



CERTIFICATE NUMBER
16-HS1495073-PDA

DATE
21 Mar 2016

ABS TECHNICAL OFFICE
Houston SED Machinery - Piping
& Electrical Sys.

CERTIFICATE OF DESIGN ASSESSMENT

This is to certify that a representative of this Bureau did, at the request of
FLOW SAFE, INC.

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate.

Product: **Valve, Pilot Operated Pressure Relief**

Model: **F7140, F7150, F7240, F7250, F7340, F7350, F7540, F7550, F8140, F8150,
F8240, F8250, F8340, F8350, F8540, F8550**

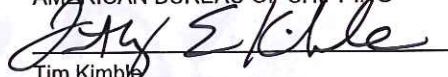
This Product Design Assessment (PDA) Certificate 16-HS1495073-PDA, dated 21/Mar/2016 remains valid until 20/Mar/2021 or until the Rules or specifications used in the assessment are revised (whichever occurs first).

This PDA is intended for a product to be installed on an ABS classed vessel, MODU or facility which is in existence or under contract for construction on the date of the ABS Rules or specifications used to evaluate the Product.

Use of the Product on an ABS classed vessel, MODU or facility which is contracted after the validity date of the ABS Rules and specifications used to evaluate the Product, will require re-evaluation of the PDA.

Use of the Product for non ABS classed vessels, MODUs or facilities is to be to an agreement between the manufacturer and intended client.

AMERICAN BUREAU OF SHIPPING


Tim Kimble
Engineer/Consultant

NOTE: This certificate evidences compliance with one or more of the Rules, Guides, standards or other criteria of ABS or a statutory, industrial or manufacturer's standards. It is issued solely for the use of ABS, its committees, its clients or other authorized entities. Any significant changes to the aforementioned product without approval from ABS will result in this certificate becoming null and void. This certificate is governed by the terms and conditions as contained in ABS Rules 1-1-A/5.9 Terms and Conditions of the Request for Product Type Approval and Agreement (2010).

FLOW SAFE

S-3865 TAYLOR ROAD

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United States 14127

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Tier: 2 - PDA Issued

Product: Valve, Pilot Operated Pressure Relief
Model: F7140, F7150, F7240, F7250, F7340, F7350, F7540, F7550, F8140, F8150, F8240, F8250, F8340, F8350, F8540, F8550

Intended Service:

Marine and Offshore Applications - Pilot Operated Pressure Safety Relief valve for gas, vapor and liquid services, including CNG and LNG applications.

Description:

These are pilot operated pressure relief valves for relieving pressure service on piping systems.

Main valve Type:

F7000 Series: Full Bore Nozzle

F8000 Series: a Variety of Reduced Bore API 520 or 526 Orifice Selections

F7040/F8040: Plastic Seat and Piston Seal

F7050/F8050: Elastomer (O-ring) Seat and Piston Seal

Pilot Valve Type:

F100: Modulating Flowing – Gas or Vapor, Set pressure range: 5 to 285 psig (0.34 to 19.6 barg)

F200: Snap-acting, non-flowing – Gas or Vapor service, Set pressure range: 15 to 6000 psig (1 to 413 barg)

F300: Modulating, flowing – Gas or Vapor or Liquid Service, Set pressure ranges; Diaphragm type: 7 to 500 psig (0.5 to 34.5 barg), Piston style: 500 to 6000 psig (34.5 to 413 barg)

F500: Modulating, non-flowing – Gas or Vapor or Liquid Service, Set pressure ranges; Diaphragm type: 7 to 285 psig (0.5 to 19.6 barg), Piston style: 285 to 6000 psig (19.6 to 413 barg)

Rating:**Discharge Coefficients (Kd):**

Gas and Vapor: 0.824 for F7000 Series, 0.878 for F8000 Series

Liquid (with only F300 and F500 Modulating Pilot valves): 0.634 for F7000 Series, 0.830/0.730 for F8000 Series

Materials:

Body - Main Valve: SA-216 WCB/SA-352 LCC, SA-351 CF3M/CF8M, Pilot Valve: A479 316/316L

Cap/Bonnet - Main Valve: SA-516-GR. 70, SA-240/479 316/316L, Pilot Valve: A351 CF3M/CF8M

Retainer/Piston – Main Valve: A240/479 316/316L, Pilot Valve: A564 630, A479 316/316L

Seat /Seals - Main Valve: Elastomer or Plastic (See below), Pilot Valve: Elastomer (see below)

Inlet & Outlet Flanges:

Pressure & temperature ratings: ASME Class 150#, 300#, 600#, 900#, 1500#, 2500# per ASME B16.34 (2013) / B16.5 (2013)

Sizes: 1", 1-1/2", 2", 3", 4", 6", 8", 10", 12", 16" (outlet only)

Pressure and Continuous Process Temperature ranges of Plastic Main Valve Seats for F7040/F8040 Series Valves:

Teflon (PTFE): -423 to 400°F (-252 to 204°C) / 25 to 1000 psig (1.7 to 69 barg)

Kel-F (PCTFE): -423 to 400°F (-252 to 204°C) / 1000 to 3000 psig (69 to 207 barg)

Polyimide (PI) or Polyamide-imide (PAI): -423 to 500°F (-252 to 260°C) / 3000 to 6000 psig (207 to 413 barg)

Polyetheretherketone (PEEK): 0 to 525°F (-18~273°C) / 3000 to 6000 psig (207 to 413 barg)

Pressure and Continuous Process Temperature ranges of Elastomer (O-rings) Main Valve and Pilot Valve Seats & Seals for F7050/F8050 Series Valves:

Buna-N: -30 to 275°F (-34 to 135°C) / 7 to 6000 psig (0.5 to 413 barg) as Seal or Main Valve Seat / 7 to 4000 psig (0.5 to 275 barg) as Pilot Seat

Fluorocarbon: -30F to 400°F (-34 to 204°C) / 7 to 6000 psig (0.5 to 413 barg) as Seal or Main Valve Seat / 7 to 4500 psig (0.5 to 310 barg) as Pilot Seat

Ethylene propylene (EPR / EPDM): -65 to 325°F (-54 to 163°C) / 7 to 6000 psig (0.5 to 413 barg) as Seal or Main Valve Seat / 7 to 4000 psig (0.5 to 275 barg) as Pilot Seat

Aflas (TFE/P): 10 to 450°F (-12 to 232°C) / 500 to 6000 psig (34 to 413 barg) as Seal or Main Valve Seat / 500 to 6000 psig (34 to 413 barg) as Pilot Seat

Polyurethane: -65 to 225°F (-54 to 107°C) / 15 to 6000 psig (1.0 to 413 barg) as Seal or Main Valve Seat / 15 to 6000 psig (1.0 to 413 barg) as Pilot Seat

Perfluoroelastomer: 0 to 525°F (-18 to 273°C) / 15 to 4000 psig (1.0 to 275 barg) as Seal or Main Valve Seat / 15 to

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4000 psig (1.0 to 275 barg) as Pilot Seat

Service Restriction:

- 1) Unit Certification is not required for this product unless used at a design temperature at or below -55°C. If the manufacturer or purchaser request an ABS Certificate for compliance with a specification or standard, the specification or standard, including inspection standards & tolerances, must be clearly defined.
- 2) Unit certification is required for products intended to be used at a design temperature at or below -55°C and the test required by section SVR 5C-8-5/13.1.1. And as per SVR 5C-8-6/2.2 and 3.2.1, Charpy V-Notch toughness test data is to be submitted by the manufacturer to the ABS surveyor.
- 3) The relief valves are to be tested in terms of system testing requirements under normal operating conditions not later than at the first loading operation to the satisfaction of the attending Surveyor as indicated in SVR 5C-8-5/13.2.5.
- 4) Use of the valves in marine applications is subjected to the limitations on threaded connections as indicated in SVR 4-6-2/5.5. And threaded connections may be used for normal fluid service in process piping systems designed per ASME B31.3 code provided they comply with the provisions in Para 314 of the B 31.3 code, in particular, (i) Threaded joints should be avoided in any service where crevice corrosion, severe erosion, or cyclic loading may occur. (ii) When threaded joints are intended to be seal welded, thread sealing compound shall not be used.
- 5) As per the Parker Material Report, Aflas VP101-80 elastomer valve seat recommended temperature range is from 25°F to 450°F and for Aflas VP 102-80 elastomer valve seat is 15°F to 450°F. The Aflas valve seat is not recommended for aromatic fuels, ketones, carbon tetrachloride, ethers, non-polar solvents, acetic acid and organic acetates per the material report.
- 6) As per API 520, Part 1, Annex D, Inlet flange rating and facing should be chosen to meet the requirements of the upstream protected equipment specification. The outlet flange rating and facing should be chosen to meet the requirements of the downstream discharge system.
- 7) As per API 520, Part 1, Annex D, Resilient, soft seated designs provide tighter sealing and can reduce the amount of leakage through the pressure relief valve. Operating temperature, pressure, & fluid corrosivity may limit the applicability of soft goods. Resilient seat materials are to be suitable for the application.
- 8) Where added corrosion resistance is needed to meet the severity of the process fluid, applicability of the valves in corrosive systems is to be verified with the manufacturer.
- 9) As per API 520, Part 1, Annex D and ABS Rules for Facilities on Offshore installations 3-3 & 4-3/3.3, for processes containing hydrogen sulfide, special attention is to be given to spring materials since they are subject to stress corrosion cracking.
- 10) Flanged connections to be per ASME B16.5, with associated temperature/pressure ratings.
- 11) When other materials than the above in ratings are selected per the manufacturer's recommendation, ABS agreement is to be obtained.
- 12) Unless specifically directed by Administration, this approval will not be construed as a substitute for flag Administration's approval.

Comments:

- 1) The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.
- 2) The safety relief valve is to be set, sealed and installed in accordance with the manufacturer's instructions.
- 3) All valves are to bear the trademark of the manufacturer legibly stamped or cast on the exterior of the valves as well as the pressure rating. The manufacturer is to guarantee also that the valve has been tested before shipment to the pressure required by the pressure rating of the valve in accordance with SVR 4-6-2/5.11.4.
- 4) If used on CNG vessel, then as per ABS CNG Guide 6-2/6 and SVR 2-3-13/3 and 23, Charpy impact tests are not required for Grade 6L (A351).
- 5) Depending on the valve seat material used, suitability of the valve in a particular system is to be verified on case-by-case basis.
- 6) Verification of set pressure is to be performed at room temperature via functional test.
- 7) NPT threads are in accordance with ASME B1.20.1.
- 8) Due to backpressure exposure to outlet flanges, some maximum inlet pressures at various temperatures need to be limited to the Pn values shown on Attachments 10.4-10.6 of the Design Analysis report.
- 9) Testing performed on both plastic-seated and elastomer-seated F7000/F8000 valves at temperatures less than -260°F demonstrated that these valves will function reliably in cryogenic conditions.

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Tier: 2 - PDA Issued**Notes/Drawing/Documentation:**

Drawing No. 07-1201, Annular Flow Plug, Revision: J, Pages: 1

Drawing No. ASME UV OP exp 01 29 2017, ASME UV manufacturer Cert, Revision: -, Pages: -

Drawing No. Assembly and Test Procedure ATP-G-010 Rev, Assembly and Test Procedure, Revision: -, Pages: -

Drawing No. BV Cert of Prod Conf Approved Rev 1, BV Certificate of Product Conformity, Revision: -, Pages: -

Drawing No. BV Recognition for BV Mode I Scheme exp 3 26 19, BV Recognition for BV Mode I Scheme, Revision: -, Pages: -

Drawing No. BV Type Approval Certificate exp 4 29 21, BV Type Approval Certificate, Revision: -, Pages: -

Drawing No. Cert-ISO9001, ISO 9001 Cert by ABS, Revision: -, Pages: -

Drawing No. Charpy-tests, SA-351 CF8M Charpy tests, Revision: -, Pages: -

Drawing No. Correspondence, ISO 9001 2008, Revision: -, Pages: 1

Drawing No. Correspondence, Confirmation of standards, Revision: -, Pages: -

Drawing No. Correspondence, Purchase Order 0016989, Revision: -, Pages: 1

Drawing No. Correspondence, Clarification about conversion and model change, Revision: -, Pages: -

Drawing No. Correspondence, Product Design Asse Cert 15-HS1393800-PDA, Revision: -, Pages: 1

Drawing No. Correspondence, Clarification about F100 Pilot Valve, Revision: -, Pages: -

Drawing No. Correspondence, Revision TA Application 15Jan2016, Revision: -, Pages: 1

Drawing No. DesignAnalysis-F7000-Rev1-forABS, Design Analysis, Revision: -, Pages: -

Drawing No. F7000&F8000 Directive Compliance 20160311, Compliance with standards, Revision: -, Pages: -

Drawing No. F7000-8000-catalog-June2015, Catalog of F7000 and F8000 Series, Revision: -, Pages: -

Drawing No. F7200-CB, Reference drawing of model F7000, Revision: -, Pages: -

Drawing No. F8200-CB, Reference drawing of model F8000, Revision: -, Pages: -

Drawing No. Inspection and Test Plans for F7350 and F835R, Inspection and Test Plans, Revision: -, Pages: -

Drawing No. NB Air Test Reports, NB Air Test Reports, Revision: -, Pages: -

Drawing No. NB-18 Capacity Tests, NB-18 Capacity Tests, Revision: -, Pages: -

Drawing No. PED F7000 Moody Cert issue 12 17 07, Moody PED Cert, Revision: -, Pages: -

Drawing No. PED-ModD-cert, PED Module D Quality System Certificate, Revision: -, Pages: -

Drawing No. Purchase Order Reference 213221, Purchase Order Reference 213221, Revision: -, Pages: 1

Drawing No. TEST REPORT-Cryo-50 Duro Buna-N-26Oct2010, Cryogenic Test Report for 50 Duro Buna N Oring, Revision: -, Pages: -

Drawing No. TEST REPORT-Cryo-70 Duro Buna-N27Oct2010, Cryogenic Test Report for 70 Duro Buna N Oring, Revision: -, Pages: -

Drawing No. TEST REPORT-Cryo-Chemraz 504-27Oct2010, Cryogenic Test Report for 504 Chemaraz 504 Oring, Revision: -, Pages: -

Terms of Validity:

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STANDARDS

ABS Rules:

ABS Rules for Conditions of Classification, Part 1 - 2016 Steel Vessels Rules 1-1-4/7.7, 1-1-A3, 1-1-A4, which covers the following:
2016 Steel Vessel Rules 4-6-2/5.11, 5.13 & 9.9, 5C-1-7/3.3.1(f), 5C-8-5/2.2.4, 5.6, 13.1.1 & 13.2.5 and 5C-8-8/2;
2005 ABS Guide for Vessels Intended to Carry Compressed Natural Gases in Bulk (Up-dated July 2015) 6-1/3, 6-2/1.6, 1.7 & 4.4, 9-2/3,
ABS Rules for Conditions of Classification, Part 1 - 2016 Offshore Units and Structures 1-1-4/9.7, 1-1-A2, 1-1-A3, which covers the following:
2016 Mobile Offshore Drilling Units 4-2-1/11.21 and 4-2-2/9;
2016 Facilities on Offshore Installations 3-2/7.17 & 15.7, 3-3/9.5.4, 15.1 & 17.9.1, 4-2/7.17 and 4-4/7.1;
2012 Guide for Classification of Drilling System (Up-dated Dec 2015) Section 2/ 1.5

National:

2015 ASME Boiler & Pressure Vessel Code, Section VIII, Div. 1.
2009 API STD 526 Flanged Steel Pressure-relief Valves
2014 API STD 527 Seat Tightness of Pressure Relief Valves
2015 API STD 520, Sizing Selection, and Installation of Pressure-relieving Device, Part 1 - Sizing and Selection

International:

European Pressure Equipment Directive 97/23/EC, Annex I, Sec.2.2.3, 05/29/1997

Government:

NA

EUMED:

NA

OTHERS:

NA