Certificate No:
TAK000027M

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Insulation Material for Cryogenic Spillage Protection

with type designation(s)
Jotachar 1709

Issued to
Jotun A/S
SANDEFJORD, **Norway**

is found to comply with
ISO 20088-3:2018 "Determination of the resistance to cryogenic spillage of insulation materials – Part 3: Jet release"

Application :

For use in applications as insulation material resistant to cryogenic spill.

Issued at **Høvik** on **2023-04-12**
This Certificate is valid until **2028-04-11** .
DNV local unit: **East & South Norway CMC**

Approval Engineer: **Stefan Marion**

for **DNV**

Gustav Heiberg
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.

Product description

A two-component solvent free amine cured 100% solid epoxy intumescent coating: **Jotachar 1709**.

Manufactured by

Jotun Paints (Europe) Ltd., Stather Road, Flixborough, Scunthorpe, North Lincolnshire, DN15 8RR, England, United Kingdom

DNV local station: Manchester

Chokwang Jotun Ltd., 96, Gwahaksandan, 1-ro, Gangseo-gu, Busan, 46742, Republic of Korea

DNV local station: Busan

Responsibility

The Company (stated on the front page of this Certificate) takes the responsibility that both design and production are in compliance with Rules, Standards and/or Regulations listed on page 1 of this certificate

Application/Limitation

The product has been tested in accordance with ISO 20088-3:2018.

The minimum thicknesses of Jotachar 1709 to be applied to prevent a temperature drop (ΔT, °C/°F) of the protected steel substrate from 23°C/73°F after 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55 and 60 minutes exposure to cryogenic liquid spillage for a given Hp/A value up to 160 m^{-1} are presented in the tables in the Appendix.

The thicknesses listed in the Appendix of this certificate are based on calculations from the results of the tests carried out. The tables in the Appendix are included in place of the optional classification format described in ISO 20088-3:2018 Annex C to offer a more detailed information given the range of thicknesses tested.

The application of the coating is to be performed in strict accordance with the manufacturer's application guideline. This includes especially surface preparation requirements, environmental conditions and curing times given in the Application Guideline.

It is the responsibility of the end user to verify that the test setup used in ISO 20088-3:2018 is relevant with regards to the cryogenic spill scenario and for the location of the insulation system on the structure.

This Type Approval Certificate is not valid for designs, components, equipment, systems or products which are subject to classification by DNV.

The use of the material for compliance with any requirements for cryogenic protection in the IGF or IGC code or DNV classification rules must be approved for each case.

This Type Approval Certificate is not giving any indication of the material's durability over time.

Any significant changes in design and / or quality of the material will render the approval invalid.

Type Approval documentation

Tests carried out

Tests carried out in accordance with ISO 20088-3:2018 at DNV Test Laboratory Spadeadam, UK.

Results are given in the Appendix.

Tests were executed using steel I-beams (254 mm x 254 mm x 73 kg) corresponding to Hp/A = 160 m^{-1} with Jotachar 1709 applied.

Marking of product

Product shall be marked with *manufacturer's name*, *place of production* and *type designation*.

The marking is to be carried out in such a way that it is visible, legible and indelible. The marking of product is to enable traceability to the DNV Type Approval Certificate.

Periodical assessment

The scope of the Periodical Assessment is to verify that the conditions stipulated for the Type Approval is complied with and that no alterations are made to the product design or choice of materials.

Periodical assessments (for Certificate Retention / Certificate Renewal) shall be performed according to DNV-CP-0338.

This 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

Appendix to TAK000027M for JOTUN A/S

The following tables list calculated thicknesses of Jotachar 1709 in mm to limit steel temperature drop to ΔT in °C and °F from a starting temperature of 23°C/ 73°F for a given time in minutes for a Hp/A value up to 160 m^{-1}. The thicknesses in the tables are to be regarded as mean Dry Film Thickness (DFT) values.

Table 1: Calculated DFT of Jotachar 1709 on I-Section with Hp/A up to 160 m^{-1}

T_{ABS} from 23°C (°C)	T_{ABS} from 73°F (°F)	ΔT (°C)	ΔT (°F)	5 min	10 min	15 min	20 min	25 min	30 min
22	71.6	-1	-1.4						
21	69.8	-2	-3.2						
20	68	-3	-5						
19	66.2	-4	-6.8						
18	64.4	-5	-8.6						
17	62.6	-6	-10.4						
16	60.8	-7	-12.2						
15	59	-8	-14						
14	57.2	-9	-15.8						
13	55.4	-10	-17.6						
12	53.6	-11	-19.4						
11	51.8	-12	-21.2						
10	50	-13	-23						
9	48.2	-14	-24.8						
8	46.4	-15	-26.6						
7	44.6	-16	-28.4						
6	42.8	-17	-30.2						
5	41	-18	-32						
4	39.2	-19	-33.8						
3	37.4	-20	-35.6						
2	35.6	-21	-37.4						
1	33.8	-22	-39.2						
0	32	-23	-41						
-1	30.2	-24	-42.8						
-2	28.4	-25	-44.6						
-3	26.6	-26	-46.4						
-4	24.8	-27	-48.2						
-5	23	-28	-50						
-6	21.2	-29	-51.8						
-7	19.4	-30	-53.6						
-8	17.6	-31	-55.4						
-9	15.8	-32	-57.2						
-10	14	-33	-59						
-11	12.2	-34	-60.8						

T_{ABS} from 23°C (°C)	T_{ABS} from 73°F (°F)	ΔT (°C)	ΔT (°F)	5 min	10 min	15 min	20 min	25 min	30 min
-12	10.4	-35	-62.6						
-13	8.6	-36	-64.4						
-14	6.8	-37	-66.2						
-15	5	-38	-68						
-16	3.2	-39	-69.8						
-17	1.4	-40	-71.6						
-18	-0.4	-41	-73.4						
-19	-2.2	-42	-75.2						
-20	-4	-43	-77						
-21	-5.8	-44	-78.8						
-22	-7.6	-45	-80.6						
-23	-9.4	-46	-82.4						
-24	-11.2	-47	-84.2						
-25	-13	-48	-86						
-26	-14.8	-49	-87.8						
-27	-16.6	-50	-89.6						
-28	-18.4	-51	-91.4						
-29	-20.2	-52	-93.2						
-30	-22	-53	-95						
-31	-23.8	-54	-96.8						
-32	-25.6	-55	-98.6						
-33	-27.4	-56	-100.4						
-34	-29.2	-57	-102.2						
-35	-31	-58	-104						
-36	-32.8	-59	-105.8						
-37	-34.6	-60	-107.6						
-38	-36.4	-61	-109.4						
-39	-38.2	-62	-111.2						
-40	-40	-63	-113						
-41	-41.8	-64	-114.8						
-42	-43.6	-65	-116.6						
-43	-45.4	-66	-118.4						
-44	-47.2	-67	-120.2						
-45	-49	-68	-122						
-46	-50.8	-69	-123.8						
-47	-52.6	-70	-125.6						
-48	-54.4	-71	-127.4						
-49	-56.2	-72	-129.2						
-50	-58	-73	-131						
-51	-59.8	-74	-132.8						

T_{ABS} from 23°C (°C)	T_{ABS} from 73°F (°F)	ΔT (°C)	ΔT (°F)	5 min	10 min	15 min	20 min	25 min	30 min
-52	-61.6	-75	-134.6						
-53	-63.4	-76	-136.4						
-54	-65.2	-77	-138.2						
-55	-67	-78	-140						
-56	-68.8	-79	-141.8						
-57	-70.6	-80	-143.6						
-58	-72.4	-81	-145.4						
-59	-74.2	-82	-147.2						
-60	-76	-83	-149						

Table 2 Calculated DFT of Jotachar 1709 on I-Section with Hp/A up to 160 m^{-1}

T_{ABS} from 23°C (°C)	T_{ABS} from 73°F (°F)	ΔT (°C)	ΔT (°F)	35 min	40 min	45 min	50 min	55 min	60 min
22	71.6	-1	-1.4						
21	69.8	-2	-3.2						
20	68	-3	-5						
19	66.2	-4	-6.8						
18	64.4	-5	-8.6						
17	62.6	-6	-10.4						
16	60.8	-7	-12.2						
15	59	-8	-14						
14	57.2	-9	-15.8						
13	55.4	-10	-17.6						
12	53.6	-11	-19.4						
11	51.8	-12	-21.2						
10	50	-13	-23						
9	48.2	-14	-24.8						
8	46.4	-15	-26.6						
7	44.6	-16	-28.4						
6	42.8	-17	-30.2						
5	41	-18	-32						
4	39.2	-19	-33.8						
3	37.4	-20	-35.6						
2	35.6	-21	-37.4						
1	33.8	-22	-39.2						
0	32	-23	-41						
-1	30.2	-24	-42.8						
-2	28.4	-25	-44.6						
-3	26.6	-26	-46.4						

T_{ABS} from 23°C (°C)	T_{ABS} from 73°F (°F)	ΔT (°C)	ΔT (°F)	35 min	40 min	45 min	50 min	55 min	60 min
-4	24.8	-27	-48.2						
-5	23	-28	-50						
-6	21.2	-29	-51.8						
-7	19.4	-30	-53.6						
-8	17.6	-31	-55.4						
-9	15.8	-32	-57.2						
-10	14	-33	-59						
-11	12.2	-34	-60.8						
-12	10.4	-35	-62.6						
-13	8.6	-36	-64.4						
-14	6.8	-37	-66.2						
-15	5	-38	-68						
-16	3.2	-39	-69.8						
-17	1.4	-40	-71.6						
-18	-0.4	-41	-73.4						
-19	-2.2	-42	-75.2						
-20	-4	-43	-77						
-21	-5.8	-44	-78.8						
-22	-7.6	-45	-80.6						
-23	-9.4	-46	-82.4						
-24	-11.2	-47	-84.2						
-25	-13	-48	-86						
-26	-14.8	-49	-87.8						
-27	-16.6	-50	-89.6						
-28	-18.4	-51	-91.4						
-29	-20.2	-52	-93.2						
-30	-22	-53	-95						
-31	-23.8	-54	-96.8						
-32	-25.6	-55	-98.6						
-33	-27.4	-56	-100.4						
-34	-29.2	-57	-102.2						
-35	-31	-58	-104						
-36	-32.8	-59	-105.8						
-37	-34.6	-60	-107.6						
-38	-36.4	-61	-109.4						
-39	-38.2	-62	-111.2						
-40	-40	-63	-113						
-41	-41.8	-64	-114.8						
-42	-43.6	-65	-116.6						
-43	-45.4	-66	-118.4						

T_{ABS} from 23°C (°C)	T_{ABS} from 73°F (°F)	ΔT (°C)	ΔT (°F)	35 min	40 min	45 min	50 min	55 min	60 min
-44	-47.2	-67	-120.2						
-45	-49	-68	-122						
-46	-50.8	-69	-123.8						
-47	-52.6	-70	-125.6						
-48	-54.4	-71	-127.4						
-49	-56.2	-72	-129.2						
-50	-58	-73	-131						
-51	-59.8	-74	-132.8						
-52	-61.6	-75	-134.6						
-53	-63.4	-76	-136.4						
-54	-65.2	-77	-138.2						
-55	-67	-78	-140						
-56	-68.8	-79	-141.8						
-57	-70.6	-80	-143.6						
-58	-72.4	-81	-145.4						
-59	-74.2	-82	-147.2						
-60	-76	-83	-149						

END OF CERTIFICATE