



BSI Standards Publication

Electricity metering equipment — General requirements, tests and test conditions

Part 11: Metering equipment

National foreword

This British Standard is the UK implementation of EN IEC 62052-11:2021+A12:2024. It is derived from IEC 62052-11:2020. It supersedes BS EN IEC 62052-11:2021+A11:2022, which is withdrawn.

The start and finish of text introduced or altered by amendment A11 is indicated in the text by tags. Tags indicating changes to text carry the number of the CENELEC amendment. For example, text altered by CENELEC amendment A11 is indicated by A11 A11

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Electricity metering equipment - General requirements, tests and
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générales, essais et conditions d'essai - Partie 11:
Équipement de comptage
(IEC 62052-11:2020)

Elektrizitätszähler - Allgemeine Anforderungen, Prüfungen
und Prüfbedingungen - Teil 11: Messeinrichtungen
(IEC 62052-11:2020)

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European foreword

The text of document 13/1808/FDIS, future edition 2 of IEC 62052-11, prepared by IEC/TC 13 "Electrical energy measurement and control" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62052-11:2021.

The following dates are fixed:

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- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2024-04-02

This document supersedes EN 62052-11:2003 and all of its amendments and corrigenda (if any).

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Endorsement notice

The text of the International Standard IEC 62052-11:2020 was approved by CENELEC as a European Standard without any modification.

European foreword to amendment A11

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This document amends EN IEC 62052-11:2021.

EN IEC 62052-11:2021/A11:2022 includes the following significant technical changes with respect to EN IEC 62052-11:2021:

— adaptation to MID and EMCD, addition of Annexes ZZA and ZZB.

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For the relationship with EU Directive(s) / Regulation(s), see informative Annexes ZZA and ZZB, which are an integral part of this document.

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European foreword to Amendment A12

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conflicting with this document have to be
withdrawn

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For the relationship with EU Legislation, see informative Annex ZZA, which is an integral part of EN IEC 62052-11:2021/A11:2022.

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A11 Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60038 (mod)	2009	IEC standard voltages	EN 60038	2011
IEC 60068-2-1	2007	Environmental testing - Part 2-1: Tests - Test A: Cold	EN 60068-2-1	2007
IEC 60068-2-2	2007	Environmental testing - Part 2-2: Tests - Test B: Dry heat	EN 60068-2-2	2007
IEC 60068-2-5	2018	Environmental testing – Part 2-5: Tests – Test S: Simulated solar radiation at ground level and guidance for solar radiation testing and weathering	EN IEC 60068-2-5	2018
IEC 60068-2-6	2007	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	2008
IEC 60068-2-27	2008	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	2009
IEC 60068-2-30	2005	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)	EN 60068-2-30	2005
IEC 60381-1	1982	Analogue signals for process control systems. Part 1: Direct current signals	HD 452.1 S1	1984
IEC 60404-5	2015	Magnetic materials - Part 5: Permanent magnet (magnetically hard) materials - Methods of measurement of magnetic properties	EN 60404-5	2015
IEC 60404-8-1	2015	Magnetic materials - Part 8-1: Specifications for individual materials - Magnetically hard materials	EN 60404-8-1	2015
IEC 60404-8-4	2013	Magnetic materials - Part 8-4: Specifications for individual materials - Cold-rolled non-oriented electrical steel strip and sheet delivered in the fully-processed state	-	-
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60721-1	1990	Classification of environmental conditions - Part 1: Environmental parameters and their severities	EN 60721-1	1995
IEC 60947-1	2007	Low-voltage switchgear and controlgear – Part 1: General rules	EN 60947-1	2007
+ A1	2010		+ A1	2011
+ A2	2014		+ A2	2014
IEC 61000-4-2	2008	Electromagnetic compatibility (EMC) - Part 4–2: Testing and measurement techniques - Electrostatic discharge immunity test	EN 61000-4-2	2009
IEC 61000-4-3	2006	Electromagnetic compatibility (EMC) - Part 4–3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	EN 61000-4-3	2006
+ A1	2007		+ A1	2008
+ A2	2010		+ A2	2010
IEC 61000-4-4	2012	Electromagnetic compatibility (EMC) - Part 4–4: Testing and measurement techniques - Electrical fast transient/burst immunity test	EN 61000-4-4	2012
IEC 61000-4-5	2014	Electromagnetic compatibility (EMC) - Part 4–5: Testing and measurement techniques - Surge immunity test	EN 61000-4-5	2014
+ A1	2017		+ A1	2017
IEC 61000-4-6	2013	Electromagnetic compatibility (EMC) - Part 4–6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	EN 61000-4-6	2014
IEC 61000-4-8	2009	Electromagnetic compatibility (EMC) - Part 4–8: Testing and measurement techniques - Power frequency magnetic field immunity test	EN 61000-4-8	2010
IEC 61000-4-11	2020	Electromagnetic compatibility (EMC) - Part 4–11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase	EN IEC 61000-4-11	2020
IEC 61000-4-12	2017	Electromagnetic compatibility (EMC) – Part 4–12: Testing and measurement techniques – Ring wave immunity test	EN 61000-4-12	2017
IEC 61000-4-18	2019	Electromagnetic compatibility (EMC) - Part 4–18: Testing and measurement techniques - Damped oscillatory wave immunity test	EN IEC 61000-4-18	2019
IEC 61000-4-19	2014	Electromagnetic compatibility (EMC) - Part 4–19: Testing and measurement techniques - Test for immunity to conducted, differential mode disturbances and signalling in the frequency range 2 kHz to 150 kHz at a.c. power ports	EN 61000-4-19	2014

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61000-4-20	2010	Electromagnetic compatibility (EMC) - Part 4–20: Testing and measurement techniques - Emission and immunity testing in transverse electromagnetic (TEM) waveguides	EN 61000-4-20	2010
IEC 61000-4-29	2000	Electromagnetic compatibility (EMC) - Part 4–29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests	EN 61000-4-29	2000
IEC 61869-3	2011	Instrument transformers - Part 3: Additional requirements for inductive voltage transformers	EN 61869-3	2011
IEC 62052-31	2015	Electricity metering equipment (AC) - General requirements, tests and test conditions - Part 31: Product safety requirements and tests	EN 62052-31	2016
IEC 62054-21	2004	Electricity metering (a.c.) - Tariff and load control - Part 21: Particular requirements for time switches	EN 62054-21	2004
IEC 62056-6-1	2017	Electricity metering data exchange - The DLMS/COSEM suite - Part 6–1: Object Identification System (OBIS)	EN 62056-6-1	2017
IEC 62056-6-2	2017	Electricity metering data exchange - The DLMS/COSEM suite - Part 6–2: COSEM interface classes	EN IEC 62056-6-2	2018
IEC 62059-32-1	2011	Electricity metering equipment - Dependability - Part 32–1: Durability - Testing of the stability of metrological characteristics by applying elevated temperature	EN 62059-32-1	2012
IEC GUIDE 98-3	-	Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)	-	-
CISPR 32	2015	Electromagnetic compatibility of multimedia equipment - Emission requirements	EN 55032	2015
			+ A11	2020
JCGM 100	2008	Evaluation of measurement data – Guide to the expression of uncertainty in measurement. (GUM 1995 with minor corrections)	-	-
-	-	Designation systems for steels – Part 1: Steel names	EN 10027-1	2016

Annex ZZA (informative)

Relationship between this European Standard and the essential requirements of Directive 2014/32/EU aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/541 to provide one voluntary means of conforming to essential requirements of Directive 2014/32/EU Measuring Instruments Directive.

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZZA.1 — Correspondence between this European Standard and Annex I and Annex V of Directive 2014/32/EU

Essential Requirements (ERs) of Directive 2014/32/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
Annex I Essential Requirements		
I. 1.2 Allowable errors, rated operating conditions, presence of disturbance	9.3	For EMC – Other disturbances are detailed in relevant accuracy class standard
I. 1.3.1 Climatic environments, temperature limits	8.2 8.3.3 8.3.4 8.3.5 9.4.4	
I. 1.3.2 Mechanical environments	5	
I. 1.3.3 Electromagnetic environments		See specific requirements of Annex V
I. 1.3.4 Other influences	9.4.3 9.4.6 9.3.13	See also specific requirements of Annex V
I. 1.4.1 Basic rules for testing	9.1	
I. 1.4.2 Ambient humidity	8.3.5	
I. 3 Repeatability	7.8	
I. 4 Discrimination and sensitivity		See specific requirement V. 5.5 below
I. 5 Durability	8.4	

I. 7.1 Fraudulent use	4.2.4 5.3 5.5 6.3	
I. 7.2 Suitable for use	5.3 5.4 5.5.2 5.6 6	
I. 7.5 Robustness and suitability of materials	5.1 5.2 5.3 5.4	
I. 7.6 Allow for control after placing on the market and put into use	5.8 6.2p) 6.5.1	
I. 8.1 Not to be influenced in any inadmissible way	9.4.9	
I. 8.2 Securing of hardware components	5.5	
I. 8.3 Securing and identification of software	5.5.1 5.5.6 6.2p)	
I. 8.4 Measurement data adequately protected against corruption	5.5.1 5.5.6	
I. 8.5 Total quantity supplied not to be reset	5.6.1	
I. 9.1 Inscriptions	6	
I. 9.3 Information on operation	6	
I. 9.5 Scale interval for the measurand	5.6	
I. 9.7 Unit of measurement		See specific requirement V.6 below
I. 9.8 Marking properties	6.2	
I. 10.1 Display or hard copy	5.6.1 5.6.3	
I. 10.2 Reading properties	5.6.3.1	
I. 10.5 Properties of display even if remote reading	5.6.3	
I. 12 Conformity evaluation	5.8 5.8.4 5.6.3.1	
Annex V Specific Requirements for Active Electrical Energy Meters (MI-003)		
V. 4.1 Permissible effects of disturbances - General	9.3	

V. 4.2 Effects of disturbances of long duration	9.4.7 9.4.5 9.4.2 9.4.2.3 9.4.2.4 9.4.2.5 9.3.6 9.3.4 9.3.5 9.3.7 9.3.11 9.3.13 9.3.12	
V. 4.3.1 Permissible effect of transient electromagnetic phenomena	9.3 9.2	
V. 4.3.2 Overcurrent	9.4.10	
V. 5.2 Number of digits on display	5.6.1	
V. 5.3 Availability when loss of electricity	5.7	
V. 5.4 Running with no load	7.6	
V. 5.5 Starting	7.7	
V. 6 Units	5.6.1	

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

NOTE The exclusion of meters designed for operation with LPITs not directly connected with the LPITs from the scope of EN IEC 62052-11:2021/A11:2022 does not imply that such meters are not permitted under Directive 2014/32/EU.



 *Text deleted.* 

CONTENTS

FOREWORD	8
INTRODUCTION	10
1 Scope	13
2 Normative references	14
3 Terms and definitions	17
3.1 General definitions	17
3.2 Definitions related to the functional elements	21
3.3 Definitions of meter ports	24
3.4 Definitions of mechanical elements	25
3.5 Definitions related to measurements	27
3.6 Definitions related to external influences	30
3.7 Definition of tests	33
3.8 Definitions related to electromechanical meters	33
3.9 Definitions related to meter marking and symbols	34
4 Nominal electrical values	35
4.1 Voltages	35
4.1.1 Nominal voltages	35
4.1.2 Voltage ranges	36
4.2 Currents	36
4.2.1 Nominal currents	36
4.2.2 Starting current	36
4.2.3 Minimum current	36
4.2.4 Maximum current	37
4.2.5 Current ranges	37
4.3 Frequencies	37
4.3.1 Nominal frequencies	37
4.3.2 Frequency ranges	37
4.4 Power consumption	37
5 Construction requirements	39
5.1 General	39
5.2 Mechanical tests	39
5.2.1 Shock test	39
5.2.2 Vibration test	40
5.3 Window	40
5.4 Terminals – Terminal block(s) – Protective conductor terminal	40
5.5 Sealing provisions	40
5.5.1 General	40
5.5.2 Meter case	40
5.5.3 Meter terminals	41
5.5.4 Sealing of detached indicating displays	41
5.5.5 Sealing of LPIT connections	41
5.5.6 Sealing of meter configuration	42
5.6 Display of measured values	42
5.6.1 General	42
5.6.2 Meters without indicating displays	42
5.6.3 Meters with indicating displays	42

5.7	Storage of measured values	43
5.8	Pulse outputs	43
5.8.1	General	43
5.8.2	Optical test output	43
5.8.3	Electrical pulse output	45
5.8.4	Operation indicator	45
5.9	Electrical pulse inputs	46
5.9.1	General characteristics	46
5.9.2	Functional tests of electrical pulse inputs	46
5.10	Auxiliary power supply	46
6	Meter marking and documentation	47
6.1	Meter accuracy class marking	47
6.2	Meter marking	47
6.3	Connection diagrams and terminal marking	51
6.4	Symbols	51
6.4.1	General	51
6.4.2	Symbols for the measuring elements	52
6.4.3	Symbols for transformer-operated meters	52
6.4.4	Identification of the displayed information	52
6.4.5	Marking of the measured quantity	53
6.4.6	Symbols of principal units used for meters (see Table 8)	53
6.4.7	Symbols for auxiliary devices	54
6.4.8	Symbols for details of the suspension of the moving element	54
6.4.9	Symbols for communication ports	54
6.5	Documentation	54
6.5.1	Installation manuals	54
6.5.2	Instruction for use	54
7	Metrological performance requirements and tests	54
7.1	General test conditions	54
7.2	Methods of accuracy verification	56
7.3	Measurement uncertainty	56
7.4	Meter constant	57
7.5	Initial start-up of the meter	57
7.6	Test of no-load condition	58
7.7	Starting current test	58
7.8	Repeatability test	59
7.9	Limits of error due to variation of the current	59
7.10	Limits of error due to influence quantities	60
7.11	Time-keeping accuracy	60
8	Climatic requirements	60
8.1	General	60
8.2	Environmental conditions	60
8.3	Tests of the effects of the climatic environments	60
8.3.1	General test requirements	60
8.3.2	Acceptance criteria	61
8.3.3	Dry heat test	61
8.3.4	Cold test	61
8.3.5	Damp heat cyclic test	61
8.3.6	Protection against solar radiation	62

8.4	Durability	62
9	The effects of external influence quantities and disturbances	62
9.1	General.....	62
9.2	Acceptance criteria	64
9.3	Electromagnetic compatibility (EMC).....	65
9.3.1	General	65
9.3.2	Voltage dips and short interruptions.....	67
9.3.3	Electrostatic discharge immunity test	69
9.3.4	Radiated, radio-frequency, electromagnetic field immunity test – test without current.....	69
9.3.5	Radiated, radio-frequency, electromagnetic field immunity test – test with current.....	70
9.3.6	Electrical fast transient/burst immunity test.....	70
9.3.7	Immunity to conducted disturbances, induced by radio-frequency fields.....	71
9.3.8	Test for immunity to conducted, differential mode disturbances and signalling in the frequency range 2 kHz to 150 kHz at AC power ports	71
9.3.9	Surge immunity test	72
9.3.10	Ring wave immunity test	74
9.3.11	Damped oscillatory wave immunity test	74
9.3.12	External static magnetic fields	75
9.3.13	Power frequency magnetic field immunity test	76
9.3.14	Emission requirements	76
9.4	Tests of immunity to other influence quantities.....	77
9.4.1	General	77
9.4.2	Harmonics in the current and voltage circuits.....	77
9.4.3	Voltage variation.....	78
9.4.4	Ambient temperature variation	79
9.4.5	Interruption of phase voltage	79
9.4.6	Frequency variation	80
9.4.7	Reversed phase sequence.....	80
9.4.8	Auxiliary voltage variation	80
9.4.9	Operation of auxiliary devices	81
9.4.10	Short-time overcurrents	81
9.4.11	Self-heating	82
9.4.12	Fast load current variations	82
9.4.13	Earth fault.....	83
10	Type test	83
10.1	Test conditions	83
10.2	Type test report	84
Annex A	(normative) Optical test output.....	85
Annex B	(normative) Class A and class B electrical pulse outputs	86
B.1	Electrical characteristics of pulse output	86
B.2	Electrical output pulse waveform.....	87
B.3	Test of electrical pulse output	87
B.4	Test of pulse input	87
Annex C	(normative) Electrical pulse output for special applications and long distances according to IEC 60381-1:1982	89
C.1	Specified operating conditions and output pulse waveform.....	89
C.2	Test of pulse output	90

C.3	Test of pulse input	91
Annex D (informative)	Meter symbols and markings	92
Annex E (informative)	Meter ports	97
Annex F (informative)	Test set-up for EMC tests	100
Annex G (informative)	Test for immunity to conducted, differential mode disturbances and signalling in the frequency range 2 kHz to 150 kHz at AC power ports	102
Annex H (normative)	Test circuit diagrams for testing influence of harmonics and interharmonics	103
Annex I (informative)	Short time overcurrent test waveform	109
Annex J (informative)	Fast load current variation test	110
Annex K (normative)	Electromagnet for testing the influence of externally produced magnetic fields	111
K.1	Permanent magnet for testing the influence of external static magnetic field	111
K.2	Electromagnet for testing the influence of external static magnetic field with magneto-motive force of 1 000 At (ampere-turns) (see Figure K.1)	111
Annex L (normative)	Test circuit diagram for the test of immunity to earth fault	113
Annex M (informative)	Meter current range	114
Annex N (informative)	Application to Branch Circuit Power Meters	115
N.1	Overview	115
N.2	Definitions	115
N.3	General	115
N.4	Cross-channel influences	116
N.5	Channel configuration and sealing for multi-branch meters	116
N.6	Verification for multi-branch meters	116
Annex O (informative)	Overview of the technical changes	117
Annex P (informative)	Test schedule – Recommended test sequences	118
Figure A.1	– Test arrangement for the test output	85
Figure A.2	– Waveform of the optical test output	85
Figure B.1	– Physical interface of the electrical pulse output	86
Figure B.2	– Electrical output pulse waveform	87
Figure B.3	– Pulse output test set-up	87
Figure B.4	– Pulse input test set-up	88
Figure C.1	– Output pulse waveform	90
Figure C.2	– Pulse output test set-up	90
Figure C.3	– Pulse input test set-up	91
Figure E.1	– Typical port configuration of a directly connected meter (example)	97
Figure E.2	– Typical port configuration of a transformer operated meter (example)	98
Figure E.3	– Typical port configuration of a LPIT operated meter with a detached indicating display (example)	98
Figure F.1	– Test set-up for the electrical fast transient/burst immunity test for transformer operated meters: each port (Mains, CT, HLV, ELV) is tested separately by adding the coupling device to the respective port	100
Figure F.2	– Test set-up for the electrical fast transient/burst immunity test for directly connected meters: each port (Mains, HLV, ELV) is tested separately by adding the coupling device to the respective port	101

Figure G.1 – Example of a test set-up for immunity to conducted, differential mode disturbances and signalling in the frequency range 2 kHz to 150 kHz at AC power ports (from IEC 61000-4-19: 2014)	102
Figure H.1 – Test circuit diagram (informative, test of influence of interharmonics and odd harmonics)	103
Figure H.2 – Burst fired wave-form (interharmonics)	104
Figure H.3 – Informative distribution of interharmonic content of burst-fired waveform (the Fourier analysis is not complete)	104
Figure H.4 – Phase fired waveform (odd harmonics) – 90° fired waveform	105
Figure H.5 – Informative distribution of harmonic content of 90° phase fired waveform (the Fourier analysis is not complete)	105
Figure H.6 – Phase fired waveform (odd harmonics) – 45° fired waveform	106
Figure H.7 – Phase fired waveform (odd harmonics) – 135° fired waveform	106
Figure H.8 – Test circuit diagram for half-wave rectification (DC and even harmonics)	107
Figure H.9 – Half-wave rectified waveform (DC and even harmonics)	107
Figure H.10 – Informative distribution of harmonic content of half-wave rectified waveform (the Fourier analysis is not complete)	108
Figure K.1 – Electromagnet for testing the influence of external static magnetic field with magneto-motive force of 1 000 At (ampere-turns)	112
Figure L.1 – Circuit to simulate earth fault condition in phase 1	113
Figure L.2 – Voltages at the meter under test	113
Figure M.1 – Meter current range	114
Table 1 – Nominal voltages	35
Table 2 – Voltage ranges	36
Table 3 – Preferred values of nominal currents	36
Table 4 – Current ranges	37
Table 5 – Frequency ranges	37
Table 6 – Maximum power consumption	38
Table 7 – Marking and documentation requirements	49
Table 8 – Symbols of principal units used for meters	53
Table 9 – Voltage and current balance	55
Table 10 – Reference conditions	55
Table 11 – Repeatability test points	59
Table 12 – Environmental conditions	60
Table 13 – Summary of the tests of immunity to influence quantities	63
Table 14 – Summary of the tests of immunity to disturbances	64
Table 15 – Acceptance criteria	65
Table 16 – Voltage dips, short interruptions and voltage variations immunity tests	67
Table 17 – Voltage dips, short interruptions and voltage variations on DC input power port immunity tests	68
Table 18 – Surge immunity test voltage	73
Table 19 – Evaluation of primary meter functions under influence of voltage variation	79
Table B.1 – Specified operating conditions	86
Table B.2 – Test of pulse output	87
Table B.3 – Test of pulse input device	88

Table C.1 – Specified operating conditions	89
Table C.2 – Test of pulse output device	91
Table C.3 – Test of pulse input device	91
Table D.1 – Examples of voltage marking according to network voltage	92
Table D.2 – Symbols for measuring elements	92
Table D.3 – Marking of the measured quantity (examples).....	93
Table D.4 – Inscriptions indicating the accuracy class and the meter constant (examples).....	93
Table D.5 – Symbols for transformer-operated meters (examples).....	94
Table D.6 – Tariff function symbols (examples).....	94
Table D.7 – Symbols for tariff function (examples)	94
Table D.8 – Symbols for auxiliary devices (examples)	95
Table D.9 – Symbols for details of the suspension of the moving element (examples).....	95
Table D.10 – Symbols for communication ports (examples)	96
Table N.1 – Cross-channel influence test conditions for multi-circuit meters	116

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICITY METERING EQUIPMENT –
GENERAL REQUIREMENTS, TESTS AND TEST CONDITIONS –****Part 11: Metering equipment****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.
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International Standard IEC 62052-11 has been prepared by IEC technical committee 13: Electrical energy measurement and control.

This second edition cancels and replaces the first edition published in 2003, and its amendment 1:2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition: see Annex O.

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

FDIS	Report on voting
13/1808/FDIS	13/1812/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 document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62052 series, published under the general title *Electricity metering equipment – General requirements*, tests and test conditions, 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.

NOTE The attention of National Committees is drawn to the fact that equipment manufacturers and testing organizations may need a transitional period following publication of a new, amended or revised IEC publication in which to make products in accordance with the new requirements and to prepare themselves for conducting new or revised tests.

It is the recommendation of the committee that the content of this publication be adopted for implementation nationally not earlier than two years from the date of publication.

INTRODUCTION

The general overview and organization of the IEC 6205x series of standards applicable to electricity metering and load control equipment is as follows:

PRODUCT FAMILY STANDARDS – GENERAL REQUIREMENTS	PRODUCT FAMILIES				
	AC meters rated up to 1 000 V for direct connection or connection through conventional transformers	Tariff and load control equipment	DC meters rated up to 1 500 V for direct connection	AC meters for connection through LPITs (as defined in the IEC 61869 series of standards)	DC meters for connection through LPITs (as defined in the IEC 61869 series of standards)
NOMINAL VALUES, CONSTRUCTION, ELECTRICAL, CLIMATIC AND EMC REQUIREMENTS. TEST METHODS	IEC 62052-11:2020	IEC 62052-21 2004	IEC 62052-11:2020	Planned: IEC 62052-XX general requirements for meters for connection through LPITs.	
SAFETY	IEC 62052-31:2015		Planned: IEC 62052-31 2 nd edition including safety requirements for DC meters	Planned: IEC 62052-XX safety requirements for meters for connection through LPITs.	
DEPENDABILITY	IEC 62059-11: 2002, IEC 62059-21:2002, IEC 62059-32-1 2011, IEC 62059-41:2006		Planned: IEC 62059-XX dependability requirements for DC meters	Planned: IEC 62059-XX dependability requirements for meters for connection through LPITs.	
ACCEPTANCE INSPECTION	IEC 62058-11:2008			Planned: IEC 62058-XX acceptance inspection requirements for meters for connection through LPITs.	
EMBEDDED SOFTWARE	Planned: IEC 6205x-xx embedded software (firmware) requirements and test methods for electricity metering and load control equipment				

PRODUCT FAMILY STANDARDS – PARTICULAR REQUIREMENTS AND ACCURACY CLASSES				
AC meters rated up to 1 000 V for direct connection or connection through conventional transformers	Tariff and load control equipment	DC meters rated up to 1 500 V for direct connection	AC meters for connection through LPITs (as defined in the IEC 61869 series of standards)	DC meters for connection through LPITs (as defined in the IEC 61869 series of standards)
Electromechanical, active energy directly connected, classes 0,5, 1, 2 IEC 62053-11:2003, IEC 62058-21:2008	Ripple control receivers IEC 62054-11:2004	Static, DC energy, directly connected, classes 0,5, 1 IEC 62053-41 –	Planned: LPIT operated meters IEC 62053-xx	Planned: LPIT operated meters IEC 62053-xx
Static, active energy directly connected, and transformer operated, classes 1, 2 IEC 62053-21:2020, IEC 62058-31:2008,	Time switches IEC 62054-21:2004	—	—	—
Static, active energy, transformer operated, classes 0,1S, 0,2S, 0,5S IEC 62053-22:2020, IEC 62058-31:2008	—	—	—	—
Static, reactive energy directly connected, and transformer operated, classes 2, 3 IEC 62053-23:2020	—	—	—	—
Static, reactive energy directly connected, and transformer operated, classes 0,5 S, 1S, 1, 2, 3 IEC 62053-24:2020	—	—	—	—
Static, active energy directly connected, prepayment classes 1, 2 IEC 62055-31:2005	—	—	—	—

This part of IEC 62052 is to be used with relevant parts of the IEC 62052, IEC 62053, IEC 62058 and IEC 62059 series:

IEC 62052-31:2015,	<i>Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 31: Product safety requirements and tests</i>
IEC 62053-11:2003,	<i>Electricity metering equipment (AC) – Particular requirements – Part 11: Electromechanical meters for active energy (classes 0,5, 1 and 2)</i>
IEC 62053-21:2020,	<i>Electricity metering equipment – Particular requirements – Part 21: Static meters for AC active energy (classes 1 and 2)</i>
IEC 62053-22:2020,	<i>Electricity metering equipment – Particular requirements – Part 22: Static meters for AC active energy (classes 0,1S, 0,2S and 0,5S)</i>
IEC 62053-23:2020,	<i>Electricity metering equipment – Particular requirements – Part 23: Static meters for reactive energy (classes 2 and 3)</i>

IEC 62053-24:2020,	<i>Electricity metering equipment– Particular requirements – Part 24: Static meters for fundamental component reactive energy (classes 0,5S, 1S, 1, 2 and 3)</i>
IEC 62053-41: – ,	<i>Electricity metering equipment– Particular requirements – Part 41: Static meters for direct current energy (classes 0,5 and 1)</i>
IEC 62055-31:2005,	<i>Electricity metering – Payment systems – Part 31: Particular requirements – Static payment meters for active energy (classes 1 and 2)</i>
IEC 62056-6-1:2017,	<i>Electricity metering data exchange – The DLMS/COSEM suite – Part 6-1: Object Identification System (OBIS)</i>
IEC 62056-6-2:2017,	<i>Electricity metering data exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes</i>
A11 Text deleted A11	
IEC 62058-11:2008,	<i>Electricity metering equipment (AC) – Acceptance inspection – Part 11: General acceptance inspection methods</i>
IEC 62058-21:2008,	<i>Electricity metering equipment (AC) – Acceptance inspection – Part 21: Particular requirements for electromechanical meters for active energy (classes 0,5, 1 and 2)</i>
IEC 62058-31:2008,	<i>Electricity metering equipment (AC) – Acceptance inspection – Part 31: Particular requirements for static meters for active energy (classes 0,2 S, 0,5 S, 1 and 2)</i>
IEC 62059-11:2002,	<i>Electricity metering equipment – Dependability – Part 11: General concepts</i>
IEC 62059-21:2002,	<i>Electricity metering equipment – Dependability – Part 21: Collection of meter dependability data from the field</i>
IEC 62059-32-1:2011,	<i>Electricity metering equipment – Dependability – Part 32-1: Durability – Testing of the stability of metrological characteristics by applying elevated temperature</i>

This document is intended to be used in conjunction with the appropriate part of IEC 62053 for the type of equipment under consideration.

The test levels are regarded as minimum values for the proper functioning of the meter under normal working conditions. For special application, other test levels may be used and are subject to an agreement between the manufacturer and the purchaser.

ELECTRICITY METERING EQUIPMENT – GENERAL REQUIREMENTS, TESTS AND TEST CONDITIONS –

Part 11: Metering equipment

1 Scope

This part of IEC 62052 specifies requirements and associated tests, with their appropriate conditions for type testing of AC and DC electricity meters. This document details functional, mechanical, electrical and marking requirements, test methods, and test conditions, including immunity to external influences covering electromagnetic and climatic environments.

NOTE 1 For other general requirements, such as safety, dependability, etc., see the relevant IEC 62052 or IEC 62059 standards. For accuracy requirements and other requirements specific to class indices, see the relevant IEC 62053 standards.

This document applies to electricity metering equipment designed to:

- measure and control electrical energy on electrical networks (mains) with voltage up to 1 000 V AC, or 1 500 V DC;

NOTE 2 For AC electricity meters, the voltage mentioned above is the line-to-neutral voltage derived from nominal voltages. See IEC 62052-31:2015, Table 7.

NOTE 3 For meters designed for operation with LPITs, only the metering unit is considered a low voltage device. If the LPITs are rated for voltages exceeding 1 000 V AC, or 1 500 V DC, the combination of the metering unit and LPITs is not a low voltage device.

- have all functional elements, including add-on modules, enclosed in, or forming a single meter case with exception of indicating displays;
- operate with integrated displays (electromechanical or static meters);
- operate with detached indicating displays, or without an indicating display (static meters only);
- be installed in a specified matching sockets or racks;
- optionally, provide additional functions other than those for measurement of electrical energy.

Meters designed for operation with Low Power Instrument Transformers (LPITs as defined in the IEC 61869 series) may be tested for compliance with this document and the relevant IEC 62053 series documents only if such meters and their LPITs are tested together as directly connected meters.

NOTE 4 Modern electricity meters typically contain additional functions such as measurement of voltage magnitude, current magnitude, power, frequency, power factor, etc.; measurement of power quality parameters; load control functions; delivery, time, test, accounting, and recording functions; data communication interfaces and associated data security functions. The relevant standards for these functions may apply in addition to the requirements of this document. However, the requirements for such functions are outside the scope of this document.

NOTE 5 Product requirements for Power Metering and Monitoring Devices (PMDs) and measurement functions such as voltage magnitude, current magnitude, power, frequency, etc., are covered in IEC 61557-12. However, devices compliant with IEC 61557-12 are not intended to be used as billing meters unless they are also compliant with IEC 62052-11 and one or more relevant IEC 62053-xx particular requirements (accuracy class) standard.

NOTE 6 Product requirements for Power Quality Instruments (PQIs) are covered in IEC 62586-1. Requirements for power quality measurement techniques (functions) are covered in IEC 61000-4-30. Requirements for testing of the power quality measurement functions are covered in IEC 62586-2.

NOTE 7 The IEC TC13 strives to consider EMC phenomena that may occur in practice in meter installations and to amend its standards to ensure that an appropriate level of electromagnetic compatibility is specified for electricity metering equipment. To this end, IEC TC13 cooperates with the relevant IEC technical committees to characterize electromagnetic phenomena, to define emission limits, immunity levels and immunity verification methods based on which the appropriate test methods and requirements can be developed in the TC13 electricity metering equipment standards.

This document is also applicable to auxiliary input and output circuits, operation indicators, and test outputs of equipment for electrical energy measurement.

NOTE 8 Some examples include pulse inputs and outputs, control inputs and outputs, and energy test outputs.

This document also covers the common aspects of accuracy testing such as reference conditions, repeatability and measurement of uncertainty.

This document does not apply to:

- meters for which the voltage line-to-neutral derived from nominal voltages exceeds 1 000 V AC, or 1 500 V DC;
- meters intended for connection with low power instrument transformers (LPITs as defined in the IEC 61869 series of standards) when tested without such transformers;
- metering systems comprising multiple devices (except of LPITs) physically remote from one another;
- portable meters;

NOTE 9 Portable meters are meters that are not permanently connected.

- meters used in rolling stock, vehicles, ships and airplanes;
- laboratory and meter test equipment;
- reference standard meters;

A11 Text deleted **A11**

- data interfaces to the register of the meter;
- matching sockets or racks used for installation of electricity metering equipment;
- any additional functions provided in electrical energy meters.

This document does not cover measures for the detection and prevention of fraudulent attempts to compromise a meter's performance (tampering).

A11 NOTE 10 **A11** Nevertheless, specific tampering detection and prevention requirements, and test methods, as relevant for a particular market are subject to agreement between the manufacturer and the purchaser.

A11 NOTE 11 **A11** Specifying requirements and test methods for fraud detection and prevention would be counterproductive, as such specifications would provide guidance for potential fraudsters.

A11 NOTE 12 **A11** There are many types of meter tampering reported from various markets; therefore, designing meters to detect and prevent all types of tampering could lead to unjustified increase in costs of meter design, verification and validation.

A11 NOTE 13 **A11** Billing systems, such as smart metering systems, are capable of detecting irregular consumption patterns and irregular network losses which enable discovery of suspected meter tampering.

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 60038:2009, *IEC standard voltages*

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Tests A: Cold*

IEC 60068-2-2:2007, *Basic environmental testing procedures – Part 2-2: Tests – Tests B: Dry heat*

IEC 60068-2-5:2018, *Environmental testing – Part 2-5: Tests – Test S: Simulated solar radiation at ground level and guidance for solar radiation testing and weathering*

IEC 60068-2-6:2007, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-27:2008, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60381-1:1982, *Analogue signals for process control systems – Part 1: Direct current signals*

IEC 60404-5:2015, *Magnetic materials – Part 5: Permanent magnet (magnetically hard) materials – Methods of measurement of magnetic properties*

IEC 60404-8-1:2015, *Magnetic materials – Part 8-1: Specifications for individual materials – Magnetically hard materials*

IEC 60404-8-4:2013, *Magnetic materials – Part 8-4: Specifications for individual materials – Cold-rolled non-oriented electrical steel strip and sheet delivered in the fully-processed state*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60721-1:1990, *Classification of environmental conditions – Part 1: Environmental parameters and their severities*

IEC 60947-1:2007, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-1:2007/AMD1:2010

IEC 60947-1:2007/AMD2:2014

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-3:2006/AMD1:2007

IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

 IEC 61000-4-5:2014/AMD1:2017, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test* 

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-11:2020, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

IEC 61000-4-12:2017, *Electromagnetic compatibility (EMC) – Part 4-12: Testing and measurement techniques – Ring wave immunity test*

IEC 61000-4-18:2019, *Electromagnetic compatibility (EMC) – Part 4-18: Testing and measurement techniques – Damped oscillatory wave immunity test*

IEC 61000-4-19:2014, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Test for immunity to conducted, differential mode disturbances and signalling in the frequency range 2 kHz to 150 kHz at AC power ports*

IEC 61000-4-20:2010, *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides*

IEC 61000-4-29:2000, *Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on DC input power port immunity tests*

IEC 61869-3:2011, *Instrument transformers – Part 3: Additional requirements for inductive voltage transformers*

IEC 62052-31:2015, *Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 31: Product safety requirements and tests*

IEC 62054-21:2004, *Electricity metering equipment (AC) – Tariff and load control – Part 21: Particular requirements for time switches*

IEC 62056-6-1:2017, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-1: Object Identification System (OBIS)*

IEC 62056-6-2:2017, *Electricity metering data exchange – The DLMS/COSEM suite – Part 6-2: COSEM interface classes*

 Text deleted 

IEC 62059-32-1:2011, *Electricity metering equipment – Dependability – Part 32-1: Durability – Testing of the stability of metrological characteristics by applying elevated temperature*

IEC GUIDE 98-3, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

CISPR 32:2015, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

JCGM 100:2008, *Evaluation of measurement data – Guide to the expression of uncertainty in measurement. (GUM 1995 with minor corrections)*

EN 10027-1:2016, *Designation systems for steels – Part 1: Steel names*

3 Terms and definitions

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

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

- IEC Electropedia website: <http://www.electropedia.org/>
- ISO Online Browsing Platform website: <http://www.iso.org/obp>

NOTE Expression of the performance of electrical and electronic measuring equipment has been taken from IEC 60359.

3.1 General definitions

3.1.1

electromechanical meter

meter in which currents in fixed coils react with the currents induced in the conducting moving element, generally (a) disk(s), which causes their movement proportional to the energy to be measured

3.1.2

static meter

meter in which currents and voltages act on solid state (electronic) elements to produce an output proportional to the energy to be measured

3.1.3

watt-hour meter

active energy meter

instrument intended to measure active energy by integrating active power with respect to time

[SOURCE: IEC 60050-300:2001, 313-06-01]

3.1.4

var-hour meter

reactive energy meter

instrument intended to measure reactive energy by integrating reactive power with respect to time

[SOURCE: IEC 60050-300:2001, 313-06-02]

3.1.5

multi-energy meter

meter which, in a single case, measures two or more types of electrical energy (watt-hour, var-hour, VA-hour)

3.1.6

multi-function meter

meter which, in a single case, incorporates other functions in addition to the energy measurement functions

Note 1 to entry: Multi-function meters may include: maximum demand indicator, time switches, ripple control or radio receivers, pulse output devices, power monitoring functions, power quality functions, input-output control functions, communication function, etc.

3.1.7

multi-rate meter

energy meter provided with multiple registers, each becoming operative as defined by a tariff schedule

Note 1 to entry: A tariff schedule could be held in the meter, operated on a time basis or a consumption basis, or by external control signals.

[SOURCE: IEC 60050-300:2001, 313-06-09, modified to be better adapted to metering and note added]

3.1.8

directly connected meter

meter intended to be connected directly to the circuit(s) being measured, without use of external instrument transformer(s)

3.1.9

transformer operated meter

meter intended to be connected to the circuit(s) being measured with the use of external instrument transformer(s)

3.1.10

bidirectional meter

meter measuring energy flow in both directions

Note 1 to entry: for instance, energy received at the measuring point (for example import) and energy supplied at the same measuring point (for example, export).

3.1.11

reference standard

reference meter

A₁₁ meter used to measure the unit of electrical energy, designed and operated to obtain the highest accuracy and stability in a controlled laboratory environment and traceable to national or international primary standards **A₁₁**

[SOURCE: IEC 62057-1: –, 3.1.7]

3.1.12

meter type for electromechanical meter

meter design, manufactured by one manufacturer, having:

- a) similar metrological properties;
- b) the same uniform construction of parts determining these properties;
- c) the same ratio of the maximum current to the nominal current;
- d) the same number of ampere-turns for the current winding at nominal current and the same number of turns per volt for the voltage winding at nominal voltage.

Note 1 to entry: The type may have several values of nominal current and nominal voltage.

Note 2 to entry: Meters are designated by the manufacturer by one or more groups of letters or numbers, or a combination of letters and numbers. Each type has one designation only.

Note 3 to entry: The type is represented by the sample meter(s) intended for the type tests, in which characteristics (nominal current and nominal voltage) are chosen from the values given in the tables proposed by the manufacturer.

Note 4 to entry: Where the number of ampere-turns would lead to a number of turns other than a whole number, the product of the number of turns of the windings by the value of the nominal current may differ from that of the sample meter(s) representative of the type.

It is advisable to choose the next number immediately above or below in order to have whole numbers of turns.

For this reason only, the number of turns per volt of the voltage windings may differ, but by no more than 20 % from that of the sample meters representative of the type.

Note 5 to entry: The ratio of the highest to the lowest basic speed of the rotors of each of the meters of the same type shall not exceed 1,5.

3.1.13**meter type for static meter**

meter design, including the indicating display, if supported, having:

- a) similar metrological properties;
- b) the same uniform construction of parts determining these properties.

Note 1 to entry: The type may have several values of nominal current and nominal voltage.

Note 2 to entry: Meters are designated by the manufacturer by one or more groups of letters or numbers, or a combination of letters and numbers. Each type has one designation only.

Note 3 to entry: The type is represented by the sample meter(s) intended for the type tests, whose characteristics (nominal current and nominal voltage) are chosen from the values given in the tables proposed by the manufacturer.

3.1.14 **$\overline{A_{11}}$ AC active power**

is defined at any single sinusoidal frequency component of a periodic signal in a single-phase circuit as the product of the RMS values of current and voltage and the cosine of the phase angle between them, where the phase angle is the angle of the voltage signal vector with respect to the current signal vector

Note 1 to entry: Under sinusoidal conditions, the AC active power is the real part of the complex power.

Note 2 to entry: The AC active power of a non-sinusoidal periodic signal is the algebraic sum of the AC active power of the sinusoidal frequency components.

Note 3 to entry: The coherent SI unit for AC active power is the watt, W.

3.1.15**active energy**

electrical energy transformable into some other form of energy

Note 1 to entry: The coherent SI unit of active energy is joule, J. Another unit is watt hour. Its multiple, kilowatt hour, kWh, is commonly used for billing consumers of electric energy and is therefore indicated on electric energy meters.

Note 2 to entry: For AC signals, the active energy is the time integral of the AC active power as defined under 3.1.14.

Note 3 to entry: For DC signals, the active energy is the time integral of the DC active power as defined under 3.1.25.

[SOURCE: IEC 601-01-19:1985, modified – Notes to entry added] $\overline{A_{11}}$

3.1.16**reactive power****var**

reactive power at any single sinusoidal frequency component of a periodic signal in a single-phase circuit is defined as the product of the RMS values of current and voltage and the sine of the phase angle between them, where the phase angle is the angle of the voltage signal vector with respect to the current signal vector

Note 1 to entry: In TC 13 standards for reactive energy the reactive power and energy are defined for fundamental frequency only.

Note 2 to entry: The algorithm used for the calculation of reactive power is not specified, however the meter is expected to meet requirements of the relevant accuracy class standard.

Note 3 to entry: The coherent SI unit for reactive power is voltampere, VA. The special unit var and its symbol var are also used.

3.1.17**reactive energy in a single-phase circuit**

integral of the reactive power as defined in 3.1.16

Note 1 to entry: The coherent SI unit of reactive energy is var hour.

3.1.18**operator**

service person responsible for operation and maintenance of metering equipment and, when applicable, the provision of necessary safety related information to the user

[SOURCE: IEC 62052-31:2015, 3.5.22]

3.1.19**rated value**

value of a quantity used for specification purposes, established for a specified set of operating conditions of a component, device, equipment, or system

[SOURCE: IEC 60050-151:2001, 151-16-08]

3.1.20**nominal value**

value of a quantity used to designate and identify a component, device, equipment, or system

Note 1 to entry: The nominal value is generally a rounded value.

[SOURCE: IEC 60050-151:2001, 151-16-09]

3.1.21**reference value**

specified value of one influence quantity considered in the reference conditions

[SOURCE: IEC 60050-300:2001, 311-07-01]

3.1.22**polyphase system****m-phase system**

set of m interrelated sinusoidal integral quantities of the same kind, where m is an integer greater than one, all quantities having the same period but usually different phases

Note 1 to entry: Polyphase systems of voltages, electric currents and linked fluxes are commonly used.

Note 2 to entry: The qualifiers two-phase, three-phase, four-phase, six-phase and twelve-phase are used for $m = 2, 3, 4, 6, 12$, respectively.

Note 3 to entry: The concept of polyphase system can, under certain conditions, be extended to non-sinusoidal periodic quantities.

[SOURCE: IEC 60050-141:2004, 141-01-03]

3.1.23**meter connection mode**

meter terminal wiring arrangement and configuration of the meter's metrological relevant embedded software (firmware) parameters applicable to the measured service type

3.1.24**service type**

number of phases and the number of wires for which the meter is suitable (for example, single-phase two-wire, three-phase three-wire, three-phase four-wire)

3.1.25**DC active power****DC power**

power in DC circuit is defined as the product of the mean value of DC current and the mean value of DC voltage

Note 1 to entry: It is assumed that the DC voltage and current is constant over the integration period.

3.1.26**apparent power**

product of the rms voltage U between the terminals of a two-terminal element or two-terminal circuit and the rms electric current I in the element or circuit

$$S = UI$$

Note 1 to entry: Under sinusoidal conditions, the apparent power is the modulus of the complex power S , thus $S = |S|$

Note 2 to entry: The coherent SI unit for apparent power is voltampere, VA.

[SOURCE: IEC 60050-111:2001, 111-11-41]

3.1.27**power factor** **λ**

under periodic conditions, ratio of the absolute value of the active power P to the apparent power S :

$$\lambda = \frac{|P|}{S}$$

Note 1 to entry: Under sinusoidal conditions, the power factor is the absolute value of the active factor.

Note 2 to entry: Active factor is also referred to as $\cos(\varphi)$ for active energy.

[SOURCE: IEC 131-11-46, modified – Note 2 to entry has been added]

3.1.28

non-active power factor

$\lambda_{\sim}$

under periodic conditions, ratio of the non-active power $Q_{\sim}$ to the apparent power S :

$$\lambda_{\sim} = \frac{Q_{\sim}}{S}$$

Note 1 to entry: Under sinusoidal conditions, the non-active power factor is the absolute value of the reactive factor.

Note 2 to entry: Reactive factor is also referred to as $\sin(\varphi)$ for reactive energy.

[SOURCE: IEC 131-11-47, modified – Note 2 to entry has been added] 

3.2 Definitions related to the functional elements

3.2.1

measuring element

part of the meter which produces an output proportional to the energy

3.2.2

test output

output used for testing the meter

Note 1 to entry: A test output may be an optical pulse output, an electrical pulse output or a communication interface.

3.2.3

operation indicator

device which gives a visible signal of the operation of the meter

[SOURCE: IEC 60050-300:2001, 314-07-13]

3.2.4

pulse

wave that departs from an initial level for a limited duration of time and ultimately returns to the original level

3.2.5

pulse output

output for emitting pulses

3.2.6

optical test output

optical pulse output used for testing the meter

3.2.7

receiving head

scanning head

functional unit detecting the marks on the rotor of an electromechanical meter or detecting signals emitted by an optical test output of a static meter

3.2.8

pulse input

pulse input for receiving pulses

3.2.9

memory

element which stores digital information

3.2.10

non-volatile memory

memory which can retain information in the absence of power

3.2.11

indicating display

device that displays the measurement results

Note 1 to entry: An indicating display may also be used to display other relevant information.

[SOURCE: OIML R 46-1 / R46-2:2012, 2.1.12, modified to be better adapted to metering]

3.2.12

integrated indicating display

indicating display integrated in the meter case

3.2.13

detached indicating display

DID

indicating display housed in its own enclosure (case) separate from the meter case, powered by the meter and specified for use only with (a) designated meter type(s)

Note 1 to entry: A detached indicating display is not a stand-alone generic human machine interface device such as a tablet, a laptop, or a general purpose industrial HMI device.

3.2.14

register

electromechanical or electronic device which stores and displays the information representing the measured energy

Note 1 to entry: In static meters, the register comprises both memory and display.

Note 2 to entry: A single display may be used with multiple electronic memories to form multiple registers.

[SOURCE: IEC 60050-300:2001, 314-07-09]

3.2.15

mains

electrical network supplying the premises

3.2.16

mains circuit

electrical circuit which is conductively connected to and energized directly from the mains

Note 1 to entry: Voltage circuits intended to be connected to the secondary side of measuring voltage transformers are classed also as mains circuits.

3.2.17

non-mains circuit

electrical circuit not energized directly from the mains

Note 1 to entry: This circuit may be isolated by a transformer or supplied by a battery.

Note 2 to entry: In this document the terms "mains circuit" and "non-mains circuit" are used, to avoid confusion with primary and secondary circuits of instrument transformers used with transformer operated meters.

[SOURCE: IEC 62477-1:2012, 3.26, modified to be better adapted to metering and additional information given in the notes.]

3.2.18

current circuit

internal connections of the meter and part of the measuring element through which flows the current of the measured electrical circuit to which the meter is connected

Note 1 to entry: For transformer operated meters, "the measured electrical circuit to which the meter is connected" is the secondary winding of the external current transformer(s).

3.2.19

voltage circuit

internal connections of the meter and part of the measuring element, and in some cases, part of the meter's power supply, energized with the voltage of the measured electrical circuit to which the meter is connected

Note 1 to entry: For transformer operated meters, "the measured electrical circuit to which the meter is connected" is the secondary winding of the external voltage transformer(s).

3.2.20

auxiliary circuit

circuit other than the voltage circuits, current circuits or the auxiliary power supply circuit, intended to be connected to (an) external device(s)

[SOURCE: IEC 62052-31:2015, 3.5.11, modified to be more precise and coherent with 3.2.18 and 3.2.19.]

3.2.21

meter's auxiliary power supply circuit

internal connections of the meter, separate from the voltage circuits, energized from separate auxiliary supply via dedicated terminals

3.2.22

auxiliary supply

U_s or U_x

electrical power supply source, other than the measured electrical circuit, energizing the meter's internal auxiliary power supply circuit via dedicated terminals

Note 1 to entry: Auxiliary power supply may be necessary if the voltage circuits become de-energized (for example, network outage), but some functions of the meter are expected to operate (for example, communications, registration of power quality events); or to reduce power consumption in the voltage circuits in special applications.

Note 2 to entry: Combinations of supply from voltage circuits and additional auxiliary power supply are also possible. Such applications are common with transformer operated meters in substations or power plants.

[SOURCE: IEC 60688:2012, 3.1.4, modified – definition adapted to metering and notes added.]

3.2.23

auxiliary device

device internal or external to the meter intended to perform a particular function in addition to the energy measurement functions

Note 1 to entry: Some examples include: clock, tariff / load / supply control switch, pulse input / output, data exchange unit.

Note 2 to entry: An auxiliary device may be internal or external to a meter.

3.2.24

supply control switch

SCS

switch internal to the meter intended to control the supply to the premises

Note 1 to entry: SCS comprises the contacts and the parts operating the contacts, and it may include a means for manual operation.

Note 2 to entry: The supply control switch should not be confused with the supply side protection device that is external to the meter and disconnects the supply in the case of an overcurrent fault.

[SOURCE: IEC 62052-31:2015, 3.7.2 modified: "internal to the meter" and "external to the meter" added.]

3.2.25

load control switch

LCS

switch intended to control loads within the premises

Note 1 to entry: LCS comprises the contacts and the parts operating the contacts.

[SOURCE: IEC 62052-31:2015, 3.7.3]

3.2.26

low-power instrument transformer

LPIT

arrangement, consisting of one or more current or voltage transformer(s) which may be connected to transmitting systems and secondary converters, all intended to transmit a low power analogue or digital output signal to measuring instruments, meters and protective or control devices or similar apparatus

EXAMPLE: An arrangement consisting of three current sensors, three voltage sensors connected to one merging unit delivering one digital output is considered an LPIT.

Note 1 to entry: LPITs are commonly called non-conventional instrument transformers (NCIT).

Note 2 to entry: The output power produced by these devices is typically lower or equal to 1 VA.

[SOURCE: IEC 61869-6:2016, 3.1.601]

3.3 Definitions of meter ports

3.3.1

port

any particular interface of the specific device or system with the external electromagnetic environment

EXAMPLE See Annex E for examples of Equipment Under Test (EUT).

Note 1 to entry: I/O ports are input, output or bi-directional, measurement, control, or data ports.

Note 2 to entry: In this document, ports intended to be connected with earth potential for functional reasons (functional earth ports) are considered as I/O ports.

Note 3 to entry: In this document the protective earth port (if any) is considered as part of the power port.

[SOURCE: IEC 61326-1:2012, 3.11]

3.3.2

enclosure port

physical boundary of the meter through which electromagnetic fields may radiate or impinge

[SOURCE: IEC 61326-1:2012, 2.3.6]

3.3.3

mains port

terminals of current and voltage circuits, including the neutral voltage terminal, of directly connected meters, and terminals of voltage circuits of transformer operated meters

3.3.4

current transformer port

terminals of current circuits of transformer operated meters

3.3.5

auxiliary power supply port

terminals of auxiliary power supply circuits of the meter

Note 1 to entry: The auxiliary power supply circuit of the meter can be a mains or non-mains circuit.

3.3.6

auxiliary port

terminals of a circuit other than the voltage measurement circuits, current measurement circuits or the auxiliary power supply circuit, intended to be connected to (an) external device(s)

3.3.7**HLV signal port**

terminals of auxiliary input or output circuits and other non-mains auxiliary circuits rated for voltages considered to be hazardous live

Note 1 to entry: For example, power line communication (PLC) terminals, tariff (rate) control inputs, control outputs rated for operation with Hazardous Live Voltages (HLV).

3.3.8**ELV signal port**

terminals of auxiliary input or output circuits, data communication circuits and other auxiliary circuits rated for voltages that are not considered hazardous live

Note 1 to entry: For the purposes of this document, the ELV (Extra Low Voltage) values are specified in IEC 62052-31:2015 6.3; this definition includes PELV and SELV circuits.

3.3.9**functional earthing****functional grounding (U.S.)**

earthing a point or points in a system or in an installation or in equipment for purposes other than electrical safety

[SOURCE: IEC 60050-195:1998/Amd1:2001, 195-01-13]

3.3.10**functional earthing terminal**

terminal in equipment for purposes of functional earthing

3.3.11**embedded software firmware identification**

sequence of characters that is inextricably linked to the embedded software (firmware)

Note 1 to entry: Software identification is usually realized as a version number, checksum, etc., and is viewable on a meter during use.

[SOURCE: WELMEC Guide 7.2 issue 5, OIML D31:2008, 3.1.42]

3.4 Definitions of mechanical elements**3.4.1****indoor meter****indoor detached indicating display**

meter or detached indicating display intended for operation under normal climatic conditions in a building or in a meter cabinet

3.4.2**outdoor meter****outdoor detached indicating display**

meter or detached indicating display intended for operation under extended climatic conditions

3.4.3**meter base**

back of the meter by which it is generally fixed and to which are attached the measuring elements, the terminals or the terminal block, and the cover

Note 1 to entry: For a flush-mounted meter, the meter base may include the sides of the case.

3.4.4**specified matching meter socket**

base with jaws, test block style connectors, or other type of detachable connectors intended for installation of socket-mounted metering equipment

Note 1 to entry: This includes terminals for connection to the supply and load circuits; also appropriate secure fixing and sealing arrangements.

Note 2 to entry: It may be a single-position socket for one meter or a multiple-position socket for two or more meters.

Note 3 to entry: This term only relates to metering equipment designed as a socket-mounted unit.

Note 4 to entry: Metering equipment can meet the relevant type testing requirements when it is properly installed in any specified matching socket.

3.4.5

specified matching meter rack

mechanical part of the installation for plug-in of one or more meters with rack-mount housing

Note 1 to entry: Racks with plugs for direct plug-in of rack-mount meters are common. Most racks use the standardized 19-inch rack system.

3.4.6

cover of meter, <of detached indicating display>

enclosure on the front of the meter or on the front of the detached indicating display, made either wholly of transparent material or opaque material provided with window(s) through which the operation indicator and the indicating display can be read

3.4.7

case of meter, <of detached indicating display>

comprises the base and the cover

Note 1 to entry: When the case is closed, it provides protection against certain external influences and, in any direction, and protection against direct contact and spread of fire.

3.4.8

terminal block

support made of insulating material on which all or some of the terminals of the meter are grouped together

3.4.9

terminal cover of meter, <of detached indicating display>

cover which conceals meter terminals or terminals of detached indicating display, and, the ends of the external wires or cables connected to the terminals

Note 1 to entry: When the meter is mounted in its normal working position and when the terminal cover is in place, it provides protection in any direction against direct contact with the meter terminals.

3.4.10

metrology seal

specific securing measure which can be applied to an electricity meter to ensure its metrological integrity

3.4.11

installation seal

specific securing measure which can be applied by an installer to ensure the integrity of the meter installation

3.4.12

sealing

means intended to protect the meter against, and provide evidence of, any unauthorized modification, readjustment, removal of parts, embedded software (firmware), etc.

Note 1 to entry: Sealing can be achieved by hardware, embedded software (firmware) or a combination of both.

[SOURCE: OIML D 31:2008, 3.1.18, modified to be better adapted to metering.]

3.4.13**equipment**

device with functions related to electrical energy measurement and control

Note 1 to entry: Some examples include electricity meters, payment meters, tariff and load control equipment. The term "meter" is used in the text sometimes as a synonym of "metering equipment". A meter may include other functions, in addition to the basic energy metering function.

3.4.14**permanently connected equipment**

equipment that is electrically connected to a supply by means of a permanent connection which can be detached only using a tool

[SOURCE: IEC 61010-1:2010, 3.1.2]

3.4.15**tool**

external device, including keys and coins, used to aid a person to perform a mechanical function

[SOURCE: IEC 61010-1:2010, 3.1.5]

3.4.16**terminal**

conductive part of a device, electric circuit or electric network, provided for connecting that device, electric circuit or electric network to one or more external conductors

[SOURCE: IEC 60050-151:2001, 151-12-12, modified – Note omitted.]

3.4.17**meter cabinet**

enclosure for housing metering equipment and affording protection suitable for the intended application

Note 1 to entry: It may be fixed on a wall, built in a wall recess or it may be free-standing and self-supporting. It may also accommodate elements of the electrical installation, such as fuses, circuit breakers, or residual current devices.

3.4.18**packaging**

products used for the containment, protection, handling, delivery and preservation of the meter from the manufacturer to the user or consumer

[SOURCE: IEC 62052-31:2015, 3.2.16]

3.5 Definitions related to measurements**3.5.1****measurand**

quantity subject to measurement

[SOURCE: IEC 60050-300:2001, 311-01-03]

3.5.2 starting current

I_{st}

for AC meters, the value of current at which the meter is required to start and continue to register active electrical energy at $\cos(\varphi) = 1$ (and in case of polyphase meters, with balanced load) or reactive electrical energy at $\sin(\varphi) = 1$ (inductive or capacitive, and in case of polyphase meters, with balanced load); for DC meters, the value of current at which the meter is required to start and continue to register electrical energy

Note 1 to entry: The term "current" indicates RMS values unless otherwise specified.

3.5.3 minimum current

I_{min}

lowest current at which the meter accuracy requirements are specified

Note 1 to entry: The term "current" indicates RMS values unless otherwise specified.

[SOURCE: OIML R 46-1 / R46-2:2012, 2.2.3, modified to be better adapted to metering.]

3.5.4 nominal current

I_n

current in accordance with which the relevant performance of the meter is fixed

Note 1 to entry: The term "current" indicates RMS values unless otherwise specified.

3.5.5 maximum current

I_{max}

highest current the meter can carry continuously and remain safe, and at which it purports to meet the accuracy requirements of the relevant standard

Note 1 to entry: The term "current" indicates RMS values unless otherwise specified.

[SOURCE: OIML R 46-1 / R46-2:2012, 2.2.5, modified to be better adapted to metering.]

3.5.6 nominal voltage

U_n

voltage in accordance with which the relevant performance of the meter is fixed

Note 1 to entry: The term "voltage" indicates RMS values unless otherwise specified.

3.5.7 nominal frequency

f_n

frequency in accordance with which the relevant performance of the meter is fixed

3.5.8 specified measuring range

set of values of a measured quantity for which the error of a meter is intended to lie within specified limits

3.5.9 accuracy

quality which characterizes the ability of a measuring instrument (meter) to provide an indicated value close to a true value of the measurand