HYGIENE SYSTEM KHS

// Integrated drinking water installation design using advanced system technology

KEMPER

DRIVING PROGRESS

"Water must flow!"

"Water is a friendly element to those who are at home in it, and who know how to deal with it."

Johann Wolfgang von Goethe (1749–1832)

Content

KEMPER Hygiene System KHS

The innovative valve system

Focus on drinking water hygiene, economy and ecology

Drinking water is the "no. 1 food source" for humans.

KEMPER has developed the hygiene system KHS to maintain drinking water hygiene and improve the quality of drinking water in plumbing installations.

The main objective of the KEMPER Hygiene System (KHS) is to prevent stagnation and the consequent impairment of the drinking water quality. Inadequate drinking water hygiene can have a direct impact on our health.

With the KHS, the operation of the drinking water installation specified in the design is guaranteed over a building's entire life cycle.

Why does KHS make sense?

Ensuring drinking water quality

The KHS can make a significant contribution to maintaining drinking water hygiene in new and existing buildings for cold (PWC) and hot (PWH/PWH-C) drinking water installations. Each building is a 'prototype' because of its use and therefore cannot be compared with another building of the same type – every building must be considered individually. The use and accordingly the underlying intended use must be defined in detail in the design, construction and operation. KHS technology shows new, innovative ways for sanitary drinking water installation in the three areas of drinking water hygiene, economy and ecology. By consistently implementing KHS, a further milestone in the field of health can be achieved, and with it an important contribution to the responsible treatment of our planet Earth.

According to EN 806

PWC = drinking water, cold
PWH = drinking water, hot
PWH-C = drinking water, hot (circulation)

Drinking water hygiene

Clean drinking water

// Ensuring drinking water quality at the tapping point as per the drinking water directive
// Compliance with drinking water hygiene (microbiological, chemical and physical)
// Stagnation prevention in the drinking water by establishing operation as intended at all times
// Temperature maintenance in drinking water installations through consumption and circulation processes (PWC < 25 °C; PWH/PWH-C > 55 °C)

Economy

Saving money and conserving resources

// Prevention of corrosion damage in the pipe system
// Movement through water exchange
// Reduction of personnel and operating costs through automated water exchange
// Documentation through a hygiene logbook

Ecology

Reduce the environmental impact and save energy

// "Sustainable water use"
// Offering drinking water 'naturally' at the tapping point
// Reduction of water exchange losses through KHS
// Reduction of circulation heat losses in the hot water

KEMPER Hygiene System KHS

Benefits

Benefits for operators, designers and contractors – the KEMPER Hygiene System KHS in the PW installation:

- // Compliance with drinking water hygiene (microbiological, chemical and physical).
- // Ensuring and maintaining drinking water quality up to the tapping point in accordance with the drinking water directive.
- // Preventive measures to avoid stagnation in the drinking water installation by ensuring intended use at all times.
- // Reduction of speed of bacterial growth (PWC < 25 °C; PWH/PWH-C > 55 °C).
- // Forced flow and continuous water exchange through targeted design of the pipe system with intelligent pipe routing.
- // Dilution effects of the water constituents through water exchange.
- // Reduction of the corrosion risk and prevention of corrosion phenomena.
- // Water movement up to the connection area of each tapping point.
- // Reduction of personnel and operating costs for manually performed water exchange as a result of automation.
- // Documentation of the water exchanging measures carried out.

INFO

LAWS, STANDARDS AND GUIDELINES

The current specifications from the German Federal Ministry of Health and the German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety on the handling of water and energy are implemented in laws, standards and guidelines.

The requirements can be fulfilled and implemented with the KHS. KHS technology can be implemented to suit each building and its use.

Compliance with drinking water hygiene?

Drinking water installations – potential reservoirs of infection

Hygiene experts repeatedly find that drinking water hygiene is inadequate in drinking water installations.

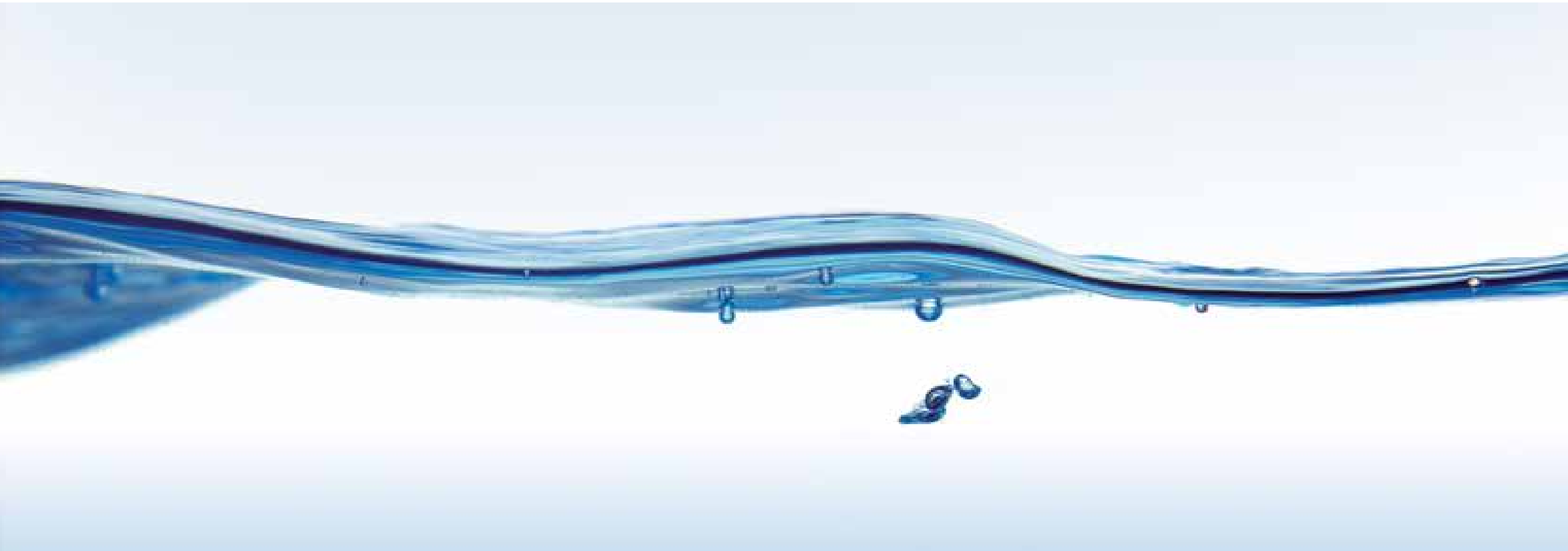
The problems are present in both the cold drinking water (PWC) and the hot drinking water (PWH/PWH-C). Experts maintain the primary cause of microbial contamination and of a change from drinking water to non-drinking water is stagnation. Stagnation is a lengthy period of 'non-use' of the water. During this time, the drinking water does not flow and is not consumed.

The cause of stagnation areas can be old, unused pipes or sections of pipes that are temporarily not used as intended. These areas are therefore a potential source of error in the drinking water installation.

The responsibility for a regular water exchange lies solely with the operator. It is recommended to disconnect unused pipes from the drinking water installation or to use all sections of the pipeline as intended.

"As intended" means that the originally intended user frequency and frequency of water being drawn must be taken as the basis.

In many cases, the use of a building or the usage behaviour has changed over a certain period of time. The originally intended use can now only be maintained by forced withdrawals. If the expected consumption of drinking water does not occur as intended in some sections of pipeline, the operation of the entire drinking water installation can be 'paralysed' by pathogens.



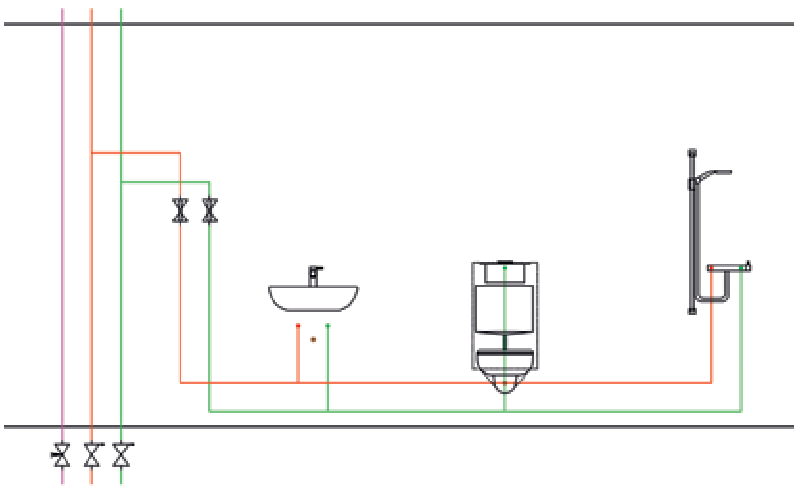
Unprofessional avoidance of stagnation?

Preventing high operating and staff costs through proper design

In public buildings (hotels, hospitals, medical practices, etc.) and in housing construction, a T installation is still frequently carried out in the cold drinking water (PWC) and hot drinking water (PWH). This results in stagnation areas in dead legs. To replace the body of water, comprehensive and cost-intensive flushing measures are required in some cases.

The argument is often frivolously put forward here that installation into the floor is permitted according to the '3-litre' rule. However, the decision to accept this permitted upper limit of 3 litres of stagnation volume means that the designer imposes a flushing schedule on the operator. If it is carried out manually by opening and closing all the taps concerned, this means an increased effort and expense in operating the building. The additional high operating and staff costs incurred as a result are seldom recognised and taken into account during the design phase. Consistent compliance with these flushing measures is as questionable as the goal of achieving a replacement of the entire water body. While the measures stipulated in the flushing schedule already cause disproportionately high costs, it can become considerably more expensive if their manual implementation does not continue to be carefully carried out, and hygiene deficiencies are detected when drinking water samples are tested.

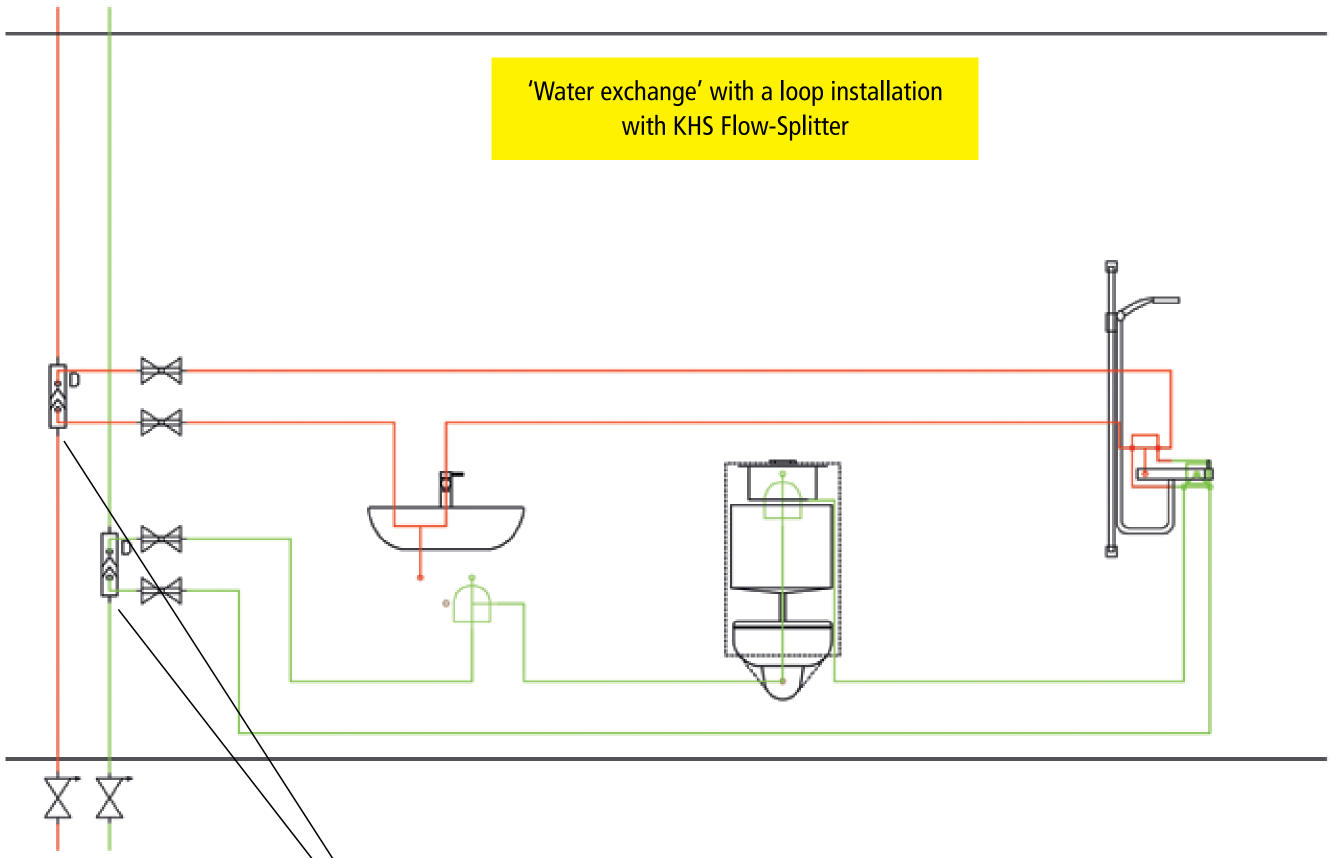
Labour-intensive water exchange at every terminal tapping point.
A common, but ineffective and expensive solution to ensure proper operation in a building.



Standard T installation in the bathroom. Stagnation areas with a high risk of contamination arise when there are infrequently used tapping points.

Preventing stagnation and maintaining temperature specifications

with the innovative valve system from KEMPER



KHS Flow-Splitter
-dynamic-

To exclude the problem of an ineffective and labour-intensive water exchange at the design stage, the installation shown above should be implemented in the bathroom area.

The innovative pipe routing in combination with KHS Flow-Splitters ensures a permanent flow through the entire pipe network when used as intended. No stagnation areas can occur. A hygienically safe installation is anchored in laws and in generally accepted codes of practice.

KHS Flow-Splitter

-dynamic-

The basis of the KHS is the KHS Flow-Splitter -dynamic-, which can be used in both cold (PWC) and hot (PWH) drinking water installations.

The KHS Flow-Splitter -dynamic- works according to the principle of the venturi valve, developed by Giovanni Battista Venturi. Due to the minimal pressure difference, the main volume flow is divided into a loop volume flow and a through volume flow by means of the venturi valve.

Through an additional component in the venturi valve, the KHS Flow-Splitter -dynamic- is able to achieve a maximum flow through the connected loops even with very small volume flows in the distribution pipe / riser.

The system is driven by water consumption downstream the KHS Flow-Splitter. The entire water content of the loop pipe is exchanged until immediately before the tapping points, stagnation and possible bacterial growth are avoided, and the drinking water temperature is kept low.

KHS Flow-Splitter -dynamic- Figure 650 00

KHS Flow-Splitter -dynamic-
Figure 650 02

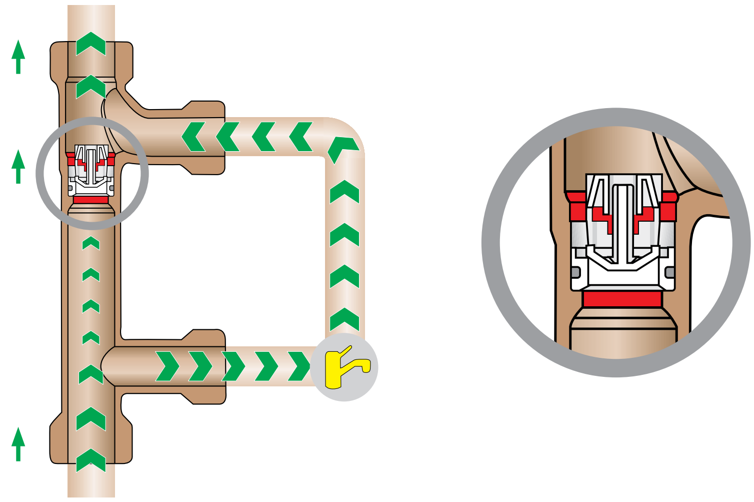
Because of the components used, problem-free installation in the installation shaft or in the suspended ceiling is possible. Regular maintenance of the components is not required.

KHS Flow-Splitter

-dynamic-

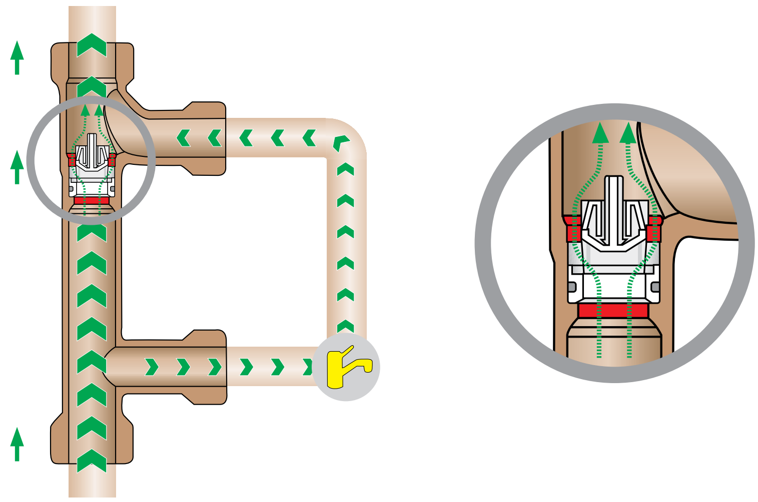
Small volume flow in the distribution pipe / riser:

The **dynamic venturi valve remains almost completely closed** – almost the entire volume flow required for supply purposes is directed through the loop. The opening pressure of the dynamic venturi valve is not reached.



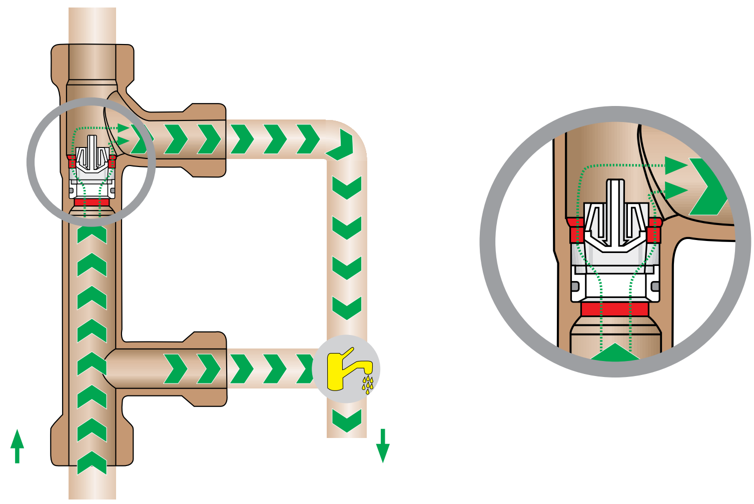
Larger volume flow in the distribution pipe / riser:

The **dynamic venturi valve opens** when the opening pressure is reached – the larger share of the volume flow moves directly through the flow splitter in the main pass, while the venturi effect causes a part of the volume flow to be redirected into the loop.



Draw-off in the loop:

The dynamic venturi valve opens when the opening pressure is reached – the volume flow is divided into the two branches of the flow splitter. This allows the loop to be installed with a small pipe size. Low pressure losses occur in the loop, which has a positive effect on the pipe sizes of the distribution pipe and a water booster.



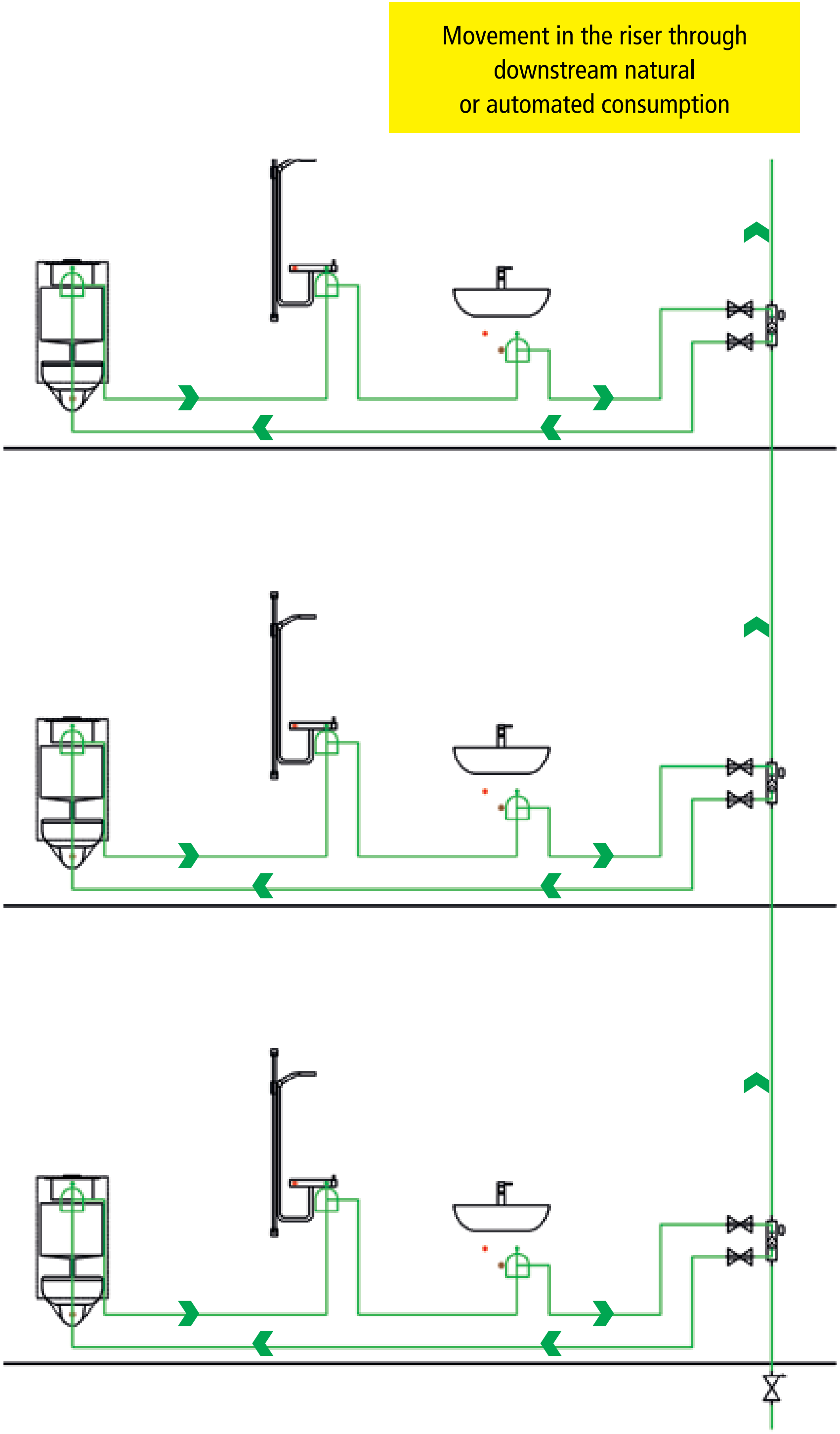
KHS Flow-Splitter

-dynamic- for PWC

There are stagnation areas in many drinking water installations, caused by rarely used or terminal tapping points. When the KHS Flow-Splitter -dynamic- is used, possible stagnation is avoided by subsequent consumption.

This consumption can be achieved by a consumer used for the intended purpose or by an automatically generated water exchange. Taps used as intended and the expected stagnation areas must be agreed with the operator in order to define a suitable installation location for KHS Flow-Splitters.

On the right is a hygienically safe installation with the KHS Flow-Splitter in the riser together with innovative pipework services. Water is exchanged in several loops connected in series either through downstream water consumption or through automated water exchanges.



KHS Flow-Splitter -dynamic- Figure 650

PRACTICAL
TIP

Design principles for KHS Flow-Splitters in PWC installations

1.

To guarantee and demonstrate the perfect functioning of the KHS, we recommend carrying out a calculation and subsequent simulation with Dendrit *STUDIO* calculation software.

2.

To permanently guarantee the function of the KEMPER Hygiene System:

// The length of the flow-splitter loop should be contained within the piping of a conventional bathroom.

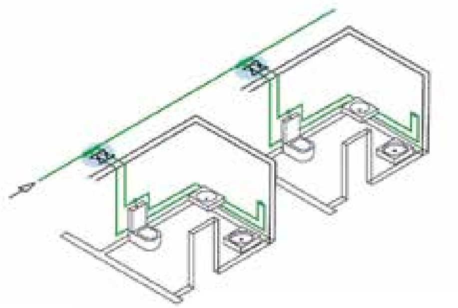
// **Pipe lengths in the flow-splitter loop of more than 80 meters are only possible under certain conditions and should be avoided where possible.**

3.

Furthermore, the function of the KHS can only be guaranteed if the KHS Flow-Splitters are used in conjunction with a system control for automatic water exchanges.

or

KHS Flow-Splitter units
Figure 650 00 Figure 650 02



KHS Hygiene Flush Box PRO
Figure 689 03 007 (single port)

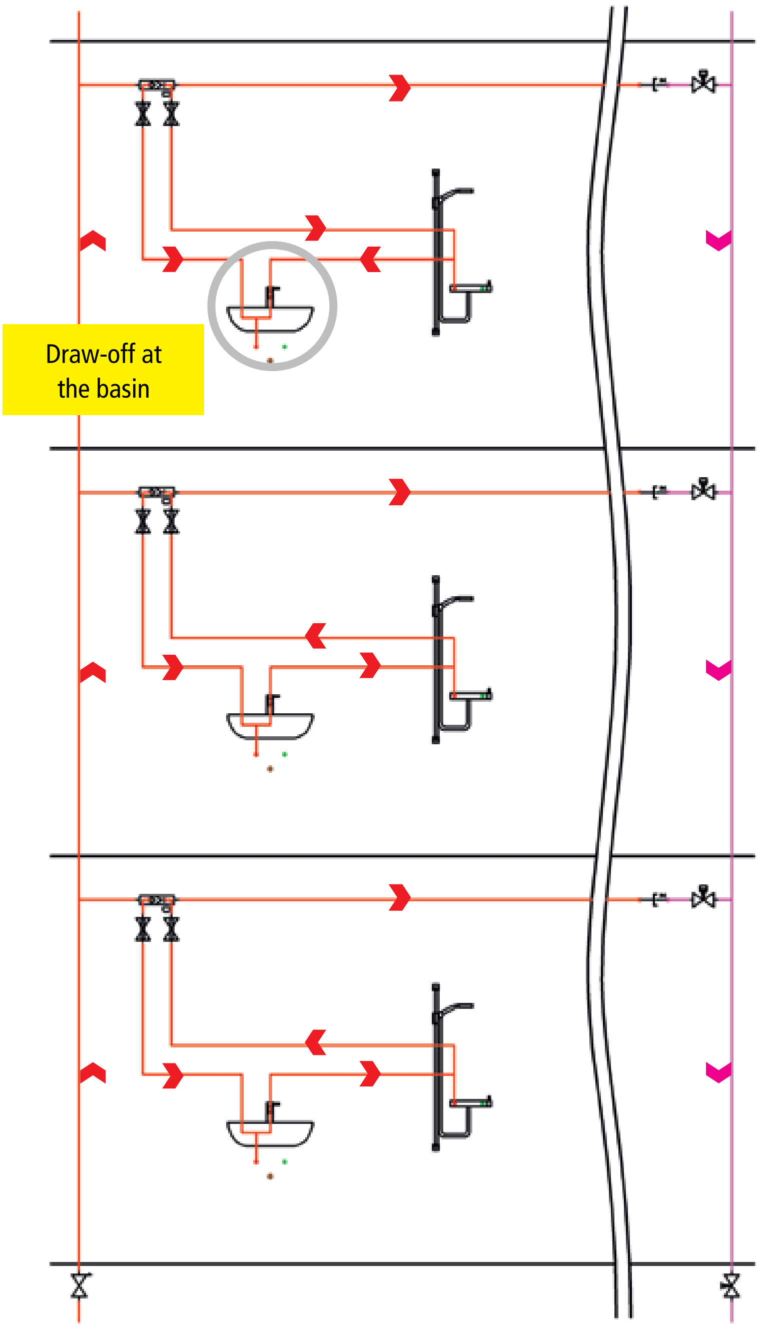
KHS Flow-Splitter

-dynamic- for PWH

Optimised circulation with energy and economic savings

If the KHS Flow-Splitter -dynamic- is used in the hot drinking water (PWH), installation in the bathrooms can be carried out using only consumption pipes (PHW pipes). The bathrooms' individual pipe loops are connected to a distribution pipe using the KHS Flow-Splitter.

Function pipes (circulation pipes (PWH-C) are not required in the distribution pipe and bathroom area. The use of regulating valves is limited to the end of the distribution pipes. A two-sided connection of the tapping points in the loop improves supply (particularly in the case of series-type shower systems).
In case of consumption, the dynamic venturi valve is opened because of the higher volume flow in the distribution pipe / riser. The greater proportion of the volume flow moves directly through the flow splitter in the main pass. The KHS Flow-Splitter diverts a partial volume flow required for temperature maintenance through the bathroom (in the loop). The temperature in the loop is kept at a high level. If no consumption takes place, water flows through the pipeline system due to the circulation volume flow driven by the circulation pump, thus ensuring temperature maintenance in the entire hot drinking water installation (PWH). The specifications of the DVGW worksheet W 551 and DIN 1988-300 are complied with. The reduced piping installation in the area of circulation pipes and the surface reduction in the area of the hot drinking water installation can cut circulation losses by up to 15 %.



Effectively prevent stagnation and maintain the temperature

// Continuous water exchange
// high temperature PWH system in circulation and consumption through stable circulation volume flow in the loop

PRACTICAL
TIP

Design principles for KHS Flow-Splitters in PWH drinking water installations

1.

To guarantee and demonstrate the perfect functioning of the KHS, we recommend carrying out a calculation and subsequent simulation with Dendrit *STUDIO* calculation software.

2.

To avoid unnecessarily influencing the size of the circulation pump (delivery head and circulation volume flow):

// the length of the flow-splitter loops should not exceed 30 m.
// a static balancing valve, such as the MULTI-FIX-PLUS, should be used if more than 5 KHS Flow-Splitters are installed in sequence.
// the number of KHS Flow-Splitters installed in sequence should not exceed 15.

3.

To achieve energy savings when using the KEMPER Hygiene System in hot water, the PWH distribution pipes must be routed to a common collective circulation pipe. The parallel routing of hot-water and circulation pipes should be avoided. If this is not possible, a conventional circulation system should be used.

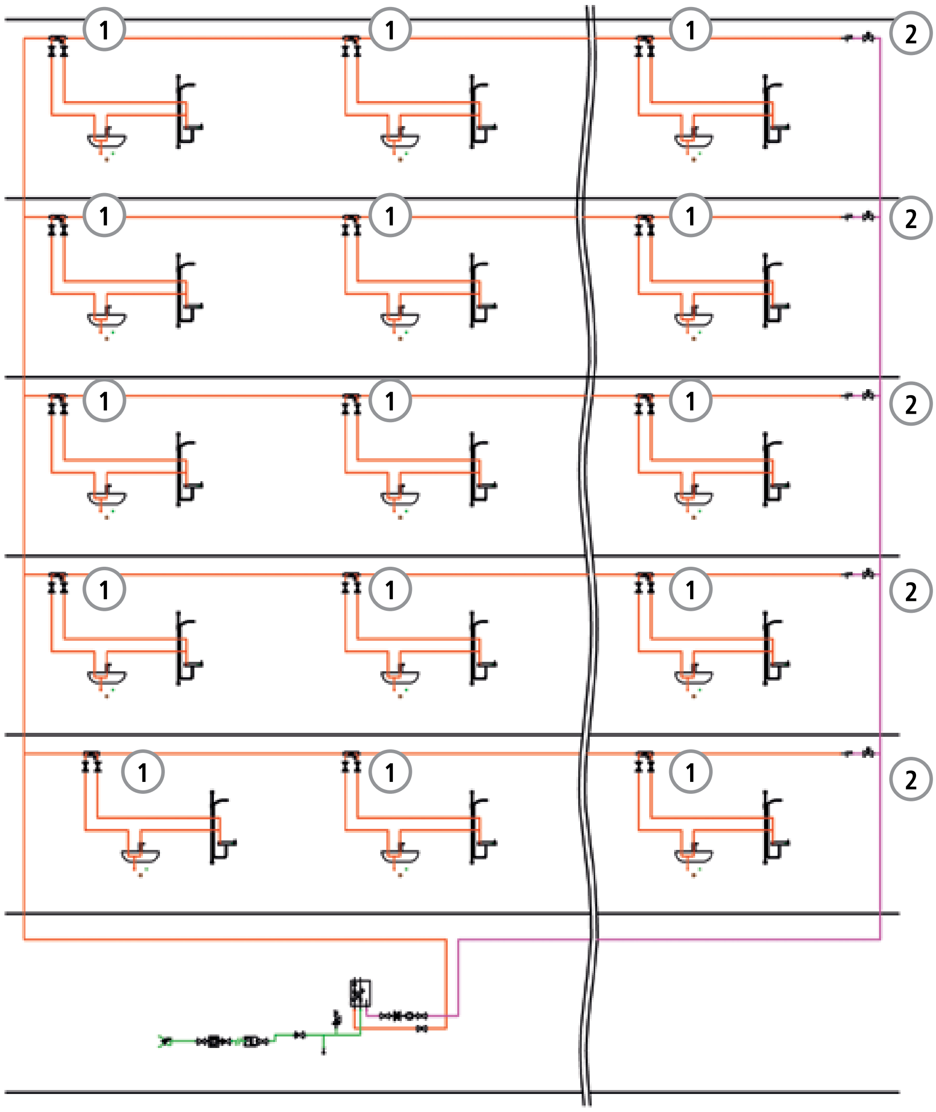
1 KHS Flow-Splitter -dynamic-

With **up to 5 KHS Flow-Splitters** in sequence:

2 MULTI-THERM thermostatic balancing valve

With **more than 5 KHS Flow-Splitters** in sequence:

2 MULTI-FIX-PLUS static balancing valve



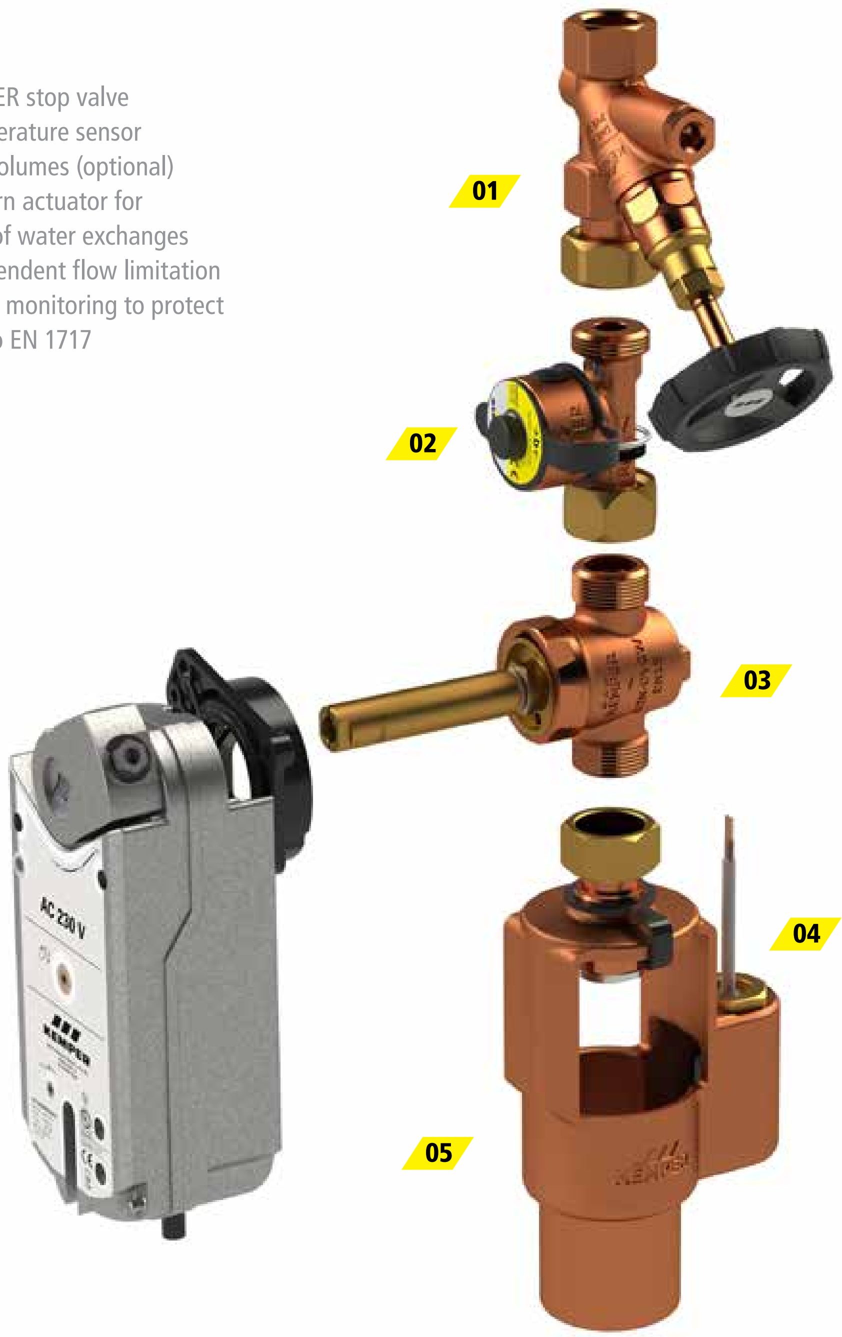
KHS Flush Point –

flush point for automated water change according to relevant standards

Benefits at a glance

// One flushing valve for all drinking water pipes up to DN 100
// Variable flow rate: 4, 10 or 20 l/min
// Maintenance possible during operation
// Tool-free maintenance with no shutdowns
// Robust and impact resistant for all application areas

01 Maintenance cut-off with WESER stop valve
02 CONTROL-PLUS flow and temperature sensor to exactly determine flushing volumes (optional)
03 Flushing valve with spring return actuator for water-hammer-free execution of water exchanges
04 Flow limiter for pressure-independent flow limitation
05 DN 50 free drain with overflow monitoring to protect the drinking water according to EN 1717



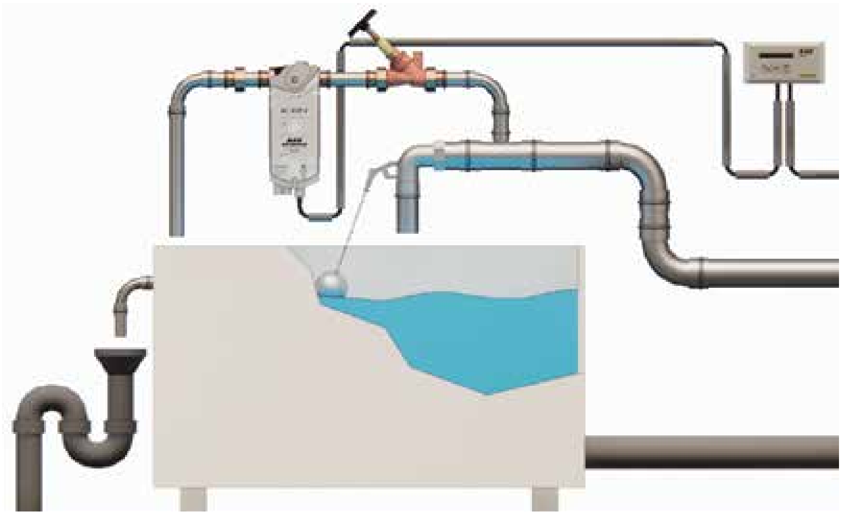
Part no.	DN	Maintenance cut-off	CONTROL-PLUS	Flushing valve	Flow limiter	Free drain
6840401500	15	•	–	230V	4, 10, 20 l/min	DN 50
6840501500	15	•	•	230V	4, 10, 20 l/min	DN 50
6840001500	15	•	–	24V	4, 10, 20 l/min	DN 50
6840101500	15	•	•	24V	4, 10, 20 l/min	DN 50

KHS Timer –

easy time control

The KHS timer allows automatically time-controlled water exchanges in individual pipelines (for example individual pipes to taps).

The time control system makes it possible to set 16 flushing intervals. The combination of a KHS free drain with an FK-5 overflow sensor guarantees the automatic closing of KHS quarter-turn stop valves in case of backflow in the wastewater network.

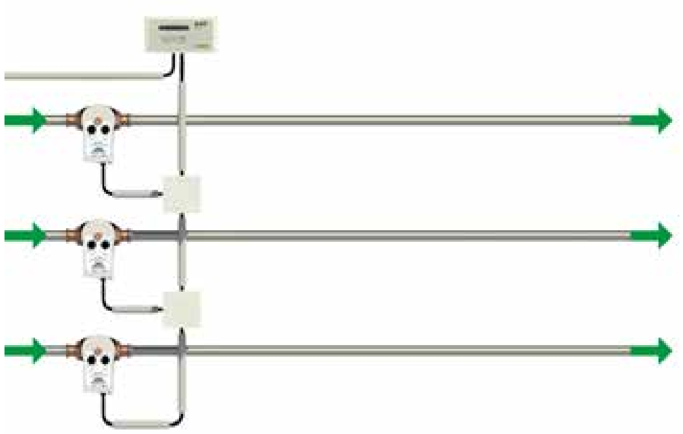


KHS timer
Figure 686 02 012

KHS quarter-turn stop valve PLUS
with spring return actuator,
Figure 686 05, DN 15–32

Flow limiter Figure 697, DN 15-50

During periods of extended absence or when the building is left, it is also possible to secure the drinking water installation by closing the connected KHS quarter-turn stop valves. Here too, 16 timer programs can be set for opening and closing.



KHS timer
Figure 686 02 012

KHS quarter-turn stop valve
with actuator
Figure 686 04

KHS Timer and Flush Point

Flush Point combined with the KHSTimer for interval-controlled water change according to relevant standards

01

02

Item	Designation	Figure
1	KHS Timer	686 02 012
2	KHS Flush Point 230V	684 04

KHS Mini Control System

for all buildings

MASTER 2.1
Figure 686 02 008

SLAVE
Figure 686 02 006

With the KEMPER KHS Mini Control System, specific water exchange measures can be implemented to ensure compliance with drinking water hygiene in all types of buildings.

In the KHS Mini Control System, a control unit is assigned to each water exchange group. A water exchange group consists of a maximum of

- // 1x MASTER or 1x SLAVE
- // 1x KHS stop valve PLUS with actuator,
- // 1x KHS Temperature Sensor,
- // 1x KHS Flow Sensor,
- // 1x KHS Free Drain with FK-5 overflow sensor

Thanks to the MASTER / SLAVE technology, a MASTER controller can address up to 62 other water exchange groups with SLAVE controllers. Its decentralised configuration eliminates the need for long cabling. Only a CAN bus cable connects the controllers to each other. From the MASTER, the maximum cable length of the CAN bus is 1000 metres in each direction (2000 metres in all).

With the Mini Control System, a water exchange process may be effected using three operating modes.

- // time-controlled water exchange
- // volume-controlled water exchange
- // temperature-controlled water exchange

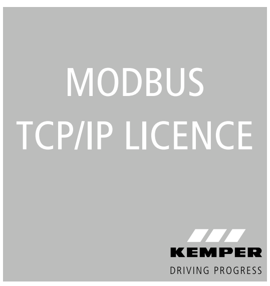
The MASTER controller has a USB interface that allows a simple backup of the data (logbook, configuration and measured data). Both parameterisation through ready-to-use configuration files and software-update installation are effected over the USB interface. In addition, all water exchange groups can be configured by hand directly on the MASTER.
MASTER 2.1 also allows the controller to be operated by smartphone, tablet PC or laptop. Another key aspect is datalogging. In combination with flow and temperature sensors, operating states can be recorded throughout the entire drinking water system.

Based on this, the MASTER 2.1 can be connected to the building management system. Three protocols are available for this:

- // Modbus TCP/IP
- // BACnet IP
- // BACnet MS/TP

The connection allows access to data points that enable visualisation, evaluation and control of all flush valves and sensors connected via the MASTER/SLAVE system.

KHS BACnet Gateway L / XL
Figure 686 02 23 / 24



Modbus TCP/IP licence
Figure 993590

KHS Mini Control System

for all buildings

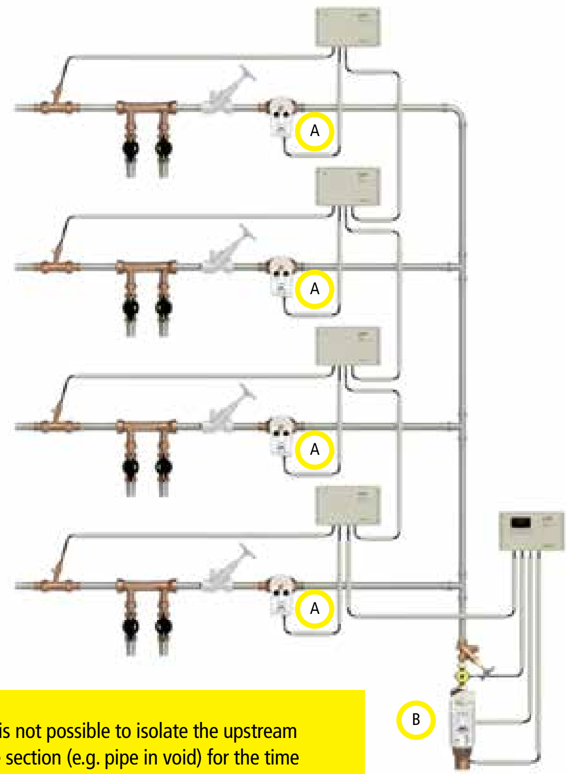
A special feature of the KHS Mini Control System MASTER 2.1 is its A/B valve technology. In A/B valve technology, up to five risers or distribution pipes are connected to one common flushing pipe. One after another, the A valves are opened and closed together with the B valve. This guarantees no draining of the flushing pipes and no water exchange between the pipelines to be flushed.

Example for a flushing process:

// Open A1 and B1 as specified, close A1 and B1
// Open A2 and B1 as specified, close A2 and B1
// Open A3 and B1 as specified, close A3 and B1
// Open A4 and B1 as specified, close A4 and B1

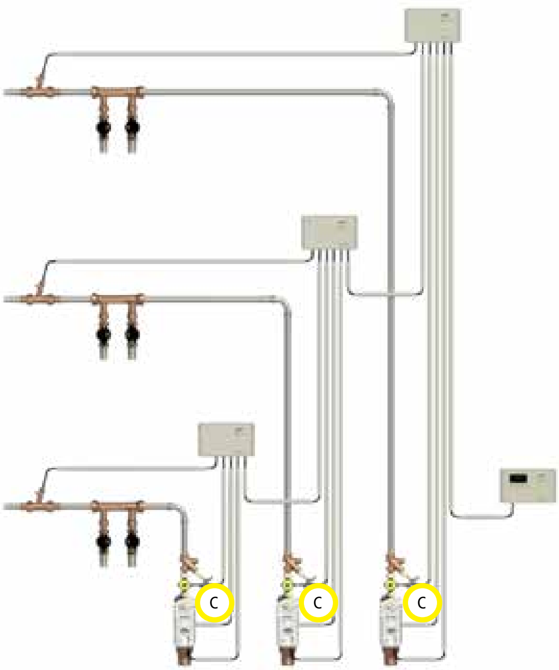
C valve technology makes it possible to perform water exchanging measures in a single riser or an individual distribution pipe independent of other water exchanging valves.

A/B valve technology



If it is not possible to isolate the upstream pipe section (e.g. pipe in void) for the time of maintenance on the valve, a maintenance shut-off (e.g. Figure 173) upstream of the valve is recommended.

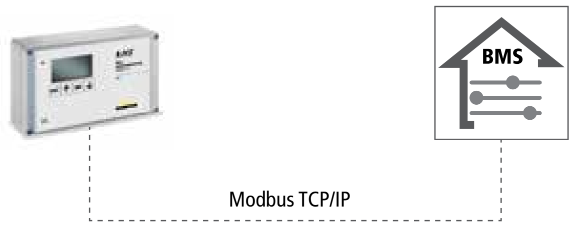
C valve technology



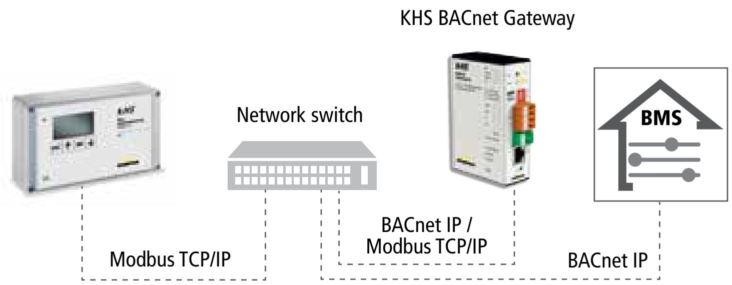
Intelligent building control

Convenient connection of the hygiene system KHS to the building management system

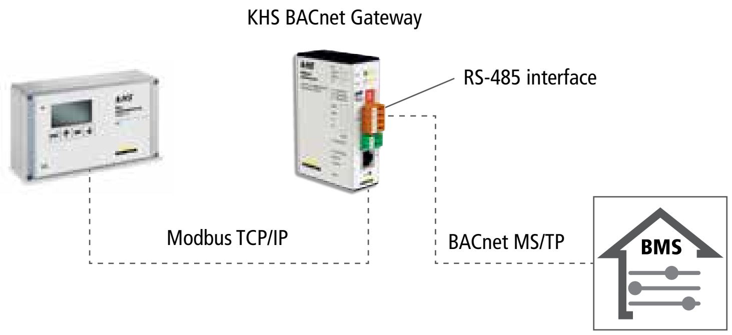
Modbus TCP/IP
For connecting the KHS Mini Control System to the building management system (BMS) via the Modbus TCP/IP protocol.



BACnet IP
For connecting the KHS Mini Control System to the building management system (BMS) via the BACnet IP protocol.



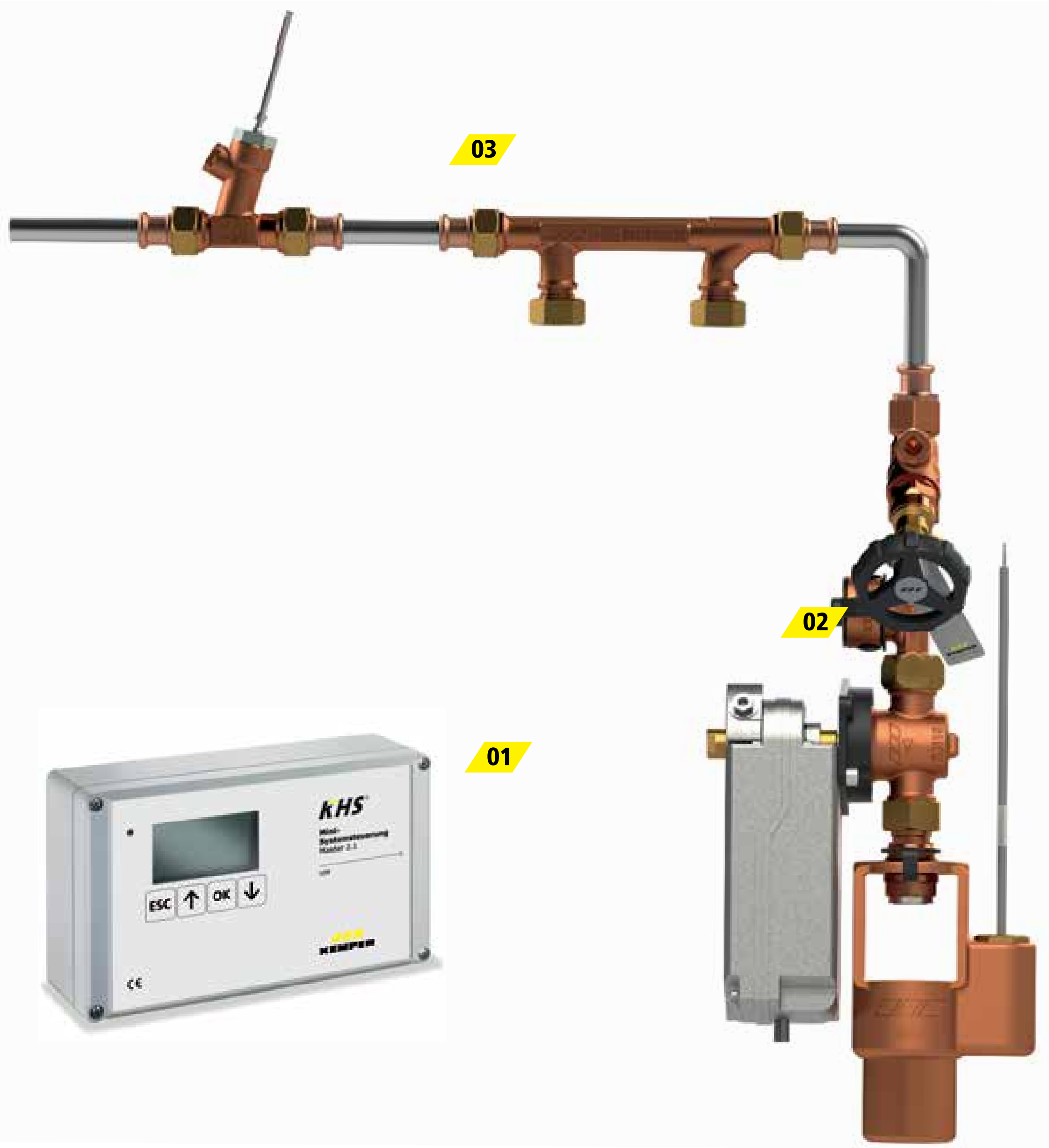
BACnet MS/TP
For connecting the KHS Mini Control System to the building management system (BMS) via the BACnet MS/TP protocol.



Version	Part no.	max. no. of SLAVES	Protocol
KHS Modbus TCP/IP Licence	993590	62	Modbus TCP/IP
KHS BACnet Gateway L	686 02 23	24	BACnet IP and MS/TP
KHS BACnet Gateway XL	686 02 24	62	BACnet IP and MS/TP

KHS Mini Control System

KHS Flush Point: with MASTER / SLAVE



Item	Designation	Figure	- time controlled	- time controlled - temperature controlled	- time controlled - temperature controlled - volume controlled
1	KHS Mini Control System MASTER 2.1	686 02	X	X	X
*	KHS Flush Point 230V	684 04	X	X	
2	KHS Flush Point 230V with CONTROL-PLUS	684 05	X	X	X
3	KHS temperature sensor Pt 1000	628 0G		X	X

* Not shown

KHS Mini Control System

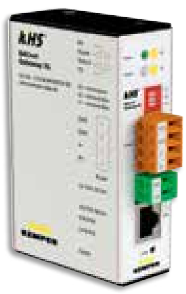
Components and accessories

KHS flush point 230V with CONTROL-PLUS
Figure 684 05

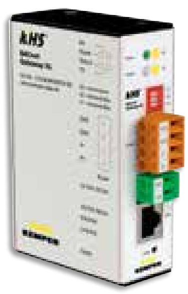
KHS flush point 230V
Figure 684 04

KHS Mini Control System
MASTER 2.1
Figure 686 02 008

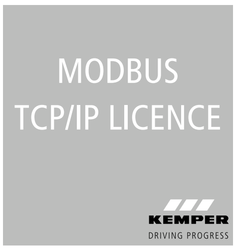
KHS Mini Control System SLAVE
Figure 686 02 006



KHS BACnet Gateway L
Figure 686 02 23



KHS BACnet Gateway XL
Figure 686 02 24



Modbus TCP/IP licence
Figure 993590

WESER free flow stop valve
Figure 173 2G

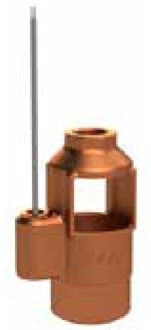
KHS quarter-turn stop valve with actuator
Figure 686 04

KHS quarter-turn stop valve
with spring return actuator, DN 15-32
Figure 686 05

KHS quarter-turn stop valve
with spring return actuator, DN 32-50
Figure 685 15

KHS temperature sensor Pt 1000
Figure 628 0G

KHS CONTROL-PLUS flow sensor
Figure 138 4G



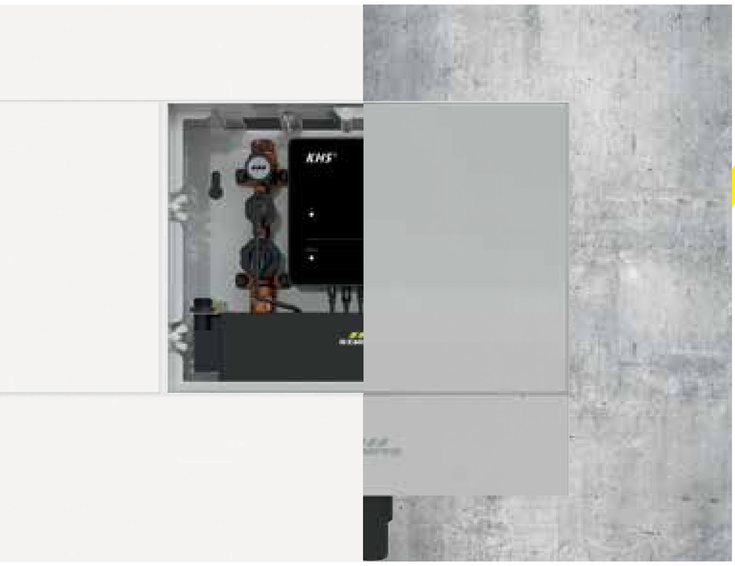
KHS free drain with overflow sensor
Figure 688 00

Flow limiter
Figure 697

KHS CONTROL PLUS connection cable
Figure 138 00 012

KHS Hygiene Flush Box PRO, PURE, LITE

Drinking water hygiene has never been so convenient



To be able to ensure the proper functioning of a drinking water installation, the designer must take the maximum usage situation into account. In practice, however, this maximum usage is not the usual situation. Stagnating sections and insufficient hygiene in both the cold drinking water (PWC) and the hot drinking water (PWH) can be the consequence. Changes in the type of use or the behaviour of the building's users have a similar effect. Over a building's lifetime, the actual frequency of withdrawals and volumes deviates strongly from the originally intended values. In this case, too, the intended use is no longer guaranteed.

KHS Hygiene Flush Boxes help restore intended use through controlled 'forced withdrawals'. Water exchange is controlled during this through the time, temperature and volume parameters.

KHS Hygiene Flush Box PRO

// Seven timers for a tailored flushing strategy in particularly hygiene-sensitive buildings
// Interval-, time-, volume-, temperature- and usage-controlled flushing
// Convenient and safe operation via WLAN (can be switched off) using the latest Access Point Technology
// Up to 100,000 event entries for verification of use according to relevant standards
// Analysis and log readout via WLAN and USB
// Flushing process management detects savings potentials and suggests improvements
// Networking of up to 60 flush boxes possible

KHS Hygiene Flush Box PURE

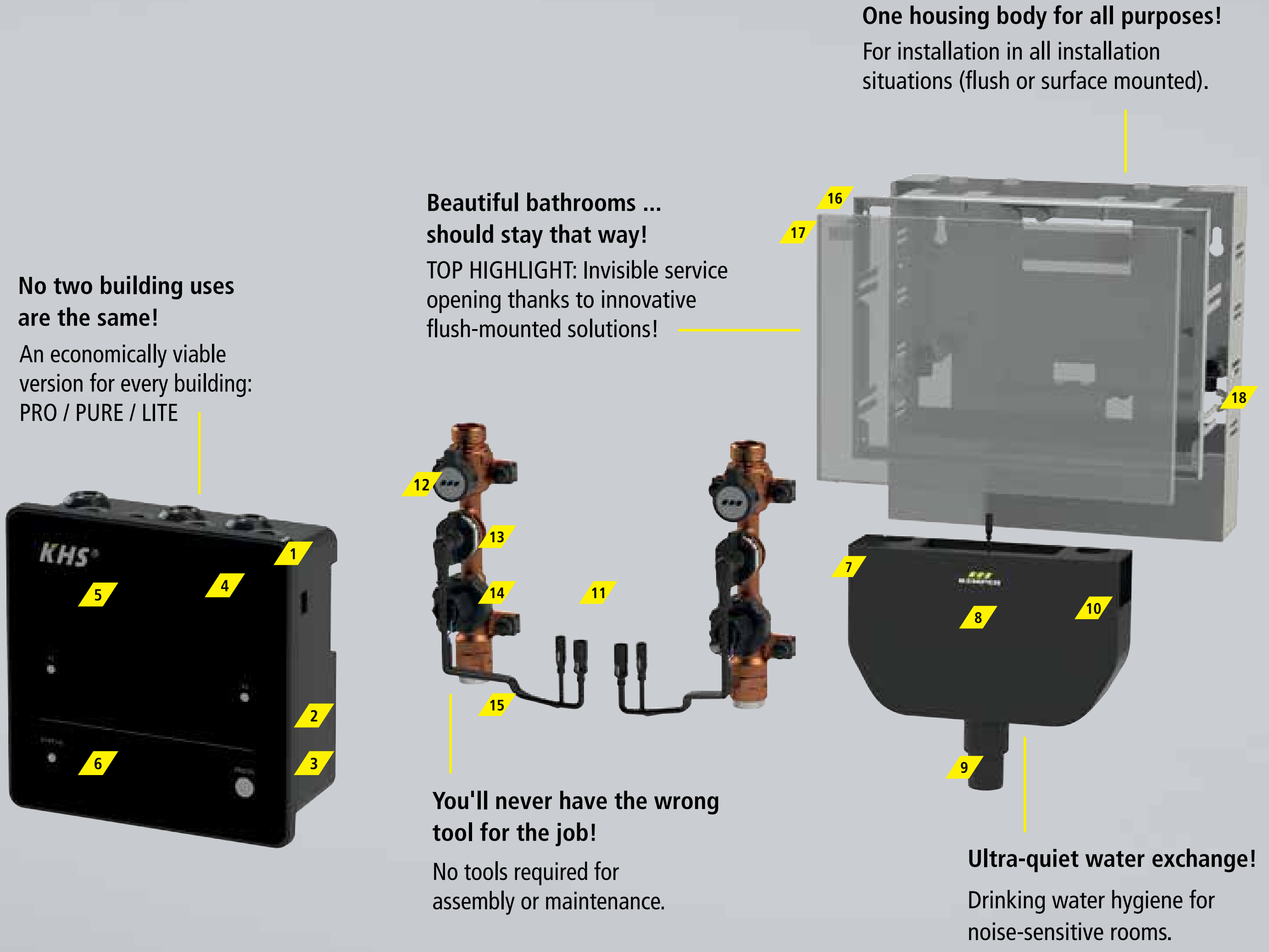
// Interval-controlled flushing
// Commissioned in less than a minute with 4 x PRESS
// Up to 100,000 event entries for verification of use according to relevant standards (readout via USB)
// Automatic detection and verification of all functional components
// Possibility of upgrading to PRO

KHS Hygiene Flush Box LITE

// No integrated controller logic
// Own control for direct connection to building automation systems / BMS

Benefits at a glance

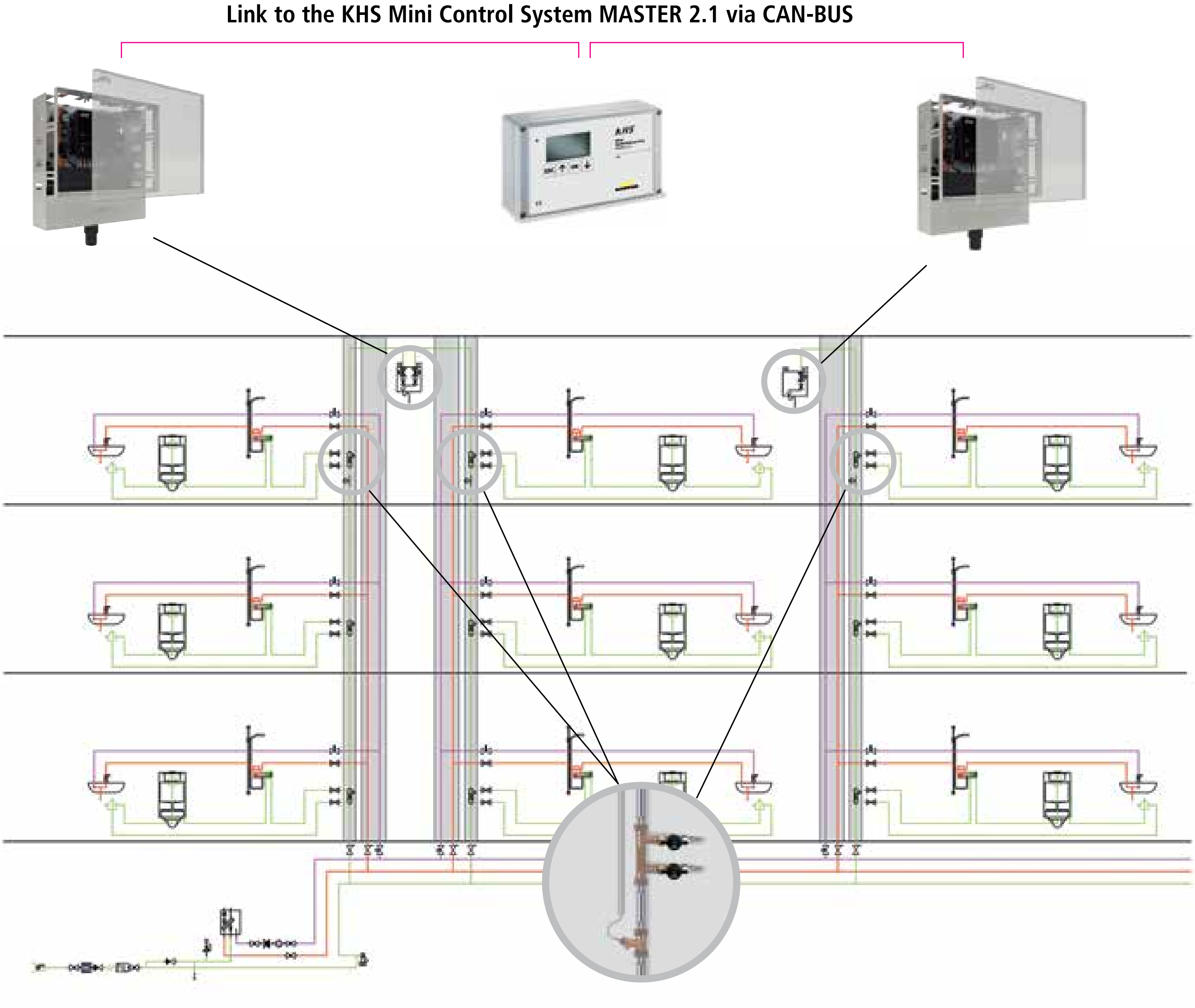
// For automated water change according to relevant standards
// For installation in all installation situations (flush or surface mounted)
// Reversible cover with magnetic push-to-open function and fall-out protection
// Digital commissioning and maintenance assistant
// Analysis and log readout via WLAN and USB
// Incorporation into BMS (BACnet and Modbus) via KEMPER Hygiene System KHS



01 PRO controller (external connections all as fixed connections inside the body)
02 Buzzer for fault messages
03 Mass storage for event log (up to 100,000 entries)
04 Potential free contact for fault messaging
05 USB interface for convenient data transfer
06 LED status display
07 High-performance trap (> 45 l/min)
08 overflow monitoring
09 Flexibility extends to the nominal drainpipe diameter (DN 40 and DN 50)
10 Free drain as per EN 1717
11 Water exchange group (single or double connection)
12 Maintenance cut-off
13 Flow and temperature sensor for flushing volume detection (TOP ENTRY)
14 Solenoid valve with integrated fine strainer (TOP ENTRY)
15 Aerator set incl. flow limiter (variable flow rate 5, 10, 15 l/min)
16 (Flush-mounted) mounting frame (incl. depth compensation)
17 Push-to-open reversible cover (incl. fall-out protection)
18 Flushing components for flushing during commissioning

Hygiene Flush Box PRO as system with MASTER 2.1

an example in a large building



Components and accessories

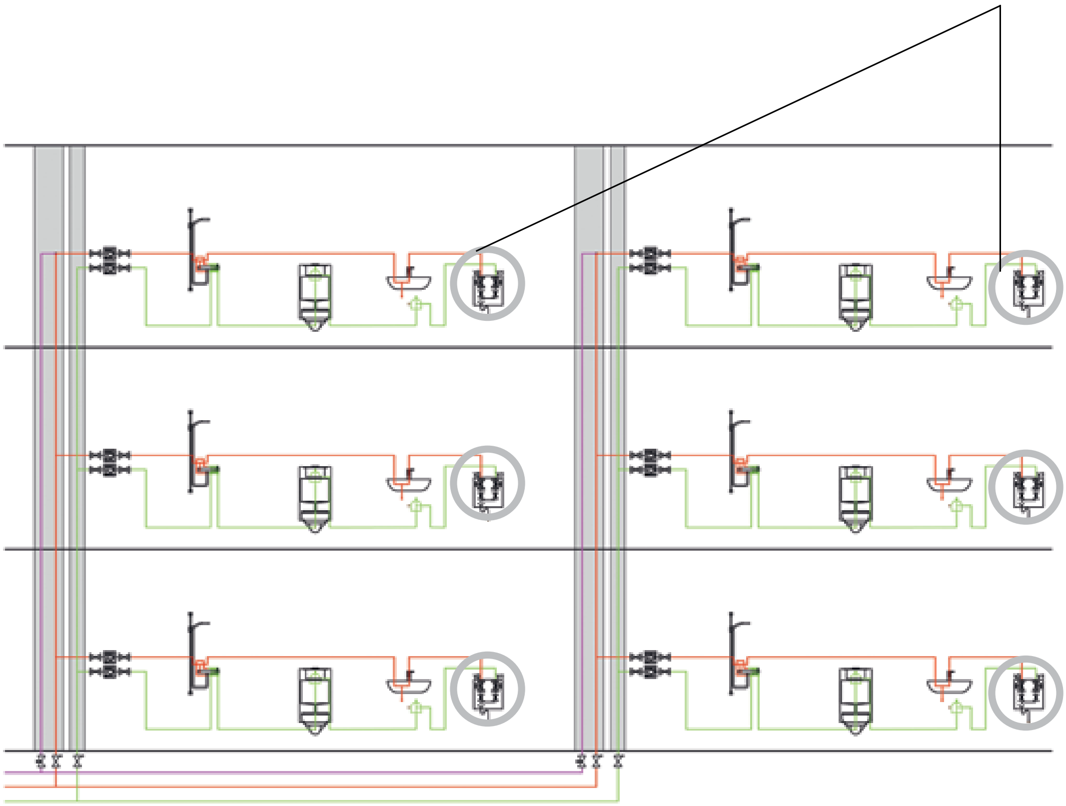
KHS Hygiene Flush Box PRO
Figure 689 03 007 (single port)
Figure 689 03 008 (double port)

KHS Mini Control System
MASTER 2.1
Figure 686 02 008

KHS temperature
PT1000
Figur 628 0G

Hygiene Flush Box PRO as a self-sufficient unit

an example in residential construction



Components and accessories

KHS Hygiene Flush Box PRO
Figure 689 03 007 (single port)
Figure 689 03 008 (double port)

Design and construction

Notes and examples

Basic information for design and construction with the KEMPER Hygiene System KHS for PWC/PWH

The following pages contain design information showing how to reduce the costs of water exchanging measures, as well as some design examples of buildings with different uses. Following the notes on the following pages during the design will ensure many years of trouble-free plant operation for the operator.

Buildings of the same construction type are not always comparable, and each plant is a prototype that must be considered individually. Consequently, not all possible applications can be addressed at this point.

These cases were selected with the criterion of presenting a particularly broad spectrum of applications. The transferability of the design examples to other use cases is shown.

In the examples presented, special emphasis was placed on innovative, but also practically feasible, pipework services. Through the design and implementation of well-thought-out pipework services in combination with an intelligent control system, the water volume for the hygienically necessary water exchange can be reduced to a minimum.

The examples shown are only intended as suggestions for possible solutions for designers' day-to-day work and are not generally binding for an identical type of building use.

Application examples:

- Schools, nurseries
- Sports halls
- Care homes, barracks
- Hospitals
- Housing construction
- Exhibition halls

Identifying permanent consumers

Reduce the costs of water exchanging measures through permanent consumers!

The costs for water exchanging measures can be reduced by placing permanent consumers before the water exchanging valves at the design stage.

Permanent consumers are consumers that ensure regular, long-term consumption and thus water movement throughout the entire pipe system. They must be defined together with the operator and examined critically. Long periods of stagnation at the weekends or during the holiday season must be taken into account when doing so.

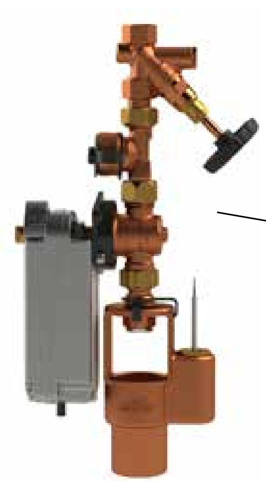
Permanent consumers placed before the water exchange valves reduce the costs for water exchanging measures.

Permanent consumers can be:

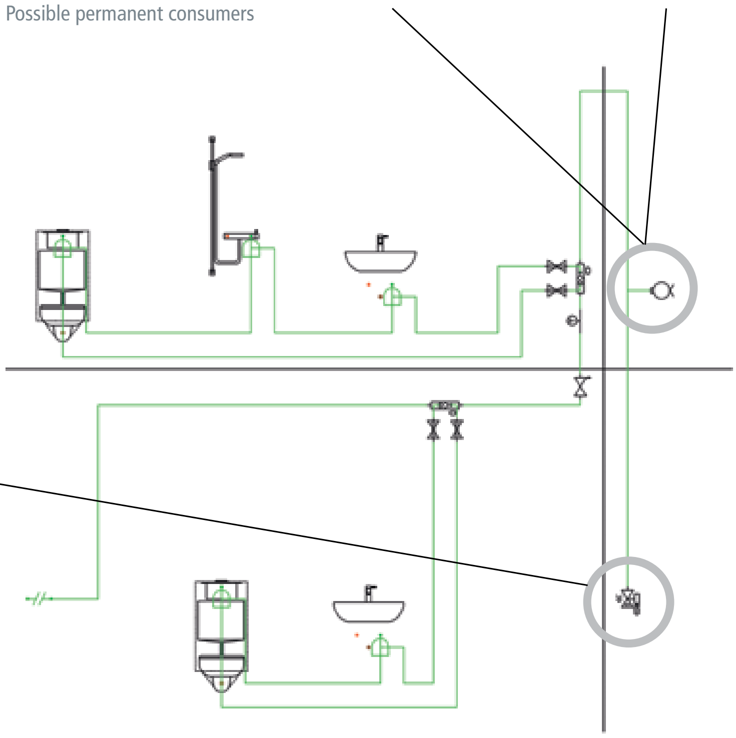
- // Laundry rooms
- // Swimming pool areas
- // Bedpan washers
- // Cooling systems for computer systems
- // Sauna areas
- // Cooling towers
- // Commercial kitchens
- // etc.

Possible permanent consumers

KHS Mini Control System
MASTER 2.1
Figure 686 02 008



KHS flush point
Figure 684 05



Intended use through a combination of permanent consumer and flush point

Problem:

Ambient air temperature changes drinking water temperatures

Pipeslines for drinking water are usually routed to the tapping points through installation shafts, false ceilings and pre-walls. Together with cold-water pipes, there are also heating pipes, hot-water and circulation pipes, lamps, transformers and IT systems in these areas. Due to their high thermal loads, they often cause increased ambient air temperatures of over 30 °C.

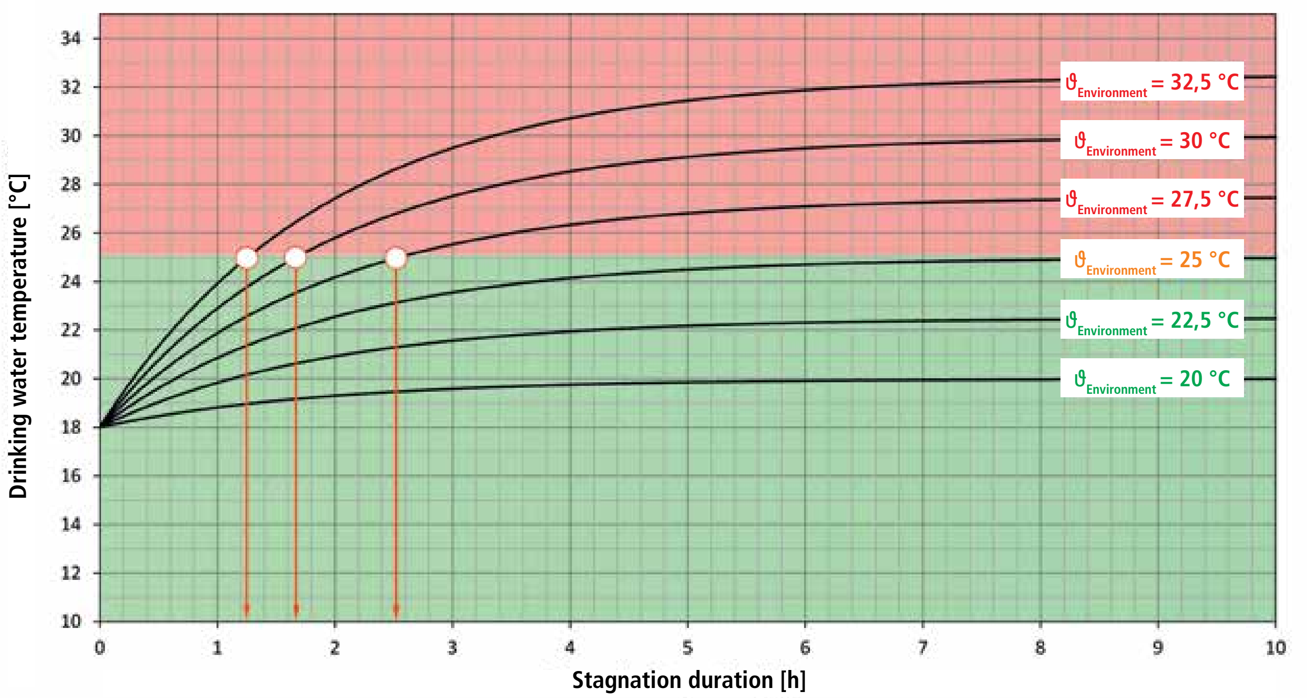
In recent years, this effect has been massively intensified by energy-saving regulations and fire protection. The German energy saving regulations (EnEV), which aim to increase buildings' overall energy efficiency, refer to the prevention of heat escaping from buildings through appropriate insulation. One aim of fire protection is to prevent the development and spread of a fire. To prevent the fire from spreading for as long as possible, individual fire compartments are created in buildings. The result of both measures are multiple sealed-off areas where heat accumulates.

Since the temperature of the drinking water correlates with stagnation, the drinking water temperatures automatically adjust to the temperatures of the ambient air as soon as stagnation begins. In these cases, the limit of 25 °C required by law for drinking water (PWC) (see illustration) is often exceeded in less than three hours. Even insulating the pipes cannot completely prevent this heat transfer, only delay it.

Heat loads that influence the ambient air temperatures in utility shafts and false ceilings!

- // Heating pipes
- // Hot-water and circulation pipes
- // Electric cables
- // Lamps and transformers
- // etc.

Temperature curve of a stagnant, 100 % insulated drinking water pipe made of copper (22 x 1.0) at different ambient air temperatures

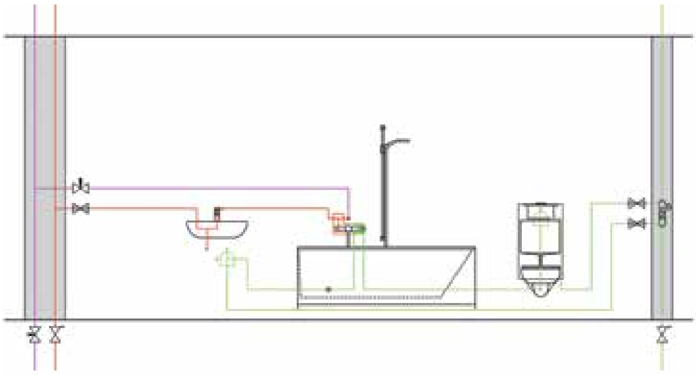


Passive solution:

avoiding heat transmission

Avoid temperature transitions from hot to cold-water pipes.

- // Separate pipe routing (separate shafts if possible) for hot and cold-water pipes
- // Lay hot pipes above and cold-water pipes below
- // Avoid heat transfer at taps through PWH connection from above with a short branch line
- // Insulate pipes and fittings (100 % according to EnEV (German energy saving regulations))
- // Discuss and agree the pipe routing for PWC and PWH with the architect



Heat transfer must be avoided at the design stage by laying hot pipes and cold-water pipes separately.

Requirements of the standard

Requirements for installation shafts and ducts

Installation shafts for cold drinking water pipes must be designed and constructed in such a way that a drinking water temperature of 25 °C (recommendation: not more than 20 °C) is not exceeded. Cold drinking water pipes must be designed and constructed in such a way that they are thermally separated from hot pipes. If necessary, they must be spatially separated. All drinking water pipes must be adequately insulated, cold drinking water pipes according to DIN 1988-200.

Requirements for plantrooms

Plantrooms can be arranged centrally or decentrally according to local conditions (see VDI 2050 Part 2). Taking stagnation times into account, the cold drinking water must not be allowed to rise to a temperature above 25 °C (recommendation: not above 20 °C). Cold drinking water pipes must be designed and constructed in such a way that they are thermally separated from heat sources. All drinking water pipes must be adequately insulated, cold drinking water pipes according to DIN 1988-200.

VDI/DVGW 6023 April 2013

In […] drinking water installations, a water exchange as intended must be ensured so that the temperature of the drinking water in cold drinking water pipes in plantrooms, installation shafts and ducts with heat sources is not heated to a temperature of more than 25 °C.

DIN 1988-200:2012-05

Doubly effective

Heat transmission reliably avoided

In circulation systems, the KEMPER thermal separator reliably prevents unwanted heat transmission from the hot water to the mixing tap and the connected cold water. On the one hand, thermal separation is achieved through the use of a thermal spacer between the hot water connection and integrated drop ear elbow.

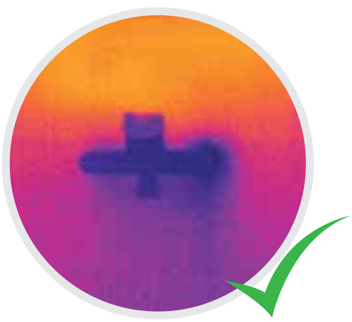
On the other hand, the location of the drop ear elbow below the hot water connection brings about a thermal stratification in the medium – on account of the density difference, no hot water moves down to the drop ear elbow.

Caution – heat transmission!

Hygiene risks in mixing taps

Thermography of two mixing taps connected to a circulation line:

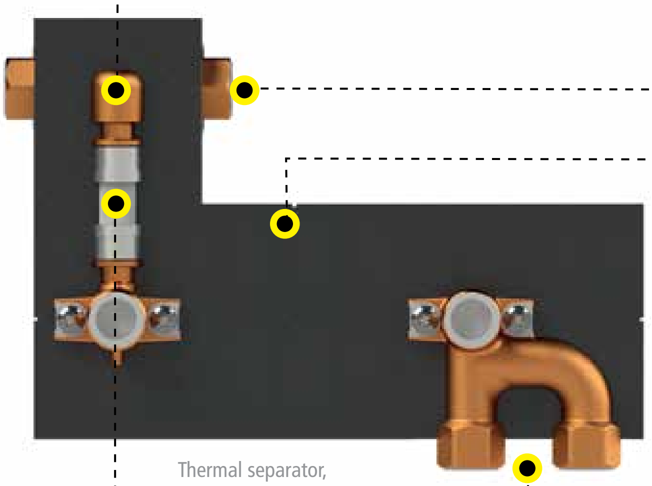
Mixing tap connected using **double drop-ear elbows.** **(Temperature clearly > 25 °C in the PWC drop ear elbow)**



Mixing tap connected using a **thermal separator.** **(Temperature < 25 °C in the PWC drop ear elbow)**

Benefits at a glance:
- // Guaranteed temperatures < 25 °C in the PWH drop ear elbow in purely circulation mode
- // 20 % cost advantage compared to a comparable self-build
- // Universal installation possible on all common pre-wall systems and installation situations

Thermal Separator



Thermal separator,
Figure 550 01, DN 15,
Female pipe thread Rp 1/2

Thermal separation
Pipe installation hot water Connection from above

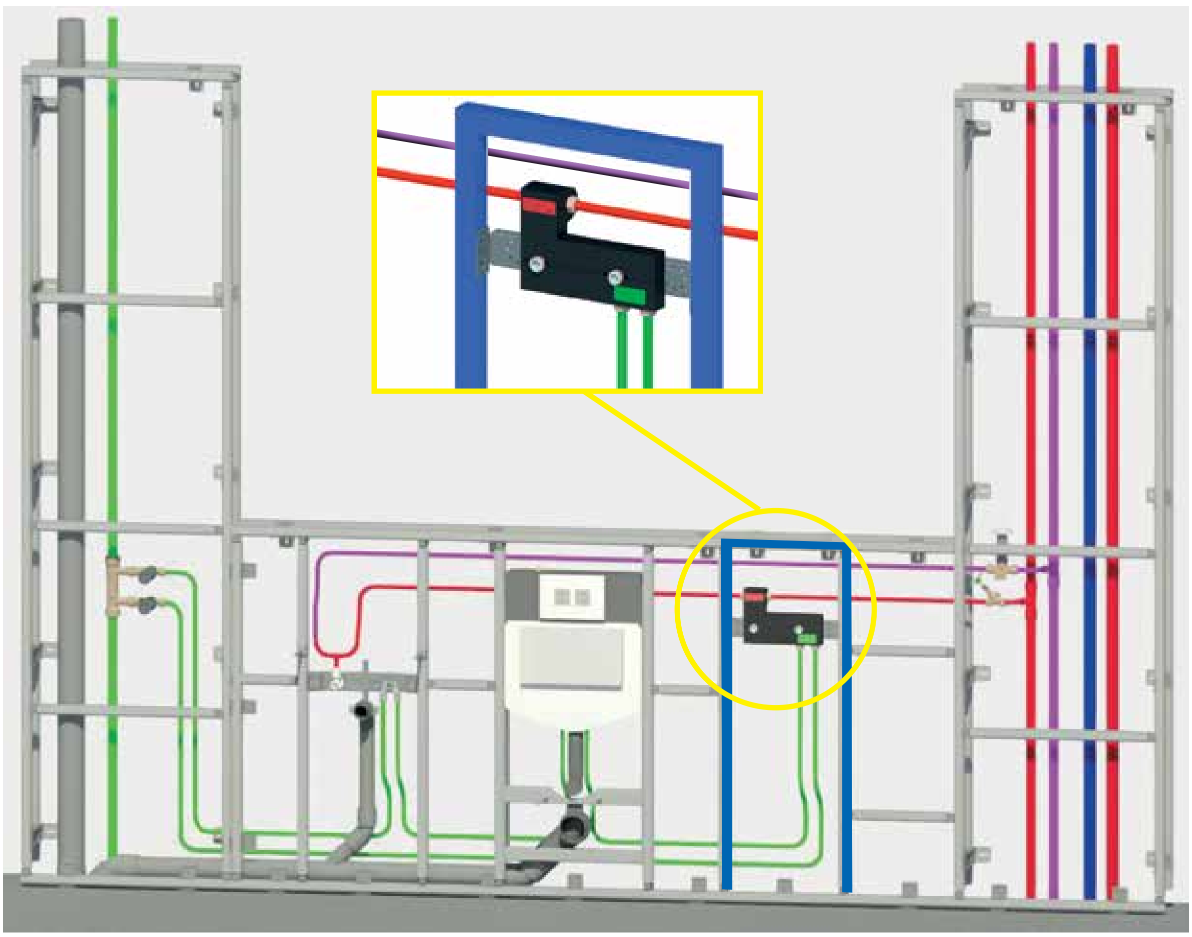
Rp 1/2" female pipe thread
Wetted parts made of corrosion-resistant gunmetal

Thermal insulation
Mounting block foamed in pressure and tension-resistant PU rigid foam

Thermal separation
Pipe installation cold water Connection from below

Thermal separation
Through the use of a thermal spacer

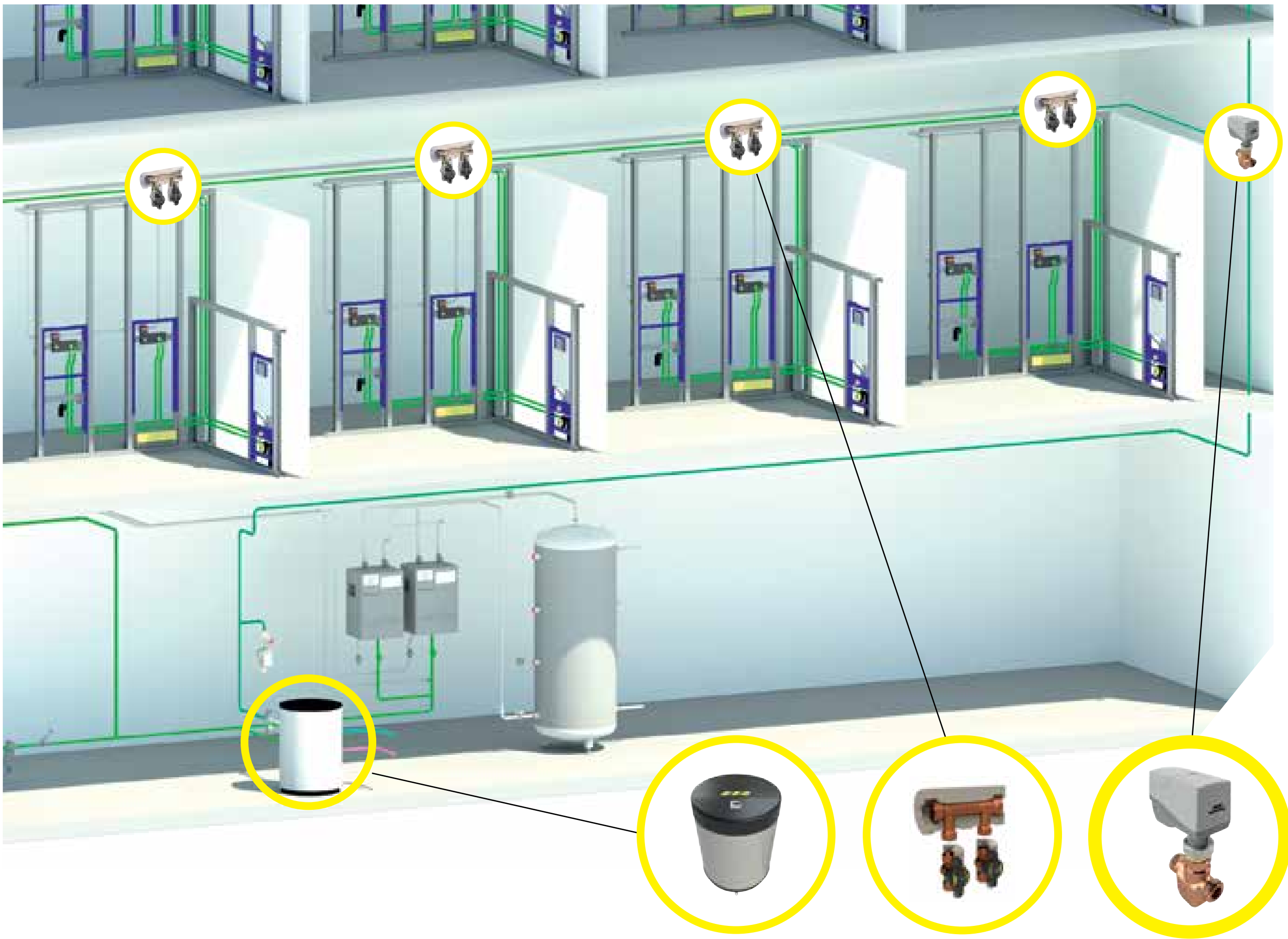
Installation example: Thermal separator in pre-wall system



Example of a bathroom in a building with special hygiene requirements

Active solution

KHS CoolFlow cold water circulation



KHS CoolFlow cooler

KHS Flow-Splitter -dynamic-

KHS CoolFlow cold-water balancing valve

With the addition of KHS CoolFlow in the innovative KEMPER Hygiene System KHS, cold water temperatures of less than 20 °C can now be permanently achieved up to the tapping point. The drinking water is distributed to the tapping point via a KHS Flow-Splitter. The KHS CoolFlow cooler cools and circulates the drinking water. The KHS CoolFlow cold water balancing valve regulates, flushes and shuts off circulation circuits as required.

In all areas

// Permanent temperature maintenance < 20 °C at each tapping point, even with high heat input

Use of innovative flow splitter technology:

// Minimised inner pipe surface
// Low number of flushing devices
// Low maintenance costs

Payback period

// KHS CoolFlow pays for itself in less than two years at high heat loads compared to temperature maintenance by flushing

KHS CoolFlow

The components

KHS CoolFlow cold water balancing valve

Automatic circulation regulating valve with integrated flushing function

3 functions – 1 valve
// Regulating function
// Flushing function
// Stop function

100 % design reliability
A single control range for all applications simplifies sizing and guarantees reliability at all design and operation stages.

Retrofittable
Existing KHS systems can be retrofitted at little cost.

Figure	Part no.
615 0G 01500	KHS CoolFlow cold water balancing valve with actuator 230V, DN 15
616 0G 01500 K	KHS CoolFlow cold water balancing valve with actuator 24V, DN 15
617 0G 01500	KHS CoolFlow cold water balancing valve without actuator/flushing function, DN 15

KHS CoolFlow cooler

Drinking water cooler with integrated circulation pump

Huge performance in a minimal space
With a space requirement of less than 0.5 m², buildings with a pipe length of up to 2000 m can be cooled to less than 20 °C.

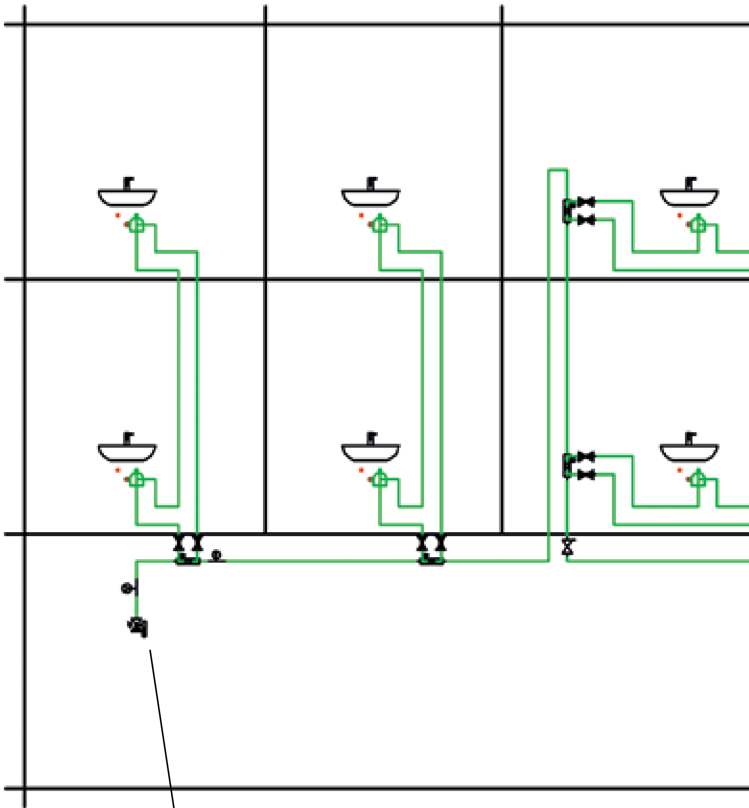
The all-rounder
Thanks to an innovative storage solution, it can be used in all existing and new chilled-water units and chillers.

The complete package
The pre-assembled compact unit with integrated circulation pump already contains all necessary components for the drinking water side, is insulated diffusion-tight and preconfigured.

Figure	Part no.
610 00 100 00	KHS CoolFlow cooler

KHS application in small / medium buildings

e.g. schools or nurseries



Application case:
- // Primary school
- // 14 classrooms
- // 2 floors

Application with transferability to other use cases:
- // Schools
- // Trade schools
- // Colleges
- // Universities
- // etc.

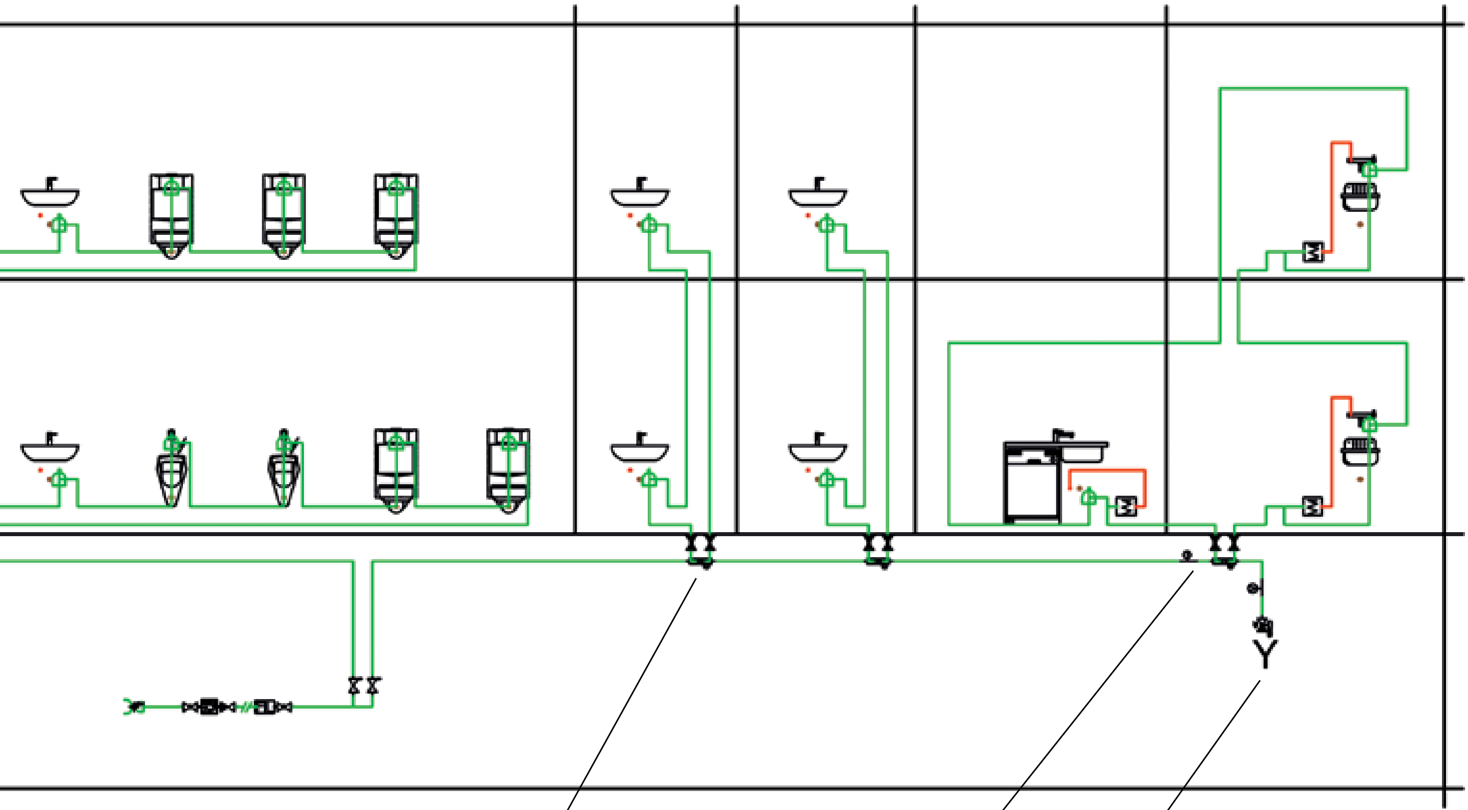
Implementation:
- // Pipe routing with loop pipes
- // Terminal KHS quarter-turn stop valves in basement
- // Monitoring and documentation of water exchange with sensors
- // Monitoring PWC temperature (< 25 °C)
- // Decentralised domestic water heater
- // Bathrooms not individually lockable

Components used:
- // KHS Flow-Splitter -dynamic- in PWC
- // KHS flush point 230V with CONTROL-PLUS
- // KHS Mini Control System MASTER 2.1
- // KHS Mini Control System SLAVE

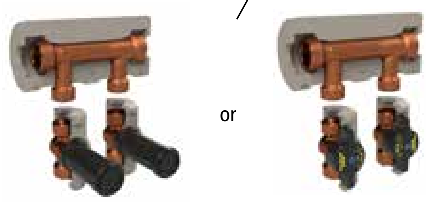
KHS Mini Control System MASTER 2.1
Figure 686 02 008 (1)

KHS flush point
Figure 684 05

(1) Wiring instructions for sensors, valves and controllers on page 55.



KHS Mini Control System
SLAVE
Figure 686 02 006



or

KHS Flow-Splitter units
Figure 650 00

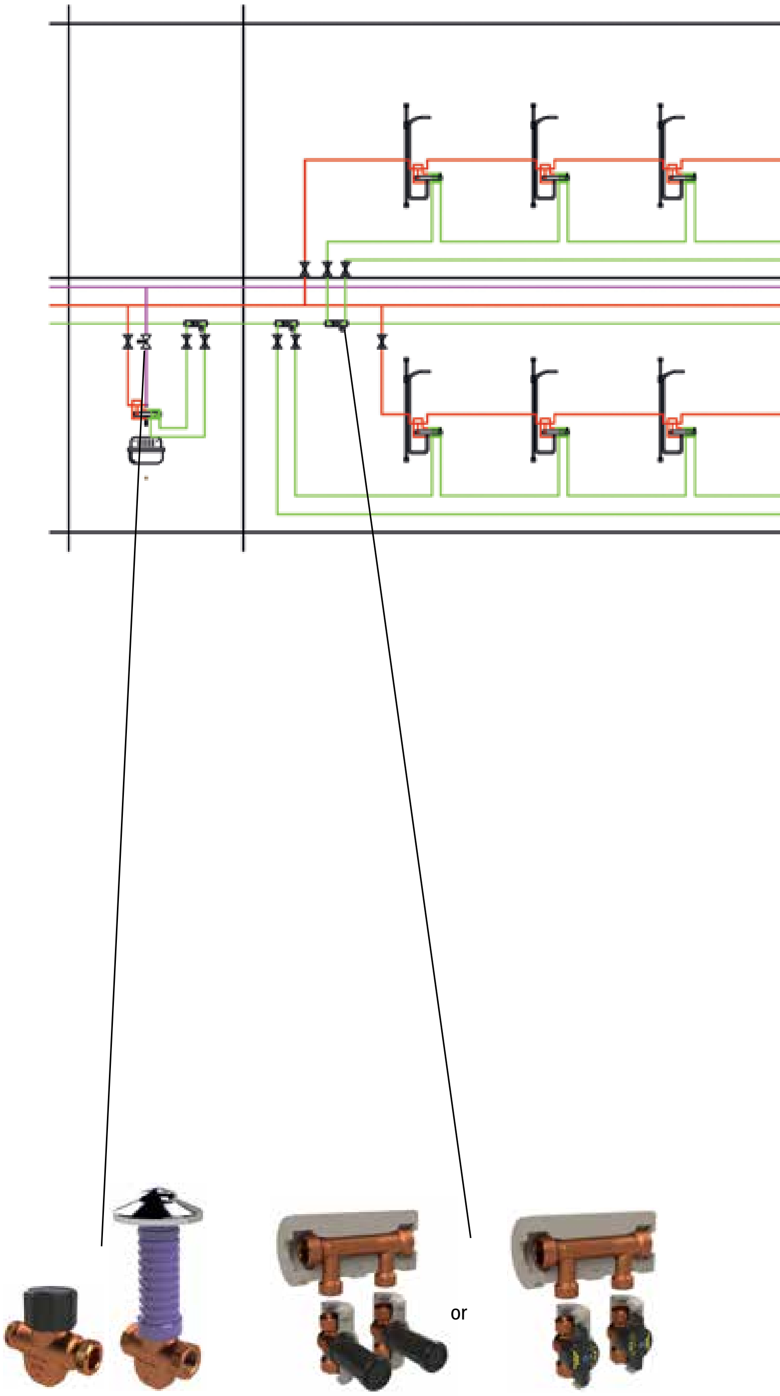
Figure 650 02

KHS temperature sensor
Pt 1000 Figure 628 0G

KHS flush point
Figure 684 05

KHS application in small / medium buildings

e.g. sports halls



ETA-THERM
Figure 130 or 540

KHS Flow-Splitter units
Figure 650 00

Figure 650 02

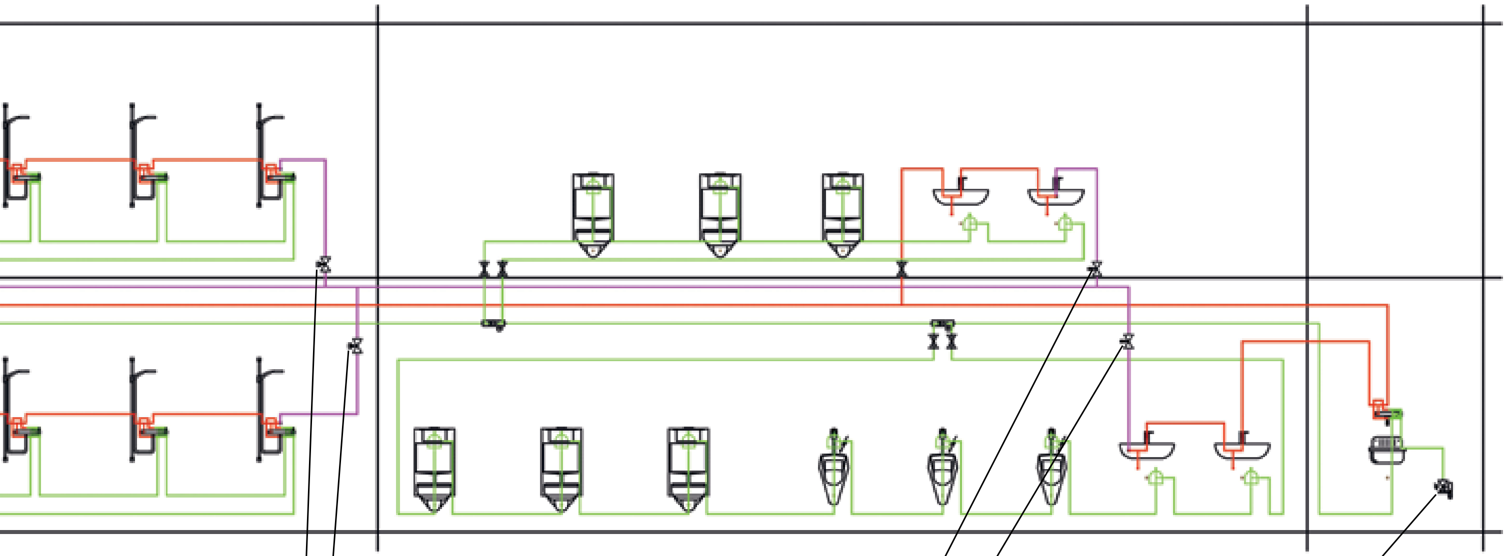
Application case:
- // Sports hall
- // Showers and toilets
- // Cleaners’ storeroom

Application with transferability to other use cases:
- // Multifunctional halls
- // Swimming pools
- // Exhibition halls
- // Stadiums
- // etc.

Implementation:
- // Pipework services with loop pipes
- // Regularly used toilets are located behind the shower facilities
- // Terminal KHS quarter-turn stop valves parallel to the sink in the cleaners’ storeroom
- // time-controlled water exchange
- // PWH-C regulated with automatic double-balancing valves

Components used:
- // KHS Flow-Splitter -dynamic- in PWC
- // ETA-THERM automatic floor regulating valve
- // MULTI-THERM automatic circulation regulating valve
- // KHS quarter-turn stop valve (DVGW certified) with actuator
- // KHS flow and temperature sensor
- // KHS free drain with overflow sensor
- // KHS Mini Control System MASTER 2.1

(1) Wiring instructions for sensors, valves and controllers on page 55.



KHS Mini Control System
MASTER 2.1
Figure 686 02 008 (1)

MULTI-THERM
Figure 141 0G

ETA-THERM
Figure 130 or 540

KHS flush point
Figure 684 05

KHS application in large buildings

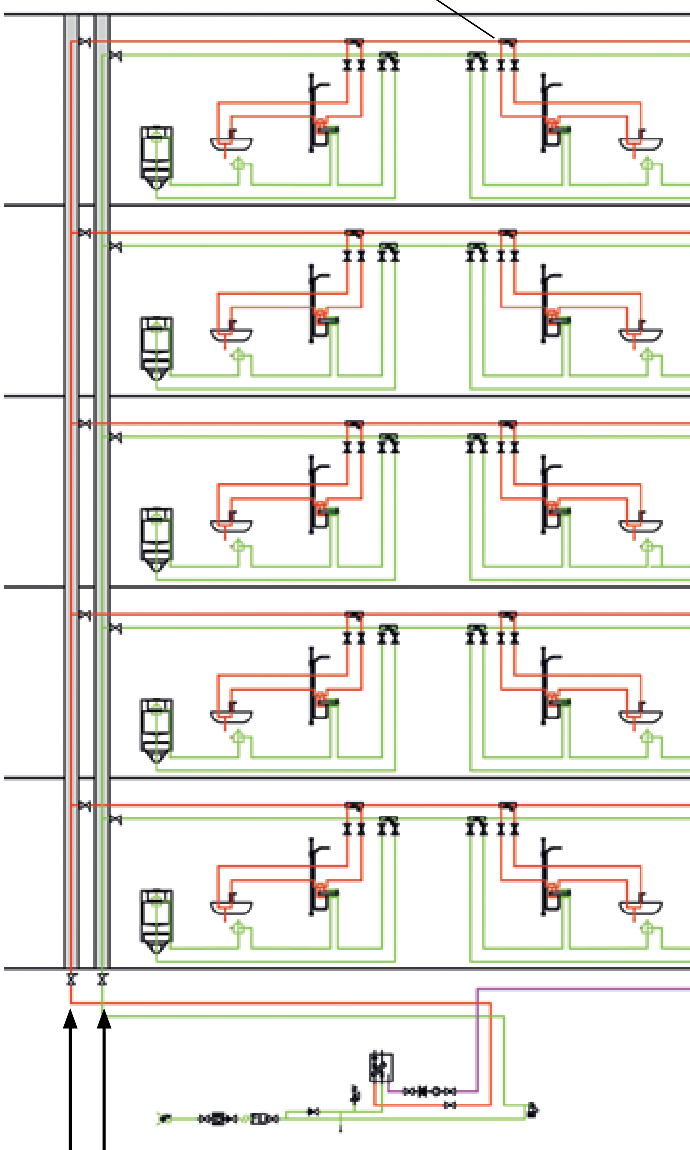
e.g. hospitals (distribution principle: horizontal)

or

KHS Flow-Splitter units
Figure 650 00 Figure 650 02

In hospitals, it is costly for the operator to ensure usage in the individual rooms according to the relevant standards. The rooms are not regularly occupied and/or the sanitary facilities are not regularly used when patients are bedridden. Nowadays, building services engineers ensure the water exchange in unused rooms by opening the tapping points. A widespread version for pipe routing is a horizontal distribution with the individual bathrooms connected along the corridors. An example of an installation
supported by the KEMPER Hygiene System KHS, calculated with KEMPER Dendrit *STUDIO* calculation software, is shown on the right.

"Periodic flushing(1) must be ensured in hospitals, medical practices or hotels, regardless of whether rooms are occupied or not."(2)



Avoid heat transmission, provide separate pipe routing for PWC and PWH!

Frequent water exchange with the KEMPER Hygiene System KHS through:

// KHS Flow-Splitter -dynamic- in the PWC and PWH

// Sensors for monitoring and documentation (volume-flow and temperature measurement)

// KHS quarter-turn stop valve (DVGW certified) with actuator

// KHS Mini Control System controlling the water exchange

Reduction of circulation heat losses in the PWH/PWH-C:

// Reduction of the pipeline for circulation

// PWH-C balancing through MULTI-THERM automatic circulation regulating valves

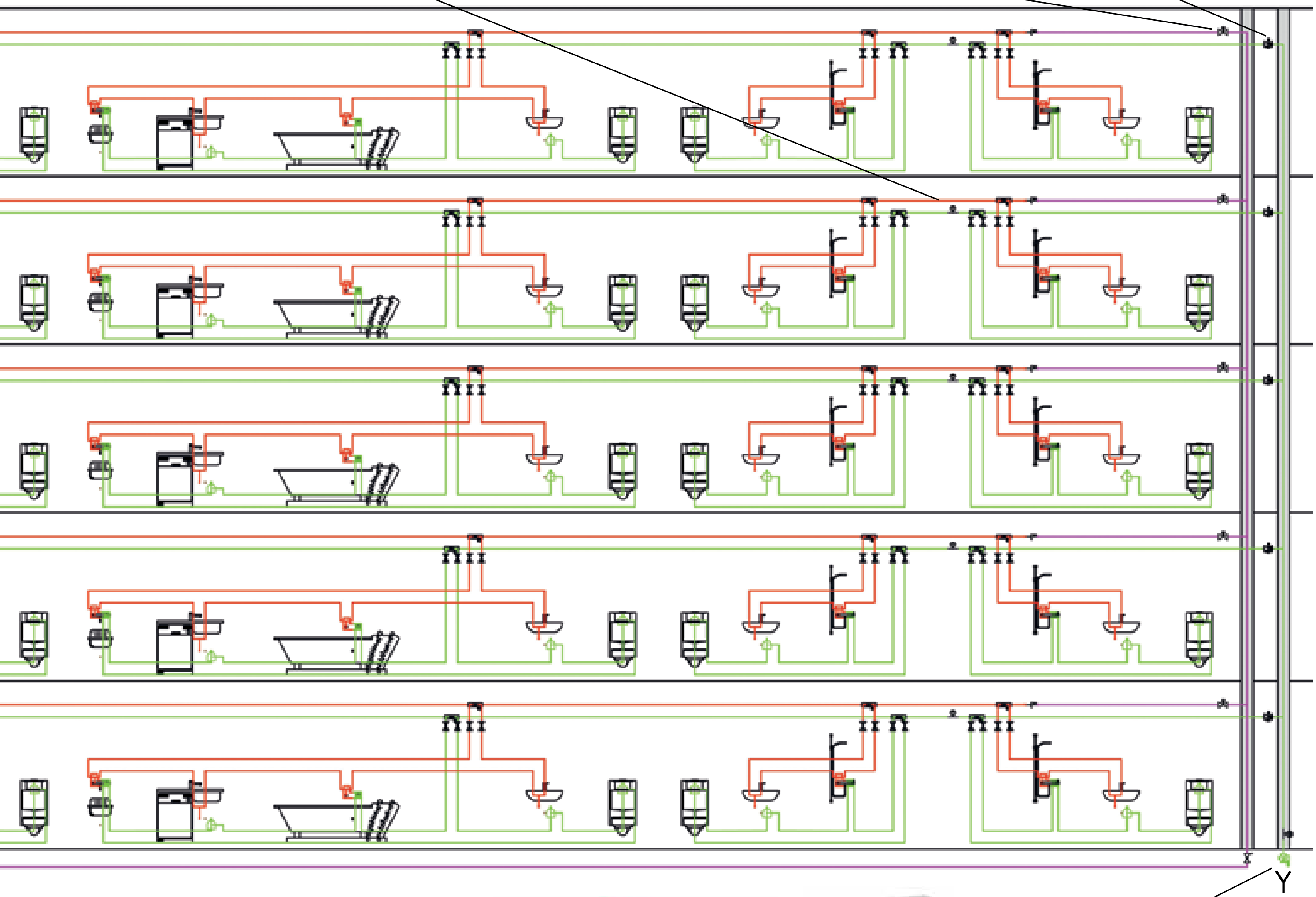
(1) In the sense of "replacing the body of water by water exchange".
(2) German federal health bulletin, health research-health protection 2006, 49:681-686DOI 10.1007/s00103-006-1284-X; published online: 09/06/2006 © SPRINGER-Medizin Verlag 2006.
(3) Wiring instructions for sensors, valves and controllers on page 55.

KHS temperature sensor
Pt 1000 Figure 628 0G

MULTI-THERM
Figure 141 0G

KHS quarter turn stop valve
with actuator (A-valve)
Figure 686 04

KHS Mini Control System
Slave
Figure 686 02 006

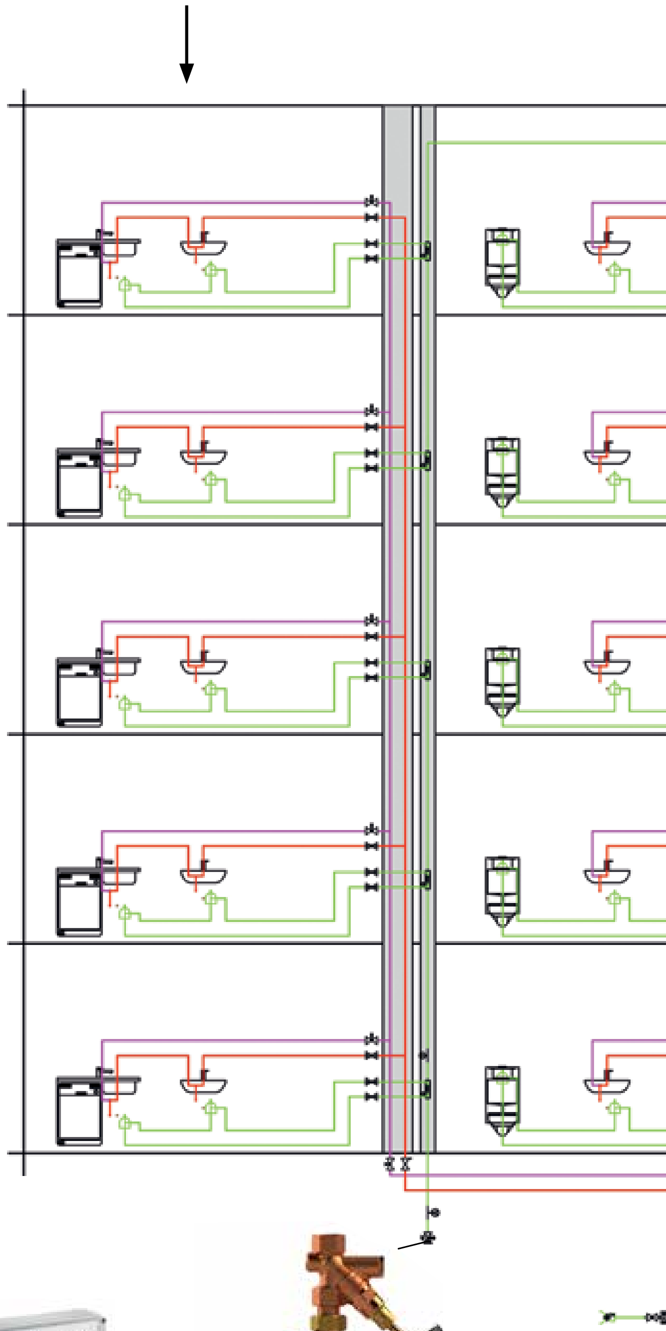


KHS Mini Control System
MASTER 2.1
Figure 686 02 008 (3)

KHS flush point
Figure 684 05

KHS application in large buildings

e.g. hospitals (distribution principle: vertical)



Application case:

- // Bed report for a hospital
- // 100 rooms (200 beds)
- // 5 floors

Application with transferability to other use cases:

- // Hospitals
- // Nursing homes
- // etc.

Implementation:

- // Taps in the staff common rooms are regularly operated as intended
- // PWC distribution pipe on higher level (if possible)
- // Terminal KHS quarter-turn stop valves in basement
- // Monitoring and documentation of water exchange with sensors
- // Monitoring PWC temperature (< 25 °C)
- // PWH-C balanced with automatic floor regulating valves and static double-balancing valves in the riser (alternative application with KHS Flow-Splitters in the PWH, see hotel design example)

Components used:

- // KHS Flow-Splitter -dynamic- in PWC
- // ETA-THERM automatic floor regulating valve
- // MULTI-FIX-PLUS static circulation regulating valve
- // KHS quarter-turn stop valve (DVGW certified) with actuator
- // KHS CONTROL PLUS flow and temperature sensor
- // KHS free drain with overflow sensor
- // KHS Mini Control System

KHS Mini Control System
MASTER 2.1
Figure 686 02 008 (1)

KHS flush point
Figure 684 05

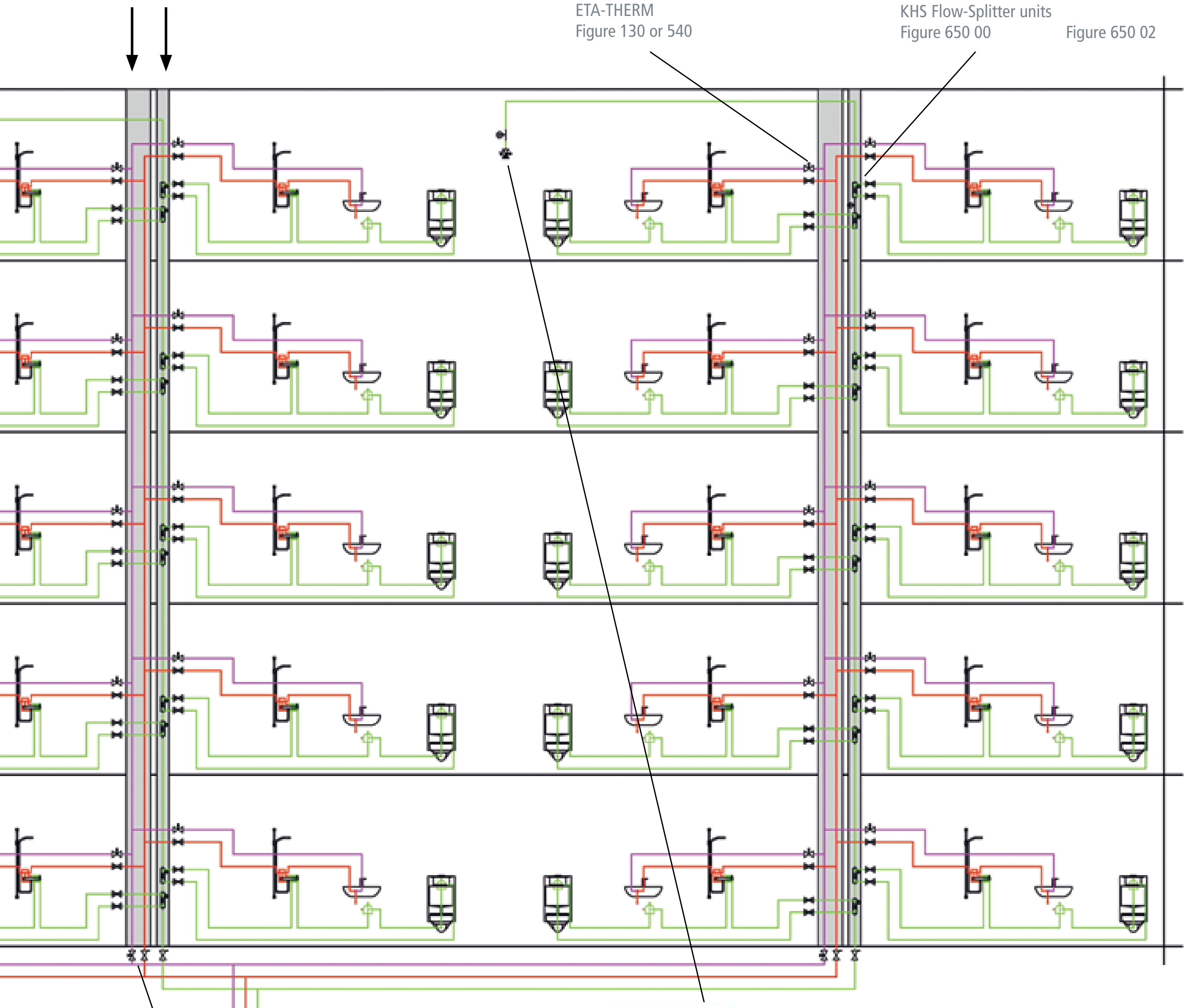
(1) Wiring instructions for sensors, valves and controllers on page 55.

Avoid heat transmission, provide separate cable routing for PWC and PWH!

ETA-THERM
Figure 130 or 540

or

KHS Flow-Splitter units
Figure 650 00 Figure 650 02



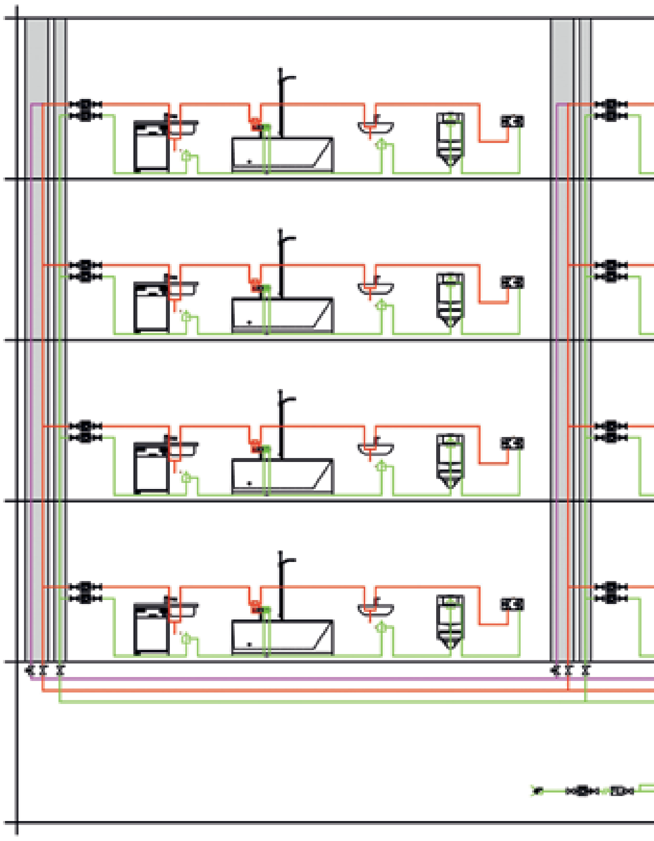
KHS Mini Control System
SLAVE
Figure 686 02 006

IS flush point
ıure 684 05

MULTI-FIX-PLUS
Figure 150 6G

KHS application in medium-sized / large buildings

Housing construction



Application case:

// Housing construction
// 4 floors
// 16 residential units

Application with transferability to other use cases:

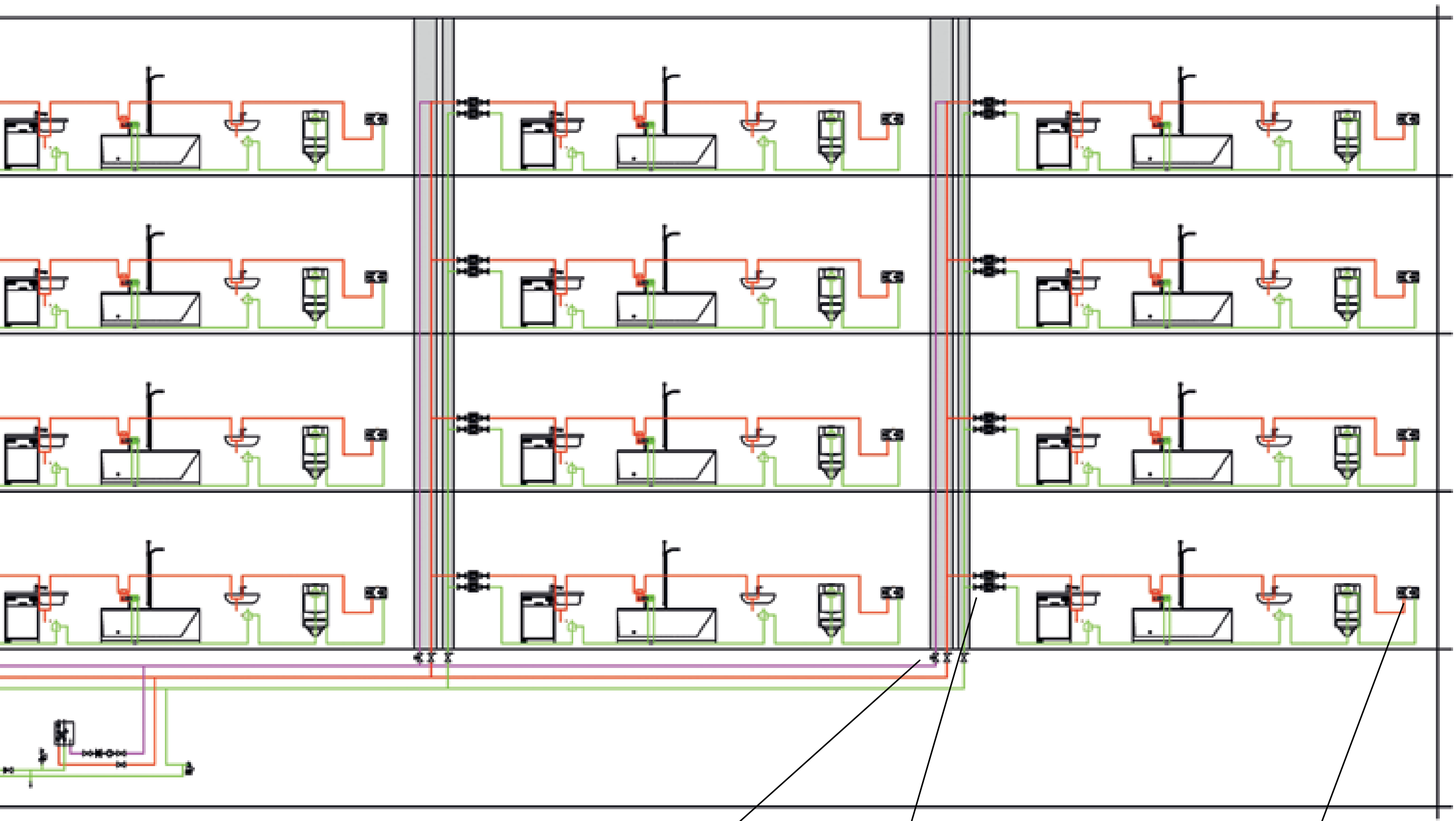
// Retirement homes
// etc.

Implementation:

// Pipeline daisy-chained to every user
// Terminal Hygiene Flush Box for PWC and PWH
// Water meter block for every residential unit
// Circulation pipe merged in the riser
// Hydraulic balancing of the circulation pipe with thermal double-balancing valves in the riser

Components used:

// KHS Hygiene Flush Box for PWC and PWH
// Stop valve water meter mounting block DUO
// MULTI-THERM automatic circulation regulating valve



MULTI-THERM
Figure 141 0G

Stop valve water meter mounting block RG
120 DUO Figure 854

KHS Hygiene Flush Box PRO
Figure 689 03 007 (single port)
Figure 689 03 008 (double port)

KHS application in large buildings

e.g. football stadiums, exhibition halls

Required KHS components:

KHS Mini Control System MASTER 2.1
Figure 686 02 008 (2)

KHS Mini Control System SLAVE
Figure 686 02 006 (2)

KHS flush point
Figure 684 05

Application case:
- // Toilet area in a football stadium
- // Pipe lengths > 300 m

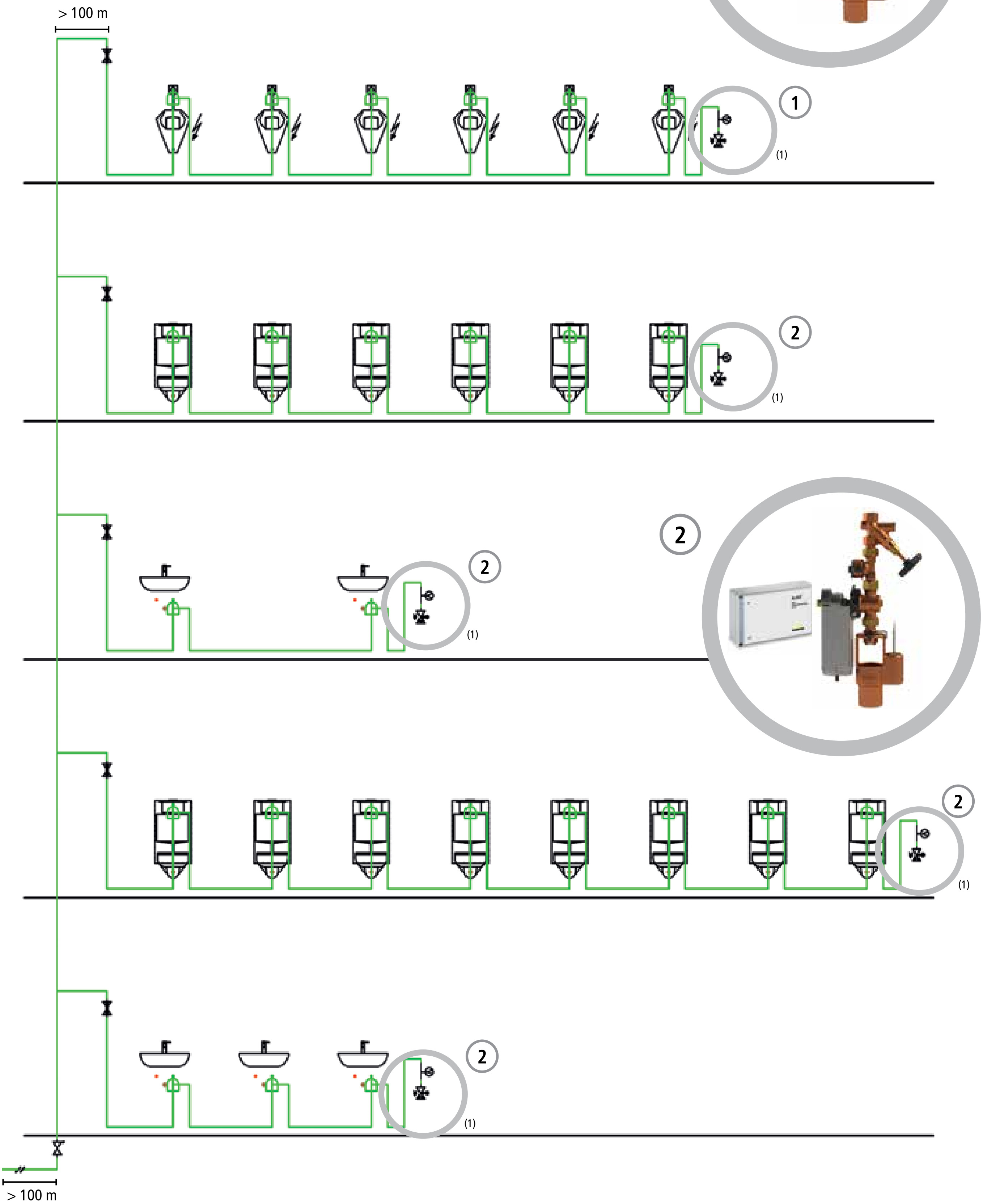
Application with transferability to other use cases:
- // Exhibition halls
- // Concert halls
- // etc.

Implementation:
- // Frequent water exchange in the toilets through terminal drive
- // Control with the operating modes time control, volume flow control and temperature control
- // Monitoring and documentation of water exchange with sensors
- // Due to the pipe lengths, a loop installation with KHS Flow-Splitters is not possible

Components used:
- // KHS quarter-turn stop valve (DVGW certified) with actuator
- // KHS flow and temperature sensor
- // KHS free drain with overflow sensor
- // KHS Mini Control System

(1) Required KHS components.
(2) Wiring instructions for sensors, valves and controllers on page 55.

Example: Sanitation facilities over 5 floors in a football stadium.
Connection is realised with a long connection length.



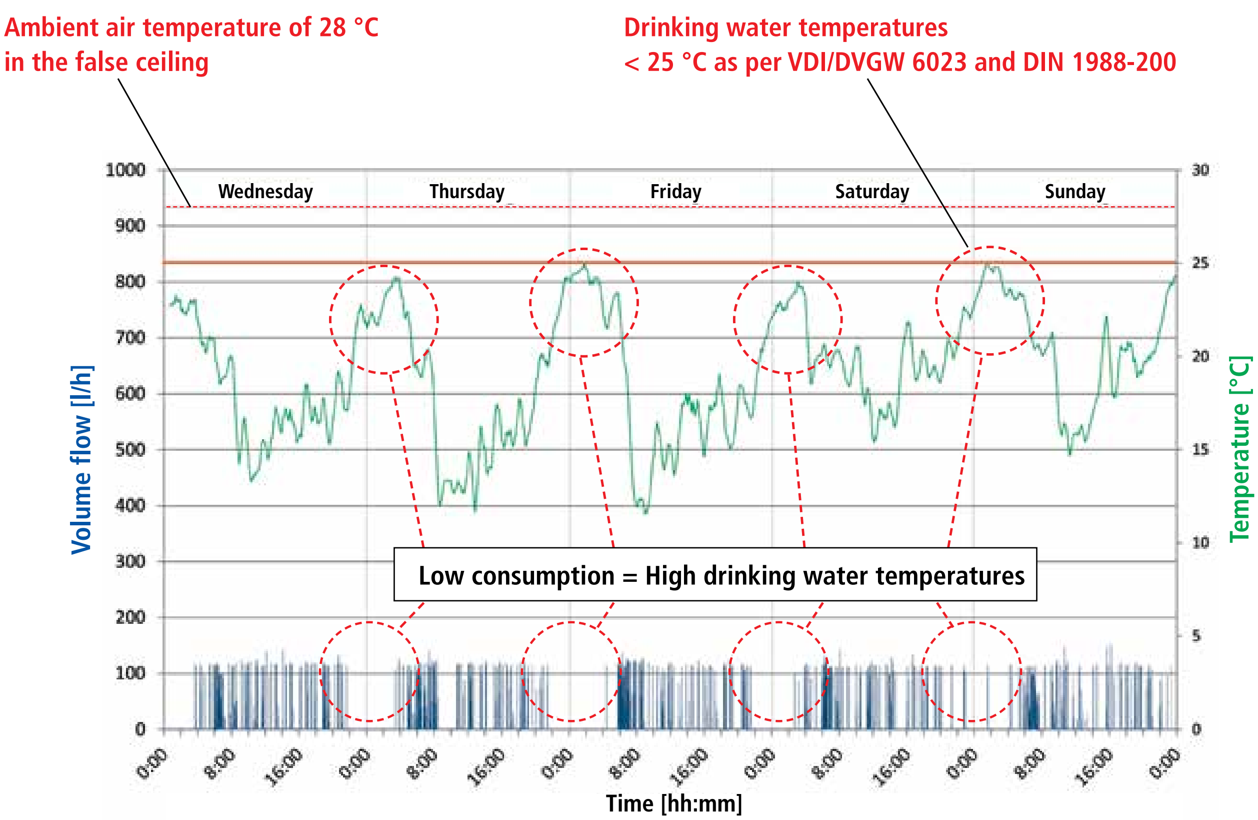
Example of hospital ward block

Use of KHS Flow-Splitters with water exchange technology

Building data
- // Permanent use of the building
- // High ambient air temperatures of 28 °C in the false ceilings

KHS technology
- // Horizontal distribution with KHS Flow-Splitters -dynamic- in the PWC
- // Terminal KHS quarter-turn stop valve for water exchange (with flow limiter 2 l/min)

Benefits of KHS technology:
- // Permanent compliance with drinking water temperatures < 25 °C as per VDI/DVGW 6023 and DIN 1988-200
- // Preventing long periods of stagnation and ensuring use as intended
- // Ensuring and maintaining the drinking water quality at all tapping points all year round



Example of hospital ward block

Use of KHS Flow-Splitters without water exchange technology

Building data

// Permanent use of the building
// High ambient air temperatures of 27 °C in the false ceilings
// Between 00:00 and 07:00, the drinking water temperatures are above 25 °C
// No water exchange technology

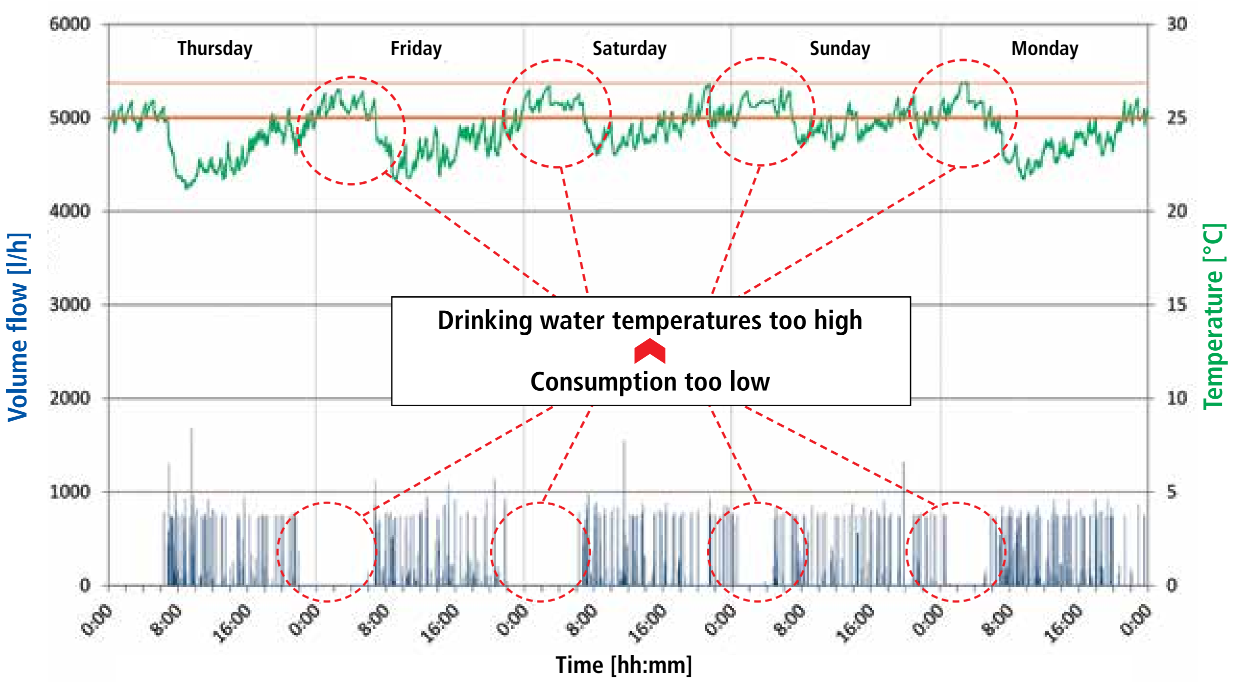
KHS technology

// horizontal distribution with KHS Flow-Splitters -static- in the PWC

Solution:

// Drinking water installations with KHS Flow-Splitters must be operated with valve technology for automatic water exchanges to be carried out!

During stagnation, drinking water temperatures will adjust to the ambient air temperatures if no water exchanging measures are taken during these periods!



Example of medical centre

Long periods of stagnation at night and on weekends

Building data

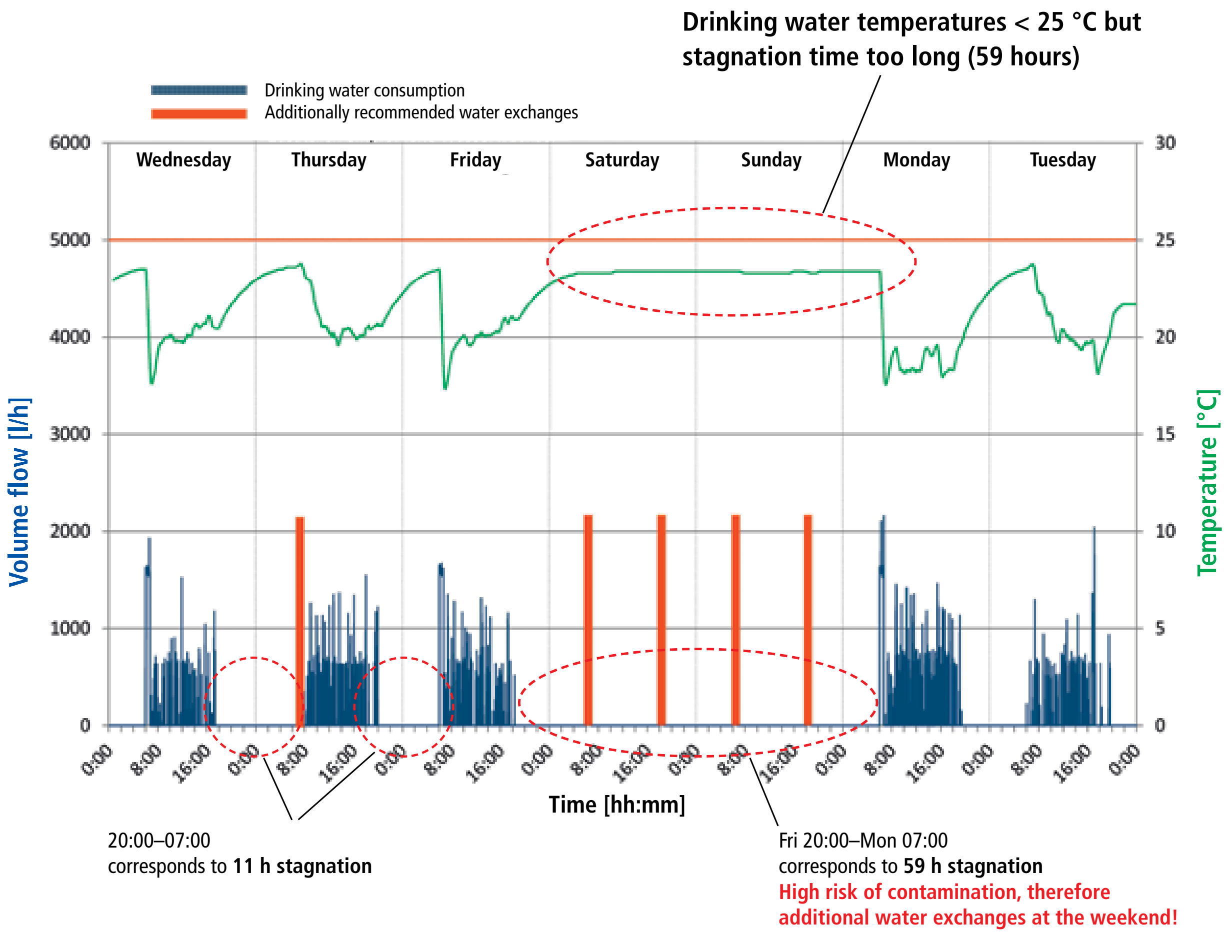
- // Building use Mon–Fri (07:00–20:00)
- // considerablevacancyon1stand2ndfloor
- // Stagnation during the night and at weekends throughout the building
- // Ambient air temperatures in the cable shafts below 25 °C

KHS technology

- // Vertical distribution with KHS Flow-Splitters -dynamic- in the PWC
- // KHS quarter-turn stop valve for automatic water exchange (with flow limiter 2 l/min)
- // KHS technology ensures that the stagnating water content is exchanged when the building is empty

Recommendation:

- // Daily drainage of the night-time stagnation water in the morning (property use of e.g. dental surgery)
- // Due to non-use at weekends, water exchanges are also recommended at weekends



Example of hospital

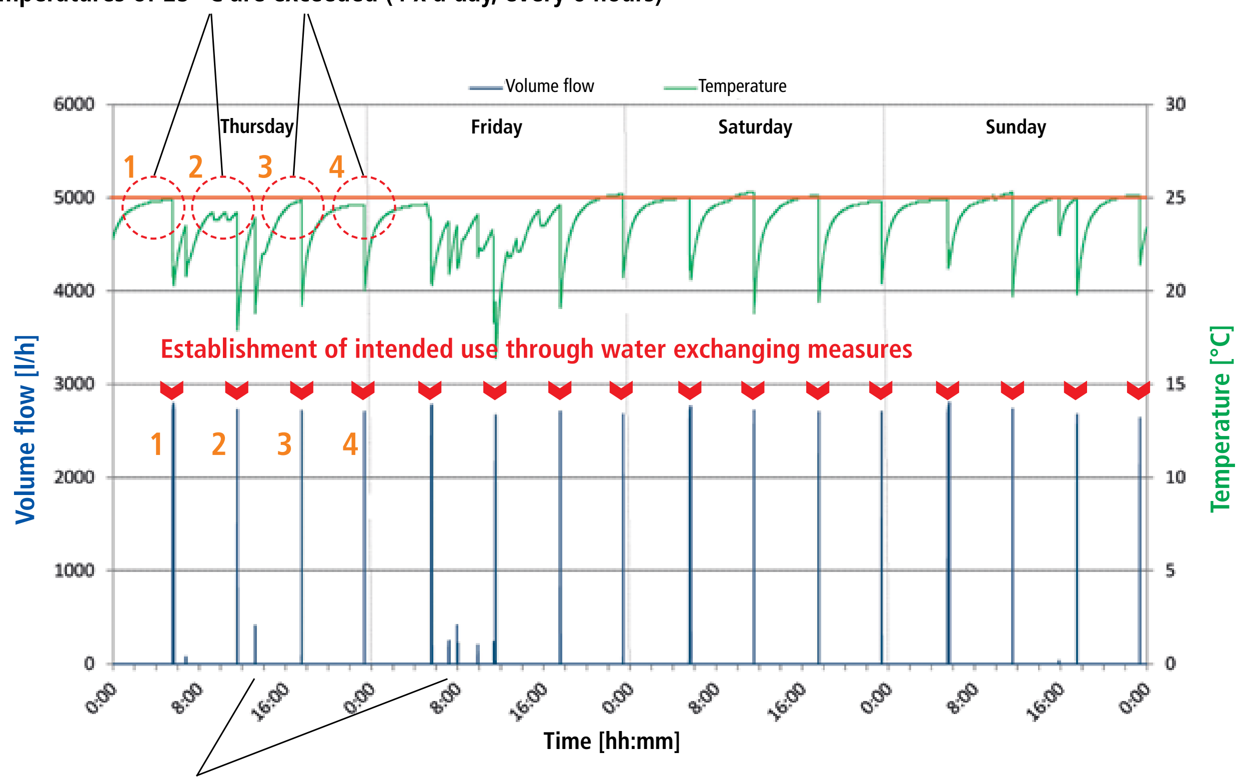
Department without water consumption in normal operation

Building data
- // Barely used bathrooms
- // Stagnation over several days
- // High ambient air temperatures in the false ceilings of 28 °C

KHS technology
- // Horizontal distribution with KHS Flow-Splitters -dynamic- in the PWC
- // KHS quarter-turn stop valves for automatic water exchange
- // Automatic water exchange every 6 hours

Result:
- // In buildings with infrequent tapping events, automated water exchanging measures with KHS technology should be used.
- // Automatic water exchanging measures ensure long-term use according to the relevant standards.
- // The combination of KHS Flow-Splitters -dynamic- with KHS quarter-turn stop valves and a controller ensures intended use is maintained.

The water exchanging measure starts before drinking water temperatures of 25 °C are exceeded (4 x a day, every 6 hours)



Infrequent consumption of drinking water through draw-off

Additional technical information

Metering ranges of flow and temperature sensor CONTROL-PLUS

Figure	DN	Figure 138 4G / Figure 138 6G flow [l/min]
1384G01000	10	0.9–15
1384G01500	15	1.8–32
1384G02000	20	3.5–50
1384G02500	25	5.0–85
1384G03200	32	9.0–150
1384G04000	40	11–188
1384G05000	50	18–316

Flow limiter

Figure	DN	Flow rate l/min	Permissible flow pressure MPa	Tolerance for permissible flow pressure
6970101500	15	>= 2	0.05–1	+/- 10 %
6970201500	15	10	0.1–1	+/- 10 %
6970301500	15	20	0.1–1	+/- 10 %
6970102000	20	38	0.2–1	+/- 10 %
6970102500	25	70	0.2–1	+/- 10 %
6970103200	32	110	0.2–1	+/- 20 %
6970104000	40	230	0.2–1	+/- 20 %
6970105000	50	350	0.2–1	+/- 20 %

Wiring instructions

for KEMPER KHS components with electrical connection

This list of cables merely provides examples of applications. The exact design of the cables in questions must be carried out on site by the designer based on the ambient conditions (temperature, frequency, routing type, mechanical load).

In accordance with VDE 0815, the diameter of signal transmission cables is specified in mm.

Designation	**Part no.**	**Wire cross section/ diameter** [mm²] [mm]	**Max. cable length** [m]	**Cable type***
KHS quarter turn stop valve with spring return actuator (24 V)	686 01 015...032	3 x X mm² (power supply) + 2 x 2 x 0.80 mm ** (position feedback)	700 (X = 1.50) 1000 (X = 2.50)	NYM-J + J-Y(ST)Y
KHS quarter turn stop valve with actuator (24 V)	686 00 015...032	5 x X mm² (power supply) + 2 x 2 x 0.80 mm ** (position feedback)	250 (X = 1.50) 450 (X = 2.50)	NYM-J + J-Y(ST)Y
KHS quarter turn stop valve with spring return actuator (230V)	686 05 015...032 686 15 032...050	3 x 1.50 mm²	1000	NYM-J
KHS quarter turn stop valve with actuator (230 V)	686 04 015...032	5 x 1.50 mm²	1000	NYM-J
KHS free drain with overflow monitoring	688 00 020...032	2 x 2 x 0.80 mm **	1000	J-Y(ST)Y
KEMPER CONTROL-PLUS flow sensor vortex principle	138 4G 015...050 138 6G 015...050	4 x 2 x 0.80 mm **	300	J-Y(ST)Y
KHS temperature sensor Pt 1000	628 0G 015...050 629 0G 015...050	2 x 2 x 0.80 mm **	1000	J-Y(ST)Y
Leakage water sensor	620 00 00100	2 x 2 x 0.80 mm **	500	J-Y(ST)Y
CAN bus cable The application is based on the ISO 11898 international standard.		1 x 2 x 0.34 mm² ** 1 x 2 x 0.50 mm² ** 1 x 2 x 0.75 mm² **	300 500 1000	CAN bus cable

* Possible cable type for fixed routing, without mechanical load
** Shielded cable lead
Subject to technical changes.

Date: August 2018

Notes

MANY THOUGHT THAT HYGIENICALLY CRITICAL COLD WATER TEMPERATURES COULD NOT SAFELY BE AVOIDED.

UNTIL WE CAME UP WITH A SOLUTION TO REMOVE THE ACCUMULATED HEAT.

www.kemper-uk.com/khscoolflow

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Hygiene System KHS 05/22