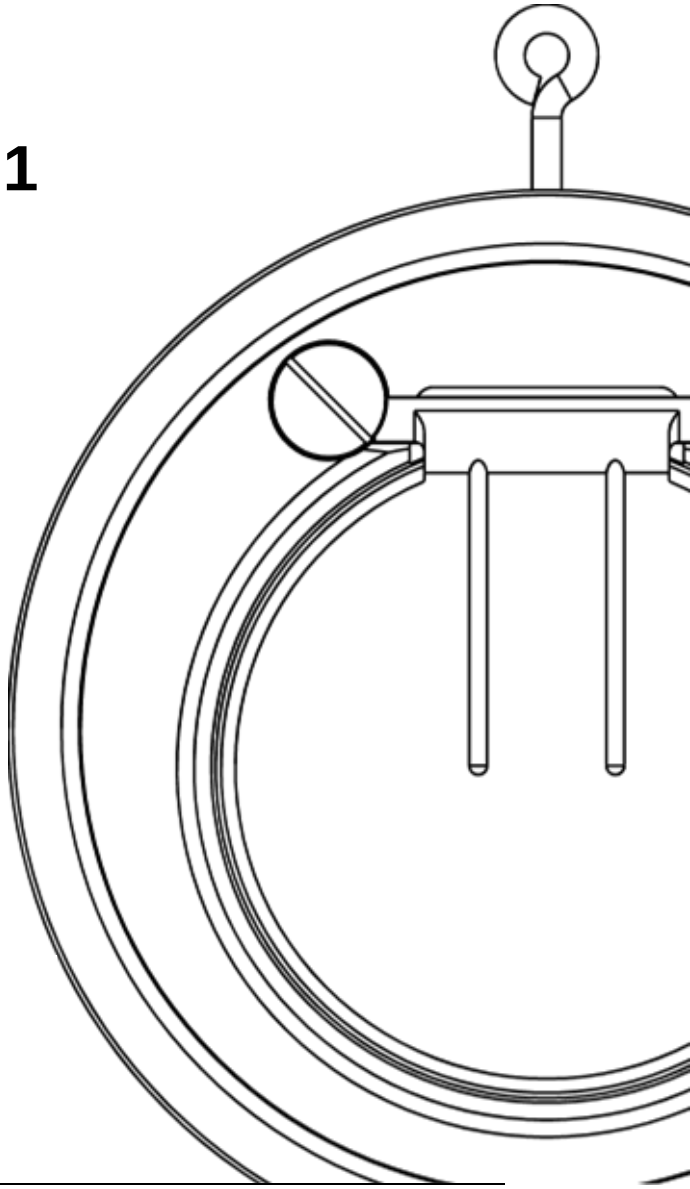
Operating instruction

Swing check valve

Product line

ZRK / ZRKF / 920 / 925.1



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Read carefully before use.
Keep for future use.
We reserve the right to make technical changes.

EN
Englisch

CONTENTS
Swing check valve

1 PREFACE

This operating instruction supports the user in the appropriate, safe and economical use of the following valves:

- Swing check valves of the product line ZRK, ZRKF, 920 and 925.1

1.1 General

These operating instructions apply to all the above-mentioned valves. To guarantee safe and smooth use, the entire manual must be read and understood before installation and commissioning. These instructions are intended to assist the user during installation, operation, maintenance and removal. In addition to the instructions in this manual, all applicable accident prevention regulations, safety rules, country-specific or system-specific regulations and instructions must be observed. These operating instructions are an essential part of the valve and must be kept available by the operator at the place of use, also for a later use.

1.2 Target group

This instruction is intended for any person who is involved in work of any kind on the valve. In particular, the operating instructions are intended for trained and qualified personnel.

1.2.1 Personnel qualification

All work on the valve must be carried out by qualified personnel only. If the personnel do not have the required qualifications, they have to be trained. This must be ensured by the operator. Persons without the required knowledge and skills are not permitted to work on the valve.

1.3 Applicable documents

This includes the corresponding data sheet and the declaration of conformity of the above mentioned valves. If necessary, these are to be requested from the manufacturer or downloaded from the website.

1.4 Warranty

AWS Apparatebau Arnold GmbH does not assume any warranty in case the operator or third parties:

- disregard this document.
- do not use the valve properly.
- should carry out interventions of any kind (conversions, modifications, etc.) on the valve.

Malfunctions due to pollution or wear of the valve as well as wearing parts (e.g. seals) are not covered by the warranty.

2 SAFETY INSTRUCTIONS

2.1 Warnings

The following warnings are used in this manual. In order to protect you from accidents, injuries and damage to property, it is important to read and observe these warnings.

	**DANGER**
	High risk Indicates an immediate danger. If not avoided, death or serious injury will result.

	**WARNING**
	Medium risk Indicates a potentially dangerous situation. If not avoided, death or serious injury may result.

	**CAUTION**
	Low risk Indicates a potentially dangerous situation. If it is not avoided, minor or slight injuries may result.

	**NOTICE**
	Commandment Indicates a potentially harmful situation. If not avoided, property damage may result.

2.2 Intended use

AWS valves may only be used within the approved pressure and temperature limits, considering chemical and corrosive influences. The valves are not suitable for fluids containing solids. Intended use includes observing and following the instructions in this manual. Modifications, conversions or any use of the valve other than the intended use are considered to be improper use.

2.3 Requirements of the user

It is the responsibility of the planner/installer and operator to ensure that:

- the valve is used as described in chapter *2.2 Intended use*.
- the piping system is properly installed and its proper functioning is regularly checked.
- only qualified personnel are used for installation, removal and maintenance.
- the valve is only professionally installed if it is in perfect condition.
- the operating instruction are taken into account by the personnel.
- personnel receive regular instruction in industrial safety and environmental protection (especially for pressurized pipes).

2.4 General safety instructions

The same regulations apply to all valves as to pipeline systems in which they are installed. The national and international regulations with regard to accident prevention as well as safety regulations must be observed by the operator.

DANGER

When working on system

- System must be switched off and secured against unauthorized switch-on.
- Pipeline must be pressureless to prevent uncontrolled leakage of the medium.
- Pipeline must have cooled down to approx. 20°C.
- Medium must be completely removed from the valve and pipeline.
- Contaminated valve must be completely decontaminated before work is performed.
- Valves may only be installed, removed and maintained by qualified personnel.

DANGER

When operating the system and the valve

- In applications with explosion hazard, hot surfaces of the system and valve parts can be a potential source of ignition. This danger must be taken into account by the operator

WARNING

When working on the system

- Any remaining liquid that may leak out during removal must be collected and disposed of.

WARNING

When operating the system and the valve

- Only media may be used which do not damage the valve and its seals (suitable material pairing). Otherwise, this can lead to leakage and leaking of the medium.
- When using media with a very low or very high temperature, burns can occur when touching the system parts or the valve housing. In this case, these may only be touched with suitable protective equipment. This must be done under the responsibility of the operator of the system.
- Pressure surges in the system can cause severe damage and must be avoided. This is the responsibility of the operator of the system.

CAUTION

Risk of minor injuries

- Wear protective gloves during installation, removal and maintenance to avoid injuries from cuts on sharp-edged components.
- Always secure the valve adequately during transport, installation and removal.

NOTICE

Notice of property damage

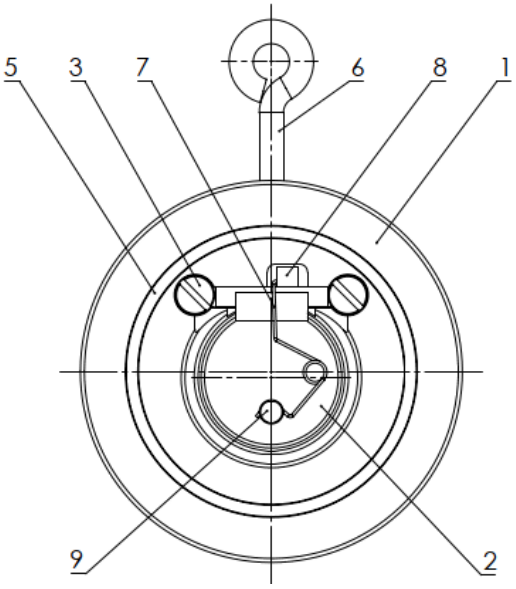
- The valve and the system can be damaged if the valve is not installed correctly.
- Do not subject the valve to pressure surges; otherwise the valve may be damaged.

3 VALVE DESCRIPTION

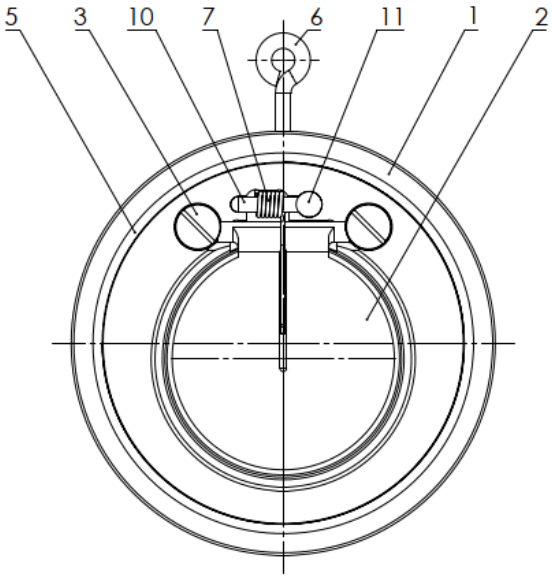
The illustrations are exemplary for the design of the valves. All further information can be found in the data sheets of the relevant product line.

The following illustration describes the product line ZRKF:

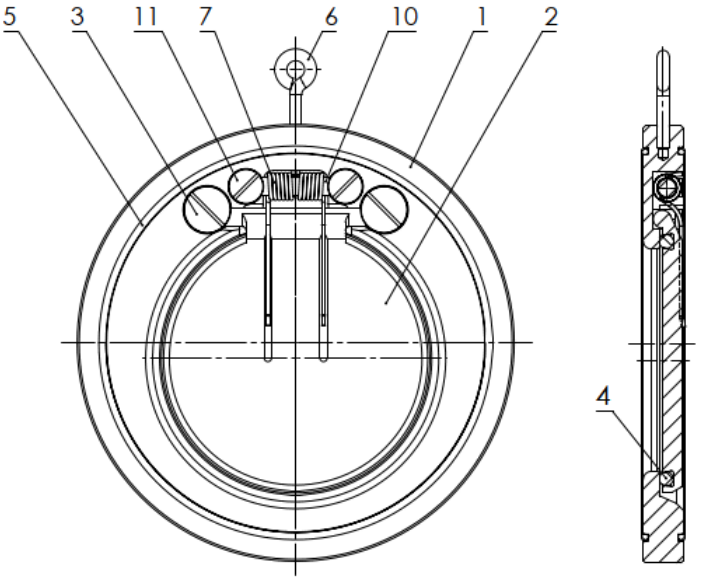
DN 32 to DN 40



From DN 50 to DN 125



From DN 150 to DN 450



Pos.	Name
1	Body
2	Disc
3	Disc retainer
4	O-ring disc
5	O-ring body
6	Eyebolt
7	Spring[1]
8	Locating pin[1]
9	Retaining bolt[1]
10	Spring pin
11	Pin retainer[1]

[1] Components only available in the product lines ZRKF and 920-with spring return.
[2] Only available in soft-sealing version.

The design of the specified product series (ZRK/ZRKF/920/925.1) differs only slightly from each other. The illustration lists all components of the valves.

3.1 Product lines

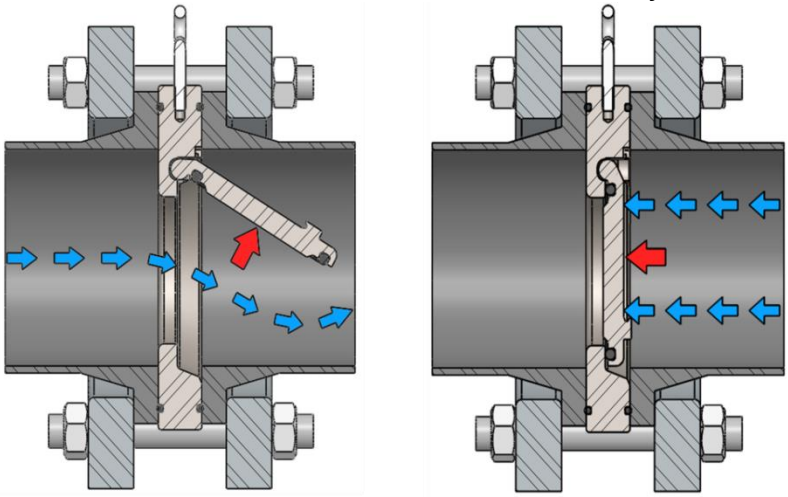
Product line	Characteristics
ZRK 	▪ From DN 32 to DN 1000. ▪ Without spring return. Centering via the outer diameter of the valve.
ZRKF 	▪ From DN 32 to DN 600. ▪ With spring return. ▪ Centering via the outer diameter of the valve.
920 	▪ From DN 32 to DN 600. ▪ Plastic version. ▪ With and without spring return. ▪ Centering via the outer diameter of the valve.
925.1 	▪ From DN 50 to DN 200. ▪ Plastic version. ▪ Centering via the outer diameter of the valve.

3.2 Intended use

Check valves are valves used for backflow prevention in piping systems. AWS check valves are characterized by their simple design as well as their short construction. They are designed for direct installation between connecting flanges.
The mentioned swing check valves are suitable for industrial use in pipeline systems for the transport of liquid and gaseous fluids. The valves are not suitable for solids. According to directive 2014/68/EU (Pressure Equipment Directive) they are suitable for all fluids of group 1 and 2.

3.3 Description of function

Swing check valves are medium-controlled backflow preventers and open when the opening force of the medium is greater than the closing force of the disc. In case of failure (e.g. pump failure) or backflow of the medium, the valve closes automatically.



Intermediate flange - check valve in fully opened and closed condition

3.4 Pressure test of the valve

The valve is leak-tested at the factory with air or water. Therefore the following warnings must be observed:

	CAUTION
	Residues on the valve ▪ Residues of the test medium may still be left on the contact surfaces of the valve. ▪ Be aware of possible reactions with the operating medium.

During a system pressure test of the system, the following warning must be observed:

	WARNING
	Excess pressure of the valve ▪ In a system pressure test of the system, the pressure must not exceed 1.5 times the max. permissible pressure PS of the valve.

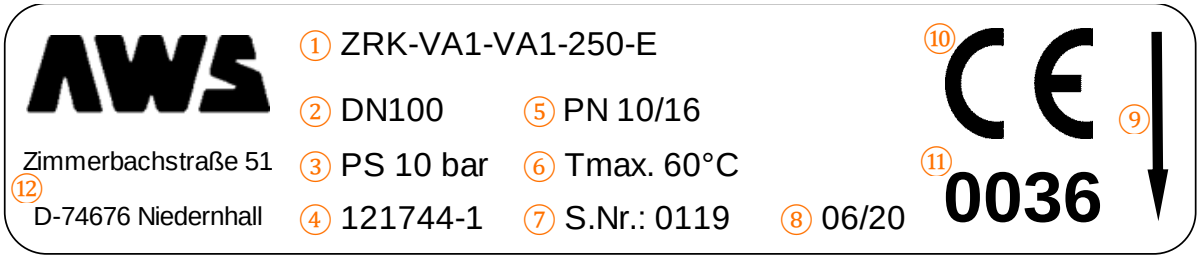
3.5 Scope of delivery

The valve is supplied ready for installation.
For valves with the add-on option S79, an additional grounding cable is included in the scope of delivery.

4 TYPE PLATE

A type plate is attached to each valve. The characteristics of the valve are listed on it. The following figure shows the structure of such a type plate.

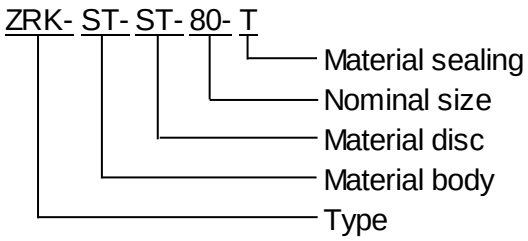
Structure of a type plate of the ZRK product line:

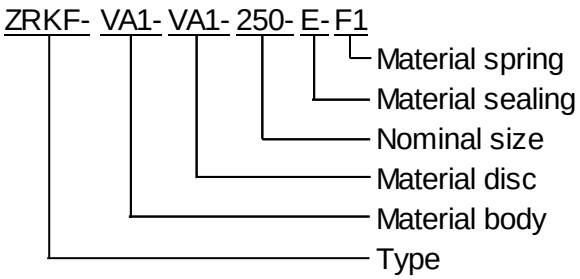


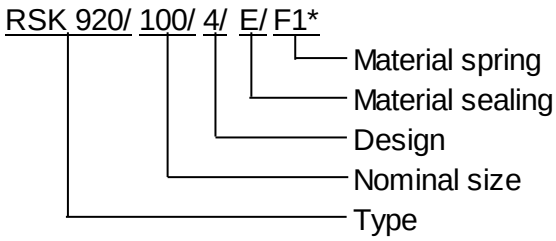
① Article description
② Nominal size
③ Pressure range
④ Commission number
⑤ Flange connection
⑥ Max. medium temperature
⑦ Serial number
⑧ Manufacturing Date
⑨ Flow direction
⑩ CE-marking
⑪ Number of the notified authority
⑫ Address of the manufacturer

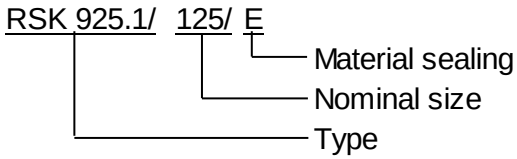
4.1 Article description breakdown

The following breakdown is an example of a standard valve for illustrative purposes.









*Spring only included in RSK 920 with spring return.

4.2 Type code

The type code of the valves is structured as follows:

	DN		Material			
Type	**Nominal size**	**Design**	**Body**	**Disc**	**Spring***	**Sealing**
ZRK	32 – 1000	ST-ST	ST = 1.0619, zinc plated	ST = 1.0619, zinc plated	F1 = 1.4571	M = Metal seated N = NBR E = EPDM F = FKM (Viton) T = PTFE
ZRKF	32 – 600	VA-VA	VA = 1.4408	VA = 1.4408	F2 = Hastelloy C4	
		VA1-VA1	VA1 = 1.4571	VA1 = 1.4571		
		AB-DU	AB = 2.0975	DU = 1.4469		
		DU-DU	DU = 1.4469	DU = 1.4469		

	DN		Material			
Type	**Nominal size**	**Design**	**Body**	**Disc**	**Spring***	**Sealing**
920	32 – 600	4	PVC-U	PVC-U	F1 = 1.4571	M = Metal seated N = NBR E = EPDM F = FKM (Viton) T = PTFE
		4.1	PVC-C	PVC-C	F2 = Hastelloy C4	
		5	PP-H	PP-H		
		8	PVDF	PVDF		

	DN	Material		
Type	**Nominal size**	**Body**	**Disc**	**Sealing**
925.1	50 – 200	PVC-U	PVC-U	E = EPDM

*Spring only available in ZRKF / 920 with spring return

5 STORAGE AND TRANSPORT

The valve is delivered in a ready-to-use condition. When storing and transporting the valve, there are some guidelines that the user must follow to guarantee proper functioning of the valve.

Storage:

- The valve must be stored in the original packaging in closed rooms.
- During storage, the valve must be protected from harmful influences (e.g. moisture or dirt).
- Valves with sealing elements made of organic materials (e.g. EPDM) must be stored away from sunlight and UV light to prevent faster aging.
- During storage the valve must be protected against mechanical damage. Special attention must be paid to the protection of the connection and sealing surfaces.
- To achieve short storage times, existing stocks should be used first (first in - first out).
- In the case of long storage periods, the seals may have aged considerably, which can lead to malfunctions.

Transport:

- During transport, the same guidelines apply as for storage.
- When transporting over long periods, the valve must be transported in a suitable packaging to protect it from mechanical damage and corrosion.
- For valves with a large nominal size, which cannot be moved manually, the appropriate sling must be used.
- Only use slings on the body or on the eyebolt of the valve, not on the internal parts.

	NOTICE
	**Transport of large swing check valves** Especially with large swing check valves (>DN100), care during unpacking and transport must be taken to ensure that the swing check valve is held horizontally. It should only be possible to open the disc upwards. This prevents the disc from opening quickly due to its weight and being damaged in the process.

Correct handling

Incorrect handling

6 INSTALLATION

The operator of the system is generally responsible for the dimensioning of the piping and the installation of the valve. The function can be affected by planning and installation errors.

6.1 Prepare installation

Before installation, the following steps must be followed:

- Remove the valve from the packaging.
- Check complete valve for transport damage.
- Check the mobility of the discs.
- In case of damage contact the manufacturer.
- Damaged valves / components must not be installed.

	DANGER
	**Accident prevention measures before installation** ▪ Pipelines of the system must be pressureless. ▪ Ensure that pipelines and valve have cooled down to lukewarm. ▪ System must be free of hazardous media. ▪ System must be switched off and secured against switching on again. ▪ If necessary, use the suitable protective equipment.

	DANGER
	**Incorrectly connected valve** ▪ Installation of the valve may only be carried out by qualified personnel. ▪ Flow direction arrow of the valve must match the flow direction of the pipeline. ▪ Only valves whose pressure class, chemical resistance, connection and dimensions correspond to the operating conditions may be installed. ▪ Valve may only be used within the intended operating limits. ▪ Pipelines must be emptied and cleaned if necessary.

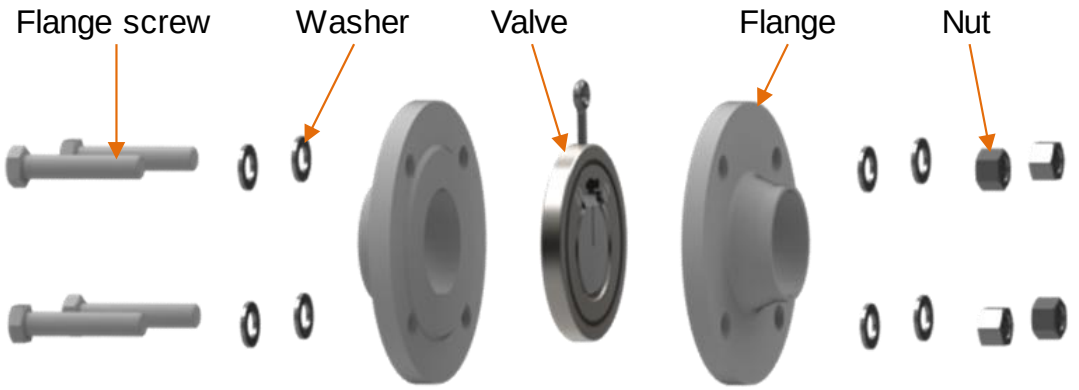
	WARNING
	**Hoist for moving large valves** ▪ Lifting equipment may only be used by the personnel instructed in it. ▪ The appropriate sling must be used for the valve. ▪ The lifting capacity of the hoist and sling must be designed for at least the total weight of the valve. ▪ Ensure that there are no persons under suspended load.

	NOTICE
	Instructions for installing the valve ▪ The system must be clean and free of contaminants at the point of installation (flanges). Special attention must be paid to the sealing surfaces. ▪ It must be ensured that a calming distance of 5 x DN (see 6.2 *Installation instruction; calming distance*) is available before and after the valve. ▪ Do not install directly on the pump flange. ▪ For large valves that can no longer be moved manually, use a hoist.

6.2 Installation instruction

When installing the valve, the following steps must be observed:

- Place one washer on each of the flange screws.
- Insert two flange screws through the lower flange holes; these can serve as a support in the installation position with horizontal flow. From the other side, place one washer on each flange bolt and fasten one nut on each of them.
- For metal seated valves (without body O-rings), the operator is responsible for providing a suitable flange sealing. This must be centered with the valve between the flanges.
- Insert the valve between the flanges using the eyebolt. Observe the installation instruction according to the flow direction, see following page.
- When installed in a horizontal pipeline, the valve can be placed on the two flange screws.
- Insert remaining flange screws into the flange holes.
- Place remaining washers on the flange screws from the other side.
- Place the remaining nuts on the flange screws and tighten them lightly.
- Center the valve between the flanges using the eyebolt.
- Tighten the flange screws crosswise with the appropriate tightening torque (for guide values, see table: *Tightening torques of the flange connection*).



Tightening torques of the flange connection

The tightening torques given below are to be understood as guide values, as they depend on various factors, such as the material and strength class of the screws or the used flange sealing (for metal-seated valves).

Screw	Tightening torque [Nm]	
	Plastic*[1]	Metallic*[2]
M12	20	50
M16	35	130
M20	60	250
M24	100	420
M27	165	600

*[1] Refers to swing check valves or piping made of plastic.

*[2] Refers to swing check valves or piping made of metallic materials.

The valve can be installed for flow directions in horizontal as well as vertical direction. Observe the following instruction, which apply to horizontal and vertical flow directions, to guarantee an optimal function.

Installation instruction for horizontal flow direction

NOTICE

Malfunctions/damage due to incorrect installation position

- The valve must be installed in the correct installation position and properly centered between the two pipelines.
- The correct installation position can be seen from the position of the eyebolt as well as the flow direction arrow on the type plate.
- Eyebolt of the valve must point upwards (see previous illustration).

Installation instruction for vertical flow direction

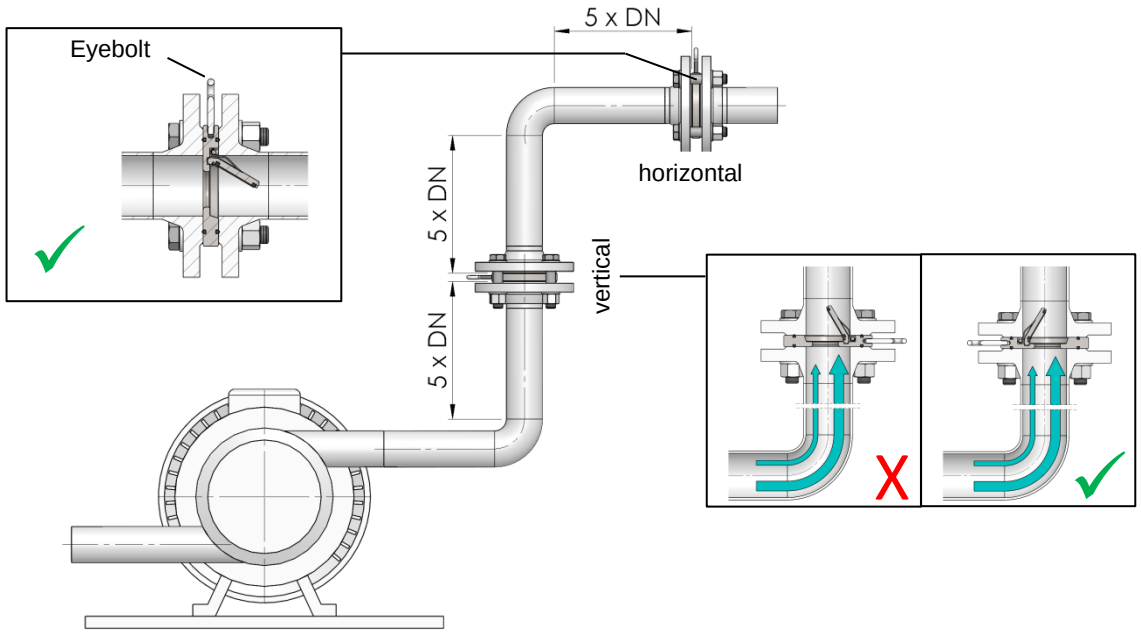
NOTICE

Malfunctions/damage due to incorrect installation position

- Valve must be installed in correct installation position and properly centered between the two pipelines.
- The correct installation position can be seen from the flow direction arrow on the type plate.
- Flow direction arrow of the valve must point upwards.

Calming distance

The illustration shows options how the valve should be installed in vertical and horizontal flow direction. It shows how the calming distance of 5 x DN must be realized in order to guarantee a proper function of the valve.



7 COMMISSIONING, DECOMISSIONING, MAINTENANCE

7.1 Commissioning

Before commissioning, compare the operating data and materials of the valve with those of the piping system. This allows the durability of the system to be checked. In the case of new systems or repairs, the entire piping system must be rinsed to remove foreign substances from the system. Ensure that the valve is properly installed and all connections are properly connected. No work may be carried out on the valve during its operation.

7.2 Decommissioning

During decommissioning and long downtimes, media that change their aggregate state must be drained or removed from the system. If necessary, the system must be flushed out.

7.3 Maintenance

AWS swing check valves are maintenance-free. However, they can be checked for function and safety to avoid unforeseen downtimes. The interval time is to be determined by the operator.

	**DANGER**
	Danger due to work on the system ▪ During operation, no work (e.g. maintenance work) may be carried out on the valve.

7.4 Remove pollutants

When working on the valve, there is a risk of coming into contact with hazardous substances.

The following warnings must be observed:

	**DANGER**
	Danger from contaminants on the valve due to use in contaminated areas ▪ Work on contaminated valves is only permitted for qualified personnel. ▪ The valve must be completely decontaminated before any work is performed on it. ▪ The required protective equipment must always be worn in the contaminated area. In addition, all safety measures must be followed when handling the respective hazardous substances. ▪ Plastic parts may be so heavily contaminated that cleaning is no longer sufficient.

7.5 Correct malfunctions and defects

Malfunctions or defects may occur during operation. The following table shows possible causes and the appropriate solution. If malfunctions/defects are not listed, please contact the manufacturer.

Malfunction/Defect	Cause	Solution
High noise emission	Calming distance too low/not respected	Install the valve at a suitable position in order to be able to maintain the calming distance
	Flow rate too low	Select smaller nominal size
No flow present	Valve and flange not matched to each other	Match or replace valve and flange
	Valve installed the wrong way round	Align flow direction arrow with flow direction
	Pressure too low	Increase pressure or flow rate
	Disc too heavy	Use other disc material
		Use suitable valve for the pipeline
		Change installation position from vertical to horizontal
	Closing spring too strong	Use a weaker closing spring
Leakage rate too high	O-ring damaged	Replace O-ring
	Disc deformed	Replace disc
	Sealing surface damaged	Rework sealing surface, replace affected component if necessary
	Sealing surface dirty	Clean the sealing surface
	Wear	Replace affected components
	Closing spring worn/defective	Replace closing spring
Flange leakage	Flanges not sufficiently braced	Check fasteners and retighten if necessary
	Sealing surface/seal damaged	Rework sealing surface, replace body if necessary
	Sealing surface/seal dirty	Clean sealing surface/seal

8 REMOVAL

When removing the valve from the pipeline, all previously mentioned warnings and instructions apply. Pay special attention to chapter *6 Installation* and chapter *7 Commissioning, decommissioning, maintenance*.

8.1 Prepare removal

Before removal, the following steps must be observed:

- Pipelines must be emptied and cleaned if necessary.
- Provide collection container if there is a residue of the medium in the pipeline.
- Observe applicable warnings and instructions to ensure safe and successful work.

8.2 Removal instructions

The following aspects must be observed during removal:

- Loosen nuts of all flange screws.
- Completely remove all nuts and washers from the flange screws.
- Pull the flange screws out of the flange holes.
- For horizontal flow, the lower flange screws can remain inserted to facilitate removal.
- Secure valve against falling down.
- Remove the valve from the flange using the eyebolt. For large valves, use a hoist and suitable sling.
- Remove the remaining flange screws from the flange holes.
- Place the valve on a suitable surface.

9 STORE / REUSE THE VALVE

After the removal, the valve can be stored or used in another system.

The following guidelines must be observed:

- There must be no residues of the medium in the valve.
- Make sure that the valve is in perfect condition before reusing it.
- Valve must be designed for the given operating conditions when reused.
- In case of storage, the information in chapter *5 Storage and transport* must be observed.

	**NOTICE**
	Environmental pollution due to residues ▪ Ensure that the valve is free of residues of the medium before disposal or storage. ▪ All materials are to be disposed of properly in accordance with applicable regulations.

10 DISPOSAL

The following regulations must be observed when disposing the valve:

	NOTICE
	**Disposal of the valve** ▪ All valve parts must be disposed of in accordance with the disposal regulations / environmental protection regulations. ▪ Pay attention to any residual buildup and outgassing of the flow media.

11 DECLARATION OF CONFORMITY

The valves are compliant with Directive 2014/68/EU (Pressure Equipment Directive). The declaration of conformity can be accessed and downloaded from the website www.aws-apparatebau.de.