Passive Fire Protection – Bilfinger Lambda Products

Lambda is the brand name used on all insulation products marketed by Bilfinger Oil & Gas. All products are designed and documented to be used in high risk environments within the oil & gas industry, nuclear power plants and process industry. The products have been developed and tested as a consequence of the rigorous requirements oil & gas industry, meeting NORSOK and ISO standards.

All Lambda products are highly recognized among professional engineers as "state of the art" insulation systems. Each product is tailor made and pre-fabricated to fit the exact valve, flange, pipe or equipment to be protected.

In addition to meeting functional requirements, all products are designed for quick and easy removal and re-installation with a minimum use of personnel and tooling. Bilfinger Lambda is continuously and proactively recognizing customer demands and developing solutions to meet these requirements.

Lambda F Pipe Polymer

Lambda F Pipe Polymer is an insulation system that provides fire protection for piping, also marketed as Favuseal Wrap-On:Pipe.

The Lambda F Pipe Polymer has been fully tested to meet the strictest on- and offshore specifications for oil and gas installations. This system is built up by a Polymer based insulation material enclosed by stainless steel (AISI 316). The pieces are fastened with stainless steel banding or pop rivets. The Lambda F Pipe Polymer can be equipped with a drain plug as required for top side installations per NORSOK standard The system has been tested successfully for jet fire with a heat load up to 350kW/m² (1350°C).

Polymer Based Jetfire Protection

Favuseal is a Polymer based passive fire protection material, which is halogen-free and does not generate corrosive or toxic gases in a fire. The Polymer material is combined with Favuseal X3M Aeorogel technology to achieve superior performance for combination classes.

The Bilfinger Lamba F Pipe Polymer with Favuseal has been extensively tested and certified in jet- and hydrocarbon fires to IMO 2010 FTP Code Part 3, ISO 22899-Part 1 and OTI 95634, as well as explosion tests.

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LAMBDA F PIPE POLYMER

POWERED BY FAVUSEAL™

Key Product Benefits

- Extreme performance – Polymer based material combined with Aerogel technology
- Withstands high operating temperature – no reaction before 170°C
- Environmentally friendly
  - No toxic gases released in a fire
  - Boric acid free
  - No halogens
  - Fiber free
  - Low smoke emission
  - No material wastage
  - Re-use
- Maintenance free – stainless steel surface
- Easy to install, remove, inspect, and re-install
- Low Life Cycle Cost
- Hydrophobic material → reduces risk of CUI
- Slim building – from 6mm
- Expands to 2 x initial thickness compared with 8 – 10 x initial thickness for competing epoxy based products
- Tested and certified by DNV up to 150 minutes
  - IMO 2010 FTP Code Part 3
  - ISO 22899-Part 1
  - Extended OTI 95634
- Combined classes

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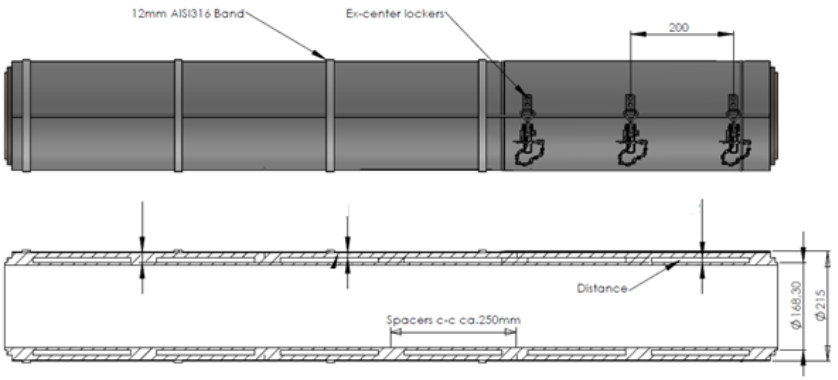
Design and Test results

Lambda F Pipe Polymer with Favuseal is easily installed and is removable to allow for inspection and maintenance. The stainless steel surface is maintenance free, and the inside is lined with Favuseal NKX-6174. In case of a fire, the Favuseal material reacts endothermically at around 170°C, releasing trapped vapour in the polymer, consuming energy to protect the object. In a second reaction at around 700°C the material forms a ceramic compound providing a fire and thermal barrier. The Favuseal material is Hydrophobic, thus providing protection against corrosion under insulation.

The Bilfinger Lambda F Pipe Polymer with Favuseal is tested with drain plug and both stainless steel banding and pop rivets. The Lambda F Pipe Polymer has been tested and certified with a range of masses and dimensions, allowing interpolation to ensure optimal protection for each object.



Completed Tests	Results	Test standard	Test Institue	Certification
Hydrocarbon fire - ability to withstand constant 1200°C	Up to 150 minutes	IMO 2010 FTP Code Part 3	RISE Fire Research AS (Sintef)	DNV GL
Jetfire - 250kW/m2 - equivalent to 0.3kg Propane / second	Over 60 minutes	ISO 22899-Part 1	RISE Fire Research AS (Sintef)	DNV GL
Jetfire - 350kW/m2 - ability to withstand 1350°C jetfire	Up to 47 minutes	Extended OTI 95 634	RISE Fire Research AS (Sintef)	Testreport
Explosion Tests	Up to 1.2 bar	Explosion Tests	Gexcon AS	Testreport
MS Test - test resistance to mechanical stress	Passed	Internal	Internal	N/A
Life Cycle Tests	Passed	15 Years actual exposure	Norner	Testreport

Bilfinger Industrier Norge AS

Kanalarmen 8
4033 Stavanger
Norway
Telephone +47 480 24 444

in.no.firmapost@bilfinger.com
www.industrier.bilfinger.com