# INTERNATIONAL STANDARD

**IEC**

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# Electricity metering – Payment systems –

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

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**Electricity metering – Payment systems –**

**Part 31:**
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**(classes 1 and 2)**

Commission Electrotechnique Internationale
International Electrotechnical Commission
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## CONTENTS

# INTERNATIONAL ELECTROTECHNICAL COMMISSION
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## ELECTRICITY METERING – PAYMENT SYSTEMS –

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

## FOREWORD

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International Standard IEC 62055-31 has been prepared by IEC technical committee 13: Equipment for electrical energy measurement and load control.

The text of this standard is based on the following documents:

| FDIS | Report on voting |
|------|------------------|
| 13/1344/FDIS | 13/1355/RVD |

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

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

IEC 62055 consists of the following parts, under the general title *Electricity metering – Payment systems*:

Part 21:   Framework for standardization

Part 31:   Static payment meters for active energy (Classes 1 and 2)

Part 41:   Standard Transfer Specification – Application layer protocol for one-way token carrier systems[1]

Part 51:   Standard Transfer Specification – Physical layer protocol for one-way numeric and magnetic card token carriers[1]

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

• reconfirmed,
• withdrawn,
• replaced by a revised edition, or
• amended.

A bilingual version of this publication may be issued at a later date.

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[1] Under consideration.

# 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 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 provides some details of payment metering terminology in Clause 17.

**ELECTRICITY METERING – PAYMENT SYSTEMS –**

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

## 1 Scope

This part of IEC 62055 applies to newly manufactured, static watt-hour payment meters of accuracy classes 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 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 V (line-to-line voltage for meters for polyphase systems).

It applies to payment meters for indoor application only, where the payment meter shall be 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 installations where the various main functional elements, such as the measuring element, the user interface unit, token carrier interface, and the load 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 part of IEC 62055, 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 part of IEC 62055 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.

This part of IEC 62055 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 part of IEC 62055 covers type-testing requirements only. For acceptance testing, the concepts given in IEC 61358 may be used as a basic guideline.

Dependability aspects are addressed in the IEC 62059 series of standards.

This part of IEC 62055 does not cover conformity tests and system compliance tests that may be required in connection with legal or other requirements of some markets.

## 2   Normative references

The following referenced documents are indispensable for the application 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 62051:1999, *Electricity metering – Glossary of terms.*

IEC 61358:1996, *Acceptance inspection for direct-connected alternating current static watt-hour meters for active energy (classes 1 and 2)*

IEC 62052-11:2003, *Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 11: Metering equipment*

IEC 62053-21:2003, *Electricity metering equipment (AC) – Particular requirements – Part 21: Static meters for active energy (classes 1 and 2)*

IEC 60050-300:2001, *International Electrotechnical Vocabulary – Electrical and electronic measurements and measuring instruments – Part 311: General terms relating to measurements – Part 312: General terms relating to electrical measurements – Part 313: Types of electrical measuring instruments – Part 314: Specific terms according to the type of instrument*

IEC 61000-4-5:1995, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61008-1:1996, *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 1: General rules*
Amendment 1 (2002)

IEC 62055-21:2005, *Electricity metering – Payment systems – Part 21: Framework for standardisation*

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

## 3   Terms and definitions

For the purposes of this part of IEC 62055, the terms and definitions given in IEC 60050-300, IEC 62051, IEC 62052-11, and IEC 62055-21, as well as the following, apply.

Where there is a difference between definitions in IEC 62055-31 and those contained in other referenced IEC standards, then those defined in IEC 62055-31 shall take precedence.

NOTE   Some of these definitions cancel and replace those for the same term in IEC 62051, including some terms in Clause 17 of that standard.

### 3.1   General payment metering definitions

**3.1.1**
**a.c. withstand voltage**
r.m.s. value of sinusoidal power frequency voltage that the equipment can withstand during tests made under specified conditions and for a specified time

[IEC 60050:1987 604-03-40, modified]

**3.1.2**
**available credit value**
value of available credit (in monetary or energy units) usable for further consumption that is either stored in the payment meter or calculated by it whenever required

**3.1.3**
**fault current**
current flowing at a given point of a network resulting from a fault at another point of this network

[IEC 60050:1986 603-02-25]

**3.1.4**
**load interface**
terminal(s) where the customer's load circuit is connected to the payment meter, or to a specified matching socket, where applicable

**3.1.5**
**multi-part installation**
payment metering installation where the functional elements comprising the measuring element(s); register(s), storage, and control; meter accounting process; user interface including any physical token carrier interface; any virtual token carrier interface; load switch(es); auxiliaries; plus supply interface and load interface are not arranged in the form of a payment meter, but instead are partitioned into two or more units that require appropriate mounting, connection, and commissioning

[IEC 62051, 17.45, modified]

**3.1.6**
**payment meter**
electricity meter with additional functionality that can be operated and controlled to allow the flow of energy according to agreed payment modes

NOTE   It includes the following functional elements: measuring element(s); register(s), storage, and control; meter accounting process and any time-based functions; user interface including any physical token carrier interface; any virtual token carrier interface; load switch(es); auxiliaries; plus supply interface and load interface. A payment meter takes the form of a single unit, or a main unit that also employs a single specified matching socket for the supply interface and load interface. In either case. some payment meter implementations may allow for some or all of any time-based functions to be provided by an external unit connected to the payment meter, such as a time switch, a ripple control receiver, or a radio receiver.

[IEC 62051, 17.47, modified]

NOTE   Refer to Figure B.1 for the generalised block diagram of a payment meter instance.

**3.1.7**
**payment metering installation**
set of payment metering equipment installed and ready for use at a customer's premises. This includes mounting the equipment as appropriate, and where a multi-part installation is involved, the connection of each unit of equipment as appropriate. It also includes the connection of the supply network to the supply interface, the connection of the customer's load circuit to the load interface, and the commissioning of the equipment into an operational state as a payment metering installation

**3.1.8**
**prepayment mode**
payment mode in which automatic interruption occurs when available credit is exhausted

**3.1.9**
**specified matching socket**
in relation to a payment meter arranged as a plug-in unit, a specified matching socket comprises a base with jaws to accept and connect to the plug-in unit, terminals for connection of the supply network and the consumer load circuit, and appropriate secure fixing and sealing arrangements. The payment meter is capable of meeting the relevant type-testing requirements when it is properly installed in any specified matching socket

**3.1.10**
**supply interface**
terminal(s) where the supply network is connected to a payment meter, or to a specified matching socket, where applicable

**3.1.11**
**time-based credit**
payment meter accounting functions that deal with the calculation and transacting of a (social) grant of credit that is released on a scheduled time basis

NOTE   See IEC 62055-21:2005, 13.8.3.

**3.1.12**
**user interface**
that part of a payment meter or payment metering installation that allows the customer to monitor and operate the installation. It may also facilitate meter reading and inspection, and metering services activities. Where physical token carriers are employed, it includes a token carrier interface

**3.2    Definitions of tokens**

**3.2.1**
**token**
<Equipment-related definition> information content including an instruction issued on a token carrier by a vending or management system, that is capable of subsequent transfer to and acceptance by a specific payment meter, or one of a group of meters, with appropriate security

[IEC 62051, 17.66, modified]

NOTE   In a more general sense, the token refers to the instruction and information being transferred, while the token carrier refers to the physical device being used to carry the instruction and information, or to the communications medium in the case of a virtual token carrier.

<System-related definition> subset of data elements, containing an instruction and information, that is present in the APDU of the application layer of the *POS to Token Carrier Interface*, and which is also transferred to the payment meter by means of a token carrier

**3.2.2**
**credit token**
value token
token that represents an amount of credit in monetary or energy value for transfer from the vending point to the payment meter

**3.2.3**
**duplicate token**
token that contains the same information as a token that has already been issued, and hence may also be a valid token

NOTE 1   This is not the same as a replacement token (refer also to 3.4.9).

NOTE 2   A duplicate token is a reissue of the same token that was previously issued and is identical to it in all aspects; whereas a replacement token is a newly generated token in place of a previously generated token and may not be identical to it in all aspects.

**3.2.4**
**multiple-use token**
token (such as a test token) that can be used for more than one successful session in a payment meter or possibly with each in a group of meters. These are typically used for meter reading or service purposes on repeated occasions

**3.2.5**
**no-value token**
token that does not result in a financial advantage or disadvantage to the consumer, which may contain meter configuration data, or instructions to perform certain tests, or to display certain values on the user interface, or to retrieve certain data from the meter and return it on a token carrier

NOTE   This is as opposed to value token.

**3.2.6**
**replacement token**
see 3.4.9

NOTE   This is not the same as a duplicate token (see 3.2.3).

**3.2.7**
**single-use token**
token (such as a credit token) that can only be used for one successful session in a payment meter

**3.2.8**
**valid token**
in relation to a specific payment meter (or group of payment meters), a token that is capable of being processed successfully by the meter(s)

**3.2.9**
**value token**
see credit token (3.2.2)

**3.3    Definitions of token carriers**

**3.3.1**
**token carrier**
<Equipment-related definition> devices or media used to transport and present token information to payment meters, such as printed paper, magnetic card, electronic memory card/key, microprocessor card, or data communications networks. The token carrier may also carry ancillary control or monitoring information to or from the payment meter, depending upon system type and requirements

<System-related definition> medium that is used in the physical layer of the *POS to Token Carrier Interface*, onto which the token is modulated or encoded, and which serves to carry the token from the point where it is generated to the remote payment meter, where it is received

**3.3.2**
**blank token carrier**
physical token carrier that has not been processed at the vending point or elsewhere and hence contains no specific data

**3.3.3**
**disposable token carrier**
token carrier that is not capable of further use once it has been accepted or used, such as a paper-based magnetic card

**3.3.4**
**machine-readable token carrier**
physical or virtual token carrier carrying token information that is capable of being read and processed automatically on presentation to an appropriate payment meter, without further manual operation

EXAMPLE   A token employing a magnetic card as the token carrier.

**3.3.5**
**memory token carrier**
physical token carrier containing a non-volatile memory device, in which the token is electronically encoded and stored while it is being transported

**3.3.6**
**microprocessor token carrier**
physical token carrier containing a microprocessor device with non-volatile memory, in which the token is electronically encoded and stored while it is being transported. In addition to the token information, the microprocessor token carrier may also contain an application programme and associated data

**3.3.7**
**numeric token carrier**
token transfer method where the token information can be represented in a secure manner by a visible and human readable sequence of numeric digits (typically 20 digits printed on a receipt)

NOTE   They may be entered into a payment meter via a keypad interface for evaluation and action.

**3.3.8**
**one-way token carrier**
physical or virtual token carrier which is used for the transfer of credit and possibly tariff and configuration data in a single direction from the vending point or the management system to the payment meter

**3.3.9**
**physical token carrier**
token carrier that requires a human to transport it at least part of the way between the point where the token is loaded onto the token carrier and the point where it is retrieved from the token carrier by the payment meter

NOTE   Examples of physical token carriers are: printed numbers; magnetic cards; printed bar codes; electronic storage in memory devices such as smart cards or memory keys; and audio messages dictated by interactive voice response equipment.

**3.3.10**
**rechargeable token carrier**
refer to 3.3.11 reusable token carrier

**3.3.11**
**reusable token carrier**
rechargeable token carrier
physical token carrier that can be used for multiple sessions for transportation of tokens