BRITISH STANDARD

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BS 7079-C1: 1989
Incorporating Amendment No. 1

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

The European Standard EN ISO 8503-1:1995 has the status of a British Standard

ICS 87.020

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This British Standard, having been prepared under the direction of the Pigments, Paints and Varnishes Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 29 September 1989

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National foreword

This Part of BS 7079 has been prepared under the direction of the Pigments, Paints and Varnishes Standards Policy Committee. It is identical with ISO 8503-1:1988 "*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*", published by the International Organization for Standardization (ISO). In 1995 the European Committee for Standardization (CEN) accepted ISO 8503-1:1988 as a European Standard EN ISO 8503-1:1995. As a consequence of implementing the European Standard this British Standard is renumbered as BS EN ISO 8503-1 and any reference to BS 7079-C1 should be read as reference to BS EN ISO 8503-1.

It has been assumed in the drafting of this standard that it will be used and applied by those who are suitably qualified and experienced and for whose guidance it has been prepared.

Cross-references

International Standard	Corresponding British Standard
	BS 2634 *Specification for roughness comparison specimens*
ISO 2632-2:1985	Part 2:1987 *Specification for spark eroded shot-blasted, grit blasted, and polished specimens* (Identical)
	BS 6741 *Glossary of surface roughness terms*
ISO 4287-1:1984	Part 1:1987 *Surface and its parameters* (Identical)
	BS 7079 *Preparation of steel substrates before application of paints and related products*
ISO 8501-1:1988	Part A1:1989 *Specification for rust grades and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings* (identical)
ISO 8503-2:1988	Part C2:1989 *Method for grading of surface profile of abrasively blast-cleaned steel substrates using a comparator* (Identical)
ISO 8503-3:1988	Part C3:1989 *Method for the calibration of surface profile comparators and for the determination of surface profile using a focusing microscope* (Identical)
ISO 8503-4:1988	Part C4:1989 *Method for the calibration of surface profile comparators and for the determination of surface profile using a stylus instrument* (Identical)

The Technical Committee has reviewed the provisions of ISO 4618, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. BS 2015 "*Glossary of paint terms*" is related to, and compatible with, ISO 4618.

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Reference is also made to ISO 8504-2[1)] for information only. It is intended that ISO 8504-2 will, in due course, be published as a further Part of this British Standard.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, the EN ISO title page, pages 2 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

[1)] In preparation

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 8503-1

May 1995

ICS 87.020

Descriptors: Paints, varnishes, substrates, steel products, tests, determination, surface condition

English version

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

(ISO 8503-1:1988)

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 relatives aux échantillons de comparaison viso-tactile ISO pour caractériser les surfaces préparées par projection d'abrasif
(ISO 8503-1:1988)

Vorbereitung von Stahloberflächen vor dem Auftragen von Beschichtungsstoffen Rauheitskenngrößen von gestrahlten Stahloberflächen — Teil 1: Anforderungen und Begriffe für ISO-Rauheitsvergleichsmuster zur Beurteilung gestrahlter Oberflächen
(ISO 8503-1:1988)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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Comité Européen de Normalisation
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Foreword

The text of the International Standard from ISO/TC 35, Paints and varnishes, of the International Organization for Standardization (ISO) has been taken over as a European Standard by the Technical Committee CEN/TC 139, Paints and varnishes.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 1995, and conflicting national standards shall be withdrawn at the latest by November 1995.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

NOTE Normative references to international publications are listed in Annex ZA (normative).

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0 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, ISO 8502 and ISO 8503 have been prepared to provide methods of assessing these factors, while ISO 8504 provides guidance on the preparation methods that are available for cleaning steel substrates, indicating the capabilities of each in attaining specified levels of cleanliness.

These International Standards do not contain recommendations for the protective coating systems to be applied to the steel surface. Neither do they contain recommendations for the surface quality requirements 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 recommendations are found in other documents such as national standards and codes of practice. It will be 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 will be 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.*

Each of these International Standards is in turn divided into separate parts.

Irrespective of the procedures and the type of abrasive that are 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 recommended that the profile should be identified as either dimpled (where shot abrasives have been used) or angular (where grit abrasives have been used) and that it should 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 should 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 comparators for reference purposes.

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

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

1 Scope and field of application

This part of ISO 8503 specifies the requirements for ISO surface profile comparators which are intended for visual and tactile comparison of steel substrates that have been blast-cleaned with either shot abrasives or grit abrasives. ISO surface profile comparators are for use in assessing, on site, the roughness of surfaces before the application of paints and related products or other protective treatments.

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NOTE Where appropriate, these comparators may 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.

This part of ISO 8503 also includes definitions of the terms used in this and the other parts of ISO 8503.

2 References

ISO 2632-2, *Roughness comparison specimens — Part 2: Spark-eroded, shot-blasted and grit-blasted, and polished.*

ISO 4287-1, *Surface roughness — Terminology — Part 1: Surface and its parameters.*

ISO 4618, *Paints and varnishes — Vocabulary.*

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, *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 — 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.*

ISO 8504-2, *Preparation of steel substrates before application of paints and related products — Surface preparation methods — Part 2: Abrasive blast-cleaning*[2)].

3 Definitions

For the purpose of this and other parts of ISO 8503, the definitions given in ISO 4618, together with the following, apply.

3.1
surface profile

the micro-roughness of a surface generally expressed as the height of the major peaks relative to the major valleys

NOTE This term is defined in ISO 4287-1 as "a line of intersection of a surface with a 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

a planar plate of four segments on which are imparted reference surface profiles as defined in this International Standard

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 **5**).

3.3
coupon

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

3.4
surface profile comparator

a 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. The term "roughness comparison specimen" (see ISO 2632-2) is preferred by ISO/TC 57, *Metrology and properties of surfaces.*

3.5
grit comparator

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

3.6
shot comparator

a comparator with surface profiles corresponding to (or simulating) surfaces obtained by abrasive blast-cleaning with metallic shot (Comparator S)

3.7
maximum peak-to-valley height (by microscopy), h_y

the vertical distance between the highest peak and the lowest valley in the field of view of a microscope (see ISO 8503-3)

NOTE h_y is usually measured in micrometres.

3.8
mean maximum peak-to-valley height (by microscopy), $\overline{h_y}$

the arithmetic mean of a number of determinations (not less than 20) of h_y (**3.7**)

3.9
sampling length, l (as defined in ISO 4287-1)

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

[2)] At present at the stage of draft.

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3.10
maximum peak-to-valley height (by stylus), R_y

the largest single peak-to-valley height occurring within an individual sampling length l (**3.9**) when using a stylus instrument (see ISO 8503-4)

NOTE R_y is defined in ISO 4287-1 as "the distance between the line of profile peaks and the lines of profile valleys within the sampling length".

3.11
mean maximum peak-to-valley height (by stylus), R_{y5}

the 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}. In DIN 4768-1, R_z is defined exactly as in the definition given above for R_{y5}.

3.12
grand mean maximum peak-to-valley height (by stylus), $\overline{R_{y5}}$

the arithmetic mean of a number of determinations (not less than 10) of R_{y5} (**3.11**)

3.13
primary profile

the original surface profile prior to blast-cleaning

3.14
secondary profile

the surface profile 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 peaks

isolated peaks, 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 the Figure. The segments shall comply with the values given in Table 1 when measured according to the methods described in ISO 8503-3 or ISO 8503-4. The visual assessment (of the comparator) shall not be inferior to preparation grade Sa 2 ½ of ISO 8501-1.

ISO surface profile comparators shall be manufactured by forming positive replicas from nickel or other corrosion-resistant metal using master coupons prepared from mild steel (for example, electro-forming has been found to give suitable products).

ISO surface profile comparators shall be marked:

"Reference comparator G to ISO 8503-1" for comparators representing profiles after blast-cleaning with grit abrasives.

"Reference comparator S to ISO 8503-1" for comparators representing profiles after blast-cleaning with shot abrasives.

Table 1 — Nominal values and tolerances for the surface profiles of the segments of ISO surface profile comparators

a) Comparators for steel, blast-cleaned with grit abrasives

Segment	Nominal reading[a] µm	Tolerance µm
1	25	3
2	60	10
3	100	15
4	150	20

b) Comparators for steel, blast-cleaned with shot abrasives

Segment	Nominal reading[a] µm	Tolerance µm
1	25	3
2	40	5
3	70	10
4	100	15

[a] When using the microscope method (see ISO 8503-3), the nominal reading refers to $\overline{h_y}$. When using the stylus method (see ISO 8503-4), the nominal reading refers to $\overline{R_{y5}}$.

Each comparator shall be accompanied by a calibration certificate stating the method for determining the surface profile, the estimated tolerance, and the calibrated surface profile, in micrometres, of each segment (see also clause **8**).

NOTE Other comparator designs and configurations may be used, provided that four segments are included which comply with the profiles and tolerances specified in this International Standard. Such a comparator, however, may not be identified as an "lSO-comparator", but it may bear the inscription that it "complies with the profiles specified in ISO 8503-1".

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5 Ranges of the profile gradings

The ranges of the profile gradings “fine”, “medium” and “coarse” shall be as given in Table 2.

Table 2 — Limits of profile grades

a) Comparators for steel, blast-cleaned with grit abrasives

Fine (G)	Profiles equal to segment 1 and up to but excluding segment 2
Medium (G)	Profiles equal to segment 2 and up to but excluding segment 3
Coarse (G)	Profiles equal to segment 3 and up to but excluding segment 4

b) Comparators for steel, blast-cleaned with shot abrasives

Fine (S)	Profiles equal to segment 1 and up to but excluding segment 2
Medium (S)	Profiles equal to segment 2 and up to but excluding segment 3
Coarse (S)	Profiles equal to segment 3 and up to but excluding segment 4

6 Calibration of comparators

A comparator shall be deemed to have been calibrated if, on measuring each of the profiles on the reference surface by either the method described in ISO 8503-3 or the method described in ISO 8503-4, the values for all the profiles are within the respective nominal values and tolerances specified in Table 1. Only surface profile comparators that comply may be inscribed on the underside as described in clause **4**.

NOTE In the absence of agreement, calibration by the method described in ISO 8503-3 is the referee procedure.

If at any time the comparator, when calibrated using the stylus method (ISO8503-4) or the microscope method (ISO 8503-3), does not comply with the specified limits given in Table 1, it shall be discarded. If the visual assessment of the cleanliness of the surface of the comparator does not correspond to Sa 2 ½ or Sa 3 specified in ISO 8501-1, the comparator shall be discarded.

7 Maintenance and re-calibration of comparators

Recommendations regarding the care of comparators are given in the Annex A.

Comparators require careful handling. If any noticeable wear is detected, the comparator shall be discarded or, if appropriate, re-calibrated.

NOTE Comparators in frequent use should be checked against an unused comparator at three-monthly intervals or whenever the surface appears worn or damaged. If a segment of a used comparator, when compared with the equivalent segment of an unused comparator, would yield a different grading assessment (see ISO 8503-2) of a surface profile, the used comparator should be discarded or re-calibrated.

8 Calibration certificate for ISO surface profile comparators

In addition to the requirements of clauses **4** to **7**, the calibration certificate for each ISO surface profile comparator shall state

a) the name of the manufacturer;

b) the serial or identification number;

c) a reference to the master coupon (see clause **4**) and its certification;

d) the date of manufacture.

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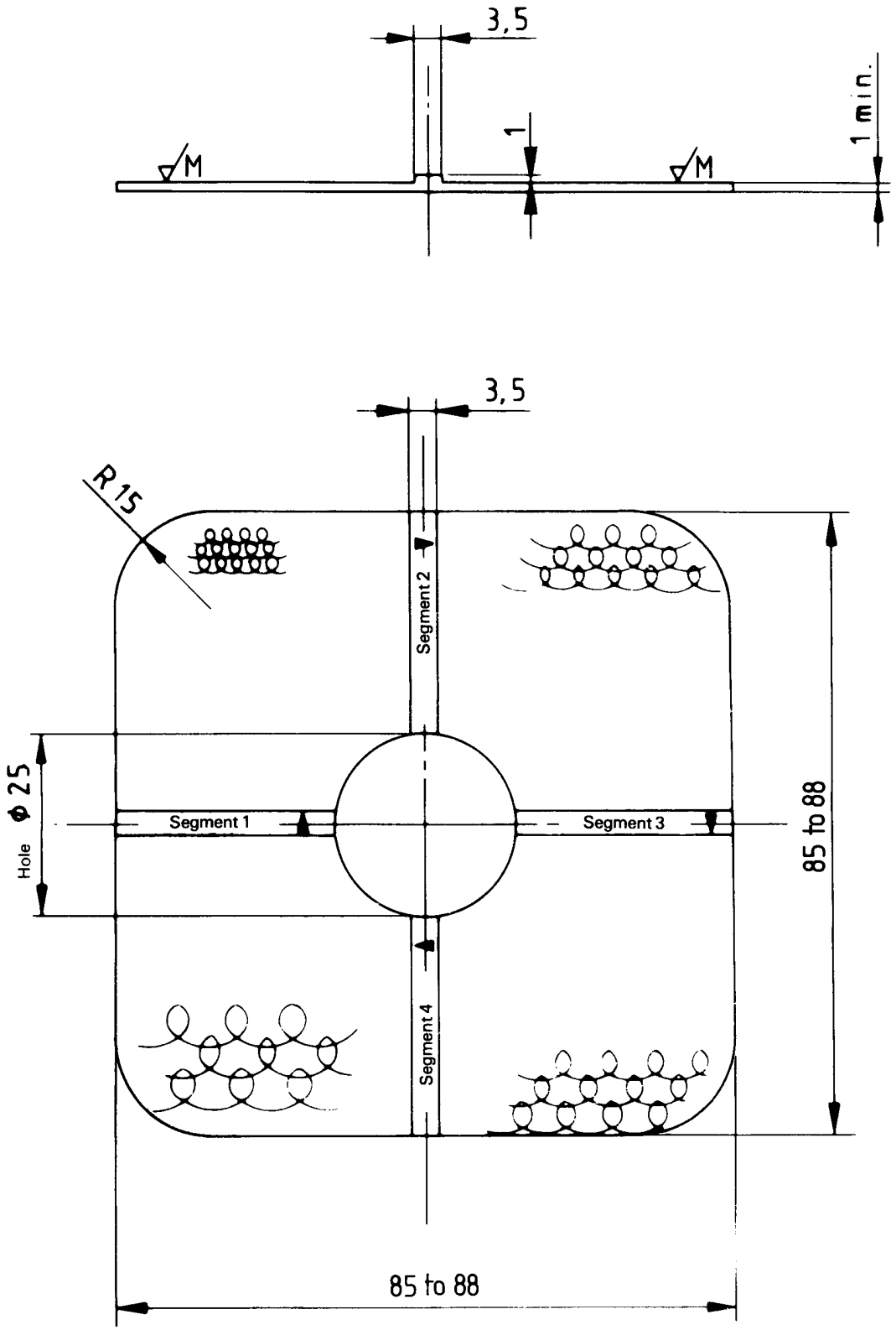


Figure — ISO surface profile comparator

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Annex A Recommendations regarding the care of ISO surface profile comparators

(This annex does not form an integral part of the Standard.)

A.1 The comparator should be treated as carefully as any other accurate instrument.

Keep the comparator in the protective case provided when not in use.

Never place the comparator face down on rough surfaces despite the protection strips.

A.2 If the comparator becomes tarnished, wash it with a dilute detergent solution and soft brush.

If the comparator becomes wet, dry it with soft tissues.

A.3 The comparator should be checked as described in clause **7**.

Annex ZA (normative) Normative references to international publications with their relevant European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

Publication	Year	Title	EN	Year
ISO 8503-2	1988	*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*	EN ISO 8503-2	1995
ISO 8503-3	1988	*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*	EN ISO 8503-3	1995
ISO 8503-4	1988	*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*	EN ISO 8503-4	1995

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Publications referred to

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