# IEC TR 61850-90-14

Edition 1.0 2021-12

# TECHNICAL REPORT

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## Communication networks and systems for power utility automation – Part 90-14: Using IEC 61850 for FACTS (flexible alternate current transmission systems), HVDC (high voltage direct current) transmission and power conversion data modelling

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 33.200

ISBN 978-2-8322-4524-8

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# CONTENTS

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IEC TR 61850-90-14 has been prepared by working group 10: Power system IED communication and associated data models, of IEC technical committee 57: Power systems management and associated information exchange. It is a Technical Report.

The text of this Technical Report is based on the following documents:

| Draft | Report on voting |
|---|---|
| 57/2232/DTR | 57/2273/RVDTR |

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The language used for the development of this Technical Report is English.

A list of all 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.

This IEC standard includes Code Components i.e. components that are intended to be directly processed by a computer.

Such content is any text found between the markers and, or otherwise is clearly labelled in this standard as a Code Component.

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The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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- withdrawn,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

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# INTRODUCTION

The IEC 61850 series was established to focus on the main primary equipment and functionality of conventional AC substations. By now it has been widely deployed and has become state of the art in that area.

Soon after, ambitions emerged to make IEC 61850 applicable to a largely widened range of equipment and functionality. Even completely new domains, like wind or hydro power generation, have created extensions to the series in order to match their applications.

Thanks to the very generic basic information and communication structures of IEC 61850 and the integrated services provided, most domain requirements can be easily adopted and fulfilled with IEC 61850 core functionality. Most of the extension work thus just needs to focus on creating a domain specific data modelling, which allows the semantic description of domain specific signals.

Due to the latest boom in deploying an exponentially increasing number of power electronics and semiconductor based equipment directly in the area of medium, high and ultra-high voltage transmission networks, the call for integrating those direct current related processes and control systems into IEC 61850 is only logical and consecutive.

Two main groups of DC based types of applications exist: FACTS devices (shunt and series connected) that mainly influence the network at a definite point of connection and Power Converters (e.g. HVDC, SFC) that additionally allow the transmission of active power between two different points of connection.

The benefits of those technologies are clear: as methods to influence conventional AC networks are limited, DC based technologies provide the possibility to actively adjust power flow and network parameters like frequency and voltage within just milliseconds. They help to support network stability, performance and quality, increase transmission capacity. They enable transmission tasks that would otherwise be technically borderline or impossible, moreover doing so mostly with unprecedented efficiency respectively low losses.

FACTS and Power Conversion are thus indispensable to secure power supply and represent a vital component within the backbone of efficient, reliable and resilient future smart grids. This technical report finally enables those technologies to also become an integral part of the IEC 61850 world.

# COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

# Part 90-14: Using IEC 61850 for FACTS (flexible alternate current transmission systems), HVDC (high voltage direct current) transmission and power conversion data modelling

## 1 Scope

This part of IEC 61850, which is a technical report, specifies the information model of devices and functions related to systems of power utility automation, specifically related to FACTS (Flexible AC Transmission Systems) and Power Conversion applications.

The IEC 61850-90-14 information model standard utilizes existing IEC 61850-7-4 logical nodes where possible, but also defines specific logical nodes where needed.

Specifically, the scope of this document:

- Covers communication between control system of FACTS, HVDC and Power Conversion and SCADA and HMI systems
- Includes the data model for FACTS, HVDC and Power conversion devices
- Does not cover Protection relays
- Does not cover process bus
- Does not cover valve communication

### 1.1 Namespace name and version

This new subclause is mandatory for any IEC 61850 namespace (as defined by IEC 61850-7-1:2011).

Table 1 shows all attributes of (Tr)IEC 61850-90-14:2020A namespace.

**Table 1 – Attributes of (Tr)IEC 61850-90-14:2020A namespace**

| Attribute | Content |
|---|---|
| **Namespace nameplate** | |
| Namespace Identifier | (Tr)IEC 61850-90-14 |
| Version | 2020 |
| Revision | A |
| Release | 3 |
| Full Namespace Name | (Tr)IEC 61850-90-14:2020A |
| Namespace Type | transitional |
| **Namespace dependencies** | |
| extends | IEC 61850-7-4:2007B version:2007 revision:B |
| **Namespace transitional status** | |
| Future handling of namespace content | The name space (Tr)IEC 61850-90-14:2020A is considered as "transitional" since the models are expected to be included in further editions of IEC 61850-7-4xx. Potential extensions/modifications may happen if/when the models are moved to the International Standard status |

The table below provides an overview of all published versions of this namespace.

| Edition | Publication date | Webstore | Namespace |
|---|---|---|---|
| Edition 1.0 | 2020-xx | IEC TR 61850-90-14:2020 | (Tr)IEC 61850-90-14:2020 |

Table 2 shows all tracking information of (Tr)IEC 61850-90-14:2020A namespace building-up.

**Table 2 – Tracking information of (Tr)IEC 61850-90-14:2020A namespace building-up**

| Attribute | Content |
|---|---|
| **Namespace IEC specific information** | |
| Version of the UML model used for generating the document (informative) | wg10built7-wg18built5-wg17built6-jwg25built2-tc17built1-tc38built1_20210122.eap |
| Date of the UML model used for generating the document (informative) | 2021-01-22 |
| Autogeneration software name and version(informative) | j61850DocBuilder 01v12 based on jCleanCim 02v02-NS beta5 |

## 1.2 Code Component distribution

The Code Components are in light and full version:

- The full version is named: *IEC_TR_61850-90-14.NSD.2020A.Full*. It contains definition of the whole data model defined in this standard with the documentation associated and access is restricted to purchaser of this part

- The light version is named: *IEC_TR_61850-90-14.NSD.2020A3.Light*. It does not contain any documentations but contains the whole data model as per full version, and this light version is freely accessible on the IEC website for download at: http://www.iec.ch/tc57/supportdocuments, but the usage remains under the licensing conditions.

The Code Components for IEC 61850 data models are formatted in compliance with the NSD format defined by the standard IEC 61850-7-7. Each Code Component is a ZIP package containing:

- the electronic representation of the Code Component itself (possibly multiple files),
- the grammar files (XSD) enabling to check the consistency of the associated files against the defined version of NSD, but as well against the IEC 61850 flexibility rules in case of private extensions
- a file describing the content of the package (IECManifest.xml)

The IECManifest file contains different sections giving information on:

- The copyright notice
- The identification of the code component
- The publication related to the code component
- The list of the electronic files which compose the code component
- An optional list of history files to track changes during the evolution process of the code component

The life cycle of a code component is not restricted to the life cycle of the related publication. The publication life cycle goes through two stages, Version (corresponding to an edition) and Revision (corresponding to an amendment). A third publication stage (Release) allows publication of Code Component in case of urgent fixes of InterOp Tissues, thus without need to publish an amendment.

Consequently new release(s) of the Code Component may be released, which supersede(s) the previous release, and will be distributed through the IEC TC57 web site at: http://www.iec.ch/tc57/supportdocuments.

The latest version/release of the document will be found by selecting the file named *IEC_TR_61850-90-14.NSD.{VersionStateInfo}.Light* with the filed VersionStateInfo of the highest value.

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

IEC 61850-5:2013, *Communication networks and systems for power utility automation – Part 5: Communication requirements for functions and device models*
IEC 61850-5:2013/AMD1:2021

IEC 61850-6:2009, *Communication networks and systems for power utility automation – Part 6: Configuration description language for communication in electrical substations related to IEDs*
IEC 61850-6:2009/AMD1:2018

IEC 61850-7-2:2010, *Communication networks and systems for power utility automation – Part 7-2: Basic information and communication structure – Abstract communication service interface (ACSI)*
IEC 61850-7-2:2010/AMD1:2020

IEC 61850-7-3:2010, *Communication networks and systems for power utility automation – Part 7-3: Basic communication structure – Common data classes*
IEC 61850-7-3:2010/AMD1:2020

IEC 61850-7-4:2010, *Communication networks and systems for power utility automation – Part 7-4: Basic communication structure – Compatible logical node classes and data object classes*
IEC 61850-7-4:2010/AMD1:2020

IEC 60633:2019, *High-voltage direct current (HVDC) transmission – Vocabulary*

IEC TR 61850-7-500:2017, *Communication networks and systems for power utility automation – Part 7-500: Basic information and communication structure – Use of logical nodes for modeling application functions and related concepts and guidelines for substations*