INTERNATIONAL STANDARD

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Paints and varnishes — Evaluation of defects on coated surfaces using optical imaging —

Part 1: General guidance

Peintures et vernis — Évaluation par imagerie optique des défauts des surfaces revêtues —

Partie 1: Lignes directrices générales

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Contents

Page

Foreword iv
Introduction v
1 Scope 1
2 Normative references 1
3 Terms and definitions 1
4 Principle 5
5 Requirements 5
Annex A (informative) **Standards for visual assessment of coating defects** 8
Bibliography 10

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 21227-1 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

ISO 21227 consists of the following parts, under the general title *Paints and varnishes — Evaluation of defects on coated surfaces using optical imaging*:

— *Part 1: General guidance*

— *Part 2: Evaluation procedure for results of multi-impact stone-chipping test*

— *Part 3: Evaluation procedure for delamination and corrosion around a scribe*

At the time of publication of this part of ISO 21227, Parts 2 and 3 were in preparation.

Introduction

Conventional ISO test methods used for evaluating surface defects and appearance changes often utilize pictorial standards which depict particular types of surface deterioration and require human visual evaluation. The technology described in the various parts of this International Standard can yield more objective, accurate, quantitative and reproducible results when compared to the human visual evaluation techniques.

Paints and varnishes — Evaluation of defects on coated surfaces using optical imaging —

Part 1: General guidance

1 Scope

This part of ISO 21227 gives definitions for and provides guidance in the use of optical imaging systems for the quantitative characterization of defects on coated surfaces that occur after exposure in various test methods, e.g. stone chipping, weathering or cross-cut testing. One aim of ISO 21227 is to use optical imaging to reproduce the results of already existing methods for visual assessment. Additionally, optical imaging provides further information which can be used for a more detailed evaluation of coating defects.

This part of ISO 21227 contains a general introduction in optical-imaging methods and definitions. The performance of individual test methods and requirements for precision are described in other parts of the standard.

2 Normative references

The following referenced documents are indispensable for the application 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.

CIE Publication No. 17.4:1987, *International lighting vocabulary*/IEC 60050-845:1987, *International Electrotechnical Vocabulary — Lighting*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
optical imaging
method for acquiring, digitizing, processing and analysing images using optical components and computer systems

3.2
illumination
application of light to a scene, objects or their surroundings so that they may be seen

[CIE 17.4:1987/IEC 60050-845:1987]

3.2.1
reflection illumination
illumination whereby light source and optical sensor are both arranged on the same side of the object

3.2.2
transmission illumination
illumination whereby light source and optical sensor are arranged on opposite sides of the object

3.2.3
bright-field illumination
method of image acquisition in which light reflected by the object and light scattered by the object are detected by the optical sensor

3.2.4
dark-field illumination
method of image acquisition in which only light scattered by the object is detected by the optical sensor

3.2.5
directional lighting
lighting in which the light on the working plane or on an object is incident predominantly from a particular direction

[CIE 17.4:1987/IEC 60050-845:1987]

3.2.6
diffused lighting
lighting in which the light on the working plane or on an object is not incident predominantly from a particular direction

[CIE 17.4:1987/IEC 60050-845:1987]

3.3 Terms relating to the optical sensor

3.3.1
field of vision
area on the object surface which is acquired by the optical sensor

3.3.2
region of interest
that part of the original image which is used for image processing and image analysis

3.3.3
objective
optical system, usually consisting of one or more lenses, which is used to acquire an image of the field of vision

3.3.4
object distance
distance between the first lens of the objective and an object which gives a sharp image

3.3.5
depth of focus
difference between the minimum and maximum object distance

3.4
image acquisition
image capture
process of creating a two-dimensional original image of an object

3.4.1
original image
digitized image taken by the image-acquisition system, without having carried out any image processing

3.4.2
charge-coupled device
CCD
device that uses a semi-conductive material as an optical sensor

NOTE The CCD chip is subdivided into very fine elements, each of which corresponds to a pixel of the digitized image. The CCDs can be arranged as an array (digital camera) or in a row (line scanner).

3.4.3
scanner
device for image acquisition which uses a one-dimensional optical sensor in which CCDs are lined up in a row

NOTE The image is built up by line scanning of the surface of an object.

3.4.4
digitization
process of converting an analogue image into a digital image

NOTE The image is divided into pixels by a grid and each pixel is assigned to one grey level.

3.4.5
pixel
smallest image-forming element to which a grey level is assigned

3.4.6
resolution
number of pixels per unit length on the surface of an object

NOTE If the resolution in the X- and Y-directions is different, both values have to be reported.

3.4.7
grey level
shade of grey assigned to a pixel

NOTE The shades are usually positive integer values taken from the grey scale.

3.4.8
grey scale
series of grey levels between white and black

EXAMPLE The 8-bit grey scale has 2^8 (= 256) grey levels. Grey level 0 corresponds to black, grey level 255 (the 256th level) to white.

3.4.9
gamma
γ
exponent used in the function $Y = X^{\gamma}$

where

X is the input signal;

Y is the output signal;

X and Y range from 0 to 1 (0 corresponding to black, 1 to white)

3.4.10
frame grabber
device for converting an analogue video signal into an digital original image