
**Paints and varnishes — Evaluation
of degradation of coatings —
Designation of quantity and size of
defects, and of intensity of uniform
changes in appearance —**

**Part 3:
Assessment of degree of rusting**

*Peintures et vernis — Évaluation de la dégradation des revêtements
— Désignation de la quantité et de la dimension des défauts, et de
l'intensité des changements uniformes d'aspect —*

Partie 3: Évaluation du degré d'enrouillement



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Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
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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.

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).

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).

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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

This third edition cancels and replaces the second edition (ISO 4628-3:2003), which has been technically revised with the following changes:

- a) a normative reference to ISO 13076 for illumination for the assessment has been added;
- b) a note on the rusted area of the degree of rusting Ri 5 has been added.

ISO 4628 consists of the following parts, under the general title *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
- Part 2: Assessment of degree of blistering
- Part 3: Assessment of degree of rusting
- Part 4: Assessment of degree of cracking
- Part 5: Assessment of degree of flaking
- Part 6: Assessment of degree of chalking by tape method
- Part 7: Assessment of degree of chalking by velvet method
- Part 8: Assessment of degree of delamination and corrosion around a scribe or other artificial defect
- Part 10: Assessment of degree of filiform corrosion

Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance —

Part 3: Assessment of degree of rusting

1 Scope

This part of ISO 4628 specifies a method for assessing the degree of rusting of coatings by comparison with pictorial standards.

The pictorial standards provided in this part of ISO 4628 show coated steel surfaces which have deteriorated to different degrees by a combination of rust broken through the coating and visible underrust.

NOTE 1 The pictorial standards have been selected from the “European rust scale” published by the European Confederation of Paint, Printing Ink and Artists’ Colours Manufacturers’ Associations (CEPE), Brussels. The correlation between the ISO scale and the “European rust scale” is given in [Annex B, Table B.1](#).

NOTE 2 The correlation between the ISO scale and the rating system of ASTM D 610 is given in [Annex B, Table B.2](#).

NOTE 3 The rust formation on uncoated steel surfaces is designated in accordance with ISO 8501-1 (rust grades A, B, C, and D).

ISO 4628-1 defines the system used for designating the quantity and size of defects and the intensity of changes in appearance of coatings and outlines the general principles of the system. This system is intended to be used, in particular, for defects caused by ageing and weathering, and for uniform changes such as colour changes, for example yellowing.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms and definitions

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

3.1

degree of rusting

Ri

rating characterizing the degree of rust formation (rust broken through and visible underrust) on a coating

4 Assessment

Assess the degree of rusting (Ri) on a coating by means of the pictorial standards given in [Figure 1](#) to [Figure 5](#). The approximate areas rusted (rust broken through plus visible underrust) shown on these standards are as indicated in [Table 1](#).

Procedures for assessing invisible underrust, if required, shall be agreed between the interested parties.

Where different degrees of rusting occur in different parts of the area being assessed, indicate these degrees of rusting together with the part where each occurs.

Carry out the assessment under good illumination, as specified in ISO 13076.

If the average size of the rust spots on the test area differs considerably from those shown in the pictorial standards, an indication of their size may be given by reference to ISO 4628-1:2015, Table 2.

NOTE The pictorial standards are basically intended for assessing the degree of rusting of coated steel. They can be used for designating the degree of corrosion of coated non-ferrous metals if the form of breakdown is comparable with that shown in the standards.

Table 1 — Degree of rusting and rusted area

Degree of rusting	Rusted area %
Ri 0	0
Ri 1	0,05
Ri 2	0,5
Ri 3	1
Ri 4	8
Ri 5	40 to 50 ^a

^a When measuring the rusted area in [Figure A.5](#), it is only about 35 %. If rust is assessed visually using [Figure 5](#), the impression of rusted area is 40 % to 50 %. One reason might be that partly delaminated rust flakes are not distinguished from other rusted areas. But this is negligible because Ri 5 normally is outside any specification.

If the assessment is to be done by an optical imaging system, calibrate the system using the images given in [Annex A](#).

5 Expression of results

Express the degree of rusting as Ri class as shown in [Figure 1](#) to [Figure 5](#).

If applicable, indicate the different degrees of rusting obtained, together with the parts of the test area concerned.

If applicable, indicate the degree of rusting Ri together with the numerical rating of the size of the rust spots.

For example, if the rusted area corresponds to [Figure 3](#), Ri 3, and the sizes of the individual rust spots are between 0,5 mm and 5 mm, report the result as

— rusting; degree of rusting Ri3 (S4).

6 Test report

The test report shall contain at least the following information:

- a) all details necessary to identify the coating examined;

- b) a reference to this part of ISO 4628, i.e. ISO 4628-3;
- c) the type of surface examined, its size and, if appropriate, its location;
- d) result of the assessment in accordance with [Clause 5](#);
- e) an indication of the illumination under which the assessment was carried out;
- f) any unusual features (anomalies) observed during the assessment;
- g) the date of the examination.

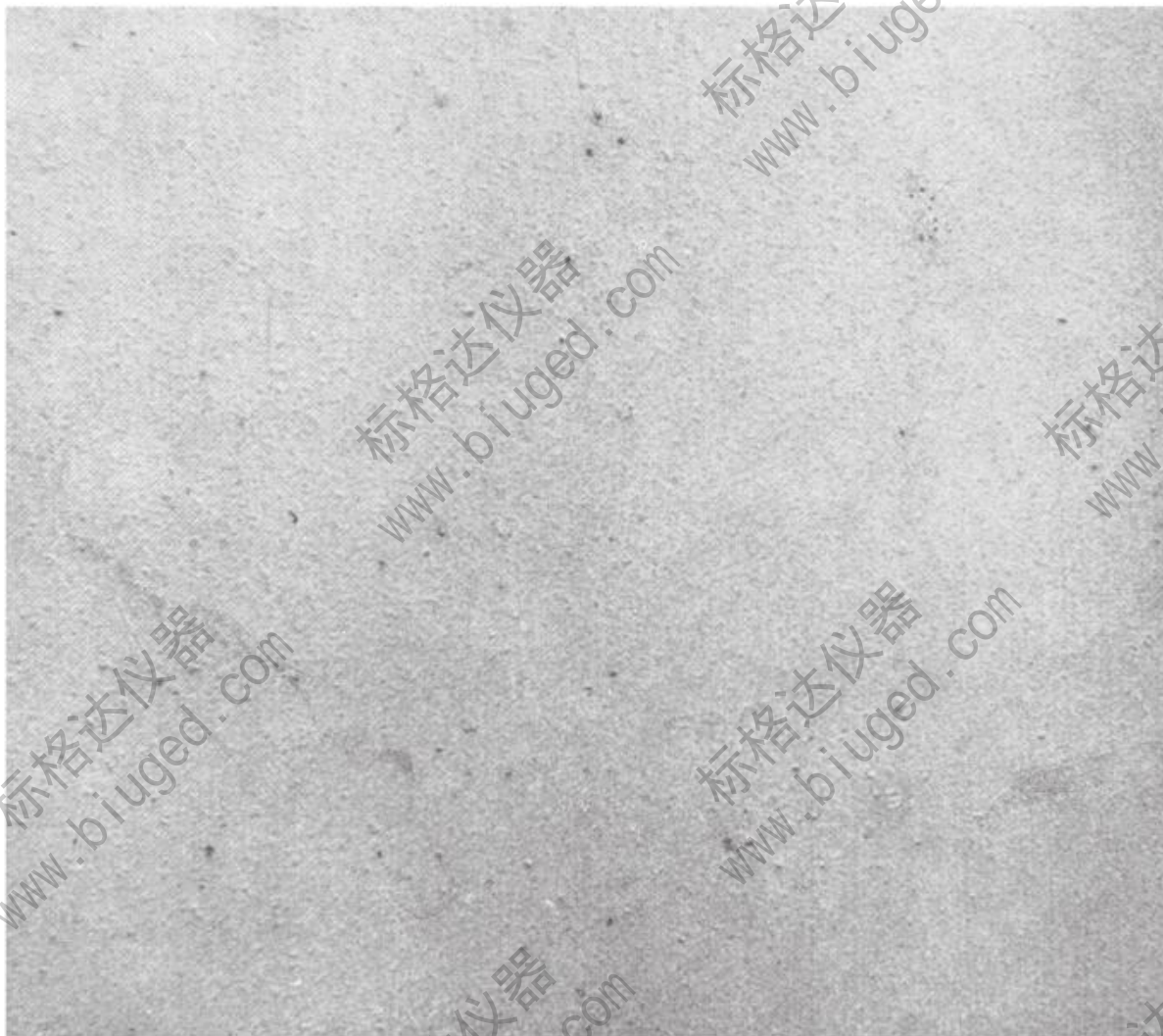


Figure 1 — Degree of rusting Ri 1



Figure 2 — Degree of rusting Ri 2



Figure 3 — Degree of rusting Ri 3

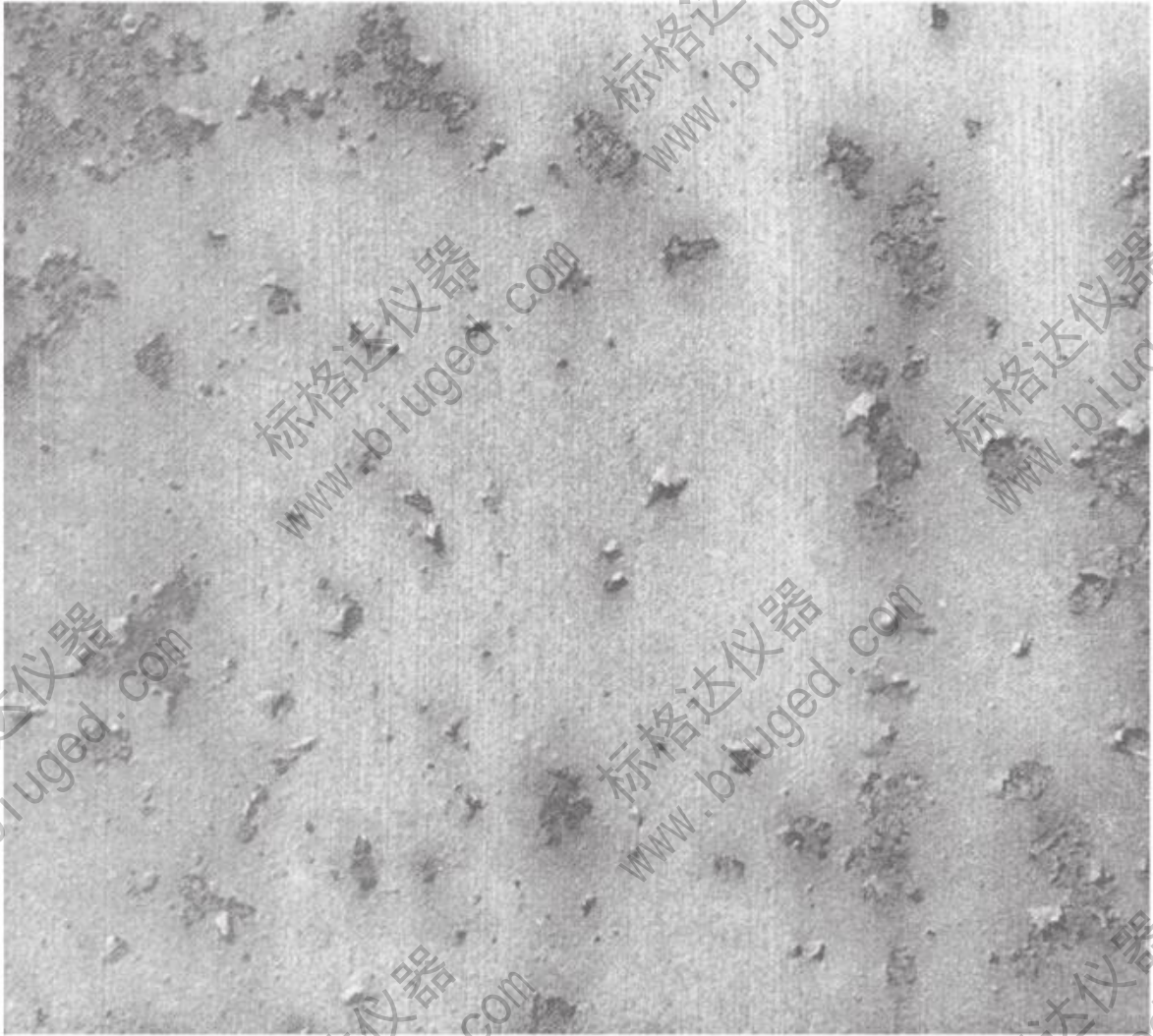


Figure 4 — Degree of rusting Ri 4

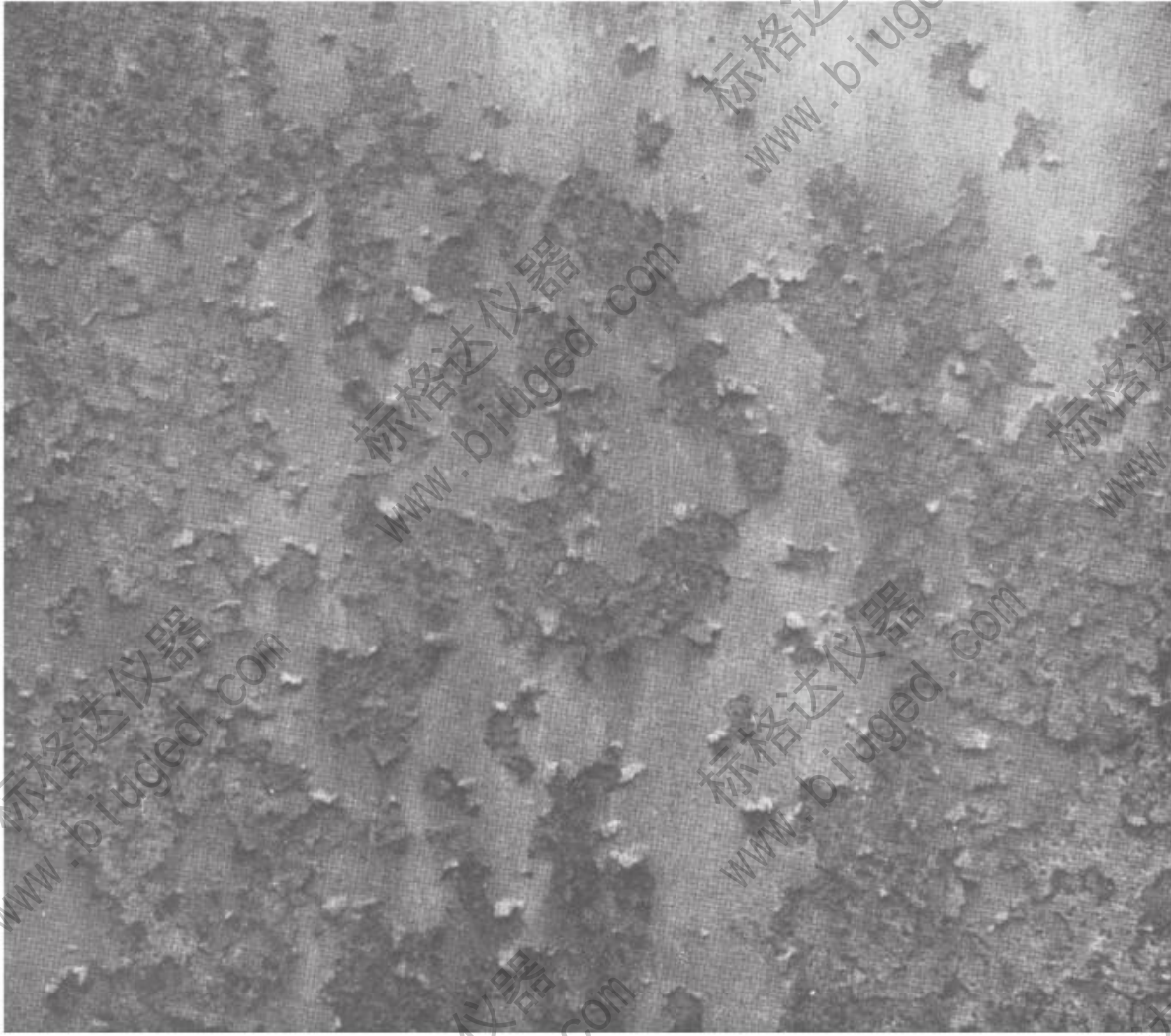


Figure 5 — Degree of rusting Ri 5

Annex A
(normative)

Calibration images

If the assessment is to be done using an optical imaging system, use the images given in [Figure A.1](#) to [Figure A.5](#) to calibrate the imaging system.



Figure A.1 — Degree of rusting Ri 1



Figure A.2 — Degree of rusting Ri 2

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Figure A.3 — Degree of rusting Ri 3

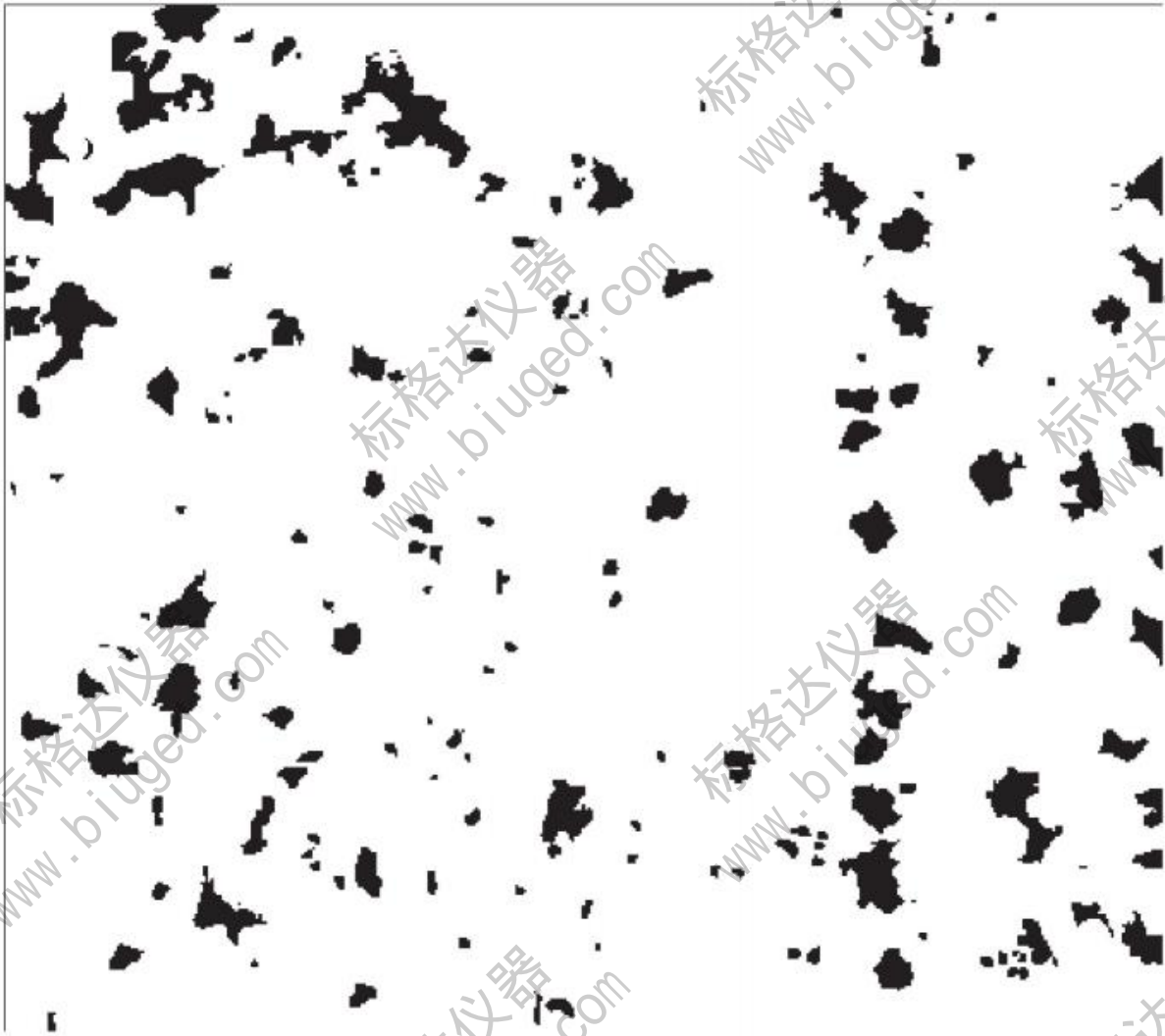


Figure A.4 — Degree of rusting Ri 4

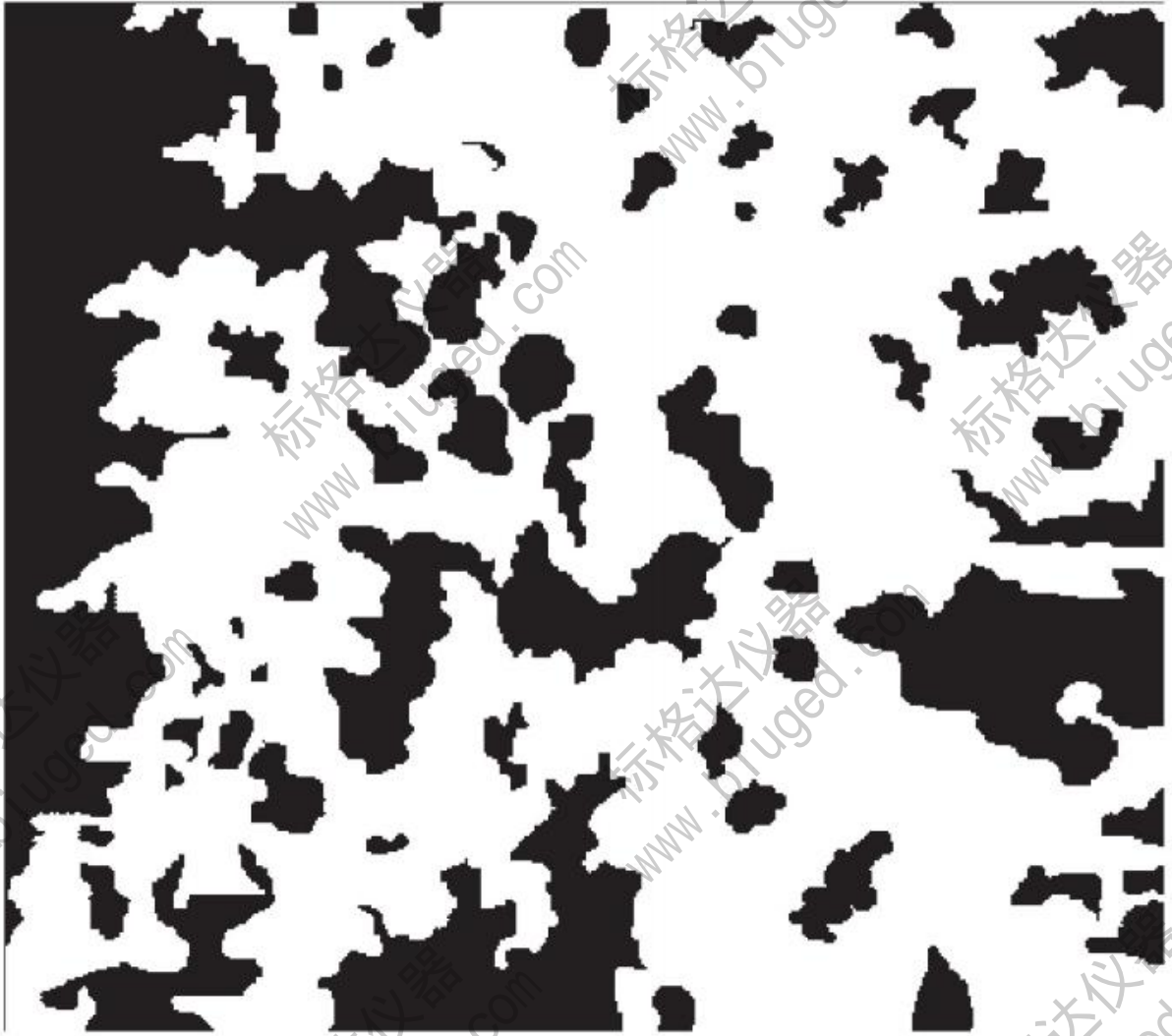


Figure A.5 — Degree of rusting Ri 5

Annex B
(informative)

Correlation between the ISO rating system and other systems

Table B.1 — Correlation between the ISO rating system and the “European rust scale”

ISO degree of rusting scale	“European rust scale”
Ri 0	Re 0
Ri 1	Re 1
Ri 2	Re 2
Ri 3	Re 3
Ri 4	Re 5
Ri 5	Re 7

Table B.2 — Approximate correlation between the ISO rating system and the ASTM rust scale

ISO degree of rusting scale	ASTM rust scale (ASTM D610)
Ri 0	10
Ri 1	9
Ri 2	7
Ri 3	6
Ri 4	4
Ri 5	1 to 2

Bibliography

- [1] ISO 8501-1, *Preparation of steel substrates before application of paints and related products — Visual assessment of surface cleanliness — Part 1: Rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings*
- [2] ASTM D610, *Test Methods for Evaluating Degree of Rusting on Painted Steel Surfaces*

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INTERNATIONAL STANDARD

**ISO
5077**

Second edition
2007-02-15

Textiles — Determination of dimensional change in washing and drying

*Textiles — Détermination des variations dimensionnelles au lavage et au
séchage domestiques*



Reference number
ISO 5077:2007(E)

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Foreword

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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 5077 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 2, *Cleansing, finishing and water resistance tests*.

This second edition cancels and replaces the first edition (ISO 5077:1984), which has been technically revised.

Textiles — Determination of dimensional change in washing and drying

1 Scope

This International Standard specifies a method for the determination of the dimensional change of fabrics, garments or other textile articles when subjected to an appropriate combination of specified washing and drying procedures.

In the case of textile articles or deformable materials, it is necessary to exercise all possible caution in the interpretation of the results.

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 139, *Textiles — Standard atmospheres for conditioning and testing*

ISO 3759, *Textiles — Preparation, marking and measuring of fabric specimens and garments in tests for determination of dimensional change*

ISO 6330, *Textiles — Domestic washing and drying procedures for textile testing*

3 Principle

The specimen is conditioned in the specified standard atmosphere and measured before subjection to the appropriate washing and drying procedures. After drying, conditioning and remeasuring of the specimen, the changes in dimensions are calculated.

4 Apparatus and reagents

Use apparatus and reagents as specified in ISO 3759 and ISO 6330.

5 Atmospheric conditions

The atmospheric conditions required for conditioning and testing are specified in ISO 139.

6 Test specimens

6.1 The selection, dimensions, marking and measuring of test specimens are specified in ISO 3759.

6.2 When possible, three specimens from each sample should be used. One or two specimens may be used when insufficient sample is available.

7 Procedure

7.1 Determine the original length and width dimensions, as appropriate, after the specimens have been conditioned and measured according to the procedure specified in ISO 139 and ISO 3759.

7.2 Wash and dry the specimens according to one of the procedures specified in ISO 6330, as agreed between the interested parties.

7.3 After washing and drying, condition and measure the specimens and calculate the dimensional change of the specimens according to the procedure specified in ISO 3759.

8 Expression of results

8.1 Calculate the mean changes in dimensions in both the length and width directions in accordance with the arrangement in ISO 3759 as follows:

$$\frac{x_t - x_o}{x_o} \times 100$$

where

x_o is the original dimension;

x_t is the dimension measured after treatment.

Record the changes in measurement separately as a percentage of the corresponding original value.

8.2 Express the average dimensional changes to the nearest 0,5 %.

8.3 State whether the dimension has decreased (shrinkage) by means of a minus sign (–) or increased (extension) by means of a plus sign (+).

9 Test report

The test report shall specify the following:

- a) the number and year of this International Standard;
- b) the number of specimens washed and dried;
- c) the procedure used for washing and drying from ISO 6330;
- d) for fabric specimens, the average dimensional change in the length (warp or wale) and the average dimensional change in the width (weft or course) to the nearest 0,5 %;
- e) for garments, the description, make and size of the garment tested;
- f) for garments, an adequate description of each measuring position and the average dimensional change to the nearest 0,5 % at each position for each garment tested.