

**Description of IEC 61850 data maps 7 and 8 in
VAMP 257 protection relays**

Table of contents

1	Introduction	4
2	Description of Logical Nodes and their Data Objects and Data Attributes	4
2.1	Information common to all Logical Nodes	5
2.2	Data map 7	6
2.2.1	PS8SGGIO36 – Programmable stage 8 start	6
2.2.2	PS8TGGIO44 – Programmable stage 8 trip	6
2.2.3	ReLaGGIO141 – Release latches.....	6
2.2.4	RevP1PDOP1 – P< reverse power	7
2.2.5	RevP2PDOP2 – P<< reverse power.....	7
2.2.6	SG1GGIO135 – Setting group 1	9
2.2.7	SG2GGIO136 – Setting group 2	9
2.2.8	THDIMHAI1 – THD IL1, IL2, IL3	10
2.2.9	THDUMHAI2 – THD Ua, Ub, Uc.....	12
2.2.10	TOPTTR1 – T>.....	13
2.2.11	U3pMMXU4 – UL1, UL2, UL3	14
2.2.12	U3ppMMXU5 – U12, U23 ,U31	15
2.2.13	UCPTUC1 – I<	16
2.2.14	UF1PTUF1 – f<	16
2.2.15	UF2PTUF2 – f<<	17
2.2.16	UIBCPTOC8 – I2> or I2/I1>	18
2.2.17	Uo1PTOV1 – Uo>	19
2.2.18	Uo2PTOV2 – Uo>>	20
2.2.19	UoMMXU10 – Uo.....	22
2.2.20	UV1PTUV1 – U<	22
2.2.21	UV2PTUV2 – U<<	23
2.2.22	UV3PTUV3 – U<<<.....	24
2.2.23	VI1GGIO137 – Virtual input 1	24
2.2.24	Virtual Inputs 2 – 4	25
2.3	Data map 8	26
2.3.1	VI4GGIO140 – Virtual input 4.....	26
2.3.2	VO1GGIO97 – Virtual output 1	26
2.3.3	Virtual outputs 2 – 6	26
2.3.4	VTAlmGGIO23 – VT alarm.....	26
2.3.5	XGGIO145 – Fault reactance	26
2.3.6	EA01GGIO164 – External AI 1	27

2.3.7 External AI's 2 – 1627

3 Bibliography.....28

1 Introduction

The goal of this document is to give a description of the IEC 61850 Logical Nodes (LN) in data maps 7 and 8 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 7

2.2.1 PS8SGGIO36 – Programmable stage 8 start

Element	Description
LN: PS8SGGIO36	Programmable stage 8 start.
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 PS8TGGIO44 – Programmable stage 8 trip

Element	Description
LN: PS8TGGIO44	Programmable stage 8 trip.
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).

2.2.3 ReLaGGIO141 – Release latches

Element	Description
LN: ReLaGGIO141	Release latches.
DO: SPCSO	Generic single point controllable status output.
DA: Oper	ASCI control service: Operate.
BDA: ctlVal	Determines the control activity.
BDA: origin	Originator information.
BDA: orCat	The category of the originator that caused a change of a value. (2 p. 20)
BDA: orIdent	The address of the originator who caused the change of the value. The value of NULL shall be reserved to indicate that the originator of a particular action is not known or is not reported. (2 p. 20)
BDA: ctlNum	Shows the control sequence number of the control service.
BDA: T	The time when the client sends the control request. (3 s. 148)
BDA: Test	An additional identifier that may be used to classify a value being a test value and not to be used for operational purposes. (2 p. 14)
BDA: Check	Specifies the kind of checks a control object shall perform before issuing the control operation if common data class is DPC (double-point control – see IEC 61850-7-3).

DA: ctrlModel	Specifies the control model of IEC 61850-7-2 that corresponds to the behaviour of the data (1 p. 51).
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2.2.4 RevP1PDOP1 – P< reverse power

Element	Description
LN: RevP1PDOP1 (P<)	First reverse and under-power 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: OpDIImms	Time delay in ms before operating once operate conditions have been met.
DA: setVal	The value of the operate delay time setting.

2.2.5 RevP2PDOP2 – P<< reverse power

Element	Description
LN: RevP2PDOP2 (P<<)	Second reverse and under-power 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.

2.2.6 SG1GGIO135 – Setting group 1

Element	Description
LN: SG1GGIO135	Setting group 1.
DO: SPCSO	Generic single point controllable status output.
DA: Oper	ASCI control service: Operate.
BDA: ctrlVal	Determines the control activity.
BDA: origin	Originator information.
BDA: orCat	The category of the originator that caused a change of a value. (2 p. 20)
BDA: orIdent	The address of the originator who caused the change of the value. The value of NULL shall be reserved to indicate that the originator of a particular action is not known or is not reported. (2 p. 20)
BDA: ctrlNum	Shows the control sequence number of the control service.
BDA: T	The time when the client sends the control request. (3 s. 148)
BDA: Test	An additional identifier that may be used to classify a value being a test value and not to be used for operational purposes. (2 p. 14)
BDA: Check	Specifies the kind of checks a control object shall perform before issuing the control operation if common data class is DPC (double-point control – see IEC 61850-7-3).
DA: ctrlModel	Specifies the control model of IEC 61850-7-2 that corresponds to the behaviour of the data (1 p. 51).

2.2.7 SG2GGIO136 – Setting group 2

Element	Description
LN: SG2GGIO136	Setting group 2.
DO: SPCSO	Generic single point controllable status output.
DA: Oper	ASCI control service: Operate.
BDA: ctrlVal	Determines the control activity.
BDA: origin	Originator information.
BDA: orCat	The category of the originator that caused a change of a value. (2 p. 20)
BDA: orIdent	The address of the originator who caused the change of the value. The value of NULL shall be reserved to indicate that the originator of a particular action is not known or is not reported. (2 p. 20)
BDA: ctrlNum	Shows the control sequence number of the control service.
BDA: T	The time when the client sends the control request. (3 s. 148)
BDA: Test	An additional identifier that may be used to classify a value being a test value and not to be used for operational purposes. (2 p. 14)
BDA: Check	Specifies the kind of checks a control object shall perform before issuing the control operation if common data class is DPC (double-point control – see IEC 61850-7-3).
DA: ctrlModel	Specifies the control model of IEC 61850-7-2 that corresponds to the behaviour of the data (1 p. 51).

2.2.8 THDIMHAI1 – THD IL1, IL2, IL3

Element	Description
LN: THDIMHAI1 (THD IL1, IL2, IL3)	Total harmonic distortions of Line 1-, Line 2- and Line 3 currents.
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.
DO: ThdA	Current total Harmonic or Interharmonic Distortion (different methods, phase related).
SDO: phsA	Value of phase A (Line 1) current THD.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 1 current THD.
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	Value of phase A (Line 2) current THD.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 2 current THD.
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	Value of phase A (Line 3) current THD.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 3 current THD.
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.

2.2.9 THDUMHA12 – THD Ua, Ub, Uc

Element	Description
LN: THDUMHA12 (THD Ua, Ub, Uc)	Total harmonic distortions of Line 1-, Line 2- and Line 3 voltages.
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.
DO: ThdPhV	Phase to ground voltage total harmonic distortion.
SDO: phsA	Value of phase A (Line 1) to neutral voltage THD.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 1 to neutral voltage THD.
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	Value of phase A (Line 2) to neutral voltage THD.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 2 to neutral voltage THD.
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	Value of phase A (Line 3) to neutral voltage THD.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 3 to neutral voltage THD.
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.

2.2.10 TOPPTR1 – T>

Element	Description
LN: TOPPTR1 (T>)	First thermal overload 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: OpDIImms	Time delay in ms before operating once operate conditions have been met.

DA: setVal	The value of the operate delay time setting.
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2.2.11 U3pMMXU4 – UL1, UL2, UL3

Element	Description
LN: U3pMMXU4 (UL1, UL2, UL3)	Line 1-, Line 2- and Line 3 voltages.
DO: PhV	Phase to ground voltages for Phases 1, 2, and 3, including Angle.
SDO: phsA	Value of phase A (line 1) voltage.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 1 voltage.
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	Value of phase B (line 2) voltage.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 2 voltage.
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	Value of phase C (line 3) voltage.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	Value of Line 3 voltage.
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.

2.2.13 U3ppMMXU5 – U12, U23 ,U31

Element	Description
LN: U3ppMMXU5 (U12, U23, U31)	Line-to-line voltages (1-2, 2-3 and 3-1)
DO: PPV	Phase to phase voltages.
SDO: phsAB	Value of phase A to phase B measurement.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	(The actual) value of phase A to phase B measurement.
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: phsBC	Value of phase B to phase C measurement.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	(The actual) value of phase B to phase C measurement.
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: phsCA	Value of phase C to phase A measurement.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	(The actual) value of phase C to phase A measurement.
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.

2.2.15 UCPTUC1 – I<

Element	Description
LN: UCPTUC1 (I<)	First undercurrent 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.

2.2.16 UF1PTUF1 – f<

Element	Description
LN: UF1PTUF1 (f<)	First underfrequency 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.

2.2.17 UF2PTUF2 – f<<

Element	Description
LN: UF2PTUF2 (f<<)	Second underfrequency 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.

2.2.18 UIBCPTOC8 – I2> or I2/I1>

Element	Description
LN: UIBCPTOC8 (I2> or I2/I1>)	First current unbalance stage(s) (motor mode or feeder mode).
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.

2.2.19 Uo1PTOV1 – Uo>

Element	Description
LN: Uo1PTOV1 (Uo>)	First overvoltage 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.

2.2.20 Uo2PTOV2 – Uo>>

Element	Description
LN: Uo2PTOV2 (Uo>>)	Second residual overvoltage 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.

2.2.21 UoMMXU10 – Uo

Element	Description
LN: UoMMXU10 (Uo)	Residual voltage.
DO: PhV	Phase to ground voltages.
SDO: neut	Value of phase neutral.
DA: cVal	Deadbanded complex value. (2 p. 52)
BDA: mag	Deadbanded value (2 p. 53).
BDA: f	The value of the residual voltage.
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.

2.2.22 UV1PTUV1 – U<

Element	Description
LN: UV1PTUV1 (U<)	First undervoltage 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.

2.2.23 UV2PTUV2 – U<<

Element	Description
LN: UV2PTUV2 (U<<)	Second undervoltage 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.

2.2.24 UV3PTUV3 – U<<<

Element	Description
LN: UV3PTUV3 (U<<<)	Third undervoltage 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.

2.2.25 VI1GGIO137 – Virtual input 1

Element	Description
LN: VI1GGIO137	Virtual input 1 (VI1).
DO: SPCSO	Generic single point controllable status output.
DA: Oper	ASCI control service: Operate.
BDA: ctrlVal	Determines the control activity.
BDA: origin	Originator information.
BDA: orCat	The category of the originator that caused a change of a value. (2 p. 20)
BDA: orIdent	The address of the originator who caused the change of the value. The value of NULL shall be reserved to indicate that the originator of a particular action is not known or is not reported. (2 p. 20)
BDA: ctrlNum	Shows the control sequence number of the control service.
BDA: T	The time when the client sends the control request. (3 s. 148)
BDA: Test	An additional identifier that may be used to classify a value being a test value and not to be used for operational purposes. (2 p. 14)
BDA: Check	Specifies the kind of checks a control object shall perform before issuing the control operation if common data class is DPC (double-point control – see IEC 61850-7-3).
DA: ctrlModel	Specifies the control model of IEC 61850-7-2 that corresponds to the behaviour of the data (1 p. 51).

2.2.26 Virtual Inputs 2 – 4

The rest of the virtual Inputs have the same structure as virtual input 1.

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

1. VI2GGIO138 (Virtual input 2)
2. VI3GGIO139 (Virtual input 3)
3. VI4GGIO140 (Virtual input 4)

Note: Virtual input 4 is located in data map 8.

2.3 Data map 8

2.3.1 VI4GGIO140 – Virtual input 4

See subsection 2.2.26 above.

2.3.2 VO1GGIO97 – Virtual output 1

Element	Description
LN: VO1GGIO97	The value of virtual output 1 (VO1).
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).

2.3.3 Virtual outputs 2 – 6

The rest of the virtual outputs have the same structure as virtual output 1.

The LN:s of the virtual outputs not already covered in this document are listed below:

1. VO2GGIO98 (Virtual output 2)
2. VO3GGIO99 (Virtual output 3)
3. VO4GGIO100 (Virtual output 4)
4. VO5GGIO101 (Virtual output 5)
5. VO6GGIO102 (Virtual output 6)

2.3.4 VTAlmGGIO23 – VT alarm

Element	Description
LN: VTAlmGGIO23 (VT alarm)	Voltage transformer alarm.
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).

2.3.5 XGGIO145 – Fault reactance

Element	Description
LN: XGGIO145	Fault reactance.
DO: AnIn	Analogue input.
DA: mag	Deadbanded value (2 p. 53).
BDA: f	The value of the fault reactance.
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).

2.3.6 EA01GGIO164 – External AI 1

Element	Description
LN: EA01GGIO164	External Analog Input 1 (External AI 1).
DO: AnIn	Analogue input.
DA: mag	Deadbanded value (2 p. 53).
BDA: f	The value of the external AI 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.

2.3.7 External AI's 2 – 16

The rest of the external analog inputs have the same structure as external analog inputs 1. The LN:s of the external analog inputs not already covered in this document are listed below:

1. EA02GGIO165 (External AI 2)
2. EA03GGIO165 (External AI 3)
3. EA04GGIO166 (External AI 4)
4. EA05GGIO167 (External AI 5)
5. EA06GGIO168 (External AI 6)
6. EA07GGIO169 (External AI 7)
7. EA08GGIO170 (External AI 8)
8. EA09GGIO171 (External AI 9)
9. EA10GGIO172 (External AI 10)
10. EA11GGIO173 (External AI 11)
11. EA12GGIO174 (External AI 12)
12. EA13GGIO175 (External AI 13)
13. EA14GGIO176 (External AI 14)
14. EA15GGIO177 (External AI 15)
15. EA16GGIO178 (External AI 16)

Note: External AI's 12 – 16 are found in data map 9.

3 Bibliography

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