# TYPE APPROVAL CERTIFICATE

Certificate no.:
**TAP00000G4**
Revision No:
**2**

## This is to certify:

**that the Safety Relief Valve for LNG/LPG Service**

with type designation(s)
**Pilot-Operated - Type F7000, Pilot-Operated - Type F8000**

issued to
## Flow-Safe, Inc.
**Orchard Park, NY, USA**

is found to comply with
**DNV rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers**
**DNV rules for classification – Ships Pt.6 Ch.2 Sec.5 Gas fuelled ship installations – Gas fuelled LNG**
**DNV rules for classification – Ships Pt.6 Ch.2 Sec.13 Gas fuelled ship installations – Gas fuelled LPG**
**DNV-OS-D101 – Marine and machinery systems and equipment, Edition July 2021**
**DNV class programme DNV-CP-0186 – Type approval – Valves**

## Application:

**Products approved by this certificate are accepted for installation on vessels classed by DNV.**

| Type: | K. factor: | Temperature range: | Max. working press.: |
|---|---|---|---|
| Pilot-Operated - Type F7000 | 0.824 | -163°C to +276°C | 19 to 413 bar |
| Pilot-Operated - Type F8000 | 0.878 | -163°C to +276°C | 19 to 413 bar |

Issued at **Hamburg** on **2026-04-28**

for **DNV**

This Certificate is valid until **2031-04-27**.
DNV local unit: **New York**

Approval Engineer: **Ana Cristina Do Carmo Insfran**

Digitally Signed By:
Sven Klinger
Location: DNV Hamburg, Germany

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 USD 300 000.

## Product description

F7000/8000 Series Pilot Operated Safety Relief Valves with four types of pilots (F100, F200, F300 F500)

- F7040: Full-bore with plastic seat and piston seal
- F7050: Full-bore with elastomer seat and piston seal. Piston seal has Teflon backup ring.
- F8040: Restricted bore with plastic seat and piston seal
- F8050: Restricted bore with elastomer seat and piston seal. Piston seal has Teflon backup ring.

Sizes: 1”x2”, 1.5”x3”, 2”x3”, 3”x4”, 4”x6”, 6”x8”, 8”x10”, 10”x12”, 12”x16”

Materials:

- Body: Carbon steel SA-216 WCB/ SA-352 LCC Stainless steel / SA-351 CF8M or CF3M
- Liner Stainless steel A743 CF8M
- Piston body Stainless steel 351 CF8M
- Seat retainer Stainless steel 316 SS

## Application/Limitation

The safety relief valves may be installed on cargo tanks and in LNG/LPG applications.

The maximum allowable working pressures and set pressures for minimum design temperature not less than -55°C:

| Size (Inlet x Outlet) | Maximum working pressure/set pressure |
|---|---|
| 1”x 2”, 1 ½”x 3”, 2”x 3” | 6000 psig (413 bar) |
| 3”x 4”, 4”x 6” | 3705 psig (255 bar) |
| 6”x 8”, 8”x10” | 1480 psig (102 bar) |
| 10”x 12” | 740 psig (51 bar) |
| 12”x 16” | 285 psig (19 bar) |

Only below sizes may be used for minimum design temperature below -55°C with the mentioned set pressures:

| Size (Inlet x Outlet) | set pressure | minimum design temperature |
|---|---|---|
| 2”x 3” | 60 psig | -165°C |
| 3”x4” | 85 psig | -165°C |
| 4”x 6” | 100 psig | -163°C |
| 6”x 8” | 100 psig | -163°C |
| 8”x 10” | 100 psig | -163°C |

Working temperature range depending on seat material for continuous cryogenic state:

| Material | Temperature |
|---|---|
| Buna-N | -34 ºC to 135 ºC |
| Viton | -34 ºC to 204 ºC |
| Ethylene, Propylene | -54 ºC to 162 ºC |
| Polyurethane | -51 ºC to 107 ºC |
| PTFE/Teflon | -55 ºC to 204 ºC |
| PCTFE/Kel-F | -55 ºC to 204 ºC |

| Material | Temperature |
|---|---|
| Vespel | -55 ºC to 260 ºC |
| PEEK | -18 ºC to 274 ºC |
| Perlast G60A | -51 °C to 260 °C |
| BUNA-N 50/70 | -163 °C to 135 °C |
| Chemraz 504 | -163 °C to 230 °C |

The pilot valve is to be protected by arrangements on board or by stiffeners placed between the pilot and main valve

The pilot valve exhaust is to be guided into the vent system.

Each valve is to be equipped with a back flow preventer.

## Type Approval documentation

**Renewal/ Initial Type Approval TAP00000G4**
Type Approval Assessment report dated 2026-03-03
Test Report Cryogenic Nitrogen Test: F7150-2-150#-X3-15X)
Hydrostatic Test Report: HD-17536-OP
Drawing: F7050 Series 4x6 and 6x8
Inspection Test Plan (ITP)
Test Report F7150 Doc. No.: ETR-004-2025 dated 2025-08-19
Assembly and test procedures:
ATP-F7000-001 dated 2022-04-06
ATP-F101 + ATP-F102 dated 2025-05-14
ATP-F200 dated 2017-02-02
ATP-F300 dated 2024-06-04
ATP-F500 dated 2019-03-11
DNV Type Testing Program Doc. No.: ETR-002-2025 dated 2025-09-22

Manufacturer's product catalogue "Bulletin: F78K0914" (June 2015)
Manufacturer's design analysis F7000/8000 rev.3 dated 2016-12-23
Manufacturer's design drawings:
Body casting 07-1229 Rev.Q dated 2016-06-15, Body machining 07-4240F Rev.E dated 2016-06-15
Body machining 07-4241F Rev.C dated 2016-06-15, Body casting drawing 07-1221 Rev.Q dated 2014-09-25, Body casting drawing 07-1235 Rev.M dated 2016-03-23, Body casting drawing 07-1225 Rev.K dated 2015-09-01, Body casting drawing 07-1227 Rev.N dated 2015-06-08, Body casting drawing 07-1231 Rev.M 2015-03-23, Body casting drawing 07-01233 Rev.M dated 2015-09-01, Body casting drawing 07-1210 Rev.0 dated 2014-02-11, Body casting drawing 07-1389 Rev. F dated 2014-11-14
F7100 Rev.J dated 2008-05-05, F715012x16-S8 dated 2016-08-10, F7200 Rev.M dated 2008-05-30, F7300 Rev.Q dated 2008-03-14, F7500 Rev. F dated 2008-08-30, F8100 Rev. J dated 2015-08-28
F8200 Rev.L dated 2015-01-07, F8300 Rev.Q dated 2018-10-15, F8350-1216 Rev.A dated 2011-01-27 F8500 Rev. E dated 2014-11-25
Manufacturer's test reports No: 8752 dated 2006-11-07, witnessed by DNV.
cryogenic test reports (8"x10" 9.1 & 100 psig) dated 2010-10-26/27 witnessed by DNV.
Cryogenic test reports (4"x 6" 100 psig) dated 2011-08-12 witnessed by GL
Cryogenic test report (2"x 3" 60 psig) dated 2016-05-12 witnessed by DNV GL.
Cryogenic test report (3"x 4" 85 psig) dated 2016-10-17
Type test report CRYO-00-002 dated October 2000

## Tests carried out

Hydraulic pressure and leakage test and cryogenic testing.

## Production testing

All valves shall be tested in presence of DNV surveyor as below:

1. Hydrostatic test of the valve body at a pressure equal to 1.5 times the design pressure.
2. Test of set pressure at ambient temperature. (with an allowance not exceeding ± 10% for 0 to 0.15 MPa, ± 6% for 0.15 to 0.3 MPa, ± 3% for 0.3 MPa and above)
3. Leak test after reset at 90% of each set pressure at room temperature.

## Certification

All valves covered by this certificate shall be delivered with a DNV product certificate, if the minimum design temperature is below -55°C or outlet size is not less than 4". Otherwise, manufacturer certificate is accepted.

Materials of the valve body are to be delivered with material certificates in accordance with DNV Rules Part 5, Chapter 7 Section 1 Table 8. All of materials with MC certificate (either issued by society or manufacturer) have to be supplied from an approved manufacturer of DNV.

## Production Place

**Flow-Safe, Inc.**
3865 Taylor Rd, Orchard Park NY 14127, USA

## Marking of product

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

- Manufacturer's name or trademark
- Design or type designation
- Size (pipe size of valve inlet)
- Set pressure and capacity
- Arrow to indicate direction of flow

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

The 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.dnv.com

END OF CERTIFICATE