

Leak detection systems - Part 5: Requirements and test/assessment methods for in-tank gauge systems and pressurised pipework systems

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>See Eesti standard EVS-EN 13160-5:2016+A1:2025 sisaldab Euroopa standardi EN 13160-5:2016+A1:2024 ingliskeelset teksti.</p> <p>Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 13.11.2024.</p> <p>Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.</p>	<p>This Estonian standard EVS-EN 13160-5:2016+A1:2025 consists of the English text of the European standard EN 13160-5:2016+A1:2024.</p> <p>This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.</p> <p>Date of Availability of the European standard is 13.11.2024.</p> <p>The standard is available from the Estonian Centre for Standardisation and Accreditation.</p>
--	---

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 23.020.10, 23.040.99

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele. Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis- ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardimis- ja Akrediteerimiskeskusega: Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation and Accreditation: Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

EUROPEAN STANDARD

EN 13160-5:2016+A1

NORME EUROPÉENNE

EUROPÄISCHE NORM

November 2024

ICS 23.020.10; 23.040.99

Supersedes EN 13160-5:2016

English Version

Leak detection systems - Part 5: Requirements and test/assessment methods for in-tank gauge systems and pressurised pipework systems

Systèmes de détection de fuites - Partie 5: Exigences et méthodes d'essai/d'évaluation des systèmes de détection de fuites en citernes et des systèmes de tuyauterie sous pression

Leckanzeigesysteme - Teil 5: Anforderungen und Prüf-/Bewertungsmethoden für Tankinhaltmesssysteme und druckbeaufschlagte Rohrleitungen

This European Standard was approved by CEN on 8 April 2016 and includes Amendment 1 approved by CEN on 11 September 2024.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



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

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

Contents	Page
European foreword	5
1 Scope	6
2 Normative references	6
3 Terms, definitions, symbols and abbreviated terms	7
3.1 Terms and definitions	7
3.2 Symbols and abbreviated terms	7
4 Requirements	7
4.1 Effectiveness of leak detection kits	7
4.1.1 General	7
4.1.2 Electrical or signal cable of the measuring device	8
4.1.3 Leak detection kit	8
4.1.4 Measures volumetric loss	8
4.1.5 Requirements for software	9
4.1.6 Mechanical construction	10
4.1.7 Effects of thermal contraction	10
4.1.8 Alarm device	10
4.2 Durability of effectiveness	10
4.2.1 Durability of effectiveness against temperature	10
4.2.2 Durability of effectiveness against chemical attack	10
4.2.3 Durability of effectiveness against hydraulic shock (only for measuring devices used on pressurized line)	10
4.2.4 Durability of effectiveness against fatigue and mechanical wear\degradation, (only for measuring devices used on pressurized line)	10
4.2.5 Durability of effectiveness against microbiological growth on critical surfaces involved in the measurement process	10
5 Testing, assessment and sampling methods	11
5.1 Effectiveness of leak detection kits	11
5.1.1 General	11
5.1.2 Disconnection of the electrical or signal cable of the measuring device	11
5.1.3 Leak detection kit	11
5.1.4 Measures volumetric loss	11
5.1.5 Software	25
5.1.6 Mechanical construction	25
5.1.7 Effects of thermal contraction	26
5.1.8 Alarm Device	26
5.2 Durability of Effectiveness	26
5.2.1 Durability of effectiveness against temperature	26
5.2.2 Durability of effectiveness against chemical attack	26
5.2.3 Durability of effectiveness against hydraulic shock (only for measuring devices used on pressurized line)	28
5.2.4 Durability of effectiveness against fatigue and mechanical wear\degradation, (only for measuring devices used on pressurized line)	28
5.2.5 Durability of effectiveness against microbiological growth on critical surfaces involved in the measurement process	29
6 Assessment and verification of constancy of performance — AVCP	29

6.1	General	29
6.2	Type testing	29
6.2.1	General	29
6.2.2	Test samples, testing and compliance criteria.....	30
6.2.3	Test reports	31
6.2.4	Shared other party results	31
6.2.5	Cascading determination of the product type results.....	31
6.3	Factory production control (FPC).....	32
6.3.1	General	32
6.3.2	Requirements.....	33
6.3.3	Product specific requirements	35
6.3.4	Procedure for modifications.....	36
6.3.5	One-off products, pre-production products (e.g. prototypes) and products produced in very low quantity	36
7	Marking, labelling and packaging.....	37
Annex A (normative) Acquisition of field data to provide a standard database for testing software leak detection systems Category A		38
A.1	Objective	38
A.2	Requirements.....	39
A.3	Equipment.....	40
A.4	Method.....	41
A.5	Data up-loading and verification	43
A.6	Induced leak rates – quantitative systems	44
A.7	Induced leak rates – qualitative systems	44
A.8	Test sequence.....	44
A.9	Simulated leak test results.....	45
A.10	Qualification for use	45
A.11	Statistical analysis.....	46
Annex B (informative) Acquisition of field data to provide a standard database for testing software leak detection systems Category B(2)		51
B.1	General	51
B.2	File sorting and selection.....	51
B.3	Data set Requirements	51
B.4	Induced leak rates – quantitative systems	52
B.5	Induced leak rates – qualitative systems.....	52
B.6	Test sequence.....	52
B.7	Evaluation of simulated leak test results.....	53
B.8	Qualification for use	53
B.9	Statistical analysis.....	53
B.10	Comparison of variable and constant leak rate pairs	57
B.11	Validation of conditions of use	57

Annex C (normative) Leak detection systems Category B(1)	59
C.1 Preparation	59
C.2 Stabilization and trial run	59
C.3 Procedure	59
C.4 Test results	63
C.5 Evaluation	63
Bibliography	66

This document is a preview generated by EVS

European foreword

This document (EN 13160-5:2016+A1:2024) has been prepared by Technical Committee CEN/TC 393 “Equipment for storage tanks and for 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 May 2025, and conflicting national standards shall be withdrawn at the latest by August 2026.

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

This document includes Amendment 1 approved by CEN on 11 September 2024.

This document supersedes ^{A1} EN 13160-5:2016 ^{A1}.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ^{A1} ^{A1}.

^{A1} *deleted text* ^{A1}

According to EN 13160-5:2004 the following fundamental changes are given:

- Requirement for a device for simulating a leak deleted;
- requirements from EN 13160-1:2003 included, which are no longer contained in EN 13160-1:2016;
- Pressure line leak detection kits included.

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

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

1 Scope

This European Standard gives requirements and corresponding test\assessment methods applicable to leak detection kits, based on volumetric loss from within the tank and/or pipework system. The kits usually comprise:

- Measuring Device
- Evaluation Device
- Alarm Device

Intended use:

Leak Detection kits are intended to be used in\with single or double skin underground tanks or single or double skin underground and/or aboveground pipework designed for flammable liquids having a flash point not exceeding 100 °C.

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

EN 590, *Automotive fuels — Diesel — Requirements and test methods*

EN 976-1, *Underground tanks of glass-reinforced plastics (GRP) — Horizontal cylindrical tanks for the non-pressure storage of liquid petroleum based fuels — Part 1: Requirements and test methods for single wall tanks*

EN 981:1996+A1:2008, *Safety of machinery — System of auditory and visual danger and information signals*

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 13160-2, *Leak detection systems — Part 2: Requirements and test/assessment methods for pressure and vacuum systems*

EN 13352:2012, *Specification for the performance of automatic tank contents gauges*

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 60296, *Fluids for electrotechnical applications — Unused mineral insulating oils for transformers and switchgear (IEC 60296)*

EN 60529, *Degrees of protection provided by enclosures (IP Code) (IEC 60529)*

EN 61672-1, *Electroacoustics — Sound level meters — Part 1: Specifications (IEC 61672-1)*

ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

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

3.1.1

quantitative output

numerical indication of the leak rate

3.1.2

qualitative output

pass/fail indication for a given test with reference to a specified leak rate

3.2 Symbols and abbreviated terms

<i>B</i>	is the bias
<i>LL</i>	is the lower confidence bound for probability of detection
<i>UL</i>	is the upper confidence bound for probability of detection
<i>MSE</i>	is the mean squared error
<i>PD</i>	is the probability of detection
<i>PFA</i>	is the probability of false alarm
<i>PI (all)</i>	is the proportion of invalid records for all records
<i>PI (leak)</i>	is the proportion of invalid records for leaking tanks
<i>PI (tight)</i>	is the proportion of invalid records for tight tanks
<i>R</i>	is the simulated leak rate
<i>C</i>	is the criterion or threshold for indicating a leak
<i>B</i>	is the estimated bias of the system
<i>SD</i>	is the standard deviation
<i>t_b</i>	is the two-sample <i>t</i> -test bias

4 Requirements

4.1 Effectiveness of leak detection kits

4.1.1 General

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

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

The measuring device shall fulfil the requirements according to 5.1 of EN 13352:2012.