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Interested committees:

Title: Draft BS EN 1779 BS Non-destructive testing - Leak testing - Criteria for method and technique selection.

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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

English Version

Non-destructive testing - Leak testing - Criteria for method and technique selection

Essais non destructifs - Contrôles d'étanchéité -
Critères de choix de la méthode et de la technique

Zerstörungsfreie Prüfung - Dichtheitsprüfung -
Kriterien zur Auswahl eines Prüfverfahrens

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 138.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN 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 CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (prEN 1779:2024) has been prepared by Technical Committee CEN/TC 138 “Non-destructive testing”, the secretariat of which is held by DIN (Germany).

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1779:1999.

prEN 1779:2024 includes the following significant technical changes with respect to EN 1779:1999:

- a) update of the normative references;
- b) Table 2 updated and figures added;
- c) 8.1 added.

1 Scope

This document specifies criteria for the selection of the most suitable method and technique for the assessment of leak tightness by indication or measurement of a gas leakage. Annex A, normative, allows a comparison of standard test methods. Leak detection using hydrostatic tests, electromagnetic methods is not included in this document.

This document can be used for equipment which can be evacuated or pressurized.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 20484:2017, *Non-destructive testing — Leak testing — Vocabulary (ISO 20484:2017)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 20484:2017, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

4 Personnel qualification

It is assumed that leak testing is performed by qualified and capable personnel. In order to prove this qualification, it is recommended to certify the personnel in accordance with EN ISO 9712:2022.

5 Units

The leakage rate is defined as the pV -throughput of a specific fluid which passes through a leak under specific conditions and is expressed in pascal cubic metre per second.

In the past, the leakage rate was expressed in various units, these are given in informative Annex B, Table B.1.

6 Tightness requirements

The leak tightness of an object is usually determined by measurement of its gas leakage rate.

Leak tightness is commonly described as the flow rate of fluid into or from the test object. For a gas, leak tightness may be conveniently indicated by the variation of pressure with time under specified conditions.

For testing, however, i.e. when drafting specifications and procedures, the leak tightness shall be expressed as leakage rate in units of gas throughput ($\text{Pa}\cdot\text{m}^3/\text{s}$) for a specific gas at specified temperature and at specified pressure conditions.

Zero leakage rate shall not be specified. The required leak tightness shall be related to the function of the object under consideration.

EXAMPLE 1 Leakage rates in the order of $5 \times 10^{-4} \text{ Pa} \cdot \text{m}^3/\text{s}$ are acceptable for compressed air cylinders. This corresponds to a pressure variation of 5000 Pa in a 10 l volume in 24 h or 0,5 l loss measured at atmospheric pressure.

EXAMPLE 2 A leakage rate of $10^{-10} \text{ Pa} \cdot \text{m}^3/\text{s}$ is typical for cardiac pacemakers. This corresponds to a loss of 1 cm³ every 30 years approximately.

The total tightness of a system can be considered in terms of tightness for all components of that system. To meet requirements the sum of the leakage rates for each component plus the sum of the leakage rates at each connecting point shall be less than the overall allowable leakage rate of the system.

The tightness of component or system shall be specified under normal operating conditions.

NOTE 1 The most significant influence on tightness is given by the nature and pressure of the gas, and by the operating temperature.

The suitability of the system for a given task is indicated by the functional tightness.

NOTE 2 To take into account factors that are unquantifiable, it might be advisable to adopt leak tightness values lower than this by a factor from three to ten.

7 Leak testing methods and techniques

7.1 General

The leak tightness of an object is usually determined by measurement of its gas leakage rate.

Leak tightness is commonly described as the flow rate of fluid into or from the test object. For a gas, leak tightness may be conveniently indicated by the variation of pressure with time under specified conditions.

The actual gas flow through the leaks of the test object, which has been determined in a leak test, shall be converted to the leakage rate with that under operating conditions.

The following considerations shall be applied to all methods by which leakage rates are determined. A review of the methods and techniques is given in Table 1.

Table 1 — Leak testing — Overview of methods and techniques

Flow direction	Extent of test	Applicability	Techniques
Gas flow out of object	Local area	Location	B.1, B.2.2, B.4, C.3
		Measurement	B.2.1, B.3, D.3
	Total area	Location	C.1, C.2
		Measurement	B.3, B.5, B.6, B.7, C.1, D.1, D.3, D.4
Gas flow into object	Local area	Location	A.3
		Measurement	A.2, D.3
	Total area	Location	
		Measurement	A.1, D.2, D.3, D.4

Application of Table 1:

1) Choose the appropriate flow direction for test.

2) Define the extent of the investigation: total or local area.

3) Define the aim of test: location or measurement.

4) Choose the appropriate method (A to D, from the normative Annex A).

5) Check any practical difficulties associated with the test.

NOTE Some techniques used for location can also give an estimate of the leakage size, but they are not allowed to demonstrate the compliance with the specifications.

7.2 Techniques for leak location and techniques for measurement

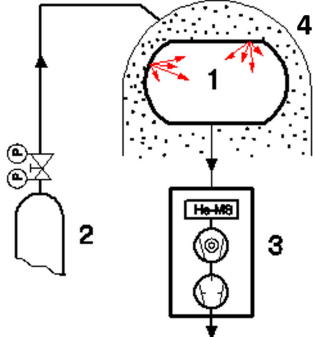
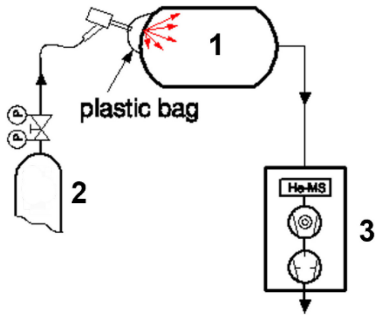
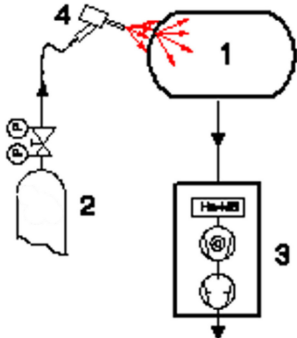
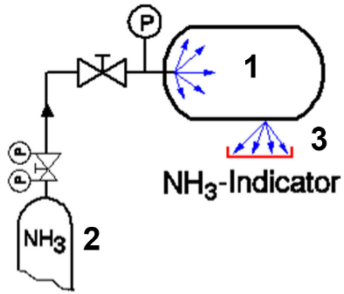
It is usually not possible to establish in one step the total leakage of a component (or a system) and the location of the leaks. Two techniques shall, therefore, be considered: measurement of the overall leakage rate or location of leaks for possible elimination.

Examples of total (or integral) techniques include the measurement of the pressure variation with time within the object and the accumulation of gas escaping from the object over a period of time.

One technique for leak location involves probing the object with a suitable tracer gas or sniffing the surface of an object filled with tracer gas.

In the selection of an appropriate technique for leak assessment, the conditions of the test (pressure, vacuum, type of gas, etc.) should be carefully considered. Some guidance is given in Clause 8.

Table 2 — Overview of methods and techniques

Techniques	Principle	Diagram
A.1	Vacuum (total)	The object (1) is evacuated and connected to the detector (3); the object is placed in a chamber (4) containing the tracer gas (2) or completely immersed in tracer gas 
A.2	Vacuum (partial)	The object (1) is evacuated and connected to the detector (3); the suspect areas are covered by a suitable, gas-tight enclosure filled with tracer gas (2) 
A.3	Vacuum (local)	The object (1) is evacuated and connected to the detector (3); the suspect points are sprayed (4) with the tracer gas (2) 
B.1	Chemical detection ammonia by	The object (1) is previously evacuated and then filled with NH_3 gas (2); the points to be checked are covered by paint or a 

Techniques	Principle	Diagram
	strip which chemically reacts with ammonia and changes colour (3)	
B.2.1	Vacuum box with internal tracer gas pressure	The diagram shows a horizontal oval component labeled '1' with red arrows pointing outwards from its top and bottom surfaces. To the left of '1' is a gas source labeled '2' with two pressure gauges. A line connects '2' to '1'. To the right of '1' is a rectangular box labeled '4'. A line connects '1' to '4'. From the bottom of '4', a line goes down to a detector unit labeled '3'. The detector unit '3' contains a 'He-MS' label and two circular components. A vertical arrow points downwards from the bottom of '3'.
B.2.2	Vacuum box by spray gun on opposite side	The diagram shows a vertical rectangular object labeled '1'. To its left is a gas source labeled '2' with two pressure gauges. A line connects '2' to a spray gun labeled '5'. The spray gun '5' is spraying red arrows onto the left side of object '1'. To the right of object '1' is a rectangular box labeled '4'. A line connects object '1' to box '4'. From the bottom of '4', a line goes down to a detector unit labeled '3'. The detector unit '3' contains a 'He-MS' label and two circular components. A vertical arrow points downwards from the bottom of '3'.
B.3	Pressure increase by accumulation	The diagram shows a horizontal oval object labeled '1' with red arrows pointing outwards from its top and bottom surfaces. To the left of '1' is a gas source labeled '2' with two pressure gauges. A line connects '2' to '1'. Above '1' is a rectangular chamber labeled '4'. A line connects '1' to the bottom of chamber '4'. From the bottom of '4', a line goes down to a detector unit labeled '3'. The detector unit '3' contains a 'He-MS' label and two circular components. A vertical arrow points downwards from the bottom of '3'.