IEC 60051-9

Edition 5.0 2019-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Direct acting indicating analogue electrical measuring instruments and their accessories –
Part 9: Recommended test methods

Appareils de mesure électriques indicateurs analogiques à action directe et leurs accessoires –
Partie 9: Méthodes d'essai recommandées

IEC 60051-9:2019-02(en-fr)

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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DIRECT ACTING INDICATING ANALOGUE ELECTRICAL MEASURING INSTRUMENTS AND THEIR ACCESSORIES –

Part 9: Recommended test methods

FOREWORD

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International Standard IEC 60051-9 has been prepared by IEC technical committee 85: Measuring equipment for electrical and electromagnetic quantities.

This fifth edition cancels and replaces the fourth edition published in 1988, Amendment 1:1994 and Amendment 2:1995. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) adding performance requirements for test equipment;
b) updating the references to the applicable standards for test methods.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
85/663/FDIS	85/672/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This International Standard is to be used in conjunction with IEC 60051-1:2016.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 60051 series, published under the general title *Direct acting indicating analogue electrical measuring instruments and their accessories*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

IEC 60051 is published in separate parts according to the following structure and under the general title *Direct acting indicating analogue electrical measuring instruments and their accessories*.

Part 1: Definitions and general requirements common to all parts

Part 2: Special requirements for ammeters and voltmeters

Part 3: Special requirements for wattmeters and varmeters

Part 4: Special requirements for frequency meters

Part 5: Special requirements for phase meters, power factor meters and synchroscopes

Part 6: Special requirements for ohmmeters (impedance meters) and conductance meters

Part 7: Special requirements for multi-function instruments

Part 8: Special requirements for accessories

Part 9: Recommended test methods

IEC 60051-9 is not complete in itself and is read in conjunction with IEC 60051-1.

DIRECT ACTING INDICATING ANALOGUE ELECTRICAL MEASURING INSTRUMENTS AND THEIR ACCESSORIES –

Part 9: Recommended test methods

1 Scope

This part of IEC 60051 applies to direct acting indicating analogue electrical measuring instruments and their accessories and gives guidance for applicable test methods and for the performance of test equipment.

This document does not apply to:

– special purpose instruments that are covered by their own IEC International Standards;
– special purpose devices that are covered by their own IEC International Standards when they are used as accessories.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60051-1:2016, *Direct acting indicating analogue electrical measuring instruments and their accessories – Part 1: Definitions and general requirements common to all parts*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 61000-4-8, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61010-1:2010, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61010-2-030, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030: Particular requirements for equipment having testing or measuring circuits*

IEC 61326-1:2012, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

IEC 61326-2-1, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 2-1: Particular requirements – Test configurations, operational conditions and performance criteria for sensitive test and measurement equipment for EMC unprotected applications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60051-1:2016 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

4 Requirements for test equipment

4.1 General

Test equipment shall have sufficient accuracy and stability for the determination of the intrinsic uncertainty of an instrument and the variations.

NOTE Calibration protocols can be used.

4.2 Test equipment for measuring the intrinsic uncertainty of an instrument and the variations

The maximum instrumental uncertainty of reference instruments used to determine the intrinsic uncertainty of an instrument and the variations shall be 0,2 times the class index of the instrument under test. In the event that a calibration protocol is used, the maximum calibration uncertainty shall be 0,2 times the class index of the equipment under test (EUT).

4.3 Test equipment for overload tests, self-heating, damping, overshoot and response time

The maximum uncertainty of the settings of the electrical quantities that will be used to test overload, self-heating, damping, overshoot and response time shall be ±1 % of those settings.

4.4 Test equipment for phase shift

Test equipment for settings of the phase shift of power meters with class indexes of 0,5 or higher shall have an uncertainty of ±1° or better.

Test equipment for settings of the phase shift of power meters with class indexes below 0,5 shall have a maximum uncertainty of ±0,1° or better. The instrumental uncertainty of test equipment for phase meters and power factor meters shall comply with 4.2.

4.5 Test equipment for temperatures

Equipment for the setting of temperatures shall have a maximum uncertainty in the temperature setting of ±1 °C in the case of EUT with a class index equal to or below 0,3. In the case of EUT with a class index above 0,3, the maximum uncertainty of the setting shall be ±2 °C.

4.6 Test equipment for humidity

Equipment for settings of humidity shall have a maximum uncertainty in the humidity settings of ±3 %

5 Test methods for determination of intrinsic uncertainty

The intrinsic uncertainty at defined test points shall be checked with slowly increasing and decreasing measuring values without any overshoot and without tapping. The test points for the type test can be defined by the manufacturer. During the routine tests, tests should be carried out at full scale at all ranges and the characteristics should be tested in one range at a minimum.

Tapping is only allowed for the determination of scale marks and for the determination of variations.

6 Test methods for damping

Damping shall be tested at 66 % of the scale length.

7 Test methods for humidity

The settings of the relative humidity in relation to temperatures shall be in accordance with the relevant requirements of IEC 60051-1. The minimum test duration for the determination of the variation shall be at least 48 h.

8 Tests with distorted AC quantities

Peak factors deviating from 1,414 1 should be simulated by a combination of the 3rd, 5th and 7th harmonic. Distortions should be simulated with the 7th harmonic.

9 Test methods for shock and vibration

Tests for mechanical shock shall be in accordance with the requirements for mechanical strength of IEC 61010-1.

The test method for vibration shall be in accordance with the requirements of IEC 60068-2-6.

Sweep frequency range: 10 Hz to 55 Hz to 10 Hz

Amplitude: 0,15 mm

Number of sweep cycles: 5

10 Test method for external magnetic field

For tests in accordance with IEC 60051-1:2016, 5.3 and Table 3, the test configuration shall comply with IEC 61000-4-8 but with a test level of 400 A/m.

11 Test method for external electric field

Electric fields should be simulated by two metallic plates placed in parallel at a distance of 1 m. The EUT shall be placed in the centre, between the plates and shall be turned around to find the worst-case position. Test points may be specified by the manufacturer. The cubature of this configuration should be at a minimum ten times higher than the cubature of the EUT to keep the field homogeneous.

12 Test methods for electrical safety

The test methods shall comply with IEC 61010-1 and IEC 61010-2-030.

Drop tests in accordance with IEC 61010-1:2010, 8.3, shall not be applied to products intended to be permanently installed in panels.

13 Test methods for electromagnetic compatibility (EMC)

The test methods shall comply with IEC 61326-1. The emission limits shall be in accordance with IEC 61326-1:2012, Table 2, and with IEC 61326-2-1. In the case of emission tests, the EUT shall comply with Class A in IEC 61326-1.

14 Test methods for recurrent tests

Time intervals and procedures of recurrent tests are at the discretion of the manufacturer or based on agreements between manufacturer and customer.

15 Test methods for nonconformity

Classifications according to IEC 60051-1:2016, 8.5 and 8.6, are procedures provided as guidance to establish the compliance of instruments and are based on a common agreement between manufacturer and customer.