

RS Series Three Way Rotary Valves

The "RS" Series Three Way Rotary Valves, consist of a duty rotary valve at quarter turn with electrical or pneumatic actuators. Model RS Valves provide a high degree of accuracy and repeatability for accurate temperature control. The valves are equally accurate in mixing or diverting service over a wide flow range. The heavy-duty design of the rotor, requires low torque in spite of a high flow coefficient (K_v), without high maintenance requirements.

Intended use

The valves, are designed to be fitted on pressure pipeline between flanged connections, with the purpose to modulate the flow rating of fluids of "Group 2". (Non Dangerous Fluids, according to article 9, point 2.1 and 2.2 of the European Pressure Equipment Directive 2014/68/EU).

In accordance with art. 2 point 3, the valves are not CE marked. The valve is part of automatic handling equipment, and represents the interface between the low level energy of the controller and the high level energy of the fluid to be controlled.

Operation

The valves are combined with a quarter turn actuator, and produces a well defined rotation of the rotor in correspondance of an equivalent signal. The movement of the rotor, defined from the signal coming from the controller, supplies a characterised flow passing through the valve, depending from the rotor profile and the process parameters.

Description

The "RS" Series The Three Way Rotary Valve, fully complies with UNI-DIN standards. The valves are available in S.G. Iron body material, UNI-DIN flanged connections and sizes from DN100 up to DN400. The pressurised element consists of different parts (body, bonnet, shaft, rotor, etc.) suitable to retain the fluid at the operating and design conditions (pressure and temperature). The flow rate is controlled by the rotor position compared to the valve connections.

The inlet and outlet connections are located on the same plane, their dimensions are defined by standards (IEC, etc.) to allows the product interchangeability within the respect of the safety criteria's. The valve is mechanically coupled to the rotor actuator consisting of different parts (Electrical motor or pneumatic piston, gears, hand-wheel, etc.). The electrical motor or the pneumatic piston, are the element that convert the auxiliary energy of the signal, into mechanical force capable of moving the rotor position, exceeding the dynamic force of the fluid and the resistance friction.



Electric operating with mod. SG actuators

| Valve size/actuators combinations | Actuators |
|-----------------------------------|-----------|
| DN100÷200 | SG1 |
| DN250÷300 | SG2 |
| DN350÷400 | SG3 |



Fig. 1 - Actuator SG

Actuator Technical Specifications

Quarter-turn Electric Actuator, power supply 230 V/60 Hz/3 Ph*, IP67 watertight execution, handwheel for emergency maneuver, anti-condensation heater, N° 2 Position limit switches, N° 2 torque limiters, opening mechanical indicator, 1000 ohm potentiometer for position retransmission, designed to be mounted directly on the valves.

Included Accessories(standard)

Driving Actuating unit MDU100 type, 4-20 mA control signal, 4-20 mA valve position retransmission, built-in motor starter assembly, control selectors LOC/REM

* actuators with different power supplies are available On request; please contact Spirax Sarco.

Pneumatic operating with mod. AP actuators

| Valve size/actuators combinations | Actuators (double effect) | Actuators (simple effect) |
|-----------------------------------|---------------------------|---------------------------|
| DN100÷200 | APM04D | APM05S |
| DN250÷300 | APM06D | APM08S |
| DN350÷400 | APM08D | APM10S |



Fig. 2 - Actuator AP

Actuator Technical Specifications

Quarter-turn pneumatic Actuator, anodized aluminum body, epoxy coated die-cast aluminum end plates, stainless steel hardware.

Included Accessories (standard)

- **On-off Optional setting:** Solenoid Valve, watertight box with No. 2 micro mechanical SPDT
- **Pneumatic Optional setting (with control signal 0,2÷1,0 bar):** pneumatic positioner mod. PP5M, reducing filter mod. FR75M.
- **Electropneumatic Optional setting (with control signal 4÷20 mA and 4-20 mA valve position retransmission):** Positioner mod. SP500M, reducing filter mod. FR75M.

Tab. 1 - "RS" Series Valves categorisation

| "RS" Series Valves Ped Categorisation | | | | | | | | | |
|---------------------------------------|-------------|-------------|---------|-----|-----|-----|-----|-----|-----|
| Body Material | Connections | Body Rating | Liquids | | | | | | |
| | | | Group 2 | | | | | | |
| | | | 100 | 150 | 200 | 250 | 300 | 350 | 400 |
| Ghisa Sferoidale | PN6 | PN6 | SEP | SEP | SEP | SEP | SEP | SEP | SEP |
| | PN10 | PN10 | SEP | SEP | SEP | SEP | - | - | - |
| | PN16 | PN16 | SEP | SEP | SEP | SEP | - | - | - |

Tab. 2 - Pipe Connections

| Type | RS | |
|----------------|-----------------|--|
| Size | DN100-400 | DN100-250 |
| Connections | UNI-DIN PN6 | UNI-DIN PN10-16 |
| Inlet Pressure | 6 bar (maximum) | 10, 16 bar (maximum) according to the flanges rating |

Note: others flanged connections available On request; please contact Spirax Sarco.

Tab. 3 - Specifications

| Type | RS |
|-----------------------|--|
| Fluids | - Fresh water - Sea water (Coating in CeramAlloy™) - Lubricant Oil |
| Differential Pressure | Through the valve: - Full port - 15 psi (maximum) |
| Leakage Rate (Max) | All sizes: - Diverting valve - 1.6% - Mixing valve - 1.8% |
| Temperature Range | 0-110°C |

| | |
|---------|--|
| Options | Accessories (to be fitted with local temperature controls) - SxS Auto P.I.D. electronic temperature controller. - SxS RTD Sensor type TE - SxS PI pneumatic temperature controller |
|---------|--|

* On request the electric actuator can supply with, 380V or 440V and 50 or 60 Hz.

Tab. 4 - K_{vs} flow rate coefficients

| DN size | 100 | 150 | 200 | 250 | 300 | 350 | 400 |
|---------|-----|-----|------|------|------|------|------|
| Std. | 304 | 671 | 1234 | 1836 | 2782 | 3856 | 4480 |

N.B.

The K_{vs} flow coefficient is expressed in Metric Units (m³/h/ bar) with water temperature at 15°C. To convert K_{vs} into U.S. C_{vs} Units (gpm/psi), use the following factor : C_{vs} = K_{vs}/0.865

Dimensions

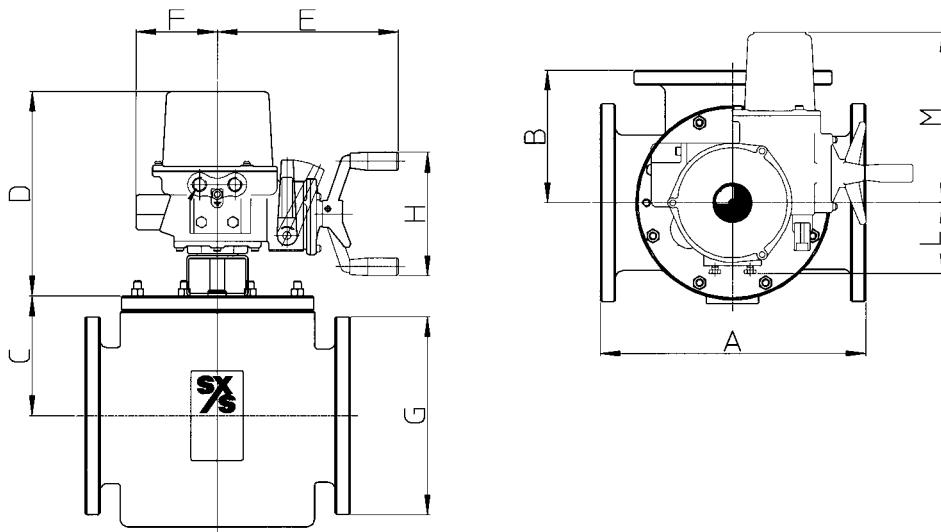


Fig. 3

mod. SG1 - DN100+200

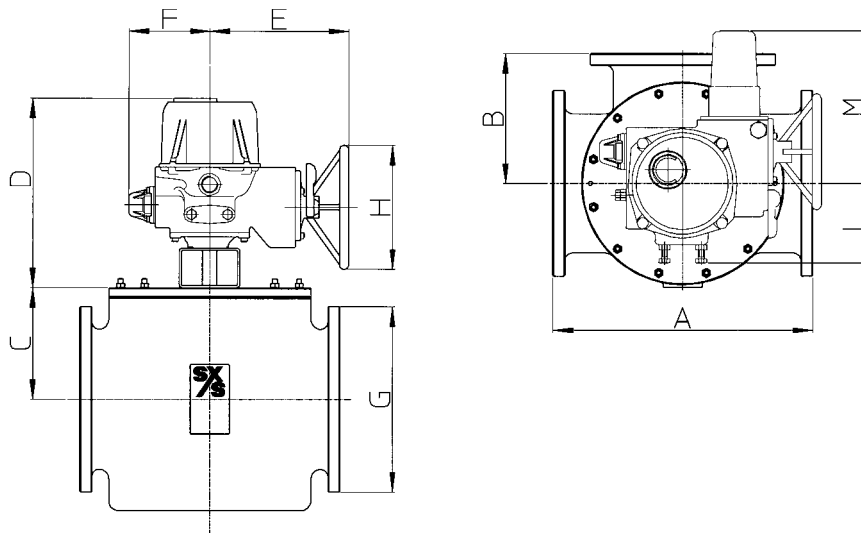


Fig. 4

mod. SG2 - DN250+300

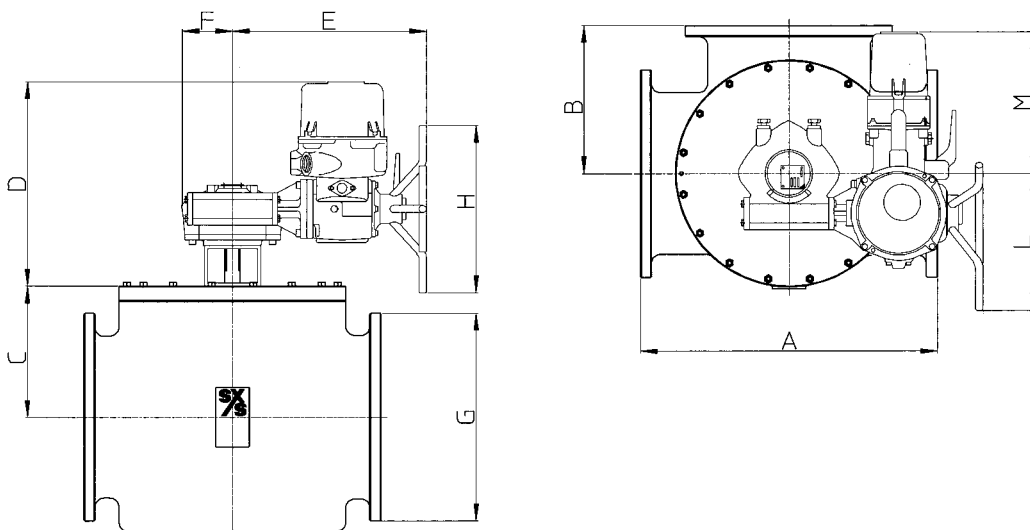


Fig. 5

mod. SG3 - DN350+400

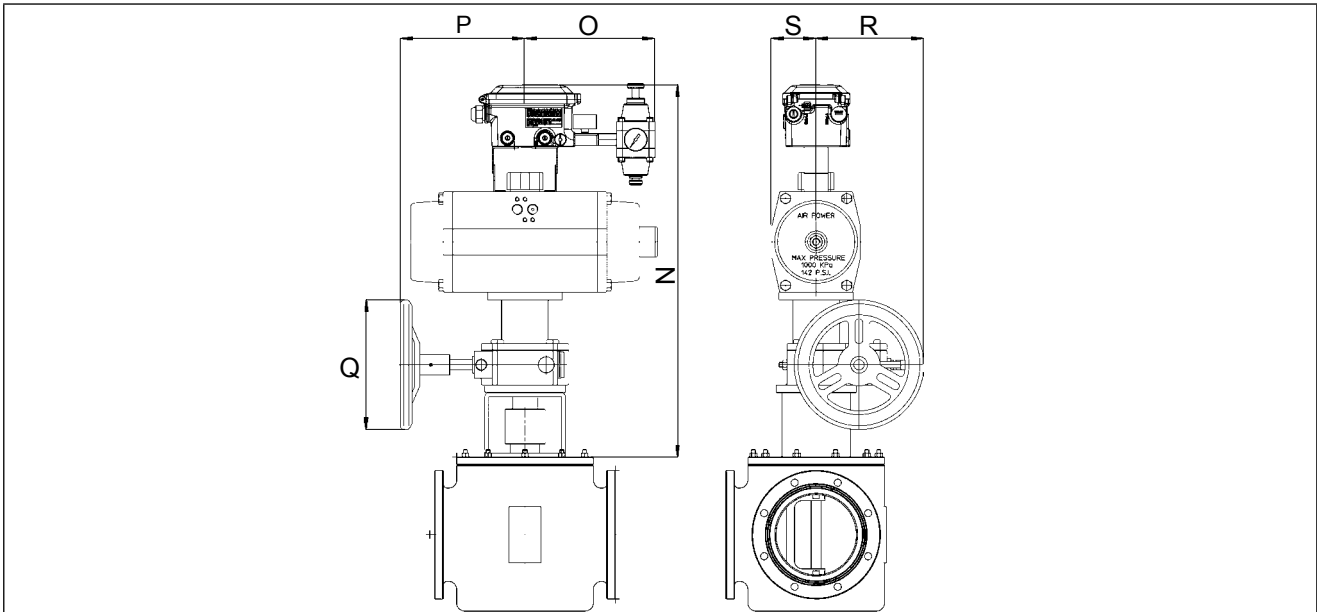


Fig. 6

mod. APM - DN100+400

Dimensions (Millimetres)

Tab. 5 - Body Valve Dimensions

| DN | A | B | C | PN6 Flanged | | | | PN10 Flanged | | | | PN16 Flanged | | | |
|-----|-----|-----|-----|-------------|----------|-----------|--------------|--------------|----------|-----------|--------------|--------------|----------|-----------|--------------|
| | | | | G | n° holes | on Φ | Φ holes | G | n° holes | on Φ | Φ holes | G | n° holes | on Φ | Φ holes |
| 100 | 300 | 150 | 131 | 210 | 4* | 170 | 18 | 220 | 8 | 180 | 18 | 220 | 8 | 180 | 18 |
| 150 | 355 | 178 | 160 | 265 | 8 | 225 | 18 | 285 | 8 | 240 | 22 | 285 | 8 | 240 | 22 |
| 200 | 450 | 225 | 194 | 320 | 8 | 280 | 18 | 340 | 8 | 295 | 22 | 340 | 12 | 295 | 22 |
| 250 | 525 | 263 | 226 | 375 | 12 | 335 | 18 | 395 | 12 | 350 | 22 | 405 | 12 | 355 | 25 |
| 300 | 600 | 300 | 282 | 440 | 12 | 395 | 22 | 445 | 12 | 400 | 22 | - | - | - | - |
| 350 | 700 | 350 | 309 | 490 | 12 | 445 | 22 | 505 | 16 | 460 | 22 | - | - | - | - |
| 400 | 800 | 400 | 330 | 540 | 16 | 495 | 22 | 565 | 16 | 515 | 25 | - | - | - | - |

* Local regulations may restrict the use whit oils.

Tab. 6 - Electric and pneumatic actuators dimensions

| DN | Electric Actuators | | | | | | Pneumatic Actuators | | | | | | | | | | | |
|-----|--------------------|-----|-----|-----|-----|-----|---------------------|-----|-----|-----|-----|-----|---------------|-----|-----|-----|-----|-----|
| | | | | | | | Double Effect | | | | | | Simple Effect | | | | | |
| | D | E | F | H | L | M | N | O | P | Q | R | S | N | O | P | Q | R | S |
| 100 | 300 | 245 | 110 | 165 | 100 | 236 | 643 | 220 | 277 | 200 | 155 | 55 | 658 | 220 | 277 | 200 | 155 | 70 |
| 150 | 300 | 245 | 110 | 165 | 100 | 236 | 643 | 220 | 277 | 200 | 155 | 55 | 658 | 220 | 277 | 200 | 155 | 70 |
| 200 | 300 | 245 | 110 | 165 | 100 | 236 | 643 | 220 | 277 | 200 | 155 | 55 | 658 | 220 | 277 | 200 | 155 | 70 |
| 250 | 380 | 280 | 165 | 250 | 130 | 300 | 739 | 220 | 338 | 200 | 155 | 73 | 823 | 220 | 345 | 300 | 225 | 108 |
| 300 | 380 | 280 | 165 | 250 | 130 | 300 | 739 | 220 | 338 | 200 | 155 | 73 | 823 | 220 | 345 | 300 | 225 | 108 |
| 350 | 470 | 420 | 105 | 430 | 315 | 300 | 803 | 220 | 338 | 300 | 213 | 108 | 908 | 220 | 345 | 500 | 325 | 145 |
| 400 | 470 | 420 | 105 | 430 | 315 | 300 | 803 | 220 | 338 | 300 | 213 | 108 | 908 | 220 | 345 | 500 | 325 | 145 |

Tab. 7 - Weights (approximate - Kg)

| Valve Size | DN100 | DN150 | DN200 | DN250 | DN300 | DN350 | DN400 |
|------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Electric Actuator | 50 | 71 | 116 | 173 | 232 | 364 | 450 |
| Pneumatic Actuator (Double Effect) | 51 | 72 | 117 | 158 | 245 | 347 | 433 |
| Pneumatic Actuator (Simple Effect) | 59 | 80 | 125 | 196 | 281 | 411 | 497 |

RS 3-way rotary valve

Principles of operation

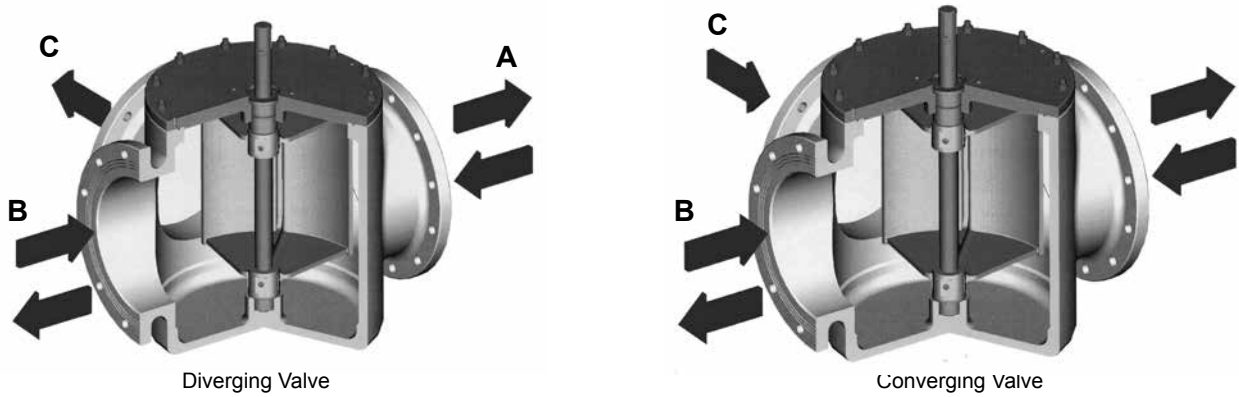
Operation of the 3-way rotary valve is simple and straightforward:

According to the application the service of the valve can be: diverging or converging.

In diverging service, flow enters the common port A or B and flows out of the other ports depending upon the position of the rotor.

In converging service, flow enters from A and C or B and C depending upon position of rotor and leaves through the common port.

All sizes have an external position indicator. Valve action can be reversed without removing the valve from the line and without additional parts.



Tab. 8 - Valve configuration

| Diverging Service | | Converging Service | |
|---|---|---|---|
| <p>DA</p> <p>4 mA (0,2 bar) 20 mA (1 bar)</p> | <p>DB</p> <p>4 mA (0,2 bar) 20 mA (1 bar)</p> | <p>MA</p> <p>4 mA (0,2 bar) 20 mA (1 bar)</p> | <p>MB</p> <p>4 mA (0,2 bar) 20 mA (1 bar)</p> |
| <p>DC</p> <p>20 mA (1 bar) 4 mA (0,2 bar)</p> | <p>DD</p> <p>20 mA (1 bar) 4 mA (0,2 bar)</p> | <p>MC</p> <p>20 mA (1 bar) 4 mA (0,2 bar)</p> | <p>MD</p> <p>20 mA (1 bar) 4 mA (0,2 bar)</p> |

The valve configuration, shows the rotor position with a signal of 4 mA or 0,2 bar (3 psi), and it is the safety position of the rotor on signal failure too.

Valve Sizing:

To select the valve nominal diameter, calculate the flow rate coefficient using (K_v), according to actual operating conditions for the fluid, by using the following formula. To obtain a satisfactory control and avoid hunting, do not oversize the valve (we suggest that the K_v should be 75-80% of the K_{vs}). Connection and valve body size will be the same as the valve port size, provided that fluid velocity is kept within acceptable limits (5 m/s approximately).

Liquids:

The following formula applies to liquids which do not tend to evaporate at operating temperature:

$$K_v = Q \cdot \sqrt{\frac{d}{\Delta P}}$$

where:

Q = flow rate volume (at operating temperature) - m^3/h

d = relative density of liquid rate (at operating temperature) - Kg/dm^3

ΔP = ppressure drop across the valve - bar

Correction factors for viscous liquids

For viscous liquids, multiply the K_v values calculated from the above formula by the following correction factors which are based on the viscosity expressed in Engler degrees:

| °Engler | 2 | 5 | 10 | 15 | 30 | 50 | 100 | 150 |
|-------------|------|------|------|------|------|------|------|------|
| Coefficient | 1,06 | 1,18 | 1,28 | 1,32 | 1,38 | 1,47 | 1,60 | 1,68 |

Tab. 9 - Materials

| N° | Part | Material | Designation |
|----|--------|------------------------|-------------------------|
| 1 | Body | Nodular cast iron | EN1563 GJS400-18-LT |
| 2 | Cover | Cast steel | ASTM A216 WBC |
| 3 | Rotor | Bronze | DIN 1705 Cu Sn5 Zn5 Pb5 |
| 4 | Shaft | Stainless steel | ASTM A351 CF8M |
| 5 | Gasket | O' Rings | Viton |
| 6 | Bushes | Bronze | DIN 1705 Cu Sn5 Zn5 Pb5 |
| 7 | Nuts | Zinc Plated Cast Steel | UNI 5587-6S |
| 9 | Studs | Cast steel | UNI 5909-4,8 |

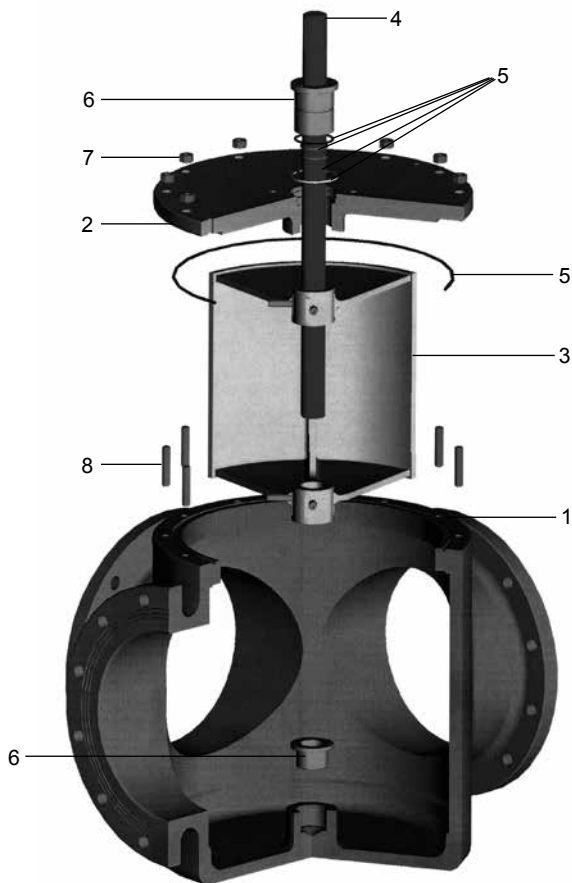


Fig. 7 - "RS" valve body

Valves spares

Always order spares by using the description given in the column headed "Available spares" (Tab. 10) and state the size and type of valve with the serial number.

Tab.10 - Available Spares

| Description | Item |
|--------------------------|---------|
| Valve gaskets Kit | 5 |
| Rotor Kit, shaft, bushes | 3, 4, 6 |
| Bushes | 6 |

Tab. 11 - Control valve nomenclature guide

| | Description | Example |
|----------------------------|--|----------------------------|
| Valve size | DN100, 125, 150, 200, 250, 300, 400 | DN250 |
| Valve series | RS | RS |
| Body/Rotor/Shaft materials | 7=S.G. Iron/Bronze/Stainless steel/Viton | 7 |
| Connections | 3=Flanged | 3 |
| Operation Modes | Mixing MA-MB-MC-MD Diverting DA-DB-DC-DD | MA |
| Stem sealing material | =Viton | |
| Rotor size | Standard full port | 0 |
| Flow coefficient | K _{vs} (to be specified) | K_{vs}=1836 |
| Connection type | PN6 PN10 PN16 | PN6 |
| Actuator Model | <p>Electrical Actuator SG1+MDU100/1=for DN100-200 valve size SG2+MDU100/2=for DN250-300 valve size SG3+MDU100/3=for DN350-400 valve size</p> <p>Pneumatic Actuator (double effect) APM04D=for DN100-200 valve size APM06D=for DN250-300 valve size APM08D=for DN350-400 valve size</p> <p>Pneumatic Actuator (simple effect) APM05S=for DN100-200 valve size APM08S=for DN250-300 valve size APM10S=for DN350-400 valve size</p> | SG2 |