

Translated English of Chinese Standard: GB/T29476-2012

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NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA

ICS 19.020; 17.020

N 50

GB/T 29476-2012

**General technical specification for mobile laboratory
instruments and equipment**

移动实验室仪器设备通用技术规范

Issued on: December 31, 2012

Implemented on: July 31, 2013

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine;
Standardization Administration of the People's Republic of China.**

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General technical specification for mobile laboratory instruments and equipment

1 Scope

This Standard specifies the terms and definitions, classification, technical requirements, test methods for mobile laboratory instruments and equipment.

This Standard applies to mobile laboratory testing, calibration or scientific experiment instruments and their auxiliary equipment used on land.

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/T 2423.1, *Environmental testing for electric and electronic products - Part 2: Test methods - Tests A: Cold*

GB/T 2423.2, *Environmental testing for electric and electronic products - Part 2: Test methods - Tests B: Dry heat*

GB/T 2423.3, *Environmental testing for electric and electronic products - Part 2: Testing method - Test Cab: Damp heat, steady state*

GB/T 2423.5, *Environmental testing - Part 2: Test methods - Test Ea and guidance: Shock*

GB/T 2423.8, *Environmental testing for electric and electronic products - Part 2: Test methods - Test Ed: Free fall*

GB/T 2423.17, *Environmental testing for electric and electronic products - Part 2: Test method - Test Ka: Salt mist*

GB/T 2423.21, *Environmental testing - Part 2: Test methods - Test M: Low air pressure*

GB/T 2423.56, *Environmental testing - Part 2: Test methods - Test Fh: Vibration, broadband random and guidance*

GB 4793.1-2007, *Safety requirements for electrical equipment for measurement,*

control, and laboratory use - Part 1: General requirements

GB/T 18268.1-2010, Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

GB/T 29479, General requirements of mobile laboratory

QC/T 252, Type test regulations for special automobile

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 29479 as well as the followings apply. For ease of use, some terms and definitions in GB/T 29479 are repeated below.

3.1 mobile laboratory

a laboratory that meets specific purposes and requirements and is composed of complete sets of devices to carry out activities such as testing, calibration or scientific experiments in mobile facilities and environments

[GB/T 29479, definition 3.1]

3.2 mobile laboratory shelter

the cabin that is used to carry mobile laboratory experimenters, testing equipment, calibration equipment and related professional facilities, and can provide a suitable operating environment for normal activities such as testing, calibration or scientific experiments

[GB/T 29479, definition 3.3]

3.3 instruments & equipment for mobile laboratory

the instruments and their auxiliary equipment that are installed, carried and stored in mobile laboratories for testing, calibration or scientific experiments

3.4 mobile feature of instruments & equipment

the instruments and equipment meet the guaranteed requirements of the mobile characteristics of the mobile laboratory, including the functional requirements to meet the needs of testing, calibration or scientific experiments under mobile conditions, and the adaptability of environmental conditions to resist or withstand changes in environmental conditions as well as specifications and interface compatibility to meet mobile lab design requirements

3.5 fixation

5 Requirements

5.1 General requirements

5.1.1 Power supply

The instruments and equipment shall be equipped with two or more power interfaces or conversion adapters of different types of voltages, such as AC 220V, DC 24V or DC 12V. The instruments and equipment using DC power supply shall also have positive and negative anti-mistake measures or operation warning signs. The battery life of instruments and equipment powered by their own power supply shall not be less than 4h.

5.1.2 Interface compatibility

If the instruments and equipment have input and output requirements such as water supply, gas supply, and data transmission, their input and output interfaces shall match those of the experimental cabin. Or provide conversion adapters that meet the universal design requirements of mobile laboratories.

5.1.3 Shockproof

The instruments and equipment shall be installed firmly and reliably. Fixed installation of instruments and equipment shall be designed with at least 2 installation points at the bottom or side. Non-fixedly installed instruments and equipment shall be equipped with special packaging or other protective devices to prevent damage or performance degradation of instruments and equipment during transportation and use. If necessary, the whole machine or components shall be designed for vibration isolation or buffering, or the corresponding level of shock absorption device shall be used.

5.1.4 Supportability

The instruments and equipment shall have the function of fault alarm and automatic diagnosis. Necessary tools and spare parts shall be provided to ensure that the instruments and equipment can be quickly restored to working condition after on-site maintenance.

5.1.5 Quick recovery

The recovery time of equipment during or after movement shall not exceed the fixed recovery time.

5.1.6 Additional influence quantity

The additional influence quantity of the instruments and equipment during and after the movement shall be completely eliminated or reduced to within the maximum allowable error range of the equipment.

5.1.7 Reliability

Under the specified environmental conditions, the average failure mileage of the instruments and equipment shall not be less than 3000km.

5.1.8 Identification

The instruments and equipment shall be marked with the parameters of the working environment in the obvious position of the product. Parameter indicators shall include: recovery time (h), operating temperature range (°C), relative humidity range (%), random vibration acceleration spectral density (m^2/s^3), drop height (mm), impact acceleration (m/s^2).

5.2 Environmental adaptability

5.2.1 Temperature

The instruments and equipment shall at least ensure that the temperature environment works normally within the range of 10°C~35°C, and is transported and stored within the range of -40°C~55°C.

5.2.2 Humidity

The instruments and equipment shall be guaranteed to work normally in an environment with a relative humidity of not higher than 80% and can be stored normally in an environment of not higher than 93%.

5.2.3 Low air pressure

The instruments and equipment shall be adapted to low-pressure environmental conditions at different altitudes. At least it shall be guaranteed to work normally in an environment where the air pressure value is not higher than 84kPa.

5.2.4 Salt spray

For the instruments and equipment used in coastal areas or in a salt spray environment, at least it shall be guaranteed to work normally in a salt spray environment with a concentration of $(5\pm0.1)\%$.

5.3 Transport resistance

5.3.1 Random vibration

The instruments and equipment shall at least be guaranteed to work, transport and store normally in a random vibration environment with a frequency range of (5~500) Hz and an acceleration spectral density of $0.05\text{m}^2/\text{s}^3$.

5.3.2 Impact

6.2.4 Salt spray

The salt spray test is carried out according to the method specified in GB/T 2423.17.

6.3 Transport resistance

6.3.1 Random vibration

The instruments and equipment working in the mobile state shall generally be in the working state during the test. The instruments and equipment that work after the movement stops and resumes are generally in a non-working state during the test. The random vibration test shall be tested according to the method specified in GB/T 2423.56.

6.3.2 Impact

The impact test is carried out according to the method specified in GB/T 2423.5.

6.3.3 Drop

The drop test is carried out according to the method specified in GB/T 2423.8.

6.4 Electromagnetic compatibility

6.4.1 Immunity

The electromagnetic compatibility immunity test shall be tested according to the method specified in the basic standard in Table 1 of 6.2 of GB/T 18268.1-2010. The performance criterion can refer to the method specified in 6.4 of GB/T 18268.1-2010.

6.4.2 Emission

The electromagnetic compatibility emission test shall be tested according to the method specified in 7.2 of GB/T 18268.1-2010.

6.5 Safety

6.5.1 Warning marks

Use a cloth dampened with the prescribed cleaner (if not specified, then with isopropyl alcohol). Wipe with hands for 30s without undue pressure.

6.5.2 Dielectric strength

6.5.2.1 Before the test, the instruments and equipment need to be pretreated with moisture. The instruments and equipment shall be placed in a test box with a relative humidity of $92.5\% \pm 2.5\%$ and a temperature of $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 48h. Test after 2h recovery at room temperature. The test shall be completed within 1h after recovery.

6.5.2.2 The power plug of the instrument is not connected to the power grid. The power

switch is in the ON position. Cut off the output of the withstand voltage tester. The current is placed in the appropriate gear. One end of the voltage output terminal of the withstand voltage tester is connected to the neutral wire and the live wire of the power supply. The other end is connected to accessible conductive parts. During the test, the voltage shall be gradually increased to the specified value at 5s or within 5s. So that there is no obvious jump in the voltage, and then keep it for 5s.

6.5.3 Contact current

Connect the power supply of the instruments and equipment to the touch current tester. The power of the instruments and equipment is placed in the ON position. Test once under normal conditions. Test once under a single fault condition. Record the contact current value.

6.5.4 Protective ground impedance

One end of the ground impedance tester is connected to the ground terminal of the instruments and equipment. The other end is connected to the accessible parts of the instruments and equipment. Set the test current to 25A. Start the tester. Record the ground impedance value after the test is completed.

6.5.5 Cleaning

If the instruments and equipment can be cleaned, clean the instruments and equipment three times. If the instruments and equipment can be sterilized, check whether they are qualified by sterilizing the instruments and equipment once. If, after processing, it is found that there are signs of moisture in the parts that may lead to danger, the instruments and equipment shall be able to pass the dielectric strength test of 6.5.2.

6.5.6 Sprinkle

Compliance is checked by visual inspection. If in doubt, pour 0.2L of water from a height of 0.1m for 15s on every part that may come into contact with electrical parts. After this treatment, the instruments and equipment shall be immediately subjected to the dielectric strength test of 6.5.2.

6.5.7 Overflow

Fill the container completely with liquid. Then use an additional volume equal to 15% of the container capacity or 0.25L. Take whichever is larger. Pour in smoothly for 60s. For instruments and equipment that may be moved after the container is filled with liquid, tilt the instruments and equipment 15° in the most unfavorable direction from its normal use position. If it is necessary to tilt in more than one direction, refill the container with liquid. After this treatment, the instruments and equipment shall be immediately subjected to the dielectric strength test of 6.5.2.

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Contact: Wayne Zheng, Sales@ChineseStandard.net

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