IEC TR 62689-100

Edition 1.0 2016-10

TECHNICAL REPORT

colour inside

Current and voltage sensors or detectors, to be used for fault passage indication purposes – Part 100: Requirements and proposals for the IEC 61850 series data model extensions to support fault passage indicators applications

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 17.220.20

ISBN 978-2-8322-3724-3

Warning! Make sure that you obtained this publication from an authorized distributor.

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD....6
INTRODUCTION....8
1 Scope....9
2 Normative references....9
3 Terms, definitions and abbreviated terms....9
3.1 Terms and definitions....9
3.2 Abbreviated terms....10
3.2.1 Generic abbreviated terms....10
3.2.2 Proposed specifically for the data model part of this document....11
3.2.3 Existing abbreviated terms used in IEC 61850 (all parts) data object names model....12
3.3 Fault classification definitions....22
4 Requirements and use cases....23
4.1 General....23
4.2 Common actors....24
4.3 Use cases: fault indication and report....33
4.3.1 Generic use case – Not fault type specific....33
4.3.2 Overcurrent non directional Fault Localization and Indication (F1C/NC)....51
4.3.3 Phase to earth faults, non directional fault detection (F2)....52
4.3.4 Overcurrent and phase to earth non directional faults detection (F3)....52
4.3.5 Overcurrent, directional and non directional, fault detection (F4)....53
4.3.6 Overcurrent, non directional, phase to earth faults, directional and non directional fault detection (F5)....53
4.3.7 Overcurrents and phase to earth faults, directional and non directional fault detection (F6)....53
4.4 Use cases related to “other functions”....53
4.4.1 Report on device health....53
4.4.2 Monitor substation environment....53
4.4.3 Monitor external communication....53
4.4.4 Monitor energy flow (energy flow related use cases)....53
4.4.5 Contribute to distributed automatic FLISR....59
4.4.6 Contribute to distributed automatic VVC....75
4.4.7 Contribute to distributed DER management....75
4.5 Use cases related to “Product life cycle”....75
4.5.1 IED configuration via CID file....75
5 Information Models....100
5.1 Mapping of requirements on LNs....100
5.1.1 General....100
5.1.2 Mapping of the requirements of Fault Identification and report....100
5.1.3 Mapping of the requirements of “other functions”....101
5.1.4 Mapping of the requirements of “product life cycle” (FieldComp remote configuration)....103
6 Logical node classes....103
6.1 General....103
6.2 Package LNGroupL....104
6.2.1 General....104
6.2.2 LICH LN....106

6.2.3 LN: Common LD Settings Name: LCLD 107
6.3 Package LNGroupM 108
6.3.1 General 108
6.3.2 LN: Energy Name: MMTNExt 109
6.3.3 LN: Energy Name: MMTRExt 111
6.3.4 LN: Measurement Name: MMXNExt 113
6.3.5 LN: Measurement Name: MMXUExt 114
6.4 Package LNGroupS 116
6.4.1 General 116
6.4.2 LN: Current presence monitoring Name: SCPI 117
6.4.3 LN: Fault Passage Indicator Name: SFPI 118
6.4.4 LN: Fault indicator statistic calculation Name: SFST 120
6.4.5 LN: Voltage presence indicator Name: SVPI 121
7 Data object name semantics and enumerations 123
7.1 Data semantics 123
7.2 Enumerated data attribute types 126
7.2.1 General 126
7.2.2 CIDHandlingResultKind enumeration 127
7.2.3 CIDHandlingStatusKind enumeration 128
7.2.4 CurrentTransformersArrangementKind enumeration 128
7.2.5 FaultConfirmationModeKind enumeration 128
7.2.6 FaultPermanenceKind enumeration 129
7.2.7 PwrFlwSignKind enumeration 129
8 SCL enumerations (from DOEnumsJAHWG51) 129
9 References 130
Annex A (informative) Interpretation of logical node tables 131
A.1 General interpretation of logical node tables 131
A.2 Conditions for element presence 131
Bibliography 134

Figure 1 – Actors global hierarchy 25
Figure 2 – System Actors SGAM positioning (function) 26
Figure 3 – System Actors SGAM positioning (not function related) 27
Figure 4 – Fault indication – Main use case 35
Figure 5 – Fault detection and indication – T1 36
Figure 6 – Fault detection and indication– T2 37
Figure 7 – Fault detection and indication for FPI – T3,T4 (with communication to HV/MV SS) in the context of FLISR as described in 4.4.5 38
Figure 8 – Fault detection and indication for FPI – T3,T4 (without communication to HV/MV SS) in the context of FLISR as described in 4.4.5 39
Figure 9 – Voltage presence/absence 52
Figure 10 – Energy flow related use cases 54
Figure 11 – Sequence diagram for monitoring energy flows use cases 55
Figure 12 – Logical selectivity – FLI along the MV feeder 61
Figure 13 – Logical selectivity – FLI inside the EU plant 62
Figure 14 – Logical selectivity – FLI along the MV feeder and anti-islanding 63
Figure 15 – Use case – fault location indication 64

Figure 16 – For further analysis 65
Figure 17 – IED configuration process via CID 77
Figure 18 – FieldComp configuration – Main UC 78
Figure 19 – FieldComp asset management 79
Figure 20 – Grid and topology planning 79
Figure 21 – Communication network planning 80
Figure 22 – First FieldComp connection to communication network 81
Figure 23 – New FieldComp configuration via CID – Remote + local (successful case) 82
Figure 24 – New FieldComp configuration via CID – Remote + local (unsuccessful case – corrupted CID) 83
Figure 25 – Existing FieldComp on-line reconfiguration – (topology – successful case) 84
Figure 26 – Possible arrangement of LNs to support fault passage indication 101
Figure 27 – Possible arrangement of LNs to support "Energy flow related use cases" 102
Figure 28 – Possible arrangement of LNs to support CID Handling 103
Figure 29 – Class diagram LogicalNodesJAHWG51::LogicalNodesJAHWG51 104
Figure 30 – Statechart diagram LNGroupL::LNGroupL 105
Figure 31 – Class diagram LNGroupL::LNGroupL 106
Figure 32 – Class diagram LNGroupM::LNGroupM 109
Figure 33 – Class diagram LNGroupS::LNGroupS 117
Figure 34 – Class diagram DOEnumsJAHWG51::DOEnumsJAHWG51 127

Table 1 – Generic acronyms and abbreviated terms 10
Table 2 – Abbreviated terms for data object names 11
Table 3 – Abbreviated terms of IEC 61850 (all parts) for data object names 12
Table 4 – Fault types 23
Table 5 – List of common actors 28
Table 6 – Data objects of LICH 107
Table 7 – Data objects of LCLD 108
Table 8 – Data objects of MMTNExt 110
Table 9 – Data objects of MMTRExt 112
Table 10 – Data objects of MMXNExt 114
Table 11 – Data objects of MMXUExt 115
Table 12 – Data objects of SCPI 117
Table 13 – Data objects of SFPI 119
Table 14 – Data objects of SFST 120
Table 15 – Data objects of SVPI 122
Table 16 – Attributes defined on classes of LogicalNodesJAHWG51 package 123
Table 17 – Literals of CIDHandlingResultKind 127
Table 18 – Literals of CIDHandlingStatusKind 128
Table 19 – Literals of CurrentTransformersArrangementKind 128
Table 20 – Literals of FaultConfirmationModeKind 128
Table 21 – Literals of FaultPermanenceKind 129
Table 22 – Literals of PwrFlwSignKind 129

Table A.1 – Interpretation of logical node tables 131
Table A.2 – Conditions for presence of elements within a context 132

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

CURRENT AND VOLTAGE SENSORS OR DETECTORS, TO BE USED FOR FAULT PASSAGE INDICATION PURPOSES –

Part 100: Requirements and proposals for the IEC 61850 series data model extensions to support fault passage indicators applications

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, Publicly Available Specifications (PAS) 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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
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.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. However, a technical committee may propose the publication of a Technical Report when it has collected data of a different kind from that which is normally published as an International Standard, for example "state of the art".

IEC TR 62689-100, which is a Technical Report, has been prepared by IEC technical committee 38: Instrument transformers, in cooperation with TC 57: Power systems management and associated information exchange.

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

Enquiry draft	Report on voting
38/499/DTR	38/519/RVC

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

A list of all parts in the IEC 62689 series, published under the general title *Current and voltage sensors or detectors, to be used for fault passage indication purposes*, can be found on the IEC website.

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

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

This part of IEC 62689 has two main framework constraints with editorial and technical impacts as

- this document will be merged with IEC TR 61850-90-6[1]: IEC TR 62689-100 will exactly stick with the targeted document structure and principles, and
- this document intends to prepare the content of the future IEC 62689-3[2] which will directly rely on the functional requirements expressed in IEC 62689-1 and IEC 62689-2.

1 Under preparation. Stage at the time of publication: IEC PWI 61850-90-6:2016.

2 Under preparation. Stage at the time of publication: IEC PWI 62689-3:2016.

CURRENT AND VOLTAGE SENSORS OR DETECTORS, TO BE USED FOR FAULT PASSAGE INDICATION PURPOSES –

Part 100: Requirements and proposals for the IEC 61850 series data model extensions to support fault passage indicators applications

1 Scope

This part of IEC 62689, which is a Technical Report, was prepared jointly with TC 57 with the scope to prepare requirements and proposals for the IEC 61850 series data model extensions to support fault passage indicators (all classes and extended functions) applications to be introduced in the future IEC 61850-90-6 and that, in turn, will be needed for the preparation of the future IEC 62689-3.

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 in substations – Part 2: Glossary*

IEC 61850-7-2, *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 62689 (all parts), *Current and voltage sensors or detectors, to be used for fault passage indication purposes*

IEC 62689-1, *Current and voltage sensors or detectors, to be used for fault passage indication purposes – Part 1: General principles and requirements*

IEC 62689-2, *Current and voltage sensors or detectors, to be used for fault passage indication purposes – Part 2: System aspects*