

**Description of IEC 61850 data maps 3 and 4 in
VAMP 257 protection relays**

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1 Introduction

The goal of this document is to give a description of the IEC 61850 Logical Nodes (LN) in data maps 3 and 4 available in VAMP 257 protection relays.

Abbreviations used in this document are explained in Table 1.1 below.

Table 1.1: List of abbreviations.

Abbreviation	Meaning
LN	Logical Node
DO	DATA in IEC 61850-7-2, data object type or instance, depending on the context
DA	Data Attribute
SDO	Substructure Data Object
BDA	Basic Data Attribute that is not structured
GOOSE	Generic Object Oriented Subscriber Events

2 Description of Logical Nodes and their Data Objects and Data Attributes

2.1 Information common to all Logical Nodes

The following table contains the information which is common to all Logical Nodes, and will thus not be repeated again in this document.

Element	Description
LN: X	Description of Logical node "X"
DO: Mod	Mode (1 p. 80)
DA: stVal	Status value of the data.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: ctrlModel	Specifies the control model of IEC 61850-7-2 that corresponds to the behaviour of the data (1 p. 51).
DO: Beh	Behaviour (2 p. 71).
DA: stVal	Status value of the data.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: Health	This information reflects the state of the logical node related HW and SW (2 p. 75).
DA: stVal	Status value of the data.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: NamePlt	Name plate.
DA: vendor	Vendor name.
DA: swRev	Software revision.
DA: d	Textual description of the data.

2.2 Data map 3

2.2.1 DI02GGIO46 – Digital input 2

Element	Description
LN: DI02GGIO46 (Digital input 2)	The value of digital input 2.
DO: Ind	Indication of the status.
DA: stVal	The status value of the data.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).

2.2.2 Digital Inputs 3-31

The rest of the digital Inputs have the same structure as Digital input 2.

The LN:s of the digital inputs not already covered in this document are listed below:

1. LN: DI03GGIO47 (Digital input 3)
2. LN: DI04GGIO48 (Digital input 4)
3. LN: DI05GGIO49 (Digital input 5)
4. LN: DI06GGIO50 (Digital input 6)
5. LN: DI07GGIO51 (Digital input 7)
6. LN: DI08GGIO52 (Digital input 8)
7. LN: DI09GGIO53 (Digital input 9)
8. LN: DI10GGIO54 (Digital input 10)
9. LN: DI11GGIO55 (Digital input 11)
10. LN: DI12GGIO56 (Digital input 12)
11. LN: DI13GGIO57 (Digital input 13)
12. LN: DI14GGIO58 (Digital input 14)
13. LN: DI15GGIO59 (Digital input 15)
14. LN: DI16GGIO60 (Digital input 16)
15. LN: DI17GGIO61 (Digital input 17)
16. LN: DI18GGIO62 (Digital input 18)
17. LN: DI19GGIO63 (Digital input 19)
18. LN: DI20GGIO64 (Digital input 20)
19. LN: DI21GGIO65 (Digital input 21)
20. LN: DI22GGIO66 (Digital input 22)
21. LN: DI23GGIO67 (Digital input 23)
22. LN: DI24GGIO68 (Digital input 24)
23. LN: DI25GGIO69 (Digital input 25)
24. LN: DI26GGIO70 (Digital input 26)
25. LN: DI27GGIO71 (Digital input 27)
26. LN: DI28GGIO72 (Digital input 28)
27. LN: DI29GGIO73 (Digital input 29)
28. LN: DI30GGIO74 (Digital input 30)
29. LN: DI31GGIO75 (Digital input 31)
30. LN: DI32GGIO76 (Digital input 32)

Note:

1. Digital input 1 (LN: DI01GGIO45) is mapped to Data map 2 and also has the same structure as digital input 2.
2. Digital input 32 (LN: DI32GGIO76) is mapped to Data map 4 and also has the same structure as digital input 2.

2.3 Data map 4

2.3.1 DI32GGIO76 – Digital input 32

See subsection 2.2.2 of this document.

2.3.2 DOC1PTOC12 – IDir>

Element	Description
LN: DOC1PTOC12 (IDir>)	First directional overcurrent protection stage.
DO: Str	Indicates the detection of a fault or an unacceptable condition.
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: dirGeneral	General direction of the fault. If the faults of individual phases have different directions, this attribute is set to both.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
DO: OpDITmms	Time delay in ms before operating once operate conditions have been met.
DA: setVal	The value of the operate delay time setting.

2.3.3 DOC2PTOC13 – IDir>>

Element	Description
LN: DOC2PTOC13 (IDir>>)	Second directional overcurrent protection stage.
DO: Str	Indicates the detection of a fault or an unacceptable condition.
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: dirGeneral	General direction of the fault. If the faults of individual phases have different directions, this attribute is set to both.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
DO: OpDITmms	Time delay in ms before operating once operate conditions have been met.
DA: setVal	The value of the operate delay time setting.

2.3.4 DOC3PTOC14 – IDir>>>

Element	Description
LN: DOC3PTOC14(IDir>>>)	Third directional overcurrent protection stage.
DO: Str	Indicates the detection of a fault or an unacceptable condition.
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: dirGeneral	General direction of the fault. If the faults of individual phases have different directions, this attribute is set to both.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
DO: OpDITmms	Time delay in ms before operating once operate conditions have been met.
DA: setVal	The value of the operate delay time setting.

2.3.5 DOC4PTOC15 – IDir>>>>

Element	Description
LN: DOC4PTOC15 (IDir>>>>)	Fourth directional overcurrent protection stage.
DO: Str	Indicates the detection of a fault or an unacceptable condition.
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: dirGeneral	General direction of the fault. If the faults of individual phases have different directions, this attribute is set to both.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
DO: OpDITmms	Time delay in ms before operating once operate conditions have been met.
DA: setVal	The value of the operate delay time setting.

2.3.6 EF1PTOC4 – Io>

Element	Description
LN: EF1PTOC4 (Io>)	First earth fault stage.
DO: Str	Indicates the detection of a fault or an unacceptable condition.
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: dirGeneral	General direction of the fault. If the faults of individual phases have different directions, this attribute is set to both.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
DO: OpDITmms	Time delay in ms before operating once operate conditions have been met.
DA: setVal	The value of the operate delay time setting.

2.3.7 EF2PTOC5 – Io>>

Element	Description
LN: EF2PTOC5 (Io>>)	Second earth fault stage.
DO: Str	Indicates the detection of a fault or an unacceptable condition.
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: dirGeneral	General direction of the fault. If the faults of individual phases have different directions, this attribute is set to both.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
DO: OpDITmms	Time delay in ms before operating once operate conditions have been met.
DA: setVal	The value of the operate delay time setting.

2.3.8 EF3PTOC6 – Io>>>

Element	Description
LN: EF3PTOC6 (Io>>>)	Third earth fault stage.
DO: Str	Indicates the detection of a fault or an unacceptable condition.
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: dirGeneral	General direction of the fault. If the faults of individual phases have different directions, this attribute is set to both.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
DO: OpDITmms	Time delay in ms before operating once operate conditions have been met.
DA: setVal	The value of the operate delay time setting.

2.3.9 EF4PTOC7 – lo>>>>

Element	Description
LN: EF4PTOC7 (lo>>>>)	Fourth earth fault stage.
DO: Str	Indicates the detection of a fault or an unacceptable condition.
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: dirGeneral	General direction of the fault. If the faults of individual phases have different directions, this attribute is set to both.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
DO: OpDITmms	Time delay in ms before operating once operate conditions have been met.
DA: setVal	The value of the operate delay time setting.

2.3.10 EnergyMMTR1 – Energy exported imported

Element	Description
LN: EnergyMMTR1	Energy exported imported
DO: SupWh	Real energy supply (default supply direction: energy flow towards busbar).
DA: actVal	Binary counter status represented as an integer value.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.
DA: pulsQty	Magnitude of the counted value per count. actVal/frVal and pulsQty are used to calculate the value: value = actVal × pulsQty value = frVal × pulsQty (2 p. 55)
DO: SupVARh	Reactive energy supply (default supply direction: energy flow towards busbar).
DA: actVal	Binary counter status represented as an integer value.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.
DA: pulsQty	Magnitude of the counted value per count. actVal/frVal and pulsQty are used to calculate the value: value = actVal × pulsQty value = frVal × pulsQty (2 p. 55)
DO: DmdWh	Real energy demand (default demand direction: energy flow from busbar away).
DA: actVal	Binary counter status represented as an integer value.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.
DA: pulsQty	Magnitude of the counted value per count. actVal/frVal and pulsQty are used to calculate the

	value: value = actVal × pulsQty value = frVal × pulsQty (2 p. 55)
DO: DmdVARh	Reactive energy demand (default demand direction: energy flow from busbar away).
DA: actVal	Binary counter status represented as an integer value.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.
DA: pulsQty	Magnitude of the counted value per count. actVal/frVal and pulsQty are used to calculate the value: value = actVal × pulsQty value = frVal × pulsQty (2 p. 55)

2.3.11 fdaMMXU9 – Frequency demand

Element	Description
LN: fdaMMXU9	Frequency demand.
DO: Hz	Frequency.
DA: mag	Deadbanded value (2 p. 53).
BDA: f	The value of the frequency demand.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.

2.3.12 fMMXU8 – Frequency

Element	Description
LN: fMMXU8	Frequency.
DO: Hz	Frequency.
DA: mag	Deadbanded value (2 p. 53).
BDA: f	The value of the frequency.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.

2.3.13 Har2PTOC11 – If2>

Element	Description
LN: Har2PTOC11 (If2>)	Second harmonic overcurrent protection (stage 1).
DO: Str	Indicates the detection of a fault or an unacceptable condition.
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: dirGeneral	General direction of the fault. If the faults of individual phases have different directions, this attribute is set to both.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
DO: OpDITmms	Time delay in ms before operating once operate conditions have been met.
DA: setVal	The value of the operate delay time setting.

2.3.14 I3pdaMMXU3 – IL1, IL2, IL3 demand

Element	Description
LN: I3pdaMMXU3 (IL1, IL2, IL3 demand)	Line 1 current, Line 2 current, Line 3 current demand.
DO: A	Phase currents (IL1, IL2, IL3).
SDO: phsA	Phase A (Line 1).
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 1 current demand.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.
SDO: phsB	Phase B (Line 2).
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 2 current demand.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.
SDO: phsC	Phase C (Line 3).
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 3 current demand.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.

2.3.15 I3pMMXU1 – IL1, IL2, IL3

Element	Description
LN: I3pdaMMXU3 (IL1, IL2, IL3)	Line 1 current, Line 2 current, Line 3 current.
DO: A	Phase currents (IL1, IL2, IL3).
SDO: phsA	Phase A (Line 1).
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 1 current.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.
SDO: phsB	Phase B (Line 2).
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 2 current.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.
SDO: phsC	Phase C (Line 3).
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 3 current.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.

2.3.16 I3prMMXU2 – IL1, IL2, IL3 RMS

Element	Description
LN: I3prMMXU2 (IL1,IL2,IL3 RMS)	Line 1 current, Line 2 current, Line 3 current RMS.
DO: A	Phase currents (IL1, IL2, IL3).
SDO: phsA	Phase A (Line 1).
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 1 current RMS.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.
SDO: phsB	Phase B (Line 2).
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 2 current RMS.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.
SDO: phsC	Phase C (Line 3).
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 3 current RMS.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.

2.3.17 IArcPIOC1 – I Arc

Element	Description
LN: IArcPIOC1 (I Arc)	(Optional) arc protection stage for phase-to-phase faults and delayed light signal. (Arc card)
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
SI unit.	SI unit.

2.3.18 Io1ArcPIOC2 – Io1 Arc

Element	Description
LN: Io1ArcPIOC2 (Io1 Arc)	(Optional) arc protection stage for earth faults. Current input = Io1. (Arc card)
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
SI unit.	SI unit.

2.3.19 Io1MMXU11 – Io1

Element	Description
LN: Io1MMXU11(Io1)	Residual current 1.
DO: A	Current.
SDO: neut	Value of phase neutral.
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of residual current 1.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.

2.3.20 Io2ArcPIOC3 – Io2 Arc

Element	Description
LN: Io2ArcPIOC3 (Io2 Arc)	(Optional) arc protection stage for earth faults. Current input = Io2. (Arc card)
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DO: StrVal	Start value. Level of the supervised value, which starts a dedicated action of the related function.
DA: setMag	Indication of the start value.
BDA: f	The actual start value.
DA: units	Units of the attribute(s) representing the value of the data.
SI unit.	SI unit.

2.3.21 Io2MMXU12 – Io2

Element	Description
LN: Io2MMXU12 (Io2)	Residual current 2.
SDO: neut	Value of phase neutral.
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of residual current 2.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.

2.3.22 IOC1GGIO142 – Fault current of I>

Element	Description
LN: IOC1GGIO142 (Fault current of I>)	Fault current of the first overcurrent protection stage.
DO: AnIn	Analogue input.
DA: mag	Deadbanded value (2 p. 53).
BDA: f	The value of the fault current of the first overcurrent protection stage.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).

2.3.23 IOC2GGIO143 – Fault current of I>>

Element	Description
LN: IOC2GGIO143 (Fault current of I>>)	Fault current of the second overcurrent protection stage.
DO: AnIn	Analogue input.
DA: mag	Deadbanded value (2 p. 53).
BDA: f	The value of the fault current of the second overcurrent protection stage.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).

2.3.24 IOC3GGIO144 – Fault current of I>>>

Element	Description
LN: IOC2GGIO143 (Fault current of I>>>)	Fault current of the third overcurrent protection stage.
DO: AnIn	Analogue input.
DA: mag	Deadbanded value (2 p. 53).
BDA: f	The value of the fault current of the second overcurrent protection stage.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).

2.3.25 IoCMMXU13 – Io calculated

Element	Description
LN: IoCMMXU13 (Io calculated)	Calculated residual current.
DO: A	Current.
SDO: res	Residual current.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	The value of the calculated residual current.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: units	Units of the attribute(s) representing the value of the data.
BDA: SIUnit	SI unit.
BDA: multiplier	Multiplier.

2.3.26 L1fGGIO24 – Line 1 fault

Element	Description
LN: L1fGGIO24	Line 1 fault.
DO: Ind	Indication of the status.
DA: stVal	The status value of the data.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).

2.3.27 L2fGGIO25 – Line 2 fault

Element	Description
LN: L2fGGIO25	Line 2 fault.
DO: Ind	Indication of the status.
DA: stVal	The status value of the data.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).

2.3.28 L3fGGIO26 – Line 3 fault

Element	Description
LN: L3fGGIO26	Line 3 fault.
DO: Ind	Indication of the status.
DA: stVal	The status value of the data.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).

2.3.29 LdPDIF1 – 87L (LDP)

Element	Description
LN: LdPDIF1	Line Differential Protection, 87L.
DO: Str	Indicates the detection of a fault or an unacceptable condition.
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: dirGeneral	General direction of the fault. If the faults of individual phases have different directions, this attribute is set to both.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: Op	Operate. Indicates the trip decision of a protection function (LN).
DA: general	Logical "or" of the phase values, for example trip or start. The attribute shall also be set if not all phases have a fault condition.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DO: LoSet	Low operate value, percentage of the nominal current.
DA: setVal	The value of a status setting.
DO: MinOpTmms	The Data minimum operating time in ms for the LN is used for co-ordinating with older electromechanical relays
DA: setVal	The value of a status setting.

2.3.30 LightSARC1 – Arc light on

Element	Description
LN: L3fGGIO26	Line 3 fault.
DO: FACntRs	Fault arc counter, resettable.
DA: stVal	The status value of the data.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).
DA: ctrlModel	Specifies the control model of IEC 61850-7-2 that corresponds to the behaviour of the data (1 p. 51).
DO: FADet	Alarm that fault arc has been detected (If status value = TRUE).
DA: stVal	The status value of the data.
DA: q	Quality (1 p. 55).
DA: t	Timestamp of the last change in one of the attribute(s) representing the value of the data or in the q attribute (1 p. 58).

3 Bibliography

1. **International Electrotechnical Commission.** *INTERNATIONAL STANDARD IEC 61850-7-4 Communication networks and systems in substations – Part 7-4: Basic communication structure for substation and feeder equipment– Compatible logical node classes and data classes.* s.l. : International Electrotechnical Commission, 2003. IEC 61850-7-4:2003(E).
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