



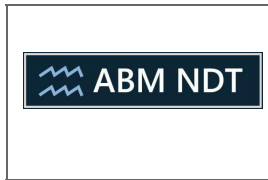
**Procedure For The Ultrasonic Testing  
Of Full Penetration Butt Welds In  
Steel Plate And Pipe**

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# ULTRASONIC INSPECTION PROCEDURE

Reference: PROC/GEN/UT/17640:2010 Issue:01 | Date of Issue: 06/02/2018

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## 1. Scope

This procedure describes the method of ultrasonic examination of full penetration butt welded joints in steel plate and pipe sections and must be adhered to as applicable to ensure customer requirements are met and that compliance with orders received is achieved.

This procedure only covers the pulse echo contact method of ultrasonic examination of fusion welded joints in low alloy ferrous steel having wall thickness up to, and including 50mm and at temperatures between 0° to 60° C.

Weld undergoing ultrasonic inspection shall be subject to 100% volumetric examination of the weld body and heat affected zone.

## 2. References

This procedure makes reference to the following documents:-

**BS EN ISO 9712:2012** Non-destructive Testing. Qualification and certification of NDT personnel.

**BS EN ISO 17640:2010** Non-destructive testing of welds. Ultrasonic testing. Techniques, testing levels, and assessment

**BS EN ISO 7963:2010** Non-destructive testing. Specification for calibration block No. 2

**BS EN 12668-1:2010** Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Pt. 1 Instruments

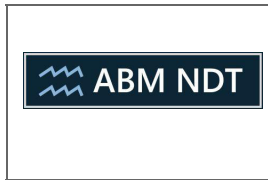
**BS EN 12668-2:2010** Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Pt 2. Probes

**BS EN 12668-3:2013** Non-destructive testing. Characterisation and verification of ultrasonic examination equipment. Combined equipment.

## 3. Definitions & Abbreviations

The following definitions and abbreviations are used in this procedure.

BWE	Back wall echo
DAC	Distance amplitude correction
dB	Decibel
FSH	Full screen height
NDT	Non-destructive testing
PCN	Personnel Certification In NDT



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SDH            Side drilled hole  
UT             Ultrasonic Testing

## 4. Personnel Qualifications

All personnel operating to this procedure shall hold a minimum of Level 2 certification in accordance with ISO 9712, in the ultrasonic testing of welds. e.g. PCN Level 2

Note: It is critical that UT operator certification must cover the configuration of weld that is to be tested i.e. 3.1 and 3.2 for plate and pipe welds.

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

## 5. Surface Finish

Surfaces from which scanning is carried out shall be such that satisfactory acoustic coupling can be maintained at all times.

Surfaces shall be free from scale, foreign material, rust, oil/grease, gouge marks, burning slag residue or any other material that could affect the sensitivity of the test.

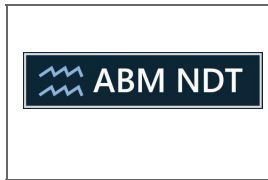
The scanning surface shall be given as either 1.25 x the maximum beam path or three times the weld thickness, whichever is greatest.

## 6. Equipment

The following equipment shall be used when working to this procedure.

- A-scan ultrasonic flaw detector.
- No.2 Calibration block.
- 0° Twin crystal, 45°, 60°, 70° single crystal 10mm Ø, 4-5MHz probes.
- Commercial couplant.
- DAC block with 3mm Ø transverse drilled holes at different depths made from the same or equivalent material as the item to be tested.

All flaw detectors and probes used shall comply with EN 12668 (all parts).



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## 7. Equipment and Performance Checks

All functional and calibration checks of equipment shall be performed in accordance with BS EN 12668-3

Daily checks to include:-

- Probe index point
- Probe beam angle

Weekly checks to include:-

- Timebase linearity
- Amplification linearity
- Probe signal to noise ratio
- Pulse duration

All equipment checks shall be recorded by the operator and shall be made available upon future request.

## 8. Couplant

Commercial couplant shall be used. Eg. UCA-7 or Sonagel. The choice of couplant used shall not be harmful to the material being tested.

## 9. Calibration & Sensitivity

When calibrating and setting sensitivity all calibration blocks and reference test pieces shall be no more than +/- 15°C from the temperature of the item under test.

All probes shall be calibrated for range using the no.2 block.

Sensitivity for compression wave probes shall be BWE to FSH from a defect free area of parent material plus an additional 6dB.

Sensitivity for shearwave probes shall be set by constructing a DAC from the 3mm SDH reference block plus an additional 14dB

Checks shall be taken every 4 hours to confirm these settings and on completion of the inspection. Checks shall also be carried out whenever a system parameter has changed or when it is suspected the system parameters are not being met. If deviations are found during these checks the corrections given in the table below shall be carried out.

Sensitivity		
1	Deviations <4 dB	Setting shall be corrected before testing is continued.
2	Reduction in sensitivity > 4 dB	Setting shall be corrected and all testing carried out with the equipment over the previous period shall be repeated.
3	Increase in sensitivity > 4 dB	Setting shall be corrected and all recorded indications shall be re-examined.
Range		
1	Deviations <2%	Setting shall be corrected before testing continued.
2	Deviations >2%	Setting shall be corrected and testing carried out with the equipment over the previous period shall be repeated.

## Transfer Correction

When separate blocks are used for establishing reference levels, a measurement shall be made of the transfer differences between the test item and the test block at a number of representative locations.

- If the differences are less than 2dB, correction is not required.
- If the differences are greater than 2dB but less than 12dB, they shall be compensated for.
- If transfer losses exceed 12dB, the reasons shall be investigated and further surface preparation carried out. When there are no apparent reasons for the high correction values, the attenuation shall be measured at various locations and where it varies significantly, corrective action shall be taken

## Signal To Noise Ratio

During the weld examination, the noise level shall remain at least 12dB below the evaluation level.