



Certificate No:
TAP00002M4

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Safety Valve

with type designation(s)

Type 91 and 94 pilot operated safety relief valves

Issued to

Emerson Automation Solutions Final Control US LP
Stafford, TX, USA

is found to comply with

DNV rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers

DNV class programme DNV-CP-0186 – Type approval – Valves

Application :

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

K. factor: See page 2

Issued at **Høvik** on **2023-08-31**

This Certificate is valid until **2028-08-30**.

for **DNV**

DNV local station: **Certification & Inspection Services**

Approval Engineer: **Maheshraja Venkatesan**

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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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Form code: TA 251

Revision: 2021-03

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Product description

Type 91/94 pilot operated bellow type safety relief valve of sizes 10" x 12" and 12" x 16" with class 150 flanged ends containing orifice area 56.5 in.² and 89.87 in.² respectively, designed according to standard API 520 part 1.

Material of construction

Valve body	: ASTM A351 Fr. CF8M
Bellows	: ASTM A240 type 304/316/304L/316L
Bellows guide	: ASTM A479 316/316L
Cap	: ASTM A240 type 316
Bolting	: ASTM A193 Gr. B8M
Primary & secondary seat	: TEFLON/ PTFE
O-ring	: TEFLON/ PTFE

Application/Limitation

The safety valve types as described and specified above are approved for use in LNG/LPG applications.

Maximum allowable relief valve setting: 3.4 bar(g)

Temperature range: -196°C to +200°C

Discharge coefficient:

For Sonic Flow, Coefficient of Discharge, $K_d = 0.770$

For Subsonic Flow, Coefficient of Discharge, $K_d = 0.678 (P_2/P_1)^{-0.285}$

where $P_1 \rightarrow$ pressure at valve inlet during flow; $P_2 \rightarrow$ pressure at valve outlet

Sufficient valve capacity is to be approved for each application.

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.

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.

The selection of the safety valves for the corresponding operation conditions as well as right installation under consideration of the used materials and media to be discharged have to be in compliance with the instructions of the manufacturer.

Type Approval documentation

Tests carried out

Cryogenic seat leakage and discharge capacity tests

Production testing and Certification

All valve bodies shall be subject by the manufacturer to a hydrostatic test at a pressure equal to 1.5 times the set pressure (maximum working pressure at room temperature).

Each valve shall be subject to leakage test (at 90% of set pressure) after reset and have set pressure sealed and verified.

Certification for the actual intended application shall follow the latest applicable edition of the Rules (as mentioned on the front page of this certificate).

Marking of product

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

- Manufacturer's name or trademark
- Valve type designation
- Size
- Maximum design pressure and temperature
- Set pressure

Periodical assessment

For retention of the Type Approval, a DNV 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 DNV-CP-0338.