

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Safety Relief Valve for LNG/LPG Service

with type designation(s)
**Spring Loaded Safety Valves Series 3000 & 4000,
 Low Pressure Pilot Operated Safety Valves Series 9010,
 Pilot Operated Safety Valves Series 9000**

Issued to

**TAI MILANO S.p.A.
 Milano MI, AG, Italy**

is found to comply with

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

Application :

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

Type:	K. factor:	Temperature range:	Max. working press.:
Spring Loaded Safety Valves Series 3000 & 4000	See certificate	See certificate	See certificate
Low Pressure Pilot Operated Safety Valves Series 9010	See certificate	See certificate	See certificate
Pilot Operated Safety Valves Series 9000	See certificate	See certificate	See certificate

Issued at **Høvik** on **2020-01-16**

for **DNV GL**

This Certificate is valid until **2025-01-15**.

DNV GL local station: **Milan**

Approval Engineer: **Sinisa Sedlan**

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Zeinab Sharifi
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

Series		3000A/B/W		4000/4000W		9010/60		9000/60/70/90	
Description		Spring loaded safety valves, angle type, ASME B16.5 flanged connections		Spring loaded safety valves, angle type, ASME B16.5 flanged or threaded connections		Low pressure pilot operated safety valves, angle type, ASME B16.5 flanged connections		Pilot operated safety valves, angle type, ASME B16.5 flanged connections	
ASME/NPT class		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Sizes	1/2"x1"	-	-	600-1500	300	-	-	-	-
	3/4"x1"	-	-	150-2500	150-300	-	-	-	-
	1"x1"	-	-	150-2500	150-300	-	-	-	-
	3/4"x1 1/2"	-	-	1500-2500	300	-	-	-	-
	1"x1 1/2"	-	-	1500-2500	300	-	-	-	-
	1"x2"	150-600	150	-	-	-	-	150-2500	150-300
	1 1/2"x2"	150-1500	150-300	-	-	-	-	150-2500	150-300
	1 1/2"x3"	150-2500	150-300	-	-	-	-	150-2500	150-300
	2"x3"	150-2500	150-900	-	-	150	150	150-2500	150-300
	3"x4"	150-1500	150-300	-	-	150	150	150-2500	150-300
	3"x6"	900-1500	150-300	-	-	-	-		
	4"x6"	150-2500	150-900	-	-	150-300	150	150-2500	150-600
	6"x8"	150-600	150	-	-	150	150	150-1500	150-900
	6"x10"	300-600	150	-	-	-	-	150-600	150-300
8"x10"	150-300	150	-	-	150	150	-	-	
10"x14"	-	-	-	-	150	150	150-600	150-300	
12"x16"	-	-	-	-	-	-	150-300	150	
12"x18"	-	-	-	-	150-300	150	-	-	
Body/Bonnet materials		A216 WCB A352 LCB/LCC A217 WC6/ WC9/C5/C12/C12A A351 CF8/CF8M/ CF3M/CK-3MCuN A995 4A/5A/6A A494 M35-1/ CW6MC/CU5MCuC/ CW12MW/CX2MW B367 C2		A216 WCB A352 LCC A351 CF8/CF8M/ CF3M/CK-3MCuN A995 4A/5A/6A A494 M35-1/ CW6MC/CU5MCuC /CW12MW/CX2MW /C2 A182 F304/F316/ F316L/F44/ F51/F53/F55 B564 UNS N04400/ N06625/N08825/ N10276 B381 F2		A216 WCB A352 LCB/LCC A351 CF8/CF8M/ CF3M/CK-3MCuN A995 4A/6A A494 CW12MW/ CW2M/CX2MW /CW6MC A105 A350 LF2 A182 F304/F316/ F316L/F44/ FXM19/F51/ F53/F55 B564 UNS N06625		A216 WCB A352 LCB/LCC A351 CF8/CF8M/ CF3M/CK-3MCuN A995 4A/6A A494 CW12MW/ CW2M/CX2MW /CW6MC A105 A350 LF2 A182 F304/F316/ F316L/F44/ FXM19/F51/ F53/F55 B564 UNS N06625	
Discharge coefficient	Liquid	0,87		0,68		0,74		0,75	
	Steam & gas	0,95-0,975		0,93-0,95		0,74		0,95	

Application/Limitation

Valves covered by this certificate may be used with gas, steam or liquid with following design conditions:

Design pressure /temperature : As per pressure-temperature ratings (refer to ASME B16.34 / ASME B16.5), dependent on the body material

Design temperatures depending on non-metallic materials:

- EPDM/Fluoroelastomer: -30°C to +150°C;
- Neoprene: -20°C to +90°C;
- FKM/Viton: -30°C to +200°C;
- MFQ/Fluorosilicone elastomer: -60°C to 200°C;
- FFPM/FFKM/Perfluoroelastomer: -46°C to 320°C;
- PTFE/Teflon: -196°C to 260°C;
- PFA/perfluoroalkoxy copolymer: -196°C to 150°C;
- FEP/fluoroethylene-propylene copolymer: -196°C to 100°C;
- Graphite: -196°C to 600°C.

Only the following valves are approved for service at temperatures equal or lower than -55°C:

No.	Series	Size	Class		Material	T _{min}
			Inlet	Outlet		
1	3000A	1"x2"	300	150	A351 CF8M	-55°C
2	3000B	1"x2"	300	150	A351 CF8M	-55°C
3	3000W	1"x2"	300	150	A351 CF8M	-196°C
4	4000	3/4"x1" NPT	1500	300	A351 CF8M	-55°C
5	4000W	3/4"x1" RF	300	150	A351 CF8M	-196°C
6	9010	8"x10"	150	150	A351 CF8M	-110°C

Materials and material protection chosen for the specific system shall be suitable for the intended medium and environmental conditions. Valves of austenitic stainless steel shall not be used in direct contact with seawater.

EPDM may not be used for hydrocarbon services.

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

Threaded joints with tapered thread are only to be allowed for:

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

The valves covered by this certificate are not to be considered fire safe and therefore shall not be installed wherever fire safe application is required; e.g. as pressure relief valves on cargo tanks in liquefied gas tankers.

Type Approval documentation

- Product catalogues for valves series 3000 & 4000, 9010 and 9000
- General description for valves series 3000, 4000, 9010 and 9000
- Stress analysis reports for valves series 3000, 4000, 9010 and 9000
- Test procedure for valves for service at cryogenic temperature
- Pressure test/cryogenic test reports witnessed by DNV GL (for 6 valves only)
- Dimensional outline drawings with material list and valve data for valves series 3000, 4000, 4000W, 9010 and 9000
- Dimensioned sectional drawings of pressure parts for valves series 3000, 4000, 9010 and 9000
- Datasheets for non-metallic materials

Tests carried out

Hydrostatic pressure test, Cryogenic testing (only for 6 valves listed above)

Production Testing

Each valve body shall be subjected to:

- hydrostatic pressure test at 1.5 times the maximum working pressure at room temperature.

- seat leakage testing at 0.9 times the set pressure.

Testing shall follow procedures and acceptance criteria in ISO 4126-1/API 527.

In addition to the above tests, cryogenic testing consisting of valve operation and leakage verification (to BS6364) for a minimum 10% of each type and size of valve intended to be used at working temperature below -55°C shall be undertaken. (Reference is made DNV GL Ship Rules Pt.5 Ch.7 Sec.5 [13.1.1])

Production testing for valves that require DNV GL product certificate shall be witnessed by DNV GL surveyor.

Certification

The valves shall be delivered with DNV GL product certificate when minimum design temperature is less than -55°C or $DN \geq 100$. Otherwise manufacturer's product certificate may be accepted.

Valve bodies shall be delivered with material certificates in accordance with DNVGL-RU-SHIP Pt.5 Ch.7 Sec.1 Table 8. Approval of manufacturer is required for VL and W material certificates.

Marking of product

For traceability to this type approval the valves are to be marked as a minimum with:

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