

RELION® PROTECTION AND CONTROL

## 615 series

### IEC 60870-5-103 Point List Manual







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# Section 1      Introduction

## 1.1      This manual

The point list manual describes the outlook and properties of the data points specific to the protection relay. The manual should be used in conjunction with the corresponding communication protocol manual.

## 1.2      Intended audience

This manual addresses the communication system engineer or system integrator responsible for pre-engineering and engineering for communication setup in a substation from a protection relay perspective.

The system engineer or system integrator must have a basic knowledge of communication in protection and control systems and thorough knowledge of the specific communication protocol.

## 1.3 Product documentation

### 1.3.1 Product documentation set

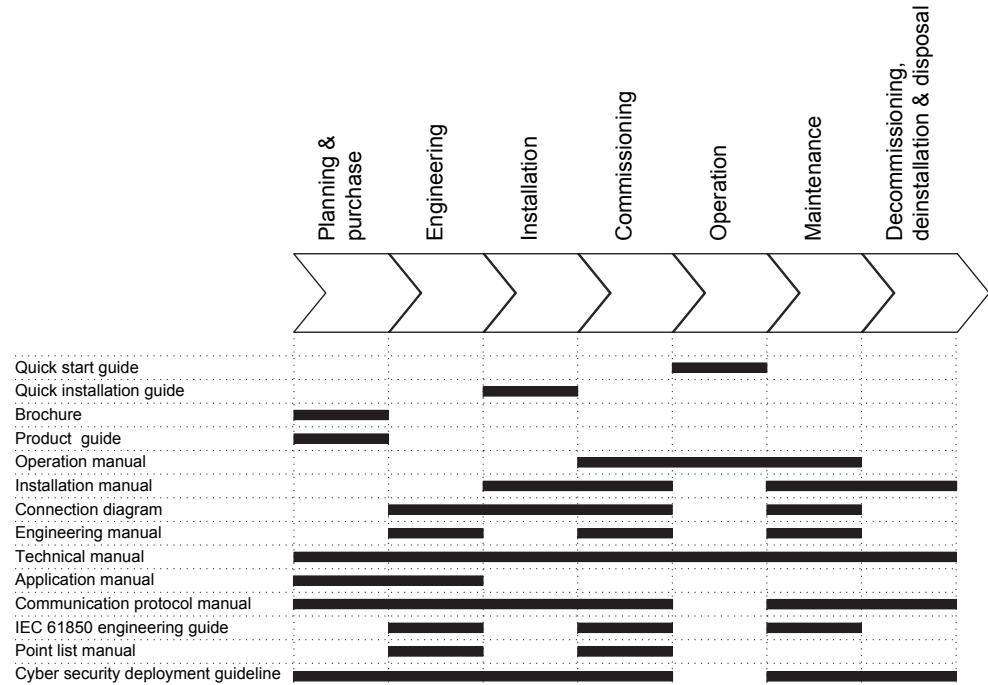


Figure 1: The intended use of documents during the product life cycle



Product series- and product-specific manuals can be downloaded from the ABB Web site <http://www.abb.com/relion>.

### 1.3.2 Document revision history

Document revision/date	Product version	History
A/2014-01-24	5.0	First release
B/2015-10-30	5.0 FP1	Content updated to correspond to the product series version
C/2016-05-20	5.0 FP1	Content updated
D/2018-12-20	5.0 FP1	Content updated



Download the latest documents from the ABB Web site  
<http://www.abb.com/relion>.

### 1.3.3

### Related documentation

Name of the document	Document ID
IEC 60870-5-103 Communication Protocol Manual	1MRS756710

## 1.4

## Symbols and conventions

### 1.4.1

### Symbols



The caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.



The information icon alerts the reader of important facts and conditions.



The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

Although warning hazards are related to personal injury, it is necessary to understand that under certain operational conditions, operation of damaged equipment may result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

### 1.4.2

### Document conventions

A particular convention may not be used in this manual.

- Abbreviations and acronyms are spelled out in the glossary. The glossary also contains definitions of important terms.
- Push button navigation in the LHMI menu structure is presented by using the push button icons.  
To navigate between the options, use and .
- Menu paths are presented in bold.  
Select **Main menu/Settings**.
- LHMI messages are shown in Courier font.  
To save the changes in nonvolatile memory, select **Yes** and press .
- Parameter names are shown in italics.  
The function can be enabled and disabled with the *Operation* setting.
- Parameter values are indicated with quotation marks.

- 
- The corresponding parameter values are "On" and "Off".
- Input/output messages and monitored data names are shown in Courier font. When the function starts, the START output is set to TRUE.
  - This document assumes that the parameter setting visibility is "Advanced".

### 1.4.3

### Functions, codes and symbols

All available functions are listed in the table. All of them may not be applicable to all products.

*Table 1: Functions included in the relays*

Function	IEC 61850	IEC 60617	IEC-ANSI
<b>Protection</b>			
Three-phase non-directional overcurrent protection, low stage	PHLPTOC1	3I> (1)	51P-1 (1)
	PHLPTOC2	3I> (2)	51P-1 (2)
Three-phase non-directional overcurrent protection, high stage	PHHPTOC1	3I>> (1)	51P-2 (1)
	PHHPTOC2	3I>> (2)	51P-2 (2)
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC1	3I>>> (1)	50P/51P (1)
	PHIPTOC2	3I>>> (2)	50P/51P (2)
Three-phase directional overcurrent protection, low stage	DPHLPDOC1	3I> -> (1)	67-1 (1)
	DPHLPDOC2	3I> -> (2)	67-1 (2)
Three-phase directional overcurrent protection, high stage	DPHHPDOC1	3I>> -> (1)	67-2 (1)
Three-phase voltage-dependent overcurrent protection	PHPVOC1	3I(U)> (1)	51V (1)
Non-directional earth-fault protection, low stage	EFLPTOC1	Io> (1)	51N-1 (1)
	EFLPTOC2	Io> (2)	51N-1 (2)
Non-directional earth-fault protection, high stage	EFHPTOC1	Io>> (1)	51N-2 (1)
	EFHPTOC2	Io>> (2)	51N-2 (2)
Non-directional earth-fault protection, instantaneous stage	EFIPTOC1	Io>>> (1)	50N/51N (1)
Directional earth-fault protection, low stage	DEFLPDEF1	Io> -> (1)	67N-1 (1)
	DEFLPDEF2	Io> -> (2)	67N-1 (2)
Directional earth-fault protection, high stage	DEFHPDEF1	Io>> -> (1)	67N-2 (1)
Admittance-based earth-fault protection	EFPADM1	Yo> -> (1)	21YN (1)
	EFPADM2	Yo> -> (2)	21YN (2)
	EFPADM3	Yo> -> (3)	21YN (3)
Wattmetric-based earth-fault protection	WPWDE1	Po> -> (1)	32N (1)
	WPWDE2	Po> -> (2)	32N (2)
	WPWDE3	Po> -> (3)	32N (3)
Transient/intermittent earth-fault protection	INTRTEF1	Io> -> IEF (1)	67NIEF (1)

Table continues on next page

Function	IEC 61850	IEC 60617	IEC-ANSI
Harmonics-based earth-fault protection	HAEFPTOC1	Io>HA (1)	51NHA (1)
Non-directional (cross-country) earth-fault protection, using calculated Io	EFHPTOC1	Io>> (1)	51N-2 (1)
Negative-sequence overcurrent protection	NSPTOC1	I2> (1)	46 (1)
	NSPTOC2	I2> (2)	46 (2)
Phase discontinuity protection	PDNSPTOC1	I2/I1> (1)	46PD (1)
Residual overvoltage protection	ROVPTOV1	Uo> (1)	59G (1)
	ROVPTOV2	Uo> (2)	59G (2)
	ROVPTOV3	Uo> (3)	59G (3)
Three-phase undervoltage protection	PHPTUV1	3U< (1)	27 (1)
	PHPTUV2	3U< (2)	27 (2)
	PHPTUV3	3U< (3)	27 (3)
Three-phase overvoltage protection	PHPTOV1	3U> (1)	59 (1)
	PHPTOV2	3U> (2)	59 (2)
	PHPTOV3	3U> (3)	59 (3)
Positive-sequence undervoltage protection	PSPTUV1	U1< (1)	47U+ (1)
	PSPTUV2	U1< (2)	47U+ (2)
Negative-sequence overvoltage protection	NSPTOV1	U2> (1)	47O- (1)
	NSPTOV2	U2> (2)	47O- (2)
Frequency protection	FRPFHQ1	f>/f<,df/dt (1)	81 (1)
	FRPFHQ2	f>/f<,df/dt (2)	81 (2)
	FRPFHQ3	f>/f<,df/dt (3)	81 (3)
	FRPFHQ4	f>/f<,df/dt (4)	81 (4)
	FRPFHQ5	f>/f<,df/dt (5)	81 (5)
	FRPFHQ6	f>/f<,df/dt (6)	81 (6)
Overexcitation protection	OEPVPH1	U/f> (1)	24 (1)
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR1	3Ith>F (1)	49F (1)
Three-phase thermal overload protection, two time constants	T2PTTR1	3Ith>T/G/C (1)	49T/G/C (1)
Negative-sequence overcurrent protection for machines	MNSPTOC1	I2>M (1)	46M (1)
	MNSPTOC2	I2>M (2)	46M (2)
Loss of load supervision	LOFLPTUC1	3I< (1)	37 (1)
Motor load jam protection	JAMPTOC1	Ist> (1)	51LR (1)
Motor start-up supervision	STTPMSU1	Is2t n< (1)	49,66,48,51LR (1)
Phase reversal protection	PREVPTOC1	I2>> (1)	46R (1)
Thermal overload protection for motors	MPTTR1	3Ith>M (1)	49M (1)
Binary signal transfer	BSTGGIO1	BST (1)	BST (1)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Stabilized and instantaneous differential protection for two-winding transformers	TR2PTDF1	3dI>T (1)	87T (1)
Numerically stabilized low-impedance restricted earth-fault protection	LREFPNDF1	dIoLo> (1)	87NL (1)
High-impedance based restricted earth-fault protection	HREFPDIF1	dIoHi> (1)	87NH (1)
High-impedance differential protection for phase A	HIAPDIF1	dHi_A>(1)	87A(1)
High-impedance differential protection for phase B	HIBPDIF1	dHi_B>(1)	87B(1)
High-impedance differential protection for phase C	HICPDIF1	dHi_C>(1)	87C(1)
Circuit breaker failure protection	CCBRBRF1	3I>/Io>BF (1)	51BF/51NBF (1)
Three-phase inrush detector	INRPHAR1	3I2f> (1)	68 (1)
Switch onto fault	CBPSOF1	SOTF (1)	SOTF (1)
Master trip	TRPPTRC1	Master Trip (1)	94/86 (1)
	TRPPTRC2	Master Trip (2)	94/86 (2)
	TRPPTRC3	Master Trip (3)	94/86 (3)
	TRPPTRC4	Master Trip (4)	94/86 (4)
	TRPPTRC5	Master Trip (5)	94/86 (5)
	TRPPTRC6	Master Trip (6)	94/86 (6)
Arc protection	ARC SARC1	ARC (1)	50L/50NL (1)
	ARC SARC2	ARC (2)	50L/50NL (2)
	ARC SARC3	ARC (3)	50L/50NL (3)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Multipurpose protection	MAPGAPC1	MAP (1)	MAP (1)
	MAPGAPC2	MAP (2)	MAP (2)
	MAPGAPC3	MAP (3)	MAP (3)
	MAPGAPC4	MAP (4)	MAP (4)
	MAPGAPC5	MAP (5)	MAP (5)
	MAPGAPC6	MAP (6)	MAP (6)
	MAPGAPC7	MAP (7)	MAP (7)
	MAPGAPC8	MAP (8)	MAP (8)
	MAPGAPC9	MAP (9)	MAP (9)
	MAPGAPC10	MAP (10)	MAP (10)
	MAPGAPC11	MAP (11)	MAP (11)
	MAPGAPC12	MAP (12)	MAP (12)
	MAPGAPC13	MAP (13)	MAP (13)
	MAPGAPC14	MAP (14)	MAP (14)
	MAPGAPC15	MAP (15)	MAP (15)
	MAPGAPC16	MAP (16)	MAP (16)
	MAPGAPC17	MAP (17)	MAP (17)
	MAPGAPC18	MAP (18)	MAP (18)
Load-shedding and restoration	LSHDPFRQ1	UFLS/R (1)	81LSH (1)
	LSHDPFRQ2	UFLS/R (2)	81LSH (2)
	LSHDPFRQ3	UFLS/R (3)	81LSH (3)
	LSHDPFRQ4	UFLS/R (4)	81LSH (4)
	LSHDPFRQ5	UFLS/R (5)	81LSH (5)
Fault locator	SCEFRFLO1	FLOC (1)	21FL (1)
Three-phase overload protection for shunt capacitor banks	COLPTOC1	3I>3I<(1)	51C/37 (1)
Current unbalance protection for shunt capacitor banks	CUBPTOC1	dI>C (1)	51NC-1 (1)
Three-phase current unbalance protection for shunt capacitor banks	HCUBPTOC1	3dI>C (1)	51NC-2 (1)
Shunt capacitor bank switching resonance protection, current based	SRCPTOC1	TD>(1)	55TD (1)
Line differential protection with in-zone power transformer	LNPLDF1	3Id/I>(1)	87L (1)
High-impedance fault detection	PHIZ1	HIF (1)	HIZ (1)
Stabilized and instantaneous differential protection for machines	MPDIF1	3dI>G/M (1)	87G/M (1)
Third harmonic-based stator earth-fault protection	H3EFPSEF1	dUo>/Uo3H (1)	27/59THD (1)
Underpower protection	DUPPDPR1	P<(1)	32U (1)
	DUPPDPR2	P<(2)	32U (2)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Reverse power/directional overpower protection	DOPPDPR1	P>/Q> (1)	32R/32O (1)
	DOPPDPR2	P>/Q> (2)	32R/32O (2)
	DOPPDPR3	P>/Q> (3)	32R/32O (3)
Three-phase underexcitation protection	UEXPDIS1	X< (1)	40 (1)
Three-phase underimpedance protection	UZPDIS1	Z>G (1)	21G (1)
Out-of-step protection	OOSRPSB1	OOS (1)	78 (1)
Multifrequency admittance-based earth-fault protection	MFADPSDE1	Io> ->Y (1)	67YN (1)
<b>Interconnection functions</b>			
Directional reactive power undervoltage protection	DQPTUV1	Q> ->,3U< (1)	32Q,27 (1)
Low-voltage ride-through protection	LVRTPTUV1	U<RT (1)	27RT (1)
	LVRTPTUV2	U<RT (2)	27RT (2)
	LVRTPTUV3	U<RT (3)	27RT (3)
Voltage vector shift protection	VVSPPAM1	VS (1)	78V (1)
<b>Power quality</b>			
Current total demand distortion	CMHAI1	PQM3I (1)	PQM3I (1)
Voltage total harmonic distortion	VMHAI1	PQM3U (1)	PQM3V (1)
Voltage variation	PHQVVR1	PQMU (1)	PQMV (1)
Voltage unbalance	VSQVUB1	PQUUB (1)	PQVUB (1)
<b>Control</b>			
Circuit-breaker control	CBXCBR1	I <-> O CB (1)	I <-> O CB (1)
Disconnecter control	DCXSWI1	I <-> O DCC (1)	I <-> O DCC (1)
	DCXSWI2	I <-> O DCC (2)	I <-> O DCC (2)
Earthing switch control	ESXSWI1	I <-> O ESC (1)	I <-> O ESC (1)
Disconnecter position indication	DCSXSWI1	I <-> O DC (1)	I <-> O DC (1)
	DCSXSWI2	I <-> O DC (2)	I <-> O DC (2)
	DCSXSWI3	I <-> O DC (3)	I <-> O DC (3)
Earthing switch indication	ESSXSWI1	I <-> O ES (1)	I <-> O ES (1)
	ESSXSWI2	I <-> O ES (2)	I <-> O ES (2)
Emergency start-up	ESMGAPC1	ESTART (1)	ESTART (1)
Autoreclosing	DARREC1	O -> I (1)	79 (1)
Tap changer position indication	TPOSYLTC1	TPOSM (1)	84M (1)
Tap changer control with voltage regulator	OLATCC1	COLTC (1)	90V (1)
Synchronism and energizing check	SECRSYN1	SYNC (1)	25 (1)
<b>Condition monitoring and supervision</b>			
Circuit-breaker condition monitoring	SSCBR1	CBCM (1)	CBCM (1)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Trip circuit supervision	TCSSCBR1	TCS (1)	TCM (1)
	TCSSCBR2	TCS (2)	TCM (2)
Current circuit supervision	CCSPVC1	MCS 3I (1)	MCS 3I (1)
Current transformer supervision for high-impedance protection scheme for phase A	HZCCASPVC1	MCS I_A(1)	MCS I_A(1)
Current transformer supervision for high-impedance protection scheme for phase B	HZCCBSPVC1	MCS I_B(1)	MCS I_B(1)
Current transformer supervision for high-impedance protection scheme for phase C	HZCCCSPVC1	MCS I_C(1)	MCS I_C(1)
Fuse failure supervision	SEQSPVC1	FUSEF (1)	60 (1)
Protection communication supervision	PCSITPC1	PCS (1)	PCS (1)
Runtime counter for machines and devices	MDSOPT1	OPTS (1)	OPTM (1)
<b>Measurement</b>			
Disturbance recorder	RDRE1	DR (1)	DFR (1)
Load profile record	LDPRLRC1	LOADPROF (1)	LOADPROF (1)
Fault record	FLTRFRC1	FAULTREC (1)	FAULTREC (1)
Three-phase current measurement	CMMXU1	3I (1)	3I (1)
	CMMXU2	3I (2)	3I (2)
Sequence current measurement	CSMSQI1	I1, I2, I0 (1)	I1, I2, I0 (1)
Residual current measurement	RESCMMXU1	Io (1)	In (1)
	RESCMMXU2	Io (2)	In (2)
Three-phase voltage measurement	VMMXU1	3U (1)	3V (1)
	VMMXU2	3U (2)	3V (2)
Residual voltage measurement	RESVMMXU1	Uo (1)	Vn (1)
	RESVMMXU2	Uo (2)	Vn (2)
Sequence voltage measurement	VSMSQI1	U1, U2, U0 (1)	V1, V2, V0 (1)
Three-phase power and energy measurement	PEMMXU1	P, E (1)	P, E (1)
RTD/mA measurement	XRGGIO130	X130 (RTD) (1)	X130 (RTD) (1)
Frequency measurement	FMMXU1	f (1)	f (1)
IEC 61850-9-2 LE sampled value sending	SMVSENDER	SMVSENDER	SMVSENDER
IEC 61850-9-2 LE sampled value receiving (voltage sharing)	SMVRCV	SMVRCV	SMVRCV
<b>Other</b>			
Minimum pulse timer (2 pcs)	TPGAPC1	TP (1)	TP (1)
	TPGAPC2	TP (2)	TP (2)
	TPGAPC3	TP (3)	TP (3)
	TPGAPC4	TP (4)	TP (4)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC1	TPS (1)	TPS (1)
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC1	TPM (1)	TPM (1)
Pulse timer (8 pcs)	PTGAPC1	PT (1)	PT (1)
	PTGAPC2	PT (2)	PT (2)
Time delay off (8 pcs)	TOFGAPC1	TOF (1)	TOF (1)
	TOFGAPC2	TOF (2)	TOF (2)
	TOFGAPC3	TOF (3)	TOF (3)
	TOFGAPC4	TOF (4)	TOF (4)
Time delay on (8 pcs)	TONGAPC1	TON (1)	TON (1)
	TONGAPC2	TON (2)	TON (2)
	TONGAPC3	TON (3)	TON (3)
	TONGAPC4	TON (4)	TON (4)
Set-reset (8 pcs)	SRGAPC1	SR (1)	SR (1)
	SRGAPC2	SR (2)	SR (2)
	SRGAPC3	SR (3)	SR (3)
	SRGAPC4	SR (4)	SR (4)
Move (8 pcs)	MVGAPC1	MV (1)	MV (1)
	MVGAPC2	MV (2)	MV (2)
Generic control point (16 pcs)	SPCGAPC1	SPC (1)	SPC (1)
	SPCGAPC2	SPC (2)	SPC (2)
Analog value scaling	SCA4GAPC1	SCA4 (1)	SCA4 (1)
	SCA4GAPC2	SCA4 (2)	SCA4 (2)
	SCA4GAPC3	SCA4 (3)	SCA4 (3)
	SCA4GAPC4	SCA4 (4)	SCA4 (4)
Integer value move	MVI4GAPC1	MVI4 (1)	MVI4 (1)

## Section 2

## IEC 60870-5-103 data mappings

### 2.1

### Overview

This document describes the IEC 60870-5-103 data points and structures available in the IED. The point lists describe a superset of all data available through the standard configuration/s. The tables show the default point definitions. All these data can be freely remapped in which case PCM600 can provide an updated point list export of the new outlook.

### 2.2

### Supported functions

#### 2.2.1

#### Supported functions in RED615

*Table 2: Supported functions*

Function	IEC 61850	A	B	C	D	E
		DE01	DE02	DE03	DE04	DE05
<b>Protection</b>						
Three-phase non-directional overcurrent protection, low stage	PHLPTOC	1	1	1		
Three-phase non-directional overcurrent protection, high stage	PHHPTOC	2	2	2		
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC	1	1	1	1	1
Three-phase directional overcurrent protection, low stage	DPHLPDOC				2	2
Three-phase directional overcurrent protection, high stage	DPHPDOC				1	1
Non-directional earth-fault protection, low stage	EFLPTOC			2		
Non-directional earth-fault protection, high stage	EFHPTOC			1		
Non-directional earth-fault protection, instantaneous stage	EFIPTOC			1		
Directional earth-fault protection, low stage	DEFLPDEF		2 <sup>1)</sup>		2	2 <sup>2)</sup>
Directional earth-fault protection, high stage	DEFHPDEF		1 <sup>1)</sup>		1	1 <sup>2)</sup>
Admittance-based earth-fault protection <sup>3)</sup>	EFPADM		(3) <sup>1)3)</sup>		(3) <sup>3)</sup>	(3) <sup>2)3)</sup>
Wattmetric-based earth-fault protection <sup>3)</sup>	WPWDE		(3) <sup>1)3)</sup>		(3) <sup>3)</sup>	(3) <sup>2)3)</sup>
Transient/intermittent earth-fault protection	INTRPTEF		1 <sup>1)4)</sup>		1 <sup>4)</sup>	1 <sup>2)4)</sup>
Harmonics-based earth-fault protection <sup>3)</sup>	HAEFPTOC		(1) <sup>3)4)</sup>	(1) <sup>3)4)</sup>	(1) <sup>3)4)</sup>	(1) <sup>3)4)</sup>
Non-directional (cross-country) earth-fault protection, using calculated lo	EFHPTOC		1		1	1
Negative-sequence overcurrent protection	NSPTOC	2	2	2	2	2
Phase discontinuity protection	PDNSPTOC		1	1	1	1
Residual overvoltage protection	ROVPTOV		3 <sup>1)</sup>		3	3 <sup>2)</sup>
Three-phase undervoltage protection	PHPTUV				3	3
Three-phase overvoltage protection	PHPTOV				3	3
Positive-sequence undervoltage protection	PSPTUV				1	1
Negative-sequence overvoltage protection	NSPTOV				1	1
Frequency protection	FRPFRQ				4	4

Table continues on next page

## Section 2 IEC 60870-5-103 data mappings

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Function	IEC 61850	A	B	C	D	E
		DE01	DE02	DE03	DE04	DE05
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR		1	1	1	1
Three-phase thermal overload protection, two time constants	T2PTTR		1	1	1	1
Binary signal transfer	BSTGGIO	1	1	1	1	1
Circuit breaker failure protection	CCBRBRF	1 <sup>5)</sup>	1	1	1	1
Three-phase inrush detector	INRPHAR	1	1	1	1	1
Switch onto fault	CBPSOF	1	1	1	1	1
Master trip	TRPPTRC	2	2	2	2	2
Multipurpose protection	MAPGAPC	18	18	18	18	18
Fault locator	SCEFRFLO				(1)	(1)
Line differential protection with in-zone power transformer	LNPLDF	1	1	1	1	1
High-impedance fault detection	PHIZ	1	1	1	1	
<b>Power quality</b>						
Current total demand distortion	CMHAI				(1) <sup>6)</sup>	(1) <sup>6)</sup>
Voltage total harmonic distortion	VMHAI				(1) <sup>6)</sup>	(1) <sup>6)</sup>
Voltage variation	PHQVVR				(1) <sup>6)</sup>	(1) <sup>6)</sup>
Voltage unbalance	VSQVUB				(1) <sup>6)</sup>	(1) <sup>6)</sup>
<b>Control</b>						
Circuit-breaker control	CBXCBR	1	1	1	1	1
Disconnecter control	DCXSWI	2	2	2	2	2
Earthing switch control	ESXSWI	1	1	1	1	1
Disconnecter position indication	DCSXSWI	3	3	3	3	3
Earthing switch indication	ESSXSWI	2	2	2	2	2
Autoreclosing	DARREC		(1)	(1)	(1)	(1)
Synchronism and energizing check	SECRSYN				1	(1) <sup>7)</sup>
<b>Condition monitoring and supervision</b>						
Circuit-breaker condition monitoring	SSCBR		1	1	1	1
Trip circuit supervision	TCSSCBR	2	2	2	2	2
Current circuit supervision	CCSPVC	1	1	1	1	1
Fuse failure supervision	SEQSPVC				1	1
Protection communication supervision	PCSITPC	1	1	1	1	1
Runtime counter for machines and devices	MDSOPT	1	1	1	1	1
<b>Measurement</b>						
Disturbance recorder	RDRE	1	1	1	1	1
Load profile record	LDPRLRC	1	1	1	1	1
Fault record	FLTRFRC	1	1	1	1	1
Three-phase current measurement	CMMXU	1	1	1	1	1
Sequence current measurement	CSMSQI	1	1	1	1	1
Residual current measurement	RESCMMXU		1	1	1	1
Three-phase voltage measurement	VMMXU				2	1 (1) <sup>7)</sup>
Residual voltage measurement	RESVMMXU		1		1	
Sequence voltage measurement	VSMSQI				1	1
Three-phase power and energy measurement	PEMMXU				1	1
RTD/mA measurement	XRGGPIO130				(1)	
Frequency measurement	FMMXU				1	1
IEC 61850-9-2 LE sampled value sending <sup>7)8)</sup>	SMVSENDER				(1)	(1)
IEC 61850-9-2 LE sampled value receiving (voltage sharing) 7)8)	SMVRCV				(1)	(1)
<b>Other</b>						
Minimum pulse timer (2 pcs)	TPGAPC	4	4	4	4	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	1	1	1	1	1

Table continues on next page

Function	IEC 61850	A	B	C	D	E
		DE01	DE02	DE03	DE04	DE05
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	1	1	1	1	1
Pulse timer (8 pcs)	PTGAPC	2	2	2	2	2
Time delay off (8 pcs)	TOFGAPC	4	4	4	4	4
Time delay on (8 pcs)	TONGAPC	4	4	4	4	4
Set-reset (8 pcs)	SRGAPC	4	4	4	4	4
Move (8 pcs)	MVGAPC	2	2	2	2	2
Generic control point (16 pcs)	SPCGAPC	2	2	2	2	2
Analog value scaling (4 pcs)	SCA4GAPC	4	4	4	4	4
Integer value move (4 pcs)	MVI4GAPC	1	1	1	1	1

1, 2, ... = Number of included instances. The instances of a protection function represent the number of identical protection function blocks available in the standard configuration.  
 () = optional

- 1) "Uo measured" is always used.
- 2) "Uo calculated" is always used.
- 3) One of the following can be ordered as an option: admittance-based E/F, wattmetric-based E/F or harmonics-based E/F.
- 4) "Io measured" is always used.
- 5) "Io calculated" is always used.
- 6) Power quality option includes current total demand distortion, voltage total harmonic distortion, voltage variation and voltage unbalance.
- 7) Available only with IEC 61850-9-2
- 8) Available only with COM0031...0037

## 2.2.2 Supported functions in REF615

Table 3: *Supported functions*

Function	IEC 61850	A	B	C	D	E	F	G	H	J	K	L	N
		FE01	FE02	FE03	FE04	FE05	FE06	FE07	FE08	FE09	FE10	FE11	FE12
<b>Protection</b>													
Three-phase non-directional overcurrent protection, low stage	PHLPTOC	1	1	1	1	1			1		1	2	2
Three-phase non-directional overcurrent protection, high stage	PHHPTOC	2	2	2	2	2			2		1	1	1
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC	1	1	1	1	1	1	1	1	1	1	1	1
Three-phase directional overcurrent protection, low stage	DPHLPDOC						2	2		2	1	2	2
Three-phase directional overcurrent protection, high stage	DPHPDOC						1	1		1	1	1	1
Non-directional earth-fault protection, low stage	EFLPTOC			2	2				2		2	2	2
Non-directional earth-fault protection, high stage	EFHPTOC			1	1				1		1		1
Non-directional earth-fault protection, instantaneous stage	EFIPTOC			1	1				1		1	1	1
Directional earth-fault protection, low stage	DEFLPDEF	2 <sup>1)</sup>	2 <sup>1)</sup>			2	2	2 <sup>2)</sup>		2	1	2 <sup>2)</sup>	2
Directional earth-fault protection, high stage	DEFHPDEF	1 <sup>1)</sup>	1 <sup>1)</sup>			1	1	1 <sup>2)</sup>		1	1	1 <sup>2)</sup>	1

Table continues on next page

## Section 2 IEC 60870-5-103 data mappings

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Function	IEC 61850	A	B	C	D	E	F	G	H	J	K	L	N
		FE01	FE02	FE03	FE04	FE05	FE06	FE07	FE08	FE09	FE10	FE11	FE12
Admittance-based earth-fault protection <sup>3)</sup>	EFPADM	(3) <sup>1)3)</sup>	(3) <sup>1)3)</sup>			(3) <sup>3)</sup>	(3) <sup>3)</sup>	(3) <sup>2)3)</sup>		(3) <sup>3)</sup>		(3) <sup>2)3)</sup>	(3) <sup>3)</sup>
Wattmetric-based earth-fault protection <sup>3)</sup>	WPWDE	(3) <sup>1)3)</sup>	(3) <sup>1)3)</sup>			(3) <sup>3)</sup>	(3) <sup>3)</sup>	(3) <sup>2)3)</sup>		(3) <sup>3)</sup>		(3) <sup>2)3)</sup>	(3) <sup>3)</sup>
Transient/intermittent earth-fault protection	INTRPTEF	1 <sup>4)</sup>	1 <sup>4)</sup>			1 <sup>4)</sup>	1 <sup>4)</sup>			1 <sup>4)</sup>		1 <sup>2)4)</sup>	1 <sup>4)</sup>
Harmonics-based earth-fault protection <sup>3)</sup>	HAEFPPTOC		(1) <sup>3)4)</sup>		(1) <sup>3)4)</sup>		(1) <sup>3)4)</sup>			(1) <sup>3)4)</sup>		(1) <sup>3)4)</sup>	(1) <sup>3)4)</sup>
Non-directional (cross-country) earth-fault protection, using calculated Io	EFHPTOC	1	1			1	1	1		1		1	
Negative-sequence overcurrent protection	NSPTOC	2	2	2	2	2	2	2	2	2	2	2	2
Phase discontinuity protection	PDNSPTOC	1	1	1	1	1	1	1	1	1		1	1
Residual overvoltage protection	ROVPTOV	3 <sup>1)</sup>	3 <sup>1)</sup>			3	3	3 <sup>2)</sup>	3	3	2	3 <sup>2)</sup>	3
Three-phase undervoltage protection	PHPTUV						3	3	3	3	2	3	3
Three-phase overvoltage protection	PHPTOV						3	3	3	3	2	3	3
Positive-sequence undervoltage protection	PSPTUV						1	1		1		2	2
Negative-sequence overvoltage protection	NSPTOV						1	1		1		2	2
Frequency protection	FRPFRQ								3	3	3	6	6
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR	1	1	1	1	1	1	1		1	1	1	1
High-impedance based restricted earth-fault protection	HREFPDIF										1 <sup>5)</sup>		
High-impedance differential protection for phase A	HIAPDIF												1
High-impedance differential protection for phase B	HIBPDIF												1
High-impedance differential protection for phase C	HICPDIF												1
Circuit breaker failure protection	CCBRBRF	1	1	1	1	1	1	1	1	1	1	1	1
Three-phase inrush detector	INRPHAR	1	1	1	1	1	1	1	1	1	1	1	1
Switch onto fault	CBPSOF	1	1	1	1	1	1	1	1	1	1	1	1
Master trip	TRPPTRC	2	2 (3) <sup>6)</sup>	2	2 (3) <sup>6)</sup>								
Arc protection	ARCSARC	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
Multipurpose protection	MAPGAPC	18	18	18	18	18	18	18	18	18	18	18	18
Fault locator	SCEFRFLO											(1)	(1)
High-impedance fault detection	PHIZ		1		1	1	1	1	1	1			1
Reverse power/directional overpower protection	DOPPDPR											2	2

Table continues on next page

Function	IEC 61850	A	B	C	D	E	F	G	H	J	K	L	N
		FE01	FE02	FE03	FE04	FE05	FE06	FE07	FE08	FE09	FE10	FE11	FE12
Multifrequency admittance-based earth-fault protection	MFADPSDE											1	1
<b>Interconnection functions</b>													
Directional reactive power undervoltage protection	DQPTUV											(1)	(1)
Low-voltage ride-through protection	LVRTPTUV											(3)	(3)
Voltage vector shift protection	VVSPPAM											(1)	(1)
<b>Power quality</b>													
Current total demand distortion	CMHAI										(1) <sup>7)</sup>	(1) <sup>7)</sup>	(1) <sup>7)</sup>
Voltage total harmonic distortion	VMHAI										(1) <sup>7)</sup>	(1) <sup>7)</sup>	(1) <sup>7)</sup>
Voltage variation	PHQVVR										(1) <sup>7)</sup>	(1) <sup>7)</sup>	(1) <sup>7)</sup>
Voltage unbalance	VSQVUB										(1) <sup>7)</sup>	(1) <sup>7)</sup>	(1) <sup>7)</sup>
<b>Control</b>													
Circuit-breaker control	CBXCBR	1	1	1	1	1	1	1	1	1	1	1	1
Disconnecter control	DCXSWI		2		2	2	2	2	2	2	2	2	2
Earthing switch control	ESXSWI		1		1	1	1	1	1	1	1	1	1
Disconnecter position indication	DCSXSWI		3		3	3	3	3	3	3	3	3	3
Earthing switch indication	ESSXSWI		2		2	2	2	2	2	2	2	2	2
Autoreclosing	DARREC	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Synchronism and energizing check	SECRSYN							(1) <sup>8)</sup>	1	1	1	(1) <sup>8)</sup>	1
<b>Condition monitoring and supervision</b>													
Circuit-breaker condition monitoring	SSCBR		1		1	1	1	1	1	1	1	1	1
Trip circuit supervision	TCSSCBR	2	2	2	2	2	2	2	2	2	2	2	2
Current circuit supervision	CCSPVC					1	1	1	1	1	1	1	1
Current transformer supervision for high-impedance protection scheme for phase A	HZCCASPVC												1
Current transformer supervision for high-impedance protection scheme for phase B	HZCCBSPVC												1
Current transformer supervision for high-impedance protection scheme for phase C	HZCCCSPVC												1
Fuse failure supervision	SEQSPVC					1	1	1	1	1	1	1	1
Runtime counter for machines and devices	MDSOPT	1	1	1	1	1	1	1	1	1	1	1	1
<b>Measurement</b>													
Disturbance recorder	RDRE	1	1	1	1	1	1	1	1	1	1	1	1
Load profile record	LDPRLRC		1		1	1	1	1	1	1	1	1	1
Fault record	FLTRFRC	1	1	1	1	1	1	1	1	1	1	1	1
Three-phase current measurement	CMMXU	1	1	1	1	1	1	1	1	1	1	1	1
Sequence current measurement	CSMSQI	1	1	1	1	1	1	1	1	1	1	1	1
Table continues on next page													

## Section 2 IEC 60870-5-103 data mappings

1MRS758070 D

Function	IEC 61850	A	B	C	D	E	F	G	H	J	K	L	N
		FE01	FE02	FE03	FE04	FE05	FE06	FE07	FE08	FE09	FE10	FE11	FE12
Residual current measurement	RESCMMXU	1	1	1	1	1	1	1	1	1	2	1	1
Three-phase voltage measurement	VMMXU					1	1	1 (1) <sup>8)</sup>	2	2	2	1 (1) <sup>8)</sup>	2
Residual voltage measurement	RESVMMXU	1	1			1	1		1	1	1		1
Sequence voltage measurement	VSMSQI					1	1	1	1	1	1	1	1
Three-phase power and energy measurement	PEMMXU					1	1	1	1	1	1	1	1
RTD/mA measurement	XRGGIO130		(1)		(1)	(1)	(1)		(1)	(1)			(1)
Frequency measurement	FMMXU					1	1	1	1	1	1	1	1
IEC 61850-9-2 LE sampled value sending <sup>8)9)</sup>	SMVSENDER					(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
IEC 61850-9-2 LE sampled value receiving (voltage sharing) <sup>8)9)</sup>	SMVRCV					(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
<b>Other</b>													
Minimum pulse timer (2 pcs)	TPGAPC	4	4	4	4	4	4	4	4	4	4	4	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	1	1	1	1	1	1	1	1	1	1	1	1
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	1	1	1	1	1	1	1	1	1	1	1	1
Pulse timer (8 pcs)	PTGAPC	2	2	2	2	2	2	2	2	2	2	2	2
Time delay off (8 pcs)	TOFGAPC	4	4	4	4	4	4	4	4	4	4	4	4
Time delay on (8 pcs)	TONGAPC	4	4	4	4	4	4	4	4	4	4	4	4
Set-reset (8 pcs)	SRGAPC	4	4	4	4	4	4	4	4	4	4	4	4
Move (8 pcs)	MVGAPC	2	2	2	2	2	2	2	2	2	2	2	2
Generic control point (16 pcs)	SPCGAPC	2	2	2	2	2	2	2	2	2	2	2	2
Analog value scaling (4 pcs)	SCA4GAPC	4	4	4	4	4	4	4	4	4	4	4	4
Integer value move (4 pcs)	MVI4GAPC	1	1	1	1	1	1	1	1	1	1	1	1
1, 2, ... = Number of included instances. The instances of a protection function represent the number of identical protection function blocks available in the standard configuration. () = optional													

- 1) "Uo measured" is always used.
- 2) "Uo calculated" is always used.
- 3) One of the following can be ordered as an option: admittance-based E/F, wattmetric-based E/F or harmonics-based E/F.
- 4) "Io measured" is always used.
- 5) "IoB measured" is always used.
- 6) Master trip is included and connected to the corresponding HSO in the configuration only when the BIO0007 module is used. If additionally the ARC option is selected, ARCSARC is connected in the configuration to the corresponding master trip input.
- 7) Power quality option includes current total demand distortion, voltage total harmonic distortion, voltage variation and voltage unbalance.
- 8) Available only with IEC 61850-9-2
- 9) Available only with COM0031...0037

## 2.2.3

## Supported functions in REG615

**Table 4:** *Supported functions*

Function	IEC 61850	A	C	D
		GE01	GE03	GE04
<b>Protection</b>				
Three-phase non-directional overcurrent protection, low stage	PHLPTOC		1	1
Three-phase non-directional overcurrent protection, high stage	PHHPTOC		1	1
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC	1	1	1
Three-phase directional overcurrent protection, low stage	DPHLPDOC	2		1 TR
Three-phase directional overcurrent protection, high stage	DPHHPDOC	1		1 TR
Three-phase voltage-dependent overcurrent protection	PHPVOC		1	1
Non-directional earth-fault protection, high stage	EFHPTOC	1	1	1
Directional earth-fault protection, low stage	DEFLPDEF	2	2	2
Directional earth-fault protection, high stage	DEFHPDEF	1	1	1
Transient/intermittent earth-fault protection	INTRTEF	1 <sup>1)</sup>		
Negative-sequence overcurrent protection	NSPTOC	2		
Negative-sequence overcurrent protection for machines	MNSPTOC		2	2
Residual overvoltage protection	ROVPTOV	2	2	2
Three-phase undervoltage protection	PHPTUV	2	2	2
Three-phase overvoltage protection	PHPTOV	2	2	2
Positive-sequence undervoltage protection	PSPTUV	2	2	2
Negative-sequence overvoltage protection	NSPTOV	2	2	2
Frequency protection	FRPFRQ	6	6	4
Overexcitation protection	OEPVPH		1	1
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR	1		
Three-phase thermal overload protection, two time constants	T2PTTR		1	1
Circuit breaker failure protection	CCBRBRF	1	1 <sup>2)</sup>	1 <sup>2)</sup>
Three-phase inrush detector	INRPHAR	1	1	1
Master trip	TRPPTRC	2 (3) <sup>3)</sup>	3 (3) <sup>3)</sup>	3 (3) <sup>3)</sup>
Arc protection	ARCSARC	(3)	(3) <sup>2)</sup>	(3) <sup>2)</sup>
Multipurpose protection	MAPGAPC	18	18	18
Stabilized and instantaneous differential protection for machines	MPDIF			1
Third harmonic-based stator earth-fault protection	H3EFPSEF		1	
Underpower protection	DUPPDPR		2	2
Reverse power/directional overpower protection	DOPPDPR	2	3	2
Three-phase underexcitation protection	UEXPDIS		1	1
Three-phase underimpedance protection	UZPDIS		1	
Out-of-step protection	OOSRPSB		1	1
<b>Interconnection functions</b>				
Directional reactive power undervoltage protection	DQPTUV	1		
Low-voltage ride-through protection	LVRTPTUV	3		
Voltage vector shift protection	VVSPPAM	1		
<b>Power quality</b>				
Current total demand distortion	CMHAI	(1) <sup>4)</sup>	(1) <sup>4)</sup>	(1) <sup>4)</sup>
Voltage total harmonic distortion	VMHAI	(1) <sup>4)</sup>	(1) <sup>4)</sup>	(1) <sup>4)</sup>
Voltage variation	PHQVVR	(1) <sup>4)</sup>	(1) <sup>4)</sup>	(1) <sup>4)</sup>
Voltage unbalance	VSQVUB	(1) <sup>4)</sup>	(1) <sup>4)</sup>	(1) <sup>4)</sup>
<b>Control</b>				
Circuit-breaker control	CBXCBR	1	1	1
Table continues on next page				

## Section 2

### IEC 60870-5-103 data mappings

1MRS758070 D

Function	IEC 61850	A	C	D
	GE01	GE03	GE04	
Disconnecter control	DCXSWI	2	2	2
Earthing switch control	ESXSWI	1	1	1
Disconnecter position indication	DCSXSWI	3	3	3
Earthing switch indication	ESSXSWI	2	2	2
Synchronism and energizing check	SECRSYN	1		1
<b>Condition monitoring and supervision</b>				
Circuit-breaker condition monitoring	SSCBR	1	1	1
Trip circuit supervision	TCSSCBR	2	2	2
Current circuit supervision	CCSPVC	1		
Fuse failure supervision	SEQSPVC	1	1	1
Runtime counter for machines and devices	MDSOPT	1	1	1
<b>Measurement</b>				
Disturbance recorder	RDRE	1	1	1
Load profile record	LDPRLRC	1	1	1
Fault record	FLTRFRC	1	1	1
Three-phase current measurement	CMMXU	1	1	2
Sequence current measurement	CSMSQI	1	1	1
Residual current measurement	RESCMMXU	1	1	1
Three-phase voltage measurement	VMMXU	2	1	2
Residual voltage measurement	RESVMMXU	1	2	1
Sequence voltage measurement	VSMSQI	1	1	1
Three-phase power and energy measurement	PEMMXU	1	1	1
RTD/mA measurement	XRGGIO130	(1)	(1)	(1)
Frequency measurement	FMMXU	1	1	1
IEC 61850-9-2 LE sampled value sending <sup>5)6)</sup>	SMVSENDER	(1)	(1)	(1)
IEC 61850-9-2 LE sampled value receiving (voltage sharing) <sup>5)6)</sup>	SMVRCV	(1)	(1)	(1)
<b>Other</b>				
Minimum pulse timer (2 pcs)	TPGAPC	4	4	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	1	1	1
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	1	1	1
Pulse timer (8 pcs)	PTGAPC	2	2	2
Time delay off (8 pcs)	TOFGAPC	4	4	4
Time delay on (8 pcs)	TONGAPC	4	4	4
Set-reset (8 pcs)	SRGAPC	4	4	4
Move (8 pcs)	MVGAPC	2	2	2
Generic control point (16 pcs)	SPCGAPC	2	2	2
Analog value scaling (4 pcs)	SCA4GAPC	4	4	4
Integer value move (4 pcs)	MVI4GAPC	1	1	1

1, 2, ... = Number of included instances. The instances of a protection function represent the number of identical protection function blocks available in the standard configuration.

( ) = optional

TR = The function block is to be used on the terminal side in the application.

- 1) "Io measured" is always used.
- 2) "Io calculated" is always used.
- 3) Master trip is included and connected to the corresponding HSO in the configuration only when the BIO0007 module is used. If additionally the ARC option is selected, ARCSARC is connected in the configuration to the corresponding master trip input.
- 4) Power quality option includes current total demand distortion, voltage total harmonic distortion, voltage variation and voltage unbalance.
- 5) Available only with IEC 61850-9-2
- 6) Available only with COM0031...0037

## 2.2.4

## Supported functions in REM615

**Table 5:** Supported functions

Function	IEC 61850	A	B	C	D
		ME01	ME02	ME03	ME04
<b>Protection</b>					
Three-phase non-directional overcurrent protection, low stage	PHLPTOC	1	1	1	1
Three-phase non-directional overcurrent protection, high stage	PHHPTOC	1	1	1	1
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC	1	1	1	1
Non-directional earth-fault protection, low stage	EFLPTOC	1			
Non-directional earth-fault protection, high stage	EFHPTOC	1	1	1	1
Directional earth-fault protection, low stage	DEFLPDEF		1 <sup>1)</sup>	1	1 <sup>1)</sup>
Three-phase undervoltage protection	PHPTUV		1	1	1
Positive-sequence undervoltage protection	PSPTUV		1	1	1
Negative-sequence overvoltage protection	NSPTOV		1	1	1
Frequency protection	FRPFRQ		2	2	2
Negative-sequence overcurrent protection for machines	MNSPTOC	2	2	2	2
Loss of load supervision	LOFLPTUC	1	1	1	1
Motor load jam protection	JAMPTOC	1	1	1	1
Motor start-up supervision	STTPMSU	1	1	1	1
Phase reversal protection	PREVPTOC	1	1	1	1
Thermal overload protection for motors	MPTTR	1	1	1	1
Circuit breaker failure protection	CCBRBRF	1	1	1	1
Master trip	TRPPTRC	2 (3) <sup>2)</sup>	2 (3) <sup>2)</sup>	2 (3) <sup>2)</sup>	2 (3) <sup>2)</sup>
Arc protection	ARCSARC	(3)	(3)	(3)	(3)
Multipurpose protection	MAPGAPC	18	18	18	18
<b>Control</b>					
Circuit-breaker control	CBXCBR	1	1	1	1
Disconnector control	DCXSWI	2	2	2	2
Earthing switch control	ESXSWI	1	1	1	1
Disconnector position indication	DCSXSWI	3	3	3	3
Earthing switch indication	ESSXSWI	2	2	2	2
Emergency start-up	ESMGAPC	1	1	1	1
<b>Condition monitoring and supervision</b>					
Circuit-breaker condition monitoring	SSCBR	1	1	1	1
Trip circuit supervision	TCSSCBR	2	2	2	2
Current circuit supervision	CCSPVC	1	1	1	1
Fuse failure supervision	SEQSPVC		1	1	1
Runtime counter for machines and devices	MDSOPT	1	1	1	1
<b>Measurement</b>					
Disturbance recorder	RDRE	1	1	1	1
Load profile record	LDPRLRC	1	1	1	1
Fault record	FLTRFRC	1	1	1	1
Three-phase current measurement	CMMXU	1	1	1	1
Sequence current measurement	CSMSQI	1	1	1	1
Residual current measurement	RESCMMXU	1	1	1	1
Three-phase voltage measurement	VMMXU		1	1	1
Residual voltage measurement	RESVMMXU			1	
Sequence voltage measurement	VSMSQI		1	1	1
Three-phase power and energy measurement	PEMMXU		1	1	1
Table continues on next page					

## Section 2 IEC 60870-5-103 data mappings

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Function	IEC 61850	A	B	C	D
		ME01	ME02	ME03	ME04
RTD/mA measurement	XRGGIO130	(1)	(1)		
Frequency measurement	FMMXU1		1	1	1
IEC 61850-9-2 LE sampled value sending <sup>3)4)</sup>	SMVSENDER		(1)	(1)	(1)
IEC 61850-9-2 LE sampled value receiving (voltage sharing) <sup>3)4)</sup>	SMVRCV		(1)	(1)	(1)
<b>Other</b>					
Minimum pulse timer (2 pcs)	TPGAPC	4	4	4	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	1	1	1	1
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	1	1	1	1
Pulse timer (8 pcs)	PTGAPC	2	2	2	2
Time delay off (8 pcs)	TOFGAPC	4	4	4	4
Time delay on (8 pcs)	TONGAPC	4	4	4	4
Set-reset (8 pcs)	SRGAPC	4	4	4	4
Move (8 pcs)	MVGAPC	2	2	2	2
Generic control point (16 pcs)	SPCGAPC	2	2	2	2
Analog value scaling (4 pcs)	SCA4GAPC	4	4	4	4
Integer value move (4 pcs)	MVI4GAPC	1	1	1	1

1, 2, ... = Number of included instances. The instances of a protection function represent the number of identical protection function blocks available in the standard configuration.  
( ) = optional

- 1) "Uo calculated" is always used.
- 2) Master trip is included and connected to the corresponding HSO in the configuration only when the BIO0007 module is used. If additionally the ARC option is selected, ARCSARC is connected in the configuration to the corresponding master trip input.
- 3) Available only with IEC 61850-9-2
- 4) Available only with COM0031-0037

## 2.2.5 Supported functions in RET615

**Table 6:** *Supported functions*

Function	IEC 61850	A	B	C	D	E	F	G	H
		TE01	TE02	TE03	TE04	TE05	TE06	TE07	TE08
<b>Protection</b>									
Three-phase non-directional overcurrent protection, low stage	PHLPTOC1	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV
	PHLPTOC2	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV
Three-phase non-directional overcurrent protection, high stage	PHHPTOC1	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV
	PHHPTOC2	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC1	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV
	PHIPTOC2	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV
Non-directional earth-fault protection, low stage	EFLPTOC1	1 HV		1 HV 1)		1 HV		1 HV 1)	
	EFLPTOC2		1 LV		1 LV 2)		1 LV		1 LV 2)
Non-directional earth-fault protection, high stage	EFHPTOC1	1 HV		1 HV 1)		1 HV		1 HV 1)	
	EFHPTOC2		1 LV		1 LV 2)		1 LV		1 LV 2)
Negative-sequence overcurrent protection	NSPTOC1	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV
	NSPTOC2	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV	1 LV
Residual overvoltage protection	ROVPTOV					2 HV	2 HV	2 HV	2 HV
Three-phase undervoltage protection	PHPTUV					2 HV	2 HV	2 HV	2 HV
Three-phase overvoltage protection	PHPTOV					2 HV	2 HV	2 HV	2 HV
Three-phase thermal overload protection, two time constants	T2PTTR	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV	1 HV

Table continues on next page

Function	IEC 61850	A	B	C	D	E	F	G	H
		TE01	TE02	TE03	TE04	TE05	TE06	TE07	TE08
Stabilized and instantaneous differential protection for two-winding transformers	TR2PTDF	1	1	1	1	1	1	1	1
Numerically stabilized low-impedance restricted earth-fault protection	LREFPNDF	1 HV	1 LV			1 HV	1 LV		
High-impedance based restricted earth-fault protection	HREFPDIF			1 HV	1 LV 3)			1 HV	1 LV 3)
Circuit breaker failure protection	CCBRBRF	1 HV 1)							
Master trip	TRPPTRC	2 (3) 4)	2 (3) 4)	2 (3) 4)	2 (3) 4)	2 (3) 4)	2 (3) 4)	2 (3) 4)	2 (3) 4)
Arc protection	ARCSARC	(3) LV 5)							
Multipurpose protection	MAPGAPC	18	18	18	18	18	18	18	18
<b>Control</b>									
Circuit-breaker control	CBXCBR	1 HV							
Disconnecter control	DCXSWI	2	2	2	2	2	2	2	2
Earthing switch control	ESXSWI	1	1	1	1	1	1	1	1
Disconnecter position indication	DCSXSWI	3	3	3	3	3	3	3	3
Earthing switch indication	ESSXSWI	2	2	2	2	2	2	2	2
Tap changer position indication	TPOSYLTC	1	1	1	1	1	1	1	1
<b>Condition monitoring and supervision</b>									
Circuit-breaker condition monitoring	SSCBR	1 HV							
Trip circuit supervision	TCSSCBR	2	2	2	2	2	2	2	2
Fuse failure supervision	SEQSPVC					1	1	1	1
Runtime counter for machines and devices	MDSOPT	1	1	1	1	1	1	1	1
<b>Measurement</b>									
Disturbance recorder	RDRE	1	1	1	1	1	1	1	1
Load profile record	LDPRLRC	1	1	1	1	1	1	1	1
Fault record	FLTRFRC	1	1	1	1	1	1	1	1
Three-phase current measurement	CMMXU1	1 HV							
	CMMXU2	1 LV							
Sequence current measurement	CSMSQI1	1 HV							
Residual current measurement	RESCMMXU1	1 HV		1 HV		1 HV		1 HV	
	RESCMMXU2		1 LV		1 LV		1 LV		1 LV
Three-phase voltage measurement	VMMXU					1 HV	1 HV	1 HV	1 HV
Residual voltage measurement	RESVMMXU					1 HV	1 HV	1 HV	1 HV
Sequence voltage measurement	VSMSQI					1 HV	1 HV	1 HV	1 HV
Three-phase power and energy measurement	PEMMXU					1 HV	1 HV	1 HV	1 HV
RTD/mA measurement	XRGGIO130	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Frequency measurement	FMMXU					1	1	1	1
IEC 61850-9-2 LE sampled value sending 6)7)	SMVSENDER					(1)	(1)	(1)	(1)
IEC 61850-9-2 LE sampled value receiving (voltage sharing) 6)7)	SMVRCV					(1)	(1)	(1)	(1)
<b>Other</b>									
Minimum pulse timer (2 pcs)	TPGAPC	4	4	4	4	4	4	4	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	1	1	1	1	1	1	1	1
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	1	1	1	1	1	1	1	1
Pulse timer (8 pcs)	PTGAPC	2	2	2	2	2	2	2	2
Time delay off (8 pcs)	TOFGAPC	4	4	4	4	4	4	4	4
Time delay on (8 pcs)	TONGAPC	4	4	4	4	4	4	4	4
Set-reset (8 pcs)	SRGAPC	4	4	4	4	4	4	4	4

Table continues on next page

## Section 2

### IEC 60870-5-103 data mappings

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Function	IEC 61850	A	B	C	D	E	F	G	H
		TE01	TE02	TE03	TE04	TE05	TE06	TE07	TE08
Move (8 pcs)	MVGAPC	2	2	2	2	2	2	2	2
Generic control point (16 pcs)	SPCGAPC	2	2	2	2	2	2	2	2
Analog value scaling (4 pcs)	SCA4GAPC	4	4	4	4	4	4	4	4
Integer value move (4 pcs)	MVI4GAPC	1	1	1	1	1	1	1	1

1, 2, ... = Number of included instances. The instances of a protection function represent the number of identical protection function blocks available in the standard configuration.  
 () = optional  
 HV = The function block is to be used on the high-voltage side in the application.  
 LV = The function block is to be used on the low-voltage side in the application.

- 1) "Io calculated" is always used.
- 2) IoB calculated is always used.
- 3) "IoB measured" is always used.
- 4) Master trip is included and connected to the corresponding HSO in the configuration only when the BIO0007 module is used. If additionally the ARC option is selected, ARCSARC is connected in the configuration to the corresponding master trip input.
- 5) "IoB calculated" and "3IB" are always used.
- 6) Available only with IEC 61850-9-2
- 7) Available only with COM0031-0037

## 2.2.6 Supported functions in REU615

Table 7: *Supported functions*

Function	IEC 61850	A	B
<b>Protection</b>		UE01	UE02
<b>Protection</b>			
Three-phase non-directional overcurrent protection, low stage	PHLPTOC		1
Three-phase non-directional overcurrent protection, high stage	PHHPTOC		1
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC		1
Residual overvoltage protection	ROVPTOV	3	
Three-phase undervoltage protection	PHPTUV	3	3
Three-phase overvoltage protection	PHPTOV	3	3
Positive-sequence undervoltage protection	PSPTUV	2	
Negative-sequence overvoltage protection	NSPTOV	2	
Frequency protection	FRPFRQ	6	
Three-phase thermal overload protection, two time constants	T2PTTR		1
Master trip	TRPPTRC	2	2
Arc protection	ARCSARC	(3) <sup>1)</sup>	
Multipurpose protection	MAPGAPC	18	18
Load-shedding and restoration	LSDHPFRQ	5	
<b>Control</b>			
Circuit-breaker control	CBXCBR	1	1
Disconnector control	DCXSWI	2	2
Earthing switch control	ESXSWI	1	1
Disconnector position indication	DCSXSWI	3	3
Earthing switch indication	ESSXSWI	2	2
Tap changer position indication	TPOSYLT		1
Tap changer control with voltage regulator	OLATCC		1
Synchronism and energizing check	SECRSYN	1	
<b>Condition monitoring and supervision</b>			
Trip circuit supervision	TCSSCBR	2	2
Current circuit supervision	CCSPVC		1
Fuse failure supervision	SEQSPVC		1
Runtime counter for machines and devices	MDSOPT	1	1

Table continues on next page

Function	IEC 61850	A	B
		UE01	UE02
<b>Measurement</b>			
Disturbance recorder	RDRE	1	1
Load profile record	LDPRLRC	1	1
Fault record	FLTRFRC	1	1
Three-phase current measurement	CMMXU		1
Sequence current measurement	CSMSQI		1
Three-phase voltage measurement	VMMXU	2	1
Residual voltage measurement	RESVMMXU	1	
Sequence voltage measurement	VSMSQI	1	1
Three-phase power and energy measurement	PEMMXU		1
RTD/mA measurement	XRGGIO130		(1)
Frequency measurement	FMMXU	1	
IEC 61850-9-2 LE sampled value sending <sup>2)3)</sup>	SMVSENDER	(1)	(1)
IEC 61850-9-2 LE sampled value receiving (voltage sharing) <sup>2)3)</sup>	SMVRCV	(1)	(1)
<b>Other</b>			
Minimum pulse timer (2 pcs)	TPGAPC	4	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	1	1
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	1	1
Pulse timer (8 pcs)	PTGAPC	2	2
Time delay off (8 pcs)	TOFGAPC	4	4
Time delay on (8 pcs)	TONGAPC	4	4
Set-reset (8 pcs)	SRGAPC	4	4
Move (8 pcs)	MVGAPC	2	2
Generic control point (16 pcs)	SPCGAPC	2	2
Analog value scaling (4 pcs)	SCA4GAPC	4	4
Integer value move (4 pcs)	MVI4GAPC	1	1
1, 2, ... = Number of included instances. The instances of a protection function represent the number of identical protection function blocks available in the standard configuration.			
() = optional			

1) Light only

2) Available only with IEC 61850-9-2

3) Available only with COM0031-0037

## 2.2.7 Supported functions in REV615

Table 8: *Supported functions*

Function	IEC 61850	A	B
		VE01	VE02
<b>Protection</b>			
Three-phase non-directional overcurrent protection, low stage	PHLPTOC	1	1
Three-phase non-directional overcurrent protection, high stage	PHHPTOC	2	2
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC	1	1
Non-directional earth-fault protection, low stage	EFLPTOC	2	
Non-directional earth-fault protection, high stage	EFHPTOC	1	1
Non-directional earth-fault protection, instantaneous stage	EFIPTOC	1	
Directional earth-fault protection, low stage	DEFLPDEF		2
Directional earth-fault protection, high stage	DEFHPDEF		1
Transient/intermittent earth-fault protection	INTRPTEF		1 <sup>1)</sup>
Negative-sequence overcurrent protection	NSPTOC	2	2
Residual overvoltage protection	ROVPTOV		1
Table continues on next page			

## Section 2 IEC 60870-5-103 data mappings

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Function	IEC 61850	A	B
	VE01	VE02	2 <sup>2)</sup>
Three-phase undervoltage protection	PHPTUV		2
Three-phase overvoltage protection	PHPTOV		2
Positive-sequence undervoltage protection	PSPTUV		1
Negative-sequence overvoltage protection	NSPTOV		1
Three-phase thermal overload protection, two time constants	T2PTTR	1	1
Circuit breaker failure protection	CCBRBRF	1	1
Master trip	TRPPTRC	2 (3) <sup>3)</sup>	2 (3) <sup>3)</sup>
Arc protection	ARCSARC	(3)	(3)
Multipurpose protection	MAPGAPC	18	18
Three-phase overload protection for shunt capacitor banks	COLPTOC	1	1
Current unbalance protection for shunt capacitor banks	CUBPTOC	1 <sup>4)</sup>	1 <sup>4)</sup>
Three-phase current unbalance protection for shunt capacitor banks	HCUBPTOC	1 <sup>4)</sup>	1 <sup>4)</sup>
Shunt capacitor bank switching resonance protection, current based	SRCPTOC	1	1
<b>Power quality</b>			
Current total demand distortion	CMHAI	(1) <sup>5)</sup>	(1) <sup>6)</sup>
Voltage total harmonic distortion	VMHAI		(1) <sup>6)</sup>
Voltage variation	PHQVVR		(1) <sup>6)</sup>
Voltage unbalance	VSQVUB		(1) <sup>6)</sup>
<b>Control</b>			
Circuit-breaker control	CBXCBR	1	1
Disconnecter control	DCXSWI	2	2
Earthing switch control	ESXSWI	1	1
Disconnecter position indication	DCSXSWI	3	3
Earthing switch indication	ESSXSWI	2	2
<b>Condition monitoring and supervision</b>			
Circuit-breaker condition monitoring	SSCBR	1	1
Trip circuit supervision	TCSSCBR	2	2
Current circuit supervision	CCSPVC	1	1
Fuse failure supervision	SEQSPVC		1
Runtime counter for machines and devices	MDSOPT	1	1
<b>Measurement</b>			
Disturbance recorder	RDRE	1	1
Load profile record	LDPRLRC	1	1
Fault record	FLTRFRC	1	1
Three-phase current measurement	CMMXU	1	1
Sequence current measurement	CSMSQI	1	1
Residual current measurement	RESCMXXU	1	1
Three-phase voltage measurement	VMMXU		1
Residual voltage measurement	RESVMMXU		2
Sequence voltage measurement	VSMSQI		1
Three-phase power and energy measurement	PEMMXU		1
RTD/mA measurement	XRGGIO130	(1)	(1)
Frequency measurement	FMMXU		1
IEC 61850-9-2 LE sampled value sending <sup>7)8)</sup>	SMVSENDER		(1)
IEC 61850-9-2 LE sampled value receiving (voltage sharing) <sup>7)8)</sup>	SMVRCV		(1)
<b>Other</b>			
Minimum pulse timer (2 pcs)	TPGAPC	4	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	1	1
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	1	1
Pulse timer (8 pcs)	PTGAPC	2	2
Table continues on next page			

Function	IEC 61850	A	B
	VE01	VE02	
Time delay off (8 pcs)	TOFGAPC	4	4
Time delay on (8 pcs)	TONGAPC	4	4
Set-reset (8 pcs)	SRGAPC	4	4
Move (8 pcs)	MVGAPC	2	2
Generic control point (16 pcs)	SPCGAPC	2	2
Analog value scaling (4 pcs)	SCA4GAPC	4	4
Integer value move (4 pcs)	MVI4GAPC	1	1

1, 2, ... = Number of included instances. The instances of a protection function represent the number of identical protection function blocks available in the standard configuration.  
 () = optional

- 1) "Io measured" is always used.
- 2) "Uob measured" is always used.
- 3) Master trip is included and connected to the corresponding HSO in the configuration only when the BIO0007 module is used. If additionally the ARC option is selected, ARCSARC is connected to the corresponding master trip input in the configuration.
- 4) The lumb measurement values are taken from this block and put in the Measurment view.
- 5) Power quality option includes only current total demand distortion.
- 6) Power quality option includes current total demand distortion, voltage total harmonic distortion, voltage variation and voltage unbalance.
- 7) Available only with IEC 61850-9-2
- 8) Available only with COM0031-0037

## 2.3 Indications and controls

*Table 9: Explanations of the indications and controls table columns*

Column name	Description
IEC 61850 name	Original IED data object identification. Described in the IEC 61850 format as Logical Device.Logical Node and thereafter .Data Object.Data Attribute. Logical Node is the same as the application function block name.
SA name	The signal may have a defined label that is visible, for example, in the Application Configuration tool in PCM600.
Description	Short description of the signal. See the technical manual for more information.
DPI value	IEC 60870-5-103 indication and control values are coded as two-bit values (= DPI). 10 = ON, 01 = OFF
FUN	Default function type definition for the signal. Can be modified via PCM600.
INF	Default information number definition for the signal. Can be modified via PCM600.
U	Signal in use or not as default. 1 = In use, 0 = Not in use Can be configured via PCM600.
ASDU	ASDU type of the signal as default. ASDU type of indications can be modified via PCM600. ASDU 1 and 2 are indications. ASDU 20 is control.
I	General interrogation (GI) setting as default. 1 = In GI, 0 = Not in GI Can be modified via PCM600.
C	Extended DPI coding. 1 = Regular OFF/ON (01/10) values 2 = Four-pole INTERMEDIATE/OFF/ON/ERROR values (00/01/10/11)

## 2.3.1 System functions

### 2.3.1.1 General data (FUN=0) IEC 60870-5-103 standard

*Table 10: General data (FUN=0) IEC 60870-5-103 standard*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LLN0									
.IndLEDRs.Oper.ctlVal	-	LED reset	10=Reset	0 <sup>1)</sup>	19	1	20	0	1
		Blocking of monitoring	10=On	0 <sup>1)</sup>	20	1	20	0	1
.Beh.stVal.(Test)	-	Test mode	10=On	0 <sup>1)</sup>	21	1	1	1	1
LD0.LLN0									
.ActSetGr.ctlVal/stVal (SG1)	-	Param setting group 1	10=SG 1	0 <sup>1)</sup>	23	1	1,20	1	1
.ActSetGr.ctlVal/stVal (SG2)	-	Param setting group 2	10=SG 2	0 <sup>1)</sup>	24	1	1,20	1	1
.ActSetGr.ctlVal/stVal (SG3)	-	Param setting group 3	10=SG 3	0 <sup>1)</sup>	25	1	1,20	1	1
.ActSetGr.ctlVal/stVal (SG4)	-	Param setting group 4	10=SG 4	0 <sup>1)</sup>	26	1	1,20	1	1
.ActSetGr.ctlVal/stVal (SG5)	-	Param setting group 5	10=SG 5	0 <sup>1)</sup>	27	1	1,20	1	1
.ActSetGr.ctlVal/stVal (SG6)	-	Param setting group 6	10=SG 6	0 <sup>1)</sup>	28	1	1,20	1	1
LD0.TCSSCBR1									
.CircAlm.stVal	ALARM	Trip circuit 1 alarm	10=Alarm	0 <sup>1)</sup>	36	1	1	1	1
LD0.LEDPTRC1									
.Op.general	-	Global operate	10=Operate	0 <sup>1)</sup>	68	1	2	1	1
.Str.general	-	Global start	10=Start	0 <sup>1)</sup>	84	1	2	1	1

1) FUN type 0 is linked to parameter *DevFunType*. Default value is 9.

### 2.3.1.2 General data (FUN=0) IEC 60870-5-103 standard, AR data

*Table 11: General data (FUN=0) IEC 60870-5-103 standard, AR data*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DARREC1									
.AutoRecOn.stVal	-	AR state	10=On	0	16	1	1	1	1
.SucRec.stVal	SUC_RECL	AR success	10=Succ.	0	128	1	1	0	1

### 2.3.1.3

### General data (FUN=10), 615-specific

*Table 12: General data (FUN=10), 615-specific*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.TRPPTRC1									
.Op.general	-	Trip1 input	10=On	10	1	1	2	0	1
.Tr.general	-	Trip1 output	10=On	10	2	1	2	0	1
LD0.TRPPTRC2									
.Op.general	-	Trip2 input	10=On	10	3	1	2	0	1
.Tr.general	-	Trip2 output	10=On	10	4	1	2	0	1
LD0.TRPPTRC3									
.Op.general	HIGH_ALARM	Trip3 input	10=On	10	5	1	2	1	1
.Tr.general	HIGH_WARN	Trip3 output	10=On	10	6	1	2	1	1
LD0.TRPPTRC4									
.Op.general	HIGH_ALARM	Trip4 input	10=On	10	7	1	2	1	1
.Tr.general	HIGH_WARN	Trip4 output	10=On	10	8	1	2	1	1
LD0.TRPPTRC5									
.Op.general	HIGH_ALARM	Trip5 input	10=On	10	12	1	2	1	1
.Tr.general	HIGH_WARN	Trip5 output	10=On	10	13	1	2	1	1
LD0.TRPPTRC6									
.Op.general	HIGH_ALARM	Trip6 input	10=On	10	14	1	2	1	1
.Tr.general	HIGH_WARN	Trip6 output	10=On	10	15	1	2	1	1
CTRL.LLN0									
.Loc.stVal	-	Local/Remote state	10=Local	10	10	1	1	1	1
.LocKeyHMI.stVal	-	Station state	10=On	10	11	1	1	1	1
LD0.LLN0									
.ProgLEDRs.Oper.ctVal	-	Reset alarm LEDs	10=Reset	10	21	1	20	0	1
LD0.LDEV1									
.DevFail.IRF	-	Internal fault	10=Fault	10	100	1	1	0	1
LD0.TCSSCBR2									
.CircAlm.stVal	ALARM	Trip circuit 2 alarm	10=Alarm	10	36	1	1	1	1
DR.RDRE1									
.RcdTrg.ctlVal	-	Trig DR recording	10=Trig	10	41	1	20	0	1
.MemClr.ctlVal	-	Clear DR memory	10=Clear	10	42	1	20	0	1
LD0.CMMXU1									
.RcdRs.Oper.ctlVal		Reset max. demands	10=Reset	10	45	1	20	0	1
LD0.CMMXU2									
.RcdRs.Oper.ctlVal		Reset max. demands	10=Reset	10	46	1	20	0	1
LD0.RESCMMXU1									
.RcdRs.Oper.ctlVal		Reset max. demands	10=Reset	10	47	1	20	0	1

Table continues on next page

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IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.RESCMMXU2									
.RcdRs.Oper.ctlVal		Reset max. demands	10=Reset	10	48	1	20	0	1
LD0.RESVMMXU1									
.RcdRs.Oper.ctlVal		Reset max. demands	10=Reset	10	49	1	20	0	1
LD0.RESVMMXU2									
.RcdRs.Oper.ctlVal		Reset max. demands	10=Reset	10	50	1	20	0	1
LD0.PEMMXU1									
.RcdRs.Oper.ctlVal		Reset max. demands	10=Reset	10	51	1	20	0	1
LD0.LEDPTRC1		Global protection:							
.Str.phsA	-	Start-phsA	10=Start	10	61	0	2	1	1
.Str.phsB	-	Start-phsB	10=Start	10	62	0	2	1	1
.Str.phsC	-	Start-phsC	10=Start	10	63	0	2	1	1
.Op.phsA	-	Operate-phsA	10=Operate	10	65	0	2	0	1
.Op.phsB	-	Operate-phsB	10=Operate	10	66	0	2	0	1
.Op.phsC	-	Operate-phsC	10=Operate	10	67	0	2	0	1
LD0.LDPRLRC1									
.MemWrn.stVal		Load profile file memory warning		10	198	0	1	0	1
.MemAlm.stVal		Load profile file memory alarm		10	199	0	1	0	1

### 2.3.1.4 LD0.GNRLLTMS1 Time synchronization (1)

Table 13: LD0.GNRLLTMS1 Time synchronization (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.GNRLLTMS1									
.TmChSt1.stVal		Time channel status	01=Up; 10=Down	10	85	1	1	0	1

### 2.3.1.5 LD0.GSELPRT1 Goose supervision (1)

Table 14: LD0.GSELPRT1 Goose supervision (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.GSELPRT1									
.Alm.stVal	ALARM	Goose alarm	10=Alarm	10	88	1	1	0	1

**2.3.1.6****LD0.I3CLPRT1 IEC 60870-5-103 protocol (1)****Table 15:** LD0.I3CLPRT1 IEC 60870-5-103 protocol (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.I3CLPRT1									
.ECFreeze.Oper.ctIVal		ASDU 205 trigger (1)	10=Trig	10	201	1	20	0	1

**2.3.1.7****LD0.I3CLPRT2 IEC 60870-5-103 protocol (2)****Table 16:** LD0.I3CLPRT2 IEC 60870-5-103 protocol (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.I3CLPRT2									
.ECFreeze.Oper.ctIVal		ASDU 205 trigger (2)	10=Trig	10	202	1	20	0	1

**2.3.1.8****LD0.LEDGGIO1 LHMI LED indications Type 1 (2 states)**

When two LED states are used, LED value “00-None” is coded as DPI value OFF, and LED values “01-Ok” and “11-Alarm” are coded as DPI value ON.

**Table 17:** LD0.LEDGGIO1 LHMI LED indications Type 1 (2 states)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LEDGGIO1									
.LEDSt1.stVal	-	LED 1 state	10=On	253	89	1	1	1	1
.LEDSt2.stVal	-	LED 2 state	10=On	253	90	1	1	1	1
.LEDSt3.stVal	-	LED 3 state	10=On	253	91	1	1	1	1
.LEDSt4.stVal	-	LED 4 state	10=On	253	92	1	1	1	1
.LEDSt5.stVal	-	LED 5 state	10=On	253	93	1	1	1	1
.LEDSt6.stVal	-	LED 6 state	10=On	253	94	1	1	1	1
.LEDSt7.stVal	-	LED 7 state	10=On	253	95	1	1	1	1
.LEDSt8.stVal	-	LED 8 state	10=On	253	96	1	1	1	1
.LEDSt9.stVal	-	LED 9 state	10=On	253	97	1	1	1	1
.LEDSt10.stVal	-	LED 10 state	10=On	253	98	1	1	1	1
.LEDSt11.stVal	-	LED 11 state	10=On	253	99	1	1	1	1

**2.3.1.9****LD0.LEDGGIO1 LHMI LED indications Type 2 (3 states, 1:1 LED state)**

When all three LED states are used, the possible LED values “00-None”, “01-Ok” and “11-Alarm” are coded as such.

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**Table 18:** LD0.LEDGGIO1 LHMI LED indications Type 2 (3 states, 1:1 LED state)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LEDGGIO1									
.LEDSt1.stVal	-	LED 1 state	00/01/11=LED State	253	119	1	1	1	2
.LEDSt2.stVal	-	LED 2 state	00/01/11=LED State	253	120	1	1	1	2
.LEDSt3.stVal	-	LED 3 state	00/01/11=LED State	253	121	1	1	1	2
.LEDSt4.stVal	-	LED 4 state	00/01/11=LED State	253	122	1	1	1	2
.LEDSt5.stVal	-	LED 5 state	00/01/11=LED State	253	123	1	1	1	2
.LEDSt6.stVal	-	LED 6 state	00/01/11=LED State	253	124	1	1	1	2
.LEDSt7.stVal	-	LED 7 state	00/01/11=LED State	253	125	1	1	1	2
.LEDSt8.stVal	-	LED 8 state	00/01/11=LED State	253	126	1	1	1	2
.LEDSt9.stVal	-	LED 9 state	00/01/11=LED State	253	127	1	1	1	2
.LEDSt10.stVal	-	LED 10 state	00/01/11=LED State	253	128	1	1	1	2
.LEDSt11.stVal	-	LED 11 state	00/01/11=LED State	253	129	1	1	1	2

### 2.3.1.10 LD0.PCSITPC1 Protection communication supervision (1)

**Table 19:** LD0.PCSITPC1 Protection communication supervision (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PCSITPC1									
.HealthAlm.stVal	ALARM	Protection communication alarm	10=Alarm	81	30	0	1	0	1

### 2.3.1.11 LD0.RCHLCCH1 Redundant Ethernet supervision (1)

**Table 20:** LD0.RCHLCCH1 Redundant Ethernet supervision (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.RCHLCCH1									
.ChLiv.stVal	CHLIV	Ethernet channel live	10=Live	10	90	1	1	0	1
.RedChLiv.stVal	REDCHLIV	Redundant Ethernet channel live	10=Live	10	91	1	1	0	1

**2.3.1.12****LD0.SCHLCCHx Ethernet channel supervision (1...3)****Table 21:** *LD0.SCHLCCHx Ethernet channel supervision (1...3)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SCHLCCH1									
.ChLiv.stVal	CH1LIV	Ethernet channel 1 live	10=Live	10	92	1	1	0	1
LD0.SCHLCCH2									
.ChLiv.stVal	CH2LIV	Ethernet channel 2 live	10=Live	10	93	1	1	0	1
LD0.SCHLCCH3									
.ChLiv.stVal	CH3LIV	Ethernet channel 2 live	10=Live	10	94	1	1	0	1

**2.3.2****Switchgear functions****2.3.2.1****CTRL.CBXCBR1 Circuit-breaker control (1)****Table 22:** *CTRL.CBXCBR1 Circuit-breaker control (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.CBCILO1									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	240	21	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	240	22	1	1	1	1
.SynItlByps.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	240	25	0	1	1	1
CTRL.CBXCBR1									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	240	23	1	1	1	1
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	240	24	1	1	1	1
CTRL.CCBRBRF1									
.Str.general	CB_FAULT_AL	Start, timer running	10=Start	240	101	0	2	1	1
.OpEx.general	TRBU	Failure, ext trip	10=Failure	240	102	0	2	0	1
.OpIn.general	TRRET	Operate, retrip	10=Operate	240	103	0	2	0	1
CTRL.CBCSWI1									
.stSel.stVal	SELECTED	CB selected	10=Selected	240	120	1	1	1	1
.Pos.stVal/ctlVal	POSITION	CB pos/control	10/01=Close/Open	240	160	1	1,20	1	2

**2.3.2.2****CTRL.DCSXSWI1 Disconnector position indication (1)****Table 23:** *CTRL.DCSXSWI1 Disconnector position indication (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.DCSXSWI1									
.Pos.stVal	POSITION	Disconnector 1 pos	10/01=Close/Open	253	1	1	1	1	2

### 2.3.2.3 CTRL.DCSXSWI2 Disconnector position indication (2)

Table 24: *CTRL.DCSXSWI2 Disconnector position indication (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.DCSXSWI2									
.Pos.stVal	POSITION	Disconnector 2 pos	10/01=Close/Open	253	2	1	1	1	2

### 2.3.2.4 CTRL.DCSXSWI3 Disconnector position indication (3)

Table 25: *CTRL.DCSXSWI3 Disconnector position indication (3)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.DCSXSWI3									
.Pos.stVal	POSITION	Disconnector 3 pos	10/01=Close/Open	253	3	1	1	1	2

### 2.3.2.5 CTRL.DCXSWI1 Disconnector control (1)

Table 26: *CTRL.DCXSWI1 Disconnector control (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.DCCILO1									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	245	21	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	245	22	1	1	1	1
.ItlByps.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	245	25	1	1	1	1
CTRL.DCXSWI1									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	245	23	1	1	1	1
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	245	24	1	1	1	1
CTRL.DCCSWI1									
.stSelD.stVal	SELECTED	DC selected	10=Selected	245	120	1	1	1	1
.Pos.stVal/ctlVal	POSITION	DC pos/control	10/01=Close/Open	245	160	1	1,20	1	2

### 2.3.2.6 CTRL.DCXSWI2 Disconnector control (2)

Table 27: *CTRL.DCXSWI2 Disconnector control (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.DCCILO2									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	246	21	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	246	22	1	1	1	1
.ItlByps.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	246	25	1	1	1	1
CTRL.DCXSWI2									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	246	23	1	1	1	1
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	246	24	1	1	1	1

Table continues on next page

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.DCCSWI2									
.stSel.stVal	SELECTED	DC selected	10=Selected	246	120	1	1	1	1
.Pos.stVal/ctlVal	POSITION	DC pos/control	10/01=Close/Open	246	160	1	1,20	1	2

### 2.3.2.7 CTRL.ESSXSWI1 Earthing switch indication (1)

Table 28: *CTRL.ESSXSWI1 Earthing switch indication (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.ESSXSWI1									
.Pos.stVal	POSITION	Earth switch pos	10/01=Close/Open	253	11	1	1	1	2

### 2.3.2.8 CTRL.ESSXSWI2 Earthing switch indication (2)

Table 29: *CTRL.ESSXSWI2 Earthing switch indication (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.ESSXSWI2									
.Pos.stVal	POSITION	Earth switch pos	10/01=Close/Open	253	12	1	1	1	2

### 2.3.2.9 CTRL.ESXSWI1 Earthing switch control (1)

Table 30: *CTRL.ESXSWI1 Earthing switch control (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.ESCILO1									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	247	21	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	247	22	1	1	1	1
.ItlByps.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	247	25	1	1	1	1
CTRL.ESXSWI1									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	247	23	1	1	1	1
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	247	24	1	1	1	1
CTRL.ESCSWI1									
.stSel.stVal	SELECTED	ES selected	10=Selected	247	120	1	1	1	1
.Pos.stVal/ctlVal	POSITION	ES pos/control	10/01=Close/Open	247	160	1	1,20	1	2

## 2.3.3 Sensors and monitoring functions

### 2.3.3.1 LD0.ARCSARC1 Arc protection (1)

*Table 31: LD0.ARCSARC1 Arc protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.ARCSARC11									
.FADet.stVal	ARC_FLT_DE T	Arc detected	10=Detect	156	211	1	1	0	1
LD0.ARCPTRC11									
.Op.general	OPERATE	Operate	10=Operate	156	213	1	2	0	1

### 2.3.3.2 LD0.ARCSARC2 Arc protection (2)

*Table 32: LD0.ARCSARC2 Arc protection (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.ARCSARC21									
.FADet.stVal	ARC_FLT_DE T	Arc detected	10=Detect	156	221	1	1	0	1
LD0.ARCPTRC21									
.Op.general	OPERATE	Operate	10=Operate	156	223	1	2	0	1

### 2.3.3.3 LD0.ARCSARC3 Arc protection (3)

*Table 33: LD0.ARCSARC3 Arc protection (3)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.ARCSARC31									
.FADet.stVal	ARC_FLT_DE T	Arc detected	10=Detect	156	231	1	1	0	1
LD0.ARCPTRC31									
.Op.general	OPERATE	Operate	10=Operate	156	233	1	2	0	1

### 2.3.3.4 LD0.BSTGGIO1 Binary signal transfer (1)

*Table 34: LD0.BSTGGIO1 Binary signal transfer (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.BSTGGIO1									
.Alm1.stVal	SEND_SIG_A	Send alarm	10=Alarm	80	1	1	1	1	1
.Alm2.stVal	RECV_SIG_A	Receive alarm	10=Alarm	80	2	1	1	1	1

**2.3.3.5 LD0.HZCCASPVC1 Current transformer supervision for high-impedance protection scheme for phase A (1)**
**Table 35:** LD0.HZCCASPVC1 Current transformer supervision for high-impedance protection scheme for phase A (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.HZCCASPVC1									
.Alm.stVal	ALARM	Alarm	10=Alarm	71	31	1	1	0	1

**2.3.3.6 LD0.HZCCBSPVC1 Current transformer supervision for high-impedance protection scheme for phase B (1)**
**Table 36:** LD0.HZCCBSPVC1 Current transformer supervision for high-impedance protection scheme for phase B (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.HZCCBSPVC1									
.Alm.stVal	ALARM	Alarm	10=Alarm	71	32	1	1	0	1

**2.3.3.7 LD0.HZCCCSPVC1 Current transformer supervision for high-impedance protection scheme for phase C (1)**
**Table 37:** LD0.HZCCCSPVC1 Current transformer supervision for high-impedance protection scheme for phase C (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.HZCCCSPVC1									
.Alm.stVal	ALARM	Alarm	10=Alarm	71	33	1	1	0	1

**2.3.3.8 LD0.IL1TCTR1 Three-phase CT supervision (1)**
**Table 38:** LD0.IL1TCTR1 Three-phase CT supervision (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.IL1TCTR1									
.Wrn.stVal	WARNING	Warning	10=Warning	81	101	1	2	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	102	1	2	0	1

**2.3.3.9 LD0.IL1TCTR2 Three-phase CT supervision (2)**
**Table 39:** LD0.IL1TCTR2 Three-phase CT supervision (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.IL1TCTR2									
.Wrn.stVal	WARNING	Warning	10=Warning	81	103	1	2	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	104	1	2	0	1

### 2.3.3.10

### LD0.MDSOPT1 Runtime counter for machines and devices (1)

*Table 40: LD0.MDSOPT1 Runtime counter for machines and devices (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MDSOPT1									
.OpTmWrn.stVal	WARNING	Accum.op.time Warning	10=Warning	71	1	1	1	1	1
.OpTmAlm.stVal	ALARM	Accum.op.time Alarm	10=Alarm	71	2	1	1	1	1

### 2.3.3.11

### LD0.MDSOPT2 Runtime counter for machines and devices (2)

*Table 41: LD0.MDSOPT2 Runtime counter for machines and devices (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MDSOPT2									
.OpTmWrn.stVal	WARNING	Accum.op.time Warning	10=Warning	71	3	1	1	1	1
.OpTmAlm.stVal	ALARM	Accum.op.time Alarm	10=Alarm	71	4	1	1	1	1

### 2.3.3.12

### LD0.RESTCTR1 Io CT supervision (1)

*Table 42: LD0.RESTCTR1 Io CT supervision (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.RESTCTR1									
.Wrn.stVal	WARNING	Warning	10=Warning	81	105	1	2	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	106	1	2	0	1

### 2.3.3.13

### LD0.RESTCTR2 Io CT supervision (2)

*Table 43: LD0.RESTCTR2 Io CT supervision (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.RESTCTR2									
.Wrn.stVal	WARNING	Warning	10=Warning	81	107	1	2	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	108	1	2	0	1

### 2.3.3.14

### LD0.RESTVTR1 Uo VT supervision (1)

*Table 44: LD0.RESTVTR1 Uo VT supervision (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.RESTVTR1									
.Wrn.stVal	WARNING	Warning	10=Warning	81	125	1	2	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	126	1	2	0	1

### 2.3.3.15 LD0.RESTVTR2 Uo VT supervision (2)

*Table 45: LD0.RESTVTR2 Uo VT supervision (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.RESTVTR2									
.Wrn.stVal	WARNING	Warning	10=Warning	81	125	1	2	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	126	1	2	0	1

### 2.3.3.16 LD0.SSCBR1 Circuit-breaker condition monitoring (1)

*Table 46: LD0.SSCBR1 Circuit-breaker condition monitoring (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SSCBR1									
.RsAccmAPwr.Oper.ctlVal	RST_IPOW	Accumul. energy reset	10=Reset	242	19	1	20	0	1
.RsCBWear.Oper.ctlVal	RST_CB_WEAR	CB life/op.counters reset	10=Reset	242	20	1	20	0	1
.RsTrvTm.Oper.ctlVal	RST_TRV_T	Travel time alarm reset	10=Reset	242	21	1	20	0	1
.OpnAlm.stVal	TRV_T_OP_ALM	Opn travel time alarm	10=Alarm	242	101	0	1	0	1
.ClsAlm.stVal	TRV_T_CL_ALM	Cls travel time alarm	10=Alarm	242	102	0	1	0	1
.OpCntAlm.stVal	OPR_ALM	CB operations alarm	10=Alarm	242	104	0	1	0	1
.OpCntLO.stVal	OPR_LO	CB operations lockout	10=Lockout	242	105	0	1	0	1
.LonTmAlm.stVal	MON_ALM	CB inactive alarm	10=Alarm	242	106	0	1	0	1
.InsAlm.stVal	PRES_ALM	Low pressure alarm	10=Alarm	242	107	0	1	0	1
.InsBlk.stVal	PRES_LO	Low pressure lockout	10=Lockout	242	108	0	1	0	1
.APwrAlm.stVal	IPOW_ALM	Iyt alarm	10=Alarm	242	109	0	1	0	1
.APwrLO.stVal	IPOW_LO	Iyt lockout	10=Lockout	242	110	0	1	0	1
.RmnNumOpAlm.stVal	CB_LIFE_ALM	CB lifetime alarm	10=Alarm	242	111	0	1	0	1
LD0.SSOPM1									
.RsSprChaTm.Oper.ctlVal	RST_SPR_T	Charge time alarm reset	10=Reset	242	22	1	20	0	1
.SprChaAlm.stVal	SPR_CHR_ALM	Spring charge time alarm	10=Alarm	242	103	0	1	0	1

### 2.3.3.17 LD0.UL1TVTR1 Three-phase VT supervision (1)

*Table 47: LD0.UL1TVTR1 Three-phase VT supervision (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.UL1TVTR1									
.Wrn.stVal	WARNING	Warning	10=Warning	81	121	1	2	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	122	1	2	0	1

### 2.3.3.18 LD0.UL1TVTR2 Three-phase VT supervision (2)

Table 48: LD0.UL1TVTR2 Three-phase VT supervision (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.UL1TVTR2									
.Wrn.stVal	WARNING	Warning	10=Warning	81	123	1	2	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	124	1	2	0	1

### 2.3.3.19 LD0.XARGGI0130 Alarm/warning

Table 49: LD0.XARGGI0130 Alarm/warning

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XARGGI0130	-								
.Alm.stVal	-	XARGGI0130 Alarm	1=Alarm	27	203	0	1	0	1
.Wrn.stVal	-	XARGGI0130 Warning	1=Warning	27	204	0	1	0	1

### 2.3.3.20 LD0.XRGGIO130 Alarm and warning

Table 50: LD0.XRGGIO130 Alarm and warning

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XRGGIO130		XRGGIO130 Card							
.Wrn.stVal	WARNING	-Warning	10=Warning	27	201	0	1	1	1
.Alm.stVal	ALARM	-Alarm	10=Alarm	27	202	0	1	1	1

## 2.3.4 Automatic control functions

### 2.3.4.1 LD0.OLATCC1 Tap changer control with voltage regulator (1)

Table 51: LD0.OLATCC1 Tap changer control with voltage regulator (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.OLATCC1									
.TapOpErr.stVal	ALARM	Alarm	10=Alarm	81	1	2	2	1	1
.TapOpR.stVal	RAISE_OWN	Raise cmd	10=Raise	81	2	2	1	1	1
.TapOpL.stVal	LOWER_OWN	Lower cmd	10=Lower	81	3	2	1	1	1
.EndPosR.stVal	-	Block raise	10=Block	81	4	2	1	1	1
.EndPosL.stVal	-	Block lower	10=Block	81	5	2	1	1	1
.ParOp.stVal/ctlVal	PARALLEL	Parallel or single op.	10=Parallel	81	6	2	1	1	1
.Auto.stVal	AUTO	Auto or manual op.	10=Auto	81	7	2	1	1	1
.LTCB1kAHi.stVal	BLKD_I_LOD	Overcurrent block	10=Block	81	11	2	1	1	1
.LTCB1kVLo.stVal	BLKD_U_UN	Undervoltage block	10=Block	81	12	2	1	1	1

Table continues on next page

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.LTCRnbk.stVal	RNBK_U_OV	Raise voltage runback block	10=Block	81	13	2	1	1	1
.CircAHiBlk.stVal	BLKD_I_CIR	High circulating current block	10=Block	81	14	2	1	1	1
.Blk.stVal	BLKD_LTCBLK	External block	10=Block	81	15	2	1	1	1
.ErrPar.stVal	PAR_FAIL	Parallel failure detected	10=Failure	81	16	2	1	1	1
.TapChg.ValWTr.ctlVal	-	Tap changer control lower	10=Lower	81	20	1	20	1	1
.TapChg.ValWTr.ctlVal	-	Tap changer control higher	10=Higher	81	21	1	20	1	1

## 2.3.5 Metering and measurand functions

### 2.3.5.1 LD0.CMMXU1 Three-phase current measurement (1)

Table 52: LD0.CMMXU1 Three-phase current measurement (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.CMMXU1									
.HiAlm.stVal	HIGH_ALARM	High alarm	10=Alarm	210	1	1	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	210	2	1	1	1	1
.LoWrn.stVal	LOW_WARN	Low warning	10=Warning	210	3	1	1	1	1
.LoAlm.stVal	LOW_ALARM	Low alarm	10=Alarm	210	4	1	1	1	1

### 2.3.5.2 LD0.CMMXU2 Three-phase current measurement (2)

Table 53: LD0.CMMXU2 Three-phase current measurement (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.CMMXU2									
.HiAlm.stVal	HIGH_ALARM	High alarm	10=Alarm	212	1	1	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	212	2	1	1	1	1
.LoWrn.stVal	LOW_WARN	Low warning	10=Warning	212	3	1	1	1	1
.LoAlm.stVal	LOW_ALARM	Low alarm	10=Alarm	212	4	1	1	1	1

### 2.3.5.3 LD0.RESCMMXU1 Residual current measurement (1)

Table 54: LD0.RESCMMXU1 Residual current measurement (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.RESCMMXU1									
.HiAlm.stVal	HIGH_ALARM	High alarm	10=Alarm	210	11	0	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	210	12	0	1	1	1

### 2.3.5.4 LD0.RESCMMXU2 Residual current measurement (2)

*Table 55: LD0.RESCMMXU2 Residual current measurement (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.RESCMMXU2									
.HiAlm.stVal	HIGH_ALARM	High alarm	10=Alarm	212	11	1	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	212	12	1	1	1	1

### 2.3.5.5 LD0.RESVMMXU1 Residual voltage measurement (1)

*Table 56: LD0.RESVMMXU1 Residual voltage measurement (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.RESVMMXU1									
.HiAlm.stVal	HIGH_ALARM	High alarm	10=Alarm	211	11	1	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	211	12	1	1	1	1

### 2.3.5.6 LD0.RESVMMXU2 Residual voltage measurement (2)

*Table 57: LD0.RESVMMXU2 Residual voltage measurement (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.RESVMMXU2									
.HiAlm.stVal	HIGH_ALARM	High alarm	10=Alarm	211	31	1	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	211	32	1	1	1	1

### 2.3.5.7 LD0.VMMXU1 Three-phase voltage measurement (1)

*Table 58: LD0.VMMXU1 Three-phase voltage measurement (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.VMMXU1									
.HiAlm.stVal	HIGH_ALARM	High alarm	10=Alarm	211	1	1	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	211	2	1	1	1	1
.LoWrn.stVal	LOW_WARN	Low warning	10=Warning	211	3	1	1	1	1
.LoAlm.stVal	LOW_ALARM	Low alarm	10=Alarm	211	4	1	1	1	1

**2.3.5.8****LD0.VMMXU2 Three-phase voltage measurement (2)****Table 59:** LD0.VMMXU2 Three-phase voltage measurement (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.VMMXU2									
.HiAlm.stVal	HIGH_ALARM	High alarm	10=Alarm	211	21	1	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	211	22	1	1	1	1
.LoWrn.stVal	LOW_WARN	Low warning	10=Warning	211	23	1	1	1	1
.LoAlm.stVal	LOW_ALARM	Low alarm	10=Alarm	211	24	1	1	1	1

**2.3.6****Power quality functions****2.3.6.1****LD0.CMHAI1 Current total demand distortion (1)****Table 60:** LD0.CMHAI1 Current total demand distortion (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.CMHAI1									
.Alm.stVal	ALARM	Distortion Alarm	10=Alarm	95	101	1	2	0	1

**2.3.6.2****LD0.CMHAI2 Current total demand distortion (2)****Table 61:** LD0.CMHAI2 Current total demand distortion (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.CMHAI2									
.Alm.stVal	ALARM	Distortion alarm	10=Alarm	95	102	1	2	0	1

**2.3.6.3****LD0.PHQVVR1 Voltage variation (1)****Table 62:** LD0.PHQVVR1 Voltage variation (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PH1QVVR1									
.VarStrGen.stVal		Variation event detected	10=Detected	95	121	1	2	0	1
.VarEnd.stVal		Variation event ended	10=Ended	95	122	1	2	0	1
.SwellOp.stVal		Swell event detected	10=Detected	95	123	1	2	0	1
.DipOp.stVal		Dip event detected	10=Detected	95	124	1	2	0	1
.IntrOptVal		Interruption event detected	10=Detected	95	125	1	2	0	1

### 2.3.6.4 LD0.VMHAI1 Voltage total harmonic distortion (1)

*Table 63: LD0.VMHAI1 Voltage total harmonic distortion (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.VMHAI1									
.Alm.stVal	ALARM	Distortion Alarm	10=Alarm	95	105	1	2	0	1

### 2.3.6.5 LD0.VMHAI2 Voltage total harmonic distortion (2)

*Table 64: LD0.VMHAI2 Voltage total harmonic distortion (2)*

IEC 61850 name	SA name	Description	DPT value	FUN	INF	U	ASDU	I	C
LD0.VMHAI2									
.Alm.stVal	ALARM	Distortion alarm	10=Alarm	95	106	1	2	0	1

### 2.3.6.6 LD0.VSQVUB1 Voltage unbalance (1)

*Table 65: LD0.VSQVUB1 Voltage unbalance (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.VSQVUB1									
.VarStr.stVal	MN_UNB_AL	Unbalance alarm	10=Alarm	95	131	1	1	0	1
.HiPctVUnb.stVal	PCT_UNB_AL	Percentile unbalance alarm	10=Alarm	95	132	1	1	0	1

## 2.3.7 Protection functions

### 2.3.7.1 LD0.CBPSOF1 Switch onto fault (1)

*Table 66: LD0.CBPSOF1 Switch onto fault (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.CBPSOF1									
.Op.general	OPERATE	Stage operate	10=Operate	170	181	1	2	0	1

### 2.3.7.2 LD0.COLxPTOC1/COLPTUC1 Capacitor bank overload protection (1)

*Table 67: LD0.COLxPTOC1/COLPTUC1 Capacitor bank overload protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.COL1PTOC1									
.Op.general	OPERATE	Overload operate	10=Operate	60	22	1	2	0	1
.Str.general	START	Overload start	10=Start	60	21	1	2	1	1
LD0.COL2PTOC1									
Table continues on next page									

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.Op.general	ALARM	Alarm	10=Alarm	60	23	1	2	0	1
LD0.COLPTUC1									
.Op.general	OPERATE	Undercurrent operate	10=Operate	60	2	1	2	0	1
.Str.general	START	Undercurrent start	10=Start	60	1	1	2	1	1

### 2.3.7.3 LD0.CUBxPTOC1 Capacitor bank unbalance current, double Y bridge (1)

Table 68: LD0.CUBxPTOC1 Capacitor bank unbalance current, double Y bridge (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.CUB2PTOC1									
.Op.general	OPERATE	Unbalance operate	10=Operate	60	112	1	2	0	1
.Str.general	START	Unbalance start	10=Start	60	111	1	2	1	1
LD0.CUB1PTOC1									
.Op.general	ALARM	Alarm	10=Alarm	60	102	1	2	0	1

### 2.3.7.4 LD0.DEFHPDEF1 Directional earth-fault protection, high stage (1)

Table 69: LD0.DEFHPDEF1 Directional earth-fault protection, high stage (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DEFHPTOC1		High (1) stage							
.Str.general	START	-Start	10=Start	163	96	1	2	1	1
.Op.general	OPERATE	-Operate	10=Operate	163	98	1	2	0	1

### 2.3.7.5 LD0.DEFLPDEF1 Directional earth-fault protection, low stage (1)

Table 70: LD0.DEFLPDEF1 Directional earth-fault protection, low stage (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DEFLPTOC1		Low (1) stage							
.Str.general	START	-Start	10=Start	163	84	1	2	1	1
.Op.general	OPERATE	-Operate	10=Operate	163	90	1	2	0	1

### 2.3.7.6 LD0.DEFLPDEF2 Directional earth-fault protection, low stage (2)

Table 71: LD0.DEFLPDEF2 Directional earth-fault protection, low stage (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DEFLPTOC2		Low (2) stage							
.Op.general	OPERATE	-Operate	10=Operate	163	91	1	2	0	1
.Str.general	START	-Start	10=Start	163	94	1	2	1	1

### 2.3.7.7 LD0.DOPPDPR1 Reverse power/directional overpower protection (1)

Table 72: *LD0.DOPPDPR1 Reverse power/directional overpower protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPPDOP1									
.Str.general	START	Stage start	10=Start	28	91	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	92	1	2	0	1

### 2.3.7.8 LD0.DOPPDPR2 Reverse power/directional overpower protection (2)

Table 73: *LD0.DOPPDPR2 Reverse power/directional overpower protection (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPPDOP2									
.Str.general	START	Stage start	10=Start	28	93	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	94	1	2	0	1

### 2.3.7.9 LD0.DOPPDPR3 Reverse power/directional overpower protection (3)

Table 74: *LD0.DOPPDPR3 Reverse power/directional overpower protection (3)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPPDOP3									
.Str.general	START	Stage start	10=Start	28	95	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	96	1	2	0	1

### 2.3.7.10 LD0.DPHHPDOC1 Three-phase directional overcurrent protection, high stage (1)

Table 75: *LD0.DPHHPDOC1 Three-phase directional overcurrent protection, high stage (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPHHPTOC1		High stage							
.Str.phsA	-	-PhsA start	10=Start	32	44	0	2	1	1
.Str.phsB	-	-PhsB start	10=Start	32	45	0	2	1	1
.Str.phsC	-	-PhsC start	10=Start	32	46	0	2	1	1
.Str.general	START	-General start	10=Start	32	96	1	2	1	1
.Op.general	OPERATE	-General operate	10=Operate	32	98	1	2	0	1

**2.3.7.11 LD0.DPHLPDOC1 Three-phase directional overcurrent protection, low stage (1)**
**Table 76:** LD0.DPHLPDOC1 Three-phase directional overcurrent protection, low stage (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPHLPTOC1		Low (1) stage							
.Str.phsA	-	-PhsA start	10=Start	32	64	0	2	1	1
.Str.phsB	-	-PhsB start	10=Start	32	65	0	2	1	1
.Str.phsC	-	-PhsC start	10=Start	32	66	0	2	1	1
.Str.general	START	-General start	10=Start	32	84	1	2	1	1
.Op.general	OPERATE	-General operate	10=Operate	32	90	1	2	0	1

**2.3.7.12 LD0.DPHLPDOC2 Three-phase directional overcurrent protection, low stage (2)**
**Table 77:** LD0.DPHLPDOC2 Three-phase directional overcurrent protection, low stage (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPHLPTOC2		Low (2) stage							
.Str.phsA	-	-PhsA start	10=Start	32	54	0	2	1	1
.Str.phsB	-	-PhsB start	10=Start	32	55	0	2	1	1
.Str.phsC	-	-PhsC start	10=Start	32	56	0	2	1	1
.Op.general	OPERATE	-General operate	10=Operate	32	91	1	2	0	1
.Str.general	START	-General start	10=Start	32	94	1	2	1	1

**2.3.7.13 LD0.DQPTUV1 Directional reactive power undervoltage protection (1)**
**Table 78:** LD0.DQPTUV1 Directional reactive power undervoltage protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DQPTUV1									
.Str.general	START	Stage start	10=Start	28	100	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	101	1	2	0	1

**2.3.7.14 LD0.DUPPDPR1 Underpower protection (1)**
**Table 79:** LD0.DUPPDPR1 Underpower protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPPDUP1									
.Str.general	START	Stage start	10=Start	28	81	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	82	1	2	0	1

### 2.3.7.15 LD0.DUPPDPR2 Underpower protection (2)

*Table 80: LD0.DUPPDPR2 Underpower protection (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPPDUP2									
.Str.general	START	Stage start	10=Start	28	83	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	84	1	2	0	1

### 2.3.7.16 LD0.EFHPTOC1 Non-directional earth-fault protection, high stage (1)

*Table 81: LD0.EFHPTOC1 Non-directional earth-fault protection, high stage (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.EFHPTOC1		High stage							
.Str.general	START	-Start	10=Start	159	96	1	2	1	1
.Op.general	OPERATE	-Operate	10=Operate	159	98	1	2	0	1

### 2.3.7.17 LD0.EFHPTOC2 Non-directional earth-fault protection, high stage (2)

*Table 82: LD0.EFHPTOC2 Non-directional earth-fault protection, high stage (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.EFHPTOC2		High stage							
.Str.general	START	-Start	10=Start	159	94	1	2	1	1
.Op.general	OPERATE	-Operate	10=Operate	159	91	1	2	0	1

### 2.3.7.18 LD0.EFIPTOC1 Non-directional earth-fault protection, instantaneous stage (1)

*Table 83: LD0.EFIPTOC1 Non-directional earth-fault protection, instantaneous stage (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.EFIPTOC1		Instantaneous stage							
.Str.general	START	-Start	10=Start	159	97	1	2	1	1
.Op.general	OPERATE	-Operate	10=Operate	159	99	1	2	0	1

### 2.3.7.19 LD0.EFLPTOC1 Non-directional earth-fault protection, low stage (1)

*Table 84: LD0.EFLPTOC1 Non-directional earth-fault protection, low stage (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.EFLPTOC1		Low (1) stage							
.Str.general	START	-Start	10=Start	159	84	1	2	1	1
.Op.general	OPERATE	-Operate	10=Operate	159	90	1	2	0	1

**2.3.7.20****LD0.EFLPTOC2 Non-directional earth-fault protection, low stage (2)****Table 85:** LD0.EFLPTOC2 Non-directional earth-fault protection, low stage (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.EFLPTOC2		Low (2) stage							
.Op.general	OPERATE	-Operate	10=Operate	159	91	1	2	0	1
.Str.general	START	-Start	10=Start	159	94	1	2	1	1

**2.3.7.21****LD0.EFPADM1 Admittance-based earth-fault protection (1)****Table 86:** LD0.EFPADM1 Admittance-based earth-fault protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.EFPADM1									
.Str.general	START	Stage1 start	10=Start	25	84	1	2	1	1
.Op.general	OPERATE	Stage1 operate	10=Operate	25	90	1	2	0	1

**2.3.7.22****LD0.EFPADM2 Admittance-based earth-fault protection (2)****Table 87:** LD0.EFPADM2 Admittance-based earth-fault protection (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.EFPADM2									
.Op.general	OPERATE	Stage2 operate	10=Operate	25	91	1	2	0	1
.Str.general	START	Stage2 start	10=Start	25	94	1	2	1	1

**2.3.7.23****LD0.EFPADM3 Admittance-based earth-fault protection (3)****Table 88:** LD0.EFPADM3 Admittance-based earth-fault protection (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.EFPADM3									
.Str.general	START	Stage3 start	10=Start	25	96	1	2	1	1
.Op.general	OPERATE	Stage3 operate	10=Operate	25	98	1	2	0	1

**2.3.7.24****LD0.FRPFRQ1 Frequency protection (1)****Table 89:** LD0.FRPFRQ1 Frequency protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.FRPTRC1									
.Str.general	START	Stage start	10=Start	27	11	1	2	1	1
LD0.FRPTOF1		Overfrequency							
.Op.general	OPR_OFRQ	-Operate	10=Operate	27	12	1	2	0	1
Table continues on next page									

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IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.FRPTUF1		Underfrequency							
.Op.general	OPR_UFRQ	-Operate	10=Operate	27	13	1	2	0	1
LD0.FRPFRC1		Frequency gradient							
.Op.general	OPR_FRG	-Operate	10=Operate	27	14	1	2	0	1

### 2.3.7.25 LD0.FRPFRQ2 Frequency protection (2)

Table 90: LD0.FRPFRQ2 Frequency protection (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.FRPTRC2									
.Str.general	START	Stage start	10=Start	27	21	1	2	1	1
LD0.FRPTOF2		Overfrequency							
.Op.general	OPR_OFRQ	-Operate	10=Operate	27	22	1	2	0	1
LD0.FRPTUF2		Underfrequency							
.Op.general	OPR_UFRQ	-Operate	10=Operate	27	23	1	2	0	1
LD0.FRPFRC2		Frequency gradient							
.Op.general	OPR_FRG	-Operate	10=Operate	27	24	1	2	0	1

### 2.3.7.26 LD0.FRPFRQ3 Frequency protection (3)

Table 91: LD0.FRPFRQ3 Frequency protection (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.FRPTRC3									
.Str.general	START	Stage start	10=Start	27	31	1	2	1	1
LD0.FRPTOF3		Overfrequency							
.Op.general	OPR_OFRQ	-Operate	10=Operate	27	32	1	2	0	1
LD0.FRPTUF3		Underfrequency							
.Op.general	OPR_UFRQ	-Operate	10=Operate	27	33	1	2	0	1
LD0.FRPFRC3		Frequency gradient							
.Op.general	OPR_FRG	-Operate	10=Operate	27	34	1	2	0	1

### 2.3.7.27 LD0.FRPFRQ4 Frequency protection (4)

Table 92: LD0.FRPFRQ4 Frequency protection (4)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.FRPTRC4									
.Str.general	START	Stage start	10=Start	27	41	1	2	1	1
LD0.FRPTOF4		Overfrequency							
.Op.general	OPR_OFRQ	-Operate	10=Operate	27	42	1	2	0	1
Table continues on next page									

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.FRPTUF4		Underfrequency							
.Op.general	OPR_UFRQ	-Operate	10=Operate	27	43	1	2	0	1
LD0.FRPFRC4		Frequency gradient							
.Op.general	OPR_FRG	-Operate	10=Operate	27	44	1	2	0	1

### 2.3.7.28 LD0.FRPFRQ5 Frequency protection (5)

Table 93: LD0.FRPFRQ5 Frequency protection (5)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.FRPTRC5									
.Str.general	START	Stage start	10=Start	27	51	1	2	1	1
LD0.FRPTOF5		Overfrequency							
.Op.general	OPR_OFRQ	-Operate	10=Operate	27	52	1	2	0	1
LD0.FRPTUF5		Underfrequency							
.Op.general	OPR_UFRQ	-Operate	10=Operate	27	53	1	2	0	1
LD0.FRPFRC5		Frequency gradient							
.Op.general	OPR_FRG	-Operate	10=Operate	27	54	1	2	0	1

### 2.3.7.29 LD0.FRPFRQ6 Frequency protection (6)

Table 94: LD0.FRPFRQ6 Frequency protection (6)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.FRPTRC6									
.Str.general	START	Stage start	10=Start	27	61	1	2	1	1
LD0.FRPTOF6		Overfrequency							
.Op.general	OPR_OFRQ	-Operate	10=Operate	27	62	1	2	0	1
LD0.FRPTUF6		Underfrequency							
.Op.general	OPR_UFRQ	-Operate	10=Operate	27	63	1	2	0	1
LD0.FRPFRC6		Frequency gradient							
.Op.general	OPR_FRG	-Operate	10=Operate	27	64	1	2	0	1

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**2.3.7.30 LD0.H3EFPSEF1 Third harmonic-based stator earth-fault protection (1)**

*Table 95: LD0.H3EFPSEF1 Third harmonic-based stator earth-fault protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.H3EFPTRC1									
.Str.general	START	Stage start	10=Start	28	121	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	122	1	2	0	1
LD0.H3EFPTOV1									
.BlkIntnSt.general	INT_BLKD	Internally blocked	10=Blocked	28	123	1	2	1	1

**2.3.7.31 LD0.HAEFPTOC1 Harmonics-based earth-fault protection (1)**

*Table 96: LD0.HAEFPTOC1 Harmonics-based earth-fault protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.HAEFPTOC1		Stage							
Str.general	START	-start	10=Start	100	121	1	2	1	1
Op.general	OPERATE	-operate	10=Operate	100	122	1	2	0	1

**2.3.7.32 LD0.HCUBxPTOC1 Capacitor bank unbalance current, H bridge (1)**

*Table 97: LD0.HCUBxPTOC1 Capacitor bank unbalance current, H bridge (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.HCUB2PTOC1									
.Op.general	OPERATE	Unbalance operate	10=Operate	60	212	1	2	0	1
.Str.general	START	Unbalance start	10=Start	60	211	1	2	1	1
LD0.HCUB1PTOC1									
.Op.general	ALARM	Alarm	10=Alarm	60	202	1	2	0	1

**2.3.7.33 LD0.HIAPDIF1 High-impedance differential protection for phase A (1)**

*Table 98: LD0.HIAPDIF1 High-impedance differential protection for phase A (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.HIAPDIF1									
.Str.general	START	Stage start	10=Start	170	170	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	170	172	1	2	0	1

## 2.3.7.34

## LD0.HIBPDIF1 High-impedance differential protection for phase B (1)

Table 99: LD0.HIBPDIF1 High-impedance differential protection for phase B (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.HIBPDIF1									
.Str.general	START	Stage start	10=Start	170	173	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	170	174	1	2	0	1

## 2.3.7.35

## LD0.HICPDIF1 High-impedance differential protection for phase C (1)

Table 100: LD0.HICPDIF1 High-impedance differential protection for phase C (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.HICPDIF1									
.Str.general	START	Stage start	10=Start	170	175	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	170	176	1	2	0	1

## 2.3.7.36

## LD0.HREFPDIF1 High-impedance based restricted earth-fault protection (1)

Table 101: LD0.HREFPDIF1 High-impedance based restricted earth-fault protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.HREFPDIF1									
.Str.general	START	Stage start	10=Start	171	84	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	171	91	1	2	0	1

## 2.3.7.37

## LD0.HREFPDIF2 High-impedance based restricted earth-fault protection (2)

Table 102: LD0.HREFPDIF2 High-impedance based restricted earth-fault protection (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.HREFPDIF2									
.Str.general	START	Stage start	10=Start	171	94	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	171	92	1	2	0	1

### 2.3.7.38

### LD0.INRPHAR1 Three-phase inrush detector (1)

Table 103: LD0.INRPHAR1 Three-phase inrush detector (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.INRPHAR1									
.Str.phsA	-	Phs A start	10=Start	167	64	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	167	65	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	167	66	0	2	1	1
.Str.general	-	General start	10=Start	167	84	1	2	1	1

### 2.3.7.39

### LD0INTRTEF1 Transient/intermittent earth-fault protection (1)

Table 104: LD0INTRTEF1 Transient/intermittent earth-fault protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0INTRTEF1									
.Str.general	START	Stage start	10=Start	158	84	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	158	90	1	2	0	1

### 2.3.7.40

### LD0JAMPTOC1 Motor load jam protection (1)

Table 105: LD0JAMPTOC1 Motor load jam protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0JAMPTOC1									
.Op.phsA		Phs A operate	1=Operate	73	11	0	2	0	1
.Op.phsB		Phs B operate	1=Operate	73	12	0	2	0	1
.Op.phsC		Phs C operate	1=Operate	73	13	0	2	0	1
.Op.general	OPERATE	Stalled operate	10=Operate	73	90	1	2	0	1

### 2.3.7.41

### LD0LNPLDF1 Line differential protection with in-zone power transformer (1)

Table 106: LD0LNPLDF1 Line differential protection with in-zone power transformer (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0LNPTRC1									
.Str.phsA		Phs A start	10=Start	193	61	0	2	1	1
.Str.phsB		Phs B start	10=Start	193	62	0	2	1	1
.Str.phsC		Phs C start	10=Start	193	63	0	2	1	1
.Op.phsA		Phs A operate	10=Operate	193	65	0	2	0	1
.Op.phsB		Phs B operate	10=Operate	193	66	0	2	0	1

Table continues on next page

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.Op.phsC		Phs C operate	10=Operate	193	67	0	2	0	1
.Op.general	OPERATE	Operate (Local or remote)	10=Operate	193	68	1	2	0	1
.Str.general	START	Start (Local or remote)	10=Start	193	84	1	2	1	1

### 2.3.7.42 LD0.LOFLPTUC1 Loss of load supervision (1)

Table 107: LD0.LOFLPTUC1 Loss of load supervision (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LOFLPTUC1									
.Str.general	START	Stage start	10=Start	78	84	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	78	90	1	2	0	1

### 2.3.7.43 LD0.LREFPNDF1 Numerically stabilized low-impedance restricted earth-fault protection (1)

Table 108: LD0.LREFPNDF1 Numerically stabilized low-impedance restricted earth-fault protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LREFPNDF1									
.Str.general	START	Stage start	10=Start	170	84	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	170	91	1	2	0	1

### 2.3.7.44 LD0.LSHDPFRQ1 Load-shedding and restoration (1)

Table 109: LD0.LSHDPFRQ1 Load-shedding and restoration (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LSHDPTRC1									
.Str.general	START	Stage start	10=Start	82	11	1	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	82	12	1	1	0	1
.Str.general	ST_REST	Start of restore	10=Start	82	13	1	1	1	1
.Op.general	RESTORE	Restore the load	10=Restore	82	14	1	1	0	1
.ManRest.Oper.ctlVal	MAN_RESTORE	Manual restore	10=Restore	82	15	1	20	0	1
.BlkRest.Oper.ctlVal	BLK_REST	Cancel restore	10=Cancel	82	16	1	20	0	1

### 2.3.7.45

### LD0.LSHDPFRQ2 Load-shedding and restoration (2)

Table 110: LD0.LSHDPFRQ2 Load-shedding and restoration (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LSHDPTRC2									
.Str.general	START	Stage start	10=Start	82	21	1	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	82	22	1	1	0	1
.Str.general	ST_REST	Start of restore	10=Start	82	23	1	1	1	1
.Op.general	RESTORE	Restore the load	10=Restore	82	24	1	1	0	1
.ManRest.Oper.ctlVal	MAN_RESTORE	Manual restore	10=Restore	82	25	1	20	0	1
.BlkRest.Oper.ctlVal	BLK_REST	Cancel restore	10=Cancel	82	26	1	20	0	1

### 2.3.7.46

### LD0.LSHDPFRQ3 Load-shedding and restoration (3)

Table 111: LD0.LSHDPFRQ3 Load-shedding and restoration (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LSHDPTRC3									
.Str.general	START	Stage start	10=Start	82	31	1	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	82	32	1	1	0	1
.Str.general	ST_REST	Start of restore	10=Start	82	33	1	1	1	1
.Op.general	RESTORE	Restore the load	10=Restore	82	34	1	1	0	1
.ManRest.Oper.ctlVal	MAN_RESTORE	Manual restore	10=Restore	82	35	1	20	0	1
.BlkRest.Oper.ctlVal	BLK_REST	Cancel restore	10=Cancel	82	36	1	20	0	1

### 2.3.7.47

### LD0.LSHDPFRQ4 Load-shedding and restoration (4)

Table 112: LD0.LSHDPFRQ4 Load-shedding and restoration (4)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LSHDPTRC4									
.Str.general	START	Stage start	10=Start	82	41	1	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	82	42	1	1	0	1
.Str.general	ST_REST	Start of restore	10=Start	82	43	1	1	1	1
.Op.general	RESTORE	Restore the load	10=Restore	82	44	1	1	0	1
.ManRest.Oper.ctlVal	MAN_RESTORE	Manual restore	10=Restore	82	45	1	20	0	1
.BlkRest.Oper.ctlVal	BLK_REST	Cancel restore	10=Cancel	82	46	1	20	0	1

**2.3.7.48****LD0.LSHDPFRQ5 Load-shedding and restoration (5)****Table 113:** LD0.LSHDPFRQ5 Load-shedding and restoration (5)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LSHDPTRC5									
.Str.general	START	Stage start	10=Start	82	51	1	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	82	52	1	1	0	1
.Str.general	ST_REST	Start of restore	10=Start	82	53	1	1	1	1
.Op.general	RESTORE	Restore the load	10=Restore	82	54	1	1	0	1
.ManRest.Oper.ctlVal	MAN_RESTORE	Manual restore	10=Restore	82	55	1	20	0	1
.BlkRest.Oper.ctlVal	BLK_REST	Cancel restore	10=Cancel	82	56	1	20	0	1

**2.3.7.49****LD0.LVRTPTUV1 Low-voltage ride-through protection (1)****Table 114:** LD0.LVRTPTUV1 Low-voltage ride-through protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LVRTPTUV1									
.Str.general	START	Stage start	10=Start	42	150	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	42	151	1	2	0	1

**2.3.7.50****LD0.LVRTPTUV2 Low-voltage ride-through protection (2)****Table 115:** LD0.LVRTPTUV2 Low-voltage ride-through protection (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LVRTPTUV2									
.Str.general	START	Stage start	10=Start	42	152	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	42	153	1	2	0	1

**2.3.7.51****LD0.LVRTPTUV3 Low-voltage ride-through protection (3)****Table 116:** LD0.LVRTPTUV3 Low-voltage ride-through protection (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LVRTPTUV3									
.Str.general	START	Stage start	10=Start	42	154	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	42	155	1	2	0	1

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**2.3.7.52 LD0.MFADPSDE1 Multifrequency admittance-based earth-fault protection (1)**

*Table 117: LD0.MFADPSDE1 Multifrequency admittance-based earth-fault protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MFADPSDE1									
.Str.general	START	Stage start	10=Start	28	75	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	76	1	2	0	1

**2.3.7.53 LD0.MNSPTOC1 Negative-sequence overcurrent protection for machines (1)**

*Table 118: LD0.MNSPTOC1 Negative-sequence overcurrent protection for machines (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MNSPTOC1									
.Str.general	START	Stage1 start	10=Start	72	84	1	2	1	1
.Op.general	OPERATE	Stage1 operate	10=Operate	72	90	1	2	0	1

**2.3.7.54 LD0.MNSPTOC2 Negative-sequence overcurrent protection for machines (2)**

*Table 119: LD0.MNSPTOC2 Negative-sequence overcurrent protection for machines (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MNSPTOC2									
.Str.general	START	Stage2 start	10=Start	72	94	1	2	1	1
.Op.general	OPERATE	Stage2 operate	10=Operate	72	91	1	2	0	1

**2.3.7.55 LD0.MPDIF1 Stabilized and instantaneous differential protection for machines (1)**

*Table 120: LD0.MPDIF1 Stabilized and instantaneous differential protection for machines (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MPTRC1									
.Op.general	OPERATE	General operate	10=Operate	29	20	1	2	0	1
.Op.phsA		Phs A operate	10=Operate	29	21	1	2	0	1
.Op.phsB		Phs B operate	10=Operate	29	22	1	2	0	1
.Op.phsC		Phs C operate	10=Operate	29	23	1	2	0	1
LD0.MLPDIF1									
.BlkIntrnSt.general	INT_BLKD	Internal block	10=Blocked	29	24	1	2	1	1

Table continues on next page

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.BlkIntnSt.phsA	INT_BLKD_A	Internal block phs A	10=Blocked	29	25	1	2	1	1
.BlkIntnSt.phsB	INT_BLKD_B	Internal block phs B	10=Blocked	29	26	1	2	1	1
.BlkIntnSt.phsC	INT_BLKD_C	Internal block phs C	10=Blocked	29	27	1	2	1	1

### 2.3.7.56 LD0.MPTTR1 Thermal overload protection for motors (1)

Table 121: LD0.MPTTR1 Thermal overload protection for motors (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MPTTR1									
.StrInh.general	BLK_RESTART	Block restart	10=Restart	76	83	1	2	1	1
.AlmThm.general	ALARM	Thermal alarm	10=Alarm	76	85	1	2	1	1
.Op.general	OPERATE	Thermal operate	10=Operate	76	90	1	2	0	1

### 2.3.7.57 LD0.NSPTOC1 Negative-sequence overcurrent protection (1)

Table 122: LD0.NSPTOC1 Negative-sequence overcurrent protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.NSPTOC1									
.Str.general	START	Stage1 start	10=Start	21	84	1	2	1	1
.Op.general	OPERATE	Stage1 operate	10=Operate	21	90	1	2	0	1

### 2.3.7.58 LD0.NSPTOC2 Negative-sequence overcurrent protection (2)

Table 123: LD0.NSPTOC2 Negative-sequence overcurrent protection (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.NSPTOC2									
.Op.general	OPERATE	Stage2 operate	10=Operate	21	91	1	2	0	1
.Str.general	START	Stage2 start	10=Start	21	94	1	2	1	1

### 2.3.7.59 LD0.NSPTOV1 Negative-sequence overvoltage protection (1)

Table 124: LD0.NSPTOV1 Negative-sequence overvoltage protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.NSPTOV1		Stage 1							
.Str.general	START	-general start	10=Start	43	84	1	2	1	1
.Op.general	OPERATE	-general operate	10=Operate	43	90	1	2	0	1

### 2.3.7.60

### LD0.NSPTOV2 Negative-sequence overvoltage protection (2)

*Table 125: LD0.NSPTOV2 Negative-sequence overvoltage protection (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.NSPTOV2		Stage 2							
.Op.general	OPERATE	-general operate	10=Operate	43	91	1	2	0	1
.Str.general	START	-general start	10=Start	43	94	1	2	1	1

### 2.3.7.61

### LD0.OEPVPH1 Overexcitation protection (1)

*Table 126: LD0.OEPVPH1 Overexcitation protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.OEPVPH1									
.Str.general	START	Stage start	10=Start	28	111	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	112	1	2	0	1

### 2.3.7.62

### LD0.PDNSPTOC1 Phase discontinuity protection (1)

*Table 127: LD0.PDNSPTOC1 Phase discontinuity protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PDNSPTOC1									
.Str.general	START	Stage start	10=Start	157	84	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	157	90	1	2	0	1

### 2.3.7.63

### LD0.PHHPTOC1 Three-phase non-directional overcurrent protection, high stage (1)

*Table 128: LD0.PHHPTOC1 Three-phase non-directional overcurrent protection, high stage (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHHPTOC1		High stage (1)							
.Str.phsA	-	Phs A start	10=Start	162	54	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	162	55	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	162	56	0	2	1	1
.Op.general	OPERATE	General operate	10=Operate	162	91	1	2	0	1
.Str.general	START	General start	10=Start	162	94	1	2	1	1

**2.3.7.64****LD0.PHHPTOC2 Three-phase non-directional overcurrent protection, high stage (2)****Table 129:** LD0.PHHPTOC2 Three-phase non-directional overcurrent protection, high stage (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHHPTOC2		High stage (2)							
.Str.phsA	-	Phs A start	10=Start	162	44	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	162	45	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	162	46	0	2	1	1
.Str.general	START	General start	10=Start	162	96	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	162	98	1	2	0	1

**2.3.7.65****LD0.PHIPTOC1 Three-phase non-directional overcurrent protection, instantaneous stage (1)****Table 130:** LD0.PHIPTOC1 Three-phase non-directional overcurrent protection, instantaneous stage (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHIPTOC1		Instantaneous stage (1)							
.Str.phsA	-	Phs A start	10=Start	162	34	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	162	35	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	162	36	0	2	1	1
.Str.general	START	General start	10=Start	162	97	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	162	99	1	2	0	1

**2.3.7.66****LD0.PHIPTOC2 Three-phase non-directional overcurrent protection, instantaneous stage (2)****Table 131:** LD0.PHIPTOC2 Three-phase non-directional overcurrent protection, instantaneous stage (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHIPTOC2		Instantaneous stage (2)							
.Str.phsA	-	Phs A start	10=Start	162	24	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	162	25	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	162	26	0	2	1	1
.Str.general	START	General start	10=Start	162	102	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	162	103	1	2	0	1

2.3.7.67

**LD0.PHIZ1 High-impedance fault detection (1)**

*Table 132: LD0.PHIZ1 High-impedance fault detection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHIZ1									
.Op.general	OPERATE	Stage operate	10=Operate	28	72	1	2	0	1
.Str.general	START	Stage start	10=Start	28	71	1	2	1	1

2.3.7.68

**LD0.PHLPTOC1 Three-phase non-directional overcurrent protection, low stage (1)**

*Table 133: LD0.PHLPTOC1 Three-phase non-directional overcurrent protection, low stage (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHLPTOC1		Low stage (1)							
.Str.phsA	-	Phs A start	10=Start	162	64	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	162	65	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	162	66	0	2	1	1
.Str.general	START	General start	10=Start	162	84	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	162	90	1	2	0	1

2.3.7.69

**LD0.PHLPTOC2 Three-phase non-directional overcurrent protection, low stage (2)**

*Table 134: LD0.PHLPTOC2 Three-phase non-directional overcurrent protection, low stage (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHLPTOC2		Low stage (2)							
.Str.phsA	-	Phs A start	10=Start	162	74	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	162	75	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	162	76	0	2	1	1
.Str.general	START	General start	10=Start	162	100	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	162	101	1	2	0	1

2.3.7.70

**LD0.PHPTOV1 Three-phase overvoltage protection (1)**

*Table 135: LD0.PHPTOV1 Three-phase overvoltage protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHPTOV1		Stage 1							
.Str.phsA	-	Phs A start	10=Start	40	64	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	40	65	0	2	1	1

Table continues on next page

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.Str.phsC	-	Phs C start	10=Start	40	66	0	2	1	1
.Str.general	START	General start	10=Start	40	84	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	40	90	1	2	0	1

### 2.3.7.71 LD0.PHPTOV2 Three-phase overvoltage protection (2)

Table 136: LD0.PHPTOV2 Three-phase overvoltage protection (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHPTOV2		Stage 3							
.Str.phsA	-	Phs A start	10=Start	40	54	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	40	55	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	40	56	0	2	1	1
.Op.general	OPERATE	General operate	10=Start	40	91	1	2	0	1
.Str.general	START	General start	10=Operate	40	94	1	2	1	1

### 2.3.7.72 LD0.PHPTOV3 Three-phase overvoltage protection (3)

Table 137: LD0.PHPTOV3 Three-phase overvoltage protection (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHPTOV3		Stage 3							
.Str.phsA	-	Phs A start	10=Start	40	44	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	40	45	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	40	46	0	2	1	1
.Str.general	START	General start	10=Start	40	96	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	40	98	1	2	0	1

### 2.3.7.73 LD0.PHPTUV1 Three-phase undervoltage protection (1)

Table 138: LD0.PHPTUV1 Three-phase undervoltage protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHPTUV1		Stage 1							
.Str.phsA	-	Phs A start	10=Start	41	64	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	41	65	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	41	66	0	2	1	1
.Str.general	START	General start	10=Start	41	84	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	41	90	1	2	0	1

### 2.3.7.74

### LD0.PHPTUV2 Three-phase undervoltage protection (2)

Table 139: LD0.PHPTUV2 Three-phase undervoltage protection (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHPTUV2		Stage 2							
.Str.phsA	-	Phs A start	10=Start	41	54	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	41	55	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	41	56	0	2	1	1
.Op.general	OPERATE	General start	10=Operate	41	91	1	2	0	1
.Str.general	START	General operate	10=Start	41	94	1	2	1	1

### 2.3.7.75

### LD0.PHPTUV3 Three-phase undervoltage protection (3)

Table 140: LD0.PHPTUV3 Three-phase undervoltage protection (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHPTUV3		Stage 3							
.Str.phsA	-	Phs A start	10=Start	41	44	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	41	45	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	41	46	0	2	1	1
.Str.general	START	General start	10=Start	41	96	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	41	98	1	2	0	1

### 2.3.7.76

### LD0.PHPVOC1 Three-phase voltage-dependent overcurrent protection (1)

Table 141: LD0.PHPVOC1 Three-phase voltage-dependent overcurrent protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHPVOC1									
.Str.general	START	General start	10=Start	40	184	1	2	1	1
.Str.phsA		Phs A start	10=Start	40	164	0	2	1	1
.Str.phsB		Phs B start	10=Start	40	165	0	2	1	1
.Str.phsC		Phs C start	10=Start	40	166	0	2	1	1
.Op.general	OPERATE	General operate	10=Operate	40	190	1	2	0	1
.Op.phsA		Phs A operate	10=Operate	40	154	0	2	0	1
.Op.phsB		Phs B operate	10=Operate	40	155	0	2	0	1
.Op.phsC		Phs C operate	10=Operate	40	156	0	2	0	1

**2.3.7.77****LD0.PREVPTOC1 Phase reversal protection (1)***Table 142: LD0.PREVPTOC1 Phase reversal protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PREVPTOC1									
.Str.general	START	Stage start	10=Start	75	84	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	75	90	1	2	0	1

**2.3.7.78****LD0.PSPTUV1 Positive-sequence undervoltage protection (1)***Table 143: LD0.PSPTUV1 Positive-sequence undervoltage protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PSPTUV1		Stage 1							
.Str.general	START	General start	10=Start	42	84	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	42	90	1	2	0	1

**2.3.7.79****LD0.PSPTUV2 Positive-sequence undervoltage protection (2)***Table 144: LD0.PSPTUV2 Positive-sequence undervoltage protection (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PSPTUV2		Stage 2							
.Op.general	OPERATE	General operate	10=Operate	42	91	1	2	0	1
.Str.general	START	General start	10=Start	42	94	1	2	1	1

**2.3.7.80****LD0.ROVPTOV1 Residual overvoltage protection (1)***Table 145: LD0.ROVPTOV1 Residual overvoltage protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.ROVPTOV1									
.Str.general	START	Stage 1 start	10=Start	44	84	1	2	1	1
.Op.general	OPERATE	Stage 1 operate	10=Operate	44	90	1	2	0	1

**2.3.7.81****LD0.ROVPTOV2 Residual overvoltage protection (2)***Table 146: LD0.ROVPTOV2 Residual overvoltage protection (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.ROVPTOV2									
.Op.general	OPERATE	Stage 2 operate	10=Operate	44	91	1	2	0	1
.Str.general	START	Stage 2 start	10=Start	44	94	1	2	1	1

### 2.3.7.82 LD0.ROVPTOV3 Residual overvoltage protection (3)

Table 147: LD0.ROVPTOV3 Residual overvoltage protection (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.ROVPTOV3									
.Str.general	START	Stage 3 Start	10=Start	44	96	1	2	1	1
.Op.general	OPERATE	Stage 3 Operate	10=Operate	44	98	1	2	0	1

### 2.3.7.83 LD0.SRCxPTOC1 Capacitor resonance protection (1)

Table 148: LD0.SRCxPTOC1 Capacitor resonance protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SRC2PTOC1									
.Op.general	OPERATE	Resonance operate	10=Operate	60	252	1	2	0	1
LD0.SRC1PTOC1									
.Op.general	ALARM	Alarm	10=Alarm	60	251	1	2	0	1

### 2.3.7.84 LD0.STTPMSU1 Motor start-up supervision (1)

Table 149: LD0.STTPMSU1 Motor start-up supervision (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.STTPMSU1									
.Str.general	MOT_START	Motor start in progress	10=Startup	74	84	1	2	1	1
.Op.general	OPR_IIT	Thermal stress operate	10=Operate	74	90	1	2	0	1

### 2.3.7.85 LD0.T1PTTR1 Three-phase thermal protection for feeders, cables and distribution transformers (1)

Table 150: LD0.T1PTTR1 Three-phase thermal protection for feeders, cables and distribution transformers (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.T1PTTR1									
.Str.general	START	Start	10=Start	168	84	1	2	1	1
.AlmThm.general	ALARM	Thermal alarm	10=Alarm	168	85	1	2	1	1
.Op.general	OPERATE	Operate	10=Operate	168	90	1	2	0	1

**2.3.7.86****LD0.T2PTTR1 Three-phase thermal overload protection, two time constants (1)****Table 151:** LD0.T2PTTR1 Three-phase thermal overload protection, two time constants (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.T2PTTR1									
.Str.general	START	Start	10=Start	168	104	1	2	1	1
.AlmThm.general	ALARM	Thermal alarm	10=Alarm	168	105	1	2	1	1
.Op.general	OPERATE	Operate	10=Operate	168	106	1	2	0	1

**2.3.7.87****LD0.TR2PTDF1 Stabilized and instantaneous differential protection for two-winding transformers (1)****Table 152:** LD0.TR2PTDF1 Stabilized and instantaneous differential protection for two-winding transformers (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.TR2PTRC1									
.Op.general	OPERATE	General operate	10=Operate	176	91	1	2	0	1
LD0.TR2LPDIF1									
.BlkWavSt.general	BLKDWAV	Waveform block, general	10=Blocking	176	158	1	2	1	1
.BlkWavSt.phsA	BLKDWAV_A	Waveform block, phs A	10=Blocking	176	159	0	2	1	1
.BlkWavSt.phsB	BLKDWAV_B	Waveform block, phs B	10=Blocking	176	160	0	2	1	1
.BlkWavSt.phsC	BLKDWAV_C	Waveform block, phs C	10=Blocking	176	161	0	2	1	1
.Blk2HSt.general	BLKD2H	2nd harmonic res. block, general	10=Blocking	176	150	1	2	1	1
.Blk2HSt.phsA	BLKD2H_A	2nd harmonic res. block, phs A	10=Blocking	176	151	0	2	1	1
.Blk2HSt.phsB	BLKD2H_B	2nd harmonic res. block, phs B	10=Blocking	176	152	0	2	1	1
.Blk2HSt.phsC	BLKD2H_C	2nd harmonic res. block, phs C	10=Blocking	176	153	0	2	1	1
.Blk5HSt.general	BLKD5H	5th harmonic res. block, general	10=Blocking	176	154	1	2	1	1
.Blk5HSt.phsA	BLKD5H_A	5th harmonic res. block, phs A	10=Blocking	176	155	0	2	1	1
.Blk5HSt.phsB	BLKD5H_B	5th harmonic res. block, phs B	10=Blocking	176	156	0	2	1	1
.Blk5HSt.phsC	BLKD5H_C	5th harmonic res. block, phs C	10=Blocking	176	157	0	2	1	1

### 2.3.7.88 LD0.UEXPDIS1 Three-phase underexcitation protection (1)

*Table 153: LD0.UEXPDIS1 Three-phase underexcitation protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.UEXPDIS1									
.Str.general	START	Stage start	10=Start	28	131	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	132	1	2	0	1

### 2.3.7.89 LD0.UZPDIS1 Three-phase underimpedance protection (1)

*Table 154: LD0.UZPDIS1 Three-phase underimpedance protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.UZPDIS1									
.Str.general	START	Stage start	10=Start	28	141	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	142	1	2	0	1

### 2.3.7.90 LD0.VVSPPAM1 Voltage vector shift protection (1)

*Table 155: LD0.VVSPPAM1 Voltage vector shift protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.VVSPPAM1									
.Op.general	OPERATE	Stage operate	10=Operate	28	102	1	2	0	1
.BlkIntnSt.general	INT_BLKD	Blocked	10=Blocked	28	103	1	2	0	1

### 2.3.7.91 LD0.WPWDE1 Wattmetric-based earth-fault protection (1)

*Table 156: LD0.WPWDE1 Wattmetric-based earth-fault protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.WPDSE1		Stage 1							
Str.general	START	-Start	10=Start	100	101	1	2	1	1
Op.general	OPERATE	-Operate	10=Operate	100	102	1	2	0	1

### 2.3.7.92 LD0.WPWDE2 Wattmetric-based earth-fault protection (2)

*Table 157: LD0.WPWDE2 Wattmetric-based earth-fault protection (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.WPDSE2		Stage 2							
Str.general	START	-Start	10=Start	100	103	1	2	1	1
Op.general	OPERATE	-Operate	10=Operate	100	104	1	2	0	1

**2.3.7.93****LD0.WPWDE3 Wattmetric-based earth-fault protection (3)****Table 158:** LD0.WPWDE3 Wattmetric-based earth-fault protection (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.WPDSE3		Stage 3							
Str.general	START	-Start	10=Start	100	105	1	2	1	1
Op.general	OPERATE	-Operate	10=Operate	100	106	1	2	0	1

**2.3.8****Protection-related functions****2.3.8.1****LD0.CCSPVC1 Current circuit supervision (1)****Table 159:** LD0.CCSPVC1 Current circuit supervision (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.CCSPVC1									
.SigFailAlm.stVal	ALARM	Fail Alarm	10=Alarm	71	21	1	1	1	1
.FailACirc.general	FAIL	Fail Operate	10=Operate	71	22	1	2	0	1

**2.3.8.2****LD0.DARREC1 Autoreclosing (1)****Table 160:** LD0.DARREC1 Autoreclosing (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DARREC1									
.RecRs.Oper.ctlVal	-	AR reset	10=Reset	169	19	1	20	0	1
.CntRs.Oper.ctlVal	-	AR counters reset	10=Reset	169	20	1	20	0	1
.PrgRec1.stVal	INPRO_1	AR 1st reclose	10=In progress	169	101	1	2	0	1
.PrgRec2.stVal	INPRO_2	AR 2nd reclose	10=In progress	169	102	1	2	0	1
.PrgRec3.stVal	INPRO_3	AR 3rd reclose	10=In progress	169	103	1	2	0	1
.PrgRec4.stVal	INPRO_4	AR 4th reclose	10=In progress	169	104	1	2	0	1
.PrgRec5.stVal	INPRO_5	AR 5th reclose	10=In progress	169	105	1	2	0	1
.PrgRec.stVal	INPRO	AR in progress	10=In progress	169	120	1	2	0	1
.CBManCls.stVal	MAN_CB_CL	CB manually closed	10=CB closed	169	159	1	2	0	1
.LO.stVal	LOCKED	Lockout status	10=Lockout	169	164	1	2	0	1
.UnsRec.stVal	UNSUC_RECL	Reclose fail status	10=Failed	169	170	1	2	0	1
.RdyRec.stVal	READY	Ready reclose status	10=Ready	169	172	1	2	0	1
.ActRec.stVal	ACTIVE	Active reclose status	10=Active	169	173	1	2	0	1
.PrgDsr.stVal	DISCR_INPRO	Discrimination time in p.	10=In progress	169	174	1	2	0	1
.PrgCutOut.stVal	CUTOUT_INPRO	Cutout time in progress	10=In progress	169	175	1	2	0	1
.FrqOpAlm.stVal	FRQ_OP_ALM	Frequent operation alarm	10=Alarm	169	176	1	2	0	1
.OpClis.general	CLOSE_CB	Operate (close XCBR)	10=Close CB	169	179	1	2	0	1

Table continues on next page

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.OpOpn.general	OPEN_CB	Operate (open XCBR)	10=Open CB	169	180	1	2	0	1
.UnsCBCls.stVal	UNSUC_CB	CB closing failed	10=Failed	169	181	1	2	0	1
.WtMstr.stVal	CMD_WAIT	Master signal to follower	10=Signal	169	182	1	2	0	1
.RclTmStr.stVal		Reclaim time start	10=Start	169	183	1	2	0	1

### 2.3.8.3 LD0.ESMGAPC1 Emergency start-up (1)

Table 161: LD0.ESMGAPC1 Emergency start-up (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.ESMGAPC1									
.Str.general	ST_EMERG_ENA	Emergency start	10=Start	77	84	1	2	1	1

### 2.3.8.4 LD0.OOSRPSB1 Out-of-step protection (1)

Table 162: LD0.OOSRPSB1 Out-of-step protection (1)

IEC 61850 name	SA name	Description	DPI values	FUN	INF	U	ASDU	I	C
LD0.OOSRPSB1									
.Op.general	OPERATE	Out-of-step trip, zone 1 or 2	10=Trip	67	1	1	2	0	1
.BlkZn.stVal	OSB	Out-of-step block, zone 1	10=Block	67	2	1	1	0	1
.Blk2Zn.stVal	OSB_Z2	Out-of-step block, zone 2	10=Block	67	3	1	1	0	1
.SwgOp.general	SWING_OP	Out-of-step trip, zone 3	10=Trip	67	4	1	2	0	1

### 2.3.8.5 LD0.SCEFRFLO1 Fault locator (1)

Table 163: LD0.SCEFRFLO1 Fault locator (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SCEFRFLO1									
.Alm.stVal	ALARM	Alarm signal	10=Alarm	65	1	1	2	0	1
.TrgSt.stVal	TRIGG	Triggered	10=Triggered	65	2	1	2	0	2

### 2.3.8.6 LD0.SECRSYN1 Synchronism and energizing check (1)

Table 164: LD0.SECRSYN1 Synchronism and energizing check (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SECRSYN1									
.SynPrg.stVal	SYNC_INPRO	Synch in progress	10=Progress	26	1	1	1	1	1
.FailCmd.stVal	CMD_FAIL_AL	CB close req failed	10=Fail	26	2	1	1	0	1
.FailSyn.stVal	CL_FAIL_AL	CB close cmd failed	10=Fail	26	3	1	1	0	1

**2.3.8.7****LD0.SEQSPVC1 Fuse failure supervision (1)****Table 165:** LD0.SEQSPVC1 Fuse failure supervision (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SEQSPVC1									
.Str.general	FUSEF_U	General start	10=Start	22	84	1	2	1	1
.Str3Ph.general	FUSEF_3PH	3 phase start	10=Start	22	94	1	2	1	1

**2.3.9****Generic functions****2.3.9.1****LD0.MAPGAPC1 Multipurpose protection (1)****Table 166:** LD0.MAPGAPC1 Multipurpose protection (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC1									
.Str.general	START	Stage start	10=Start	27	151	1	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	152	1	1	0	1

**2.3.9.2****LD0.MAPGAPC2 Multipurpose protection (2)****Table 167:** LD0.MAPGAPC2 Multipurpose protection (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC2									
.Str.general	START	Stage start	10=Start	27	153	1	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	154	1	1	0	1

**2.3.9.3****LD0.MAPGAPC3 Multipurpose protection (3)****Table 168:** LD0.MAPGAPC3 Multipurpose protection (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC3									
.Str.general	START	Stage start	10=Start	27	155	1	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	156	1	1	0	1

**2.3.9.4****LD0.MAPGAPC4 Multipurpose protection (4)****Table 169:** LD0.MAPGAPC4 Multipurpose protection (4)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC4									
.Str.general	START	Stage start	10=Start	27	157	1	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	158	1	1	0	1

### 2.3.9.5 LD0.MAPGAPC5 Multipurpose protection (5)

*Table 170: LD0.MAPGAPC5 Multipurpose protection (5)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC5									
.Str.general	START	Stage start	10=Start	27	159	1	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	160	1	1	0	1

### 2.3.9.6 LD0.MAPGAPC6 Multipurpose protection (6)

*Table 171: LD0.MAPGAPC6 Multipurpose protection (6)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC6									
.Str.general	START	Stage start	10=Start	27	161	1	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	162	1	1	0	1

### 2.3.9.7 LD0.MAPGAPC7 Multipurpose protection (7)

*Table 172: LD0.MAPGAPC7 Multipurpose protection (7)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC7									
.Str.general	START	Stage start	10=Start	27	163	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	164	1	2	1	1

### 2.3.9.8 LD0.MAPGAPC8 Multipurpose protection (8)

*Table 173: LD0.MAPGAPC8 Multipurpose protection (8)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC8									
.Str.general	START	Stage start	10=Start	27	165	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	166	1	2	1	1

### 2.3.9.9 LD0.MAPGAPC9 Multipurpose protection (9)

*Table 174: LD0.MAPGAPC9 Multipurpose protection (9)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC9									
.Str.general	START	Stage start	10=Start	27	167	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	168	1	2	1	1

### 2.3.9.10 LD0.MAPGAPC10 Multipurpose protection (10)

*Table 175: LD0.MAPGAPC10 Multipurpose protection (10)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC10									
.Str.general	START	Stage start	10=Start	27	169	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	170	1	2	1	1

### 2.3.9.11 LD0.MAPGAPC11 Multipurpose protection (11)

*Table 176: LD0.MAPGAPC11 Multipurpose protection (11)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC11									
.Str.general	START	Stage start	10=Start	27	171	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	172	1	2	1	1

### 2.3.9.12 LD0.MAPGAPC12 Multipurpose protection (12)

*Table 177: LD0.MAPGAPC12 Multipurpose protection (12)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC12									
.Str.general	START	Stage start	10=Start	27	173	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	174	1	2	1	1

### 2.3.9.13 LD0.MAPGAPC13 Multipurpose protection (13)

*Table 178: LD0.MAPGAPC13 Multipurpose protection (13)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC13									
.Str.general	START	Stage start	10=Start	27	175	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	176	1	2	1	1

### 2.3.9.14 LD0.MAPGAPC14 Multipurpose protection (14)

*Table 179: LD0.MAPGAPC14 Multipurpose protection (14)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC14									
.Str.general	START	Stage start	10=Start	27	177	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	178	1	2	1	1

### 2.3.9.15 LD0.MAPGAPC15 Multipurpose protection (15)

*Table 180: LD0.MAPGAPC15 Multipurpose protection (15)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC15									
.Str.general	START	Stage start	10=Start	27	179	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	180	1	2	1	1

### 2.3.9.16 LD0.MAPGAPC16 Multipurpose protection (16)

*Table 181: LD0.MAPGAPC16 Multipurpose protection (16)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC16									
.Str.general	START	Stage start	10=Start	27	181	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	182	1	2	1	1

### 2.3.9.17 LD0.MAPGAPC17 Multipurpose protection (17)

*Table 182: LD0.MAPGAPC17 Multipurpose protection (17)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC17									
.Str.general	START	Stage start	10=Start	27	183	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	184	1	2	1	1

### 2.3.9.18 LD0.MAPGAPC18 Multipurpose protection (18)

*Table 183: LD0.MAPGAPC18 Multipurpose protection (18)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MAPGAPC18									
.Str.general	START	Stage start	10=Start	27	185	1	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	27	186	1	2	1	1

### 2.3.9.19 LD0.MVGAPC1 Move (8 pcs) (1)

*Table 184: LD0.MVGAPC1 Move (8 pcs) (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MVGAPC1									
.SPCSO1.stVal	-	Input 1 signal	10=On	11	1	0	1	1	1
.SPCSO2.stVal	-	Input 2 signal	10=On	11	2	0	1	1	1
.SPCSO3.stVal	-	Input 3 signal	10=On	11	3	0	1	1	1
Table continues on next page									

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.SPCSO4.stVal	-	Input 4 signal	10=On	11	4	0	1	1	1
.SPCSO5.stVal	-	Input 5 signal	10=On	11	5	0	1	1	1
.SPCSO6.stVal	-	Input 6 signal	10=On	11	6	0	1	1	1
.SPCSO7.stVal	-	Input 7 signal	10=On	11	7	0	1	1	1
.SPCSO8.stVal	-	Input 8 signal	10=On	11	8	0	1	1	1

### 2.3.9.20 LD0.MVGAPC2 Move (8 pcs) (2)

Table 185: LD0.MVGAPC2 Move (8 pcs) (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MVGAPC2									
.SPCSO1.stVal	-	Input 1 signal	10=On	11	11	0	1	1	1
.SPCSO2.stVal	-	Input 2 signal	10=On	11	12	0	1	1	1
.SPCSO3.stVal	-	Input 3 signal	10=On	11	13	0	1	1	1
.SPCSO4.stVal	-	Input 4 signal	10=On	11	14	0	1	1	1
.SPCSO5.stVal	-	Input 5 signal	10=On	11	15	0	1	1	1
.SPCSO6.stVal	-	Input 6 signal	10=On	11	16	0	1	1	1
.SPCSO7.stVal	-	Input 7 signal	10=On	11	17	0	1	1	1
.SPCSO8.stVal	-	Input 8 signal	10=On	11	18	0	1	1	1

### 2.3.9.21 LD0.SPCGAPC1 Generic control point (16 pcs) (1)

The binary outputs can be configured either as pulse- or persistent-type outputs. Pulse-type outputs are triggered with the write value "ON". Persistent-type outputs can be written with both values "ON" and "OFF". The setting mode "toggled" for local operation corresponds to "persistent" for remote operation.

Table 186: LD0.SPCGAPC1 Generic control point (16 pcs) (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SPCGAPC1									
.SPCS01ctlVal	-	Output control 1	10/01=On/Off	11	141	1	20	0	1
.SPCS02ctlVal	-	Output control 2	10/01=On/Off	11	142	1	20	0	1
.SPCS03ctlVal	-	Output control 3	10/01=On/Off	11	143	1	20	0	1
.SPCS04ctlVal	-	Output control 4	10/01=On/Off	11	144	1	20	0	1
.SPCS05ctlVal	-	Output control 5	10/01=On/Off	11	145	1	20	0	1
.SPCS06ctlVal	-	Output control 6	10/01=On/Off	11	146	1	20	0	1
.SPCS07ctlVal	-	Output control 7	10/01=On/Off	11	147	1	20	0	1
.SPCS08ctlVal	-	Output control 8	10/01=On/Off	11	148	1	20	0	1
.SPCS09ctlVal	-	Output control 9	10/01=On/Off	11	149	1	20	0	1
.SPCS10ctlVal	-	Output control 10	10/01=On/Off	11	150	1	20	0	1

Table continues on next page

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.SPCS11.ctlVal	-	Output control 11	10/01=On/Off	11	151	1	20	0	1
.SPCS12.ctlVal	-	Output control 12	10/01=On/Off	11	152	1	20	0	1
.SPCS13.ctlVal	-	Output control 13	10/01=On/Off	11	153	1	20	0	1
.SPCS14.ctlVal	-	Output control 14	10/01=On/Off	11	154	1	20	0	1
.SPCS15.ctlVal	-	Output control 15	10/01=On/Off	11	155	1	20	0	1
.SPCS16.ctlVal	-	Output control 16	10/01=On/Off	11	156	1	20	0	1

### 2.3.9.22

### LD0.SPCGAPC2 Generic control point (16 pcs) (2)

The binary outputs can be configured either as pulse- or persistent-type outputs. Pulse-type outputs are triggered with the write value "ON". Persistent-type outputs can be written with both values "ON" and "OFF". The setting mode "toggled" for local operation corresponds to "persistent" for remote operation.

*Table 187: LD0.SPCGAPC2 Generic control point (16 pcs) (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SPCGAPC2									
.SPCS01.ctlVal	-	Output control 1	10/01=On/Off	11	181	1	1,20	0	1
.SPCS02.ctlVal	-	Output control 2	10/01=On/Off	11	182	1	1,20	0	1
.SPCS03.ctlVal	-	Output control 3	10/01=On/Off	11	183	1	1,20	0	1
.SPCS04.ctlVal	-	Output control 4	10/01=On/Off	11	184	1	1,20	0	1
.SPCS05.ctlVal	-	Output control 5	10/01=On/Off	11	185	1	1,20	0	1
.SPCS06.ctlVal	-	Output control 6	10/01=On/Off	11	186	1	1,20	0	1
.SPCS07.ctlVal	-	Output control 7	10/01=On/Off	11	187	1	1,20	0	1
.SPCS08.ctlVal	-	Output control 8	10/01=On/Off	11	188	1	1,20	0	1
.SPCS09.ctlVal	-	Output control 9	10/01=On/Off	11	189	1	1,20	0	1
.SPCS10.ctlVal	-	Output control 10	10/01=On/Off	11	190	1	1,20	0	1
.SPCS11.ctlVal	-	Output control 11	10/01=On/Off	11	191	1	1,20	0	1
.SPCS12.ctlVal	-	Output control 12	10/01=On/Off	11	192	1	1,20	0	1
.SPCS13.ctlVal	-	Output control 13	10/01=On/Off	11	193	1	1,20	0	1
.SPCS14.ctlVal	-	Output control 14	10/01=On/Off	11	194	1	1,20	0	1
.SPCS15.ctlVal	-	Output control 15	10/01=On/Off	11	195	1	1,20	0	1
.SPCS16.ctlVal	-	Output control 16	10/01=On/Off	11	196	1	1,20	0	1

## 2.3.9.23

## LD0.SRGAPC1 Set-reset (8 pcs) (1)

Table 188: LD0.SRGAPC1 Set-reset (8 pcs) (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SRGAPC1									
.Rs1.ctlVal	-	Reset flip-flop 1	10=Reset	11	101	1	20	0	1
.Rs2.ctlVal	-	Reset flip-flop 2	10=Reset	11	102	1	20	0	1
.Rs3.ctlVal	-	Reset flip-flop 3	10=Reset	11	103	1	20	0	1
.Rs4.ctlVal	-	Reset flip-flop 4	10=Reset	11	104	1	20	0	1
.Rs5.ctlVal	-	Reset flip-flop 5	10=Reset	11	105	1	20	0	1
.Rs6.ctlVal	-	Reset flip-flop 6	10=Reset	11	106	1	20	0	1
.Rs7.ctlVal	-	Reset flip-flop 7	10=Reset	11	107	1	20	0	1
.Rs8.ctlVal	-	Reset flip-flop 8	10=Reset	11	108	1	20	0	1

## 2.3.9.24

## LD0.SRGAPC2 Set-reset (8 pcs) (2)

Table 189: LD0.SRGAPC2 Set-reset (8 pcs) (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SRGAPC2									
.Rs1.ctlVal	-	Reset flip-flop 1	10=Reset	11	111	1	20	0	1
.Rs2.ctlVal	-	Reset flip-flop 2	10=Reset	11	112	1	20	0	1
.Rs3.ctlVal	-	Reset flip-flop 3	10=Reset	11	113	1	20	0	1
.Rs4.ctlVal	-	Reset flip-flop 4	10=Reset	11	114	1	20	0	1
.Rs5.ctlVal	-	Reset flip-flop 5	10=Reset	11	115	1	20	0	1
.Rs6.ctlVal	-	Reset flip-flop 6	10=Reset	11	116	1	20	0	1
.Rs7.ctlVal	-	Reset flip-flop 7	10=Reset	11	117	1	20	0	1
.Rs8.ctlVal	-	Reset flip-flop 8	10=Reset	11	118	1	20	0	1

## 2.3.9.25

## LD0.SRGAPC3 Set-reset (8 pcs) (3)

Table 190: LD0.SRGAPC3 Set-reset (8 pcs) (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SRGAPC3									
.Rs1.ctlVal	-	Reset flip-flop 1	10=Reset	11	121	1	20	0	1
.Rs2.ctlVal	-	Reset flip-flop 2	10=Reset	11	122	1	20	0	1
.Rs3.ctlVal	-	Reset flip-flop 3	10=Reset	11	123	1	20	0	1
.Rs4.ctlVal	-	Reset flip-flop 4	10=Reset	11	124	1	20	0	1
.Rs5.ctlVal	-	Reset flip-flop 5	10=Reset	11	125	1	20	0	1
.Rs6.ctlVal	-	Reset flip-flop 6	10=Reset	11	126	1	20	0	1
.Rs7.ctlVal	-	Reset flip-flop 7	10=Reset	11	127	1	20	0	1
.Rs8.ctlVal	-	Reset flip-flop 8	10=Reset	11	128	1	20	0	1

### 2.3.9.26

### LD0.SRGAPC4 Set-reset (8 pcs) (4)

Table 191: LD0.SRGAPC4 Set-reset (8 pcs) (4)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SRGAPC4									
.Rs1.ctlVal	-	Reset flip-flop 1	10=Reset	11	131	1	20	0	1
.Rs2.ctlVal	-	Reset flip-flop 2	10=Reset	11	132	1	20	0	1
.Rs3.ctlVal	-	Reset flip-flop 3	10=Reset	11	133	1	20	0	1
.Rs4.ctlVal	-	Reset flip-flop 4	10=Reset	11	134	1	20	0	1
.Rs5.ctlVal	-	Reset flip-flop 5	10=Reset	11	135	1	20	0	1
.Rs6.ctlVal	-	Reset flip-flop 6	10=Reset	11	136	1	20	0	1
.Rs7.ctlVal	-	Reset flip-flop 7	10=Reset	11	137	1	20	0	1
.Rs8.ctlVal	-	Reset flip-flop 8	10=Reset	11	138	1	20	0	1

### 2.3.10

### Physical and raw I/O data

#### 2.3.10.1

#### LD0.BSTGGIO1 Binary signal transfer (1)

Table 192: LD0.BSTGGIO1 Binary signal transfer (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.BSTGGIO1									
.SPCSO1.stVal	RECV_SIG_1	Output 1 State	01/10=Off/On	80	51	0	1,20	0	1
.SPCSO2.stVal	RECV_SIG_2	Output 2 State	01/10=Off/On	80	52	0	1,20	0	1
.SPCSO3.stVal	RECV_SIG_3	Output 3 State	01/10=Off/On	80	53	0	1,20	0	1
.SPCSO4.stVal	RECV_SIG_4	Output 4 State	01/10=Off/On	80	54	0	1,20	0	1
.SPCSO5.stVal	RECV_SIG_5	Output 5 State	01/10=Off/On	80	55	0	1,20	0	1
.SPCSO6.stVal	RECV_SIG_6	Output 6 State	01/10=Off/On	80	56	0	1,20	0	1
.SPCSO7.stVal	RECV_SIG_7	Output 7 State	01/10=Off/On	80	57	0	1,20	0	1
.SPCSO8.stVal	RECV_SIG_8	Output 8 State	01/10=Off/On	80	58	0	1,20	0	1
.Ind1.stVal	SEND_SIG_1	Input 1 State	01/10=Off/On	80	11	0	1	0	1
.Ind2.stVal	SEND_SIG_2	Input 2 State	01/10=Off/On	80	12	0	1	0	1
.Ind3.stVal	SEND_SIG_3	Input 3 State	01/10=Off/On	80	13	0	1	0	1
.Ind4.stVal	SEND_SIG_4	Input 4 State	01/10=Off/On	80	14	0	1	0	1
.Ind5.stVal	SEND_SIG_5	Input 5 State	01/10=Off/On	80	15	0	1	0	1
.Ind6.stVal	SEND_SIG_6	Input 6 State	01/10=Off/On	80	16	0	1	0	1
.Ind7.stVal	SEND_SIG_7	Input 7 State	01/10=Off/On	80	17	0	1	0	1
.Ind8.stVal	SEND_SIG_8	Input 8 State	01/10=Off/On	80	18	0	1	0	1

## 2.3.10.2

## LD0.XAGGIO130 Physical binary I/O signals (status only)

Table 193: LD0.XAGGIO130 Physical binary I/O signals (status only)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XAGGIO130									
.Ind1.stVal	-	XA130-Input 1	10/01=On/Off	54	1	0	1	1	1
.Ind2.stVal	-	XA130-Input 2	10/01=On/Off	54	2	0	1	1	1
.Ind3.stVal	-	XA130-Input 3	10/01=On/Off	54	3	0	1	1	1
.Ind4.stVal	-	XA130-Input 4	10/01=On/Off	54	4	0	1	1	1

## 2.3.10.3

## LD0.XBGGIO110 Physical I/O

Table 194: LD0.XBGGIO110 Physical I/O

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XBGGIO110	-								
.Ind1.stVal	-	XB110-Input 1	10/01=ON/OFF	50	41	0	1	1	1
.Ind2.stVal	-	XB110-Input 2	10/01=ON/OFF	50	42	0	1	1	1
.Ind3.stVal	-	XB110-Input 3	10/01=ON/OFF	50	43	0	1	1	1
.Ind4.stVal	-	XB110-Input 4	10/01=ON/OFF	50	44	0	1	1	1
.Ind5.stVal	-	XB110-Input 5	10/01=ON/OFF	50	45	0	1	1	1
.Ind6.stVal	-	XB110-Input 6	10/01=ON/OFF	50	46	0	1	1	1
.Ind7.stVal	-	XB110-Input 7	10/01=ON/OFF	50	47	0	1	1	1
.Ind8.stVal	-	XB110-Input 8	10/01=ON/OFF	50	48	0	1	1	1
.SPCSO1.stVal	-	XB110-Output 1	10/01=ON/OFF	50	141	0	1	1	1
.SPCSO2.stVal	-	XB110-Output 1	10/01=ON/OFF	50	142	0	1	1	1
.SPCSO3.stVal	-	XB110-Output 1	10/01=ON/OFF	50	143	0	1	1	1
.SPCSO4.stVal	-	XB110-Output 1	10/01=ON/OFF	50	144	0	1	1	1

## 2.3.10.4

## LD0.XGGIO100 Physical binary I/O signals (status only)

Table 195: LD0.XGGIO100 Physical binary I/O signals (status only)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XGGIO100									
.SPCSO1.stVal	-	X100-Output 1	10/01=On/Off	53	101	0	1	1	1
.SPCSO2.stVal	-	X100-Output 2	10/01=On/Off	53	102	0	1	1	1
.SPCSO3.stVal	-	X100-Output 3	10/01=On/Off	53	103	0	1	1	1
.SPCSO4.stVal	-	X100-Output 4	10/01=On/Off	53	104	0	1	1	1
.SPCSO5.stVal	-	X100-Output 5	10/01=On/Off	53	105	0	1	1	1
.SPCSO6.stVal	-	X100-Output 6	10/01=On/Off	53	106	0	1	1	1

### 2.3.10.5

### LD0.XGGIO110 Physical binary I/O signals (status only)

Table 196: LD0.XGGIO110 Physical binary I/O signals (status only)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XGGIO110									
.Ind1.stVal	-	X110-Input 1	10/01=On/Off	52	1	0	1	1	1
.Ind2.stVal	-	X110-Input 2	10/01=On/Off	52	2	0	1	1	1
.Ind3.stVal	-	X110-Input 3	10/01=On/Off	52	3	0	1	1	1
.Ind4.stVal	-	X110-Input 4	10/01=On/Off	52	4	0	1	1	1
.Ind5.stVal	-	X110-Input 5	10/01=On/Off	52	5	0	1	1	1
.Ind6.stVal	-	X110-Input 6	10/01=On/Off	52	6	0	1	1	1
.Ind7.stVal	-	X110-Input 7	10/01=On/Off	52	7	0	1	1	1
.Ind8.stVal	-	X110-Input 8	10/01=On/Off	52	8	0	1	1	1
.SPCSO1.stVal	-	X110-Output 1	10/01=On/Off	52	101	0	1	1	1
.SPCSO2.stVal	-	X110-Output 2	10/01=On/Off	52	102	0	1	1	1
.SPCSO3.stVal	-	X110-Output 3	10/01=On/Off	52	103	0	1	1	1
.SPCSO4.stVal	-	X110-Output 4	10/01=On/Off	52	104	0	1	1	1

### 2.3.10.6

### LD0.XGGIO120 Physical binary I/O signals (status only)

Table 197: LD0.XGGIO120 Physical binary I/O signals (status only)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XGGIO120									
.Ind1.stVal	-	X120-Input 1	10/01=On/Off	51	1	0	1	1	1
.Ind2.stVal	-	X120-Input 2	10/01=On/Off	51	2	0	1	1	1
.Ind3.stVal	-	X120-Input 3	10/01=On/Off	51	3	0	1	1	1
.Ind4.stVal	-	X120-Input 4	10/01=On/Off	51	4	0	1	1	1

### 2.3.10.7

### LD0.XGGIO130 Physical binary I/O signals (status only)

Table 198: LD0.XGGIO130 Physical binary I/O signals (status only)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XGGIO130									
.Ind1.stVal	-	X130-Input 1	10/01=On/Off	50	1	0	1	1	1
.Ind2.stVal	-	X130-Input 2	10/01=On/Off	50	2	0	1	1	1
.Ind3.stVal	-	X130-Input 3	10/01=On/Off	50	3	0	1	1	1
.Ind4.stVal	-	X130-Input 4	10/01=On/Off	50	4	0	1	1	1
.Ind5.stVal	-	X130-Input 5	10/01=On/Off	50	5	0	1	1	1
.Ind6.stVal	-	X130-Input 6	10/01=On/Off	50	6	0	1	1	1

Table continues on next page

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.SPCSO1.stVal	-	X130-Output 1	10/01=On/Off	50	101	0	1	1	1
.SPCSO2.stVal	-	X130-Output 2	10/01=On/Off	50	102	0	1	1	1
.SPCSO3.stVal	-	X130-Output 3	10/01=On/Off	50	103	0	1	1	1

## 2.4 Analog events

Analog events are generated as ASDU 4 messages, according to the IEC 60870-5-103 standard. The value coding format is short floating point. The value is directly taken from the corresponding source IEC 61850 value, and cannot be rescaled. If the source IEC 61850 value is of integer format, it is automatically converted into short floating point for the ASDU 4 message.

*Table 199: Explanations of the analog event table columns*

Column name	Description
IEC 61850 name	Source object name
Description	Short description of the signal. See the technical manual for more information.
Values	Value range of the source object
FUN	Default function type definition for the object. Editable.
INF	Default information number definition for the object. Editable.
U	Object in use or not. As default, ASDU 4 objects are not in use. Editable.
ASDU	ASDU number of the message. In this case 4.
I	General interrogation default setting. Editable.

### 2.4.1 LD0.CMMXU1 Three-phase current measurement (1)

*Table 200: LD0.CMMXU1 Three-phase current measurement (1)*

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.CAVMMXU1							
.A.phsA.cVal.mag	Phs A demand	0...50.00 [xIn]	66	181	0	4	0
.A.phsB.cVal.mag	Phs B demand	0...50.00 [xIn]	66	182	0	4	0
.A.phsC.cVal.mag	Phs C demand	0...50.00 [xIn]	66	183	0	4	0
LD0.CMAMMXU1							
.A.phsA.cVal.mag	Phs A max. demand	0...50.00 [xIn]	66	150	0	4	0
.A.phsB.cVal.mag	Phs B max. demand	0...50.00 [xIn]	66	151	0	4	0
.A.phsC.cVal.mag	Phs C max. demand	0...50.00 [xIn]	66	152	0	4	0
LD0.CMIMMXU1							
.A.phsA.cVal.mag	Phs A min. demand	0...50.00 [xIn]	66	153	0	4	0
.A.phsB.cVal.mag	Phs B min. demand	0...50.00 [xIn]	66	154	0	4	0
.A.phsC.cVal.mag	Phs C min. demand	0...50.00 [xIn]	66	155	0	4	0

## 2.4.2

## LD0.CMMXU2 Three-phase current measurement (2)

Table 201: LD0.CMMXU2 Three-phase current measurement (2)

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.CAVMMXU2							
.A.phsA.cVal.mag	Phs A demand	0...50.00 [ $\times 10^{-3}$ ]	66	184	0	4	0
.A.phsB.cVal.mag	Phs B demand	0...50.00 [ $\times 10^{-3}$ ]	66	185	0	4	0
.A.phsC.cVal.mag	Phs C demand	0...50.00 [ $\times 10^{-3}$ ]	66	186	0	4	0
LD0.CMAMMXU2							
.A.phsA.cVal.mag	Phs A max. demand	0...50.00 [ $\times 10^{-3}$ ]	66	156	0	4	0
.A.phsB.cVal.mag	Phs B max. demand	0...50.00 [ $\times 10^{-3}$ ]	66	157	0	4	0
.A.phsC.cVal.mag	Phs C max. demand	0...50.00 [ $\times 10^{-3}$ ]	66	158	0	4	0
LD0.CMIMMXU2							
.A.phsA.cVal.mag	Phs A min. demand	0...50.00 [ $\times 10^{-3}$ ]	66	159	0	4	0
.A.phsB.cVal.mag	Phs B min. demand	0...50.00 [ $\times 10^{-3}$ ]	66	160	0	4	0
.A.phsC.cVal.mag	Phs C min. demand	0...50.00 [ $\times 10^{-3}$ ]	66	161	0	4	0

## 2.4.3

## LD0.FLTRFRC1 Fault record (1)

The fault recorder component contains a lot of potential registration data available for the device type in question. The registration data in turn depends on that the device application performs the needed measurement functions.

Table 202: LD0.FLTRFRC1 Fault record (1)

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.FLTRFRC1							
.FltPtR.mag	Fault resistance	0...1000000 ohm	66	1	0	4	0
.FltDiskm.mag	Fault distance	0.00...3000.00 pu	66	2	0	4	0
.Max50DifAA.mag	Max. diff current IL1	0.000...80.000 pu	66	3	0	4	0
.Max50DifAB.mag	Max. diff current IL2	0.000...80.000 pu	66	4	0	4	0
.Max50DifAC.mag	Max. diff current IL3	0.000...80.000 pu	66	5	0	4	0
.Max50RstAA.mag	Max. bias current IL1	0.000...50.000 pu	66	6	0	4	0
.Max50RstAB.mag	Max. bias current IL2	0.000...50.000 pu	66	7	0	4	0
.Max50RstAC.mag	Max. bias current IL3	0.000...50.000 pu	66	8	0	4	0
.DifAPhsA.mag	Diff current IL1	0.000...80.000 pu	66	9	0	4	0
.DifAPhsB.mag	Diff current IL2	0.000...80.000 pu	66	10	0	4	0
.DifAPhsC.mag	Diff current IL3	0.000...80.000 pu	66	11	0	4	0
.RstAPhsA.mag	Bias current IL1	0.000...50.000 pu	66	12	0	4	0
.RstAPhsB.mag	Bias current IL2	0.000...50.000 pu	66	13	0	4	0
.RstAPhsC.mag	Bias current IL3	0.000...50.000 pu	66	14	0	4	0
.DifARes.mag	Diff current Io	0.000...80.000 pu	66	15	0	4	0

Table continues on next page

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
.RstARes.mag	Bias current Io	0.000...50.000 pu	66	16	0	4	0
.Max50APhsA1.mag	Max. current IL1	0.000...50.000 ×In	66	17	0	4	0
.Max50APhsB1.mag	Max. current IL2	0.000...50.000 ×In	66	18	0	4	0
.Max50APhsC1.mag	Max. current IL3	0.000...50.000 ×In	66	19	0	4	0
.Max50ARes1.mag	Max. current Io	0.000...50.000 ×In	66	20	0	4	0
.APhsA1.mag	Current IL1	0.000...50.000 ×In	66	21	0	4	0
.APhsB1.mag	Current IL2	0.000...50.000 ×In	66	22	0	4	0
.APhsC1.mag	Current IL3	0.000...50.000 ×In	66	23	0	4	0
.ARes1.mag	Current Io	0.000...50.000 ×In	66	24	0	4	0
.AResClc1.mag	Current Io-calculated	0.000...50.000 ×In	66	25	0	4	0
.APsSeq1.mag	Current Pos-Seq	0.000...50.000 ×In	66	26	0	4	0
.ANgSeq1.mag	Current Neg-Seq	0.000...50.000 ×In	66	27	0	4	0
.Max50APhsA2.mag	Max. current IL1(b)	0.000...50.000 ×In	66	28	0	4	0
.Max50APhsB2.mag	Max. current IL2(b)	0.000...50.000 ×In	66	29	0	4	0
.Max50APhsC2.mag	Max. current IL3(b)	0.000...50.000 ×In	66	30	0	4	0
.Max50ARes2.mag	Max. current Io(b)	0.000...50.000 ×In	66	31	0	4	0
.APhsA2.mag	Current IL1(b)	0.000...50.000 ×In	66	32	0	4	0
.APhsB2.mag	Current IL2(b)	0.000...50.000 ×In	66	33	0	4	0
.APhsC2.mag	Current IL3(b)	0.000...50.000 ×In	66	34	0	4	0
.ARes2.mag	Current Io(b)	0.000...50.000 ×In	66	35	0	4	0
.AResClc2.mag	Current Io-calculated(b)	0.000...50.000 ×In	66	36	0	4	0
.APsSeq2.mag	Current Pos-Seq(b)	0.000...50.000 ×In	66	37	0	4	0
.ANgSeq2.mag	Current Neg-Seq(b)	0.000...50.000 ×In	66	38	0	4	0
.Max50APhsA3.mag	Max. current IL1(c)	0.000...50.000 ×In	66	39	0	4	0
.Max50APhsB3.mag	Max. current IL2(c)	0.000...50.000 ×In	66	40	0	4	0
.Max50APhsC3.mag	Max. current IL3(c)	0.000...50.000 ×In	66	41	0	4	0
.Max50ARes3.mag	Max. current Io(c)	0.000...50.000 ×In	66	42	0	4	0
.APhsA3.mag	Current IL1(c)	0.000...50.000 ×In	66	43	0	4	0
.APhsB3.mag	Current IL2(c)	0.000...50.000 ×In	66	44	0	4	0
.APhsC3.mag	Current IL3(c)	0.000...50.000 ×In	66	45	0	4	0
.ARes3.mag	Current Io(c)	0.000...50.000 ×In	66	46	0	4	0
.AResClc3.mag	Current Io-calculated(c)	0.000...50.000 ×In	66	47	0	4	0
.APsSeq3.mag	Current Pos-Seq(c)	0.000...50.000 ×In	66	48	0	4	0
.ANgSeq3.mag	Current Neg-Seq(c)	0.000...50.000 ×In	66	49	0	4	0
.PhVPhsA1.mag	Voltage UL1	0.000...4.000 ×Un	66	50	0	4	0
.PhVPhsB1.mag	Voltage UL2	0.000...4.000 ×Un	66	51	0	4	0
.PhVPhsC1.mag	Voltage UL3	0.000...4.000 ×Un	66	52	0	4	0
.PPVPhsAB1.mag	Voltage U12	0.000...4.000 ×Un	66	53	0	4	0
.PPVPhsBC1.mag	Voltage U23	0.000...4.000 ×Un	66	54	0	4	0

Table continues on next page

## Section 2 IEC 60870-5-103 data mappings

1MRS758070 D

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
.PPVPhsCA1.mag	Voltage U31	0.000...4.000 ×Un	66	55	0	4	0
.VRes1.mag	Voltage Uo	0.000...4.000 ×Un	66	56	0	4	0
.VZro1.mag	Voltage Zero-Seq	0.000...4.000 ×Un	66	57	0	4	0
.VPsSeq1.mag	Voltage Pos-Seq	0.000...4.000 ×Un	66	58	0	4	0
.VNgsSeq1.mag	Voltage Neg-Seq	0.000...4.000 ×Un	66	59	0	4	0
.PhVPhsA2.mag	Voltage UL1(b)	0.000...4.000 ×Un	66	60	0	4	0
.PhVPhsB2.mag	Voltage UL2(b)	0.000...4.000 ×Un	66	61	0	4	0
.PhVPhsC2.mag	Voltage UL3(b)	0.000...4.000 ×Un	66	62	0	4	0
.PPVPhsAB2.mag	Voltage U12(b)	0.000...4.000 ×Un	66	63	0	4	0
.PPVPhsBC2.mag	Voltage U23(b)	0.000...4.000 ×Un	66	64	0	4	0
.PPVPhsCA2.mag	Voltage U31(b)	0.000...4.000 ×Un	66	65	0	4	0
.VRes2.mag	Voltage Uo(b)	0.000...4.000 ×Un	66	66	0	4	0
.VZro2.mag	Voltage Zero-Seq(b)	0.000...4.000 ×Un	66	67	0	4	0
.VPsSeq2.mag	Voltage Pos-Seq(b)	0.000...4.000 ×Un	66	68	0	4	0
.VNgsSeq2.mag	Voltage Neg-Seq(b)	0.000...4.000 ×Un	66	69	0	4	0
.MaxTmpRI.mag	PTTR thermal level	0.00...99.99	66	70	0	4	0
.AMaxNgPs.mag	PDNSPTOC1 ratio I2/I1	0.00...999.99%	66	71	0	4	0
.DifANAngVN1.mag	Angle Uo - Io	-180.00...180.00 deg	66	72	0	4	0
.DifAAAngVBC1.mag	Angle U23 - IL1	-180.00...180.00 deg	66	73	0	4	0
.DifABAngVCA1.mag	Angle U31 - IL2	-180.00...180.00 deg	66	74	0	4	0
.DifACAngVAB1.mag	Angle U12 - IL3	-180.00...180.00 deg	66	75	0	4	0
.DifANAngVN2.mag	Angle Uo - Io(b)	-180.00...180.00 deg	66	76	0	4	0
.DifAAAngVBC2.mag	Angle U23 - IL1(b)	-180.00...180.00 deg	66	77	0	4	0
.DifABAngVCA2.mag	Angle U31 - IL2(b)	-180.00...180.00 deg	66	78	0	4	0
.DifACAngVAB2.mag	Angle U12 - IL3(b)	-180.00...180.00 deg	66	79	0	4	0
.HzRteChg.mag	Frequency gradient	-10.00...10.00 Hz/s	66	80	0	4	0
.CondNeut.mag	Conductance Yo	-1000.00...1000.00 mS	66	81	0	4	0
.SusNeut.mag	Susceptance Yo	-1000.00...1000.00 mS	66	82	0	4	0
.PPLoopRis.mag	Fault loop Resistance	-1000.00...1000.00 ohm	66	83	0	4	0
.PPLoopReact.mag	Fault loop Reactance	-1000.00...1000.00 ohm	66	84	0	4	0
.CBCIrtm.mag	Breaker clear time	0.000...3.000 s	66	85	0	4	0
.Hz.mag	Frequency	30.00...80.00 Hz	66	86	0	4	0

**2.4.4****LD0.PEMMXU1 Three-phase power and energy measurement (1)****Table 203:** LD0.PEMMXU1 Three-phase power and energy measurement (1)

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.PEAVMMXU1							
.TotVA.mag	S demand	-999999.9...999999.9 kVA	66	205	0	4	0
.TotW.mag	P demand	-999999.9...999999.9 kW	66	208	0	4	0
.TotVAr.mag	Q demand	-999999.9...999999.9 kVAr	66	211	0	4	0
.TotPF.mag	PF demand	-1.00...1.00	66	214	0	4	0
LD0.PEMAMMXU1							
.TotVA.mag	S max. demand	-999999.9...999999.9 kVA	66	206	0	4	0
.TotW.mag	P max. demand	-999999.9...999999.9 kW	66	209	0	4	0
.TotVAr.mag	Q max. demand	-999999.9...999999.9 kVAr	66	212	0	4	0
LD0.PEMIMMXU1							
.TotVA.mag	S min. demand	-999999.9...999999.9 kVA	66	207	0	4	0
.TotW.mag	P min. demand	-999999.9...999999.9 kW	66	210	0	4	0
.TotVAr.mag	Q min. demand	-999999.9...999999.9 kVAr	66	213	0	4	0

**2.4.5****LD0.RESCMMXU1 Residual current measurement (1)****Table 204:** LD0.RESCMMXU1 Residual current measurement (1)

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.RCAVMMXU1							
.A.res.cVal.mag	Residual demand	0...50.00 [xIn]	66	187	0	4	0
LD0.RCMAMMXU1							
.A.res.cVal.mag	Residual max. demand	0...50.00 [xIn]	66	162	0	4	0
LD0.RCMIMMXU1							
.A.res.cVal.mag	Residual min. demand	0...50.00 [xIn]	66	163	0	4	0

**2.4.6****LD0.RESCMMXU2 Residual current measurement (2)****Table 205:** LD0.RESCMMXU2 Residual current measurement (2)

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.RCAVMMXU2							
.A.res.cVal.mag	Residual demand	0...50.00 [xIn]	66	188	0	4	0
LD0.RCMAMMXU2							
.A.res.cVal.mag	Residual max. demand	0...50.00 [xIn]	66	164	0	4	0
LD0.RCMIMMXU2							
.A.res.cVal.mag	Residual min. demand	0...50.00 [xIn]	66	165	0	4	0

## 2.4.7 LD0.RESVMMXU1 Residual voltage measurement (1)

*Table 206: LD0.RESVMMXU1 Residual voltage measurement (1)*

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.RVAVMMXU1							
.PhV.res.cVal.mag	Residual demand	0...4.00 [ $\times U_n$ ]	66	203	0	4	0

## 2.4.8 LD0.RESVMMXU2 Residual voltage measurement (2)

*Table 207: LD0.RESVMMXU2 Residual voltage measurement (2)*

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.RVAVMMXU2							
.PhV.res.cVal.mag	Residual demand	0...4.00 [ $\times U_n$ ]	66	204	0	4	0

## 2.4.9 LD0.SCEFRFLO1 Fault locator

*Table 208: LD0.SCEFRFLO1 Fault locator*

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.FLO1RFRC1							
.PhReact.mag	Fault reactance	0...1000000 ohm	65	10	0	4	0
.FltDiskm.mag	Fault distance	0...3000.000 km	65	21	0	4	0
.FltLoop.stVal	Fault loop	0...1000000 ohm	65	22	0	4	0
.FltPtR.mag	Fault point resistance	0...1000000 ohm	65	23	0	4	0
.FltR.mag	Fault loop resistance	0...1000000 ohm	65	24	0	4	0
.FltX.mag	Fault loop reactance	0...1000000 ohm	65	25	0	4	0
.RatFltALod.mag	Fault to load current ratio	0...60000.00	65	26	0	4	0
.EqDisLod.mag	Estim. equivalent load distance	0.00...1.00	65	27	0	4	0
.PhGndCapac.mag	Estim. PE line capacitive reactance	0...1000000 ohm	65	28	0	4	0
.FltDisQ.stVal	Fault distance quality	0...511	65	29	0	4	0

## 2.4.10 LD0.SECRSYN1 Synchronism and energizing check

*Table 209: LD0.SECRSYN1 Synchronism and energizing check*

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.SECRSYN1							
.EnSt.stVal	Line/Bus energy state	0...4	80	60	0	4	0

**2.4.11****LD0.TPOSYLT1 Tap changer position indication (1)****Table 210:** LD0.TPOSYLT1 Tap changer position indication (1)

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.TPOSYLT1							
.ValWTr.posVal	Tap position	-64...63	25	20	1	4	1

**2.4.12****LD0.VMMXU1 Three-phase voltage measurement (1)****Table 211:** LD0.VMMXU1 Three-phase voltage measurement (1)

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.VAVMMXU1							
.PhV.phsA.cVal.mag	Phs A demand	0...4.00 [ $\times$ Un]	66	191	0	4	0
.PhV.phsB.cVal.mag	Phs B demand	0...4.00 [ $\times$ Un]	66	192	0	4	0
.PhV.phsC.cVal.mag	Phs C demand	0...4.00 [ $\times$ Un]	66	193	0	4	0
.PPV.phsAB.cVal.mag	Phs AB demand	0...4.00 [ $\times$ Un]	66	194	0	4	0
.PPV.phsBC.cVal.mag	Phs BC demand	0...4.00 [ $\times$ Un]	66	195	0	4	0
.PPV.phsCA.cVal.mag	Phs CA demand	0...4.00 [ $\times$ Un]	66	196	0	4	0

**2.4.13****LD0.VMMXU2 Three-phase voltage measurement (2)****Table 212:** LD0.VMMXU2 Three-phase voltage measurement (2)

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.VAVMMXU2							
.PhV.phsA.cVal.mag	Phs A demand	0...4.00 [ $\times$ Un]	66	197	0	4	0
.PhV.phsB.cVal.mag	Phs B demand	0...4.00 [ $\times$ Un]	66	198	0	4	0
.PhV.phsC.cVal.mag	Phs C demand	0...4.00 [ $\times$ Un]	66	199	0	4	0
.PPV.phsAB.cVal.mag	Phs AB demand	0...4.00 [ $\times$ Un]	66	200	0	4	0
.PPV.phsBC.cVal.mag	Phs BC demand	0...4.00 [ $\times$ Un]	66	201	0	4	0
.PPV.phsCA.cVal.mag	Phs CA demand	0...4.00 [ $\times$ Un]	66	202	0	4	0

**2.5****Energy counters**

Energy counters are coded as private ASDU 205 data objects. Energy values are taken directly from the corresponding source IEC 61850 objects, and are therefore dependent on how the source objects are coded.

ASDU 205 objects are intended to be binary counters, which makes their value to roll over at the maximum binary value (all bits 1). Source value roll-over in turn is usually defined as 999999999 decimal from where the value rolls over to 0. This is intended

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to be a directly user-readable energy value. Therefore, the source roll-over value needs to be known to synchronize it with the ASDU 205 value.

In the present IED version the source roll-over values are fixed and cannot be changed using PCM600.

**Table 213:** *Explanations of the energy counter value table columns*

Column name	Description
IEC 61850 name	Source object name
Description	Short description of the signal. See the technical manual for more information.
FUN	Default function type definition for the object. Editable.
INF	Default information number definition for the object. Editable.
Source roll-over	Needed for synchronizing the ASDU 205 counter value roll-over. Editable.

## 2.5.1

### LD0.PEMMXU1 Three-phase power and energy measurement

**Table 214:** *LD0.PEMMXU1 Three-phase power and energy measurement*

IEC 61850 name	Description	FUN	INF	Source roll-over
LD0.PEMMTR1				
.SupWh.actVal	Reverse active energy	133	51	1000000000
.SupVArh.actVal	Reverse reactive energy	133	52	1000000000
.DmdWh.actVal	Forward active energy	133	53	1000000000
.DmdVArh.actVal	Forward reactive energy	133	54	1000000000

## 2.6

### Class 2 measurands

The information here relates to nonstandard Class 2 data frames. It is also always possible to select any standard Meas I or Meas II Class 2 frame for the protocol. User-definable Class 2 data measurands use ASDU type 9. The function type and infomation number for the user frame can be freely configured. The default setting is FUN=10, INF=230. See the communication protocol manual for more information.

[Figure 2](#) shows how the values are located when adding measurands to the user frame with PCM600.

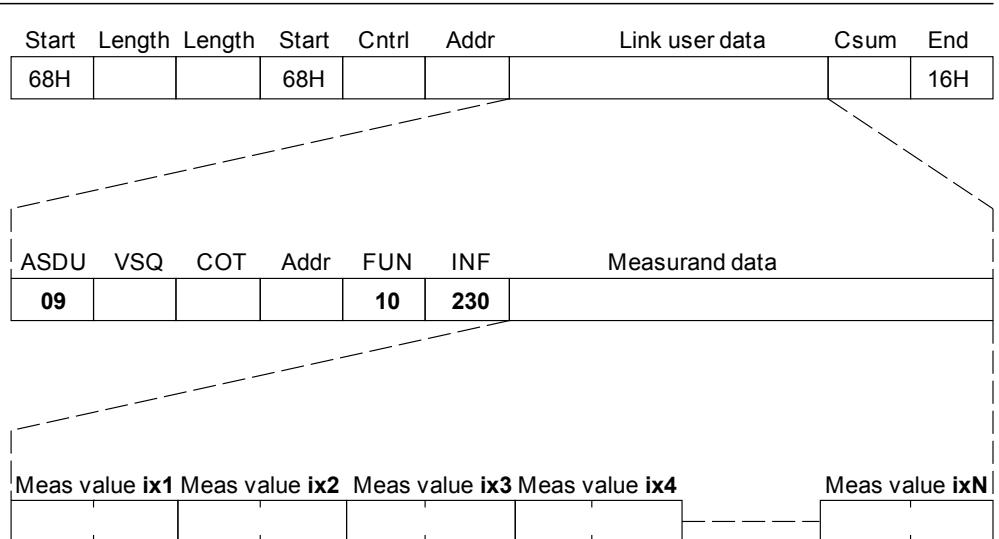


Figure 2: Class 2 frame response for the user-definable private Class 2 frame number 0

Table 215: Explanations of the Class 2 data measurands table columns

Column name	Description
IEC 61850 name	Source object name
Description	Short description of the signal. See the technical manual for more information.
Values	Source value range
Scaled max. value	Limit setting for the IEC 60870-5-103 value as default. Editable.

## 2.6.1 LD0.CMMXU1 Three-phase current measurement (1)

Table 216: LD0.CMMXU1 Three-phase current measurement (1)

IEC 61850 name	Description	Values	Scaled max. value
LD0.CMMXU1			
.A.phsA.instCVal.mag	Phase IL1 magnitude	0.00...50.00 ×In	2.4
.A.phsB.instCVal.mag	Phase IL2 magnitude	0.00...50.00 ×In	2.4
.A.phsC.instCVal.mag	Phase IL3 magnitude	0.00...50.00 ×In	2.4

## 2.6.2 LD0.CMMXU2 Three-phase current measurement (2)

Table 217: LD0.CMMXU2 Three-phase current measurement (2)

IEC 61850 name	Description	Values	Scaled max. value
LD0.CMMXU2			
.A.phsA.instCVal.mag	Phase IL1 magnitude	0.00...50.00 ×In	2.4
.A.phsB.instCVal.mag	Phase IL2 magnitude	0.00...50.00 ×In	2.4
.A.phsC.instCVal.mag	Phase IL3 magnitude	0.00...50.00 ×In	2.4

## 2.6.3 LD0.CSMSQI1 Sequence current measurement (1)

Table 218: LD0.CSMSQI1 Sequence current measurement (1)

IEC 61850 name	Description	Values	Scaled max. value
LD0.CSMSQI1			
.SeqA.c1.instCVal.mag	Pos. seq. magnitude	0.00...50.00 ×In	2.4
.SeqA.c2.instCVal.mag	Neg. seq. magnitude	0.00...50.00 ×In	2.4
.SeqA.c3.instCVal.mag	Zero seq. magnitude	0.00...50.00 ×In	2.4

## 2.6.4 LD0.CSMSQI2 Sequence current measurement (2)

Table 219: LD0.CSMSQI2 Sequence current measurement (2)

IEC 61850 name	Description	Values	Scaled max. value
LD0.CSMSQI2			
.SeqA.c1.instCVal.mag	Pos. seq. magnitude	0.00...50.00 ×In	2.4
.SeqA.c2.instCVal.mag	Neg. seq. magnitude	0.00...50.00 ×In	2.4
.SeqA.c3.instCVal.mag	Zero seq. magnitude	0.00...50.00 ×In	2.4

## 2.6.5 LD0.FMMXU1 Frequency measurement (1)

Table 220: LD0.FMMXU1 Frequency measurement (1)

IEC 61850 name	Description	Values	Scaled max. value
LD0.FMMXU1			
.Hz.instMag	Frequency	35.00...75.00 Hz	100

## 2.6.6 LD0.HAEFPTOC1 Harmonics-based earth-fault protection (1)

*Table 221: LD0.HAEFPTOC1 Harmonics-based earth-fault protection (1)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.HAEFMHAI1			
.HRmsA.res.cVal.mag	Calc. harmonics current	0.0...30000.0 A	250

## 2.6.7 LD0.LNPLDF1 Line differential protection with in-zone power transformer (1)

*Table 222: LD0.LNPLDF1 Line differential protection with in-zone power transformer (1)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.LNLPDIF1			
.DifAClc.phsA.cVal.mag	Diff. current phs A	0.00...80.00 ×Ir	1.2
.DifAClc.phsB.cVal.mag	Diff. current phs B	0.00...80.00 ×Ir	1.2
.DifAClc.phsC.cVal.mag	Diff. current phs C	0.00...80.00 ×Ir	1.2
.RstA.phsA.cVal.mag	Stab. current phs A	0.00...80.00 ×Ir	1.2
.RstA.phsB.cVal.mag	Stab. current phs C	0.00...80.00 ×Ir	1.2
.RstA.phsC.cVal.mag	Stab. current phs C	0.00...80.00 ×Ir	1.2

## 2.6.8 LD0.MPTTR1 Thermal overload protection for motors (1)

*Table 223: LD0.MPTTR1 Thermal overload protection for motors (1)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.MPTTR1			
.TmpRI.mag	Relative temp	0.00...9.99	10

## 2.6.9 LD0.PEMMXU1 Three-phase power and energy measurement (1)

*Table 224: LD0.PEMMXU1 Three-phase power and energy measurement (1)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.PEMMXU1			
.TotW.instMag	Active power P	-999999.9...999999.9 kW	1000
.TotVAr.instMag	Ractive power Q	-999999.9...999999.9 kVAr	1000
.TotVA.instMag	Apparent power S	-999999.9...999999.9 kVA	1000
.TotPF.instMag	Power factor	-1.00...1.00	1

## 2.6.10 LD0.RESCMMXU1 Residual current measurement (1)

*Table 225: LD0.RESCMMXU1 Residual current measurement (1)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.RESCMMXU1			
.A.res.instCVal.mag	Io magnitude	0.00...50.00 ×In	2.4

## 2.6.11 LD0.RESCMMXU2 Residual current measurement (2)

*Table 226: LD0.RESCMMXU2 Residual current measurement (2)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.RESCMMXU2			
.A.res.instCVal.mag	Io magnitude	0.00...50.00 ×In	2.4

## 2.6.12 LD0.RESVMMXU1 Residual voltage measurement (1)

*Table 227: LD0.RESVMMXU1 Residual voltage measurement (1)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.RESVMMXU1			
.PhV.res.instCVal.mag	Uo magnitude	0.00...4.00 ×Un	2.4

## 2.6.13 LD0.RESVMMXU2 Residual voltage measurement (2)

*Table 228: LD0.RESVMMXU2 Residual voltage measurement (2)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.RESVMMXU2			
.PhV.res.instCVal.mag	Uo magnitude	0.00...4.00 ×Un	2.4

## 2.6.14 LD0.SCA4GAPC1 Analog value scaling (1)

*Table 229: LD0.SCA4GAPC1 Analog value scaling (1)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.SCA4GAPC1			
.AnValOut1.mag	Value 1 after scaling	-2000000.0...2000000.0	1
.AnValOut2.mag	Value 2 after scaling	-2000000.0...2000000.0	1
.AnValOut3.mag	Value 3 after scaling	-2000000.0...2000000.0	1
.AnValOut4.mag	Value 4 after scaling	-2000000.0...2000000.0	1

**2.6.15****LD0.SCA4GAPC2 Analog value scaling (2)****Table 230:** LD0.SCA4GAPC2 Analog value scaling (2)

IEC 61850 name	Description	Values	Scaled max. value
LD0.SCA4GAPC2			
.AnValOut1.mag	Value 1 after scaling	-2000000.0...2000000.0	1
.AnValOut2.mag	Value 2 after scaling	-2000000.0...2000000.0	1
.AnValOut3.mag	Value 3 after scaling	-2000000.0...2000000.0	1
.AnValOut4.mag	Value 4 after scaling	-2000000.0...2000000.0	1

**2.6.16****LD0.SCA4GAPC3 Analog value scaling (3)****Table 231:** LD0.SCA4GAPC3 Analog value scaling (3)

IEC 61850 name	Description	Values	Scaled max. value
LD0.SCA4GAPC3			
.AnValOut1.mag	Value 1 after scaling	-2000000.0...2000000.0	1
.AnValOut2.mag	Value 2 after scaling	-2000000.0...2000000.0	1
.AnValOut3.mag	Value 3 after scaling	-2000000.0...2000000.0	1
.AnValOut4.mag	Value 4 after scaling	-2000000.0...2000000.0	1

**2.6.17****LD0.SCA4GAPC4 Analog value scaling (4)****Table 232:** LD0.SCA4GAPC4 Analog value scaling (4)

IEC 61850 name	Description	Values	Scaled max. value
LD0.SCA4GAPC4			
.AnValOut1.mag	Value 1 after scaling	-2000000.0...2000000.0	1
.AnValOut2.mag	Value 2 after scaling	-2000000.0...2000000.0	1
.AnValOut3.mag	Value 3 after scaling	-2000000.0...2000000.0	1
.AnValOut4.mag	Value 4 after scaling	-2000000.0...2000000.0	1

**2.6.18****LD0.T1PTTR1 Three-phase thermal protection for feeders, cables and distribution transformers (1)****Table 233:** LD0.T1PTTR1 Three-phase thermal protection for feeders, cables and distribution transformers (1)

IEC 61850 name	Description	Values	Scaled max. value
LD0.T1PTTR1			
.Tmp.mag	Object temp.	-100.0...9999.9°C	1000
.TmpRI.mag	Relative temp.	0.00...99.99	100

---

**2.6.19 LD0.T2PTTR1 Three-phase thermal overload protection, two time constants (1)**

*Table 234: LD0.T2PTTR1 Three-phase thermal overload protection, two time constants (1)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.T1PTTR2			
.Tmp.mag	Object temp	-100.0...9999.9°C	1000
.TmpRI.mag	Relative temp	0.00...99.99	100

**2.6.20 LD0.TR2PTDF1 Stabilized and instantaneous differential protection for two-winding transformers (1)**

*Table 235: LD0.TR2PTDF1 Stabilized and instantaneous differential protection for two-winding transformers (1)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.TR2PTDF1			
.DifAClC.phsA.cVal.mag	Diff. current phs A	0.00...80.00 ×Ir	1.2
.DifAClC.phsB.cVal.mag	Diff. current phs B	0.00...80.00 ×Ir	1.2
.DifAClC.phsC.cVal.mag	Diff. current phs C	0.00...80.00 ×Ir	1.2
.RstA.phsA.cVal.mag	Bias current phs A	0.00...80.00 ×Ir	1.2
.RstA.phsB.cVal.mag	Bias current phs B	0.00...80.00 ×Ir	1.2
.RstA.phsC.cVal.mag	Bias current phs C	0.00...80.00 ×Ir	1.2

**2.6.21 LD0.VMMXU1 Three-phase voltage measurement (1)**

*Table 236: LD0.VMMXU1 Three-phase voltage measurement (1)*

IEC 61850 name	Description	Values	Scaled max. value
LD0.VMMXU1			
.PhV.phsA.cVal.mag	UL1 magnitude	0.00...4.00 ×Un	2.4
.PhV.phsB.cVal.mag	UL2 magnitude	0.00...4.00 ×Un	2.4
.PhV.phsC.cVal.mag	UL3 magnitude	0.00...4.00 ×Un	2.4
.PPV.phsAB.instCVal.mag	U12 magnitude	0.00...4.00 ×Un	2.4
.PPV.phsBC.instCVal.mag	U23 magnitude	0.00...4.00 ×Un	2.4
.PPV.phsCA.instCVal.mag	U31 magnitude	0.00...4.00 ×Un	2.4

**2.6.22****LD0.VMMXU2 Three-phase voltage measurement (2)****Table 237:** LD0.VMMXU2 Three-phase voltage measurement (2)

IEC 61850 name	Description	Values	Scaled max. value
LD0.VMMXU2			
.PhV.phsA.cVal.mag	UL1 magnitude	0.00...4.00 ×Un	2.4
.PhV.phsB.cVal.mag	UL2 magnitude	0.00...4.00 ×Un	2.4
.PhV.phsC.cVal.mag	UL3 magnitude	0.00...4.00 ×Un	2.4
.PPV.phsAB.instCVal.mag	U12 magnitude	0.00...4.00 ×Un	2.4
.PPV.phsBC.instCVal.mag	U23 magnitude	0.00...4.00 ×Un	2.4
.PPV.phsCA.instCVal.mag	U31 magnitude	0.00...4.00 ×Un	2.4

**2.6.23****LD0.VSMSQI1 Sequence voltage measurement (1)****Table 238:** LD0.VSMSQI1 Sequence voltage measurement (1)

IEC 61850 name	Description	Values	Scaled max. value
LD0.VSMSQI1			
.SeqV.c1.instCVal.mag	Pos. seq. magnitude	0.00...4.00 ×Un	2.4
.SeqV.c2.instCVal.mag	Neg. seq. magnitude	0.00...4.00 ×Un	2.4
.SeqV.c3.instCVal.mag	Zero seq. magnitude	0.00...4.00 ×Un	2.4

**2.6.24****LD0.VSMSQI2 Sequence voltage measurement (2)****Table 239:** LD0.VSMSQI2 Sequence voltage measurement (2)

IEC 61850 name	Description	Values	Scaled max. value
LD0.VSMSQI2			
.SeqV.c1.instCVal.mag	Pos. seq. magnitude	0.00...4.00 ×Un	2.4
.SeqV.c2.instCVal.mag	Neg. seq. magnitude	0.00...4.00 ×Un	2.4
.SeqV.c3.instCVal.mag	Zero seq. magnitude	0.00...4.00 ×Un	2.4

**2.6.25****LD0.XARGGIO130 RTD input values****Table 240:** LD0.XARGGIO130 RTD input values

IEC 61850 name	Description	Values	Scaled max. value
LD0.XARGGIO130			
.AnIn1.instMag	RTD input 1	-10000.0...10000.0	10000
.AnIn2.instMag	RTD input 2	-10000.0...10000.0	10000
.AnIn3.instMag	RTD input 3	-10000.0...10000.0	10000

## 2.6.26 LD0.XRGGIO110 RTD input values

*Table 241: LD0.XRGGIO110 RTD input values*

IEC 61850 name	Description	Values	Scaled max. value
LD0.XRGGIO110			
.AnIn1.instMag	RTD input 1	-10000.0...10000.0	10000
.AnIn2.instMag	RTD input 2	-10000.0...10000.0	10000
.AnIn3.instMag	RTD input 3	-10000.0...10000.0	10000
.AnIn4.instMag	RTD input 4	-10000.0...10000.0	10000
.AnIn5.instMag	RTD input 5	-10000.0...10000.0	10000
.AnIn6.instMag	RTD input 6	-10000.0...10000.0	10000
.AnIn7.instMag	RTD input 7	-10000.0...10000.0	10000
.AnIn8.instMag	RTD input 8	-10000.0...10000.0	10000

## 2.6.27 LD0.XRGGIO130 RTD input values

*Table 242: LD0.XRGGIO130 RTD input values*

IEC 61850 name	Description	Values	Scaled max. value
LD0.XRGGIO130			
.AnIn1.instMag	RTD input 1	-10000.0...10000.0	10000
.AnIn2.instMag	RTD input 2	-10000.0...10000.0	10000
.AnIn3.instMag	RTD input 3	-10000.0...10000.0	10000
.AnIn4.instMag	RTD input 4	-10000.0...10000.0	10000
.AnIn5.instMag	RTD input 5	-10000.0...10000.0	10000
.AnIn6.instMag	RTD input 6	-10000.0...10000.0	10000
.AnIn7.instMag	RTD input 7	-10000.0...10000.0	10000
.AnIn8.instMag	RTD input 8	-10000.0...10000.0	10000

---

## Section 3

# Interoperability profile for 615 series IEC 60870-5-103

### 3.1

## Physical layer

#### 3.1.1

### Electrical interface

- EIA RS-485
- Number of loads ..... for one protection equipment

NOTE - EIA RS-485 standard defines unit loads so that 32 of them can be operated on one line. For detailed information refer to clause 3 of EIA RS-485 standard.

#### 3.1.2

### Optical interface

- Glass fibre
- Plastic fibre
- F-SMA type connector
- BFOC/2,5 type connector

#### 3.1.3

### Transmission speed

- 9 600 bit/s
- 19 200 bit/s

### 3.2

## Link layer

There are no choices for the link layer.

---

## 3.3 Application layer

### 3.3.1 Transmission mode for application data

Mode 1 (least significant octet first), as defined in 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

### 3.3.2 COMMON ADDRESS of ASDU

- One COMMON ADDRESS OF ASDU (identical with station address)
- More than one COMMON ADDRESS OF ASDU

### 3.3.3 Selection of standard information numbers in monitor direction

#### 3.3.3.1 System functions in monitor direction

INF	Semantics
<input checked="" type="checkbox"/>	<0> End of general interrogation
<input checked="" type="checkbox"/>	<1> Time synchronization
<input checked="" type="checkbox"/>	<2> Reset FCB
<input checked="" type="checkbox"/>	<3> Reset CU
<input checked="" type="checkbox"/>	<4> Start/restart
<input checked="" type="checkbox"/>	<5> Power on

#### 3.3.3.2 Status indications in monitor direction

INF	Semantics
<input checked="" type="checkbox"/>	<16> Auto-recloser active
<input type="checkbox"/>	<17> Teleprotection active
<input type="checkbox"/>	<18> Protection active
<input type="checkbox"/>	<19> LED reset
<input checked="" type="checkbox"/>	<20> Monitor direction blocked
<input checked="" type="checkbox"/>	<21> Test mode
<input type="checkbox"/>	<22> Local parameter setting
<input checked="" type="checkbox"/>	<23> Characteristic 1
<input checked="" type="checkbox"/>	<24> Characteristic 2
<input checked="" type="checkbox"/>	<25> Characteristic 3
<input checked="" type="checkbox"/>	<26> Characteristic 4

Table continues on next page

- <27> Auxiliary input 1
- <28> Auxiliary input 2
- <29> Auxiliary input 3
- <30> Auxiliary input 4

Note <27>...<30>: Depending on Binary I/O options and application usage there may be additional auxiliary inputs available in the IED. As default, all "raw" binary input data are mapped to private data. It is possible for user to re-map these additional inputs into standard <27>...<30> 'Auxiliary Inputs', if wanted.

### 3.3.3.3

#### Supervision indications in monitor direction

INF	Semantics
<input type="checkbox"/> <32>	Measurand supervision I
<input type="checkbox"/> <33>	Measurand supervision V
<input type="checkbox"/> <35>	Phase sequence supervision
<input checked="" type="checkbox"/> <36>	Trip circuit supervision
<input type="checkbox"/> <37>	I>> back-up operation
<input type="checkbox"/> <38>	VT fuse failure
<input type="checkbox"/> <39>	Teleprotection disturbed
<input type="checkbox"/> <46>	Group warning
<input type="checkbox"/> <47>	Group alarm

Note <32>, <33> and <38>: IED current and voltage measurement supervision signals and alarms are found in private data definitions. Semantics of these signals are more complex in this IED series than what is defined by the IEC 60870-5-103 standard.

### 3.3.3.4

#### Earth fault indications in monitor direction

INF	Semantics
<input type="checkbox"/> <48>	Earth fault L <sub>1</sub>
<input type="checkbox"/> <49>	Earth fault L <sub>2</sub>
<input type="checkbox"/> <50>	Earth fault L <sub>3</sub>
<input type="checkbox"/> <51>	Earth fault forward, for example line
<input type="checkbox"/> <52>	Earth fault reverse, for example busbar

Note: In this IED series there exist different functions (and signals) for non-directional or directional earth fault protection. Function- and stage-dependent start/pickup signals are found in private data locations.

### 3.3.3.5

#### Fault indications in monitor direction

INF	Semantics
<input type="checkbox"/> <64>	Start /pickup L <sub>1</sub>
<input type="checkbox"/> <65>	Start /pickup L <sub>2</sub>
<input type="checkbox"/> <66>	Start /pickup L <sub>3</sub>

Table continues on next page

- 
- <67> Start /pick-up N
  - <68> General trip
  - <69> Trip L<sub>1</sub>
  - <70> Trip L<sub>2</sub>
  - <71> Trip L<sub>3</sub>
  - <72> Trip I>> (back-up operation)
  - <73> Fault location X in ohms
  - <74> Fault forward/line
  - <75> Fault reverse/busbar
  - <76> Teleprotection signal transmitted
  - <77> Teleprotection signal received
  - <78> Zone 1
  - <79> Zone 2
  - <80> Zone 3
  - <81> Zone 4
  - <82> Zone 5
  - <83> Zone 6
  - <84> General start/pick-up
  - <85> Breaker failure
  - <86> Trip measuring system L<sub>1</sub>
  - <87> Trip measuring system L<sub>2</sub>
  - <88> Trip measuring system L<sub>3</sub>
  - <89> Trip measuring system E
  - <90> Trip I>
  - <91> Trip I>>
  - <92> Trip IN>
  - <93> Trip IN>>

Note: In this IED series, function-specific fault signals are as default mapped to private data locations.

### 3.3.3.6

#### Auto-reclosure indications in monitor direction

- | INF                                 | Semantics                     |
|-------------------------------------|-------------------------------|
| <input checked="" type="checkbox"/> | <128> CB 'on' by AR           |
| <input type="checkbox"/>            | <129> CB 'on' by long-time AR |
| <input checked="" type="checkbox"/> | <130> AR blocked              |

Note <129>: Terms 'short-' or 'long-time' AR are not directly usable in this IED series. The AR functionality in the IED performs AR shots (1...5) that are user configurable. See private AR data definitions. Depending on user AR configuration it is possible to re-map some private data into standard data, if wanted.

**3.3.3.7****Measurands in monitor direction**

<b>INF</b>	<b>Semantics</b>
<input checked="" type="checkbox"/>	<144> Measurand I
<input checked="" type="checkbox"/>	<145> Measurands I, V
<input checked="" type="checkbox"/>	<146> Measurands I, V, P, Q
<input checked="" type="checkbox"/>	<147> Measurands $I_N$ , $V_{EN}$
<input checked="" type="checkbox"/>	<148> Measurands $I_{L1,2,3}$ , $V_{L1,2,3}$ , P, Q, f

**3.3.3.8****Generic functions in monitor direction**

<b>INF</b>	<b>Semantics</b>
<input type="checkbox"/>	<240> Read headings of all defined groups
<input type="checkbox"/>	<241> Read values or attributes of all entries of one group
<input type="checkbox"/>	<243> Read directory of a single entry
<input type="checkbox"/>	<244> Read value or attribute of a single entry
<input type="checkbox"/>	<245> End of general interrogation of generic data
<input type="checkbox"/>	<249> Write entry with confirmation
<input type="checkbox"/>	<250> Write entry with execution
<input type="checkbox"/>	<251> Write entry aborted

**3.3.4****Selection of standard information numbers in control direction****3.3.4.1****System functions in control direction**

<b>INF</b>	<b>Semantics</b>
<input checked="" type="checkbox"/>	Initiation of general interrogation
<input checked="" type="checkbox"/>	Time synchronization

**3.3.4.2****Generic functions in control direction**

<b>INF</b>	<b>Semantics</b>
<input type="checkbox"/>	<240> Read headings of all defined groups
<input type="checkbox"/>	<241> Read values or attributes of all entries of one group
<input type="checkbox"/>	<243> Read directory of a single entry
<input type="checkbox"/>	<244> Read value or attribute of a single entry
<input type="checkbox"/>	<245> End of general interrogation of generic data
<input type="checkbox"/>	<249> Write entry with confirmation
<input type="checkbox"/>	<250> Write entry with execution
<input type="checkbox"/>	<251> Write entry aborted

### 3.3.5

### Basic application functions

- Test mode
- Blocking of monitor direction
- Disturbance data
- Generic services
- Private data

### 3.3.6

### Miscellaneous

Measurands are transmitted as Class2 data using ASDU 3 or ASDU 9. The default MVAL scalings in this IED series is 2.4. The MVAL for each separate measurand can be freely reprogrammed.

Measurand	Max. MVAL = rated value times	
	1.2 or	2.4
Current L <sub>1</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Current L <sub>2</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Current L <sub>3</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Voltage L <sub>1-E</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Voltage L <sub>2-E</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Voltage L <sub>3-E</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Active power P	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Reactive power Q	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Frequency f	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Voltage L <sub>1</sub> - L <sub>2</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

The IED contains additional private Class2 frames, including private measurands. User can freely select between standard or private Class2 frames.



If some required application data is not included in the interoperability profile chapter, it does not necessarily mean that it is missing from the IED. For example, the data is available in the IED, but it does not create timetagged change events which are required for Class1 data, or the data in the IED is not defined like in the IEC 60870-5-103 standard. Map this missing data into generic application object points using Application Configuration tool. The protocol identification (function type, information number) for the generic points can thereafter be freely modified by PCM600. Refer to the point list for the outlook and default definitions of the generic application object points.

## Section 4      Glossary

<b>AR</b>	Autoreclosing
<b>ASDU</b>	Application-layer service data unit
<b>DPI</b>	Double-point information
<b>EIA RS-485</b>	Electrical communication interface standard
<b>EMC</b>	Electromagnetic compatibility
<b>Ethernet</b>	A standard for connecting a family of frame-based computer networking technologies into a LAN
<b>HSO</b>	High-speed output
<b>IEC</b>	International Electrotechnical Commission
<b>IEC 60870-5-103</b>	1. Communication standard for protective equipment 2. A serial master/slave protocol for point-to-point communication
<b>IEC 61850</b>	International standard for substation communication and modeling
<b>IED</b>	Intelligent electronic device
<b>LED</b>	Light-emitting diode
<b>LHMI</b>	Local human-machine interface
<b>PCM600</b>	Protection and Control IED Manager
<b>PE</b>	1. Polyethylene 2. Protective earth





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