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TRANSPORT INDUSTRY STANDARD
OF THE PEOPLE'S REPUBLIC OF CHINA

ICS 03.220.20; 35.240.60

R 86

Filing No.:

JT/T 883-2014

**Commercial vehicle driving dangerous warning system
technical requirements and test procedures**
营运车辆行驶危险预警系统技术要求和试验方法

Issued on: April 15, 2014

Implemented on: September 01, 2014

Issued by: Ministry of Transport of PRC

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Commercial vehicle driving dangerous warning system technical requirements and test procedures

1 Scope

This standard specifies the general requirements, functional requirements, performance requirements, installation and use requirements, test methods, for the driving dangerous warning system of commercial vehicles (hereinafter referred to as the warning system).

This standard is applicable to the dangerous warning system for commercial vehicles, which are equipped with the warning function of the front vehicle collision and the dangerous state of lane departure.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

GB 5768.3-2009 Road traffic signs and markings - Part 3: Road traffic markings

GB/T 26773-2011 Intelligent transport systems - Lane departure warning systems - Performance requirements and test procedures

JT/T 794 GNSS system for operating vehicles - Technical specification for vehicle terminals

ISO 15623:2002 Transport information and control systems - Forward vehicle collision warning systems - Performance requirements and test procedures

IEC 60825-1 Safety of laser products - Part 1: Equipment classification and requirements

3 Terms and definitions

The terms and definitions as defined in JT/T 794, GB/T 26773-2011, ISO 15623:2002, as well as the following terms and definitions, apply to this document.

3.1

Commercial vehicle driving dangerous warning system

A system, which automatically collects the speed, distance from the front vehicle, lane, other vehicle running status information, during the driving process of the commercial vehicle; warns or alerts the driver, by means of including but not limited to voice prompts, according to the method for judging the dangerous driving status of the vehicle, which is set in the early warning system; preferentially uses the CAN bus communication method, to transmit the dangerous state warning information to the on-board terminal of the road transportation vehicle's satellite positioning system. The vehicle driving dangerous state includes a front vehicle collision dangerous state, a lane departure dangerous state, etc.

4 General requirements

4.1 Composition of early warning system

The early warning system shall include a front vehicle collision warning module, a lane departure warning module, a data communication interface. The front vehicle collision warning module and the lane departure warning module shall transmit no less than the following information, to the on-board terminal of satellite positioning system, through the data communication interface, respectively.

- a) Front vehicle collision information: Front vehicle collision warning (primary collision warning/collision warning), front vehicle distance, relative speed;
- b) Lane departure information: Lane departure warning, lane departure direction.

4.2 Others

The appearance, nameplate, text, graphics, signs, materials, enclosure protection of each module of the early warning system shall meet the requirements of JT/T 794.

5 Functional requirements

5.1 Self-check

The early warning system shall be started, within 30 s after the vehicle is started; complete the self-check of all the main system sensors and components; clearly indicate the current working status of the early warning system, by signal lights or display screens. If there is a fault, it will indicate the fault type and other information, through the signal light or display screen; transmit it to the on-board terminal of the satellite positioning system, at the same time.

5.2 Automatic calibration

5.4.3 When driving under normal road conditions, the early warning system shall be able to detect lane lines, in lighting conditions such as in day, night, dusk, dawn.

5.4.4 When the driver has a tendency to change lanes or turn AND turn on the turn signal in the correct direction, the early warning system shall not issue a lane departure warning.

5.4.5 When the wipers act, the early warning system shall work normally.

5.4.6 When the alarm conditions are met, the early warning system shall immediately send out the lane departure warning information; transmit it to the on-board terminal of satellite positioning system, at the same time.

5.5 Others

The early warning system shall provide the driver with a human-machine interface, including indicator lights related to the operating state of the system, alarm information of dangerous states in the form of sound/tactile/visualization, the operating/stop/fault state of the system. Indicator lights shall clearly show status in direct sunlight and at night.

6 Performance requirements

6.1 Overall performance

The early warning system and firmware shall keep working independently and stably for 24 hours. They shall meet the following performance requirements:

- a) Reliability: The mean time between failures (MTBF) of the early warning system is not less than 3000 h;
- b) Scalability: It shall have a CAN bus data interface. It can be equipped with an RS232 interface or an RS485 interface or other connection to external devices, as well as a sensor data interface, according to actual needs.

6.2 Others

The electrical performance, environmental adaptation performance, electromagnetic compatibility performance of the early warning system shall comply with the relevant requirements of JT/T 794.

7 Installation and usage requirements

7.1 The early warning system shall be installed, in accordance with the manufacturer's recommendations. It shall not affect the driver's sight. It shall not be installed on surfaces, which are prone to vibration.

7.2 The main components of the early warning system, such as controllers and sensors, shall be marked with the manufacturer's logo.

7.3 The windshield shall be kept clean, to ensure the alarm function of the camera-type early warning system.

7.4 The manufacturer shall provide the installation manual, operation guide, etc. of the early warning system. The installation manual shall contain documentation, that the system is properly calibrated and functionally valid. The operating instructions shall at least describe:

- The minimum speed at which the warning system operates;
- Under what conditions/can the system detect and track the vehicle;
- The type of route signs that can be captured;
- The type of indicator light, which informs the driver of the normal operation of the system.

8 Test methods

8.1 Test conditions

The test conditions are as follows:

- a) Road conditions: Dry and flat asphalt or concrete pavement;
- b) Horizontal visibility: Not less than 1 km;
- c) The visible lane markings on the test pavement shall be in good condition AND comply with the provisions of GB 5768.3-2009.

8.2 Alarm test of front vehicle collision dangerous state

8.2.1 Test 1

8.2.1.1 Test method

The subject vehicle approaches, at a constant speed, the stationary front vehicle. The test process is as shown in Figure 1.

8.2.1.2 Test conditions

The conditions for test 1 are as follows:

- a) The forward direction of the subject vehicle and the front vehicle shall be parallel to the lane line;

8.2.3.3 Test procedure

The test steps are as follows:

- a) The subject vehicle follows the front vehicle; drives at a constant speed of 72 km/h in the middle of the lane; the subject vehicle is 30 m away from the rear of the front vehicle;
- b) After following 7 s, the front vehicle starts to decelerate; maintains the deceleration at 0.3 g, within 1.5 s after braking;
- c) If the system issues a collision warning, when the time to collision (TTC) is not less than 2.40 s, the test will pass and end;
- d) If the system issues a collision warning, when the time to collision (TTC) is less than 2.40 s, the test fails and ends;
- e) If the system does not issue a collision warning, when the time to collision (TTC) drops to 2.16 s, the test shall be terminated immediately;
- f) At the end of the test, the driver of the subject vehicle shall take braking measures and turn the steering wheel, to leave the lane, to avoid collision with the front vehicle.

8.2.4 Reliability of vehicle forward collision warning

Under the test conditions of 8.2.1 ~ 8.2.3, the number of each test requires no less than seven consecutive tests. The early warning system shall pass five of the seven tests, AND cannot fail two consecutive tests.

8.3 Alarm test for lane departure dangerous state

8.3.1 Test rules

Carry out test respectively on different lane types in 5.4.2. The test method is carried out, in accordance with the requirements of Chapter 5 of GB/T 26773-2011.

8.3.2 Reliability of lane departure alarm

For repeatability tests conducted on straight lanes, the early warning system shall pass three tests out of a single set of four tests, AND pass 13 tests out of a total of 16 tests as required.

Appendix A

(Normative)

Technical specifications and requirements for early warning systems ¹⁾

A.1 Warning

A.1.1 Overview

The vehicle forward collision warning system shall provide warnings, in accordance with the following functional requirements.

A.1.2 Monitor the distance and relative speed between the subject vehicle and the obstacle vehicle

Information about front obstacle vehicles can be sensed by optical radar, radio wave radar, image processing systems.

A.1.3 Judge the time to collision

According to the speed of the subject vehicle, the distance to the obstacle vehicle, the relative speed, it may estimate the possible time to collision. If the system detects multiple obstacle vehicles at the same time, the system can automatically select the obstacle vehicle at the position, that the subject vehicle will reach the fastest, on its running trajectory.

A.1.4 Primary collision warning and collision warning

A.1.4.1 The vehicle forward collision warning system shall provide at least two different warnings: Primary collision warning and collision warning. The purpose of a primary collision warning is to inform the front obstacle vehicle, so that the driver can be prepared to take the necessary action, to avoid a collision. A collision warning, on the other hand, informs the driver that immediate action shall be taken, to avoid a collision.

A.1.4.2 Warnings can be used alone or in combination with visual, auditory or tactile methods. In the collision warning, auditory or tactile methods shall be used. In addition, visual alarms can be used as auxiliary means, for the aforementioned warning methods.

A.1.4.3 The warning shall be determined by the following factors: The relative speed and distance between the subject vehicle and the obstacle vehicle, the speed of the subject vehicle, the driver's braking reaction time, the vehicle's braking deceleration.

¹⁾ Translated from Chapter 5 of ISO 15623:2002.

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