

METHODS FOR CHECKING EQUIPMENT DESIGNED TO CURB ACCELERATION IN THE EVENT OF PEDDLE MISAPPLICATION

Created: March 20th 2018

Revised: June 14th 2019 (Reiwa 1)

March 15th 2019

May 22nd 2018

1. Effective Dates

This equipment test method will go into effect starting April 1st, 2018. Furthermore, the revisions made on June 14th, 2019 (Reiwa 1) will come into effect on June 14st, 2019 (Reiwa 1).

2. Scope of Application

This test method shall, among those tests conducted as part of the automotive assessment information providing service implemented by the National Agency for Automotive Safety & Victims' Aid (hereafter referred to as "NASVA"), apply to "equipment designed to curb acceleration in the event of peddle misapplication" of passenger vehicles with 10 occupants or less and commercial vehicles with a gross vehicle mass of 2.8 tons or less.

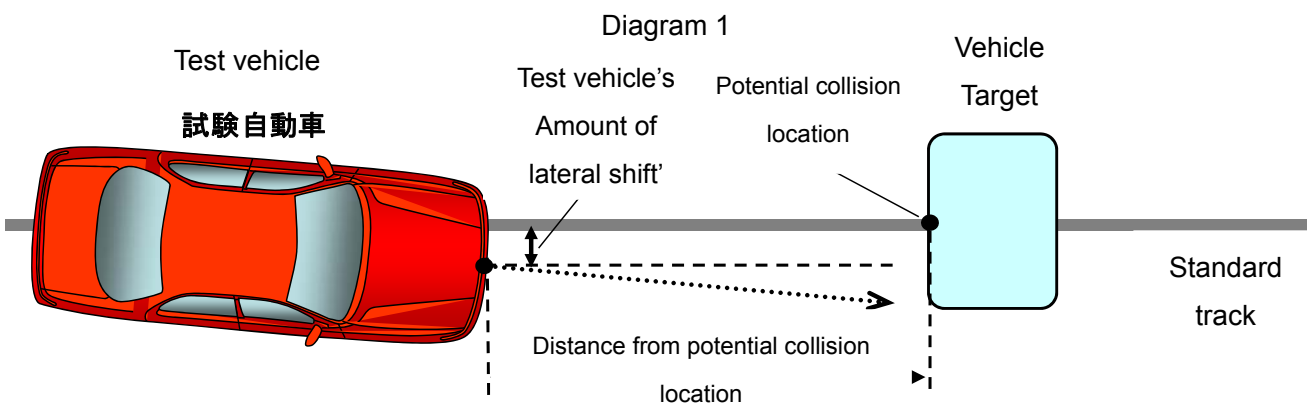
3. Definition of Terms

The terms used in this testing method are defined as follows.

- (1) **"Equipment designed to curb acceleration"**: In the event of peddle misapplication at times when a vehicle is departing or accelerating, the driver mishandles the operation of the shift lever, acceleration peddle etc., if there is a possibility of colliding with an obstacle nearby, in order to prevent a collision or to reduce injury, the equipment restrains running at times of sudden departure or sudden acceleration.
- (2) **"Standard Track"**: The course the test vehicle will run.
- (3) **"Mass at Vehicle Delivery"**: The total weight of the built in components; motor, fuel and relating equipment, lubricating oil, coolant etc. In full amount, as well as any standard tools that maybe loaded in e.g. spare tires, tools.
- (4) **"Temperature of Brakes Before Testing"**: The check of the temperature of each wheel's lining, parts etc. in line with the JIS D 0210 established method. Before each test run while the car is still stationary. In the event that a higher temperature is found

in the left or right wheels during measuring, the highest temperature shall be used.

- (5) "**Vehicle Target** ": A testing system shown in Appendix A that simulates the front of a car.
- (6) "**Potential collision location**": A hypothesized location for a collision along the standard track (Diagram 1).
- (7) "**Distance from potential collision location**": The distance of the center front (Foff, Fon) or center back (Roff, Ron) of the test vehicle from the potential collision location on the Standard Track (Diagram 1).
- (8) "**Amount of lateral shift**": The error difference of the lateral movement between the tip of the center of the car measured against the Standard Track (Diagram 1).
- (9) "**Brake off time**": The point in time that the test driver's foot had been separated from the pedal during the test run.
- (10) "**Acceleration on time**": The point in time when the acceleration peddle first started to move during the test run.
- (11) "**Acceleration full time**": The point in time when the acceleration peddle was fully pushed all the way during the test run.
- (12) "**Test run start position**": Where the test is to be set, the target position for starting the test run on the standard track.



4. Test conditions

4.1 .Data provided by the manufacturer

The manufacturer will provide the basic necessary data required for testing in Appendix 1.

4.2. Test Vehicle's Condition

The test vehicle's condition shall be as follows:

- (1) **Load condition**: With one driver riding, the mass of the test car including the

measuring equipment etc. shall be mass + 200 kg (within $\pm 1\%$) as at the time of vehicle delivery. The load distribution of the front and rear axles shall be equivalent (within $\pm 5\%$) to the load distribution at the time of vehicle delivery (%).

If the above requirements cannot be met, parts maybe be removed or attached so as to meet these conditions, so long as performance is not adversely affected. Any parts attached should be secured securely.

- (2) **Tires:** The tires used shall be the ones equipped at the time of purchase. Tire air pressure before test run (at room temperature) on a horizontal surface, should be adjusted to that which is recorded in the specification sheet.
- (3) **Braking device:** The discs, drums and linings shall be used in accordance with the method stipulated in paragraph 5.1(2) "lap run" when purchasing test vehicles. The braking device should be adjusted accordingly, ensuring that it has not been affected by abnormal factors such as moisture or abnormal thermal history.
- (4) **Drive axle:** In vehicles where a drive axle can be selected, please select a normally use drive axle.
- (5) **Engine output etc.:** In motors and electric motors where it is possible to switch to a more powerful setting, please set to a general use setting.
- (6) **Protection devices:** In vehicles with safety equipment for the driver seat , if deemed necessary the devices maybe deactivated.
- (7) **Configuration of equipment designed to curb acceleration in the event of peddle misapplication:** Equipment designed to curb acceleration in the event of peddle misapplication (including ABES etc. which operate at the same time as said device), in cases where the driver can adjust the operating timing, it shall be set to the timing which was recommended by the manufacturer.

4.3. Test Track

The test track shall meet the following requirements:

- (1) The test track shall be a flat, dry, and clean paved road surface without any leaves, dirt, etc.
- (2) The standard track shall have a friction coefficient of about 0.9 under dry conditions. The measurement procedure shall comply with ASTM E1337, for the test tires ASTM E1136, where the test load is $4586\pm 67\text{N}$, tire pressure is $241\pm 3\text{kPa}$ and speed is $64\pm 0.8\text{km/h}$.
- (3) During testing, there shall be no obstacles or paint marks within a lateral distance of 3.0m to either side of the standard track and with a longitudinal distance of 30m ahead of the test vehicle when the test ends. Furthermore, ensure there are no loud

sounds or ultrasonic sounds in the vicinity which may impact test results.

4.4 Weather conditions

The test shall be executed in the following Weather conditions.

- (1) At the time of test, air temperature is within the range of $-5^{\circ}\text{C}\sim 40^{\circ}\text{C}$.
- (2) At the time of test, average wind speed is 5 m/s or less.
- (3) A visibility of at least 1km is ensured.
- (4) A declaration by a vehicle manufacturer might allow the following tests under sunlight conditions to be avoided:
 - The illumination is 2000Lux or less at the time of testing
 - There are shadows created by trees or structures in the vicinity of the test run line.
 - Direct sunlight on the front or back of the vehicle.
 - Temperature at time of testing below 5°C .

4.5 Data Measurement

The following data items shall be measured, with the sampling frequency at 100Hz or higher.

- (1) Brake off time
- (2) Acceleration on time
- (3) Acceleration full time
- (4) Test vehicle start location
- (5) Test vehicle speed
- (6) Temperature of brakes before braking

4.6. Measuring equipment

The following measuring equipment for testing shall be capable of smoothly handling the data of the measurement items covered in Section 4.5. Additionally, before conducting the test, the vehicle position shall be verified. As for the other measurement equipment, accuracy shall be checked based on the results of calibration by the measurement equipment manufacturer.

- (1) Device used to measure vehicle position: ensure that the device's accuracy is within $\pm 0.03\text{m}$
- (2) Device used to measure vehicle speed: ensure that the device's accuracy is within $\pm 0.1\text{km/h}$
- (3) Device used to check brake temperature: ensure that the device's accuracy is within

±3%

5. Test method

5.1. Test preparation

- (1) Formatting operation: If the vehicle manufacturer requests it, the test vehicle is allowed to run up to 100km on ordinary roads to initialize its sensor units. As long as the conditions required for initialization are met, the initialization work may be performed in conjunction with the above conditioning run.
- (2) Lap run: In equipment that automatically intervenes in the running of a vehicle's braking system, if requested by the manufacturer, in order to warm up the test vehicle's brake equipment disk, drum or friction material, excluding tests with similar lap runs, to achieve a deceleration of 3.7m/s² from a speed of 64km/h, operate the brake 200 times (till stopped). The interval from when the brake is first operated to when the brake is next operated is the time required to lower the brake temperature to between 110 ° C. and 132 ° C, or distance travelled having reached 1.6 km, whichever is earlier. After each stop, the vehicle will accelerate back up to 64 km/h and maintain that speed until the next braking (equivalent to that specified in FMVSS 105 S7.4.1.1). If the conditions necessary for initialization are satisfied, the initialization work of item 5.1 (1) may be carried out together with the above-mentioned lap run.
- (3) Selecting test conditions

As indicated in table 1, tests are performed measuring four test conditions depending on travelling direction and Vehicle Targets used. As is the case with Foff and Roff, if the device has control, even though there is no Vehicle Target, the device must be deactivated. Furthermore, if there is a request from the manufacturer, if there is a direction of travel in which the device does not operate, that direction of travel shall not be tested.

Table 1 Test condition options

Condition identifier	Direction of travel	Instillation of Vehicle Target
Foff	Forward	No
Fon	Forward	Yes
Roff	Reverse	No
Ron	Reverse	Yes

5.2. Testing

- (1) Re-brake conditioning: In the case of the first braking system test for the test car (generic term of the test carrying out brake conditioning of item 5.1), before starting the test, repeat the process of Item 5.1 (2) at least 35 times in principle for re-conditioning. Further, when the period from the conditioning run of 5.1 to the test exceeded two weeks, the process may be repeated up to 50 times depending on the condition of the brake system in the test vehicle. In the case of second or more braking system test (same when it takes multiple days in the same test), 35times if one week or more has passed since the previous test data, and 50 times at most if two weeks or more have passed, it is possible to carry our re-brake conditioning. If re-brake conditioning test is not carried out on the day of test, warm up run should be carried out until the brake temperature exceed 100° C by the procedure of the item 5.1 (2)
- (2) Set up for the start position of the test: The test start position is selected from one of the choices where the distance between the start and potential collision site is 1.0 m, 0.9 m, or 0.8 m. Selection of this position is declared by the automobile manufacture etc. for each condition in the traveling direction.
- (3) Brake temperature: In an apparatus that controls the running of a vehicle by automatically intervening in the braking system, measure the brake temperature before the test run and confirm that it is in the range of 65 ° C to 100 ° C.
- (4) Installation of Vehicle Targets: Under the conditions of Fon and Ron, a Vehicle Target is set at the potential collision position. At this time, it is installed so that the center of the front face of the Vehicle Target is at perpendicular angle to the runway.
- (5) Transmission: For Foff and Fon, set the gear position to the D range if the transmission of the test vehicle is an automatic transmission and the lowest forward gear in the case of the manual transmission. In the case of Roff and Ron, the gear position is set to the R range in the case of the automatic transmission and set as the reverse gear in the case of the manual transmission.
- (6) Movement to the test running start position: Start the engine of the test automobile 20 m before the Vehicle Target installation position on the track. After that, the vehicle will roll to the test running start position and stop. In addition, the gear position of the transmission must not be changed during the movement, and the accelerator and brake operations shall be minimized as much as possible and no sudden pedal operation shall be performed.
- (7) Preparation at the test start position: Regarding the restarting operation of the engine and the change of the gear position of the transmission after moving to the test start position, follow the method by offer from the automobile manufacturer, etc. In the test

of Roff and Ron, the engine may be started by moving to the test start position by a self-selected procedure. If the test traveling start position has passed, the procedure from (6) is repeated.

- (8) Test driving: The test driver quickly steps from the brake pedal to the accelerator pedal and holds it all the way down until the test car stops or exceeds the potential collision location, maintaining the steering wheel in the neutral position.
- (9) Number of tests: For Fon and Ron, acquire valid test results once. When carrying out Foff and Roff, obtain valid test results three times. For Fon and Ron, however, if preliminary data has been submitted by the automaker, etc., only when the first avoidance result in this test differs from the avoidance result of the preliminary data, additional tests perform the test twice to obtain effective test results. In all the tests, if the test result is the same collision speed twice consecutively, the third test can be omitted. Also, tests determined to be invalid (Foul) in the check of the test results in paragraph 5.3 shall not be included in valid test times.

5.3. Confirmation of test results and test video recording

- (1) Measurement section: In a test run, the measurement section shall start at the point at which the test driver lets off the brake and end at either the point at which the test vehicle stops or passes the Hypothetical Collision Position, whichever occurs earlier..

- (2) Adjustment of measured values

For the test results obtained for, the following items a) to e), measurement values etc. shall be rounded off to the nearest unit in each item. (Hereinafter the same in this test method.)

a) Maximum lateral shift amount: Read the maximum value (absolute value regardless of direction) of the lateral shift amount within the measurement section in units of 0.01 m.

b) Brake off position: Read the distance from the potential collision location at the start of the measurement section in units of 0.01 m.

c) Speed when accelerator is on: Read the speed of test car at accelerator on in increments of 0.1 km/h.

d) Accelerator depression time: Read the time taken from the accelerator on time to the accelerator full time in units of 0.01 s.

e) Collision speed: Read the speed of the test car at the time when the distance from the virtual collision position becomes 0.0 m or less in increments of 0.1 km/h. If it does not reach the potential collision location, it is 0 km/h.

- (3) Test video recording

(a) In-vehicle video: Record in front of the test vehicle, around the driver's seat and the event of pedal miss-application are recorded by the video camera installed in the vehicle compartment of the test vehicle. (If it is difficult to shoot in the car due to sunshine etc., shooting can be canceled after consultation with the car manufacturer etc.)

(b) Out-vehicle video: Record the driving condition of the test car and the collision / avoidance situation with the test target with a video camera installed at the side of the test track. At that time, the video camera shall be installed near the virtual collision position where a collision between the test car and the test target is expected.

(4) Confirming validity of test results

If one of the following factors (a to f) is present, the test result is considered invalid (foul).

a) When the maximum lateral shift amount exceeds 0.1m

b) When the brake off position exceeds the range of ± 0.02 m from the test track start position

c) When the accelerator on speed exceeds 0.5 km/h

d) When the accelerator pedal depression time is less than 0.13s or exceeds 0.25s

e) When necessary measurement results cannot be obtained due to malfunction or failure of the measuring instrument, or when it is judged that there is a clear error

f) When an action other than the one stipulated in the test is performed, such as touching the brake pedal when the accelerator is on.

g) When the test video of (3) is not acquired (except when the driving status of the test car, the operating status of the test target and the collision / avoidance status can be confirmed by the in-vehicle video or the outside video)

6. Recording test results

6.1. Recording the environmental factors

The test conditions, the test vehicle specifications, the test date (day, month, year), ambient conditions during the test and the like shall be recorded in Appendix 2.

6.2 Recording the measurements

For each test condition that was carried out, record the measured values sorted out in 5.3 (2) for the test results determined to be valid in 5.3 (3) in the corresponding column of Appendix 2.

6.3 Test results

(1) Record the collision speed, which is the median value among three effective test results for each test condition of Foff and Roff, in the corresponding column of Appendix 2

respectively. The same shall apply when 5 effective tests of Fon and Ron are carried out three times according to 5.2 (9). In addition, when Foff or Roff is omitted according to 5.1 (3), then this is to be recorded in the corresponding column of Appendix 2.

(2) The rate of change in speed is obtained by the following formula, and the numerical values obtained up to the first decimal place after rounding off the second decimal place are recorded in the corresponding column of Appendix 2.

For the Fon, Foff, Ron and Roff in this case, the median value of the collision speed shall be used. When Foff or Roff is omitted according to 5.1 (3), the rate of change in speed will be "1.0".

- Speed change rate (F side) = $(Foff - Fon) / Foff$
- Speed change rate (R side) = $(Roff - Ron) / Roff$

(3) For the "Avoidance" column in Appendix 2, "○" is recorded when the rate of change rate arranged in 6.3 (2) is "1.0", "Δ" when it is "0.1 or more but less than 1.0", and "X" when it is "less than 0.1".

Appendix A - Vehicle Target specifications

Vehicle Target specifications used are the same as those outlined by Euro-NCAP (Test Protocol - AEB systems Version1.0 July 2013 ANNEX A EVT SPECIFICATIONS).

(Currently Messring Systembau Ltd's ADAC Advanced Emergency Braking System (AEBS) (<http://www.messring.de/test-facilities-and-components/adac/>) specifications are satisfactory.)

Attached 1 shows the outward appearance of the Vehicle Target.

The Vehicle Targets are designed to exhibit sensed characteristics equivalent to those of segment C vehicles in Europe for sensors such as laser radar, millimeter wave radar and camera.

The number plate of the Vehicle Target displays the 7JNCAP7 logo. The air pressure of the Vehicle Target should be set to 25 kPa and this air pressure should be maintained during the test.



Attached 1 – Vehicle Target outward appearance

Appendix 1 Specifications of vehicle tested for equipment designed to curb acceleration in the event of peddle misapplication

(To be filled out by manufacturer)

1. Specifications of the car being examined

(1) Make/Model (Nickname): _____ / _____ (_____)

(2) Sensor system : Front _____ Back _____

(3) Is there breaking control? (_____ yes / _____ no)

(4) Tires used at time of testing

	Front	Back
Size		
Brand/model		
Air pressure (kPa)		

2. Declaration from the manufacturer

●Choice of test starting position : Front _____ 1.0m · 0.9m · 0.8m _____

Back _____ 1.0m · 0.9m · 0.8m _____

●Recommended operations at test start point (Engine timing ON/FF、 shift lever position) :

● Test results from automobile producer, etc.: If the automaker or import agent has performed their own tests, a book equivalent to Appendix 2 will be prepared. If applicable please attach.

Appendix 2 - Test results of equipment designed to curb acceleration in the event of peddle misapplication

(To be filled out by examining officer)

Test date (YYYY/MM/DD): _____ Test site: _____

Examining officer: _____

1. Specifications of the car being examined

(1) Make/Model (Nickname): _____ / _____ (_____)

(2) Model number: _____

(3) Sensor system : Front _____ Back _____

(4) Tires used at time of testing

	Front	Back
Size		
Brand/model		
Air pressure (kPa)		

(5) Test vehicle's weight distribution

		Left side	Right side	Subtotal	Total	Front-back distribution
Distribution at time of delivery (daN)	Front					%
	Back					%
Distribution at time of testing (daN)	Front					%
	Back					%

(Note) 1daN=1kgf recorded

2. Environmental conditions

Start time : _____ Weather : _____ Temp. : _____ Wind speed : _____

Finish time : _____ Weather : _____ Temp. : _____ Wind speed : _____

Any other notes/remarks: _____

3. Test results

Test start position: Advancing _____ m Reversing _____ m

		Maximum lateral displacement (m)	Position at Time of Brake off (m)	Speed at time of acceleration (km/h)	Accelerator depression time (s)	Speed at collision (km/h)	Median of speed at collision	Speed change rate	Avoidance
Foff	1st try								
	2nd try								
	3rd try								
Fon	1st try								
	2nd try								
	3rd try								
Roff	1st try								
	2nd try								
	3rd try								
Ron	1st try								
	2nd try								
	3rd try								