



# SLOVENSKI STANDARD

## SIST EN 13160-4:2016

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**Sistemi za kontrolo tesnosti - 4. del: Zahteve in metode za preskušanje in ocenjevanje senzorskih sistemov za zaznavanje netesnosti**

Leak detection systems - Part 4: Requirements and test/assessment methods for sensor based leak detection systems

Leckanzeigesysteme - Teil 4: Anforderungen und Prüf-/Bewertungsverfahren für sensorbasierte Leckanzeigesysteme

Systèmes de détection de fuites - Partie 4: Exigences et méthodes d'essai/d'évaluation des systèmes de détection de fuite par capteur

**Ta slovenski standard je istoveten z: EN 13160-4:2016**

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**ICS:**

23.020.01	Vsebniki za shranjevanje tekočin na splošno	Fluid storage devices in general
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## Leak detection systems - Part 4: Requirements and test/assessment methods for sensor based leak detection systems

Systèmes de détection de fuites - Partie 4: Exigences et méthodes d'essai/d'évaluation des systèmes de détection de fuites par capteur

Leckanzeigesysteme - Teil 4: Anforderungen und Prüf-/Bewertungsverfahren für sensorbasierte Leckanzeigesysteme

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

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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 .....	4
<b>1 Scope .....</b>	<b>6</b>
<b>2 Normative references .....</b>	<b>6</b>
<b>3 Terms and definitions.....</b>	<b>6</b>
<b>4 Requirements .....</b>	<b>6</b>
<b>4.1 Effectiveness.....</b>	<b>6</b>
<b>4.1.1 General .....</b>	<b>6</b>
<b>4.1.2 Presence of liquids.....</b>	<b>7</b>
<b>4.1.3 Presence of vapours .....</b>	<b>7</b>
<b>4.1.4 Re-usability of the sensor .....</b>	<b>7</b>
<b>4.1.5 Requirements for software, (only if provided).....</b>	<b>7</b>
<b>4.2 Durability of effectiveness .....</b>	<b>8</b>
<b>4.2.1 Durability of effectiveness against temperature .....</b>	<b>8</b>
<b>4.2.2 Durability of effectiveness against chemical attack.....</b>	<b>8</b>
<b>5 Testing, assessment and sampling methods.....</b>	<b>8</b>
<b>5.1 Effectiveness of the leak detection systems.....</b>	<b>8</b>
<b>5.1.1 General .....</b>	<b>8</b>
<b>5.1.2 Presence of liquid .....</b>	<b>8</b>
<b>5.1.3 Presence of vapours .....</b>	<b>12</b>
<b>5.1.4 Re-usability of the discriminating and non-discriminating sensors .....</b>	<b>12</b>
<b>5.1.5 Re-usability of vapour sensors .....</b>	<b>13</b>
<b>5.1.6 Software (only if provided).....</b>	<b>13</b>
<b>5.2 Durability of effectiveness .....</b>	<b>14</b>
<b>5.2.1 Durability of effectiveness against temperature .....</b>	<b>14</b>
<b>5.2.2 Durability of effectiveness against chemical attack.....</b>	<b>16</b>
<b>6 Assessment and verification of constancy of performance - AVCP.....</b>	<b>17</b>
<b>6.1 General .....</b>	<b>17</b>
<b>6.2 Type testing .....</b>	<b>17</b>
<b>6.2.1 General .....</b>	<b>17</b>
<b>6.2.2 Test samples, testing and compliance criteria .....</b>	<b>18</b>
<b>6.2.3 Test reports .....</b>	<b>19</b>
<b>6.2.4 Shared other party results .....</b>	<b>19</b>
<b>6.2.5 Cascading determination of the product type results.....</b>	<b>20</b>
<b>6.3 Factory production control (FPC).....</b>	<b>21</b>
<b>6.3.1 General .....</b>	<b>21</b>
<b>6.3.2 Requirements .....</b>	<b>21</b>
<b>6.3.3 Product specific requirements .....</b>	<b>24</b>
<b>6.3.4 Procedure for modifications .....</b>	<b>24</b>
<b>6.3.5 One-off products, pre-production products (e.g. prototypes) and products produced in very low quantity.....</b>	<b>24</b>
<b>7 Marking, labelling and packaging.....</b>	<b>25</b>

<b>8</b>	<b>Environmental aspects</b> .....	<b>26</b>
	<b>Annex A (informative) Environmental aspects</b> .....	<b>27</b>
	<b>Annex ZA (informative) Clauses of this European Standard addressing the provisions of the EU Construction Products Regulation</b> .....	<b>29</b>
<b>ZA.1</b>	<b>Scope and relevant characteristics</b> .....	<b>29</b>
<b>ZA.2</b>	<b>Procedure for AVCP of sensor based leak detection systems</b> .....	<b>30</b>
<b>ZA.2.1</b>	<b>System(s) of AVCP</b> .....	<b>30</b>
<b>ZA.2.2</b>	<b>Declaration of performance (DoP)</b> .....	<b>31</b>
<b>ZA.2.2.1</b>	<b>General</b> .....	<b>31</b>
<b>ZA.2.2.2</b>	<b>Content</b> .....	<b>32</b>
<b>ZA.2.2.3</b>	<b>Example of DoP</b> .....	<b>32</b>
<b>ZA.3</b>	<b>CE marking and labelling</b> .....	<b>34</b>
	<b>Bibliography</b> .....	<b>38</b>

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**EN 13160-4:2016 (E)****European foreword**

This document (EN 13160-4:2016) has been prepared by Technical Committee CEN/TC 393 "Equipment for tanks and filling 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 April 2018.

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 13160-4:2003.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

According to edition 2003 the following fundamental changes are given:

- requirements from EN 13160-1:2003 included, which are no longer contained in EN 13160-1:2016;
- new structure — requirements, testing, marking divided;
- new test procedure for vapour sensors and reusability of vapour sensors;
- test liquids revised.

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 systems*
- *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 pipe work systems*
- *Part 6: Sensors in monitoring wells*
- *Part 7: Requirements and test/assessment methods for leak detection linings*

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.

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**EN 13160-4:2016 (E)****1 Scope**

This European Standard gives requirements and the corresponding test/assessment methods applicable to sensor based leak detection systems (leak detection kits). The leak detection kits are intended to be used in interstitial spaces, leakage containments or monitoring wells. The leak detection kits are usually composed by:

- sensing device(s);
- evaluation device;
- alarm device.

**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 228, *Automotive fuels — Unleaded petrol — Requirements and test methods*

EN 12285-1, *Workshop fabricated steel tanks — Part 1: Horizontal cylindrical single skin and double skin tanks for the underground storage of flammable and non-flammable water polluting liquids*

EN 13160-1:2016, *Leak detection systems — Part 1: General principles*

EN 13160-3:2016, *Leak detection systems — Part 3: Requirements and test/assessment methods for liquid systems for tanks*

EN 14879-4:2007, *Organic coating systems and linings for protection of industrial apparatus and plants against corrosion caused by aggressive media — Part 4: Linings on metallic components*

EN 60079-29-1, *Explosive atmospheres — Part 29-1: Gas detectors — Performance requirements of detectors for flammable gases (IEC 60079-29-1)*

**3 Terms and definitions**

For the purposes of this document, the terms and definitions given in EN 13160-1:2016 and the following apply.

**3.1****re-usability of the sensor**

capability of a sensor to be used again after already detected liquid or vapour

**4 Requirements****4.1 Effectiveness****4.1.1 General**

This type of leak detection kit is classified according to EN 13160-1:2016 as class III.



The general requirements on leak detection systems according to Clause 5 of EN 13160-1:2016 shall be met.

Liquid or vapour sensors shall be installed in such a way that they can detect specific liquids or their vapours present in or entering the leakage containment, interstitial space or monitoring wells. The sensor shall react within a time specified by the manufacturer.

The leakage containment can take the form of a

- sump or riser designed to contain spills from leaks originating from pipework or pumps/dispensers;
- bund, designed to contain leakage from an above ground storage tank or from any other above ground facility containing liquids;
- other facilities in which sensors can be installed to detect the presence of liquids or vapours.

An alarm device according to EN 13160-3:2016, 4.1.3.5, shall be provided.

In the event of a sensor disconnection of the power supply an alarm condition shall result.

In case of a short circuit between two conductors in the connection between sensor and evaluation device an alarm shall be triggered.

#### 4.1.2 Presence of liquids

Liquid sensors shall detect specific liquids they may come into contact with (e.g. stored/conveyed product, water), according to the following requirements:

Category 1: Non-discriminating sensor.

The sensor shall detect the presence of any liquid (stored/conveyed product and water).

Category 2: Discriminating sensor.

Category 2A: The sensor shall detect the presence of liquid stored/conveyed product or water and discriminates between the two aforementioned.

Category 2B: The sensor shall detect the presence of a film of liquid (stored/conveyed product) with a vapour pressure  $\geq 30$  kPa at 20 °C floating on water.

#### 4.1.3 Presence of vapours

The sensor shall detect specific vapours from flammable liquids with a vapour pressure  $\geq 30$  kPa at 20 °C when their concentration is a volume fraction less than or equal to  $1000 \times 10^{-6}$ .

#### 4.1.4 Re-usability of the sensor

Any re-useable sensor shall be able to detect a new leak condition after removal of liquid or vapour. The recovery time shall be:

- not higher than 24 h from after the removal of the vapour leak conditions for any vapour sensors;
- not higher than 7 days from after the removal of the liquid leak conditions for any liquid sensor (or after the removal of the water for the vapour sensors) that doesn't need any manual reset procedure.

#### 4.1.5 Requirements for software, (only if provided)

The software, where provided, shall have a facility for self-checking by fulfilling the following requirements:

**EN 13160-4:2016 (E)**

- a self-diagnostic mode to test the integrity of the system at start up and periodically during use. A negative result of self-diagnostic mode shall result in a distinguishable alarm condition;
- a facility to check the consistency of the input and output data, malfunction shall result in a distinguishable alarm condition.

**4.2 Durability of effectiveness****4.2.1 Durability of effectiveness against temperature**

The working temperature ranges for leak detection sensors shall be as follows:

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

**4.2.2 Durability of effectiveness against chemical attack**

Parts of leak detection kits which can come into contact with the stored/conveyed liquid/water or its vapour and air shall be resistant.

**5 Testing, assessment and sampling methods****5.1 Effectiveness of the leak detection systems****5.1.1 General**

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For the tests minimum one sample shall be provided by the manufacturer.

For the tests the following documentation shall be provided by the manufacturer:

- documentation according to Clause 7;
- datasheet of the parts of the leak detection kit;
- electrical diagrams of the parts of the leak detection kit;
- design and application drawings;
- lists of the parts used including material data.

Leak detection kits shall be inspected visually to confirm that the sample complies with the documentation.

**5.1.2 Presence of liquid****5.1.2.1 Non-discriminating liquid sensors (Category 1)****5.1.2.1.1 Test equipment**

- mounting device for fixing the sensor;
- temperature sensor with an accuracy of  $\pm 1$  K;

- vessel with a diameter of 100 mm and with a volume of at least 1 l;
- time measuring device with an accuracy of  $\pm 1$  s;
- according to the signal of the sensor a measuring device regarding measuring current or voltage or an oscilloscope with an accuracy of 1 %;
- number of test samples (sensor or sensor with evaluation and alarm device);
- potable water;
- stored/conveyed product or the following test liquids:

a) for unleaded petrol according to EN 228

1) with maximum 5 % ethanol

47,5 % (V/V) toluene

30,4 % (V/V) isooctane (2,2,4-trimethylpentane)

17,1 % (V/V) n-heptane

3,0 % (V/V) methanol

2,0 % (V/V) butanol

2) with > 5 % (V/V) and  $\leq 20$  % (V/V) ethanol

20 % (V/V) ethanol

37,7 % (V/V) toluene

24,2 % (V/V) isooctane (2,2,4- trimethylpentane)

13,5 % (V/V) n-heptane

3 % (V/V) methanol

1,6 % (V/V) butanol

The tolerance for the component of the test liquid shall be 0,1 %.

b) for other petroleum products: liquids according to EN 14879-4:2007, Annex C.

### 5.1.2.1.2 Preparation

The tests shall be carried out at a temperature of  $(20 \pm 5)$  °C.

The output values of the current or voltage or the signal frequency for sensors without evaluation/alarm device shall be measured at the beginning of the test.

When using an evaluation device this shall indicate the operation condition.

a) The sensor shall be installed in the mounting device.

**EN 13160-4:2016 (E)**

The vessel shall be filled with potable water up to 75 %.

- b) The sensor shall be installed in the mounting device.

The vessel shall be filled with test liquid up to 75 %.

**5.1.2.1.3 Procedure**

- a) The test shall be carried out with at least 3 samples. The sensor shall be lowered into the potable water until the alarm condition is reached and the alarm device activates an alarm accordingly. When testing an analogue sensor the measured signal shall change accordingly.
- b) According to the test procedure a) but the test shall be carried out with test liquid.

**5.1.2.1.4 Evaluation**

The test shall be deemed to have passed if:

- the times according to 4.1.1 for reaching the activation point when lowering the test samples into potable water or test liquid are met;
- the measured immersion depth complies with the test liquid height required to activate an alarm as specified by the manufacturer.

The actual reaction times, the test liquid height and water height shall be recorded and given in the test report.

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**5.1.2.2 Discriminating liquid sensors of Category 2A**

SIST EN 13160-4:2016

**5.1.2.2.1 Test equipment**

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According to 5.1.2.1.1.

**5.1.2.2.2 Preparation**

According to 5.1.2.1.2.

**5.1.2.2.3 Procedure**

According to 5.1.2.1.3.

**5.1.2.2.4 Evaluation**

The test shall be deemed to have passed if:

- the times according to 4.1.1 for reaching the activation point when lowering the test samples into test liquid are met;
- the test liquid height measured is in accordance with the specification of the manufacturer and resulting in a test liquid alarm;
- the potable water height measured is in accordance with the specification of the manufacturer and resulting in a water alarm.

The actual reaction times, the test liquid height and water height shall be recorded and given in the test report.

### 5.1.2.3 Discriminating liquid sensors of category 2B

#### 5.1.2.3.1 Test equipment

According to 5.1.2.1.1 and additional a pipette with a scale with an accuracy of 1 %.

#### 5.1.2.3.2 Preparation

The tests shall be carried out at a temperature of  $(20 \pm 5)$  °C.

The output values of the current or voltage or the signal frequency for sensors without evaluation/alarm device shall be measured at the beginning of the test.

When using an evaluation device this shall indicate the operation condition.

##### a) Test with potable water:

The sensor shall be installed in the mounting device.

The vessel shall be filled with potable water up to 75 %.

##### b) Test with test liquid film on water:

The sensor shall be installed in the mounting device.

The vessel shall be filled with potable water up to 75 %.

The sensor shall be lowered into the vessel. The immersion depth into the potable water shall be chosen in a way that a covering with potable water is reached according to the specification of the manufacturer.

The pipette with the test liquid shall be prepared.

#### 5.1.2.3.3 Procedure

##### a) Test with potable water:

The sensor shall be suspended in air and the alarm device shall be activated accordingly.

When the sensor is immersed into the potable water the alarm device shall be de-activated.

The test shall be carried out with at least 3 samples.

##### b) Test with test liquid film on water:

With a pipette, test liquid shall be put on the potable water drop by drop until the sensor activates an alarm. The quantity of the test liquid shall be recorded and shall be calculated into a film thickness.

The test shall be carried out with at least 3 samples.

#### 5.1.2.3.4 Evaluation

The test shall be deemed to have passed if:

##### a) Test with potable water:

— an alarm condition appears in air and ceases after immersion in potable water.

##### b) Test with test liquid film on water: