



SLOVENSKI STANDARD
oSIST prEN 1175:2018
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Varnost vozil za talni transport - Električne/elektronske zahteve

Safety of industrial trucks - Electrical/electronic requirements

Sicherheit von Flurförderzeugen - Elektrische/Elektronische Anforderungen

Sécurité des chariots de manutention - Prescriptions électriques/électroniques

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Safety of industrial trucks - Electrical/electronic requirements

Sécurité des chariots de manutention - Prescriptions électriques/électroniques

Sicherheit von Flurförderzeugen - Elektrische/Elektronische Anforderungen

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 1175:2017) 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 will supersede EN 1175-1:1998+A1:2010, EN 1175-2:1998+A1:2010, EN 1175-3:1998+A1:2010.

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.

The main changes compared to the previous version are:

- the present Standard provide requirements on the level of performance required for the different safety functions of the control system;
- specifications for the design of safety-related functions of control systems are given in agreement with the standard EN ISO 13849-1;
- energy sources;
- connectors;
- motors;
- standard references;
- assistance systems.

prEN 1175:2017 (E)**1 Scope**

This European Standard specifies the electrical requirements for the design and construction of the electrical installation in self-propelled industrial trucks that are within the scope of ISO 5053-1, except variable reach trucks as defined in ISO 5053-1:2015, 3.21 and 3.22, straddle carriers as defined in ISO 5053-1:2015, 3.18 and 3.19, and specific functions, parts and/or systems utilized for the automatic operation of driverless industrial trucks as defined in ISO 5053-1:2015, 3.32.

NOTE 1 Reference is made to this standard in other standards which cover the non-electrical requirements of the various industrial truck types.

NOTE 2 This document only covers the integration of the standalone equipment to the industrial trucks. Other Directives and/or standards can apply to such equipment.

NOTE 3 This standard does not cover driverless functions of industrial trucks.

The requirements of this standard are valid, when trucks are operated under the following climatic conditions:

- defined in the applicable parts of the EN ISO 3691 series and the EN 16307 series;
- relative humidity in the range 30 % to 95 % (not condensing).

This standard deals with safety requirements for all electrical components of industrial trucks, including electrically actuated hydraulic/pneumatic valves. It is intended to be used to avoid or minimize hazards or hazardous situations listed in Annex I. These situations can arise during the operation in the area of use for which it is designed and during maintenance of trucks in accordance with the specifications and instruction given by the manufacturer.

This standard does not deal with all those requirements to reduce hazards which could occur:

- a) during construction;
- b) for industrial trucks that are required to operate in severe conditions (e.g. in extreme climates, in freezer applications, in hazardous environments);
- c) because of malfunction of not electric safety-related parts of control systems, e.g. hydraulic and pneumatic elements like pistons, not electric valves, pumps etc.

NOTE 4 The level of the defined required performance for electrical safety related control systems can be used as a guideline to determine the performance of non-electric systems.

This European Standard does not repeat all the technical rules which are state of the art and which are applicable to the materials used to build industrial trucks, for which reference can be made to EN ISO 12100.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendment) applies.

EN 12198-1, *Safety of machinery - Assessment and reduction of risks arising from radiation emitted by machinery - Part 1: General principles*

EN 12895:2015, *Industrial trucks - Electromagnetic compatibility*

EN 16307 (all parts), *Industrial trucks - Safety requirements and verification - Part 6: Supplementary requirements for burden and personnel carriers*

EN 50565-1, *Electric cables - Guide to use for cables with a rated voltage not exceeding 450/750 V (U0/U) - Part 1: General guidance*

EN 60034-8, *Rotating electrical machines - Part 8: Terminal markings and direction of rotation (IEC 60034-8)*

EN 60068-2-27, *Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock (IEC 60068-2-27)*

EN 60068-2-6, *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal) (IEC 60068-2-6)*

EN 60204-1:2006,¹ *Safety of machinery - Electrical equipment of machines - Part 1: General requirements (IEC 60204-1:2005, modified)*

EN 60332-1-2, *Tests on electric and optical fibre cables under fire conditions - Part 1-2: Test for vertical flame propagation for a single insulated wire or cable - Procedure for 1 kW pre-mixed flame (IEC 60332-1-2)*

EN 60384-14, *Fixed capacitors for use in electronic equipment - Part 14: Sectional specification - Fixed capacitors for electromagnetic interference suppression and connection to the supply mains (IEC 60384-14)*

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

EN 60664-1:2007, *Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests (IEC 60664-1)*

EN 60695-11-10, *Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods (IEC 60695-11-10)*

EN 60947-4-1:2010,² *Low-voltage switchgear and controlgear - Part 4-1: Contactors and motor-starters - Electromechanical contactors and motor-starters (IEC 60947-4-1)*

EN 60947-5-1, *Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices (IEC 60947-5-1)*

EN 61643-11, *Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods (IEC 61643-11)*

EN 62281, *Safety of primary and secondary lithium cells and batteries during transport (IEC 62281)*

EN 62485-3, *Safety requirements for secondary batteries and battery installations - Part 3: Traction batteries (IEC 62485)*

¹ As impacted by EN 60204-1:2006/A1:2009 and EN 60204-1:2006/corrigendum Feb.2010.

² As impacted by EN 60947-4-1:2010/A1:2012.

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prEN 62485-6, *Safety requirements for secondary batteries and battery installations - Part 5: lithium-ion batteries for traction applications (IEC/CDV 62485-6)*

EN 62619, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications (IEC 62619)*

prEN 62902, *Secondary batteries – Marking symbols for identification of their chemistry (IEC/CDV 62902)*

EN ISO 3691 (all parts), *Industrial trucks - Safety requirements and verification (ISO 3691)*

EN ISO 6743-4, *Lubricants, industrial oils and related products (class L) - Classification - Part 4: Family H (Hydraulic systems) (ISO 6743-4:2015)*

EN ISO 13849-1:2015, *Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)*

ISO 3287, *Powered industrial trucks — Symbols for operator controls and other displays*

ISO 5053-1:2015, *Industrial trucks — Terminology and classification — Part 1: Types of industrial trucks*

ISO 22915-1, *Industrial trucks — Verification of stability — Part 1: General*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5053-1:2015 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

nominal voltage of the truck system

U_e

value of the voltage of the electrical system and to which its characteristics are referred

3.2

nominal battery voltage

total number of battery cells connected in series in the truck's system multiplied by the nominal cell voltage, relative to the chemical technology of the cell

3.3

driving system

electrically controlled system moving truck on ground, generating torque with effect on one or more driving wheels

3.4

low speed

travel speed below 0,4 m/s for pedestrian trucks and below 0,7 m/s for all other types of trucks

3.5 electrical load handling system LHS

system for electrical or electronically controlled load handling

3.6 electrical steering

electrical or electronic system controlling the angular position of the wheel(s) of the truck with respect to its vertical longitudinal centre plane

Note 1 to entry: See Annex F for examples.

3.7 assistance system

system intended to improve the operational performance, the ergonomics of industrial trucks, or to warn the operator about hazards due to improper use in the specific operation related to the work environment and application

Note 1 to entry: Assistance systems are not necessary for the safe operation of industrial trucks and are not covered by EN 1526, *Safety of industrial trucks — Additional requirements for automated functions on trucks*. Assistance systems have to be clearly distinguished from safety functions that are required by law (e.g. Machinery Directive) or by harmonized standards. In specific cases, some types can help to prevent accidents during the operations or reduce their consequences and thus promote a safer use.

3.8 required performance level PL_r

performance level (PL) applied in order to achieve the required risk reduction for each safety function

[SOURCE: EN ISO 13849-1:2015, 3.1.24]

3.9 setpoint

operator physical actions on the intended control device

Note 1 to entry: e.g. for travelling the actuation of the accelerator pedal.

3.10 actpoint

actual physical value of the system output, e.g. truck speed or position of truck steered wheel(s)

3.11 service brake

braking system allowing the operator to control, directly or indirectly, the speed of the truck or to bring the truck to a halt

[SOURCE: ISO 6292:2008, 3.12]

Note 1 to entry: The service brake can also be activated by the electronic control system of the truck.

Note 2 to entry: The service brake can also serve as a parking brake.

prEN 1175:2017 (E)**3.12****parking brake**

braking system allowing a vehicle to be held stationary mechanically, even on an inclined surface, particularly in the absence of the operator

[SOURCE: ISO 6292:2008, 3.11]

3.13**safety function**

function of the machine whose failure can result in an immediate increase of the risk(s)

[SOURCE: ISO 12100:2010, 3.30]

3.14**risk**

combination of the probability of occurrence of harm and the severity of that harm

[SOURCE: ISO 12100:2010, 3.12]

3.15**type test**

one-time test made on a complete truck or separated equipment to verify compliance with this standard

3.16**routine test**

repetitive test required for all production trucks

3.17**control circuit**

electrical circuit used for the control, including monitoring, of the truck and the electrical equipment

3.18**auxiliary circuit**

electrical circuit that controls lights, fans and other accessories

3.19**power circuit**

circuit that supplies power from the energy source to units of equipment used for productive operation and transforming

3.20**energy source**

unit for energizing equipment of the truck used for productive operation

Note 1 to entry: For trucks, energy sources can be:

- batteries based on different technologies;
- liquid or gaseous fuel combined with internal combustion engine or fuel cell;
- AC power sources.

3.21**frame fault**

accidental connection of an electrical potential to the truck frame exposed conductive parts

3.22**IC truck**

truck equipped with internal combustion engine on which the power is transferred to the powered movement by mechanical, hydraulic or electrical system

3.23**normal operating position**

position in which the operator is able to control all functions for driving and load handling as defined by the manufacturer

Note 1 to entry: Additional positions are permitted to be defined by the manufacturer if it is not possible to control all the functions of the truck from a single position. A rotating seat or stand-up end-control truck with more than one operating direction is considered as being or having a single operating position.

[SOURCE: EN ISO 3691-1:2015, 3.8]

4 Requirements**4.1 General requirements****4.1.1 Low voltage/high voltage**

The safety of the truck shall not be jeopardized at any voltage level that might occur.

Electrical systems of trucks powered by lead-acid batteries shall be designed so that all functions operate in the voltage range from 70 % up to 120 % of the nominal voltage. These limits shall be adapted to other energy sources technologies by the manufacturer.

4.1.2 Frame fault

The electric circuits shall be so designed or protected, that frame faults shall not cause inadvertent movements that cannot be controlled by the operator.

A type test shall be carried out by simulating a frame fault at each electric motor of the truck, which is fed by a pulse control e.g. by a converter. Low power motors like wiper or fan motors are excluded from test.

After introducing the frame fault the motor shall be set to a minimum of 20 % of the maximum operational speed for duration of 5 s.. Uncontrolled movement shall not occur.

During the test of the driving system the truck shall be jacked up (idled driving wheels).

4.1.3 Protection against electric shock

Non isolated live parts of trucks in operating condition shall be protected to a degree of IPxxB preventing direct contact. For top surfaces, the minimum degree shall be IPxxD in accordance with EN 60529.

The cover of an electrical enclosure containing live parts in excess of nominal voltage 60 V DC or 25 V AC, shall be accessible only by use of a tool; this requirement doesn't apply to covers for batteries up to 120 V.

Indirect contact to live parts shall be avoided by electric separation of the protection devices in accordance with EN 60204-1:2006, 6.3.2.3. See also HD 60364-4-41:2007, 4.13.5.

Provisions shall be given in order to electrically disconnect the energy sources for maintenance and replacement operations.