DNV·GL

TYPE APPROVAL CERTIFICATE

Certificate No:
TAP00000RH
Revision No:
1

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

Application :

May be used for flammable fluids (LNG/LPG) service, 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:	**DN4 to DN100**

Issued at **Hamburg** on **2017-01-02**

This Certificate is valid until **2022-01-01**.
DNV GL local station: **Essen**

Approval Engineer: **Guido Friederich**

for **DNV GL**
Digitally Signed By: Drews, Olaf
Location: DNVGL Hamburg
Signing Date: 2017-03-16

Olaf Drews
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Job Id: **262.1-009052-6**
Certificate No: **TAP00000RH**
Revision No: **1**

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	DN13, 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 BHKP and MHKP	DIN ISO 228 Female thread 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 DIN 3202-F1 F10/40-F63/160-F250-F320
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: 315 bar - stainless steel DN 20: 420 bar - carbon steel DN 25: 315 bar - both
BKHP	DN 20/25 (stainless/carbon steel)	All	420
MKHP	DN 32 – 50 (stainless/carbon steel)	All	420
KH-ISO 250	DN 13 – 63 (carbon steel / stainless steel)	flanges	250
KH-ISO 400	DN 13 – 80 (carbon steel / stainless steel)	flanges	400

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

Application/Limitation

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

Material description	Material no.	Temperature range, °C
Free cutting steel 11SMn30	1.0715	-20°C to +120°C
Carbon steel S355J2+N Fine grained steel with Re≥355N/mm²	1.0577 All steels in according to AD-2000-code, data sheet W10	 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

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

Max temperature range for standard seal material:

Ball seats	Stem and adater 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

Limitation / Certification

- Design, fabrication and certification of valves for installations in LPG / LNG systems on board of liquefied gas tankers to be carried out in accordance with DNV GL Rules Pt. 5 Ch. 7 - "Liquefied gas tankers".

- Design, fabrication and certification of valves for installations in ship's LNG and gas fuel systems to be carried out in accordance with DNV GL Rules Pt. 6 Ch.2, Section 5 -"Gas fuelled ship installations" and DNV GL Rules Pt. 5 Ch. 7 - "Liquefied gas tankers".
- The selection of valve materials for gas fuelled ship installations as well as for LPG/LNG service conditions on board of Liquefied gas tankers has to be carried out with the applicable DNV GL Rules.
- Valves for operation with flammable fluids (LPG/LNG) are to be classed within Pipe Class I, see DNV GL Rules Pt. 4 Ch. 6 - Piping systems.

- Threaded joints may 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.
- 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 ouside 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.

- Valves not suitable for sour gas and fluids specified as toxic or dangerous fluids.

Type Approval documentation

The approval is based on the following documention :

- Manufacturers ringbinder received with manufacturers letter dated 2011- 07-07 containg Drawings,
- Parts lists with material specifications
- Product information and test reports

Tests carried out

According recognized standard: DIN EN 12266-1
Industrial valves – Testing of metallic valves
Pressure tests, test procedures and acceptance criteria –
Mandatory requirements

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.

The objective of the periodical assessment is to verify that the conditions for the type approval have not been altered.

The main scope of the periodical assessment will normally include:
- Verification of the TA applicant's production and quality system w.r.t ensuring continued consistent production of the type approved products at the TA applicant's own premises and at other companies that are given the responsibility for manufacturing of the products.
- Review of the TA documentation and that this is still used as a basis for the production
- Review of possible changes to the design, the material and the performance of the product
- Verification of the product marking

END OF CERTIFICATE

DNV·GL

Certificate No:
TAP00000RM

TYPE APPROVAL CERTIFICATE

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

Application :

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

Valves may be used for lubrication oil, hydraulic oil, fresh and sea water, chemicals, steam, sanitary and compressed air.

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

This Certificate is valid until **2022-01-01**.
Issued at **Hamburg** on **2017-01-02**

DNV GL local station: **Essen**

Approval Engineer: **Guido Friederich**

for **DNV GL**
Digitally Signed By: Drews, Olaf
Location: DNVGL Hamburg
Signing Date: 2017-01-24

Olaf Drews
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Product description

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

Application/Limitation

PKH valves may be used for lubrication oil, hydraulic oil, fresh and sea water, chemicals, steam, sanitary and compressed air.

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 Fine grained steel with Re≥355N/mm²	1.0577 All steels in according to AD-2000-code, data sheet W10	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

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

Limitation
The PKH valves may not be used for the following service and operation conditions:
Flowing media specified as toxic or dangerous fluids, sour gas
Flammable and liquefied gases including LNG/LPG, e.g. as subject to the IGC Code and IGF Code

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

Type Approval documentation

The approval is based on the following documention:
- PKH ball valve Design drawings
- Parts lists with material specifications
- PKH Ball valve product information and brochures

Tests carried out

According recognized standard: DIN EN 12266-1
Industrial valves – Testing of metallic valves
Pressure tests, test procedures and acceptance criteria –
Mandatory requirements

Test		
Title	Test reference	Purpose
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 - 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

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.

The objective of the periodical assessment is to verify that the conditions for the type approval have not been altered.

The main scope of the periodical assessment will normally include:

- Verification of the TA applicant's production and quality system w.r.t ensuring continued consistent production of the type approved products at the TA applicant's own premises and at other companies that are given the responsibility for manufacturing of the products.
- Review of the TA documentation and that this is still used as a basis for the production
- Review of possible changes to the design, the material and the performance of the product
- Verification of the product marking

END OF CERTIFICATE

DNV·GL

Certificate No:
TAP00000RS

TYPE APPROVAL CERTIFICATE

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

Application :

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

RVZ valves may be used for hydraulic oil, lubrication oil, fresh and sea water, steam, sanitary and compresed air.

Type:	Temperature range:	Max. working press.:	Sizes:
RVZ-SAE210	-20° 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

This Certificate is valid until **2022-01-01**.
Issued at **Hamburg** on **2017-01-02**

DNV GL local station: **Essen**

Approval Engineer: **Guido Friederich**

for **DNV GL**
Digitally Signed By: Drews, Olaf
Location: DNVGL Hamburg
Signing Date: 2017-01-24

Olaf Drews
Head of Section

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Product description

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

Application/Limitation

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

RVZ valves may be used for hydraulic oil, lubrication oil, fresh and sea water, steam, sanitary and compresed air.

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 Fine grained steel with Re≥355N/mm²	1.0577 All steels in according to AD-2000-code, data sheet W10	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

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
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

Limitation
The RVZ-SAE valves may not be used for the following service and operation conditions:
RVZ-SAE valves are not suitable for operation with fluids specified as toxic or dangerous fluids
Cryogenic fluids including LNG/LPG, e.g. as subject to the IGC Code and IGF Code

Type Approval documentation

Design drawings RVZ-SAE210 ; DN 15 to DN 50, Parts lists with material specification
Design drawings RVZ-SAE420 ; DN 15 to DN 50, Parts lists with material specification

Tests carried out

According recognized standard: DIN EN 12266-1
Industrial valves – Testing of metallic valves
Pressure tests, test procedures and acceptance criteria –
Mandatory requirements

Test		
Title	Test reference	Purpose
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 - 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

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 trade mark
- 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.
The objective of the periodical assessment is to verify that the conditions for the type approval have not been altered. The main scope of the periodical assessment will normally include:

- Verification of the TA applicant's production and quality system w.r.t ensuring continued consistent production of the type approved products at the TA applicant's own premises and at other companies that are given the responsibility for manufacturing of the products.
- Review of the TA documentation and that this is still used as a basis for the production
- Review of possible changes to the design, the material and the performance of the product
- Verification of the product marking

END OF CERTIFICATE