
Road vehicles — Roof load carriers

Véhicules routiers — Porte-charges de toit

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 40, *Specific aspects for light and heavy commercial vehicles, busses and trailers*.

This first edition cancels and replaces ISO/PAS 11154:2006, which has been technically revised.

The main changes are as follows:

- update and revision of document structure, which results in renumbering;
- update and revision [Clause 2](#);
- update and revision [Clause 6](#);
- addition of test procedure [\(6.4\)](#);
- addition of lane change test [\(6.11.3\)](#);
- addition of brake test [\(6.11.4\)](#);
- revision of [6.12.2](#), changing application of force from 10 min to 1 min.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Road vehicles — Roof load carriers

1 Scope

This document applies for roof racks of passenger cars and light commercial vehicles up to a permissible total weight of 3,5 t according to ISO 1176 and specifies requirements and test methods for these. It is also valid for roof racks mounted on trailers.

So-called magnetic or suction foot racks, i.e. roof racks whose attachment on the vehicle is only via magnetic forces or vacuum, are excluded from this document.

This document provides safety-related requirements under consideration of the weight, centre of gravity, air resistance and other safety-relevant properties for structures of roof racks for which no other technical or statutory regulations otherwise apply and which are not listed in 4.2. In individual cases, test requirements can extend beyond these requirements.

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.

ISO 179-1, *Plastics — Determination of Charpy-impact properties — Part 1: Non-instrumented impact test*

ISO 3888-2, *Passenger cars — Test track for a severe lane-change manoeuvre — Part 2: Obstacle avoidance*

ISO 4210-2, *Cycles — Safety requirements for bicycles — Part 2: Requirements for city and trekking, young adult, mountain and racing bicycles*

ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps*

EN 15194, *Cycles — Electrically power assisted cycles — EPAC Bicycles*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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

roof rack

device, which is attached directly or indirectly via other roof rack forms on the roof of passenger cars or vehicles derived from this and which are suitable for the transportation of loads (3.2)

3.2

load

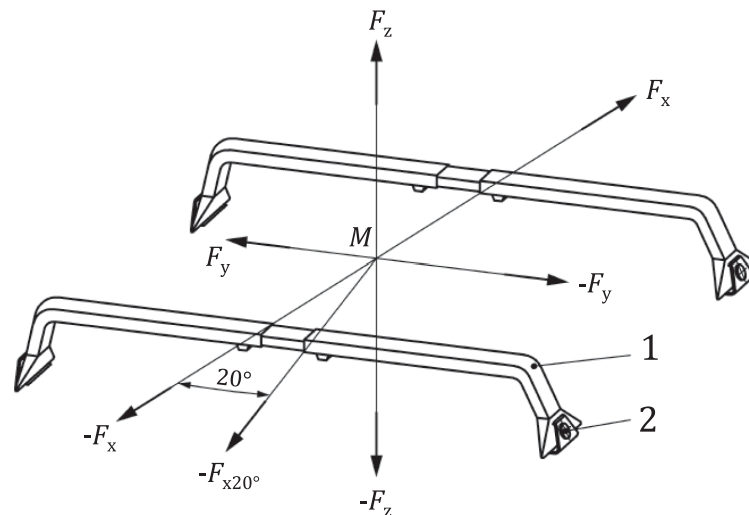
transport goods which can be transported with the *roof racks* (3.1) provided for this

4 Symbols, types and designation

4.1 Symbols

$-F_Z$	direction of the normal force of the load
F_Z	direction of the vertical force, acting vertically to the direction of travel
F_Y	direction of the lateral force, acting laterally to the direction of travel
$-F_x$	direction of the longitudinal force, acting longitudinally to the direction of travel
F_x	direction of the opposing longitudinal force, acting against the direction of travel
$-F_{x20^\circ}$	direction of the force in the horizontal plane, 20° to the vehicle longitudinal axis through the centre point M
m_D	permissible roof load in kilograms
m_N	permissible load bearing capacity of the roof rack in kilograms
m_E	dead weight of the roof racks and possibly the roof structural system in kilograms
s	stroke path from deformation and displacement in millimetres
x-direction	vehicle longitudinal axis
y-direction	transverse to the vehicle longitudinal axis (horizontal)
z-direction	transverse to the vehicle longitudinal axis (vertical)
M	force application point
F_{Vr}	front wheel contact force
F_g	gravity force
F_{Hr}	force transmitted to the ground by the rear wheel
S_m	centre of gravity of test bicycle
RS	wheelbase
h_{Sm}	height of centre of gravity

The directions of action by the individual forces are shown correspondingly in [Figure 1](#).



Key

- 1 cross member
- 2 support foot

Figure 1 — Presentation with the example of a base carrier, consisting of two carrying brackets and four support feet for clamping attachment to a vehicle roof

4.2 Types

The following types of roof racks are differentiated:

Type A	Base carrier
Type B	Luggage carrier
Type C	Ski carrier, snowboard carrier
Type D	Windsurf carrier
Type E	Bicycle carrier
Type F	Boat carrier
Type G	Roof box
Type H	Air deflector device, advertising carriers and signal lights
Type I	Luggage basket
Type J	Front wheel/Rear wheel holder (bicycle)
Type K	Cross-country ski carrier
Type L	Surf mast carrier

NOTE Only types A and B can be mounted directly on the vehicle. Type A contains a base carrier, which is mounted directly on the vehicle or on special devices on the vehicle. Type B (luggage carrier) is a luggage basket with integrated carrier function. Types C to L can only be mounted on the base carrier (Type A). Special versions are possible insofar as these correspond to the safety requirements of this document (see Introduction and [Clause 1](#)).

The following essential elements characterize the base carrier:

- carrying bracket or cross member for holding and attaching roof rack types C to L;
- device (for example, supporting foot with retaining claws) for positive and non-positive attachment of the carrying bracket or cross member to the vehicle or to special devices on the vehicle (screwed or clamped connection or railing or similar).

4.3 Designation

Roof racks according to this document can be marked via the designation of the document and the designation of the type.

EXAMPLE Designation of a roof rack type A:

Roof rack ISO 11154 – A

5 Attachment to the vehicle

The attachment of the roof racks to be tested according to this document with the vehicle shall be realized by a mechanical non-positive locking. Combinations of non-positive with positive locking are thus not excluded.

If a manufacturer brings a special roof rack into circulation, which only requires a carrying bracket or cross member of type A (e.g. single wheel carrier or wind deflector) for attachment to the vehicle, the manufacturer shall test this special roof rack completely with the entire intended structure and the intended vehicle according to this document.

6 Safety requirements, tests

6.1 Measurement uncertainties

Unless otherwise stated, the measurement uncertainties based on the Newton values shall correspond to the following:

Forces and torques	±5 %
Masses and weights	±2 %
Dimensions	±2 %
Angles	±2°
Time (e.g. test duration)	±5 s
Temperatures	±5 %
Pressure	±5 %
Speed	±5 %

6.2 General

The test requirements described in the following clauses are minimum requirements. Tests with increased requirements are permissible.

The following requirements and associated tests apply for components whose failure would also entail a failure of the overall system or detachment/loss of the load or which would render safe driving of the vehicle impossible.

6.3 Resistance of the materials

The roof rack including accessories shall fulfil requirements 6.11 to 6.13 in the temperature range from $-20\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$.

This is to be demonstrated for plastic parts in the force flow by one of the following methods:

- material test certificates and test reports¹⁾ show the suitability of the design for the intended purpose;
- performing tests under the above extreme conditions;
- reference to corresponding material standards.

6.4 Test procedure

Five test samples shall be used for the tests. The sequence of the tests shall follow Figure 2.

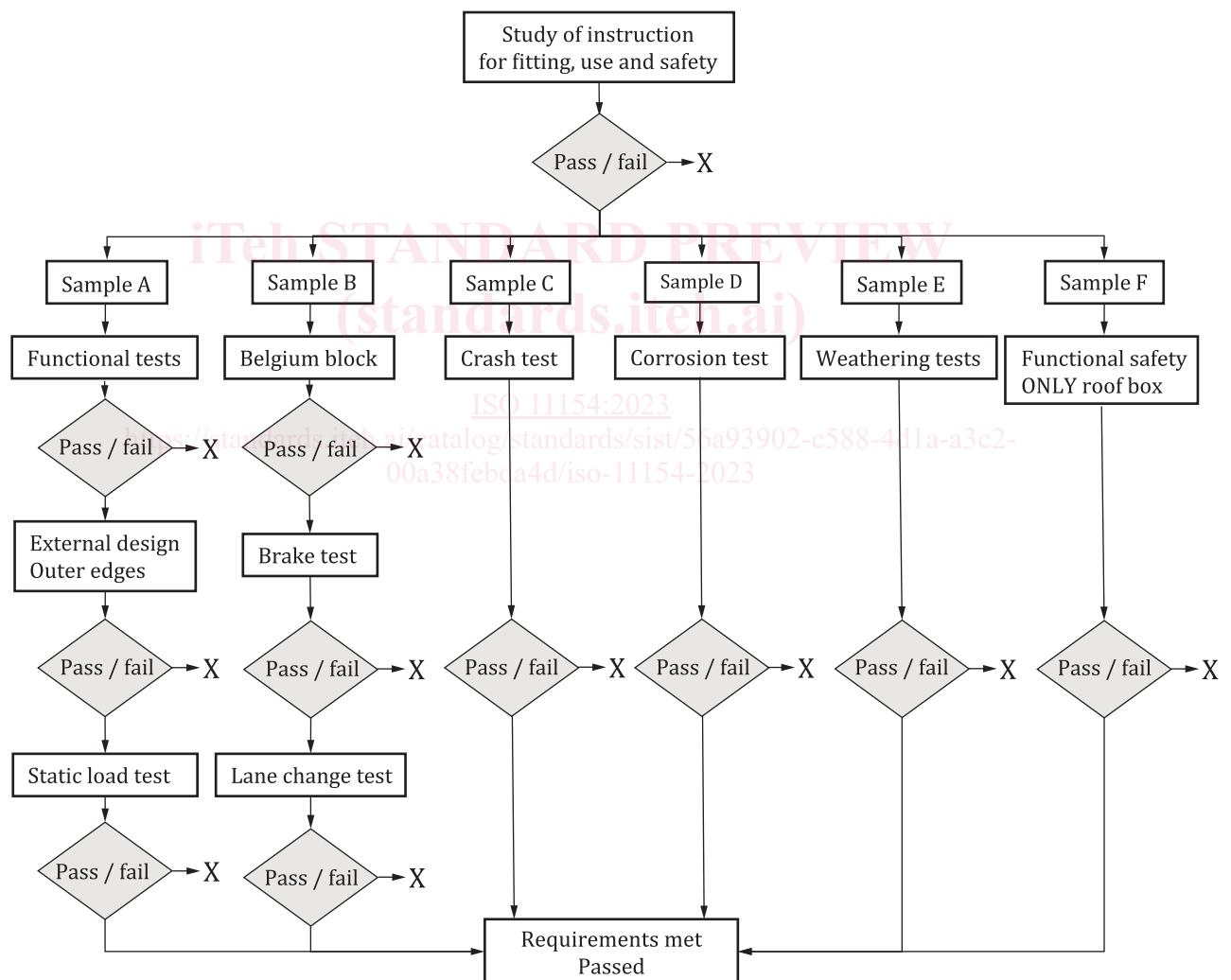


Figure 2 — Test sequence

1) For example, technical specifications for the material or test sample of the manufacturer or manufacturer certificate.

6.5 Test conditions

The strength and functional safety are determined both by dynamic test bench tests as well as in drive tests and static-load tests.

The screws are tightened with the torques indicated in the instructions for use.

The roof racks shall be tested in the installation situation approved as least favourable for the user (e.g. height-adjustable roof racks are tested in the highest position).

For types A to L, the distance in the x-direction of the middle plane of the base carrier, which the roof racks to be tested assume, shall be (700 ± 2) mm. Roof racks for which the distance is already specified by regulations or design, shall be tested with the specified distance. In case of roof racks that are fastened to rain gutters, the following rain gutter distances shall serve as a basis: during drive test $\geq 1\,250$ mm; during the tests for the static load bearing capacity = 1 250 mm. If the intended use is limited by the manufacturer of the roof rack, the maximum permissible distance of rain gutters shall be applied.

The detailed mounting conditions that shall be followed for the test are oriented to the specifications of the manufacturers of the roof racks or vehicle manufacturers. These specifications shall be included in the user information.

6.6 Test specimens

Roof racks which correspond to the series state shall be presented as test specimens for the operational safety (see 6.11), the brake test (see 6.11.4), the static-load bearing capacity (see 6.12) and the crash simulation stress (see 6.13). A new test specimen can be used, if required, for testing the operational safety. If one of these tests is negative, this test may only be repeated to pass these requirements if an improvement has been made to the roof rack or the attachment to the vehicle. The other tests shall be repeated with this new technical status if their result is affected by the modification.

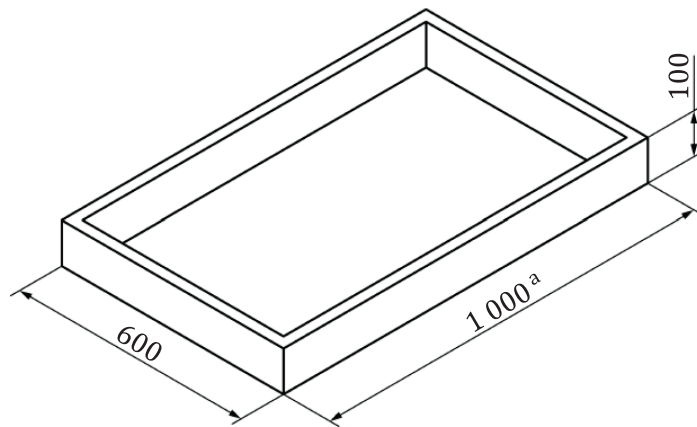
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6.7 Test instruments

6.7.1 Roof-box dummy for load simulation

The test crate shall be designed according to Figure 3 and shall not be deformed by the load. The mass of the test crate shall correspond to Table 1. The mass of the load weights shall be evenly distributed. The centre of gravity height of the laden roof-box dummy shall be between 50 mm and 80 mm above the roof rack, roof rails or roof panel.

Dimensions in millimetres



- ^a If the distance between the outer roof rails is more than 900 mm, the length of the test crate shall correspond to this distance plus 100 mm.

Figure 3 — Test crate

6.7.2 Test wheel

The test bicycle shall correspond to [Annex A](#).

The test wheel shall exhibit a diameter of 700 mm and the mass shall correspond to [Table 1](#).

6.7.3 Test skis

The test skis shall exhibit a mass according to [Table 1](#).

6.7.4 Test snowboards

The snowboard shall exhibit a mass according to [Table 1](#).

6.7.5 Test surfboard

The test surfboard shall exhibit a mass according to [Table 1](#). The dimensions of the test surfboard shall correspond to [Figure 4](#).

Dimensions in millimetres

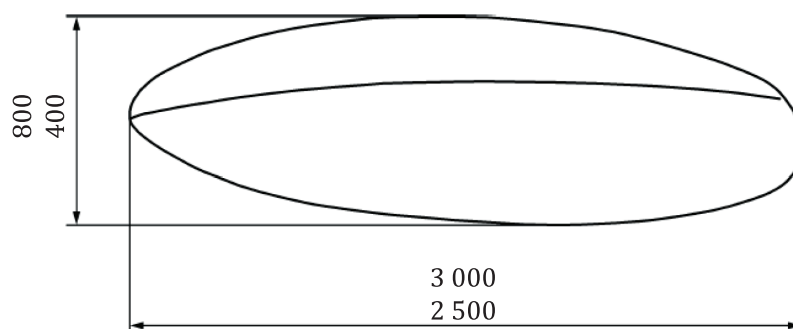


Figure 4 — (Wind) surfboard

6.7.6 Test surf mast

The test surf mast shall exhibit a mass according to [Table 1](#) and a minimum length of 4 500 mm.

6.7.7 Test boat

The test boat shall exhibit a mass according to [Table 1](#). The dimensions of the test boat shall correspond to [Figure 5](#).

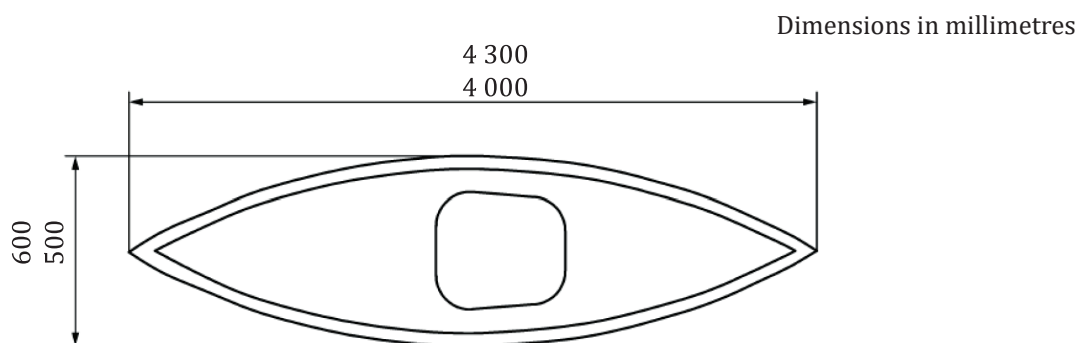


Figure 5 — Boat

6.7.8 Test ladder

The test ladder shall exhibit a length of 4 m, with a mass of 9,5 kg.

6.7.9 Test roof box

The test roof box is not the roof-box dummy [see (6.7.1)] but the roof box itself.

This shall be loaded with the masses from [Table 1](#).

6.7.10 Test air deflector device

The test air deflector device is the air deflector device itself.

6.7.11 Test basket

The test basket is the luggage basket itself. Test baskets shall be differentiated into two types: with gallery on all sides (see [Figure 6](#)), with side gallery (see [Figure 7](#)).

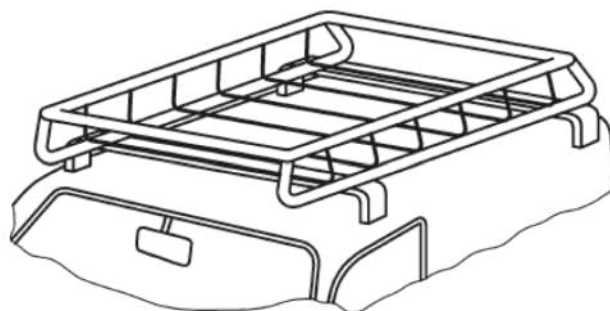


Figure 6 — Test basket with gallery on all sides

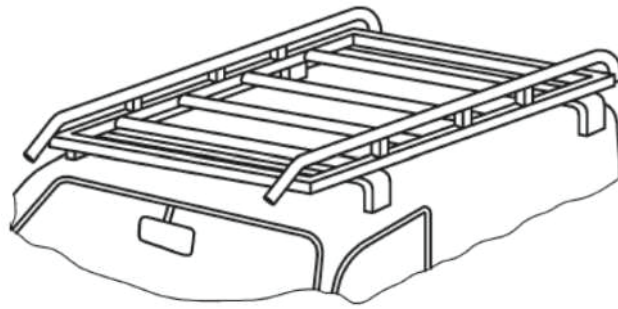


Figure 7 — Test basket with side gallery

6.8 External design

In order to avoid injuries to other road users in the event of accidents, roof racks shall conform to the requirements (see ECE-R 26, outer edges and protrusions) applicable at the time of testing.

See national statutory regulations regarding external limitation and lighting. An unintentional detachment the cross member out of the means of attachment of the base carrier shall be prevented by design (e.g. end stop).

6.9 Functional design

Safety-relevant locking mechanisms shall be secured against automatic and unintentional opening.

The testing of the locking mechanisms shall be performed by a manual test.

6.10 Attachment and type of load during the test

The attachment of the roof racks and their load during the tests according to [6.11](#) to [6.13](#) shall be carried out as specified by the manufacturer.