Communication networks and systems for power utility automation

Part 5: Communication requirements for functions and device models
National foreword

This British Standard is the UK implementation of EN 61850-5:2013+A1:2022. It is identical to IEC 61850-5:2013, incorporating amendment 1:2022. It supersedes BS EN 61850-5:2003 which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by [\textsuperscript{A}\textsubscript{1}].

The UK participation in its preparation was entrusted to Technical Committee PEL/57, Power systems management and associated information exchange.

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Communication networks and systems for power utility automation - Part 5: Communication requirements for functions and device models

(IEC 61850-5:2013)

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This document supersedes EN 61850-5:2003.

EN 61850-5:2013 includes the following significant technical changes with respect to EN 61850-5:2003:
- extension from substation automation systems to utility automation systems;
- including the interfaces for communication between substations (interfaces 2 and 11);
- requirements from communication beyond the boundary of the substation.

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European foreword to Amendment 1

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<td>Electrical Power System Device Function - Numbers, Acronyms, and Contact Designations</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>
CONTENTS

FOREWORD ............................................................................................................................... 9
INTRODUCTION .......................................................................................................................... 11
  1 Scope ................................................................................................................................ 12
  2 Normative references ........................................................................................................ 12
  3 Terms and definitions ........................................................................................................ 15
    3.1 General ......................................................................................................................... 15
    3.2 Connections ................................................................................................................ 17
    3.3 Relations between IEDs ............................................................................................. 18
    3.4 Substation structures ................................................................................................. 18
    3.5 Power utility automation functions at different levels ............................................. 19
    3.6 Miscellaneous .......................................................................................................... 20
  4 Abbreviations .................................................................................................................... 20
  5 Power utility automation functions .................................................................................. 21
    5.1 General ......................................................................................................................... 21
    5.2 Example substation automation system ..................................................................... 21
      5.2.1 General ................................................................................................................ 21
      5.2.2 Logical allocation of application functions and interfaces ............................... 21
      5.2.3 The physical allocation of functions and interfaces ........................................... 23
      5.2.4 The role of interfaces ......................................................................................... 23
    5.3 Other application examples ....................................................................................... 24
      5.3.1 Substation – Substation ..................................................................................... 24
      5.3.2 Substation – Network Control Center ............................................................... 24
      5.3.3 Wind .................................................................................................................... 24
      5.3.4 Hydro ................................................................................................................. 24
      5.3.5 DER and distribution automation ..................................................................... 24
      5.3.6 FACTS and Power Conversion ....................................................................... 25
      5.3.7 Distribution Automation and Feeder Automation ........................................... 25
  6 Goal and requirements ........................................................................................................ 26
    6.1 Interoperability .......................................................................................................... 26
    6.2 Static design requirements ........................................................................................ 26
    6.3 Dynamic interaction requirements ............................................................................ 27
    6.4 Response behaviour requirements ............................................................................ 27
    6.5 Approach to interoperability .................................................................................... 28
    6.6 Conformance test requirements ................................................................................ 28
  7 Categories of application functions .................................................................................. 28
    7.1 General ......................................................................................................................... 28
    7.2 System support functions .......................................................................................... 29
    7.3 System configuration or maintenance functions ...................................................... 29
    7.4 Operational or control functions .............................................................................. 29
    7.5 Bay local process automation functions .................................................................. 29
    7.6 Distributed process automation functions ............................................................... 30
  8 Description and requirements of application functions .................................................. 30
    8.1 Approach ..................................................................................................................... 30
    8.2 Application function description .............................................................................. 31
    8.3 The PICOM description .............................................................................................. 31
9.5.5 Use of Logical Nodes for applications ......................................................... 65
10 System description and system requirements ..................................................... 65
  10.1 Need for a formal system description ............................................................. 65
  10.2 Requirements for Logical Node behaviour in the system ............................ 65
11 Performance requirements .................................................................................. 66
  11.1 Time synchronisation .................................................................................... 66
  11.2 Message performance requirements .............................................................. 70
  11.2.1 Basic definitions and requirements ............................................................ 70
  11.2.2 Concepts of message types and performance classes ............................... 73
  11.2.3 Definition of transfer time and synchronization classes ........................... 75
  11.3 Definition of messages types and performances classes ............................. 76
  11.3.1 Type 1 – Fast messages ("Protection") .......................................................... 76
  11.3.2 Type 2 – Medium speed messages ("Automatics") ........................................ 77
  11.3.3 Type 3 – Low speed messages ("Operator") .................................................. 77
  11.3.4 Type 4 – Raw data messages ("Samples") ..................................................... 77
  11.3.5 Type 5 – File transfer functions ................................................................. 78
  11.3.6 Type 6 – Command messages and file transfer with access control .......... 78
  11.4 Requirements for data and communication quality ....................................... 79
  11.4.1 General remarks ....................................................................................... 79
  11.4.2 Data integrity ............................................................................................ 79
  11.4.3 Reliability .................................................................................................. 80
11.5 Requirements concerning the communication system ..................................... 82
  11.5.1 Communication failures ........................................................................... 82
  11.5.2 Requirements for station and bay level communication ............................. 82
  11.5.3 Requirements for process level communication ......................................... 83
  11.5.4 Requirements for recovery delay ............................................................... 83
  11.5.5 Requirements for communication redundancy ......................................... 83
11.6 System performance requirements ................................................................. 84
12 Additional requirements for the data model ....................................................... 84
  12.1 Semantics .................................................................................................... 84
  12.2 Logical and physical identification and addressing ......................................... 84
  12.3 Self-description ............................................................................................ 84
  12.4 Administrative issues ................................................................................... 84
Annex A (informative) Logical nodes and related PICOMs .................................. 86
Annex B (informative) PICOM identification and message classification ............ 101
  B.1 General ........................................................................................................ 101
  B.2 Identification and type allocation of PICOMs ................................................. 102
Annex C (informative) Communication optimization .......................................... 109
Annex D (informative) Rules for function definition ............................................. 110
  D.1 Function definition ....................................................................................... 110
  D.2 Function description ..................................................................................... 110
  D.2.1 Task of the function .................................................................................. 110
  D.2.2 Starting criteria for the function ............................................................... 110
  D.2.3 Result or impact of the function ............................................................... 110
  D.2.4 Performance of the function .................................................................... 110
  D.2.5 Function decomposition ........................................................................... 110
  D.2.6 Interaction with other functions ............................................................... 110
Annex H (informative) Substation configurations ................................................................. 144
  H.1 Selected substations and associated layouts .............................................................. 144
  H.2 Assigned protection and control functions ................................................................. 145
    H.2.1 General .................................................................................................................. 145
    H.2.2 Substation T1-1 .................................................................................................... 145
    H.2.3 Substation D2-1 .................................................................................................... 147
    H.2.4 Substation T1-2 .................................................................................................... 147
    H.2.5 Substation T2-2 .................................................................................................... 147

Annex I (informative) Examples for protection functions in compensated networks .......... 149
  I.1 The Transient Earth Fault (PTEF) .............................................................................. 149
  I.2 Short term bypass (YPSH) ........................................................................................ 150
  I.3 The double earth fault (PTOC) .................................................................................. 150

Bibliography .......................................................................................................................... 151

Figure 2 – Levels and logical interfaces in substation automation systems ............................. 22
Figure 3 – The logical node and link concept (explanation see text) ........................................ 34
Figure 4 – Examples of the application of the logical node concept (explanation see text) ....... 35
Figure 5 – Protection function consisting of three Logical Nodes .......................................... 36
Figure 6 – The basic communication links of a logical node of main protection type .............. 43
Figure 7 – Decomposition of functions into interacting LNs on different levels: Examples for generic automatic function, breaker control function and voltage control function ................................................................. 61
Figure 8 – Decomposition of functions into interacting LN on different levels: Examples for generic function with telecontrol interface, protection function and measuring/metering function ................................................................. 62
Figure 9 – Example for control and protection LNs of a transformer bay combined in one physical device (some kind of maximum allocation) ................................................................. 62
Figure 10 – Example for interaction of LNs for switchgear control, interlocking, synchrocheck, autoreclosure and protection (Abbreviation for LN see above) ................................. 63
Figure 11 – Example for sequential interacting of LNs (local and remote) in a complex function like point-on-wave switching (Abbreviations for LN see above) – Sequence view ................................................. 63
Figure 12 – Circuit breaker controllable per phase (XCBR instances per phase) and instrument transformers with measuring units per phase (TCTR or TVTR per phase) ............. 64
Figure 14 – Transfer time for binary signal with conventional output and input delays ............. 71
Figure 15 – Definition of transfer time \( t \) for binary signals in case of line protection .......... 72
Figure 16 – Definition of transfer time \( t \) over serial link in case of line protection ................. 73

Figure H.1 – T1-1 Small size transmission substation (single busbar 132 kV with infed from 220 kV) ........................................................................................................ 144
Figure H.2 – D2-1 Medium size distribution substation (double busbar 22 kV with infed from 69 kV) ........................................................................................................ 144
Figure H.3 – T1-2 Small size transmission substation (1 1/2 breaker busbar at 110 kV) ......... 144
Figure H.4 – T2-2 Large size transmission substation (ring bus at 526 kV, double busbar at 138 kV) ........................................................................................................ 145
Figure H.5 – Substation of type T1-1 with allocation functions ............................................. 146
Figure H.6 – Substation of type D2-1 with allocated functions ............................................ 147
Figure H.7 – Substation of type T1-2 (functions allocated same as for T2-2 in Figure H.8) .... 147
Figure H.8 – Substation of type T2-2 with allocated functions ............................................. 148
Figure I.1 – The transient earth fault in a compensated network ......................................... 149
Table G.5 – Function decomposition into logical nodes (Part 3) .......................................... 142
Table G.6 – Function decomposition into logical nodes (Part 4) .......................................... 143
Table H.1 – Definition of the configuration of all substations evaluated ............................... 145
INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMUNICATION NETWORKS AND SYSTEMS
FOR POWER UTILITY AUTOMATION –

Part 5: Communication requirements
for functions and device models

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This consolidated version of the official IEC Standard and its amendment has been prepared for user convenience.

International Standard IEC 61850-5 has been prepared by IEC technical committee 57: Power systems management and associated information exchange.

The changes, corrections and updates have been made mainly according to the comments received.

The major changes of this consolidated version with regard to the edition 2 are as follows:

a) extensions of the requirements with some Logical Nodes
b) errors and typos have been corrected
c) harmonization of all Logical Node descriptions (impact on all Logical Node tables)
d) re-organization of selected clause structures
e) updating of headlines
f) re-ordering subclauses in the chapter about performances

to provide
– ease of reading and understanding of the requirements for the IEC 61850 series
– consistent and updated requirement references for the data model and communication service parts

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all the parts in the IEC 61850 series, published under the general title Communication networks and systems for power utility automation, can be found on the IEC website.

Future standards in this series will carry the new general title as cited above. Titles of existing standards in this series will be updated at the time of the next edition.

The committee has decided that the contents of the base publication and its amendment will remain unchanged until the stability date indicated on the IEC web site under 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.
This part of IEC 61850 is part of a set of standards, the IEC 61850 series. The IEC 61850 series is intended to provide interoperability between all devices in power utility automation systems. Therefore, it defines communication networks and systems for power utility automation, and more specifically the communication architecture for subsystems like substation automation systems. The sum of all subsystems may result also in the description of the communication architecture for the overall power system management.

Communication between these devices in subsystems and between the subsystems within the overall power utility automation system fulfils a lot of requirements imposed by all the functions to be performed in power utility automation systems starting from the core requirements in substations. These requirements are stated both for the data to be organized in a data model and for the data exchange resulting in services. Performance of the data exchange means not only transfer times but also the quality of the data exchange avoiding losses of information in the communication.

Depending on the philosophy both of the manufacturer and the user and on the state-of-the-art in technology, the allocation of functions to devices and control levels is not commonly fixed. Therefore, the standard shall support any allocation of functions. This results in different requirements for the different communication interfaces within the substation or plant, at its border and beyond.

The IEC 61850 series shall be long living but allow following the fast changes in communication technology by both its technical approach and its document structure. The IEC 61850 series has been organized so that at least minor changes to one part do not require a significant rewriting of another part. For example, the derived data models in subsequent parts (IEC 61850-7-x) and mappings to dedicated stacks (IEC 61850-8-x and IEC 61850-9-x) based on the communication requirements in IEC 61850-5 will not change the requirements defined in IEC 61850-5. In addition, the general parts, the requirement specification and the modelling parts are independent from any implementation. The implementation needed for the use of the standard is defined in some few dedicated parts referring to mainstream communication means thus supporting the long living of the standard and its potential for later technical changes.

This consolidated version of IEC 61850-5:2013 and its Amendment 1 defines the communication requirements for functions and device models for power utility automation systems.

The modelling of communication requires the definition of objects (e.g., data objects, data sets, report control, log control) and services accessing the objects (e.g., get, set, report, create, delete). This is defined in IEC 61850-7 with a clear interface to implementation. To use the benefits of communication technology, in this standard no new protocol stacks are defined but a standardized mapping on existing stacks is given in IEC 61850-8 and IEC 61850-9. A System configuration language (IEC 61850-6) for strong formal description of the system usable for software tools and a standardized conformance testing (IEC 61850-10) complement the standard.

NOTE 1 To keep the layered approach of the standard not mixing application and implementation requirements, terms like client, server, data objects, etc. are normally not used in IEC 61850-5 (requirements). In IEC 61850-7 (modelling), -8 and -9 (specific communication service mapping) terms belonging to application requirements like PICOM are normally not used.

NOTE 2 Specific requirements concerning extensions of part 8 are covered in separate technical reports, e.g. IEC TR 61850-80-3.
1 Scope

The specifications of this document refer to general, respectively core, communication requirements of the application functions in all domains of power utility automation systems. Dedicated communication requirements and most examples of application functions in this document are from the domain substation automation but may be reused in or extended to other domains within power utility automation systems. Note that sometimes instead of the term substation automation domain the term substation domain is used, especially if both the switchyard devices (primary system) and the automation system (secondary system) are regarded.

The description of the application functions is not used to standardize these functions, but to identify communication requirements between Intelligent Electronic Devices (IEDs) hosting these functions within plants and substations in the power system, between such stations (e.g. between substation for line protection) and between the plant or substation and higher-level remote operating places (e.g. network control centres) and maintenance places. In addition interfaces to remote technical services (e.g. maintenance centres) are considered. The general scope is the communication requirements for power utility automation systems. The basic goal is interoperability for all interactions providing a seamless communication system for the overall power system management. Another prerequisite for interoperability is a commonly defined method for time synchronization.

Standardizing application functions and their implementation is completely outside the scope of this document. Therefore, it cannot be assumed a single philosophy of allocating application functions to devices. To support the resulting request for free allocation of these functions, a proper breakdown of these functions into parts relevant for communication is defined. The exchanged data and their required performance are defined.

The same or similar IEDs from substations like protective and control devices are found in other domains like power plants also. Using this document for such devices in these plants facilitates the system integration e.g. between the power plant control and the related substation automation system. For some of such other application domains like wind power plants, hydro power plants and distributed energy resources specific standard parts according to the IEC 61850 series have been already defined and published.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60617, Graphical symbols for diagrams – 12-month subscription to regularly updated online database comprising parts 2 to 13 of IEC 60617

IEC 60834-1:1999, Teleprotection equipment of power systems – Performance and testing – Part 1: Command systems