IEC 60051-4

Edition 5.0 2018-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Direct acting indicating analogue electrical measuring instruments and their accessories title –
Part 4: Special requirements for frequency meters

Appareils mesureurs électriques indicateurs analogiques à action directe et leurs accessoires –
Partie 4: Exigences particulières pour les fréquencemètres

IEC 60051-4:2018-08(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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FOREWORD

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International Standard IEC 60051-4 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 1984. This edition constitutes a technical revision.

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

a) updating of content in line with new editions of IEC 60051-1 and IEC 60051-9;
b) addition of Annex A to specify the nonconformity classification of test items.

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

CDV	Report on voting
85/557/CDV	85/580B/RVC

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

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

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 website 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- withdrawn,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 60051-4 is not complete in itself and is read in conjunction with IEC 60051-1.

All of these parts are arranged in the same format and a standard relationship between subject and clause number is maintained throughout these parts. This arrangement will assist the reader of IEC 60051 to distinguish information relating to the different types of instruments.

DIRECT ACTING INDICATING ANALOGUE ELECTRICAL MEASURING INSTRUMENTS AND THEIR ACCESSORIES TITLE –

Part 4: Special requirements for frequency meters

1 Scope

This part of IEC 60051 applies to direct acting indicating analogue frequency meters of the following types:

- pointer-type frequency meters (as defined in 3.2.11 of IEC 60051-1:2016);
- vibrating-reed frequency meters (as defined in 3.2.12 of IEC 60051-1:2016).

This document also applies to non-interchangeable accessories (as defined in 3.1.23 of IEC 60051-1:2016) used with frequency meters.

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 60051-9, *Direct acting indicating analogue electrical measuring instruments and their accessories – Part 9: Recommended test methods*

3 Terms and definitions

See IEC 60051-1:2016.

4 Description, classification and compliance

See IEC 60051-1:2016.

5 Requirements

5.1 Reference conditions

See Table 1.

Table 1 – Reference conditions and tolerances, in addition to those given in Table 2 of IEC 60051-1:2016 for testing purposes relating to the influence quantities

Influence quantity	Reference condition unless otherwise marked	Tolerance permitted for testing purposes, applicable for a single reference value [a]
Voltage of AC measured quantity	Nominal value or any voltage within the nominal range)	±2 % of the nominal value
[a] For a nominal range, no tolerance is allowed.		

5.2 Limits of intrinsic uncertainty, fiducial value

5.2.1 Limits of intrinsic uncertainty

See IEC 60051-1:2016.

5.2.2 Correspondence between intrinsic uncertainty and accuracy class

See IEC 60051-1:2016.

5.2.3 Fiducial value

5.2.3.1 General

The fiducial value for a frequency meter corresponds to:

a) The upper limit of the measuring range.

b) For vibrating-reed frequency meters that have several rows of reeds, each row is considered to be a separate range, and each row has its own fiducial value that is the upper limit of the measuring range of that row.

5.2.3.2 Special requirements for vibrating reed frequency meters

For vibrating reed frequency meters, the following shall also apply:

a) The difference between the nominal frequencies of two adjacent reeds shall not exceed twice the limit of the permissible intrinsic uncertainty.

b) With a uniform rate of change of frequency, reeds shall reach their maximum amplitudes of vibration in the sequence implied by their nominal frequencies.

c) The uncertainty is taken as the greatest value of the frequency differences:

   1) between the nominal frequency for each reed and the frequency at which that reed has its maximum amplitude of vibration, or

   2) between the mean of the nominal frequencies of any two adjacent reeds and the frequency at which these reeds have the same amplitude of vibration.

5.3 Nominal range of use and variations

5.3.1 Nominal range of use

See Table 2.

Table 2 – Limits of the nominal range of use and permissible variations in addition to those given in Table 3 of IEC 60051-1:2016

Influence quantity	Limits of the nominal range of use unless otherwise marked	Permissible variation expressed as a percentage of the class index
Voltage of measured quantity	Nominal voltage ±15 % or lower limit of nominal range -15 % and upper limit of nominal range +15 %	100 %
Distortion of voltage of measured quantity	15 %	100 %

5.3.2 Limits of variations

See IEC 60051-1:2016.

5.3.3 Conditions for the determination of variations

See IEC 60051-1:2016.

5.4 Operating uncertainty, overall system uncertainty and variations

See IEC 60051-1:2016.

5.5 Electrical requirements

5.5.1 Electrical safety requirements

See IEC 60051-1:2016.

5.5.2 Self-heating

See IEC 60051-1:2016.

5.5.3 Permissible overloads

5.5.3.1 Continuous overload

Frequency meters, together with their non-interchangeable accessory(ies), if any, except for instruments fitted with a non-locking switch, shall be subjected to a continuous voltage overload of 120 % of the nominal voltage or 120 % of the upper limit of the nominal range for a period of 2 h.

After having cooled to its reference temperature, the frequency meter, together with its non-interchangeable accessory(ies), if any, shall comply with its accuracy requirements; however, the overload shall not be repeated.

The continuous overload test shall be carried out under reference conditions, except for the voltage, at any frequency within the measuring range.

For the recommended test, see IEC 60051-9.

5.5.3.2 Overloads of short duration

Frequency meters together with their non-interchangeable accessory(ies), if any, shall be subjected to voltage overloads of short duration.

The values of voltage for the overloads of short duration shall be the product of the relevant factor given in Table 3 and the value of the nominal voltage or the upper limit of the nominal range for voltage, unless other values are stated by the manufacturer.

The full duration of each overload shall be applied except when an automatic circuit breaker (or fuse) fitted to the instrument has interrupted the circuit in less than the time specified in Table 3 .

The automatic circuit breaker shall be reset (or the fuse replaced) before the application of the next overload.

Table 3 – Overloads of short duration for frequency meters

Voltage factor	Number of overloads	Duration of each overload (s)	Interval between successive overloads (s)
Class indices 0,3 and smaller			
2	5	1	15
Class indices 0,5 and greater			
2	9	0,5	60
2	1	5	–
Where two series of tests are specified, they should both be carried out, in the order given.			

After having been subjected to the overloads of short duration and after having cooled to the reference temperature, the frequency meter together with its non-interchangeable accessory(ies), if any, shall comply with its accuracy requirements; however, the overloads shall not be repeated.

The short duration overload test shall be carried out under reference conditions, except for the voltage, at any frequency within the measuring range.

For the recommended tests, see IEC 60051-9.

5.5.4 Limiting range of temperature

See IEC 60051-1:2016.

5.5.5 Deviation from zero

The requirements of 5.5.5 do not apply to vibrating reed frequency meters.

If a frequency meter has a setting mark (zero scale mark) on the scale, it shall be tested for return to that mark when de-energized.

The test shall be carried out under reference conditions.

After a period of energization of 30 s at the upper limit of the measuring range, the deviation of the index from the setting mark (zero scale mark), expressed as a percentage of the scale length, shall not exceed a value corresponding to 50 % of the class index.

For the recommended test, see IEC 60051-9.