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The interior fittings of passenger car

乘用车内部凸出物

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The interior fittings of passenger car

1 Scope

This standard specifies the protrusion requirements internal components of the passenger compartment (except the internal rear-view mirror), the control unit, the roof or the movable roof, the parts of seat back and the rear of the seat, as well as the electrical operation requirements for the windows, roof-panel systems and partition systems.

This standard applies to category M₁ automobiles.

2 Normative references

The provisions in following documents become the provisions of this Standard through reference in this Standard. For the dated references, the subsequent amendments (excluding corrections) or revisions do not apply to this Standard; however, parties who reach an agreement based on this Standard are encouraged to study if the latest versions of these documents are applicable. For undated references, the latest edition of the referenced document applies.

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

GB 14166 Safety belts and restraint systems for adult occupants of motor vehicles

GB 15083 Strength requirement and test of automobile seats their anchorages and any head restraints

ISO 2575:2004 Road vehicles - Symbols of controls, indicators and tell-tales

ISO 6487:1980 Measurement technology and testing instrument of collision test

3 Terms and definitions

The following terms and definitions apply to this standard.

3.1

Internal fittings

The line determined by the tangent point of the vertical tangent of the instrument panel (see the note to 3.4 in Appendix D).

3.5

Roof

The part of the top of vehicle which is surrounded by the upper edge of the front windshield, the upper edge of the rear window, the upper frame on both sides (see the note to 3.5 in Appendix D).

3.6

Belt line

A line formed by the lower edge of the side window of the vehicle.

3.7

Convertible car

Vehicles with no rigid parts above the belt line except for the front windshield pillar, rollover protection brackets and/or seat belt fixing points (see the notes to 3.5 and 3.7 in Appendix D).

3.8

Vehicle with opening roof

A vehicle with a roof or a portion thereof that can be folded back, opened, or slid as relative to a vehicle structural component above the belt line (see the note to 3.5 in Appendix D).

3.9

Folding (tip-up) seat

The auxiliary seat for temporary use, which is usually folded.

3.10

Protective system

Internal components and devices which are used to restrain the occupant.

3.11

Type of a protective system

A type of protection device that does not differ in the following main aspects:

3.16.1

Ignition key

A device that controls the power required to operate an automobile engine or motor. This definition also includes non-mechanical devices.

3.16.2

Power key

A device that allows power to be supplied to an automotive power system. The power key may also be the ignition key. This definition also includes non-mechanical devices.

3.17

Airbag

A device that assists the vehicle's seat belt and the restraint system, that is, a system which, if a serious collision affecting the structure of the vehicle occurs, automatically deploy the flexible structure to restrict the violent collision of one or more parts of the vehicle occupant with the interior of the passenger compartment by compressing the gas contained therein.

3.18

Sharp edge

Edges of rigid materials with a radius of curvature of less than 2.5 mm, except for protrusions less than 3.2 mm (measured from the panel according to the procedure as described in F.1 of Appendix F). For cases where the protrusion height is less than 3.2 mm, this minimum radius of curvature requirement is not applicable as long as the protrusion height is not more than half of its width and its edge is rounded (see the note to 3.18 in Appendix D).

4 Requirements

4.1 The internal components of the passenger compartment in front of the front seat's "H" point and above the level of the instrument panel (excluding the side door)

4.1.1 In the reference zone as defined in 3.3, there shall be no dangerous rough surfaces or sharp edges that may increase the risk of serious injury to the occupant. If the head collision zone is determined according to Appendix C, the components described in 4.1.2 ~ 4.1.6 below shall be considered to meet the

requirements of 4.1.4 and 4.1.5. Alternatively, according to the procedure as described in Appendix G, sufficient tests shall be used to demonstrate that during the collision test, it will not contact the bracket due to cut off the soft material which has a Shore (A) hardness below 50. In this case, the radius requirement does not apply (see the note to 4.1.6 in Appendix D).

4.1.7 If the dynamic reference zone is determined according to Appendix B, it shall meet the following requirements:

4.1.7.1 If the protective system of the vehicle cannot prevent the head of the dummy (as specified in B.1.2.1 of Appendix B) from coming into contact with the instrument panel, thus the dynamic reference zone is determined according to Appendix B, then the requirements of 4.1.2 ~ 4.1.6 apply only to parts located in this zone.

Parts of other areas of the instrument panel above the level of the instrument panel shall, if in contact to the sphere which has a diameter of 165 mm, be at least rounded.

4.1.7.2 If the protective system of this vehicle model is capable of preventing the contact of the head of the dummy (as specified in B.1.2.1 of Appendix B) with the instrument panel, thereby determining that there is no reference zone, then the requirements of 4.1.2 ~ 4.1.6 do not apply to this vehicle model.

Parts above the level of the instrument panel shall, if in contact to the sphere which has a diameter of 165 mm, be at least rounded.

4.2 The internal components of the passenger compartment in front of the “H” point of the front seat and below the level of the instrument panel (excluding the side door and the foot pedal)

4.2.1 Except for the foot pedal and its fixtures as well as the components that are not accessible to the devices and operating procedures as described in Appendix H, the various components (switches, ignition keys, etc.) involved in 4.2 shall comply with the provisions of 4.1.4 ~ 4.1.6 (see the note to 4.2.1 in Appendix D).

4.2.2 If the hand brake lever is mounted above or below the instrument panel, when it is in the released position, even if a frontal collision occurs, it is impossible for the occupant to touch it. Otherwise, the surface of the brake lever shall meet the requirements of 4.3.2.3 (see the note to 4.2.2 in Appendix D).

4.2.3 When designing and manufacturing shelves or other similar components, ensure that the brackets have no raised edges and that one of the following requirements is met (see the note to 4.2.3 in Appendix D):

4.2.3.1 The part of the shelf or other similar component facing the interior of the

4.3.2.2 The joystick and push button shall be designed and constructed to ensure that, when subjected to a 378 N forward longitudinal horizontal force, the protrusion at the most unfavorable position of the human body shall fall within 25 mm to the surface of panel or fall off or bend or deform. When it falls off or bends, no dangerous protrusion shall be left in the original position. However, the joystick of the glass lifter is allowed to protrude 35 mm from the surface (see the note to 4.3.2.2 in Appendix D).

4.3.2.3 When the hand brake lever is in the released position and the shift lever is in any forward gear, unless in the area as specified in 3.3a) and b) or below the horizontal plane which passes through the “H” point of the front seat, otherwise the cross-sectional area at a point 6.5 mm away from the most convex part in the longitudinal direction shall not be less than 650 mm², the radius of curvature shall not be less than 3.2 mm (see the note to 4.3.2.3 in Appendix D).

4.3.3 The requirements of 4.3.2.3 above do not apply to hand brake levers which are mounted on the floor; for such hand brake levers, when in the released position, if the height of any part of the joystick is above the horizontal plane passing through the lowest “H” point of the front seat, then the cross-sectional area as measured on the horizontal plane not more than 6.5 mm (as measured along the perpendicular direction) away from the apex of the protrusion is at least 650 mm². The radius of curvature shall be not less than 3.2 mm.

4.3.4 For other vehicle components not covered by the above, such as seat rails, horizontal & vertical adjustment mechanism of seat, seat belt retractor, etc., if the position of these components is lower than the horizontal plane which passes through the “H” point of each seat, even if they can be reached by the occupant, they are not subject to these terms (see the note to 4.3.4 in Appendix D).

4.3.4.1 Components that are mounted on the roof but are not part of the roof structure, such as handles, roof lights, sun visors, etc., shall have a radius of curvature of not less than 3.2 mm. The width of the protrusion shall not be less than the downward protrusion; or, these protrusions shall pass the energy absorbing test as specified in Appendix G (see the note to 4.3.4.1 in Appendix D).

4.3.5 For some components which are made of a soft material with a Shore (A) hardness of less than 50 and which are mounted on a rigid support, the rigid support shall meet the above requirements. Alternatively, according to the procedure described in Appendix G, sufficient tests shall be used to demonstrate that such components will not touch the frame during the collision test due to cutting off the soft material which has a Shore (A) hardness below 50. In this case, the radius requirement does not apply.

be in an area that cannot be reached by a sphere which has a diameter of 165 mm. If this condition cannot met, then the opening mechanism and the operating mechanism are either in the retracted state when they are in the stop position; or the design and manufacture of these mechanisms meet the following requirements: when subjected to a force of 378 N in the impact direction along a trajectory of the ball-head model path (according to the provisions of Appendix G), the protrusion height (measured according to the measurement method of Appendix F) falls within 25 mm from the mounting surface of the mechanism; or there shall be no remaining protrusions at the original position after falling off (see the note to 4.5.1.2.3 in Appendix D).

4.5.2 Power-operated roof-panel system and its operating parts shall meet the requirements of 4.8 below.

4.6 Convertible car (see the note to 4.6 in Appendix D)

4.6.1 For convertible cars, the lower edge of the upper part of the rollover protection bracket and the upper part of the windshield frame shall meet the requirements of 4.4 in all normal use positions. Folding bars or connectors located above or in front of the occupant to support the non-rigid roof shall have neither rearward or downward dangerous rough surfaces nor sharp edges (see the note to 4.6.1 in Appendix D).

4.7 Parts fixed at the backside of the seat of the vehicle

4.7.1 Requirements

4.7.1.1 The surface of the parts at the backside of the seat shall be free of any dangerous rough surfaces or sharp edges that may increase the risk or severity of occupant injury (see the note to 4.7.1.1 in Appendix D).

4.7.1.2 The backrest part of the front seats in the head collision zone (as determined in Appendix C) within the boundaries specified in 4.7.1.2.1 and 4.7.1.2.2 shall meet the energy absorption performance as specified in Appendix G. To determine the head collision zone, if the front seats are adjustable, they shall be in the rearmost driving position, the backrest angle shall be as close as possible to 25°, unless otherwise specified by the manufacturer (see the note to 4.7.1.2 in Appendix D).

4.7.1.2.1 For free-standing front seats, the rear passenger's head collision zone shall be within the area at the top of the backside of the front seat backrest which extends 100 mm from the center of the seat to both sides.

4.7.1.2.1.1 For seats with headrests, the headrest shall be at the lowest position each time the test is carried out and the test point of action shall be on the vertical line through the center of the headrest.

4.7.1.2.1.2 For seats designed for installation in a variety of vehicle models, the collision zone shall be determined according to the vehicle model in which the rearmost driving position is the most unfavorable, so that the determined collision zone can be considered applicable to all other vehicle models.

4.7.1.2.2 For integral front seats, the head collision zone is between the two longitudinal vertical planes 100 mm extended from both sides of the central plane of each outside occupant. The central plane's position of each outer seat of the integral front seat is as specified by the manufacturer.

4.7.1.2.3 In the head collision zone outside the boundaries as specified in 4.7.1.2.1 and 4.7.1.2.2, the seat frame shall be padded to avoid direct contact with the occupant's head; meanwhile in this area, the frame shall have a radius of curvature of at least 5 mm. Alternatively, these components meet the energy absorption requirements as specified in Annex G (see the note to 4.7.1.2.3 in Appendix D).

4.7.2 These provisions do not apply to the last row of seats, seats facing the side or rear of the vehicle, back-to-back seats, folding (tip-up) seats. If there are parts which are covered by the soft material of Shore (A) hardness less than 50 in the head collision zone of the seat, headrest, and its support frame, the rigid parts shall comply with all other provisions mentioned above than the energy absorption as specified in Appendix G.

4.7.3 If the seat has been tested to meet the requirements of GB 15083 (or ECE R17 03 series revision or updated version), it is considered to meet the requirements of 4.7.

4.8 Electrical operation of windows, roof-panel systems and partition systems

4.8.1 The following requirements apply to the electrical operation of the window/roof-panel system/partition system, to minimize the possibility of injury from accidental or erroneous operation.

4.8.2 Requirements of normal operation

Except for the conditions as specified in 4.8.3, the power-operated window/roof-panel system/partition system is allowed to be closed in one or more of the following cases:

4.8.2.1 The ignition key is inserted into the ignition switch in either position or when the non-mechanical device is in the same state.

4.8.2.2 When the power key has been connected to the power supply device of the power-operated window, roof-panel system or partition system.

4.8.3.1.2.1 The position which allows to pass through the opening to place a semi-rigid cylindrical test bar with a diameter of 200 mm, whilst the contact point between the test bar and the opening is the point to determine the retraction characteristics in 4.8.3.1.1.

4.8.3.1.2.2 The initial position before closing;

4.8.3.1.2.3 The position at least 50 mm more than the position at which the retraction begins;

4.8.3.1.2.4 In the case of tilting movement of the roof-panel system, the opening position of maximum.

4.8.3.1.3 According to 4.8.3.1.1, in order to check the power-operated window/roof-panel system/partition system with retraction device, extend out the measuring tool/test bar from the inside of the vehicle through the opening (for the partition system, from the rear of the passenger compartment). The cylindrical surface of the bar is in contact with a portion of the vehicle structure that forms the boundary of the window/roof-panel system/blocking system. The rigidity of the measuring tool shall be (10 ± 0.5) N/mm. The position of the test bar is as shown in Figure E.1 of Appendix E (usually perpendicular to the frame of window/roof-panel system/partition system and perpendicular to the closing direction). The position of the test bar as relative to the frame and the closing direction shall remain constant throughout the test.

4.8.4 Switch position and operation

4.8.4.1 The method of setting or operating the switch of power-operated window/roof-panel system/interrupting system shall minimize the risk of accidental shutdown. In addition to the case of 4.8.2.7, 4.8.2.9 or 4.8.3, in order to close, the switch shall be continuously actuated.

4.8.4.2 The switches to the rear windshield, roof-panel system and partition system for use of the rear occupants of the vehicle shall be capable of being deactivated by the driver's control switch, which is placed in front of the transverse vertical plane that passes through the "R" point of the front seat. prior to. If the rear windshield, roof-panel system and partition system are equipped with an automatic retraction device, it does not require this type of driver control switch. However, if the driver control switch is already present, it shall not interfere with the automatic retraction device or hinder the drop of the partition system.

The risk of accidental operation shall be minimized when setting the driver control switch. Use the symbols as shown in Figure E.2 in Appendix E to identify it. It may also use the equivalent symbols, such as using the symbols as specified in ISO 2575:2004 which is copied by the Figure E.3 of Appendix E.

Appendix B

(Normative)

Confirmation of dynamically determined head collision zone

B.1 Confirmation of the head collision zone dynamically determined by the protection system

B.1.1 Unlike the procedure described in Appendix C, the applicant can demonstrate through a procedure approved by the technical service department responsible for the test management that the dynamically determined head collision zone is relevant to the vehicle model.

B.1.2 A suitable method of testing the dynamically determined head collision zone may be one of the following methods.

B.1.2.1 Real vehicle collision test

Regarding the protective system installed on this vehicle model, use at least the collision speed of 48.3 km/h and the frontal collision conditions within the range of $\pm 30^\circ$ with respect to the fixed rigid barrier wall, to determine the order in which the occupants move. Usually a test of 0° , $+30^\circ$ and -30° is sufficient.

Use the 5th percentile female, the 50th percentile male, and the 95th percentile male adult dummy to substitute the occupant, to evaluate the dynamically determined head collision zone. Before the test, according to the requirements of the manufacturer, place each dummy at the recommended seating position, or:

B.1.2.2 Sled Tests

Under the effect of the deceleration-time diagram (change of velocity 50 km/h) as shown in Figure F.1 of Appendix F of GB 14166 (or Appendix 8 of ECE R16), make each dummy of the dummy family as specified above to be subjected to movement which is equivalent to a frontal movement of the dummy in the real vehicle's frontal collision test (according to B.1.2.1), to investigate the sequence of movement.

If the center line of the test object (usually the body-in-white) is within $\pm 18^\circ$ from the longitudinal centerline of the sled, it is considered that the direction in which the dummy moves forward is satisfactory. Usually the test of 0° , $+18^\circ$ and -18° is sufficient, or:

B.1.2.3 Simulated collision test

Appendix C

(Normative)

Determination of head collision zone

C.1 The head collision zone consists of all non-glass surfaces inside the vehicle that can be in static contact with a 165 mm diameter ball-head model which is part of the measuring device. The size from the ankle articulation point to the top of the ball-head model of this device can be continuously adjusted from 736 mm to 840 mm.

C.2 The head collision zone can be determined by the following procedure or by using a mapping method.

C.2.1 For each seating position as specified by the manufacturer, place the hinge point of the measuring device as follows.

C.2.1.1 Adjustable seat

C.2.1.1.1 Place it at the “H” point (see the Appendix C of GB 11551);

C.2.1.1.2 Place it at a point 127 mm in front of the “H” point, the height of this point is the height of the “H” point after the seat moves forward for 127 mm, or 19 mm higher than the original “H” point (see the note to C.2.1.1.2 in Appendix D).

C.2.1.2 Non-adjustable seat

Place it at the “H” point.

C.2.2 Within the internal dimensions of the vehicle, for each adjustable size from the articulation point of the ankle to the top of the ball-head model, it shall determine all contact points that can be measured by the measuring device in front of the “H” point (see the note to C.2.2 in Appendix D).

Set the measuring arm of the measuring device to the minimum length and the ankle joint to the “H” point of the rear seat. If the ball-head model exceeds the front seat’s backrest, no contact point can be found in this measurement.

C.2.3 Place the measuring device in the vertical position and turn the measuring device forward and downward in the vertical planes as close as possible to 90° on both sides of the longitudinal vertical plane of the vehicle passing the “H” point. Measure all the points that may be in contact.

To determine the point of contact, the length of the measuring arm of the

Appendix D

(Informative)

Notes to standard provisions and annexes

D.1 Note to 3.3

The reference zone is determined without an interior rear-view mirror. The energy absorption test is also performed without an interior rear-view mirror. The pendulum shall not touch the mount of the interior rear-view mirror.

The exemption area behind the steering wheel as specified in these clauses is equally valid for the front passenger's head collision zone.

For the adjustable steering wheel, there is an exemption area when the steering wheel is in all possible driving positions, the final exemption area is reduced to a common part of these areas.

Where a variety of steering wheels are available, the steering wheel which has the smallest diameter, most unfavorable state shall be used to determine the exemption zone.

D.2 Note to 3.4

The level of the instrument panel extends over the entire width of the passenger compartment. When a plumb line moves in the width direction of the vehicle, it is determined by the last tangent point of the plumb line and the surface of the instrument panel. If there are two or more tangent points at the same time as the plumb line and the surface of the instrument panel, it shall use the lower tangent point to establish the level of the instrument panel; for the sub-instrument panel, if the tangent point of the plumb line to the instrument panel cannot be used to determine the level, it may use the intersection between the horizontal line 25.4 mm higher above the "H" point of the front seats and the sub-instrument panel to determine its level.

D.3 Note to 3.5

On both sides of the vehicle body, the roof shall start from the upper edge of the door. Under normal circumstances, when the door is opened, the boundary between the two sides of the roof is the outer contour as formed by the bottom side (side view) of the remaining vehicle body. Above the window, the boundary at side of the roof is a continuous transparent line (light transmission point of the side window glass). For the pillar, the side boundary of the roof is the line connecting the light transmission lines at both sides. For vehicles as defined in

If the protrusion of the ignition key's handle is made of materials which have a Shore (A) hardness of 60 ~ 80 and a thickness of at least 5 mm, or if all surfaces are covered with at least 2 mm of this material, it is considered to meet the requirements of this clause.

D.13 Note to 4.2.2

Determine if the hand brake lever can be touched as follows:

When the hand brake lever is located on or above the level of the instrument panel (checked according to 4.1 in the collision zone), use the ball-head model as specified in Appendix C.

When the hand brake lever is below the level of the instrument panel (in this case, check the hand brake lever as specified in 4.3.2.3), use the knee model as specified in Appendix H.

D.14 Note to 4.2.3

The provisions as stated in 4.2.3 also apply to the shelf and sub-instrument panel in front of the front seat's "H" point, below the level of the instrument panel, between the front seats. If a cavity is closed, it can be regarded as a glovebox and is not subject to these provisions.

D.15 Note to 4.2.3.1

The specified dimensions refer to the surface of the panel prior to covering a material which has a Shore (A) hardness of less than 50 (see 4.2.4). The energy absorption test is carried out according to the provisions of Appendix G.

D.16 Note to 4.2.3.2

If the shelf falls off or breaks, it shall not create a dangerous section. This applies not only to the frame, but also to the other edges facing the passenger compartment due to the force.

The part of shelf with the maximum strength shall be considered as the part closest to the fixing device. In addition, under the effect of the applied force, "significant deformation" shall mean the bending deformation of the shelf, measured at the initial point of contact with the test cylinder, which shall be visible folding or deformation visible to naked eyes. Elastic deformation is allowed.

The length of the test cylinder is at least 50 mm.

D.17 Note to 4.3

"Other components" shall include, for example, window's lock buttons, upper

of the “H” point.

D.22 Note to 4.3.4

If the horizontal planes passing through the lowest “H” points of the front and rear seats do not coincide, then it requires determining a vertical plane which passes through the “H” point of the front seat and is perpendicular to the longitudinal axis of the vehicle. For the exemption zone, it shall, as relative to each “H” point of them, consider respectively the front and rear passenger compartments, until reaching the vertical plane determined above.

D.23 Note to 4.3.4.1

The movable sun visor shall take into account the various locations of use, the frame of the sun visor shall not be considered a rigid support (see 4.3.5).

D.24 Note to 4.4

When performing the roof-panel test to measure the protrusions and parts that can be contacted by a 165 mm diameter sphere, it shall remove the roof-panel (when the Shore (A) hardness is below 50). When evaluating the specified radius, it shall consider the specifications and characteristics of the roof-panel material. The test area of the roof-panel shall extend to above and in front of the transverse plane as limited by the baseline of the mannequin torso on the last row of seats.

D.25 Note to 4.4.2.1 (see 3.18 for definitions of “sharp edge”)

The amount of downward protrusion shall be measured perpendicular to the roof according to F.1 in Appendix F.

The width of the protrusion shall be measured in a direction perpendicular to its axis. In particular, for the rigid arch or rib of the roof, the protrusion height protruded out of the inner surface of the roof shall be not more than 19 mm.

D.26 Note to 4.5

Any rib of the movable roof, if it can be touched by a 165 mm diameter sphere, shall meet the requirements of 4.4.

D.27 Notes to 4.5.1.2, 4.5.1.2.1, 4.5.1.2.2

When the roof's opening mechanism and the operating mechanism are in the stop position whilst the roof is closed, it shall meet all the provisions.

D.28 Note to 4.5.1.2.3

Apply a force of 378 N even if the initial protrusion height is equal to or smaller

than 25 mm. The protrusion height is measured when it is loaded.

Apply a force of 378 N according to the direction of impact as specified in Appendix G, which is tangent to the trajectory of the ball-head model. When applying the force, it generally uses a flat-ended indenter which has a diameter of not more than 50 mm. However, for the areas where this is impossible, it may use other equivalent test methods, such as removing the obstructions.

“Stop position” refers to the position of the operating mechanism when it is locked.

D.29 Note to 4.6

The rod system of the convertible roof is not a rollover protection bracket.

D.30 Note to 4.6.1

The upper edge of the windshield window frame is calculated from above the transparent contour of the windshield.

D.31 Note to 4.7.1.1

See 3.18 for the definition of “sharp edge”.

D.32 Note to 4.7.1.2

When determining the head collision zone of the front seat’s backrest, any components necessary to support the seat’s backrest shall be considered part of the seat’s backrest.

D.33 Note to 4.7.1.2.3

The padding of the seat frame structure shall also avoid dangerous rough surfaces or sharp edges that may increase the risk of serious injury to the occupant.

D.34 Note to Appendix C “Determination of head collision zone”

D.34.1 Note to 2.1.1.2

One of two determined heights as selected by the manufacturer.

D.34.2 Note to C.2.2

When determining the point of contact, the arm length of the measuring device is constant in each individual measurement. Each measurement starts from the vertical position.

D.34.3 Note to C.3

Appendix F

(Normative)

Method of measuring the protrusion height

F.1 To determine the amount of protrusion of a component mounted on a plate as relative to the plate, it may make a 165 mm diameter sphere roll over the surface of the part and keep it in contact with the part. From the contact with the part, measure the variation “Y” of the center of the sphere in the direction perpendicular to the plate surface. In all the changes, the maximum value of “Y” is the protrusion height.

F.1.1 If the surface of the plate and parts are covered by a material which has a Shore (A) hardness of less than 50, the measurement shall be made after removing the covering material.

F.2 The protrusion height of the switches, pull-knobs, etc. located in the reference zone shall be measured by the following measuring devices and procedures.

F.2.1 Measuring device

F.2.1.1 The instrument for measuring the protrusion height consists of a hemispherical ball-head model which has a diameter of 165 mm and a sliding head which has a diameter of 50 mm in the middle of the ball-head model.

F.2.1.2 The relative position of the end plane of the indenter to the edge of the ball-head model can be read from the scale by an active pointer. When the measuring device slides on the component to be tested, the pointer stays at the position of the maximum measured value. When measuring, the range shall not be less than 30 mm; to meet the measurement requirements, the minimum resolution scale is 0.5 mm.

F.2.1.3 Calibration method

F.2.1.3.1 Place the measuring instrument on a flat surface, make its axis perpendicular to the plane. When the flat end of the indenter is in contact with the plane, the scale is zeroed.

F.2.1.3.2 Insert a 10 mm thick gauge between the flat-end of the indenter and the support plane. Check whether the reading indicated by the pointer is consistent with the thickness of the gauge.

F.2.1.4 The measuring instrument for the protrusion height is as shown in Figure

Appendix G

(Normative)

Test procedure for energy absorbing materials

G.1 Installation of test sample

G.1.1 Components made of energy absorbing materials shall be mounted on the structural support of the vehicle which secures it. If possible, it is best to be installed directly on the vehicle body for test. The structure support or the vehicle body shall be securely attached to the test bench, to prevent movement during impact.

G.1.2 If required by the manufacturer, the components can also be attached to fixtures mounted on the simulated vehicle. However, the “component-clamp” system shall have the same geometry as the real “component-structure support” system on the vehicle, meanwhile the geometric rigidity of the former is not lower than the latter, its energy absorption capacity is not higher than the latter.

G.2 Test device

G.2.1 The device consists of a pendulum whose center of rotation is supported by a ball bearing. The converted mass of the pendulum at the center of the impact is 6.8 kg. The lower end of the pendulum is a rigid hammer which has a diameter of 165 mm, the center of which coincides with the center of impact of the pendulum. The calculation formula of converted mass is as follows:

$$m_{\tau} = m(l/a)$$

Where:

m_{τ} - The converted mass of the impact center of pendulum, in kilograms (kg);

m - The total mass of the pendulum, in kilograms (kg);

l - The distance between the center of gravity of the pendulum and the rotary axis, in meters (m);

α - The distance between the impact center and the rotary axis, in millimeters (mm).

G.2.2 There are two acceleration sensors and one speed sensor installed on the pendulum, to measure various data in the direction of impact.

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