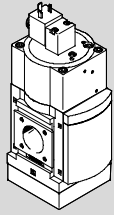


Soft-start/quick exhaust valve MS9-SV-...-C



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Operating instructions

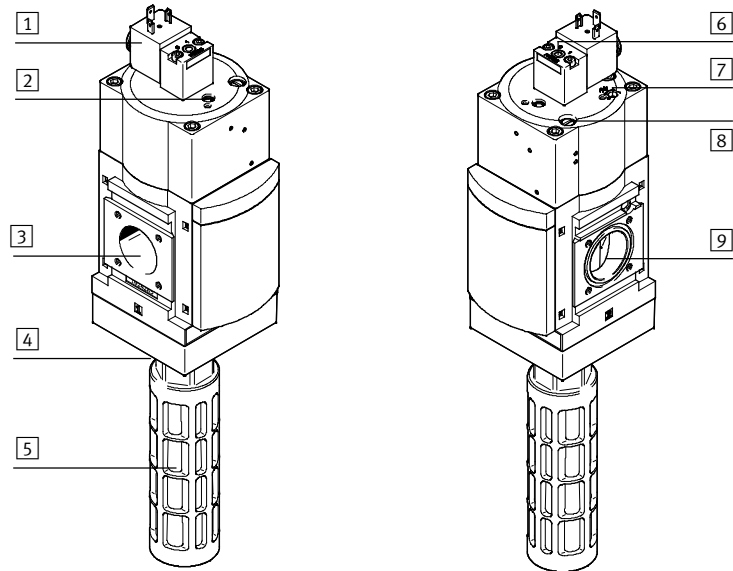
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Soft-start/quick exhaust valve MS9-SV-...-C English

1 Product description

1.1 Operating elements and connections



- | | |
|---|--|
| 1 Pilot solenoid valve | 6 Manual override at the pilot solenoid valve |
| 2 Manual override at the soft-start/quick exhaust valve | 7 Flow control screw for setting the filling time |
| 3 Pneumatic port 1 (compressed air inlet) | 8 Adjusting screw for setting the pressure switching point |
| 4 Pneumatic port 3 (exhaust) | 9 Pneumatic port 2 (compressed air outlet) |
| 5 Silencer | |

Fig. 1 Control sections and connections

1.2 Characteristics

Characteristics	Type	Specification
Series	MS	Standard service unit
Size	9	Grid dimension 90 mm
Function	-SV	Soft-start/quick exhaust valve
Connection size	-3/4	Thread G3/4
	-1	Thread G1
	-AGD	Connecting plate G1/2
	-AGE	Connecting plate G3/4
	-AGF	Connecting plate G1
	-AGG	Connecting plate G1 1/4
	-AGH	Connecting plate G1 1/2
	-N3/4	Thread N3/4
	-N1	Thread N1
	-AQR	Connecting plate N1/2
	-AQS	Connecting plate N3/4
	-AQT	Connecting plate N1
	-AQU	Connecting plate N1 1/4
	-AQV	Connecting plate N1 1/2
	-G	Module without connecting thread, without connecting plate
-NG	Module without connecting thread, without connecting plate (connection 3 in NPT)	
Performance level	-C	in accordance with EN ISO 13849-1
Supply voltage	-V24	24 V DC (connection arrangement in accordance with EN 175301)
	-10V24P	24 V DC (M12 in accordance with IEC 61076-2-101)
	-V110	110 V AC (connection arrangement in accordance with EN 175301)
	-V230	230 V AC (connection arrangement in accordance with EN 175301)
Options	-S	Silencer
Tamper protection	-MH	Cover – only manual override (MO)
	-MK	Cover – adjusting screws pressure switching point (PSP) and main throttle (MT), manual override (MO)

Fig. 2 Overview of variants

2 Function and application

The electro-pneumatic soft-start/quick exhaust valve MS9-SV-...-C is intended for fast pressure reducing as well as pressure reducing in pneumatic piping systems and terminals in industry.

Symbol	Function
	Soft-start/quick exhaust valve, electro-pneumatically actuated

Fig. 3 Circuit symbol of the functions

The product is intended for installation in machines or automated systems and may be used only in the following ways:

- in industrial applications
- within the limits of the product defined through the technical data (→ 13 Technical data)
- in its original status, without unauthorised modifications
- in perfect technical condition

2.1 Foreseeable misuse

Foreseeable misuse includes:

- use outdoors
- use as a press safety valve
- use in the non-industrial area/residential area
- use outside the limits of the product defined in the technical data
- unauthorised modifications
- use in reversible operation (reversal of supply and exhaust air)
- “low demand mode” in accordance with EN 61511 or vacuum operation

→ Note

In the event of damage caused by unauthorised manipulation or use other than that intended, the guarantee is invalidated and the manufacturer is not liable for damages.

3 Requirements for product use

- Make these operating instructions available to the design engineer and installer of the machine or system in which this product will be used.
- Keep these operating instructions during the entire product life cycle.
- Observe the rules/information of the trade association, the VDE specifications and relevant national regulations at the location of use.

3.1 Technical requirements

General conditions for the correct and safe use of the product, which must be observed at all times:

- Maintain the specified limits (e.g. for pressures, temperatures and electric voltages).
- Make sure there is a supply of correctly prepared compressed air in accordance with the specifications on the medium.
- Before mounting, remove particles in the supply lines through appropriate measures. In this way, you protect the product from premature failure and higher wear.
- Pressurize your entire system slowly. This allows avoidance of abrupt movements.
- Observe the warnings and instructions in these operating instructions.
- Use the product in its original state, without any unauthorised product modifications.

3.2 Qualification of trained personnel

Installation, mounting, commissioning, maintenance, repair and removal from operation may only be performed by qualified personnel with knowledge and experience with electrical and pneumatic control technology.

3.3 Range of application and certifications

The products MS9-SV-...-C-V110-... and MS9-SV-...-C-V230-... fulfil requirements of EC directives and are equipped with the CE marking.



Standards and test values, which the product must comply with and fulfil, can be found in the section "Technical data". The product-relevant EC directives can be obtained from the declaration of conformity in the internet.

→ www.festo.com

3.4 Standards

Standard	Title
EN ISO 13849-1:2008-06	Safety of machinery - safety-related parts of control systems Part 1: General principles for design
EN ISO 13849-2:2008-06	Safety of machinery - safety-related parts of control systems Part 2: Validation
EN 60204-1:2006-06	Safety of machinery - electrical equipment of machines Part 1: General requirements
EN ISO 4414:2010-11	Fluid engineering - general rules and safety-related requirements for pneumatic systems and their components

Fig. 4 Standards

3.5 Service

Please consult your local Festo repair service if you have any technical problems.

4 Mounting and installation

4.1 Mechanical



Note

Information about mounting of module connectors, sub-bases and mounting brackets can be found in the operating instructions enclosed with the relevant accessories.

- Place the MS9-SV-...-C as close as possible to the location of use.
- Place the MS9-SV-...-C in such a way that you have sufficient space for a silencer.
- The mounting orientation is any desired.
- Observe the flow direction from 1 to 2. Serving as orientation are the numerals 1 on the product housing.

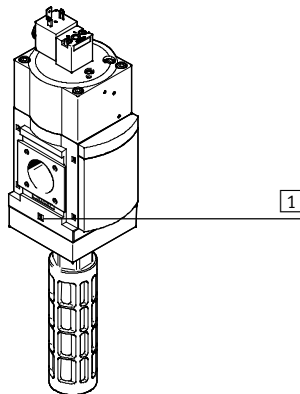


Fig. 5 Flow direction

Combination with service units of the MS series

1. Place the module connectors MS9-MV 2 in the grooves of the individual devices. A seal 1 is required between the individual devices.
2. Fasten the module connectors MS9-MV with 2 screws.

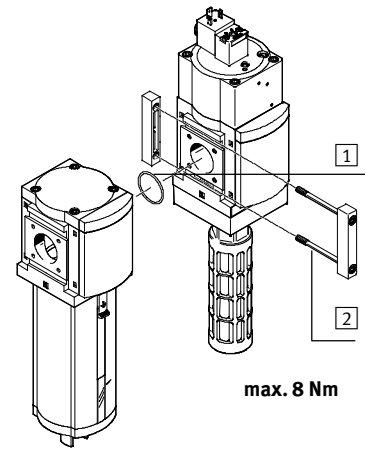


Fig. 6 Assembly

4.2 Pneumatic

Port 1 and 2

If using fittings:

- Observe the maximum permissible screw-in depth of the connecting threads:

ISO 228		NPT	
MS9-...-3/4/1:	18.5 mm	MS9-...-N3/4/N1:	18.5 mm
MS9-...-AGD/AGE/AGF:	18.5 mm	MS9-...-AQR/AQS/AQT:	18.5 mm
MS9-...-AGG/AGH:	31.5 mm	MS9-...-AQU/AQV:	31.5 mm

Fig. 7 Max. screw-in depth

- Make sure that the compressed air lines are connected correctly.
- Screw the connectors into the pneumatic ports using suitable sealing material.

Port 3 (thread size G1 or NPT1)

When exhausting a system through the MS9-SV-...-C, high sound pressure levels are generated. We therefore recommend that you use a silencer.



Note

The silencer listed in the accessories U-1-B can be retrofitted on replaced only on equipment with metric threads.

When retrofitting the silencer on a device with NPT thread at port 3, the cover of the MS9-SV-...-C can be destroyed. When retrofitting, an adequate silencer with NPT thread must be used.

- Screw the silencer into the pneumatic port 3.
- Make sure that there is unrestricted exhausting. Neither the silencer nor port 3 should be blocked.

5 Electrical connection



Warning

Electrical connections should be established only in the absence of voltage and by qualified personnel.



Warning

Use only power sources which guarantee reliable electrical isolation of the operating voltage in accordance with IEC/EN 60204-1. Consider also the general requirements for PELV circuits in accordance with IEC/EN 60204-1.



Note

Long signal lines reduce the resistance to interference.

- Make sure that the signal cables are not longer than 20 m.

6 Commissioning

To start up the device, proceed as follows:

1. Apply operating pressure p1.
2. Switch on the supply voltage.

The output pressure p2 is built up slowly. The filling time "t" is set through the flow control screw attached to the cover. The output pressure rises corresponding to the set throttle point (→ Fig. 12). If the preset pressure switching point (PSP) is reached, the main seat of the valve opens (→ Fig. 13). The MS9-SV-...-C is then ready for operation.

No further settings are required.

Tamper protection

To prevent a manipulation of the settings, setting and control elements can be equipped with a cover → 11 Accessories.

7 Operation



Note

Exhaust with a voltage drop

8 Maintenance and care

- Switch off the following sources of energy before cleaning the exterior of the device:
 - Operating voltage
 - Compressed air
 - If needed, clean the MS9-SV-...-C from outside.
- Soap suds (max. +50 °C), petroleum ether and all non-abrasive cleaning agents may be used.

9 Disassembly



Note

Residual pressure must be eliminated.

1. Switch off the following sources of energy before dismantling:
 - Operating voltage
 - Compressed air
2. Separate the respective connections from the MS9-SV-...-C.

10 De-commissioning and disposal

In coordination with the waste management company, the product can be completely disposed of through metal recycling (e.g. EAK 17 04 02). If necessary, the solenoid valve is dismantled and disposed of separately in electronic scrap recycling (EAK 16 02 16).

11 Accessories

Designation	Type
Silencer	U-1-B
Cover ¹⁾	MS9-SV-C-MH
Cover ²⁾	MS9-SV-C-MK

1) covers the manual override

2) covers pressure switching point, main throttle and manual override

Fig. 8 Accessories

Festo accessories can be found at: → www.festo.com/catalogue

12 Troubleshooting

Malfunction	Possible cause	Remedy
Valve switches abruptly	Pressure switching point too low, flow control valve opened too wide	Correct settings
Valve does not switch	Pressure switching point too high, flow control valve not opened widely enough	Correct settings

Fig. 9 Troubleshooting

13 Technical data

13.1 Safety-related characteristics

MS9-SV	-10V24P	-V24	-V110	-V230
Safety function	Venting			
Performance Level (PL)	Venting: up to category 1, PL c			
Max. pos. test pulse at logic 0 [µs]	3800	3200	–	–
Max. neg. test pulse at logic 1 [µs]	4900	2800	–	–
Venting time [s]	→ 13.5 Venting time			
CE marking (see declaration of conformity)	–		To EU Low Voltage Directive	

Fig. 10 Safety-related characteristics

13.2 General data

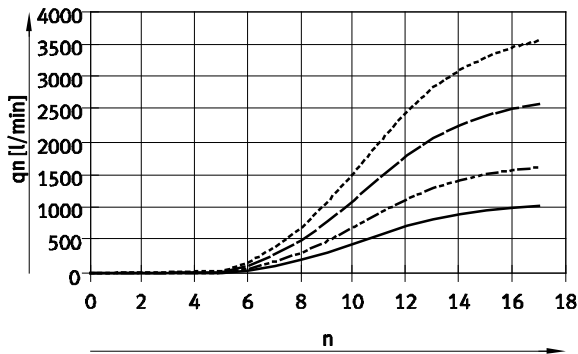
MS9-SV	-10V24P	-V24	-V110	-V230	
Pneumatic connection 1	with accessories (connection sizes → Fig. 2)				
Pneumatic connection 2	with accessories (connection sizes → Fig. 2)				
Pneumatic connection 3	G1 NPT1				
Type of mounting	In-line installation With accessories				
Mounting position	Any				
Design	Piston slide				
Actuation type	Electric				
Exhaust function	No flow control				
Type of control	Piloted				
Valve function	3/2-way valve, monostably closed, pressure built-up function adjustable				
Operating medium	Compressed air to ISO 8573-1:2010 [7:4:4]				
Note on operating medium	Operation with lubricated medium possible (in which case lubricated operation will always be required)				
Operating pressure p1 [bar]	3.5 ... 16				
Pressure switching point [bar]	adjustable → diagram Fig. 13				
Venting flow rate	adjustable through flow control valve → diagram Fig. 12				
C-value 1 → 2 [l/(s*bar)]	-3/4:	57.61			
	-1	69.59			
	-AGD:	31.43			
	-AGE:	54.24			
	-AGF:	68.24			
	-AGG:	68.45			
	-AGH:	66.07			
C-value 2 → 3 [l/(s*bar)]	-3/4:	55.52			
	-1	54.01			
	-AGD:	56.22			
	-AGE:	54.07			
	-AGF:	52.73			
	-AGG:	51.06			
	-AGH:	51.36			
b-value 1 → 2	-3/4:	0.37			
	-1	0.32			
	-AGD:	0.47			
	-AGE:	0.37			
	-AGF:	0.34			
	-AGG:	0.35			
	-AGH:	0.35			
b-value 2 → 3	-3/4:	0.49			
	-1	0.46			
	-AGD:	0.60			
	-AGE:	0.49			
	-AGF:	0.47			
	-AGG:	0.45			
	-AGH:	0.44			
Standard nominal flow rate 1 → 2 [l/min]	-3/4/-N3/4:	14150			
	-1/-N1	16460			
	-AGD/-AQR:	8300			
	-AGE/-AQS:	13250			
	-AGF/-AQT:	16340			
	-AGG/-AQU:	16550			
	-AGH/-AQV:	15910			
	Standard flow rate 2 → 3 [l/min]	-3/4:	14790		
		-1	14140		
-N3/4:		14900			
-N1		14100			
-AGD/-AQR:		16500			
-AGE/-AQS:		14400			
-AGF/-AQT:		13800			
-AGG/-AQU:		13200			
-AGH/-AQV:		13200			
Ambient temperature [°C]	0 ... +60 (0 ... +50 with pressure sensor)				
Temperature of medium [°C]	0 ... +60 (0 ... +50 with pressure sensor)				
Storage temperature [°C]	0 ... +60 (0 ... +50 with pressure sensor)				
Shock resistance	Shock test with severity level 1 according to FN 942017-5 and EN 60068-2-27				
Vibration resistance	Transport application test with severity level 1 to FN 942017-4 and EN 60068-2-6				

MS9-SV		-10V24P	-V24	-V110	-V230
Nominal operating voltage	[V DC]	24	24	–	–
	[V AC]	–	–	110	230
Electrical connection		Plug, M12x1, 4-pin	Plug, rectangular design, in accordance with EN 175301-803, shape A		
Coil characteristics		24 V DC, 2.7 W	24 V DC, 8.4 W	110 V AC 50/60 Hz: pick-up power 14.5/12 VA holding capacity 10.5/7.6 VA	230 V AC 50/60 Hz: pick-up power 14.5/12 VA holding capacity 10.5/7.6 VA
Permissible voltage fluctuation	[%]	10			
Sound pressure level	[dB(A)]	93			
Protection class in accordance with IEC 60529		IP65			
Housing material information		Die-cast aluminium			
Cover material information		Wrought aluminium alloy			
Lower cover material information		PA			
Seals material information		NBR			
Product weight	[g]	3200			

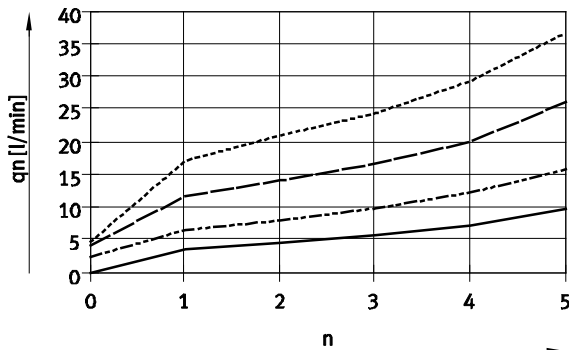
Fig. 11 General data

13.3 Venting flow rate

Flow rate q_n dependent on the number of revolutions n of the main throttle screw (HD)



Range up to 5 revolutions

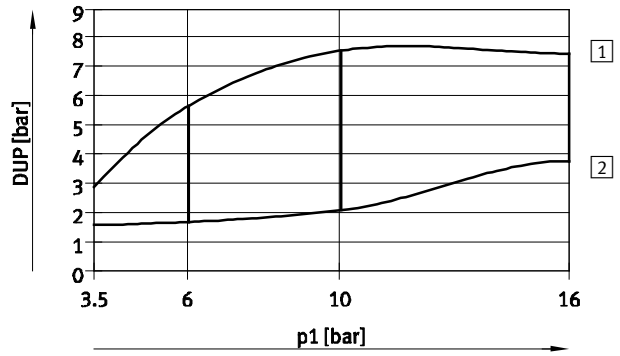


- p1: 3 bar
- - - p1: 6 bar
- p1: 10 bar
- - - p1: 14 bar

Fig. 12 Flow diagram

13.4 Pressure switching point

With the main throttle (MT) located in the cover, a slower pressure build-up of output pressure p_2 is achieved. If the output pressure p_2 has reached the switch-through pressure, the valve opens and the complete operating pressure p_1 builds up at the output. The pressure switching point can be set by turning the adjusting screw for the pressure switching point (PSP).



- 1 PSP maximum
- 2 PSP minimum

Fig. 13 Pressure switching point

Example:

At an operating pressure $p_1 = 6$ bar, the pressure switching point can be set in a range of 1.8 ... 5.5 bar.

13.5 Venting time

The following table shows the venting time in normal operation (N) with silencer U-1-B, → 11 Accessories, at various volumes and operating pressures.

Normal operation N	Volume [l]	Operating pressure 4 bar		Operating pressure 6 bar		Operating pressure 10 bar		Operating pressure 16 bar	
		Venting time [s]		Venting time [s]		Venting time [s]		Venting time [s]	
		at 1.0 bar	at 0.5 bar	at 1.0 bar	at 0.5 bar	at 1.0 bar	at 0.5 bar	at 1.0 bar	at 0.5 bar
	10	0.53	0.62	0.65	0.75	0.8	0.9	0.93	1.03
	20	0.69	0.89	0.9	1.08	1.13	1.31	1.37	1.56
	40	1.17	1.55	1.62	2.02	2.02	2.44	2.56	3.02
	150	3.48	4.87	4.66	6.1	6.49	8.11	8.33	10.09

Fig. 14 Venting time