



PROFACTOR®
DER DEUTSCHE QUALITÄTSSTANDARD

EN

TECHNICAL DATA SHEET AND USER MANUAL



PRODUCT CODE

PF RVM 389.20
PF RVM 389.25
PF RVM 389.32
PF RVM 390.20
PF RVM 390.25
PF RVM 390.32

**THREE-/FOUR-WAY
MIXING VALVES**

1. PURPOSE AND SCOPE

Rotary control valves are designed to control the flow of heat transfer agent in the heating and cooling systems (heating with radiators, heating in the floor and other surface systems).

Three-way mixing valves are generally used as blending, but may also be used as a separator. Four-way mixing valve should be used if high return temperature is required (for example, using equipment for solid fuels). In other cases, the three-way mixing valves are preferable.

Rotary valves may be used on pipelines transporting liquid environments, non-aggressive to the product material: water, glycol-based heat transfer agent with additives, which neutralize the dissolved oxygen. The maximum content of glycol up to 50%. The operation of the valve may be done both manually and by means of the electric drive with torque of at least 5 Nm.

2. TECHNICAL SPECIFICATIONS

Three-way mixing valve (PF RVM 389):

Nominal size DN: 20 mm to 32 mm

Connecting thread G: 3/4" to 1 1/4"

Nominal (conditional) pressure PN: 10 Bar

The maximum pressure drop across the valve Δp : 1 Bar (Mixing) / 2 Bar (Separating)

Capacity Kvs at $\Delta p=1$ Bar: 6,3 m³/h to 14,5 m³/h

The maximum value of leakage when the valve is closed, % from Kvs, at Δp :
0,05% (Mixing) / 0,02% (Separating)

Temperature of the working environment: -10°C to +110°C

Four-way mixing valve (PF RVM 390):

Nominal size DN: 20 mm to 32 mm

Connecting thread G: 3/4" to 1 1/4"

Nominal (conditional) pressure PN: 10 Bar

The maximum pressure drop across the valve Δp : 1 Bar

Capacity Kvs at $\Delta p=1$ Bar: 6,3 m³/h to 14,5 m³/h

The maximum value of leakage when the valve is closed, % from Kvs, at Δp : 1%

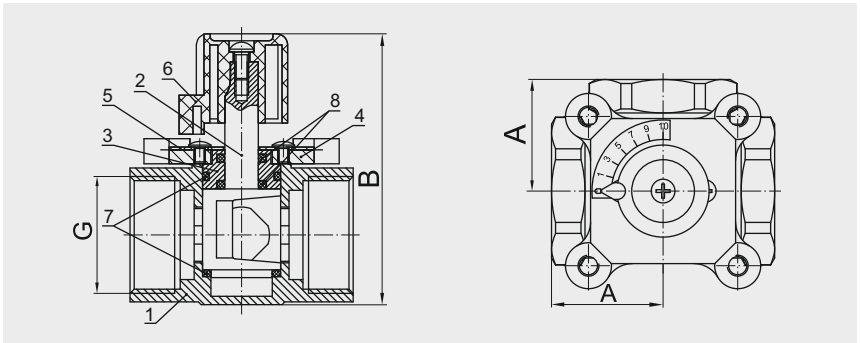
Temperature of the working environment: -10°C to +110°C

3. DESIGN

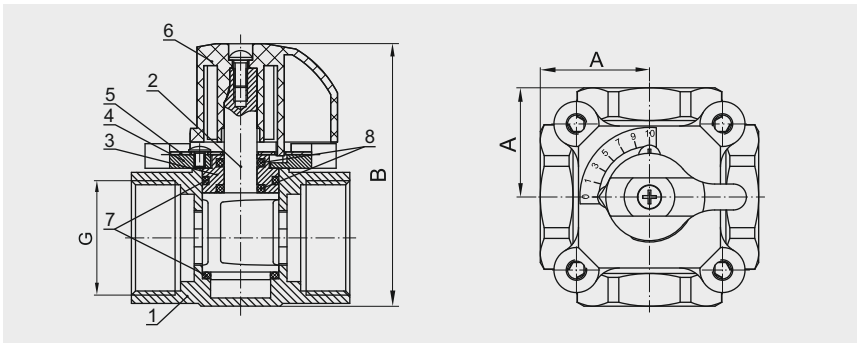
The valve does not provide a sealed flow overlap, and is not a shut-off valve! All cylindrical tube threads are in an accordance with DIN EN ISO 228-1, and all metric threads are in an accordance with DIN ISO 261.

Three-way mixing valves have shutter with segmental gate, and four-way mixing valves — shutter with bypass damper plate. Three-way mixing valves have possible angle of rotation of 360 degrees. Four-way mixing valves have driving lever (6) with a rotation limiter which limits the rotation angle up to 90 degrees. The plate (5) has a scale graded from 0 to 10.

Three-way mixing valve (PF RVM 389)



Four-way mixing valve (Code PF RVM 390)



1 – Body

2 – Rotary shutter

3 – Sleeve

4 – Flange

5 – Plate with the scale

6 – Lever

7 – Big sealing ring

8 – Small sealing ring

4. MATERIALS

Body 1 — CW617N (DIN EN 12165-2011)

Details 2, 3 — CW614N (DIN EN 12164-2011)

Flange 4 — Zinc alloy

Plate 5 — Aluminum (DIN EN 1676)

Lever 6 — ABS

Sealing rings 7, 8 — EPDM

5. NOMECLATURE AND DIMENSIONS

Three-way mixing valve (PF RVM 389)

Product Code	PF RVM 389.20	PF RVM 389.25	PF RVM 389.32
DN	20	25	32
G	3/4"	1"	1¼"
Kvs at $\Delta p=1$ Bar, m ³ /h	6,3	10	14,5
A, mm	36	36	40
B, mm	86	89	98
Weight, g	668	750	862

Four-way mixing valve (PF RVM 390)

Product Code	PF RVM 390.20	PF RVM 390.25	PF RVM 390.32
DN	20	25	32
G	3/4"	1"	1¼"
Kvs at $\Delta p=1$ Bar, m ³ /h	6,3	10	14,5
A, mm	36	36	40
B, mm	86	89	98
Weight, g	751	834	1010

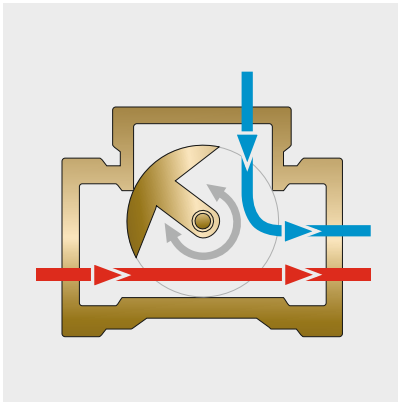
6. PRINCIPLE OF OPERATION

The three-way mixing valve may act as flow mixing or flow separation. By turning the shutter in one direction the passage of hot liquid will gradually open and equally close for the cold liquid (return flow from the heater).

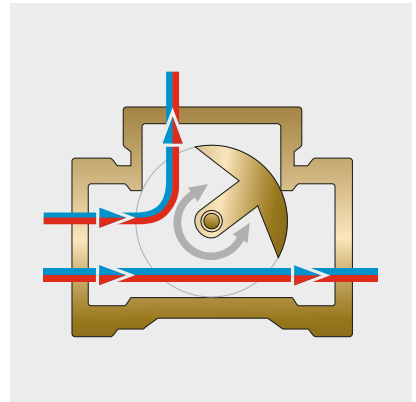
This increases the temperature of mixable working fluid (flow for heater) at an almost constant flow rate. The required temperature in the system is achieved by adding the necessary amount of liquid flowing from the return pipe to the boiler feed.

Principle of operation Three-way mixing valve:

Mixing the flow



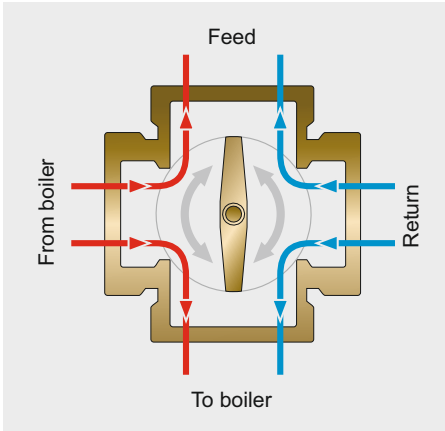
Separating the flow



Four-way mixing valve works on the principle of double-pass, i.e. the water from the boiler is mixed with a certain portion of the water from the return. When the passage of the hot water is closed, the bypass return path to the heater opens to achieve the desired water temperature in the circulating flow.

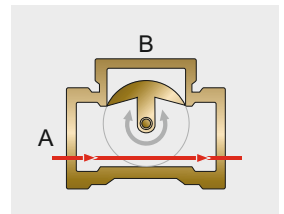
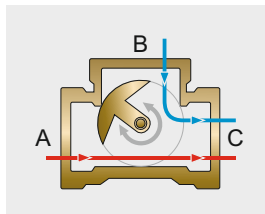
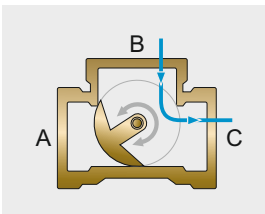
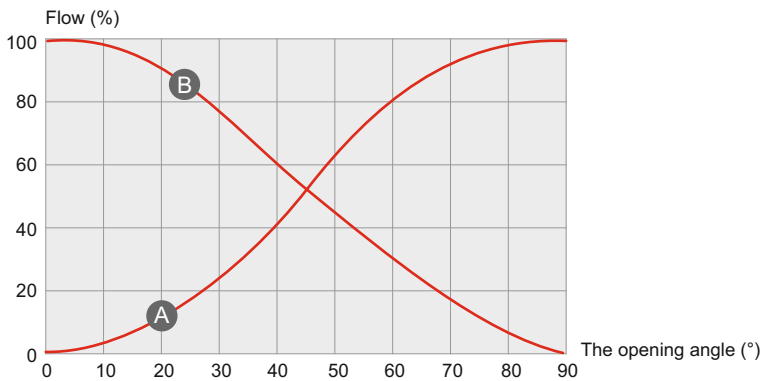
In this case water returning to the boiler reaches a higher temperature than with the three-way valve use. This reduces the risk of low-temperature corrosion in liquid and solid fuel fired boilers, and thus extends the operation of the boiler.

Principle of operation Four-way mixing valve:

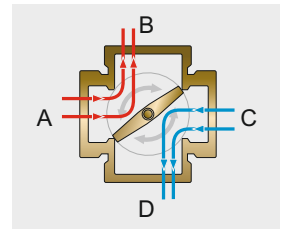
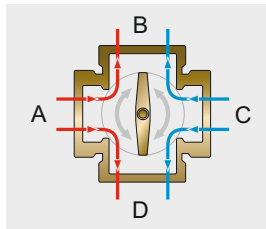
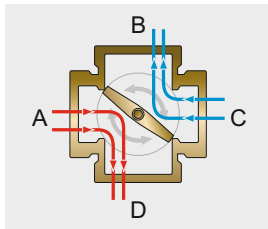
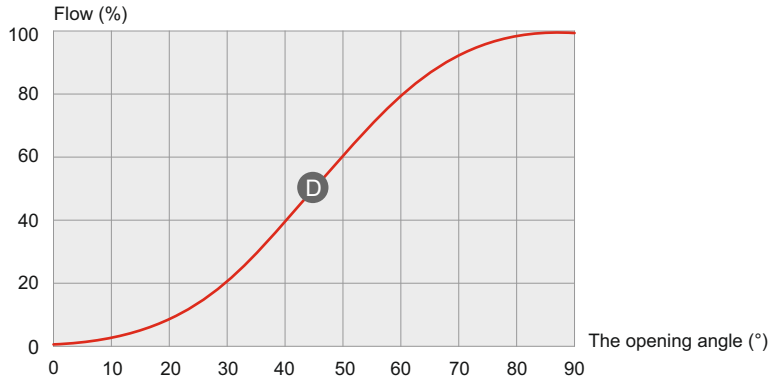


7. VALVE CHARACTERISTICS

Three-way mixing valve:



Four-way mixing valve:

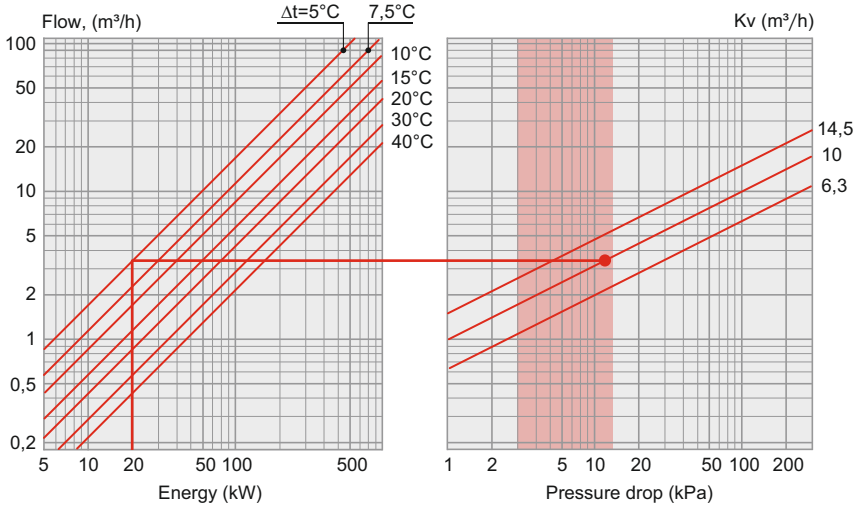


8. VALVE NOMINAL SIZE SELECTION

Each valve has its own flow factor (Kv), knowing which it is possible to determine the best valve for your system. The pressure drop range should be between 3 – 15 kPa (0.03 – 0.15 bars). If two valves fit this pressure drop range, valve with a lower flow factor is selected. For radiator heating systems, $\Delta t = 20^\circ\text{C}$ is commonly used, while $\Delta t = 5^\circ\text{C}$ is used for floor heating systems.

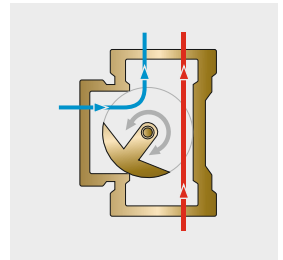
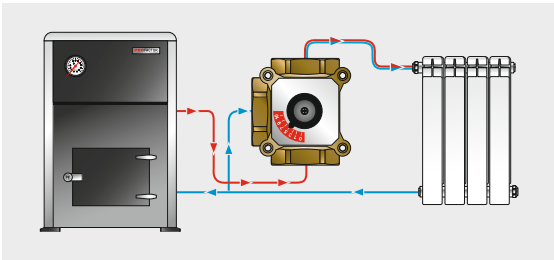
When glycol is added to the heat carrier (water) the viscosity increases and the heat capacity of this heat carrier changes, which also should be considered when selecting a valve. If the glycol content is between 30% – 50%, then a valve with a higher Kv value (by one level) must be selected. Lower glycol content does not affect the valve performance.

Valve nominal size selection chart:

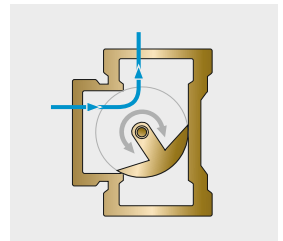
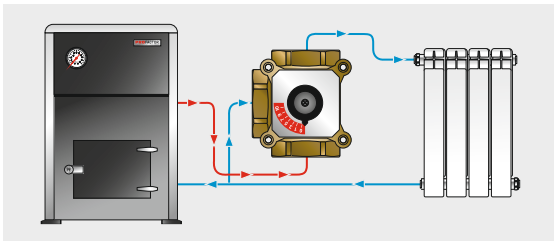


9. CONNECTION EXAMPLES

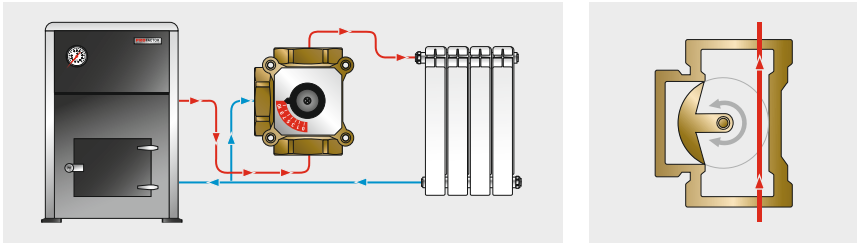
Scheme of the work of the three-way mixing valve in the mixing mode, a semi-open (operation)



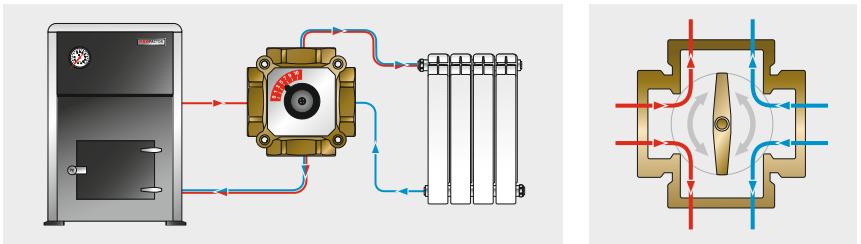
Scheme of the work of the three-way mixing valve in the complete closure mode



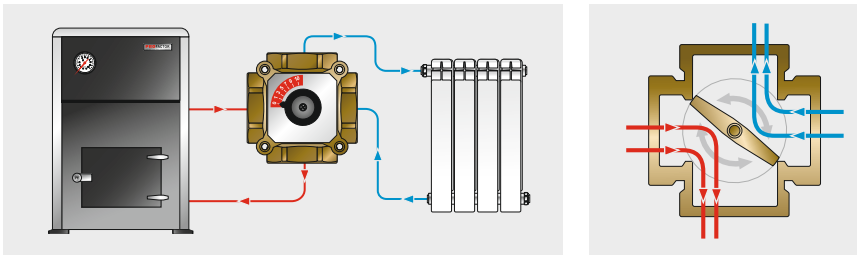
Scheme of the work of the three-way mixing valve in the fully open mode



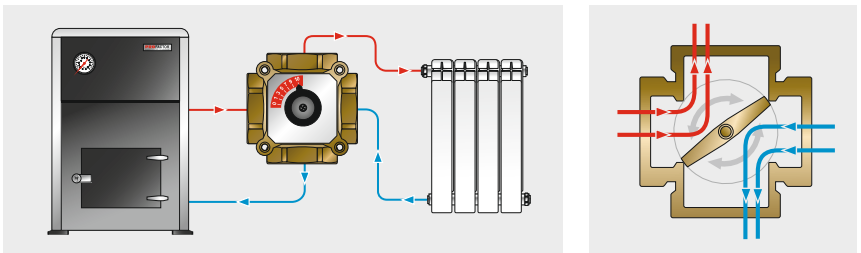
Scheme of the work of the three-way mixing valve in the mixing mode, a semi-open (operation)



Scheme of the work of the three-way mixing valve in the complete closure mode



Scheme of the work of the three-way mixing valve in the fully open mode



10. INSTALLATION INSTRUCTIONS

Before the valve installation the pipe must be clean of rust, dirt, scale, sand, and other foreign matter that affect the product performance. Heating, heat supply, hot and cold-water supply systems, as well as boiling room pipes must be washed with water after the installation until water comes out with no mechanical impurities.

When making manual adjustments the valve can be installed in any position (connecting with a parallel pipe thread). With automated control of the valve a sufficient space for installation/dismounting of the electric actuator must be provided. Additionally, the valve should be installed in a position, where the electric actuator will be located on the side or top of the valve. Installation of the electric actuator must be carried out in accordance with the instructions found in the passport of the given actuator.

The three-way valve function (mixing / division), as well as the direction of the heat carrier flow are chosen during installation. Depending on the choice, the plate with the scale must be rotated/turned over according to the desired rotation of the flap. To do this, take off the handle, unscrew the two fixing screws of the plate and place it in the required position.

The valve should not experience the stress from the pipe (bending, compression, elongation, torsion, skewness, vibration, misalignment of connectors, uneven tightening of the fasteners). If necessary, supports or compensators should be provided to reduce the load on the valve from the pipe. Misalignment of connected pipes should not exceed 3 mm with the length of up to 1 m, plus 1 mm for each subsequent meter. The valve should be securely attached to the pipe, the leakage of the working fluid through the threaded parts is not allowed.

Threaded connections must be completed using sealing material for winding up the threads — PTFE-tape (PTFE — polytetrafluoroethylene, Teflon sealing material), polyamide thread with silicone or flax. It is necessary to ensure that excess sealing material does not reach the regulating parts of the valve.

To prevent damage to regulating parts it is advised to install a mechanical filtration system ahead of the valve. Inspect the accuracy of installation.

A manometric leak test of the system is necessary after installation. This test allows the system to be protected from leaks and damage associated with them.

11. OPERATING AND MAINTENANCE

Rotary control valves should be operated without exceeding the pressure and temperature found in the technical specifications table.

Installation and dismantling of equipment, as well as any repair or adjustment operation must be carried out with no pressure in the system. Allow equipment to cool down to ambient temperature. The valve design does not allow using it as a shut-off valve (leakage value is listed in the Section 2 (technical specifications)).

12. WARRANTY OBLIGATIONS

The warranty period is 12 months from the date of sale to the end consumer. Throughout the entire warranty period, the manufacturer guarantees the proper functioning of the product and its compliance with safety requirements, provided that the consumer follows the rules for storage, transportation, installation, operation, and maintenance of the product. The warranty covers all defects arising through the manufacturer's fault.

The warranty does not cover defects resulting from:

- Violation of storage, transportation, installation, operation, or maintenance conditions;
- Exposure to substances aggressive to the materials of the product;
- Signs of mechanical damage;
- Damage caused by fire, natural disasters, or other force majeure circumstances;
- Damage caused by improper actions of the user;
- Evidence of unauthorized interference with the product design.

The product described in this technical manual is a technically complex device that must be installed by a qualified specialist with appropriate experience working with this type of equipment.

Installation and commissioning must be carried out by an authorized and certified company.

Profactor Armaturen GmbH reserves the right to make changes to the product design that do not affect its technical characteristics or functional features.



INTERNATIONAL WARRANTY CARD

NAME OF THE PRODUCT

PRODUCT CODE, SIZE

QUANTITY

SELLER NAME AND ADDRESS

DATE OF PURCHASE

SELLER STAMP

SELLER SIGNATURE

For the warranty term refer to the Warranty obligation clause in the technical manual

FOLD LINE

FOLD LINE

In case of any claims to the product quality the following documents should be submitted:

1. Application with customer and product details:

- Name of the customer, actual address and phone number
- Article of the product
- Reason for the claim and photo
- Plumbing system where installed (name, address, phone number)

2. Invoice copy and receipt

3. Warranty card

RETURN/EXCHANGE COMMENTS

DATE

SIGNATURE



Profactor Armaturen GmbH

Ruffinallee 9, c/o Kanzlei Antegra, 82166 Gräfelfing, Germany;
Tel.: +49 89 21546092; info@pf-armaturen.de; www.profactor.de