
**Preparation of steel substrates before
application of paints and related
products — Surface roughness
characteristics of blast-cleaned steel
substrates —**

Part 1:

**Specifications and definitions for ISO
surface profile comparators for the
assessment of abrasive blast-cleaned
surfaces**

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*Préparation des subjectiles d'acier avant application de peintures et
de produits assimilés — Caractéristiques de rugosité des subjectiles
d'acier décapés —*

*Partie 1: Spécifications et définitions des comparateurs viso-tactiles ISO
pour caractériser les surfaces décapées par projection d'abrasif*



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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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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 8503-1 was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 12, *Preparation of steel substrates before application of paints and related products*.

This second edition cancels and replaces the first edition (ISO 8503-1:1988), which has been technically revised.

ISO 8503 consists of the following parts, under the general title *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates*:

- *Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces*
- *Part 2: Method for the grading of surface profile of abrasive blast-cleaned steel — Comparator procedure*
- *Part 3: Method for the calibration of ISO surface profile comparators and for the determination of surface profile — Focusing microscope procedure*
- *Part 4: Method for the calibration of ISO surface profile comparators and for the determination of surface profile — Stylus instrument procedure*
- *Part 5: Replica tape method for the determination of the surface profile*

Introduction

The performance of protective coatings of paint and related products applied to steel is significantly affected by the state of the steel surface immediately prior to painting. The principal factors that are known to influence this performance are:

- a) the presence of rust and mill scale;
- b) the presence of surface contaminants, including salts, dust, oils and greases;
- c) the surface profile.

International Standards ISO 8501 (all parts), ISO 8502 (all parts) and ISO 8503 (all parts) have been prepared to provide methods of assessing these factors, while ISO 8504 (all parts) provides guidance on the preparation methods which are available for cleaning steel substrates, indicating the capabilities of each in attaining specified levels of cleanliness.

These International Standards do not contain provisions for the protective coating systems to be applied to the steel surface or for the surface quality provisions for specific situations, even though surface quality can have a direct influence on the choice of protective coating to be applied and on its performance. Such provisions are found in other documents, such as national standards and codes of practice.

It is necessary for the users of these International Standards to ensure that the qualities specified are:

- compatible and appropriate both for the environmental conditions to which the steel is exposed and for the protective coating system to be used;
- within the capability of the cleaning procedure specified.

The four International Standards referred to above deal with the following aspects of preparation of steel substrates:

- ISO 8501: Visual assessment of surface cleanliness;
- ISO 8502: Tests for the assessment of surface cleanliness;
- ISO 8503: Surface roughness characteristics of blast-cleaned steel substrates;
- ISO 8504: Surface preparation methods.

Irrespective of the procedures and the type of abrasive used for the preparation of steel substrates, the surface after blast-cleaning consists of random irregularities with peaks and valleys that are not easily characterized. Consequently, it was concluded that, because of this random nature, no method is capable of giving a precise value for the profile. Thus, it is intended that the profile be identified as either dimpled (where shot abrasives are used) or angular (where grit abrasives are used) and that it be graded as “fine”, “medium” or “coarse”, each grade being defined by the limits specified in this part of ISO 8503. These surface characteristics are considered to give sufficient distinguishing features for most painting requirements.

Particular attention, however, is drawn to the fact that the grades “fine”, “medium” and “coarse” represent different ranges in terms of roughness parameters, dependent upon whether these grades are applied to shot abrasive or grit abrasive blast-cleaned surfaces. In consequence, the effect produced on a given coating by a given grade “fine”, “medium” or “coarse” is determined not only by the specific surface character but also by the specific roughness value $\overline{R_{y5}}$ or $\overline{h_y}$ belonging to that grade. Where surface profile is particularly important, both the grade of the surface profile (“fine”, “medium” or “coarse”) and the type of abrasive which is to be used are to be specified.

This part of ISO 8503 specifies the limits for the “fine”, “medium” and “coarse” surface for both dimpled and angular profiles, and specifies the design of ISO comparators for reference purposes.

Requirements regarding the care of ISO surface profile comparators are given in Annex A.

ISO 8503-2 describes the method of using these ISO comparators. The many abrasive blast-cleaning procedures in common use are described in ISO 8504-2.

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Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates —

Part 1: Specifications and definitions for ISO surface profile comparators for the assessment of abrasive blast-cleaned surfaces

1 Scope

This part of ISO 8503 specifies the requirements for ISO surface profile comparators, which are intended for visual and tactile comparison of steel substrates which have been blast-cleaned with either shot abrasives or grit abrasives. This part of ISO 8503 also includes definitions of the terms used in the ISO 8503 series and requirements for the care of ISO surface profile comparators.

NOTE 1 ISO surface profile comparators are used for assessing, on site, the roughness of surfaces before the application of paints and related products or other protective treatments.

NOTE 2 Where appropriate, these ISO comparators can be used for assessing the roughness profile of other abrasive blast-cleaned substrates and, in addition, their use is not restricted solely to surfaces that are to be painted.

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 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*

ISO 8503-2, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 2: Method for the grading of surface profile of abrasive blast-cleaned steel — Comparator procedure*

ISO 8503-3, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 3: Method for the calibration of ISO surface profile comparators and for the determination of surface profile — Focusing microscope procedure*

ISO 8503-4, *Preparation of steel substrates before application of paints and related products — Surface roughness characteristics of blast-cleaned steel substrates — Part 4: Method for the calibration of ISO surface profile comparators and for the determination of surface profile — Stylus instrument procedure*

3 Terms and definitions

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

**3.1
surface profile**

micro-roughness of a surface

NOTE This is generally expressed as the height of the major peaks relative to the major valleys. This term is defined in ISO 4287 as a “profile that results from the intersection of the real surface by a specified plane”. Characteristics of the roughness of blast-cleaned surfaces are defined in 3.7, 3.8, 3.10 to 3.12 and in ISO 8503-4.

**3.2
ISO surface profile comparator**

planar plate of four segments on which are imparted reference **surface profiles** (3.1)

NOTE The reference surface profiles are prepared by forming, on a corrosion-resistant metal, positive replicas of an appropriately blast-cleaned mild steel **coupon** (3.3) (see Clause 4).

**3.3
coupon**

mild steel flat plate of four segments and of sufficient gauge such that blast-cleaning does not cause distortion

**3.4
surface profile comparator**

specimen surface, or surface of known average profile, representing a particular abrasive blast-cleaning process

NOTE The comparator is used to give guidance on the appearance and feel of an abrasive blast-cleaned surface and to enable an assessment to be made of the profile of the surface.

**3.5
grit comparator
ISO Comparator G**

comparator with **surface profiles** (3.1) corresponding to (or simulating) surfaces obtained by abrasive blast-cleaning with metallic or mineral grit

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**3.6
shot comparator
ISO Comparator S**

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comparator with **surface profiles** (3.1) corresponding to (or simulating) surfaces obtained by abrasive blast-cleaning with metallic shot

**3.7
maximum peak-to-valley height**

h_y
<measurement by microscopy> vertical distance between the highest peak and the lowest valley in the field of view of a microscope

NOTE 1 h_y is usually measured in micrometres.

NOTE 2 For determination, see ISO 8503-3.

**3.8
mean maximum peak-to-valley height**

$\overline{h_y}$
<measurement by microscopy> arithmetic mean of a number of determinations (not less than 20) of **maximum peak-to-valley height**, h_y (3.7)

**3.9
sampling length**

l
length of the reference line used for identifying the irregularities characterizing the surface roughness

3.10 maximum peak-to-valley height

R_y

<measurement by stylus> largest single peak-to-valley height occurring within an individual **sampling length**, l (3.9), when using a stylus instrument

NOTE The determination of R_y is described in ISO 8503-4.

3.11 mean maximum peak-to-valley height

R_{y5}

<measurement by stylus> arithmetic mean of the **maximum peak-to-valley heights**, R_y (3.10), of five adjoining single **sampling lengths**, l (3.9)

NOTE R_{y5} is also sometimes known as R_z DIN or R_{tm} .

3.12 grand mean maximum peak-to-valley height

$\overline{R_{y5}}$

<measurement by stylus> arithmetic mean of not less than 10 determinations of **mean maximum peak-to-valley height**, R_{y5} (3.11)

3.13 primary profile

original **surface profile** (3.1) prior to blast-cleaning

3.14 secondary profile

surface profile (3.1) resulting from the effect of the blast-cleaning process on the **primary profile** (3.13)

3.15 hackles

thin raised slivers of steel, still attached to the substrate, which are caused by the impact of abrasives on a steel surface during blast-cleaning and which sometimes protrude above the other peaks

3.16 rogue peak

isolated peak, substantially higher than the surrounding peaks, normally caused by the presence of over-sized abrasive in the abrasive mixture used during blast-cleaning with grit abrasives

4 ISO surface profile comparators

ISO surface profile comparators shall be planar and shall have the dimensions given in Figure 1. The segments shall conform to the values given in Table 1 where measured in accordance with the methods described in ISO 8503-3 or ISO 8503-4. The visual assessment (of the ISO comparator) shall not be inferior to preparation grade Sa 2½ of ISO 8501-1.

ISO surface profile comparators shall be manufactured by forming positive replicas from nickel or other corrosion-resistant metals using master coupons prepared from mild steel.

NOTE 1 Electro-forming has, for example, been found to give suitable products.

ISO surface profile comparators shall be marked as follows:

| | |
|--------------------------------------|--|
| Reference comparator G to ISO 8503-1 | for ISO comparators representing profiles after blast-cleaning with grit abrasives |
| Reference comparator S to ISO 8503-1 | for ISO comparators representing profiles after blast-cleaning with shot abrasives |