

BS EN 13796-3:2017



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Safety requirements for cableway installations designed to carry persons — Carriers

Part 3: Fatigue testing

National foreword

This British Standard is the UK implementation of EN 13796-3:2017. It supersedes BS EN 13796-3:2005 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MCE/20, Aerial ropeways.

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

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English Version

Safety requirements for cableway installations designed to carry persons - Carriers - Part 3: Fatigue testing

Prescriptions de sécurité pour les installations à câbles
transportant des personnes - Véhicules - Partie 3 :
Essais de fatigue

Sicherheitsanforderungen an Seilbahnen für den
Personenverkehr - Fahrzeuge - Teil 3:
Ermüdungsversuche

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European Foreword

This document (EN 13796-3:2017) 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 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of an identical text or by endorsement, at the latest by September 2017, and conflicting national standards shall be withdrawn at the latest by September 2017.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights or similar rights. CEN and/or CENELEC shall not be held responsible for identifying all or some of these patent rights.

This document replaces EN 13796-3:2005.

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 the EU Directive(s) 2000/9/EC.

For relationship with the EU Directive 2000/9/EC, see informative Annex ZA, which is an integral part of this document.

EN 13796 comprises the following parts under the general title *Safety requirements for cableway installations designed to carry persons – Carriers*:

- *Part 1: Grips, carrier trucks, on-board brakes, cabins, chairs, carriages, maintenance carrier, tow-hangers*
- *Part 2: Slipping resistance test for grips*
- *Part 3: Fatigue testing*

The most significant changes compared to the previous edition of EN 13796-3 are as follows:

- in Clause 7, 6th indent, the manufacturing tests pursuant to EN 13796-1 and the results thereof are added to the documents requested to the testing laboratory manufacturer by replacing the testing procedure stipulated in Subclause 11.1;
- in Subclause 11.1, the methods for inspecting test specimens following the test are amended.

This document forms part of the standards programme approved by the CEN Technical Board on safety requirements for cableway installations designed to carry persons. This programme comprises the following standards:

- EN 1907, *Safety requirements for cableway installations designed to carry persons — Terminology*
- EN 12929 (all parts), *Safety requirements for cableway installations designed to carry persons — General requirements*
- EN 12930, *Safety requirements for cableway installations designed to carry persons — Calculations*;
- EN 12927 (all parts), *Safety requirements for cableway installations designed to carry persons — Ropes*;
- EN 1908, *Safety requirements for cableway installations designed to carry persons — Tensioning devices*

- EN 13223 *Safety requirements for cableway installations designed to carry persons — Drive systems and other mechanical equipment*
- EN 13796 (all parts), *Safety requirements for cableway installations designed to carry persons — Carriers*
- EN 13243, *Safety requirements for cableway installations designed to carry persons — Electrical equipment other than for drive systems*
- EN 13107, *Safety requirements for cableway installations designed to carry persons — Civil engineering work*
- EN 1709, *Safety requirements for cableway installations designed to carry persons — Pre-commissioning inspection, maintenance and operational inspection and checks*
- EN 1909, *Safety requirements for cableway installations designed to carry persons — Recovery and evacuation*
- EN 12397, *Safety requirements for cableway installations designed to carry persons — Operation*
- EN 12408, *Safety requirements for cableway installations designed to carry persons — Quality assurance*

Together these form a series of standards regarding design, manufacture, construction, maintenance and operation of all cableway installations designed to carry persons.

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, Republic of Serbia, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, The Former Yugoslav Republic of Macedonia, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the safety requirements applicable to carriers for cableway installations for passenger transportation. This standard is applicable to the various types of installations and takes into account their environment.

This European Standard sets out the requirements to be met for fatigue tests for carriers of unidirectional monocable aerial ropeways of capacity not greater than 16 persons according to EN 13796-1.

This standard does not apply to installations for the transportation of goods nor to lifts.

2 Normative references

The following referenced documents, in whole or in part, are referenced in the normal manner for this document and are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies (including any amendments).

EN 1907, *Safety requirements for cableway installations designed to carry persons – Terminology*

EN 13796-1, *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 ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

3 Terms and definitions

For the purposes of this document, the terms and definitions provided in EN 1907 and EN 13796-1 apply.

4 Symbols and abbreviations

$\Delta\varepsilon$	Range of elongation	($\mu\text{m}/\text{m}$)
ε_m	Mean elongation	($\mu\text{m}/\text{m}$)
ε_u	Lower limit of elongation	($\mu\text{m}/\text{m}$)
$\varepsilon_{\text{stat}}$	Elongation due to static loading ($G + Q$)	($\mu\text{m}/\text{m}$)
ΔF	Range of load	(kN)
F_m	Mean load	(kN)
F_u	Minimum load	(kN)
G	Self-weight of carrier	(kN)
N	Number of cycles	(-)
Q	Useful load	(kN)

5 General

The danger factors and corresponding safety measures to be taken into consideration in this standard appear in EN 13796-1.

It is recommended that the tests are carried out by a qualified test laboratory that respects the provisions set out in EN ISO/IEC 17025.

NOTE This does not mean that the test laboratory requires the approval or authorisation of third parties.

Once they have undergone fatigue testing, the test pieces shall not be used again for transport in an installation.

6 Parts to be tested

The test is carried out either on the fully equipped carrier or on its load-bearing structure alone. Elements having an effect on the fatigue behaviour of the load-bearing structure shall remain in place for the test, or be taken into account adequately in the definition of the masses or forces. For ski racks, an equivalent mass of 5 kg per set of equipment shall be allowed for as specified in EN 13796-1.

To simplify the test, the carrier may be subdivided into sub-assemblies. The following are regarded as sub-assemblies:

- grip;
- suspension;
- intermediate structure;
- cabin or chair;
- seat.

If the test is carried out on sub-assemblies, care shall be taken to ensure that they are loaded in the same way as in the carrier as a complete unit.

The geometry and materials of the test piece shall be identical to the series-manufactured components. Their methods of manufacture shall be equivalent. In particular, the test piece shall be galvanized if it is planned for the component to be so.

7 Information to be supplied by the manufacturer

The manufacturer shall supply the test laboratory with the following information and documents:

- general description of the carrier or sub-assembly;
- diagrams, sketches and manufacturing drawings of the carrier or sub-assembly;
- descriptions and explanations necessary for understanding the above-mentioned sketches and drawings and the method of operation of the carrier or sub-assembly;
- scope of use of the carrier
- declaration of conformity certifying that the carriers and sub-assemblies supplied for the test meet the requirements of the operating manual specified in EN 13796-1;

— manufacturing inspections in accordance with EN 13796-1 and their results

The test pieces shall be identified by a mark.

8 Examination prior to test

The test laboratory shall verify by means of at least a visual examination that the carrier or the sub-assemblies comply with the documentation supplied by the manufacturer.

The procedure and the result of the examination shall be included in the test report.

9 Test requirements

The test consists of subjecting the carrier or sub-assemblies to the number of cycles and the effects of actions defined in Clause 10.

The test may be carried out either as a function of the intensity of the action (load) or as a function of the elongation it causes.

The excitation shall be sinusoidal in form.

On the test bench, adequate account shall be taken of the degrees of freedom the test piece has in actual operation. In particular, the grips shall be subjected to $N/2$ cycles in the horizontal position and to $N/2$ cycles inclined at 45° to the horizontal.

If the test so requires, shock-absorbing elements may be replaced with rigid elements as long as:

- safety components are not involved;
- during the test, this does not cause any reduction in the effect of actions on the test piece or parts of it.

The values of the parameters specified in Clause 10 shall be recorded at least every 500 000 cycles.

When the test is carried out as a function of elongation, the measuring point selected shall not be located in an area of stress concentration.

10 Test parameters

10.1 Test parameters for unidirectional aerial ropeways with fixed grips

The carriers or sub-assemblies of unidirectional aerial ropeways with fixed grips shall be subjected to $N = 5 \times 10^6$ identical cycles as defined in Figure 1 and Table 1 below.

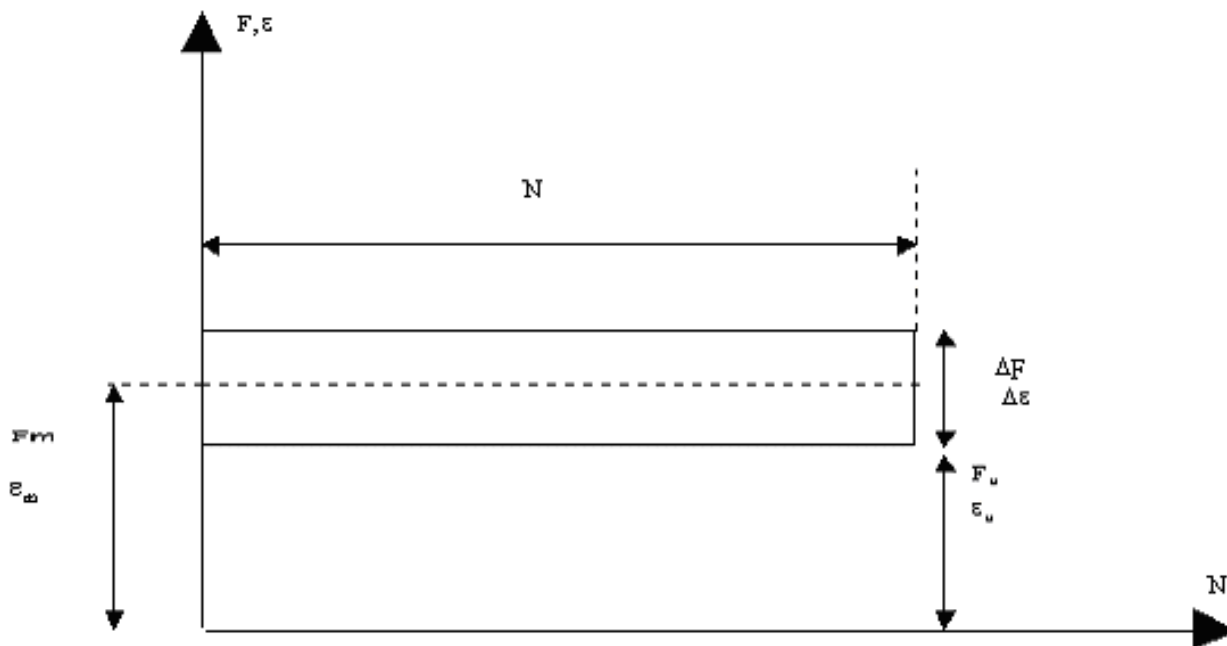


Figure 1 – Test parameters for unidirectional aerial ropeways with fixed grips

Table 1 – Test parameters for unidirectional aerial ropeways with fixed grips

Parameters	Grips, suspensions, intermediate structures, cabins or chairs, seats	
F_m, ϵ_m	$F_m \geq (G + Q)$	$\epsilon_m \geq \epsilon_{stat}$
F_u, ϵ_u	$F_u > 0$	$\epsilon_u > 0$
$\Delta F, \Delta \epsilon$	$2(G + Q)$	$2 \epsilon_{stat}$
N	5×10^6	5×10^6

10.2 Test parameters for unidirectional aerial ropeways with detachable grips

The carriers or sub-assemblies of unidirectional aerial ropeways with detachable grips shall be subjected to a total of $N = 5 \times 10^6$ cycles. These N cycles are distributed according to the two levels defined in Figure 2 and Table 2 below.

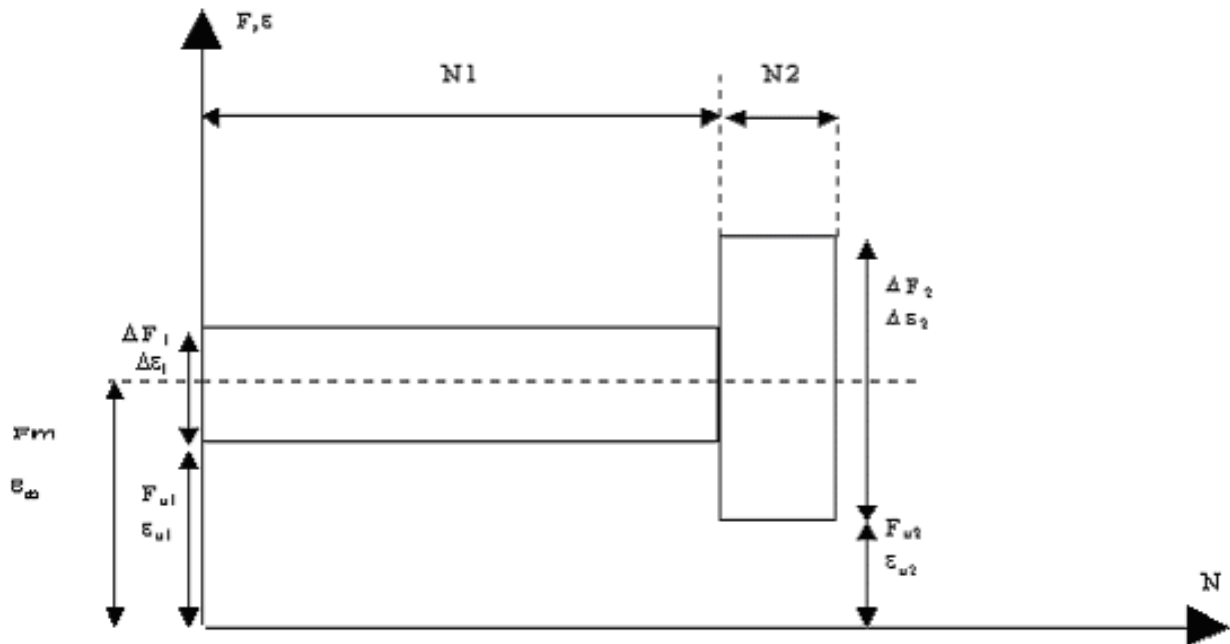


Figure 2 – Test parameters for unidirectional aerial ropeways with detachable grips

Table 2 – Test parameters for unidirectional aerial ropeways with detachable grips

Parameters	Grips, suspensions, intermediate structures, cabins or chairs, seats			
	Level 1		Level 2	
F_m, ε_m	F_m as level 2	ε_m as level 2	$F_m \geq (G + Q)$	$\varepsilon_m \geq \varepsilon_{stat}$
F_u, ε_u	$F_{u1} > F_{u2}$	$\varepsilon_{u1} > \varepsilon_{u2}$	$F_{u2} > 0$	$\varepsilon_{u2} > 0$
$\Delta F, \Delta \varepsilon$	$2 (G + Q)$	$2 \varepsilon_{stat}$	$2,5 (G + Q)^a$	$2,5 \varepsilon_{stat}^a$
N_i	$4,5 \times 10^6$	$4,5 \times 10^6$	$0,5 \times 10^6$	$0,5 \times 10^6$

^a For the intermediate structures, chairs, cabins, seats, the coefficient of 2,5 may be reduced to 2,0 if the carrier includes an intermediate structure with dampers.

11 Conclusion of the test

11.1 Inspection of test pieces after the test

After the test, the test pieces shall be subjected to:

- a visual examination to detect any wear and any obvious defects
- and crack detection by magnetic particle method or dye penetration method

This inspection shall, if necessary, be carried out after disassembly of the test body.

11.2 Evaluation of the test results

The fatigue test results shall be considered satisfactory if:

- the test piece has been subjected to the number of cycles specified in Tables 1 or 2;
- any external defects detected prior to the test have not developed further during the test;
- no new surface cracks have been detected after the test;
- no deformation has been detected after the test that may adversely affect the suitability for use of the test piece;
- no further deterioration has been detected after the test that may adversely affect safety.

11.3 Test report

The procedures and results shall be recorded in a test report.

The test report shall meet the requirements of EN ISO/IEC 17025.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2000/9/EC relating to cableway installations designed to carry persons

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 2000/9/EC relating to cableway installations designed to carry persons.

Once this standard is cited in the Official Journal of the European Union (OJEU) under that Directive and has been implemented as a national standard in at least one Member State, compliance with the 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 corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 2000/9/EC relating to cableway installations designed to carry persons

Clause(s)/sub-clause(s) of this EN	Essential Requirements (ERs) of Directive 2000/9/EC	Qualifying remarks/Notes
Article 5	2.2, 2.4, 2.6.1	
Article 6	2.2, 2.4, 2.6.1	
Article 9	2.2, 2.4, 2.6.1	
Article 10	2.2, 2.4, 2.6.1	
Article 11	2.2, 2.4, 2.6.1	

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

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