

# INTERNATIONAL STANDARD

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**Electricity metering – Payment systems –**

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

**(standards.iteh.ai)**

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IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland  
Email: [inmail@iec.ch](mailto:inmail@iec.ch)  
Web: [www.iec.ch](http://www.iec.ch)

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Tel.: +41 22 919 02 11

Fax: +41 22 919 03 00

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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International Standard IEC 62055-51 has been prepared by working group 15, of IEC technical committee 13: Electrical energy measurement, tariff and load control.

IEC 62055-51 is complementary to, and is to be read in conjunction with, IEC 62055-41.

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

CDV	Report on voting
13/1406/CDV	13/1410/RVC

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.

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- withdrawn,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
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## INTRODUCTION

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. At the time of preparation of this part, 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 – 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
- Part 52: Standard transfer specification – Physical layer protocol for a two-way virtual token carrier for direct local connection

The Part 4x series specifies application layer protocols and the Part 5x series specifies physical layer protocols.

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 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 national electricity utility in South Africa (Eskom) first developed and published the STS in 1993 and transferred ownership to the STS Association in 1998 for management and further development.

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Prior to the development of the STS a variety of proprietary payment meters and POS equipment had been developed, which were, however, not compatible with each other. This gave rise to a definite need among the major users to move towards standardized solutions in addressing operational problems experienced where various types of payment meter and POS equipment had to be operated simultaneously. An STS was developed that would allow for the application and inter-operability of payment meters and POS equipment from multiple manufacturers in a payment metering installation.

The TokenCarrier is the physical device or medium used to transport the information from the vending system to the payment meter. Two types of token carriers are specified in this part of IEC 62055, a magnetic card and a numeric 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 like water and gas. 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.

The STS Association has established a D-type liaison with working group 15 of IEC TC 13 for the development of standards within the scope of the STS and is thus responsible for the maintenance of any such IEC standards that might be developed as a result of this liaison.

The STS Association is also registered with the IEC as a Registration Authority for providing maintenance services in support of the STS (see Clause C.1 of IEC 62055-41 for more information).

## ELECTRICITY METERING – PAYMENT SYSTEMS –

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

#### 1 Scope

This part of IEC 62055 specifies a physical layer protocol of the standard transfer specification (STS) for transferring units of credit and other management information between a point-of-sale (POS) system and an STS-compliant electricity payment meter.

It specifies

- encoding of token data onto token carriers in the physical layer protocol at the POS for various TokenCarrierTypes such as numeric and magnetic cards;
- decoding of token data from token carriers in the physical layer protocol at the payment meter for various TokenCarrierTypes such as numeric and magnetic cards.

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 should be read in conjunction with IEC 62055-41.

NOTE 1 Although developed for payment systems for electricity, the standard also covers tokens used in other utility services, such as water and gas.

[IEC 62055-51:2007](#)

NOTE 2 STS-compliant products are required to comply with selective parts of this International Standard only, which should be the subject of the purchase contract (see Annex A).

#### 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 60050-300, *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 62051, *Electricity metering – Glossary of terms*

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

IEC 62055-41, *Electricity metering – Payment systems – Part 41: Standard transfer specification – Application layer protocol for one-way token carrier systems*

ISO/IEC 7810:2003, *Identification cards – Physical characteristics*

ISO/IEC 7811-2:2001, *Identification cards – Recording technique – Part 2: Magnetic stripe – Low coercivity*

ISO/IEC 7813:2006, *Information technology – Identification cards – Financial transaction cards*



### 3 Terms, definitions and abbreviations

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-300, IEC 62051, IEC 62055-31, IEC 62055-41 apply.

#### 3.2 Abbreviations

ANSI	American National Standards Institute
APDU	ApplicationProtocolDataUnit
ASCII	American Standard Code for Information Interchange
DOE	DateOfExpiry
DD	Discretionary Data
EA	EncryptionAlgorithm
ED	ExpirationDate
ETX	ASCII End Of Text character
FS	FieldSeparator
ID	Identification; Identifier
ISO	International Standards Organization
KRN	KeyRevisionNumber
LRC	LongitudinalRedundancyCheck
OSI	Open Systems Interconnection
PAN	PrimaryAccountNumber
POS	PointOfSale
PRN	Printer
PSTN	Public Switched Telephone Network
SC	ServiceCode
SGC	SupplyGroupCode
STS	Standard Transfer Specification
STX	ASCII Start of Text character
TCDU	TokenCarrierDataUnit
TCT	TokenCarrierType
TI	TariffIndex

### 3.3 Notation and terminology

Throughout this standard the following rules are observed regarding the naming of terms.

- Entity names, data element names, function names and process names are treated as generic object classes and are given names in terms of phrases in which the words are capitalized and joined without spaces. Examples are: SupplyGroupCode as a data element name, EncryptionAlgorithm07 as a function name and TransferCredit as a process name (see note).
- Direct (specific) reference to a named class of object uses the capitalized form, while general (non-specific) reference uses the conventional text i.e. lower case form with spaces. An example of a direct reference is: “The SupplyGroupCode is linked to a group of meters”, while an example of a general reference is: “A supply group code links to a vending key”.
- Other terms use the generally accepted abbreviated forms like PSTN for Public Switched Telephone Network.

NOTE The notation used for the naming of objects has been aligned with the so-called “camel-notation” used in the common information model (CIM) standards prepared by TC 57, in order to facilitate future harmonization and integration of payment system standards with the CIM standards.

### 3.4 Numbering conventions

In this standard, the representation of numbers in binary strings uses the convention that the least significant bit is to the right and the most significant bit is to the left.

Numbering of bit positions start with bit position 0, which corresponds to the least significant bit of a binary number.

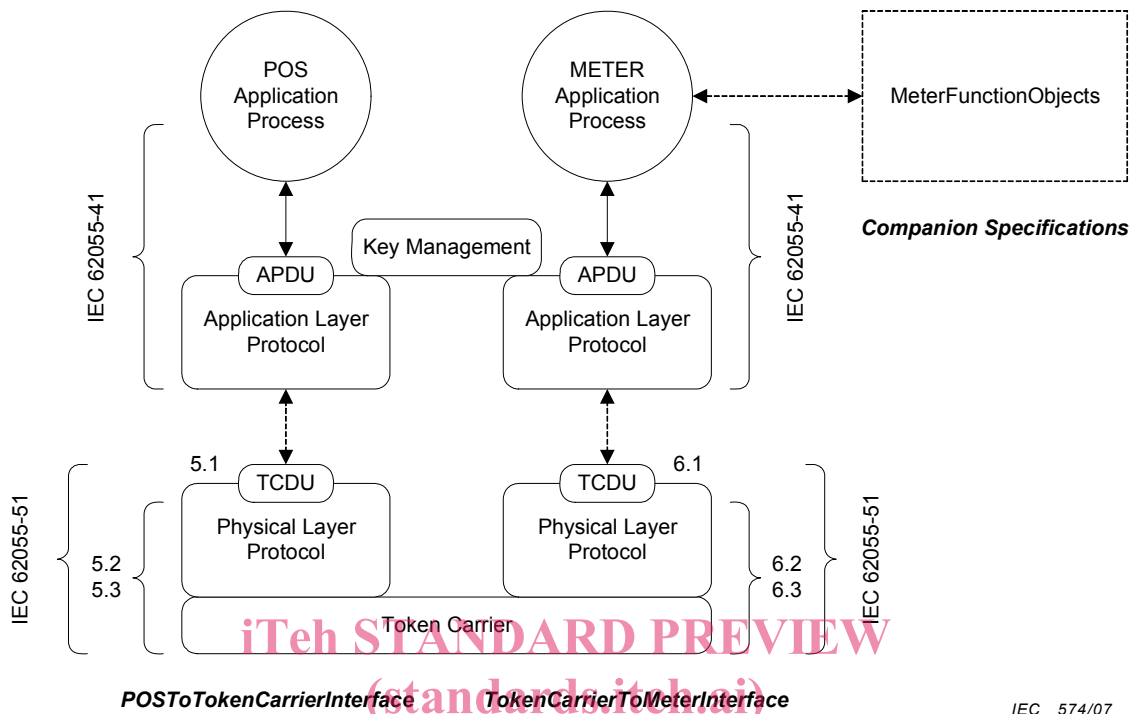
Numbers are generally in decimal format, unless otherwise indicated. Any digit without an indicator signifies decimal format.

Binary digit values range from 0-1.

Decimal digit values range from 0-9.

Hexadecimal digit values range from 0-9, A-F and are indicated by “hex”.

#### 4 STS protocol reference model



IEC 574/07

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APDU      ApplicationLayerDataUnit; data interface to the application layer protocol

TCDU      TokenCarrierDataUnit; data interface to the physical layer protocol

Relevant clause number references in this standard are indicated adjacent to each box

**Figure 1 – Physical layers of the STS protocol stack**

The STS is a secure data transfer protocol between a POS and a payment meter using a token carrier as the transfer medium. The application layer protocol deals with tokens and encryption processes and functions and is specified in IEC 62055-41, while the physical layer protocol deals with the actual encoding of the token data onto various types of token carriers (see Figure 1).

This standard specifies a physical layer protocol that deals with the actual encoding of the token data onto a numeric token carrier and a magnetic card token carrier and operates in conjunction with the application layer protocol specified in IEC 62055-41.

Examples of other types of physically transportable token carrier devices are: numeric, magnetic cards, memory cards and memory keys, which might be specified in future in other parts of the IEC 62055-5x series.

A more complete description of the STS reference model and data flows from the POSApplicationProcess to the MeterApplicationProcess may be found in Clause 5 of IEC 62055-41.