

Procedure For The Ultrasonic Testing Of Steel, Copper Alloy And Nickel Alloy Castings to DEF STAN 02-729 Part 5

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1. Scope

This procedure covers the manual ultrasonic testing of steel castings and of copper alloy and nickel alloy castings using the compression (longitudinal) and shear wave pulse-echo contact technique, in accordance with DEF STAN 02-729 Part 5 Issue 4 clause 21, for on-site and in-house use.

Steel castings are assessed against DEF STAN 02-745. Copper alloy and nickel alloy castings (e.g. nickel copper alloy, nickel aluminium bronze, alloy 625, copper nickel chromium, gunmetal and aluminium silicon bronze) are assessed against DEF STAN 02-863. Where a specific Defence Standard exists for the casting material concerned, the NDE acceptance standards in that standard shall apply (DEF STAN 02-863 clause 2.6).

Where DEF STAN 02-729 Part 5 is referenced from a material specification, the material specification has precedence over this procedure (clause 1.5).

The casting material type, grain structure and surface condition may limit the useful application of ultrasonic testing (clause 21.1). The suitability of steel castings for ultrasonic testing shall be assessed in accordance with BS EN 12680-1 (DEF STAN 02-745 clause 3.4.1); see section 12.

Where designated regions are to be examined ultrasonically, this procedure, including the method of assessing defect severity given in section 13, shall be approved by the Design Authority or its nominated representative before use (DEF STAN 02-745 clauses 3.4.2 and 4.2; DEF STAN 02-863 clause 2.5.4).

Unless otherwise agreed, the ultrasonic testing of steel castings shall be backed up by radiography to DEF STAN 02-729 Part 1 of selected areas nominated by the Design Authority, representing a minimum of 10% of the total area examined ultrasonically (DEF STAN 02-745 clause 3.4.2). For copper alloy and nickel alloy castings, ultrasonic testing is used where radiography is not possible and both methods are not mandatory (DEF STAN 02-863 clause 2.5.4). Radiography is outside the scope of this procedure.

This procedure is to be used for the inspection of newly manufactured castings, including weld repairs, and, where suitable, can be used for in-service inspection.

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

Unless otherwise specified in the Contract Documents, testing shall be performed after all heat treatment has been completed, when the grain structure is refined and attenuation is reduced (clause 21.5 b)).

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2. References

This procedure makes reference to the following documents:-

DEF STAN 02-729 Part 5 Issue 4 Requirements for Non-Destructive Examination Methods. Part 5: Ultrasonic

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

DEF STAN 02-863 Issue 4 Requirements for the Classification, Dimensions, Tolerances and General Standards of Acceptance for Copper and Nickel Alloy Castings

BS EN 12680-1:2025 Founding. Ultrasonic testing. Part 1: Steel castings for general purposes

BS 2737:1956 Terminology of internal defects in castings as revealed by radiography

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 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

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

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3. Definitions & Abbreviations

As well as the terms defined in 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
BWE	Back wall echo
DEF STAN	Defence Standard
DAC	Distance-amplitude correction

Contract Documents: The purchase order, drawings, reference diagrams, material specification and any other documents that specify the requirements for the item.

Design Authority: The authority responsible for the design of the item, as identified in the Contract Documents.

Approval Authority: The authority responsible for approving the examining authority, its procedures and personnel, as identified in the Contract Documents.

Material specification: The DEF STAN or other specification to which the casting is supplied, e.g. DEF STAN 02-747 or DEF STAN 02-830.

Reference diagram: The designer's diagram showing the Critical Test Regions and Test Regions of a Class I or Class II casting (DEF STAN 02-745 clause 2; DEF STAN 02-863 clause 2.2).

Critical Test Region, Test Region, Non-designated Region: The regions of a casting as defined in DEF STAN 02-745 clause 2.1 and DEF STAN 02-863 clause 2.2.

Contract drawing section thickness: The section thickness of the casting shown on the contract drawing, against which the reduction in section thickness is assessed.

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.

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