
**Non-destructive testing — Leak testing
— Vocabulary**

Essais non-destructifs — Contrôle d'étanchéité — Vocabulaire

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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.

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ISO 20484 was prepared by the European Committee Standardization (CEN) Technical Committee CEN/TC 138, *Leak testing*, in collaboration with ISO Technical Committee TC 135, *Non-destructive testing*, Subcommittee SC 6, *Leak testing*, in accordance with the agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This document is based on and replaces the European standard EN 1330-8:1998, *Non-destructive testing — Terminology — Part 8: Terms used in leak tightness testing*.

Introduction

The series of European standards, EN 1330, comprises 10 parts prepared separately by groups of experts, each group consisting of experts in a given NDT (non-destructive testing) method (for EN 1330-3 to EN 1330-10).

A comparative examination of these parts has shown the existence of common terms that are often defined differently. These terms have been taken from EN 1330-3 to EN 1330-10 and then split into two categories:

- general terms corresponding to other fields such as physics, electricity, metrology, etc. and already defined in international documents; these terms are the subject of EN 1330-1;
- common terms specific to NDT; these terms, the definitions of which have been harmonized in an Ad Hoc group, are the subject of EN 1330-2.

In view of the nature of the approach taken, the list of terms in EN 1330-1 and EN 1330-2 are in no way exhaustive.

EN 1330 consists of the following parts:

- *Part 1: General terms*
- *Part 2: Terms common to the non-destructive testing methods*
- *Part 3: Terms used in industrial radiographic testing*
- *Part 4: Terms used in ultrasonic testing*
- *Part 7: Terms used in magnetic particle testing*
- *Part 9: Terms used in acoustic emission*
- *Part 10: Terms used in visual examination*

NOTE 1 ISO 12718 replaced EN 1330-5.

NOTE 2 ISO 12706 was published formerly as the draft European standard prEN 1330-6.

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Non-destructive testing — Leak testing — Vocabulary

1 Scope

This document defines the terms used in leak testing.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

3.1 Atomic/molecular structure

3.1.1 concentration

c

ratio of the number of atoms or molecules of a given constituent in a gas mixture to the total number of atoms or molecules in the mixture

Note 1 to entry: For ideal gases, this is equivalent to the ratio of the partial pressure to the total pressure.

Note 2 to entry: In other cases, the concentration is considered as mole fraction and the symbol used is n_B .

3.1.2 ionization potential

minimum energy, expressed in electronvolts, required to remove an electron from an atom or molecule or ion to form a positive ion

3.2 Pressure and vacuum

3.2.1 atmospheric pressure

pressure of the atmosphere at a specified place and time

3.2.2 partial pressure

p_A, p_B

pressure that would be exerted by a gas or vapour if it alone was present in an enclosure

3.3 Gas-solid interaction

3.3.1 gettering

removal of a gas by permanent binding in or on a solid, usually involving chemical reaction

3.3.2

occlusion of gas

trapping of undissolved gas in a solid during solidification

3.3.3

permeation

mechanism of adsorption/solution/diffusion/desorption in a solid material that allows a substance to pass through under a partial pressure difference

3.3.4

permeability coefficient

P_{perm}

coefficient, dependent on temperature, characterizing the *conductance* (4.2.1) of a material for the *permeation* (3.3.3) of a given substance

4 Terms relating to gas

4.1 Properties of gases

4.1.1

ideal gas

perfect gas

gas obeying the relationship $pV = nRT$, where $n = m/M$

where

p is the pressure;

V is the volume;

m is the mass of the gas;

M is the molecular mass;

R is the ideal gas constant;

T is the absolute temperature.

4.2 Flow of gas

4.2.1

conductance

C

throughput divided by the difference in mean pressures prevailing at two specified cross-sections or at either sides of the duct or orifice, assuming isothermal conditions

Note 1 to entry: Applies to fluid flow in a duct, or part of a duct, or a constriction.

4.2.2

flow rate

q_M, q_N, q_V

rate at which an amount of mass, a number of particles or moles pass through a given cross section of the system

Note 1 to entry: Mass: q_M , Particles: q_N , Molar: q_V .

Note 2 to entry: For gases, the volume flow rate (Volume: symbol q_V) is a measure of quantity only at specified conditions.

4.2.3**pV-throughput** q_G

rate at which a volume of gas at specified pressure passes a given cross section of the system

Note 1 to entry: In leak detection, pV-throughput is used to express the flow rate of gas. The temperature and molar weight or density are given additionally so that the flow rate can be calculated using the gas equation.

4.2.4**resistance to flow** w

reciprocal of conductance (flow)

4.2.5**dynamic viscosity coefficient** η

coefficient, dependent on temperature, that defines the resistance of a specified fluid to the motion, due to the molecular interactions

4.3 Gas leakage**4.3.1****leak**

<non-destructive testing (NDT)> hole, porosity, permeable element or other structure in the wall of an object allowing gas to pass from one side of the wall to the other by the effect of pressure- or concentration-difference across the wall

4.3.2**conductance leak**

leak which consists of one or more discrete passages, including porous areas, through which a fluid may flow

4.3.3**orifice leak**

conductance leak (4.3.2) having a diameter much greater than the leakage path length

Note 1 to entry: It may also be considered as an opening in a very thin wall.

4.3.4**capillary leak**

conductance leak (4.3.2) in which the diameter is small compared to the length

4.3.5**leakage rate**

pV-throughput of a specific fluid which passes through a leak under specific conditions

4.3.6**leaktight object**

object with a leakage rate lower than that stated in a specification

4.3.7**molecular leak**

leak of such geometric configuration and under such pressure conditions that gas flowing through it obeys the laws of molecular flow

4.3.8

standard leakage rate

leakage rate of a leak with stated standard temperature and pressure at one end and, at the other end, a pressure low enough to have a negligible effect on the leakage rate

Note 1 to entry: Different standard pressure- and temperature conditions are used [e.g. standard temperature and pressure (STP), standard ambient temperature and pressure (SATP)].

4.3.9

permeation leak

leak which permits a gas to flow through a non-porous wall

4.3.10

total leakage rate

integral leakage rate

sum of all leakage rates from all leaks of an object, expressed as a pV-throughput

4.3.11

virtual leak

apparent (not real) leak, caused by mechanisms generating a signal equivalent to a leakage rate signal

Note 1 to entry: Such mechanisms can be due to, for example, temperature and volume effects or slow release of sorbed or occluded gases from surfaces or from the bulk of the material.

4.3.12

viscous leak

leak of such geometric configuration and under such pressure conditions that gas flowing through it obeys the laws of viscous flow

5 Terms relating to test techniques

5.1 Test techniques

5.1.1

accumulation test

leakage test where a tracer gas is collected in a known volume over a specified period of time and the *partial pressure* (3.2.2) increase of the tracer gas is measured

Note 1 to entry: The leakage rate can be obtained by calibrating the partial pressure rise with that due to a known leak or comparing the measured *concentration* (3.1.1) with a known concentration.

5.1.2

carrier gas test

flushing test

leakage test in which a viscous gas flow is created along the outer surface of the test object in a chamber to carry escaping tracer gas to the sensor

5.1.3

vacuum tracer gas test

leakage test in which tracer gas is detected in a space where the tracer gas atoms move freely to the sensor

Note 1 to entry: Each tracer gas species moves with its specific thermal velocity.

5.1.4

bombing test

back-pressurising test

leakage test in which sealed objects are subjected to pressurization with tracer gas prior to testing them in a vacuum chamber

5.1.5**bubble test**

leakage test used to detect leaks by the immersion of the object in a test fluid or covering its outer surface with a surfactant (foaming) solution

Note 1 to entry: The pressure difference across the walls of the object is high enough that leaks are shown by bubble formation.

5.1.6**hood test**

over-all leakage test in which the object is placed in a soft enclosure at *atmospheric pressure* ([3.2.1](#))

Note 1 to entry: If the object is evacuated, the enclosure is filled with tracer gas and the leak detector is connected to the inner volume of the object.

Note 2 to entry: If the object is pressurized with the tracer gas, the test is performed with the sampling probe inserted in the hood.

5.1.7**pressure change test**

leakage test in which the rate of the total pressure change (decay or rise) in an object is measured over a period of time

5.1.8**flow measurement test**

leakage test in which the flow is measured necessary to maintain a pressure difference across the object boundary

Note 1 to entry: The upstream pressure may be controlled by pressure regulator or an auxiliary volume.

5.1.9**pressure dye test**

leakage test in which a liquid containing a dye or fluorescent oil is driven by a pressure differential into the leak in the wall of the object to be tested and is then detected by a visual inspection on the other side

5.1.10**chemical reaction test**

leakage test in which the outside of the test object is probed with a reactive substance showing a reaction when in contact with escaping fluid

Note 1 to entry: A typical example for the reaction may involve the colour change of an indicator.

5.1.11**radionuclide leakage test**

leakage test which uses a radioactive tracer fluid and a detector for measuring the radiation emitted by the tracer fluid

5.2 Test equipment**5.2.1****tracer gas leak detector**

instrument capable of detecting and measuring *pV-throughputs* ([4.2.3](#)) of a specific tracer gas with acceptable response time

Note 1 to entry: A gas sensor is too slow and a flow meter is not sensitive enough to be a tracer gas leak detector.

5.2.2**counterflow helium leak detector**

mass spectrometer leak detector in which the tracer gas (helium or hydrogen) enters through the backing line into the outlet port of the high vacuum pump and the partial pressure of the tracer gas is measured on the high vacuum side of this pump

5.2.3

direct flow leak detector

mass spectrometer leak detector in which the tracer gas enters the high vacuum side of the pump system where the partial pressure of tracer gas is measured

5.2.4

differential Pirani gauge

leak detector, in which the gas coming from the test object or a sampling probe enters one of two similar Pirani tubes (thermal conductivity gauges) being arms in a Wheatstone bridge

5.2.5

discharge tube leak indicator

glass tube, linked to the vacuum system to be tested, in which the gas present in the system is exposed to a high frequency electrical discharge

Note 1 to entry: Shape and colours of the discharge are related to the nature and pressure of the gas present in the system.

5.2.6

halogen leak detector

leak detector that is sensitive to halogen tracer gas

Note 1 to entry: Examples are alkali-ion diode-, infrared-, flame-ionization- and electron-capture detector.

5.2.7

helium leak detector

leak detector that is sensitive to helium (^4He) tracer gas

5.2.8

mass spectrometer leak detector

MSLD

leak detector in which the sensing element is a mass spectrometer, tuned to respond only to the tracer gas

5.2.9

spark coil leak tester

high frequency discharge coil of the Tesla type which indicates pin holes in a glass vacuum system by a spark jumping between the core of the coil and the pin hole

5.2.10

ultrasonic leak tester

sensor that detects ultrasonic sound produced by the flow of a gas or liquid through a *conductance leak* ([4.3.2](#)) and which converts this to a usable signal

5.3 Test equipment components

5.3.1

sampling probe

device used to collect tracer gas from an area of the test object and transfer it to the leak detector at the reduced pressure required

5.3.2

spray gun

device for directing a fine jet of tracer gas on an object under vacuum testing

5.3.3

test seal

temporary seal only used for the test, e.g. plugs or gaskets, other than operating seals