Semechnice 132, 518 01 Dobruška
Tel./fax: +420 494 664 203
Tel.: +420 494 664 201
E-mail: pzp@pzp.cz
http://www.pzp.cz

Recommended incorporations of PZP heat pumps into heating systems

In this part of basic design documentation are contained basic diagrams of heat pump connections within heating systems.

In the diagrams there are connections of the heat pump primary side with reference to the low-potential heat source from which the heat is extracted by the heat pump. There are outlined differences among individual types of heat pumps there, the ways of hot water warming, the ways of heating in combining the heat pump with another heat source and also incorporation of heat pumps into cascade if required heating performance is to be higher than that provided only by a single heat pump.

This basic documentation is intended for designers and assembly companies to be used in their work as a tool, not a dogma that must be strictly followed when designing heating systems containing heat pumps.

Basic connections of air/water heat pumps of the split type – their primary circuit

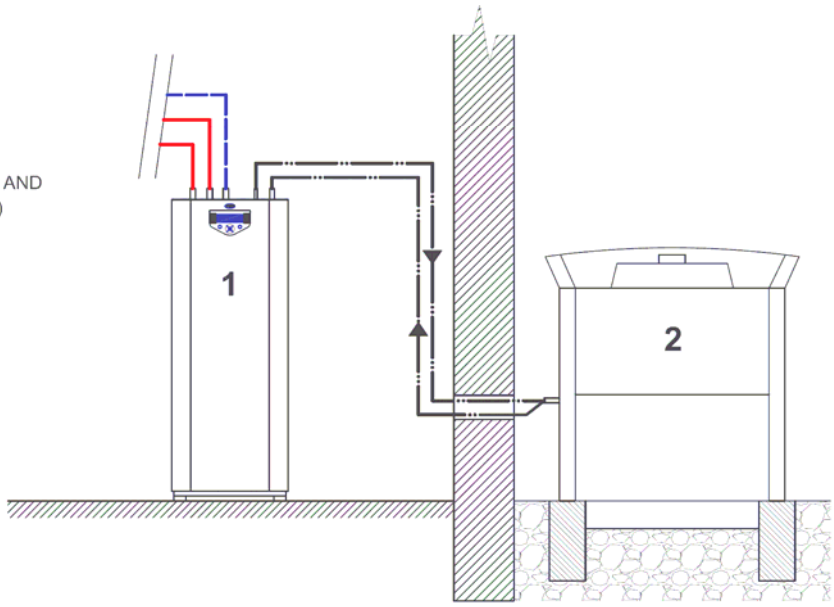
The location of the heat pump and the evaporator results from the required limited length of interconnecting pipelines of the primary circuit. It is to be striven for minimization of this length, thus up to 12 m. Longer lines must be discussed with the heat pump manufacturer. As ideal we can consider the case when the heat pump is standing in a technical room at an external wall and the evaporator is located outside that wall outdoor so that the distance between the evaporator and the wall is min. 0,5 m.

In the external wall there must be prepared an aperture in which both primary circuit pipeline and electric interconnection of the evaporator with the heat pump will be set. In the aperture is to be embedded a sleeve (e.g. a PVC tube, Ø 110 for HP 3AW 06 to 18 and Ø 125 for HP 3AW 22 to 36).

It is suitable to make the ground below the evaporator (amid its fundaments) lower by app. 0,30 m for frost deposit thawing.
For technical parameters, dimensions of devices, recommended locations of outdoor units and other technical information refer to the design basic document “Air/water heat pumps, split types”.

RETURN WATER
DHW WATER
FLOW WATER

(HP3AW 06 S - 18 S AND
HP1AW 06 S - 16 S)



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. HEAT PUMP - EXTERNAL PART

LEGEND OF PIPES :

FLOW WATER
RETURN WATER
PIPES OF PRIMARY CIRCUIT

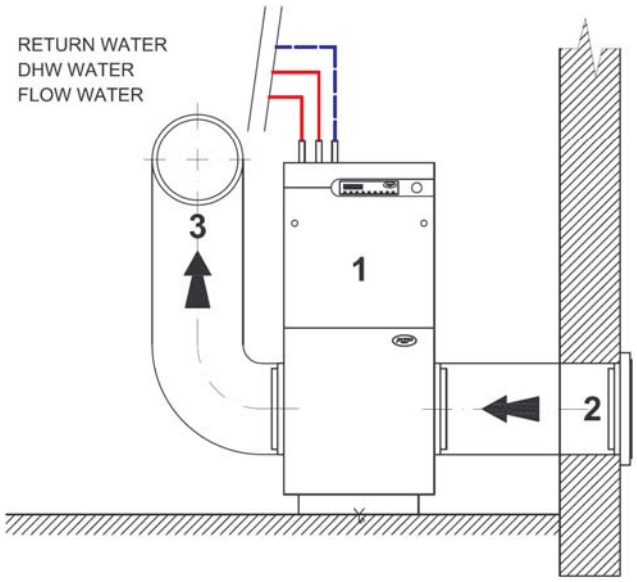
Basic connections of air/water heat pumps, the Komplet type – their primary circuit

The air/water heat pump of Komplet type is interconnected with outdoor space by means of air system ducts. The aggregate length of interconnecting air system duct is max. 10 m. The air system duct must have thermo-insulating and sound deadening effects. The ducts discharging air from the heat pump must be of a length of 2,5 m at least. We recommend to situate external wall openings for air supply and air discharging in different sides of the building (e.g. across a building corner). In case they must be at the same building side face, a minimum distance of 2,5 m between them is necessary. In the event, that a heat pump location requires air system ducts longer than specified above, such design must be discussed with the heat pump manufacturer.

A round aperture must be prepared in the external wall with an embedded sleeve for air system duct connecting the lines inside the building and for protective grid fixing on the external side of the building.

To the heat pump there is necessary to lead a pipeline draining thawed frost deposits arising from condensed air humidity.
In designing the use of the heat pump it is necessary to consider its ground plan dimensions of 870 x 750 mm influencing minimum width of all the doors through which the heat pump shall be moved to the place of its installation, namely 800 mm.

As to technical parameters, dimensions of devices and other technical information see the design basic document “TCLM KOMPLET heat pumps”.



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. INSULATED AIRDUCT - AIR INLET
3. INSULATED AIRDUCT - AIR OUTLET

LEGEND OF PIPES :

FLOW WATER
RETURN WATER

Basic connections of earth/water heat pumps – their primary circuit

The primary circuit of earth/water heat pumps consists in underground tube collector (a horizontal – planar collector or a vertical borehole), distributor, interconnecting pipelines thermally insulated to avoid air humidity condensation on their surface, circulation pump, closing and draining fittings, filter, flow sensing device, pressure gauge, thermometer and open expansion tank.

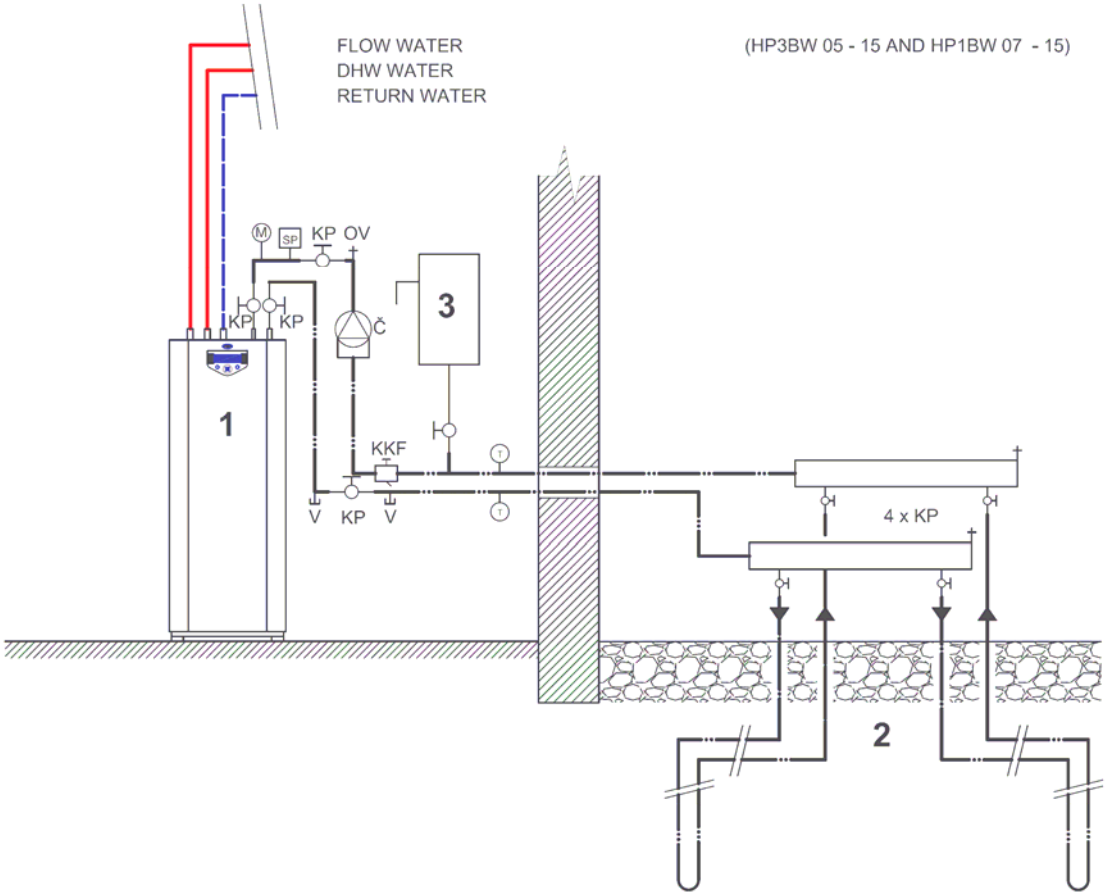
The length of pipelines connecting the heat pump with the distributor is not limited. Dimensions and the length of interconnecting pipelines must be in accordance with required technical parameters of the heat pump and parameters of the primary circuit circulation pump.

The distributor may be situated inside the building (e.g. in a technical room containing the heat pump) or outside the building (e.g. in a ground shaft near the underground collector). The distributor is equipped with closing fittings drainage and de-aeration.

A pipe sleeve must be placed in the aperture for pipeline passage through building structure and that pipeline shall be sufficiently thermally insulated. The aperture may be located both above and below the completed ground level.
All sections of the primary circuit must be laid sloping so as they can be well de-aerated (usually on the distributor in the highest point in the technical room).
Draining fittings must be positioned in such a way to enable primary circuit proper filling.
The recommended minimum distance from building structure to the underground collector is 5 m, the same must be held for borders of neighbouring estates. The recommended distance between vertical underground collectors (boreholes) is 10 m.
Shorter distances may cause damage to the building or influencing of heat accumulation among individual vertical underground collectors (boreholes).

We recommend underground collector situating on the estate suitably and primary circuit routing between the underground collector and the building to be chosen in such a way that no crossing of other lines (water supply line, sewage and the like) may happen. In case any crossing of the primary circuit pipeline and other lines is inevitable, it is necessary to take measures to avoid negative effect on other lines (e.g. water supply line or sewage freezing and similar).
In this basic design documentation are not included the issues of proceeding in underground collector implementation including the legislation applicable to the building and the dispose of waters permissions.

As to technical parameters, dimensions of devices, recommended dimension design of the primary circuits for individual performances of heat pumps and other technical information see please the design basic document “Earth/water and water/water heat pumps”.



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. HORIZONTAL COLLECTORS OR BOREHOLES
3. OPEN EXPANSION VESSEL

LEGEND OF PIPES :

FLOW WATER
RETURN WATER
PIPES OF PRIMARY CIRCUIT

LEGEND OF FITTINGS :

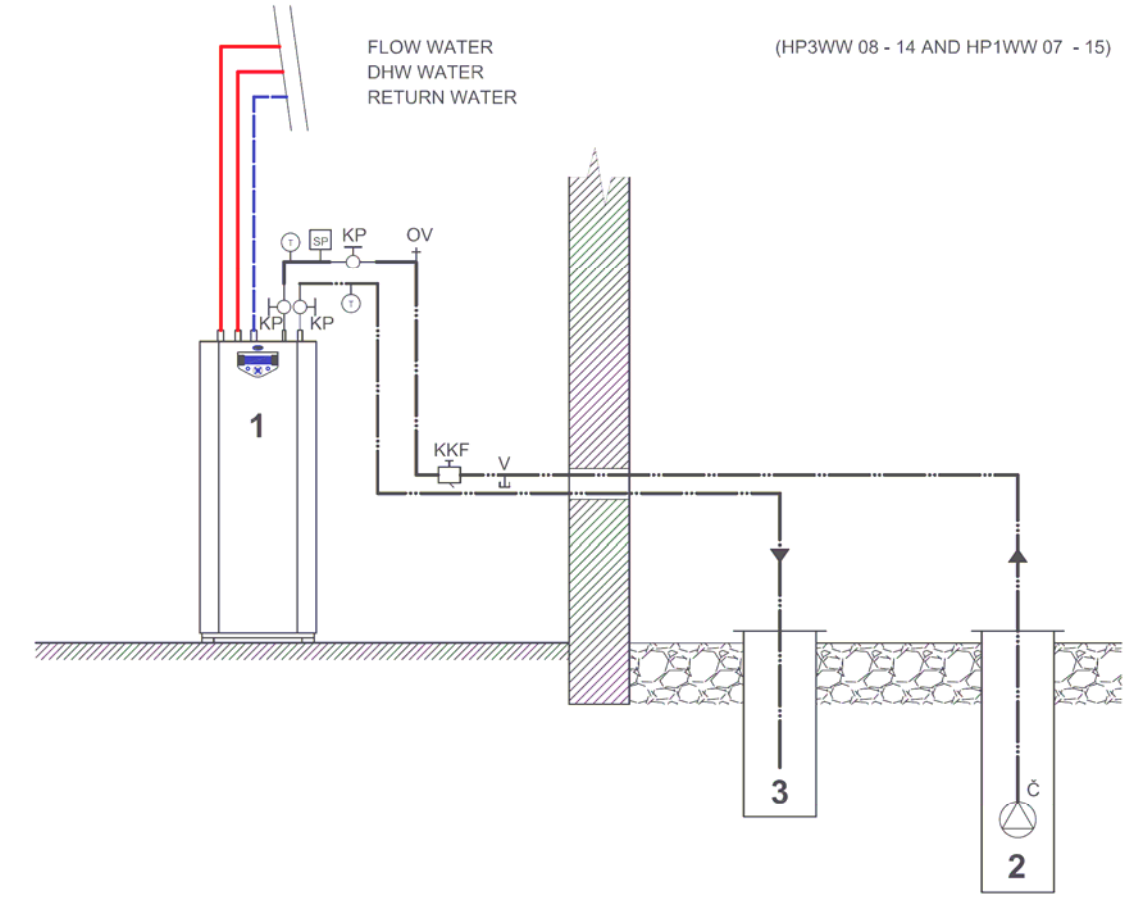
Č	- CIRCULATION PUMP
KKF	- VALVE WITH FILTER
KP	- VALVE
M	- PRESSURE GAUGES
OV	- AIR-VENT VALVE
T	- THERMOMETER
SP	- PRESSURE SWITCH
V	- DISCHARGE VALVE

Basic connections of water/water heat pumps – their primary circuit

The primary circuit of water/water heat pumps consists of facilities for water intake and draining (a suction and a drain well), interconnecting pipelines with thermal insulation preventing surface condensation of air humidity, suction pump, closing and draining fittings, filter, flow sensing device, pressure gauge, thermometer.

The length of pipelines interconnecting the heat pump and the water intake and draining facilities is not limited. The dimensions and the length of the interconnecting pipeline must be in accordance with required technical parameters of the heat pump and the suction pump of the primary circuit.
A pipe sleeve must be placed in the point of the aperture for pipeline passage through building structure and the pipeline shall be sufficiently thermally insulated. The aperture may be located both above and below the completed ground level.

The depth of wells for water intake and draining, their positions to each other shall be determined by a hydrogeology specialist with regard to the hydrogeological conditions in the place of well locations.
For technical parameters, dimensions of devices, requirements on source yield and temperature for individual heat pump performances and other technical information refer to the design basic document “Earth/water and water/water heat pumps”.



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. SUCTION WELL
3. DRAIN WELL

LEGEND OF PIPES :

FLOW WATER
RETURN WATER
PIPES OF PRIMARY CIRCUIT

LEGEND OF FITTINGS :

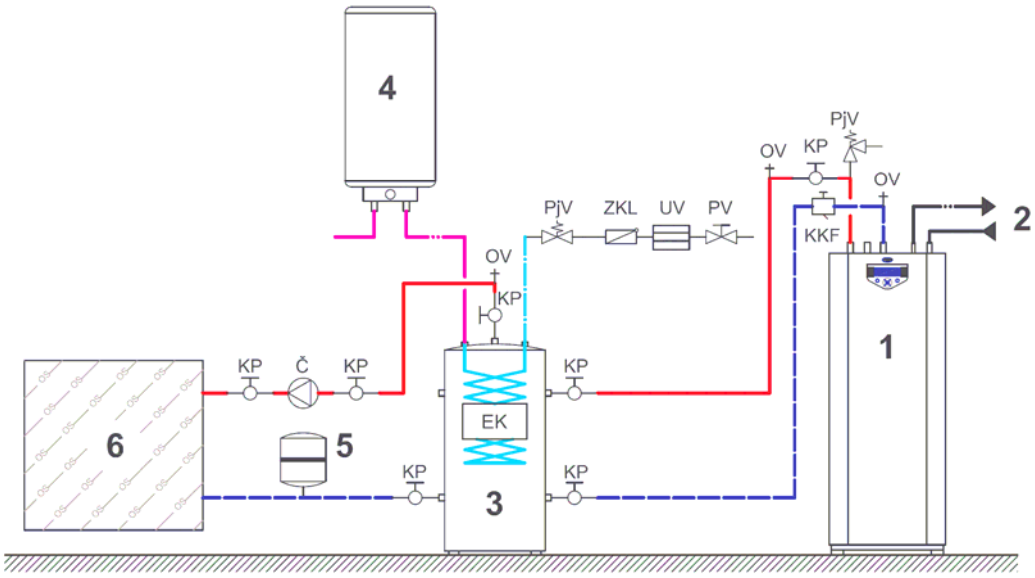
Č	- CIRCULATION PUMP
KKF	- VALVE WITH FILTER
KP	- VALVE
OV	- AIR-VENT VALVE
T	- THERMOMETER
SP	- PRESSURE SWITCH
V	- DISCHARGE VALVE

Hot water preparation using a heat exchanger in the buffer tank and additional warming in an accumulating cylinder

Hot water preparation is split into two stages. In the first stage, hot water is pre-warmed in the heat exchanger in the buffer tank by means of the heat pump during operation of heating; in the second stage, hot water is additionally warmed in a cylinder.

The buffer tank is equipped with a tubular exchanger connected to cold water distribution lines in the building. Heating water circulating between the heat pump and the heating system pre-warms hot water to a temperature similar to that of heating water. Pre-warmed water then enters the accumulating cylinder where it is additionally warmed to the temperature needed.
Water is flowing in the distribution pipelines between the buffer tank heat exchanger and the cylinder only during hot water take-off in the building.

This solution of hot water preparation is appropriate where a buffer tank is necessary and in buildings with lower consumption of hot water (e.g. family houses).
More information can be obtained from the design basic document “Basic requirements on the design of a heating system comprising the heat pump – 3.1 Hot water warming (pre-warming) during heating operation”.



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. PRIMARY CIRCUIT PIPES
3. BUFFER TANK WITH HEAT EXCHANGER AND ELECTRIC COIL
4. CYLINDER
5. EXPANSION VESSEL
6. HEATING SYSTEM

LEGEND OF PIPES :

- FLOW WATER
- RETURN WATER
- PIPES OF PRIMARY CIRCUIT
- COLD WATER
- HOT WATER

LEGEND OF FITTINGS :

Č	- CIRCULATION PUMP
KKF	- VALVE WITH FILTER
KP	- VALVE
UV	- WATER CONDITIONING
OV	- AIR-VENT VALVE
PjV	- PRESSURE SAFETY VALVE
PV	- VALVE
ZKL	- NON RETURN VALVE

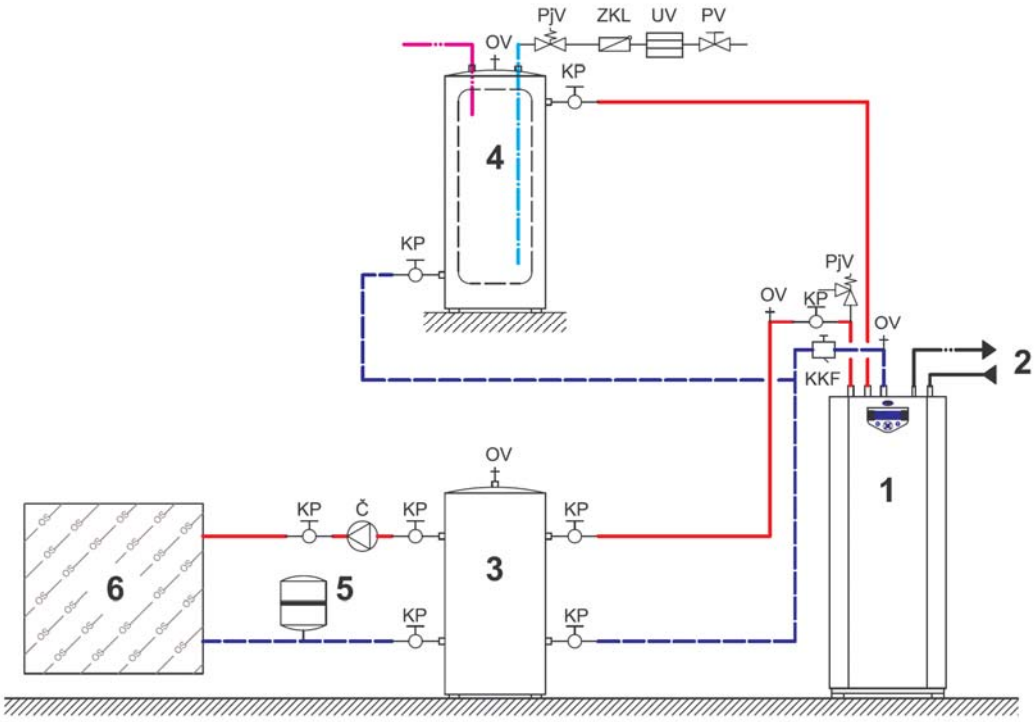
Hot water preparation by means of an indirectly warming cylinder

Hot water is prepared in an indirectly warming independent cylinder. In this case the user can specify the priority of heat pump operation for either the heating system or hot water warming.
The heat pump can be equipped with a three-way change-over valve enabling to change heating water circulation between the heat pump and the buffer tank to heating water circulation between the heat pump and the indirectly warming cylinder.

The heat pump regulation monitors the temperature of hot water in the cylinder and in the event of its drop below the set value heat pump operation is changed-over to the mode of hot water preparation. In this mode, the heat pump is working with the maximum temperature of outlet heating water. When hot water becomes pre-warmed by the heat pump it is additionally warmed by the electric boiler situated in the heat pump.

When selecting an indirectly warming cylinder, the heat transfer surface of the heat exchanger must be in accordance with heat pump performance. Basically, it is not essential if it is the case of a double-jacket cylinder or a cylinder with a tubular or other heat exchanger.
This method of hot water preparation is suitable in the systems of floor heating where in the mode of hot water pre-warming the temperature gradient can be increased by the heat pump regulation even up to 50/40°C in comparison with the heating mode where the temperature gradient is by app. 10°C lower (in case the equithermic curve influence is applied, such temperature difference may be considerably higher). In this case moreover, the electric boiler taking over a portion of hot water additional warming is blocked by the HDO signal only for 4 hours contrary to additional warming in a usual cylinder, where HDO signal blocking takes 16 hours (e.g. family houses).

Further information can be found in the design basic document “Basic requirements on the design of a heating system comprising the heat pump – 3.2 Hot water warming (pre-warming) when priority of DHW warming or heating is specified”.



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. PRIMARY CIRCUIT PIPES
3. BUFFER TANK
4. CYLINDER
5. EXPANSION VESSEL
6. HEATING SYSTEM

LEGEND OF PIPES :

- FLOW WATER
- RETURN WATER
- PIPES OF PRIMARY CIRCUIT
- COLD WATER
- HOT WATER

LEGEND OF FITTINGS :

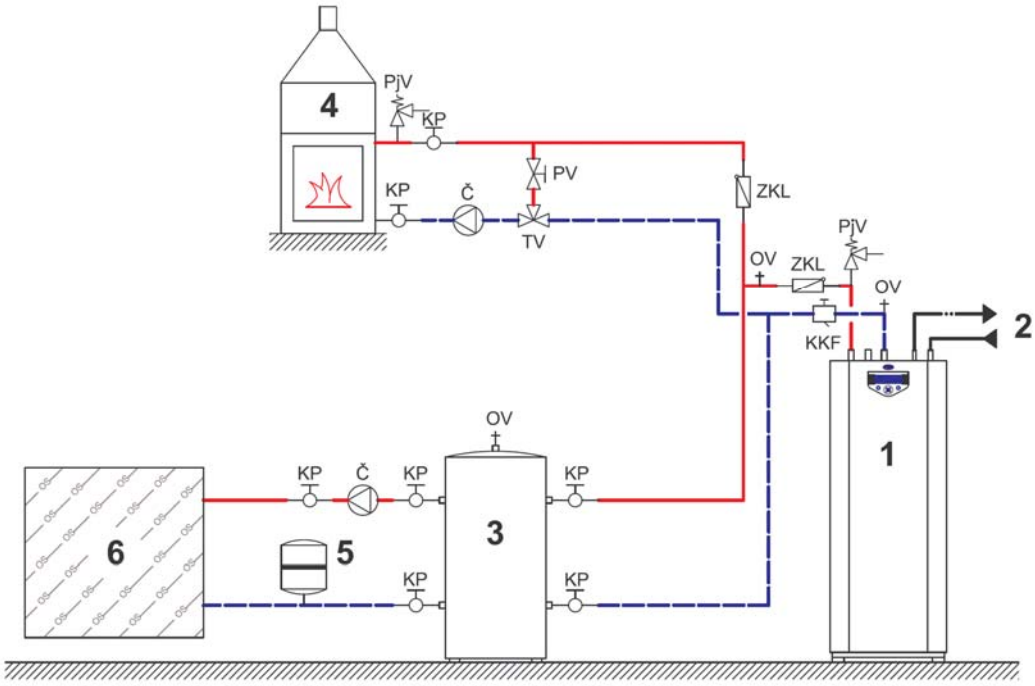
Č	- CIRCULATION PUMP
KKF	- VALVE WITH FILTER
KP	- VALVE
UV	- WATER CONDITIONING
OV	- AIR-VENT VALVE
PjV	- PRESSURE SAFETY VALVE
PV	- VALVE
ZKL	- NON RETURN VALVE

Integration of a solid fuel heat source (burner) into a heating system with the heat pump

A solid fuel burner (solid fuel boiler, hearth, hearth stove and the like) is a facility working with heating water parameters that markedly differ from those of the heat pump (higher temperature, lower flow of heating water, minimum inlet temperature is demanded for heating water an the like). As a rule, such source is used in the cases where it originally worked as the main heat source or if the customer intends to utilize the heat using a hot-water element in the stove or hearth. Designing this, it is necessary to consider all risks (hot-water element life time, complexity and usage rate of the system, heating performance of the solid fuel burner and necessary performance of the heating system, different temperature gradients and similar).

Operation of such solid fuel burner is usually semi-automatic and does not represent a main heat source in heating systems with heat pumps. Circulation pump operation is controlled by outlet temperature of the solid fuel burner (if the boiler is not working the pump is off). If the solid fuel burner is working for a system comprising the heat pump, temperature of buffer tank heating water increases and the heat pump regulation puts the heat pump out of operation (this is valid under the prerequisite that heating performance of the solid fuel burner is not lower than required heating performance of the heating system). When the solid fuel burner stops heat supply into the heating system, heating water in the buffer tank gets cool and heat pump operation starts.

Prior to heat pump installation into an existing distribution system with a solid fuel burner, it is necessary to assess the size of heating surface and if heating performance will be sufficient in the low-temperature mode of heating with the heat pump.



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. PRIMARY CIRCUIT PIPES
3. BUFFER TANK
4. SOLID FUEL BURNER
5. EXPANSION VESSEL
6. HEATING SYSTEM

LEGEND OF PIPES :

FLOW WATER
RETURN WATER
PIPES OF PRIMARY CIRCUIT

LEGEND OF FITTINGS :

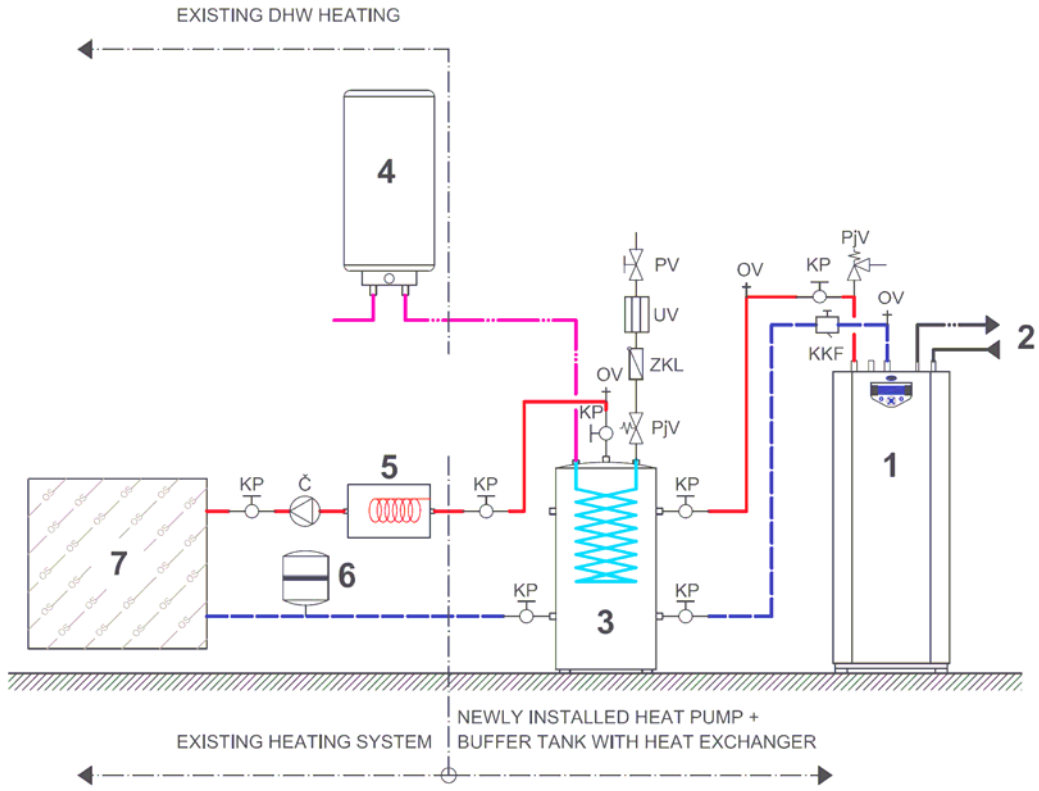
Č	- CIRCULATION PUMP
KKF	- VALVE WITH FILTER
KP	- VALVE
OV	- AIR-VENT VALVE
PjV	- PRESSURE SAFETY VALVE
PV	- VALVE
TV	- THREE WAY VALVE
ZKL	- NON RETURN VALVE

Heat pump integration into an existing distribution system of heating with an electric boiler

By integrating the heat pump into an existing distribution system of central heating with an electric boiler, that electric boiler becomes a supplementary heat source for the heat pump. Its operation is then controlled by the superior regulation of the heat pump. The original regulators for heating system operation (room temperature regulators) are connected into the heat pump regulation.
In the return pipeline between the heating system and the electric boiler there shall be set a buffer tank. It is suitable to deliver a buffer tank with a heat exchanger for hot water pre-warming. For hot water additional warming the existing cylinder can be used.

By additional installation of the heat pump into a system with an electric boiler, needed electric power consumption does not increase.

Prior to heat pump installation into an existing electric boiler system it is necessary to assess heating system distribution lines with respect to pipeline dimensions and heating surface size and if heating performance will be sufficient in the low-temperature mode of heating with the heat pump.



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. PRIMARY CIRCUIT PIPES
3. BUFFER TANK WITH HEAT EXCHANGER
4. CYLINDER
5. ELECTRIC BOILER
6. EXPANSION VESSEL
7. HEATING SYSTEM

LEGEND OF FITTINGS :

Č	- CIRCULATION PUMP
KKF	- VALVE WITH FILTER
KP	- VALVE
UV	- WATER CONDITIONING
OV	- AIR-VENT VALVE
PjV	- PRESSURE SAFETY VALVE
PV	- VALVE
ZKL	- NON RETURN VALVE

LEGEND OF PIPES :

- FLOW WATER
- RETURN WATER
- PIPES OF PRIMARY CIRCUIT
- COLD WATER
- HOT WATER

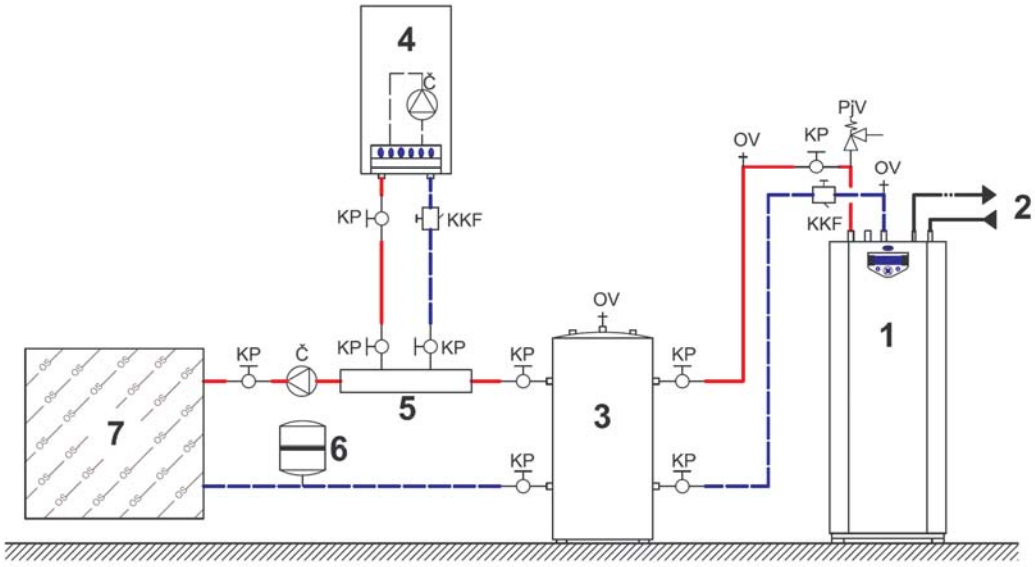
Connection of the heat pump with a complementary source – a gas boiler

Connection of the heat pump with a complementary source – a gas boiler is used in the cases when an existing gas boiler is in the building and the heat pump is installed additionally or no electric boiler as the complementary source can be used in the building due to insufficient power input.
The gas boiler with a circulation pump is connected in parallel to supply pipelines between the buffer tank and the heating system through a header.

Gas boiler operation is subject to the superior regulation of the heat pump.
It is not each time ideal for the gas boiler to be utilized as the complementary heat source. The complementary source takes over only a small portion of heating performance supply into the heating system (20 to 40% of the aggregate heating performance needed). In the time period, when heat pump performance is no more sufficient to cover the thermal loss of the building, the superior regulation starts to switch over to complementary source performance. The gas boiler switches off and on frequently which may reduce its lifetime.
Suitable complementary sources are low-temperature gas boilers with stepless regulation of heating performance. Unsuitable sources are single stage gas boilers having usually too large heating performance designed.

Since the gas boiler is a rather complicated device, heat pump connection with a complementary gas boiler must be approved by the manufacturer or the supplier of the gas boiler.
Prior to heat pump installation into an existing distribution system with a gas boiler it is necessary to assess heating system distribution lines with respect to pipeline dimensions and heating surface size and if heating performance will be sufficient in the low-temperature mode of heating with the heat pump.

More information can be found in the design basic document “Basic connections of heating systems comprising the heat pump – 4 “A heating system comprising the heat pump and a gas boiler as a complementary heat source”.



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. PRIMARY CIRCUIT PIPES
3. BUFFER TANK
4. GAS BOILER
5. HEADER
6. EXPANSION VESSEL
7. HEATING SYSTEM

LEGEND OF PIPES :

FLOW WATER
RETURN WATER
PIPES OF PRIMARY CIRCUIT

LEGEND OF FITTINGS :

Č	- CIRCULATION PUMP
KKF	- VALVE WITH FILTER
KP	- VALVE
OV	- AIR-VENT VALVE
PjV	- PRESSURE SAFETY VALVE

Heat pump integration into a multi circuit heating system

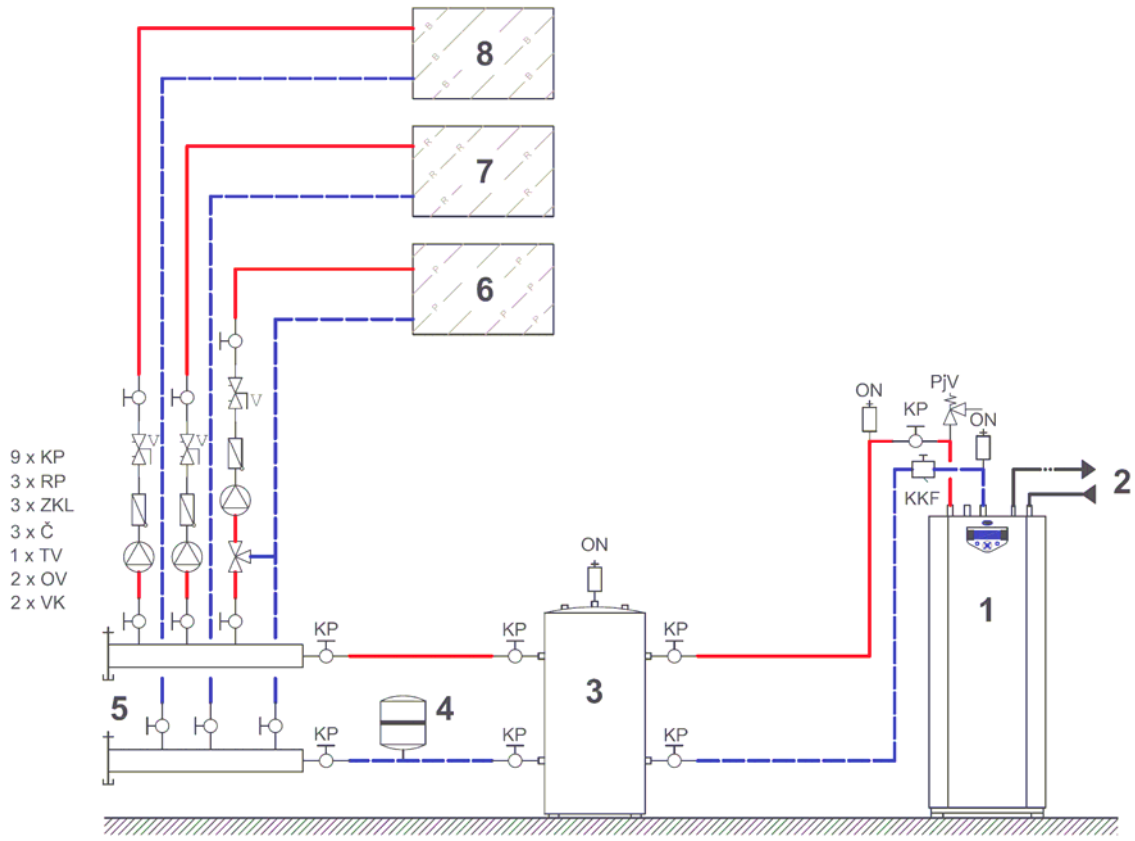
The heat pump may be connected in a heating system with one or more heating circuits. Through a buffer tank, the heat pump is hydraulically separated from the heating system. All heating circuits have their own circulation pumps and they are connected to a distributor. Each heating circuit operates on the basis of higher-level requirements (e.g. from a room temperature regulator situated in the heating circuit reference room, a swimming pool regulation and the like). The superior regulation of the heat pump takes over those higher-level requirements and controls heat pump operation.

If different temperatures of heating water in the individual heating branches (e.g. combined heating system – radiators and floor heating) are not required, in heating branches are installed mixing fittings. Heating water temperature is controlled by the heat pump regulation in equithermic way.

Water flow between the heat pump and the buffer tank is determined by required hydraulic parameters of the heat pump.

For proper operation of a heating system comprising the heat pump, the water flow between the buffer tank and the distributor shall be equivalent to the water flow in the heat pump, i.e. the sum of flows in heating branches is equivalent to the flow in the heat pump.

If one or more branches have a mixing fitting, then the sum of flows leaving the distributor for heating branches must be equivalent to the flow in the heat pump. And at the same time it must be ensured that the temperature of heating water returning into the buffer tank from the heating system is equivalent to the temperature of heating water entering the heat pump.



LEGEND :

1. HEAT SYSTEM - INTERNAL PART
2. PRIMARY CIRCUIT PIPES
3. BUFFER TANK
4. EXPANSION VESSEL
5. MANIFOLD
6. UNDER FLOOR HEATING (UFH) WITH THERMAL FLOW 40/35°C
7. RADIATORS WITH THERMAL FLOW 50/40°C
8. SWIMMING POOL HEAT EXCHANGER WITH THERMAL FLOW 50/40°C

LEGEND OF FITTINGS :

Č	- CIRCULATION PUMP
KKF	- VALVE WITH FILTER
KP	- VALVE
OV	- AIR-VENT VALVE
PjV	- PRESSURE SAFETY VALVE
RP	- FLOW REGULATOR
TV	- THREE WAY VALVE
VK	- DISCHARGE VALVE
ZKL	- NON RETURN VALVE

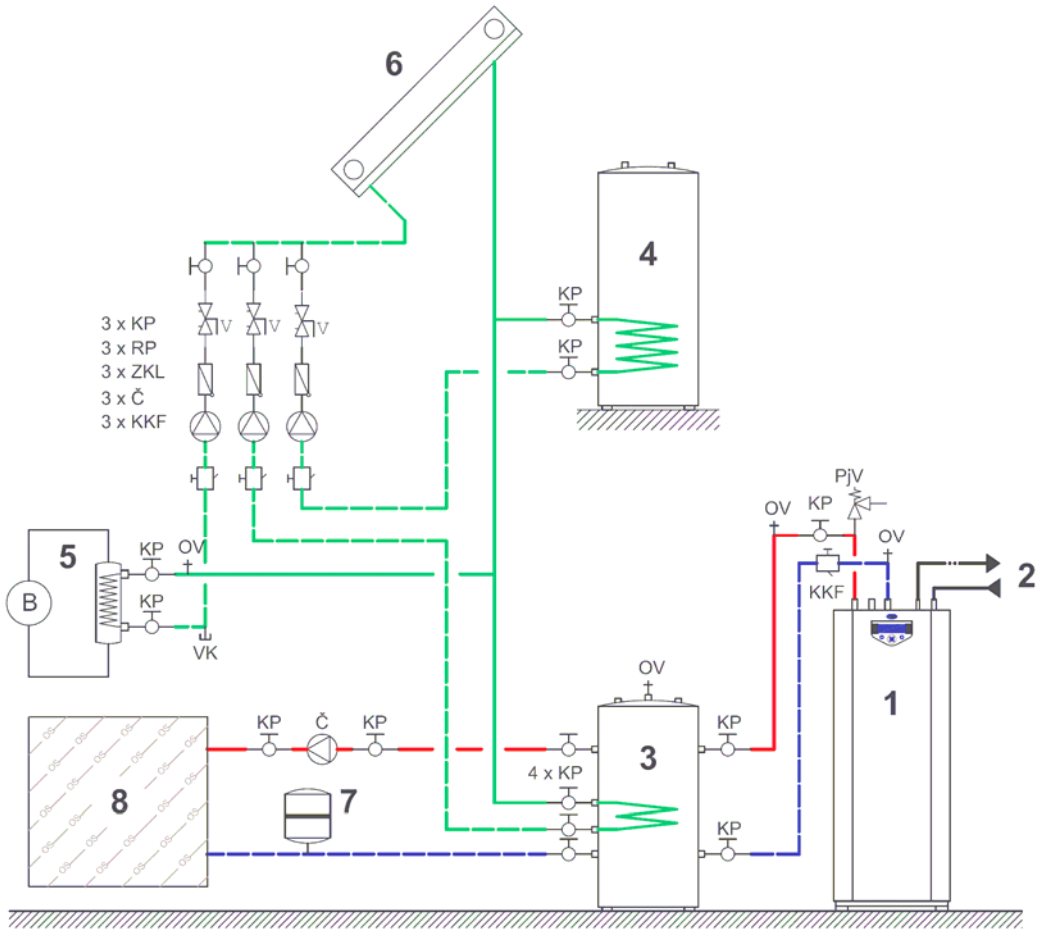
LEGEND OF PIPES :

FLOW WATER
RETURN WATER
PIPES OF PRIMARY CIRCUIT

Joint integration of the heat pump and a solar system into a heating system

To integrate the heat pump and the solar system jointly in a heating system is practicable having no regard to investment demands and energy gains.
The solar system will be connected into the heating system through a heat exchanger situated in the buffer tank. In case higher amount of heat is added into heating water by the solar system the temperature of water in the buffer tank may increase so that the heat pump switches off. When solar system heat becomes exhausted, heat will be again supplied into the heating system by the heat pump.

The regulations of the solar system and the heat pump need not to be interconnected. The heating system comprising the heat pump is influenced by the solar system indirectly.
In supplying heat for hot water preparation and swimming pool water warming, interconnection of the heat pump and the solar system brings duplication of equipment – two exchangers for the swimming pool (the solar system utilizes non-freezing mixture as its heat transfer liquid whereas the heat pump works with heating water), a solar system heat exchanger warming hot water and pre-warming by the heat pump and the like.



LEGEND :

1. HEAT SYSTEM - INTERNAL PART
2. PRIMARY CIRCUIT PIPES
3. BUFFER TANK
4. CYLINDER
5. SWIMMING POOL HEAT EXCHANGER
6. SOLAR COLLECTOR
7. EXPANSION VESSEL
8. HEATING SYSTEM

LEGEND OF FITTINGS :

Č	- CIRCULATION PUMP
KKF	- VALVE WITH FILTER
KP	- VALVE
OV	- AIR-VENT VALVE
PjV	- PRESSURE SAFETY VALVE
RP	- FLOW REGULATOR
VK	- DISCHARGE VALVE
ZKL	- NON RETURN VALVE

LEGEND OF PIPES :

- FLOW WATER
- RETURN WATER
- PIPES OF PRIMARY CIRCUIT
- FLOW WATER - SOLAR
- RETURN WATER - SOLAR

Integration of the water/water mini heat pump into distribution lines of a heating system with the heat pump

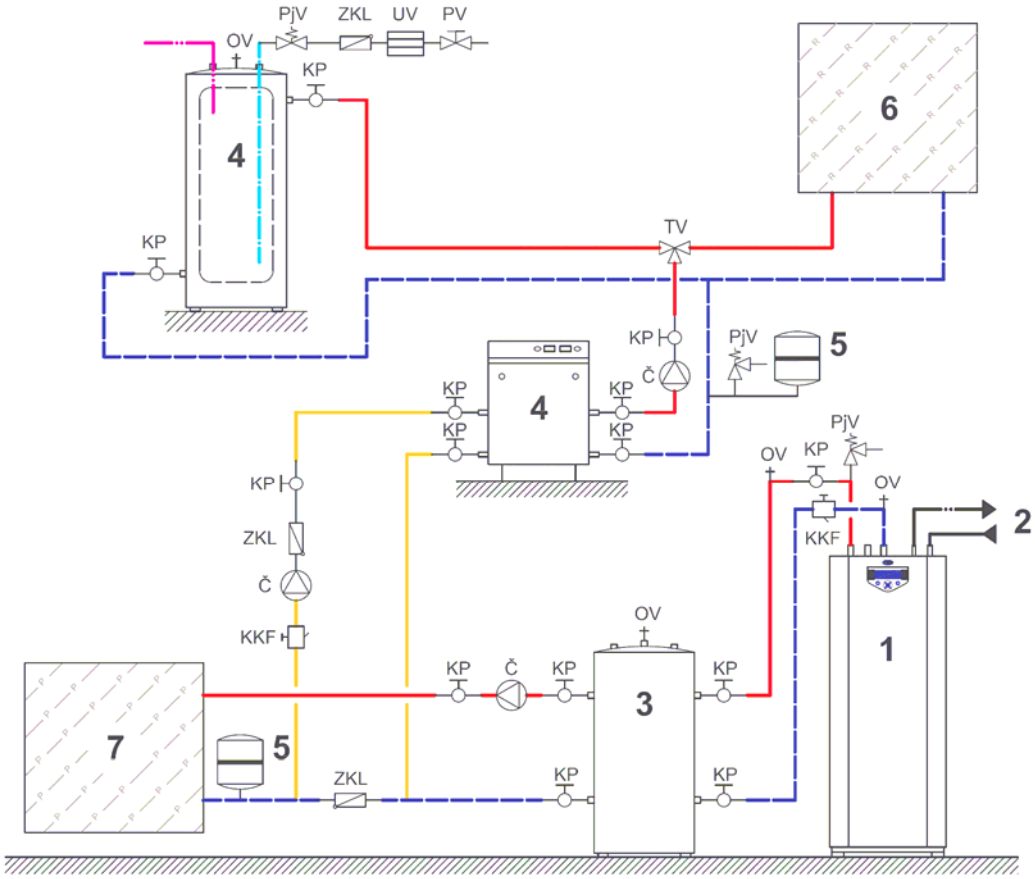
The water/water mini heat pump is used in heating systems with the heat pump where the main portion of heat supply in a building is provided by a low-temperature heating surface (floor heating). The water/water mini heat pump provides heat supply into that part of the heating system that requires a higher temperature (up to 60°C) of heating water, e.g. radiators, hot water preparation, water warming for a swimming pool.

The primary circuit of the water/water mini heat pump is connected in parallel to the return pipeline between the heating system and the buffer tank. A return valve must be set in the return pipeline, in the point of connection of the primary circuit of the water/water mini heat pump inlet-outlet.
In the winter mode, when heating system is running, it is ensured that heating water can circulate between the heating system and the buffer tank and heating water can be any time taken into the water/water mini heat pump as a source of low-potential heat.

In the summer mode, when heating system is not running, by demand for water/water mini heat pump operation the circulation pump on the heating system side is started as well. Thus in the summer mode, building internal environment is slightly cooled down.

The advantage of water/water mini heat pump use as a supplementary heat source with higher temperature of heating water is in maximum utilization of the main heat source (heat pump) operating with minimum temperature of heating water.

Further information is contained in the design basic document “TCMM mini heat pumps”.



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. PRIMARY CIRCUIT PIPES
3. BUFFER TANK
4. HP TCMM MINI
5. EXPANSION VESSEL
6. RADIATORS WITH THERMAL FLOW 50/40°C
7. UNDER FLOOR HEATING (UFH) WITH THERMAL FLOW 40/35°C

LEGEND OF FITTINGS :

Č	- CIRCULATION PUMP
KKF	- VALVE WITH FILTER
KP	- VALVE
OV	- AIR-VENT VALVE
PjV	- PRESSURE SAFETY VALVE
PV	- VALVE
TV	- THREE WAY VALVE
UV	- WATER CONDITIONING
ZKL	- NON RETURN VALVE

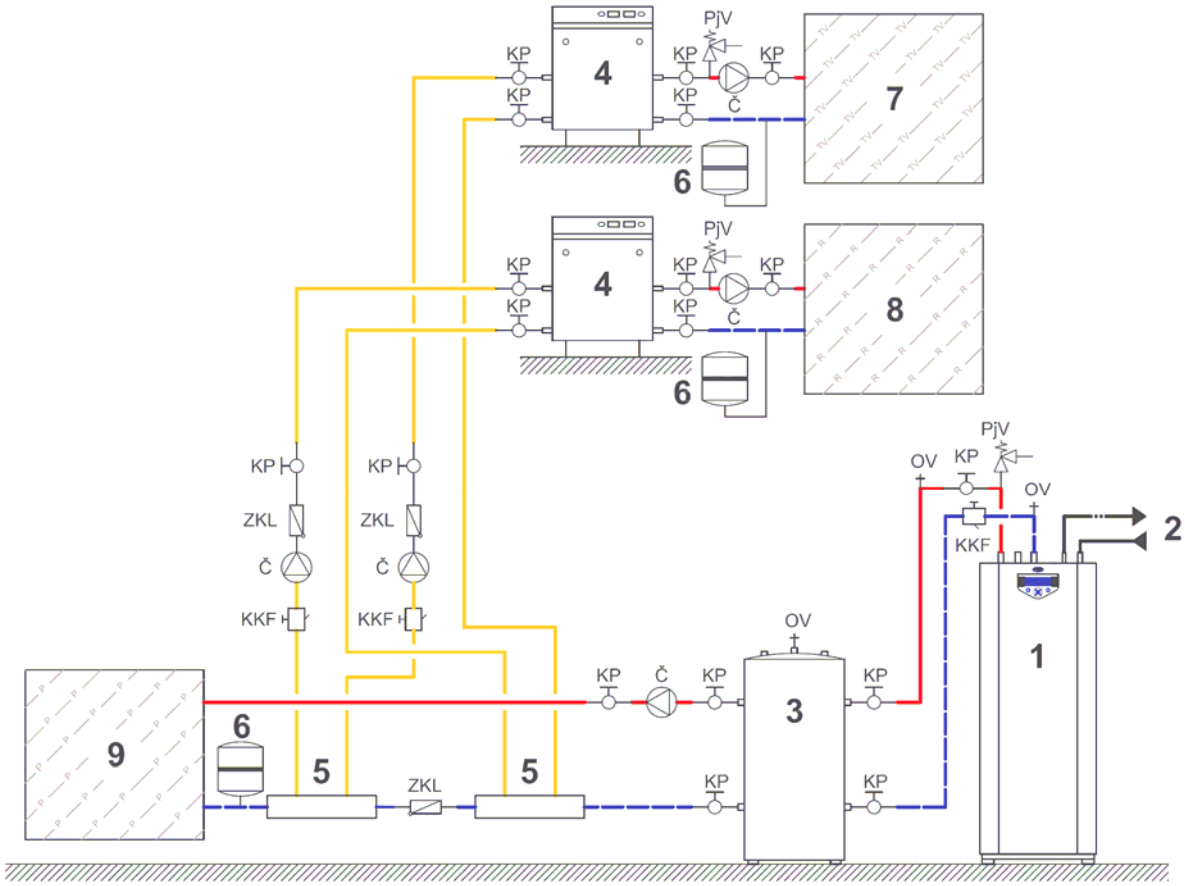
LEGEND OF PIPES :

- FLOW WATER
- RETURN WATER
- COLD WATER
- HOT WATER
- PIPES OF PRIMARY CIRCUIT
- PIPES OF PRIMARY CIRCUIT HP TCMM MINI

Integration of water/water mini heat pumps into distribution lines of a heating system with the heat pump

Besides standard connection of a single water/water mini heat pump it is also possible to integrate more such heat pumps; by reason of either more heating circuits requiring a higher thermal gradient or a demand to separate hot water warming from the system of central heating.

As against the standard connection with one TCMM mini heat pump, heat pumps are connected in the return pipeline between the heating system and the buffer tank through thermo-hydraulic distributors.



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. PRIMARY CIRCUIT PIPES
3. BUFFER TANK
4. HP TCMM MINI
5. HEADER
6. EXPANSION VESSEL
7. HOT WATER WITH THERMAL FLOW 60/55°C
8. RADIATORS WITH THERMAL FLOW 50/40°C
9. UNDER FLOOR HEATING (UFH) WITH THERMAL FLOW 40/35°C

LEGEND OF FITTINGS :

Č	- CIRCULATION PUMP
KKF	- VALVE WITH FILTER
KP	- VALVE
OV	- AIR-VENT VALVE
PjV	- PRESSURE SAFETY VALVE
ZKL	- NON RETURN VALVE

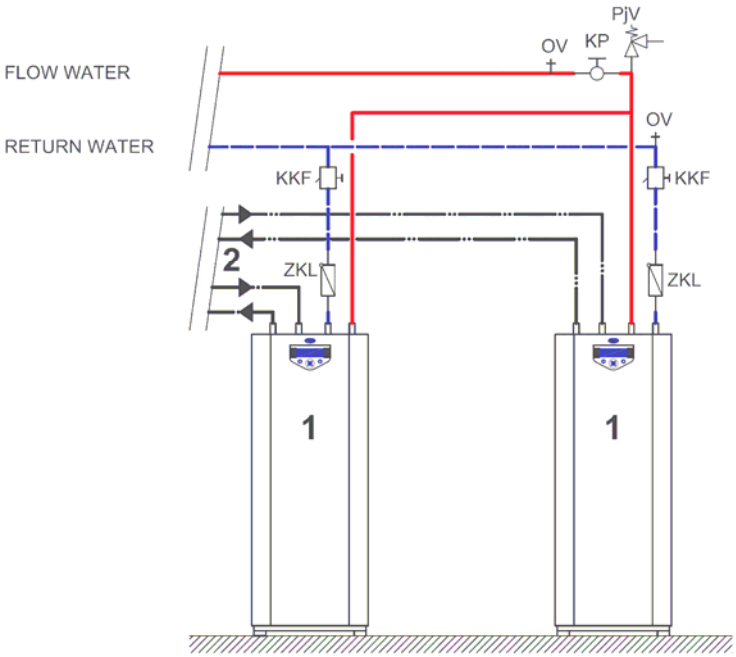
LEGEND OF PIPES :

- FLOW WATER
- RETURN WATER
- PIPES OF PRIMARY CIRCUIT
- PIPES OF PRIMARY CIRCUIT HP TCMM MINI

Cascade connection of heat pumps

Heat pumps are connected in a cascade in order to cover thermal losses of the building exceeding 60 kW. The heat pumps are connected into the heating system through the buffer tank and they are controlled by the superior regulation.

Required water flow through the circulation pump of each heat pump is ensured according to required hydraulic parameters for the respective size of the heat pump. Hydraulic connection of the heat pumps is made by means of parallel flow connection to equalized pressure loss, so called Teichelmann connection.



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. PRIMARY CIRCUIT PIPES

LEGEND OF PIPES :

FLOW WATER
RETURN WATER
PIPES OF PRIMARY CIRCUIT

LEGEND OF FITTINGS :

KKF	- VALVE WITH FILTER
KP	- VALVE
OV	- AIR-VENT VALVE
PjV	- PRESSURE SAFETY VALVE
ZKL	- NON RETURN VALVE

Positions of temperature probes

Diagram: Hot water preparation by means of the buffer tank heat exchanger and additional warming in a cylinder

Temperature probe B11 – measures temperature of heating system return water; the probe is positioned in the buffer tank bottom part in a temperature probe well

Temperature probe B12 – measures temperature of heating water for the purpose of control of hot water warming; the probe is positioned in the middle or top part of the buffer tank in a temperature probe well

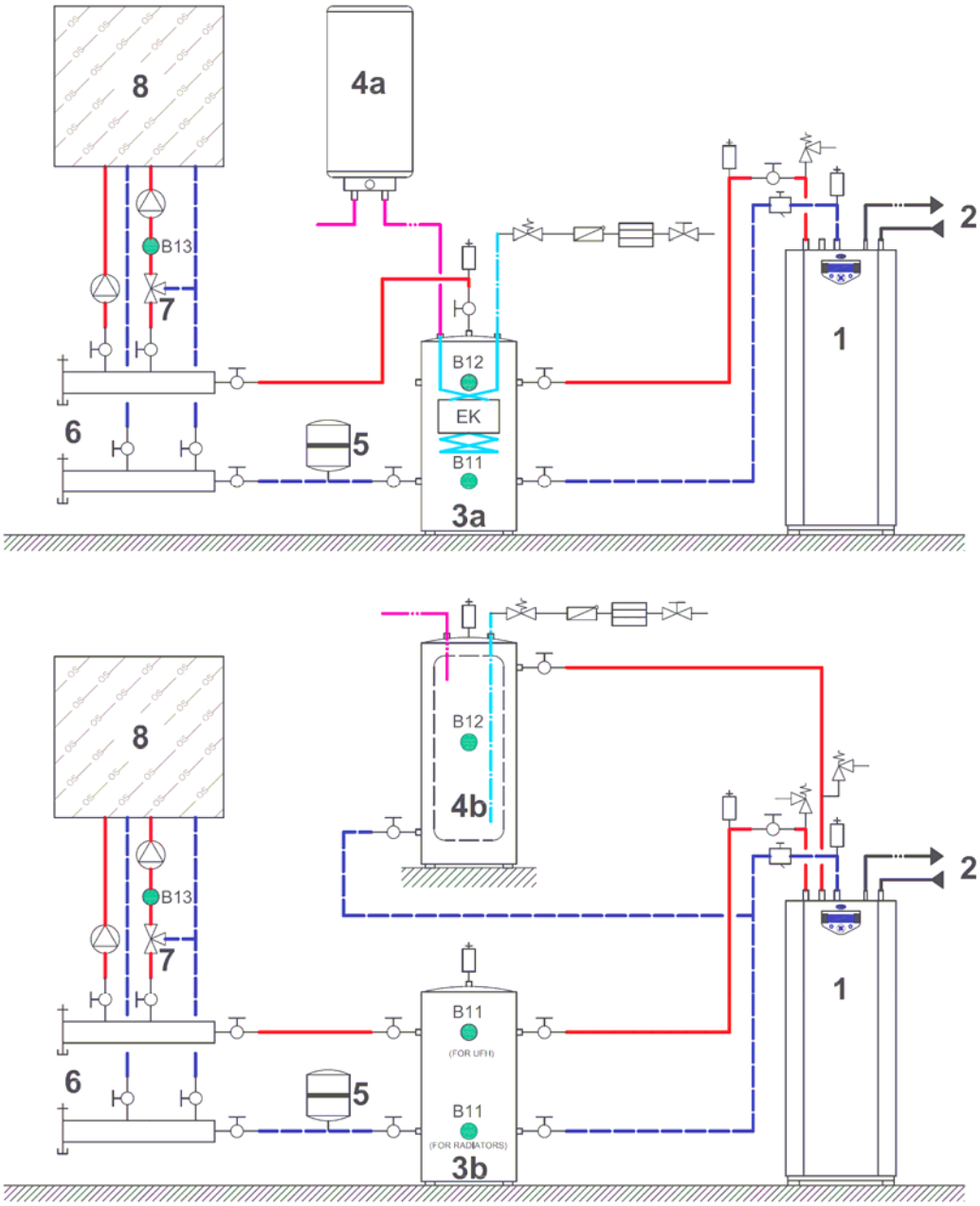
Temperature probe B13 – measures temperature in the heating system for the purpose of control of servo valves (in combined two-temperature heating systems); the probe is positioned in a temperature probe well behind the mixing valve

Diagram: Hot water preparation by means of an indirectly warming cylinder

Temperature probe B11 – measures temperature of heating system return water;
- the probe is positioned in the buffer tank bottom part in a temperature probe well in the case of heat supply into heating systems with a higher thermal gradient (radiators, combined heating systems and the like);
- the probe is positioned in the top part of the buffer tank in a temperature probe well in the case of heat supply into heating systems with a lower thermal gradient (floor heating etc.).

Temperature probe B12 – measures temperature of heating water for the purpose of control of hot water warming; the probe is positioned in a separate DHW tank in a temperature probe well

Temperature probe B13 – measures temperature in the heating system for the purpose of control of servo valves (in combined two-temperature heating systems); the probe is positioned in a temperature probe well behind the mixing valve



LEGEND :

1. HEAT PUMP - INTERNAL PART
2. PRIMARY CIRCUIT PIPES
3a. BUFFER TANK WITH HEAT EXCHANGER AND ELECTRIC COIL
3b. BUFFER TANK
4a. CYLINDER
4b. CYLINDER
5. EXPANSION VESSEL
6. MANIFOLD
7. THREE WAY VALVE
8. HEATING SYSTEM