GENERAL PRODUCT AND FUNCTIONAL DESCRIPTION

for KHS CoolFlow cold water circulation

KEMPER
DRIVING PROGRESS

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Plant and functional description

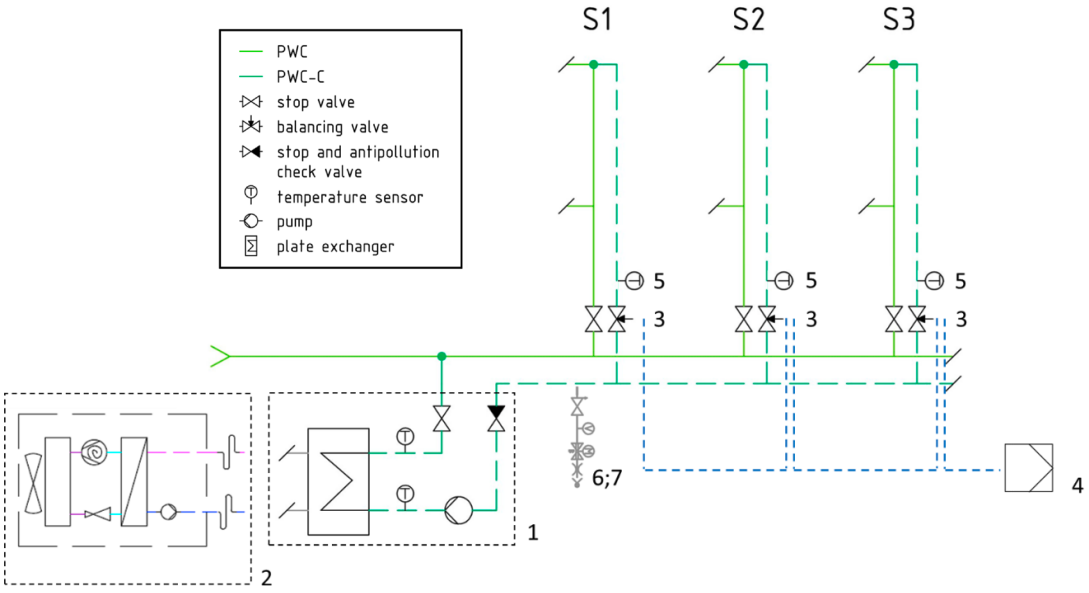
A general product and functional description, including the schematic diagram and the simulation results, are key documents for compiling a full plant and functional description.

This document contains a representative description for operating a cold water circulation system and aims to support the designer.

Note! Project-specific plant and functional descriptions are compiled by the designer.

Representative description for operating a cold water circulation system

Representative PWC-C diagram



1: KHS CoolFlow cooler
2: KHS CoolFlow chiller
3: KHS CoolFlow cold water balancing valve + actuator for shutoff and flushing function
4: KHS Mini Control System MASTER 2.1
5: KHS temperature sensor Pt1000
6;7: KHS Flush Point (flush valve with spring reset); KHS free drain

Note! In principle, the drinking water installation has the same structure as a hot water circulation system.

Representative description of (various) operating situations

1. Demand operating situation

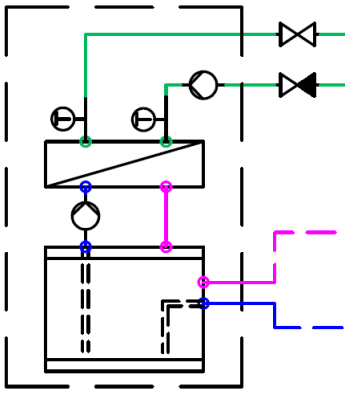
Im Bedarfsfall wird Trinkwasser über die Trinkwasserinstallation den jeweiligen Einrichtungsgegenständen zur Verfügung gestellt. Der Zirkulationsvolumenstrom kann aus hydraulischen Gründen während einer Entnahme unterbrochen werden. In diesem Fall findet keine Kühlung im Durchflussprinzip statt. Die Pumpe schaltet sich hierbei automatisch ab. Wird der Zirkulationsvolumenstrom wieder freigegeben, schaltet sich die Pumpe automatisch ein.

2. Circulation operating situation

The circulation pump of the KHS CoolFlow cooler circulates the drinking water in the circuit. Usually, system temperatures are set at 15 °C -16 °C on the output side and 19 °C - 20 °C on the input side. Thanks to the dynamic modulation of the circulation pump, the system can adapt to the thermal loads of the building. These vary throughout the seasons, for example, due to changing weather or different consumption patterns in daytime and at night.

Ill. 1 - Fig. 610 01

The drinking water is cooled by a plate heat exchanger in the KHS CoolFlow cooler. This transmits the heat to the chilled-water unit. The chilled-water unit is usually operated at temperatures from 6 °C to 12 °C. For this reason, the KHS CoolFlow cooler is diffusion-tightly insulated. Since the working range (15 °C – 20 °C) in the drinking water is above the dewpoint and as a result water does not precipitate under conditions typical for the building, no additional diffusion-tight insulation is needed for the drinking water installation.



Schematic representation

Hydraulic balancing of the PWC-C lines must be carried out for optimised operation (energy consumption, hygienic requirements, etc.). The hydraulic balancing of the lines is carried out using the KHS CoolFlow cold water control valve. An expansion element ensures the hydraulic balancing depending on the temperature (preset 17 °C).
Temperatures +- 1-2 K are justifiable and normal here.
Operation can be tested via temperature sensors and a higher level master control system and recorded depending on the setting.

Ill. 2 - Fig. 615 0G

Representative description of (various) operating situations

3. Water exchange operating situation

Correct water exchange must be ensured, in spite of the cold water circulation system. This is automatically carried out and logged by a flush valve with spring reset in conjunction with the KHS CoolFlow cold water balancing valves (Fig. 2) via the master control system. In the process, the circulation mode is deliberately interrupted. All KHS CoolFlow cold water balancing valves are closed with the help of the actuators. Only the KHS CoolFlow cold water balancing valve of the line to be flushed moves to the flushing position with the help of the actuator. In the process, the biggest hydraulic cross-section in the balancing valve is opened and the water is therefore exchanged completely and as turbulently as possible. The flush valve (Fig. 3) then opens the flow path via the free drain (Fig. 4).

The duration of the water exchange is defined by the quantity or duration set. The flush volume flow depends on the installed flow limiter (5, 10 or 20 l/min).

In increments, all of the lines are thus flushed out in sequence in line with the building-specific flushing settings. Following the water exchange, all KHS CoolFlow cold water balancing valves return to the balancing position and circulation is carried out again.

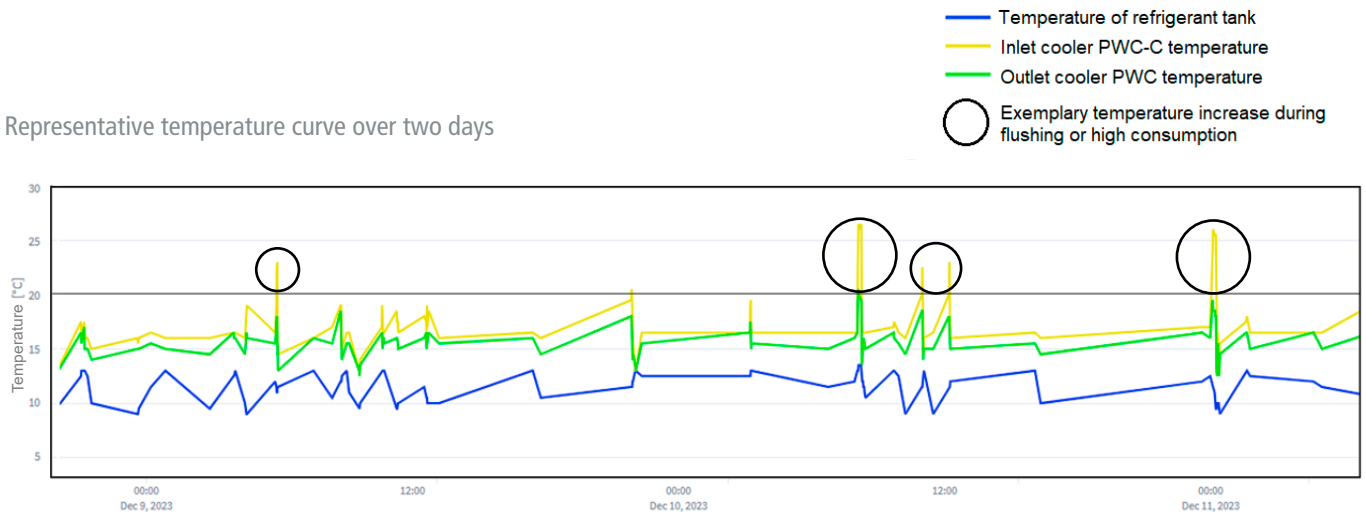
Note! Interruption of the circulation mode

- Large draw-offs are reasons why the circulation flow can be interrupted in the PWC-C and PWH-C. This happens when the flow rate is too high in proportion to the circulation flow (hydraulic principle).

- The operating situation of correct water exchange for PWC according to DIN EN 806-5 (every 7 days) or VDI 6023 (every 3 days) using cold water balancing valves by means of a flush valve.

In this case, there is no cooling of the cold water. After the circulation mode starts up again, the circulation pump circulates the drinking water over the KHS CoolFlow cooler and cools it back down to the set PWC-C output temperature.

Representative temperature curve over two days



Description of components

1. KHS CoolFlow cooler: Figure 610 01

As a PHE drinking water cooler for cooling and distributing the cold water to the tapping point in the drinking water installation with integrated circulation pump.
Adjustment range PWC temperature 15 °C to 25 °C, comprising PWM-regulated circulation pump with gunmetal housing and integrated check valve. Integrated coolant buffer tank (100l) including drinking water-side maintenance cut-off.

Pre-assembled and with diffusion-tight insulation. Wetted metal parts made from dezincification-free and corrosion-resistant gunmetal, resistant to aggressive water, stainless steel and drinking water-approved plastics. Material of the plate heat exchanger is stainless steel 1.4401/1.4404.

Low-noise operation, installation on the ground with a compact design. Connection to CoolFlow Chiller hydraulically separated, integration of all CoolFlow Chillers possible. Electronic control unit for high control quality in operation, including measuring element Pt1000. Factory pre-assembled electrical connection of actuators and sensors to the control unit.

Complies with the following standards and approvals:

- Plastic parts with KTW- and W270 approval
- According to UBA valuation basis
- ÜA-Reg.-Nr. R-15.2.3-21-17048, WIEN-ZERT

Can be used up to an operating pressure PN 10 (drinking water-side) and PN 6 (coolant side), a min. ambient temp. of 0 °C and a max. ambient temp. of 50 °C (see Ill.1).

2. KHS CoolFlow cold water balancing valve with 230V actuator: Figure 615 0G

Wetted metal parts made from dezincification-free and corrosion-resistant gunmetal, resistant against aggressive water. Thermostatic balancing valve with integrated flushing function, 15 °C to 22 °C, automatic fine balancing valve for the hydraulic balancing of floor distribution lines from kv min 0.02, for thermal self-regulating, hydraulic balancing with electrical shut-off device can be combined with a flushing system. With PTFE seat gasket, maintenance free EPDM spindle gasket, water hammer free operation, shutoff, regulating and pre-set function.

Complies with the following standards and approvals:

- Plastic parts with KTW- and W270 approval
- According to UBA valuation basis
- ÜA-Reg.-Nr. R-15.2.3-21-17048, WIEN-ZERT

Can be used up to an operating pressure of PN 10 and a max. operating and ambient temperature of 50 °C. Protection class IP54 (see Ill. 2).

3. Data logger and gateway for KHS CoolFlow cooler: Figure 611 00

Data logger and gateway for the KHS CoolFlow cooler for connection to the building management system.
Saves all analysable parameters and serves as interface for the BMS/BA via Modbus TCP/IP. Plug-and-play thanks to prepared installation space and connection cable for power and data connection in the KHS CoolFlow cooler. Data storage on micro SD card, supplied. Readable and writeable data points provided via Ethernet using Modbus TCP/IP protocol.

Data logger and Gateway
Fig. 611 00

4. KHS Mini Control System MASTER 2.1 & KHS Mini Control System SLAVE:
Figure 686 02 008
Figure 686 02 006

For execution, logging and monitoring of water exchanging measures in PWC and PWH. For the decentralised control of sensors and actuators in the Master-Slave process. For the connection of max. one shutoff each with full bore and actuator or low pressure-loss shutoffs with full bore and fail-safe closed actuator or a balancing valve and actuator, temperature sensor, flow sensor with vortex sensor and overflow sensor.

KHS Mini
Control System
MASTER 2.1
Fig. 686 02 008

KHS Mini
Control System
SLAVE
Fig. 686 02 006

Execution of the Master-Slave process via CAN-Bus (max. length CAN-Bus 2000 m), can be expanded by 62 Slave control systems or 60 hygiene flushing devices.

USB interface for updating the firmware, reading out the logbook and data logging and for downloading and uploading the configuration file. Acoustic and visual alarm signal during fault (can be switched off), alarm acknowledgement on unit and notification via email during malfunction possible.

Readout and configuration using integrated web server. Operating modes (16 memory locations): Time, temperature, flow rate control, routine, security/leak protection and data logging.
Data logging with 12 million lines for parameters, temperature, flow rate and consumption, storage rate: 1 s to 59 min.

Manual mode of all valves possible. Ideal for wall installation. Logbook with 50000 entries for flushing and system events. Display with background lighting.

The control systems must have a protection class of IP54 and a switching capacity of 230V. Max. ambient temperature 50 °C must not be exceeded.

5. KHS temperature sensor Pt1000:
Figure 628 0G

Wetted metal parts made from dezincification-free and corrosion-resistant gunmetal, resistant against aggressive water. For recording operating temperatures with measuring element Pt-1000 (4-wire) and low pressure-loss full bore. Free from dead spots.

Complies with the following standards and approvals:

- DIN EN 60751

Can be used up to an operating pressure of PN 16, a min. operating temperature of 0 °C, a max. operating temperature of 105 °C.

KHS
temperature sensor
Pt1000
Fig. 628 0G

6. KHS Flush Point 230 V with CONTROL-PLUS: Figure 684 05

Complete KHS Flush Point for automated water change according to relevant standards. Enables turbulent water exchange in drinking water pipes up to DN 100 (doubly turbulent up to DN 65).

Wetted metal parts made from stainless steel and gunmetal, resistant against aggressive water. Flush valve as low pressure-loss shutoffs with full bore with maintenance free EPDM spindle gasket, removable inner top part, with EPDM closing body and gunmetal closing body and fail-safe closed spring return actuator. Actuator suitable for controllers with switching outlet. Water hammer free operation for all opening and closing processes. Free from dead spots.

Complies with the following standards and approvals:

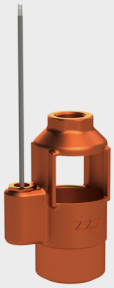
- DVGW approval
- according to DVGW worksheet W 570
- Soundproofing certification as per DIN EN ISO 3822 Class 1
- DIN EN 13828

Can be used up to an operating pressure of PN 16 and a max. operating temperature of 90 °C and ambient air of 55 °C. Protection class IP54.

Ill. 3
KHS Spülgruppe
Fig. 684

7. KHS Frfree drain with Overflow sensor: Figure 688 00

Wetted metal parts made from dezincification-free and corrosion-resistant gunmetal, resistant against aggressive water. Drain device according to DIN EN 1717 with built-in float switch, for monitoring back pressurised dirty water. With overflow sensor. Protection class IP68, free from dead spots.



Ill. 4
KHS Freier Ablauf
Fig. 688 00

8. KHS CoolFlow Chiller:
Figure 618 01

For cooling the KHS CoolFlow cold water cooler. Air-cooled CoolFlow Chiller with compact design and infinitely variable cooling control for outdoor installation for energy-efficient operation of a drinking water chiller in a cold water circulation system. Weather-resistant base frame with removable cladding panels made of from powder-coated steel. Modern EC fans and integrated fan control to reduce operating costs and optimally adjust the fan speed to the actual ambient conditions. Infinitely variable rev. speed regulation through thermal low-noise fan control for particularly low noise emissions. Fully hermetic, vibration-damped rotating-piston inverter compressor for infinitely variable adjustment of the compressor frequency, with refrigerator oil filling.

Refrigerant circuit made of refrigerant copper pipe, hermetically sealed and pressure tested at the factory, dried and filled with R410A safety refrigerant. Controllable via Schrader valve. High- and low-pressure control device, filter dryer and electronic expansion valve to increase energy efficiency and improve control quality. Evaporator as refrigerant-water heat exchanger as tube bundle heat exchanger, vapour-diffusion-tight insulation. Insulated medium circuit with manual bleeder valve, differential pressure monitor for monitoring the volume flow, and speed-controlled circulation pump according to the specifications of the Ecodesign Directive.

Medium connections in solid design with one-inch female pipe thread. Internal control box with terminal strip for mains power supply, contact for external release and potential-free contact for collective fault signal. Completely wired and tested main and control circuit with transformer, control fuses to protect the device's PCB. Automatic restart after power failure. Clear display of medium inlet and outlet temperature as well as function display of fan, compressor, required maintenance interval and elementary faults, such as high/low and differential pressure.

Coded fault messages and display of all operation-relevant control parameters with password-protected access. Compliance with all requirements of the Ecodesign Directive (EU) 2016/2281 (LOT 21) through optimised heat exchanger surfaces, use of high-efficiency components and optimisation of operationally relevant system parameters (* air inlet 35 °C TK, medium temperatures 7/12 °C, 0% glycol concentration)

Protection class IPX4, sound pressure level (distance 10 m free field) 37.3 dB(A), sound power level 68.5 dB(A), working range -15 to +45 °C, adjustment range at return temperature +10 to +20 °C, max. air volume flow 3900 m³/h.

KHS CoolFlow
Cold water
Chiller
Fig. 618 01

9. Connection set for chiller units: Figure 619 01 001

For connecting the KHS CoolFlow chiller, Figure 618 01 and of the KHS CoolFlow cooler, Figure 610 01. For shutting off for maintenance and repair work, selected components suitable for both KHS CoolFlow chiller 4.7kW (1.6-5.6) and 7.6kW (2.0-10.0).

Comprising:
Two pipe compensators G 1, one pressure relief valve Rp 1/2 x Rp 3/4, 6 bar, one double nipple R 1/2, two reducing T-pieces Rp 1 x Rp 1/2, two stop valves Rp 1, two stop valves Rp 1 with plugged drain ports on both sides, five extensions for manometers and drain valves G 1/4, three manometers with vertical connection G 1/4, two drain valves G 1/4'' x G 3/4'', one dirt trap Rp 1, two double nipples R 1, one membrane expansion vessel 12 litres, R 1/2, one screw connection R 1/2 x Rp 1/2, one manual balancing valve Rp 1.

Wetted parts made of gunmetal and drinking-water-approved plastics according to UBA valuation basis.

Connection unit
Fig. 619 01 001

Information from the BTGA practical guideline

How to keep cold water cold?

https://www.btga.de/der-praxis-leitfaden-wie-halte-ich-kaltwas-ser-kalt-ist-erschienen/

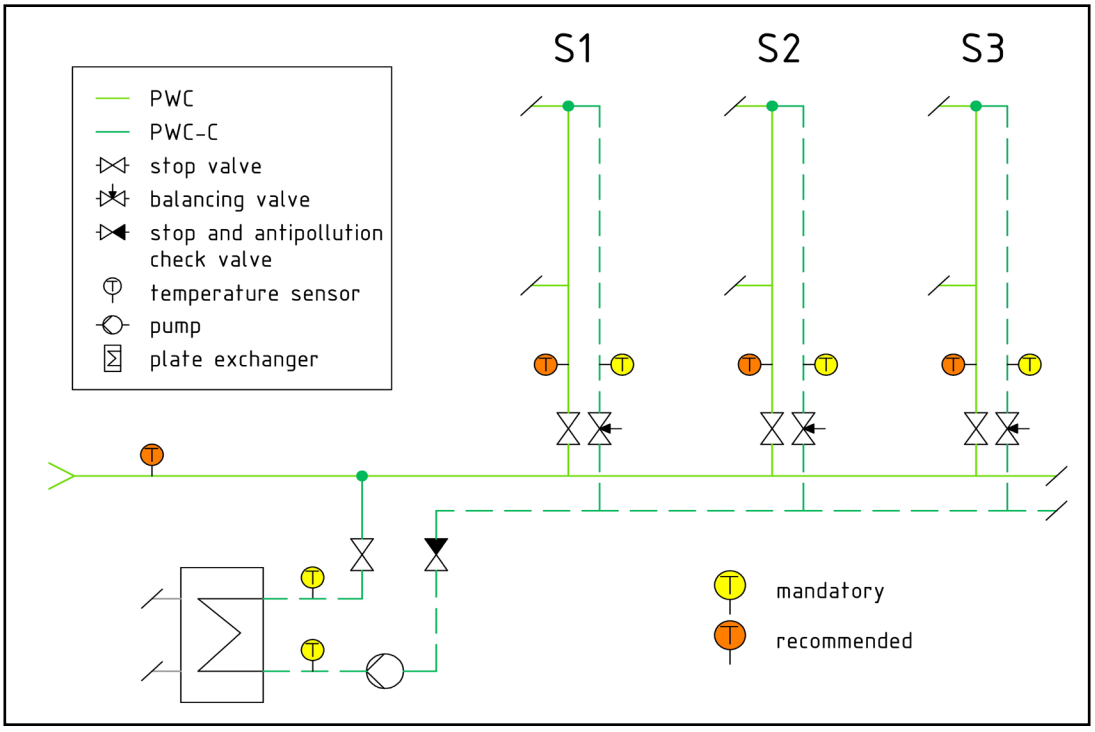
The BTGA practical guidelines contain practical tips and recommendations on how the cold drinking water temperatures (PWC) required by standards and for the sake of hygiene can be adhered to in a drinking water installation.

The tips provided are designed to give information on energy efficiency, health protection and sustainable handling of the number one foodstuff 'drinking water' to employees of building services system construction as well as to people who are planning or operate a domestic water installation.

Proof of operation
Devices to collect and record the system temperatures and hygienically required water exchange must be included in the design to prove intended use. Conclusions about compliance with intended use can be drawn by analysing the recorded data and any malfunctions that occur can be identified.
It is recommended to incorporate sensors in the monitoring system (VDI 3810 sheet 2, 6023 sheet 3).

Temperature
Temperature sensors should be included in the design in line with the illustration shown here to record, monitor and, where appropriate, control the system temperatures in the PWC and PWC-C. The temperature sensors are required at the inlet and outlet of the cooling device and on the cold water balancing valves.
More temperature sensors are also recommended, for example on the building water connection and the line cut-offs.

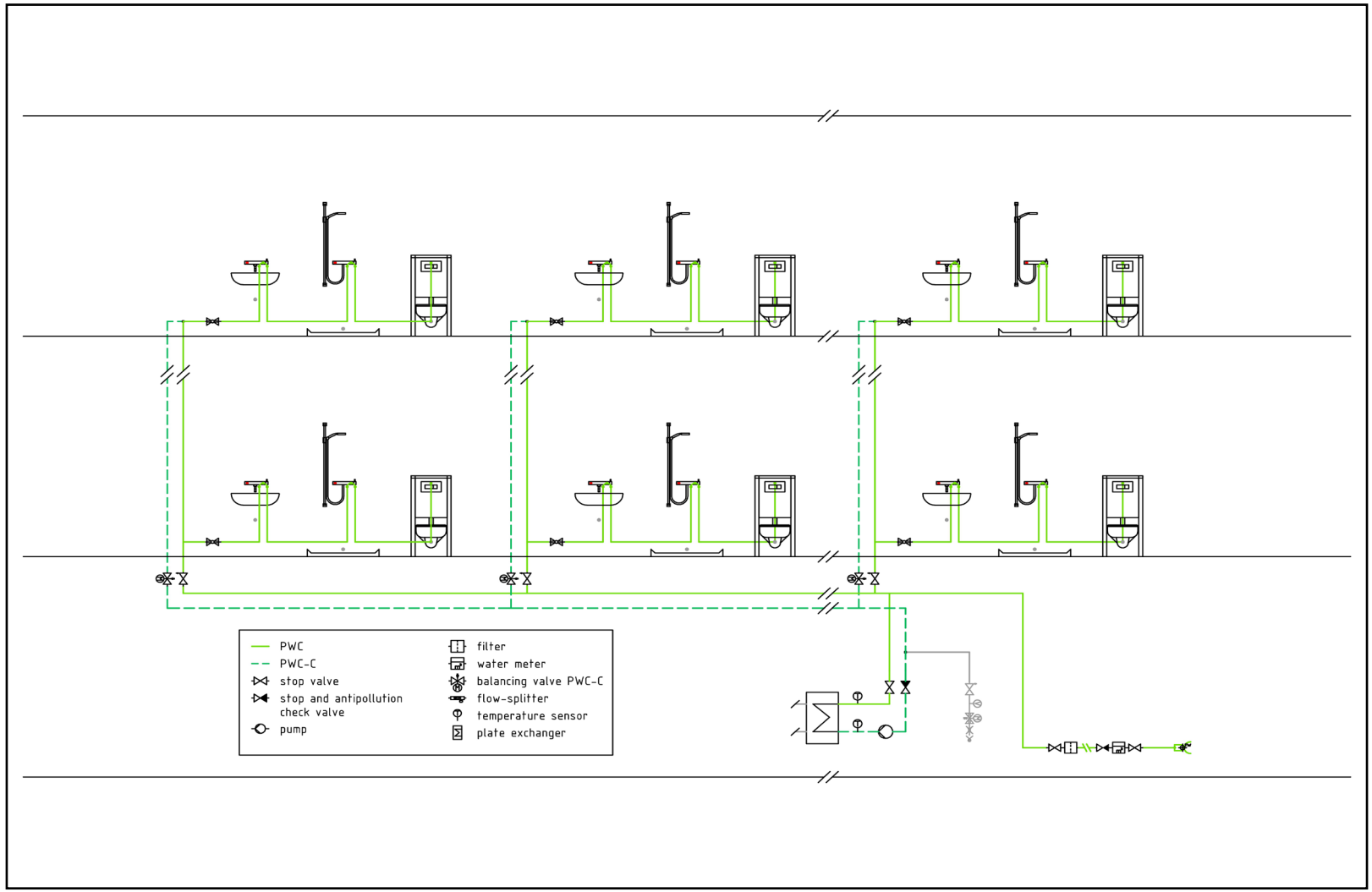
Representative schematic diagram of a PWC/PWC-C installation including temperature sensors



Annex

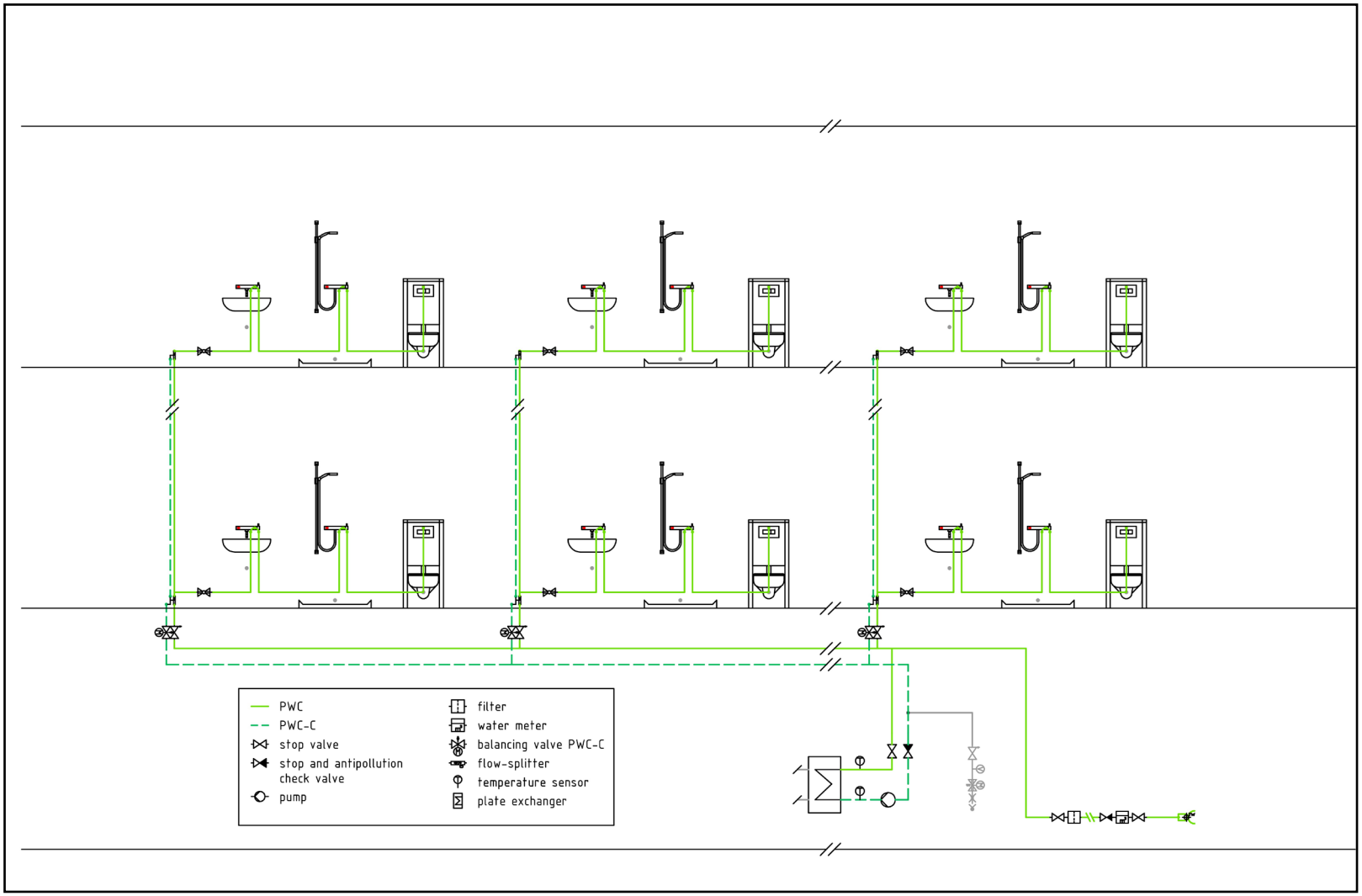
1. Example systems - vertical distribution pipe system

1.1. PWC-C riser circulation – bathroom series installation

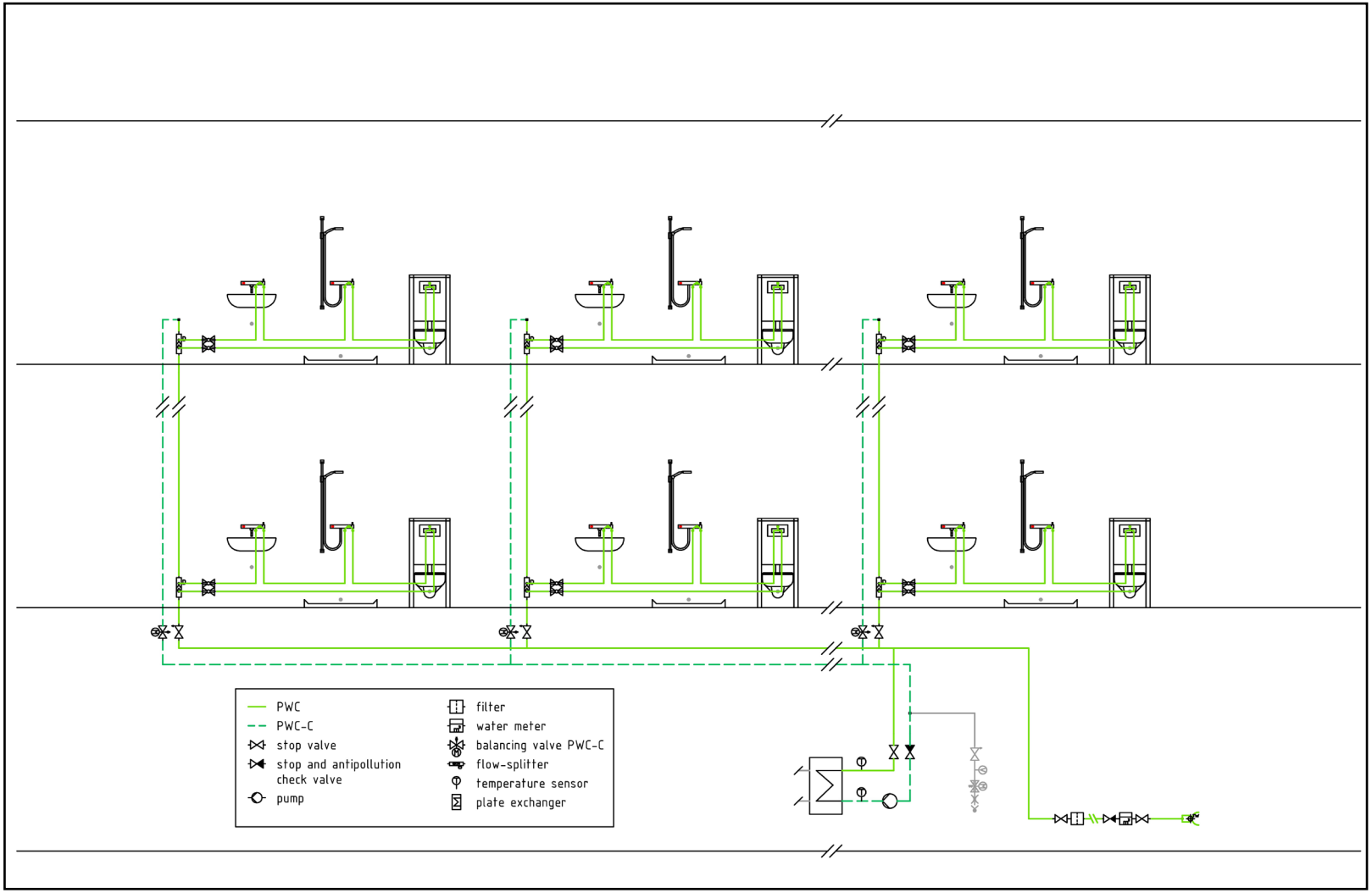


Annex

1.2. PWC-C inliner circulation – bathroom series installation

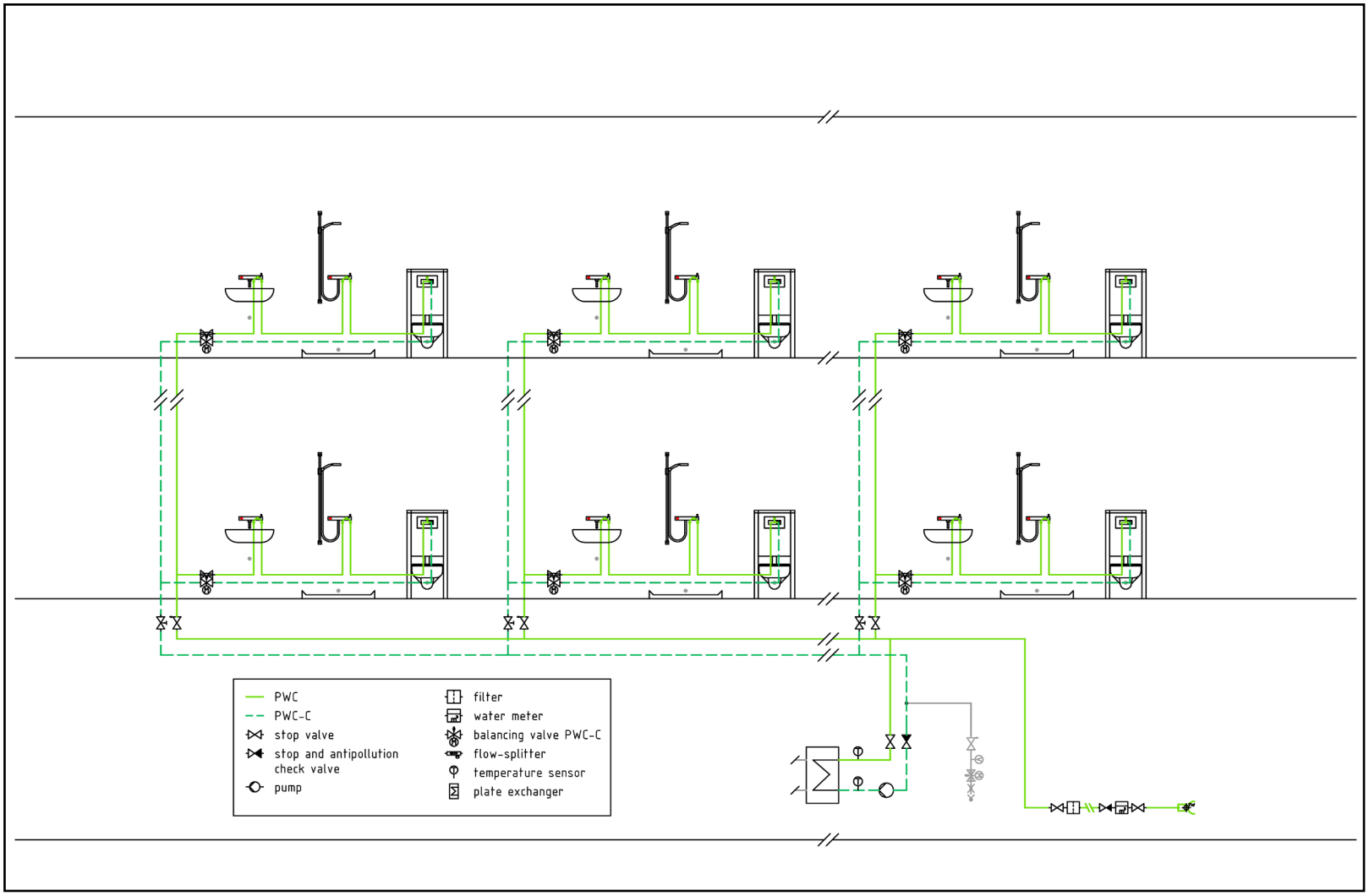


1.3. PWC-C circulation to point of use – bathroom connection with Flow-Splitters



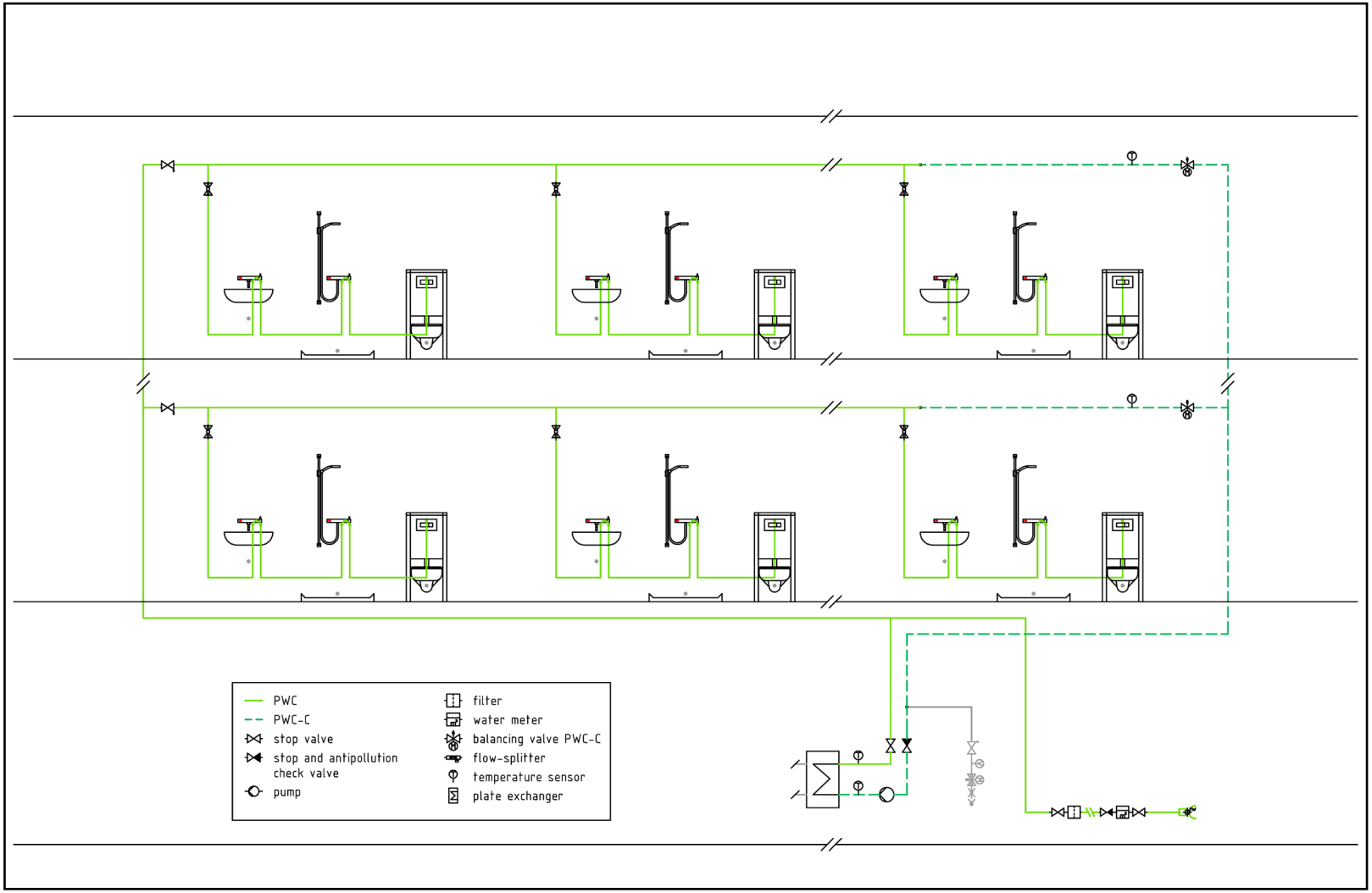
Annex

1.4. PWC-C circulation to point of use – PWC series installation



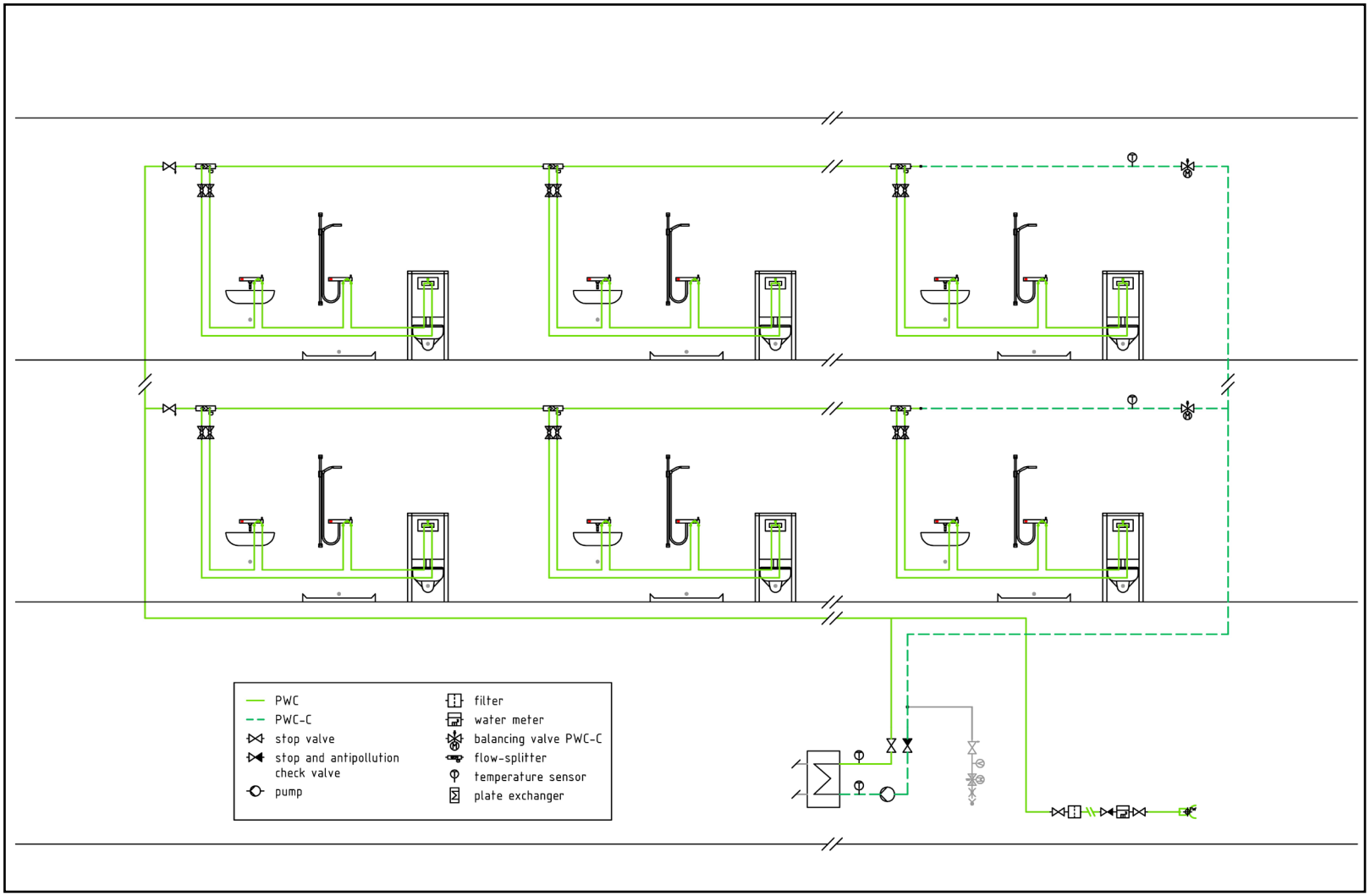
2. Example systems - horizontal distribution pipe system

2.1. PWC-C riser circulation – bathroom series installation

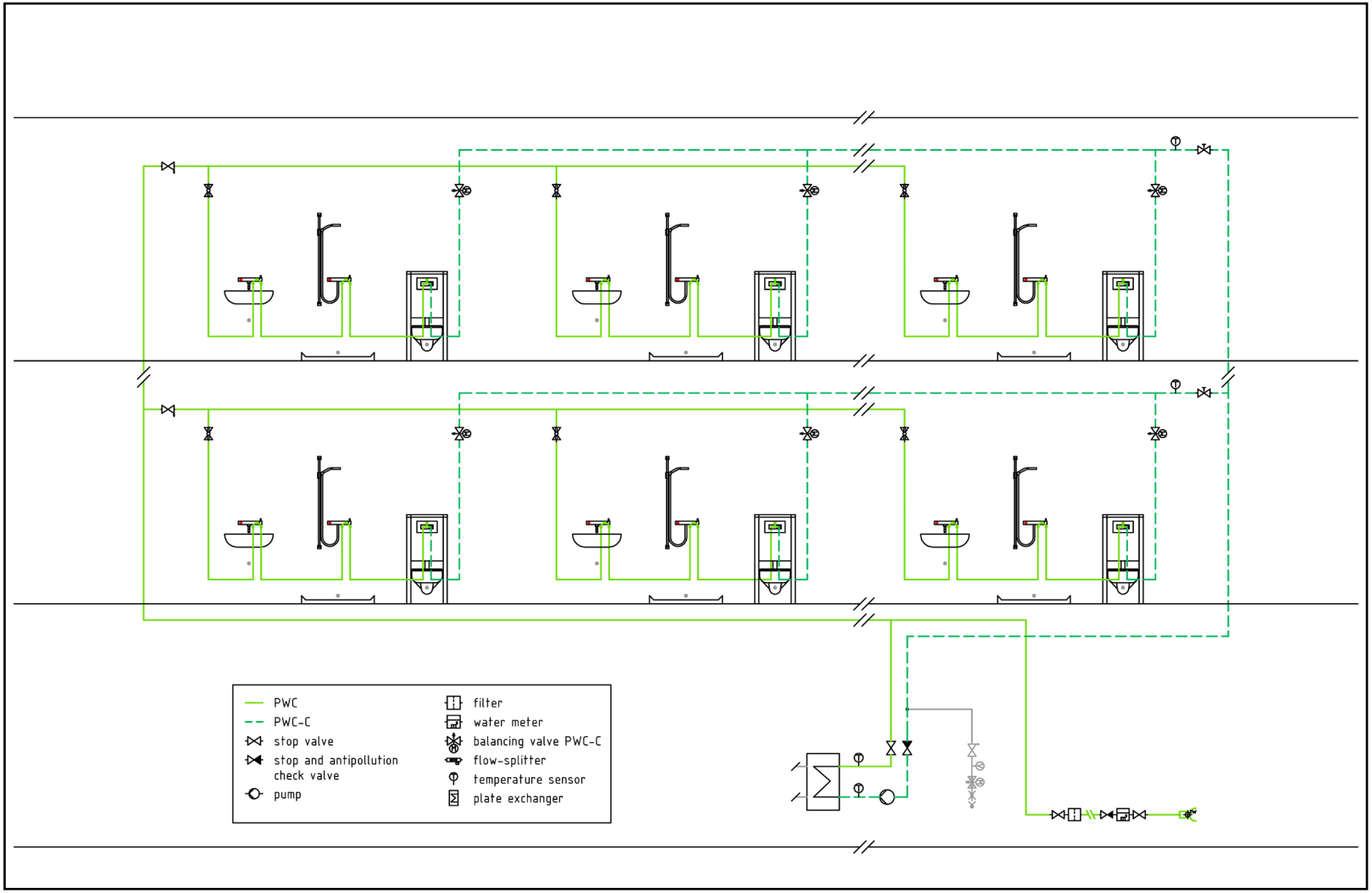


Annex

2.2. PWC-C circulation to point of use – PWC installed with Flow-Splitters



2.3. PWC-C circulation to point of use – bathroom series installation



Notes

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