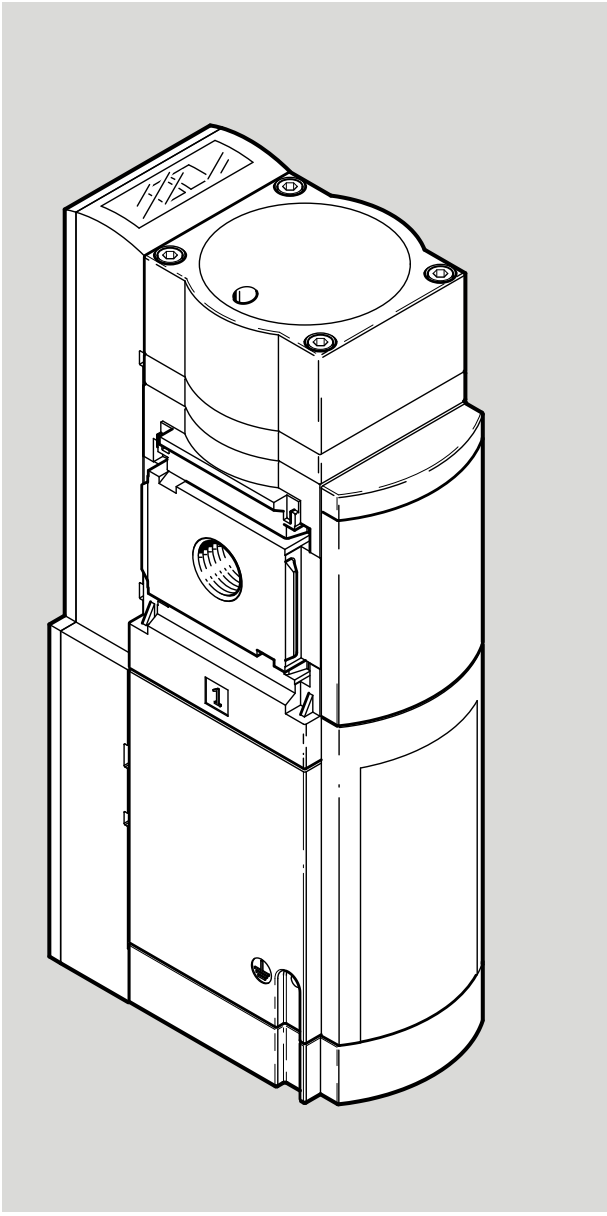
MS6-SV-...-E-10V24

Soft start/quick exhaust valve



FESTO

Instructions |
Assembly, Installation,
Safety func.

8111049

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2019-10d
[8111051]

Translation of the original instructions

Table of contents

1 Applicable documents

All available documents for the product ➔ www.festo.com/pk.

1.1 Specified standards

Version	
EN ISO 12100:2010-11	EN 60068-2-27:2009-05
EN ISO 13849-1/AC:2009-03	EN 61131-2:2007-09
EN ISO 13849-2:2012-10	IEC 60204-1:2009-02
EN 60204-1/A1:2009-02	ISO 8573-1:2010-04
EN 60068-2-6:2008-02	ISO 19973-1:2015-08
EN 61508-1:2011-02	

Tab. 1 Standards specified in the document

2 Safety

2.1 Safety Instructions

- Only use the product in original status without unauthorised modifications.
- Only use the product if it is in perfect technical condition.
- Observe labelling on the product.
- Take into consideration the ambient conditions at the location of use.
- Prior to mounting, installation and maintenance work: Switch off power supply and secure it from being switched back on.
- Observe tightening torques. Unless otherwise specified, the tolerance is ± 20 %.
- The product must be operated only with the specified multi-pin plug sockets NECA-S1G9-P9-MP....
- Non-compliance with the information in this instruction manual can lead to loss of the safety function.

2.2 Intended Use

The product is intended solely for fast and safe venting and for building up pressure gently in pneumatic piping systems and terminals in industry. The product is a safe, redundant mechatronic system designed for implementation of the safety functions:

- Safe venting
- Protection against unexpected pressure build-up (pressurisation).

The product is intended for installation in a machine or automated system and must be used exclusively as follows:
– In an industrial environment
– Within the limits of the product defined by the technical data ➔ 14 Technical Data.
– In its original condition, without unauthorised modifications
– In perfect technical condition
– In standard operation, which includes standstill, set-up and service operation, as well as emergency operation

2.3 Foreseeable Misuse

The following examples of foreseeable misuse are among those not approved as intended use:
– Outdoor use
– Operation without adequate venting options ➔ 6 Assembly
– Use as press safety valve
– Bypass of the safety function
– Use in reversible operation (using supply air instead of exhaust air, and vice versa)
– Vacuum operation
– Use of incorrect or clogged silencers

2.4 Training of qualified personnel

Installation, commissioning, service and disassembly should only be conducted by skilled personnel. The skilled personnel must be familiar with the installation of electrical and pneumatic control systems.

3 Additional information

– Accessories ➔ www.festo.com/catalogue.
– Spare parts ➔www.festo.com/spareparts.

4 Service

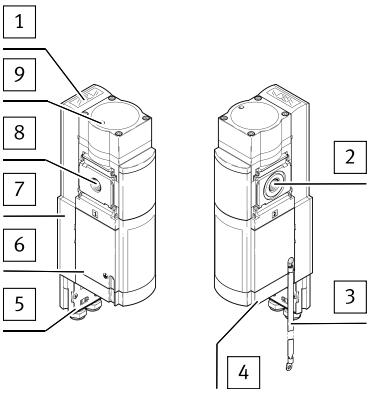
Contact your regional Festo contact person if you have technical questions ➔ www.festo.com.

5 Product Overview

5.1 Design

5.1.1 Product design

The product corresponds to category 4 with a maximum achievable performance level e in accordance with EN ISO 13849-1.



1 LED display (Power LED and Error LED)
2 pneumatic port 2 (compressed air outlet port)
3 pre-assembled earthing strap
4 pneumatic port 3 (exhaust)
5 Multi-pin plug socket NECA (accessories)
6 Mono-block valve
7 Electronic insert
8 pneumatic port 1 (compressed air inlet port)
9 Flow control screw for soft start function

Fig. 1 Product design

Feature	Code	Type
Series	M	Modular
Power class	S	Standard
Size	6	Housing width 62 mm
Function	– SV	Soft-start/quick exhaust valve, electric
Connection size	– 1/2	G1/2
	– AGB	G1/4
	– AGC	G3/8
	– AGD	G1/2
	– AGE	G3/4
	– AQN	NPT1/4
	– AQP	NPT3/8
	– AQR	NPT1/2
	– AQS	NPT3/4
Performance level	– E	In accordance with EN ISO 13849-1, category 4 2-channel with self-monitoring, safety device in accordance with EC Machinery Directive 2006/42/EG
supply voltage	– 10V24	24 V DC
Options[1)]	– SO	Silencer open

Feature	Code	Type
Pressure gauge / pressure gauge alternative[1)]	– AG	Integrated pressure gauge
	– A4	Adapter for EN pressure gauge ¼, without pressure gauge
	– AD1	Pressure sensor with display, M8 plug, PNP, 3-pin
	– AD2	Pressure sensor with display, M8 plug, NPN, 3-pin
	– AD3	Pressure sensor with display, plug M12, PNP, 4-pin, analogue output 4 ... 20 mA
	– AD4	Pressure sensor with display, plug M12, NPN, 4-pin, analogue output 4 ... 20 mA
Alternative pressure gauge scaling[1)]	– PSI	psi scaling
	– MPA	MPa scaling
	– BAR	bar scaling
Multi-pin plug socket[1)]	– MP1	Sub-D, 9-pin, screw terminal, without cable Enable signals static (EN1 = 24 V, EN2 = 24 V)
	– MP3	Sub-D, 9-pin, screw terminal, without cable Enable signals static (EN1 = 0 V, EN2 = 24 V) Cross-circuit detection possible
	– MP5	Sub-D, 9-pin, screw terminal, without cable Enable signals static (EN1 = 0V, EN2 = 24V) Galvanic isolation of enable signal from the supply voltage
Type of mounting[1)]	– WPB	Mounting bracket for large mounting spacing
UL certification[1)]	– UL1	UL certification for Canada and USA
Alternative flow direction[1)]	– Z	Flow direction from right to left

1) optional

Tab. 2 Product overview

5.2 Function

The product is a safe, redundant mechatronic system in accordance with the requirements of EN ISO 13849-1+2. The safe venting pneumatic safety function is guaranteed even in the event of an error in the valve (e.g. due to wear or contamination). Through its electrical connection (NECA multi-pin plug socket Sub-D, 9-pin), the product receives secure enable signals (EN1/EN2) from commercially-available electronic or electromechanical safety relay units, which monitor the machine's protective devices (e.g. emergency stop, light curtain, electric door switch on the protective housing, etc.).

Automatic start/monitored start modes of operation

Two modes of operation are possible:

– Automatic start (automatic reset)
  The automatic start (automatic reset) mode of operation is preset with a bridge from terminal 5 to terminal 6 in the multi-pin plug socket NECA (delivery status).
– Monitored start (monitored reset)
  The monitored start (monitored reset) mode of operation should be seen as a subordinate start from the perspective of the complete system. The enable signal from the safety relay or the controller always has priority.

In both modes of operation, the product can be electrically triggered using either static or dynamic enable signals (EN1/EN2), depending on the multi-pin plug socket NECA used.

i

The impulse generated by the start button must be within a time-frame of 0.1 s and 2 s.
If the start button is held down for too long or is locked down, the system identifies a cross circuit and the product is placed in fault mode.

i

The start signal for S34 must not be generated until 1 s after the enable signals EN1/EN2 are generated.
If the start signal is generated before or simultaneously with the enable signals, it will not be recognised and must be generated again.

Automatic start (delivery status) and monitored start

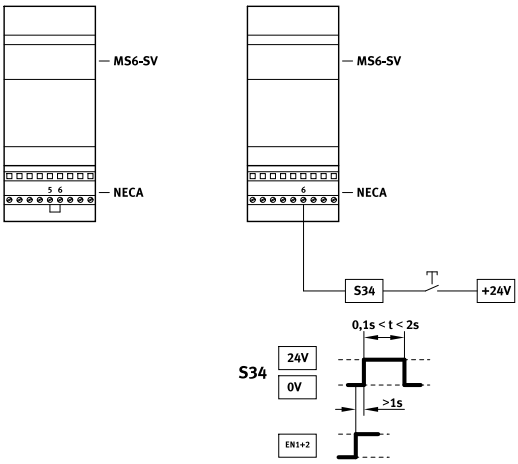


Fig. 2 Operating Modes

Operational principle of the multi-pin plug sockets NECA-...-MP1, -MP3 und -MP5

Status of EN1	Status of EN2	Status of valve with NECA-...-MP1	Status of valve with NECA-...-MP3	Status of valve with NECA-...-MP5
0 V	0 V	Unpressurised	Valve switches to fault mode	Valve does not switch to fault mode, but remains in the safe, unpressurized status Note: Detection of shorts across contacts and error detection and evaluation necessary via external controller
0 V	24 V	Valve switches to fault mode	Pressurised	Pressurised
24 V	24 V	Pressurised	Valve switches to fault mode	Valve does not switch to fault mode, but remains in the safe, unpressurized status Note: Detection of shorts across contacts and error detection and evaluation necessary via external controller
24 V	0 V	Valve switches to fault mode	Unpressurised	Unpressurised

Tab. 3 Operational principle of the multi-pin plug sockets NECA

Identification of signal transitions

If safety outputs with test pulses are used to control the product, the following runtime performance must be observed:

- MS6-SV-E exhaust status
  - Test pulses < 3 ms are ignored
- MS6-SV-E pressurisation status
  - Test pulses < 12 ms are ignored

Detection of shorts across contacts of the enable signals

In general, detection of shorts across contacts is required to guarantee performance level e. Depending on the selected plug, either the product itself or the safety relay unit/PLC detects the cross circuit.

NECA-...-MP1	NECA-...-MP3	NECA-...-MP5
by safety relay unit/PLC (clocked signals)	by product	by safety relay unit/PLC (potential difference monitoring)

Tab. 4 Detection of shorts across contacts

Connection examples

MS6-SV-E with multi-pin plug socket NECA-S1G9-P9-MP1

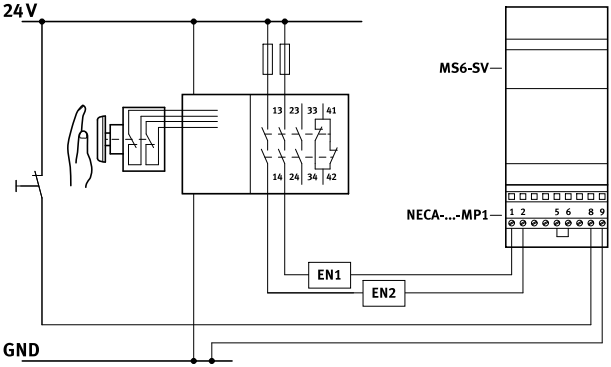


Fig. 3 Connection NECA-...-MP1

The multi-pin plug socket NECA-...-MP1 can be used for static and clocked safety outputs.

– static enable signals (EN1/EN2 = 24 V)

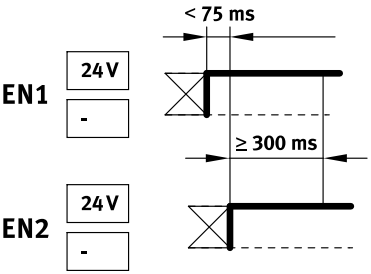


Fig. 4 Static enable signals – signal distance

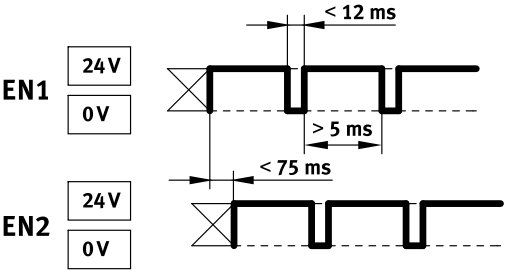


Fig. 5 Enable signals – cross circuit detection

– clocked enable signals (EN1/EN2 = 24 V) for detection of shorts across contacts.

Detection of shorts across contacts by clock signals is always carried out by the safety relay unit/safety PLC.

Switching characteristics diagrams ➔ Fig.20.

i

The clock outputs of different controller manufacturers are not standardised. The usability must be checked in every case. If the clock pulse is outside the described limits, this is recognised by the product as an error and a safe switch-off is carried out.

MS6-SV-E with multi-pin plug socket NECA-S1G9-P9-MP3

i

The multi-pin plug socket NECA-S1G9-P9-MP3 is intended for conventional circuitry with electromechanical safety relays. If problems arise in use with bipolar semiconductor outputs, use the multi-pin plug socket NECA-S1G9-P9-MP5.

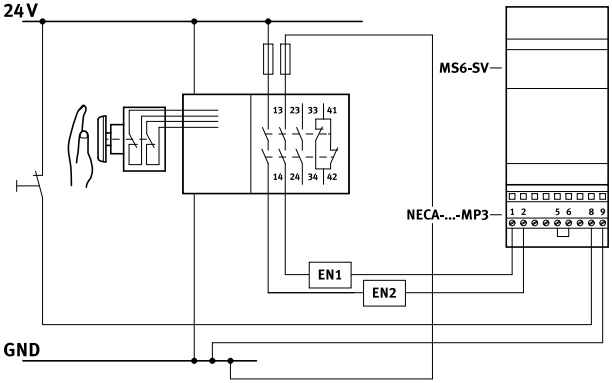


Fig. 6 Connection with NECA-...-MP3

– static enable signals with opposite potentials
– Time delay of the level change of the enable signals is monitored
– Behaviour on detection of a cross circuit:
  – Product in exhausted status: remains in safe status and switches to malfunction
  – Product in pressurised status: switches to safe status and to malfunction

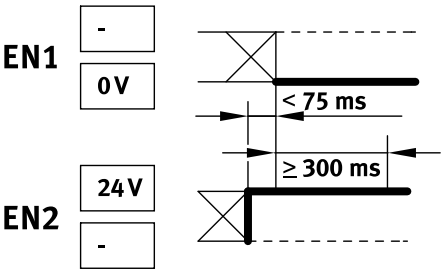


Fig. 7 Static enable signals – signal distance

Switching characteristics diagrams ➔ Fig.23.

MS6-SV-E with multi-pin plug socket NECA-S1G9-P9-MP5

NOTICE!

A cross circuit between the enable signals EN1/EN2 is not detected and does not cause an error response. The system is pressurised only if the enable signals are applied correctly.

- Ensure that detection of shorts across contacts is established and guaranteed by corresponding measures in the peripherals (PLC/safety control) in accordance with the valid safety standards.

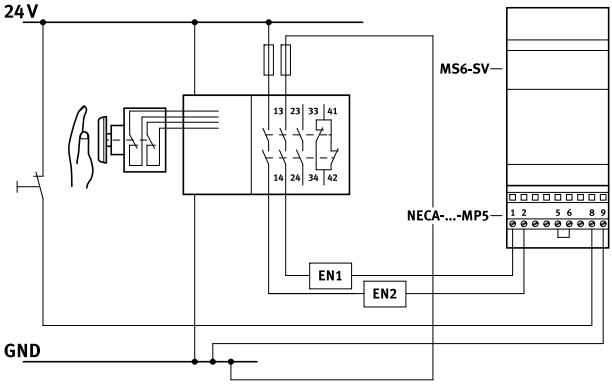


Fig. 8 Connection with NECA-...-MP5

– static enable signals with opposite potentials
– Time delay of the level change of the enable signals is not monitored
– Behaviour on detection of a cross circuit (through upstream safety relay unit/PLC):
  – MS6-SV- E in exhausted status: remains in safe status and does not go into malfunction
  – MS6-SV- E in pressurised status: goes into safe status and does not go into malfunction
– Enable signals are galvanically separated from the supply voltage

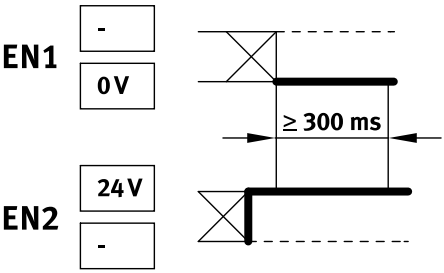


Fig. 9 Static enable signals – signal distance

Switching characteristics diagrams ➔ Fig.23.

Switching statuses

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The time delay t2 between EN1 and EN2 must be automatically defined. The duration of the delay is not evaluated. The multi-pin plug socket NECA-MP5 does not enable the product to detect shorts across contacts.

Signal contact

The signal contact is a potential-free N/O contact of a semiconductor relay. The contact can be picked up in the feedback circuit of a safety control system through terminals 3 and 4 of the NECA multi-pin plug socket as required.

NOTICE!

If the signal contact is operated outside the permitted technical data, this will cause irreparable failure. Compliance with the specification must be ensured through an appropriate protective circuit.

NOTICE!

Assignment of these contacts is not required to achieve the safety category.

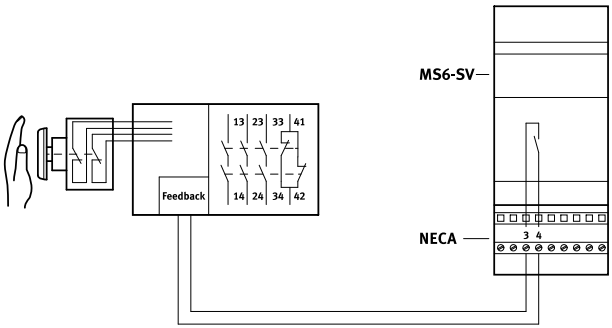


Fig. 10 Feedback signal connection

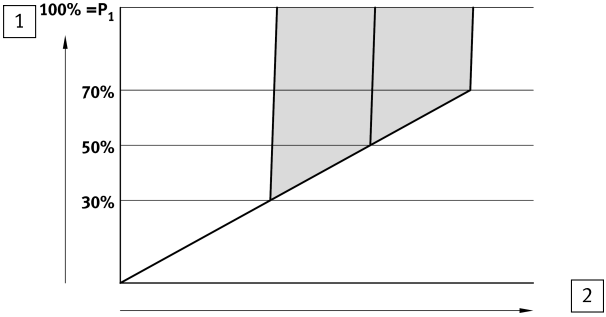
Switching behaviour diagrams, with multi-pin plug socket NECA-S1G9-P9-MP1 ➔ Fig.20 and with multi-pin plug socket NECA-S1G9-P9-MP3/MP5 ➔ Fig.23.

Status of valve	Signal contact
Control for pressurisation by EN1 and EN2	Open
Control for exhaust through EN1 and EN2	Closed
Malfunction (red LED flashing)	Open
Supply voltage is not connected	Open

Tab. 5 Switching statuses of the signal contact

Switch-through pressure/filling time

The flow control screw in the cover generates a gradual pressure build-up of outlet pressure p2. The pressure rise can be adjusted by turning the flow control screw. When the outlet pressure p2 reaches about 50% of the operating pressure p1, the valve opens and the maximum flow rate performance is enabled.



1 Ratio of p2 to p1 [%] 2 Time axis

Fig. 11 Switch-through pressure tolerance field

Example:

At an operating pressure of p1 = 4 bar with reference to the approved tolerance of ± 20% a switch-through pressure of 1.2 to 2.8 bar is permissible.

5.3 Safety function in accordance with EN ISO 13849

The product is a safe, redundant mechatronic system designed for implementation of the safety functions:

– Safe venting
– Protection against unexpected pressure build-up (pressurisation).

NOTICE!

Failure of the safety function
The product must be brought to initial position (exhausted status) at least once a month to guarantee the safety function.

NOTICE!

Failure of the safety function
Common cause failures (CCF) cause the failure of the safety function, since in this case both channels in a two-channel system fail simultaneously.
If measures to control the CCFs are not observed, the safety function of the soft-start/quick exhaust valve can be impaired.
- Make sure that the described measures observed and .

NOTICE!

Failure of the safety function
Non-compliance with the technical data can lead to loss of the safety function.

The electro-pneumatic soft-start/quick exhaust valve has control technology features which enable performance level e to be reached for the safety functions. This product has been designed and manufactured in accordance with the fundamental and reliable safety principles of EN ISO 13849-2.
The following requirements apply to the manager:
– Specifications on mounting and operating conditions in these operating instructions must be observed.
– For use in higher categories (2 to 4), the requirements of EN ISO 13849, e.g. CCF, must be considered.
– The basic and proven safety principles of EN ISO 13849-2 relating to implementation and operation of the component must be satisfied.
– When using this product in machines or systems subject to specific C standards, it must be in compliance with the requirements specified in the standards.
– Before using the product, a risk assessment in accordance with EN ISO 12100 as specified in the EC Machinery Directive 2006/42/EG, appendix I, paragraph 1 and 1.1.2 is required.
– The user is responsible for coordinating all applicable safety regulations and rules with the competent authority and for compliance with regulations and rules.

Failures due to a common cause (Common Cause Failure – CCF)
The following measures ensure that common cause failures are avoided:
– Compliance with the permissible values for vibration and shock stress
– Compliance with the temperature range
– Compliance with compressed air quality as specified in the technical data, in particular avoiding flash rust particles (such as caused by servicing work) as well as compliance with the residual oil content of max. 0.1 mg/m³ when using ester-containing oils (which may, for example, be contained in the compressor oil)
– Compliance with the maximum operating pressure, if necessary with a pressure-relief valve
– Clogging of the silencer must be avoided .

PFH_d value

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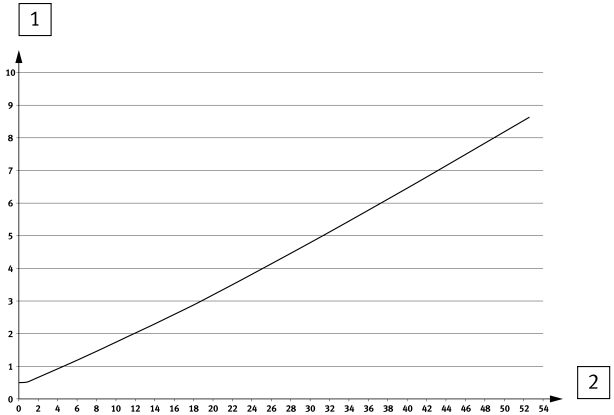
The PFH_d value depends on the model of the product and the annual actuation rate (n_{op}).



1 PFH $_d$ [10 $^{-8}$h $^{-1}$] 2 Actuation rate (n $_{op}$) [10 ^{4}/a]

Fig. 12 PFHd value

6 Assembly

6.1 Requirement

– Take appropriate measures to remove any particles in the supply lines.

6.2 Preparation

NOTICE!

In order to ensure electromagnetic compatibility in accordance with the EMC Directive, note the following:

- Ensure a wall clearance of 32 mm, e.g. with the MS6-WPB mounting bracket.
- Do not lay cables between the wall and the product.

NOTICE!

Failure of the safety function.

Failure to comply with the minimum distance of 15 mm between the silencer and base can result in the loss of the safety function.

- Observe minimum distance of 15 mm below the silencer .
  The free space ensures the exhaust can escape.

– Place product as close as possible to the installation site.
– The product can be mounted in any position.

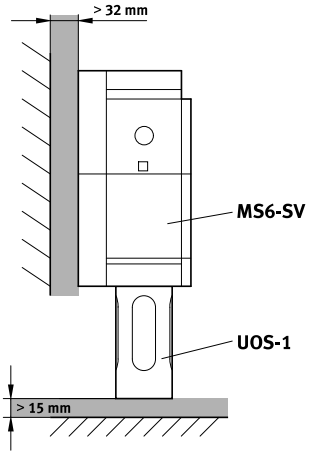


Fig. 13 Installation

– Observe the flow direction 1 to 2. The numerals 1 on the product housing serve as orientation.

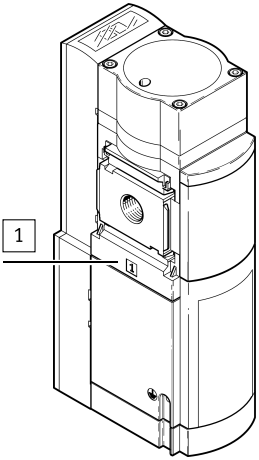


Fig. 14 Flow direction

6.3 Assembly with MS-series service unit components

⚠ WARNING!

Failure of the safety function.
Incorrect installation in the service unit combination can result in failure of the exhaust safety function.

- Only devices that do not impair the exhaust process, even after a possible malfunction of the device, may be placed downstream from the MS6-SV-....

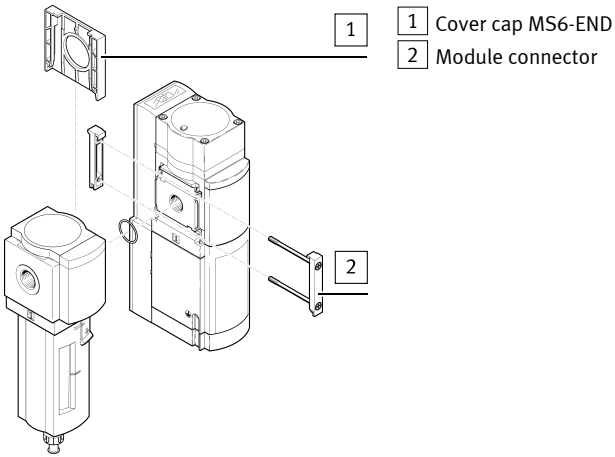


Fig. 15 Assembly

1. Slide the cover cap MS6-END [1] upwards and remove it.
2. Insert a seal [2] between the individual devices (module connector MS6-MV in scope of delivery).
3. Place module connector [2] in the slots of the individual devices.
4. Fasten the module connector with two screws (product scope of delivery). Tightening torque: maximum1.2 Nm.

7 Installation

7.1 Pneumatic Installation

Port 1 and 2
If using screw connectors:
– Note the screw-in depth of the connector thread: 10 mm.
– Make sure that the compressed air lines are connected correctly.
– Screw the connectors into the pneumatic connections using a suitable sealing material.

Connection 3

NOTICE!

Failure of the safety function

Clogging of the cushioning body of an unsuitable silencer may result in reduced bleeding (back pressure). This may result in failure of the safety function.

- Use the silencer UOS-... intended for the device exclusively.

– Use only suitable silencers ➔ www.festo.com/catalogue.
– Screw the silencer into pneumatic port 3.
– Make sure exhaust has no obstacles: do not block silencer or port 3.

7.2 Electrical Installation

⚠ WARNING!

Risk of injury due to electric shock.

- For the electric power supply, use only PELV circuits that ensure a reliable electric disconnection from the mains network.
- Observe IEC 60204-1/EN 60204-1.

Connecting earthing strap

- Connect the pre-assembled earth strap to the earth potential with low impedance (short cable with large cross-section).

This prevents malfunctions due to electromagnetic interference and ensures electromagnetic compatibility in accordance with the EMC Directives.

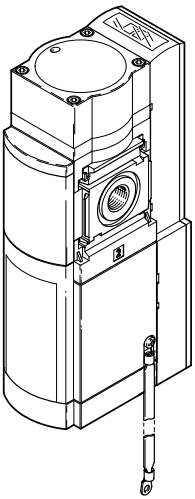


Fig. 16 Earth cable connection

Connecting multi-pin plug socket NECA

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The product may only be used with the approved NECA multi-pin plug sockets NECA-... .
Information on terminal connections can be found in the assembly instructions enclosed with the multi-pin plug socket.

i

When mounting the multi-pin plug sockets NECA-... with enclosed seal, note the correct position of the plug with reference to the valve. The display window of the multi-pin plug socket NECA-... must point forward.

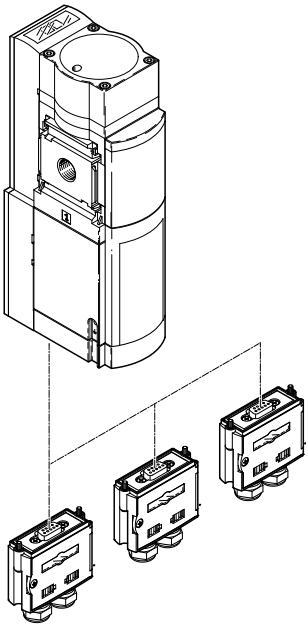


Fig. 17 Electrical connection

1. Connect multi-pin plug socket NECA-... in the correct orientation. The window points to the silencer.
2. Make sure that the screws are fastened tightly in order to guarantee degree of protection IP65. The maximum tightening torque is 0.4 ± 0.1 Nm.

Inputs and outputs

Terminal in multi-pin Plug socket NECA-...	I/O	I/O allocation		
1	EN1	Enable signal 1 (static or dynamic)	Input 0 V/24 V (EN 61131-2 type 2)	.
2	EN2	Enable signal 2 (static or dynamic)	Input 0 V/24 V (EN 61131-2 type 2)	
3	13	Signal contact, NO	Potential-free contact (semiconductor relay), maximum 120 mA, maximum 60 V DC	.
4	14			
5	A5	Contact for automatic start mode of operation	–	.
6	S34	Contact for “automatic start” or “monitored start” operating mode	Input 0 V/24 V (EN 61131-2 type 2)	
7	-	-		
8	+L1	Operating voltage	+24 V DC ±10%	
9	M	GND		

Tab. 6 Terminal assignment

8 Commissioning

i

For easier commissioning, we recommend planning a reset button (normally closed) in the power supply circuit. This simplifies a reset in case of error.

The commissioning description is graphically supported with the following diagrams:
– with multi-pin plug socket NECA-S1G9-P9-MP1 ➔ Fig.20.
– with multi-pin plug socket NECA-S1G9-P9-MP3/MP5 ➔ Fig.23.

The diagrams show the switching characteristics of the inputs and outputs in normal operation (if the automatic start mode of operation has been set). The operator’s actions are marked in the diagram by an arrow.

1. Apply operating pressure p1.
2. Switch on the supply voltage. The product runs a self-test for errors.
   – Power LED (green)
     – lights during self-test for around 6 s
     – Flashes green after successful self-test
   – Error LED (red)
     – lights during self-test for around 6 s
     – goes out after successful self-test

   There is a brief ejection of compressed air at outlets 2 und 3 during the self-test.

   ↳ The product is now ready for operation and can be pressurised.

   i

   The valve is tested pneumatically in a self-test once an hour for as long as the product remains in this status. Operating pressure p1 must be applied; otherwise, the valve switches to malfunction.
3. Apply Enable signals EN1/EN2. In monitored start mode of operation a start signal is also required at S34 .
   – Power LED (green) lights.
   – The outlet pressure p2 is built up slowly.

   Duration t of the pressure build-up is adjusted with the flow control screw attached to the cover. The output pressure rises depending on the throttle setting . When the switch-through pressure is reached (approx. 50% of operating pressure p1), the valve's main seat opens ➔ Fig.11. The product now pressurises the system at full flow.

9 Operation

i

The mechanical system of the product is not tested when it is pressurised.

- Perform a forced switch-off at least once a month if the process-related switching frequency is lower.

i

The pause period after exhausting is 2 s. This period must always be complied with. Only then can pressurisation be repeated.

10 Maintenance

10.1 Maintenance work

NOTICE!

Failure of the safety function

Clogging of the cushioning body of an unsuitable silencer may result in reduced bleeding (back pressure). This may result in failure of the safety function.

- Use the silencer UOS-... intended for the device exclusively.

- Check the silencer regularly and replace if necessary.

10.2 Cleaning

1. Switch off energy sources:
   - Operating voltage
   - Compressed air
2. Clean the outside of the product as required. Approved cleaning agents are soap solutions (max. +50 °C), petroleum ether and all non-abrasive cleaning agents.

11 Malfunctions

11.1 Diagnostics

LED display

Operating statuses and errors are indicated by flashing light-emitting diodes.

Power LED (green)	Error LED (red)	Meaning
Off	Off	Operating voltage not applied
lights for approx. 6 s after switch on	lights for approx. 6 s after switch on	Product runs through all tests during start-up
flashes once a second	Off	Product is in exhausted status
continuously on	Off	Product is in pressurised status
		Product is waiting for the signal (S34) with monitored start
4x briefly	flashes once a second	error code

Tab. 7 LED display

Display of error codes

The error code is displayed by 4 short flash pulses of the Power LED (green). Then the Error LED (red) displays the error code (number of flash pulses = error code). The flash pulses for both LEDs repeat continuously. The LEDs only stop flashing when the operating voltage is switched off in order to clear the error.

Overview of error codes:

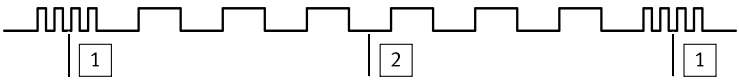


Fig. 18 Example of error code

After 4 short flash pulses of the Power LED 1, there are 6 long flash pulses of the Error LED 2. This indicates error code 6 (pneumatic fault). A pneumatic fault occurs, for example, if the operating pressure is below the required minimum pressure or there is no pressure at all.

11.2 Fault clearance

- Check compressed air supply
- Check power supply
- Check installation of the signal lines
- Start device .
- If the fault occurs again: contact Festo service ➔ www.festo.com.

Malfunction/ error code	**Possible cause**	**Remedy**
2	Bouncing on the enable signals	– Make sure that only debounced contacts are used (e.g. for protective guards or doors).
5	Power supply is insufficient	– provide sufficient power supply.
	Power unit is not correctly dimensioned; voltage collapses	– use a sufficiently dimensioned power unit.
6	Pressure supply was interrupted	– Restore compressed air supply.
8	Enable signals outside the specification	– Comply with specification .
	Multi-pin plug socket NECA or cable is defective	– NECACheck multi-pin plug socket or wiring and replace if defective.
Additional Error codes	PLC emits test pulses that are offset to the enable signals	– Switch off test pulses. – Use MP5 plug connector.
	Malfunction due to electrical or electromagnetic effects (EMC information not in compliance)	– note maximum length of the signal lines. – Connect earthing correctly. – maintain minimum wall distance. – Do not install cables behind the product.

Malfunction/ error code	Possible cause	Remedy
Pressure p1 collapses briefly at every switching operation	The cross-section of the product pressure supply is too small	– Tighten flow control screw. – Attach reservoir in front of p1 inlet. – Adjust compressed air supply, e.g. increase cross section of the supply line.

Tab. 8 Fault clearance

12 Disassembly

1. Switch off energy sources:
   – Operating voltage
   – Compressed air
2. Separate the applicable connections from the product.

13 Disposal

ENVIRONMENT!

Send the packaging and product for environmentally sound recycling in accordance with the current regulations ➔ www.festo.com/sp.

14 Technical Data

14.1 Technical data, mechanical

MS6-SV-E		
Type of mounting		In-line installation With accessories
Constructive design		Piston seat has no overlap
Position sensing principle		Piston magnet principle
Reset method		Mechanical spring
Mounting position		Any
Sound pressure level	[dB(A)]	75 with silencer UOS-1
Environmental conditions		
Shock resistance		Shock test with severity level 2 in accordance with EN 60068-2-27
Vibration resistance		with severity level 2 in accordance with EN 60068-2-6
Degree of protection		
Degree of protection		IP65
Note		with multi-pin plug socket NECA
Materials		
Housing		Die-cast aluminium
Seal		NBR

Tab. 9 Technical data, mechanical

14.2 Technical Data, Pneumatic

MS6-SV-E		
Pneumatic connection 1, 2	[G]	1/2
Pneumatic port 3	[G]	1
Pilot air supply		Internal
Exhaust function		Without flow control option
Manual override		None
Type of control		Piloted
Valve function		3/2-way valve, monostable, closed Soft-start function

MS6-SV-E		
Medium		
Operating medium		Compressed air according to ISO 8573-1:2010 [7:4:4] and inert gases
Note		Lubricated operation possible, in which case lubricated operation will always be required
Temperature		
Medium	[°C]	-10 … +50
Environment	[°C]	-10 … +50
Bearing	[°C]	-10 … +50
Operating pressure		
Operating pressure	[bar]	3.5 … 10
Residual pressure in normal operation	[bar]	0 (no residual pressure)
Residual pressure in the event of error	[bar]	≤ 0.4 (at p1 = 10 bar and flow control fully open)
C value	[l/(s bar)]	19.3
B value		0.21
Flow rate values		
Standard nominal flow rate 1 → 2	[l/min]	4300 (at p1 = 6 bar, p2 = 5 bar)
Standard flow rate 2 → 3	[l/min]	9000 (at p1 = 6 bar
Standard flow rate 2 → 3 in the event of a critical fault	[l/min]	≥ 6000 (at p1 = 6 bar)
Switch-through point		Approx. 50% of p1
Filling flow		Adjustable by flow control
minimum pause time after exhaust	[s]	≥ 2

Tab. 10 Technical Data, Pneumatic

14.3 Technical Data, Electrical

MS6-SV-E		
Actuation type		Electrical
Switching frequency	[Hz]	≤ 0.5

MS6-SV-E		
Electrical connection		Sub-D, 9-pin, only with multi-pin plug sockets NECA-S1G9-P9-MP...
Degree of protection		IP65 with multi-pin plug socket NECA
Protection against electric shock (protection against direct and indirect contact in accordance with EN/IEC 60204-1)		by PELV fixed power supply
Switching position indicator		LED and potential-free contact
Operating voltage		
Nominal operating voltage DC	[V]	24
Current consumption	[A]	≤ 0.12[1)]
Voltage fluctuations		
Permissible voltage fluctuations	[%]	±10
Switching time		
Switching time off	[ms]	40
Switching time on	[ms]	130
Duty cycle	[%]	100
Semiconductor relay (signal contact)		
Voltage	[V]	≤ 60
continuous current	[A]	≤ 0.12
Resistance in switched-on status	[Ω]	≤ 25
Leakage current in switched-off status	[µA]	≤ 1
Protection class		III

1) A high starting current will apply briefly when switching on.

Tab. 11 Technical Data, Electrical

14.4 Safety engineering characteristics

Type	MS6-SV-E
Conforms to standard	EN ISO 13849-1
	EN ISO 13849-2
	EN 61508-1:2011-02

Type	MS6-SV-E
Safety function	safe venting and protection against unexpected start-up (pressurisation)
Performance Level (PL)	Category 4, PL e
Safety Integrity Level (SIL)	SIL 3
Service life characteristic B10 according to ISO 19973-1:2015	0.9 mill. switching cycles
Service life value at maximum approved operating pressure	0.25 mill. switching cycles
Service life [years]	20
Probability of dangerous failure per hour (PFH_d)	
PFH_d for the electronic part of the product	4.08 E-9 h^{-1}
PFH_d for the complete device[1)]	5.19 E-9 h^{-1}
CCF measures	Maintain operating pressure limits
	Comply with temperature range
	Comply with permissible load
	Comply with compressed air quality
Note on forced checking procedure	Switching frequency at least 1/month
CE marking (➔ declaration of conformity)	in accordance with EU Machinery Directive 2006/42/EG in accordance with EU EMC Directive 2004/108/EG
Type test	The functional safety of the product has been certified by an independent testing body ➔ EC-type examination certificate (www.festo.com)
Certificate issuing authority	IFA Europe notified body - characteristics number 0121
Certificate no.	IFA 1001180

1) This calculation is based on an average actuation rate of once per hour for 365 days and 24 hours. It is calculated with B10d = 2 x B10 (➔ Fig. 1).

Tab. 12 Safety engineering characteristics

14.5 Filling flow

Flow rate qn dependent on the number of rotations n of the flow control screw

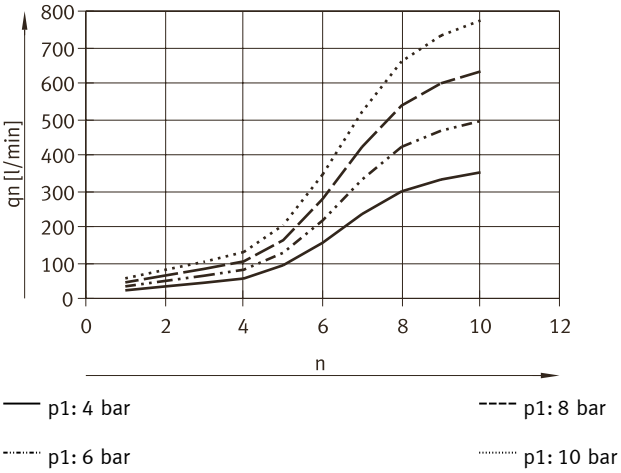


Fig. 19 Flow diagram

14.6 Exhaust time

The following table shows the exhaust time in normal operation (N) and in the event of a fault (F) for different volumes and operating pressures.

NOTICE!

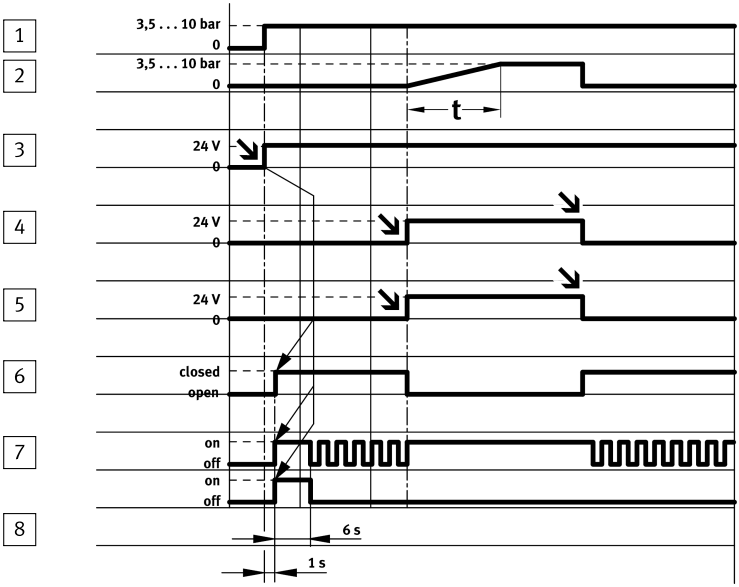
In the case of a fault (F) the worst possible fault in the valve's interior is assumed (worst case).

Normal operation: N Fault case: F			**Operating pressure 3.5 bar**		**Operating pressure 6 bar**		**Operating pressure 10 bar**	
			Exhaust time [s]		Exhaust time [s]		Exhaust time [s]	
			to 1.0 bar	to 0.5 bar	to 1.0 bar	to 0.5 bar	to 1.0 bar	to 0.5 bar
Volume [l]	2	N	0.1	0.2	0.24	0.3	0.3	0.4
		(F)	(0.16)	(0.22)	(0.28)	(0.35)	(0.36)	(0.52)
	10	N	0.3	0.45	0.55	0.7	0.7	0.9
		(F)	(0.4)	(0.6)	(0.8)	(1.1)	(1.2)	(1.9)
	20	N	0.5	0.85	1.0	1.3	1.4	1.7
		(F)	(0.8)	(1.25)	(1.5)	(2.2)	(2.4)	(3.9)
	40	N	1.2	1.9	2.2	3.0	3.0	3.9
		(F)	(1.7)	(2.8)	(3.4)	(5.3)	(5.1)	(8.1)
	150	N	3.2	5.0	6.0	8.2	11.0	12.8
		(F)	(4.8)	(8.2)	(9.8)	(15.4)	(16.2)	(29.0)

Tab. 13 Exhaust time

14.7 Switching characteristics of the multi-pin plug sockets NECA-...-MP1, -MP3 und -MP5

14.7.1 Switching characteristics for multi-pin plug socket NECA-S1G9-P9-MP1



1 Operating pressure p1
2 Outlet pressure p2
3 +L1: operating voltage
4 EN1: Enable signal 1
5 EN2: Enable signal 2
6 Signal contacts
7 Power LED (green)
8 Error LED (red)

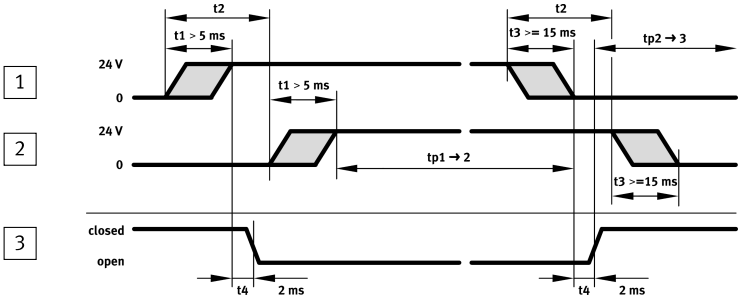
Fig. 20 Input and output switching characteristics in normal operation (when automatic start mode of operation is set) for multi-pin plug socket NECA-S1G9-P9-MP1

NOTICE!

- Pulses at inputs EN1 and EN2 from 0 to 24 V, of ≤ 3 ms duration do not send an error message to the product.
- Pulses at inputs EN1 and EN2 from 24 to 0 V, of ≤ 12 ms duration do not send an error message to the product.

The following diagrams shows the exact switching characteristics of the Enable signals EN1 and EN2 with time offset. The maximum reaction time can be derived from the delay between the two signals.

EN2 before EN1 (for multi-pin plug socket NECA-S1G9-P9-MP1)



1 EN2: Enable signal 2

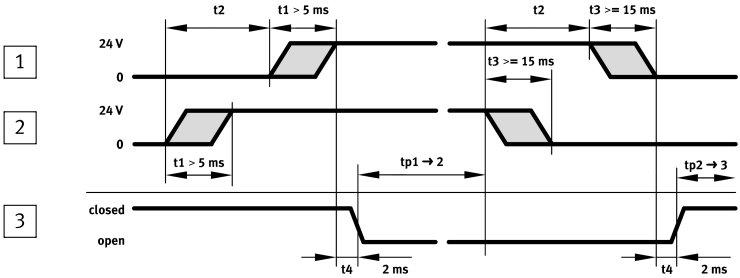
2 EN1: Enable signal 1

3 Signal contacts

Fig. 21 Runtime performance of enable signals with NECA-...-MP1

Maximum reaction time from exhausting to pressurisation: t2 + t1 = 75 ms + 5 ms = 80 ms
Maximum reaction time from pressurisation to exhausting: t3 + t4 = 15 ms + 2 ms = 17 ms

EN1 before EN2 (for multi-pin plug socket NECA-S1G9-P9-MP1)



1 EN2: Enable signal 2

2 EN1: Enable signal 1

3 Signal contacts

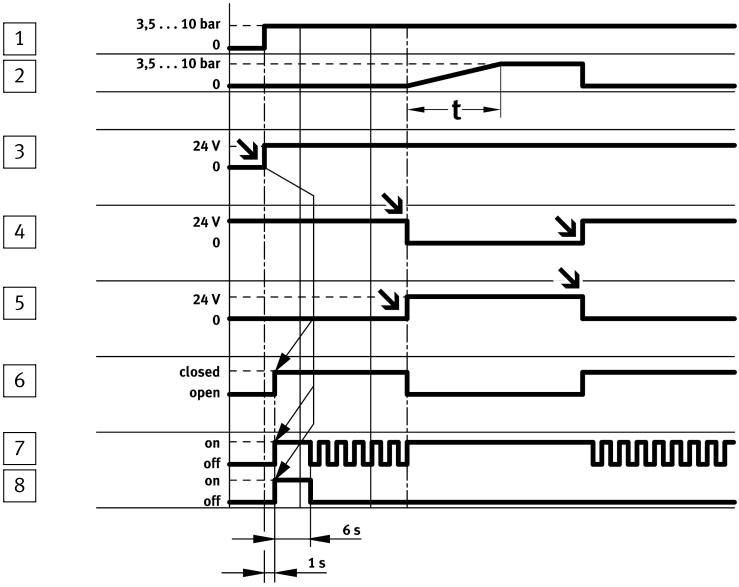
Fig. 22 Runtime performance of enable signals with NECA-...-MP1

Maximum reaction time from exhausting to pressurisation:
t2 + t1 + t4 = 75 ms + 5 ms + 2 ms = 82 ms
Maximum reaction time from pressurisation to exhausting:
t2 + t3 + t4 = 75 ms + 15 ms + 2 ms = 92 ms

Runtime performance	
t1 > 5 ms:	Level of EN2/EN1 must be HIGH for min. 5 ms (debounce time/input filter/stabilisation time).
t2 < = 75 ms:	maximum permissible delay time between EN1 and EN2. If exceeded, the product is not pressurised and an error message is output.
t3 > = 15 ms:	Level of EN2/EN1 must be LOW for min. 15 ms (debounce time/input filter/stabilisation time).
t4 = 2 ms:	maximum internal time delay caused by the program sequence.
tp1 → 2:	Pressurisation > 300 ms
tp2 → 3:	Exhausting > 1 s

Tab. 14 Runtime performance

14.7.2 Switching characteristics for multi-pin plug socket NECA-S1G9-P9-MP3/-MP5

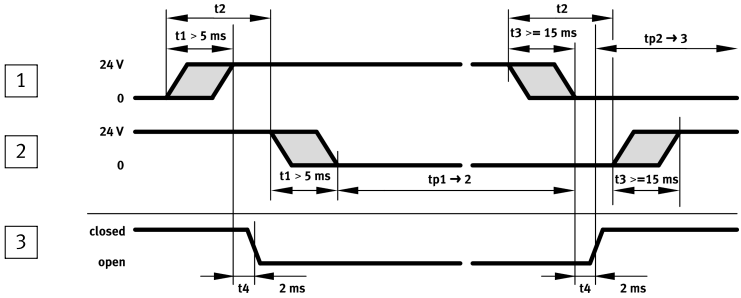


1 Operating pressure p1
2 Outlet pressure p2
3 +L1: operating voltage
4 EN1: Enable signal 1
5 EN2: Enable signal 2
6 Signal contacts
7 Power LED (green)
8 Error LED (red)

Fig. 23 Input and output switching characteristics in normal operation (when automatic start mode of operation is set) for multi-pin plug socket NECA-S1G9-P9-MP3/-MP5

Exhausting and output of an error message at NECA-...-MP3:
– EN1 and EN2 = 0 V (LOW)
– EN1 and EN2 = 24 V (HIGH)
Exhausting and output of no error message at NECA-...-MP5:
– EN1 and EN2 = 0 V (LOW)
– EN1 and EN2 = 24 V (HIGH)
The following diagrams shows the exact switching characteristics of the Enable signals EN1 and EN2 with time offset. The maximum reaction time can be derived from the delay between the two signals.

EN2 before EN1 (for multi-pin plug socket NECA-S1G9-P9-MP3/-MP5)

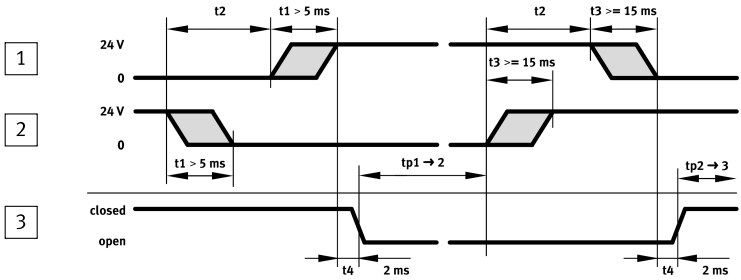


1 EN2: Enable signal 2
2 EN1: Enable signal 1
3 Signal contacts

Fig. 24 Runtime performance of enable signals with NECA-...-MP3/-MP5

Maximum reaction time from exhausting to pressurisation: t2 + t1 = 75 ms + 5 ms = 80 ms
Maximum reaction time from pressurisation to exhausting: t3 + t4 = 15 ms + 2 ms = 17 ms

EN1 before EN2 (for multi-pin plug socket NECA-S1G9-P9-MP3/-MP5)



1 EN2: Enable signal 2
2 EN1: Enable signal 1
3 Signal contacts

Fig. 25 Runtime performance of enable signals with NECA-...-MP3/-MP5

Maximum reaction time from exhausting to pressurisation: t2 + t1 + t4 = 75ms + 5ms + 2ms = 82ms

Maximum reaction time from pressurisation to exhausting:
t2 + t3 + t4 = 75 ms + 15 ms + 2 ms = 92 ms

Runtime performance of enable signals	
t1 > 5 ms:	Level of EN2 (EN1) must be HIGH (LOW) for min. 5 ms (debounce time/input filter/stabilisation time).
t2 < = 75 ms:	maximum permissible delay time between EN1 and EN2.
	Exceeding maximum permissible delay time: – Product is not pressurised and an error message is output (NECA-...-MP3) – Product is not pressurised and an error message is output (NECA-...-MP5)
t3 > = 15 ms:	Level of EN2 (EN1) must be LOW (HIGH) for min. 15 ms (debounce time/input filter/stabilisation time).
t4 = 2 ms:	maximum internal time delay caused by the program sequence.
tp1 → 2:	Pressurisation > 300 ms
tp2 → 3:	Exhausting > 2 s

Tab. 15 Runtime performance of enable signals

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