BRITISH STANDARD

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Safety of industrial trucks — Electrical requirements —

Part 2: General requirements for internal combustion engine powered trucks

ICS 53.060

National foreword

This British Standard is the UK implementation of EN 1175-2:1998+A1:2010. It supersedes BS EN 1175-2:1998 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by [A1⟩ ⟨A1].

The UK participation in its preparation was entrusted to Technical Committee MHE/7, Industrial trucks.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Safety of industrial trucks - Electrical requirements - Part 2: General requirements of internal combustion engine powered trucks

Sécurité des chariots de manutention - Prescriptions électriques - Partie 2: Prescriptions générales des chariots équipés d'un moteur thermique

Sicherheit von Flurförderzeugen - Elektrische Anforderungen - Teil 2: Allgemeine Anforderungen für Flurförderzeuge mit Verbrennungsmotoren

This European Standard was approved by CEN on 23 November 1997 and includes Amendment 1 approved by CEN on 26 September 2010.

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Foreword

This document (EN 1175-2:1998+A1:2010) 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of an identical text or by endorsement, at the latest by May 2011, and conflicting national standards shall be withdrawn at the latest by May 2011.

[A1] 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 and integral part of this document. [A1]

[A1] *deleted text* [A1]

[A1] The main changes compared to the previous version are:

— modification of Annex ZA;

— minor technical changes in 5.3;

— requirements for radiation and software parameters;

— reference to EN 292-1 be replaced with EN ISO 12100-1:2003, EN 292-2 be replaced with EN ISO 12100-2:2003 and EN 954-1 be replaced with EN ISO 13849-1:2008. [A1]

This document includes Amendment 1, approved by CEN on 2010-09-26.

This document supersedes EN 1175-2:1998.

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1] [A1].

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 European Standard is one of a package of standards for the safety of industrial trucks:

[A1] prEN 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/DIS 3691-1:2008)* [A1]

[A1] EN 1726-2 [A1] 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 andtrucks specially designed to travel with elevated load

[A1] EN 1551 [A1] Safety of industrial trucks - Self propelled trucks over 10 000 kg capacity

[A1] EN 1459 [A1] Safety of industrial trucks - [A1] Self propelled variable [A1] reach trucks

[A1] EN ISO 3691-5, *Industrial trucks — Safety requirements and verification — Part 5: Pedestrian-propelled trucks (ISO 3691-5:2009)* [A1]

[A1] *deleted text* [A1]

[A1] EN 1757-3 [A1]	Safety of industrial trucks; pedestrial controlled manual and semi manual trucks - Part 3 - Platform trucks

[A1] *deleted text* [A1]

EN 1525	Safety of industrial trucks - Driverless trucks and their systems
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 requirments for the electric power transmission systems of internal combustion engine powered trucks
EN 1526	Safety of industrial trucks - Automated functions of trucks
[A1] EN 1755 [A1]	Safety of industrial trucks - Operation in potentially explosive atmospheres; Use in flammable gas, vapour, mist and dust
[A1] EN 12053 [A1]	Safety of industrial trucks - Test methods for measuring noise [A1] emissions [A1]
prEN ISO/DIS 13564	Test method for measuring visibility from self-propelled trucks
[A1] EN 13059 [A1]	Safety of industrial trucks - Test methods for measuring vibration
[A1] EN 12895 [A1]	Industrial trucks - Electromagnetic compatibility

[A1] *deleted text* [A1]

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

0 Introduction

[A1] This European Standard is a type C standard as stated in EN ISO 12100-1:2003. [A1].This standard has been prepared to be a harmonized standard to provide one means of conforming with the electrical aspects of the Essential Safety Requirements of the Machinery Directive and associated EFTA Regulations. Electrical installations complying with this standard are deemed to satisfy these requirements.

The extent to which hazards are covered is indicated in the scope of this standard. [A1] In addition, machinery should comply as appropriate with EN ISO 12100-2:2003 for hazards which are not covered by this European Standard. [A1]

1 Scope

1.1 This standard specifies the electrical and related mechanical safety requirements for the design and construction of the electrical installation in internal combustion engine powered trucks (hereinafter referred to as "trucks") with starter battery nominal voltages up to and including 24 V.

NOTE 1 Part 3 of this standard details specific electrical requirements for electrical power transmission systems of internal combustion engine powered trucks.

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

[A1] *deleted text* [A1]

[A1] NOTE 3 The special requirements for operation in potentially explosive atmospheres are not covered in this European Standard. [A1]

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

— Maximum ambient temperature, continuous duty: +40°C;

— Lowest ambient temperature: -20 °C;

— Service altitude: up to 2000 m;

— Relative humidity: in the range 30 % to 95 % (non condensing).

1.3 This standard covers specific hazards which could occur during the intended use of trucks. [A1] For hazards occurring during construction, transportation, commissioning, decommissioning and disposal, reference should be made to EN ISO 12100-2:2003. [A1]

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the 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 European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[A1] *deleted text* [A1]

EN 1050:1996 Safety of machinery - Principles for risk assessment

〈A1〉 EN 12895:2000, *Industrial trucks — Electromagnetic compatibility* 〈A1〉

EN 60947-5-1:1991 Low-voltage switchgear and controlgear
Part 5: Control circuit devices and switching elements
Section one: Electromechanical control circuit devices (IEC 947-5-1:1990)

〈A1〉 EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003)*

EN ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003)*

EN ISO 13849-1:2008, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)* 〈A1〉

ISO 5053:1987 Powered industrial trucks - Terminology

3 Definitions

For the purposes of this standard, definitions given in ISO 5053:1987 apply together with the following:

3.1
nominal battery voltage
the total number of battery cells connected in series multiplied by 2 V for conventional lead acid batteries and by 1,2 V for alkaline batteries. For other types of batteries corresponding definitions apply

4 〈A1〉 List of significant hazards 〈A1〉

The following significant hazards from Annex A of EN 1050:1996 (within brackets) 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 remove the hazard in each situation.

Hazard	**Corresponding requirements**
4.1 Mechanical hazards (1)	
4.1.1 Crushing hazard (1.1)	5.1.2 Battery constrain
4.1.2 Impact by collision (1.6)	5.3.4 Speed limitation
4.1.2.1 - when driven by the operator	5.3.5 Steering control
4.1.3 Loss of stability (1.11)	
- from excess speed	
- from faulty battery mass	
4.2 Electrical hazards (2)	5.1.1 Battery insulation
4.2.1 Electric shock (2.1)	5.2 Protection of circuits
4.2.2 Short circuit	

4.2.3 Overloading	5.4.1 Protection 5.4.2 Cross-sectional area 5.4.3 Specification 5.4.5 Mechanical protection 5.4.6 Wiring that flexes 5.5 Protection against electric shock
4.3 Hazards generated by substances (7)	5.1.2 Battery constraint 5.4.4 Fuel leakage
4.4 Ergonomic hazards (8) 4.4.1 Human error (8.6) 4.4.1.1 - when the truck is serviced	5.4.7 Identification 6 Information for use 〚A1〛 5.3.6 Parameter 5.6.1 Non ionising radiation 6.3 Non ionising radiation 〚A1〛
4.5 Hazards due to functional disorders (10)	5.1.3 Battery disconnection 5.2 Protection of circuits 5.3.1 Low voltage 5.3.2 Frame faults 5.3.3 Load handling control 5.3.4 Speed limitation 5.3.5 Steering control 〚A1〛 5.3.6 Parameter 〚A1〛 5.4.3 Specification 5.4.4 Fuel leakage 5.4.5 Mechanical protection 5.4.6 Wiring that flexes
〚A1〛 Programming errors	5.3.6 Parameter 〚A1〛

[A1] Electromagnetic radiation	5.6.1 Non ionising radiation 5.6.2 Electromagnetic compatibility 6.3 Non ionising radiation [A1]

5 General requirements

5.1 Starter battery

5.1.1 Insulation

Any live parts of the battery not connected to the frame shall be insulated.

5.1.2 Constraining

Batteries of all trucks shall be constrained to prevent displacement which may give rise to danger.

5.1.3 Disconnection

Truck shall be so designed and constructed that the battery can be electrically disconnected with the aid of an easily accessible device e.g. a switch or connector.

Disconnectable battery terminals satisfy this requirement providing the terminals are accessible without the use of a key or tool.

5.2 Protection of circuits

Control and auxiliary circuits shall be fuse protected against short circuit conditions and dangerous excess current. Several auxiliary circuits in parallel, with combined rated current not exceeding 12 A, may be protected by a single device.

5.3 Safety related control systems

5.3.1 Low voltage

Electrical control systems shall be so designed that all functions operate and safety is not jeopardized if the voltage should fall below the nominal battery voltage by as much as 15%.

NOTE Where a system is required to function during engine starting condition, special precautions can be required.

5.3.2 Frame faults

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

5.3.3 Load handling control

Electrical and electronic control load handling systems, shall be arranged so that in case of a fault the load handling movement can be stopped. The safety related parts shall be in accordance with category 1 [A1] in EN ISO 13849-1:2008, 6.2. [A1]

This requirement is not necessary where the movements are controlled by some other means, e.g. direct manually operated hydraulic valves.

5.3.4 Speed limitation

For limiting or reducing the speed of a function on trucks designed to travel with an elevated operator and/or load for stability reasons the following shall apply:

a) The electrical and electronic circuits shall be so designed and fitted that in the event of electrical faults, the speed limitation is preserved or the motion shall be brought to a controlled stop. Restarting shall not be possible until the circuit has been restored. Where it is not possible to satisfy the above requirements by a simple electrical or electronic circuit, the electrical or electronic circuits may be duplicated. Facilities shall be provided to check the correct functioning at service intervals in accordance with the manufacturers' instruction;

The safety related parts shall be in accordance with category 2 [A1] in EN ISO 13849-1:2008, 6.2. [A1]

b) Mechanically operated switches may be of positive action type in accordance with EN 60947-5-1:1991 such that they disconnect the circuit. Other switches can be used providing the system meets the safety requirements in a) (above).

5.3.5 Steering control

Electrical and electronic steering control systems shall be arranged so as to avoid operation of the steering system unrelated to the manual input during travel. Any electrical or electronic fault capable of producing the above condition shall be detected and the steering assistance de-energized within 0,1 s. Where the power steering system is fully dependent on the electrical power source, the truck shall also be brought to a controlled stop automatically. It shall be possible to check the operation of the safety circuit of this system at service intervals in accordance with the manufacturers instruction. The safety related parts shall be in accordance with category 3 [A1] in EN ISO 13849-1:2008, 6.2. [A1]

5.3.6 [A1] Parameter

Any uncontrolled change of the electronic system parameter shall maintain the safe operation and correct function of the truck.

Any change of parameter values controlled by the operator shall not result in a hazardous situation. The system shall ensure safe operation and correct function of the truck. [A1]

5.4 Wiring practices, conductors and electrical components

One pole of the electrical system may be connected to the truck frame.

5.4.1 Protection

All conductors not connected to the truck frame shall be either effectively insulated and where necessary protected against thermal and mechanical damage or shall be so placed and safeguarded as to avoid danger when the truck is in its normal operating condition.

5.4.2 Cross-sectional area

The cross-sectional area of conductors shall be so selected that during operation of the truck the temperature does not exceed the temperature rating of insulation used.

5.4.3 Specification

Copper conductors external to enclosures (excluding short connections between electric or electronic components and wires that are an integral part of a proprietary component) shall be:

a) flexible;

b) of cross-sectional area not less than:

1) for control wiring 0,50 mm²;

2) for signal wiring 0,30 mm²;

3) for data communication wiring and for conductors of adequately supported copper multicore cables and wiring harnesses 0,08 mm²

c) of cross-sectional area not less than 1,00 mm^2 for single wires not incorporated into a harness or extending from the harness more than 250 mm.

Conductors of other materials shall be selected and sized to give equivalent performance.

5.4.4 Fuel leakage

Wiring and electrical components shall be designed, placed or protected to minimize hazards arising from leakage from the fuel system, such as contamination and fire.

5.4.5 Mechanical protection

Where wiring passes through metal parts of the frame or enclosures, the holes shall be fitted with insulating bushes or the wiring protected by some other equivalent means.

5.4.6 Wiring that flexes

Wiring that flexes during normal operation of the truck functions shall be relieved of mechanical strain at their electrical termination.

5.4.7 Identification

Wires, cables, terminals etc shall be identified by codings in accordance with the electrical diagram included in the service manual.

5.5 Protection against electric shock

Exposed high tension ignition terminals on trucks shall be protected against direct contact by barriers or insulated caps.

5.6 〈A1〉 Electromagnetic radiations

5.6.1 Non ionising radiations

Where trucks are fitted with functional related non-ionising radiation devices (e.g. radio transmitter, RFID reader, data collection system), the radiation shall be minimized with consideration to influence to persons, in particular with active or non-active implantable medical devices.

5.6.2 Electromagnetic compatibility

Any functional electromagnetic emission and the immunity of the electric/electronic systems shall be within the limits of EN 12895:2000. A1

6 Information for use

NOTE The main information for use is detailed in the truck standards as listed in the foreword section. The following are additional requirements.

6.1 Electrical diagram

An electrical diagram (which shall include nominal battery voltage and where applicable, frame polarity) shall be included in the service manual. Connection points for auxiliary lighting shall be indicated.

6.2 Safety checks

Methods and intervals for checking safety systems shall be included in the service manual or instruction handbook.

6.3 A1 Non ionising radiation

If the truck, after the commissioning, can be equipped with devices (e.g. radio transmitter, RFID reader, data collection system) that are likely to emit non-ionising radiation which can cause harm to persons, in particular persons with active or non-active implantable medical devices, a warning shall be given in the instruction manual. If those auxiliary devices are installed by the user, the user itself shall ensure that the supplier instructions are fulfilled and/or no harm for the persons has risen.

Where trucks are fitted with non-ionising radiation devices warning signs shall be installed. A1

Annex ZA
(informative)

A1 Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 2006/42/EC

Clause(s)/sub-clause(s) of this EN	Essential Requirements (ERs) of Directive 2006/42	Qualifying remarks/Notes
5.1, 5.1.1	1.1.3 Materials and products	
5.3	1.2.1 Safety and reliability of control systems .	
5.3.1, 5.3.6	1.2.6 Failure of the power supply	
5.3.4	1.3.1 Risk of loss of stability	
5.1.1, 5.4, 6.2	1.3.2 Risk of break-up during operation	
5.1.2	1.3.3 Risks due to falling or ejected objects	
5.5, 5.1, 5.2, 5.4	1.5.1 Electricity supply	
5.4.7, 6.1	1.5.4 Errors of fitting	
5.2	1.5.5 Extreme temperatures	
5.2, 5.4	1.5.6 Fire	
5.4.4	1.5.7 Explosion	
5.6	1.5.10 Radiation	
5.6.2	1.5.11 External radiation	
5.1.2, 5.4.4	1.5.13 Emissions of hazardous materials and substances	
5.1.3	1.6.3 Isolation of energy sources	

Table ZA.1 — *(continued)*

6.3	1.7.2 Warning of residual risks	
6	1.7.4.2 Contents of the instructions	
5.3.1	3.3.2 Starting/moving	
5.1	3.5.1 Batteries	
5.3.4	4.1.2.1 Risks due to lack of stability	
5.3.3	6.3.1 Risks due to movements of the carrier	

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard. 〈A1〉

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