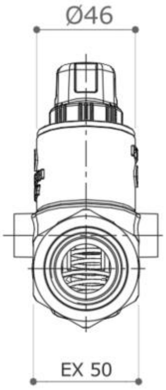
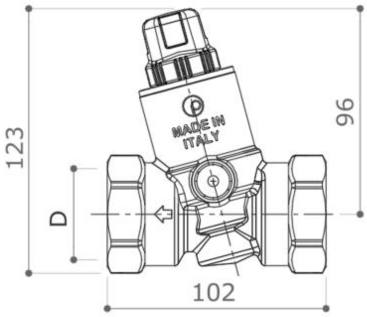
DESCRIPTION

TB05

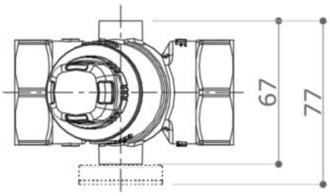
Adjustable thermal balancing valve for sanitary hot water recirculation systems, made by lead free corrosion resistant brass conform to European (UBA-List & 4 MS) and USA (NSF) standard requirements. Equipped with Thermal element for automatic anti legionella treatment. Available with female x female connections.
Available optional:
• T39P/80 thermometer

DIMENSIONS





	D	Peso [g]
FxF	1” EN10266-1	1240
FxF	1 1/4” EN10266-1	1080



MATERIALS

Body	CW511L (EN 12165)-CuZn38As-ASTM C27453	***Protection Handwheel***	PA66
O-ring	EPDM-X	***Presetting Handwheel***	ABS
Spring	AISI302	***Shutter***	PSU

CHARACTERISTICS

Max working pressure	16 bar	***Accuracy***	±2°C
Maximum Differential Pressure	1 bar	***Default Presetting***	52°C
Max working temperature	90°C	K_{vmax}	4,3
Temperature setting range	38°- 58°C	K_{disnf} ***(by-passC)***	2
Disinfection Temperature	> 70°C	K_{vmin}	0,5

OPERATING PRINCIPLE

Thermostatic balancing valve TB05 solves the balancing/temperature setting problems typical of sanitary hot water recirculation systems.

1. <u>Balancing</u>

It often happens that the furthest users from the generator are penalized and consequently are supplied with domestic hot water that does not reach the minimum desired temperature value. These situations are perceived by users as a malfunction of the system itself.

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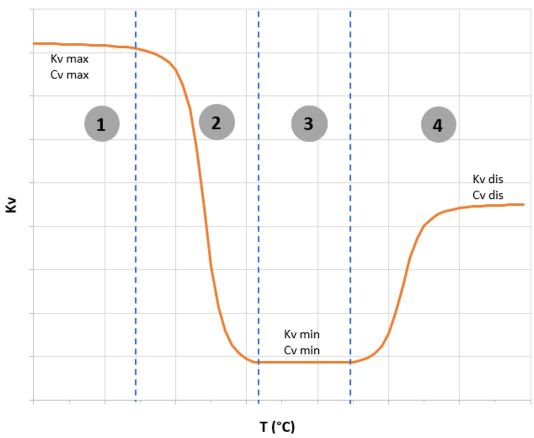
The presence of a thermosensitive element (which is the heart of the valve itself) allows you to automatically balance the flow in the recirculation network depending on whether the water temperature exceeds the pre-set value or not. Having established in advance an equal delivery temperature value for all the thermostatic balancing valves installed (for example 52 ° C), all the distribution risers will be supplied by hot domestic hot water at the desired temperature.

Thanks to the presence of a presetting device (selectable by removing the protective knob) the user has the possibility to set the desired temperature value ranging in the range 38°- 58°C (factory presetting 52 ° C). It is good practice that all the valves of the same system are set to the same value.

2. Anti-legionella disinfection/treatments

As required by health safety standards, anti-legionella treatments can be required to avoid proliferation of bacteria in hot potable water system. A common safety procedure is flushing the system with water at more than 70° C, temperature required to kill the bacteria the valve is designed to increase the Kv value at temperatures around 70°C, with the behavior depending on the presetting: a higher presetting results in an increase in Kv at higher temperatures (refer to the graph shown on the last page).

The following diagram shows the variation of the flow rate (expressed as Kv) as a function of the temperature of the water flowing across the thermostatic balancing valve. Practically five distinct areas of operation can be identified.



Working area 1 – **Maximum K_{vmax}**, $T_{water} << T_{presetting}$
In this temperature range the valve is completely open and a spring is balancing the thermostatic element variations.

Working area 2 – **variable Kv**, when T_{water} is reaching $T_{presetting}$.
When the water temperature is reaching the selected temperature the thermostatic element is expanding and is closing the valve till the minimum design K_{vmin} .

Working area 3 – **K_{vmin}**, $T_{water} \geq T_{presetting}$
When the water temperature is higher than the selected temperature the thermostatic element is keeping the valve in closed position and only the minimum flow rate is guarantee, K_{vmin} .

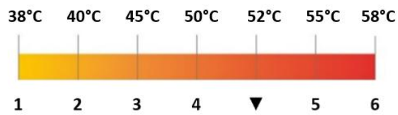
Working area 4 - **$K_{disinf.}$**, $T_{water} \geq T_{disinf}$
As soon as the temperature exceeds T_{disinf}, the valve maintains K_{disinf} for all temperatures above Tdisinf. This operating mode is designed to ensure effective disinfection of the system, ensuring that optimal conditions are maintained for adequate and safe treatment.

The TB05 are not a shut off valve, a minimum flow rate K_{vmin} is guaranteed (refer to the graph shown on the last page).

PRESETTING OPERATION.

TB05 valve has factory presetting at 52°C (corresponding to position ▼ on the selector), the user can change the presetting by following the instructions:

1. Remove the handwheel protection cap
2. Turn the selector to the target position



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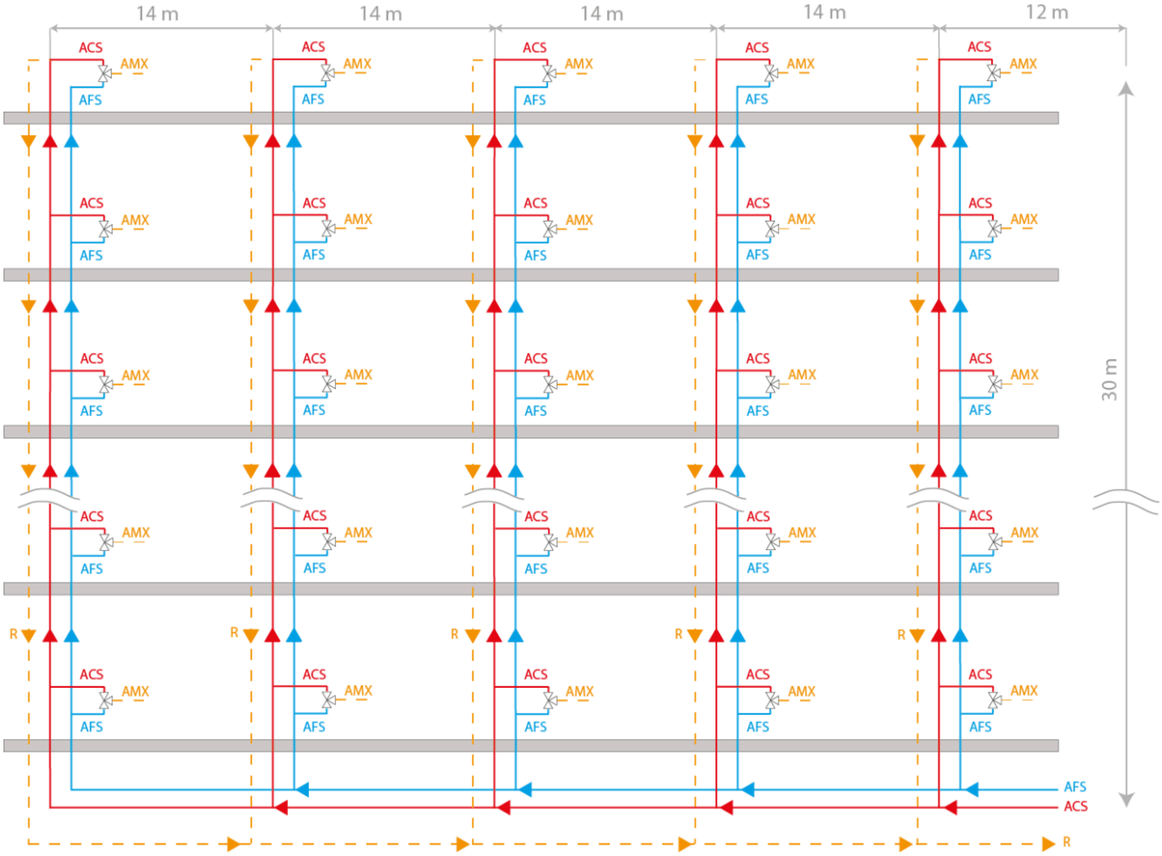
This is a simple but important operation for the proper functioning of the system. It is always advisable to preset the system valves at a temperature value greater than 3-5 ° C compared to the temperature actually desired on the most penalized users. This way, the overall pressure losses will be limited to the advantage of choosing the circulator dedicated to the recirculation network.

EXAMPLE OF CALCULATION/DESIGN

The correct sizing of the system and the evaluation of the impact that each component can have in the fluid dynamics of the same is always the root of good operation. It is therefore essential to evaluate the incidence of the thermostatic balancing valve in the overall calculation of the pressure drops for the choice of the type of needed circulator. An explanatory practical example is given below.

Consider a multi-story residential complex characterized by the presence of 5 risers for the distribution of sanitary water, each of it consists of the Hot Water (A_{CS}) riser, the Cold Water riser (A_{FS}) and the Recirculation R.



A. STANDARD WORKING OPERATION

To guarantee to the most penalized thermostatic balancing valve a flow of water whose temperature (T_{SF}) is not lower than 5 ° C with respect to the outlet of the generator (T_G), each flow rate can be calculated considering the heat losses along the entire line from the generator to the last thermal balancing valve.

Hypothesis:

1. ACS temperature T_G = 57°C
2. Valve selected temperature TB05 52°C (pos.▼ - default)
3. Heat loses of the pipes. q_l= 12 W/m
4. Maximum temperature drops through the system, risers and horizontal manifold. $\Delta T = T_G - T_{SF} \leq 5K$

For each riser and for each stretch of horizontal manifold, the extent of the heat losses are evaluated and, based on that, the amount of water flowrate to ensure a ΔT = 5K is determined.

Circuit n°	Total vertical length (ACS + R) (m)	Vertical risers er Heat losses (W)	Total horizontal manifold length (m)	Horizontal manifold heat losses (W)	Total heat loss for every complete circuit (W)	Total heat loss (W)	Riser flow rate (l/h)	Total flow rate (l/h)
1	60	720	12	144	864	4416	128	760
2	60	720	14	168	888	3552	134	632
3	60	720	14	168	888	2664	143	497
4	60	720	14	168	888	1776	158	354
5	60	720	14	168	888	888	195	195

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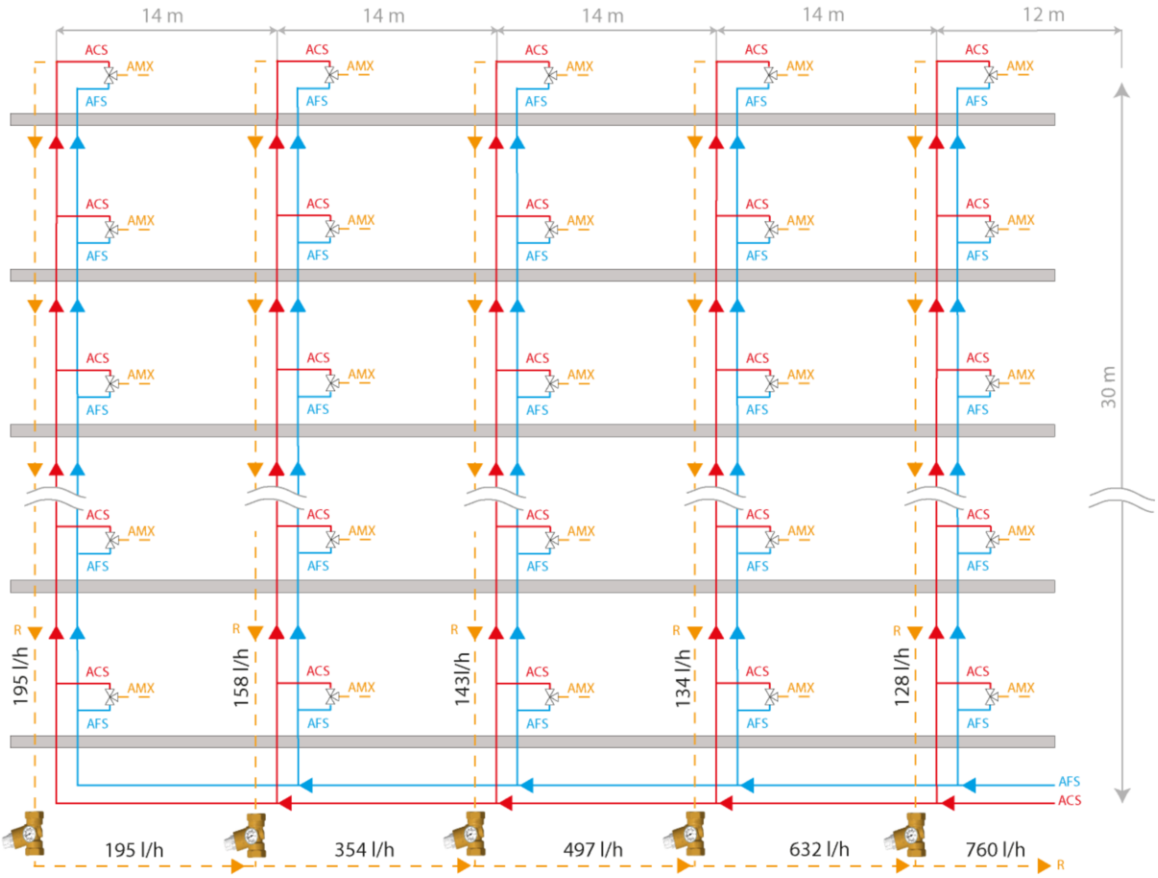

Based on the flow rate value calculated for the most penalized riser by heat losses (Column n ° 5 - 195 l / h), the available water temperature (TG = 57 ° C) and the maximum temperature jump (5K) allowed as an initial hypothesis and the preset value, the Kv and the relative pressure drop at 52 ° C will be evaluated (with an excellent approximation corresponding to the position ▼ on the valve). Through the characteristic diagram of the TB05 thermostatic balancing valve (or from the relative table values shown below for ease of reference) the Kv value settles at 1.3

T (°C) - pos (Kv)	1	2	3	4	▼	5	6
15	2,9	3,1	3,5	3,9	4,0	4,1	4,3
17,5	2,9	3,1	3,5	3,9	4,0	4,1	4,3
20	2,9	3,1	3,5	3,9	4,0	4,1	4,3
22,5	2,9	3,1	3,5	3,8	4,0	4,1	4,3
25	2,8	3,0	3,4	3,8	4,0	4,1	4,3
27,5	2,6	2,9	3,4	3,8	4,0	4,1	4,3
30	2,3	2,8	3,3	3,7	3,9	4,1	4,3
32,5	2,0	2,6	3,1	3,6	3,8	4,0	4,2
35	1,7	2,3	2,9	3,5	3,7	3,9	4,2
37,5	1,3	1,9	2,7	3,3	3,5	3,8	4,1
40	1,0	1,5	2,3	3,0	3,3	3,6	4,0
42,5	0,7	1,1	2,0	2,7	3,0	3,4	3,9
45	0,5	0,9	1,5	2,4	2,6	3,1	3,7
47,5	0,5	0,6	1,1	2,0	2,2	2,8	3,5
50	0,5	0,5	0,7	1,5	1,8	2,4	3,2
52,5	0,5	0,5	0,5	1,0	1,3	2,0	2,9
55	0,6	0,5	0,5	0,6	0,9	1,5	2,4
57,5	0,7	0,6	0,5	0,5	0,5	0,8	1,8
60	1,1	1,0	0,7	0,5	0,5	0,5	1,2
62,5	1,5	1,3	1,0	0,5	0,5	0,5	0,5
65	1,7	1,5	1,4	0,8	0,6	0,5	0,5
67,5	1,9	1,7	1,6	1,3	1,0	0,6	0,5
70	2,0	1,9	1,8	1,5	1,4	1,2	0,6
72,5	2,0	2,0	1,9	1,7	1,6	1,4	1,2
75	2,0	2,0	2,0	1,9	1,8	1,7	1,5
77,5	2,0	2,0	2,0	2,0	1,9	1,8	1,7
80	2,0	2,0	2,0	2,0	2,0	1,9	1,8
82,5	2,0	2,0	2,0	2,0	2,0	2,0	1,9
85	2,0	2,0	2,0	2,0	2,0	2,0	2,0

$$\Delta P = \left(\frac{Q}{100x\ Kv}\right)^2 = \left(\frac{195}{100x\ 1.3}\right)^2 = 2{,}25\ kPa$$

To this value, the following must be added

1. The distributed head losses between the generator and the last draw-off point before the start of the recirculation network;
2. The head losses characterizing the recirculation network.

The total head loss value associated with the total recirculation flow rate calculated in the table (760 l/h) will allow determining the flow rate/head characteristics necessary to select the recirculation pump to be installed. However, it is also important to size the "disinfection" system.

B. DISINFECTION

By installing the TB05 thermostatic valve on all risers, an automatic legionella treatment can be carried out across the entire system in a single operation. Only the implementation of isolation systems (either automatic or manual) would enable disinfection operations to be carried out separately for each column (step-by-step process).
Following an example of how the operation is performed on a system with 5 risers.
Hypothesis:

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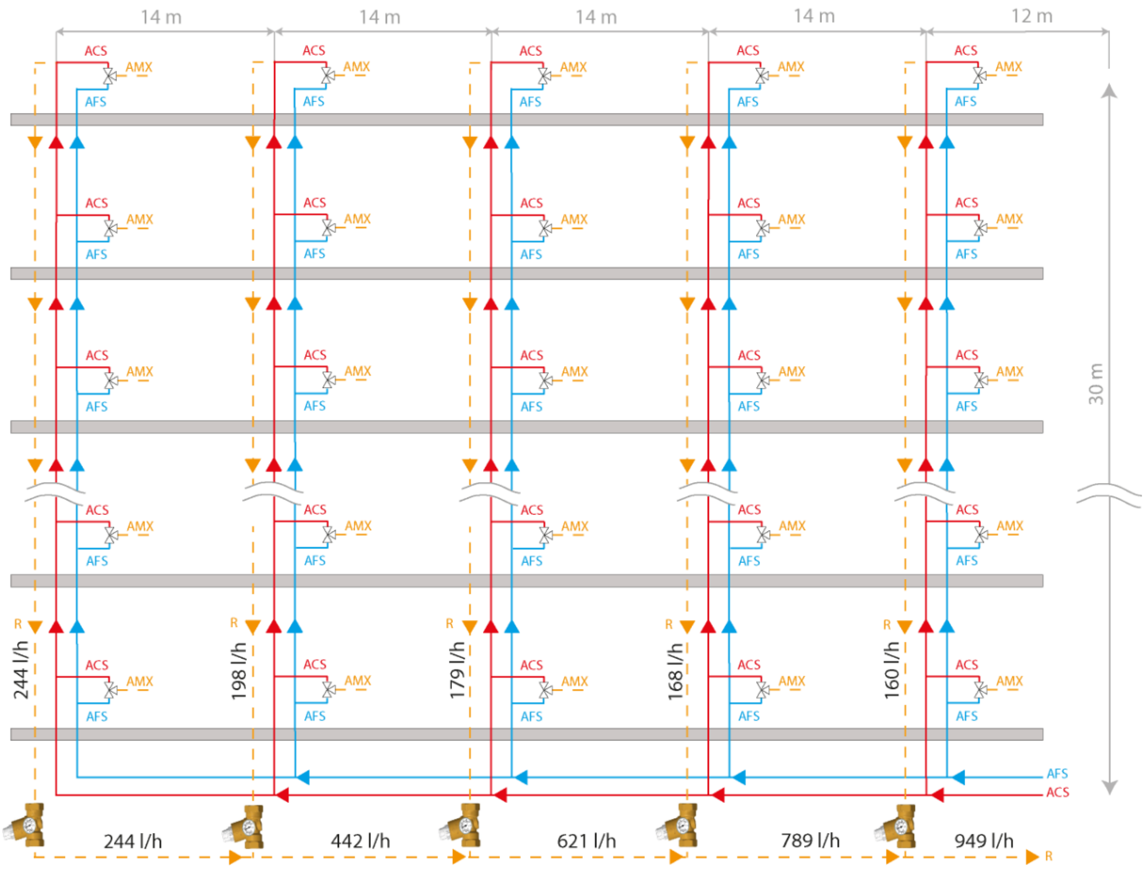
1. Disinfection Water temperature T_G = 75°C ;
2. Factory selected disinfection temperature 70°C ;
3. Heat losses of the pipes. q_l= 15 W/m (+ 25% compared to normal operation);
4. Maximum temperature drops through the system, risers and headers. $\Delta T = T_G - T_{SF} \leq 5K$.

For each riser and for each stretch of horizontal manifold, the extent of the heat losses are evaluated and, based on that, the amount of water flowrate to ensure a ΔT = 5K is determined.

Circuit n°	Total vertical length (ACS + R) (m)	Vertical risers er Heat loss (W)	Total horizontal headers length (m)	Horizontal Headers heat loss (W)	Total heat loss for every complete circuit (W)	Total heat loss (W)	Riser flow rate (l/h)	Total flow rate (l/h)
1	60	900	12	180	1080	5520	160	949
2	60	900	14	210	1110	4440	168	789
3	60	900	14	210	1110	3330	179	621
4	60	900	14	210	1110	2220	198	442
5	60	900	14	210	1110	1110	244	244



Based on the flow rate calculated for the column most affected by thermal losses (Column No. 5 – 244 l/h), the available water temperature (75°C), the maximum temperature drop (5K) assumed as the initial hypothesis, and the presetting value, the evaluation of the Kv factor and the corresponding head loss at 70°C will be carried out.

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T (°C) - pos (Kv)	1	2	3	4	▼	5	6
15	2,9	3,1	3,5	3,9	4,0	4,1	4,3
17,5	2,9	3,1	3,5	3,9	4,0	4,1	4,3
20	2,9	3,1	3,5	3,9	4,0	4,1	4,3
22,5	2,9	3,1	3,5	3,8	4,0	4,1	4,3
25	2,8	3,0	3,4	3,8	4,0	4,1	4,3
27,5	2,6	2,9	3,4	3,8	4,0	4,1	4,3
30	2,3	2,8	3,3	3,7	3,9	4,1	4,3
32,5	2,0	2,6	3,1	3,6	3,8	4,0	4,2
35	1,7	2,3	2,9	3,5	3,7	3,9	4,2
37,5	1,3	1,9	2,7	3,3	3,5	3,8	4,1
40	1,0	1,5	2,3	3,0	3,3	3,6	4,0
42,5	0,7	1,1	2,0	2,7	3,0	3,4	3,9
45	0,5	0,9	1,5	2,4	2,6	3,1	3,7
47,5	0,5	0,6	1,1	2,0	2,2	2,8	3,5
50	0,5	0,5	0,7	1,5	1,8	2,4	3,2
52,5	0,5	0,5	0,5	1,0	1,3	2,0	2,9
55	0,6	0,5	0,5	0,6	0,9	1,5	2,4
57,5	0,7	0,6	0,5	0,5	0,5	0,8	1,8
60	1,1	1,0	0,7	0,5	0,5	0,5	1,2
62,5	1,5	1,3	1,0	0,5	0,5	0,5	0,5
65	1,7	1,5	1,4	0,8	0,6	0,5	0,5
67,5	1,9	1,7	1,6	1,3	1,0	0,6	0,5
70	2,0	1,9	1,8	1,5	1,4	1,2	0,6
72,5	2,0	2,0	1,9	1,7	1,6	1,4	1,2
75	2,0	2,0	2,0	1,9	1,8	1,7	1,5
77,5	2,0	2,0	2,0	2,0	1,9	1,8	1,7
80	2,0	2,0	2,0	2,0	2,0	1,9	1,8
82,5	2,0	2,0	2,0	2,0	2,0	2,0	1,9
85	2,0	2,0	2,0	2,0	2,0	2,0	2,0

Using the characteristic diagram of the TB05 thermostatic balancing valve (or the corresponding tabular values provided below for ease of reference), it is found that the Kv value stabilizes at 1,4.

$$\Delta P = \left(\frac{Q}{100x\ Kv}\right)^2 = \left(\frac{244}{100x\ 1{,}4}\right)^2 = 3\ kPa$$

To this value, the following must be added:

1. The distributed head losses between the generator and the last draw-off point before the start of the recirculation network;
2. The head losses characterizing the recirculation network.

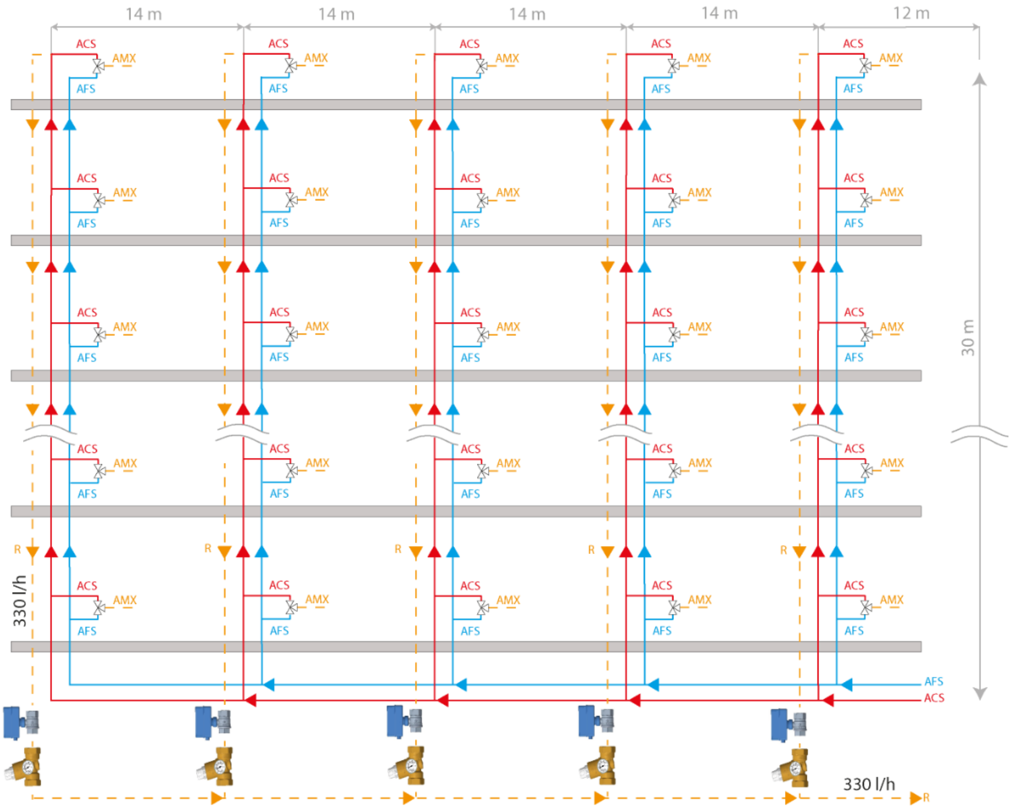
The total head loss value associated with the total recirculation flow rate calculated in the table (949 l/h) will allow determining the flow rate/head characteristics necessary to select the pump to be installed for disinfection.

DISINFECTION BY USE OF REMOTE CONTROL

If the system is equipped with an automatic enabling/disabling mechanism for individual recirculation columns (zone valves), it becomes possible to implement (and size) a step-by-step disinfection process, treating one column at a time.

The basic assumptions and methodology remain fundamentally the same as those described in point B, but the sizing is carried out exclusively on the least favorable column.

Circuit n°	Total vertical length (ACS + R) (m)	Vertical risers er Heat loss (W)	Total horizontal Headers length (m)	Horizontal Headers heat loss (W)	Total heat loss for every complete circuit (W)	Total heat loss (W)	Riser flow rate (l/h)
1	60	900	12	180		1920	
2	60	900	14	210		1920	
3	60	900	14	210		1920	
4	60	900	14	210		1920	
5	60	900	14	210	1920	1920	330



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Once we have the flow rate for the least circuit (riser n° 5 – 330 l/h), based on the hypothesis of water temperature (75 °C) and maximum delta T allowed (5K) it is possible to proceed with evaluation of K_v and pressure drop at 70°C

T (°C) - pos (Kv)	1	2	3	4	▼	5	6
15	2,9	3,1	3,5	3,9	4,0	4,1	4,3
17,5	2,9	3,1	3,5	3,9	4,0	4,1	4,3
20	2,9	3,1	3,5	3,9	4,0	4,1	4,3
22,5	2,9	3,1	3,5	3,8	4,0	4,1	4,3
25	2,8	3,0	3,4	3,8	4,0	4,1	4,3
27,5	2,6	2,9	3,4	3,8	4,0	4,1	4,3
30	2,3	2,8	3,3	3,7	3,9	4,1	4,3
32,5	2,0	2,6	3,1	3,6	3,8	4,0	4,2
35	1,7	2,3	2,9	3,5	3,7	3,9	4,2
37,5	1,3	1,9	2,7	3,3	3,5	3,8	4,1
40	1,0	1,5	2,3	3,0	3,3	3,6	4,0
42,5	0,7	1,1	2,0	2,7	3,0	3,4	3,9
45	0,5	0,9	1,5	2,4	2,6	3,1	3,7
47,5	0,5	0,6	1,1	2,0	2,2	2,8	3,5
50	0,5	0,5	0,7	1,5	1,8	2,4	3,2
52,5	0,5	0,5	0,5	1,0	1,3	2,0	2,9
55	0,6	0,5	0,5	0,6	0,9	1,5	2,4
57,5	0,7	0,6	0,5	0,5	0,5	0,8	1,8
60	1,1	1,0	0,7	0,5	0,5	0,5	1,2
62,5	1,5	1,3	1,0	0,5	0,5	0,5	0,5
65	1,7	1,5	1,4	0,8	0,6	0,5	0,5
67,5	1,9	1,7	1,6	1,3	1,0	0,6	0,5
70	2,0	1,9	1,8	1,5	1,4	1,2	0,6
72,5	2,0	2,0	1,9	1,7	1,6	1,4	1,2
75	2,0	2,0	2,0	1,9	1,8	1,7	1,5
77,5	2,0	2,0	2,0	2,0	1,9	1,8	1,7
80	2,0	2,0	2,0	2,0	2,0	1,9	1,8
82,5	2,0	2,0	2,0	2,0	2,0	2,0	1,9
85	2,0	2,0	2,0	2,0	2,0	2,0	2,0

From the characteristic diagram of the TB05 thermostatic balancing valve (or from the corresponding tabular values provided below for ease of reference), it is observed that the Kv value settles at 1,4.

$$\Delta P = \left(\frac{Q}{100x\,Kv}\right)^2 = \left(\frac{330}{100x\;1{,}4}\right)^2 = 5{,}6\;kPa$$

To this value, the following must be added:

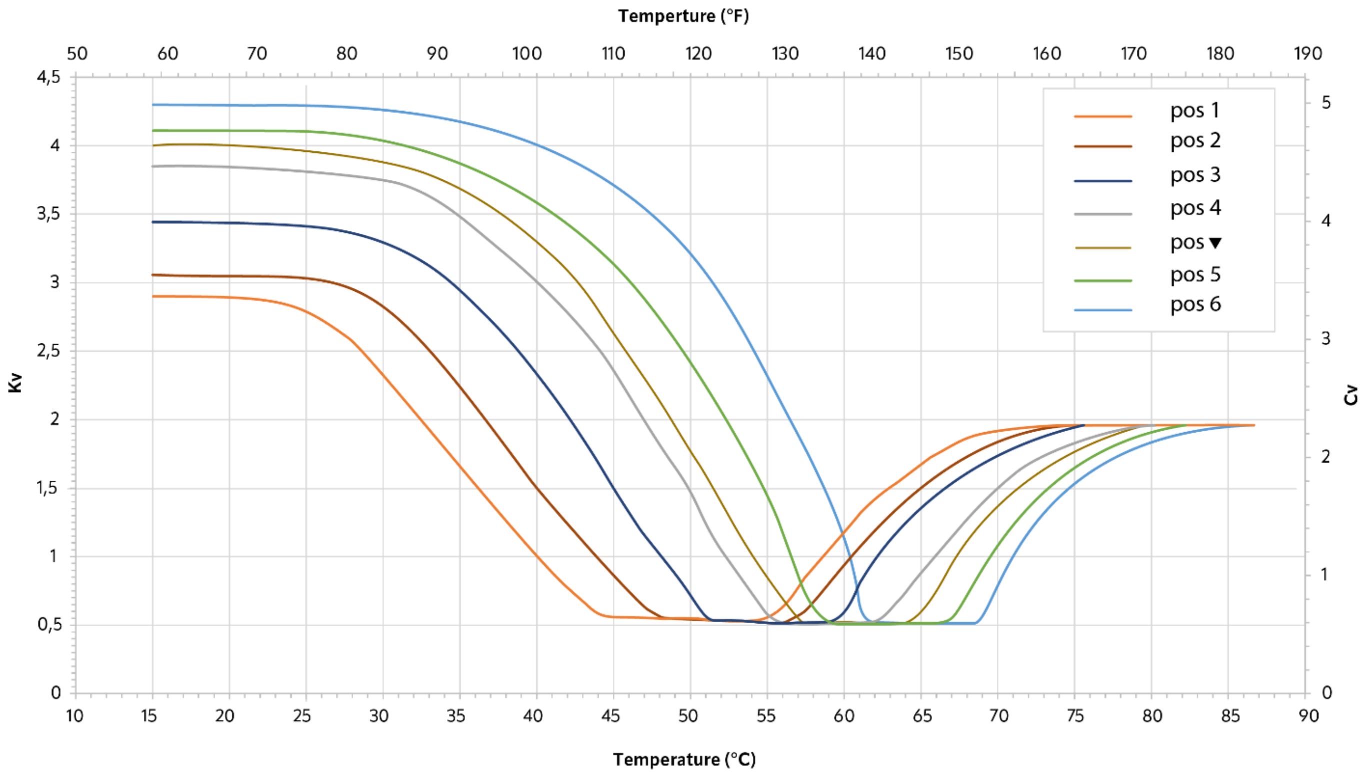
1. The distributed head losses between the generator and the last draw-off point before the start of the recirculation network;
2. The head losses characterizing the recirculation network.

Such total head loss value associated with the calculated disinfection flow rate (330 l/h) will allow determining the flow rate/head characteristics necessary to select the disinfection pump.

Although the implementation of a system that enables STEP-BY-STEP DISINFECTION may be more expensive due to the inclusion of motorized zone valves, from a functional perspective, it allows a disinfection process dedicated specifically to each individual column. This results in a lower dedicated flow rate for each column, assuming the same process temperature.

Kv vs.TEMPERATURES CHART

Below is the characteristic operating diagram of the TB05 valves which shows the K_v value as a function of the temperature of the water passing through the valve and the presetting value selected.



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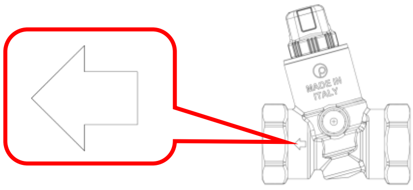
INSTALLATION

The TB05 Valve can be installed both at the top or at the bottom of the riser, with the following considerations:

- Accessible;
- At least 0.5 meters from the header;
- With the right orientation considering flow rate direction



The TB05 thermostatic balancing valve can be installed without any particular precautions regarding the position; it can be installed both vertically and horizontally and possibly also upside-down. Not being equipped with built-in filters or electrical/electronic elements, there is no risk.

As for all types of balancing valves (whether they are intended for air conditioning systems or as in this case for sanitary distribution systems), in order to avoid operating problems, it is always recommended to install means of suitable filtering capacity in the systems. such as the 51F - FILTERBALL ball valves with incorporated strainer.

ACCESSORIES

T39P/80

Double scale 0-80°C / 32°-176°F

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