

EDS

Engineering,
GM DAEWOO Auto & Technology
Standards

EVALUATION OF INDUCTION OR FLAME HARDENING IN STEEL

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1. PURPOSE

This standard aims at establishing appropriate test method for **GMDAT** by specifying method of measuring case depth of steel hardness by flame or induction hardening process.

2. SCOPE

This standard specifies the methods of measuring case depth (hereinafter referred to as the case depth) of steel hardened by flame or induction hardening process.

3. DEFINITIONS

3.1. Effective case depth

The distance from the surface of a case, as quenched or as quenched and tempered, to the position of critical hardness as specified in Table 1. For special purpose, the critical hardness other than Table 1 may be designated.

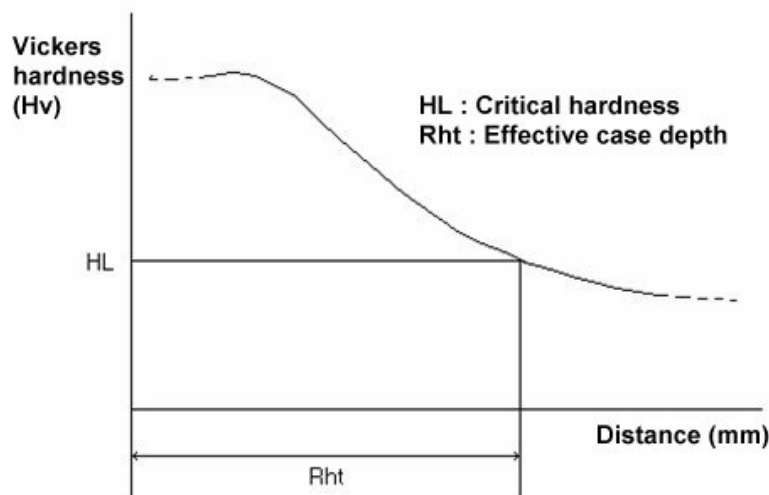


Fig. 1. Definition of effective case depth

Table 1. Critical Hardness of the Effective Case Depth

Carbon content of steel (%)	Critical hardness (Hv)
0.23 ~ 0.33	350
0.33 ~ 0.43	400
0.43 ~ 0.53	450
0.53 min.	500

Note: The carbon content of steel shall apply to the midpoint of range specified for the steel grade to be tested.

3.2. Total case depth

The distance from the surface of the hardness case to the point where the difference in physical and chemical properties between the case and the core material is no longer determinable. Physical properties shall be determined by the hardness and chemical properties by the macro-structure.

4. TEST PIECE

In principle, for the test piece, the product itself, hardened by flame or induction hardening process, shall be used. If impossible, a separate test specimen of the same material quality and processed under the same heat treatment conditions as the product may be used as an alternative.

4.1. Measuring point of sample

When the measuring points are not specified in the drawing, the test piece shall be prepared along either transverse or longitudinal direction as the hardening pattern and effective hardening depth measurement differ according to the shape and function of parts. The measuring points for components are as follows:

4.1.1. Gear Teeth : PCD

4.1.2. Thrust faces : two radial planes perpendicular to the surface

4.1.3. SHAFT & JOURNAL

(1) Transverse plane passing through the hardening center point and perpendicular to the shaft

(2) One or more radial planes passing through the pattern run-out and hardening center axis

5. KIND OF MEASURING METHOD

5.1. Measuring method by hardness test

5.1.1. The test piece shall be cut at right angle to the hardened case, and the surface shall be finished by polishing for testing. Care shall be taken in cutting and polishing that these processes may not affect the hardness and not blunt the edges of the surface to be tested.

5.1.2. The case depth shall be measured by means of vickers hardness test to the test surface. In this case, vickers hardness test load shall be 0.3 kgf or 1 kgf but if necessary, it shall be selected as 0.1 ~ 1 kgf.

5.1.3. Hardness transition curve shall be made according to the following 2 methods.

(1) Method A

1) The hardness transition curve shall be made by measuring the hardness along the straight line at right angle to the test plane. If necessary, after selecting 2 to 5 points within a 1.5 mm span on the plane, one hardness transition curve shall be made by measuring the hardness on each point along the straight line at right angle to the plane (See Fig. 2).

2) In the case of marking the hardness transition curve by vickers hardness test, the space between the measuring points shall be, in principle, not more than 0.1 mm.

3) For the vickers hardness test, the space between the center of the adjacent indentation shall be not less than 2.5 times the diagonal length of the indentation.

(2) Method B(Only for effective case depth)

1) Only in case effective case depth is 0.3 max.(See Fig. 3).

2) Effective case depth shall exist between t1 and t2 on the surface, distance between t1 and t2 shall be 0.3