

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Jet Fire Protection

with type designation(s)
T&S Firebox, Powered by Favuseal

Issued to
T&S Co., Ltd.
Goseong-gun, Republic of Korea

is found to comply with
DNV GL offshore standards

Application :

Approved for use as jet fire protection of valves and flanges.

Issued at **Høvik** on **2020-03-09**

This Certificate is valid until **2025-03-08**.

DNV GL local station: **Gimhae Station**

for **DNV GL**

Approval Engineer: **Helge Bjørnara**

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Mårten Schei-Nilsson
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

"T&S Firebox, Powered by Favuseal",

Fire protection box mounted over a valve or flange. The box is made of 0.7 mm steel plates and consists of two halves fastened together with steel latches c-c 200 mm at all joints.

A layer of "Favuseal NKX-6174" intumescent Polymer Based Fire Protection material and a 6 mm thick "Favuseal X3M mat" are fitted to the inside of the box, fastened by steel pins and washers.

The box may incorporate an inspection hatch of maximum size 300 x 210 mm (width x length) and fastened by latches and a piano hinge. The box may also incorporate a Ø21 mm drain plug.
2 mm Favuseal NKX-6174 gaskets are fitted between the hatch and the box.

"Favuseal NKX-6174" and "Favuseal X3M mat" are manufactured by Favuseal.

Nominal density of "Favuseal NKX-6174" is 1776 kg/m³.

Nominal density of "Favuseal X3M mat" is 200 ± 20 kg/m³.

For further details see Quality Assurance Plan under Type Approval documentation below.

Application/Limitation

Approved for use as jet fire protection of valves and flanges.

The thickness of "Favuseal NKX-6174" (in addition to 6 mm thick "Favuseal X3M mat") to be applied to avoid temperatures to rise on the valves or flanges less than 200 °C, 225 °C, 250 °C, 275 °C, 300 °C, 325 °C, 350 °C, 375 °C and 400 °C, at different operating temperatures, are given in appendix table 1-4. Maximum temperature rise is related to a start temperature equal to the operating temperature for the system to be protected.

The effect of unprotected valve spindles penetrating the protection box is not accounted for, and must be evaluated for each case.

Any project specific design solutions arrived at on basis of this certificate are to be further validated by project specific approvals carried out by the appointed verifying authority for each project in each case at the detail engineering stage.

The approval refers only to the fire resistance properties of the system.

The application of the insulation materials is to be performed in accordance with the manufacturer's application manual.

Each product is to be supplied with its manual for application and maintenance.

Type Approval documentation

Certification in accordance with Class Programme DNVGL-CP-0338, September 2018.

Assessment Report No. 101010.73-1 version 3 dated 2014-06-11 from SP, Trondheim, Norway.

Test Report No. 101010.64-A version 2, dated 2017-01-05 from SINTEF NBL, Trondheim, Norway.

Test Report No. 101010.64-C version 2, dated 2017-01-05 from SINTEF NBL, Trondheim, Norway.

Test Report No. 101010.64-D version 2, dated 2017-01-05 from SINTEF NBL, Trondheim, Norway.

Test Report No. 103070.71-A version 2, dated 2017-01-05 from SINTEF NBL, Trondheim, Norway.

Test Report No. 103070.71-B version 2, dated 2017-01-05 from SINTEF NBL, Trondheim, Norway.

"Quality Assurance Plan for Measuring, Production and Installation of T&S Firebox «Powered by Favuseal»", Doc. No. T&S-MN-19001 from T&S.

Tests carried out

Tested according to ISO 22899-1.



Job Id: **262.1-032735-1**
Certificate No: **TAF00001C2**

Marking of product

The product or packing is to be marked with name of manufacturer and type designation.

Periodical assessment

DNV GL's surveyor is to be given permission to perform Periodical Assessments at any time during the validity of this certificate and at least every second year. The arrangement is to be in accordance with procedure described in Class Programme DNVGL-CP-0338, Section 4.

Appendix to certificate TAF00001C2

Maximum temperature rise is related to a start temperature equal to the operating temperature for the system to be protected.

For example a process system with an operating temperature of 100 °C will have a maximum temperature rise of 300 °C before the critical temperature 400 °C will be reached.

All time values in table 1 to 4 are based on operating temperatures and maximum time to reach critical temperatures.

"Surface / mass" in the tables below refer to the ratio of "outer surface area of the box" / "mass of valve or flange".

Table 1:

Surface/steel mass 0.053 m ² /kg												
Protection time (min)	Favuseal NKX-6174 thickness (mm)											
		5	6	7	8	9	10	11	12	13	14	15
Operating temperature (°C) (Based on critical temperature 400 °C)	200	19	20	22	24	26	29	32	34	37	40	43
	175	21	23	25	27	30	33	36	39	42	45	49
	150	22	24	27	30	33	37	40	44	47	51	55
	125	24	26	29	32	36	40	44	48	52	56	61
	100	25	28	31	34	38	43	47	52	56	61	66
	75	27	30	33	37	41	46	51	55	60	65	70
	50	29	32	35	39	44	49	54	59	64	69	74
	25	30	34	38	42	47	52	57	63	68	73	79
	0	32	36	40	44	49	55	60	66	71	77	83

Table 2:

Surface/steel mass 0.042 m ² /kg												
Protection time (min)	Favuseal NKX-6174 thickness (mm)											
		5	6	7	8	9	10	11	12	13	14	15
Operating temperature (°C) (Based on critical temperature 400 °C)	200	24	27	30	33	35	37	40	42	45	47	50
	175	26	29	32	36	39	42	45	48	51	54	57
	150	28	31	35	39	42	45	48	52	55	58	62
	125	30	33	37	41	44	48	52	55	59	63	67
	100	32	36	40	44	47	51	55	59	63	67	71
	75	35	39	43	47	51	55	59	63	67	71	76
	50	37	41	45	49	53	57	62	66	71	75	80
	25	39	43	47	52	56	61	66	70	75	80	85
	0	41	45	50	55	59	64	69	74	79	84	89

Table 3:

Surface/steel mass 0.023 m ² /kg												
Protection time (min)		Favuseal NKX-6174 thickness (mm)										
		5	6	7	8	9	10	11	12	13	14	15
Operating temperature (°C) (Based on critical temperature 400 °C)	200	34	37	40	44	47	50	53	56	59	62	66
	175	37	40	43	47	50	54	57	61	64	68	72
	150	40	43	47	51	54	58	62	65	69	73	77
	125	43	47	51	55	59	63	67	71	75	79	83
	100	46	50	54	59	63	67	71	75	79	83	88
	75	49	53	58	63	67	71	75	80	84	88	93
	50	52	57	62	67	71	75	80	84	89	93	98
	25	55	60	65	71	75	80	85	89	94	99	104
	0	58	63	69	75	79	84	89	94	99	104	109

Table 4:

Surface/steel mass 0.011 m ² /kg												
Protection time (min)		Favuseal NKX-6174 thickness (mm)										
		5	6	7	8	9	10	11	12	13	14	15
Operating temperature (°C) (Based on critical temperature 400 °C)	200	47	51	56	61	64	67	70	73	76	79	83
	175	51	56	61	67	70	73	76	80	83	86	90
	150	56	61	67	73	76	79	83	86	90	93	97
	125	60	66	72	79	82	86	89	93	96	100	104
	100	65	71	78	85	88	92	96	100	104	108	112
	75	69	76	83	91	95	99	103	107	111	115	119
	50	74	81	89	97	101	105	109	114	118	122	127
	25	79	87	95	104	108	112	117	121	126	130	135
	0	84	92	101	110	114	119	124	128	133	138	143