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Specification for the performance of automatic tank contents gauges

Anforderungen an automatische Tankinhaltsmessgeräte

Spécification de performance des dispositifs mesureurs automatiques de niveau de réservoir

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Specification for the performance of automatic tank contents gauges

Spécification de performance des jauges automatiques de niveau de réservoir

Anforderungen an automatische Tankfüllstandmessgeräte

This European Standard was approved by CEN on 28 January 2012.

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

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Contents

Page

Foreword

This document (EN 13352:2012) 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of an identical text or by endorsement, at the latest by September 2012, and conflicting national standards shall be withdrawn at the latest by September 2012.

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 13352:2002.

The main changes with respect to the previous edition are listed below:

— test liquid changed;

— requirement concerning the compatibility of the materials in contact with fuels (including ethanol blends and biodiesel) and/or their vapour added;

— test equipment modified;

— test procedures modified to reduce the number of tests without affect the overall performances; some procedures are performed in climatic chamber;

— some notes about the performance of water indication added that may be affected if the fuel to monitor is an ethanol blend;

— information concerning environmental aspects included.

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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The principal function of a tank gauge is to measure the level of liquid contained in a storage tank without the need to access the tank and take manual dip readings. The gauge measures liquid parameters, which can include height, mass, temperature, density and pressure. These can then be used to determine the tank's content. Methods of establishing tank's content, e.g. direct volume measurement, are not addressed in this standard.

The increasing need for continuous inventory control for security, effective site operation and environmental protection has made the use of tank gauges a practical solution for any tank installation. In addition, in the case of volatile products, the advent of vapour emission control makes access to the tank for dipping purposes increasingly difficult.

Automatic tank gauging systems are devices which can interface with other measuring equipment and can be capable of providing one or more of the following functions:

Basic gauging

Where the gauge is used solely to confirm that there is sufficient ullage to accept delivery of a quantity of product into the tank or where the gauge is used solely to measure the liquid contents of the tank.

Inventory control

Where the tank contents information is used for stock accounting purposes. This can be transferred manually or, where the gauge forms part of an integrated system, automatically.

Automatic reconciliation

Where the tank contents information is used together with measured additions to and depletions from the storage tanks contents in a defined time period to identify possible discrepancies.

Automatic Calibration

Where the tank level information in connection with refuel volume is used to calculate tank calibration data.

1 Scope

This European Standard specifies the minimum performance requirements for various classes of automatic tank gauges which are limited to static tanks of shop fabricated manufacture both metallic and non metallic, underground and above ground which do not exceed 5 m in height.

It is applicable to gauges for fuels (products) which are flammable, having a flash point up to but not exceeding 100 °C, stored at premises (e.g. filling stations) at which fuel is dispensed for use in vehicles and other forms of transportation. This European Standard applies to gauges suitable for use at ambient temperatures and subject to normal operational pressure variations.

Gauging of liquefied gases are not covered by this standard.

This European Standard relates to the measurement of product level, measurement of product temperature and detection of the presence of free water. The detection of free water may be compromised for Alcohol blended fuels.

NOTE 1 This standard is not intended to cover safety functionalities (i.e. overfill prevention, leak detection, etc.). Further Standards apply.

NOTE 2 This standard is not intended to cover legal metrology requirements.

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 590:2009+A1:2010, *Automotive fuels — Diesel — Requirements and test methods*

EN 14214, *Automotive fuels — Fatty acid methyl esters (FAME) for diesel engines — Requirements and test methods*

EN 15376, *Automotive fuels — Ethanol as a blending component for petrol — Requirements and test methods*

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

EN ISO/IEC 17025:2005, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)*

3 Terms and definitions

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

3.1
automatic tank gauge (ATG)
device capable, as a minimum, of providing a measurement of the level of liquid contained in a storage tank without the need for manual access into the tank

3.2
ullage
product quantity which can safely be delivered into the tank without running the risk of exceeding the maximum safe filling capacity

3.3
gauge sensor
device which measures one or more of product level, temperature and free water presence

3.4
gauging system
combined system of gauge sensor(s) and associated indicator device(s)

3.5
indicator device
device which receives and displays the output signals from the gauge sensor(s). It may process that data and display, print or transmit information as required

3.6
maximum permissible error (MPE)
extreme values of an error permitted by specifications, regulations etc. for a given measuring instrument

3.7
measuring range (MR)
distance between the upper and lower limits of measurement over which the performance requirements are satisfied

3.8
readability
property of a measuring instrument where the indicating device is constructed in such a way that its indication may be read without ambiguity

3.9
reference level measurement device (RLMD)
certified level measurement device used for verification of the ATG's performance

3.10
reference temperature measurement device (RTMD)
certified temperature measurement device used for verification of the ATG's performance

3.11
repeatability
ability of a measuring instrument to provide closely similar indications for repeated applications of the same measurand under the same conditions of measurement (ISO-Publication)

Note 1 to entry: These conditions include:

— reduction to a minimum of the variations due to the observer;

— the same measurement procedure;

— the same observer;

— the same measuring equipment, used under the same conditions;

— the same location;

— repetition over a short period of time.

Note 2 to entry: Repeatability can be expressed quantitatively in terms of the dispersion characteristics of the indications.

3.12
resolution
smallest difference between indications of a displaying device that can be meaningfully distinguished (ISO-Publication)

Note 1 to entry: For a digital displaying device, this is the change in the indication when the least significant digit changes by one step.

Note 2 to entry: This concept applies also to a recording device.

3.13
consecutive readings
reading taking from the indicator device at intervals of no less than 1 minute, in consideration of the refresh time of the measurement and display cycle

4 General requirements

4.1 Temperature ranges

The components of an automatic tank gauge shall be designed for operation under atmospheric conditions and rated subdivided into the temperature categories according to Table 1.

Table 1 — Temperature category

Temperature category	Temperature range
O	−25 °C to +55 °C
P	−5 °C to +45 °C
U	−5 °C to +30 °C
I	+5 °C to +40 °C

NOTE The temperature category are intended to cover Over-ground, Underground, Indoor and Protected environments.

4.2 Variations in the properties of stored products

The performance requirements for ATGs according to 5.1 and 5.2 shall be satisfied when using one or more of the following test liquids:

— Type 1 Diesel according to EN 590:2009+A1:2010;

— Type 2 Transformer oil according to EN 60296.

NOTE 1 The above test liquids have defined ranges of variations in their physical properties.

NOTE 2 The above test liquids cover also the characteristics of gasoline and bio-fuels (including bio-diesel and ethanol-gasoline blends) for level and temperature measurements only.

4.3 Humidity

For all classes of gauging system, the performance shall be unaffected by humidity, i.e. the gauge sensors shall operate in conditions of 95 % non-condensing humidity.

4.4 Characteristics of the materials

All materials that may be in permanent contact with fuels or their vapours during the normal use of the probe shall comply with the requirements of Annex E for all fuels as appropriate. The tests shall be performed only for fuels foreseen by the manufacturer for that type of probe.

NOTE The type of fuels for which the probe is intended to be used may be determined by the literature accomplishing the probe or by a manufacturer statement. In absence of such information, tests are performed for each test fluid.

5 Performance requirements

5.1 Level measurement

Gauging systems shall be classified as one of three classes, A, B or C, satisfying the performance requirements for level measurement according to Table 2 over their entire measuring range and operating temperature range.

Table 2 — Level measurement performance requirements

Class	Maximum permissible error (MPE)	Repeatability
A	± 1 mm	0,5 mm
B	± 2 mm	1 mm
C	± 1 % of measuring range	0,5 % of measuring range

The method of type testing for level measurement is given in Clause 9.

5.2 Temperature measurement

Where average product temperature measurement is provided, the performance requirements for temperature measurement according to Table 3 shall be satisfied.

Table 3 — Temperature measurement performance requirements

Class	Maximum permissible error ° C
A	± 1,0
B	± 2,0
C	Not prescribed

The method of type testing for temperature measurement is given in Clause 9.

5.3 Water detection

Where water detection is provided, this facility shall:

5.3.1 Detect a minimum free water level of 30 mm when the probe has been installed on the bottom of the tank.

5.3.2 Indicate the presence of free water within 1 min of the free water reaching the level specified in 5.3.1 (response time).

5.3.3 Cease to indicate the presence of free water within 5 min of the free water dropping below the level specified in 5.3.1 (recovery time).

5.3.4 Activate an alarm within 1 min on detecting the presence of free water at a pre-set level.

NOTE To prevent false alarms during deliveries it is permitted to disable water detection.

The method of type testing for free water detection is given in Clause 10.

5.4 Essential information

The information available for display, printing or transmission by the indicator device shall include:

a) the identification of the tank (for multiple tank systems);

b) product identification (for multiple tank systems);

c) the level and an indication of the volume of product in the tank and/or ullage with an indicated resolution according to Table 4;

d) the date and time of the reading (if printed);

e) indication of water present (if water detection fitted);

f) high water alarm (if water detection fitted);

g) sensor disconnection indication;

h) visual indication of power on.

Table 4 — Required resolution for level measurement and volume indication

Class	Level measurement resolution	Volume indication resolution
A	0,1 mm	1 l
B	0,2 mm	1 l
C	0,1 %	0,1 %

The correct provision of essential information shall be verified through the type approval test procedure described in Clause 8.

NOTE 1 With a multiple tank system, a single indicator device for the gauge sensors can be provided in which case it should be capable of being switched between tanks or should switch automatically between tanks and should then indicate clearly to which tank the information shown refers.

NOTE 2 To achieve accurate volume measurement, an accurate tank capacity table is required. Suggested methods for generating tank capacity tables are referenced in Annex B (informative).

5.5 Indicator device

The display of information shall be stable to within the corresponding MPE for the class of measurement performance (A, B or C) over a range of environmental temperature for the indicator device. The manufacturer shall specify this range either as category O or category I, according to 4.1.

5.6 Manufacturers instructions

Instructions shall be provided by the manufacturer for the safe installation, accurate positioning of the gauge sensor, operation and maintenance of the automatic tank gauging system.

NOTE See Annex B (informative) for further information.

5.7 Classification and designation

5.7.1 Gauge sensors shall be designated according to the following classifications as established by the relevant test methods:

a) Class of measurement performance (class A, B or C in accordance with Table 2 and Table 3);

b) the temperature range over which this class of performance is achieved (category O, P or U according to 4.1);

c) water detection performance (W represents compliance according to 5.3).

These classifications shall be designated each by a single letter or numeral according to the following syntax:

a)	b)	c)
{A}	{O}	
{B}	{P}	[W]
{C}	{U}	

Items bracketed { } are required. One option from each classification shall be given.

Items bracketed [ ] are optional.

For example, a sensor achieving class of performance B, over the temperature range of category U and capable of water detection would be designated BUW.

These designations shall not be affixed other than to sensors within the range of tank sizes specified by manufacturer for which approval has been obtained.

5.7.2 Indicator devices (where separate from the sensor) shall be designated according to the following classifications as established by the relevant test methods:

a) measurement performance (class A, B or C in accordance with Table2 and Table 3);

b) the temperature range over which this class of performance is achieved (category O or I according to 4.1).

These classifications shall be designated each by a single letter according to the following syntax: