Relion® 615 series

Line Differential Protection and Control RED615 IEC 60870-5-103 Point List Manual

ABB

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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 IED. 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 an IED 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

The application manual contains application descriptions and setting guidelines sorted per function. The manual can be used to find out when and for what purpose a typical protection function can be used. The manual can also be used when calculating settings.

The communication protocol manual describes a communication protocol supported by the IED. The manual concentrates on vendor-specific implementations.

The engineering guide provides information for IEC 61850 engineering of the protection IEDs with PCM600 and IET600. This guide concentrates especially on the configuration of GOOSE communication with these tools. The guide can be used as a technical reference during the engineering phase, installation and commissioning phase, and during normal service. For more details on tool usage, see the PCM600 documentation.

The engineering manual contains instructions on how to engineer the IEDs using the different tools in PCM600. The manual provides instructions on how to set up a PCM600 project and insert IEDs to the project structure. The manual also

recommends a sequence for engineering of protection and control functions, LHMI functions as well as communication engineering for IEC 61850 and other supported protocols.

The installation manual contains instructions on how to install the IED. The manual provides procedures for mechanical and electrical installation. The chapters are organized in chronological order in which the IED should be installed.

The operation manual contains instructions on how to operate the IED once it has been commissioned. The manual provides instructions for monitoring, controlling and setting the IED. The manual also describes how to identify disturbances and how to view calculated and measured power grid data to determine the cause of a fault.

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

The technical manual contains application and functionality descriptions and lists function blocks, logic diagrams, input and output signals, setting parameters and technical data sorted per function. The manual can be used as a technical reference during the engineering phase, installation and commissioning phase, and during normal service.

1.3.2 Document revision history

Document revision/date	Product version	History
A/2009-07-03	2.0	First release
B/2010-06-11	3.0	Content updated to correspond to the product version
C/2012-05-11	4.0	Content updated to correspond to the product version
D/2013-02-21	4.0 FP1	Content updated to correspond to the product series version

Download the latest documents from the ABB Website http://www.abb.com/substationautomation.

1.3.3 Related documentation

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

1.4 Symbols and conventions

1.4.1 Symbols

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

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

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

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

1.4.2 Document conventions

A particular convention may not be used in this manual.

- Abbreviations and acronyms in this manual are spelled out in the glossary. The glossary also contains definitions of important terms.
- Push-button navigation in the LHMI menu structure is presented by using the push-button icons.
  To navigate between the options, use ⬆ and ⬇.
- HMI menu paths are presented in bold.
  Select **Main menu/Settings**.
- LHMI messages are shown in Courier font.
  To save the changes in non-volatile 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".
- IED 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

Table 1:   RED615 functions, codes and symbols

Function	IEC 61850	IEC 60617	IEC-ANSI
Protection			
Three-phase non-directional overcurrent protection, low stage	PHLPTOC1	3I> (1)	51P-1 (1)
Three-phase non-directional overcurrent protection, high stage	PHHPTOC1	3I>> (1)	51P-2 (1)
	PHHPTOC2	3I>> (2)	51P-2 (2)
Three-phase non-directional overcurrent protection, instantaneous stage	PHIPTOC1	3I>>> (1)	50P/51P (1)
Non-directional earth-fault protection, low stage	EFLPTOC1	Io> (1)	51N-1 (1)
	EFLPTOC2	Io> (2)	51N-1 (2)
Non-directional earth-fault protection, high stage	EFHPTOC1	Io>> (1)	51N-2 (1)
Non-directional earth-fault protection, instantaneous stage	EFIPTOC1	Io>>>	50N/51N
Directional earth-fault protection, low stage	DEFLPDEF1	Io> -> (1)	67N-1 (1)
	DEFLPDEF2	Io> -> (2)	67N-1 (2)
Directional earth-fault protection, high stage	DEFHPDEF1	Io>> ->	67N-2
Admittance based earth-fault protection	EFPADM1	Yo> -> (1)	21YN (1)
	EFPADM2	Yo> -> (2)	21YN (2)
	EFPADM3	Yo> -> (3)	21YN (3)
Wattmetric based earth-fault protection	WPWDE1	Po> -> (1)	32N (1)
	WPWDE2	Po> -> (2)	32N (2)
	WPWDE3	Po> -> (3)	32N (3)
Transient / intermittent earth-fault protection	INTRPTEF1	Io> -> IEF	67NIEF
Harmonics based earth-fault protection	HAEFPTOC1	Io>HA	51NHA
Non-directional (cross-country) earth fault protection, using calculated Io	EFHPTOC1	Io>> (1)	51N-2 (1)
Negative-sequence overcurrent protection	NSPTOC1	I2> (1)	46 (1)
	NSPTOC2	I2> (2)	46 (2)
Phase discontinuity protection	PDNSPTOC1	I2/I1>	46PD
Residual overvoltage protection	ROVPTOV1	Uo> (1)	59G (1)
	ROVPTOV2	Uo> (2)	59G (2)
	ROVPTOV3	Uo> (3)	59G (3)
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR1	3Ith>F	49F
Binary signal transfer	BSTGGIO1	BST	BST
Line differential protection and related measurements, stabilized and instantaneous stages	LNPLDF1	3dI>L	87L
Circuit breaker failure protection	CCBRBRF1	3I>/Io>BF	51BF/51NBF
Three-phase inrush detector	INRPHAR1	3I2f>	68
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Master trip	TRPPTRC1	Master Trip (1)	94/86 (1)
	TRPPTRC2	Master Trip (2)	94/86 (2)
Control			
Circuit-breaker control	CBXCBR1	I <-> O CB	I <-> O CB
Disconnector control	DCXSWI1	I <-> O DCC (1)	I <-> O DCC (1)
	DCXSWI2	I <-> O DCC (2)	I <-> O DCC (2)
Earthing switch control	ESXSWI1	I <-> O ESC	I <-> O ESC
Disconnector position indication	DCSXSWI1	I <-> O DC (1)	I <-> O DC (1)
	DCSXSWI2	I <-> O DC (2)	I <-> O DC (2)
	DCSXSWI3	I <-> O DC (3)	I <-> O DC (3)
Earthing switch indication	ESSXSWI1	I <-> O ES (1)	I <-> O ES (1)
	ESSXSWI2	I <-> O ES (2)	I <-> O ES (2)
Auto-reclosing	DARREC1	O -> I	79
Condition monitoring			
Circuit-breaker condition monitoring	SSCBR1	CBCM	CBCM
Trip circuit supervision	TCSSCBR1	TCS (1)	TCM (1)
	TCSSCBR2	TCS (2)	TCM (2)
Current circuit supervision	CCRDIF1	MCS 3I	MCS 3I
Protection communication supervision	PCSRTPC1	PCS	PCS
Measurement			
Disturbance recorder	RDRE1	-	-
Three-phase current measurement	CMMXU1	3I	3I
Sequence current measurement	CSMSQI1	I1, I2, I0	I1, I2, I0
Residual current measurement	RESCMMXU1	Io	In
Residual voltage measurement	RESVMMXU1	Uo	Vn

Section 2   IEC 60870-5-103 data mappings

2.1   Overview

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

2.2   Supported functions

Table 2:   *Supported functions in RED615*

Function block	DE01	DE02	DE03
PHLPTOC1	•	•	•
PHHPTOC1	•	•	•
PHHPTOC2	•	•	•
PHIPTOC1	•	•	•
EFLPTOC1			•
EFLPTOC2			•
EFHPTOC1			•
EFIPTOC1			•
DEFLPDEF1		•	
DEFLPDEF2		•	
DEFHPDEF1		•	
EFPADM1		o	
EFPADM2		o	
EFPADM3		o	
WPWDE1		o	
WPWDE2		o	
WPWDE3		o	
INTRPTEF1		•	
HAEFPTOC1		o	o
EFHPTOC1		•	
NSPTOC1	•	•	•
NSPTOC2	•	•	•
Table continues on next page			

Function block	DE01	DE02	DE03
PDNSPTOC1		●	●
ROVPTOV1		●	
ROVPTOV2		●	
ROVPTOV3		●	
T1PTTR1		●	●
BSTGGIO1	●	●	●
LNPLDF1	●	●	●
CCBRBRF1	●	●	●
INRPHAR1	●	●	●
TRPPTRC1	●	●	●
TRPPTRC2	●	●	●
CBXCBR1	●	●	●
DCXSWI1	●	●	●
DCXSWI2	●	●	●
ESXSWI1	●	●	●
DCSXSWI1	●	●	●
DCSXSWI2	●	●	●
DCSXSWI3	●	●	●
ESSXSWI1	●	●	●
ESSXSWI2	●	●	●
DARREC1		o	o
SSCBR1		●	●
TCSSCBR1	●	●	●
TCSSCBR2	●	●	●
CCRDIF1	●	●	●
PCSRTPC1	●	●	●
RDRE1	●	●	●
CMMXU1	●	●	●
CSMSQI1	●	●	●
RESCMMXU1		●	●
RESVMMXU1		●	
● = available in the device variant, o = optionally available in the device variant			

2.3 Indications and controls

Table 3:   *Explanations of the indications and controls table columns*

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

2.3.1 General Data(FUN=0) IEC 60870-5-103 standard

Table 4:   *General Data(FUN=0) IEC 60870-5-103 standard*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LNN0									
.LEDRs1.ctlVal	-	LED reset	10=Reset	0	19	1	20	0	1
.Beh.stVal.(Test)	-	Test mode	10=On	0	21	1	1	1	1
LD0.I3CGGIO1									
.ActSG.ctlVal/stVal	-	Param setting group 1	10=SG 1	0	23	1	1,20	1	1
.ActSG.ctlVal/stVal	-	Param setting group 2	10=SG 2	0	24	1	1,20	1	1
.ActSG.ctlVal/stVal	-	Param setting group 3	10=SG 3	0	25	1	1,20	1	1
.ActSG.ctlVal/stVal	-	Param setting group 4	10=SG 4	0	26	1	1,20	1	1
.ActSG.ctlVal/stVal	-	Param setting group 5	10=SG 5	0	27	1	1,20	1	1
.ActSG.ctlVal/stVal	-	Param setting group 6	10=SG 6	0	28	1	1,20	1	1
LD0.TCSSCBR1									
.CirAlm.stVal	ALARM	Trip circuit 1 alarm	10=Alarm	0	36	1	1	1	1
LD0.LEDPTRC1									
.Op.general	-	Global operate	10=Operate	0	68	1	2	0	1
.Str.general	-	Global start	10=Start	0	84	1	2	1	1

2.3.2 General Data(FUN=0) IEC 60870-5-103 standard - AR data

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

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

2.3.3 General Data(FUN=10) - 615-specific

Table 6:   General Data(FUN=10) - 615-specific

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.TRPPTRC1									
.Op.general	-	Trip1 input	10=On	10	1	1	2	0	1
.Tr.general	-	Trip1 output	10=On	10	2	1	2	0	1
LD0.TRPPTRC2									
.Op.general	-	Trip2 input	10=On	10	3	1	2	0	1
.Tr.general	-	Trip2 output	10=On	10	4	1	2	0	1
CTRL.LLN0									
.Loc.stVal	-	Local/Remote state	10=Local	10	10	1	1	1	1
.LocRem.Station	-	Station state	10=On	10	11	1	1	1	1
LD0.LLN0									
.LEDRs2.ctlVal	-	Reset alarm LEDs	10=Reset	10	21	1	20	0	1
.SetSeld.stVal	-	Param.setting reserved	10=Res	10	80	1	1	1	1
.SetChg.stVal	-	Param.setting changed	10=Chng	10	81	1	1	1	1
LD0.TCSSCBR2									
.CirAlm.stVal	ALARM	Trip circuit 2 alarm	10=Alarm	10	36	1	1	1	1
DR.RDRE1									
.RcdTrg.ctlVal	-	Trig DR recording	10=Trig	10	41	1	20	0	1
.MemClr.ctlVal	-	Clear DR memory	10=Clear	10	42	1	20	0	1
LD0.CMSTA1									
.RecRs.ctlVal	-	Reset max.demands 1	10=Reset	10	45	1	20	0	1
LD0.LEDPTRC1		Global protection:							
.Str.phsA	-	Start-phsA	10=Start	10	61	0	2	1	1
.Str.phsB	-	Start-phsB	10=Start	10	62	0	2	1	1
.Str.phsC	-	Start-phsC	10=Start	10	63	0	2	1	1
.Op.phsA	-	Operate-phsA	10=Operate	10	65	0	2	0	1
.Op.phsB	-	Operate-phsB	10=Operate	10	66	0	2	0	1
.Op.phsC	-	Operate-phsC	10=Operate	10	67	0	2	0	1

2.3.4 LD0.MVGAPC1 Multipurpose binary inputs (1)

Table 7:   *LD0.MVGAPC1 Multipurpose binary inputs (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MVGAPC1									
.Q1.stVal	-	Input 1 signal	10=On	11	1	0	1	1	1
.Q2.stVal	-	Input 2 signal	10=On	11	2	0	1	1	1
.Q3.stVal	-	Input 3 signal	10=On	11	3	0	1	1	1
.Q4.stVal	-	Input 4 signal	10=On	11	4	0	1	1	1
.Q5.stVal	-	Input 5 signal	10=On	11	5	0	1	1	1
.Q6.stVal	-	Input 6 signal	10=On	11	6	0	1	1	1
.Q7.stVal	-	Input 7 signal	10=On	11	7	0	1	1	1
.Q8.stVal	-	Input 8 signal	10=On	11	8	0	1	1	1

2.3.5 LD0.MVGAPC2 Multipurpose binary inputs (2)

Table 8:   *LD0.MVGAPC2 Multipurpose binary inputs (2)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.MVGAPC2									
.Q1.stVal	-	Input 1 signal	10=On	11	11	0	1	1	1
.Q2.stVal	-	Input 2 signal	10=On	11	12	0	1	1	1
.Q3.stVal	-	Input 3 signal	10=On	11	13	0	1	1	1
.Q4.stVal	-	Input 4 signal	10=On	11	14	0	1	1	1
.Q5.stVal	-	Input 5 signal	10=On	11	15	0	1	1	1
.Q6.stVal	-	Input 6 signal	10=On	11	16	0	1	1	1
.Q7.stVal	-	Input 7 signal	10=On	11	17	0	1	1	1
.Q8.stVal	-	Input 8 signal	10=On	11	18	0	1	1	1

2.3.6 LD0.SRGAPC1 Multipurpose binary outputs - flip-flop resets (1)

Table 9:   *LD0.SRGAPC1 Multipurpose binary outputs - flip-flop resets (1)*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SRGAPC1									
.Rs1.ctlVal	-	Reset flip-flop 1	10=Reset	11	101	1	20	0	1
.Rs2.ctlVal	-	Reset flip-flop 2	10=Reset	11	102	1	20	0	1
.Rs3.ctlVal	-	Reset flip-flop 3	10=Reset	11	103	1	20	0	1
.Rs4.ctlVal	-	Reset flip-flop 4	10=Reset	11	104	1	20	0	1
.Rs5.ctlVal	-	Reset flip-flop 5	10=Reset	11	105	1	20	0	1
Table continues on next page									

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.Rs6.ctlVal	-	Reset flip-flop 6	10=Reset	11	106	1	20	0	1
.Rs7.ctlVal	-	Reset flip-flop 7	10=Reset	11	107	1	20	0	1
.Rs8.ctlVal	-	Reset flip-flop 8	10=Reset	11	108	1	20	0	1

2.3.7 LD0.SRGAPC2 Multipurpose binary outputs - flip-flop resets (2)

Table 10:   LD0.SRGAPC2 Multipurpose binary outputs - flip-flop resets (2)

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

2.3.8 LD0.SPCGGIO1 Multipurpose binary outputs (1)

The binary outputs may be configured either as pulse- or persistent-type outputs. Pulse-type outputs are triggered with the write value "ON". Persistent-type outputs can be written with both "ON" and "OFF" values. The persistent type is the same as the toggled mode on LHMI and WHMI.

Table 11:   LD0.SPCGGIO1 Multipurpose binary outputs (1)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SPCGGIO1									
.SPCS01.ctlVal	-	Output control 1	10/01=On/Off	11	141	1	20	0	1
.SPCS02.ctlVal	-	Output control 2	10/01=On/Off	11	142	1	20	0	1
.SPCS03.ctlVal	-	Output control 3	10/01=On/Off	11	143	1	20	0	1
.SPCS04.ctlVal	-	Output control 4	10/01=On/Off	11	144	1	20	0	1
.SPCS05.ctlVal	-	Output control 5	10/01=On/Off	11	145	1	20	0	1
.SPCS06.ctlVal	-	Output control 6	10/01=On/Off	11	146	1	20	0	1
.SPCS07.ctlVal	-	Output control 7	10/01=On/Off	11	147	1	20	0	1
.SPCS08.ctlVal	-	Output control 8	10/01=On/Off	11	148	1	20	0	1
.SPCS09.ctlVal	-	Output control 9	10/01=On/Off	11	149	1	20	0	1
.SPCS10.ctlVal	-	Output control 10	10/01=On/Off	11	150	1	20	0	1
.SPCS11.ctlVal	-	Output control 11	10/01=On/Off	11	151	1	20	0	1
Table continues on next page									

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

2.3.9 LD0.SPCGGIO2 Multipurpose binary outputs (2)

The binary outputs may be configured either as pulse- or persistent-type outputs. Pulse-type outputs are triggered with the write value "ON". Persistent-type outputs can be written with both "ON" and "OFF" values. The persistent type is the same as the toggled mode on LHMI and WHMI.

Table 12:   LD0.SPCGGIO2 Multipurpose binary outputs (2)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.SPCGGIO2									
.SPCS01.ctlVal	-	Output control 1	10/01=On/Off	11	181	1	1,20	0	1
.SPCS02.ctlVal	-	Output control 2	10/01=On/Off	11	182	1	1,20	0	1
.SPCS03.ctlVal	-	Output control 3	10/01=On/Off	11	183	1	1,20	0	1
.SPCS04.ctlVal	-	Output control 4	10/01=On/Off	11	184	1	1,20	0	1
.SPCS05.ctlVal	-	Output control 5	10/01=On/Off	11	185	1	1,20	0	1
.SPCS06.ctlVal	-	Output control 6	10/01=On/Off	11	186	1	1,20	0	1
.SPCS07.ctlVal	-	Output control 7	10/01=On/Off	11	187	1	1,20	0	1
.SPCS08.ctlVal	-	Output control 8	10/01=On/Off	11	188	1	1,20	0	1
.SPCS09.ctlVal	-	Output control 9	10/01=On/Off	11	189	1	1,20	0	1
.SPCS10.ctlVal	-	Output control 10	10/01=On/Off	11	190	1	1,20	0	1
.SPCS11.ctlVal	-	Output control 11	10/01=On/Off	11	191	1	1,20	0	1
.SPCS12.ctlVal	-	Output control 12	10/01=On/Off	11	192	1	1,20	0	1
.SPCS13.ctlVal	-	Output control 13	10/01=On/Off	11	193	1	1,20	0	1
.SPCS14.ctlVal	-	Output control 14	10/01=On/Off	11	194	1	1,20	0	1
.SPCS15.ctlVal	-	Output control 15	10/01=On/Off	11	195	1	1,20	0	1
.SPCS16.ctlVal	-	Output control 16	10/01=On/Off	11	196	1	1,20	0	1

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

Table 13:   LD0.NSPTOC1 Negative-sequence overcurrent protection (1)

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

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

Table 14: *LD0.NSPTOC2 Negative-sequence overcurrent protection (2)*

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

2.3.12 CTRL.CCRDIF1 Current circuit failure protection

Table 15: *CTRL.CCRDIF1 Current circuit failure protection*

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.CCRDIF1									
.Alm.stVal	ALARM	Fail Alarm	10=Alarm	23	1	1	1	1	1
.Op.general	FAIL	Fail Operate	10=Operate	23	90	1	2	0	1

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

Table 16: *LD0.EFPADM1 Admittance-based earth-fault protection (1)*

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

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

Table 17: *LD0.EFPADM2 Admittance-based earth-fault protection (2)*

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

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

Table 18: *LD0.EFPADM3 Admittance-based earth-fault protection (3)*

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

2.3.16 LD0.ROVPTOV1 Residual overvoltage protection - stage 1

Table 19:   LD0.ROVPTOV1 Residual overvoltage protection - stage 1

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

2.3.17 LD0.ROVPTOV2 Residual overvoltage protection - stage 2

Table 20:   LD0.ROVPTOV2 Residual overvoltage protection - stage 2

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

2.3.18 LD0.ROVPTOV3 Residual overvoltage protection - stage 3

Table 21:   LD0.ROVPTOV3 Residual overvoltage protection - stage 3

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

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

Table 22:   LD0.XGGIO130 Physical binary I/O signals (status only)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.XGGIO130									
.Ind1.stVal	-	X130-Input 1	10/01=On/Off	50	1	0	1	1	1
.Ind2.stVal	-	X130-Input 2	10/01=On/Off	50	2	0	1	1	1
.Ind3.stVal	-	X130-Input 3	10/01=On/Off	50	3	0	1	1	1
.Ind4.stVal	-	X130-Input 4	10/01=On/Off	50	4	0	1	1	1
.Ind5.stVal	-	X130-Input 5	10/01=On/Off	50	5	0	1	1	1
.Ind6.stVal	-	X130-Input 6	10/01=On/Off	50	6	0	1	1	1
.SPCSO1.stVal	-	X130-Output 1	10/01=On/Off	50	101	0	1	1	1
.SPCSO2.stVal	-	X130-Output 2	10/01=On/Off	50	102	0	1	1	1
.SPCSO3.stVal	-	X130-Output 3	10/01=On/Off	50	103	0	1	1	1

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

Table 23:   *LD0.XGGIO120 Physical binary I/O signals (status only)*

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

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

Table 24:   *LD0.XGGIO110 Physical binary I/O signals (status only)*

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

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

Table 25:   *LD0.XGGIO100 Physical binary I/O signals (status only)*

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

2.3.23 LD0.BSTGGIO1 Binary signal transfer supervision

Table 26: LD0.BSTGGIO1 Binary signal transfer supervision

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

2.3.24 LD0.PCSRTPC1 Protection communication supervision

Table 27: LD0.PCSRTPC1 Protection communication supervision

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.PCSRTPC1									
.HealthAlm.stVal	ALARM	Communication alarm	10=Alarm	80	10	1	1	1	1

2.3.25 LD0.WPWDE1 Wattmetric-based earth-fault protection - stage 1

Table 28: LD0.WPWDE1 Wattmetric-based earth-fault protection - stage 1

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

2.3.26 LD0.WPWDE2 Wattmetric-based earth-fault protection - stage 2

Table 29: LD0.WPWDE2 Wattmetric-based earth-fault protection - stage 2

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

2.3.27　　　　LD0.WPWDE3 Wattmetric-based earth-fault protection - stage 3

Table 30:　　　LD0.WPWDE3 Wattmetric-based earth-fault protection - stage 3

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

2.3.28　　　　LD0.HAEFPTOC1 Harmonics-based earth-fault protection

Table 31:　　　LD0.HAEFPTOC1 Harmonics-based earth-fault protection

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

2.3.29　　　　LD0.PDNSPTOC1 Phase discontinuity protection

Table 32:　　　LD0.PDNSPTOC1 Phase discontinuity protection

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

2.3.30　　　　LD0.INTRPTEF1 Transient/intermittent earth-fault protection

Table 33:　　　LD0.INTRPTEF1 Transient/intermittent earth-fault protection

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.INTRPTEF1									
.Str.general	START	Stage start	10=Start	158	84	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	158	90	1	2	0	1

2.3.31 LD0.EFLPTOC1 Non-directional earth-fault and sensitive earth-fault protection - low stage 1

Table 34:   *LD0.EFLPTOC1 Non-directional earth-fault and sensitive earth-fault protection - low stage 1*

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

2.3.32 LD0.EFLPTOC2 Non-directional earth-fault and sensitive earth-fault protection - low stage 2

Table 35:   *LD0.EFLPTOC2 Non-directional earth-fault and sensitive earth-fault protection - low stage 2*

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

2.3.33 LD0.EFHPTOC1 Non-directional earth-fault and sensitive earth-fault protection - high stage 1

Table 36:   *LD0.EFHPTOC1 Non-directional earth-fault and sensitive earth-fault protection - high stage 1*

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

2.3.34 LD0.EFIPTOC1 Non-directional earth-fault and sensitive earth-fault protection - instantaneous stage 1

Table 37:   *LD0.EFIPTOC1 Non-directional earth-fault and sensitive earth-fault protection - instantaneous stage 1*

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

2.3.35   LD0.PHIPTOC1 Phase overcurrent protection - instantaneous stage 1

Table 38:   *LD0.PHIPTOC1 Phase overcurrent protection - instantaneous stage 1*

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

2.3.36   LD0.PHHPTOC2 Phase overcurrent protection - high stage 2

Table 39:   *LD0.PHHPTOC2 Phase overcurrent protection - high stage 2*

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

2.3.37   LD0.PHHPTOC1 Phase overcurrent protection - high stage 1

Table 40:   *LD0.PHHPTOC1 Phase overcurrent protection - high stage 1*

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

2.3.38 LD0.PHLPTOC1 Phase overcurrent protection - low stage 1

Table 41:   LD0.PHLPTOC1 Phase overcurrent protection - low stage 1

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

2.3.39 LD0.DEFLPDEF1 Directional earth-fault protection - low stage 1

Table 42:   LD0.DEFLPDEF1 Directional earth-fault protection - low stage 1

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

2.3.40 LD0.DEFLPDEF2 Directional earth-fault protection - low stage 2

Table 43:   LD0.DEFLPDEF2 Directional earth-fault protection - low stage 2

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

2.3.41 LD0.DEFHPDEF1 Directional earth-fault protection - high stage 1

Table 44:   LD0.DEFHPDEF1 Directional earth-fault protection - high stage 1

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

2.3.42 LD0.INPHAR1 Three-phase inrush detection

Table 45: LD0.INPHAR1 Three-phase inrush detection

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.INPHAR1									
.Str.phsA	-	-phsA start	10=Start	167	64	0	2	1	1
.Str.phsB	-	-phsB start	10=Start	167	65	0	2	1	1
.Str.phsC	-	-phsC start	10=Start	167	66	0	2	1	1
.Str.general	-	-general start	10=Start	167	84	1	2	1	1

2.3.43 LD0.T1PTTR1 Thermal overload protection (1)

Table 46: LD0.T1PTTR1 Thermal overload protection (1)

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

2.3.44 LD0.DARREC1 Autorecloser

Table 47: LD0.DARREC1 Autorecloser

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

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.Op.general	CLOSE_CB	Operate (close XCBR)	10=Close CB	169	179	1	2	0	1
.OpOpn.general	OPEN_CB	Operate (open XCBR)	10=Open CB	169	180	1	2	0	1
.UnsCBCls.stVal	UNSUC_CB	CB closing failed	10=Failed	169	181	1	2	0	1
.WtMstr.stVal	CMD_WAIT	Master signal to follower	10=Signal	169	182	1	2	0	1

2.3.45 LD0.LNPDIF1 Line-differential protection

Table 48: LD0.LNPDIF1 Line-differential protection

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LNPDIF1									
.Str.general	START	Stage start	10=Start	192	84	1	2	1	1
.Op.general	OPERATE	Stage operate	10=Operate	192	90	1	2	0	1

2.3.46 LD0.CMMXU1 Phase currents (1) limit supervision

Table 49: LD0.CMMXU1 Phase currents (1) limit supervision

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

2.3.47 LD0.RESCMMXU1 Residual current (1) limit supervision

Table 50: LD0.RESCMMXU1 Residual current (1) limit supervision

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

2.3.48 LD0.RESVMMXU1 Residual voltage (1) limit supervision

Table 51: LD0.RESVMMXU1 Residual voltage (1) limit supervision

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

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

Table 52: CTRL.Cxxxxx1 Circuit breaker (1) CB object and failure protection

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

2.3.50 LD0.SSCBR1 Circuit breaker (1) condition monitoring

Table 53: LD0.SSCBR1 Circuit breaker (1) condition monitoring

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

2.3.51 CTRL.DCXSWI1 Disconnector (1) - controllable object

Table 54: CTRL.DCXSWI1 Disconnector (1) - controllable object

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

2.3.52 CTRL.DCXSWI2 Disconnector (2) - controllable object

Table 55: CTRL.DCXSWI2 Disconnector (2) - controllable object

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.DCCILO2									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	246	21	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	246	22	1	1	1	1
.ItlByPss.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	246	25	1	1	1	1
CTRL.DCXSWI2									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	246	23	1	1	1	1
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	246	24	1	1	1	1
CTRL.DCCSWI2									
.stSeld.stVal	SELECTED	DC selected	10=Selected	246	120	1	1	1	1
.Pos.stVal/ctlVal	POSITION	DC pos/control	10/01=Close/Open	246	160	1	1,20	1	2

2.3.53 CTRL.ESXSWI1 Earth switch - controllable object

Table 56: CTRL.ESXSWI1 Earth switch - controllable object

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
CTRL.ESCILO1									
.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	247	21	1	1	1	1
.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	247	22	1	1	1	1
.ItlByPss.stVal	ITL_BYPASS	Interlocking bypass	10=Bypassed	247	25	1	1	1	1
CTRL.ESXSWI1									
.BlkOpn.stVal	BLK_OPEN	Open blocked	10=Blocked	247	23	1	1	1	1
Table continues on next page									

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	247	24	1	1	1	1
CTRL.ESCSWI1									
.stSeld.stVal	SELECTED	ES selected	10=Selected	247	120	1	1	1	1
.Pos.stVal/ctlVal	POSITION	ES pos/control	10/01=Close/Open	247	160	1	1,20	1	2

2.3.54 CTRL.DCSXSWI1 Disconnector (1) - non-controllable object

Table 57: CTRL.DCSXSWI1 Disconnector (1) - non-controllable object

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

2.3.55 CTRL.DCSXSWI2 Disconnector (2) - non-controllable object

Table 58: CTRL.DCSXSWI2 Disconnector (2) - non-controllable object

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

2.3.56 CTRL.DCSXSWI3 Disconnector (3) - non-controllable object

Table 59: CTRL.DCSXSWI3 Disconnector (3) - non-controllable object

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

2.3.57 CTRL.ESSXSWI1 Earth switch (1) - non-controllable object

Table 60: CTRL.ESSXSWI1 Earth switch (1) - non-controllable object

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

2.3.58 CTRL.ESSXSWI2 Earth switch (2) - non-controllable object

Table 61: CTRL.ESSXSWI2 Earth switch (2) - non-controllable object

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

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

Table 62: LD0.LEDGGIO1 LHMI LED indications Type 1 (2 states)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LEDGGIO1									
.ISCSO1.stVal	-	LED 1 state	10=On	253	89	1	1	1	1
.ISCSO2.stVal	-	LED 2 state	10=On	253	90	1	1	1	1
.ISCSO3.stVal	-	LED 3 state	10=On	253	91	1	1	1	1
.ISCSO4.stVal	-	LED 4 state	10=On	253	92	1	1	1	1
.ISCSO5.stVal	-	LED 5 state	10=On	253	93	1	1	1	1
.ISCSO6.stVal	-	LED 6 state	10=On	253	94	1	1	1	1
.ISCSO7.stVal	-	LED 7 state	10=On	253	95	1	1	1	1
.ISCSO8.stVal	-	LED 8 state	10=On	253	96	1	1	1	1
.ISCSO9.stVal	-	LED 9 state	10=On	253	97	1	1	1	1
.ISCSO10.stVal	-	LED 10 state	10=On	253	98	1	1	1	1
.ISCSO11.stVal	-	LED 11 state	10=On	253	99	1	1	1	1

2.3.60 LD0.LEDGGIO1 LHMI LED indications Type 2 (3 states)

Table 63: LD0.LEDGGIO1 LHMI LED indications Type 2 (3 states)

IEC 61850 name	SA name	Description	DPI value	FUN	INF	U	ASDU	I	C
LD0.LEDGGIO1									
.ISCSO1.stVal	-	LED 1 state	01=Ok;10=Alarm	253	119	1	1	0	2
.ISCSO2.stVal	-	LED 2 state	01=Ok;10=Alarm	253	120	1	1	0	2
.ISCSO3.stVal	-	LED 3 state	01=Ok;10=Alarm	253	121	1	1	0	2
.ISCSO4.stVal	-	LED 4 state	01=Ok;10=Alarm	253	122	1	1	0	2
.ISCSO5.stVal	-	LED 5 state	01=Ok;10=Alarm	253	123	1	1	0	2
.ISCSO6.stVal	-	LED 6 state	01=Ok;10=Alarm	253	124	1	1	0	2
.ISCSO7.stVal	-	LED 7 state	01=Ok;10=Alarm	253	125	1	1	0	2
.ISCSO8.stVal	-	LED 8 state	01=Ok;10=Alarm	253	126	1	1	0	2
.ISCSO9.stVal	-	LED 9 state	01=Ok;10=Alarm	253	127	1	1	0	2
.ISCSO10.stVal	-	LED 10 state	01=Ok;10=Alarm	253	128	1	1	0	2
.ISCSO11.stVal	-	LED 11 state	01=Ok;10=Alarm	253	129	1	1	0	2

2.4 Class 2 data measurands

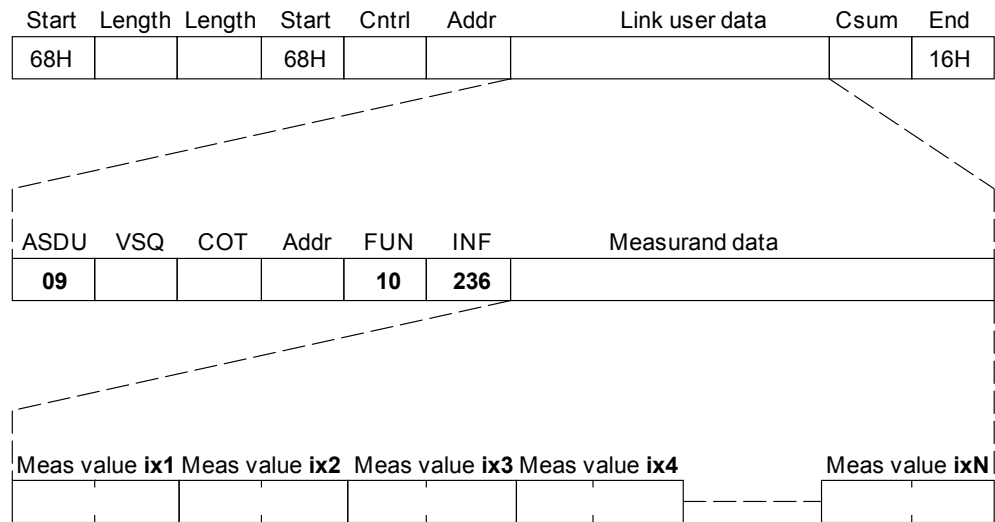Class 2 data measurands use ASDU type 9, function type 10 and information number 236 for frame 6 and 237 for frame 7.

Start	Length	Length	Start	Cntrl	Addr	Link user data	Csum	End
68H			68H					16H

ASDU	VSQ	COT	Addr	FUN	INF	Measurand data
09				10	236	

Meas value ix1	Meas value ix2	Meas value ix3	Meas value ix4	Meas value ixN

Figure 1:   *Class 2 frame response in the predefined private Class 2 frames, numbers 6 or 7*

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

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

Table 64:   *Explanations of the class 2 data measurands table columns*

Column name	Description
IEC 61850 name	Original IED data object identification. Described in the IEC 61850 format as Logical Device.Logical Node and thereafter .Data Object.Data Attribute. Logical Node is the same as the application function block name.
Description	Short description of the signal. See the application function block documentation for more details.
Scale	Absolute IED object value that corresponds to the IEC 60870-5-103 maximum value.
ix (D-a)	D-a relates to variants DE01, 02 and 03.

2.4.1 Class 2 private measurand data (6 and 7)

Table 65:   *Class 2 private measurand data (6 and 7)*

IEC 61850 name	Description	Scale	ix (D-a)
LD0.CMMXU1 Phase currents (1)			
LD0.CMMXU1	Phase-to-ground current		
.A.phsA.cVal.mag	-phsA magnitude	2.4	1
.A.phsB.cVal.mag	-phsB magnitude	2.4	2
.A.phsC.cVal.mag	-phsC magnitude	2.4	3
LD0.RESCMMXU1 Residual current (1)			
LD0.RESCMMXU1	Residual current		
.A.res.cVal.mag	-magnitude	2.4	4
LD0.RESVMMXU1 Residual voltage (1)			
LD0.RESVMMXU1	Residual voltage		
.PhV.res.cVal.mag	-magnitude	2.4	8
LD0.CSMSQI1 Sequence of currents (1)			
LD0.CSMQI1	Sequence of currents		
.SeqA.c1.cVal.mag	-positive magnitude	2.4	5
.SeqA.c2.cVal.mag	-negative magnitude	2.4	6
.SeqA.c3.cVal.mag	-zero magitude	2.4	7
LD0.T1PTTR1 Temperature of protected object (T1)			
LD0.T1PTTR1			
.Tmp.mag	Temperature	1000	9
LD0.CMSTA1 Demand currents (1)			
LD0.CMSTA1	Phase-current demands		
.AvAmpsA.mag	-phsA magnitude	2.4	10*
.AvAmpsB.mag	-phsB magnitude	2.4	11*
.AvAmpsC.mag	-phsC magnitude	2.4	12*
LD0.LNPDIF1 Line Differential- and Bias currents (1)			
LD0.LNPDIF1.DifAClc			
.phsA.cVal.mag	Differential current A	1.2	13*
.phsB.cVal.mag	Differential current B	1.2	14*
.phsC.cVal.mag	Differential current C	1.2	15*
LD0.TR2PDIF1.RstA			
.phsA.cVal.mag	Bias current A	1.2	16*
.phsB.cVal.mag	Bias current B	1.2	17*
.phsC.cVal.mag	Bias current C	1.2	18*
LD0.HAEFMHAI1 Current harmonics (1)			
LD0.HAEFMHAI1			
.HRmsA.res.cVal.mag	Current harmonics	250	999

Section 3 Interoperability profile for 615 series IEC 60870-5-103

3.1 Physical layer

3.1.1 Electrical interface

☒ EIA RS-485

☐ Number of loads .... for one protection equipment

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

3.1.2 Optical interface

☒ Glass fibre

☐ Plastic fibre

☐ F-SMA type connector

☐ BFOC/2,5 type connector

3.1.3 Transmission speed

☒ 9 600 bit/s

☒ 19 200 bit/s

3.2 Link layer

There are no choices for the link layer.

3.3 Application layer

3.3.1 Transmission mode for application data

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

3.3.2 COMMON ADDRESS of ASDU

☒ One COMMON ADDRESS OF ASDU (identical with station address)

☐ More than one COMMON ADDRESS OF ASDU

3.3.3 Selection of standard information numbers in monitor direction

3.3.3.1 System functions in monitor directions

	INF	Semantics
☒	<0>	End of general interrogation
☒	<0>	Time synchronization
☒	<2>	Reset FCB
☒	<3>	Reset CU
☒	<4>	Start/restart
☒	<5>	Power on

3.3.3.2 Status indications in monitor direction

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

Table continues on next page

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

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

3.3.3.3   Supervision indications in monitor direction

	INF	Semantics
☐	<32>	Measurand supervision I
☐	<33>	Measurand supervision V
☐	<35>	Phase sequence supervision
☒	<36>	Trip circuit supervision
☐	<37>	I>> back-up operation
☐	<38>	VT fuse failure
☐	<39>	Teleprotection disturbed
☐	<46>	Group warning
☐	<47>	Group alarm

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

3.3.3.4   Earth fault indications in monitor direction

	INF	Semantics
☐	<48>	Earth fault L_1
☐	<49>	Earth fault L_2
☐	<50>	Earth fault L_3
☐	<51>	Earth fault forward, for example line
☐	<52>	Earth fault reverse, for example busbar

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

3.3.3.5   Fault indications in monitor direction

	INF	Semantics
☐	<64>	Start /pick-up L_1
☐	<65>	Start /pick-up L_2

Table continues on next page

☐ <66>   Start /pick-up L_3

☐ <67>   Start /pick-up N

☒ <68>   General trip

☐ <69>   Trip L_1

☐ <70>   Trip L_2

☐ <71>   Trip L_3

☐ <72>   Trip I>> (back-up operation)

☐ <73>   Fault location X in ohms

☐ <74>   Fault forward/line

☐ <75>   Fault reverse/busbar

☐ <76>   Teleprotection signal transmitted

☐ <77>   Teleprotection signal received

☐ <78>   Zone 1

☐ <79>   Zone 2

☐ <80>   Zone 3

☐ <81>   Zone 4

☐ <82>   Zone 5

☐ <83>   Zone 6

☐ <84>   General start/pick-up

☒ <85>   Breaker failure

☐ <86>   Trip measuring system L_1

☐ <87>   Trip measuring system L_2

☐ <88>   Trip measuring system L_3

☐ <89>   Trip measuring system E

☐ <90>   Trip I>

☐ <91>   Trip I>>

☐ <92>   Trip IN>

☐ <93>   Trip IN>>

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

3.3.3.6 Auto-reclosure indications in monitor direction

	INF	Semantics
☒	<128>	CB 'on' by AR
☐	<129>	CB 'on' by long-time AR
☒	<130>	AR blocked

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

3.3.3.7 Measurands in monitor direction

	INF	Semantics
☒	<144>	Measurand I
☒	<145>	Measurands I, V
☒	<146>	Measurands I, V, P, Q
☒	<147>	Measurands I_N, V_{EN}
☒	<148>	Measurands $I_{L1,2,3}$, $V_{L1,2,3}$, P, Q, f

3.3.3.8 Generic functions in monitor direction

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

3.3.4 Selection of standard information numbers in control direction

3.3.4.1 System functions in control direction

	INF	Semantics
☒	<0>	Initiation of general interrogation
☒	<0>	Time synchronization

3.3.4.2 Generic functions in monitor direction

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

3.3.5 Basic application functions

☒ Test mode

☐ Blocking of monitor direction

☒ Disturbance data

☐ Generic services

☒ Private data

3.3.6 Miscellaneous

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

Measurand	Max. MVAL = rated value times	
	1.2 or	2.4
Current L_1	☒	☒
Current L_2	☒	☒
Current L_3	☒	☒
Voltage L_{1-E}	☒	☒
Voltage L_{2-E}	☒	☒
Voltage L_{3-E}	☒	☒
Active power P	☒	☒
Reactive power Q	☒	☒
Frequency f	☒	☒
Voltage $L_1 - L_2$	☒	☒

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

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

Section 4   Glossary

AR	Autoreclosing
EMC	Electromagnetic compatibility
HMI	Human-machine interface
IEC	International Electrotechnical Commission
IEC 60870-5-103	1. Communication standard for protective equipment
	2. A serial master/slave protocol for point-to-point communication
IEC 61850	International standard for substation communication and modeling
IED	Intelligent electronic device
IET600	Integrated Engineering Toolbox in PCM600
LHMI	Local human-machine interface
PCM600	Protection and Control IED Manager

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