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Road vehicles — Roof load carriers —

Part 4: Magnetic fixing devices

Véhicules routiers — Dispositifs porte-charges de toit —

Partie 4: Dispositifs à fixation magnétique

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 11154-4 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 14, *Exterior fittings*.

ISO 11154 consists of the following parts, under the general title *Road vehicles — Roof load carriers*:

— *Part 1: Roof bars*

— *Part 4: Magnetic fixing devices*

Road vehicles — Roof load carriers —

Part 4: Magnetic fixing devices

1 Scope

This part of ISO 11154 establishes technical specifications for the magnetic fixing devices of roof load carriers and specifies the minimum safety requirements, and test methods, for such devices, thus offering the occupants of those vehicles on which the carriers are mounted, as well as other road users and pedestrians, a minimum level of safety when the devices are used in accordance with the manufacturer's instructions.

This part of ISO 11154 is applicable to magnetic fixing devices suitable for carrying a defined load and intended for mounting on or above the roofs of passenger cars and light commercial vehicles having a maximum authorized total mass (Code ISO-M08), as defined in ISO 1176, of up to 3,5 t. It is not applicable to vacuum-fixed devices — experience with and testing of those devices not being able to guarantee a minimum safety level for carrying goods on either vehicle roof or rear.

The requirements of this part of ISO 11154 complete the provisions of Directives 79/488/EEC and 72/245/EEC concerning magnetic fixing devices.

2 Normative references

The following referenced documents are indispensable for the application 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 612:1978, *Road vehicles — Dimensions of motor vehicles and towed vehicles — Terms and definitions*

ISO 1176, *Road vehicles — Masses — Vocabulary and codes*

ISO 4130, *Road vehicles — Three-dimensional reference system and fiducial marks — Definitions*

ISO 4892 (all parts), *Plastics — Methods of exposure to laboratory light sources*

ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests*

European Commission Directive 79/488/EEC of 18 April 1979 adapting to technical progress Council Directive 74/483/EEC on the approximation of the laws of the Member States relating to the external projections of motor vehicles

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4130 and the following apply.

3.1
magnetic roof rack
magnetic fixing device set designed to carry a load on the roof of a vehicle

NOTE In general they are not compatible with the use of additional accessories.

3.2
magnetic ski/snowboard holder
magnetic fixing device designed to carry one or more pairs of skis or one or more snowboards on the roof of a vehicle

NOTE In general they are not compatible with the use of additional accessories.

3.3
maximum vehicle roof load
m_d
maximum load capacity, expressed in kilograms, permissible on the vehicle's upper structure as defined by the vehicle manufacturer

3.4
maximum magnetic fixing set load
$m_{b,mdev}$
maximum load capacity, or number of units, expressed in either kilograms or as a quantity, permissible on a magnetic fixing device set as defined by the magnetic fixing set manufacturer

3.5
mass of the specific roof set
$m_{e,mdev}$
sum, expressed in kilograms, of the component masses of the magnetic fixing devices

3.6
theoretical maximum load
m_n
maximum vehicle roof load, m_d, less the mass of the specific roof set, $m_{e,mdev}$, expressed in kilograms

3.7
deflection
d
sum, expressed in millimetres, of permanent deformations and sliding displacement of a magnetic fixing when fixed to the vehicle roof and under test conditions

3.8
test devices
load simulation devices used during testing

EXAMPLE Test reference ski, test reference ladder.

3.9
lifting force
F_a
force, expressed in newtons, applied during testing to simulate the vertical components of the aerodynamic or vertical effect of the load or both

3.10
forward longitudinal force
F_l
force, expressed in newtons, applied during testing to simulate the horizontal forward component of the force caused by the load in the X plane

NOTE The X plane is defined in ISO 4130.

3.11
20° horizontal force
F_{lq}
force, expressed in newtons, applied during testing to simulate the effect caused by the load during braking when cornering

3.12
lateral force
F_{lat}
force, expressed in newtons, applied during testing to simulate the horizontal component of the force caused by the load parallel to the Y plane

NOTE The Y plane is defined in ISO 4130.

3.13
angular position of the device
α
angle between the carrier device and the vertical plane

See Figure D.1 a).

4 Requirements

4.1 Resistance to lifting force, F_a

4.1.1 When tested in accordance with 5.2.2, on completion of the test the magnetic ski/snowboard holder or ladder holder shall meet the following requirements:

a) the load shall remain fixed on the magnetic fixing device;

b) the magnetic fixing device shall remain fixed on the roof;

c) no breakage of any part shall occur.

4.1.2 When tested in accordance with 5.3.2, on completion of the test the magnetic roof rack shall remain fixed on the roof.

4.2 Slide resistance under quasi-static forward longitudinal force, F_l

When tested in accordance with 5.2.3 and 5.3.3, respectively, on completion of the test the magnetic ski/snowboard holder and magnetic roof rack shall meet the following requirements:

a) the load shall remain fixed on the magnetic fixing device;

b) no breakage of any part shall occur;

c) the maximum deflection shall not exceed 50 mm.

4.3 Slide resistance under quasi-static 20° horizontal force, F_{lq}

When tested in accordance with 5.2.4 and 5.3.4, respectively, on completion of the test the magnetic ski/snowboard holder and magnetic roof rack shall meet the following requirements:

a) the load shall remain fixed on the magnetic fixing device;

b) no breakage of any part shall occur;

c) the maximum deflection shall not exceed 50 mm.

4.4 Slide resistance test under quasi-static lateral force, F_{lat}

4.4.1 When tested in accordance with 5.2.5, on completion of the test the magnetic ski/snowboard holder shall meet the following requirements:

a) the load shall remain fixed on the magnetic fixing device;

b) the magnetic fixing device shall remain fixed on the roof;

c) no breakage of any part shall occur.

4.4.2 The slide resistance test under the quasi-static lateral force, F_{lat}, is not required for the magnetic roof rack.

4.5 Resistance to corrosion

When tested in accordance with 5.4, no active corrosion which affects the basic function of each part (i.e. sliding, screwing, articulation) shall appear.

4.6 Resistance of materials

The materials used shall enable the magnetic fixing device to fulfil the requirements of 4.1 to 4.4 in a range of exterior temperatures between – 20 °C and +60 °C, taking into consideration ultraviolet stability and ozone ageing.

This shall be shown by one of the following methods:

a) material certification and report showing that the design is suitable for the intended purposes (for these documents, refer to ISO 9001 or equivalent standards);

b) direct testing under the above-mentioned extreme conditions, in accordance with Clause 5;

c) reference to applicable material standards.

4.7 Overhang and external shape

The width of the magnetic fixing device should be limited to the width of the vehicle roof panel and shall not exceed the maximum width of the vehicle according to ISO 612:1978, 6.2.

The external radius of all connectable components shall be in accordance with Directive 79/488/EEC, paragraphs 6.16.2 and 6.16.3.

4.8 Additional securing means

An additional means of securing the magnetic fixing device to the road vehicle, consisting of a strap or cable permanently attached through the vehicle doors, shall be used to guard against failure.

5 Test method

5.1 General

5.1.1 All tests shall be carried out on the vehicle roof in the following sequence:

a) test under F_a;

b) test under F_l;

c) test under F_{lq};

d) other tests.

5.1.2 Each test shall be run using, as appropriate, the following configurations:

a) on a wet roof;

b) after applying a film (e.g. protective plastic layer) 0,025 mm thick on the roof if the testing tool specified in 6.4 b) is provided by the device manufacturer;

c) after applying a film (e.g. protective plastic layer) 0,25 mm thick on the roof if the testing tool specified in 6.4 b) is *not* provided by the device manufacturer.

5.1.3 Three magnetic fixing devices, manufactured using current production tools, shall be made available as test specimens.

5.1.4 Prior to each test, the magnetic fixing devices shall be fitted, released and retightened in accordance with the manufacturer's instructions. The torque or force used shall be in accordance either with the manufacturer's instructions or, in the absence of such instructions, with Annex A.

5.1.5 Test forces shall be applied to achieve the maximum value within 5 s to 10 s, with a tolerance of $^{+5}_{0}$ %.

5.1.6 The approval/rejection procedure shall be as illustrated in the examples given in Annex B.

5.1.7 The test devices used to load the magnetic fixing devices during the tests are defined in each test procedure.

5.1.8 The deflection, d, shall be measured in accordance with Figure C.1.

5.2 Magnetic ski/snowboard holder test procedure

5.2.1 Test device

Use for the test

— pairs of skis each (pair) having a total mass equal to 6 kg, or

— snowboards each of 6 kg mass.

5.2.2 Test of resistance to lifting force, F_a

5.2.2.1 Nominal value of the force

5.2.2.1.1 For the transport of skis, the nominal value of the lifting force, F_a, shall be calculated, in newtons, by (see Figure D.1):

$$F_a = 240 \times m_{b,mdev}$$

EXAMPLE In Figure D.1 b), $F_a = 240 \times 2 = 480$ N
In Figure D.1 c), $F_a = 240 \times 4 = 960$ N

5.2.2.1.2 For the transport of snowboards, the nominal value of the lifting force, F_a, shall be calculated, in newtons, by (see Figure D.1):

$$F_a = (300 + 420\sin\alpha) \times m_{b,mdev}$$

EXAMPLE In Figure D.1 d), $F_a = (300 + 420\sin\alpha) \times 1 = 720$ N ($\alpha = 90°$)
In Figure D.1 e), $F_a = (300 + 420\sin\alpha) \times 1 = 720$ N ($\alpha = 90°$)
In Figure D.1 f), $F_a = (300 + 420\sin\alpha) \times 2 = 720 \times 2 = 1\,440$ N ($\alpha = 90°$)

5.2.2.1.3 Where it is possible to mount either skis or snowboards, or both together, or if the angle α can be adjusted, the worst case shall be considered.

5.2.2.2 Test procedure

The test shall be carried out as follows.

a) Mount the magnetic fixing device set.

b) Install the test device or devices and clamp in accordance with the instructions for fitting and use.

c) Progressively and continuously apply a lifting force, F_a, as shown in Figure D.2 a), up to the required nominal value.

d) Maintain application of the force for 10 min.

e) Release the force.

Where the front and rear attachments are different, repeat the procedure on the rear attachment with a nominal value of the force, $F_a / 2$.

5.2.3 Test of slide resistance under quasi-static forward longitudinal force, F_l

5.2.3.1 Nominal value of the force

For the transport of skis and snowboards, the nominal value of the forward longitudinal force, F_l, shall be calculated, in newtons, by (see Figure D.1):

$$F_l = 240 \times m_{b,mdev}$$

5.2.3.2 Test procedure

The test shall be carried out as follows.

a) Mount the magnetic fixing device.

b) Install the test device or devices and clamp in accordance with the instructions for fitting and use.

c) Install the measuring equipment in accordance with Annex C.

d) Progressively and continuously apply the longitudinal force, F_l, as shown in Figure D.2 b), up to the required nominal value, then immediately release the force.

e) Measure the deflection, d_1.

5.2.4 Test of slide resistance under quasi-static 20° horizontal force, F_{lq}

5.2.4.1 Nominal value of the force

For the transport of skis and snowboards, the nominal value of the 20° horizontal force, F_{lq}, shall be calculated, in newtons, by (see Figure D.1):

$$F_{lq} = 240 \times m_{b,mdev}$$

5.2.4.2 Test procedure

The test shall be carried out as follows.

a) Mount the magnetic fixing device.

b) Install the test device or devices and clamp in accordance with the instructions for fitting and use.

c) Install the measuring equipment in accordance with Annex C.

d) Progressively and continuously apply the 20° horizontal force, F_{lq}, as shown in Figure D.2 c), up to the required nominal value, so that the force can be equally distributed over the number of units.

e) Release the force.

f) Measure the deflection, d_2.

5.2.5 Test of slide resistance under quasi-static lateral force, F_{lat}

5.2.5.1 Nominal value of the force

5.2.5.1.1 For the transport of skis, the nominal value of the lateral force, F_{lat}, shall be calculated, in newtons, by (see Figure D.1):

$$F_{lat} = 120 \times m_{b,mdev}$$

EXAMPLE In Figure D.1 b), $F_{lat} = 120 \times 2 = 240$ N
In Figure D.1 c), $F_{lat} = 120 \times 4 = 480$ N

5.2.5.1.2 For the transport of snowboards, the nominal value of the lateral force, F_{lat}, shall be calculated, in newtons, by (see Figure D.1):

$$F_{lat} = (120 + 600\cos\alpha) \times m_{b,mdev}$$

EXAMPLE In Figure D.1 d), $F_{lat} = (120 + 600\cos\alpha) \times 1 = 120$ N ($\alpha = 90°$)
In Figure D.1 e), $F_{lat} = (120 + 600\cos\alpha) \times 1 = 120$ N ($\alpha = 90°$)
In Figure D.1 f), $F_{lat} = (120 + 600\cos\alpha) \times 2 = 120 \times 2 = 240$ N ($\alpha = 90°$)

5.2.5.1.3 Where it is possible to mount either skis or snowboards, or both together, or if the angle α can be adjusted, the worst case shall be considered.

5.2.5.2 Test procedure

The test shall be carried out as follows:

a) Mount the magnetic fixing device.

b) Install the test device or devices and clamp as described in the instructions for fitting and use.

c) Progressively and continuously apply the lateral force, F_{lat}, as shown in Figure D.2 d), up to the required nominal value, so that the force is equally distributed over the number of units.

d) Maintain application of the force for 10 min.

e) Release the force, and measure and record the total deflection, d_3.

f) Repeat the procedure, applying a lateral force in the opposite direction.

Where the front and rear attachments are different, repeat the procedure on both attachments.

5.3 Magnetic roof rack test procedure

5.3.1 Test device

Use as the test device a parallelepiped with the dimensions (length, L, width, l, and height, h — see Figure D.3) in accordance with the manufacturer's specifications.

The test device shall not be deformed by the load.

The following test conditions apply:

— the ballast used to adjust the mass shall be uniformly distributed over the test device;

— the test mass shall be adjusted to an accuracy of ± 1 kg;

— the test device shall be installed on the roof rack in accordance with Figure D.4, and the tightening of the test device on the magnetic roof rack shall give good cohesion between the roof rack and the test device;

— the mass is defined for each test.

5.3.2 Test of resistance to lifting force, F_a

5.3.2.1 Nominal value of the force

The nominal value of the lifting force, F_a, shall be calculated, in newtons, by:

$$F_a = 2\,500 + 0{,}5 m_x \times g$$

where

m_x is the actual maximum load (m_n or $m_{b,mdev}$, whichever is the lower).

g = 9,81 m/s^2