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RAILWAY INDUSTRY STANDARD
OF THE PEOPLE'S REPUBLIC OF CHINA

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TB/T 2296-2011

Replacing TB/T 2296-1991

**General technical specification for
railway axle counters**

铁路信号计轴设备通用技术条件

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Table of contents

Foreword.....	3
1 Scope	4
2 Normative references	4
3 Equipment components.....	6
4 Equipment working environment	6
5 Technical requirements	7
6 Test methods.....	11
7 Inspection rules	15
8 Marking, packaging, transportation, and storage.....	16

Foreword

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

This standard replaces TB/T 2296-1991 "General technical specification for railway axle counters". As compared with TB/T 2296-1991, the main technical changes of this standard are as follows:

- DELETE the product classification;
- MODIFY the wheel sensor impact indicators;
- MODIFY that when the minimum wheel diameter of the axle detector is 840 mm AND the driving speed is 0 km/h ~ 350 km/h, it shall work reliably; DELETE the minimum diameter 470 mm of the wheel;
- MODIFY the response time requirements of the output conditions of the axle counter;
- IMPROVE the reliability indicator;
- ADD the test methods, inspection rules, marking, packaging, transportation, storage and other requirements.

This standard was proposed by AND shall be under the jurisdiction of Xi'an Railway Signal Research Institute.

The drafting organization of this standard: Beijing Railway Communication Signal Research & Design Institute Co., Ltd.

The main drafters of this standard: Fu Jun, Hu Shuxuan, Zhang Yingying, Gu Guoxin.

This Standard replaces the standard previously issued as follows:

- TB/T 2296-1991.

General technical specification for railway axle counters

1 Scope

This standard specifies the composition, working environment, technical requirements, test methods, inspection rules and markings, packaging, transportation and storage of axle counters.

This standard is applicable to the design, manufacture, inspection and maintenance of axle counter.

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) are applicable to this Standard.

GB/T 191 Packaging - Pictorial marking for handling of goods (GB/T 191-2008, ISO 780:1997, MOD)

GB/T 2423.1 Environmental testing for electric and electronic products - Part 2: Test methods - Test A: Cold (GB/T 2423.1-2008, IEC 60068-2-1:2007, IDT)

GB/T 2423.2 Environmental testing for electric and electronic products - Part 2: Test methods - Test B: Dry heat (GB/T 2423.2-2008, IEC 60068-2-2:2007, IDT)

GB/T 2423.4 Environmental testing for electric and electronic products - Part 2: Test methods Test Db: Damp heat, cycle (12h + 12h cycle) (GB/T 2423.4-2008, IEC 60068-2-30:2005, IDT)

GB/T 2423.5 Environmental testing for electric and electronic products - Part 2: Test methods - Test Ea and guidance: Shock (GB/T 2423.5-1995, idt IEC 60068-2-27:1987)

GB/T 2423.10 Environmental testing for electric and electronic products - Part 2: Test methods Test Fc: Vibration (sinusoidal) (GB/T 2423.10-2008, IEC 60-8-2-6:1995.IDT)

GB/T 4588.3 Design and use of printed boards (GB/T 4588.3-2002, IEC 60326-3:1991, EQV)

GB/T 5023.4 Polyvinyl chloride insulated cables of rated voltages up to and including 450 V/750 V - Part 4: Sheathed cables for fixed wiring (GB/T 5023.4-2008, IEC 60227-4:1997, IDT)

GB/T 15157.2 Connectors for frequencies below 3 MHz for use with printed boards - Part 2: Detail specification for two-part connectors with assessed quality for printed boards for basic grid of 2.54 mm (0.1 in) with common mounting features (GB/T 15157.2-1998, idt IEC 60603-2:1995)

GB/T 21562-2008 Railway application - Specification and demonstration of reliability, availability, maintainability and safety (RAMS) (IEC 62278-2002, IDT)

GB/T 24339.1 Railway applications - Communication signaling and processing systems - Part 1: Safety-related communication in closed transmission systems (GB/T 24339.1- 2009, IEC 62280-1:2002, IDT)

GJB 2889 XC series high reliable small circular wire spring electrical connector - Specification

TB/T 1447 Insulation resistance of signal products

TB/T 1448 Insulation and voltage resistance for communication signal products

TB/T 1498 Technical specification for packaging of railway communication signal products

TB/T 3073-2003 Railway signaling equipment - Electromagnetic compatibility test and limits

TB/T 3074-2003 Railway signaling equipment - Lightning electromagnetic pulse protection - Technical conditions

TB/T 3189 Specification of railway signal axle counter application system

IEC 62279-2002 Railway applications - Communications, signaling and processing systems - Software for railway control and protection systems

IEC 62425-2007 Railway applications - Communication, signaling and processing systems - Safety related electronic systems for signaling

- a) The communication interface shall adopt RS232 or RS422 communication mode with photoelectricity isolation;
- b) The communication interface mechanical characteristics shall be DB9 connectors.

5.2 Technical indicators of axle counter

5.2.1 The detection capability shall comply with the following requirements:

- a) When the wheel diameter is not less than 840 mm, the equipment shall be capable of detecting the train speed of 0 km/h ~ 350 km/h;
- b) When the wheel diameter is not less than 350 mm, the equipment shall be capable of detecting the train speed of 0 km/h ~ 100 km/h;

5.2.2 The response time shall comply with the following requirements:

- a) The response time of the track section from the occupied to the cleared output conditions shall not be greater than 2 s;
- b) The response time of the track section from cleared to the occupied output conditions shall not be greater than 1 s.

5.2.3 The axle counter sensor shall be capable of reliable operation in all types of steel rails of 43 kg/m and above.

5.2.4 The structure and installation of outdoor trackside equipment shall comply with the requirements of railway construction boundary.

5.2.5 The outdoor trackside equipment shall be capable of reliable operation under disturbances such as steel rail traction currents and harmonics in the electrified section.

5.3 Hardware requirements of axle counter

5.3.1 The system design of the equipment shall comply with the relevant provisions in GB/T 21562-2008, GB/T 24339.1, and IEC 62425-2007.

5.3.2 The safety integrity level of the axle counter shall reach to the level 4 requirements of GB/T 21562-2008.

5.3.3 The host computer (computing unit) of axle counter shall adopt a 2-take-2 safety computer architecture and, if necessary, a 2-by-2-take-2 safety computer structure.

5.3.4 Key components shall comply with the following provisions:

- a) Initial detection: in accordance with the provisions of this standard and under the standard atmospheric conditions, MAKE the equipment be subjected to appearance inspection and functional testing.
- b) Condition test: After the equipment is placed in the standard atmospheric condition for 2 hours, PUT it into the test chamber in the normal working position.
- c) Severity rating: -5 °C (indoor equipment) and -40 °C (outdoor equipment), with the duration in 2 h.
- d) Intermediate testing: During the test, the equipment is energized and kept working. After 2 hours of heat preservation, CONTINUE keeping the temperature to conduct appearance inspection and functional testing. The test results shall comply with the requirements of 5.1 and 5.2.
- e) Final testing: After the test, RESTORE the test chamber to standard atmospheric conditions and MAKE the equipment be restored for 2 h under standard atmospheric conditions; then CONDUCT appearance inspection and functional testing. The test results shall comply with the provisions of 5.1, 5.2, and 5.3.

6.4 High temperature test

It shall follow the provisions of GB/T 2423.2 to conduct the high temperature test, AND it shall comply with the following provisions:

- a) Initial detection: in accordance with the provisions of this standard and under the standard atmospheric conditions, MAKE the equipment be subjected to appearance inspection and functional testing.
- b) Condition test: After the equipment is placed in the standard atmospheric condition for 2 hours, PUT it into the test chamber in the normal working position.
- c) Severity rating: +40 °C (indoor equipment), +70 °C (outdoor equipment), +80 °C (rail equipment), with the duration in 2 h; AND the duration shall be extended to 6 h in highland area.
- d) Intermediate testing: During the test, the equipment is energized and kept working. After 2 hours of heat preservation, CONTINUE keeping the temperature to conduct appearance inspection and functional testing. The test results shall comply with the requirements of 5.1 and 5.2.
- e) Final testing: After the test, RESTORE the test chamber to standard atmospheric conditions and MAKE the equipment be restored for 2 h

- 1) Wheel sensor: when the vibration frequency is 2 Hz ~ 9 Hz and 9 Hz ~ 200 Hz, the acceleration is 100 m/s²;
- 2) Wheel electronic detection box: when the vibration frequency is 2 Hz ~ 9 Hz and 9 Hz ~ 200 Hz, the acceleration is 20 m/s²;
- 3) CONDUCT test along vertical, horizontal longitudinal, and horizontal transverse directions, ensuring continuous vibration along each direction for 30 min.
- d) Final testing: After test, CONDUCT appearance inspection and functional testing, AND the results shall comply with the provisions of 5.1, 5.2, and 5.3.

6.7 Impact test

It shall follow the provisions of GB/T 2423.5 to conduct the impact test, AND it shall comply with the following provisions:

- a) Initial detection: In accordance with the provisions of this standard and under the standard atmospheric conditions, MAKE the equipment be subjected to appearance inspection and functional testing.
- b) Condition test: INSTALL the wheel sensor on the location of the steel rail as specified and then FIX it onto the vibration table in normal use state.
- c) Severity rating: peak acceleration 500 m/s², pulse duration 11 ms, and vertical impact 6 times;
- d) Final testing: After test, CONDUCT appearance inspection and functional testing, AND the results shall comply with the provisions of 5.1, 5.2, and 5.3.

6.8 Lightning protection test

It shall, in accordance with the provisions of 9.3 in TB/T 3074-2003, respectively conduct the line-to-line and line-to-ground impact test against the equipment indoor part power supply inlet, outdoor part power supply inlet, communication transmission interface, and sensor signal interface, AND the test results shall comply with the requirements of 5.9.

6.9 Electromagnetic compatibility test

It shall, in accordance with the provisions of TB/T 3073-2003, conduct test against the cabinet, power supply inlet, and signal interface; AND the test results shall comply with the provisions of 5.10.

- b) When the structure, materials, and processes have a significant change which may affect the equipment performance;
- c) In normal production, the wheel sensor is subjected to type inspection once every three years AND the other equipment is subjected to type inspection once every five years;
- d) When the equipment is restored production after production suspension for three years;
- e) When the exit-factory inspection results are greatly different from the last type inspection results;
- f) When the quality supervision institute proposes for type inspection.

7.3.2 Type inspection items shall include all the technical requirements as specified in this standard.

7.3.3 The axle counters after type inspection shall not be considered as qualified product for exit-factory.

8 Marking, packaging, transportation, and storage

8.1 Each equipment shall be clearly marked with the product label, which shall contain the following:

- a) The product model and name;
- b) The exit-factory number;
- c) The date of manufacture;
- d) The manufacturer and logo.

8.2 The packaging box shall be marked in accordance with the relevant provisions of GB/T 191.

8.3 The packaging of the equipment shall comply with the relevant provisions of TB/T 1498.

8.4 Each package shall be accompanied by product certificate, product specifications and packing list.

8.5 During transportation, it shall not be affected by rain and snow, strong vibration or collision.