This is a preview - click here to buy the full publication

TECHNICAL REPORT

# IEC TR 62055-21

First edition
2005-08

## Electricity metering – Payment systems –

## Part 21: Framework for standardization

© IEC 2005 — Copyright - all rights reserved

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 the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE XE

*For price, see current catalogue*

This is a preview - click here to buy the full publication



# CONTENTS

FOREWORD ..... 6
INTRODUCTION ..... 8
1 Scope ..... 9
2 References ..... 9
3 Terms and definitions ..... 10
3.1 Definitions ..... 10
3.2 Abbreviated terms ..... 12
3.3 Notation and terminology ..... 13
4 General concepts ..... 14
5 The generic entity model ..... 15
6 Generic functions and application process reference model for the Payment_Metering_System ..... 16
6.1 Reference model ..... 16
6.2 Business functions ..... 17
6.3 Support functions ..... 18
6.4 Business processes ..... 18
6.5 Support processes ..... 19
6.6 Payment_Metering_Application process ..... 20
7 Framework for standardization ..... 22
7.1 Generic processes ..... 23
7.2 Generic functions ..... 23
7.3 Data elements ..... 23
7.4 System entities and interfaces ..... 23
8 Example specification for a payment metering system ..... 25
9 Future aspects ..... 25
10 Generic processes ..... 25
10.1 Class 1: Supply_Agreement process ..... 27
10.2 Class 2: Purchase_Agreement process ..... 27
10.3 Class 3: Account_Configuration process ..... 27
10.4 Class 4: Metering_Configuration process ..... 27
10.5 Class 5: Delivery_Configuration process ..... 27
10.6 Class 6: Connection_Authorization process ..... 27
10.7 Class 7: Transmission_Delivery process ..... 27
10.8 Class 8: Distribution_Delivery process ..... 27
10.9 Class 9: Installation_Connection process ..... 27
10.10 Class 10: Point_Of_Delivery_Connection process ..... 27
10.11 Class 11: Customer process_Delivery ..... 28
10.12 Class 12: Meter_Reading process ..... 28
10.13 Class 13: Customer_Billing process ..... 28
10.14 Class 14: Payment_Receipting process ..... 28
10.15 Class 15: Receipt_Issuing process ..... 28
10.16 Class 16: Credit_Transfer process ..... 28
10.17 Class 17: Delivery_Regulation process ..... 28
10.18 Class 18: Supplier_Settlement process ..... 29
10.19 Class 19: Time_Provision process ..... 29
10.20 Class 20: System_Testing process ..... 29

This is a preview - click here to buy the full publication



10.21 Class 21: Information_Display process ..... 29
10.22 Class 22: Information_Recording process ..... 29
10.23 Class 23: Data_Exchange process ..... 29
10.24 Class 24: Security_Enforcement process ..... 29
11 Generic Functions ..... 29
11.1 Class 1: Supplier function ..... 30
11.2 Class 2: Customer function ..... 30
11.3 Class 3: Contract function ..... 31
11.4 Class 4: Generation function ..... 31
11.5 Class 5: Transmission function ..... 31
11.6 Class 6: Distribution function ..... 32
11.7 Class 7: Metering function ..... 32
11.8 Class 8: Delivery function ..... 33
11.9 Class 9: Accounting function ..... 34
11.10 Class 10: Receipting function ..... 35
11.11 Class 11: Settlement function ..... 35
11.12 Class 12: Time function ..... 35
11.13 Class 13: Test function ..... 36
11.14 Class 14: Display function ..... 36
11.15 Class 15: Recording function ..... 36
11.16 Class 16: Data_Exchange function ..... 37
11.17 Class 17: Security function ..... 37
11.18 Function_Object ..... 38
12 Data elements ..... 39
13 System entities and interfaces ..... 41
13.1 CIS: Customer_Information_System ..... 42
13.2 CIS_to_POS_Interface ..... 42
13.3 POS: Point_Of_Sale ..... 42
13.4 POS_to_Token_Carrier_Interface ..... 43
13.5 Token_Carrier ..... 44
13.6 Token_Carrier_to_Meter_Interface ..... 45
13.7 Payment_Meter ..... 47

Annex A (informative) Example of a requirements specification for an electricity payment metering system based on an existing system ..... 57
A.1 Scope ..... 57
A.2 Definitions ..... 57
A.3 Customer_Information_System ..... 57
A.4 CIS_to_POS_Interface ..... 61
A.5 Point of sale ..... 63
A.6 POS_to_Token_Carrier_Interface ..... 69
A.7 Token_Carrier ..... 80
A.8 Token_Carrier_to_Meter_Interface ..... 80
A.9 Payment meter ..... 87

INDEX ..... 101

This is a preview - click here to buy the full publication



Figure 1 – General concepts of a Payment Metering System ..... 14
Figure 2 – Generic entity model for electricity payment metering systems ..... 15
Figure 3 – Generic function model and application process for payment metering systems ..... 16
Figure 4 – Framework for standardization in electricity payment metering systems ..... 22
Figure 5 – Sub-classification of the Token_Carrier_to_Meter_Interface functions ..... 45
Figure 6 – Functional block diagram of a single-part payment meter installation ..... 47
Figure 7 – Payment meter core functions and application process ..... 48
Figure 8 – Sub-classification of the Accounting functions ..... 50
Figure 9 – Sub-classification of the Metering functions ..... 52
Figure 10 – Sub-classification of the Delivery functions ..... 53
Figure 11 – Sub-classification of the Time functions ..... 55
Figure A.1 – Meter_Key and Token_Data_Block generation process ..... 73

Table 1 – Generic business functions ..... 18
Table 2 – Generic support functions ..... 18
Table 3 – Generic business processes ..... 19
Table 4 – Generic support processes ..... 19
Table 5 – Definition of generic process classes ..... 26
Table 6 – Definition of generic function classes ..... 30
Table 7 – Examples of security function attributes ..... 37
Table 8 – Attributes of the Function_Object ..... 38
Table 9 – Example of a Real_Time_Clock function object ..... 38
Table 10 – Attributes of a Data_Object ..... 39
Table 11 – Examples of records used in payment metering systems ..... 40
Table 12 – Examples of application layer functions ..... 42
Table 13 – Examples of POS functions ..... 43
Table 14 – Examples of application layer token types ..... 44
Table 15 – Sub-classification of the Token_Carrier_to_Meter_Interface functions ..... 46
Table 16 – Generic processes employed by the payment meter application process ..... 49
Table 17 – Sub-classification of the Accounting functions ..... 51
Table 18 – Main attributes of the Accounting functions ..... 52
Table 19 – Main attributes of the Metering functions ..... 52
Table 20 – Sub-classification of the Delivery functions ..... 54
Table 21 – Main attributes of the Delivery functions ..... 55
Table 22 – Sub-classification of the Time functions ..... 55
Table 23 – Main attributes of the Time functions ..... 56
Table A.1 – Recording function records ..... 58
Table A.2 – Example of Meter_record attributes ..... 61
Table A.3 – Records to be downloaded from the CIS to the POS ..... 61
Table A.4 – Records to be uploaded from the POS to the CIS ..... 62
Table A.5 – Payment types ..... 64
Table A.6 – Transaction types ..... 64

This is a preview - click here to buy the full publication



Table A.7 – Classification of POS token vending capability ..... 65
Table A.8 – Data elements to be recorded ..... 68
Table A.9 – Example of a transaction record ..... 68
Table A.10 – Definition of control field ..... 70
Table A.11 – Data elements used in tokens ..... 72
Table A.12 – Definition of the Meter_Key_Generation function ..... 73
Table A.13 – Data elements in the PAN_Block ..... 74
Table A.14 – Data elements in the CONTROL_Block ..... 74
Table A.15 – Vending Key_Types ..... 74
Table A.16 – Meter Key_Types ..... 75
Table A.17 – Definition of the set_ED_Key_Token_Data_Block_Generation function ..... 75
Table A.18 – Data elements associated with the Vending_Key ..... 77
Table A.19 – Data elements associated with the Meter_Key ..... 77
Table A.20 – Definition of the Class_0_Class_2_Token_Data_Block_Generation function ..... 77
Table A.21 – Definition of the Class_1_Token_Data_Block_Generationfunction ..... 78
Table A.22 – Definition of the Set_ED_Key_Token_Extraction function ..... 81
Table A.23 – Definition of the Class 0 and Class 2 token extraction function ..... 82
Table A.24 – Definition of the Class_1_Token_Extraction function ..... 83
Table A.25 – Definition of the Metering function ..... 89
Table A.26 – Definition of the Cumulative_Total_Register ..... 92
Table A.27 – Definition of the Delivery function ..... 93
Table A.28 – Definition of the Accounting function ..... 98
Table A.29 – Definition of the Accounting register ..... 100

This is a preview - click here to buy the full publication



INTERNATIONAL ELECTROTECHNICAL COMMISSION

# ELECTRICITY METERING – PAYMENT SYSTEMS –

## Part 21: Framework for standardization

## 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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
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.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a technical report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

Technical reports do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful by the maintenance team.

IEC 62055-21, which is a technical report, has been prepared by Technical Committee 13: Equipment of electrical energy measurement and load control.

This is a preview - click here to buy the full publication



The text of this technical report is based on the following documents:

| Enquiry draft | Report on voting |
|---|---|
| 13/1318A/DTR | 13/1325A/RVC |

Full information on the voting for the approval of this technical report 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: Particular requirements – Static payment meters for active energy (classes 1 and 2)

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

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

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.

This is a preview - click here to buy the full publication



# INTRODUCTION

There is widespread activity in the application and development of payment metering systems in IEC member countries. Whilst there are many similarities in equipment functionality and operation of electricity payment metering systems in these countries, there is divergence in the particular payment technology used as well as in the use of particular token carrier technologies. An example of this is the large number of solutions using disposable magnetic cards.

A need has been identified to describe the various systems and their elements in a coherent manner and to provide a framework for standardization of payment metering systems, their elements and interfaces.

This technical report thus seeks to meet the following objectives:

a) to present a systematic methodology to follow for use by suppliers to produce requirements specifications for system procurement;

b) to present a systematic methodology to follow for use by equipment manufacturers to produce specifications for systems and products;

c) to present a standard way in specifying system requirements or functionality in order that such specifications may be easily compared and evaluated by manufacturers and users;

d) to ensure that such specifications are produced in an “open” format to allow the interoperability of sub-system components.

It has to be noted that it is not the intention of this technical report that there should be only one standard for payment metering systems or sub-systems, but that it should provide guidelines for defining several such standards according to the specific needs of the industry as and when these are identified.

The standardization work of TC13 WG15 should follow the guidelines given in this technical report in order to present such standards in a coherent and systematic way that meets the above objectives.

The IEC 62055 series covers payment systems, encompassing the customer information systems, point of sales systems, token carriers, payment meters and the respective interfaces that exist between these entities.

This is a preview - click here to buy the full publication



# ELECTRICITY METERING – PAYMENT SYSTEMS –

## Part 21: Framework for standardization

## 1 Scope

This technical report sets out a framework for the integration of standards into a system specification for electricity payment metering systems. It addresses the payment metering system application process, generic processes, generic functions, data elements, system entities and interfaces that exist in present payment metering systems. The approach taken in the framework is sufficiently generic to payment metering systems so that it should be equally applicable to future systems.

NOTE 1 This technical report excludes the application of coin-operated meters in payment systems.

NOTE 2 This technical report specifically covers electricity metering payment systems. However, it is recognised that payment metering is an established requirement in other utility services and the general framework for standardization in this technical report can be applied to such other utility services.

NOTE 3 Contract functions are confined to single bi-lateral supply agreements between a supplier and a customer and specifically exclude related third party agreements such as may be found in the deregulated markets.

NOTE 4 Future aspects are considered in Clause 9.

## 2 References

IEC 60050-300: *International Electrotechnical Vocabulary (IEV) – 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 62051:1999, *Electricity metering – Glossary of terms*

IEC 62055-31, *Electricity metering – Payment systems – Part 31: Particular requirements – Static payment meters for active energy (classes 1 and 2)* [1]

IEC/PAS 62055-41:2003, *Electricity Metering – Payment metering systems – Part 41: Standard Transfer Specification*

— NRS 009-6-6: *Interface Standards – Standard Transfer Specification / Credit dispensing unit – Electricity dispenser – Categories of tokens and transaction data fields*

— NRS 009-6-7: *Interface Standards – Standard Transfer Specification / Credit dispensing unit – Electricity dispenser – Token encoding and data encryption and decryption*

— NRS 009-6-8: *Interface Standards – Standard Transfer Specification / Disposable magnetic token technology – Token encoding format and physical token definition*

— NRS 009-6-9: *Interface Standards – Standard Transfer Specification / Numeric token technology – Token encoding format and physical token definition*

— NRS 009-7: *Standard transfer specification / The management of cryptographic keys*

---

[1] To be published.

This is a preview - click here to buy the full publication



IEC 62055-41, *Electricity Metering – Payment metering systems – Part 41: Standard Transfer Specification – Application layer for one-way token carrier systems* [1]

IEC 62055-51, *Electricity Metering – Payment metering systems – Part 51: Standard Transfer Specification – Physical layer for one-way numeric and magnetic card token carrier systems* [1]

IEC 62056-21:2001, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange*

IEC 62056-46:2002, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 46: Data link layer using HDLC protocol*

IEC 62056-47, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 47: COSEM transport layers for IPv4 networks*[2]

IEC 62056-53:2002, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 53: COSEM application layer*

IEC 62056-61:2002, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 61: Object identification system (OBIS)*