

ICS 17.040.30

CCS A 50/64



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 42554-2023

**General requirements for environmental testing of measuring
instruments**

计量器具环境试验的通用要求

Issued on: May 23, 2023

Implemented on: December 1, 2023

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

Table of Contents

1 Scope	1
2 Normative references	1
3 Terms, definitions and abbreviated terms	2
3.1 Terms and definitions	2
3.2 Abbreviated terms	6
4 Applicable requirements for measuring instruments	6
4.1 General	6
4.2 Additional requirements	7
4.3 Durability error	7
4.4 Influence quantity tests	7
4.5 Test severity levels	7
5 Applicable environmental conditions	7
5.1 General	7
5.2 Application conditions	7
5.3 Measuring instruments fitted with a checking facility	8
5.4 Measuring instruments fitted with a durability protection facility	8
5.5 Requirements for battery-powered measuring instruments	8
6 Type evaluation	9
6.1 Application documents for type evaluation	9
6.2 General requirements	9
6.3 Metrological performance tests	9
6.4 Durability tests	9
6.5 Test programme	9
6.6 Test methods	9
6.7 Number of test samples	10
6.8 Sample tests	10
7 Initial verification	10
8 Test severity levels	10
8.1 General	10
8.2 Environmental classification and severity levels of the climatic tests	10
8.3 Environmental classification and levels of the mechanical tests	12
8.4 Electromagnetic environment classification and severity levels	12

8.5 Additional notes on battery supply	16
9 Routine performance tests	17
9.1 Evaluation of measurement uncertainty	17
9.2 Points requiring attention in the tests	17
10 Climatic environmental tests	21
10.1 Static temperature	21
10.2 Damp heat	22
10.3 Water	24
10.4 Atmospheric pressure	25
10.5 Dust protection	25
10.6 Salt mist	26
11 Mechanical performance tests	27
11.1 Vibration	27
11.2 Tilting and toppling	28
12 Performance tests of the wiring and the supply source	29
12.1 Immunity to direct current supply variation (mains supply)	29
12.2 Alternating current supply variation (mains supply)	30
12.3 Supply disturbances	31
12.4 Other disturbances introduced through the connection of external wiring	36
13 Electromagnetic environment interference tests	38
13.1 Power frequency magnetic field	38
13.2 Radio-frequency electromagnetic field immunity	39
13.3 Electrostatic discharge immunity	41
14 Performance tests related to battery supply or non-mains supply	42
14.1 Internal battery low voltage	42
14.2 12 V and 24 V vehicle battery supply	43
Annex A (informative) Durability evaluation	47
A.1 Overview	47
A.2 Features of durability protection	47
Annex B (informative) Equipment for the atmospheric pressure test	49
B.1 Introduction	49
B.2 Equipment needed for the atmospheric pressure test	49
Bibliography	51

1 Scope

The document fixes the environmental conditions of the environmental testing of measuring instruments, the technical requirements and test methods of type evaluation, and the test severity levels. It gives the technical requirements and the test methods, at the different test severity levels, for routine performance tests, climatic environmental tests, mechanical performance tests, performance tests of the supply source, electromagnetic environment interference tests and performance tests connected with the supply.

It applies to the environmental testing carried out for the type evaluation and for the routine testing of measuring instruments.

Note 1: the document does not include requirements for instruments unrelated to external influence quantities, for example zeroing devices and totalizers.

Note 2: the document does not deal with the safety of the measuring instrument itself, with electromagnetic emission or with similar tests.

Note 3: the document does not deal with the transport of the measuring instrument while it is not operating.

Note 4: the document does not deal with the remote protocols of the measuring instrument.

2 Normative references

The environmental test methods cited are GB/T 2423.1 (test A: cold), GB/T 2423.2 (test B: dry heat), GB/T 2423.3 (test Cab: steady damp heat), GB/T 2423.4 (test Db: cyclic damp heat, 12 h plus 12 h cycle), GB/T 2423.7 (test Ec: shock caused by rough handling, mainly for equipment-type specimens), GB/T 2423.10 (test Fc: vibration, sinusoidal), GB/T 2423.17 (test Ka: salt mist), GB/T 2423.38 (test R: water test methods and guidance), GB/T 2423.43 (mounting of specimens for vibration, shock and similar dynamic tests) and GB/T 2423.56 (test Fh: broadband random vibration and guidance).

The electromagnetic compatibility documents cited are GB/T 17214.2 (operating conditions of industrial process measurement and control devices, part 2: power), GB/T 17626.1, GB/T 17626.2 (electrostatic discharge immunity), GB/T 17626.3 (radiated radio-frequency electromagnetic field immunity), GB/T 17626.4 (electrical fast transient/burst immunity), GB/T 17626.5 (surge immunity), GB/T 17626.6 (immunity to conducted disturbances induced by radio-frequency fields), GB/T 17626.8 (power frequency magnetic field immunity), GB/T 17626.11 (voltage dips, short interruptions and voltage variations immunity), GB/T 17626.13 (low-frequency immunity to harmonics, interharmonics and mains signalling at alternating current ports), GB/T 17626.17 (ripple immunity at direct current input ports), GB/T 17626.20 (emission and immunity tests in transverse electromagnetic (TEM) waveguides) and GB/T 17626.29 (voltage dips, short interruptions and voltage variations immunity at direct current input ports).

The remaining cited documents are GB/T 17799.1 and GB/T 17799.2 (generic immunity standards for the residential, commercial and light-industrial environment and for the industrial environment), GB/Z 18039.1, GB/T 18039.3 and GB/Z 18039.5 (description and classification of the electromagnetic environment, compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage supply systems, and the electromagnetic environment of such systems), GB/T 21437.2 and GB/T 21437.3 (road vehicles, electrical disturbances from conduction and coupling, parts 2 and 3), GB/T 28046.2 (road vehicles, environmental conditions and testing for electrical and electronic equipment, part 2: electrical loads), JJF 1001-2011 (general terms in metrology and their definitions), IEC 60512-11-8:1995, IEC 61000-4-19:2014 and OIML V1:2013 (international vocabulary of terms in legal metrology).

3.1 Terms and definitions

The terms defined in JJF 1001-2011 and OIML V1:2013 and the terms below apply.

3.1.1 electronic measuring instrument: a measuring instrument that uses electronic means, or is fitted with an electronic device, to measure an electrical or a non-electrical quantity. Any auxiliary device involved in legal metrology is regarded as part of the measuring instrument.

3.1.2 module: a device that performs a specific function or several functions and that can be evaluated separately against the specified metrological and technical performance requirements. A module may be a complete measuring instrument, such as a price-computing scale or an electricity meter, or a part of one, such as a printer or an indicator.

3.1.3 device: an identifiable measuring instrument, or a part of a measuring instrument, or a part of a series of measuring instruments, having a specific function or several functions. A device may be a complete measuring instrument or a part of one; an electronic device may in some sense also be a module.

3.1.4 measurement error: the measured quantity value minus the reference quantity value. The concept can be used in two cases: where a single reference quantity value is involved, as when calibration is made against a measurement standard whose measurement uncertainty can be neglected, or where the conventional quantity value is given, the measurement error then being known; and where the measurand is assumed to be represented by a unique true value, or by a set of true values whose range can be neglected, the measurement error then being unknown. The document notes that measurement error is easily confused with a produced mistake or a lapse of attention. Source: JJF 1001-2011, 5.3.

3.1.5 indication: the quantity value given by a measuring instrument or a measuring system. An indication may be presented visually or audibly, or transmitted to another device; it is