BS EN 13922:2020+A1:2022

BSI Standards Publication

Tanks for transport of dangerous goods — Service equipment for tanks — Overfill prevention systems for liquid fuels

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National foreword

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The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by ▌A1⟩ ⟨A1▌.

The UK participation in its preparation was entrusted to Technical Committee AUE/18, Tanks for the transport of dangerous goods.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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EN 13922:2020+A1

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English Version

Tanks for transport of dangerous goods - Service equipment for tanks - Overfill prevention systems for liquid fuels

Citernes destinées au transport de matières dangereuses - Équipement de service pour citernes - Dispositifs limiteurs de remplissage pour carburants pétroliers liquides

Tanks für die Beförderung gefährlicher Güter - Bedienungsausrüstung von Tanks - Überfüllsicherungssysteme für flüssige Kraft- und Brennstoffe

This European Standard was approved by CEN on 1 December 2019 and includes Amendment 1 approved by CEN on 10 August 2022.

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European foreword

This document (EN 13922:2020+A1:2022) has been prepared by Technical Committee CEN/TC 296 “Tanks for the transport of dangerous goods”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by March 2023, and conflicting national standards shall be withdrawn at the latest by March 2023.

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 supersedes [A1⟩ EN 13922:2020 ⟨A1].

This document includes Amendment 1 approved by CEN on 10 August 2022.

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1⟩ ⟨A1].

In comparison with the 2011 edition, the following fundamental changes were made:

— safety integrity level (SIL) added;

— requirements and tests for electromagnetic compatibility (EMC) revised;

— temperature for the sensors extended to +60 °C;

— electrical requirements in 6.3.7 expanded for clarification;

— waveform signal changed to waveform pulse throughout the standard;

— Annex A tables and figures revised to reflect installed base;

— the word "peak" was added in Table A.3 before "sensor current" only for clarification;

— referred standards updated.

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 organisations 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.

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Introduction

The overfill prevention system prevents the maximum filling level of a compartment of a tank-vehicle from being exceeded by interrupting the filling operation on the loading site.

It is not the function of an overfill prevention system to prevent volume or weight overloading. The function of the overfill prevention system is the final means of containing the loaded product within a compartment and preventing a dangerous condition. It is therefore of critical importance that all components have a high degree of reliability and that all European gantries provide a compatible system with the tank-vehicles.

Not all the components of an overfill prevention system are necessarily supplied by one manufacturer but may include cross-compatible parts supplied by different manufacturers/suppliers. However, cross-compatibility does not mean interchangeability.

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1 Scope

This document specifies the following points regarding the minimum requirements for an overfill prevention system:

— functions;

— major components;

— characteristics;

— test methods.

This document is applicable to overfill prevention systems for liquid fuels having a flash point up to but not exceeding 100 °C, excluding liquefied petroleum gas (LPG).

NOTE Vapour path detection is not part of this standard but can be provided as an option.

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

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

EN 60079-11, *Explosive atmospheres — Part 11: Equipment protection by intrinsic safety "i" (IEC 60079-11)*

EN 60079-14, *Explosive atmospheres — Part 14: Electrical installations design, selection and erection IEC 60079-14)*

EN 61000-4-3, *Electromagnetic compatibility (EMC) — Part 4-3: Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3)*

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

EN 61508-1, *Functional safety of electrical/electronic/programmable electronic safety-related systems — Part 1: General requirements (IEC 61508-1)*

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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:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp/ui

3.1
overfill prevention system
sensors or sensor circuits, interface plug/socket, overfill prevention controller and all connecting wiring and cables

3.2
cross-compatibility
ability of one part of the overfill prevention system to be able to work safely and satisfactorily with another part of the overfill prevention system although the parts are supplied by different manufacturers

3.3
dry sensor
state of the sensor when not immersed in liquid

3.4
effective cycle time
period taken for the overfill prevention system to identify a fault condition and switch to a non-permissive state

3.5
fail-safe
switching to a non-permissive state if any single component failure in the overfill prevention system renders the overfill prevention system unable to detect an overfill or loss of earth connection

3.6
five-wire system
system which uses five wire interface signals for liquid level detection

3.7
gantry control system
system which controls the loading of product into the tank-vehicle

3.8
gantry control system reaction time
period commencing when the overfill prevention controller's output changes to non-permissive state and ending with the cessation of all product flow after the closure of the gantry control valve

3.9
interoperable
ability of different parts of the overfill prevention system to operate together, and a functional aspect of cross-compatibility

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3.10
warm-up time
period to switch to a permissive state after plug connection is made to a tank-vehicle socket with no sensor immersed in liquid

3.11
non-permissive
output state of the overfill prevention controller which disables liquid flow

3.12
overfill prevention controller
device mounted at the gantry which connects to the tank-vehicle and which provides a permissive signal or non-permissive signal to the gantry control system

3.13
overfill prevention system response time
period commencing when a sensor becomes wet and ending when the controller output switches to non-permissive signal

3.14
permissive
output state of the overfill prevention controller which enables liquid flow

3.15
self-checking
automatic and continuous checking of the integrity of an overfill prevention system's components to verify its ability to perform its minimum functions

3.16
sensor
device and any associated circuit mounted on or in a tank-vehicle's compartment and connected to interface socket which provides the wet or dry signal to the overfill prevention controller

Note 1 to entry: Wet signal includes all other conditions than the dry signal.

3.17
sensor circuit
sensor not directly wired to the interface socket but using intermediate components/electronics to transfer the sensor output to the interface socket

3.18
two-wire system
system which uses two-wire interface signals for liquid level detection

3.19
wet sensor
state of a sensor just sufficiently submerged in liquid to initiate a change in signal output from dry to wet

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4 Functions

4.1 To prevent overfilling of the tank-vehicle's compartment by providing a fail-safe output to a gantry control system.

4.2 To provide a failsafe monitored earthing connection from the gantry to the tank-vehicle's shell via a bonding connection to the tank-vehicle's chassis.

4.3 To provide visual indication of the status of the overfill prevention system.

5 Major components

5.1 Tank-vehicle mounted equipment

The following equipment shall be installed on the tank-vehicle as a minimum:

— one sensor or sensor circuit per compartment;

— one 10 pin socket;

— wiring to the sensors;

— earthing provision.

5.2 Equipment fitted at the gantry

The overfill prevention equipment mounted on the tank truck is operable when the following equipment is installed at a loading gantry:

— overfill prevention controller;

— one 10 pin plug and cable for connection to tank-vehicle socket.

5.3 Optional equipment

The overfill prevention system can provide the vapour collection detection safety interlock which prevents loading unless the vapour collection hose is connected to the tank-vehicle and the vapour transfer valve(s) is (are) open.

6 Characteristics

6.1 Overfill prevention system working characteristics

6.1.1 Overfill

The overfill prevention system shall be an electronic system, gantry based and gantry operated. The interface wiring shall be suitable for a two-wire or a five-wire overfill prevention system and the gantry based controller shall automatically detect the difference between either overfill prevention system through a standardized 10 pin plug and socket — see Figures A.2 and A.3 — and perform its functions.

Electrical specifications for the interface are included in Annex A.

The overfill prevention controller shall only provide a permissive signal to permit loading if, once connected, there is no system fault and no sensor is wet.

Upon an overfill condition or the detection of any overfill prevention system or controller fault, the controller shall switch to non-permissive state.

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The overfill prevention system shall be fail safe and shall be self-checking. The effective cycle time between self-checks shall be less than the overfill response time.

The overfill prevention response time shall not exceed 700 ms.

The overfill prevention system shall be capable of handling up to and including the following number of compartments for each type of installation:

— Two-wire system 8 compartments;

— Five-were system 12 compartments.

No signals other than those defined in the standard are allowed.

6.1.2 Earthing

The overfill prevention system shall provide an electrical connection from the gantry earth to the tank-vehicle chassis via the cable and connection plug and socket and shall continuously verify this connection throughout the loading operation.

To comply with the transport regulations (ADR), a good electrical connection from the tank vehicle chassis to earth shall be established before tanks are filled or emptied.

Should the electrical resistance of the connection exceed a maximum of 10 kΩ, the gantry controller shall switch to non-permissive state.

6.1.3 Severe environmental condition

Where the overfill prevention system is subjected to temperatures outside the specified temperature range all applicable temperature values shall be extended. All other requirements shall remain unchanged.

6.1.4 Requirements for electromagnetic compatibility (EMC)

The overfill prevention system shall fulfil the requirements of:

— EN 61000-6-4 for emission;

— EN 61000-4-3 for immunity.

6.1.5 Circuit interlock (optional)

When included within the overfill prevention system, the circuitinterlock (switch) shall provide the function of the vapour collection detection interlock described in 5.3 and shall be connected as shown in Figures A.4 and A.5.

6.1.6 Electrical interface

At the plug/socket interface each sensor or sensor circuit shall be suited for controller's intrinsically safe parameters. The electrical connections of the 10-pin-socket shall comply with Table A.16.

The cable used shall comply with Table A.9 and EN 60079-14.

6.1.7 Interoperability of sensors

Sensors connected directly to the 10-pin socket as shown in Figures A.4 and A.5, shall be interoperable, but not necessarily mechanically interchangeable.

Sensors connected indirectly (i.e. through an additional electronic device) to the 10-pin socket as shown in Figures A.4 and A.5, may not be interoperable.

6.1.8 Tank vehicle identification device (optional)

When included with the overfill prevention system, a tank vehicle identification device shall provide a unique identification number using a 1-wire protocol, as shown in Figures A.4 and A.5.

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6.2 Sensors

6.2.1 General

Any of the following types of sensors may be used:

— two-wire system: negative temperature coefficient (NTC) thermistor, optic or other compatible device;

— five-wire system: optic or other compatible device;

— sensor circuit.

6.2.2 Two-wire system

Thermistor sensors shall have a NTC and shall work in the temperature range from −20 °C to +50 °C.

Thermistor sensors have a warm-up time which shall not exceed 75 s with the thermistor sensor at an ambient temperature of −20 °C.

NOTE 1 Optic sensors or other compatible sensors have a negligible warm-up time.

Two-wire sensors can be used on tank-vehicles with no more than 8 compartments. The overfill prevention controller shall always monitor 8 sensors and stop all loading if any sensor detects an overfill. Tank-vehicles equipped with two-wire sensors with less than 8 compartments shall employ an electronic dummy sensor for the unused channels of the controller.

These dummies shall form part of the tank-vehicle mounted equipment.

The electronic dummy sensor shall generate a permissive signal when it is connected to a controller. The signal shall correspond to a wave form as shown in Figure A.1 with the values according to Table A.4.

A two-wire optic or other compatible sensor shall work in the temperature range from −20 °C to +60 °C. When connected to a gantry controller, a dry sensor shall generate a permissive signal, which shall correspond to a wave form as shown in Figure A.1 with the values according to Table A.4.

NOTE 2 Sensor operating temperature range is different from ambient temperature range because of the effect of direct sunlight on the tank.

6.2.3 Five-wire system

A five-wire optic sensor or other compatible sensors shall work in the temperature range from −20 °C to +60 °C. When connected to a gantry controller, a dry sensor shall generate a permissive signal, which shall correspond to a wave form as shown in Figure A.1 with the values according to Table A.1.

NOTE Sensor operating temperature range is different from ambient temperature range because of the effect of direct sunlight on the tank.

6.2.4 Sensor circuit

A sensor circuit shall comply with the requirements according to 6.2.2 and 6.2.3 as applicable.

6.2.5 Response time

The reaction time from sensor going wet to the change of state of the signal at the interface socket shall not exceed 250 ms.

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