INTERNATIONAL STANDARD

ISO 3452-4

First edition
1998-12-15

Non-destructive testing — Penetrant testing —

Part 4: Equipment

Essais non destructifs — Examen par ressuage — Partie 4: Équipement

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 3452 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 3452-4 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 135, *Non-destructive testing*, Subcommittee SC 2, *Surface methods*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this standard, read "..this European Standard..." to mean "...this International Standard...".

This first edition together with ISO 3452-1, ISO 3452-2 and ISO 3452-3 cancels and replaces ISO 3452:1984, which has been technically revised.

ISO 3452 consists of the following parts, under the general title *Non-destructive testing — Penetrant testing*:

— *Part 1: General principles*

— *Part 2: Penetrant testing materials*

— *Part 3: Reference test blocks*

— *Part 4: Equipment*

Annex ZA provides a list of corresponding International and European Standards for which equivalents are not given in the text.

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Contents

Foreword

The text of EN ISO 3452-4:1998 has been prepared by Technical Committee CEN/TC 138 "Non-destructive testing", the secretariat of which is held by AFNOR, in collaboration with Technical Committee ISO/TC 135 "Non-destructive testing".

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 June 1999, and conflicting national standards shall be withdrawn at the latest by June 1999.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association. This European Standard is considered to be a supporting standard to those application and product standards which in themselves support an essential safety requirement of a New Approach Directive and which make reference to this European Standard.

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.

Introduction

At the present time, one part of this Standard is published independently on the European and ISO levels, the others are under the Vienna Agreement and consequently have the ISO number at the European level. However, the Vienna agreement was applied during the work, so some European Standards have referenced them under their previous European number. The following table gives the correspondance between these different numbers.

Title	previous number*	official number
Non-destructive testing - Penetrant testing		
Part 1: General principles		EN 571-1
Part 2: Testing of penetrant materials	prEN 571-2	prEN ISO 3452-2
Part 3: Reference test blocks	prEN 571-3	EN ISO 3452-3
Part 4: Equipment	prEN 956	EN ISO 3452-4
*number under which this document is referenced in some European Standards		

1 Scope

This European standard specifies the characteristics of equipment used in penetrant testing. The characteristics of equipment required for carrying out penetrant testing depend on the number of tests to be made and on the size of the components to be tested. Two types of equipment are included in this standard:

a) equipment suitable for carrying out in situ penetrant testing techniques;

b) fixed installations.

2 Normative references

This European Standard 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 these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 571-1	Non destructive testing - Penetrant testing - Part 1: General principles for the examination
prEN ISO 3452-2	Non-destructive testing - Penetrant testing - Part 2: Testing of penetrant materials (ISO/DIS 3452-2:1996)
EN ISO 3452-3	Non-destructive testing - Penetrant testing - Part 3: Reference blocks (ISO 3452-3:1998)
prEN ISO 3059	Non-destructive testing - Penetrant testing and magnetic particle testing - Viewing conditions.

3 General

Equipment used in penetrant testing shall be selected and applied considering the following general aspects:

- equipment should be selected being suitable for the penetrant testing technique;

- all relevant health, safety and environmental requirements shall be complied with;.

- the application shall be in accordance with the requirements of EN 571-1.

4 Equipment for in situ inspection

The equipment used for in situ inspection shall fullfill the requirements of EN 571-1, prEN ISO 3452-2 and EN ISO 3452-3. Depending on the process being employed the following testing equipment may be used:

- portable spray equipment
- cloth (lint free)
- brushes
- personal protective equipment
- white light source
- UV(A) source.

5 Equipment for fixed installations

5.1 General requirements

All materials of construction used for the manufacture of fixed penetrant inspection installations, e. g. tanks, pipework and ducting, shall be manufactured from materials which are resistant to attack by the products used throughout the complete process. In addition, these materials shall not cause any modification to the properties of the penetrant systems used.

Penetrant installations shall be located in an area where there is no possibility of contamination of the working solutions from external sources, e. g. leaks from overhead steam pipes. In addition penetrant tanks should be fitted with lids which should be kept shut when the plant is not in use.

Where plants are fitted with effluent treatment or water recirculating systems, the system shall be designed to ensure that any water discharged to waste meets local discharge requirements. In addition the recycled water shall be of a quality suitable for rinsing components.

Where extraction systems are fitted, e. g. with spray application of penetrant, they shall be designed such that the local health and safety requirements relevant to operational safety and local air emission laws are fully met.

All chemicals used in penetrant testing shall be stored in closed containers and storage shall meet relevant health and safety requirements.

5.2 Preparation and precleaning area

Suitable equipment shall be used to carry out the preparation and precleaning requirements described in EN 571-1.

Degreasing areas shall be equipped to ensure degreasing of the components in accordance with preparation and precleaning requirements described in EN 571-1 and if necessary shall include an area for cooling the components prior to the application of penetrant. The degreasing and cooling facilities shall be of adequate size to handle the flow of components. Vapour degreasers using halogenated hydrocarbons shall meet relevant air pollution requirements.

5.3 Penetrant application area

Penetrant application areas shall have the facilities for applying penetrant by air assisted, airless and/or electrostatic spraying, spray cans, brushing, flow-on techniques or immersion in a tank of penetrant liquid.

The tanks used for all processed chemicals shall be installed with a proper retaining tray. Where fluorescent penetrants are applied by manual spraying equipment, a source of UV-A should be provided for checking the surface to be tested for penetrant coverage. Where spray application is employed, suitable extraction facilities shall be provided.

5.4 Penetrant drain area

Penetrant drain stations shall consist of a tray having a sloping base, arranged so that the penetrant is collected in a separate container of the tank containing the penetrant.

5.5 Excess penetrant removal area

5.5.1 Immersion wash tank

Immersion tanks shall comprise means for agitating the water or moving the components to be tested. The tank may be equipped with a tank for the overflow of a part of the contaminated water.

The tank shall be equipped with means for controlling the water temperature.

5.5.2 Spray-wash areas

Spray-wash stations shall comprise either manual or automatic spraying equipment.

Manual spraying equipment shall be equipped with a water or air/water spray gun capable of delivering a suitable spray at a pressure as low as possible and at a temperature not exceeding 50 °C. The pressure shall be measured as near as practicably possible to the spray nozzle without a valve between the meter and the nozzle. Where manual spraying equipment is employed, a suitable source of illumination shall be provided to control the excess penetrant removal either white light for colour contrast penetrant or UV-A for fluorescent penetrant.

Automatic spraying equipment shall meet the requirements for manual equipment. In addition the number, design and location of the nozzles shall be such that all test surfaces of the components are evenly rinsed. A suitable

drain shall be provided where automatic spraying equipment is employed. Water retained in recesses shall be removed by suitable means.

5.5.3 Emulsifier area

Emulsifier stations shall comprise the equipment given in (a) and (b), as appropriate to the process used.

a) Where a hydrophilic emulsifier is to be applied by an immersion technique the station shall comprise a tank suitable to allow components to be immersed completely in the solution for a controlled time.

Hydrophilic emulsifier may also be applied using suitable equipment by foam or flow-on technique.

b) A lipophilic emulsifier shall be applied by immersion only. The station shall comprise a tank which will allow complete immersion of components in a solution for a controlled time. This shall be followed by drainage.

5.6 Drying area

If entrapped water is to be removed, appropriate equipment shall be used such as a suction system or means of rotating parts.

To remove surface water appropriate equipment such as a warm air (maximum 80 °C) recirculating oven shall be used.

To avoid condensation or oxidation of metals and to ensure that components are properly dried, a forced air oven shall be used to ensure that there is a uniform controlled temperature distribution together with a high air flow.

5.7 Developer application area

Developer stations shall comprise the equipment given in 5.7a) to d) as appropriate to the developer used.

a) Powder developer.
The station shall comprise equipment for applying the developer by one of the following:

1) dust storm cabinet
2) electrostatic spray gun
3) flock gun
4) tumbler
5) insufflator
6) fluidized bed.

The equipment shall be constructed such that an even thin coating of the developer powder is applied to all surfaces.

Where a cabinet is used, it shall be of sufficient size to accommodate all the work pieces examined, either as single components or as multiples placed in wire baskets. It shall have a sealed, hinged lid and be fitted with heaters to prevent contamination of the powder by moisture. Where an electrostatic spray or a flock gun is used, suitable means of extraction shall be provided.

b) Water suspension developer.
The station shall comprise a tank which shall be fitted with a lid and shall be of such a size that total immersion of components can be achieved. It shall have facilities for continuous agitation of the developer either by clean air or by mechanical means, and shall be capable of maintaining the developer at the temperature recommended by the manufacturer and include a system for permitting excess developer to drain back freely into the tank.

c) Solvent-based developer.
The station shall comprise equipment for spray application of the developer within a cabinet. This developer may be applied by air assisted, airless and/or electrostatic spraying. The equipment shall be fitted with suitable mechanical agitation to maintain the developer in suspension. Where applicable the spray gun shall be actuated by dry, clean filtered air. This developer may be spray applied from an aerosol container or spray cans. The cabinet shall be constructed so that unrestricted spraying of the component can take place.

d) Water soluble developer.