



# SLOVENSKI STANDARD

## SIST EN 13160-1:2016

01-november-2016

Nadomešča:

SIST EN 13160-1:2003

---

### Sistemi za kontrolo tesnosti - 1. del: Splošna načela

Leak detection systems - Part 1: General principles

Leckanzeigesysteme - Teil 1: Allgemeine Grundsätze

Systèmes de détection de fuites - Partie 1 : Principes généraux

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

**Ta slovenski standard je istoveten z: EN 13160-1:2016**

<https://standards.iteh.ai/catalog/standards/sist/40ac4bff-81d6-4f7d-b336-053e9bb02b78/sist-en-13160-1-2016>

#### **ICS:**

23.020.01	Vsebniki za shranjevanje tekočin na splošno	Fluid storage devices in general
-----------	---	----------------------------------

**SIST EN 13160-1:2016**

**en,fr,de**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN 13160-1:2016

<https://standards.iteh.ai/catalog/standards/sist/40ac4bff-81d6-4f7d-b336-053c9bb02b78/sist-en-13160-1-2016>

EUROPEAN STANDARD

EN 13160-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

July 2016

ICS 23.020.01; 23.040.99; 29.260.20

Supersedes EN 13160-1:2003

English Version

## Leak detection systems - Part 1: General Principles

Systèmes de détection de fuites - Partie 1: Principes  
généraux

Leckanzeigesysteme - Teil 1: Allgemeine Grundsätze

This European Standard was approved by CEN on 8 April 2016.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

SIST EN 13160-1:2016

<https://standards.iteh.ai/catalog/standards/sist/40ac4bff-81d6-4f7d-b336-053c9bb02b78/sist-en-13160-1-2016>



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

## Contents

	Page
European foreword.....	3
<b>1 Scope.....</b>	<b>4</b>
<b>2 Normative references.....</b>	<b>4</b>
<b>3 Terms and definitions.....</b>	<b>4</b>
<b>4 Classes of leak detection systems.....</b>	<b>7</b>
<b>5 Requirements.....</b>	<b>7</b>
5.1 General.....	7
5.2 Avoidance or reduction of ignition sources.....	8
5.3 Safety and electromagnetic requirements.....	8
5.4 Leak indicating device.....	9
5.5 Inspection of equipment.....	9
<b>Annex A (informative) Examples of leak detection systems.....</b>	<b>10</b>
A.1 Leak detection systems – class I.....	10
A.2 Leak detection systems – class II.....	15
A.3 Leak detection systems – class III.....	16
A.4 Leak detection systems – class IV.....	18
A.5 Leak detection systems – class V.....	20
<b>Annex B (informative) Equipment categories for explosion-proof parts of the leak detection systems.....</b>	<b>21</b>
<b>Bibliography.....</b>	<b>22</b>

## European foreword

This document (EN 13160-1:2016) has been prepared by Technical Committee CEN/TC 393 “Equipment for storage tanks and for service stations”, the secretariat of which is held by DIN.

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 January 2017, and conflicting national standards shall be withdrawn at the latest by January 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 13160-1:2003.

According to edition 2003 the following fundamental changes are given:

- new definitions for the Class IV C added;
- requirements concerning electromagnetic compatibility added;
- requirements for the different classes shifted to the part of the appropriate class.

This European Standard *Leak detection systems* consists of 7 parts:

- *Part 1: General principles*
- *Part 2: Requirements and test/assessment methods for pressure and vacuum kits*
- *Part 3: Requirements and test/assessment methods for liquid systems for tanks*
- *Part 4: Requirements and test/assessment methods for sensor based leak detection systems*
- *Part 5: Requirements and test/assessment methods for in-tank gauge systems and pressurized pipework systems*
- *Part 6: Sensors in monitoring wells*
- *Part 7: Requirements and test/assessment methods for interstitial spaces, leak detection linings and leak detection jackets*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

**EN 13160-1:2016 (E)****1 Scope**

This European Standard specifies the general principles for leak detection systems for use with double-skin, single-skin, underground or above ground tanks and pipework designed for water polluting fluids.

**2 Normative references**

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 60079-0, *Explosive atmospheres — Part 0: Equipment — General requirements (IEC 60079-0)*

EN 60079-26, *Explosive atmospheres — Part 26: Equipment with equipment protection level (EPL) Ga (IEC 60079-26)*

EN 60950-1, *Information technology equipment — Safety — Part 1: General requirements (IEC 60950-1)*

EN 61000-6-1, *Electromagnetic compatibility (EMC) — Part 6-1: Generic standards — Immunity for residential, commercial and light-industrial environments (IEC 61000-6-1)*

EN 61000-6-2, *Electromagnetic compatibility (EMC) — Part 6-2: Generic standards — Immunity for industrial environments (IEC 61000-6-2)*

EN 61000-6-3, *Electromagnetic compatibility (EMC) — Part 6-3: Generic standards — Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3)*

EN 61000-6-4, *Electromagnetic compatibility (EMC) — Part 6-4: Generic standards — Emission standard for industrial environments (IEC 61000-6-4)*

EN 61010-1, *Safety requirements for electrical equipment for measurement, control and laboratory use — Part 1: General requirements (IEC 61010-1)*

EN 61340-4-1, *Electrostatics — Part 4-1: Standard test methods for specific applications — Electrical resistance of floor coverings and installed floors (IEC 61340-4-1)*

EN ISO 80079-36:2016, *Explosive atmospheres — Part 36: Non-electrical equipment for explosive atmospheres — Basic method and requirements (ISO 80079-36:2016)*

**3 Terms and definitions**

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

**3.1****atmospheric pressure conditions**

pressures ranging from 0,08 MPa (0,8 bar) to 0,11 MPa (1,1 bar)

**3.2****working pressure**

maximum pressure which is generated by a pressure/vacuum generator in the interstitial space under normal operating conditions

**3.3****operating pressure**

fluid pressure occurring during specified operating conditions

**3.4****leak detection system**

includes all equipment required to indicate a leak

Note 1 to entry: Main components could include the interstitial space, leak protecting linings, leak protecting jacket, leak indicating device, leak detector, system pipework, leak detecting media, monitoring wells or sensors.

**3.5****interstitial space**

space between the walls of double-skin systems. It provides the passage for fluids which may enter the interstitial space

**3.6****double-skin tank**

tank constructed with an inner and outer wall with an interstitial space where the maximum filling level of the tank does not exceed the height of the interstitial space

**3.7****single-skin tank**

tank constructed with a single wall

**3.8****leak detection lining**

internal layer which solely or in conjunction with the tank wall produces a suitable interstitial space

<https://standards.iteh.ai/catalog/standards/sist/40ac4bff-81d6-4f7d-b336-053c9bb02b78/sist-en-13160-1-2016>

**3.9****leak detection jacket**

external layer which solely or in conjunction with an intermediate material and the tank wall produces a suitable interstitial space

**3.10****intermediate layer**

material used to separate the inner and outer surfaces, it ensures the creation of an interstitial space

**3.11****double-skin pipework**

pipework constructed with an inner and outer wall with an interstitial space

**3.12****single-skin pipework**

pipework constructed with a single wall

**3.13****vacuum leak detector**

detects a leak using air as the leak detection medium, an alarm is triggered by a rise in pressure in the interstitial space in the event of a leak

**3.14****pressure leak detector**

detects a leak using air or inert gas as the leak detection medium; an alarm is triggered by a drop in pressure within the interstitial space in the event of a leak

**EN 13160-1:2016 (E)****3.15****leak detector using liquid**

detects a leak using liquid as a leak detection medium; any leak in the interstitial space is indicated by a drop of the leak detection liquid level

**3.16****liquid sensor**

device which will detect liquid

**3.17****vapour sensor**

device which will detect gas and vapour

**3.18****leak indicating device**

indicates the operational and the alarm status of any connected sensors or leak detectors

**3.19****tank gauge leak detection system**

a tank gauge system measures the volume of liquid stored in a tank, a loss can be indicated where the volume of liquid drawn from the tanks is monitored independently from the gauge and reconciled with changes in the stored volume, a loss can also be indicated by analysis of the changes in "static" liquid volume during periods when no additions to, or depletions, from the tank are taking place

iteh STANDARD PREVIEW  
(standards.iteh.ai)

**3.19.1****static leak detection**

where a tank integrity test is carried out by the gauge whilst no additions to or depletions from the tank contents are being made

[SIST EN 13160-1:2016](https://standards.iteh.ai/catalog/standards/sist/40ac4bff-81d6-4f7d-b336-053c9bb02b78/sist-en-13160-1-2016)

<https://standards.iteh.ai/catalog/standards/sist/40ac4bff-81d6-4f7d-b336-053c9bb02b78/sist-en-13160-1-2016>

**3.19.2****dynamic leak or loss detection**

where the tank contents gauge forms part of an integrated detection system and is used to detect a leak or loss during normal operation where additions to or depletion from the tank contents may be made, a loss can be detected in tanks and pipeworks, connected with the tank, which may indicate a leak

**3.19.3****statistical quiet period leak detection**

where the gauge system collects data during intervals (which are shorter than required for static leak detection) between dispensing and delivery operations, the data are then analysed to determine if a loss has occurred, which may indicate a leak

**3.19.4****tank integrity test**

test which is capable of detecting a leakage rate in accordance with a given test procedure, the test takes into account the thermal expansion of the liquid being stored, evaporative losses and the effects of any other variables including groundwater level

**3.20****monitoring wells**

wells installed into the ground around a storage system, positioned to ensure that any liquid or vapour from a leakage from the system will reach one of them

Note 1 to entry: The monitoring well is used to ensure that the leakage can be detected visually or by sensors.

**3.21****leakage containment**

system, which is designed that leakage from a primary system can be detected and contained



**3.22****frost protected area**

area where the temperature will not go below 0 °C

**3.23****liquid stop device**

valve used to prevent the passage of liquid beyond a fixed point in a connecting line

**4 Classes of leak detection systems**

For the purpose of this standard the following classes apply in order of protection for the level of safety or environmental protection required:

- Class I: Systems of this class will detect a leak above as well as below the liquid level in a double-skin system. They are inherently safe and will detect a leak before any liquid can enter the environment (i.e. pressure or vacuum systems).
- Class II: Systems of this class will detect a leak above as well as below the liquid level in a double-skin system with the possibility of the leak detection liquid leaking into the environment (i.e. liquid monitoring system).
- Class III: Systems of this class will detect a leak below the liquid level in a tank or in a pipework system. These systems are based on liquid and/or vapour sensors located in leakage containment or interstitial space. A possibility exists of product entering the environment.
- Class IV: Systems of this class will detect, to specific levels of probability, specified rates of change of tank contents (i.e. leakages into or out of the tank). A strong possibility exists that product will enter the environment in the event of a leak.
- Class IV A: Dynamic leak detection systems will by reconciliation also indicate leaks in the connected pipework.
- Class IV B: Static tank gauge leak detection systems or statistical quiet period leak detection systems will only indicate leaks in a tank.
- Class IV C: Pressure line leak detection system which will detect a leak in pressurized pipework, only when no product is being dispensed.
- Class V: Systems of this class may detect liquid loss in tanks or pipework below the liquid level. Product will enter the environment before the leak is detected (i.e. sensors of class III in monitoring wells).

For examples for the different classes see Annex A.

**5 Requirements****5.1 General**

Leak detection systems shall trigger the alarm in the event of a leak or in the event of malfunctions of the leak detection system. All leak detection systems shall indicate every leak by a visual and audible alarm.

In the event of a power interruption, the leak detection system shall be designed to resume normal operation on the restoration of the power supply.

Leak detection systems shall be designed for operation under atmospheric conditions according to 3.1.

**EN 13160-1:2016 (E)**

The components of a leak detection system shall be suitable to operate in the following temperature ranges:

- Type 1: — -20 °C to +60 °C;
- Type 2: — 0 °C to +40 °C;
- Type 3: — -40 °C to +40 °C.

Leak detection systems and/or their components intended for installation in a potentially explosive atmosphere shall be explosion protected. If there exists the possibility of an explosive atmosphere being present within the leak detection system and/or its components these shall be explosion protected.

The leak detection systems shall be designed for installation in such a way to prevent accidental disconnection of the equipment's power supply. Plug and socket connections or switches are only permitted if their interruption triggers off an alarm.

For a leak detection system using liquid the interstitial space shall be equipped with a test nozzle above the liquid level in the inner tank.

The leak detection system shall be capable of being tested or capable of simulating a leak condition. Disconnections of any sensor or transducer or a short circuit in connecting cables shall result in an alarm condition. All indications and sounders shall be capable of being tested.

The leak detection systems shall be designed so that correct operation can be verified.

The leak detection systems shall be used and maintained in accordance with the manufacturer's instruction.

If a leak detector serves more than one tank or pipework equipment is required which shows or allows to test in an event of an alarm which tank or pipework leaks.

## 5.2 Avoidance or reduction of ignition sources

[https://standards.iteh.ai/catalog/standards/sist/40ac4bff-81d6-4f7d-b336-40ac4bff-81d6-4f7d-b336-](https://standards.iteh.ai/catalog/standards/sist/40ac4bff-81d6-4f7d-b336-40ac4bff-81d6-4f7d-b336)

All electrical and non-electrical equipment and components, intended for use in potentially explosive atmospheres, shall be designed and constructed according to good engineering practice and in conformity with the required categories for group II equipment to ensure avoidance of any ignition source. To classify the category of the equipment it shall be subjected to an ignition hazard assessment in accordance with 5.2 of EN ISO 80079-36:2016.

Device categories for explosion-proof parts of the leak detection systems see Annex B.

Where regulations require, the leak protecting lining used in a conductive tank shall be conductive with a surface resistance of less than  $1 \times 10^9 \Omega$  in order to dissipate any electrostatic charges if the stored product has a flash point of  $< 55 \text{ °C}$ .

This requirement shall be tested according to EN 61340-4-1.

Where the leak protecting lining has a greater surface resistance than  $1 \times 10^9 \Omega$  an object shall be inserted in the stored product which is capable of dissipating the electrostatic charges loads, either

- 1) a steel plate with a surface of  $(0,04 \times V_t)$  in  $\text{m}^2$  in which  $V_t$  is the volume in  $\text{m}^3$  of the tank or
- 2) steel filling, dipping and/or suction pipes which have a total surface as indicated above.

In both cases the object inserted in the stored product shall have provision for earthing with a resistance less than  $1000 \Omega$ .

## 5.3 Safety and electromagnetic requirements

All electrical equipment of the leak detection system or its parts not in relation with hazardous areas shall comply with EN 61010-1 or EN 60950-1.

All electrical equipment of the leak detection system or its parts in relation with hazardous areas shall be in compliance with an appropriate mode of protection according to the EN 60079-0 or EN 60079-26.

All non-electrical equipment of the leak detection system or its parts to be installed into hazardous locations shall be in compliance with an appropriate mode of protection according to EN ISO 80079-36.

Leak detection systems shall be in compliance with the EN 61000-6-1 and the EN 61000-6-3 or the EN 61000-6-2 and the EN 61000-6-4 in the field of the electromagnetic compatibility.

#### 5.4 Leak indicating device

The operating condition shall be clearly indicated.

The visual alarm shall be clearly indicated.

It shall be impossible to switch off the visual alarm while the system is powered on and an alarm condition exists.

The audible alarm shall be suitable for continuous operation and shall be designed for muting.

All leak indicating devices shall be designed for connecting an additional alarm. The output parameter shall be stated.

All indicators shall be equipped with a device for testing the operating condition of the alarm.

#### 5.5 Inspection of equipment

The user shall ensure before use of the equipment that

- the electrical equipment and the leak detection system shall be suitable for its application when installed in or connected with a hazardous area;
- the equipment shall be installed in accordance with the manufacturer's instructions;
- the installing staff shall be trained and qualified for mounting, starting up and functional testing of the leak detection systems;
- after setting up a functional test shall be carried out by the qualified person including a test protocol according to manufacturer's regulations.

The user shall ensure that an annual function test is carried out by a qualified person according to manufacturer's recommendations.

The interval of the function test can be extended if permanent online monitoring is used which shall fulfil the following requirements:

- Permanent and active monitoring of the power supply via daily data transmission, minimum the operating data (e.g. pressure / vacuum of the system).
- Where applicable the tightness of the system including a warning when the values are below the threshold.
- Identification of necessary maintenance e.g. of pumps, dry filters.
- Significant changes or manipulation within the system shall be identified and shall result in a warning.
- In case of an alarm immediate information (e.g. SMS, e-mail) shall be transmitted. Multiple sending is required as long as the problem is not fixed.