Relion® 615 series

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

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Document ID: 1YHT530005D05
Issued: 2014-05-16
Revision: B
Product version: 4.1

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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

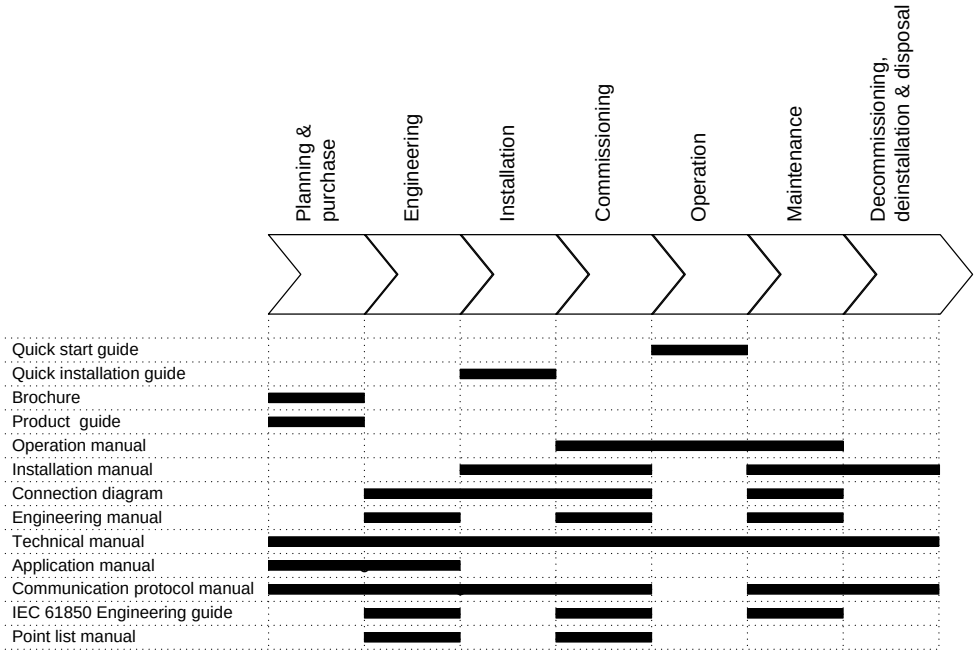

Figure 1: The intended use of documents during the product life cycle

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

1.3.2 Document revision history

Document revision/date	Product version	History
A/2010-07-02	3.0	First release
B/2014-05-16	4.1	Content updated to correspond to the product 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 60870-5-103 Communication Protocol Manual	1MRS756710

1.4 Symbols and conventions

1.4.1 Symbols

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

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

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

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

1.4.2 Document conventions

A particular convention may not be used in this manual.

- Abbreviations and acronyms are spelled out in the glossary. The glossary also contains definitions of important terms.
- Push button navigation in the LHMI menu structure is presented by using the push button icons.
  To navigate between the options, use  and  .
- Menu paths are presented in bold.
  Select **Main menu/Settings**.
- LHMI messages are shown in Courier font.
  To save the changes in 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.
- This document assumes that the parameter setting visibility is "Advanced".

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, instance 1	PHLPTOC1	3I> (1)	51P-1 (1)
Three-phase non-directional overcurrent protection, high stage, instance 1	PHHPTOC1	3I>> (1)	51P-2 (1)
Three-phase non-directional overcurrent protection, high stage, instance 2	PHHPTOC2	3I>> (2)	51P-2 (2)
Three-phase non-directional overcurrent protection, instantaneous stage, instance 1	PHIPTOC1	3I>>> (1)	50P/51P (1)
Three-phase non-directional overcurrent protection that contains three independent phase-segregated timers, low stage, instance 1	PH3LPTOC1	3I> (1)	51P-1 (1)
Three-phase non-directional overcurrent protection that contains three independent phase-segregated timers, low stage, instance 2	PH3LPTOC2	3I> (2)	51P-1 (2)
Three-phase non-directional overcurrent protection that contains three independent phase-segregated timers, high stage, instance 1	PH3HPTOC1	3I>> (1)	51P-2 (1)
Three-phase non-directional overcurrent protection that contains three independent phase-segregated timers, high stage, instance 2	PH3HPTOC2	3I>> (2)	51P-2 (2)
Three-phase non-directional overcurrent protection that contains three independent phase-segregated timers, instantaneous stage, instance 1	PH3IPTOC1	3I>>> (1)	50P/51P (1)
Non-directional earth-fault protection, low stage, instance 1	EFLPTOC1	Io> (1)	51N-1 (1)
Non-directional earth-fault protection, low stage, instance 2	EFLPTOC2	Io> (2)	51N-1 (2)
Non-directional earth-fault protection, high stage, instance 1	EFHPTOC1	Io>> (1)	51N-2 (1)
Non-directional earth-fault protection, instantaneous stage	EFIPTOC1	Io>>>	50N/51N
Directional earth-fault protection, low stage, instance 1	DEFLPDEF1	Io> -> (1)	67N-1 (1)
Directional earth-fault protection, low stage, instance 2	DEFLPDEF2	Io> -> (2)	67N-1 (2)
Directional earth-fault protection, high stage	DEFHPDEF1	Io>> ->	67N-2
Admittance based earth-fault protection, instance 1	EFPADM1	Yo> -> (1)	21YN (1)

Table continues on next page

Function	IEC 61850	IEC 60617	IEC-ANSI
Admittance based earth-fault protection, instance 2	EFPADM2	Yo> -> (2)	21YN (2)
Admittance based earth-fault protection, instance 3	EFPADM3	Yo> -> (3)	21YN (3)
Transient/intermittent earth-fault protection	INTRPTEF1	Io> -> IEF	67NIEF
Harmonics based earth-fault protection 1)	HAEFPTOC1	Io>HA	51NHA
Non-directional (cross-country) earth fault protection, using calculated Io	EFHPTOC1	Io>> (1)	51N-2 (1)
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	PDNSPTOC1	I2/I1>	46PD
Residual overvoltage protection, instance 1	ROVPTOV1	Uo> (1)	59G (1)
Residual overvoltage protection, instance 2	ROVPTOV2	Uo> (2)	59G (2)
Residual overvoltage protection, instance 3	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
Master trip, instance 1	TRPPTRC1	Master Trip (1)	94/86 (1)
Master trip, instance 2	TRPPTRC2	Master Trip (2)	94/86 (2)
Control			
Circuit-breaker control	CBXCBR1	I <-> O CB	I <-> O CB
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)
Earthing switch control	ESXSWI1	I <-> O ESC	I <-> O ESC
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)
Disconnector position indication, instance 3	DCSXSWI3	I <-> O DC (3)	I <-> O DC (3)
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)
Autoreclosing	DARREC1	O -> I	79
Condition monitoring			
Circuit-breaker condition monitoring	SSCBR1	CBCM	CBCM
Trip circuit supervision, instance 1	TCSSCBR1	TCS (1)	TCM (1)
Trip circuit supervision, instance 2	TCSSCBR2	TCS (2)	TCM (2)

Table continues on next page

Function	IEC 61850	IEC 60617	IEC-ANSI
Current circuit supervision	CCRDIF1	MCS 3I	MCS 3I
Protection communication supervision	PCSRTPC1	PCS	PCS
Measurement			
Disturbance recorder	RDRE1	-	-
Three-phase current measurement, instance 1	CMMXU1	3I	3I
Sequence current measurement, instance 1	CSMSQI1	I1, I2, I0	I1, I2, I0
Residual current measurement, instance 1	RESCMMXU1	Io	In
Residual voltage measurement	RESVMMXU1	Uo	Vn

Section 2 IEC 60870-5-103 data mappings

2.1 Overview

These tables show the default point definitions. The user is able to freely remap all these data. In that case PCM600 can provide an updated point list export of the new outlook.

Indications and controls table columns

IEC 61850 name	Internal signal that is mapped to the IEC 60870-5-103 point. Expressed in the form 'Logical Device.Logical Node.Data Object.Data Attribute'.
AFL-Common SA name	AFL name of the corresponding data signal.
Description	Signal description.
DPI value	Value description. DPI value 10 means ON and value 01 means OFF.
FUN	Default Function Type definition for the point. Observe that Function Type 0 means that FUN in practice contains the given Device Function Type. The user-definable Function Type definition is set to the same FUN value as default.
INF	Default Information Number definition for the point. The user-definable Information Number definition is set to the same INF value as default.
InUse	1 means that the point is taken in use as default, and 0 that the point is not in use as default.
ASDU	ASDU point type. 1 and 2 are indications in monitoring direction. 20 means that the point is controllable.
GI	Default setting for General Interrogation. 1 means ON, 0 means OFF.
Coding	IEC 60870-5-103 DPI value coding. 1 means that the point shows OFF (01) and ON (10) values only. 2 means that the point shows values Intermediate (00), OFF (01), ON (10) and Error (11).

Class 2 data table columns

Index	Value position within the Class2 frame.
IEC 61850 name	Internal signal that is mapped to the IEC 60870-5-103 point.
Description	Signal description.
Default scale	Value that corresponds to the maximum IEC 60870-5-103 measurand value 1.

Table continues on next page

Frame No6	Shows if the value is present in Class2 frame 6.
Frame No7	Shows if the value is present in Class2 frame 7.
Comment	Additional information.

2.2 Point list for RED615 Ver.4.1 DC01-03 and DC53

Table 2: Indications and controls

IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
Device function type - standard data									
LD0.DARREC1.AROn.stVal	-	Autorecloser state	10=AR ON,01=AR OFF	0	16	1	1	1	1
LD0.LLN0.LEDRs1.ctlVal	-	LED reset	10=Reset indications and alarm LEDs	0	19	1	20	0	1
LD0.LLN0.Beh.stVal (Test mode)	-	Test mode	10=Test mode ON, 01=Test mode OFF	0	21	1	1	1	1
LD0.I3CGGIO1.ActSG.ctlVal	-	Parameter setting group 1	10=Setting group 1 in use	0	23	1	1,20	1	1
LD0.I3CGGIO1.ActSG.ctlVal	-	Parameter setting group 2	10=Setting group 2 in use	0	24	1	1,20	1	1
LD0.I3CGGIO1.ActSG.ctlVal	-	Parameter setting group 3	10=Setting group 3 in use	0	25	1	1,20	1	1
LD0.I3CGGIO1.ActSG.ctlVal	-	Parameter setting group 4	10=Setting group 4 in use	0	26	1	1,20	1	1
LD0.I3CGGIO1.ActSG.ctlVal	-	Parameter setting group 5	10=Setting group 5 in use	0	27	1	1,20	1	1
LD0.I3CGGIO1.ActSG.ctlVal	-	Parameter setting group 6	10=Setting group 6 in use	0	28	1	1,20	1	1
LD0.TCSSCBR1.CirAlm.stVal	TCSSCBR1.ALARM	Trip circuit 1 alarm	10=TCS1 alarm	0	36	1	1	1	1
LD0.LEDPTRC1.Op.general	-	Global operate	10=Operate (LEDPTRC)	0	68	1	2	0	1
LD0.LEDPTRC1.Str.general	-	Global start	10=Start (LEDPTRC)	0	84	1	2	1	1
LD0.DARREC1.SucRec.stVal	DARREC1.SUC_RECL	Successful reclose status	10=Successful reclose	0	128	1	1	0	1
Device function type - private data									
LD0.TRPPTRC1.Op.general	-	TRPTRC1 input signal	10=Input signal ON	10	1	1	2	0	1
LD0.TRPPTRC1.Tr.general	-	TRPTRC1 trip output signal	10=Trip output signal ON	10	2	1	2	0	1
LD0.TRPPTRC2.Op.general	-	TRPTRC2 input signal	10=Input signal ON	10	3	1	2	0	1
LD0.TRPPTRC2.Tr.general	-	TRPTRC2 trip output signal	10=Trip output signal ON	10	4	1	2	0	1
CTRL.LLN0.Loc.stVal	-	Local/Remote state	10=Local, 01=Remote	10	10	1	1	1	1
CTRL.LLN0.LocRem.stVal.Station	-	Station state	10=Station ON, 01=OFF	10	11	1	1	1	1
LD0.LLN0.LEDRs2.ctlVal	-	Reset alarm LEDs	10=Reset alarm LEDs only	10	21	1	20	0	1
LD0.TCSSCBR2.CirAlm.stVal	TCSSCBR2.ALARM	Trip circuit 2 alarm	10=TCS2 alarm	10	36	1	1	1	1
DR.RDRE1.RcdTrg.ctlVal	-	Trig DR recording	10=External DR trig	10	41	1	20	0	1
DR.RDRE1.MemClr.ctlVal	-	Clear DR memory	10=Clear memory	10	42	1	20	0	1
LD0.CMSTA1.RecRs.ctlVal	-	Reset CMMXU1 max.demands	10=Reset max values	10	45	1	20	0	1
LD0.LEDPTRC1.Str.phsA	-	Global start- phsA	10=Start phsA	10	61	0	2	1	1
LD0.LEDPTRC1.Str.phsB	-	Global start- phsB	10=Start phsB	10	62	0	2	1	1
LD0.LEDPTRC1.Str.phsC	-	Global start- phsC	10=Start phsC	10	63	0	2	1	1
LD0.LEDPTRC1.Op.phsA	-	Global operate -phsA	10=Operate phsA	10	65	0	2	0	1
LD0.LEDPTRC1.Op.phsB	-	Global operate -phsB	10=Operate phsB	10	66	0	2	0	1
LD0.LEDPTRC1.Op.phsC	-	Global operate -phsC	10=Operate phsC	10	67	0	2	0	1
LD0.LLN0.SetSeId.stVal	-	Parameter setting rights reserved	10=Reserved	10	80	1	1	0	1
LD0.LLN0.SetChg.stVal	-	Parameter settings changed	10=Changed	10	81	1	1	0	1
Multipurpose inputs									
LD0.MVGAPC1.Q1.stVal	-	MVGAPC1 input 1 signal	10=Input ON, 01=OFF	11	1	0	1	1	1

Table continues on next page

IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
LD0.MVGAPC1.Q2.stVal	-	MVGAPC1 input 2 signal	10=Input ON, 01=OFF	11	2	0	1	1	1
LD0.MVGAPC1.Q3.stVal	-	MVGAPC1 input 3 signal	10=Input ON, 01=OFF	11	3	0	1	1	1
LD0.MVGAPC1.Q4.stVal	-	MVGAPC1 input 4 signal	10=Input ON, 01=OFF	11	4	0	1	1	1
LD0.MVGAPC1.Q5.stVal	-	MVGAPC1 input 5 signal	10=Input ON, 01=OFF	11	5	0	1	1	1
LD0.MVGAPC1.Q6.stVal	-	MVGAPC1 input 6 signal	10=Input ON, 01=OFF	11	6	0	1	1	1
LD0.MVGAPC1.Q7.stVal	-	MVGAPC1 input 7 signal	10=Input ON, 01=OFF	11	7	0	1	1	1
LD0.MVGAPC1.Q8.stVal	-	MVGAPC1 input 8 signal	10=Input ON, 01=OFF	11	8	0	1	1	1
LD0.MVGAPC2.Q1.stVal	-	MVGAPC2 input 1 signal	10=Input ON, 01=OFF	11	11	0	1	1	1
LD0.MVGAPC2.Q2.stVal	-	MVGAPC2 input 2 signal	10=Input ON, 01=OFF	11	12	0	1	1	1
LD0.MVGAPC2.Q3.stVal	-	MVGAPC2 input 3 signal	10=Input ON, 01=OFF	11	13	0	1	1	1
LD0.MVGAPC2.Q4.stVal	-	MVGAPC2 input 4 signal	10=Input ON, 01=OFF	11	14	0	1	1	1
LD0.MVGAPC2.Q5.stVal	-	MVGAPC2 input 5 signal	10=Input ON, 01=OFF	11	15	0	1	1	1
LD0.MVGAPC2.Q6.stVal	-	MVGAPC2 input 6 signal	10=Input ON, 01=OFF	11	16	0	1	1	1
LD0.MVGAPC2.Q7.stVal	-	MVGAPC2 input 7 signal	10=Input ON, 01=OFF	11	17	0	1	1	1
LD0.MVGAPC2.Q8.stVal	-	MVGAPC2 input 8 signal	10=Input ON, 01=OFF	11	18	0	1	1	1
SRGAPC1, flip-flop reset control									
LD0.SRGAPC1.Rs1.ctlVal	-	Reset SRGAPC1 flip-flop 1	10=Reset	11	101	1	20	0	1
LD0.SRGAPC1.Rs2.ctlVal	-	Reset SRGAPC1 flip-flop 2	10=Reset	11	102	1	20	0	1
LD0.SRGAPC1.Rs3.ctlVal	-	Reset SRGAPC1 flip-flop 3	10=Reset	11	103	1	20	0	1
LD0.SRGAPC1.Rs4.ctlVal	-	Reset SRGAPC1 flip-flop 4	10=Reset	11	104	1	20	0	1
LD0.SRGAPC1.Rs5.ctlVal	-	Reset SRGAPC1 flip-flop 5	10=Reset	11	105	1	20	0	1
LD0.SRGAPC1.Rs6.ctlVal	-	Reset SRGAPC1 flip-flop 6	10=Reset	11	106	1	20	0	1
LD0.SRGAPC1.Rs7.ctlVal	-	Reset SRGAPC1 flip-flop 7	10=Reset	11	107	1	20	0	1
LD0.SRGAPC1.Rs8.ctlVal	-	Reset SRGAPC1 flip-flop 8	10=Reset	11	108	1	20	0	1
SRGAPC2, flip-flop reset control									
LD0.SRGAPC2.Rs1.ctlVal	-	Reset SRGAPC2 flip-flop 1	10=Reset	11	111	1	20	0	1
LD0.SRGAPC2.Rs2.ctlVal	-	Reset SRGAPC2 flip-flop 2	10=Reset	11	112	1	20	0	1
LD0.SRGAPC2.Rs3.ctlVal	-	Reset SRGAPC2 flip-flop 3	10=Reset	11	113	1	20	0	1
LD0.SRGAPC2.Rs4.ctlVal	-	Reset SRGAPC2 flip-flop 4	10=Reset	11	114	1	20	0	1
LD0.SRGAPC2.Rs5.ctlVal	-	Reset SRGAPC2 flip-flop 5	10=Reset	11	115	1	20	0	1
LD0.SRGAPC2.Rs6.ctlVal	-	Reset SRGAPC2 flip-flop 6	10=Reset	11	116	1	20	0	1
LD0.SRGAPC2.Rs7.ctlVal	-	Reset SRGAPC2 flip-flop 7	10=Reset	11	117	1	20	0	1
LD0.SRGAPC2.Rs8.ctlVal	-	Reset SRGAPC2 flip-flop 8	10=Reset	11	118	1	20	0	1
Multipurpose binary outputs									
LD0.SPCGGIO1.SPCS01.Oper.ctlVal	-	Output control 1	10/01=On/Off	11	141	1	20	0	1
LD0.SPCGGIO1.SPCS02.Oper.ctlVal	-	Output control 2	10/01=On/Off	11	142	1	20	0	1
LD0.SPCGGIO1.SPCS03.Oper.ctlVal	-	Output control 3	10/01=On/Off	11	143	1	20	0	1
LD0.SPCGGIO1.SPCS04.Oper.ctlVal	-	Output control 4	10/01=On/Off	11	144	1	20	0	1
LD0.SPCGGIO1.SPCS05.Oper.ctlVal	-	Output control 5	10/01=On/Off	11	145	1	20	0	1

Table continues on next page

IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
LD0.SPCGGIO1.SPCS06.Oper.ctlVal	-	Output control 6	10/01=On/Off	11	146	1	20	0	1
LD0.SPCGGIO1.SPCS07.Oper.ctlVal	-	Output control 7	10/01=On/Off	11	147	1	20	0	1
LD0.SPCGGIO1.SPCS08.Oper.ctlVal	-	Output control 8	10/01=On/Off	11	148	1	20	0	1
LD0.SPCGGIO1.SPCS09.Oper.ctlVal	-	Output control 9	10/01=On/Off	11	149	1	20	0	1
LD0.SPCGGIO1.SPCS10.Oper.ctlVal	-	Output control 10	10/01=On/Off	11	150	1	20	0	1
LD0.SPCGGIO1.SPCS11.Oper.ctlVal	-	Output control 11	10/01=On/Off	11	151	1	20	0	1
LD0.SPCGGIO1.SPCS12.Oper.ctlVal	-	Output control 12	10/01=On/Off	11	152	1	20	0	1
LD0.SPCGGIO1.SPCS13.Oper.ctlVal	-	Output control 13	10/01=On/Off	11	153	1	20	0	1
LD0.SPCGGIO1.SPCS14.Oper.ctlVal	-	Output control 14	10/01=On/Off	11	154	1	20	0	1
LD0.SPCGGIO1.SPCS15.Oper.ctlVal	-	Output control 15	10/01=On/Off	11	155	1	20	0	1
LD0.SPCGGIO1.SPCS16.Oper.ctlVal	-	Output control 16	10/01=On/Off	11	156	1	20	0	1
LD0.SPCGGIO2.SPCS01.Oper.ctlVal	-	Output control 1	10/01=On/Off	11	181	1	1,20	0	1
LD0.SPCGGIO2.SPCS02.Oper.ctlVal	-	Output control 2	10/01=On/Off	11	182	1	1,20	0	1
LD0.SPCGGIO2.SPCS03.Oper.ctlVal	-	Output control 3	10/01=On/Off	11	183	1	1,20	0	1
LD0.SPCGGIO2.SPCS04.Oper.ctlVal	-	Output control 4	10/01=On/Off	11	184	1	1,20	0	1
LD0.SPCGGIO2.SPCS05.Oper.ctlVal	-	Output control 5	10/01=On/Off	11	185	1	1,20	0	1
LD0.SPCGGIO2.SPCS06.Oper.ctlVal	-	Output control 6	10/01=On/Off	11	186	1	1,20	0	1
LD0.SPCGGIO2.SPCS07.Oper.ctlVal	-	Output control 7	10/01=On/Off	11	187	1	1,20	0	1
LD0.SPCGGIO2.SPCS08.Oper.ctlVal	-	Output control 8	10/01=On/Off	11	188	1	1,20	0	1
LD0.SPCGGIO2.SPCS09.Oper.ctlVal	-	Output control 9	10/01=On/Off	11	189	1	1,20	0	1
LD0.SPCGGIO2.SPCS10.Oper.ctlVal	-	Output control 10	10/01=On/Off	11	190	1	1,20	0	1
LD0.SPCGGIO2.SPCS11.Oper.ctlVal	-	Output control 11	10/01=On/Off	11	191	1	1,20	0	1
LD0.SPCGGIO2.SPCS12.Oper.ctlVal	-	Output control 12	10/01=On/Off	11	192	1	1,20	0	1
LD0.SPCGGIO2.SPCS13.Oper.ctlVal	-	Output control 13	10/01=On/Off	11	193	1	1,20	0	1
LD0.SPCGGIO2.SPCS14.Oper.ctlVal	-	Output control 14	10/01=On/Off	11	194	1	1,20	0	1
LD0.SPCGGIO2.SPCS15.Oper.ctlVal	-	Output control 15	10/01=On/Off	11	195	1	1,20	0	1
LD0.SPCGGIO2.SPCS16.Oper.ctlVal	-	Output control 16	10/01=On/Off	11	196	1	1,20	0	1
Negative sequence overcurrent protection									
LD0.NSPTOC1.Str.general	NSPTOC1.START	Stage1 start	10=Stage1 start	21	84	1	2	1	1
LD0.NSPTOC1.Op.general	NSPTOC1.OPERATE	Stage1 operate	10=Stage1 operate	21	90	1	2	0	1
LD0.NSPTOC2.Op.general	NSPTOC2.OPERATE	Stage2 operate	10=Stage2 operate	21	91	1	2	0	1
LD0.NSPTOC2.Str.general	NSPTOC2.START	Stage2 start	10=Stage2 start	21	94	1	2	1	1
Current circuit failure protection									
CTRL.CCRDIF1.Alm.stVal	CCRDIF1.FAIL	Current circuit failure alarm	10 = Alarm	23	1	1	1	1	1
CTRL.CCRDIF1.Op.general	CCRDIF1.ALARM	Current circuit failure operate	10 = Operate	23	90	1	2	0	1
Admittance based earthfault protection (3 stages)									
LD0.EFPADM1.Str.general	EFPADM1.START	Stage1 start	10 = Stage1 start	25	84	1	2	1	1
LD0.EFPADM1.Op.general	EFPADM1.OPERATE	Stage1 operate	10 = Stage1 operate	25	90	1	2	0	1
LD0.EFPADM2.Op.general	EFPADM2.OPERATE	Stage2 operate	10 = Stage2 operate	25	91	1	2	0	1

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IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
LD0.EFPADM2.Str.general	EFPADM2.START	Stage2 start	10 = Stage2 start	25	94	1	2	1	1
LD0.EFPADM3.Str.general	EFPADM3.START	Stage3 start	10 = Stage3 start	25	96	1	2	1	1
LD0.EFPADM3.Op.general	EFPADM3.OPERATE	Stage3 operate	10 = Stage3 operate	25	98	1	2	0	1
Residual overvoltage protection (3 stages), variant DC02									
LD0.ROVPTOV1.Str.general	ROVPTOV1.START	Stage 1 Start	10 = Stage1 start	44	84	1	2	1	1
LD0.ROVPTOV1.Op.general	ROVPTOV1.OPERATE	Stage 1 Operate	10 = Stage1 operate	44	90	1	2	0	1
LD0.ROVPTOV2.Op.general	ROVPTOV2.OPERATE	Stage 2 Operate	10 = Stage2 operate	44	91	1	2	0	1
LD0.ROVPTOV2.Str.general	ROVPTOV2.START	Stage 2 Start	10 = Stage2 start	44	94	1	2	1	1
LD0.ROVPTOV3.Str.general	ROVPTOV3.START	Stage 3 Start	10 = Stage3 start	44	96	1	2	1	1
LD0.ROVPTOV3.Op.general	ROVPTOV3.OPERATE	Stage 3 Operate	10 = Stage3 operate	44	98	1	2	0	1
Physical binary I/O signals									
LD0.XGGIO130.Ind1.stVal	-	X130-Input 1	10=ON, 01=OFF	50	1	0	1	1	1
LD0.XGGIO130.Ind2.stVal	-	X130-Input 2	10=ON, 01=OFF	50	2	0	1	1	1
LD0.XGGIO130.Ind3.stVal	-	X130-Input 3	10=ON, 01=OFF	50	3	0	1	1	1
LD0.XGGIO130.Ind4.stVal	-	X130-Input 4	10=ON, 01=OFF	50	4	0	1	1	1
LD0.XGGIO130.Ind5.stVal	-	X130-Input 5	10=ON, 01=OFF	50	5	0	1	1	1
LD0.XGGIO130.Ind6.stVal	-	X130-Input 6	10=ON, 01=OFF	50	6	0	1	1	1
LD0.XGGIO130.SPCSO1.stVal	-	X130-Output 1	10=ON, 01=OFF	50	101	0	1	1	1
LD0.XGGIO130.SPCSO2.stVal	-	X130-Output 2	10=ON, 01=OFF	50	102	0	1	1	1
LD0.XGGIO130.SPCSO3.stVal	-	X130-Output 3	10=ON, 01=OFF	50	103	0	1	1	1
LD0.XGGIO120.Ind1.stVal	-	X120-Input 1	10=ON, 01=OFF	51	1	1	1	1	1
LD0.XGGIO120.Ind2.stVal	-	X120-Input 2	10=ON, 01=OFF	51	2	1	1	1	1
LD0.XGGIO120.Ind3.stVal	-	X120-Input 3	10=ON, 01=OFF	51	3	1	1	1	1
LD0.XGGIO120.Ind4.stVal	-	X120-Input 4	10=ON, 01=OFF	51	4	1	1	1	1
LD0.XGGIO110.Ind1.stVal	-	X110-Input 1	10=ON, 01=OFF	52	1	1	1	1	1
LD0.XGGIO110.Ind2.stVal	-	X110-Input 2	10=ON, 01=OFF	52	2	1	1	1	1
LD0.XGGIO110.Ind3.stVal	-	X110-Input 3	10=ON, 01=OFF	52	3	1	1	1	1
LD0.XGGIO110.Ind4.stVal	-	X110-Input 4	10=ON, 01=OFF	52	4	1	1	1	1
LD0.XGGIO110.Ind5.stVal	-	X110-Input 5	10=ON, 01=OFF	52	5	1	1	1	1
LD0.XGGIO110.Ind6.stVal	-	X110-Input 6	10=ON, 01=OFF	52	6	1	1	1	1
LD0.XGGIO110.Ind7.stVal	-	X110-Input 7	10=ON, 01=OFF	52	7	1	1	1	1
LD0.XGGIO110.Ind8.stVal	-	X110-Input 8	10=ON, 01=OFF	52	8	1	1	1	1
LD0.XGGIO110.SPCSO1.stVal	-	X110-Output 1	10=ON, 01=OFF	52	101	0	1	1	1
LD0.XGGIO110.SPCSO2.stVal	-	X110-Output 2	10=ON, 01=OFF	52	102	0	1	1	1
LD0.XGGIO110.SPCSO3.stVal	-	X110-Output 3	10=ON, 01=OFF	52	103	0	1	1	1
LD0.XGGIO110.SPCSO4.stVal	-	X110-Output 4	10=ON, 01=OFF	52	104	0	1	1	1
LD0.XGGIO100.SPCSO1.stVal	-	X100-Output 1	10=ON, 01=OFF	53	101	0	1	1	1
LD0.XGGIO100.SPCSO2.stVal	-	X100-Output 2	10=ON, 01=OFF	53	102	0	1	1	1
LD0.XGGIO100.SPCSO3.stVal	-	X100-Output 3	10=ON, 01=OFF	53	103	0	1	1	1

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IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
LD0.XGGIO100.SPCSO4.stVal	-	X100-Output 4	10=ON, 01=OFF	53	104	0	1	1	1
LD0.XGGIO100.SPCSO5.stVal	-	X100-Output 5	10=ON, 01=OFF	53	105	0	1	1	1
LD0.XGGIO100.SPCSO6.stVal	-	X100-Output 6	10=ON, 01=OFF	53	106	0	1	1	1
Binary signal transfer supervision									
LD0.BSTGGIO1.Alm1.stVal	BSTGGIO1.SEND_SIG_A	Binary signal sending alarm	10=Send alarm	80	1	1	1	1	1
LD0.BSTGGIO1.Alm2.stVal	BSTGGIO1.RECV_SIG_A	Binary signal receiving alarm	10=Receive Alarm	80	2	1	1	1	1
LD0.PCSRTPC1.HealthAlm.stVal	PCSRTPC1.ALARM	Protection communication alarm	10=Communication alarm	80	10	1	1	1	1
Harmonics-based earth-fault protection									
LD0.HAEFPTOC1.Str.general	START	Stage start	10=Start	100	121	1	2	1	1
LD0.HAEFPTOC1.Op.general	OPERATE	Stage operate	10=Operate	100	122	1	2	0	1
Phase discontinuity protection (1 stage), variants DC02,03,53									
LD0.PDNSPTOC1.Str.general	PDNSPTOC1.START	Start	10=Stage start	157	84	1	2	1	1
LD0.PDNSPTOC1.Op.general	PDNSPTOC1.OPERATE	Operate	10=Stage operate	157	90	1	2	0	1
Transient/intermittent earth-fault protection (1 stage)									
LD0.INTRPTEF1.Str.general	INTRPTEF1.START	Start	10=Stage start	158	84	1	2	1	1
LD0.INTRPTEF1.Op.general	INTRPTEF1.OPERATE	Operate	10=Stage operate	158	90	1	2	0	1
Non-directional earth-fault protection -variant dependent on DC03,53									
LD0.EFLPTOC1.Str.general	EFLPTOC1.START	Low(1) stage start	10=Low(1) Stage start	159	84	1	2	1	1
LD0.EFLPTOC1.Op.general	EFLPTOC1.OPERATE	Low(1) stage operate	10=Low(1) Stage operate	159	90	1	2	0	1
LD0.EFLPTOC2.Op.general	EFLPTOC2.OPERATE	Low(2) stage operate	10=Low(2) Stage operate	159	91	1	2	0	1
LD0.EFLPTOC2.Str.general	EFLPTOC2.START	Low(2) stage start	10=Low(2) Stage start	159	94	1	2	1	1
LD0.EFHPTOC1.Str.general	EFHPTOC1.START	High stage start	10=High Stage start	159	96	1	2	1	1
LD0.EFIPTOC1.Str.general	EFIPTOC1.START	Inst stage start	10=Inst Stage start	159	97	1	2	1	1
LD0.EFHPTOC1.Op.general	EFHPTOC1.OPERATE	High stage operate	10=High Stage operate	159	98	1	2	0	1
LD0.EFIPTOC1.Op.general	EFIPTOC1.OPERATE	inst stage operate	10=Inst Stage operate	159	99	1	2	0	1
Phase overcurrent protection (4 stages), variant DC53									
LD0.PH(3)IPTOC1.Str.phsA	-	Instanteous stage Start[.phsA]	10=Inst.Stage phsA start	162	34	0	2	1	1
LD0.PH(3)IPTOC1.Str.phsB	-	Instanteous stage Start[.phsB]	10=Inst.Stage phsB start	162	35	0	2	1	1
LD0.PH(3)IPTOC1.Str.phsC	-	Instanteous stage Start[.phsC]	10=Inst.Stage phsC start	162	36	0	2	1	1
LD0.PH(3)HPTOC2.Str.phsA	-	High(2) stage Start[.phsA]	10=High(2).Stage phsA start	162	44	0	2	1	1
LD0.PH(3)HPTOC2.Str.phsB	-	High(2) stage Start[.phsB]	10=High(2).Stage phsB start	162	45	0	2	1	1
LD0.PH(3)HPTOC2.Str.phsC	-	High(2) stage Start[.phsC]	10=High(2) Stage phsC start	162	46	0	2	1	1
LD0.PH(3)HPTOC1.Str.phsA	-	High(1) stage Start[.phsA]	10=High(1).Stage phsA start	162	54	0	2	1	1
LD0.PH(3)HPTOC1.Str.phsB	-	High(1) stage Start[.phsB]	10=High(1).Stage phsB start	162	55	0	2	1	1
LD0.PH(3)HPTOC1.Str.phsC	-	High(1) stage Start[.phsC]	10=High(1) Stage phsC start	162	56	0	2	1	1
LD0.PH(3)LPTOC1.Str.phsA	-	Low stage Start[.phsA]	10=Low Stage phsA start	162	64	0	2	1	1
LD0.PH(3)LPTOC1.Str.phsB	-	Low stage Start[.phsB]	10=Low Stage phsB start	162	65	0	2	1	1
LD0.PH(3)LPTOC1.Str.phsC	-	Low stage Start[.phsC]	10=Low Stage phsC start	162	66	0	2	1	1
LD0.PH(3)LPTOC1.Str.general	PH(3)LPTOC1.START	Low stage Start[.general]	10=Low Stage start	162	84	1	2	1	1

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IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
LD0.PH(3)LPTOC1.Op.general	PH(3)LPTOC1.OPERATE	Low stage Operate[.general]	10=Low Stage operate	162	90	1	2	0	1
LD0.PH(3)HPTOC1.Op.general	PH(3)HPTOC1.OPERATE	High(1) stage Operate[.general]	10=High(1) Stage operate	162	91	1	2	0	1
LD0.PH(3)HPTOC1.Str.general	PH(3)HPTOC1.START	High(1) stage Start[.general]	10=High(1) Stage start	162	94	1	2	1	1
LD0.PH(3)HPTOC2.Str.general	PH(3)HPTOC2.START	High(2) stage Start[.general]	10=High(2) Stage start	162	96	1	2	1	1
LD0.PH(3)IPTOC1.Str.general	PH(3)IPTOC1.START	Instanteous stage Start[.general]	10=Inst Stage start	162	97	1	2	1	1
LD0.PH(3)HPTOC2.Op.general	PH(3)HPTOC2.OPERATE	High(2) stage Operate[.general]	10=High(2) Stage operate	162	98	1	2	0	1
LD0.PH(3)IPTOC1.Op.general	PH(3)IPTOC1.OPERATE	Instanteous stage Operate[.general]	10=Inst Stage operate	162	99	1	2	0	1
Directional earth-fault protection (2 stages), variant DC02									
LD0.DEFLPTOC1.Str.general	DEFLPDEF1.START	Low(1) stage start	10=Low(1) Stage start	163	84	1	2	1	1
LD0.DEFLPTOC1.Op.general	DEFLPDEF1.OPERATE	Low(1) stage operate	10=Low(1) Stage operate	163	90	1	2	0	1
LD0.DEFLPTOC2.Op.general	DEFLPDEF2.OPERATE	Low(2) stage operate	10=Low(2) Stage operate	163	91	1	2	0	1
LD0.DEFLPTOC2.Str.general	DEFLPDEF2.START	Low(2) stage start	10=Low(2) Stage start	163	94	1	2	1	1
LD0.DEFHPTOC1.Str.general	DEFHPDEF1.START	High stage start	10=High Stage start	163	96	1	2	1	1
LD0.DEFHPTOC1.Op.general	DEFHPDEF1.OPERATE	High stage operate	10=High Stage operate	163	98	1	2	0	1
Directional earth-fault protection (3 stages)									
LD0.DEFLPTOC1.Str.general	DEFLPDEF1.START	Low(1) Stage start	10 = Stage1 start	163	84	1	2	1	1
LD0.DEFLPTOC1.Op.general	DEFLPDEF1.OPERATE	Low(1) Stage operate	10 = Stage1 operate	163	90	1	2	0	1
LD0.DEFLPTOC2.Op.general	DEFLPDEF2.OPERATE	Low(2) Stage operate	10 = Stage2 operate	163	91	1	2	0	1
LD0.DEFLPTOC2.Str.general	DEFLPDEF2.START	Low(2) Stage start	10 = Stage2 start	163	94	1	2	1	1
LD0.DEFHPTOC1.Str.general	DEFLPDEF1.START	High(1) Stage start	10 = Stage1 start	163	96	1	2	1	1
LD0.DEFLPTOC1.Op.general	DEFLPDEF1.OPERATE	High(1) Stage operate	10 = Stage1 operate	163	98	1	2	0	1
Three-phase inrush detection									
LD0.INRPHAR1.Str.phsA	-	Start[.phsA]	10=Start phsA	167	64	0	2	1	1
LD0.INRPHAR1.Str.phsB	-	Start[.phsB]	10=Start phsB	167	65	0	2	1	1
LD0.INRPHAR1.Str.phsC	-	Start[.phsC]	10=Start phsC	167	66	0	2	1	1
LD0.INRPHAR1.Str.general	-	Start[.general]	10=Start general	167	84	1	2	1	1
Thermal overload protection, variants DC02,03,53									
LD0.T1PTTR1.Str.general	T1PTTR1.START	Start	10=Start	168	84	1	2	1	1
LD0.T1PTTR1.AlmThm.general	T1PTTR1.ALARM	Thermal alarm	10=Thermal alarm	168	85	1	2	1	1
LD0.T1PTTR1.Op.general	T1PTTR1.OPERATE	Operate	10=Operate	168	90	1	2	0	1
Autoreclosing, optional in DC02,03									
LD0.DARREC1.RsRec.ctlVal	-	AR reset	10=Reset	169	19	1	20	0	1
LD0.DARREC1.RsCnt.ctlVal	-	AR counters reset	10=Reset	169	20	1	20	0	1
LD0.DARREC1.PrgRec1.stVal	DARREC1.INPRO_1	AR in progress 1st reclose	10=In progress	169	101	1	2	0	1
LD0.DARREC1.PrgRec2.stVal	DARREC1.INPRO_2	AR in progress 2nd reclose	10=In progress	169	102	1	2	0	1
LD0.DARREC1.PrgRec3.stVal	DARREC1.INPRO_3	AR in progress 3rd reclose	10=In progress	169	103	1	2	0	1
LD0.DARREC1.PrgRec4.stVal	DARREC1.INPRO_4	AR in progress 4th reclose	10=In progress	169	104	1	2	0	1
LD0.DARREC1.PrgRec5.stVal	DARREC1.INPRO_5	AR in progress 5th reclose	10=In progress	169	105	1	2	0	1
LD0.DARREC1.PrgRec.stVal	DARREC1.INPRO	AR in progress	10=In progress	169	120	1	2	0	1

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IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
LD0.DARREC1.CBManCls.stVal	DARREC1.MAN_CB_CL	CB manually closed	10=CB manually closed	169	159	1	2	0	1
LD0.DARREC1.LO.stVal	DARREC1.LOCKED	Lockout status	10=Lockout	169	164	1	2	0	1
LD0.DARREC1.UnsRec.stVal	DARREC1.UNSUC_RECL	Unsuccessful reclose status	10=Unsuccessful reclose	169	170	1	2	0	1
LD0.DARREC1.RdyRec.stVal	DARREC1.READY	Ready reclose status	10=Reclose ready	169	172	1	2	0	1
LD0.DARREC1.ActRec.stVal	DARREC1.ACTIVE	Active reclose status	10=Reclose active	169	173	1	2	0	1
LD0.DARREC1.PrgDsr.stVal	DARREC1.DISCR_INPRO	Discrimination time in progress	10=Discrimination time in progress	169	174	1	2	0	1
LD0.DARREC1.PrgCutOut.stVal	DARREC1.CUTOUT_INPRO	Cutout time in progress	10=Cutout time in progress	169	175	1	2	0	1
LD0.DARREC1.FrqOpAlm.stVal	DARREC1.FRQ_OP_ALM	Frequent operation counter alarm	10=Frequent operation alarm	169	176	1	2	0	1
LD0.DARREC1.Op.general	DARREC1.CLOSE_CB	Operate (close command to XCBR)	10=Close command to CB	169	179	1	2	0	1
LD0.DARREC1.OpOpn.general	DARREC1.OPEN_CB	Operate (open command to XCBR)	10=Open command to CB	169	180	1	2	0	1
LD0.DARREC1.UnsCBCls.stVal	DARREC1.UNSUC_CB	Unsuccessful CB closing status	10=Unsuccessful CB closing	169	181	1	2	0	1
LD0.DARREC1.WtMstr.stVal	DARREC1.CMD_WAIT	Master signal to follower	10=Master signal to follower	169	182	1	2	0	1
Line differential protection									
LD0.LNPDIF1.Str.general	LNPDIF1.START	Stage start	10=Start	192	84	1	2	1	1
LD0.LNPDIF1.Op.general	LNPDIF1.OPERATE	Stage operate	10=Operate	192	90	1	2	0	1
Phase currents limit supervison									
LD0.CMMXU1.HiAlm.stVal	CMMXU1.HIGH_ALARM	Phase currents High alarm	10=High alarm	210	1	1	1	1	1
LD0.CMMXU1.HiWrn.stVal	CMMXU1.HIGH_WARN	Phase currents High warning	10=High warning	210	2	1	1	1	1
LD0.CMMXU1.LoWrn.stVal	CMMXU1.LOW_WARN	Phase currents Low warning	10=Low warning	210	3	1	1	1	1
LD0.CMMXU1.LoAlm.stVal	CMMXU1.LOW_ALARM	Phase currents Low alarm	10=Low alarm	210	4	1	1	1	1
Residual current limit supervision									
LD0.RESCMMXU1.HiAlm.stVal	RESCMMXU1.HIGH_ALARM	Residual current High alarm	10=High alarm	210	11	1	1	1	1
LD0.RESCMMXU1.HiWrn.stVal	RESCMMXU1.HIGH_WARN	Residual current High warning	10=High warning	210	12	1	1	1	1
Residual voltage limit supervision									
LD0.RESVMMXU1.HiAlm.stVal	RESVMMXU1.HIGH_ALARM	Residual voltage High alarm	10=High alarm	211	11	1	1	1	1
LD0.RESVMMXU1.HiWrn.stVal	RESVMMXU1.HIGH_WARN	Residual voltage High warning	10=High warning	211	12	1	1	1	1
Circuit breaker position and failure protection									
CTRL.CBCILO1.EnaOpn.stVal	CBXCBR1.ENA_OPEN	CB open enabled	10=Open enabled	240	21	1	1	1	1
CTRL.CBCILO1.EnaCls.stVal	CBXCBR1.ENA_CLOSE	CB close enabled	10=Close enabled	240	22	1	1	1	1
CTRL.CBXCBR1.BlkOpn.stVal	CBXCBR1.BLK_OPEN	CB open blocked	10=Open blocked	240	23	1	1	1	1
CTRL.CBXCBR1.BlkCls.stVal	CBXCBR1.BLK_CLOSE	CB close blocked	10=Close blocked	240	24	1	1	1	1
CTRL.CBCILO1.ItlByPss.stVal	CBXCBR1.ITL_BYPASS	CB interlocking bypass	10=Interlocking bypassed	240	25	0	1	1	1
CTRL.CCBRBRF1.Str.general	CCBRBRF1.CB_FAULT_AL	CBFP Start, timer running	10=Start,timer running	240	101	0	2	1	1
CTRL.CCBRBRF1.OpEx.general	CCBRBRF1.TRBU	CBFP Failure, external trip	10=Failure,external trip	240	102	0	2	0	1
CTRL.CCBRBRF1.OpIn.general	CCBRBRF1.TRRET	CBFP Operate, internal retrip	10=Operate, internal re-trip	240	103	0	2	0	1
CTRL.CBCSWI.Pos.stSeld		CB selected	10=Selected	240	120	1	2	1	1
CTRL.CBCSWI1.Pos.stVal	CBXCBR1.POSITION	Circuit breaker position	10=Close; 01=Open; 00=Intermediate; 11=Error	240	160	1	1,20	1	2

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IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
Circuit breaker condition monitoring, variants DC02,03,53									
LD0.SSCBR1.RsAccAPwr.ctlVal	SSCBR1.RST_IPOW	Reset accumulation energy	10=Reset	242	19	1	20	0	1
LD0.SSCBR1.RsCBWear.ctlVal	SSCBR1.RST_CB_WEAR	Reset CB remaining life and op.counters	10=Reset	242	20	1	20	0	1
LD0.SSCBR1.RsTrvTm.ctlVal	SSCBR1.RST_TRV_T	Reset CB travelling time alarm	10=Reset	242	21	1	20	0	1
LD0.SSCBR1.RsSprChaTm.ctlVal	SSCBR1.RST_SPR_T	Reset CB spring charge time alarm	10=Reset	242	22	1	20	0	1
LD0.SSCBR1.OpnAlm.stVal	SSCBR1.TRV_T_OP_ALM	Open travel time exceeded	10=Open travel time alarm	242	101	0	1	0	1
LD0.SSCBR1.ClsAlm.stVal	SSCBR1.TRV_T_CL_ALM	Close travel time exceeded	10=Close travel time alarm	242	102	0	1	0	1
LD0.SSCBR1.SprChaAlm.stVal	SSCBR1.SPR_CHR_ALM	Spring charging time exceeded	10=Spring charging time alarm	242	103	0	1	0	1
LD0.SSCBR1.OpNumAlm.stVal	SSCBR1.OPR_ALM	Num of CB operations alarm	10=CB operations alarm	242	104	0	1	0	1
LD0.SSCBR1.OpNumLO.stVal	SSCBR1.OPR_LO	Num of CB operations lockout limit	10=CB operations lockout alarm	242	105	0	1	0	1
LD0.SSCBR1.LonTmAlm.stVal	SSCBR1.MON_ALM	CB 'not operated for long time' alarm	10=CB unactive alarm	242	106	0	1	0	1
LD0.SSCBR1.PresAlm.stVal	SSCBR1.PRES_ALM	Pressure below alarm level	10=Low pressure alarm	242	107	0	1	0	1
LD0.SSCBR1.PresLO.stVal	SSCBR1.PRES_LO	Pressure below lockout level	10=Low pressure lockout alarm	242	108	0	1	0	1
LD0.SSCBR1.APwrAlm.stVal	SSCBR1.IPOW_ALM	Acc. currents power (Iyt),alarm limit	10=Iyt alarm	242	109	0	1	0	1
LD0.SSCBR1.APwrLO.stVal	SSCBR1.IPOW_LO	Acc. currents power (Iyt),lockout limit	10=Iyt lockout alarm	242	110	0	1	0	1
LD0.SSCBR1.CBLifAlm.stVal	SSCBR1.CB_LIFE_ALM	Remaining life of CB exceeded alarm	10=CB life alarm	242	111	0	1	0	1
Controllable disconnector 1									
CTRL.DCCILO1.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	245	21	1	1	1	1
CTRL.DCCILO1.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	245	22	1	1	1	1
CTRL.DCCILO1.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
CTRL.DCXSWI1.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
CTRL.DCCSWI1.Pos.stVal/ctlVal	POSITION	DC pos/control	10/01=Close/Open	245	160	1	1,20	1	1
Controllable disconnector 2									
CTRL.DCCILO2.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	246	21	1	1	1	1
CTRL.DCCILO2.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	246	22	1	1	1	1
CTRL.DCCILO2.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
CTRL.DCXSWI2.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
CTRL.DCCSWI2.Pos.stVal/ctlVal	POSITION	DC pos/control	10/01=Close/Open	246	160	1	1,20	1	1
Controllable earth switch 1									
CTRL.ESCILO1.EnaOpn.stVal	ENA_OPEN	Open enabled	10=Enabled	247	21	1	1	1	1

Table continues on next page

IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
CTRL.ESCILO1.EnaCls.stVal	ENA_CLOSE	Close enabled	10=Enabled	247	22	1	1	1	1
CTRL.ESCILO1.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
CTRL.ESXSWI1.BlkCls.stVal	BLK_CLOSE	Close blocked	10=Blocked	247	24	1	1	1	1
CTRL.ESCSWI1.stSeld.stVal	SELECTED	DC selected	10=Selected	247	120	1	1	1	1
CTRL.ESCSWI1.Pos.stVal/ctlVal	POSITION	DC pos/control	10/01=Close/Open	247	160	1	1,20	1	1
Disconnector positions									
CTRL.DCSXSWI1.Pos.stVal	DCSXSWI1.POSITION	Disconnector 1 position	10=Close; 01=Open; 00=Intermediate; 11=Error	253	1	1	1	1	2
CTRL.DCSXSWI2.Pos.stVal	DCSXSWI2.POSITION	Disconnector 2 position	10=Close; 01=Open; 00=Intermediate; 11=Error	253	2	1	1	1	2
CTRL.DCSXSWI3.Pos.stVal	DCSXSWI3.POSITION	Disconnector 3 position	10=Close; 01=Open; 00=Intermediate; 11=Error	253	3	1	1	1	2
CTRL.ESSXSWI1.Pos.stVal	ESSXSWI1.POSITION	Earth switch position	10=Close; 01=Open; 00=Intermediate; 11=Error	253	11	1	1	1	2
CTRL.ESSXSWI2.Pos.stVal	ESSXSWI2.POSITION	Earth switch 2 pos	10=Close; 01=Open; 00=Intermediate; 11=Error	253	12	1	1	1	2
LHMI LED indications type 1 (2 states)									
LD0.LEDGGIO1.ISCSO1.stVal	-	LED 1 state	10=On	253	89	1	1	1	1
LD0.LEDGGIO1.ISCSO2.stVal	-	LED 2 state	10=On	253	90	1	1	1	1
LD0.LEDGGIO1.ISCSO3.stVal	-	LED 3 state	10=On	253	91	1	1	1	1
LD0.LEDGGIO1.ISCSO4.stVal	-	LED 4 state	10=On	253	92	1	1	1	1
LD0.LEDGGIO1.ISCSO5.stVal	-	LED 5 state	10=On	253	93	1	1	1	1
LD0.LEDGGIO1.ISCSO6.stVal	-	LED 6 state	10=On	253	94	1	1	1	1
LD0.LEDGGIO1.ISCSO7.stVal	-	LED 7 state	10=On	253	95	1	1	1	1
LD0.LEDGGIO1.ISCSO8.stVal	-	LED 8 state	10=On	253	96	1	1	1	1
LD0.LEDGGIO1.ISCSO9.stVal	-	LED 9 state	10=On	253	97	1	1	1	1
LD0.LEDGGIO1.ISCSO10.stVal	-	LED 10 state	10=On	253	98	1	1	1	1
LD0.LEDGGIO1.ISCSO11.stVal	-	LED 11 state	10=On	253	99	1	1	1	1
LHMI LED indications type 2 (3 states, 1:1 LED state)									
LD0.LEDGGIO1.ISCSO1.stVal	-	LED 1 state	00/01/11=LED State	253	119	1	1	1	2
LD0.LEDGGIO1.ISCSO2.stVal	-	LED 2 state	00/01/11=LED State	253	120	1	1	1	2
LD0.LEDGGIO1.ISCSO3.stVal	-	LED 3 state	00/01/11=LED State	253	121	1	1	1	2
LD0.LEDGGIO1.ISCSO4.stVal	-	LED 4 state	00/01/11=LED State	253	122	1	1	1	2
LD0.LEDGGIO1.ISCSO5.stVal	-	LED 5 state	00/01/11=LED State	253	123	1	1	1	2
LD0.LEDGGIO1.ISCSO6.stVal	-	LED 6 state	00/01/11=LED State	253	124	1	1	1	2
LD0.LEDGGIO1.ISCSO7.stVal	-	LED 7 state	00/01/11=LED State	253	125	1	1	1	2
LD0.LEDGGIO1.ISCSO8.stVal	-	LED 8 state	00/01/11=LED State	253	126	1	1	1	2
LD0.LEDGGIO1.ISCSO9.stVal	-	LED 9 state	00/01/11=LED State	253	127	1	1	1	2
LD0.LEDGGIO1.ISCSO10.stVal	-	LED 10 state	00/01/11=LED State	253	128	1	1	1	2
LD0.LEDGGIO1.ISCSO11.stVal	-	LED 11 state	00/01/11=LED State	253	129	1	1	1	2

Table 3: Class 2 PRIVATE measurand frames 6 and 7 for RED615 variants DC01, DC02, DC03

Index	IEC 61850 name	Description	Default scale	Frame No6	Frame No7	Comment
1	LD0.CMMXU1.A.phsA.cVal.mag	Phase current A	2.4	x	x	
2	LD0.CMMXU1.A.phsB.cVal.mag	Phase current B	2.4	x	x	
3	LD0.CMMXU1.A.phsC.cVal.mag	Phase current C	2.4	x	x	
4	LD0.RESCMMXU1.A.res.cVal.mag[1)]	Residual current	2.4	x	x	n.a in DC01
5	LD0.CSMSQI1.SeqA.c1.cVal.mag	Positive sequence current	2.4	x	x	
6	LD0.CSMSQI1.SeqA.c2.cVal.mag	Negative sequence current	2.4	x	x	
7	LD0.CSMSQI1.SeqA.c3.cVal.mag	Zero sequence current	2.4	x	x	
8	LD0.RESVMMXU1.A.res.cVal.mag[2)]	Residual voltage	2.4	x	x	n.a in DC01,03
9	LD0.T1PTTR1.Tmp.mag	Temperature of protected object	1000	x	x	n.a in DC01
10	LD0.CMSTA1.AvAmps1.mag	Phase current A -demand value	2.4		x	
11	LD0.CMSTA1.AvAmps2.mag	Phase current B -demand value	2.4		x	
12	LD0.CMSTA1.AvAmps3.mag	Phase current C -demand value	2.4		x	
13	LD0.LNPDIF1.DifAClc.phsA.cVal.mag	Differential current A	1.2		x	
14	LD0.LNPDIF1.DifAClc.phsB.cVal.mag	Differential current B	1.2		x	
15	LD0.LNPDIF1.DifAClc.phsC.cVal.mag	Differential current C	1.2		x	
16	LD0.LNPDIF1.RstA.phsA.cVal.mag	Bias current A	1.2		x	
17	LD0.LNPDIF1.RstA.phsB.cVal.mag	Bias current B	1.2		x	
18	LD0.LNPDIF1.RstA.phsC.cVal.mag	Bias current C	1.2		x	
19	LD0.HAEFMHAI1.HRmsA.res.CVal.mag	Harmonic current	250			

1) Only in DC02 and DC03
2) Only in DC02

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 615 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 615 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: Function-specific fault signals are as default mapped to private data locations in 615 series IEDs.

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 615 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 615 series devices is 2.4. User can freely reprogram the MVAL for each separate measurand.

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.

Section 4 Glossary

AFL	Application function block library
ASDU	Application-layer service data unit
DPI	Double-point information
DR	Disturbance recorder
EMC	Electromagnetic compatibility
FUN	Function type
GI	General interrogation
I/O	Input/output
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
INF	Information number
LED	Light-emitting diode
LHMI	Local human-machine interface
PCM600	Protection and Control IED Manager
TCS	Trip-circuit supervision

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