

TYPE APPROVAL

Certificate No.:
TA-DNVGL-CP-0424-07729-0

Issued:
2021-11-02

Valid until:
2026-11-01

Issued for:

Protective coating system

with system composition as described in Annex 1.

Issued to:

Mankiewicz Gebr. & Co. (GmbH & Co. KG)

Georg-Wilhelm-Straße 189, 21107 Hamburg, Germany

According to:

DNVGL-SE-0436:2018-04

Shop approval in renewable energy

On the basis of:

DNVGL-CP-0424:2016-05

Coatings for protection of FRP structures with heavy rain erosion loads

And

DNVGL-CP-0083: 2016-03

Polyester resin, vinylester resin, gelcoat and topcoat

except for the requirement of DNVGL-CP-0424 for the rain erosion test

Applying:

DNVGL-SE-0441:2016-06

Type and component certification of wind turbines

Based on the documents listed in Annex 1.

This Type Approval consists of this page and Annex 1 which is integral part of the approval.

Any significant change in design and / or quality of the material will render this Type Approval invalid.

Hellerup, 2021-11-02



For DNV GL Renewables Certification
Bente Vestergaard
Service Line Leader

Hamburg, 2021-11-02



For DNV GL Renewables Certification
Peter Schmidt
Principal Project Manager

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Application

Surface coating for rotor blades made of epoxy resin-based laminates. The coating system may optionally be used for leading-edge protection purposes but the influence of rain impacting the LEP system was not evaluated in this context.

Description

Putty	ALEXIT BladeRep Profile Filler 5	
Topcoat	ALEXIT BladeRep Topcoat 12	
LEP*	ALEXIT BladeRep LEP10	optional, intended for leading edge only

* Rain erosion tests to document the leading-edge protection purposes has not been part in this approval. Rain erosion tests, when performed, shall be according to site requirements.

Limitations

The approved putty layer thickness is limited to a maximum of 0.5mm.

Type Approval documentation

Technical data sheets	ALEXIT BladeRep Profile Filler 5, 491-5F / BR5F66, dated March 2018 ALEXIT BladeRep Topcoat 12, 471-43 / BR12XX, dated July 2021 ALEXIT BladeRep LEP 10, 542-10 / BR1075, dated January 2021	
Safety data sheets	ALEXIT BR5F66-BladeRep Profile Filler 5, 4915F61163000, ver. 1, dated 2021-02-26 ALEXIT-BladeRep Hardener 5F 495, 4955F90Q20000, ver. 1, dated 2021-02-26 ALEXIT BR1275-BladeRep Topcoat 12, 471437035W000, ver. 2, dated 2020-10-05 ALEXIT BR12H0-BladeRep Hardener 12, 4053D00000000, ver. 2, dated 2020-11-10 ALEXIT BR12T7-BladeRep Thinner 12 Fast, 9021400000000, ver. 4, dated 2020-10-06 ALEXIT-BladeRep LEP 10, 4429A70357000, ver. 1, dated 2021-02-16 ALEXIT-BladeRep Hardener 10, 4459A90Q20000, ver. 1, dated 2021-02-16	
Test report	Test report – KD-101620 / Coating System 6 Rev 2, KD-101620, dated 16.06.2021, issued by Mankiewicz Gebr. & Co. Test report - KD-102844 / Taber LEP, KD-102844, dated 30.06.2021, issued by Mankiewicz Gebr. & Co.	
Inspection report	Mankiewicz Workshop Inspection Report Coatings, WIR-07363-001 Rev. 0, issued by DNV GL, dated 2020-11-04	
Quality control documentation	Several Certificates of Analysis Certificate EN9100:2018, technically equivalent to AS 9100D and JISQ 9100:2016 for Aviation, Space and Defence organizations are fulfilled. Include the standard ISO 9001:2015 Quality Management System, 12 210 54611 TMS, dated 2020-11-17, issued by TÜV Süd	

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Material properties

Test Method	Test Conditions	Mean	Unit
Bend test topcoat according to ISO 1519	- at RT	18.1	%
	- at -40°C	3.3	%
	- at RT after exposure to UV light according to ISO 16474-3 Type 1A, method 1 for at least 3000 hours ¹⁾	5.1	%
Pull-off test full system according to ISO 4624:2016	- at RT	5.3	MPa
	- at RT after exposure to UV light according to ISO 16474-3 Type 1A, method 1 for at least 3000 hours ¹⁾	7.28	MPa
	- at RT after 1000hrs at wet/cold/humidity ^{1,2)}	5.66	MPa
	- at RT after 1000hrs according to ISO 6270-2 ¹⁾	5.21	MPa
The gloss of the LEP layer at 60° according to ISO 2813:2014 is higher than the limit of 30 defined in DNVGL-CP-0424. This is acceptable for systems applied to the leading edge.			
Test results show that the gloss of the topcoat layers decreases more than 30% due to UV aging. This is acceptable as the gloss properties are not relevant for the protective properties of the coating systems.			
Taber Abrasion topcoat according to ASTM D4060	- 1000g/1000r, CS-10	90	mg
Taber Abrasion LEP according to ASTM D4060	- 1000g/1000r, CS-10	11	mg

1) after aging reconditioning at 23/50 for 24h is required before mechanical tests will be carried out

2) conditioning cycle: 2h at 5°C >> down to -40°C in 2h >> 6h at -40°C >> up to 5°C in 2h >> 2h at 5°C >> up to 60°C / 98% in 2h >> 6h at 60°C / 98% >> down to 5°C in 2h

The different layers of the test specimens were cured according to the Technical Data Sheets. The ALEXIT BladeRep Profile Filler 5 was applied with 0.5mm layer thickness. The recommended dry film thickness is 100µm for ALEXIT BladeRep Topcoat 12 and minimum 600µm for ALEXIT BladeRep LEP 10.

Manufacturing Sites covered by evaluation

Mankiewicz Gebr. & Co. (GmbH & Co.)

Georg-Wilhelm-Straße 189

21107 Hamburg

Germany

Last workshop inspection: 2020-11-04

Periodical assessment

2.5 years after the last workshop inspection, the client shall inform DNV GL about any modifications in production. An intermediate inspection might be needed based on the implemented changes.