Version 07-2025

The new circulation system

Instant hot water even without a circulation pipe

NEW CIRCULATION

MILLER
ENERGIESYSTEME GMBH

Contents

Fundamentals of the New Circulation

What is special about the new circulation system?

To avoid waiting for hot water at distant taps, the circulation system described below breaks new ground:

In contrast to classic circulation, the New Circulation does not require an additional pipe, as it uses the existing cold water pipe to return the circulating water.

This opens up completely new possibilities and special features:

- **Optimum legionella protection**, as stagnation is avoided for the first time in both hot and cold water pipes
- **Immediately hot water** as required at the end of the line
- **53 % less heat loss** than classic circulation
- Circulation also possible through **water meters**

  → This is the first solution for apartment buildings
- **Problem solver** in old buildings, as **no additional pipe** required Solution for legionella problems, missing third pipe, water meters in the supply pipe (e.g. in MFH), or defective trace heating
- **Frost protection** in all pipe sections with looped pipe routing
- **Anti-scald function**, as the water is not immediately hot
- **Automatic line balancing**, e.g. in apartment buildings
- Water-saving push-button solution for poorly insulated DHW pipes in old buildings or for kitchens at the end of the pipe run
- **Cost-effective solution**, even for retrofitting

Legionella protection module for heat pumps

Problem when using heat pumps:

Heat pumps are becoming increasingly popular. As they work particularly efficiently at low flow temperatures, they are often operated at around 50° C. Legionella protection is no longer guaranteed.

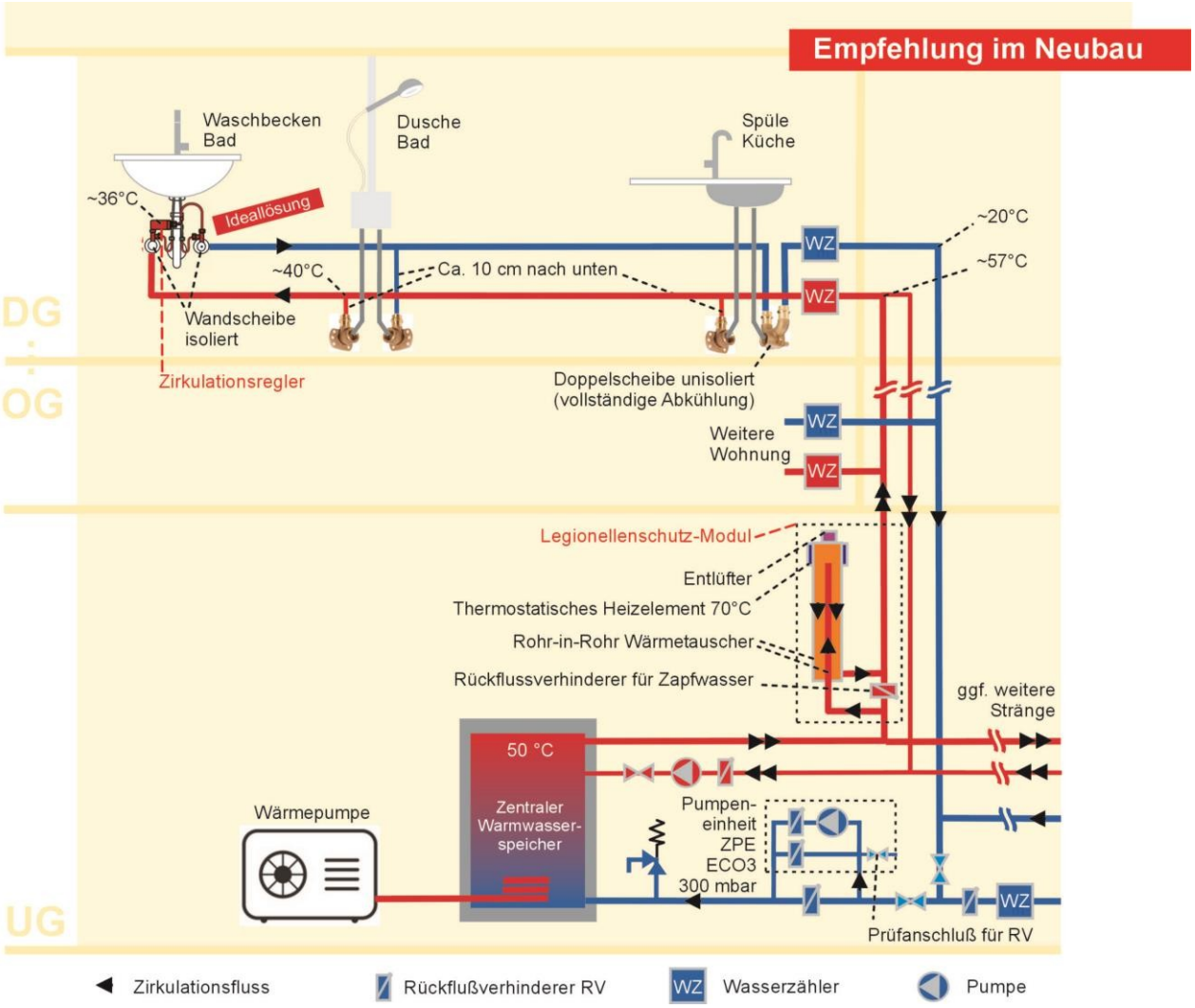
At the same time, current laboratory tests show that every tenth German drinking water system currently has an unacceptably high concentration of legionella.

Solution:

The water flowing into the building from the hot water storage tank at approx. 50°C is passed through a legionella protection module and thermally disinfected by heating the water to 70°C. Legionella and germs are reliably killed at 70°C within just a few seconds.

Special feature of the legionella protection module:

- **Safe legionella protection** in buildings for **the first time** despite low storage tank temperatures. The removal of stagnant water by the new circulation system is supplemented by a legionella protection module to disinfect water flowing into the building.
- **Extremely low energy consumption of just 3.5 W** for thermal disinfection, as the counterflow heat exchanger achieves outstanding efficiency thanks to the minimal flow rate.
- **Can also be used in apartment buildings.** Bypass by means of backflow preventer for large volumes of tap water.
- **Simple installation,** also possible at a later date.



Legionella protection module in apartment building with classic circulation

Attention: Classic circulation is deactivated during operation of the legionella protection module (e.g. at night)

Hygiene-optimized pipe routing

Current problem:

In circulation mode, warm water permanently enters the stagnant area of the mixer tap connections due to heat conduction and pipe-in-pipe circulation.

Special feature of the new pipe routing:

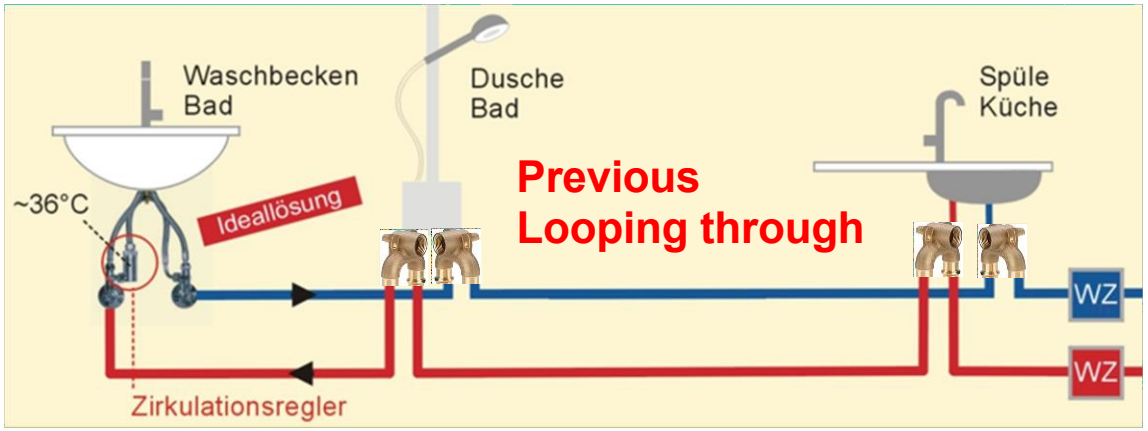
- **Optimum legionella protection**, as there is an extremely short heat transfer from the circulating DHW pipe down to the cold, non-insulated wall panel
- **Faster hot water** at the last tap, as all non-insulated wall panels do not heat up.
- **Significantly lower heat losses** compared to looping through non-insulated wall panels during circulation (with classic and new circulation).

A short, hygienically optimized heat transfer of the cooling section is made possible by the **branch leading vertically downwards (approx. 10 cm)**, whereby the stratification behaviour of the water is used.

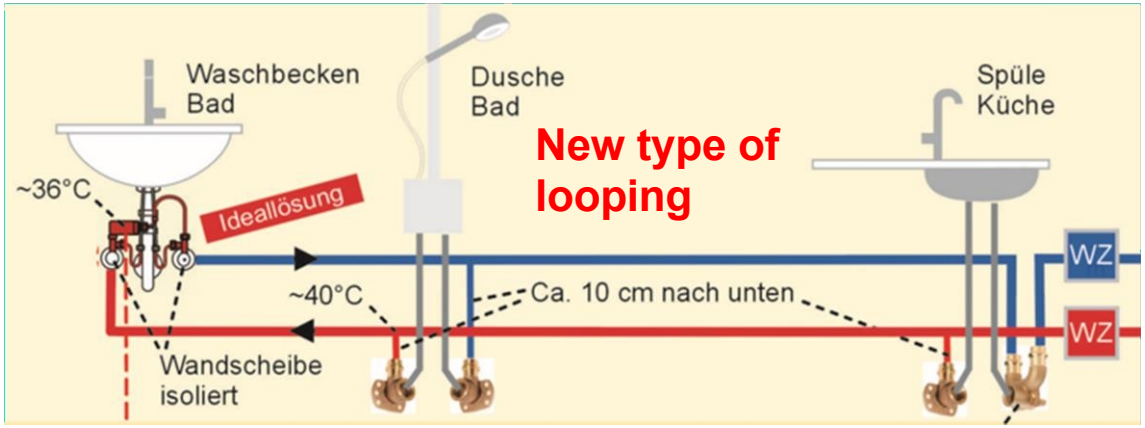
Shorter discharge times are achieved **through small pipe cross-sections** with low water volumes in the pipes **and** the **avoidance of flow through non-insulated double-walled disks.**

Significant **energy and water savings** are made possible by direct, continuous pipe routing and thus the **avoidance of heat loss through double-wall panels**.

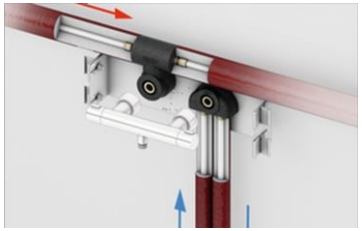
Hot water pipes have 100 % insulation, while **condensation insulation** is sufficient for **cold water pipes** (better cooling)**.**



Looping through the pipes from below by means of uninsulated double-walled disks



Looping through using a T-piece downwards to simple uninsulated wall plates



In order to prevent the hygiene-critical heat transfer (> 25 °C) at the taps in drinking water installations, these should generally not be integrated into the circulation circuit on the hot water side via a double wall plate. Instead, a sufficiently long cooling section of approx. 10 x DN with heat flow from top to bottom should be provided.

Source: http://www.bosy-online.de/Stagnation-Trinkwasser.htm

Picture left: https://www.shk-profi.de/artikel/shk_So_that_cold_water_stays_cold-3052025.html

Current innovations

Hygiene-optimized installation of the circulation controller

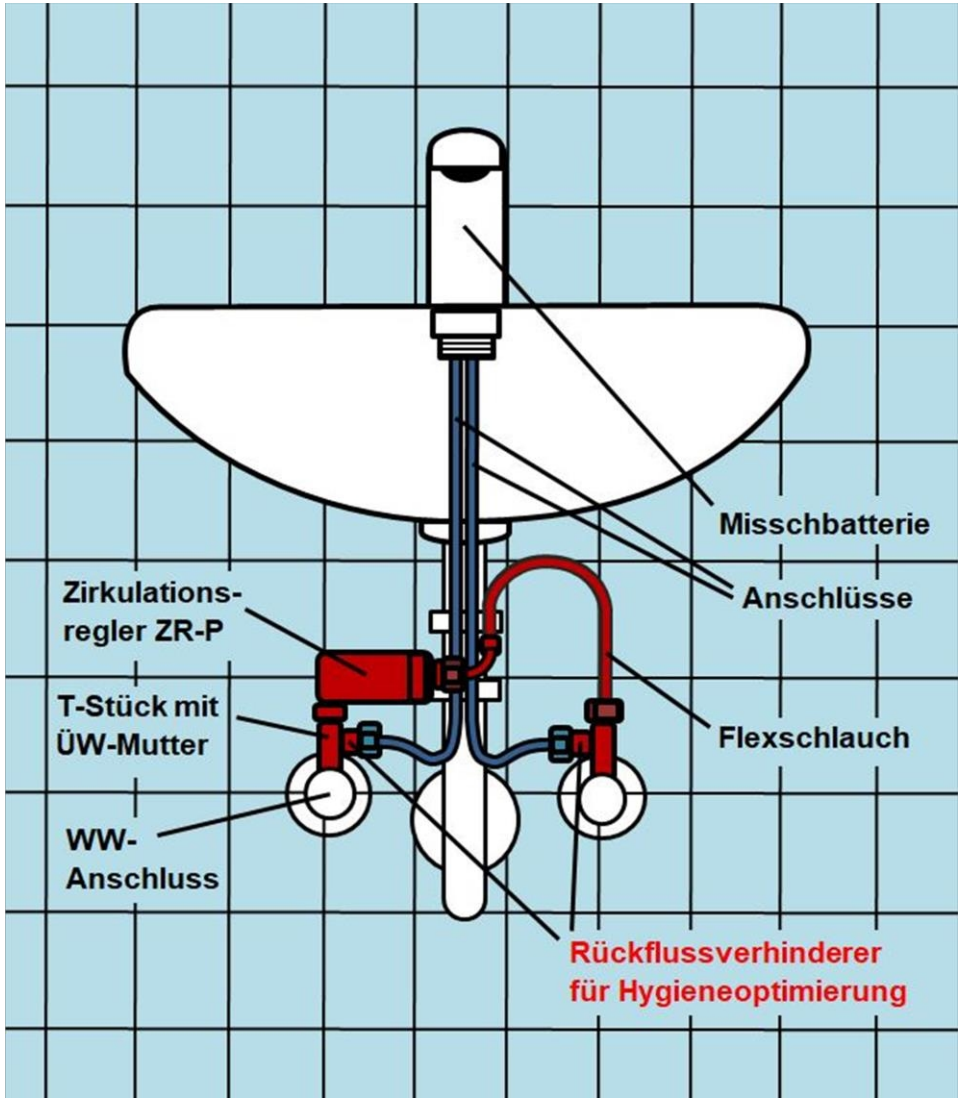
The circulation controller is positioned horizontally at the top outlet of the T-piece. The respective mixer tap connections are positioned at the side outlet of the T-piece. This prevents pipe-in-pipe circulation in the two supply lines to the mixer tap.

Backflow preventers are placed at the side outlet of each T-piece to prevent pipe-in-pipe circulation in the connecting pipes to the mixer tap.

Special feature of the new installation method:

- **Optimum legionella protection**, in all pipe sections in the tap area:
  - Circulation regulator, flexible hose and T-pieces have circulation flowing through them (water exchange)
  - Backflow preventers in the lateral T-piece outlets prevent pipe-in-pipe circulation in the supply lines to the mixer tap.
- **Significantly lower heat losses** when using insulated wall panels, as the circulation runs through the corner valves.

The type of pipe routing to the wall panels is irrelevant here.



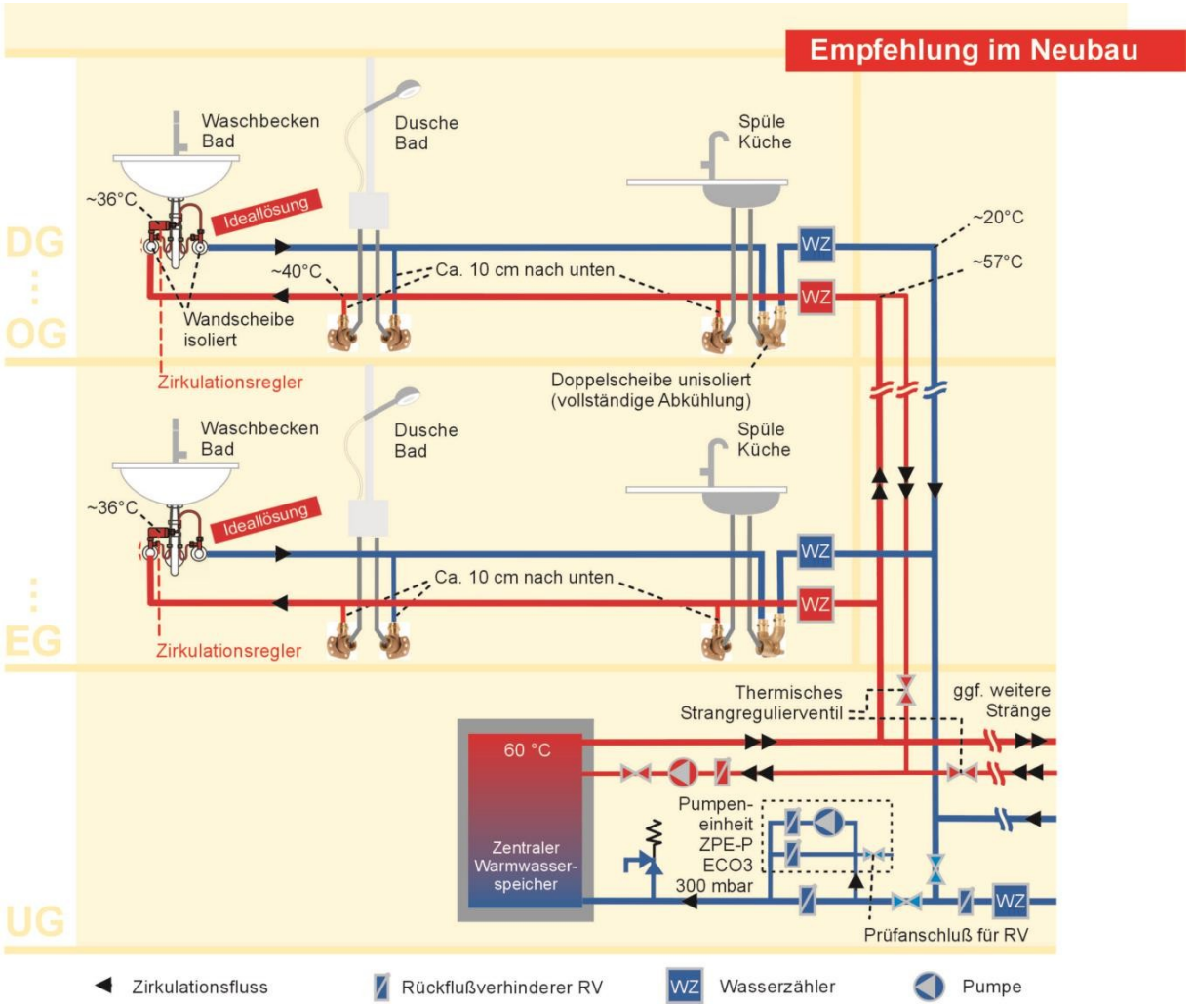
New (horizontal) arrangement of a circulation controller under a washbasin

Current innovations

Planning recommendations for the new building

- **Vertical risers** are equipped **with classic circulation** and run **close to the kitchen** so that hot or cold water is quickly available as required
- The **hot and cold water line** is **looped through within the home** and ends at a washbasin (e.g. bathroom or guest WC)
- **All water branches** within the respective apartments are **looped through using T-pieces approx. 10 cm above non-insulated wall panels.** The branch pipe leading downwards serves as a cooling section and is also insulated
- **Hot water pipes** within the respective apartment are **100% insulated**
- **Cold water pipes are insulated against condensation**. This increases the cooling of the water in the cold water pipe
- The **cold water connection in the kitchen** (near the hot water meter) has an **uninsulated double wall washer** so that the returning water cools down completely to wall temperature.
- **Cold water pipes have a minimum distance from hot water pipes to** prevent heat coupling

Note: These planning recommendations are also recommended without installing the new circulation system



Solution in detached and semi-detached houses

Brief description of how it works

The circulation controller installed at the last tap (e.g. washbasin) circulates the cooling water back to the cylinder via the cold water pipe, where it is reheated.

This constant, extremely slow circulation (typically 2-4 liters per hour) guarantees instant hot water.

When the tap is opened, hotter water continues to flow from the hot water pipe, while colder water continues to flow from the cold water pipe. This keeps the water temperature at a constant lukewarm level - until finally hot water mixed with cold water also produces a lukewarm temperature.

The shower already supplies 40° warm water at the beginning and hot or cold water is available almost immediately in the middle of the line (in this case the kitchen).

Special feature:

- Optimum legionella protection - even in KW pipes
- 50% more energy-saving than classic circulation
- No additional pipe therefore problem solver

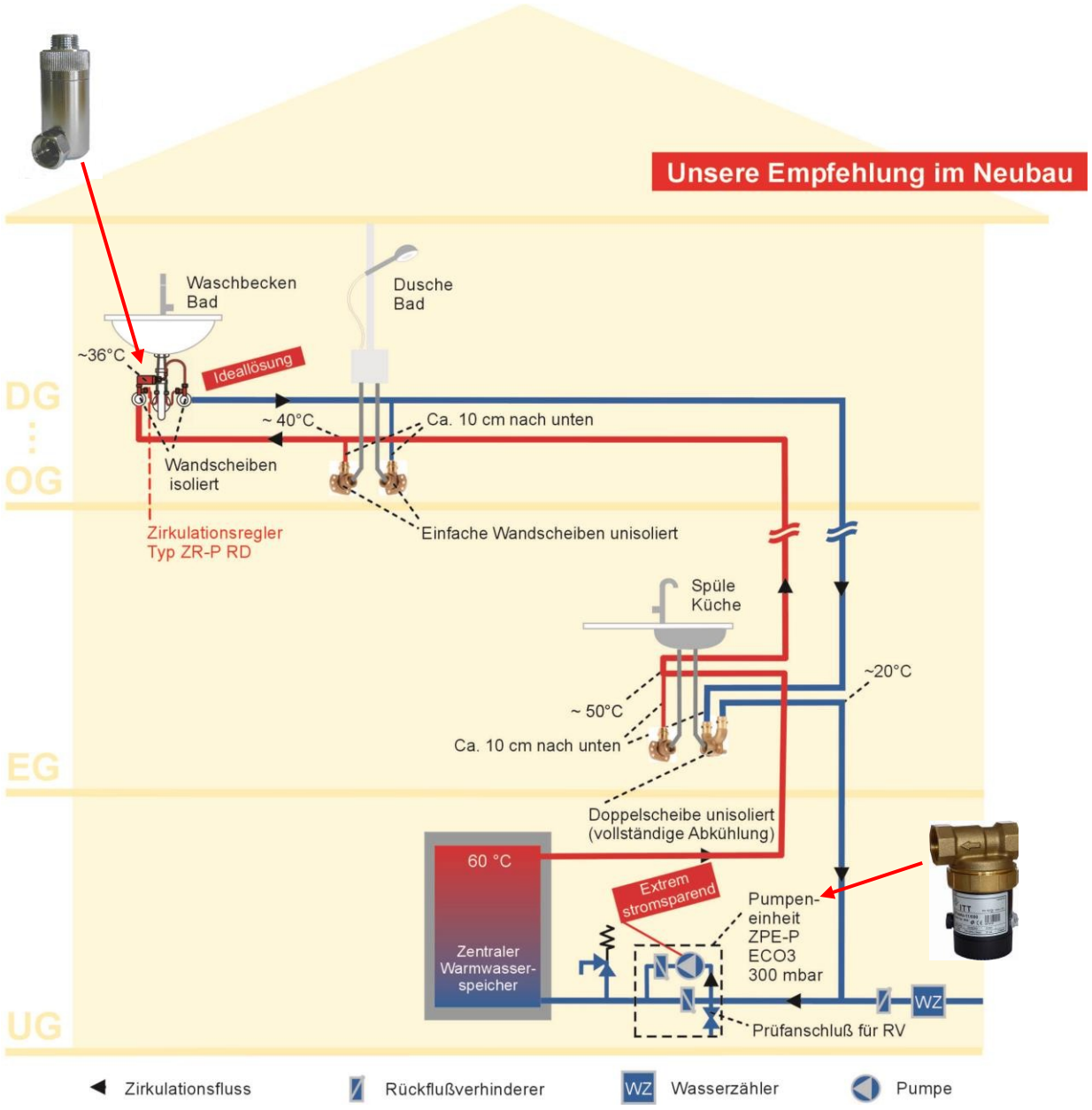
  In the absence of a third pipe, water meters in the supply pipes or defective trace heating

Attention new type of pipe installation:

Advantageous pipe installation by looping through with T-piece and approx. 10 cm vertical branch line down to cold wall panel→

Extremely short temperature transition to cold

This results in significantly better hygiene and **much faster hot water at the final tapping point**, as the wall panels no longer heat up



Solution in detached and semi-detached houses

Circulation with circulation pump and radio buttons

Function sequence

1. Press the radio button in the bathroom or kitchen 1a Alternatively, motion detector in the bathroom
2. Radio receiver switches pump on
3. Circulation pump with 300 mbar stat. Final pressure fills the DHW pipe within a short time
4. Hot water is now available even at the last tap→ Circulation controller closes
5. The radio receiver switches the circulation pump off again automatically after 4 minutes

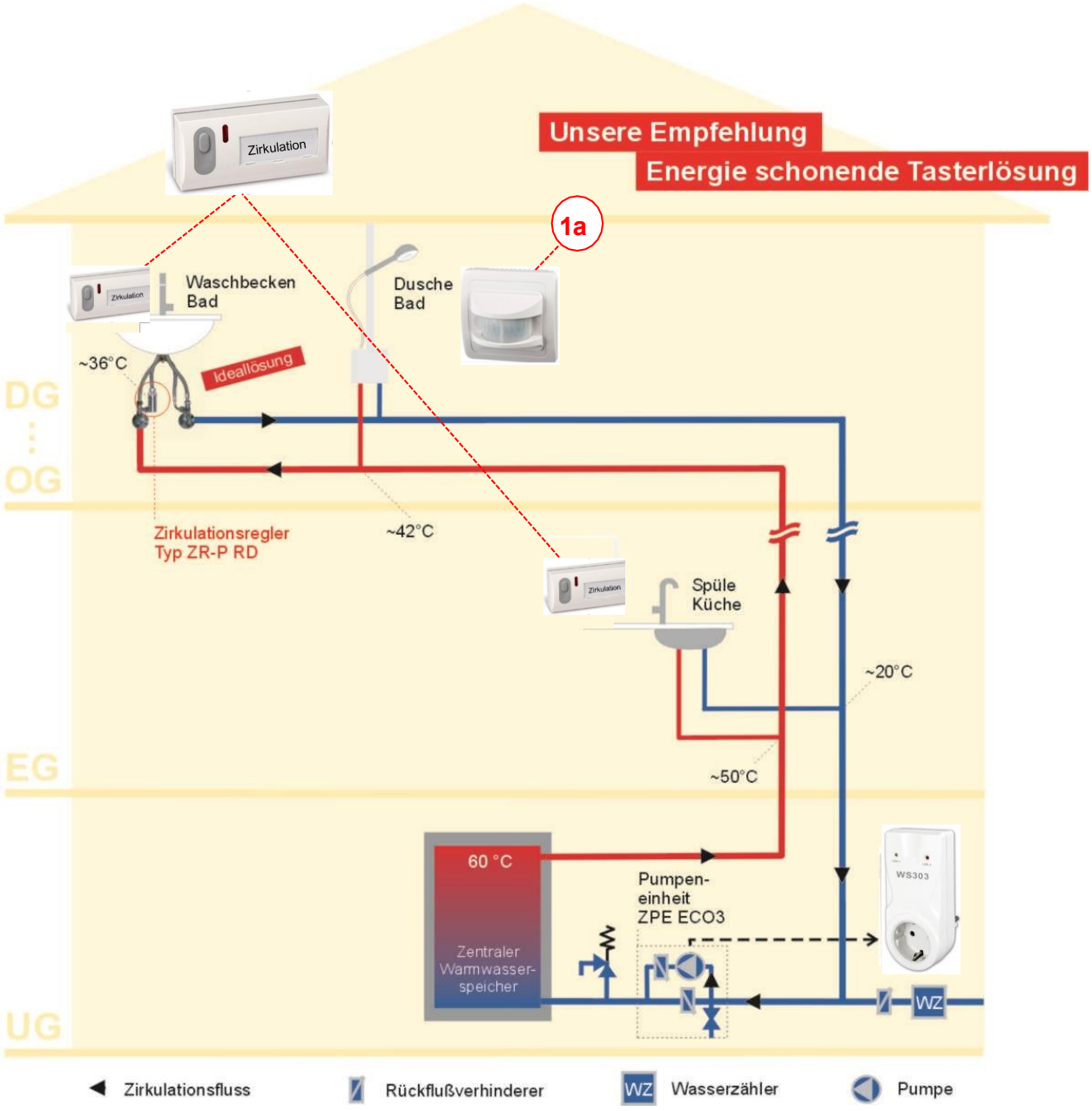
Special feature:

- No additional energy consumption as circulation is only activated when required. Ideal for poor insulation
- Hot water quickly thanks to high pump output (high-efficiency pump 300 mbar, 27 W)
- Problem solver in old systems with poor insulation DHW pipe insulation or long DHW pipes

Attention building planners:

Determine the heat requirement without additional heat loss through circulation, as:

1. No circulation pipe is present
2. There is actually no additional energy consumption



Solution in detached and semi-detached houses

Circulation with fresh water station and radio buttons Function

identical to page 2

Instead of a DHW cylinder, the NEW CIRCULATION can also be operated together with a fresh water station

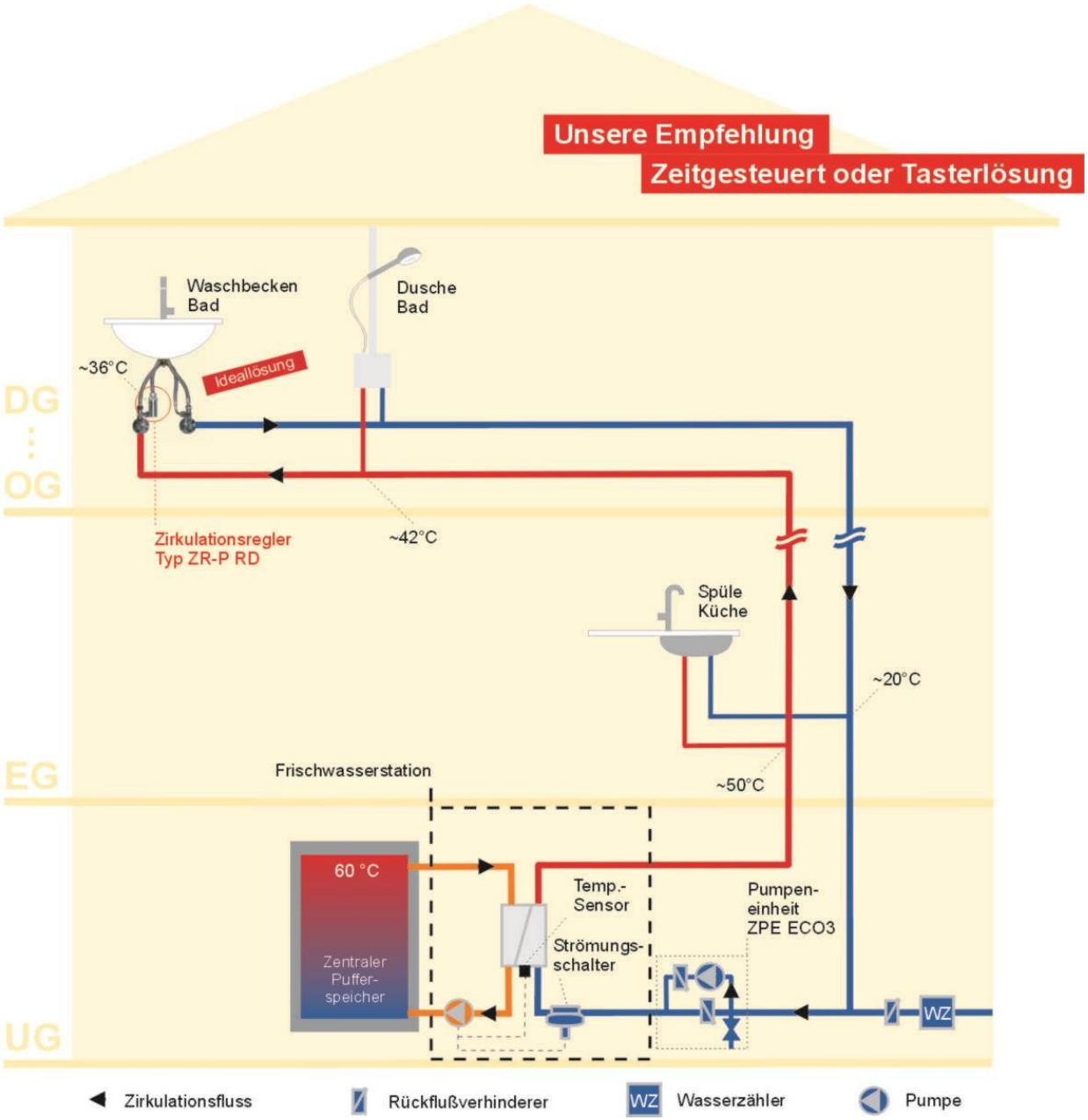
Special feature:

- No third pipe required
- Halved heat losses when using the NEW CIRCULATION instead of classic circulation
- If the heat exchanger of the fresh water station is kept at the set temperature by means of a temperature sensor, the pump unit can be operated either time-controlled or button-controlled
- However, if the charging pump is only controlled by a flow switch, the pump unit (ZPE ECO3) can only be operated using radio buttons

Attention building planners:

Determination of the heat requirement without additional heat loss through circulation, as

1. no circulation pipe present
2. actually no additional energy consumption

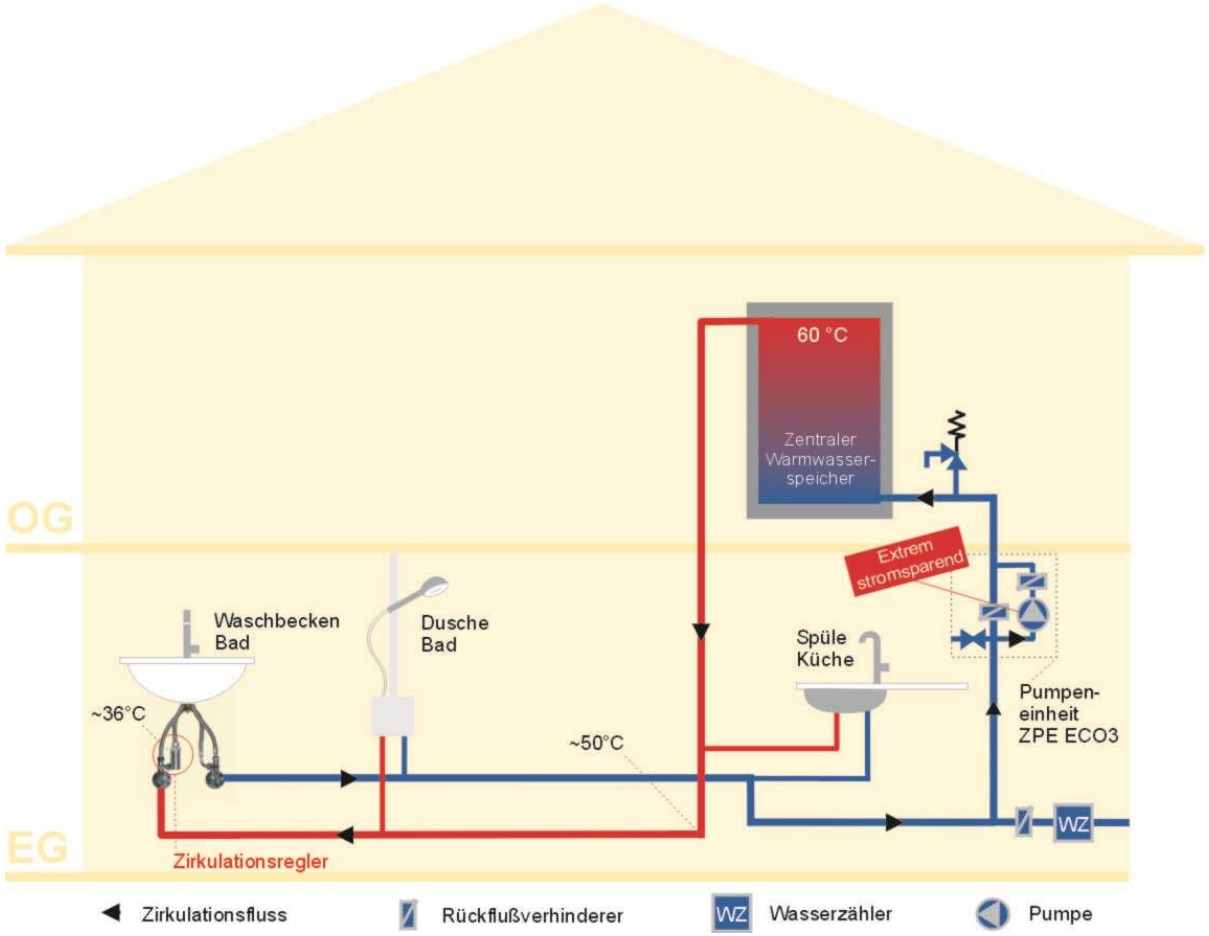


Solution in detached and semi-detached houses

Circulation with storage tank in the roof area

Hot water storage tank at any location Special feature:

- Any location for the cylinder (basement or attic possible)
- Ideal solution in old buildings with poor DHW pipe insulation and additional so-called radio buttons plus radio switch socket with delayed switch-off)
- Reliable function even with long and widely branched hot water and DHW pipes
- No undersupplied lines possible (systematic line balancing)
- DHW outlet on the cylinder can be arranged as required
- Low pump output with only 2-8 W is sufficient. This saves up to 90 % electricity costs
- Circulation operation optionally via timer or demand-controlled push-button solution via radio
- Optimum legionella protection for hot and, for the first time, cold water pipes. DHW cylinder serves as a legionella filter



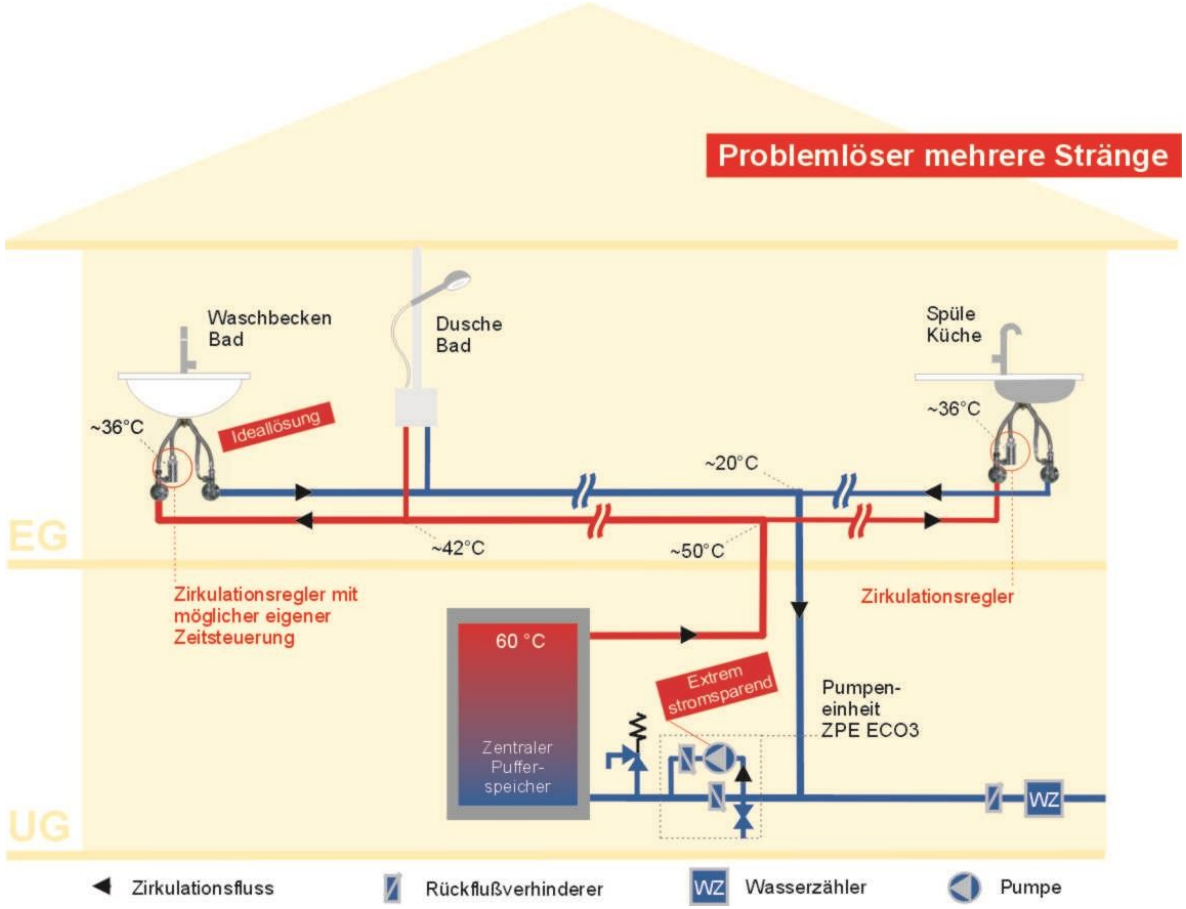
Solution in detached and semi-detached houses

Circulation with several lines

In this example, the bathrooms and kitchen are each supplied with a separate pipe run.

Special feature:

- Common pump for driving any number of pipe runs, each with a circulation controller at the end of each run
- Halving of heat losses compared to operation using classic circulation
- Inexpensive and energy-saving, even when retrofitted
- Kitchen at the end of the line has hot water quickly, but not immediately hot or cold water
- Circulation time-controlled or with radio buttons
- Low pump output of approx. 4 W is sufficient. This saves up to 90 % on electricity costs
- Optimum legionella protection for hot and, for the first time, cold water pipes. DHW cylinder (> 60 °C) acts as a legionella filter



Solution in detached and semi-detached houses

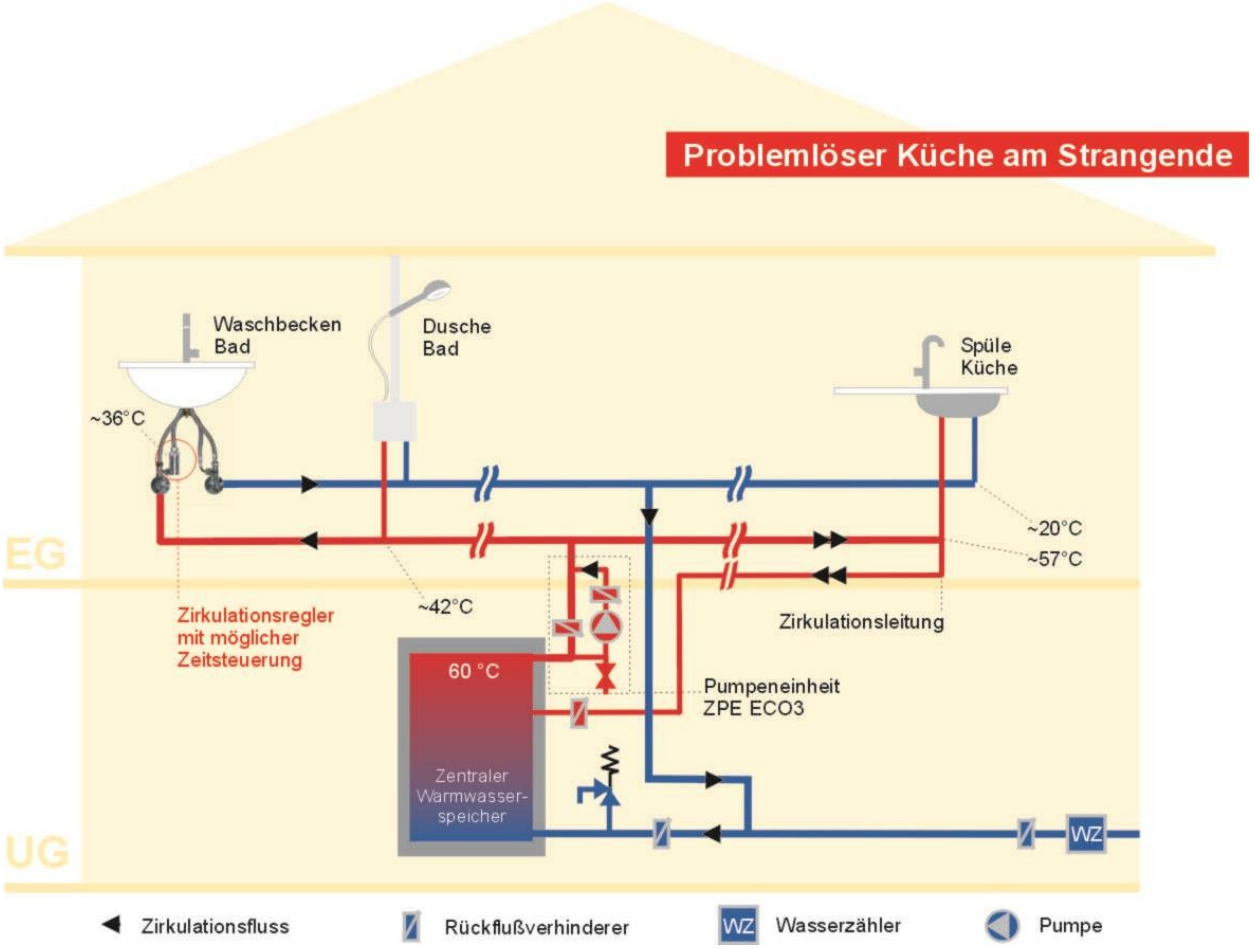
Combination of NEW CIRCULATION with classic circulation

Bathrooms are supplied with NEW CIRCULATION, while the kitchen is operated at a separate end of the line using classic circulation

NEW CIRCULATION halves the heat losses in the bathroom line (for hand washing/showers) while improving hygiene at the same time (hot water and domestic hot water lines are protected against legionella.

Special feature:

- Immediate hot or cold water at the kitchen tap (also at the end of the line)
- Common pump for driving the NEW and classic circulation systems
- Cost-effective and energy-saving with full convenience at all taps (circulation controller is financed by saving a third pipe to the bathroom)
- Time control via pump possible
- Small pump output from 4 W is sufficient. This saves up to 90 % electricity costs
- Optimum legionella protection for hot and, for the first time, cold water pipes to the bathroom. DHW cylinder serves as a legionella filter



Solution in an apartment building

Protection against legionella proliferation in apartments with NEW CIRCULATION

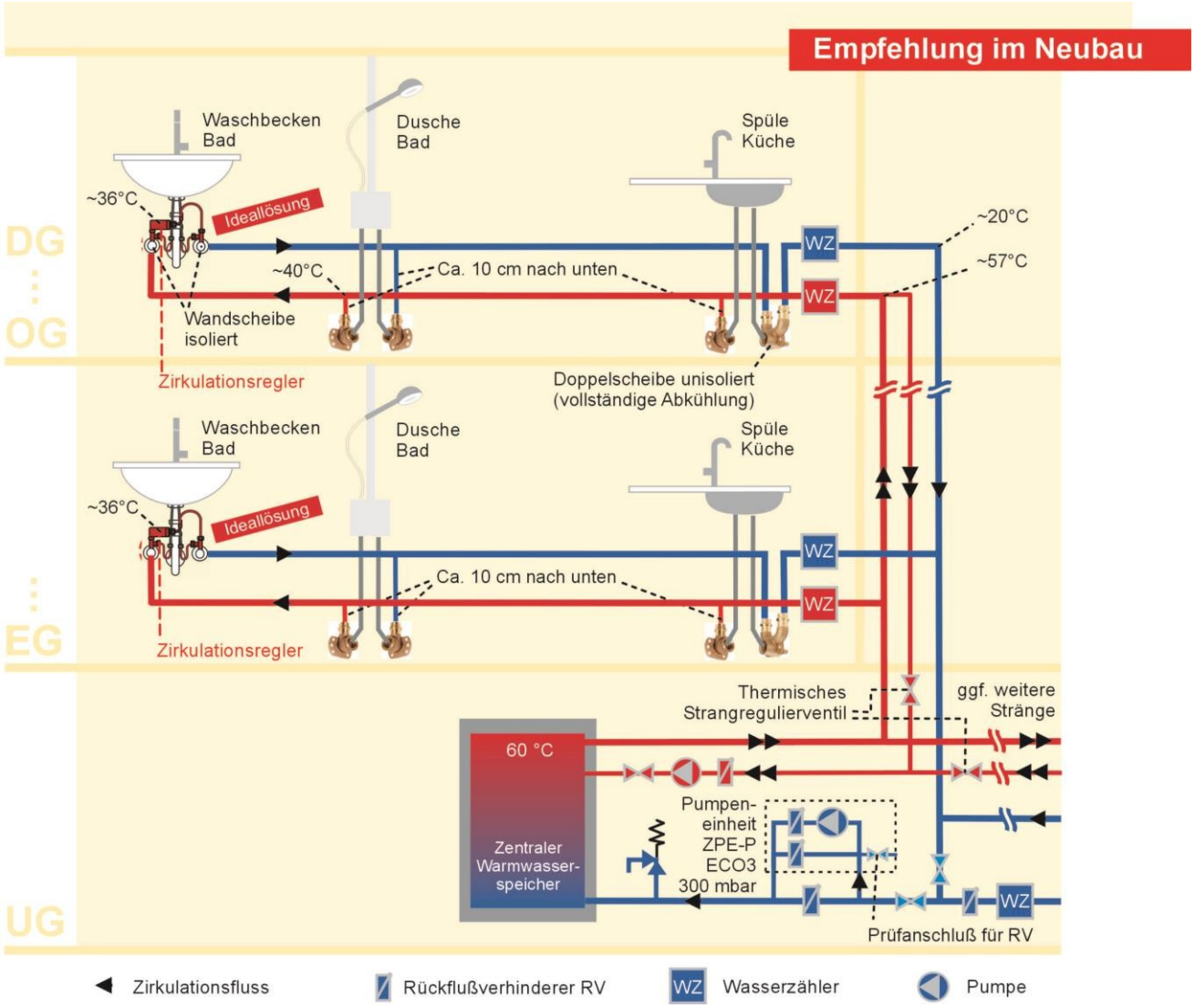
With classic circulation, the hot water pipes are protected against the proliferation of legionella up to the respective apartment entrance.
The pipes within the apartments and the cold water riser are stagnant and therefore at risk of legionella proliferation.

Special feature/improvement through new circulation:

- Tap-independent protection of all apartment pipes (hot and, for the first time, cold water pipes) with regard to legionella proliferation
- Cold water risers are also protected by constantly slow water exchange
- Central hot water tank supplies water that is low in legionella and thus acts as a legionella filter in the circuit
- Simple retrofitting in buildings with legionella problems
- Permanent and reliable system protection
  compared to thermal disinfection, which is rarely carried out dis
- Reduction of pipe-related pollutants (copper, lead, etc.) in old systems
- Simple and reliable legionella protection of the two hygienically questionable dead pipes to the ventilation shaft (installation of a ZR-P ES)
- Complete water exchange approx. every 2 hours (a legionella doubling takes place max. every 3-5 hours)

Attention: New type of pipe laying:

Pipe laying by means of looping through with T-piece and approx. 10 cm vertical stub pipe down to cold wall panel - see page 2 for details



Solution in an apartment building

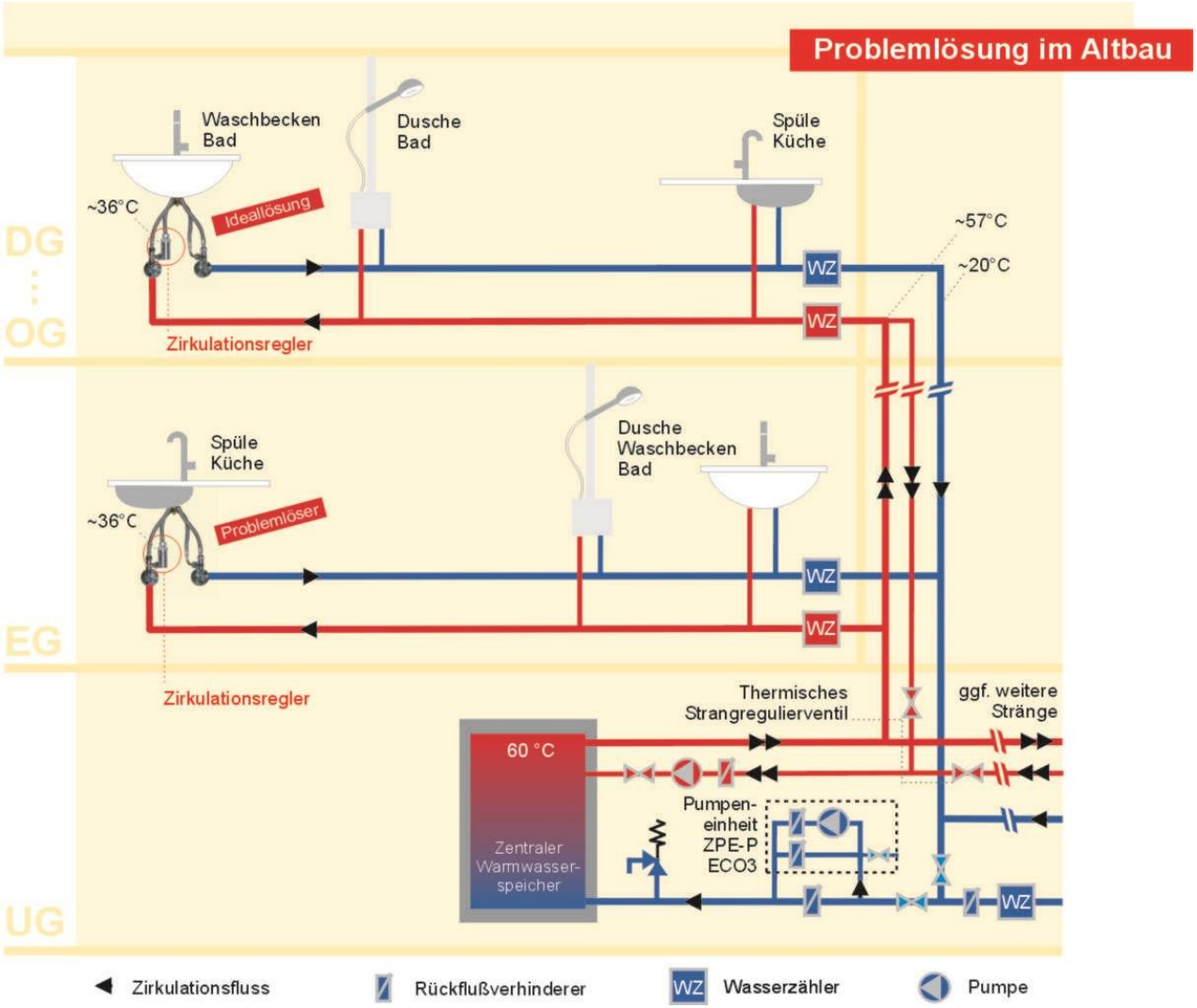
Combination of NEW CIRCULATION with classic circulation

Classic circulation is advantageous for long supply pipes while NEW CIRCULATION works in the apartments through water meters to the last tap

Special feature:

- Quick hot or cold water at kitchen taps (near the water meters)
- Immediate hot water even at the most remote taps in the home, e.g. bathroom sink
- Savings on all bath lines in new builds

  → Only 2 instead of 4 water meters per apartment
- Significant savings in heat losses (in new builds, all so-called bath lines are omitted)
- Optimum legionella protection even in rarely used pipes in the apartments
- Test connection enables a leak test of the two backflow preventers (RV)
- Prevents unintentional counting of the water timer in the event of dynamic pressure fluctuations
  - Circulation pump with high static final pressure of 300 mbar ensures minimum opening cross-section in the circulation controller



Solution in an apartment building

Replacement for expensive or defective trace heating

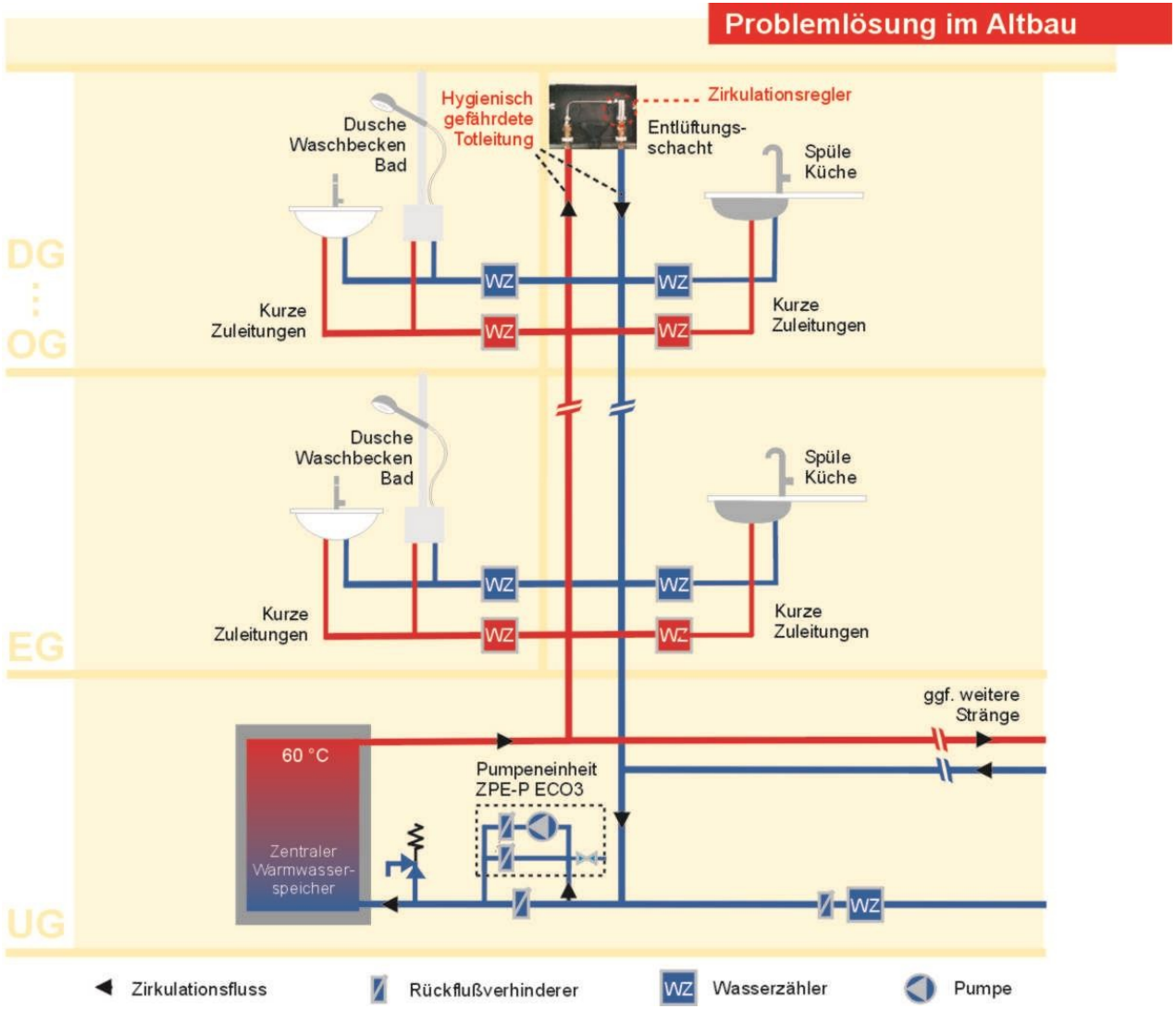
Circulation ends before water meters, circulation controller in the vent shaft

Special feature:

- Solution for short apartment outlets (from the water meter to the last tap)
- Very cost-effective solution with extremely short amortization time
- Only one circulation controller per line
- Circulation ends before the water meters
- Hygienic mitigation of the two dead pipes to the ventilation shaft
- Small pump is sufficient even in larger buildings

Note - problem solver:

- At kitchen taps on upper floors, warm water is quickly available when tapping starts, but not immediately cold or hot water.



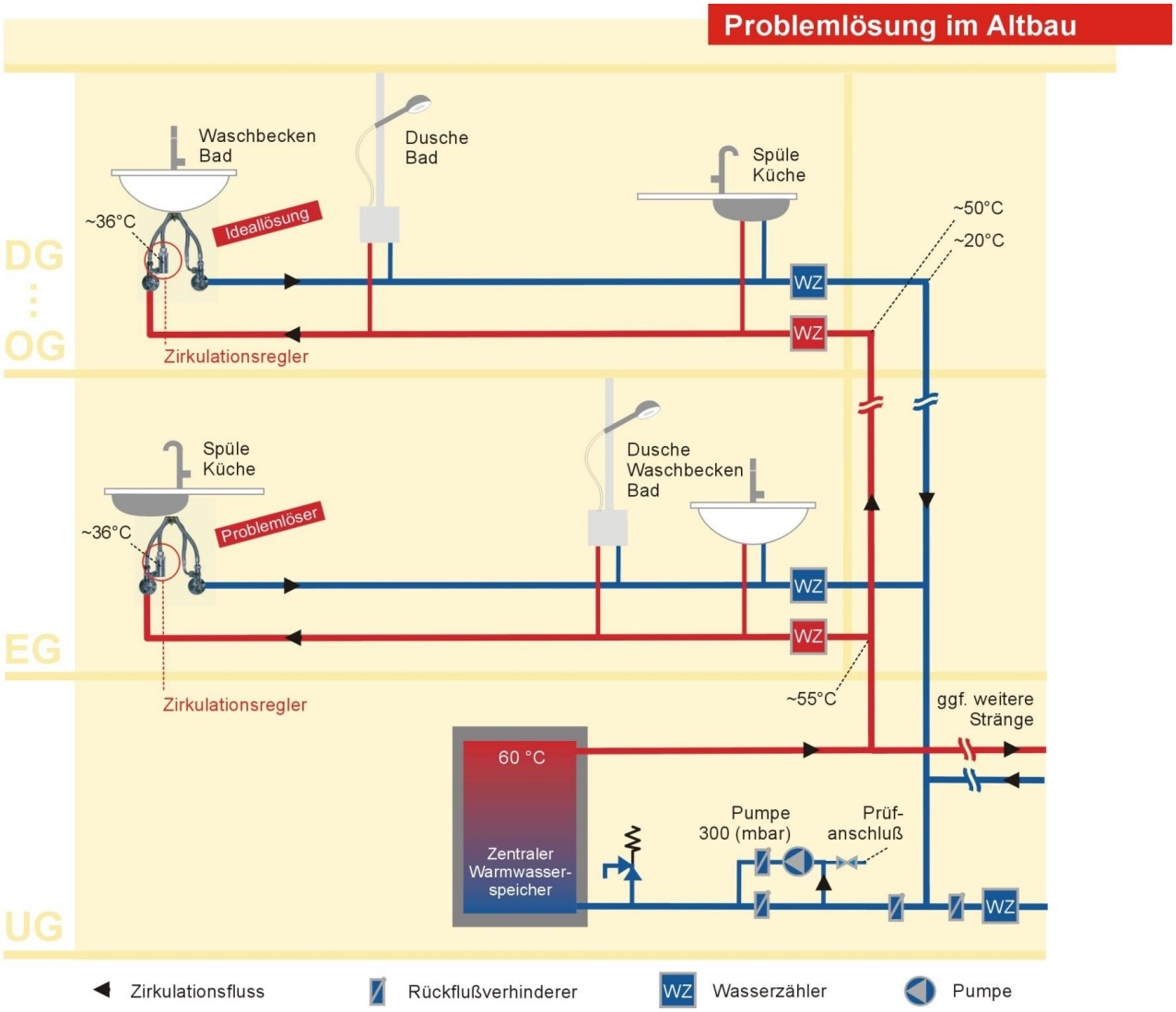
Solution in an apartment building

Replacement for expensive or defective trace heating

Circulation controller mounted at the last tap Special feature:

- Circulation through the water meter is possible up to the furthest tapping point
- Instant hot water is also possible at the most distant tap within an apartment
- Quick hot water at kitchen taps with water meters

  However, waiting time until cold water is available
- Simple problem solution in the event of a defective hea
- Counting behavior of the water meters:
  - The clocks do not count during normal operation (extremely low circulation volumes below the clock's response threshold)
  - During the switch-on phase of the pump (e.g. in the morning by timer), the clocks count correctly (DHW consumption minus KW consumption. This corresponds to the actual billed heat consumption)
  - Avoidance of unintentional counting of the water meters in the event of dynamic pressure fluctuations with the pump at maximum output (27 W)



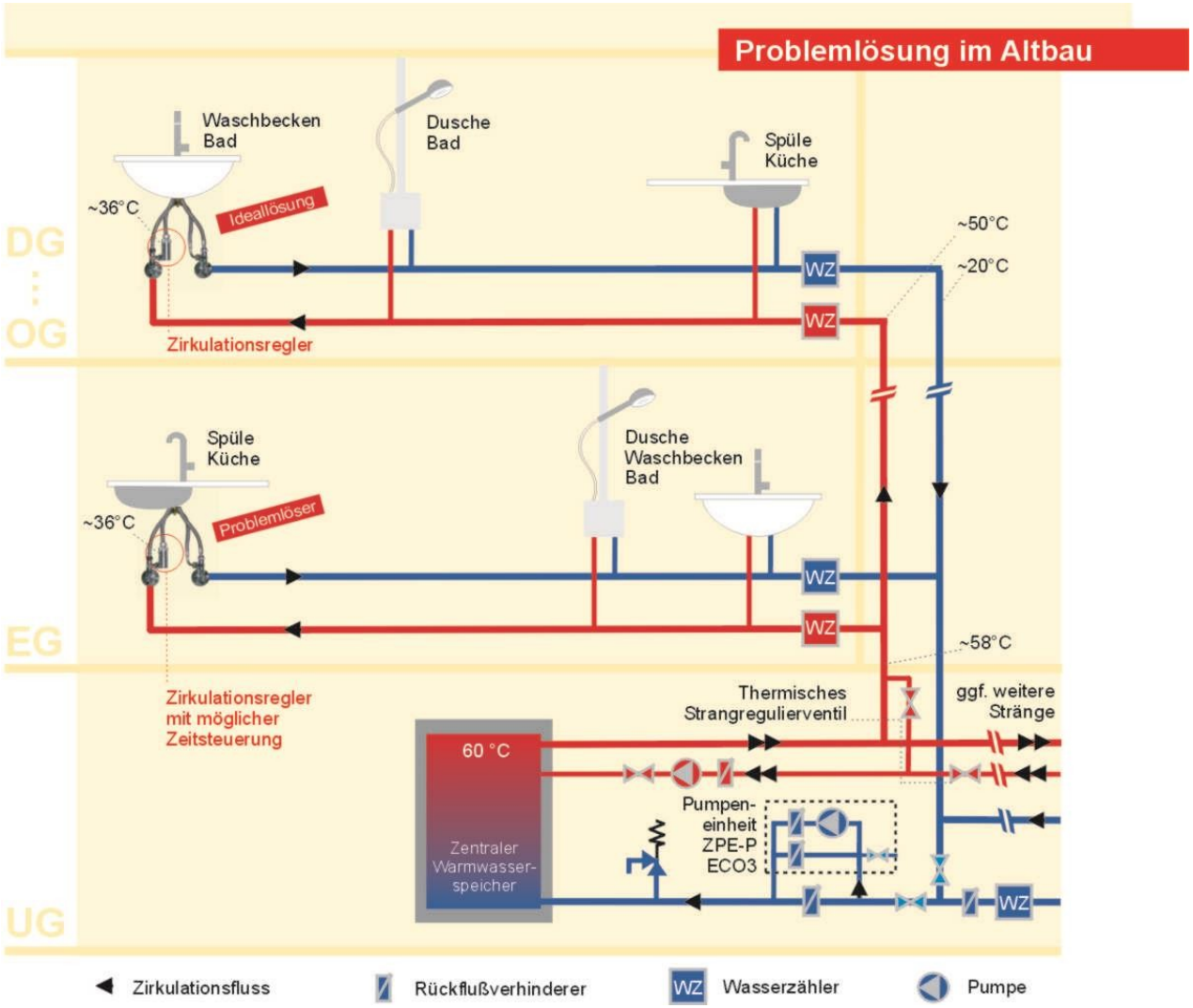
Solution in an apartment building

Replacement for expensive or defective trace heating

Solution as on page 14 but with retrofitting of a classic circulation in spacious basement area

Special feature:

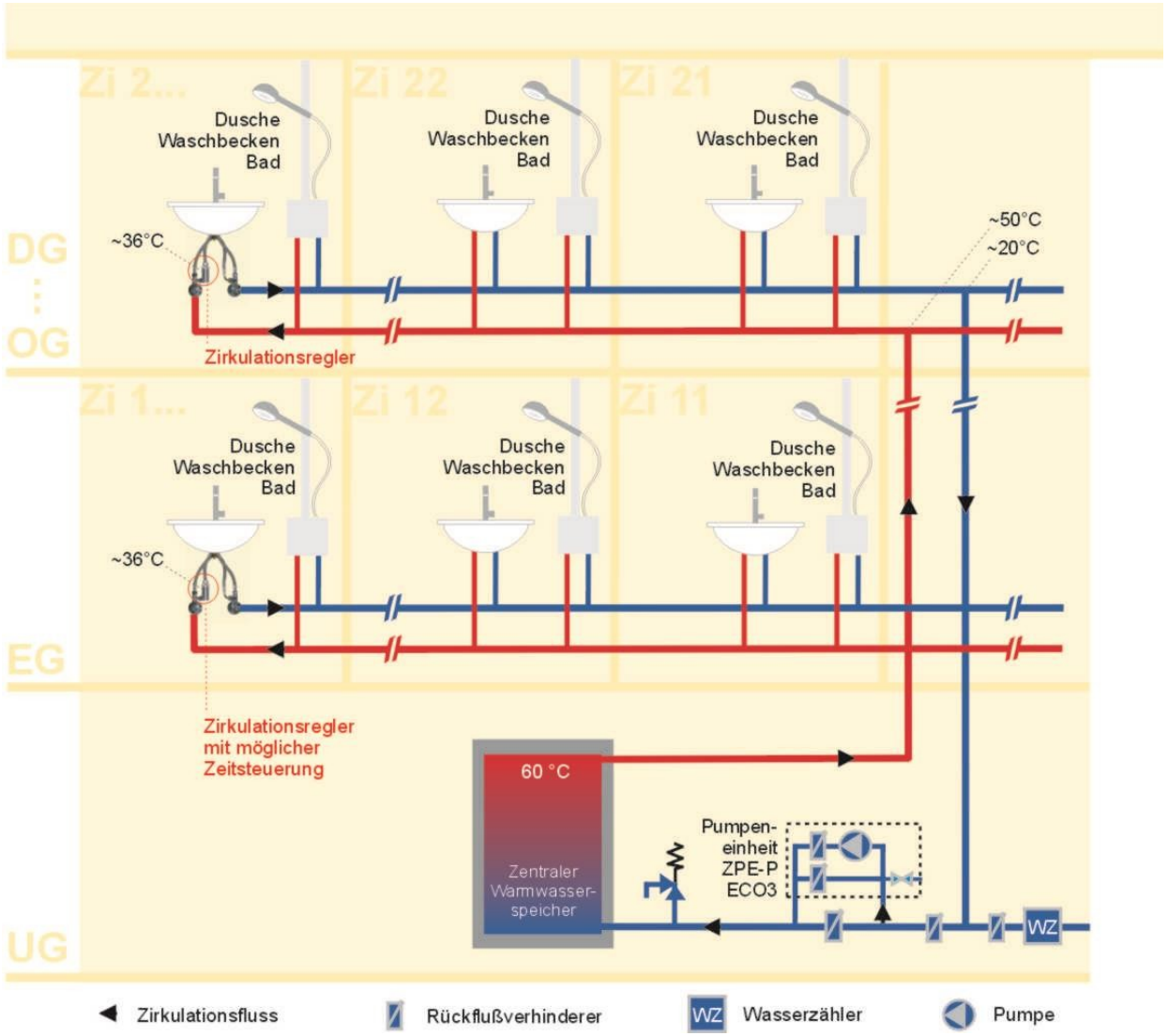
- Full cylinder temperature at the start of the respective riser, even despite long supply lines in the basement area
  → Shorter waiting time for hot or cold water when tapping starts on the top floors
  floors
- Easy access for retrofitting classic circulation in the basement area
- Avoidance of unintentional counting of the water meter during dynamic pressure fluctuations
- Optimum legionella protection for hot and, for the first time, cold water pipes. WW storage tank serves as a legionella filter



Solution for hotels and many more

Several rooms per line in series Special feature:

- Optimum legionella protection even if the rooms are used irregularly
- Cost-effective solution, as only one circulation controller for several rooms
- Halved heat losses compared to classic circulation
- Circulation pump with low output is sufficient
- Easy to retrofit as no third pipe is required



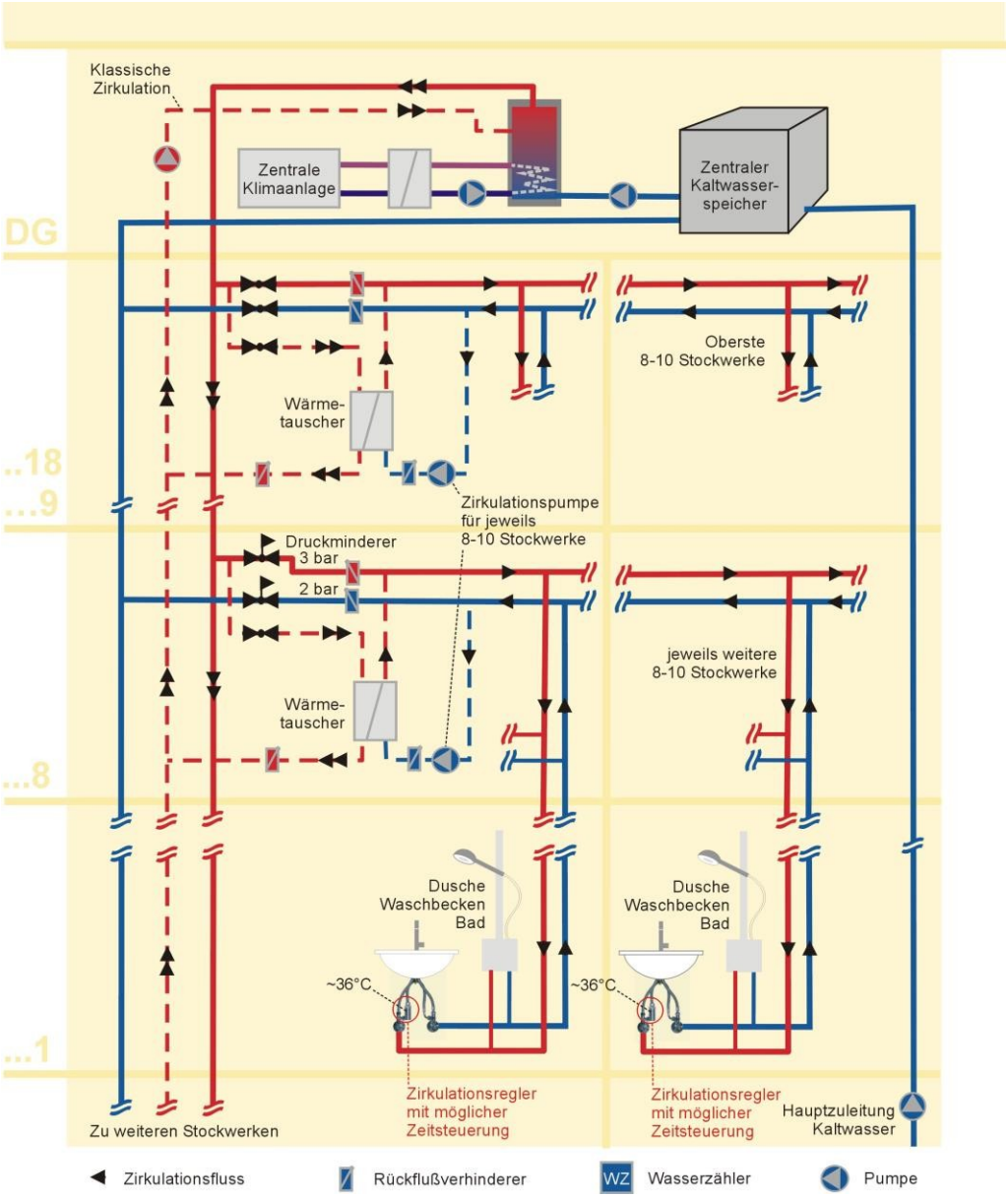
Solution for large and tall buildings

Independent circulation unit for 8-10 floors each using pressure reducer and heat exchanger

Special feature:

- Halving of heat losses compared to classic circulation (with the option of switching off individual pipe sections)
- Optimum legionella protection
- Cost-effective overall solution, as one circulation controller is sufficient for each of 8-10 rooms
- Additional energy savings thanks to the option of individual line shut-off using the circulation controller as a thermal controller
- Additional energy savings in hot countries, as the air conditioning system only has to dissipate half as much heat loss from the pipes out of the building

Planned functional diagram for the Fairmont Makkah Clock Royal Tower in Mecca

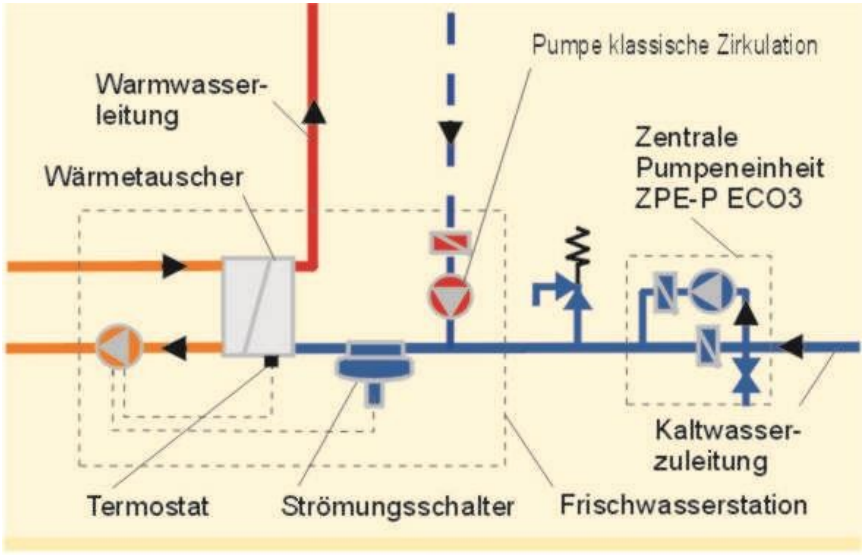


Fresh water station with new circulation

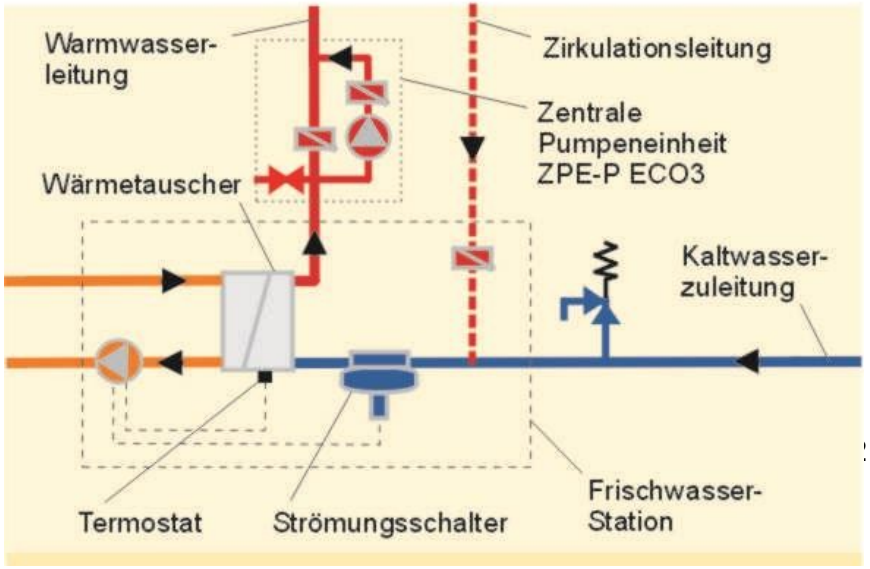
Fresh water station with heat exchanger, controlled by flow switch or thermostatically controlled to set temperature

Special feature:

- With thermostatically controlled charging pump (heat exchanger regulated to set temperature), NEW CIRCULATION can be operated without restriction (as with standard DHW cylinders)
- The pump unit (ZPE-P ECO3) can be installed in the cold water supply pipe (see Fig. 1)
- For circulation through a water meter, the pump pressure must be 300 mbar (see Fig. 1)
- If the circulation pipe is shut down, the previous pump can be used for sporadic water exchange (e.g. active for 5 minutes a day) (see Fig. 1)
- For heat exchangers that only control the charging pump using a flow switch, the NEW CIRCULATION can be retrofitted using a "push-button solution". This allows the DHW pipe to be filled as required using radio buttons (see page 2)
- A combination of classic circulation with extension by the NEW CIRCULATION is possible with a common pump, as also shown on page 6, for small systems without a water meter in the circulation circuit (see Fig. 2 or page 9)



Figur
e 1



Installation requirements and instructions

The following requirements apply to the operation of the new circulation system

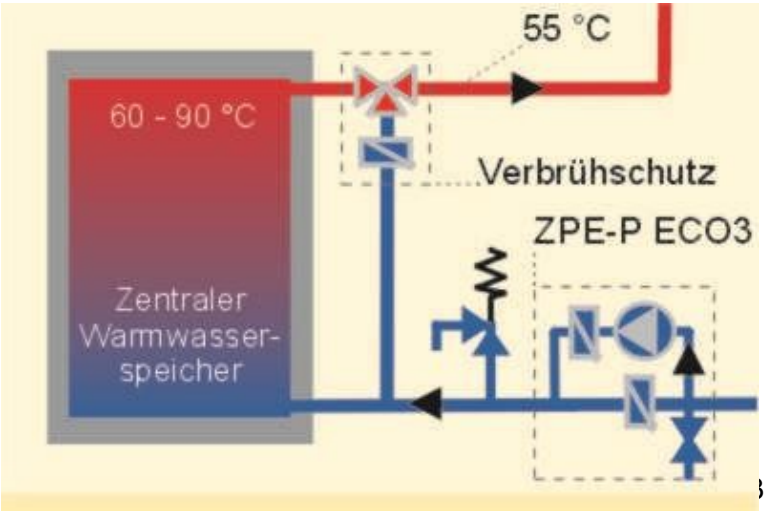
- **No mixed installation.** If hot water pipes are made of copper and galvanized cold water pipes, there is a risk of corrosion in the cold water pipes when operating the new circulation system, as water from copper pipes must not be fed back into galvanized steel pipes.
- Hot and cold water pipes must have the same water pressure to form a circuit. There must be **no pressure reducer in the cold water supply line to the storage tank.**
  If necessary, this pressure reducer must be moved to the house supply line.
- Some **fresh water stations** only have a flow switch to control the charging pump. This means that the New Circulation can **be** operated **using radio buttons**, but cannot be time-controlled.
- **Time-controlled operation** of the new circulation is possible with a thermostatically regulated charging pump control, in which the heat exchanger of the fresh water station is permanently kept at the set temperature.

Storage tank with scald protection

In order to prevent the risk of scalding (e.g. high cylinder temperatures from solar systems), a so-called scald protection is often used in the hot water outlet.

A constant output temperature can be regulated by adding cold water.

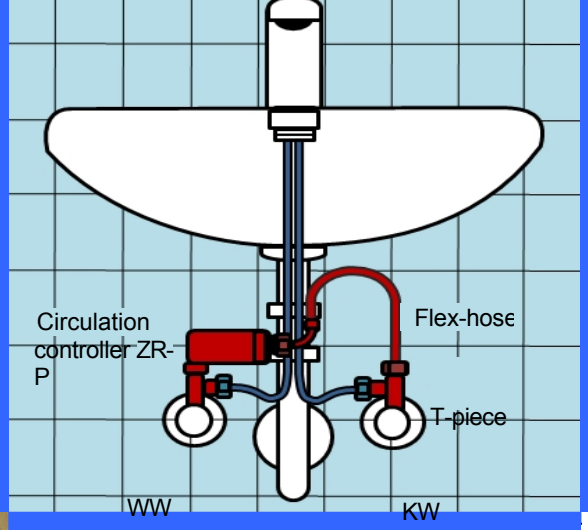
The circulation pump placed in the cold water supply line to the cylinder must be positioned **upstream** of the branch of the hot water line for scalding protection (see fig. 3).



Calcification resistant

Circulation controller
ZR-P RD

For pump operation (Incl. installation accessories) for installation at the most remote tap point



Circulation controller
installed below a washbasin

Attention new ! Horizontal installation

on most remote Tapping point by means of T-pieces (with union nut and 2 valves) and flexible hose

Scope of delivery
of the circulation controller

Round housing with service-friendly internal structure

Incl. universal installation set 2 T-pieces 3/8" with ÜW nut 1 flexible hose 3/8", seals

Complete set
ZR-ZPE ECO3 for single and multi-family houses

For circulation with circulation pump 3 - 27 W (saves up to 90 % electricity)

Scope of delivery :
1 x circulation pump 300 mbar
2 x transitions 1" to 22 mm 1 x ZR-P RD with accessories

ZR-ZPE ECO3

Large (25 mm Ø) backflow preventer already integrated

New !
With test connection

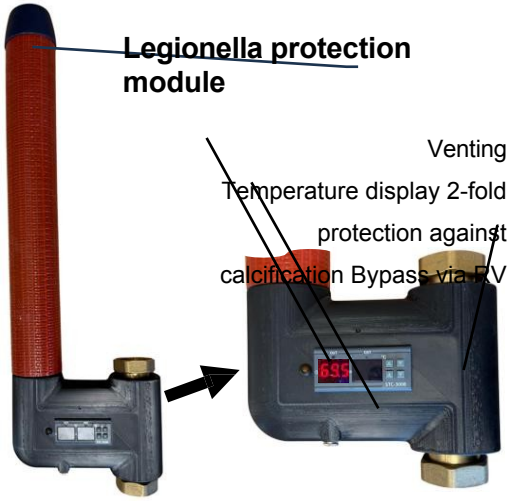
and additional backflow preventer in series with the pump

With circulation controller and installation accessories

Circulation controller
ZR-P ES for air vent shaft

With installation accessories for quick and easy installation in the ventilation shaft

Scope of delivery:
Transitions on both sides 1/2 "AG, Chrome-plated copper pipe bent 90°, 2 double nipples, 2 crimp fittings



Legionella protection module
For single and multi-family homes

Thermal disinfection at low cylinder temperature and use of heat pump + Calcification protection

Scope of delivery:
Transitions on both sides ÜW nut 1 1/2" female thread, 2 flat gaskets 1 1/2"
1 plug-in power supply 12V, 5A

Radio transmitter variant 1

Surface-mounted for gluing

Wall-mounted transmitter (1 button cell CR2430, 5 years
Dimensions 40 x 84.5 x 23.5 mm

For switching on the switching on the circulation pump

Plug & Play
Unpack, plug in, run

Radio transmitter variant 2

Surface-mounted for sticking on

Wall-mounted transmitter at the same price (1 CR2430 button cell, 5 years)
Dimensions 81.2 x 81.2 x 15.6 mm

4-channel radio button
For switching on the circulation pump and up to 3 other switchable devices as required

Plug & Play
Plug in, runs ***Unpacking,***

Plug & Play
Unpack, plug in, run

Including Schuko plug for pump

Radio receiver

Switching socket with switch-off delay

For switching the circulation pump via the radio transmitter

Time-delayed switch-off is programmed to 4 minutes

Switching capacity 250 V AC, 16 A

Radio transmitter Motion detector

Surface-mounted solution
For battery operation to automatically switch on the circulation pump
e.g. in bathrooms or public sports facilities (two 1.5 V, AA batteries)

Radio repeater

Amplifier 433 MHz)

The signal from the transmitter is received and transmitted to the receiver in amplified form.
Simply plug in and you're done. The socket is looped through

More details and price on request

Timer switch

For time-controlled operation

or as reliable legionella protection
If the circulation is not activated for a longer period of time using a radio button e.g. during vacations

96 switching times, Switch to manual operation, status display

Including Schuko plug for pump

The NEW CIRCULATION

An idea whose time has come

Controlled circulation of the water

- prevents the formation of legionella
- supplies hot water immediately
- and saves 50 % energy
  (compared to classic circulation)

Our
NEW CIRCULATION
Your advantage and satisfied customers

Give us a call - we will be happy to advise you

Partner for satisfied customers

MILLER
ENERGIESYSTEME GMBH

Miller Energiesysteme GmbH, Schwalbenstr. 32, 71263 Weil der Stadt - Managing Director Bernhard Miller
Registered office of the company: 71263 Weil der Stadt, Register court Stuttgart, HRB 769325, St-No.70095 / 05188
Phone +49 (0) 70 33 / 39 19 85 Fax +49 (0) 70 33 / 39 19 86 Email: info@miller-energiesysteme.de www.miller-energiesysteme.de