

EVALUATION OF THE INDUCTION OR FLAME HARDENING OF COMPONENTS**1. Scope**

This procedure defines the methods to be used for evaluating induction or flame hardened steel or cast iron components relative to specified requirements.

2. Principle of Methods

Induction or flame hardening requirements are normally specified by a combination of the following methods:

- (a) Surface hardness in specified areas of the component
- (b) A hardening pattern to be effective in specific areas to a specific depth
- (c) Hardness requirements at specific depths below the surface

Methods detailed in this procedure are for determining conformance with these specifications and include interpretation of surface hardness requirements, a macroscopic method for determining the hardening pattern, and a hardness traverse method for determining the depth of effective hardening.

3. Apparatus Required

- 1. Cut-off machine
- 2. Linishing machine
- 3. Metallurgical hand grinders or equivalent
- 4. Hardness test machines
- 5. 5 % Nital etch solution
- 6. Low-powered metallurgical microscope with calibrated graticule

Conditioning and Test Conditions

All test values indicated herein are based on material conditioned in a controlled atmosphere of 23 +/- 2 °C and 50 +/- 5 % relative humidity for not less than 24 h prior to testing and tested under the same conditions unless otherwise specified.

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4. Selection of Sample

Unless specified on the component print, selection of the position for determining the hardening pattern or depth of effective hardening is dependent on the geometry and function of the component. Components shall be sectioned in such a manner as to permit measurement in the following positions, a transverse and longitudinal section generally being necessary.

Gear Teeth

1. In a plane midway along and normal to the tooth flank face.
2. In a radial plane through the centre line of the tooth.

Thrust Faces

Two radial planes at 90 °and normal to the face.

Shafts and Journals

1. In a transverse plane, normal to the axis and through the centre of the hardened zone.
2. One or more radial planes through the axis to show the centre of the hardened zone and areas of pattern run-out.

5. Preparation of Sample

The surface of the sample on which the hardening pattern or depth of effective hardening is to be determined, must be ground to a sufficiently fine finish to permit etching and distinct formation of hardness test impressions. All precautions must be taken to prevent rounding of edges and overheating of the sample.

6. Determination of Surface Hardness

1. The surface hardness should be determined using standardised methods and practices, the actual method used being as specified on the component print with due regard to corrections for surface curvature.
2. Sufficient hardness tests should be made to ensure compliance with specification over the total area and to define the periphery of the hardened zone.
3. Acceptance of hardening in sections not normally accessible to hardness testing, e.g., fillet radii, groove roots, etc., may be determined by ensuring satisfactory extension of the hardening pattern using the method detailed in para 7.