
Varnost vozil za talni transport - Električne zahteve - 1. del: Splošne zahteve za električna vozila za talni transport na baterijski pogon

Safety of industrial trucks - Electrical requirements - Part 1: General requirements for battery powered trucks

Sicherheit von Flurförderzeugen - Elektrische Anforderungen - Teil 1: Allgemeine Anforderungen für Flurförderzeuge mit batterieelektrischem Antrieb

Sécurité des chariots de manutention - Prescriptions électriques - Partie 1: Prescriptions générales des chariots alimentés par batterie

<https://standards.iteh.ai/catalog/standards/sist/3899aa63-38e0-45ff-87de-28d31b3e0044/sist-en-1175-1-1998>

Ta slovenski standard je istoveten z: EN 1175-1:1998

ICS:

43.120	Električna cestna vozila	Electric road vehicles
53.060	Industrijski tovornjaki	Industrial trucks

SIST EN 1175-1:1998**en**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 1175-1:1998](#)

<https://standards.iteh.ai/catalog/standards/sist/3899aa63-38e0-45ff-87de-28d31b3e0044/sist-en-1175-1-1998>

EUROPEAN STANDARD

EN 1175-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

January 1998

ICS 53.060

Descriptors: industrial truck, electric power supply, electric batteries, safety of machines, accident prevention, hazards, tests, electrical installation, design, insulation resistance, protection against electric shocks, control devices, wiring, utilization, information, marking

English version

Safety of industrial trucks - Electrical requirements - Part 1: General requirements for battery powered trucks

Sécurité des chariots de manutention - Prescriptions
électriques - Partie 1: Prescriptions générales des chariots
alimentés par batterie

Sicherheit von Flurförderzeugen - Elektrische
Anforderungen - Teil 1: Allgemeine Anforderungen für
Flurförderzeuge mit batterieelektrischem Antrieb

This European Standard was approved by CEN on 23 November 1997.

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.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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

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

Contents

	Page
FOREWORD	6
0 INTRODUCTION	8
1 SCOPE	8
2 NORMATIVE REFERENCES	9
3 DEFINITIONS	10
4 LIST OF HAZARDS	11
5 GENERAL REQUIREMENTS	13
5.1 TRACTION BATTERY	13
5.1.1 Installation and protection	13
5.1.2 Constraining	13
5.1.3 Disconnection	13
5.2 BATTERY CONNECTORS	14
5.3 HEAT DISSIPATING ELECTRICAL COMPONENTS	14
5.4 ELECTRIC MOTORS	14
5.5 CONTACTORS	14
5.6 ELECTRO-MECHANICAL BRAKES	14
5.7 PROTECTION AGAINST ELECTRIC SHOCK	14
5.7.1 Direct contact	14
5.7.2 Indirect contact	14
5.7.3 Connection to the frame	14
5.7.4 On-board chargers	15
5.8 PROTECTION OF ELECTRICAL EQUIPMENT	15
5.8.1 Short circuits and overloads	15
5.8.2 Overcurrent protective devices	15
5.9 SAFETY RELATED CONTROL SYSTEMS	15
5.9.1 Low voltage	15
5.9.2 Frame faults	15
5.9.3 Travel control system	15
5.9.4 Pulse control travel systems	16
5.9.5 Prevention of travel	16
5.9.6 Steering control	16
5.9.7 Load handling control	16
5.9.8 Tiller control	16
5.9.9 Speed limitation	16
5.9.10 Slack wire-ropes or chains	17
5.10 CONDUCTORS	17
5.10.1 Protection	17
5.10.2 Cross-sectional area	17
5.10.3 Specification	17
5.11 WIRING PRACTICES	18
5.11.1 Multicore cables	18
5.11.2 Main current cables	18
5.11.3 Wiring that flexes	18
5.11.4 Mechanical protection	18
5.11.5 Identification	18
5.12 BATTERY CHARGING	18

5.12.1	Movement during charging	18
5.12.2	Charger switching	18
5.13	EMERGENCY SWITCHING OFF	18
5.13.1	Access	18
5.13.2	Function	18
5.14	DIELECTRIC TEST (TYPE TEST)	19
5.14.1	Performance	19
5.14.2	Test voltage	19
5.14.3	Electronic components	19
5.15	INSULATION RESISTANCE TEST (ROUTINE TEST)	19
5.15.1	Test voltage	19
5.15.2	Insulation resistance of truck	20
5.15.3	Insulation resistance of battery	20
6.1	BATTERY	20
6.1.1	Container	20
6.1.2	Terminals and connectors	20
6.1.3	Poles	20
6.1.4	Cover	20
6.2	BATTERY CONNECTORS	20
6.2.1	Requirements	20
6.2.2	Emergency disconnection	21
6.3	PROTECTION AGAINST ELECTRIC SHOCK	21
6.3.1	Electrical enclosures	21
6.3.2	Circuits	21
6.3.3	Bonding	21
6.3.4	Detection of frame faults	21
6.4	EMERGENCY SWITCHING OFF	21
6.5	INSULATION RESISTANCE TEST (ROUTINE TEST)	21
6.5.1	Test voltage	21
6.5.2	Insulation resistance of truck	21
6.5.3	Insulation resistance of battery	22
7	INFORMATION FOR USE	22
7.1	ELECTRICAL DIAGRAM	22
7.2	SAFETY CHECKS	22
7.3	BATTERY	22
7.4	MINIMUM MARKING	22
	ANNEX A (NORMATIVE)	23
	CONNECTORS FOR TRACTION BATTERIES	23
A.1	NORMATIVE REFERENCES	23
A.2	DEFINITION	23
A.2.1	Nominal current	23
A.2.2	Emergency breaking current	24
A.3	REQUIREMENTS	23
A.3.1	Mounting bracket	23
A.3.2	Physical properties	24
A.3.3	Contacts	24
A.3.4	Rated current	24
A.3.5	Polarity reversing	24
A.3.6	Contacts with connector casing	24
A.3.7	Temperature resistance	24
A.3.8	Enclosure protection	24
A.3.9	Protection of half-connector fitted to the battery	24
A.3.10	Coding	24

A.3.11 Cable sections	24
A.3.12 Locking of half-connectors	25
A.4 TYPE-TEST METHODS	25
A.4.1 Coding test	25
A.4.2 Samples	25
A.4.3 Preconditioning	25
A.4.4 Temperature rise test	25
A.4.5 Low temperature test	26
A.4.6 Mechanical life test	26
A.4.7 Sequential treatment for drop test	26
A.4.8 Drop test	26
A.4.9 Dielectric test	26
A.4.10 Test of disconnection in overload conditions for range 1 only	27
A.4.11 Test of disconnection under emergency conditions for range 1 only	27
A.5 MAINTENANCE OF QUALITY	27
ANNEX B (NORMATIVE)	30
ELECTRIC MOTORS - OUTPUT AND TEST RULES	30
B.1 NORMATIVE REFERENCES	30
B.2 DEFINITIONS	30
B.3 CLASSIFICATION OF ENCLOSURE AND COOLING	31
B.3.1 Protection	31
B.3.2 Cooling	31
B.4 REQUIREMENTS	31
B.4.1 Rated output	31
B.4.2 Classes of insulation	32
B.4.3 Rated output test	32
B.4.4 Characteristic curves	33
B.4.5 Tolerances on characteristic curves	34
B.4.6 Overspeed test	34
B.4.7 Dielectric test	34
B.4.8 Terminal markings	35
B.4.9 Markings - Identification	35
B.5 TESTING	35
B.5.1 General	35
B.5.2 Type tests	35
B.5.3 Routine tests	36
ANNEX C (NORMATIVE)	37
ELECTROMAGNETIC CONTACTORS	37
C.1 DEFINITIONS	37
C.2 NOMINAL SERVICE CONDITIONS	37
C.2.1 Climatic conditions	37
C.3 TYPES OF CONTACTOR	37
C.3.1 Type A	37
C.3.2 Type B	38
C.3.3 Type C	38
C.3.4 Type D	38
C.4 GENERAL REQUIREMENTS	38
C.4.1 Limits of operation	38
C.4.2 Mechanical durability	39
C.5 TYPE TESTS	39
C.5.1 Temperature rise test of main circuit	39
C.5.2 Temperature rise tests of operating coils	40

C.5.3 Dielectric tests	41
C.5.4 Verification of operating limits	41
C.5.5 Verification of making and breaking capacities in proving operation	41
C.5.6 Verification of rated making and breaking capacities of intermittently rated contactors of table C.6 category 2	42
C.5.7 Verification of mechanical durability	42
C.6 ROUTINE TEST	43
C.6.1 Operating limits	43
C.6.2 Dielectric test	43
C.7 MARKING	43
ANNEX ZA (INFORMATIVE)	44
Clauses of this European Standard addressing essential requirements or other provisions of EU Directives	

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 1175-1:1998](https://standards.iteh.ai/catalog/standards/sist/3899aa63-38e0-45ff-87de-28d31b3e0044/sist-en-1175-1-1998)

<https://standards.iteh.ai/catalog/standards/sist/3899aa63-38e0-45ff-87de-28d31b3e0044/sist-en-1175-1-1998>

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 July 1998, and conflicting national standards shall be withdrawn at the latest by July 1998.

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).

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

prEN 1726	Safety of machinery - 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.
prEN 1726-2	Safety of machinery - 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 specially designed to travel with elevated load
prEN 1551	Safety of industrial trucks - Self propelled trucks over 10 000 kg capacity
prEN 1459	Safety of industrial trucks - Variable reach trucks
prEN 1757-1	Safety of industrial trucks - Pedestrian controlled manual and semi manual trucks - Part 1: Stacker trucks
prEN 1757-2	Safety of industrial trucks - Pedestrian controlled manual and semi manual trucks - Part 2: Pallet trucks with lift height up to 300 mm
prEN 1757-3	Safety of industrial trucks - Pedestrian controlled manual and semi manual trucks - Part 3: Platform trucks
prEN 1757-4	Safety of industrial trucks - Pedestrian controlled manual and semi manual trucks - Part 4: Scissor lift pallet-trucks
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 requirements for the electric power transmission systems of internal combustion engine powered trucks
EN 1526	Safety of industrial trucks - Additional requirements for automated functions on trucks

prEN 1755	Safety of machinery - Industrial trucks - Operation in potentially explosive atmospheres; Use in flammable gas, vapour, mist and dust
prEN 12053	Safety of industrial trucks - Test methods for measuring noise emission
prEN ISO/DIS 13564	Test method for measuring visibility from self-propelled trucks (ISO/DIS 13564:1996)
prEN 13059	Safety of industrial trucks - Test methods for measuring vibration
prEN 12895	Industrial trucks - Electromagnetic compatibility

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.

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

[SIST EN 1175-1:1998](https://standards.iteh.ai/catalog/standards/sist/3899aa63-38e0-45ff-87de-28d31b3e0044/sist-en-1175-1-1998)

<https://standards.iteh.ai/catalog/standards/sist/3899aa63-38e0-45ff-87de-28d31b3e0044/sist-en-1175-1-1998>

0 Introduction

This European Standard is a type C standard as stated in EN 292-1. 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. In addition, machinery should comply as appropriate with EN 292 for hazards which are not covered by this standard.

1 Scope

1.1 This standard specifies electrical and related mechanical safety requirements for design and construction of the electrical installation in battery powered industrial trucks hereinafter referred to as trucks, with nominal voltages of the truck system up to 240 V. The Annex A is normative and gives requirements for "Connectors for traction batteries". Annex B is normative and contains "Electric motors - Output and test rules" and Annex C is normative and contains "Electromagnetic contactors".

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 standard does not address the subject of charging of traction batteries (CENELEC TC 21X is preparing safety standards for battery charging).

NOTE 3: This standard does not address the subject of electromagnetic compatibility (EMC).

NOTE 4: The special requirements for operation in potentially explosive atmospheres are not covered in this standard.

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

- Average ambient temperature for continuous duty: +25°C;
- Maximum ambient temperature, short term (up to 1 h): +40°C;
- Lowest ambient temperature for trucks intended for use in normal indoor conditions:..... +5 °C;
- Lowest ambient temperature for trucks intended for use in normal outdoor conditions: .. -20 °C;
- Altitude:..... up to 2000 m;
- Relative humidity: in the range 30 % to 95 % (non condensing).

1.3 This standard covers specific hazards (listed in clause 4), which could occur during the intended use of trucks. For hazards occurring during construction, transportation, commissioning, de-commissioning and disposal, reference should be made to EN 292:1991.

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.

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 Part 2: Technical principles and specification
EN 563 : 1994	Safety of machinery - Temperatures of touchable surfaces - Ergonomic data to establish temperature limit values for hot surfaces
EN 954-1:1996	Safety of machinery - Safety related parts of control systems Part 1: General principles for design
EN 1050:1996	Safety of machinery - Principles for risk assessment
EN 60034-1:1995	Rotating electrical machines Part 1: Rating and performance (IEC 34-1:1994, modified)
EN 60204-1:1992	Safety of machinery - Electrical equipment of machines Part 1: General requirements (IEC 204-1:1992, modified) ¹⁾
EN 60529:1991	Degrees of protection provided by enclosures (IP Code) (IEC 529:1989)
EN 60947-3:1992	Low-voltage switchgear and controlgear Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units (IEC 947-3:1990, modified + Corrigendum December 1991)
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)
HD 53.6 S2:1992	Rotating electrical machines; Part 6: Methods of cooling (IC Code) (IEC 34-6:1991)
HD 53.8 S4:1993	Rotating electrical machines; Part 8: Terminal markings and direction of rotation of rotating machines (IEC 34-8:1972 + A1:1990, modified)
HD 405.1 S1	Tests on electric cables under fire conditions. Part 1 : Test on a single vertical insulated wire or cable
IEC 85:1984	Thermal evaluation and classification of electrical insulation
IEC 384-14:1993	Fixed capacitors for use in electronic equipment. Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains

¹⁾ This standard applies only in parts (option 3). Specific clauses have been indicated in the text.

ISO 5053:1987	Powered industrial trucks - Terminology
ISO 6743-4:1982	Lubricants, industrial oils and related products (class L). Classification - Part 4: Family H (Hydraulic systems)

3 Definitions

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

3.1 nominal voltage (of the truck system): The total number of battery cells connected in series in the truck system multiplied by 2 V for lead acid batteries and by 1,2 V for alkaline batteries.

3.2 truck type test: One-off test to verify compliance with this standard for each truck type.

3.3 truck routine test: Repetitive test required for all production trucks.

3.4 nominal current: Current in amperes that the connector is able to carry continuously without exceeding the allowable temperature indicated in A.3.7

3.5 emergency breaking current: Current in amperes specified in A.4.11 that the connector shall be able to break in the case of exceptional circumstance or hazard.

3.6 motor type test: A test made on one or more items of electrical equipment of a new design or of a new manufacture to demonstrate that it complies with this standard.

3.7 motor routine test: A test to which the electrical equipment on an order is subjected to prove its soundness. This can be reduced by agreement to testing a percentage of a production batch.

3.8 maximum service rotational frequency (speed) of a motor: The highest rotational frequency assigned to the machine by the manufacturer.

3.9 rated motor voltage: Rated voltage is equal to the nominal voltage of the vehicle battery, i.e. the maximum number of cells which are connected in series multiplied by the nominal voltage of each cell, which for lead acid cells is 2,0 V and 1,2 V for conventional alkaline batteries.

3.10 rated motor output: The output in kW at the shaft of an electric motor as agreed by the manufacturer under the associated conditions (e.g. rotational frequency, rated voltage and current).

3.11 continuous rated motor output: The rated output assigned by the manufacturer that can be sustained indefinitely on test without exceeding the temperature rises specified in table B.1

3.12 one hour rated motor output: The rated output assigned by the manufacturer that can be sustained for one hour, starting from normal ambient temperature without exceeding the temperature rises specified in table B.1

3.13 short time rated motor output: The rated output assigned by the manufacturer that can be sustained for a specified period starting from the normal ambient temperature without exceeding the temperature rises specified in table B.1

3.14 duty type motor rating: The time for a duty cycle is 10 min and the cyclic duration factor is expressed as a percentage that can be sustained, starting from the normal ambient temperature without exceeding the temperature rise specified in table B.1

4 List of hazards

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) - between truck components - between truck & obstacles 4.1.2 Impact by collision (20) 4.1.2.1 - when driven by the operator 4.1.3 Loss of stability (18) - from excess speed - from faulty battery mass	5.1.2 Constraining 5.6 Electro-mechanical brakes 5.9.3 Travel control system 5.9.4 Pulse control travel system 5.9.8 Tiller control 5.9.9 Speed limitation 5.9.10 Slack wire-ropes or chains 7.4 Battery
4.2 Electrical hazards (2) 4.2.1 electric shock (2.1) 4.2.2 short circuit 4.2.3 overloading - all voltages	5.1.1.1 Covers 5.1.1.2 Design of covers 5.1.3 Disconnection 5.2 Battery connectors 5.4 Electric motors 5.5 Contactors 5.7.1 Direct contact 5.7.2 Indirect contact 5.7.3 Connection to the frame 5.7.4 On-board chargers 5.8 Protection of electrical equipment 5.10.1 Protection 5.10.2 Cross-sectional area 5.11.1 Multicore cables 5.11.2 Main current cables 5.11.3 Wiring that flexes 5.11.4 Protection 5.12.1 Movement during charging 5.12.2 Charger switching 5.14 Dielectric test 5.15 Insulation resistance test
120 V < voltages ≤ 240 V	6.1.1 Battery 6.1.2 Terminals and connectors 6.1.3 Poles 6.1.4 Cover 6.2 Battery connectors 6.3.1 Electrical enclosures 6.3.2 Circuits 6.3.3 Bonding 6.3.4 Detection of frame faults 6.5 Insulation resistance test 7.4 Minimum marking
4.3 Thermal hazards (3)	5.3 Heat dissipating electrical components