

Procedure For The Ultrasonic Testing Of Steel H Beams With Parallel Flanges and IPE Beams

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1. Scope

This procedure covers the manual ultrasonic testing of steel H beams with parallel flanges and IPE beams using the reflection method of ultrasonic testing for the detection of the presence of internal discontinuities.

This method is based on the reflection of longitudinal ultrasonic waves, the direction of which are approximately perpendicular to the surface of the product.

The examination consists of:

A. location and evaluation of the discontinuities by comparing the amplitude of the discontinuity echo with the amplitude of a 5mm FBH located at the same depth as the discontinuity. Note: Only those discontinuities giving an echo amplitude equal or greater than 5mm FBH shall be considered.

B. determining the area of the discontinuity using the -6dB beam width technique, with the length being parallel to the rolling direction and the width being perpendicular to the rolling direction.

2. Application

The examination shall take place at stages defined in the purchasing specification, drawings, inspection/test plans, etc. Unless otherwise agreed, testing shall be performed in the delivery condition.

All beams tested in accordance with this procedure shall be examined using longitudinal waves and the manual pulse-echo contact scanning technique. Equipment shall utilise an A scan presentation.

All flanges and webs of the beam shall be tested from one side only. In the case of flanges, the testing shall be conducted on the opposite side from the web i.e. the outside face of the flange.

3. References

This procedure makes reference to the following documents:-

BS EN ISO 9712:2022 Non-destructive testing. Qualification and certification of NDT personnel.

BS EN 10306:2002 Iron and steel. Ultrasonic testing of H beams with parallel flanges and IPE beams

BS EN ISO 2400:2025 Non-destructive testing. Ultrasonic testing. Specification for standard block No. 1

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BS EN ISO 22232-1:2020 Non-destructive testing. Characterization and verification of ultrasonic test equipment. Part 1: Instruments

BS EN ISO 22232-2:2020 Non-destructive testing. Characterization and verification of ultrasonic test equipment. Part 2: Probes

BS EN ISO 22232-3:2020 Non-destructive testing. Characterization and verification of ultrasonic test equipment. Part 3: Combined equipment

BS EN 1330-1:2014 Non-destructive testing. Terminology. List of general terms

BS EN ISO 5577:2025 Non-destructive testing. Ultrasonic testing. Vocabulary

BS EN ISO 16811:2025 Non-destructive testing. Ultrasonic testing. Sensitivity and range setting

BS EN ISO 16827:2025 Non-destructive testing. Ultrasonic testing. Characterization and sizing of discontinuities

4. Definitions & Abbreviations

Internal discontinuity - Any imperfection lying within the thickness of the flange or web, e.g. planar or laminar imperfection, single plane or multi-plane inclusion bands or clusters.

Defect - Unacceptable internal discontinuity i.e. one exceeding the specified maximum size or population density limits.

Population density - The number of individual internal discontinuities of a size greater than a specified minimum size and less than a specified maximum size, per specified area of body or length or edge zone.

Manual or assisted manual testing - Testing by an operator applying an ultrasonic probe, or probes, to the flat surface, manually executing the appropriate scanning pattern on the flat product surface and visually assessing ultrasonic signal indications on the electronic equipment screen either by direct viewing or built-in signal amplitude alarm devices.

FBH - Flat bottom hole

DAC - Distance amplitude correction curve

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5. Personnel Qualifications

All personnel operating to this procedure shall hold a minimum of Level 2 certification in accordance with BS EN ISO 9712 in the ultrasonic testing of forgings and wrought products, e.g. PCN Level 2.

All personnel shall also hold a valid eyesight certificate (meeting the requirements of BS EN ISO 9712 Section 7.4) obtained within the last 12 months.

All personnel documentation shall be kept on file and made available to the customer, end-user or client upon request.

6. Surface Finish

In the as rolled stage, beams shall normally be examined without any special surface preparation. Scanning surfaces shall be free from paint, non-adhering scale, dry couplant, surface irregularities or any other substance which could reduce coupling efficiency, hinder free movement of the probe or cause errors of interpretation.

The surface condition shall be considered acceptable providing the specified quality class can be achieved.

7. Equipment

The ultrasonic flaw detector shall have an A-scan presentation and comply with the requirements of BS EN ISO 22232-1 and have a current calibration certificate.

Calibration blocks shall comply with BS EN ISO 2400.

5mm FBH reference blocks made from material having similar acoustic properties and surface condition as the product under examination. The reference block shall have at least three reflectors covering the depth range under examination.

A stepped reference block covering the thickness range(s) to be used in the test.

8. Probes

Only combined double crystal 0° compression wave probes shall be used and shall have the following characteristics: a greatest transducer dimension of 9-25mm (unless otherwise agreed) and a nominal frequency of 2-5 MHz.

Probes used shall conform to the requirements of BS EN ISO 22232-2.

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