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BSI Standards Publication

Micrographic examination of the non-metallic inclusion content of steels using standard pictures

National foreword

This British Standard is the UK implementation of EN 10247:2017. It supersedes BS EN 10247:2007 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ISE/101/7, Methods of physical and metallographic testing.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English Version

Micrographic examination of the non-metallic inclusion content of steels using standard pictures

Détermination micrographique de la teneur en inclusions non-métalliques des aciers à l'aide d'images-types

Metallographische Prüfung des Gehaltes nichtmetallischer Einschlüsse in Stählen mit Bildreihen

This European Standard was approved by CEN on 18 January 2017.

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European foreword

This document (EN 10247:2017) has been prepared by Technical Committee ECISS/TC 101 “Test methods for steel (other than chemical analysis)”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by January 2018, and conflicting national standards shall be withdrawn at the latest by January 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 10247:2007.

The many changes in the current revision result from only a few basic adjustments. The length to width limit ratio for globular inclusions has been changed from 1,3 to 3 (Annex I), and the mathematical principles underlying the chart have been more clearly defined (Annex H). These two changes have led to many numerical changes in Table 2 and Figure 11, where moreover some classes have been deleted and others added. The rules of assessment have changed, most notably to allow stringer formation from two particles upward (Subclause 3.1.2, Annex B), to exclude stringer formation between a stringer and a single particle (Subclause 3.1.2), and to consistently define the classification of inclusions by shape, arrangement, and colour (Clause 3, Annexes A and B). Finally, the assessment and recording sheets have been redesigned to simplify manual use (Annexes K, L, and M).

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This document establishes procedures for the assessment of inclusions in steels, based on their morphology using standard pictures.

These procedures include principles that yield results coherent with consolidated individual inclusion measurements and expressed in physical units.

The chart of standard pictures is derived from mathematical principles. In distinction to other inclusion rating standards, in this standard the order of the classification begins with the length (row index q).

The results may be directly computed from field assessments. The same precision level is achieved by using the same method in manual evaluation and computer controlled measurements.

The results are in physical units: length in $\mu m/mm^2$, number/mm^2, areas in $\mu m^2/mm^2$.

1 Scope

This European Standard defines a method of microscopic non-metallic endogenous inclusion assessment using picture charts.

The method does not apply to particles of a length or diameter less than 3,0 µm or a width smaller than 2,0 µm. If defined by a product standard or agreement between the involved parties for certain special products, inclusions with a width below 2,0 µm can be evaluated by length alone. Inclusions with dimensions exceeding the upper limits in Table 2 are evaluated as belonging to the maximum class and noted separately with their true dimensions (see 8.5.6).

It is assumed, if particles are elongated or if there are stringers of particles, that they are parallel to each other. Other arrangements are not covered by this draft standard. This draft European Standard applies to samples with a microscopic precipitation approaching random distribution.

From the data of measurements obtained by this method, evaluation according to other standards can be established.

This draft European Standard does not apply to free cutting steels.

NOTE The basic principle of this draft European Standard allows the determination of non-metallic inclusion content by image analysis techniques.

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.

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

ISO 9042, *Steels — Manual point counting method for statistically estimating the volume fraction of a constituent with a point grid*

3 Terms and definitions

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

3.1 General:

3.1.1
particle
single precipitate, in general non-metallic

3.1.2
stringer
arrangement of at least 2 particles, normally aligned, that meet the proximity conditions $e \leq 40$ µm and $t \leq 10$ µm

Note 1 to entry: For formation of stringers particles with $L < 3$ µm or $w < 2$ µm are not taken into account (see Figure 5).

Note 2 to entry: See Figure 3 for proximity conditions, Figure 7 and Annex B and Annex C for examples