

# Multifunction thermostatic regulator for domestic hot water recirculation loops



01325/20 EN

replaces 01325/17 GB

## 116 series



### Function

The thermostatic regulator is used for automatic balancing of recirculation loops in domestic hot water distribution systems, so as to ensure that all parts of the system reach the required temperature. It is also equipped with a by-pass mechanism, to be used in the event of thermal disinfection against Legionella.

The device is produced in a version complete with automatic thermal disinfection function or fitted for disinfection against Legionella, with the possibility of installing a special cartridge for disinfection controlled by an actuator.

The regulator complies with specifications by DVGW (according to standard W554) and by WRAS (UK).



### Product range

- Code 1162.. Thermostatic regulator for recirculation loops with thermostatic thermal disinfection function  
 DN 15 (1/2") - DN 20 (3/4") - DN 25 (1") - DN 32 (1 1/4")
- Code 1161.. Thermostatic regulator for recirculation loops fitted for controlled thermal disinfection function  
 DN 15 (1/2") - DN 20 (3/4") - DN 25 (1") - DN 32 (1 1/4")

### Technical specifications

#### Materials:

Body: dezincification-resistant alloy CR EN 12165 CW724R  
 Adjustable cartridge: PSU  
 Springs: stainless steel EN 10270-3 (AISI 302)  
 Hydraulic seals: EPDM  
 Adjustment knob: ABS

#### Performance:

Medium: drinking water  
 Max. working pressure: 16 bar  
 Max. differential pressure: 1 bar  
 Max. inlet temperature: 90°C  
 Adjustment temperature range: (DN 15 - DN 20) 35-60 °C  
 (DN 25 - DN 32) 35-65 °C  
 Factory setting: 52 °C  
 Disinfection temperature: 70 °C  
 Closing temperature: 75 °C  
 Kv max (m<sup>3</sup>/h): - DN 15 / DN 20: 1,8  
 - DN 25 / DN 32: 3,8  
 Kv dis (m<sup>3</sup>/h): - DN 15 / DN 20: 1  
 - DN 25 / DN 32: 2  
 Kv min (m<sup>3</sup>/h) - DN 20 (58 °C): 0,120 ± 20 %  
 - DN 15 (58 °C): 0,100 - 20 %  
 - DN 25 / DN 32: 0,9 ± 20 %  
 Kv (Δt = 5K) (m<sup>3</sup>/h): - DN 15 / DN 20: 0,45  
 - DN 25 / DN 32: 1,6

Certification: DVGW (W554), WRAS  
 Connections: 1/2"-3/4"-1"-1 1/4" F (EN 10226-1)  
 Temperature gauge/probe pocket: Ø 10 mm

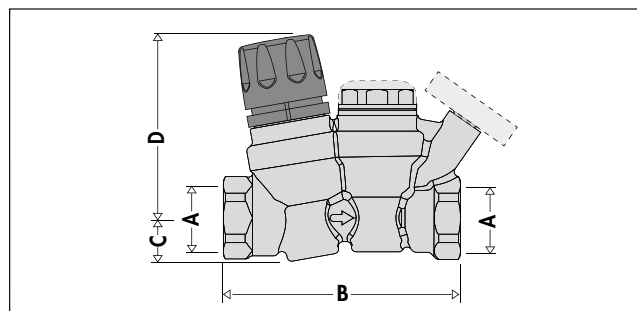
#### Temperature gauge code 116010

Scale: 0-80 °C  
 Diameter: Ø 40 mm  
 Stem diameter: Ø 9 mm

### Insulation cod. CBN116140/CBN116160

Material: closed cell expanded PE-X  
 Thickness: min 13 mm – max 23 mm  
 Density: - inner part 30 Kg/m<sup>3</sup>  
 - outer part 80 Kg/m<sup>3</sup>  
 Thermal conductivity (EN 12667): - at 10 °C: 0,036 W/(m·K)  
 - at 40 °C: 0,041 W/(m·K)  
 Coefficient of resistance to water vapour diffusion: > 1.300  
 Working temperature range: 0-100 °C  
 Fire behaviour (DIN 4102): class B2

### Dimensions



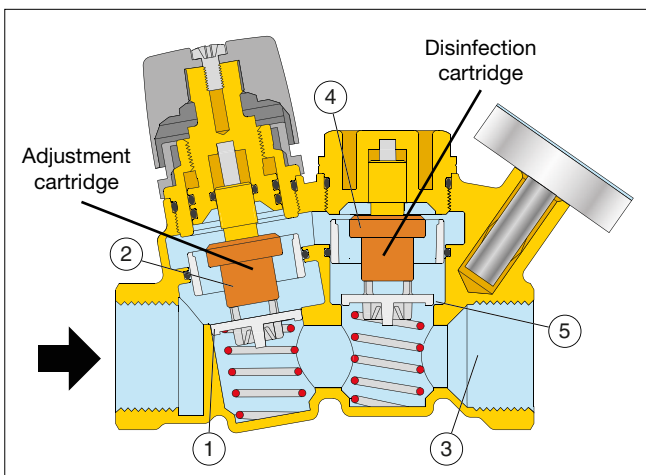
Code	DN	A	B	C	D	Mass (kg )
116.40	15	1/2"	100	18,5	74,5	0,750
116.50	20	3/4"	100	18,5	74,5	0,700
116.60	25	1"	115	26,5	110,5	1,400
116.70	32	1 1/4"	115	26,5	110,5	1,200

## Operating principle

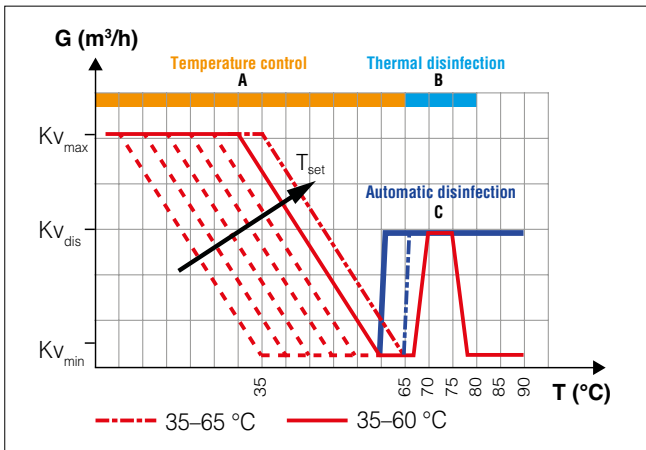
In domestic hot water distribution circuits, to respect modern systems requirements for the prevention of Legionella growth, it is essential to ensure that all sections are kept at the correct temperature. The recirculation network must be balanced, to avoid non-uniform temperature distribution.

The thermostatic regulator, installed on each branch of the recirculation circuit, automatically maintains the set temperature. This device modulates the medium flow rate in accordance with the water inlet temperature by means of the action of a dedicated internal thermostatic cartridge.

When the water temperature approaches the set value, the obturator progressively reduces the passage. The medium flow rate supplied by the recirculation pump is thus distributed to the other network branches, resulting in effective automatic thermal balancing. If necessary, the regulator is already equipped with a thermal disinfection function, which is useful if the system temperature is to be increased to values over 55–60 °C. This function can be completely automatic, activated by a dedicated second thermostatic cartridge that trips at 70 °C, or controlled with a control unit by means of a thermo-electric actuator.



## Hydraulic characteristics



The graph shows the variation of the Kv value depending on the device configuration (A, B, C) and on the inlet temperature of the domestic hot water.

### Function A - Temperature control

$Kv_{max}$  (m<sup>3</sup>/h) = 1,8 (DN 15/DN 20) -  $Kv_{max}$  (m<sup>3</sup>/h) = 3,8 (DN 25/DN 32)

### Function B - Thermostatic thermal disinfection

$Kv_{dis}$  (m<sup>3</sup>/h) = 1 (DN 15/DN 20) -  $Kv_{dis}$  (m<sup>3</sup>/h) = 2 (DN 25/DN 32). (maximum flow rate for a disinfection process with a temperature of 70 °C)

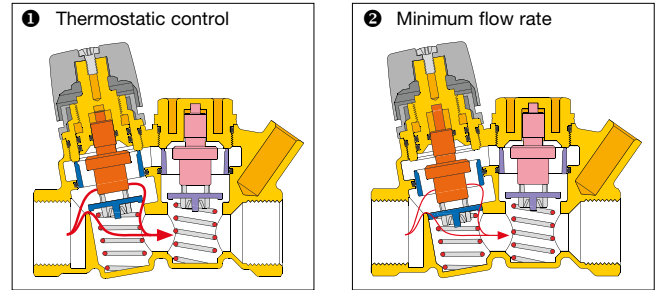
$Kv_{min}$  (m<sup>3</sup>/h) = 0,12 (DN 15/DN 20) -  $Kv_{min}$  (m<sup>3</sup>/h) = 0,9 (DN 25/DN 32). (minimum flow rate with the module of the main regulator closed)

### Function C - Controlled thermal disinfection

$Kv_{dis}$  (m<sup>3</sup>/h) = 1 (DN 15/DN 20) -  $Kv_{dis}$  (m<sup>3</sup>/h) = 2 (DN 25/DN 32). (flow rate through the valve by means of a cartridge with thermo-electric actuator, with by-pass completely open)

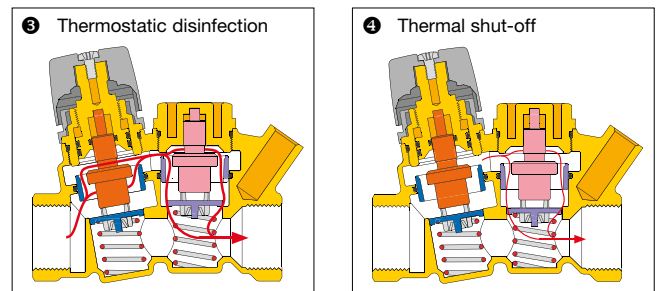
## Function A - Temperature control

On reaching the set temperature, the obturator (1), governed by the thermostatic sensor (2), modulates the closure of the hot water outlet (3), thereby aiding circulation towards the other connected circuits. If the temperature decreases, there is the opposite action and the passage reopens, so as to ensure that all the branches of the system reach the required temperature. The characteristic curve of the valve is shown in curve A.



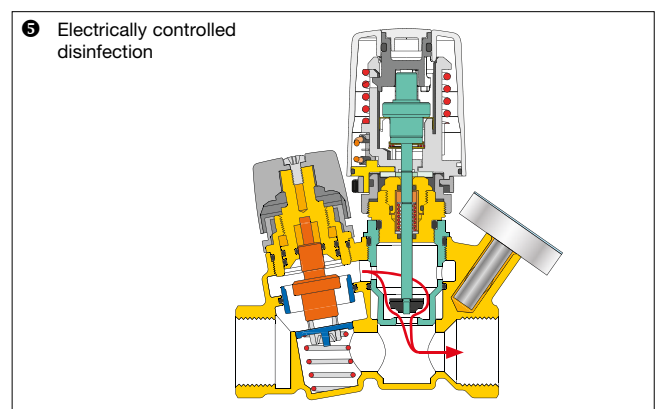
## Function B - Thermostatic thermal disinfection

The characteristic curve of operation B is the same as curve A until a temperature higher than about 68 °C is reached. At this value the second thermostatic sensor (4) intervenes with the aim of controlling the disinfection process, allowing circulation independently of the action of the first thermostat. This allows a passage of medium through a special by-pass (5), opening a passage up to the temperature of 70°C. If the temperature rises beyond this value, the flow through the by-pass circuit is reduced so as to allow thermal balancing to be performed even during the disinfection process. When it reaches about 75°C, the regulator reduces the orifice so as not to circulate medium at a high temperature, to avoid possible problems in the system. The characteristic curve of the valve is shown in curve A+B.



## Function C - Controlled thermal disinfection

The characteristic curve of operation C is the same as curve A until the temperature of intervention of the electronic disinfection system is reached. At this value (which is controlled by a dedicated thermostat or electronic system), the thermo-electric actuator 656 series intervenes with the aim of controlling the disinfection process, allowing circulation independently of the action of the first thermostat, by means of a dedicated by-pass. In this case, the minimum head loss is produced during thermal disinfection against Legionella. The characteristic curve of the valve is shown in curve A+C.



## Construction details

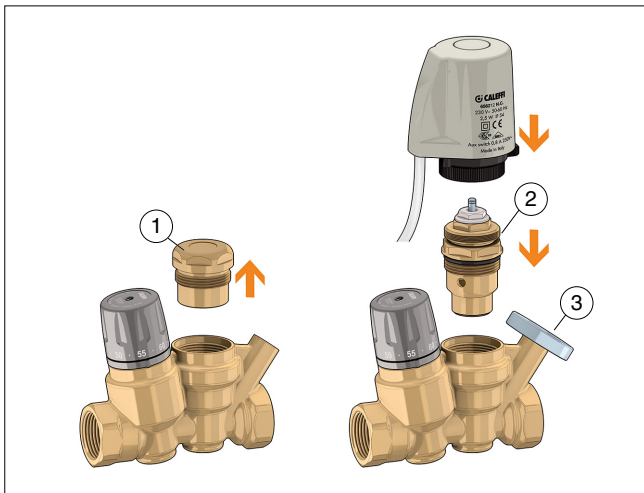
### CR Alloy with very low lead contents

The material used to make the regulator body is perfectly in line with the new normative provision concerning contact with potable water. This is an innovative alloy with very low lead contents and dezincification resistant properties.

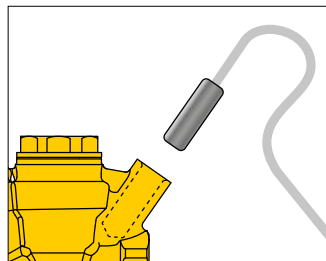
### Accessories

To transform code 116140/50/60/70 into controlled mode it is sufficient to remove the plug (1) and screw on the cartridge code 116000 in its place (2). In this application, any 656 series thermo-electric actuator can be used.

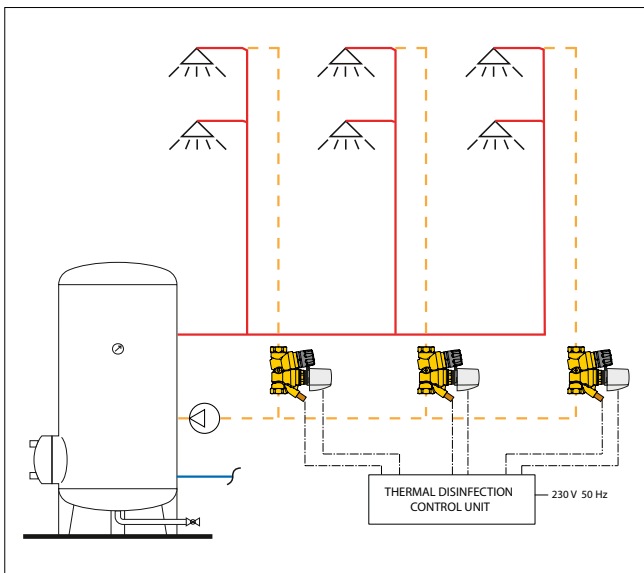
The regulator can be equipped with a temperature gauge for measuring and controlling the temperature of the hot water in the circuit, code 116010 (3)



The temperature gauge pocket can also be used for inserting a special immersion probe (with  $\varnothing < 10$  mm) for remote control of the disinfection temperature by a dedicated control unit.



This system allows disinfection control in each circuit and optimization of the disinfection process. In this case it is possible to measure and monitor the water temperature in each circuit, even from remote.



## System sizing

The thermostatic regulators are used for automatic balancing of the various branches of domestic hot water recirculation circuits, so as to ensure the required temperature in each section, to prevent the Legionella growth and limit heat dispersion. The recirculation circuits are generally sized according to the flow rate required for each branch, based on the allowed heat dispersion and the corresponding decrease in temperature along the pipe. Generally speaking, the maximum allowed temperature drop between the point of departure from the central system and the point of return to the latter is 5 °C. According to the flow rate, determined using the various calculation methods, it is possible to calculate the head loss caused by passage through the thermostatic regulator, using the graphs provided below.

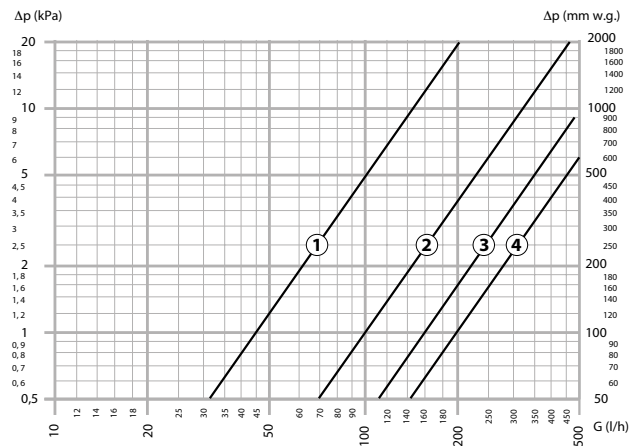
The head loss curves are shown with:

- valve in thermostatic operating mode. In this case, reference is made to an average aperture of 5K, between the valve set temperature and the incoming water temperature, bearing in mind the dispersion along the pipe. This value allows the head required for the recirculation pump to be limited. **It is also always necessary to ensure the minimum flow rate required by the mixing valves in the central system.**

- valve in by-pass operating mode. In this case, the valve obturator is fully open and the minimum head loss is produced during thermal disinfection against Legionella.

The suggested control range is from 55 °C to 60 °C (according to specification DVGW W551). Factory setting 52 °C.

### Fluid dynamic characteristics



	5K thermostatic operation	Operation in by-pass mode
DN 15-DN 20	<b>1</b>	<b>2</b>
DN 25-DN 32	<b>3</b>	<b>4</b>

To choose the recirculation pump head, the head loss at the valve should be added to the head loss in the most disadvantaged circuit.

### Example

Recirculation circuit calculated for an average dispersion of 12 W/m and a temperature difference of 2K between the starting point and the most unfavourable delivery point, at the top of a column 20 m in height. Thermostatic regulator located at the base of the column.

Flow rate for the column, which therefore passes through the thermostatic regulator.

$$G = 12 \cdot 20 \cdot 0,860/2 = 103 \text{ l/h}$$

Thermostatic regulator setting temperature:

$$T_{\text{reg}} = 55 \text{ °C.}$$

The graph shows the head loss at the valve, in thermostatic operation:

$$\Delta p_{\text{reg}} = 6 \text{ kPa.}$$

From calculations based on the nominal flow rates, the head loss of the most disadvantaged circuit pipes and circuit components, such as storage, mixing valve, valves can be found.

Let us suppose that this value is known:

$$\Delta p_{\text{circuit}} = 14 \text{ kPa}$$

Pump head at nominal flow rate:

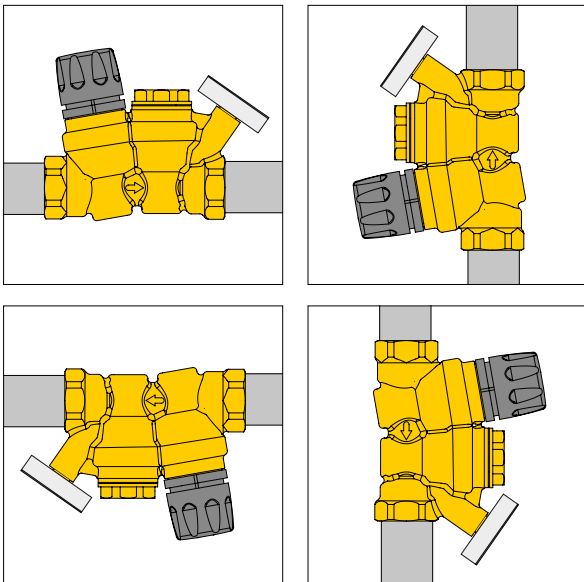
$$H = \Delta p_{\text{circuit}} + \Delta p_{\text{reg}} = 14 + 6 = 20 \text{ kPa.}$$

## Certification

The thermostatic regulator is complying with the performance requirements of the product specification W554, applicable according to the provisions on system standards W551 for the prevention of Legionnaires' disease. It is also certified by WRAS in the UK. The thermostatic regulator is made of materials certified for contact with drinking water, for use in the distribution circuits of water for human consumption.

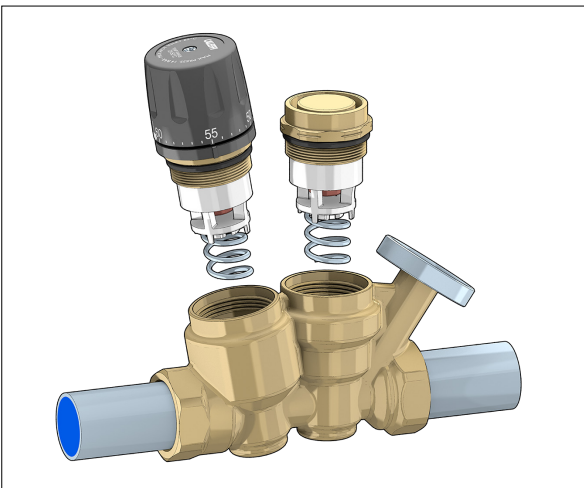
## Installation

Before fitting the thermostatic regulator, the pipes must be flushed to ensure that none of the impurities in circulation will reduce its performance. We recommend always installing strainers of sufficient capacity at the inlet from the water main. The thermostatic regulator can be fitted in any position, vertical or horizontal, by respecting the flow direction indicated by the arrow on the valve body. The thermostatic regulator must be installed according to the diagrams given in this manual. It must be installed in such a way as to allow free access to the device, for checking operation and maintenance.



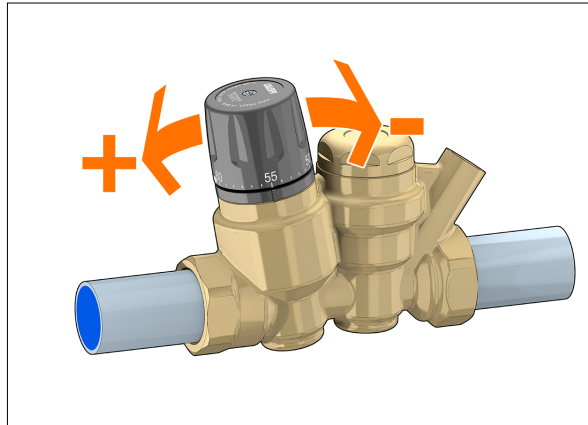
## Maintenance

Both the adjustment cartridge and the disinfection control cartridge can be removed from the valve body for checking, cleaning or replacement.



## Temperature adjustment

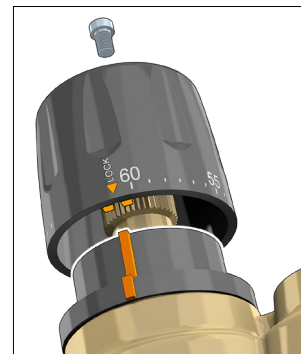
The temperature is set at the desired value by turning the upper screw with the special knob.



The graduated scale shows the temperatures at which the indicator can be set. It is recommended to set the valve temperature at a value about 5K greater than the water temperature at the valve inlet, taking into account the heat losses along the line, to limit the head required at the recirculation pump. Take care to ensure the minimum flow rate at the mixing valves in the central heating system.

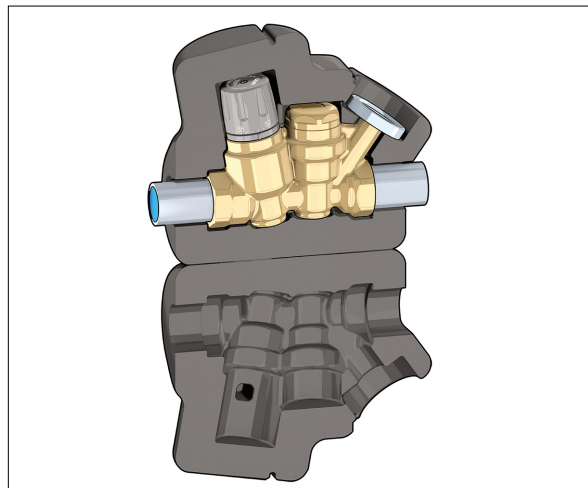
## Adjustment locking

After adjusting the temperature, the setting can be locked at the desired value using the control knob. For this purpose, unscrew the locking screw at the top of the control knob, remove the knob and then put it back on so that the internal reference couples with the protrusion on the knob holder nut. When this block is used, the reference of the indication of the temperature values on the knob is lost. To restore it, completely unscrew the regulating headwork counter-clockwise. Reposition the knob on MAX value. Tighten the locking screw.



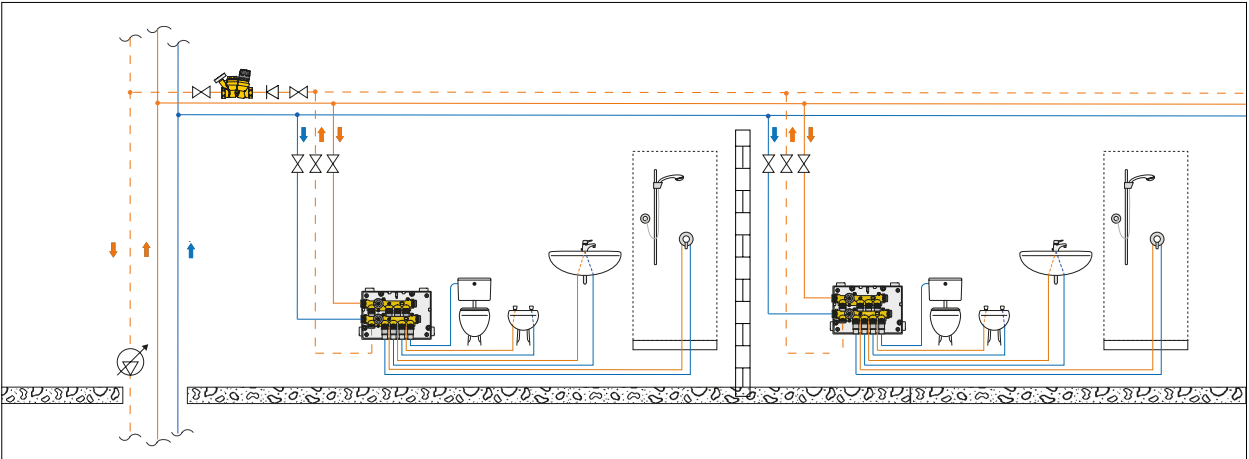
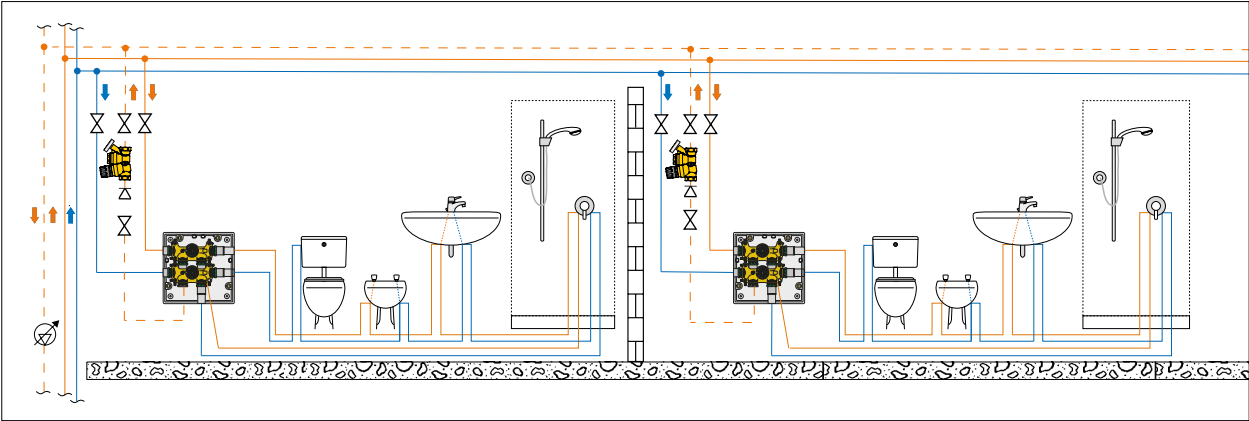
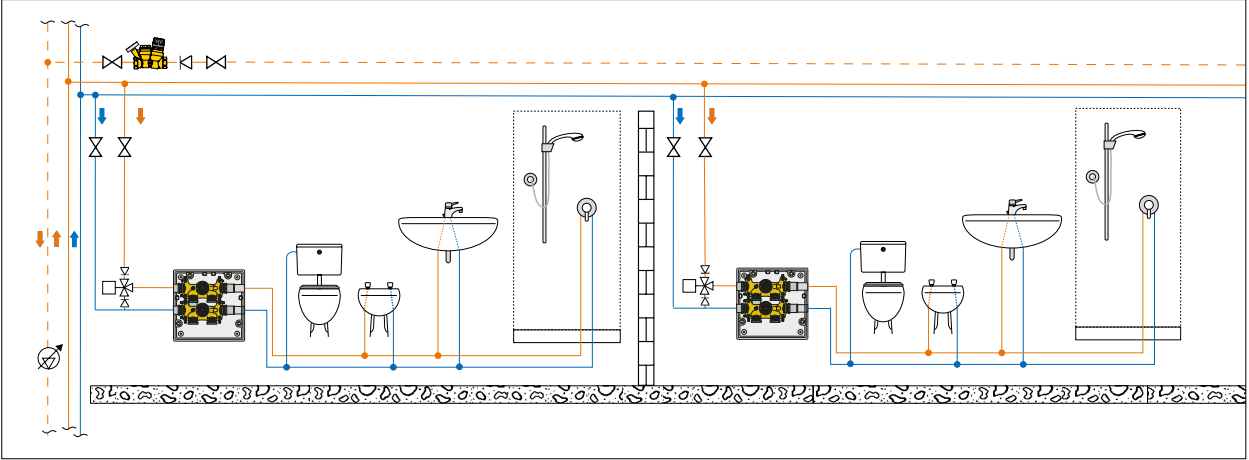
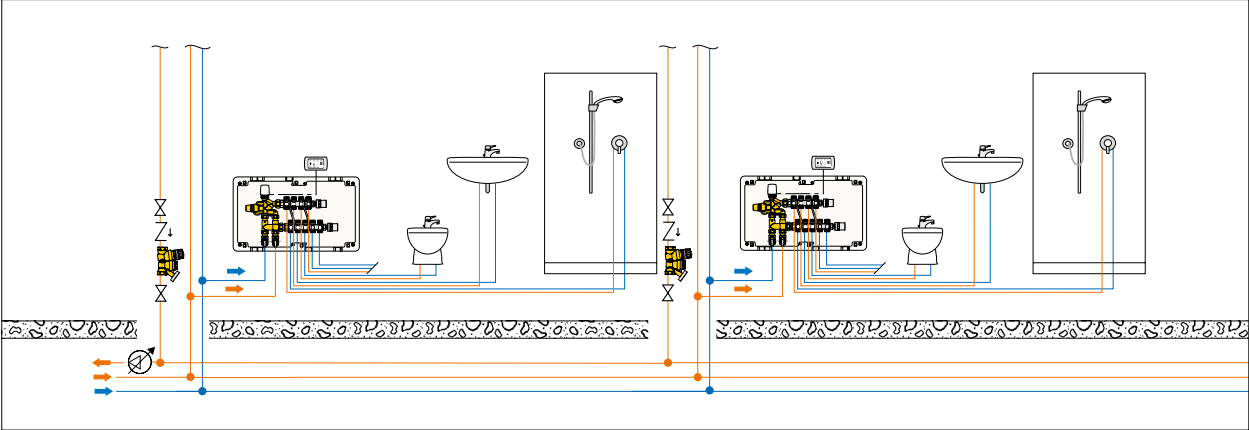
## Insulation

The preformed shell insulation code CBN116140 and CBN116160 optional is available in order to grant perfect thermal insulation and energy saving.





**Application diagrams**



## Accessories



Cartridge for thermal disinfection function controlled by an actuator. For use with 116 series combined with 656. series actuators.

Code

**116000**



Thermo-electric actuators normally closed.

Code

**Series 656**



Insulation for 1/2" and 3/4" multifunction thermostatic regulator 116 series.

Code

**CBN116140 - CBN116160**

## SPECIFICATION SUMMARY

### Series 1162

Thermostatic regulator for domestic hot water recirculation circuits with thermostatic thermal disinfection function. Dezincification-resistant alloy body. Sizes DN 15 (from DN 15 to DN 32). Connections 1/2" (from 1/2" to 1 1/4") F (EN 10226-1). Adjustable PSU cartridge. EPDM hydraulic seals. Temperature gauge/probe pocket Ø 10 mm. Maximum working pressure 16 bar. Maximum differential pressure 1 bar. Adjustment temperature range 35-60 °C (DN 15 - DN 20), 35-65 °C (DN 25 - DN 32). Factory setting 52 °C. Disinfection temperature 70 °C. Closing temperature 75 °C.

### Series 1161

Thermostatic regulator for domestic hot water recirculation circuits fitted for actuator-controlled thermal disinfection function. Dezincification-resistant alloy body. Sizes DN 15 (from DN 15 to DN 32). Connections 1/2" (from 1/2" to 1 1/4") F (EN 10226-1). Adjustable PSU cartridge. EPDM hydraulic seals. Temperature gauge/probe pocket Ø 10 mm. Maximum working pressure 16 bar. Maximum differential pressure 1 bar. Adjustment temperature range 35-60 °C (DN 15 - DN 20), 35-65 °C (DN 25 - DN 32).

### Code 116000

Cartridge for actuator-controlled thermal disinfection function. For use with 116 series combined with 656 series actuators.

### Series 6562

Thermo-electric actuator, with position indicator. Normally closed, with auxiliary microswitch (code 656212/4). Self-extinguishing polycarbonate protective shell. Colour white RAL 9010 (code 656202/4), grey RAL 9002 (code 656212/4). Electric supply 230 V (AC); 24 V (AC); 24 V (DC). Starting current ≤ 1 A. Running current 13 mA 230 V (AC); 140 mA 24 V (AC) - 24 V (DC). Running power consumption 3 W. Auxiliary microswitch contact rating (code 656212/4) 0,8 A (230 V). Protection class IP 54. Made with double insulation. Medium working temperature range: 5-75 °C. Ambient temperature: operation 0-50 °C EN 60721-3-3 Cl. 3K3, max. humidity 85 %, transportation -10-70 °C EN 60721-3-2 Cl. 2K2, max. humidity 95 %, storage -5-50 °C EN 60721-3-1 Cl. 1K2, max. humidity 95 %. Opening/closing time from 120 to 180 s. Supply cable length 80 cm. To ENEC and SEV standard.

### Code CBN116140/CBN116160

Insulation for thermostatic regulator 116 series. Closed cell expanded PE-X shell insulation. Minimum thickness 13 mm, maximum 23 mm. Inner density 30 kg/m<sup>3</sup>, external density 80 kg/m<sup>3</sup>. Thermal conductivity at 10 °C 0,036 W/(m·K), at 40 °C 0,041 W/(m·K). Temperature range 0-100 °C. Fire resistance (DIN4102) Class B2.

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