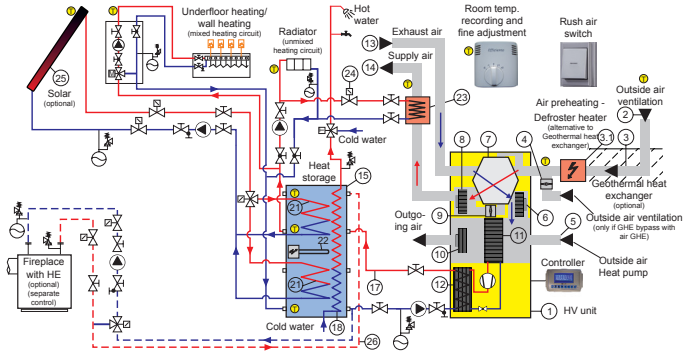
3.3 Functional Description



Ventilation Module

The HV unit (1) provides the building with supply air and exhausts the contaminated exhaust air. Via the ventilation outside air connection (2) and by means of the supply air fan (8), outside air is sucked into the building via a geothermal heat exchanger (3) laid in the ground. Via the geothermal heat exchanger the outside air is preheated in winter and precooled in summer. As an alternative to the geothermal heat exchanger an electric defroster heater (3.1) can be used that preheats the outside air in winter.

The fresh air is conducted through the reverse flow duct heat exchanger (7) and draws heat from the counterflowing exhaust air (13). Via the supply-air duct system the fresh air enters the living areas as supply air (14). In summer the fresh air can be channelled past the reverse flow duct heat exchanger. For this purpose the summer bypass flap (9) in the supply-air bypass duct is repositioned. With the optional geothermal heat exchanger bypass (4) the fresh air supply can be switched over. The fresh air can thus be supplied via the geothermal heat exchanger or directly via the outside air connection. In this way the fresh air is always aspirated at the optimum temperature.

Heat Pump

The exhaust air is conducted through the evaporator (11) (air-to-refrigerant heat exchanger) of the heat pump by means of the exhaust-air fan (6). In the evaporator the exhaust air delivers the residual heat still contained within it to the refrigerant circuit heat pump. The heat pump draws heat energy from the exhaust air in the evaporator and delivers it directly to the thermal storage water(17) in the condenser (12) (refrigerant-to-water heat exchanger) of the heat pump. In order to cover the complete heat requirement for the heating mode and domestic water needs, additional outside air (5) is directly aspirated and also conducted through the evaporator. Thereby the additional outside air delivers heat energy to the refrigerant circuit heat pump. In the case where the supply air and exhaust air fan motors are not in operation, the volume flow required to operate the heat pump is aspirated by the heat pump outer air fan motor (10) alone. By this means the optimum volume flow is always conducted through the evaporator of the heat pump. In this way an optimum coefficient of performance of the heat pump for each operating state of the HV unit is ensured.

Heat Storage Tank

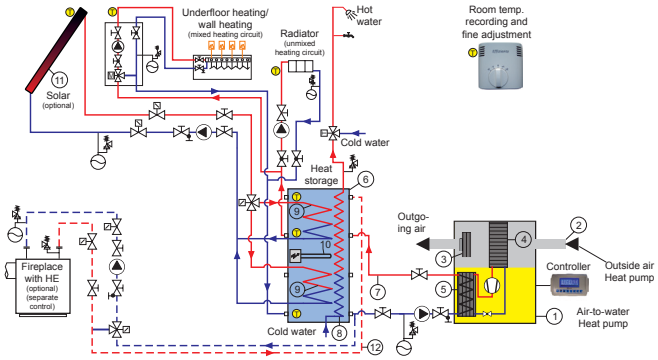
The storage tank (15) is heated via the heat pump and, where a solar thermal system (25) or water-conducting fireplace. If the energy recovered from the heat pump and solar thermal system is not sufficient, the electric heating element (22) is switched on automatically. The energy recovered from the heat pump is supplied directly to the thermal storage water (17) in the the condenser (12) (refrigerant-to-water heat exchanger) of the heat pump. The energy recovered from the solar thermal system is supplied via the heat exchanger (21). Via the domestic hot water heat exchanger (18) energy is removed and supplied to the tap connections in the building. The static heating surfaces and/or the hot water duct heater (23) in the supply air are connected directly to the storage tank.

Legend:

1 HV unit
2 Outside air intake ventilation
3 Geothermal heat exchanger (GHE)
3.1 Defroster heater (alternative to GHE)
4 Geothermal heat exchanger bypass ventilation
5 Outside air for heat pump
6 Ventilator exhaust air
7 Reverse flow duct heat exchanger
8 Ventilator supply air
9 Summer bypass supply air
10 Fan heat pump
11 Evaporator heat pump
12 Condenser heat pump
13 Exhaust air from room
14 Supply air into room
15 Heat storage tank KS-PWS 500-2, 500 L
17 Storage water supply
18 Hot water heat exchanger
21 Solar heat exchanger
22 Electric heating element
23 Supply-air heater (optional)
24 Supply air temperature limiter (optional)
25 Solar thermal system (optional)
26 Fireplace supply (optional)

4.3 Functional Description

Air-to-water heat pump, indoor installation



Heat pump

The outside air (2) is aspirated through the evaporator (4) (air-to-refrigerant heat exchanger) of the heat pump by means of the fan (3). The heat pump draws heat energy from the outside air in the evaporator and delivers this directly to the storage water (6) in the condenser (5) (refrigerant-to-water heat exchanger) of the heat pump.

Heat Storage Tank

The storage tank (6) is heated via the heat pump and, where applicable, a solar thermal system (11) or water-conducting fireplace. If the energy recovered from the heat pump and solar thermal system is not sufficient, the electric heating element (10) is switched on in a controlled manner. The energy recovered from the heat pump is supplied directly to the storage water (6) in the condenser (5) (refrigerant-to-water heat exchanger) of the heat pump. The energy recovered from the solar thermal system is supplied via the heat exchanger (9). Via the domestic water heat exchanger (8) energy is removed and supplied to the tap connections in the building. The static heating surfaces are connected directly at the storage tank.

Legend:

1 Air-to-water heat pump
2 Outside air for heat pump
3 Fan for heat pump
4 Evaporator for heat pump
5 Condenser for heat pump
6 Heat storage tank KS-PWS 500-2, 500 l
7 Storage water supply
8 Hot water heat exchanger
9 Solar heat exchanger
10 Electric heating element
11 Solar thermal system (optional)
12 Fireplace flow (optional)

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