

ELEKTRILISED MÕÕTEMUUNDURID VAHELDUV- JA
ALALISVOOLUSUURUSTE MUUNDAMISEKS ANALOOG-
VÕI DIGITAALSIGNAALIDEKS

Electrical measuring transducers for converting AC
and DC electrical quantities to analogue or digital
signals

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>See Eesti standard EVS-EN IEC 60688:2024 sisaldab Euroopa standardi EN IEC 60688:2024 ingliskeelset teksti.</p> <p>Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 20.12.2024.</p> <p>Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.</p>	<p>This Estonian standard EVS-EN IEC 60688:2024 consists of the English text of the European standard EN IEC 60688:2024.</p> <p>This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.</p> <p>Date of Availability of the European standard is 20.12.2024.</p> <p>The standard is available from the Estonian Centre for Standardisation and Accreditation.</p>
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English Version

**Electrical measuring transducers for converting AC and DC
electrical quantities to analogue or digital signals
(IEC 60688:2024)**

Transducteurs électriques de mesure convertissant les
grandeurs électriques alternatives ou continues en signaux
analogiques ou numériques
(IEC 60688:2024)

Elektrische Messumformer zur Umwandlung von
elektrischen Wechselstromgrößen und Gleichstromgrößen
in analoge oder digitale Signale
(IEC 60688:2024)

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European foreword

The text of document 85/921/FDIS, future edition 5 of IEC 60688, prepared by TC 85 "Measuring equipment for electrical and electromagnetic quantities" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60688:2024.

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IEC 60051 (series)	NOTE	Approved as EN IEC 60051 (series)
IEC 60051-1	NOTE	Approved as EN 60051-1
IEC 60068-2-30	NOTE	Approved as EN 60068-2-30
IEC 60255-151	NOTE	Approved as EN 60255-151
IEC 60359	NOTE	Approved as EN 60359
IEC 60364-4-44	NOTE	Approved as HD 60364-4-444
IEC 60381-1:1982	NOTE	Approved as HD 452.1 S1:1984 (not modified)
IEC 60664-1	NOTE	Approved as EN IEC 60664-1
IEC 61000-4-7	NOTE	Approved as EN 61000-4-7
IEC 61010 (series)	NOTE	Approved as EN IEC 61010 (series)
IEC 61869 (series)	NOTE	Approved as EN IEC 61869 (series)
IEC 62052-11:2020	NOTE	Approved as EN IEC 62052-11:2021 (not modified) + A11:2022

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Electrical measuring transducers for converting AC and DC electrical quantities to analogue or digital signals

Transducteurs électriques de mesure convertissant les grandeurs électriques alternatives ou continues en signaux analogiques ou numériques



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INTERNATIONAL STANDARD

NORME INTERNATIONALE



Electrical measuring transducers for converting AC and DC electrical quantities to analogue or digital signals

Transducteurs électriques de mesure convertissant les grandeurs électriques alternatives ou continues en signaux analogiques ou numériques

INTERNATIONAL
ELECTROTECHNICAL
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CONTENTS

FOREWORD.....	9
INTRODUCTION.....	11
1 Scope.....	12
2 Normative references	13
3 Terms and definitions	14
3.1 General terms	14
3.2 Terms describing transducers	15
3.3 Terms describing transducers according to the measurand	17
3.4 Terms describing transducers according to their output load	18
3.5 Nominal values	19
3.6 Terms describing transducers with provisions to be adjusted by users	19
3.7 Influence quantities and reference conditions.....	20
3.8 Errors and variations.....	20
3.9 Accuracy, accuracy class, class index.....	21
3.10 Terms related to primary of transducers.....	21
3.11 Terms related to secondary output of transducers.....	22
4 Environmental conditions.....	22
5 Ratings.....	22
6 Requirements for design and construction	23
6.1 General.....	23
6.1.1 Transducer general architecture	23
6.1.2 Classification of transducers (TRD)	23
6.2 Safety requirements.....	24
6.2.1 General	24
6.2.2 Protection against electric shocks.....	24
6.2.3 Protection against mechanical hazards.....	25
6.2.4 Resistance to mechanical stress.....	25
6.2.5 Protection against the spread of fire	25
6.2.6 Equipment temperature limits and resistance to heat.....	25
6.2.7 Protection against hazards from fluids	26
6.2.8 Protection against radiation, including laser sources, and against sonic and ultrasonic pressure	26
6.2.9 Protection against liberated gases and substances, explosion and implosion.....	26
6.2.10 Components and subassemblies.....	26
6.2.11 Protection by interlocks	26
6.2.12 Hazards resulting from application.....	26
6.2.13 Risk assessment	27
6.3 EMC requirements	27
6.3.1 General	27
6.3.2 Immunity requirements	27
6.3.3 Emission requirements	28
6.4 Climatic requirements	28
6.5 Mechanical requirements	28
6.6 Functional requirements.....	28
6.7 Marking requirements	28
6.8 Documentation requirements	28

7	Type tests	29
8	Routine tests	29
Annex A (normative) Requirements for TRD1.....		30
A.1	General.....	30
A.2	References for the purposes of this Annex A	30
A.3	Terminology for the purposes of this Annex A	30
A.4	Environmental conditions	30
A.5	Ratings	30
A.6	Requirements for design and construction of TRD1.....	31
A.6.1	General	31
A.6.2	Safety requirements.....	31
A.6.3	EMC requirements	31
A.6.4	Climatic requirements	31
A.6.5	Mechanical requirements	31
A.6.6	Functional requirements	31
A.6.7	Marking requirements	39
A.6.8	Documentation requirements	42
A.7	Type tests for TRD1.....	42
A.7.1	General	42
A.7.2	General additional requirements for type tests for TRD1.....	42
A.7.3	Variations due to auxiliary supply voltage	43
A.7.4	Variations due to auxiliary supply frequency	44
A.7.5	Variations due to ambient temperature	44
A.7.6	Variations due to the frequency of the input quantity(ies).....	45
A.7.7	Variations due to the input voltage.....	46
A.7.8	Variations due to the input current	46
A.7.9	Variations due to power factor	47
A.7.10	Variation due to output load.....	48
A.7.11	Variations due to distortion of the input quantity(ies).....	49
A.7.12	Variation due to magnetic field of external origin.....	49
A.7.13	Variation due to unbalanced currents.....	50
A.7.14	Variation due to interaction between measuring elements.....	51
A.7.15	Variation due to self-heating	52
A.7.16	Variation due to continuous operation.....	52
A.7.17	Variation due to common mode interference	53
A.7.18	Variation due to series mode interference.....	53
A.7.19	Permissible excessive inputs	54
A.7.20	Impulse voltage tests	54
A.7.21	High frequency disturbance test.....	55
A.7.22	Test for temperature rise	55
A.7.23	Other tests.....	55
Annex B (normative) Requirements for TRD2.....		56
B.1	General.....	56
B.2	References for the purposes of this Annex B	56
B.3	Terminology for the purposes of this Annex B	56
B.4	Environmental conditions	56
B.4.1	General	56
B.4.2	Normal environmental conditions	56

B.5	Ratings for TRD2	57
B.5.1	General	57
B.5.2	Input ratings	57
B.5.3	Output ratings.....	58
B.5.4	General ratings.....	59
B.6	Requirements for design and construction of TRD2.....	61
B.6.1	General	61
B.6.2	Safety requirements.....	61
B.6.3	EMC requirements	61
B.6.4	Climatic requirements	61
B.6.5	Mechanical requirements	62
B.6.6	Functional requirements	66
B.6.7	Marking requirements	73
B.6.8	Documentation requirements	74
B.7	Type tests of TRD2	76
B.7.1	General	76
B.7.2	Safety tests	76
B.7.3	EMC tests.....	76
B.7.4	Climatic tests.....	77
B.7.5	Mechanical tests.....	79
B.7.6	Functional tests	89
B.7.7	Verification of markings and documentation.....	96
B.7.8	Short-time currents tests.....	96
B.7.9	Inter-turn overvoltage tests.....	97
B.7.10	Anti-aliasing tests	98
B.7.11	Test with harmonics and at low frequencies.....	98
B.8	Routine tests for TRD2	99
B.8.1	General	99
B.8.2	Accuracy tests	99
B.8.3	Verification of markings	99
B.8.4	Safety tests	99
B.8.5	Inter-turn overvoltage tests.....	99
Annex C	(normative) Interface coding	100
C.1	General.....	100
C.2	Characteristics of interface connection.....	100
C.3	Coding of rated output values for transducers	100
C.4	Coding of auxiliary power supply for transducers	102
C.5	Coding of transfer function curves for transducers	103
C.6	Interface full coding for output of transducers	103
C.6.1	General	103
C.6.2	Examples of interface codes and most common interface codes	104
Annex D	(informative) Anti-aliasing guidance	106
Annex E	(normative) Requirements for the measurement of harmonics and low frequencies.....	109
E.1	General.....	109
E.2	Requirements for accuracy class extension WBm0	109
E.3	Requirements for accuracy class extension WBm1	110
E.4	Requirements for accuracy class extension WBm2	110
E.5	Requirements for accuracy class extension WBm3	111

Annex F (normative) Markings of terminals of TRD2	112
F.1 Marking of terminals for TRD2 monitoring AC current.....	112
F.2 Marking of terminals for TRD2 monitoring voltage	112
Annex G (informative) Guidance related to cables, busbars and bare conductors within an installation	114
G.1 Insulation of cables	114
G.2 Temperature of cables and busbars	114
G.2.1 Cables	114
G.2.2 Busbars	114
Annex H (informative) Guidance related to overvoltage categories and measurement categories.....	115
H.1 Concept of overvoltage category	115
H.2 Approach of IEC 60664-1 for primary circuits of TRD2	115
H.2.1 General	115
H.2.2 Examples with IEC 60664-1:2020, for primary measuring circuits, OVC III, PD 2, altitude under 2 000 m, inhomogeneous field	115
H.3 Approach of IEC 61010 (all parts) for primary circuits of TRD2	116
H.3.1 General	116
H.3.2 Example with IEC 61010-2-030:2023 for primary measuring circuits, OVC III, PD 2, altitude under 2 000 m, inhomogeneous field.....	116
H.4 Approach for secondary circuits of TRD2	117
Annex I (informative) Examples of clamping units and relationship between clamping unit and connecting device.....	118
I.1 Clamping unit in a connecting device	118
I.2 Examples of clamping units.....	118
Bibliography.....	125
Figure 1 – Transducer (TRD) architecture example	23
Figure A.1 – Transfer function curve A.....	35
Figure A.2 – Transfer function curve B.....	36
Figure A.3 – Transfer function curve C.....	36
Figure A.4 – Transfer function curve D.....	37
Figure A.5 – Transfer function curve E.....	37
Figure B.1 – Relationship between ambient air temperature and relative humidity	61
Figure B.2 – Dimensions	63
Figure B.3 – Accuracy limits of a TRD2-IAC (a) and TRD2-IDC (b)	68
Figure B.4 – Definition of the angle between primary conductor and the equipment	71
Figure B.5 – Definition of the primary conductor position according to the position factor	72
Figure B.6 – Gauges of form A and form B.....	83
Figure B.7 – Test equipment for flexion test.....	85
Figure B.8 – Measurement of the step response time.....	91
Figure B.9 – Temperature cycle accuracy test.....	93
Figure B.10 – Test set up for impact of magnetic field from other phases – a) First step – b) Second step	94
Figure B.11 – Accuracy measurement test set up	96
Figure D.1 – Digital data acquisition system example.....	106

Figure D.2 – Frequency response mask for metering accuracy class 1 ($f_r = 60$ Hz, $f_s = 4\,800$ Hz)	108
Figure I.1 – Clamping unit in a connecting device	118
Figure I.2 – Screw clamping units	119
Figure I.3 – Pillar clamping units	120
Figure I.4 – Stud clamping units	121
Figure I.5 – Saddle clamping units	122
Figure I.6 – Lug clamping units	123
Figure I.7 – Mantle clamping units	124
Table 1 – Functional classification of transducers with minimal required functions	23
Table 2 – Definition of ports	27
Table 3 – Performance criteria for EMC immunity tests	28
Table A.1 – Usage groups	30
Table A.2 – Relationship between the limits of intrinsic error, expressed as a percentage of the fiducial value, and the class index	31
Table A.3 – Pre-conditioning	32
Table A.4 – Reference conditions of the influence quantities and tolerances for testing purposes	32
Table A.5 – Reference conditions relative to the measurand	33
Table A.6 – Examples of marking relating to the reference conditions and nominal range of use for temperature	40
Table A.7 – Symbols for marking transducers	41
Table A.8 – Permissible variations due to AC auxiliary supply	43
Table A.9 – Permissible variations due to DC auxiliary supply	44
Table A.10 – Permissible variations due to auxiliary supply frequency	44
Table A.11 – Permissible variations due to ambient temperature	45
Table A.12 – Permissible variations due to the frequency of input quantity	46
Table A.13 – Permissible variations due to the input voltage	46
Table A.14 – Permissible variations due to the input current	47
Table A.15 – Permissible variations due to power factor	48
Table A.16 – Permissible variations due to output load	49
Table A.17 – Permissible variations due to distortion of input quantities	49
Table A.18 – Permissible variations due to magnetic field of external origin	50
Table A.19 – Permissible variations due to unbalance currents	51
Table A.20 – Permissible variations due to interactions between measuring elements	51
Table A.21 – Permissible variations due to self-heating	52
Table A.22 – Permissible variations due to continuous operation	53
Table A.23 – Permissible variations due to series mode interference	54
Table B.1 – Environmental conditions parameters	56
Table B.2 – Preferred rated burden for TRD2 with an AC or DC voltage output, or a frequency output	59
Table B.3 – Rated burden for TRD2 with an AC or DC current output	59
Table B.4 – Rated temperatures for TRD2	60

Table B.5 – Rated humidity classes	60
Table B.6 – Examples of terminal lugs for equipment connected to copper conductors	63
Table B.7 – Nominal cross-sections of round copper conductors and approximate relationship between mm ² and AWG/kcmil sizes	64
Table B.8 – Minimum values for maximum cross section of conductors up to 400 A inclusive	65
Table B.9 – Minimum values for maximum cross section of conductors from 400 A and up to 800 A inclusive	66
Table B.10 – Minimum values for maximum cross section for copper bars for currents above 400 A and up to 3 150 A inclusive	66
Table B.11 – Limits for relative error and phase error for TRD2-IAC	67
Table B.12 – Limits of error for TRD2-IDC	67
Table B.13 – Limits of relative error for TRD2-UAC	69
Table B.14 – Limits of relative error for TRD2-UDC	70
Table B.15 – Limits for the position of the primary conductor with respect to the equipment	71
Table B.16 – RJ45 connector pinout	73
Table B.17 – Temperature tests	78
Table B.18 – Tightening torques for the verification of the mechanical strength of screw-type terminals	80
Table B.19 – Maximum conductor cross-sections and corresponding gauges	81
Table B.20 – Relationship between conductor cross-section and diameter	82
Table B.21 – Test values for flexion and pull-out tests for round copper conductors	84
Table B.22 – Test values for pull-out test for flat copper conductors	86
Table B.23 – Test copper conductors for test currents up to 400 A inclusive	87
Table B.24 – Test copper conductors for test currents above 400 A and up to 800 A inclusive	88
Table B.25 – Test copper bars for test currents above 400 A and up to 3 150 A inclusive	88
Table B.26 – Burden values for basic accuracy tests	89
Table C.1 – Coding of interface connection	100
Table C.2 – Rated AC RMS voltage output	101
Table C.3 – Rated DC voltage output	101
Table C.4 – Rated range of DC voltage output	101
Table C.5 – Rated AC RMS current output less than 1A	101
Table C.6 – Rated range of DC current output	102
Table C.7 – Rated frequency output	102
Table C.8 – Rated pulse density output	102
Table C.9 – Coding of power supply for transducers supplied from a measuring instrument via the connector	103
Table C.10 – Coding of external power supply for transducers	103
Table C.11 – Coding of transfer function curves for TRD1	103
Table C.12 – Interface full coding for output of transducers	104
Table C.13 – Examples of interface codes and most common interface codes	104
Table D.1 – Anti-aliasing filter	107
Table E.1 – Limits of error for harmonics – Accuracy class extension WBm0	109

Table E.2 – Limits of errors for harmonics – Accuracy class extension WBm1.....	110
Table E.3 – Limits of errors for harmonics – Accuracy class extension WBm2.....	111
Table E.4 – Limits of errors for supra-harmonics – Accuracy class extension WBm3.....	111
Table F.1 – Marking of terminals for TRD2 monitoring current.....	112
Table F.2 – Marking of terminals for TRD2 monitoring voltage	113
Table H.1 – Clearances according to IEC 60664-1:2020	115
Table H.2 – Creepage distances according to IEC 60664-1:2020	116
Table H.3 – Clearances according to IEC 61010-2-030:2017	117
Table H.4 – Creepage distances according to IEC 61010-2-030:2023	117

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL MEASURING TRANSDUCERS FOR CONVERTING AC AND DC
ELECTRICAL QUANTITIES TO ANALOGUE OR DIGITAL SIGNALS**

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IEC 60688 has been prepared by IEC technical committee 85: Measuring equipment for electrical and electromagnetic quantities. It is an International Standard.

This fifth edition cancels and replaces the fourth edition published in 2021. This edition constitutes a technical revision.

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

- a) updating normative references;
- b) updating definitions;
- c) updating structure;
- d) adding DC power measurement.

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

Draft	Report on voting
85/921/FDIS	85/932/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

In this document, the following print types are used:

- requirements and definitions: in roman type;
- NOTES: in smaller roman type;
- *compliance*: in italic type.

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

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

Energy distribution systems need to guarantee energy efficiency, availability, and network performance to address the following challenges:

- meet sustainable development requirements, where energy measurement is necessary to identify sources of energy savings, and to improve the energy performance of manufacturing, commercial organisations, and public services;
- adjust to technological evolutions (electronic loads, electronic measuring methods, etc.);
- address end-user needs (cost saving, compliance building regulations, etc.) regarding electrical energy management;
- ensure safety and continuity of service;
- adjust to the evolution of installation standards;
- meet the needs of new applications for DC systems (photovoltaic, electrical vehicle, DC distribution, etc.).

Monitoring electrical quantities in internal networks contributes to addressing these challenges.

To set up this monitoring, transducers:

- perform the measurement of different types of electrical quantities,
- convert AC and DC electrical quantities to analogue or digital signals,
- can be combined with measuring equipment to monitor and analyse electrical quantities.

NOTE Some of the terms used in this document are different from those used in IEC 60051 (all parts) due to the fundamental differences between indicating instruments and measuring transducers.

ELECTRICAL MEASURING TRANSDUCERS FOR CONVERTING AC AND DC ELECTRICAL QUANTITIES TO ANALOGUE OR DIGITAL SIGNALS

1 Scope

This document applies to transducers (TRD) with electrical inputs and outputs for making measurements of AC or DC electrical quantities. The output signal can be in the form of an analogue or digital signal.

This document applies to measuring transducers used for converting electrical quantities such as:

- current,
- voltage,
- active power,
- reactive power,
- power factor,
- phase angle,
- frequency,
- harmonics or total harmonic distortion,
- apparent power, and
- DC power

to an output signal.

NOTE The above electrical quantities include AC and/or DC components.

This document applies

- a) if the fundamental frequency of the input(s) lies between 0 Hz and 1 500 Hz,
- b) to the electrical measuring transducer if it is part of a system for the measurement of an electrical or non-electrical quantity,
- c) to transducers for use in a variety of applications such as telemetry and process control and in one of a number of defined environments.

This document is not applicable for:

- instrument transformers that comply with IEC 61869 (all parts),
- transmitters for use in an industrial process application that comply with IEC 60770 (all parts),
- power metering and monitoring devices (PMD) that comply with IEC 61557-12,
- meters that comply with the IEC 62053 series,
- handheld sensors,
- residual current monitoring devices (RCMs) that comply with IEC 62020-1,
- residual current detecting devices (RDC-DD) that comply with IEC 62955,
- in-cable control and protection devices (IC-CPDs) that comply with IEC 62752,
- modular residual current devices (MRCDs) that comply with IEC 60947-2:2016/AMD1:2019, Annex M.

Within the measuring range, the output signal is a function of the measurand. An auxiliary supply can be required.

This document is intended:

- to specify the terminology and definitions relating to transducers whose main application is in industry,
- to unify the test methods used in evaluating transducer performance,
- to specify accuracy limits and output values for transducers.

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

IEC 60068-2-11, *Environmental testing – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-52:2017, *Environmental testing – Part 2-52: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*

IEC 60228:2023, *Conductors of insulated cables*

IEC TR 61000-2-3, *Electromagnetic compatibility (EMC) – Part 2: Environment – Section 3: Description of the environment – Radiated and non-network-frequency-related conducted phenomena*

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

IEC 61010-1:2010/AMD1:2016

IEC 61010-2-030:2023, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030: Particular requirements for equipment having testing or measuring circuits*

IEC 61326-1:2020, *Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements*

IEC 61557-12:2018, *Electrical safety in low voltage distribution systems up to 1 000 V AC and 1 500 V DC – Equipment for testing, measuring or monitoring of protective measures – Part 12: Power metering and monitoring devices (PMD)*

IEC 61557-12:2018/AMD1:2021

IEC 61558-1:2017, *Safety of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests*

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests*

IEC 62586-1:2017, *Power quality measurement in power supply systems – Part 1: Power quality instruments (PQI)*

ISO 4628-3:2016, *Paints and varnishes – Evaluation of degradation of coatings – Designation of quantity and size of defects, and of intensity of uniform changes in appearance – Part 3: Assessment of degree of rusting*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

NOTE Some of the terms used in this document are different from those used in IEC 60051 (all parts) due to the fundamental differences between indicating instruments and measuring transducers.

3.1 General terms

3.1.1

alternating current

electric current that is a periodic function of time with a zero direct component or, by extension, a negligible direct component

Note 1 to entry: For the qualifier AC, see IEC 60050-151:2001, 151-15-01.

[SOURCE: IEC 60050-131:2002, 131-11-24]

3.1.2

alternating voltage

alternating tension

voltage that is a periodic function of time with a zero direct component or, by extension, a negligible direct component

Note 1 to entry: For the qualifier AC, see IEC 60050-151:2001, 151-15-01.

[SOURCE: IEC 60050-131:2002, 131-11-25]

3.1.3

direct current system

DC system

electrical system fed by unidirectional voltage

[SOURCE: IEC 60050-601:1985, 601-01-04]

3.1.4

direct current

electrical current that is time-independent or, by extension, periodic current the direct component of which is of primary importance

Note 1 to entry: For the qualifier DC, see IEC 60050-151:2001, 151-15-02.

[SOURCE: IEC 60050-131:2002, 131-11-22]