	110	100	95	-	-	-
PUZ-WM85V/YAA(-BS)	80	75	70	120	113	105
PUZ-WM112V/YAA(-BS)	65	60	55	98	90	83
SUZ-SWM40VA	130	120	120	-	-	-
SUZ-SWM60VA	120	110	100	-	-	-
SUZ-SWM80VA	110	95	90	165	143	135
PUHZ-SW75V/YAA(-BS)	115	100	95	173	150	143
PUHZ-SW100V/YAA(-BS)	100	90	80	150	135	120
PUHZ-SW120V/YHA(-BS)	85	75	70	128	113	105
PUHZ-SHW80VAA(-BS)	80	70	65	120	105	98
PUHZ-SHW112V/YAA(-BS)	60	60	55	90	90	83
PUHZ-SHW140YHAR5(-BS) 50		50	45	75	75	68
PUD-S(H)WM60VAA(-BS)	95	85	80	143	128	120
PUD-S(H)WM80V/YAA(-BS) 80		70	65	120	105	98
PUD-S(H)WM100V/YAA(-BS) 70		65	60	105	98	90
PUD-S(H)WM120V/YAA(-BS) 60		55	51	90	83	76
PUD-SHWM140V/YAA(-BS) 53		50	45	80	75	68

4.5.6 Dimensions

Monoblock
EHPT20X-YM9D / ERPT20X-VM2D / EHPT30X-YM9ED / ERPT30X-VM2ED

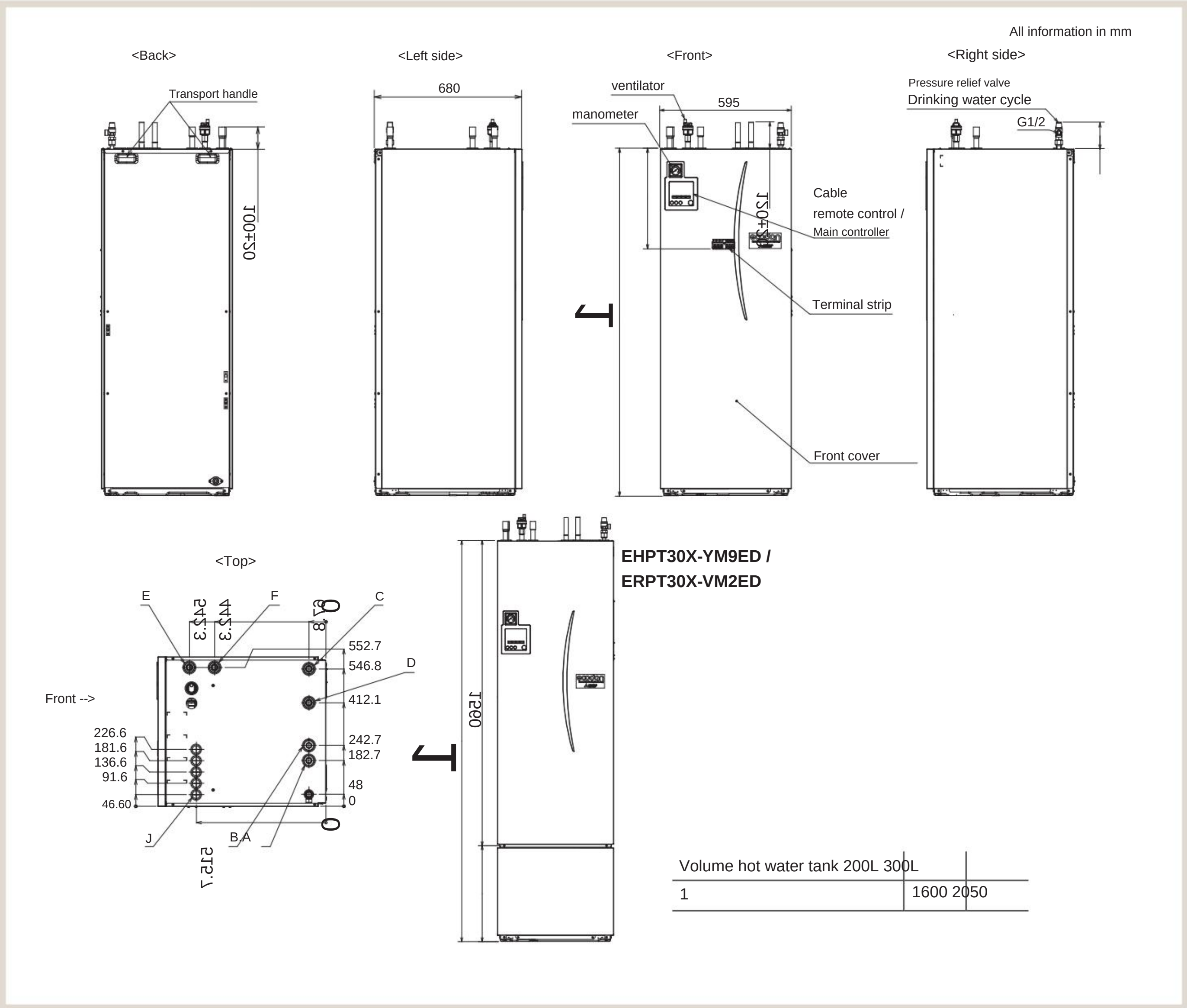


Fig.	Connection	Diameter/connection type
A	Hot water connection	22 mm/clamp connection
b	Cold water connection	22 mm/clamp connection
C	Heating return connection	28 mm/clamp connection
D	Heating flow connection	28 mm/clamp connection
E	Heat pump flow connection (monoblock)	28 mm/clamp connection
F	Heat pump return connection (monoblock)	28 mm/clamp connection
J	Electrical cable entry ①②③④n	Cable glands ÿ, ÿ and ÿ for low voltage wiring including external signal and temperature sensor cables. Cable entry ÿ and n for high voltage wiring including power cables, indoor/outdoor cables and external output cables. * For a radio receiver (optional), use cable gland ÿ.

EHPT20Q-VM2EA

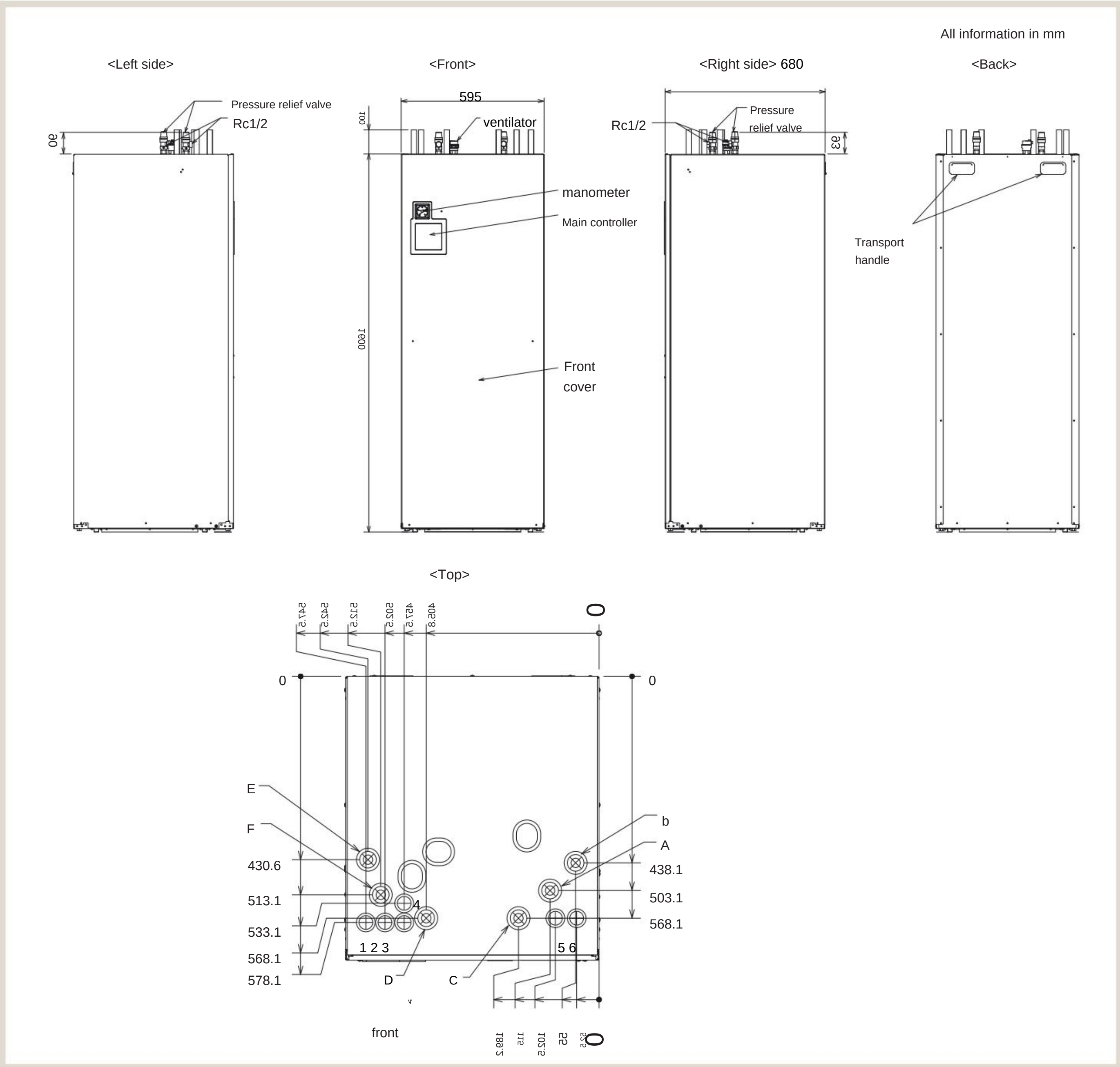


Fig.	Pipe and cable description	Diameter/connection type 22 mm/	Max. pipe and cable length [m]
A	Hot water connection	clamp connection	–
b	Cold water connection	22 mm/clamp connection 22	–
C	Heating return connection	mm/clamp connection	65
D	Heating flow connection	22 mm/clamp connection 22	65
E	Heat pump flow connection (monoblock)	mm/clamp connection	15
F	Heat pump return connection (monoblock)	22 mm/clamp connection	15
1 input for additional heating (power cable 230 V)		Additional heating cable	–
2 Main power input (power cord 230 V)		Power cord	–
3 Storage module – outdoor unit (power cable 230V)		Power cord storage module – outdoor unit	15
4 Input for output cables		Output cable	–
5 input for signal input		Signal input cable and remote sensor cable	–
6 input for wireless receiver and Wi-Fi interface		Lay a wireless receiver cable and a Ecodan Wi-Fi interface cable (option)	–

Split
EHST20D-YM9D / EHST30D-YM9ED / ERST20D-YM9D / ERST30D-YM9ED

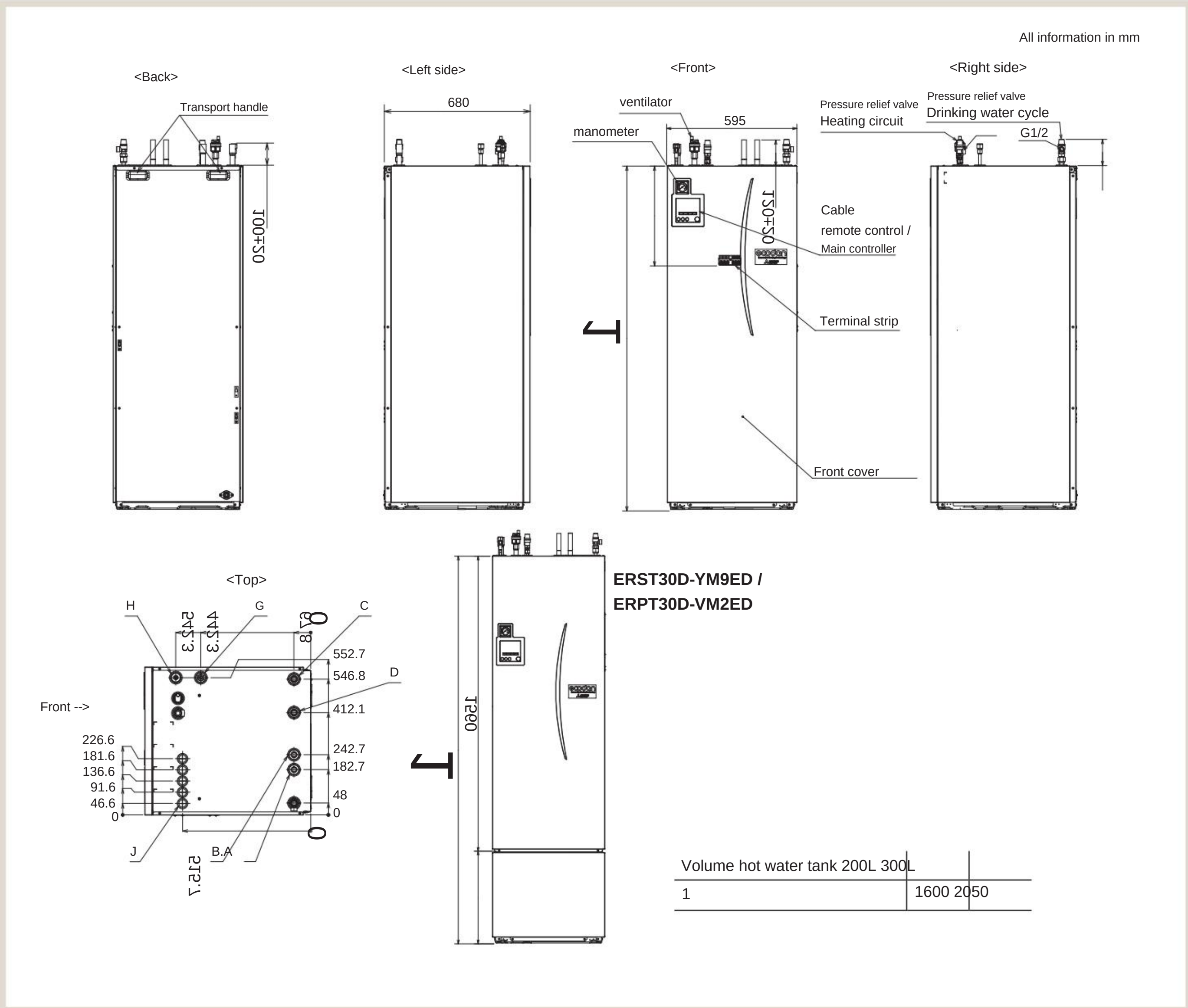


Fig. Connection		Diameter/connection type
A	Hot water connection	22 mm/clamp connection
b	Cold water connection	22 mm/clamp connection
C	Heating return connection	28 mm/clamp connection
D	Heating flow connection	28 mm/clamp connection
G	Connection plate heat exchanger (gas) (with plate heat exchanger)	12.7 mm/flare (E*ST**D *) 15.88 mm/flare (E*ST**C *)
H	Refrigerant (liquid) connection (with plate heat exchanger)	6.35 mm/flare (E*ST**D-*) 9.52 mm/flare (E*ST**C-*)
J	Electrical cable entry ①②③④n	Cable glands ÿ, ÿ and ÿ for low voltage wiring including external signal and temperature sensor cables. Cable entry ÿ and n for high voltage wiring including power cables, indoor/outdoor cables and external output cables. * For a radio receiver (optional), use cable gland ÿ.

4.6 Hydromodules

4.6.1 Technical data

Device name				EHSD-YM9D	ERSD-YM9D	EHSD-MED	EHSC-YM9D
Dimensions	without packaging	Height	[mm]	800	800	800	800
		Width	[mm]	530	530	530	530
		depth	[mm]	360	360	360	360
	with packaging	Height	[mm]	560	560	560	560
		Width	[mm]	600	600	600	600
		depth	[mm]	990	990	990	990
Housing	Munsell		–	6.2 PB 9/0.9	6.2 PB 9/0.9	6.2 PB 9/0.9	6.2 PB 9/0.9
	RAL code		–	260 90 05	260 90 05	260 90 05	260 90 05
	material		–	pre-coated metal			
Weight (empty)			[kg]	44	44	36	48
Weight (full)			[kg]	49	50	38	54
Gross weight			[kg]	57	58	49	61
Water volume on the heating side (primary circuit) 1)			[l]	5.2	5.2	1.7	6.1
Type of installation			–	wall hanging			
Electrical Data	Control board 2) (including 2 pumps)	Voltage supply	[ph]	~/N	~/N	~/N	~/N
			[V]	230	230	230	230
			[Hz]	50	50	50	50
		Power consumption	[kW]	0.30	0.30	0.30	0.30
		Current strength	[A]	1.95	1.95	1.95	1.95
		validation	[A]	10	10	10	10
	Electric heating element	Voltage supply	[ph]	3~	3~	–	3~
			[V]	400	400	–	400
			[Hz]	50	50	–	50
		Performance	[kW]	3+6	3+6	–	3+6
		Heating levels	–	3	3	–	3
		Current strength	[A]	13	13	–	13
		validation	[A]	16	16	–	16
pump (primary circuit)	Power consumption (at volume flow of 10/20/Lmax/min) 3)	Speed level 1 [W]		10/13/15	10/13/15	10/13/15	10/13/15
		Speed level 2 [W]		16/21/27	16/21/27	16/21/27	16/21/27
		Speed level 3 [W]		24/32/42	24/32/42	24/32/42	24/32/42
		Speed level 4 [W]		34/46/58	34/46/58	34/46/58	34/46/58
		Speed level 5 [W]		47/58/60	47/58/60	47/58/60	47/58/60
	Current strength (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[A]	0.2/0.2/0.3	0.2/0.2/0.3	0.2/0.2/0.3	0.2/0.2/0.3
		Speed level 2 [A]		0.2/0.3/0.4	0.2/0.3/0.4	0.2/0.3/0.4	0.2/0.3/0.4
		Speed level 3 [A]		0.3/0.4/0.5	0.3/0.4/0.5	0.3/0.4/0.5	0.3/0.4/0.5
		Speed level 4 [A]		0.4/0.5/0.6	0.4/0.5/0.6	0.4/0.5/0.6	0.4/0.5/0.6
		Speed level 5 [A]		0.5/0.6/0.6	0.5/0.6/0.6	0.5/0.6/0.6	0.5/0.6/0.6
	Delivery head (at volume flow of 0/20/Lmax)	Speed level 5 [m]		7.5/7.2/4.9	7.5/7.2/4.9	7.5/7.2/4.9	7.5/7.2/4.9
	curve		–	according to the following information			
Volume flow	Primary circuit	max. 4)	[l/min]	36.9	36.9	36.9	36.9
		at least 5)	[l/min]	5.0	5.0	5.0	5.0
Heat exchanger refrigerant primary circuit			–	MWA1-44-DM	MWA1-44-DM	MWA1-44-DM	MWA2-38-PA-4
	Primary circuit drinking water		–	–	–	–	–
Expansion vessel volume			[l]	10	10	–	10
Primary circuit	form		[MPa]	0.1	0.1	–	0.1

Continued on next page

Device name				EHSD-YM9D	ERSD-YM9D	EHSD-MED	EHSC-YM9D
Safety device	Primary circuit	Temperature sensor	[°C]	1~80	1~80	1~80	1~80
		Pressure relief valve	[MPa]	0.3	0.3	0.3	0.3
		Flow monitor (min. flow)	[l/min]	5.0	5.0	5.0	5.0
		Safety temperature limiter (electric heating rod)	[°C]	90	90	–	90
		Thermal validation (electric heating rod)	[°C]	121	121	–	121
connections	Water	Primary circuit [mm]	[mm]	28	G1-A	28	28
	Refrigerant	gas	[mm]	12.7	12.7	12.7	15.88
		liquid		6.35	6.35	6.35	9.52
Refrigerant 8)			Type	R32/R410A	R32/R410A	R32/R410A	R410A
Guaranteed Operating range 9)	Ambient temperature		[°C]	0~35	0~35	0~35	0~35
			[%RH] ÿ 80 [°C]		ÿ 80	ÿ 80	ÿ 80
	Outside temperature	Heat	[°C]	see technical data for outdoor unit			
		Cool		–	10~46 10)	–	–
Operating area	Heat	Room temp.	[°C]	10~30	10~30	10~30	10~30
		flow temp.	[°C]	20~60	20~60	20~60	20~60
	Cool	Room temp.	[°C]	–	–	–	–
		flow temp.	[°C]	–	5~25	–	–
	Drinking water		[°C]	–	–	–	–
	Anti-Legionella program		[°C]	–	–	–	–
Sound power level (PWL)			[dB(A)] 41		41	41	40

1) Value does not include the volume of the domestic hot water circuit, primary circuit DHW (from the 3-way valve to the heating system branch), piping to the expansion vessel.
2) If supplied via its own voltage source.
3) Volume flow depends on the connected outdoor unit.
4) If the maximum volume flow is exceeded, a flow velocity of > 1.5 m/s is reached, which can lead to erosion corrosion.
5) If the volume flow falls below the minimum, the flow monitor is activated.
6) Hot water output varies depending on the outdoor unit connected.
7) Refrigerant circuit between outdoor unit and indoor unit (hydro module or storage module).
8) The environment must be frost-free.
9) For device types without electric heating elements and electric screw-in heaters, the max. hot water temperature = max. flow temperature of the outdoor unit - 3°C. For the maximum flow temperature of the outdoor unit, see the outdoor unit data table.
10) Refer to table in outdoor unit specification. (min. 10°C)
Cooling mode is not available when the ambient temperature is low.
If you use your system in cooling mode at low ambient temperatures (10°C or less), there is a risk of damage to the plate heat exchanger from frozen water.

Device name				ERSC-YM9D	EHSC-MED	ERSC-MED	EHSE-YM9ED
Dimensions	without packaging	Height	[mm]	800	800	800	950
		Width	[mm]	530	530	530	600
		depth	[mm]	360	360	360	360
	with packaging	Height	[mm]	560	560	560	560
		Width	[mm]	600	600	600	690
		depth	[mm]	990	990	990	1150
Housing	Munsell		–	6.2 PB 9/0.9	6.2 PB 9/0.9	6.2 PB 9/0.9	6.2 PB 9/0.9
	RAL code		–	260 90 05	260 90 05	260 90 05	260 90 05
	material		–	pre-coated metal			
Weight (empty)			[kg]	48	40	41	63
Weight (full)			[kg]	55	42	44	73
Gross weight			[kg]	62	53	54	78
Water volume on the heating side (primary circuit) 1)			[l]	6.1	2.6	2.6	10.0
Type of installation			–	wall hanging			
Electrical Data	Control board 2) (including 2 pumps)	Voltage supply	[ph]	~/N	~/N	~/N	~/N
			[V]	230	230	230	230
			[Hz]	50	50	50	50
		Power consumption	[kW]	0.30	0.30	0.30	0.34
		Current strength	[A]	1.95	1.95	1.95	2.56
		validation	[A]	10	10	10	10
	Electric heating element	Voltage supply	[ph]	3~	–	–	3~
			[V]	400	–	–	400
			[Hz]	50	–	–	50
		Performance	[kW]	3+6	–	–	3+6
		Heating levels	–	3	–	–	3
		Current strength	[A]	13	–	–	13
		validation	[A]	16	–	–	16
pump (primary circuit)	Power consumption (at volume flow of 10/20/Lmax/min) 3)	Speed level 1 [W]		10/13/15	10/13/15	10/13/15	31/37/38
		Speed level 2 [W]		16/21/27	16/21/27	16/21/27	51/63/38
		Speed level 3 [W]		24/32/42	24/32/42	24/32/42	75/94/105
		Speed level 4 [W]		34/46/58	34/46/58	34/46/58	106/134/153
		Speed level 5 [W]		47/58/60	47/58/60	47/58/60	148/180/180
	Current strength (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[A]	0.2/0.2/0.3	0.2/0.2/0.3	0.2/0.2/0.3	0.3/0.3/0.3
		Speed level 2 [A]		0.2/0.3/0.4	0.2/0.3/0.4	0.2/0.3/0.4	0.4/0.5/0.5
		Speed level 3 [A]		0.3/0.4/0.5	0.3/0.4/0.5	0.3/0.4/0.5	0.6/0.7/0.8
		Speed level 4 [A]		0.4/0.5/0.6	0.4/0.5/0.6	0.4/0.5/0.6	0.9/1.1/1.2
		Speed level 5 [A]		0.5/0.6/0.6	0.5/0.6/0.6	0.5/0.6/0.6	1.2/1.4/1.4
	Delivery head (at volume flow of 0/20/Lmax)	Speed level 5 [m]		7.5/7.2/4.9	7.5/7.2/4.9	7.5/7.2/4.9	12.7/11/9.5
	curve		–	according to the following information			
Volume flow	Primary circuit	max. 4)	[l/min]	36.9	36.9	36.9	61.5
		at least 5)	[l/min]	5.0	5.0	5.0	5.0
Heat exchanger refrigerant primary circuit			–	MWA2-38-PA-4	MWA2-38-PA-4	MWA2-38-PA-4	MWA2-72PA
	Primary circuit drinking water		–	–	–	–	–
Expansion vessel volume			[l]	10	–	–	–
Primary circuit	form		[MPa]	0.1	–	–	–

Continued on next page

Device name				ERSC-YM9D	EHSC-MED	ERSC-MED	EHSE-YM9ED
Safety device	Primary circuit	Temperature sensor [°C]		1~80	1~80	1~80	1~80
		Pressure relief valve [MPa]		0.3	0.3	0.3	0.3
		Flow [l/min] monitor (min. flow)		5.0	5.0	5.0	5.0
		Safety temperature limiter (electric heating rod)	[°C]	90	–	–	90
		Thermal validation (electric heating rod)	[°C]	121	–	–	121
connections	Water	Primary circuit [mm]		G1-A	28	G1-B	G1-1/2-B
	Refrigerant	gas	[mm]	15.88	15.88	15.88	25.4 (soldered)
		liquid	[mm]	9.52	9.52	9.52	9.52
Refrigerant 8)				R410A	R410A	R410A	R410A
Guaranteed Operating range 9)	Ambient temperature		Type [°C]	0~35	0~35	0~35	0~35
			[%RH] ÿ 80		ÿ 80	ÿ 80	ÿ 80
	Outside temperature	Heat	[°C]	see technical data for outdoor unit			
		Cool	[°C]	10~46	–	10~46	–
Operating area	Heat	Room temp.	[°C]	10~30	10~30	10~30	10~30
		flow temp.	[°C]	20~60	20~60	20~60	20~60
	Cool	Room temp.	[°C]	–	–	–	–
		flow temp.	[°C]	5~25	–	5~25	–
	Drinking water		[°C]	–	–	–	–
	Anti-Legionella program		[°C]	–	–	–	–
Sound power level (PWL)			[dB(A)] 40		40	40	45

1) Value does not include the volume of the domestic hot water circuit, primary circuit DHW (from the 3-way valve to the heating system branch), piping to the expansion vessel.

2) If supplied via its own voltage source.
3) Volume flow depends on the connected outdoor unit.
4) If the maximum volume flow is exceeded, a flow velocity of > 1.5 m/s is reached, which can lead to erosion corrosion.
5) If the volume flow falls below the minimum, the flow monitor is activated.
6) Hot water output varies depending on the outdoor unit connected.
7) Refrigerant circuit between outdoor unit and indoor unit (hydro module or storage module).
8) The environment must be frost-free.
9) For device types without electric heating elements and electric screw-in heaters, the max. hot water temperature = max. flow temperature of the outdoor unit - 3°C.
For the maximum flow temperature of the outdoor unit, see the outdoor unit data table.

Device name				ERSE-YM9ED	EHSE-MED	ERSE-MED	EHPX-YM9D
Dimensions	without packaging	Height	[mm]	950	950	950	800
		Width	[mm]	600	600	600	530
		depth	[mm]	360	360	360	360
	with packaging	Height	[mm]	560	560	560	560
		Width	[mm]	690	690	690	600
		depth	[mm]	1150	1150	1150	990
Housing	Munsell		–	6.2 PB 9/0.9	6.2 PB 9/0.9	6.2 PB 9/0.9	6.2 PB 9/0.9
	RAL code		–	260 90 05	260 90 05	260 90 05	260 90 05
	material		–	pre-coated metal			
Weight (empty)			[kg]	64	61	62	33
Weight (full)			[kg]	74	71	72	38
Gross weight			[kg]	79	76	77	46
Water volume on the heating side (primary circuit) 1)			[l]	10.0	10.0	10.0	4.5
Type of installation			–	wall hanging			
Electrical Data	Control board 2) (including 2 pumps)	Voltage supply	[ph]	~/N	~/N	~/N	~/N
			[V]	230	230	230	230
			[Hz]	50	50	50	50
		Power consumption	[kW]	0.34	0.34	0.34	0.30
		Current strength	[A]	2.56	2.56	2.56	1.95
		validation	[A]	10	10	10	10
	Electric heating element	Voltage supply	[ph]	3~	–	–	3~
			[V]	400	–	–	400
			[Hz]	50	–	–	50
		Performance	[kW]	3+6	–	–	3+6
		Heating levels	–	3	–	–	3
		Current strength	[A]	13	–	–	13
		validation	[A]	16	–	–	16
pump (primary circuit)	Power consumption (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[W]	31/37/38	31/37/38	31/37/38	10/13/15
		Speed level 2	[W]	51/63/38	51/63/38	51/63/38	16/21/27
		Speed level 3	[W]	75/94/105	75/94/105	75/94/105	24/32/42
		Speed level 4	[W]	106/134/153	106/134/153	106/134/153	34/46/58
		Speed level 5	[W]	148/180/180	148/180/180	148/180/180	47/58/60
	Current strength (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[A]	0.3/0.3/0.3	0.3/0.3/0.3	0.3/0.3/0.3	0.2/0.2/0.3
		Speed level 2	[A]	0.4/0.5/0.5	0.4/0.5/0.5	0.4/0.5/0.5	0.2/0.3/0.4
		Speed level 3	[A]	0.6/0.7/0.8	0.6/0.7/0.8	0.6/0.7/0.8	0.3/0.4/0.5
		Speed level 4	[A]	0.9/1.1/1.2	0.9/1.1/1.2	0.9/1.1/1.2	0.4/0.5/0.6
		Speed level 5	[At	1.2/1.4/1.4	1.2/1.4/1.4	1.2/1.4/1.4	0.5/0.6/0.6
	Delivery head (at volume flow of 0/20/Lmax)	Speed level 5	the]	12.7/11/9.5	12.7/11/9.5	12.7/11/9.5	7.5/7.2/4.9
	curve		–	according to the following information			
Volume flow	Primary circuit	max. 4)	[l/min]	61.5	61.5	61.5	36.9
		at least 5)	[l/min]	5.0	5.0	5.0	5.0
Heat exchanger refrigerant primary circuit				MWA2-72PA	MWA2-72PA	MWA2-72PA	–
	Primary circuit drinking water			–	–	–	–
Expansion vessel primary circuit		volume	[l]	–	–	–	10
		form	[MPa] –		–	–	0.1

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Device name				ERSE-YM9ED	EHSE-MED	ERSE-MED	EHPX-YM9D
Safety device	Primary circuit	Temperature sensor [°C]		1~80	1~80	1~80	1~80
		Pressure relief valve	[MPa]	0.3	0.3	0.3	0.3
		Flow monitor (min. flow)	[l/min]	5.0	5.0	5.0	5.0
		Safety temperature limiter (electric heating element)	[°C]	90	–	–	90
		Thermal validation (electric heating rod)	[°C]	121	–	–	121
connections	Water	Primary circuit	[mm]	G1-1/2-B	G1-1/2-B	G1-1/2-B	28
	Refrigerant	gas	[mm]	25.4 (soldered)	25.4 (soldered)	25.4 (soldered)	–
		liquid	[mm]	9.52	9.52	9.52	–
Refrigerant 8)			Type	R410A	R410A	R410A	R32
Guaranteed Operating range 9)	Ambient temperature		[°C]	0~35	0~35	0~35	0~35
			[%RH] ÿ 80 [°C]		ÿ 80	ÿ 80	ÿ 80
	Outside temperature	Heat		see technical data for outdoor unit			
		Cool	[°C]	10~46	–	10~46	–
Heating **operating range**		Room temp.	[°C]	10~30	10~30	10~30	10~30
		flow temp.	[°C]	20~60	20~60	20~60	20~60
	Cool	Room temp.	[°C]	–	–	–	–
		flow temp.	[°C]	5~25	–	5~25	–
	Drinking water		[°C]	–	–	–	–
	Anti-Legionella program		[°C]	–	–	–	–
Sound power level (PWL)			[dB(A)] 45		45	45	40

1) Value does not include the volume of the domestic hot water circuit, primary circuit DHW (from the 3-way valve to the heating system branch), piping to the expansion vessel.

2) If supplied via its own voltage source.
3) Volume flow depends on the connected outdoor unit.
4) If the maximum volume flow is exceeded, a flow velocity of > 1.5 m/s is reached, which can lead to erosion corrosion.
5) If the volume flow falls below the minimum, the flow monitor is activated.
6) Hot water output varies depending on the outdoor unit connected.
7) Refrigerant circuit between outdoor unit and indoor unit (hydro module or storage module).
8) The environment must be frost-free.
9) For device types without electric heating elements and electric screw-in heaters, the max. hot water temperature = max. flow temperature of the outdoor unit - 3°C.
For the maximum flow temperature of the outdoor unit, see the outdoor unit data table.

Device name				ERPX-YM9D	EHPX-MED	ERPX MD
Dimensions	without packaging	Height	[mm]	800	800	800
		Width	[mm]	530	530	530
		depth	[mm]	360	360	360
	with packaging	Height	[mm]	560	560	560
		Width	[mm]	600	600	600
		depth	[mm]	990	990	990
Housing	Munsell		–	6.2 PB 9/0.9	6.2 PB 9/0.9	6.2 PB 9/0.9
	RAL code		–	260 90 05	260 90 05	260 90 05
	material		–	pre-coated metal		
Weight (empty)			[kg]	35	25	30
Weight (full)			[kg]	39	26	31
Gross weight			[kg]	48	38	44
Water volume on the heating side (primary circuit) 1)			[l]	4.5	1.0	1.0
Type of installation			–	wall hanging		
Electrical Data	Control board 2) (including 4 pumps)	Voltage supply	[ph]	~/N	~/N	~/N
			[V]	230	230	230
			[Hz]	50	50	50
		Power consumption	[kW]	0.30	0.30	0.30
		Current strength	[A]	1.95	1.95	1.95
		validation	[A]	10	10	10
	Electric heating element	Voltage supply	[ph]	3~	–	–
			[V]	400	–	–
			[Hz]	50	–	–
		Performance	[kW]	3+6	–	–
		Heating levels	–	3	–	–
		Current strength	[A]	13	–	–
		validation	[A]	16	–	–
pump (primary circuit)	Power consumption (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[W]	10/13/15	10/13/15	10/13/15
		Speed level 2	[W]	16/21/27	16/21/27	16/21/27
		Speed level 3	[W]	24/32/42	24/32/42	24/32/42
		Speed level 4	[W]	34/46/58	34/46/58	34/46/58
		Speed level 5	[W]	47/58/60	47/58/60	47/58/60
	Current strength (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[A]	0.2/0.2/0.3	0.2/0.2/0.3	0.2/0.2/0.3
		Speed level 2	[A]	0.2/0.3/0.4	0.2/0.3/0.4	0.2/0.3/0.4
		Speed level 3	[A]	0.3/0.4/0.5	0.3/0.4/0.5	0.3/0.4/0.5
		Speed level 4	[A]	0.4/0.5/0.6	0.4/0.5/0.6	0.4/0.5/0.6
		Speed level 5	[At	0.5/0.6/0.6	0.5/0.6/0.6	0.5/0.6/0.6
	Delivery head (at volume flow of 0/20/Lmax)	Speed level 5	the]	7.5/7.2/4.9	7.5/7.2/4.9	7.5/7.2/4.9
	curve		–	according to the following information		
Volume flow	Primary circuit	max. 4)	[l/min] 36.9	[l/	36.9 36.9	
		at least 5)	min] 5.0		5.0	5.0
Heat exchanger refrigerant primary circuit				–	–	–
	Primary circuit drinking water			–	–	–
Expansion vessel primary circuit		volume	[l]	10	–	10
		form	[MPa]	0.1	–	0.10

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Device name				ERPX-YM9D	EHPX-MED	ERPX MD
Safety device	Primary circuit	Temperature sensor [°C]		1~80	1~80	1~80
		Pressure relief	[MPa]	0.3	0.3	0.3
		valve Flow monitor (min. flow)	[l/min]	5.0	5.0	5.0
		Safety temperature limiter (electric heating rod)	[°C]	90	–	90
		Thermal validation (electric heating rod)	[°C]	121	–	121
connections	Water	Primary circuit	[mm]	G1-A	28	G1-A
	Refrigerant	gas	[mm]	–	–	–
		liquid	[mm]	–	–	–
Refrigerant 7)				Water	R32	Water
Guaranteed Operating range 8)	Ambient temperature		Type [°C]	0~35	0~35	0~35
			[%RH] ÿ 80		ÿ 80	ÿ 80
	Outside temperature	Heat	[°C]	see technical data for outdoor unit		
		Cool	[°C]	10~46 8)	–	10~46 8)
Operating range 9)	Heat	Room temp.	[°C]	10~30	10~30	10~30
		flow temp.	[°C]	20~60	20~60	20~60
	Cool	Room temp.	[°C]	–	–	–
		flow temp.	[°C]	5~25	–	5~25
	Drinking water		[°C]	–	–	–
	Anti-Legionella program		[°C]	–	–	–
Sound power level (PWL)			[dB(A)] 40		40	40

1) Value does not include the volume of the domestic hot water circuit, primary circuit DHW (from the 3-way valve to the heating system branch), piping to the expansion vessel.
2) If supplied via its own voltage source.
3) Volume flow depends on the connected outdoor unit.
4) If the maximum volume flow is exceeded, a flow velocity of > 1.5 m/s is reached, which can lead to erosion corrosion.
5) If the volume flow falls below the minimum, the flow monitor is activated.
6) Hot water output varies depending on the outdoor unit connected.
7) Refrigerant circuit between outdoor unit and indoor unit (hydro module or storage module).
8) The environment must be frost-free.
9) For device types without electric heating elements and electric screw-in heaters, the max. hot water temperature = max. flow temperature of the outdoor unit - 3°C. For the maximum flow temperature of the outdoor unit, see the outdoor unit data table.
10) Refer to table in outdoor unit specification. (min. 10°C)
Cooling mode is not available when the ambient temperature is low.
If you use your system in cooling mode at low ambient temperatures (10°C or less), there is a risk of damage to the plate heat exchanger from frozen water.

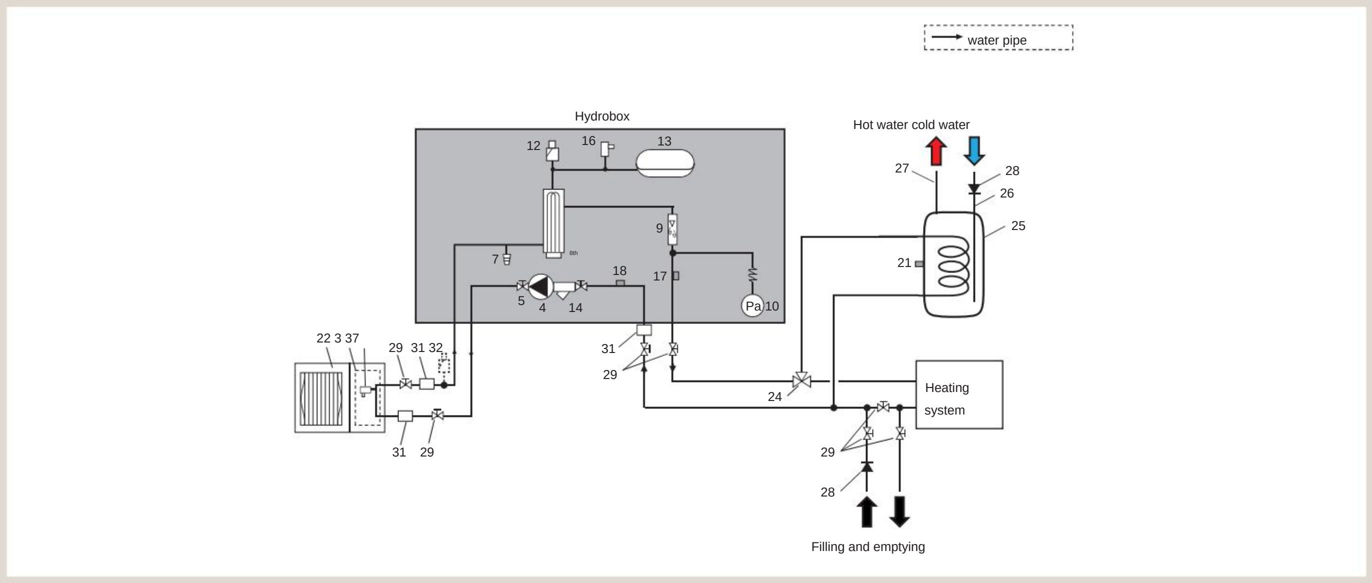
4.6.2 Hydraulic structure

Installation instructions
• The connections for the domestic hot water are not included in the hydro module package and must be provided by the customer. • Observe local regulations for water connections.

• Install a filter in the inlet of the hydromodule. • Drain lines at all safety valves must be installed in accordance with local regulations. • Install a backflow preventer according to IEC 61770 on the cold water inlet.

• If components or connecting pipes made of different metals are used, the connections must be
Connection pieces must be insulated to prevent any damage caused by corrosion.

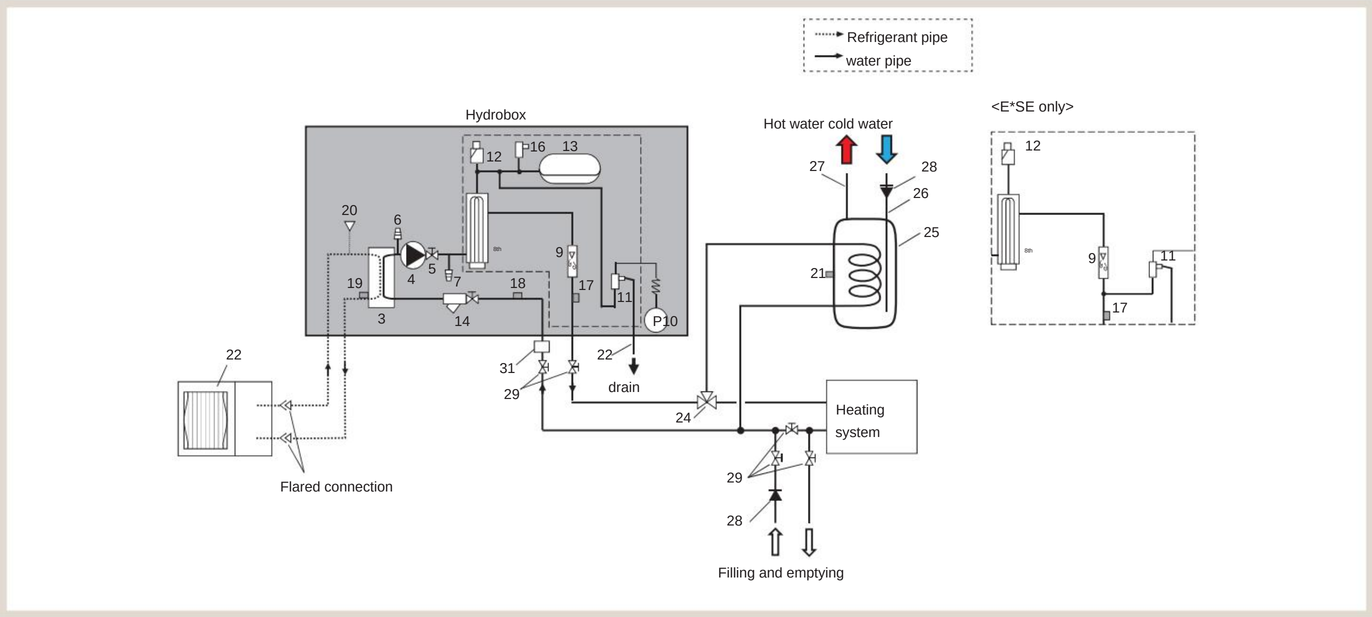
EHPX



A NOTICE!
Do not install an additional pressure relief valve on the heating circuit of an E*PT**X device.

3	plate heat exchangers	**13**	expansion tank	**25**	external hot water tanks (on site)
4	Primary pump 1	**14**	Dirt trap **16**	**26**	Cold water (on site)
5	pump shut-off valve		Pressure relief valve (5 bar)	**27**	Hot water (on site)
7	Drain tap (heating circuit)	**17**	Temperature sensor flow THW1	**28**	backflow preventers (on site)
8	electric heating element 1, 2	**18**	Temperature sensor return THW2	**29**	Shut-off valve (on site)
9	flow sensor	**21**	temperature sensor for domestic hot water TH5B	**31**	filters
10	pressure gauges	**22**	outdoor unit	**32**	breathers (on site)
12	Automatic air vent	**24**	3-way diverter valve		

EHSD/EHSC/EHSE/ERSD/ERSC/ERSE



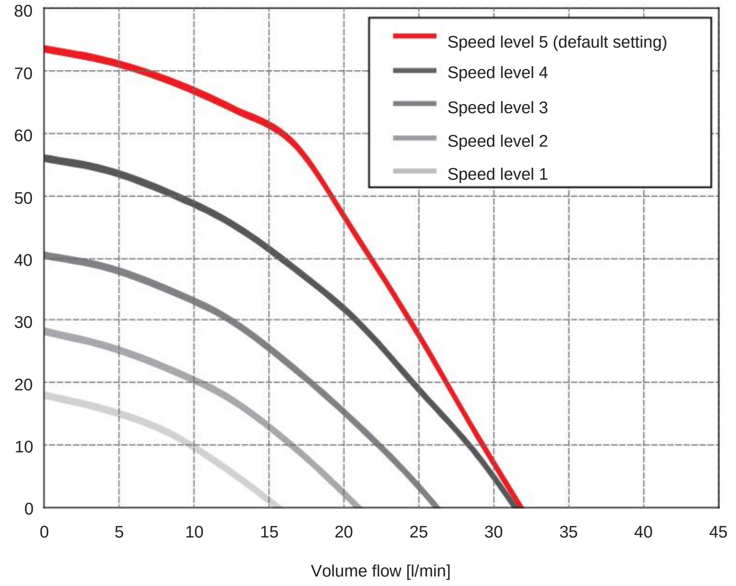
A NOTICE!

Do not install an additional pressure relief valve on the heating circuit of an E*PT**X device.

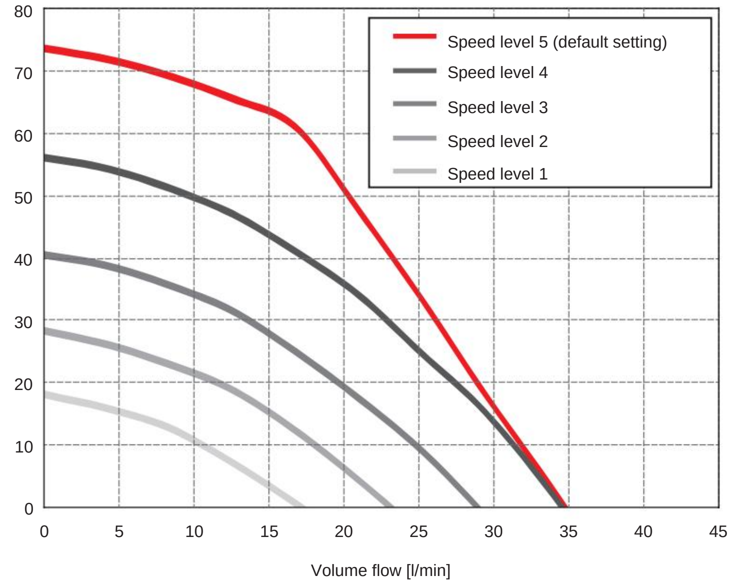
3 plate heat exchangers	**13** expansion tank	**24** 3-way diverter valve
4 Primary pump 1	**14** Dirt trap **16**	**25** external hot water tanks (on site)
5 pump shut-off valve	Pressure relief valve (5 bar)	**26** Cold water (on site)
7 Drain tap (heating circuit)	**17** Temperature sensor flow THW1	**27** Hot water (on site)
8 electric heating element 1, 2	**18** Temperature sensor return THW2	**28** backflow preventers (on site)
9 flow sensor	**19** Temperature sensor refrigerant liquid TH2	**29** Shut-off valve (on site)
10 pressure gauges	**20** pressure sensor	**31** filters
11 Pressure relief valve (3 bar)	**21** temperature sensor for domestic hot water TH5B	
12 Automatic air vent	**22** outdoor unit	

4.6.3 Pump characteristics

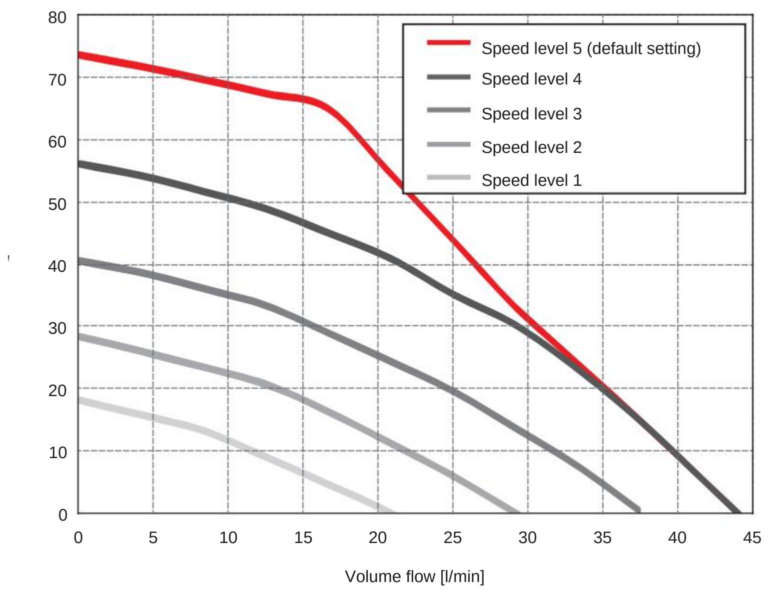
ERSD



EHSD

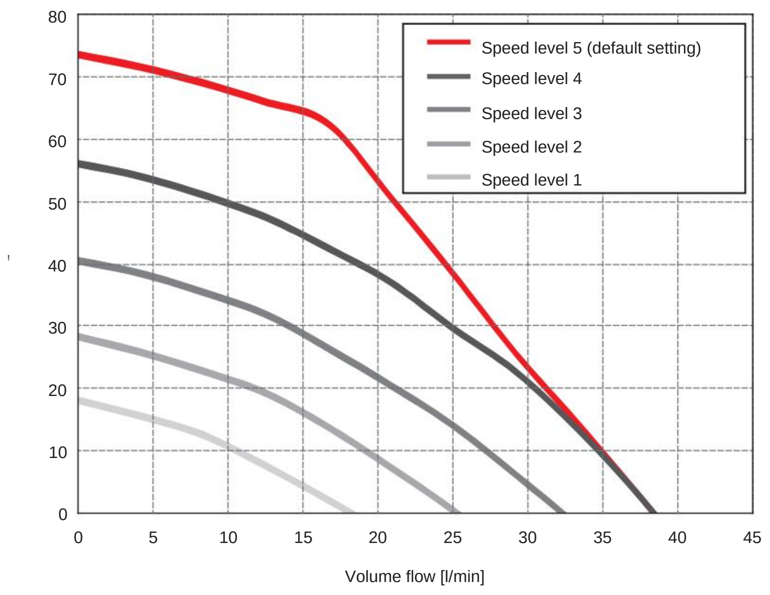


EHSC



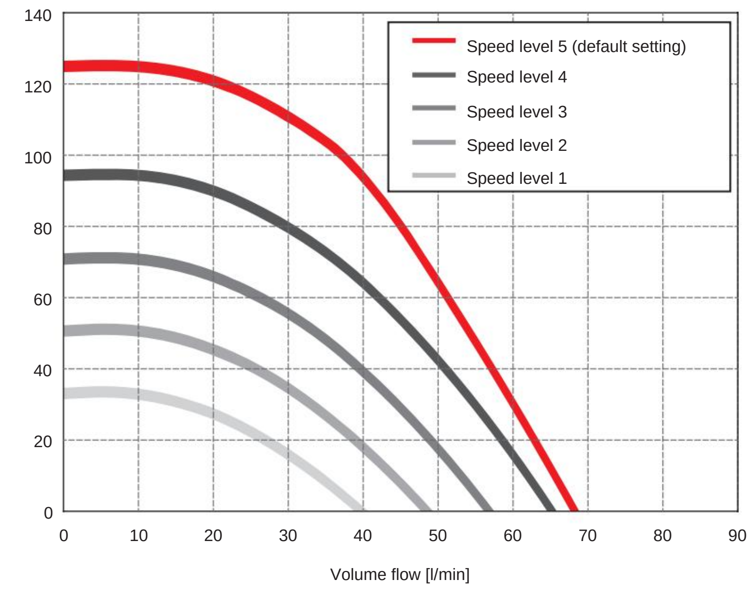
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
30
35
40
45
Volume flow [l/min]
Speed level 5 (default setting)
Speed level 4
Speed level 3
Speed level 2
Speed level 1

ERSC

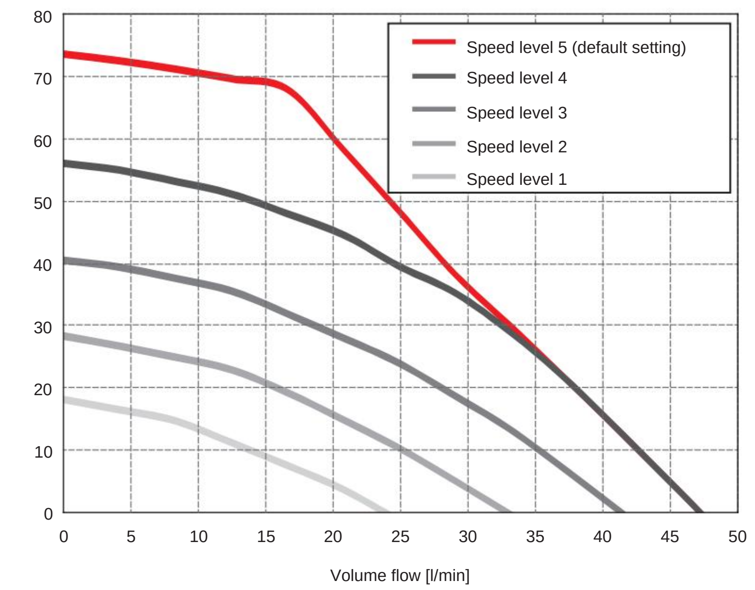


80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
30
35
40
45
Volume flow [l/min]
Speed level 5 (default setting)
Speed level 4
Speed level 3
Speed level 2
Speed level 1

EHSE/ERSE



EHPX



4.6.4 Recommended minimum volume flows

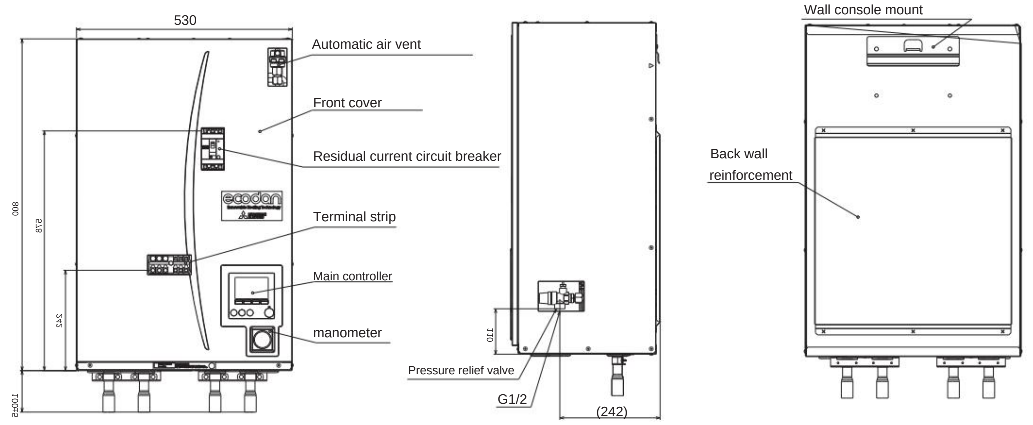
Setting the flow speed on the primary pump

The pump speed can be adjusted in 5 stages on the pump using the control unit. Adjust the pump speed so that the flow rate in the primary circuit is suitable for the installed outdoor unit.

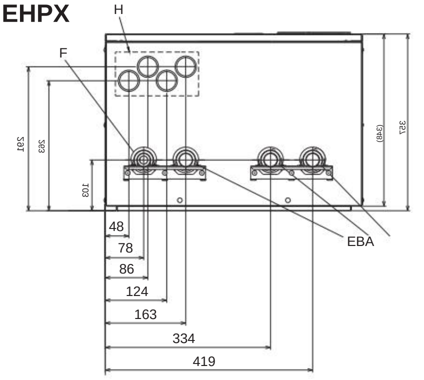
Volume flow in the primary circuit	Outdoor unit	Volume flow [l/min]
Monoblock		
Power inverters	PUZ-WM50VHA	6.5 – 14.3
	PUZ-WM60VAA	8.6 – 17.2
	PUZ-WM85YAA	10.8 – 24.4
	PUZ-WM112YAA	14.4 – 32.1
Zubadan inverter	PUZ-HWM140YHA	17.7 – 40.1
Eco inverter	QUHZ-W40VA	3.0 – 8.0
Split		
Power inverters	PUD-SWM60VAA	9.0 – 22.9
	PUD-SWM80YAA	9.0 – 22.9
	PUD-SWM100YAA	14.3 – 34.4
	PUD-SWM120YAA	14.3 – 34.4
Zubadan inverter	PUD-SHWM60VAA	9.0 – 22.9
	PUD-SHWM80YAA	9.0 – 22.9
	PUD-SHWM10YAA	14.3 – 34.4
	PUD-SHWM120YAA	14.3 – 34.4
	PUD-SHWM140YAA	14.3 – 34.4
	PUHZ-SHW140YHAR5	17.9 – 36.9
Eco inverter	SUZ-SWM40VA	6.5 – 11.4
	SUZ-SWM60VA	7.2 – 17.2
	SUZ-SWM80VA	7.8 – 21.5

* If the volume flow falls below 5.0 l/min, the flow sensor is triggered.
If the volume flow exceeds 36.9 l/min and the flow velocity is higher than 2.0 m/s, this may lead to erosion corrosion of the pipes.

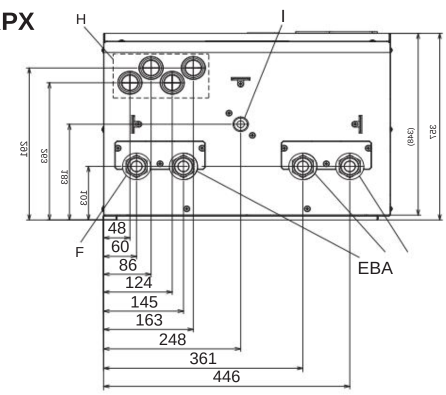
4.6.5 Dimensions



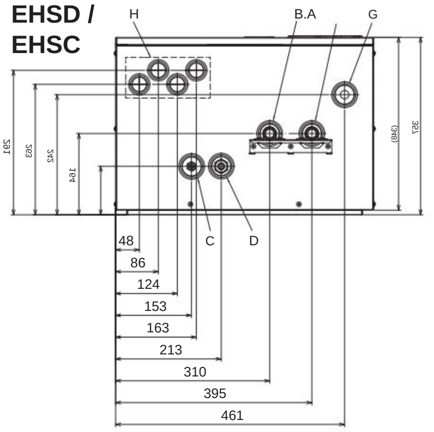
EHPX



ERPX



EHSD / EHSC



ERSD / ERSC

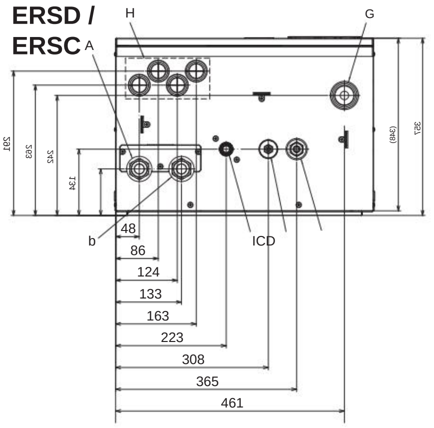


Fig.	Pipe description A	Connection size/type
	Return connection (heating and/or domestic hot water)	28 mm clamp connection (EHSD/EHSC/EHPX-*) G1 (ERSD/ERSC/ERPX-*) G1-1/2 (E*SE-*)
b	Flow connection (heating and/or domestic hot water)	28 mm clamp connection (EHSD/EHSC/EHPX-*) G1 (ERSD/ERSC/ERPX-*) G1-1/2 (E*SE-*)
C	Refrigerant (liquid)	6.35 mm/flare (E*SD-*) 9.52 mm/flare (E*SC-*) 9.52 mm/flare (E*SE-*)
D	Refrigerant (gas)	12.7 mm/flare (E*SD-*) 15.88 mm/flare (E*SC-*) ø25.4 solder connection
E	Heat pump flow connection 28 mm clamp connection (EHPX-*); G1 (ERPX-*)	
F	Heat pump return connection 28 mm clamp connection (EHPX-*), G1 (ERPX-*)	
G	Connection drain safety valve G1/2'' IT (connection within hydro module housing)	
H	Electrical cable entry ①②③④	Cable glands 1 and 2 for high voltage wiring including power cables, indoor/outdoor cables and external output cables. Cable bushings 3 and 4 for low-voltage wiring including external signal and temperature sensor cables. For a radio receiver (optional) use cable entry 4.
I	Condensate drain	ø20 AG

Notice

• The connection of the refrigerant lines must be freely accessible for maintenance purposes. • If the refrigerant lines are to be reconnected after disconnecting, leave them rebuild the expanded part of the line.

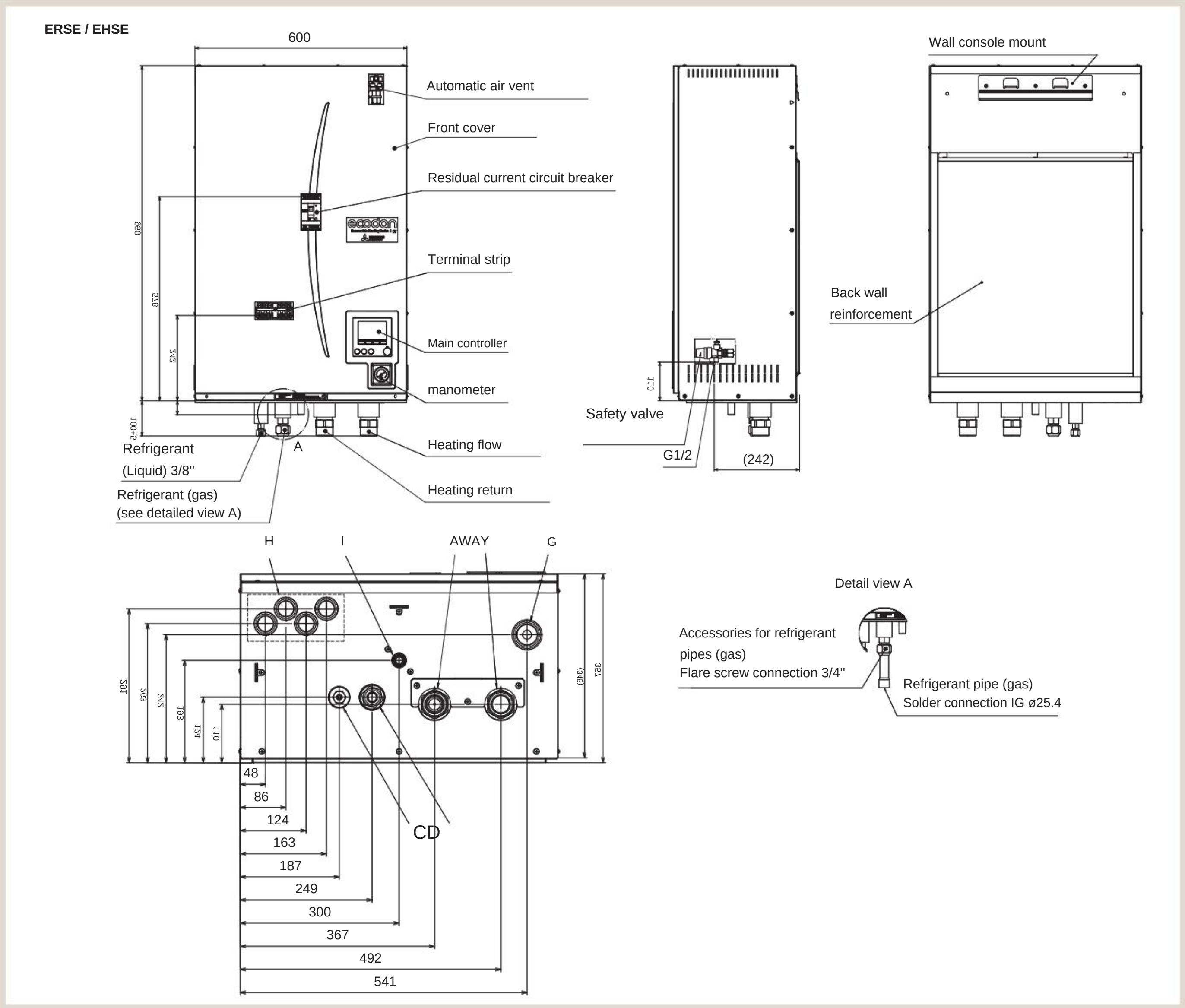


Fig.	Pipe description	Connection size/type	
A	Return connection (Heating and/or domestic hot water)	28 mm clamp connection (EHSD/EHSC/EHPX-*) G1 (ERSD/ERSC-*) G1-1/2 (E*SE-*)	
b	Flow connection (Heating and/or domestic hot water)	28 mm clamp connection (EHSD/EHSC/EHPX-*) G1 (ERSD/ERSC-*) G1-1/2 (E*SE-*)	
C	Refrigerant (liquid)	6.35 mm/flare (E*SD-*) 9.52 mm/flare (E*SC-*) 9.52 mm/flare (E*SE-*)	**Notice** • The connection of the refrigerant lines must be freely accessible for maintenance purposes. • If the refrigerant lines are to be reconnected after loosening, have the flared part of the line rebuilt.
D	Refrigerant (gas)	12.7 mm/flare (E*SD-*) 15.88 mm/flare (E*SC-*) ø25.4 solder connection	
E	Heat pump flow connection	28 mm clamp connection (EHPX-*)	
F	Heat pump return connection	28 mm clamp connection (EHPX-*)	
G	Connection drain safety valve	G1/2" IT (connection within hydro module housing)	
H	Electrical cable entry ①②③④	Cable glands 1 and 2 for high voltage wiring including power cables, indoor/outdoor cables and external output cables. Cable glands 3 and 4 for low voltage wiring including external signal and temperature sensor cables. For a radio receiver (optional) use cable gland 4. ø20 AG	
I	Condensate drain		

5. Device description brine/water heat pumps

5.1 System structure

The Geodan heat pump installed in the building is connected to a geothermal probe or a geothermal collector to be provided on site. Inside the heat pump there is a hermetically closed refrigeration circuit in which the refrigerant circulates.

The brine circuit absorbs the energy underground and transfers it to the refrigerant in the heat pump. The refrigerant evaporates within the system and is passed on to the compressor. The gaseous refrigerant is compressed in the compressor - causing the temperature to rise.
In the next step, the energy is passed on to the heat distribution system in the building. The cooled refrigerant is pumped through the probe or collector again - the cycle begins again.

In parallel to the heating, the Geodan heat pump also provides hot water. An integrated 170 liter hot water tank provides hot water up to 60 °C at any time of the year.

5.2 Technical data

Device name				EHGT17D-YM9ED
Dimensions	without packaging	Height	[mm]	1750
		Width	[mm]	595
		depth	[mm]	680
	with packaging	Height	[mm]	1850
		Width	[mm]	660
		depth	[mm]	800
Housing	Munsell		–	6.2PB 9/0.9
	RAL code		–	260 90 05
	material		–	Pre-coated metal
Weight (empty)			[kg]	181
Weight (full)			[kg]	360
Gross weight			[kg]	198
Water volume on the heating side (primary circuit) 1)			[l]	5.47
Type of installation			–	floor standing
Electrical data	Heat pump (without electric heating element)	Voltage supply	[ph]	3N~
			[V]	400
			[Hz]	50
		validation	[A]	16
	Electric heating element	Voltage supply	[ph]	3~
			[V]	400
			[Hz]	50
		Performance	[kW]	9
		Heating step	–	3
		Current strength	[A]	13
		validation	[A]	16
pump (primary circuit)	Type			DC motor
	Power consumption (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[W]	10/13/15
		Speed level 2 [W]		16/21/27
		Speed level 3 [W]		24/32/42
		Speed level 4 [W]		34/46/58
		Speed level 5 [W]		47/58/60
	Current strength (at volume flow of 10/20/Lmax/min) 3)	Speed level 1	[A]	0.2/0.2/0.3
		Speed level 2	[A]	0.2/0.3/0.4
		Speed level 3	[A]	0.3/0.4/0.5
		Speed level 4	[A]	0.4/0.5/0.6
		Speed level 5	[A]	0.5/0.6/0.6
	Delivery head (at volume flow of 0/20/Lmax)	Speed level 5	[m]	7.5/7.2/4.9
pump (hot water)	Power consumption (Default setting: Speed level 2	Speed level 1	[W]	55
		Speed level 2 [W]		69
		Speed level 3 [W]		80
	Current strength (Default setting: Speed level 2	Speed level 1	[A]	0.25
		Speed level 2	[A]	0.31
		Speed level 3	[A]	0.34
	Volume flow (Default setting: Speed level 2	Speed level 1	[l/min]	13.5
		Speed level 2	[l/min]	19.0
		Speed level 3	[l/min]	22.9

Continued on next page

Device name				EHGT17D-YM9ED
Volume flow	Primary circuit	max. 2)	[l/min]	27.7
		at least 3)	[l/min]	7.1
Heat exchanger	Brine circuit - refrigerant			MWA1-70PA
	Refrigerant - primary circuit		–	MWA1-44PA
	Primary circuit drinking water		–	CBH18-24H
Domestic hot water tank	volume		[l]	170
	material		–	Duplex 2304 stainless steel (EN10088)
	Explained load profile			L
	ÿwh efficiency of water heating			134
	Energy efficiency class of water heating			A+
Safety device	Primary circuit	Temperature sensor [°C]		1~80
		Pressure relief valve [MPa]		0.3
		Flow monitor (Min. flow)	[l/min]	5.0
		Safety temperature limiter (electric heating rod)	[°C]	90
		Thermal validation (electric heating rod)	[°C]	121
	Hot water tank temperature sensor [°C]			40~70
Brine cycle	Temperature sensor		[°C]	-8~30
	Flow monitor (min. flow)		[l/min]	5.5
Refrigerant circulation	Temperature sensor (high)		[°C]	-20~125
	Temperature sensor (low)		[°C]	-40 ~90
	Pressure switch		[MPa]	4.14 ± 0.1
	Pressure sensor		[MPa]	0~0.5
connections	Water	Primary circuit [mm] [mm]		ÿ 28
		Hot water	[mm]	ÿ 22
	Brine			ÿ 28
Refrigerant			–	R32
Guaranteed Operating range 4)	Ambient temperature		[°C]	0~35
			[%RH]	ÿ 80
Operating area	Heat	Room temperature [°C]		10~30
		Flow temperature [°C]		20~60
	Drinking water		[°C]	40~60
	Anti-Legionella program		[°C]	60~70
Sound pressure level (SPL)			[dB(A)]	42
Sound power level (PWL)			[dB(A)]	53

1) The volume of the sanitary water circuit is not included in this value.

2) When the water flow rate exceeds the maximum, the flow speed is greater than 1.5m/s, which may cause erosion corrosion.

3) If the volume flow falls below the minimum, the flow monitor is activated.

4) The environment must be frost-free.

5.3 Hydraulic structure

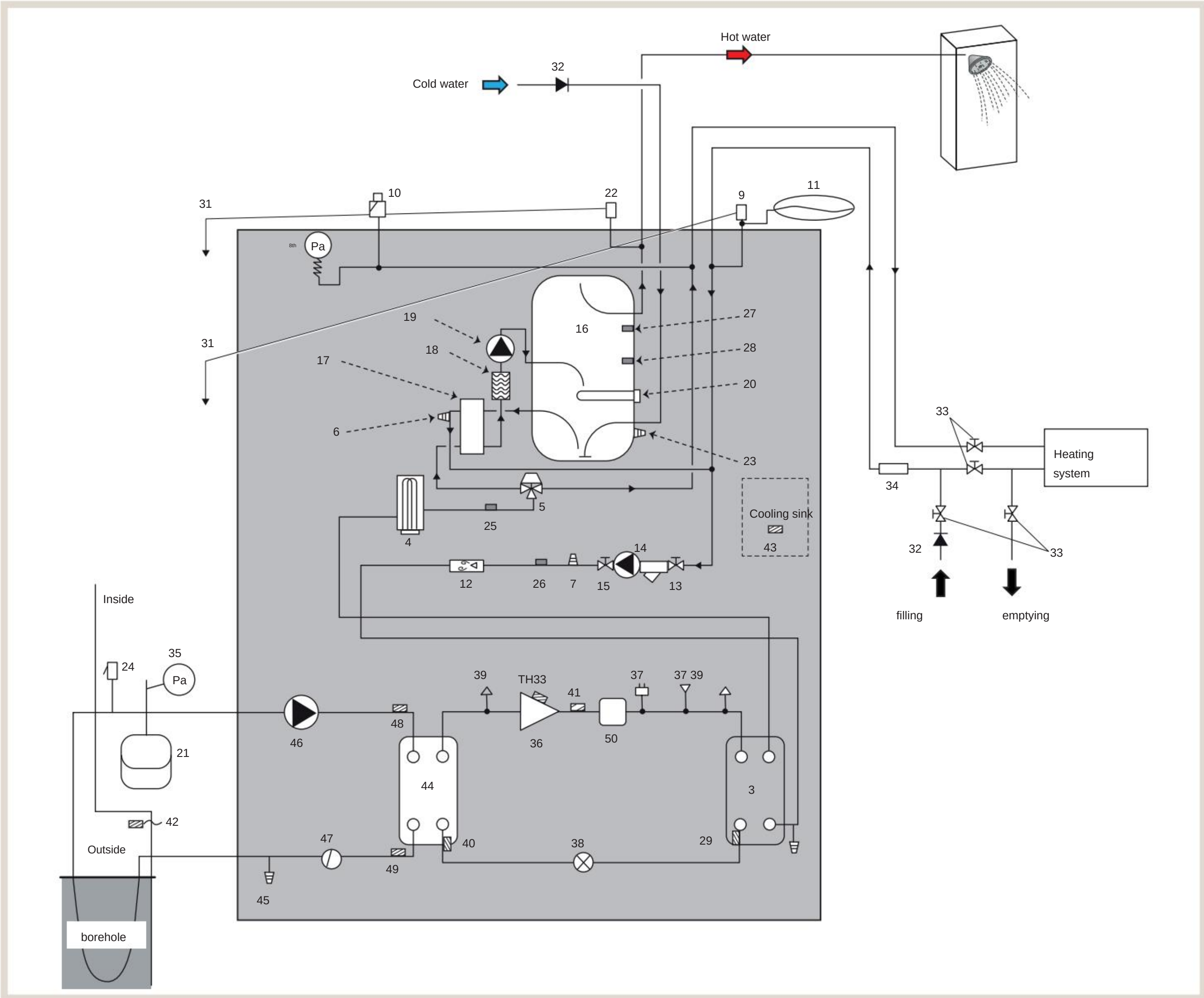
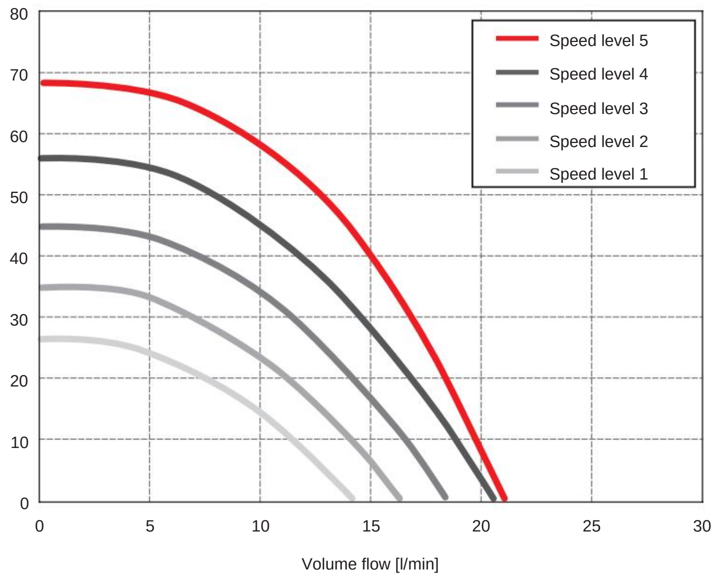


plate heat exchangers (refrigerant - water)	Charging pump domestic hot water circuit	compressor
4 electric heating element 1, 2	**20** electric heating element (TWW) (optional components)	**37** High pressure switch/sensor
5 3-way valve	**21** Level container (on site) **22**	**38** Linear expansion valve
6 Manual venting	Pressure relief valve (10 bar) (drinking water)	**39** charging plugs
7 Drain tap (primary circuit)	**23** Drain cock (TWW storage) **24** Pressure	**40** liquid temperature sensors (TH3)
8 pressure gauges	relief valve (3 bar) (on site)	**41** outlet temperature sensor (TH4)
9 Pressure relief valve (3 bar)	**25** temperature sensor flow (THW1)	**42** outside temperature sensors (TH7)
10 Automatic air vent	**26** Return temperature sensor (THW2)	**43** heat sink temperature sensor (TH8)
11 Expansion vessel (optional components)	**27** TWW storage temperature sensor (THW5A)	**45** Drainage tap (brine circuit)
12 flow sensor	**28** temperature sensors TWW storage (THW5B)	**46** brine circulation pump
13 mud flaps	**29** Temperature sensor refrigerant liquid (TH2)	**47** flow monitors
14 Heating circuit pump 1 (primary circuit)	**31** Drain pipe (on site)	**48** brine inlet temperature sensor (TH32)
15 pump shut-off valve	**32** backflow preventers (on site)	**49** Brine outlet temperature sensor (TH34)
16 domestic hot water tanks	**33** Shut-off valve (on site)	**50** silencers
17 plate heat exchangers (heating water - TWW)	**34** magnetic filters (provided by customer) (recommended)	
18 limescale separators	**35** pressure gauges (on site)	

5.4 Pump characteristics



5.5 Recommended minimum volume flows

Setting the flow speed on the primary pump

The pump speed can be adjusted in 5 stages on the pump using the control unit. Adjust the pump speed so that the flow rate in the primary circuit is suitable for the installed outdoor unit.

Device	Range of water delivery rate [l/min]
EHGT17D-YM9ED	7.1 – 27.7

If the volume flow falls below 7.1 l/min, the flow sensor in the storage module is triggered.
If the volume flow exceeds 27.7 l/min and the flow velocity is higher than 1.5 m/s, this may lead to erosion corrosion of the pipes.

5.6 Heating times

Heating time [min]	170 litres
	Brine temperature 0 °C
EHGT17D-YM9ED	75

5.7 Dimensions

EHGT17DE-YM9ED

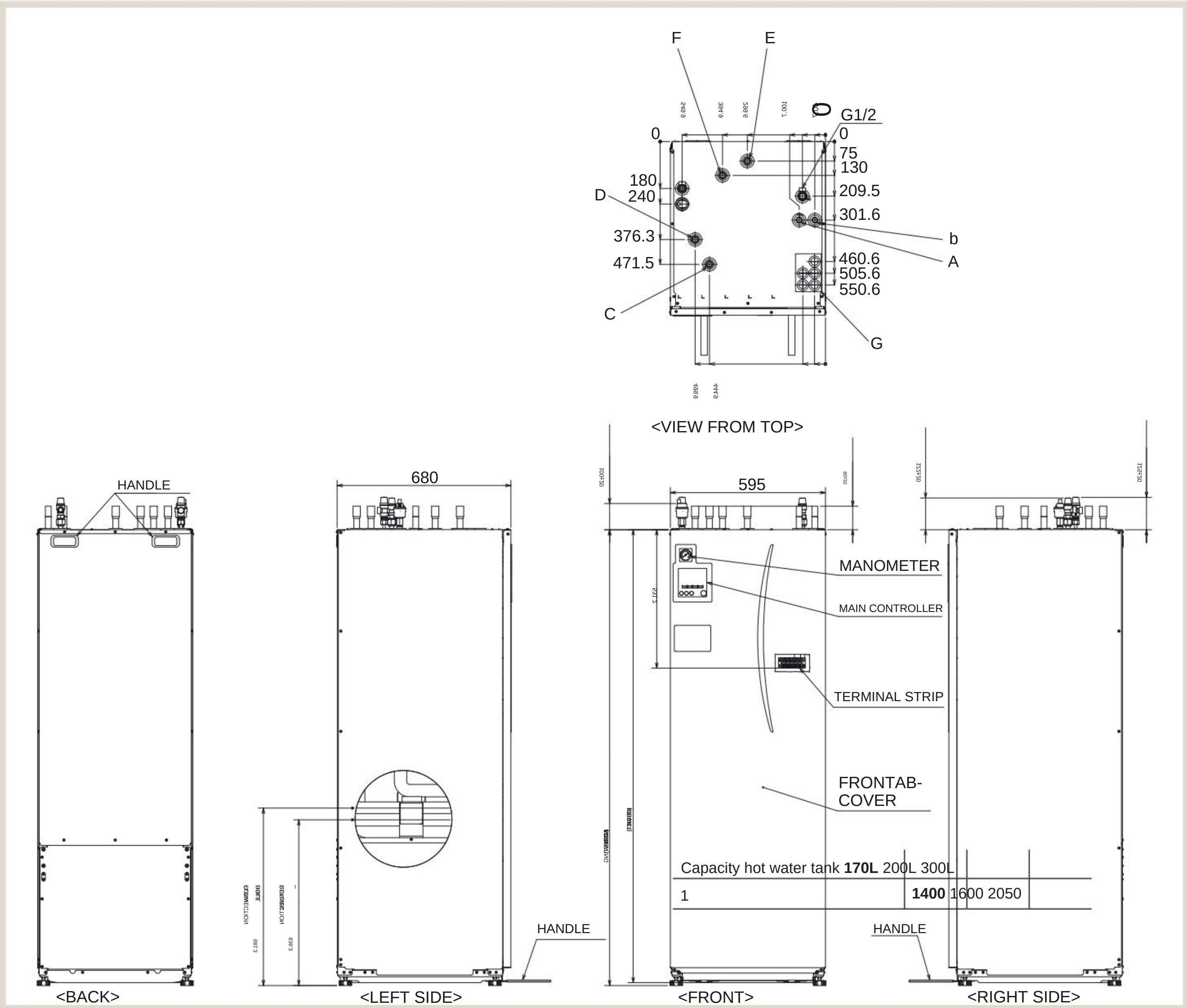


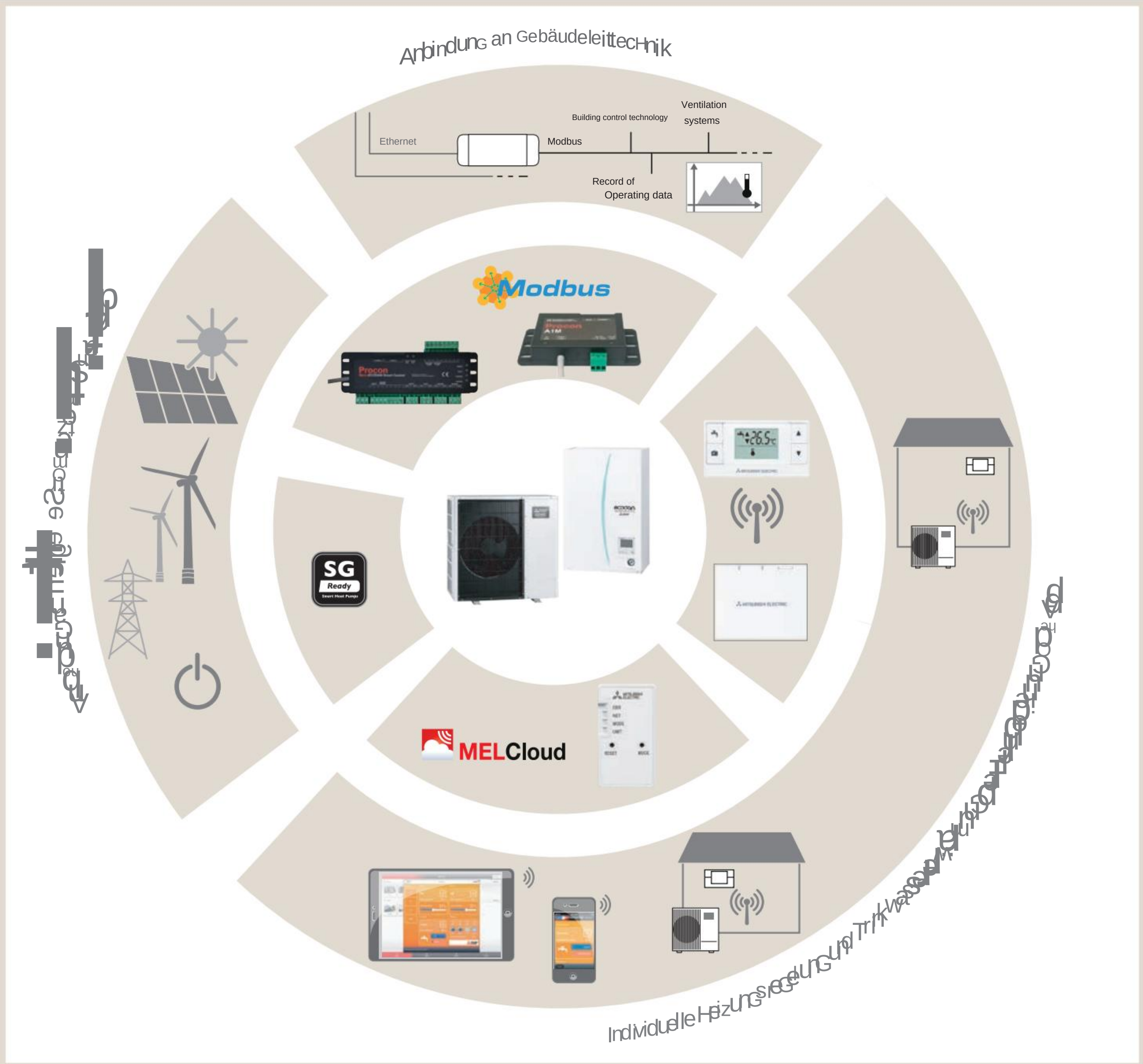
Fig.	Connection	Diameter/connection type
A	Domestic hot water connection	22 mm/clamp connection
b	Cold water connection	22 mm/clamp connection
C	Heating return connection	28 mm/clamp connection
D	Heating flow connection	28 mm/clamp connection
E	Brine pipe (borehole connection)	28 mm/clamp connection
F	Brine pipe (borehole connection)	28 mm/clamp connection
J	Electrical cable entry +	Cable glands ÿ, ÿ and ÿ for low voltage wiring including external signal and temperature sensor cables. Cable entry ÿ and n for high voltage wiring including power cables, indoor/outdoor cables and external output cables. * For a radio receiver (optional), use cable gland ÿ.

6. The heat pump controller FTC6

6.1 introduction

The requirements of a heating system for its control are usually diverse. The control is largely responsible for comfortable and energy-efficient operation of the entire system. Are in a building e.g
If radiators are combined with underfloor heating, these heating circuits must be controlled independently of each other. With a bivalent system, the boiler can be switched on according to different system specifications.
Depending on CO_2 emissions, the calculated operating costs, the outside temperature or an external signal - the connection/ switching is carried out completely automatically. This ensures an optimal result. Other controller functions include heating mode without an outdoor unit and the screed heating program. In addition to the control technology requirements, there are now numerous requirements for controllers in the area of simple operation and smart integration in buildings.

The Ecodan heat pump as a system solution



6.1.1 Overview of the most important functions

• Access to the most important operating modes via quick view
• Summer and winter operation
• Weather-compensated flow temperature or room temperature control of two heating circuits
• Legionella program with drinking water temperatures of up to 70 °C
• Day-dependent programming of heating circuits, remote controls and drinking water heating
• Holiday programming with date function
• Cascading of up to six heat pump systems • Heating and cooling function (only with indoor units ERS•)
• Bivalent control of another heat generator
• Screed heating
• Initial commissioning without an outdoor unit
• Integrated energy monitoring (not with cascade)
• Integration into intelligent power grids with smart grid
• Commissioning assistant (wizard)
• Integrating live temperature monitoring into energy monitoring
• Automatic summer shutdown
• Night operation / quiet operation
• Bivalent operation over 0-10 V

6.1.2 Operated remotely

In addition to the main control element, a radio remote control can also be used as a room thermostat. The most important system information is shown on the display of this control unit. The heat pumps can be operated and the corresponding parameters can be changed quickly and easily using just four buttons.

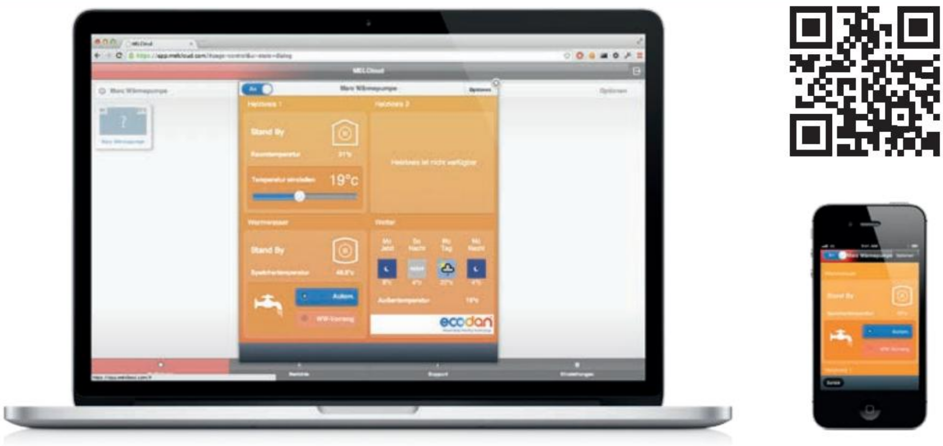
Radio remote control PAR-WT50R-E and receiver PAR-WT51R-E

6.1.3 MELCloud – the “smart” heat pump control

In times of increasing digitalization and increasing demand for smart home solutions, Ecodan heat pump systems also offer the option of immediately displaying all important system data via the MELCloud.

The MELCloud provides access to all relevant settings of the Ecodan heat pump from anywhere. The heating system can be controlled and monitored using a smartphone or tablet PC via encrypted access. With the app you can keep an eye on all the important functions of the Ecodan heat pumps.
The required WiFi adapter MAC-567IF-E (W) connects the heat pump to a local network within range.

Interface MELCloud as a desktop version or mobile app



Monitoring live and trend data is also becoming increasingly important in smart home systems. The MELCloud also provides this important function.

Display temperature curves

List of supported hardware and software

Tablet (app or web client)	Smartphone (app or web client)	operating system	Internet browser (web client only)
Apple iPad/iPad mini	Apple iPhone	Android	Internet Explorer
Samsung Galaxy Tab/Note	Samsung Galaxy S	Apple iOS/OS	Google Chrome
Dell Latitude	Nokia Lumia	Microsoft Windows 8	Apple Safari
BlackBerry PlayBook	BlackBerry Z10	BlackBerry 10	Mozilla Firefox
Google Nexus	Google Nexus		Opera

This list does not claim to be complete. More than the systems and products mentioned can use MELCloud. This list is intended as a guide only. Please note that usage may vary slightly depending on hardware and software combination.

6.1.4 Modbus interface

A Modbus interface (Procon MelcoBEMS MINI (A1M)) available via an adapter also enables connection to a building management system. All important data points for operating or setpoint changes as well as important actual values can be read and written via the interface.

Modbus interfaces	
Analog inputs	Analogue outputs
digital inputs	Digital outputs

Modbus interface Procon A1M

Modbus installations must always be carried out correctly. Please note:

- Shielded cable (copper braid)
- Twisted pairs
- No spur lines
- Terminating resistor (depending on installation)

Cascade applications can also be controlled via the Procon adapter.

Function table Modbus – Procon – Ecodan (excerpt)

Designation	address	Modicon address	details
A1M Firmware Version [READ ONLY]	10	40011	A1M firmware version
Error code (decimal) [READ ONLY]	12	40013	8000 = No error message 6999 = incorrect data transmission between A1M and device (see error code description in the device documentation)
System on/off	25	40026	0 = System OFF 1 = system ON 2 = Emergency mode READ ONLY (see room temperature – heating circuit 1...) 3 = test run READ ONLY (see room temperature – heating circuit 1...)
A/C mode – heating circuit 1	28	40029	0 = room temperature heating 1 = heating flow temperature 2 = heating curve 3 = room temperature cooling (not for all devices) 4 = Cooling flow temperature 5 = floor heating drying
A/C mode – heating circuit 2	29	40030	0 = room temperature heating 1 = heating flow temperature 2 = heating curve 3 = room temperature cooling (not for all devices) 4 = Cooling flow temperature 5 = floor heating drying
Set storage temperature	31	40032	Set the target temperature in the following temperature range: Storage temperature: 40 °C – 60 °C, in 1 °C increments Temperature value in °C x 100
Heating/cooling thermostat setpoint temperature - heating circuit 1 (signed)	32	40033	Temperature value in °C x 100
Heating/cooling thermostat setpoint temperature - heating circuit 1	33	40034	Temperature value in °C x 100
Heating/cooling thermostat setpoint temperature - heating circuit 2 (signed)	34	40035	Temperature value in °C x 100
Heating/cooling thermostat setpoint temperature - heating circuit 2	35	40036	Temperature value in °C x 100
Vacation mode	38	40039	0 = Normal 1 = vacation mode
Heating/cooling switchover	58	40059	0 = heating 1 = cooling
Defrost operation [READ ONLY]	67	40068	0 = Normal 1 = standby 2 = defrost 3 = restart
7-segment display error code 10th digit [READ ONLY]	70	40071	0 = A 1 = b 2 = E 3 = F 4 = J 5 = L 6 = P 7 = U
7-segment display error code 1 digit [READ ONLY]	71	40072	1-15 = 1-5 16 = O 17 = H 18 = J 19 = L 20 = P 21 = U
Storage temperature	106	40107	Temperature value in °C x 100

In the case of a cascade, the errors can still be read out as follows:

Designation	address	Modicon address	Details
Indoor unit 1, error code 10th digit [READ ONLY]	155	40156	See table details 1st place
Indoor unit 1, error code 1 digit [READ ONLY]	156	40157	See table details 10 digits
Indoor unit 2, error code 10th digit [READ ONLY]	157	40158	See table details 1st place
Indoor unit 2, error code 1 digit [READ ONLY]	158	40159	See table details 10 digits
Indoor unit 3, error code 10th digit [READ ONLY]	159	40160	See table details 1st place
Indoor unit 3, error code 1 digit [READ ONLY]	160	40161	See table details 10 digits
Indoor unit 4, error code 10th digit [READ ONLY]	161	40162	See table details 1st place
Indoor unit 4, error code 1 digit [READ ONLY]	162	40163	See table details 10 digits
Indoor unit 5, error code 10th digit [READ ONLY]	163	40164	See table details 1st place
Indoor unit 5, error code 1 digit [READ ONLY]	164	40165	See table details 10 digits
Indoor unit 6, error code 10th digit [READ ONLY]	165	40166	See table details 1st place
Indoor unit 6, error code 1 digit [READ ONLY]	166	40167	See table details 10 digits

Details 10th digit:

7-segment display Error code 10th digit
0 = A
1 = b
2 = E
3 = F
4 = J
5 = L
6 = P
7 = U

Details 1st place:

7-segment display Error code 1 digit
1-15 = 1-F
16 = O
17 = H
18 = J
19 = L
20 = P
21 = U

6.1.5 Ecodan Smart Control

6.1.5.1 Dangers and safety instructions

Electric shock
Make sure the device does not get wet or exposed to any other moisture.

operating temperatur
Only operate the device at an ambient temperature of -20 °C to 60 °C.

Shielded cables
When connecting an indoor unit to the Ecodan Smart Control, only use shielded cables to avoid interference with radio communication services. Using shielded cables ensures that you meet the appropriate EMC classification for the environment.

Liability
Mitsubishi Electric Germany assumes no liability for any damage caused to the user of this product. We reserve the right to change this manual at any time and without notice. The information we provide is believed to be accurate and reliable. We assume no responsibility for the use or for any infringement of patents or other rights of third parties through their use. If the device is used in a condition not specified by the manufacturer, the protection provided by the device may be impaired.

6.1.5.2 Compliance

This product complies with the basic EU marketing guidelines and complies with the requirements and provisions of the following guidelines:
- 2014/30/EU (Electromagnetic Compatibility)
- 2014/35/EU (low voltage)
- 2011/65/EU (RoHS – Restriction of Hazardous Substances)

6.1.5.3 Electromagnetic compatibility (EMC)

The Ecodan Smart Control is a Class A product. In a domestic environment, this product may cause radio frequency interference. In this case, the user will be asked to take appropriate action.

Class A products are intended for non-residential use. Class A products can also be used in...
but may cause interference and require the user to take appropriate corrective action.

A declaration of conformity according to the above guidelines and standards has been issued and is available upon request.

If the Ecodan Smart Control causes interference with radio communication services, which can be caused by turning it off and on
If the problem occurs when the device is turned on, you are encouraged to try to correct the problem by one or more of the following measures:

- Reorient the receiving antenna.
- Reposition the Ecodan Smart Control.
- Move the Ecodan Smart Control away from the receiver.

If necessary, contact an Ecodan Smart Control technical support representative or an experienced radio/TV or EMC technician for further suggestions.

6.1.5.4 Hardware

Housing

The housing is made of black, non-flammable ABS plastic.

digital inputs

There are two digital inputs for voltage-free contacts.

Configurable analog inputs

There are two configurable analog inputs that can be set separately via software as follows: voltage (0-10 V), current (0-20 mA) or resistance (1-10 kÿ).

Relay outputs

There are four relay outputs, each equipped with connections for the NO and NC contacts (rating of the relay outputs: 2 A at 50 V AC).

Each relay is equipped with a corresponding, hardware-controlled green LED. It lights up when the relay is activated.

Dip switch

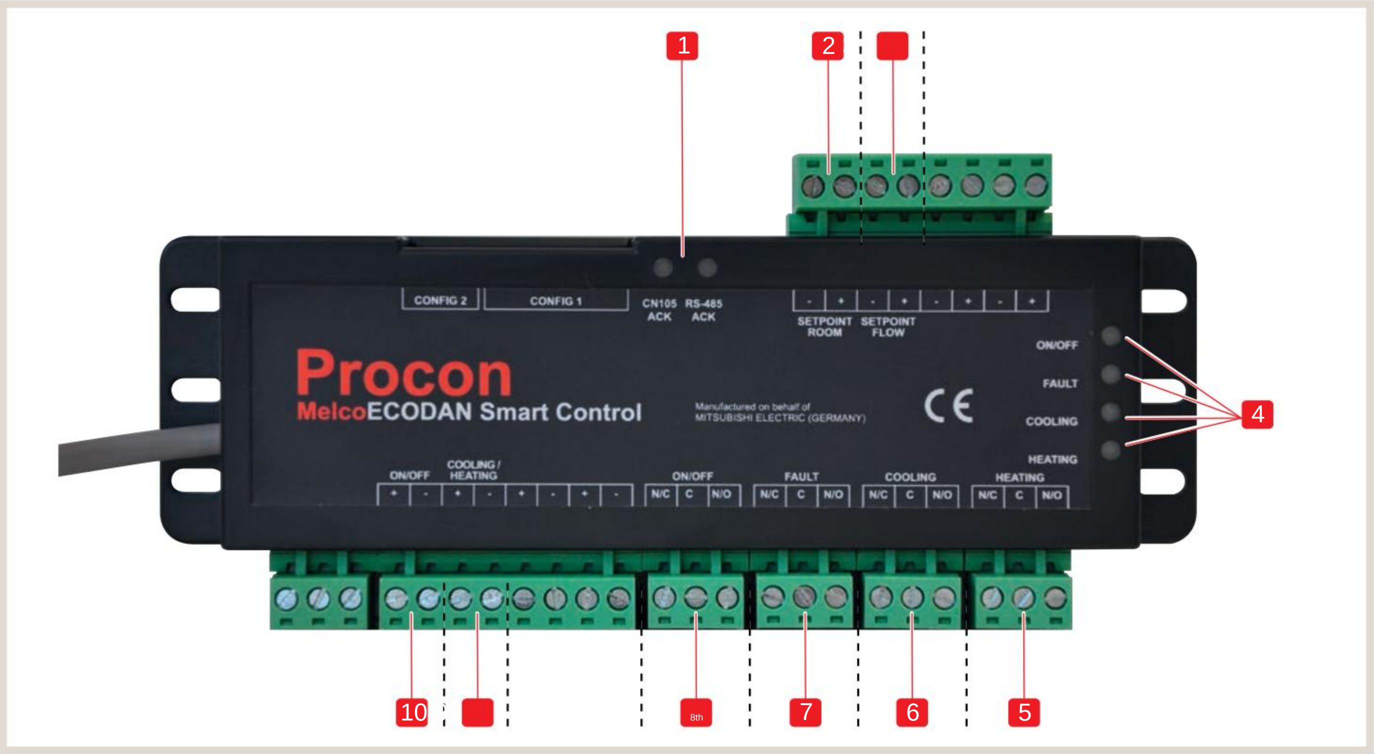
Two DIP switch banks are provided for configuring the Ecodan Smart Control. These are used for software configuration.

Free CN105 supply line

The power is supplied via the Ecodan device and the CN105 connection. No external power supply is required. The free CN105 supply line is one meter long.

Status LEDs

In addition to the relay status LEDs, there are two green software-controlled LEDs that can be used for status information. Figure 1 shows the Ecodan Smart Control.



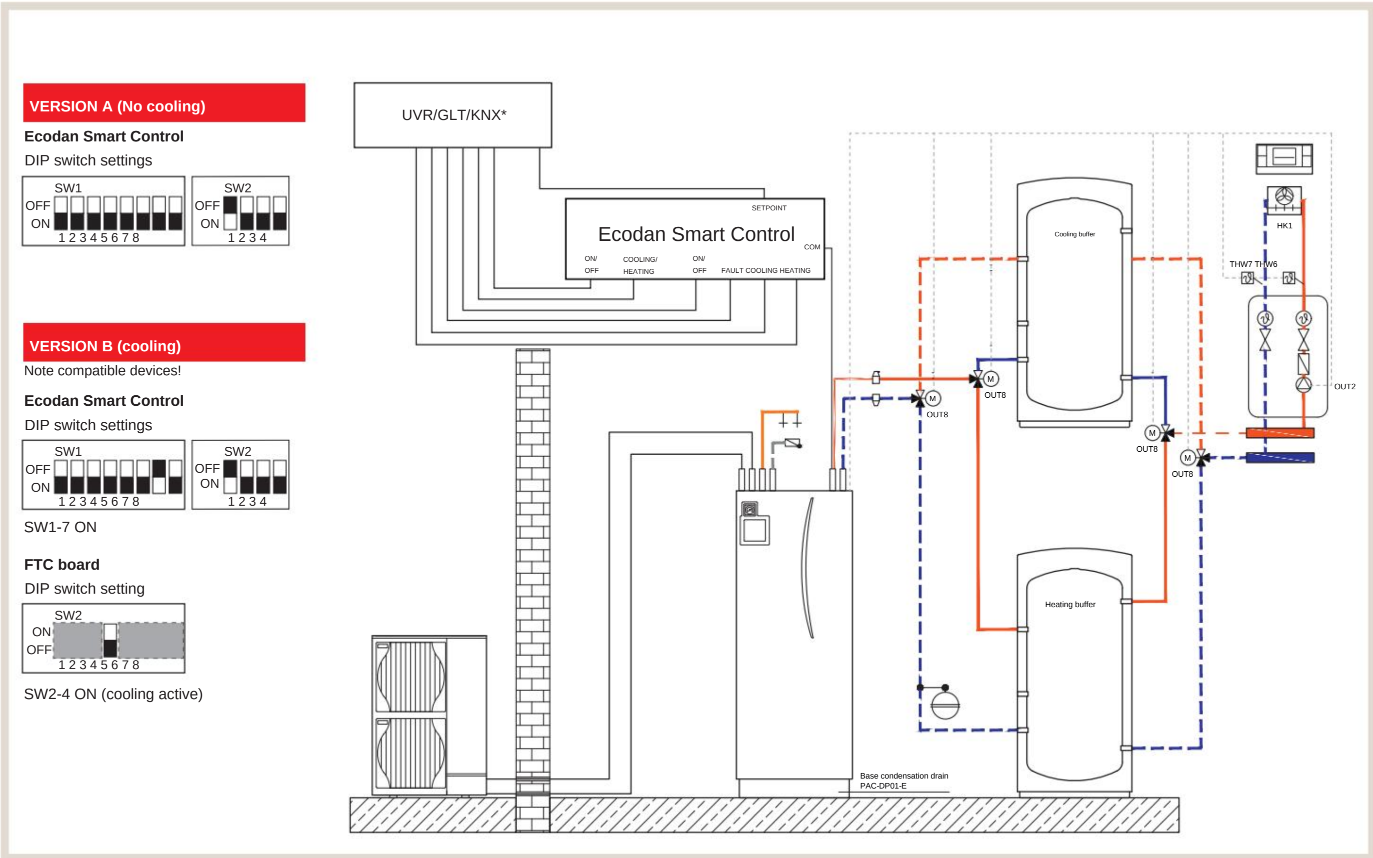
position	Explanation
1	Communication LEDs
2	Setpoint room temperature
3	Setpoint flow temperature (heating/cooling)
4	LEDs to display the digital outputs
5	Heating active
6	Cooling active
7	Error (collective fault)
8th	Device On
9	Heating/cooling switchover
10	Device on/off

6.1.5.5 System overview

Overview

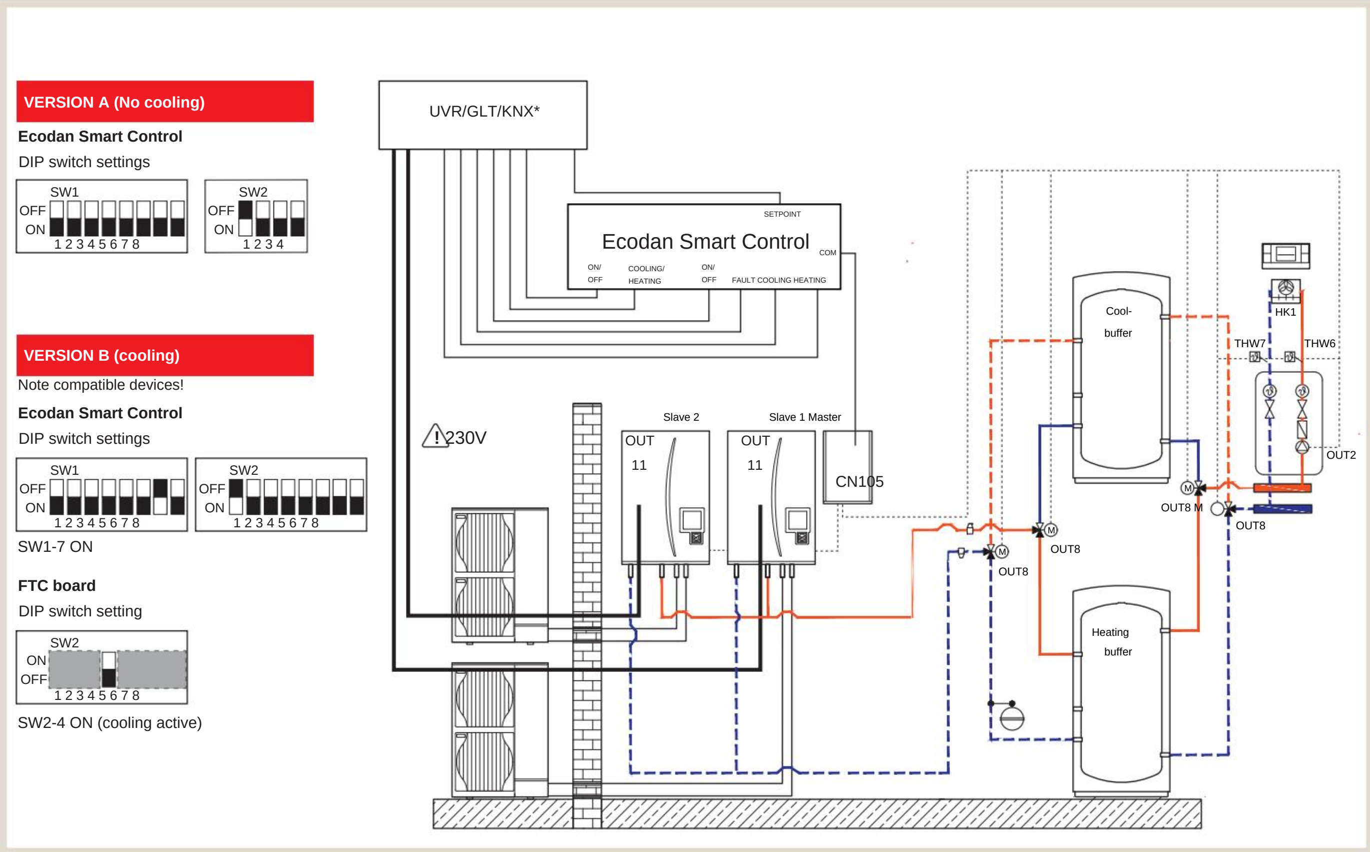
The device is intended for connection to individual indoor devices as well as to cascades (master board).
The Ecodan Smart Control is only intended for systems with one heating circuit. If you want to switch between heating and cooling with the Ecodan Smart Control, you must use an indoor unit that can be cooled. In addition, dew point protection must be provided on site.

System example for individual application



* Universal heating controller/building management technology/KNX

System example cascade application



* Universal heating controller/building management technology/KNX

The Ecodan Smart Control continuously queries all defined information from the heat pump.

A NOTICE!

If you change the settings using the remote control included in the scope of delivery, they will be overwritten cyclically. If an Ecodan Smart Control is connected, you can only set and operate the system with the Ecodan Smart Control.

6.1.5.6 DIP switch

There are two DIP switch banks. The first switch bank (1) has eight DIP switches, the first of which is designated 1-1 and the last 1-8. The second DIP switch bank (2) has four DIP switches, these are designated 2-1 to 2-4. The DIP switch position is only read when the device is switched on. It is therefore not possible to switch the DIP switches during operation.

6.1.5.7 DIP switches 1-1 and 1-2

These DIP switches determine the flow temperature ranges during cooling operation according to the following table.

DIP switch 1-1	DIP switches 1-2	Range (cooling operation) (°C)
OUT OF	OUT OF	15 – 25
OUT OF	A	10 – 25
A	OUT OF	5-25
A	A	5-25

When delivered, 1-1 and 1-2 are OFF.

6.1.5.8 DIP switches 1-3 and 1-4

These DIP switches determine the flow temperature ranges in heating mode according to the following table.

DIP switches 1-3	DIP switches 1-4	Range (heating mode) (°C)
OUT OF	OUT OF	25 – 45
OUT OF	A	25 – 50
AT	OUT OF	25 – 55
AT	A	25 – 60

When delivered, 1-3 and 1-4 are OFF.

Room temperature range (heating mode)
The room temperature range in heating mode is fixed between 10 °C and 30 °C. Selection only possible in heating mode.

6.1.5.9 DIP switches 1-5 and 1-6

These DIP switches determine the configurable analog input types according to the following table.

DIP switches 1-5	DIP switches 1-6	Input type for all inputs
OUT OF	OUT OF	Voltage 10V (1 – 10V)
OUT OF	A	Resistance (1 – 10 kÿ)
A	OUT OF	Power (4 – 20 mA)
A	A	Voltage 5V (1 – 5V)

When delivered, 1-5 and 1-6 are OFF.

6.1.5.10 DIP switches 1-7

This switch determines whether cooling is possible with the Ecodan.

DIP switches 1-7	Cooling supported
OUT OF	No
A	Yes

When delivered, switches 1-7 are OFF.

A NOTICE!

Risk of material damage and functional impairment.
Not all indoor units are suitable for cooling operation. If you cool with an incompatible indoor unit, malfunctions may occur and any warranty will be void!
ÿOnly use the devices listed below.
ÿIn addition to the DIP switch on the Ecodan Smart Control, also set the corresponding one on the FTC 6. the DIP switch.
ÿMake sure that the temperature does not fall below the dew point.
ÿUse on-site dew point protection.

Indoor units suitable for cooling operation
The following list gives you an overview of the indoor units that are suitable for cooling operation:

ERPX-YM9D
ERPX MD
ERSC-YM9D
ERSC-MED
ERSD-YM9D
ERSE-MED
ERSE-YM9ED

ERPT20X-VM2D
ERPT30X-VM2ED
FIRST20D-YM9D
FIRST30D-YM9ED

6.1.5.11 Wiring and function of the inputs

Digital input ON/OFF
The Ecodan heat pump is switched on and off with the digital input ON/OFF.

ON/OFF input	Cooling supported
Open	Ecodan device ON
Closed	Ecodan device OFF

The command is sent to the Ecodan heat pump when the status of the input changes. For example, if it changes from "Open" to "Closed", the device is switched off. If it changes from "Closed" to "Open", the device is switched on.

A NOTICE!

Risk of material damage to the compressor!
If the ON/OFF cycle time is set too short, the compressor can be damaged!
ÿPlease note that the compressor has a minimum running time of three minutes. A second switch-on cycle may only be started after ten minutes at the earliest.

Digital input COOLING/HEATING

The digital input COOLING/HEATING is used to switch between the modes for cooling and heating operation of the Ecodan.

COOLING/HEATING input	Operation
Open	Ecodan in HEATING OPERATION
Closed	Ecodan in COOLING OPERATION

The command is sent to the Ecodan heat pump when the status of the input changes. For example, if it changes from "Open" to "Closed", it switches to cooling mode. If it changes from "Closed" to "Open", it switches to heating mode.

A NOTICE!

Cooling operation is only possible if the corresponding DIP switch of the Ecodan Smart Control and the corresponding DIP switch of the FTC have first been set correctly. In addition, only the flow temperature control type needs to be set in cooling mode. Cooling operation in room temperature mode is not possible and results in an error.

A NOTICE!

Risk of material damage to the compressor!

If the ON/OFF cycle time is set too short, the compressor can be damaged!

Please note that the compressor has a minimum running time of three minutes. A second switch-on cycle may only be started after ten minutes at the earliest.

6.1.5.12 Analog input ROOM SETPOINT

The SETPOINT ROOM input is an analog input that is used to specify the setpoint temperature for the room. A room temperature sensor must be provided to set the setpoint for the room temperature. In the following table you can see the limits for the input values:

Input type	“Lower limit” input	“Upper limit” input
Voltage 10V	1V	10V
Resistance	1kÿ	10 kÿ
Current strength	4mA	20mA
Voltage 5V	1V	5V

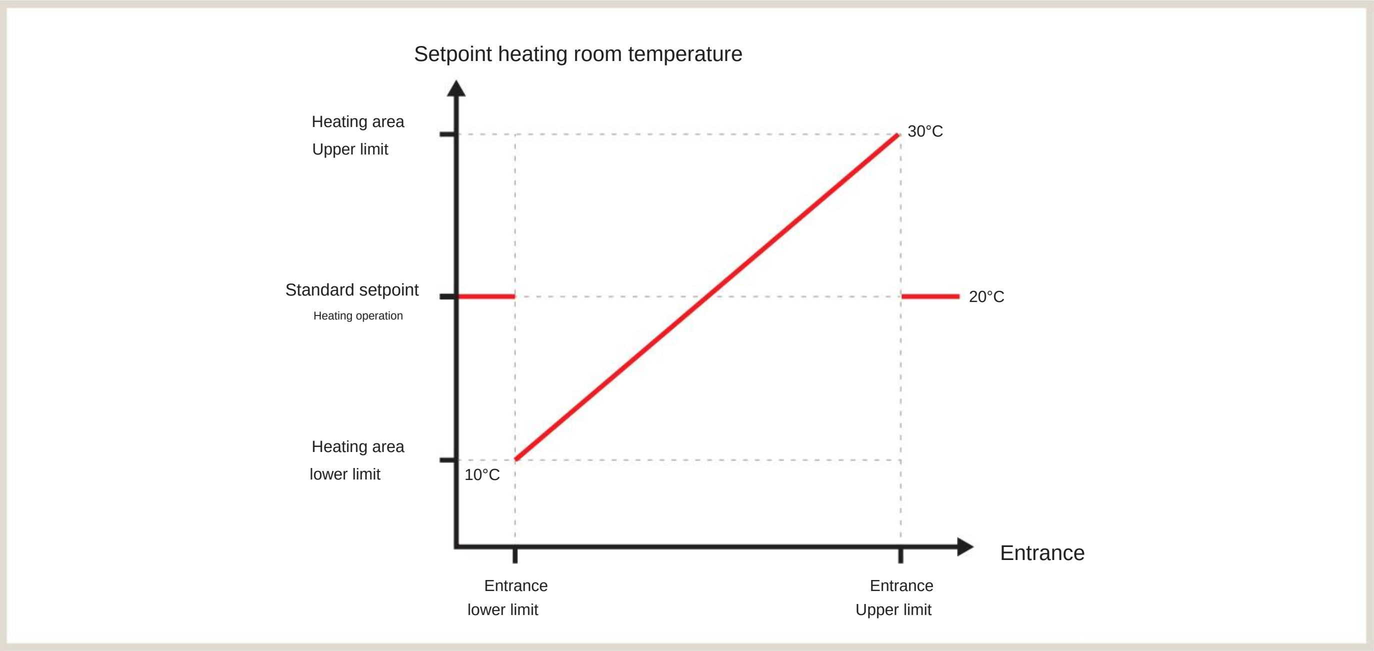
Outside these limits, a setpoint of 20 °C is preset in heating mode.

Cooling operation

Controlling the room temperature in cooling mode is not possible and triggers an error message on the ESC. In this case, the setpoint for the room temperature is not changed or regulated. The Ecodan switches to the flow temperature heating operating mode with a setpoint of 45 °C to ensure safe operation.

Heating operation

The setpoint specification for room temperature control in heating mode is possible in the range of 10 °C – 30 °C. Outside these limits, a setpoint of 20 °C is preset in heating mode.
If the setpoint specification is between the lower and upper limits, the setpoint is calculated by interpolating the lower and upper limits of heating operation.



6.1.5.13 Analog input SETPOINT FORWARD

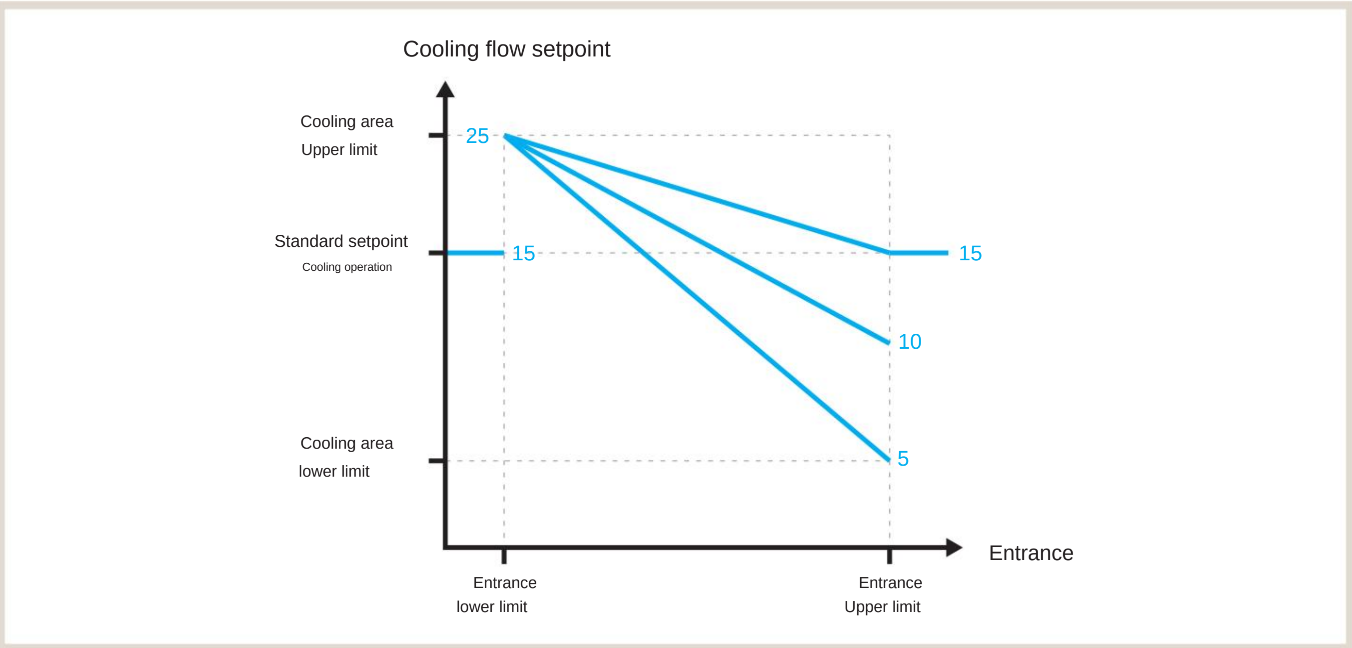
The SETPOINT FLOW input is an analog input with which the Ecodan heat pump receives the specification for its flow temperature. In the following table you can see the limits for the input values:

Input type	“Lower limit” input	“Upper limit” input
Voltage 10V	1V	10V
Resistance	1kÿ	10 kÿ
Current strength	4mA	20mA
Voltage 5V	1V	5V

If the input value is outside this range, the default setting for the flow temperature setpoint is adopted. For cooling mode, this value is 15 °C. If the value in heating mode is outside the range, the device switches to room temperature mode with a setpoint of 20 °C.

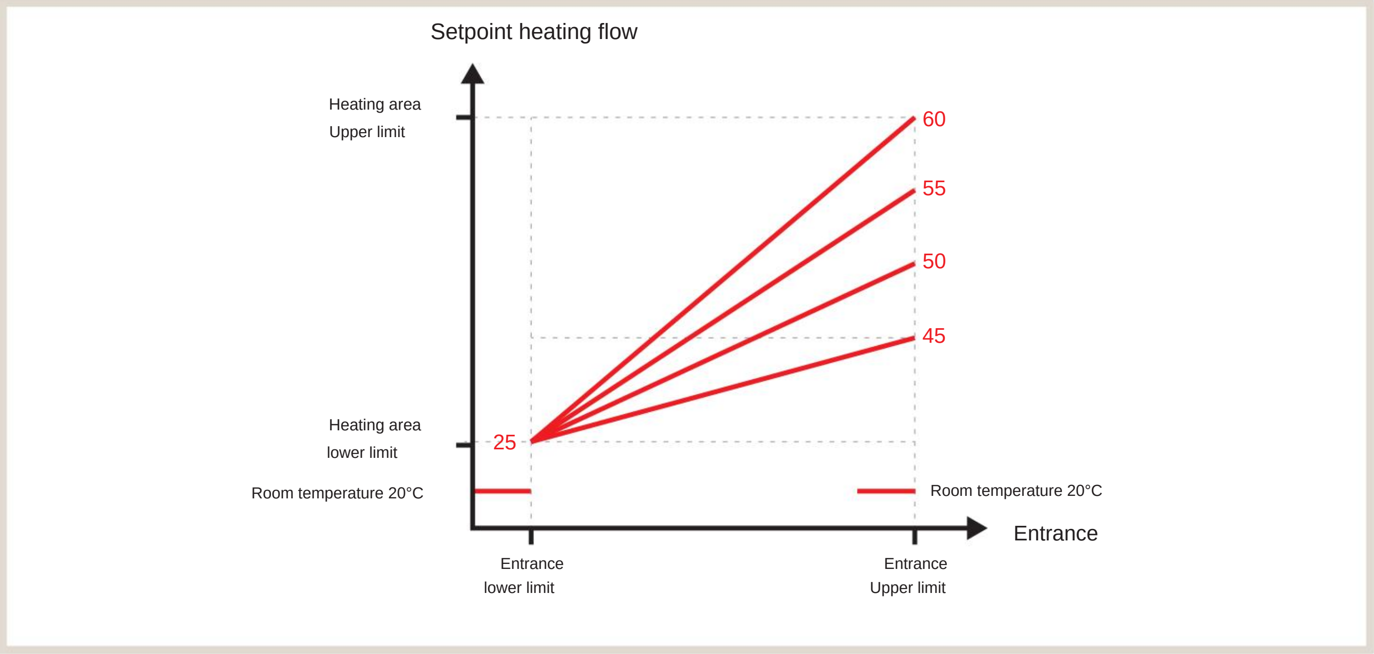
Cooling operation

For cooling operation, the setpoint is specified as shown in Figure 3. If the input value is between the lower and upper limits, the setpoint is calculated by interpolating the lower and upper limits of cooling operation.
The lower and upper limits for cooling operation are set by DIP switches 1-1 and 1-2.



Heating operation

For heating mode, the setpoint is specified as shown in Figure 4. If the input value is between the lower and upper limits, the setpoint is calculated by interpolating the lower and upper limits of heating operation.
The lower and upper limits for heating operation are set by DIP switches 1-3 and 1-4.



6.1.5.14 Digital relay outputs

Digital output ON/OFF

This digital output shows the operating status of the Ecodan heat pump. The relay is closed when the Ecodan heat pump is switched on and is opened when the heat pump is switched off.

Status Ecodan system	Status ON/OFF relay (between NO and C)
Communication error between ESC and Ecodan	Open
OUT OF	Open
A	Closed

Digital output error

The relay is open (between NO and C) if there are no errors. It is closed (between NO and C) when the following occurs:

- Communication error with the Ecodan device (but not in the first minute after switching on or back) set). The system continues to run in the last operating mode set.
- Error message on the Ecodan main controller (switching off error).

Errors that cannot be switched off

- The values of the inputs SETPOINT ROOM and SETPOINT FLOW are both between the lower and lower Upper limit for input. This is an invalid status.
- The COOLING/HEATING digital input is closed (COOLING mode displayed) and Cooling operation is not supported (DIP switch 1-7 is OFF). This is an invalid status.
- The COOLING/HEATING digital input is closed (COOLING mode displayed) and the value for the ROOM SETPOINT input is between the lower and upper limits for the input. This is an invalid status because cooling operation is not allowed for room temperature.

In the case of non-switching errors, the mode is set to “heating flow temperature” with a setpoint of 45°C.
In cascade applications, the OUT11 (error output) of the respective indoor devices must also be read in.

Digital output cooling mode

This relay is activated when the system is in cooling mode. If there is a communication error, the relay will be deactivated after two minutes.

Ecodan system mode	ON/OFF relay status (between NO and C)
Communication error between ESC and Ecodan	Open
Cooling flow temperature	Closed
All other modes	Open

Digital output heating mode

This relay is activated when the system is in heating mode. If there is a communication error, the relay will be deactivated after two minutes.

Ecodan system mode	ON/OFF relay status (between NO and C)
Communication error between ESC and Ecodan	Open
Heating flow temperature	Closed
Heating room temperature	Closed

6.1.5.15 Regulation

Turn on

During the first minute, the Ecodan Smart Control is in start-up mode and temporarily displays an error. The error display turns off after one minute.

To switch on and off

The ON/OFF switching takes place via a digital input. Based on the value of this input, the command is then sent to the Ecodan device to switch the system ON or OFF accordingly. The ON/OFF input is continuously monitored during normal operation. Should the status change, the command is sent to the Ecodan device to turn the system ON or OFF accordingly. The ON/OFF relay shows the status of the Ecodan device, but not the switching status at the digital input ON/OFF.

6.1.5.16 Setting and switching of operating modes

The operating mode depends on the status of the digital input COOLING/HEATING and the value of the inputs for ROOM SETPOINT and FLOW SETPOINT.

HEATING OPERATION/COOLING OPERATION input	SETPOINT ROOM input	SETPOINT FLOW input	mode	Default setting (°C)
Closed (cooling mode)	Outside the range	Outside the range	Cooling flow temperature 15	
Closed (cooling mode)	Outside the range	Within range	Cooling flow temperature according to analog setpoint specification	
Closed (cooling mode)	Within range	Outside the range	<Error>*	45
Closed (cooling mode)	Within range	Within range	<Error>*	45
Open (heating mode)	Outside the range	Outside the range	Heating room temperature	20
Open (heating mode)	Outside the range	Within range	Heating flow temperature	according to analogue setpoint specification
Open (heating mode)	Within range	Outside the range	Heating room temperature	according to analogue setpoint specification
Open (heating mode)	Within range	Within range	<Error>*	45

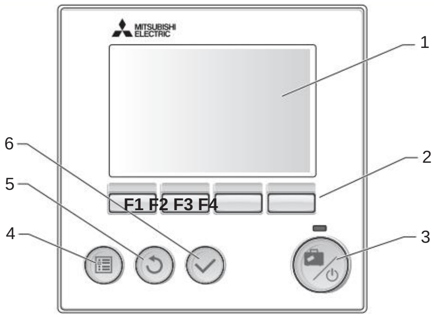
* In the event of errors, the mode is changed to “Heating flow temperature” and the setpoint is set to 45 °C.

All commands are overwritten at an interval of 30 seconds. This means that the Ecodan system can only be operated via the Ecodan Smart Control if it is connected.

6.2 The control panel of the FTC6 heat pump controller

The Ecodan heat pump systems can be controlled via a clearly and elegantly designed control panel. The system can be parameterized using the control panel and the setpoints and operating states can be set. In addition, information such as the currently recorded temperatures can be read.

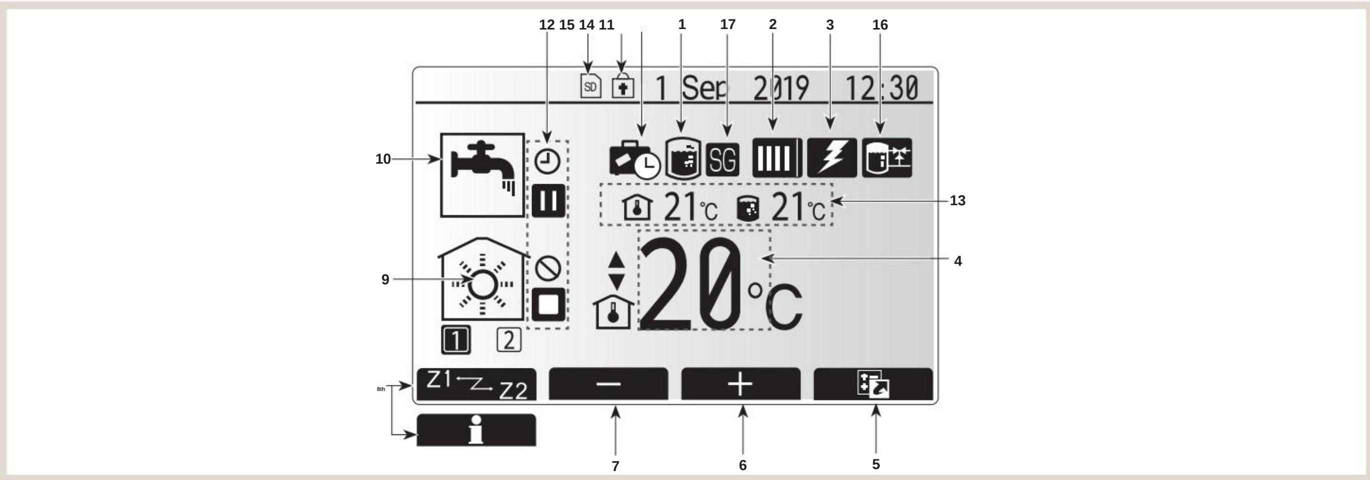
With the time programs, the system can be easily programmed individually using the control panel. The intuitive display of the operating states enables the system information to be recorded at a glance. If there is an error, this can also be clearly read on the display.



Position	Name	function
1	display	Displays all information.
2	Function keys	Used to scroll through the menu and adjust settings. Function is determined by the menu that can be seen on the display (1).
3	Power/vacation button	If the system is off, pressing it once will turn it back on. Pressing it again while the system is switched on activates the holiday program. If the button is pressed for 3 seconds, the system will turn off.1)
4	Menu button	Access to system settings.
5	Back button	Return to previous menu.
6	Confirm button	To select or save.

1) If the system is switched off or the power supply is interrupted, the water circuit protection functions (e.g. antifreeze function) CANNOT be used. Please note that if these protection functions are not activated, the water circuit may be damaged.

Icons in the main menu

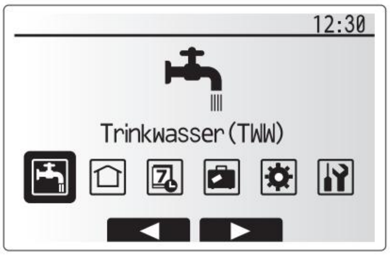


Pos.	Meaning	Icon Description	
1	Legionella program		If this symbol is displayed, the Legionella program is activated.
2	Heat pump operating mode		Normal operation
			Defrost operation
			Emergency operation
			Quiet operation activated
3	electric heating		When this symbol is displayed, the screw-in heater or heating element is in operation.
4	Target temperature		Target flow temperature
			Target room temperature
			Heating curve
5	option		Pressing the corresponding function key displays the quick view menu.
6	+		Increasing the desired temperature.
7	–		Decrease the desired temperature.
8th	Z1 Z2		Pressing the corresponding function button switches between heating circuit (zone) 1 and heating circuit (zone) 2.
	information		Long press the corresponding function key to display the information screen.
9	Space heater (Cooling) mode		Heating mode: heating circuit 1 or heating circuit 2
			Cooling mode: cooling circuit 1 or cooling circuit 2
10	Hot water operation		Normal or Eco mode
11	Vacation program		When this icon is displayed, the vacation program is activated.
12	Features		Time program
	Features		Blocked
	Features		Software diagnostics
	Features		Standby
	Features		Stand-by cascade control
	Features		stop
	Features		in operation
13	Current temperature		Current room temperature
			Current hot water tank temperature
14	Blocking		The menu button is locked or switching between hot water and heating is locked in the Options menu.
15	SD memory card		The SD memory card is written.
	SD memory card		The SD memory card cannot be written to.
16	Buffer storage control		When this icon is displayed, buffer memory control is active.
17	Smart grid ready		When this symbol is displayed, “Smart grid ready” is active.

6.3 Menu – Main Settings

The main settings menu can be accessed by pressing the Menu button. To reduce the risk of untrained users accidentally changing the settings, there are two levels of access to the main settings; the service menu is protected by a password.

User level

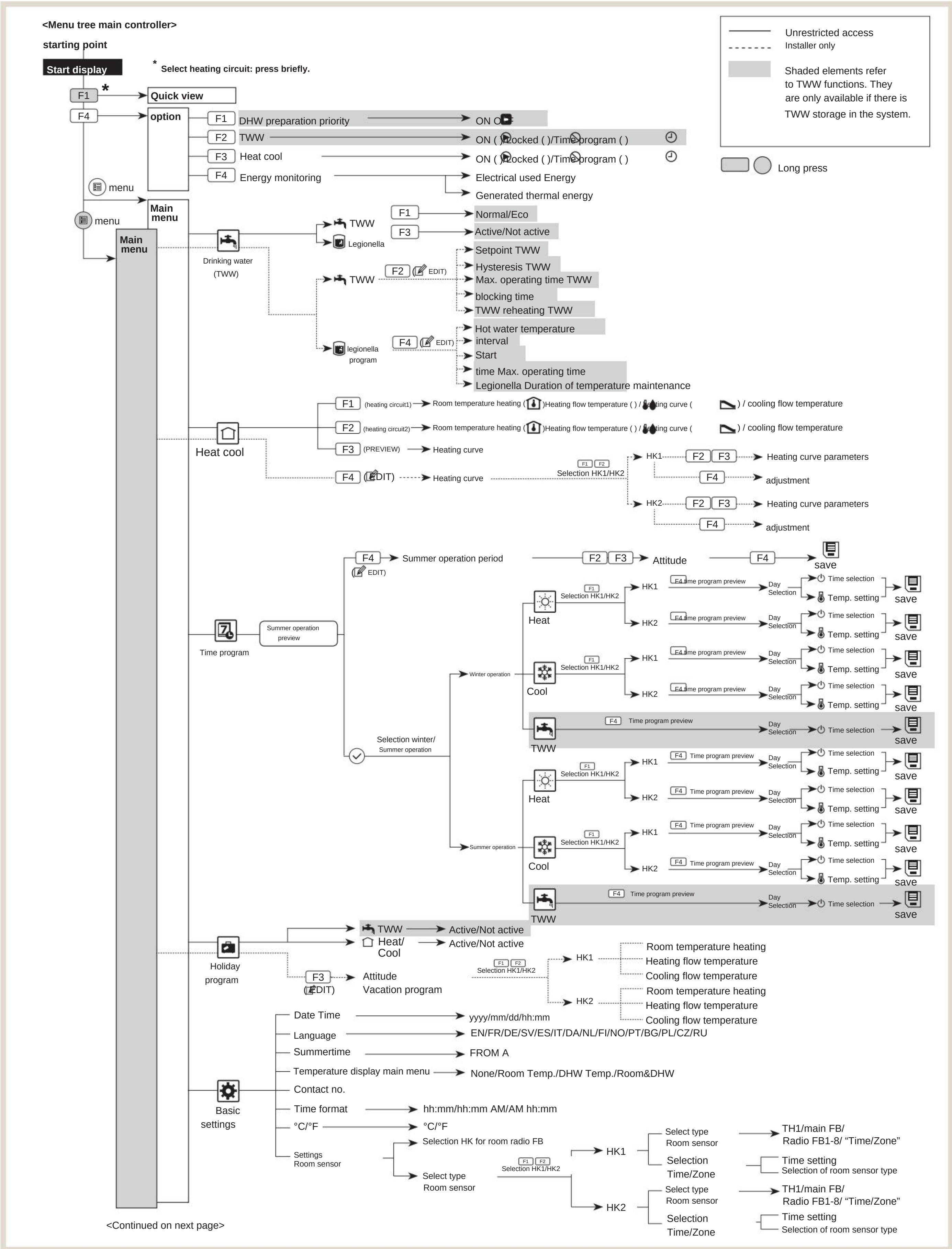


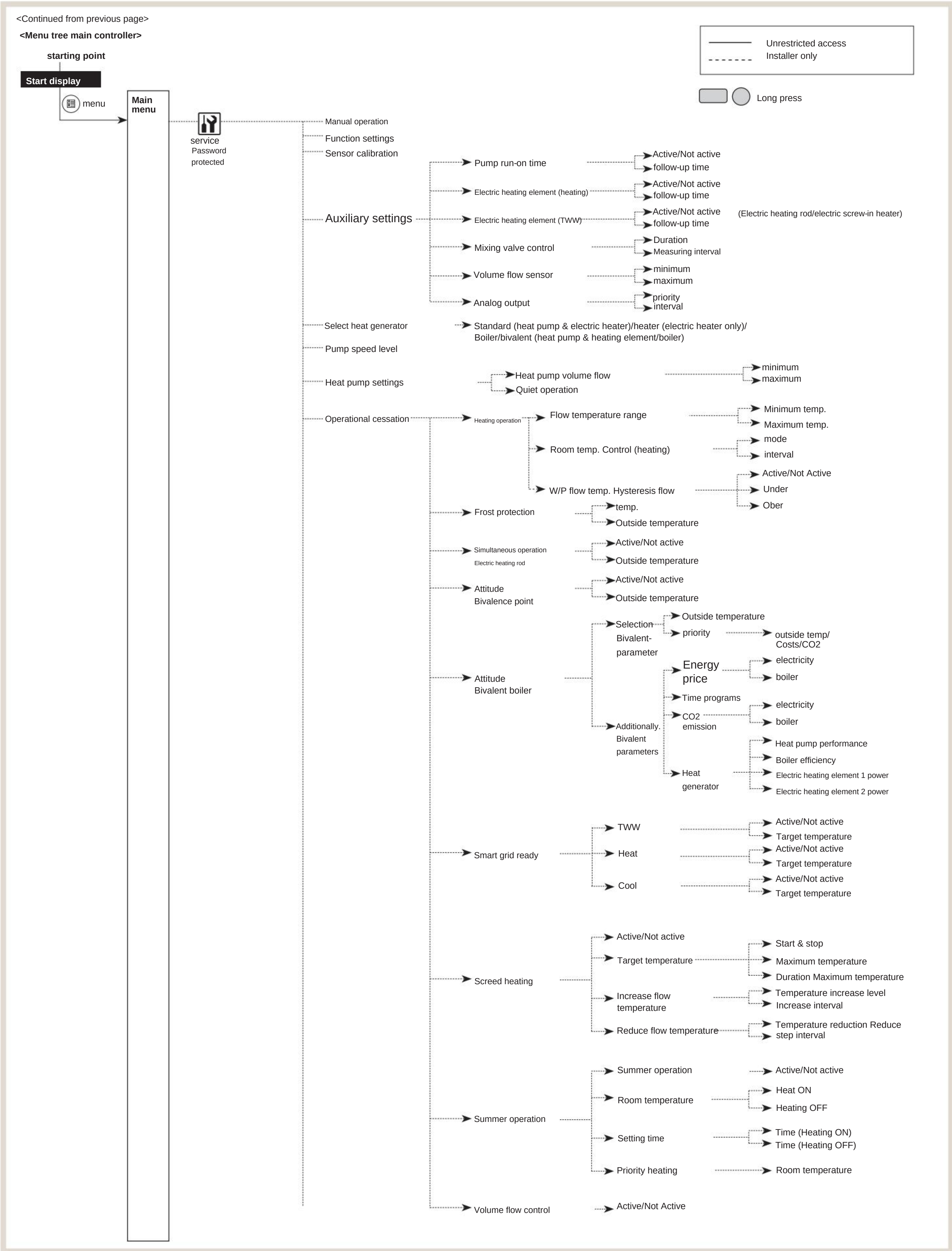
If the menu button is briefly pressed once, the main settings are displayed but cannot be edited. This allows the user to view and change the current settings, but not to change the operating parameters.

Skilled craftsman level

When the menu button is pressed for 3 seconds, the main settings are displayed with all available functions. The following items can be viewed and/or edited (depending on the access level).

Icon	Description
	Domestic hot water (DHW)
	Heat cool
	Time program
	Vacation program
	Basic settings
	Service (password protected)


<Menu tree main controller>
starting point
Start display
* Select heating circuit: press briefly.
Unrestricted access
Installer only
Shaded elements refer to TWW functions. They are only available if there is TWW storage in the system.
Long press
F1
Quick view
F4
option
F1 DHW preparation priority
ON OFF
F2 TWW
ON ( )Locked ( )/Time program ( )
F3 Heat cool
ON ( )Locked ( )/Time program ( )
F4 Energy monitoring
Electrical used Energy
Generated thermal energy
menu
Main menu
Drinking water (TWW)
TWW
F1 Normal/Eco
Legionella
F3 Active/Not active
F2 EDIT)
Setpoint TWW
Hysteresis TWW
Max. operating time TWW
blocking time
TWW reheating TWW
legionella program
F4 EDIT)
Hot water temperature
interval
Start
time Max. operating time
Legionella Duration of temperature maintenance
Heat cool
F1 (heating circuit1) Room temperature heating ( )Heating flow temperature ( ) / Heating curve ( ) / cooling flow temperature
F2 (heating circuit2) Room temperature heating ( )Heating flow temperature ( ) / Heating curve ( ) / cooling flow temperature
F3 (PREVIEW) Heating curve
F4 (EDIT) Heating curve
Selection HK1/HK2
HK1 F2 F3 Heating curve parameters
F4 adjustment
HK2 F2 F3 Heating curve parameters
F4 adjustment
Time program
Summer operation preview
F4 Summer operation period
EDIT)
F2 F3 Attitude
F4 save
Selection winter/ Summer operation
Winter operation
Summer operation
Heat
Cool
TWW
Selection HK1/HK2
HK1
HK2
F4 Time program preview
Day Selection
Time selection
Temp. setting
save
Holiday program
TWW Active/Not active
Heat/ Cool Active/Not active
F3 (EDIT)
Attitude
Vacation program
Selection HK1/HK2
Room temperature heating
Heating flow temperature
Cooling flow temperature
Basic settings
Date Time
yyyy/mm/dd/hh:mm
Language
EN/FR/DE/SV/ES/IT/DA/NL/FI/NO/PT/BG/PL/CZ/RU
Summertime
FROM A
Temperature display main menu
None/Room Temp./DHW Temp./Room&DHW
Contact no.
Time format
hh:mm/hh:mm AM/AM hh:mm
°C/°F
°C/°F
Settings Room sensor
Selection HK for room radio FB
Select type Room sensor
Select type Room sensor
TH1/main FB/ Radio FB1-8/ "Time/Zone"
Selection Time/Zone
Time setting
Selection of room sensor type
<Continued on next page>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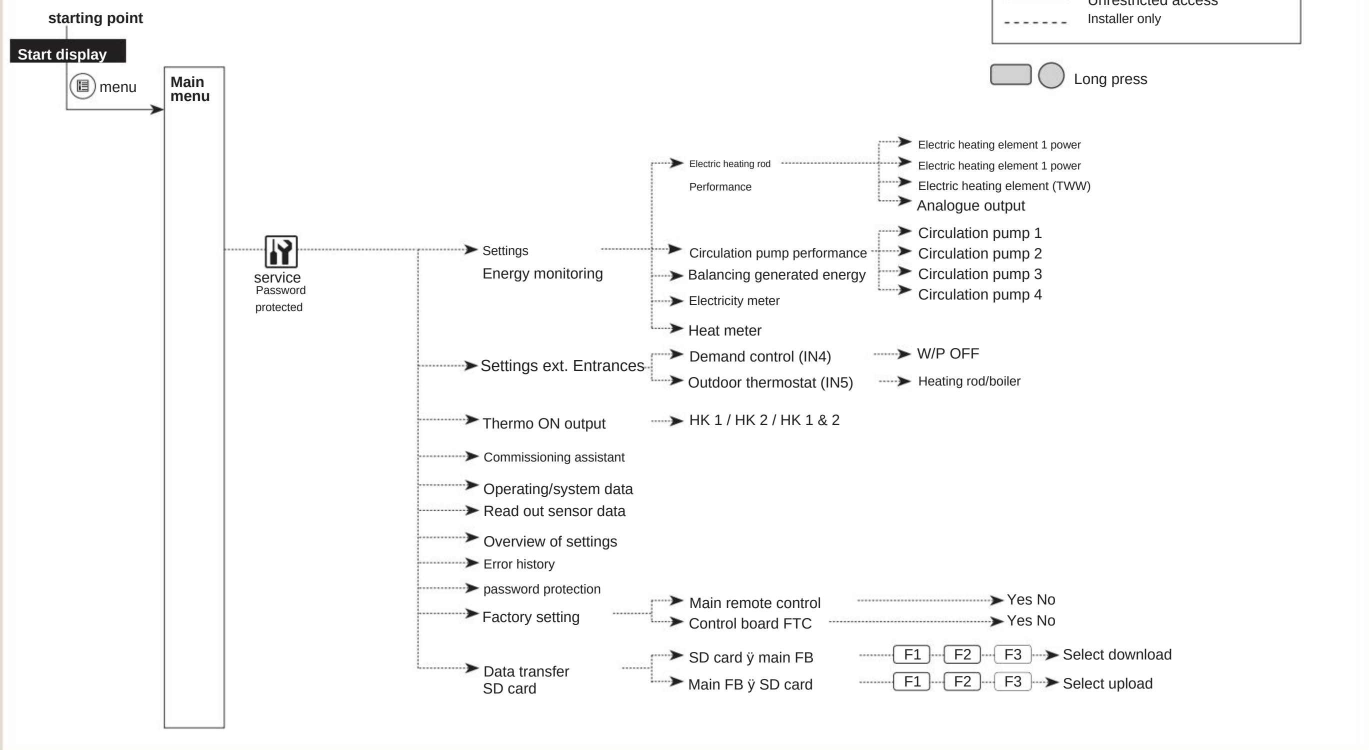
<Menu tree main controller>
starting point
Start display
menu
Main menu
Unrestricted access
Installer only
Long press
service
Password protected
Manual operation
Function settings
Sensor calibration
Auxiliary settings
Pump run-on time
Active/Not active
follow-up time
Electric heating element (heating)
Active/Not active
follow-up time
Electric heating element (TWW)
Active/Not active
follow-up time
(Electric heating rod/electric screw-in heater)
Mixing valve control
Duration
Measuring interval
Volume flow sensor
minimum
maximum
Analog output
priority
interval
Select heat generator
Standard (heat pump & electric heater)/heater (electric heater only)/
Boiler/bivalent (heat pump & heating element/boiler)
Pump speed level
Heat pump settings
Heat pump volume flow
minimum
maximum
Quiet operation
Operational cessation
Heating operation
Flow temperature range
Minimum temp.
Maximum temp.
Room temp. Control (heating)
mode
interval
W/P flow temp. Hysteresis flow
Active/Not Active
Under
Ober
Frost protection
temp.
Outside temperature
Simultaneous operation
Electric heating rod
Active/Not active
Outside temperature
Attitude
Bivalence point
Active/Not active
Outside temperature
Attitude
Bivalent boiler
Selection
Bivalent-
parameter
Outside temperature
priority
outside temp/
Costs/CO2
Energy price
electricity
boiler
Time programs
CO2 emission
electricity
boiler
Additionally.
Bivalent
parameters
Heat generator
Heat pump performance
Boiler efficiency
Electric heating element 1 power
Electric heating element 2 power
Smart grid ready
TWW
Active/Not active
Target temperature
Heat
Active/Not active
Target temperature
Cool
Active/Not active
Target temperature
Screed heating
Active/Not active
Target temperature
Start & stop
Maximum temperature
Duration Maximum temperature
Increase flow temperature
Temperature increase level
Increase interval
Reduce flow temperature
Temperature reduction Reduce
step interval
Summer operation
Summer operation
Active/Not active
Room temperature
Heat ON
Heating OFF
Setting time
Time (Heating ON)
Time (Heating OFF)
Priority heating
Room temperature
Volume flow control
Active/Not Active

<Continued from previous page>

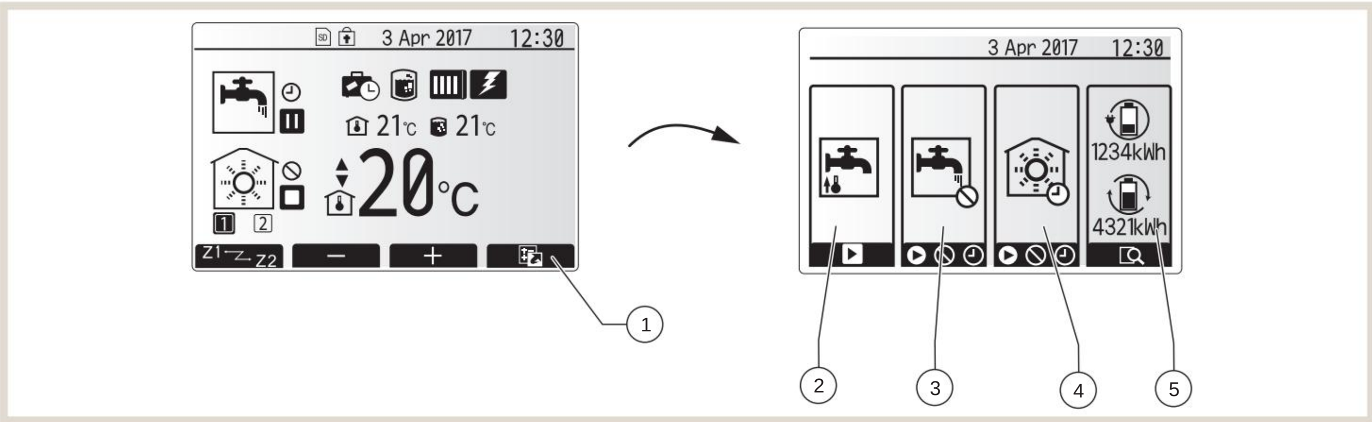
<Menu tree main controller>



6.4 Features

6.4.1 Quick view

Use F4 (1) to go from the main menu to the quick view. Quick view .
You can change the most important operating modes of the system at the push of a button.



Legend
1 quick view
2 Priority for DHW production (forced DHW heating)
3 DHW heating operating mode
4 Space heating/cooling operating mode
5 Energy monitoring

In the quick view you can make the following settings:

Pos.	operation mode	Function key	function
2	Priority DHW production (forced drinking water heating)	F1	By pressing the F1 button, you can have the drinking water heated once to the set setpoint, regardless of the current operating mode of the heat pump. Pressing F1 again deactivates this DHW heating and the system works again in its original state.
3	Drinking water heating	F2	You can use the F2 function key to switch the DHW heating mode. The drinking water heating is switched on. Drinking water heating is deactivated. Drinking water heating is enabled via the set time program.
4	Space heating/cooling	F3	You can use the F3 function key to switch the space heating/cooling mode. The space heating/cooling is switched on. Space heating/cooling is disabled. The room heating/cooling is enabled via the set time program.
5	Energy monitoring	F4	The electrical energy consumed since the beginning of the month and the thermal energy generated since the beginning of the month are displayed here. You can use the F4 function key to display the values broken down by operating mode and in different time periods (since the beginning of the month/last month/the month before last/since the beginning of the year/last year).

6.4.2 Outside temperature-compensated control

With the FTC6 heat pump controller you can choose between purely outside temperature-controlled flow temperature control and control via the room temperature. With outside temperature-controlled flow temperature control, a flow temperature at a specific outside temperature is selected on the controller.

6.4.3 Setting the heating curve

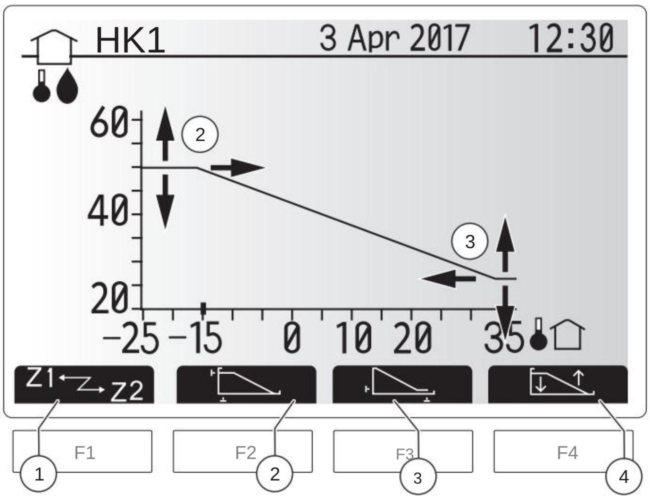
You can adjust the heating curve individually in the editing mode. • Press the menu button for 3 seconds to enter edit mode

• Select the menu Heat cool.

• Choose Edit heating curve with F4.

The simplest heating curve is defined by two points. When delivered, the set heating curve goes from a maximum flow temperature of 50°C at an outside temperature of -15°C to a minimum flow temperature of 25°C at an outside temperature of 34°C. The flow temperature is linear between these two outside temperatures.

It is constant above and below the set outside temperatures.



Legend

Select 1 heating circuit

2 Set the first (upper) base point

3 Set the second (lower) base point

Add 4 knee point

You can select the foot points with the function keys F2 and F3 and also add a knee point with F4.

Use F1 to select the heating curves of the different heating circuits.

Example 1:

You want to achieve a flow temperature of 35°C at an outside temperature of -12°C. From +18°C outside temperature, the flow temperature should be 25°C. • Press the F2 button and set the first (upper) base

point: With F1 (ÿ) or F2 (ÿ) you change the flow temperature to 35°C and with F2 (ÿ) or F3 (ÿ) you change the outside temperature to -12°C.

• Confirm with ÿ.

• Press the F3 button and set the second (lower) base point: Use F1 (ÿ) or F2 (ÿ) to change the flow temperature to 25°C and use F2 (ÿ) or F3 (ÿ) to change the outside temperature to +18°C.

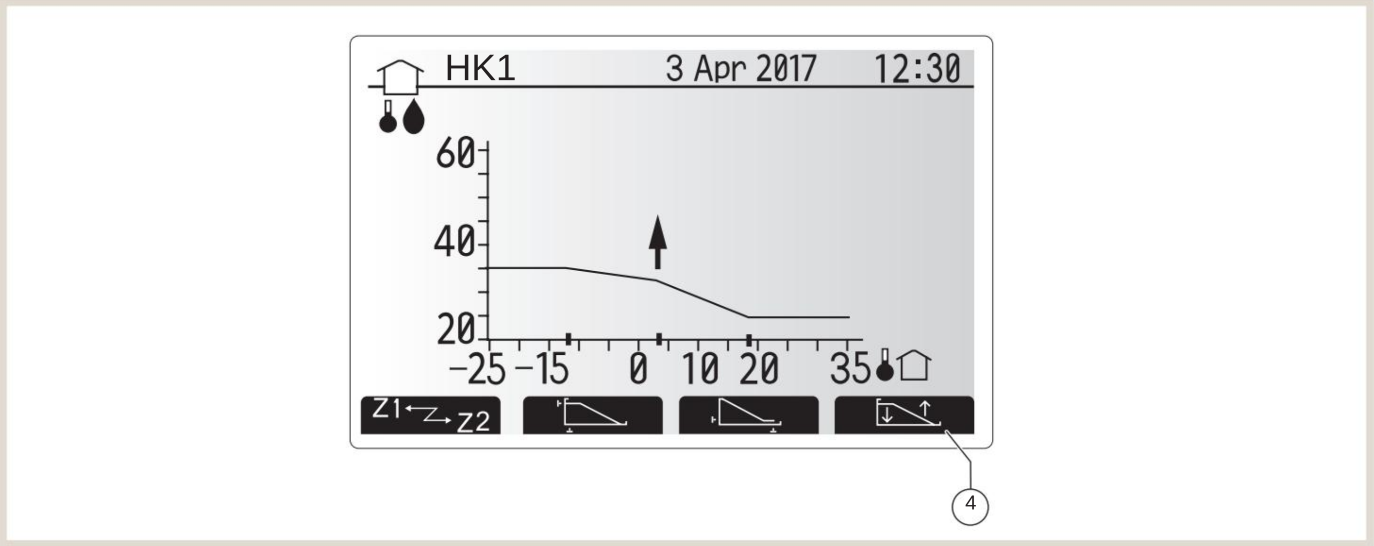
• Confirm with ÿ.

Example 2:

At outside temperatures of around 0°C you want to achieve a higher flow temperature than is provided by the linear curve.

Add a knee point to your heating curve to increase the flow temperature at average outside temperatures.
You want to achieve a flow temperature of 35°C at an outside temperature of -12°C. From +18°C outside temperature, the flow temperature should be 25°C.
At an outside temperature of 3°C, the flow temperature should be 32°C. • Set the foot points as described above.

- Press the F4 button and set the knee point: Use F1 (ÿ) or F2 (ÿ) to change the flow temperature to 32°C and with F2 (ÿ) or F3 (ÿ) the outside temperature to +5°C.
- Confirm with ÿ.



Legend
Add 4 knee point

The heating curve is set by you as a specialist tradesman individually for the building and according to expected user behavior. The operator can then adjust the heating curve as needed during the heating period.

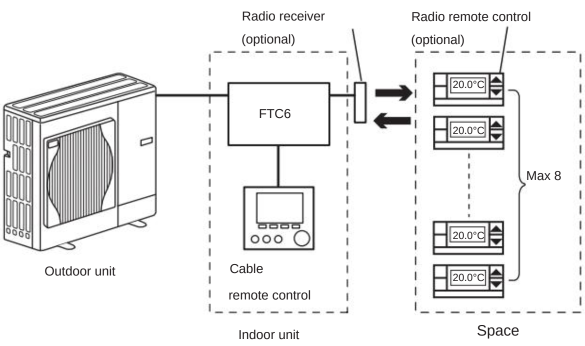
6.4.4 Room temperature control

The room temperature control is equipped with a self-learning function. The function gradually reduces the flow temperature to reach the set room temperature. This ensures long-term energy-efficient operation of the heat pump system. In addition, it is unnecessary for the operator to set the heating curve.
You can choose whether a wired room temperature sensor should be installed in a reference room or up to eight radio remote controls.

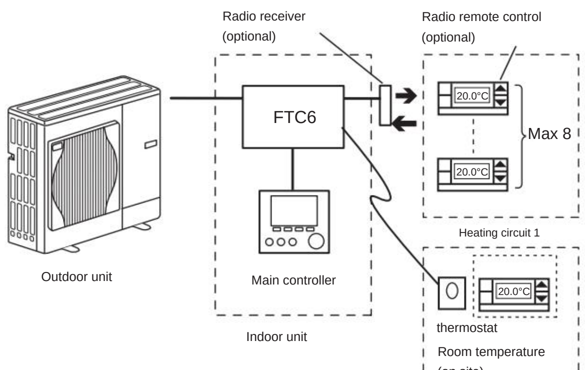
6.4.5 Control options

Temperature control 1 heating circuit	Temperature control 2 heating circuits

Control option A1

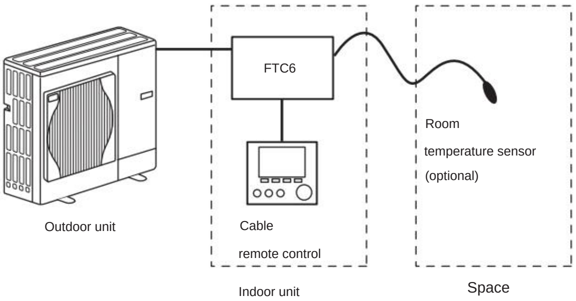


Control option A2

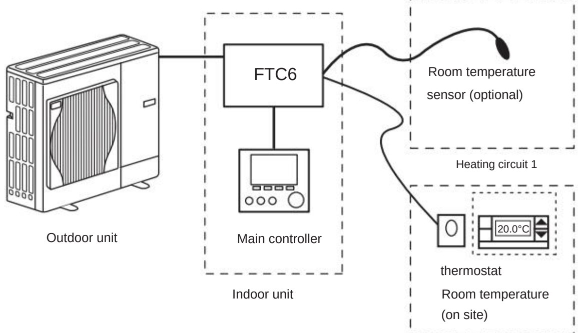


Heating circuit 1: Room temperature control (auto adaptation)
Heating circuit 2: Control via heating curve or flow temperature

Control option B1

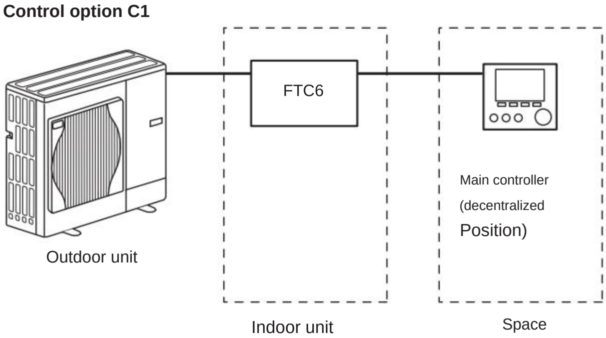


Control option B2

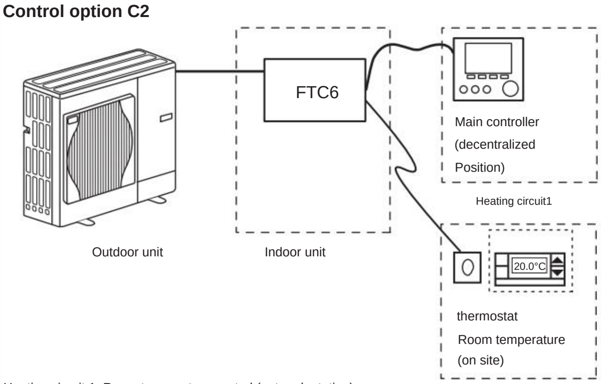


Heating circuit 1 room temperature control (auto adaptation)
Heating circuit 2 control via heating curve or flow temperature

Control option C1

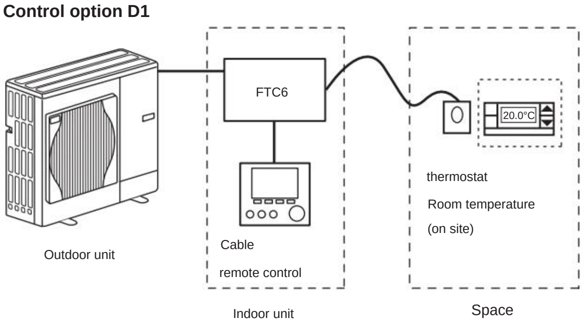


Control option C2

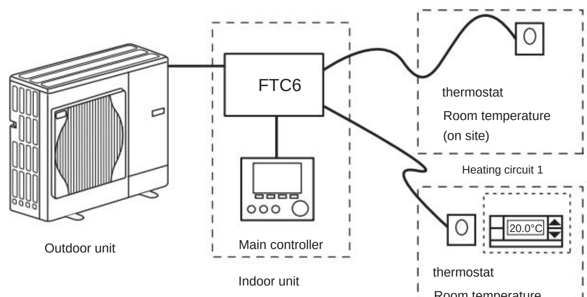


Heating circuit 1: Room temperature control (auto adaptation)
Heating circuit 2: Control via heating curve or flow temperature

Control option D1



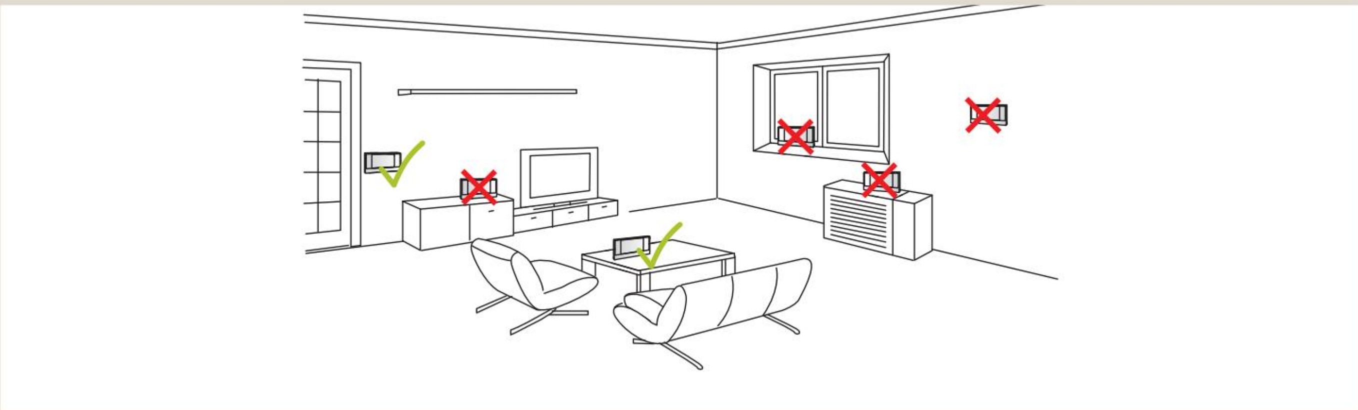
Control option D2



Heating circuit 1, heating circuit 2:
Control via heating curve or flow temperature

When using the radio remote control, the room temperature can be changed from 10 °C to 30 °C. In addition, an absence of up to 72 hours and the immediate heating of the drinking water can be set.

Position of the radio receiver

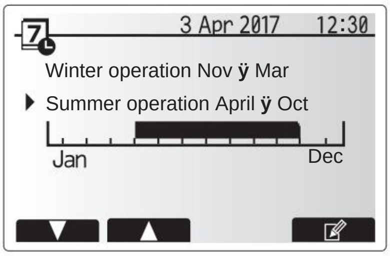


The radio receiver should be installed at least 50 cm away from any sources of interference (e.g. induction hob).

The maximum distance between the radio receiver and the radio remote control can be up to 45 m and depends largely on the environmental conditions (e.g. type of building).

6.4.6 Time programs

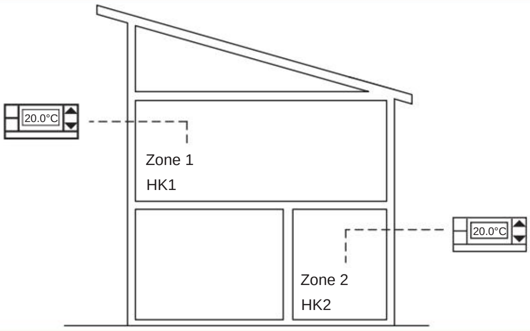
The time program can be set in two variants (summer or winter operation). If a period (in months) is set for winter operation, the remaining time is automatically set for summer operation.



A scheme of operating modes (heating, cooling, DHW production) can be set up in each time program. If no separate scheme is set up in summer operation, the scheme from winter operation applies here. If summer operation has been defined for 12 months, only the summer operation operating scheme applies.

Set heating time program

4 switching points can be set in 24 hours. For heating systems with two heating circuits, a radio remote control or sensor is required for each heating circuit.



The temperatures for the individual heating circuits can be set depending on the day via programming.

Example:

The customer wants there to be a time program for the winter period, namely from November to March. The second time program for summer time should therefore run from April to October.
The customer wants continuous heating in winter.
In HK 1 it should be 20°C from 6:00 a.m. to 10:00 p.m. and in HK 2 it should be heated to 22°C. On the weekends, the customer would like it to be a little warmer in the morning, and in the course of the morning the temperature should be lowered back to 20°C.
At night the room temperature is always reduced to 18°C.

In the summer, the heating should be switched off during the day and heated to 18°C at night on weekdays and 20°C on weekends.

	HK1		HK2	
weekday	time	Target room temperature	time	Target room temperature
Winter operation (November – March)				
Mon-Fri	06:00 am	20°C	06:00 am	22°C
	22:00 O'clock	18°C	22:00 O'clock	18°C
Sat-Sun	06:00 am	22°C	07:30 am	22°C
	9:00 a.m	20°C	12:00 o'clock	20°C
	22:00 O'clock	18°C	9:30 p.m	18°C
Summer operation (April – October)				
Mon-Fri	06:00 am	–	06:00 am	–
	22:00 O'clock	18°C	22:00 O'clock	18°C
Sat-Sun	9:00 a.m	–	10:00 a.m	–
	22:00 O'clock	20°C	9:30 p.m	20°C

Set the duration of the time programs

Proceed as follows:

• In the main menu, select the symbol for the time program and confirm with ÿ.
The preview window for the planning period appears.
• Use F1 (ÿ) or F2 (ÿ) to select the winter operation time program and press the F4 (edit) key.
The window for editing the time bar appears.
• Use F2 (ÿ) or F3 (ÿ) to select November as the starting month and confirm with ÿ. • Use F2 (ÿ) or F3 (ÿ) to select March as the end month and confirm with ÿ. • Save the settings with F4.

If you have saved the period for winter operation, the remaining period (April to October) is automatically set for summer operation.

Define room temperature setpoints and switching points

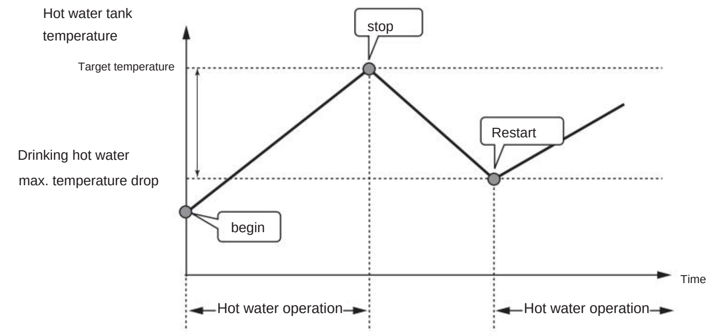
Proceed as follows:

• In the main menu, select the symbol for the time program and confirm with ÿ.
The preview window for the planning period appears.
• Use F1 (ÿ) or F2 (ÿ) to select the winter operation time program and confirm with ÿ.
The submenu appears. The icons show the following modes (if available):
• Heating
• Cooling
• TWW
• Use F2/F3 to select the mode Heat and confirm with ÿ.
The preview window of the heating time program will be displayed.
• If necessary, select heating circuit 1 (HK 1) using F1. • Use F2/F3 to select Monday (Mon) and press F4 (edit).
Editing mode appears.
• Now combine the days of the week Monday to Friday by selecting the days one after the other with F2/F3 and check the box with F1. • Confirm with ÿ.
The switching time display appears.
• Use F3 (ÿ) to select the first switching point 6:00 a.m. and press F1 to set the temperature at this point change switching point.
• Confirm with ÿ.
• Use F2 (-) or F3 (+) to set the temperature to 20 °C and confirm with ÿ. • Use F3 (ÿ) to select the next switching point 10:00 p.m. and set the desired temperature to 18 °C a.
• Confirm with ÿ.
• Save the settings with F4.
• Similarly, set the switching points for the weekend and save your settings with F4.
• Use F1 to select heating circuit 2 (HK 2) and set the heating times for heating circuit 2 and save yours Settings with F4.
• Proceed in the same way for summer operation.

6.4.7 Drinking water heating

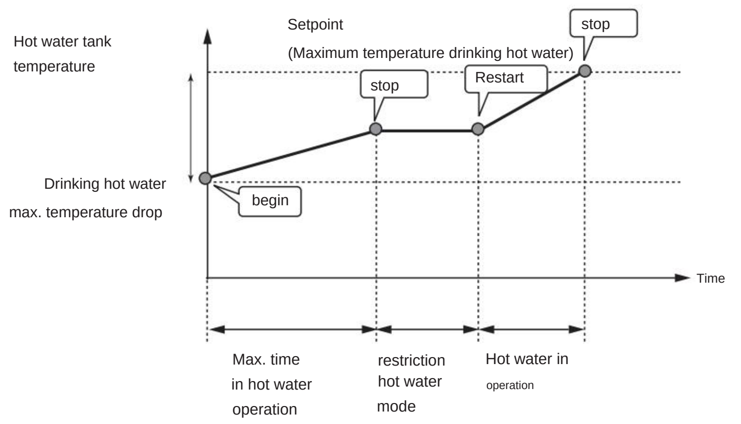
Drinking water heating in normal mode

The controller is equipped with a drinking water priority circuit. The THW5 sensor, which is installed in the drinking water tank, constantly reports the current temperature of the drinking water to the controller. If the maximum temperature drop is reached, the system switches the 3-way switching valve and the water is heated until the domestic hot water temperature has again reached the set setpoint (maximum domestic hot water temperature).



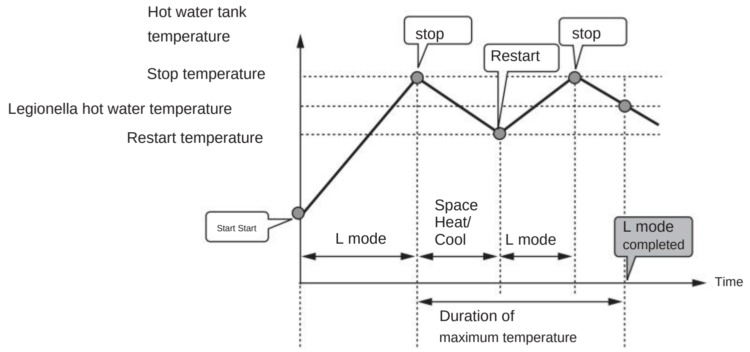
Drinking water heating in Eco mode

There is also an eco mode for heating drinking water. If this function is activated, when the maximum temperature drop is reached, the drinking water is heated using the most energy-efficient compressor operation for an adjustable period of time. Once the maximum operating time for this hot water heating has expired, the system switches to heating mode for a defined time so that the building does not cool down too much. After the time for the domestic hot water restriction has expired, the drinking water priority circuit becomes active again and the water is heated until the domestic hot water temperature has reached the set maximum temperature.



Legionella program

In the Legionella program, the temperature in the drinking water tank is raised to more than 60°C and maintained for a definable period of time in order to minimize the risk of Legionella infestation of the drinking water installation. In addition, a temperature of 70°C can be set so that pipes and fittings that are further away can also be reached. If available, the electric heating element is automatically used for this purpose. The DVGW worksheet W 551 and the Drinking Water Ordinance in the current version must be observed.



6.4.8 Query summary of settings

You can easily query all settings via the controller and receive a quick overview of the relevant target values and other settings.

Proceed as follows:
• Select • Enter main menu > Service menu and confirm with ÿ.
the password (factory setting 0000) and confirm with ÿ.
• Select with F1 (ÿ) or F2 (ÿ) Overview of settings and confirm with ÿ.
--> All settings are displayed. You can scroll through the settings using F1 (ÿ) or F2 (ÿ).

6.4.9 RU block

In some regions of Germany, the energy supply company (EVU) reserves the right to block discounted heat pump electricity for a certain period of time.

There is an external input for this utility block on the FTC6 heat pump controller. The utility signal must be applied potential-free to input IN4 (TBI.1 terminals 7-8) as a normally open contact. When the contact is closed, the outdoor unit continues to be supplied with voltage for safety reasons; the compressor and electric heating element are blocked and do not start.

After the utility company's approval has been given, the heat pump starts again and provides heat for the drinking water and the building.

6.4.10 Screed heating

If underfloor heating is installed, you can use the function to dry the freshly laid screed in a new building. The program changes the flow Screed heating temperature in the steps you specify Screed to dry gradually.

When operation is completed, the system stops all operating modes except frost protection.

When it comes to function Screed heating the target flow temperature in heating circuit 1 is the same as in heating circuit 2.

A NOTICE!

ÿEspecially when outside temperatures are low, we recommend using an electric heating element.

A NOTICE!

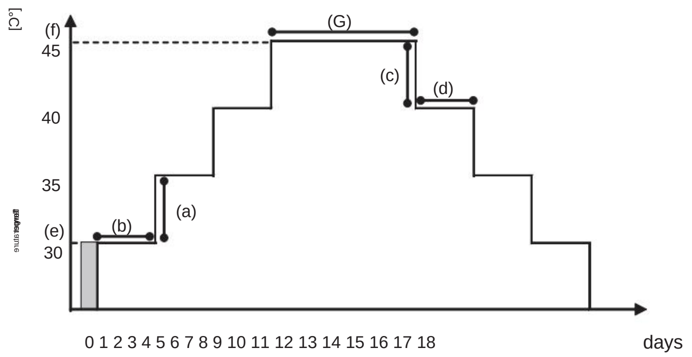
ÿDisconnect the wires to the external inputs of the room temperature sensor, the demand control and the outside temperature thermostat, otherwise the target flow temperature could not be reached.

A NOTICE!

In the event of a power failure, the screed heating function is interrupted and not continued.

ÿEnsure a consistent power supply.

ÿStart the function after a power failure Screed heating anew.



function		Icon	Description	Setting options	Unit	Default setting
Screed heating			Set the function to ON and turn on the system via the main controller; the drying operation begins.	On off		Out of
flow temperature (Increase)		a	Set the increase step for the target flow temperature.	+1 to +10	°C	+5
		b	Set the period of time for which the target flow temperature is maintained.	1 to 7	days	2
flow temperature (lowering)		c	Set the reduction step for the target flow temperature.	-1 to 10	°C	-5
		d	Set the period for which the target flow temperature is maintained.	1 to 7	days	2
Target temperature	Start and end	e	Set the target flow temperature at the start and end of operation.	25 to 60	°C	30
	Maximum	f	Set the maximum target flow temperature.	25 to 60	°C	45
	Maximum value Length of time	G	Set the period for which the maximum target flow temperature is maintained.	1 to 20	days	5

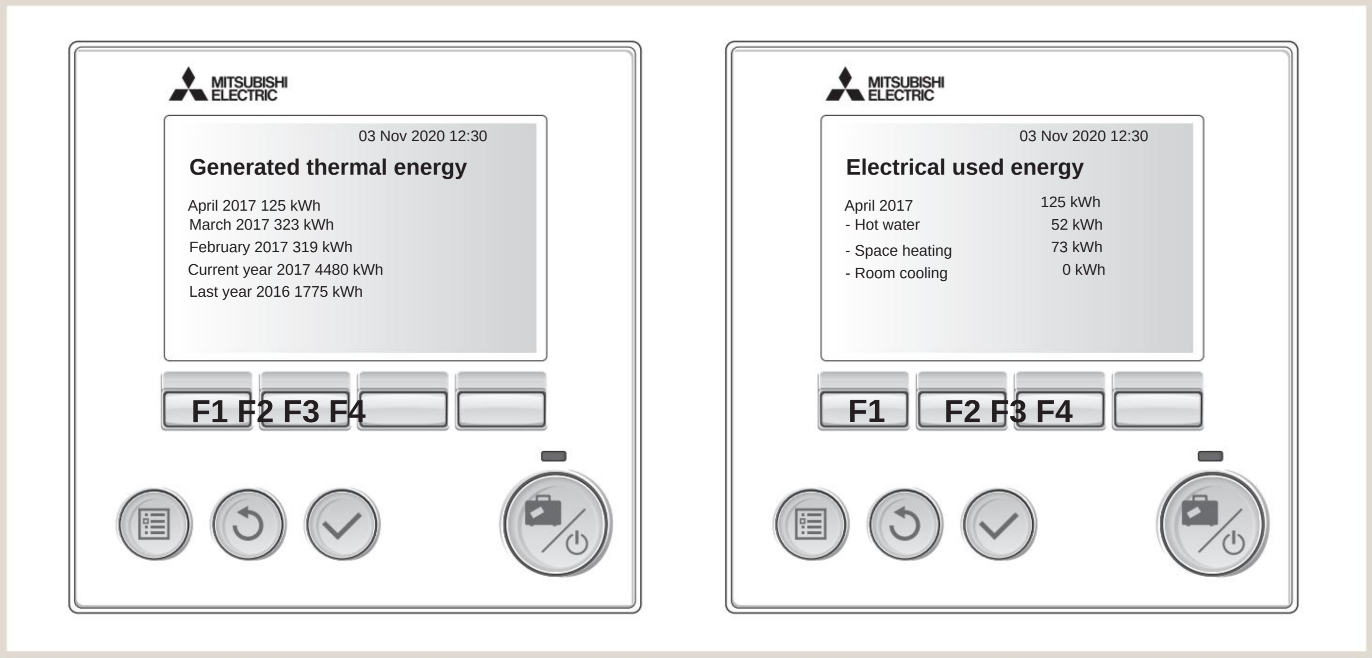
More details about Screed heating can be found in the installation instructions of the indoor unit.

6.4.11 Monitoring

Energy monitoring

The FTC6 heat pump controller has an integrated energy monitoring function. This gives the user an overview of the efficiency of his system (use of electrical energy in relation to thermal energy generated). You can access the integrated energy monitoring via the quick view.

Display cumulative values



These cumulative energy values are displayed directly:

- Total electrical energy used (since the beginning of the month)
- Total thermal energy generated (since the beginning of the month)

Energy monitoring can still be used to monitor the energy values in the respective operating mode - heating, cooling and DHW heating - in these periods:

- current month
- last month
- month before last
- current year
- last year

A NOTICE!

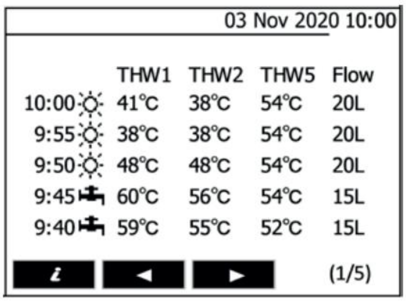
ÿThe data recorded for determining the “electrical energy used” can fluctuate significantly depending on the grid connection situation. If greater accuracy is required for monitoring, the display of the recorded data from external electricity meters and heat meters can be set up.

Live temperature monitoring

The Live Temperature Monitoring function shows the current temperatures, operating mode and the measured volume flow of the integrated volume flow sensor. The displayed values are automatically updated every 5 minutes and saved in the main remote control for a maximum of 120 minutes.

The following data is displayed:

- Time
- Operating mode (heating mode / cooling mode / DHW / legionella test / stop)
- Flow temperature measured at sensor THW1
- Return temperature measured at sensor THW2
- DHW temperature measured at sensor THW5B (if available)
- Volume flow measured in the primary circuit



This makes it easy to analyze and calculate the required power and temperature spread in the heating system. This is a significant help, especially during commissioning.

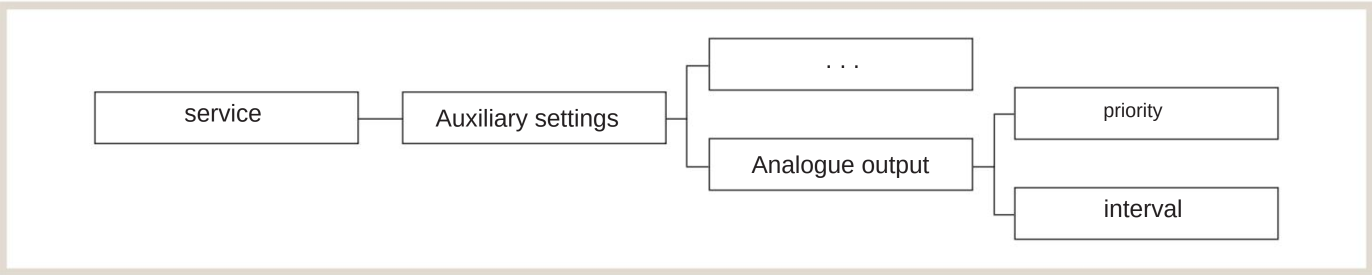
6.4.12 Bivalent control of additional heat generators

The FTC6 heat pump controller offers the option of enabling a second heat generator (oil or gas boiler) using a switching contact. This contact, OUT10, is located on the TBO.3 1-2 terminal block. In addition, the DIP switch SW1-1 must be set to ON/AN.

The second heat generator can be switched on according to the outside temperature, operating costs or CO2 emissions. The mode of operation is then bivalent-alternative (you can find more information about this in chapter “2. Basics” from page 12).

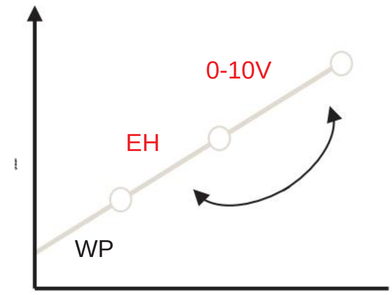
For operation, the switchover point must be selected in the service level (operating settings) under the boiler settings item. For the variant with optimized operating costs, the efficiency for the second heat generator must be entered.
When switching based on the lowest possible CO2 emissions, the corresponding emission parameters must be entered. For heat pump electricity, 0.56 kg CO2/kWh can be assumed (unless 100% comes from renewable energies), heating oil 0.27 kg CO2/kWh and natural gas 0.21 kg CO2/kWh.

Menu structure



It is also possible to add a second heat generator based on the required flow temperature for all heat generators. This function is only available for heating mode and not DHW. The mode of operation is then bivalent-parallel (you can find more information about this in chapter “2. Basics” from page 12). The necessary contact OUTA1 is located on the terminal block TBI.4 7-8. The DIP switch SW6-4 must be set to ON/AN. The heating circuit sensors THW6 and THW7 are also necessary, which are preferably positioned after a buffer tank.

The control logic for this dual-mode operation is flexible and can be adjusted as required. Depending on the required heating output or flow temperature, either the electric heating element (EH) (factory setting) or the 2nd heat generator (0-10V) is switched on after the heat pump WP.



This order can be changed using the “Priority” parameter, so that if the heat pump performance is insufficient, the second heat generator is activated via the 0-10V signal.
The electric heating element (EH) or 2nd heat generator (0-10V) is activated when the following conditions are met:

- Heat pump works for 30 min. (factory setting) see “Electric heating element (heating)”;
  “Delay time” parameter (setting range 5 – 180min)
- ACTUAL flow temperature at sensor THW6 <= TARGET flow temperature – 3K

If the switch-on conditions are met, the voltage is increased/reduced in 1-volt steps (11 steps in total) to achieve the desired flow temperature.

The flow temperature control is implemented as follows:

Condition SHOULD – IS	volt
ACTUAL flow temperature (THW6) >= target flow temperature + 2K	- 1V
ACTUAL flow temperature (THW6) = target flow temperature	+/- 0V
ACTUAL flow temperature (THW6) >= target flow temperature - 2K	+ 1V

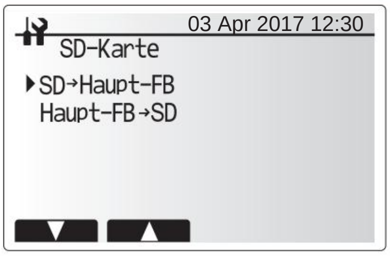
The “Interval” parameter checks the TARGET/ACTUAL conditions every 5 minutes (factory setting) and can be shortened or lengthened (setting range: 1 – 30min). This makes the response time of the 2nd heat generator faster/slower.

6.4.13 Software for PC and SD card

The individual parameters of each individual heat pump system can be easily set on the PC before installation. The data is saved on an SD card and read during commissioning via an SD card slot integrated on the indoor unit's circuit board. In the event of service, a quick and reliable error analysis can be carried out using the stored operating data. A 2GB SD memory card can record up to 30 days of operating parameters. If a longer recording time is required, an SD memory card with a maximum storage capacity of 32 GB can also be used. This saves time and allows targeted problem solving.

Mitsubishi Electric offers service software so that you can program the FTC6 heat pump controller quickly and easily. All relevant controller settings are made using a standard PC and saved on an SD card. The saved settings are then loaded onto the FTC6 heat pump controller via the service level.

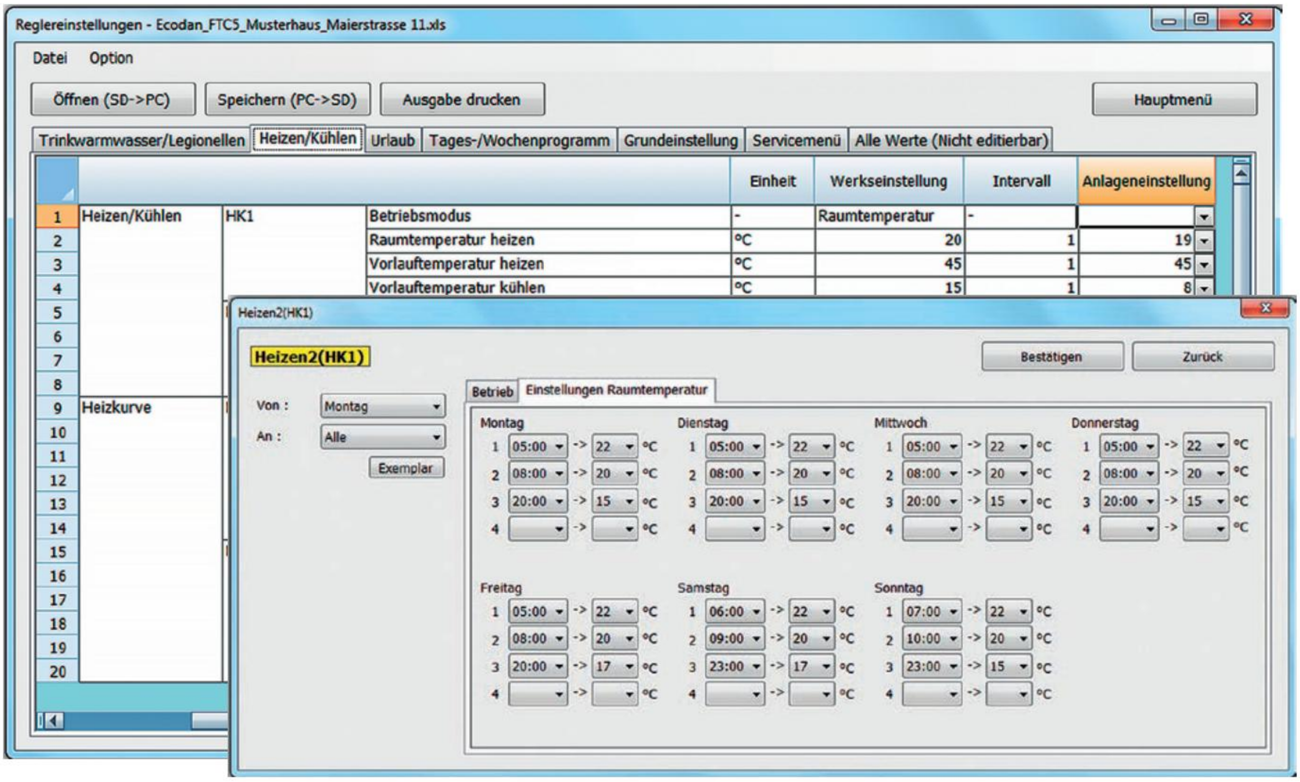
Select transmission direction



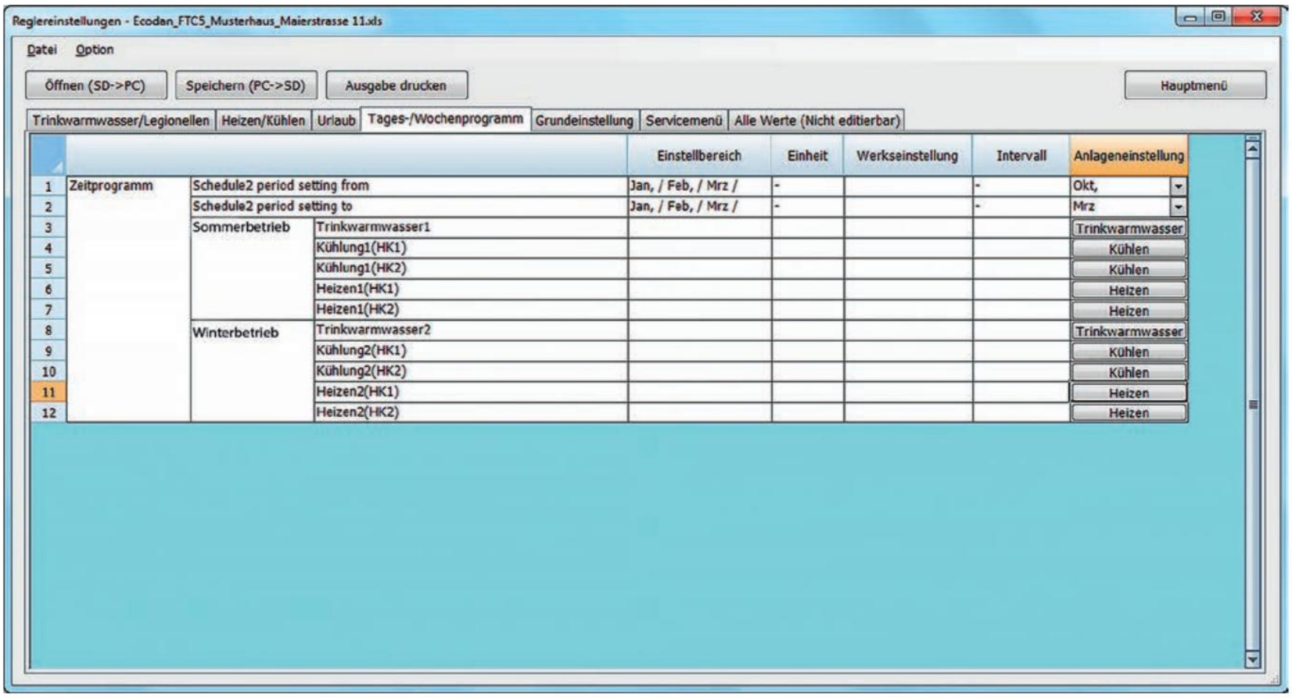
Select download data

The functionality also offers the download of the parameters from the controller to the SD card.

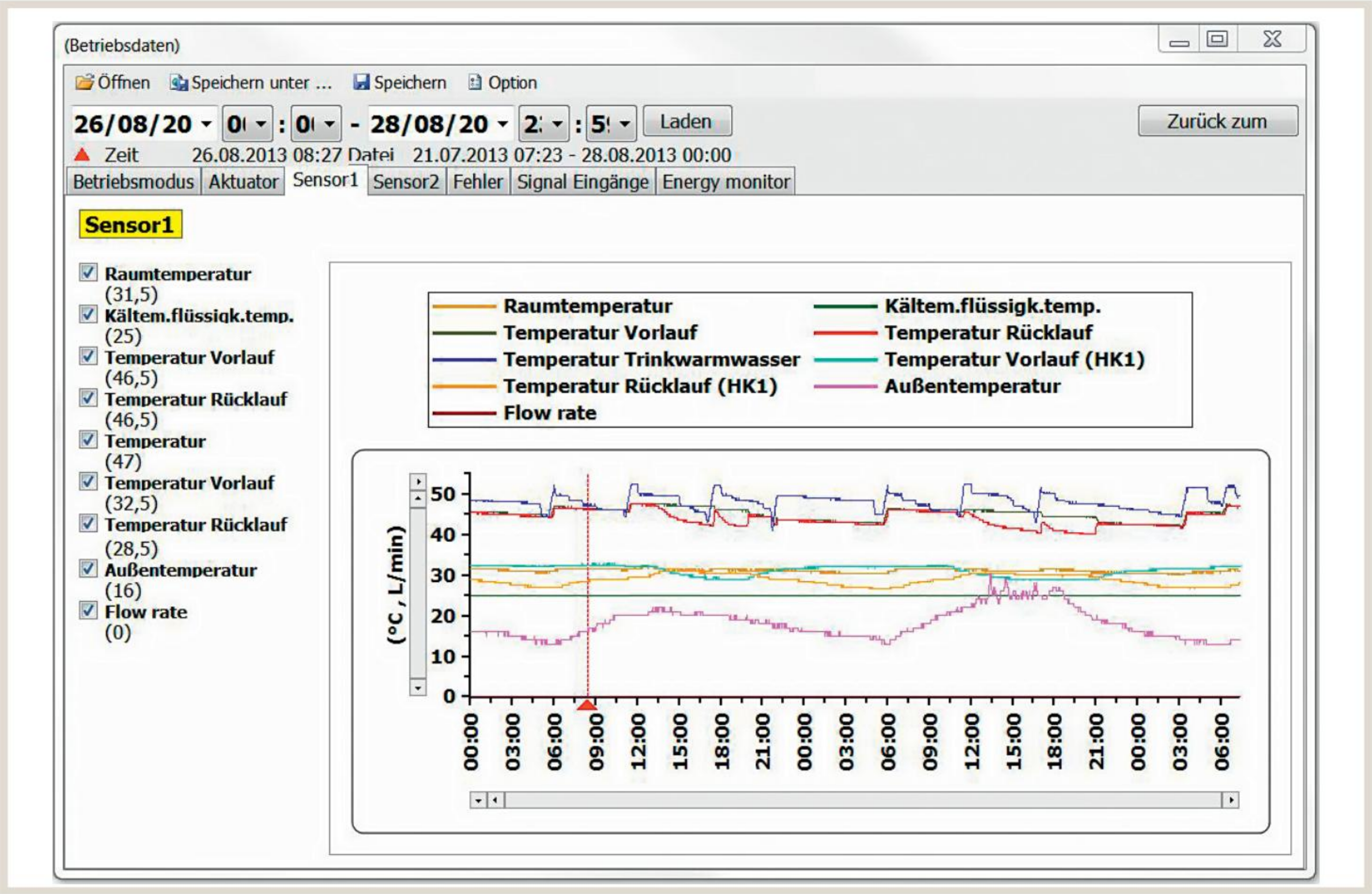
Controller settings on the PC



Set the time program on the PC



Evaluate operating data



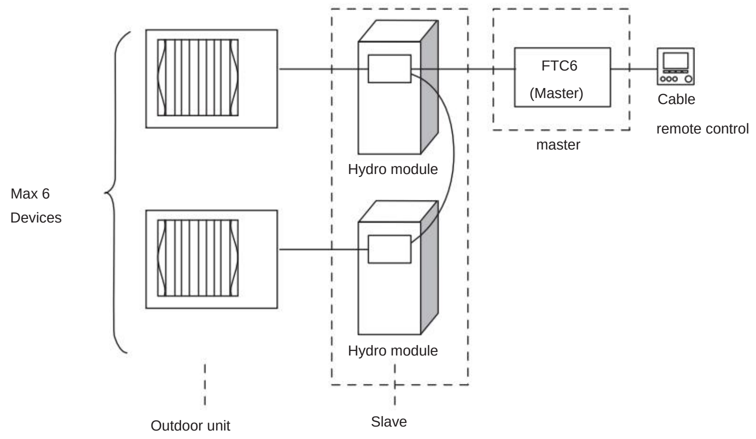
recording

As soon as an SD card is inserted into the FTC6 heat pump controller, the system automatically begins recording all system-relevant data (e.g.: flow and return sensors, condensing temperature, room temperature, number and time of defrosts of the heat pump outdoor unit).

The recorded data can also be graphically displayed and evaluated on the PC using the service software for the SD cards. The included 2GB SD card can record up to 30 days of data. The oldest data will then be overwritten. If a longer recording period is required, a standard SD card with a maximum of 32 GB can be retrofitted. The recording period is then a maximum of 16 months.

6.4.14 Cascade control

With the heat pump controller you have the option of implementing a heat pump cascade of up to six heat pumps. The outdoor devices must be identical in construction.



Domestic hot water heating
All heat pumps in the cascade can be used to heat domestic hot water.
Heating mode is not available while domestic hot water is being prepared.

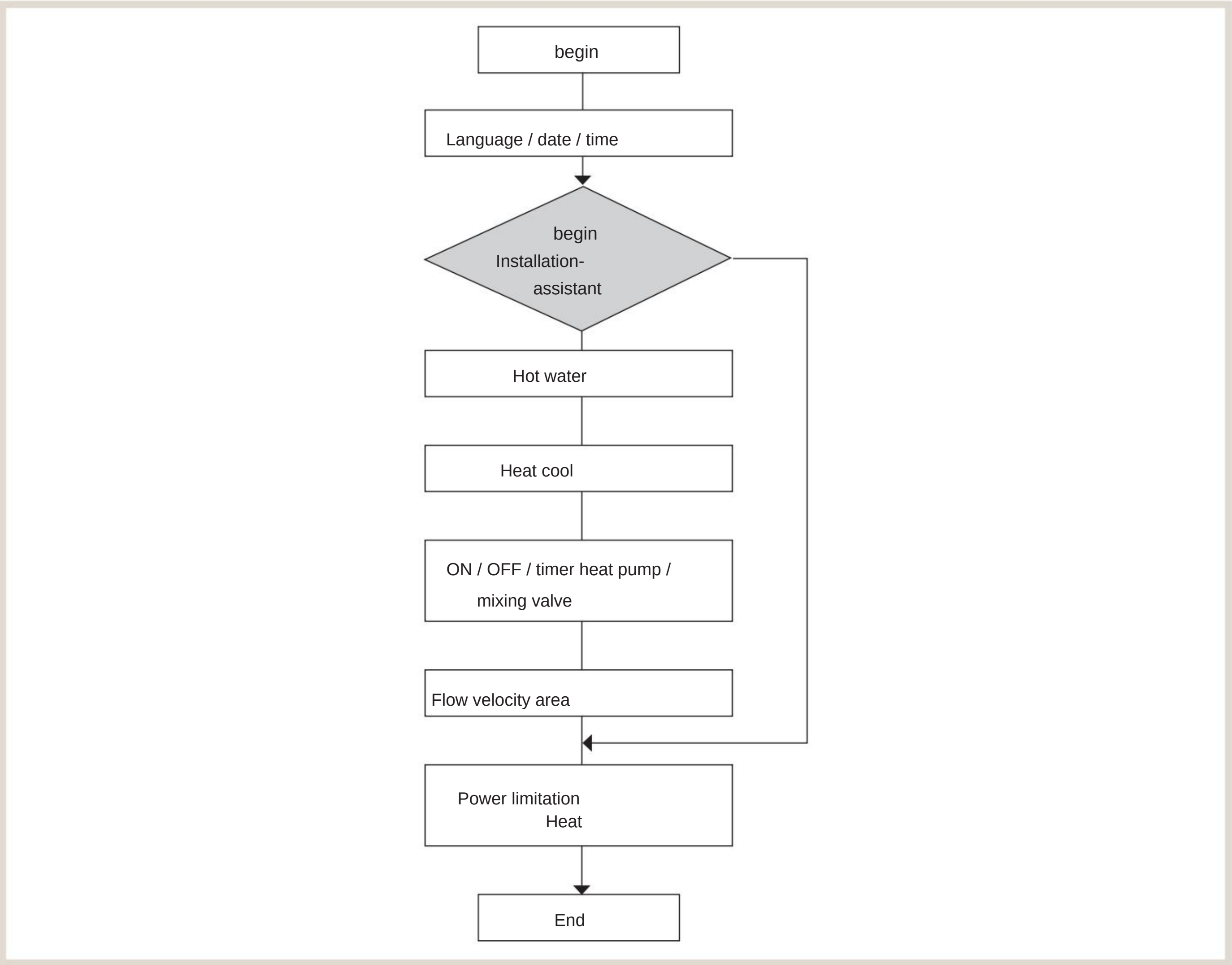
Efficiency, service life and security of supply
So that the heat pumps achieve the same running time in heating mode, the lead machine is changed at a constant rhythm with a difference of a maximum of 100 operating hours. This increases the service life of the entire system and avoids early maintenance due to excessive load on individual outdoor devices. If a device malfunction occurs, the redundancy function puts the next freely available device into operation. This prevents failure of the entire system and ensures security of supply.

The master controller also ensures efficient control of the individual outdoor devices, with each outdoor device working in optimal partial load operation depending on heat requirements. This achieves improved efficiency of the entire cascade.

6.4.15 Commissioning assistant

The commissioning assistant (wizard) is activated automatically during initial commissioning and is intended to enable quick and problem-free commissioning. If this is not desired, the commissioning wizard can also be skipped. The following basic functions can be configured using the commissioning assistant: • Language / date / time • Domestic hot water (temperature and mode) • Heating (heating circuits) • Heating/cooling operating mode • Pump level for hot water and heating mode • Min. volume flow of heating pump • Mixer running time for mixed heating circuit (if available) • Power limitation of electric heating element (Attention! Setting cannot be reversed)

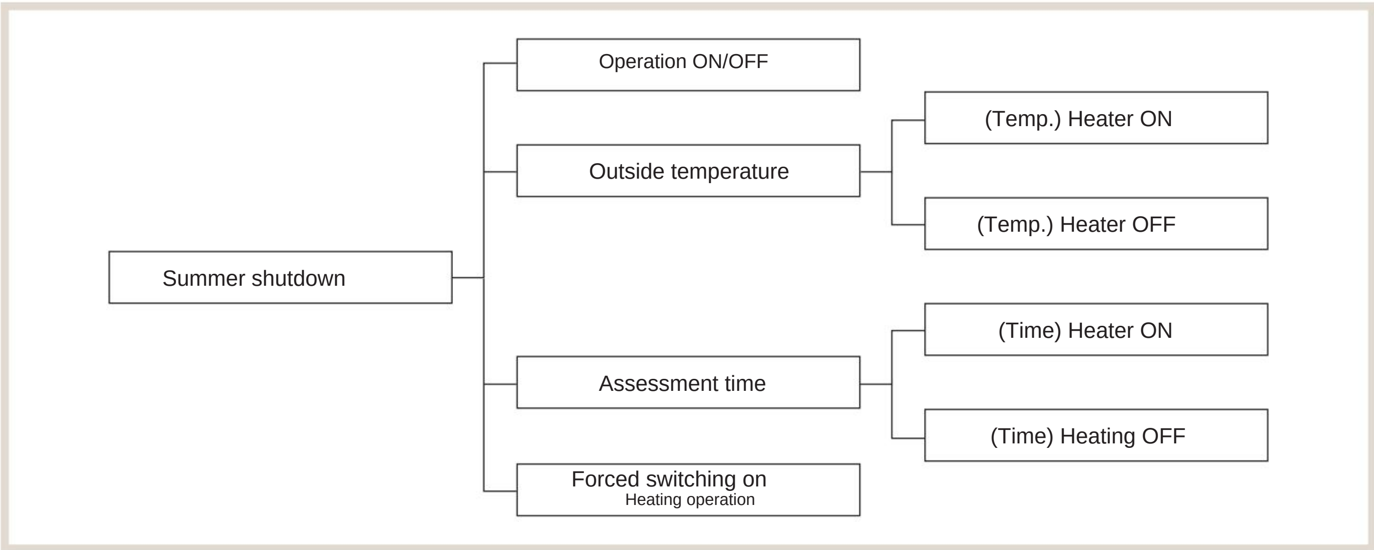
Sequence



6.4.16 Automatic summer shutdown

The automatic summer switch-off function allows you to switch between summer and winter operation based on the outside temperature and the selected evaluation time (thermal inertia of the building). The function has no influence on domestic hot water preparation and is deactivated at the factory.
The function that configures temperatures and times is activated under the menu item: Service ÿ Operating settings ÿ Summer shutdown.

Menu structure



Outside temperature:
Under this menu item, two outside temperatures can be defined for switching the heating on or off.
operational:

- Parameter “(Temp.) Heating OFF” (factory setting: 15°C; setting range: 5 – 20°C).
- Parameter “(Temp.) Heating ON” (factory setting: 10°C; setting range: 4 – 19°C).

The “(Temp.) Heating OFF” parameter is used to select the desired outside temperature at which the heat pump switches off heating mode. The “(Temp.) Heating ON” parameter is used to select the temperature at which the heat pump switches heating mode on again. This allows a freely selectable switch-back hysteresis from -1K to -16K.

Evaluation time:
With this parameter, depending on the type of building, you can choose how the outside temperature should be averaged. This takes the building damping into account when switching off or switching on the heating operation again.

Two periods are set for averaging the recorded outside temperature:
- Parameter “(Time) Heating OFF” (factory setting: 6h; setting range: 1 – 48h)
- Parameter “(Time) Heating ON” (factory setting: 6h; setting range: 1 – 48h)

The parameter “(Time) Heating OFF” is directly assigned to the parameter “(Temp.) Heating OFF” and describes how long the recorded outside temperature must be below the set outside temperature until the heating mode is automatically switched off. The “(Time) Heating ON” parameter applies analogously to the logic for restarting the heating mode. It is recommended to define the same on/off times for both parameters.

The following guide values can be used for building attenuation:

- <12h averaging of the outside temperature ÿ e.g. wooden construction with fast heat transfer and simple glazing
- 12h–24h averaging of the outside temperature ÿ e.g. brick buildings with thermal insulation protection and medium heat transfer.
- 24h–48h averaging of the outside temperature ÿ Buildings with slow, sluggish heat transfer

Forced switching on heating mode:
In the event of a drastic drop in temperature within a short period of time, the heating operation can be switched on again immediately without the outside temperature being averaged:

• Parameter “Forced switching on heating mode” •
(Factory setting: 5°C; Setting range: -30 – 10°C)

This can prevent the building from cooling down and maintain a comfortable room temperature.

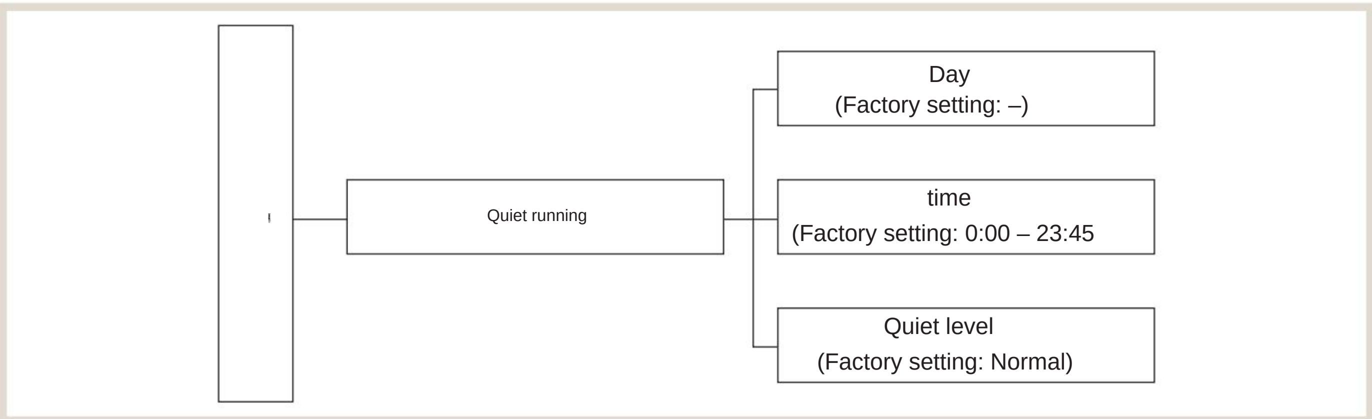
6.4.17 Night setback / quiet operation

With the night setback / quiet function, the operating noise of the outdoor unit can be reduced in a time-controlled manner.
This may be necessary, especially at night, in order to meet emissions regulations in accordance with TA Noise. For this purpose, the performance/speed of the compressor and fan is reduced in 2 selectable levels. This also reduces the available heating/cooling power. The function is available for the following heat pump series:

- PUZ World Cup
- PUD SWM
- PUD-S(H)WM
- EHGT17D

The function is equipped with a time program in which the desired quiet mode can be selected for each day of the week. The selected time interval and the selected quiet level are then valid for all selected days of the week.
In general, a week-long time interval from 10 p.m. to 6 a.m. is recommended. It is not possible to select different time intervals or quiet levels on different days of the week.

Menu structure



Depending on the selected level of the quiet function, there are different effects on noise emissions and heating output. The levels can be selected in the main controller as follows:

The table below shows the corresponding sound output and heating output for the different levels. This data is used for initial preliminary planning and may differ under other (real) operating conditions.

Outdoor unit PUZ-WM	**Normal level**		**Level 1 quiet operation**		**Level 2 quiet running**	
Condition: A7/W35	**Max. sound power (PWL / Lw)**	**Max. heating power**	**Max. sound power (PWL / Lw)**	**Max. heating power**	**Max. sound power (PWL / Lw)**	**Max. heating output**
50	63dB(A)	5.6kW	57dB(A)	5.0kW	55dB(A)	4.0kW
60	60dB(A)	7.9kW	55dB(A)	4.9kW	54dB(A)	4.4kW
85	60dB(A)	10.5kW	55dB(A)	6.5kW	54dB(A)	5.9kW
112	62dB(A)	13.5kW	57dB(A)	8.1kW	55dB(A)	6.8kW

Outdoor unit PUD-SWM	**Normal level**		**Level 1 quiet operation**		**Level 2 quiet running**	
Condition: A7/W35	**Max. sound power (PWL / Lw)**	**Max. heating power**	**Max. sound power (PWL / Lw)**	**Max. heating power**	**Max. sound power (PWL / Lw)**	**Max. heating output**
60	58dB(A)	8.3kW	55dB(A)	4.5kW	55dB(A)	4.5kW
80	60dB(A)	8.9kW	56dB(A)	5.5kW	55dB(A)	5.0kW
100	63dB(A)	10.9kW	57dB(A)	6.5kW	55dB(A)	5.5kW
120	65dB(A)	12.9kW	60dB(A)	10.0kW	58dB(A)	6.8kW

Outdoor unit PUD-SHWM	**Level Normal**		**Level 1 quiet operation**		**Level 2 quiet running**	
Condition: A7/W35	**Max. sound power (PWL / Lw)**	**Max. heating power**	**Max. sound power (PWL / Lw)**	**Max. heating power**	**Max. sound power (PWL / Lw)**	**Max. heating output**
60	58dB(A)	8.3kW	55dB(A)	4.5kW	55dB(A)	4.5kW
80	60dB(A)	8.9kW	56dB(A)	5.5kW	55dB(A)	5.0kW
100	63dB(A)	10.9kW	57dB(A)	6.5kW	55dB(A)	5.5kW
120	65dB(A)	12.9kW	60dB(A)	10.0kW	58dB(A)	6.8kW
140	68dB(A)	14.4kW	62dB(A)	12.0kW	58dB(A)	8.4kW

6.4.18 Special functions

In addition to the settings of the FTC6 heat pump controller in the storage/hydro module, it is possible to specify certain operating modes directly on the outdoor unit. • Reduced night operations

• Performance control

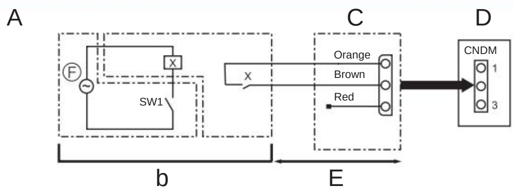
For these special functions, the optional adapter PAC-SC36NA-E (accessory) is required as well as the CNDM plug location on the corresponding outdoor unit. These special functions may only be used by experienced specialists, as incorrect installation can lead to increased energy consumption, loss of comfort and/or noise pollution. Both special functions cannot be used at the same time.

Reduced night operations

If it is not possible to maintain the required noise level at night despite the outdoor unit's various installation options, this function can represent an alternative solution.

This reduces the maximum compressor frequency by 10 to 20% (depending on the device type) and the maximum fan speed by 10 to 15% (depending on the device type). This means that reduced night operation can be set using an on-site timer.

Reduced post-operation (on site)



A Example of a circuit diagram (reduced night operation)
B On-site arrangement
C External input adapter (PAC-SC36NA-E)
X relay
SW1 switching contact 1 (closer)
D Control board on the outdoor unit
E Max. 10 m
F Power supply for relays

Using the following additional function, the operating noise of the outdoor unit can be reduced by approximately 3 to 4 dB.

Reduced night operation is activated when a commercially available timer or the contact input of an ON/OFF switch is additionally installed on the CNDM plug (optional accessory) on the control board of the outdoor unit.

• Effectiveness depends on outside temperatures and operating conditions.

1 When using the external input adapter (PAC-SC36NA-E) (optional accessory), create the circuit diagram as shown.
2 SW1 ON/ON: Reduced night operation
SW1 OFF/AUS: Normal operation

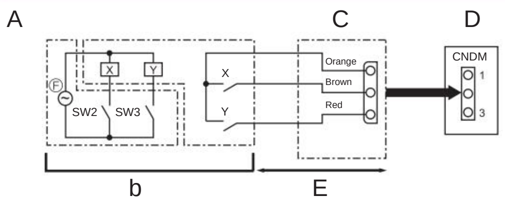
A notice:

When the DIP switches SW7-1 and SW9-1 on the outdoor unit control board are turned on (ON), reset the DIP switches SW7-1, SW9-1 to OFF/AUS. This function cannot be used together with the power control function.

Performance control

The power control allows the compressor's power output to be specifically adjusted to 100%, 75%, 50% and 0%. The power control must not be used in combination with the SG-Ready circuit, as conflicting switching commands can result in increased energy consumption, loss of comfort and/or noise pollution.

Power control (on site)



A Example of a circuit diagram (power control)
B On-site arrangement
C External input adapter (PAC-SC36NA-E)
X,Y relay
SW2 switching contact 2 (closer)
SW3 switching contact 3 (closer)
D Control board on the outdoor unit
E Max. 10 m
F Power supply for relays

Using the following additional function, the power output can be reduced to 0 to 100% of the conventional power output.
The power control is activated when a commercially available timer or the contact input of an ON/OFF switch is additionally installed on the CNDM connector (optional accessory) on the control board of the outdoor unit.

1 When using the external input adapter (PAC-SC36NA-E) (optional accessory), create the circuit diagram as shown.
2 By setting SW7-1 on the outdoor unit control board, the power output (compared to the traditional power output) can be limited as shown below.

Performance code	SW7-1	SW2	SW3	Power output
Performance control	OH NO	OFF/OFF	OFF/OFF	100%
		OH NO	OFF/OFF	75%
		OH NO	OH NO	50%
		OFF/OFF	OH NO	0% (stop)

6.4.19 Smart grid connection of the Ecodan systems

The electricity required to operate a heat pump is increasingly being generated from renewable energy sources.
However, the generation of electricity from wind or solar depends on the weather - and therefore cannot be timed according to demand. When conditions are favorable, there are ever larger surpluses of electricity or there are times when little electricity can be produced. Politics and science are therefore looking for solutions that make “green” electricity more predictable, for solutions that can react flexibly to natural electricity generation.
The heat pump plays an important role in these concepts.

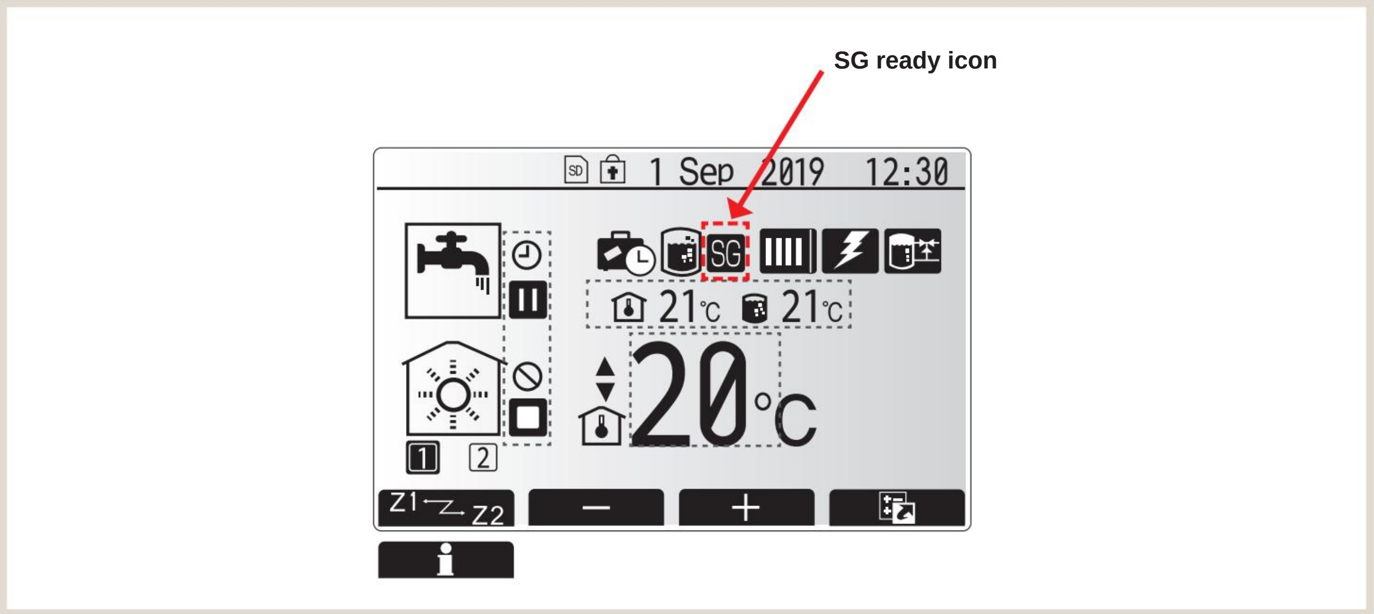
Heat pumps whose control technology enables integration into a smart grid (intelligent power grid, English Smart Grid = SG) are intended to remedy the above-mentioned challenge. For this purpose, the SG-Ready label was introduced with specified requirements for the heat pump systems. The label is mainly used in Germany, Austria and Switzerland.

SG-Ready makes it possible to use heat pumps in an energetically sensible manner across four operating states in order to make the best possible use of renewable energy sources. These operating states are displayed via two switching contacts. The switching contacts are usually controlled by the energy supply company (EVU), but can also be done in other ways (e.g. switching contacts of a photovoltaic module).

Overview of switching and operating states

switching state	Entrance 1	Entrance 2	Operating condition
1	OUT OF	OUT OF	Normal business. Business as usual
2	OUT OF	A	Power off command
3	A	OUT OF	Recommendation for switching on (e.g. when generating photovoltaic electricity)
4	A	A	Command to turn on

By using the FTC6 heat pump controller, the integration of the Ecodan systems into a smart grid is generally possible, but not absolutely necessary. However, the Ecodan system offers a further incentive to use existing renewable energies sensibly and to work cost-efficiently. As soon as switching states 2, 3 and 4 are activated, the “SG-READY” symbol appears in the display of the main remote control.



Overview of switching and operating states for Smart Grid

The following overview shows the resulting system specifications for the four Smart Grid switching states.

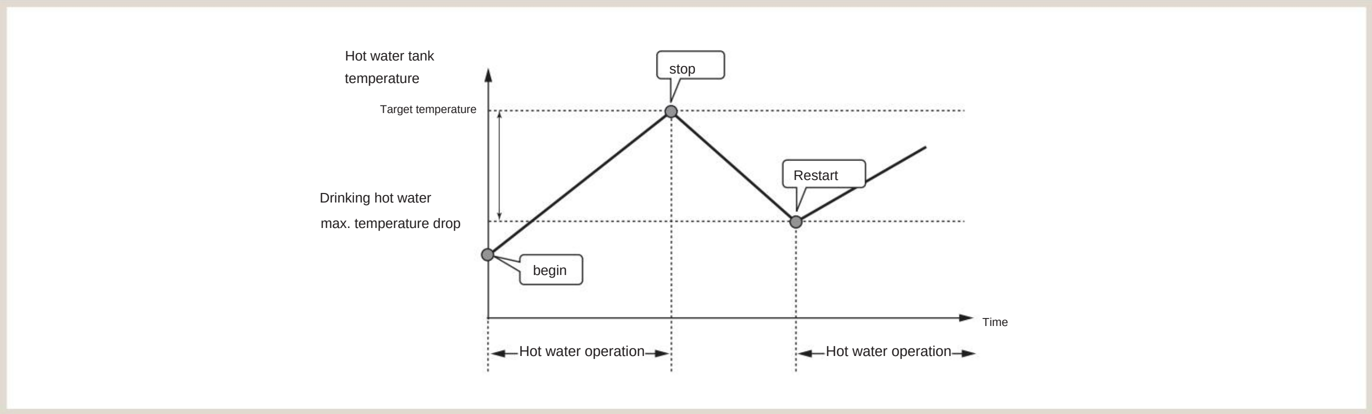
Switching state input 1		Entrance 2	Heat pump operation	Operating mode	Meaning and setting options
1	OFF (open)	OFF (open)	Normal business. Business as usual	–	–
2	OFF (open)	ON (closed) command	to turn off	–	The compressor and heating elements are switched off
3	ON (closed) OFF (open)		Recommendation to switch on (Use of self-generated electricity (e.g. PV) or district heating (e.g. solar thermal energy, solid fuel boiler)	Drinking water heating	The DHW setpoint is increased. Setpoint increase by: (+1 - +20 °C) --(inactive)
				Heating mode 1) Cooling operation The setpoint is changed (5 - 25°C) 15 °C factory setting	The setpoint is changed (20 - 60 °C) 50 °C factory setting
4	ON (closed) ON (closed) Command to switch on		(Use of load variables tariffs of the energy supply company)	Cooling operation The setpoint is changed (5 - 25°C) 10 °C factory setting	Maximum temperature TWW: 55 °C 2) 60 °C 3)
				–	The setpoint is changed (20 - 60 °C) 55 °C factory setting

1) The heating mode (control via heating curve or flow temperature) requires the optional radio remote control
2) Without electric screw-in heater or heating element and maximum flow temperature of the outdoor unit of 55 °C
3) With electric screw-in heater or maximum flow temperature of the outdoor unit of 60 °C

The FTC6 provides two potential-free contacts (input 1 (IN11; TBI.3 3-4) and input 2 (IN12 TBI.3 1-2)), which work according to the patterns listed in the table above.

Switching state 1

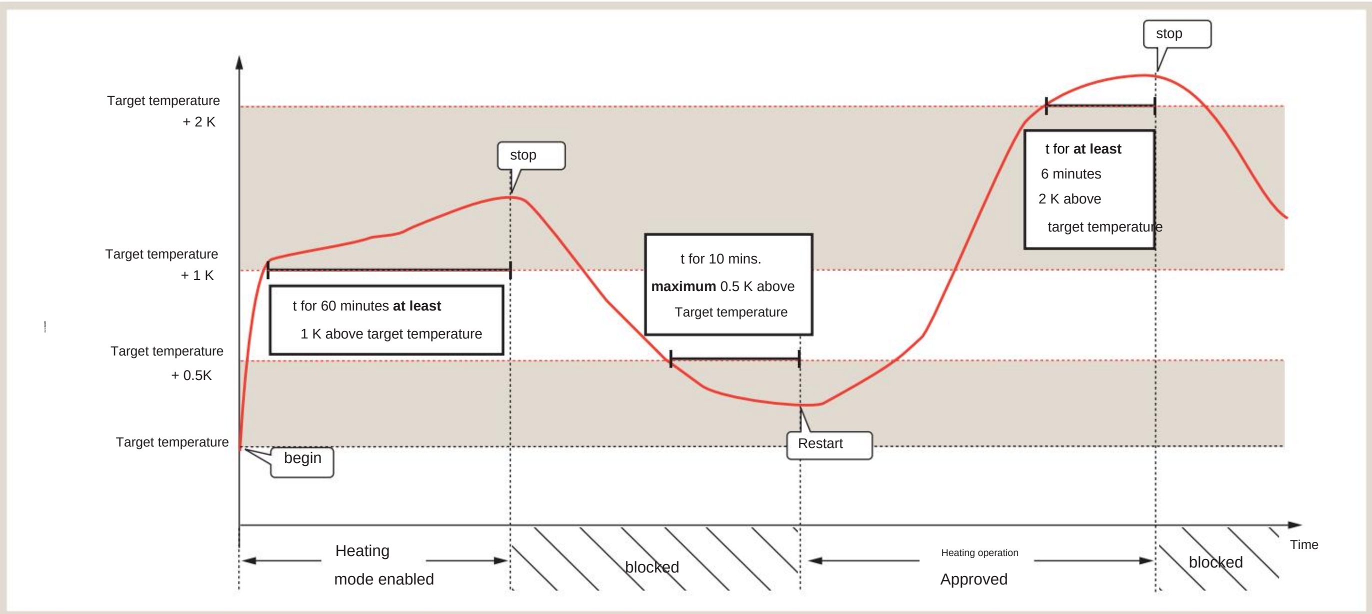
Drinking water heating



In switching state 1 (input 1 OFF / input 2 OFF), the system is in normal operating state. The release for domestic hot water heating is always given when the target temperature falls below the set temperature by a defined temperature delta. Hot water preparation is stopped as soon as the target temperature is continuously exceeded for at least one minute.

Heating operation

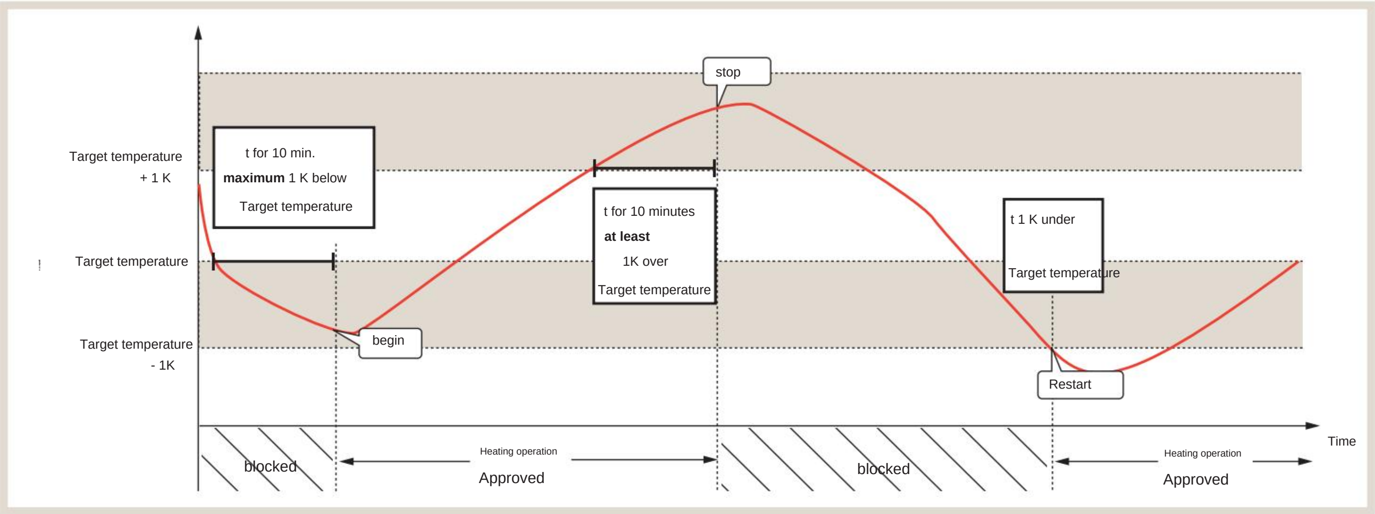
Room temperature control with auto adaptation



Heating mode is generally enabled when the temperature falls below the setpoint. Furthermore, heating mode is enabled if the target temperature is exceeded by a maximum of + 0.5 K for 10 minutes. The heating mode is locked after the setpoint value has been exceeded by at least + 1 K for 60 minutes or + 2 K for 6 minutes.

Room temperature control via heating curve or fixed flow temperature control

If a heating curve or a fixed flow temperature control is used to switch the heating mode (only in...
Combination with our radio remote controls as thermostat ON / OFF), other temperature deltas and time intervals apply:



Heating mode is enabled for ten minutes if the setpoint falls below the setpoint by a maximum of 1K and is blocked for ten minutes if the setpoint is exceeded by more than 1K. If the temperature falls below the setpoint by more than 1 K, the heat pump's heating mode is enabled immediately.

6.4.20 Switching state 2

In switching state 2 (input 1 OFF / input 2 ON), neither heating mode nor domestic hot water preparation is enabled. The Legionella protection program is also not approved.

Switching state 3

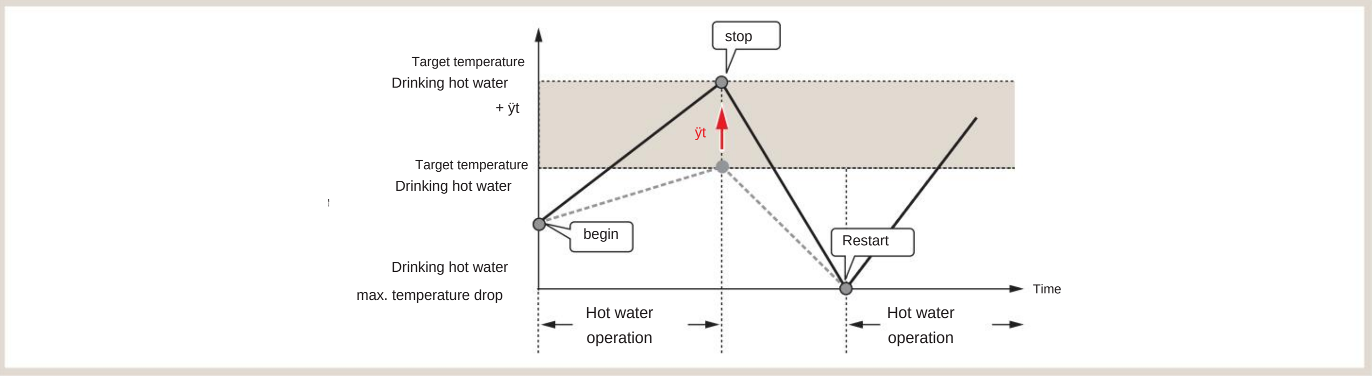
Drinking water heating

In switching state 3 (input 1 ON / input 2 OFF), the drinking water is heated to the set hot water target temperature plus a defined temperature delta. The target temperature can be increased continuously by the temperature delta using the controller

- +1 - +20 °C •

Factory setting: inactive

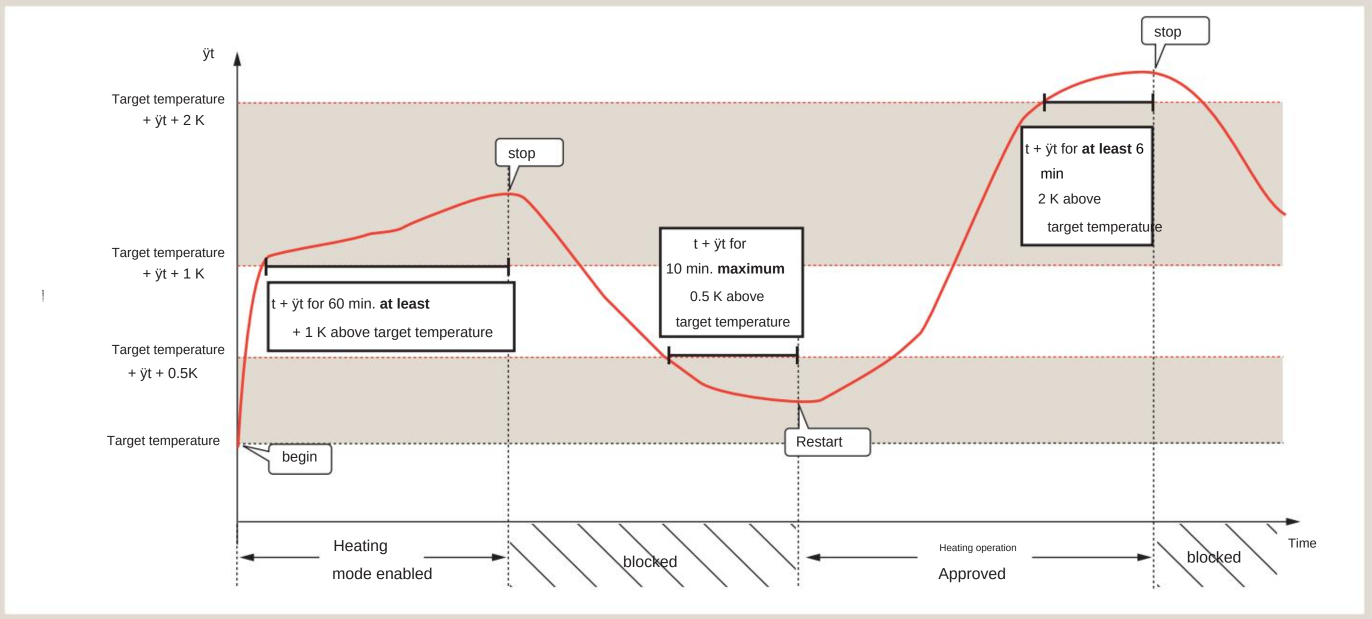
to be chosen. The maximum temperature of 60 °C in the DHW storage is not exceeded.

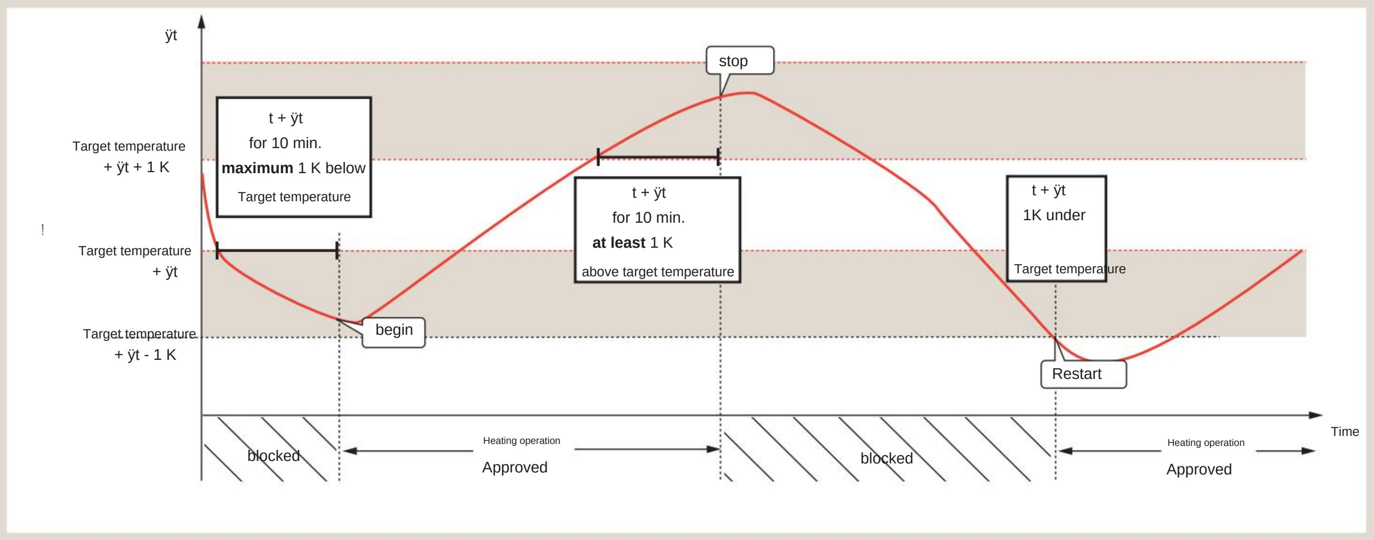


Heating/cooling operation

For heating/cooling operation, a (heating) buffer storage tank is required, analogous to domestic hot water preparation. As soon as the SG-Ready function is activated, a buffer storage target temperature can be defined. The setting range for the buffer storage target temperature is:

- Heating mode: 20 – 60 °C (factory setting: 50 °C)
- Cooling mode: 5 – 25 °C (factory setting: 15 °C)

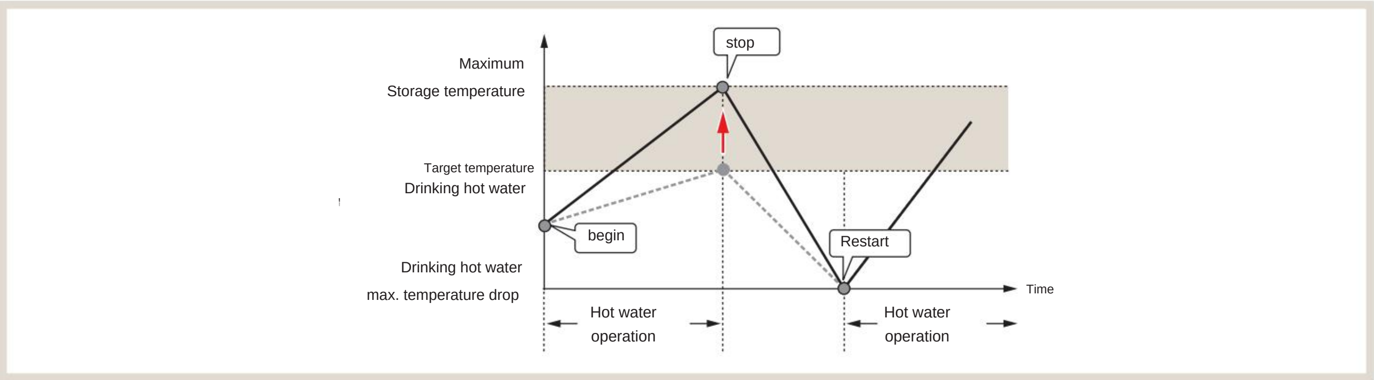




Switching state 4

Domestic hot water heating In
switching state 4 (input 1 on/input 2 on), domestic hot water heating is always enabled when the target temperature falls below the setpoint temperature by a defined temperature delta. Hot water production is stopped as soon as the setpoint is reached or exceeded for at least one minute.

The special feature in switching state 4 is that the domestic hot water is heated to the maximum storage temperature. This corresponds to 60°C if there is an additional electric heater and the maximum flow temperature of the heat pump is 60°C. It corresponds to 55°C if there is no electric additional heating and the maximum flow temperature of the heat pump is 55°C.



Heating/cooling operation

For heating/cooling operation in switching state 4, a (heating) buffer storage is also required, for which a different target temperature can be set. The setting range for the buffer storage target temperature is:

• Heating mode: 20 – 60°C (factory setting: 55°C)
• Cooling mode: 5 – 25°C (factory setting: 10°C)

Operational process

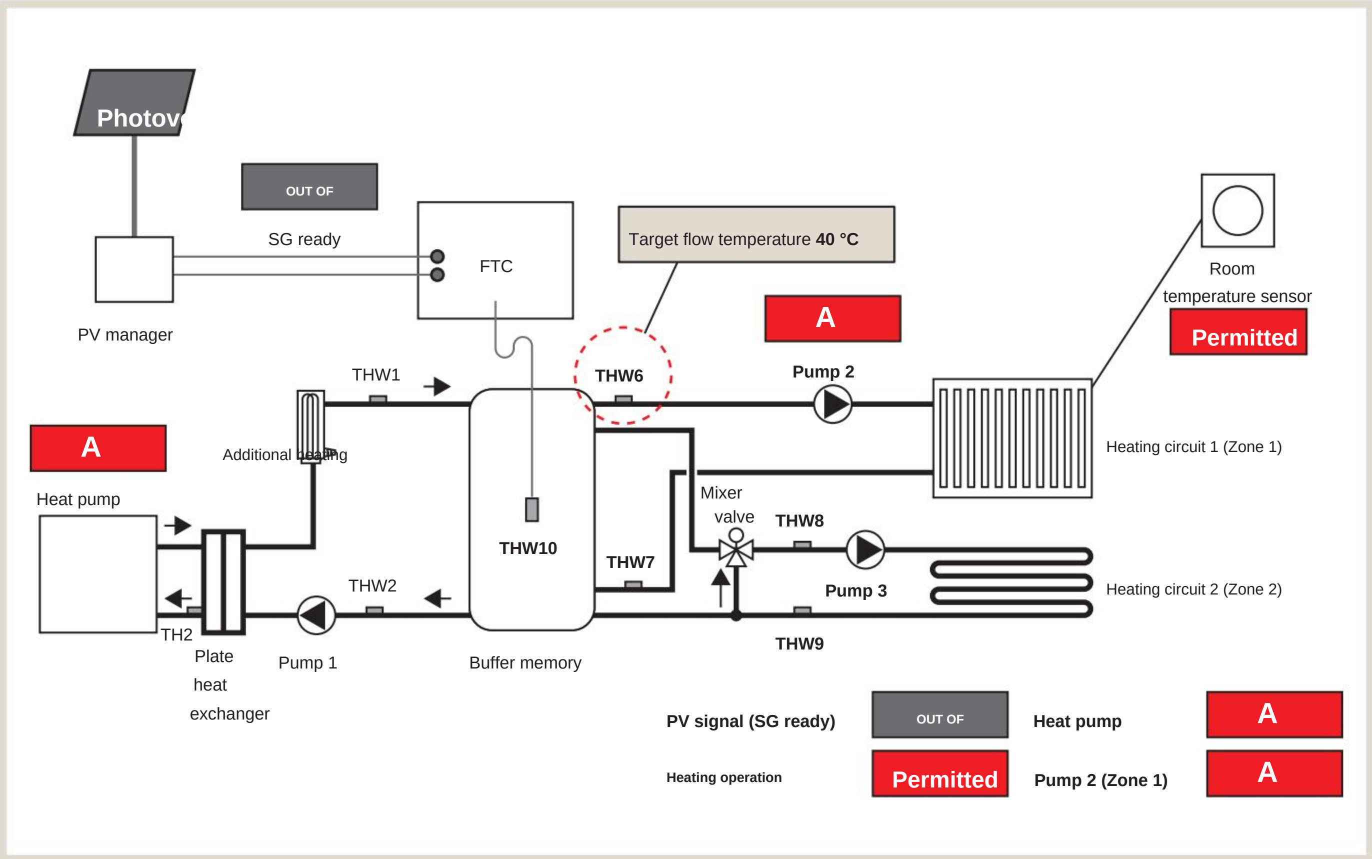
The operating sequence of the heat pump system, for switching states 3 (recommendation) and 4 (command), is identical and is divided into different operating sections:

1. Normal operation
2. Heat storage “Ready”
3. Heat storage (loading buffer storage)
4. Heat extraction (discharge of buffer storage)

Depending on the operating section, different sensors or actuators are switched. The table below shows the corresponding sensors/actuators:

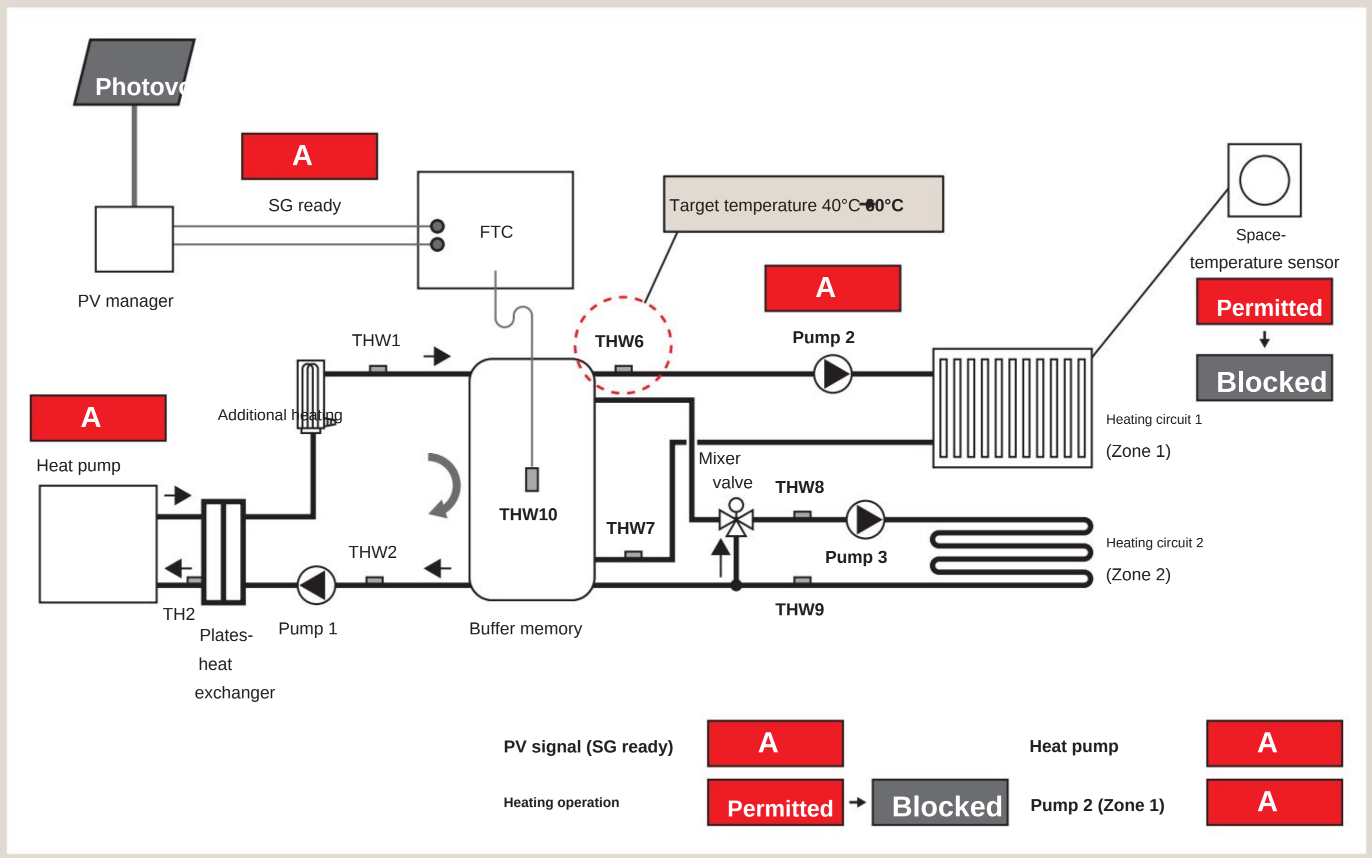
Operating section	SG Ready Contact	Operation heat pump requirement	Heating/cooling	Heating/cooling circuit pump HK1
1. Normal operation	OUT OF	AT	AT	AT
2. Heat storage ready 3. Heat	AT	AT	AT	AT
storage (buffer storage loading) ON		AT	OUT OF	OUT OF
4. Heat extraction (discharge buffer tank) OFF		OUT OF	AT	AT

Normal operation



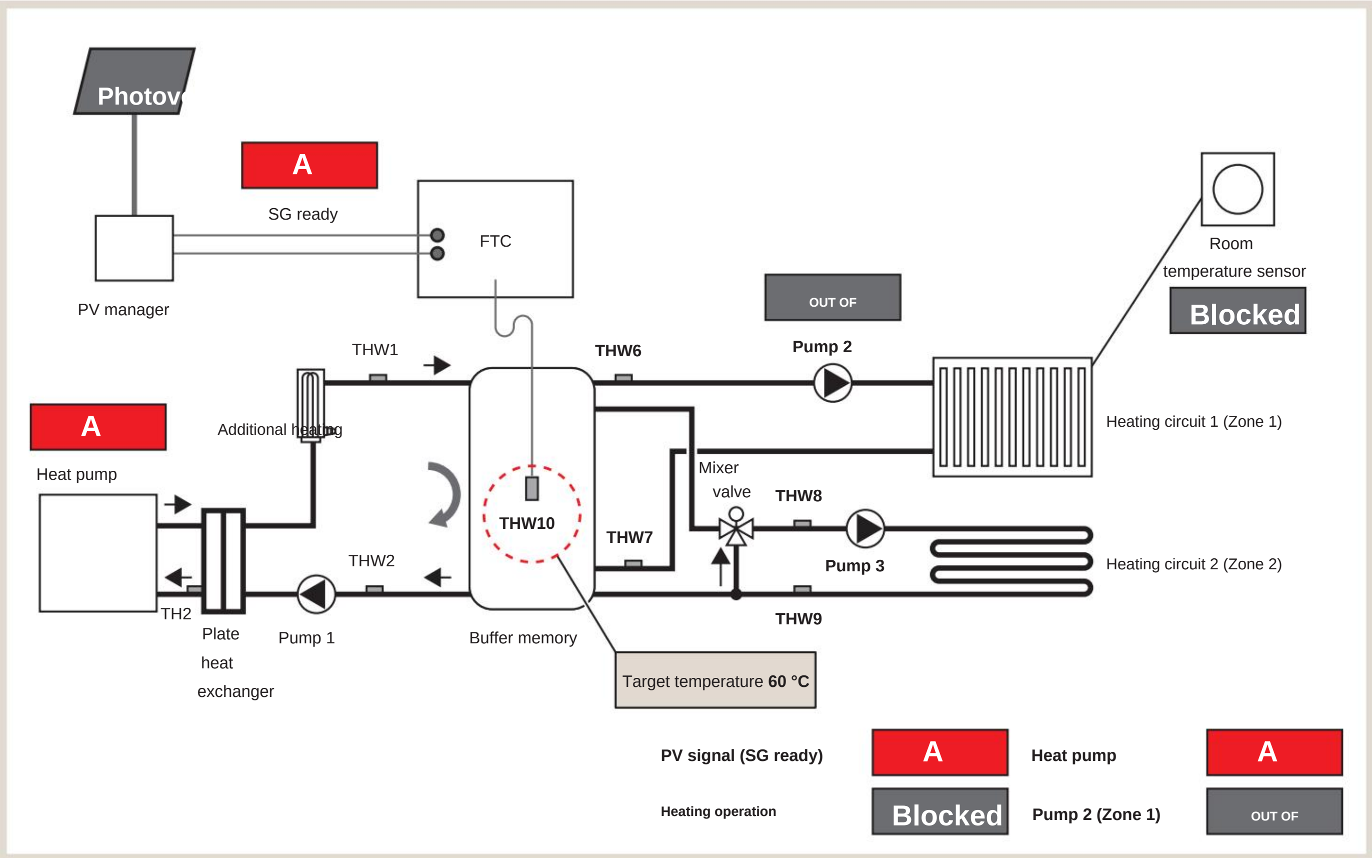
In the “normal operation” operating section, the SG-Ready contact is not switched. There is no excess PV electricity available. The heat pump system works according to the standard controller setting.

Heat storage “Ready”



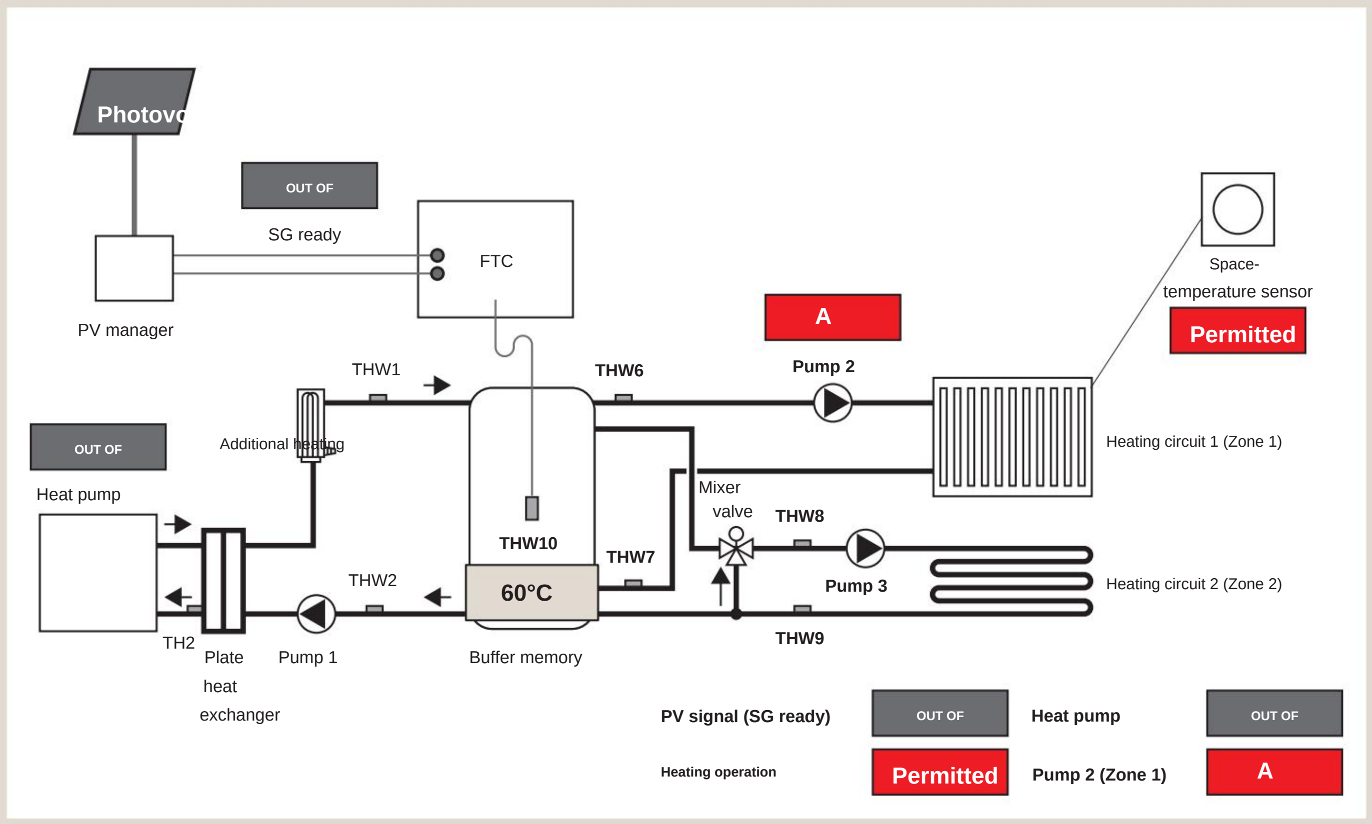
In the “Heat storage ready” operating section, the SG-Ready contact is switched. Excess PV electricity is available. The target flow temperature for heating circuit 1 (Zone 1) is raised to 60°C. The heat pump system works with higher performance. As soon as the room temperature in heating circuit 1 (Zone 1) is exceeded at the room temperature sensor, the heating circuit is blocked. This prevents heating circuit 1 from overheating.

Heat storage (loading buffer storage)



The SG-Ready contact is switched in the “Heat storage, loading, buffer storage” operating section. Excess PV electricity is available. The heating circuit pump for heating circuit 1 (Zone 1) is OFF because operation is blocked.
This prevents heating circuit 1 from overheating. The buffer storage sensor THW10 adopts the setpoint temperature of the flow temperature sensor THW6. The heat pump works until a) there is no
longer an SG-Ready signal or b) the
maximum target temperature at the buffer storage sensor THW10 is reached.

Heat extraction (discharge of buffer storage)



In the “Heat storage, discharge, buffer storage” operating section, the SG-Ready contact is not switched. There is no excess PV electricity available. The buffer storage is sufficiently charged and the heat pump is switched off. The heating circuit pump for heating circuit 1 (Zone 1) is switched on as soon as heat is required. The heat pump remains switched off as long as

a) there is sufficient heat in the buffer storage or
b) excess PV power is available again via the SG-Ready contact.

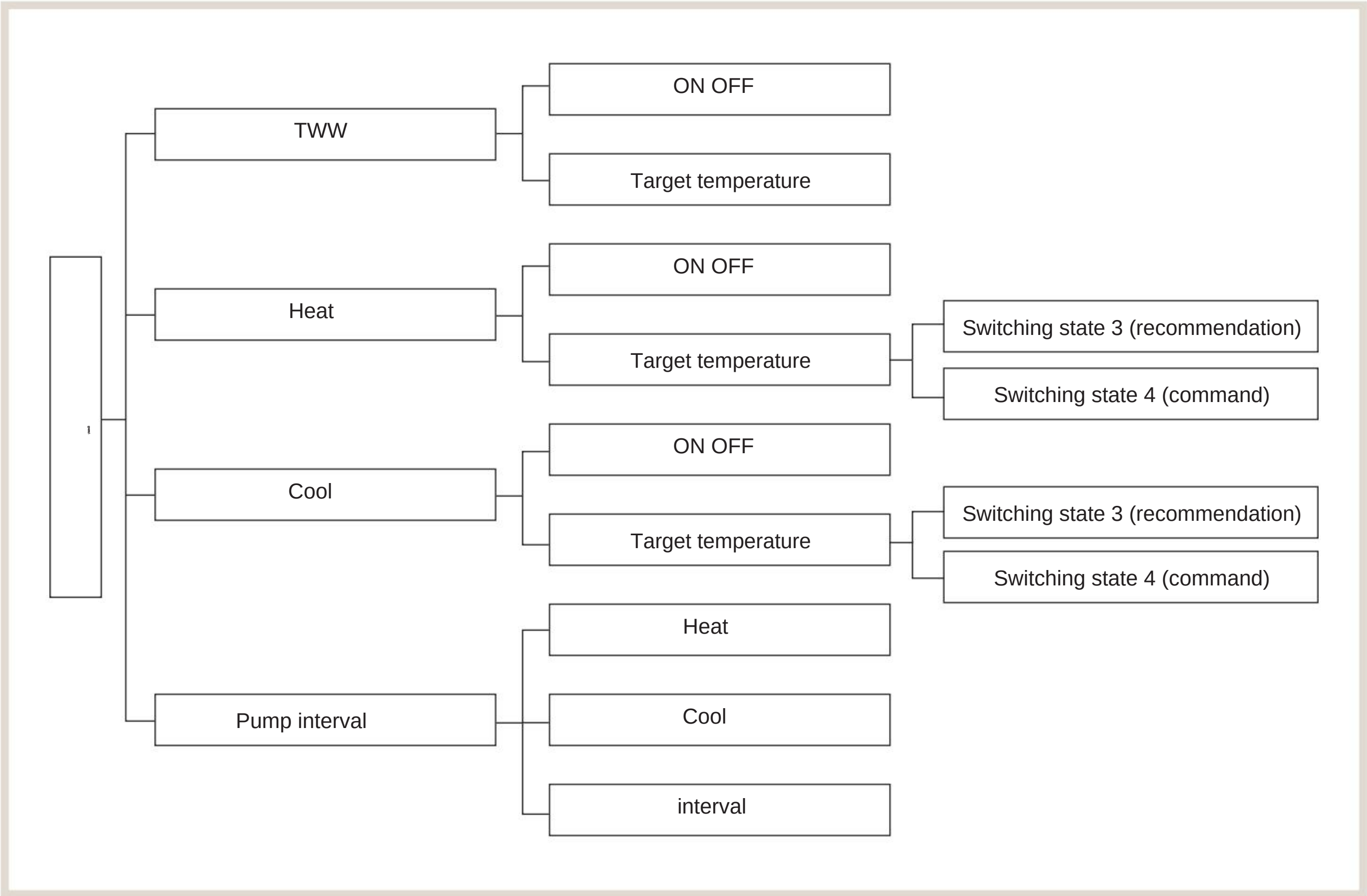
Pump interval

The additional “pump interval” function, in combination with a (heating) buffer tank, enables the intermittent operation of the heating/ cooling circuit pump HK1. The function is only activated if the actual temperature in the heating/
Cooling buffer storage greater than the target temperature in the heating/cooling circuit. Depending on the interval selected, the heating/ Cooling circuit pump HK1 switched off briefly to avoid overheating or undercooling of the individual rooms.
This function should only be activated if there is no individual room control or no mixing valve. The setting range of the heating/cooling circuit pump HK1 is:

- Interval: 10 – 120 min (factory setting: 10 min)

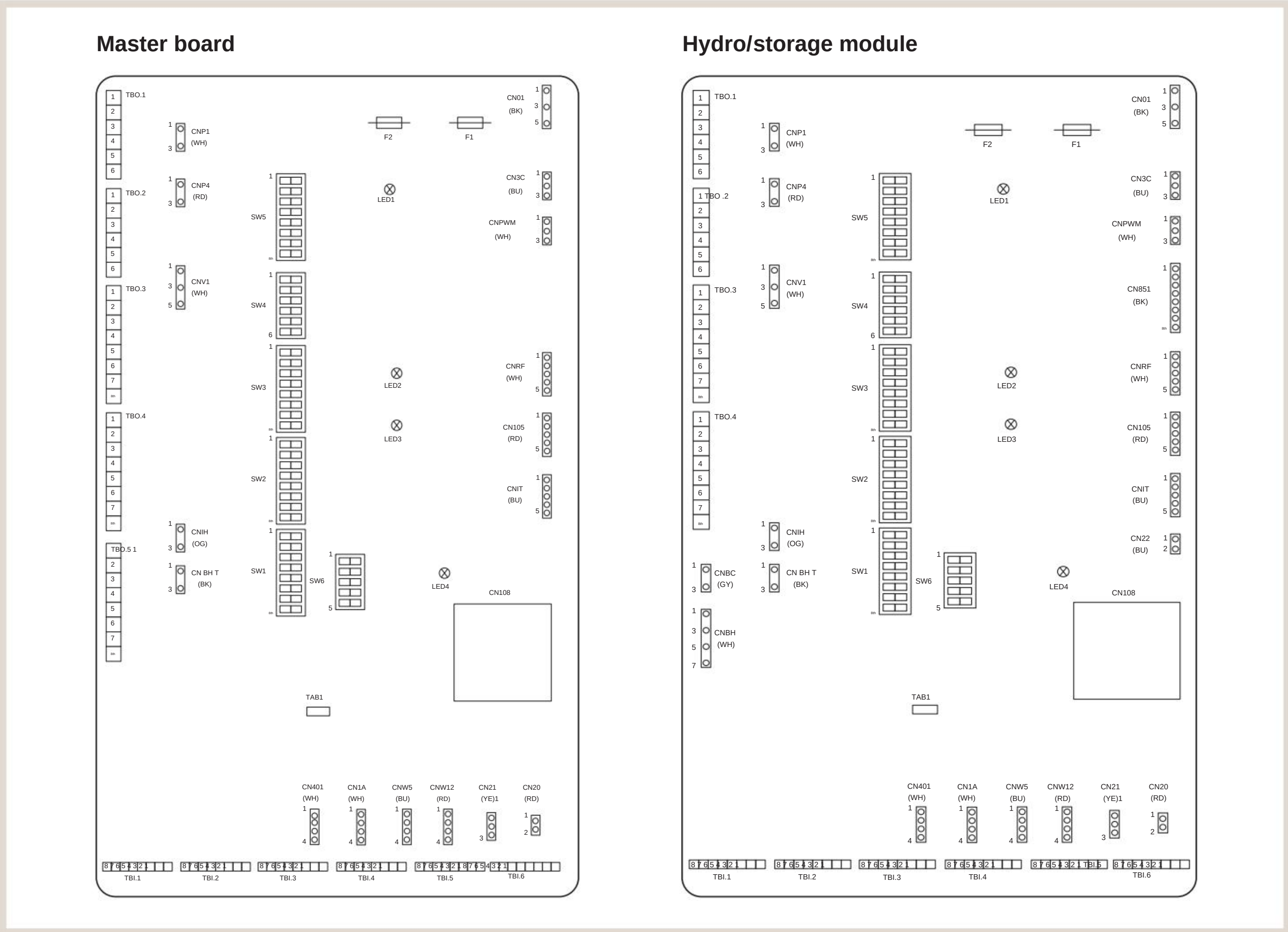
According to the factory setting of 10 minutes, the temperature in the buffer tank is checked with the target flow temperature and, if necessary, interrupted for approx. 3 minutes. The longer the interval is selected, the slower the system reacts and the risk of the rooms overheating increases.

Menu structure



6.5 Signal inputs/outputs

Input and output connections



6.5.1 Signal inputs

Designation terminal strip connection position				OFF (open)	Locked in)
IN1	TBI.1 7-8	–	Room thermostat 1 input 1)	See SW2-1	
IN 2	TBI.1 5-6	–	Flow monitor 1 input	See SW2-2	
IN3	TBI.1 3-4	–	Flow monitor 2 input (HK 1)	See SW3-2	
IN4	TBI.1 1-2	–	EVU contact	Normal	Heating source OFF/boiler operation 3)
IN5	TBI.2 7-8	–	Outdoor/bivalent thermostat input 2)	Standard operation	Operation of heating element/boiler operation 3)
IN6	TBI.2 7-8	–	Room thermostat 2 input 1)	See SW3-1	
IN7	TBI.2 3-4	–	Flow monitor 3 input (HK 2)	See SW3-2	
IN8	TBI.3 7-8	–	Electricity meter 1 4)	See installation manual	
IN9	TBI.3 5-6	–	Electricity meter 2 4)		
IN 10	TBI.2 1-2	–	Heat meter 1 4)		
IN11	TBI.3 3-4	–	Smart Grid enabled input		
IN12	TBI.3 1-2	–	Smart Grid enabled input		
IN1A	TBI.4 1-3	CN1A	Flow sensor		

1) Set the ON/OFF switching time of the room thermostat to 10 minutes or more; otherwise the compressor may be damaged.
2) If an outdoor thermostat is used to control the operation of electric heating elements, the service life of the electric heating elements and accessories may be reduced.
3) To switch on the boiler operation, select ext. via the main controller in the service menu under "Settings". Inputs" has the value "Boiler".
4) Connectable electricity meter and heat meter:

Connectable electricity meter and heat meter

Impulse type	Voltage-free contact for 12 V DC, detection by FTC	
Pulse duration	Minimum ON duration: 40 ms	Minimum OFF duration: 100 ms
Possible impulse unit	0.1 pulses/kWh, 1 pulses/kWh, 10 pulses/kWh, 100 pulses/kWh, 1000 pulses/kWh	

Wiring specifications and parts to be provided by the customer

Surname	Designation	Type and specification
Signal input	Cable	Use PVC-coated cables or strands. Max. 30 m. Cable Type: CV, CVS or equivalent. Conductor cross section: strand 0.13 mm² to 0.52 mm². Cable: Ø 0.4 mm to Ø 0.8 mm.
	Switch	Voltage-free contact signals. Remote switch: Minimum load 12V DC, 1mA.

6.5.2 Temperature sensor inputs

Name	terminal strip	connection position		Optional accessory
TH1	–	CN20	Temperature sensor (room temperature) 1)	PAC-SE41TS-E (12m)
TH2	–	CN21	Temperature sensor (liquid refrigerant) 2)	–
THW1	–	CNW12 1-2	temperature sensors (flow temperature)	–
THW2	–	CNW12 3-4	temperature sensors (return temperature)	–
THW5A	–	CNW5 1-2	Temperature sensor (top domestic hot water tank) 3)	–
THW5B	–	CNW5 3-4	temperature sensors (bottom domestic hot water tank) (optional)	PAC-TH011TK2-E (5m) / PAC-TH011TKL2-E (30m)
THW6	TBI.5 7-8	–	Temperature sensor (HK 1 flow temperature) 3) (optional) 1) 4)	PAC-TH011-E (5m)
THW7	TBI.5 5-6	–	Temperature sensor (HK 1 return temperature) (optional) 1)	
THW8	TBI.5 3-4	–	Temperature sensor (HK 2 flow temperature) (optional) 1)	PAC-TH011-E (5m)
THW9	TBI.5 1-2	–	Temperature sensor (HK 2 return temperature) (optional) 1)	
THW10	TBI.6 5-6	–	Temperature sensor (buffer tank) (optional) 1)	PAC-TH012HT-E (5m) / PAC-TH012HTL-E (30m)
THWB1	TBI.6 11-12	–	Temperature sensor (boiler flow temperature) (optional) 1)	

1) The maximum length of the temperature sensor connecting cables is 30 m.
2) Except PAC-IF072/073B-E.
3) Only in conjunction with memory module.
4) For hydro module and master board.

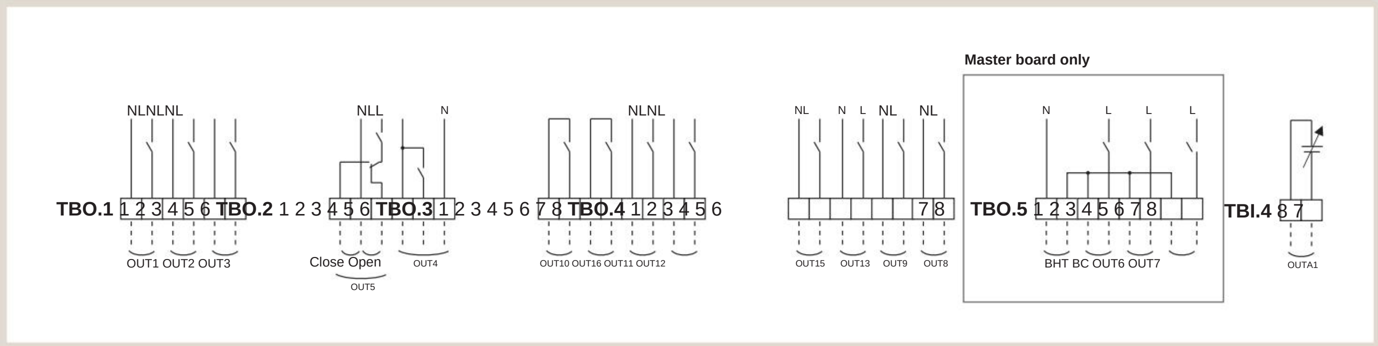
CAUTION!

Lay the temperature sensor connecting cables at a sufficient distance from the power supply and the wiring of the outputs OUT1 to OUTA1.

6.5.3 Signal outputs

Designation	terminal strip	connection position		OFF	ON
OUT1	TBO.1 1-2	CNP1	Primary circuit pump 1 output (space heating and domestic hot water)	OFF	ON
OUT2	TBO.1 3-4	–	Heating circuit pump 2 output (space heating for HK 1)	OFF	ON
OUT3	TBO.1 5-6	–	Heating circuit pump 3 output (space heating for HK 2) 1)	OFF	ON
			2-way valve No. 2b output 2)		
OUT4	TBO.2 4-6	CNV1	3-way diverter valve (2-way valve #1) output 3-way diverter valve	Heating	TWW
	–	CN851 4)	output		
OUT5	TBO.2 1-2	–	Mixing valve output 1)	stop	Close
	TBO.2 2-3				Open
OUT6	TBO.5 5-6 3)	CNBH 1-3 4)	Electric additional heater 1 output	OFF	ON
OUT7	TBO.5 7-8 3)	CNBH 5-7 4)	Electric additional heater 2 output	OFF	ON
OUT8	TBO.4 7-8	–	Cooling operation signal output	OFF	ON
OUT9	TBO.4 5-6	CNIH	Electric screw-in heater output	OFF	ON
OUT10	TBO.3 1-2	–	Boiler output	OFF	ON
OUT11	TBO.3 5-6	–	Error signal output	Normal	Mistake
OUT12	TBO.3 7-8	–	Defrost signal	Normal	Defrost
OUT13	TBO.4 3-4	–	2-way valve No. 2a output 2)	OFF	ON
OUT14	–	CNP4	Heating circuit pump 4 (DHW) output	OFF	ON
OUT15	TBO.4 1-2	–	Compressor input signal ON	OFF	ON
OUT16	TBO.3 3-4	–	Heating/Cooling Thermo ON signal	OFF	ON
OUTA1	TBI.4 7-8	–	Analogue output (0-10V)	–	–
B.C	TBO.5 3-4 3)	CNBC 4)	Electric additional heater fuse output	OFF	ON
BHT	TBO.5 1-2 3)	CNBHT 4)	Thermostat for electric additional heating	Thermostat normal: closed	Thermostat high Temperature: open

1) For temperature control of heating circuit 2.
2) For 2-way valve, ON/OFF control.
3) Master board
4) Hydro/storage module
– Do not connect any terminals that are marked "–" in the "Terminal strip" field.



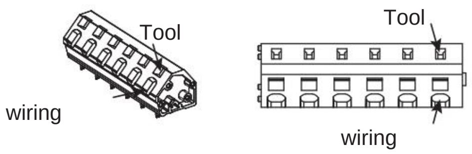
Wiring specifications and parts to be provided by the customer

Surname	Designation	Type and specification
Signal output	Cable	Use PVC-coated cables or strands. Max. 30 m. Cable Type: CV, CVS or equivalent. Conductor cross section: strand 0.25 mm² to 1.5 mm². Cable: Ø 0.25 mm to Ø 1.5 mm.

A NOTICE!

1. When the hydro module is powered from the outdoor unit, the maximum total power is current (a) + (b) = 3.0 A.
2. Do not connect multiple water circulation pumps directly to each output (OUT1, OUT2 and OUT3) on, but via a relay.
3. Connect a suitable surge arrester (depending on the on-site load) to OUT10 (TBO.3 1-2).
4. Stranded wire should be provided with an insulated ferrule (design accordingly DIN 46228-4).

Wiring to TB0.1 to 5

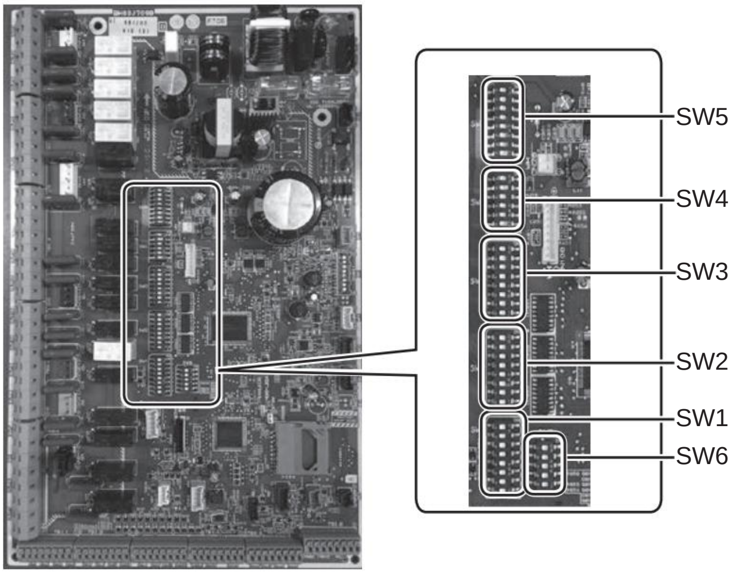


6.5.4 DIP switch functions

There are six groups of DIP switches (SW…) on the circuit board of the FTC6 heat pump controller. The DIP switch number is printed next to the respective switches on the circuit board. The word ON is printed on the circuit board and on the DIP switch block itself. To move the switch you need a pen or something similar.

The DIP switch settings are listed on the following page.
• Make sure that both the indoor and outdoor unit power is turned off before making the DIP switch settings.

Representation of DIP switches



Air/water heat pumps

DIP switch function	OFF/OFF	ON/ON	Factory setting
SW1 SW1-1 boiler	Without boiler	With boiler	OFF
SW1-2 heat pump max. flow temperature 55 °C		60°C	ON1)
SW1-3 domestic hot water tank	Without DHW storage	With TWW storage	OFF
SW1-4 Electric screw-in heater	Without electrical Screw-in heater	With electric screw-in heater OFF	
SW1-5 electric heating element	Without electric heating element	With electric heating element	OFF: E•••-MED, E••T•••-M•ED• ON : E•••-•M2/6/9•D, E••T•••-•M2/6/9•D
SW1-6 electric heating element function	Only for heating	For heating and DHW	OFF: E•••-MED, E••T•••-M•ED• ON : E•••-•M2/6/9•D E••T•••-•M2/6/9•D
SW1-7 Type of outdoor unit	Split	Monoblock systems	OFF: except EHPX-•M••D E•ST•••-•M••D ON : EHPX-•M••D, E•ST•••-•M••D
SW1-8 radio remote control	Without radio remote control	With radio remote control	OFF
SW2 SW2-1 Input room thermostat 1 (IN1) Logic reversal	Stop operation of heating circuit 1 Thermostat “closed”	Stop operation of heating circuit 1 Thermostat “open”	OFF
SW2-2 input flow monitor 1 (IN2) Logic reversal	Error detection when “closed”	Error detection when “open”	OFF
SW2-3 Power limitation of electric heating element inactive		Active	OFF: except E•••-VM2D, E••T•••-VM2•D ON : E•••-VM2D, E••T•••-VM2•D

DIP switch function		OFF/OFF	ON/ON	Factory setting
SW 2	SW2-4 cooling mode function	Inactive	Active	OFF: except ERS•-•M••D, EH•T•••-•M••D• ON : ERS•-•M••D, ER•T•••-•M••D
	SW2-5 Automatic switching to two-way th heat generator (if the outdoor unit stops running due to an error)	Inactive	Active 2)	OFF
	SW2-6 buffer memory	Without buffer storage	With buffer storage	OFF
	SW2-7 temperature control 2 heating circuits	Inactive	Active 6)	OFF
	SW2-8 flow sensor	Without flow sensor	With flow sensor	ON
SW3	SW3-1 Input room thermostat 2 (IN6) Logic reversal	Stop operation of heating circuit 2 Thermostat “closed”	Stop operation of heating circuit 2 Thermostat “open”	OFF
	SW3-2 input flow monitors 2 and 3 Logic reversal	Error detection when “closed”	Error detection when “open”	OFF
	SW3-3 Type of 3-way switching valve (storage module only)	AC motor	Stepper motor	OFF: E•PT20/30X-M••D•, E•ST••C/30D-•M••D ON : E•PT17X-•M••D•, E•ST17/20D-•M••D
	SW3-4 electricity meter	Without electricity meter	With electricity meter	OFF
	SW3-5 heating mode function 3)	Inactive	Active	ON
	SW3-6 2-way valve, ON/OFF control	Inactive	Active	OFF
	SW3-7 heat exchanger for DHW	Smooth tube heat exchanger in Storage	External plate heat exchanger	OFF
	SW3-8 heat meter	Without heat meter	With heat meter	OFF
SW4	SW4-1 Control multiple outdoor units	Inactive	Active	OFF
	SW4-2 Position of the control of several outdoor devices 7)	Slave	master	OFF
	SW4-3 –	–	–	OFF
	SW4-4 Indoor unit operation alone (during installation) 4)	Inactive	Active	OFF
	SW4-5 Emergency operation (only heating element in operation) 5)	Normal	Emergency mode (only heating in operation)	OFF
	SW4-6 emergency operation (boiler operation) 5)	Normal	Emergency operation (boiler operation)	OFF
SW5	SW5-1 DHW storage tank overheating protection (L4)	Active	Inactive 8)	OFF
	SW5-2 Improved auto adaptation	Inactive	Active	ON
	SW5-3 SW5-4 SW5-5 SW5-6 SW5-7	see tables below		

Memory module performance code

	SW5-3	SW5-4	SW5-5	SW5-6	SW5-7
E•ST••C-•M••D	ON	ON	ON	ON	OFF
E•ST••D-•M••D	ON	OFF	OFF	ON	OFF
E••T••X-•M••D•	OFF	OFF	OFF	OFF	OFF

Performance code hydro module

	SW5-3	SW5-4	SW5-5	SW5-6	SW5-7
E•SC-•M••D	ON	ON	ON	ON	OFF
E•SD-•M••D	ON	OFF	OFF	ON	OFF
E•SE-•M•ED	OFF	ON	ON	OFF	ON
EHPX-•M••D	OFF	OFF	OFF	OFF	OFF

DIP switch function		OFF/OFF	ON/ON	Factory setting
SW5	SW5-8 –	–	–	OFF
SW6	SW6-1 –	–	–	OFF
	SW6-2 –	–	–	OFF
	SW6-3 pressure sensor	Inactive	Active	OFF: except E•SD-•M••D, E•ST••D-•M••D ON : E•SD-•M••D, E•ST••D-•M••D
	SW6-4 Analog output signal (0-10V)	Inactive	Active	OFF
	SW6-5 –	–	–	OFF

1) When the indoor unit is connected to an outdoor unit whose maximum leaving water temperature is 55°C, DIP SW1-2 needs to be set to OFF.
2) When set to ON/AN, the external output (OUT11) is available. For security reasons, this function is not available in certain errors. (In such a case, system operation must be stopped and only the heating circuit pump continues to run).
3) This switch only works when the hydro module is connected to a PUHZ-FRP outdoor unit. If another type of outdoor unit is connected, The heating mode function is active regardless of whether this switch is set to ON/ON or OFF/OFF.
4) Heating operation and DHW operation can be carried out using the electric additional heaters without connecting an outdoor unit.
5) If emergency operation is no longer required, return the switch to the OFF position.
6) Only active when SW3-6 is set to OFF.
7) Only active when SW4-1 is ON/ON.
8) If you use external heat, e.g. B. If you integrate solar thermal energy, you must ensure overheating protection on site.

EHGT17D-YM9ED

DIP switch function	OFF/OFF	ON/ON	Factory setting
SW1 SW1-1 boiler	Without boiler	With boiler	OFF
SW1-2 Heat pump max. flow temperature 55 °C SW1-3 Domestic		60°C	ON
hot water tank Without DHW tank SW1-4 Electric screw-in heater		With TWW storage	ON
	Without electrical screw-in tongue	With electric screw-in heater OFF	
SW1-5 electric heating element	Without electric heating element	With electric heating element	ON
SW1-6 electric heating element function	Only for heating	For heating and DHW	ON
SW1-7 –	–	–	OFF
SW1-8 radio remote control	Without radio remote control	With radio remote control	OFF
SW2 SW2-1 Input room thermostat 1 (IN1) Logic reversal	Stop operation of heating circuit 1 Thermostat “closed”	Stop operation of heating circuit 1 Thermostat “open”	OFF
SW2-2 input flow monitor 1 (IN2) Logic reversal	Error detection when “closed”	Error detection when “open”	OFF
SW2-3 Power limitation of electric heating element inactive		Active	OFF
SW2-4 –	–	–	OFF
SW2-5 Automatic switching to two-way th heat generator (if the outdoor unit stops running due to an error)	Inactive	Active 1)	OFF
SW2-6 buffer memory	Without buffer storage	With buffer storage	OFF
SW2-7 temperature control 2 heating circuits	Inactive	Active 4)	OFF
SW2-8 –	–	–	ON
SW3 SW3-1 Input room thermostat 2 (IN6) Logic reversal	Stop operation of heating circuit 2 Thermostat “closed”	Stop operation of heating circuit 2 Thermostat “open”	OFF
SW3-2 input flow monitors 2 and 3 Logic reversal	Error detection when “closed”	Error detection when “open”	OFF
SW3-3 –	–	–	ON
SW3-4 electricity meter	Without electricity meter	With electricity meter	OFF
SW3-5 –	–	–	OFF
SW3-6 2-way valve, ON/OFF control	Inactive	Active	OFF
SW3-7 –	–	–	ON
SW3-8 heat meter	Without heat meter	With heat meter	OFF
SW4 SW4-1 –	–	–	OFF
SW4-2 –	–	–	OFF
SW4-3 –	–	–	OFF
SW4-4 Indoor unit operation alone (during installation) 2)	Inactive	Active	OFF
SW4-5 Emergency operation (only heating element in operation) 3)	Normal	Emergency operation (only heating in operation)	OFF3)
SW4-6 emergency operation (boiler operation) 3)	Normal	Emergency operation (boiler operation)	OFF3)
SW5 SW5-1 –	–	–	OFF
SW5-2 Improved auto adaptation	Inactive	Active	ON
SW5-3 performance code	–	–	ON
SW5-4	–	–	OFF
SW5-5	–	–	OFF
SW5-6	–	–	ON
SW5-7	–	–	OFF
SW5-8 –	–	–	OFF
SW6 SW6-1 –	–	–	OFF
SW6-2 –	–	–	OFF
SW6-3 –	–	–	OFF
SW6-4 Analog output signal (0-10V)	Inactive	Active	OFF
Select SW6-5 model	Air/water heat pump	Brine/water heat pump	ON

1) When set to ON/ON, the external output (OUT11) is available. For security reasons, this function is not available in certain errors.
(In such a case, system operation must be stopped and only the heating circuit pump continues to run).
2) Heating operation and DHW operation can only take place in the water circuit, as with electric additional heaters.
3) If emergency operation is no longer required, return the switch to the OFF position.
4) Only active when SW3-6 is set to OFF.

7. Hydraulics and electrical connection for air/water heat pumps

7.1 General information

The electrical and hydraulic installation diagrams listed are schematic representations without shut-off and safety-related installations in accordance with the recognized rules of technology. The systems must be designed in accordance with the currently valid laws and standards. The minimum volume flow, depending on the heat pump used, must be adhered to. The use of microbubble air separators and sludge separators is recommended for trouble-free operation.

To protect the power supply to the heat pumps, an all-pole circuit breaker with characteristic C (slow) must always be used. To ensure standard-compliant personal and fire protection, the use of AC/DC sensitive Type B FI circuit breakers to connect the heat pump and/or the outdoor unit to the supply network is recommended.

The mains connection and all protective measures (e.g. FI circuit) must always be carried out in accordance with the following regulations:

- IEC 60364-4-41
- VDE regulations
- Technical connection conditions (TAB) of the local energy supply company (EVU)

The hydraulic installation schemes can be used for both split refrigeration units and monoblock units. Depending on the device technology (split or monoblock), the DIP switch (SW1-7: ON/AN = monoblock / OFF/AUS = split) is already preset at the factory.

7.2 Electrical connection data

Danger!
Use an AC/DC sensitive residual current circuit breaker!

7.2.1 Power supply for outdoor devices

	max. operating current [A]	rec. Fuse size [A] Cable cross	section [mm²] Max. cable length	[m]
PUZ-WM50VHA	13	1x16	3x1.5	18
			3x2.5	30
			3x4	48
PUZ-WM60VAA	13	1x16	3x1.5	18
			3x2.5	30
			3x4	48
PUZ-WM85YAA	11.5	3x16	5x1.5	36
			5x2.5	60
			5x4	96
PUZ-WM112YAA	13	3x16	5x1.5	32
			5x2.5	53
			5x4	85
SUZ-SWM40VA	13.9	1x16	3x1.5	14
			3x2.5	24
			3x4	38
SUZ-SWM60VA	13.9	1x16	3x1.5	14
			3x2.5	24
			3x4	38
SUZ-SWM80VA	13.9	1x16	3x1.5	14
			3x2.5	24
			3x4	38
PUD-SWM60VAA	16.5	1x20	3x2.5	20
			3x4	32
PUD-SHWM60VAA	16.5	1x20	3x2.5	20
			3x4	32
PUD-SWM80YAA	8.0	3x16	5x1.5	52
			5x2.5	86
			5x4	138
PUD-SHWM80YAA	8.0	3x16	5x1.5	52
			5x2.5	86
			5x4	138
PUD-SWM100YAA	10.0	3x16	5x1.5	41
			5x2.5	69
			5x4	110
PUD-SHWM100YAA	10.0	3x16	5x1.5	41
			5x2.5	69
			5x4	110
PUD-SWM120YAA	12.0	3x16	5x1.5	34
			5x2.5	57
			5x4	92
PUD-SHWM120YAA	12.0	3x16	5x1.5	34
			5x2.5	57
			5x4	92

	max. operating current [A]	rec. Fuse size [A]	Cable cross section [mm²]	Max. cable length [m]
PUD-SHWM140YAA	12.0	3x16	5x1.5	34
			5x2.5	57
			5x4	92
PUHZ-SW160YKA	19	3x25	5x4	53
			5x6	80
PUHZ-SW200YKA	21	3x32	5x6	63
			5x10	105
PUHZ-SHW140YHAR5	13	3x16	5x1.5	31
			5x2.5	52
			5x4	84
PUHZ-SHW230YKA2R2	20	3x25	5x4	41
			5x6	63
			5x10	105
QUHZ-W40VA	13	1x16	3x1.5	18
			3x2.5	30
			3x4	48

7.2.2 Power supply for indoor devices

The control board of the indoor units is usually powered by a connecting cable from the outdoor unit. This is also the data line.

	max. operating current [A]	rec. Fuse size [A]	Cable cross section [mm²]	Max. cable length [m]
Outdoor unit – indoor unit	–	via outdoor unit	4x1.5	45
			4x2.5	50
			3x2.5 + 1x2.5 (S3)	80

Alternatively, the control boards of the indoor units can be provided with their own power supply. In this case, DIP switch SW8-3 on the outdoor unit must be set to ON.

7.2.3 Power supply for additional heating of indoor units

Memory modules	max. operating current Additional heater [A]	rec. Fuse size [A]	Cable cross section [mm²]	max. cable length [m]
EHST20D-YM9D	13	3x16	5x1.5	31
			5x2.5	52
EHST30D-YM9D	13	3x16	5x1.5	31
			5x2.5	52
FIRST20D-YM9D	13	1x16	3x1.5	18
			3x2.5	30
FIRST30D-YM9D	13	1x16	3x1.5	18
			3x2.5	30
EHPT20X-YM9D	13	3x16	5x1.5	31
			5x2.5	52
ERPT20X-VM2D	9	1x16	3x1.5	18
			3x2.5	30
EHPT30X-YM9ED	13	3x16	5x1.5	31
			5x2.5	52
ERPT30X-VM2ED	9	1x16	3x1.5	18
			3x2.5	30
EHPT20Q-VM2EA	8.7	1x16	3x1.5	18
			3x2.5	30
EHGT17D-YM9ED	13	3x16	5x1.5	31
			5x2.5	52

Hydromodules	max. operating current Additional heater [A]	rec. Fuse size [A] Cable cross section [mm²] Max. cable length [m]		
EHPX-YM9D	13	3x16	5x1.5	31
			5x2.5	52
EHSD-YM9D	13	3x16	5x1.5	31
			5x2.5	52
EHSC-YM9D	13	3x16	5x1.5	31
			5x2.5	52
EHSE-YM9ED	13	3x16	5x1.5	31
			5x2.5	52
EHSE-MED	no additional heating	–	–	–
ERSD MED	no additional heating	–	–	–
ERSD-YM9D	13	3x16	5x1.5	31
			5x2.5	52
ERSC-MED	no additional heating	–	–	–
ERSE-YM9ED	13	1x16	5x1.5	31
			5x2.5	52
ERSE-MED	no additional heating	–	–	–
EHPX-MED	no additional heating	–	–	–
ERPX-YM9D	13	3x16	5x1.5	31
			5x2.5	52
ERPX MD	no additional heating	–	–	–

7.3 Overview of temperature sensors and inputs and outputs

The following tables show the temperature sensors of the system as well as the inputs and outputs of the individual components.

Surname	Terminal strip	Plug	function
TH1	–	CN20	Temperature sensor (room temperature) 1)
TH2	–	CN21	Temperature sensor (liquid refrigerant) 2)
THW1	–	CNW12 1-2	Temperature sensor (flow temperature)
THW2	–	CNW12 3-4	Temperature sensor (return temperature)
THW5A	–	CNW5 1-2	Temperature sensor (top domestic hot water tank) (optional) 1) 3)
THW5B	–	CNW5 3-4	Temperature sensor (bottom domestic hot water tank) 2) (optional) 1) 6)
THW6	TBI.5 7-8	–	Temperature sensor (HK 1 flow temperature) (optional) 1)
THW7	TBI.5 5-6	–	Temperature sensor (HK 1 return temperature) (optional) 1)
THW8	TBI.5 3-4	–	Temperature sensor (HK 2 flow temperature) (optional) 1)
THW9	TBI.5 1-2	–	Temperature sensor (HK 2 return temperature) (optional) 1)
THW10	TBI.6 5-6	–	Temperature sensor (buffer storage) (only in conjunction with SG-Ready, optional) 1)
THWB1	TBI.6 11-12	–	Temperature sensor (boiler flow temperature) (optional) 1)
IN1	TBI.1 7-8	–	Room thermostat 1 input
IN 2	TBI.1 5-6	–	Flow monitor 1 input
IN3	TBI.1 3-4	–	Flow monitor 2 input (HK 1)
IN4	TBI.1 1-2	–	Request control input
IN5	TBI.2 7-8	–	Outdoor/bivalent thermostat input
IN6	TBI.2 7-8	–	Room thermostat 2 input
IN7	TBI.2 3-4	–	Flow monitor 3 input (HK 2)
IN8	TBI.3 7-8	–	Electricity meter 1
IN9	TBI.3 5-6	–	Electricity meter 2
IN 10	TBI.2 1-2		Heat meter 1
IN11	TBI.3 3-4		Smart Grid enabled input
IN12	TBI.3 1-2		Smart Grid enabled input
INA1	TBI.4 1-3	CN1A	Flow sensor
OUT1	TBO.1 1-2	–	Primary circuit pump 1 output (space heating and domestic hot water)
OUT2	TBO.1 3-4	–	Heating circuit pump 2 output (space heating for HK 1)
OUT3	TBO.1 5-6	–	Heating circuit pump 3 output (space heating for HK 2)
OUT4	TBO.2 4-6	CNV1	3-way diverter valve (2-way valve #1) output
	–	CN851 5)	3-way switching valve output
OUT5	TBO.2 1-2	–	Mixing valve output
	TBO.2 2-3		
OUT6	TBO.5 5-6 4)	CNBH 1-3 5)	Electric additional heater 1 output
OUT7	TBO.5 7-8 4)	CNBH 5-7 5)	Electric additional heater 2 output
OUT8	TBO.4 7-8	–	Cooling operation signal output
OUT9	TBO.4 5-6	CNIH	Electric screw-in heater output
OUT10	TBO.3 1-2	–	Boiler output
OUT11	TBO.3 5-6		Error signal output
OUT12	TBO.3 7-8		Defrost signal
OUT13	TBO.4 3-4		2-way valve #2 output
OUT14	–	CNP4	Heating circuit pump 4 (DHW) output
OUT15	TBO.4 1-2		Compressor input signal ON
OUT16	TBO.3 3-4		Heating/Cooling Thermo ON signal
OUTA1	TBI.4 7-8		Analogue output
B.C	TBO.5 3-4 4)	CNBC 5)	Electric additional heater fuse output
BHT	TBO.5 1-2 4)	CNBHT 5)	Thermostat for electric additional heating
WIRELESS	–	CNRF	Receiver radio remote control
WIFI	–	CN105	WiFi adapter, Ecodan Smart Control or ModBus interface
CN108	–	–	SD card slot

1) The maximum length of the temperature sensor connecting cables is 30 m
2) Except PAC-IF072/073B-E
3) Only in conjunction with memory module
4) Master board
5) Hydro/storage module
6) Hydro module and master board

7.4 System examples

7.4.1 System example 1: Storage module with 1 or 2 heating circuits and DHW heating

System example 1 for Ecodan storage module			
Outdoor unit	Eco Inverter / Power Inverter / Zubadan	**operating mode**	monovalent / monoenergetic
Indoor unit	Memory module	**Heating circuits**	1x unmixed and/or 1x mixed

General information

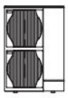
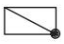
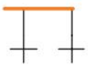
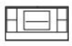
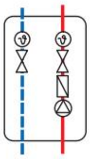
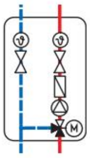
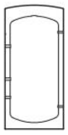
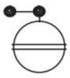
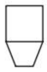
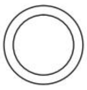
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

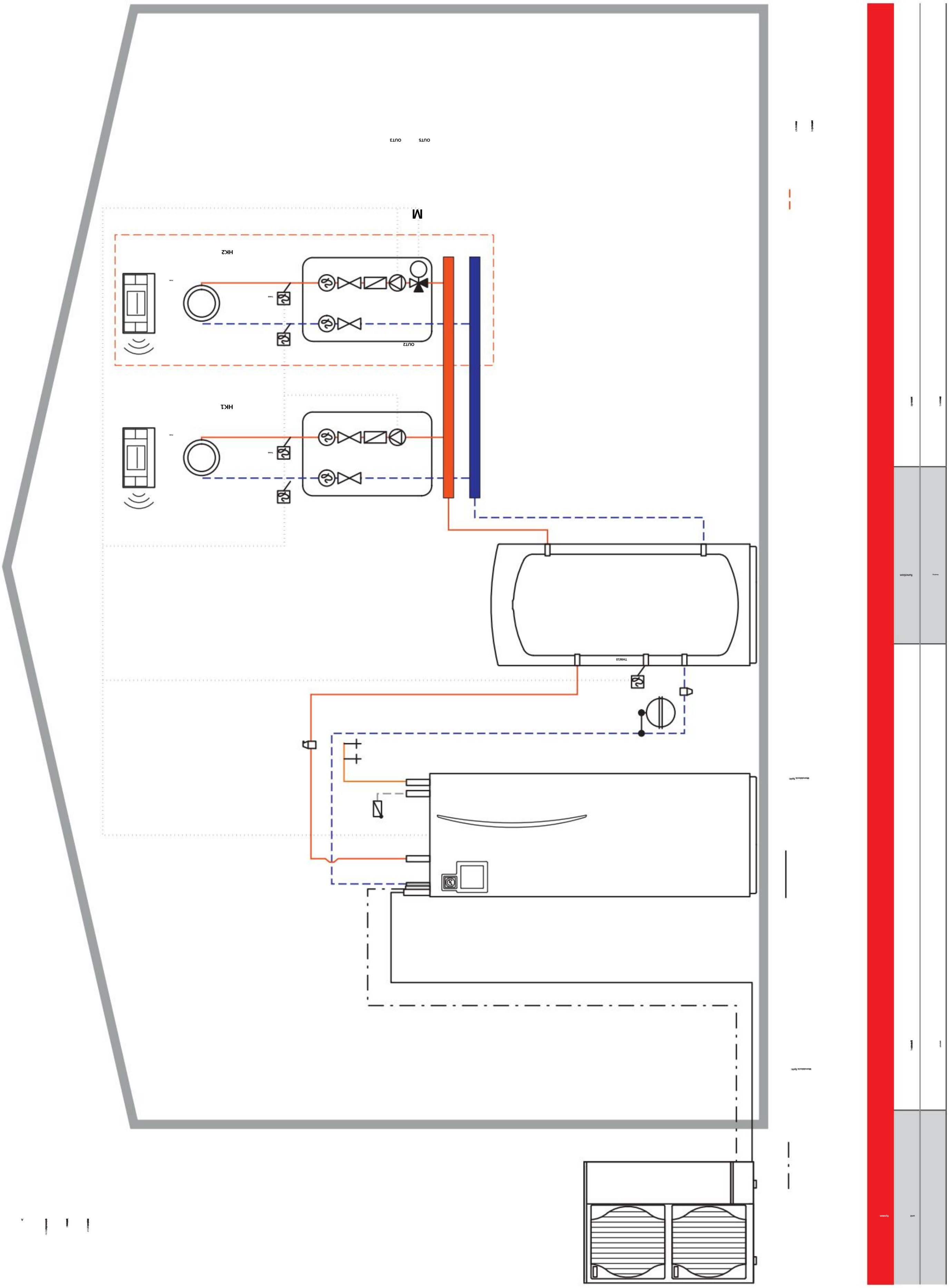
Description

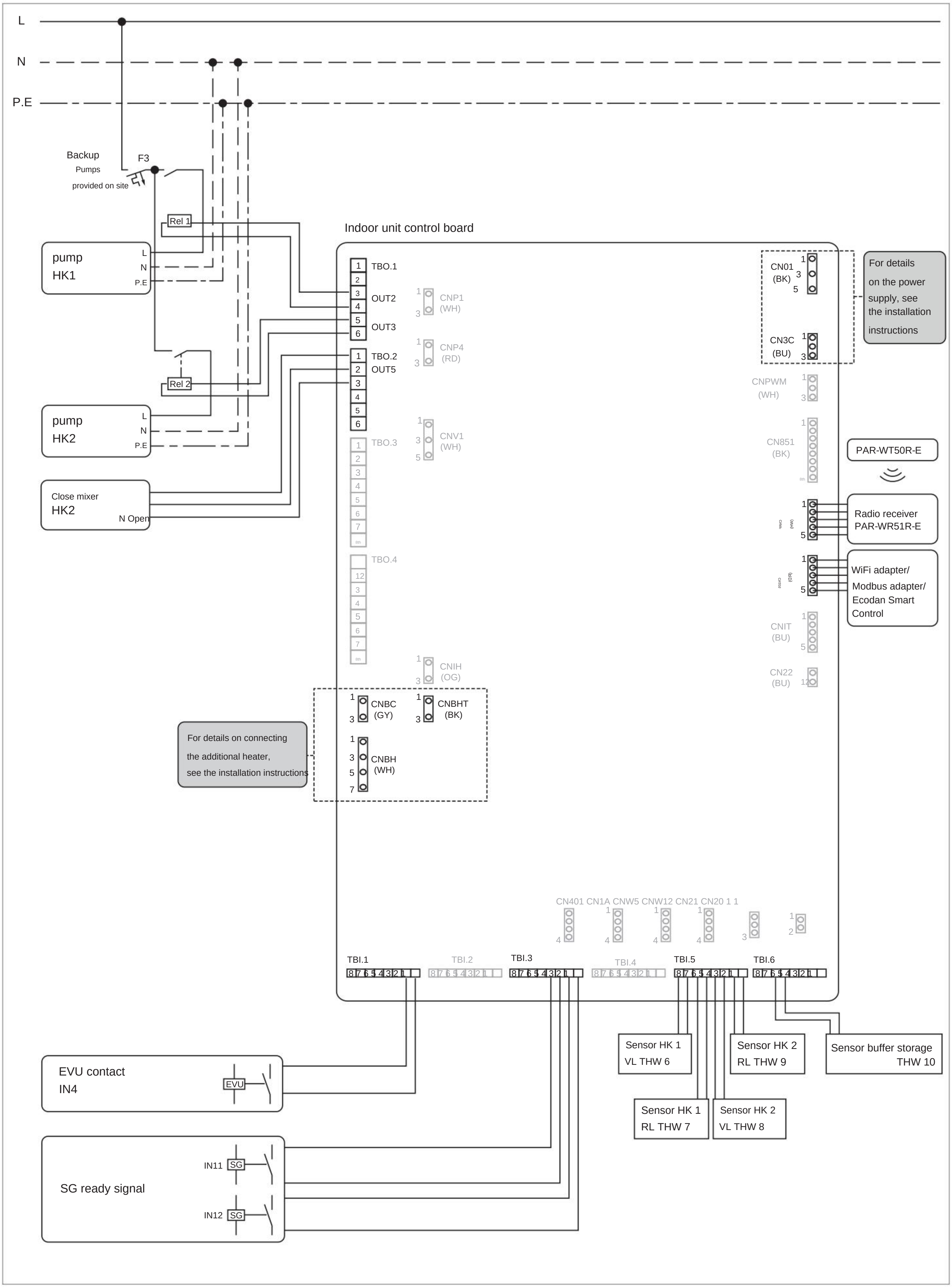
Heat pump system for heating and drinking water heating with one or two heating circuits.

Area of application

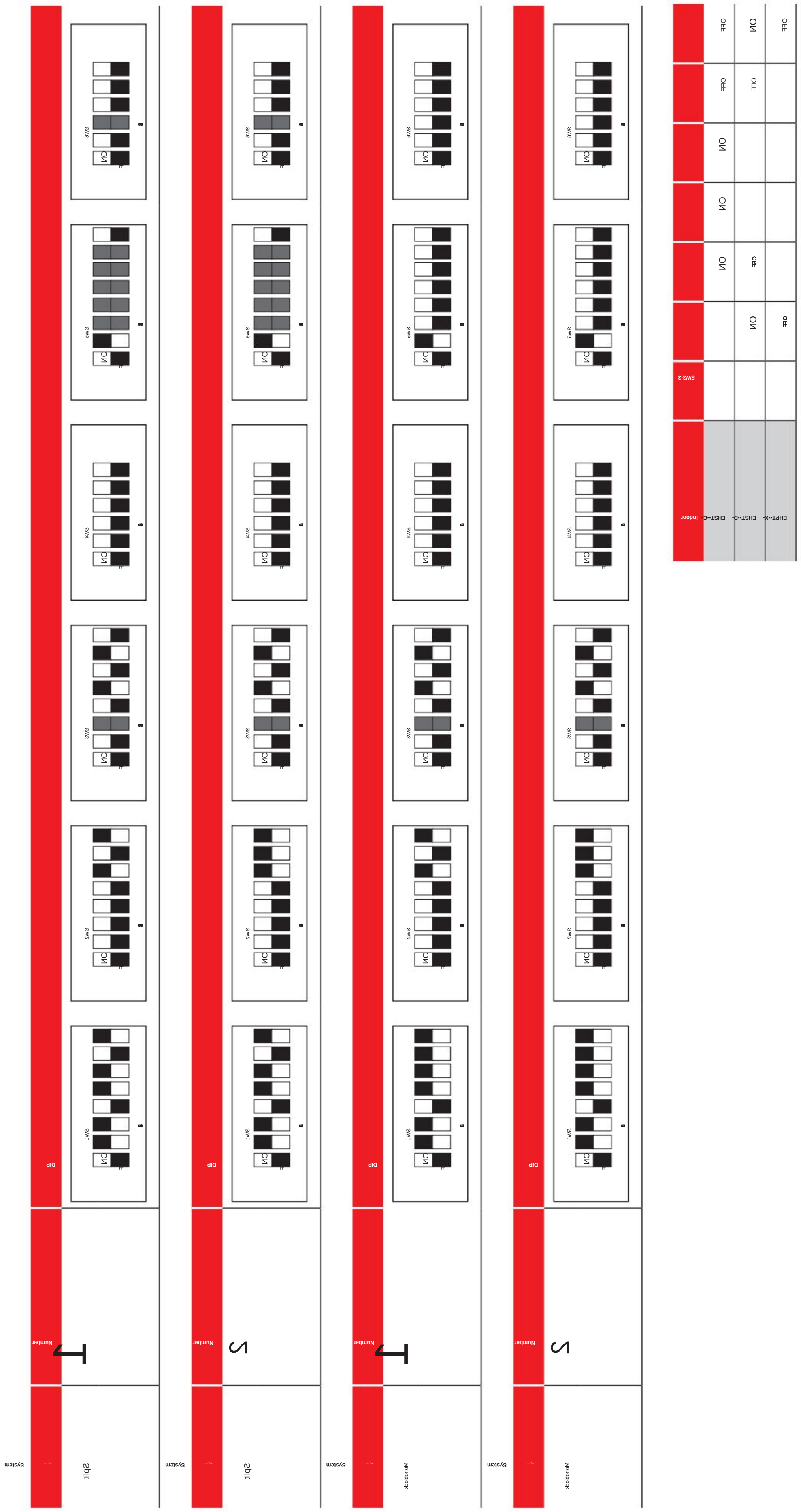
Single-family houses (modernization and new construction)

Icon	Description	symbol	Description	symbol	Description
	Outdoor unit		Non-return valve		3-way switching valve with motor
	tap		Air separator		Radio remote control PAR-WT50R-E / Room thermostat
	Memory module		Pump group		Pump group with mixer
	Buffer memory		expansion tank		Mud separator
	Heating circuit (e.g. underfloor heating or radiators)				


HK2
HK1
M
OUT2
OUT3
OUT5
THW5


L
N
P.E
Backup
Pumps
provided on site
F3
Rel 1
Rel 2
pump
HK1
pump
HK2
Close mixer
HK2
N Open
Indoor unit control board
TBO.1
OUT2
OUT3
TBO.2
OUT5
TBO.3
TBO.4
CNP1
(WH)
CNP4
(RD)
CNV1
(WH)
CNIH
(OG)
CNBC
(GY)
CNBHT
(BK)
CNBH
(WH)
For details on connecting
the additional heater,
see the installation instructions
CN01
(BK)
CN3C
(BU)
For details
on the power
supply, see
the installation
instructions
CNPWM
(WH)
CN851
(BK)
PAR-WT50R-E
Radio receiver
PAR-WR51R-E
WiFi adapter/
Modbus adapter/
Ecodan Smart
Control
CNIT
(BU)
CN22
(BU)
CN401 CN1A CNW5 CNW12 CN21 CN20
TBI.1
TBI.2
TBI.3
TBI.4
TBI.5
TBI.6
EVU contact
IN4
EVU
SG ready signal
IN11
IN12
SG
Sensor HK 1
VL THW 6
Sensor HK 2
RL THW 9
Sensor buffer storage
THW 10
Sensor HK 1
RL THW 7
Sensor HK 2
VL THW 8

Machine Translated by Google



7.4.2 System example 2: Storage module with heating, cooling and DHW heating

System example 2 for Ecodan storage module reversible			
Outdoor unit	Eco Inverter / Power Inverter / Zubadan	**operating mode**	monovalent or monoenergetic
Indoor unit	Memory module reversible	**Heating circuits**	1x unmixed and/or 1x mixed

General information

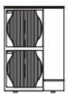
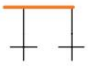
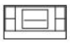
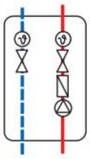
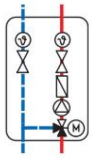
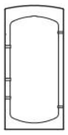
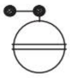
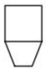
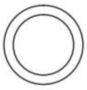
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

Description

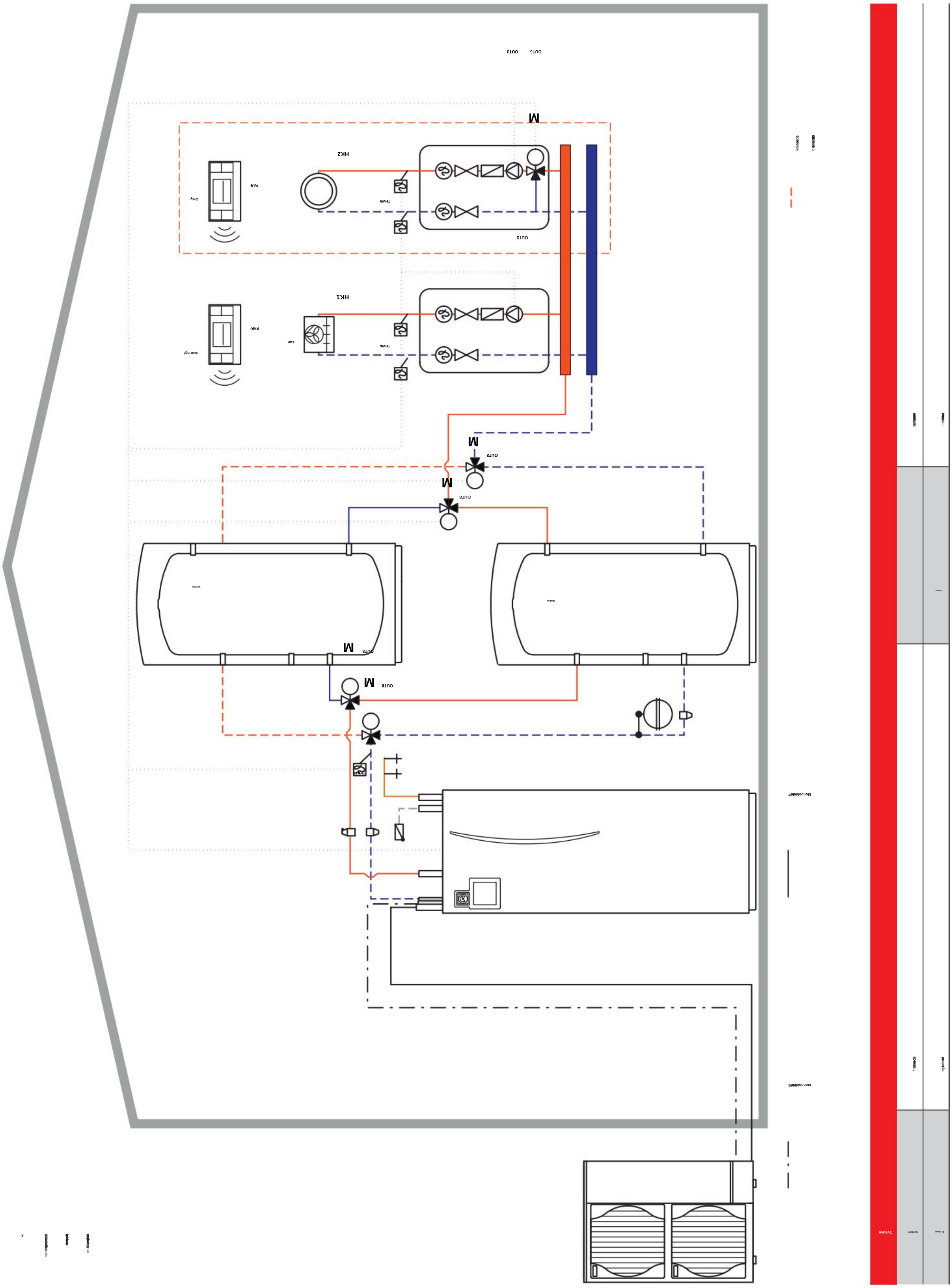
Reversible monoblock/split system for heating, cooling1) and drinking water heating.

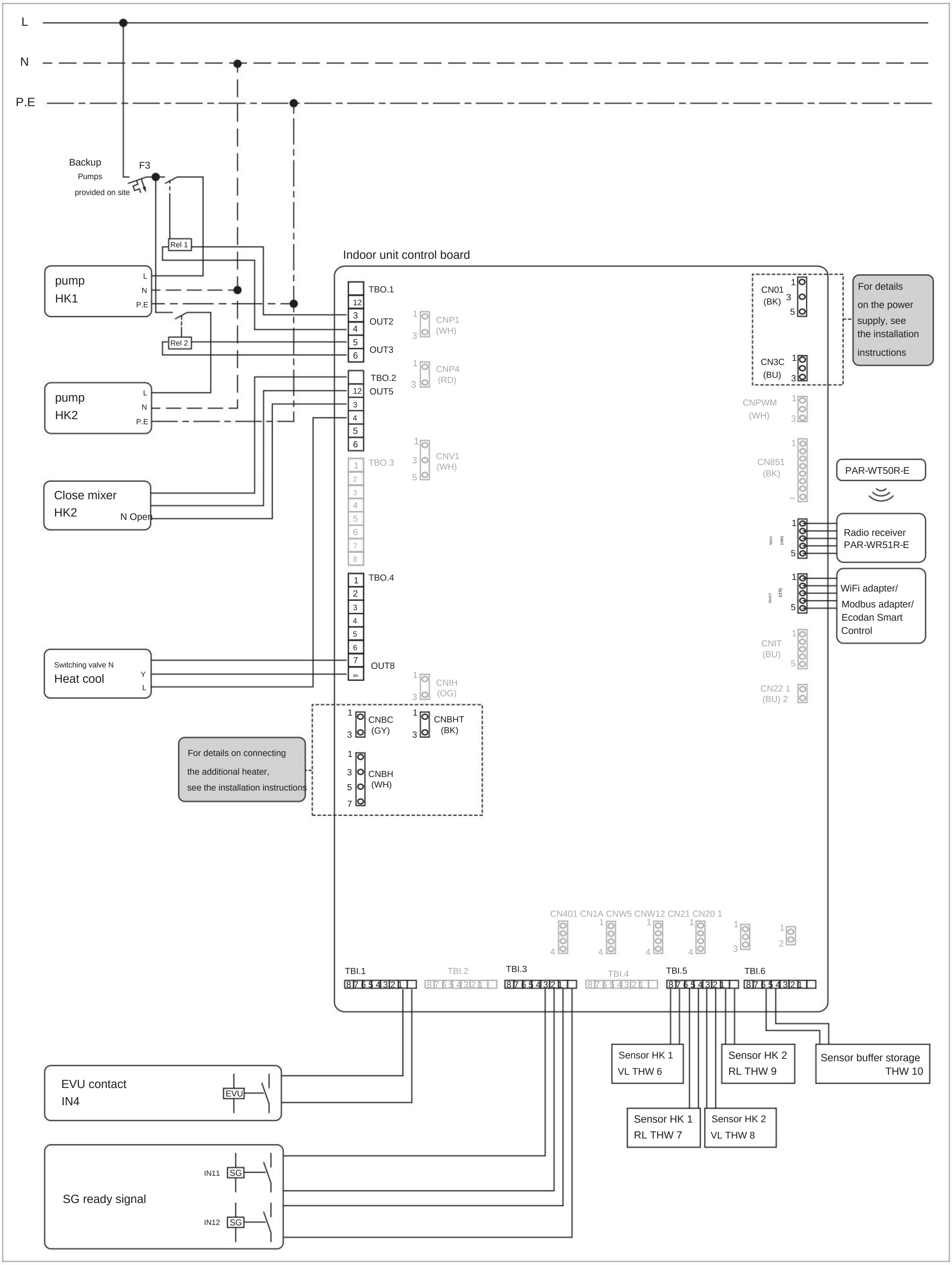
Area of application

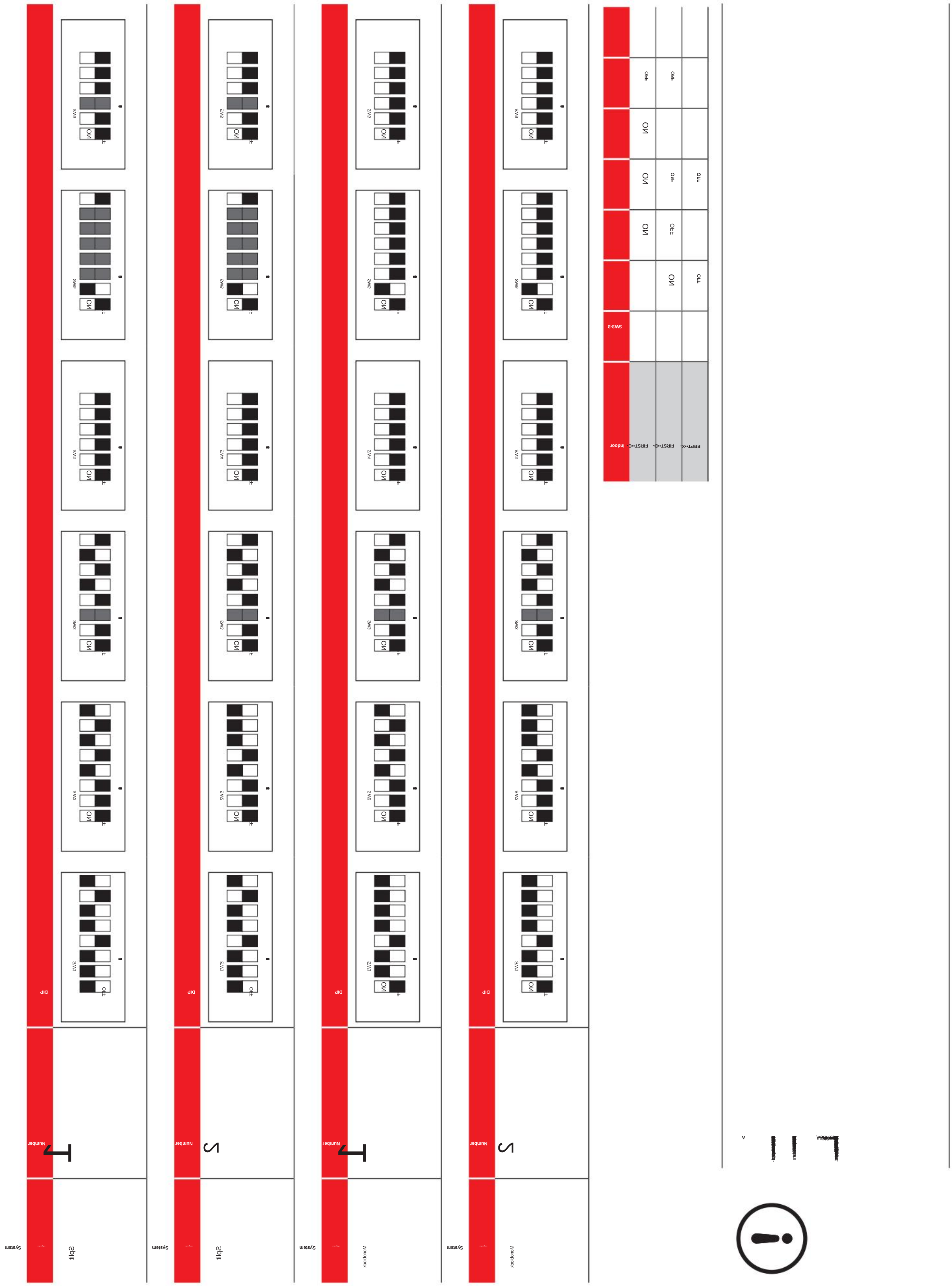
Single-family houses (modernization and new construction)

Icon Description		symbol	Description	symbol	Description
	Outdoor unit		Non-return valve		3-way switching valve with motor
	tap		Air separator		Radio remote control PAR-WT50R-E / Room thermostat
	Memory module		Pump group		Pump group with mixer
	Buffer memory		expansion tank		Mud separator
	Heating circuit (e.g. underfloor heating or radiators)		Fan coil unit		

1) Please check whether the heat pump outdoor unit is suitable for cooling.


HK2
HK1
OUT2
OUT3
OUT5
OUT8
M
THW6
THW9
Fan
Heating


L
N
P.E
Backup
Pumps
provided on site
F3
Rel 1
Rel 2
pump
HK1
L
N
P.E
pump
HK2
L
N
P.E
Close mixer
HK2
N Open
Switching valve N
Heat cool
Y
L
Indoor unit control board
TBO.1
OUT2
OUT3
CNP1
(WH)
CNP4
(RD)
TBO.2
OUT5
CNV1
(WH)
TBO.3
TBO.4
OUT8
CNIH
(OG)
CNBC
(GY)
CNBHT
(BK)
CNBH
(WH)
For details on connecting
the additional heater,
see the installation instructions
CN01
(BK)
CN3C
(BU)
For details
on the power
supply, see
the installation
instructions
CNPWM
(WH)
CN851
(BK)
PAR-WT50R-E
Radio receiver
PAR-WR51R-E
WiFi adapter/
Modbus adapter/
Ecodan Smart
Control
CNIT
(BU)
CN22 1
(BU) 2
CN401 CN1A CNW5 CNW12 CN21 CN20 1
TBI.1
TBI.2
TBI.3
TBI.4
TBI.5
TBI.6
EVU contact
IN4
EVU
SG ready signal
IN11
SG
IN12
SG
Sensor HK 1
VL THW 6
Sensor HK 2
RL THW 9
Sensor buffer storage
THW 10
Sensor HK 1
RL THW 7
Sensor HK 2
VL THW 8



7.4.3 System example 3: Hydro module with heating and drinking water heating

System example for Ecodan storage module			
Outdoor unit	Eco Inverter / Power Inverter / Zubadan	**operating mode**	monovalent or monoenergetic
Indoor unit	Hydro module	**Heating circuits**	1x unmixed and/or 1x mixed

General information

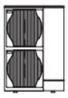
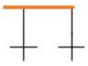
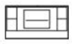
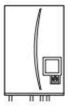
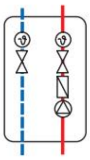
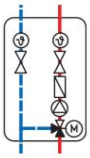
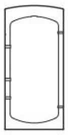
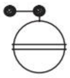
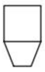
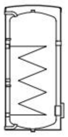
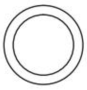
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

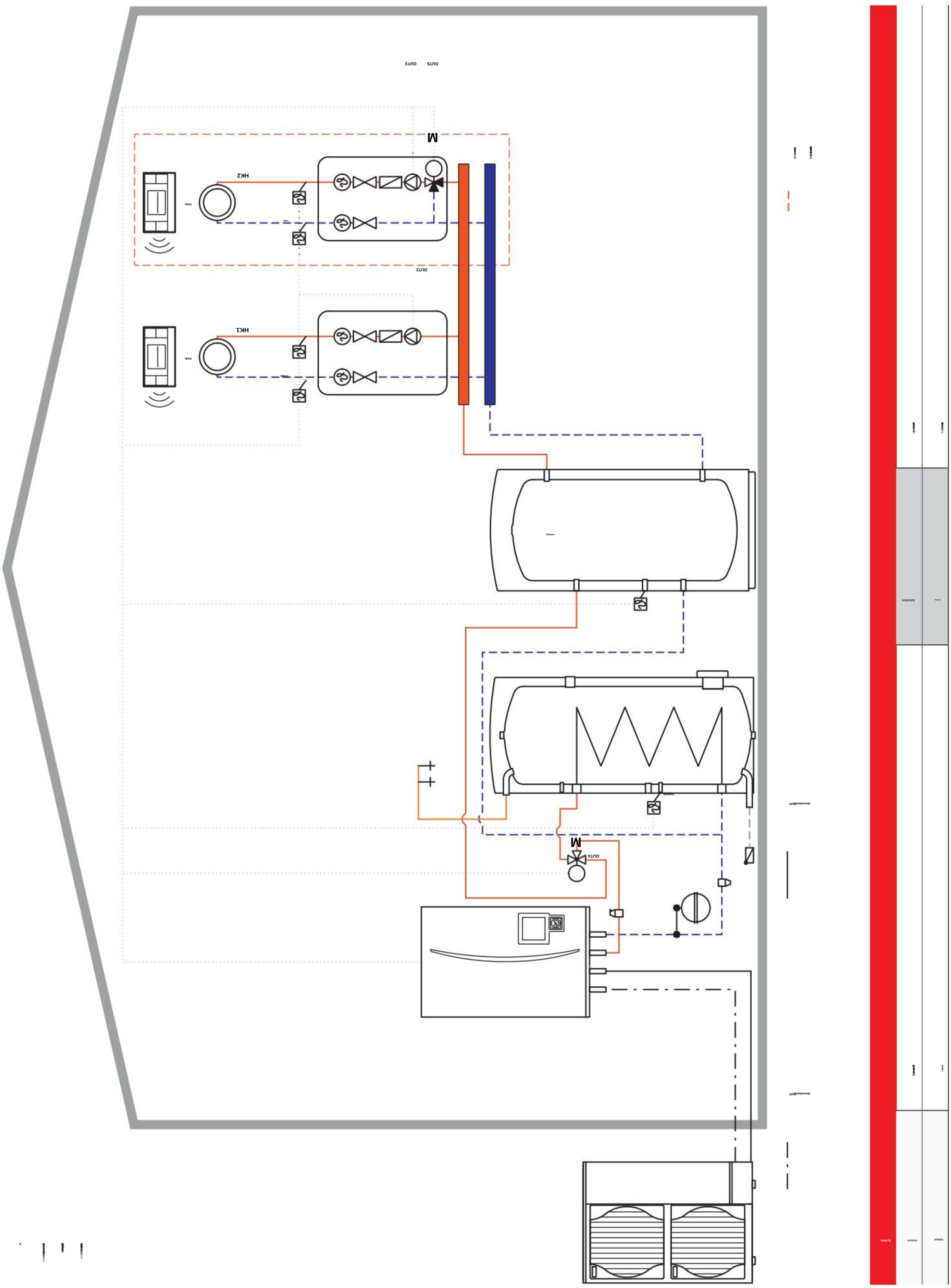
Description

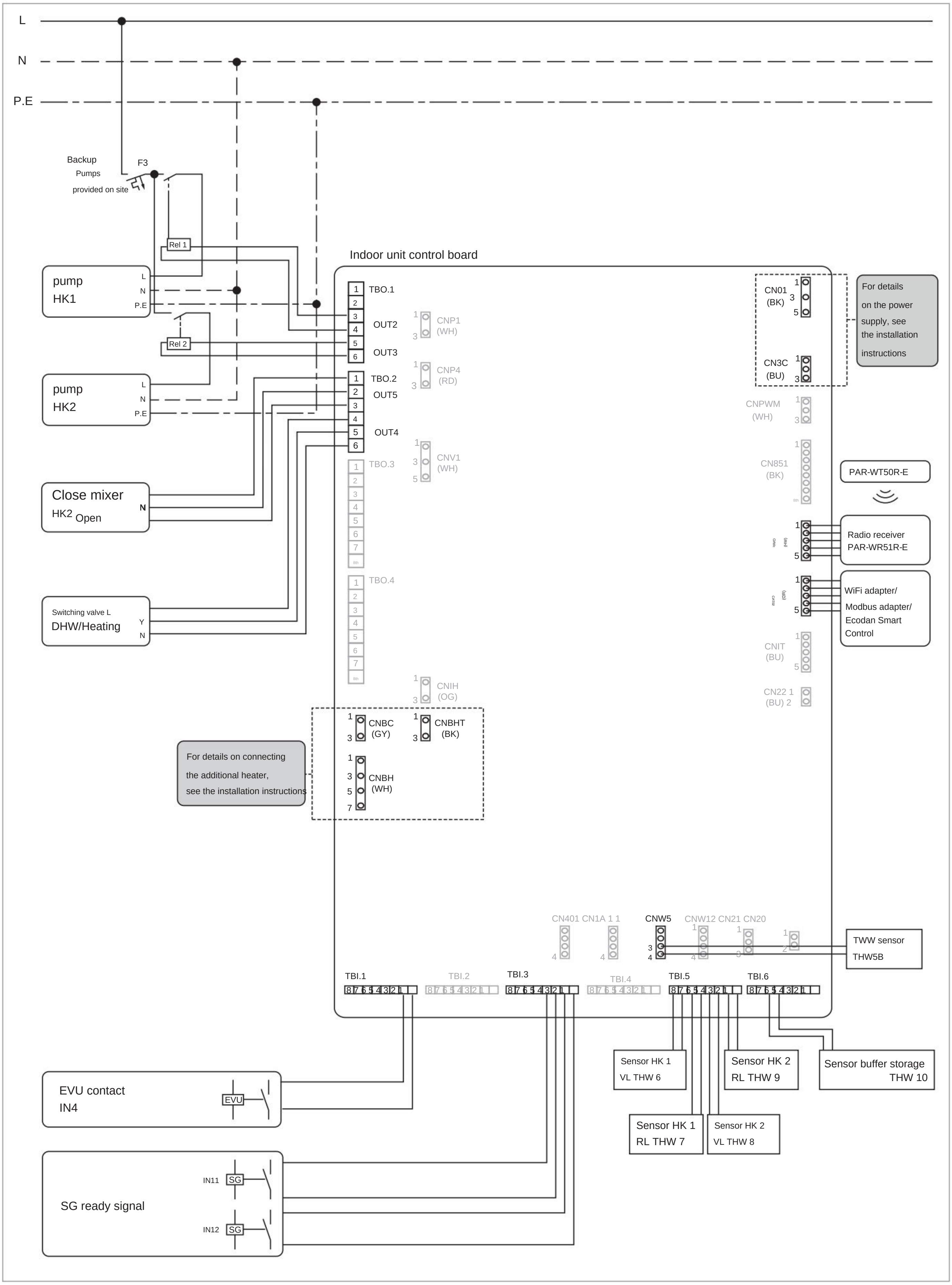
Monoblock or split system for heating and drinking water heating.

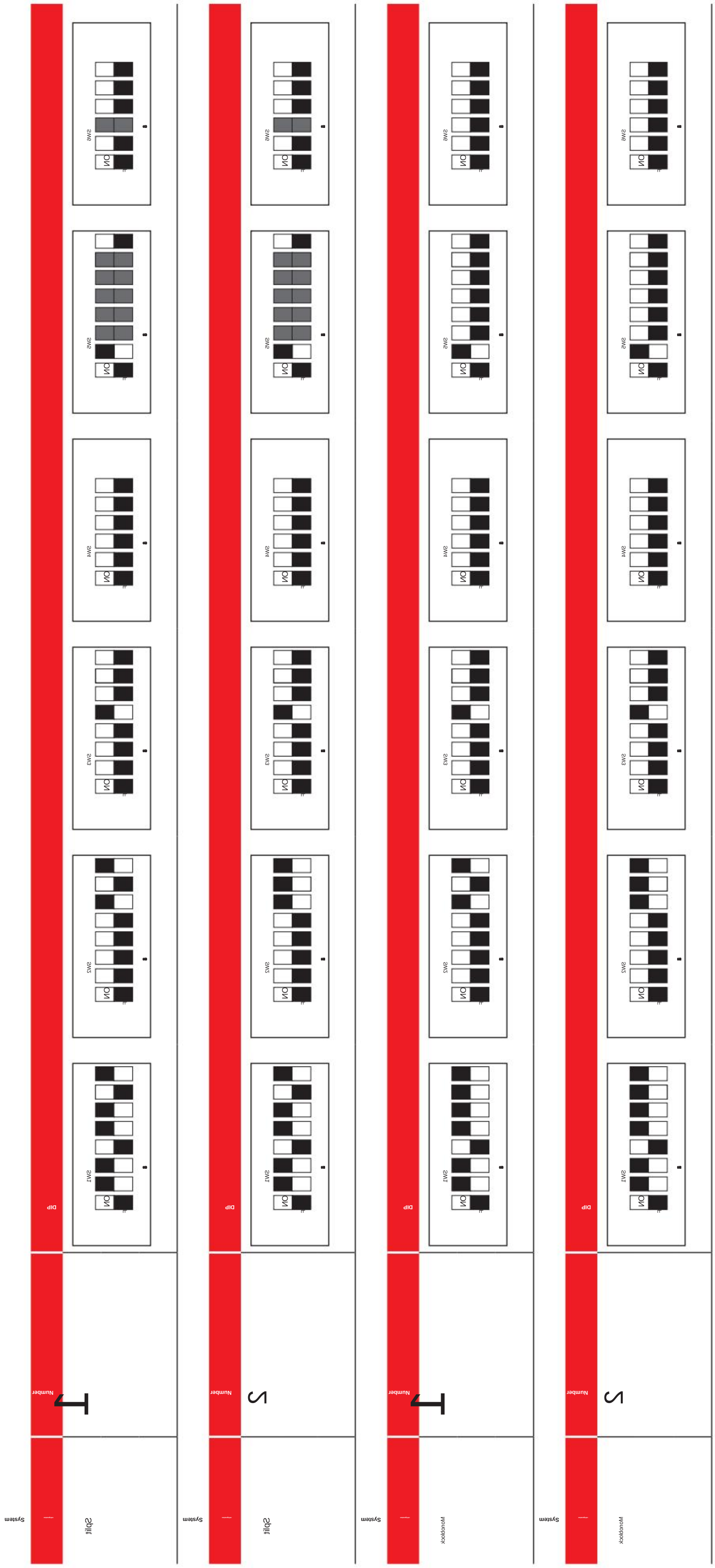
Area of application

Single and two-family houses (modernization and new construction)

Icon	Description	symbol	Description	symbol	Description
	Outdoor unit		Non-return valve		3-way switching valve with motor
	tap		Air separator		Radio remote control PAR-WT50R-E / Room thermostat
	Hydro module		Pump group		Pump group with mixer
	Buffer memory		expansion tank		Mud separator
	Domestic hot water tank		Heating circuit (e.g. underfloor heating or radiators)		


HK1
HK2
OUT2
OUT3
OUT5
OUT4
M


L
N
P.E
Backup
Pumps
provided on site
F3
Rel 1
Rel 2
pump
HK1
L
N
P.E
pump
HK2
Close mixer
HK2 Open
N
Switching valve L
DHW/Heating
Y
N
Indoor unit control board
TBO.1
OUT2
OUT3
TBO.2
OUT5
OUT4
TBO.3
TBO.4
CNP1
(WH)
CNP4
(RD)
CNV1
(WH)
CNIH
(OG)
CNBC
(GY)
CNBHT
(BK)
CNBH
(WH)
For details on connecting
the additional heater,
see the installation instructions
CN01
(BK)
CN3C
(BU)
For details
on the power
supply, see
the installation
instructions
CNPWM
(WH)
CN851
(BK)
PAR-WT50R-E
Radio receiver
PAR-WR51R-E
WiFi adapter/
Modbus adapter/
Ecodan Smart
Control
CNIT
(BU)
CN22 1
(BU) 2
CN401 CN1A 1 1
CNW5
CNW12 CN21 CN20
TWW sensor
THW5B
TBI.1
TBI.2
TBI.3
TBI.4
TBI.5
TBI.6
Sensor HK 1
VL THW 6
Sensor HK 2
RL THW 9
Sensor buffer storage
THW 10
Sensor HK 1
RL THW 7
Sensor HK 2
VL THW 8
EVU contact
IN4
EVU
SG ready signal
IN11
SG
IN12
SG



Indoor	SW5-3					
EHSC-	ON	ON	ON	ON	OFF	
EHSD-	ON	OFF			OFF	
EHSE-	OFF		ON	OFF		OFF
EHPX-	OFF					

7.4.4 System example 4: Hydro module with heating, cooling and drinking water heating

System example 4 for Ecodan hydromodule reversible			
Outdoor unit	Eco Inverter / Power Inverter / Zubadan	**operating mode**	monovalent or monoenergetic
Indoor unit	Reversible hydromodule	**Heating circuits**	1x unmixed and/or 1x mixed

General information

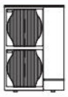
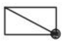
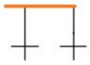
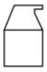
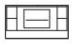
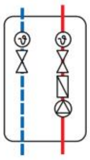
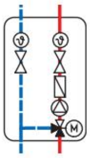
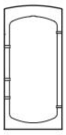
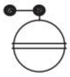
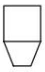
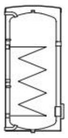
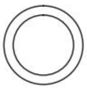
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

Description

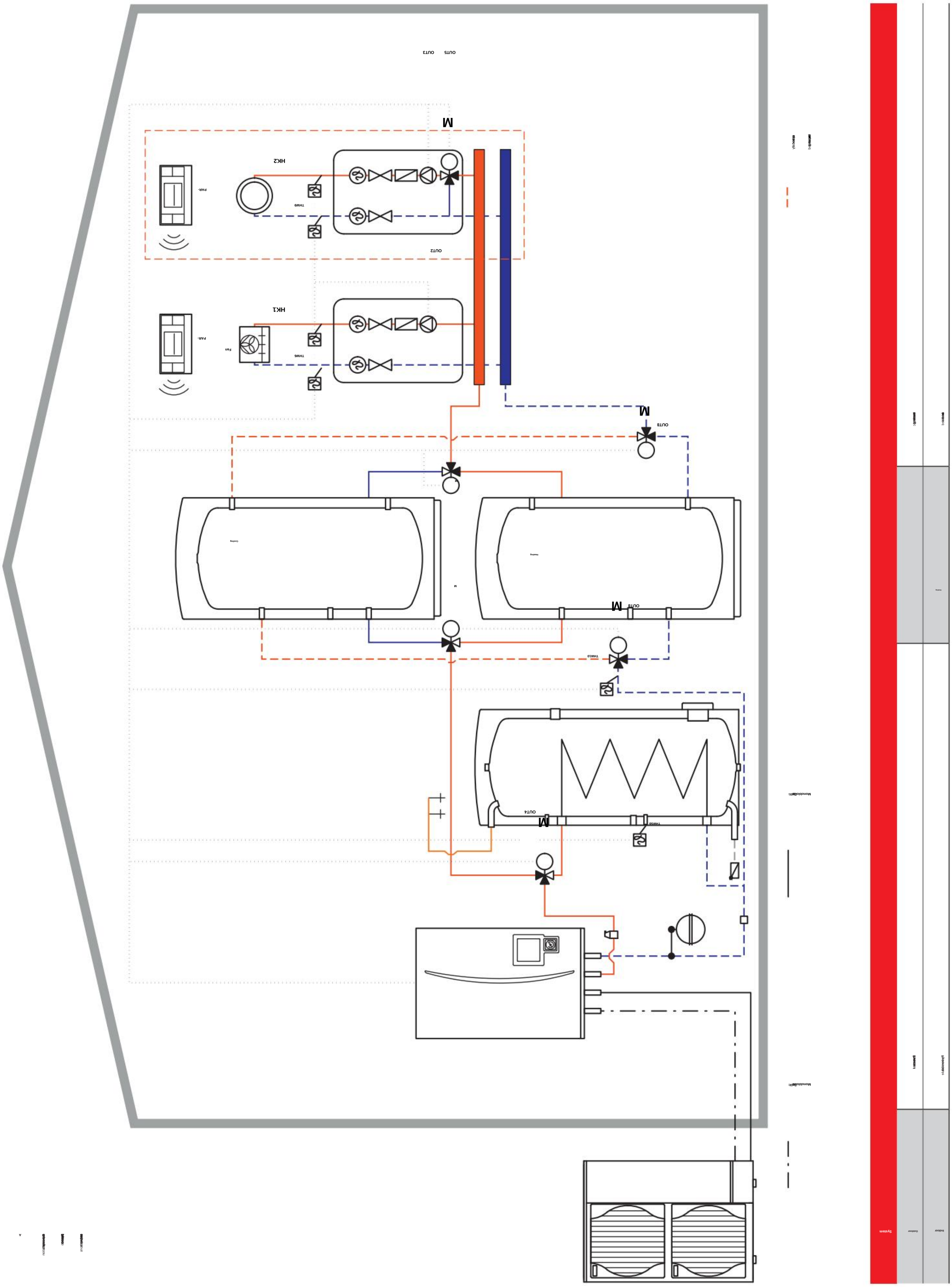
Reversible monoblock/split system for heating, cooling1) and drinking water heating.

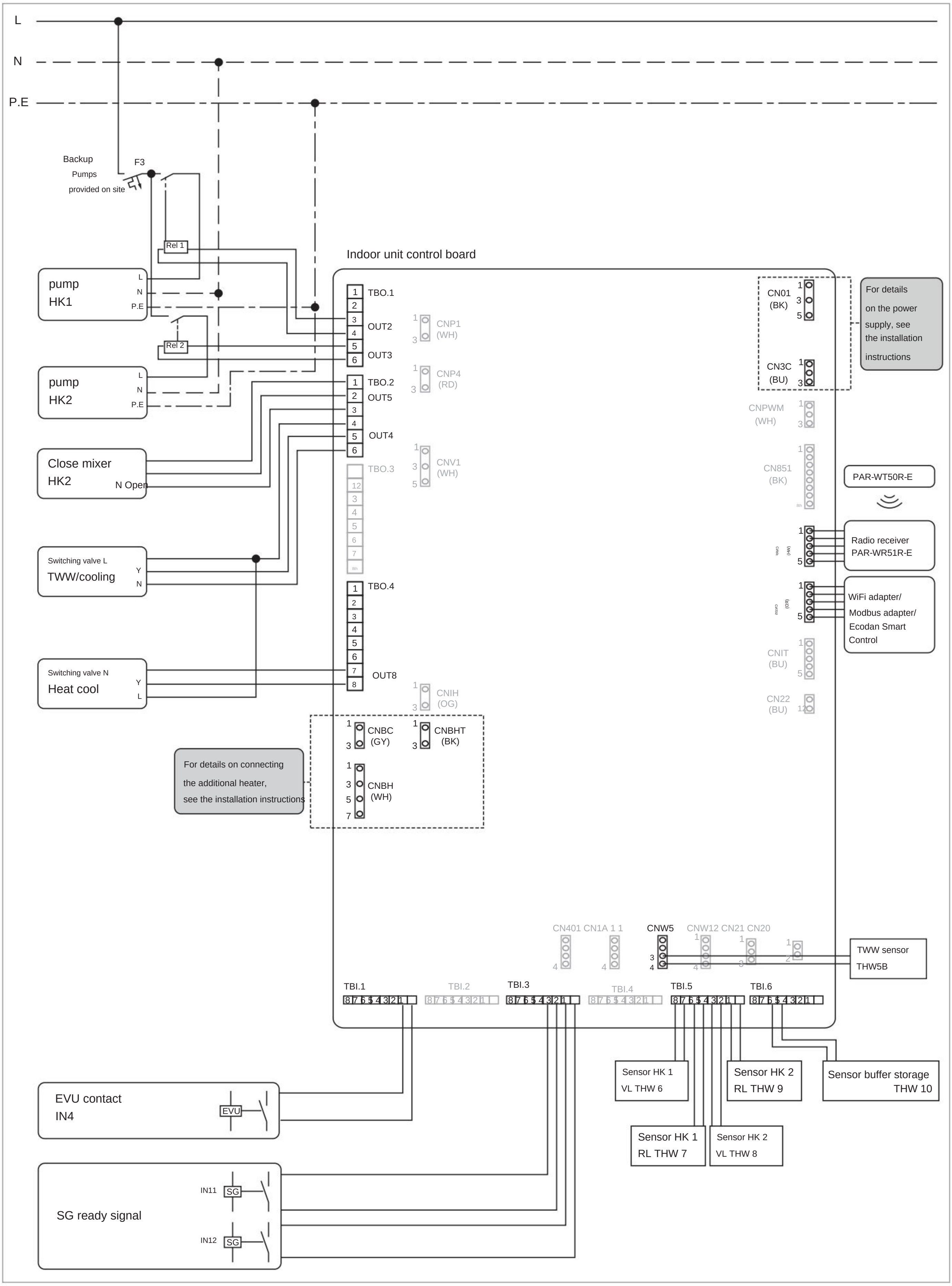
Area of application

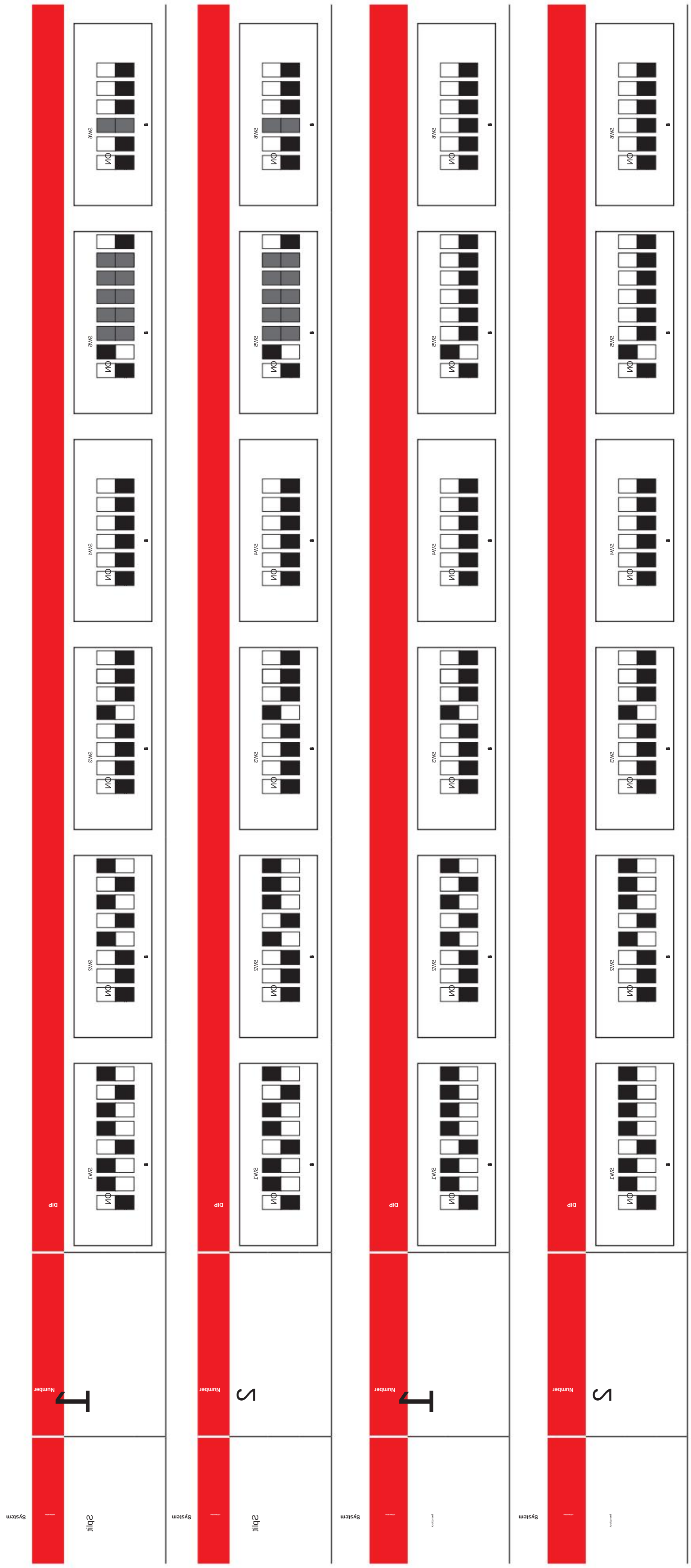
Single and two-family houses (modernization and new construction)

Icon	Description	symbol	Description	symbol	Description
	Outdoor unit		Non-return valve		3-way switching valve with motor
	tap		Air separator		Radio remote control PAR-WT50R-E / Room thermostat
	Hydro module		Pump group		Pump group with mixer
	Buffer memory		expansion tank		Mud separator
	Domestic hot water tank		Heating circuit (e.g. underfloor heating or radiators)		Fan coil unit

1) Please check whether the heat pump outdoor unit is suitable for cooling.




L
N
P.E
Backup
Pumps
provided on site
F3
Rel 1
Rel 2
Indoor unit control board
pump
HK1
pump
HK2
Close mixer
HK2
N Open
Switching valve L
TWW/cooling
Switching valve N
Heat cool
TBO.1
OUT2
OUT3
TBO.2
OUT5
OUT4
TBO.3
TBO.4
OUT8
CNP1 (WH)
CNP4 (RD)
CNV1 (WH)
CNIH (OG)
CNBC (GY)
CNBHT (BK)
CNBH (WH)
For details on connecting the additional heater, see the installation instructions
CN01 (BK)
CN3C (BU)
For details on the power supply, see the installation instructions
CNPWM (WH)
CN851 (BK)
PAR-WT50R-E
Radio receiver PAR-WR51R-E
WiFi adapter/ Modbus adapter/ Ecodan Smart Control
CNIT (BU)
CN22 (BU)
CN401 CN1A
CNW5
CNW12 CN21 CN20
TWW sensor THW5B
TBI.1
TBI.2
TBI.3
TBI.4
TBI.5
TBI.6
EVU contact
IN4
EVU
SG ready signal
IN11
IN12
SG
Sensor HK 1 VL THW 6
Sensor HK 2 RL THW 9
Sensor buffer storage THW 10
Sensor HK 1 RL THW 7
Sensor HK 2 VL THW 8



Indoor	SW5-3					
ERSC-	ON	ON	ON	ON	Off	
ERSD-	ON	Off		ON	Off	
ERSE-	Off		ON	Off		Off
ERPX-	Off			Off		

7.4.5 System example 5: Hydro module with bivalent boiler

System example 5 for Ecodan hydromodule and bivalent boiler			
Outdoor unit	Eco Inverter / Power Inverter / Zubadan	**operating mode**	bivalent alternative/parallel
Indoor unit	Hydro module	**Heating circuits**	1x unmixed and/or 1x mixed

General information

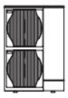
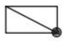
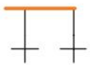
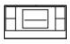
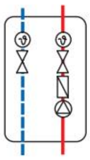
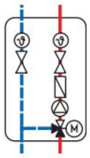
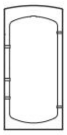
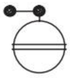
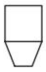
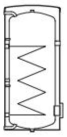
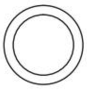
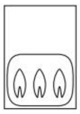
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

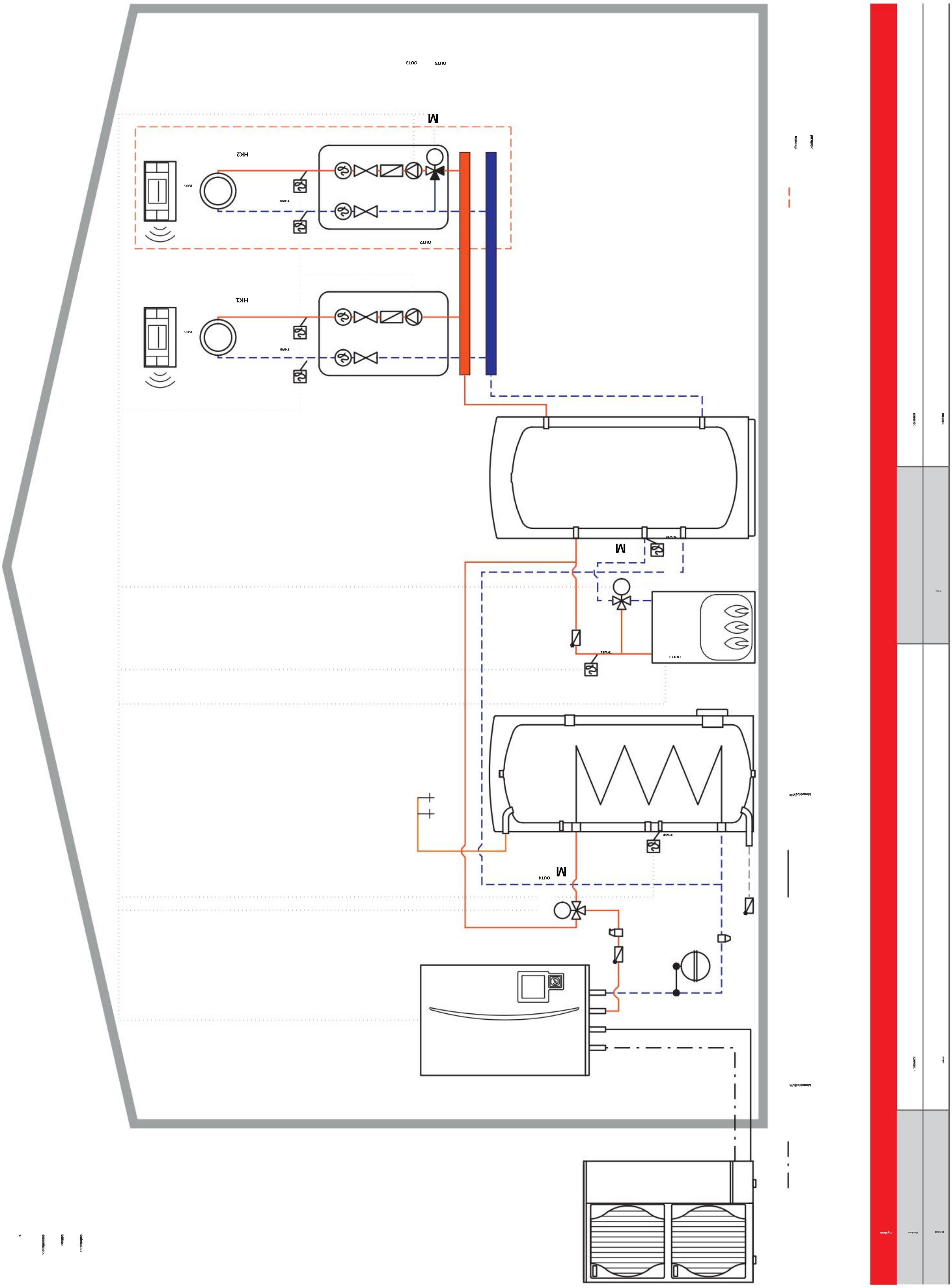
Description

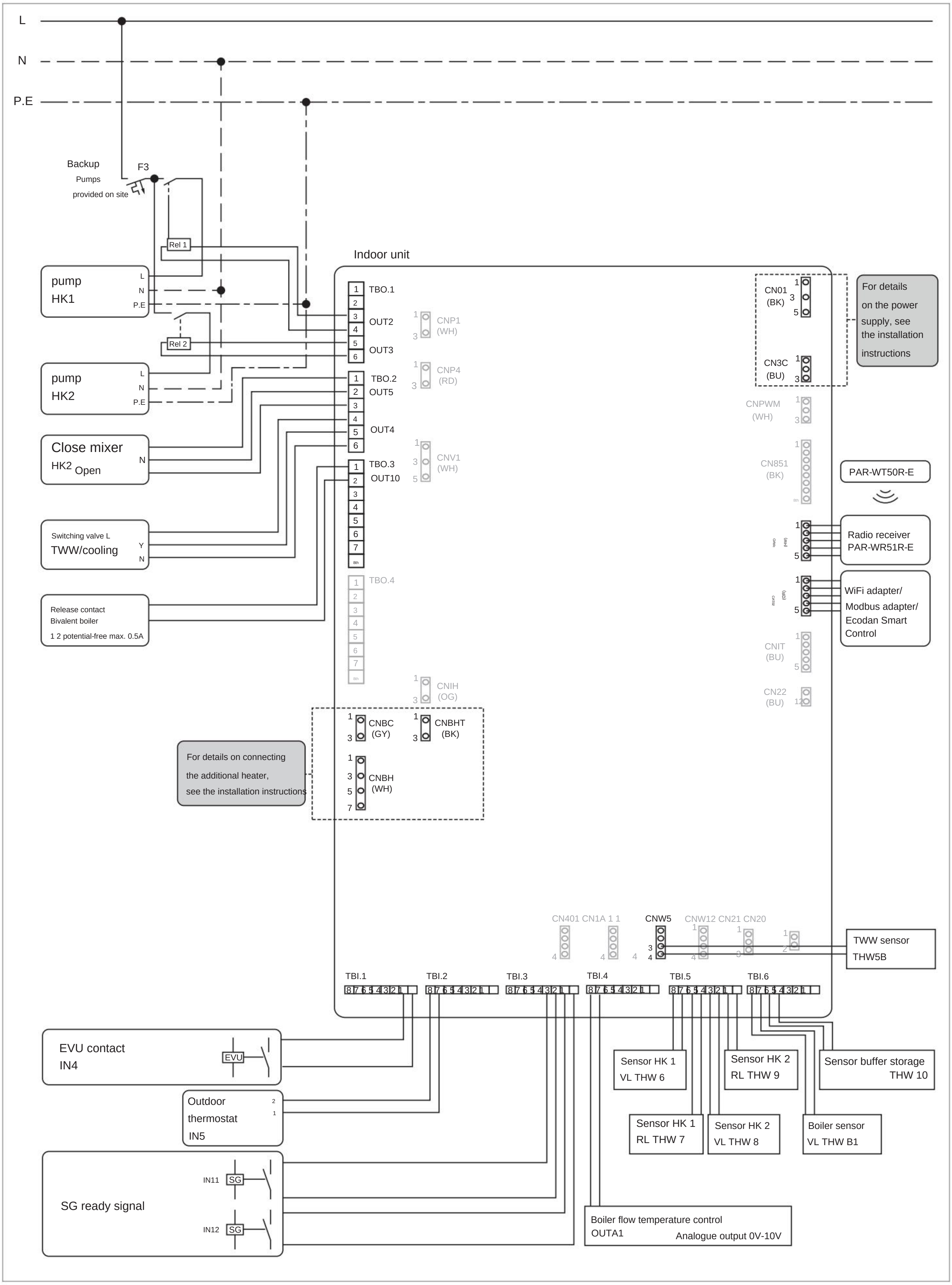
Bivalent monoblock or split heat pump system for heating and drinking water heating.

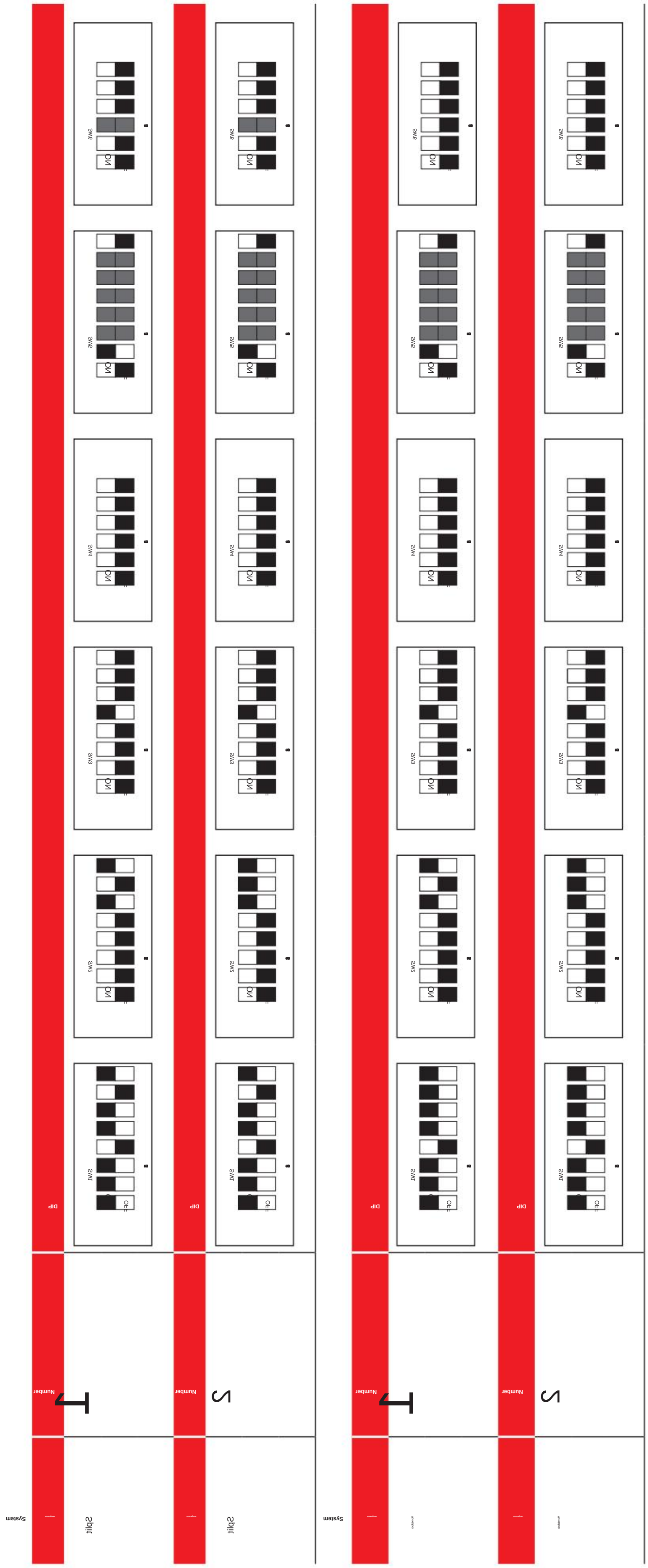
Area of application

Single and two-family houses (modernization and new construction)

Icon	Description	symbol	Description	symbol	Description
	Outdoor unit		Non-return valve		3-way switching valve with motor
	tap		Air separator		Radio remote control PAR-WT50R-E / Room thermostat
	Hydro module		Pump group		Pump group with mixer
	Buffer memory		expansion tank		Mud separator
	Domestic hot water tank		Heating circuit (e.g. underfloor heating or radiators)		Bivalent boiler


HK2
HK1
OUT2
OUT3
OUT5
OUT4
OUT10
M


L
N
P.E
Backup
Pumps
provided on site
F3
Rel 1
Rel 2
Indoor unit
pump
HK1
pump
HK2
Close mixer
HK2 Open
Switching valve L
TWW/cooling
Release contact
Bivalent boiler
1 2 potential-free max. 0.5A
TBO.1
OUT2
OUT3
TBO.2
OUT5
OUT4
TBO.3
OUT10
TBO.4
CNP1
(WH)
CNP4
(RD)
CNV1
(WH)
CNIH
(OG)
CNBC
(GY)
CNBHT
(BK)
CNBH
(WH)
For details on connecting
the additional heater,
see the installation instructions
CN01
(BK)
CN3C
(BU)
For details
on the power
supply, see
the installation
instructions
CNPWM
(WH)
CN851
(BK)
PAR-WT50R-E
Radio receiver
PAR-WR51R-E
WiFi adapter/
Modbus adapter/
Ecodan Smart
Control
CNIT
(BU)
CN22
(BU)
CN401 CN1A
CNW5
CNW12 CN21 CN20
TWW sensor
THW5B
TBI.1
TBI.2
TBI.3
TBI.4
TBI.5
TBI.6
EVU contact
IN4
EVU
Outdoor
thermostat
IN5
SG ready signal
IN11
IN12
SG
Sensor HK 1
VL THW 6
Sensor HK 2
RL THW 9
Sensor buffer storage
THW 10
Sensor HK 1
RL THW 7
Sensor HK 2
VL THW 8
Boiler sensor
VL THW B1
Boiler flow temperature control
OUTA1
Analogue output 0V-10V



Indoor	SW5-3				
EHSC-	ON	ON	ON	ON	OFF
EHSD-	ON	OFF	OFF		OFF
EHPX-	OFF		OFF		

7.4.6 System example 6: Hydro module with multi-buffer storage and fresh water station

System example 6 for Ecodan hydromodule with multi-buffer storage and fresh water station			
Outdoor unit	Eco Inverter / Power Inverter / Zubadan	**operating mode**	monovalent or monoenergetic
Indoor unit	Hydro module	**Heating circuits**	1x unmixed and 1x mixed

General information

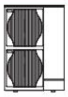
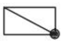
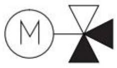
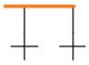
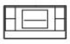
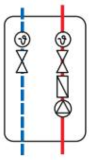
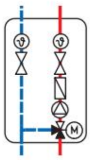
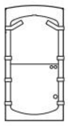
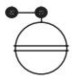
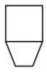
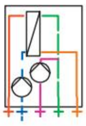
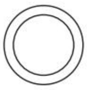
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

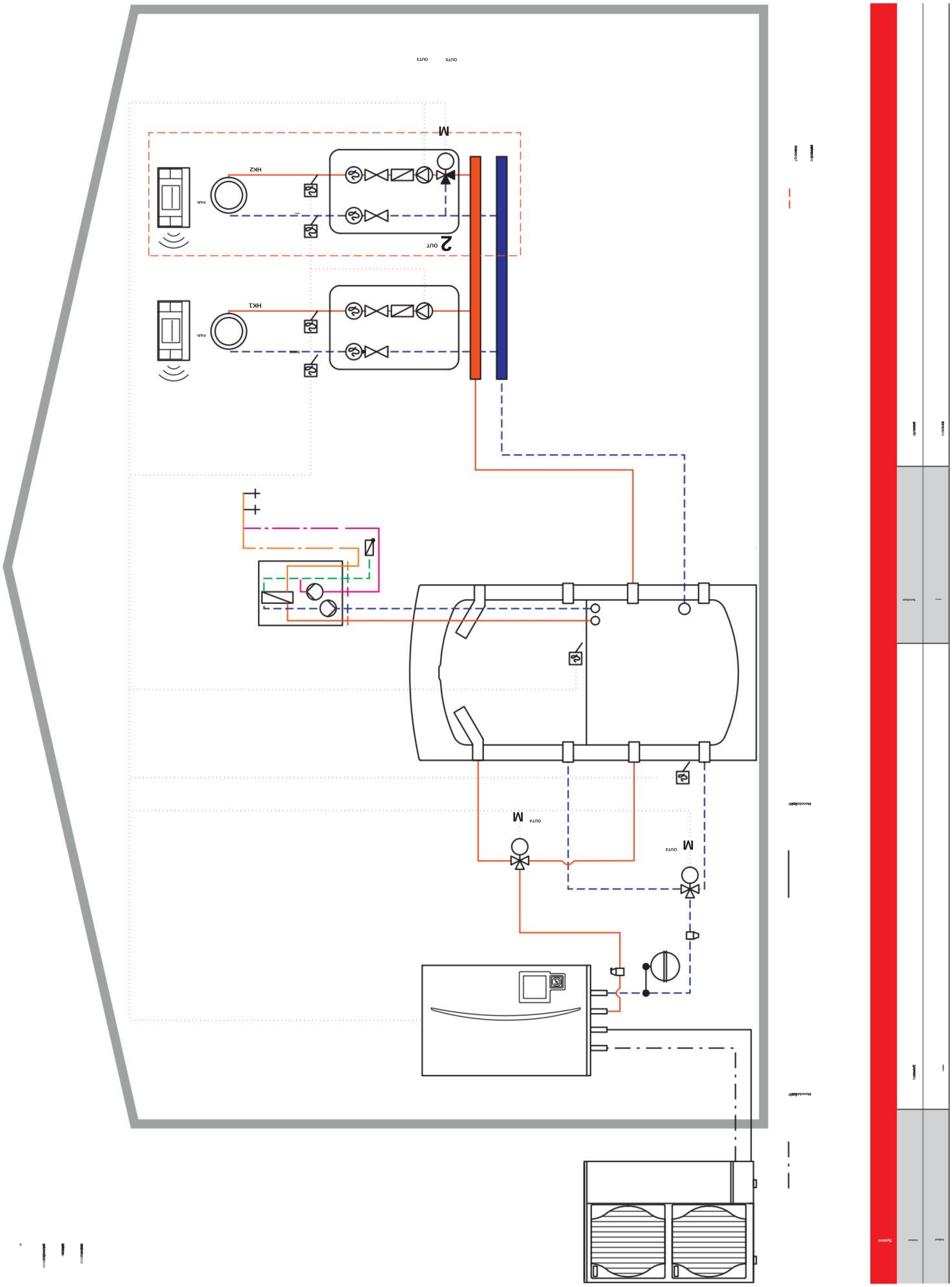
Description

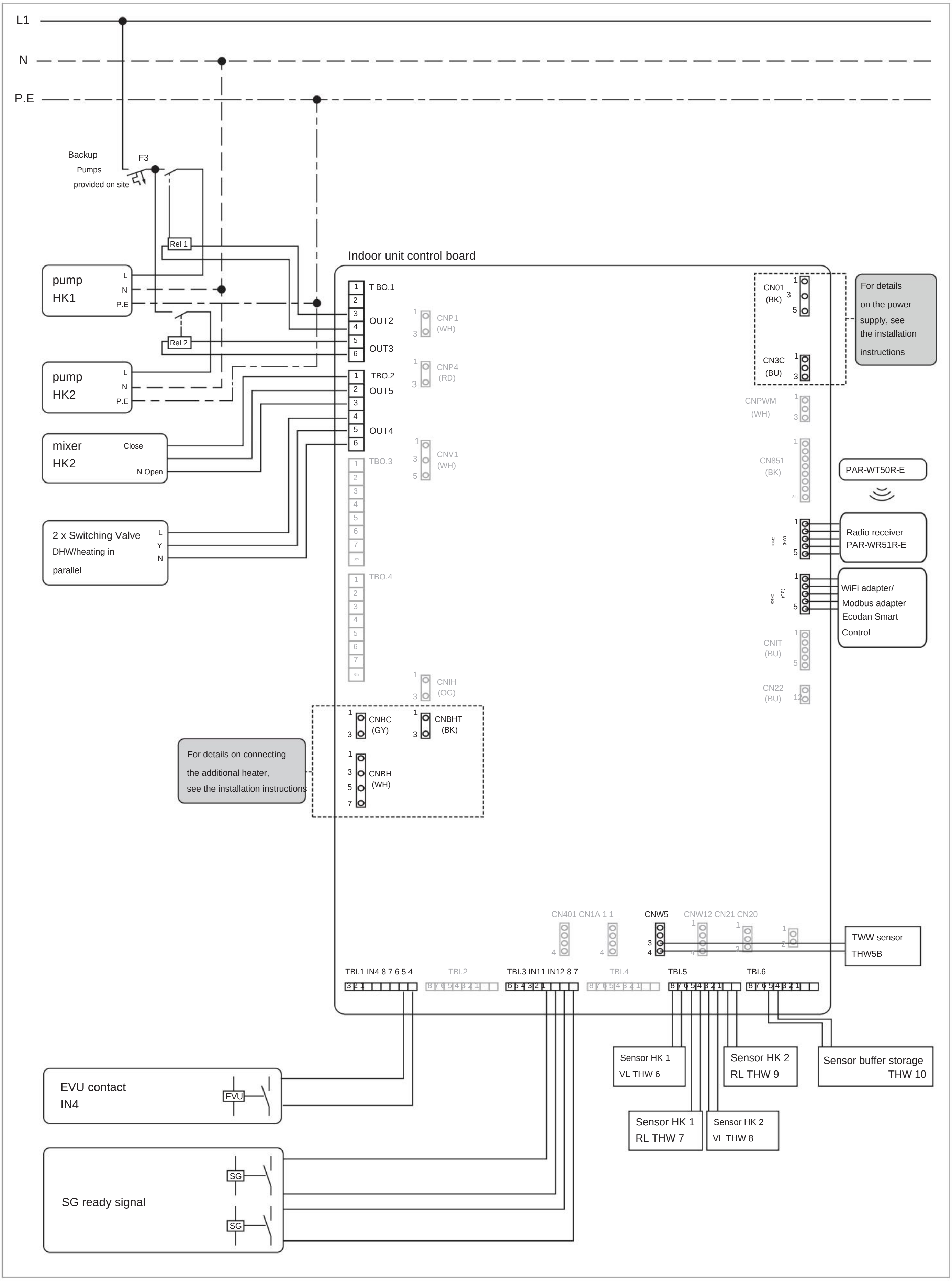
Heat pump split/monoblock system for heating and drinking water heating.

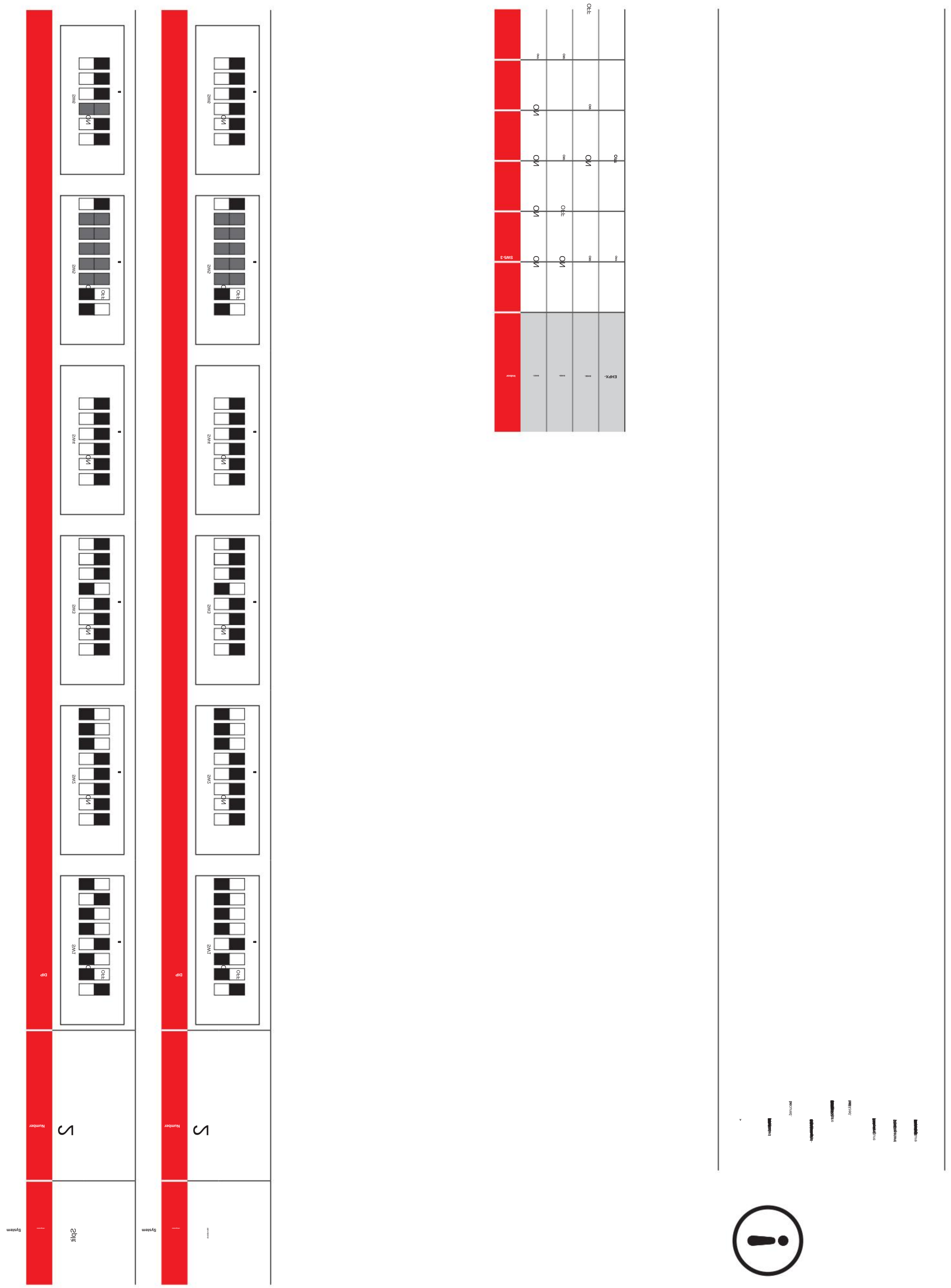
Area of application

Single and two-family houses (modernization and new construction)

Icon Description		symbol	Description	symbol	Description
	Outdoor unit		Non-return valve		3-way switching valve with motor
	tap		Air separator		Radio remote control PAR-WT50R-E / Room thermostat
	Hydro module		Pump group		Pump group with mixer
	Multifunctional buffer storage PZ		expansion tank		Mud separator
	Fresh water station with TWW circulation		Heating circuit (e.g. underfloor heating or radiators)		




L1
N
P.E
Backup
Pumps
provided on site
F3
Rel 1
Rel 2
pump
HK1
L
N
P.E
pump
HK2
mixer
HK2
Close
N Open
2 x Switching Valve
DHW/heating in
parallel
L
Y
N
Indoor unit control board
T BO.1
OUT2
OUT3
TBO.2
OUT5
OUT4
TBO.3
TBO.4
CNP1
(WH)
CNP4
(RD)
CNV1
(WH)
CNIH
(OG)
CNBC
(GY)
CNBHT
(BK)
CNBH
(WH)
For details on connecting
the additional heater,
see the installation instructions
CN01
(BK)
CN3C
(BU)
For details
on the power
supply, see
the installation
instructions
CNPWM
(WH)
CN851
(BK)
PAR-WT50R-E
Radio receiver
PAR-WR51R-E
WiFi adapter/
Modbus adapter
Ecodan Smart
Control
CNIT
(BU)
CN22
(BU)
CN401 CN1A
CNW5
CNW12 CN21 CN20
TWW sensor
THW5B
TBI.1 IN4 8 7 6 5 4
TBI.2
TBI.3 IN11 IN12 8 7
TBI.4
TBI.5
TBI.6
Sensor HK 1
VL THW 6
Sensor HK 2
RL THW 9
Sensor buffer storage
THW 10
Sensor HK 1
RL THW 7
Sensor HK 2
VL THW 8
EVU contact
IN4
EVU
SG ready signal
SG
SG



7.4.7 System example 7: Hydro module with multi-buffer storage and external heat (e.g. solar)

System example 7 for Ecodan hydromodule with multi-buffer storage and external heat (e.g. solar)			
Outdoor unit	Eco Inverter / Power Inverter / Zubadan	**operating mode**	bivalent alternative or bivalent parallel
Indoor unit	Hydro module	**Heating circuits**	1x unmixed and 1x mixed

General information

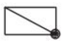
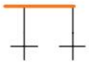
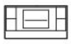
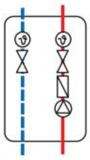
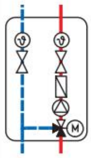
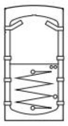
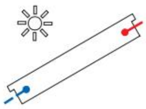
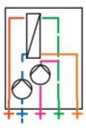
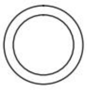
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

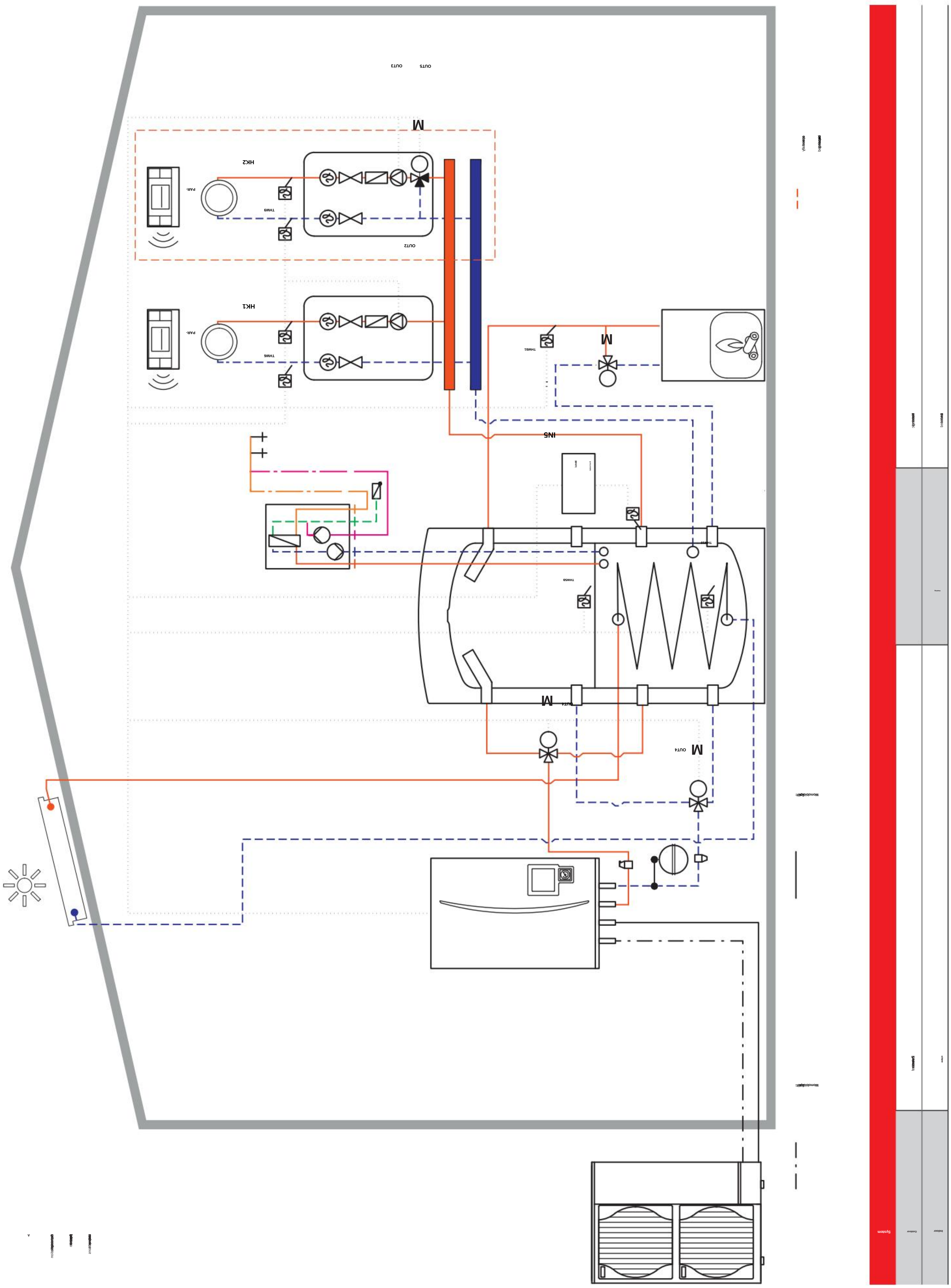
Description

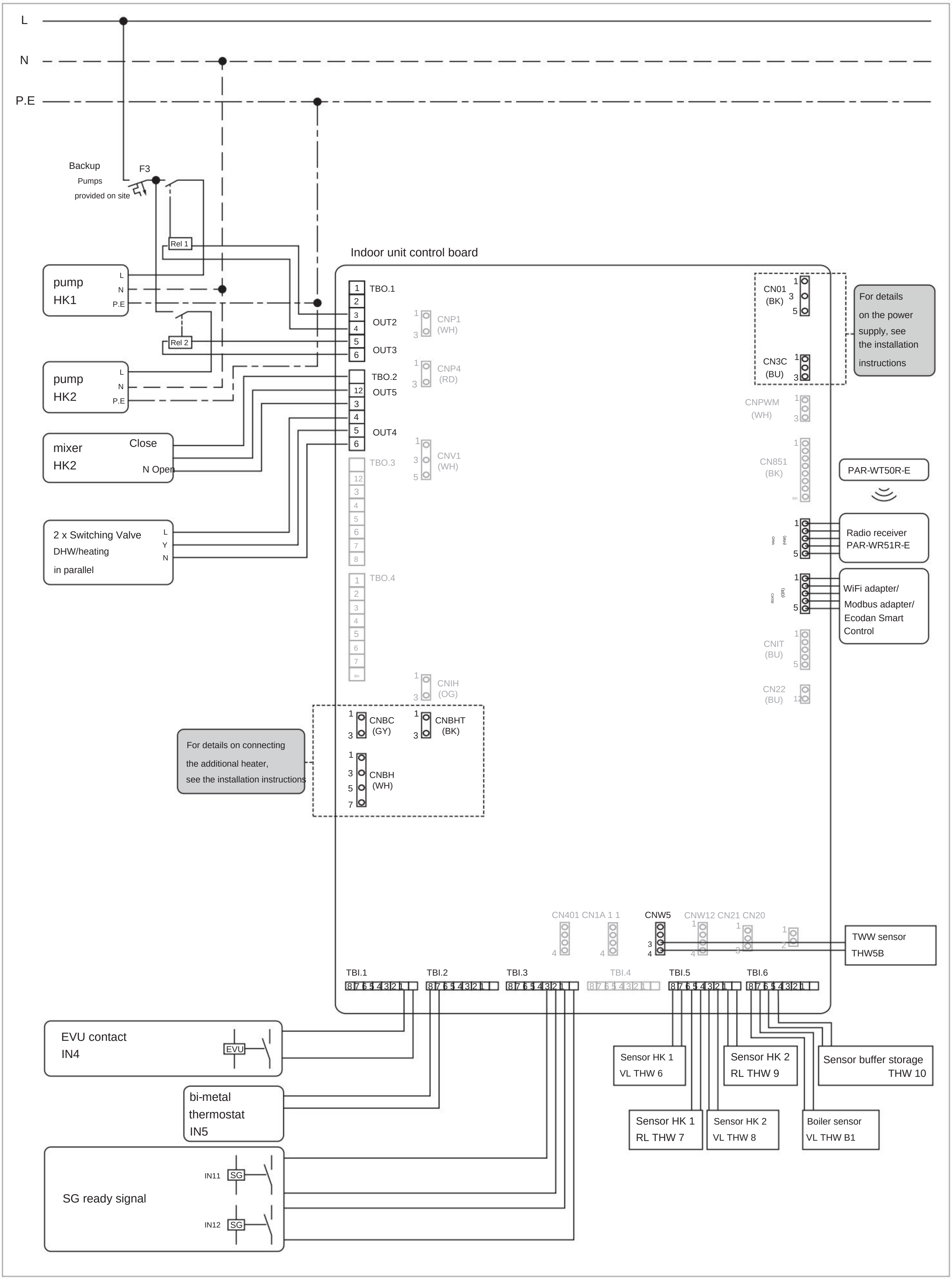
Bivalent monoblock/split heat pump system for heating and drinking water heating.

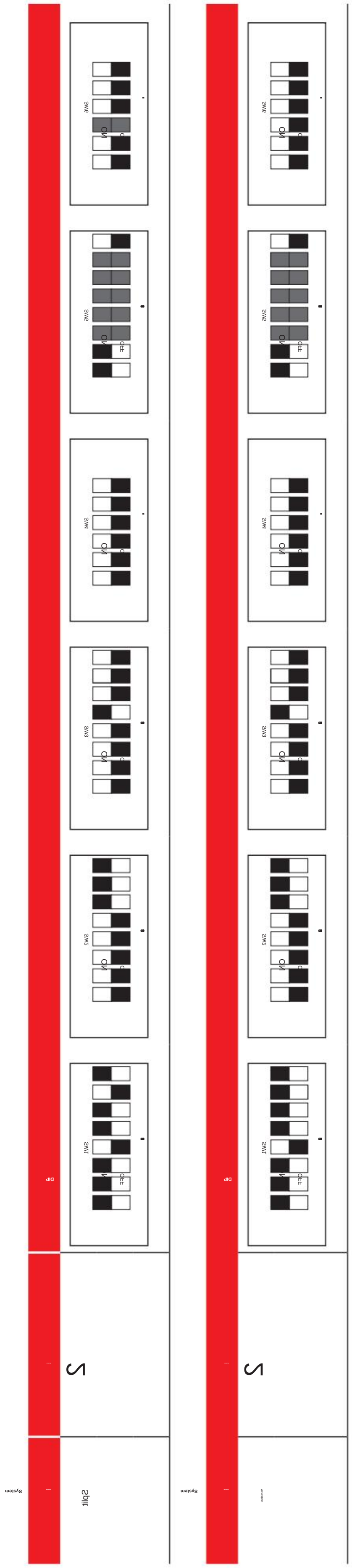
Area of application

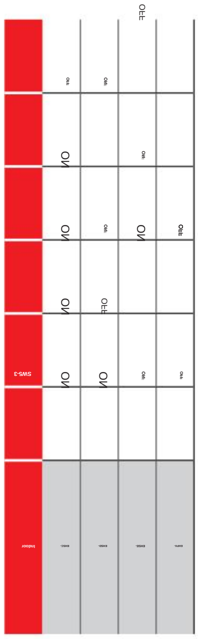
Single and two-family houses (modernization and new construction)

Icon Description		symbol	Description	symbol	Description
	Outdoor unit		Non-return valve		3-way switching valve with motor
	tap		Air separator		Radio remote control PAR-WT50R-E / Room thermostat
	Hydro module		Pump group		Pump group with mixer
	Multifunctional buffer storage PZR		expansion tank		Mud separator
	Solid fuel boiler	bi-metal thermostat	Bi-metal thermostat		Solar collector
	Fresh water station with TWW circulation		Heating circuit (e.g. underfloor heating or radiators)		


HK2
HK1
OUT2
IN5
OUT4
M


L
N
P.E
Backup
Pumps
provided on site
F3
Rel 1
Rel 2
Indoor unit control board
pump
HK1
pump
HK2
mixer
HK2
Close
N Open
2 x Switching Valve
DHW/heating
in parallel
TBO.1
OUT2
OUT3
TBO.2
OUT5
OUT4
TBO.3
TBO.4
CNP1
(WH)
CNP4
(RD)
CNV1
(WH)
CNIH
(OG)
CNBC
(GY)
CNBHT
(BK)
CNBH
(WH)
For details on connecting
the additional heater,
see the installation instructions
CN01
(BK)
CN3C
(BU)
For details
on the power
supply, see
the installation
instructions
CNPWM
(WH)
CN851
(BK)
PAR-WT50R-E
Radio receiver
PAR-WR51R-E
WiFi adapter/
Modbus adapter/
Ecodan Smart
Control
CNIT
(BU)
CN22
(BU)
CN401 CN1A
CNW5
CNW12 CN21 CN20
TWW sensor
THW5B
TBI.1
TBI.2
TBI.3
TBI.4
TBI.5
TBI.6
EVU contact
IN4
EVU
bi-metal
thermostat
IN5
SG ready signal
IN11
IN12
SG
Sensor HK 1
VL THW 6
Sensor HK 2
RL THW 9
Sensor buffer storage
THW 10
Sensor HK 1
RL THW 7
Sensor HK 2
VL THW 8
Boiler sensor
VL THW B1





7.4.8 System example 8: Hydro module with multi-buffer storage and photovoltaics

System example 8 for Ecodan hydromodule with multi-buffer storage and external heat (e.g. solar)			
Outdoor unit	Eco Inverter / Power Inverter / Zubadan	**operating mode**	bivalent alternative or bivalent parallel
Indoor unit	Hydro module	**Heating circuits**	1x unmixed and 1x mixed

General information

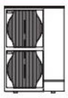
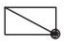
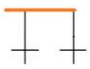
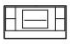
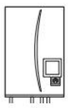
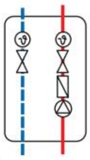
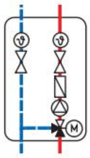
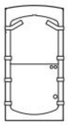
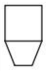
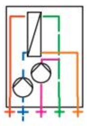
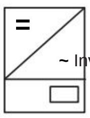
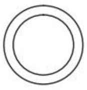
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

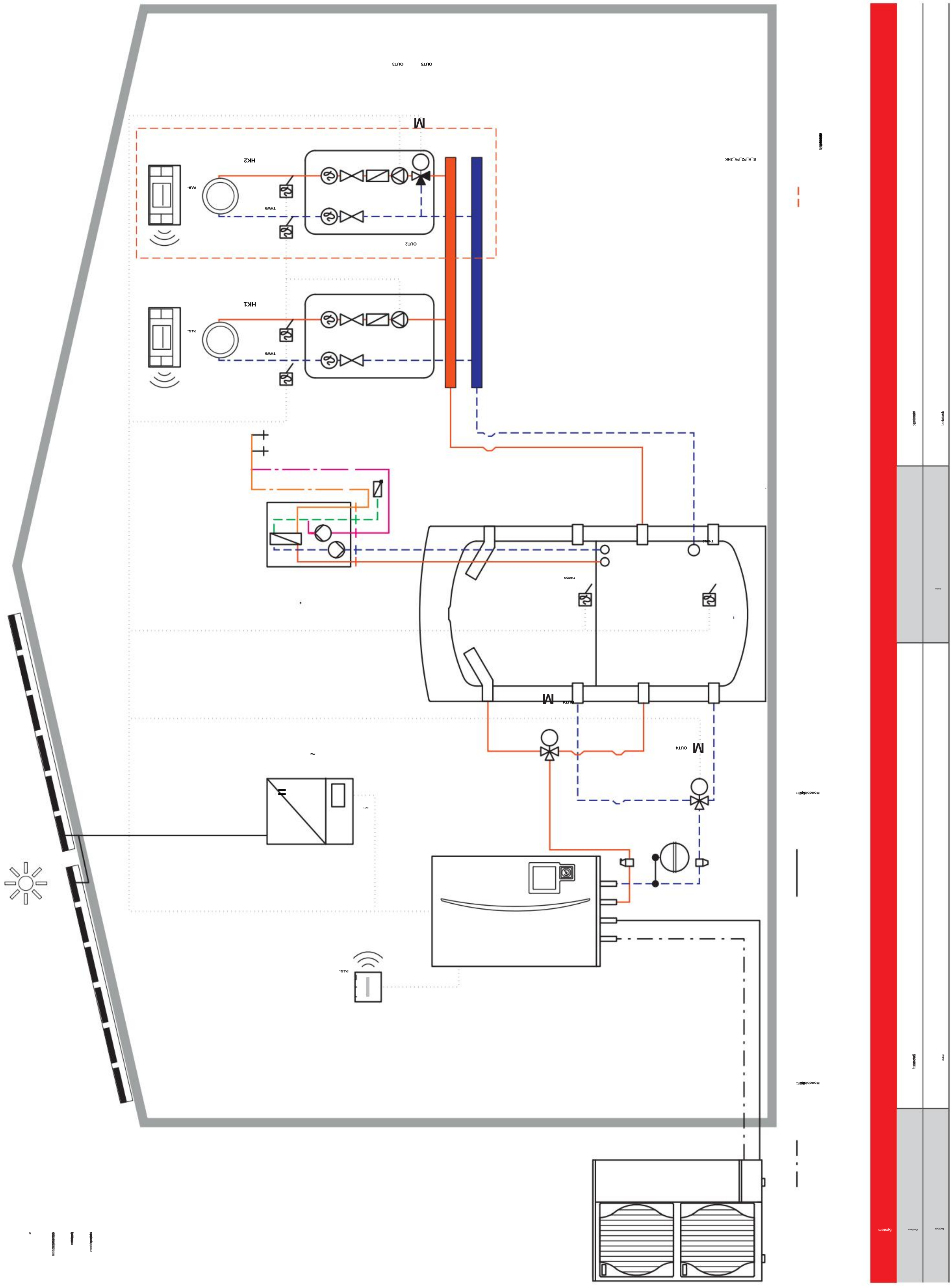
Description

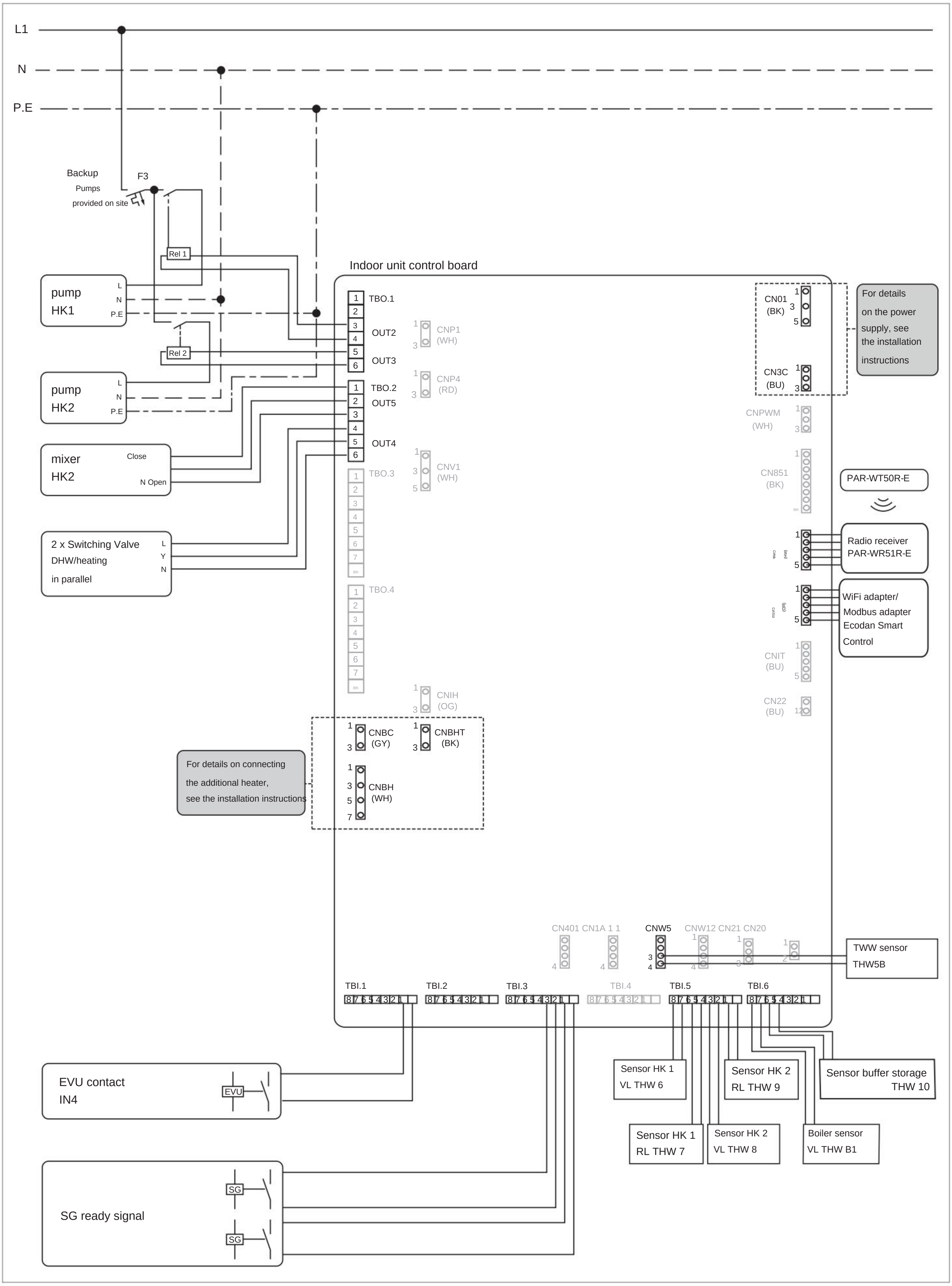
Bivalent monoblock/split heat pump system for heating and drinking water heating.

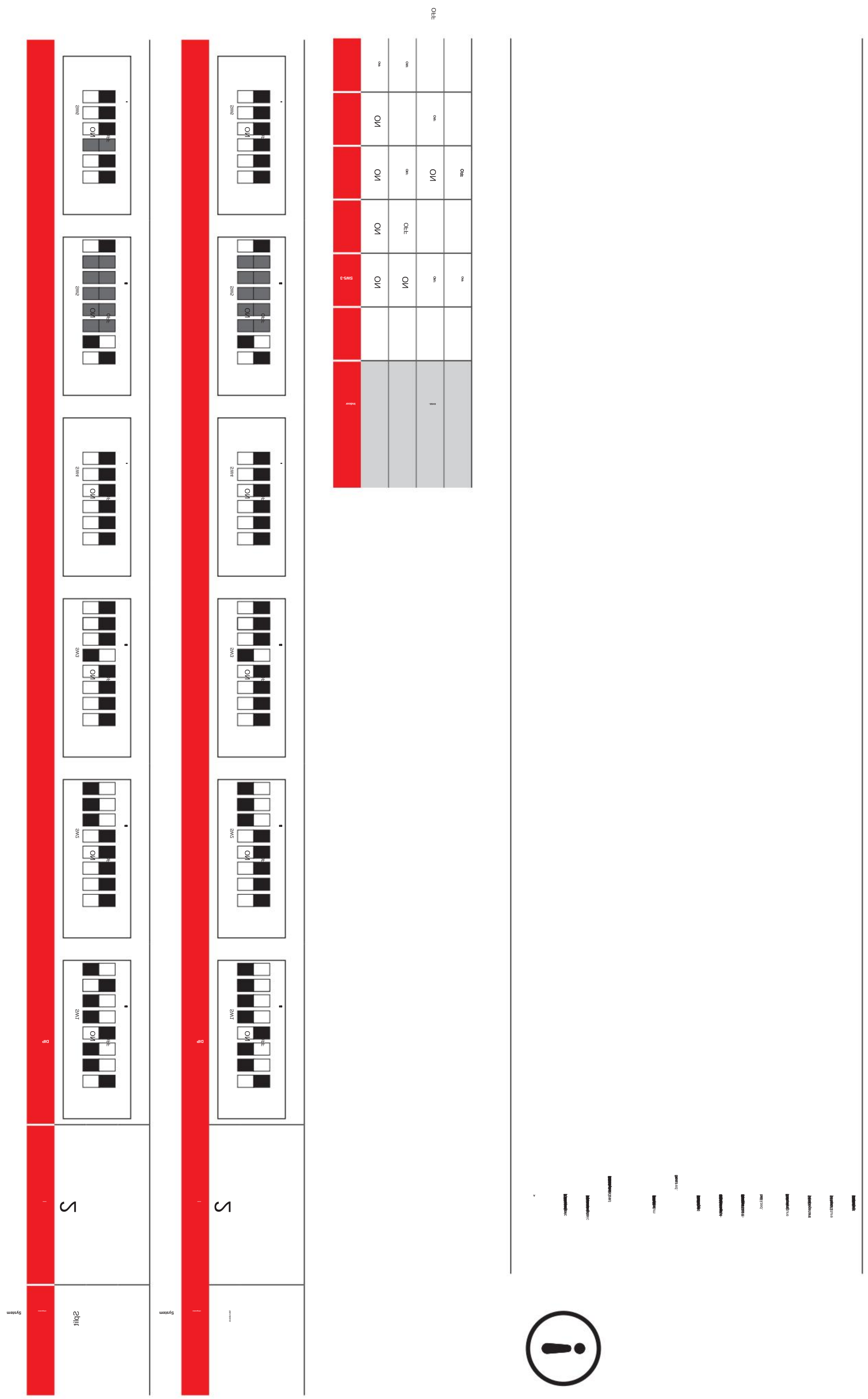
Area of application

Single and two-family houses (modernization and new construction)

Icon	Description	symbol	Description	symbol	Description
	Outdoor unit		Non-return valve		3-way switching valve with motor
	tap		Air separator		Radio remote control PAR-WT50R-E / Room thermostat
	Hydro module		Pump group		Pump group with mixer
	Multifunctional buffer storage PZ		expansion tank		Mud separator
	Fresh water station with TWW circulation		~ Inverter		Photovoltaic module
	Heating circuit (e.g. underfloor heating or radiators)				


HK2
HK1
OUT2
OUT3
OUT5
OUT4
M


L1
N
P.E
Backup
Pumps
provided on site
F3
Rel 1
Rel 2
pump
HK1
L
N
P.E
pump
HK2
mixer
HK2
Close
N Open
2 x Switching Valve
DHW/heating
in parallel
L
Y
N
Indoor unit control board
TBO.1
OUT2
OUT3
TBO.2
OUT5
OUT4
TBO.3
TBO.4
CNP1
(WH)
CNP4
(RD)
CNV1
(WH)
CNIH
(OG)
CNBC
(GY)
CNBHT
(BK)
CNBH
(WH)
For details on connecting
the additional heater,
see the installation instructions
CN01
(BK)
CN3C
(BU)
For details
on the power
supply, see
the installation
instructions
CNPWM
(WH)
CN851
(BK)
PAR-WT50R-E
Radio receiver
PAR-WR51R-E
WiFi adapter/
Modbus adapter
Ecodan Smart
Control
CNIT
(BU)
CN22
(BU)
CN401 CN1A 1 1
CNW5
CNW12 CN21 CN20
TWW sensor
THW5B
TBI.1
TBI.2
TBI.3
TBI.4
TBI.5
TBI.6
EVU contact
IN4
EVU
SG ready signal
SG
Sensor HK 1
VL THW 6
Sensor HK 2
RL THW 9
Sensor buffer storage
THW 10
Sensor HK 1
RL THW 7
Sensor HK 2
VL THW 8
Boiler sensor
VL THW B1



7.4.9 System example 9: Hydro module with multi-buffer storage and external heat (e.g. solar)

System example 9 for Ecodan hydromodule with multi-buffer storage and external heat (e.g. solar)			
Outdoor unit	Eco Inverter / Power Inverter / Zubadan	**operating mode**	bivalent alternative or bivalent parallel
Indoor unit	Hydro module	**Heating circuits**	1x mixed

General information

The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

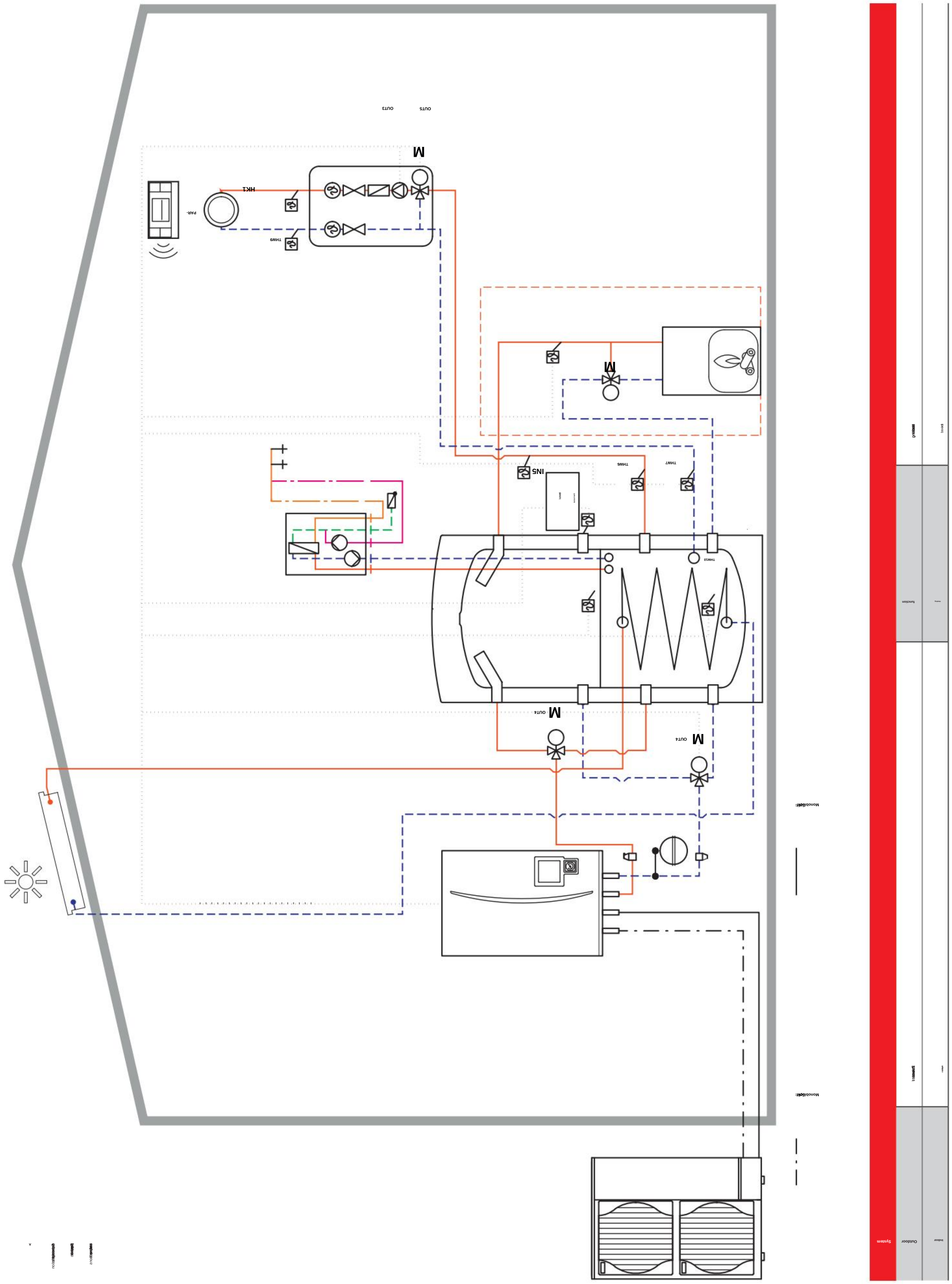
Description

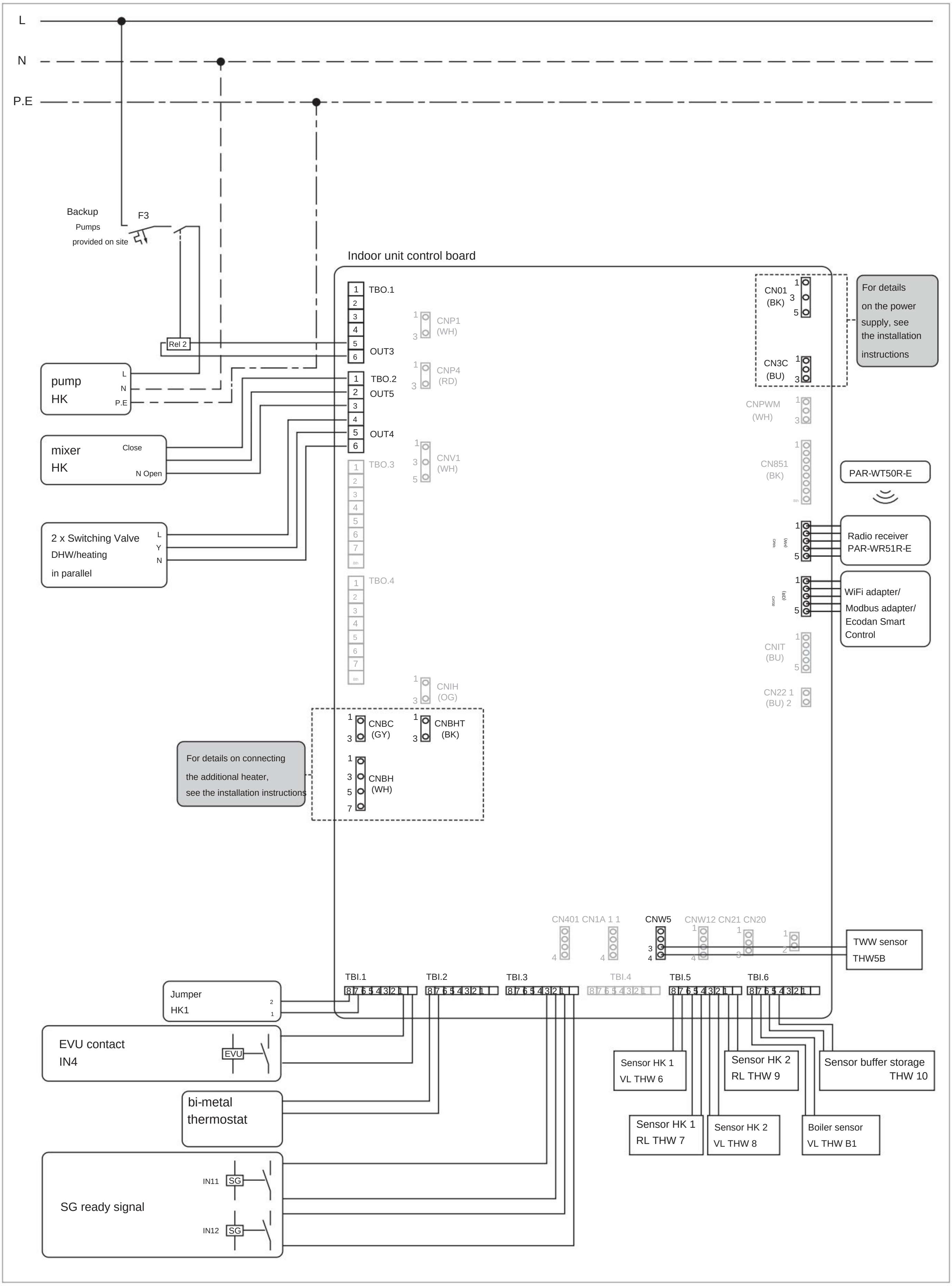
Bivalent monoblock/split heat pump system for heating and drinking water heating.

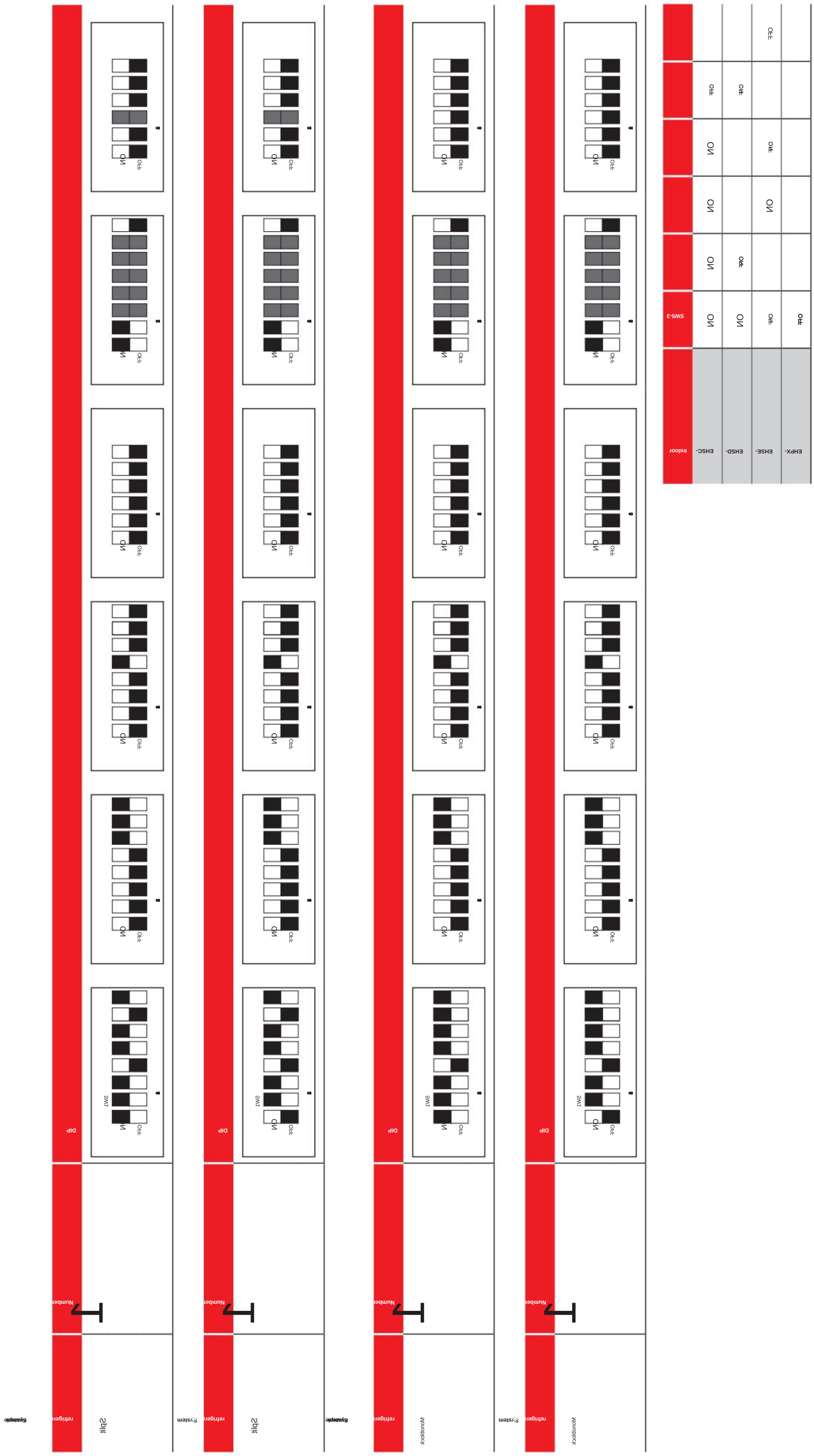
Area of application

Single and two-family houses (modernization and new construction)

Icon Description		symbol	Description	symbol	Description
	Outdoor unit		Non-return valve		Solar collector
	tap		Air separator		Radio remote control PAR-WT50R-E / Room thermostat
	Hydro module		Pump group		Pump group with mixer
	Multifunctional buffer storage PZR		expansion tank		Mud separator
	Solid fuel boiler		Heating circuit (e.g. underfloor heating or radiators)		
	Fresh water station with TWW circulation		3-way switching valve with motor		




L
N
P.E
Backup
Pumps
provided on site
F3
Indoor unit control board
TBO.1
OUT3
Rel 2
pump
HK
L
N
P.E
TBO.2
OUT5
OUT4
mixer
HK
Close
N Open
2 x Switching Valve
DHW/heating
in parallel
L
Y
N
TBO.3
TBO.4
CNP1
(WH)
CNP4
(RD)
CNV1
(WH)
CNIH
(OG)
CNBC
(GY)
CNBHT
(BK)
CNBH
(WH)
For details on connecting
the additional heater,
see the installation instructions
CN01
(BK)
CN3C
(BU)
For details
on the power
supply, see
the installation
instructions
CNPWM
(WH)
CN851
(BK)
PAR-WT50R-E
Radio receiver
PAR-WR51R-E
WiFi adapter/
Modbus adapter/
Ecodan Smart
Control
CNIT
(BU)
CN22 1
(BU) 2
CN401 CN1A 1 1
CNW5
CNW12 CN21 CN20
TWW sensor
THW5B
TBI.1
TBI.2
TBI.3
TBI.4
TBI.5
TBI.6
Jumper
HK1
EVU contact
IN4
EVU
bi-metal
thermostat
SG ready signal
IN11
SG
IN12
SG
Sensor HK 1
VL THW 6
Sensor HK 2
RL THW 9
Sensor buffer storage
THW 10
Sensor HK 1
RL THW 7
Sensor HK 2
VL THW 8
Boiler sensor
VL THW B1


Indoor
SW5-3
EHSC-
EHSD-
EHSE-
EHPX-
ON
OFF
DIP
SW1
Number
refriger
System
Split
Monoblock

A NOTICE!

1. To ensure that heat pumps, multi-buffer storage and external heat generators operate as efficiently as possible, the following information must be observed:

ÿIf a log boiler is integrated as a second heat generator, the use of the OUT10 switching contact is not necessary.

ÿSolar thermal systems and solar control must be provided on site.
ÿFor parallel control of 2 x 3-way valves, the maximum contact load (230 V AC, 0.1 A) for OUT 4 must be protected via an on-site relay.
ÿWhen integrating solar and/or log boilers into a low-temperature heating system (e.g. underfloor heating), heating circuit 2 (HK2) must be defined and heating circuit 1 (HK1) must be deactivated with an on-site jumper via switching contact IN1. In addition, the THW10 buffer storage sensor must be used to prevent simultaneous heat pump operation when there is sufficient solar yield. The THW10 buffer storage sensor should be attached to the multi-buffer storage tank at the height of the heating circuit flow. In the radio remote control, bivalent operation must be activated in the service menu under “External input setting” and “Boiler” selected.
ÿThe maximum storage temperature of 88 °C must be activated via DIP switch SW5-1 (ON).
ÿThe maximum HP return temperature of 80 °C must be ensured on site.

2. For maximum comfort and high efficiency, we recommend additionally recording the room temperature when using the outside temperature-dependent control type. This can be achieved either with the radio remote control PAR-WT50R-E, a room thermostat (on site) or the room temperature sensor TH1 (PAC-SE41TS-E).

The following temperature sensors are pre-installed in the indoor unit at the factory:
ÿRefrigerant liquid temperature sensor TH2
ÿFlow/return temperature sensor THW1/2 The
drinking water sensor THW5 must also be installed if an adjacent multi-buffer tank is used.

7.4.10 System example 10: Hydro module cascade with heating and domestic hot water

System example 10 for Ecodan hydromodul 2x cascade			
Outdoor unit	Power Inverter / Zubadan	**Operating mode**	monovalent
Indoor unit	Hydro module	**Heating circuits**	1x unmixed and/or 1x mixed

General information

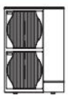
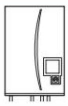
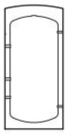
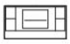
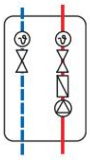
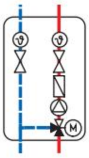
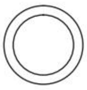
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

Description

Monoblock/split heat pump system for heating (cascade).

Area of application

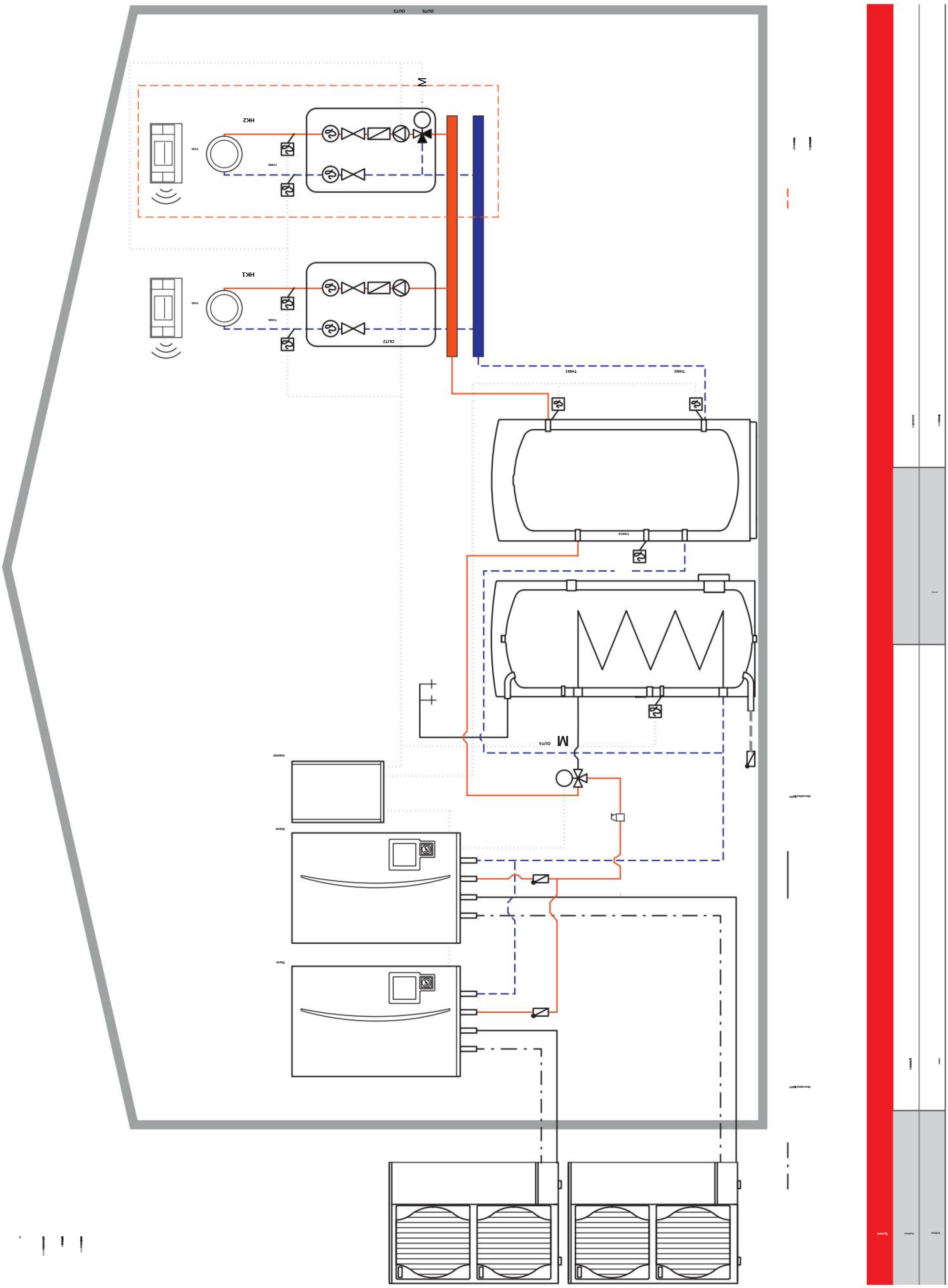
Multi-family homes and businesses (modernization and new construction)

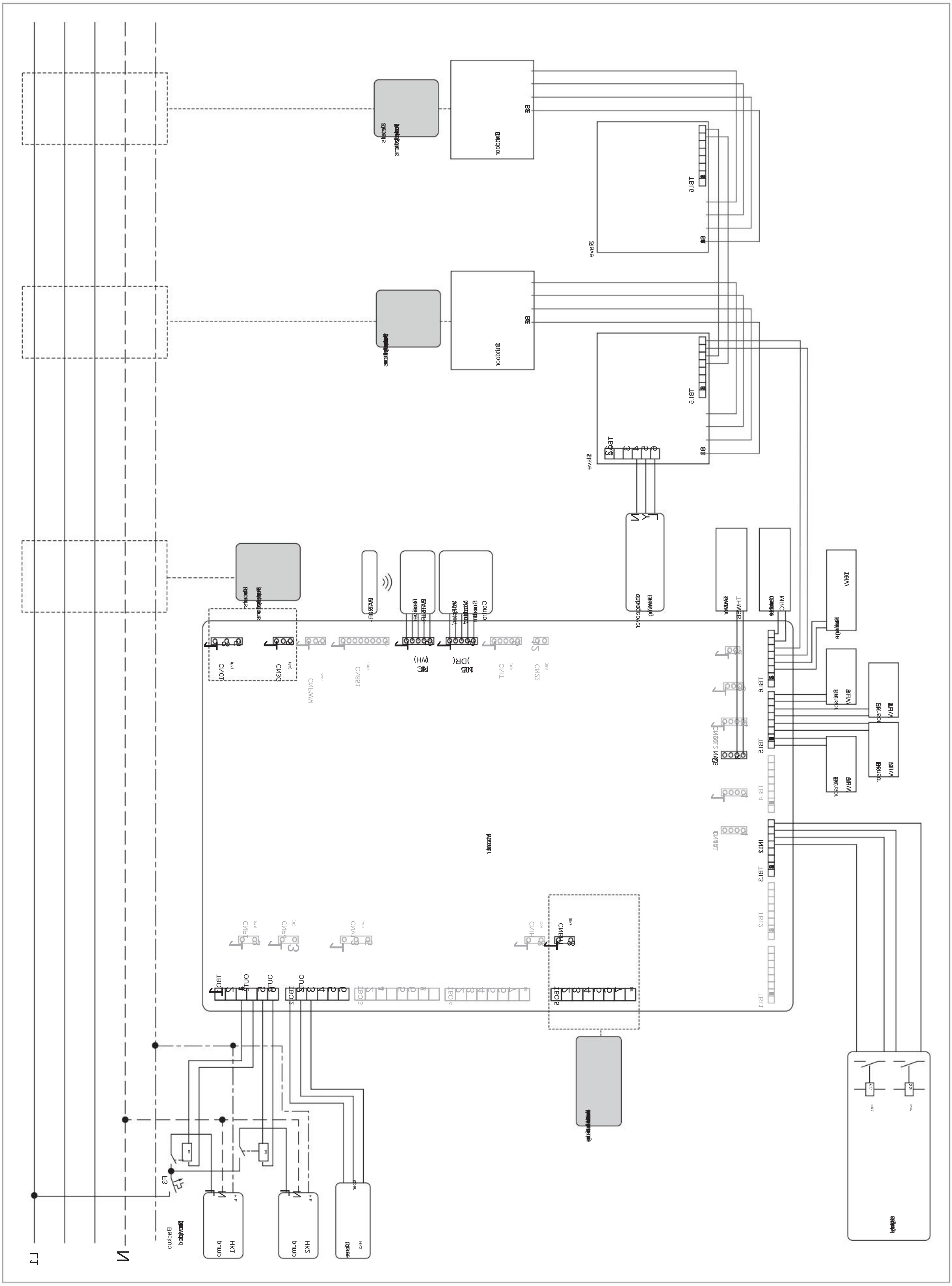
Icon Description		symbol	Description	symbol	Description
	Outdoor unit		Hydro module		3-way switching valve with motor
	Buffer memory		Radio remote control PAR-WT50R-E / Room thermostat		Pump group
	Pump group with mixer		Heating circuit (e.g. underfloor heating or radiators)		

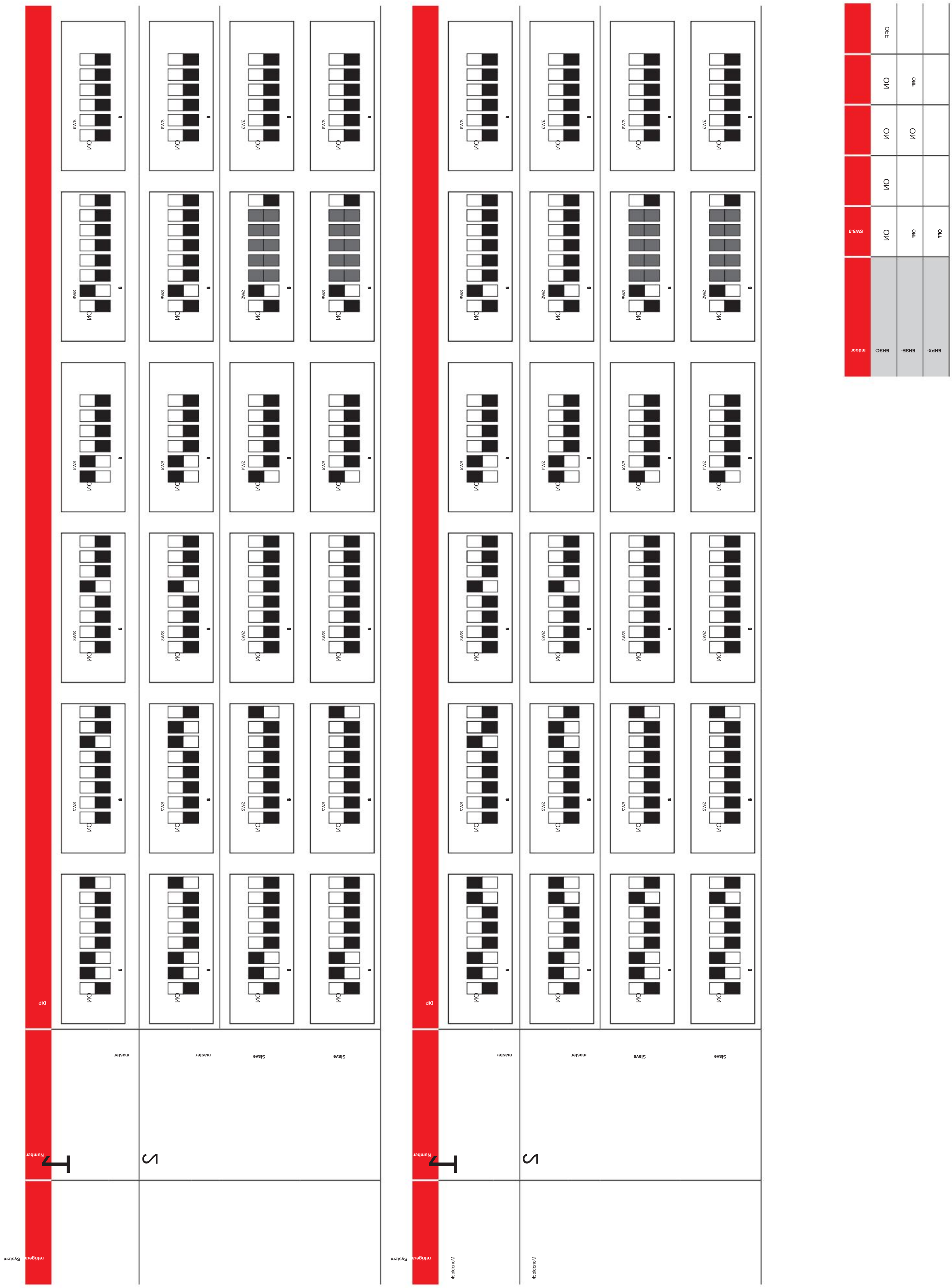
A NOTICE!

The cascade control can control up to 6 outdoor/indoor device combinations. An additional master controller (PAC-IF071B-E) is always necessary. The boards in the hydro modules must be activated for a cascade using DIP switch SW4-1 and converted to slave controllers using DIP switch SW4-2.

The following temperature sensors are pre-installed in the hydro modules at the factory:
ÿRefrigerant liquid temperature sensor TH2
ÿFlow/return temperature sensor THW1/2
To record the temperature of all heat pumps, the master controller also uses the flow/
Return temperature sensor THW1/2 supplied. These must be installed behind the buffer storage.






refrigerant System
Number
DIP
master
Slave
Monoblock
Indoor
EHSC-
EHSE-
EHPX-
SW5-3

7.4.11 System example 11: Hydro module cascade with heating, domestic hot water and bivalent boiler

System example 11 for Ecodan hydromodul 2x cascade			
Outdoor unit	Power Inverter / Zubadan	**Operating mode**	monovalent
Indoor unit	Hydro module	**Heating circuits**	1x unmixed and/or 1x mixed

General information

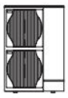
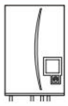
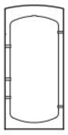
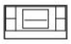
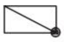
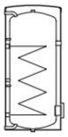
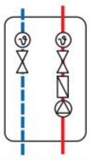
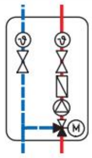
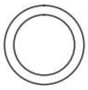
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

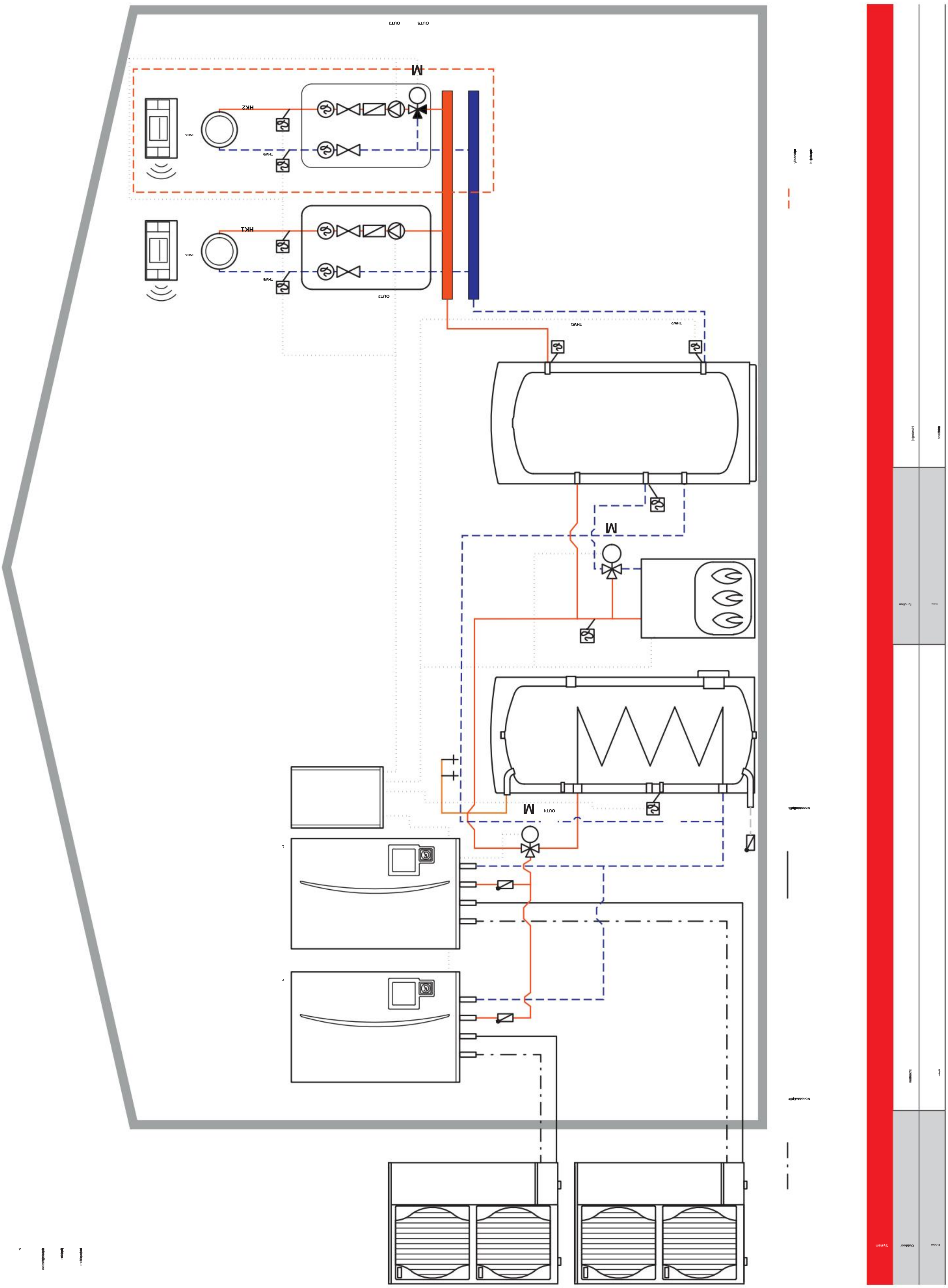
Description

Monoblock/split heat pump system for heating and drinking water heating (cascade).

Area of application

Multi-family homes and businesses (modernization and new construction)

Icon Description		symbol	Description	symbol	Description
	Outdoor unit		Hydro module		3-way switching valve with motor
	Buffer memory		Radio remote control PAR-WT50R-E / Room thermostat		Non-return valve
	Domestic hot water tank		Pump group		Pump group with mixer
	Heating circuit (e.g. underfloor heating or radiators)				



CAUTION!

Incorrectly connected temperature sensors or incorrect DIP switch settings can lead to malfunctions or uneconomical operation! ÿConnect the THW5B drinking water sensor to the master controller (contact CNW5).

ÿConnect the 3-way switching valve to the corresponding hydraulic module (e.g. Slave 1: OUT4, Contact TBO.2.4-6).

ÿSet the DIP switches SW1-3 for the master controller and the corresponding hydromodule to ON (A).

A NOTICE!

The cascade control can control up to 6 outdoor/indoor device combinations. An additional master controller (PAC-IF061B-E) is always necessary. The boards in the hydro modules must be converted to slave controllers using DIP switches SW4-2. The following temperature sensors are pre-installed in the hydro modules at the factory:

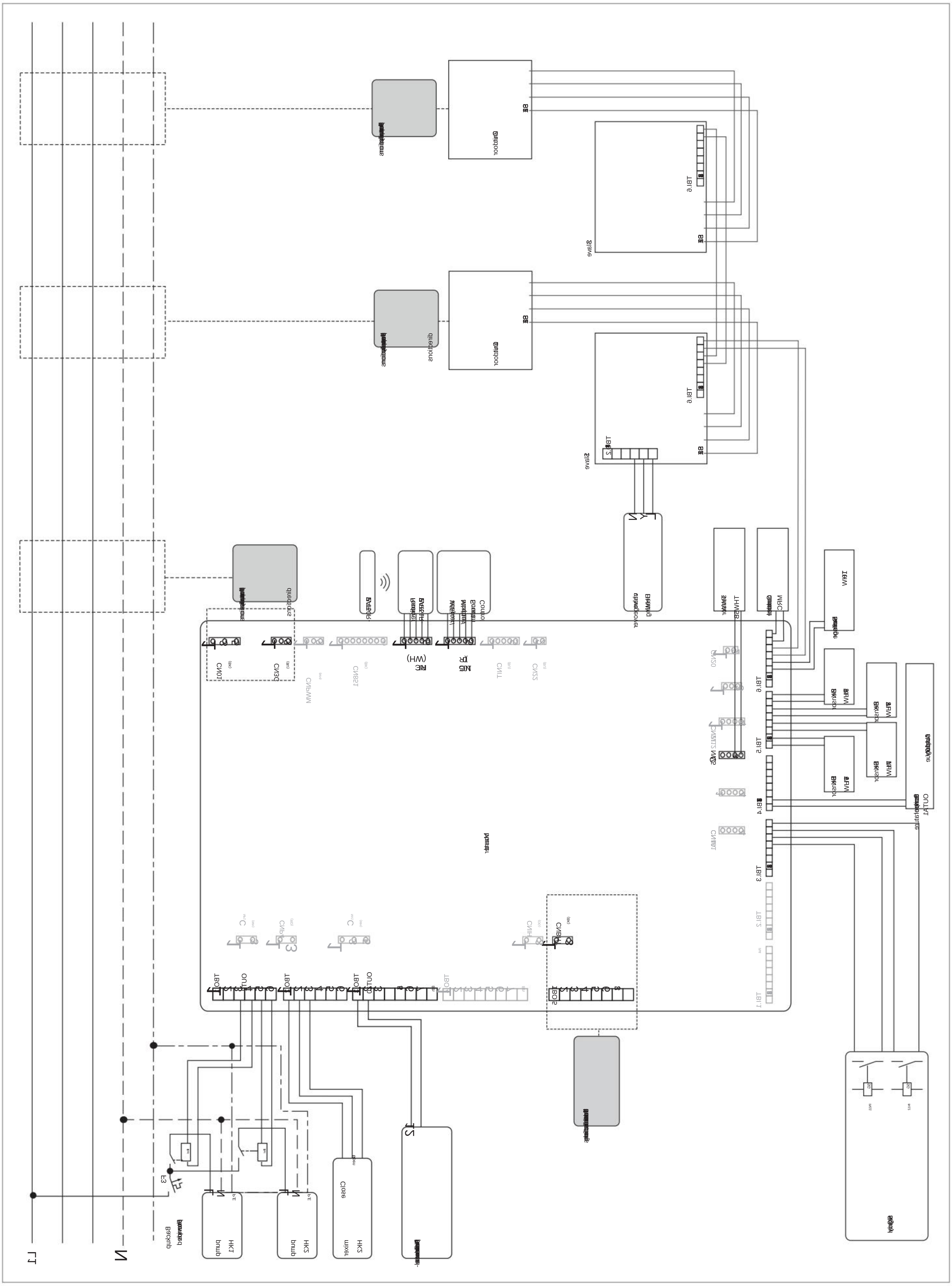
ÿRefrigerant liquid temperature sensor TH2

ÿFlow/return temperature sensor THW1/2

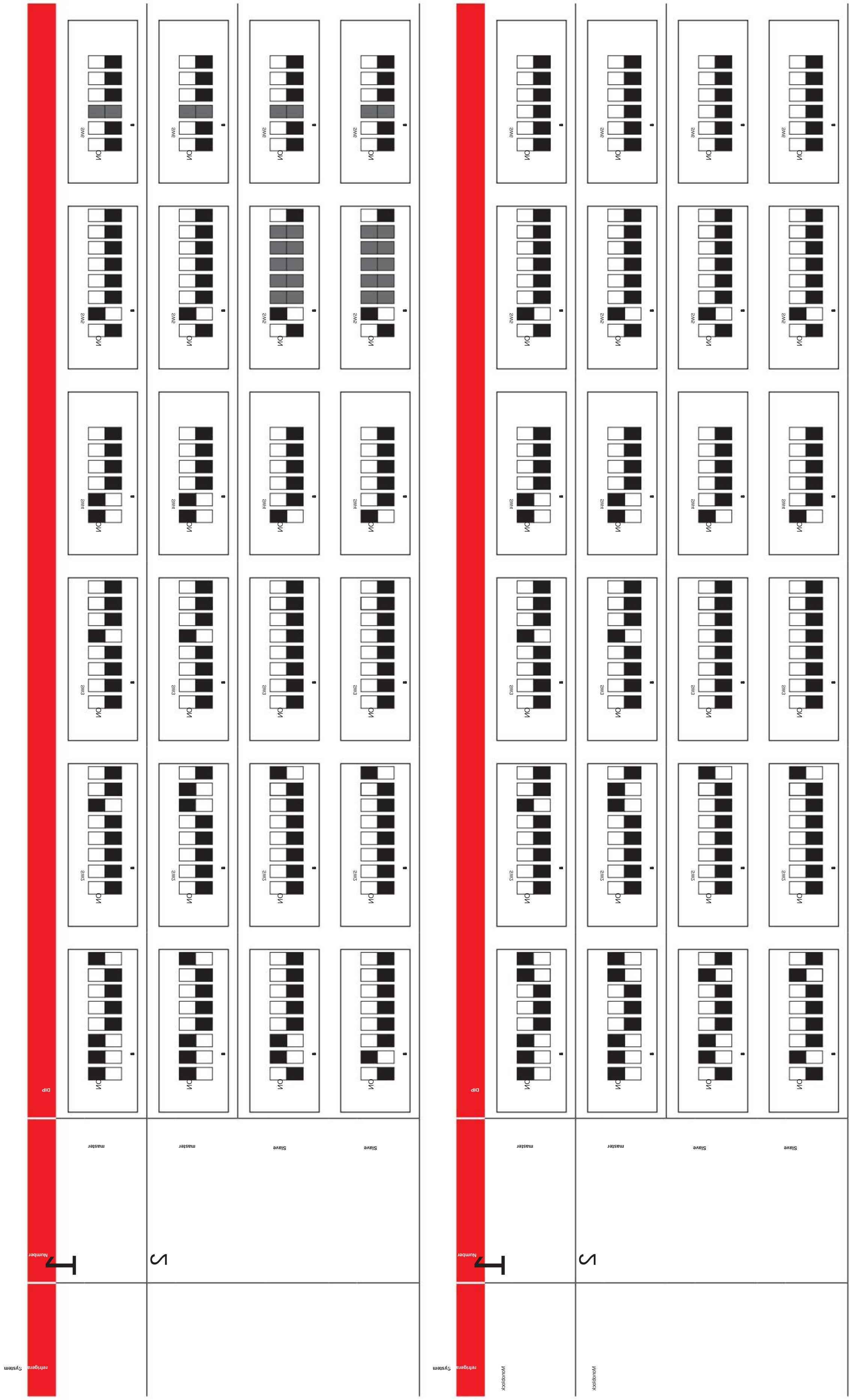
To record the temperature of all heat pumps, the master controller also uses the flow/ Return temperature sensor THW1/2 supplied. These must be installed behind the buffer storage.

The flow and return temperature sensors of the 2nd heat generator (THBW1/2) as well as the release signal (OUT10; contact TBO.1 1-2) must be connected to the master controller. The communication connection between the master controller and the hydromodules is via a 2-wire bus cable and must not exceed a maximum distance of 10 m.

The flow temperature of the bivalent boiler can be continuously controlled via a 0-10V signal (OUTA1).



Indoor	SW5-3				
E-SC-	ON	ON	ON	ON	Off
E-SD-	ON	Off			Off
EHPX-	Off				



8th. Hydraulics and electrical connection brine/water heat pump

8.1 General information

The electrical and hydraulic installation diagrams listed are schematic representations without shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. The minimum volume flow, depending on the heat pump used, must be adhered to. The use of microbubble air separators and dirt separators is recommended for trouble-free operation.

To protect the power supply to the heat pumps, an all-pole circuit breaker with characteristic C (slow) must always be used. To ensure standard-compliant personal and fire protection, the use of AC/DC sensitive Type B FI circuit breakers to connect the heat pump and/or the outdoor unit to the supply network is recommended.

The mains connection and all protective measures (e.g. FI circuit) must always be carried out in accordance with the following regulations:

- IEC 60364-4-41
- VDE regulations
- Technical connection conditions (TAB) of the local energy supply company (EVU)

8.2 Electrical connection data

Danger!
Use an AC/DC sensitive residual current circuit breaker!

Description	Power supply power [kW]		Fuse [A]	min. cable cross section [mm²]
Electric heating element (primary circuit)	3~400V 50Hz	9	16	2.5
Electric screw-in heater (optional)	~/N 230V 50Hz	1	16	2.5
Brine/water heat pump EHGT17D-YM9ED 3N~	400 V 50 Hz		16	5×1.5

8.3 Overview of temperature sensors and inputs and outputs

The following tables show the temperature sensors of the system as well as the inputs and outputs of the individual components.

Surname	Terminal strip	Plug	function
TH1	–	CN20 (RD)	Temperature sensor (refrigerant)
TH2	–	CN21	Temperature sensor (liquid refrigerant) 2)
TH32	–	TH32	Temperature sensor (brine inlet temperature)
TH34	–	TH34	Temperature sensor (brine outlet temperature
THW1	–	CNW12 1-2	Temperature sensor (flow temperature)
THW2	–	CNW12 3-4	Temperature sensor (return temperature)
THW5A	–	CNW5 1-2	Temperature sensor (top domestic hot water tank) (optional) 1)
THW5B	–	CNW53-4	Temperature sensor (bottom domestic hot water tank) (optional) 1)
THW6	TBI.5 7-8	–	Temperature sensor (HK 1 flow temperature) (optional) 1)
THW7	TBI.5 5-6	–	Temperature sensor (HK 1 return temperature) (optional) 1)
THW8	TBI.5 3-4	–	Temperature sensor (HK 2 flow temperature) (optional) 1)
THW9	TBI.5 1-2	–	Temperature sensor (HK 2 return temperature) (optional) 1)
THW10	TBI.6 5-6	–	Temperature sensor (buffer storage) (only in conjunction with SG-Ready, optional) 1)
THWB1	TBI.6 11-12	–	Temperature sensor (boiler flow temperature) (optional) 1)
IN1	TBI.1 7-8	–	Room thermostat 1 input
IN 2	TBI.1 5-6	–	Flow monitor 1 input
IN3	TBI.1 3-4	–	Flow monitor 2 input (HK 1)
IN4	TBI.1 1-2	–	Request control input
IN5	TBI.2 7-8	–	Outdoor/bivalent thermostat input
IN6	TBI.2 7-8	–	Room thermostat 2 input
IN7	TBI.2 3-4	–	Flow monitor 3 input (HK 2)
IN8	TBI.3 7-8	–	Electricity meter 1
IN9	TBI.3 5-6	–	Electricity meter 2
IN 10	TBI.2 1-2		Heat meter 1
IN11	TBI.3 3-4		Smart Grid enabled input
IN12	TBI.3 1-2		Smart Grid enabled input
INA1	TBI.4 1-3	CN1A	Flow sensor
OUT1	TBO.1 1-2	–	Primary circuit pump 1 output (space heating and domestic hot water)
OUT2	TBO.1 3-4	–	Heating circuit pump 2 output (space heating for HK 1)
OUT3	TBO.1 5-6	–	Heating circuit pump 3 output (space heating for HK 2)
OUT4	TBO.2 4-6	–	3-way diverter valve (2-way valve #1) output
OUT5	TBO.2 1-2 TBO.2 2-3	–	Mixing valve output
OUT6	–	CNBH 1-3	Electric additional heater 1 output
OUT7	–	CNBH 5-7	Electric additional heater 2 output
OUT9	TBO.4 5-6	CNIH	Electric screw-in heater output
OUT10	TBO.3 1-2	–	Boiler output
OUT11	TBO.3 5-6		Error signal output
OUT13	TBO.4 3-4		2-way valve #2 output
OUT14	–	CNP4	Heating circuit pump 4 (DHW) output
OUT15	TBO.4 1-2		Compressor input signal ON
OUT16	TBO.3 3-4		Heating/Cooling Thermo ON signal
OUTA1	TBI.4 7-8		Analogue output
B.C	–	CNBC	Electric additional heater fuse output
BHT	–	CNBHT	Thermostat for electric additional heating
WIRELESS	–	CNRF	Receiver radio remote control
WIFI	–	CN105	WiFi adapter, Ecodan Smart Control or ModBus interface
CN108	–	–	SD card slot

1) The maximum length of the temperature sensor connecting cables is 30 m.
2) Except PAC-IF072/073B-E.

8.4 System examples

8.4.1 System example 1: GEODAN storage module with 2 HK

System example 1 for GEODAN storage module			
Outdoor unit	-	**Operating mode**	monovalent
Indoor unit	GEODAN storage module	**Heating circuits**	1x unmixed and/or 1x mixed

General information

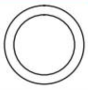
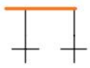
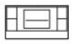
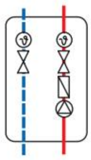
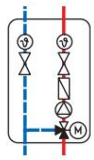
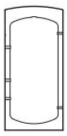
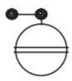
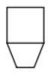
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

Description

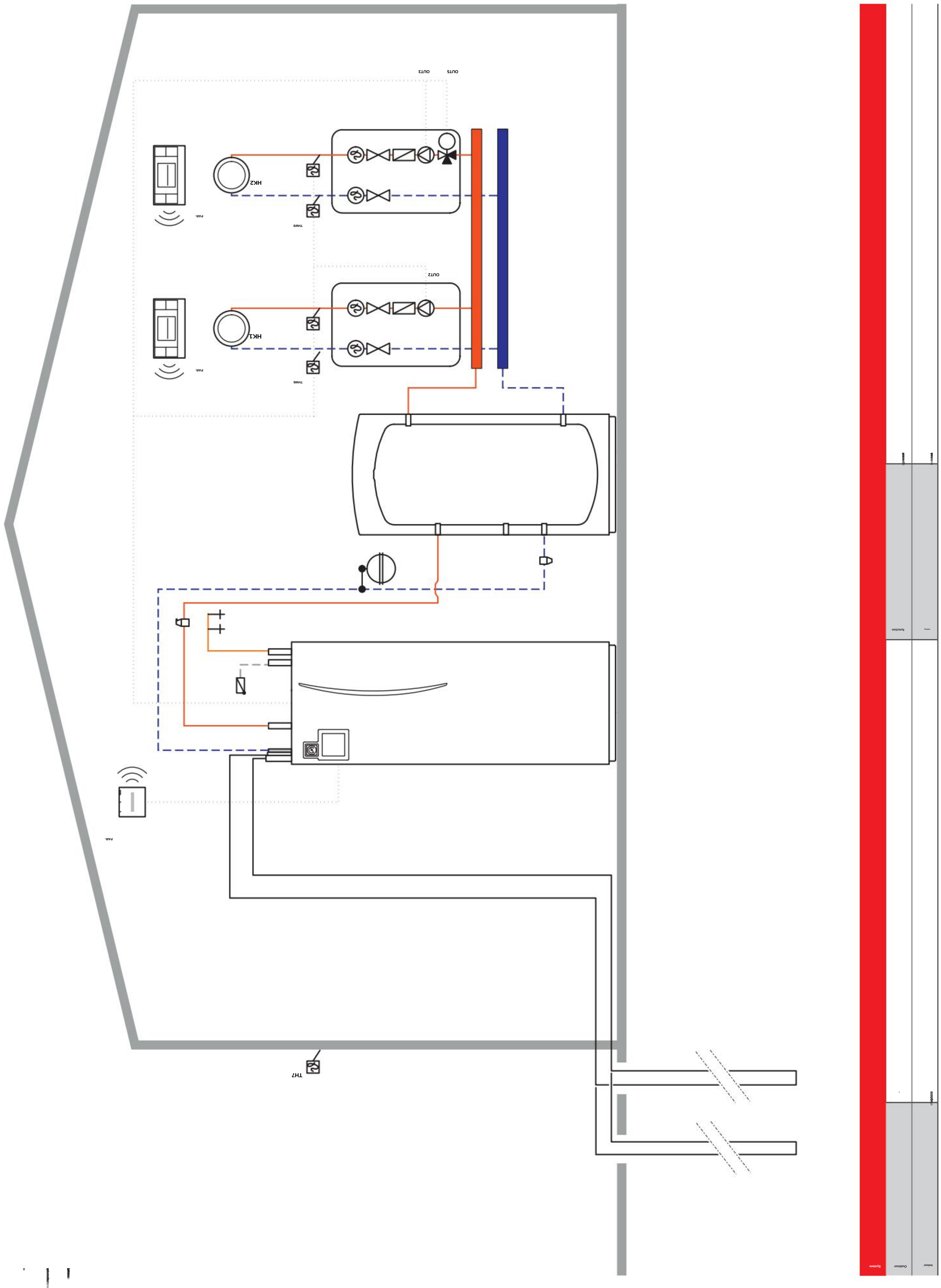
Brine/water heat pump system for heating and drinking water heating with one or two heating circuits.

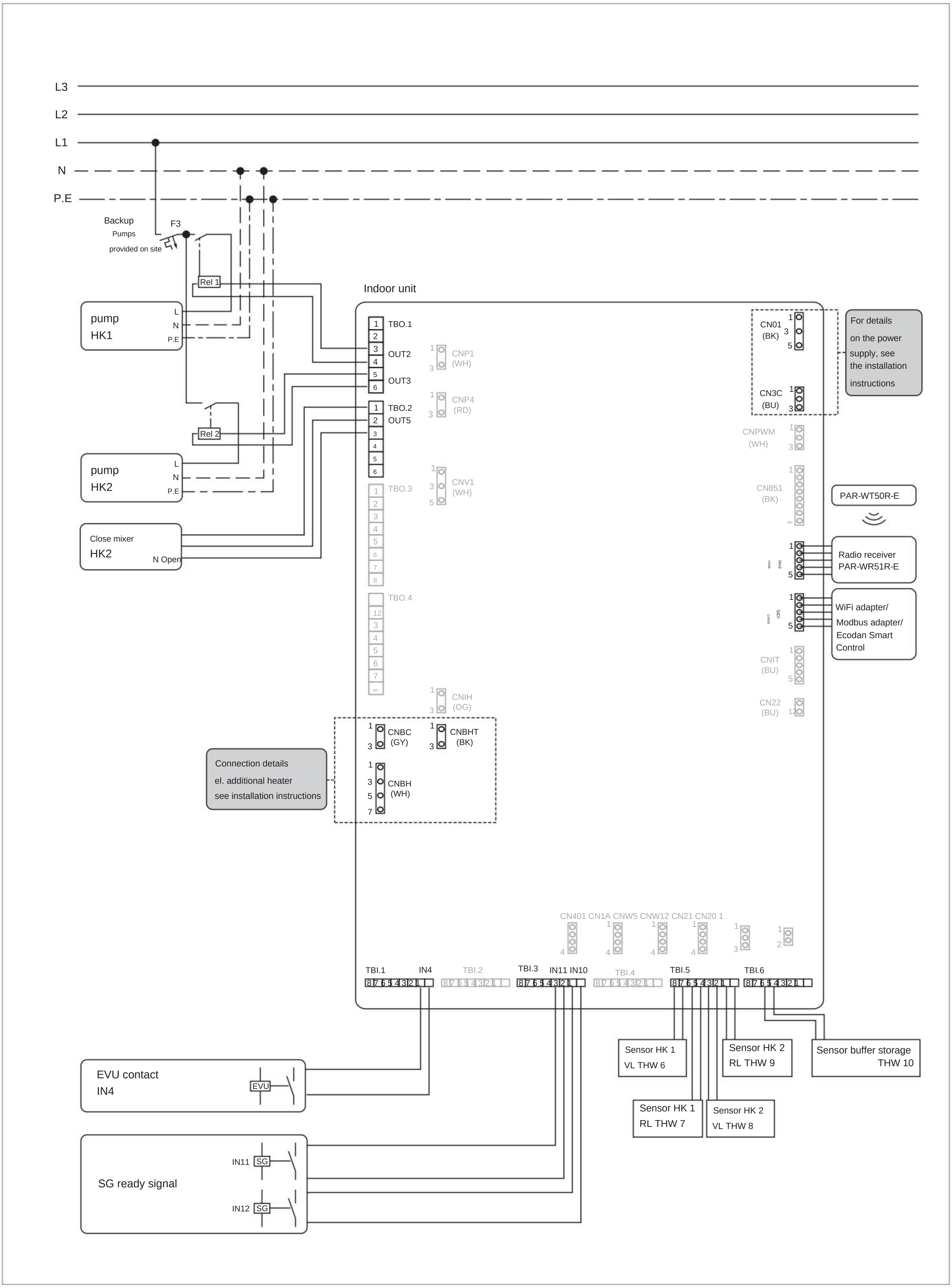
Area of application

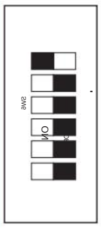
Single-family houses (modernization and new construction)

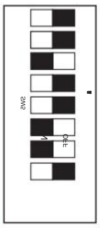
Icon Description		symbol	Description	symbol	Description
	Heating circuit (e.g. underfloor heating or radiators)		Non-return valve		3-way switching valve with motor
	tap		Air separator		Radio remote control PAR-WT50R-E / Room thermostat
	Memory module		Pump group		Pump group with mixer
	Buffer memory		expansion tank		Mud separator

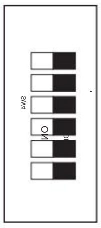
Machine Translated by Google

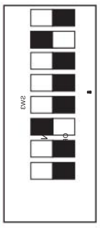


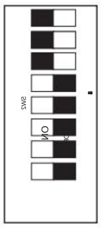

L3
L2
L1
N
P.E
Backup
Pumps
provided on site
F3
Rel 1
Rel 2
Indoor unit
pump
HK1
L
N
P.E
pump
HK2
Close mixer
HK2
N Open
TBO.1
OUT2
OUT3
TBO.2
OUT5
TBO.3
TBO.4
CNP1
(WH)
CNP4
(RD)
CNV1
(WH)
CNIH
(OG)
CNBC
(GY)
CNBHT
(BK)
CNBH
(WH)
Connection details
el. additional heater
see installation instructions
CN01
(BK)
CN3C
(BU)
For details
on the power
supply, see
the installation
instructions
CNPWM
(WH)
CN851
(BK)
PAR-WT50R-E
Radio receiver
PAR-WR51R-E
WiFi adapter/
Modbus adapter/
Ecodan Smart
Control
CNIT
(BU)
CN22
(BU)
CN401 CN1A CNW5 CNW12 CN21 CN20
TBI.1
IN4
TBI.2
TBI.3
IN11 IN10
TBI.4
TBI.5
TBI.6
Sensor HK 1
VL THW 6
Sensor HK 2
RL THW 9
Sensor buffer storage
THW 10
Sensor HK 1
RL THW 7
Sensor HK 2
VL THW 8
EVU contact
IN4
EVU
SG ready signal
IN11
IN12
SG

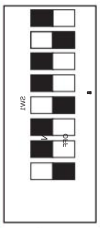

SW6
ON


SW2
OFF


SW4
ON


SW3


SW5
ON


SW1
OFF

8.4.2 System example 2: GEODAN storage module with 1 HK

System example 2 for GEODAN storage module			
Outdoor unit	-	**Operating mode**	monovalent
Indoor unit	GEODAN storage module	**Heating circuits**	1x unmixed

General information

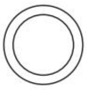
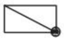
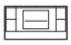
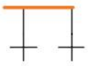
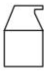
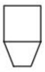
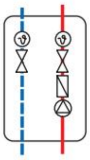
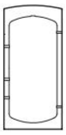
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

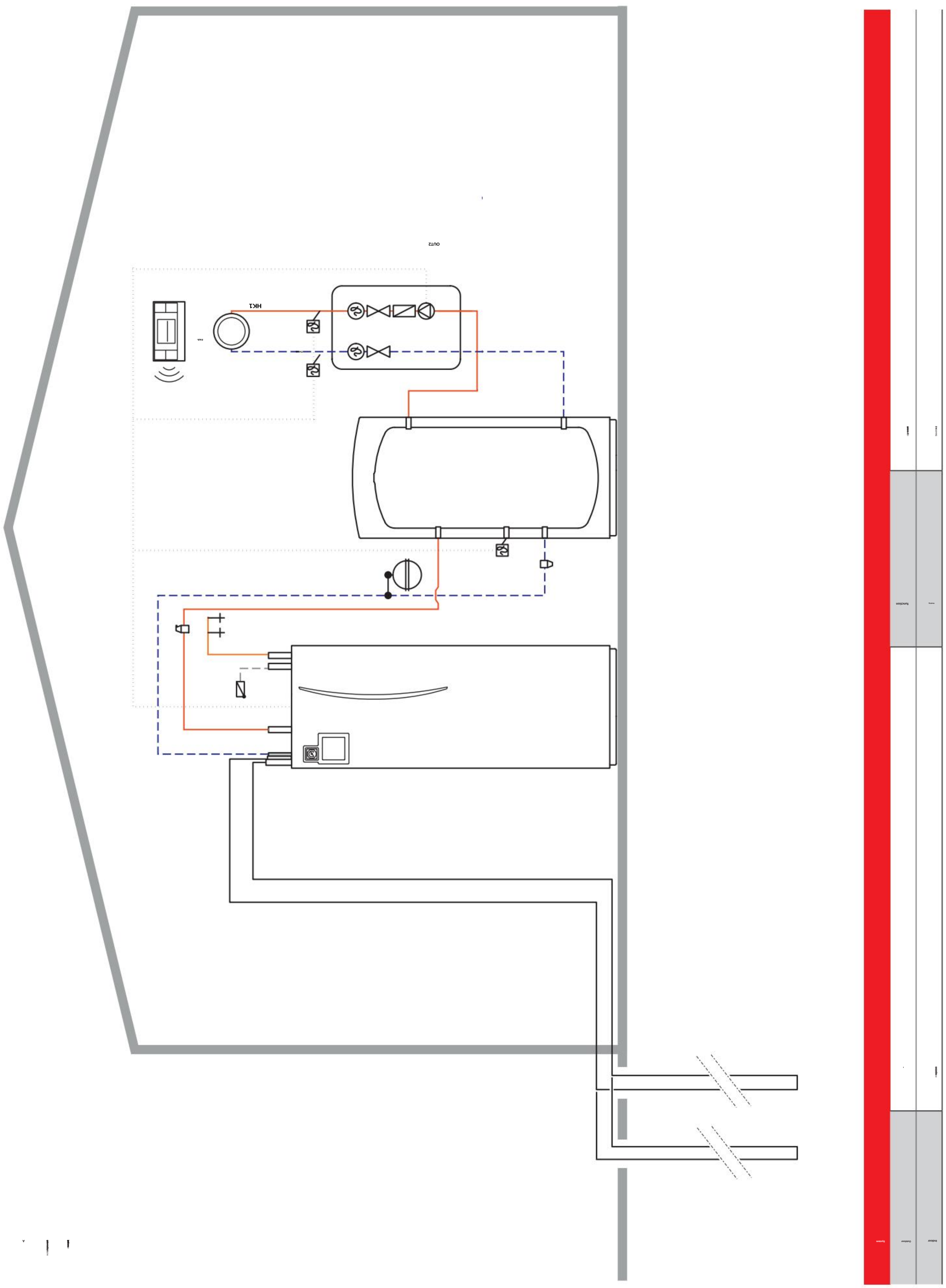
Description

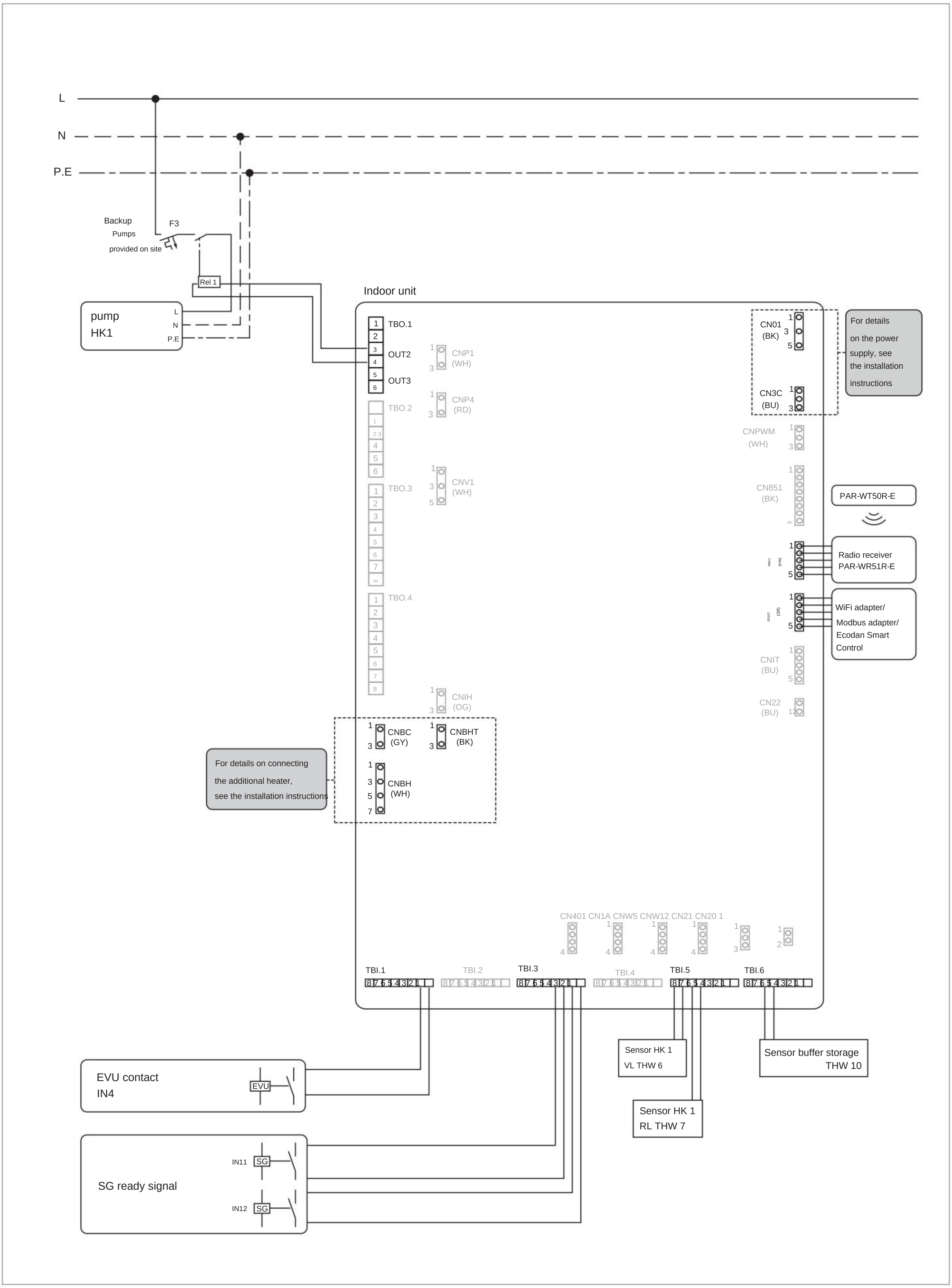
Brine/water heat pump system for heating and drinking water heating with one or two heating circuits.

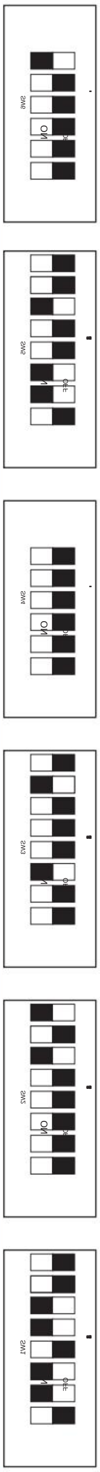
Area of application

Single-family houses (modernization and new construction)

symbol	Description	symbol	Description	symbol	Description
	Heating circuit (e.g. underfloor heating or radiators)		Non-return valve		Radio remote control PAR-WT50R-E / Room thermostat
	tap		Air separator		Mud separator
	Memory module		Pump group		
	Buffer memory		expansion tank		


OUT2
HK1


L
N
P.E
Backup
Pumps
provided on site
F3
Rel 1
pump
HK1
L
N
P.E
Indoor unit
TBO.1
OUT2
OUT3
TBO.2
TBO.3
TBO.4
CNP1
(WH)
CNP4
(RD)
CNV1
(WH)
CNIH
(OG)
CNBC
(GY)
CNBHT
(BK)
CNBH
(WH)
CN01
(BK)
CN3C
(BU)
For details
on the power
supply, see
the installation
instructions
CNPWM
(WH)
CN851
(BK)
PAR-WT50R-E
Radio receiver
PAR-WR51R-E
WiFi adapter/
Modbus adapter/
Ecodan Smart
Control
CNIT
(BU)
CN22
(BU)
For details on connecting
the additional heater,
see the installation instructions
CN401 CN1A CNW5 CNW12 CN21 CN20 1
TBI.1
TBI.2
TBI.3
TBI.4
TBI.5
TBI.6
Sensor HK 1
VL THW 6
Sensor HK 1
RL THW 7
Sensor buffer storage
THW 10
EVU contact
IN4
EVU
SG ready signal
IN11
SG
IN12
SG



8.4.3 System example 3: GEODAN storage module with passive cooling

System example 3 for GEODAN storage module			
Outdoor unit	-	**Operating mode**	monovalent
Indoor unit	GEODAN storage module	**Heating circuits**	1x unmixed

General information

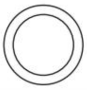
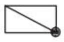
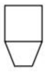
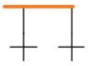
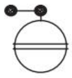
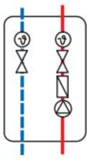
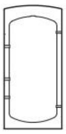
The electrical and hydraulic installation diagrams listed are schematic representations without complete shut-off and safety-related installations in accordance with the rules of technology. The systems must be designed in accordance with the currently valid laws and standards. Please also note the relevant planning instructions.

Description

Brine/water heat pump system for heating and drinking water heating with one or two heating circuits.

Area of application

Single-family houses (modernization and new construction)

symbol	Description	symbol	Description	symbol	Description
	Heating circuit (e.g. underfloor heating or radiators)		Non-return valve		Mud separator
	tap		Air separator		expansion tank
	Memory module		Pump group		Buffer memory

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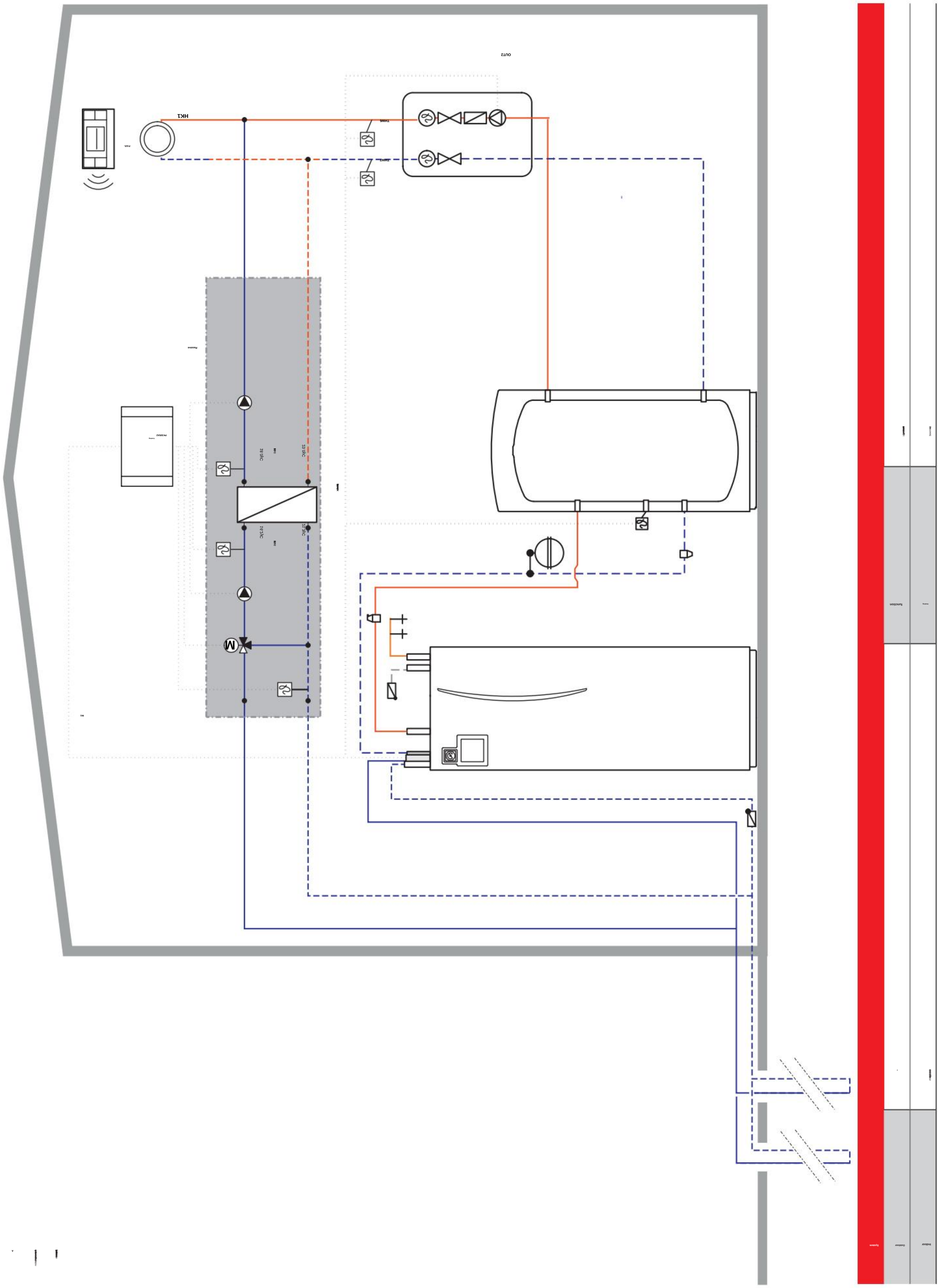
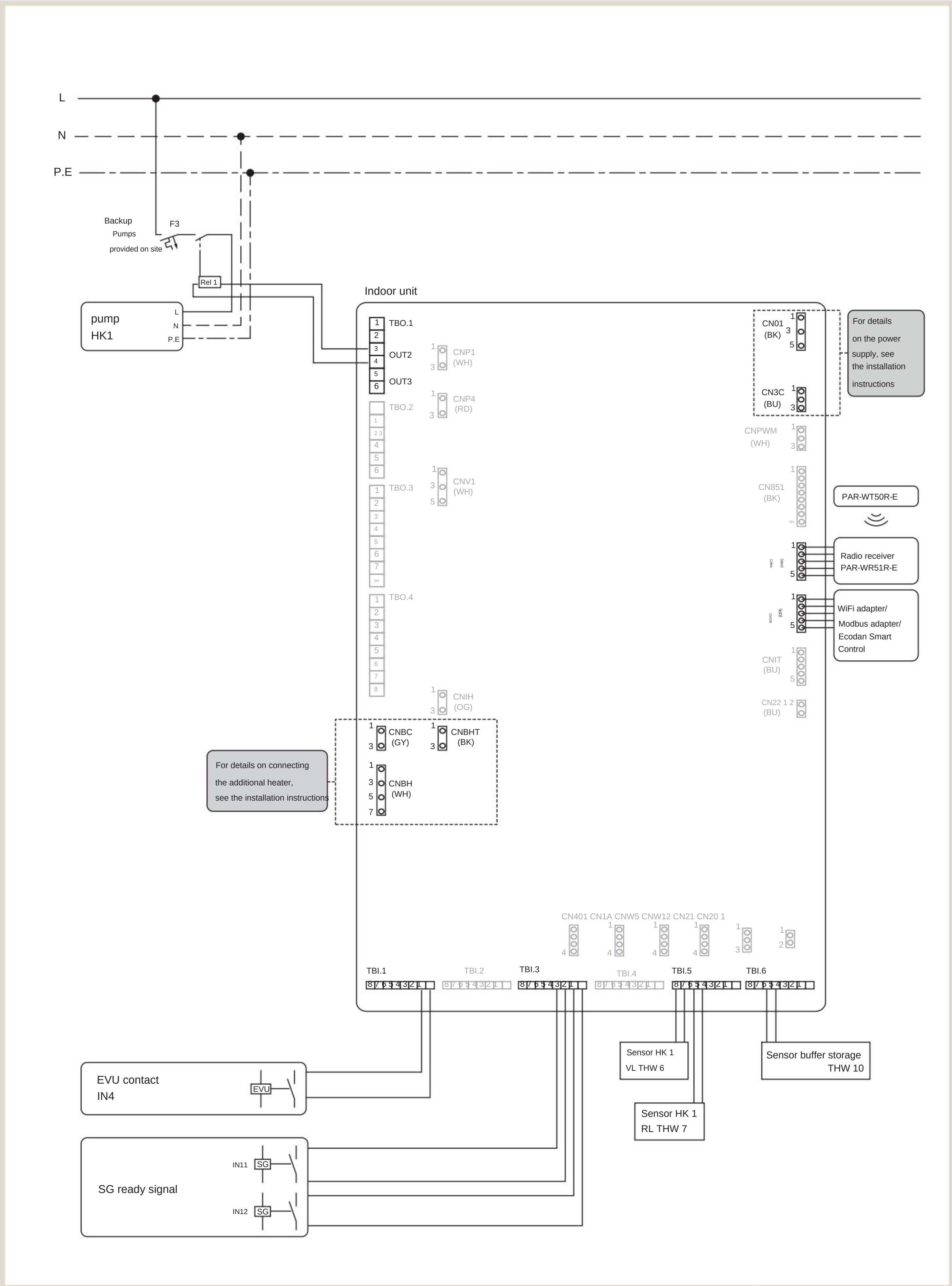
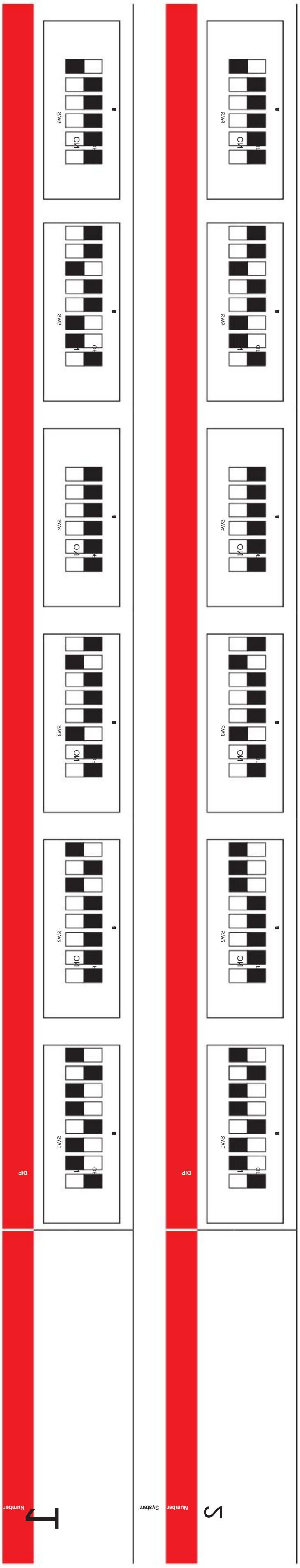




L
N
P.E
Backup
Pumps
provided on site
F3
Rel 1
pump
HK1
Indoor unit
TBO.1
OUT2
OUT3
CNP1 (WH)
CNP4 (RD)
TBO.2
TBO.3
CNV1 (WH)
TBO.4
CNIH (OG)
CN01 (BK)
CN3C (BU)
For details on the power supply, see the installation instructions
CNPWM (WH)
CN851 (BK)
PAR-WT50R-E
Radio receiver PAR-WR51R-E
WiFi adapter/ Modbus adapter/ Ecodan Smart Control
CNIT (BU)
CN22 (BU)
CNBC (GY)
CNBHT (BK)
CNBH (WH)
For details on connecting the additional heater, see the installation instructions
CN401 CN1A CNW5 CNW12 CN21 CN20
TBI.1
TBI.2
TBI.3
TBI.4
TBI.5
TBI.6
EVU contact
IN4
EVU
SG ready signal
IN11
IN12
SG
Sensor HK 1 VL THW 6
Sensor HK 1 RL THW 7
Sensor buffer storage THW 10

System Number	DIP
1	SW1 SW2 SW3 SW4 SW5 SW6
2	SW1 SW2 SW3 SW4 SW5 SW6



9. Accessories

9.1 Domestic hot water tank

All Mitsubishi Electric air/water heat pumps can be used for both heating and drinking water heating. Suitable products from Mitsubishi Electric are available for individual drinking water heating solutions. The FTC6 heat pump controller has the necessary functions and adjustable programs. Three different types are available: WPS300, WPS400 and WPS500.

The planning, installation and operation of drinking water storage tanks requires compliance with DIN 1988 and the instructions in DVGW worksheet W 551.

9.1.1 Description

All drinking water tanks are enamelled in accordance with DIN 4753 and equipped with high-quality insulation made of pentane-driven foam including a foil jacket. The double-coiled smooth-tube heat exchanger with a large surface area is particularly suitable for rapid heating and high drinking water comfort. An integrated magnesium anode offers the necessary corrosion protection in accordance with DIN 4753-6. If drinking water temperatures above 60°C are required, either the maintenance and cleaning opening can be equipped with an electric flange heater or the electric heating rod connection sleeve (R 11/2" IT) can be used.

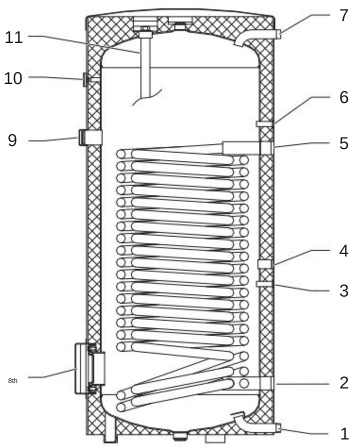
The hydraulic connection should be carried out in accordance with the hydraulic schemes recommended by Mitsubishi Electric. It should be noted that the storage tanks may only be used in closed heating systems and that the heating water must meet the requirements of VDI 2035 Sheets 1 + 2. All other safety devices must be provided in accordance with EN 12828. The connection on the drinking water side must be carried out in accordance with DIN 1988 and DIN 4753.
Applicable guidelines and regulations of the local utility companies must be observed.

9.1.2 Technical data

Designation	WPS300-1	WPS400-1	WPS500-1
Storage volume * [l]	302	380	469
Heat retention losses * [W]	70	86	100
Energy efficiency class *	b	C	C
Diameter including insulation [mm]	700	700	700
Insulation pentane foam [mm]	50	50	50
Height [mm]	1294	1591	1921
Tilting dimension [mm]	1445	1715	2025
WT heating area [m²]	3.2	5.0	6.2
WT content [l]	22	36	43
Standby energy loss [kWh/24h]	2.41	2.80	3.26
Permissible operating pressure drinking water [bar]	10	10	10
Permissible operating pressure for heating [bar]	10	10	10
Permissible operating temperature drinking water [°C] 95		95	95
Permissible operating temperature heating [°C]	110	110	110
Weight [kg]	106	139	199

* according to ErP Lot 2

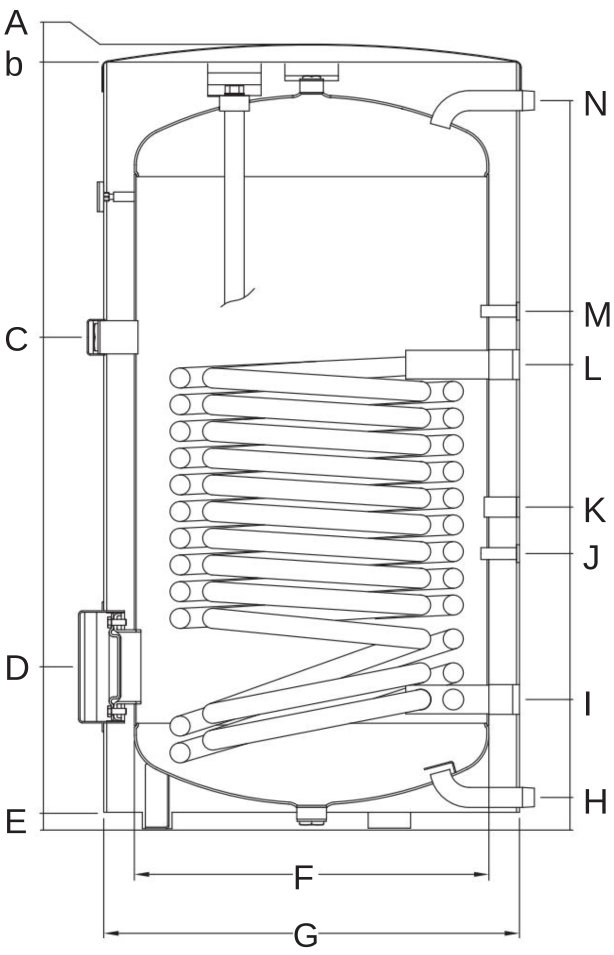
DHW storage (connection dimensions)



Pos.	Description	WPS300-1	WPS400-1	WPS500-1
1	Cold water entry	R 1" AG	R 1" AG	R 1" AG
2	Heat pump return	R 1 ¼" IT	R 1 ¼" IT	R 1 ¼" IT
3	Sensor sleeve with clamping spring for drinking water sensor THW5	Ø 20 x 2.0	Ø 20 x 2.0	Ø 20 x 2.0
4	Drinking water circulation	R ¾" IT	R ¾" IT	R ¾" IT
5	Heat pump flow	R 1 ¼" IT	R 1 ¼" IT	R 1 ¼" IT
6	Sensor sleeve with clamping spring	Ø 20 x 2.0	Ø 20 x 2.0	Ø 20 x 2.0
7	Hot water outlet	R 1" AG	R 1" AG	R 1" AG
8th	Blind flange & cover	DN110	DN110	DN110
9	Connection sleeve for electric heating element	R 1 ½" IT	R 1 ½" IT	R 1 ½" IT
10	thermometer	Ø 16 x 60	Ø 16 x 60	Ø 16 x 60
11	anode	G 1 ¼" 33 x 625 mm	G 1 ¼" 33 x 850 mm	G 1 ¼" 33 x 1060 mm

To increase your comfort, you can use a circulation pipe to ensure that hot water is available directly at the point of use. With the hot water circulation set for drinking water tank WPS, a hot water circulation line can be connected to the circulation connection (4) of the tank. The circulation set is available as an accessory. The circulation pump required for integration into the system must be provided by the customer.

DHW storage (connection positions)



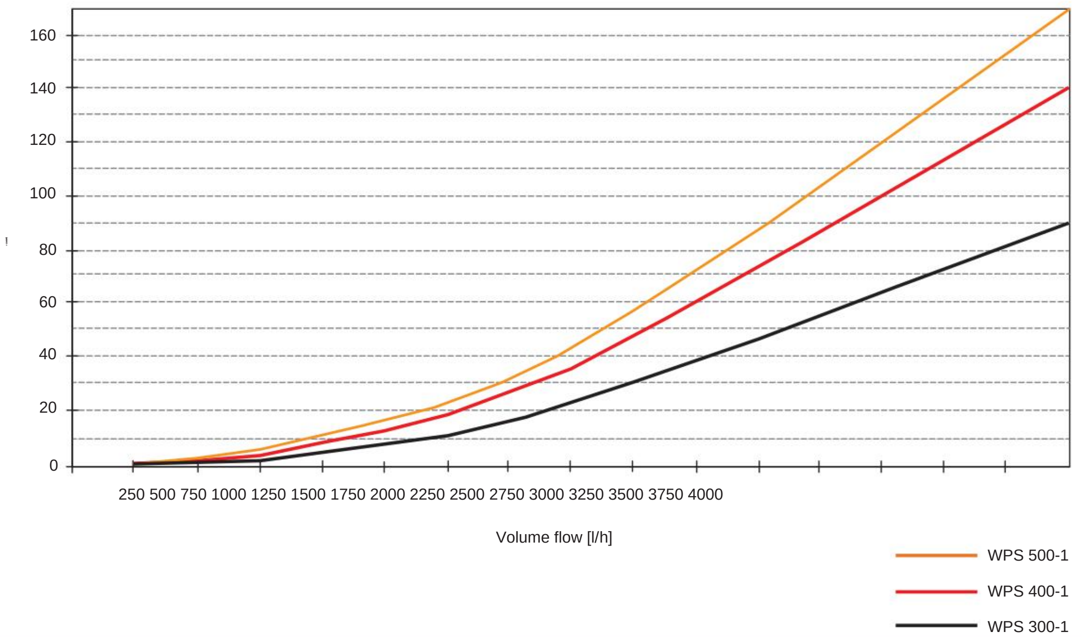
Pos.	Description	WPS300-1	WPS400-1	WPS500-1
A	Overall height (with storage cover) [mm]	1324	1621	1952
B	Overall height (without storage cover) [mm]	1294	1591	1921
C	Connection sleeve for electric heating element [mm]	830	1140	1319
D	Blind flange and cover [mm]	275	276	275
E	Base height from floor [mm]	30	30	30
F	inner diameter [mm]	597	597	597
G	width including insulation [mm]	700	700	700
H	Cold water connection [mm]	55	55	55
I	Heat pump return [mm]	220	221	220
J	Sensor sleeve with clamping spring for drinking water sensor THW5 [mm]	466	592	699
K	drinking water circulation [mm]	544	666	1035
L	Heat pump flow [mm]	784	1100	1279
M	sensor sleeve with clamping spring [mm]	874	1190	1369
N	Hot water connection [mm]	1229	1526	1853

9.1.3 Drinking water tap capacity

Performance information WPS 300-1			
Heating water flow temperature [°C]	Continuous power [kW]	Withdrawal volume flow 10 °C–45 °C [l/h]	Performance index NL(1) at 80 °C Primary temperature
90	108	2646	9
80	87	2132	
70	65	1593	
55	35	858	
Performance information WPS 400-1			
Heating water flow temperature [°C]	Continuous power [kW]	Withdrawal volume flow 10 °C–45 °C [l/h]	Performance index NL(1) at 80 °C Primary temperature
90	139	3406	14
80	112	2744	
70	84	2058	
55	45	1103	
Performance data WPS 500-1			
Heating water flow temperature [°C]	Continuous power [kW]	Withdrawal volume flow 10 °C–45 °C [l/h]	Performance index NL(1) at 80 °C Primary temperature
90	155	3798	18
80	124	3038	
70	93	2279	
55	50	1225	

9.1.4 Pressure loss smooth tube heat exchanger

The following diagram shows the pressure loss of the smooth-tube heat exchanger for the WPS300-1, WPS400-1 and WPS500-1 domestic hot water tanks.

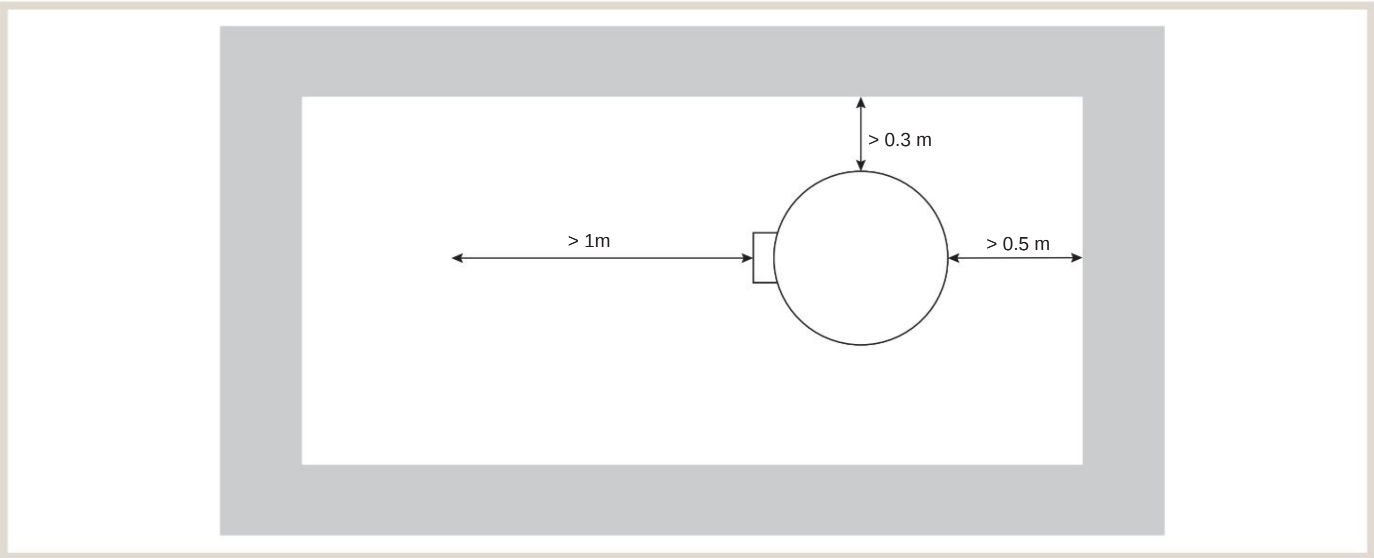


9.1.5 Assembly and commissioning

• Assembly and commissioning may only be carried out by certified specialists. • The storage unit must be installed in a frost-free room. • The surface must be level and suitable for the corresponding weight load. Small bumps can be compensated for using the included adjustable feet.

• The necessary minimum dimensions for free accessibility must be provided for and adhered to during the planning stage become.

Minimum dimensions for installation



9.1.6 Cleaning, care and maintenance

Depending on the water hardness, regular maintenance and cleaning of the domestic hot water tank is recommended. For this purpose, the drinking water tanks are equipped with a maintenance and cleaning opening. When servicing or replacing the magnesium anode, particular attention must be paid to free accessibility (ceiling height).

9.2 Buffer memory

9.2.1 General information

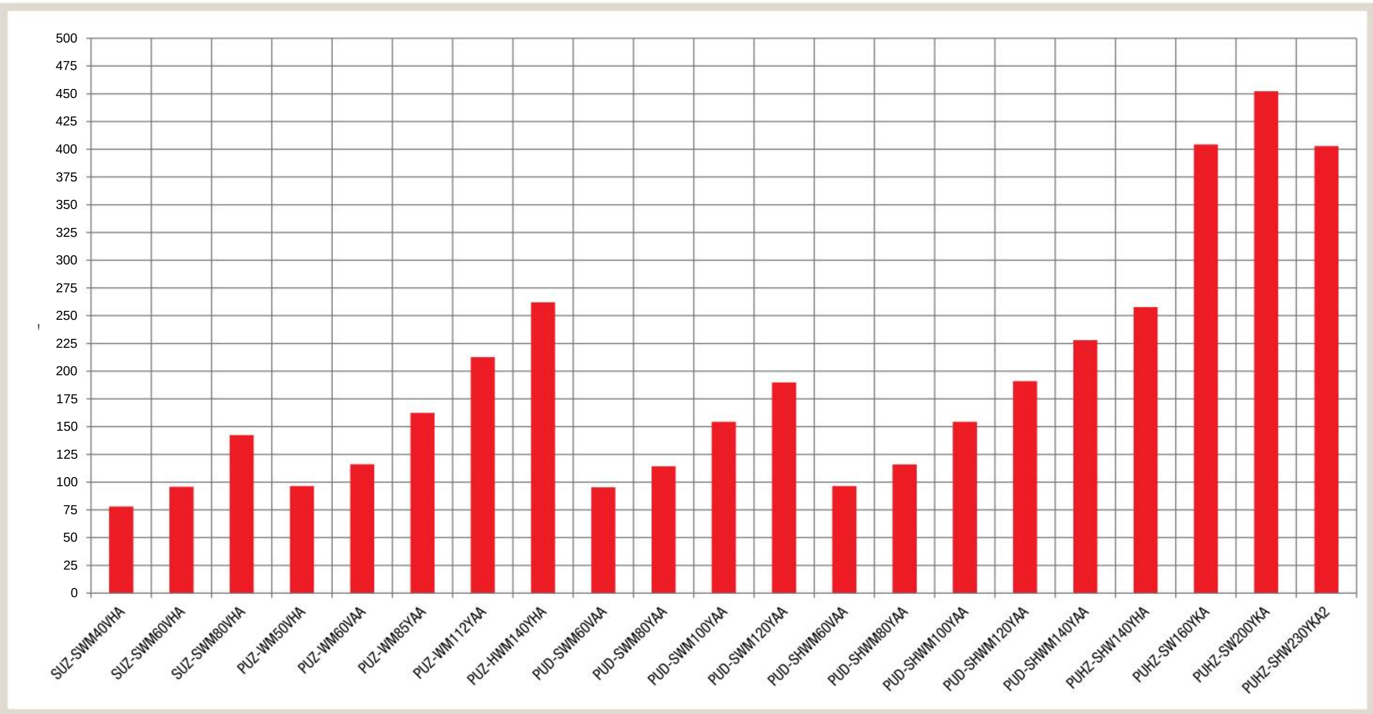
The use of buffer storage is generally recommended. A buffer memory fulfills the following functions:

• Hydraulic decoupling of the air/water heat pumps (parallel integration). • Provision of energy for the defrosting process of the air/water heat pump. • Provision of the minimum volume flow and extension of the compressor running time in the efficient partial load range. • Bridging possible blackout periods by the energy supply company. • Energy management when using multiple heat generators (solar system, bivalent systems). • Energy management to increase the use of own electricity in the building or for grid-reactive control ("smart" Grid-capable heat pump).

Depending on which heating system is used in the respective building, the functions listed above may become more or less relevant. To ensure trouble-free operation, the minimum energy for the defrosting process must be taken into account.

The following diagram shows the minimum required volume of a buffer storage for the defrosting process based on VDI4650.

Volume of the buffer storage for the defrosting process



The volume recommended in the diagram refers to an outside temperature of 7 °C, an average buffer storage temperature of 35 °C and a flow temperature of 35 °C. This corresponds to the temperature level of an underfloor heating system.

A NOTICE!

At higher buffer storage temperatures, such as B. with radiators, a larger amount of energy is available for the defrosting process. This can result in a smaller buffer volume.

9.2.2 Description

The PS buffer storage series from Mitsubishi Electric is built according to the state of the art and recognized safety regulations. The PS buffer tank series may only be used for storing heating water in accordance with VDI 2035 in closed heating systems with operating temperatures of max. 95°C and operating pressures of up to 3 bar. The PS series buffer storage can be used as a heating and cooling buffer, as a separating storage tank for hydraulic decoupling and providing the necessary defrosting energy.

The storage container is made of high quality steel (S235JRG2). The diffusion-tight storage insulation consists of pentane-blown foam for the greatest possible thermal insulation and a laminated foil jacket (sheet metal cladding only PS100) in white.

Features/equipment

- Floor-standing installation or optionally wall-mounted (PS100 only)
- Wall bracket for wall-mounted installation included in delivery
- Fastening material provided by the customer
- 2 x heating flow/return connections
- 2 x heat pump flow/return connections
- 1 x connection for electric heating element, in the middle
- Operating pressure max. 3 bar
- Operating temperature max. 95°C

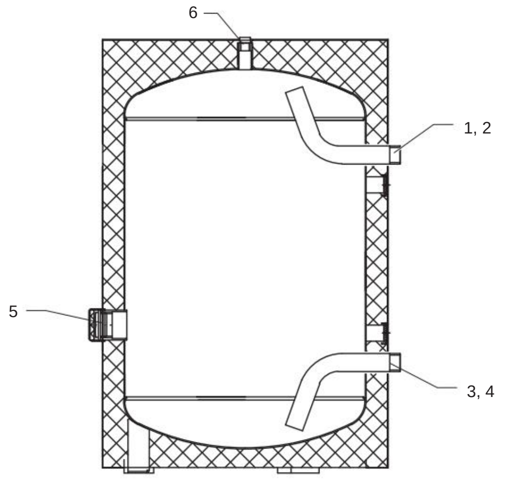
9.2.3 Technical data

Designation		PS100-1	PS200-1	PS300-1	PS500-2
Storage volume *	[l]	100	200	300	480
Warming losses *	[F]	30	56	69	99
Energy efficiency class *	[–]	A	b	b	C
Diameter including insulation	[mm]	–	600	700	700
insulation pentane foam	[mm]	40	50	50	50
Height	[mm]	805	1300	1330	1921
Max. permissible operating pressure	[bar]	3	3	3	3
Max. permissible operating temperature	[°C]	95	95	95	95
Weight	[kg]	42	59	72	118

* according to Regulation (EU) No. 814/2013

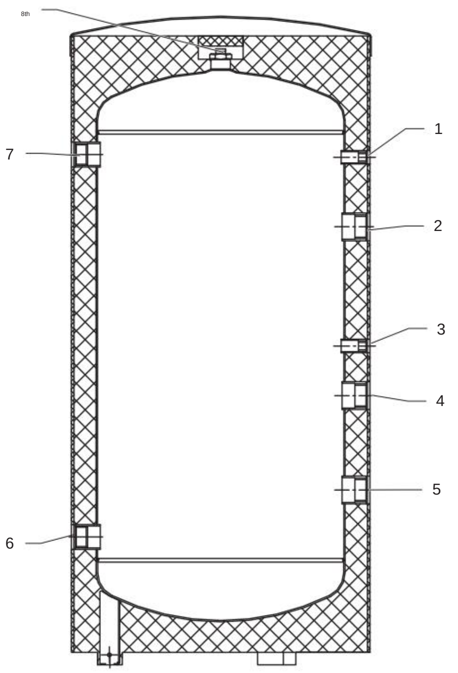
9.2.4 Hydraulic connections

Buffer tank PS100-1



Pos.	Description	PS100-1
1	Heat pump flow	G 1" AG
2	Heating circuit flow	G 1" AG
3	Heat pump return	G 1" AG
4	Heating circuit return	G 1" AG
5	Connection sleeve for bivalence boiler or electric heating element	Rp 1 ½"
6	ventilator	G ½"

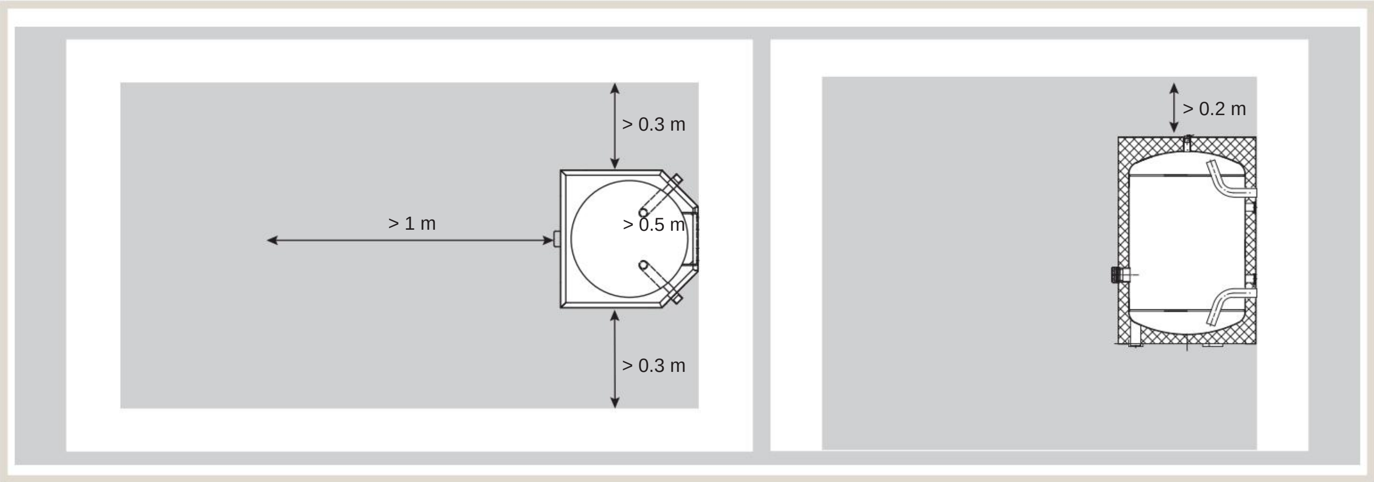
Buffer tank PS200/300/500-1



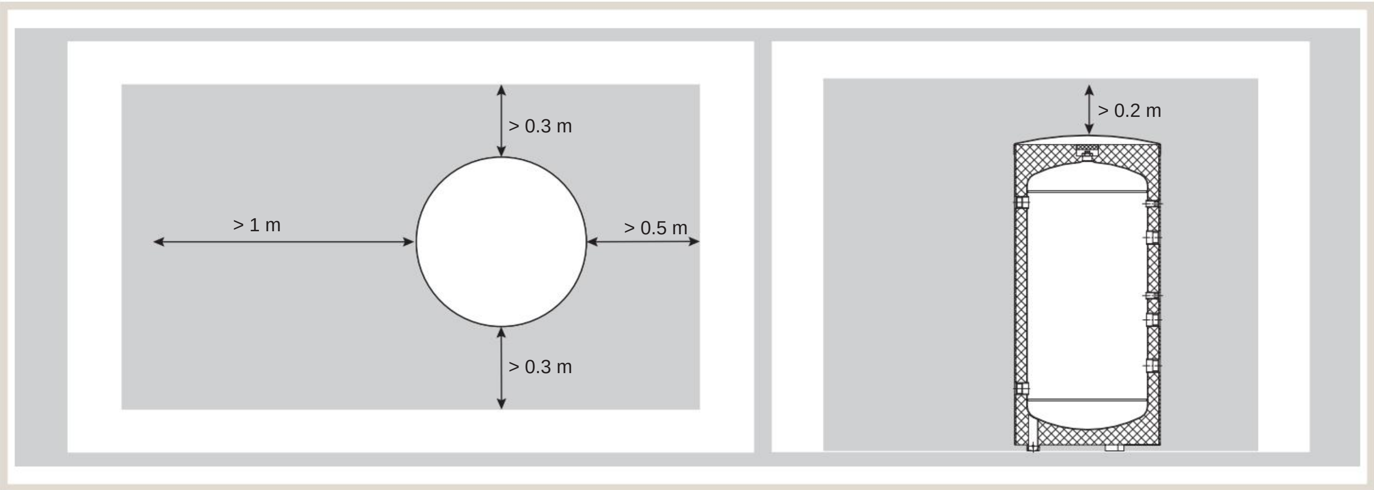
Pos.	Description	PS200-1	PS300-1	PS500-2
1	sleeve	G ½"	Rp ½"	G ½"
2	Heat pump flow	G 1 ½"	Rp 1 ½"	G 2 ½"
3	sleeve	G ½"	Rp ½"	G ½"
4	Connection sleeve for bivalence boiler or electric heating element	G 1 ½"	Rp 1 ½"	G 1 ½"
5	Heat pump return	G 1 ½"	Rp 1 ½"	G 2 ½"
6	Heating circuit return	G 1 ¼"	Rp 1 ¼"	G 2 ½"
7	Heating circuit flow	G 1 ¼"	Rp 1 ¼"	G 2 ½"
8th	ventilator	G ½"	G ½"	G ½"

Minimum dimensions for installation

PS100-1 (wall-mounted or floor-standing installation)

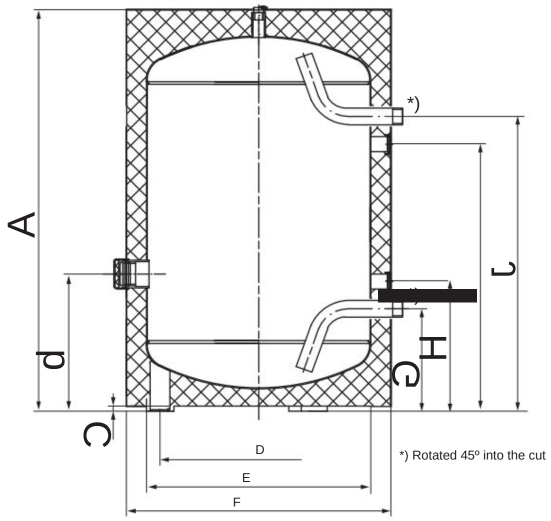


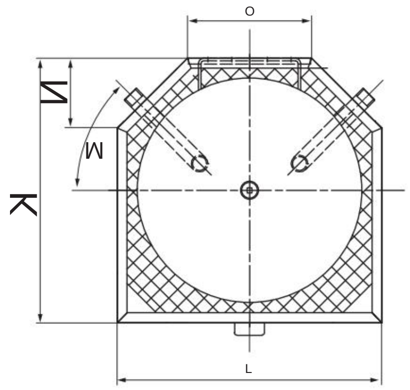
PS200-1/300-1/500-2 (wall-mounted or floor-standing installation)



9.2.5 Dimensions

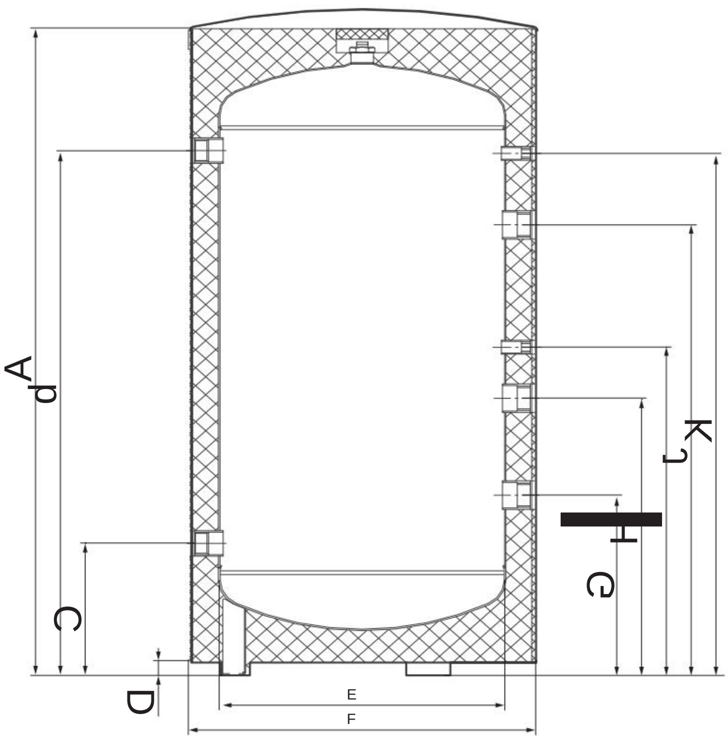
Buffer tank PS100-1





Pos.	Description	[mm]
A	Total height	805
b	Connection sleeve for Bivalence boiler or Electric heating rod	274
C	Base height from the ground	10
D	Diameter of adjustable feet Ø 395	
E	Inner diameter	Ø450
F	Width including insulation	530
G	Heating circuit return/ Heat pump return	204
H	Spacer bracket (for wall mounting)	260
I	Mounting wall console 535	
J	Heating circuit flow/ Heat pump flow	590
K	depth	530
L	Width at the front	530
M	Connection flow/return 45°	
N	Wall distance Forward/rewind	140x45°
O	Width at the back	249

Buffer tank PS200-1/300-1/500-2



Pos.	Description	PS200-1 [mm]	PS300-1 [mm]	PS500-2 [mm]
A	Total height	1260	1294	1921
b	Heating circuit flow	1028	1060	1657
C	Heating circuit return	258	240	259
D	Base height from floor 50		30	25
E	Inner diameter	Ø500	Ø597	Ø597
F	Outer diameter incl. insulation	Ø600	Ø700	Ø700
G	Heat pump return 352		420	521
H	Connection sleeve for Bivalence boiler or Electric heating rod	542	610	918
I	sleeve	642	710	1078
J	Heat pump flow	882	920	1535
K	sleeve	1022	1060	1675

9.3 Multi-function buffer storage

The multifunctional buffer tank PZ/PZR is suitable for all hot water central heating systems with heat pumps and enables the additional integration of solid fuel, oil-fired boilers, solar systems and gas boilers. The multifunctional buffer tank is equipped with a stove-enamelled powder coating for perfect corrosion protection. An integrated layer separation plate and thermal layer device ensure optimal temperature stratification and thus offer efficient hot water preparation.

Features/equipment

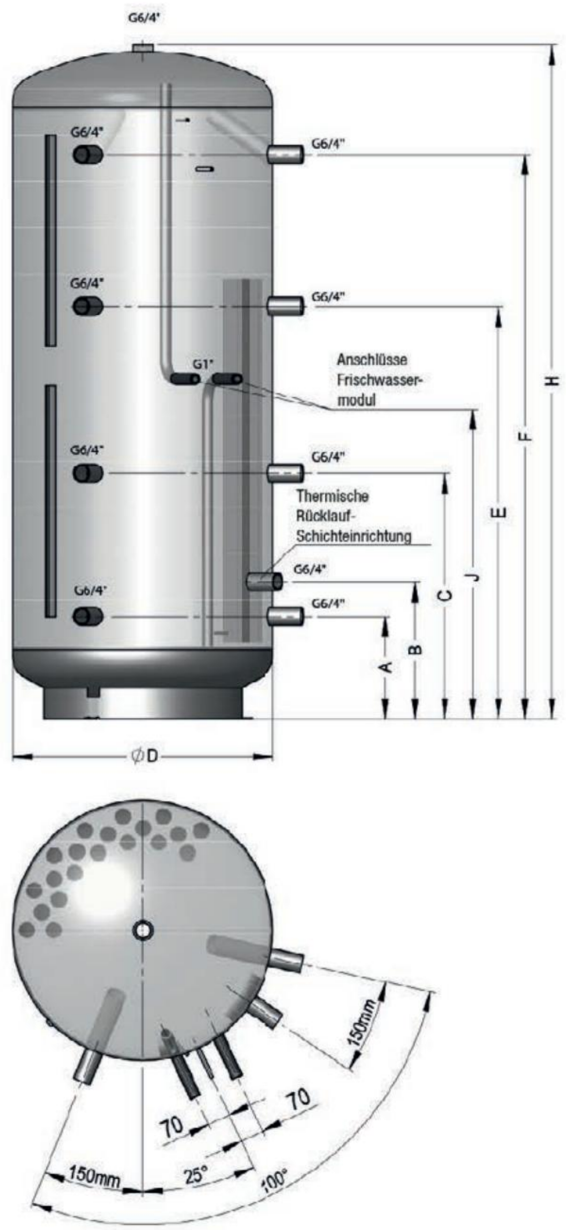
- Nominal volume 780/960 liters
- Large pipe registers for type PZR
- Operating pressure 3 bar, test pressure 4.5 bar buffer tank
- Operating pressure max. 10 bar, test pressure 15 bar in the pipe register for type PZR
- 2 sensor channels for variable positioning of the sensors on type PZ/PZR
- Powder coating exterior
- innovative fleece insulation with a stable, shape-retaining polystyrene jacket 100 mm.

9.3.1 Technical data

Designation		PZ800	PZR800	PZ1000	PZR1000
Storage volume	[l]	800	800	1000	1000
diameter including insulation	[mm]	990	990	990	990
insulation fleece	[mm]	–	–	–	–
height including insulation	[mm]	1785	1785	2135	2135
Number of sensor channels	[Piece] -		–	–	–
Max. permissible operating pressure	[bar]	–	–	–	–
Max. permissible operating temperature	[°C]	95	95	95	95
Solar WT area	[m²]	–	2.4	–	3.0
Solar WT content	[l]	–	15.6	–	19.2
Weight	[kg]	105	142	122	162

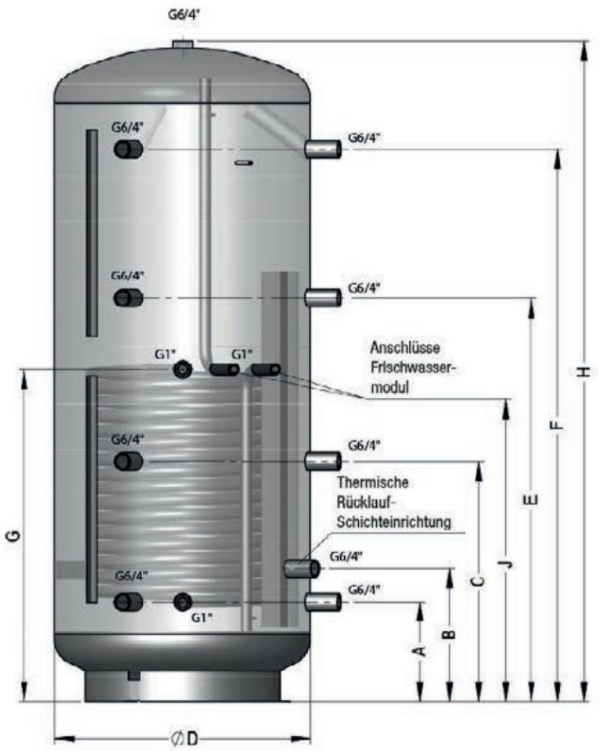
9.3.2 Dimensions and hydraulic connections

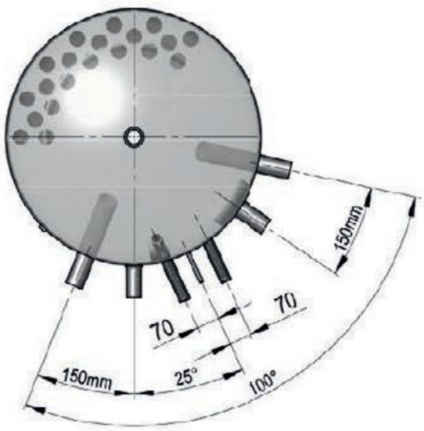
ECO FRESH PZ



Pos.	Dimensions [mm]	PZ800	PZ1000
H	Height	1700	2050
Hges	height including insulation	1785	2135
ØD	diameter	790	790
ØDges	diameter including insulation	990	990
A	Heat pump return heating or solar return 260		310
b	Heating circuit return thermal layering	365	415
C	Heat pump flow (heating mode) or heating circuit flow	630	745
E	Heat pump return hot water	1030	1250
F	Heat pump flow hot water or Heating circuit flow	1430	1710
J	Fresh water station connections	855	1030
Contents [l]		800	1000
Tilting dimension [mm]		1750	2090

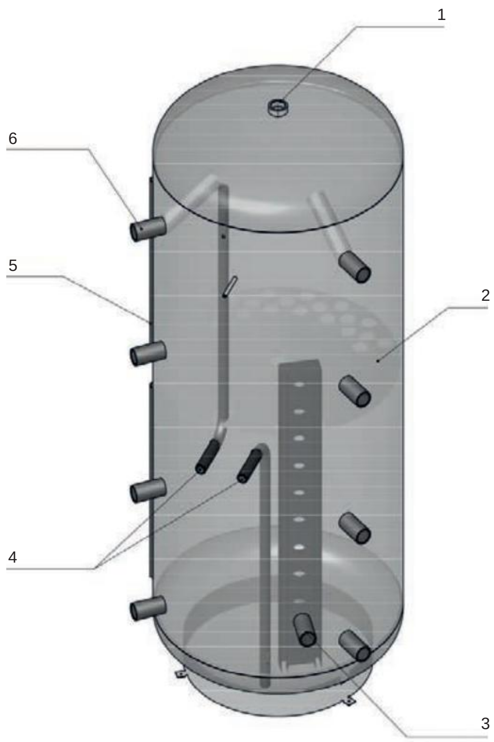
ECO FRESH PZR





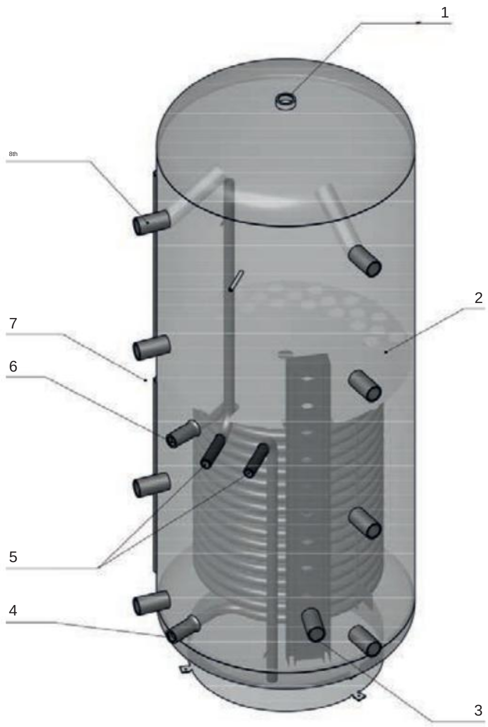
Pos.	Dimensions [mm]	PZ(R)800	PZ(R)1000
H	Height	1700	2050
Hges	height including insulation	1785	2135
ØD	diameter	790	790
ØDges	diameter including insulation	990	990
A	Heat pump return heating or solar return 260		310
b	Heating circuit return thermal layering	365	415
C	Heat pump flow (heating mode) or heating circuit flow	630	745
E	Heat pump return hot water	1030	1250
F	Heat pump flow hot water or Heating circuit flow	1430	1710
G	Solar advance	845	1030
J	Fresh water station connections	855	1030
Contents [l]		800	1000
Tilting dimension [mm]		1750	2090
Heat exchanger – solar			
Heating surface [m²]		2.4	3
Contents [l]		15.6	19.2

ECO FRESH PZ



Pos.	Description	PZ800	PZ1000
1	Venting	G 1 1/2"	G 1 1/2"
2	Layered board		
3	Thermal return layer device	G 1 1/2"	G 1 1/2"
4	2 x connections fresh water station ECO FRESH G 1"		G 1"
5	2 x sensor channel		
6	8 x Connectors	G 1 1/2"	G 1 1/2"

ECO FRESH PZR



Pos.	Description	PZR800	PZR1000
1	Venting	G 1 1/2"	G 1 1/2"
2	Layered board		
3	Thermal return layer device	G 1 1/2"	G 1 1/2"
4	Solar RL	G 1"	G 1"
5	2 x connections fresh water module ECO SWIFT G 1"		G 1"
6	Solar VL	G 1"	G 1"
7	2 x sensor channel	G 3/4"	G 3/4"
8th	8 x Connectors	G 1 1/2"	G 1 1/2"

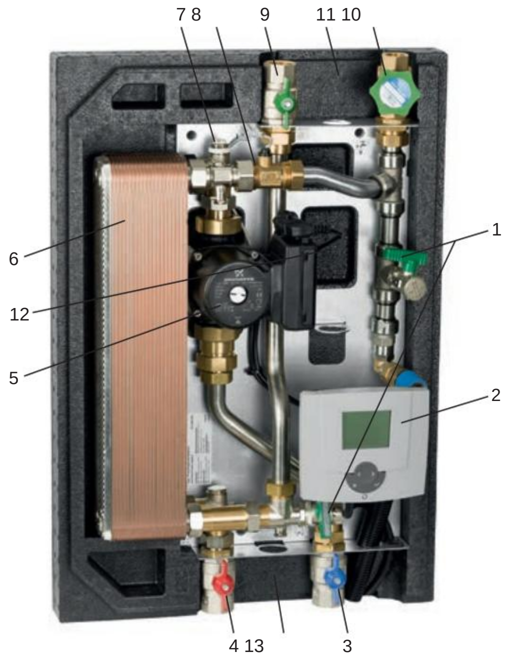
9.4 Fresh water station

In the ECO FRESH-EZ fresh water station, the drinking water is heated to the specified tapping temperature using the continuous flow principle. The integrated heat exchanger is always supplied with as little heating water from the buffer storage as is required to maintain a constant tapping temperature. Due to the special heat exchanger design, a low return temperature of the heating water to the buffer storage can be expected. By recording the temperature difference and volume flow data, the electronic control simultaneously determines and stores the amount of heat consumed. The fresh water station is equipped with a circulation connection including a pump. This pump is controlled by the integrated control using its own program.

Features/equipment

- Fast-reacting sensor – resulting in constant water temperature – even in the event of sudden load changes (e.g. when additional hot water is required)
- Large flow range up to 40 liters/min. – This means that the device can be used for one- and two-family households
- very energy-saving thanks to the lowest possible energy consumption and the greatest possible temperature spread
- Supports temperature stratification in the buffer storage
- compact design including circulation connection
- Electronic control with the best possible protection against calcification
- Max. operating temperature: 95 °C
- Max. operating pressure – primary circuit: 3 bar
- Max. operating pressure – secondary circuit: 6 bar
- Safety valve, installed to protect the device: 10 bar
- kVS value – primary: 2.2
- kVS value – secondary: 2.3
- Primary circuit pump: Wilo Yonos Para 15/7.5 PWM
- Circulation pump: Wilo Yonos Para Z 15/7.0 RKC.

Fresh water station ECO FRESH-EZ



Pos.	Description
1	Filling and emptying taps
2	Regulator
3	Primary connection heat supply return
4	Primary connection for heat supply flow
5	Primary circulation pump
6	Heat exchanger
7	Venting

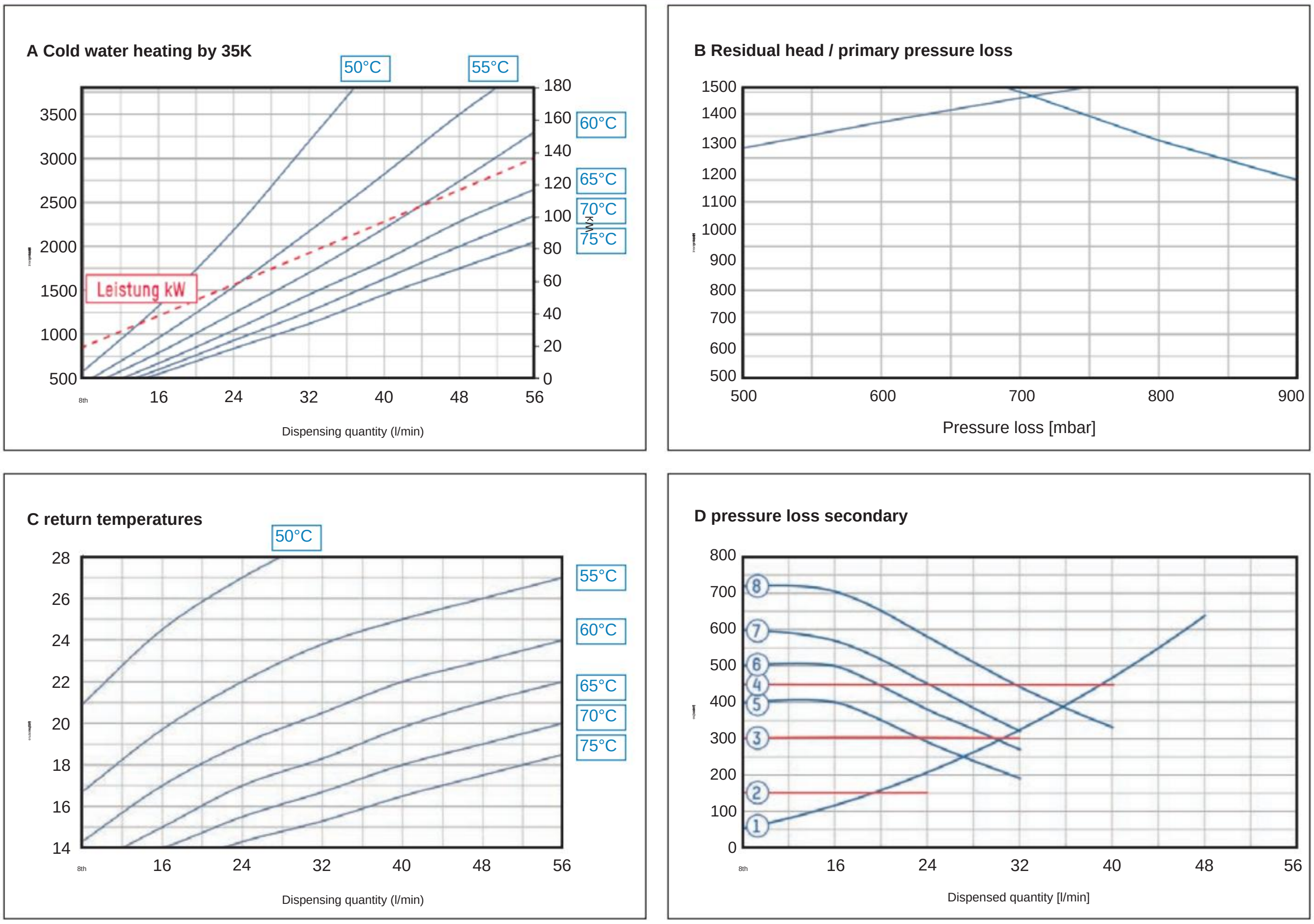
Pos.	Description
8th	Volume flow sensor
9	Connection for drinking water distribution (warm)
10	Connection to the main drinking water supply line
11	Circulation connection (optional)
12	Integrated circulation
13	Two-zone layering/cascading

9.4.1 Technical data

Designation	ECO FRESH-E/EZ
rated capacity	22 l/min. at 45 °C WW and 55 °C primary VL
Fresh hot water temperature	45 °C (at storage temperature 55 °C)
Primary operating temperature, max.	95°C
Operating temperature secondary, max.	85°C
Operating pressure primary, max.	10 bar
Operating pressure secondary, max.	9 bar
Return temperature, max.	30°C
Blow-off pressure DN15 safety valve	15 bar
Pressure loss, primary	see diagram
Pressure loss, secondary	see diagram
Plate heat exchanger	Stainless steel 1.4403, copper soldered
Primary circuit pump	Grundfos UPML 25-105 130 PWM
Circulation pump	Grundfos UPM3 Auto L15-70
Pressure loss, primary	see diagram
Pressure loss, secondary	see diagram
Measuring range of tap volume flow	1 to 40 l/min.
Electrical connection data	
Mains voltage	230V AC ± 10%
Mains frequency	50...60 Hz
Power consumption	max. 250 W
Protection class	IP40
Dimensions and insulation	
Dimension (mm)	470 x 685 x 193.2 (W x H x D)
Weight	max. 22 kg (without water content)
Hood	Designer hood made of EPP with plastic cover
insulation	integrates EPP
connections	
Ball valves	1" IT
Cold water connection	3/4"
Heating water/buffer water flow	G 6/4“
Heating water/buffer water return	G 6/4“
Connection secondary	
circulation	G 6/4“
Cold water	G 6/4“
Hot water	G 6/4“

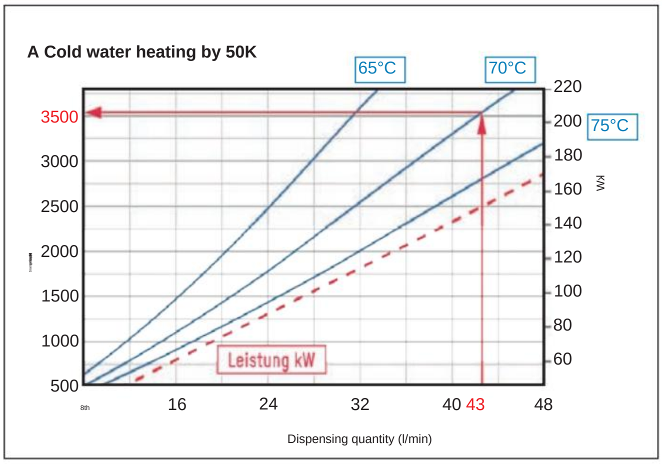
9.4.2 Flow and pressure loss diagrams for cold water heating

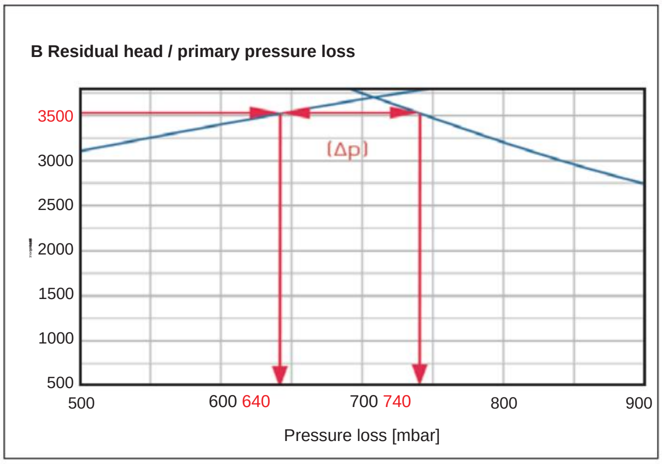
Flow and pressure loss diagrams for cold water heating by 35K (10...45 °C)

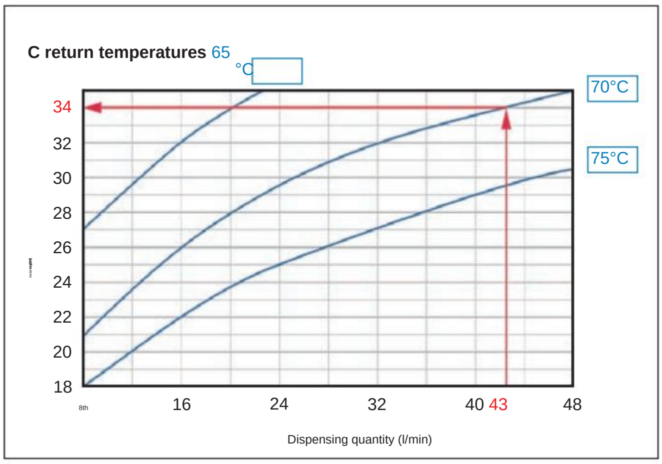


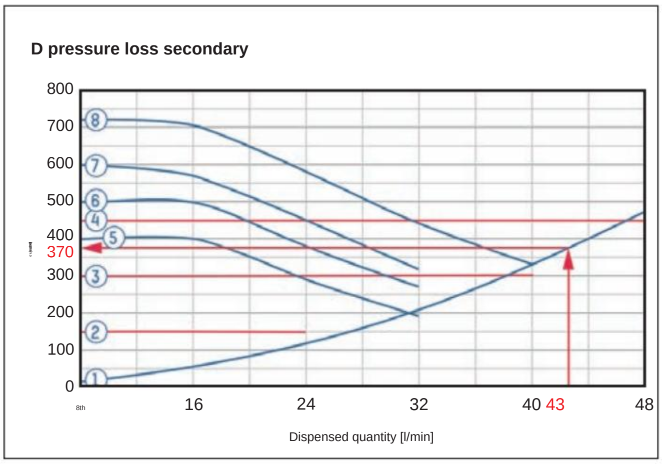
1 Pressure loss cold water and circulation (secondary)
2 Circulation pump constant pressure 1
3 Circulation pump constant pressure 2
4 Circulation pump constant pressure 3
5 Circulation pump constant curve 1
6 Circulation pump constant curve 2
7 Circulation pump constant curve 3
8 circulation pump constant curve 4

Flow and pressure loss diagrams for cold water heating by 50K (10...60 °C)









1 Pressure loss cold water and circulation (secondary)
2 Circulation pump constant pressure 1
3 Circulation pump constant pressure 2
4 Circulation pump constant pressure 3
5 Circulation pump constant curve 1
6 Circulation pump constant curve 2
7 Circulation pump constant curve 3
8 circulation pump constant curve 4

Example for interpreting the flow and pressure loss diagrams

Given

- Hot water tap volume: 19 l/min.
- Heating flow temperature primary: 70°C

Wanted

- Heating water requirement in l/h
- Heating return temperature primarily in °C
- Secondary pressure loss in mbar
- Pressure loss primarily in mbar

solution

- In diagram A, the tapping rate at the intersection point is 19 l/min. and flow primary 70 °C, the heating water requirement is read as 1350 l/h.
- In diagram B, with a heating water requirement of 1350 l/h, a pressure Loss primarily read from 340 mbar. The delivery head of the pump is 460 mbar, minus the pressure loss, the remaining delivery head of the pump is 120 mbar (ÿp).
- In diagram C, at the given dispensing volume of 19 l/min. and the selected flow temperature of 70°C, the return temperature is primarily read as 28.5°C.
- In diagram D, for the given data, the pressure loss becomes secondary read at 225 mbar.

9.5 Pump groups

The pump groups are suitable for use with the FTC6 heat pump controller (see chapter “6. The FTC6 heat pump controller” on page 174) from Mitsubishi Electric and can be used for mixed and unmixed heating circuits. The pump groups are available in four different versions and are delivered fully assembled.
The pump groups are equipped with electronic high-efficiency circulation pumps.

Depending on the version, the pump groups are also equipped with a 3-way mixer and corresponding actuator. This is suitable for supplying low-temperature heating systems (e.g. underfloor heating) and regulates the required flow temperature by adding return water. The control is carried out via flow and return sensors THW6 / THW7 / THW8 / THW9 (part name PAC-TH011-E), which are connected to the heat pump controller FTC6.

These sensors are designed as contact sensors. It is important to ensure that the distance between the sensor measuring point and the flow/return of the pump group is as short as possible in order to avoid annoying dead times.
The use of thermal paste between the contact sensor and the flow/return line of the heating circuits is recommended to support signal transmission. Components of the pump groups are:

• High-efficiency circulation pump with connection cable,
• Thermometer for flow and return, •
Pump ball valve, • Wall
bracket,
• EPP insulation, •
3-way mixer (only for T-MK version).

9.5.1 Technical data

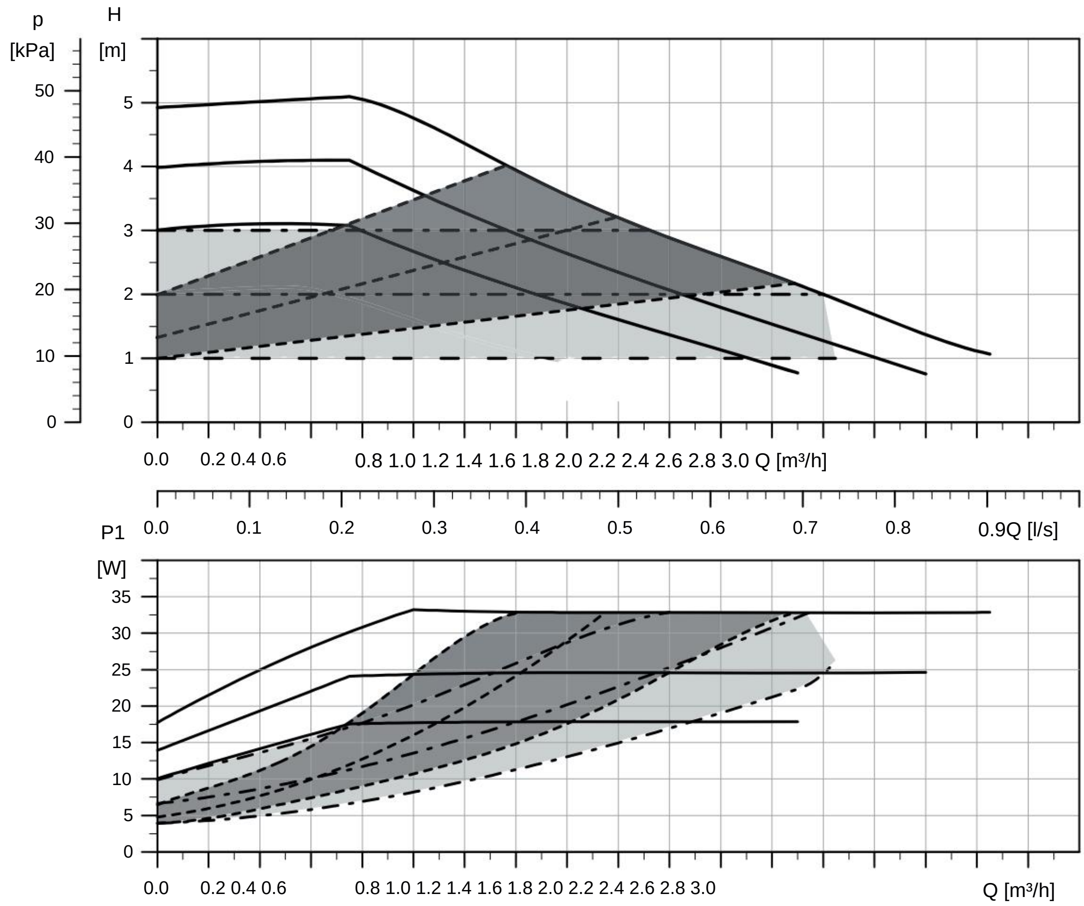
Designation	UK 1 Edd. 8th	MK 1 Edd. 8th	UK 1 1/4 Edd. 8th	MK 1 1/4 Edd. 8th
Nominal diameter	DN25	DN25	DN32	DN32
Qmax	3.6 m³/h	3.6 m³/h	3.6 m³/h	3.6 m³/h
H x W x D	420x250x255mm	420x250x255mm	420x250x255mm	420x250x255mm
Hmax	7.2m	7.2m	7.2m	7.2m
pump	UPM3 Hybrid 25-70	UPM3 Hybrid 25-70	UPM3 Hybrid 32-70	UPM3 Hybrid 25-70
kVs value	9.7 m³/h	6.2 m³/h	11.0 m³/h	6.4 m³/h
Installation length	180mm	180mm	180mm	180mm
Mixer + actuator	No	Yes. Servomotor 230 V, 140 s, 90°, 6 Nm No		Yes. Servomotor 230 V, 140 s, 90°, 6 Nm
Axle distance	125mm	125mm	125mm	125mm
Connection at the top	G 1" IT	G 1" IT	G 1¼" IT	G 1¼" IT
Connection below	G 1 ½" AG (flat seal) G 1 ½" AG	(flat seal)	G 1 ½" AG (flat seal) G 1 ½" AG	(flat seal)
Max. operating temperature 110	°C	110°C	110°C	110°C
Max. operating pressure	6 bar	6 bar	6 bar	6 bar

Pump groups

Machine Translated by Google

9.5.2 Pump characteristics

Pump characteristic curve UPM3 Hybrid 25-70 / 32-70



High efficiency pump

Ready for Ecodesign 2015

EEI ÿ 0.20 according to EN 16297-3:2012

P L, averaged ÿ 25W

Line style	Description
________	Constant characteristic curve
------	Proportional pressure
__ ·__ ·__ ·__	Constant pressure

9.6 DLRV fan coil unit

The large selection of wall-mounted controls and on-board controls enables user-friendly and complete control of all functions. The advanced management system with a PID logic controls the fan speed to maintain perfect temperature and humidity levels, reduce noise emissions and ensure high efficiency.

The main feature of the DLRV fan coil units is that the micro fans are installed between the heat exchanger and the front cover. These micro fans are connected in parallel to the water valves and work when the water temperature rises above 35°C. With a function selection on the control panel, the tangential fan stops and the micro fans begin exhausting hot air through the front cover. This ensures natural radiant heat release and convection with very low noise emissions.

9.6.1 Guaranteed area of application

	Room temperature	Water inlet temperature
Cooling operation	5 – 32°C	4 – 80°C
Heating operation	5 – 32°C	4 – 80°C

Maximum water pressure: 1,000 kPA

A NOTICE!

For proper operation, the fan coil unit may only be used within the temperature range specified in the table. If the device is operated outside the limits, malfunction or a drop in pressure may occur.

9.6.2 Nominal technical characteristics

		i-LIFE2 SLIM 080	i-LIFE2 SLIM 170	i-LIFE2 SLIM 270	i-LIFE2 SLIM 320	i-LIFE2 SLIM 370
Water content in register [l]		0.47	0.8	1.13	1.46	1.8
Max. operating pressure	[bar]	10	10	10	10	10
maximum temperature Water entry	[°C]	80	80	80	80	80
Minimum temperature Water entry	[°C]	4	4	4	4	4
Water connections *	["]	Eurocone 3/4	Eurocone 3/4	Eurocone 3/4	Eurocone 3/4	Eurocone 3/4
Power supply	[Ph], [V], [Hz]	1, 230, 50	1, 230, 50	1, 230, 50	1, 230, 50	1, 230, 50
Weight DLRV	[kg]	17.3	20.4	23.4	26.4	29.4

* Supplied as standard with adapter set (2 pieces) and flat gasket and 3/4 connections.

9.6.3 Technical data

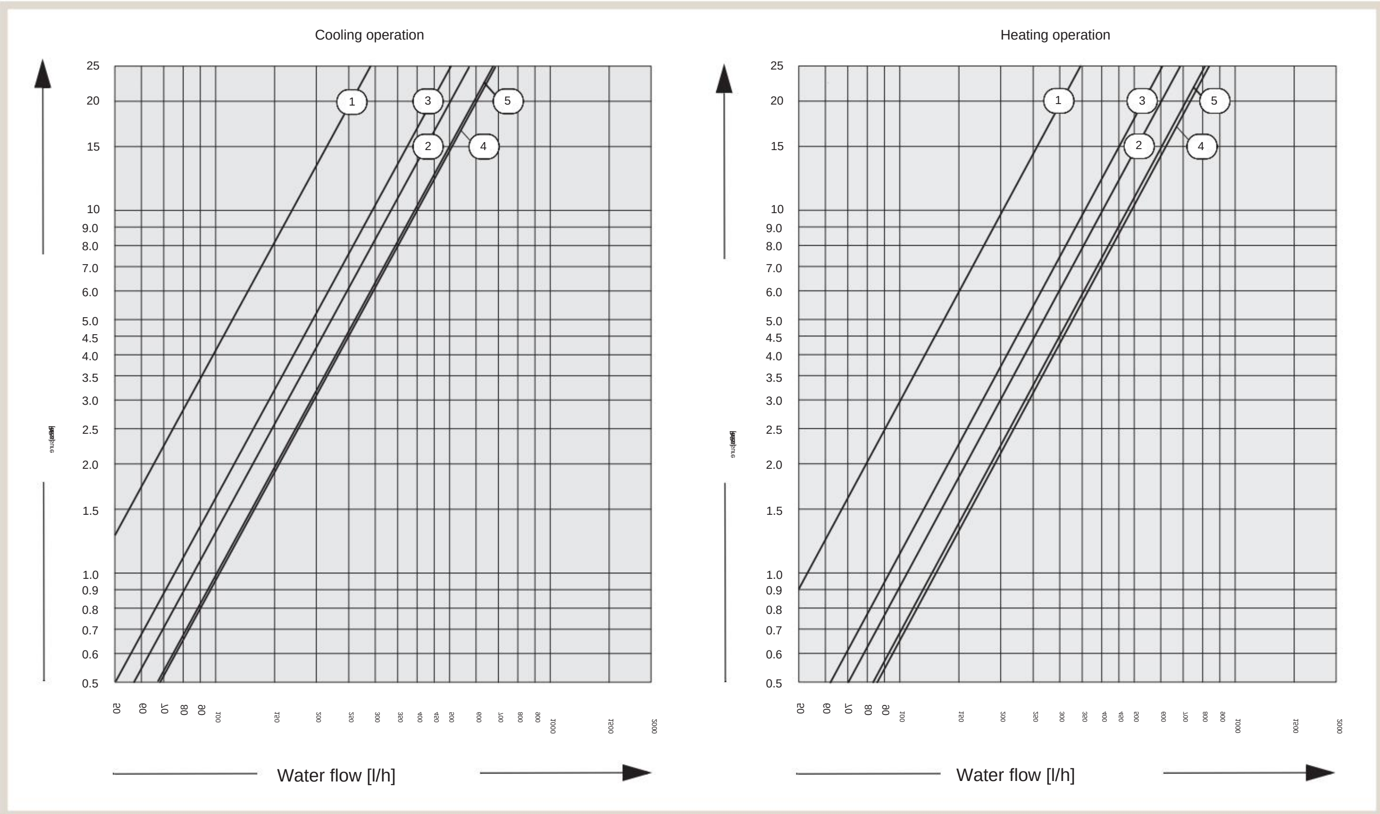
Device name			i-LIFE2 SLIM / DLRV 080	i-LIFE2 SLIM / DLRV 170	i-LIFE2 SLIM / DLRV 270
Power supply		[Ph], [V], [Hz]	1, 230, 50	1, 230, 50	1, 230, 50
FCEER *1, 6		[kW]	150	197	320
Energy class in cooling mode			b	A	A
FCCOP *2, 6		[kW]	183	262	387
Energy class in heating mode			b	b	A
Power consumption *1	Min / Med / Max	[W]	0.70 / 4.46 / 10.7	1.62 / 10.1 / 19.0	1.82 / 9.86 / 20.0
Air flow *1	Min / Med / Max	[m³/h]	51 / 93 / 125	122 / 221 / 277	189 / 334 / 425
Total performance in cooling mode *1	Min / Med / Max	[kW]	0.40 / 0.69 / 0.76	0.81 / 1.39 / 1.75	1.32 / 2.18 / 2.75
Net total output in Cooling mode *1,6,7	Min / Med / Max	[kW]	0.40 / 0.69 / 0.75	0.81 / 1.38 / 1.73	1.32 / 2.17 / 2.73
Sensitive performance in cooling mode *1	Min / Med / Max	[kW]	0.30 / 0.54 / 0.66	0.67 / 1.17 / 1.53	1.03 / 1.72 / 2.21
Sensible net power in Cooling mode *1, 6, 7	Min / Med / Max	[kW]	0.30 / 0.54 / 0.65	0.67 / 1.16 / 1.51	1.03 / 1.71 / 2.19
Latent net performance in Cooling mode *1, 6, 7	Min / Med / Max	[kW]	0.10 / 0.15 / 0.10	0.14 / 0.22 / 0.22	0.29 / 0.46 / 0.54
Water flow rate in Cooling operation *1	Min / Med / Max	[l/s]	0.02 / 0.03 / 0.04	0.04 / 0.07 / 0.08	0.06 / 0.10 / 0.13
Pressure loss in cooling mode *1	Min / Med / Max	[kPa]	2 / 5 / 6	1 / 3 / 5	6/15/24
Total output in heating mode *2	Min / Med / Max	[kW]	0.50 / 0.78 / 0.88	1.06 / 1.65 / 2.11	1.54 / 2.40 / 3.27
Net total output in Heating mode *2.6	Min / Med / Max	[kW]	0.50 / 0.78 / 0.89	1.06 / 1.66 / 2.13	1.54 / 2.41 / 3.29
Water flow rate in Heating mode *2	Min / Med / Max	[l/s]	0.02 / 0.04 / 0.04	0.05 / 0.08 / 0.10	0.07 / 0.12 / 0.16
Pressure loss in heating mode *2	Min / Med / Max	[kPa]	3 / 6 / 8	2 / 5 / 8	8/19/33
Sound pressure *3	Min / Med / Max	[dB(A)]	24 / 35 / 41	26 / 36 / 42	27 / 37 / 44
Sound power *4, 7	Min / Med / Max	[dB(A)]	33 / 44 / 50	35 / 45 / 51	36 / 46 / 53
Dimensions (H x W x D) *5		[mm]	579x737x131	579x937x131	579x1137x131
Weight *5		[kg]	17	20	23

1) Room temperature: 27°C dry bulb; 19°C wet bulb; Cooling water (inlet/outlet): 7/12°C
2) Room temperature: 20°C dry bulb; Hot water (inlet/outlet): 45/40°C
3) Sound pressure level in a free sound field above a reflective floor surface 1 m in front of the fans and 1 m from the ground. Non-binding value calculated from the sound power level.
4) Sound power based on measurements according to ISO 3741 and Eurovent Directive 8/2.
5) Device in standard configuration and design, without special accessories.
6) Values based on the EN14511-3:2013 standard.
7) Values based on Regulation (EU) No. 2016/2281

Device name			i-LIFE2 SLIM / DLRV 320	i-LIFE2 SLIM / DLRV 370
Power supply		[Ph], [V], [Hz]	1, 230, 50	1, 230, 50
FCEER *1, 6		[kW]	294	275
Energy class in cooling mode			A	A
FCCOP *2, 6		[kW]	401	346
Energy class in heating mode			A	A
Power consumption *1	Min / Med / Max	[W]	2.47 / 11.3 / 29.0	4.91 / 12.3 / 33.0
Air flow *1	Min / Med / Max	[m³/h]	258 / 430 / 593	367 / 499 / 697
Total performance in cooling mode *1	Min / Med / Max	[kW]	1.62 / 2.52 / 3.22	2.00 / 2.82 / 3.76
Net total output in Cooling mode *1,6,7	Min / Med / Max	[kW]	1.62 / 2.51 / 3.19	2.00 / 2.81 / 3.73
Sensitive performance in cooling mode *1	Min / Med / Max	[kW]	1.38 / 2.24 / 3.02	1.71 / 2.40 / 3.30
Sensible net power in Cooling mode *1, 6, 7	Min / Med / Max	[kW]	1.38 / 2.23 / 2.99	1.70 / 2.39 / 3.27
Latent net performance in Cooling mode *1, 6, 7	Min / Med / Max	[kW]	0.24 / 0.28 / 0.20	0.30 / 0.42 / 0.46
Water flow rate in Cooling operation *1	Min / Med / Max	[l/s]	0.08 / 0.12 / 0.15	0.10 / 0.14 / 0.18
Pressure loss in cooling mode *1	Min / Med / Max	[kPa]	5/11/17	6/13/24
Total output in heating mode *2	Min / Med / Max	[kW]	2.22 / 3.07 / 3.88	2.48 / 3.41 / 4.33
Net total output in Heating mode *2.6	Min / Med / Max	[kW]	2.22 / 3.08 / 3.91	2.48 / 3.43 / 4.36
Water flow rate in Heating mode *2	Min / Med / Max	[l/s]	0.11 / 0.15 / 0.19	0.12 / 0.16 / 0.21
Pressure loss in heating mode *2	Min / Med / Max	[kPa]	9/16/25	10/20/32
Sound pressure *3	Min / Med / Max	[dB(A)]	27 / 38 / 46	31 / 39 / 47
Sound power *4, 7	Min / Med / Max	[dB(A)]	36 / 47 / 55	40 / 48 / 56
Dimensions (H x W x D) *5		[mm]	579x1337x131	579x1537x131
Weight *5		[kg]	26	29

1) Room temperature: 27°C dry bulb; 19°C wet bulb; Cooling water (inlet/outlet): 7/12°C
2) Room temperature: 20°C dry bulb; Hot water (inlet/outlet): 45/40°C
3) Sound pressure level in a free sound field above a reflective floor surface 1 m in front of the fans and 1 m from the ground. Non-binding value calculated from the sound power level.
4) Sound power based on measurements according to ISO 3741 and Eurovent Directive 8/2.
5) Device in standard configuration and design, without special accessories.
6) Values based on the EN14511-3:2013 standard.
7) Values based on Regulation (EU) No. 2016/2281

9.6.4 Pressure loss



Pos.	Designation	Pos.	Designation
1	i-LIFE2 SLIM 080	**4**	i-LIFE2 SLIM 320
2	i-LIFE2 SLIM 170	**5**	i-LIFE2 SLIM 370
3	i-LIFE2 SLIM 270		

9.6.5 Sound pressure level DLRV

Device designation	i-LIFE2 SLIM 080 i-LIFE2 SLIM 170		i-LIFE2 SLIM 270	i-LIFE2 SLIM 320	i-LIFE2 SLIM 370
Sound pressure level at max. air flow [db(A)] 41		142	44	46	47
Sound pressure level at med. Airflow [db(A)] 35		36	37	38	39
Sound pressure level at min. air flow [db(A)] 24		26	27	27	31

The sound pressure level information is based on measurements carried out in a sound-reflective room in accordance with ISO 7779.

9.6.6 Sound power level DLRV

Device name Max.	i-LIFE2 SLIM 080	i-LIFE2 SLIM 170	i-LIFE2 SLIM 270	i-LIFE2 SLIM 320	i-LIFE2 SLIM 370
sound power level Med. [db(A)]	50	51	53	55	56
sound power level [db(A)]	44	45	46	47	48
Min. sound power level [db(A)]	33	35	36	36	40

The sound power level information is based on measurements taken in a low-sound reflection environment room were carried out in accordance with ISO 7779.

i-LIFE2 SLIM 080

	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz
Max. speed [dB(A)] 46.5 **Med. speed**		24.5	20.4	26.1	29.8	27.3	27.2	26.0	25.0	21.9	19.8	19.3
[dB(A)] 48.8 **Min. speed** [dB(A)] 49.2		30.1	31.2	32.1	35.9	42.6	37.5	35.9	36.5	36.8	34.6	32.9
		34.0	36.5	37.2	39.9	43.3	45.4	41.0	40.5	43.5	41.8	39.8

	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10 kHz	dB(A)
Max. speed [dB(A)] 15.6		14.0	10.2	14.2	12.6	15.5	14.8	13.2	16.8	33.0
Medical speed [dB(A)] 30.8		29.5	25.8	24.3	20.7	19.5	17.8	15.5	18.9	44.0
Min. speed [dB(A)] 38.0		37.2	34.1	32.8	29.5	26.8	23.2	19.0	18.8	50.0

i-LIFE2 SLIM 170

	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz
Max. speed [dB(A)] 39.9 **Med. speed**		22.8	23.8	26.8	31.2	30.9	29.0	31.9	28.4	25.6	23.6	22.4
[dB(A)] 43.4		30.8	32.3	34.1	36.3	41.5	37.1	36.5	40.9	38.0	35.2	33.7
Min. speed [dB(A)] 40.4		34.8	37.6	38.8	40.2	43.1	45.0	41.3	41.0	46.3	42.6	40.7

	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10 kHz	dB(A)
Max. speed [dB(A)] 19.9		18.0	13.6	14.2	11.7	14.0	13.6	11.7	15.3	35.0
Medical speed [dB(A)] 31.6 **Min. speed**		30.4	26.4	24.8	20.8	19.5	17.6	15.3	18.7	45.0
[dB(A)] 38.9		38.2	34.9	33.6	30	27.1	23.2	19.0	18.6	51.0

i-LIFE2 SLIM 270

	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz
Max. speed [dB(A)] 41.1		23.0	24.8	27.6	30.7	30.3	29.2	33.3	29	26.8	26.5	23.7
Medical speed [dB(A)] 47.1		31.0	33.1	35.9	37.1	40.4	38.0	37.9	42.0	39.0	36.0	34.9
Min. speed [dB(A)] 50.2		37.3	40	42.3	43.1	45.5	45.9	44	43.5	47.2	44.7	42.9

	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10 kHz	dB(A)
Max. speed [dB(A)] 21.0 **Med. speed**		18.4	14.3	14.4	11.4	13.3	13.3	11.3	14.9	36.0
[dB(A)] 32.7 **Min. speed** [dB(A)] 41.9		31.3	27.5	26.1	22.2	19.8	18.2	15.7	18.7	46.0
		40.4	37.2	36.3	32.7	29.7	25.8	21.8	21.2	53.0

i-LIFE2 SLIM 320

	100Hz 125Hz 160Hz 200Hz 250Hz 315Hz 400Hz 500Hz 630Hz 800Hz 1kHz											1.25kHz
Max. speed [dB(A)] 33.3 **Med. speed**		23.3	26.2	32.7	28.6	34.1	29.8	29.3	26.2	25.2	24.9	31.4
[dB(A)] 34.8		34.0	36.9	40.2	40.1	41.2	39.8	39.9	43.0	39.3	37.4	36.2
Min. speed [dB(A)] 43.4		45.8	43.3	44.8	46.3	47.4	46.2	45.5	45.3	51.1	45.8	44.9

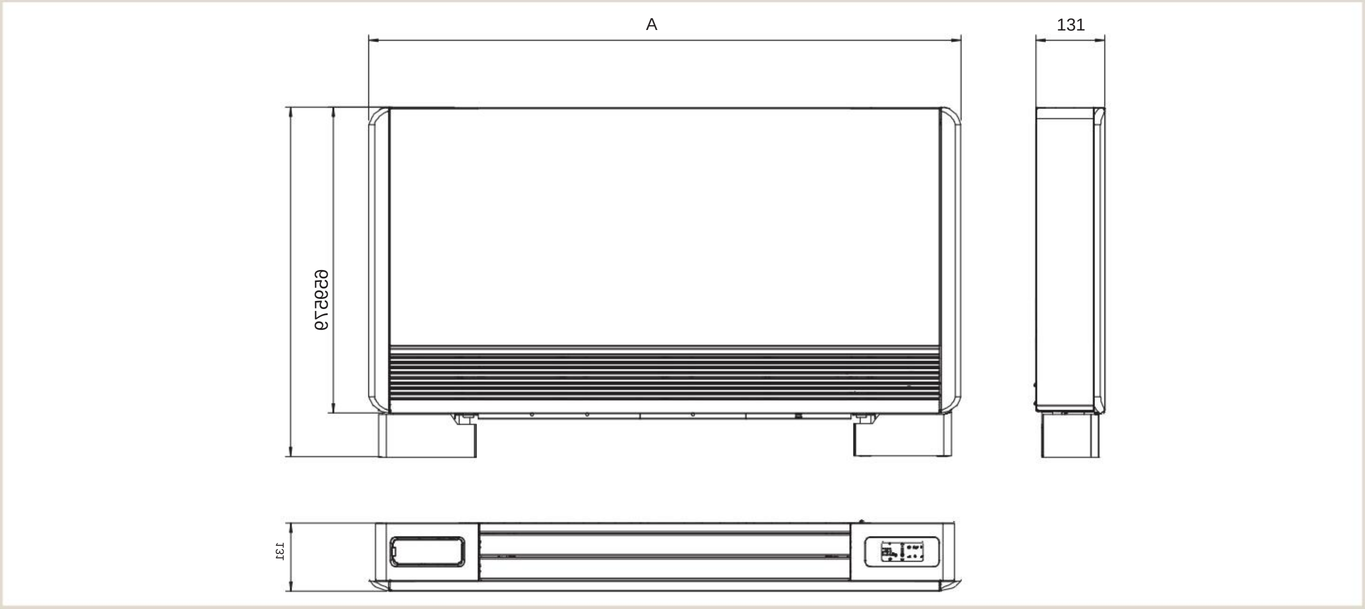
	1.6kHz 2kHz 2.5kHz 3.15kHz 4kHz 5kHz 6.3kHz 8kHz							10 kHz dB(A)	
Max. speed [dB(A)] 19.0		14.8	11.6	11.6	13.1	13.8	14.6	15.8	18.3	36.4
Medical speed [dB(A)] 33.3 **Min. speed**		31.4	27.3	26.3	23.2	23.0	22.4	20.5	24.4	47.0
[dB(A)] 42.8		41.5	38.2	36.9	33.4	30.7	27.1	23.6	24.6	55.0

i-LIFE2 SLIM 370

	100Hz 125Hz 160Hz 200Hz 250Hz 315Hz 400Hz 500Hz 630Hz 800Hz 1kHz											1.25kHz
Max. speed [dB(A)] 45.7		30.8	31.0	34.3	33.2	36.3	33.1	36.1	31.4	30.6	28.7	25.7
Medical speed [dB(A)] 45.5		40.7	37.8	42.4	40.7	42.3	40.2	40.1	43.0	41.4	38.5	36.9
Min. speed [dB(A)] 50.2		49.0	47.8	45.8	47.8	48.4	47.1	46.2	46.2	52.2	47.1	45.2

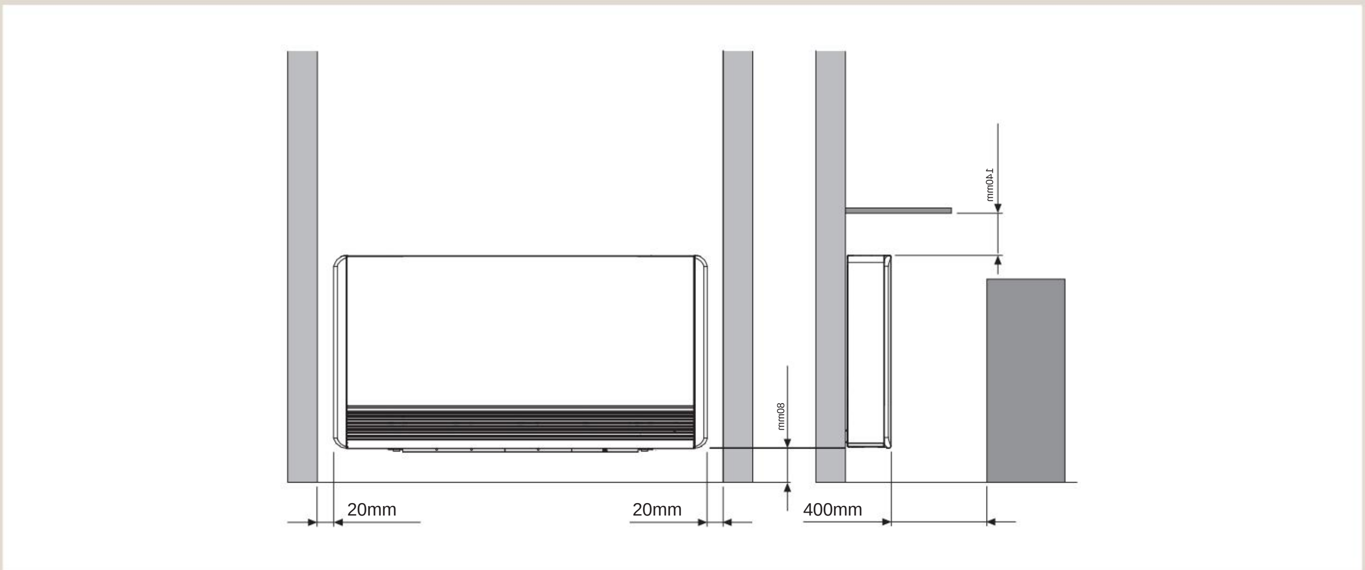
	1.6kHz 2kHz 2.5kHz 3.15kHz 4kHz 5kHz 6.3kHz 8kHz							10 kHz dB(A)	
Max. speed [dB(A)] 22.9 **Med. speed**		20.7	16.6	15.9	16.3	16.6	17.5	17.6	20.6	39.2
[dB(A)] 34.8 **Min. speed** [dB(A)] 43.3		33.0	29.8	28.3	25.0	23.3	21.6	19.0	21.5	48.0
		42.1	39.4	38.4	34.9	32.0	28.2	24.5	23.9	56.0

9.6.7 Dimensions of fan coil unit with housing i-LIFE2 SLIM DLRV



Device name	i-LIFE2 SLIM 080	i-LIFE2 SLIM 170	i-LIFE2 SLIM 270	i-LIFE2 SLIM 320	i-LIFE2 SLIM 370
A [mm]	720	920	1120	1320	1520

9.6.8 Minimum clearances during installation



10. Appendix

In the appendix to the Ecodan planning manual, we have prepared useful and additional additional content and information for you. Below you will find:

- In chapter “10.1 Heat pump commissioning protocol” on page 334 there is a copy of our commissioning protocol for a heat pump.
- In chapter “10.2 Data sheets” on page 336 there is an overview of our Zubadan, Power and Eco Inverter products.
- In chapter “10.5 Manufacturer’s Declaration” on page 368 our manufacturer’s declaration for your energy supply company regarding “EVU shutdown” for the use of a “heat pump tariff”.
- In chapter “10.3 Radiator calculations” on page 362 there are tables for calculating radiator dimensions.
- In chapter “10.4 System logbook” on page 366 there is a copy template of our refrigerant logbook.
- In chapter “10.6 Laws, standards, guidelines and regulations” on page 369 there is a list of relevant standards and guidelines on the subject of heat pumps.
- In chapter “10.7 Index” on page 370 there is an overview of important technical terms used in this planning manual.

10.1 Heat pump commissioning protocol

Company stamp

order number ______________________

Plant location

Surname ______________________

Street ______________________

ZIP / City ______________________

phone ______________________

Preparatory work/conditions

		Remarks
Installation of the outdoor unit and the indoor unit according to Mitsubishi Electric Installation and planning document	☐ Yes ☐ no	
Refrigeration piping with refrigerator-quality refrigerant pipe with diffusion-tight insulation up to the devices (WP split version)	☐ Yes ☐ no	
Refrigerant lines hermetically sealed until the commissioning date	☐ Yes ☐ no	
All hydraulic/water side work completed and bled; after The integration corresponds to the information provided by the responsible specialist company Mitsubishi Electric installation and planning document	☐ Yes ☐ no	
Electrical work completed (outdoor unit, indoor unit, connecting line)	☐ Yes ☐ no	
All required sensors installed	☐ Yes ☐ no	

Services

Visual inspection of the inner and outer parts for assembly errors and damage; Basis for planning and installation documents Mitsubishi Electric	☐ Yes ☐ no	
Flaring and connecting the refrigerant lines	☐ Yes ☐ no	
Leak testing of the refrigerant lines with dried nitrogen	☐ Yes ☐ no	
Evacuating, dehumidifying and filling the system	☐ Yes ☐ no	
Commissioning of the heat pump system	☐ Yes ☐ no	
Measuring and recording the system	☐ Yes ☐ no	
Instruction of the operator of the system	☐ Yes ☐ no	

I was instructed in the operation and safe handling of the system.

____

Location Date, signature operator

Device data

Designation Ecodan package ______________________

Outdoor unit type ______________________ serial number ______________________

Indoor unit type ______________________ serial number ______________________

Laid refrigerant pipe

dimension __________ / __________ mm length ______________________

Settings controller

Attach list from the software.

Additional system components
No functional guarantee is provided for installations that are not approved for use with Mitsubishi Electric heat pumps. Functional impairments are possible.

Heating circuits

2. mixed heating circuit with mixing valve ☐ Yes ☐ no
with contact sensor ☐ PAC-TH011-E ☐ ____________
with heating circuit pump bivalent operation, if yes ☐ Yes ☐ no
with contact sensor ☐ PAC-TH011HT-E ☐ ____________

regulation

Room remote control ☐ PAR-WT50R-E ☐ ____________
Room temperature sensor ☐ PAC-SE41TS-W ☐ ____________

Legionella

Legionella switching desired, electric heater must be connected ☐ Yes ☐ no

Hydraulics

System filled and vented according to VDI 2035 ☐ Yes ☐ no
All safety devices relevant to the system were correctly dimensioned and installed ☐ Yes ☐ no

Buffer storage/hydraulic switch

Buffer memory ☐ Yes ☐ no
with contact sensor ☐ PAC-TH011-E ☐ ____________
Hydraulic switch with contact sensor ☐ PAC-TH011-E ☐ ____________

Additional electric heater:

el. connected ☐ Yes ☐ no
Bivalent temperature: ____________ °C
2kW / 3kW / 6kW / 9kW ____________

Remarks

____

____

____

Remarks

____

____

____

____

____

____

____

____

____

____

____
Date, signature of service technician

10.2 Data sheets

DEVICE NAME			**Mono air/water heat pump**			
OUTDOOR UNIT			**Power inverter PUZ-WM50VHA**			
			Heat	**Heat cool**		
INDOOR UNIT	**Hydro module**		**EHPX-YM9D**	**ERPT20X-VM2D / ERPX-YM9D**		
	Memory module EHPT20X-YM9D					
Technical data of the outdoor unit						
Nominal heating output	(A2/W35)	[kW]	5.0			
Heating output	(A-7/W35)	[kW]	5.0			
Max. heating output	(A-15/W35)	[kW]	3.9			
Power range min./max.	(A2/W35)	[kW]	2.5 – 5.4			
COP (EN14511)	(A7/W35)	-	5.00			
COP (VDI4650)	(A-7/W35)	-	3.12			
	(A2/W35)	-	4.04			
	(A7/W35)	-	5.00			
	(A10/W35)	-	5.30			
Cooling capacity/EER	(A35/W7)	[kW] / -	–			
	(A35/W18)	[kW] / -	–			
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35			
	(cooling operation)	[°C]	–			
Nominal volume flow	(heating mode)	[l/min]	12.90			
	(cooling operation)	[l/min]	–			
Power supply for outdoor unit		[Ph], [V], [Hz]	1, 230, 50			
max. current consumption		[A]	13			
Max. Input		[kW]	2.81			
max. starting current		[A]	5			
validation		[A]	16			
Dimensions (Height × Width × Depth)		[mm]	923×950×330			
Weight		[kg]	71			
connections	Heating VL/RL	-	G1			
Refrigerant / quantity	R32	[kg]	2			
Global warming potential (GWP)		-	675			
CO2 equivalent		[t]	1.35			
Sound power level	EN12102	[dB(A)]	61			
Technical data Indoor units Max.			**EHPT20X-YM9D EHPX-YM9D**		**ERPT20X-VM2D ERPX-YM9D**	
flow temperature		[°C]	60	60	60	60
Nominal storage capacity		[Liter]	200	–	200	–
Volume MAG		[Liter]	12	10	12	10
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	1, 230, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	2	3 / 6 / 9
	validation	[A]	16	16	16	16
Dimensions (Height × Width × Depth)		[mm]	1600 × 595 × 680 800 × 530 × 360 1600 × 595 × 680 800 × 530 × 360			
Weight		[kg]	102	37	100	39
connections	Heating VL/RL	[mm]	28	G1	28	28
	TWW VL/RL	[mm]	22	–	22	–
	Cold liquid/gas	[mm]	–	6.35 / 12.7	–	–
sound power level	EN12102	[db(A)]	40	41	40	40
Energy efficiency class according to EU Regulation No. 811/2023						
Heating, average climate	Low temp. application		A+++	A+++	A+++	A+++
	Medium temperature		A++	A++	A++	A++
Drinking water heating	application tap profile	L	A	–	A	–

DEVICE NAME		**Mono air/water heat pump**				
OUTDOOR UNIT		**Power inverter PUZ-WM60VAA**				
			Heat	**Heat cool**		
INDOOR UNIT		**Hydro module**	**EHPX-YM9D**	**ERPT20X-VM2D / ERPX-YM9D**		
		Memory module EHPT20X-YM9D				
Technical data of the outdoor unit						
Nominal heating output	(A2/W35)	[kW]	6.0			
heating capacity	(A-7/W35)	[kW]	6.0			
Max. heating output	(A-15/W35)	[kW]	5.3			
Performance range min./max.	(A2/W35)	[kW]	3.4 – 7.1			
COP (EN14511)	(A7/W35)	-	5.06			
COP (VDI4650)	(A-7/W35)	-	3.33			
	(A2/W35)	-	4.22			
	(A7/W35)	-	5.06			
	(A10/W35)	-	5.36			
Cooling capacity/EER	(A35/W7)	[kW] / -	–			
	(A35/W18)	[kW] / -	–			
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35			
	(cooling operation)	[°C]	–			
Nominal volume flow	(heating mode)	[l/min]	17.20			
	(cooling operation)	[l/min]	–			
Power supply for outdoor unit		[Ph], [V], [Hz]	1, 230, 50			
max. current consumption		[A]	13			
Max. Input		[kW]	2.81			
max. starting current		[A]	9			
validation		[A]	16			
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480			
Weight		[kg]	98			
connections	Heating VL/RL	-	G1			
Refrigerant / quantity	R32	[kg]	2.2			
Global warming potential (GWP)		-	675			
CO2 equivalent		[t]	1,485			
Sound power level	EN12102	[dB(A)]	58			
Technical data for indoor units			**EHPT20X-YM9D**	**EHPX-YM9D**	**ERPT20X-VM2D**	**ERPX-YM9D**
Max. flow temperature		[°C]	60	60	60	60
nominal storage capacity		[Liter]	200	–	200	–
Volume MAG		[Liter]	12	10	12	10
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	1, 230, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	2	3 / 6 / 9
	validation	[A]	16	16	16	16
Dimensions (Height × Width × Depth)		[mm]	1600 × 595 × 680	800 × 530 × 360	1600 × 595 × 680	800 × 530 × 360
Weight		[kg]	102	37	100	39
connections	Heating VL/RL	[mm]	28	G1	28	28
	TWW VL/RL	[mm]	22	–	22	–
	Cold liquid/gas	[mm]	–	6.35 / 12.7	–	–
Sound power level	EN12102	[db(A)]	40	41	40	40
energy efficiency class according to EU Regulation No. 811/2023						
Heating, average climate	Low temp. application		A+++	A+++	A+++	A+++
	Medium temperature application		A++	A++	A++	A++
Drinking water heating	tap profile	L	A	–	A	–

DEVICE NAME			Mono air/water heat pump		
OUTDOOR UNIT			Power inverter PUZ-WM85YAA		
			Heat	Heat cool	
INDOOR UNIT		Hydro module	EHPX-YM9D	ERPT20X-VM2D / ERPX-YM9D	
		Memory module			
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	8.5		
Heating output	(A-7/W35)	[kW]	8.5		
Max. heating output	(A-15/W35)	[kW]	7.3		
Power range min./max.	(A2/W35)	[kW]	3.4 – 9.7		
COP (EN14511)	(A7/W35)	-	4.80		
COP (VDI4650)	(A-7/W35)	-	3.05		
	(A2/W35)	-	4.23		
	(A7/W35)	-	4.80		
	(A10/W35)	-	5.10		
Cooling capacity/EER	(A35/W7)	[kW] / -	–		
	(A35/W18)	[kW] / -	–		
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35		
	(cooling operation)	[°C]	–		
Nominal volume flow	(heating mode)	[l/min]	24.40		
	(cooling operation)	[l/min]	–		
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50		
max. current consumption		[A]	11.5		
Max. Input		[kW]	2.49		
max. starting current		[A]	4		
validation		[A]	16		
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480		
Weight		[kg]	111		
connections	Heating VL/RL	-	G1		
Refrigerant / quantity	R32	[kg]	2.2		
Global warming potential (GWP)		-	675		
CO2 equivalent		[t]	1,485		
Sound power level	EN12102	[dB(A)]	58		
Technical data of indoor units			**EHPX-YM9D**	**ERPT20X-VM2D**	**ERPX-YM9D**
Max. flow temperature		[°C]	60	60	60
Nominal storage capacity		[Liter]	–	200	–
Volume MAG		[Liter]	10	12	10
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	1, 230, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	2	3 / 6 / 9
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	800×530×360
Weight		[kg]	37	100	39
connections	Heating VL/RL	[mm]	G1	28	28
	TWW VL/RL	[mm]	–	22	–
	Cold liquid/gas	[mm]	6.35/12.7	–	–
Sound power level	EN12102	[db(A)]	41	40	40
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A+++	A+++	A+++
	Medium temperature		A++	A++	A++
Drinking water heating	application tap profile	L	–	A	–

DEVICE NAME			**Mono air/water heat pump**		
OUTDOOR UNIT			**Power inverter PUZ-WM85YAA**		
			Heat	**Heat cool**	
INDOOR UNIT		**Hydro module**			
		Memory module	**EHPT20X-YM9D / EHPT30X-YM9ED**	**ERPT30X-VM2ED**	
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	8.5		
heating capacity	(A-7/W35)	[kW]	8.5		
Max. heating output	(A-15/W35)	[kW]	7.3		
Performance range min./max.	(A2/W35)	[kW]	3.4 – 9.7		
COP (EN14511)	(A7/W35)	-	4.80		
COP (VDI4650)	(A-7/W35)	-	3.05		
	(A2/W35)	-	4.23		
	(A7/W35)	-	4.80		
	(A10/W35)	-	5.10		
Cooling capacity/EER	(A35/W7)	[kW] / -	–		
	(A35/W18)	[kW] / -	–		
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35		
	(cooling operation)	[°C]	–		
Nominal volume flow	(heating mode)	[l/min]	24.40		
	(cooling operation)	[l/min]	–		
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50		
max. current consumption		[A]	11.5		
Max. Input		[kW]	2.49		
max. starting current		[A]	4		
validation		[A]	16		
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480		
Weight		[kg]	111		
connections	Heating VL/RL	-	G1		
Refrigerant / quantity	R32	[kg]	2.2		
Global warming potential (GWP)		-	675		
CO2 equivalent		[t]	1,485		
Sound power level	EN12102	[dB(A)]	58		
Technical data for indoor units			**EHPT20X-YM9D**	**EHPT30X-YM9ED**	**ERPT30X-VM2ED**
Max. flow temperature		[°C]	60	60	60
Nominal storage capacity		[Liter]	200	300	300
Volume MAG		[Liter]	12	10	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	1, 230, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	2
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	1600×595×680	2050×595×680	1600×595×680
Weight		[kg]	102	109	107
connections	Heating VL/RL	[mm]	28	28	28
	TWW VL/RL	[mm]	22	22	22
	Refrigeration liquid/	[mm]	–	–	–
gas **Sound power level**	EN12102	[db(A)]	40	40	40
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A+++	A+++	A+++
	Medium temperature application		A++	A++	A++
Drinking water heating	tap profile	L	A	A+	A+

DEVICE NAME			**Mono air/water heat pump**		
OUTDOOR UNIT			**Power inverter PUZ-WM112YAA**		
			Heat	**Heat cool**	
INDOOR UNIT		**Hydro module**	**EHPX-YM9D**	**ERPT20X-VM2D / ERPX-YM9D**	
		Memory module			
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	11.2		
heating capacity	(A-7/W35)	[kW]	11.2		
Max. heating output	(A-15/W35)	[kW]	8.4		
Power range min./max.	(A2/W35)	[kW]	4.2 – 12.5		
COP (EN14511)	(A7/W35)	-	4.70		
COP (VDI4650)	(A-7/W35)	-	3.28		
	(A2/W35)	-	4.03		
	(A7/W35)	-	4.70		
	(A10/W35)	-	5.00		
Cooling capacity/EER	(A35/W7)	[kW] / -	–		
	(A35/W18)	[kW] / -	–		
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35		
	(cooling operation)	[°C]	–		
Nominal volume flow	(heating mode)	[l/min]	32.10		
	(cooling operation)	[l/min]	–		
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50		
max. current consumption		[A]	13		
Max. Input		[kW]	2.81		
max. starting current		[A]	5		
validation		[A]	16		
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480		
Weight		[kg]	132		
connections	Heating VL/RL	-	G1		
Refrigerant / amount	R32	[kg]	3		
of global warming potential (GWP)		-	675		
CO2 equivalent		[t]	2,025		
Sound power level	EN12102	[dB(A)]	60		
Technical data Indoor units Max.			**EHPX-YM9D**	**ERPT20X-VM2D**	**ERPX-YM9D**
flow temperature Nominal		[°C]	60	60	60
storage capacity		[Liter]	–	200	–
Volume MAG		[Liter]	10	12	10
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	1, 230, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	2	3 / 6 / 9
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	800×530×360
Weight		[kg]	37	100	39
connections	Heating VL/RL	[mm]	G1	28	28
	TWW VL/RL	[mm]	–	22	–
	Refrigeration liquid/	[mm]	6.35 / 12.7	–	–
gas **Sound power level**	EN12102	[db(A)]	41	40	40
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A+++	A+++	A+++
	Medium temperature application		A++	A++	A++
Drinking water heating	tap profile	L	–	A	–

DEVICE NAME			Mono air/water heat pump		
OUTDOOR UNIT			Power inverter PUZ-WM112YAA		
			Heat	Heat cool	
INDOOR UNIT			Hydro module		
			Memory module EHPT20X-YM9D / EHPT30X-YM9ED	ERPT30X-VM2ED	
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	11.2		
Heating output	(A-7/W35)	[kW]	11.2		
Max. heating output	(A-15/W35)	[kW]	8.4		
Power range min./max.	(A2/W35)	[kW]	4.2 – 12.5		
COP (EN14511)	(A7/W35)	-	4.70		
COP (VDI4650)	(A-7/W35)	-	3.28		
	(A2/W35)	-	4.03		
	(A7/W35)	-	4.70		
	(A10/W35)	-	5.00		
Cooling capacity/EER	(A35/W7)	[kW] / -	–		
	(A35/W18)	[kW] / -	–		
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35		
	(cooling operation)	[°C]	–		
Nominal volume flow	(heating mode)	[l/min]	32.10		
	(cooling operation)	[l/min]	–		
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50		
max. current consumption		[A]	13		
Max. Input		[kW]	2.81		
max. starting current		[A]	5		
validation		[A]	16		
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480		
Weight		[kg]	132		
connections	Heating VL/RL	-	G1		
Refrigerant / quantity	R32	[kg]	3		
Global warming potential (GWP)		-	675		
CO2 equivalent		[t]	2,025		
Sound power level	EN12102	[dB(A)]	60		
Technical data for indoor units			EHPT20X-YM9D	EHPT30X-YM9ED	ERPT30X-VM2ED
Max. flow temperature		[°C]	60	60	60
Nominal storage capacity		[Liter]	200	300	300
Volume MAG		[Liter]	12	–	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	1, 230, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	2
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	1600×595×680	2050×595×680	1600×595×680
Weight		[kg]	102	109	107
connections	Heating VL / RL	[mm]	28	28	28
	TWW VL/RL	[mm]	22	22	22
	Cold liquid/gas	[mm]	–	–	–
Sound power level	EN12102	[db(A)]	40	40	40
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A+++	A+++	A+++
	Medium temp. application		A++	A++	A++
Drinking water heating	Tap profile	L	A	A+	A+

DEVICE NAME			Mono air/water heat pump			
OUTDOOR UNIT			Power inverter PUZ-HWM140YHA			
			Heat		Heat cool	
INDOOR UNIT			Hydro module			
			Memory module EHPT20X-YM9D / EHPT30XYM9ED		ERPT20X-VM2D / ERPT30X-VM2ED	
Technical data of the outdoor unit						
Nominal heating output	(A2/W35)	[kW]	14.0			
Heating output	(A-7/W35)	[kW]	14.0			
Max. heating output	(A-15/W35)	[kW]	14.0			
Power range min./max.	(A2/W35)	[kW]	5.1 – 16.3			
COP (EN14511)	(A7/W35)	-	4.46			
COP (VDI4650)	(A-7/W35)	-	2.51			
	(A2/W35)	-	3.89			
	(A7/W35)	-	4.46			
	(A10/W35)	-	4.76			
Cooling capacity/EER	(A35/W7)	[kW] / -	–			
	(A35/W18)	[kW] / -	–			
Area of application outside air temperature	(heating mode)	[°C]	-28 ~ +35			
	(cooling operation)	[°C]	+10 ~ 46			
Nominal volume flow	(heating mode)	[l/min]	40.1			
	(cooling operation)	[l/min]	– / 34.1			
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50			
max. current consumption		[A]	13.0			
Max. Input		[kW]	2.84			
max. starting current		[A]	7			
validation		[A]	16			
Dimensions (Height × Width × Depth)		[mm]	1350×1020×330			
Weight		[kg]	143			
connections	Heating VL/RL	-	G1			
Refrigerant / amount	R32	[kg]	3.3			
of global warming potential (GWP)		-	675			
CO2 equivalent		[t]	2,275			
Sound power level	EN12102	[dB(A)]	53			
Technical data Indoor units Max.			EHPT20X-YM9D	EHPT30XYM9ED	ERPT20X-VM2D	ERPT30X-VM2ED
flow temperature Nominal		[°C]	60	60	60	60
storage capacity		[Liter]	200	300	200	300
Volume MAG		[Liter]	12	–	12	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	1, 230, 50	1, 230, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	2	2
	validation	[A]	16	16	16	16
Dimensions (Height × Width × Depth)		[mm]	1600 × 595 × 680	2050 × 595 × 680	1600 × 595 × 680	1600 × 595 × 680
Weight		[kg]	102	109	94	107
connections	Heating VL / RL	[mm]	28	28	28	28
	TWW VL/RL	[mm]	22	22	22	22
	Cold liquid/gas	[mm]	–	–	–	–
Sound power level	EN12102	[db(A)]	40	40	40	40
energy efficiency class according to EU Regulation No. 811/2023						
Heating, average climate	Low temp. application		A+++	A+++	A+++	A+++
	Medium temperature application		A++	A++	A++	A++
Drinking water heating	tap profile	L	A	A+	A+	A+

DEVICE NAME			Mono air/water heat pump			
OUTDOOR UNIT			Power inverter PUZ-HWM140YHA			
			Heat		Heat cool	
INDOOR UNIT		Hydro module	EHPX-MED / EHPX-YM9D		ERPX-MD / ERPX-YM9D	
		Memory module				
Technical data of the outdoor unit						
Nominal heating output	(A2/W35)	[kW]	14.0			
heating capacity	(A-7/W35)	[kW]	14.0			
Max. heating output	(A-15/W35)	[kW]	14.0			
Performance range min./max.	(A2/W35)	[kW]	5.1 – 16.3			
COP (EN14511)	(A7/W35)	-	4.46			
COP (VDI4650)	(A-7/W35)	-	2.51			
	(A2/W35)	-	3.89			
	(A7/W35)	-	4.46			
	(A10/W35)	-	4.76			
Cooling capacity/EER	(A35/W7)	[kW] / -	–			
	(A35/W18)	[kW] / -	–			
Area of application outside air temperature	(heating mode)	[°C]	-28 ~ +21			
	(cooling operation)	[°C]	+10 ~ 46			
Nominal volume flow	(heating mode)	[l/min]	40.1			
	(cooling operation)	[l/min]	– / 34.1			
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50			
max. current consumption		[A]	13.0			
Max. Input		[kW]	2.84			
max. starting current		[A]	7			
validation		[A]	16			
Dimensions (Height × Width × Depth)		[mm]	1350×1020×330			
Weight		[kg]	143			
connections	Heating VL/RL	-	G1			
Refrigerant / quantity	R32	[kg]	3.3			
Global warming potential (GWP)		-	675			
CO2 equivalent		[t]	2.2275			
Sound power level	EN12102	[dB(A)]	67			
Technical data for indoor units			**EHPX-MED**	**EHPX-YM9D**	**ERPX MD**	**ERPX-YM9D**
Max. flow temperature		[°C]	60	60	60	60
nominal storage capacity		[Liter]	–	–	–	–
Volume MAG		[Liter]	–	10	–	10
heating rod	Power supply	[Ph], [V], [Hz]	–	3, 400, 50	–	3, 400, 50
	Performance	[kW]	–	3 / 6 / 9	–	3 / 6 / 9
	validation	[A]	–	16	–	16
Dimensions (Height × Width × Depth)		[mm]	800 × 530 × 350	800 × 530 × 350	800 × 530 × 350	800 × 530 × 360
Weight		[kg]	25	37	30	39
connections	Heating VL/RL	[mm]	28	G1	G1-B	28
	TWW VL/RL	[mm]	–	–		–
	Refrigeration liquid/	[mm]	–	6.35 / 12.7	–	–
gas Sound power level	EN12102	[db(A)]	40	41	40	40
Energy efficiency class according to EU Regulation No. 811/2023						
Heating, average climate	Low temp. application		–	A+++	–	A+++
	Medium temp. application		–	A++	–	A++
Drinking water heating	Tap profile	L	–	–	–	–

DEVICE NAME			Split air/water heat pump	
OUTDOOR UNIT			Power inverter SUZ-SWM40VA	
			Heat cool	
INDOOR UNIT		Hydro module	ERSD-YM9D	
		Memory module ERST20D-YM9D		
Technical data of the outdoor unit				
Nominal heating output	(A2/W35)	[kW]	4.0	
heating capacity	(A-7/W35)	[kW]	5.0	
Max. heating output	(A-15/W35)	[kW]	4.3	
Performance range min./max.	(A2/W35)	[kW]	2.2 – 5.9	
COP (EN14511)	(A7/W35)	-	5.20	
COP (VDI4650)	(A-7/W35)	-	2.84	
	(A2/W35)	-	4.02	
	(A7/W35)	-	5.20	
	(A10/W35)	-	5.50	
Cooling capacity/EER	(A35/W7)	[kW] / -	4.5 / 3.29	
	(A35/W18)	[kW] / -	5.6 / 4.97	
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35	
	(cooling operation)	[°C]	+10 ~ +46	
Nominal volume flow	(heating mode)	[l/min]	11.50	
	(cooling operation)	[l/min]	12.90	
Power supply for outdoor unit		[Ph], [V], [Hz]	1, 230, 50	
max. current consumption		[A]	13.9	
Max. Input		[kW]	3.10	
max. starting current		[A]	5	
validation		[A]	16	
Dimensions (Height × Width × Depth)		[mm]	840×880×330	
Weight		[kg]	54	
connections	Heating VL/RL	-	6.35 / 12.7	
Refrigerant / quantity	R32	[kg]	1.2	
Global warming potential (GWP)		-	675	
CO2 equivalent		[t]	0.81	
Sound power level	EN12102	[dB(A)]	58	
Technical data for indoor units			**ERSD-YM9D**	**FIRST20D-YM9D**
Max. flow temperature		[°C]	60	60
nominal storage capacity		[Liter]	–	–
Volume MAG		[Liter]	–	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50
	Performance	[kW]	3+6	3+6
	validation	[A]	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680
Weight		[kg]	50	102
connections	Heating VL/RL	[mm]	G1-B	28
	TWW VL/RL	[mm]	–	22
	Cold liquid/gas	[mm]	6.35 / 12.7	6.35 / 12.7
Sound power level	EN12102	[db(A)]	41	41
energy efficiency class according to EU Regulation No. 811/2023				
Heating, average climate	Low temp. application		–	–
	Medium temp. application		–	–
Drinking water heating	tap profile	L	–	L

DEVICE NAME			Split air/water heat pump		
OUTDOOR UNIT			Power inverter SUZ-SWM60VA		
			Heat cool		
INDOOR UNIT		Hydro module	ERSD-YM9D		
			Memory module ERST20D-YM9D / ERST30D-VM2ED		
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	5.0		
heating capacity	(A-7/W35)	[kW]	6.0		
Max. heating output	(A-15/W35)	[kW]	5.7		
Performance range min./max.	(A2/W35)	[kW]	3.0 – 6.7		
COP (EN14511)	(A7/W35)	-	4.86		
COP (VDI4650)	(A-7/W35)	-	2.96		
	(A2/W35)	-	4.01		
	(A7/W35)	-	4.86		
	(A10/W35)	-	5.16		
Cooling capacity/EER	(A35/W7)	[kW] / -	5.0 / 3.02		
	(A35/W18)	[kW] / -	6.0 / 4.88		
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35		
	(cooling operation)	[°C]	+10 ~ +46		
Nominal volume flow	(heating mode)	[l/min]	14.30		
	(cooling operation)	[l/min]	14.30		
Power supply for outdoor unit		[Ph], [V], [Hz]	1, 230, 50		
max. current consumption		[A]	13.9		
Max. Input		[kW]	3.10		
max. starting current		[A]	7		
validation		[A]	16		
Dimensions (Height × Width × Depth)		[mm]	840×880×330		
Weight		[kg]	54		
connections	Heating VL/RL	-	6.35 / 12.7		
Refrigerant / quantity	R32	[kg]	1.2		
Global warming potential (GWP)		-	675		
CO2 equivalent		[t]	0.81		
Sound power level	EN12102	[dB(A)]	60		
Technical data for indoor units Max.			**ERSD-YM9D**	**FIRST20D-YM9D**	**FIRST30D-VM2ED**
flow temperature		[°C]	60	60	60
Nominal storage capacity		[Liter]	–	–	300
Volume MAG		[Liter]	–	–	12
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	~/N, 230, 50
	Performance	[kW]	3+6	3+6	2
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	2050×595×680
Weight		[kg]	44	310	110
connections	Heating VL/RL	[mm]	G1-B	28	28
	TWW VL/RL	[mm]	–	22	22
	Refrigeration liquid/	[mm]	6.35 / 12.7	6.35 / 12.7	12.7 / 6.35
gas **Sound power level**	EN12102	[db(A)]	41	41	41
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		–	–	A++
	Medium temperature application		–	–	A++
Drinking water heating	tap profile	L	–	L	A+

DEVICE NAME			Split air/water heat pump	
OUTDOOR UNIT			Power inverter SUZ-SWM80VA	
				Heat cool
INDOOR UNIT			Hydro module	
			Memory module ERST20D-YM9D / ERST30D-VM2ED	
Technical data of the outdoor unit				
Nominal heating output	(A2/W35)	[kW]	6.5	
heating capacity	(A-7/W35)	[kW]	6.8	
Max. heating output	(A-15/W35)	[kW]	6.0	
Performance range min./max.	(A2/W35)	[kW]	3.0 – 7.1	
COP (EN14511)	(A7/W35)	-	4.97	
COP (VDI4650)	(A-7/W35)	-	3.27	
	(A2/W35)	-	3.68	
	(A7/W35)	-	4.97	
	(A10/W35)	-	5.27	
Cooling capacity/EER	(A35/W7)	[kW] / -	5.0 / 3.02	
	(A35/W18)	[kW] / -	6.0 / 4.88	
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35	
	(cooling operation)	[°C]	+10 ~ +46	
Nominal volume flow	(heating mode)	[l/min]	18.60	
	(cooling operation)	[l/min]	15.50	
Power supply for outdoor unit		[Ph], [V], [Hz]	1, 230, 50	
max. current consumption		[A]	13.9	
Max. Input		[kW]	3.10	
max. starting current		[A]	7	
validation		[A]	16	
Dimensions (Height × Width × Depth)		[mm]	840×880×330	
Weight		[kg]	54	
connections	Heating VL/RL	-	6.35 / 12.7	
Refrigerant / quantity	R32	[kg]	1.2	
Global warming potential (GWP)		-	675	
CO2 equivalent		[t]	0.81	
Sound power level	EN12102	[dB(A)]	62	
Technical data for indoor units Max.			**ERSD-YM9D**	**ERSD MED**
flow temperature		[°C]	60	60
Nominal storage capacity		[Liter]	–	–
Volume MAG		[Liter]	–	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	–
	Performance	[kW]	3+6	–
	validation	[A]	16	–
Dimensions (Height × Width × Depth)		[mm]	800×530×360	800×530×360
Weight		[kg]	44	38
connections	Heating VL/RL	[mm]	G1-B	G1-B
	TWW VL/RL	[mm]	–	–
	Refrigeration liquid/	[mm]	6.35 / 12.7	6.35 / 12.7
gas **Sound power level**	EN12102	[db(A)]	41	41
Energy efficiency class according to EU Regulation No. 811/2023				
Heating, average climate	Low temp. application		–	–
	Medium temperature application		–	–
Drinking water heating	tap profile	L	–	–

DEVICE NAME			Split air/water heat pump		
OUTDOOR UNIT			Power inverter PUD-SWM60VAA		
			Heat		
INDOOR UNIT		Hydro module	EHSD-YM9D		
		Memory module	EHST20D-YM9D / EHST30D-YM9ED		
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	6.0		
heating capacity	(A-7/W35)	[kW]	6.0		
Max. heating output	(A-15/W35)	[kW]	5.7		
Performance range min./max.	(A2/W35)	[kW]	3.1 – 7.1		
COP (EN14511)	(A7/W35)	-	4.76		
COP (VDI4650)	(A-7/W35)	-	3.13		
	(A2/W35)	-	3.91		
	(A7/W35)	-	4.76		
	(A10/W35)	-	5.06		
Cooling capacity/EER	(A35/W7)	[kW] / -	–		
	(A35/W18)	[kW] / -	–		
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35		
	(cooling operation)	[°C]	–		
Nominal volume flow	(heating mode)	[l/min]	17.20		
	(cooling operation)	[l/min]	–		
Power supply for outdoor unit		[Ph], [V], [Hz]	1, 230, 50		
max. current consumption		[A]	16.5		
Max. Input		[kW]	3.68		
max. starting current		[A]	12		
validation		[A]	20		
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480		
Weight		[kg]	101		
connections	Heating liquid./ gas	-	6.35 / 12.7		
Refrigerant / quantity	R32	[kg]	1.3		
Global warming potential (GWP)		-	675		
CO2 equivalent		[t]	0.8775		
Sound power level	EN12102	[dB(A)]	55		
Technical data of indoor units			**EHSD-YM9D**	**EHST20D-YM9D**	**EHST30D-YM9ED**
Max. flow temperature		[°C]	60	60	60
Nominal storage capacity		[Liter]	–	200	300
Volume MAG		[Liter]	10	12	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	3 / 6 / 9
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	2050×595×680
Weight		[kg]	44	106	116
connections	Heating VL/RL	[mm]	28	28	28
	TWW VL/RL	[mm]	–	22	22
	Cold liquid/gas	[mm]	6.35 / 12.7	6.35 / 12.7	6.35 / 12.7
Sound power level	EN12102	[db(A)]	41	41	41
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A++	A++	A++
	Medium temp. application		A++	A++	A++
Drinking water heating	Tap profile	L/XL	–	A	A+

DEVICE NAME		Split air/water heat pump			
OUTDOOR UNIT		Power inverter PUD-SWM80YAA			
			Heat		
INDOOR UNIT		Hydro module	EHSD-YM9D		
		Memory module EHST20D-YM9D / EHST30D-YM9ED			

Technical data of the outdoor unit			
Nominal heating output	(A2/W35)	[kW]	8.0
heating capacity	(A-7/W35)	[kW]	8.0
Max. heating output	(A-15/W35)	[kW]	7.3
Performance range min./max.	(A2/W35)	[kW]	3.1 – 9.3
COP (EN14511)	(A7/W35)	-	4.76
COP (VDI4650)	(A-7/W35)	-	2.91
	(A2/W35)	-	3.94
	(A7/W35)	-	4.76
	(A10/W35)	-	5.06
Cooling capacity/EER	(A35/W7)	[kW] / -	–
	(A35/W18)	[kW] / -	–
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35
	(cooling operation)	[°C]	–
Nominal volume flow	(heating mode)	[l/min]	22.90
	(cooling operation)	[l/min]	–
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50
max. current consumption		[A]	8th
Max. Input		[kW]	5.21
max. starting current		[A]	5
validation		[A]	16
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480
Weight		[kg]	114
connections	Heating liquid./ gas	-	6.35 / 12.7
Refrigerant / quantity	R32	[kg]	1.3
Global warming potential (GWP)		-	675
CO2 equivalent		[t]	0.8775
Sound power level	EN12102	[dB(A)]	56

Technical data of indoor units			EHSD-YM9D	EHST20D-YM9D	EHST30D-YM9ED
Max. flow temperature		[°C]	60	60	60
Nominal storage capacity		[Liter]	–	200	300
Volume MAG		[Liter]	10	12	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	3 / 6 / 9
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	2050×595×680
Weight		[kg]	44	106	116
connections	Heating VL/RL	[mm]	28	28	28
	TWW VL/RL	[mm]	–	22	22
	Cold liquid/gas	[mm]	6.35 / 12.7	6.35 / 12.7	6.35 / 12.7
Sound power level	EN12102	[db(A)]	41	41	41
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A++	A++	A++
	Medium temp. application		A++	A++	A++
Drinking water heating	Tap profile	L/XL	–	A	A+

DEVICE NAME			Split air/water heat pump		
OUTDOOR UNIT			Power inverter PUD-SWM100YAA		
			Heat		
INDOOR UNIT		Hydro module	EHSD-YM9D		
		Memory module	EHST20D-YM9D / EHST30D-YM9ED		
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	10.0		
heating capacity	(A-7/W35)	[kW]	10.0		
Max. heating output	(A-15/W35)	[kW]	9.0		
Performance range min./max.	(A2/W35)	[kW]	3.2 – 12.1		
COP (EN14511)	(A7/W35)	-	5.00		
COP (VDI4650)	(A-7/W35)	-	3.02		
	(A2/W35)	-	3.96		
	(A7/W35)	-	5.00		
	(A10/W35)	-	5.30		
Cooling capacity/EER	(A35/W7)	[kW] / -	–		
	(A35/W18)	[kW] / -	–		
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35		
	(cooling operation)	[°C]	–		
Nominal volume flow	(heating mode)	[l/min]	28.70		
	(cooling operation)	[l/min]	–		
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50		
max. current consumption		[A]	10		
Max. Input		[kW]	6.51		
max. starting current		[A]	5		
validation		[A]	16		
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480		
Weight		[kg]	120		
connections	Heating liquid./ gas	-	6.35 / 12.7		
Refrigerant / quantity	R32	[kg]	1.6		
Global warming potential (GWP)		-	675		
CO2 equivalent		[t]	1.08		
Sound power level	EN12102	[dB(A)]	59		
Technical data of indoor units			**EHSD-YM9D**	**EHST20D-YM9D**	**EHST30D-YM9ED**
Max. flow temperature		[°C]	60	60	60
Nominal storage capacity		[Liter]	–	200	300
Volume MAG		[Liter]	10	12	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	3 / 6 / 9
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	2050×595×680
Weight		[kg]	44	106	116
connections	Heating VL/RL	[mm]	28	28	28
	TWW VL/RL	[mm]	–	22	22
	Cold liquid/gas	[mm]	6.35 / 12.7	6.35 / 12.7	6.35 / 12.7
Sound power level	EN12102	[db(A)]	41	41	41
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A++	A++	A++
	Medium temp. application		A++	A++	A++
Drinking water heating	Tap profile	L/XL	–	A	A+

DEVICE NAME			Split air/water heat pump		
OUTDOOR UNIT			Power inverter PUD-SWM120YAA		
			Heat		
INDOOR UNIT		Hydro module	EHSD-YM9D		
		Memory module	EHST20D-YM9D / EHST30D-YM9ED		
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	12.0		
heating capacity	(A-7/W35)	[kW]	12.0		
Max. heating output	(A-15/W35)	[kW]	10.4		
Performance range min./max.	(A2/W35)	[kW]	3.2 – 12.7		
COP (EN14511)	(A7/W35)	-	4.70		
COP (VDI4650)	(A-7/W35)	-	2.78		
	(A2/W35)	-	3.96		
	(A7/W35)	-	4.70		
	(A10/W35)	-	5.00		
Cooling capacity/EER	(A35/W7)	[kW] / -	–		
	(A35/W18)	[kW] / -	–		
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35		
	(cooling operation)	[°C]	–		
Nominal volume flow	(heating mode)	[l/min]	34.40		
	(cooling operation)	[l/min]	–		
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50		
max. current consumption		[A]	12		
Max. Input		[kW]	7.82		
max. starting current		[A]	5		
validation		[A]	16		
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480		
Weight		[kg]	120		
connections	Heating liquid./ gas	-	6.35×12.7		
Refrigerant / quantity	R32	[kg]	1.6		
Global warming potential (GWP)		-	675		
CO2 equivalent		[t]	1.08		
Sound power level	EN12102	[dB(A)]	60		
Technical data of indoor units			**EHSD-YM9D**	**EHST20D-YM9D**	**EHST30D-YM9ED**
Max. flow temperature		[°C]	60	60	60
Nominal storage capacity		[Liter]	–	200	300
Volume MAG		[Liter]	10	12	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	3 / 6 / 9
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	2050×595×680
Weight		[kg]	44	106	116
connections	Heating VL/RL	[mm]	28	28	28
	TWW VL/RL	[mm]	–	22	22
	Cold liquid/gas	[mm]	6.35 / 12.7	6.35 / 12.7	6.35 / 12.7
Sound power level	EN12102	[db(A)]	41	41	41
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A++	A++	A++
	Medium temp. application		A++	A++	A++
Drinking water heating	Tap profile	L/XL	–	A	A+

DEVICE NAME			Split heat pump	
OUTDOOR UNIT			Power inverter PUHZ-SW160YKA	
			Heat	Heat cool
INDOOR UNIT		Hydro module	EHSE-YM9ED	ERSE-YM9ED
		Memory module		
Technical data of the outdoor unit				
Nominal heating output	(A2/W35)	[kW]	16	
heating capacity	(A-7/W35)	[kW]	13.4	
Max. heating output	(A-15/W35)	[kW]	11.6	
Performance range min./max.	(A2/W35)	[kW]	10.6 – 19.9	
COP (EN14511)	(A7/W35)	-	22.0/4.21	
COP (VDI4650)	(A-7/W35)	-	2.80	
	(A2/W35)	-	3.11	
	(A7/W35)	-	4.20	
	(A10/W35)	-	–	
Cooling capacity/EER	(A35/W7)	[kW] / -	16.00/2.76	
	(A35/W18)	[kW] / -	18.00/4.56	
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35	
	(cooling operation)	[°C]	+10 ~ +46	
Nominal volume flow	(heating mode)	[l/min]	–	
	(cooling operation)	[l/min]	–	
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50	
max. current consumption		[A]	19	
Max. Input		[kW]	12.27	
max. starting current		[A]	6	
validation		[A]	25	
Dimensions (Height × Width × Depth)		[mm]	1050×330×1338	
Weight		[kg]	136	
connections	Heating liquid./ gas	-	9.52 / 25.4	
Refrigerant / quantity	R410A	[kg]	7.1	
Global warming potential (GWP)		-	675	
CO2 equivalent		[t]	4.79	
Sound power level	EN12102	[dB(A)]	78	
Technical data of indoor units			**EHSE-YM9ED**	**ERSE-YM9ED**
Max. flow temperature		[°C]	–	–
Nominal storage capacity		[Liter]	–	–
Volume MAG		[Liter]	–	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9
	validation	[A]	16	16
Dimensions (Height × Width × Depth)		[mm]	950×360×600	950×360×600
Weight		[kg]	63	64
connections	Heating VL/RL	[mm]	G1 1/2" AG	G1 1/2" AG
	TWW VL/RL	[mm]	–	–
	Cold liquid/gas	[mm]	9.52 / 25.4	9.52 / 25.4
Sound power level	EN12102	[db(A)]	45	45
Energy efficiency class according to EU Regulation No. 811/2023				
Heating, average climate	Low temp. application		–	–
	Medium temp. application		–	–
Drinking water heating	Tap profile	L/XL	–	–

DEVICE NAME			Split heat pump	
OUTDOOR UNIT			Power inverter PUHZ-SW200YKA	
			Heat	Heat cool
INDOOR UNIT		Hydro module	EHSE-YM9ED	ERSE-YM9ED
		Memory module		
Technical data of the outdoor unit				
Nominal heating output	(A2/W35)	[kW]	20	
heating capacity	(A-7/W35)	[kW]	15.3	
Max. heating output	(A-15/W35)	[kW]	13.5	
Performance range min./max.	(A2/W35)	[kW]	10.5 – 21.5	
COP (EN14511)	(A7/W35)	-	25.0/4.00	
COP (VDI4650)	(A-7/W35)	-	2.67	
	(A2/W35)	-	2.80	
	(A7/W35)	-	4.00	
	(A10/W35)	-	–	
Cooling capacity/EER	(A35/W7)	[kW] / -	20.0/2.25	
	(A35/W18)	[kW] / -	22.0/4.1	
Area of application outside air temperature	(heating mode)	[°C]	-20 ~ +35	
	(cooling operation)	[°C]	+10 ~ +46	
Nominal volume flow	(heating mode)	[l/min]	–	
	(cooling operation)	[l/min]	–	
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50	
max. current consumption		[A]	21	
Max. Input		[kW]	13.78	
max. starting current		[A]	8th	
validation		[A]	32	
Dimensions (Height × Width × Depth)		[mm]	1050×330×1338	
Weight		[kg]	136	
connections	Heating liquid./ gas	-	12.7 / 25.4	
Refrigerant / quantity	R410A	[kg]	7.7	
Global warming potential (GWP)		-	675	
CO2 equivalent		[t]	5.2	
Sound power level	EN12102	[dB(A)]	78	
Technical data of indoor units			**EHSE-YM9ED**	**ERSE-YM9ED**
Max. flow temperature		[°C]	–	–
Nominal storage capacity		[Liter]	–	–
Volume MAG		[Liter]	–	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9
	validation	[A]	16	16
Dimensions (Height × Width × Depth)		[mm]	950×360×600	950×360×600
Weight		[kg]	63	64
connections	Heating VL/RL	[mm]	G1 1/2" AG	G1 1/2" AG
	TWW VL/RL	[mm]	–	–
	Cold liquid/gas	[mm]	9.52 / 25.4	9.52 / 25.4
Sound power level	EN12102	[db(A)]	45	45
Energy efficiency class according to EU Regulation No. 811/2023				
Heating, average climate	Low temp. application		–	–
	Medium temp. application		–	–
Drinking water heating	Tap profile	L/XL	–	–

DEVICE NAME			Mono air/water heat pump
OUTDOOR UNIT			Power inverter QUHZ-W40VA
			Heat
INDOOR UNIT			Hydro module
			Memory module EHPT20Q-VM2EA
Technical data of the outdoor unit			
Nominal heating output	(A2/W35)	[kW]	4.0
heating capacity	(A-7/W35)	[kW]	4.2
Max. heating output	(A-15/W35)	[kW]	3.9
Performance range min./max.	(A2/W35)	[kW]	1.94 – 5.72
COP (EN14511)	(A7/W35)	-	3.36
COP (VDI4650)	(A-7/W35)	-	2.55
	(A2/W35)	-	3.41
	(A7/W35)	-	3.36
	(A10/W35)	-	3.66
Cooling capacity/EER	(A35/W7)	[kW] / -	–
	(A35/W18)	[kW] / -	–
Area of application outside air temperature	(heating mode)	[°C]	-15 ~ +35
	(cooling operation)	[°C]	–
Nominal volume flow	(heating mode)	[l/min]	8.00
	(cooling operation)	[l/min]	–
Power supply for outdoor unit		[Ph], [V], [Hz]	1, 230, 50
max. current consumption		[A]	12
Max. Input		[kW]	2.21
max. starting current		[A]	5
validation		[A]	16
Dimensions (Height × Width × Depth)		[mm]	715×879×320
Weight		[kg]	57
connections	Heating liquid./ gas	-	G1"
Refrigerant / quantity	R32	[kg]	1.15
Global warming potential (GWP)		-	675
CO2 equivalent		[t]	0.00115
Sound power level	EN12102	[dB(A)]	53
Technical data of indoor units			**EHPT20Q-VM2EA**
Max. flow temperature		[°C]	70
Nominal storage capacity		[Liter]	200
Volume MAG		[Liter]	–
heating rod	Power supply	[Ph], [V], [Hz]	1, 230, 50
	Performance	[kW]	2
	validation	[A]	16
Dimensions (Height × Width × Depth)		[mm]	1600×595×680
Weight		[kg]	77
connections	Heating VL/RL	[mm]	22
	TWW VL/RL	[mm]	22
	Cold liquid/gas	[mm]	–
Sound power level	EN12102	[db(A)]	40
Energy efficiency class according to EU Regulation No. 811/2023			
Heating, average climate	Low temp. application		A++
	Medium temp. application		A+
Drinking water heating	Tap profile	L	A+

DEVICE NAME			Split air/water heat pump		
OUTDOOR UNIT			Zubadan inverter PUD-SHWM60VAA		
			Heat		
INDOOR UNIT	Hydro module		EHSD-YM9D		
	Memory module EHST20D-YM9D / EHST30D-YM9ED				
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	6.0		
heating capacity	(A-7/W35)	[kW]	6.0		
Max. heating output	(A-15/W35)	[kW]	7.3		
Performance range min./max.	(A2/W35)	[kW]	3.1 – 7.0		
COP (EN14511)	(A7/W35)	-	4.99		
COP (VDI4650)	(A-7/W35)	-	3.21		
	(A2/W35)	-	3.95		
	(A7/W35)	-	4.99		
	(A10/W35)	-	5.29		
Cooling capacity/EER	(A35/W7)	[kW] / -	–		
	(A35/W18)	[kW] / -	–		
Area of application outside air temperature	(heating mode)	[°C]	-28 ~ +35		
	(cooling operation)	[°C]	–		
Nominal volume flow	(heating mode)	[l/min]	17.20		
	(cooling operation)	[l/min]	–		
Power supply for outdoor unit		[Ph], [V], [Hz]	1, 230, 50		
max. current consumption		[A]	16.5		
Max. Input		[kW]	3.68		
max. starting current		[A]	12		
validation		[A]	20		
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480		
Weight		[kg]	102		
connections	Cold liquid/gas -		6.35 / 12.7		
Refrigerant / quantity	R32	[kg]	1.4		
Global warming potential (GWP)		-	675		
CO2 equivalent		[t]	0.945		
Sound power level	EN12102	[dB(A)]	55		
Technical data for indoor units Max.			**EHSD-YM9D**	**EHST20D-YM9D**	**EHST30D-YM9ED**
flow temperature		[°C]	60	60	60
Nominal storage capacity		[Liter]	–	200	300
Volume MAG		[Liter]	10	12	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	3 / 6 / 9
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	2050×595×680
Weight		[kg]	44	106	116
connections	Heating VL/RL	[mm]	28	28	28
	TWW VL/RL	[mm]	–	22	22
	Refrigeration liquid/	[mm]	6.35 / 12.7	6.35 / 12.7	6.35 / 12.7
gas **Sound power level**	EN12102	[db(A)]	41	41	41
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A++	A++	A++
	Medium temperature application		A++	A++	A++
Drinking water heating	tap profile	L/XL	–	A	A+

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DEVICE NAME		Split air/water heat pump		
OUTDOOR UNIT		Zubadan inverter PUD-SHWM80YAA		
			Heat	
INDOOR UNIT		Hydro module	EHSD-YM9D	
		Memory module EHST20D-YM9D / EHST30D-YM9ED		

Technical data of the outdoor unit			
Nominal heating output	(A2/W35)	[kW]	8.0
heating capacity	(A-7/W35)	[kW]	8.0
Max. heating output	(A-15/W35)	[kW]	8.8
Performance range min./max.	(A2/W35)	[kW]	3.1 – 9.5
COP (EN14511)	(A7/W35)	-	5.03
COP (VDI4650)	(A-7/W35)	-	3.02
	(A2/W35)	-	3.94
	(A7/W35)	-	5.03
	(A10/W35)	-	5.33
Cooling capacity/EER	(A35/W7)	[kW] / -	–
	(A35/W18)	[kW] / -	–
Area of application outside air temperature	(heating mode)	[°C]	-28 ~ +35
	(cooling operation)	[°C]	–
Nominal volume flow	(heating mode)	[l/min]	22.90
	(cooling operation)	[l/min]	–
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50
max. current consumption		[A]	8th
Max. Input		[kW]	5.21
max. starting current		[A]	5
validation		[A]	16
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480
Weight		[kg]	115
connections	Cold liquid/gas -		6.35 / 12.7
Refrigerant / quantity	R32	[kg]	1.4
Global warming potential (GWP)		-	675
CO2 equivalent		[t]	0.945
Sound power level	EN12102	[dB(A)]	56

Technical data for indoor units Max.			EHSD-YM9D	EHST20D-YM9D	EHST30D-YM9ED
flow temperature		[°C]	60	60	60
Nominal storage capacity		[Liter]	–	200	300
Volume MAG		[Liter]	10	12	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	3 / 6 / 9
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	2050×595×680
Weight		[kg]	44	106	116
connections	Heating VL/RL	[mm]	28	28	28
	TWW VL/RL	[mm]	–	22	22
	Refrigeration liquid/	[mm]	6.35 / 12.7	6.35 / 12.7	6.35 / 12.7
gas Sound power level	EN12102	[db(A)]	41	41	41
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A++	A++	A++
	Medium temperature application		A++	A++	A++
Drinking water heating	tap profile	L/XL	–	A	A+

DEVICE NAME			Split air/water heat pump		
OUTDOOR UNIT			Zubadan inverter PUD-SHWM100YAA		
			Heat		
INDOOR UNIT		Hydro module	EHSD-YM9D		
		Memory module EHST20D-YM9D / EHST30D-YM9ED			
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	10.0		
Heating output	(A-7/W35)	[kW]	10.0		
Max. heating output	(A-15/W35)	[kW]	10.7		
Power range min./max.	(A2/W35)	[kW]	3.2 – 12.4		
COP (EN14511)	(A7/W35)	-	5.00		
COP (VDI4650)	(A-7/W35)	-	3.08		
	(A2/W35)	-	3.96		
	(A7/W35)	-	5.00		
	(A10/W35)	-	5.30		
Cooling capacity/EER	(A35/W7)	[kW] / -	–		
	(A35/W18)	[kW] / -	–		
Area of application outside air temperature	(heating mode)	[°C]	-28 ~ +35		
	(cooling operation)	[°C]	–		
Nominal volume flow	(heating mode)	[l/min]	28.70		
	(cooling operation)	[l/min]	–		
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50		
max. current consumption		[A]	10		
Max. Input		[kW]	6.51		
max. starting current		[A]	5		
validation		[A]	16		
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480		
Weight		[kg]	121		
connections	Cold liquid/gas - [kg]		6.35 / 12.7		
Refrigerant / quantity	R32		1.7		
Global warming potential (GWP)		-	675		
CO2 equivalent		[t]	1.1475		
Sound power level	EN12102	[dB(A)]	59		
Technical data of indoor units			**EHSD-YM9D**	**EHST20D-YM9D**	**EHST30D-YM9ED**
Max. flow temperature		[°C]	60	60	60
nominal storage capacity		[Liter]	–	200	300
Volume MAG		[Liter]	10	12	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	3 / 6 / 9
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	2050×595×680
Weight		[kg]	44	106	116
connections	Heating VL/RL	[mm]	28	28	28
	TWW VL/RL	[mm]	–	22	22
	Refrigeration liquid/	[mm]	6.35 / 12.7	6.35 / 12.7	6.35 / 12.7
gas **Sound power level**	EN12102	[db(A)]	41	41	41
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A++	A++	A++
	Medium temperature		A++	A++	A++
Drinking water heating	application tap profile	L/XL	–	A	A+

DEVICE NAME			Split air/water heat pump		
OUTDOOR UNIT			Zubadan inverter PUD-SHWM120YAA		
			Heat		
INDOOR UNIT	Hydro module		EHSD-YM9D		
	Memory module EHST20D-YM9D / EHST30D-YM9ED				
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	12.0		
Heating output	(A-7/W35)	[kW]	12.0		
Max. heating output	(A-15/W35)	[kW]	12.3		
Power range min./max.	(A2/W35)	[kW]	3.2 – 13.2		
COP (EN14511)	(A7/W35)	-	4.80		
COP (VDI4650)	(A-7/W35)	-	2.78		
	(A2/W35)	-	3.96		
	(A7/W35)	-	4.80		
	(A10/W35)	-	5.10		
Cooling capacity/EER	(A35/W7)	[kW] / -	–		
	(A35/W18)	[kW] / -	–		
Area of application outside air temperature	(heating mode)	[°C]	-28 ~ +35		
	(cooling operation)	[°C]	–		
Nominal volume flow	(heating mode)	[l/min]	34.40		
	(cooling operation)	[l/min]	–		
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50		
max. current consumption		[A]	12		
Max. Input		[kW]	7.82		
max. starting current		[A]	5		
validation		[A]	16		
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480		
Weight		[kg]	121		
connections	Cold liquid/gas - [kg]		6.35 / 12.7		
Refrigerant / quantity	R32		1.7		
Global warming potential (GWP)		-	675		
CO2 equivalent		[t]	1.1475		
Sound power level	EN12102	[dB(A)]	60		
Technical data of indoor units			**EHSD-YM9D**	**EHST20D-YM9D**	**EHST30D-YM9ED**
Max. flow temperature		[°C]	60	60	60
nominal storage capacity		[Liter]	–	200	300
Volume MAG		[Liter]	10	12	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	3 / 6 / 9
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	2050×595×680
Weight		[kg]	44	106	116
connections	Heating VL/RL	[mm]	28	28	28
	TWW VL/RL	[mm]	–	22	22
	Refrigeration liquid/	[mm]	6.35 / 12.7	6.35 / 12.7	6.35 / 12.7
gas Sound power level	EN12102	[db(A)]	41	41	41
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A++	A++	A++
	Medium temperature		A++	A++	A++
Drinking water heating	application tap profile	L/XL	–	A	A+

DEVICE NAME			Split air/water heat pump		
OUTDOOR UNIT			Zubadan inverter PUD-SHWM140YAA		
			Heat		
INDOOR UNIT		Hydro module	EHSD-YM9D		
			Memory module EHST20D-YM9D / EHST30D-YM9ED		
Technical data of the outdoor unit					
Nominal heating output	(A2/W35)	[kW]	14.0		
Heating output	(A-7/W35)	[kW]	14.0		
Max. heating output	(A-15/W35)	[kW]	14.2		
Power range min./max.	(A2/W35)	[kW]	3.5 – 14.6		
COP (EN14511)	(A7/W35)	-	4.70		
COP (VDI4650)	(A-7/W35)	-	2.70		
	(A2/W35)	-	3.81		
	(A7/W35)	-	4.70		
	(A10/W35)	-	5.00		
Cooling capacity/EER	(A35/W7)	[kW] / -	–		
	(A35/W18)	[kW] / -	–		
Area of application outside air temperature	(heating mode)	[°C]	-28 ~ +35		
	(cooling operation)	[°C]	–		
Nominal volume flow	(heating mode)	[l/min]	40.10		
	(cooling operation)	[l/min]	–		
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50		
max. current consumption		[A]	12		
Max. Input		[kW]	7.82		
max. starting current		[A]	7		
validation		[A]	16		
Dimensions (Height × Width × Depth)		[mm]	1020×1050×480		
Weight		[kg]	1222		
connections	Cold liquid/gas - [kg]		6.35 / 12.7		
Refrigerant / quantity	R32		1.7		
Global warming potential (GWP)		-	675		
CO2 equivalent		[t]	1.1475		
Sound power level	EN12102	[dB(A)]	62		
Technical data of indoor units			**EHSD-YM9D**	**EHST20D-YM9D**	**EHST30D-YM9ED**
Max. flow temperature		[°C]	60	60	60
nominal storage capacity		[Liter]	–	200	300
Volume MAG		[Liter]	10	12	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50	3, 400, 50
	Performance	[kW]	3 / 6 / 9	3 / 6 / 9	3 / 6 / 9
	validation	[A]	16	16	16
Dimensions (Height × Width × Depth)		[mm]	800×530×360	1600×595×680	2050×595×680
Weight		[kg]	44	106	116
connections	Heating VL/RL	[mm]	28	28	28
	TWW VL/RL	[mm]	–	22	22
	Refrigeration liquid/	[mm]	6.35 / 12.7	6.35 / 12.7	6.35 / 12.7
gas Sound power level	EN12102	[db(A)]	41	41	41
Energy efficiency class according to EU Regulation No. 811/2023					
Heating, average climate	Low temp. application		A++	A++	A++
	Medium temperature		A++	A++	A++
Drinking water heating	application tap profile	L/XL	–	A	A+

DEVICE NAME			Split air/water heat pump	
OUTDOOR UNIT			Zubadan inverter PUHZ-SHW140YHAR5	
			Heat	Heat cool
INDOOR UNIT		Hydro module	EHSC-YM9D	ERSC-MED
		Memory module –		–
Technical data of the outdoor unit				
Nominal heating output	(A2/W35)	[kW]	14.0	
heating capacity	(A-7/W35)	[kW]	14	
Max. heating output	(A-15/W35)	[kW]	–	
Performance range min./max.	(A2/W35)	[kW]	5.7 – 15.8	
COP (EN14511)	(A7/W35)	-	11.2 / 4.46	
COP (VDI4650)	(A-7/W35)	-	15.7 / 2.75	
	(A2/W35)	-	14.9 / 3.14	
	(A7/W35)	-	–	
	(A10/W35)	-	–	
Cooling capacity/EER	(A35/W7)	[kW] / -	12.5 / 2.17	
	(A35/W18)	[kW] / -	12.5 / 4.26	
Area of application outside air temperature	(heating mode)	[°C]	-28 ~ +35	
	(cooling operation)	[°C]	+10 ~ +46	
Nominal volume flow	(heating mode)	[l/min]	–	
	(cooling operation)	[l/min]	–	
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50	
max. current consumption		[A]	13	
Max. Input		[kW]	9.85	
max. starting current		[A]	6	
validation		[A]	16	
Dimensions (Height × Width × Depth)		[mm]	1350×330×950	
Weight		[kg]	143	
connections	Heating VL/RL -		–	
Refrigerant / quantity	R32	[kg]	3.3	
Global warming potential (GWP)		-	–	
CO2 equivalent		[t]	–	
Sound power level	EN12102	[dB(A)]	70	
Technical data of indoor units			**EHSC-YM9D**	**ERSC-MED**
Max. flow temperature		[°C]	60	60
Nominal storage capacity		[Liter]	–	–
Volume MAG		[Liter]	–	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	–
	Performance	[kW]	3+6	–
	validation	[A]	16	–
Dimensions (Height × Width × Depth)		[mm]	800×530×360	800×530×360
Weight		[kg]	48	41
connections	Heating VL/RL	[mm]	28	G1-B
	TWW VL/RL	[mm]	–	–
	Cold liquid/gas	[mm]	9.52 / 15.88	9.52 / 15.88
sound power level	EN12102	[db(A)]	40	40
Energy efficiency class according to EU Regulation No. 811/2023				
Heating, average climate	Low temp. application		–	–
	Medium temperature		–	–
Drinking water heating	application tap profile	L	–	–

DEVICE NAME			Split air/water heat pump		
OUTDOOR UNIT			Zubadan inverter PUHZ-SHW230YKA2R2		
				Heat	Heat cool
INDOOR UNIT			Hydro module	EHSE-YM9ED	ERSE-YM9ED
			Memory module –		–

Technical data of the outdoor unit			
Nominal heating output	(A2/W35)	[kW]	23.0
heating capacity	(A-7/W35)	[kW]	23
Max. heating output	(A-15/W35)	[kW]	22.9
Performance range min./max.	(A2/W35)	[kW]	11.8 – 23.2
COP (EN14511)	(A7/W35)	-	23.0 / 3.65
COP (VDI4650)	(A-7/W35)	-	23.0 / 2.85
	(A2/W35)	-	13.2 / 3.45
	(A7/W35)	-	3.65
	(A10/W35)	-	3.95
Cooling capacity/EER	(A35/W7)	[kW] / -	20.0 / 2.22
	(A35/W18)	[kW] / -	20.0 / 3.55
Area of application outside air temperature	(heating mode)	[°C]	-28 ~ +35
	(cooling operation)	[°C]	+10 ~ +46
Nominal volume flow	(heating mode)	[l/min]	65.9
	(cooling operation)	[l/min]	57.3
Power supply for outdoor unit		[Ph], [V], [Hz]	3, 400, 50
max. current consumption		[A]	20
Max. Input		[kW]	13.2
max. starting current		[A]	5
validation		[A]	25
Dimensions (Height × Width × Depth)		[mm]	1050×330×1338
Weight		[kg]	148
connections	Cold liquid/gas [mm]		12.7/25.4
Refrigerant / quantity	R410A	[kg]	7.1
Global warming potential (GWP)		–	2088
CO2 equivalent		[t]	14.8
Sound power level	EN12102	[dB(A)]	75

Technical data of indoor units			EHSE-YM9ED	ERSE-YM9ED
Max. flow temperature		[°C]	60	60
nominal storage capacity		[Liter]	–	–
Volume MAG		[Liter]	–	–
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50	3, 400, 50
	Performance	[kW]	3/6/9	3/6/9
	validation	[A]	10	10
Dimensions (Height × Width × Depth)		[mm]	950×600×350	950×600×350
Weight		[kg]	62	63
connections	Heating VL/RL	[mm]	G1 1/2" AG	G1 1/2" AG
	TWW VL/RL	[mm]	–	–
	Refrigeration liquid/	[mm]	9.52 / 25.4	9.52 / 25.4
gas Sound power level	EN12102	[db(A)]	45	45
Energy efficiency class according to EU Regulation No. 811/2023				
Heating, average climate	Low temp. application		A++	A++
	Medium temperature application		A++	A++
Drinking water heating	tap profile	L	–	–

DEVICE NAME		Brine/water heat pump	
OUTDOOR UNIT			EHGT17D-YM9ED
			Heat
INDOOR UNIT		Hydro module	
		Memory module	
Technical data of the outdoor unit			
Nominal heating		[kW]	5.00
output Cooling		[kW]	3.91
output Electrical power consumption		[kW]	1.09
Coefficient of performance (COP)			4.58
Performance range min./max.	(B0/W35)	[kW]	2.5 – 10.0
Heating output electric heating		[kW]	3, 6, 9
element Max. flow temperature		[°C]	60
Area of application source temperature		[°C]	-8 ~ +30
Nominal volume flow	Brine circle	[l/min]	22
	heating circuit	[l/min]	15
Sound power level	EN12102	[dB(A)]	42
Refrigerant	Type		R32
	Filling quantity	[kg]	0.9
	Global warming potential (GWP)		675
	CO2 equivalent	[t]	0.61
Heat pump	Power supply	[Ph], [V], [Hz]	3, 400, 50
	validation	[A]	16
	max. starting current (inverter)	[A]	< 4
heating rod	Power supply	[Ph], [V], [Hz]	3, 400, 50
	validation	[A]	16
Dimensions (Height × Width × Depth)		[mm]	1750×595×680
Weight		[kg]	181
connections	Heating VL/RL	[mm]	28
	Brine circuit VL/RL	[mm]	28
	TWW V/RL	[mm]	22
Energy efficiency class according to EU Regulation No. 811/2023			
Heating, average climate	Low temp. application		A++
	Medium temp. application		A++
Drinking water heating	Tap profile	L	A+

10.3 Radiator calculations

Cast radiators

Overall height [mm]		280	430				580				680	980		
Depth [mm]		250	70	110	160	220	70	110	160	220	160	70	160	220
VLT	RLT													
90	85	102	61	79	104	136	76	102	141	181	165	125	228	291
90	80	97	58	75	99	130	72	97	134	172	156	118	217	276
90	75	92	55	71	93	123	68	92	127	163	148	112	205	261
90	70	87	52	67	88	116	64	87	119	153	140	106	194	246
90	65	81	48	63	83	109	60	81	112	144	131	99	182	231
90	60	76	45	58	77	101	56	76	104	134	122	92	169	216
85	80	93	55	71	94	123	68	93	127	164	149	113	207	263
85	75	88	52	67	89	117	65	88	121	155	141	107	195	249
85	70	82	49	63	84	110	61	82	114	146	133	100	184	234
85	65	77	46	59	78	103	57	77	106	137	124	94	173	220
85	60	72	43	55	73	96	53	72	99	127	116	88	161	205
80	75	83	49	64	84	111	61	83	114	147	134	101	185	236
80	70	78	46	60	79	104	58	78	108	138	126	95	174	222
80	65	73	43	56	74	98	54	73	101	129	118	89	163	208
80	60	68	40	52	69	91	50	68	94	120	110	83	152	193
80	55	63	37	48	64	84	46	63	87	111	101	77	140	179
75	70	74	44	57	75	98	55	74	102	130	119	90	165	210
75	65	69		53	70	92	51	69	95	122	111	84	154	196
75	60	64	41 38	49	65	86	47	64	88	113	103	78	143	182
75	55	59	35	45	60	79	44	59	81	105	95	72	132	168
75	50	54	32	41	55	72	40	54	74	95	87	66	120	153
70	65	65	38	50	66	86	48	65	89	114	104	79	145	184
70	60	60	36	46	61	80	44	60	83	106	97	73	134	171
70	55	55	33	43	56	74	41	55	76	98	89	67	124	157
70	50	50	30	39	51	67	37	50	69	89	81	61	113	143
70	45	45	27	35	46	60	34	45	62	80	73	55	101	129
65	60	56	33	43	57	75	41	56	77	99	90	68	125	159
65	55	51	31	40	52	69	38	51	71	91	83	63	115	146
65	50	47	28	36	48	62	35	47	64	83	75	57	105	133
65	45	42	25	32	43	56	31	42	58	74	68	51	94	119
65	40	37	22	28	37	49	27	37	51	65	59	45	82	105
60	55	48	28	37	48	63	35	48	66	84	77	58	106	135
60	50	43	26	33	44	58	32	43	59	76	69	53	96	123
60	45	39	23	30	39	52	29	39	53	68	62	47	86	110
60	40	34	20	26	34	45	25	34	47	60	55	41	76	96
55	50	39	23	30	40	53	29	39	54	70	64	48	88	112
55	45	35	21	27	36	47	26	35	49	62	57	43	79	100
55	40	31	18	24	31	41	23	31	42	54	50	38	69	88
55	35	26	16	20	26	35	19	26	36	46	42	32	58	74
55	30	21	12	16	21	28	16	21	29	37	34	26	47	60
50	45	32	19	24	32	42	23	32	44	56	51	39	71	90
50	40	28	16	21	28	37	20	28	38	49	44	34	62	79
50	35	23	14	18	24	31	17	23	32	41	38	28	52	66
50	30	19	11	14	19	25	14	19	26	33	30	23	42	53
45	40	24	15	19	25	33	18	24	34	43	39	30	54	69
45	35	20	12	16	21	27	15	20	28	36	33	25	46	58
45	30	16	10	12	16	22	12	16	22	29	26	20	36	46
45	25	11			12	15		11	16	20	18	14	25	32
40	35	18	7 10	9 13	18	23	8 13	18	24	31	28	21	39	50
40	30	14	8	11	14	18	10	14	19	24	22	17	31	39
40	25	9	6	7	10	13	7	9	13	17	15	12	21	27

Room temperature: 20 °C – standard heating output according to DIN EN 442 [watt/unit] – radiator exponent: 1.3

Steel radiators

Overall height [mm]		300		450			600			1000		
Depth [mm]		250	70	110	160	220	70	110	160	220	160	70
VLT	RLT											
90	85	56	86	62	83	111	82	111	142	136	175	228
90	80	54	82	59	79	106	77	106	135	130	166	217
90	75	51	77	56	75	100	73	100	128	123	157	205
90	70	48	73	53	70	94	69	94	121	116	148	194
90	65	45	68	50	66	88	65	88	113	109	139	182
90	60	42	64	46	62	82	60	82	106	101	130	169
85	80	51	78	56	75	101	74	101	129	123	158	207
85	75	48	74	53	71	95	70	95	122	117	150	195
85	70	45	69	50	67	90	66	90	115	110	141	184
85	65	43	65	47	63	84	62	84	108	103	132	173
85	60	40	61	44	58	78	57	78	100	96	123	161
80	75	46	70	51	67	90	66	90	116	111	142	185
80	70	43	66	48	63	85	62	85	109	104	134	174
80	65	40	62	45	59	80	58	80	102	98	125	163
80	60	37	57	41	55	74	54	74	95	91	116	152
80	55	35	53	38	51	68	50	68	87	84	107	140
75	70	41	62	45	60	80	59	80	103	98	126	165
75	65	38	58	42	56	75	55	75	96	92	118	154
75	60	35	54	39	52	70	51	70	89	86	110	143
75	55	33	50	36	48	64	47	64	82	79	101	132
75	50	30	45	33	44	59	43	59	75	72	92	120
70	65	36	54	39	53	70	52	70	90	86	111	145
70	60	33	51	37	49	65	48	65	84	80	103	134
70	55	30	47	34	45	60	44	60	77	74	95	124
70	50	28	42	31	41	55	40	55	70	67	86	113
70	45	25	38	28	37	49	36	49	63	60	78	101
65	60	31	47	34	45	61	45	61	78	75	96	125
65	55	28	43	31	42	56	41	56	72	69	88	115
65	50	26	39	29	38	51	37	51	65	62	80	105
65	45	23	35	26	34	46	33	46	58	56	72	94
65	40	20	31	22	30	40	29	40	51	49	63	82
60	55	26	40	29	39	52	38	52	66	63	81	106
60	50	24	36	26	35	47	34	47	60	58	74	96
60	45	21	32	24	31	42	31	42	54	52	66	86
60	40	19	29	21	28	37	27	37	47	45	58	76
55	50	22	33	24	32	43	31	43	55	53	68	88
55	45	19	30	21	29	38	28	38	49	47	60	79
55	40	17	26	19	25	33	25	33	43	41	53	69
55	35	14	22	16	21	28	21	28	36	35	45	58
55	30	12	18	13	17	23	17	23	29	28	36	47
50	45	17	27	19	26	35	25	35	44	42	54	71
50	40	15	23	17	22	30	22	30	38	37	47	62
50	35	13	20	14	19	25	19	25	32	31	40	52
50	30	10	16	11	15	20	15	20	26	25	32	42
45	40	13	21	15	20	27	19	27	34	33	42	54
45	35	11	17	12	17	22	16	22	28	27	35	46
45	30	9	14	10	13	18	13	18	23	22	28	36
45	25		10	7		12		12	16	15	19	25
40	35	6 10	15	11	9 14	19	9 14	19	24	23	30	39
40	30	8th	12	8	11	15	11	15	19	18	24	31
40	25	5	8	6	8	10	8	10	13	13	16	21

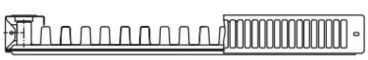
Room temperature: 20 °C – standard heating output according to DIN EN 442 [watt/unit] – radiator exponent: 1.3

Flat radiator, profile

Overall height [mm]		350					500					600					900				
Depth [mm]		65		100		155	65		100		155	65		100		155	65		100		155
Radiator type		10	11	21	22	33	10	11	21	22	33	10	11	21	22	33	10	11	21	22	33
Radiator exponent [n]		1.25	1.25	1.27	1.28	1.30	1.25	1.27	1.30	1.29	1.31	1.27	1.28	1.30	1.30	1.31	1.29	1.30	1.30	1.32	1.32
VLT	RLT																				
90	85	637	884	1344	1624	2322	856	1187	1797	2160	3159	1004	1390	2085	2512	3660	1446	1994	2908	3513	4945
90	80	606	841	1279	1545	2206	815	1129	1708	2053	3001	955	1322	1981	2387	3477	1374	1895	2763	3336	4695
90	75	575	798	1212	1464	2089	773	1071	1617	1945	2840	905	1252	1876	2260	3290	1302	1794	2616	3155	4442
90	70	543	754	1145	1381	1969	730	1011	1524	1834	2676	854	1182	1768	2130	3100	1228	1691	2466	2972	4184
90	65	511	709	1075	1297	1847	687	949	1430	1721	2509	803	1109	1658	1998	2907	1152	1586	2313	2785	3920
90	60	478	663	1004	1210	1722	642	887	1333	1605	2337	749	1035	1546	1863	2708	1075	1479	2156	2593	3650
85	80	578	802	1219	1472	2101	777	1077	1626	1955	2856	910	1259	1886	2272	3309	1309	1804	2631	3173	4467
85	75	548	761	1155	1393	1987	737	1020	1538	1851	2701	862	1192	1784	2150	3129	1239	1707	2489	3000	4223
85	70	518	718	1089	1314	1872	696	962	1449	1744	2543	813	1124	1681	2025	2946	1168	1608	2344	2823	3974
85	65	486	675	1023	1233	1755	654	903	1358	1636	2382	763	1055	1575	1898	2760	1095	1507	2197	2643	3721
85	60	454	630	954	1149	1634	610	842	1265	1524	2217	712	983	1467	1768	2569	1020	1404	2046	2459	3461
80	75	521	723	1096	1322	1885	700	968	1459	1756	2560	818	1132	1692	2039	2966	1175	1619	2360	2842	4001
80	70	492	682	1034	1246	1774	661	913	1373	1653	2408	771	1066	1593	1919	2790	1107	1524	2221	2673	3762
80	65	461	640	969	1168	1661	620	856	1285	1549	2254	723	999	1491	1797	2611	1037	1427	2080	2500	3519
80	60	430	597	903	1088	1545	579	798	1196	1442	2096	674	931	1387	1672	2428	965	1327	1935	2323	3271
80	55	399	553	835	1005	1427	536	738	1104	1332	1933	624	860	1281	1543	2240	892	1225	1786	2142	3015
75	70	465	645	977	1177	1674	625	862	1296	1561	2272	729	1007	1503	1811	2632	1045	1438	2096	2520	3548
75	65	436	605	915	1102	1566	586	808	1212	1461	2124	683	943	1406	1694	2461	978	1345	1961	2355	3315
75	60	406	564	852	1025	1455	546	752	1126	1359	1973	636	877	1307	1574	2286	909	1250	1822	2186	3077
75	55	376	521	787	946	1342	505	695	1039	1253	1818	587	810	1205	1452	2106	839	1152	1680	2013	2834
75	50	344	478	720	865	1225	463	635	948	1145	1658	537	740	1100	1325	1921	766	1052	1534	1835	2583
70	65	410	569	860	1035	1470	551	759	1137	1372	1992	642	886	1319	1590	2308	918	1262	1840	2208	3108
70	60	382	530	800	962	1364	513	706	1056	1274	1848	597	823	1225	1476	2142	853	1172	1708	2047	2882
70	55	353	489	738	887	1256	474	651	972	1174	1701	551	759	1128	1359	1970	786	1079	1573	1882	2650
70	50	323	448	674	809	1144	433	595	886	1070	1549	503	693	1028	1238	1794	716	983	1433	1713	2411
70	45	291	404	607	729	1029	391	536	796	963	1391	453	623	924	1113	1611	644	883	1288	1537	2163
65	60	357	495	746	898	1271	480	659	984	1188	1722	557	768	1141	1375	1995	795	1092	1592	1906	2683
65	55	329	457	688	826	1169	442	607	905	1093	1582	513	707	1049	1264	1833	732	1004	1464	1750	2463
65	50	300	417	627	753	1063	404	553	823	995	1438	468	644	955	1150	1666	666	913	1331	1589	2237
65	45	271	376	564	676	954	364	498	738	893	1288	421	579	856	1032	1493	598	819	1194	1423	2003
65	40	239	332	497	596	839	322	439	649	786	1132	371	510	753	907	1312	526	720	1050	1249	1759
60	55	305	423	636	764	1080	410	562	836	1010	1461	475	654	970	1168	1692	676	928	1352	1615	2273
60	50	278	386	579	695	980	374	511	759	918	1325	432	595	880	1061	1535	615	842	1228	1464	2061
60	45	250	347	520	623	877	336	459	679	822	1185	388	533	788	949	1373	550	754	1099	1308	1841
60	40	220	306	457	548	770	296	404	596	722	1038	341	469	691	833	1203	483	661	964	1145	1612
55	50	255	354	530	636	896	343	468	694	840	1210	396	544	805	969	1402	562	770	1122	1336	1881
55	45	229	317	475	569	800	307	419	619	750	1079	354	487	718	865	1250	502	687	1002	1190	1676
55	40	201	279	416	498	699	270	368	541	656	943	311	426	628	756	1092	439	601	876	1039	1462
55	35	171	238	354	423	593	230	313	459	557	798	264	362	532	641	925	373	509	742	878	1236
55	30	139	193	286	342	477	187	253	369	449	640	214	292	428	516	742	300	409	597	704	991
50	45	207	287	429	513	720	278	378	558	676	971	320	439	647	779	1125	453	619	902	1071	1507
50	40	181	251	375	448	628	243	331	486	590	845	280	383	563	679	979	395	539	786	931	1310
50	35	154	213	317	379	530	207	280	410	498	712	237	324	475	573	825	333	455	663	783	1102
50	30	124	172	255	304	423	166	225	327	399	568	190	260	380	457	658	267	363	530	623	877
45	40	161	223	332	396	554	216	293	429	521	745	247	339	497	599	864	349	476	694	820	1154
45	35	136	188	279	333	465	182	247	360	438	625	208	285	417	503	724	293	399	582	686	966
45	30	108	150	223	265	368	146	197	285	348	494	166	227	331	398	573	233	316	461	542	763
45	25	77	107	157	186	257	103	138	199	244	344	117	159	231	278	399	163	221	322	377	530
40	35	117	162	240	286	398	157	212	308	375	534	179	245	358	431	619	251	342	499	586	825
40	30	93	128	190	225	313	124	167	242	295	419	141	193	281	338	485	198	268	391	459	645
40	25	65	90	132	156	215	87	116	166	204	287	98	134	193	233	333	136	185	269	314	442

Room temperature: 20 °C – standard heating output according to DIN EN 442 [watt/unit]


Type 10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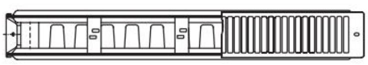
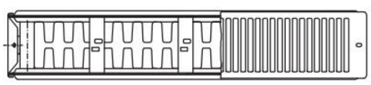
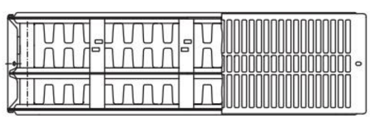

Type 21


Type 22


Type 33

Flat radiator, smooth

Overall height [mm]		350					500					600					900				
Depth [mm]		65		100		155	65		100		155	65		100		155	65		100		155
Radiator type		10	11	21	22	33	10	11	21	22	33	10	11	21	22	33	10	11	21	22	33
Radiator exponent [n]		1.25	1.25	1.27	1.28	1.30	1.25	1.27	1.30	1.29	1.31	1.27	1.28	1.30	1.30	1.31	1 .29	1.30	1.30	1.32	1.32
VLT	RLT																				
90	85	537	775	1209	1500	2206	730	1084	1667	2117	2946	864	1281	1954	2495	3425	1252	1778	2733	3385	4821
90	80	512	738	1150	1427	2097	695	1032	1584	2012	2799	822	1218	1857	2371	3253	1190	1689	2597	3214	4578
90	75	485	701	1091	1352	1985	660	978	1499	1906	2648	779	1154	1758	2245	3079	1127	1599	2459	3040	4331
90	70	459	662	1030	1276	1871	623	923	1414	1798	2496	736	1089	1657	2116	2901	1063	1508	2318	2864	4079
90	65	431	622	967	1198	1755	586	867	1326	1687	2340	691	1022	1555	1985	2720	998	1414	2174	2683	3822
90	60	403	582	903	1118	1636	548	810	1236	1573	2180	645	954	1449	1851	2534	931	1318	2027	2499	3559
85	80	488	704	1097	1359	1996	663	983	1508	1917	2663	783	1160	1768	2258	3096	1134	1608	2472	3058	4355
85	75	463	668	1039	1287	1889	629	931	1427	1814	2519	742	1099	1673	2136	2928	1073	1522	2339	2890	4117
85	70	437	630	980	1214	1779	594	879	1344	1710	2372	700	1036	1576	2012	2757	1011	1433	2203	2720	3875
85	65	411	592	920	1139	1667	558	825	1259	1603	2222	657	972	1477	1886	2583	948	1343	2065	2547	3628
85	60	383	553	858	1062	1553	521	769	1173	1494	2068	613	906	1375	1756	2404	884	1251	1923	2369	3375
80	75	440	635	986	1222	1791	597	884	1353	1721	2388	705	1043	1586	2025	2776	1018	1443	2218	2739	3901
80	70	415	599	930	1151	1686	564	834	1273	1621	2246	664	982	1493	1906	2611	959	1358	2088	2575	3668
80	65	389	562	872	1079	1578	529	782	1192	1518	2102	623	921	1398	1785	2444	898	1272	1955	2409	3431
80	60	363	524	812	1005	1468	494	728	1109	1413	1955	580	858	1301	1661	2272	836	1183	1819	2239	3189
80	55	336	485	751	929	1355	457	674	1024	1305	1803	537	793	1201	1533	2096	772	1092	1679	2064	2940
75	70	392	566	878	1087	1591	533	788	1202	1530	2119	628	928	1409	1799	2463	905	1282	1970	2428	3459
75	65	368	531	823	1018	1488	500	738	1124	1432	1981	588	869	1318	1683	2303	847	1199	1843	2269	3232
75	60	343	495	766	947	1383	466	687	1045	1332	1840	547	809	1225	1564	2139	788	1114	1713	2106	3000
75	55	317	458	708	874	1275	431	635	963	1228	1695	506	746	1129	1442	1971	727	1027	1579	1940	2763
75	50	291	419	647	799	1164	395	580	879	1122	1546	462	682	1031	1316	1798	664	938	1441	1768	2518
70	65	346	500	773	956	1396	470	694	1055	1345	1858	553	816	1237	1579	2160	795	1125	1730	2127	3030
70	60	322	465	719	889	1296	438	645	979	1249	1724	514	759	1148	1466	2004	739	1044	1605	1972	2809
70	55	298	430	663	819	1193	404	595	901	1150	1586	474	699	1057	1350	1844	680	962	1478	1814	2583
70	50	272	393	606	748	1087	370	543	821	1049	1444	433	638	963	1230	1679	621	876	1347	1650	2351
70	45	246	354	546	673	977	334	489	738	944	1297	390	575	866	1106	1508	558	788	1211	1481	2109
65	60	301	435	671	829	1208	409	602	918	1164	1606	480	708	1070	1366	1867	689	973	1496	1836	2616
65	55	278	401	618	763	1111	377	555	839	1071	1475	442	652	984	1256	1715	634	895	1376	1686	2401
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65	40	202	291	447	551	797	274	401	602	771	1056	320	470	706	901	1228	456	642	987	1204	1715
60	55	257	371	572	706	1026	350	513	775	990	1362	409	603	909	1161	1584	586	827	1271	1556	2216
60	50	235	338	521	642	932	319	467	704	900	1236	372	548	825	1054	1437	532	751	1154	1410	2009
60	45	211	304	467	575	834	286	419	630	806	1105	334	491	738	943	1285	477	672	1033	1260	1795
60	40	186	268	411	506	731	253	369	552	708	968	294	432	648	827	1126	419	589	906	1103	1571
55	50	215	310	477	588	851	292	428	643	823	1129	341	502	754	963	1312	487	686	1055	1287	1834
55	45	193	278	427	525	760	262	383	574	735	1007	305	448	673	860	1170	435	612	941	1147	1634
55	40	170	245	374	460	664	230	336	502	643	879	268	393	589	752	1022	381	535	823	1001	1426
55	35	145	209	319	391	563	196	286	425	546	744	228	334	499	637	865	323	454	698	846	1205
55	30	117	169	257	316	453	159	231	342	440	597	184	269	401	512	694	260	365	561	678	966
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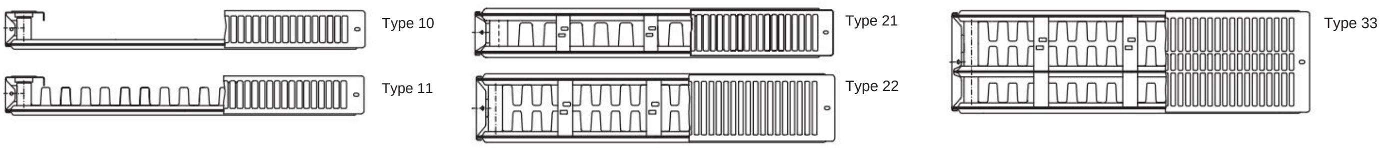
50	40	153	220	337	414	596	208	302	450	578	788	241	353	528	674	916	342	481	739	897	1277
50	35	130	187	285	350	503	176	256	380	488	664	204	299	446	569	772	289	405	623	755	1075
50	30	105	151	229	281	402	142	205	304	391	530	164	239	356	455	616	231	324	498	601	855
45	40	135	196	298	366	526	184	267	398	511	695	213	312	466	595	808	302	424	652	790	1125
45	35	114	165	251	308	442	156	225	334	429	583	179	263	391	500	677	254	356	547	661	942
45	30	92	132	200	245	350	124	180	264	341	461	143	209	310	396	536	201	282	434	522	744
45	25	65	94	141	172	245	88	126	185	239	321	101	147	217	277	373	141	197	303	363	517
40	35	99	142	216	264	378	134	194	286	368	498	154	226	335	428	579	218	305	469	565	805
40	30	78	113	170	208	297	106	153	224	289	391	122	178	263	336	454	171	239	368	442	629
40	25	55	79	118	144	204	74	106	154	200	268	85	123	181	231	311	118	165	253	302	430

Room temperature: 20 °C – standard heating output according to DIN EN 442 [watt/unit]



10.4 Plant logbook

operator

Company name

contact person

Street, No.

ZIP / City

Installation location

Plant manufacturer

Company name

Street, No.

ZIP / City

Plant data

Manufacturer/Type

serial number

Construction year

Installation

Refrigerant/quantity

Check interval

☐ 1 × per year > 5 t < 50 t CO_2 equivalent

☐ 2 × per year > 5 t < 500 t CO_2 equivalent

☐ 4 × per year > 500 t CO_2 equivalent

Doubling the test intervals if a recognized leak detection system is installed.

Refrigerant/refrigeration machine oil

Date	Refrigerant/oil	kg filled	kg disposed of	Reason	Expert

Repairs/Maintenance

Date	report	Expert

10.5 Manufacturer’s declaration

Manufacturer's declaration

Utility shutdown to use a heat pump tariff

There is a potential-free contact on the PAC-IF071B-E board of our heat pump controller FTC6 for the utility shutdown to use a heat pump tariff.

The corresponding contact is located in the indoor unit (storage module/hydromodule) on the terminal block TBI.1, terminals 1-2 labeled IN4. The contact is opened at the factory.
If the contact is open: The heat pump compressor and connected electric heating elements are enabled.
If the contact is closed: The heat pump compressor and connected electric heating elements are blocked.

When using the above-mentioned contact, we hereby guarantee that the heat pump compressor and optionally connected electric heating elements will be switched off or blocked during the utility shutdown.

Please note the technical connection conditions (TAB) of the local energy supply company (EVU).
In Germany, the blocking of the network supply is limited to a maximum of 3 times 2 hours within a day (24 hours).

Note: The power supply of the Mitsubishi Electric heat pump control/electronics must not be affected by tariffs that can be switched off or utility blocks. An uncontrolled interruption of the power supply to the heat pump control/electronics disables important safety functions. This can result in serious device damage.

Mitsubishi Electric Europe BV

10.6 Laws, standards, guidelines and regulations

Standard/Guideline	Explanation
BS7206	Specification for unvented hot water storage units and packages
DIN EN 442	Radiators and convectors
DIN 1988	Technical rules for drinking water installations
DIN V 4108-6	Thermal protection and energy saving in buildings – Part 6: Calculation of the annual heating heat and annual heating energy requirements
DIN 4109	Sound insulation in building construction; Requirements and evidence
DIN V 4701	Energy assessment of heating and ventilation systems – Part 10: Heating, drinking water heating, ventilation
DIN 4753	Drinking water heaters, drinking water heating systems and storage drinking water heaters
DIN EN 12102	Air conditioning units, liquid cooling units, heat pumps and dehumidifiers with electrically driven compressors for room heating and cooling - measurement of airborne noise emissions - determination of the sound power level
DIN EN 12828	Heating systems in buildings – planning of hot water heating systems
DIN EN ISO 13790	Energy efficiency of buildings – Calculation of energy requirements for heating and cooling
DIN EN 14511	Air conditioners, liquid chillers and heat pumps with electrically driven compressors for space heating and cooling
DIN EN 14825	Air conditioners, liquid chillers and heat pumps with electrically driven compressors for space heating and cooling - testing and performance measurement under part-load conditions and calculation of the seasonal performance factor
DIN EN 15450	Heating systems in buildings – planning heating systems with heat pumps
DIN V 18599-1	Energy assessment of buildings - calculation of the useful, final and primary energy requirements for heating, cooling, Ventilation, domestic hot water and lighting – Part 1: General balancing procedures, terms, zoning and evaluation of energy sources
DVGW W 551	Drinking water heating and drinking water pipeline systems - Technical measures to reduce Legionella growth - Planning, construction, operation and renovation of drinking water installations
Energy Saving Ordinance (EnEV)	Ordinance on energy-saving thermal insulation and energy-saving system technology in buildings
Energy Performance of Buildings Directive (EPBD)	Energy Performance of Buildings Directive
Renewable Energy Heat Act (EEWärmeG)	Law to promote renewable energies in the heating sector
F-Gases Regulation	Regulation (EU) No. 517/2014 on fluorinated greenhouse gases
Ecodesign Directive/Energy-related Products Directive (ErP)	Requirements for the environmentally friendly design of energy-related products
Directive 2010/30/EU	EU framework directive on uniform energy consumption labeling across Europe (2010/30/EU)
Regulation (EU) No. 811/2013	Regulation supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy labeling of space heaters, combination heaters, sets of space heaters, temperature controllers and solar devices and sets of combination heaters, temperature controllers and solar devices.
Regulation (EU) No. 812/2013	Regulation supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to the energy efficiency labeling of water heaters, hot water storage tanks and systems consisting of water heaters and solar devices.
Regulation (EU) No. 813/2013	Regulation implementing Directive 2009/125/EC of the European Parliament and of the Council as regards ecodesign requirements for space heaters and combination heaters
Regulation (EU) No. 814/2013	Regulation implementing Directive 2009/125/EC of the European Parliament and of the Council as regards ecodesign requirements for water heaters and water storage tanks.
Technical instructions for protection against Noise (TA Noise)	Sixth General Administrative Regulation for the Federal Immission Control Act
Drinking Water Ordinance (TrinkwV)	Regulation on the quality of water intended for human consumption
VDI 2035	Prevention of damage in hot water heating systems
VDI 4650 Sheet 1	Calculations of heat pumps - short procedure for calculating the annual performance factor of Heat pump systems – electric heat pumps for space heating and hot water preparation
VDI 6023	Hygiene in drinking water installations – requirements for planning, execution, operation and maintenance

10.7 Index

K

L

M

N

O

P

R

S

T

U

v

W

Z

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Our air conditioners and heat pumps contain fluorinated greenhouse gases R410A, R407C, R134a and R32.
Further information can be found in the corresponding operating instructions.

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