PUBLICLY AVAILABLE SPECIFICATION

ISO/PAS 11154

First edition
2006-12-15

Road vehicles — Roof load carriers

Véhicules routiers — Porte-charges de toit

Reference number
ISO/PAS 11154:2006(E)

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Published in Switzerland

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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.

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.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

— an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;

— an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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

This first edition cancels and replaces the first edition of ISO 11154-1 (ISO 11154-1:1995) and the first edition of ISO 11154-4 (ISO 11154-4:2004), which have been technically revised.

Introduction

Considering the state of the art and the ongoing work on the revision of DIN 75302, a city crash test and a short dynamic test were added. Furthermore, ISO 11154-1 and ISO 11154-4 were merged into a single document. German and French committee members declared their wish to replace their existing national standard by this revised version of ISO PAS 11154.

Standardized test bench method of subsystems which could be used as an alternative of the road test are still under development. Alternative method to city crash test might also be considered.

For some products, for example ladder holder, national regulation must be considered.

At the time of publication, dedicated roof bars complying with car manufacturers specifications already on sales or under development was considered satisfactory. They are encouraged to apply this Publicly Available Specification for their products as soon as possible.

At the time of publication, roof load carriers developed to previous ISO 11154 series or equivalent national standards were considered satisfactory.

Road vehicles — Roof load carriers

SAFETY PRECAUTIONS — This Publicly Available Specification is not applicable to vacuum fixing devices and roof containers (boxes) with magnetic fixation. The experience with and testing results of those devices shows that they are not able to guarantee a minimum safety level for carrying goods on either vehicle roof or rear.

1 Scope

This Publicly Available Specification specifies the minimum safety requirements for all roof load carriers intended for mounting on or above the roofs of passenger cars and light commercial vehicles with a maximum authorized total mass up to 3,5 t (ISO M08) as defined in ISO 1176.

It applies to:

a) mechanically attached general use roof bars suitable for carrying a load,

b) accessories and their attachments to roof bars for special purpose applications,

c) mechanically attached specific purpose roof devices suitable for carrying a defined load, and

d) magnetic fixing devices suitable for carrying a defined load.

This Publicly Available Specification establishes technical specifications and test methods which offer the user of the roof load carriers, other road users and pedestrians a minimum level of safety when these fixing devices are being used in accordance with the manufacturer's instructions.

Moreover, the requirements of ISO/PAS 11154 complete the provisions of Directive 74/483 EEC and ECE R 26 concerning these products.

For additional devices intended for example to limit the movement of the load, requirements and test methods are not defined in this Publicly Available Specification. If needed, both manufacturer and laboratories will work out additional test(s) or choose the most appropriate test(s) described in this Publicly Available Specification.

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 179 (all parts), *Plastics — Determination of Charpy impact properties*

ISO 527 (all parts), *Plastics — Determination of tensile properties*

ISO 612: 1978, *Road vehicles — Dimensions of motor vehicles and towed vehicles — Terms and definitions*

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

ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

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

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

ISO 6487, *Road vehicles — Measurement techniques in impact test — Instrumentation*

ISO 9227:2006, *Corrosion tests in artificial atmospheres — Salt spray tests*

3 Terms and definitions

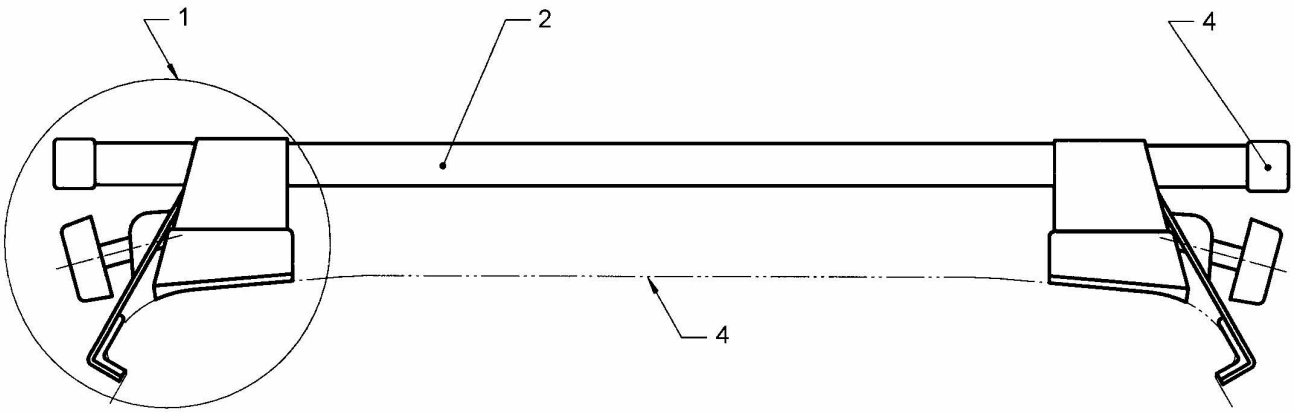
For the purposes of this document, the terms and definitions given in ISO 4130 and the following apply.

3.1
roof bar
supporting bar with connecting devices which enables a load to be carried on the roof of a vehicle

NOTE 1 Generally, roof bars are compatible with the use of additional accessories.

NOTE 2 Roofs bars are fixed on the roof or on original-equipment rails of the vehicle.

EXAMPLE See Figure 1.



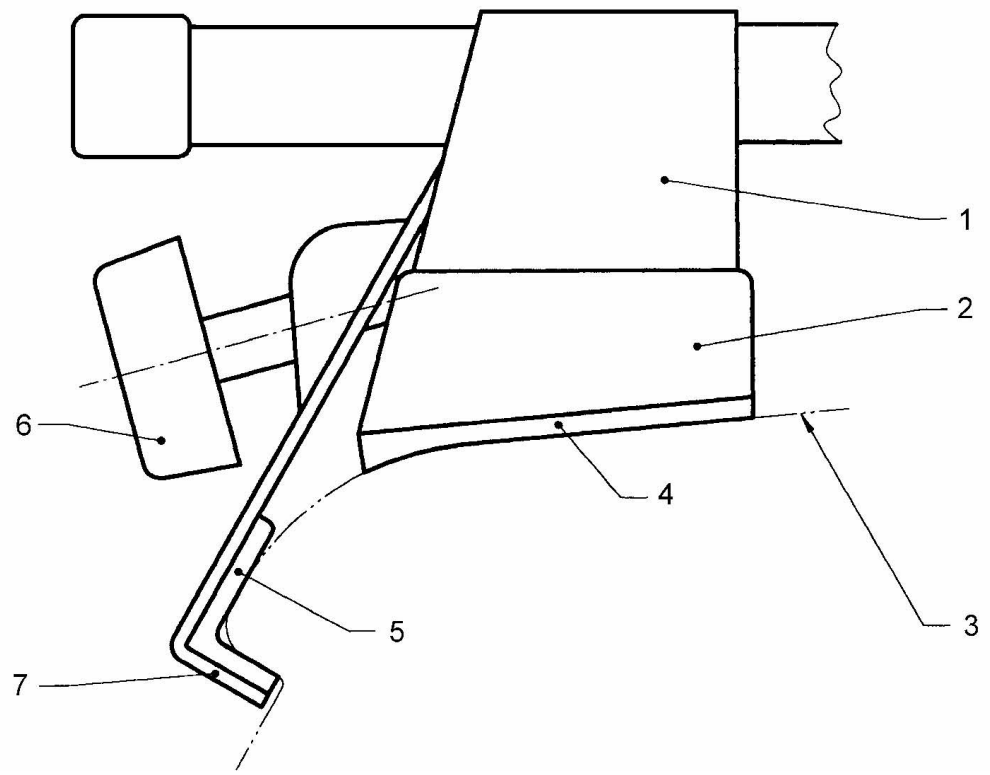
Key

1 connecting devices
2 supporting bar
3 vehicle roof
4 end-cap

Figure 1 — Components of roof bar

3.2
connecting device
set of parts connecting the supporting bar to the vehicle

EXAMPLES See Figure 1 and 2.



Key

1 foot
2 pad
3 vehicle roof
4 body protector
5 body protector
6 tightening system
7 fixing clamp

Figure 2 — Components of connecting device

3.3
specific purpose roof device
roof device designed for a specific type of load or use having its own fixation to the vehicle

3.4
additional accessory
device used in conjunction with the roof bars, roof racks and roof decks to carry a specific type of load

3.5
bicycle carrier
any device intended for carrying bicycle(s) on roof bars

EXAMPLES See Figures 3 and 4.

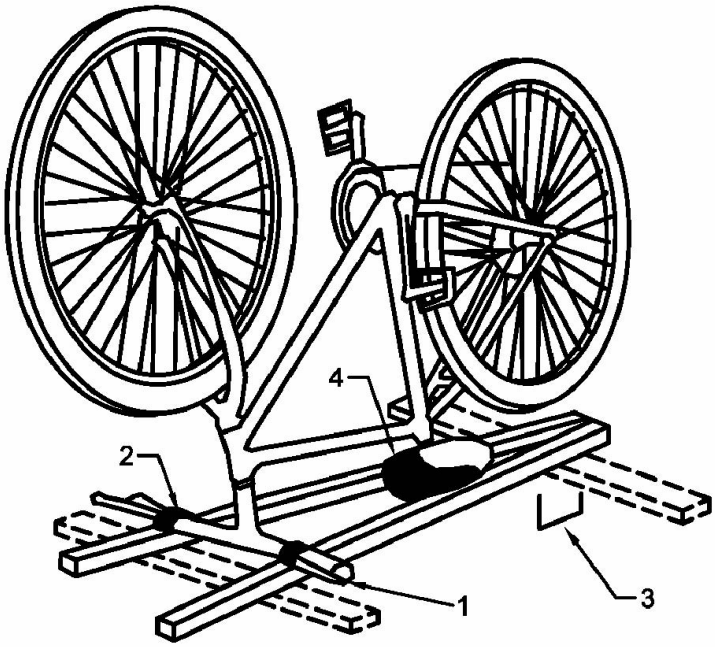
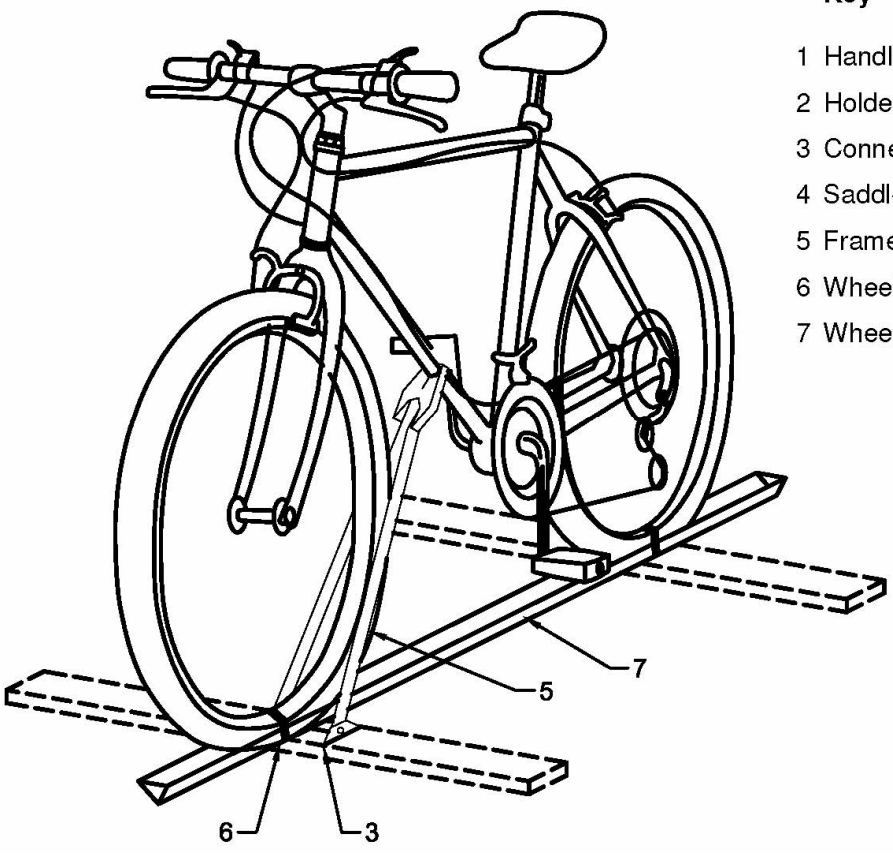


Figure 3 — Bicycle carrier, saddle down



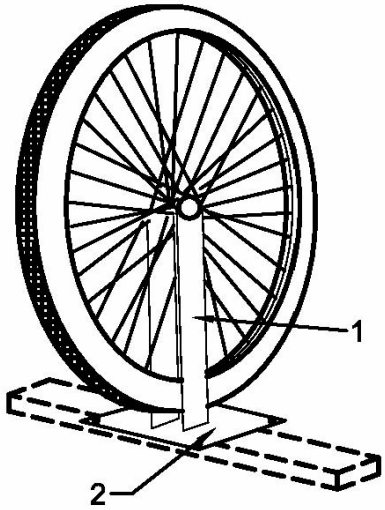
Key

1 Handle bar
2 Holder
3 Connecting devices
4 Saddle holder
5 Frame support
6 Wheel holder
7 Wheel tray

Figure 4 — Bicycle carrier, saddle up

3.6
bicycle-wheel carrier
any device intended for carrying bicycle wheel(s) on roof bars, roof decks or roof racks

EXAMPLE See Figure 5.

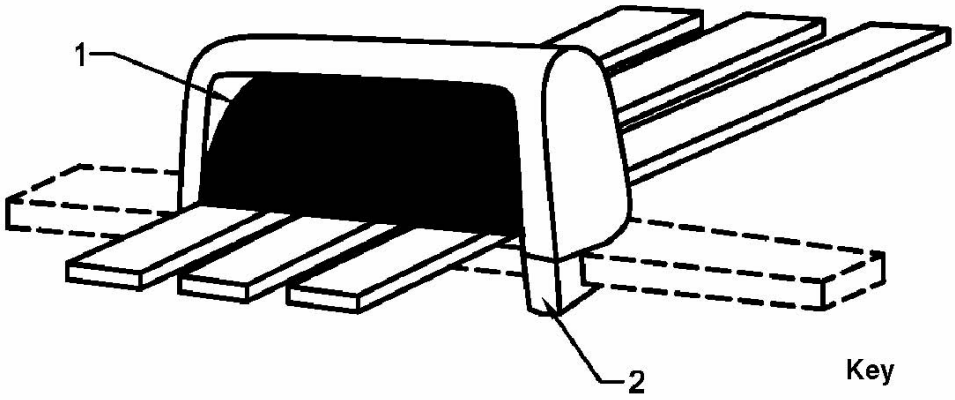


Key
1 wheel holder
2 connecting devices

Figure 5 — Bicycle-wheel carrier

3.7
ski and/or snow-board carrier
any device intended for carrying ski(s), snow-board(s) and/or sticks on roof bars , roof decks or roof racks

EXAMPLE See Figure 6.



Key
1 ski clamping
2 connecting devices

Figure 6 — Ski and/or snow-board carrier

3.8
sailboard and/or surfboard carrier
any device intended for carrying sailboard(s) with or without mast and boom and/or surfboard(s) on roof bars, roof decks or roof racks

EXAMPLES See Figure 7.

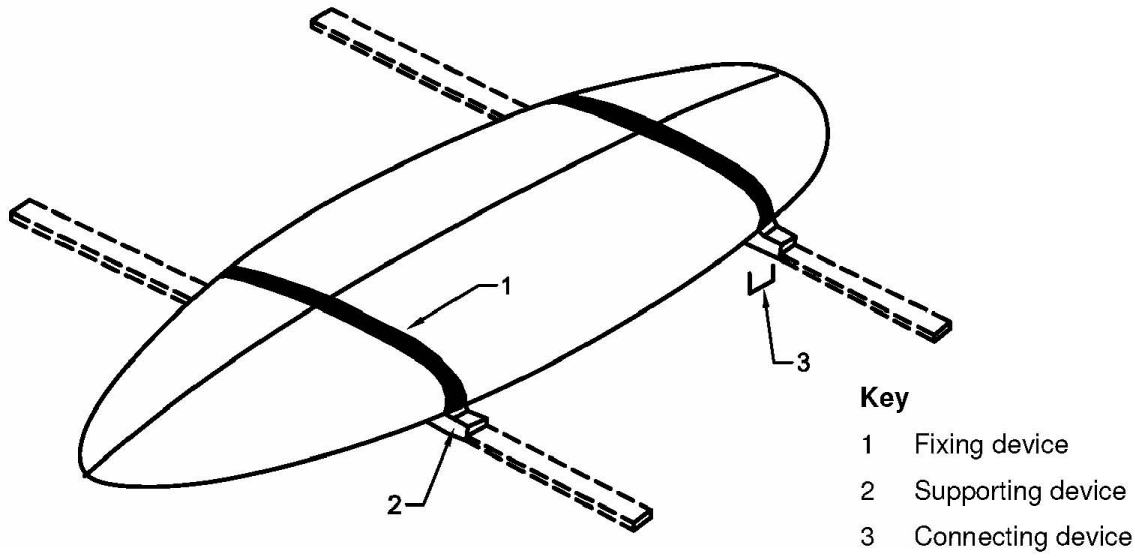
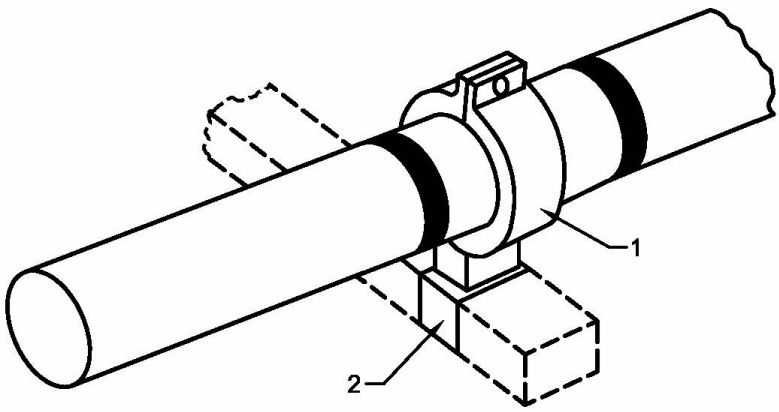


Figure 7 — Sailboard and/or surfboard carrier

3.9
sailboard mast carrier
any device intended for carrying sailboard mast(s) on roof bars, roof decks or roof racks

EXAMPLE See Figure 8.

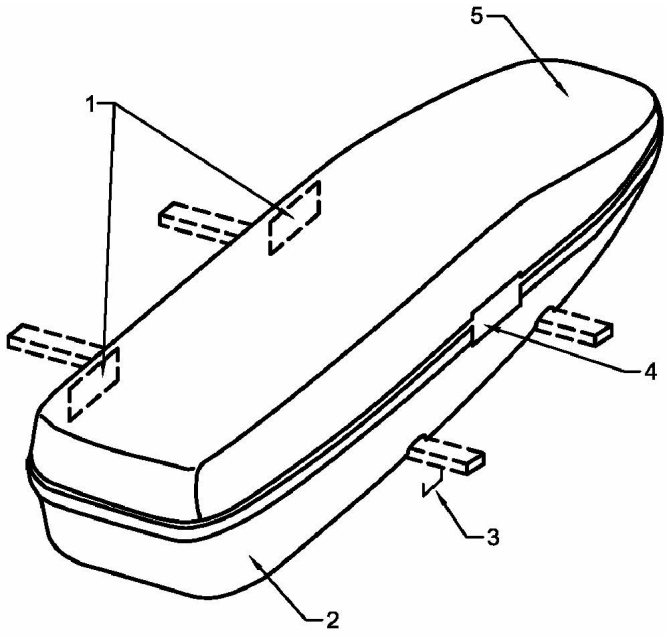


Key
1 fixing device
2 connecting device

Figure 8 — Sailboard mast carrier

3.10
roof container
containers intended for the transport of different loads such as suit-cases, bags, skis, etc. on roof bars, roof decks or roof racks

EXAMPLE See Figure 9.

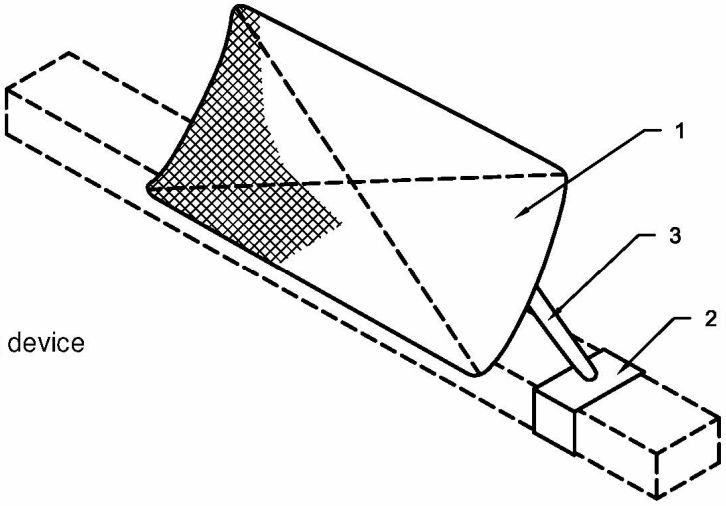


Key
1 hinge(s)
2 bottom section
3 connecting device
4 closing device
5 top section

Figure 9 — Roof container

3.11
wind deflector
device intended for modifying the aerodynamic drag (e.g. when towing caravan) fixed on roof bars, roof decks or roof racks

EXAMPLE See Figure 10.



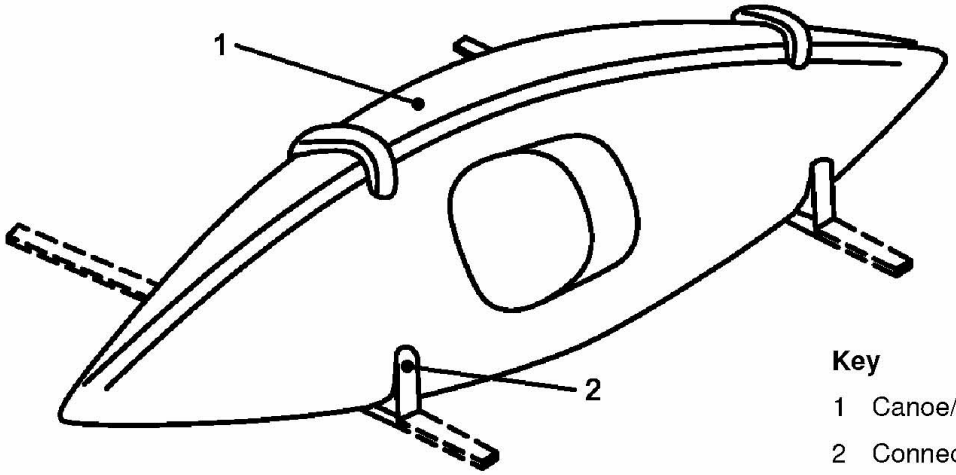
Key

1 Deflector
2 Connecting device
3 Support

Figure 10 — Wind deflector

3.12
canoe and/or kayak carrier
any device intended for carrying canoe(s) and/or kayak on roof bars , roof decks or roof racks

EXAMPLE See Figure 11.



Key

1 Canoe/ kayak
2 Connecting device

Figure 11 — Canoe and/or kayak carrier

3.13
roof deck (basket)
basket device or platform intended for carrying different loads such as suit-cases, bags, skis and/or roof deck

EXAMPLE See Figure 12.

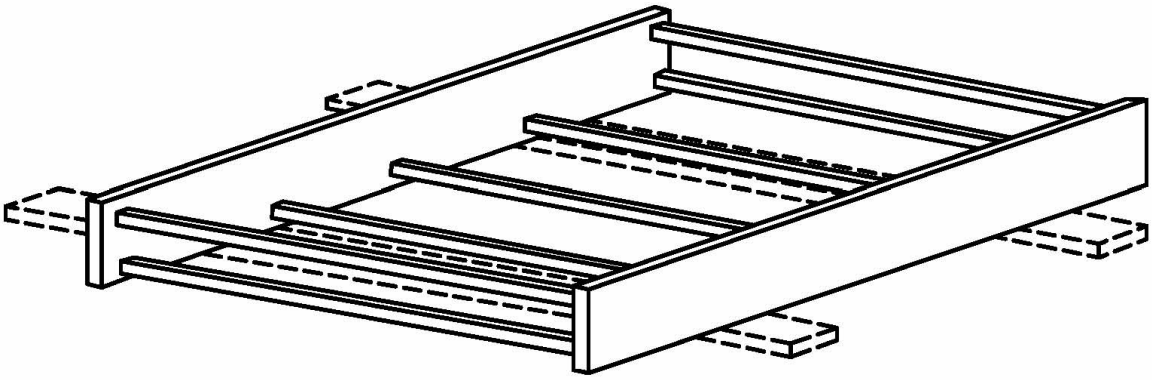


Figure 12 — Roof deck

3.14
adapter for roof bars accessories
any device intended for fixing accessories defined in 3.5 to 3.13 on roof bars

EXAMPLES See Figure 13 and 14.

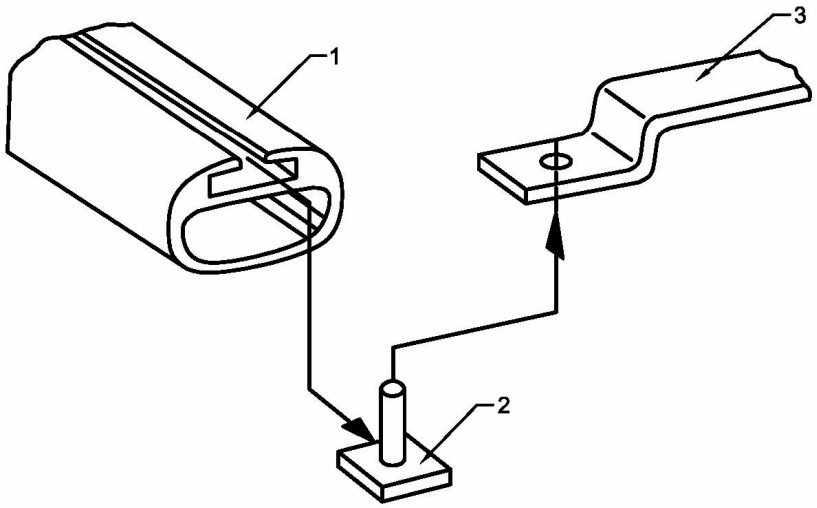


Figure 13 — adapter for roof bars accessories

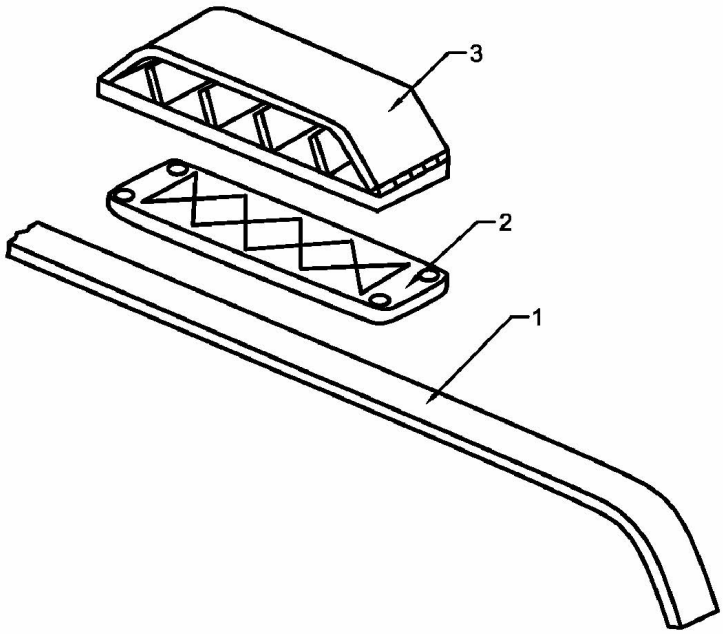


Figure 14 — adapter for roof bars accessories

Key

1 roof bar
2 adapter
3 accessory

3.15
roof rack
specific purpose roof device having its own fixation to the vehicle designed to carry a load on the roof of a vehicle

NOTE In general, they are not compatible with the use of additional specific purpose roof devices.

3.16
ladder holder
specific purpose roof device having its own fixation to the vehicle designed to carry ladder(s) on the roof or on the lateral side of the vehicle

NOTE In general, they are not compatible with the use of additional specific purpose roof devices.

3.17
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.

3.18
magnetic ski/snowboard holder
magnetic fixing device designed to carry ski(s) or snowboard(s) on the roof or on the side of a vehicle

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

3.19
load fixing device
any device other than those defined in 3.5 to 3.14 intended for fixing load(s) on roof bars and/or roof deck and/or roof rack

EXAMPLES See Figure 15 (textile straps, metallic straps, synthetic material straps, hooks, etc.).

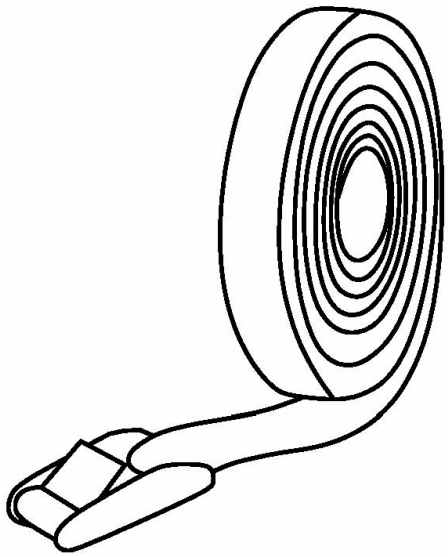
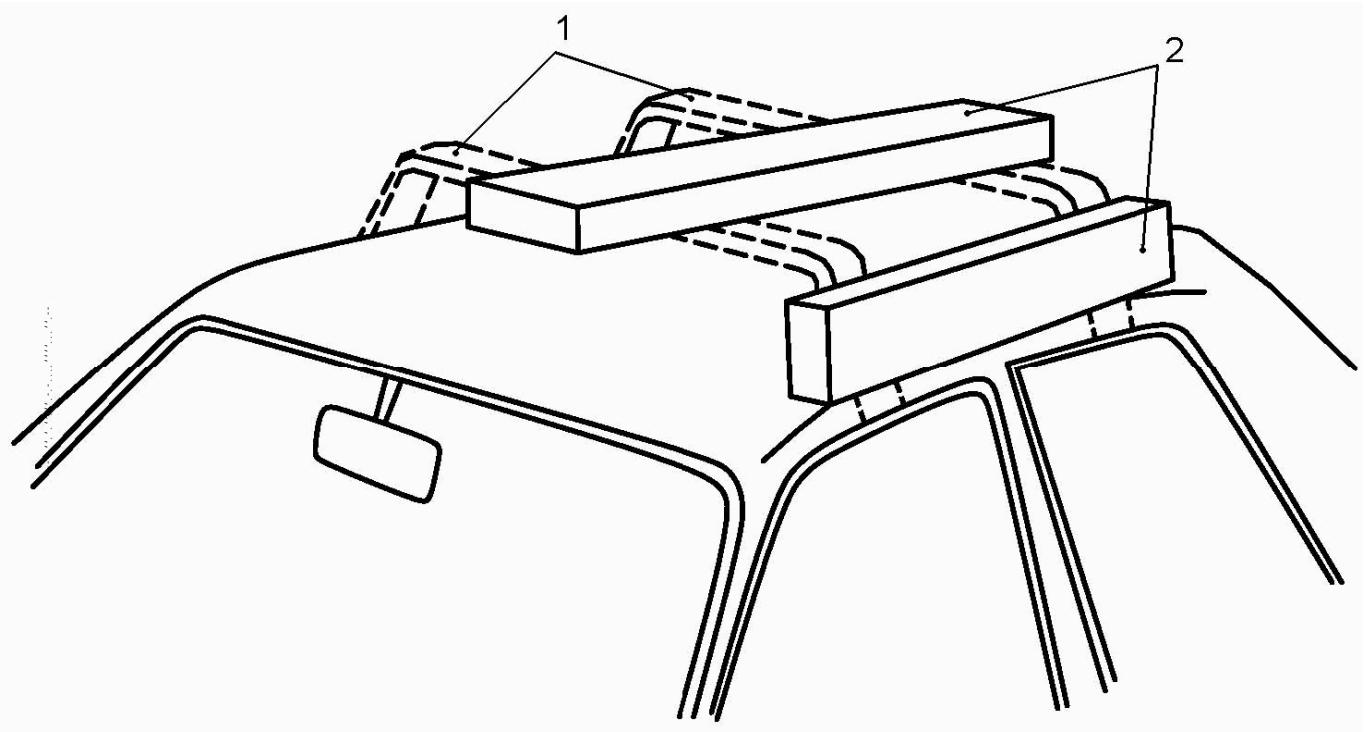


Figure 15 — Load fixing device

3.20
additional devices
all devices intended for example to limit the movement of the load, fixed the load, etc.

3.21
location of accessory
placement of the accessory on roof bars

EXAMPLE See Figure 16.



Key

1 roof bars

2 accessory

Figure 16 — Placement of the accessory on roof bars

3.22
maximum vehicle roof load

m_d

maximum load capacity, expressed in kilograms, permissible on the vehicle upper structure as defined by the vehicle manufacturer

3.23
maximum roof carrier load

m_b

maximum load capacity or number of units, expressed either in kilograms or as a quantity, permissible on a device set as defined by the device set manufacturer

3.24
mass of the specific roof device set

$m_{e\ mdev}$

sum, expressed in kilograms, of the component masses of the devices

3.25
mass of set of roof load carrier device

m_e

total mass of set of roof carrier device, expressed in kilograms

3.26
theoretical maximum load

m_n

maximum vehicle roof load m_d minus mass of set of roof load carrier devices m_e or minus mass of the specific roof device set, $m_{e\ mdev}$, expressed in kilograms

3.27
actual maximum load
m_x
theoretical maximum load m_n or maximum roof carrier load m_b, expressed in kilograms, whichever is lowest

3.28
lifting force
F_a
force, expressed in newtons, applied during testing to simulate the vertical components of the aerodynamic effect and/or vertical effect of the load

3.29
forward longitudinal force
F_l
force, expressed in newtons, applied during testing to simulate the horizontal forward, F_l or the backward, $-F_a$ component of the force caused by the load in the X-plane

NOTE The X plane is defined in ISO 4130.

3.30
20° horizontal force
F_{lq}
force, expressed in newtons, applied during testing to simulate the effect caused by the load during braking when cornering

3.31
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.

3.32
ladder lifting force
$F_{a\,lad}$
alternative force, expressed in newtons, applied during testing at the extremity of the ladder to simulate the pitch effect caused by the ladder

3.33
angular position of the device
α
angle between the carrier device and the vertical plane

EXAMPLE See Figure 17.

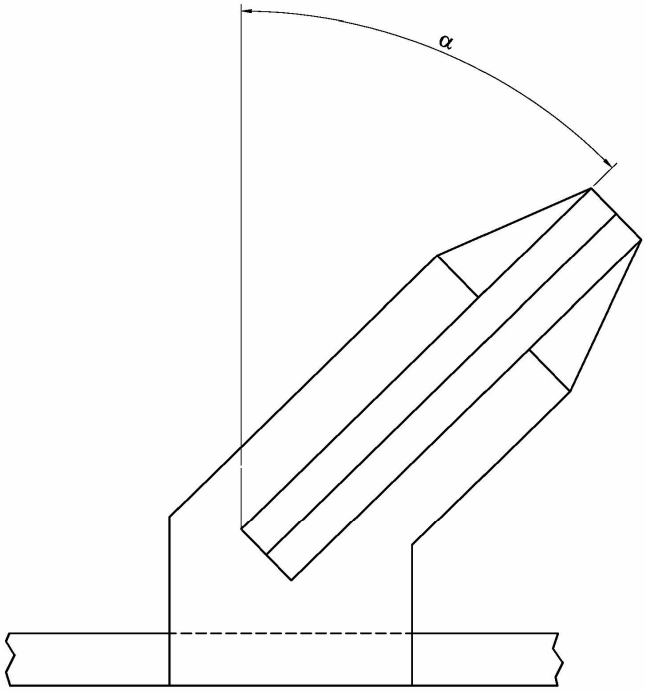


Figure 17 — Angular position of a device, *α*

3.34
deflection
d
sum, expressed in millimetres, of permanent deformations and sliding displacement of a roof bar, an accessory, a specific purpose device or a magnetic fixing device when fixed to the vehicle roof and under test conditions

3.35
test devices
load simulation devices used during testing

EXAMPLES Examples include test reference ski, test reference ladder, test bicycle

3.36
test box
load simulation device used during testing

3.37
test bench
device up on which the tests are performed

NOTE See Annex A.

3.38
wind deflector area
S
vertical projection of the wind deflector area measured in m²

3.39
roof load carrier
any device which enables a specific or undefined load to be carried on the roof of a vehicle

4 Classification, designation and coding

The following designation type and coding of roof load carrier given in Table 1 apply throughout this entire document:

Table 1 — Designation type and coding of roof load carrier given

Designation	Definition according to	Type	coding
Roof bar	3.1	A	ISO11154-A
Magnetic roof rack	3.17	B	ISO11154-B
Magnetic Ski / Snow board holder	3.18	C	ISO11154-C
Taxi and advertising magnetic sign	-	D	ISO11154-D
Roof rack	3.15	E	ISO11154-E
Ladder holder	3.16	F	ISO11154-F
Roof (box) container With its fixation on the roof	-	G	ISO11154-G
Bicycle carrier	3.5	H	ISO11154-H
Bicycle-wheel carrier	3.6	I	ISO11154-I
Ski and/or snow-board carrier	3.7	J	ISO11154-J
Sailboard and/or surfboard carrier	3.8	K	ISO11154-K
Sailboard mast carrier	3.9	L	ISO11154-L
Roof (box) container	3.10	M	ISO11154-M
Wind deflector	3.11	N	ISO11154-N
Mechanically fixing taxi and advertising sign	-	O	ISO11154-O
Canoe and/or kayak	3.12	P	ISO11154-P
Roof deck (basket)	3.13	Q	ISO11154-Q
Load fixing device	3.19	R	ISO11154-R

5 Requirements and test methods

5.1 Synthesis of requirements and tests applicable to each types of roof load carriers

Roof load carriers shall:

a) meet the requirements given in 5.3 and 5.4 when submitted to the test given in Table 2;

b) be delivered with instruction for fitting, use and the customer according to 6;

c) be marked according to 7.

The synopsis in Annex B gives an overview of the requirements to meet.

NOTE The requirements described in the following sections shall be considered to be minimum requirements. It is permitted, subject to an agreement between parties, as a substitute, to test to more stringent requirements if they cover all the requirements of this International standard.

Table 2 — Synthesis of tests applicable to each types of roof load carriers

Roof load carrier designation	Tests													
	Type	$F_{a\ +z'z}$	$F_{alad\ +/-\ z'z}$	$F_{l\ +/-x'x}$	F_{lq}	$F_{lat\ +/-y'y}$	City crash	Dynamic	Corrosion	Material	Impact and opening	traction	Specific magnetic	Overhang and external shape
Roof bar	A	V	NA	V	V	NA	V	V	V/ B	V/B	NA	NA	NA	V
Magnetic roof rack	B	V	NA	V	V	NA	V	V	V/B	V/B	NA	NA	V	V
Magnetic Ski / Snow board holder	C	V	NA	V	V	V	V	V	V/B	V/B	NA	NA	V	V
Taxi and advertising magnetic sign	D	V	NA	V	V	NA	V	V	V/B	V/B	NA	NA	V	V
Roof rack	E	V	NA	V	V	NA	V	V	V/B	V/B	NA	NA	NA	V
Ladder holder	F	V	V	V	V	NA	V	V	V/B	V/B	NA	NA	NA	V
Roof (box) container With its fixation on the roof	G	V	NA	V	V	NA	V	V	V/B	V/B	B	NA	NA	V
Bicycle carrier	H	B	NA	B	NA	B	V/B	V/B	V/B	V/B	NA	NA	NA	V/B
Bicycle-wheel carrier	I	B	NA	B	NA	B	V/B	V/B	V/B	V/B	NA	NA	NA	V/B

Ski and/or snow-board carrier	J	B	NA	B	NA	B	V/B	V/B	V/B	V/B	NA	NA	NA	V/B
Sailboard and/or surfboard carrier	K	B	NA	B	NA	B	V/B	V/B	V/B	V/B	NA	NA	NA	V/B
Sailboard mast carrier	L	B	NA	B	NA	B	V/B	V/B	V/B	V/B	NA	NA	NA	V/B
Roof (box) **container**	M	B	NA	B	NA	B	V/B	V/B	V/B	V/B	B	NA	NA	V/B
Wind deflector Mechanicall y fixing	N	B	NA	B	NA	B	V/B	V/B	V/B	V/B	NA	NA	NA	V/B
Taxi and advertising sign Mechanicall y fixing	O	B	NA	B	NA	B	V/B	V/B	V/B	V/B	NA	NA	NA	V/B
Canoe and/or kayak	P	B	NA	B	NA	B	V/B	V/B	V/B	V/B	NA	NA	NA	V/B
Roof deck (basket)	Q	B	NA	B	NA	B	V/B	V/B	V/B	V/B	NA	NA	NA	V/B
Load fixing device	R	NA	NA	NA	NA	NA	NA	NA	B	NA	NA	B	NA	NA
Additional device	Additional device as defined in 3.20 are outside the scope of this standard													

NOTE 1 V means test to be performed on vehicle or on a roof.

NOTE 2 V/B means test to be performed either on vehicle or on test bench.

NOTE 3 B means test to be performed on test bench.

NOTE 4 NA means not applicable.

5.2 Test methods — Generalities

5.2.1 Test samples

Devices manufactured from current production tools or representatives tools shall be made available as test specimens

One new sample can be used for each test including each static tests. Corrosion and material tests can be done with a sample already used for one test.

5.2.2 Test devices

The test devices used to load the specific purpose roof devices and/or additional accessories and the test box used to load the roof bars, roof racks and roof decks during the tests shall be in accordance with the figures shown in Annex C.

Masses of test devices used for the test are according to Table 3.

Table 3 — Mass of test devices

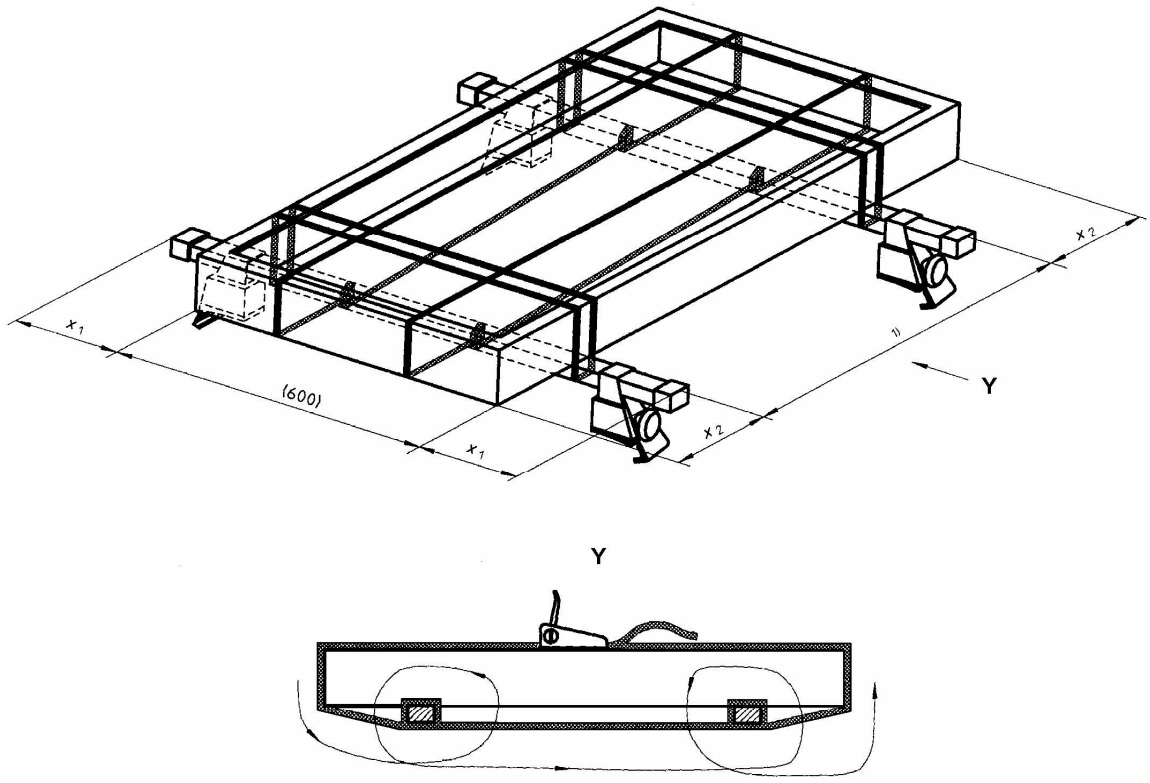
Test devices	Mass Kg
Test box	According to manufacturer's specification
Roof rack, roof deck	According to manufacturer's specification
Bicycle (each)	17
Bicycle wheel (each)	2
Roof container	According to manufacturer's specification
Pair of skis (each pair)	7
Snowboards (each)	7
Surfboard, Sailboard, Canoe	25
Mast	3
Taxi and advertising signs	According to manufacturer's specification
Ladder	According to manufacturer's specification

5.2.3 Fixation of the test device

The test box shall be firmly attached to the roof bars or roof rack or roof deck as shown in Figures 18, 19 and 20 to preclude any movement between the roof load carrier and the test box.

For bars having specific profile and a warning in the instruction for use recommending using it for carrying load, the test box shall be fixed in a rigid way. Load should be fix on a stiff board (board width = 700 mm), the plate is fixed 2 time to each bar, the distance of fixations of the bars is 600 mm in Y, Load and board are fixed symmetrically to the bars. The centre of gravity of the load shall be between 50 to 80 mm over the surface of roof bars. In other cases, the bars shall be tested fixing the load with support bar and straps as described in Figure 20.

For roof load carrier of types C, F, H to L and P, the specified test load (test bicycle, test ski, …) shall be fixed according as specified in the instruction of use of the roof device.

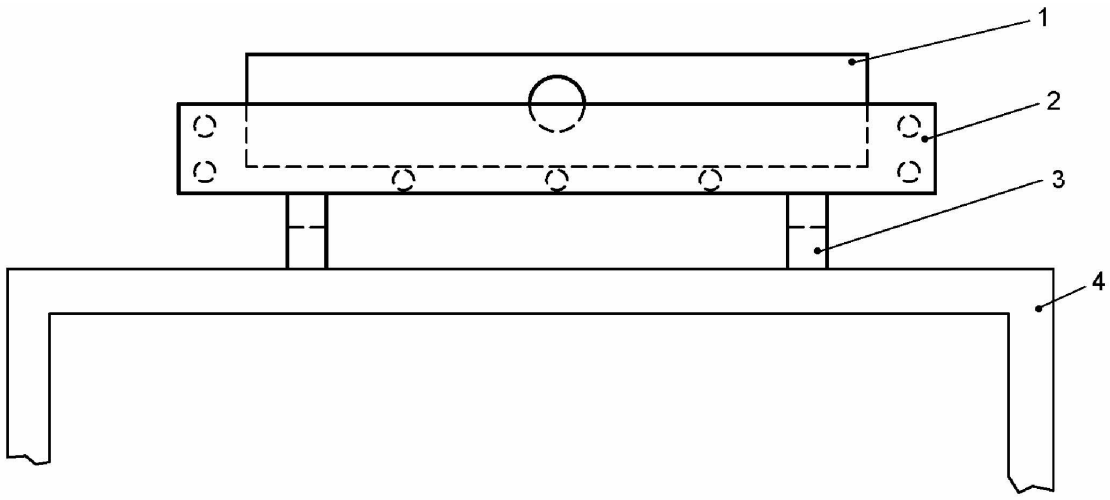


cordance with mounting instructions or 700 mm by default

Figure 18 — Test box location and strapping

Key

1) In accordance with mounting instructions or 700 mm by default



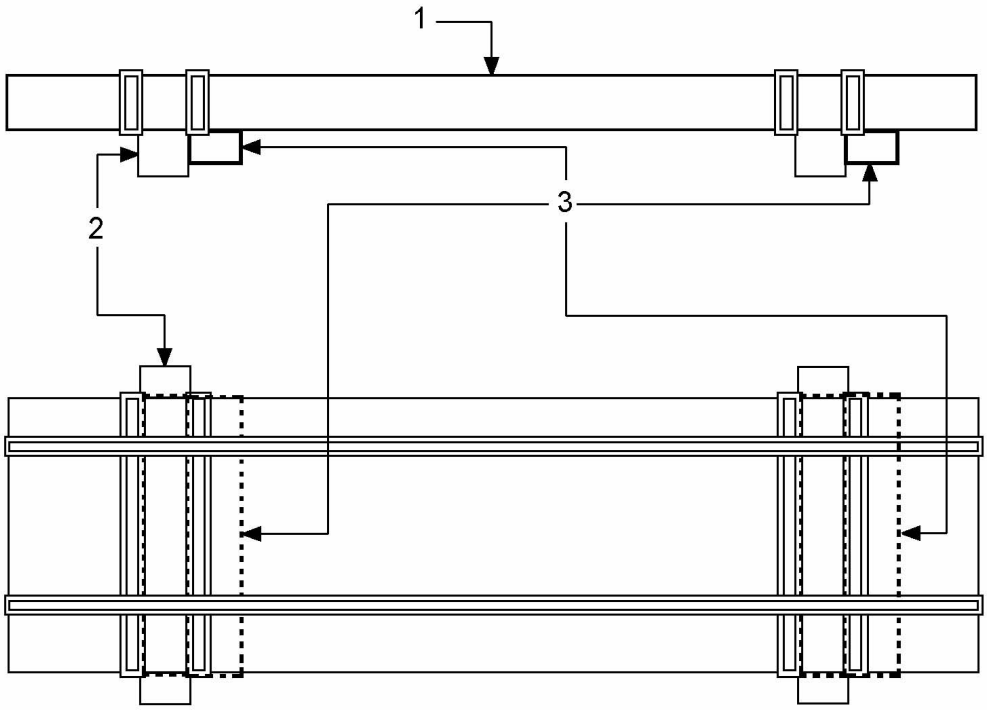
Key

1 Test load

Key

1 test load
2 roof deck
3 roof bars
4 test bench

Figure 19 — Test box strapping



Key

1 test box

2 roof bars

3 support tubes

NOTE The centre of gravity of the mass is the centre of gravity of the test box.

Figure 20 — Fixation of the test load

If all fixation points specified by the manufacturer of the roof bars or roof racks are not used when fixing an accessory to these devices or if these devices are modified for fixing the accessory, all tests for qualifying the fixations between the roof and the load carrier shall be done (see 5.1).

The distance between the bars of the test bench shall be in accordance with the instructions for the fitting and use of the devices. If it is not defined in the manufacturer's instructions, the distance between the roof bars of the test bench shall be 700 mm. Where special roof bars are required, they shall be permanently attached to the test bench. The accessory shall be mounted at the middle of the test bench

Adjustable roof carrier devices shall be tested in the most unfavourable mounting circumstances authorised by the fitting instruction.

For set of more than two bars, the test box shall be attached in turn:

a) from the first to second, and then

b) from the second to the third bar, etc.

5.2.4 Roof load carrier loading

The test devices used to load the devices during the tests are defined in each test method.

The actual maximum load m_x (see 3.27) shall be adjusted to an accuracy of ±1 kg.

Prior to each test the 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 instruction or, in absence of such instruction with Annex D.

5.2.5 Quasi static test, value of the test forces

5.2.5.1 Application time

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

5.2.5.2 Lifting force, F_a

The lifting force F_a (see 3.28) is function of the projection on the horizontal plan X of the frontal surface of the load carried fitted on the roof of the vehicle. Table 4 gives the value of F_a to apply during static test for each roof load carrier types.

Table 4 — Lifting force corresponding to the different types of roof load carrier

Roof load carrier designation	Type	Lifting force, F_a N
Roof bar	A	3000 if two surfboards can be mounted side by side according to the manufacturer specification 2500 if one surfboard can be mounted, or some ones mounted over the others and 1500 on the rear bar if fixation are not the same
Magnetic roof rack	B	3000 if two surfboards can be mounted side by side according to the manufacturer specification 2500 if one surfboard can be mounted, or some ones mounted over the others and 1500 on the rear fixing point

Magnetic Ski / Snow board holder	C	240 x number skis (side by side) 120 x nb of ski on the rear fixing point 720 x number snowboard (side by side) and 360 x nb of snowboard on the rear fixing point
Taxi and advertising magnetic sign	D	NA
Roof rack	E	3000 and 1500 on the rear bar if fixation are not the same
ladder holder	F	1000 x number of ladder (side by side)
Roof (box) container With its fixation on the roof	G	2000 and 1000 on the rear bar if fixation are not the same
Bicycle carrier	H	600 or 600x number of bicycle in case of multiple bicycles carrier single unit
Bicycle-wheel carrier	I	NA
Ski and/or snow-board carrier	J	240 x number skis (side by side) 720 x number snowboard (side by side)
Sailboard and/or surfboard carrier	K	1500
Sailboard mast carrier	L	NA
Roof (box) container	M	2000
Wind deflector	N	NA
Mechanically fixing taxi and advertising sign	O	NA
Canoe and/or kayak	P	1500
Roof deck (basket)	Q	2500
Load fixing device	R	NA

5.2.5.3 Longitudinal force, F_l

5.2.5.3.1 The forward longitudinal force, F_l (see 3.29) and the backward longitudinal force, $-F_l$ are function of the mass of the load carried on the roof of the vehicle. Table 5 gives the value of F_l and $-F_l$, function of the mass corresponding to the maximum roof carrier load, m_b (see 3.23) to apply during static test for these roof load carrier types.

NOTE when the roof carrier load is expressed as a quantity, the mass to consider is the mass of the test device multiplied by the number of units.

Table 5 — Forward and backward longitudinal force F_l corresponding to the maximum roof load carrier load, mb - roof load carrier types A to C, E to M, P and Q

Mass corresponding to the maximum roof load carrier load, m_b kg	Half longitudinal force 0,5 F_l or -0,5 F_l N	Longitudinal force F_l N
1	20	40
30	600	1200
40	800	1600
50	1000	2000
60	1200	2400
70	1400	2800
80	1600	3200
90	1800	3600
100	2000	4000
300	6000	12000
NOTE The requirements for any load value not contained in table shall be derived by linear interpolation		

5.2.5.3.2 For wind deflector, the backward longitudinal force is function of the vertical projection of the wind deflector area. Table 6 gives the value of $-F_l$, function of the wind deflector area, S (see 3.38) to apply during static test for this roof load carrier type.

Table 6 — Backward longitudinal force Fl - roof load carrier type N

Wind deflector area, S m²	Half backward longitudinal force - 0,5 F_l N	Backward longitudinal force - F_l N
0	0	0
0,2	240	480
0,3	360	720
0,4	480	960
0,5	600	1200
NOTE The requirements for any load value not contained in table shall be derived by linear interpolation		

5.2.5.3.3 For advertising and taxi signs, the backward longitudinal force is function of the vertical projection of the device area. Table 7 gives the value of $-F_l$, function of the device area, S to apply during static test for these devices.

Table 7 — backward longitudinal force Fl - roof load carrier types D and O

Advertising or taxi signs area, S m²	Half backward longitudinal force - 0,5 F_l N	Backward longitudinal force - F_l N
0	0	0
0,1	240	480
0,2	480	960
0,3	720	1440
0,4	960	1920
0,5	1200	2400
NOTE The requirements for any load value not contained in table shall be derived by linear interpolation.		

5.2.5.4 20° horizontal force

The 20° horizontal force, F_{lq} (see 3.30) is function of the mass of the load carried on the roof of the vehicle. Table 8 gives the value of $F_{lq,}$ function of the mass corresponding to the maximum roof carrier load, m_b (see 3.23) to apply during static test for these roof load carrier types.

NOTE When the roof carrier load is expressed as a quantity, the mass to consider is the mass of the test device multiplies by the number of units.

IMPORTANT — Test under a 20° horizontal force is not applicable to roof load carrier of type N and O.

Table 8 — 20° horizontal force Flq corresponding to the maximum roof load carrier load, mb - roof load carrier types A to M, P and Q

Mass corresponding to the maximum roof load carrier load, m_b kg	Half longitudinal force 0,5 F_{lq} N	Longitudinal force F_{lq} N
1	20	40
30	600	1200
40	800	1600
50	1000	2000
60	1200	2400
70	1400	2800
80	1600	3200
90	1800	3600
100	2000	4000
300	6000	12000
NOTE The requirements for any load value not contained in table shall be derived by linear interpolation		

5.2.5.5 Lateral force, F_{lat}

The lateral force, F_{lat} (see 3.31) is function of the mass of the load carried on the roof of the vehicle. Table 9 gives the value of $F_{lat,}$ function of the mass corresponding to the maximum roof carrier load, m_b (see 3.23) to apply during static test for these roof load carrier types.

NOTE when the roof carrier load is expressed as a quantity, the mass to consider is the mass of the test device multiplies by the number of units.

Table 9 — Lateral force function of the mass corresponding to the maximum roof carrier load, mb

Roof load carrier designation	Type	Lateral force, F_{lat} N
Magnetic Ski / Snow board holder	C	240 x number skis (side by side) 720 x number snowboard (side by side)
Taxi and advertising magnetic sign	D	NA
Bicycle carrier	H	600
Bicycle-wheel carrier	I	NA
Ski and/or snow-board carrier	J	240 x number skis 720 x number snowboard
Sailboard and/or surfboard carrier	K	375 x number of surf
Sailboard mast carrier	L	NA
Roof (box) container	M	20 x (load + mass of the roof container)
Wind deflector	N	NA
Mechanically fixing taxi and advertising sign	O	NA
Canoe and/or kayak	P	375 x number of canoe
Roof deck (basket)	Q	20 x (load + mass of the roof deck)
Load fixing device	R	NA

5.3 Requirements applicable to all types and associated test methods

5.3.1 Resistance to corrosion

5.3.1.1 Requirements

— After testing in accordance with 5.3.1.2, there shall be no corrosion of the ground material that would reduce the function and strength of the roof load carrier.

— There shall be no deformation and rupture of any component during and after dismounting

5.3.1.2 Test method

— The roof load carrier shall be tested assembled. It is allowed to cut from a larger coated specimen including at least a typical roof load carrier fixation part(s) mounted according to the manufacturer specification. The cut edges shall be adequately protected as specified in ISO 9227-6.3

— The bolts shall be tightened with the mean torques determined according to the manufacturer specification or in accordance with Annex D if no specification is provided. A representative part having the same material and coating can be used for simulating the interface.

— The degreased roof load carrier shall be submitted to a salt spray test in accordance with ISO9227.

— Duration of testing: 192 h.

— Torque meter, visual inspection

5.3.2 Resistance of materials

5.3.2.1 General

The roof load carriers shall be designed for a range of exterior temperatures between −20°C to 60°C taking into consideration ultra violet stability and ozone ageing.

a) For structural components, the mechanical characteristic of plastic material can have a variation of 10% of impact and/or tensile strength after weathering of 250h according to ISO 4892-2 (checked if all test conditions are described and/or find appropriate ISO standards) plastic parts.

   Choice between impact and tensile test shall be according to actual force in the parts during use.

   Test has to be performed on specimen. Tensile test has to be performed according to ISO 527, impact test has to be performed according to ISO 179.

   NOTE This is consider as suitable but further investigation are necessary for confirming this value for all parts considering the effect of the design and the various strength in the parts.

   NOTE Providing a technical report is one way for demonstrating that the material characteristics under this range of temperature and the design are suitable

b) For roof container plastic shells the mechanical characteristic of plastic material shall to meet the criteria defined in 5.3.2.2.

   Test has to be performed on specimen and depending of the result of the test, the impact test “cold resistance of roof containers” (Form G) has to be performed on the roof container (see Annex XXX).

   Detailed prescription and test method is given in annex 5.3.2.2.

c) For rubber submitted to tensile strength, after weathering of 48 h at an ozone concentration of 50 ± 5 pphm. Test has to be performed on part/ or specimen according to ISO 1431-1 under an elongation of 20% ± 2%, there shall be no cracking due to weathering.

5.3.2.2 Special requirements for roof containers

5.3.2.2.1 Functional Reliability of Roof Container

— The maximum deformation at −20°C and at 60°C shall not impair function ability. It shall be possible to safely and securely open and lock the roof container, as specified in the instructions for use, at −20°C and at 60°C. Permanent visible deformations are not permitted. The functional test is performed with 1.5 times the permitted load; weights and distribution in analogy to Table 2.

— The roof container is fixed in its position of use (horizontal orientation) to two carrier bars with a distance of 700 mm between them.

— Testing is performed at homogeneous temperatures of the component of −20°C and 60°C. Testing at −20°C is performed immediately after cold conditioning of the box for 1 hour; testing at 60°C is performed immediately after hot conditioning at 60°C for six hours.

5.3.2.2.2 Cold Resistance of Roof Containers (Forms G and M)

— At a drop height of 1 m (if semi finished products of category A are used) and of 1.25 m (if semi finished products of category B are used) the component shall not be fractured into separate parts and shall not be perforated.

— The strength of the roof container is tested by a drop test at –20 °C (see Figure 21). The test shall be performed in such a way that the drop weight with a mass of 2.5 Kg hits the front end of the suspended (the front end shall have no ground contact) roof container in free fall with its pointed end.

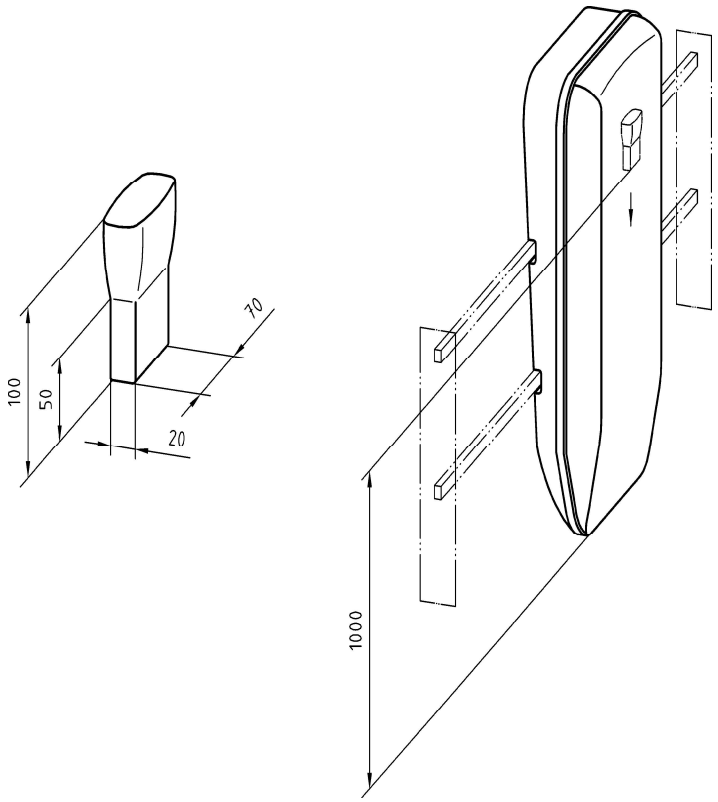


Figure 21 — Drop test

5.3.2.2.3 Weathering Resistance of Roof Containers Shell material (Forms G and M)

5.3.2.2.3.1 Requirements

A useful life of 5 years is assumed. Under ISO 4892-2A this corresponds roughly to duration of testing of 250 h. The testing duration is derived from the intensity of irradiation (0,47 W/m² +/-0,02 W/m² at 340nm), the global irradiance in western Europe and an assumed exposure time of the container.

a) Category A corresponds to:

   — a remaining impact strength after weathering of minimum 75 % compared with the impact strength before weathering, and

   — the remaining impact strength after weathering exposure may be less than 30 kJ/ m².

b) Category B corresponds to:

   — a remaining impact strength after weathering of less than 75 % compared with of the impact strength before weathering, and

   — the remaining impact strength after weathering exposure is minimal 30 kJ/ m².

c) A material with:

   — a remaining impact strength after weathering of less than 75 % compared with of the impact strength before weathering, and

   — the remaining impact strength after weathering exposure is less than 30 kJ/ m²

is not suitable for roof box shell material.

5.3.2.2.3.2 Test method

— Material of roof container shells shall be tested in accordance with ISO 4892-2 (DIN EN ISO 4892-2). The duration of testing in steady state shall be 250 h at an intensity of irradiation of 0,47 W/m² +/-0,02 W/m² at 340nm. The black standard temperature shall be (65 ± 3) °C. The test cycle shall be performed with a sprinkling time of (18 ± 0,5) min followed by a drying period of (102 ± 0,5) min. Relative air humidity in the drying phase shall be 65%

— After testing in accordance with ISO 4892-2 (DIN EN ISO 4892-2) impact strength tests following ISO 179-1/1 FU (DIN EN ISO 179-1/1fU) for compound materials shall be performed both on weathered and unweathered samples.

— Impact strength tests shall be performed by a blow onto the unweathered side. The reduction of impact strength as a result of weathering shall be determined on samples which have the same orientation in terms of the manufacturing process.

  The evaluation of results shall be carried out as follows (assessment and categorization see Table 10) to determine the value of the impact strength on weathered and unweathered samples, 7 of the 10 specimens tested shall display fracture in order to obtain a true (or factual) impact strength value or a resulting mean value following ISO 179. In case the determination of impact strength for the unweathered samples yields 0% fractures (there is no fracture and the specimen is only bent and/or drawn through, possibly in conjunction with stress whitening) the impact strength value displayed on the test equipment for drawn through, unfractured specimens (no fracture), cf. Case 4 and case 5, shall be used.

Table 10 — Impact Strength as specified in DIN EN ISO 179-1/1fU; Categorization

Case	Initial Value, unweathered	Weathered at 250 h Xenon	Category
1	— no fracture	— no fracture	A
2	— fracture; — impact strength X [kJ/m²]	— fracture; — remaining impact strength Y [kJ/m²] ≥ 75 % of X	A
3	— fracture; — impact strength X [kJ/m²]	— fracture; — remaining impact strength Y [kJ/m²] < 75 % of X — Y ≥ 30 kJ/m²	B
4	— no fracture; — apparent impact strength X [kJ/m²]	— fracture; — remaining impact strength Y [kJ/m²] ≥ 75 % of X	A
5	— no fracture; — apparent impact strength X [kJ/m²]	— fracture; — remaining impact strength Y [kJ/m²] < 75 % of X — Y ≥ 30 kJ/m²	B
6	— fracture; — impact strength X [kJ/m²]	— fracture; — remaining impact strength Y [kJ/m²] < 75 % of X — Y < 30 kJ/m²	Not suitable material

5.3.3 Overhang and external shape

a) it is recommended that the width of the roof load carrier device be limited to the width of the vehicle roof panel. However, the width of the roof load carrier device shall not exceed the maximum width of the vehicle according to ISO 612: 1978 clause 6.2.

b) the external radius of all connectable components shall conform to paragraphs 6.16.2 and 6.16.3 of EEC Directive 74-483.

5.3.4 Resistance to city Crash

5.3.4.1 Requirement

When tested in accordance with 5.3.4.2, on completion of the test, the roof load carrier device shall meet the following requirements:

a) The load shall keep fixed to the device;

b) The load and the device shall keep to the vehicle and on the vehicle roof;

c) The failure of one or several elements of either the device or the vehicle elements dedicated to load carrier is acceptable. Any of those elements whose mass is superior to 10 grams shall keep fixed to the device and to the vehicle.

5.3.4.2 Test method

The test method is described in Annex E.

5.3.5 Resistance to shaking and vibration

5.3.5.1 Requirements

When tested in accordance to 5.3.5.2, on completion of the test, the roof load carrier device shall meet the following requirements:

a) the sliding of structural components shall not exceed 2 mm at the contact points;

b) the load shall keep fixed to the roof load carrier device;

c) the load and the roof load carrier devices shall keep fixed to the vehicle and on the vehicle roof;

d) no deformation of the components shall occur;

e) no rotation of the screw greater than 10° shall occur.

5.3.5.2 Test method

The test method is described in Annex F.

As an alternative, a test bench method can be used if the equivalency with the road test described in Annex F is demonstrated for both roof bars and accessories.

5.4 Specific requirements and associated test methods

5.4.1 Type A, roof bar, type E, roof rack

5.4.1.1 Requirements

When tested in accordance with 5.4.1.2, on completion of the test, the roof load carrier shall meet the following requirements:

a) under F_a:

- the roof load carrier shall remain fixed on the roof;
- no breakage of any part shall occur;
- If the front and rear connecting devices are different, on completion of the test, the rear roof bar shall remain fixed to the roof under a force 0,5 F_a.

b) Under F_l

- the load shall remain fixed on the roof load carrier;
- no breakage of any part shall occur;
- under 0,5 F_l the instant deflection shall not exceed than 10 mm;
- the maximum deflection, d, shall not exceed 50 mm.

c) Under – 0,5 F_l

- the load shall remain fixed on the roof load carrier;
- no breakage of any part shall occur;
- the maximum deflection, d, shall not exceed 50 mm

d) Under F_{lq}

— the load shall remain fixed on the roof load carrier;

— no breakage of any part shall occur;

— under 0,5 F_{lq} the instant deflection shall not exceed 10mm;

— the maximum deflection, d, shall not exceed 50 mm

5.4.1.2 Test method

The nominal value of the forces is given in 5.2.5.

The test shall be carried out according to Annexe G.

5.4.2 Types H to P and Q, additional accessories mechanically fixed

5.4.2.1 Requirements

a) Compatibility with roof bars

Compatibility regarding fitting and loading between accessory and roof bars shall be assured by the accessory itself and/or by the adapter (see 3.14).

b) Location of the accessory.

The accessory location shall conform to the accessory and roof bars manufacturer(s) instruction(s).

c) Resistance to quasi static forces.

When tested in accordance with 5.4.2.2, on completion of the test, the additional accessories shall meet the requirements given in Table 10.

d) Specific roof container requirements

— Impact test

When tested in accordance with Annex H, on completion of the test, the roof container shall not be broken, damaged or deformed.

— Hinge test

When tested in accordance with Annex H, on completion of the test, the fixation elements and the hinges between the upper and lower parts of the roof container shall not be broken, damaged or deformed. The test shall be performed at (23 ± 5) °C.

— Functional Reliability of Roof Container

— The maximum deformation at –20°C and at 60°C shall not impair function ability. It shall be possible to safely and securely open and lock the roof container, as specified in the instructions for use, at –20°C and at 60°C. Permanent visible deformations are not permitted. The functional test is performed with 1.5 times the permitted load; weights and distribution in analogy to Table 2.

— The roof container is fixed in its position of use (horizontal orientation) to two carrier bars with a distance of 700 mm between them.

— Testing is performed at homogeneous temperatures of the component of –20°C and 60°C. Testing at –20°C is performed immediately after cold conditioning of the box for 1 hour; testing at 60°C is performed immediately after hot conditioning at 60°C for six hours.

Table 11 — Additional accessories — Requirements

Type	Under F_a	Under F_l and - F_l		Under $\pm F_{lat}$	
Type H, bicycle carrier	a) the load shall remain fixed on or in the accessory; b) the load and the accessory shall remain fixed on the roof bars; c) no breakage of any part shall occur.	d) the load shall remain fixed on or in the accessory; e) the load and the accessory shall remain fixed on the roof bars; f) no breakage of any part shall occur; g) the maximum deflection shall not exceed	≥ 50 mm	a) the load shall remain fixed on or in the accessory; b) the load and the accessory shall remain fixed on the roof bars; c) no breakage of any part shall occur; d) the maximum deflection shall not exceed	≥10 mm and 10°
Type I, bicycle wheel carrier			≥ 15°		≥10 mm and 10°
Type J, ski and/or snow-board carrier			NA		≥10 mm
Type K, sailboard and/or surfboard carrier			≥ 50 mm		≥10 mm
Type L, sailboard mast carrier			≥ 50 mm		≥10 mm
Type M, roof (box) container			≥ 50 mm		≥10 mm
Type N, wind deflector			NA		NA
Type O, Taxi and advertising sign			NA		NA
Type P, canoe and/or Kayak			≥ 50 mm		≥10 mm
Type Q, roof deck (basket)			≥ 50 mm		≥10 mm

5.4.2.2 Test method

The nominal value of the force is given in annex 5.2.5.

The test shall be carried out according to Annexes G and H.

5.4.3 Type B, magnetic roof rack and Type D, taxi and advertising magnetic sign

5.4.3.1 Requirements

When tested in accordance with 5.4.3.2, on completion of the test, the magnetic devices shall meet the following requirements:

a) under F_a:

— the magnetic devices shall remain fixed on the roof;

— no breakage of any part shall occur;

— If the front and rear connecting devices are different, on completion of the test, the rear connecting devices of the magnetic devices shall remain fixed to the roof under a force 0,5 F_a.

b) Under F_l

— the load shall remain fixed on the magnetic roof rack;

— no breakage of any part shall occur;

— under 0,5 F_l the instant deflection shall not exceed than 10 mm;

— the maximum deflection, d, shall not exceed 50 mm.

c) Under – 0,5 F_l

— the load shall remain fixed on the magnetic roof rack;

— no breakage of any part shall occur;

— the maximum deflection, d, shall not exceed 50 mm

d) Under F_{lq}

— the load shall remain fixed on the magnetic roof rack;

— no breakage of any part shall occur;

— under 0,5 F_{lq} the instant deflection shall not exceed than 10 mm;

— the maximum deflection, d, shall not exceed 50 mm

5.4.3.2 Test method

The nominal value of the forces is given in 5.2.5.

The test shall be carried out according to Annex G.

5.4.4 Type C, magnetic ski / snow board holder

5.4.4.1 Requirements

When tested in accordance with 5.4.3.2, on completion of the test, the magnetic ski / snow board holder shall meet the following requirements:

a) under F_a:

— the magnetic ski / snow board holder shall remain fixed on the roof;

— no breakage of any part shall occur;

— If the front and rear connecting devices are different, on completion of the test, the rear connection of the magnetic device shall remain fixed to the roof under a force 0,5 F_a.

b) Under F_l

- the load shall remain fixed on the magnetic ski / snow board holder;
- no breakage of any part shall occur;
- under 0,5 F_l the instant deflection shall not exceed than 10 mm;
- the maximum deflection, d, shall not exceed 50 mm.

c) Under – 0,5 F_l

- the load shall remain fixed on the magnetic ski / snow board holder;
- no breakage of any part shall occur;
- the maximum deflection, d, shall not exceed 50 mm.

d) Under F_{lq}

- the load shall remain fixed on the magnetic ski / snow board holder;
- no breakage of any part shall occur;
- under 0,5 F_{lq} the instant deflection shall not exceed than 10 mm;
- the maximum deflection, d, shall not exceed 50 mm.

e) Under F_{lat}

- the load shall remain fixed on the magnetic ski / snow board holder;
- no breakage of any part shall occur;
- the maximum deflection, d, shall not exceed 50 mm.

5.4.4.2 Test method

The nominal value of the forces is given in 5.2.5.

The test shall be carried out according to Annex G.

5.4.5 Type F, ladder holder

5.4.5.1 Requirements

When tested in accordance with 5.4.5.2, on completion of the test, the ladder holder shall meet the following requirements:

a) under F_a:

- the ladder holder shall remain fixed on the roof;
- no breakage of any part shall occur;

b) Under F_l

- the load shall remain fixed on the ladder holder;
- no breakage of any part shall occur;
- the maximum deflection, d, shall not exceed 50 mm.

c) Under – 0,5 F_l

- the load shall remain fixed on the ladder holder;
- no breakage of any part shall occur;
- the maximum deflection, d, shall not exceed 50 mm

d) Under F_{lq}

- the load shall remain fixed on the ladder holder;
- no breakage of any part shall occur;
- the maximum deflection, d, shall not exceed 50 mm

e) Under F_{ladd}

- the load shall remain fixed on the ladder holder;
- the load and the ladder holder shall remain fixed on the roof;
- no breakage of any part shall occur.

5.4.5.2 Test methods

The nominal value of the forces is given in 5.2.5.

The test shall be carried out according to Annex G.

5.4.6 Type G, roof (box) container with its fixation

5.4.6.1 Requirements

When tested in accordance with 5.4.6.2, on completion of the test, the roof container shall meet the following requirements:

a) under F_a:

- the roof container shall remain fixed on the roof;
- no breakage of any part shall occur;
- If the front and rear connecting devices are different, on completion of the test, the rear connecting devices shall remain fixed to the roof under a force 0,5 F_a.

b) Under F_l

- the load shall remain fixed in the roof container;
- no breakage of any part shall occur;
- under 0,5 F_l the instant deflection shall not exceed than 10mm;
- the maximum deflection, d, shall not exceed 50 mm.

c) Under – 0,5 F_l

- the load shall remain fixed in the roof container;
- no breakage of any part shall occur;
- the maximum deflection, d, shall not exceed 50 mm

d) Under F_{lq}

- the load shall remain fixed in the roof container;
- no breakage of any part shall occur;
- under 0,5 F_{lq} the instant deflection shall not exceed than 10 mm;
- the maximum deflection, d, shall not exceed 50 mm

e) Impact test

- When tested in accordance with annex H, on completion of the test, the roof container shall not be broken, damaged or deformed.

f) Hinge test

- When tested in accordance with annex H, on completion of the test, the fixation elements and the hinges between the upper and lower parts of the roof container shall not be broken, damaged or deformed.

5.4.6.2 Test method

The nominal value of the forces is given in 5.2.5.

The test shall be carried out according to annexes G and H.

5.4.7 Type R, load fixing device

5.4.7.1 Requirements

When tested in accordance with 5.4.7.2, no rupture of the load fixing device (textile strap, belts, metal strap...) shall occur.

5.4.7.2 Test method

The test forces shall be applied with a traction speed 50 mm/min to 110 mm/min.

a) Test of the bits (textile, steel...)

The following test procedure shall be used:

— Apply a pre tension to the bit (simple bit) of 250 N;

— Submit the bit (simple bit) to a traction force of 2000 N or to the value indicated by the manufacturer of the roof load carrier device if this value is higher;

— Measure the instantaneous displacement of the bit (simple bit) under 2000 N or to the value indicated by the roof load carrier manufacturer if this value is higher;

— Apply an increasing traction force until rupture of the bit (simple bit);

— Consign the value of the traction force at the time of the rupture.

b) Test of the strap tightening fasteners, product in vehicle configuration

The following test procedure shall be used:

— Submit the fastener in configuration of use to a force of traction force of 2000 N or to the value indicated by the roof load carrier manufacturer if this value is higher;

— Apply an increasing traction force until rupture;

— Consign the value of the force of traction at the time of the rupture.

6 Instruction for fitting, use and the consumer

6.1 General

Instructions for fitting and use should be preserved for other users of the roof load carrier or roof load carrier device than the first customer. An example is given in annex I.

6.2 Language of instructions

All instruction shall be written in the official languages of the countries of sale.

6.3 Fitting instructions

The manufacturer of the roof load carrier shall include the following in the assembly instructions:

a) Detailed fitting instructions with figures or illustrations and product description. Similar parts shall be unambiguously described.

b) The value of the torque or force where it is necessary to apply a specific torque or force to a fastening device in order to fasten the roof load carrier to a vehicle;

c) Mounting points;

An application list shall be available and reference to that list shall be included in the outer packaging.

There should be:

— a spacing of either approximately 700 mm between the fixing points of the roof bars/roof racks/magnetic fixing device or the spacing specified by the vehicle or device manufacturer (see Figure 18);

— mounting points corresponding to the type or types of vehicle for which the roof bars, roof rack or magnetic fixing devices are intended;

— mounting points corresponding to the type or types of roof bars roof racks or roof decks the additional accessories are intended;

— a warning that the roof load carrier is not to be used on vehicles or roof bars, roof decks or roof racks other than those specified by the manufacturer;

— details of the type of roof bars for which the accessory is suitable to be mounted.

6.4 Instructions for use

The roof load carrier device manufacturer shall provide instructions for use containing at least the following:

a) The value of the maximum load capacity or specific quantity of units, or both, which can be mounted on the roof load carrier for the vehicle for which it is made and a warning not to exceed the vehicle manufacturer's maximum roof load carrying capacity and regarding the relevant mass regulation. An example of is given in Annex J.

b) Requirements and recommendations:

   1) The load shall be evenly distributed over the area of the carrier system, and the centre of gravity of the load kept as low as possible. Loads which overhang the ends of the carrier system shall conform to any relevant laws or by-laws in force, and shall be adequately secured.

   2) Loads shall be adequately secured using suitable straps or similar tightening and locking devices. The security of the load and roof load carrier shall be checked after loading and regularly throughout the journey. Elastic straps shall not be used. The user is warned to maintain and to use straps in working order.

   3) It is recommended that items which may produce significant lifting forces (surfboard, sailboard…) are carried in such a way that lifting force is minimized, securing them independently to the front and rear of the vehicle using straps or other methods which are capable of withstanding the lifting forces. Elastic straps shall not be used.

   4) Where specialised accessories are available for carrying or securing loads, for example cycle carriers, these should be used,

   5) The handling characteristics of a vehicle (in particular crosswind sensitivity, handling on bends and braking) change when a carrier system is fitted and especially if that system is loaded. Driving techniques should be altered to allow for these changes, speed reduced, especially on bends, and braking distances made greater.

   6) To reduce fuel consumption, the roof load carrier should be removed after use;

c) Warning:

   1) The importance of correctly following the instructions for fitting and use;

   2) The need for the fixing devices to be tightened correctly and checked regularly during travel;

   3) The necessity of carrying loads within the limitations of 6.4 a) and 6.4 b);

4) The necessity of securing loads correctly and safely;

5) The importance maintaining equipment in good working order ,

6) The need to check the full contact of the whole magnetic surface in accordance with the device manufacturer's instructions.

7) The importance for keeping the instruction for use.

6.5 Other instructions for the consumer

In addition for magnetic fixing devices, the consumer shall be instructed to:

a) Check that the magnetic properties of the roof material are given;

b) Check the magnetic characteristics of the contact surface by means of a testing tool provide by the magnetic device manufacturer;

c) Store magnetic fixing devices away from electric or electronic appliances;

d) Not store the magnetic fixing devices in direct contact with each other;

e) Check that the surface of the magnet and of the car roof is clean, dry and undamaged;

f) Not place the magnetic fixing device set completely or partially on any part of the roof other than steel parts;

g) When a magnetic device is placed on a steel sun roof, keep the sun roof in the closed position and not operate it;

h) Not employ magnetic devices on vehicles whose roofs have been repaired by means of tin, plaster layers or through varnishing of same;

i) Be aware that following accidental damage (e.g. fall down of the device), the magnetic properties of the device could be affected

j) Ensure, for safety reasons, that the skis are placed with their turned and towards the back of the car;

k) Not interpose any object of any type between the magnetic fixing device and the roof of the car.

7 Marking

Roof load carrier devices shall be marked with the following information:

a) name or trade mark of the manufacturer, importer or distributor;

b) type or model of roof load carrier device;

c) maximum load and kind of load defined according to clause 3 of this standard and in the instructions for use

d) reference ensuring traceability;

e) ISO coding according to 4;

f) if necessary the attachment position on the vehicle.

Annex A
(normative)

Test bench

A.1 Static test bench

A.1.1 Compatibility regarding the fitment between special roof bar and/or special adapters and the static test bench shall be assured by the bench itself.

A.1.2 The static test bench shall be:

a) adjustable,

b) rigid,

c) adaptable,

d) not deformed

A.2 Test bench dimensional characteristics

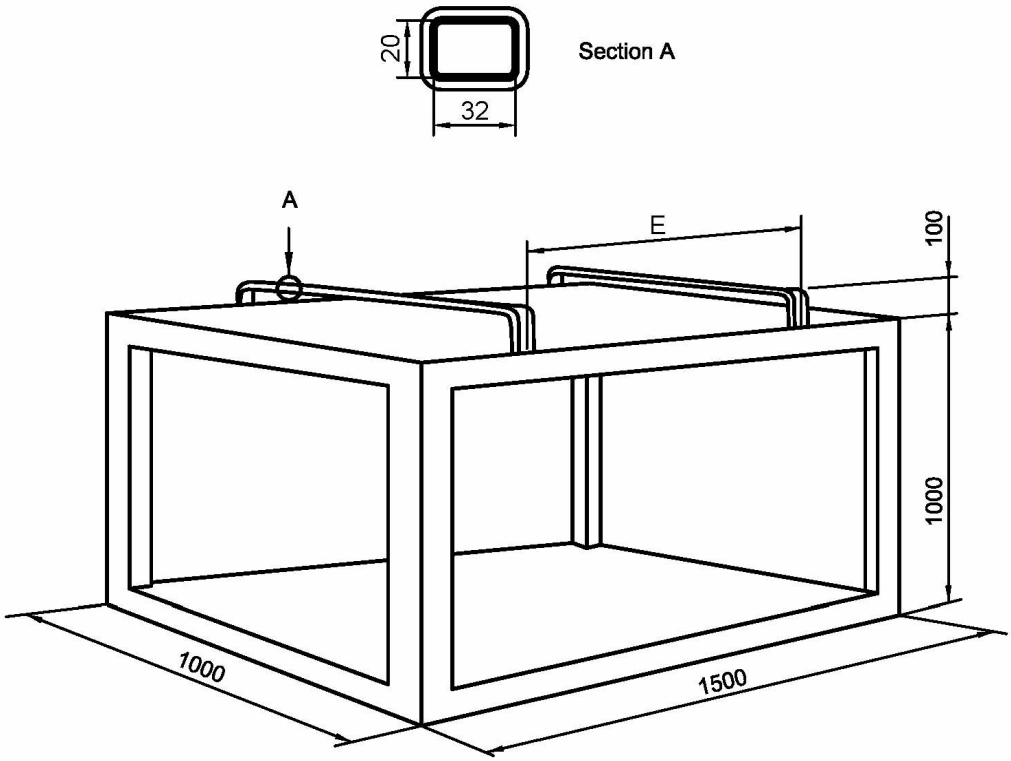


Figure A.1 — Example of typical test bench (Detail - A Dimension of test bench bars)

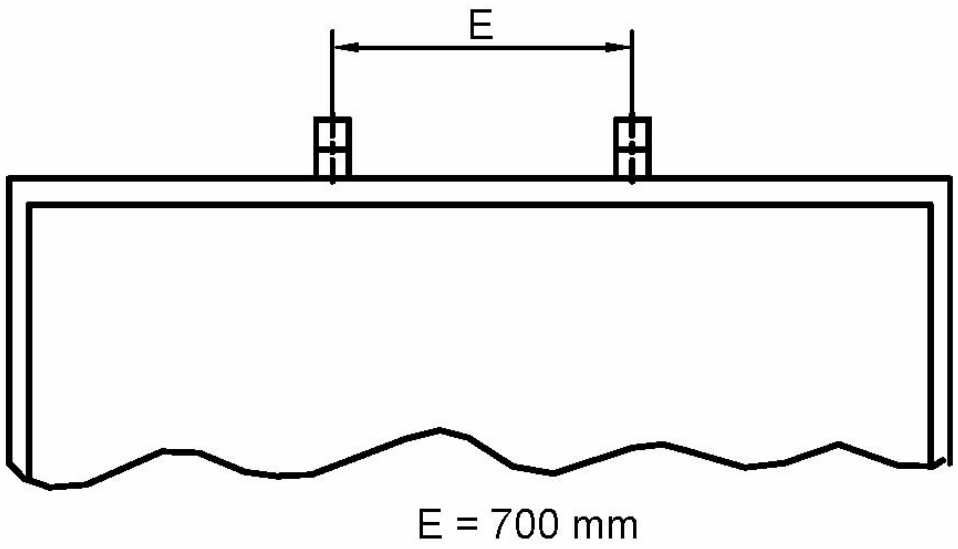


Figure A.2 — Distance between the bars

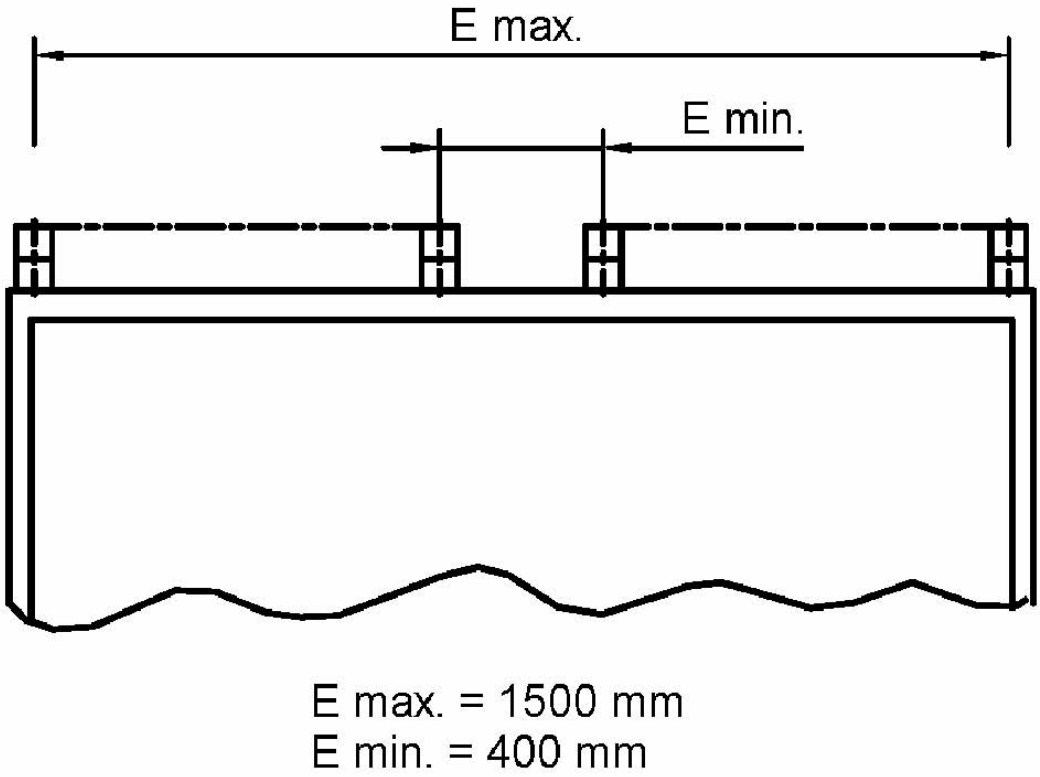
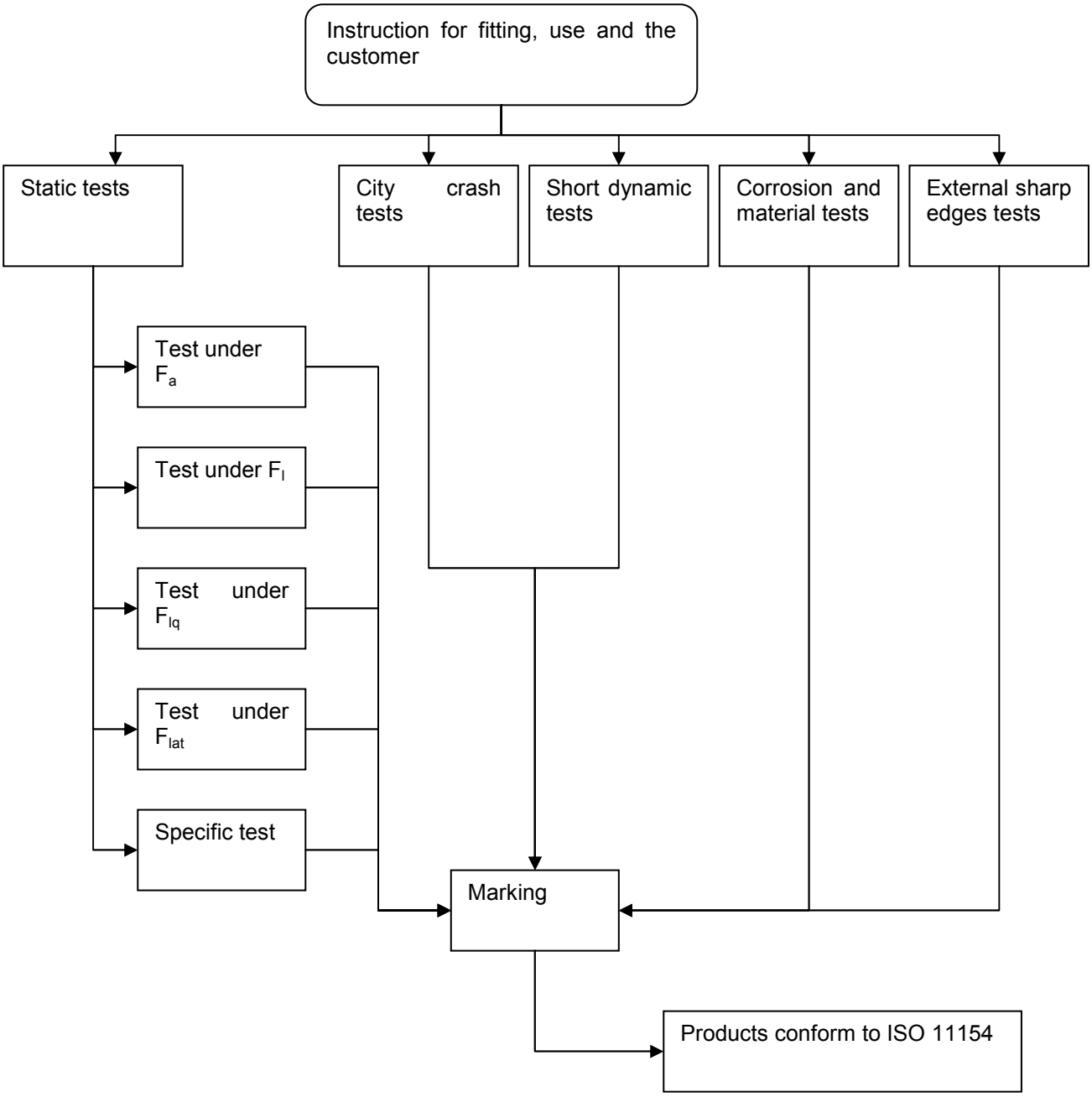


Figure A.3 — Adjustable bars

Annex B
(normative)

Synopsis of requirements

The following synopsis illustrates the requirements to conform to this international standard.



Annex C
(normative)

Test devices and test box

C.1 Test box

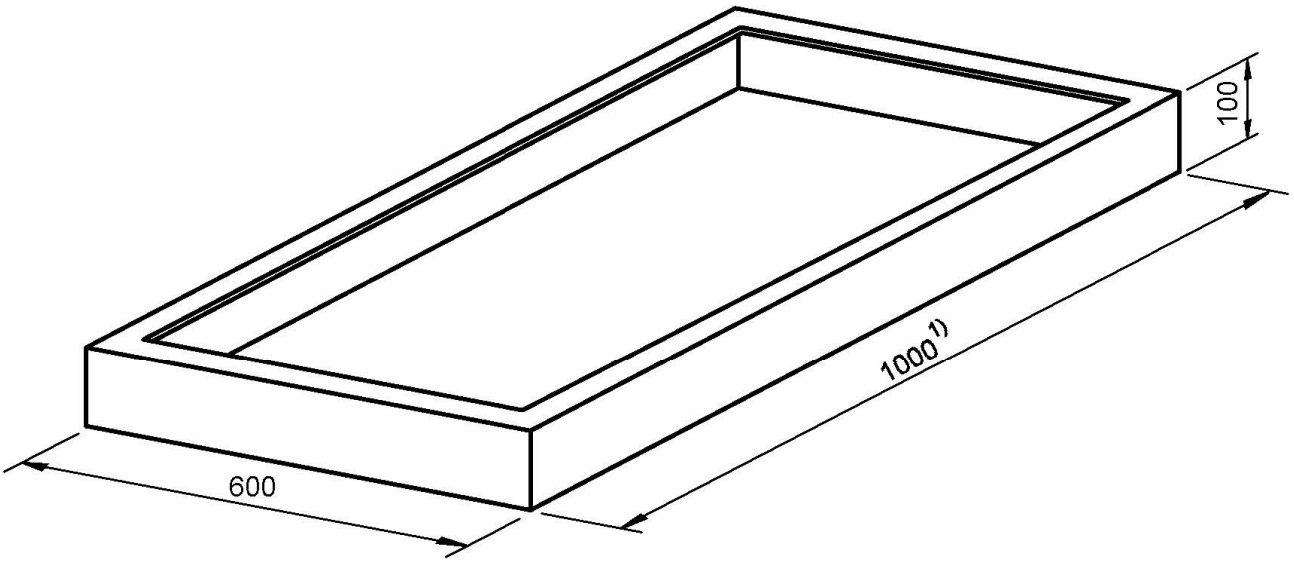
The test box shall be in accordance with Figure C1 and shall not be deformed by the load.

The test box mass shall be in accordance with 5.2.2, table 3.

The ballast used to adjust the mass shall be uniformly distributed in the test box.

The centre of gravity of the load shall be between 50 to 80mm over the surface of roof bars, roof rack or roof deck.

Dimensions in millimetres



1) If the distance between outside roof bars is more than 900 mm, the test box length shall be equal to this distance plus 100 mm

Figure C.1 — Test box

C.2 Test bicycle

The test bicycle shall be in accordance with Figure C2.

The test bicycle mass shall be in accordance with 5.2.2, table 3.

Dimensions in millimetres

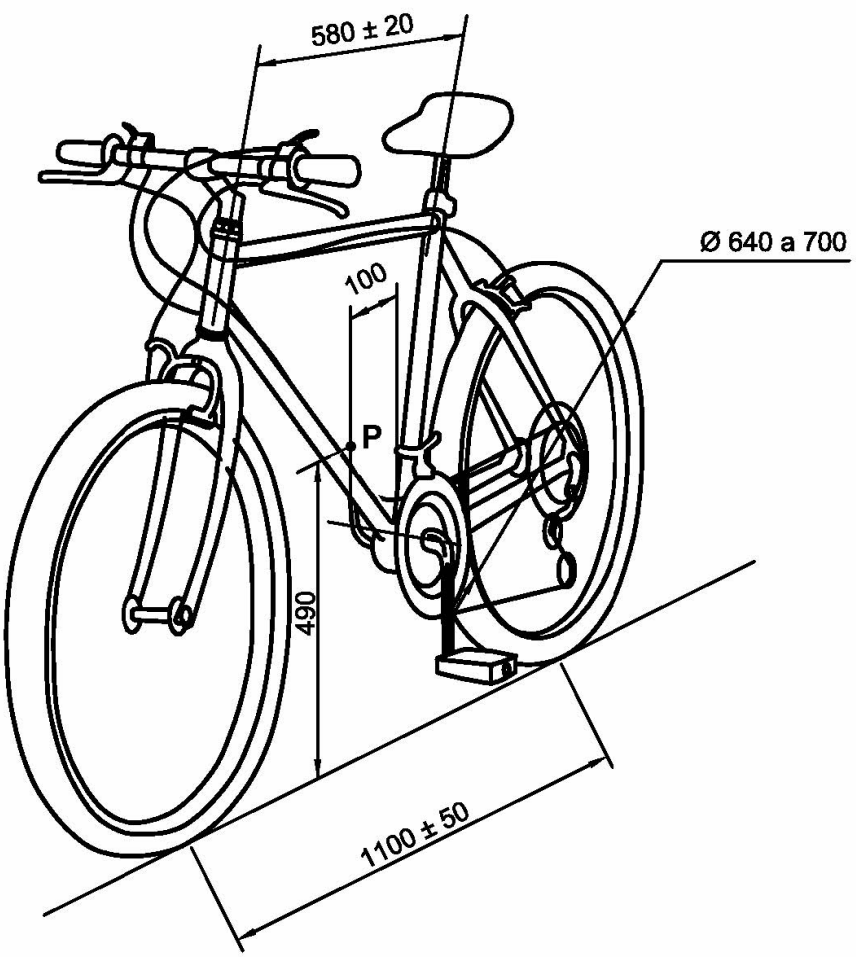


Figure C.2 — Test bicycle

C.3 Test wheel

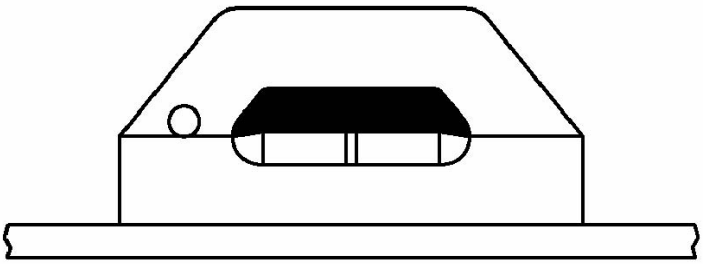
The test wheel shall be a 28 in diameter wheel.

The test wheel mass shall be in accordance with 5.2.2, Table 3.

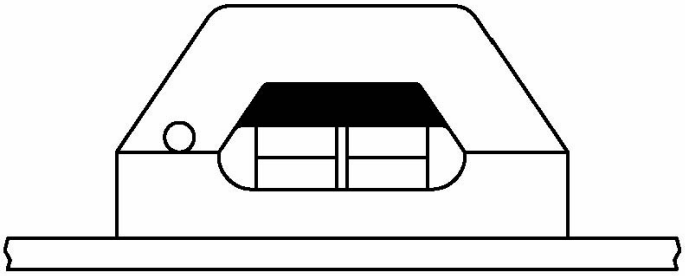
C.4 Test skis

The test skis shall be a pair of skis having a mass in accordance with 5.2.2, table 3.

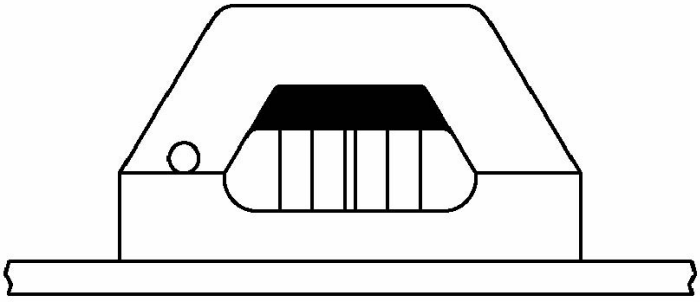
Figure C.3 shows various installations of skis.



a) Installation of one pair of skis (two locations)



b) Installation of two pairs of skis (two locations)



c) Installation of two pairs of skis (two locations)

Figure C.1 — Test skis installations

C.5 Test snowboards

The test snowboard shall be a snowboard having a mass in accordance with 5.2.2, Table 3.

C.6 Test surfboard

The test surfboard shall be a surfboard having a mass in accordance with 5.2.2, Table 3.

The test surfboard shall be in accordance with Figure C.4

Dimensions in millimetres

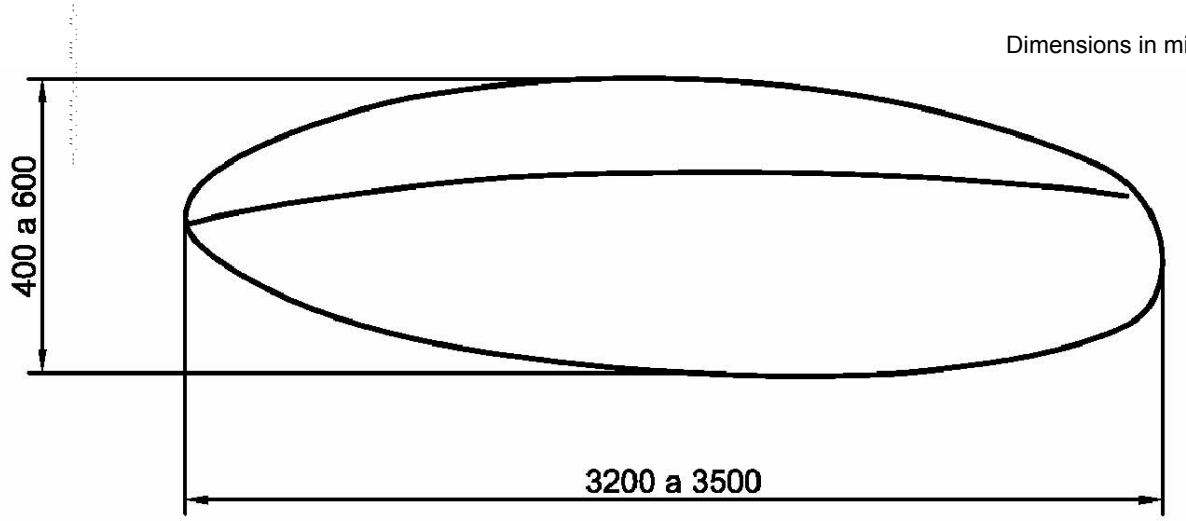


Figure C.2 — Test surfboard

C.7 Test mast

The test mast shall be a mast having a mass in accordance with 5.2.2, Table 3.

C.8 Test canoe

The test canoe shall be a canoe having a mass in accordance with 5.2.2, Table 3.

The test canoe shall be in accordance with Figure C4.

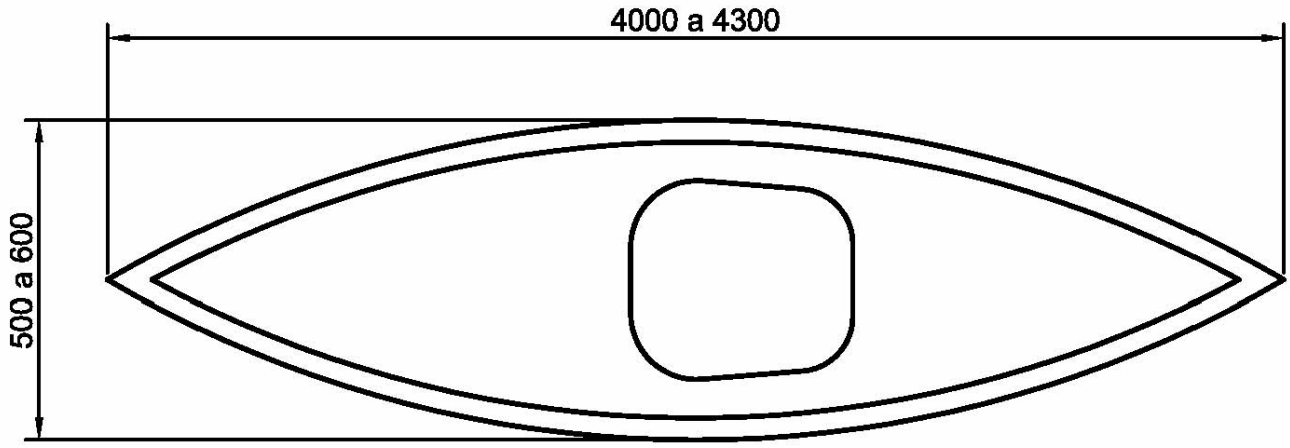


Figure C.5 — Test canoe

C.9 Test ladder

The length of the test ladder shall be 4 m.

The test ladder mass shall be in accordance with 5.2.2, Table 3.

C.10 Test container

The test container is the container itself.

It shall be loaded in accordance with 5.2.2, Table 3.

C.11 Test wind deflector

The test container is the container itself.

Annex D
(normative)

Tightening torques for fastening roof load carriers

Table D.1 gives the tightening torque corresponding to each of the different types of fastener used with roof load carriers.

Table D.1 — Tightening torques

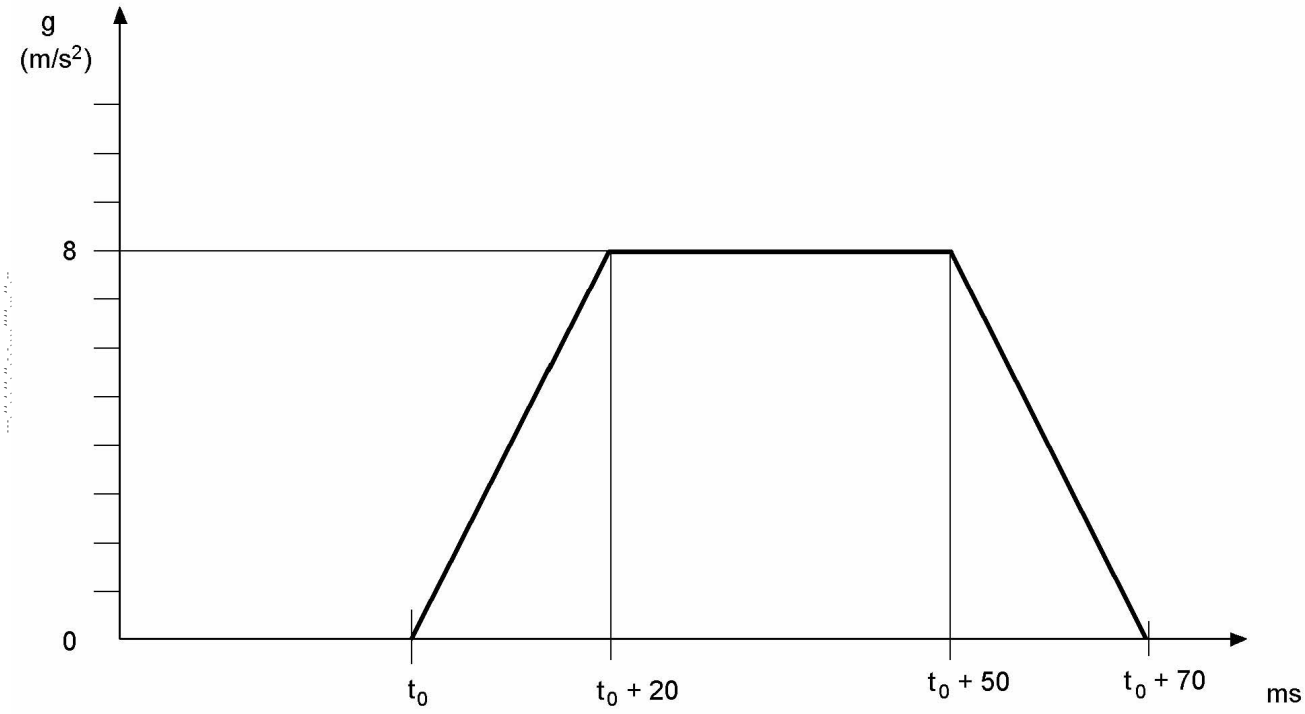
Type of fixing	Torque
Hand nut/screw ∅ less than 35 mm	2 Nm
Hand nut/screw ∅ 35 to 45 mm	3 Nm
Hand nut/screw ∅ 45 to 55 mm	4 Nm
Hand nut/screw ∅ 55 to 65 mm	5 Nm
Slotted - Head screw M6	3 Nm
Slotted - Head screw M8	4 Nm
CHC, VH, TORX M6 screw	5 Nm
CHC, VH, TORX M8 screw	6 Nm
Hexagon nut M6	5 Nm
Hexagon nut M8	6 Nm
Butterfly nut M6	2 Nm
Butterfly nut M8	3 Nm
1) TORX is trade-name. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.	

Annex E
(normative)

City crash test — Test procedure

E.1 Solicitation level

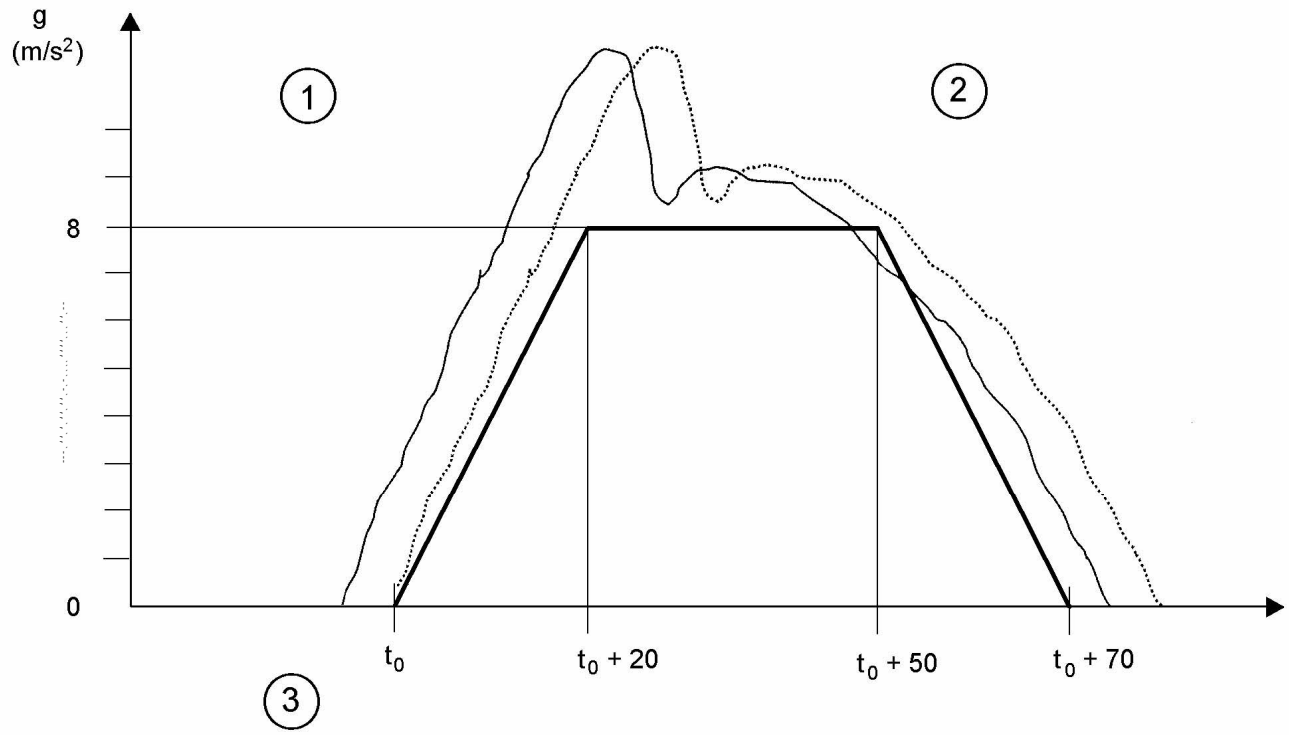
A solicitation shall be applied to the load carrier device mounted on vehicle roof. This deceleration or acceleration shall be according to Figure E.1.



Entry speed shall be16 km/h 0/+2 km/h.

Figure E.1 — Solicitation level

A possible translation of the recorded curve is allowed for checking the validity of the curve recorded during the test. An example is given in Figure E.2.



Key

1 test curve as recorded during test

2 possibility to move test curve: this example shows that the curve is valid

3 initial speed 16 (-0/+2) km/h: for example 16,2 km/h is OK

Figure E.2 — Possible translation

E.2 Test method

E.2.1 Test bench

For accessories, a standard test bench shall be used using roof bars of 22 by 32 cross section except if the manufacturer recommends using specific roof bars or "C" profile.

E.2.2 Measurement equipment and test conditions

The signal filtration for acceleration shall be CFC 60 according to ISO 6487.

The position of sensors and measurement chains for the acceleration on trolley shall be according to ISO standard 6487.

It is recommended to perform the test at ambient temperature of at least 10°C.

E.2.3 Test procedure

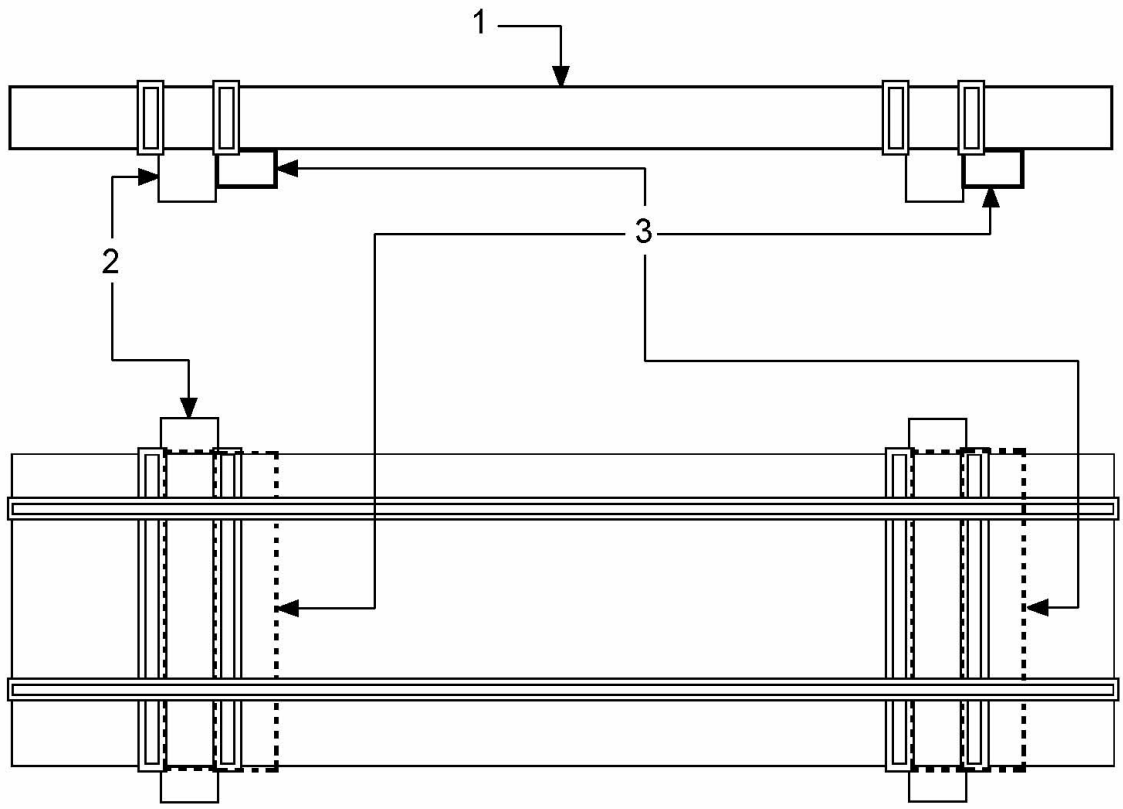
a) Mount the roof load carrier on fitting points as defined in the instruction of use and according to the method advised by the vehicle manufacturer or the supplier.

   1) For bars having specific profile and a warning in the instruction for use recommending using it for carrying load, the test box shall be fixed in a rigid way. Load should be fix on a stiff board (board width = 700 mm), the plate is fixed 2 time to each bar, the distance of fixations of the bars is 600 mm in Y, Load and board are fixed symmetrically to the bars. The centre of gravity of the load shall be between 50 to 80mm over the surface of roof bars. In other cases, the bars shall be tested fixing the load with support bar and straps as described in Figure E.3.

   2) Mount the specified test load (test bicycle, test ski, …) according as specified in the instruction of use of the roof device.

b) load the roof load carrier device to its maximal capacity (the one advised)

c) Fit strongly on the test trolley the structural system (roof load carrier device / roof or roof bars) or any equivalent configuration (body, unit)



Key

1 test box
2 roof bars
3 support tubes

NOTE The centre of gravity of the mass is the centre of gravity of the test box.

Figure E.3 — Load fixation

E.3 Test report

The test report shall include:

a) Type of bars or devices;

b) Date;

c) Initial speed;

d) Acceleration or deceleration curve;

e) Ambient temperature during test;

f) Conclusion of the test.

Annex F
(normative)

Test procedure — Short dynamic test

F.1 Test vehicles

a) For dedicated roof load carrier, the test vehicle shall be the vehicle for which the roof load carrier is designed for.

b) For non dedicated products, the test vehicle shall have the following characteristic:

- Vehicle from the production line (brand-new, second hand…)
- Wheelbase between 2 450 mm to 2 750 mm
- No pneumatic or electronic controlled suspension
- High of the roof between 1 400 mm to 1 650 mm

c) Loading of the test vehicle: driver and if necessary measuring equipment and co-driver.

F.2 Loading conditions

The roof load carrier device shall be loaded to 1,5 the authorized load as defined by the roof load carrier manufacturer.

F.3 Test track

Annexe K gives the instruction for the construction of the "Belgium Blocks" test track.

The length shall be at least 100 m.

F.4 Test procedure

This test shall be carried out as follows:

a) mount the device on the vehicle or on the test bench in accordance with the instruction for fitting and use;

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

c) drive the test vehicle at a constant speed of 15 km/h for 2 000 m on the Belgium Blocks test track;

d) drive the test vehicle at a constant speed of 25 km/h for 2 000 m on the Belgium Blocks test track;

e) drive the test vehicle at a constant speed of 35 km/h for 2 000 m on the Belgium Blocks test track;

f) measure and record the deflection, d.

Annex G
(normative)

Quasi static tests — Test procedure

G.1 Test procedure for mechanically fixed roof load carrier devices

G.1.1 Test procedure of resistance to resistance to lifting force, F_a

This test shall be carried out as follows:

a) mount the device on the vehicle or on the test bench in accordance with the instructions for fitting and use;

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 Annex L up to the required nominal value;

d) maintain 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, Fa/2.

G.1.2 Test procedure of resistance to longitudinal force, F_l

This test shall be carried out as follows:

a) mount the device on the vehicle or on the test bench in accordance with the instruction for fitting and use;

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 to Annex M;

d) progressively and continuously apply a forward longitudinal force, F_l, as shown in annex L up to the required nominal value, then immediately release the force;

e) measure and record the deflection, d as shown in Annex M;

f) progressively and continuously apply a backward longitudinal force, $-F_{l/2}$, as shown in annex L up to the required nominal value, then immediately release the force;

g) measure and record the deflection, d, as shown in Annex M.

G.1.3 Test procedure of resistance to 20° horizontal force, F_{lq}

This test shall be carried out as follows:

a) mount the device on the vehicle or on the test bench in accordance with the instruction for fitting and use;

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 to Annex M;

d) progressively and continuously apply a 20° horizontal force, F_{lq}, as shown in Annex L up to the required nominal value, then immediately release the force;

e) measure and record the deflection, d, as shown in Annex M.

G.1.4 Test procedure of resistance to lateral force, F_{lat}

This test shall be carried out as follows:

a) mount the device on the vehicle or on the test bench in accordance with the instruction for fitting and use;

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 to Annex M;

d) progressively and continuously apply a lateral force, F_{lat}, as shown in Annex L up to the required nominal value, so that the force is equally distributed over the number of units.

e) Maintain application of the force for 10 min, then immediately release the force;

f) Measure and record the deflection, d, as shown in Annex M;

g) progressively and continuously apply a lateral force, F_{lat}, in the opposite direction as shown in Annex L up to the required nominal value, so that the force is equally distributed over the number of units;

h) Maintain application of the force for 10 min, then immediately release the force;

i) Measure and record the deflection, d, as shown in Annex M.

G.1.5 Test procedure of resistance to ladder lifting force, $F_{a\ lad}$

This test shall be carried out as follows:

a) mount the device on the vehicle or on the test bench in accordance with the instruction for fitting and use;

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 to Annex M;

d) progressively and continuously apply upward a ladder lifting force, $F_{l\ lad}$, as shown in Annex L up to the required nominal value;

e) progressively and continuously apply downward a ladder lifting force, $F_{l\ lad}$, as shown in Annex L up to the required nominal value.

G.2 Test procedure for magnetic fixing roof load carrier devices

Each test described in G.1 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 testing tool specified in 6.5 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 testing tool specified in 6.5 b) is not provided by the device manufacturer;

Annex H
(normative)

Test procedure — Specific roof container tests

H.1 Impact test

The impact test device shall be metallic, see Figure H1. Mass of the impact device: 2,5 kg.

This test shall be carried out as follows:

— install the test device in a vertical position as shown in Figure H.1;

— install the impact test device in the roof container as shown in Figure H.2;

— drop the impact device.

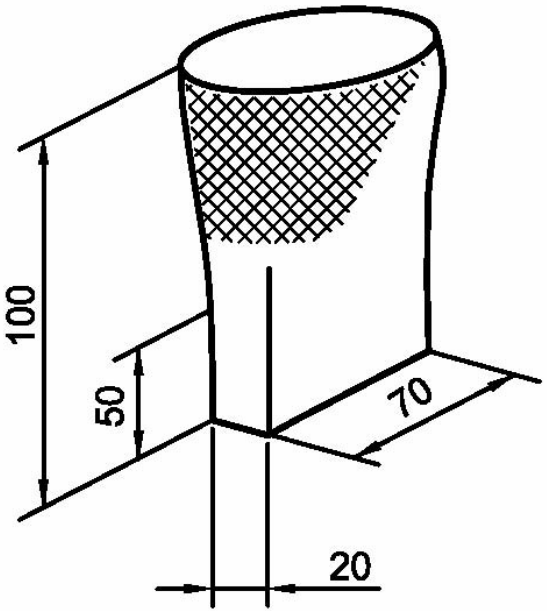


Figure H.1 — Impact test device

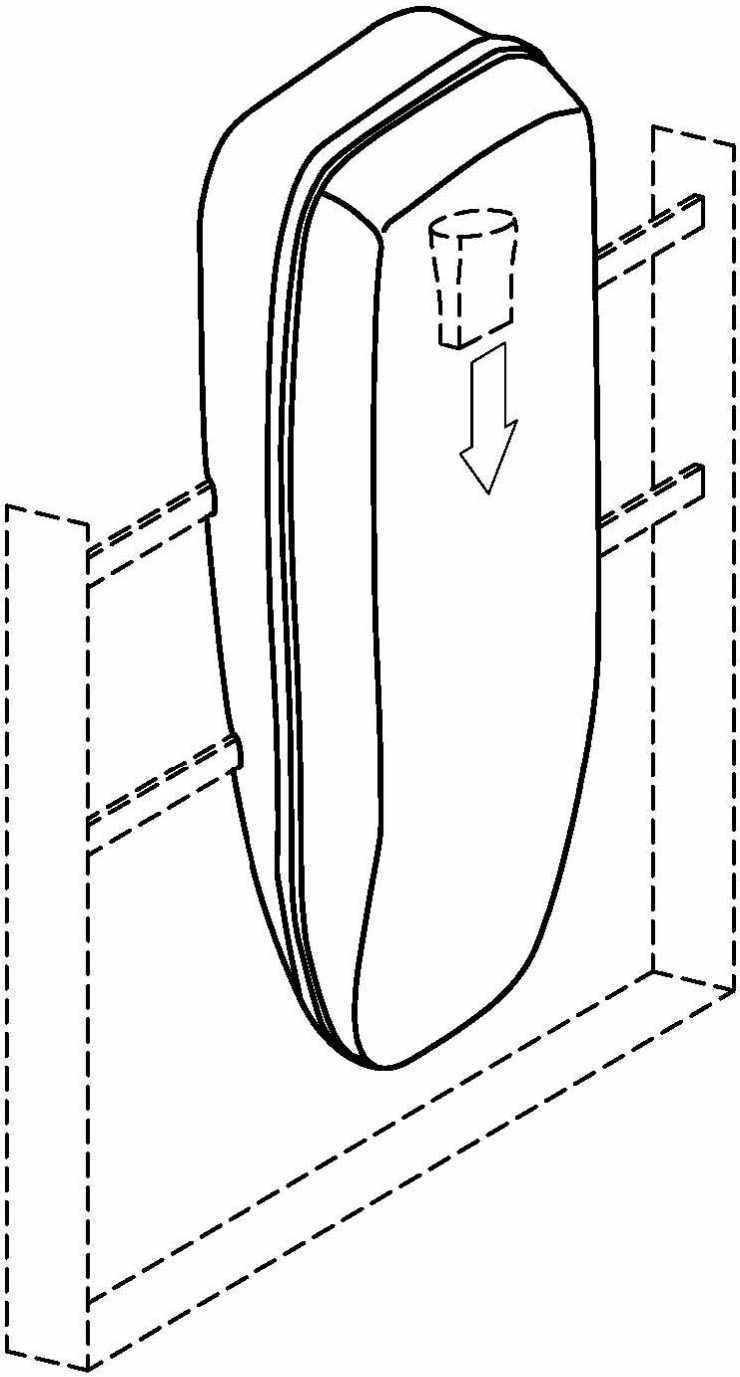


Figure H.2 — Impact test configuration

H.2 Hinges test

Nominal value of the effort: 750 N

This test shall be carried out as follows:

— install the test device in reverse horizontal position as described in Figure H.3;

— load the test device to the required value using sand. The load shall be uniformly distributed over the test device;

— progressively raise the test device as shown in Figure H.3;

— maintain this position for 10 minutes.

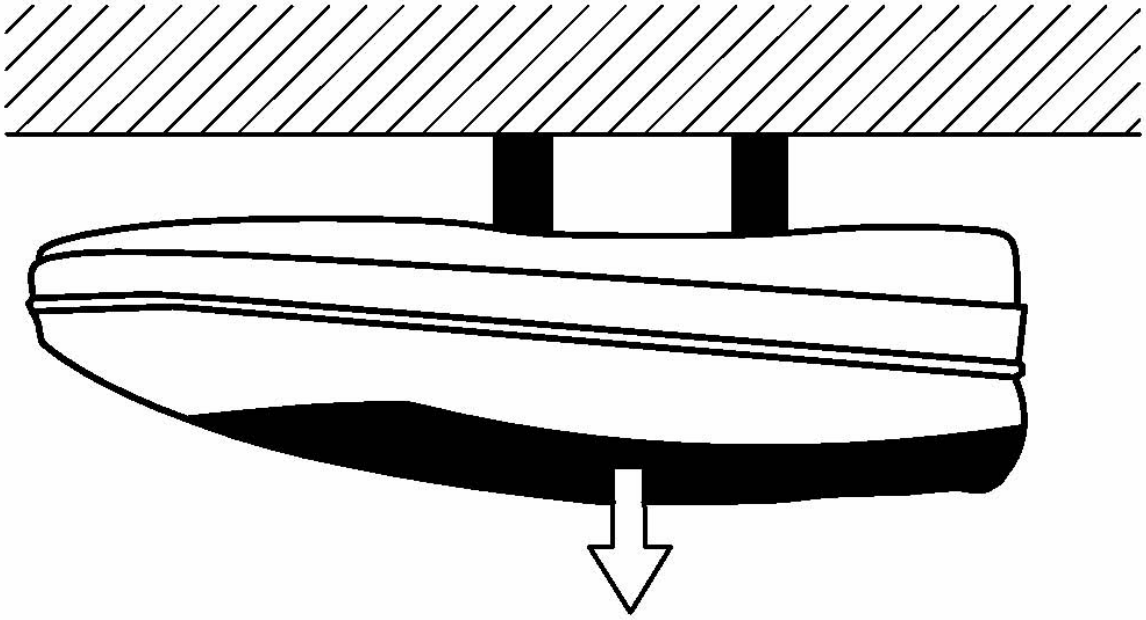


Figure H.3 — Hinge test

Annex I
(informative)

Example for safety instructions in the instruction for use

This annex gives an example of wording for safety instruction in the instruction use delivered with the roof load carrier devices.

The individual operations and steps described in these Assembly and Mounting Instructions as well as the Safety Indications for First or Repeated Mounting and Handling of the roof rack must absolutely be followed.

The roof rack is designed such that with proper assembly, mounting and operation no damage can occur to the vehicle.

The permitted roof load of (state value) kg must not be exceeded. (For the calculation of payload cf. Annex B).

Assembly and mounting must be carried out in accordance with the instructions.

Before any journey, all screw connections and connections of the roof bars and all other supports must be checked for tight fit and tightened if required.

After any interruption of a journey during which the vehicle with roof rack has been left unsupervised, all freely accessible fixations of the roof rack and of the load should be checked for tight fit and function ability (check for damage due to outside intervention).

Whenever roof racks are refitted to the vehicle roof and after any new loading of roof racks, roof racks and loads shall be checked the first time after a short period of driving, 50 km or 30 minutes maximum, for tight fit and function ability and tightened if necessary. Especially on longer journeys, screw connections between roof bars and the vehicle roof must be checked at regular intervals – after 500 km at the latest – for firmness and tightness and must be retightened if necessary. On bad terrain, a check on screw connections must be repeated at intervals of two hours of driving.

Pieces of luggage must be distributed evenly, the centre of gravity must be kept as low as possible; the load must be secured against slipping using appropriate belts (not elastic belts with or without hooks).

Attention: The behaviour of the car when driving it changes depending on the load carried.

Sudden braking, abrupt starts and fast driving round bends should be avoided as far as possible.

When carrying a load on the roof the driving speed has to be adjusted to outside conditions such as the road surface, side winds, the general traffic situation etc. It is recommended to keep to the speed recommendation for any road.

With roof racks, the national regulations must be followed, (e.g. StVZO – German Highway Admission code, French Code de la Route …).

For reasons of fuel economy and for the safety of other road users, roof racks should be dismantled from the car when not in use.

Never drive into a car wash with roof racks fitted.

When driving with roof racks with or without load in garages or closed parking lots, under bridges, subways or tunnels the significantly greater height of the vehicle must be taken into account. If this is neglected, collisions with even major damage to property and/or personal injury may be the consequence.

Annex J
(informative)

Determination of allowable additional mass

The maximum payload on a roof rack is limited by

— the maximum permitted weight on the vehicle roof

— the maximum permitted weight of the roof rack

— the payload of the vehicle

For the calculation of the payload and examples of calculations: see Table J1

Table J.1 — Calculation of the Payload

Reference	to be taken into account	Example 1	Example 2	Example 3
a	maximum permitted weight on the vehicle roof as specified by the vehicle manufacturer	60	75	100
b	payload as specified by the vehicle manufacturer	350	500	650
c	maximum load carrying capacity of roof rack	75	50	100
d	assumed load (75 kg/person + luggage)	300	380	450
e	deadweight of roof rack	10	5	20
f	vertical load on ball coupling	0	50	75
g	maximum payload on roof rack – the lowest of the following calculated values:			
	g = a - e	50	70	80
	g = c	75	50	100
	g = b – (d + e + f)	40	65	105
	permitted payload	40	50	80

Annex K
(normative)

Instructions for the construction of the "Belgian Block" test track

This annex gives the instruction for the construction of the "Belgian Block" test track according to M.I.R.A. (Motor Industry Research Association) Bulletin III / 49.

K.1 Width of roadway

The width of the roadway shall not be less than 3,70 m

K.2 Surface

The surface of the testing route is deliberately intended to be uneven in order to correspond to a paved road in bad condition.

In the longitudinal direction of the roadway there shall be raised areas and depressions at intervals between 600 mm and 1500 mm with relative depths of up to 75 mm. The indentations shall be pan-shaped and of elliptic contour, the longitudinal axis of which is to lie parallel to the direction of travel.

The height of the individual blocks shall differ as much as possible and at random with a tolerance of ± 25 mm from the average height.

K.3 Hardness

Although the surface of the roadway is intended to represent a poor quality road, it is constructed solidly so as not to deteriorate with use.

K.4 Dimension of the blocks

The dimensions of the blocks are as follows:

Width: 130 ± 10 mm

Length: 150 mm to 230 mm

Height: 100 mm to 150 mm

K.5 Material

The blocks shall be made in granite

K.6 Base

The base shall be concrete, laid so as to provide a foundation for the irregularities described in A2.

K.7 Pavement

The mortar that is so to receive the blocks consists of a compound of dry cement and sand. The blocks are set in the mortar so that the result is a random arrangement of elevations and indentations. It must be taken into account that this construction is to be suitable for forming a pavement that is inflexible and therefore is different from the usual pavement. In that way the blocks are to remain in almost the same position in which they are originally laid.

K.8 Space between the blocks

The space between the blocks is to be (24 ± 5) mm. Into this space wet mortar mixed with stone chipping is to be swept until about 10mm below the upper edge of the deepest set blocks. The remaining 10mm may be filled with clay so that the road is more slippery when it is wet.

K.9 Border and exits

A rigid sloping border is to be provided on each side of the roadway. Entrance and exit ramps with a 1 in 20 descending slope shall be provided at the ends of the roadway.

K.10 Camber of roadway

Because of the irregularities of the roadway, no camber is specified.

Annex L
(normative)

Force application

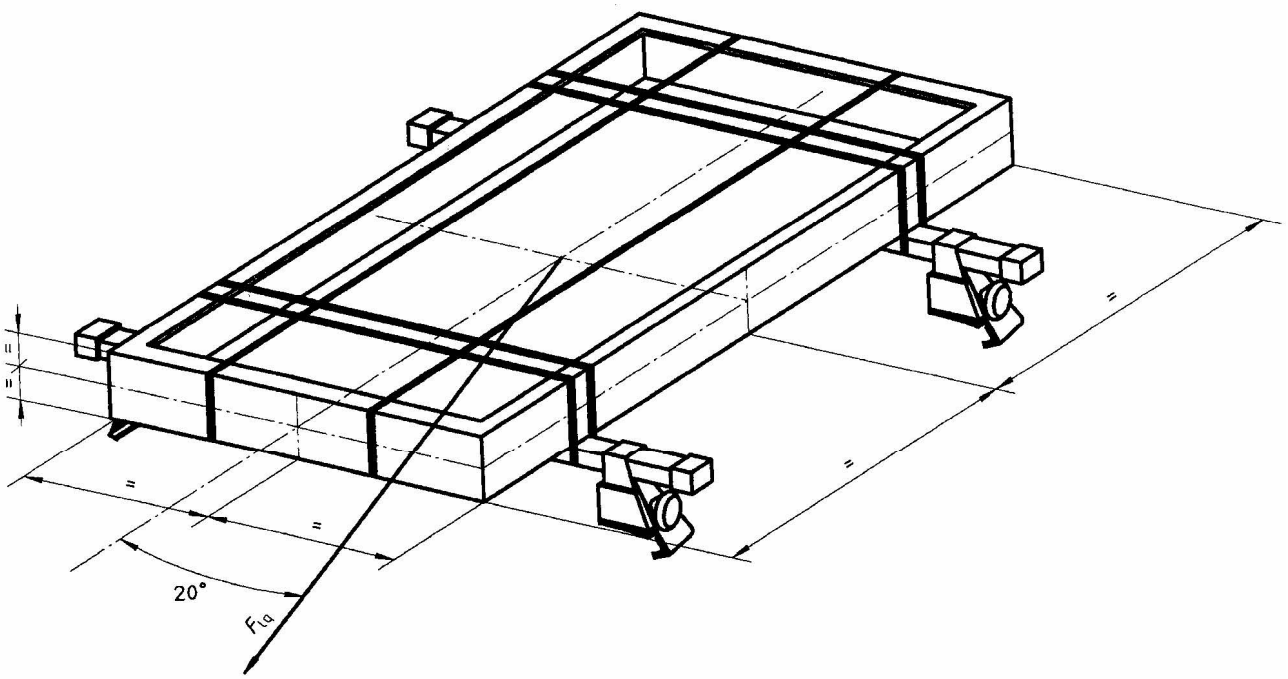
L.1 Location of point of application of the force

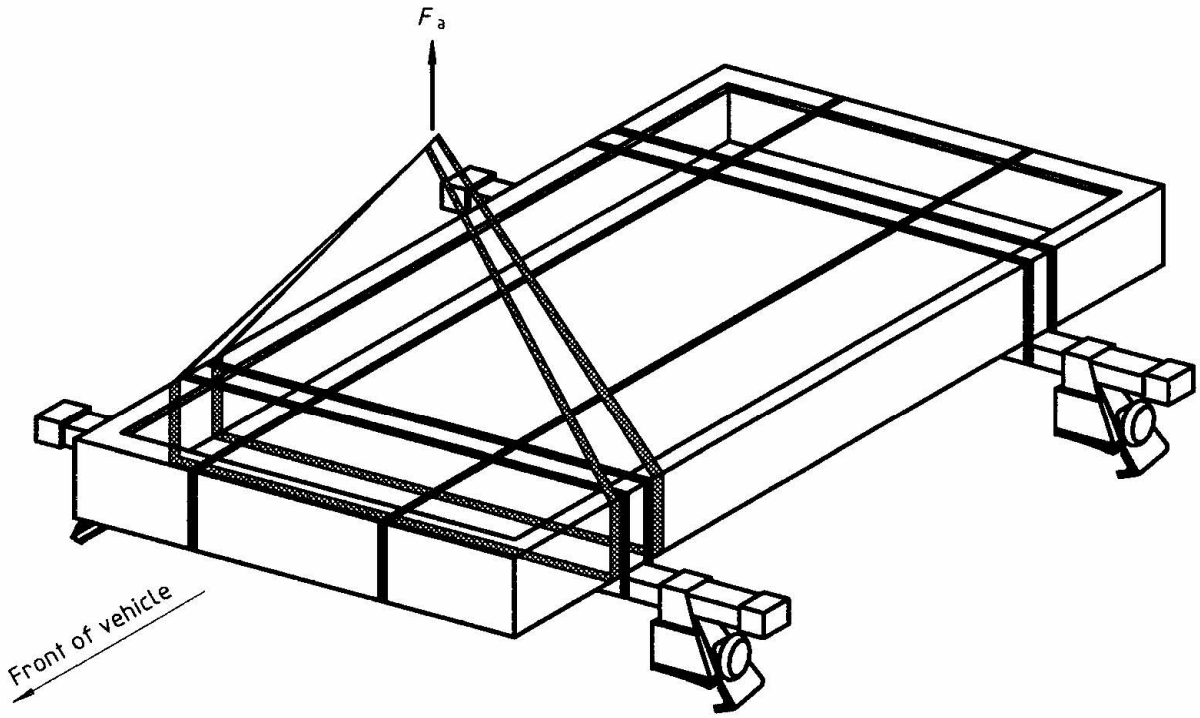
The location of point of application of the static forces shall be in accordance with Table L1 and Figures L1 to L8.

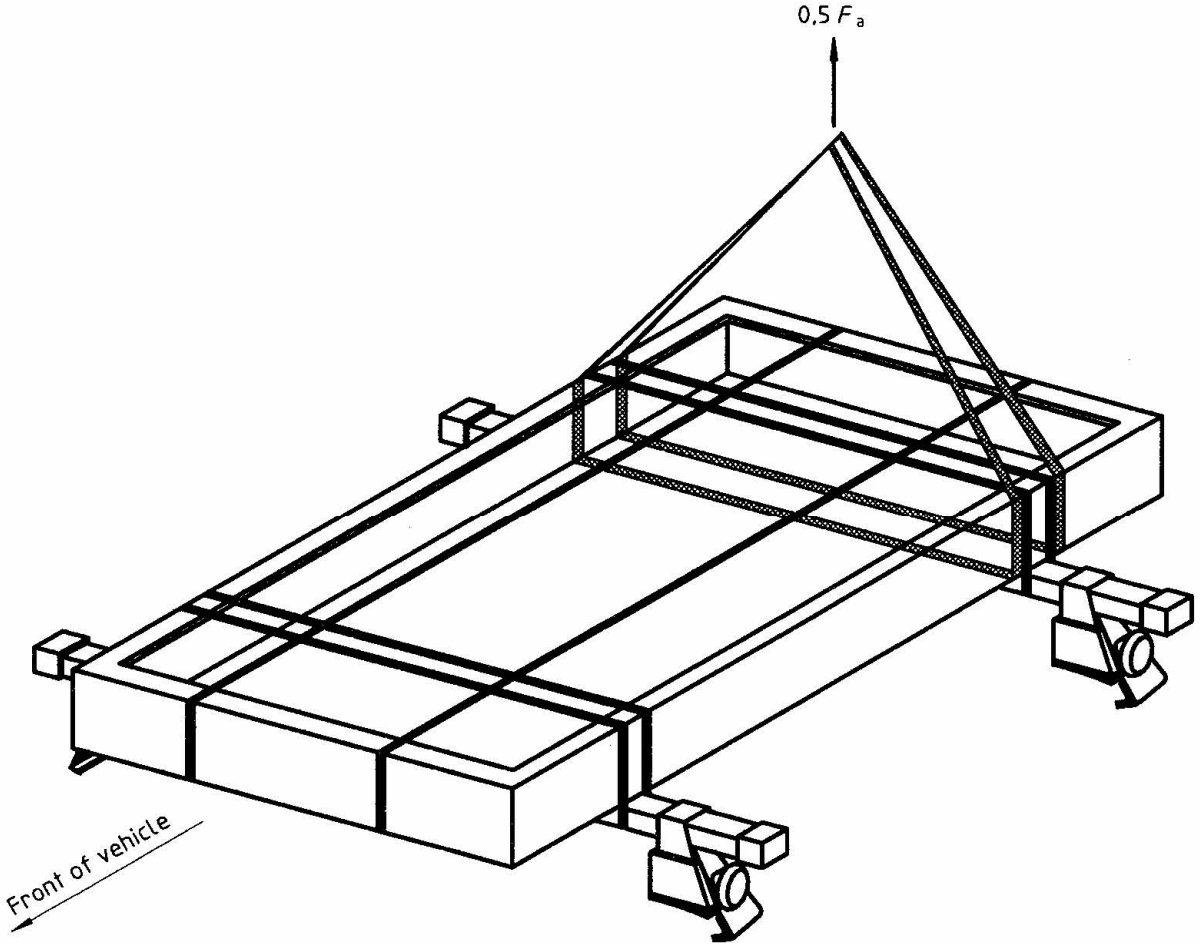
Table L.1 — Location of the point of application of the static forces

Roof load carrier	Distance in mm of the point of application of the force from the loading area ± 5mm	The force is applied
Test box	See Figure L1	See Figure F1
Wind deflector	**See Figure L2**	**See Figure L2**
Roof rack	See Figure L1	See Figure L1, above the centre of gravity on the front frame of the test box.
luggage rack	50 mm	over width of front barrier; applied evenly without loading; for roof racks without barriers cf. Figure L1.
Ski/snowboard carriers	See Figure L8	in the centre of gravity of the “test skis” or of the snowboard (see Figure L8)
Sailboard carrier	at the centre of gravity of board	over the sailboard or equivalent substitute device
bicycle carrier	at the centre of gravity of the bicycles (see Figure L5)	over the bicycles or equivalent substitute device(s)
Wheel carrier	See Figure L6	See Figure L6
Canoe carrier	at the centre of gravity of the boats to be carried	through the centre of gravity on the front edge of the boat or equivalent substitute device.
roof container	at the centre of gravity of the container	through the centre of gravity onto the entire container or equivalent substitute device.
luggage basket	(100 ± 20 mm)	over width of front barrier; applied evenly without loading; for roof racks without barriers cf. Figure L1.

L.2 Test box







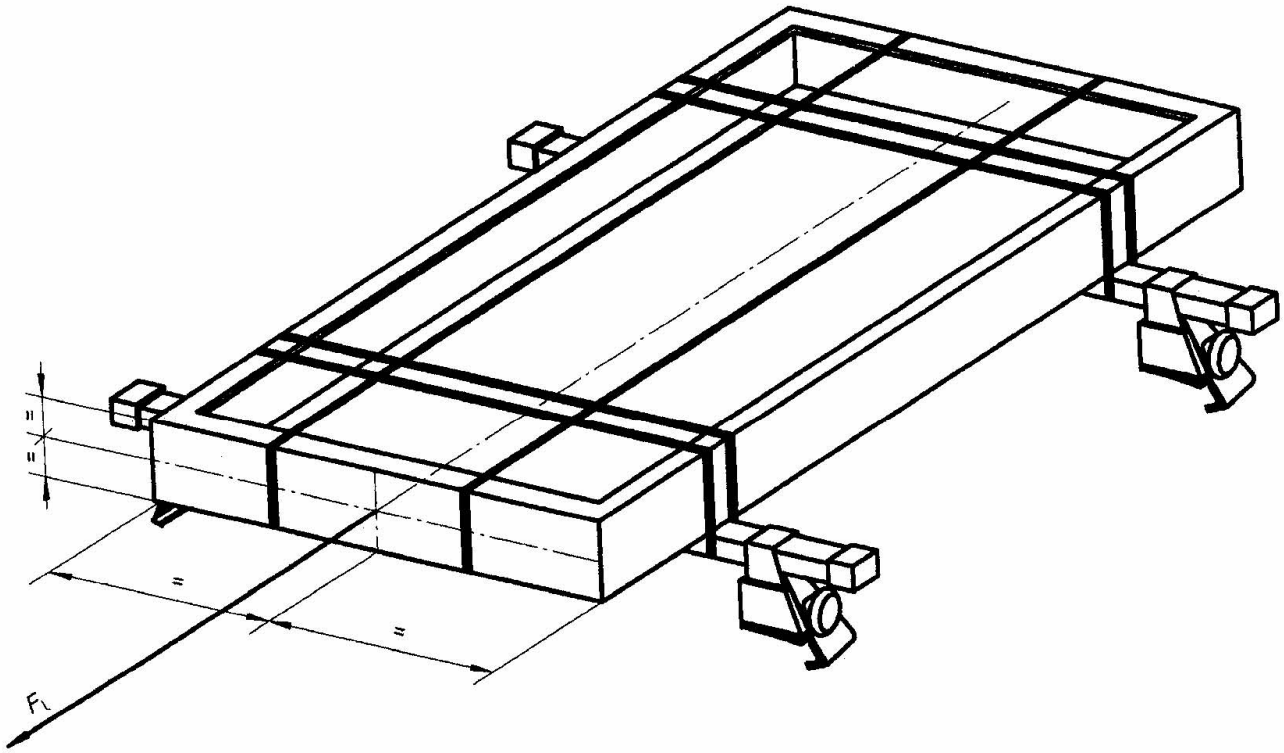


Figure L.1 — Test box

L.3 Wind deflector

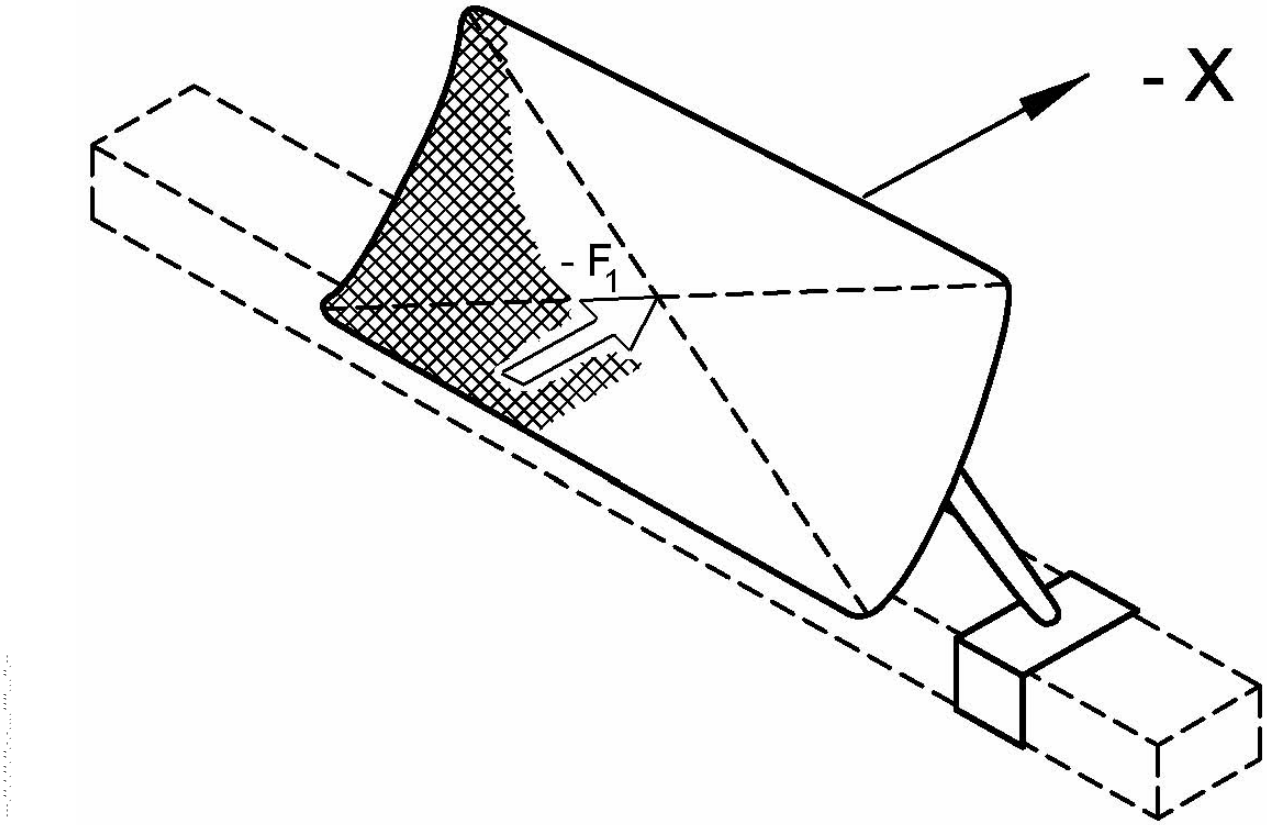
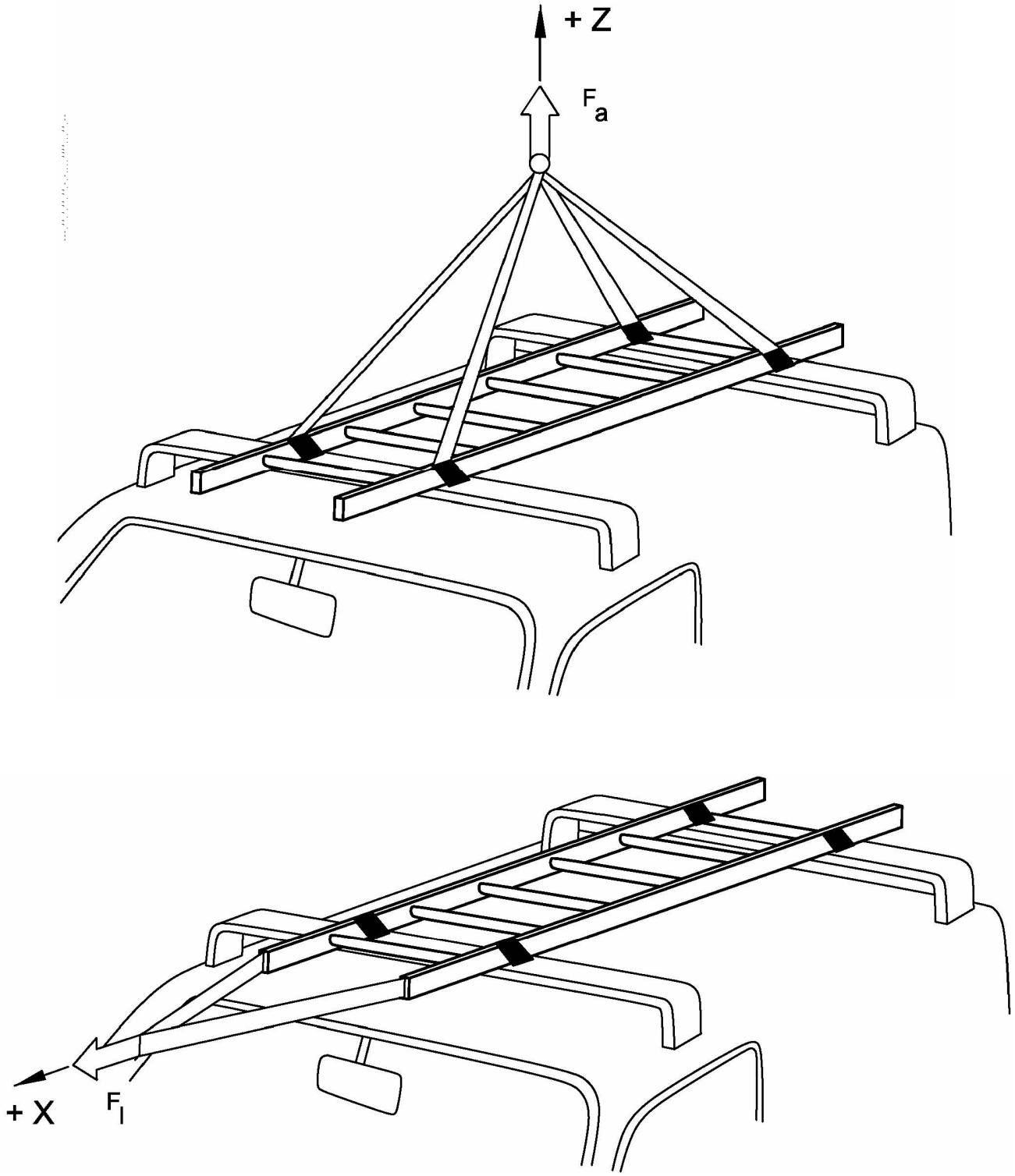


Figure L.2 — Wind deflector

L.4 Roof rack

See L 2.

L.5 Ladder



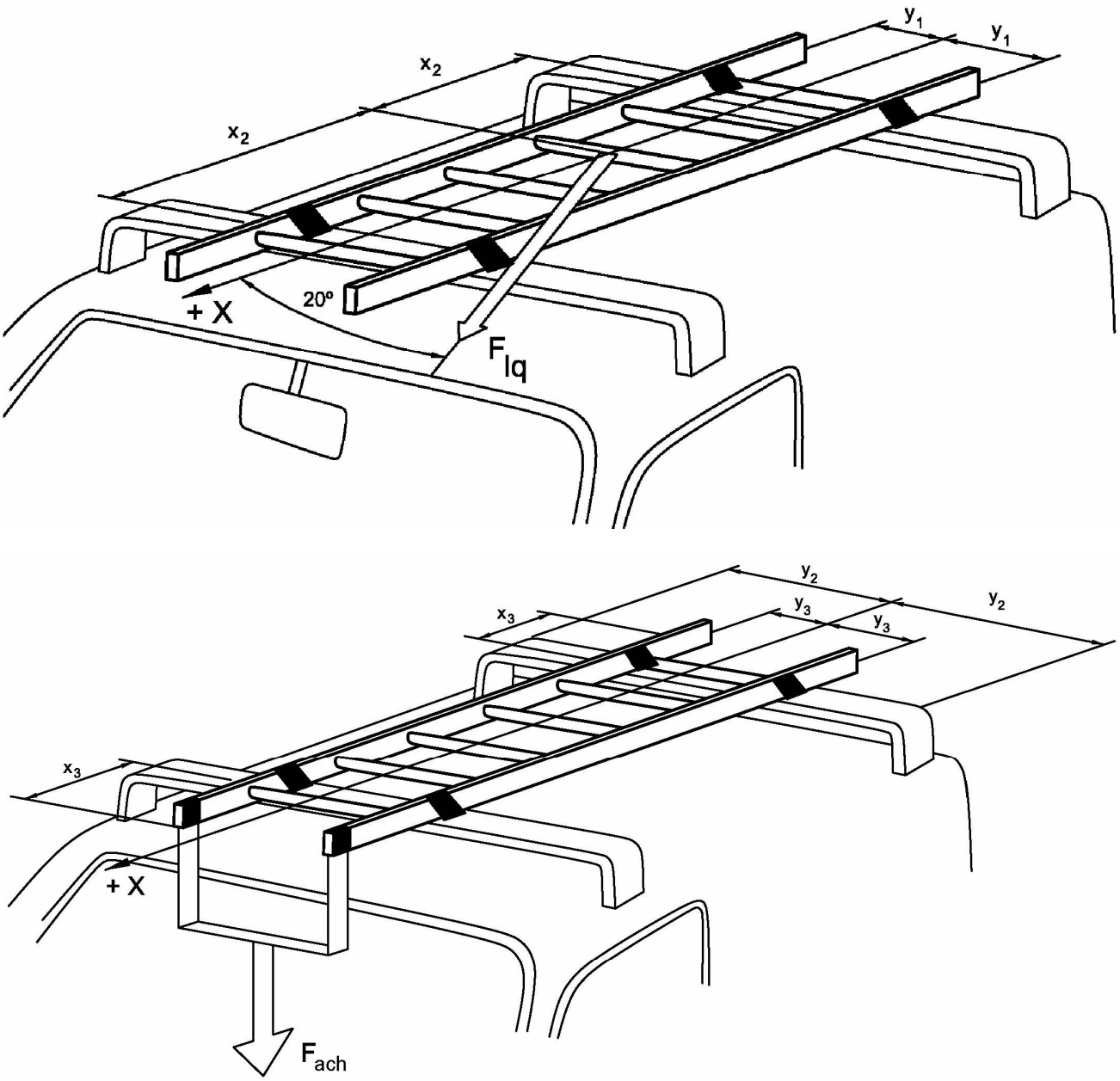


Figure L.3 — Ladder holder

L.6 Sailboard mast

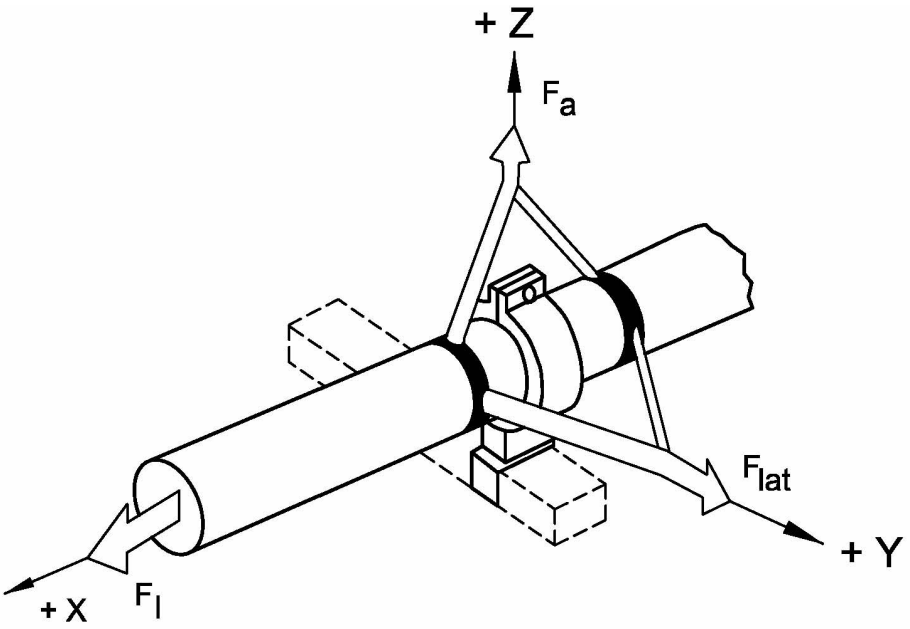
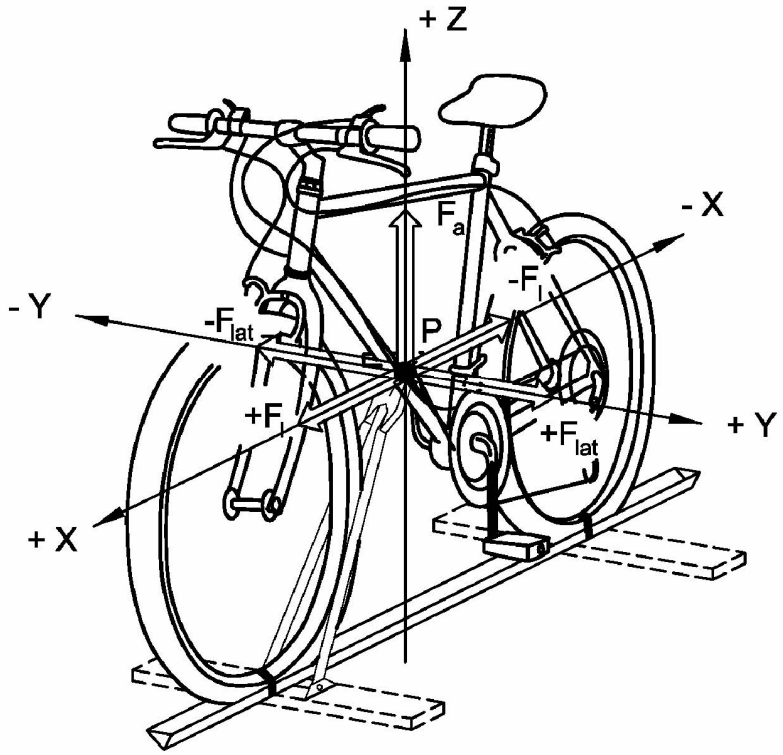


Figure L.4 — Sailboard mast

L.7 Bicycle carrier



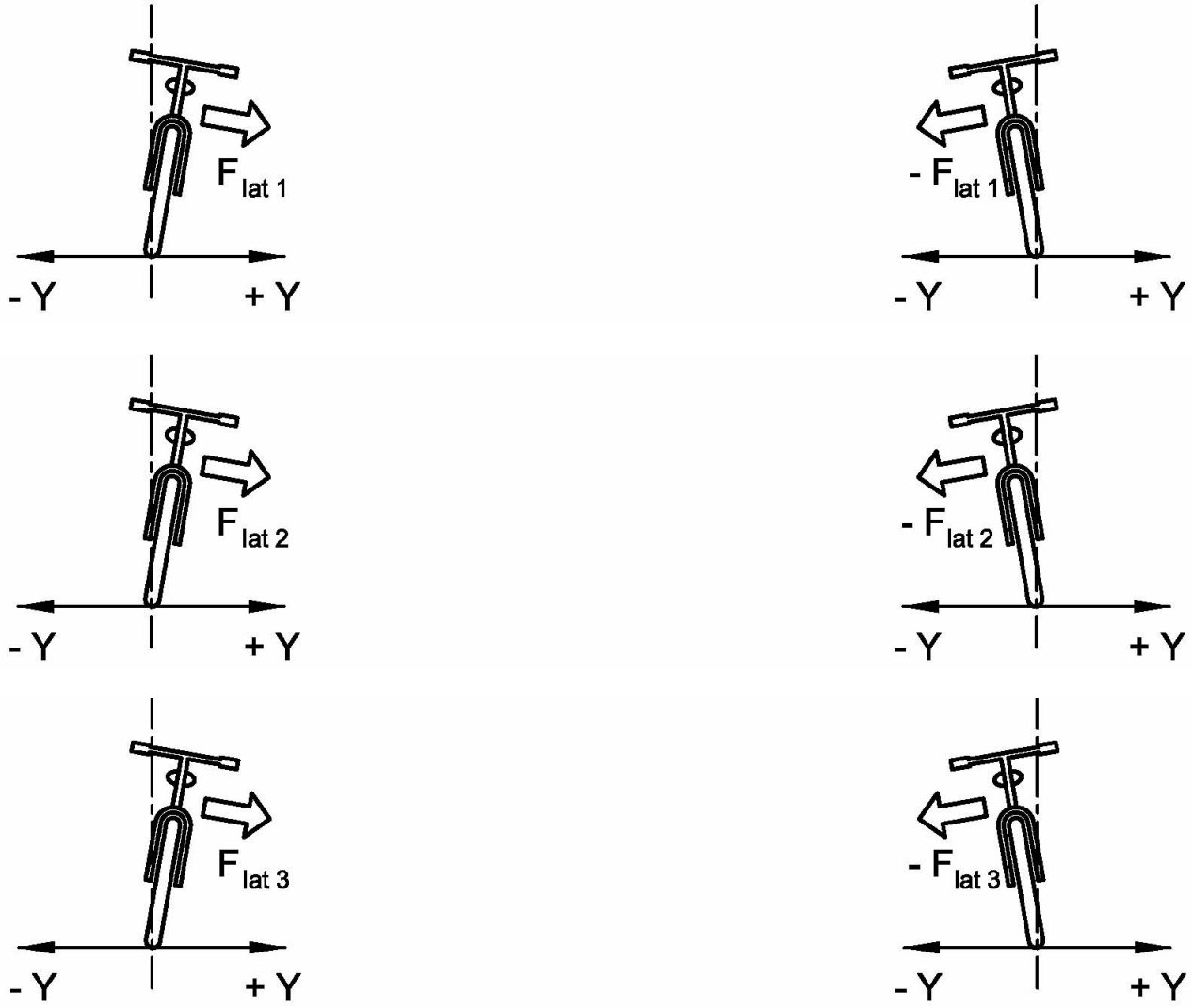


Figure L.5 — Bicycle carrier

L.8 Wheel carrier

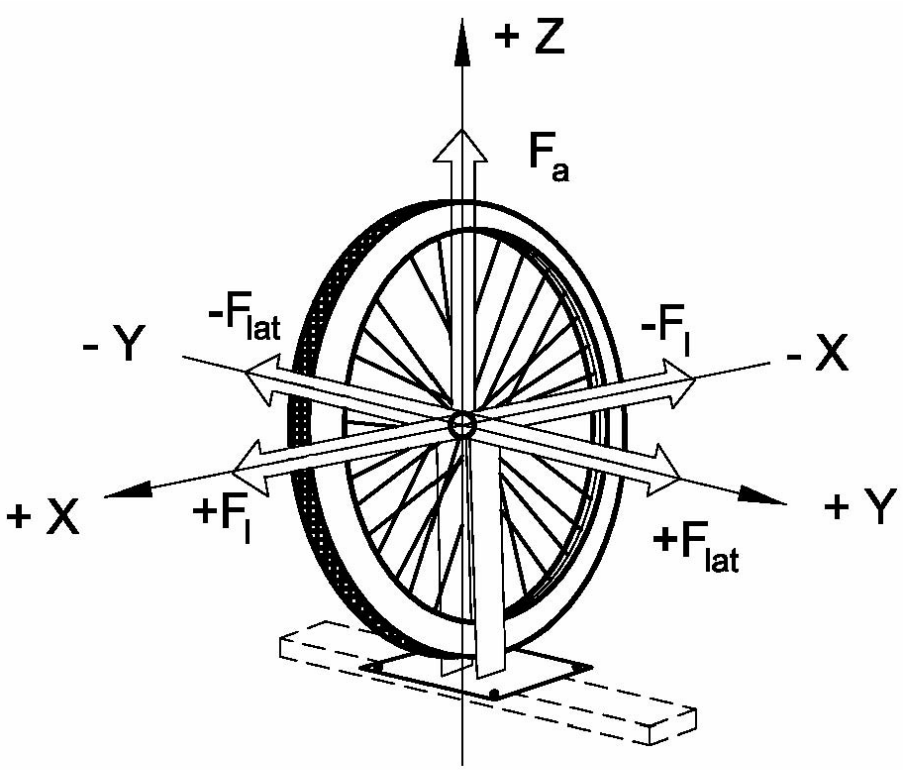


Figure L.6 — Wheel carrier

L.9 Sailboard or surfboard

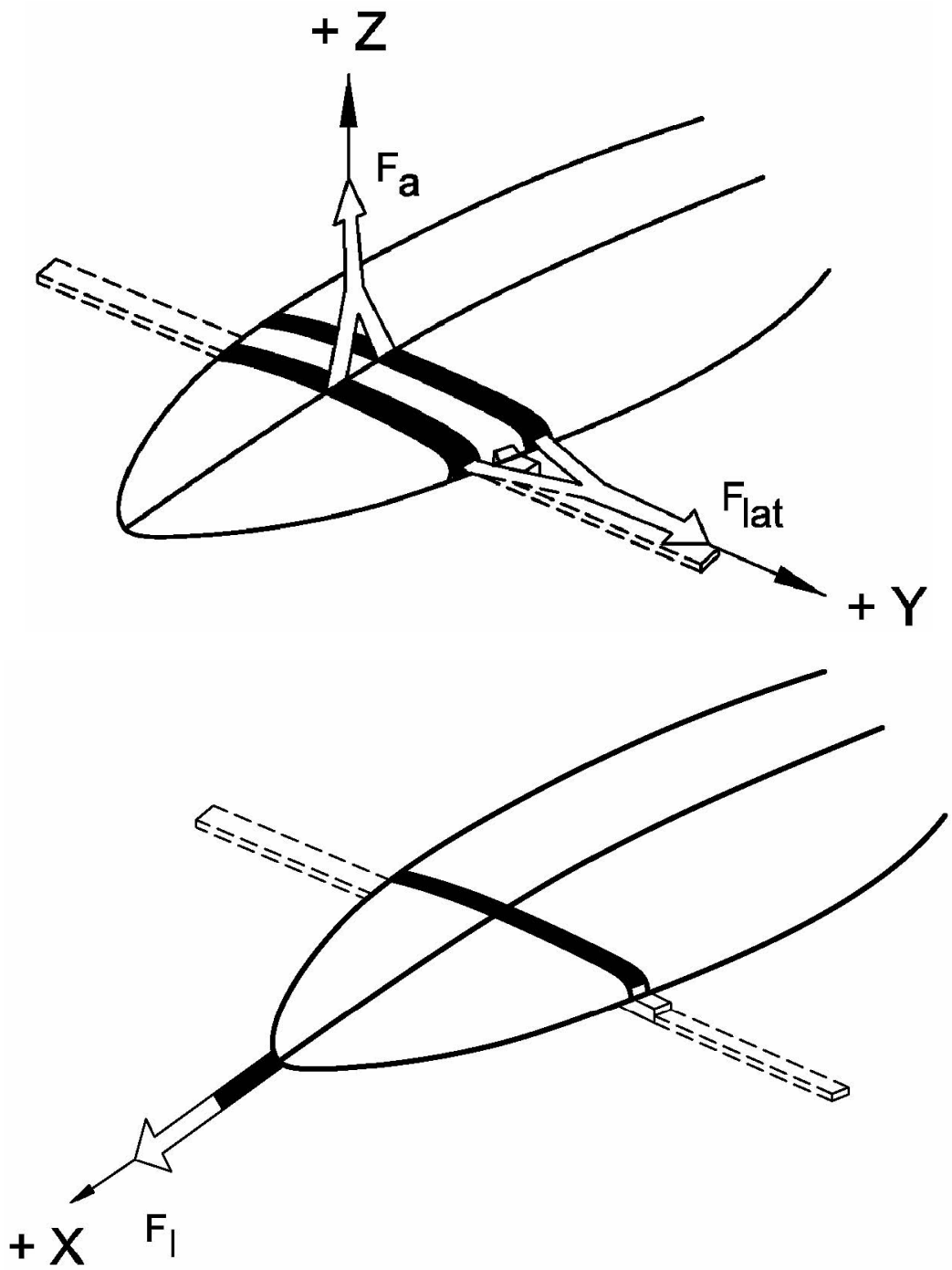
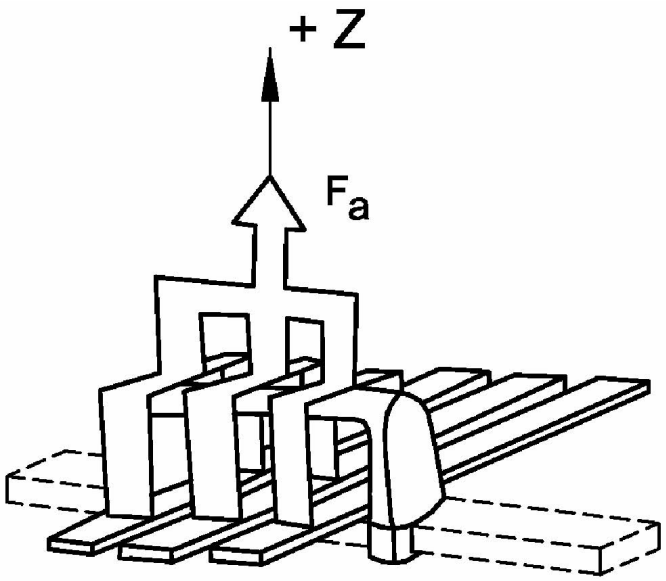
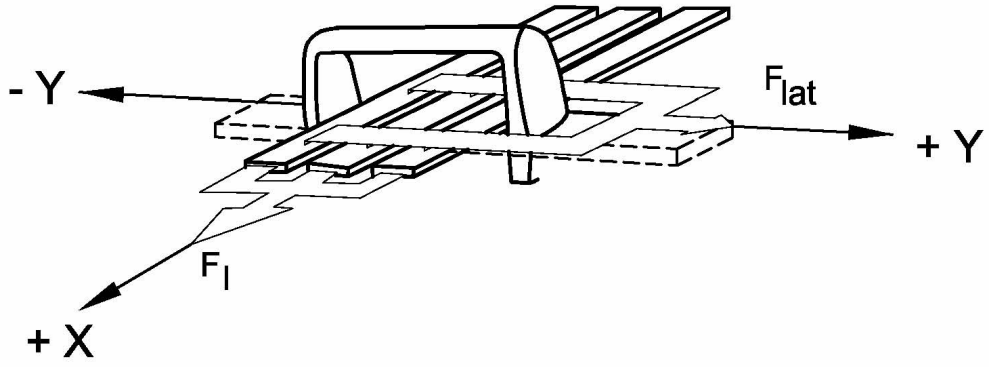


Figure L.7 — Surfboard carrier

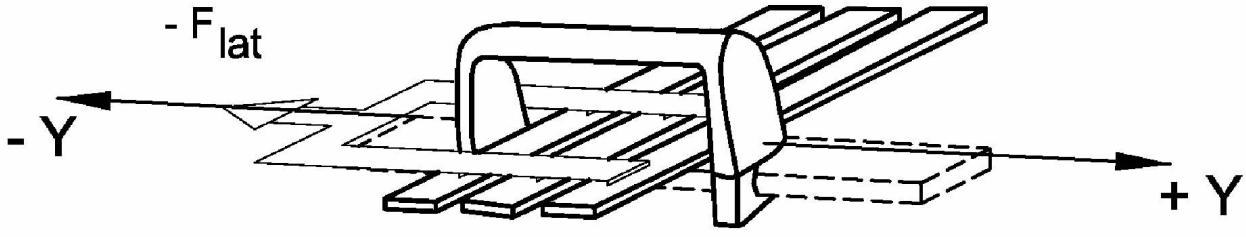
L.10 Skis or snowboard



a) Lifting force F_a



b) Forward longitudinal force F_l and lateral force F_{lat}



c) Lateral force F_{lat}

Figure L.8 — Skis carrier

Annex M
(normative)

Measuring deflection, d

M.1 Roof bars

The deflection, d, shall be measured according to Figure M1.

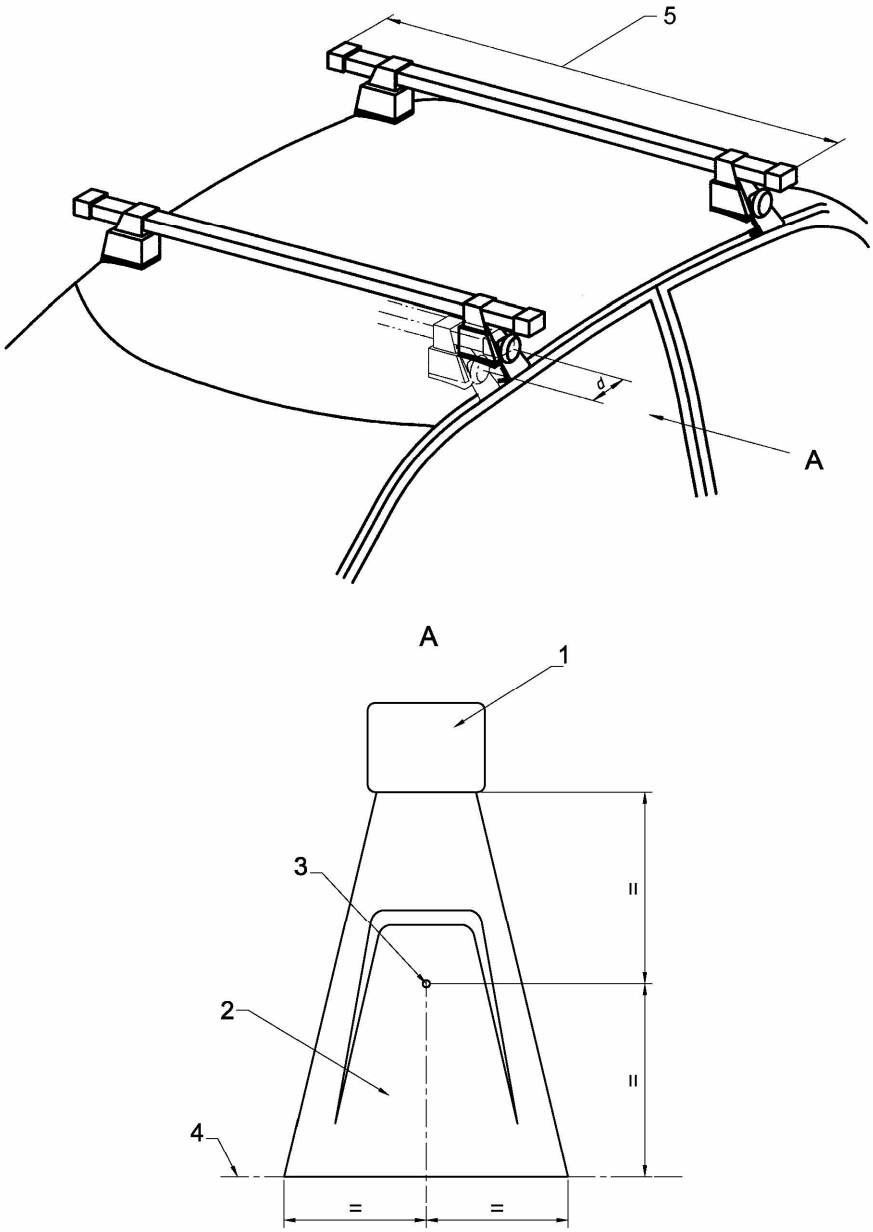


Figure M.1 — Roof bars

Key

1 bar
2 fixing clamp
3 measuring point
4 fixing level
5 bar length

M.2 Magnetic roof load carriers

The deflection, d, shall be measured according to Figures M.1, M.7.

M.3 Additional accessories

M.3.1 Roof deck

The deflection, d, shall be measured according to Figure M.2.

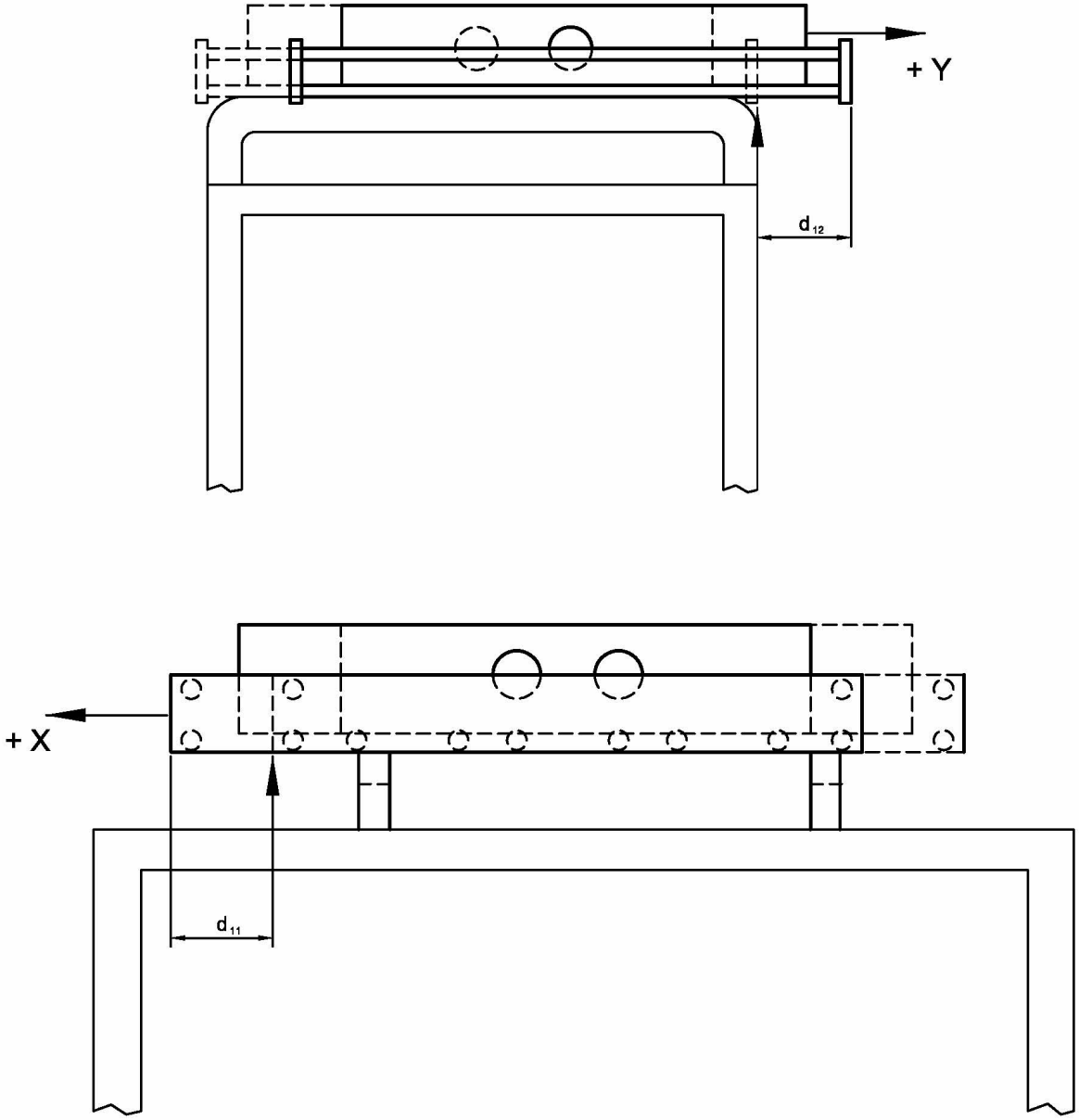


Figure M.2 — Roof deck

M.3.2 Roof container

The deflection, d, shall be measured at the fixation points of the roof container to the roof bars according to Figure M.3.

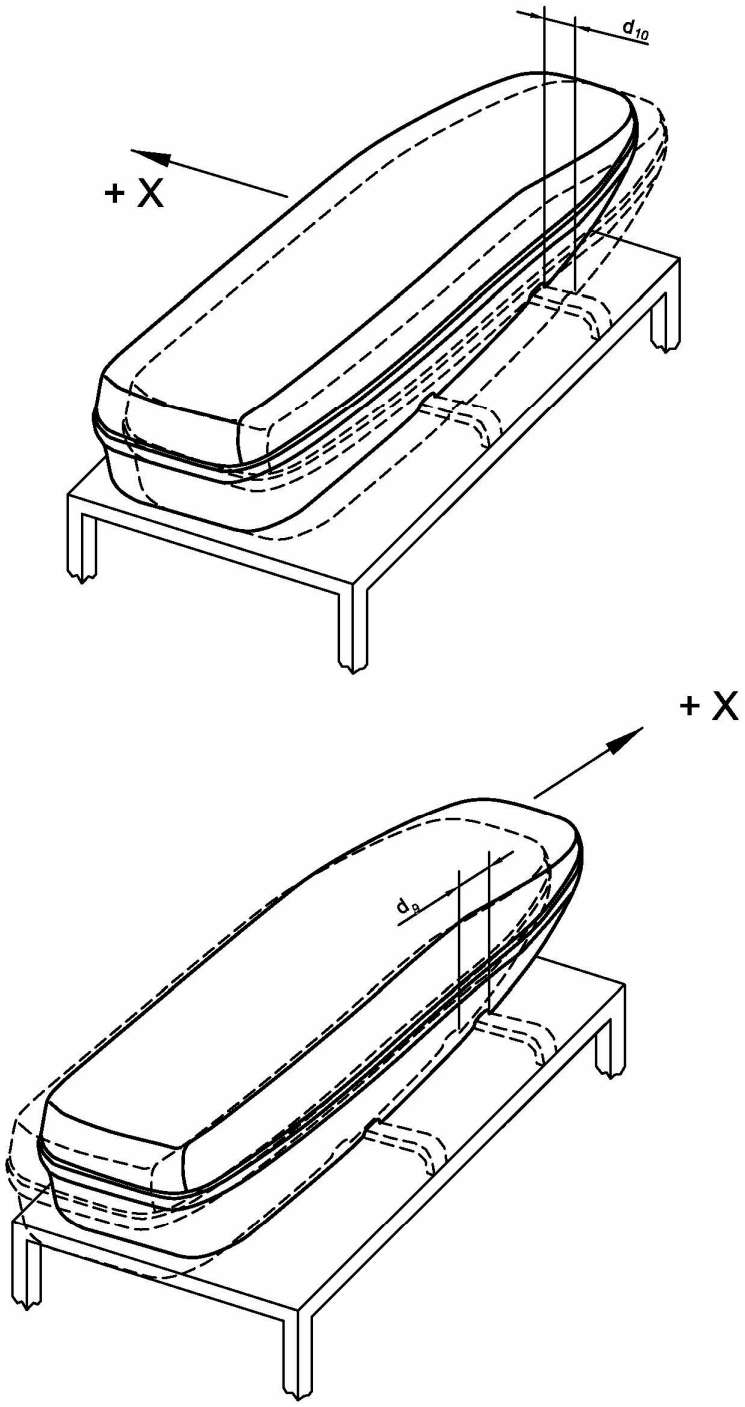


Figure M.3 — Roof container

M.3.3 Sailboard mast

The deflection, d, shall be measured according to Figure M.4.

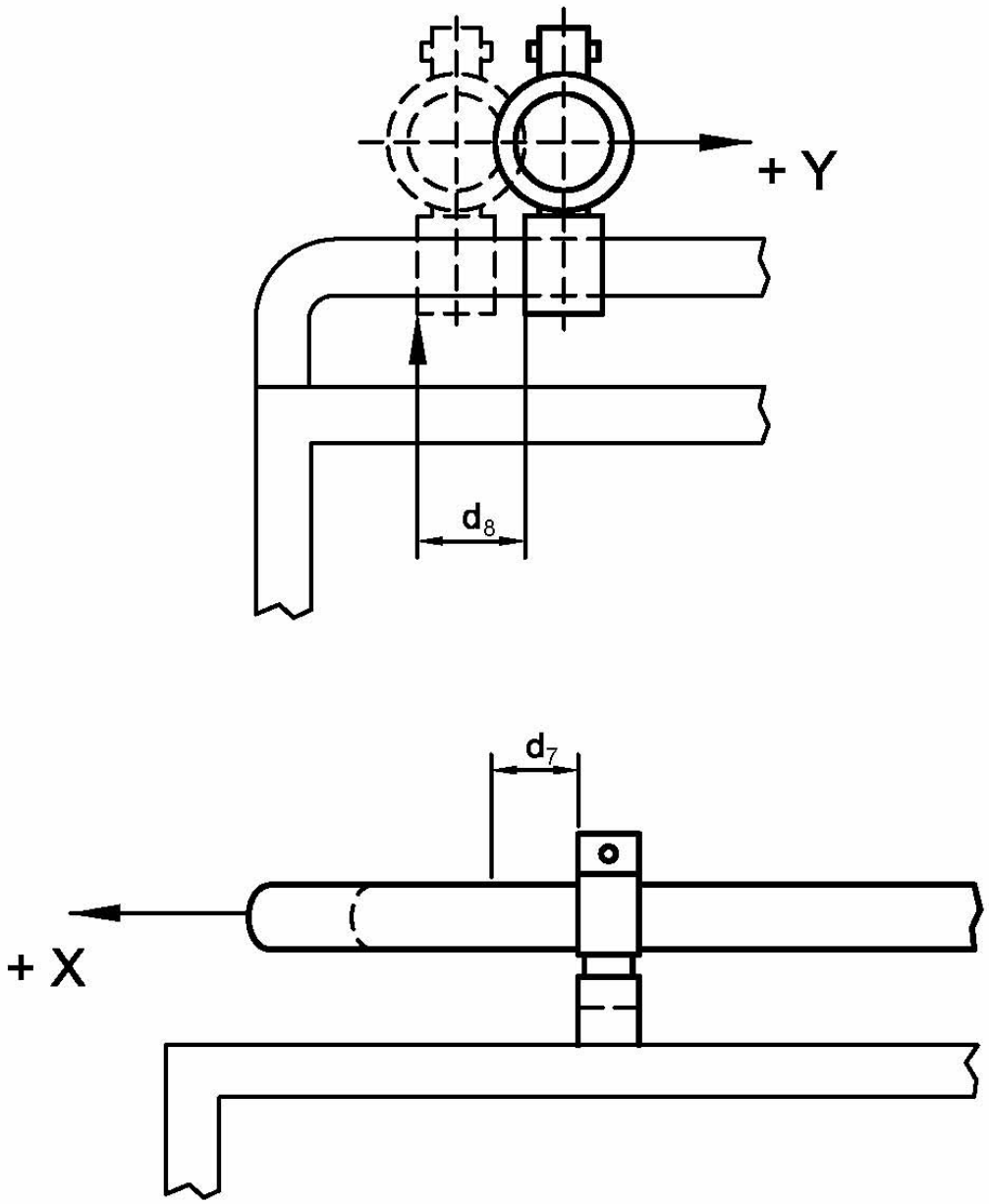


Figure M.4 — Sailboards mast

M.3.4 Surfboard

The deflection, d, shall be measured according to Figure M.5.

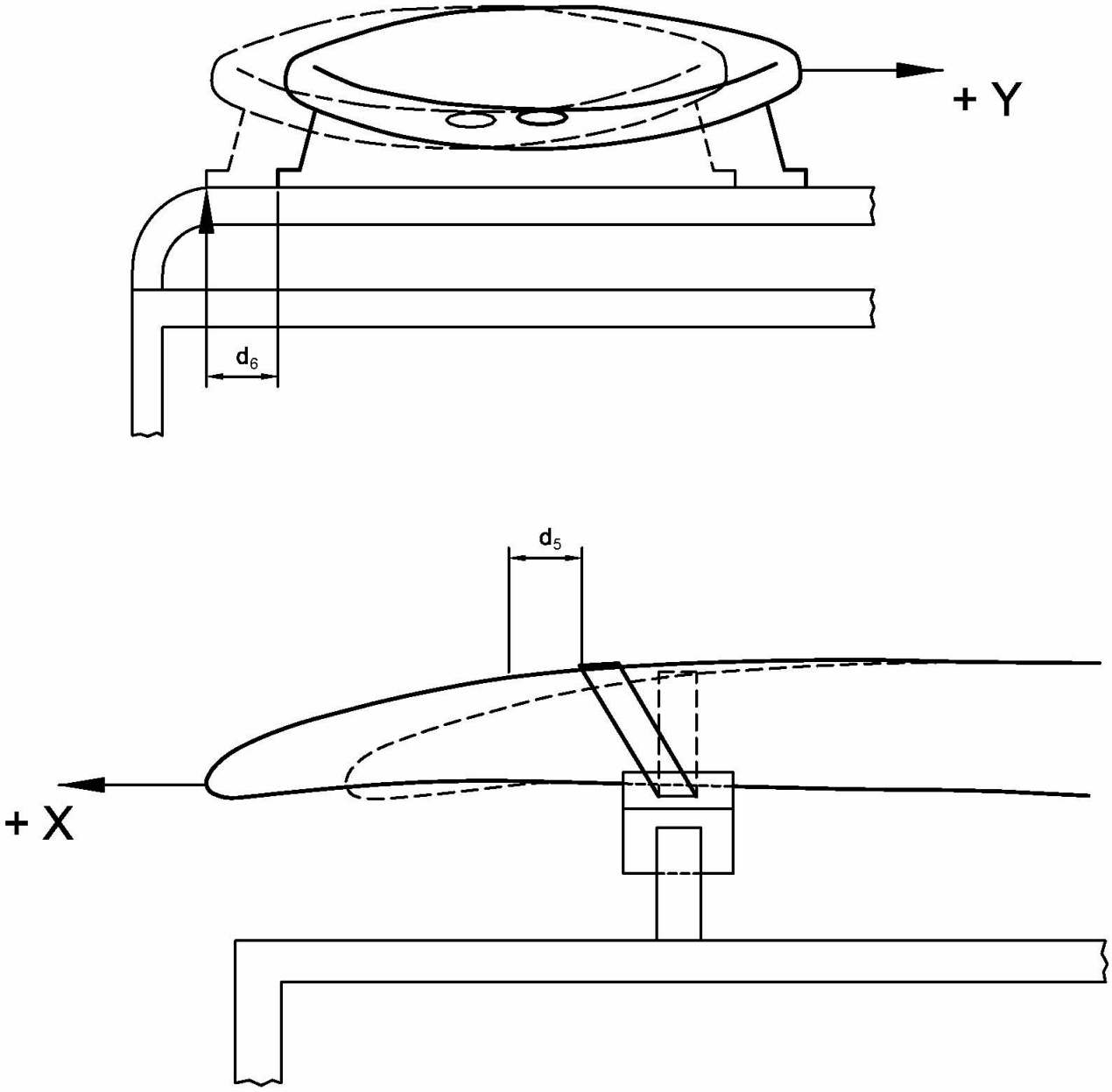


Figure M.5 — Surfboard

M.3.5 Wheel carrier

The deflection, d, shall be measured according to Figure M.6.

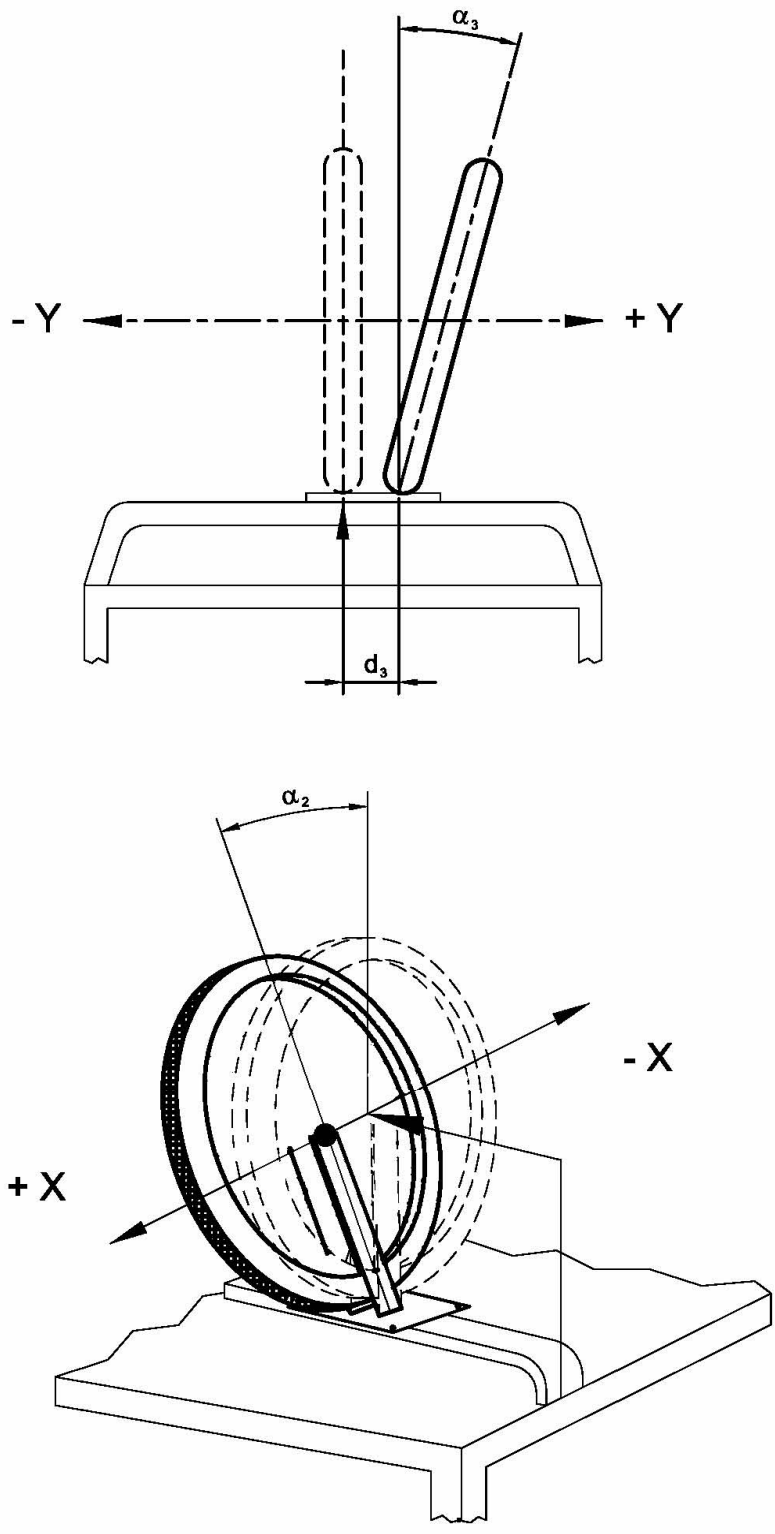


Figure M.6 — Wheel carrier

M.3.6 Skis or surfboard carrier

The deflection, d, shall be measured according to Figure M.7.

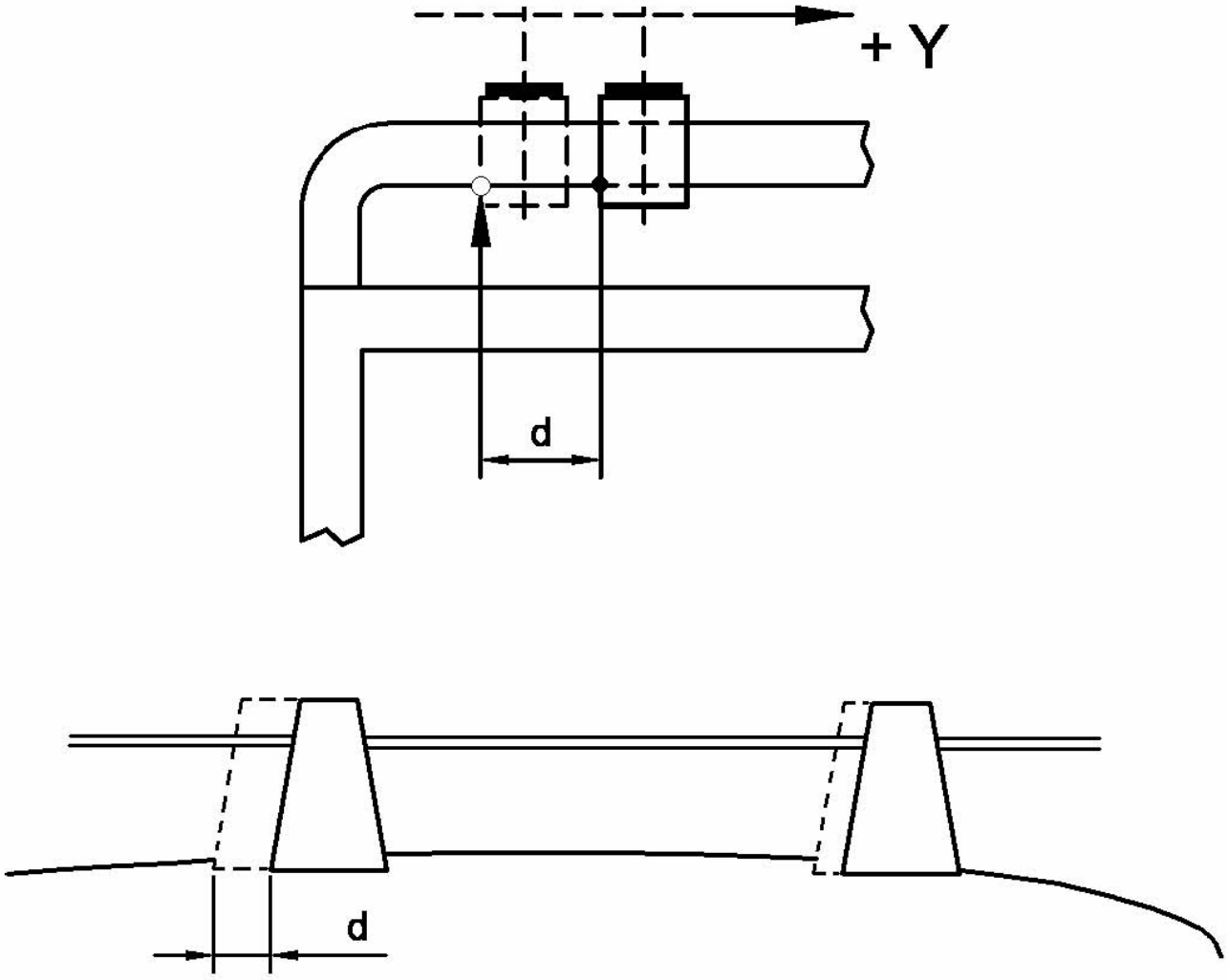


Figure M.7 — Skis carrier

M.4 Ladder holder

The deflection, d, shall be measured according to Figure M8.

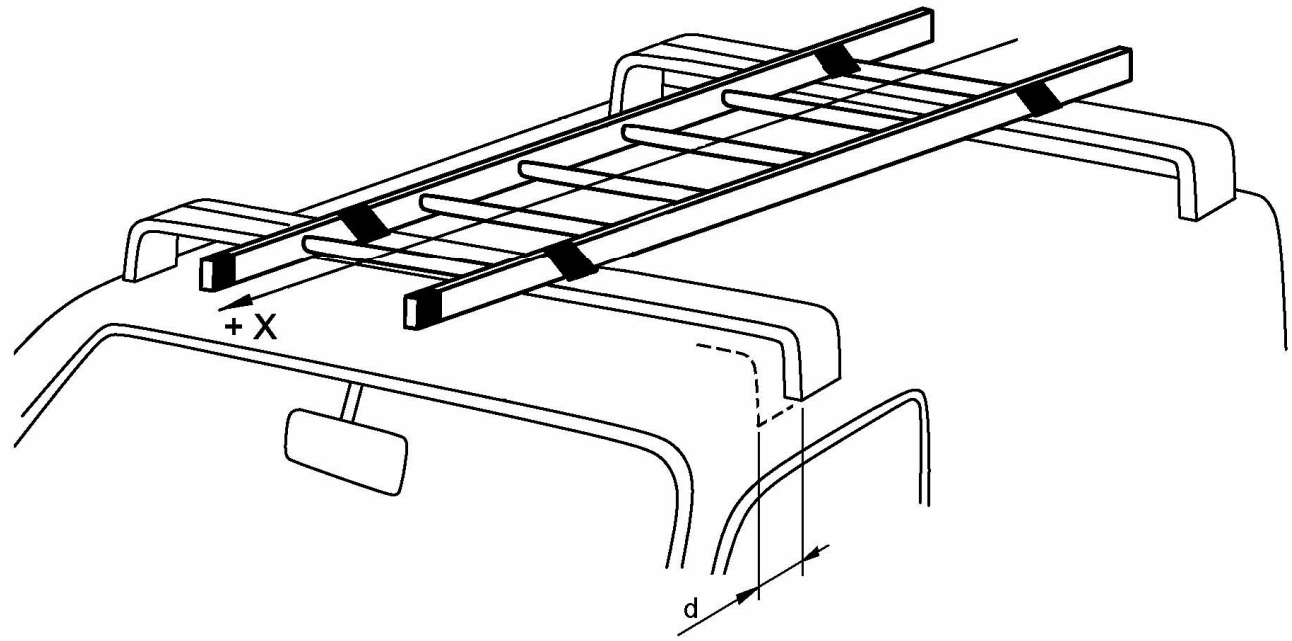


Figure M.8 — Ladder holder

Bibliography

[1] MIRA (Motor Industry Research Association) Bulletin III/49 — Construction of the "Belgian Block"

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