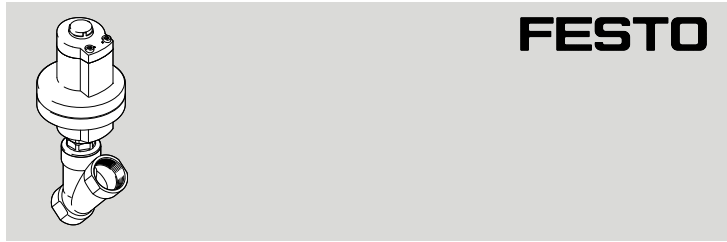


VZXA-M

Angle seat valve with diaphragm actuator



Instructions | Operating

8110518
2019-07b
[8110520]



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

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

1.2 Specified standards

Version	
IEC 61508:2010 Part 1,2,4 ... 7	IEC 61511:2016

Tab. 1 Standards specified in the document

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.
- Use the valve only in the flow direction indicated.
- Take into consideration the ambient conditions at the location of use.

Media

- Only use media in accordance with the specifications → 16 Technical data.
- Use only media that will not cause dangerous reactions if mixed.
- Do not operate the product with chemically unstable gases, abrasive media or solid materials.

Actuator

- Do not open the actuator (pressure in the actuator or loaded spring).
- Avoid mechanical stresses on the valve. Do not use the actuator as a lever.

Return to Festo

Hazardous substances can endanger the health and safety of personnel and cause damage to the environment. To prevent hazards, the product should only be returned upon explicit request by Festo.

- Consult your regional Festo contact.
- Complete the declaration of contamination and attach it to the outside of the packaging.
- Comply with all legal requirements for the handling of hazardous substances and the transport of dangerous goods.

2.2 Intended use

The angle seat valve VZXA-...-M is intended to shut-off gaseous or liquid media in piping systems.

- To control liquid media, use only the product variant VZXA-B-... Use (media flow under valve seat).

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 Information on functional safety

3.1 Operating conditions

- General information on safe operation → 2 Safety.
- Periodic tests (performance test) → 11 Maintenance → 11.1 General.
- Ambient conditions and additional technical specifications → 16 Technical data.

3.2 Achievable safety rating

The product is suitable for use as an element in a safety-related 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 execution of the entire system.

NOTICE!

It is only possible to determine whether the product is suitable for specific applications by also assessing further components of the subsystem.

3.3 Safety function

Single-acting valves

The safety function comprises acceptance of the initial position on request. The request is implemented by removal of the operating pressure.

- Valves with NO control function: the valve opens completely and remains open until operating pressure is applied.
- Valves with NC control function: the valve closes completely and remains closed until operating pressure is applied.

3.4 Characteristic values

Safety standards (in accordance with IEC 61508)		Value
Assessment path (Route of assessment)		2 _H / 1 _S
Type of subsystem (Type of Sub System)		Type A
Operating mode (Mode of Operation)		Low Demand and High Demand
Test interval (Assumed Test Interval)	T _i	1 a
Confidence level (Confidence Level)	1-α	95 %
Hardware fault tolerance (Hardware Fault Tolerance)	HFT	0
Failure rate for dangerous errors (Lambda Dangerous)	λ _D	1.36 * 10 ⁻⁷ /h
Failure rate for dangerous errors not detected (Lambda Dangerous Undetected)	λ _{DU}	1.36 * 10 ⁻⁷ /h
Mean time to dangerous failure (Mean Time To Dangerous Failure)	MTTF _D	7.37 * 10 ⁶ h
Degree of coverage of dangerous errors through the proof test (Proof Test Coverage)	PTC	95 %
Low Demand Mode		
Assumed demands per year (Assumed Demands per Year)	n _{op}	1 / a
Mean probability of dangerous failure on demand (Average Probability of Failure on Demand)	PFD _{avg}	5.95 * 10 ⁻⁴
High Demand Mode		
Assumed demands per year (Assumed Demands per Year)	n _{op}	1/h (8760/a)
Mean frequency of a dangerous failure per hour (Probability of dangerous Failure per Hour)	PFH	1.36 * 10 ⁻⁷ /h

Tab. 2 Safety standards (in accordance with IEC 61508)

4 Further information

- Accessories → www.festo.com/catalogue.
- Spare parts → www.festo.com/spareparts.

5 Service

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

6 Product overview

6.1 Configuration

6.1.1 Product design

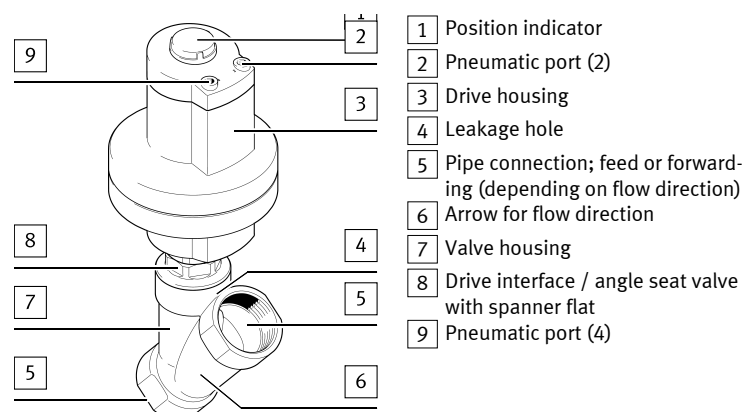
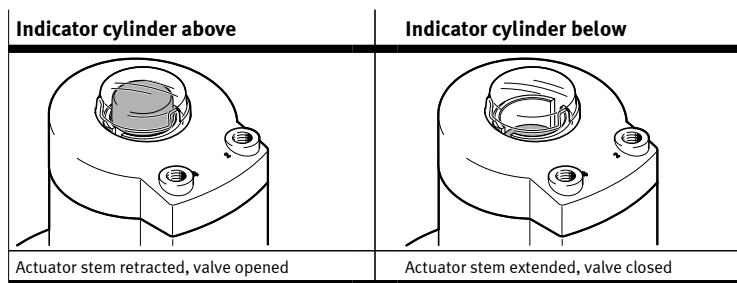


Fig. 1 Product design

Position indicator

The pneumatic position indicator shows the position of the actuator stem.



Tab. 3 Position indicator

6.1.2 Product variants and type code



The following section explains selected product characteristics that are necessary to understand the instruction manual. Description of the complete type code

→ www.festo.com/catalogue.

Feature	Value	Description
Type	VZXA	Angle seat valve
Media flow	A	above valve seat, closing in the direction of media flow (for gaseous media)
	B	under valve seat, closing against the direction of media flow (for gaseous and liquid media)
Connection type	TS6, TS7, TS13	Line connection and connection standard
Temperature of medium	M2	-10 ... +180 °C
	M3	-30 ... +200 °C
Valve housing material	V13	Stainless steel 1.4409
	V14	Stainless steel ASTM A351-CF3M
Seat seal material	TP	PTFE modified
	T	PTFE
Medium pressure	4 to 30	0 ... 4 bar to 0 ... 30 bar
Actuator	M	Diaphragm actuator
Actuator size	90	90 mm
Control function		closed via spring force, NC
	S	opened by spring force, NO
	PR	closed by reduced spring force, NC

Tab. 4 Description of key features

6.2 Function

The angle seat valve VZXA-...-M is an externally controlled 2/2 directional control valve with diaphragm actuator. The valve seat is slanted approx. 40° toward the media flow. To close the valve, the valve actuator using the actuator stem presses the valve disc into the valve seat in a force fit.

The supply of the operating medium is controlled by an external valve (usually electrically actuated) that must also be integrated into the supply cable for the drive.

The actuator can be rotated 360° around the valve body.

Flow over valve seat

The valve is closed by spring force with the medium flow.

- Media pressure assists the closing of the valve.
- The valve is opened by operating pressure.
- Only suitable for gaseous media, because use of incompressible media causes pressure surges in the piping.

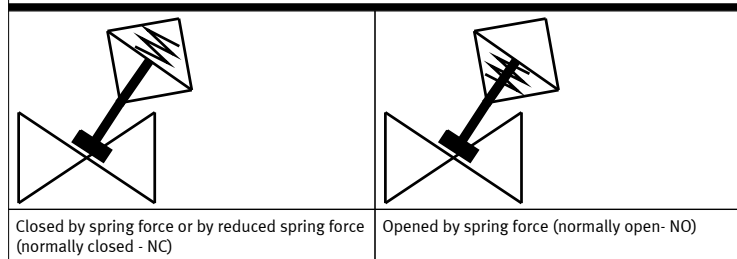
Flow under valve seat

The valve is closed by spring force or by operating pressure against the media flow.

- Media pressure assists the opening of the valve.
- In some designs media pressure that is too high or operating pressure that is too low can result in the valve not closing completely.

Control function

Single-acting



Tab. 5 Control function

7 Transport and storage

- For delivery of used products: Comply with all legal requirements for the handling of hazardous substances and the transport of dangerous goods. For returns to Festo → 2 Safety.
- Store the product in a cool, dry, UV-protected and corrosion-protected environment. Ensure that storage times are kept to a minimum.

8 Assembly and installation



With angle seat valves VZXA-...-K46-..., use only fittings G $\frac{1}{8}$ with max. SW14.

Requirements

- The piping is unpressurised, and no medium flows in it.
- The line ends are mounted.
- Connecting cables and fittings are clean.

Cleaning the valve

- Remove all transport packaging. The material used in the packaging has been specifically chosen for its recyclability (exception: oil-impregnated paper = residual waste).

Traces of residual grease may be evident on the product due to the production process used.

- Clean the valve immediately before installation.

Installing the valve

⚠ WARNING!

Risk of injury due to slipping or falling objects.

The valve can weigh up to 11.5 kg, depending on the product version. Body parts can be crushed. In overhead installations, the result can be serious head injuries.

- Secure the valve from falling or slipping with appropriate means of securing.

1. Bring the valve into its mounting position.
 - Observe the flow direction. The permitted flow direction is marked by an arrow on the valve housing → Fig. 1, [6].
2. Connect the piping to the valve housing.
 - Tightening torque → Tab. 6 Pipe connection tightening torque
3. Connect the operating medium line.
 - Pneumatic connection (2): operating medium
 - Pneumatic connection (4): exhaust port
4. Mount the silencer in the exhaust port or use a tubing connection for guided exhaust air.

Connection size	["]	1	1¼	1½	2	2½
Max. pipe connection tightening torque	[Nm]	350	450	540	620	750

Tab. 6 Pipe connection tightening torque

9 Commissioning

⚠ WARNING!

Risk of injury from manipulation in the operating area of the angle seat valve.

Limbs can be cut or severed.

- Operate the angle seat valve only if it is fully mounted.

Requirements

- The valve is fully mounted and connected.

Checking operating conditions

1. Check operating conditions and limit values → 16 Technical data.
2. Check connection points for tightness.
3. Check compatibility of the devices in the system for maximum pressure (consider pressure peaks). If necessary, adjust the application parameters.

Commissioning the valve

1. Supply medium.
2. Slowly apply operating pressure to the valve. The operating pressure required for reliable switching of the valve depends on the medium pressure.
3. Function and direction control of the individual pneumatic drives.

10 Operation

⚠ WARNING!

Risk of injury from touching hot surfaces.

Valve housing and actuator can become hot at high temperature of medium. Severe burns are possible.

- Do not touch the angle seat valve during operation or immediately afterward.

- Comply with operating conditions.
- Comply with maintenance conditions → 11 Maintenance → 11.1 General.

After longer idle times:

- Actuate the valve several times and check for correct function.

11 Maintenance

11.1 General

⚠ WARNING!

Risk of injury from touching hot surfaces.

Valve housing and actuator can become hot at high temperature of medium.

Severe burns are possible.

- Allow the angle seat valve to cool off before working on it.

- Check product regularly from the outside for leakage and function.
- Check function of the product regularly.
- Clean product regularly with commercial cleaning agents.

11.2 Proof test Proof Test

The proof test (Proof Test) consists of shutting the operating pressure off and on.

- Run the proof test once a year.

i

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

1. Shut off operating pressure.
2. Check valve position.
 - ↳ The test is successful if the safe state is reached within the specified time. For assessment of the safe state → 3.3 Safety function.
3. Slowly apply operating pressure to the valve.
 - ↳ The test will be successful if the valve returns to its original position.
4. Check the valve externally (visual inspection).
 - ↳ The test is successful if no defect or leakage is detected.
5. Document test results.

12 Malfunctions

Fault description	Cause	Remedy
Valve does not close or closes too slowly.	VZXA-B: media pressure is too high or operating pressure too low. Medium contains too many or too large contaminants.	Set required differential pressure or adjust operating pressure → 16 Technical data. Comply with operating conditions.
Valve does not open or opens too slowly.	VZXA-A: operating pressure is too low or media pressure is too high. VZXA-B: operating pressure is too low.	Adjust operating pressure or media pressure. Adjust operating pressure.
Medium leaks out of leakage hole.	Seal cartridge is defective.	Replace seal cartridge → Spare parts documentation.
Medium cannot be shut off.	Seat seal is defective.	Replace seat seal → Spare parts documentation.

Tab. 7

13 Modification

⚠ DANGER!

Risk of injury from flying objects.

Unsecured parts under pressure can fly around and injure people.

- Before replacing wearing parts, depressurise the valve and piping.

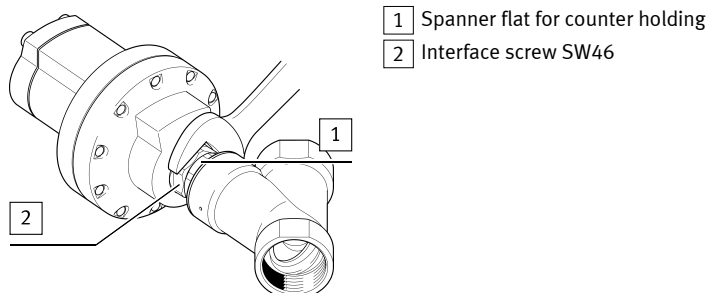


Fig. 2 Demounting actuator

13.1 Removing actuator from the valve housing – in installed position

The actuator can be removed from the valve housing without having to remove the valve from the piping.

1. Depressurise the piping and allow valve to cool to room temperature.
2. Secure the actuator with suitable equipment to prevent it from falling or slipping.
3. Extend the actuator stem.
 - With valves with NO control function: pressurise connection (2) (3 bar).
 - For valves with NC control function: exhaust the actuator.
4. Loosen interface screw [2].
5. Remove actuator from the valve housing.
6. Shut off operating pressure.

13.2 Removing actuator from the valve housing – in removed position

1. Extend the actuator stem.
 - With valves with NO control function: pressurise connection (2) (3 bar).
 - For valves with NC control function: exhaust the actuator.

2. Loosen interface screw [2].
3. Remove actuator from the valve housing.
4. Shut off operating pressure.

13.3 Mounting actuator on the valve housing

1. Extend the actuator stem.
 - For valves with NO control function: pressurise connection (2) slowly (3 bar).
 - For valves with NC control function: exhaust the actuator.
2. Push valve body spindle completely into the valve body.
3. Place actuator on valve housing.
4. Tighten interface screw [2].
 - Tightening torque: 50 Nm
5. Shut off operating pressure.

13.4 Turning actuator

1. Loosen interface screw [2] (max. ½ turn).
2. Rotate actuator to desired position.
3. Tighten interface screw [2].
 - Tightening torque: 50 Nm

14 Disassembly

⚠ DANGER!

Risk of injury due to movement of pressurised parts.

The valve can switch if there is a drop in pressure. Limbs can be cut or severed.

- Before removal, move the valve to the closed position.
- Before removal, depressurise the valve and the piping.

⚠ WARNING!

Risk of injury from touching hot surfaces.

Valve housing and actuator can become hot at high temperature of medium. Severe burns are possible.

- Allow the angle seat valve to cool off before working on it.

⚠ WARNING!

Risk of injury due to slipping or falling objects.

The valve can weigh up to 11.5 kg, depending on the product version. Body parts can be crushed. In overhead installations, the result can be serious head injuries.

- Secure the valve from falling or slipping with appropriate means of securing.

1. Depressurise the piping and the connecting cable of the operating medium. Allow the valve and piping to cool.
2. Empty the piping and valve completely.
 - Make sure no one is located in front of the outlet opening.
 - Catch draining media in a suitable container.
3. Disconnect the connecting cable of the operating medium from the valve.
4. Disconnect the piping connections and remove the valve.

15 Disposal

- Dispose of the product in an environmentally friendly manner. In doing so, take the remaining media into account (use of problematic materials if applicable)
- Observe the local regulations for environmentally friendly disposal.

16 Technical data

16.1 Technical data, general

Type	VZXA...-M
Constructive design	Poppet valve with diaphragm actuator
Actuation type	Pneumatic
Sealing principle	Soft
Mounting position	Any
Type of mounting	In-line installation
Valve function	2/2
Flow direction	Non-reversible
Product weight	→ www.festo.com/catalogue
CE marking	in accordance with declaration of conformity → www.festo.com/sp
Medium	
Medium VZXA...-A	Compressed air grade of filtration 200 µm, inert gases, vapour ¹⁾
Medium VZXA...-B	Compressed air grade of filtration 200 µm, inert gases, water, neutral liquid media, petroleum, petroleum based hydraulic fluid, vapour
Medium pressure	[bar] 0 ... 30, in accordance with information on product labelling
Viscosity	[mm ² /s] ≤ 600
Operating medium	
Operating medium	Compressed air to ISO 8573-1:2010 [7:4:4]
Operating pressure	[bar] max. 7

Type		VZXA-...-M
Ambient conditions		
Temperature of medium (modified PTFE seat seal material) [°C]		-30 ... +200
Temperature of medium (PTFE seat seal material) [°C]		-10 ... +180
Permissible min./max. temperature (TS) (modified PTFE seat seal material) [°C]		-30 ... +200
Permissible min./max. temperature (TS) (PTFE seat seal material) [°C]		-10 ... +180
Ambient temperature [°C]		0 ... +60
Actuator degree of protection		IP65, IP67, IP67K (with guided exhaust air)
Valve housing connection		
VZXA-...-TS6		Threaded collar in accordance with DIN ISO 228
VZXA-...-TS7		Threaded collar in accordance with ANSI/ASME B 1.20.1
VZXA-...-TS13		Threaded collar in accordance with DIN ISO 10226
Operating medium port		G½
Note on materials		
Valve housing VZXA-...-V13		Stainless steel casting (1.4409)
Valve housing VZXA-...-V14		Stainless steel casting (ASTM A351-CF3M)
Seat seal VZXA-...-TP		PTFE modified
Seat seal VZXA-...-T		PTFE
Drive housing		Stainless steel casting (1.4408)
Diaphragm actuator seals		NBR
Actuator stem		High-alloy stainless steel
Actuator cover		Stainless steel casting (1.4408)

1) other media on request

Tab. 8 Technical data, general, VZXA

16.2 Technical data, pneumatic

Nominal pressure, burst pressure and flow rate of valve body VZXA-...-TS

Connection size	[""]	1	1¼	1½	2	2½
Nominal width DN		25	32	40	50	60
Nominal pressure of fitting PN (up to 200°C temperature of medium) [bar]		40		25		
Burst pressure (up to 200°C temperature of medium) [bar]		200		125		
Flow rate $K_v^{1)}$						
VZXA-B-...-90 [m³/h]		23.6	33.1	49.0	60.4	77.9
VZXA-A-...-90 [m³/h]		24.7	35.4	47.4	68.5	77.4

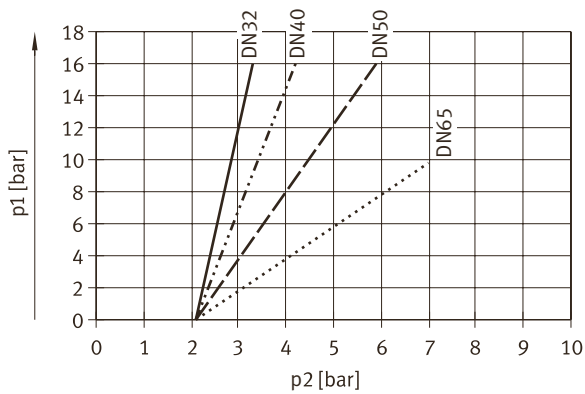
1) water, at + 20 °C, media pressure 1 bar at valve inlet, free discharge

Tab. 9 Technical data, pneumatic, VZXA- -TS

Media pressure and operating pressure VZKA-B-...-M-90-...-S (media flow under valve seat, NO)

Nominal width DN	32	40	50	65
Max. media pressure [bar]	16		12.2	5.8
Min. operating pressure [bar]	3.3	4.2	5	

Tab. 10 Limit values of media pressure and operating pressure VZKA-B-...-M-90-...-S



p1 Medium pressure p2 Operating pressure

Fig. 3 Media pressure and operating pressure VZKA-B-...-M-90-...-S

Media pressure and operating pressure VZXA-B-...-M-90 (media flow under valve seat, NC)

Nominal width DN	25	32	40	50	65
Max. media pressure [bar]	30	25	16	10	5.6
Min. operating pressure [bar]	5				

Tab. 11 Limit values of media pressure and operating pressure VZXA-B-...-M-90

Media pressure and operating pressure VZXA-B-...-M-90-...-PR (media flow under valve seat, NC with reduced spring force)

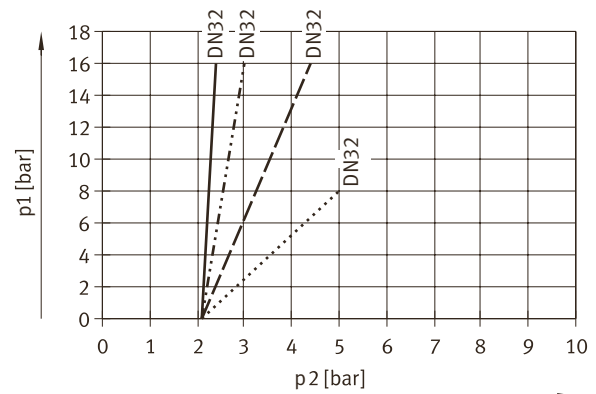
Nominal width DN	25	32	40
Max. media pressure [bar]	14.5	7.5	6
Min. operating pressure [bar]	2.1		

Tab. 12 Limit values of media pressure and operating pressure VZXA-B-...-M-90-...-PR

Media pressure and operating pressure VZXA-A-...-M-90-...-PR (media flow over valve seat, NC with reduced spring force)

Nominal width DN	32	40	50	65
Max. media pressure [bar]	16			8
Min. operating pressure [bar]	2.4	3	4.4	5

Tab. 13 Limit values of media pressure and operating pressure VZXA-A-...-M-90-...-PR



p1 Medium pressure

p2 Operating pressure

Fig. 4 Media pressure and operating pressure VZXA-A-...-M-90-...-PR