

ASSOCIATION STANDARD

T/CSAE 78-2018

**Evaluation and test methods for regenerative braking comfort
of electric vehicles
(English Translation)**

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Foreword

This standard is based on GB/T 1.1-2009 "Standardization Work Guide Part 1. Standard Structure and Compilation" Read on.

1 Scope

This standard specifies the evaluation and test methods for the regenerative braking comfort of electric vehicles.

This standard applies to Class M and Class N electric vehicles equipped with a coordinated regenerative braking system.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only the dated version applies to this file. For dated documents, the latest edition (including all amendments) applies to this document.

GB/T 18384.1 Electric Vehicle Safety Requirements Part 1. Vehicle Rechargeable Energy

Storage System (REESS) GB/T 19596 electric vehicle terminology GB 21670 Passenger car brake system technical requirements and test methods GB 12676 Technical requirements and test methods for brake systems for commercial vehicles and trailers GB/T 4970 Automotive ride test method

3 Terms and definitions

The definitions of GB/T 18384.1-2015 and GB/T 19596-2017, as well as the following terms and definitions, apply to this document. For the sake of for use, some of the terms and definitions in GB/T 18384.1-2015 and GB/T 19596-2017 are repeated below.

3.1 Rechargeable energy storage system rechargeable energy storage system (REESS)

An energy storage system that can be charged and provides electrical energy, such as batteries and capacitors.

[GB/T 18384.1-2015, definition 3.1]

3.2 Regenerative braking system regenerative braking system

When the car is taxiing, slowing down or going downhill, the kinetic energy and potential energy during the driving process are converted or partially converted into vehicle-mounted rechargeable energy storage.

The system's energy is stored in the brake system.

Note: Rewrite GB/T 19596-2017, definition 3.1.2.1.8.

4.1 Road

The test road shall be a straight, dry asphalt pavement or cement pavement.

4.2 Wind speed

The wind speed is no more than 3m/s.

4.3 Status of automotive technology

4.3.1

The requirements for test vehicles, running-in, etc. of passenger cars shall be in accordance with the requirements of Test Method 7 of GB 21670-2008. Commercial vehicle Test vehicles, running-in, etc. are required to comply with the requirements of test requirements 5.1 in GB 12676-2014.

4.3.2

The assembly, parts, accessories and accessories of the car (including the on-board tools and spare tires) shall be fully equipped and installed according to the regulations.

In the prescribed position. The adjustment status shall comply with the technical requirements of the design of the vehicle. [GB/T 4970-2009 3.3.1]

4.3.3

Tire inflation pressure should be in accordance with the technical requirements of the vehicle design, the error does not exceed $\pm 3\%$ of the specified inflation pressure.

[GB/T 4970-2009 3.3.2]

4.4 Car load

The load of the car is the rated maximum loading quality, and can be tested for other load conditions as needed. The load is evenly distributed and fixed Reliable, should not be shaken and turned off during the test, and should not change the quality due to moisture, loss and so on. [GB/T 4970-2009 3.4]

5 Test equipment

The test equipment should include an accelerometer, a data acquisition instrument, a vehicle speedometer, a filter, and the like. Test system consisting of test instruments it should be suitable for smoothness measurement, and its performance should be stable and reliable. [GB/T 4970-2009 4.1]

6 Test methods

6.1

Acceleration sensor installation location.

1) Class M vehicles. the driver and the upper seat cushion on the same side, on the seat back, on the floor of the foot;

2) Class N vehicles. above the driver's seat cushion, seat back, and foot floor.

Accelerometers only need to measure longitudinal (X-axis) vibration. For the arrangement of the sensors on the seat back, see GB/T 4970-2009

Figure 2; The sensor on the floor of the step is placed in the middle of the driver's (or occupant) feet. Mounted above the seat cushion, seated

The sensor on the back should be in close contact with the human body. The sensor structure above the seat cushion can be seen in GB/T 4970-2009. Figure B.1.

For the structure of the sensor, see Figure B.2 of GB/T 4970-2009. [GB/T 4970-2009 5.1]

6.2

Adjust the state of charge of the rechargeable energy storage system to near the middle value.

6.3

Test according to the following braking strength.

- 1) The braking strength is 0.05g;
- 2) The braking strength is 0.1g;
- 3) The braking strength is 0.15g;
- 4) The braking strength is 0.2g;
- 5) The braking strength is 0.3g.

6.4

Accelerate the vehicle to 120km/h. If the maximum vehicle speed is less than 120km/h, it will run at the highest speed that can be achieved.

6.5

Release the accelerator pedal and wait until the vehicle speed drops to 10km/h below the test speed (ie 110km/h or (maximum speed)-10km/h)), depress the brake pedal and brake at the braking intensity specified in 6.3 until the vehicle stops, recording the test positions Acceleration time history.

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6.6

The effective number of tests for each braking strength shall be not less than 5 times.

6.7

For vehicles with multiple coasting regenerative braking strength modes, the corresponding mode should be set before the test and the regenerative braking strength should be set.

The mode is recorded in the test report and the regenerative braking strength mode is not allowed to be changed during the test.

7 Regenerative brake ride comfort evaluation

Regenerative braking ride comfort is evaluated using the vibration dose value (see Appendix A).