

TYPE APPROVAL CERTIFICATE**This is to certify:****That the Safety Valve for Boiler and Pressure Vessel**with type designation(s)
441, 442, 431, 433

Issued to

**LESER GmbH & Co. KG
HOHENWESTEDT, Germany**

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.5 "Liquefied Gas Carriers"
Det Norske Veritas' Standards for Certification 2.9 No. 5-794.40
Offshore Standard DNV-OS-D101, Marine and Machinery Systems and Equipment****Application :****The Full Lift Safety Valves Type 441/442 and the Safety Relief Valves Type 431/433 may be used for Steam , Liquids, Gases and LPG services.
Only type 441-2" is approved to be used in LNG systems with temperature below -55°C.****Type: K. factor:**
441, 442 see certificate
431, 433 see certificateThis Certificate is valid until **2018-12-31**.Issued at **Høvik** on **2015-07-02**for **DNV GL**DNV GL local station: **Essen**Approval Engineer: **Adel Samiei**

**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

- Flanged Full lift Safety Relief Valves, spring loaded type 441, 442
- Flanged Safety Relief Valves, spring loaded type 431, 433
- Design (conventional and balanced bellow):

Screwed cap H2 Packed lever H4 Plain lever H3	Type 441 (closed bonnet)	Type 433 (closed bonnet)
Plain lever H3	Type 442 (open bonnet)	Type 431 (open bonnet)
Opening characteristics	Normal (liquids) Full lift (steam/gases)	Normal (steam/gases/liquids)
Connection inlet/outlet	Flanged	Flanged
Standard pressure rating	Inlet: PN16, PN 25, PN40 (CL150 or CL300) Outlet: PN10, PN16 (CL150)	Inlet: PN16, PN40, PN160 Outlet:PN16, PN40

- Valve sizes 431, 433 and 441,442 incl. DIN-, ANSI-, XXL- and Full nozzle design:

d ₀ (mm)	12	18	23	29	37	46	60	74	92	98	125	165	200	235	295
DN	15	20	25	32	40	50	65	80	100	125	150	200	250	300	400
ANSI	-	-	1"	1½"	1½"	2"	3"	-	4"	-	-	8"	10"	12"	16"

Material specifications and temperature range:

Part / Type	4411/4421 4311/4331	4415/4425 4315/4335	4412/4422 4312/4332	4414/4334	441 XXL, 442 XXL
Body	Grey cast Iron: GG-25(0.6025)	Nodular cast Iron: GGG40.3 (0.7043) or A536 (60-40-18)	Steel castings for pressure purposes: GP240GH(1.0619) or WCB	Steel castings for pressure purposes: GX5CrNiMo19-11-2 (1.4408) or CF8M	1.0460(C22.8) or 1.0425(P265GH) Or X2CrNiMoTi17-12-2 (1.4571) Or 316Ti
Disc	Stainless Steel: X39CrMo17-1(1.4122) Or MT440			X2CrNiMo17-12-2(1.4404 - 316L) Or X2CrNiMoTi17-12-2 (1.4571 - 316T) Or X39CrMo17-1 (1.4122 - MT440)	
Seat	Stainless Steel: X2CrNiMo17-12-2 (1.4404 - 316L)				1.0305* 1.0460* C22.8 X2CrNiMoTi17-12-2 (1.4571 - 316Ti)
Temp.	-10°C to +120°C	0°C to +350°C	-29°C to +450°C	-196°C to +400°C	-196°C to +550°C

* stellited

Application/Limitation

- Valves of grey cast iron (type 4411, 4421, 4311 and 4331) shall not be used in Class I and II piping systems.
- Valves of nodular cast iron (type 4415, 4425, 4315 and 4335) are not permitted fitted in Class I piping systems

- Discharge coefficient factor based on test results in accordance with ASME section VIII:

Type:	DN (Disc design)	K. factor:	
		Steam	Gas
441,442	ALL	2,6	1,7
431,433	15 (metallic disc)	2,9	1,9
	15 (O-ring disc)	3,0	2,0
	20	6,3	4,1
	All other	4,9	3,2

- Valves with throat inside diameter < 38 mm for the normal type (type 431 and 433) and < 20 mm for the full lift type valve (type 441 and 442) are not to be used on boilers.
- Sufficient valve capacity is to be calculated for each application acc. to DNV ship rules Pt.4 Ch.6.

Type Approval documentation

- High Performance Catalog Series 441/442, Edition May 2012, Doc. No. 0777.5465
- Modulate Action Catalog Series 431/433, Edition August 2014, Doc. No. 0777.5646
- TÜV Type Test Approval No. 14-576, dated 03/2014
- TÜV Type Test Approval No. 13-577, dated 10/2013
- National Board Testing Laboratory reports dated 10/2011
- Manufacturer's test report HAM600226 dated 05/1986 and HAM600226-1 dated 2010-02-24
- 350-41-09 Rev. 0 dated 1980-04-17
- 350.1209-02-01 Rev.2 dated 2013-01-08
- 350.1909-02-01 Rev.2 dated 2013-08-21
- 350.4709-02-01 Rev.2 dated 2013-08-23

Prototype Tests carried out

Cryogenic test – set pressure test

Production testing and Certification

- All valves shall be tested as below:
 - Hydrostatic test of the valve body at a pressure equal to 1.5 times the design pressure for all valves.
 - Test of set pressure at ambient temperature.
 - Leak test after reset at 90% of each set pressure at room temperature.
- Above tests shall be done in presence of DNV GL surveyor for valves intended for LNG/LPG systems and also for valves where DN≥40.
- Documents, signboards etc. which are to accompany each product/delivery:
 - Instruction and maintenance manuals
 - Surveyors report
 - DNV product certificate is required for all valves intended to be used at working temperature below -55°C or having DN≥40.
- Materials of the valve body intended for LNG/LPG systems are to be delivered with material certificates in accordance with DNV Ship Rules Part 5, Chapter 5 Section 2 Tabel E1. For other systems, material certificates are to be in accordance with DNV Ship rules Pt.4 Ch.6 Sec.2 Table A2.

Job Id: **262.1-002761-4**
Certificate No: **P-15169**

- All of materials with NV or Work certificate have to be supplied from an approved manufacturer of DNV GL for the type and grade of steel being supplied and for the relevant steelmaking and processing route.

Marking of product

For traceability to this Type Approval the products are to be marked with:

- Manufacturer's name or trade mark
- Design or type designation
- Size
- Set pressure and capacity.

Periodical assessment

For retention of the Type Approval, a DNV GL surveyor shall perform periodical assessment every second year and before the expiry date of this certificate. The scope of the periodical assessment survey is to verify that the conditions stipulated for the Type Approval is complied with and that no alterations are made to the product design or choice of materials.

The main elements of the certificate retention survey are:

- review of Type Approval documentation
- review of possible changes in design, materials and performance
- ensure traceability between manufacturer's product type marking and Type Approval Certificate.

END OF CERTIFICATE