

RELION® 620 SERIES

# 620 series

## IEC 60870-5-103 Point List Manual







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## Conformity

This product complies with the directive of the Council of the European Communities on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2014/30/EU) and concerning electrical equipment for use within specified voltage limits (Low-voltage directive 2014/35/EU). This conformity is the result of tests conducted by ABB in accordance with the product standard EN 60255-26 for the EMC directive, and with the product standards EN 60255-1 and EN 60255-27 for the low voltage directive. The product is designed in accordance with the international standards of the IEC 60255 series.

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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

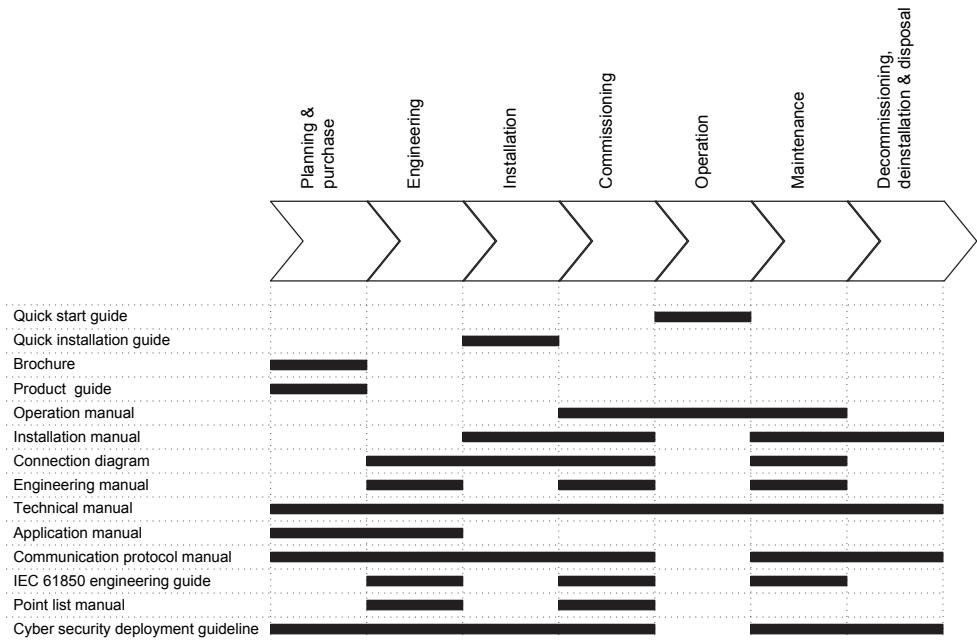


Figure 1: The intended use of documents during the product life cycle



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

### 1.3.2 Document revision history

Document revision/date	Product version	History
A/2015-12-11	2.0 FP1	First release
B/2019-06-19	2.0 FP1	Content updated



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

### 1.3.3 Related documentation

Name of the document	Document ID
IEC 60870-5-103 Communication Protocol Manual	1MRS757647

## 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	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)
	DPHHPDOC2	3I>> -> (2)	67-2 (2)
Three-phase voltage-dependent overcurrent protection	PHPVOC1	3I(U)> (1)	51V (1)
	PHPVOC2	3I(U)> (2)	51V (2)
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)
	DEFLPDEF3	Io> -> (3)	67N-1 (3)
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)
Multifrequency admittance-based earth-fault protection	MFADPSDE1	Io> -> Y (1)	67YN (1)
Transient/intermittent earth-fault protection	INTRPTEF1	Io> -> IEF (1)	67NIEF (1)
Harmonics-based earth-fault protection	HAEFPTOC1	Io>HA (1)	51NHA (1)
Table continues on next page			

Function	IEC 61850	IEC 60617	ANSI
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)
	PHPTUV4	3U< (4)	27 (4)
Single-phase undervoltage protection, secondary side	PHAPTV1	U_A< (1)	27_A (1)
Three-phase overvoltage protection	PHPTOV1	3U> (1)	59 (1)
	PHPTOV2	3U> (2)	59 (2)
	PHPTOV3	3U> (3)	59 (3)
Single-phase overvoltage protection, secondary side	PHAPTOV1	U_A> (1)	59_A (1)
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	FRPFRQ1	f>/f<,df/dt (1)	81 (1)
	FRPFRQ2	f>/f<,df/dt (2)	81 (2)
	FRPFRQ3	f>/f<,df/dt (3)	81 (3)
	FRPFRQ4	f>/f<,df/dt (4)	81 (4)
	FRPFRQ5	f>/f<,df/dt (5)	81 (5)
	FRPFRQ6	f>/f<,df/dt (6)	81 (6)
Overexcitation protection	OEPVPH1	U/f> (1)	24 (1)
	OEPVPH2	U/f> (2)	24 (2)
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 phase (undercurrent)	PHPTUC1	3I< (1)	37 (1)
	PHPTUC2	3I< (2)	37 (2)
Loss of load supervision	LOFLPTUC1	3I< (1)	37 (1)
	LOFLPTUC2	3I< (2)	37 (2)
Motor load jam protection	JAMPTOC1	Ist> (1)	51LR (1)
Table continues on next page			

Function	IEC 61850	IEC 60617	ANSI
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)
Stabilized and instantaneous differential protection for machines	MPDIF1	3dI>M/G (1)	87M/G (1)
High-impedance/flux-balance based differential protection for motors	MHZPDIF1	3dIH>M (1)	87MH (1)
Stabilized and instantaneous differential protection for two-winding transformers	TR2PTDF1	3dI>T (1)	87T (1)
Numerical stabilized low-impedance restricted earth-fault protection	LREFPNDF1	dloLo> (1)	87NL (1)
	LREFPNDF2	dloLo> (2)	87NL (2)
High-impedance based restricted earth-fault protection	HREFPDIF1	dloHi> (1)	87NH (1)
	HREFPDIF2	dloHi> (2)	87NH (2)
Circuit breaker failure protection	CCBRBRF1	3I>/Io>BF (1)	51BF/51NBF (1)
	CCBRBRF2	3I>/Io>BF (2)	51BF/51NBF (2)
	CCBRBRF3	3I>/Io>BF (3)	51BF/51NBF (3)
Three-phase inrush detector	INRPHAR1	3I2f> (1)	68 (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)
Arc protection	ARCSARC1	ARC (1)	50L/50NL (1)
	ARCSARC2	ARC (2)	50L/50NL (2)
	ARCSARC3	ARC (3)	50L/50NL (3)
High-impedance fault detection	PHIZ1	HIF (1)	HIZ (1)
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)
	LSHDPFRQ6	UFLS/R (6)	81LSH (6)
Table continues on next page			

Function	IEC 61850	IEC 60617	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)
Automatic switch-onto-fault logic (SOF)	CVPSOF1	CVPSOF (1)	SOFT/21/50 (1)
Voltage vector shift protection	VVSPPAM1	VS (1)	78V (1)
Directional reactive power undervoltage protection	DQPTUV1	Q> ->,3U< (1)	32Q,27 (1)
	DQPTUV2	Q> ->,3U< (2)	32Q,27 (2)
Underpower protection	DUPPDPR1	P< (1)	32U (1)
	DUPPDPR2	P< (2)	32U (2)
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)
	UEXPDIS2	X< (2)	40 (2)
Low-voltage ride-through protection	LVRTPTUV1	U<RT (1)	27RT (1)
	LVRTPTUV2	U<RT (2)	27RT (2)
	LVRTPTUV3	U<RT (3)	27RT (3)
Rotor earth-fault protection	MREFPTOC1	Io>R (1)	64R (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)
Table continues on next page			

Function	IEC 61850	IEC 60617	ANSI
Circuit breaker uncorresponding position start-up	UPCALH1	CBUPS (1)	CBUPS (1)
	UPCALH2	CBUPS (2)	CBUPS (2)
	UPCALH3	CBUPS (3)	CBUPS (3)
Three-independent-phase non-directional overcurrent protection, low stage	PH3LPTOC1	3I_3> (1)	51P-1_3 (1)
	PH3LPTOC2	3I_3> (2)	51P-1_3 (2)
Three-independent-phase non-directional overcurrent protection, high stage	PH3HPTOC1	3I_3>> (1)	51P-2_3 (1)
	PH3HPTOC2	3I_3>> (2)	51P-2_3 (2)
Three-independent-phase non-directional overcurrent protection, instantaneous stage	PH3IPTOC1	3I_3>>> (1)	50P/51P_3 (1)
Directional three-independent-phase directional overcurrent protection, low stage	DPH3LPDOC1	3I_3> -> (1)	67-1_3 (1)
	DPH3LPDOC2	3I_3> -> (2)	67-1_3 (2)
Directional three-independent-phase directional overcurrent protection, high stage	DPH3HPDOC1	3I_3>> -> (1)	67-2_3 (1)
	DPH3HPDOC2	3I_3>> -> (2)	67-2_3 (2)
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)
Shunt capacitor bank switching resonance protection, current based	SRCPOTOC1	TD> (1)	55TD (1)
Control			
Circuit-breaker control	CBXCBR1	I <-> O CB (1)	I <-> O CB (1)
	CBXCBR2	I <-> O CB (2)	I <-> O CB (2)
	CBXCBR3	I <-> O CB (3)	I <-> O CB (3)
Disconnector control	DCXSWI1	I <-> O DCC (1)	I <-> O DCC (1)
	DCXSWI2	I <-> O DCC (2)	I <-> O DCC (2)
	DCXSWI3	I <-> O DCC (3)	I <-> O DCC (3)
	DCXSWI4	I <-> O DCC (4)	I <-> O DCC (4)
Earthing switch control	ESXSWI1	I <-> O ESC (1)	I <-> O ESC (1)
	ESXSWI2	I <-> O ESC (2)	I <-> O ESC (2)
	ESXSWI3	I <-> O ESC (3)	I <-> O ESC (3)
Disconnector 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)
	DCSXSWI4	I <-> O DC (4)	I <-> O DC (4)
Earthing switch indication	ESSXSWI1	I <-> O ES (1)	I <-> O ES (1)
	ESSXSWI2	I <-> O ES (2)	I <-> O ES (2)
	ESSXSWI3	I <-> O ES (3)	I <-> O ES (3)
Emergency start-up	ESMGAPC1	ESTART (1)	ESTART (1)
Table continues on next page			

Function	IEC 61850	IEC 60617	ANSI
Autoreclosing	DARREC1	O -> I (1)	79 (1)
	DARREC2	O -> I (2)	79 (2)
Synchronism and energizing check	SECRSYN1	SYNC (1)	25 (1)
Tap changer position indication	TPOSYLTC1	TPOSM (1)	84M (1)
Tap changer control with voltage regulator	OLATCC1	COLTC (1)	90V (1)
<b>Condition monitoring and supervision</b>			
Circuit-breaker condition monitoring	SSCBR1	CBCM (1)	CBCM (1)
	SSCBR2	CBCM (2)	CBCM (2)
	SSCBR3	CBCM (3)	CBCM (3)
Trip circuit supervision	TCSSCBR1	TCS (1)	TCM (1)
	TCSSCBR2	TCS (2)	TCM (2)
Current circuit supervision	CCSPVC1	MCS 3I (1)	MCS 3I (1)
	CCSPVC2	MCS 3I (2)	MCS 3I (2)
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)
Advanced current circuit supervision for transformers	CTSRCTF1	MCS 3I,I2 (1)	MCS 3I,I2 (1)
Fuse failure supervision	SEQSPVC1	FUSEF (1)	60 (1)
Runtime counter for machines and devices	MDSOPT1	OPTS (1)	OPTM (1)
	MDSOPT2	OPTS (2)	OPTM (2)
<b>Measurement</b>			
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)
	CSMSQI2	I1, I2, I0 (B) (1)	I1, I2, I0 (B) (1)
Residual current measurement	RESCMMXU1	Io (1)	In (1)
	RESCMMXU2	Io (2)	In (2)
Three-phase voltage measurement	VMMXU1	3U (1)	3V (1)
Single-phase voltage measurement	VAMMXU2	U_A (2)	V_A (2)
	VAMMXU3	U_A (3)	V_A (3)
Residual voltage measurement	RESVMMXU1	Uo (1)	Vn (1)
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)
Load profile record	LDPRLRC1	LOADPROF (1)	LOADPROF (1)
Table continues on next page			

Function	IEC 61850	IEC 60617	ANSI
Frequency measurement	FMMXU1	f (1)	f (1)
<b>Fault location</b>			
Fault locator	SCEFRFLO1	FLOC (1)	21FL (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>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)
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC1	TPS (1)	TPS (1)
	TPSGAPC2	TPS (2)	TPS (2)
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC1	TPM (1)	TPM (1)
	TPMGAPC2	TPM (2)	TPM (2)
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)
	MVGAPC3	MV (3)	MV (3)
	MVGAPC4	MV (4)	MV (4)
Integer value move	MVI4GAPC1	MVI4 (1)	MVI4 (1)
	MVI4GAPC2	MVI4 (2)	MVI4 (2)
	MVI4GAPC3	MVI4 (3)	MVI4 (3)
	MVI4GAPC4	MVI4 (4)	MVI4 (4)
Table continues on next page			

Function	IEC 61850	IEC 60617	ANSI
Analog value scaling	SCA4GAPC1	SCA4 (1)	SCA4 (1)
	SCA4GAPC2	SCA4 (2)	SCA4 (2)
	SCA4GAPC3	SCA4 (3)	SCA4 (3)
	SCA4GAPC4	SCA4 (4)	SCA4 (4)
Generic control point (16 pcs)	SPCGAPC1	SPC (1)	SPC (1)
	SPCGAPC2	SPC (2)	SPC (2)
	SPCGAPC3	SPC (3)	SPC (3)
	SPCRGAPC1	SPCR (1)	SPCR (1)
Remote generic control points			
Local generic control points	SPCLGAPC1	SPCL (1)	SPCL (1)
Generic up-down counters	UDFCNT1	UDCNT (1)	UDCNT (1)
	UDFCNT2	UDCNT (2)	UDCNT (2)
	UDFCNT3	UDCNT (3)	UDCNT (3)
	UDFCNT4	UDCNT (4)	UDCNT (4)
	UDFCNT5	UDCNT (5)	UDCNT (5)
	UDFCNT6	UDCNT (6)	UDCNT (6)
	UDFCNT7	UDCNT (7)	UDCNT (7)
	UDFCNT8	UDCNT (8)	UDCNT (8)
	UDFCNT9	UDCNT (9)	UDCNT (9)
	UDFCNT10	UDCNT (10)	UDCNT (10)
	UDFCNT11	UDCNT (11)	UDCNT (11)
	UDFCNT12	UDCNT (12)	UDCNT (12)
Programmable buttons (16 buttons)	FKEYGGIO1	FKEY (1)	FKEY (1)
<b>Logging functions</b>			
Disturbance recorder	RDRE1	DR (1)	DFR (1)
Fault recorder	FLTRFRC1	FAULTREC (1)	FAULTREC (1)
Sequence event recorder	SER1	SER (1)	SER (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 REF620

*Table 2: Supported functions*

Function	IEC 61850	A (CTs/VTs)	B (Sensors)
	FE201	FE201	FE202
<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
Three-phase directional overcurrent protection, low stage	DPHLPDOC	2	2
Three-phase directional overcurrent protection, high stage	DPHHPDOC	2	2
Three-phase voltage-dependent overcurrent protection	PHPVOC	2	2
Non-directional earth-fault protection, low stage	EFLPTOC	2	2
Non-directional earth-fault protection, high stage	EFHPTOC	1	1
Non-directional earth-fault protection, instantaneous stage	EFIPTOC1	1	1
Directional earth-fault protection, low stage	DEFLPDEF	3	3 <sup>1)</sup>
Directional earth-fault protection, high stage	DEFHPDEF	1	1 <sup>1)</sup>
Admittance-based earth-fault protection	EFPADM	3	3 <sup>1)</sup>
Wattmetric-based earth-fault protection	WPWDE	3	3 <sup>1)</sup>
Table continues on next page			

## Section 2

### IEC 60870-5-103 data mappings

1MRS758292 B

Function	IEC 61850	A (CTs/VTs)	B (Sensors)
		<b>FE201</b>	<b>FE202</b>
Multifrequency admittance-based earth-fault protection	MFADPSDE	1	1 <sup>1)</sup>
Transient/intermittent earth-fault protection	INTRPTEF	1	1 <sup>1)</sup>
Harmonics-based earth-fault protection	HAEFPTOC	1	1
Negative-sequence overcurrent protection	NSPTOC	2	2
Phase discontinuity protection	PDNSPTOC	1	1
Residual overvoltage protection	ROVPTOV	3	3 <sup>1)</sup>
Three-phase undervoltage protection	PHPTUV	4	4
Single-phase undervoltage protection, secondary side	PHAPTVU	1	
Three-phase overvoltage protection	PHPTOV	3	3
Single-phase overvoltage protection, secondary side	PHAPTOV	1	
Positive-sequence undervoltage protection	PSPTUV	2	2
Negative-sequence overvoltage protection	NSPTOV	2	2
Frequency protection	FRPFRQ	6	6
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR	1	1
Loss of phase (undercurrent)	PHPTUC	1	1
Circuit breaker failure protection	CCBRBRF	3	3
Three-phase inrush detector	INRPHAR	1	1
Master trip	TRPPTRC	4	4
Arc protection	ARCSARC	(3)	(3)
High-impedance fault detection	PHIZ	1	1
Load-shedding and restoration	LSHDPFRQ	6	6
Multipurpose protection	MAPGAPC	18	18
Automatic switch-onto-fault logic (SOF)	CVPSOF	1	1
Voltage vector shift protection	VVSPPAM	(1)	(1)
Directional reactive power undervoltage protection	DQPTUV	(2)	(2)
Underpower protection	DUPPDPR	(2)	(2)
Reverse power/directional overpower protection	DOPPDPR	(2)	(2)
Low-voltage ride-through protection	LVRTPTUV	(3)	(3)
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 uncorresponding position start-up	UPCALH	3	3
Three-independent-phase non-directional overcurrent protection, low stage	PH3LPTOC	2	2
Table continues on next page			

Function	IEC 61850	A (CTs/VTs)	B (Sensors)
		<b>FE201</b>	<b>FE202</b>
Three-independent-phase non-directional overcurrent protection, high stage	PH3HPTOC	2	2
Three-independent-phase non-directional overcurrent protection, instantaneous stage	PH3IPTOC	1	1
Directional three-independent-phase directional overcurrent protection, low stage	DPH3LPDOC	2	2
Directional three-independent-phase directional overcurrent protection, high stage	DPH3HPDOC	2	2
Three-phase overload protection for shunt capacitor banks	COLPTOC	(1)	
Current unbalance protection for shunt capacitor banks	CUBPTOC	(1)	
Shunt capacitor bank switching resonance protection, current based	SRCPTOC	(1)	
<b>Control</b>			
Circuit-breaker control	CBXCBR	3	3
Disconnecter control	DCXSWI	4	4
Earthing switch control	ESXSWI	3	3
Disconnecter position indication	DCSXSWI	4	4
Earthing switch indication	ESSXSWI	3	3
Autoreclosing	DARREC	2	2
Synchronism and energizing check	SECRSYN	1	(1) <sup>2</sup>
<b>Condition monitoring and supervision</b>			
Circuit-breaker condition monitoring	SSCBR	3	3
Trip circuit supervision	TCSSCBR	2	2
Current circuit supervision	CCSPVC	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
Runtime counter for machines and devices	MDSOPT	2	2
<b>Measurement</b>			
Three-phase current measurement	CMMXU	1	1
Sequence current measurement	CSMSQI	1	1
Residual current measurement	RESCMMXU	1	1
Three-phase voltage measurement	VMMXU	1	1
Single-phase voltage measurement	VAMMXU	1	(1) <sup>2</sup>
Residual voltage measurement	RESVMMXU	1	
Sequence voltage measurement	VSMSQI	1	1
Table continues on next page			

## Section 2

### IEC 60870-5-103 data mappings

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Function	IEC 61850	A (CTs/VTs)	B (Sensors)
		<b>FE201</b>	<b>FE202</b>
Three-phase power and energy measurement	PEMMXU	1	1
Load profile record	LDPRLRC	1	1
Frequency measurement	FMMXU	1	1
<b>Fault location</b>			
Fault locator	SCEFRFLO	(1)	(1)
<b>Power quality</b>			
Current total demand distortion	CMHAI	1	1
Voltage total harmonic distortion	VMHAI	1	1
Voltage variation	PHQVVR	1	1
Voltage unbalance	VSQVUB	1	1
<b>Other</b>			
Minimum pulse timer (2 pcs)	TPGAPC	4	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	2	2
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	2	2
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	4	4
Integer value move	MVI4GAPC	4	4
Analog value scaling	SCA4GAPC	4	4
Generic control point (16 pcs)	SPCGAPC	3	3
Remote generic control points	SPCRGAPC	1	1
Local generic control points	SPCLGAPC	1	1
Generic up-down counters	UDFCNT	12	12
Programmable buttons (16 buttons)	FKEYGGIO	1	1
<b>Logging functions</b>			
Disturbance recorder	RDRE	1	1
Fault recorder	FLTRFRC	1	1
Sequence event recorder	SER	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)  $U_o$  is calculated from the measured phase voltages
- 2) Available only with IEC 61850-9-2 LE

## 2.2.2

## Supported functions in REM620

*Table 3: Supported functions*

Function	IEC 61850	A (CTs/VTs)	B (Sensors)
		ME201	ME202
<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
Three-phase directional overcurrent protection, low stage	DPHLPDOC	1	1
Three-phase directional overcurrent protection, high stage	DPHHPDOC	2	2
Three-phase voltage-dependent overcurrent protection	PHPVOC	2	2
Non-directional earth-fault protection, low stage	EFLPTOC	1 <sup>1)2)</sup>	1 <sup>2)</sup>
Non-directional earth-fault protection, high stage	EFHPTOC	1 <sup>1)2)</sup>	1 <sup>2)</sup>
Non-directional earth-fault protection, instantaneous stage	EFIPTOC1	1 <sup>1)2)</sup>	1 <sup>2)</sup>
Directional earth-fault protection, low stage	DEFLPDEF	1 <sup>1)2)</sup>	1 <sup>2)3)</sup>
Directional earth-fault protection, high stage	DEFHPDEF	1 <sup>1)2)</sup>	1 <sup>2)3)</sup>
Residual overvoltage protection	ROVPTOV	3	3 <sup>3)</sup>
Three-phase undervoltage protection	PHPTUV	4	4
Single-phase undervoltage protection, secondary side	PHAPTV	1	
Three-phase overvoltage protection	PHPTOV	3	3
Single-phase overvoltage protection, secondary side	PHAPTOV	1	
Positive-sequence undervoltage protection	PSPTUV	2	2
Negative-sequence overvoltage protection	NSPTOV	2	2
Frequency protection	FRPFRQ	6	6
Negative-sequence overcurrent protection for machines	MNSPTOC	2	2
Loss of load supervision	LOFLPTUC	2	2
Motor load jam protection	JAMPTOC	1	1
Motor start-up supervision	STTPMSU	1	1
Phase reversal protection	PREVPTOC	1	1
Thermal overload protection for motors	MPTTR	1	1
Stabilized and instantaneous differential protection for machines	MPDIF	1	
High-impedance/flux-balance based differential protection for motors	MHZPDIF	1	
Table continues on next page			

Function	IEC 61850	A (CTs/VTs)	B (Sensors)
		<b>ME201</b>	<b>ME202</b>
High-impedance based restricted earth-fault protection	HREFPDIF	1	
Circuit breaker failure protection	CCBRBRF	3	3
Master trip	TRPPTRC	4	4
Arc protection	ARCSARC	(3) <sup>4)</sup>	(3) <sup>4)</sup>
Multipurpose protection	MAPGAPC	18	18
Automatic switch-onto-fault logic (SOF)	CVPSOF	1	1
Directional reactive power undervoltage protection	DQPTUV	(2)	(2)
Underpower protection	DUPPDPR	(2)	(2)
Reverse power/directional overpower protection	DOPPDPR	(3)	(3)
Three-phase underexcitation protection	UEXPDIS	(2)	(2)
Low-voltage ride-through protection	LVRTPTUV	(3)	(3)
Rotor earth-fault protection	MREFPTOC	1	1
<b>Control</b>			
Circuit-breaker control	CBXCBR	3	3
Disconnecter control	DCXSWI	4	4
Earthing switch control	ESXSWI	3	3
Disconnecter position indication	DCSXSWI	4	4
Earthing switch indication	ESSXSWI	3	3
Emergency start-up	ESMGAPC	1	1
Synchronism and energizing check	SECRSYN	1	(1) <sup>5)</sup>
<b>Condition monitoring and supervision</b>			
Circuit-breaker condition monitoring	SSCBR	3	3
Trip circuit supervision	TCSSCBR	2	2
Current circuit supervision	CCSPVC	1	1
Fuse failure supervision	SEQSPVC	1	1
Runtime counter for machines and devices	MDSOPT	2	2
<b>Measurement</b>			
Three-phase current measurement	CMMXU	2	1
Sequence current measurement	CSMSQI	2	1
Residual current measurement	RESCMMXU	1	1
Three-phase voltage measurement	VMMXU	1	1
Single-phase voltage measurement	VAMMXU	1	(1) <sup>5)</sup>
Residual voltage measurement	RESVMMXU	1	
Sequence voltage measurement	VSMSQI	1	1
Three-phase power and energy measurement	PEMMXU	1	1
Load profile record	LDPRLRC	1	1
Frequency measurement	FMMXU	1	1
Table continues on next page			

Function	IEC 61850	A (CTs/VTs)	B (Sensors)
		ME201	ME202
<b>Power quality</b>			
Current total demand distortion	CMHAI	1	1
Voltage total harmonic distortion	VMHAI	1	1
Voltage variation	PHQVVR	1	1
Voltage unbalance	VSQVUB	1	1
<b>Other</b>			
Minimum pulse timer (2 pcs)	TPGAPC	4	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	2	2
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	2	2
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	4	4
Integer value move	MVI4GAPC	4	4
Analog value scaling	SCA4GAPC	4	4
Generic control point (16 pcs)	SPCGAPC	3	3
Remote generic control points	SPCRGAPC	1	1
Local generic control points	SPCLGAPC	1	1
Generic up-down counters	UDFCNT	12	12
Programmable buttons (16 buttons)	FKEYGGIO	1	1
<b>Logging functions</b>			
Disturbance recorder	RDRE	1	1
Fault recorder	FLTRFRC	1	1
Sequence event recorder	SER	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) Function uses calculated value when the high-impedance based restricted earth-fault protection is used
- 2) Function uses calculated value when the rotor earth-fault protection is used
- 3) Uo is calculated from the measured phase voltages
- 4) Io is calculated from the measured phase currents
- 5) Available only with IEC 61850-9-2 LE

## 2.2.3

## Supported functions in RET620

*Table 4: Supported functions*

Function	IEC 61850	A (CTs/VTs)
		TE201
<b>Protection</b>		
Three-phase non-directional overcurrent protection, low stage	PHLPTOC1	1 HV
	PHLPTOC2	1 LV
Three-phase non-directional overcurrent protection, high stage	PHHPTOC1	1 HV
	PHHPTOC2	1 LV
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC1	1 HV
	PHIPTOC2	1 LV
Three-phase directional overcurrent protection, low stage	DPHLPDOC	1 HV
Three-phase directional overcurrent protection, high stage	DPHHPDOC	1 HV
Non-directional earth-fault protection, low stage	EFLPTOC1	1 HV1)
	EFLPTOC2	1 LV1)
Non-directional earth-fault protection, high stage	EFHPTOC1	1 HV1)
	EFHPTOC2	1 LV1)
Directional earth-fault protection, low stage	DEFLPDEF	2 HV1)
Directional earth-fault protection, high stage	DEFHPDEF	1 HV1)
Negative-sequence overcurrent protection	NSPTOC1	1 HV
	NSPTOC2	1 LV
Residual overvoltage protection	ROVPTOV	3 HV
Three-phase undervoltage protection	PHPTUV	4 HV
Three-phase overvoltage protection	PHPTOV	3 HV
Positive-sequence undervoltage protection	PSPTUV	2 HV
Negative-sequence overvoltage protection	NSPTOV	2 HV
Frequency protection	FRPFRQ	3 HV
Overexcitation protection	OEPVPH	2 HV
Three-phase thermal overload protection, two time constants	T2PTTR	1 HV
Loss of phase (undercurrent)	PHPTUC1	1 HV
	PHPTUC2	1 LV
Stabilized and instantaneous differential protection for two-winding transformers	TR2PTDF	1
Numerical stabilized low-impedance restricted earth-fault protection	LREFPNDF1	1 HV
	LREFPNDF2	1 LV
High-impedance based restricted earth-fault protection	HREFPDIF1	1 HV
	HREFPDIF2	1 LV
Table continues on next page		

Function	IEC 61850	A (CTs/VTs) TE201
Circuit breaker failure protection	CCBRBRF1	1 HV
	CCBRBRF2	1 LV
	CCBRBRF3	1 HV
Three-phase inrush detector	INRPHAR	1 HV
Master trip	TRPPTRC	4
Arc protection	ARCSARC	(3) <sup>2)</sup>
Load-shedding and restoration	LSHDPFRQ	6 HV
Multipurpose protection	MAPGAPC	18
Automatic switch-onto-fault logic (SOF)	CVPSOF	1 HV
Underpower protection	DUPPDPR	2 HV
Reverse power/directional overpower protection	DOPPDPR	3 HV
<b>Control</b>		
Circuit-breaker control	CBXCBR1	1 HV
	CBXCBR2	1 LV
	CBXCBR3	1 HV
Disconnecter control	DCXSWI1	1 HV
	DCXSWI2	1 HV
	DCXSWI3	1 LV
	DCXSWI4	1 LV
Earthing switch control	ESXSWI1	1 HV
	ESXSWI2	1 LV
	ESXSWI3	1 HV
Disconnecter position indication	DCSXSWI1	1 HV
	DCSXSWI2	1 HV
	DCSXSWI3	1 LV
	DCSXSWI4	1 LV
Earthing switch indication	ESSXSWI1	1 HV
	ESSXSWI2	1 LV
	ESSXSWI3	1 HV
Synchronism and energizing check	SECRSYN	1 HV
Tap changer position indication	TPOSYLTC	1
Tap changer control with voltage regulator	OLATCC	(1) LV
<b>Condition monitoring and supervision</b>		
Circuit-breaker condition monitoring	SSCBR1	1 HV
	SSCBR2	1 LV
	SSCBR3	1 HV
Table continues on next page		

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

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Function	IEC 61850	A (CTs/VTs)
		<b>TE201</b>
Trip circuit supervision	TCSSCBR1	1 HV
	TCSSCBR2	1 LV
Current circuit supervision	CCSPVC1	1 HV
	CCSPVC2	1 LV
Advanced current circuit supervision for transformers	CTSRCTF	1
Fuse failure supervision	SEQSPVC	1 HV
Runtime counter for machines and devices	MDSOPT	2
<b>Measurement</b>		
Three-phase current measurement	CMMXU1	1 HV
	CMMXU2	1 LV
Sequence current measurement	CSMSQI1	1 HV
	CSMSQI2	1 LV
Residual current measurement	RESCMMXU1	1 HV
	RESCMMXU2	1 LV
Three-phase voltage measurement	VMMXU	1 HV
Single-phase voltage measurement	VAMMMXU2	1 LV
	VAMMMXU3	1 HV
Residual voltage measurement	RESVMMXU	1 HV
Sequence voltage measurement	VSMSQI	1 HV
Three-phase power and energy measurement	PEMMXU	1 HV
Load profile record	LDPRLRC	1 HV
Frequency measurement	FMMXU	1 HV
<b>Power quality</b>		
Current total demand distortion	CMHAI	1 HV
Voltage total harmonic distortion	VMHAI	1 HV
Voltage variation	PHQVVR	1 HV
Voltage unbalance	VSQVUB	1 HV
<b>Other</b>		
Minimum pulse timer (2 pcs)	TPGAPC	4
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	2
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	2
Pulse timer (8 pcs)	PTGAPC	2
Time delay off (8 pcs)	TOFGAPC	4
Time delay on (8 pcs)	TONGAPC	4
Set-reset (8 pcs)	SRGAPC	4
Move (8 pcs)	MVGAPC	4
Table continues on next page		

Function	IEC 61850	A (CTs/VTs) TE201
Integer value move	MVI4GAPC	4
Analog value scaling	SCA4GAPC	4
Generic control point (16 pcs)	SPCGAPC	3
Remote generic control points	SPCRGAPC	1
Local generic control points	SPCLGAPC	1
Generic up-down counters	UDFCNT	12
Programmable buttons (16 buttons)	FKEYGGIO	1
<b>Logging functions</b>		
Disturbance recorder	RDRE	1
Fault recorder	FLTRFRC	1
Sequence event recorder	SER	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) Function uses calculated value when the high-impedance based restricted earth-fault protection is used  
 2)  $I_0$  is calculated from the measured phase currents

## 2.3

## Indications and controls

*Table 5: 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 6: 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	19	1	20	0	1
		Blocking of monitoring	10=On	0	20	1	20	0	1
.Beh.stVal.(Test)	-	Test mode	10=On	0	21	1	1	1	1
LD0.LLN0									
.ActSetGr.ctlVal/stVal (SG1)	-	Param setting group 1	10=SG 1	0	23	1	1,20	1	1
.ActSetGr.ctlVal/stVal (SG2)	-	Param setting group 2	10=SG 2	0	24	1	1,20	1	1
.ActSetGr.ctlVal/stVal (SG3)	-	Param setting group 3	10=SG 3	0	25	1	1,20	1	1
.ActSetGr.ctlVal/stVal (SG4)	-	Param setting group 4	10=SG 4	0	26	1	1,20	1	1
.ActSetGr.ctlVal/stVal (SG5)	-	Param setting group 5	10=SG 5	0	27	1	1,20	1	1
.ActSetGr.ctlVal/stVal (SG6)	-	Param setting group 6	10=SG 6	0	28	1	1,20	1	1
LD0.TCSSCBR1									
.CircAlm.stVal	ALARM	Trip circuit 1 alarm	10=Alarm	0	36	1	1	1	1
LD0.LEDPTRC1									
.Op.general	-	Global operate	10=Operate	0	68	1	2	1	1
.Str.general	-	Global start	10=Start	0	84	1	2	1	1

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

*Table 7: 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), 620-specific

*Table 8: General data (FUN=10), 620-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

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

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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.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.LDPRRLRC1									
.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 9: 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 10: 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 11: 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.ctlVal		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 12:** 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.ctrlV.al		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 13:** 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.

**Table 14:** 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

Table continues on next page

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IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.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 15: 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 16: 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 17: 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 3 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 18: 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
.SynlItlByps.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
.Opln.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.CBXCBR2 Circuit-breaker control (2)

*Table 19: CTRL.CBXCBR2 Circuit-breaker control (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.CBCILO2									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	240	26	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	240	27	1	1	1	1
.SynlItlByps.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	240	30	0	1	1	1
CTRL.CBXCBR2									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	240	28	1	1	1	1
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	240	29	1	1	1	1
CTRL.CCBRBRF2									
.Str.general	CB_FAULT_AL	Start, timer running	10=Start	240	104	0	2	1	1
.OpEx.general	TRBU	Failure, ext trip	10=Failure	240	105	0	2	0	1
.Opln.general	TRRET	Operate, retrip	10=Operate	240	106	0	2	0	1
CTRL.CBCSWI2									
.stSel.stVal	SELECTED	CB selected	10=Selected	240	121	1	1	1	1
.Pos.stVal/ctlVal	POSITION	CB pos/control	10/01=Close/Open	240	161	1	1,20	1	2

### 2.3.2.3 CTRL.CBXCBR3 Circuit-breaker control (3)

Table 20: *CTRL.CBXCBR3 Circuit-breaker control (3)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.CBCILO3									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	240	31	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	240	32	1	1	1	1
.SynItlByps.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	240	35	0	1	1	1
CTRL.CBXCBR3									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	240	33	1	1	1	1
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	240	34	1	1	1	1
CTRL.CCBRBRF3									
.Str.general	CB_FAULT_AL	Start, timer running	10=Start	240	107	0	2	1	1
.OpEx.general	TRBU	Failure, ext trip	10=Failure	240	108	0	2	0	1
.Opln.general	TRRET	Operate, retrip	10=Operate	240	109	0	2	0	1
CTRL.CBCSWI3									
.stSel.stVal	SELECTED	CB selected	10=Selected	240	122	1	1	1	1
.Pos.stVal/ctlVal	POSITION	CB pos/control	10/01=Close/Open	240	162	1	1,20	1	2

### 2.3.2.4 CTRL.DCSXSWI1 Disconnector position indication (1)

Table 21: *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

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

Table 22: *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

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

Table 23: *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

**2.3.2.7****CTRL.DCSXSWI4 Disconnector position indication (4)****Table 24:** *CTRL.DCSXSWI4 Disconnector position indication (4)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.DCSXSWI4									
.Pos.stVal	POSITION	Disconnector 4 pos	10/01=Close/Open	253	4	1	1	1	2

**2.3.2.8****CTRL.DCXSWI1 Disconnector control (1)****Table 25:** *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									
.stSel.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

**2.3.2.9****CTRL.DCXSWI2 Disconnector control (2)****Table 26:** *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
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

### 2.3.2.10

### CTRL.DCXSWI3 Disconnector control (3)

Table 27: *CTRL.DCXSWI3 Disconnector control (3)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.DCCIGO3									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	246	26	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	246	27	1	1	1	1
.ItlByps.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	246	30	1	1	1	1
CTRL.DCXSWI3									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	246	28	1	1	1	1
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	246	29	1	1	1	1
CTRL.DCCSWI3									
.stSel.stVal	SELECTED	DC selected	10=Selected	246	121	1	1	1	1
.Pos.stVal/ctlVal	POSITION	DC pos/control	10/01=Close/Open	246	161	1	1,20	1	2

### 2.3.2.11

### CTRL.DCXSWI4 Disconnector control (4)

Table 28: *CTRL.DCXSWI4 Disconnector control (4)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.DCCIGO4									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	246	31	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	246	32	1	1	1	1
.ItlByps.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	246	35	1	1	1	1
CTRL.DCXSWI4									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	246	33	1	1	1	1
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	246	34	1	1	1	1
CTRL.DCCSWI4									
.stSel.stVal	SELECTED	DC selected	10=Selected	246	122	1	1	1	1
.Pos.stVal/ctlVal	POSITION	DC pos/control	10/01=Close/Open	246	162	1	1,20	1	2

### 2.3.2.12

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

Table 29: *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

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

*Table 30: 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

### 2.3.2.14 CTRL.ESSXSWI3 Earthing switch indication (3)

*Table 31: CTRL.ESSXSWI3 Earthing switch indication (3)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.ESSXSWI3									
.Pos.stVal	POSITION	Earth switch pos	10/01=Close/Open	253	13	1	1	1	2

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

*Table 32: 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									
.stSelD.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

### 2.3.2.16 CTRL.ESXSWI2 Earthing switch control (2)

*Table 33: CTRL.ESXSWI2 Earthing switch control (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.ESCILO2									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	247	26	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	247	27	1	1	1	1
.ItlByps.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	247	30	1	1	1	1
CTRL.ESXSWI2									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	247	28	1	1	1	1
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	247	29	1	1	1	1

Table continues on next page

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IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.ESCSWI2									
.stSel.stVal	SELECTED	ES selected	10=Selected	247	121	1	1	1	1
.Pos.stVal/ctlVal	POSITION	ES pos/control	10/01=Close/Open	247	161	1	1,20	1	2

### 2.3.2.17 CTRL.ESXSWI3 Earthing switch control (3)

Table 34: *CTRL.ESXSWI3 Earthing switch control (3)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.ESCILO3									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	247	31	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	247	32	1	1	1	1
.ItlByps.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	247	35	1	1	1	1
CTRL.ESXSWI3									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	247	33	1	1	1	1
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	247	34	1	1	1	1
CTRL.ESCSWI3									
.stSel.stVal	SELECTED	ES selected	10=Selected	247	122	1	1	1	1
.Pos.stVal/ctlVal	POSITION	ES pos/control	10/01=Close/Open	247	162	1	1,20	1	2

### 2.3.3 Sensors and monitoring functions

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

Table 35: *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 36: *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 37: 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.CTSRCTF1 Advanced current circuit supervision for transformers (1)

*Table 38: LD0.CTSRCTF1 Advanced current circuit supervision for transformers (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.CTSRCTF1									
.Alm.general	ALARM	Alarm	10=Alarm	26	11	1	1	1	1
.Op.general	FAIL	CT secondary failure	10=Operate	26	12	1	2	1	1

### 2.3.3.5 LD0.HZCCASPVC1 Current transformer supervision for high-impedance protection scheme for phase A (1)

*Table 39: 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 40: 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 41: 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 42: 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	1	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	102	1	1	0	1

### 2.3.3.9 LD0.IL1TCTR2 Three-phase CT supervision (2)

*Table 43: 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	1	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	104	1	1	0	1

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

*Table 44: 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 45: 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 46: 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	1	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	106	1	1	0	1

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

*Table 47: 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	1	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	108	1	1	0	1

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

*Table 48: 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	1	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	126	1	1	0	1

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

*Table 49: 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	127	1	2	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	128	1	2	0	1

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

*Table 50: 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	1	1
.ClsAlm.stVal	TRV_T_CL_ALM	Cls travel time alarm	10=Alarm	242	102	0	1	1	1
.OpCntAlm.stVal	OPR_ALM	CB operations alarm	10=Alarm	242	104	0	1	1	1
.OpCntLO.stVal	OPR_LO	CB operations lockout	10=Lockout	242	105	0	1	1	1
.LonTmAlm.stVal	MON_ALM	CB inactive alarm	10=Alarm	242	106	0	1	1	1
.InsAlm.stVal	PRES_ALM	Low pressure alarm	10=Alarm	242	107	0	1	1	1

Table continues on next page

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IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.InsBlk.stVal	PRES_LO	Low pressure lockout	10=Lockout	242	108	0	1	1	1
.APwrAlm.stVal	IPOW_ALM	Iyt alarm	10=Alarm	242	109	0	1	1	1
.APwrLO.stVal	IPOW_LO	Iyt lockout	10=Lockout	242	110	0	1	1	1
.RmnNumOpAlm.stVal	CB_LIFE_ALM	CB lifetime alarm	10=Alarm	242	111	0	1	1	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	1	1

### 2.3.3.17

### LD0.SSCBR2 Circuit-breaker condition monitoring (2)

Table 51: LD0.SSCBR1 Circuit-breaker condition monitoring (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SSCBR2									
.RsAccmAPwr.Oper.ctlVal	RST_IPOW	Accumul. energy reset	10=Reset	242	29	1	20	0	1
.RsCBWear.Oper.ctlVal	RST_CB_WEAR	CB life/op.counters reset	10=Reset	242	30	1	20	0	1
.RsTrvTm.Oper.ctlVal	RST_TRV_T	Travel time alarm reset	10=Reset	242	31	1	20	0	1
.OpnAlm.stVal	TRV_T_OP_ALM	Opn travel time alarm	10=Alarm	242	121	0	1	1	1
.ClsAlm.stVal	TRV_T_CL_ALM	Cls travel time alarm	10=Alarm	242	122	0	1	1	1
.OpCntAlm.stVal	OPR_ALM	CB operations alarm	10=Alarm	242	124	0	1	1	1
.OpCntLo.stVal	OPR_LO	CB operations lockout	10=Lockout	242	125	0	1	1	1
.LonTmAlm.stVal	MON_ALM	CB inactive alarm	10=Alarm	242	126	0	1	1	1
.InsAlm.stVal	PRES_ALM	Low pressure alarm	10=Alarm	242	127	0	1	1	1
.InsBlk.stVal	PRES_LO	Low pressure lockout	10=Lockout	242	128	0	1	1	1
.APwrAlm.stVal	IPOW_ALM	Iyt alarm	10=Alarm	242	129	0	1	1	1
.APwrLO.stVal	IPOW_LO	Iyt lockout	10=Lockout	242	130	0	1	1	1
.RmnNumOpAlm.stVal	CB_LIFE_ALM	CB lifetime alarm	10=Alarm	242	131	0	1	1	1
LD0.SSOPM2									
.RsSprChaTm.Oper.ctlVal	RST_SPR_T	Charge time alarm reset	10=Reset	242	32	1	20	0	1
.SprChaAlm.stVal	SPR_CHR_ALM	Spring charge time alarm	10=Alarm	242	123	0	1	1	1

## 2.3.3.18

## LD0.SSCBR3 Circuit-breaker condition monitoring (3)

Table 52: LD0.SSCBR3 Circuit-breaker condition monitoring (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SSCBR3									
.RsAccmAPwr.Oper.ctlVal	RST_IPOW	Accumul. energy reset	10=Reset	242	39	1	20	0	1
.RsCBWear.Oper.ctlVal	RST_CB_WEAR	CB life/op.counters reset	10=Reset	242	40	1	20	0	1
.RsTrvTm.Oper.ctlVal	RST_TRV_T	Travel time alarm reset	10=Reset	242	41	1	20	0	1
.OpnAlm.stVal	TRV_T_OP_ALM	Opn travel time alarm	10=Alarm	242	141	0	1	1	1
.ClsAlm.stVal	TRV_T_CL_ALM	Cls travel time alarm	10=Alarm	242	142	0	1	1	1
.OpCntAlm.stVal	OPR_ALM	CB operations alarm	10=Alarm	242	144	0	1	1	1
.OpCntLO.stVal	OPR_LO	CB operations lockout	10=Lockout	242	145	0	1	1	1
.LonTmAlm.stVal	MON_ALM	CB inactive alarm	10=Alarm	242	146	0	1	1	1
.InsAlm.stVal	PRES_ALM	Low pressure alarm	10=Alarm	242	147	0	1	1	1
.InsBlk.stVal	PRES_LO	Low pressure lockout	10=Lockout	242	148	0	1	1	1
.APwrAlm.stVal	IPOW_ALM	Iyt alarm	10=Alarm	242	149	0	1	1	1
.APwrLO.stVal	IPOW_LO	Iyt lockout	10=Lockout	242	150	0	1	1	1
.RmnNumOpAlm.stVal	CB_LIFE_ALM	CB lifetime alarm	10=Alarm	242	151	0	1	1	1
LD0.SSOPM3									
.RsSprChaTm.Oper.ctlVal	RST_SPR_T	Charge time alarm reset	10=Reset	242	42	1	20	0	1
.SprChaAlm.stVal	SPR_CHR_ALM	Spring charge time alarm	10=Alarm	242	143	0	1	1	1

## 2.3.3.19

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

Table 53: 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	1	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	122	1	1	0	1

## 2.3.3.20

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

Table 54: 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	1	0	1
.Alm.stVal	ALARM	Alarm	10=Alarm	81	124	1	1	0	1

### 2.3.3.21 LD0.XBRGGI0130 Alarm/warning

*Table 55: LD0.XBRGGI0130 Alarm/warning*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XBRGGIO130	-								
.Alm1.stVal	-	XBRGGIO130 Alarm	1=Alarm	27	205	0	1	0	1
.Wrn1.stVal	-	XBRGGIO130 Warning	1=Warning	27	206	0	1	0	1

### 2.3.3.22 LD0.XRGGIO105 Alarm and warning

*Table 56: LD0.XRGGIO105 Alarm and warning*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XRGGIO105									
.Alm1.stVal		Alarm	10=Alarm	27	207	0	1	0	1
.Wrn1.stVal		Warning	10=Warning	27	208	0	1	0	1

## 2.3.4 Automatic control functions

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

*Table 57: 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	1	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
.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 58: 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 59: 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	0	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	212	2	0	1	1	1
.LoWrn.stVal	LOW_WARN	Low warning	10=Warning	212	3	0	1	1	1
.LoAlm.stVal	LOW_ALARM	Low alarm	10=Alarm	212	4	0	1	1	1

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

*Table 60: 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 61: 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	0	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	212	12	0	1	1	1

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

*Table 62: 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.VAMMXU2 Single-phase voltage measurement (2)

*Table 63: LD0.VAMMXU2 Single-phase voltage measurement (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.VAMMXU2									
.HiAlm.stVal	HIGH_ALARM	High alarm	10=Alarm	211	105	1	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	211	106	1	1	1	1
.LoWrn.stVal	LOW_WARN	Low warning	10=Warning	211	107	1	1	1	1
.LoAlm.stVal	LOW_ALARM	Low alarm	10=Alarm	211	108	1	1	1	1

### 2.3.5.7 LD0.VAMMXU3 Single-phase voltage measurement (3)

*Table 64: LD0.VAMMXU3 Single-phase voltage measurement (3)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.VAMMXU3									
.HiAlm.stVal	HIGH_ALARM	High alarm	10=Alarm	211	109	1	1	1	1
.HiWrn.stVal	HIGH_WARN	High warning	10=Warning	211	110	1	1	1	1
.LoWrn.stVal	LOW_WARN	Low warning	10=Warning	211	111	1	1	1	1
.LoAlm.stVal	LOW_ALARM	Low alarm	10=Alarm	211	112	1	1	1	1

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

*Table 65: 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

## 2.3.6 Power quality functions

### 2.3.6.1 LD0.CMHAI1 Current total demand distortion (1)

*Table 66: 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.PHQVVR1 Voltage variation (1)

*Table 67: LD0.PHQVVR1 Voltage variation (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHQVVR1									
.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

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

*Table 68: 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

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

*Table 69: 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	3 min unbalance alarm	10=Alarm	95	131	1	2	0	1
.HiPctVUnb.stVal	PCT_UNB_AL	Percentile unbalance alarm	10=Alarm	95	132	1	2	0	1

## 2.3.7 Protection functions

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

Table 70: *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									
.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

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

Table 71: *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

### 2.3.7.3 LD0.CVPSOF1 Automatic switch-onto-fault logic (SOF) (1)

Table 72: *LD0.CVPSOF1 Automatic switch-onto-fault logic (SOF) (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.CVPSOF1									
.TrFltSt.stVal	OPERATE	Trip fault state	10=Trip fault	170	201	1	2	0	1

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

Table 73: *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 74:** 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 75:** 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.DEFLPDEF3 Directional earth-fault protection, low stage (3)****Table 76:** LD0.DEFLPDEF3 Directional earth-fault protection, low stage (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DEFLPTOC3		Low (3) stage							
.Str.general	START	-Start	10=Start	163	99	1	2	1	1
.Op.general	OPERATE	-Operate	10=Operate	163	100	1	2	0	1

**2.3.7.8****LD0.DOPPDPR1 Reverse power/directional overpower protection (1)****Table 77:** 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

**2.3.7.9****LD0.DOPPDPR2 Reverse power/directional overpower protection (2)****Table 78:** 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

### 2.3.7.10

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

*Table 79: 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

### 2.3.7.11

### LD0.DPH3HPDOC1 Directional three-independent-phase directional overcurrent protection, high stage (1)

*Table 80: LD0.DPH3HPDOC1 Directional three-independent-phase directional overcurrent protection, high stage (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPH3HPDOC1		High stage							
.Str.phsA	-	Phs A start	10=Start	34	44	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	34	45	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	34	46	0	2	1	1
.Str.general	START	General start	10=Start	34	96	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	34	98	1	2	0	1

### 2.3.7.12

### LD0.DPH3HPDOC2 Directional three-independent-phase directional overcurrent protection, high stage (2)

*Table 81: LD0.DPH3HPDOC2 Directional three-independent-phase directional overcurrent protection, high stage (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPH3HPDOC2		High stage							
.Str.phsA	-	Phs A start	10=Start	34	99	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	34	34	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	34	35	0	2	1	1
.Str.general	START	General start	10=Start	34	36	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	34	100	1	2	0	1

### 2.3.7.13

### LD0.DPH3LPDOC1 Directional three-independent-phase directional overcurrent protection, low stage (1)

*Table 82: LD0.DPH3LPDOC1 Directional three-independent-phase directional overcurrent protection, low stage (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPH3LPDOC1		Low (1) stage							
.Str.phsA	-	Phs A start	10=Start	34	64	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	34	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	34	66	0	2	1	1
.Str.general	START	General start	10=Start	34	84	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	34	90	1	2	0	1

**2.3.7.14 LD0.DPH3LPDOC2 Directional three-independent-phase directional overcurrent protection, low stage (2)**

*Table 83: LD0.DPH3LPDOC2 Directional three-independent-phase directional overcurrent protection, low stage (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPH3LPDOC2		Low (2) stage							
.Str.phsA	-	Phs A start	10=Start	34	54	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	34	55	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	34	56	0	2	1	1
.Op.general	OPERATE	General operate	10=Operate	34	91	1	2	0	1
.Str.general	START	General start	10=Start	34	94	1	2	1	1

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

*Table 84: 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

**2.3.7.16 LD0.DPHHPDOC2 Three-phase directional overcurrent protection, high stage (2)**

*Table 85: LD0.DPHHPDOC2 Three-phase directional overcurrent protection - high stage (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DPHHPTOC2		High stage							
.Str.phsA	-	-PhsA start	10=Start	32	34	0	2	1	1
.Str.phsB	-	-PhsB start	10=Start	32	35	0	2	1	1
.Str.phsC	-	-PhsC start	10=Start	32	36	0	2	1	1
.Str.general	START	-General start	10=Start	32	99	1	2	1	1
.Op.general	OPERATE	-General operate	10=Operate	32	100	1	2	0	1

2.3.7.17

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

*Table 86: 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

2.3.7.18

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

*Table 87: 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

2.3.7.19

**LD0.DQPTUV1 Directional reactive power undervoltage protection (1)**

*Table 88: 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

2.3.7.20

**LD0.DQPTUV2 Directional reactive power undervoltage protection (2)**

*Table 89: LD0.DQPTUV2 Directional reactive power undervoltage protection (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DQPTUV2									
.Str.general	START	Stage start	10=Start	28	200	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	201	1	2	0	1

**2.3.7.21****LD0.DUPPDPR1 Underpower protection (1)****Table 90:** 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

**2.3.7.22****LD0.DUPPDPR2 Underpower protection (2)****Table 91:** 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

**2.3.7.23****LD0.EFHPTOC1 Non-directional earth-fault protection, high stage (1)****Table 92:** 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

**2.3.7.24****LD0.EFHPTOC2 Non-directional earth-fault protection, high stage (2)****Table 93:** 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	100	1	2	1	1
.Op.general	OPERATE	-Operate	10=Operate	159	101	1	2	0	1

**2.3.7.25****LD0.EFIPTOC1 Non-directional earth-fault protection, instantaneous stage (1)****Table 94:** LD0.EFIPTOC1 Non-directional earth-fault protection, instantaneous stage (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LDO.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

### 2.3.7.26

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

*Table 95: 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

### 2.3.7.27

### LD0.EFLPTOC2 Non-directional earth-fault protection, low stage (2)

*Table 96: 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

### 2.3.7.28

### LD0.EFPADM1 Admittance-based earth-fault protection (1)

*Table 97: 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

### 2.3.7.29

### LD0.EFPADM2 Admittance-based earth-fault protection (2)

*Table 98: 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

### 2.3.7.30

### LD0.EFPADM3 Admittance-based earth-fault protection (3)

*Table 99: 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

**2.3.7.31****LD0.FRPFRQ1 Frequency protection (1)****Table 100:** 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
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

**2.3.7.32****LD0.FRPFRQ2 Frequency protection (2)****Table 101:** 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

**2.3.7.33****LD0.FRPFRQ3 Frequency protection (3)****Table 102:** 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

### 2.3.7.34

### LD0.FRPFRQ4 Frequency protection (4)

*Table 103: 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
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

### 2.3.7.35

### LD0.FRPFRQ5 Frequency protection (5)

*Table 104: 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

### 2.3.7.36

### LD0.FRPFRQ6 Frequency protection (6)

*Table 105: 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

**2.3.7.37****LD0.HAEFPTOC1 Harmonics-based earth-fault protection (1)****Table 106:** 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

**2.3.7.38****LD0.HIAPDIF1 High-impedance differential protection for phase A (1)****Table 107:** 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

**2.3.7.39****LD0.HIBPDIF1 High-impedance differential protection for phase B (1)****Table 108:** 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

**2.3.7.40****LD0.HICPDIF1 High-impedance differential protection for phase C (1)****Table 109:** 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

**2.3.7.41****LD0.HREFPDIF1 High-impedance based restricted earth-fault protection (1)****Table 110:** 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

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

*Table 111: 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

**2.3.7.43 LD0.INRPHAR1 Three-phase inrush detector (1)**

*Table 112: LD0.INRPHAR1 Three-phase inrush detector (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.INRPHAR1		Second harmonic based block							
.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	BLK2H	General start	10=Start	167	84	1	2	1	1

**2.3.7.44 LD0INTRTEF1 Transient/intermittent earth-fault protection (1)**

*Table 113: 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

**2.3.7.45 LD0.JAMPTOC1 Motor load jam protection (1)**

*Table 114: LD0.JAMPTOC1 Motor load jam protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.JAMPTOC1									
.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

**2.3.7.46****LD0.LOFLPTUC1 Loss of load supervision (1)****Table 115:** *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

**2.3.7.47****LD0.LOFLPTUC2 Loss of load supervision (2)****Table 116:** *LD0.LOFLPTUC2 Loss of load supervision (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LOFLPTUC2									
.Str.general	START	Stage start	10=Start	78	94	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	78	91	1	2	0	1

**2.3.7.48****LD0.LREFPNDF1 Numerically stabilized low-impedance restricted earth-fault protection (1)****Table 117:** *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

**2.3.7.49****LD0.LREFPNDF2 Numerically stabilized low-impedance restricted earth-fault protection (2)****Table 118:** *LD0.LREFPNDF2 Numerically stabilized low-impedance restricted earth-fault protection (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LREFPNDF2									
.Str.general	START	Stage start	10=Start	170	94	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	170	92	1	2	0	1

### 2.3.7.50

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

Table 119: 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	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	82	12	1	2	0	1
.Str.general	ST_REST	Start of restore	10=Start	82	13	1	2	1	1
.Op.general	RESTORE	Restore the load	10=Restore	82	14	1	2	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

### 2.3.7.51

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

Table 120: 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	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	82	22	1	2	0	1
.Str.general	ST_REST	Start of restore	10=Start	82	23	1	2	1	1
.Op.general	RESTORE	Restore the load	10=Restore	82	24	1	2	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

### 2.3.7.52

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

Table 121: 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	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	82	32	1	2	0	1
.Str.general	ST_REST	Start of restore	10=Start	82	33	1	2	1	1
.Op.general	RESTORE	Restore the load	10=Restore	82	34	1	2	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

### 2.3.7.53

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

Table 122: 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	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	82	42	1	2	0	1
.Str.general	ST_REST	Start of restore	10=Start	82	43	1	2	1	1
.Op.general	RESTORE	Restore the load	10=Restore	82	44	1	2	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

### 2.3.7.54

### LD0.LSHDPFRQ5 Load-shedding and restoration (5)

Table 123: 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	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	82	52	1	2	0	1
.Str.general	ST_REST	Start of restore	10=Start	82	53	1	2	1	1
.Op.general	RESTORE	Restore the load	10=Restore	82	54	1	2	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

### 2.3.7.55

### LD0.LSHDPFRQ6 Load-shedding and restoration (6)

Table 124: LD0.LSHDPFRQ6 Load-shedding and restoration (6)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LSHDPFRQ6									
.Str.general	START	Stage start	10=Start	82	61	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	82	62	1	2	0	1
.Str.general	ST_REST	Start of restore	10=Start	82	63	1	2	1	1
.Op.general	RESTORE	Restore the load	10=Restore	82	64	1	2	0	1
.ManRest.Oper.ctlVal	MAN_RESTORE	Manual restore	10=Restore	82	65	1	20	0	1
.BlkRest.Oper.ctlVal	BLK_REST	Cancel restore	10=Cancel	82	66	1	20	0	1

### 2.3.7.56

### LD0.LVRTPTUV1 Low-voltage ride-through protection (1)

Table 125: 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

### 2.3.7.57

### LD0.LVRTPTUV2 Low-voltage ride-through protection (2)

Table 126: 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

### 2.3.7.58

### LD0.LVRTPTUV3 Low-voltage ride-through protection (3)

Table 127: 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

### 2.3.7.59

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

Table 128: 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

### 2.3.7.60

### LD0.MHZPDIF1 High-impedance/flux-balance based differential protection for motors (1)

Table 129: LD0.MHZPDIF1 High-impedance/flux-balance based differential protection for motors (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MHZPDIF1									
.Str.general	START	Stage start	10=Start	29	51	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	29	52	1	2	0	1

**2.3.7.61****LD0.MNSPTOC1 Negative-sequence overcurrent protection for machines (1)***Table 130: 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

**2.3.7.62****LD0.MNSPTOC2 Negative-sequence overcurrent protection for machines (2)***Table 131: 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

**2.3.7.63****LD0.MPDIF1 Stabilized and instantaneous differential protection for machines (1)***Table 132: 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									
.BlkIntnSt.general	INT_BLKD	Internal block	10=Blocked	29	24	1	2	1	1
.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

### 2.3.7.64

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

*Table 133: 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

### 2.3.7.65

### LD0.MREFPTOC1 Rotor earth-fault protection (1)

*Table 134: LD0.MREFPTOC1 Rotor earth-fault protection (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MRE1PTOC1									
.Op.general	ALARM	Alarm	10=Alarm	29	101	1	2	0	1
LD0.MRE2PTOC1									
.Str.general	START	Stage start	10=Start	29	102	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	29	103	1	2	0	1

### 2.3.7.66

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

*Table 135: 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

### 2.3.7.67

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

*Table 136: 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

**2.3.7.68****LD0.NSPTOV1 Negative-sequence overvoltage protection (1)****Table 137:** 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

**2.3.7.69****LD0.NSPTOV2 Negative-sequence overvoltage protection (2)****Table 138:** 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

**2.3.7.70****LD0.OEPVPH1 Overexcitation protection (1)****Table 139:** 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

**2.3.7.71****LD0.OEPVPH2 Overexcitation protection (2)****Table 140:** LD0.OEPVPH2 Overexcitation protection (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.OEPVPH2									
.Str.general	START	Stage Start	10=Start	28	113	1	2	1	1
.Op.general	OPERATE	Stage Operate	10=Operate	28	114	1	2	0	1

**2.3.7.72****LD0.PDNSPTOC1 Phase discontinuity protection (1)****Table 141:** 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

**2.3.7.73**

**LD0.PH3HPTOC1 Three-independent-phase non-directional overcurrent protection, high stage (1)**

*Table 142: LD0.PH3HPTOC1 Three-independent-phase non-directional overcurrent protection, high stage (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PH3HPTOC1		High stage (1)							
.Str.phsA	-	Phs A start	10=Start	164	54	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	164	55	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	164	56	0	2	1	1
.Op.general	OPERATE	General operate	10=Operate	164	91	1	2	0	1
.Str.general	START	General start	10=Start	164	94	1	2	1	1

**2.3.7.74**

**LD0.PH3HPTOC2 Three-independent-phase non-directional overcurrent protection, high stage (2)**

*Table 143: LD0.PH3HPTOC2 Three-independent-phase non-directional overcurrent protection, high stage (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PH3HPTOC2		High stage (2)							
.Str.phsA	-	Phs A start	10=Start	164	44	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	164	45	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	164	46	0	2	1	1
.Str.general	START	General start	10=Start	164	96	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	164	98	1	2	0	1

**2.3.7.75**

**LD0.PH3IPTOC1 Three-independent-phase non-directional overcurrent protection, instantaneous stage (1)**

*Table 144: LD0.PH3IPTOC1 Three-independent-phase non-directional overcurrent protection, instantaneous stage (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PH3IPTOC1		Instantaneous stage (1)							
.Str.phsA	-	Phs A start	10=Start	164	34	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	164	35	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	164	36	0	2	1	1
.Str.general	START	General start	10=Start	164	97	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	164	99	1	2	0	1

**2.3.7.76****LD0.PH3LPTOC1 Three-independent-phase non-directional overcurrent protection, low stage (1)***Table 145: LD0.PH3LPTOC1 Three-independent-phase non-directional overcurrent protection, low stage (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PH3LPTOC1		Low stage (1)							
.Str.phsA	-	Phs A start	10=Start	164	64	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	164	65	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	164	66	0	2	1	1
.Str.general	START	General start	10=Start	164	84	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	164	90	1	2	0	1

**2.3.7.77****LD0.PH3LPTOC2 Three-independent-phase non-directional overcurrent protection, low stage (2)***Table 146: LD0.PH3LPTOC2 Three-independent-phase non-directional overcurrent protection, low stage (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PH3LPTOC2		Low stage (2)							
.Str.phsA	-	Phs A start	10=Start	164	74	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	164	75	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	164	76	0	2	1	1
.Str.general	START	General start	10=Start	164	100	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	164	101	1	2	0	1

**2.3.7.78****LD0.PHAPTOV1 Single-phase overvoltage protection, secondary side (1)***Table 147: LD0.PHAPTOV1 Single-phase overvoltage protection, secondary side (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHAPTOV1									
.Str.general	START	Stage start	10=Start	40	120	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	40	121	1	2	0	1

**2.3.7.79****LD0.PHAPTV1 Single-phase undervoltage protection, secondary side (1)***Table 148: LD0.PHAPTV1 Single-phase undervoltage protection, secondary side (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHAPTV1									
.Str.general	START	Stage start	10=Start	41	120	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	41	120	1	2	0	1

**2.3.7.80**

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

*Table 149: 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

**2.3.7.81**

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

*Table 150: 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

**2.3.7.82**

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

*Table 151: 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

**2.3.7.83****LD0.PHIPTOC2 Three-phase non-directional overcurrent protection, instantaneous stage (2)****Table 152:** 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

**2.3.7.84****LD0.PHIZ1 High-impedance fault detection (1)****Table 153:** 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

**2.3.7.85****LD0.PHLPTOC1 Three-phase non-directional overcurrent protection, low stage (1)****Table 154:** 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

**2.3.7.86****LD0.PHLPTOC2 Three-phase non-directional overcurrent protection, low stage (2)****Table 155:** 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

Table continues on next page

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IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.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

### 2.3.7.87 LD0.PHPTOV1 Three-phase overvoltage protection (1)

Table 156: 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
.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

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

Table 157: 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

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

Table 158: 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

**2.3.7.90****LD0.PHPTUC1 Loss of phase (undercurrent) (1)****Table 159:** LD0.PHPTUC1 Loss of phase (undercurrent) (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASCU	I	C
LD0.PHPTUC1									
.Str.phsA		Phs A start	10=Start	41	201	0	2	1	1
.Str.phsB		Phs B start	10=Start	41	202	0	2	1	1
.Str.phsC		Phs C start	10=Start	41	203	0	2	1	1
.Str.general	START	Stage start	10=Start	41	200	1	2	1	1
.Op.phsA		Phs A operate	10=Operate	41	205	0	2	0	1
.Op.phsB		Phs B operate	10=Operate	41	206	0	2	0	1
.Op.phsC		Phs C operate	10=Operate	41	207	0	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	41	204	1	2	0	1

**2.3.7.91****LD0.PHPTUC2 Loss of phase (undercurrent) (2)****Table 160:** LD0.PHPTUC2 Loss of phase (undercurrent) (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHPTUC2									
.Str.phsA		Phs A start	10=Start	41	209	0	2	1	1
.Str.phsB		Phs B start	10=Start	41	210	0	2	1	1
.Str.phsC		Phs C start	10=Start	41	211	0	2	1	1
.Str.general	START	Stage start	10=Start	41	208	1	2	1	1
.Op.phsA		Phs A operate	10=Operate	41	213	0	2	0	1
.Op.phsB		Phs B operate	10=Operate	41	214	0	2	0	1
.Op.phsC		Phs C operate	10=Operate	41	215	0	2	0	1
.Op.general	OPERATE	Stage operate	10=Operate	41	212	1	2	0	1

**2.3.7.92****LD0.PHPTUV1 Three-phase undervoltage protection (1)****Table 161:** 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

### 2.3.7.93

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

*Table 162: 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

### 2.3.7.94

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

*Table 163: 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

### 2.3.7.95

### LD0.PHPTUV4 Three-phase undervoltage protection (4)

*Table 164: LD0.PHPTUV4 Three-phase undervoltage protection (4)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHPTUV4		Stage 4							
.Str.phsA	-	Phs A start	10=Start	41	99	0	2	1	1
.Str.phsB	-	Phs B start	10=Start	41	34	0	2	1	1
.Str.phsC	-	Phs C start	10=Start	41	35	0	2	1	1
.Str.general	START	General start	10=Start	41	36	1	2	1	1
.Op.general	OPERATE	General operate	10=Operate	41	100	1	2	0	1

**2.3.7.96****LD0.PHPVOC1 Three-phase voltage-dependent overcurrent protection (1)***Table 165: 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

**2.3.7.97****LD0.PHPVOC2 Three-phase voltage-dependent overcurrent protection (2)***Table 166: LD0.PHPVOC2 Three-phase voltage-dependent overcurrent protection (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PHPVOC2									
.Str.general	START	General start	10=Start	40	200	1	2	1	1
.Str.phsA		Phs A start	10=Start	40	201	0	2	1	1
.Str.phsB		Phs B start	10=Start	40	202	0	2	1	1
.Str.phsC		Phs C start	10=Start	40	203	0	2	1	1
.Op.general	OPERATE	General operate	10=Operate	40	204	1	2	0	1
.Op.phsA		Phs A operate	10=Operate	40	205	0	2	0	1
.Op.phsB		Phs B operate	10=Operate	40	206	0	2	0	1
.Op.phsC		Phs C operate	10=Operate	40	207	0	2	0	1

**2.3.7.98****LD0.PREVPTOC1 Phase reversal protection (1)***Table 167: 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

### 2.3.7.99 LD0.PSPTUV1 Positive-sequence undervoltage protection (1)

*Table 168: 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

### 2.3.7.100 LD0.PSPTUV2 Positive-sequence undervoltage protection (2)

*Table 169: 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

### 2.3.7.101 LD0.ROVPTOV1 Residual overvoltage protection (1)

*Table 170: 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

### 2.3.7.102 LD0.ROVPTOV2 Residual overvoltage protection (2)

*Table 171: 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

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

*Table 172: 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

**2.3.7.104****LD0.SRCxPTOC1 Capacitor resonance protection (1)****Table 173:** 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

**2.3.7.105****LD0.STTPMSU1 Motor start-up supervision (1)****Table 174:** 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

**2.3.7.106****LD0.T1PTTR1 Three-phase thermal protection for feeders, cables and distribution transformers (1)****Table 175:** 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

**2.3.7.107****LD0.T2PTTR1 Three-phase thermal overload protection, two time constants (1)****Table 176:** 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

### 2.3.7.108

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

*Table 177: 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

### 2.3.7.109

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

*Table 178: 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

### 2.3.7.110

### LD0.UEXPDIS2 Three-phase underexcitation protection (2)

*Table 179: LD0.UEXPDIS2 Three-phase underexcitation protection (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.UEXPDIS2									
.Str.general	START	Stage start	10=Start	28	133	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	28	134	1	2	0	1

**2.3.7.111 LD0.UPCALH1 Circuit breaker uncorresponding position start-up (1)**
**Table 180:** *LD0.UPCALH1 Circuit breaker uncorresponding position start-up (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.UPCALH1									
.Op.general	OPERATE	Operate	10=Operate	71	51	1	2	0	1

**2.3.7.112 LD0.UPCALH2 Circuit breaker uncorresponding position start-up (2)**
**Table 181:** *LD0.UPCALH2 Circuit breaker uncorresponding position start-up (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.UPCALH2									
.Op.general	OPERATE	Operate	10=Operate	71	52	1	2	0	1

**2.3.7.113 LD0.UPCALH3 Circuit breaker uncorresponding position start-up (3)**
**Table 182:** *LD0.UPCALH3 Circuit breaker uncorresponding position start-up (3)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.UPCALH3									
.Op.general	OPERATE	Operate	10=Operate	71	53	1	2	0	1

**2.3.7.114 LD0.VVSPPAM1 Voltage vector shift protection (1)**
**Table 183:** *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
.BlklntrSt.general	INT_BLKD	Blocked	10=Blocked	28	103	1	2	0	1

**2.3.7.115 LD0.WPWDE1 Wattmetric-based earth-fault protection (1)**
**Table 184:** *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

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

*Table 185: 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

### 2.3.7.117 LD0.WPWDE3 Wattmetric-based earth-fault protection (3)

*Table 186: 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 187: LD0.CCSPVC1 Current circuit supervision (1)*

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

### 2.3.8.2 LD0.CCSPVC2 Current circuit supervision (2)

*Table 188: LD0.CCSPVC2 Current circuit supervision (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0L.CCSPVC2									
.FailACirc.general	FAIL	Fail Operate	10=Operate	71	23	1	1	1	1
.SigFailAlm.stVal	ALARM	Fail Alarm	10=Alarm	71	24	1	2	0	1

### 2.3.8.3

### LD0.DARREC1 Autoreclosing (1)

*Table 189: 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
.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

### 2.3.8.4

### LD0.DARREC2 Autoreclosing (2)

*Table 190: LD0.DARREC2 Autoreclosing (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.DARREC2									
.RecRs.Oper.ctlVal	-	AR reset	10=Reset	179	19	1	20	0	1
.CntRs.Oper.ctlVal	-	AR counters reset	10=Reset	179	20	1	20	0	1
.PrgRec1.stVal	INPRO_1	AR 1st reclose	10=In progress	179	101	1	2	0	1
.PrgRec2.stVal	INPRO_2	AR 2nd reclose	10=In progress	179	102	1	2	0	1
.PrgRec3.stVal	INPRO_3	AR 3rd reclose	10=In progress	179	103	1	2	0	1
.PrgRec4.stVal	INPRO_4	AR 4th reclose	10=In progress	179	104	1	2	0	1
.PrgRec5.stVal	INPRO_5	AR 5th reclose	10=In progress	179	105	1	2	0	1
.PrgRec.stVal	INPRO	AR in progress	10=In progress	179	120	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
.CBManCls.stVal	MAN_CB_CL	CB manually closed	10=CB closed	179	159	1	2	0	1
.LO.stVal	LOCKED	Lockout status	10=Lockout	179	164	1	2	0	1
.UnsRec.stVal	UNSUC_RECL	Reclose fail status	10=Failed	179	170	1	2	0	1
.RdyRec.stVal	READY	Ready reclose status	10=Ready	179	172	1	2	0	1
.ActRec.stVal	ACTIVE	Active reclose status	10=Active	179	173	1	2	0	1
.PrgDsr.stVal	DISCR_INPRO	Discrimination time in p.	10=In progress	179	174	1	2	0	1
.PrgCutOut.stVal	CUTOUT_INPRO	Cutout time in progress	10=In progress	179	175	1	2	0	1
.FrqOpAlm.stVal	FRQ_OP_ALM	Frequent operation alarm	10=Alarm	179	176	1	2	0	1
.OpCls.general	CLOSE_CB	Operate (close XCBR)	10=Close CB	179	179	1	2	0	1
.OpOpn.general	OPEN_CB	Operate (open XCBR)	10=Open CB	179	180	1	2	0	1
.UnsCBCls.stVal	UNSUC_CB	CB closing failed	10=Failed	179	181	1	2	0	1
.WtMstr.stVal	CMD_WAIT	Master signal to follower	10=Signal	179	182	1	2	0	1
.RclTmStr.stVal		Reclaim time start	10=Start	179	183	1	2	0	1

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

Table 191: 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

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

Table 192: 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

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

Table 193: 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

**2.3.8.8****LD0.SEQSPVC1 Fuse failure supervision (1)****Table 194:** 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.FKEYGGIO1 Programmable buttons (16 buttons) (1)****Table 195:** LD0.FKEYGGIO1 Programmable buttons (16 buttons) (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.FKEYGGIO1									
.SPCSO1.stVal	L1	LED 1	01=Off, 10=On	253	131	1	1	1	1
.SPCSO2.stVal	L2	LED 2	01=Off, 10=On	253	132	1	1	1	1
.SPCSO3.stVal	L3	LED 3	01=Off, 10=On	253	133	1	1	1	1
.SPCSO4.stVal	L4	LED 4	01=Off, 10=On	253	134	1	1	1	1
.SPCSO5.stVal	L5	LED 5	01=Off, 10=On	253	135	1	1	1	1
.SPCSO6.stVal	L6	LED 6	01=Off, 10=On	253	136	1	1	1	1
.SPCSO7.stVal	L7	LED 7	01=Off, 10=On	253	137	1	1	1	1
.SPCSO8.stVal	L8	LED 8	01=Off, 10=On	253	138	1	1	1	1
.SPCSO9.stVal	L9	LED 9	01=Off, 10=On	253	139	1	1	1	1
.SPCSO10.stVal	L10	LED 10	01=Off, 10=On	253	140	1	1	1	1
.SPCSO11.stVal	L11	LED 11	01=Off, 10=On	253	141	1	1	1	1
.SPCSO12.stVal	L12	LED 12	01=Off, 10=On	253	142	1	1	1	1
.SPCSO13.stVal	L13	LED 13	01=Off, 10=On	253	143	1	1	1	1
.SPCSO14.stVal	L14	LED 14	01=Off, 10=On	253	144	1	1	1	1
.SPCSO15.stVal	L15	LED 15	01=Off, 10=On	253	145	1	1	1	1
.SPCSO16.stVal	L16	LED 16	01=Off, 10=On	253	146	1	1	1	1

**2.3.9.2****LD0.MAPGAPC1 Multipurpose protection (1)****Table 196:** 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

### 2.3.9.3 LD0.MAPGAPC2 Multipurpose protection (2)

*Table 197: 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

### 2.3.9.4 LD0.MAPGAPC3 Multipurpose protection (3)

*Table 198: 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

### 2.3.9.5 LD0.MAPGAPC4 Multipurpose protection (4)

*Table 199: 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

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

*Table 200: 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

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

*Table 201: 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

**2.3.9.8****LD0.MAPGAPC7 Multipurpose protection (7)****Table 202:** *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	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	164	1	1	0	1

**2.3.9.9****LD0.MAPGAPC8 Multipurpose protection (8)****Table 203:** *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	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	166	1	1	0	1

**2.3.9.10****LD0.MAPGAPC9 Multipurpose protection (9)****Table 204:** *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	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	168	1	1	0	1

**2.3.9.11****LD0.MAPGAPC10 Multipurpose protection (10)****Table 205:** *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	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	170	1	1	0	1

**2.3.9.12****LD0.MAPGAPC11 Multipurpose protection (11)****Table 206:** *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	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	172	1	1	0	1

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

*Table 207: 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	1	1	1
.Op.general	OPERATE	Stage operate	10=Operate	27	174	1	1	0	1

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

*Table 208: 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

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

*Table 209: 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

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

*Table 210: 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

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

*Table 211: 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

**2.3.9.18****LD0.MAPGAPC17 Multipurpose protection (17)****Table 212:** 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

**2.3.9.19****LD0.MAPGAPC18 Multipurpose protection (18)****Table 213:** 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

**2.3.9.20****LD0.MVGAPC1 Move (8 pcs) (1)****Table 214:** 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
.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

**2.3.9.21****LD0.MVGAPC2 Move (8 pcs) (2)****Table 215:** 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

Table continues on next page

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.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

### 2.3.9.22 LD0.MVGAPC3 Move (8 pcs) (3)

*Table 216: LD0.MVGAPC3 Move (8 pcs) (3)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MVGAPC3									
.SPCSO1.stVal	-	Input 1 signal	10=On	11	21	0	1	1	1
.SPCSO2.stVal	-	Input 2 signal	10=On	11	22	0	1	1	1
.SPCSO3.stVal	-	Input 3 signal	10=On	11	23	0	1	1	1
.SPCSO4.stVal	-	Input 4 signal	10=On	11	24	0	1	1	1
.SPCSO5.stVal	-	Input 5 signal	10=On	11	25	0	1	1	1
.SPCSO6.stVal	-	Input 6 signal	10=On	11	26	0	1	1	1
.SPCSO7.stVal	-	Input 7 signal	10=On	11	27	0	1	1	1
.SPCSO8.stVal	-	Input 8 signal	10=On	11	28	0	1	1	1

### 2.3.9.23 LD0.MVGAPC4 Move (8 pcs) (4)

*Table 217: LD0.MVGAPC4 Move (8 pcs) (4)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MVGAPC4									
.SPCSO1.stVal	-	Input 1 signal	10=On	11	31	0	1	1	1
.SPCSO2.stVal	-	Input 2 signal	10=On	11	32	0	1	1	1
.SPCSO3.stVal	-	Input 3 signal	10=On	11	33	0	1	1	1
.SPCSO4.stVal	-	Input 4 signal	10=On	11	34	0	1	1	1
.SPCSO5.stVal	-	Input 5 signal	10=On	11	35	0	1	1	1
.SPCSO6.stVal	-	Input 6 signal	10=On	11	36	0	1	1	1
.SPCSO7.stVal	-	Input 7 signal	10=On	11	37	0	1	1	1
.SPCSO8.stVal	-	Input 8 signal	10=On	11	38	0	1	1	1

### 2.3.9.24 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 218:** LD0.SPCGAPC1 Generic control point (16 pcs) (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SPCGAPC1									
.SPCS01.ctlVal	-	Output control 1	10/01=On/Off	11	141	1	20	0	1
.SPCS02.ctlVal	-	Output control 2	10/01=On/Off	11	142	1	20	0	1
.SPCS03.ctlVal	-	Output control 3	10/01=On/Off	11	143	1	20	0	1
.SPCS04.ctlVal	-	Output control 4	10/01=On/Off	11	144	1	20	0	1
.SPCS05.ctlVal	-	Output control 5	10/01=On/Off	11	145	1	20	0	1
.SPCS06.ctlVal	-	Output control 6	10/01=On/Off	11	146	1	20	0	1
.SPCS07.ctlVal	-	Output control 7	10/01=On/Off	11	147	1	20	0	1
.SPCS08.ctlVal	-	Output control 8	10/01=On/Off	11	148	1	20	0	1
.SPCS09.ctlVal	-	Output control 9	10/01=On/Off	11	149	1	20	0	1
.SPCS10.ctlVal	-	Output control 10	10/01=On/Off	11	150	1	20	0	1
.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

**2.3.9.25****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 219:** 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

Table continues on next page

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IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.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

### 2.3.9.26

### LD0.SPCGAPC3 Generic control point (16 pcs) (3)

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 220: LD0.SPCGAPC3 Generic control point (16 pcs) (3)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SPCGAPC3									
.SPCS01.ctlVal	-	Output control 1	10/01=On/Off	11	161	1	1,20	0	1
.SPCS02.ctlVal	-	Output control 2	10/01=On/Off	11	162	1	1,20	0	1
.SPCS03.ctlVal	-	Output control 3	10/01=On/Off	11	163	1	1,20	0	1
.SPCS04.ctlVal	-	Output control 4	10/01=On/Off	11	164	1	1,20	0	1
.SPCS05.ctlVal	-	Output control 5	10/01=On/Off	11	165	1	1,20	0	1
.SPCS06.ctlVal	-	Output control 6	10/01=On/Off	11	166	1	1,20	0	1
.SPCS07.ctlVal	-	Output control 7	10/01=On/Off	11	167	1	1,20	0	1
.SPCS08.ctlVal	-	Output control 8	10/01=On/Off	11	168	1	1,20	0	1
.SPCS09.ctlVal	-	Output control 9	10/01=On/Off	11	169	1	1,20	0	1
.SPCS10.ctlVal	-	Output control 10	10/01=On/Off	11	170	1	1,20	0	1
.SPCS11.ctlVal	-	Output control 11	10/01=On/Off	11	171	1	1,20	0	1
.SPCS12.ctlVal	-	Output control 12	10/01=On/Off	11	172	1	1,20	0	1
.SPCS13.ctlVal	-	Output control 13	10/01=On/Off	11	173	1	1,20	0	1
.SPCS14.ctlVal	-	Output control 14	10/01=On/Off	11	174	1	1,20	0	1
.SPCS15.ctlVal	-	Output control 15	10/01=On/Off	11	175	1	1,20	0	1
.SPCS16.ctlVal	-	Output control 16	10/01=On/Off	11	176	1	1,20	0	1

### 2.3.9.27

### LD0.SPCLGAPC1 Local generic control points (1)

Table 221: LD0.SPCLGAPC1 Local generic control points (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SPCLGAPC1									
.SPCS01.ctlVal	-	Output control 1	10/01=On/Off	11	221	1	1	0	1
.SPCS02.ctlVal	-	Output control 2	10/01=On/Off	11	222	1	1	0	1
Table continues on next page									

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.SPCS03.ctlVal	-	Output control 3	10/01=On/Off	11	223	1	1	0	1
.SPCS04.ctlVal	-	Output control 4	10/01=On/Off	11	224	1	1	0	1
.SPCS05.ctlVal	-	Output control 5	10/01=On/Off	11	225	1	1	0	1
.SPCS06.ctlVal	-	Output control 6	10/01=On/Off	11	226	1	1	0	1
.SPCS07.ctlVal	-	Output control 7	10/01=On/Off	11	227	1	1	0	1
.SPCS08.ctlVal	-	Output control 8	10/01=On/Off	11	228	1	1	0	1
.SPCS09.ctlVal	-	Output control 9	10/01=On/Off	11	229	1	1	0	1
.SPCS10.ctlVal	-	Output control 10	10/01=On/Off	11	230	1	1	0	1
.SPCS11.ctlVal	-	Output control 11	10/01=On/Off	11	231	1	1	0	1
.SPCS12.ctlVal	-	Output control 12	10/01=On/Off	11	232	1	1	0	1
.SPCS13.ctlVal	-	Output control 13	10/01=On/Off	11	233	1	1	0	1
.SPCS14.ctlVal	-	Output control 14	10/01=On/Off	11	234	1	1	0	1
.SPCS15.ctlVal	-	Output control 15	10/01=On/Off	11	235	1	1	0	1
.SPCS16.ctlVal	-	Output control 16	10/01=On/Off	11	236	1	1	0	1

### 2.3.9.28

### LD0.SPCRGAPC1 Remote generic control points (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 222: LD0.SPCRGAPC1 Remote generic control points (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SPCRGAPC1									
.SPCS01.ctlVal	-	Output control 1	10/01=On/Off	1	201	1	1,20	0	1
.SPCS02.ctlVal	-	Output control 2	10/01=On/Off	1	202	1	1,20	0	1
.SPCS03.ctlVal	-	Output control 3	10/01=On/Off	1	203	1	1,20	0	1
.SPCS04.ctlVal	-	Output control 4	10/01=On/Off	1	204	1	1,20	0	1
.SPCS05.ctlVal	-	Output control 5	10/01=On/Off	1	205	1	1,20	0	1
.SPCS06.ctlVal	-	Output control 6	10/01=On/Off	1	206	1	1,20	0	1
.SPCS07.ctlVal	-	Output control 7	10/01=On/Off	1	207	1	1,20	0	1
.SPCS08.ctlVal	-	Output control 8	10/01=On/Off	1	208	1	1,20	0	1
.SPCS09.ctlVal	-	Output control 9	10/01=On/Off	1	209	1	1,20	0	1
.SPCS10.ctlVal	-	Output control 10	10/01=On/Off	1	210	1	1,20	0	1
.SPCS11.ctlVal	-	Output control 11	10/01=On/Off	1	211	1	1,20	0	1
.SPCS12.ctlVal	-	Output control 12	10/01=On/Off	1	212	1	1,20	0	1
.SPCS13.ctlVal	-	Output control 13	10/01=On/Off	1	213	1	1,20	0	1
.SPCS14.ctlVal	-	Output control 14	10/01=On/Off	1	214	1	1,20	0	1
.SPCS15.ctlVal	-	Output control 15	10/01=On/Off	1	215	1	1,20	0	1
.SPCS16.ctlVal	-	Output control 16	10/01=On/Off	1	216	1	1,20	0	1

### 2.3.9.29

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

Table 223: 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

### 2.3.9.30

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

Table 224: 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

### 2.3.10

### Physical and raw I/O data

#### 2.3.10.1

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

Table 225: 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

## 2.3.10.2

## LD0.XBGGIO115 Physical binary I/O signals (status only)

Table 226: LD0.XBGGIO115 Physical binary I/O signals (status only)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XBGGIO115									
.Ind1.stVal		XB115-Input 1	10/01=On/Off	50	21	0	1	1	1
.Ind2.stVal		XB115-Input 2	10/01=On/Off	50	22	0	1	1	1
.Ind3.stVal		XB115-Input 3	10/01=On/Off	50	23	0	1	1	1
.Ind4.stVal		XB115-Input 4	10/01=On/Off	50	24	0	1	1	1
.Ind5.stVal		XB115-Input 5	10/01=On/Off	50	25	0	1	1	1
.Ind6.stVal		XB115-Input 6	10/01=On/Off	50	26	0	1	1	1
.Ind7.stVal		X105-Input 7	10/01=On/Off	50	27	0	1	1	1
.Ind8.stVal		XB115-Input 8	10/01=On/Off	50	28	0	1	1	1
.SPCSO1.stVal		XB115-Output 1	10/01=On/Off	50	121	0	1	1	1
.SPCSO2.stVal		XB115-Output 2	10/01=On/Off	50	122	0	1	1	1
.SPCSO3.stVal		XB115-Output 3	10/01=On/Off	50	123	0	1	1	1
.SPCSO4.stVal		XB115-Output 4	10/01=On/Off	50	124	0	1	1	1

## 2.3.10.3

## LD0.XBRGGIO130 Physical binary I/O signals (status only)

Table 227: LD0.XBRGGIO130 Physical binary I/O signals (status only)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XBRGGIO130									
.SPCSO1.stVal		XBR130-Output 1	10/01=On/Off	27	211	0	1	1	1
.SPCSO2.stVal		XBR130-Output 2	10/01=On/Off	27	212	0	1	1	1
.SPCSO3.stVal		XBR130-Output 3	10/01=On/Off	27	213	0	1	1	1

## 2.3.10.4

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

Table 228: 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.XGGIO105 Physical binary I/O signals (status only)

Table 229: LD0.XGGIO105 Physical binary I/O signals (status only)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XGGIO105									
.Ind1.stVal		X105-Input 1	10/01=On/Off	50	11	0	1	1	1
.Ind2.stVal		X105-Input 2	10/01=On/Off	50	12	0	1	1	1
.Ind3.stVal		X105-Input 3	10/01=On/Off	50	13	0	1	1	1
.Ind4.stVal		X105-Input 4	10/01=On/Off	50	14	0	1	1	1
.Ind5.stVal		X105-Input 5	10/01=On/Off	50	15	0	1	1	1
.Ind6.stVal		X105-Input 6	10/01=On/Off	50	16	0	1	1	1
.Ind7.stVal		X105-Input 7	10/01=On/Off	50	17	0	1	1	1
.Ind8.stVal		X105-Input 8	10/01=On/Off	50	18	0	1	1	1
.SPCSO1.stVal		X105-Output 1	10/01=On/Off	50	111	0	1	1	1
.SPCSO2.stVal		X105-Output 2	10/01=On/Off	50	112	0	1	1	1
.SPCSO3.stVal		X105-Output 3	10/01=On/Off	50	113	0	1	1	1
.SPCSO4.stVal		X105-Output 4	10/01=On/Off	50	114	0	1	1	1

### 2.3.10.6

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

Table 230: 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

## 2.3.10.7

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

Table 231: 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

## 2.3.10.8

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

Table 232: 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
.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

## 2.3.10.9

## LD0.XHBGGIO105 Physical binary I/O signal (status only)

Table 233: LD0.XHBGGIO105 Physical binary I/O signal (status only)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XHBGGIO105									
.Ind1.stVal	-	XHB105-Input 1	10/01=On/Off	50	31	0	1	1	1
.Ind2.stVal	-	XHB105-Input 2	10/01=On/Off	50	32	0	1	1	1
.Ind3.stVal	-	XHB105-Input 3	10/01=On/Off	50	33	0	1	1	1
.Ind4.stVal	-	XHB105-Input 4	10/01=On/Off	50	34	0	1	1	1
.Ind5.stVal	-	XHB105-Input 5	10/01=On/Off	50	35	0	1	1	1
.Ind6.stVal	-	XHB105-Input 6	10/01=On/Off	50	36	0	1	1	1
.Ind7.stVal	-	XHB105-Input 7	10/01=On/Off	50	37	0	1	1	1
.Ind8.stVal	-	XHB105-Input 8	10/01=On/Off	50	38	0	1	1	1
.SPCSO1.stVal	-	XHB105-Output 1	10/01=On/Off	50	131	0	1	1	1
.SPCSO2.stVal	-	XHB105-Output 2	10/01=On/Off	50	132	0	1	1	1
.SPCSO3.stVal	-	XHB105-Output 3	10/01=On/Off	50	133	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 234: 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 235: 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 [ $\times 10^{-6}$ ]	66	181	0	4	0
.A.phsB.cVal.mag	Phs B demand	0...50.00 [ $\times 10^{-6}$ ]	66	182	0	4	0
.A.phsC.cVal.mag	Phs C demand	0...50.00 [ $\times 10^{-6}$ ]	66	183	0	4	0
LD0.CMAMMXU1							
.A.phsA.cVal.mag	Phs A max. demand	0...50.00 [ $\times 10^{-6}$ ]	66	150	0	4	0
.A.phsB.cVal.mag	Phs B max. demand	0...50.00 [ $\times 10^{-6}$ ]	66	151	0	4	0
.A.phsC.cVal.mag	Phs C max. demand	0...50.00 [ $\times 10^{-6}$ ]	66	152	0	4	0
LD0.CMIMMXU1							
.A.phsA.cVal.mag	Phs A min. demand	0...50.00 [ $\times 10^{-6}$ ]	66	153	0	4	0
.A.phsB.cVal.mag	Phs B min. demand	0...50.00 [ $\times 10^{-6}$ ]	66	154	0	4	0
.A.phsC.cVal.mag	Phs C min. demand	0...50.00 [ $\times 10^{-6}$ ]	66	155	0	4	0

## 2.4.2

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

*Table 236: 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 [xIn]	66	184	0	4	0
.A.phsB.cVal.mag	Phs B demand	0...50.00 [xIn]	66	185	0	4	0
.A.phsC.cVal.mag	Phs C demand	0...50.00 [xIn]	66	186	0	4	0
LD0.CMAMMXU2							
.A.phsA.cVal.mag	Phs A max. demand	0...50.00 [xIn]	66	156	0	4	0
.A.phsB.cVal.mag	Phs B max. demand	0...50.00 [xIn]	66	157	0	4	0
.A.phsC.cVal.mag	Phs C max. demand	0...50.00 [xIn]	66	158	0	4	0
LD0.CMIMMXU2							
.A.phsA.cVal.mag	Phs A min. demand	0...50.00 [xIn]	66	159	0	4	0
.A.phsB.cVal.mag	Phs B min. demand	0...50.00 [xIn]	66	160	0	4	0
.A.phsC.cVal.mag	Phs C min. demand	0...50.00 [xIn]	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 237: 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 lo	0.000...80.000 pu	66	15	0	4	0

Table continues on next page

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

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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

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
.VNgSeq1.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
.VNgSeq2.mag	Voltage Neg-Seq(b)	0.000...4.000 ×Un	66	69	0	4	0
.MaxTmpRl.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
.DifABAAngVCA1.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
.DifABAAngVCA2.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 238: 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 239: 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 [ $\times 10^{-3}$ ]	66	187	0	4	0
LD0.RCMAMMXU1							
.A.res.cVal.mag	Residual max. demand	0...50.00 [ $\times 10^{-3}$ ]	66	162	0	4	0
LD0.RCMIMMXU1							
.A.res.cVal.mag	Residual min. demand	0...50.00 [ $\times 10^{-3}$ ]	66	163	0	4	0

## 2.4.6

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

*Table 240: 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 [ $\times 10^{-3}$ ]	66	188	0	4	0
LD0.RCMAMMXU2							
.A.res.cVal.mag	Residual max. demand	0...50.00 [ $\times 10^{-3}$ ]	66	164	0	4	0
LD0.RCMIMMXU2							
.A.res.cVal.mag	Residual min. demand	0...50.00 [ $\times 10^{-3}$ ]	66	165	0	4	0

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

*Table 241: 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 [ $\times$ Un]	66	203	0	4	0

## 2.4.8 LD0.SCEFRFLO1 Fault locator

*Table 242: 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

## 2.4.9 LD0.SECRSYN1 Synchronism and energizing check

*Table 243: 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

## 2.4.10 LD0.TPOSYLTC1 Tap changer position indication (1)

*Table 244: LD0.TPOSYLTC1 Tap changer position indication (1)*

IEC 61850 name	Description	Values	FUN	INF	U	ASDU	I
LD0.TPOSYLTC1							
.ValWTr.posVal	Tap position	-64...63	25	20	1	4	1

## 2.4.11 LD0.VAMMXU2 Single-phase voltage measurement (2)

*Table 245: LD0.VAMMXU2 Single-phase voltage measurement (2)*

IEC 61850 name	Description	DPI value	FUN	INF	U	ASDU	I
LD0.VAAVMMXU2							
.PhV.phsA.cVal.mag	Demand value phsA	0.00...4.00 [xUn]	66	217	0	4	0
.PPV.phsAB.cVal.mag	Demand value phsAB	0.00...4.00 [xUn]	66	218	0	4	0

## 2.4.12 LD0.VAMMXU3 Single-phase voltage measurement (3)

*Table 246: LD0.VAMMXU3 Single-phase voltage measurement (3)*

IEC 61850 name	Description	DPI value	FUN	INF	U	ASDU	I
LD0.VAAVMMXU3							
.PhV.phsA.cVal.mag	Demand value phsA	0.00...4.00 [xUn]	66	219	0	4	0
.PPV.phsAB.cVal.mag	Demand value phsAB	0.00...4.00 [xUn]	66	220	0	4	0

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

*Table 247: 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 [xUn]	66	191	0	4	0
.PhV.phsB.cVal.mag	Phs B demand	0...4.00 [xUn]	66	192	0	4	0
.PhV.phsC.cVal.mag	Phs C demand	0...4.00 [xUn]	66	193	0	4	0
.PPV.phsAB.cVal.mag	Phs AB demand	0...4.00 [xUn]	66	194	0	4	0
.PPV.phsBC.cVal.mag	Phs BC demand	0...4.00 [xUn]	66	195	0	4	0
.PPV.phsCA.cVal.mag	Phs CA demand	0...4.00 [xUn]	66	196	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 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 248:** *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.

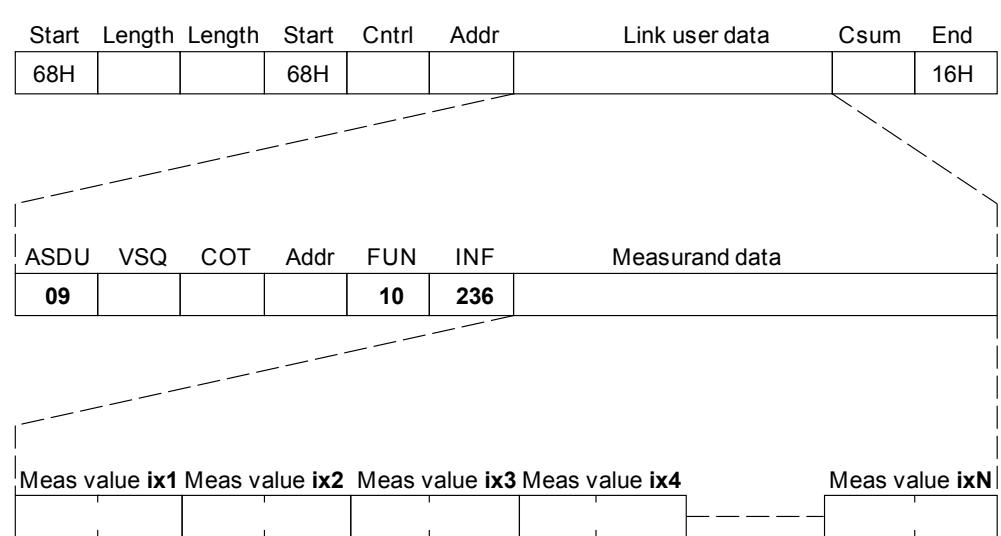
## 2.5.1 LD0.PEMMXU1 Three-phase power and energy measurement

**Table 249:** *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

Class 2 data measurands use ASDU type 9, function type 10 and information number 236 for frame 6 and 237 for frame 7.



*Figure 2: Class 2 frame response in the predefined private Class 2 frames, numbers 6 or 7*

The data value indexes, named ix in the Class 2 point list table, runs from 1 to N. Each measurand data value occupies two data octets. The indexes in the Class 2 point list table are necessarily not presented in incremental order. Indexes are common for frame numbers 6 and 7. Indexes containing an asterisk (\*) are only relevant for frame number 7. Index 999 means that objects are available but not pre-mapped to any Class 2 frame.

The user can freely compose an own private Class 2 frame using PCM600. The Function Type and the Information Number for this user-definable Class 2 frame can be configured through the setting parameters. Default values are FUN = 10, INF = 230.

*Table 250: Explanations of the class 2 data measurands 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.
Description	Short description of the signal. See the technical manual for more information.
Scale	Absolute IED object value that corresponds to the IEC 60870-5-103 maximum value.
ix	Index, that is location of the measurement value within the class 2 frame.

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

Table 251: *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 252: *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 253: *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 254: *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 255: 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 256: 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.MPTTR1 Thermal overload protection for motors (1)

*Table 257: 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

## 2.6.8

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

*Table 258: 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

## 2.6.9

## LD0.RESCMMXU1 Residual current measurement (1)

*Table 259: 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

**2.6.10****LD0.RESCMMXU2 Residual current measurement (2)***Table 260: 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

**2.6.11****LD0.RESVMMXU1 Residual voltage measurement (1)***Table 261: 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

**2.6.12****LD0.SCA4GAPC1 Analog value scaling (1)***Table 262: 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

**2.6.13****LD0.SCA4GAPC2 Analog value scaling (2)***Table 263: 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

## 2.6.14 LD0.SCA4GAPC3 Analog value scaling (3)

*Table 264: 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

## 2.6.15 LD0.SCA4GAPC4 Analog value scaling (4)

*Table 265: 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

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

*Table 266: 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

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

*Table 267: 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

**2.6.18****LD0.TR2PTDF1 Stabilized and instantaneous differential protection for two-winding transformers (1)****Table 268:** 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

**2.6.19****LD0.VAMMXU2 Single-phase voltage measurement (2)****Table 269:** LD0.VAMMXU2 Single-phase voltage measurement (2)

IEC 61850 name	Description	Values	Scaled maximum value
LD0.VAMMXU2			
.PhV.phsA.cVal.mag	Phase voltage A	0.00...4.00 [xUn]	2.4
.PPV.phsAB.cVal.mag	Phase-to-phase voltage AB	0.00...4.00 [xUn]	2.4

**2.6.20****LD0.VAMMXU3 Single-phase voltage measurement (3)****Table 270:** LD0.VAMMXU3 Single-phase voltage measurement (3)

IEC 61850 name	Description	Values	Scaled maximum value
LD0.VAMMXU3			
.PhV.phsA.cVal.mag	Phase voltage A	0.00...4.00 [xUn]	2.4
.PPV.phsAB.cVal.mag	Phase-to-phase voltage AB	0.00...4.00 [xUn]	2.4

**2.6.21****LD0.VMMXU1 Three-phase voltage measurement (1)****Table 271:** 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

Table continues on next page

IEC 61850 name	Description	Values	Scaled max. value
.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.VSMSQI1 Sequence voltage measurement (1)

Table 272: *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

## 2.6.23 LD0.XBRGGIO130 RTD input values

Table 273: *LD0.XBRGGIO130 RTD input values*

IEC 61850 name	Description	Values	Scaled max. value
LD0.XBRGGIO130			
.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

## 2.6.24 LD0.XRGGIO105 RTD input values

Table 274: *LD0.XRGGIO105 RTD input values*

IEC 61850 name	Description	Values	Scaled max. value
LD0.XRGGIO105			
.AnIn1.instMag	RTD input 1	-10000.0...10000.0	10000
.AnIn2.instMag	RTD input 2	-10000.0...10000.1	10001
.AnIn3.instMag	RTD input 3	-10000.0...10000.2	10002
.AnIn4.instMag	RTD input 4	-10000.0...10000.3	10003
.AnIn5.instMag	RTD input 5	-10000.0...10000.4	10004
.AnIn6.instMag	RTD input 6	-10000.0...10000.5	10005
.AnIn7.instMag	RTD input 7	-10000.0...10000.6	10006
.AnIn8.instMag	RTD input 8	-10000.0...10000.7	10007

**2.6.25****LD0.XRGGIO110 RTD input values****Table 275:** *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



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## Section 3

# Interoperability profile for 620 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 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**

INF	Semantics
<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**

INF	Semantics
<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**

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

**3.3.4.2****Generic functions in monitor direction**

INF	Semantics
<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>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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