

Procedure For The Magnetic Particle Testing Of Steel Castings To DEF STAN 02-729 Part 2

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1. Scope

This procedure describes the method of magnetic particle inspection of ferromagnetic steel castings in accordance with DEF STAN 02-729 Part 2 Issue 4, with acceptance to DEF STAN 02-745 unless otherwise specified in the Contract Documents, and must be adhered to as applicable to ensure customer requirements are met and that compliance with orders received is achieved.

This procedure is only applicable to the testing of castings using portable AC yoke MPI equipment and the continuous wet method of inspection, with either colour contrast (black magnetic ink on white contrast paint) or fluorescent magnetic ink. AC yokes are the preferred magnetising equipment (DEF STAN 02-729 Part 2 clause 7.2 a)); permanent magnets and DC yokes are not covered by this procedure.

Unless otherwise specified in DEF STAN 02-729 Part 2, the technical requirements of BS EN ISO 9934-1, -2 and -3 apply (clause 1.4). Written approval of this procedure shall be obtained from the Design Authority before it is used (clause 4.1 b)).

Copper alloy, nickel alloy and austenitic stainless steel castings are not ferromagnetic and shall be tested by liquid penetrant instead (DEF STAN 02-745 clause 3.3.1).

This procedure covers the testing of newly manufactured castings, weld repairs, in-service items and repairs to cast items. It does not apply to the examination of nuclear plant and machinery (DEF STAN 02-729 Part 2 clause 1.3).

2. References

This procedure makes reference to the following documents:-

DEF STAN 02-729 Part 2 Issue 4 Requirements for Non-Destructive Examination Methods. Part 02: Magnetic Particle

DEF STAN 02-745 Issue 3 Classification, Inspection Requirements and Acceptance Standards for Steel Castings

BS EN 1369:2012 Founding - Magnetic particle testing

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

BS EN ISO 18490:2026 Non-destructive testing. Evaluation of vision acuity of NDT personnel

BS EN ISO 9934-1:2016 Non-destructive testing. Magnetic particle testing. Part 1: General principles

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BS EN ISO 9934-2:2015	Non-destructive testing. Magnetic particle testing. Part 2: Detection media
BS EN ISO 9934-3:2015	Non-destructive testing. Magnetic particle testing. Part 3: Equipment
BS EN ISO 3059:2012	Non-destructive testing. Penetrant testing and magnetic particle testing. Viewing conditions.
BS EN 1330-1:2014	Non-destructive testing. Terminology. List of general terms

Controlling document highlighted in **bold**.

3. Safety

Personnel working to this procedure shall work in such a manner as to comply with the Health and Safety at Work act (1974)

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, etc.

Mains powered equipment i.e. 110V yokes shall be in good working order and have been PAT tested within the last 12 months.

Caution: AC yokes produce magnetic fields which may be capable of disrupting and or stopping the normal operation of watches, credit cards, pacemakers and other items sensitive to strong magnetic fields.

4. Personnel qualification

All personnel operating to this procedure shall hold a minimum of Level 2 certification in accordance with BS EN ISO 9712 in the magnetic particle testing of castings, e.g. PCN Level 2.

All personnel shall meet the vision requirements of BS EN ISO 9712 and provide documentary evidence (DEF STAN 02-729 Part 2 clause 4.2 i)): near vision acuity shall permit reading a minimum of Jaeger number 1 or Times Roman N 4.5 or equivalent letters (1.6 mm high) at not less than 300 mm, with one or both eyes, corrected or uncorrected; colour vision shall be sufficient to distinguish and differentiate contrast between the colours or shades of grey used in the method. Vision shall be tested annually. Information on vision testing is given in BS EN ISO 18490.

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Personnel shall be able to demonstrate their ability to meet the requirements of this procedure (clause 4.2 b)). A register of approved personnel shall be kept (clause 4.2 j)).

Documentation relating to operators certification shall be kept on file at the administration offices for review purposes.

5. Description of method

Magnetic particle inspection is a method used to detect cracks, cold laps, inclusions and other discontinuities on or close to the surface of ferromagnetic materials. Magnetic particle examination is not suitable for testing non-ferromagnetic materials such as austenitic stainless steels.

The magnetic particle inspection test described in this procedure consists of locally magnetising an area to be examined, then by applying suitably prepared magnetic particles and subsequently interpreting and evaluating any resulting particle accumulations. Maximum detectability occurs when the discontinuity is positioned on the surface and perpendicular to the magnetic flux.

6. Testing materials

The following magnetic particle inspection materials shall be used.

Fluorescent method
Hydrocarbon based fluorescent magnetic ink.
The ink shall have a solid content within the manufacturer's specification for the product, as stated on the product data sheet.

Colour contrast method
Hydrocarbon based black magnetic ink.
The ink shall have a solid content within the manufacturer's specification for the product, as stated on the product data sheet.
White contrast aid paint.

Solvent cleaner.

All consumables shall comply with the requirements of BS EN ISO 9934-2. It is highly recommended that all MPI consumables used are from the same product family to ensure compatibility.

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