

ESU – mixing nodes of water heaters



proposal and consultation
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ErP conform



EC motor

Technical parameters

■ ESU – mixing node

The mixing node is used to control the flow of heating water to MBW water heaters (IBW) up to a heating power of 120 kW. ESU designation Cxx – Vyy, where xx in the type symbol indicates the type of pump, yy indicates the Kv value of the mixing valve. Control is provided by a BELIMO servo motor. Version A is with a 0–10V analogue controlled servo drive, it is primarily intended for control from a customer control system. Version B is with a three-point servo drive, intended for control by a Digireg® controller.

In addition to power regulation, the control system also protects the water heater against freezing. Performance regulation is provided by mixing the inlet water with the return at a constant water flow. The mixing node, in conjunction with other system components, protects the heater against freezing. The water flowing through the node must not contain impurities, solid impurities and aggressive chemical substances that damage copper, brass, stainless steel, zinc, plastics, rubber. The highest permitted operating parameters of the heating water are as follows:

- maximum fluid temperature +110 °C
- minimum fluid temperature +2 °C
- maximum water pressure 1 MPa
- minimum water pressure 20 kPa
- relative air humidity 90 % non-condensing

The water temperature must not drop below the ambient air temperature during operation, as there is a risk of moisture condensation in the pump motor. The minimum operating water pressure ensures that air is not sucked in by the vent valve, which must be mounted at the highest point of the water circuit.

When designing the location of the mixing node, we recommend following the principles as below:

- follow the manufacturer's instructions for VO application
- the mixing done must always be fixed so that the shaft of the pump motor is in a horizontal position!
- the mixing node must be in such a position to ensure its venting
- when placed in the ceiling, it is necessary to maintain inspection and service access to the mixing node and venting valve

■ Dimensions and materials

The mixing nodes are produced in a performance series of ten sizes, which differ in pump type, three-way valve size, servo-drive type and connecting pipe diameter. The heating water connection is unified on copper pipes with a diameter of 3/4" and 1". The flow and pressure loss of the mixing node is determined by the size of the pump and the size of the control valve. (Kv in the range of 0.6 to 16).

■ Variant

The mixing node is fitted with two ball valves at the inlet to ensure the possibility of disconnecting the heating or cooling circuit during repairs. There is a filter in front of the mixing node. The four-way and three-way mixing node is controlled by a BELIMO servomotor of the HT series. The pump is located behind the mixer. The last letter (A, B) of the type symbol of the mixing node distinguishes the servomotor control method. The letter A indicates that the mixing node is fitted with a HT 24-SR-T servo drive, which is intended for continuous regulation (control by an analog voltage signal 0–10V). The letter B means that the node is designed to be controlled by a Digireg® controller and is fitted with a HT 24-3-S servo drive with three-point 24V control.

The maximum output is determined for a water temperature gradient of 80/60 °C.

■ Regulation

The mixing node is installed in front of the water heater. The pump ensures water circulation in the heater. The mixing valve controlled by a servo drive ensures performance regulation by mixing the return water from the heater and the heating water. When the control system is set to full thermal output, all water flows in a large circuit, i.e. from the boiler through the primary circulation pump to the mixing

Type	pump	L _{max} [mm]	pipng [°]	P _{max} [kW]
ESU C40-V0.6	UPM3Flex AS25-70 130	760	3/4	4
ESU C40-V1.0	UPM3Flex AS25-70 130	760	3/4	7
ESU C40-V1.6	UPM3Flex AS25-70 130	760	3/4	11
ESU C40-V2.5	UPM3Flex AS25-70 130	760	3/4	18
ESU C40-V4.0	UPM3Flex AS25-70 130	760	3/4	29
ESU C40-V6.3	UPM3Flex AS25-70 130	760	3/4	50
ESU C80-V6.3	Magna 1 25-80	760	3/4	55
ESU C80-V10	Magna 1 25-80	860	1	80
ESU C80-V16	Magna 1 25-80	860	1	127

Temperature gradient 80/60 °C, dT = 20 °C.
Max. output with pressure loss at the valve: 10–15 kPa.

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node, it goes through the filter, valve, SU pump, water heater and returns to the heating water header to boilers.

When reducing the power of the heater, the valve starts to let only a part of the water from the source through and thereby continuously lowers the temperature of the water flowing through the heater. If no heating power is required, water flows only in the heater circuit, i.e. that the valve allows the entire flow of water from the return through the pump to the exchanger. A four-way valve is used to prevent the water flow in the boiler circuit from completely stopping during regulation. The pump in the mixing node overcomes only the pressure losses of the heater circuit (ie the VO heater and all elements in the mixing node). The boiler circuit pump must therefore be sized to cover all pressure losses up to the mixing node (of the entire boiler circuit) at the nominal water flow, which was determined during the design of the water heater.

A three-way valve is used for mixing nodes with Kv up to 4.0. We recommend installing a bypass in front of the mixing node to ensure flow to the boiler, even when the mixing node is closed. With the bypass installed, the flow of the pump on the boiler is not affected, and the bypass also prevents the water in the boiler circuit from cooling down.

■ Installation and maintenance

The mixing node connects to the heater. The mixing node must never be exposed to load by straining and twisting the connected pipe. It is convenient to mount the mixing nodes on separate hangers using heating sleeves on the wall, pipes or on an auxiliary structure. When placed under a soffit, it is necessary to maintain inspection and service access to the mixing node for easy cable connection. The filter requires regular inspection, maintenance and cleaning. When assembling the node, it is necessary to turn the filter with the sludge container downwards. If the position is incorrect, there is a risk of increased clogging of the filter and its clogging. Reduced permeability or even non-permeability of the filter results in a significant reduction in the performance of the heater and increases the risk of the heater freezing.

Above all, during the test operation, it is necessary to check and clean the sludge tank. If the filter is often clogged, the entire heating circuit must be cleaned. Even during normal operation of the device, a regular check of the filter is necessary. When cleaning the filter, it is necessary to close all water ways to minimize water leakage from the system. The mixing node must always be installed in such a way that air can escape to the heater vent or the boiler circuit vent.

The mixing node must be fixed so that the shaft of the pump motor is in a horizontal position. After watering the system,

the circulation pump must be vented according to the manufacturer's instructions (Grundfos). The desired pump speed is indicated for each mixing node. This is set with a rotating plastic wheel on the pump during assembly. When connecting the mixing node, it is necessary to check the correct setting of the valve and servo drive. With the assembled mixing node, the position of the inner segment of the mixer can be recognized by the fit on the face of the shaft extension. The perpendicular to the seating surface for a three-way valve points to the axis of the inner segment, for a four-way valve the perpendicular points to the axis of the inner segment.

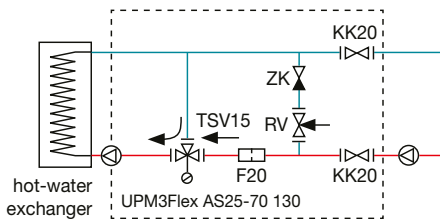
For the version with a three-way valve, proceed as follows. Out of the three paths, the valve always has the path to which the chamfered surface on the valve shaft is directed closed. With the assembled mixing node, the setting can be recognized by the notch on the face of the shaft extension. The notch always points towards a closed waterway. For the version with a four-way valve, proceed as follows. Of the four paths, the valve always has the path between which the cut-out on the face of the servo drive shaft is closed.

■ Information

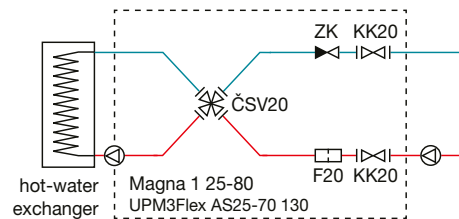
The mixing node cannot be used for flow regulation in cold water systems. We recommend the use of ESUCH nodes to regulate the performance of water coolers.

Supplementary image

Standard connection



three-way mixing node Kv 0.6–4.0



four-way mixing node Kv 6.3–16