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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

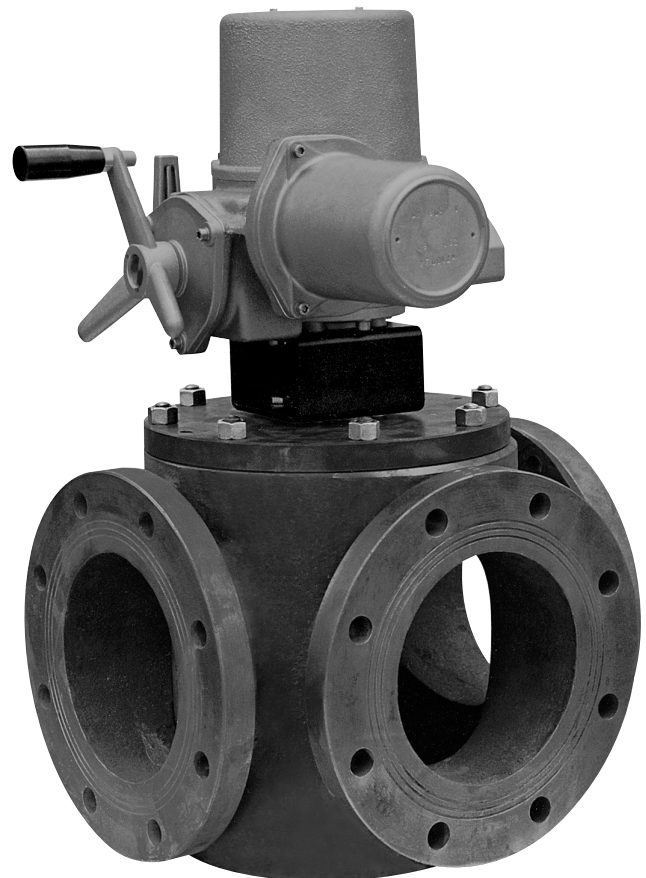
The valves are combined with a quarter turn actuator, and produces a well defined rotation of the rotor in correspondance of an equivalent signal. The movement of the rotor, defined from the signal coming from the controller, supplies a characterised flow passing through the valve, depending from the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

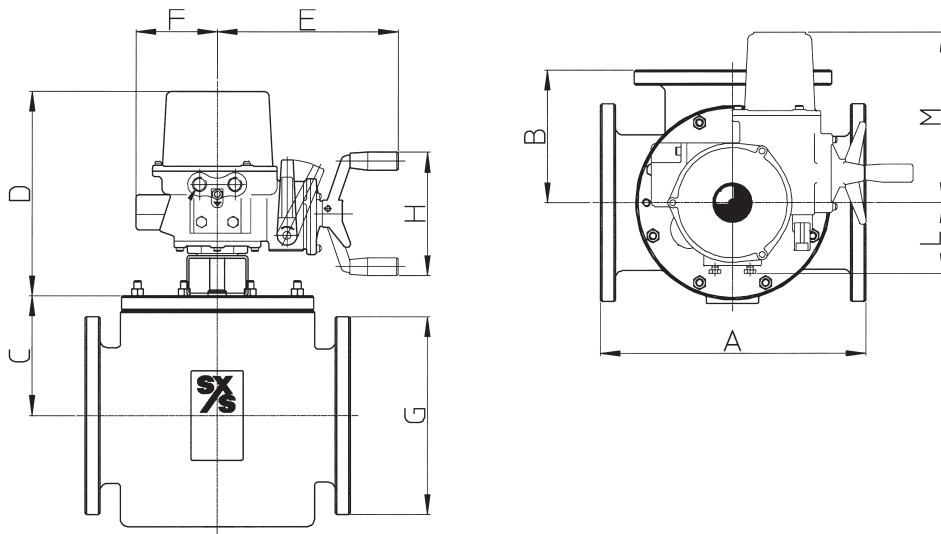


Fig. 3

mod. SG1 - DN100+200

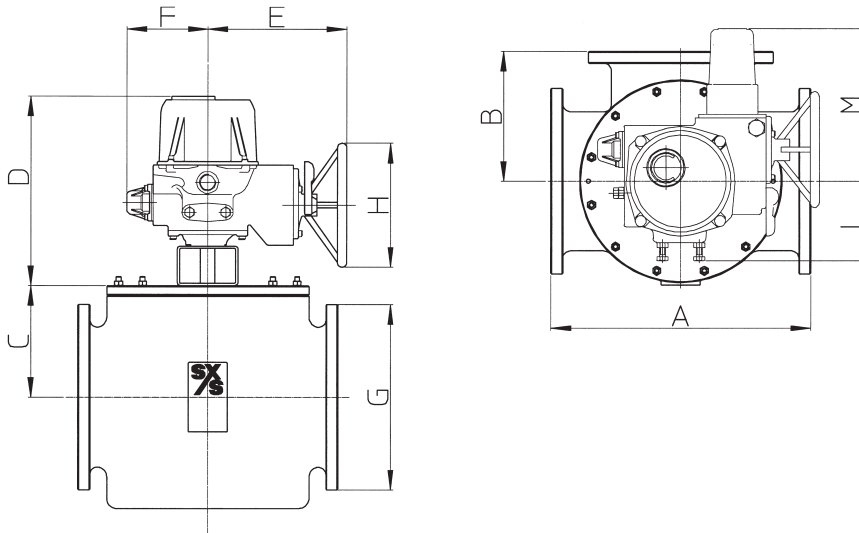


Fig. 4

mod. SG2 - DN250+300

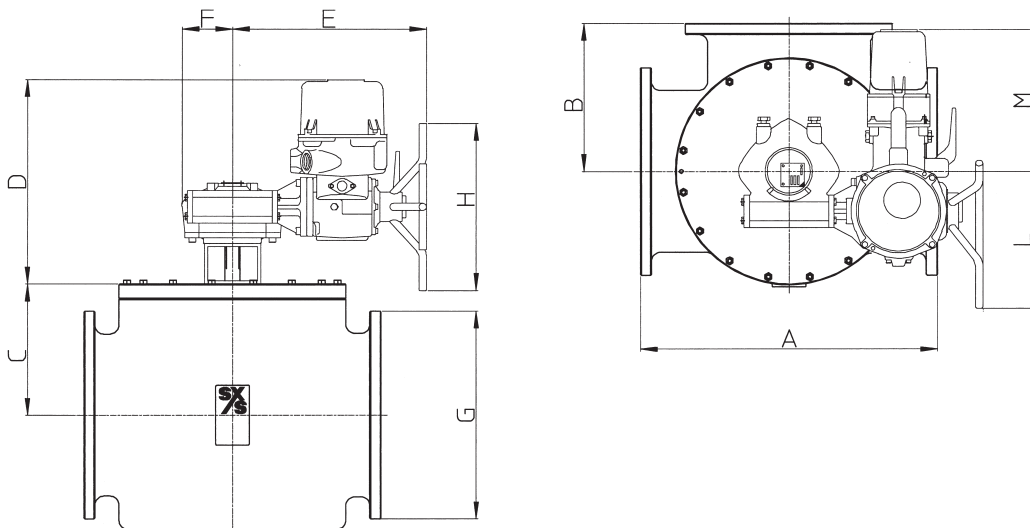


Fig. 5

mod. SG3 - DN350+400

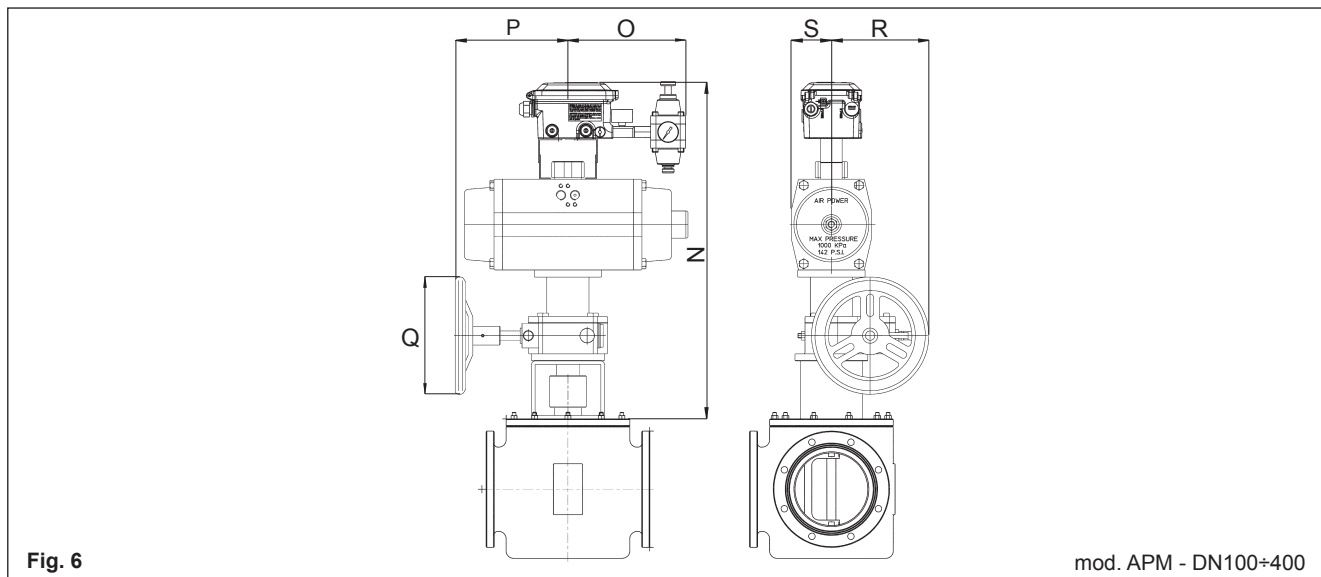


Fig. 6

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

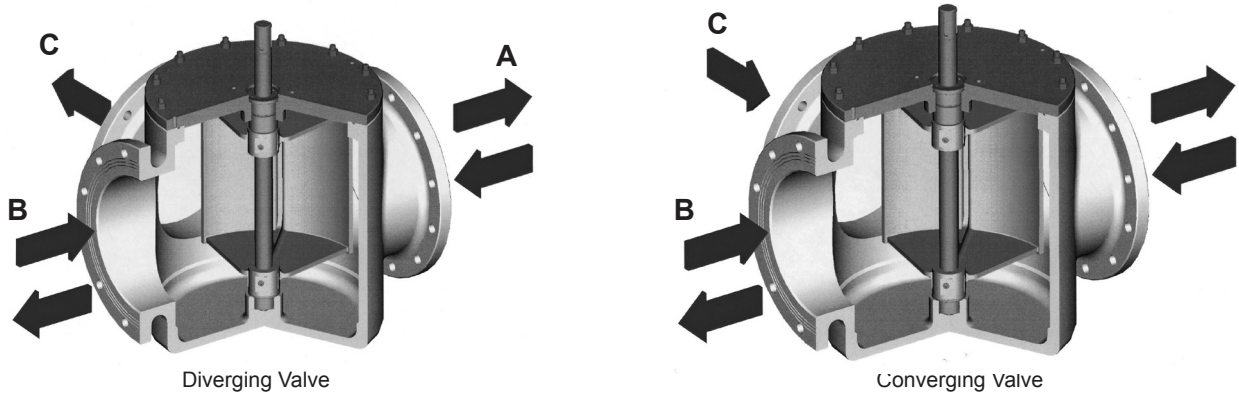
Operation of the 3-way rotary valve is simple and straightforward:

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) - m³/h

d = relative density of liquid rate (at operating temperature) - Kg/dm³

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
		Bronze	ASTM B148 C95800
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

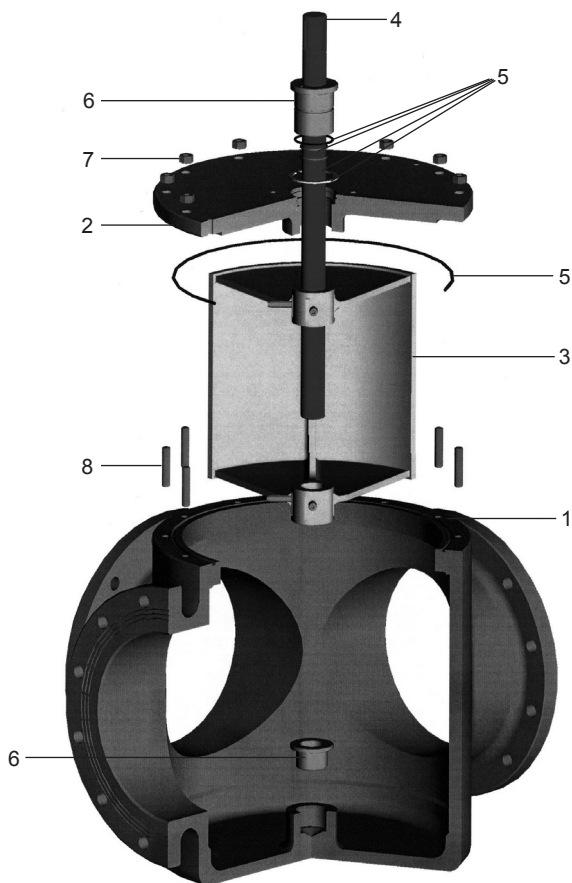


Fig. 7 - "RS" valve body

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/ body gasket	5=Bronze/Bronze/Stainless steel/O'ring in Viton 7=S.G. Iron/Bronze/Stainless steel/O'ring in 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	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 Pneumatic Actuator (double effect) APM04D=for DN100-200 valve size APM06D=for DN250-300 valve size APM08D=for DN350-400 valve size Pneumatic Actuator (simple effect) APM05S=for DN100-200 valve size APM08S=for DN250-300 valve size APM10S=for DN350-400 valve size	SG2