

Communication networks and systems in substations —

Part 4: System and project management

The European Standard EN 61850-4:2002 has the status of a British Standard

ICS 33.200

National foreword

This British Standard is the official English language version of EN 61850-4:2002. It is identical with IEC 61850-4:2002.

The UK participation in its preparation was entrusted to Technical Committee PEL/57, Power system control and associated communications, which has the responsibility to:

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Kommunikationsnetze und -systeme
in Stationen
Teil 4: System- und Projektverwaltung
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Foreword

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Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annex ZA is normative and annexes A and B are informative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61850-4:2002 was approved by CENELEC as a European Standard without any modification.

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COMMUNICATION NETWORKS AND SYSTEMS IN SUBSTATIONS –

Part 4: System and project management

1 Scope and object

This part of IEC 61850 applies to substation automation systems (SAS). It defines the communication between intelligent electronic devices (IEDs) in the substation and the related system requirements.

The specifications of this part pertain to the system and project management with respect to:

- the engineering process and its supporting tools;
- the life cycle of the overall system and its IEDs;
- the quality assurance beginning with the development stage and ending with discontinuation and decommissioning of the SAS and its IEDs.

The requirements of the system and project management process and of special supporting tools for engineering and testing are described.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61850. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61850 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60848:1988, *Preparation of function charts for control systems*

IEC 61082 (all parts), *Preparation of documents used in the electrotechnology*

IEC 61175:1993, *Designations for signals and connections*

IEC 61346 (all parts), *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations*

ISO 9001:1994, *Quality systems – Model for quality assurance in design, development, production, installation and servicing*

3 Definitions

For the purpose of this part of IEC 61850, the following definitions apply:

3.1

supporting tools

those that support the user in the engineering, the operation and the management of the SAS and its IEDs. The following tasks can be implemented:

- engineering;
- project management;
- parameter change(s);
- diagnostics;
- testing;
- documentation;
- other services.

NOTE The tools are usually part of the SAS.

3.1.1

engineering tools

those tools that support the creation and documentation of the conditions for adapting an SAS to the specific substation and customer requirements. They are divided into project management, parameterization and documentation tools.

3.2

expandability

the criteria for the efficient extension of an SAS (hardware and functional) by use of the engineering tools

3.3

flexibility

the criteria for the fast and efficient implementation of functional changes including hardware

3.4

scalability

the criteria for a cost effective SAS while recognizing various functionalities, various IEDs, substation sizes and substation voltage ranges

3.5

parameters

variables which define the behaviour of functions of the SAS and its IEDs within a given range of values

3.5.1

system parameters

data which define the interaction of IEDs in the SAS. They are especially important in the:

- configuration of the SAS;
- communication between IEDs;
- marshalling of data between IEDs;
- processing and visualization of data from other IEDs (for example, at the station level)

3.6**IED-parameter set**

all parameter values needed for the definition of the behaviour of the IED and its adaptation to the substation conditions. Where the IED has to operate autonomously, the parameter-set can be generated without system parameters using an IED-specific parameterization tool. Where the IED is a part of the SAS the parameter set may include system parameters, which should be coordinated by a general parameterization tool at the SAS level

3.7**SAS-parameter set**

all parameter values needed for the definition of the behaviour of the overall SAS and its adaptation to the substation conditions. The parameter set includes the IED-parameter sets of all participating IEDs

3.8**remote terminal unit (RTU)**

typically used as an outstation in a Supervisory Control and Data Acquisition (SCADA) system. An RTU may act as an interface between the communication network and the substation equipment. The function of an RTU may reside in one IED or may be distributed

3.9**SAS product family**

different IEDs of one manufacturer with various functionalities and with the ability to perform substation automation systems. The IEDs of a product family are unified in relation to the design, the operational handling, the mounting and wiring conditions and they use common or coordinated supporting tools

3.10**SAS installation**

the concrete instance of a substation automation system consisting of multiple interoperable IEDs of one or more manufacturers

3.11**configuration list**

an overview of all compatible hardware and software versions of components and IEDs including the software versions of relevant supporting tools operating together in an SAS-product family. Additionally, the configuration list contains the supported transmission protocols for communication with IEDs of other manufacturers

3.12**manufacturer**

the producer of IEDs and/or supporting tools. A manufacturer may be able to deliver an SAS solely by use of his own IEDs and supporting tools (SAS product family)

3.13**system integrator**

a turnkey deliverer of SAS installations. The responsibility of system integration includes the engineering, the delivery and mounting of all participating IEDs, the factory and site acceptance tests and the trial operation. The quality assurance, the maintenance and spare delivery obligations and the warranty shall be agreed in the contract between the system integrator and the customer

3.14

system life cycle

the term has two specific meanings:

- a) for the manufacturer, the time period between the start of the production of a newly developed SAS product family and the discontinuation of support for the relevant IEDs;
- b) for the customer, the time period between the commissioning of the SAS-installation mainly based on a SAS product family and the decommissioning of the latest SAS-installation from the same family

3.15

test equipment

all tools and instruments which simulate and verify the input/outputs of the operating environment of the SAS such as switchgear, transformers, network control centres or connected telecommunication units on the one side, and the communication channels between the IEDs of the SAS on the other

3.16

conformance test

the check of data flow on communication channels in accordance with the standard conditions concerning access organization, formats and bit sequences, time synchronization, timing, signal form and level, reaction to errors. The conformance test can be carried out and certified for the standard or specially described parts of the standard. The conformance test should be carried out by an ISO 9001 certified organization or system integrator

3.17

system test

the check of correct behaviour of the IEDs and of the overall SAS under various application conditions. The system test marks the final stage of the development of IEDs as part of a SAS product family

3.18

type test

the verification of correct behaviour of the IEDs of the SAS by use of the system tested software under the environmental test conditions corresponding with the technical data. This marks the final stage of the hardware development and is the precondition for the start of the production. This test must be carried out with IEDs that have been manufactured through the normal production cycle

3.19

factory acceptance test (FAT)

customer agreed functional tests of the specifically manufactured SAS-installation or its parts, using the parameter set for the planned application. This test should be carried out in the factory of the system integrator by the use of process simulating test equipment

3.20

site acceptance test (SAT)

the verification of each data and control point and the correct functionality inside the SAS and between the SAS and its operating environment at the whole installed plant by use of the final parameter set. The SAT is a precondition for the SAS being put into operation

4 Abbreviations

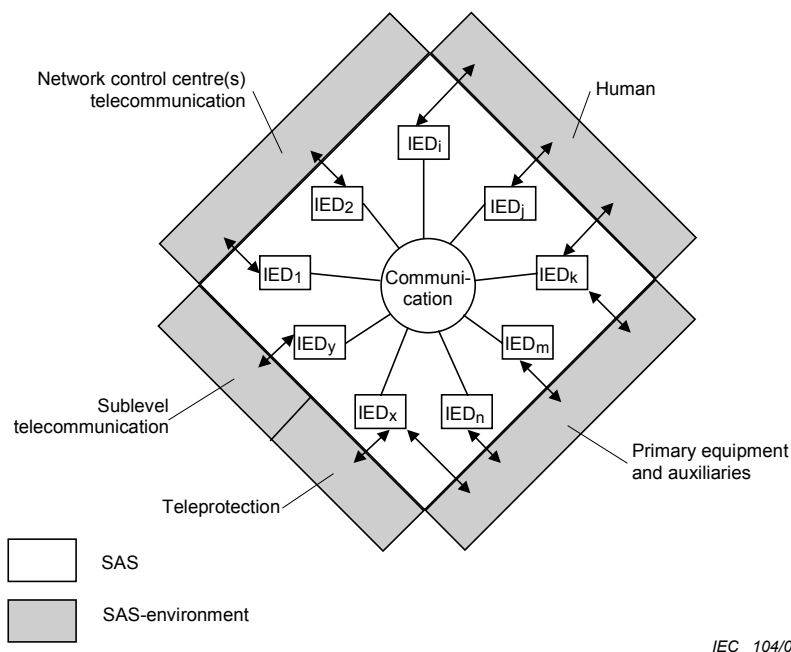
ASDU	- Application Service Data Unit
CD ROM	- Compact Disc Read Only Memory
CAD	- Computer Aided Design
CT	- Current Transformer
FAT	- Factory Acceptance Test
HMI	- Human Machine Interface
IED	- Intelligent Electronic Device
PE	- Process Environment
RTU	- Remote Terminal Unit
SAS	- Substation Automation System
SAT	- Site Acceptance Test
SCADA	- Supervisory Control and Data Acquisition
TE	- Telecommunication Environment
VT	- Voltage Transformer

5 Engineering requirements

5.1 Introduction

The engineering includes:

- the definition of the necessary hardware configuration of the SAS: i.e. the definition of the IEDs and their interfaces with one another and to the environment as shown in figure 1;
- the adaptation of functionality and signal quantities to the specific operational requirements by use of parameters;
- the documentation of all specific definitions (i.e. parameter set, terminal connections, etc.).



IEC 104/02

Figure 1 – Structure of the SAS and its environment

As shown in figure 1, the SAS consists of different IEDs which communicate with each other via communication channels and which execute tasks concerning interactions with the environment of the SAS, such as:

- telecommunication environment (TE);
 - network control centre(s);
 - subordinate systems;
 - teleprotection.
- the human as a local operator.
- process environment (PE) like switchgear, transformer, auxiliaries.

NOTE Teleprotection is outside the scope of the IEC 61850 series.

Typical IEDs may be:

- for the telecommunication environment:
 - gateways;
 - converters;
 - RTUs (telecommunication side);
 - protection relays (teleprotection side).
- for the human machine interface (HMI):
 - gateways;
 - personal computers;
 - workstations;
 - IEDs with integrated HMIs.
- for the process environment (PE):
 - bay control units;
 - protection relays;
 - RTUs (process side);
 - meters;
 - autonomous controllers (i.e. voltage controllers);
 - transducers;
 - digital VTs and CTs.

5.2 Categories and types of parameters

5.2.1 Classification

Parameters are data, which control and support the operation of:

- hardware configuration (composition of IEDs);
- software of IEDs;
- process environment (primary equipment and auxiliaries);
- HMI with different supporting tools; and
- telecommunication environment

in a substation automation system (SAS) and its IEDs in such a way that the operations of the substation and customer specific requirements are fulfilled.