INTERNATIONAL STANDARD

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

Part 3: Evaluation of delamination and corrosion around a scribe

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

Partie 3: Évaluation du décollement et de la corrosion autour d'une rayure

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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 21227-3 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 multi-impact stone-chipping test*

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

Introduction

The conventional ISO test methods for evaluating surface defects and changes in appearance often utilize pictorial standards which depict particular types of surface deterioration and require human visual evaluation. The technology and procedures described in this part of ISO 21227 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 3: Evaluation of delamination and corrosion around a scribe

1 Scope

This part of ISO 21227 specifies a method for evaluating delamination and corrosion around a scribe by means of digital optical imaging. The damaged surface can be produced in accordance with ISO 9227, ISO 11997-1 or ISO 11997-2.

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.

ISO 4628-8, *Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance — Part 8: Assessment of degree of delamination and corrosion around a scribe*

ISO 21227-1, *Paints and varnishes — Evaluation of defects on coated surfaces using optical imaging — Part 1: General guidance*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21227-1 and the following apply.

3.1
delaminated area
area from which a paint or paint system has detached

3.2
corroded area
substrate area from which a paint or paint system has detached and which has subsequently been attacked by corrosion

4 Principle

A grey scale or colour image is produced from the digital optical image of a surface damaged by delamination or corrosion around a scribe. In the simplest case, this image is converted into a binary image (thresholding). The damaged area is measured and the mean and maximum width of delamination or corrosion is determined.

In addition, the shape of the zone affected by delamination or corrosion around a scribe can be identified using digital optical imaging.

5 Requirements

5.1 General

The assessment shall be carried out under the conditions specified in ISO 21227-1.

5.2 Illumination

The illumination shall be such that the damaged areas can be clearly distinguished from the undamaged areas. Because of the high contrast, corrosion can be easily recognized under diffused reflection illumination after stripping the coating. When detecting delamination without previously removing the coating, directional reflection illumination can be of advantage because of the low contrast.

5.3 Resolution

The minimum resolution shall be 6 pixels per millimetre.

NOTE Different resolutions, in particular in the case of damage involving a large number of fissures, can lead to different values for the damaged areas.

If a resolution deviating from the resolution specified above is used, this shall be stated in the test report.

6 Calibration

By adjusting the optical imaging system, it is possible to digitize a damaged area. By calibrating the scale in both X and Y directions (e.g. with graph paper graduated in millimetres), the previously generated binary image can be measured with sufficient accuracy to obtain the width of the delamination or corrosion.

When using a reference scale based on pictorial standards, calibration should be performed with these images. In this case, an interlaboratory test should be conducted to determine the correlation between visual assessment and digital optical imaging.

7 Procedure

Prepare the test panels for digital evaluation following the procedure given in ISO 4628-8.

Using the previously calibrated digital optical imaging system, take a picture of the test panel area containing the scribe and of the adjacent damaged area. After suitable threshold setting and detection, the digital image delivers a value for the damaged area including the area of the scribe. The scribe length on the assessed area shall also be determined. The start and end of the scribe and the corresponding damaged area are not assessed.

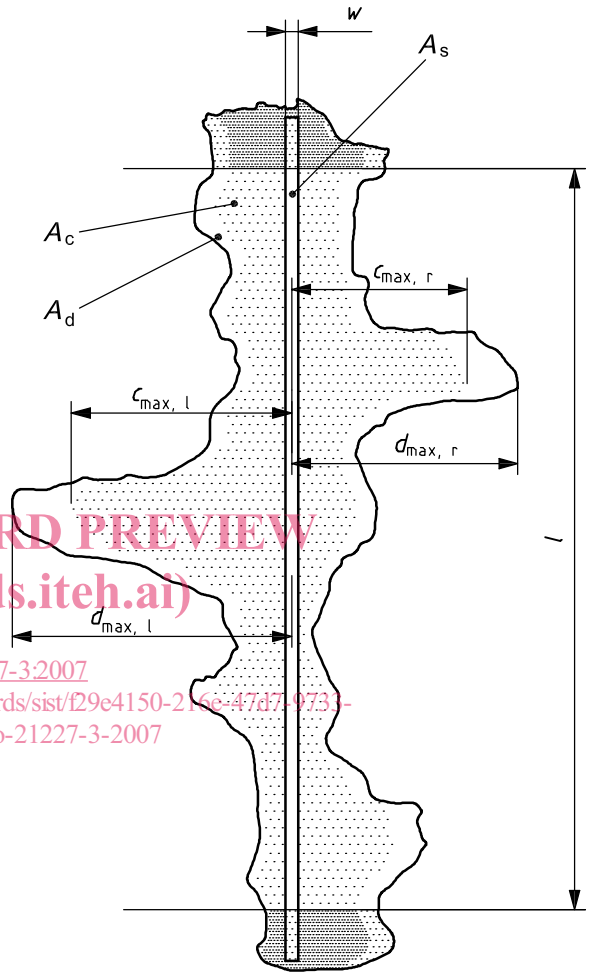
If the test panel contains several scribes or zones to be assessed (e.g. two intersecting scribes), they may be treated as sections of a single scribe, and the relevant areas and scribe lengths may be added to one another. The area of intersection is not assessed.

If the scribe width is not known, it shall be measured. If the scribe width cannot be measured, it shall be set to the same value (preferably zero) for all comparative samples, and this value shall be quoted in the test report.

8 Evaluation

8.1 General

Unlike visual assessment of delamination or corrosion area, digital optical imaging can directly determine the size of an area of any shape (see Figure 1); A_d, A_c, d_{max} and c_{max} are evaluated and d and c are then calculated. Consequently, subsequent assessments will be more precise and reproducible.



Key

A_s	area of the scribe in the area of evaluation
A_d	area of delamination including the evaluated area of corrosion and area of the scribe
A_c	area of corrosion including the evaluated area of the scribe
w	width of the scribe
l	evaluated length of the scribe
$d_{max,\ l}$	maximum width of delamination on the left side of the scribe
$d_{max,\ r}$	maximum width of delamination on the right side of the scribe
$c_{max,\ l}$	maximum width of corrosion on the left side of the scribe
$c_{max,\ r}$	maximum width of corrosion on the right side of the scribe

Figure 1 — Image with all parameters required for assessment

8.2 Mean width of delamination or corrosion

With the known scribe width w, calculate the scribe area A_s, using Equation (1):

$$A_s = w \times l \tag{1}$$

Calculate the mean delamination width d, in millimetres, using Equation (2):

$$d = \frac{A_d - A_s}{2} \times \frac{1}{l} \tag{2}$$