INTERNATIONAL STANDARD

IEC

61850-7-1

First edition
2003-07

Communication networks and systems in substations –

Part 7-1:
Basic communication structure for substation and feeder equipment –
Principles and models

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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, 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.

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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.

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International Standard IEC 61850-7-1 has been prepared by IEC technical committee 57: Power system control and associated communications.

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

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<td>57/646/RVD</td>
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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.
IEC 61850 consists of the following parts, under the general title *Communication networks and systems in substations*.

Part 1: Introduction and overview
Part 2: Glossary
Part 3: General requirements
Part 4: System and project management
Part 5: Communication requirements for functions and device models
Part 6: Configuration description language for communication in electrical substations related to IEDs
Part 7-1: Basic communication structure for substation and feeder equipment – Principles and models
Part 7-2: Basic communication structure for substation and feeder equipment – Abstract communication service interface (ACSI)
Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes
Part 7-4: Basic communication structure for substation and feeder equipment – Compatible logical node classes and data classes
Part 8-1: Specific communication service mapping (SCSM) – Mappings to MMS (ISO/IEC 9506-1 and ISO/IEC 9506-2) and to ISO/IEC 8802-3
Part 9-1: Specific communication service mapping (SCSM) – Sampled values over serial unidirectional multidrop point to point link
Part 9-2: Specific communication service mapping (SCSM) – Sampled values over ISO/IEC 8802-3
Part 10: Conformance testing

The content of this part is based on existing or emerging standards and applications. The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this standard may be issued at a later date.

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1 To be published.
2 Under consideration.
INTRODUCTION

This part of the IEC 61850 series provides an overview of the architecture for communication and interactions between substation devices such as protection devices, breakers, transformers, substation hosts etc.

This document is part of a set of specifications which details a layered substation communication architecture. This architecture has been chosen to provide abstract definitions of classes (representing hierarchical information models) and services such that the specifications are independent of specific protocol stacks, implementations, and operating systems.

The goal of the IEC 61850 series is to provide interoperability between the IEDs from different suppliers or, more precisely, between functions to be performed in a substation but residing in equipment (physical devices) from different suppliers. Interoperable functions may be those functions that represent interfaces to the process (for example, circuit breaker) or substation automation functions such as protection functions. This part of the IEC 61850 series uses simple examples of functions to describe the concepts and methods applied in the IEC 61850 series.

This part of the IEC 61850 series describes the relationships between other parts of the IEC 61850 series. Finally this part defines how interoperability is reached.

NOTE Interchangeability, i.e. the ability to replace a device from the same vendor, or from different vendors, utilising the same communication interface and as a minimum, providing the same functionality, and with no impact on the rest of the system. If differences in functionality are accepted, the exchange may require some changes somewhere in the system also. Interchangeability implies a standardisation of functions and, in a strong sense, of devices which are both outside the scope of this standard. Interchangeability is outside the scope, but it will be supported following this standard for interoperability.
Table 1 – Guide for the reader

<table>
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The “x” means that this part of the IEC 61850 series should be read.
The “in extracts” means that extracts of this part of the IEC 61850 series should be read to understand the conceptual approach used.
The “–” means that this part of the IEC 61850 series may be read.

* These documents are under consideration.

This part of the IEC 61850 series is intended for all stakeholders of standardised communication and standardised systems in the utility industry. It provides an overview of and an introduction to IEC 61850-7-4, IEC 61850-7-3, IEC 61850-7-2, IEC 61850-6, and IEC 61850-8-1.

Table 1 provides a simplified guide as to which parts of the IEC 61850 series should be read by various stakeholders. Four groups are shown: utility, vendor, various consultants, and others.
1 Scope

This part of the IEC 61850 series introduces the modelling methods, communication principles, and information models that are used in the parts of IEC 61850-7-x. The purpose of this part of the IEC 61850 series is to provide – from a conceptual point of view – assistance to understand the basic modelling concepts and description methods for:

– substation-specific information models for substation automation systems,
– device functions used for substation automation purposes, and
– communication systems to provide interoperability within substations.

Furthermore, this part of the IEC 61850 series provides explanations and provides detailed requirements relating to the relation between IEC 61850-7-4, IEC 61850-7-3, IEC 61850-7-2 and IEC 61850-5. This part explains how the abstract services and models of IEC 61850-7-x are mapped to concrete communication protocols as defined in IEC 61850-8-1.

The concepts and models provided in this part of the IEC 61850 series may also be applied to describe information models and functions for:

– substation to substation information exchange,
– substation to control centre information exchange,
– information exchange for distributed automation,
– information exchange for metering,
– condition monitoring and diagnosis, and
– information exchange with engineering systems for device configuration.

NOTE 1  This part of IEC 61850 uses examples and excerpts from other parts of the IEC 61850 series. These excerpts are used to explain concepts and methods. These examples and excerpts are informative in this part of IEC 61850.

NOTE 2   Examples in this part use names of classes (e.g. XCBR for a class of a logical node) defined in IEC 61850-7-4, IEC 61850-7-3, and service names defined in IEC 61850-7-2. The normative names are defined in IEC 61850-7-4, IEC 61850-7-3, and IEC 61850-7-2 only.

NOTE 3  This part of IEC 61850 does not provide a comprehensive tutorial. It is recommended that this part be read first – in conjunction with IEC 61850-7-4, IEC 61850-7-3, and IEC 61850-7-2. In addition, it is recommended that IEC 61850-1 and IEC 61850-5 also be read.

NOTE 4  This part of IEC 61850 does not discuss implementation issues.
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 61850-2, Communication networks and systems in substations – Part 2: Glossary

IEC 61850-5, Communication networks and systems in substations – Part 5: Communication requirements for functions and devices models

IEC 61850-7-2, Communication networks and systems in substations – Part 7-2: Basic communication structure for substation and feeder equipment – Abstract communication service interface (ACSI)

IEC 61850-7-3, Communication networks and systems in substations – Part 7-3: Basic communication structure for substation and feeder equipment – Common data classes

IEC 61850-7-4, Communication networks and systems in substations – Part 7-4: Basic communication structure for substation and feeder equipment – Compatible logical node classes and data classes

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 8825 (all parts), Information technology – ASN.1 encoding rules
