

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Ball Valve**

with type designation(s)

NP, FB, FBL, FBM, FR, PQR-i, TEV-f

Issued to

BAC VALVES S.A.**Figueras GERONA, Spain**

is found to comply with

Det Norske Veritas' Rules for Classification of Ships Pt.4, Ch.6 "Piping Systems"**Det Norske Veritas' Rules for Classification of Ships Pt.5, Ch.4 "Chemical Carriers"****Det Norske Veritas' Rules for Classification of Ships Pt.5, Ch.5 "Liquefied Gas Carriers"****Det Norske Veritas' Standards for Certification 2.9 No. 5-794.40****Application :****Ball valves approved for use in machinery piping systems, ship piping systems and cargo handling piping systems.****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.****Temperature range:** -196 °C to 250 °C (dep. on material and testing, see cert.)**Max. working press.:** See certificate**Sizes:** See certificateThis Certificate is valid until **2019-09-24**.Issued at **Høvik** on **2015-09-25**DNV GL local station: **Barcelona**for **DNV GL**Approval Engineer: **Simon Ratcliffe**

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.

Product description

Split body, full bore free-floating or trunnion mounted ball. Flanged or threaded end connections.
Body thickness and bolting according to ASME B16.34-2013 and EN12516-1 depending on rating.

Size ranges:

Type	Sizes	Ratings
NP	DN250, 300, 350 and 400 (10", 12", 14" and 16")	PN16, PN25, PN40, #150, #300
FB	DN15, 20, 25, 40, 50, 80, 100, 150 and 200	PN16, PN25, PN40, #150, #300
FBL	DN15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150 and 200	PN16, PN25, PN40, #150, #300
FBM	DN15, 20, 25, 32, 40 and 50	PN16, PN25, PN40, #150, #300
FR	DN15, 20, 25, 32, 40 and 50	PN16, PN25, PN40, #150, #300
PQR-i	½", ¾", 1", 1½", 2", 3", 4", 6", 8", 10" and 12"	PN16, PN25, PN40, #150, #300
TEV-f	½", 1", 1½", 2", 3", 4", 6"	#600 – ½" #1500 – 1" PN40, #150, #300 - 1½", 2", 3", 4", 6"

Material combinations:

Type	Body	Ball / Stem	Seals	Seat
NP (SS)	SS, ASTM A-351 CF8M		PTFE, Reinf. PTFE and Graphite	Mod. PTFE
FBM	SS, ASTM A-351 CF8M	SS, ASTM A-351 CF8M		
FB, FB-L (CS)	CS, DIN EN10213-2 WNo 1,0619 / ASTM A105 N / WCC	SS, ASTM A-351 CF8M / 904L / AISI 316 SS, DIN EN10213-4 WNo 1,4308 / AISI 304		
FR,FB, FB-L (SS)	SS, DIN EN10213-4 WNo 1,4408 / CF8M / SS316	SS WNo 1,4408 / AISI 316 / CF8M		
PQR-i	CS, ASTM A-216 WCC / A 105 SS, ASTM A-351 CF8M / SS316	SS ASTM A-351 CF8M / AISI 316		
TEV-f	ASTM A479 316 ASTM A351 CF8M	ASTM A479 316 ASTM A351 CF8M		

Application/Limitation

The valve types and sizes listed in the below table have been subjected for a cryogenic test at minimum design temperature and can be used in systems with design temperatures down to:

Type	Sizes	Max. working pressure	Minimum design temperature
FB (SS)	DIN DN15, DN20, DN25, DN40, DN50, DN80, DN100, DN150 ANSI ½", ¾", 1", 1½", 2", 3", 4", 6" DIN DN15, DN25, DN50, DN80, DN100, DN150 ANSI ½", 1", 2", 3", 4", 6"	40 bar	-196 °C
FBM	DIN DN20 ANSI ¾"	49,6 bar	-110 °C
FR (SS)	DIN DN15 ANSI ½"	40 bar	-196 °C
PQR-I (SS)	ANSI ½", ¾", 1", 1½", 2", 3", 4"	40 bar	-110 °C
TEV-f	ANSI 1½", 6" Class 150	40 bar	-196 °C
		19 bar	-196 °C

Valves not subjected to a cryogenic test can be used in systems with design temperatures down to -55 or -40 °C, depending on the body material. Maximum working pressures according to rating and standard.

Maximum design temperature: +250 °C

Materials in body and bonnet shall be charpy tested when the thickness exceeds 6 mm. Acceptance criteria according to DNV Rules for Ships Pt.5 Ch.5 Sec.2 Tables D1 to D4.

In addition to the systems mentioned on the front-page, the valves may be used in the following chemicals:

- Ammonium Nitrate Solution, 93% or less ¹⁾
- Carbon disulphide
- Hydrogen peroxide Solutions of 60% but not over 70% ¹⁾
- Diethyl Ether ¹⁾
- Phosphorus, yellow or white ¹⁾
- Propylene oxide and mixtures of ethylene oxide/propylene oxide ^{1, 2)}
- Sulphuric acid ¹⁾
- Sulphur liquid

Notes:

¹⁾ - only valves of stainless steel may be used.

²⁾ - FBM type valves may not be used in Propylene oxide.

Valve type FBL, FBM and FR may not be used for sea water systems or hydrocarbon services where "fire safe" application is required ref. DNV Rules for Ships Pt.4 Ch.1 Sec.3 B500, or as shut off or quick closing valve.

Carbon steels and stainless steel grades 304, 316, 304L and 316L are not permitted for use in sea water systems.

Type Approval documentation

Tests carried out

Fire test (for NP, FB and PQR-i), hydrostatic pressure test, seat leakage test and cryogenic testing (for FB, PQR-I)

Production testing

The valve housing of each valve shall be subjected to a hydrostatic pressure test at minimum 1.5 times the design pressure. The test pressure need not be more than 70 bar in excess of the design pressure.

Holding time: 2 min. for sizes up to 100 mm/4"
5 min. for sizes 125 - 250 mm/5" - 10",
10 min. for sizes 300 mm - 450 mm/12" - 16",

No leakage is permitted.

The valve assembly shall be subjected to a hydrostatic seat leakage test. The test pressure shall at least be equal to the design pressure. The test shall be performed with closed valve with the other end open to atmosphere. The pressure shall be applied independently on each side. For valves intended for ship's side or bottom the test pressure is not to be less than 5 bar.

Holding time: 5 min. for all sizes.
Acceptable leakage range: Drop tight

In addition to the above tests, cryogenic testing consisting of valve operation and leakage verification (to BS 6364) for a minimum of 10% of each type and size of valve intended to be used at a working temperature below -55 °C shall be undertaken (DNV Ship Pt.5 Ch.5 Sec.6 H300).

The following BAC test procedures have been reviewed to comply with the above requirements;
PQ-25 Rev.3 – Test Procedure for Ball Valves and Butterfly Valves
IQ-7 Rev.3 – Cryogenic Test Instruction

Certification

Each valve is to be surveyed and certified by Det Norske Veritas when required by Det Norske Veritas Rules, or by the Purchaser.

DNV product certificate is required for all valves intended to be used at working temperature below -55 °C or having DN ≥ 100.

For LNG/LPG applications: Material certificates are required in line with DNV Rules for Ship Pt.5 Ch.5 Sec.2 Table E1.

For other applications: Material certificates shall be according to DNV ship rules Pt.4 Ch.6 Sec.2 Table A2.

Marking of product

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

- Manufacturer's name or trade mark
- Type designation
- Size
- Pressure class

Periodical assessment

For retention of the Type Approval, DNV GL Surveyor shall perform a survey – every second year and before the expiry date of this certificate to verify that the conditions for the type approval are complied with.