

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Ball Valve

with type designation(s)

Z (DIN), Z (ANSI/ASME), Z (ANSI/ASME), ZRB (ANSI/ASME), ZRB (ANSI/ASME), K/KRB (ANSI/ASME), K/KRB (ANSI/ASME)

Issued to

**PEKOS FABRICACION, S.L.U.,
Artea VIZCAYA, Spain**

is found to comply with

**DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV GL class programme DNVGL-CP-0186 – Type approval – Valves
DNV GL rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers**

Application :

Product(s) approved by this certificate is/are accepted for installation on vessels classed by DNV GL.

| Type: | Temperature range: | Max. working press.: | Sizes: |
|--------------------------|--------------------|-----------------------|--|
| Z (DIN) | See certificate | PN 10/16/25/40 | DN 15, 20, 25, 32 40, 50, 65, 80, 100, 125, 150 & 200 |
| Z (ANSI/ASME) | See certificate | Class 150 | 1/2", 3/4", 1", 1-1/2", 2", 2-1/2", 3", 4", 6" & 8" |
| Z (ANSI/ASME) | See certificate | Class 300 | 1/2", 3/4", 1", 1-1/2", 2", 2-1/2", 3" & 4" |
| ZRB (ANSI/ASME) | See certificate | Class 150 | 1/2" x 3/8", 3/4" x 1/2", 1" x 3/4", 1-1/2" x 1-1/4", 2" x 1-1/2", 3" x 2-1/2", 4" x 3", 6" x 5", 8" x 6", 10" x 8" & 12" x 10" |
| ZRB (ANSI/ASME) | See certificate | Class 300 | 1/2" x 3/8", 3/4" x 1/2", 1" x 3/4", 1-1/2" x 1-1/4", 2" x 1-1/2", 3" x 2-1/2", 4" x 3" & 6" x 5" |
| K/KRB (ANSI/ASME) | See certificate | Class 600 | 2" & 2-1/2" |
| K/KRB (ANSI/ASME) | See certificate | Class 800 | 1/4", 3/8", 1/2", 3/4", 1", 1-1/4", 1-1/2" & 2" |

This Certificate is valid until **2022-05-11**.

Issued at **Høvik** on **2018-04-04**

for **DNV GL**

DNV GL local station: **Bilbao**

Approval Engineer: **Zeinab Sharifi**

**Marianne Spæren Marveng
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: **262.1-023910-2**
 Certificate No: **TAP00000T2**
 Revision No: **1**

Product description

Standard floating ball valves, 2/3-piece. Full/reduced bore with flanged, threaded or welded ends. The design and construction of valve ends are in accordance with the following standards:

- Flanged ends : ASME B16.5/ EN 1092-1
- Threaded ends : ASME B1.20.1
- Buttwelding ends : ASME B16.25
- Socket welding ends : ASME B16.11
- Min. wall/body thickness : ASME B16.34/ EN 12516-1

Configuration of valve type, size and pressure ratings:

| Valve type | Size | Pressure rating |
|---|---|-----------------|
| Z (DIN) Floating, full bore, 2-piece, split body, flanged end according to EN 1092-1 | DN15, 20, 25, 32, 40 & 50 | PN10/16/40 |
| | DN65, 80 & 100 | PN10/16 |
| | DN65, 80 & 100 | PN25/40 |
| | DN125 & 150 | PN10/16 |
| | DN125 | PN25/40 |
| | DN200 | PN10/16 |
| Z (ANSI/ ASME) Floating, full bore, 2-piece, split body, flanged end according to ASME B16.5 | 1/2", 3/4" & 1" | class 150 |
| | 1-1/2", 2", 2-1/2", 3" & 4" | class 150 |
| | 6" & 8" | class 150 |
| | 1/2", 3/4" & 1" | class 300 |
| | 1-1/2", 2", 2-1/2", 3" & 4" | class 300 |
| ZRB (ANSI/ ASME) Floating, reduced bore, 2-piece, end entry, flanged end according to ASME B16.5 | 1/2" x 3/8" & 3/4" x 1/2" | class 150 |
| | 1" x 3/4" & 1-1/2" x 1-1/4" | class 150 |
| | 2" x 1-1/2", 3" x 2-1/2" & 4" x 3" | class 150 |
| | 6" x 5", 8" x 6", 10" x 8" & 12" x 10" | class 150 |
| | 1/2" x 3/8" & 3/4" x 1/2" | class 300 |
| | 1" x 3/4" & 1-1/2" x 1-1/4" | class 300 |
| | 2" x 1-1/2", 3" x 2-1/2" & 4" x 3" | class 300 |
| | 6" x 5" | class 300 |
| K/ KRB (ANSI/ ASME) Floating, full bore, 3-piece, split body, NPT/BSPP/BW/SW ends | 1/4", 3/8", 1/2", 3/4", 1", 1-1/4", 1-1/2" & 2" | class 800 |
| | 2" & 2 1/2" | class 600 |

Materials:

| Valve type | Body & valve ends | Ball | Stem | Sealing materials |
|---------------------|--|---|---|--|
| Z (DIN) | 1.0619, 1.6220, 1.4408 | 1.4408/ 1.4401 | 1.4404/ 1.4401/ A182 Gr. F51/ XM-19 | - Ball seat: PTFE/ PTFE+FG/ PTFE+CG - Body seal: PTFE/ PTFE+FG/ PTFE+CG/ Graphite |
| Z (ANSI/ ASME) | ASTM A216 Gr. WCC, ASTM A352 Gr. LCC, ASTM A351 Gr. CF8M | ASTM A351 Gr. CF8M/ ASTM A182 F316 | AISI 316/ AISI 316L/ A182 Gr. F51/ XM-19 | - Stem seal & packing: PTFE+FG, PTFE+CG, PTFE, FKM, NBR, Graphite |
| ZRB (ANSI/ ASME) | ASTM A216 Gr. WCC, ASTM A352 Gr. LCC, ASTM A351 Gr. CF8M | ASTM A351 Gr. CF8M/ ASTM A182 F316 | AISI 316/ AISI 316L A182 Gr. F51/ XM-19 | - Ball seat: PTFE/ PTFE+FG/ PTFE+CG - Body seal: PTFE/ PTFE+FG/ PTFE+CG/ Graphite/ FKM - Stem seal & packing: PTFE+FG, PTFE+CG, PTFE, FKM, NBR, Graphite |
| K/ KRB (ANSI/ ASME) | ASTM A182 F316/ 316L, ASTM A105, ASTM A350 Gr. LF2 | ASTM A182 F316/ 316L | AISI 316/ AISI 316L/ A182 Gr. F51/ XM-19 | - Ball seat & stem seal: PTFE/ PTFE+FG/ PTFE+CG - Body seal: PTFE/ PTFE+FG/ PTFE+CG/ Graphite - Stem seal & packing: |

Job Id: **262.1-023910-2**
 Certificate No: **TAP00000T2**
 Revision No: **1**

| | | | | |
|--|--|--|--|-----------------------------|
| | | | | PTFE+CG, FKM, NBR, Graphite |
|--|--|--|--|-----------------------------|

Application/Limitation

Valves covered by this certificate are approved to be used in ship piping, machinery piping, LNG/LPG and cargo piping systems.

Maximum pressure-temperature ratings shall be according to ASME B16.34/ EN 12516-1 for the selected construction metallic material.

Temperature ranges for non-metallic sealings:

| | | |
|------------------------|---|-------------------|
| PTFE/ PTFE+FG/ PTFE+CG | : | -196°C to +250 °C |
| PEEK | : | - 80°C to +270 °C |
| PCTFE | : | -196°C to +185 °C |
| FKM | : | -46°C to +220 °C |
| FFKM | : | -25°C to +325 °C |
| NBR | : | -40°C to +120 °C |
| Graphite | : | -196°C to +450 °C |

Valves intended for use in fire systems shall have same non-metallic materials as the qualified fire tested valve, ref. to API 607 Clause 7.2.5.

Austenitic stainless steel grades listed in this certificate are not permitted for use in sea water systems. Also, carbon steels in direct contact with seawater shall be properly protected. Surface preparation and coating shall be approved by society.

The approval does not include any operating gear for remote control and actuator part of the valve.

The breakaway torque shall fulfil the requirements set forth in the product standard or specification as applicable, considering the stem material grade & dimensions.

The valve shall be installed according to the manufacturer’s instructions.

Valves with threaded joints shall not be used for piping systems conveying toxic or flammable media or services where fatigue, severe erosion or crevice corrosion is expected to occur.

Valves with threaded ends for direct connectors of pipe lengths with tapered thread shall be allowed for:

- class I, outside diameter not more than 33.7 mm
- class II and class III, outside diameter not more than 60.3 mm.

Valves with parallel thread ends shall be allowed only for class III applications with outside diameter not more than 60.3 mm.

Valves with socket welded ends in accordance with DNV GL Pt.4 Ch.6 Sec.9 [6.1]:

- shall not be used in overboard pipes where substantial thickness is required.
- may be used for class I & II pipes with an OD of 88.9 mm and less.
- shall be subject to the Society's consideration in each case for stainless steel pipes

Type Approval documentation

Drawings:

| | | |
|------------------------------|------------------------------|-----------------------------|
| 0-36-040300---GV-DNV, rev. 2 | 0-07-015150-GGVV-DNV, rev. 2 | 0-36-040010---G-DNV, rev. 2 |
| 001B03600040300I, rev. 02 | 001B00700015150, rev. 00 | 001B03600040040, rev. 02 |
| 002B00200040300I, rev. 01 | 002000700015150, rev. 2 | 002B001F4040040, rev. 00 |
| 005003600040000, rev. 04 | 005-07-015-C, rev. 2 | 002B001F1040040, rev. 00 |
| 011B03600040000, rev. 03 | 011-07-015 rev. 0 | 005003600040000, rev. 04 |
| 001B03600050300, rev. 01 | 001B00700020150, rev. 00 | 011B03600040000, rev. 03 |
| 002B00200050300I, rev. 00 | 002000700020000 rev. 0 | 001B03600050040, rev. 01 |
| 001A03600065300, rev. 00 | 0-07-015300-GGVV-DNV rev. 2 | 002B001F4050040, rev. 01 |

Job Id: **262.1-023910-2**
Certificate No: **TAP00000T2**
Revision No: **1**

002A00100065300, rev. 00
001B03600080300, rev. 00
002B00200080300, rev. 00
005003600080000, rev. 02
011B03600080000, rev. 04
001B03600100300I, rev. 01
002B00200100300, rev. 1
0-36-125010---G-DNV, rev. 2
001B03600125016I, rev. 00
002B00100125016, rev. 00
005003600125000, rev. 02
011B03600125000, rev. 02
001B03600125040I, rev. 00
002B00100125040, rev. 00
001B03600150016I, rev. 00
002B00100150016, rev. 00
001B03600200010I, rev. 01
002B00100200010, rev. 01
005003600200000, rev. 01
011B03600200000, rev. 01
001B03600200016I, rev. 03
002B00100200016, rev. 01
0-36-150150---GV-DNV, rev. 2
001B03600150150, rev. 01
002B00200150150I, rev. 00
005003600125000, rev. 02
011B03600125000, rev. 02
001B03600200150I, rev. 03
002B00200200150, rev. 01
005003600200000, rev. 01
011B03600200000, rev. 01
0-41-01080-SGSGV-DNV, rev. 2
00100410010800, rev. 05
002SF410008800, rev. 02
002BF410008800, rev. 02
002NF410008800, rev. 02
002WF410006800-80, rev. 01

00500410010800, rev. 08
00100410010800, rev. 05
002SF410010800, re. 02
002BF410010800, rev. 02
002NF410010800, rev. 02
002WF410010800-80, rev. 01
00500410010800, rev. 08
00100410015800, rev. 05
002SF410015800, rev. 03
002BF410015800, rev. 02
002NF410015800, rev. 04
002WF410015800-80, rev. 01
00500410010800, rev. 08
00100410020800, rev. 05
002SF410020800, rev. 04
002BF410020800, rev. 02
002NF410020800, rev. 04
002WF410020800-80, rev. 01
00500410020800, rev. 07

0010007RE015300, rev. 00
002000700015300, rev. 00
005-07-015-C, rev. 2
011-07-015, rev. 1
001A00700020300, rev. 00
002000700020000 rev. 0
0-07-025150-GVV-DNV, rev. 2
001B0R700025150, rev. 01
002000700025150, rev. 03
005003600015000, rev. 02
011B03600015000, rev. 03
001A0R700040150, rev. 00
002000700040150, rev. 1
005003600025000, rev. 02
011B03600025000, rev. 03
001B0R700025300, rev. 00
002000700025300, rev. 0
005003600015000, rev. 02
011B03600015000, rev. 03
001A0R700040300, rev. 01
002000700040150, rev. 1
005003600025000, rev. 02
011B03600025000, rev. 03
0-07-050150-GVV-DNV, rev. 2
001B0R700050150, rev. 01
002A00700050000, rev. 01
005003600040000, rev. 04
011B03600040000, rev. 03
001B0R700080150, rev. 00
002000700080150, rev. 1
001A0R700100150, rev. 01
002000700100150, rev. 2
005003600080000, rev. 2
011B03600080000, rev. 04
0-07-050300-GVV-DNV, rev. 2
001B0R700050300, rev. 01

002A00700050000, rev. 01
005003600040000, rev. 04
011B03600040000, rev. 03
001B0R700080300, rev. 01
002000700080150, rev. 1
001B0R700100300, rev. 00
002000700100300, rev. 0
005003600080000, rev. 02
011B03600080000, rev. 04
0-07-150150-GVV-DNV, rev. 2
001B0R700150150, rev. 02
002B00700150150, rev. 0
005003600125000, rev. 02
011B03600125000, rev. 02
001B0R700200150, rev. 00
002B00700200150, rev. 00
001A0R700250150, rev. 01
002B00700250150, rev. 00
005003600200000, rev. 01

002B001F1050040, rev. 01
001B03600065016, rev. 1
002B001F4065016, rev. 01
002B001F1065016, rev. 01
001B03600065040, rev. 00
002B001F4065040, rev. 00
002B001F1065040, rev. 00
001B03600080016, rev. 02
002B001F4080016I, rev. 04
002B001F1080016I, rev. 02
005003600080000, rev. 02
011B03600080000, rev. 04
001B03600080040I, rev. 03
002B001F4080040I, rev. 01
002B001F1080040I, rev. 01
001B03600100016I, rev. 01
002B001F4100016I, rev. 02
002B001F1100016I, rev. 00
001B03600100040I, rev. 00
002B001F4100040I, rev. 00
002B001F1100040, rev. 00
0-36-040150---GV-DNV, rev. 2
001B03600040150, rev. 03
002B00200040150I, rev. 01
005003600040000, rev. 04
011B03600040000, rev. 03
001B03600050150, rev. 01
002B00200050150I, rev. 00
001B03600065150, rev. 00
002B00200065150, rev. 00
001B03600080150, rev. 01
002B00200080150I, rev. 00
005003600080000, rev. 02
011B03600080000, rev. 04
001B03600100150, rev. 01
002B00200100150I, rev. 02
ORB41-01080-SGSGV-DNV,
rev. 3
00100410010800, rev. 05
002SR410015800, rev. 05
002BR410015800, rev. 02
002NR410015800, rev. 05
002WR410015800-80, rev. 01
00500410010800, rev. 08
00100410015800, rev. 05
002SR410020800, rev. 03
002BR410020800, rev. 02
002NR410020800, rev. 04
002WR410020800-80, rev. 01
00500410010800, rev. 08
00100410020800, rev. 05
002SR410025800, rev. 03
002BR410025800, rev. 02
002NR410025800, rev. 04
002WR410025800-80, rev. 01
00500410020800, rev. 07
00100410025800, rev. 03

Job Id: **262.1-023910-2**
Certificate No: **TAP00000T2**
Revision No: **1**

00100410025800, rev. 03
002SF410025800, rev. 03
002BF410025800, rev. 02
002NF410025800, rev. 04
002WF410025800-80, rev. 01
00500410020800, rev. 07
00100410032800, rev. 04
002SF410032800, rev. 06
002BF410032800, rev. 05
002NF410032800, rev. 05
002WF410032800-80, rev. 01
00500410040800, rev. 06
00100410040800, rev. 03
002SF410040800, rev. 05
002BF410040800, rev. 03
002NF410040800, rev. 04
002WF410040800-80, rev. 02
00500410040800, rev. 06
ORB41-06580-SGSGV-1-DNV,
rev. 3
00100410050600, rev. 03
002SR410065600, rev. 03
002BR410065600, rev. 02
002NR410065600, rev. 01
002WR410065600-80, rev. 00
00500410040800-1, rev. 00
0-41-05080-SGSGV-1-DNV, rev.
3
00100410050600, rev. 03
002BF410050600, rev. 02
002SF410050600, rev. 04
002NF410050600, rev. 03
002WF410050600-80, rev. 01
00500410040800-1, rev. 00
0-41-05080-SGSGV-DNV, rev. 3
00100410065600, rev. 01
002SF410065600, rev. 03
002BF10065600, rev. 02
002NF410065600, rev. 02
002WF10065600-80, rev. 00
00500410065600, rev. 04
011B03600200000, rev. 01
001A0R700300150, rev. 01
002A00700300150, rev. 00
0-07-150300-GVV-DNV, rev. 2
001B0R700150300, rev. 01
002B00700150150, rev. 0
005003600125000, rev. 2
011B03600125000, rev. 2
0-36-015040---G-DNV, rev. 2
001B03600015040, rev. 01
002B001F1015040, rev. 00
002B001F4015040, rev. 0
005003600015000, rev. 02
011B03600015000, rev. 03
001B03600020040, rev. 01
002B001F1020040, rev. 00
002B001F4020040, rev. 00
001B03600025040, rev. 00
002B001F1025040, rev. 01
002B001F4025040, rev. 0
005003600025000, rev. 02
011B03600025000, rev. 03
001B03600032040, rev. 0
002B001F1032040, rev. 00
002B001F4032040, rev. 00
0-36-015150---GV-DNV, rev. 2
001B03600015150, rev. 02
002B00200015150, rev. 01
005003600015000, rev. 02
011B03600015000, rev. 03
001B03600020150, rev. 01
002B00200020150, rev. 01
001B03600025150, rev. 01
002B00200025150, rev. 01
005003600025000, rev. 02
011B03600025000, rev. 03
002SR410032800, rev. 04
002BR410032800, rev. 02
002NR410032800, rev. 03
002WR410032800-80, rev. 01
00500410020800, rev. 07
00100410032800, rev. 04
002SR410040800, rev. 04
002BR410040800, rev. 04
002NR410040800, rev. 05
002WR410040800-80, rev. 01
00500410040800, rev. 06
00100410040800, rev. 03
002SR410050800, rev. 03
002BR410050800, rev. 03
002NR410050800, rev. 02
002WR410050800-80, rev. 01
00500410040800, rev. 06
0-36-015300---GV-DNV, rev. 2
001B03600015300, rev. 02
002B00200015300, rev. 00
005003600015000, rev. 02
011B03600015000, rev. 03
001B03600020300, rev. 01
002B00200020300, rev. 1
001B03600025300, rev. 02
002B00200025300, rev. 01
005003600025000, rev. 02
011B03600025000, rev. 03

Design & Calculation Dossier Pekos Ball Valves, Rev. 0 dated 2015-09-22

Torque table DC-75-02-10-PF rev. 08

Stem calculation rev. 1 dated 2017-03-28

Body 2 calculation – ZRB dated 2017-03-28, rev. 1

Body 2 calculation – Z full bore dated 2016-02-07, rev. 0

Pressure & Functional test – General procedure PR. 75-02 Rev. 15 June 2016

Pressure-temperature chart dated 2017-04-26 for various gasket materials used

Fire test reports from Lloyds: BBO 1000062/1/A1 dated 2009-12-16, BBO 1000062/2/A1 dated 2009-12-16, BBO 1000062/3/A1 dated 2009-12-16, BBO 1000062/4/A1 dated 2009-12-17, BBO 1000062/5/A1 dated 2009-12-17, BBO 1000062/6/A1 dated 2009-12-17, BBO 1000062/7/A1 dated 2007-11-29 & BBO 1000062/8/A1 dated 2007-11-29

Cryogenic test report nos.: CRY-DNV-1-2-300, CRY-DNV-3-4-300, CRY-DNV-1-300, CRY-DNV-32-40, CRY-DNV-11-2-300, CRY-DNV-2-300, CRY-DNV-21-2-300, CRY-DNV-3-300, CRY-DNV-4-300, CRY-DNV-125-40, CRY-DNV-6-150, CRY-DNV-8-150, CRY-DNV-1-2-800, CRY-DNV-1-2RB-800, CRY-DNV-3-4-800, CRY-DNV-1-800, CRY-DNV-11-2-800, CRY-DNV-2-600, CRY-DNV-21-2-600.

Job Id: **262.1-023910-2**
Certificate No: **TAP00000T2**
Revision No: **1**

Certification

For DNV GL-RU-SHIP Pt.4 Ch.6 applications (general piping systems):

Valve bodies shall be delivered with material certificates in accordance with DNV GL Ship Pt.4 Ch.6 Sec.2 Table 3. Materials with VL and W certificates shall be manufactured in a foundry approved by the society.

DNV GL product certificates are required for valves with DN > 100 mm and design pressure \geq 16 bar, and for ship side valves where DN > 100 mm regardless of pressure. For other valves a manufacturer's product certificate may be accepted.

For DNV GL-RU-SHIP Pt.5 Ch.7 applications (LNG/LPG):

Valves shall be delivered with product certificate when minimum design temperature is less than -55°C (reference is made to DNV GL Ship Rules Pt.5 Ch.7 Sec.1 Table 7).

Otherwise manufacturer's certificate may be accepted.

Material certificates for valve bodies are required to be in line with DNV GL Pt.5 Ch.7 Sec.1 Table 8.

Production Tests

All valves are to be tested as below:

- Hydrostatic test of the valve body at a pressure equal to 1.5 times the design pressure.
- Seat and stem leakage test at a pressure equal to 1.1 times the design pressure for valves.

Production testing and acceptance criteria shall be in accordance with API 598/EN 12266-1.

For LNG/LPG applications (in addition to above tests):

- Cryogenic testing consisting of valve operation and leakage verification to be performed as per B6364 for a minimum of 10% of each delivery intended to be used at a minimum design temperature below -55°C.

Production tests for valves which are to be delivered with a DNV GL product certificate, shall be witnessed by DNV GL surveyor.

Tests carried out

Fire test, cryogenic test.

Marking of product

For traceability to this type approval each product is at least to be marked with:

- Manufacturer's name or trade mark
- Type designation
- Maximum working pressure & temperature
- Serial number

Periodical assessment

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 approval are complied with. Reference is made to DNVGL-CP-0338.

Renewal should be applied for in writing before the certificate expires.