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Safety-belt anchorages, ISOFIX anchorages systems and ISOFIX top tether anchorages for vehicles

汽车安全带安装固定点、ISOFIX 固定点系统及上拉带固定点

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Safety-belt anchorages, ISOFIX anchorages systems and ISOFIX top tether anchorages for vehicles

1 Scope

This standard specifies the position, strength requirements, test methods of the ISOFIX anchorage system of the safety-belt anchorages, ISOFIX anchorages systems and ISOFIX top tether anchorages of child restraint system for vehicles.

This standard applies to categories M and N vehicles, which are equipped with seat belt anchorages for adult occupants, in forward-facing and rear-facing seats.

This standard also applies to categories M_1 and N_1 vehicles, which are equipped with ISOFIX anchorages for child restraint systems and their top tether anchorages.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

GB 11551-2003 The protection of the occupant in the event of a frontal collision for passenger car

GB 11552-2009 The interior fittings of passenger car

GB 13057-2003 The strength of the seats and their anchorages of passenger vehicles

GB 14166-2013 Safety-belts, restraint systems, child restraint systems and ISOFIX child restraint systems for occupants of power-driven vehicles

GB/T 15089-2001 Classification of power-driven vehicles and trailers

GB 27887-2011 Restraining devices for child occupants of power-driven vehicles

ISO 6487:2002 Road vehicles - Measurement techniques in impact tests - Instrumentation

3 Terms and definitions

The following terms and definitions apply to this document.

4.1.1 The design, manufacture, arrangement of seat belt anchorages shall meet the following requirements:

a) Appropriate seat belts shall be able to be fitted. The seat belt anchorages (especially in terms of strength) of the front outer seats shall be suitable for the installation of seat belts, which have retractors and guides; except for the vehicle, which is equipped with other types of seat belts with retractors. If the anchorage is only suitable for some special types of seat belts, the type of such seat belts shall be indicated in the test report.

b) There shall be no risk of slippage of the seat belt, when properly worn.

c) There shall be no risk of damage to the webbing, when the webbing comes into contact with protruding parts on the vehicle or seat structure.

d) For the anchorage that can change the position (the anchorage is convenient for the occupant to enter the vehicle and can restrain the occupant), the provisions in this standard shall apply to the anchorage, when it is in an effective restraint position.

4.1.2 All ISOFIX anchorage systems and ISOFIX top tether anchorages, which are used for the installation of ISOFIX CRS, shall be designed, manufactured, arranged as follows:

a) Ensure that the vehicle meets this standard, during normal use. For the anchorage system and ISO top tether anchorage, which can be added to any vehicles, they shall also meet this standard. At the same time, there shall be a description of the anchorage system, in the relevant application documents.

b) The strength design of the anchorage system and the ISOFIX top tether anchorage system shall meet the ISOFIX child restraint system, which has the quality group 0, group 0+, group I, as defined in GB 27887-2011.

4.1.3 The design and arrangement of the ISOFIX anchorage system shall meet the following requirements:

a) There shall be two transverse horizontal rigid rods, which have a diameter of 6 mm ± 0.1 mm; the minimum effective length of the two rods is 25 mm; the two rods are coaxial, as shown in Figure B.4 of Appendix B.

b) All ISOFIX anchorage systems, which are installed on the vehicle's seating position, shall be located at a distance of not less than 120 mm (horizontal measurement to the center of the rod) from point H (see Appendix C, for the determination of point H).

c) For all ISOFIX anchorage systems, which are installed on vehicles, it shall be ensured that the ISOFIX child restraint fixation module ISO/F2(B) or

ISO/F2X(B1), which are described in Figure B.5 or Figure B.6 of Appendix B of GB 14166-2013, can be installed.

d) The inclination angle of the bottom surface of the fixation module ISO/F2(B) or ISO/F2X(B1), which are defined in Figure B.5 or Figure B.6 of Appendix B of GB 14166-2013, is as follows; the measurement of the inclination angle is relative to the vehicle reference plane, which is defined in Figure C.3 in Appendix C:

1) Front and rear tilt angle: 15° ± 10°;

2) Left and right deviation angle: 0° ± 5°;

3) Flip angle: 0° ± 10°.

e) ISOFIX anchorage system's position shall be permanently fixed; it can also be hidden. For concealable anchorages, it shall meet the corresponding requirements of the ISOFIX anchorage system, during normal use.

f) For each ISOFIX lower anchorage rod (in normal use) or each permanently fixed guide, when unobstructed by seat cushions and backrests: along the vertical longitudinal plane, which passes through the midpoint of the rod or guide, it shall be clearly visible, in the 30° upwards along the horizontal plane. Alternatively, there shall be permanent markings, near each lower anchorage rod and guide on the vehicle. Marking is selected by the manufacturer, in one of the following forms:

1) As shown in Figure B.12 of Appendix B, it is a circular icon, which has a diameter of not less than 13 mm; meanwhile the icon shall have a sharp contrast with its background,; the icon shall be close to the position of the rod of each anchorage system;

2) The height of capital letters "ISOFIX" shall not be less than 6 mm.

4.1.4 The design and arrangement of the anchorages of the ISOFIX top tether anchorage shall meet the following requirements:

a) The car manufacturer may choose to use one of the two methods 4.1.4b) and 4.1.4c). However, the 4.1.4b) only applies when the ISOFIX position is on the seat.

b) According to the requirements of 4.1.4d) and 4.1.4e), in the design seating position, the distance -- between the ISOFIX top tether anchorage, which connects the ISOFIX top tether connector, and the reference point of the shoulder -- shall be not more than 2000 mm; meanwhile, within the shadow area, as shown in Figure B.6 ~ Figure B.10 of Appendix B, the placement of the two-dimensional template, as shown in Figure B.5 of Appendix B, shall be in accordance with the following conditions:

function of the ISOFIX top tether strap;

2) The non-rigid webbing retractor or the deployable retractor shall be not less than 65 mm, away from the torso line; the fixed rigid retractor shall be not less than 100 mm, away from the torso line;

3) After it is installed in the state of use, carry out the test, by applying the load to the ISOFIX top tether anchorage, as specified in 5.5. The retracting device shall have sufficient strength.

e) The top tether fixation device can be hidden on the seat back, if it is not in the pull-up area of the top tether strap, on the top of the seat back.

f) The anchorage of the ISOFIX top tether anchorage shall meet the requirements for the connection size of the ISOFIX top tether hook, which is specified in Figure B.3 of Appendix B. Space shall be provided, around the anchorage of the ISOFIX top tether, to allow its locking and unlocking operations. For those located behind the ISOFIX anchorage system, all anchorages, that can be used to connect the ISOFIX top tether hook or ISOFIX top tether connector, shall take one or more of the following measures, to avoid misuse:

1) Design all such anchorages in the area of ISOFIX top tether anchorages as ISOFIX top tether anchorages;

2) Only use one of the symbols, as shown in Figure B.13 of Appendix B, or its mirror-symmetrical symbol, for marking on the ISOFIX top tether anchorage;

3) An obvious mark on the anchorage, that does not meet the above two requirements, means that it cannot be used in combination with any ISOFIX anchorage system.

g) For each covered ISOFIX top tether anchorage, the cover shall be marked with the symbol or mirror-symmetrical symbol, as shown in Figure B.13 of Appendix B, meanwhile the cover shall be able to be removed, without the use of tools.

4.2 Minimum quantity of seat belt anchorages

4.2.1 Minimum quantity requirements for regular anchorages

4.2.1.1 The categories M and N vehicles (except for categories M_2 and M_3 vehicles of Class I, Class II, Class A, as defined in GB/T 15089) shall have seat belt anchorages, that meet the requirements of this standard. Vehicles of category M_1 shall be equipped with ISOFIX anchorage systems, that meet the requirements of 4.2.2. Vehicles of category N_1, which are equipped with ISOFIX anchorage systems, shall also meet the requirements of this standard. For the anchorages of the full harness-type safety belts (with or without retractors), which are approved as S-type safety belts, in accordance with GB 14166, it shall meet the requirements of this standard. However, additional

anchorages or anchorages for installing the crotch belt assembly are not required to meet the strength and location requirements of this standard.

4.2.1.2 The minimum quantity of seat belt anchorages, at all forward-facing and rear-facing seats, shall comply with the provisions of Appendix D.

4.2.1.3 However, for the outer seats of the category N_1 vehicles, that are not in the front row (Note a in Table D.1 of Appendix D), when there is a passage for passengers to pass between the seats and the nearest side enclosure, it is allowed to set only 2 lower anchorages. If the space between the seat and the side enclosure is a passage, the distance -- between the vertical plane of the longitudinal center of the seat (measured at point R) and the side enclosure -- shall be greater than 500 mm, when all doors are closed.

4.2.1.4 For the front middle seat (Note b in Table D.1 of Appendix D), if the windshield is located outside the reference area, which is defined in Appendix B of GB 11552, only 2 lower anchorages may be set. However, if it is located in the reference area, then 3 anchorages are required, at which time the windshield is considered to be part of the reference area.

4.2.1.5 For all the seating positions of Note c in Table D.1 of Appendix D, 3 anchorages shall be set. If one of the following conditions is met, only 2 anchorages can be set:

- There is a seat or other vehicle part in front, that meets the requirements of 5.3.3 in GB 13057-2003;

- No part of the vehicle is in the reference area; OR when the vehicle is in motion, no part of the vehicle can enter the reference area;

- Vehicle components in the reference area shall meet the energy absorption requirements, which are specified in 5.2 of GB 13057-2003.

4.2.1.6 For all seats, that can be used when the vehicle is stationary, as well as seats, which are not included in 4.2.1.1 ~ 4.2.1.4, seat belt anchorages are not required. However, if the seat belt anchorages are set for this seat position on the vehicle, these anchorages shall comply with the provisions of this standard; only 2 lower anchorages are allowed at this time.

4.2.1.7 The requirements for the middle seat in the upper front row of a double-decker passenger car are the same as those for the outer front row.

4.2.2 Minimum quantity of ISOFIX locations

4.2.2.1 All category M_1 vehicles shall be equipped with at least 2 ISOFIX positions; at least 2 ISOFIX positions shall be equipped with ISOFIX anchorage system and ISOFIX top tether anchorage, at the same time. The type and quantity of ISOFIX fixtures, which are installed in each ISOFIX position, shall be determined according to GB 14166.

80°; if the rear seats are adjustable, the above requirements are valid, in all normal moving positions.

4.3.2.3 Front seats of vehicles other than category M_1

For all normal moving positions of the front seats of vehicles other than the category M_1, α_1 and α_2 shall be within 30° ~ 80°. For all normal use positions of the front seats of vehicles, which have a maximum gross mass not exceeding 3500 kg, the value of α_1 and α_2 shall be 60° ± 10°, when at least one of them is a constant value (such as the anchorage on the seat).

4.3.2.4 Rear seats and special front or rear seats for vehicles other than category M_1

For the bench seats other than the vehicles of category M_1, the front and rear seats which have an adjustment mechanism and a backrest angle less than 20° (see Figure E.1 in Appendix E), the other rear seats in the normal use position, the α_1 and α_2 are allowed to be within 20° ~ 80°. For all normal seating positions of the front seat of the vehicle, which has a maximum total mass not exceeding 3500 kg, when at least one of α_1 and α_2 is a constant value (such as the anchorage on the seat), its value shall be 60° ± 10°. For the normal seating positions of the non-front seats of categories M_2 and M_3 vehicles, α_1 and α_2 shall be 45° ~ 90°.

4.3.2.5 The distance between the two lower anchorages of the seat belt

The distance -- between two vertical planes, that pass through the two lower anchorages L_1 and L_2 of the same seat belt, meanwhile are parallel to the longitudinal center plane of the vehicle -- shall not be less than 350 mm. For the rear middle seating positions of categories M_1 and N_1 vehicles, if the middle seat is not interchangeable with other seats, the above distance shall not be less than 240 mm. The longitudinal center plane of the seat shall be between points L_1 and L_2; the distance shall be at least 120 mm.

4.3.3 Position of effective anchorages on seat belts (see Appendix E)

4.3.3.1 If the position of the effective anchorages on the seat belt is affected by the use of webbing guides or similar devices, the position of the effective anchorages shall be determined, according to the position of the anchorage, when the longitudinal centerline of the webbing passes through the point J_1. From point R, use the following three line segments to determine point J_1:

- RZ: Take a line segment, which has a length of 530 mm, from point R up along the torso line;

- ZX: From point Z along a line perpendicular to the longitudinal center plane of the vehicle, cut a line segment, which has a length of 120 mm towards the anchorage;

- XJ_1: From point X along a straight line perpendicular to the plane, which is

determined by RZ and ZX, cut a line segment, which has a length of 60 mm forward.

Points J_2 and J_1 are symmetrical, with respect to the longitudinal vertical plane, which passes through the torso line, which is the torso line of the mannequin, as placed on the seat. When double doors are used, to provide passages for the front and rear seats, meanwhile the upper anchorage is on the B-pillar, the anchorage system shall not hinder the occupant getting on and off the vehicle.

4.3.3.2 The effective anchorage on the seat belt shall be located below the FN plane, which is perpendicular to the longitudinal center plane of the seat AND at an angle of 65° to the torso line. For the rear seats, this angle can be reduced to 60°. The FN plane intersects the torso line at point D. At this time, it must guarantee that DR = 315 mm + 1.8S. However, when S ≤ 200 mm, DR = 675 mm.

4.3.3.3 The effective anchorage on the seat belt shall be at the rear of the FK plane, which is perpendicular to the longitudinal center plane of the seat AND at an angle of 120° to the torso line AND intersecting at point B. At this time, it shall guarantee that BR = 260 mm + S. However, when S ≥ 280 mm, the manufacturer can choose BR = 260 mm + 0.8S.

4.3.3.4 The value of S shall not be less than 140 mm.

4.3.3.5 The effective anchorage of the seat belt shall be located behind the vertical plane, which passes through the point R and perpendicular to the longitudinal center plane of the vehicle, as shown in Appendix E.

4.3.3.6 The effective anchorage of the seat belt shall be above the horizontal plane, which passes through the point C, as specified in E.1.3 of Appendix E.

4.3.3.7 In addition to the upper effective anchorage specified in 4.3.3.1, if one of the following conditions is met, another additional effective anchorage may be equipped:

a) Additional anchorages shall meet the requirements of 4.3.3.1 ~ 4.3.3.6.

b) Additional anchorages shall be available, without the aid of tools. The anchorage shall meet the requirements of 4.3.3.5 and 4.3.3.6; it shall be located in the area, which is determined by 80 mm up and down in the vertical direction, as shown in Figure E.1 of Appendix E.

c) The anchorage of the full-harness type safety belt, that meets the requirements specified in 4.3.3.6, shall be located behind the transverse plane, which passes through the torso line and in the following positions:

1) For a single anchorage, it is located within the included angle, between two vertical planes passing through points J_1 and J_2, as specified in 4.3.3.1; its horizontal section is as shown in Figure E.2 of Appendix E;

and 4.5.1.

4.5.5 Apply a static load to the SFAD on the ISOFIX, according to 5.6.2.2, to examine the strength of the ISOFIX anchorage system. ISOFIX anchorage systems, which have ISOFIX top tether anchorages, shall also be tested in accordance with 5.6.2.3. The longitudinal horizontal displacement AND the displacement in the direction of the oblique force during loading shall not exceed 125 mm, allowing permanent deformation and partial cracking. If the required force is maintained for the specified time, the ISOFIX lower anchorage, the top tether anchorage, the surrounding area shall not fail. The additional test of 5.6.2.4 shall be carried out, for the case of the anchorage system on the seat assembly. No cracks shall appear after the test; meanwhile it shall meet the requirements that the maximum displacement of the X point, which is caused by the forward force and the oblique force, shall not be greater than 125 mm.

5 Test methods

5.1 General

5.1.1 Carry out the test according to 5.2. Fix the vehicle, according to the manufacturer's requirements.

5.1.1.1 The test is carried out on the body frame, OR on the whole vehicle.

5.1.1.2 Only one seat or a group of seat belt anchorage test is allowed, if the following conditions are met:

a) Have the same structural performance as the corresponding anchorages of other seats or seat groups;

b) A anchorage fully or partially installed on a seat or seat group, whose structural characteristics are the same as those of other seats or seat groups.

5.1.1.3 Doors and windows are installed or not; doors and windows are closed or opened.

5.1.1.4 It is permitted to retain normal equipment, that enhances the structure of the vehicle.

5.1.2 The seat shall be placed in the most unfavorable driving or use position; the position of the seat shall be stated in the inspection report. If the backrest angle is adjustable, it shall be adjusted to the position, which is specified by the manufacturer; OR it shall ensure that the actual torso angle of the seat for categories M_1 and N_1 vehicles is 25° as far as possible, or 15° for other categories of vehicles.

5.2 Fixation of vehicle

5.2.1 During the test, all methods of fixing the vehicle shall not strengthen the seat belt anchorages and ISOFIX anchorages and their surrounding parts; meanwhile, it shall not weaken the normal deformation of the structure.

5.2.2 All devices, for fixing the vehicle, shall be not less than 500 mm in front of the anchorage to be measured, OR not less than 300 mm behind; meanwhile, it shall not affect the body structure within the entire width.

5.2.3 It is recommended that the frame be fastened to a support, which is close to the wheel axis or suspension attachment point.

5.2.4 If a fixing method different from that specified in 5.2.1 ~ 5.2.3 is adopted, its equivalence shall be proved.

5.3 Test conditions

5.3.1 All seat belt anchorages of the same group of seats shall be tested at the same time. If there is a possibility that the test fails, due to asymmetric loading of the seat or anchorage, an additional test may be performed.

5.3.2 Apply the load, in a direction parallel to the longitudinal center plane of the vehicle AND 10° ± 5° upward from the horizontal line. First apply a preload of 10% of the total load (error ±30%); then increase the load to the total load.

5.3.3 Apply the load to the specified value, within 60 s. It can also be loaded to the specified value, within 4 s, at the request of the manufacturer, AND maintained for at least 0.2 s.

5.3.4 See 5.4 and Appendix F, for the human body module, which is used for the test. Place the device in Figure F.1 of Appendix F on the seat cushion; push it as far back as possible to the backrest; pull the seat belt back tightly. Put the device as shown in Figure F.2 of Appendix F in place. Place the seat belt on the device and tighten it. Preloading is not necessary, at this time. The width of the 254 mm or 406 mm human body module, which is selected for each seating position, shall be as close as possible to the distance between the two anchorages. The placement of the human body module shall avoid the influence of the loading force and force distribution, during the test.

5.3.5 The test conditions for the anchorages on the safety belt are as follows:

a) Front outer seats

The seat belt anchorages shall be subjected to the test, which is specified in 5.4.1. During the test, a simulated three-point safety belt, which is equipped with a retractor or an upper webbing guide, shall be used to transfer the load to the three anchorages. In addition, if the number of anchorages is more than that specified in 4.2, these anchorages shall be tested according to the provisions of 5.4.5. Use a simulated seat belt to load, during the test.

5.4.1.3 At the same time, a test load of 13500 N ± 200 N shall be applied to the lower body module (see Figure F.1 in Appendix F). For categories M_2 and N_2 vehicles, the test load shall be 6750 N ± 200 N; for categories M_3 and N_3 vehicles, the test load is 4500 N ± 200 N.

5.4.2 Test of three-point seat belt anchorage without retractor or with retractor on the upper anchorage

5.4.2.1 A test load of 13500 N ± 200 N shall be applied to the upper body module (see Figure F.2 in Appendix F), which is connected to the upper anchorage of the seat belt and the corresponding lower anchorage. If the upper anchorage has a retractor, it shall be tested together with the retractor. For categories M_2 and N_2 vehicles, the test load shall be 6750 N ± 200 N; for categories M_3 and N_3 vehicles, the test load is 4500 N ± 200 N.

5.4.2.2 At the same time, a test load of 13500 N ± 200 N shall be applied to the lower body module (see Figure F.1 in Appendix F). For categories M_2 and N_2 vehicles, the test load shall be 6750 N ± 200 N; or categories M_3 and N_3 vehicles, the test load is 4500 N ± 200 N.

5.4.3 Test of attachment point of two-point seat belt (lap belt)

A test load of 22250 N ± 200 N shall be applied to the lower body module, which is attached to the lap belt (see Figure F.1 in Appendix F). For categories M_2 and N_2 vehicles, the test load shall be 11100 N ± 200 N; for categories M_3 and N_3 vehicles, the test load shall be 7400 N ± 200 N.

5.4.4 Tests for seat belt anchorages on the seat frame OR separately on the seat frame and body frame

5.4.4.1 While conducting the tests specified in 5.4.1, 5.4.2, 5.4.3, the loads specified below shall be applied to each seat or group of seats.

5.4.4.2 In addition to the loads specified in 5.4.1, 5.4.2, 5.4.3, it shall also apply a force, which is equivalent to 20 times the mass of the seat assembly. Inertia loads shall be applied to the seat or to seat-related parts, that are equivalent to the actual mass of the corresponding seat. Additional loads and distribution of loads shall be determined by the manufacturer and approved by the inspection agency. For categories M_2 and N_2 vehicles, the load is 10 times the mass of the seat assembly; for categories M_3 and N_3 vehicles, it shall be 6.6 times the mass of the seat assembly.

5.4.5 Test of special type seat belt anchorages

5.4.5.1 Using a device that simulates a shoulder strap, apply a test load of 13500 N ± 200 N to the upper body module (see Figure F.2 in Appendix F), which is connected to the anchorage.

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