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BALANCING THERMOSTAT INSTALLATIONS RECIRCULATING HOT WATER THERMOSTATIC CONTROL USING THERMOSTATIC SELF-ACTING PROPORTIONAL VALVE

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Abstract: *MTCV proportional thermostatic control valve is a multipurpose balancing thermostatic valve used in hot water recirculation systems. MTCV provides thermostatic balancing of hot water systems while maintaining a constant temperature in the system, thus limiting the flow recirculation to the minimum necessary. Adjustment feature of MTCV is presented and location of proportional valve in the hot water recirculation thermostatic system.*

Key words: *MTCV proportional thermostatic control valve, thermostatic balancing, hot water recirculation*

1. Introduction

Simultaneously, MTCV proportional thermostatic control valve can achieve a disinfection process through two features:

- a automatic disinfection module - thermocouple (fig. 2).
- a thermal actuator TWA controller and PT1000 temperature sensor (Fig. 3).

Fig. 2. *Automatic version with automatic function of disinfection - "B" * thermometer is an accessory*

Fig. 1. *Basic version – A*

Fig. 3. *Version with electronically controlled disinfection process - "C"*

2. Main functions of the self-acting proportional valve

- thermostatic balancing of hot water systems in the temperature range 35-60 ° C - Version A;
- automatic thermic disinfection at temperatures above 68 ° C, with safety protection system to prevent the temperature rise above 75 ° C (automatically stops the flow of recirculation) - Version "B";
- automatic disinfection process , electronically controlled, with the possibility of programming the temperature and duration of disinfection - version "C";
- automatic cleaning system by temporarily lowering the temperature setting for full opening MTCV valve for maximum flow;
- temperature measurement version ;
- unwanted interventions protection;
- measuring and constant monitoring of temperature - version "C";
- stop function for circulation riser through optional fittings with integrated ball valve;
- upgrading MTCV modular valve during operation, even with the pressurization;
- service - if necessary, calibrated thermocouple can be replaced.

MTCV is an automatic proportional thermostatic control valve. A thermocouple is placed in the valve plug to react to temperature changes.

If water temperatures increase above the reference point thermocouple expands and the valve cone moves towards the valve seat, thus limiting the recirculation flow.

If the water temperature drops below the reference point thermocouple valve opens allowing more flow on the circulation pipe. The valve is in equilibrium (= nominal flow rate calculated) when the water temperature has reached the set valve.

MTCV adjustment feature is illustrated in Fig. 4, version 1-A.

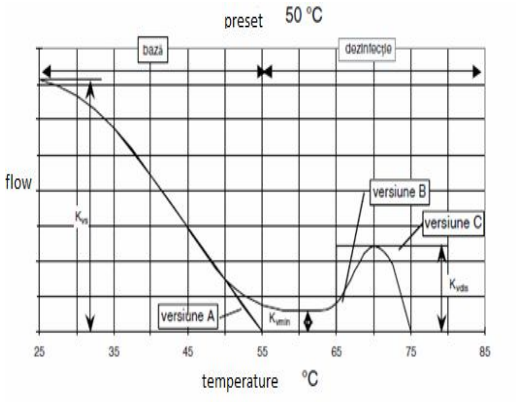

Fig. 4. *Adjusting Features of MTCV*

• A basic version

• Version B: Kvmin = 0.15 m3 / h - minimum flow bypass when main control module is closed.

* Kvdis = 0.60 m3 / h for DN 20

* Kvdis = 0.50 m3 / h for DN 15 - Max flow of disinfection process at a temperature of 70 ° C.

Regulating feature of MTCV

• Version C:

* Kvdis = 0.60 m3 / h for DN 20 and DN 15 - flow through MTCV when disinfection module is fully open (adjusting to the thermal actuator TWA-NC).

* Kvdis - Kv during disinfection

When the water temperature is 5 ° C above the set point, the flow through the valve is stopped.

A special seal protects the thermocouple from direct contact with water, which extended her life and at the same time, ensures precision control.

A safety spring protect the thermocouple against damage when the water temperature exceeds the set point value.

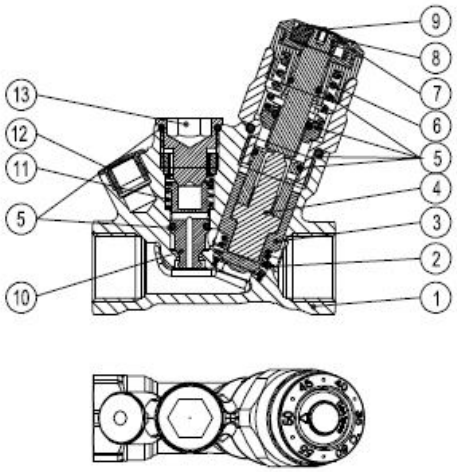

Fig. 5. *Design - Basic version - A*

1. Valve Body 2. Spring 3. Cone 4. Thermocouple 5. O-ring 6. Safety spring 7. Control ring 8. Control button 9. Setting sealing stopper 10. Disinfection module Cone 11. Safety spring 12. Thermometer Plug 13. Disinfection module plug.

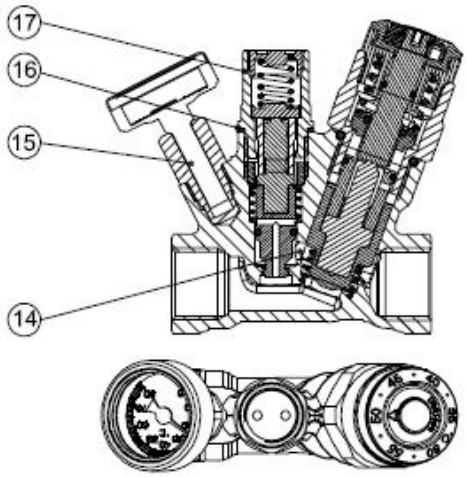

Fig. 6. *Automatic version - B ** thermometer is an accessory*

Fig. 6 automatic version – B ** thermometer is an accessory

1-13 as described in FIG. 5

14 - Bypass for disinfection, 15 - Thermometer, 16 - copper Seal 17 - disinfection module;

2.1. Location of Automatic proportional valve in thermostatic DHW system

MTCV standard version - A can be retrofitted easily and quickly to the position of thermal disinfection against Legionella in hot water systems.

After removing the plug from the connector, disinfection can be carried out under working pressure) can be mounted disinfection module.

Disinfection module will control the flow regulator according to its characteristics, thus making thermal disinfection of hot water facility.

Mounted disinfection module automatically opens a bypass Kv min = 0.15 m3 / h, allowing the flow to disinfection. A version of this bypass MTCV is always closed to prevent sedimentation of dirt and limestone. The MTCV module can be retrofitted with disinfection even after long hours in version without the risk of bypass lock.

The A version operates in temperature range 35-60 ° C. When hot water temperature rises above 65 ° C, the disinfection process is launched - which means that the flow through the main valve seat MTCV stops and opens bypass "flow disinfection." Adjustment function is now executed by the disinfection module that bypass open when the temperature is above 65 ° C.

The disinfection process is carried out until reaching a temperature of 70 ° C. If the hot water temperature increases further, the flow through the bypass disinfection is reduced (the thermal balancing system during disinfection) and at the temperature of 75 ° C flow stops. This is to protect the hot water system against corrosion and scale deposition and to reduce the risk of burns.

Optionally a thermometer can be installed in both versions, A and B, to measure and inspect the temperature of hot water recirculated.

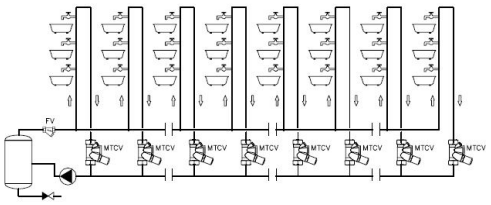

Fig. 7. *Example of MTCV / basic version / location in hot water system*

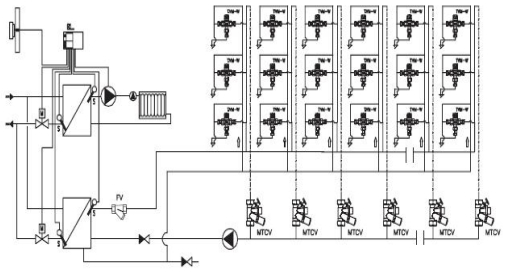

Fig. 8. *Schematic layout of hot water recirculation - automatic version.*

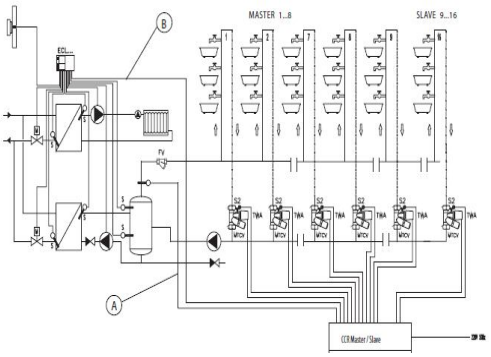

Fig. 9. *A) Indirect heating system Connection with instant parallel hot water production system - CCR-2 system independent B) indirect heating system Connection with instant parallel instantaneous DHW production - CCR-2 dependent system*

MTCV versions "A" and "B" can be retrofitted to an electronically controlled disinfection process (Version C).

After removing the cap disinfection, a thermal actuator TWA can be mounted.

In the head should be mounted a thermometer Pt 1000 temperature sensor.

Thermal actuator and sensor are connected to the controller CCR-2 that allows an efficient disinfection for each riser circulation. The main control module is working in the temperature range 35-60 ° C. When the disinfection / hot water treatment begins, CCR-2 controls the flow through TWA thermal actuators MTCV through.

3. Conclusions

The advantages of electronically controlled disinfection process with CCR-2 are:

- complete disinfection process control on each riser.
- total length of disinfection optimisation.
- Selection of optional temperature disinfection.
- Selection of optional disinfection period.
- measuring and monitoring online water temperature in each riser.
- possibility for connection regulator station heating or boiler room (i.e. Danfoss ECL) or a BMS (RS 485).

References

1. Petitjean, R.: *Total hydronuc balancing. A handbook for design and trouble-shooting of hydronic systems* , Sweden 1997 by Responstrych, Sweden;
2. Jauschowetz, R: *Rheart-warming hydraulic balancing*, Vienna Herz Armaturen Ges.mbH © 2004;
3. Danfoss - *Sheet Multipurpose balancing thermostatic valve MTCV*.
4. Boyle, G.: *Renewable Energy.* Glasgow. Oxford University Press, 200