IEC 62055-41

Edition 3.0 2018-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Electricity metering – Payment systems – Part 41: Standard transfer specification (STS) – Application layer protocol for one-way token carrier systems

Comptage de l'électricité – Systèmes de paiement – Partie 41: Spécification de transfert normalisé (STS) – Protocole de couche application pour les systèmes de supports de jeton unidirectionnel

IEC 62055-41:2018-03(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

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International Standard IEC 62055-41 has been prepared by IEC technical committee 13: Electrical energy measurement and control.

This third edition cancels and replaces the second edition of IEC 62055-41, issued in 2014. It constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

- currency transfer tokens for electricity, water, gas and time metering;
- finer resolution for gas and time credit transfer;
- common code PAN for 2 and 4 digit manufacturer codes;
- reserved MfrCode values for certification and testing purposes;
- provision for DLMS/COSEM as a virtual token carrier type;

- addition of DKGA04, an advanced key derivation function from 160-bit VendingKey;
- withdrawal of DES for EA09 and TDES for DKGA03 cryptographic algorithms, but DES for DKGA02 remains in use;
- addition of MISTY1 cryptographic algorithm using a 128-bit DecoderKey with supporting key change tokens;
- transfer of SGC values to the meter via key change tokens;
- revision of the test/display token requirements;
- revision of the KMS to reflect current best practice;
- revision of the TID roll over management guidelines;
- definition of BaseDate is referenced to Coordinated Universal Time;
- disassociation of IIN from the ISO standard definition;
- various clarifications and enhancements to support the above.

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

FDIS	Report on voting
13/1755/FDIS	13/1764/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.

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 "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.

INTRODUCTION

The IEC 62055 series covers payment systems, encompassing the customer information systems, point of sale systems, token carriers, payment meters and the respective interfaces that exist between these entities. At the time of preparation of this document, IEC 62055 comprised 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 (STS) – Application layer protocol for one-way token carrier systems

Part 42: Transfer reference numbers (TRN) – Application layer protocol for one-way token carrier systems

Part 51: Standard transfer specification (STS) – Physical layer protocol for one-way numeric and magnetic card token carriers

Part 52: Standard transfer specification (STS) – Physical layer protocol for a two-way virtual token carrier for direct local connection

Part 4x series specify application layer protocols and Part 5x series specify physical layer protocols.

NOTE 1 Part 42 is not interoperable with Part 41, Part 51 and Part 52.

NOTE 2 Part 42 was in preparation at the time of publication of this edition of Part 41.

The standard transfer specification (STS) is a secure message protocol that allows information to be carried between point of sale (POS) equipment and payment meters and it caters for several message types such as credit, configuration control, display and test instructions. It further specifies devices and codes of practice that allow for the secure management (generation, storage, retrieval and transportation) of cryptographic keys used within the system.

The token carrier, which is not specified in this part of IEC 62055, is the physical device or medium used to transport the information from the POS equipment to the payment meter. Three types of token carriers are currently specified in IEC 62055-51 and IEC 62055-52; the magnetic card, the numeric token carrier and a virtual token carrier, which have been approved by the STS Association. New token carriers can be proposed as new work items through the National Committees or through the STS Association.

Although the main implementation of the STS is in the electricity supply industry, it inherently provides for the management of other utility services such as water and gas. It should be noted that certain functionalities may not apply across all utility services, for example, MaximumPowerLimit in the case of a water meter. Similarly, certain terminology may not be appropriate in non-electrical applications, for example, Load Switch in the case of a gas meter. Future revisions of the STS may allow for other token carrier technologies like smart cards and memory keys with two-way functionality and to cater for a real-time clock and complex tariffs in the payment meter.

Not all the requirements specified in this document are compulsory for implementation in a particular system configuration and as a guideline, a selection of optional configuration parameters are listed in Clause C.12.

The STS Association is registered with the IEC as a Registration Authority for providing maintenance services in support of the STS (see Clause C.1 for more information).

Publication of the first edition of IEC 62055-41 in May 2007 resulted in its rapid adoption as the preferred global standard for prepayment meters in many IEC member countries and a

majority of IEC affiliate member countries. Prepayment electricity meters and their associated Payment Systems are now produced, operated and maintained by an ecosystem of utilities, meter manufacturers, meter operators, vending system providers, vending agents, banking institutions and adjacent industries. Multi-stakeholder interests are served by the STS Association comprising of more than 150 organisations located in over 35 countries. Interoperability and conformance to the Standard Transfer Specification (STS) are guaranteed by Conformance test specifications developed and administered by the STS Association. A full list of the STS Association services can be found at http://www.sts.org.za.

Developed originally for prepayment electricity meters in Africa – via an IEC TC13 WG15 D-type liaison with the STS Association – this IEC standard now serves more users in Asia than Africa, with a total of approximately 50 million meters operated by 500 utilities in 94 countries. Management of the technology has been administered by the STS Association in fulfilment of its role as the IEC appointed Registration Authority.

With the ongoing development of advanced cryptographic algorithms, it has become desirable to revise the security levels of IEC 62055-41 so as to reflect the state of the art best practices, which will be appropriate for deployment of new systems having a useful life expectancy of at least the next 30 years.

Similarly, smart metering systems with payment functionality have evolved to employ tariff functions in the meter, thus raising the need to provide for the transfer of currency units to the meter instead of service units.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning special reserved token identifier given in 6.3.5.2.

IEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured the IEC that he/she is willing to negotiate licences either free of charge or under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from:

Address:	Itron Measurement and Systems, P.O. Box 4059,TygerValley 7536, Republic of South Africa
Tel:	+27 21 928 1700
Fax:	+27 21 928 1701
Website:	http://www.itron.com

Address:	Conlog (Pty) Ltd, P.O. Box 2332, Durban 4000, Republic of South Africa
Tel:	+27 31 2681141
Fax:	+27 31 2087790
Website:	http://www.conlog.co.za

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified above. IEC shall not be held responsible for identifying any or all such patent rights.

ISO (www.iso.org/patents) and IEC (http://patents.iec.ch) maintain on-line data bases of patents relevant to their standards. Users are encouraged to consult the data bases for the most up to date information concerning patents.

The International Electrotechnical Commission (IEC) draws attention to the fact that it is claimed that compliance with this International Standard may involve the use of a

maintenance service concerning encryption key management and the stack of protocols on which the present International Standard IEC 62055-41 is based [see Clause C.1]. The IEC takes no position concerning the evidence, validity and scope of this maintenance service.

The provider of the maintenance service has assured the IEC that he is willing to provide services under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the provider of the maintenance service is registered with the IEC. Information may be obtained from:

Address:	The STS Association, P.O. Box 868, Ferndale 2160, Republic of South Africa
Tel:	+27 11 061 5000
Fax:	+27 86 679 4500
Email:	support@sts.org.za
Website:	http://www.sts.org.za

ELECTRICITY METERING – PAYMENT SYSTEMS –

Part 41: Standard transfer specification (STS) – Application layer protocol for one-way token carrier systems

1 Scope

This part of IEC 62055 specifies the application layer protocol of the STS for transferring units of credit and other management information from a point of sale (POS) system to an STS-compliant payment meter in a one-way token carrier system. It is primarily intended for application with electricity payment meters without a tariff employing energy-based tokens, but may also have application with currency-based token systems and for services other than electricity.

It specifies:

- a POS to token carrier interface structured with an application layer protocol and a physical layer protocol using the OSI model as reference;
- tokens for the application layer protocol to transfer the various messages from the POS to the payment meter;
- security functions and processes in the application layer protocol such as the Standard Transfer Algorithm and the Data Encryption Algorithm, including the generation and distribution of the associated cryptographic keys;
- security functions and processes in the application layer protocol at the payment meter such as decryption algorithms, token authentication, validation and cancellation;
- specific requirements for the meter application process in response to tokens received;
- a scheme for dealing with payment meter functionality in the meter application process and associated companion specifications;
- generic requirements for an STS-compliant key management system;
- guidelines for a key management system;
- entities and identifiers used in an STS system;
- code of practice for the management of TID roll-over key changes in association with the revised set of base dates;
- code of practice and maintenance support services from the STS Association.

It is intended for use by manufacturers of payment meters that have to accept tokens that comply with the STS and also by manufacturers of POS systems that have to produce STS-compliant tokens and is to be read in conjunction with IEC 62055-5x series.

STS-compliant products are required to comply with selective parts of this document only, which is the subject of the purchase contract (see also Clause C.12).

NOTE Although developed for payment systems for electricity, the document also makes provision for tokens used in other utility services, such as water and gas.

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 TR 62051:1999, *Electricity metering – Glossary of terms*

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

IEC 62055-31:2005, *Electricity metering – Payment systems – Part 31: Particular requirements – Static payment meters for active energy (classes 1 and 2)*

IEC 62055-51:2007, *Electricity metering – Payment systems – Part 51: Standard transfer specification (STS) – Physical layer protocol for one-way numeric and magnetic card token carriers*

IEC 62055-52:2008, *Electricity metering – Payment systems – Part 52: Standard transfer specification (STS) – Physical layer protocol for a two-way virtual token carrier for direct local connection*

ISO/IEC 7812-1:2017, *Identification cards – Identification of issuers – Part 1: Numbering system*

ISO/IEC 18033-3, *Information technology – Security techniques – Encryption Algorithms – Part 3: Block ciphers*

ISO 9797-2, *Information technology – Security techniques – Message Authentication. Codes (MACs) – Part 2: Mechanisms using a dedicated hash-function*

ISO 10118-3, *Information technology – Security techniques – Hash-functions – Part 3: Dedicated Hash Functions*

ANSI X3.92-1981, *American National Standard Data Encryption Algorithm, American National Standards Institute – Data Encryption Algorithm*

FIPS PUB 46-3:1999, *Federal Information Processing Standards Publication – Data Encryption Standard*

NIST SP 800-108, *Recommendation for Key Derivation Using Pseudorandom Functions*

3 Terms, definitions, abbreviated terms, notation and terminology

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC TR 62051 and IEC 62055-31 as well as the following apply.

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

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

NOTE Where there is a difference between the definitions in this document and those contained in other referenced IEC standards, then those defined in this document take precedence.

The term “meter” is used interchangeably with “payment meter”, “prepayment meter” and “decoder”, where the decoder is a sub-part of an electricity payment meter or of a multi-device payment meter.

The term “POS” is used synonymously with “CIS”, “MIS” and “HHU” in the sense that tokens may also be generated by, and transferred between these entities and the payment meter.