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Replacing GB/T 13594-2003

**Performance requirements and test methods of anti-lock
braking system for commercial vehicle and trailer**

商用车辆和挂车防抱制动系统性能要求及试验方法

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1 Scope

GB/T 13594-2025 is the Chinese national standard on performance requirements and test methods of anti-lock braking system for commercial vehicle and trailer, in the field of road vehicles engineering. The /T suffix marks it as a recommended standard: it is not compulsory by itself, but it becomes binding as soon as a contract, a tender or a customer specification calls it up - which in practice is how most foreign buyers meet it. It was issued on 25 April 2025 by the State Administration for Market Regulation; Standardization Administration of China, and has been in force since 1 August 2025. Classification: ICS 43.040.40, CCS T24. This page is published from the official record of the standard held by the Chinese standards administration: the identification, the dates, the classification and the issuing body are taken from there. The clause text, the tables and the numeric limits are in the document itself, which is delivered complete in English translation.

This document specifies the classification and performance requirements of anti-lock braking system for commercial vehicles and trailers, and describes the test methods and procedures. This document applies to vehicles equipped with anti-lock braking system, as well as categories M2, M3, N, and O vehicles as per GB/T 15089.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB 4094, Road vehicles - Symbols for controls, indicators and tell-tales

GB/T 5620, Road vehicles - Vocabulary and definition for braking of automotive vehicles and their trailers

GB 12676-2014, Technical requirements and testing methods for commercial vehicle and trailer braking systems

GB/T 20716.1, Road vehicles - Connectors for the electrical connection of towing and towed vehicles (7-pole) - Part

1.Connectors for braking systems and running gears of vehicles with 24 V nominal supply voltage

GB 34660, Road vehicles - Requirements and test methods of electromagnetic compatibility

3 Terms and definitions

For the purposes of this document, terms and definitions given in GB/T 5620, as well as the following, apply.

3.1 full cycling A control status, under which the anti-lock braking system repeatedly adjusts the braking force to prevent the wheels from locking up. Note

1.The situation where only one adjustment is made during the braking-to-stop process does not meet the definition. Note

2.For air-brake trailers, the anti-lock braking system can only be confirmed as being in full cycling when the pressure of each brake chamber directly controlled by the wheels exceeds the maximum cycle pressure of

0.1 MPa throughout the entire braking process.

4 Symbols

The following symbols apply to this document. E. Wheelbase. ER. The distance between the traction pin and the center of the semi-trailer axle or the center of each axle (or the distance between the hook and the center of the axle of the center axle trailer or the center of each axle). F. Force. FbR. The braking force when the trailer's anti-lock braking system is not operating. FbRAL. The braking force when the trailer's anti-lock braking system is operating. FbRmax. The maximum value of FbR. FbRmaxi. FbRmax when only the ith axle of the trailer is braked. FCd. The sum of the static normal reaction forces of the road surface on the unbraked drive shaft of the train. FCnd. The sum of the static normal reaction forces of the road surface on the unbraked driven axle of the train. Fdyn. The normal dynamic reaction force of the road surface when the anti-lock braking system is working. Fi. The static normal reaction force of the road surface on the ith axis. Fidyn. Fdyn on the ith axle of a commercial vehicle or trailer. FM. The sum of the static normal reaction forces of the road

surface on each wheel of the vehicle (towing vehicle). ϵ . Vehicle adhesion coefficient utilization rate, the quotient of maximum braking intensity (zAL) and adhesion coefficient (k) when the anti-lock braking system is working. ϵ_H . The value of ϵ on a high-adhesion-coefficient road surface. ϵ_i . The value of ϵ measured on the i -axis (for vehicles equipped with Category 3 anti-lock braking system). ϵ_L . The value of ϵ on a low-adhesion-coefficient road surface.

Note. For two-axle vehicles, FM_{nd} and FM_d are simplified to F_i .

5.1 Categories M2, M3, and N vehicles

5.1.1 General A vehicle is considered to be equipped with an anti-lock braking system if it is equipped with one of the following systems.

5.1.2 Category 1 anti-lock braking system Vehicles equipped with a Category 1 anti-lock braking system shall meet all performance requirements of this document.

5.1.3 Category 2 anti-lock braking system Vehicles equipped with a Category 2 anti-lock braking system shall meet all performance requirements except those specified in 6.3.3.6.

5.1.4 Category 3 anti-lock braking system Vehicles equipped with a Category 3 anti-lock braking system shall meet all performance requirements except those specified in

6.3.3.5 and 6.3.3.6. On these vehicles, any axle (bridge) or axle (bridge) group not including a directly controlled wheel shall comply with the provisions of Appendix E of GB 12676-2014 regarding the adhesion coefficient utilization rate and the wheel lock-up sequence under different braking intensities and load conditions. These requirements can be checked by adjusting the control force of the service brakes and conducting braking tests on roads with high adhesion coefficient (approximately 0.8) and low adhesion coefficient (maximum 0.3).

5.2 Category O vehicles

5.2.1 General A trailer is considered to be equipped with an anti-lock braking system when at least one wheel on each side is directly controlled, and the remaining wheels are controlled directly or indirectly by the anti-lock braking system. For a full trailer, at least two wheels on one front axle and two wheels on one rear axle shall be directly controlled, each axle shall have at least one independent adjuster, and the remaining wheels can be directly or indirectly controlled.

5.2.2 Category A anti-lock braking system Trailers equipped with a Category A anti-lock braking system shall meet all the performance requirements of this document.

5.2.3 Category B anti-lock braking system Trailers equipped with a Category B anti-lock braking system shall meet all the performance requirements except for 6.4.3.2.

6.2 General requirements

6.2.1 When an electrical fault occurs that affects the system's function or performance requirements (including abnormal power supply, failure of the controller's external circuit, controller failure, regulator failure) or when a sensor malfunctions, a warning shall be issued to the driver via a dedicated optical warning signal. The warning signal shall comply with the provisions of GB 4094 regarding yellow warning tell-tales.

Note. Before a standardized testing procedure is established, the manufacturer must provide the technical department with an analysis of potential controller failures and their consequences. This information must be agreed upon by both the manufacturer and the technical department.

6.2.2 For sensor anomalies that cannot be detected under static conditions, the detection shall be performed before the vehicle speed exceeds 10 km/h. However, since the wheels do not rotate under static conditions, the sensor cannot generate a vehicle speed signal. To prevent issuing false warning signals, the detection can be postponed, but the sensor shall be confirmed to be working properly before the vehicle speed exceeds 15 km/h.

Note. If there is no fault, the warning signal shall turn off before the vehicle speed reaches 10 km/h or 15 km/h, but the warning signal may turn back on when the vehicle is stationary.

6.2.3 When the vehicle is stationary and the anti-lock braking system is energized, the electronic control regulator shall cycle at least once.

6.2.4 Except for category N1 vehicles, automobiles equipped with an anti-lock braking system and permitted to tow a trailer equipped with an anti-lock braking system shall have a separate optical warning tell-tale for the trailer's anti-lock braking system, conforming to the requirements of 6.2.1. The warning signal shall operate through a 5- contact connector conforming to GB/T 20716.1 and comply with the provisions of GB 4094 regarding yellow warning tell-tales. When coupled to a trailer without an anti- lock braking system or when not coupled to a trailer, the warning signal shall be automatically identifiable and not illuminated.

Note. If appropriate, use the 5-contact or 7-contact connectors in GB/T 20716.1.

6.2.5 When the anti-lock braking system experiences the fault described in 6.2.1, the following requirements shall be met.

a) For categories M2, M3, and N vehicles, their residual braking performance shall meet the requirements specified in

4.2.1.4 of GB 12676-2014 regarding the performance of the corresponding vehicle in the event of component failure of the service brake transmission device. When used for emergency braking, this shall not be used as a reason to deviate from emergency braking regulations;