# IEC 60051-6

Edition 5.0 2017-12

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Direct acting indicating analogue electrical measuring instruments and their accessories –**
**Part 6: Special requirements for ohmmeters (impedance meters) and conductance meters**



**Appareils mesureurs électriques indicateurs analogiques à action directe et leurs accessoires –**
**Partie 6: Exigences particulières pour les ohmmètres (les impédancemètres) et les conductancemètres**

IEC 60051-6:2017-12(en-fr)

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

**About the IEC**
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

**About IEC publications**
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

**IEC Catalogue - webstore.iec.ch/catalogue**
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

**IEC publications search - www.iec.ch/searchpub**
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

**IEC Just Published - webstore.iec.ch/justpublished**
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

**Electropedia - www.electropedia.org**
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

**IEC Glossary - std.iec.ch/glossary**
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

**IEC Customer Service Centre - webstore.iec.ch/csc**
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.



**A propos de l'IEC**
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

**A propos des publications IEC**
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

**Catalogue IEC - webstore.iec.ch/catalogue**
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

**Recherche de publications IEC - www.iec.ch/searchpub**
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

**IEC Just Published - webstore.iec.ch/justpublished**
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

**Electropedia - www.electropedia.org**
Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

**Glossaire IEC - std.iec.ch/glossary**
65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

**Service Clients - webstore.iec.ch/csc**
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

IEC 60051-6

Edition 5.0 2017-12

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

## Direct acting indicating analogue electrical measuring instruments and their accessories –
## Part 6: Special requirements for ohmmeters (impedance meters) and conductance meters



## Appareils mesureurs électriques indicateurs analogiques à action directe et leurs accessoires –
## Partie 6: Exigences particulières pour les ohmmètres (les impédancemètres) et les conductancemètres

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 17.220.20

ISBN 978-2-8322-5189-8

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

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

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

## FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.



International Standard IEC 60051-6 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 |
|---|---|
| 85/559/CDV | 85/582A/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 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 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 60051-6 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 –

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

## 1 Scope

This part of IEC 60051 applies to direct acting indicating analogue electrical measuring ohmmeters (impedance meters) and conductance meters.

This document also applies to some non-interchangeable accessories of ohmmeters (impedance meters) and conductance meters.

This document also applies to a direct acting indicating electrical measuring instrument whose scale marks do not correspond directly to its electrical input quantity, provided that the relationship between them is known.

This document also applies to electronic devices of ohmmeters (impedance meters) and conductance meters in their measuring and/or auxiliary circuits.



This document does not apply to insulation ohmmeters, grounding ohmmeters and external commercial power ohmmeters (impedance meters) and conductance 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 – Part1: Definitions and general requirements common to all parts*

## 3 Terms and definitions

See IEC 60051-1:2016.

## 4 Description, classification and compliance

### 4.1 Description

#### 4.1.1 Description according to methods of operation or nature

See IEC 60051-1:2016.

#### 4.1.2 Description according to environmental conditions

See IEC 60051-1:2016.

#### 4.1.3 Description according to mechanical conditions

See IEC 60051-1:2016.

#### 4.1.4 Description according to degrees of protection

See IEC 60051-1:2016.

#### 4.1.5 Description according to methods of measurement

Ohmmeters (impedance meters) and conductance meters shall be described according to whether they measure resistance values by a two-terminal or a four-terminal method.

#### 4.1.6 Description according to linearity of scale

Ohmmeters (impedance meters) and conductance meters shall be described according to whether they have a linear scale or a non-linear scale.

### 4.2 Classification

Ohmmeters (impedance meters) and conductance meters shall be classified in one of the accuracy classes denoted by the following class indices:

0,05, 0,1, 0,2, 0,5, 1, 1,5, 2, 2,5, 3, 5, 10, 20.

### 4.3 Compliance with the requirements of this standard



**4.3.1** See IEC 60051-1:2016.

**4.3.2** See IEC 60051-1:2016.



**4.3.3** See IEC 60051-1:2016.

**4.3.4** For impedance meters and for instruments not scaled in units of resistance or conductance, the manufacturer's instructions shall be followed.

## 5 Requirements

### 5.1 Reference conditions

See IEC 60051-1:2016.

### 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** The fiducial value for non-linear scale ohmmeters and impedance meters is the indicated value.

The class index is marked using symbol E-3 given in Table 6 of IEC60051-1:2016 (see Clause 6 of IEC 60051-1:2016).

**5.2.3.2** The fiducial value for linear scale ohmmeters is the upper limit of the measuring range.

The class index is marked using symbol E-4 given in Table 6 of IEC60051-1:2016 (see Clause 6 of IEC 60051-1:2016).

### 5.3 Nominal range of use and variations

#### 5.3.1 Nominal range of use

**5.3.1.1** See IEC 60051-1:2016.

**5.3.1.2** The requirements in Table 2 of IEC 60051-1:2016 concerning ripple, distortion, peak-factor and frequency do not apply to ohmmeters, conductance meters and impedance meters.

#### 5.3.2 Limits of variations

See IEC 60051-1:2016.

The requirements in Table 2 of IEC60051-1:2016 concerning ripple, distortion, peak-factor and frequency do not apply to ohmmeters, conductance meters and impedance meters.

Ohmmeters, conductance meters and impedance meters, which employ a battery as a power source, shall operate correctly when the batteries' voltage and internal resistance are within the range stated by the manufacturer. When the preliminary adjustments specified by the manufacturer have been carried out, any variations caused by changes of the battery characteristics shall not cause the instrument to indicate outside its accuracy class.



#### 5.3.3 Conditions for the determination of variations



**5.3.3.1** See IEC 60051-1:2016.

**5.3.3.2** See IEC 60051-1:2016.

**5.3.3.3** See IEC 60051-1:2016.

**5.3.3.4** The variations of ohmmeters, impedance meters and conductance meters intended for intermittent use shall be determined immediately after pre-conditioning, if any.

### 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

The requirements of self-heating do not apply to ohmmeters, impedance meters and conductance meters.

#### 5.5.3 Permissible overloads

The requirements of permissible overloads do not apply to ohmmeters, impedance meters and conductance meters.

#### 5.5.4 Limiting range of temperature

See IEC 60051-1:2016.

#### 5.5.5 Deviation from zero

The requirements of deviation from zero do not apply to ohmmeters, impedance meters and conductance meters.

#### 5.5.6 Electromagnetic compatibility (EMC)

See IEC 60051-1:2016.

### 5.6 Constructional requirements

#### 5.6.1 General constructional requirements

See IEC 60051-1:2016.

#### 5.6.2 Damping

See IEC 60051-1:2016.

#### 5.6.3 Sealing to prevent access

See IEC 60051-1:2016.



#### 5.6.4 Scales

##### 5.6.4.1 Scale divisions



See IEC 60051-1:2016.

##### 5.6.4.2 Scale numbering

See IEC 60051-1:2016.

##### 5.6.4.3 Direction of deflection

The requirements of the direction of deflection do not apply to the ohmmeters, impedance meters and conductance meters.

##### 5.6.4.4 Limits of the measuring range

a) See IEC 60051-1:2016.

b) For ohmmeters with non-linear scales, the method of identifying the limits of the measuring range by the omission of subdivisions outside the measuring range shall not be used.

c) The measuring range shall correspond to at least 50 % of the scale length.

#### 5.6.5 Stopper

The requirements of stopper do not apply to ohmmeters, impedance meters and conductance meters.

#### 5.6.6 Preferred values

The preferred values shall be agreed between the manufacturer and the user.