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Sikkerhed ved industritrucks – Elektriske/elektroniske krav

Safety of industrial trucks – Electrical/electronic requirements

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European foreword

This document (EN 1175:2025) 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of an identical text or by endorsement, at the latest by May 2026, and conflicting national standards shall be withdrawn at the latest by May 2026.

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 EN 1175:2020.

This document specifies up-to-date requirements for electric/electronic installations of industrial trucks. Requirements are mainly based on safety functions and not only on safety related parts and take into account exclusively electric/electronic elements.

The main changes compared to EN 1175:2020 are:

— updating of normative and informative references;

— added references to EN ISO 3691-2:2023, to EN ISO 3691-3:2016, to EN ISO 3691-6:2021.

— correction of the specification in transport test for contactors in Annex B;

— updating of Table 5.

This document is intended to be used in conjunction with EN ISO 3691 series and EN 16307 series.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

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.

Introduction

This document is a type-C standard as stated in EN ISO 12100:2010.

This document is of relevance for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e.g. for maintenance (small, medium and large enterprises).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

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

1 Scope

This document 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 5053-1:2020, except rough-terrain variable-reach trucks as defined in ISO 5053-1:2020, 3.21 and 3.22, straddle carriers as defined in ISO 5053-1:2020, 3.18 and 3.19, and all those functions utilized for the automatic operation of driverless industrial trucks as defined in ISO 5053-1:2020, 3.32. It provides the electrical/electronic and safety-related parts of control system requirements for those self-propelled industrial trucks identified above.

NOTE 1 For detailed information about the electrical/electronic requirements for driverless trucks see EN ISO 3691-4:2023, 4.1.3.

NOTE 2 Reference is made to this document in other standards which cover the non-electrical requirements of the various industrial truck types.

This document deals with safety requirements for all electrical and electronic components of industrial trucks, including electrically actuated hydraulic/pneumatic valves. It specifies minimum performance levels required for safety functions realized by safety related parts of control systems. 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 document does not deal with hazards which could occur:

— during construction;

— when operating in potentially explosive atmospheres;

— because of malfunction of non-electric safety-related parts of control systems, e.g. hydraulic and pneumatic elements like pistons, non-electric valves, pumps, etc.;

— when operating outside the range of 30 % to 95 % (not condensing) of relative humidity.

NOTE 3 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.

NOTE 4 Hazards due to penetration of water and dust are covered by the definition of PL_r of safety functions, according to EN ISO 13849-1:2023.

NOTE 5 Safety measures outside the scope of the electrical/electronic system are covered by other safety standards e.g. EN ISO 3691 series and EN 16307 series.

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 12895:2015+A1:2019, *Industrial trucks — Electromagnetic compatibility*

EN 16307-1:2020, *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 50565-1:2014, *Electric cables — Guide to use for cables with a rated voltage not exceeding 450/750 V (U0/U) — Part 1: General guidance*

EN 60034-8:2007,[1] *Rotating electrical machines — Part 8: Terminal markings and direction of rotation (IEC 60034-8:2007)*

EN 60068-2-27:2009, *Environmental testing — Part 2-27: Tests — Test Ea and guidance: Shock (IEC 60068-2-27:2008)*

EN 60068-2-6:2008, *Environmental testing — Part 2-6: Tests — Test Fc: Vibration (sinusoidal) (IEC 60068-2-6:2007)*

EN 60204-1:2018, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

EN 60332-1-2:2004,[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 60332-1-2:2004)*

EN 60529:1991,[3] *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 60695-11-10:2013,[4] *Fire hazard testing — Part 11-10: Test flames — 50 W horizontal and vertical flame test methods (IEC 60695-11-10:2013)*

EN 60947-5-5:1997,[5] *Low-voltage switchgear and controlgear — Part 5-5: Control circuit devices and switching elements — Electrical emergency stop device with mechanical latching function (IEC 60947-5-5:1997)*

EN 61643-11:2012,[6] *Low-voltage surge protective devices — Part 11: Surge protective devices connected to low-voltage power systems — Requirements and test methods (IEC 61643-11:2011)*

EN 62485-3:2014, *Safety requirements for secondary batteries and battery installations — Part 3: Traction batteries (IEC 62485-3:2014)*

EN 62620:2015,[7] *Secondary cells and batteries containing alkaline or other non-acid electrolytes — Secondary lithium cells and batteries for use in industrial applications (IEC 62620:2014)*

EN IEC 60384-14:2023, *Fixed capacitors for use in electronic equipment — Part 14: Sectional specification — Fixed capacitors for electromagnetic interference suppression and connection to the supply mains (IEC 60384-14:2023)*

EN IEC 60664-1:2020,[8] *Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests (IEC 60664-1:2020)*

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1 As impacted by EN 60034-8:2007/A1:2014.
2 As impacted by EN 60332-1-2:2004/A1:2015, EN 60332-1-2:2004/A11:2016 and EN 60332-1-2:2004/A12:2020.
3 As impacted by EN 60529:1991/A1:2000, EN 60529:1991/A2:2013, EN 60529:1991/AC:2019-02, EN 60529:1991/AC:2016-12 and EN 60529:1991/A2:2013/AC:2019-02.
4 As impacted by EN 60695-11-10:2013/AC:2014.
5 As impacted by EN 60947-5-5:1997/A1:2005, EN 60947-5-5:1997/A11:2013 and EN 60947-5-5:1997/A2:2017.
6 As impacted by EN 61643-11:2012/A11:2018.
7 As impacted by EN 62620:2015/A1:2023.
8 As impacted by EN IEC 60664-1:2020/AC:2020-12.

EN IEC 62281:2019,[9] *Safety of primary and secondary lithium cells and batteries during transport (IEC 62281:2019)*

EN IEC 62619:2022, *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 62619:2022)*

EN IEC 62902:2019, *Secondary batteries — Marking symbols for identification of their chemistry (IEC 62902:2019)*

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

EN ISO 13849-1:2023, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2023)*

EN ISO 3691-1:2015,[10] *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, including Cor 1:2013)*

EN ISO 3691-2:2023, *Industrial trucks — Safety requirements and verification — Part 2: Self-propelled variable-reach trucks (ISO 3691-2:2023)*

EN ISO 3691-3:2016,[11] *Industrial trucks — Safety requirements and verification — Part 3: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads (ISO 3691-3:2016)*

EN ISO 3691-6:2021, *Industrial trucks — Safety requirements and verification — Part 6: Burden and personnel carriers (ISO 3691-6:2021)*

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

IEC 60417:2024, *DB, Graphical symbols for use on equipment*

IEC 60947-4-1:2023, *Low-voltage switchgear and controlgear — Part 4-1: Contactors and motor-starters — Electromechanical contactors and motor-starters*

ISO 3287:1999, *Powered industrial trucks — Symbols for operator controls and other displays*

ISO 5053-1:2020, *Industrial trucks — Vocabulary — Part 1: Types of industrial trucks*

ISO 7000:2019, *Graphical symbols for use on equipment — Registered symbols*

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[9] As impacted by EN IEC 62281:2019/A1:2021 and EN IEC 62281:2019/A2:2023.
[10] As impacted by EN ISO 3691-1:2015/A1:2020.
[11] As impacted by EN ISO 3691-3:2016/A1:2023.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5053-1:2020 and the following apply.

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

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

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

3.1
U_n
nominal voltage of the truck system
designated value of the voltage of the electrical system and to which its characteristics are referred

3.2
nominal battery voltage
number of battery cells connected in series multiplied by the nominal cell voltage, relative to the chemical technology of the cell

Note 1 to entry: If the battery consists of cells connected in series and in parallel, the nominal voltage is defined by the number of cells, which are arranged in one line of cells connected in series.

3.3
drive system
electrically controlled system moving truck on ground, generating torque with effect on one or more drive 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
LHS
electrical load handling system
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 cannot be used as safety functions (3.13).

3.8
PL_r
required performance level
performance level (PL) applied to achieve the required risk reduction for each safety function

[SOURCE: EN ISO 13849-1:2023, 3.1.6, note 1 to entry deleted]

3.9
setpoint
operator's physical actions on the intended control device

Note 1 to entry: For travelling, the actuation of the accelerator control.

3.10
actpoint
actual physical value of the system output

Note 1 to entry: Examples of actpoint are: truck speed, position of truck steered wheel(s), energised solenoid and the combination of voltage, current and frequency applied to a drive motor.

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 6292:2020, 3.9, modified by substituting “braking system” with “brake” in the term]

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.

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 6292:2020, 3.8, modified by substituting “braking system” with “brake” in the term]

3.13
safety function
function of the machine whose failure can result in an immediate increase of the risk(s)

[SOURCE: EN ISO 12100:2010, 3.30]

3.14
risk
combination of the probability of occurrence of harm and the severity of that harm

[SOURCE: EN ISO 12100:2010, 3.12]

3.15
type test
test to the requirements of this document of an example of devices, systems or complete trucks representative of the production, including the relevant range of options provided by the manufacturer of the truck, as part of the verification of compliance with this document

3.16
routine test
tests carried out during series production necessary to maintain compliance with this document

3.17
control circuit
electrical circuit used for the control, including monitoring, of the truck and its 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 truck operation

3.20
energy source
unit for energizing equipment of the truck used for productive operation

Note 1 to entry: Energy sources for trucks 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 a live part to the truck frame or exposed conductive parts

3.22
IC truck
truck equipped with an internal combustion engine of which the power is transferred to a 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]

3.24
high voltage truck
truck whose U_n is greater than 120 V DC or 50 V AC and less than or equal to 1 500 V DC or 1 000 V AC under idle or fully charged condition

3.25
OPC
operator-presence control
device that detects the presence of the operator in the normal operating position

3.26
electric powered assisted steering system
mechanical and/or hydraulic steering system powered by an electrical system