

TYPE APPROVAL CERTIFICATE

Certificate No:
TAP00000RH
Revision No:
2

This is to certify:

That the **Ball Valve**

with type designation(s)
BKH, BKHP, MKHP, KH-ISO, KHSAE

Issued to
MHA ZENTGRAF GmbH & Co. KG
Merzig, Saarland, Germany

is found to comply with
DNV rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV class programme DNV-CP-0186 – Type approval – Valves
DNV GL offshore standards

Application :

May be used for hydraulic oil, fuel oil, lubricating oil, inert gas, fresh water, sea water, sanitary, starting/control air, service air, brine, CO₂, steam, and refrigerants.

Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.

Temperature range: See certificate
Max. working press.: See certificate
Sizes: DN 4 to DN 100

Issued at **Hamburg** on **2022-02-01**

This Certificate is valid until **2027-01-31**.

DNV local station: **Essen**

Approval Engineer: **Guido Friederich**



for **DNV**
Digitally Signed By: Drews, Olaf
Location: DNV GL SE Hamburg, Germany
Signing Date: 2022-02-02

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Olaf Drews
Head of Section

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LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Product description

Valve types	Sizes
BKH	DN 4, 6, 8, 10, 13 and 16, 20 and 25
BKHP	DN 20 and 25
MKHP	DN 32, 40 and 50
KH-ISO 250	DN 13, 19, 25, 32, 38, 51, 56 and 63
KH-ISO 320	DN 15, 20, 25, 32, 40, 50, 65, 80 and 100
KH-ISO 400	DN 13, 19, 25, 32, 38, 51, 56, 63 and 80
KH-SAE 210/420	DN 15, 20, 25, 32, 40, 50, 65 and 80
KH-SAE 210	DN 15, 20, 25, 32, 40, 50, 65, 80 and 100
KH-SAE 420	DN 15, 20, 25, 32, 40, 50, 65 and 80

End connections

Valve types	End connections/rating
BKH and BKHP and MHKP	DIN ISO 228 Female thread ISO 7/1 Rc female thread, ANSI B16.5 flange ANSI B1.20.1 NPT Female thread ISO 8434 (DIN2353) Light series ISO 8434 (DIN2353) Heavy series SAE J 514 UN/UNF Female thread ISO 6162-1 3000 psi SAE-split flange adapter ISO 6162-2 6000 psi SAE-split flange adapter ISO 6162-1 3000 psi SAE-adapter ISO 6162-2 6000 psi SAE-adapter EN 1092 PN 10/40 – PN 63/160 – PN 250 – PN 320
KH-ISO 250	3600 psi, ISO 6164
KH-ISO 320	DN15-50 : 5075 psi, not part of ISO 6164 DN 65-100: 5075 psi, not part of ISO 6164
KH-ISO 400	5800 psi, ISO 6164
KH-SAE 210/420	3000 and 6000 psi, ISO 6162-1 and -2
KH-SAE 210	3000 psi, ISO 6162-1
KH-SAE 420	6000 psi, ISO 6162-2

Pressure ratings

Valve types	Size	Tube connections	Max. pressure (bar) at ambient temperature
BKH	DN 4 – 25 (stainless steel/carbon steel)	All	DN 4-16: 500 bar – (carbon steel / stainless steel) DN 16: 400 bar- stainless steel DN 16: 420 bar - carbon steel DN 20: 350 bar - stainless steel DN 20: 420 bar - carbon steel DN 25: 350 bar - both
BKHP	DN 20/25 (stainless/carbon steel)	All	500 bar
MKHP	DN 32 – 50 (stainless/carbon steel)	All	420 bar
KH-ISO 250	DN 13 – 63 (carbon steel / stainless steel)	flanges	250 bar
KH-ISO 400	DN 13 – 80 (carbon steel / stainless steel)	flanges	400 bar

Product description – continuation

Pressure ratings – continuation

Valve types	Size	Tube connections	Max. pressure (bar) at ambient temperature
KH-ISO 320	DN 15 – 100 (carbon steel / stainless steel)	flanges	350
KH-SAE 210/420	DN 15 – 80 (carbon steel / stainless steel)	flanges	210/420
KH-SAE 210	DN 15 – 100 (carbon steel / stainless steel)	flanges	DN 15/20: 350bar DN 25: 320bar DN 32: 280bar DN 40-100: 210bar
KH-SAE 420	DN 15 – 80 (carbon steel / stainless steel)	flanges	420

Pressure reduction factors for elevated temperatures:

Temperature (°C)	Carbon steel unalloyed	Low alloyed steels	Stainless steels
20	1	1	1
50	1	1	0,95
100	1	1	0,85
150	0,89	0,93	0,77
200	0,81	0,87	0,71
250	0,72	0,81	0,67

Materials

Material description	Material no.	Temperature range, °C
Free cutting steel 11SMn30	1.0715	-20°C to +120°C
Carbon steel S355J2+N	1.0577	according to AD-2000-code, data sheet W10
Fine grained steel with Re \geq 355N/mm ²	All steels in according to AD-2000-code, data sheet W10	
Stainless steel X6CrNiMoTi17-12-2 X2CrNiMoN22-5-3 X5CrNiMo17-12-2 X2CrNiMo17-13-2	1.4571 1.4462 1.4401 1.4404	-273°C to +250°C -40°C to +250°C -200°C to +250°C -200°C to +250°C

Max temperature range for standard seal material:

Ball seats	Stem and adapter sealing	Temperature range
Polyacetal, POM	-	-40°C to +100°C
Polytetrafluorethylene, PTFE	-	-200°C to +220°C
Polyvinylidenefluorid, PVDF	-	-40°C to +150°C
Polyetheretherketone, PEEK	-	-40°C to +250°C
Cast iron, GG25	-	-40°C to +250°C
-	Acrylonitrile-butadiene-rubber, NBR	-30°C to +100°C
-	Fluor-rubber, FPM	-20°C to +200°C
-	Fluor-rubber FPM special compound	- 46°C to +225°C
-	Ethylen-Propylene-Dien-rubber, EPDM	-50°C to + 130°C
-	Polytetrafluorethylene, PTFE	-200°C to +220°C
-	Perfluorelastomere, FFKM	-20°C to + 275°C
-	Tetrafluorethylene/Propylene, FEPM	-25°C to + 250°C

Application

Valves may be used for hydraulic oil, fuel oil, lubricating oil, inert gas, fresh water, sea water, sanitary, starting/control air, service air, brine, CO₂, steam, and refrigerants.

Limitation

The type approved valves shall not be used for the following service and operation conditions:

Operation with flowing media specified as toxic or dangerous fluids.
 Cryogenic fluids including LNG / LPG as specified by applications subjected to the IGC Code and IGF Code.

Valves with threaded connections:

To be used for outside diameters as stated below except for piping systems conveying toxic or flammable media or services where fatigue, severe erosion or crevice corrosion is expected to occur.

Valves with threaded connections for intended use with flammable media are only limited to installation in accessory lines and instrumentation lines with external diameters of 25mm or less.

Threaded joints with parallel thread are not allowed for pipe connections within pipe class I.

Threaded joints with tapered joints shall be allowed for pipe class I, outside diameter not more than 33,7 mm.

Pipe Class II and Class III outside diameter not more than 60,3 mm.

Threaded joints in CO₂ systems shall be allowed only inside protected spaces and in CO₂ cylinder rooms.

Threaded joints with parallel thread shall be allowed for Class III, outside diameter not more than 60,3 mm.

Type Approval documentation

The approval is based on the following documentation:

Manufacturers ringbinder received with manufacturers letter dated 2011- 07-07 containing Drawings,

Parts lists with material specifications

New Test reports:

Test report BKHP500-DN20-G3/4-442A, Test report BKH-DN25-G1-442A, Test report BKHP500-DN25-G1-112A Zn

Test report BKHP500-DN25-G1-442A, Test report BKH-DN20-G3/4-442A, Test report BKH-DN25-G1-112A Zn

Type Approval Assessment Report, renewal audit, dated: 2022-01-14

Tests carried out

Test standards:

DNV Rules Part 4 Chapter 6
 DNV Class Program 0186
 DIN EN 12266-1 / ISO 5208

Piping systems
 Valves
 Industrial valves – Testing of metallic valves
 Pressure tests, test procedures and acceptance criteria –
 Mandatory requirements

Test		Purpose
Title	Test reference	
Shell strength	P10	To confirm the pressure containing capability of the shell against internal pressure
Shell tightness	P11	To confirm the leak tightness of the shell including the operating mechanism sealing against internal pressure
Seat tightness	P12	To confirm the capability of the seat(s) to comply with the specified leakage rate <ul style="list-style-type: none"> - at the time of manufacture - In the direction(s) for which the valve is designed

Minimum test duration: 10 Minutes

Marking of product

For traceability to this type approval the products are to be marked with:

- Manufacturers name or trade mark
- Valve type designation
- Size
- Maximum design pressure and temperature
- Arrow to indicate direction of flow on one way flow valves

Periodical assessment

A condition for retention of the Type Approval Certificate in its validity period is that periodical assessments are successfully carried out.

For retention of the Type Approval, a DNV GL Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the Type Approval are complied with. Refer to DNVGL-CP-0338, Sec.4.

END OF CERTIFICATE

TYPE APPROVAL CERTIFICATE

Certificate No:
TAP00000RM
Revision No:
1

This is to certify:

That the **Ball Valve**

with type designation(s)
PKH

Issued to

MHA ZENTGRAF GmbH & Co. KG
Merzig, Saarland, Germany

is found to comply with

DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV class programme DNV-CP-0186 – Type approval – Valves

Application :

Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.

May be used for hydraulic oil, fuel oil, lubricating oil, inert gas, fresh water, sea water, sanitary, starting/control air, service air, brine, CO₂, steam, and refrigerants.

Temperature range: See certificate
Max. working press.: 420 bar (at ambient temperature)
Sizes: DN 6 to DN 50

Issued at **Hamburg** on **2022-02-01**

This Certificate is valid until **2027-01-31**.

DNV local station: **Essen**

Approval Engineer: **Guido Friederich**



for **DNV**

Digitally Signed By: Drews, Olaf
Location: DNV GL SE Hamburg, Germany
Signing Date: 2022-02-02

Olaf Drews
Head of Section

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Product description

Ball valve for mounting within manifolds, e.g., within hydraulic systems.

Nominal valve size: DN 6 to DN 50

Design pressure: DN 6, DN 10: 500 bar
 DN 13, 16, 20, 25, 32, 40 and 50: 420 bar

Temperature range: Depending on type of materials and design pressure

Materials for PKH valves including maximum temperature range for body, adaptors, stem and ball:

Material description	Material no.	Temperature range, °C
Free cutting steel 11SMn30	1.0715	-20°C to +120°C
Carbon steel S355J2+N	1.0577	according to AD-2000-code, data sheet W10
Fine grained steel with Re \geq 355N/mm ²	All steels in according to AD-2000-code, data sheet W10	
Stainless steel		
X6CrNiMoTi17-12-2	1.4571	-273°C to +250°C
X2CrNiMoN22-5-3	1.4462	-40°C to +250°C
X5CrNiMo17-12-2	1.4401	-200°C to +250°C
X2CrNiMo17-13-2	1.4404	-200°C to +250°C

Seal material for PKH valves including temperature range:

Ball seats	Stem and adater sealing materials	Temperature range
Polyacetal, POM	-	-40°C to +100 °C
Polytetrafluorethylene, PTFE	-	-200°C to +220°C
Polyvinylidenefluorid, PVDF	-	-40°C to +150°C
Polyetheretherketone, PEEK	-	-40°C to +250°C
Cast iron, GG25	-	-40°C to +250°C
-	Acrylonitrile-butadiene-rubber, NBR	-30°C to +100°C
-	Fluor-rubber, FPM	-20°C to +200°C
-	Fluor-rubber FPM special compound	- 46°C to +225°C
-	Athylen-Propylene-Dien-rubber, EPDM	-50°C to +130°C
-	Polytetrafluorethylene, PTFE	-200°C to +220°C
-	Perfluorelastomer, FFKM	-20°C to +275°C
-	Tetrafluorethylene/Propylene, FEPM	-25°C to +250°C

Pressure reduction factors for elevated temperatures:

Temperature (°C)	Carbon steel unalloyed	Low alloyed steels	Stainless steels
20	1	1	1
50	1	1	0,95
100	1	1	0,85
150	0,89	0,93	0,77
200	0,81	0,87	0,71
250	0,72	0,81	0,67

Application

PKH valves may be used for hydraulic oil, fuel oil, lubricating oil, inert gas, fresh water, sea water, sanitary, starting/control air, service air, brine, CO2, steam, and refrigerants

Limitation

The PKH valves shall not be used for the following service and operation conditions:

Operation with flowing media specified as toxic or dangerous fluids.
 Cryogenic fluids including LNG / LPG as specified by applications subjected to the IGC Code and IGF Code.

Remark for PKH valve fabrication: The PKH Bolt in the valve body has to be secured against loosening due to vibration caused by ship's engine room operation.

Tests carried out

DNV Rules Pt.4 Ch.6 – Piping systems
 DNV Class Program CP-0186 - Valves
 Test standard: DIN EN 12266-1
 Industrial valves – Testing of metallic valves
 Pressure tests, test procedures and acceptance criteria –
 Mandatory requirements

Test		Purpose
Title	Test reference	
Shell strength	P10	To confirm the pressure containing capability of the shell against internal pressure
Shell tightness	P11	To confirm the leak tightness of the shell including the operating mechanism sealing against internal pressure
Seat tightness	P12	To confirm the capability of the seat(s) to comply with the specified leakage rate <ul style="list-style-type: none"> - at the time of manufacture - In the direction(s) for which the valve is designed

Minimum test duration

Nominal size	Minimum test duration	
	Production and acceptance test - liquid or gas	Type test -liquid or gas
up to DN 50	15 s	10 min

Type Approval documentation

The approval is based on the following documentation:
 PKH ball valve Design drawings
 Parts lists with material specifications
 PKH Ball valve product information and brochures
 Type Approval Assessment Report (Audit Report) dated 2016-05-24.
 Type Approval Assessment Report (renewal Audit), dated 2021-12-12

Marking of product

For traceability to this type approval the products are to be marked with:

- Manufacturer's name or trademark
- Valve type designation
- Size
- Maximum design pressure and temperature
- Arrow to indicate direction of flow on one way flow valves

Periodical assessment

A condition for retention of the Type Approval Certificate in its validity period is that periodical assessments are successfully carried out.

For retention of the Type Approval, a DNV GL Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the Type Approval are complied with. Refer to DNVGL-CP-0338, Sec.4.

END OF CERTIFICATE

TYPE APPROVAL CERTIFICATE

Certificate No:
TAP00000RS
Revision No:
1

This is to certify:

That the Check Valve

with type designation(s)
RVZ-SAE210, RVZ-SAE420

Issued to
MHA ZENTGRAF GmbH & Co. KG
Merzig, Saarland, Germany

is found to comply with
DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV class programme DNV-CP-0186 – Type approval – Valves

Application :

Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.

May be used for hydraulic oil, fuel oil, lubricating oil, inert gas, fresh water, sea water, sanitary, starting/control air, service air, brine, CO₂, steam, and refrigerants.

Type:	Temperature range:	Max. working press.:	Sizes:
RVZ-SAE210	-20°C to 100°C	210 bar (at ambient temperature)	DN 15 to DN 50
RVZ-SAE420	-20°C to 100°C	420 bar (at ambient temperature)	DN 15 to DN 50

Issued at **Hamburg** on **2022-02-01**

This Certificate is valid until **2027-01-31**.

DNV local station: **Essen**

Approval Engineer: **Guido Friederich**



for **DNV**

Digitally Signed By: Drows, Olaf
Location: DNV GL SE Hamburg, Germany
Signing Date: 2022-02-02

Olaf Drows
Head of Section

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Product description

Check valves to be installed in pipes for various fluid flow applications.

Available type sizes : RVZ-SAE ; DN 15, DN 20, DN 25, DN 32, DN 40, DN 50
 Design Temperature: depending on material selection,
 see table with material/ temperature ranges
 Design Pressure: RVZ-SAE210: 210 bar / RVZ-SAE420: 420 bar
 Flange connections: RVZ-SAE210: ISO 6162-1
 RVZ-SAE420: ISO 6162-2

Materials for RVZ valves including maximum temperature range for body, adaptors, stem and ball:

Material description	Material no.	Temperature range, °C
Free cutting steel 11SMn30	1.0715	-20°C to +120°C
Carbon steel S355J2+N	1.0577	according to AD-2000-code, data sheet W10
Fine grained steel with Re _≥ 355N/mm ²	All steels in according to AD-2000-code, data sheet W10	
Stainless steel		
X6CrNiMoTi17-12-2	1.4571	-273°C to +250°C
X2CrNiMoN22-5-3	1.4462	-40°C to +250°C
X5CrNiMo17-12-2	1.4401	-200°C to +250°C
X2CrNiMo17-13-2	1.4404	-200°C to +250°C

Seal material for RVZ valves including temperature range:

Ball seats	Stem and adater sealing materials	Temperature range
Polyacetal, POM	-	-40°C to +100 °C
Polytetrafluorethylene, PTFE	-	-200°C to +220°C
Polyvinylidene-fluorid, PVDF	-	-40°C to +150°C
Polyetheretherketone, PEEK	-	-40°C to +250°C
Cast iron, GG25	-	-40°C to +250°C
-	Acrylonitrile-butadiene-rubber, NBR	-30°C to +100°C
-	Fluor-rubber, FPM	-20°C to +200°C
-	Fluor-rubber FPM special compound	- 46°C to +225°C
-	Athylen-Propylene-Dien-rubber, EPDM	-50°C to +130°C
-	Polytetrafluorethylene, PTFE	-200°C to +220°C
-	Perfluorelastomer, FFKM	-20°C to +275°C
-	Tetrafluorethylene/Propylene, FEPM	-25°C to +250°C

Pressure reduction factors for elevated temperatures:

Temperature (°C)	Carbon steel unalloyed	Low alloyed steels	Stainless steels
20	1	1	1
50	1	1	0,95
100	1	1	0,85
150	0,89	0,93	0,77
200	0,81	0,87	0,71
250	0,72	0,81	0,67

Application

RVZ valves may be used for hydraulic oil, fuel oil, lubricating oil, inert gas, fresh water, sea water, sanitary, starting/control air, service air, brine, CO2, steam, and refrigerants.

Limitation

The RVZ-SAE valves shall not be used for the following service and operation conditions:
 Operation with flowing media specified as toxic or dangerous fluids.
 Cryogenic fluids including LNG / LPG as specified by applications subjected to the IGC Code and IGF Code.

Tests carried out

Test standards:

DNV Rules Part 4 Chapter 6 DNV Class Program 0186 DIN EN 12266-1	Piping systems Valves Industrial valves – Testing of metallic valves Pressure tests, test procedures and acceptance criteria – Mandatory requirements
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Test		Purpose
Title	Test reference	
Shell strength	P10	To confirm the pressure containing capability of the shell against internal pressure
Shell tightness	P11	To confirm the leak tightness of the shell including the operating mechanism sealing against internal pressure
Seat tightness	P12	To confirm the capability of the seat(s) to comply with the specified leakage rate <ul style="list-style-type: none"> - at the time of manufacture - In the direction(s) for which the valve is designed

Minimum test duration:

Nominal size	Minimum test duration Production and acceptance test - liquid or gas	Type test -liquid or gas
up to DN 50	15 s	10 min

Type Approval documentation

Design drawings RVZ-SAE 210; DN 15 to DN 50, Parts lists with material specification
 Design drawings RVZ-SAE 420; DN 15 to DN 50, Parts lists with material specification
 Type Approval Assessment Report (renewal Audit), dated 2021-12-12

Marking of product

For traceability to this type approval each valve shall be marked on its type plate with the following minimum information:

- Manufacturer's name and/or trademark
- Valve type and size
- Design pressure
- Design temperature
- Arrow to indicate direction of flow on one way flow valves

Periodical assessment

A condition for retention of the Type Approval Certificate in its validity period is that periodical assessments are successfully carried out.

For retention of the Type Approval, a DNV GL Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the Type Approval are complied with. Refer to DNVGL-CP-0338, Sec.4.

END OF CERTIFICATE