
International Standard



4968

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Steel — Macrographic examination by sulphur print (Baumann method)

Acier — Examen macrographique par empreinte au soufre (méthode Baumann)

First edition — 1979-11-01

UDC 669.14 : 620.183.42

Ref. No. ISO 4968-1979 (E)

Descriptors : steels, metallography, macroscopic analysis, Baumann tests, photographic recording, sulphur.

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 4968 was developed by Technical Committee ISO/TC 17, *Steel*, and was circulated to the member bodies in April 1978.

It has been approved by the member bodies of the following countries:

Australia	Hungary	Poland
Austria	India	Portugal
Belgium	Iran	Romania
Bulgaria	Ireland	South Africa, Rep. of
Canada	Italy	Spain
Chile	Japan	Sweden
Czechoslovakia	Korea, Dem. P. Rep. of	Switzerland
Denmark	Korea, Rep. of	Turkey
Egypt, Arab Rep. of	Mexico	United Kingdom
Finland	Netherlands	USA
France	New Zealand	USSR
Germany, F. R.	Norway	

No member body expressed disapproval of the document.

Steel — Macrographic examination by sulphur print (Baumann method)

1 Scope and field of application

This International Standard specifies a method (Baumann) for the macrographic examination of steel by means of contact printing using silver salts and sulphuric acid.

The method is applicable to non-alloy and alloy steels¹⁾ in which the sulphur content is less than 0,1 %.²⁾

2 General

2.1 The sulphur print test is essentially a qualitative test. It is inadvisable to assess the sulphur content of a given steel merely on the basis of its sulphur print.

2.2 Experience shows that the degree of darkening of the photo-sensitive emulsion is not always in proportion to the quantity of sulphides present in the metal. Certain factors may influence the macrographic attack to a greater or lesser extent; as examples, the following may be quoted :

- the chemical composition of the steel : the presence of certain elements modifies the type and shape of the sulphides and consequently the appearance of the image obtained, for example concentrations of titanium greater than 0,1 % give prints which do not reveal sulphides;
- the surface condition of the sample : the presence of surface cold working may alter the image obtained;
- the sensitivity of the photographic paper.

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

3 Principle and aim of the test

3.1 The aim of macrographic examination by sulphur printing is to detect, by printing on photo-sensitive paper³⁾ previously soaked in sulphuric acid solution, the position of areas containing sulphur inclusions found in the metal in various chemical forms and with various shapes : iron sulphide, manganese sulphides, mixed sulphides, oxy-sulphides etc.

3.2 The distribution of the sulphur-rich areas is revealed by the local release of hydrogen sulphide, causing darkening of the sensitive emulsion due to the chemical conversion of the silver halides to silver sulphide.

3.3 By examining the distribution and size of the sulphur inclusions detected by this process it is possible to make some assessment of the degree of uniformity of the metal from the section examined. Thus sulphur printing reveals chemical irregularities (segregations : for example those of a non-rimming free-cutting steel) and may reveal certain physical irregularities (for example cracks and porosity). Furthermore, sulphur printing may be used sometimes to distinguish rimming steel from killed steel and may also draw attention to certain areas where tests (for example, mechanical tests) or sampling for analysis may need to be carried out.

1) This method may also be applied to cast irons.

2) In the case of sulphur steels (sulphur content > 0,1 %) testing may be carried out, but with a very dilute solution of sulphuric acid.

3) The photographic paper may be replaced by a flat film. The positive and transparent prints obtained from the flat film may be used directly to produce negative proofs.