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**INTERNATIONAL STANDARD**



**3763**

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## **Wrought steels — Macroscopic methods for assessing the content of non-metallic inclusions**

*Aciers corroyés — Méthodes macroscopiques de détermination de la teneur en inclusions non métalliques*

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## FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3763 was drawn up by Technical Committee ISO/TC 17, *Steel*, and was circulated to the Member Bodies in May 1975.

It has been approved by the Member Bodies of the following countries :

Australia	Iran	South Africa, Rep. of
Austria	Ireland	Spain
Belgium	Italy	Sweden
Canada	Korea, Dem. P. Rep. of	Switzerland
Czechoslovakia	Netherlands	Turkey
Denmark	New Zealand	United Kingdom
Finland	Norway	U.S.A.
France	Poland	U.S.S.R.
Hungary	Romania	Yugoslavia

The Member Body of the following country expressed disapproval of the document on technical grounds :

Japan

# Wrought steels – Macroscopic methods for assessing the content of non-metallic inclusions

## 1 SCOPE AND FIELD OF APPLICATION

1.1 This International Standard describes the macroscopic methods used in current practice for assessing the content of non-metallic inclusions in wrought steel products.

1.2 Macroscopic methods are those dealing with non-metallic inclusions visible to the naked eye or with the aid of a magnifying glass with a magnification of not more than X 10. Only inclusions equal to or greater than 1 mm long are taken into consideration.

1.3 The methods usually applied and defined in this International Standard are :

- the blue fracture test method;
- the step machined test method;
- the magnetic particle inspection method.

## 2 GENERAL

### 2.1 Characteristics of non-metallic inclusions

Non-metallic inclusions, shown by the macroscopic methods given in clauses 3, 4 and 5, appear as stringers.

The parameters characterizing non-metallic inclusions shall be their total number and their length or thickness. No distinction is made concerning the type of inclusion.

### 2.2 Sampling

It should be noted that the shape of the inclusion as well as the number of inclusions and their distribution depend on the grade of steel, the method of production, the conditions of killing, the shape of the ingot and the rolling reduction. These various factors should be taken into consideration when selecting the sample.

For these reasons it is not possible to formulate a universal method of sampling and accordingly general rules are given in the case of each method.

## 3 BLUE FRACTURE TEST METHOD

### 3.1 Principle

The blue fracture test method consists in determining the total number and distribution of non-metallic inclusions

visible on the surface of a fracture which has undergone blue tempering. This fracture is in the longitudinal direction of the product and the inclusions normally appear as white stringers.

### 3.2 Field of application

The blue fracture test method is applicable to forged or rolled products and can be used for a wide range of products. In general, the test is carried out on semi-finished products.

### 3.3 Sampling and preparation of test piece

#### 3.3.1 Sampling

The test piece shall consist of a slice the thickness (for example between 5 and 20 mm) of which depends on the dimensions of the product, the thickness being measured parallel to the longitudinal direction, and the slice being taken by hot or cold sawing or by flame cutting. In general a thickness of 10 mm is recommended.

When flame cutting is used, care shall be taken to ensure that the fracture takes place outside the heat-affected zone.

The number and position of the test pieces shall be the subject of an agreement between the parties concerned.

#### 3.3.2 Preparation

The test piece may contain a groove in the middle of one of the principal sides (i.e. perpendicular to the longitudinal axis of the product). Its shape is variable and its depth shall be such that the thickness of the remaining slice complies with the conditions defined above. The purpose of this groove is to facilitate the fracture of the test piece.

### 3.4 Procedure

After undergoing normalizing treatment if necessary, the test piece shall be either

- heated in air so that at the moment of starting the test, the metal is at the blue brittleness temperature (300 to 350 °C), or
- fractured at the ambient temperature and the two pieces subsequently heated to blue the fractures.