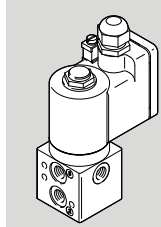


VOFD-L50T-M32-...-F10

Valve



FESTO

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Instructions | Operating

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Translation of the original instructions

1 About this document

This document describes the use of the above-mentioned product. It contains additional information for use of the product in safety-related systems (safety handbook in accordance with IEC 61508).

1.1 Further applicable documents

- Certification documents
- VOFD assembly instructions

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

1.2 Target group

This document is targeted towards individuals who mount and operate the product. It is additionally targeted towards individuals who are entrusted with the planning and application of the product in a safety-oriented system.

1.3 Specified standards

| Version | |
|------------------|------------------|
| IEC 61508-1:2010 | IEC 61508-4:2010 |
| IEC 61508-2:2010 | IEC 61511:2016 |

Tab. 1 Specified standards

2 Safety

2.1 General 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.
- Only use media in accordance with the specifications → 11 Technical data.
- Product must be regularly tested by a qualified person, and the test must be documented → 9 Maintenance.

Return to Festo

- In the event of malfunctions or failure: replace the product and let Festo know about the failure.
- Before returning, please contact the technical consultant from Festo in order to clarify the conditions of the return.

2.2 Intended use

The VOFD-L50T-M32-...-F10 valves are directly actuated, electromechanical control valves. They are made of a basic valve from the VOFD-L50T-M32-...-F10 series in combination with a solenoid coil from the VACC-S18 series. The valves are used for controlling pneumatic actuators.

2.3 Training of qualified personnel

Work on the product should only be conducted by qualified personnel. The qualified personnel must be familiar with installation of process automation systems.

3 Further 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 Information on functional safety

5.1 Achievable safety rating

The product is suitable for use as an element in a safety-oriented system in accordance with IEC 61511.

- In low-demand mode up to SIL 2
- In high-demand mode up to SIL 2.

Taking into account the necessary minimum hardware fault tolerance of HFT = 1, the product can also be used up to SIL 3 with a redundant design of the entire system.

NOTICE!

The suitability for certain applications can only be determined in connection with the assessment of further components of the subsystem.

5.2 Safety function

The safety function comprises the safe venting of a control unit connected to port 2. The safety function is triggered by switching off the power supply at the solenoid coil. As long as the voltage remains switched off at the solenoid coil, the connection between ports 2 and 3 is enabled. This switching position represents the safe state.

5.3 Operating conditions

- General information on safe operation → 2 Safety.
- Periodic tests (performance test) → 9 Maintenance.
- Ambient conditions and additional technical specifications → 11 Technical data.

5.4 Limitations of use

The service life is not limited if the operating conditions are complied with.

- Maximum admissible interval for a complete performance test: 7 years

5.5 Characteristic values

| Safety standards (in accordance with IEC 61508) | | Value |
|--|---|----------------------------|
| Probability of dangerous failure on demand (Probability of Dangerous Failure on Demand) | PFD _{spec} | 4.59 * 10 ⁻⁴ |
| Test interval (Assumed Test Interval) | T _i | 1 a |
| Confidence level (Confidence Level) | 1 - α | 95 % |
| Hardware fault tolerance (Hardware Fault Tolerance) | HFT | 0 |
| Diagnostic coverage (Diagnostic Coverage) | DC | 0 |
| Type of subsystem (Type of Subsystem) | | Type A |
| Operating mode (Mode of Operation) | | Low Demand and High Demand |
| degree of coverage of dangerous errors through the proof test (Proof Test Coverage) | PTC | 99 % |
| Assumed demands per year (Assumed Demands per Year) | n _{op} | 1 / a |
| Total Failure Rate (Total Failure Rate) | λ _S + λ _D | 2.10 * 10 ⁻⁷ /h |
| Failure rate for dangerous errors detected (Lambda Dangerous Detected) | λ _{DD} | 0 |
| Failure rate for dangerous errors not detected (Lambda Dangerous Undetected) | λ _{DU} | 5.24 * 10 ⁻⁸ /h |
| Failure rate for safe errors (Lambda Safe) | λ _S | 1.57 * 10 ⁻⁷ /h |
| Mean time to failure (Mean Time to Failure) | MTTF | 544 a |
| Mean time to dangerous failure (Mean Time to Dangerous Failure) | MTTF _D | 2,178 a |
| Mean probability of dangerous failure on demand (Average Probability of Failure on Demand) | PFD _{avg} (T _i = 1 a) | 2.30 * 10 ⁻⁴ |
| | PFD _{avg} (T _i = 2 a) | 4.60 * 10 ⁻⁴ |
| | PFD _{avg} (T _i = 5 a) | 1.15 * 10 ⁻³ |
| | PFD _{avg} (T _i = 7 a) | 1.61 * 10 ⁻³ |
| Mean frequency of a dangerous failure per hour (Probability of dangerous Failure per Hour) | PFH | 5.24 * 10 ⁻⁸ /h |

Tab. 2 Safety characteristics

6 Function

The VOFD-L50T-M32-...-F10 valves are single-solenoid 3/2-way valves with mechanical spring return. When the system is off, the valve disc is pressed onto the seat by a spring. This shuts off the compressed air supply at the input.

- If voltage is applied at the solenoid coil: the armature is attracted. Exhaust port 3 is closed and the flow between ports 1 and 2 is unblocked.
- If there is no voltage at the solenoid coil: the compressed air supply from port 1 is closed. Port 2 is connected with exhaust port 3. This allows a downstream control unit to be vented.

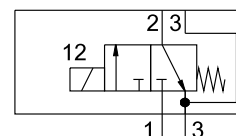


Fig. 1 Circuit symbol

7 Assembly and installation

7.1 Requirements

- The piping is unpressurised.
- Connecting cables and fittings are clean.
- The power supply is switched off.

7.2 Assembly

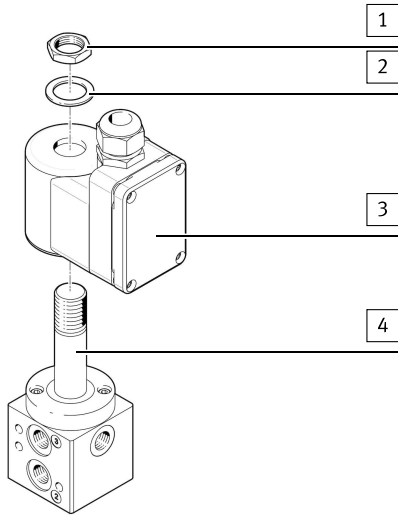


Fig. 2 Mounting solenoid coil on valve body

1. Ensure that no condensed water can accumulate in the valve.
2. Slide solenoid coil [3] onto the armature guide tube [4].
3. Slide spring washer [2] onto the armature guide tube.
4. Tighten nut [1] (≙ 22).
 - Tightening torque: 17.5 Nm ± 10%

For outdoor applications

NOTICE!

Moisture, foreign matter and other contamination that enters the valve can damage the product and limit functioning.

- Ensure that there is ventilation.
- Use exhaust protection.

- Duct exhaust air.

With 1/2" and 1/2 NPT connection:

- Use exhaust protection VABD-D3-SN-N12.

With 1/4" and 1/4 NPT connection:

- Use exhaust protection VABD-D3-SN-G14.

7.3 Pneumatic installation

- Recommended: use feed line with ≥ 6 mm cross-section.
- Use only fittings with cylindrical threaded lugs and sealing rings or cutting rings.
- Do not use additional sealing agents such as PTFE sealing tape or hemp.
- Do not use anti-friction coating or lubricant.

7.4 Electrical installation

- Take suitable measures for protective circuit to limit peak disconnection voltages.
- Any polarity.

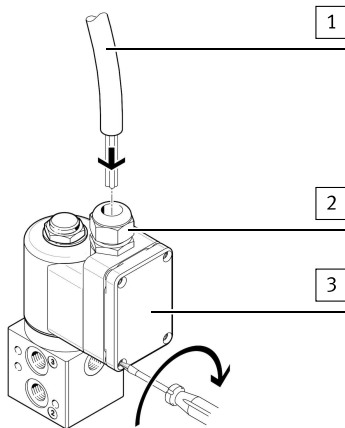


Fig. 3 Electrical connection of solenoid coil

1. Loosen the screws on the terminal housing and open cover [3].
2. When loosening the cap nut of the cable [2] connector, prevent the lock nut on the case from loosening (use second key).
3. Guide cable [1] through the cable connector and wire it to the terminals.
4. Connect the solenoid coil to the local equipotential bonding via the inner or outer protective grounding terminal.
5. Tighten the cap nut of the cable connector [2].
 - Tightening torque: 4.3 Nm ± 10%
6. Close the cover of the terminal housing [3] and tighten screws.
 - Tightening torque: 2.5 Nm ± 20%

Function check

- After assembly, actuate the solenoid valve a few times and check for correct function.

8 Commissioning

- After complete assembly and installation, check and document the safety function.

9 Maintenance

9.1 General

- When used as intended, the product is maintenance-free.
- Repairs to the product are not permissible. In the event of malfunctions or failure: Replace the product and let Festo know about the failure. Return defective products to Festo.

9.2 Proof test (Proof test)

The proof test consists of switching off the voltage at the solenoid valve and then switching the voltage back on.

- Perform the proof test at least once every 7 years.

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During the proof test, the safety of the application must be ensured.

1. Switch off the voltage at the solenoid coil.
2. Measure the time until the pressure at port 2 has completely decreased to the ambient pressure (reached the safe state).
 - ↳ The test is successful if the safe state is reached within the given time and a downstream actuator has taken its intended position.
3. Switch on the voltage at the solenoid coil.
 - ↳ The test is successful if the pressure at port 2 has reached the original value.
4. Check the valve externally (visual inspection).
 - ↳ The test is successful if no defect, leakage or contamination is detected.
5. Document test results.

10 Disposal

ENVIRONMENT!

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

11 Technical data

| General | VOFD-L50T-M32-...-F10 |
|--|---|
| Mounting position | Any |
| Medium | Compressed air to ISO 8573-1:2010 [7:2:2] |
| Temperature of medium [°C] | -25 ... 60 |
| Ambient temperature [°C] | -25 ... 60 |
| Ambient temperature Low-Demand Mode [°C] | -25 ... 60 |
| Storage temperature [°C] | -20 ... 40 |
| Corrosion resistance class CRC | 4 |
| Degree of protection (in mounted state) | IP65 |
| Operating pressure [bar] | 0 ... 10 |

Tab. 3 Technical data