INTERNATIONAL STANDARD

IEC 62056-62

Second edition
2006-11

Electricity metering –
Data exchange for meter reading, tariff and load control –

Part 62:
Interface classes

Reference number
IEC 62056-62:2006(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site (www.iec.ch)**

- **Catalogue of IEC publications**

  The on-line catalogue on the IEC web site (www.iec.ch/searchpub) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

  This summary of recently issued publications (www.iec.ch/online_news/ justpub) is also available by email. Please contact the Customer Service Centre (see below) for further information.

- **Customer Service Centre**

  If you have any questions regarding this publication or need further assistance, please contact the Customer Service Centre:

  Email: custserv@iec.ch
  Tel: +41 22 919 02 11
  Fax: +41 22 919 03 00

INTERNATIONAL STANDARD

IEC 62056-62

Second edition
2006-11

Electricity metering – Data exchange for meter reading, tariff and load control –

Part 62: Interface classes

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 XF

For price, see current catalogue

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRICITY METERING – DATA EXCHANGE FOR METER READING, TARIFF AND LOAD CONTROL –

Part 62: Interface classes

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 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 the stack of protocols on which the present standard IEC 62056-62 is based.

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 (see also 4.6.2 and Annex E) may be obtained from:

DLMS[1] User Association

Geneva / Switzerland

www.dlms.ch

[1] Device Language Message Specification.

International Standard IEC 62056-62 Ed. 2 has been prepared by IEC technical committee 13: Equipment for electrical energy measurement and load control.

This second edition cancels and replaces the first edition published in 2002 and constitutes a technical revision.

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

- the list of common data types has been amended, some new types have been added;
- formatting for floating point numbers has been added;
- new HLS mechanisms have been added;
- instance specific data types have been replaced with a well-defined set of applicable data types;
- new units have been added;
- encoding of application_context_name and authentication_mechanism_name attributes of the Association LN class has has been clarified;
- new interface classes "Register table" and "Status mapping" have been added;
- a new version of the "IEC local port setup", "Modem configuration", "Auto connect" and "HDLC setup" interface classes have been added;
- new interface classes for setting up a TCP/IP based communication profile have been added. References to related IETF RFCs and standards, as well as related definitions have been added;
- several amendments in Annex D "Relation to OBIS" have been made.

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

FDIS	Report on voting
13/1389/FDIS	13/1400/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.

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 the publication may be issued at a later date.

INTRODUCTION

Driven by the need of the utilities to optimize their business processes, the meter becomes more and more part of an integrated metering and billing system. Whereas in the past the commercial value of a meter was mainly generated by its data acquisition and processing capabilities, nowadays the critical issues are system integration and interoperability.

The Companion Specification for Energy Metering (COSEM) addresses these challenges by looking at the meter as an integrated part of a commercial process, which starts with the measurement of the delivered product (energy) and ends with the revenue collection.

The meter is specified by its "behaviour" as seen from the utility's business processes. The formal specification of the behaviour is based on object modelling techniques (interface classes and objects). The specification of these objects forms a major part of COSEM.

The COSEM server model (see 4.5) represents only the externally visible elements of the meter. The client applications that support the business processes of the utilities, customers and meter manufacturers make use of this server model. The meter offers means to retrieve its structural model (the list of objects visible through the interface), and provides access to the attributes and specific methods of these objects.

The set of different interface classes form a standardized library from which the manufacturer can assemble (model) its individual products. The elements are designed so that with them the entire range of products (from residential to commercial and industrial applications) can be covered. The choice of the subset of interface classes used to build a meter, their instantiation, and their implementation are part of the product design and therefore left to the manufacturer. The concept of the standardized metering interface class library provides the different users and manufacturers with a maximum of diversity without having to sacrifice interoperability.

ELECTRICITY METERING – DATA EXCHANGE FOR METER READING, TARIFF AND LOAD CONTROL –

Part 62: Interface classes

1 Scope

This part of IEC 62056 specifies a model of a meter as it is seen through its communication interface(s). Generic building blocks are defined using object-oriented methods, in the form of interface classes to model meters from simple up to very complex functionality.

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

IEC 60559:1989, *Binary floating-point arithmetic for microprocessor systems*

IEC 61334-4-41:1996, *Distribution automation using distribution line carrier systems – Part 4: Data communication protocols – Section 41: Application protocols – Distribution line message specification*

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

IEC 62051-1:2004, *Electricity metering – Data exchange for meter reading, tariff and load control – Glossary of terms – Part 1: Terms related to data exchange with metering equipment using DLMS/COSEM*

IEC 62056-21:2002, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 21: Direct local data exchange*

IEC 62056-31:1999, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 31: Using local area networks on twisted pair with carrier signalling*

IEC 62056-46:2002, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 46: Data link layer using HDLC-protocol*
Amendment 1[2]

IEC 62056-47:2006, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 47: COSEM transport layers for IPv4 networks*

IEC 62056-53:2006, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 53: COSEM Application layer*

[2] To be published.

IEC 62056-61:2006, *Electricity metering – Data exchange for meter reading, tariff and load control – Part 61: Object identification system(OBIS)*

ANSI C12.19:1997 / IEEE 1377:1997, *Utility Industry End Device Data Tables*

STD 0005: 1981, *Internet Protocol (Also: IETF RFC 0791, RFC 0792, RFC 0919, RFC 0922, RFC 0950, RFC 1112)*

STD 0051: 1994, *The Point-to-Point Protocol (PPP) (Also: IETF RFC 1661, RFC 1662)*

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, and IEC 62051-1 apply.

3.2 Abbreviations

AARE	Application Association Response
AARQ	Application Association ReQuest
ACSE	Application Control Service Element
APDU	Application Protocol Data Unit
ASE	Application Service Element
A-XDR	Adapted eXtended Data Representation
CHAP	Challenge Handshake Authentication Protocol
COSEM	Companion Specificationfor Energy Metering
CtoS	Client to Server Challenge
DHCP	Dynamic Host Control Protocol
DLMS	Device Language Message Specification
DNS	Domain Name Server
EAP	Extensible Authentication Protocol
GMT	Greenwich Mean Time
GPS	Global Positioning System
HLS	High Level Security
IANA	Internet Assigned Numbers Authority
IC	Interface Class
IETF	Internet Engineering Task Force
IP	Internet Protocol
IPCP	Internet Protocol Control Protocol
LCP	Link Control Protocol
LLS	Low Level Security
LN	Logical Name
LSB	Least Significant Bit
m	mandatory
MD5	Message Digest Algorithm 5
MSB	Most Significant Bit
o	Optional

OBIS	OBject Identification System
PAP	Password Authentication Protocol
PDU	Protocol Data Unit
PLMN	Public Land Mobile Network
PPP	Point-to-Point Protocol
PSTN	Public Switched Telephone Network
ROHC	Robust Header Compression
SAP	Service Access Point
SHA-1	Secure Hash Algorithm
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol
SN	Short Name
StoC	Server to Client Challenge

4 Basic principles

4.1 General

This subclause describes the basic principles on which the COSEM interface classes are built. It also gives a short overview on how interface objects (instantiations of the interface classes) are used for communication purposes. Data collection systems and metering equipment from different vendors, following these specifications can exchange data in an interoperable way.

Object modelling: for specification purposes this standard uses the technique of object modelling. An object is a collection of attributes and methods.

The information of an object is organized in attributes. They represent the characteristics of an object by means of attribute values. The value of an attribute may affect the behaviour of an object. The first attribute in any object is the “logical_name”. It is one part of the identification of the object. An object may offer a number of methods to either examine or modify the values of the attributes.

Objects that share common characteristics are generalized as an interface class with a class_id. Within a specific class, the common characteristics (attributes and methods) are described once for all objects. Instantiations of an interface class are called COSEM objects.

Manufacturers may add proprietary methods or attributes to any object, using negative numbers.

Figure 1 illustrates these terms by means of an example:

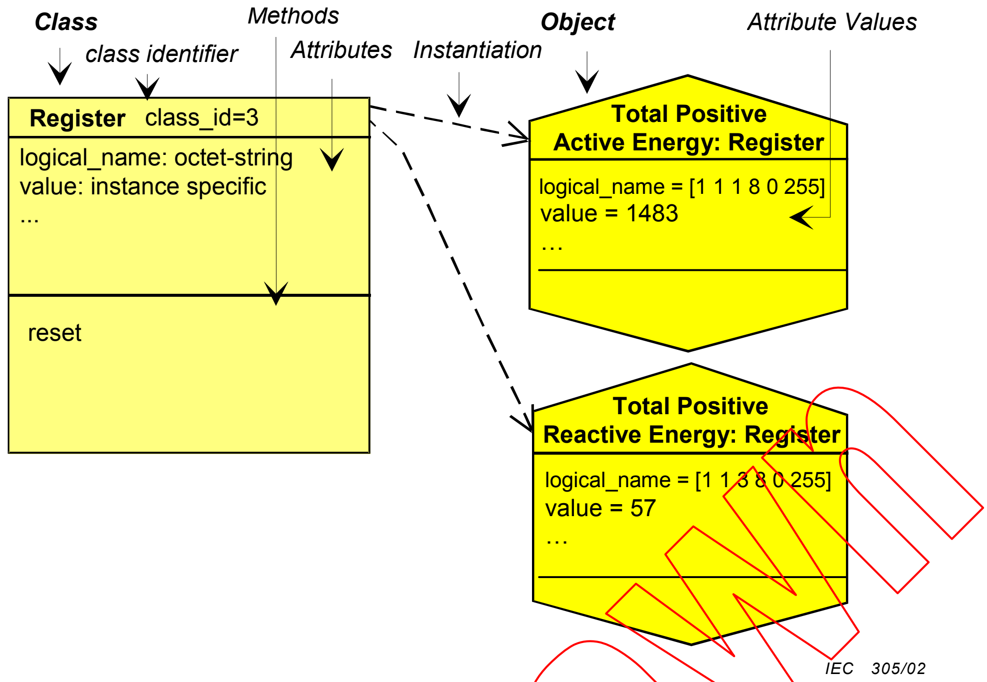

Figure 1 – An interface class and its instances

The interface class "Register" is formed by combining the features necessary to model the behaviour of a generic register (containing measured or static information) as seen from the client (central unit, hand-held terminal). The contents of the register are identified by the attribute "logical_name". The logical_name contains an OBIS identifier (see IEC 62056-61). The actual (dynamic) content of the register is carried by its "value" attribute.

Defining a specific meter means defining several specific registers. In the example of Figure 1, the meter contains two registers, i.e. two specific COSEM objects of the class "Register" are instantiated. This means that specific values are assigned to the different attributes. Through the instantiation, one COSEM object becomes a "total, positive, active energy register" whereas the other becomes a "total, positive, reactive energy register".

REMARK The COSEM objects (instances of interface classes) represent the behaviour of the meter as seen from the "outside". Therefore, modifying the value of an attribute must always be initiated from the outside (e.g. resetting the value of a register). Internally initiated changes of the attributes are not described in this model (e.g. updating the value of a register).

4.2 Class description notation

This subclause describes the notation used to define the interface classes.

A short text describes the functionality and application of the class. A table gives an overview of the class including the class name, the attributes, and the methods (class description template).

Class name		**Cardinality**	**class_id, version**		
Attribute(s)		***Data type***	***Min.***	***Max.***	***Def.***
1. logical_name	(static)	octet-string			
2. …	(…)	…			
3. …	(…)	…			
Specific method(s) (if required)		***m/o***			
1. …		…			
2. …		…			

Each attribute and method must be described in detail.

Class name	Describes the class (e.g. “Register”, “Clock”, “Profile generic”,...)	
Cardinality	Specifies the number of instances of the class within a logical device (see 4.6).	
	value	The class shall be instantiated exactly “value” times.
	min...max.	The class shall be instantiated at least “min.” times and at most “max.” times. If min. is zero (0) then the class is optional, otherwise (min. > 0) "min." instantiations of the class are mandatory.
class_id	Identification code of the class (range 0 to 65 535). The class_id of each object is retrieved together with the logical name by reading the object_list attribute of an “Association LN” / ”Association SN” object. The class_id-s from 0 to 8 191 are reserved to be specified by the DLMS UA. Class_id-s from 8 192 to 32 767 are reserved for manufacturer specific interface classes. Class_id-s from 32 768 to 65 535 are reserved for user group specific interface classes. DLMS UA reserves the right to assign ranges to individual manufacturers or user groups.	
Version	Identification code of the version of the class. The version of each object is retrieved together with the logical name and the class_id by reading the object_list attribute of an “Association LN” / ”Association SN” object. **Within one logical device, all instances of a certain class must be of the same version.**	
Attribute(s)	Specifies the attribute(s) that belong to the class.	
	(*dyn.*)	Classifies an attribute that carries a process value, which is updated by the meter itself.
	(static)	Classifies an attribute, which is not updated by the meter itself (e.g. configuration data).
logical_name	octet-string	The logical name is always the first attribute of a class. It identifies the instantiation (COSEM object) of this class. The value of the logical_name conforms to OBIS (see IEC 62056-61).
Data type	Defines the data type of an attribute (see 4.3).	
Min.	Specifies if the attribute has a minimum value.	
	x	The attribute has a minimum value.
	<empty>	The attribute has no minimum value.
Max.	Defines if the attribute has a maximum value.	
	x	The attribute has a maximum value.
	<empty>	The attribute has no maximum value.
Def.	Specifies if the attribute has a default value. This is the value of the attribute after reset.	
	x	The attribute has a default value.
	<empty>	The default value is not defined by the class definition.

Specific method(s)	Provides a list of the specific methods that belong to the object.	
	Method Name ()	The method has to be described in the subsection "Method description".
m/o	Defines if the method is mandatory or optional.	
	m (mandatory)	The method is mandatory.
	o (optional)	The method is optional.

Attribute description

Describes each attribute with its data type (if the data type is not simple), its data format and its properties (minimum, maximum and default values).

Method description

Describes each method and the invoked behaviour of the instantiated COSEM object(s).

NOTE Services for accessing attributes or methods by the protocol are described in IEC 62056-53.

Selective access

The xDLMS services Read, Write, UnconfirmedWrite (used with SN referencing) and GET, SET (used with LN referencing) typically reference the entire attribute. However, for certain attributes selective access to just a part of the attribute may be provided. The part of the attribute is identified by specific selective access parameters. These are defined as part of the attribute specification.

4.3 Common data types

The following table contains the list of data types usable for attributes of COSEM objects.

Table 1 – Common data types

Type description	Tag [a]	Definition	Value range
--simple data types			
null-data	[0]		
boolean	[3]	boolean	TRUE or FALSE
bit-string	[4]	An ordered sequence of boolean values	
double-long	[5]	Integer32	-2 147 483 648… 2 147 483 647
double-long-unsigned	[6]	Unsigned32	0…4 294 967 295
octet-string	[9]	An ordered sequence of octets (8 bit bytes)	
visible-string	[10]	An ordered sequence of ASCII characters	
bcd	[13]	binary coded decimal	
integer	[15]	Integer8	-128…127
long	[16]	Integer16	-32 768…32 767
unsigned	[17]	Unsigned8	0…255
long-unsigned	[18]	Unsigned16	0…65 535
long64	[20]	Integer64	$-2^{63}…2^{63}-1$
long64-unsigned	[21]	Unsigned64	$0…2^{64}-1$