TECHNICAL SPECIFICATION

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Paints and varnishes — Coating systems for wind-turbine rotor blades —

Part 2: Determination and evaluation of resistance to rain erosion using rotating arm

Peintures et vernis — Matériaux de revêtement pour pales de turbines éoliennes —

Partie 2: Détermination et évaluation de la résistance à l'érosion causée par la pluie au moyen d'un bras rotatif

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

A list of all parts in the ISO 19392 series can be found on the ISO website.

Introduction

In the wind energy industry, coatings are applied to rotor blades surface to protect the glass fibre reinforced polymer composite substrate. Rain drops and hailstones can damage these coatings in such a way that individual layers come off or the whole coating delaminates from the substrate.

ISO/TS 19392-1 describes the minimum requirements and weathering of the coating system. Rain erosion can be simulated by means of high speed water jets or water droplets impinging on the specimen surface. This document describes a method which simulates rain erosion by accelerating one or more coated panels, attached to the end of rotating arms, through a simulated rain field at a constant rotational velocity. ISO/TS 19392-3 describes a method where a water jet or a series of water jets at defined pressure hits the surface of the specimen.

Paints and varnishes — Coating systems for wind-turbine rotor blades —

Part 2: Determination and evaluation of resistance to rain erosion using rotating arm

1 Scope

This document specifies a test method for the determination of resistance of coating systems or tape for wind-turbine rotor blades to rain erosion by using the rotating arm test.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 1513, *Paints and varnishes — Examination and preparation of test samples*

ISO 2808, *Paints and varnishes — Determination of film thickness*

ISO 4618, *Paints and varnishes — Terms and definitions*

ISO 4628-1:2016, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 1: General introduction and designation system*

ISO 4628-2, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 2: Assessment of degree of blistering*

ISO 4628-4, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 4: Assessment of degree of cracking*

ISO 4628-5, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 5: Assessment of degree of flaking*

ISO 4628-6, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 6: Assessment of degree of chalking by tape method*

ISO 13076, *Paints and varnishes — Lighting and procedure for visual assessments of coatings*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

ISO 19403-2, *Paints and varnishes — Wettability — Part 2: Determination of the surface free energy of solid surfaces by measuring the contact angle*

ASTM G73-10, *Standard Test Method for Liquid Impingement Erosion Using Rotating Apparatus*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4618 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
exposed area
exposed surface
area which has contact with the water droplets

4 Principle

A method for simulating rain erosion is to accelerate one or more coated panels, attached to the end of rotating arms, through a simulated rain field at a constant rotational velocity. As the rain droplets impinge on the surface of the specimen, an impact force is transferred to the coated sample panel. Over time, this causes degradation of the coating and underlying composite structure, and the coating is thereby removed.

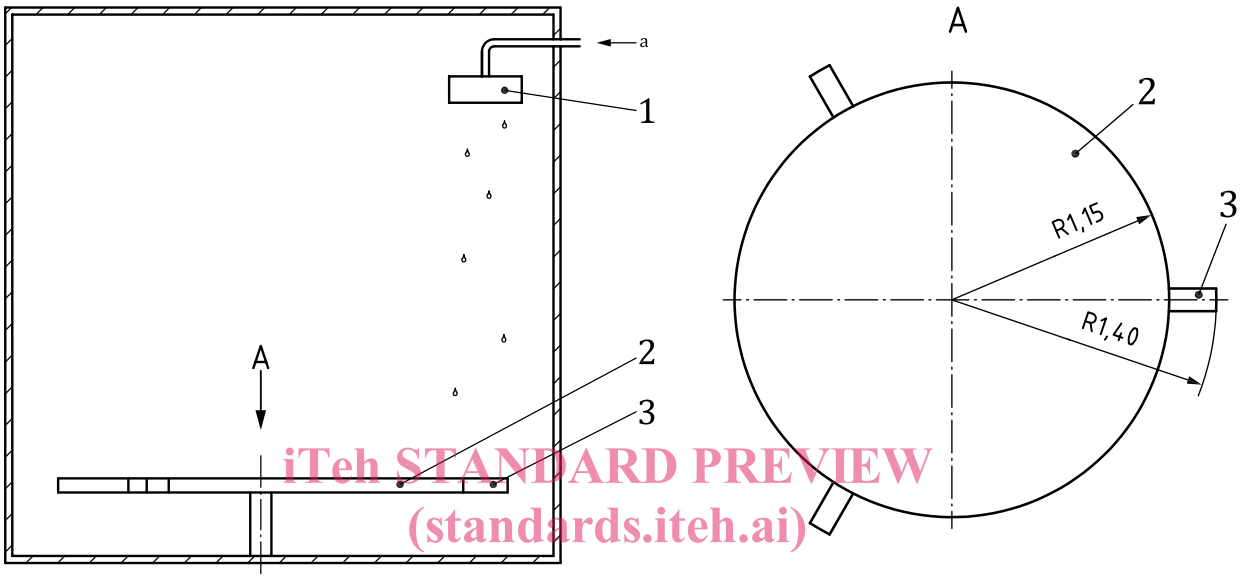
The degree of erosion is determined by visual or microscopic inspection at defined intervals. The test is finished as soon as the composite substrate is exposed. The evaluation enables pass or fail decision as well as a comparison with different coating systems in the same conditions in the same test rig. Also possible is the investigation of the course of the damage starting from initiation until complete failure.

5 Apparatus

Ordinary laboratory apparatus, together with the following.

5.1 Testing device with rotating arm, an example of which is shown in Figure 1.

Dimensions in metres



a) Side view **b) Top view**

Key

1 rain generator
2 rotating disk
3 specimen holder
a Water flow.

Figure 1 — Schematic illustration of an example of a test device with vertical axis of rotation

There are a number of different apparatus designs available with different testing parameters – and even some with the same apparatus design which have different testing parameters. As these differences can give different results, the user is advised to use caution when comparing results from different facilities and different parameters.

6 Sampling

Take a representative sample of the product to be tested (or of each product in case of a multi-coat system), as described in ISO 15528.

Examine and prepare each sample for testing, as described in ISO 1513.