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**Steel — Etching method for
macroscopic examination**

Acier — Méthode d'attaque pour examen macroscopique



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Foreword

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The committee responsible for this document is ISO/TC 17, *Steel*, Subcommittee SC 7, *Methods of testing (other than mechanical tests and chemical analysis)*.

This second edition cancels and replaces the first edition (ISO 4969:1980), which has been technically revised.

Steel — Etching method for macroscopic examination

1 Scope

This International Standard establishes guidelines for the macroscopic examination of steel by hot etching, room temperature etching and electrolytic etching.

The method has very wide application. Selection of the type, concentration and temperature of the reagent, the etching apparatus and the conditions of surface preparation of the test piece make it possible to achieve the required aim.

NOTE It might be difficult to see fine voids and cracks and discriminate between them and determine their nature by macroetching.

2 Principle

2.1 The use of the test and the conditions for interpreting the results observed depend on the particular case, details are presented in product standards or shall be subject to special agreement.

2.2 Macroscopic etching reveals the macrostructure of a metal test piece and any gross physical or chemical irregularities present.

2.3 The reagent acts by dissolving different parts of the metal surface at unequal rates, and thus, produces differences in level which makes observation possible.

2.4 Macroscopic examination after etching reveals lack of chemical uniformity (segregation of elements), lack of physical uniformity (cracks, porosity), and any intentional or accidental structural variations such as those caused, for instance, by hardening, decarburization or case hardening.

2.5 In addition, enhanced sensitivity can be achieved by altering the conditions of preparation and attack. For instance, it is possible to reveal the dendritic structure of a metal or the presence of inclusions or very small defects.

2.6 Observation of the etched surface is carried out with the unaided eye and/or with a magnifying glass, or with a stereomicroscope.

3 Sampling

3.1 The position and number of sampling shall be determined according to the requirements of the product standard, specification, contract or order. In the absence of any special requirements, sampling must be planned according to the details of the manufacturing process and the grade being evaluated.

3.2 The macroetching test, as applied to the inspection of steel products of this method, is carried out on slices, usually 13 mm to 25 mm in thickness. Disks or specimens are usually cut to reveal a transverse surface, but the requirements of the specification, contract, or order can include the preparation and examination of a longitudinal surface. In most cases, a longitudinally-oriented macroetching disc is taken with the plane to be etched along the centre line of the wrought product and it includes both outside surfaces with a length in the longitudinal direction, usually 1,5 times greater than the thickness or diameter.