



SLOVENSKI STANDARD
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Varnost vozil za talni transport - Obratovanje v potencialno eksplozivnih atmosferah - Uporaba v območju vnetljivega plina, pare, megle in prahu

Safety of industrial trucks - Operation in potentially explosive atmospheres - Use in flammable gas, vapour, mist and dust

Sicherheit von Flurförderzeugen - Einsatz in explosionsgefährdeten Bereichen - Verwendung in Bereichen mit brennbaren Gasen, Dämpfen, Nebeln oder Stäuben

Sécurité des chariots de manutention - Fonctionnement en atmosphères explosibles - Utilisation dans des atmosphères inflammables dues à la présence de gaz, de vapeurs, brouillards ou poussières inflammables

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Safety of industrial trucks - Operation in potentially explosive atmospheres - Use in flammable gas, vapour, mist and dust

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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 150.

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Contents

	Page
Foreword.....	3
1 Scope.....	6
2 Normative references.....	6
3 Definitions	8
4 Safety requirements and/or measures	11
4.1 General	11
4.2 Hot surfaces	12
4.3 Safety shutdown	13
4.4 Mechanically generated sparks.....	13
4.5 Electrical system.....	14
4.6 Internal combustion engines.....	16
4.7 Electrostatic risks	16
4.8 Requirements for brakes, clutches and couplings.....	19
4.9 Requirements for pneumatic systems	21
4.10 Requirements for trucks equipped with gas a detection system.....	21
5 Verification of safety requirements and/or protective measures.....	24
5.1 Determination of the maximum surface temperatures	24
5.2 Measurement of resistance and capacitance	27
5.3 Flameproof enclosure.....	28
6 Information for use.....	29
6.1 Instruction handbook.....	29
6.2 Marking.....	31
6.3 Warning labels.....	32
Annex A (informative) List of significant hazards.....	33
Annex B (informative) Relation between zones, categories and EPL's	36
Annex C (informative) Typical examples of fork cladding.....	37
Annex D (informative) Typical examples of profiled surfaces.....	38
Annex E (normative) Requirements for transmission belts in accordance with ISO 9563 or ISO 1813	42
Annex F (informative) Examples for marking of trucks.....	43
Annex G (informative) Significant technical changes between this document and the previous edition of this European Standard	45
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC	53
Annex ZB (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 94/9/EC.....	54
Bibliography.....	55

Foreword

This document (prEN 1755:2013) has been prepared by Technical Committee CEN/TC 150 “Industrial trucks - safety”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

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 Annexes ZA and ZB, which are an integral part of this document.

This document supersedes EN 1755:2000+A1:2009.

Annex G provides details of significant technical changes between this European Standard and the previous edition.

This European Standard is one of a series of European Standards for the safety of industrial trucks:

EN 1175-1, *Safety of industrial trucks — Electrical requirements — Part 1: General requirements for battery-powered trucks*

EN 1175-2, *Safety of industrial trucks — Electrical requirements — Part 2: General requirements for internal combustion engine powered trucks*

EN 1175-3, *Safety of industrial trucks — Electrical requirements — Part 3: Specific requirements for the electric power transmission systems of internal combustion engine powered trucks*

EN 1459, *Safety of industrial trucks — Self propelled variable reach trucks*

EN 1525, *Safety of industrial trucks — Driverless industrial trucks and their systems*

EN 1526, *Safety of industrial trucks — Additional requirements for automated functions on trucks*

EN 1755, *Safety of industrial trucks — Operation in potentially explosive atmospheres — Use in flammable gas, vapour, mist and dust*

EN 1757-3, *Safety of industrial trucks — Pedestrian controlled manual and semi-manual trucks — Part 3: Platform trucks*

EN ISO 3691-5:2009, *Industrial trucks - Safety requirements and verification - Part 5: Pedestrian-propelled trucks*

EN ISO 3691-1:2012, *Industrial trucks — Safety requirements and verification Part 1: Self-propelled industrial trucks, other than driverless variable-reach trucks and burden-carrier trucks*

EN 12053, *Safety of industrial trucks — Test methods for measuring noise emissions*

EN 12895, *Safety of industrial trucks — Electromagnetic compatibility*

EN 13059, *Safety of Industrial trucks — Test method for measuring vibration*

ISO 13564, *Powered industrial trucks — Test methods for verification of visibility — Part 1: Sit-on and stand-on operator trucks up to and including 10 t capacity (ISO/DIS 13564-1:2007)*

prEN 1755:2013 (E)

EN 16307-1:2013, *Industrial trucks - Safety requirements and verification - Part 1: Supplementary requirements for self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

EN 16307-5:2012, *Industrial trucks - Safety requirements and verification - Part 5: Supplementary requirements for pedestrian-propelled trucks*

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Introduction

This standard has been prepared to be a type C standard to provide one means of conforming with the essential requirements of the Machinery Directive and associated EFTA regulations. It will also provide one means of conforming with the essential requirements of the Directive concerning equipment and protective systems intended for use in potentially explosive atmospheres. The machines concerned and the extent to which hazards, hazardous situations and hazardous events are covered, are indicated in the scope of this standard.

In addition, industrial trucks should comply with EN ISO 12100:2010 for hazards which are not covered by this standard.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards for machines that have been designed and built according the provisions of this type C standard.

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prEN 1755:2013 (E)**1 Scope**

This European Standard applies to self-propelled and pedestrian propelled manual and semi-manual industrial trucks (hereafter often referred to as trucks) for use in potentially explosive atmospheres including their load handling devices and removable attachments.

Fork arms, load platforms or integrated attachments are considered to be parts of the truck. Attachments mounted on the load carrier or on fork arms which are removable by the user are not considered to be a part of the truck

This European Standard deals only with the prevention of the ignition of an explosive atmosphere by industrial trucks and describes the additional requirements for trucks of equipment group II and equipment category 2G, 3G, 2D and 3D.

The relationship between equipment categories and the respective zones is shown in Annex B.

This standard does not cover trucks for category 1 and trucks intended for use in explosive atmospheres with hybrid mixtures.

All trucks intended for use in potentially explosive atmospheres within the scope of this European Standard need to comply with the requirements stated in this European Standard. Where additional hazards could occur, an ignition hazard assessment according to EN 13463-1:2009 will be carried out, taking into consideration these special circumstances and additional requirements contained in EN 13463-1:2009 and if relevant modified by the specific parts of EN 13463 for other types of protection.

This European Standard covers the technical requirements necessary to avoid or minimize the significant hazards listed in Annex A, which could occur during normal operation, maintenance or foreseeable misuse (in accordance with the data given by the manufacturer) of industrial trucks.

This European standard does not apply to trucks intended for use in hazardous atmospheres with carbon disulfide (CS₂), carbonmonoxide (CO) and/or ethylenoxide (C₂H₄O) due to special properties of these gases.

Trucks marked IIB+H₂ and/or C₂H₂ (hydrogen and/or acetylene) are also suitable for IIA or IIB atmospheres.

This European Standard is valid for atmospheres with an ambient temperature range of -20 °C to +40 °C, i.e. trucks built to this European Standard will be satisfactory to any service conditions within this range unless otherwise specified. [s.iteh.ai/catalog/standards/sist/acfe1ca6-3051-47dd-bb8b-dad0f76f8a49/sist-en-1755-2016](https://www.iteh.ai/catalog/standards/sist/acfe1ca6-3051-47dd-bb8b-dad0f76f8a49/sist-en-1755-2016)

NOTE The ambient temperature range (-20 °C to +40) °C is in line with EN 3691-1.

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 1127-1:2011, *Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology*

EN 1149-5:2008, *Protective clothing – Electrostatic properties – Part 5: Material performance and design requirements*

EN 1175-1:1998+A1:2010, *Safety of industrial trucks - Electrical requirements – Part 1: General requirements for battery-powered trucks*

EN 1175-2:1998+A1:2010, *Safety of industrial trucks - Electrical requirements - Part 2: General requirements for internal combustion engine powered trucks*

EN 1175-3:1998+A1:2010, *Safety of industrial trucks - Electrical requirements - Part 3: Specific requirements for the electric power transmission systems of internal combustion engine powered trucks*

EN 1459:1998+A3:2012, *Safety of industrial trucks - Self-propelled variable reach trucks*

EN 1757-3:2002, *Safety of industrial trucks - Pedestrian propelled manual and semi-manual trucks – Part 3: Platform trucks*

EN 1834-1:2000, *Reciprocating internal combustion engines - Safety requirements for design and construction of engines for use in potentially explosive atmospheres – Part 1: Group II engines for use in flammable gas and vapour atmospheres*

EN 1834-3:2000, *Reciprocating internal combustion engines - Safety requirements for design and construction of engines for use in potentially explosive atmospheres - Part 3: Group II engines for use in flammable dust atmospheres*

EN ISO 3691-1:2012, *Industrial trucks - Safety requirements and verification - Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks (ISO 3691-1:2011)*

prEN ISO 3691-4, *Industrial trucks - Safety requirements and verification - Part 4: Driverless industrial trucks and their systems (ISO/DIS 3691-4:2006)*

EN ISO 3691-5:2009, *Industrial trucks – Safety requirements and verification – Part 5: Pedestrian-propelled trucks (ISO 3691-5:2009)*

prEN ISO 3691-6, *Industrial trucks - Safety requirements and verification - Part 6: Burden and personnel carriers (ISO/DIS 3691-6:2006)*

EN ISO 12100:2010, *Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)*

EN 13237:2012, *Potentially explosive atmospheres - Terms and definitions for equipment and protective systems intended for use in potentially explosive atmospheres*

EN 13463-1:2009, *Non electrical equipment for use in potentially explosive atmospheres – Part 1: Basic method and requirements*

EN 13463-5:2011, *Non electrical equipment for use in potentially explosive atmospheres – Part 5: Protection by constructional safety “c”*

EN 13463-6:2005, *Non electrical equipment for use in potentially explosive atmospheres – Part 6: Protection by control of ignition source “b”*

EN 16307-1:2013, *Industrial trucks - Safety requirements and verification - Part 1: Supplementary requirements for self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*

prEN 16307-4, *Industrial trucks - Safety requirements and verification - Part 4: Supplementary requirements for driverless industrial trucks and their systems*

FprEN 16307-5, *Industrial trucks - Safety requirements and verification - Part 5: Supplementary requirements for pedestrian-propelled trucks*

prEN 16307-6, *Industrial trucks - Safety requirements and verification - Part 6: Supplementary requirements for burden and personnel carriers*

EN ISO 20344:2011, *Personal protective equipment – Test methods for footwear (ISO 20344:2011)*

prEN 1755:2013 (E)

EN 50271:2010, *Electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen - Requirements and tests for apparatus using software and/or digital technologies*

EN 60079-0:2009, *Explosive atmospheres - Part 0: Equipment - General requirements (IEC 60079-0:2007, modified)*

EN 60079-1:2007, *Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d" (IEC 60079-1:2007+ Corrigendum C1:2008)*

EN 60079-14:2008, *Explosive atmospheres – Part 14: Electrical installations, design, selection and erection*

EN 60079-15:2010, *Explosive atmospheres — Part 15: Equipment protection by type of protection "n" (IEC 60079-15:2010)*

EN 60079-17:2007+Corr:2008, *Explosive atmospheres - Part 17: Electrical installations inspection and maintenance*

EN 60079-29-1:2007, *Explosive atmospheres – Part 29-1: Gas detectors – Performance requirements of detectors for flammable gases*

EN 60079-29-2:2007, *Explosive atmospheres - Part 29-2: Gas detectors - Selection, installation, use and maintenance of detectors for flammable gases and oxygen*

EN 60079-31:2009, *Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosure "t" (IEC 60079-31:2008+Corrigendum 1:2009)*

EN 60529:1991/A1:2000, *Degrees of protection provided by enclosures (IP code)*

IEC/TS 60079-32-1:20XX, *Explosive atmospheres – Part 32-1: Electrostatics hazards - Guidance*

ISO 284:2012, *Conveyor belts - Electrical conductivity - Specification and test method*

ISO 1813:1998, *Belt drives - V-ribbed belts, joined V-belts and V-belts including wide section belts and hexagonal belts - Electrical conductivity of antistatic belts: Characteristics and methods of test*

ISO 9563:1990, *Belt drives - Electrical conductivity of antistatic endless synchronous belts - Characteristics and test method*

3 Definitions

For the purpose of this standard, the following terms and definitions apply.

3.1 explosive atmosphere
mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapours, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture

(SOURCE: EN 13237:2012, A1)

3.2 potentially explosive atmosphere
atmosphere which could become explosive due to local and operational conditions

(SOURCE: EN 13237:2012, A2)

3.3**ignition temperature of an explosive gas atmosphere (gases, vapours or mists)**

lowest temperature of a heated surface at which, under specified conditions the ignition of an explosive atmosphere will occur

(SOURCE: EN 13237:2012, 3.66)

Note 1 to entry: Definition is only applicable to gas and vapour.

3.4**ignition temperature of a dust cloud**

lowest temperature of the hot inner wall of a furnace at which ignition occurs in a dust cloud in air contained therein

(SOURCE: EN 13237:2012, 3.63)

3.5**minimum ignition temperature of a dust layer**

lowest temperature of a hot surface at which a dust layer of predetermined thickness on the hot surface ignites

(SOURCE: EN 13237:2012, 3.65)

3.6**maximum surface temperature**

temperature used for marking of the equipment which is the highest temperature that can be attained in service under the most adverse operating conditions (but within the recognised tolerance) by any part or surface of equipment or component which can produce an ignition of the surrounding explosive atmosphere with an appropriate safety margin

(SOURCE: EN 13463-1:2009, 3.84)

Note 1 to entry: The manufacturer will prescribe the product standard and also in his particular design he should take into account the following other conditions:

- fault conditions specified in the standard for the type of protection concerned;
- all operating conditions specified in any other standard specified by him including recognized overloads; any other operating condition specified by him.

Note 2 to entry: The relevant surface temperature may be internal or external depending upon the type of protection concerned.

Note 3 to entry: For equipment intended for use in explosive dust atmospheres, the surface temperature is determined without any deposited dust on the equipment, see EN 13463-1:2009, 6.2.3.

3.7**wheel**

outer part of a wheel which is of a different material from the wheel centre

3.8**categories**

the definitions of categories are covered in clause 3.26 and A.6 of EN 13237:2012

3.9**service brake**

all build-in sequences or equipments (e.g. electrical, hydraulic or mechanical or in combination) used for deceleration of the truck

prEN 1755:2013 (E)**3.10****restricted breathing enclosure**

enclosure according EN 60079-15:2010, Clause 20

3.11**safety function**

function to be implemented by a safety device, which is intended to achieve or maintain a safe state for the EUC (equipment under control), in respect of ignition hazards”

3.12**safety shutdown**

shutdown of a truck or a piece of equipment activated by a safety function to prevent potential ignition sources of becoming effective

3.13**normal operation**

situation when the equipment, protective systems, and components are operating for their intended use within their design parameters

(SOURCE: EN 13463-1:2009, 3.7)

3.14**malfunction**

equipment, protective systems and components do not perform the intended function

(SOURCE:EN 13463-1:2009, 3.8)

3.15**expected malfunction**

disturbances or equipment faults which are known to occur in practice

(SOURCE:EN 13463-1:2009, 3.8.1)

3.16**rare malfunction**

type of malfunction which may happen only in rare instances [1755:2016](https://standards.iteh.ai/catalog/standards/sist/acfe1ca6-3051-47dd-bb8b-dad0f76f8a49/sist-en-1755-2016)

(SOURCE: EN 13463-1:2009, 3.8.2) <https://standards.iteh.ai/catalog/standards/sist/acfe1ca6-3051-47dd-bb8b-dad0f76f8a49/sist-en-1755-2016>

Note 1 to entry: For example, this includes two independent expected malfunctions which, separately, would not create an ignition hazard but which, in combination, do create an ignition hazard, are regarded as a single rare malfunction.

3.17**earthing straps**

straps made of conductive or dissipative materials strong enough to withstand mechanical and chemical influences installed to achieve potential equalisation between truck chassis and the floor/ground

3.18**controlled stop**

condition in which the truck is in a safe stationary state

3.19**high charging process**

process that generates a higher rate of electrostatic charging than simple manual operations (e.g. rubbing, cleaning with a dry cloth, raising from a seat, walking, wiping of clothes etc.).

Note 1 to entry: Typical examples of high charging processes include e.g. the flow of insulating liquids or powders, high voltage spray charging, transmission belts, brushes und foils.

4 Safety requirements and/or measures

4.1 General

All trucks within the scope of this European Standard shall comply with the requirements given in EN 13463-1 unless otherwise stated in this European Standard.

Note This European Standard deals only with the prevention of ignition of an explosive atmosphere by the truck.

A list of hazards which can occur is given in Annex A. Where additional hazards could occur, an ignition hazard assessment according to EN 13463-1 shall be carried out.

Industrial trucks for use in potentially explosive atmospheres shall fulfil the relevant requirements given in the following European standards and additionally the requirements given in 4.2 to 4.11:

- EN 1459, *Safety of industrial trucks — Self propelled variable reach trucks*
- EN 1757-3, *Safety of industrial trucks — Pedestrian controlled manual and semi-manual trucks — Part 3: Platform trucks*
- EN ISO 3691-1, *Industrial trucks — Safety requirements and verification - Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*
- prEN ISO 3691-4, *Industrial trucks - Safety requirements and verification - Part 4: Driverless industrial trucks and their systems*
- EN ISO 3691-5, *Industrial trucks - Safety requirements and verification - Part 5: Pedestrian-propelled trucks*
- prEN ISO 3691-6, *Industrial trucks - Safety requirements and verification - Part 6: Burden and personnel carriers*
- EN 16307-1, *Industrial trucks - Safety requirements and verification - Part 1: Supplementary requirements for self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks*
- prEN 16307-4, *Industrial trucks - Safety requirements and verification - Part 4: Supplementary requirements for driverless industrial trucks and their systems*
- FprEN 16307-5, *Industrial trucks - Safety requirements and verification - Part 5: Supplementary requirements for pedestrian-propelled trucks*
- prEN 16307-6, *Industrial trucks - Safety requirements and verification - Part 6: Supplementary requirements for burden and personnel carriers*

Trucks of group II suitable for potentially explosive atmospheres of gas, vapour or mist shall be subdivided in accordance with 4.2 of EN 60079-0:2009 into the subdivisions:

- IIA
- IIB
- IIB + H₂
- IIB + C₂H₂
- IIB + H₂ + C₂H₂

prEN 1755:2013 (E)

NOTE 1 Trucks marked IIB are also suitable for IIA atmospheres.

NOTE 2 Trucks marked IIB+H₂ and/or C₂H₂ (hydrogen and/or acetylene) are also suitable for IIA or IIB atmospheres.

Trucks of group III suitable for potentially explosive atmospheres of dust shall be subdivided in accordance with 4.3 of EN 60079-0:2009 into the subdivisions:

- IIIA
- IIIB
- IIIC

For the flammability test of non metallic materials see EN 13463-1:2009, 8.4.3.

4.2 Hot surfaces**4.2.1 General**

For 3G and 2G trucks the maximum surface temperature of any part of the truck shall not exceed the ignition temperature of the explosive atmosphere in which the truck is to be used.

For 3D and 2D trucks the maximum surface temperature of any part of the truck which can come into contact with dust clouds or dust layers shall not exceed the actual maximum surface temperature as defined on the truck marking plate.

Maximum surface temperatures shall be determined in accordance with 5.1.

Reduction of this surface temperature by means of thermal insulation is not permitted.

NOTE 1 The relationship of the maximum surface temperature of the equipment and the minimum ignition temperature of dust layers and dust clouds is given in EN 1127-1.

NOTE 2 The maximum surface temperature is determined without any dust deposited on the equipment.

NOTE 3 The possible insulation effects of a dust layer on the surface temperatures are taken into account by the safety margin to the dust layer ignition temperature specified in EN 1127-1 (75 K for a 5 mm layer).

4.2.2 Temperature monitoring

Surface temperatures can be limited by the use of a temperature monitoring and limiting system which provides a safety shutdown according to 5.3 in case limiting values are exceeded. For category 3 the temperature limiting device shall fulfil the requirements of Ignition Prevention Level 1 (IPL 1) according to EN 13463-6:2005 Clause 8. For category 2 the Ignition Prevention Level 2 (IPL 2) shall apply.

4.2.3 Temperature classification and marking

A truck shall be:

- classified in a temperature class given in Table 1 for trucks of category 2G and 3G, or
- defined by the actual maximum surface temperature,

and shall be marked accordingly, see also 6.2 and Annex F.