

---

**Barve in laki - Premazni sistemi za lopatice rotorjev vetrnih turbin - 2. del:  
Ugotavljanje in vrednotenje odpornosti proti eroziji zaradi dežja z vrtečo roko  
(ISO/TS 19392-2:2018)**

Paints and varnishes - Coating systems for wind-turbine rotor blades - Part 2:  
Determination and evaluation of resistance to rain erosion using rotating arm (ISO/TS  
19392-2:2018)

Beschichtungsstoffe - Beschichtungssysteme für Rotorblätter von Windenergieanlagen -  
Teil 2: Bestimmung und Bewertung der Beständigkeit gegen Regenerosion mittels  
rotierendem Arm (ISO/TS 19392-2:2018)

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 (ISO/TS 19392-2:2018)

**Ta slovenski standard je istoveten z: FprCEN ISO/TS 19392-2**

**ICS:**

27.180	Vetrne elektrarne	Wind turbine energy systems
87.040	Barve in laki	Paints and varnishes

**kSIST-TS FprCEN ISO/TS 19392-2:2022 en,fr,de**

**iTeh STANDARD  
PREVIEW  
(standards.iteh.ai)**

[kSIST-TS FprCEN ISO/TS 19392-2:2022](https://standards.iteh.ai/catalog/standards/sist/1b97be8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022)

<https://standards.iteh.ai/catalog/standards/sist/1b97be8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022>

TECHNICAL  
SPECIFICATION

ISO/TS  
19392-2

First edition  
2018-04

---

---

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

Part 2:

**Determination and evaluation of  
resistance to rain erosion using  
rotating arm**

*(standards.iteh.ai)*

*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*

<https://standards.iteh.ai/catalog/standards/sist/1b970e8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022>



Reference number  
ISO/TS 19392-2:2018(E)

© ISO 2018

**iTeh STANDARD  
PREVIEW  
(standards.iteh.ai)**

[kSIST-TS FprCEN ISO/TS 19392-2:2022](https://standards.iteh.ai/catalog/standards/sist/1b97be8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022)  
<https://standards.iteh.ai/catalog/standards/sist/1b97be8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
Foreword.....	iv
Introduction.....	v
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>2</b>
<b>4 Principle</b> .....	<b>2</b>
<b>5 Apparatus</b> .....	<b>3</b>
<b>6 Sampling</b> .....	<b>3</b>
<b>7 Test specimens</b> .....	<b>4</b>
7.1 Substrate.....	4
7.2 Preparation.....	4
7.3 Conditioning.....	4
7.4 Thickness of coating.....	5
<b>8 Procedure</b> .....	<b>5</b>
8.1 Number of determinations.....	5
8.2 Examination before exposure.....	5
8.3 Calibration.....	5
8.4 Exposure to simulation of rain erosion.....	5
8.5 Examination after exposure.....	6
<b>9 Evaluation</b> .....	<b>6</b>
<b>10 Precision</b> .....	<b>7</b>
<b>11 Test report</b> .....	<b>7</b>
<b>Annex A (normative) Details of test methods</b> .....	<b>8</b>
<b>Bibliography</b> .....	<b>10</b>

## ISO/TS 19392-2:2018(E)

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

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.  
<https://standards.iteh.ai/catalog/standards/sist/1b97be8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022>

## 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.

# iTeh STANDARD PREVIEW (standards.iteh.ai)

[kSIST-TS FprCEN ISO/TS 19392-2:2022](https://standards.iteh.ai/catalog/standards/sist/1b97be8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022)  
<https://standards.iteh.ai/catalog/standards/sist/1b97be8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022>

**iTeh STANDARD  
PREVIEW  
(standards.iteh.ai)**

[kSIST-TS FprCEN ISO/TS 19392-2:2022](https://standards.iteh.ai/catalog/standards/sist/1b97be8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022)

<https://standards.iteh.ai/catalog/standards/sist/1b97be8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022>



# 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*  
<https://standards.iteh.ai/catalog/standards/sist/1b97be8c-1610-4618-2241-0041d4161041>

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*

## ISO/TS 19392-2:2018(E)

### 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.

**(standards.iteh.ai)**

[kSIST-TS FprCEN ISO/TS 19392-2:2022  
https://standards.iteh.ai/catalog/standards/sist/1b97be8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022](https://standards.iteh.ai/catalog/standards/sist/1b97be8c-66b2-46cc-832e-22fe1c0da1cd/ksist-ts-fprcen-iso-ts-19392-2-2022)