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# INTERNATIONAL STANDARD



# 3754

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

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## Steel — Determination of effective depth of hardening after flame or induction hardening

*Acier — Détermination de la profondeur conventionnelle de trempe après chauffage superficiel*

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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 3754 was drawn up by Technical Committee ISO/TC 17, *Steel*, and was circulated to the Member Bodies in March 1975.

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

Australia	Germany	South Africa, Rep. of
Austria	Hungary	Spain
Belgium	India	Switzerland
Brazil	Iran	Turkey
Canada	Mexico	United Kingdom
Czechoslovakia	Netherlands	U.S.A.
Denmark	New Zealand	U.S.S.R.
Finland	Norway	Yugoslavia
France	Romania	

The Member Bodies of the following countries expressed disapproval of the document on technical grounds :

Ireland  
Sweden

# Steel — Determination of effective depth of hardening after flame or induction hardening

## 1 SCOPE

This International Standard

- a) defines the effective depth of hardening (DS) after flame or induction hardening;
- b) specifies the method for measuring this depth of hardening.

## 2 FIELD OF APPLICATION

This International Standard applies to

- a) hardened layers with a depth greater than 0,3 mm;
- b) parts which, in the surface hardened condition, have at a distance  $3 \times DS$  from the surface, a hardness less than

$$\text{hardness limit (HV)} - 100$$

Where these conditions are not satisfied, the effective depth of hardness after flame or induction hardening shall be defined by agreement between the parties concerned. For steels where the hardness of a part at a distance  $3 DS$  from the surface is above hardness limit  $(HV) - 100$ , the criterion may still be used on condition that a higher hardness limit is chosen for the assessment of the effective depth of hardening (see clause 3).

## 3 DEFINITION

**effective depth of hardening after flame or induction hardening (DS) :** The distance between the surface of the product and the layer where the Vickers hardness (HV) under a load of 9,8 N (1 kgf)<sup>1)</sup> is equal to the value specified by the term "hardness limit".<sup>2)</sup>

It is a function of the minimum surface hardness required for the part, given by the following equation :

$$\text{hardness limit (HV)} = 0,80 \times \text{minimum surface hardness (HV)}$$

The effective depth of hardening after flame or induction hardening is designated by the letters "DS". This depth is expressed in millimetres, and is applicable to the area specified in the drawing of the part, which may or may not have been ground depending upon the specification.

## 4 MEASUREMENT

### 4.1 Cases of dispute

The method of measurement of the effective depth of hardening after flame or induction hardening specified in this clause shall be the only one applicable in cases of dispute.

### 4.2 Principle of the measurement

The effective depth of hardening shall be determined from the gradient of hardness in a cross-section normal to the surface. It shall be estimated graphically on the curve representing the hardness as a function of the distance from the surface of the part.

### 4.3 Measuring procedure

The measurement shall be carried out, unless otherwise agreed between the parties concerned, on a cross-section of the part in the hardened condition.

#### 4.3.1 Preparation of the surface to be examined

The surface on which the measurement is to be made shall be polished so as to permit the correct measurement of the size of the hardness impressions. Every precaution shall be taken to avoid rounding the edges of this surface and overheating the part.

1) By agreement between the parties concerned, loads different from the reference load 9,8 N (1 kgf), within the range 5 to 50 N, may be used.

By agreement between the parties concerned, the superficial Rockwell method for measuring the hardness may be used, in which case the hardness limit value should be specified.

2) By agreement between the parties concerned, other values of the hardness limit may be used. The effective depth should then be designated by the use of a suffix to the letters "DS".

#### 4.3.2 Determination of the hardness

The hardness impressions shall be placed along one or more parallel lines normal to the surface and within a band ( $W$ ) 1,5 mm in width (see the figure).

The distance between the surface and the successive impressions shall increase by steps of 0,1 mm (for example  $d_2 - d_1$ ), the first point near the surface being 0,15 mm from the surface ( $d_1$ ). In the case of a large depth of surface hardening, the distance between the impressions may be greater, but the distance between the impressions shall remain 0,1 mm in the immediate area of the presumed hardness limit zone.

These measurements shall be carried out on the surface in question in one or more bands specified by agreement between the parties and indicated on the drawing. For each, the results make it possible to plot the curve representing the hardness as a function of the distance from the surface.

#### 4.4 Result of the measurement

The curve or curves plotted make it possible to determine, for each band of the surface in question, the distance to the surface from the point where the hardness is equal to the hardness limit; this distance shall represent the effective depth of hardening after flame or induction hardening.

### 5 TEST REPORT

The test report shall include the following particulars :

- the description of the part and its heat treatment;
- the area of the part in which the tests were carried out;
- the effective depth of hardening after flame or induction hardening.

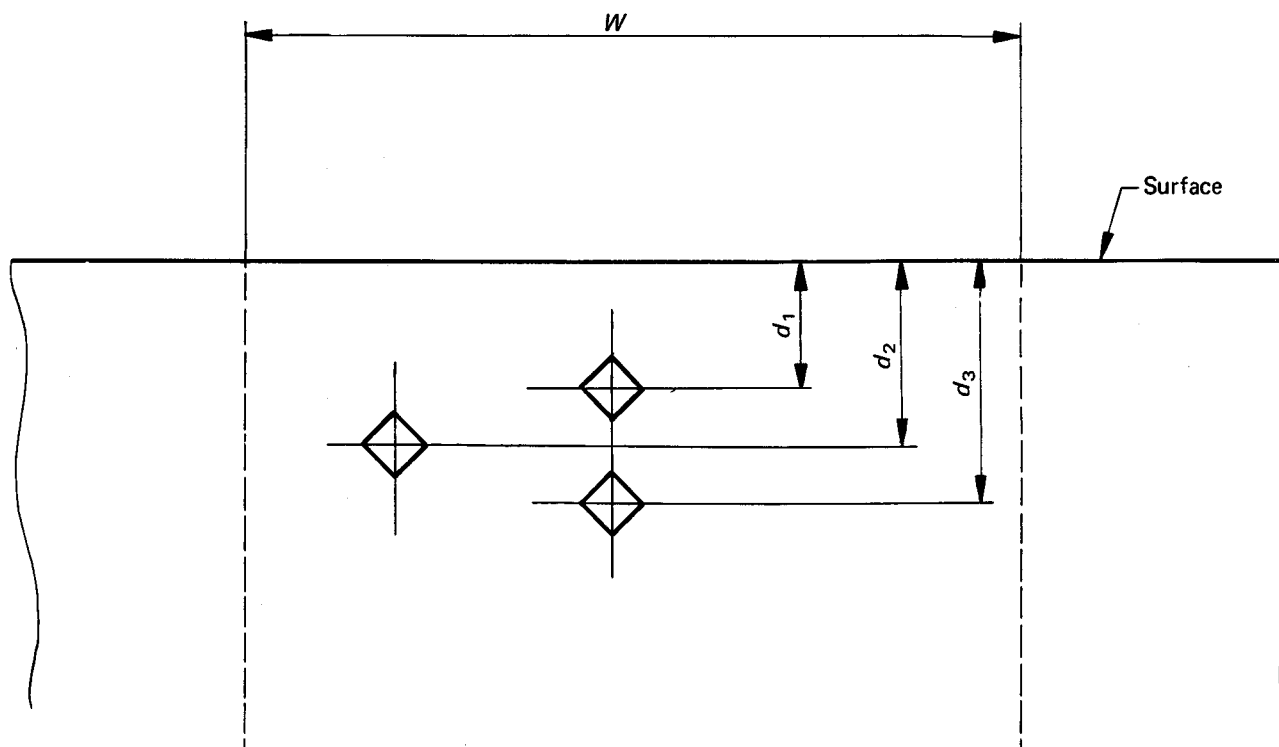


FIGURE — Position of the hardness impressions