

Procedure For The Ultrasonic Testing Of Spheroidal Graphite Cast Iron Castings To BS EN 12680-3

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Authored By: Mr A Sample PCN Level 3 **Signed:** Mr A Sample **Date:**	**Authorised For Use By:** **Signed:** **Date:**

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1. Scope

This procedure covers the ultrasonic inspection of spheroidal graphite (SG) cast iron castings for internal discontinuities by the pulse-echo technique in accordance with BS EN 12680-3:2025.

This procedure does not cover ultrasonic testing of the nodularity of spheroidal graphite cast irons, the phased array technique or the transmission technique.

This procedure does not apply to steel castings, for which BS EN 12680-1 or BS EN 12680-2 is applicable.

This procedure has been written to cover the inspection of newly manufactured castings, but may cover the inspection of in-service items providing the requirements of this procedure can be met. This procedure also covers items which have been subject to initial upgrading and repair work.

This procedure does not cover any castings which have been extensively machined (i.e. into finished components) except where proof machining/turning has taken place to improve surface condition.

2. References

This procedure makes reference to the following documents:

BS EN 12680-3:2025 Founding. Ultrasonic testing. Part 3: Spheroidal graphite cast iron castings

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

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

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

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BS EN ISO 16811:2025	Non-destructive testing. Ultrasonic testing. Sensitivity and range setting
BS EN ISO 7963:2022	Non-destructive testing. Ultrasonic testing. Specification for calibration block No. 2
BS EN ISO 16810:2024	Non-destructive testing. Ultrasonic testing. General principles
BS EN ISO 16827:2025	Non-destructive testing. Ultrasonic testing. Characterization and sizing of discontinuities
BS EN 1370:2026	Founding. Examination of surface condition

3. Definitions & Abbreviations

As well as the terms defined in BS EN 12680-3, BS EN 1330-1 and BS EN ISO 5577 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
SDH	Side drilled hole
FSH	Full screen height
DAC	Distance-amplitude correction
BWE	Back wall echo
DGS	Distance-gain-size
SG	Spheroidal graphite
Rim zone	1/5 of wall thickness from surface (5 mm min, 30 mm max)
Dross	Fine slag particles (oxides, sulphides etc.) in the rim zone

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 operating to this procedure shall hold a minimum of Level 2 certification in accordance with BS EN ISO 9712 in the ultrasonic testing of castings, 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.

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Documentation relating to ultrasonic operators employed by or working for the foundry shall be kept on file at the administration offices for review purposes.

6. Identification And Datum Points

All castings tested shall be marked (either cast on or stamped) with a unique number for identification purposes, this number shall be used as the datum point for reporting purposes.

7. Surface Preparation

The surface condition shall be such that satisfactory coupling conditions can be maintained at all times.

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.

To meet the above requirements it is recommended that all surfaces are either dressed, shot blasted or proof machined. Surface condition requirements in accordance with BS EN 1370 should be agreed at the time of enquiry and order.

For guidance the following surface finishes are considered acceptable:

- Shotblast: BS EN 1370 - 4S1 or equivalent
- Ground: BS EN 1370 - 4S2 or equivalent.

The roughness of any machined surface used for testing shall be Ra ≤ 12.5 µm.

For special test techniques, higher surface qualities such as 2S1 or 2S2 (BS EN 1370) and Ra ≤ 6.3 µm can be necessary.

If a casting is found to have a surface condition which means that a complete satisfactory ultrasonic examination cannot take place, then the foundry management and/or the responsible Level 3 shall be informed so that corrective action can be taken before the casting is subject to ultrasonic testing.

8. Extent Of Inspection

The areas of the casting to be tested, the number or percentage of castings to be tested and whether these areas are to be point tested or scanned (and in which directions) shall be agreed at the time of enquiry and order. These areas should preferably be indicated on the casting drawing.

Additional testing may be required in order to conform with customer requirements; these shall be given in writing by the foundry or customer prior to NDT operations commencing.

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