

INTERNATIONAL STANDARD

Electricity metering – Payment systems –
Part 31: Particular requirements – Static payment meters for active energy
(classes 0,5, 1 and 2)



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2022 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

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

About the IEC

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

About IEC publications

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

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

INTERNATIONAL STANDARD

Electricity metering – Payment systems –
Part 31: Particular requirements – Static payment meters for active energy
(classes 0,5, 1 and 2)

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 91.140.50

ISBN 978-2-8322-3940-7

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD	5
INTRODUCTION	7
1 Scope	8
2 Normative references	9
3 Terms and definitions	10
3.1 General payment metering	10
3.2 Tokens	12
3.3 Token carriers	13
3.4 Tokens and token carriers	14
3.5 Definitions related to load switching	15
3.5 Switches of metering equipment	16
3.6 Timekeeping and tariff control	16
4 Standard Nominal electrical values	17
5 Mechanical Construction requirements	18
5.1 General	18
5.2 General mechanical requirements	18
5.3 Case	19
5.4 Window	19
5.5 Terminals	19
5.6 Terminal covers	19
5.2 Clearance and creepage distances	18
5.8 Insulating encased meter of protective class II	19
5.9 Resistance to heat and fire	19
5.3 Protection against penetration of dust and water	18
5.11 Display and indicators	19
5.4 Display of measured values	19
5.4.1 General	19
5.4.2 Minimum display capability	19
5.4.3 Indicators	20
5.5 Storage of measured values	20
5.6 Output device	20
5.7 Marking of the meter	20
5.8 Token carrier interface	21
5.8.1 General	21
5.8.2 Token carrier acceptor	21
5.8.3 Keypad interface	21
6 Climatic requirements conditions	21
6.1 General	21
6.2 Temperature range	21
6.2.1 General	21
6.2.2 Operation within the specified operating range	21
6.2.3 Operation within the limit range of operation	22
6.2.4 Storage and transport outside the limit range of operation	22
6.3 Relative humidity	23
6.4 Protection against penetration of dust and water	23
6.5 Tests of the effect of the climatic environments	23

7	Electrical requirements.....	23
7.1	General requirements	23
7.2	Influence of supply voltage.....	24
7.2.1	Voltage range(s).....	24
7.2.2	Voltage dips and short interruptions	25
7.2.3	Abnormal voltage conditions	26
7.4	Influence of short-time overcurrents	26
7.5	Influence of heating	27
7.3	Heating	27
7.4	Insulation	27
7.5	Long Term Over Voltage Withstand	27
7.6	Electromagnetic compatibility (EMC)	27
7.6.1	General.....	27
7.6.2	General test conditions	27
7.6.3	Test of immunity to electrostatic discharges	28
7.6.4	Test of immunity to radiated RF electromagnetic fields	28
7.6.5	Test of immunity to electrical fast transients/bursts.....	28
7.6.6	Test of immunity to conducted disturbances, induced by RF fields	28
7.6.7	Surge immunity test.....	29
7.6.8	Test of immunity to damped oscillatory waves test	29
7.6.9	Radio interference suppression.....	29
7.9	Load switching	31
7.7	Power consumption	31
7.7.1	General.....	31
7.7.2	Voltage circuits.....	31
7.7.3	Current circuits.....	31
7.8	Influence of self-heating on accuracy	31
7.9	Electrical tests on supply control and load control switches (SCS and LCS).....	31
7.10	Auxiliary output control switches (ACS)	31
7.11	Token carrier acceptor interface test	32
8	Metering Accuracy requirements.....	32
9	Functional requirements.....	32
9.1	General.....	32
9.2	Robustness of meter accounting process.....	32
10	Type test	34
Annex A	(informative) Functional performance	35
A.1	Basic functionalities – prepayment mode	35
A.1.1	General.....	35
A.1.2	Prepayment mode – core functionalities	35
A.1.3	Core functional tests within voltage and temperature range limits.....	38
A.1.4	Functional tests within the limit range of operation with voltage.....	39
A.1.5	Functional tests within the limit range of operation with temperature	39
A.1.6	Prepayment mode – token handling and data integrity requirements.....	40
A.2	Additional functionalities	41
A.2.1	General.....	41
A.2.2	Requirements for other modes of operation	42
A.2.3	Collection of agreed debt.....	42
A.2.4	Time-of-use tariff facilities.....	42

A.3	System compliance requirements	43
Annex B (informative)	Reference model for a payment meter	44
B.1	General	44
B.2	Generalised payment meter instance	45
B.3	Functions in a single-part payment meter	48
B.3.1	General	48
B.3.2	Meter application process	48
B.3.3	Token_Carrier_to_Meter_Interface function	48
B.3.4	Accounting function	48
B.3.5	Metering function	48
B.3.6	Delivery function	49
B.3.7	Time functions	49
B.3.8	Test functions	49
B.3.9	Display functions	49
B.3.10	Recording functions	50
B.3.11	Security functions	50
Annex C (normative) Performance requirements for payment meters with load switching utilisation categories UC2, UC3 and UC4		
Annex C (normative)	Requirements for payment meters with supply control switches	60
Annex D (normative)	Requirements of timekeeping	61
D.1	General	61
D.1.1	General	61
D.1.2	Real-time clock support facilities	61
D.1.3	Operation reserve	61
D.1.4	Primary batteries	62
D.1.5	Back up battery replacement	62
D.1.6	Real-time clock setting and synchronisation facilities	62
D.2	Synchronous clocks	62
D.3	Crystal-controlled clocks	62
D.4	Tests of timekeeping accuracy	63
D.4.1	General	63
D.4.2	General test conditions	63
D.4.3	Test of synchronous clocks in payment meters	63
D.4.4	Test of crystal-controlled clocks in payment meters	63
D.5	Effects of disturbances on timekeeping	64
D.5.1	General	64
D.5.2	Electromagnetic disturbances	64
D.5.3	Voltage dips and short interruptions	65
D.5.4	Harmonics in the voltage waveform	66
Bibliography	67
List of comments	68
Figure B.1	Generalised block diagram of a payment meter instance	46
Table 1	Voltage ranges	24
Table C.1 – Summary of test currents for UC2, UC3 and UC4		
Table C.2 – Test sequence and sample plan		

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICITY METERING – PAYMENT SYSTEMS –

**Part 31: Particular requirements –
Static payment meters for active energy (classes 0,5 1, 1 and 2)**

FOREWORD

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

This commented version (CMV) of the official standard IEC 62055-31:2022 edition 2.0 allows the user to identify the changes made to the previous IEC 62055-31:2005 edition 1.0. Furthermore, comments from IEC TC 13 experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

IEC 62055-31 has been prepared by IEC technical committee 13: Electrical energy measurement and control. It is an International Standard.

This second edition cancels and replaces the first edition published in 2005. This edition constitutes a technical revision.

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

- a) Title modified.
- b) Removal of the contents of Annex C relating to the requirements for the supply control switch, and added reference to IEC 62052-31:2015 which contains the relevant requirements.

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

Draft	Report on voting
13/1864/FDIS	13/1866/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/standardsdev/publications.

A list of all parts in the IEC 62055 series, published under the general title *Electricity metering – Payment systems*, 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 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.

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

Payment meters are used in situations where the supply of electrical energy to the load may be interrupted or its restoration enabled under the control of the payment meter in relation to a payment tariff agreed between the customer and the supplier. The payment meter is part of a system that uses token carriers to pass payment information as tokens between a vending network and the payment meters that include the meter accounting process.

The primary reason for this edition is to align it with the requirements introduced in IEC 62052-31:2015 metering safety standard. **2**

The functions of a payment meter are to measure electrical energy consumed and to decrement the available credit value in accordance with the metered consumption, and possibly in accordance with the passing of time. This available credit value is incremented as the result of payments made to the electricity supplier, and the meter accounting process continuously calculates the balance of available credit held by the customer. When the available credit value has been decremented to a predetermined value that is related to the payment mode in use, a switch is used to interrupt the supply to the customer's load. However, additional features may be present in the payment meter, which prevent or delay the opening of the switch, or limit further consumption to a low load level. Such "social" features may include the provision of an emergency credit facility, the possibility of operation in a fixed-payment mode, and the inhibiting of interruptions for certain periods of time.

In return for the payment (usually in cash) and depending on the particular type of system, the customer may be issued with a single-use token on a disposable token carrier for the equivalent value, or a reusable token carrier may be credited with that value, or the token may be transmitted directly to the meter via a communications network (a so-called virtual token carrier). "One-way" and "two-way" data transfer systems may be used, and the token carriers may be: physical devices such as smart cards, or other electronic devices, or magnetic cards; virtual token carriers where the token information is transferred by a remote communications system; or numeric token carriers where sequences of digits are issued on a paper receipt and entered via a keypad on the meter.

IEC 62051:1999, Clause 17 provides some details of payment metering terminology.

ELECTRICITY METERING – PAYMENT SYSTEMS –

Part 31: Particular requirements – Static payment meters for active energy (classes 0,5, 1 and 2)

1 Scope

This part of IEC 62055 applies to newly manufactured, static watt-hour payment meters of accuracy classes 0,5, 1 and 2 for direct connection, for the measurement of alternating current electrical energy consumption of a frequency in the range 45 Hz to 65 Hz that include a ~~load~~ **supply control** **3** switch for the purpose of interruption or restoration of the electricity supply to the load in accordance with the current value of the available credit maintained in the payment meter. It does not apply to static watt-hour payment meters where the voltage across the connection terminals exceeds ~~600~~ **1 000 V** **4** (line-to-line voltage for meters for polyphase systems).

It applies to payment meters for indoor application ~~only~~, operating under normal climatic conditions **5** where the payment meter ~~shall be~~ is mounted as for normal service (i.e. together with a specified matching socket where applicable).

Payment meters are implementations where all the main functional elements are incorporated in a single enclosure, together with any specified matching socket. There are also ~~multi-part~~ **multi-device** **6** payment metering installations where the various main functional elements, such as the measuring element, the user interface unit, token carrier interface, and the ~~load~~ **supply control** switch are implemented in more than one enclosure, involving additional interfaces. ~~This part of IEC 62055 does not apply to multi-part payment metering installations.~~

Functional requirements that apply to payment meters are also defined in this document, and include informative basic functional requirements and tests for the prepayment mode of operation in Annex A. Allowances are made for the relatively wide range of features, options, alternatives, and implementations that may be found in practice. The diverse nature and functionality of payment meters prevent the comprehensive specification of detailed test methods for all of these requirements. However, in this case, the requirements are stated in such a way that tests can then be formulated to respect and validate the specific functionality of the payment meter being tested.

This document does not cover specific functionality or performance requirements for ~~safety~~, circuit protection, isolation or similar purposes that may be specified through reference to other specifications or standards. ~~Safety requirements removed from Edition 1.0 have been replaced with references to the safety requirements now contained in IEC 62052-31:2015, the product safety standard for newly manufactured electricity meters. In-service safety testing (ISST) is not covered by IEC 62052-31:2015 and is left to national best practice usually as an extension of existing in-service testing (IST) of metrology stability.~~

This document does not cover software requirements. ~~Software requirements for basic energy meter metrology are under consideration for the IEC 62059 series of standards, and in other organisations.~~

This document covers type-testing requirements only. For acceptance testing, the ~~concepts~~ requirements given in ~~IEC 61358~~ IEC 62058-11:2008 and IEC 62058-31:2008 may be used ~~as a basic guideline.~~

Dependability aspects are addressed in the IEC 62059 series of standards. Additional reliability, availability, maintenance and life cycle aspects are provided by IEC TC 56.