



# SLOVENSKI STANDARD

## SIST EN 1755:2001

01-december-2001

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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 poussière inflammables

Ta slovenski standard je istoveten z: EN 1755:2000

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ICS 53.060

English version

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

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This European Standard was approved by CEN on 16 August 1999.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

## Contents

Foreword	3
0 Introduction	5
1 Scope	5
2 Normative references	6
3 Definitions	8
3.1 explosive atmosphere	8
3.2 potentially explosive atmosphere	8
3.3 minimum ignition temperatures	8
3.4 maximum surface temperature	8
3.5 tyre	9
3.6 categories	9
3.7 automatic monitoring	9
3.8 emergency stop (function)	9
3.9 emergency stop (device)	9
3.10 normal operating conditions	9
3.11 service brake	9
4 List of hazards	10
5 Safety requirements and/or measures	21
5.1 Trucks for conformity category 3 G	21
5.2 Trucks for conformity category 2 G	25
5.3 Trucks for conformity category 3 D	29
5.4 Trucks for conformity category 2 D	31
6 Verification of the safety requirements and/or measures	33
6.1 General	33
6.2 Temperature measurement	33
6.3 Earthing of trucks	36
6.4 Gas penetration test	37
6.5 Verification and test for pressurized enclosures	38
7 Information for use	38
7.1 Instruction handbook	38
7.2 Minimum marking	40
Annexe A (informative) Relation between the classification of zones and their conformity categories	42
Annexe ZA (INFORMATIVE)	43

[SIST EN 1755:2001](https://standards.iteh.ai/catalog/standards/sist/baa02bb0-4db0-49db-abc7-8a09532005d2/sist-en-1755-2001)

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## Foreword

This European Standard 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 August 2000, and conflicting national standards shall be withdrawn at the latest by August 2000.

This European Standard 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 standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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

EN 1175-1, *Safety of Industrial trucks — Part 1: Electrical 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 — Variable reach trucks*

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

EN 1526, *Safety of Industrial trucks — Automated function of industrial trucks*

EN 1551, *Safety of Industrial trucks — Self propelled trucks over 10 000 kg capacity*

EN 1726-1, *Safety of Industrial trucks — Part 1: Self propelled trucks up to and including 10 000 kg capacity and tractors with a drawbar pull including 20 000 N*

EN 1726-2, *Safety of Industrial trucks — Part 2: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated load*

EN 1755, *Safety of Industrial trucks — Operation in potentially explosive atmospheres; use in flammable gas, vapour, mist and dust*

EN 1757-1, *Safety of Industrial trucks — Pedestrian controlled manual and semi-manual trucks — Part 1: Stacker trucks*

EN 1757-2, *Safety of Industrial trucks — Pedestrian controlled manual and semi-manual trucks — Part 2: Pallet trucks with lift height up to 300 mm*

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

EN 1757-4, *Safety of Industrial trucks — Pedestrian controlled manual and semi-manual trucks — Part 4: Pallet-trucks with scissor lift*

EN 12053, *Safety of Industrial trucks — Noise measurement of industrial trucks; sound pressure level at the operator's position and sound power level for the environment*

prEN ISO 13564, *Safety of Industrial trucks — Visibility test method (ISO FDIS 13564:1997)*

EN 13059, *Safety of Industrial trucks — Vibration test method*

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

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## 0 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 extent to which hazards are covered is indicated in the scope of this standard.

In addition, industrial trucks should comply with EN 292-1 for hazards which are not covered by this standard.

## 1 Scope

This European Standard applies to self-propelled and pedestrian controlled manual and semi-manual industrial trucks as specified in the European Standards

EN 1459, *Safety of Industrial trucks — Variable reach trucks*

EN 1551, *Safety of Industrial trucks — Self propelled trucks over 10 000 kg capacity*

EN 1726-1, *Safety of Industrial trucks — Part 1: Self propelled trucks up to and including 10 000 kg capacity and tractors with a drawbar pull including 20 000 N*

EN 1726-2, *Safety of Industrial trucks — Part 2: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated load*

EN 1757-1, *Safety of Industrial trucks — Pedestrian controlled manual and semi-manual trucks — Part 1: Stacker trucks*

EN 1757-2, *Safety of Industrial trucks — Pedestrian controlled manual and semi-manual trucks — Part 2: Pallet trucks with lift height up to 300 mm*

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

EN 1757-4, *Safety of Industrial trucks — Pedestrian controlled manual and semi-manual trucks — Part 4: Pallet-trucks with scissor lift*

and gives additional requirements to these industrial trucks in accordance with the Directive 94/9/EEC, group II conformity category 2 and 3 including the load handling device, hereafter named "trucks", intended for use in areas where explosive atmospheres

- of gas, vapour or mist may occur, defined in zone 1 and zone 2 respectively
- or
- of flammable dust may occur, defined in zone 21 and zone 22 respectively.

The relation between the classification of zones and their conformity categories are shown in the informative annex A.

This European Standard covers the technical requirements necessary to minimize the specific hazards listed in clause 4 which could occur during normal operation and maintenance (in accordance with the data given by the manufacturer or their authorized representative) of industrial trucks.

Trucks for group II suitable for explosive atmospheres of gas, vapour or mist shall be subdivided in accordance with the respective mixture of the potentially explosive atmospheres in which they are intended to operate. The subdivision is in accordance with annex A of EN 50014:1997/A2: 1999.

Trucks marked IIB are suitable for application required for Group IIA trucks. Trucks marked IIC are suitable for application required for subgroup IIA and subgroup IIB trucks, but are not suitable to be used in areas with flammable gas and vapour atmospheres containing carbon disulfide (CS<sub>2</sub>).

Where hybrid mixtures are present, the requirements for gas, vapour and mist as well as for dust shall be fulfilled.

Fork arms, load platforms or integrated attachments are part of the truck. Attachments mounted on the load carrier or fork arms are not part of the truck.

## 2 Normative references

This draft standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at appropriate places in the text and the publications are listed hereafter.

For dated references, subsequent amendments to or revisions of, any of these publications apply to this standard only when incorporated in it by amendments or revision. For undated references the latest edition of the publication referred to applies.

EN 292-1:1991, *Safety of machinery; Basic concepts, General principles for design — Part 1: Basic terminology, methodology*

EN 292-2:1991, *Safety of machinery; Basic concepts, General principles for design — + A1:1995 Part 2: Technical principles and specifications*

EN 954-1:1996, *Safety of machinery; Safety related parts of control systems — Part 1: General principles of design*

EN 1127-1:1997, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology*

EN 1175-1:1998, *Safety of Industrial trucks — Part 1: Electrical requirements for battery-powered trucks*

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EN 1175-2:1998, *Safety of Industrial trucks — Part 2: Electrical requirements for internal combustion engine powered trucks*

EN 1175-3:1998, *Safety of Industrial trucks — Part 3: Electrical requirements for the electric power transmission systems of internal combustion engine powered trucks*

prEN 1551:1999, *Safety of Industrial trucks — Self propelled trucks over 10 000 kg capacity*



EN 1726-1:1998, *Safety of Industrial trucks — Self propelled trucks up to and including 10 000 kg capacity and tractors with a drawbar pull up to and including 20 000 N — Part 1: General requirements*

prEN 1726-2:1995, *Safety of Industrial trucks — Self propelled trucks up to and including 10 000 kg capacity and tractors with a drawbar pull up to and including 20 000 N — Part 2: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads*

prEN 1834-1:1999, *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*

prEN 1834-3:1999, *Reciprocating internal combustion engines — Safety requirements for design and construction of engines for use in potentially explosive atmospheres — Part 3: Engines for use in combustible dust atmospheres*

EN 50014:1997/A2:1999, *Electrical apparatus for potentially explosive atmospheres — General requirements*

EN 50015:1998, *Electrical apparatus for potentially explosive atmospheres — Oil immersion "o"*

EN 50016:1995, *Electrical apparatus for potentially explosive atmospheres — Pressurized apparatus "p"*

EN 50017:1998, *Electrical apparatus for potentially explosive atmospheres — Powder filling "q"*

EN 50018:1994, *Electrical apparatus for potentially explosive atmospheres — Flameproof enclosure "d"*

EN 50019:1994, *Electrical apparatus for potentially explosive atmospheres — Increased safety "e"*

EN 50020:1990, *Electrical apparatus for potentially explosive atmospheres — Intrinsic safety "i"*

EN 50021:1999, *Electrical apparatus for potentially explosive atmospheres — Electrical apparatus with type of protection of "n"*

EN 50028:1987, *Electrical apparatus for potentially explosive atmospheres — Encapsulation "m"*

EN 50039:1980, *Electrical apparatus for potentially explosive atmospheres — Intrinsically safe systems "i"*

EN 50054:1998, *Electrical apparatus for the detection and measurement of combustible gases — General requirements and test methods*

EN 50057:1998, *Electrical apparatus for the detection and measurement of combustible gases — Performance requirements for group II apparatus indicating up to 100 % lower explosion limit*

EN 60079-14:1997, *Electrical apparatus for explosive gas atmospheres — Electrical installations in hazardous areas (other than mines)*

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

IEC 60093:1980, *Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials*

IEC 243-1:1988, *Methods of test for electric strength of solid insulating materials — Part 1: Test at power frequencies*

IEC 1241-1-1:1993, *Electrical apparatus for use in the presence of combustible dust — Part 1: Electrical apparatus protected by enclosures; Section 1: Specification for apparatus*

IEC 1241-1-2:1993, *Electrical apparatus for use in the presence of combustible dust — Part 1: Electrical apparatus protected by enclosures; Section 2: Selection, installation and maintenance*

ISO 1813:1998, *Anti static endless V-belts; Electrical conductivity characteristics and method of test*

ISO 2883:1980, *Rubber, vulcanized; Antistatic and conductive products for industrial use; Electrical resistance limits*

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 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

#### 3.2

##### **potentially explosive atmosphere**

an atmosphere which could become explosive due to local and operational conditions

#### 3.3

##### **minimum ignition temperatures**

the definition given in clauses 3.30, 3.31, 3.32 and 3.33 of EN 1127-1:1997 shall apply

#### 3.4

##### **maximum surface temperature**

the highest temperature attained in service under the most adverse operating conditions within the rating of the apparatus by any part or any surface of the equipment and accessible to the potentially explosive atmosphere

NOTE 1 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 The relevant surface temperature may be internal or external depending upon the type of protection concerned.

### 3.5

#### **tyre**

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

### 3.6

#### **categories**

the definitions of categories are covered in clause 6.4.1 of EN 1127-1:1997

### 3.7

#### **automatic monitoring**

a back-up safety function which ensures that a safety measure is initiated if the ability of a component or an element to perform its function is diminished, or if the process conditions are changed in such a way that hazards are generated

### 3.8

#### **emergency stop (function)**

Function which is intended:

— to avert arising or to reduce existing hazards to persons, damage to machinery or to work in process;

—

— to be initiated by a single human action.

### 3.9

#### **emergency stop (device)**

a normally actuated control device used to initiate an emergency stop function

### 3.10

#### **normal operating conditions**

the operating conditions when the truck is used in substantially firm, smooth, level and prepared surfaces

### 3.11

#### **service brake**

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

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#### 4 List of hazards

The following hazards from annex A of EN 414 are applicable in the situations described and could involve risks to persons if not reduced or eliminated. The corresponding requirements are designed to limit the risk or reduce the hazards in each situation.

HAZARD	Corresponding requirement
1.0 General Requirements	
1.0.1 Principles of integrated explosion safety	5. Safety Requirements and/or Measures
1.0.2 Design considerations	5. Safety Requirements and/or Measures
1.0.3 Special checking and maintenance conditions	6.2 Temperature Measurement 7.1 Instruction Handbook
1.0.4 Surrounding area conditions	5.1.1 Hot surface
1.0.5 Marking	7.2 Minimum marking
1.0.6 Instructions	7.1 Instruction Handbook 7.2 Minimum marking
1.1 Selection of materials	
1.1.1 Explosion avoidance	5.1.2 Mechanically generated sparks and clearances 5.1.7.3 Friction Clutches 5.1.8.2 Friction Brakes 5.1.9 Load handling device 5.2.2 Mechanically generated sparks 5.2.4 Ignition by Electrostatic discharges 5.2.8.2 Mechanical Clutches 5.2.9.2.4 Added Safety 5.2.10 Load handling device 5.3.2 Mechanically generated sparks and clearances 5.3.7.2 Friction Brakes 5.3.8 Load handling device 5.4.2 Mechanically generated sparks and clearances 5.4.7 Clutches 5.4.8 Friction brakes (Service brakes) 5.4.9 Parking brakes, load handling devices and hydraulic systems
1.1.2 Limits of operating conditions reaction between materials	not applicable
1.1.3 Effects on predictable changes in materials characteristics	5.1.7.3 Friction Clutches 5.1.8.2 Friction Brakes 5.1.9 Load handling device 5.2.8.2 Mechanical Clutches 5.2.9.2.4 Added Safety 5.2.10 Load handling device 5.3.7.2 Friction Brakes 5.3.8 Load handling device 5.4.7 Clutches 5.4.8 Friction brakes (Service brakes) 5.4.9 Parking brakes, load handling devices and hydraulic systems

1.2	Design and Construction	
1.2.1	Technological knowledge of explosion protection for safe operation throughout foreseeable lifetime	5.1.1 Hot surface 5.1.2 Mechanically generated sparks and clearances 5.1.3 Ignition by Electrostatic discharges 5.1.4 Reciprocating internal combustion engines 5.1.5 Electrical Installation 5.1.6 Pneumatic systems 5.1.7 Clutches 5.1.8 Brakes 5.1.9 Load handling device 5.1.10 Hydraulic system 5.2.1 Hot surface 5.2.2 Mechanically generated sparks 5.2.3 Clearances 5.2.4 Ignition by Electrostatic discharges 5.2.5 Reciprocating internal combustion engines 5.2.6 Electrical installation 5.2.7 Pneumatic systems 5.2.8 Clutches 5.2.9 Brakes 5.2.10 Load handling device 5.2.11 Hydraulic system 5.3.1 Hot surface 5.3.2 Mechanically generated sparks and clearances 5.3.3 Reciprocating internal combustion engines 5.3.4 Electrical installation 5.3.5 Pneumatic systems 5.3.6 Clutches 5.3.7 Brakes 5.3.8 Load handling device 5.3.9 Hydraulic system 5.4.1 Hot surface 5.4.2 Mechanically generated sparks and clearances 5.4.3 Ignition by electrostatic discharges 5.4.4 Reciprocating internal combustion engines 5.4.5 Electrical installation 5.4.6 Pneumatic systems 5.4.7 Clutches 5.4.8 Friction brakes (Service brakes) 5.4.9 Parking brakes, load handling devices and hydraulic systems
1.2.2	Safe functioning of replacement components	5.1.1 Hot surface 5.1.2 Mechanically generated sparks and clearances 5.1.3 Ignition by Electrostatic discharges 5.1.4 Reciprocating internal combustion engines 5.1.5 Electrical Installation 5.1.6 Pneumatic systems 5.1.7 Clutches 5.1.8 Brakes 5.1.9 Load handling device 5.1.10 Hydraulic system 5.2.1 Hot surface