

TÖÖSTUSLIKUD MOOTORKÄRUD. OHUTUSNÕUDED JA
VASTAVUSKONTROLL. TÄIENDAVAD NÕUDED
TÖÖTAMISEKS PLAHVATUSOHTLIKUS KESKKONNAS

Industrial Trucks - Safety requirements and verification
- Supplementary requirements for operation in
potentially explosive atmospheres

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 1755:2015 sisaldab Euroopa standardi EN 1755:2015 ingliskeelset teksti.	This Estonian standard EVS-EN 1755:2015 consists of the English text of the European standard EN 1755:2015.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 18.11.2015.	Date of Availability of the European standard is 18.11.2015.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

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

ICS 53.060

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:

Aru 10, 10317 Tallinn, Eesti; 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

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.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Aru 10, 10317 Tallinn, Estonia; homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

English Version

**Industrial Trucks - Safety requirements and verification -
Supplementary requirements for operation in potentially
explosive atmospheres**

Chariots de manutention - Prescriptions de sécurité et
vérification - Prescriptions supplémentaires pour le
fonctionnement en atmosphères explosibles

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

This European Standard was approved by CEN on 24 July 2015.

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, 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 United Kingdom.



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	3
Introduction	4
1 Scope	6
2 Normative references	6
3 Terms and definitions	8
4 Safety requirements and/or protective 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.....	17
4.7 Electrostatic risks	17
4.8 Requirements for brakes, clutches and couplings.....	21
4.9 Requirements for pneumatic systems.....	23
4.10 Category 3G trucks equipped with restricted breathing enclosures “nR” and gas detection systems.....	23
4.11 Flammability of non-metallic materials	25
5 Verification of safety requirements and/or protective measures	26
5.1 Determination of the maximum surface temperatures	26
5.2 Measurement of circuit resistance and capacitance	30
6 Information for use	32
6.1 General.....	32
6.2 Instruction handbook.....	32
6.3 Marking.....	34
6.4 Warning labels	35
Annex A (normative) List of significant hazards	36
Annex B (informative) Relationship between zones (area classification) and truck categories	37
Annex C (informative) Typical example of cladding of load handling devices	38
Annex D (informative) Typical examples of non-conductive surface areas according to 4.7.3.1	39
Annex E (normative) Requirements for transmission belts in accordance with ISO 9563 or ISO 1813	42
Annex F (informative) Significant technical changes between this document and the previous edition of this European Standard	43
Annex G (informative) Warning labels for trucks with restricted breathing enclosure(s)	47
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 94/9/EC	48
Bibliography	51

European foreword

This document (EN 1755:2015) has been prepared by Technical Committee CEN/TC 150 “Industrial Trucks - Safety”, the secretariat of which is held by BSI.

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 2016, and conflicting national standards shall be withdrawn at the latest by November 2017.

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 1755:2000+A2:2013.

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.

Informative Annex F provides details of significant technical changes between this document and the previous edition: EN 1755:2000+A2:2013.

This document is one of a series of European Standards for the safety of industrial trucks which are listed in 4.1 and in the Bibliography.

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.

Introduction

This standard is a type-C standard as stated in EN ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and hazardous events are covered, are indicated in the scope of 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 in accordance with the provisions of this type C standard.

This standard (EN 1755:2015) covers safety requirements and their verification for industrial trucks as defined in ISO 5053-1 that are not covered exhaustively by:

- EN 1459;
- EN 1526;
- EN 1757-3;
- EN ISO 3691-1;
- EN ISO 3691-5;
- EN ISO 3691-6;

NOTE The above-mentioned standards are listed in the Bibliography or in Clause 2.

Assessment of hazards

The industrial truck needs to be designed in such a way that it is fit for its purpose or function and can be adjusted and maintained without putting persons at risk when used under the conditions foreseen (e.g. explosive atmospheres) by the manufacturer.

In order to properly design an industrial truck and to cover all specific safety requirements, the manufacturer will have to identify the hazards that apply to the industrial truck and carry out a risk assessment. The manufacturer will then need to design and construct the industrial truck taking this assessment into account.

The aim of this procedure is to eliminate the risk of accidents throughout the foreseeable lifetime of the machinery, including the phases of assembling and dismantling where risks of accidents could also arise from foreseeable abnormal situations.

In selecting the most appropriate methods, the manufacturer will need to apply the following principles, in the order given here:

- eliminate or reduce risks as far as possible by design (inherently safe machinery design and construction);
- take the necessary protective measures in relation to risks that cannot be eliminated by design;
- inform users of any shortcoming of the protective measures adopted;
- indicate whether any particular training is required;
- specify any need to provide personal protection equipment;
- refer to the appropriate user's document for proper operating instructions.

Industrial trucks need to be designed to prevent foreseeable misuse wherever possible, if such would engender risk. In other cases, the instructions will need to draw the user's attention to ways shown by experience in which the machinery ought not to be used.

This standard (EN 1755:2015) does not repeat all the technical rules which are state-of-the art and which are applicable to the material used to construct the industrial truck. Reference will also need to be made to EN ISO 12100.

This document is a preview generated by EVS

1 Scope

This European Standard applies to self-propelled and pedestrian propelled manual and semi-manual industrial trucks as defined in ISO 5053-1 including their load handling devices and attachments (hereafter referred to as trucks) intended for use in potentially explosive atmospheres.

NOTE 1 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 specifies supplementary technical requirements for the prevention of the ignition of an explosive atmosphere of flammable gases, vapours, mists or dusts by industrial trucks of equipment group II and equipment category 2G, 3G, 2D or 3D.

NOTE 2 The relationship between an equipment category (hereafter referred to as category) and the corresponding zone (area classification) is shown in informative Annex B.

This European Standard does not include:

- trucks of equipment group I;
- trucks of equipment group II, equipment category 1;
- trucks intended for use in potentially explosive atmospheres with hybrid mixtures;
- protective systems.

This European Standard is not applicable to trucks intended for use in potentially explosive atmospheres of carbon disulphide (CS₂), carbon monoxide (CO) and/or ethylene oxide (C₂H₄O) due to the special properties of these gases.

This standard is applicable to trucks intended for use in atmospheres with an ambient temperature range of -20 °C to +40 °C, i.e. trucks built in accordance with this European Standard will be satisfactory to any service conditions within this range unless otherwise specified.

NOTE 3 The ambient temperature range -20 °C to +40 °C is in line with EN ISO 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, *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, *Safety of industrial trucks — Part 2: Electrical requirements for internal combustion engine powered trucks*

EN 1175-3, *Safety of industrial trucks — Part 3: Electrical 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 trucks and their systems*

EN 1757-3, *Safety of industrial trucks - Pedestrian controlled 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, *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 13463-1:2009, *Non-electrical equipment for use in potentially explosive atmospheres - Part 1: Basic method and requirements*

EN 13463-3, *Non-electrical equipment for use in potentially explosive atmospheres - Part 3: Protection by flameproof enclosure 'd'*

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

EN 13463-8, *Non-electrical equipment for potentially explosive atmospheres - Part 8: Protection by liquid immersion 'k'*

EN 14986, *Design of fans working in potentially explosive atmospheres*

EN 50271, *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 60079-0:2012, *Explosive atmospheres - Part 0: Equipment - General requirements (IEC 60079-0:2011, modified)*

EN 60079-7, *Explosive atmospheres - Part 7: Equipment protection by increased safety "e" (IEC 60079-7)*

EN 60079-14:2014, *Explosive atmospheres - Part 14: Electrical installations design, selection and erection (IEC 60079-14:2012)*

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

EN 60079-17, *Explosive atmospheres — Part 17: Electrical installations inspection and maintenance (IEC 60079-17)*

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

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

EN 60079-31, *Explosive atmospheres — Equipment dust ignition protection by enclosure "t" (IEC 60079-31)*

CLC/TR 60079-32-1, *Explosive atmospheres - Part 32-1: Electrostatic hazards, guidance*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

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

EN 61508-6, *Functional safety of electrical/electronic/programmable electronic safety-related systems - Part 6: Guidelines on the application of IEC 61508-2 and IEC 61508-3 (IEC 61508-6)*

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 (ISO 3691-1:2011)*

EN ISO 13849-1, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1)*

EN ISO 20344, *Personal protective equipment - Test methods for footwear (ISO 20344)*

ISO 284, *Conveyor belts — Electrical conductivity — Specification and test method*

ISO 1813, *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, *Belt drives — Electrical conductivity of antistatic endless synchronous belts — Characteristics and test method*

ISO 15870, *Powered industrial trucks — Safety signs and hazard pictorials — General principles*

3 Terms and definitions

For the purpose of this document, 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, 3.28]

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

[SOURCE: EN 13237:2012, 3.28.2]

3.3
hybrid mixture
mixture of flammable substances with air in different physical states

[SOURCE: EN 13237:2012, 3.40]

3.4
auto ignition temperature
lowest temperature (of a hot surface) at which under specified test conditions an ignition of a flammable gas or flammable vapour in mixture with air or air/inert gas occurs

[SOURCE: EN 13237:2012, 3.45]