

23 One heat pump 22-48 kW, oil or gas boiler, DHW from one coil cylinder

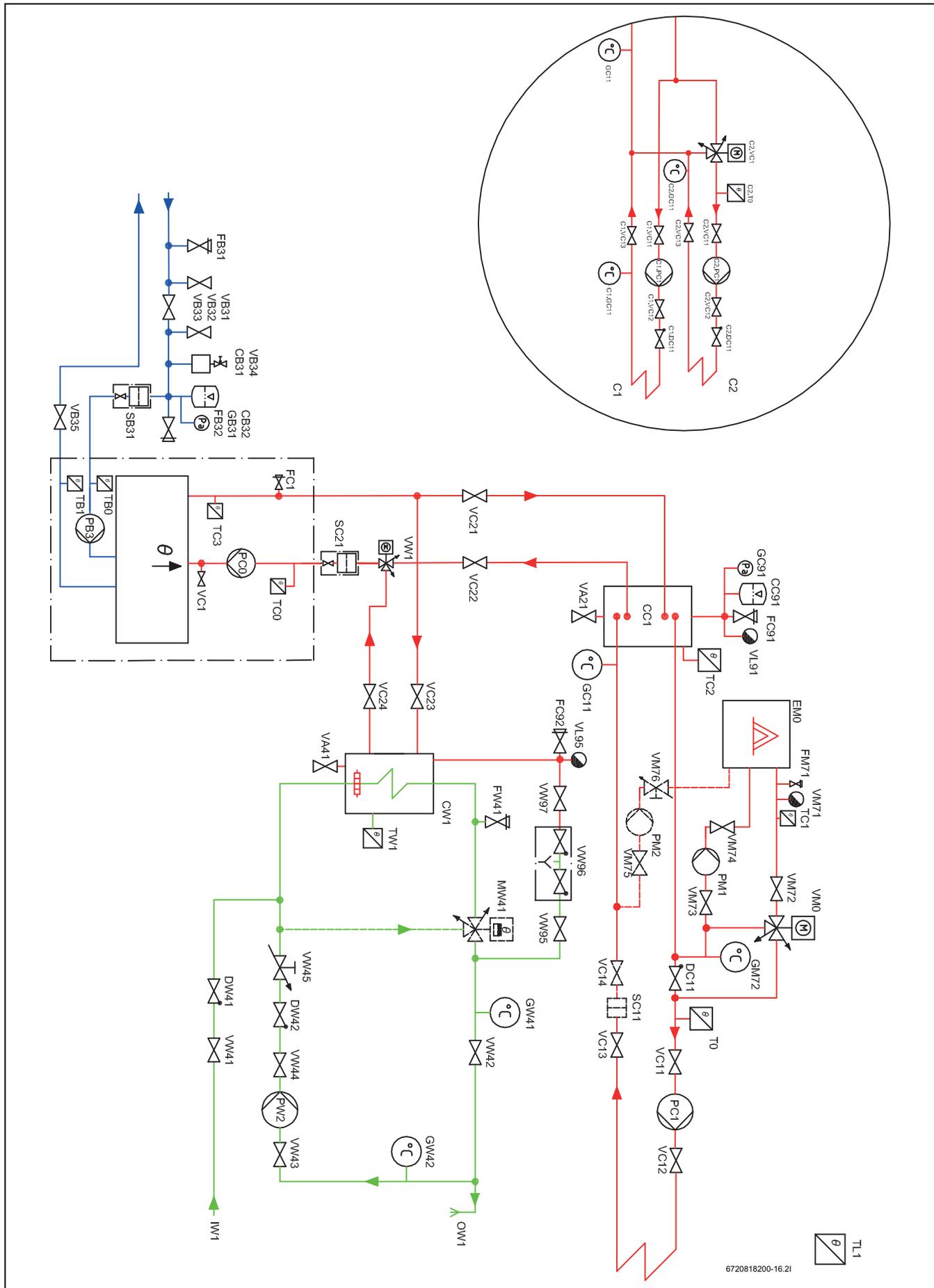


Fig. 17

## General specifications

### Overview

This system solution is intended for properties with one heating circuit. Maximum system temperature requirement is 80/60 (80° flow, 60° return) at the DOT (Dimensioning Outdoor Temperature) for the region where the properties is.

### Function

The heat pump supplies the majority of the required heating.

### Heat production from heat pump

The set point value for the flow is calculated from the outdoor temperature TL1 and the heat curve. Adjustments are made against the flow temperature T0. The curve is calculated automatically from the basic settings. The customer has the option of adapting the heat curve at different outdoor temperatures. In case of low heating system flow, start and stop of compressors are done against buffer temperature TC2 in case it shows a higher temperature than T0

### Exercise operation

All circulation pumps, and the 3-way valves, runs for one minute if they have not been used for 7 days.

### Summer/Winter mode

Winter mode is activated either immediately when TL1 drops below set temperature (7°C), or after 6 hours below 15°C (both settings adjustable) Summer mode is activated when TL1 has been above 17°C for more than 3 hours (both settings adjustable)

### Filling of the heating system

Filling of heating water is performed via VW96 which must comply with EN 1717. Filling in this fashion, minimizes the amount of gas introduced into the heating system since it is vented largely through VL95 during filling or immediately after. Filling more than twice a year is indicative of a too small expansion vessel or leakage. Refilling of water may be required more frequently for a certain time after commissioning.

### De-airing of heating system

The type and positioning in the system of the buffer tank CC1 makes it function, together with the vent VL91, as a heating system vent.

### Dirt separator for the heating system

The type and positioning in the system of the buffer tank CC1 makes it function also as a sediment separator. Gathered sediment can be flushed out via VA21. But when a heat pump is installed in an existing heating system, a magnetite filter is needed (SC11)

### Adjustment of heating system flow

The connecting mode according to this system solution works for any low-flow or high-flow system, but optimal function is obtained when the heating system nominal flow equals that of the heat pump. With the heat pump in continuous operation, the temperature difference TC3 – TC0 becomes the same as T0 – GC11. The flow can be adjusted primarily by adjusting the pressure height of the PC1 pumps respectively. However, a correct flow may have the consequence that only part of the heating system becomes hot. This means that the distribution valves of the heating system needs adjusting (radiators/floor heating).

### Flow temperature sensors T0, TC1 and C2.T0

For steel pipes these sensors must be of immersion type. For copper pipe it can be a contact sensor.

### Mixed circuit

#### Overview

Two heating circuits, one of which requires more heat, e.g. radiators and the 2:nd e.g. floor heating.

#### Function

The (optional) heating circuit with lower temperature demand is controlled through an accessory (Multi-regulator) to which an external sensor, a mixing valve and a circulation pump are connected.

### Mixed heating circuit C2

When using C2, accessories are required, including Multi-regulator, sensor C2.T0 and circulation pump C2.PC1. The flow set point value is calculated from the outdoor temperature TL1 and the heat curve for C2 Adjustments are made against flow temperature C2.T0 by controlling C2.VC1 to open against the buffer CC1 during a temperature drop. C2.PC1 can be set to be active in winter mode only or permanently.

### 22 – 48 kW heat pump

#### Overview

In winter mode the respective Compressor in the heat pump (ER1, ER2) starts when T0 falls below the preset temperature by the current heat pump hysteresis, and stops when T0 rises above the preset temperature by the current compressor hysteresis. Once stopped, the respective compressor is blocked from restarting for 3 minutes. The hysteresis is floating and individual for each compressor. This means that the starting order of the heat pumps changes; the one with the longest non operating time will start first and the one with the long-est operating time will stop first.

#### Pump control heat carrier pump PC0

PC0 starts before start of the first compressor and runs for a while after the last compressor stops. PC0 is regulated to keep a constant temperature difference for TC3-TC0.

#### Pump control collector circuit pump PB3

PB3 starts before the first compressor starts and runs for a while after the last compressor stops. PB3 is regulated against TB1. in order to keep a constant temperature difference TBO - TB1 within the normal working interval.

Outside normal collector circuit temperatures, the temperature difference is adjusted to achieve optimal operation.

#### De-airing of collector circuit

When ethanol is used as antifreeze it is important that there are no automatic venting devices in the collector circuit since these will tend to vent the ethanol over time. Instead, there is a 4.5 liter plastic vessel CB31 where air gathers and is vented manually via VB34. When glycol is used as antifreeze, automatic vents with microbubble separators are required instead of CB31, and VB34 must be installed directly on the pipe

### Mixed additional heat

#### Overview

Mixed additional heat (oil or gas boiler) that can be started and stopped by a signal from the heat pump and is used as additional heat for both heating and potable hot water production.

#### Function

The additional heat EMO assists when the heat pump alone is unable to satisfy the heating demand or when the additional heat is cheaper than heat produced by the heat pump (Hybrid function)

#### Control of mixed additional heat EMO

Engaging of the mixed additional heat EMO is performed with a degree minute calculator from the difference between actual value and set point value T0 - 3K. When the number of degree minutes is fulfilled, the system receives starting permission and the boiler circulation begins. When the temperature sensor TC1 confirms that the working temperature has been reached, the mixing valve control of VMO begins which then regulates T0 to setpoint. Disconnection occurs when the mixing valve has closed and the degree minute calculation of the difference between the T0 actual value and set point value reaches the preset number of degree minutes.

#### PM1 (& PM2) boiler pump control

The boiler pump(s) is started at the same time as the start signal to the boiler EMO, and keeps running until 2 minutes after the start signal to EMO has been removed.

**Heating buffer CW1 (potable hot water production)**

CW1 can also be heated by the boiler, via the thermal valve VM1, that start to open toward CW1 at 60°C

- 3) Heat pump size
- 4) Only possible to use one compressor in heat pump

**Adjusting of mixed additional heat EMO**

The internal temperature regulation of the additional heat should be set about 10K above the maximal heating system temperature (the highest flow temperature of the heat curve). The start signal from the heat pump is connected in such a way that the additional heat cannot be started in the absence of this signal, but without the security function, requiring manual acknowledgement for restart. The boiler alarm should not be connected to the heat pump; if the additional heat is not hot within a reasonable amount of time an alarm is received through the temperature sensor TC1.

**Condensing boiler with low temp return**

If a condensing boiler with a 2:nd return is used, PM2 should be installed together with VM75, VM76 and DM71. It will supply the boiler with lower return temperature for the condensing part of the boiler. VM76 to be adjusted according to boiler requirement for minimum flow to this return (normally around 10% of nominal total flow).

**Fresh water tank**

**Overview**

The property also requires a small to medium amount of potable hot water, which is supplied by fresh water cylinder(s).

**Function**

The fresh water tank is heated by the heat pump, the 3-step electrical heater on the heat pump flow, or integrated electrical heater (backup function).

**Fresh water tank (potable hot water production)**

The heat pump should be set to use a local hot water sensor. Hot water mode is activated when TW1 drops below the start temperature. Hot water mode ceases when TW1 and TCO exceed the stop limit. In hot water mode the compressor starts and the 3-way valve VW1 is put in hot water position. The heat pump normally charges the fresh water tank with both compressors, until the end of the charging cycle, when the compressor with most running hours are stopped. But it is possible to make a setting to limit DHW charging to one compressor only, if the DHW cylinder is small compared to the heat pump power. The speed of PCO is controlled during the charging to ensure high charging temperatures during the start of the charging, and high flow at the end of the charging cycle, to ensure that the buffer is charged all the way to the bottom.

**Flow in the hot potable water circulation**

In order to maintain the dimensioned capacity of the fresh water tank CW1, it is important that the flow in the hot water circulation is not too high that the maximum return of the heat pump is exceeded. The temperature difference between GW41 and GW42 should be about 5K.

**Thermal mixing valve MW41**

This valve is only needed on direct customer request; there are no functional or legal requirements for it. Temperature limitation is handled by the stop level on the charging temperature from the heat pump and backup heater.

**DHW dimensioning**

	1x F500 <sup>1)</sup>	1x F750 <sup>2)</sup>
1x G222 <sup>3)</sup>	10	12
1x G228 <sup>3)</sup>	14	16
1x G238 <sup>3)</sup>	8 <sup>4)</sup>	22
1x G248 <sup>3)</sup>	10 <sup>4)</sup>	12 <sup>4)</sup>

Table 21 no. of apartments

- 1) Coil cylinder 500 lit.
- 2) Coil cylinder 750 lit.