

RELION® PRODUCT FAMILY

Grid Automation

REC615 and RER615

IEC 60870-5-101/104 Point List Manual





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Section 1 Introduction

1.1 This manual

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

1.2 Intended audience

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

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

1.3 Product documentation

1.3.1 Product documentation set

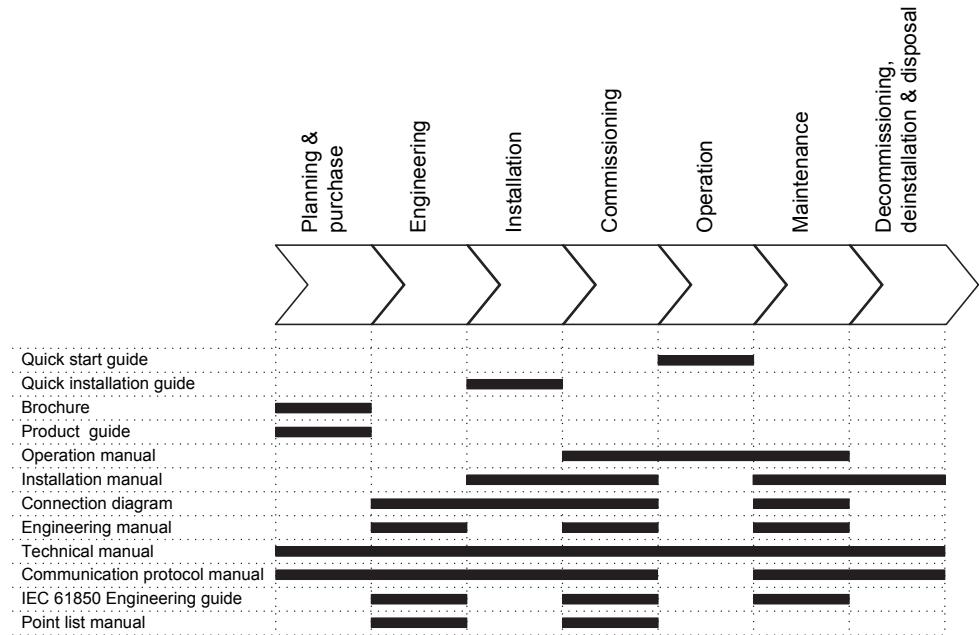


Figure 1: The intended use of documents during the product life cycle



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

1.3.2 Document revision history

Document revision/date	Product version	History
A/2018-08-31	2.0	First release
B/2019-05-31	2.0.3	Content updated to correspond to the product series version



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 60870-5-101/104 Communication Protocol Manual	1MRS758756

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.
- The example figures illustrate the IEC display variant.
- 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.

1.4.3

Functions, codes and symbols

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

Table 1: Functions included in the relays

Function	IEC 61850	IEC 60617	IEC-ANSI
Protection			
Three-phase non-directional overcurrent protection, low stage, instance 1	PHLPTOC1	3I> (1)	51P-1 (1)
	FPHLPTOC1	F3I> (1)	F51P-1 (1)
Three-phase non-directional overcurrent protection, high stage, instance 1	PHHPTOC1	3I>> (1)	51P-2 (1)
Three-phase non-directional overcurrent protection, instantaneous stage, instance 1	PHIPTOC1	3I>>> (1)	50P/51P (1)
Three-phase non-directional overcurrent protection, instantaneous stage, instance 2	PHIPTOC2	3I>>> (2)	50P/51P (2)
Three-phase directional overcurrent protection, low stage, instance 1	DPHLPDOC1	3I> -> (1)	67-1 (1)
	FDPHLPDOC1	F3I> -> (1)	F67-1 (1)
Three-phase directional overcurrent protection, low stage, instance 2	DPHLPDOC2	3I> -> (2)	67-1 (2)
	FDPHLPDOC2	F3I> -> (2)	F67-1 (2)
Three-phase directional overcurrent protection, low stage, instance 3	DPHLPDOC3	3I> -> (3)	67-1 (3)
Three-phase directional overcurrent protection, low stage, instance 4	DPHLPDOC4	3I> -> (4)	67-1 (4)
Three-phase directional overcurrent protection, high stage, instance 1	DPHHPDOC1	3I>> -> (1)	67-2 (1)
Three-phase directional overcurrent protection, high stage, instance 2	DPHHPDOC2	3I>> -> (2)	67-2 (2)
Three-phase directional overcurrent protection, high stage, instance 3	DPHHPDOC3	3I>> -> (3)	67-2 (3)
Three-phase directional overcurrent protection, high stage, instance 4	DPHHPDOC4	3I>> -> (4)	67-2 (4)
Non-directional earth-fault protection, low stage, instance 1	EFLPTOC1	Io> (1)	51N-1 (1)
	FEFLPTOC1	Flo> (1)	F51N-1 (1)
Non-directional earth-fault protection, high stage, instance 1	EFHPTOC1	Io>> (1)	51N-2 (1)
Non-directional earth-fault protection, instantaneous stage, instance 1	EFIPTOC1	Io>>> (1)	50N/51N (1)
Directional earth-fault protection, low stage, instance 1	DEFLPDEF1	Io> -> (1)	67N-1 (1)
	FDEFLPDEF1	Flo> -> (1)	F67N-1 (1)
Directional earth-fault protection, low stage, instance 2	DEFLPDEF2	Io> -> (2)	67N-1 (2)
	FDEFLPDEF2	Flo> -> (2)	F67N-1 (2)
Directional earth-fault protection, low stage, instance 3	DEFLPDEF3	Io> -> (3)	67N-1 (3)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Directional earth-fault protection, low stage, instance 4	DEFLPDEF4	Io> -> (4)	67N-1 (4)
Directional earth-fault protection, high stage, instance 1	DEFHPDEF1	Io>> -> (1)	67N-2 (1)
Directional earth-fault protection, high stage, instance 2	DEFHPDEF2	Io>> -> (2)	67N-2 (2)
Directional earth-fault protection, high stage, instance 3	DEFHPDEF3	Io>> -> (3)	67N-2 (3)
Directional earth-fault protection, high stage, instance 4	DEFHPDEF4	Io>> -> (4)	67N-2 (4)
Transient / intermittent earth-fault protection, instance 1	INTRPTEF1	Io> -> IEF (1)	67NIEF (1)
Admittance-based earth-fault protection, instance 1	EFPADM1	Yo> -> (1)	21YN (1)
Admittance-based earth-fault protection, instance 2	EFPADM2	Yo> -> (2)	21YN (2)
Admittance-based earth-fault protection, instance 3	EFPADM3	Yo> -> (3)	21YN (3)
Wattmetric-based earth-fault protection, instance 1	WPWDE1	Po> -> (1)	32N (1)
Wattmetric-based earth-fault protection, instance 2	WPWDE2	Po> -> (2)	32N (2)
Wattmetric-based earth-fault protection, instance 3	WPWDE3	Po> -> (3)	32N (3)
Harmonics-based earth-fault protection, instance 1	HAEFPTOC1	Io>HA (1)	51NHA (1)
Multifrequency admittance-based earth-fault protection, instance 1	MFADPSDE1	Io> -> Y (1)	67YN (1)
Multifrequency admittance-based earth-fault protection, instance 2	MFADPSDE2	Io> -> Y (2)	67YN (2)
Negative-sequence overcurrent protection, instance 1	NSPTOC1	I2> (1)	46 (1)
Negative-sequence overcurrent protection, instance 2	NSPTOC2	I2> (2)	46 (2)
Phase discontinuity protection, instance 1	PDNSPTOC1	I2/I1> (1)	46PD (1)
Residual overvoltage protection, instance 1	ROVPTOV1	Uo> (1)	59G (1)
Residual overvoltage protection, instance 2	ROVPTOV2	Uo> (2)	59G (2)
Three-phase undervoltage protection, instance 1	PHPTUV1	3U< (1)	27 (1)
Three-phase undervoltage protection, instance 2	PHPTUV2	3U< (2)	27 (2)
Three-phase undervoltage protection, instance 3	PHPTUV3	3U< (3)	27 (3)
Three-phase overvoltage protection, instance 1	PHPTOV1	3U> (1)	59 (1)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Three-phase overvoltage protection, instance 2	PHPTOV2	3U> (2)	59 (2)
Three-phase overvoltage protection, instance 3	PHPTOV3	3U> (3)	59 (3)
Positive-sequence undervoltage protection, instance 1	PSPTUV1	U1< (1)	47U+ (1)
Negative-sequence overvoltage protection, instance 1	NSPTOV1	U2> (1)	47O- (1)
Loss of phase (underrcurrent), instance 1	PHPTUC1	3I< (1)	37 (1)
Loss of phase (underrcurrent), instance 2	PHPTUC2	3I< (2)	37 (2)
Frequency protection, instance 1	FRPFRQ1	f>/f<,df/dt (1)	81 (1)
Frequency protection, instance 2	FRPFRQ2	f>/f<,df/dt (2)	81 (2)
Three-phase thermal protection for feeders, cables and distribution transformers, instance 1	T1PTTR1	3Ith>F (1)	49F (1)
Circuit breaker failure protection, instance 1	CCBRBRF1	3I>/Io>BF (1)	51BF/51NBF (1)
Circuit breaker failure protection, instance 2	CCBRBRF2	3I>/Io>BF (2)	51BF/51NBF (2)
Three-phase inrush detector, instance 1	INRPHAR1	3I2f> (1)	68 (1)
Master trip, instance 1	TRPPTRC1	Master Trip (1)	94/86 (1)
Master trip, instance 2	TRPPTRC2	Master Trip (2)	94/86 (2)
Multipurpose protection, instance 1	MAPGAPC1	MAP (1)	MAP (1)
Multipurpose protection, instance 2	MAPGAPC2	MAP (2)	MAP (2)
Multipurpose protection, instance 3	MAPGAPC3	MAP (3)	MAP (3)
Multipurpose protection, instance 4	MAPGAPC4	MAP (4)	MAP (4)
Multipurpose protection, instance 5	MAPGAPC5	MAP (5)	MAP (5)
Multipurpose protection, instance 6	MAPGAPC6	MAP (6)	MAP (6)
Load-shedding and restoration, instance 1	LSHDPFRQ1	UFLS/R (1)	81LSH (1)
Load-shedding and restoration, instance 2	LSHDPFRQ2	UFLS/R (2)	81LSH (2)
Fault locator, instance 1	SCEFRFLO1	FLOC (1)	21FL (1)
Three-phase power directional element, instance 1	DPSRDIR1	I1-> (1)	32P (1)
Three-phase power directional element, instance 2	DPSRDIR2	I1-> (2)	32P (2)
Power quality			
Current total demand distortion, instance 1	CMHAI1	PQM3I (1)	PQM3I (1)
Voltage total harmonic distortion, instance 1	VMHAI1	PQM3U (1)	PQM3V (1)
Voltage variation, instance 1	PHQVVR1	PQMU (1)	PQMV (1)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Voltage unbalance, instance 1	VSQVUB1	PQUUB (1)	PQVUB (1)
Control			
Circuit-breaker control, instance 1	CBXCBR1	I <-> O CB (1)	I <-> O CB (1)
Circuit-breaker control, instance 2	CBXCBR2	I <-> O CB (2)	I <-> O CB (2)
Disconnector control, instance 1	DCXSWI1	I <-> O DCC (1)	I <-> O DCC (1)
Disconnector control, instance 2	DCXSWI2	I <-> O DCC (2)	I <-> O DCC (2)
Disconnector control, instance 3	DCXSWI3	I <-> O DCC (3)	I <-> O DCC (3)
Disconnector control, instance 4	DCXSWI4	I <-> O DCC (4)	I <-> O DCC (4)
Disconnector control, instance 5	DCXSWI5	I <-> O DCC (5)	I <-> O DCC (5)
Disconnector control, instance 6	DCXSWI6	I <-> O DCC (6)	I <-> O DCC (6)
Disconnector control, instance 7	DCXSWI7	I <-> O DCC (7)	I <-> O DCC (7)
Disconnector control, instance 8	DCXSWI8	I <-> O DCC (8)	I <-> O DCC (8)
Disconnector position indication, instance 1	DCSXSWI1	I <-> O DC (1)	I <-> O DC (1)
Disconnector position indication, instance 2	DCSXSWI2	I <-> O DC (2)	I <-> O DC (2)
Earthing switch indication, instance 1	ESSXSWI1	I <-> O ES (1)	I <-> O ES (1)
Earthing switch indication, instance 2	ESSXSWI2	I <-> O ES (2)	I <-> O ES (2)
Earthing switch indication, instance 3	ESSXSWI3	I <-> O ES (3)	I <-> O ES (3)
Earthing switch indication, instance 4	ESSXSWI4	I <-> O ES (4)	I <-> O ES (4)
Earthing switch indication, instance 5	ESSXSWI5	I <-> O ES (5)	I <-> O ES (5)
Earthing switch indication, instance 6	ESSXSWI6	I <-> O ES (6)	I <-> O ES (6)
Earthing switch indication, instance 7	ESSXSWI7	I <-> O ES (7)	I <-> O ES (7)
Earthing switch indication, instance 8	ESSXSWI8	I <-> O ES (8)	I <-> O ES (8)
Autoreclosing, instance 1	DARREC1	O -> I (1)	79 (1)
Autoreclosing, instance 2	DARREC2	O -> I (2)	79 (2)
Synchronism and energizing check, instance 1	SECRSYN1	SYNC (1)	25 (1)
Automatic transfer switch, instance 1	ATSABTC1	ATSABTC1	ATSABTC1
Condition monitoring			
Circuit-breaker condition monitoring, instance 1	SSCBR1	CBCM (1)	CBCM (1)
Circuit-breaker condition monitoring, instance 2	SSCBR2	CBCM (2)	CBCM (2)
Trip circuit supervision, instance 1	TCSSCBR1	TCS (1)	TCM (1)
Trip circuit supervision, instance 2	TCSSCBR2	TCS (2)	TCM (2)
Fuse failure supervision, instance 1	SEQSPVC1	FUSEF (1)	60 (1)
Fuse failure supervision, instance 2	SEQSPVC2	FUSEF (1)	60 (1)
Runtime counter for machines and devices, instance 1	MDOPT1	OPTS (1)	OPTM (1)
Voltage presence, instance 1	PHSVPR1	PHSVPR(1)	PHSVPR(1)
Voltage presence, instance 2	PHSVPR2	PHSVPR(2)	PHSVPR(2)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Measurement			
Three-phase current measurement, instance 1	CMMXU1	3I (1)	3I (1)
Three-phase current measurement, instance 2	CMMXU2	3I (2)	3I (2)
Sequence current measurement, instance 1	CSMSQI1	I1, I2, I0 (1)	I1, I2, I0 (1)
Sequence current measurement, instance 2	CSMSQI2	I1, I2, I0 (2)	I1, I2, I0 (2)
Residual current measurement, instance 1	RESCMMXU1	Io (1)	In (1)
Three-phase voltage measurement, instance 1	VMMXU1	3U (1)	3V (1)
Three-phase voltage measurement, instance 2	VMMXU2	3U (2)	3V (2)
Residual voltage measurement, instance 1	RESVMMXU1	Uo (1)	Vn (1)
Sequence voltage measurement, instance 1	VSMSQI1	U1, U2, U0 (1)	V1, V2, V0 (1)
Sequence voltage measurement, instance 2	VSMSQI2	U1, U2, U0 (2)	V1, V2, V0 (2)
Three-phase power and energy measurement, instance 1	PEMMXU1	P, E (1)	P, E (1)
Three-phase power and energy measurement, instance 2	PEMMXU2	P, E (2)	P, E (2)
Single-phase power and energy measurement, instance 1	SPEMMXU1	SP, SE (1)	SP, SE (1)
Single-phase power and energy measurement, instance 2	SPEMMXU2	SP, SE (2)	SP, SE (2)
Frequency measurement, instance 1	FMMXU1	f (1)	f (1)
Frequency measurement, instance 2	FMMXU2	f (2)	f (2)
Load profile record, instance 1	LDPRLRC1	LOADPROF (1)	LOADPROF (1)
Other			
Minimum pulse timer (2 pcs), instance 1	TPGAPC1	TP (1)	TP (1)
Minimum pulse timer (2 pcs), instance 2	TPGAPC2	TP (2)	TP (2)
Minimum pulse timer (2 pcs, second resolution), instance 1	TPSGAPC1	TPS (1)	TPS (1)
Minimum pulse timer (2 pcs, minute resolution), instance 1	TPMGAPC1	TPM (1)	TPM (1)
Pulse timer (8 pcs), instance 1	PTGAPC1	PT (1)	PT (1)
Pulse timer (8 pcs), instance 2	PTGAPC2	PT (2)	PT (2)
Time delay off (8 pcs), instance 1	TOFGAPC1	TOF (1)	TOF (1)
Time delay off (8 pcs), instance 2	TOFGAPC2	TOF (2)	TOF (2)
Time delay on (8 pcs), instance 1	TONGAPC1	TON (1)	TON (1)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Time delay on (8 pcs), instance 2	TONGAPC2	TON (2)	TON (2)
Set-reset (8 pcs), instance 1	SRGAPC1	SR (1)	SR (1)
Set-reset (8 pcs), instance 2	SRGAPC2	SR (2)	SR (2)
Move (8 pcs), instance 1	MVGAPC1	MV (1)	MV (1)
Move (8 pcs), instance 2	MVGAPC2	MV (2)	MV (2)
Move (8 pcs), instance 3	MVGAPC3	MV (3)	MV (3)
Move (8 pcs), instance 4	MVGAPC4	MV (4)	MV (4)
Move (8 pcs), instance 5	MVGAPC5	MV (5)	MV (5)
Move (8 pcs), instance 6	MVGAPC6	MV (6)	MV (6)
Move (8 pcs), instance 7	MVGAPC7	MV (7)	MV (7)
Move (8 pcs), instance 8	MVGAPC8	MV (8)	MV (8)
Generic control point (16 pcs), instance 1	SPCGAPC1	SPC (1)	SPC (1)
Generic control point (16 pcs), instance 2	SPCGAPC2	SPC (2)	SPC (2)
Remote generic control points, instance 1	SPCRGAPC1	SPCR (1)	SPCR (1)
Local generic control points, instance 1	SPCLGAPC1	SPCL (1)	SPCL (1)
Generic up-down counters, instance 1	UDFCNT1	UDCNT (1)	UDCNT (1)
Generic up-down counters, instance 2	UDFCNT2	UDCNT (2)	UDCNT (2)
Generic up-down counters, instance 3	UDFCNT3	UDCNT (3)	UDCNT (3)
Analog value scaling, instance 1	SCA4GAPC1	SCA4 (1)	SCA4 (1)
Analog value scaling, instance 2	SCA4GAPC2	SCA4 (2)	SCA4 (2)
Analog value scaling, instance 3	SCA4GAPC3	SCA4 (3)	SCA4 (3)
Analog value scaling, instance 4	SCA4GAPC4	SCA4 (4)	SCA4 (4)
Analog value scaling, instance 5	SCA4GAPC5	SCA4 (5)	SCA4 (5)
Analog value scaling, instance 6	SCA4GAPC6	SCA4 (6)	SCA4 (6)
Analog value scaling, instance 7	SCA4GAPC7	SCA4 (7)	SCA4 (7)
Analog value scaling, instance 8	SCA4GAPC8	SCA4 (8)	SCA4 (8)
Analog value scaling, instance 9	SCA4GAPC9	SCA4 (9)	SCA4 (9)
Analog value scaling, instance 10	SCA4GAPC10	SCA4 (10)	SCA4 (10)
Analog value scaling, instance 11	SCA4GAPC11	SCA4 (11)	SCA4 (11)
Analog value scaling, instance 12	SCA4GAPC12	SCA4 (12)	SCA4 (12)
Integer value move, instance 1	MVI4GAPC1	MVI4 (1)	MVI4 (1)
Integer value move, instance 2	MVI4GAPC2	MVI4 (2)	MVI4 (2)
Daily timer function, instance 1	DTMGAPC1	DTMGAPC1	DTMGAPC1
Daily timer function, instance 2	DTMGAPC2	DTMGAPC2	DTMGAPC2
Programmable buttons (4 buttons)	FKEY4GGIO1	FKEY4GGIO1	FKEY4GGIO1

Table continues on next page

Function	IEC 61850	IEC 60617	IEC-ANSI
Logging functions			
Disturbance recorder	RDRE1	DR (1)	DFR (1)
Fault record	FLTRFRC1	FAULTREC (1)	FAULTREC (1)

Section 2 IEC 60850-5-101/104 data mappings

2.1 Overview

This document describes the IEC 60870-5-101/IEC 60870-5-104 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 REC615

Table 2: Supported functions

Function	IEC 61850	A	B	C	E	F	G	H
	CE01	CE02	CE03	CE04	CE05	CE06	CE07	
Protection								
Three-phase non-directional overcurrent protection, low stage	PHLPTOC	(1)	(1)	(1)	(1)			
	FPHLPTOC	(1)	(1)	(1)	(1)			
Three-phase non-directional overcurrent protection, high stage	PHHPTOC	(1)	(1)	(1)	(1)			
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC	1	1	1	1	1	2 ¹⁴⁾	2 ¹⁴⁾
Three-phase directional overcurrent protection, low stage	DPHLPDOC	(2)	(2)	(2)	(2)	2 ¹⁾	4 ¹⁾²⁾³⁾	4 ¹⁾²⁾³⁾
	FDPHLPDOC	(2)	(2)	(2)	(2)			
Three-phase directional overcurrent protection, high stage	DPHPDOC	(1)	(1)	(1)	(1)	2 ¹⁾	4 ¹⁾²⁾³⁾	4 ¹⁾²⁾³⁾
Non-directional earth-fault protection, low stage	EFLPTOC	(1)	(1)	(1)	(1) ⁴⁾			
	FEFLPTOC	(1)	(1)	(1)	(1) ⁴⁾			
Non-directional earth-fault protection, high stage	EFHPTOC	(1)	(1)	(1)	(1) ⁴⁾			
Non-directional earth-fault protection, instantaneous stage	EFIPTOC	1	1	1	1 ⁴⁾	1	1	1
Directional earth-fault protection, low stage	DEFLPDEF	(2) ⁵⁾	(2) ⁵⁾	(2) ⁵⁾	(2) ⁴⁾⁵⁾	2 ¹⁾	4 ¹⁾²⁾³⁾	4 ¹⁾²⁾³⁾
	FDEFLPDEF	(2) ⁵⁾	(2) ⁵⁾	(2) ⁵⁾	(2) ⁴⁾⁵⁾		6)7)8)	6)7)8)
Directional earth-fault protection, high stage	DEFHPDEF	(1) ⁵⁾	(1) ⁵⁾	(1) ⁵⁾	(1) ⁴⁾⁵⁾	2 ¹⁾	4 ¹⁾²⁾³⁾	4 ¹⁾²⁾³⁾
Table continues on next page								

Section 2

IEC 60850-5-101/104 data mappings

1MRS758759 B

Function	IEC 61850	A CE01	B CE02	C CE03	E CE04	F CE05	G CE06	H CE07
Transient / intermittent earth-fault protection	INTRPTEF	(1) ⁵⁾	(1) ⁵⁾	(1) ⁵⁾	(1) ⁴⁾⁵⁾			
Admittance-based earth-fault protection ⁵⁾	EFPADM	(3) ⁵⁾	(3) ⁵⁾	(3) ⁵⁾	(3) ⁴⁾⁵⁾			
Wattmetric-based earth-fault protection ⁵⁾	WPWDE	(3) ⁵⁾	(3) ⁵⁾	(3) ⁵⁾	(3) ⁴⁾⁵⁾			
Harmonics-based earth-fault protection ⁵⁾	HAEFPTOC	(1)	(1)	(1)	(1) ⁴⁾			
Multifrequency admittance-based earth-fault protection	MFADPSDE	(1) ⁵⁾	(1) ⁵⁾	(1) ⁵⁾	(1) ⁴⁾⁵⁾	1 ¹⁾	2 ^{1)9)10)11)}	2 ^{1)9)10)11)}
Negative-sequence overcurrent protection	NSPTOC	2	2	2	2			
Phase discontinuity protection	PDNSPTOC	1	1	1	1	1	1	1
Residual overvoltage protection	ROVPTOV	(1) ⁵⁾	(2) ^{9)10)}	(1) ⁵⁾	(2) ^{9)10)}	1 ¹⁾	2 ^{1)9)10)}	2 ^{1)9)10)}
Three-phase undervoltage protection	PHPTUV	(3)	(3) ¹²⁾	(3)	(3) ¹²⁾	1 ¹⁾	2 ¹⁾¹³⁾	2 ¹⁾¹³⁾
Three-phase overvoltage protection	PHPTOV	(3)	(3) ¹²⁾	(3)	(3) ¹²⁾	1 ¹⁾	2 ¹⁾¹³⁾	2 ¹⁾¹³⁾
Positive-sequence undervoltage protection	PSPTUV	(1)	(1)	(1)	(1)			
Negative-sequence overvoltage protection	NSPTOV	(1)	(1)	(1)	(1)			
Loss of phase (undercurrent)	PHPTUC						2 ¹⁴⁾	2 ¹⁴⁾
Frequency protection	FRPFRQ	(2)	(2)	(2)	(2)	1 ¹⁾	2 ¹⁾¹³⁾	2 ¹⁾¹³⁾
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR	1	1	1	1	1	1	1
Circuit breaker failure protection	CCBRBRF	2	2	2	2 ⁴⁾	1	2 ¹¹⁾¹⁴⁾	2 ¹¹⁾¹⁴⁾
Three-phase inrush detector	INRPHAR	1	1	1	1	1	1	1
Master trip	TRPPTRC	2	2	2	2	2	2	2
Multipurpose protection ¹⁵⁾	MAPGAPC	6	6	6	6	2	2	2
Load-shedding and restoration	LSHDPFRQ	(1)	(1)	(1)	(1)	1 ¹⁾	2 ¹⁾¹³⁾	2 ¹⁾¹³⁾
Fault locator	SCEFRRFLO	(1)	(1)	(1)	(1)	1 ¹⁾	1 ¹⁾	1 ¹⁾
Three-phase power directional element	DPSRDIR	1	1	1	1	1	2	2
Power quality								
Current total demand distortion	CMHAI	(1)	(1)	(1)	(1)			
Voltage total harmonic distortion	VMHAI	(1)	(1)	(1)	(1)			
Voltage variation	PHQVVR	(1)	(1)	(1)	(1)			
Voltage unbalance	VSQVUB	(1)	(1)	(1)	(1)			
Control								
Circuit-breaker control	CBXCBR	2	2	2	2	1	2	2
Disconnecter control	DCXSWI	8	8	8	8	4	8	8
Disconnecter position indication	DCSXSWI	2	2	2	2	1	2	2
Earthing switch indication	ESSXSWI	8	8	8	8	4	8	8
Autoreclosing	DARREC	(1)	(1)	(1)	(1)	1 ¹⁾	2 ¹⁾	2 ¹⁾
Synchronism and energizing check	SECRSYN		1		1	1		
Automatic transfer switch	ATSABTC	(1)	(1)	(1)	(1)	1 ¹⁾	1 ¹⁾	1 ¹⁾
Condition monitoring								
Table continues on next page								

Function	IEC 61850	A CE01	B CE02	C CE03	E CE04	F CE05	G CE06	H CE07
Circuit-breaker condition monitoring	SSCBR	2	2	2	2	1	$2^{14})$	$2^{14})$
Trip circuit supervision	TCSSCBR	2	2	2	2	2	2	2
Fuse failure supervision	SEQSPVC	1	1	1	1	1	$2^{13})^{14})$	$2^{13})^{14})$
Runtime counter for machines and devices	MDSOPT	1	1	1	1			
Voltage presence	PHSVPR	1	$2^{13})$	1	$2^{13})$	1	$2^{13})$	$2^{13})$
Measurement								
Three-phase current measurement	CMMXU	1	1	1	1	1	$2^{14})$	$2^{14})$
Sequence current measurement	CSMSQI	1	1	1	1	1	$2^{14})$	$2^{14})$
Residual current measurement	RESCMMXU	1	1	1		1	1	1
Three-phase voltage measurement	VMMXU	1	$2^{13})$	1	$2^{13})$	$2^{13})$	$2^{13})$	$2^{13})$
Residual voltage measurement	RESVMMXU					1		
Sequence voltage measurement	VSMSQI	1	$2^{13})$	1	$2^{13})$		$2^{13})$	$2^{13})$
Three-phase power and energy measurement	PEMMXU	1	1	1	1	1	$2^{13})^{14})$	$2^{13})^{14})$
Single-phase power and energy measurement	SPEMMXU	1	1	1	1	1	$2^{13})^{14})$	$2^{13})^{14})$
Frequency measurement	FMMXU	1	$2^{13})$	1	$2^{13})$	1	$2^{13})$	$2^{13})$
Load profile record	LDPRLRC	1	1	1	1	1	1	1
Other								
Minimum pulse timer (2 pcs)	TPGAPC	2	2	2	2	2	2	2
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	1	1	1	1	1	1	1
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	1	1	1	1	1	1	1
Pulse timer (8 pcs)	PTGAPC	2	2	2	2	2	2	2
Time delay off (8 pcs)	TOFGAPC	2	2	2	2	2	2	2
Time delay on (8 pcs)	TONGAPC	2	2	2	2	2	2	2
Set-reset (8 pcs)	SRGAPC	2	2	2	2	2	2	2
Move (8 pcs)	MVGAPC	8	8	8	8	8	8	8
Generic control point (16 pcs)	SPCGAPC	2	2	2	2	2	2	2
Remote generic control points	SPCRGAPC	1	1	1	1	1	1	1
Local generic control points	SPCLGAPC	1	1	1	1	1	1	1
Generic up-down counters	UDFCNT	3	3	3	3	3	3	3
Analog value scaling	SCA4GAPC	12	12	12	12	12	12	12
Integer value move	MVI4GAPC	2	2	2	2	2	2	2
Daily timer function	DTMGAPC	2	2	2	2	2	2	2
Programmable buttons (4 buttons)	FKEY4GGIO	1	1	1	1	1	1	1
Logging functions								
Disturbance recorder	RDRE	1	1	1	1	1	1	1
Fault record	FLTRFRC	1	1	1	1	1	1	1
1, 2, ... = number of included instances () = optional								

- 1) Specific functional package to be selected for functional package 1 (G,H), 2 (C,D) and 3 (D)
 2) Voltage group B always used with the third and fourth instances

- 3) Current group B always used with the third and fourth instances
- 4) Io calculated is always used
- 5) Uo calculated is always used
- 6) Uo calculated is always used with the first and second instances
- 7) UoB calculated is always used with the third and fourth instances
- 8) IoB calculated is always used with the third and fourth instances
- 9) Uo calculated is always used with the first instance
- 10) UoB calculated is always used with the second instance
- 11) IoB calculated is always used with the second instance
- 12) Voltage group B always used with the third instance
- 13) Voltage group B always used with the second instance
- 14) Current group B always used with the second instance
- 15) UoB calculated is always used

2.2.2 Supported functions in RER615

Table 3: Supported functions

Function	IEC 61850	IEC 60617	IEC-ANSI	A	D	E
Protection						
Three-phase non-directional overcurrent protection, low stage	PHLPTOC	3I>	51P-1	(1)	(1)	(1)
	FPHLPTOC	F3I>	F51P-1	(1)	(1)	(1)
Three-phase non-directional overcurrent protection, high stage	PHHPTOC	3I>>	51P-2	(1)	(1)	(1)
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC	3I>>>	50P/51P	1	1	1
Three-phase directional overcurrent protection, low stage	DPHLPDOC	3I> ->	67-1	(2)	(2)	(2)
	FDPHPDOC	F3I> ->	F67-1	(2)	(2)	(2)
Three-phase directional overcurrent protection, high stage	DPHPDOC	3I>> ->	67-2	(1)	(1)	(1)
Non-directional earth-fault protection, low stage	EFLPTOC	Io>	51N-1	(1)	(1)	(1) ¹⁾
	FEFLPTOC	Flo>	F51N-1	(1)	(1)	(1) ¹⁾
Non-directional earth-fault protection, high stage	EFHPTOC	Io>>	51N-2	(1)	(1)	(1) ¹⁾
Non-directional earth-fault protection, instantaneous stage	EFIPTOC	Io>>>	50N/51N	1	1	1 ¹⁾
Directional earth-fault protection, low stage	DEFLPDEF	Io> ->	67N-1	(2) ²⁾	(2) ²⁾	(2) ¹⁾²⁾
	FDEFLPDEF	Flo> ->	F67N-1	(2) ²⁾	(2) ²⁾	(2) ¹⁾²⁾
Directional earth-fault protection, high stage	DEFHPDEF	Io>> ->	67N-2	(1) ²⁾	(1) ²⁾	(1) ¹⁾²⁾
Transient / intermittent earth-fault protection	INTRPTEF	Io> -> IEF	67NIEF	(1) ²⁾	(1) ²⁾	(1) ¹⁾²⁾
Admittance-based earth-fault protection	EFPADM	Yo> ->	21YN	(3) ²⁾	(3) ²⁾	(3) ¹⁾²⁾
Wattmetric-based earth-fault protection	WPWDE	Po> ->	32N	(3) ²⁾	(3) ²⁾	(3) ¹⁾²⁾
Harmonics-based earth-fault protection	HAEFPTOC	Io>HA	51NHA	(1)	(1)	(1) ¹⁾
Multifrequency admittance-based earth-fault protection	MFADPSDE	Io> -> Y	67YN	(1) ²⁾	(1) ²⁾	(1) ¹⁾²⁾
Negative-sequence overcurrent protection	NSPTOC	I2>	46	2	2	2
Table continues on next page						

Function	IEC 61850	IEC 60617	IEC-ANSI	A	D	E
				RE01	RE02	RE03
Phase discontinuity protection	PDNSPTOC	I2/I1>	46PD	1	1	1
Residual overvoltage protection	ROVPTOV	Uo>	59G	(1) ²⁾	(2) ³⁾⁴⁾	(2) ³⁾⁴⁾
Three-phase undervoltage protection	PHPTUV	3U<	27	(3)	(3) ⁵⁾	(3) ⁵⁾
Three-phase overvoltage protection	PHPTOV	3U>	59	(3)	(3) ⁵⁾	(3) ⁵⁾
Positive-sequence undervoltage protection	PSPTUV	U1<	47U+	(1)	(1)	(1)
Negative-sequence overvoltage protection	NSPTOV	U2>	47O-	(1)	(1)	(1)
Frequency protection	FRPFRQ	f>/f<,df/dt	81	(2)	(2)	(2)
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR	3lth>F	49F	1	1	1
Circuit breaker failure protection	CCBRBRF	3l>/lo>BF	51BF/51NBF	2	2	2 ¹⁾
Three-phase inrush detector	INRPHAR	3I2f>	68	1	1	1
Master trip	TRPPTRC	Master Trip	94/86	2	2	2
Multipurpose protection	MAPGAPC	MAP	MAP	6	6	6
Load-shedding and restoration	LSDHPFRQ	UFLS/R	81LSH	(1)	(1)	(1)
Fault locator	SCEFRFLO	FLOC	21FL	(1)	(1)	(1)
Three-phase power directional element	DPSRDIR	I1->	32P	1	1	1
Power quality						
Current total demand distortion	CMHAI	PQM3I	PQM3I	(1)	(1)	(1)
Voltage total harmonic distortion	VMHAI	PQM3U	PQM3V	(1)	(1)	(1)
Voltage variation	PHQVVR	PQMU	PQMV	(1)	(1)	(1)
Voltage unbalance	VSQVUB	PQUUB	PQVUB	(1)	(1)	(1)
Control						
Circuit-breaker control	CBXCBR	I <-> O CB	I <-> O CB	2	2	2
Disconnecter control	DCXSXI	I <-> O DCC	I <-> O DCC	8	8	8
Disconnecter position indication	DCSXSWI	I <-> O DC	I <-> O DC	2	2	2
Earthing switch indication	ESSXSWI	I <-> O ES	I <-> O ES	8	8	8
Autoreclosing	DARREC	O -> I	79	1	1	1
Synchronization and energizing check	SECRSYN	SYNC	25		1	1
Automatic transfer switch	ATSABTC	ATSABTC1	ATSABTC1	(1)	(1)	(1)
Condition monitoring						
Circuit-breaker condition monitoring	SSCBR	CBCM	CBCM	2	2	2
Trip circuit supervision	TCSSCBR	TCS	TCM	2	2	2
Fuse failure supervision	SEQSPVC	FUSEF	60	1	1	1
Runtime counter for machines and devices	MDSOPT	OPTS	OPTM	1	1	1
Voltage presence	PHSVPR	PHSVPR	PHSVPR	1	2 ⁶⁾	2 ⁶⁾
Measurement						
Three-phase current measurement	CMMXU	3I	3I	1	1	1
Sequence current measurement	CSMSQI	I1, I2, I0	I1, I2, I0	1	1	1
Residual current measurement	RESCMMXU	Io	In	1	1	

Table continues on next page

Section 2

IEC 60850-5-101/104 data mappings

1MRS758759 B

Function	IEC 61850	IEC 60617	IEC-ANSI	A	D	E
				RE01	RE02	RE03
Three-phase voltage measurement	VMMXU	3U	3V	1	$2^6)$	$2^6)$
Sequence voltage measurement	VSMSQI	U1, U2, U0	V1, V2, V0	1	$2^6)$	$2^6)$
Three-phase power and energy measurement	PEMMXU	P, E	P, E	1	1	1
Single-phase power and energy measurement	SPEMMXU	SP, SE	SP, SE	1	1	1
Frequency measurement	FMMXU	f	f	1	$2^6)$	$2^6)$
Load profile record	LDPRLRC	LOADPROF	LOADPROF	1	1	1
Other						
Minimum pulse timer (2 pcs)	TPGAPC	TP	TP	2	2	2
Minimum pulse timer (2 pcs, second resolution)	TPSGAPC	TPS	TPS	1	1	1
Minimum pulse timer (2 pcs, minute resolution)	TPMGAPC	TPM	TPM	1	1	1
Pulse timer (8 pcs)	PTGAPC	PT	PT	2	2	2
Time delay off (8 pcs)	TOFGAPC	TOF	TOF	2	2	2
Time delay on (8 pcs)	TONGAPC	TON	TON	2	2	2
Set-reset (8 pcs)	SRGAPC	SR	SR	2	2	2
Move (8 pcs)	MVGAPC	MV	MV	8	8	8
Generic control point (16 pcs)	SPCGAPC	SPC	SPC	2	2	2
Remote generic control points	SPCRGAPC	SPCR	SPCR	1	1	1
Local generic control points	SPCLGAPC	SPCL	SPCL	1	1	1
Generic up-down counters	UDFCNT	UDCNT	UDCNT	3	3	3
Analog value scaling	SCA4GAPC	SCA4	SCA4	12	12	12
Integer value move	MVI4GAPC	MVI4	MVI4	2	2	2
Daily timer function	DTMGAPC	DTMGAPC1	DTMGAPC1	2	2	2
Programmable buttons (4 buttons)	FKEY4GGIO	FKEY4GGIO 1	FKEY4GGIO 1	1	1	1
Logging functions						
Disturbance recorder	RDRE	DR	DFR	1	1	1
Fault record	FLTRFRC	FAULTREC	FAULTREC	1	1	1
1, 2, ... = number of included instances () = optional						

- 1) Io calculated is always used
- 2) Uo calculated is always used
- 3) Uo calculated is always used with the first instance
- 4) UoB calculated is always used with the second instance
- 5) Voltage group B is always used with the third instance
- 6) Voltage group B is always used with the second instance

2.3 Indications

2.3.1 Supported ASDU types

The Object type column contains an internal type identification for the data objects. Internal object types in turn can be configured into different IEC 60870-5-101/104 ASDU data types.

Table 4: Supported ASDU types in monitoring direction

Object type	Description	IEC 60870-5-101/104 ASDU alternatives			
		Interrogated		Change event	
		ASDU	Type string	ASDU	Type string
1	One bit digital input	1	M_SP_NA_1	2	M_SP_TA_1 ¹⁾
				30	M_SP_TB_1 ²⁾
		3	M_DP_NA_1	4	M_DP_TA_1 ¹⁾
				31	M_DP_TB_1 ²⁾

- 1) Requires setting parameter *Time Format* to be in mode “Short 24 bits”
- 2) Requires setting parameter *Time Format* to be in mode “Full 56 bits”

2.3.2 General device data

Table 5: General device data

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.LLN0			
1	10	.Loc.stVal		Local state	1=Local
		LD.LDEV1			
1	900	.StLstOv.stVal		Internal stat values overflow	1=Overflow
1	901	.MeasLstOv.stVal		Internal meas values overflow	1=Overflow
1	902	.ChgFlg.stVal		Composition changed	1=Changed
		DR.RDRE1			
1	12	.RcdMade.stVal		DR recording made	1=Made
		LD0.GSELPRT1			
1	15	.Alm.stVal		Goose alarm	1=Alarm
		LD0.LDEV1			
1	20	.DevWrn.stVal		Warning (one bit)	1=Warning
1	30	.DevFail.stVal		IRF (one bit)	1=Internal fault
		LD0.LLN0			
1	40001	.ActSetGr.stVal		Setting group 1 in use	1=In Use
1	40002	.ActSetGr.stVal		Setting group 2 in use	1=In Use
1	40003	.ActSetGr.stVal		Setting group 3 in use	1=In Use

Table continues on next page

Object type	Addr	IEC 61850 name	SA name	Description	Values
1	40004	.ActSetGr.stVal		Setting group 4 in use	1=In Use
1	40005	.ActSetGr.stVal		Setting group 5 in use	1=In Use
1	40006	.ActSetGr.stVal		Setting group 6 in use	1=In Use

2.3.3 LD0.ATSABTC1 Automatic transfer switch (1)

Table 6: LD0.ATSABTC1 Automatic transfer switch (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.ATSABTC1			
1	200	.OpOpn1.general	OPEN_CB1	CB open Bus 1	1=Open
1	201	.OpCls1.general	CLOSE_CB1	CB close Bus 1	1=Close
1	202	.OpOpn2.general	OPEN_CB2	CB open Bus 2	1=Open
1	203	.OpCls2.general	CLOSE_CB2	CB close Bus 2	1=Close
1	204	.TrnBlkAlm.stVal	BLKD_AL	ATS blocked alarm	1=Alarm
1	205	.PrgAuto.stVal	INPRO	Automatic operation in progress	1=Auto

2.3.4 CTRL.Cxxxxx1 Circuit breaker - CB object and failure protection (1)

Table 7: CTRL.Cxxxxx1 Circuit breaker - CB object and failure protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.CBCILO1			
1	3000	.EnaCls.stVal	ENA_CLOSE	Close enabled	1=Enabled
1	3001	.EnaOpn.stVal	ENA_OPEN	Open enabled	1=Enabled
		CTRL.CBCSWI1			
2	7001	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3
1	3003	.Pos.stSelD	SELECTED	CB selected	1=Selected
1	3002	.SynIntlByps.stVal	SYNC_ITL_BYP	Interlocking bypass	1=Bypassed
		CTRL.CBCXCBR1			
1	3004	.BlkCls.stVal	BLK_CLOSE	Close blocked	1=Blocked
1	3005	.BlkOpn.stVal	BLK_OPEN	Open blocked	1=Blocked
		CTRL.CCBRBFRF1			
1	3008	.OpEx.general	TRBU	Failure ext.trip	1=Failure
1	3009	.OpIn.general	TRRET	Operate, re-trip	1=Operate
1	3010	.Str.general	CB_FAULT_AL	Start, timer running	1=Start

2.3.5

CTRL.Cxxxx2 Circuit breaker - CB object and failure protection (2)

Table 8: CTRL.Cxxxx2 Circuit breaker - CB object and failure protection (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.CBCILO2			
1	3012	.EnaCls.stVal	ENA_CLOSE	Close enabled	1=Enabled
1	3013	.EnaOpn.stVal	ENA_OPEN	Open enabled	1=Enabled
		CTRL.CBCSWI2			
2	7002	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3
1	3015	.Pos.stSelD	SELECTED	CB selected	1=Selected
1	3014	.SynlItlByps.stVal	SYNC_ITL_BYP	Interlocking bypass	1=Bypassed
		CTRL.CBCXCBR2			
1	3016	.BlkCls.stVal	BLK_CLOSE	Close blocked	1=Blocked
1	3017	.BlkOpn.stVal	BLK_OPEN	Open blocked	1=Blocked
		CTRL.CCBRBRF2			
1	3020	.OpEx.general	TRBU	Failure ext.trip	1=Failure
1	3021	.OpIn.general	TRRET	Operate, re-trip	1=Operate
1	3022	.Str.general	CB_FAULT_AL	Start, timer running	1=Start

2.3.6

LD0.CMHAI1 Current total demand distortion (1)

Table 9: LD0.CMHAI1 Current total demand distortion (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.CMHAI1			
1	3086	.Alm.stVal	ALARM		1=Alarm

2.3.7

LD0.CMMXU1 Three-phase current measurement (1)

Table 10: LD0.CMMXU1 Three-phase current measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.CMMXU1			
1	4701	.HiAlm.stVal	HIGH_ALARM	High alarm	1=Alarm
1	4702	.HiWrn.stVal	HIGH_WARN	High warning	1=Warning
1	4703	.LoWrn.stVal	LOW_WARN	Low warning	1=Warning
1	4704	.LoAlm.stVal	LOW_ALARM	Low alarm	1=Alarm

2.3.8

LD0.CMMXU2 Three-phase current measurement (2)

Table 11: LD0.CMMXU2 Three-phase current measurement (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.CMMXU2			
1	4705	.HiAlm.stVal	HIGH_ALARM	High alarm	1=Alarm
1	4706	.HiWrn.stVal	HIGH_WARN	High warning	1=Warning
1	4707	.LoWrn.stVal	LOW_WARN	Low warning	1=Warning
1	4708	.LoAlm.stVal	LOW_ALARM	Low alarm	1=Alarm

2.3.9

LD0.DARREC1 Autoreclosing (1)

Table 12: LD0.DARREC1 Autoreclosing (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DARREC1			
1	2806	.SucRec.stVal	SUC_RECL	Succesful reclose	1=Succesful
1	2819	.AutoRecOn.stVal	AR_ON	AR on/off	1=On
1	2801	.PrgRec1.stVal	INPRO_1	AR 1st reclose	1=In progress
1	2802	.PrgRec2.stVal	INPRO_2	AR 2nd reclose	1=In progress
1	2803	.PrgRec3.stVal	INPRO_3	AR 3rd reclose	1=In progress
1	2804	.PrgRec4.stVal	INPRO_4	AR 4th reclose	1=In progress
1	2805	.PrgRec5.stVal	INPRO_5	AR 5th reclose	1=In progress
1	2800	.PrgRec.stVal	INPRO	AR in progress	1=In progress
1	2814	.CBManCls.stVal	MAN_CB_CL	CB manually closed	1=CB closed
1	2808	.LO.stVal	LOCKED	Lockout status	1=Lockout
1	2807	.UnsRec.stVal	UNSUC_RECL	Reclose fail status	1=Failed
1	2809	.RdyRec.stVal	READY	Ready reclose status	1=Ready
1	2810	.ActRec.stVal	ACTIVE	Active reclose status	1=Active
1	2811	.PrgDsr.stVal	DISCR_INPRO	Discrimination time inpro.	1=In progress
1	2812	.PrgCutOut.stVal	CUTOUT_INPRO	Cutout time in progress	1=In progress
1	2813	.FrqOpAlm.stVal	FRQ_OP_ALM	Frequent operation alarm	1=Alarm
1	2815	.OpCls.general	CLOSE_CB	Operate (close XCBR)	1=Close CB
1	2816	.OpOpn.general	OPEN_CB	Operate (open XCBR)	1=Open CB
1	2817	.UnsCBCls.stVal	UNSUC_CB	CB closing failed	1=Failed
1	2818	.WtMstr.stVal	CMD_WAIT	Master signal to follower	1=Signal

2.3.10

LD0.DARREC2 Autoreclosing (2)

Table 13: LD0.DARREC2 Autoreclosing (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DARREC2			
1	2826	.SucRec.stVal	SUC_RECL	Succesful reclose	1=Success
1	2839	.AutoRecOn.stVal	AR_ON	AR on/off	1=On
1	2821	.PrgRec1.stVal	INPRO_1	AR 1st reclose	1=In progress
1	2822	.PrgRec2.stVal	INPRO_2	AR 2nd reclose	1=In progress
1	2823	.PrgRec3.stVal	INPRO_3	AR 3rd reclose	1=In progress
1	2824	.PrgRec4.stVal	INPRO_4	AR 4th reclose	1=In progress
1	2825	.PrgRec5.stVal	INPRO_5	AR 5th reclose	1=In progress
1	2820	.PrgRec.stVal	INPRO	AR in progress	1=In progress
1	2814	.CBManClIs.stVal	MAN_CB_CL	CB manually closed	1=CB closed
1	2828	.LO.stVal	LOCKED	Lockout status	1=Lockout
1	2827	.UnsRec.stVal	UNSUC_RECL	Reclose fail status	1=Failed
1	2829	.RdyRec.stVal	READY	Ready reclose status	1=Ready
1	2830	.ActRec.stVal	ACTIVE	Active reclose status	1=Active
1	2831	.PrgDsr.stVal	DISCR_INPRO	Discrimination time inpro.	1=In progress
1	2832	.PrgCutOut.stVal	CUTOUT_INPRO	Cutout time in progress	1=In progress
1	2833	.FrqOpAlm.stVal	FRQ_OP_ALM	Frequent operation alarm	1=Alarm
1	2835	.OpClIs.general	CLOSE_CB	Operate (close XCBR)	1=Close CB
1	2836	.OpOpn.general	OPEN_CB	Operate (open XCBR)	1=Open CB
1	2837	.UnsCBClIs.stVal	UNSUC_CB	CB closing failed	1=Failed
1	2838	.WtMstr.stVal	CMD_WAIT	Master signal to follower	1=Signal

2.3.11

CTRL.DCXSWI1 Disconnector control (1)

Table 14: CTRL.DCXSWI1 Disconnector control (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCILO1			
1	3100	.EnaClIs.stVal	ENA_CLOSE	Close enabled	1=Enabled
1	3101	.EnaOpn.stVal	ENA_OPEN	Open enabled	1=Enabled
1	3102	.ItlByPss.stVal	ITL_BYPASS	Interlocking bypass	1=Bypassed
		CTRL.DCCSWI1			
2	7120	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3
1	3103	.Pos.stSelD	SELECTED	CB selected	1=Selected
		CTRL.DCXSWI1			
1	3104	.BlkClIs.stVal	BLK_CLOSE	Close blocked	1=Blocked
1	3105	.BlkOpn.stVal	BLK_OPEN	Open blocked	1=Blocked

2.3.12 CTRL.DCXSWI2 Disconnector control (2)

Table 15: CTRL.DCXSWI2 Disconnector control (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCILO2			
1	3106	.EnaCls.stVal	ENA_CLOSE	Close enabled	1=Enabled
1	3107	.EnaOpn.stVal	ENA_OPEN	Open enabled	1=Enabled
1	3108	.ItlByPss.stVal	ITL_BYPASS	Interlocking bypass	1=Bypassed
		CTRL.DCCSWI2			
2	7130	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3
1	3109	.Pos.stSelD	SELECTED	CB selected	1=Selected
		CTRL.DCXSWI2			
1	3110	.BlkCls.stVal	BLK_CLOSE	Close blocked	1=Blocked
1	3111	.BlkOpn.stVal	BLK_OPEN	Open blocked	1=Blocked

2.3.13 CTRL.DCXSWI3 Disconnector control (3)

Table 16: CTRL.DCXSWI3 Disconnector control (3)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCILO3			
1	3112	.EnaCls.stVal	ENA_CLOSE	Close enabled	1=Enabled
1	3113	.EnaOpn.stVal	ENA_OPEN	Open enabled	1=Enabled
1	3114	.ItlByPss.stVal	ITL_BYPASS	Interlocking bypass	1=Bypassed
		CTRL.DCCSWI3			
2	7140	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3
1	3115	.Pos.stSelD	SELECTED	CB selected	1=Selected
		CTRL.DCXSWI3			
1	3116	.BlkCls.stVal	BLK_CLOSE	Close blocked	1=Blocked
1	3117	.BlkOpn.stVal	BLK_OPEN	Open blocked	1=Blocked

2.3.14 CTRL.DCXSWI4 Disconnector control (4)

Table 17: CTRL.DCXSWI4 Disconnector control (4)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCILO4			
1	3118	.EnaCls.stVal	ENA_CLOSE	Close enabled	1=Enabled
1	3119	.EnaOpn.stVal	ENA_OPEN	Open enabled	1=Enabled
1	3120	.ItlByPss.stVal	ITL_BYPASS	Interlocking bypass	1=Bypassed
		CTRL.DCCSWI4			
2	7150	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3

Table continues on next page

Object type	Addr	IEC 61850 name	SA name	Description	Values
1	3121	.Pos.stSelD	SELECTED	CB selected	1=Selected
		CTRL.DCXSWI4			
1	3122	.BlkCls.stVal	BLK_CLOSE	Close blocked	1=Blocked
1	3123	.BlkOpn.stVal	BLK_OPEN	Open blocked	1=Blocked

2.3.15 CTRL.DCXSWI5 Disconnector control (5)

Table 18: *CTRL.DCXSWI5 Disconnector control (5)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCIGO5			
1	3124	.EnaCls.stVal	ENA_CLOSE	Close enabled	1=Enabled
1	3125	.EnaOpn.stVal	ENA_OPEN	Open enabled	1=Enabled
1	3126	.ItlByPss.stVal	ITL_BYPASS	Interlocking bypass	1=Bypassed
		CTRL.DCCSWI5			
2	7160	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3
1	3127	.Pos.stSelD	SELECTED	CB selected	1=Selected
		CTRL.DCXSWI5			
1	3128	.BlkCls.stVal	BLK_CLOSE	Close blocked	1=Blocked
1	3129	.BlkOpn.stVal	BLK_OPEN	Open blocked	1=Blocked

2.3.16 CTRL.DCXSWI6 Disconnector control (6)

Table 19: *CTRL.DCXSWI6 Disconnector control (6)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCIGO6			
1	3130	.EnaCls.stVal	ENA_CLOSE	Close enabled	1=Enabled
1	3131	.EnaOpn.stVal	ENA_OPEN	Open enabled	1=Enabled
1	3132	.ItlByPss.stVal	ITL_BYPASS	Interlocking bypass	1=Bypassed
		CTRL.DCCSWI6			
2	7161	.Pos.stVal	POSITION	Interm.=0 Off=1 On=2 Bad=3	0...3
1	3133	.Pos.stSelD	SELECTED	CB selected	1=Selected
		CTRL.DCXSWI6			
1	3134	.BlkCls.stVal	BLK_CLOSE	Close blocked	1=Blocked
1	3135	.BlkOpn.stVal	BLK_OPEN	Open blocked	1=Blocked

2.3.17 CTRL.DCXSWI7 Disconnector control (7)

Table 20: *CTRL.DCXSWI7 Disconnector control (7)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCILO7			
1	3136	.EnaCls.stVal	ENA_CLOSE	Close enabled	1=Enabled
1	3137	.EnaOpn.stVal	ENA_OPEN	Open enabled	1=Enabled
1	3138	.ItlByPss.stVal	ITL_BYPASS	Interlocking bypass	1=Bypassed
		CTRL.DCCSWI7			
2	7162	.Pos.stVal	POSITION	Interm.=0 Off=1 On=2 Bad=3	0...3
1	3139	.Pos.stSelD	SELECTED	CB selected	1=Selected
		CTRL.DCXSWI7			
1	3140	.BlkCls.stVal	BLK_CLOSE	Close blocked	1=Blocked
1	3141	.BlkOpn.stVal	BLK_OPEN	Open blocked	1=Blocked

2.3.18 CTRL.DCXSWI8 Disconnector control (8)

Table 21: *CTRL.DCXSWI8 Disconnector control (8)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCILO8			
1	3142	.EnaCls.stVal	ENA_CLOSE	Close enabled	1=Enabled
1	3143	.EnaOpn.stVal	ENA_OPEN	Open enabled	1=Enabled
1	3144	.ItlByPss.stVal	ITL_BYPASS	Interlocking bypass	1=Bypassed
		CTRL.DCCSWI8			
2	7163	.Pos.stVal	POSITION	Interm.=0 Off=1 On=2 Bad=3	0...3
1	3145	.Pos.stSelD	SELECTED	CB selected	1=Selected
		CTRL.DCXSWI8			
1	3146	.BlkCls.stVal	BLK_CLOSE	Close blocked	1=Blocked
1	3147	.BlkOpn.stVal	BLK_OPEN	Open blocked	1=Blocked

2.3.19 CTRL.DCSXSWI1 Disconnector position indication (1)

Table 22: *CTRL.DCSXSWI1 Disconnector position indication (1)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCSXSWI1			
2	7114	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3

2.3.20**CTRL.DCSXSWI2 Disconnector position indication (2)****Table 23:** *CTRL.DCSXSWI2 Disconnector position indication (2)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCSXSWI2			
2	7115	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3

2.3.21**LD0.DEFHPDEF1 Directional earth-fault protection, high stage (1)****Table 24:** *LD0.DEFHPDEF1 Directional earth-fault protection, high stage (1)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DEFHPTOC1			
1	811	.Str.general	START	General start	1=Start
1	810	.Op.general	OPERATE	General operate	1=Operate

2.3.22**LD0.DEFHPDEF2 Directional earth-fault protection, high stage (2)****Table 25:** *LD0.DEFHPDEF2 Directional earth-fault protection, high stage (2)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DEFHPTOC2			
1	1219	.Str.general	START	General start	1=Start
1	1218	.Op.general	OPERATE	General operate	1=Operate

2.3.23**LD0.DEFHPDEF3 Directional earth-fault protection, high stage (3)****Table 26:** *LD0.DEFHPDEF3 Directional earth-fault protection, high stage (3)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DEFHPTOC3			
1	1221	.Str.general	START	General start	1=Start
1	1220	.Op.general	OPERATE	General operate	1=Operate

2.3.24 LD0.DEFHPDEF4 Directional earth-fault protection, high stage (4)

Table 27: LD0.DEFHPDEF4 Directional earth-fault protection, high stage (4)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DEFHPTOC4			
1	1223	.Str.general	START	General start	1=Start
1	1222	.Op.general	OPERATE	General operate	1=Operate

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

Table 28: LD0.DEFLPDEF1 Directional earth-fault protection, low stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DEFLPTOC1			
1	813	.Str.general	START	General start	1=Start
1	812	.Op.general	OPERATE	General operate	1=Operate

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

Table 29: LD0.DEFLPDEF2 Directional earth-fault protection, low stage (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DEFLPTOC2			
1	815	.Str.general	START	General start	1=Start
1	814	.Op.general	OPERATE	General operate	1=Operate

2.3.27 LD0.DEFLPDEF3 Directional earth-fault protection, low stage (3)

Table 30: LD0.DEFLPDEF3 Directional earth-fault protection, low stage (3)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DEFLPTOC3			
1	1215	.Str.general	START	General start	1=Start
1	1214	.Op.general	OPERATE	General operate	1=Operate

2.3.28

LD0.DEFLPDEF4 Directional earth-fault protection, low stage (4)*Table 31: LD0.DEFLPDEF4 Directional earth-fault protection, low stage (4)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DEFLPTOC4			
1	1217	.Str.general	START	General start	1=Start
1	1216	.Op.general	OPERATE	General operate	1=Operate

2.3.29

LD0.DPHHPDOC1 Three-phase directional overcurrent protection, high stage (1)*Table 32: LD0.DPHHPDOC1 Three-phase directional overcurrent protection, high stage (1)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPHHPTOC1			
1	836	.Str.general	START	General start	1=Start
1	837	.Str.phsA		phase A start	1=Start
1	838	.Str.phsB		phase B start	1=Start
1	839	.Str.phsC		phase C start	1=Start
1	832	.Op.general	OPERATE	General operate	1=Operate
1	833	.Op.phsA		phase A operate	1=Operate
1	834	.Op.phsB		phase B operate	1=Operate
1	835	.Op.phsC		phase C operate	1=Operate

2.3.30

LD0.DPHHPDOC2 Three-phase directional overcurrent protection, high stage (2)*Table 33: LD0.DPHHPDOC2 Three-phase directional overcurrent protection, high stage (2)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPHHPTOC2			
1	1180	.Str.general	START	General start	1=Start
1	1181	.Str.phsA		phase A start	1=Start
1	1182	.Str.phsB		phase B start	1=Start
1	1183	.Str.phsC		phase C start	1=Start
1	1176	.Op.general	OPERATE	General operate	1=Operate
1	1177	.Op.phsA		phase A operate	1=Operate
1	1178	.Op.phsB		phase B operate	1=Operate
1	1179	.Op.phsC		phase C operate	1=Operate

2.3.31 LD0.DPHHPDOC3 Three-phase directional overcurrent protection, high stage (3)

Table 34: LD0.DPHHPDOC3 Three-phase directional overcurrent protection, high stage (3)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPHHPTOC3			
1	1188	.Str.general	START	General start	1=Start
1	1189	.Str.phsA		phase A start	1=Start
1	1190	.Str.phsB		phase B start	1=Start
1	1191	.Str.phsC		phase C start	1=Start
1	1184	.Op.general	OPERATE	General operate	1=Operate
1	1185	.Op.phsA		phase A operate	1=Operate
1	1186	.Op.phsB		phase B operate	1=Operate
1	1187	.Op.phsC		phase C operate	1=Operate

2.3.32 LD0.DPHHPDOC4 Three-phase directional overcurrent protection, high stage (4)

Table 35: LD0.DPHHPDOC4 Three-phase directional overcurrent protection, high stage (4)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPHHPTOC4			
1	1210	.Str.general	START	General start	1=Start
1	1211	.Str.phsA		phase A start	1=Start
1	1212	.Str.phsB		phase B start	1=Start
1	1213	.Str.phsC		phase C start	1=Start
1	1192	.Op.general	OPERATE	General operate	1=Operate
1	1193	.Op.phsA		phase A operate	1=Operate
1	1194	.Op.phsB		phase B operate	1=Operate
1	1195	.Op.phsC		phase C operate	1=Operate

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

Table 36: LD0.DPHLPDOC1 Three-phase directional overcurrent protection, low stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPHLPTOC1			
1	844	.Str.general	START	General start	1=Start
1	845	.Str.phsA		phase A start	1=Start
1	846	.Str.phsB		phase B start	1=Start
1	847	.Str.phsC		phase C start	1=Start

Table continues on next page

Object type	Addr	IEC 61850 name	SA name	Description	Values
1	840	.Op.general	OPERATE	General operate	1=Operate
1	841	.Op.phsA		phase A operate	1=Operate
1	842	.Op.phsB		phase B operate	1=Operate
1	843	.Op.phsC		phase C operate	1=Operate

2.3.34

LD0.DPHLPDOC2 Three-phase directional overcurrent protection, low stage (2)
Table 37: LD0.DPHLPDOC2 Three-phase directional overcurrent protection, low stage (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPHLPTOC2			
1	1164	.Str.general	START	General start	1=Start
1	1165	.Str.phsA		phase A start	1=Start
1	1166	.Str.phsB		phase B start	1=Start
1	1167	.Str.phsC		phase C start	1=Start
1	1160	.Op.general	OPERATE	General operate	1=Operate
1	1161	.Op.phsA		phase A operate	1=Operate
1	1162	.Op.phsB		phase B operate	1=Operate
1	1163	.Op.phsC		phase C operate	1=Operate

2.3.35

LD0.DPHLPDOC3 Three-phase directional overcurrent protection, low stage (3)
Table 38: LD0.DPHLPDOC3 Three-phase directional overcurrent protection, low stage (3)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPHLPTOC3			
1	1172	.Str.general	START	General start	1=Start
1	1173	.Str.phsA		phase A start	1=Start
1	1174	.Str.phsB		phase B start	1=Start
1	1175	.Str.phsC		phase C start	1=Start
1	1168	.Op.general	OPERATE	General operate	1=Operate
1	1169	.Op.phsA		phase A operate	1=Operate
1	1170	.Op.phsB		phase B operate	1=Operate
1	1171	.Op.phsC		phase C operate	1=Operate

2.3.36 LD0.DPHLPDOC4 Three-phase directional overcurrent protection, low stage (4)

Table 39: LD0.DPHLPDOC4 Three-phase directional overcurrent protection, low stage (4)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPHLPTOC4			
1	1128	.Str.general	START	General start	1=Start
1	1129	.Str.phsA		phase A start	1=Start
1	1130	.Str.phsB		phase B start	1=Start
1	1131	.Str.phsC		phase C start	1=Start
1	1132	.Op.general	OPERATE	General operate	1=Operate
1	1133	.Op.phsA		phase A operate	1=Operate
1	1134	.Op.phsB		phase B operate	1=Operate
1	1135	.Op.phsC		phase C operate	1=Operate

2.3.37 LD0.DPSRDIR1 Three-phase power directional element (1)

Table 40: LD0.DPSRDIR1 Three-phase power directional element (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPSRDIR1			
1	1151	.Dir.general	RELEASE	Dir criteria satisfied	1=Release

2.3.38 LD0.DPSRDIR2 Three-phase power directional element (2)

Table 41: LD0.DPSRDIR2 Three-phase power directional element (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPSRDIR2			
1	1152	.Dir.general	RELEASE	Dir criteria satisfied	1=Release

2.3.39 LD0.DTMGAPC1 Daily timer function (1)

Table 42: LD0.DTMGAPC1 Daily timer function (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DTMGAPC1			
1	401	.Op.general	-	Output status	1=On

2.3.40**LD0.DTMGAPC2 Daily timer function (2)****Table 43:** LD0.DTMGAPC2 Daily timer function (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DTMGAPC2			
1	402	.Op.general	-	Output status	1=On

2.3.41**LD0.EFHPTOC1 Non-directional earth-fault protection, high stage (1)****Table 44:** LD0.EFHPTOC1 Non-directional earth-fault protection, high stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.EFHPTOC1			
1	859	.Str.general	START	General start	1=Start
1	858	.Op.general	OPERATE	General operate	1=Operate

2.3.42**LD0.EFIPTOC1 Non-directional earth-fault protection, instantaneous stage (1)****Table 45:** LD0.EFIPTOC1 Non-directional earth-fault protection, instantaneous stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.EFIPTOC1			
1	863	.Str.general	START	General start	1=Start
1	862	.Op.general	OPERATE	General operate	1=Operate

2.3.43**LD0.EFLPTOC1 Non-directional earth-fault protection, low stage (1)****Table 46:** LD0.EFLPTOC1 Non-directional earth-fault protection, low stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.EFLPTOC1			
1	865	.Str.general	START	General start	1=Start
1	864	.Op.general	OPERATE	General operate	1=Operate

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

Table 47: LD0.EFPADM1 Admittance-based earth-fault protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.EFPADM1			
1	871	.Str.general	START	General start	1=Start
1	870	.Op.general	OPERATE	General operate	1=Operate

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

Table 48: LD0.EFPADM2 Admittance-based earth-fault protection (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.EFPADM2			
1	873	.Str.general	START	General start	1=Start
1	872	.Op.general	OPERATE	General operate	1=Operate

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

Table 49: LD0.EFPADM3 Admittance-based earth-fault protection (3)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.EFPADM3			
1	875	.Str.general	START	General start	1=Start
1	874	.Op.general	OPERATE	General operate	1=Operate

2.3.47 CTRL.ESSXSWI1 Earthing switch indication (1)

Table 50: CTRL.ESSXSWI1 Earthing switch indication (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.ESSXSWI1			
2	7050	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3

2.3.48 CTRL.ESSXSWI2 Earthing switch indication (2)

Table 51: CTRL.ESSXSWI2 Earthing switch indication (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.ESSXSWI2			
2	7080	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3

2.3.49 CTRL.ESSXSWI3 Earthing switch indication (3)

Table 52: CTRL.ESSXSWI3 Earthing switch indication (3)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.ESSXSWI3			
2	7090	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3

2.3.50 CTRL.ESSXSWI4 Earthing switch indication (4)

Table 53: CTRL.ESSXSWI4 Earthing switch indication (4)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.ESSXSWI4			
2	7100	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3

2.3.51 CTRL.ESSXSWI5 Earthing switch indication (5)

Table 54: CTRL.ESSXSWI5 Earthing switch indication (5)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.ESSXSWI5			
2	7110	.Pos.stVal	POSITION	Interm.=0; Off=1; On=2; Bad=3	0...3

2.3.52 CTRL.ESSXSWI6 Earthing switch indication (6)

Table 55: CTRL.ESSXSWI6 Earthing switch indication (6)

Object type	Addr	IEC 61850	SA name	Description	Values
		CTRL.ESSXSWI6			
2	7111	.Pos.stVal	POSITION	Interm.=0 Off=1 On=2 Bad=3	0...3

2.3.53 CTRL.ESSXSWI7 Earthing switch indication (7)

Table 56: CTRL.ESSXSWI7 Earthing switch indication (7)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.ESSXSWI7			
2	7112	.Pos.stVal	POSITION	Interm.=0 Off=1 On=2 Bad=3	0...3

2.3.54 CTRL.ESSXSWI8 Earthing switch indication (8)

Table 57: CTRL.ESSXSWI8 Earthing switch indication (8)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.ESSXSWI8			
2	7113	.Pos.stVal	POSITION	Interm.=0 Off=1 On=2 Bad=3	0...3

2.3.55 LD0.FDEFLPDEF1 FA - Directional earth-fault protection, low stage (1)

Table 58: LD0.FDEFLPDEF1 FA - Directional earth-fault protection, low stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FDEFLPTOC1			
1	813	.Str.general	START	General start	1=Start
1	812	.Op.general	OPERATE	General operate	1=Operate

2.3.56 LD0.FDEFLPDEF2 FA - Directional earth-fault protection, low stage (2)

Table 59: LD0.FDEFLPDEF2 FA - Directional earth-fault protection, low stage (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FDEFLPTOC2			
1	815	.Str.general	START	General start	1=Start
1	814	.Op.general	OPERATE	General operate	1=Operate

2.3.57 LD0.FDPHLPOC1 FA - Three-phase directional overcurrent protection, low stage (1)

Table 60: LD0.FDPHLPOC1 FA - Three-phase directional overcurrent protection, low stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FDPHLPTOC1			
1	844	.Str.general	START	General start	1=Start
1	845	.Str.phsA		phase A start	1=Start
1	846	.Str.phsB		phase B start	1=Start
1	847	.Str.phsC		phase C start	1=Start
1	840	.Op.general	OPERATE	General operate	1=Operate

Table continues on next page

Object type	Addr	IEC 61850 name	SA name	Description	Values
1	841	.Op.phsA		phase A operate	1=Operate
1	842	.Op.phsB		phase B operate	1=Operate
1	843	.Op.phsC		phase C operate	1=Operate

2.3.58

LD0.FDPHLPDOC2 FA - Three-phase directional overcurrent protection, low stage (2)
Table 61: LD0.FDPHLPDOC2 FA - Three-phase directional overcurrent protection, low stage (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FDPHLPDOC2			
1	852	.Str.general	START	General start	1=Start
1	853	.Str.phsA		phase A start	1=Start
1	854	.Str.phsB		phase B start	1=Start
1	855	.Str.phsC		phase C start	1=Start
1	848	.Op.general	OPERATE	General operate	1=Operate
1	849	.Op.phsA		phase A operate	1=Operate
1	850	.Op.phsB		phase B operate	1=Operate
1	851	.Op.phsC		phase C operate	1=Operate

2.3.59

LD0.FEFLPTOC1 FA - Non-directional earth-fault protection, low stage (1)
Table 62: LD0.FEFLPTOC1 FA - Non-directional earth-fault protection, low stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FEFLPTOC1			
1	865	.Str.general	START	General start	1=Start
1	864	.Op.general	OPERATE	General operate	1=Operate

2.3.60

LD0.FKEY4GGIO1 Programmable buttons (4 buttons) (1)
Table 63: LD0.FKEY4GGIO1 Programmable buttons (4 buttons) (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FKEY4GGIO1			
1	60	.SPCSO1.stVal	LED 1	Output state 1	1=On
1	61	.SPCSO2.stVal	LED 2	Output state 2	1=On
1	62	.SPCSO3.stVal	LED 3	Output state 3	1=On
1	63	.SPCSO4.stVal	LED 4	Output state 4	1=On

2.3.61 LD0.FPHLPTOC1 FA - Three-phase non-directional overcurrent protection, low stage (1)

Table 64: LD0.FPHLPTOC1 FA - Three-phase non-directional overcurrent protection, low stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FPHLPTOC1			
1	1010	.Str.general	START	General start	1=Start
1	1011	.Str.phsA		phase A start	1=Start
1	1012	.Str.phsB		phase B start	1=Start
1	1013	.Str.phsC		phase C start	1=Start
1	1006	.Op.general	OPERATE	General operate	1=Operate
1	1007	.Op.phsA		phase A operate	1=Operate
1	1008	.Op.phsB		phase B operate	1=Operate
1	1009	.Op.phsC		phase C operate	1=Operate

2.3.62 LD0.FRPFQ1 Frequency protection (1)

Table 65: LD0.FRPFQ1 Frequency protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FRPTRC1			
1	889	.Str.general	START	Stage 1 start	1=Start
1		LD0.FRPTROF1		Overfrequency	
1	883	.Op.general	OPR_OFRQ	operate	1=Operate
1		LD0.FRPTRUF1		Underfrequency	
1	895	.Op.general	OPR_UFRQ	operate	1=Operate
1		LD0.FRPFRC2		Frequency gradient	
1	877	.Op.general	OPR_FRG	operate	1=Operate

2.3.63 LD0.FRPFQ2 Frequency protection (2)

Table 66: LD0.FRPFQ2 Frequency protection (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FRPTRC2			
1	890	.Str.general	START	Stage 2 start	1=Start
1		LD0.FRPTROF2		Overfrequency	
1	884	.Op.general	OPR_OFRQ	operate	1=Operate
1		LD0.FRPTRUF2		Underfrequency	
1	896	.Op.general	OPR_UFRQ	operate	1=Operate
1		LD0.FRPFRC2		Frequency gradient	
1	878	.Op.general	OPR_FRG	operate	1=Operate

2.3.64**LD0.HAEFPTOC1 Harmonics-based earth-fault protection (1)****Table 67:** LD0.HAEFPTOC1 Harmonics-based earth-fault protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.HAEFPTOC1			
1	1337	.Str.general	START	General start	1=Start
1	1336	.Op.general	OPERATE	General operate	1=Operate

2.3.65**LD0.INRPHAR1 Three-phase inrush detector (1)****Table 68:** LD0.INRPHAR1 Three-phase inrush detector (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.INRPHAR1			
1	903	.Str.general	START	General start	1=Start
1	904	.Str.phsA		phase A start	1=Start
1	905	.Str.phsB		phase B start	1=Start
1	906	.Str.phsC		phase C start	1=Start

2.3.66**LD0INTRPTEF1 Transient / intermittent earth-fault protection (1)****Table 69:** LD0INTRPTEF1 Transient / intermittent earth-fault protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0INTRPTEF1			
1	1074	.Str.general	START	General Start	1=Start
1	1075	.Op.general	OPERATE	General Operate	1=Operate

2.3.67**LD0.LDPRLRC1 Load profile record (1)****Table 70:** LD0.LDPRLRC1 Load profile record (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.LDPRLRC1			
1	-	.MemWrn.stVal	MEM_WARN	Memory warning	1=Alarm
1	-	.MemAlm.stVal	MEM_ALARM	Memory alarm	1=Warning

2.3.68

LD0.LEDPTRC1 Global protection signals

Table 71: LD0.LEDPTRC1 Global protection signals

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.LEDPTRC1		Global protection signals	
1	40	.Str.general		- General Start	1=Start
1	41	.Str.phsA		- phsA Start	1=Start
1	42	.Str.phsB		- phsB Start	1=Start
1	43	.Str.phsC		- phsC Start	1=Start
1	44	.Str.neut		- neut Start	1=Start
1	45	.Op.general		- General Operate	1=Operate
1	46	.Op.phsA		- phsA Operate	1=Operate
1	47	.Op.phsB		- phsB Operate	1=Operate
1	48	.Op.phsC		- phsC Operate	1=Operate
1	49	.Op.neut		- neut Operate	1=Operate

2.3.69

LD0.LSHDPFRQ1 Load-shedding and restoration (1)

Table 72: LD0.LSHDPFRQ1 Load-shedding and restoration (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.LSHDPTRC1			
1	919	.Str.general	START	Stage start	1=Start
1	916	.Op.general	OPERATE	Stage operate	1=Operate
		LD0.LSHDPTOF1			
1	918	.Str.general	ST_REST	Start of restore	1=Start
1	917	.Op.general	RESTORE	Restore the load	1=Resore

2.3.70

LD0.LSHDPFRQ2 Load-shedding and restoration (2)

Table 73: LD0.LSHDPFRQ2 Load-shedding and restoration (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.LSHDPTRC2			
1	923	.Str.general	START	Stage start	1=Start
1	920	.Op.general	OPERATE	Stage operate	1=Operate
		LD0.LSHDPTOF2			
1	922	.Str.general	ST_REST	Start of restore	1=Start
1	921	.Op.general	RESTORE	Restore the load	1=Resore

2.3.71 LD0.MAPGAPC1 Multipurpose protection (1)

Table 74: *LD0.MAPGAPC1 Multipurpose protection (1)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MAPGAPC1			
1	941	.Str.general		Start	1=Start
1	940	.Op.general		Operate	1=Operate

2.3.72 LD0.MAPGAPC2 Multipurpose protection (2)

Table 75: *LD0.MAPGAPC2 Multipurpose protection (2)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MAPGAPC2			
1	943	.Str.general		Start	1=Start
1	942	.Op.general		Operate	1=Operate

2.3.73 LD0.MAPGAPC3 Multipurpose protection (3)

Table 76: *LD0.MAPGAPC3 Multipurpose protection (3)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MAPGAPC3			
1	945	.Str.general		Start	1=Start
1	944	.Op.general		Operate	1=Operate

2.3.74 LD0.MAPGAPC4 Multipurpose protection (4)

Table 77: *LD0.MAPGAPC4 Multipurpose protection (4)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MAPGAPC4			
1	1339	.Str.general		Start	1=Start
1	1338	.Op.general		Operate	1=Operate

2.3.75 LD0.MAPGAPC5 Multipurpose protection (5)

Table 78: *LD0.MAPGAPC5 Multipurpose protection (5)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MAPGAPC5			
1	1341	.Str.general		Start	1=Start
1	1340	.Op.general		Operate	1=Operate

2.3.76 LD0.MAPGAPC6 Multipurpose protection (6)

Table 79: LD0.MAPGAPC6 Multipurpose protection (6)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MAPGAPC6			
1	1344	.Str.general		Start	1=Start
1	1342	.Op.general		Operate	1=Operate

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

Table 80: LD0.MDSOPT1 Runtime counter for machines and devices (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MDSOPT1			
1	971	OpTmWrn.stVal	WARNING	Op. time warning	1=Warning
1	972	OpTmAlm.stVal	ALARM	Op. time alarm	2=Alarm

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

Table 81: LD0.MFADPSDE1 Multifrequency admittance-based earth-fault protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MFADPSDE1			
1	1224	.Str.general	START	Stage start	1=Start
1	1225	.Op.general	OPERATE	Stage operate	1=Operate

2.3.79 LD0.MVGAPC1 Move (8 pcs) (1)

Table 82: LD0.MVGAPC1 Move (8 pcs) (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MVGAPC1			
1	230	.SPCSO1.stVal		Input 1	0/1=Off/On
1	231	.SPCSO2.stVal		Input 2	0/1=Off/On
1	232	.SPCSO3.stVal		Input 3	0/1=Off/On
1	233	.SPCSO4.stVal		Input 4	0/1=Off/On
1	234	.SPCSO5.stVal		Input 5	0/1=Off/On
1	235	.SPCSO6.stVal		Input 6	0/1=Off/On
1	236	.SPCSO7.stVal		Input 7	0/1=Off/On
1	237	.SPCSO8.stVal		Input 8	0/1=Off/On

2.3.80**LD0.MVGAPC2 Move (8 pcs) (2)****Table 83:** LD0.MVGAPC2 Move (8 pcs) (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MVGAPC2			
1	240	.SPCSO1.stVal		Input 1	0/1=Off/On
1	241	.SPCSO2.stVal		Input 2	0/1=Off/On
1	242	.SPCSO3.stVal		Input 3	0/1=Off/On
1	243	.SPCSO4.stVal		Input 4	0/1=Off/On
1	244	.SPCSO5.stVal		Input 5	0/1=Off/On
1	245	.SPCSO6.stVal		Input 6	0/1=Off/On
1	246	.SPCSO7.stVal		Input 7	0/1=Off/On
1	247	.SPCSO8.stVal		Input 8	0/1=Off/On

2.3.81**LD0.MVGAPC3 Move (8 pcs) (3)****Table 84:** LD0.MVGAPC3 Move (8 pcs) (3)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MVGAPC3			
1	250	.SPCSO1.stVal		Input 1	0/1=Off/On
1	251	.SPCSO2.stVal		Input 2	0/1=Off/On
1	252	.SPCSO3.stVal		Input 3	0/1=Off/On
1	253	.SPCSO4.stVal		Input 4	0/1=Off/On
1	254	.SPCSO5.stVal		Input 5	0/1=Off/On
1	255	.SPCSO6.stVal		Input 6	0/1=Off/On
1	256	.SPCSO7.stVal		Input 7	0/1=Off/On
1	257	.SPCSO8.stVal		Input 8	0/1=Off/On

2.3.82**LD0.MVGAPC4 Move (8 pcs) (4)****Table 85:** LD0.MVGAPC4 Move (8 pcs) (4)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MVGAPC4			
1	260	.SPCSO1.stVal		Input 1	0/1=Off/On
1	261	.SPCSO2.stVal		Input 2	0/1=Off/On
1	262	.SPCSO3.stVal		Input 3	0/1=Off/On
1	263	.SPCSO4.stVal		Input 4	0/1=Off/On
1	264	.SPCSO5.stVal		Input 5	0/1=Off/On
1	265	.SPCSO6.stVal		Input 6	0/1=Off/On
1	266	.SPCSO7.stVal		Input 7	0/1=Off/On
1	267	.SPCSO8.stVal		Input 8	0/1=Off/On

2.3.83 LD0.MVGAPC5 Move (8 pcs) (5)

Table 86: LD0.MVGAPC5 Move (8 pcs) (5)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MVGAPC5			
1	270	.SPCSO1.stVal	-	Input 1	0/1=Off/On
1	271	.SPCSO2.stVal	-	Input 2	0/1=Off/On
1	272	.SPCSO3.stVal	-	Input 3	0/1=Off/On
1	273	.SPCSO4.stVal	-	Input 4	0/1=Off/On
1	274	.SPCSO5.stVal	-	Input 5	0/1=Off/On
1	275	.SPCSO6.stVal	-	Input 6	0/1=Off/On
1	276	.SPCSO7.stVal	-	Input 7	0/1=Off/On
1	277	.SPCSO8.stVal	-	Input 8	0/1=Off/On

2.3.84 LD0.MVGAPC6 Move (8 pcs) (6)

Table 87: LD0.MVGAPC6 Move (8 pcs) (6)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MVGAPC6			
1	280	.SPCSO1.stVal	-	Input 1	0/1=Off/On
1	281	.SPCSO2.stVal	-	Input 2	0/1=Off/On
1	282	.SPCSO3.stVal	-	Input 3	0/1=Off/On
1	283	.SPCSO4.stVal	-	Input 4	0/1=Off/On
1	284	.SPCSO5.stVal	-	Input 5	0/1=Off/On
1	285	.SPCSO6.stVal	-	Input 6	0/1=Off/On
1	286	.SPCSO7.stVal	-	Input 7	0/1=Off/On
1	287	.SPCSO8.stVal	-	Input 8	0/1=Off/On

2.3.85 LD0.MVGAPC7 Move (8 pcs) (7)

Table 88: LD0.MVGAPC7 Move (8 pcs) (7)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MVGAPC7			
1	290	.SPCSO1.stVal	-	Input 1	0/1=Off/On
1	291	.SPCSO2.stVal	-	Input 2	0/1=Off/On
1	292	.SPCSO3.stVal	-	Input 3	0/1=Off/On
1	293	.SPCSO4.stVal	-	Input 4	0/1=Off/On
1	294	.SPCSO5.stVal	-	Input 5	0/1=Off/On
1	295	.SPCSO6.stVal	-	Input 6	0/1=Off/On
1	296	.SPCSO7.stVal	-	Input 7	0/1=Off/On
1	297	.SPCSO8.stVal	-	Input 8	0/1=Off/On

2.3.86**LD0.MVGAPC8 Move (8 pcs) (8)****Table 89:** *LD0.MVGAPC8 Move (8 pcs) (8)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MVGAPC8			
1	300	.SPCSO1.stVal	-	Input 1	0/1=Off/On
1	301	.SPCSO2.stVal	-	Input 2	0/1=Off/On
1	302	.SPCSO3.stVal	-	Input 3	0/1=Off/On
1	303	.SPCSO4.stVal	-	Input 4	0/1=Off/On
1	304	.SPCSO5.stVal	-	Input 5	0/1=Off/On
1	305	.SPCSO6.stVal	-	Input 6	0/1=Off/On
1	306	.SPCSO7.stVal	-	Input 7	0/1=Off/On
1	307	.SPCSO8.stVal	-	Input 8	0/1=Off/On

2.3.87**LD0.NSPTOC1 Negative-sequence overcurrent protection (1)****Table 90:** *LD0.NSPTOC1 Negative-sequence overcurrent protection (1)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.NSPTOC1			
1	958	.Str.general	START	General start	1=Start
1	957	.Op.general	OPERATE	General operate	1=Operate

2.3.88**LD0.NSPTOC2 Negative-sequence overcurrent protection (2)****Table 91:** *LD0.NSPTOC2 Negative-sequence overcurrent protection (2)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.NSPTOC2			
1	960	.Str.general	START	General start	1=Start
1	959	.Op.general	OPERATE	General operate	1=Operate

2.3.89**LD0.NSPTOV1 Negative-sequence overvoltage protection (1)****Table 92:** *LD0.NSPTOV1 Negative-sequence overvoltage protection (1)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.NSPTOV1			
1	966	.Str.general	START	General start	1=Start
1	965	.Op.general	OPERATE	General operate	1=Operate

2.3.90 LD0.PDNSPTOC1 Phase discontinuity protection (1)

Table 93: LD0.PDNSPTOC1 Phase discontinuity protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PDNSPTOC1			
1	974	.Str.general	START	General start	1=Start
1	973	.Op.general	OPERATE	General operate	1=Operate

2.3.91 LD0.PHQVVR1 Voltage variation (1)

Table 94: LD0.PHQVVR1 Voltage variation (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PH1QVVR1			
1	3092	.VarStrGen.stVal		Variation event detected	1=Detected
1	3088	.VarEnd.stVal		Variation event ended	1=Ended
1	3089	.SwlOp.stVal		Swell event detected	1=Detected
1	3090	.DipOp.stVal		Dip event detected	1=Detected
1	3091	.IntrOp.stVal		Interruption event detected	

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

Table 95: LD0.PHHPTOC1 Three-phase non-directional overcurrent protection, high stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHHPTOC1			
1	979	.Str.general	START	General start	1=Start
1	980	.Str.phsA		phase A start	1=Start
1	981	.Str.phsB		phase B start	1=Start
1	982	.Str.phsC		phase C start	1=Start
1	975	.Op.general	OPERATE	General operate	1=Operate
1	976	.Op.phsA		phase A operate	1=Operate
1	977	.Op.phsB		phase B operate	1=Operate
1	978	.Op.phsC		phase C operate	1=Operate

2.3.93**LD0.PHIPTOC1 Three-phase non-directional overcurrent protection, instantaneous stage (1)****Table 96:** LD0.PHIPTOC1 Three-phase non-directional overcurrent protection, instantaneous stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHIPTOC1			
1	995	.Str.general	START	General start	1=Start
1	996	.Str.phsA		phase A start	1=Start
1	997	.Str.phsB		phase B start	1=Start
1	998	.Str.phsC		phase C start	1=Start
1	991	.Op.general	OPERATE	General operate	1=Operate
1	992	.Op.phsA		phase A operate	1=Operate
1	993	.Op.phsB		phase B operate	1=Operate
1	994	.Op.phsC		phase C operate	1=Operate

2.3.94**LD0.PHIPTOC2 Three-phase non-directional overcurrent protection, instantaneous stage (2)****Table 97:** LD0.PHIPTOC2 Three-phase non-directional overcurrent protection, instantaneous stage (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHIPTOC2			
1	1114	.Str.general	START	General start	1=Start
1	1115	.Str.phsA		phase A start	1=Start
1	1116	.Str.phsB		phase B start	1=Start
1	1117	.Str.phsC		phase C start	1=Start
1	1110	.Op.general	OPERATE	General operate	1=Operate
1	1111	.Op.phsA		phase A operate	1=Operate
1	1112	.Op.phsB		phase B operate	1=Operate
1	1113	.Op.phsC		phase C operate	1=Operate

2.3.95**LD0.PHLPTOC1 Three-phase non-directional overcurrent protection, low stage (1)****Table 98:** LD0.PHLPTOC1 Three-phase non-directional overcurrent protection, low stage (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHLPTOC1			
1	1010	.Str.general	START	General start	1=Start
1	1011	.Str.phsA		phase A start	1=Start
1	1012	.Str.phsB		phase B start	1=Start
1	1013	.Str.phsC		phase C start	1=Start

Table continues on next page

Object type	Addr	IEC 61850 name	SA name	Description	Values
1	1006	.Op.general	OPERATE	General operate	1=Operate
1	1007	.Op.phsA		phase A operate	1=Operate
1	1008	.Op.phsB		phase B operate	1=Operate
1	1009	.Op.phsC		phase C operate	1=Operate

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

Table 99: LD0.PHPTOV1 Three-phase overvoltage protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHPTOV1			
1	1023	.Str.general	START	General start	1=Start
1	1024	.Str.phsA		phase A start	1=Start
1	1025	.Str.phsB		phase B start	1=Start
1	1026	.Str.phsC		phase C start	1=Start
1	1019	.Op.general	OPERATE	General operate	1=Operate
1	1020	.Op.phsA		phase A operate	1=Operate
1	1021	.Op.phsB		phase B operate	1=Operate
1	1022	.Op.phsC		phase C operate	1=Operate

2.3.97 LD0.PHPTOV2 Three-phase overvoltage protection (2)

Table 100: LD0.PHPTOV2 Three-phase overvoltage protection (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHPTOV2			
1	1031	.Str.general	START	General start	1=Start
1	1032	.Str.phsA		phase A start	1=Start
1	1033	.Str.phsB		phase B start	1=Start
1	1034	.Str.phsC		phase C start	1=Start
1	1027	.Op.general	OPERATE	General operate	1=Operate
1	1028	.Op.phsA		phase A operate	1=Operate
1	1029	.Op.phsB		phase B operate	1=Operate
1	1030	.Op.phsC		phase C operate	1=Operate

2.3.98**LD0.PHPTOV3 Three-phase overvoltage protection (3)****Table 101:** LD0.PHPTOV3 Three-phase overvoltage protection (3)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHPTOV3			
1	1039	.Str.general	START	General start	1=Start
1	1040	.Str.phsA		phase A start	1=Start
1	1041	.Str.phsB		phase B start	1=Start
1	1042	.Str.phsC		phase C start	1=Start
1	1035	.Op.general	OPERATE	General operate	1=Operate
1	1036	.Op.phsA		phase A operate	1=Operate
1	1037	.Op.phsB		phase B operate	1=Operate
1	1038	.Op.phsC		phase C operate	1=Operate

2.3.99**LD0.PHPTUC1 Loss of phase, undercurrent (1)****Table 102:** LD0.PHPTUC1 Loss of phase, undercurrent (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHPTUC1			
1	1089	.Str.general	START	General start	1=Start
1	1090	.Str.phsA		phase A start	1=Start
1	1091	.Str.phsB		phase B start	1=Start
1	1092	.Str.phsC		phase C start	1=Start
1	1080	.Op.general	OPERATE	General operate	1=Operate
1	1081	.Op.phsA		phase A operate	1=Operate
1	1082	.Op.phsB		phase B operate	1=Operate
1	1083	.Op.phsC		phase C operate	1=Operate

2.3.100**LD0.PHPTUC2 Loss of phase, undercurrent (2)****Table 103:** LD0.PHPTUC2 Loss of phase, undercurrent (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHPTUC2			
1	1097	.Str.general	START	General start	1=Start
1	1098	.Str.phsA		phase A start	1=Start
1	1099	.Str.phsB		phase B start	1=Start
1	1100	.Str.phsC		phase C start	1=Start
1	1093	.Op.general	OPERATE	General operate	1=Operate
1	1094	.Op.phsA		phase A operate	1=Operate
1	1095	.Op.phsB		phase B operate	1=Operate
1	1096	.Op.phsC		phase C operate	1=Operate

2.3.101 LD0.PHPTUV1 Three-phase undervoltage protection (1)

Table 104: LD0.PHPTUV1 Three-phase undervoltage protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHPTUV1			
1	1047	.Str.general	START	General start	1=Start
1	1048	.Str.phsA		phase A start	1=Start
1	1049	.Str.phsB		phase B start	1=Start
1	1050	.Str.phsC		phase C start	1=Start
1	1043	.Op.general	OPERATE	General operate	1=Operate
1	1044	.Op.phsA		phase A operate	1=Operate
1	1045	.Op.phsB		phase B operate	1=Operate
1	1046	.Op.phsC		phase C operate	1=Operate

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

Table 105: LD0.PHPTUV2 Three-phase undervoltage protection (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHPTUV2			
1	1055	.Str.general	START	General start	1=Start
1	1056	.Str.phsA		phase A start	1=Start
1	1057	.Str.phsB		phase B start	1=Start
1	1058	.Str.phsC		phase C start	1=Start
1	1051	.Op.general	OPERATE	General operate	1=Operate
1	1052	.Op.phsA		phase A operate	1=Operate
1	1053	.Op.phsB		phase B operate	1=Operate
1	1054	.Op.phsC		phase C operate	1=Operate

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

Table 106: LD0.PHPTUV3 Three-phase undervoltage protection (3)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHPTUV3			
1	1063	.Str.general	START	General start	1=Start
1	1064	.Str.phsA		phase A start	1=Start
1	1065	.Str.phsB		phase B start	1=Start
1	1066	.Str.phsC		phase C start	1=Start
1	1059	.Op.general	OPERATE	General operate	1=Operate
1	1060	.Op.phsA		phase A operate	1=Operate
1	1061	.Op.phsB		phase B operate	1=Operate
1	1062	.Op.phsC		phase C operate	1=Operate

2.3.104**LD0.PHSVPR1 Voltage presence (1)****Table 107:** LD0.PHSVPR1 Voltage presence (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHSVPR1			
1	210	.VLiv.stVal	U_LIVE	High voltage presence	1=High voltage
1	211	.VLivPhsA.stVal	U_A_AB_LIVE	High phsA or phsAB voltage	1=High voltage
1	212	.VLivPhsB.stVal	U_B_BC_LIVE	High phsB or phsBC voltage	1=High voltage
1	213	.VLivPhsC.stVal	U_C_CA_LIVE	High phsC or phsCA voltage	1=High voltage
1	214	.VDea.stVal	U_DEAD	Low voltage presence	1=Low voltage
1	215	.VDeaPhsA.stVal	U_A_AB_DEAD	Low phsA or phsAB voltage	1=Low voltage
1	216	.VDeaPhsB.stVal	U_B_BC_DEAD	Low phsB or phsBC voltage	1=Low voltage
1	217	.VDeaPhsC.stVal	U_C_CA_DEAD	Low phsC or phsCA voltage	1=Low voltage

2.3.105**LD0.PHSVPR2 Voltage presence (2)****Table 108:** LD0.PHSVPR2 Voltage presence (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHSVPR2			
1	218	.VLiv.stVal	U_LIVE	High voltage presence	1=High voltage
1	219	.VLivPhsA.stVal	U_A_AB_LIVE	High phsA or phsAB voltage	1=High voltage
1	220	.VLivPhsB.stVal	U_B_BC_LIVE	High phsB or phsBC voltage	1=High voltage
1	221	.VLivPhsC.stVal	U_C_CA_LIVE	High phsC or phsCA voltage	1=High voltage
1	222	.VDea.stVal	U_DEAD	Low voltage presence	1=Low voltage
1	223	.VDeaPhsA.stVal	U_A_AB_DEAD	Low phsA or phsAB voltage	1=Low voltage
1	224	.VDeaPhsB.stVal	U_B_BC_DEAD	Low phsB or phsBC voltage	1=Low voltage
1	225	.VDeaPhsC.stVal	U_C_CA_DEAD	Low phsC or phsCA voltage	1=Low voltage

2.3.106**LD0.PSPTUV1 Positive-sequence undervoltage protection (1)****Table 109:** LD0.PSPTUV1 Positive-sequence undervoltage protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PSPTUV1			
1	1077	.Str.general	START	General start	1=Start
1	1073	.Op.general	OPERATE	General operate	1=Operate

2.3.107 LD0.RESCMMXU1 Residual current measurement (1)

Table 110: LD0.RESCMMXU1 Residual current measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.RESCMMXU1			
1	4709	.HiAlm.stVal	HIGH_ALARM	High alarm	1=Alarm
1	4710	.HiWrn.stVal	HIGH_WARN	High warning	1=Warning

2.3.108 LD0.RESVMMXU1 Residual voltage measurement (1)

Table 111: LD0.RESVMMXU1 Residual voltage measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.RESVMMXU1			
1	4724	.HiAlm.stVal	HIGH_ALARM	High alarm	1=Alarm
1	4723	.HiWrn.stVal	HIGH_WARN	High warning	1=Warning

2.3.109 LD0.ROVPTOV1 Residual overvoltage protection (1)

Table 112: LD0.ROVPTOV1 Residual overvoltage protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.ROVPTOV1			
1	1086	.Str.general	START	General start	1=Start
1	1085	.Op.general	OPERATE	General operate	1=Operate

2.3.110 LD0.ROVPTOV2 Residual overvoltage protection (2)

Table 113: LD0.ROVPTOV2 Residual overvoltage protection (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.ROVPTOV2			
1	1088	.Str.general	START	General start	1=Start
1	1087	.Op.general	OPERATE	General operate	1=Operate

2.3.111 LD0.SECRSYN1 Synchronism and energizing check (1)

Table 114: LD0.SECRSYN1 Synchronism and energizing check (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SECRSYN1			
1	1136	.SynPrg	SYNC_INPRO	Synch. in progress	1=In progress
1	1134	.FailCmd	CMD_FAIL_AL	Close request fail	1=Failed
1	1135	.FailSyn	CL_FAIL_AL	Close cmd fail	1=Failed

2.3.112 LD0.SEQSPVC1 Fuse failure supervision (1)

Table 115: LD0.SEQSPVC1 Fuse failure supervision (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SEQSPVC1			
1	1137	.Str.general	FUSEF_U	Start	1=Start
1	1138	.Str3Ph.general	FUSEF_3PH	3-phase start	1=Start

2.3.113 LD0.SEQSPVC2 Fuse failure supervision (2)

Table 116: LD0.SEQSPVC2 Fuse failure supervision (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SEQSPVC2			
1	1139	.Str.general	FUSEF_U	Start	1=Start
1	1140	.Str3Ph.general	FUSEF_3PH	3-phase start	1=Start

2.3.114 LD0.SPCGAPC1 Generic control point (16 pcs) (1)

Table 117: LD0.SPCGAPC1 Generic control point (16 pcs) (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPCGAPC1			
1	5090	.SPCS01.stVal		Output 1 state	0/1=Off/On
1	5091	.SPCS02.stVal		Output 2 state	0/1=Off/On
1	5092	.SPCS03.stVal		Output 3 state	0/1=Off/On
1	5093	.SPCS04.stVal		Output 4 state	0/1=Off/On
1	5094	.SPCS05.stVal		Output 5 state	0/1=Off/On
1	5095	.SPCS06.stVal		Output 6 state	0/1=Off/On
1	5096	.SPCS07.stVal		Output 7 state	0/1=Off/On
1	5097	.SPCS08.stVal		Output 8 state	0/1=Off/On
1	5098	.SPCS09.stVal		Output 9 state	0/1=Off/On
1	5099	.SPCS10.stVal		Output 10 state	0/1=Off/On
1	5100	.SPCS11.stVal		Output 11 state	0/1=Off/On
1	5101	.SPCS12.stVal		Output 12 state	0/1=Off/On
1	5102	.SPCS13.stVal		Output 13 state	0/1=Off/On
1	5103	.SPCS14.stVal		Output 14 state	0/1=Off/On
1	5104	.SPCS15.stVal		Output 15 state	0/1=Off/On
1	5105	.SPCS16.stVal		Output 16 state	0/1=Off/On

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

Table 118: LD0.SPCGAPC2 Generic control point (16 pcs) (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPCGAPC2			
1	5110	.SPCS01.stVal		Output 1 state	0/1=Off/On
1	5111	.SPCS02.stVal		Output 2 state	0/1=Off/On
1	5112	.SPCS03.stVal		Output 3 state	0/1=Off/On
1	5113	.SPCS04.stVal		Output 4 state	0/1=Off/On
1	5114	.SPCS05.stVal		Output 5 state	0/1=Off/On
1	5115	.SPCS06.stVal		Output 6 state	0/1=Off/On
1	5116	.SPCS07.stVal		Output 7 state	0/1=Off/On
1	5117	.SPCS08.stVal		Output 8 state	0/1=Off/On
1	5118	.SPCS09.stVal		Output 9 state	0/1=Off/On
1	5119	.SPCS10.stVal		Output 10 state	0/1=Off/On
1	5120	.SPCS11.stVal		Output 11 state	0/1=Off/On
1	5121	.SPCS12.stVal		Output 12 state	0/1=Off/On
1	5122	.SPCS13.stVal		Output 13 state	0/1=Off/On
1	5123	.SPCS14.stVal		Output 14 state	0/1=Off/On
1	5124	.SPCS15.stVal		Output 15 state	0/1=Off/On
1	5125	.SPCS16.stVal		Output 16 state	0/1=Off/On

2.3.116 LD0.SPCLGAPC1 Local generic control points (1)

Table 119: LD0.SPCLGAPC1 Local generic control points (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPCLGAPC1			
1	5158	.SPCS01.stVal		Output 1 state	0/1=Off/On
1	5159	.SPCS02.stVal		Output 2 state	0/1=Off/On
1	5160	.SPCS03.stVal		Output 3 state	0/1=Off/On
1	5161	.SPCS04.stVal		Output 4 state	0/1=Off/On
1	5162	.SPCS05.stVal		Output 5 state	0/1=Off/On
1	5163	.SPCS06.stVal		Output 6 state	0/1=Off/On
1	5164	.SPCS07.stVal		Output 7 state	0/1=Off/On
1	5165	.SPCS08.stVal		Output 8 state	0/1=Off/On
1	5166	.SPCS09.stVal		Output 9 state	0/1=Off/On
1	5167	.SPCS10.stVal		Output 10 state	0/1=Off/On
1	5168	.SPCS11.stVal		Output 11 state	0/1=Off/On
1	5169	.SPCS12.stVal		Output 12 state	0/1=Off/On
1	5170	.SPCS13.stVal		Output 13 state	0/1=Off/On

Table continues on next page

Object type	Addr	IEC 61850 name	SA name	Description	Values
1	5171	.SPCS14.stVal		Output 14 state	0/1=Off/On
1	5172	.SPCS15.stVal		Output 15 state	0/1=Off/On
1	5173	.SPCS16.stVal		Output 16 state	0/1=Off/On

2.3.117 LD0.SPCRGAPC1 Remote generic control points (1)

Table 120: LD0.SPCRGAPC1 Remote generic control points (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPCRGAPC1			
1	5142	.SPCS01.stVal		Output 1 state	0/1=Off/On
1	5143	.SPCS02.stVal		Output 2 state	0/1=Off/On
1	5144	.SPCS03.stVal		Output 3 state	0/1=Off/On
1	5145	.SPCS04.stVal		Output 4 state	0/1=Off/On
1	5146	.SPCS05.stVal		Output 5 state	0/1=Off/On
1	5147	.SPCS06.stVal		Output 6 state	0/1=Off/On
1	5148	.SPCS07.stVal		Output 7 state	0/1=Off/On
1	5149	.SPCS08.stVal		Output 8 state	0/1=Off/On
1	5150	.SPCS09.stVal		Output 9 state	0/1=Off/On
1	5151	.SPCS10.stVal		Output 10 state	0/1=Off/On
1	5152	.SPCS11.stVal		Output 11 state	0/1=Off/On
1	5153	.SPCS12.stVal		Output 12 state	0/1=Off/On
1	5154	.SPCS13.stVal		Output 13 state	0/1=Off/On
1	5155	.SPCS14.stVal		Output 14 state	0/1=Off/On
1	5156	.SPCS15.stVal		Output 15 state	0/1=Off/On
1	5157	.SPCS16.stVal		Output 16 state	0/1=Off/On

2.3.118 LD0.SSCBR1 Circuit-breaker condition monitoring (1)

Table 121: LD0.SSCBR1 Circuit-breaker condition monitoring (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SSCBR1			
1	3067	.APwrAlm.stVal	IPOW_ALM	Iyt alarm	1=Alarm
1	3068	.APwrLO.stVal	IPOW_LO	Iyt lockout	1=Lockout
1	3069	.RmnNumOpAlm.stVal	CB_LIFE_ALM	CB lifetime alarm	1=Alarm
1	3070	.ClsAlm.stVal	TRV_T_CL_ALM	Close travel time alarm	1=Alarm
1	3071	.LonTmAlm.stVal	MON_ALM	CB inactive alarm	1=Alarm
1	3072	.OpnAlm.stVal	TRV_T_OP_ALM	Open travel time alarm	1=Alarm
1	3073	.OpCntAlm.stVal	OPR_ALM	CB operations alarm	1=Alarm
1	3074	.OpCntLO.stVal	OPR_LO	CB operations lockout	1=Lockout

Table continues on next page

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Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SSIMG1			
1	3075	.InsAlm.stVal	PRES_ALM	Low pressure alarm	1=Alarm
1	3076	.InsBlk.stVal	PRES_LO	Low pressure lockout	1=Lockout
		LD0.SSOPM1			
1	3077	.SprChaAlm.stVal	SPR_CHR_ALM	Spring charge time alarm	1=Alarm

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

Table 122: LD0.SSCBR2 Circuit-breaker condition monitoring (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SSCBR2			
1	3167	.APwrAlm.stVal	IPOW_ALM	lyt alarm	1=Alarm
1	3168	.APwrLO.stVal	IPOW_LO	lyt lockout	1=Lockout
1	3169	.RmnNumOpAlm.stVal	CB_LIFE_ALM	CB lifetime alarm	1=Alarm
1	3170	.ClsAlm.stVal	TRV_T_CL_ALM	Close travel time alarm	1=Alarm
1	3171	.LonTmAlm.stVal	MON_ALM	CB inactive alarm	1=Alarm
1	3172	.OpnAlm.stVal	TRV_T_OP_ALM	Open travel time alarm	1=Alarm
1	3173	.OpCntAlm.stVal	OPR_ALM	CB operations alarm	1=Alarm
1	3174	.OpCntLO.stVal	OPR_LO	CB operations lockout	1=Lockout
		LD0.SSIMG2			
1	3175	.InsAlm.stVal	PRES_ALM	Low pressure alarm	1=Alarm
1	3176	.InsBlk.stVal	PRES_LO	Low pressure lockout	1=Lockout
		LD0.SSOPM2			
1	3177	.SprChaAlm.stVal	SPR_CHR_ALM	Spring charge time alarm	1=Alarm

2.3.120 LD0.TCSSCBR1 Trip circuit supervision (1)

Table 123: LD0.TCSSCBR1 Trip circuit supervision (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.TCSSCBR1			
1	1204	.CirAlm.stVal	ALARM	Supervision alarm	1=Alarm

2.3.121 LD0.TCSSCBR2 Trip circuit supervision (2)

Table 124: LD0.TCSSCBR2 Trip circuit supervision (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.TCSSCBR2			
1	1205	.CirAlm.stVal	ALARM	Supervision alarm	1=Alarm

2.3.122**LD0.T1PTTR1 Three-phase thermal protection for feeders, cables and distribution transformers (1)****Table 125:** LD0.T1PTTR1 Three-phase thermal protection for feeders, cables and distribution transformers (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.T1PTTR1			
1	1200	.Str.general	START	General start	1=Start
1	1198	.Alm.Thm.general	ALARM	Thermal alarm	1=Alarm
1	1199	.Op.general	OPERATE	General operate	1=Operate

2.3.123**LD0.TRPPTRC1 Master trip (1)****Table 126:** LD0.TRPPTRC1 Master trip (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.TRPPTRC1			
1	50	.Op.general		- Op input signal	1=Operate input
1	51	.Tr.general		- Trip output signal	1=Trip output

2.3.124**LD0.TRPPTRC2 Master trip (2)****Table 127:** LD0.TRPPTRC2 Master trip (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.TRPPTRC2			
1	52	.Op.general		- Op input signal	1=Operate input
1	53	.Tr.general		- Trip output signal	1=Trip output

2.3.125**LD0.VMHAI1 Voltage total harmonic distortion (1)****Table 128:** LD0.VMHAI1 Voltage total harmonic distortion (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.VMHAI1			
1	3087	.Alm.stVal	ALARM		1=Alarm

2.3.126 LD0.VMMXU1 Three-phase voltage measurement (1)

Table 129: LD0.VMMXU1 Three-phase voltage measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.VMMXU1			
1	4715	.HiAlm.stVal	HIGH_ALARM	High alarm	1=Alarm
1	4716	.HiWrn.stVal	HIGH_WARN	High warning	1=Warning
1	4717	.LoAlm.stVal	LOW_ALARM	Low alarm	1=Alarm
1	4718	.LoWrn.stVal	LOW_WARN	Low warning	1=Warning

2.3.127 LD0.VMMXU2 Three-phase voltage measurement (2)

Table 130: LD0.VMMXU2 Three-phase voltage measurement (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.VMMXU2			
1	4719	.HiAlm.stVal	HIGH_ALARM	High alarm	1=Alarm
1	4720	.HiWrn.stVal	HIGH_WARN	High warning	1=Warning
1	4721	.LoAlm.stVal	LOW_ALARM	Low alarm	1=Alarm
1	4722	.LoWrn.stVal	LOW_WARN	Low warning	1=Warning

2.3.128 LD0.VSQVUB1 Voltage unbalance (1)

Table 131: LD0.VSQVUB1 Voltage unbalance (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.VSQVUB1			
1	3093	.VarStr.stVal		Event start	1=Start
1	3094	.HiPctVUnb.stVal		Unbalance exceeds limit	1=Exceeds

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

Table 132: LD0.WPWDE1 Wattmetric-based earth-fault protection (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.WPSDE1			
1	1331	.Str.general	START	General start	1=Start
1	1330	.Op.general	OPERATE	General operate	1=Operate

2.3.130**LD0.WPWDE2 Wattmetric-based earth-fault protection (2)****Table 133:** LD0.WPWDE2 Wattmetric-based earth-fault protection (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.WPSDE2			
1	1333	.Str.general	START	General start	1=Start
1	1332	.Op.general	OPERATE	General operate	1=Operate

2.3.131**LD0.WPWDE3 Wattmetric-based earth-fault protection (3)****Table 134:** LD0.WPWDE3 Wattmetric-based earth-fault protection (3)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.WPSDE3			
1	1335	.Str.general	START	General start	1=Start
1	1334	.Op.general	OPERATE	General operate	1=Operate

2.3.132**LD0.XGGIO100 Physical I/O states****Table 135:** LD0.XGGIO100 Physical I/O states

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.XGGIO100			
1	5040	.SPCSO01.stVal		Output 1 state	0/1=Off/On
1	5041	.SPCSO02.stVal		Output 2 state	0/1=Off/On
1	5042	.SPCSO03.stVal		Output 3 state	0/1=Off/On
1	5043	.SPCSO04.stVal		Output 4 state	0/1=Off/On
1	5044	.SPCSO05.stVal		Output 5 state	0/1=Off/On
1	5045	.SPCSO06.stVal		Output 6 state	0/1=Off/On

2.3.133**LD0.XGGIO110 Physical I/O states****Table 136:** LD0.XGGIO110 Physical I/O states

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.XGGIO110			
1	5020	.Ind1.stVal		Input 1 state	0/1=Off/On
1	5021	.Ind2.stVal		Input 2 state	0/1=Off/On
1	5022	.Ind3.stVal		Input 3 state	0/1=Off/On
1	5023	.Ind4.stVal		Input 4 state	0/1=Off/On
1	5024	.Ind5.stVal		Input 5 state	0/1=Off/On
1	5025	.Ind6.stVal		Input 6 state	0/1=Off/On

Table continues on next page

Object type	Addr	IEC 61850 name	SA name	Description	Values
1	5026	.Ind7.stVal		Input 7 state	0/1=Off/On
1	5027	.Ind8.stVal		Input 8 state	0/1=Off/On
1	5030	.SPCSO01.stVal		Output 1 state	0/1=Off/On
1	5031	.SPCSO02.stVal		Output 2 state	0/1=Off/On
1	5032	.SPCSO03.stVal		Output 3 state	0/1=Off/On
1	5033	.SPCSO04.stVal		Output 4 state	0/1=Off/On

2.3.134 LD0.XGGIO120 Physical I/O states

Table 137: LD0.XGGIO120 Physical I/O states

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.XGGIO120			
1	5010	.Ind1.stVal		Input 1 state	0/1=Off/On
1	5011	.Ind2.stVal		Input 2 state	0/1=Off/On
1	5012	.Ind3.stVal		Input 3 state	0/1=Off/On
1	5013	.Ind4.stVal		Input 4 state	0/1=Off/On

2.4 Measurands

2.4.1 Supported ASDU types

The Object type column contains an internal type identification for the data objects. Internal object types in turn can be configured into different IEC 60870-5-101/104 ASDU data types.

For measurand values, the object type code also reflects which value coding variation the object has as default.

Table 138: Supported ASDU types in monitoring direction

Object type	Description	IEC 60870-5-101/104 ASDU alternatives			
		Interrogated		Change event	
		ASDU	Type string	ASDU	Type string
20	Measurand, floating point	13	M_ME_NC_1	14	M_ME_TC_1 1)2)
				36	M_ME_TF_1 2)3)
21	Measurand, normalized	9	M_ME_NA_1	10	M_ME_TA_1 1)2)
				34	M_ME_TD_1 2)3)
22	Measurand, scaled value	11	M_ME_NB_1	12	M_ME_TB_1 1)2)
				35	M_ME_TE_1 2)3)

- 1) Requires setting parameter *Time Format* to be in mode “Short 24 bits”
 2) The stack supports point-dependent value format changing between all three measurand formats. In PCM600 each measurand object occurs in three interchangeable format instances.
 3) Requires setting parameter *Time Format* to be in mode “Full 56 bits”

2.4.2 General device data

Table 139: General device data

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.LLN0			
21	10002	.LocKeyHMI.stVal		Local/Remote state analog	0=Off; 1=Local; 2=Remote; 3=Station
		DR.RDRE1			
21	10111	.FltNum.stVal		Number of DR recordings	0...65535
21	10112	.MemUsed.stVal		DR Rec. memory used	0...100 [%]
		LD0.GNRLLTMS1			
21	8516	.TmSrcSt.stVal		Current time source	Code: See manual
21	8515	.TmSyn.stVal		IEC 61850-9-2 source	0..2
		LD0.LDEV1			
21	10003	.ChgAckCnt.stVal		Num of comp changes	0...999999
21	10006	.DevWrn.stVal		Warning code	See the technical manual.
21	10007	.DevFail.stVal		Fault code	See the technical manual.
		LD0.LLN0			
21	40000	.ActSetGr.stVal		Active setting group	1...6
21	40010	.ParChgCnt.stVal		Number of setting changes	0...20000
		LD0.LPHD1			
21	10004	.NumPwrUp.stVal		Num of power ups	0...999999
21	10005	.PhyHealth.stVal		Device Health	0=OK; 1=Warn; 2=Error
21	10008	.WacTrg.stVal		Num of wdog starts	0...999999
21	10009	.WrmStr.stVal		Num of warm starts	0...999999

2.4.3 LD0.CMMXU1 Three-phase current measurement (1)

Table 140: LD0.CMMXU1 Three-phase current measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.CMMXU1.A		Phase current 1	
20	8000	.cVal.phsA.mag	I_DB_A	- phase A magnitude	0...40.00 [xln]
20	8001	.cVal.phsB.mag	I_DB_B	- phase B magnitude	0...40.00 [xln]
20	8002	.cVal.phsC.mag	I_DB_C	- phase C magnitude	0...40.00 [xln]

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

Table 141: LD0.CMMXU2 Three-phase current measurement (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.CMMXU2.A		Phase current 2	
20	8003	.phsA.cVal.mag	I_DB_A	- phase A magnitude	0...40.00 [xln]
20	8004	.phsB.cVal.mag	I_DB_B	- phase B magnitude	0...40.00 [xln]
20	8005	.phsC.cVal.mag	I_DB_C	- phase C magnitude	0...40.00 [xln]

2.4.5 LD0.CSMSQI1 Sequence current measurement (1)

Table 142: LD0.CSMSQI1 Sequence current measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.CSMSQI1			
20	8012	.SeqA.c1.cVal.mag.f	I1_DB	- positive magnitude	0...40.00 [xln]
20	8013	.SeqA.c2.cVal.mag.f	I2_DB	- negative magnitude	0...40.00 [xln]
20	8014	.SeqA.c3.cVal.mag.f	I3_DB	- zero magnitude	0...40.00 [xln]

2.4.6 LD0.CSMSQI2 Sequence current measurement (2)

Table 143: LD0.CSMSQI2 Sequence current measurement (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.CSMSQI2			
20	8015	.SeqA.c1.cVal.mag.f	I1_DB	- positive magnitude	0...40.00 [xln]
20	8016	.SeqA.c2.cVal.mag.f	I2_DB	- negative magnitude	0...40.00 [xln]
20	8017	.SeqA.c3.cVal.mag.f	I3_DB	- zero magnitude	0...40.00 [xln]

2.4.7 LD0.DARREC1 Autoreclosing (1)

Table 144: LD0.DARREC1 Autoreclosing (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DARREC1			
21	10103	.AutoRecSt.stVal	STATUS	Autorec. status	-2...4
21	10104	.ShotPntr.stVal	SHOT_PTR	Shot pointer value	0...65535

2.4.8 LD0.DARREC2 Autoreclosing (2)

Table 145: LD0.DARREC2 Autoreclosing (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DARREC2			
21	10105	.AutoRecSt.stVal	STATUS	Autorec. status	-2...4
21	10106	.ShotPntr.stVal	SHOT_PTR	Shot pointer value	0...65535

2.4.9 LD0.DPSRDIR1 Three-phase power directional element (1)

Table 146: LD0.DPSRDIR1 Three-phase power directional element (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPSRDIR1			
21	10151	.Dir.dirGeneral	DIRECTION	Direction information	0-Idle;1-forw;2-backw;3-Both

2.4.10 LD0.DPSRDIR2 Three-phase power directional element (2)

Table 147: LD0.DPSRDIR2 Three-phase power directional element (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DPSRDIR2			
21	10152	.Dir.dirGeneral	DIRECTION	Direction information	0-Idle;1-forw;2-backw;3-Both

2.4.11 LD0.FLTRFRC1 Fault record (1)

Table 148: LD0.FLTRFRC1 Fault record (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FLTRFRC1			
20	8024	.OpCnt.stVal		Fault record number	0...999999
20	12000	.StrDur.mag		Start duration	0.00...100.00 [%]

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Section 2

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Object type	Addr	IEC 61850 name	SA name	Description	Values
20	12002	.ProFcn.stVal		Protection function	Code (see doc)
20	12003	.ActSetGr.stVal		Active setting group	1...6
20	12004	.ShotPntr.stVal		AR Shot pointer	1...5
20	12005	.FltDiskm.mag		Fault distance	0.00...3000.00 pu
20	12006	.FltPtR.mag		Fault resistance	0.00...1000000.00 [ohm]
20	12007	.PhReact.mag		Fault reactance	0.00...1000000.00 [ohm]
20	12015	.Max50APhsA1.mag		Maximum phase A current 1	0.000...50.000 [xIn]
20	12016	.Max50APhsB1.mag		Maximum phase B current 1	0.000...50.000 [xIn]
20	12017	.Max50APhsC1.mag		Maximum phase C current 1	0.000...50.000 [xIn]
20	12018	.Max50ARes1.mag		Maximum residual current 1	0.000...50.000 [xIn]
20	12019	.APhsA1.mag		Phase A current 1	0.000...50.000 [xIn]
20	12020	.APhsB1.mag		Phase B current 1	0.000...50.000 [xIn]
20	12021	.APhsC1.mag		Phase C current 1	0.000...50.000 [xIn]
20	12022	.ARes1.mag		Residual current 1	0.000...50.000 [xIn]
20	12023	.AResClc1.mag		Calculated residual current 1	0.000...50.000 [xIn]
20	12024	.APsSeq1.mag		Positive sequence current 1	0.000...50.000 [xIn]
20	12025	.ANgSeq1.mag		Negative sequence current 1	0.000...50.000 [xIn]
20	12037	.PhVPhsA1.mag		Phase A voltage 1	0.000...4.000 [xUn]
20	12038	.PhVPhsB1.mag		Phase B voltage 1	0.000...4.000 [xUn]
20	12039	.PhVPhsC1.mag		Phase C voltage 1	0.000...4.000 [xUn]
20	12040	.PPVPhsAB1.mag		Phase A-B voltage 1	0.000...4.000 [xUn]
20	12041	.PPVPhsBC1.mag		Phase B-C voltage 1	0.000...4.000 [xUn]
20	12042	.PPVPhsCA1.mag		Phase C-A voltage 1	0.000...4.000 [xUn]
20	12043	.VRes1.mag		Residual voltage 1	0.000...4.000 [xUn]
20	12044	.VZro1.mag		Zero sequence voltage 1	0.000...4.000 [xUn]
20	12045	.VPsSeq1.mag		Positive sequence voltage 1	0.000...4.000 [xUn]
20	12046	.VNgsSeq1.mag		Negative sequence voltage 1	0.000...4.000 [xUn]
20	12047	.MaxTmpRl.mag		PTTR thermal level	0.00...99.99
20	12048	.AMaxNgPs.mag		PDNSPTOC1 ratio I2/I1	0.00...999.99 [%]
20	12049	.DifANAngVN1.mag		Angle Uo - Io (1)	-180.00...180.00 [deg]
20	12050	.DifAAAngVBC1.mag		Angle U23 - IL1 (1)	-180.00...180.00 [deg]
20	12051	.DifABAAngVCA1.mag		Angle U31 - IL2 (1)	-180.00...180.00 [deg]
20	12052	.DifACACngVAB1.mag		Angle U12 - IL3 (1)	-180.00...180.00 [deg]
20	12053	.Hz.mag		Frequency	
20	12054	.HzRteChg.mag		Frequency gradient	-10.00...10.00 [Hz/s]
20	12055	.CondNeut.mag		Conductance Yo	-1000.00...1000.00 [mS]
20	12056	.SusNeut.mag		Susceptance Yo	-1000.00...1000.00 [mS]
20	12059	.VRes2.mag		Residual voltage 2	0.000...4.000 [xUn]
20	12060	.PhVPhsA2.mag		Phase A voltage 2	0.000...4.000 [xUn]

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Object type	Addr	IEC 61850 name	SA name	Description	Values
20	12061	.PhVPhsB2.mag		Phase B voltage 2	0.000...4.000 [xUn]
20	12062	.PhVPhsC2.mag		Phase C voltage 2	0.000...4.000 [xUn]
20	12063	.PPVPhsAB2.mag		Phase A-B voltage 2	0.000...4.000 [xUn]
20	12064	.PPVPhsBC2.mag		Phase B-C voltage 2	0.000...4.000 [xUn]
20	12065	.PPVPhsCA2.mag		Phase C-A voltage 2	0.000...4.000 [xUn]
20	12066	.VZro2.mag		Zero sequence voltage 2	0.000...4.000 [xUn]
20	12067	.VPsSeq2.mag		Positive sequence voltage 2	0.000...4.000 [xUn]
20	12068	.VNgsSeq2.mag		Negative sequence voltage 2	0.000...4.000 [xUn]
20	12071	.CBCIrTm.mag		Breaker clear time	0.000...3.000 [s]
20	12075	.DifANAAngVN2.mag		Angle Uo - Io (2)	-180.00...180.00 [deg]
20	12076	.DifAAAngVBC2.mag		Angle U23 - IL1 (2)	-180.00...180.00 [deg]
20	12077	.DifABAAngVCA2.mag		Angle U31 - IL2 (2)	-180.00...180.00 [deg]
20	12078	.DifACAngVAB2.mag		Angle U12 - IL3 (2)	-180.00...180.00 [deg]
20	12080	.Max50APhsA2.mag		Maximum phase A current 2	0.000...50.000 [xIn]
20	12081	.Max50APhsB2.mag		Maximum phase B current 2	0.000...50.000 [xIn]
20	12082	.Max50APhsC2.mag		Maximum phase C current 2	0.000...50.000 [xIn]
20	12083	.Max50ARes2.mag		Maximum residual current 2	0.000...50.000 [xIn]
20	12084	.APhsA2.mag		Phase A current 2	0.000...50.000 [xIn]
20	12085	.APhsB2.mag		Phase B current 2	0.000...50.000 [xIn]
20	12086	.APhsC2.mag		Phase C current 2	0.000...50.000 [xIn]
20	12087	.ARes2.mag		Residual current 2	0.000...50.000 [xIn]
20	12088	.AResClc2.mag		Calculated residual current 2	0.000...50.000 [xIn]
20	12089	.APsSeq2.mag		Positive sequence current 2	0.000...50.000 [xIn]
20	12090	.ANgSeq2.mag		Negative sequence current 2	0.000...50.000 [xIn]
20	12095	.Max50APhsA3.mag		Maximum phase A current 3	0.000...50.000 [xIn]
20	12096	.Max50APhsB3.mag		Maximum phase B current 3	0.000...50.000 [xIn]
20	12097	.Max50APhsC3.mag		Maximum phase C current 3	0.000...50.000 [xIn]
20	12098	.Max50ARes3.mag		Maximum residual current 3	0.000...50.000 [xIn]
20	12099	.APhsA3.mag		Phase A current 3	0.000...50.000 [xIn]
20	12100	.APhsB3.mag		Phase B current 3	0.000...50.000 [xIn]
20	12101	.APhsC3.mag		Phase C current 3	0.000...50.000 [xIn]
20	12102	.ARes3.mag		Residual current 3	0.000...50.000 [xIn]
20	12103	.AResClc3.mag		Calculated residual current 3	0.000...50.000 [xIn]
20	12104	.APsSeq3.mag		Positive sequence current 3	0.000...50.000 [xIn]
20	12105	.ANgSeq3.mag		Negative sequence current 3	0.000...50.000 [xIn]
20	12110	.Max50DifAA.mag		Max diff current IL1	0.000...80.000 pu
20	12111	.Max50DifAB.mag		Max diff current IL2	0.000...80.000 pu
20	12112	.Max50DifAC.mag		Max diff current IL3	0.000...80.000 pu
20	12113	.Max50RstAA.mag		Max bias current IL1	0.000...50.000 pu

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Object type	Addr	IEC 61850 name	SA name	Description	Values
20	12114	.Max50RstAB.mag		Max bias current IL2	0.000...50.000 pu
20	12115	.Max50RstAC.mag		Max bias current IL3	0.000...50.000 pu
20	12116	.DifAPhsA.mag		Diff current IL1	0.000...80.000 pu
20	12117	.DifAPhsB.mag		Diff current IL2	0.000...80.000 pu
20	12118	.DifAPhsC.mag		Diff current IL3	0.000...80.000 pu
20	12119	.RstAPhsA.mag		Bias current IL1	0.000...50.000 pu
20	12120	.RstAPhsB.mag		Bias current IL2	0.000...50.000 pu
20	12121	.RstAPhsC.mag		Bias current IL3	0.000...50.000 pu
20	12122	.DifARes.mag		Diff current Io	0.000...80.000 pu
20	12123	.RstARes.mag		Bias current Io	0.000...50.000 pu
20	12125	.PPLoopRis.mag		Fault loop resistance	-1000.00...1000.00 [ohm]
20	12126	.PPLoopReact.mag		Fault loop reactance	-1000.00...1000.00 [ohm]

2.4.12 LD0.FMMXU1 Frequency measurement (1)

Table 149: LD0.FMMXU1 Frequency measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FMMXU1			
20	8025	.Hz.mag	F_DB	Frequency	35.00...75.00 [Hz]

2.4.13 LD0.FMMXU2 Frequency measurement (2)

Table 150: LD0.FMMXU2 Frequency measurement (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.FMMXU2			
20	8026	.Hz.mag	F_DB	Frequency	35.00...75.00 [Hz]

2.4.14 LD0.LEDGGIO1 LED states (1)

Table 151: LD0.LEDGGIO1 LED states (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.LEDGGIO1			
21	8501	.LEDSt1.stVal		0=Off; 1=Alarm; 2=Warning	0...2
21	8502	.LEDSt2.stval		0=Off; 1=Alarm; 2=Warning	0...2
21	8503	.LEDSt3.stval		0=Off; 1=Alarm; 2=Warning	0...2
21	8504	.LEDSt4.stval		0=Off; 1=Alarm; 2=Warning	0...2
21	8505	.LEDSt5.stval		0=Off; 1=Alarm; 2=Warning	0...2
21	8506	.LEDSt6.stval		0=Off; 1=Alarm; 2=Warning	0...2

Table continues on next page

Object type	Addr	IEC 61850 name	SA name	Description	Values
21	8507	.LEDSt7.stval		0=Off; 1=Alarm; 2=Warning	0...2
21	8508	.LEDSt8.stval		0=Off; 1=Alarm; 2=Warning	0...2
21	8509	.LEDSt9.stval		0=Off; 1=Alarm; 2=Warning	0...2
21	8510	.LEDSt10.stval		0=Off; 1=Alarm; 2=Warning	0...2
21	8511	.LEDSt11.stVal		0=Off; 1=Alarm; 2=Warning	0...2

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

Table 152: LD0.MDSOPT1 Runtime counter for machines and devices (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MDSOPT1			
21	8512	.stVal	OPR_TIME	Operating days (hours × 0.0417)	0...12150 [days]
20	-	.stVal	OPR_TIME	Operating hours	0...299999 [hours]
22	-	.stVal	OPR_TIME	Operating days (hours × 0.0417)	0...12150 [days]

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

Table 153: LD0.PEMMXU1 Three-phase power and energy measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PEMMXU1			
20	8033	.TotW.mag	P_DB	Total active power P	-/+ 999.999
20	8035	.TotVAr.mag	Q_DB	Total reactive power Q	-/+ 999.999
20	8034	.TotVA.mag	S_DB	Total apparent power S	-/+ 999.999
20	8032	.TotPF.mag	PF_DB	Average power factor	-1...1

2.4.17 LD0.PEMMXU2 Three-phase power and energy measurement (2)

Table 154: LD0.PEMMXU2 Three-phase power and energy measurement (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PEMMXU2			
20	8041	.TotW.mag	P_DB	Total active power P	-/+ 999.999
20	8043	.ToVAr.mag	Q_DB	Total reactive power Q	-/+ 999.999
20	8042	.ToVA.mag	S_DB	Total apparent power S	-/+ 999.999
20	8040	.TotPF.mag	PF_DB	Average power factor	-1...1

2.4.18 LD0.RESCMMXU1 Residual current measurement (1)

Table 155: LD0.RESCMMXU1 Residual current measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.RESCMMXU1.A.cVal		Phase current 1	
20	8036	.cVal.res.mag	I_ISNT_RES	- residual magnitude	0...40.00 [xIn]

2.4.19 LD0.RESVMMXU1 Residual voltage measurement (1)

Table 156: LD0.RESVMMXU1 Residual voltage measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.RESVMMXU1			
20	8069	.PhV.res.cVal.mag	U_DB_RES	- residual magnitude	0...4.00 [xUn]

2.4.20 LD0.SCA4GAPC1 Analog value scaling (1)

Table 157: LD0.SCA4GAPC1 Analog value scaling (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC1			
20	8300	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8301	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8302	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8303	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.21 LD0.SCA4GAPC2 Analog value scaling (2)

Table 158: LD0.SCA4GAPC2 Analog value scaling (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC2			
20	8304	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8305	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8306	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8307	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.22**LD0.SCA4GAPC3 Analog value scaling (3)****Table 159:** *LD0.SCA4GAPC3 Analog value scaling (3)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC3			
20	8308	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8309	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8310	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8311	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.23**LD0.SCA4GAPC4 Analog value scaling (4)****Table 160:** *LD0.SCA4GAPC4 Analog value scaling (4)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC4			
20	8312	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8313	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8314	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8315	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.24**LD0.SCA4GAPC5 Analog value scaling (5)****Table 161:** *LD0.SCA4GAPC5 Analog value scaling (5)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC5			
20	8316	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8317	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8318	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8319	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.25**LD0.SCA4GAPC6 Analog value scaling (6)****Table 162:** *LD0.SCA4GAPC6 Analog value scaling (6)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC6			
20	8320	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8321	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8322	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8323	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.26 LD0.SCA4GAPC7 Analog value scaling (7)

Table 163: LD0.SCA4GAPC7 Analog value scaling (7)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC7			
20	8324	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8325	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8326	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8327	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.27 LD0.SCA4GAPC8 Analog value scaling (8)

Table 164: LD0.SCA4GAPC8 Analog value scaling (8)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC8			
20	8328	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8329	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8330	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8331	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.28 LD0.SCA4GAPC9 Analog value scaling (9)

Table 165: LD0.SCA4GAPC9 Analog value scaling (9)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC9			
20	8332	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8333	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8334	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8335	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.29 LD0.SCA4GAPC10 Analog value scaling (10)

Table 166: LD0.SCA4GAPC10 Analog value scaling (10)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC10			
20	8336	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8337	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8338	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8339	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.30**LD0.SCA4GAPC11 Analog value scaling (11)****Table 167:** LD0.SCA4GAPC11 Analog value scaling (11)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC11			
20	8340	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8341	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8342	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8343	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.31**LD0.SCA4GAPC12 Analog value scaling (12)****Table 168:** LD0.SCA4GAPC12 Analog value scaling (12)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SCA4GAPC12			
20	8344	.AnValOut1.mag	AO1_VALUE	Analog value 1	-10000...10000
20	8345	.AnValOut2.mag	AO2_VALUE	Analog value 2	-10000...10000
20	8346	.AnValOut3.mag	AO3_VALUE	Analog value 3	-10000...10000
20	8347	.AnValOut4.mag	AO4_VALUE	Analog value 4	-10000...10000

2.4.32**LD0.SECRSYN1 Synchronism and energizing check (1)****Table 169:** LD0.SECRSYN1 Synchronism and energizing check (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SECRSYN1			
21	10163	.EnSt.stVal	ENERG_STATE	Energ. state of line and bus	0...4 See the technical manual.

2.4.33**LD0.SPEMMXU1 Single-phase power and energy measurement (1)****Table 170:** LD0.SPEMMXU1 Single-phase power and energy measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPEMMXU1.W		Active power	
	-	.phsA.instCVal.mag		-phase A	-999999.9...999999.9
	-	.phsB.instCVal.mag		-phase B	-999999.9...999999.9
	-	.phsC.instCVal.mag		-phase C	-999999.9...999999.9
		LD0.SPEMMXU1.VAr		Rective power	
	-	phsA.instCVal.mag		-phase A	-999999.9...999999.9

Table continues on next page

Object type	Addr	IEC 61850 name	SA name	Description	Values
	-	.phsB.instCVal.mag		-phase B	-999999.9...999999.9
	-	.phsC.instCVal.mag		-phase C	-999999.9...999999.9
		LD0.SPEMMXU1.VA		Apparent power	
	-	.phsA.instCVal.mag		-phase A	-999999.9...999999.9
	-	.phsB.instCVal.mag		-phase B	-999999.9...999999.9
	-	.phsC.instCVal.mag		-phase C	-999999.9...999999.9
		LD0.SPEMMXU1.PF		Power factor	
	-	.phsA.instCVal.mag		-phase A	-1.00...1.00
	-	.phsB.instCVal.mag		-phase B	-1.00...1.00
	-	.phsC.instCVal.mag		-phase C	-1.00...1.00

2.4.34 LD0.SPEMMXU2 Single-phase power and energy measurement (2)

Table 171: LD0.SPEMMXU2 Single-phase power and energy measurement (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPEMMXU2.W		Active power	
	-	.phsA.instCVal.mag		-phase A	-999999.9...999999.9
	-	.phsB.instCVal.mag		-phase B	-999999.9...999999.9
	-	.phsC.instCVal.mag		-phase C	-999999.9...999999.9
		LD0.SPEMMXU2.VAr		Rective power	
	-	.phsA.instCVal.mag		-phase A	-999999.9...999999.9
	-	.phsB.instCVal.mag		-phase B	-999999.9...999999.9
	-	.phsC.instCVal.mag		-phase C	-999999.9...999999.9
		LD0.SPEMMXU2.VA		Apparent power	
	-	.phsA.instCVal.mag		-phase A	-999999.9...999999.9
	-	.phsB.instCVal.mag		-phase B	-999999.9...999999.9
	-	.phsC.instCVal.mag		-phase C	-999999.9...999999.9
		LD0.SPEMMXU2.PF		Power factor	
	-	.phsA.instCVal.mag		-phase A	-1.00...1.00
	-	.phsB.instCVal.mag		-phase B	-1.00...1.00
	-	.phsC.instCVal.mag		-phase C	-1.00...1.00

2.4.35

LD0.SSCBR1 Circuit-breaker condition monitoring (1)

Table 172: LD0.SSCBR1 Circuit-breaker condition monitoring (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPH1SCBR1			
20	10131	.AccmAPwr.mag		lyt value, phase A	0...1e6
21	10136	.RmnNumOp.stVal		Remaining life, phase A	-9999...9999
		LD0.SPH2SCBR1			
20	10132	.AccmAPwr.mag		lyt value, phase B	0...1e6
21	10137	.RmnNumOp.stVal		Remaining life, phase B	-9999...9999
		LD0.SPH3SCBR1			
20	10133	.AccmAPwr.mag		lyt value, phase C	0...1e6
21	10138	.RmnNumOp.stVal		Remaining life, phase C	-9999...9999
		LD0.SSCBR1			
21	10134	.InaTmdCnt.stVal		CB inactive days	0...9999
21	10135	.OpCntRs.stVal		CB op.counter	0...99999
20	10139	.OpTmCls.mag		Close travel time	0...60000
20	10140	.OpTmOpr.mag		Open travel time	0...60000
		LD0.SSOPM1			
20	10141	.TmsSprCha.mag		Spring charge time	0...99.99

2.4.36

LD0.SSCBR2 Circuit-breaker condition monitoring (2)

Table 173: LD0.SSCBR2 Circuit-breaker condition monitoring (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPH1SCBR2			
20	10231	.AccmAPwr.mag		lyt value, phase A	0...1e6
21	10236	.RmnNumOp.stVal		Remaining life, phase A	-9999...9999
		LD0.SPH2SCBR2			
20	10232	.AccmAPwr.mag		lyt value, phase B	0...1e6
21	10237	.RmnNumOp.stVal		Remaining life, phase B	-9999...9999
		LD0.SPH3SCBR2			
20	10233	.AccmAPwr.mag		lyt value, phase C	0...1e6
21	10238	.RmnNumOp.stVal		Remaining life, phase C	-9999...9999
		LD0.SSCBR2			
21	10234	.InaTmdCnt.stVal		CB inactive days	0...9999
21	10235	.OpCntRs.stVal		CB op.counter	0...99999
20	10239	.OpTmCls.mag		Close travel time	0...60000
20	10240	.OpTmOpr.mag		Open travel time	0...60000
		LD0.SSOPM2			
20	10241	.TmsSprCha.mag		Spring charge time	0...99.99

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

Table 174: LD0.T1PTTR1 Three-phase thermal protection for feeders, cables and distribution transformers (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.T1PTTR1			
20	10142	.Tmp.mag	TEMP	Object temperature	-100.0...9999.9 [C]
20	10143	.TmpRI.mag	TEMP_RL	Relative temperature	0.00...99.99 [C]

2.4.38 LD0.VMMXU1 Three-phase voltage measurement (1)

Table 175: LD0.VMMXU1 Three-phase voltage measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.VMMXU1.PhV		Phase voltages 1	
20	8047	.cVal.phsA.mag	U_INST_A	- phase A magnitude	0...5.00 [xUn]
20	8048	.cVal.phsB.mag	U_INST_B	- phase B magnitude	0...5.00 [xUn]
20	8049	.cVal.phsC.mag	U_INST_C	- phase C magnitude	0...5.00 [xUn]
		LD0.VMMXU1.PPV		Phase-to-phase voltages 1	
20	8050	.cVal.phsAB.mag	U_INST_AB	- phase AB magnitude	0...5.00 [xUn]
20	8051	.cVal.phsBC.mag	U_INST_BC	- phase BC magnitude	0...5.00 [xUn]
20	8052	.cVal.phsCA.mag	U_INST_CA	- phase CA magnitude	0...5.00 [xUn]

2.4.39 LD0.VMMXU2 Three-phase voltage measurement (2)

Table 176: LD0.VMMXU2 Three-phase voltage measurement (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.VMMXU2.PhV		Phase voltages 2	
20	8062	.cVal.phsA.mag	U_INST_A	- phase A magnitude	0...5.00 [xUn]
20	8063	.cVal.phsB.mag	U_INST_B	- phase B magnitude	0...5.00 [xUn]
20	8064	.cVal.phsC.mag	U_INST_C	- phase C magnitude	0...5.00 [xUn]
		LD0.VMMXU2.PPV		Phase-to-phase voltages 2	
20	8065	.cVal.phsAB.mag	U_INST_AB	- phase AB magnitude	0...5.00 [xUn]
20	8066	.cVal.phsBC.mag	U_INST_BC	- phase BC magnitude	0...5.00 [xUn]
20	8067	.cVal.phsCA.mag	U_INST_CA	- phase CA magnitude	0...5.00 [xUn]

2.4.40

LD0.VSMSQI1 Sequence voltage measurement (1)

Table 177: LD0.VSMSQI1 Sequence voltage measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.VSMSQI1			
20	8076	.SeqA.c1.instCVal.mag	U1_INST	- positive magnitude	0...5.00 [xUn]
20	8077	.SeqA.c2.instCVal.mag	U2_INST	- negative magnitude	0...5.00 [xUn]
20	8078	.SeqA.c3.instCVal.mag	U3_INST	- zero magnitude	0...5.00 [xUn]

2.4.41

LD0.VSMSQI2 Sequence voltage measurement (2)

Table 178: LD0.VSMSQI2 Sequence voltage measurement (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.VSMSQI2			
20	8091	.SeqA.c1.instCVal.mag	U1_INST	- positive magnitude	0...5.00 [xUn]
20	8092	.SeqA.c2.instCVal.mag	U2_INST	- negative magnitude	0...5.00 [xUn]
20	8093	.SeqA.c3.instCVal.mag	U3_INST	- zero magnitude	0...5.00 [xUn]

2.5

Integrated totals

2.5.1

Supported ASDU types

The Object type column contains an internal type identification for the data objects. Internal object types in turn can be configured into different IEC 60870-5-101/104 ASDU data types.

Table 179: Supported ASDU types in monitoring direction

Object type	Description	IEC 60870-5-101/104 ASDU alternatives			
		Interrogated		Change event	
		ASDU	Type string	ASDU	Type string
30	Integrated totals	15	M_IT_NA_1	16	M_IT_TA_1 ¹⁾
				37	M_IT_TB_1 ²⁾

1) Requires setting parameter *Time Format* to be in mode "Short 24 bits"

2) Requires setting parameter *Time Format* to be in mode "Full 56 bits"

2.5.2

CTRL.CBCSWI1 Operation counter

Table 180: CTRL.CBCSWI1 Operation counter

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.CBSWI1			
30	14100	.OpCntRs.stVal		CB1 op. counter	0...65535

2.5.3 CTRL.CBCSWI2 Operation counter (2)

Table 181: CTRL.CBCSWI2 Operation counter (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.CBCSWI2			
30	14101	.OpCntRs.stVal		CB2 op. counter	0...65535

2.5.4 CTRL.DCCSWIx Operation counters

Table 182: CTRL.DCCSWIx Operation counters

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCSWI1			
30	14110	.OpCntRs.stVal		Controllable DC1 op. counter	0...65535
		CTRL.DCCSWI2			
30	14120	.OpCntRs.stVal		Controllable DC2 op. counter	0...65535
		CTRL.DCCSWI3			
30	14130	.OpCntRs.stVal		Controllable DC3 op. counter	0...65535
		CTRL.DCCSWI4			
30	14140	.OpCntRs.stVal		Controllable DC4 op. counter	0...65535
		CTRL.DCCSWI5			
30	14150	.OpCntRs.stVal		Controllable DC5 op. counter	0...65535
		CTRL.DCCSWI6			
30	14151	.OpCntRs.stVal		Controllable DC6 op. counter	0...65535
		CTRL.DCCSWI7			
30	14152	.OpCntRs.stVal		Controllable DC7 op. counter	0...65535
		CTRL.DCCSWI8			
30	14153	.OpCntRs.stVal		Controllable DC8 op. counter	0...65535

2.5.5 LD0.MVI4GAPC1 Integer value move (1)

Table 183: LD0.MVI4GAPC1 Integer value move (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MVI4GAPC1			
30	14200	.ISCS01.stVal		Integer value 1	0...maxInt
30	14201	.ISCS02.stVal		Integer value 2	0...maxInt
30	14202	.ISCS03.stVal		Integer value 3	0...maxInt
30	14203	.ISCS04.stVal		Integer value 4	0...maxInt

2.5.6**LD0.MVI4GAPC2 Integer value move (2)****Table 184:** LD0.MVI4GAPC2 Integer value move (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.MVI4GAPC2			
30	14204	.ISCS01.stVal		Integer value 1	0...maxInt
30	14205	.ISCS02.stVal		Integer value 2	0...maxInt
30	14206	.ISCS03.stVal		Integer value 3	0...maxInt
30	14207	.ISCS04.stVal		Integer value 4	0...maxInt

2.5.7**LD0.PHQVVR1 Voltage variation (1)****Table 185:** LD0.PHQVVR1 Voltage variation (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PHQVVR1			
30	-	.DipInstCnt.stVal		Dip Inst. op. counter	0...2147483647
30	-	.DipMaxCnt.stVal		Dip Max dur. op. counter	0...2147483648
30	-	.DipMomCnt.stVal		Dip Mom. op. counter	0...2147483649
30	-	.DipTmpCnt.stVal		Dip Temp. op. counter	0...2147483650
30	-	.SwellInstCnt.stVal		Swell Inst. op. counter	0...2147483651
30	-	.SwellMaxCnt.stVal		Swell Max dur. op. counter	0...2147483652
30	-	.SwellMomCnt.stVal		Swell Mom. op. counter	0...2147483653
30	-	.SwellTmpCnt.stVal		Swell Temp. op. counter	0...2147483654
30	-	.IntrInstCnt.stVal		Inter. Inst. op. counter	0...2147483655
30	-	.IntrDipMaxCnt.stVal		Inter. Max dur. op. counter	0...2147483656
30	-	.IntrDipMomCnt.stVal		Inter. Mom. op. counter	0...2147483657
30	-	.IntrDipTmpCnt.stVal		Inter. Temp. op. counter	0...2147483658

2.5.8**LD0.PEMMTR1 Three-phase energy values (1)****Table 186:** LD0.PEMMTR1 Three-phase energy values (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PEMMTR1			
30	14000	.SupWh.actVal		Reverse active energy	0...1E10 [Kwh]
30	14001	.SupVArh.actVal		Reverse reactive energy	0...1E10 [kVAr]
30	14002	.DmdWh.actVal		Forward active energy	0...1E10 [Kwh]
30	14003	.DmdVArh.actVal		Forward reactive energy	0...1E10 [kVAr]

2.5.9 LD0.PEMMTR2 Three-phase power measurements (2)

Table 187: LD0.PEMMTR2 Three-phase power measurements (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PEMMTR2			
30	14005	.SupWh.actVal		Reverse active energy	0...1E10 [Kwh]
30	14006	.SupVArh.actVal		Reverse reactive energy	0...1E10 [KVArh]
30	14007	.DmdWh.actVal		Forward active energy	0...1E10 [Kwh]
30	14008	.DmdVArh.actVal		Forward reactive energy	0...1E10 [KVArh]

2.5.10 LD0.SPEMMXU1 Single-phase power and energy measurement (1)

Table 188: LD0.SPEMMXU1 Single-phase power and energy measurement (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPEMMTR1			
30	-	.SupWhA.actVal		Reverse active energy, phs A	0...1E10 [Kwh]
30	-	.SupWhB.actVal		Reverse active energy, phs B	0...1E10 [Kwh]
30	-	.SupWhC.actVal		Reverse active energy, phs C	0...1E10 [Kwh]
30	-	.SupVArhA.actVal		Reverse reactive energy,phs A	0...1E10 [KVArh]
30	-	.SupVArhB.actVal		Reverse reactive energy,phs B	0...1E10 [KVArh]
30	-	.SupVArhC.actVal		Reverse reactive energy,phs C	0...1E10 [KVArh]
30	-	.DmdWhA.actVal		Forward active energy , phsA	0...1E10 [Kwh]
30	-	.DmdWhB.actVal		Forward active energy, phsB	0...1E10 [Kwh]
30	-	.DmdWhC.actVal		Forward active energy, phsC	0...1E10 [Kwh]
30	-	.DmdVArhA.actVal		Forward reactive energy, phsA	0...1E10 [KVArh]
30	-	.DmdVArhB.actVal		Forward reactive energy, phsB	0...1E10 [KVArh]
30	-	.DmdVArhC.actVal		Forward reactive energy, phsC	0...1E10 [KVArh]

2.5.11 LD0.SPEMMXU2 Single-phase power and energy measurement (2)

Table 189: LD0.SPEMMXU2 Single-phase power and energy measurement (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPEMMTR2			
30	-	.SupWhA.actVal		Reverse active energy, phs A	0...1E10 [Kwh]
30	-	.SupWhB.actVal		Reverse active energy, phs B	0...1E10 [Kwh]
30	-	.SupWhC.actVal		Reverse active energy, phs C	0...1E10 [Kwh]
30	-	.SupVArhA.actVal		Reverse reactive energy,phs A	0...1E10 [KVArh]
30	-	.SupVArhB.actVal		Reverse reactive energy,phs B	0...1E10 [KVArh]

Table continues on next page

Object type	Addr	IEC 61850 name	SA name	Description	Values
30	-	.SupVArhC.actVal		Reverse reactive energy,phs C	0...1E10 [KVArh]
30	-	.DmdWhA.actVal		Forward active energy, phsA	0...1E10 [Kwh]
30	-	.DmdWhB.actVal		Forward active energy, phsB	0...1E10 [Kwh]
30	-	.DmdWhC.actVal		Forward active energy, phsC	0...1E10 [Kwh]
30	-	.DmdVArhA.actVal		Forward reactive energy, phsA	0...1E10 [KVARh]
30	-	.DmdVArhB.actVal		Forward reactive energy, phsB	0...1E10 [KVARh]
30	-	.DmdVArhC.actVal		Forward reactive energy, phsC	0...1E10 [KVARh]

2.6 Controls

2.6.1 Supported ASDU types

The Object type column contains an internal type identification for the data objects.

The internal object types appear in the protocol as standard IEC 60870-5-101/104 ASDU data types.

Table 190: Supported ASDU types in control direction

Object type	Description	ASDU	Type string
50	Single bit control	45	C_SC_NA_1
51	Double bit control	47	C_DC_NA_1

2.6.2 General device data

Table 191: General device data

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.LLN0			
50	20000	.IndLEDRs.Oper.ctlVal		Reset indication LEDs	1=Reset
50	20001	.ProgLEDRs.Oper.ctlVal		Reset programmable LEDs	1=Reset
		LD0.LDEV1			
50		.WrmStrCmd.Oper.ctlVal		Reset device	1=Reset
		LD0.LLN0			
50	41001	ActSetGr.Oper.ctlVal		Activate setting group 1	1=Activate
50	41002	ActSetGr.Oper.ctlVal		Activate setting group 2	1=Activate
50	41003	ActSetGr.Oper.ctlVal		Activate setting group 3	1=Activate
50	41004	ActSetGr.Oper.ctlVal		Activate setting group 4	1=Activate
50	41005	ActSetGr.Oper.ctlVal		Activate setting group 5	1=Activate
50	41006	ActSetGr.Oper.ctlVal		Activate setting group 6	1=Activate

2.6.3 CTRL.Cxxxxx1 Circuit breaker control (1)

Table 192: *CTRL.Cxxxxx1 Circuit breaker control (1)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.CBCSWI1			
51	21000	.Pos.Oper.ctlVal	-	Circuit breaker control	2/1=On/Off

2.6.4 CTRL.Cxxxxx2 Circuit breaker control (2)

Table 193: *CTRL.Cxxxxx2 Circuit breaker control (2)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.CBCSWI2			
51	21001	.Pos.Oper.ctlVal	-	Circuit breaker control	2/1=On/Off

2.6.5 LD0.DARREC1 Autoreclosing (1)

Table 194: *LD0.DARREC1 Autoreclosing (1)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DARREC1			
50	20003	.CntRs.Oper.ctlVal		AR reset all counters	1=Reset
50	20004	.RecRs.Oper.ctlVal		AR reset	1=Reset

2.6.6 LD0.DARREC2 Autoreclosing (2)

Table 195: *LD0.DARREC2 Autoreclosing (2)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.DARREC2			
50	20023	.CntRs.Oper.ctlVal		AR reset all counters	1=Reset
50	20024	.RecRs.Oper.ctlVal		AR reset	1=Reset

2.6.7 CTRL.DCXSWI1 Disconnector control (1)

Table 196: *CTRL.DCXSWI1 Disconnector control (1)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCSWI1			
51	21201	.Pos.Oper.ctlVal	-	Disconnector control	0/1=On/Off

2.6.8 CTRL.DCXSWI2 Disconnector control (2)

Table 197: CTRL.DCXSWI2 Disconnector control (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCSWI2			
51	21202	.Pos.Oper.ctlVal	-	Disconnector control	0/1=On/Off

2.6.9 CTRL.DCXSWI3 Disconnector control (3)

Table 198: CTRL.DCXSWI3 Disconnector control (3)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCSWI3			
51	21203	.Pos.Oper.ctlVal	-	Disconnector control	0/1=On/Off

2.6.10 CTRL.DCXSWI4 Disconnector control (4)

Table 199: CTRL.DCXSWI4 Disconnector control (4)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCSWI4			
51	21204	.Pos.Oper.ctlVal	-	Disconnector control	0/1=On/Off

2.6.11 CTRL.DCXSWI5 Disconnector control (5)

Table 200: CTRL.DCXSWI5 Disconnector control (5)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCSWI5			
51	21205	.Pos.Oper.ctlVal	-	Disconnector control	0/1=On/Off

2.6.12 CTRL.DCXSWI6 Disconnector control (6)

Table 201: CTRL.DCXSWI6 Disconnector control (6)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCSWI6			
51	21206	.Pos.Oper.ctlVal	-	Disconnector control	0/1=On/Off

2.6.13 CTRL.DCXSWI7 Disconnector control (7)

Table 202: *CTRL.DCXSWI7 Disconnector control (7)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCSWI7			
51	21207	.Pos.Oper.ctlVal	-	Disconnector control	0/1=On/Off

2.6.14 CTRL.DCXSWI8 Disconnector control (8)

Table 203: *CTRL.DCXSWI8 Disconnector control (8)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		CTRL.DCCSWI8			
51	21208	.Pos.Oper.ctlVal	-	Disconnector control	0/1=On/Off

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

Table 204: *LD0.LSHDPFRQ1 Load-shedding and restoration (1)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.LSHDPTOF1			
50	-	.BlkRest.Oper.ctlVal	-	Cancel restore	1=Cancel
50	-	.ManRest.Oper.ctlVal		Manual restore	1=Manual restore

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

Table 205: *LD0.LSHDPFRQ2 Load-shedding and restoration (2)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.LSHDPTOF2			
50	-	.BlkRest.Oper.ctlVal	-	Cancel restore	1=Cancel
50	-	.ManRest.Oper.ctlVal		Manual restore	1=Manual restore

2.6.17 LD0.PHQVVR1 Voltage variation (1)

Table 206: *LD0.PHQVVR1 Voltage variation (1)*

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.PH1QVVR1			
50	-	.CntRs.Oper.ctlVal	-	Reset all counters	1=Reset

2.6.18**DR.RDRE1 Disturbance recorder (1)****Table 207:** DR.RDRE1 Disturbance recorder (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		DR.RDRE1			
50	20008	.MemClr.Oper.ctlVal	-	Clear all records	1=Clear
50	20007	.RcdTrg.Oper.ctlVal	-	Trig recording	1=Trig

2.6.19**LD0.SPCGAPC1 Generic control point (16 pcs) (1)****Table 208:** LD0.SPCGAPC1 Generic control point (16 pcs) (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPCGAPC1			
50	21114	.SPCS01.ctlVal	-	Output 1 control	0/1=Off/On
50	21122	.SPCS02.ctlVal	-	Output 2 control	0/1=Off/On
50	21123	.SPCS03.ctlVal	-	Output 3 control	0/1=Off/On
50	21124	.SPCS04.ctlVal	-	Output 4 control	0/1=Off/On
50	21125	.SPCS05.ctlVal	-	Output 5 control	0/1=Off/On
50	21126	.SPCS06.ctlVal	-	Output 6 control	0/1=Off/On
50	21127	.SPCS07.ctlVal	-	Output 7 control	0/1=Off/On
50	21128	.SPCS08.ctlVal	-	Output 8 control	0/1=Off/On
50	21129	.SPCS09.ctlVal	-	Output 9 control	0/1=Off/On
50	21115	.SPCS10.ctlVal	-	Output 10 control	0/1=Off/On
50	21116	.SPCS11.ctlVal	-	Output 11 control	0/1=Off/On
50	21117	.SPCS12.ctlVal	-	Output 12 control	0/1=Off/On
50	21118	.SPCS13.ctlVal	-	Output 13 control	0/1=Off/On
50	21119	.SPCS14.ctlVal	-	Output 14 control	0/1=Off/On
50	21120	.SPCS15.ctlVal	-	Output 15 control	0/1=Off/On
50	21121	.SPCS16.ctlVal	-	Output 16 control	0/1=Off/On

2.6.20**LD0.SPCGAPC2 Generic control point (16 pcs) (2)****Table 209:** LD0.SPCGAPC2 Generic control point (16 pcs) (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPCGAPC2			
50	21130	.SPCS01.ctlVal	-	Output 1 control	0/1=Off/On
50	21138	.SPCS02.ctlVal	-	Output 2 control	0/1=Off/On
50	21139	.SPCS03.ctlVal	-	Output 3 control	0/1=Off/On
50	21140	.SPCS04.ctlVal	-	Output 4 control	0/1=Off/On
50	21141	.SPCS05.ctlVal	-	Output 5 control	0/1=Off/On

Table continues on next page

Section 2

IEC 60850-5-101/104 data mappings

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Object type	Addr	IEC 61850 name	SA name	Description	Values
50	21142	.SPCS06.ctlVal	-	Output 6 control	0/1=Off/On
50	21143	.SPCS07.ctlVal	-	Output 7 control	0/1=Off/On
50	21144	.SPCS08.ctlVal	-	Output 8 control	0/1=Off/On
50	21145	.SPCS09.ctlVal	-	Output 9 control	0/1=Off/On
50	21131	.SPCS10.ctlVal	-	Output 10 control	0/1=Off/On
50	21132	.SPCS11.ctlVal	-	Output 11 control	0/1=Off/On
50	21133	.SPCS12.ctlVal	-	Output 12 control	0/1=Off/On
50	21134	.SPCS13.ctlVal	-	Output 13 control	0/1=Off/On
50	21135	.SPCS14.ctlVal	-	Output 14 control	0/1=Off/On
50	21136	.SPCS15.ctlVal	-	Output 15 control	0/1=Off/On
50	21137	.SPCS16.ctlVal	-	Output 16 control	0/1=Off/On

2.6.21 LD0.SPCRGAPC1 Remote generic control points (1)

Table 210: LD0.SPCRGAPC1 Remote generic control points (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SPCRGAPC1			
50	21252	.SPCS01.ctlVal	-	Output 1 control	0/1=Off/On
50	21253	.SPCS02.ctlVal	-	Output 2 control	0/1=Off/On
50	21254	.SPCS03.ctlVal	-	Output 3 control	0/1=Off/On
50	21255	.SPCS04.ctlVal	-	Output 4 control	0/1=Off/On
50	21256	.SPCS05.ctlVal	-	Output 5 control	0/1=Off/On
50	21257	.SPCS06.ctlVal	-	Output 6 control	0/1=Off/On
50	21258	.SPCS07.ctlVal	-	Output 7 control	0/1=Off/On
50	21259	.SPCS08.ctlVal	-	Output 8 control	0/1=Off/On
50	21260	.SPCS09.ctlVal	-	Output 9 control	0/1=Off/On
50	21261	.SPCS10.ctlVal	-	Output 10 control	0/1=Off/On
50	21262	.SPCS11.ctlVal	-	Output 11 control	0/1=Off/On
50	21263	.SPCS12.ctlVal	-	Output 12 control	0/1=Off/On
50	21264	.SPCS13.ctlVal	-	Output 13 control	0/1=Off/On
50	21265	.SPCS14.ctlVal	-	Output 14 control	0/1=Off/On
50	21266	.SPCS15.ctlVal	-	Output 15 control	0/1=Off/On
50	21267	.SPCS16.ctlVal	-	Output 16 control	0/1=Off/On

2.6.22**LD0.SRGAPC1 Set-reset (8 pcs) (1)****Table 211:** LD0.SRGAPC1 Set-reset (8 pcs) (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SRGAPC1			
50	21157	.Rs1.ctlVal	-	Reset flip-flop 1	1=Reset
50	21158	.Rs2.ctlVal	-	Reset flip-flop 2	1=Reset
50	21159	.Rs3.ctlVal	-	Reset flip-flop 3	1=Reset
50	21160	.Rs4.ctlVal	-	Reset flip-flop 4	1=Reset
50	21161	.Rs5.ctlVal	-	Reset flip-flop 5	1=Reset
50	21162	.Rs6.ctlVal	-	Reset flip-flop 6	1=Reset
50	21163	.Rs7.ctlVal	-	Reset flip-flop 7	1=Reset
50	21164	.Rs8.ctlVal	-	Reset flip-flop 8	1=Reset

2.6.23**LD0.SRGAPC2 Set-reset (8 pcs) (2)****Table 212:** LD0.SRGAPC2 Set-reset (8 pcs) (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SRGAPC2			
50	21165	.Rs1.ctlVal	-	Reset flip-flop 1	1=Reset
50	21166	.Rs2.ctlVal	-	Reset flip-flop 2	1=Reset
50	21167	.Rs3.ctlVal	-	Reset flip-flop 3	1=Reset
50	21168	.Rs4.ctlVal	-	Reset flip-flop 4	1=Reset
50	21169	.Rs5.ctlVal	-	Reset flip-flop 5	1=Reset
50	21170	.Rs6.ctlVal	-	Reset flip-flop 6	1=Reset
50	21171	.Rs7.ctlVal	-	Reset flip-flop 7	1=Reset
50	21172	.Rs8.ctlVal	-	Reset flip-flop 8	1=Reset

2.6.24**LD0.SSCBR1 Circuit-breaker condition monitoring (1)****Table 213:** LD0.SSCBR1 Circuit-breaker condition monitoring (1)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SSCBR1			
50	20005	.RsAccmAPwr.Oper.ctlVal		Reset accumulated energy	1=Reset
50	20006	.RsCBWear.Oper.ctlVal		Reset CB life	1=Reset
50	20011	.RsTrvTm.Oper.ctlVal		Reset CB travelling time	1=Reset
		LD0.SSOPM1			
50	20012	.RsSprChaTm.Oper.ctlVal		Reset spring charging time	1=Reset

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

Table 214: LD0.SSCBR2 Circuit-breaker condition monitoring (2)

Object type	Addr	IEC 61850 name	SA name	Description	Values
		LD0.SSCBR2			
50	20015	.RsAccmAPwr.Oper.ctlVal		Reset accumulated energy	1=Reset
50	20016	.RsCBWear.Oper.ctlVal		Reset CB life	1=Reset
50	20021	.RsTrvTm.Oper.ctlVal		Reset CB travelling time	1=Reset
		LD0.SSOPM2			
50	20022	.RsSprChaTm.Oper.ctlVal		Reset spring charging time	1=Reset

Section 3

IEC 60870-5-101/104 protocol implementation

3.1

Overview

- IEC 60870-5-101 = Companion standard for basic telecontrol tasks
- IEC 60870-5-5 = Basic Application Functions
- IEC 60870-5-2 = Link Transmission Procedures
- IEC 60870-5-4 = Definition and Coding of Application Information Elements
- IEC 60870-5-3 = General Structure of Application Data
- IEC 60870-5-1 = Transmission Frame Formats

Please note that the IEC 60870-5-104 protocol support shares application level feature of the IEC 60870-5-101 implementation defined in this section.

The pages in this section have been extracted from the 60870-5-101 © IEC: 2003, Section 8.

3.2

Interoperability IEC 60870-5-101

This companion standard presents sets of parameters and alternatives from which subsets have to be selected to implement particular telecontrol systems. Certain parameter values, such as the number of octets in the COMMON ADDRESS of ASDUs represent mutually exclusive alternatives. This means that only one value of the defined parameters is admitted per system. Other parameters, such as the listed set of different process information in command and in monitor direction allow the specification of the complete set or subsets, as appropriate for given applications. This Clause summarizes the parameters of the previous Clauses to facilitate a suitable selection for a specific application. If a system is composed of equipment stemming from different manufacturers it is necessary that all partners agree on the selected parameters.

The selected parameters should be marked in the white boxes.

-
- Function or ASDU is not used
 - Function or ASDU is used as standardized (default)
 - Function or ASDU is used in reverse mode
 - Function or ASDU is used in standard and reverse mode

The possible selection (blank, X, R, or B) is specified for each specific clause or parameter.



The full specification of a system may require individual selection of certain parameters for certain parts of the system, such as the individual selection of scaling factors for individually addressable measured values.

3.3

System or device

(System-specific parameter, indicate the station's function by marking one of the following with “X”.)

- System definition
- Controlling station definition (master)
- Controlled station definition (slave)

3.4

Network configuration

(Network-specific parameter, all configurations that are used are to be marked with “X”.)

- | | | | |
|-------------------------------------|-------------------------|--------------------------|-----------------------|
| <input checked="" type="checkbox"/> | Point-to-point | <input type="checkbox"/> | Multipoint-party line |
| <input checked="" type="checkbox"/> | Multiple point-to-point | <input type="checkbox"/> | Multipoint-star |

3.5

Physical layer

(Network-specific parameter, all configurations and data rates that are used are to be marked with “X”.)

Transmission speed (control direction)

Unbalanced interchange Circuit V. 24/V.28 Standard	Unbalanced interchange Circuit V. 24/V.28 Recommended if >1200 bit/s	Balanced interchange Circuit X. 24/X.27	
<input type="checkbox"/> 100 bit/s	<input checked="" type="checkbox"/> 2400 bit/s	<input checked="" type="checkbox"/> 2400 bit/s	<input type="checkbox"/> 56000 bit/s
<input type="checkbox"/> 200 bit/s	<input checked="" type="checkbox"/> 4800 bit/s	<input checked="" type="checkbox"/> 4800 bit/s	<input type="checkbox"/> 64000 bit/s
<input checked="" type="checkbox"/> 300 bit/s	<input checked="" type="checkbox"/> 9600 bit/s	<input checked="" type="checkbox"/> 9600 bit/s	
<input checked="" type="checkbox"/> 600 bit/s		<input checked="" type="checkbox"/> 19200 bit/s	
<input checked="" type="checkbox"/> 1200 bit/s		<input checked="" type="checkbox"/> 38400 bit/s	

Transmission speed (monitor direction)

Unbalanced interchange Circuit V. 24/V.28 Standard	Unbalanced interchange Circuit V. 24/V.28 Recommended if >1200 bit/s	Balanced interchange Circuit X. 24/X.27	
<input type="checkbox"/> 100 bit/s	<input checked="" type="checkbox"/> 2400 bit/s	<input checked="" type="checkbox"/> 2400 bit/s	<input type="checkbox"/> 56000 bit/s
<input type="checkbox"/> 200 bit/s	<input checked="" type="checkbox"/> 4800 bit/s	<input checked="" type="checkbox"/> 4800 bit/s	<input type="checkbox"/> 64000 bit/s
<input checked="" type="checkbox"/> 300 bit/s	<input checked="" type="checkbox"/> 9600 bit/s	<input checked="" type="checkbox"/> 9600 bit/s	
<input checked="" type="checkbox"/> 600 bit/s		<input checked="" type="checkbox"/> 19200 bit/s	
<input checked="" type="checkbox"/> 1200 bit/s		<input checked="" type="checkbox"/> 38400 bit/s	

3.6 Link layer

(Network-specific parameter, mark all used options with an “X“. Specify the maximum frame length. If a non-standard assignment of class 2 messages is implemented for unbalanced transmission, indicate the Type ID and COT of all messages assigned to class 2.)

Frame format FT 1.2, single character 1 and the fixed time-out interval are used exclusively in this companion standard.

Link transmission procedure	Address field of the link
<input checked="" type="checkbox"/> Balanced transmission	<input type="checkbox"/> Not present (balanced transmission only)
<input checked="" type="checkbox"/> Unbalanced transmission	<input checked="" type="checkbox"/> One octet

Table continues on next page

-
- Two octets
 - Structured
 - Unstructured

Frame length

- 4095 Maximum length L (control direction)
- 255 Maximum length L (monitor direction)
- Time during which repetitions are permitted (Trp) or number of repetitions

When using an unbalanced link layer, the following ASDU types are returned in class 2 messages (low priority) with the indicated causes of transmission:

- The standard assignment of ASDUs to class 2 messages is used as follows:

Type identification	Cause of transmission

- A special assignment of ASDUs to class 2 messages is used as follows:

Type identification	Cause of transmission



In response to a class 2 poll, a controlled station may respond with class 1 data when there is no class 2 data available.

3.7

Application layer

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.

Common address of ASDU

(System-specific parameter, mark all used configurations with an “X“.)

- One octet Two octets

Information object address

(System-specific parameter, mark all used configurations with an “X“.)

- | | |
|--|--|
| <input checked="" type="checkbox"/> One octet | <input checked="" type="checkbox"/> Structured |
| <input checked="" type="checkbox"/> Two octets | <input checked="" type="checkbox"/> Unstructured |
| <input checked="" type="checkbox"/> Three octets | |

Cause of transmission

(System-specific parameter, mark all used configurations with an “X“.)

- One octet Two octets (with originator address). Originator address is set to zero if not used

Selection of standard ASDUs

Process information in monitor direction

(Station-specific parameter, mark each Type ID with an “X“ if it is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

- | | | |
|-------------------------------------|---|-----------|
| <input checked="" type="checkbox"/> | <1>:= Single-point information | M_SP_NA_1 |
| <input checked="" type="checkbox"/> | <2>:= Single-point information with time tag | M_SP_TA_1 |
| <input checked="" type="checkbox"/> | <3>:= Double-point information | M_DP_NA_1 |
| <input checked="" type="checkbox"/> | <4>:= Double-point information with time tag | M_DP_TA_1 |
| <input type="checkbox"/> | <5>:= Step position information | M_ST_NA_1 |
| <input type="checkbox"/> | <6>:= Step position information with time tag | M_ST_TA_1 |
| <input type="checkbox"/> | <7>Bitstring of 32 bit | M_BO_NA_1 |
| <input type="checkbox"/> | <8>:= Bitstring of 32 bit with time tag | M_BO_TA_1 |
| <input checked="" type="checkbox"/> | <9>:= Measured value, normalized value | M_ME_NA_1 |
| <input checked="" type="checkbox"/> | <10>:= Measured value, normalized value with time tag | M_ME_TA_1 |

Table continues on next page

<input checked="" type="checkbox"/>	<11>:= Measured value, scaled value	M_ME_NB_1
<input checked="" type="checkbox"/>	<12>:= Measured value, scaled value with time tag	M_ME_TB_1
<input checked="" type="checkbox"/>	<13>:= Measured value, short floating point value	M_ME_NC_1
<input checked="" type="checkbox"/>	<14> := Measured value, short floating point value with time tag	M_ME_TC_1
<input checked="" type="checkbox"/>	<15>:= Integrated totals	M_IT_NA_1
<input checked="" type="checkbox"/>	<16>:= Integrated totals with time tag	M_IT_TA_1
<input type="checkbox"/>	<17>:= Event of protection equipment with time tag	M_EP_TA_1
<input type="checkbox"/>	<18>:= Packed start events of protection equipment with time tag	M_EP_TB_1
<input type="checkbox"/>	<19>:= Packed output circuit information of protection equipment with time tag	M_EP_TC_1
<input type="checkbox"/>	<20>:= Packed single-point information with status change detection	M_SP_NA_1
<input checked="" type="checkbox"/>	<21>:= Measured value, normalized value without quality descriptor	M_ME_ND_1
<input checked="" type="checkbox"/>	<30>:= Single-point information with time tag CP56Time2a	M_SP_TB_1
<input checked="" type="checkbox"/>	<31>:= Double-point information with time tag CP56Time2a	M_DP_TB_1
<input type="checkbox"/>	<32>:= Step position information with time tag CP56Time2a	M_ST_TB_1
<input type="checkbox"/>	<33>:= Bitstring of 32 bit with time tag CP56Time2a	M_BO_TB_1
<input checked="" type="checkbox"/>	<34>:= Measured value, normalized value with time tag CP56Time2a	M_ME_TD_1
<input checked="" type="checkbox"/>	<35>:= Measured value, scaled value with time tag CP56Time2a	M_ME_TE_1
<input checked="" type="checkbox"/>	<36>:= Measured value, short floating point value with time tag CP56Time2a	M_ME_TF_1
<input checked="" type="checkbox"/>	<37>:= Integrated totals with time tag CP56Time2a	M_IT_TB_1
<input type="checkbox"/>	<38>:= Event of protection equipment with time tag CP56Time2a	M_EP_TD_1
<input type="checkbox"/>	<39>:= Packed start events of protection equipment with time tag CP56Time2a	M_EP_TE_1
<input type="checkbox"/>	<40>:= Packed output circuit information of protection equipment with time tag CP56Time2a	M_EP_TF_1

Either ASDUs of the set <2>, <4>, <6>, <8>, <10>, <12>, <14>, <16>, <17> or of the set <30...40> are used.

Process information in control direction

(Station-specific parameter, mark each Type ID with an “X“ if it is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

<input checked="" type="checkbox"/>	<45>:= Single command	C_SC_NA_1
<input checked="" type="checkbox"/>	<46>:= Double command	C_DC_NA_1
<input type="checkbox"/>	<47>:= Regulating step command	C_RC_NA_1
<input type="checkbox"/>	<48>:= Set point command, normalized value	C_SE_NA_1
<input type="checkbox"/>	<49>:= Set point command, scaled value	C_SE_NB_1
<input type="checkbox"/>	<50>:= Set point command, short floating point value	C_SE_NC_1
<input type="checkbox"/>	<51> := Bitstring of 32 bit	C_BO_NA_1

System information in monitor direction

(Station-specific parameter, mark with an “X“ if it is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

<input type="checkbox"/>	<70> := End of initialization	M_EI_NA_1
--------------------------	-------------------------------	-----------

System information in control direction

(Station-specific parameter, mark each Type ID with an “X“ if it is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

<input checked="" type="checkbox"/>	<100>:= Interrogation command	C_IC_NA_1
<input checked="" type="checkbox"/>	<101>:= Counter interrogation command	C_CI_NA_1
<input type="checkbox"/>	<102>:= Read command	C_RD_NA_1
<input checked="" type="checkbox"/>	<103>:= Clock synchronization command (option see 7.6)	C_CS_NA_1
<input type="checkbox"/>	<104>:= Test command	C_TS_NA_1
<input type="checkbox"/>	<105>:= Reset process command	C_RP_NA_1
<input checked="" type="checkbox"/>	<106>:= Delay acquisition command	C_CD_NA_1

Parameter in control direction

(Station-specific parameter, mark each Type ID with an “X“ if it is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

<input type="checkbox"/>	<110>:= Parameter of measured value, normalized value	P_ME_NA_1
<input type="checkbox"/>	<111>:= Parameter of measured value, scaled value	P_ME_NB_1
<input type="checkbox"/>	<112>:= Parameter of measured value, short floating point value	P_ME_NC_1
<input type="checkbox"/>	<113>:= Parameter activation	P_AC_NA_1

File transfer

(Station-specific parameter, mark each Type ID with an "X" if it is only used in the standard direction, "R" if only used in the reverse direction, and "B" if used in both directions.)

<input type="checkbox"/>	<120>:= File ready	F_FR_NA_1
<input type="checkbox"/>	<121>:= Section ready	F_SR_NA_1
<input type="checkbox"/>	<122>:= Call directory, select file, call file, call section	F_SC_NA_1
<input type="checkbox"/>	<123>:= Last section, last segment	F_LS_NA_1
<input type="checkbox"/>	<124>:= Ack file, ack section	F_AF_NA_1
<input type="checkbox"/>	<125>:= Segment	F_SG_NA_1
<input type="checkbox"/>	<126>:= Directory {blank or X, only available in monitor (standard) direction}	F_DR_TA_1

Type identifier and cause of transmission assignments

(Station-specific parameters)

Shaded boxes: option not required.

Blank: functions or ASDU not used.

Mark the Type Identification/cause of transmission combinations.

"X" if only used in the standard direction

"R" if only used in the reverse direction

"B" if used in both directions

Type identification		Cause of transmission																			
		Periodic, cyclic	Background scan	Spontaneous	Initialized	Request or requested	Activation	Activation confirmation	Deactivation	Deactivation confirmation	Activation termination	Return info caused by a remote cmd	Return info caused by a local cmd	File transfer	Interrogated by group <number>	Request by group <number> counter request	Unknown type identification	Unknown cause of transmission	Unknown common address of ASDU	Unknown information object address	
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47	
<1>	M_SP_NA_1			X		X											X				
<2>	M_SP_TA_1					X		X													
<3>	M_DP_NA_1			X		X											X				
<4>	M_DP_TA_1				X		X														
<5>	M_ST_NA_1																				
<6>	M_ST_TA_1																				
<7>	M_BO_NA_1																				
<8>	M_BO_TA_1																				
<9>	M_ME_NA_1	X		X		X											X				
<10>	M_ME_TA_1				X		X														
<11>	M_ME_NB_1	X		X		X											X				
<12>	M_ME_TB_1				X		X														
<13>	M_ME_NC_1	X		X		X											X				
<14>	M_ME_TC_1				X		X														
<15>	M_IT_NA_1																	X			
<16>	M_IT_TA_1																	X			
<17>	M_EP_TA_1																				
<18>	M_EP_TB_1																				
<19>	M_EP_TC_1																				
<20>	M_PS_NA_1																				
<21>	M_ME_ND_1	X		X		X												X			
<30>	M_SP_TB_1					X		X								X	X				
<31>	M_DP_TB_1					X		X								X	X				
<32>	M_ST_TB_1																				
<33>	M_BO_TB_1																				
<34>	M_ME_TD_1				X		X														
<35>	M_ME_TE_1				X		X														
<36>	M_ME_TF_1				X		X														
<37>	M_IT_TB_1				X													X			

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1MRS758759 B

Type identification		Cause of transmission												
		1	2	3	4	5	6	7	8	9	10	11	12	13
<38>	M_EP_TD_1													
<39>	M_EP_TE_1													
<40>	M_EP_TF_1													
<45>	C_SC_NA_1					X	X	X	X	X				X X X X
<46>	C_DC_NA_1					X	X	X	X	X				X X X X
<47>	C_RC_NA_1													
<48>	C_SE_NA_1													
<49>	C_SE_NB_1													
<50>	C_SE_NC_1													
<51>	C_BO_NA_1													
<70>	M_EI_NA_1*													
<100>	C_IC_NA_1					X	X	X	X	X				X X X X
<101>	C_CI_NA_1					X	X			X				X X X X
<102>	C_RD_NA_1													
<103>	C_CS_NA_1		X			X	X							X X X X
<104>	C_TS_NA_1													
<105>	C_RP_NA_1													
<106>	C_CD_NA_1													
<110>	P_ME_NA_1													
<111>	P_ME_NB_1													
<112>	P_ME_NC_1													
<113>	P_AC_NA_1													
<120>	F_FR_NA_1													
<121>	F_SR_NA_1													
<122>	F_SC_NA_1													
<123>	F_LS_NA_1													
<124>	F_AF_NA_1													

Table continues on next page

Type identification		Cause of transmission																	
		Periodic, cyclic	Background scan	Spontaneous	Initialized	Request or requested	Activation	Activation confirmation	Deactivation	Deactivation confirmation	Activation termination	Return info caused by a remote cmd	Return info caused by a local cmd	File transfer	Interrogated by group <number>	Request by group <number> counter request	Unknown type identification	Unknown cause of transmission	Unknown common address of ASDU
1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47	
<125>	F_SG_NA_1																		
<126>	F_DR_TA_1*																		
* Blank or X only																			

3.8 Basic application functions

Station initialization

(Station-specific parameter, mark with an “X“ if the function is used.)

Remote initialization

Cyclic data transmission

(Station-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

Cyclic data transmission

Read procedure

(Station-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

Read procedure

Spontaneous transmission

(Station-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

- Spontaneous transmission

Double transmission of information objects with cause of transmission spontaneous

(Station-specific parameter, mark each information type with an “X“ where both a Type ID without time and a corresponding Type ID with time are issued in response to a single spontaneous change of a monitored object.)

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list.

- Double-point information M_DP_NA_1, M_DP_TA_1 and M_DP_TB_1
- Step position information M_ST_NA_1, M_ST_TA_1 and M_ST_TB_1
- Bitstring of 32 bit M_BO_NA_1, M_BO_TA_1 and M_BO_TB_1 (if defined for a specific project)
- Measured value, normalized value M_ME_NA_1, M_ME_TA_1, M_ME_ND_1 and M_ME_TD_1
- Measured value, scaled value M_ME_NB_1, M_ME_TB_1 and M_ME_TE_1
- Measured value, short floating point number M_ME_NC_1, M_ME_TC_1 and M_ME_TF_1

Station interrogation

(Station-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

- global
- group 1 group 7 group 13
- group 2 group 8 group 14
- group 3 group 9 group 15
- group 4 group 10 group 16
- group 5 group 11
- group 6 group 12

Information object addresses assigned to each group must be shown in a separate table.

Clock synchronization

(Station-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

- Clock synchronization
- Day of week used
- RES1, GEN (time tag substituted/ not substituted) used
- SU-bit (summertime) used

Command transmission

(Object-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

- Direct command transmission
- Direct set point command transmission
- Select and execute command
- Select and execute set point command
- C_SE ACTTERM used
- No additional definition
- Short-pulse duration (duration determined by a system parameter in the outstation)
- Long-pulse duration (duration determined by a system parameter in the outstation)
- Persistent output

Transmission of integrated totals

(Station- or object-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

- Mode A: Local freeze with spontaneous transmission
- Mode B: Local freeze with counter interrogation
- Mode C: Freeze and transmit by counter-interrogation commands

Table continues on next page

Mode D: Freeze by counter-interrogation command, frozen values reported

Counter read

Counter freeze without reset

Counter reset

General request counter

Request counter group 1

Request counter group 2

Request counter group 3

Request counter group 4

Parameter loading

(Object-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

Threshold value

Smoothing factor

Low limit for transmission of measured values

High limit for transmission of measured values

Parameter activation

(Station-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

Act/deact of persistent cyclic or periodic transmission of the addressed object

Test procedure

(Station-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

Test procedure

File transfer

(Station-specific parameter, mark with an “X“ if the function is used.)

File transfer in monitor direction

- Transparent file
- Transmission of disturbance data of protection equipment
- Transmission of sequences of events
- Transmission of sequences of recorded analogue values

File transfer in control direction

- Transparent file

Background scan

(Station-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

- Background scan

Acquisition of transmission delay

(Station-specific parameter, mark with an “X“ if the function is only used in the standard direction, “R“ if only used in the reverse direction, and “B“ if used in both directions.)

- Acquisition of transmission delay

Section 4 Glossary

ASDU	Application-layer service data unit
COT	Cause of transmission
EMC	Electromagnetic compatibility
IEC	International Electrotechnical Commission
IEC 60870-5-101	Companion standard for basic telecontrol tasks
IEC 60870-5-104	Network access for IEC 60870-5-101
IEC 60870-5-4	
IED	Intelligent electronic device
LHMI	Local human-machine interface
PCM600	Protection and Control IED Manager

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