GEMÜ ZRSK

Metal check valve

EN **Operating instructions**

further information
webcode: GW-ZRSK

Contents

1 General information

1.1 Information

- The descriptions and instructions apply to the standard versions. For special versions not described in this document the basic information contained herein applies in combination with any additional special documentation.
- Correct installation, operation, maintenance and repair work ensure faultless operation of the product.
- Should there be any doubts or misunderstandings, the German version is the authoritative document.
- Contact us at the address on the last page for staff training information.

1.2 Symbols used

The following symbols are used in this document:

Symbol	Meaning
●	Tasks to be performed
▶	Response(s) to tasks
–	Lists

1.3 Definition of terms

Working medium

The medium that flows through the GEMÜ product.

1.4 Warning notes

Wherever possible, warning notes are organised according to the following scheme:

SIGNAL WORD	
Possible symbol for the specific danger	Type and source of the danger ▶ Possible consequences of non-observance. ● Measures for avoiding danger.

Warning notes are always marked with a signal word and sometimes also with a symbol for the specific danger.

The following signal words and danger levels are used:

⚠ DANGER

Imminent danger!

▶ Non-observance can cause death or severe injury.

⚠ WARNING

Potentially dangerous situation!

▶ Non-observance can cause death or severe injury.

⚠ CAUTION

Potentially dangerous situation!

▶ Non-observance can cause moderate to light injury.

NOTICE

Potentially dangerous situation!

▶ Non-observance can cause damage to property.

The following symbols for the specific dangers can be used within a warning note:

Symbol	Meaning
	Danger of explosion!
	Risk of crushing!
	Corrosive chemicals!
	Hot plant components!

2 Safety information

The safety information in this document refers only to an individual product. Potentially dangerous conditions can arise in combination with other plant components, which need to be considered on the basis of a risk analysis. The operator is responsible for the production of the risk analysis and for compliance with the resulting precautionary measures and regional safety regulations.

The document contains fundamental safety information that must be observed during commissioning, operation and maintenance. Non-compliance with these instructions may cause:

- Personal hazard due to electrical, mechanical and chemical effects.
- Hazard to nearby equipment.
- Failure of important functions.
- Hazard to the environment due to the leakage of dangerous substances.

The safety information does not take into account:

- Unexpected incidents and events, which may occur during installation, operation and maintenance.
- Local safety regulations which must be adhered to by the operator and by any additional installation personnel.

Prior to commissioning:

1. Transport and store the product correctly.
2. Do not paint the screws and plastic parts of the product.
3. Carry out installation and commissioning using trained personnel.
4. Provide adequate training for installation and operating personnel.
5. Ensure that the contents of the document have been fully understood by the responsible personnel.
6. Define the areas of responsibility.
7. Observe the safety data sheets.
8. Observe the safety regulations for the media used.

During operation:

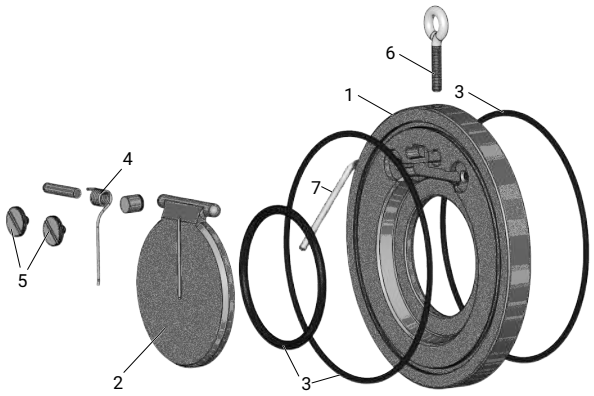
9. Keep this document available at the place of use.
10. Observe the safety information.
11. Operate the product in accordance with this document.
12. Operate the product in accordance with the specifications.
13. Maintain the product correctly.
14. Do not carry out any maintenance work and repairs not described in this document without consulting the manufacturer first.

In cases of uncertainty:

15. Consult the nearest GEMÜ sales office.

3 Product description

3.1 Construction



Item	Name	Materials
1	Body	1.4408 investment casting, 1.0460 galvanized, 1.4571, alu bronze (CC333G) 2.0975, 1.4469 super duplex
2	Disc	1.4408 investment casting, 1.0460 galvanized, 1.4571, 1.4469 super duplex
3	Seal (O-ring)	NBR, EPDM, FKM, PTFE
4	Spring	1.4571, Hastelloy
5	Screws	1.4571
6	Eye bolt	1.4571
7	Manual override	

3.2 Description

GEMÜ ZRSK is a metal check valve with integrated flange seal. The valve body, disc and seal are available in various materials.

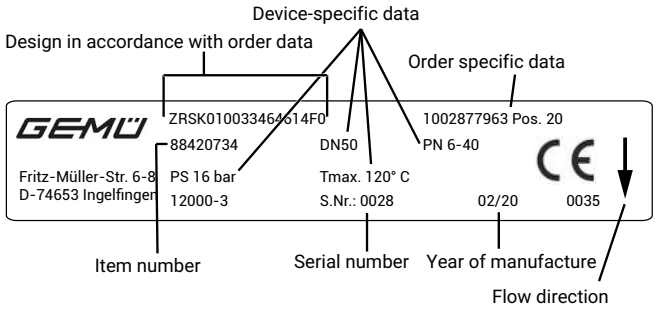
The GEMÜ ZRSK is clamped between two flanges during installation. The centring is based on the outside diameter of the housing

3.3 Function

The flow of fluid causes disc **2** in the check valve to open. Check valves therefore need a lower opening pressure. The resulting opening force moves the check valve against spring **4** and the weight force of disc **2** so that the medium is released.

To potentially achieve higher flows, special flange adaptors are provided which enable the valve to have a larger opening angle. If the outlet pressure exceeds the inlet pressure, the check valve closes and creates a seal against the medium using the O-ring. The valve is sealed off from the outside via the O-ring. It is therefore recommended that flange sleeves with smooth sealing surfaces be used.

3.4 Product label



4 Correct use

⚠ DANGER

Danger of explosion!

► Risk of death or severe injury

● Do **not** use the product in potentially explosive zones.

⚠ WARNING

Improper use of the product!

► Risk of severe injury or death.

► Manufacturer liability and guarantee will be void.

● Only use the product in accordance with the operating conditions specified in the contract documentation and this document.

● The product may only be used in potentially explosive zones confirmed in the declaration of conformity (ATEX).

The product is designed for installation in piping systems and for controlling a working medium.

5 Order data

The order data provide an overview of standard configurations.

Please check the availability before ordering. Other configurations available on request.

Order codes

1 Type	Code
Check valve	ZRSK

2 DN	Code
DN 32	0032
DN 40	0040
DN 50	0050
DN 65	0065
DN 80	0080
DN 100	0100
DN 125	0125
DN 150	0150
DN 200	0200
DN 250	0250
DN 300	0300
DN 350	0350
DN 400	0400
DN 450	0450
DN 500	0500
DN 600	0600

3 Operating pressure	Code
6 bar	1
10 bar	2
16 bar	3

4 Connection type	Code
PN 6 / flange EN 1092	1
PN 10 / flange EN 1092	2
PN 16 / flange EN 1092	3
ANSI B16.5, Class 150	D

5 Body material	Code
1.4408, investment casting	37
1.0460, galvanized	3HD
1.4571	46
2.0975/CC333G	5A0
1.4469, super duplex	4W1

6 Disc material	Code
1.4408	37
1.0460, galvanized	3HD
1.4571	46
1.4469, super duplex	4W1

7 Seal material	Code
NBR	2
FKM	4
PTFE	5
EPDM	14

7 Seal material	Code
EPDM (FDA, DVGW-Water certification)	18
Steel	10

8 Spring return	Code
Without return spring	F0
Spring 1.4571	F1
Spring Hastelloy	F2

9 Manual override	Code
Manual override	H
Without	

10 Type of design	Code
Without	
Valve free of oil and grease, media wetted area cleaned and packed in PE bag	0107
Media wetted area cleaned to ensure suitability for paint applications, parts sealed in plastic bag	0101
Check valve with bonded O-ring	2577

11 Special version	Code
Without	
ATEX certification	X

Order example

Ordering option	Code	Description
1 Type	ZRSK	Check valve
2 DN	0100	DN 100
3 Operating pressure	3	16 bar
4 Connection type	3	PN 16 / flange EN 1092
5 Body material	46	1.4571
6 Disc material	46	1.4571
7 Seal material	14	EPDM
8 Spring return	F0	Without return spring
9 Manual override		Without
10 Type of design		Without
11 Special version		Without

6 Technical data

6.1 Medium

Working medium: Liquid and gaseous fluids of groups 1 (explosive, flammable, toxic, oxidizing) and 2 (other fluids) acc. to the Pressure Equipment Directive 2014/68/EU.

6.2 Temperature

Media temperature:

Seal material:

NBR (code 2):	-10 — 90 °C
EPDM (code 14):	-10 — 95 °C
FKM (code 4):	-10 — 150 °C
PTFE (code 5):	-40 — 200 °C
Metallic (code 10)	-40 — 200 °C

6.3 Pressure

Operating pressure:

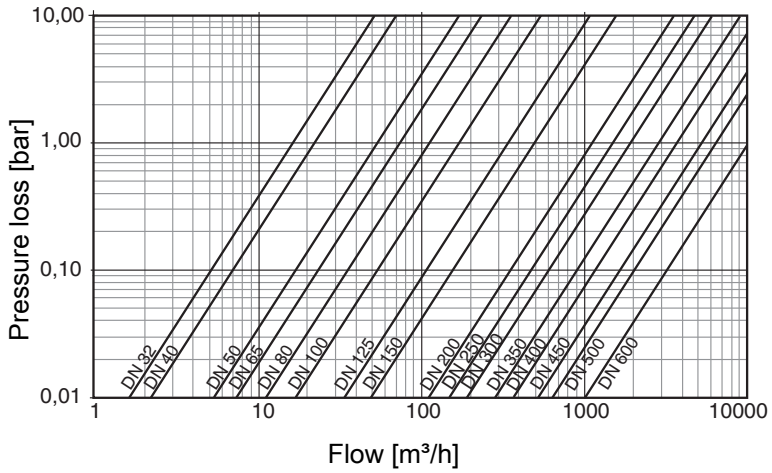
DN 32 – 300:	Max. 16 bar
DN 350 – 600:	Max. 10 bar

According to the Pressure Equipment Directive depending on nominal size and material (temperature 20 °C) for liquids of groups 1 and 2.

Vacuum: Can be used up to a vacuum of 100 mbar (abs), or with bonded O-ring (K-no. 2577) up to a vacuum of 20 mbar (abs)

These values apply to room temperature and air. The values may deviate for other media and other temperatures.

Pressure loss:



The diagram values are valid for water at 20 °C.
Please contact GEMÜ for the calculation of other fluids.

Pressure for disc opening:

A minimum back pressure of 0.3 bar is required for sealing the check valve.

DN	Piping			
	Horizontal		Vertical	
	Spring			
	Without	with	Without	with
32	2.0	15.0	10.0	25.0
40	2.0	15.0	10.0	25.0
50	2.0	15.0	10.0	25.0
65	2.0	15.0	10.0	25.0
80	2.0	15.0	10.0	25.0
100	2.0	15.0	10.0	25.0
125	2.0	15.0	10.0	25.0
150	2.0	15.0	10.0	25.0
200	4.0	17.0	14.0	25.0
250	4.0	17.0	14.0	25.0
300	4.0	17.0	14.0	25.0
350	6.0	18.0	18.0	27.0
400	6.0	18.0	18.0	28.0
450	6.0	18.0	18.0	28.0
500	6.0	18.0	24.0	34.0
600	6.0	18.0	26.0	36.0

Pressures in mbar

Leakage rate:

A acc. to EN 12266-1 (with plastic seal)
G acc. to EN 12266-1 (metallic sealing)

Kv values:

DN	Kv values
32	16.2
40	22.2
50	54.0
65	75.0
80	112.0
100	172.0
125	342.0
150	490.0
200	1128.0
250	1500.0
300	2290.0
350	2890.0
400	3700.0
450	5000.0
500	6550.0
600	9500.0

Kv values in m^3/h

6.4 Product compliance

Machinery Directive: 2006/42/EC

Pressure Equipment Directive: 2014/68/EU

Food: FDA*

Drinking water: Seal material O-ring EPDM (code 18) with DVGW approval *

Environment: RoHS

Explosion protection: ATEX (2014/34/EU)

* This feature is not possible for all versions.
For further information see Availability.

6.5 Mechanical data

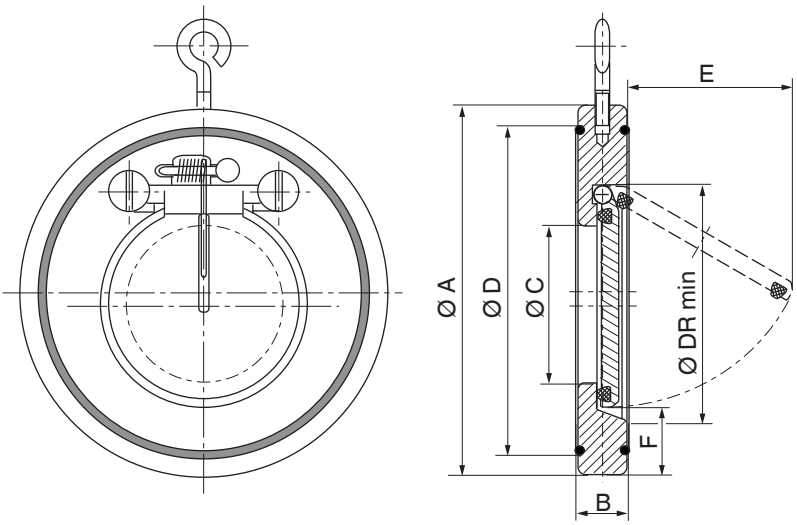
Weight:

DN	Material code [1]	
	37, 3HD, 46	4W1, 5A0
32	0.5	0.47
40	0.78	0.73
50	0.9	0.85
65	1.23	1.15
80	1.5	1.4
100	2.4	2.25
125	3.3	3.1
150	4.6	4.3
200	7.5	7.10
250	13.0	12.2
300	21.3	20.0
350	33.3	31.22
400	46.9	44.0
450	71.0	67.0
500	90.0	85.0
600	128.0	120.0

Weights in kg

1) **Body material**
Code 37: 1.4408, investment casting
Code 3HD: 1.0460, galvanized
Code 46: 1.4571
Code 5A0: 2.0975/CC333G
Code 4W1: 1.4469, super duplex

7 Dimensions



DN						Manual override						
						Without		with				
						without spring	with spring					
	Connection code [1]											
	1	2	3	D	2	1, 2, 3, D						
	øA				F	B			øC	øD	øDR min	E
32	79.0	85.0	85.0	74.0	25.0	15.0	15.0	-	18.0	59.0	37.0	22.0
40	89.0	95.0	95.0	83.0	28.0	16.0	16.0	-	22.0	72.0	43.0	25.0
50	98.0	109.0	109.0	105.0	29.0	14.0	14.0	19.0	32.0	86.0	54.0	37.0
65	118.0	129.0	129.0	124.0	31.0	14.0	14.0	19.0	40.0	109.0	70.0	50.0
80	134.0	144.0	144.0	137.0	32.0	14.0	14.0	20.0	54.0	119.0	82.0	61.0
100	154.0	164.0	164.0	175.0	31.0	18.0	18.0	23.0	70.0	146.0	106.0	77.0
125	184.0	195.0	195.0	197.0	35.0	18.0	18.0	24.0	92.0	173.0	131.0	98.0
150	209.0	220.0	220.0	222.0	35.0	20.0	20.0	29.0	112.0	197.0	159.0	120.0
200	264.0	275.0	275.0	279.0	38.0	22.0	22.0	30.0	154.0	255.0	207.0	160.0
250	319.0	330.0	331.0	340.0	41.0	26.0	26.0	35.0	192.0	312.0	260.0	190.0
300	375.0	380.0	386.0	410.0	41.0	32.0	32.0	43.0	227.0	363.0	309.0	220.0
350	425.0	440.0	446.0	451.0	54.0	38.0	-	48.0	266.0	416.0	341.0	250.0
400	475.0	491.0	499.0	514.0	55.0	44.0	-	-	310.0	467.0	392.0	290.0
450	-	541.0	558.0	549.0	60.0	52.0	-	-	350.0	520.0	442.0	340.0
500	580.0	596.0	621.0	606.0	58.0	58.0	-	-	400.0	550.0	493.0	390.0
600	681.0	698.0	738.0	718.0	60.0	62.0	-	-	486.0	660.0	595.0	470.0

Dimensions in mm

1) **Connection type**
Code 1: PN 6 / flange EN 1092
Code 2: PN 10 / flange EN 1092
Code 3: PN 16 / flange EN 1092
Code D: ANSI B16.5, Class 150

8 Manufacturer's information

8.1 Delivery

- Check that all parts are present and check for any damage immediately upon receipt.

The product's performance is tested at the factory. The scope of delivery is apparent from the dispatch documents and the design from the order number.

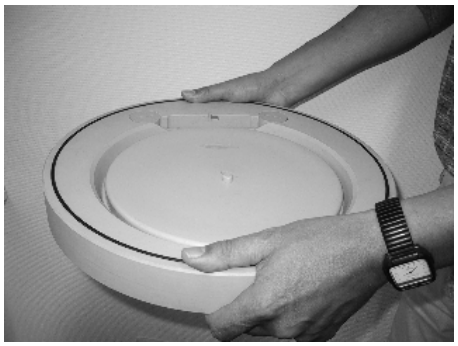
8.2 Packaging

The product is packaged in a cardboard box which can be recycled as paper.

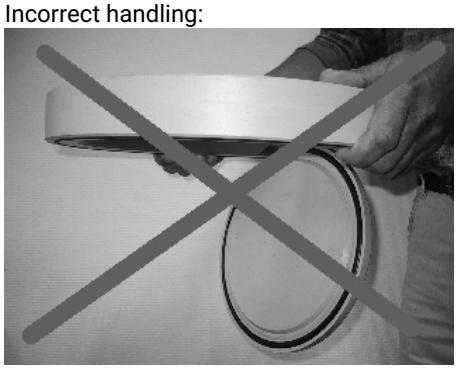
8.3 Transport

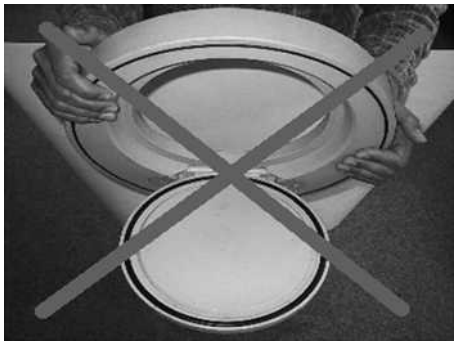
1. Only transport the product by suitable means. Do not drop. Handle carefully.
2. After the installation dispose of transport packaging material according to relevant local or national disposal regulations / environmental protection laws.
3. Hold products > DN 100 horizontally so that the product can only open upwards.

Correct handling:



Incorrect handling:





8.4 Storage

1. Store the product free from dust and moisture in its original packaging.
2. Avoid UV rays and direct sunlight.
3. Do not exceed the maximum storage temperature (see chapter "Technical data").
4. Do not store solvents, chemicals, acids, fuels or similar fluids in the same room as GEMÜ products and their spare parts.

9 Installation in piping

9.1 Preparing for installation

⚠ DANGER

Risk of crushing!

► Risk of severe injury.
- Depressurize the plant before performing any work on the product.
- Observe correct handling procedures.

⚠ WARNING

The equipment is subject to pressure!

► Risk of severe injury or death
- Depressurize the plant.
- Completely drain the plant.

⚠ WARNING

Corrosive chemicals!

► Risk of caustic burns
- Wear appropriate protective gear.
- Completely drain the plant.

⚠ CAUTION

Hot plant components!

► Risk of burns
- Only work on plant that has cooled down.

⚠ CAUTION

Exceeding the maximum permissible pressure.

► Damage to the product
- Provide precautionary measures against exceeding the maximum permitted pressures caused by pressure surges (water hammer).

⚠ CAUTION

Use as step!

► Damage to the product
► Risk of slipping-off
- Choose the installation location so that the product cannot be used as a foothold.
- Do not use the product as a step or a foothold.

NOTICE

Suitability of the product!

► The product must be appropriate for the piping system operating conditions (medium, medium concentration, temperature and pressure) and the prevailing ambient conditions.

NOTICE

Tools!

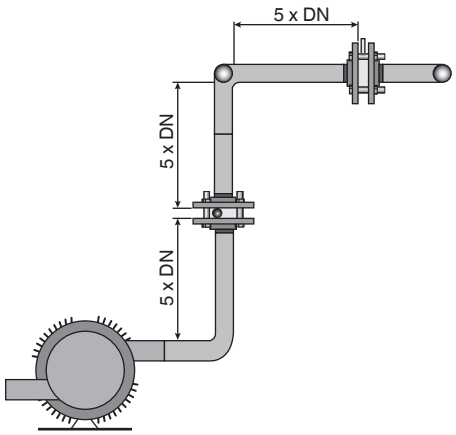
► The tools required for installation and assembly are not included in the scope of delivery.

● Use appropriate, functional and safe tools.

1. Ensure the product is suitable for the relevant application.
2. Check the technical data of the product and the materials.
3. Keep appropriate tools ready.
4. Wear appropriate protective gear, as specified in the plant operator's guidelines.
5. Observe appropriate regulations for connections.
6. Have installation work carried out by trained personnel.
7. Shut off plant or plant component.
8. Secure plant or plant component against recommissioning.
9. Depressurize the plant or plant component.
10. Completely drain the plant (or plant component) and let it cool down until the temperature is below the media vaporization temperature and cannot cause scalding.
11. Correctly decontaminate, rinse and ventilate the plant or plant component.
12. Lay piping so that the product is protected against transverse and bending forces, and also from vibrations and tension.
13. Only install the product between matching aligned pipes (see chapters below).
14. Pay attention to the installation position: horizontal or vertical.
15. Pay attention to the direction of the working medium: positioned in-line with flow direction

9.2 Installation

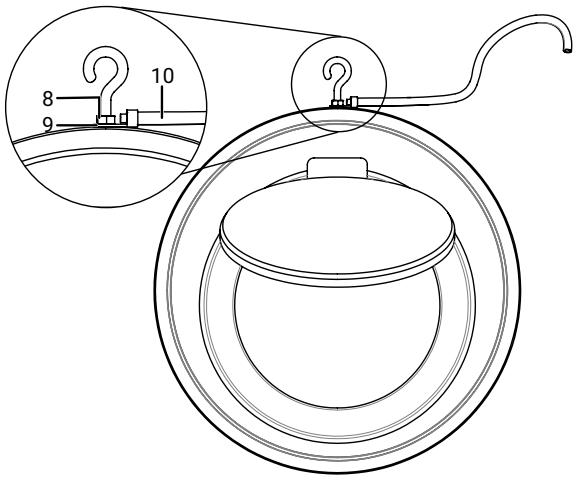
1. Carry out preparations for installation (see chapter "Preparing for installation").
2. Inspect check valve and O-rings for possible damage before installation. Check the freedom of movement of the check valve. Damaged parts must not be installed.
3. Make sure that you only install check valves whose pressure class, chemical resistance, connection and dimensions are appropriate for the conditions of use.
4. Provide a straight pipe section of at least 5 times the nominal diameter upstream and downstream of the check valve.



5. Use flanges to EN1092-1 or EN1092-2 for metal piping.
6. Do not mount directly on a pump flange.
7. Avoid pulsating flow conditions and water hammer.
8. Installation with vertical flow is only permissible if the check valve can open upwards.
9. If the medium flows horizontally through the check valve, the eye bolt must point upwards.
10. Guide the check valve between the flanges with the eye bolt. Centring is performed with the outside diameter of the body against the inside of the flange bolts.
11. Tighten flange bolts to the appropriate torque in a diagonal pattern.

Flange bolt torques	
Thread	Torque [Nm]
M10	30
M12	50
M16	130
M 20	250
M24	420
M27	600
M30	850
M33	1100
M36	1500

9.3 ATEX version



- Fix cable lug **9** to nut **8** with the earthing cable **10** and earth it.

10 Manual override

A manual override is available for nominal sizes DN 50–300. The manual override is actuated by an Allen key. The Allen key is not included in the scope of delivery.

- Insert the Allen key in the manual override and turn by the required angle (max. 90°).

11 Commissioning

⚠ WARNING

Corrosive chemicals!

► Risk of caustic burns

- Wear appropriate protective gear.
- Completely drain the plant.

⚠ CAUTION

Leakage!

► Emission of dangerous materials

- Provide precautionary measures against exceeding the maximum permitted pressures caused by pressure surges (water hammer).

1. Check the tightness and the function of the product (close and reopen the product).
2. Flush the piping system of new plant and following repair work (the product must be fully open).

   ⇨ Harmful foreign matter has been removed.

   ⇨ The product is ready for use.
3. Commission the product.

12 Troubleshooting

Error	Possible cause	Troubleshooting
The product does not open or does not open fully	Foreign matter in the product	Remove and clean the product
	Faulty product	Replace product
The product does not close or does not close fully	O-ring of disc faulty	Replace O-ring of disc
	Foreign matter in the product	Remove and clean the product
Joint between check valve and piping is leaking	O-ring of body faulty	Replace O-ring of body
Connection between check valve and piping is leaking	Flange bolts not tightened	Tighten the flange bolts
Check valve leaking	Check valve faulty	Check the check valve for potential damage and replace if necessary
	O-ring of disc faulty	Replace O-ring of disc

13 Inspection and maintenance

⚠ WARNING

The equipment is subject to pressure!

► Risk of severe injury or death
- Depressurize the plant.
- Completely drain the plant.

⚠ CAUTION

Hot plant components!

► Risk of burns
- Only work on plant that has cooled down.

⚠ CAUTION

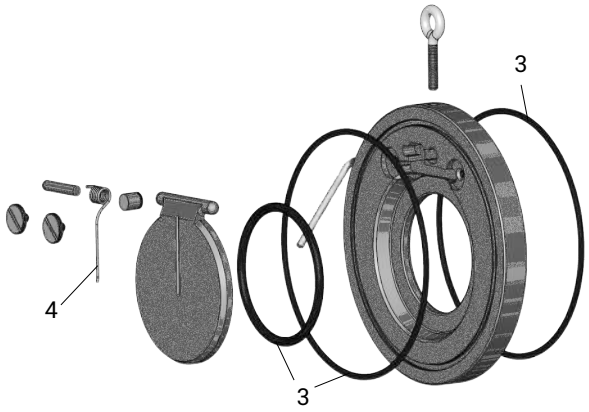
- Servicing and maintenance work must only be performed by trained personnel.
- GEMÜ shall assume no liability whatsoever for damage caused by improper handling or third-party actions.
- In case of doubt, contact GEMÜ prior to commissioning.

The operator must carry out regular visual examination of the GEMÜ products dependent on the operating conditions and the potential danger in order to prevent leakage and damage.

The product also must be disassembled and checked for wear in the corresponding intervals.

1. Have servicing and maintenance work performed by trained personnel.
2. Wear appropriate protective gear as specified in plant operator's guidelines.
3. Shut off plant or plant component.
4. Secure the plant or plant component against recommissioning.
5. Depressurize the plant or plant component.
6. Actuate GEMÜ products which are always in the same position four times a year.

13.1 Spare parts



Item	Name	Order description
3	O-rings	SP*ZR*
4	Spring	

- Replace O-rings **3** and spring **4** (see “Removal from piping“, page 17).

14 Removal from piping

NOTICE

► If defective, the entire check valve must be replaced.

1. Observe the safety information.
2. Undo the flange bolts.
3. Pull out the check valve using the eye bolt 6 (see “Construction“, page 5).
4. Unhook the spring (option) **4** and unscrew the two screws **5**.
5. Remove the disc **2**.
6. Replace the O-rings **3**.
7. Insert the disc **2**.
8. Hook in new spring (option) **4**.
9. Insert the check valve using the eye bolt **6**.
10. Tighten the flange bolts.

15 Disposal

1. Pay attention to adhered residual material and gas diffusion from penetrated media.
2. Dispose of all parts in accordance with the disposal regulations/environmental protection laws.

16 Returns

Legal regulations for the protection of the environment and personnel require that the completed and signed return delivery note is included with the dispatch documents. Returned goods can be processed only when this note is completed. If no return delivery note is included with the product, GEMÜ cannot process credits or repair work but will dispose of the goods at the operator's expense.

1. Clean the product.
2. Request a return delivery note from GEMÜ.
3. Complete the return delivery note.
4. Send the product with a completed return delivery note to GEMÜ.

17 EU Declaration of Incorporation according to the EC Machinery Directive 2006/42/EC, Annex II B

EU Declaration of Incorporation

according to the EC Machinery Directive 2006/42/EC, Annex II B

We, the company

GEMÜ Gebr. Müller Apparatebau GmbH & Co. KG
Fritz-Müller-Strasse 6–8
74653 Ingelfingen-Criesbach, Germany

hereby declare under our sole responsibility that the below-mentioned product complies with the relevant essential health and safety requirements in accordance with Annex I of the above-mentioned Directive.

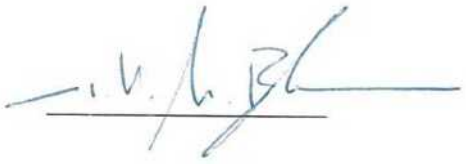
Product:	GEMÜ ZRSK
Product name:	Metal check valve
The following essential health and safety requirements of the EC Machinery Directive 2006/42/EC, Annex I have been applied or adhered to:	1.1.2.; 1.1.3.; 1.1.5.; 1.3.2.; 1.3.3.; 1.3.4.; 1.3.7.; 1.5.3.; 1.5.4.; 1.5.5.; 1.5.6.; 1.6.1.; 1.6.5.; 1.7.1.; 1.7.1.1.; 1.7.2.; 1.7.3.; 1.7.4.; 1.7.4.1.; 1.7.4.2.; 1.7.4.3.
The following harmonized standards (or parts thereof) have been applied:	EN ISO 12100:2010

We also declare that the specific technical documents have been created in accordance with part B of Annex VII.

The manufacturer undertakes to transmit relevant technical documents on the partly completed machinery to the national authorities in response to a reasoned request. This communication takes place electronically.

This does not affect the industrial property rights.

The partly completed machinery may be commissioned only if it has been determined, if necessary, that the machinery into which the partly completed machinery is to be installed meets the provisions of the Machinery Directive 2006/42/EC.



M. Barghoorn
Head of Global Technics

Ingelfingen, 05/10/2023

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18 EU Declaration of Conformity in accordance with 2014/68/EU (Pressure Equipment Directive)

EU Declaration of Conformity

in accordance with 2014/68/EU (Pressure Equipment Directive)

We, the company	GEMÜ Gebr. Müller Apparatebau GmbH & Co. KG Fritz-Müller-Strasse 6–8 74653 Ingelfingen-Criesbach, Germany

hereby declare under our sole responsibility that the below-mentioned product complies with the regulations of the above-mentioned Directive.

Product:	GEMÜ ZRSK
Product name:	Metal check valve
Notified body:	TÜV Rheinland Industrie Service GmbH Am Grauen Stein 1 51105 Cologne, Germany
ID number of the notified body:	0035
No. of the QA certificate:	01 202 926/Q-02 0036
Applied conformity assessment procedure(s):	Module H
The following harmonized standards (or parts thereof) have been applied:	EN 16668:2016 + A1:2018

Information for products with a nominal size ≤ DN 25:

The products are developed and produced according to GEMÜ's in-house process instructions and standards of quality which comply with the requirements of ISO 9001 and ISO 14001. According to Article 4, Paragraph 3 of the Pressure Equipment Directive 2014/68/EU, these products must not be identified by a CE-marking.

M. Barghoorn
Head of Global Technics

Ingelfingen, 05/10/2023

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