

Communication networks and systems for power utility automation - Part 9-2: Specific communication service mapping (SCSM) - Sampled values over ISO/IEC 8802-3 (IEC 61850-9-2:2011)

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

| | |
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| See Eesti standard EVS-EN 61850-9-2:2011 sisaldab Euroopa standardi EN 61850-9-2:2011 ingliskeelset teksti. | This Estonian standard EVS-EN 61850-9-2:2011 consists of the English text of the European standard EN 61850-9-2:2011. |
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English version

**Communication networks and systems for power utility automation -
Part 9-2: Specific communication service mapping (SCSM) -
Sampled values over ISO/IEC 8802-3
(IEC 61850-9-2:2011)**

Réseaux et systèmes de communication
pour l'automatisation des systèmes
électriques -
Partie 9-2: Mise en correspondance des
services de communication spécifiques
(SCSM) -
Valeurs échantillonnées
sur l'ISO/CEI 8802-3
(CEI 61850-9-2:2011)

Kommunikationsnetze und -systeme für
die Automatisierung in der elektrischen
Energieversorgung -
Teil 9-2: Spezifische Abbildung von
Kommunikationsdiensten (SCSM) -
Abgetastete Werte über ISO/IEC 8802-3
(IEC 61850-9-2:2011)

This European Standard was approved by CENELEC on 2011-10-27. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 57/1133/FDIS, future edition 2 of IEC 61850-9-2, prepared by IEC/TC 57 "Power systems management and associated information exchange" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61850-9-2:2011.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-07-27
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2014-10-27

This document supersedes EN 61850-9-2:2004.

EN 61850-9-2:2011 includes the following significant technical changes with respect to EN 61850-9-2:2004:

- addition of an optional Link redundancy layer (Tables 3 to 6);
- redefinition of "reserved" fields in link layer (5.3.3.4);
- evolution of USVCB and MSVCB components (Tables 9, 10, 12);
- evolution of encoding for the transmission of the sampled value buffer (Table 14).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61850-9-2:2011 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | <u>EN/HD</u> | <u>Year</u> |
|--------------------|-------------|---|--------------|-------------|
| IEC 60874-10-1 | - | Connectors for optical fibres and cables - Part 10-1: Detail specification for fibre optic connector type BFOC/2,5 terminated to multimode fibre type A1 | - | - |
| IEC 60874-10-2 | - | Connectors for optical fibres and cables - Part 10-2: Detail specification for fibre optic connector type BFOC/2,5 terminated to single-mode fibre type B1 | - | - |
| IEC 60874-10-3 | - | Connectors for optical fibres and cables - Part 10-3: Detail specification for fibre optic adaptor type BFOC/2,5 for single and multimode fibre | - | - |
| IEC/TR 61850-1 | - | Communication networks and systems in substations - Part 1: Introduction and overview | - | - |
| IEC/TS 61850-2 | - | Communication networks and systems in substations - Part 2: Glossary | - | - |
| IEC 61850-6 | - | Communication networks and systems for power utility automation - Part 6: Configuration description language for communication in electrical substations related to IEDs | EN 61850-6 | - |
| IEC 61850-7-1 | - | Communication networks and systems for power utility automation - Part 7-1: Basic communication structure - Principles and models | EN 61850-7-1 | - |
| IEC 61850-7-2 | - | Communication networks and systems for power utility automation - Part 7-2: Basic information and communication structure - Abstract communication service interface (ACSI) | EN 61850-7-2 | - |
| IEC 61850-7-3 | - | Communication networks and systems for power utility automation - Part 7-3: Basic communication structure - Common data classes | EN 61850-7-3 | - |
| IEC 61850-7-4 | - | Communication networks and systems for power utility automation - Part 7-4: Basic communication structure - Compatible logical node classes and data object classes | EN 61850-7-4 | - |

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | <u>EN/HD</u> | <u>Year</u> |
|--------------------|----------------------------|--|-----------------|----------------------------|
| IEC 61850-8-1 | - | Communication networks and systems for power utility automation - Part 8-1: Specific Communication Service Mapping (SCSM) - Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3 | EN 61850-8-1 | - |
| IEC/TS 62351-6 | - | Power systems management and associated information exchange - Data and communications security - Part 6: Security for IEC 61850 | - | - |
| IEC 62439-3 + A1 | 2010 201X ¹⁾ | Industrial communication networks - High availability automation networks - Part 3: Parallel Redundancy Protocol (PRP) and High availability Seamless Redundancy (HSR) | EN 62439-3 + A1 | 2010 201X ¹⁾ |
| ISO/IEC 7498-1 | 1994 | Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model | - | - |
| ISO/IEC 8326 | 1996 | Information technology - Open systems Interconnection - Session service definition | - | - |
| ISO/IEC 8327-1 | 1996 | Information technology - Open Systems Interconnection - Connection-oriented Session protocol: Protocol specification | - | - |
| ISO/IEC 8649 | 1996 | Information technology - Open systems interconnection - Service definition for the Association Control Service Element (ACSE) | - | - |
| ISO/IEC 8650-1 | 1996 | Information technology - Open systems interconnection - Connection-oriented protocol for the association control service element: Protocol specification | - | - |
| ISO/IEC 8802-3 | 2000 | Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications | - | - |
| ISO/IEC 8822 | 1994 | Information technology - Open Systems Interconnection - Presentation service definition | - | - |
| ISO/IEC 8823-1 | 1994 | Information technology - Open Systems Interconnection - Connection-oriented presentation protocol: Protocol specification | - | - |
| ISO/IEC 8824-1 | 2008 | Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation | - | - |
| ISO/IEC 8825-1 | - | Information technology - ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER) | - | - |

¹⁾ To be published.

| <u>Publication</u> | <u>Year</u> | <u>Title</u> | <u>EN/HD</u> | <u>Year</u> |
|--------------------|-------------|--|--------------|-------------|
| ISO 9506-1 | 2003 | Industrial automation systems - Manufacturing - Message Specification - Part 1: Service definition | - | - |
| ISO 9506-2 | 2003 | Industrial automation systems - Manufacturing Message Specification - Part 2: Protocol specification | - | - |
| IEEE 754 | 1985 | Binary Floating-Point Arithmetic (R1990) | - | - |
| IEEE 802.1Q | 1998 | IEEE Standard for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks | - | - |
| IETF RFC 791 | - | Internet Protocol - DARPA Internet Program Protocol Specification | - | - |
| IETF RFC 792 | - | Internet Control Message Protocol | - | - |
| IETF RFC 793 | - | Transmission Control Protocol - DARPA Internet Program Protocol Specification | - | - |
| IETF RFC 826 | - | Ethernet Address Resolution Protocol | - | - |
| IETF RFC 894 | - | Standard for the Transmission of IP Datagrams over Ethernet Networks | - | - |
| IETF RFC 919 | - | Broadcasting Internet Datagrams | - | - |
| IETF RFC 1006 | - | ISO transport services on top of TCP: Version 3 | - | - |
| IETF RFC 1112 | - | Host Extensions for IP Multicasting | - | - |

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INTRODUCTION

This part of IEC 61850 defines the SCSM for sampled values over ISO/IEC 8802-3. The intent of this SCSM definition is to include the complete mapping of the sampled value model.

This part of IEC 61850 applies to electronic current and voltage transformers (ECT and EVT having a digital output), merging units, and intelligent electronic devices, for example protection units, bay controllers and meters, or sensors.

Process bus communication structures can be arranged in different ways as described in IEC/TR 61850-1. In addition to the transmission of sampled value data sets, which are directly connected to ISO/IEC 8802-3, a selection of IEC 61850-8-1 services is necessary to support the access to the SV control block. References to the relevant IEC 61850-8-1 services are provided in this SCSM. For less complex devices (for example merging units), the sampled value control block can be pre-configured, in which case there is no need to implement IEC 61850-8-1 services based on the MMS-Stack.

This document defines the mapping of sampled value class model (IEC 61850-7-2) to ISO/IEC 8802-3. This SCSM, in combination with IEC 61850-7 and IEC 61850-6, allows interoperability between devices from different manufacturers.

This standard does not specify individual implementations or products, nor does it constrain the implementation of entities and interfaces within a computer system. This standard specifies the externally visible functionality of implementations together with conformance requirements for such functionalities.

Reading guide:

- This document is an extended mapping specification of IEC 61850-8-1 to cover sampled value transmission over ISO/IEC 8802-3.
- This document can best be understood if the reader is thoroughly familiar with IEC 61850-7-1, IEC 61850-7-2, IEC 61850-7-3 and IEC 61850-7-4.
- The ACSI services defined in IEC 61850-7-2 are not explained in this part of IEC 61850.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 9-2: Specific communication service mapping (SCSM) – Sampled values over ISO/IEC 8802-3

1 Scope

This part of IEC 61850 defines the specific communication service mapping (SCSM) for the transmission of sampled values according to the abstract specification in IEC 61850-7-2. The mapping is that of the abstract model on a mixed stack using direct access to an ISO/IEC 8802-3 link for the transmission of the samples in combination with IEC 61850-8-1.

Each SCSM consists of three parts:

- a specification of the communication stack being used,
- the mapping of the abstract specifications of IEC 61850-7 series on the real elements of the stack being used, and
- the implementation specification of functionality, which is not covered by the stack being used.

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 60874-10-1, *Connectors for optical fibres and cables – Part 10-1: Detail specification for fibre optic connector type BFOC/2,5 terminated to multimode fibre type A1* (withdrawn)

IEC 60874-10-2, *Connectors for optical fibres and cables – Part 10-2: Detail specification for fibre optic connector type BFOC/2,5 terminated to single-mode fibre type B1* (withdrawn)

IEC 60874-10-3, *Connectors for optical fibres and cables – Part 10-3: Detail specification for fibre optic adaptor type BFOC/2,5 for single and multimode fibre* (withdrawn)

IEC/TR 61850-1, *Communication networks and systems for power utility automation – Part 1: Introduction and overview*

IEC/TS 61850-2, *Communication networks and systems for power utility automation – Part 2: Glossary*

IEC 61850-6, *Communication networks and systems for power utility automation – Part 6: Configuration description language for communication in electrical substations related to IEDs*

IEC 61850-7-1, *Communication networks and systems for power utility automation – Part 7-1: Basic communication structure – Part 7-1: Principles and models*

IEC 61850-7-2, *Communication networks and systems for power utility automation – Part 7-2: Basic information and communication structure – Abstract communication service interface (ACSI)*

IEC 61850-7-3, *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*

IEC 61850-7-4, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*

IEC 61850-8-1, *Communication networks and systems for power utility automation – Part 8-1: Specific Communication Service Mapping (SCSM) – Mappings to MMS (ISO 9506-1 and ISO 9506-2) and to ISO/IEC 8802-3*

IEC/TS 62351-6, *Power systems management and associated information exchange – Data and communications security – Part 6: Security for IEC 61850*

IEC 62439-3:2010, *Industrial communication networks – High availability automation networks – Part 3: Parallel Redundancy Protocol (PRP) and High-availability Seamless Redundancy (HSR) Amendment 1¹*

ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model*

ISO/IEC 8326:1996, *Information technology – Open Systems Interconnection – Session service definition*

ISO/IEC 8327-1:1996, *Information technology – Open Systems Interconnection – Connection-oriented session protocols: Protocol specification*

ISO/IEC 8649:1996, *Information technology – Open Systems Interconnection – Service definition for the Associated Control Service Element*

ISO/IEC 8650-1:1996, *Information technology – Open Systems Interconnection – Connection-oriented protocol for the Association Control Service Element: Protocol specification*

ISO/IEC 8802-3:2000, *Information technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements – Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications*

ISO/IEC 8822:1994, *Information technology – Open Systems Interconnection – Presentation service definition*

ISO/IEC 8823-1:1994, *Information technology – Open Systems Interconnection – Connection-oriented presentation protocol: Protocol specification*

ISO/IEC 8824-1:2008, *Information technology – Abstract Syntax Notation One (ASN. 1): Specification of basic notation*

ISO/IEC 8825-1, *Information technology – ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)*

ISO 9506-1:2003, *Industrial automation systems – Manufacturing Message Specification – Part 1: Service definition*

¹ To be published.

ISO 9506-2:2003, *Industrial automation systems – Manufacturing Message Specification – Part 2: Protocol specification*

IEEE 754:1985, *IEEE Standard for Binary Floating-Point Arithmetic*

IEEE 802.1Q:1998, *IEEE Standards for Local and Metropolitan Area Networks: Virtual Bridged Local Area Networks*

RFC 791, *Internet Protocol*; IETF, available at <http://www.ietf.org> [cited on 2011-03-18]

RFC 792, *Internet Control Message Protocol*; IETF, available at <http://www.ietf.org> [cited on 2011-03-18]

RFC 793, *Transmission Control Procedure*; IETF, available at <http://www.ietf.org> [cited on 2011-03-18]

RFC 826, *Ethernet Address Resolution Protocol or Converting Network Protocol Addresses to 48.bit Ethernet Address for Transmission on Ethernet Hardware*; IETF, available at <http://www.ietf.org> [cited on 2011-03-18]

RFC 894, *A Standard for the Transmission of IP Datagrams over Ethernet Networks*; IETF, available at <http://www.ietf.org> [cited on 2011-03-18]

RFC 919, *Broadcasting Internet Datagrams*; IETF, available at <http://www.ietf.org> [cited on 2011-03-18]

RFC 1006 *ISO transport services on top of TCP: Version 3*; IETF, available at <http://www.ietf.org> [cited on 2011-03-18]

RFC 1112, *Host Extensions for IP multicasting*; IETF, available at <http://www.ietf.org> [cited on 2011-03-18]

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC/TS 61850-2 apply.

4 Abbreviations

| | |
|-------|---|
| ACSI | Abstract communication service interface |
| ASDU | Application service data unit |
| ASN.1 | Abstract syntax notation number one |
| APCI | Application protocol control information |
| APDU | Application protocol data unit |
| APPID | Application identifier |
| AUI | Attachment unit interface |
| BER | ASN.1 basic encoding rules |
| BS | Bitstring |
| c | Conditional support. The item shall be implemented if the stated condition exists |
| CFI | Canonical format identifier |