Procedure For The Ultrasonic Thickness Determination Of Materials In Accordance With BS EN ISO 16809:2025

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1. Scope

This is a general procedure that describes the methods and principles for manual ultrasonic thickness determinations and corrosion monitoring of metallic materials. The examinations are to be carried out by direct contact, based on the accurate determination of the time of flight of ultrasonic pulses.

The procedure covers the determination of thickness of materials and components in-service, during manufacture or under repair.

This procedure is written in accordance with BS EN ISO 16809:2025.

2. Applicable documents

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

BS EN ISO 16809:2025 Non-destructive testing. Ultrasonic thickness determination

BS EN ISO 16831:2025 Non-destructive testing. Ultrasonic testing. Characterization and verification of ultrasonic equipment for the determination of thickness.

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

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

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

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3. Safety

Personnel working to this procedure shall work in such a manner as to comply with the Health and Safety at Work etc. 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.

Any equipment that requires the use of mains electricity shall have successfully passed a PAT test within the last 12 months and be in good working condition.

Where thickness determinations are carried out in hazardous atmospheres, the applicable safety regulations and standards shall be followed. In explosive atmospheres, the instrument, probe and cable combination shall be classified as intrinsically safe, and the relevant safety certification and documentation shall be checked and completed prior to use. Standard ultrasonic equipment is not normally intrinsically safe. In corrosive atmospheres, the couplant shall not react adversely with the environment and shall retain its acoustic properties.

4. Personnel qualification

Operators trained and qualified in ultrasonic testing to PCN (BS EN ISO 9712) Level 2 will be employed to carry out ultrasonic thickness determinations in accordance with this procedure.

The operator shall have a detailed understanding and training related to ultrasonic thickness determination. In addition, the operator shall have knowledge of the product and material where thickness is to be determined.

All personnel shall meet the eyesight requirements of BS EN ISO 9712 Section 7.4 and shall be certified annually to ensure this.

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

5. Modes of determination

The thickness of a part or structure is determined by accurately measuring the time required for a short ultrasonic pulse generated by a transducer to travel through the thickness of the material once, twice or several times.

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The material thickness is then determined by multiplying the known sound velocity of the material with the transit time by the number of times the pulse transits the material wall.

This principle can be accomplished by applying one of the following modes, see Figure 1.

- ❏ Mode 1: Measure the transit time from the initial excitation pulse to a first returning echo, minus a zero correction to account for the thickness of the transducer wear surface and the couplant layer (first backwall echo mode)
- ❏ Mode 2: Measure the transit time from the end of the delay line to the first backwall echo (first backwall echo delay line mode)
- ❏ Mode 3: Measure the transit time between backwall echoes (multiple echoes)
- ❏ Mode 4: Measure the transit time for a pulse travelling from the transmitter to a receiver in contact with the backwall (through transmission mode)

Figure 1 – Modes of determination

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