

Iron and steel — Determination of the conventional depth of hardening after surface heating

The European Standard EN 10328:2005 has the status of a
British Standard

ICS 77.040.10

National foreword

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Iron and steel - Determination of the conventional depth of hardening after surface heating

Produits sidérurgiques - Détermination de la profondeur conventionnelle de trempe après chauffage superficiel

Eisen und Stahl - Bestimmung der Einhärtungstiefe nach dem Randschichthärten

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Contents

	Page
1 Scope	4
2 Normative references	4
3 Terms and definitions	4
4 Conventions	4
5 Limits of the method	5
6 Test method	5
7 Test report	6

Foreword

This document (EN 10328:2005) has been prepared by Technical Committee ECISS/TC 2 “Steel – Physico-chemical and non-destructive testing”, the secretariat of which is held by AFNOR.

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1 Scope

This document defines the test method for the determination of the conventional depth of hardening after surface heating.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 6507-1, *Metallic materials - Vickers hardness test - Part 1: Test method. (ISO 6507-1:1997)*

3 Terms and definitions

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

3.1

hardness limit

hardness (expressed in HV and measured according to EN ISO 6507-1) defined compared to minimal hardness on the surface of the piece in question by the ratio :

"hardness limits" = 0,80 X "minimal surface hardness".

3.2

effective depth of hardness after surface heating

distance between the surface of the piece to be tested and the point in the layer where the Vickers hardness is equal to the hardness limit, when measured under a strength of 9,807 N

4 Conventions

4.1 Expression of the effective depth of hardness after surface heating

This parameter is designated by the symbol D.S.

Its determination is expressed in millimetres, in the zone designated in the plan, on a piece, which may or may not have been rectified depending on the specification.

4.2 Special cases

All other values of hardness limit should be specially agreed. It should then be indicated by the symbol D.S.

By agreement between the parties, loads differing from the test strength (9,807 N) may be used, these loads being within the range 4,903 and 49,03 N.

Similarly, the use of the Rockwell method should be the subject of a prior agreement between the parties, which should also define the value of the hardness limit.

5 Limits of the method

The test is carried out only on:

- a) layers hardened by quenching, the thickness of which is greater than 0,3 mm;
- b) pieces which, in the condition in question, have at the distance 3 x DS from the surface, a hardness less than :

HV = a hardness lower than the hardness limit – 100.

In the cases where these conditions are not satisfactory, the depth of hardening after surface heating, shall be defined by special agreement (see 4.2).

6 Test method

6.1 General

The measuring is carried out, unless otherwise agreed, on a cross section of the piece in the hardened condition.

The method of determining the effective depth of hardening after surface heating under test strength 9,807 N (see 3.1) is the only one applicable in the case of litigation.

6.2 Principles of determination

The depth of hardening is determined from the profile of hardness from a cross section normal to the surface. It is calculated graphically on a curve representing the variations of this hardness as a function of the distance from the surface of the piece.

6.3 Carrying out the determination

6.3.1 Preparation of the surface examined

The section to be determined shall be polished so as to permit the correct determination of the dimensions of the hardness impressions. All necessary precautions shall be taken to avoid rounding the edges of this section adjacent to the surface and over heating the piece.

6.3.2 Determination of the hardness

The hardness impressions are placed along one or more lines normal to the surface and within a band width (w) 1,5 mm wide (see Figure 1).

The distance between the surface and successive impressions increases in 0,1 mm steps, the first point near the surface being 0,15 mm from the surface. In the case of very deep surface hardness, the distances between the impressions can be greater, but the distance between the impressions (S) shall remain 0,1 mm in the immediate vicinity of the zone presumed to exhibit the maximum hardness. The distances between the surface and the impressions ($d_1, d_2, d_3...$) are determined from the centre of the latter: the absolute error should then not be greater than $\pm 25 \mu\text{m}$.

These determinations are carried out on the surface in question in one or more specified regions by agreement between the parties and indicated on the drawing. For each region, the variation in hardness results should be plotted on a curve that represents them as a function of the distance to the surface.

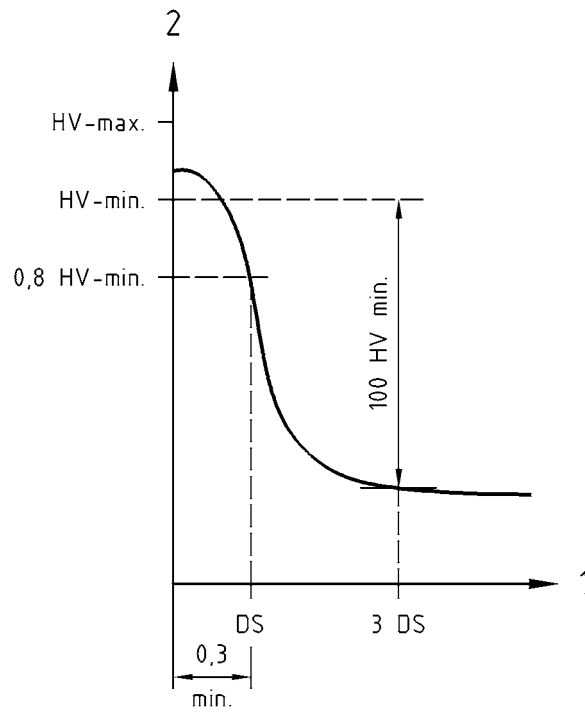
6.4 Result of the determination

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 representing the effective depth of hardening after surface heating.

7 Test report

The test report should indicate:

- test piece description and its heat treatment ;
- area of the piece where the tests are carried out ;
- curves of the zones in question ;
- depth of hardness after surface heating ;
- parameters which have influenced the results.



Key

- 1 Distance
- 2 HV

Figure 1 — Position of the hardness impressions

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