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Replacing 15086-2006

Motor vehicles' door locks and retention components performance requirements and test methods

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Foreword

Chapters 3 and 4 of this standard are mandatory, AND the rest are recommended.

This standard is drafted in accordance with the rules given in GB/T 1.1-2009.

This standard replaces GB 15086-2006 “Motor vehicles’ door locks and retention components performance requirements and test methods” As compared with GB 15086-2006, the main technical changes are as follows:

- ADD the “door system” (see 2.2), “door hinge system” (see 2.6), “child safety lock system” (see 2.11), “side front door” (see 2.12), “side rear door” (see 2.13), “fork-bolt” (see 2.14), “door closure warning system” (see 2.15), “door latch system” (see 2.16), “primary door latch” (see 2.17), “primary door latch system” (see 2.18), “auxiliary door latch” (see 2.19), “trunk lid” (see 2.20), and “back door” (see 2.21);

- MODIFY the definitions of “door”, “latch” “striker (or stop) which had been listed in GB 15086-2006 (see 2.1, 2.7, 2.8; 2.1, 2.5, 2.6 of 2006 version);

- CHANGE the “longitudinal load” and “lateral load” into “load 1” and “load 2” (see 3.2.1.1, 3.2.1.2);

- DELETE the requirements that “The door hinge system of the vehicle's side hinged door must be installed in the front edge of the door along the vehicle travel direction. If the door is free-style, this requirement applies to the door that opens firstly, and the other shall be able to be latched” (see 3.1.5 of 2006 version);

- ADD the general requirements for door locks (see 3.1) and latching requirements for door locks (see 3.2.3);

- ADD the requirements for vertically opened rear door locks and door hinges [see 3.2.1.3, 3.2.1.4 b), 3.2.1.5.1 d)];

- ADD the test requirements for individual hinges (see 3.2.1.5.2);

- ADD the side door requirements of rearwards installed hinges (see 3.2.1.5.3);

- ADD the load 1, load 2 and inertia load requirements of the sliding door lock (see 3.2.2.1, 3.2.2.2, 3.2.2.3);

Introduction

China is a member of the WTO. With the release of the world's first regulation GTR No.1 “Global regulation on door locks and door retention components”, it will become the first officially issued global motor vehicle technology regulation. Therefore, Therefore, GB 15086 adopts, through modification, the global technical regulation GTR No.1 “Global regulation on door locks and door retention components” (English version).

GTR No.1 was developed through harmonizing the European regulations (mainly ECE R11 and EU Directive 70/387/EEC) and North American regulations (primarily the Federal Motor Vehicle Safety Standard FMVSS 206 and Canadian Motor Vehicle Safety Standard CMVSS 206) on “Motor vehicles’ door lock and door retention components”, AND its technical content is consistent with that of the ECE R 11.03 series.

GTR No.1 is applicable to category 1-1 vehicles (equivalent to the category M1 vehicles of ECE classification) and Category 2 vehicles (equivalent to the category N vehicles of ECE classification). The vehicle classification methods are specified in the Appendix 5 of GTR No.1, BUT the vehicle category definition are not applicable to our country; meanwhile, as for some descriptions in Appendix 5 “DISCUSSION OF ISSUES TO BE ADDRESSED BY A GTR” of GTR No.1, currently GTR is modifying the vehicle classification and definition, AND whether it is applicable to all category 2 vehicles is still under discussion. As for the vehicle classification in China, it adopts the standard GB/T 15089-2001 “Classification of power-driven vehicles and trailers”, which is modified from the Appendix 7 of European ECE R.E.3 series. To maintain the consistency of GB 15086, the vehicle classification methods currently used in China are followed. Therefore, this standard is applicable to “the door lock and door retention components of the side door (including sliding doors) or back door for the category M_1 and N_1 vehicles for passenger access”.

Motor vehicles' door locks and retention components performance requirements and test methods

1 Scope

This standard specifies the terms and definitions, technical requirements and test methods for vehicle door locks and door retention components, including latches, hinges and other supports.

This standard applies to the door lock and door retention components of the side door (including sliding doors) or back door for the category M_1 and N_1 vehicles for passenger access.

2 Terms and definitions

The following terms and definitions apply to this document.

2.1

Doors

It refers to the hinged door and sliding door used at the vehicle side or back which can be opened and closed for entry and exit of the occupant. It does not include folding doors, roll-up doors and simple doors easy to be installed and removed.

2.2

Door system

It includes door, latch, striker (or stop), door hinge, and guide rail and sliding door assembly, as well as the other retention components which are located on the door or around the door frame. The double door system includes two doors.

2.3

Door lock

Door latch system

It is composed of at least one latch and one striker (or stop).

2.17

Primary door latch

It refers to the door lock with fully latched position and secondary latched position.

2.18

Primary door latch system

It is composed of at least one latch and one striker (or stop).

2.19

Auxiliary door latch

It is the door lock with fully latched position which is installed onto the door or door system that had been equipped with the primary door latch system.

2.20

Trunk lid

It refers to a movable vehicle body panel, which is used as the an entrance into the space from the outside of the compartment in which the permanently mounted partition or fixed or downwardly folded seat back is completely separated from the passenger compartment.

2.21

Back door

It refers to the door or door system which is located at the rear end of the motor vehicle, through which the occupant can get into or off the vehicle, OR the cargo can be loaded or unloaded. It does not include the following components:

a) Trunk lid;

b) Doors or windows consisting entirely of glass material, with door locks and/or door hinge systems mounted directly on the glass material.

3.2.1.4 Inertial loads

Each primary door latch system and auxiliary door latch system shall comply with the dynamic requirements of a) and/or b) of the following inertial load requirements, OR comply with the calculation requirements of c).

Inertial load requirements:

a) As for the door latch system, under the unlatched conditions of the latched device, respectively APPLY 30g initial load along the direction parallel with the vehicle longitudinal axis and the vehicle transverse axis, AND it shall not be disengaged from the fully latched position;

b) As for the rear door lock system, under the unlatched conditions of the latched device, APPLY 30g initial load along the direction parallel with the vehicle vertical axis, AND it shall not be disengaged from the fully latched position;

c) As for each component and sub-system, it may obtain the minimum inertial load along the specific direction through calculation. The combined inertial load to prevent unlocking shall be such as to ensure that the door latch system, when correctly mounted to the door AND subjected to the inertial loads specified in a) and/or b) above, is kept at the latched position.

3.2.1.5 Door hinges

3.2.1.5.1 Each door hinge system shall be capable of withstanding the performance requirements of the following door hinge systems:

a) Supports the door;

b) Shall not be disengaged at longitudinal loads of 11000 N;

c) Shall not be disengaged at a transverse load of 9000 N;

d) The rear door hinge opened vertically shall not be disengaged under the vertical load of 9000N.

3.2.1.5.2 If the entire door hinge system is not tested and only a single hinge in a door hinge system is tested, the hinge shall be loaded in proportion to the total number of hinges in the door hinge system.

3.2.1.5.3 As for the side door with a rear-mounted hinge and which can be operated independently of other doors, it shall comply with all of the following rear-mounted hinge rear side door requirements:

3.2.2.4.1 As for the sliding door guide rail and sliding door assembly or other supporting method, when it is at the fully latched and closed position, respectively APPLY 9000N outwards transverse force onto the opposite sides of the door (18000 N in total), the sliding door guide rail and sliding door assembly or other supporting components shall not be disengaged from the door frame.

3.2.2.4.2 When performing the test of 3.2.2.4.1, if any one of the following conditions occurs, the sliding door retention component does not comply with the requirements:

a) When the required force is maintained, the separation distance between the inside of the door and the outer edge of the door frame shall allow the 100 mm diameter ball to pass;

b) The total displacement of any one of the force applying device reaches to 300 mm.

3.2.3 Latching device of door lock

3.2.3.1 The latching device of the door lock is equipped as follows:

a) Each door shall be provided with at least one latching device which, when latched, shall be capable of preventing the operation of the outside door handle and other outer locking opening controls, AND is equipped with operating device in the vehicle, from which it can realize the locking and unlocking of this latching device;

b) Each rear side door shall be provided with at least one latching device which, when locked, shall prevent the operation of the inner door handle and other inner lock opening controls, AND is able to open the door with independent action as well as operate the inner door handle and other inner lock opening control device;

c) The latching device may be one of the following systems:

1) Child safety lock systems;

2) A door locking and unlocking system installed in the vehicle for easy operation by the driver or occupant of the front row near the door.

Any of the systems 1) and 2) above shall be allowed to be used as other locking functions.

3.2.3.2 A rear door fitted with an inside door handle or other inner lock opening control shall be provided with at least one latching device in the vehicle which,

that the latching direction of the lock is parallel with the coupling of the fixture; MAKE the test device comply with the installation requirements for the latch and striker (or stop).

B.2.1.2.2 INSTALL a weight to apply a load of 900 N to separate the latch from the striker (or stop) in the direction in which the door is opened.

B.2.1.2.3 In the directions as specified in 3.2.1.1 or 3.2.2.1 and Figure B.4, at a rate of not more than 5 mm/min, APPLY the test load until it reaches to the required load; RECORD the reachable maximum load.

B.2.1.3 Test plates

The test plates to which the door lock is installed shall have a locking (or block) notch configuration to simulate the environment in which the door lock is mounted on the actual vehicle.

B.2.2 Load 2 test

B.2.2.1 Fully latched position

B.2.2.1.1 A typical static tensile test fixture is shown in Figure B.2. INSTALL the latch and striker (or stop) at fully latched position onto the test fixture; MAKE the test device comply with the installation requirements for the latch and striker (or stop).

B.2.2.1.2 In the directions as specified in 3.2.1.2 or 3.2.2.2 and Figure B.4, at a rate of not more than 5 mm/min, APPLY the test load until it reaches to the required load; RECORD the reachable maximum load.

B.2.2.2 Secondary latched position

B.2.2.2.1 A typical static tensile test fixture is shown in Figure B.2. INSTALL the latch and striker (or stop) at secondary latched position onto the test fixture; MAKE the test device comply with the installation requirements for the latch and striker (or stop).

B.2.2.2.2 In the directions as specified in 3.2.1.2 or 3.2.2.2 and Figure B.4, at a rate of not more than 5 mm/min, APPLY the test load until it reaches to the required load; RECORD the reachable maximum load.

B.2.3 Load 3 test (only for vertically opened rear door lock)

B.2.3.1 A typical static tensile test fixture is shown in Figure B.3. INSTALL the latch and striker (or stop) at fully latched position onto the test fixture; MAKE the test device comply with the installation requirements for the latch and striker (or stop).

Appendix C

(Normative)

Inertia test procedure

C.1 Overview

Through calculation analysis or dynamic test against the components in the real vehicle relationship, ASSESS the ability of the door latch system to withstand inertia load.

C.2 Test procedures

C.2.1 Selection 1 - Calculation

C.2.1.1 It provides an analytical calculation method to determine the ability of a door latch system to withstand inertia loads. During calculation, the spring force adopts the mean value of minimum value when the door lock is at the installation position and the minimum value when the door lock is at the release position, without considering the friction resistance and the work done; if the weight of each component can limit the opening of the lock, it can also be ignored. It is allowed to ignore these factors during calculation, because they provide additional safety factors.

C.2.1.2 As for each component or sub-system, it can calculate its minimum inertial load in a particular direction. The combined inertial load to prevent unlocking shall be such as to ensure that the door latch system (correctly mounted on the door) remains in the latched position when subjected to an inertial load of 30 g in any direction.

For example:

As known:

The structure of the latch is shown in Figure C.1. The door latch system is affected by the deceleration of 294.2 m/s^2 (30 g);

The average spring force of the button spring, P = 4.5 N;

The output torque of the pawl spring, T = 0.45 N•m;

Deceleration: a = 30 g = 30 × 9.80655 = 294.2 m/s^2

Mass (kg): m_1 = 0.0163; m_2 = 0.0227; m_3 = 0.0122; m_4 = 0.0422;

C.2.2.3.4 Lateral setting 2 (only for vehicles with different side door configurations): POSITION the vehicle or the white vehicle body so that its horizontal axis aligns with the axis of the accelerator, and SIMULATE the side impact along the direction contrary to that indicated in C.2.2.3.3.

C.2.3 Selection 3 - Door dynamic test

C.2.3.1 Test device

C.2.3.1.1 Door components

The door assembly shall include at least a door lock, an outside door handle with a mechanical lock operation, an inside door opening lever, and a latching device.

C.2.3.1.2 INSTALL the door test fixture.

C.2.3.1.3 Acceleration or deceleration devices.

C.2.3.1.4 Laces.

C.2.3.1.5 A device or means for recording door opening.

C.2.3.1.6 Apparatus for measuring and recording acceleration.

C.2.3.2 Test preparation

C.2.3.2.1 INSTALL the door assembly separately or in combination with the test device. The installation of each door and striker (or stop) shall be in accordance with their installation on the vehicle, AND in the direction required by the inertia load test (C.2.3.3).

C.2.3.2.2 INSTALL the test device onto the accelerator.

C.2.3.2.3 INSTALL the device used to record door opening.

Note: The purpose of the device is to ensure that if the door closes after being opened during the test course, it can be recorded.

C.2.3.2.4 ENSURE that the door lock is in the fully latched position, the door is fastened and the latching device is unlocked, AND the window glass (if any) is closed.

C.2.3.3 Test direction (see Figure C.3)

C.2.3.3.1 Longitudinal setting 1: POSITION the door assembly on the accelerator along the frontal impact direction.

D.2.1.3 Vertical load test (only for vertically opened rear door hinges)

D.2.1.3.1 As for the typical test fixture, SEE Figure D.1. INSTALL the door hinge system on the test fixture. The hinge shall be installed with the centreline of the hinge as the basis to simulate that the door is fully closed AND the distance between one hinge of the test fixture and the outer end of the other hinge is set to 406 mm ± 4 mm. The load shall be applied through the center line of the hinge pin in a direction orthogonal to the longitudinal and lateral loads, as shown in Figure D.2.

D.2.1.3.2 APPLY the test load at a rate not exceeding 5 mm/min, until reaching to the required load. If any of the hinges are disconnected, the test fails and the maximum load achieved is recorded.

D.2.2 Individual hinge

D.2.2.1 Test assessment

In some cases, a single hinge in a door hinge system shall be tested. The results of a single hinge test shall demonstrate that it complies with the door hinge system requirements in 3.2.1.5.1 (e.g. a single hinge in a double hinge system shall withstand 50% of the load requirements of the entire system).

D.2.2.2 Test procedure

D.2.2.2.1 Longitudinal load

INSTALL the single hinge on the test fixture. The hinge shall be installed with the centreline of the hinge as the basis to simulate that the door is fully closed. The load shall be applied at equidistant positions between the linear centres of the hinge pin engaging portions, AND pass the center line of the hinge pin in the longitudinal direction of the vehicle. APPLY the test load at a rate not exceeding 5 mm/min, until reaching to the required load. If any of the hinges are disconnected, the test fails and the maximum load achieved is recorded.

D.2.2.2.2 Lateral load

INSTALL the single hinge on the test fixture. The hinge shall be installed with the centreline of the hinge as the basis to simulate that the door is fully closed. The load shall be applied at equidistant positions between the linear centres of the hinge pin engaging portions, AND pass the center line of the hinge pin in the lateral direction of the vehicle. APPLY the test load at a rate not exceeding 5 mm/min, until reaching to the required load. If any of the hinges are disconnected, the test fails and the maximum load achieved is recorded.

D.2.2.2.3 Vertical load (only for vertically opened rear door hinges)

E.3.4 DETERMINE the conditions of the front or rear edge of the sliding door or its adjacent vehicle structure comprises including latch/striker (or stop).

E.3.5 CLOSE the sliding door, and MAKE sure that all the door retention components are fully latched.

E.3.6 When the door edge contains one latch/striker (or stop), USE the following preparation procedures:

- The force applying plate length is 150 mm, width is 50 mm, and thickness at least 15 mm, AND it is required for the force applying plate edge to have a R6 mm ± 1 mm rounding;

- PLACE the force applying device and the force applying plate against the door, in order to make the applied force is orthogonal to the longitudinal centerline of the vehicle, AND is vertically located at the center of the latch/striker (or stop) in the door mounting portion;

- PLACE the force applying plate such as to make its long edge close to the door edge as parallel as possible.

E.3.7 When the door edge contains more than one latch/striker (or stop), USE the following preparation procedures:

- The force applying plate length is 300 mm, width is 50 mm, and thickness at least 15 mm, AND it is required for the force applying plate edge to have a R6 mm ± 1 mm rounding;

- PLACE the force applying device and the force applying plate against the door, in order to make the applied force is orthogonal to the longitudinal centerline of the vehicle, AND is vertically located at the center between the most forward and rearward outer edges of all the latch/striker (or stop);

- PLACE the force applying plate such as to make its long edge close to the door edge as parallel as possible.

E.3.8 When the door edge does not contain latch/striker (or stop), USE the following preparation procedures:

- The force applying plate length is 300 mm, width is 50 mm, and thickness at least 15 mm;

- PLACE the force applying device and the force applying plate against the door, in order to make the applied force is orthogonal to the longitudinal centerline of the vehicle, AND is vertically located at the midpoint of the

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