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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

English Version

Safety requirements for cableway installations designed to carry persons - Drive systems and other mechanical equipment

Prescriptions de sécurité pour les installations à câbles transportant des personnes - Entraînements et autres dispositifs mécaniques

Sicherheitsanforderungen an Seilbahnen für die Personenbeförderung - Antriebe und weitere mechanische Einrichtungen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 242.

If this draft becomes a European Standard, 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.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (prEN 13223:2025) has been prepared by Technical Committee CEN/TC 242 "Safety requirements for cableway installations designed to carry persons", the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 13223:2015+A1:2022.

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 Directives, see Annex ZA, which is an integral part of this document.

Compared with EN 13223:2015+A1:2022, the following major changes have been made:

- The foreword has been revised;
- Undated references to standards have been replaced by dated references to standards;
- 6.6.4 has been clarified with regard to the protection of workers;
- 9.10.1 has been clarified;
- 12.2.8 has been revised;
- 18.4.3 has been expanded with regard to the protection of workers;
- Annex ZA has been revised.

This European Standard is part of a European series of standards on safety requirements for cableway installations designed to carry persons. This series of standards consists of the following parts:

- EN 1907 *Terminology*
- EN 12929 (all parts) *General requirements*
- EN 12930 *Calculations*
- EN 12927 *Ropes*
- EN 1908 *Tensioning devices*
- EN 13223 *Drives systems and other mechanical equipment*
- EN 13796 (all parts) *Carriers*
- EN 13243 *Electrical equipment other than for drive systems*
- EN 13107 *Civil engineering works*
- EN 1709 *Precommissioning inspection and instructions for maintenance and operational inspection and checks*
- EN 1909 *Recovery and evacuation*

- EN 12397 *Operation*
- EN 12408 *Quality control*
- EN 17064 *Prevention and fight against fire*

All these standards form a whole for the planning, manufacture, installation, maintenance and operation of cableway installations designed to carry persons.

For the ski tows, the work of the International Organization for Transportation by Rope (OITAF) has been taken into account in the drafting of this document.

1 Scope

This document sets out the safety requirements for the mechanical and electrical equipment of the drive systems and the other mechanical equipment of cableway installations designed to carry persons. The various types of cableway system and their environment are taken into account.

This document applies to the planning, installation, manufacture, maintenance and operation of the mechanical and electrical equipment of the drive systems and the other mechanical equipment of the cableway installations designed to carry persons.

This document sets out requirements for accident prevention and worker protection without prejudice to the application of national regulations.

National regulations pertaining to construction law or regulations, or that serve to protect special groups of persons, remain unaffected.

This document does not apply to cableways for freight transport or to lifts.

Clauses 6 to 11 apply to mechanical and electrical equipment of the drive systems.

Clauses 12 to 20 apply to other mechanical equipment.

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 1709:2019, *Safety requirements for cableway installations designed to carry persons — Precommissioning inspection and instructions for maintenance and operational inspection and checks*

EN 1907:2017, *Safety requirements for cableway installations designed to carry persons — Terminology*

EN 1908:2015, *Safety requirements for cableway installations designed to carry persons — Tensioning devices*

EN 1909:2017, *Safety requirements for cableway installations designed to carry persons — Recovery and evacuation*

EN 1993-1-1:2022, *Eurocode 3: Design of steel structures — Part 1-1: General rules and rules for buildings*

EN 1993-1-9:2025, *Eurocode 3: Design of steel structures — Part 1-9: Fatigue*

EN 10204:2004, *Metallic products — Types of inspection documents*

EN 12397:2017, *Safety requirements for cableway installations designed to carry persons — Operation*

EN 12408:2004, *Safety requirements for cableway installations designed to carry persons — Quality control*

EN 12927:2019, *Safety requirements for cableway installations designed to carry persons — Ropes*

EN 12929-1:2015+A1:2022, *Safety requirements for cableway installations designed to carry persons — General requirements — Part 1: Requirements for all installations*

EN 12929-2:2015+A1:2022, *Safety requirements for cableway installations designed to carry persons — General requirements — Part 2: Additional requirements for reversible bi-cable aerial ropeways without carrier truck brakes*

- EN 12930:2015, *Safety requirements for cableway installations designed to carry persons — Calculations*
- EN 13107:2015,¹ *Safety requirements for cableway installations designed to carry persons — Civil engineering works*
- EN 13243:2015, *Safety requirements for cableway installations designed to carry persons — Electrical equipment other than for drive systems*
- EN 13796-1:2017, *Safety requirements for cableway installations designed to carry persons — Carriers — Part 1: Grips, carrier trucks, on-board brakes, cabins, chairs, carriages, maintenance carriers, tow hangers*
- EN 13796-2:2017+A1:2022, *Safety requirements for cableway installations designed to carry persons — Carriers — Part 2: Slipping resistance tests for grips*
- EN 13796-3:2017+A1:2022, *Safety requirements for cableway installations designed to carry persons — Carriers — Part 3: Fatigue tests*
- EN 17064:2018, *Safety requirements for cableway installations designed to carry persons — Prevention and fight against fire*
- EN ISO 898-1:2013,² *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 1: Bolts, screws and studs with specified property classes — Coarse thread and fine pitch thread (ISO 898-1:2013)*
- EN ISO 898-2:2022, *Fasteners — Mechanical properties of fasteners made of carbon steel and alloy steel — Part 2: Nuts with specified property classes (ISO 898-2:2022)*
- EN ISO 898-3:2018,³ *Mechanical properties of fasteners made of carbon steel and alloy steel — Part 3: Flat washers with specified property classes (ISO 898-3:2018)*
- EN ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components (ISO 4414:2010)*
- EN ISO 5817:2023, *Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — Quality levels for imperfections (ISO 5817:2023)*
- EN ISO 9606-1:2017, *Qualification testing of welders — Fusion welding — Part 1: Steels (ISO 9606-1:2012, including Cor 1:2012 and Cor 2:2013)*
- ISO 281:2007, *Rolling bearings — Dynamic load ratings and rating life*
- ISO 6336:2019 (all parts), *Calculation of load capacity of spur and helical gears*

¹ As amended by EN 13107:2015/AC:2016.

² As amended by EN ISO 898-1:2013/AC:2013.

³ As amended by EN ISO 898-3:2013/A1:2021.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1907:2017 and the following apply.

3.1

Automatic travel

Entire travel process, which is controlled automatically from the control console and can be partially influenced by control points under special conditions.

3.2

Manual travel

Entire travel process, which is controlled only by the machine operator from the control console.

3.3

Electrical stop

Emergency stop with main drive motor

Emergency stop with auxiliary drive motor

Procedure in which the cableway is brought to a standstill after the corresponding safety circuit has been interrupted by an emergency stop using the main or auxiliary drive motor.

3.4

Emergency stop with service brake

Procedure in which the service brake is activated after the corresponding safety circuit has been interrupted and the power supply to the main or auxiliary drive motor is interrupted.

3.5

Emergency stop with safety brake

Process in which the safety brake is activated after the corresponding safety circuit has been interrupted or triggered mechanically and the power supply to the main or auxiliary drive motor is interrupted.

3.6

Braking force control

Process in which the braking force is controlled during braking according to a specified deceleration value so that the cableway is brought to a standstill with as constant a deceleration as possible.

3.7

Braking force setting

Control-based determination of the braking force based on the torque of the main drive motor immediately before stopping is initiated, whereby the value of the braking force remains unchanged until standstill.

3.8

Deceleration monitoring

Monitoring of the deceleration caused when the cableway is stopped by the main or auxiliary drive motor or a mechanical brake.

3.9

Normal stopping point

Normal standstill position of the carriers in the stations for cableways with reversible operation and pulsed movement operation.

3.10**Retraction distance**

Distance between the carrier and the normal stopping point in one station if the other carrier moves to the buffer in the other station.

3.11**Entry monitoring**

Monitoring of the speed curve in the station entry area.

3.12**Position monitor checking**

Checks of the position monitor settings, among which a distinction is made:

3.12.1**Fixed point checking**

Check of the information provided by the position monitor about the carrier status in relation to a fixed point on the line.

3.12.2**Synchronicity monitoring**

Monitoring of the information provided by the position monitor about the carrier status compared with the same information from the second position monitor.

3.12.3**Zero position check**

Check as to whether the position monitors are in the starting position when the carriers are in the stations.

3.13**Minimum speed**

Lower speed limit value.

3.14**Main carrier rail**

Structure on which the carriers are moved from the station entrance to the station exit in normal operation.

3.15**Continuous operation**

Operating state in which the system is operated at full or partial load in uninterrupted and continuous operation.

4 General requirements**4.1 Application of the standard**

The requirements of this document apply to all cableways and shall be applied together with the requirements of EN 1709:2019, EN 1908:2015, EN 1909:2017, EN 12397:2017, EN 12408:2004, EN 12927:2019, EN 12929-1:2015+A1:2022, EN 12929-2:2015+A1:2022, EN 12930:2015, EN 13243:2015, EN 13107:2015, EN 13796-1:2017, EN 13796-2:2017+A1:2022, EN 13796-3:2017+A1:2022 and EN 17064:2018.

4.2 Safety principles

4.2.1 General

The safety principles according to EN 12929-1:2015+A1:2022 shall apply.

For the electrical equipment of the drive systems, the safety principles of EN 13243:2015 shall apply.

4.2.2 Hazard scenarios

The following events can result in a hazard situation that is reduced or avoided by the safety requirements of this document:

- a) Deropement of ropes;
- b) Prevention of operational movement of the ropes due to blocking by mechanical equipment or hanging on system parts;
- c) Damage to or failure of the drive and braking devices and the supporting and guiding elements of the ropes due to wear, heating, corrosion or fatigue;
- d) Failure of the drive and braking devices, the supporting and guiding elements of the ropes and other mechanical equipment in the stations and on the line due to insufficient dimensioning;
- e) Reduction of power transmission from the drive sheave to the haul rope or carrying-hauling rope;
- f) Reduction in the friction force of the braking device;
- g) Hanging or falling of carriers at towers and in stations;
- h) Collision of carriers or between a carrier and an obstacle when entering, exiting and passing through stations;
- i) Incorrect coupling or uncoupling of carriers with detachable grips;
- j) Excessive deceleration or acceleration of the haul ropes and carrying-hauling ropes and of the carriers;
- k) Exceeding the maximum permissible travel speed;
- l) Unintentional starting of the cableway;
- m) Risk posed by mechanical equipment to persons who are in the traffic and work area;
- n) Impermissible pitch between carriers;
- o) Operation in unfavourable weather conditions (e.g. wind, frost, ice, rain);
- p) Foreseeable misconduct by persons (passengers, operating personnel, third parties).

4.2.3 Safety measures

Safety measures shall be taken to eliminate the hazard scenarios listed in 4.2.2.

The measures mentioned in this document are essentially construction related and should achieve the following objectives:

- a) Prevent deropement;

- b) In the event of deropement: catch the rope, prevent the rope from hanging or blocking, and shut down the system;
- c) Prevent carriers from deroping, crashing, hanging and suffering a dangerous collision;
- d) Prevent failure of safety-related mechanical and hydraulic equipment;
- e) Detect dangerous malfunctions of detachable grips and safely bring the carriers to a standstill;
- f) Detect impermissible pitch between carriers and take the necessary measures;
- g) Prevent insufficient or excessive deceleration or excessive acceleration of haul ropes and carrying-hauling ropes and the carriers;
- h) Detect that the maximum permissible travel speed has been exceeded and stop the system;
- i) Detect unintended movement of the cableway and take the necessary measures;
- j) Protect persons against falling and touching moving parts;
- k) Prevent the risk of persons colliding with carriers.

5 General requirements for hydraulic devices

The general requirements of EN 1908:2015 apply to hydraulic equipment.

6 General requirements for drive systems

6.1 General principles

6.1.1 The general requirements of EN 12929-1:2015+A1:2022 shall be observed for the design of the drive units. The associated technical documents are listed in Annex C.

6.1.2 The drive systems shall allow the machine to start and stop several times in succession.

6.1.3 The provisions for other electrical equipment are contained in EN 13243:2015.

6.2 Main drive system

6.2.1 The main drive system shall permit as smooth a startup as possible and travel in either direction, regardless of the load. It shall be designed for continuous operation in the most unfavourable loading condition and with the highest permissible travel speed.

6.2.2 Startup with the main drive system shall be possible in the most unfavourable loading condition with an average acceleration of at least $0,15 \text{ m/s}^2$. In the case of aerial ropeways, an average acceleration of $0,5 \text{ m/s}^2$ and an instantaneous acceleration (average acceleration over $0,5 \text{ s}$) of $1,5 \text{ m/s}^2$ shall not be exceeded.

6.2.3 It shall be possible to continuously adjust the travel speed over the entire speed range between the minimum speed and the maximum permissible travel speed. For test runs without a significant load, it shall also be possible to maintain the travel speed of approximately $0,3 \text{ m/s}$ during the time required to travel along the length of the cableway.

6.2.4 It shall be possible to maintain the specified travel speed with sufficient precision and to regulate it in a stable manner for all loading conditions that occur during operation.

6.2.5 The deviations from the target value of the travel speed shall not exceed $\pm 5\%$.

6.2.6 If the cableway has to be brought to a stop, the power supply to the main drive motor shall be shut off automatically by two circuits (redundancy) of which at least one shall be galvanic or of an equivalent system. In the event of an emergency stop using the service brake or safety brake, the power supply shall be shut off immediately; otherwise, it shall be shut off no later than when the installation comes to a stop.

6.2.7 In the case of a multi-motor drive, the motors shall be loaded according to their power in each operating state.

6.3 Auxiliary drive

6.3.1 The auxiliary drive shall be capable of maintaining operation at a speed appropriate to the requirements.

6.3.2 In addition, the other requirements of 6.2.1 shall be met.

6.4 Recovery drive and evacuation drive

6.4.1 The recovery drive is used only for evacuation (in accordance with EN 1909:2017).

6.4.2 The recovery drive shall be designed to operate for three times the maximum evacuation time required and at a travel speed of at least 0,5 m/s.

6.4.3 The recovery drive shall be provided with the safety devices required for safe evacuation at the requisite travel speed.

6.4.4 To ensure that the recovery drive remains capable of operation even if these safety devices fail, it shall be possible to bypass them in accordance with EN 13243:2015.

6.4.5 The electrical equipment of the recovery drive and the evacuation drive shall be as simple as possible. It shall be possible to ensure their functionality in a simple manner.

6.4.6 The electrical equipment of these drives shall be separated from each other and from the main drive system in such a way that interference between the various drives is prevented as far as possible.

6.4.7 The following also applies to the recovery drive:

- a) It shall be capable of being put into operation within 15 minutes;
- b) Serious errors during the changeover shall be ruled out;
- c) Incorrect operation, e.g. incorrect direction of travel, shall not result in overloading of the mechanical parts or the mounting;
- d) It shall be possible to operate recovery drives that have a remote control even if the remote control fails.

6.5 Types of control system

6.5.1 Travel can be initiated and, to a certain extent, influenced:

- a) By the machine operator from the control console (control-console control system);
- b) By personnel from the control points located in the carriers (carrier control system);
- c) By personnel from the control points located on the platform (platform control system);
- d) By special equipment (e.g. timers, people counters) or by passengers (automatic control system);
- e) During service travel by personnel from a control point located in the opposite station or return station (service travel control system).

6.5.2 Regardless of other available control system types, each cableway shall have a control-console control system.

6.5.3 Only one control system type may be active at a time. In particular, the travel command may only be issued from the control points belonging to the corresponding control system type.

6.5.4 Switching from one travel type and from one control system type to another may only take place at a standstill and shall be possible for a short period of time.

6.6 Safety functions and control devices

6.6.1 If a safety function is initiated or an emergency stop device is operated, the cableway shall automatically be brought safely to a stop (electrical stop, emergency stop with service brake or emergency stop with safety brake) and/or startup shall be automatically prevented by interrupting the relevant safety circuit.

NOTE Bring to a safe stop also means that an emergency stop using the service brake or, if applicable, an emergency stop using the safety brake is triggered if torque may no longer be exerted by the main or auxiliary motor after a safety function has been triggered.

6.6.2 Failure of the main energy source shall not affect the operation of the safety functions or shall result in the cableway being transferred to a safe state. Use of the recovery drive shall not be prevented.

6.6.3 After a safety function has been triggered or after an emergency stop device has been activated, startup may only be possible after performing a manual reset in the control room or at other points with equivalent operating and display equipment, whereby the reset:

- a) May only be effective when the cableway is at a standstill;
- b) Shall not impair the functionality of the safety function or the emergency stop device itself.

6.6.4 The operation of a maintenance switch (safety switch) or a pull cord shall:

- a) Trigger the stopping of the cableway by the action of a brake on the drive sheave or on a sheave with sufficient static friction, i.e. the corresponding safety circuit shall be interrupted;
- b) Prevent restarting by applying a brake to the drive sheave.

These devices shall also stop the auxiliary drives in the station (tyre and chain conveyors, sidings, passenger loading bands etc.) when the system is switched off.

6.6.5 EN 13243:2015 shall be observed for the removal of safety functions.

6.7 Motors/engines

6.7.1 General requirements

The design and construction of the motors shall take into account the operating conditions, the climatic conditions and the sea level.

6.7.2 Internal combustion engines

6.7.2.1 Internal combustion engines shall be stationary and equipped with a battery-powered starter.

6.7.2.2 The exhaust gases from internal combustion engines shall be discharged into the open. Supply and exhaust air shall be ensured.

6.7.2.3 As a minimum, the oil pressure and the engine temperature shall be monitored.

6.8 Gearboxes

6.8.1 Gearboxes shall be dimensioned for all operational load cases.

6.8.2 If they transmit rope forces, gearbox housings and their mountings shall be dimensioned with a safety margin of 3,5 relative to the yield point.

6.8.3 The lubrication of gearboxes shall be ensured over the entire range of travel speeds and ambient temperatures during operation. This also applies to the auxiliary and recovery drive, and for reverse operation.

6.8.4 Gearing calculations shall be carried out in accordance with ISO 6336:2019 (all parts), taking into account the operating conditions; for gearboxes classified as a safety component, the safety against permanent tooth root breakage shall be at least 1,7 and the flank safety shall be at least 1,0.

6.9 Power transmission devices

6.9.1 Mechanical power transmission

6.9.1.1 Flat belts shall not be used for power transmission. Chain drives for the main and auxiliary drives may be used only in closed housings with continuous lubrication.

6.9.1.2 Power transmission devices such as couplings, cardan shafts etc. shall be dimensioned for all operational loading conditions.

6.9.1.3 The end positions of the clutch couplings shall be mechanically lockable and electrically monitored.

6.9.2 Hydraulic power transmission

6.9.2.1 The general requirements of EN 1908:2015 shall be observed.

6.9.2.2 It shall be possible to start up the system smoothly in both directions of travel and bring it to a stop under all operating conditions.

6.9.2.3 When the brakes are applied, the oil pump shall be automatically set to the zero position (oil delivery stopped) or to neutral; in the case of the recovery drive, this can also be done manually.