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TECHNICAL REPORT

colour inside

Communication networks and systems for power utility automation – Part 90-17: Using IEC 61850 to transmit power quality data

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 90-17: Using IEC 61850 to transmit power quality data

FOREWORD

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IEC 61850-90-17, which is a technical report, has been prepared by IEC technical committee 57: Power systems management and associated information exchange, in cooperation with IEC technical committee 85: Measuring equipment for electrical and electromagnetic quantities.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
57/1676/DTR	57/1836/RVDTR

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

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

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

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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- withdrawn,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.

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

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.

INTRODUCTION

Power quality (PQ) measurement methods are defined in IEC 61000-4-30.

Power quality measurement instruments are used to evaluate the quality of electricity (voltage characteristics) supplied by distribution and transmission systems and to evaluate the performance (emission) of equipment.

These instruments provide different types of data for different applications of PQ data:

- Power quality monitoring:
  - Continuity of supply monitoring,
  - Monitoring of different voltage characteristics: Voltage quality (VQ) covers a wide range of voltage disturbances and deviations in voltage magnitude or waveform from the optimum values.
- Power quality compliance reporting:
  - Continuous monitoring and compliance reporting of different voltage characteristics at point of connection.
  - Additional data are helpful for:
    a) Detailed problem analysis (e.g. waveform or transient records),
    b) Flexible data evaluation (e.g. grid codes for data post processing).

NOTE See also “Document on Guidelines of Good Practice on the Implementation and Use of Voltage Quality Monitoring Systems for Regulatory Purposes, which has been jointly developed by CEER and the ECRB” (C12-EQS-51-03) and CIGRÉ/CIRED Joint Working Group (JWG) C4.112: “Guidelines for Power quality monitoring – measurement locations, processing and presentation of data”.

IEC 61850 provides the services and data modeling for transmission of PQ related data from instruments to substation/SCADA systems.

There is a desire to have a communication mechanism that is compliant to the concept of IEC 61850. This document lays out how this shall be done.

File based transmission of PQ data is based on the following standards:

- IEC 60255-24/IEEE Std. C37.111, *Measuring relays and protection equipment – Part 24: Common format for transient data exchange (COMTRADE) for power systems for fault records,*
- IEEE Std. 1159.3, PQDIF for PQ records (events, measurements, records).

During modelling of PQ applications IEC 61850-7-4 and IEC 61850-7-3 will be reviewed.

COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 90-17: Using IEC 61850 to transmit power quality data

1 Scope

This part of IEC 61850, which is a technical report, provides a way of exchanging power quality data between instruments whose functions include measuring, recording and possibly monitoring power quality phenomena in power supply systems, and clients using them in a way that is compliant to the concepts of IEC 61850.

The main goal is the interoperability of power quality instruments.

NOTE 1 The measurement of PQ phenomena maybe provided by communication e.g. IEC 61850-9-2 or instrument transformers. Their application is outside of the scope of this document.

NOTE 2 This document does not set any limits for power quality values, but only repeats limits from other sources (e.g. EN 50160, IEC TS 62749) as suitable examples.

NOTE 3 This document provides recommendations for naming conventions for PQ measurements provided by power quality instruments to manifest the usage of Power quality measurement methods and to ensure interoperability.

This document provides

- Guidelines for using of IEC 61850 for power quality domain,
- Name space extensions based on power quality function assessment,
- Profile for using IEC 61850 in the specific context of IEC 61000-4-30.

Specific power quality requirements that cannot be wholly covered with existing Logical Nodes (LN) or Common Data Classes (CDC) (e.g. LN for continuous power quality recorders, LN for RVC, etc.) will be addressed and added in the next editions of IEC 61850-7-3 and IEC 61850-7-4.

NOTE 4 This document references to/is compliance with the future 61850 amendment 2.1, and also bring the needed elements which are mandatory to understand the document; at least the new presence conditions rules, as well as the enumeration models.

The namespace introduced by this document in Clause 7 has the following properties:

- Namespace Version: 2016
- Namespace Revision:
- UML model file which reflects this namespace edition: wg10uml02v20draftPQ00-wg18uml02v11b-wg17uml02v17c-jwg25uml02v04c-tc17umlv0-tc38umlv0.eap, UML model version WG10UML02v20DraftUpdate
- Namespace release date: 2017-01-17
- Namespace name: “(Tr)IEC61850-90-17:2016”

This name space is considered as "transitional" since the models are expected to be included in future editions of IEC 61850-7-4xx. Potential extensions/modifications may happen if/when the models are moved to International Standard status. Only the new data objects and CDCs which are represented in bold-italic will be tagged with this namespace name. The others still refer to the namespace where they are primarily defined.

The Profile (set of additional rules) for using IEC 61850 in the specific context of IEC 61000-4-30, introduced in this document in Clause 6 is named “Profile_61000-4-30_(Tr)IEC61850-90-17:2016”.

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 TR 61000-3-6, *Electromagnetic compatibility (EMC) – Part 3-6: Limits – Assessment of emission limits for the connection of distorting installations to MV, HV and EHV power systems*

IEC TR 61000-3-7, *Electromagnetic compatibility (EMC) – Part 3-7: Limits – Assessment of emission limits for the connection of fluctuating installations to MV, HV and EHV power systems*

IEC TR 61000-3-13, *Electromagnetic compatibility (EMC) – Part 3-13: Limits – Assessment of emission limits for the connection of unbalanced installations to MV, HV and EHV power systems*

IEC TR 61000-3-14, *Electromagnetic compatibility (EMC) – Part 3-14: Assessment of emission limits for harmonics, interharmonics, voltage fluctuations and unbalance for the connection of disturbing installations to LV power systems*

IEC 61000-4-7:2009, *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*

IEC 61000-4-15:2010, *Electromagnetic compatibility (EMC) – Part 4-15: Testing and measurement techniques – Flickermeter – Functional and design specifications*

IEC 61000-4-30:2015, *Electromagnetic compatibility (EMC) – Part 4-30: Testing and measurement techniques – Power quality measurement methods*

IEC TS 61850-2, *Communication networks and systems in substations – Part 2: Glossary*

IEC 61850-7-1:2011, *Communication networks and systems for power utility automation – Part 7-1: Basic communication structure – Principles and models*

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

IEC 61850-8-1:2011, *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 TR 61850-90-2, *Communication networks and systems for power utility automation – Part 90-2: Using IEC 61850 for the communication between substations and control centres*

IEC 62586-1:2013, *Power quality measurement in power supply systems – Part 1: Power quality instruments (PQI)*

IEC TS 62749:2015, *Assessment of power quality – Characteristics of electricity supplied by public networks*

IEEE Std. 1159.3:2003, *Power Quality Data Interchange Format (PQDIF)*

EN 51060, *Voltage characteristics in public distribution systems*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
power quality instrument
PQI
instrument according to IEC 62586-1 whose main function is to measure, record and possibly monitor power quality parameters in power supply systems, and whose measuring methods (class A or class S) are defined in IEC 61000-4-30

3.2
power quality instrument class A
PQI-A
PQI according to IEC 62586-1 whose measuring methods comply with class A of IEC 61000-4-30

3.3
channel
individual measurement path through an instrument

Note 1 to entry: "Channel" and "phase" are not the same. A voltage channel is by definition the difference in potential between 2 conductors. Phase refers to a single conductor. On polyphase systems, a channel may be between 2 phases, or between a phase and neutral, or between a phase and earth, or between neutral and earth.

3.4
power quality instrument class S
PQI-S
PQI according to IEC 62586-1 whose measuring methods comply with class S of IEC 61000-4-30

3.5
declared input voltage
Udin
value obtained from the declared supply voltage by a transducer ratio

3.6
declared supply voltage
Uc
nominal voltage Un of the system

Note 1 to entry: If by agreement between the supplier and the customer a voltage different from the nominal voltage is applied to the terminals, then this voltage is the declared supply voltage Uc.

3.7
flicker
impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time

[SOURCE: IEC 60050-161:1990, 161-08-13]

3.8
power quality
characteristics of the electricity at a given point on an electrical system, evaluated against a set of reference technical parameters

Note 1 to entry: These parameters might, in some cases, relate to the compatibility between electricity supplied on a network and the loads connected to that network.

3.9
r.m.s. (root-mean-square) value
square root of the arithmetic mean of the squares of the instantaneous values of a quantity taken over a specified time interval and a specified bandwidth

4 Abbreviated terms

For the purposes of this document, the abbreviated terms given in IEC TS 61850-2 and IEC 61850-7-2 and the following apply.

ACSI	Abstract communication service interface
CDC	Common Data Class
COMFEDE	Common format for event data exchange
COMTRADE	Common format for transient data exchange
Ds	derived statistics
DB	Database
DMS	Distribution Management System
DO	Data Object
EHV	Extra high voltage
EMS	Energy management system
EMC	Electromagnetic Compatibility
F	Element is forbidden
GMS	Generation Management System
HV	High voltage (> 35 kV)
IED	Intelligent Electronic Device
IP	Internet Protocol
LAN	Local Area Network
LD	Logical Device
LN	Logical Node
LV	Low voltage (< 1 kV)
M	Element is mandatory
MMS	Manufacturing Messaging Specification. See IEC 61850-8-1
M-O-C	mandatory – optional – conditional
MS	Management System
MSV	Mains signalling voltage (ripple control)
MV	Medium voltage (1 kV to 35 kV)
n/a	Not applicable