Procedure For The Ultrasonic Testing

Of Steel Bar to ASTM A388/API 6A PSL3

(ISO 10423)

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1. Scope

This procedure covers the ultrasonic inspection of round steel bar products using the longitudinal wave manual pulse-echo technique for on-site and in-house use.

This procedure follows practices laid down in ISO 10423 (API6A PSL3) and ASTM A388.

The procedure only covers the testing of ferritic, martensitic, austenitic, duplex steel, steel alloys and super-alloys (i.e. Inconel) solid round, square and rectangular bar products.

This procedure is only to be used for the inspection of newly manufactured wrought bar products and does not cover in-service inspection or items which have been subject to any repair work

This procedure does not cover bar stock which has been extensively machined (i.e. into components) except where turning has taken place to improve surface condition.

This procedure only covers solid bar products and is not applicable to bars which have been bored or are hollow.

This procedure shall be carried out once all heat treatment operations have been completed and at least 48 hours after the final heat treatment operation has been completed.

2. References

This procedure makes reference to the following documents:-

API 6A / BS EN ISO 10423:2009 Petroleum and natural gas industries. Drilling and production equipment. Wellhead and christmas tree equipment
ASTM A388 / A 388M-19 Standard Practice for Ultrasonic Examination of Steel Forgings
BS EN ISO 9712:2012 Non-destructive Testing. Qualification and certification of NDT personnel.
BS EN ISO 2400:2012 Non-Destructive testing - Ultrasonic Examination - Specification for calibration block No. 1
BS EN 12668-1:2010 Non-destructive testing - Characterization and verification of ultrasonic examination equipment - Part 1: Instruments
BS EN 12668-2:2010 Non-destructive testing - Characterization and verification of ultrasonic examination equipment - Part 2: Probes
BS EN 12668-3:2013 Non-destructive testing - Characterization and verification of ultrasonic examination equipment - Part 3: Combined equipment
BS EN 1330-1:2014 Non-destructive testing - Terminology - List of general terms
BS EN 1330-4:2010 Non-destructive testing - Terminology - Terms used in ultrasonic testing

BS EN ISO 16811:2014 Non-destructive testing - Ultrasonic testing - Sensitivity And Range Setting

3. Definitions & Abbreviations

As well as the terms defined in BS EN 1330-1 and BS EN 1330-4 this procedure uses the following definitions:

PCN	Personnel certification in Non-destructive testing
COSHH	Control of substances hazardous to health
PPE	Personal protective equipment
FBH	Flat-bottom hole
FSH	Full screen height
DAC	Distance-amplitude correction

4. Safety

All consumables used shall have accompanying COSHH data sheets and shall be disposed of in a way that is non-injurious to site personnel or to the environment.

Personnel working to this procedure shall at all times wear mandatory PPE; overalls, safety boots, hard hat, high visibility clothing, safety eyewear.

5. Personnel Qualifications

All personnel following this procedure must be currently certified by PCN (or ISO 9712 equivalent body) to a minimum of Level 2 covering the ultrasonic testing of forgings and wrought products.

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

Documentation relating to ultrasonic operators working on-site for the steel supplier/end user shall be kept on file at the administration offices for review purposes.

6. Identification And Datum Points

All bars tested shall be permanently stamped/engraved at one end with an identifying cast number and where more than one bar from the same cast is to be tested, each bar shall be uniquely numbered by stamping/with indelible ink at the same end for identification purposes.

The end of the bar marked with the cast number shall be used as the datum point for reporting purposes.

7. Surface Finish

The surface roughness of exterior finishes shall not exceed 250 µin. [6.3 µm] unless otherwise shown on the forging drawing or stated in the order or the contract.

Regardless of surface condition, all surfaces to be examined shall be clean and free from paint, scale, dry couplant, surface irregularities or any other substance that could reduce coupling efficiency, hinder the free movement of the probe or cause errors in interpretation.

Unsatisfactory surface finish shall be categorised as a non-conformance to procedure as per section 15.

8. Extent of Inspection

All bars tested in accordance with this procedure shall be examined using the longitudinal wave manual pulse-echo technique on:

- In the case of square/rectangular bars: 100% of all four faces parallel to the direction of rolling.
- In the case of round bars: 360^0 of the cylindrical surface of the bar along full length.
- Where possible a end-to-end scan shall be performed from both end faces where the sound path covers the full length of the bar under test. Where not possible this shall be noted on the final report.

This procedure only covers solid round, square and rectangular bar stock and is not applicable to bar stock which has been bored.

9. Equipment Specification

The following equipment is required in order to carry out this procedure:

An ultrasonic flaw detector with an A-scan presentation which meets the requirements of BS EN 12668-1/ASTM A388.

A calibration block No. 1 manufactured in accordance with BS EN ISO 2400.

A set of reference blocks to cover the range required in the sensitivity required (See appendix C).

Reference test blocks shall be manufactured out of the same (or acoustically similar) material as the items under test and shall also have a comparable surface finish to the items under test.