DNV·GL

Certificate No:
TAP00001MU

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Butterfly Valves

with type designation(s)
QUADAX OFFSET BUTTERFLY VALVES

Issued to
müller quadax gmbh
Forchtenberg, Baden-Württemberg, Germany

is found to comply with
DNV GL rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers
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.
Temperature range: **-165°C to + 440°C**
Max. working press.:
Sizes: **DN 50 - DN 1800 / DN 2" - DN 70"**

Issued at **Hamburg** on **2020-01-24**
This Certificate is valid until **2025-01-23**.
DNV GL local station: **Augsburg**

for **DNV GL**

Approval Engineer: **Guido Friederich**

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.

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Product description

QUADAX butterfly valves designed with different connection styles providing different operation design principles depending on service conditions in piping systems.

Valve design:	ISO 5752/20, EN 558-1, ANSI B16.10
Valve side flanges:	DIN EN 1092, ASME B 16.5
Valve top flange:	EN ISO 5211.
Valve connection design styles:	Wafer type; Lug type; Buttwelded type, Double flange, Top entry
Valve operation design:	Tripple offset; Four offset

Butterfly valve nominal sizes:	
Double flange type	DN 50 to DN 1800 / DN 2” to DN 70”
Lug type	DN 50 to DN 1800 / DN 2” to DN 70”
Buttwelded type	DN 50 to DN 1800 / DN 2” to DN 70”
Double flange	DN 50 to DN 1800 / DN 2” to DN 70”
Top entry	DN 50 to DN 1800 / DN 2” to DN 70”

Pressure ratings:	PN 10 to PN 40 / ANSI Class 150 to Class 300
Design temperature [1]:	-165°C to +440°C

Butterfly valves may be equipped with manual, pneumatic or electric actuator [2].

Materials

Item	Material type	Standard
Valve body	Stainless steel	1.4408 CF8M ; 1.4571 AISI 316Ti; 1.4409 CF3M
Valve stem	Stainless steel	1.4571 AISI 316Ti; 1.4980 UNS S 66286
Valve disk	Stainless steel	1.4408 CF8M ; 1.4571 AISI 316Ti; 1.4409 CF3M
Seat	Austenit Alloy	Inconel 625

Application

Butterfly valves approved for the use in ships piping, machinery piping, fuel systems and cargo handling piping systems.
Operating media include oil, flammable gases, nitrogen and cryogenic liquefied gases including LNG.

Note:
Fuel oil, lubrication oil, hydraulic oil and thermal oil are in this context regarded as “Flammable liquids”.
See DNV GL Rules, Pt. 4 Ch. 1, Section 3 – Design principles

Limitation

1 If the type approved butterfly valves are intended for use and installation on board of a vessel with a cargo and/or media temperature below -165°C, the requirements for design temperatures below -165°C shall be specially agreed with the flag state administration. The type approval is covered to a minimum design temperature of -165°C.

2 Actuators and additional mountings are not included in this type approval.

Tests carried out

The butterfly valves have been tested according to the following standards and subjected to the following scope of tests:

Test standards:	DNV GL Pt. 5 Ch. 7 Liquefied gas tankers DNV GL Rules Pt.4 Ch.6 – Piping systems DNV GL Class Programme CP 0186 – Valves BS 6364 "Specification for valves for cryogenic service"
Valve test	Purpose
Pressure test	Minimum test pressure = 1,5 times the design pressure Test standard: DNV GL Pt. 5 / Ch.7; Pt.4 Ch. 6; DNV GL CP 0186
Seat tightness	To confirm the capability of the seat with the specified leakage rate Seat tightness test at ambient temperature, test fluid: Nitrogen
Seat tightness	Seat tightness test at cryogenic temperature, test temperature -196°C, Test fluid Helium.
Functional test	Functional test at cryogenic temperature, test temperature -196°C, test fluid Helium, (20 cycles OPEN/CLOSE)

Type Approval documentation

Production testing

I. Liquefied gas tankers

1. Certification of valves [DN ≥ 100 **or** Working temperature < -55°C]
For all valves having a nominal Diameter DN ≥ 100 or a working temperature below -55°C a product certificate has to be issued by DNV GL based on the following scope of tests and according to:
DNV GL Rules Part 5, Chapter 7 – Liquefied gas tankers, Section 5, Item 13.2

Type of test	Test pressure
Shell strength	1,5 times the design pressure
Tightness test of pressure bearing housing	1,1 times the design pressure
Seat tightness test	1,1 times the design pressure
Functional test	Design / work pressure

Pt. 5 Ch. 7, Section 1, Table 7 – Certification of components

DN ≥ 100 or Working temperature < -55° C	Type of certificate / Issued by VL Certificate / DNV GL

2. Additional cryogenic testing – 10 % of the batch
In addition, cryogenic testing consisting of valve operation and leakage verification 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 carried out.

3. Material certification of valves working temperature < -55°C
DNV GL Rules Part 5, Chapter 7 – Liquefied gas tankers

Pt. 5 Ch. 7, Section 1, Table 8 – Certification of material quality and testing
Material certificates of valve bodies

Valve nominal diameter	Type of Certificate / Issued by
DN > 100	VL Certificate / DNV GL
DN ≤ 100	W Works Certificate / Manufacturer

4. Certification of valves [Working temperature ≥ -55°C]
For all valves intended for use at a working temperature ≥ -55°C a works certificate has to be issued based on the tests listed above and according to
DNV GL Rules Part 5, Chapter 7 – Liquefied gas tankers, Section 1

Valve nominal size	Type of certificate / Issued by
DN < 100 mm	W Works Certificate / Manufacturer

Material certificates (valve bodies)
W Works Certificate, issued by
Manufacturer

Remark

For valves intended to be installed in ship's gas fuel systems certification requirements according to DNV GL Rules Pt. 6 Ch.2 Section 5 – "Gas fuelled ship installations " are to be observed where as for application on liquefied gas tankers DNV GL Rules Pt. 5 Ch. 7 – Liquefied gas tankers applies.

Production testing - continuation

II. Ships gas as fuel systems

For each valve intended to be installed in ship's gas fuel supply systems a product certificate is to be issued based on the following scope of tests and according to
DNV GL Rules Part 6, Chapter 2, Section 5 – Gas fuelled ship installations – Gas fuelled

Type of test	Test pressure
Shell strength	1,5 times the design pressure
Tightness test of pressure bearing housing	1,1 times the design pressure
Seat tightness test	1,1 times the design pressure
Functional test	Design / work pressure

Valves in LNG / Gas fuel system – Table 3 Certification required

Valve design conditions - Test and certification	Type of certificate / Issued by
Design temperature < 0°C / DNV GL Pt.5 Ch.7 irrespective of size	VL Certificate / DNV GL
Design pressure > 10 bar/ DNV GL Pt.5 Ch.7 irrespective of size	VL Certificate / DNV GL
Design pressure ≤ 10 bar Design temperature ≥ 0°C	Works certificate / Manufacturer

Material certificates
DNV GL Pt. 6 Ch.2 Section 5 – Gas fuelled ship installations
Table 4 Certification of material quality and testing

Design temperature	Type of certificate / Issued by
< 0°C	VL Certificate / DNV GL
≥ 0°C	W Works Certificate / Manufacturer

III General valve service conditions

[Other than covered by requirements for liquefied gas tankers and ship's gas fuel systems]
Certification of valves for general service conditions and applications
Valves to be used for general applications other than covered by requirements for liquefied gas tankers and gas fuelled ship installations shall be certified according to
DNV GL Rules Pt.4 Ch.6 – Piping systems, Section 9

Valve nominal size / Pressure rating	Type of certificate / Issued by
DN > 100 mm / PN > 16 bar	VL Certificate / DNV GL
DN ≤ 100 mm / PN ≤ 16 bar	W Works Certificate / Manufacturer
Ship side valves DN > 100 mm regardless of pressure rating	VL Certificate / DNV GL

Material certificates (valve bodies)
In accordance with DNV GL Rules Pt.4 Ch.6 – Piping systems, Section 2 – Table 3
Note:
Valves having a nominal diameter DN >100 and to be fabricated with a design temperature > 400°C shall provide VL material certificates for valve body and bolts.

Marking of product

Each valve shall be clearly marked for identification. The identification marking may be performed on the body or on a plate of non-corrosive material. When a metallic plate is used, the plate shall be permanently fixed to the body.
Identification marking on the body shall be located to non stressed areas and shall be clearly legible. The identification marking shall as a minimum include the following:

- Manufacturers name or trade mark
- Valve type designation
- Size
- Maximum design pressure and temperature

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 Type Approval are complied with. Refer to DNVGL-CP-0338, Sec.4.

This certificate is only valid if required periodical assessments are carried out with satisfactory results. To check the validity of this certificate, please look it up in https://approvalfinder.dnvgl.com

END OF CERTIFICATE