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**Automatic Instruments for Weighing Road Vehicles in
Motion - Part 1: General Technical Specification**

动态公路车辆自动衡器

第 1 部分：通用技术规范

(OIML R134:2006, Automatic Instruments for Weighing Road Vehicles in Motion and
Measuring Axle Loads, NEQ)

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Automatic Instruments for Weighing Road Vehicles in Motion - Part 1: General Technical Specification

1 Scope

This Part of GB/T 21296 specifies the terms and definitions, classification and naming, measurement requirements, general technical requirements, production and installation requirements, general requirements for installation conditions and maintenance, WIM system functions and data requirements, test methods, inspection rules, as well as the requirements for marking, packaging, transportation and storage of automatic instruments for weighing road vehicles in motion (hereinafter referred to as: WIM weighing instruments).

This Part applies to the legally relevant applications and general applications of WIM weighing instruments.

This Part applies to WIM weighing instruments or systems that are installed in the controlled weighing area and adopt the principle of gravity to obtain the axle load (which can be directly measured, or obtained by accumulating the separately measured wheel loads), axle-group load and curb weight of road vehicles, regardless of the specific product structure and technical implementation mode. WIM weighing instruments without the controlled weighing area may take this Part as a reference.

This Part does not apply to weighing instruments or measuring systems, in which, there is no relative movement of the load receptor or measuring device and the vehicle in the horizontal driving direction during measurement, such as: static wheel load gauge and load measuring device embedded in vehicle components, etc.

This Part does not apply to weighing instruments or measuring systems that cannot guarantee that all tyres of the test vehicle and the upper surface of the load receptor are approximately on the same plane during measurement (for example, products and systems that simply place the load receptor on the road surface).

This Part does not apply to weighing instruments that merely measure the wheel load on one side, and then, obtain the axle load, axle-group load and curb weight by multiplying.

2 Normative References

The following documents are indispensable to the application of this document. In terms of references with a specified date, only versions with a specified date are applicable to this document. In terms of references without a specified date, the latest version (including all the modifications) is applicable to this document.

GB/T 191 Packaging - Pictorial Marking for Handling of Goods

GB/T 2423.3 Environmental Testing - Part 2: Testing Method - Test Cab: Damp Heat, Steady State

GB/T 13384 General Specifications for Packing of Mechanical and Electrical Product

GB/T 14250 Terminology of Weighing Instruments

GB/T 17626.2 Electromagnetic Compatibility - Testing and Measurement Techniques - Electrostatic Discharge Immunity Test

GB/T 17626.3 Electromagnetic Compatibility - Testing and Measurement Techniques - Radiated, Radio-frequency, Electromagnetic Field Immunity Test

GB/T 17626.4 Electromagnetic Compatibility - Testing and Measurement Techniques - Electrical Fast Transient / Burst Immunity Test

GB/T 17626.5 Electromagnetic Compatibility - Testing and Measurement Techniques - Surge Immunity Test

GB/T 17626.6 Electromagnetic Compatibility - Testing and Measurement Techniques - Immunity to Conducted Disturbances, Induced by Radio-frequency Fields

GB/T 17626.11 Electromagnetic Compatibility - Testing and Measurement Techniques - Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests

GB/T 26389 Method of Classified Type of Weighing Instrument Products

ISO 7637-2 Road Vehicles - Electrical Disturbances from Conduction and Coupling - Part 2: Electrical Transient Conduction along Supply Lines Only

ISO 7637-3 Road Vehicles - Electrical Disturbances from Conduction and Coupling - Part 3: Electrical Transient Transmission by Capacitive and Inductive Coupling via Lines other than Supply Lines

3 Terms and Definitions

What is defined in GB/T 14250, and the following terms and definitions are applicable to this document.

3.1 General Definitions

3.1.1 Weighing instrument

Weighing instrument refers to a measuring equipment that determines the mass of an object by the force of gravity acting on the object.

NOTE 1: the “mass” (or “weight value”) in this Part has a more relevant meaning of “conventional mass” or “conventional value of the weighing result in air”, while “weight” is more of

5.9.1.1 Temperature limits

Within the temperature range of $-10\text{ }^{\circ}\text{C} \sim +40\text{ }^{\circ}\text{C}$, the weighing instrument shall satisfy the corresponding metrological performance requirements and general technical requirements.

For weighing instruments with special purposes, the applicable temperature range may be different from the above requirements. The condition is that the temperature range is not less than $30\text{ }^{\circ}\text{C}$, and shall be clearly marked in the explanatory marking.

5.9.1.2 Influence of temperature on no-load indication

When the ambient temperature changes by $5\text{ }^{\circ}\text{C}$, the change of indication at or near the zero point of the weighing instrument shall not exceed one scale interval.

5.9.2 Humidity

When the relative humidity does not exceed 85%, the WIM weighing instrument shall satisfy the corresponding metrological performance requirements and general technical requirements.

5.9.3 Power supply

When the voltage of the power supply changes within the following ranges, the electronic weighing instrument shall maintain the corresponding metrological performance requirements and technical requirements:

- a) Weighing instruments using alternating current power (AC): the voltage value is between 0.85 times the lower limit of the nominal voltage and 1.1 times the upper limit of the nominal voltage;
- b) Weighing instruments using direct current online power (DC) (including rechargeable batteries that can be fully charged when the weighing instruments are working): the voltage value is within the range of 1.2 times the specified minimum voltage to the nominal voltage (or the upper limit of the working voltage range);
- c) Weighing instruments powered by batteries (including non-rechargeable batteries or rechargeable batteries that cannot be charged online): the voltage value is within the range of the specified minimum voltage to the nominal voltage (or the upper limit of the working voltage range);
- d) 12 V vehicle battery powered WIM weighing instruments: 9 V ~ 16 V;
- e) 24 V vehicle battery powered WIM weighing instruments: 16 V ~ 32 V.

In this Part, the minimum voltage refers to the minimum voltage value, at which, the weighing instruments can normally operate before automatic shutdown.

5.10 Unit of Measurement Results

The measurement results of the WIM weighing instruments of mass and load shall be expressed in the unit of (kg) or (t).

5.11 Scale Interval of Static Weighing

As a WIM weighing instrument provides the static weighing mode, if its scale interval is not equal to the dynamic scale interval (d), when the WIM weighing instrument is in the weighing-in-motion state, it shall be able to automatically switch to the dynamic scale interval, so as to ensure that the scale interval of static weighing is only applicable to static weighing. Even if the WIM weighing instrument has a static weighing mode, the static weighing mode cannot be easily accessed, unless manually operated by an authorized person.

5.12 Operating Speed

Within the nominal operating speed range of the weighing instrument, the WIM weighing instrument shall maintain the corresponding metrological performance requirements and technical requirements. When it exceeds the operating speed range, no data will be output, or a warning sign of exceeding the speed range shall be attached in accordance with the requirements of 9.3.8.

This operating speed range may be adjusted or determined in accordance with the test conditions during the on-site weighing test.

6 General Technical Requirements

6.1 Applicability

The WIM weighing instrument shall be designed and manufactured to be applicable to various intended vehicle weighing requirements on the site of application, for example, in structure and size, it shall be applicable to the intended weighing vehicle. Meanwhile, the applicability of the service environment and the general operation mode shall also be thoroughly considered.

Except for the purpose of control instrument, WIM weighing instruments shall not be required to have the static weighing function.

Unless both dynamic and static type evaluations have been simultaneously carried out, WIM weighing instruments shall not be marked with the static weighing function.

If the WIM weighing instrument is not applicable to liquid load vehicles, it shall be indicated in a prominent position on the instruction manual and the designation.

When the WIM design is completed, conduct visual inspection on whether the above-mentioned requirements are satisfied.

On the site of WIM system, driving signs shall be set up in a prominent position (easy to be seen by the driver). The sign shall have the words “drive at a constant speed”. The minimum operating speed range and the maximum operating speed range allowed by the WIM weighing instrument or system shall also be indicated on the same sign. The ranges shall not exceed the ranges permitted by the product’s type approval certificate, nor shall they exceed the requirements of the traffic management department for the road section where the product is installed and used.

6.6 Zero-setting Device

6.6.1 Accuracy of zero-setting device

The zero-setting device that the weighing instrument shall be equipped with can be a semi-automatic zero-setting device or an automatic zero-setting device.

The zero-setting device shall be able to set the zero point within $\pm 0.25d$; the adjustment range of the zero-setting device shall be not greater than 4% of the maximum capacity (Max); the adjustment range of the initial zero-setting device shall be not greater than 20% of the maximum capacity (Max).

During automatic operation, the semi-automatic zero-setting device shall not operate.

Only when the weighing instrument is balanced and stabilized can the automatic zero-setting device and the semi-automatic zero-setting device be operated.

After the design of the WIM weighing instrument is completed, in accordance with the method of 10.3, the zero-setting device shall be tested and verified.

6.6.2 Zero-tracking device

The zero-tracking device can only be operated under the following conditions:

- a) The indication is zero;
- b) The weighing instrument is in a balanced and stabilized state;
- c) The correction within 1 s shall be not greater than $0.5d$;
- d) The actual zero-point is approximately within 4% Max.

For WIM weighing instruments with the zero-tracking device, the corresponding weights shall be loaded on the load receptor, then, the primary indications shall be observed for verification. They may also be verified by applying simulated loads, and then, observing the primary indications.

6.7 Data Output and Software

6.7.1 Quality of readings

The weighing indicating device of WIM weighing instrument shall be able to indicate the weighing result by itself. The electronic weighing instrument shall be a digital indicator, whose primary indications are generally composed of a name, a figure and a mass unit. The primary indications shall satisfy the requirements for legibility in terms of size, shape and clarity. The indicating device and printing device shall provide the indications in a simple and juxtaposed mode.

6.7.2 Output information

For WIM weighing instruments equipped with the indicating or printing device, after each normal weighing operation, the weighing instruments shall be able to indicate or print the corresponding weighing result in accordance with the specified procedure; the indicated or printed information shall not be less than the information required as follows:

- a) For WIM weighing instruments that merely determined the gross vehicle mass, the information that shall at least be indicated or printed includes: gross vehicle mass, operating speed, date and time. If the associated warnings are not printed, the results of uncertified single-axle load or axle-group load cannot be indicated or printed.
- b) For WIM weighing instruments that need to provide the single-axle load, the information that shall at least be indicated or printed includes: single-axle load, gross vehicle mass, operating speed, date and time. For this type of weighing instruments, it is unnecessary to print the type of axle-group.
- c) For WIM weighing instruments that need to provide the axle-group load, the information that shall at least be indicated or printed includes: single-axle load, axle-group load, gross vehicle mass, operating speed, date and time. For this type of weighing instruments, the type of axle-group shall be indicated or printed.

If WIM weighing instruments are equipped with the indicating or printing device, while conducting the in-motion test in accordance with the method of 10.4, the relevant content shall be indicated or printed to verify whether the indicating or printing device complies with the requirements of this clause.

6.7.3 Indication range

Without clarified indications or printed warnings, the weighing instruments shall not indicate or print the single-axle load, axle-group load (if applicable) and gross vehicle mass when the single-axle load (during partial weighing) or curb weight (during full-draught weighing) is less than the minimum capacity, or greater than the weighing result of the maximum capacity + 9*d*.

After the design of the WIM weighing instruments is completed, use a weight or load simulation device to test the indication range of the WIM weighing instruments.

6.7.4 Accumulating device

The WIM weighing instruments shall be equipped with an accumulating device, which can

In accordance with the method of 10.4.4.7, conduct the in-motion test to verify whether the WIM weighing instrument complies with the requirements of this clause.

6.7.8 Software

The legally relevant software used by the WIM weighing instruments shall satisfy the following requirements:

- a) Print-seal the legally relevant software and legally relevant parameters (including type-specific parameters and device-specific parameters), so that the software cannot be modified without breaking the seal; or any changes to the software shall be automatically signaled by an identification code and easily detectable.
- b) The software shall be given a fixed version No., which is stored in the data storage of the legally relevant software, and can be invoked and indicated, so as to satisfy the management requirements of the metrological department. If each software change may affect the functions and accuracy of the weighing instrument, the version No. of the software shall be changed.

After the installation of the WIM weighing instrument is completed, visually inspect the software version No. and protection of the WIM weighing instrument to verify whether they comply with the requirements of this clause.

6.8 Lead Sealing or Print Sealing Device

6.8.1 Overview

Devices that do not allow to be opened or adjusted by the user shall be lead sealed or print sealed. During print sealing, the outer casing can be sealed, and other forms of sealing that can provide sufficient integrity (for example, electronic print sealing) are also allowed.

Under all circumstances, lead sealing and print sealing shall be easily completed. Print sealing shall be adopted on all parts that cannot be protected in any other mode that may affect the measurement accuracy.

Any parameter device that can change the measurement results, especially recalibration device, shall be lead sealed or print sealed.

6.8.2 Electronic print sealing device

When it is impossible to adopt mechanical lead sealing or print sealing devices to protect the parameters that may affect the measurement results, an electronic print sealing device may be adopted to implement the protection. The electronic print sealing device adopts the following modes:

- a) The legal status of the electronic print sealing device shall be identifiable by the user, verification personnel and supervisory personnel;

- b) Set access rights to allow only authorized persons (for example, verification personnel) to access, for example, through passwords or special hardware devices (for example, keys); the passwords shall be modifiable;
- c) A record of at least the last modification shall be kept.

The record shall include the date and the operation mode of identifying modification by the authorized person [see b) above]. If multiple revisions can be stored, the oldest record can only be deleted before a new revision is made. If there is no further rewriting of the last revision, the traceability of the revised information shall be maintained for at least two years.

After the installation of the WIM weighing instrument is completed, visually inspect the lead sealing or print sealing of the WIM weighing instrument to verify whether it complies with the requirements of this clause.

7 Production and Installation Requirements

7.1 Overview

The performance of WIM weighing instruments is closely related to the manufacturer's design, manufacturing level and on-site installation of the equipment.

7.2 Load Receptor

7.2.1 Sturdy construction

When the axle-load close to the maximum capacity or the curb weight is applied to the load receptor of the WIM weighing instrument and any part thereof, no permanent deformation shall be generated; the influence of the deformation of the load receptor on the weighing result may be ignored.

7.2.2 Surface treatment

For any component of the load receptor exposed to the air, if it is easy to rust, it shall be treated with anti-corrosion.

7.2.3 Anti-skid and wear-resistant

When the length of the load receptor along the driving direction exceeds 2 m, necessary additional anti-skid measures shall be taken on the upper surface of the load receptor to ensure that the vehicle is within the speed control range of the installation site and safe to drive under various weather conditions. In addition, it shall be ensured that the weighing performance of the WIM weighing instrument complies with the requirements of this Part within the operating speed range.

The upper surface of the load receptor shall be able to withstand repeated rolling by the vehicle tyres for the corresponding sites and purposes of application. When the wear consumption depth

7.5 Prevention from Dust Accumulation

Appropriate protective measures shall be taken for the gap between the weighing instrument and the ground to prevent dust, sand and gravel from entering the inside of the load receptor or the foundation pit, and affecting the normal operation of the WIM weighing instrument.

7.6 Water Drainage

If the load receptor of the weighing instrument is installed in a foundation pit, a water drainage system shall be provided to prevent any component of the weighing instrument from being submerged by water or other liquids for a prolonged period of time.

7.7 Heating

If the load cell of the weighing instrument is installed in an environment where the temperature may be lower than $-10\text{ }^{\circ}\text{C}$, appropriate heating measures shall be taken to ensure the normal operation of the load cell.

8 General Requirements for Installation Conditions and Maintenance

8.1 General Requirements

In order to thoroughly exert the performance of the WIM weighing instruments, the user shall provide appropriate instrument installation and equipment operating conditions, and thoroughly and continuously maintain them in accordance with the requirements of the WIM weighing instrument manufacturer. The user shall realize that the implementation of the performance of the WIM system depends not only on the weighing instrument itself, but also on the environmental conditions where the weighing instrument is installed and its application and maintenance level. The performance required by the user shall be well-matched with the environmental conditions of the site installation. If limited by objective conditions, and the environmental conditions of installation cannot reach the requirements, the WIM weighing instruments shall be downgraded for application.

8.2 Conditions of Installation Site

8.2.1 Requirements for driving safety and construction

The installation site of the WIM weighing instruments shall be able to ensure the driving safety of the vehicle under test and satisfy the construction requirements of the corresponding controlled weighing area.

8.2.2 Principles of installation site selection

The installation site of all types of WIM weighing instruments shall comply with the following principles:

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