

# Non-destructive testing of steel forgings —

## Part 3: Ultrasonic testing of ferritic or martensitic steel forgings

The European Standard EN 10228-3:1998 has the status of a  
British Standard

ICS 77.040.20; 77.140.85

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# National foreword

This British Standard is the English language version of EN 10228-3:1998. Together with BS EN 10228-4 it supersedes BS 4124:1991 which will be withdrawn when BS EN 10228-4, *Ultrasonic testing of austenitic-ferritic stainless steel forgings*, is published.

The UK participation in its preparation was entrusted by Technical Committee ISE/73, Steels for pressure purposes, to Subcommittee ISE/73/3, Steel forgings for pressure purposes, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

## Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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## Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 15 and a back cover.

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on 15 September 1998

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English version

## Non-destructive testing of steel forgings — Part 3: Ultrasonic testing of ferritic or martensitic steel forgings

Essais non destructifs des pièces forgées en acier — Partie 3: Contrôle par ultrasons des pièces forgées en aciers ferritiques et martensitiques

Zerstörungsfreie Prüfung von Schmiedestücken aus Stahl — Teil 3: Ultraschallprüfung von Schmiedestücken aus ferritischem oder martensitischem Stahl

This European Standard was approved by CEN on 21 December 1997.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

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Foreword

This European Standard has been prepared by Technical Committee ECISS/TC 28, Steel forgings, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 1998, and conflicting national standards shall be withdrawn at the latest by November 1998.

The titles of the other parts of this European Standard are:

- *Part 1: Magnetic particle inspection.*
- *Part 2: Penetrant testing.*
- *Part 4: Ultrasonic testing of austenitic and austenitic-ferritic stainless steel forgings.*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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## 1 Scope

This part of EN 10228 describes the techniques to be used for the manual, pulse-echo, ultrasonic testing of forgings manufactured from ferritic and martensitic steel. Mechanized scanning techniques, such as immersion testing, may be used but should be agreed between the purchaser and supplier (see clause 4).

This part of EN 10228 applies to four types of forgings, classified according to their shape and method of production. Types 1, 2 and 3 are essentially simple shapes. Type 4 covers complex shapes.

This part of EN 10228 does not apply to:

- closed die forgings;
- turbine rotor and generator forgings.

Ultrasonic testing of austenitic and austenitic-ferritic stainless steel forgings is the subject of Part 4 of this European Standard.

## 2 Normative references

This part of EN 10228 incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this part of EN 10228 only when incorporated in by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 473, *Qualification and certification of NDT personnel*.

prEN 12668-1, *Non-destructive testing — Characterization and verification of ultrasonic examination equipment — Part 1: Instruments*.

prEN 12668-2, *Non-destructive testing — Characterization and verification of ultrasonic examination equipment — Part 2: Probes*.

prEN 12668-3, *Non-destructive testing — Characterization and verification of ultrasonic examination equipment — Part 3: Combined equipment*.

prEN 583-2, *Ultrasonic examination — Part 2: Sensitivity and range setting*.

prEN 583-5, *Ultrasonic examination — Part 5: Characteristics and sizing of discontinuities*.

prEN 12223, *Ultrasonic examination — Calibration blocks*.

prEN 1330, *Non-destructive testing — Terminology — Part 4: Terms used in ultrasonic testing*.

## 3 Definitions

For the purposes of this part of EN 10228 the definitions given in prEN 1330-4 apply.

## 4 Items for agreement

The following aspects concerning ultrasonic testing shall be agreed between the purchaser and supplier at the time of the enquiry or order:

- a) the manufacturing stage(s) at which ultrasonic testing shall be performed (see clause 9);
- b) the volume(s) to be tested and whether grid scanning coverage or 100 % scanning coverage is required (see clause 12);
- c) the use of twin crystal probes for near surface examination (see 7.2.6);
- d) the quality class required, or the quality classes and the zones to which they apply (see clause 14);
- e) the applicable recording/acceptance criteria if different from those detailed in Table 5, Table 6 or Table 7;
- f) whether any special scanning coverage, equipment or couplant is required in addition to that detailed in clauses 7 and 12;
- g) the scanning technique to be used if not manual (see clause 1);
- h) the sizing techniques to be used for extended discontinuities (see clause 15);
- i) the technique(s) to be used for setting sensitivity (see clause 11);
- j) whether the test is to be conducted in the presence of the purchaser or his representative;
- k) whether a written procedure shall be submitted for approval by the purchaser (see clause 5).

## 5 Written procedure

### 5.1 General

Ultrasonic testing shall be performed in accordance with a written procedure. Where specified in the enquiry or order, the written procedure shall be submitted to the purchaser for approval prior to testing.

### 5.2 Form

This written procedure shall be in the form of:

- a) a product specification;
- b) a procedure written specifically for the application; or
- c) this part of EN 10228, if it is accompanied by examination details specific to the application.

### 5.3 Content

The written procedure shall contain the following details as a minimum requirement:

- a) description of the forgings to be examined;
- b) reference documents;
- c) qualification and certification of examination personnel;
- d) stage of manufacture at which the examination is carried out;
- e) examination zones specified in terms of the applicable quality classes;
- f) preparation of scanning surfaces;
- g) couplant;
- h) description of examination equipment;
- i) calibration and settings;
- j) scanning plan;
- k) description and sequence of examination operations;
- l) recording/evaluation levels;
- m) characterization of discontinuities;
- n) acceptance criteria;
- o) examination report.

## 6 Personnel qualification

Personnel shall be qualified and certificated in accordance with EN 473.

## 7 Equipment and accessories

### 7.1 Flaw detector

The flaw detector shall feature A-scan presentation and conform to prEN 12668-1.

### 7.2 Probes

#### 7.2.1 General requirements

Normal probes and shear wave probes shall conform to the requirements of prEN 12668-2.

Where further information is required supplementary probes may also be used. Supplementary probes shall not be used for the initial detection of defects. It is recommended that supplementary probes conform to prEN 12668-2.

#### 7.2.2 Contouring

Probes shall be contoured when required by EN 583-2.

#### 7.2.3 Nominal frequency

Probes shall have a nominal frequency in the range from 1 MHz to 6 MHz.

#### 7.2.4 Normal probes

Effective crystal diameter shall be in the range from 10 mm to 40 mm.

#### 7.2.5 Shear wave probes

Shear wave probe beam angles shall be in the range from 35° to 70°.

Effective crystal area shall be in the range from 20 mm<sup>2</sup> to 625 mm<sup>2</sup>.