Relion® 615 series

Motor Protection and Control
REM615
IEC 60870-5-103 Point List Manual

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This product complies with the directive of the Council of the European Communities on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2004/108/EC) and concerning electrical equipment for use within specified voltage limits (Low-voltage directive 2006/95/EC). This conformity is the result of tests conducted by ABB in accordance with the product standards EN 50263 and EN 60255-26 for the EMC directive, and with the product standards EN 60255-1 and EN 60255-27 for the low voltage directive. The product is designed in accordance with the international standards of the IEC 60255 series.

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Section 1 Introduction

1.1 This manual

The point list manual describes the outlook and properties of the data points specific to the 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

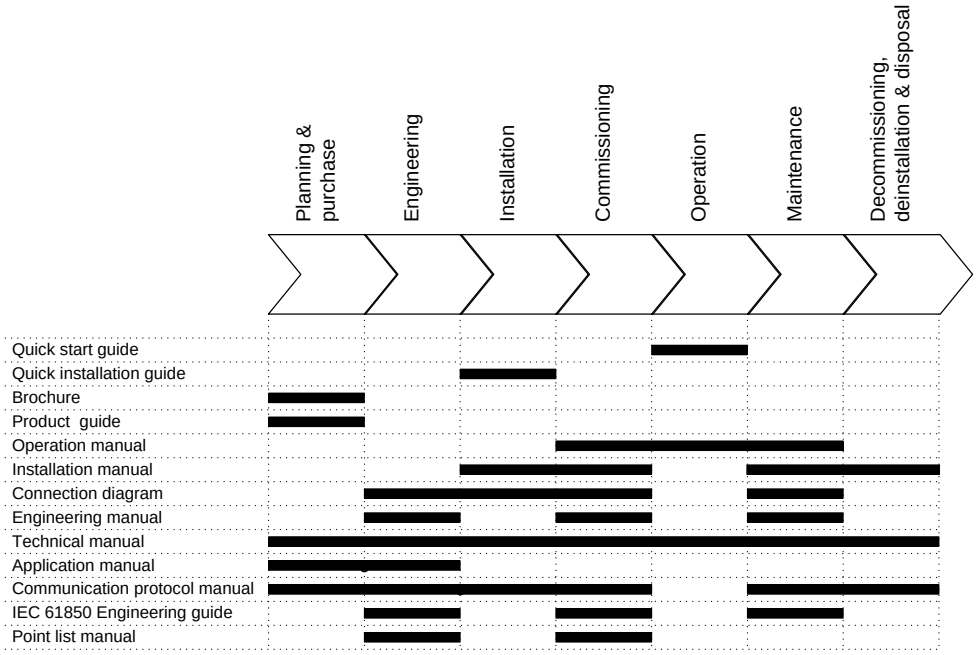

Figure 1: The intended use of documents during the product life cycle

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: REM615 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, instantaneous stage	PHIPTOC1	3I>>> (1)	50P/51P (1)
Non-directional earth-fault protection, low stage	EFLPTOC1	Io> (1)	51N-1 (1)
Non-directional earth-fault protection, high stage	EFHPTOC1	Io>> (1)	51N-2 (1)
Directional earth-fault protection, low stage	DEFLPDEF1	Io> -> (1)	67N-1 (1)
Three-phase undervoltage protection	PHPTUV1	3U< (1)	27 (1)
Positive-sequence undervoltage protection	PSPTUV1	U1< (1)	47U+ (1)
Negative-sequence overvoltage protection	NSPTOV1	U2> (1)	47O- (1)
Frequency protection	FRPFRQ1	f>/f<,df/dt (1)	81 (1)
	FRPFRQ2	f>/f<,df/dt (2)	81 (2)
Negative-sequence overcurrent protection for motors	MNSPTOC1	I2>M (1)	46M (1)
	MNSPTOC2	I2>M (2)	46M (2)
Loss of load supervision	LOFLPTUC1	3I<	37
Motor load jam protection	JAMPTOC1	Ist>	51LR
Motor start-up supervision	STTPMSU1	Is2t n<	49,66,48,51LR
Phase reversal protection	PREVPTOC1	I2>>	46R
Thermal overload protection for motors	MPTTR1	3Ith>M	49M
Circuit breaker failure protection	CCBRBRF1	3I>/Io>BF	51BF/51NBF
Master trip	TRPPTRC1	Master Trip (1)	94/86 (1)
	TRPPTRC2	Master Trip (2)	94/86 (2)
Arc protection	ARCSARC1	ARC (1)	50L/50NL (1)
	ARCSARC2	ARC (2)	50L/50NL (2)
	ARCSARC3	ARC (3)	50L/50NL (3)
Multi-purpose protection	MAPGAPC1	MAP (1)	MAP (1)
	MAPGAPC2	MAP (2)	MAP (2)
	MAPGAPC3	MAP (3)	MAP (3)
	MAPGAPC4	MAP (4)	MAP (4)
	MAPGAPC5	MAP (5)	MAP (5)
	MAPGAPC6	MAP (6)	MAP (6)

Table continues on next page

Function	IEC 61850	IEC 60617	IEC-ANSI
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)
Emergergency startup	ESMGAPC1	ESTART	ESTART
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
Fuse failure supervision	SEQRFUF1	FUSEF	60
Runtime counter for machines and devices	MDSOPT1	OPTS	OPTM
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
Three-phase voltage measurement	VMMXU1	3U	3U
Residual voltage measurement	RESVMMXU1	Uo	Vn
Sequence voltage measurement	VSMSQI1	U1, U2, U0	U1, U2, U0
Three-phase power and energy measurement	PEMMXU1	P, E	P, E
RTD/mA measurement	XRGGIO130	X130 (RTD)	X130 (RTD)
Frequency measurement	FMMXU1	f	f

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 REM615 Ver.4.1 MC01-03 and MC51

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.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
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
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

Table continues on next page

IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
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
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

Table continues on next page

IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
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
Fuse failure protection									
LD0.SEQRFUF1.Str.general	SEQRFUF1.FUSEF_U	General start	10=General start	22	84	1	2	1	1
LD0.SEQRFUF1.Str3Ph.general	SEQRFUF1.FUSEF_3PH	3 phase start	10=3 phase start	22	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
Frequency protection, 2 stages (MC02,03,51)									
LD0.FRPTRC1.Str.general	FRPFRQ1.START	Stage 1 start	10 = Stage1 start	27	11	1	2	1	1
LD0.FRPTOF1.Op.general	FRPFRQ1.OPR_OFRQ	Operate 1 signal for overfrequency	10 = Stage1 overfrequency operate	27	12	1	2	0	1
LD0.FRPTUF1.Op.general	FRPFRQ1.OPR_UFRQ	Operate 1 signal for underfrequency	10 = Stage1 underfrequency operate	27	13	1	2	0	1
LD0.FRPFRC1.Op.general	FRPFRQ1.OPR_FRG	Operate 1 signal for frequency gradient	10= Stage1 frequency gradient operate	27	14	1	2	0	1
LD0.FRPTRC2.Str.general	FRPFRQ2.START	Stage 2 start	10 = Stage2 start	27	21	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.FRPTOF2.Op.general	FRPFRQ2.OPR_OFRQ	Operate 2 signal for overfrequency	10 = Stage2 overfrequency operate	27	22	1	2	0	1
LD0.FRPTUF2.Op.general	FRPFRQ2.OPR_UFRQ	Operate 2 signal for underfrequency	10 = Stage2 underfrequency operate	27	23	1	2	0	1
LD0.FRPFRC2.Op.general	FRPFRQ2.OPR_FRG	Operate 2 signal for frequency gradient	10 = Stage2 frequency gradient operate	27	24	1	2	0	1
Multipurpose analog protection functions (6 stages) (MC01,MC02)									
LD0.MAPGAPC1.Str.general	MAPGAPC1.START	Stage 1 Start	10 = Stage1 start	27	151	0	1	0	1
LD0.MAPGAPC1.Op.general	MAPGAPC1.OPERATE	Stage 1 Operate	10 = Stage1 operate	27	152	0	1	0	1
LD0.MAPGAPC2.Str.general	MAPGAPC2.START	Stage 2 Start	10 = Stage2 start	27	153	0	1	0	1
LD0.MAPGAPC2.Op.general	MAPGAPC2.OPERATE	Stage 2 Operate	10 = Stage2 operate	27	154	0	1	0	1
LD0.MAPGAPC3.Str.general	MAPGAPC3.START	Stage 3 Start	10 = Stage3 start	27	155	0	1	0	1
LD0.MAPGAPC3.Op.general	MAPGAPC3.OPERATE	Stage 3 Operate	10 = Stage3 operate	27	156	0	1	0	1
LD0.MAPGAPC4.Str.general	MAPGAPC4.START	Stage 4 start	10=Start	27	157	0	1	0	1
LD0.MAPGAPC4.Op.general	MAPGAPC4.OPERATE	Stage 4 operate	10=Start	27	158	0	1	0	1
LD0.MAPGAPC5.Str.general	MAPGAPC5.START	Stage 5 start	10=Start	27	159	0	1	0	1
LD0.MAPGAPC5.Op.general	MAPGAPC5.OPERATE	Stage 5 operate	10=Start	27	160	0	1	0	1
LD0.MAPGAPC6.Str.general	MAPGAPC6.START	Stage 6 start	10=Start	27	161	0	1	0	1
LD0.MAPGAPC6.Op.general	MAPGAPC6.OPERATE	Stage 6 operate	10=Start	27	162	0	1	0	1
XRGGIO130 Alarm/Warning (MC01,MC02)									
LD0.XRGGIO130.Wrn.stVal	XRGGIO130.WARNING	XRGGIO130 Warning	10 = Warning	27	201	0	1	0	1
LD0.XRGGIO130.Alm.stVal	XRGGIO130.ALARM	XRGGIO130 Alarm	10 = Alarm	27	202	0	1	0	1
Phase undervoltage protection (1 stage) (MC02,03,51)									
LD0.PHPTUV1.Str.phsA	-	Start[.phsA]	10=PhsA start	41	64	0	2	1	1
LD0.PHPTUV1.Str.phsB	-	Start[.phsB]	10=PhsB start	41	65	0	2	1	1
LD0.PHPTUV1.Str.phsC	-	Start[.phsC]	10=PhsB start	41	66	0	2	1	1
LD0.PHPTUV1.Str.general	PHPTUV1.START	Start[.general]	10=Start general	41	84	1	2	1	1
LD0.PHPTUV1.Op.general	PHPTUV1.OPERATE	Operate[.general]	10=Operate general	41	90	1	2	0	1
Positive sequence undervoltage protection (1 stage) (MC02,03,51)									
LD0.PSPTUV1.Str.general	PSPTUV1.START	Start[.general]	10=Start general	42	84	1	2	1	1
LD0.PSPTUV1.Op.general	PSPTUV1.OPERATE	Operate[.general]	10=Operate general	42	90	1	2	0	1
Negative sequence overvoltage protection (1 stage) (MC02,03,51)									
LD0.NSPTOV1.Str.general	NSPTOV1.START	Start[.general]	10=Start general	43	84	1	2	1	1
LD0.NSPTOV1.Op.general	NSPTOV1.OPERATE	Operate[.general]	10=Operate general	43	90	1	2	0	1
Physical binary I/O signals									
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

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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
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
LD0.XAGGIO130.Ind1.stVal	-	XA130-Input 1	10=ON, 01=OFF	54	1	0	1	1	1
LD0.XAGGIO130.Ind2.stVal	-	XA130-Input 2	10=ON, 01=OFF	54	2	0	1	1	1
LD0.XAGGIO130.Ind3.stVal	-	XA130-Input 3	10=ON, 01=OFF	54	3	0	1	1	1
LD0.XAGGIO130.Ind4.stVal	-	XA130-Input 4	10=ON, 01=OFF	54	4	0	1	1	1
Generic operation time supervision									
LD0.MDSOPT1.OpTmWrn.stVal	MDSOPT1.WARNING	Accum. operation time Warning	10=Warning	71	1	1	1	1	1
LD0.MDSOPT1.OpTmAlm.stVal	MDSOPT1.ALARM	Accum. operation time Alarm	10=Alarm	71	2	1	1	1	1
Negative sequence overcurrent protection for motors (2 stages)									
LD0.MNSPTOC1.Str.general	MNSPTOC1.START	Stage1 start	10=Stage1 start	72	84	1	2	1	1
LD0.MNSPTOC1.Op.general	MNSPTOC1.OPERATE	Stage1 operate	10=Stage1 operate	72	90	1	2	0	1
LD0.MNSPTOC2.Str.general	MNSPTOC2.START	Stage2 start	10=Stage2 start	72	94	1	2	1	1
LD0.MNSPTOC2.Op.general	MNSPTOC2.OPERATE	Stage2 operate	10=Stage2 operate	72	91	1	2	0	1
Stalled motor protection									
LD0.JAMPTOC1.Op.general	JAMPTOC1.OPERATE	Operate[.general]	10=Stage operate	73	90	1	2	0	1
Motor startup supervision									
LD0.STTPMSS1.Str.general	STTPMSU.MOT_START	Motor startup in progress	10=Startup	74	84	1	2	1	1
LD0.STTPMSS1.Op.general	STTPMSU.OPR_IIT	Thermal stress operate	10=Operate	74	90	1	2	0	1
LD0.STTPRMI1.Op.general	STTPMSU.OPR_STALL	Stalling operate	10=Operate	74	91	1	2	0	1
Phase reversal protection									
LD0.PREVPTOC1.Str.general	PREVPTEOC1.START	Stage start	10=Stage start	75	84	1	2	1	1
LD0.PREVPTOO1.Op.general	PREVPTEOC1.OPERATE	Stage operate	10=Stage operate	75	90	1	2	0	1
Motor thermal overload protection									

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LD0.MPPTR1.StrInh.general	MPTTR1.BLK_RESTART	Block restart	10=Block restart	76	83	1	2	1	1
LD0.MPPTR1.AlmThm.general	MPTTR1.ALARM	Thermal alarm	10=Alarm	76	85	1	2	1	1
LD0.MPPTR1.Op.general	MPTTR1.OPERATE	Thermal operate	10=Operate	76	90	1	2	0	1
Emegency start enabled									
LD0.EMSGAPC1.Str.general	ESMGAPC1.ST_EMERG_ENA	Emergency start	10=Emergency start	77	84	1	2	1	1
Loss of load protection									
LD0.LOFLPTUC1.Str.general	LOFLPTUC1.START	Stage1 start	10=Stage1 start	78	84	1	2	1	1
LD0.LOFLPTUC1.Op.general	LOFLPTUC1.OPERATE	Stage1 operate	10=Stage1 operate	78	90	1	2	0	1
Arc protection									
LD0.ARCSARC1.FADet.stVal	ARCSARC1.ARC_FLT_DET	Stage1 Fault arc detected	10=Stage1 arc detected	156	211	1	1	0	1
LD0.ARCSARC1.InRemFA.stVal		Stage1 Remote fault arc detected	10=Stage1 Remote arc detected	156	212	1	1	0	1
LD0.ARCPTRC1.Op.general	ARCSARC1.OPERATE	Stage1 Operate	10=Stage1 operate	156	213	1	2	0	1
LD0.ARCSARC2.FADet.stVal	ARCSARC2.ARC_FLT_DET	Stage2 Fault arc detected	10=Stage2 arc detected	156	221	1	1	0	1
LD0.ARCSARC2.InRemFA.stVal		Stage2 Remote fault arc detected	10=Stage2 Remote arc detected	156	222	1	1	0	1
LD0.ARCPTRC2.Op.general	ARCSARC2.OPERATE	Stage2 Operate	10=Stage2 operate	156	223	1	2	0	1
LD0.ARCSARC3.FADet.stVal	ARCSARC3.ARC_FLT_DET	Stage3 Fault arc detected	10=Stage3 arc detected	156	231	1	1	0	1
LD0.ARCSARC3.InRemFA.stVal		Stage3 Remote fault arc detected	10=Stage3 Remote arc detected	156	232	1	1	0	1
LD0.ARCPTRC3.Op.general	ARCSARC3.OPERATE	Stage3 Operate	10=Stage3 operate	156	233	1	2	0	1
Non-directional earthfault protection, 2 stages (MC01 only)									
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.EFHPTOC1.Str.general	EFHPTOC1.START	High stage start	10=High Stage start	159	96	1	2	1	1
LD0.EFHPTOC1.Op.general	EFHPTOC1.OPERATE	High stage operate	10=High Stage operate	159	98	1	2	0	1
Phase overcurrent protection (2 stages)									
LD0.PHIPTOC1.Str.phsA	-	Instanteous stage Start[.phsA]	10=Inst.Stage phsA start	162	34	0	2	1	1
LD0.PHIPTOC1.Str.phsB	-	Instanteous stage Start[.phsB]	10=Inst.Stage phsB start	162	35	0	2	1	1
LD0.PHIPTOC1.Str.phsC	-	Instanteous stage Start[.phsC]	10=Inst.Stage phsC start	162	36	0	2	1	1
LD0.PHLPTOC1.Str.phsA	-	Low stage Start[.phsA]	10=Low Stage phsA start	162	64	0	2	1	1
LD0.PHLPTOC1.Str.phsB	-	Low stage Start[.phsB]	10=Low Stage phsB start	162	65	0	2	1	1
LD0.PHLPTOC1.Str.phsC	-	Low stage Start[.phsC]	10=Low Stage phsC start	162	66	0	2	1	1
LD0.PHLPTOC1.Str.general	PHLPTOC1.START	Low stage Start[.general]	10=Low Stage start	162	84	1	2	1	1
LD0.PHLPTOC1.Op.general	PHLPTOC1.OPERATE	Low stage Operate[.general]	10=Low Stage operate	162	90	1	2	0	1
LD0.PHIPTOC1.Str.general	PHIPTOC1.START	Instanteous stage Start[.general]	10=Inst Stage start	162	97	1	2	1	1
LD0.PHIPTOC1.Op.general	PHIPTOC1.OPERATE	Instanteous stage Operate[.general]	10=Inst Stage operate	162	99	1	2	0	1
Directional earth-fault protection (1 stage) (MC02,03,51)									
LD0.DEFLPTOC1.Str.general	DEFLPDEF1.START	Low stage start	10=Low Stage start	163	84	1	2	1	1

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LD0.DEFLPTOC1.Op.general	DEFLPDEF1.OPERATE	Low stage operate	10=Low Stage operate	163	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
Phase-to-phase voltage limit supervision (MC02,03,51)									
LD0.VMMXU1.HiAlm.stVal	VMMXU1.HIGH_ALARM	Ph-Ph voltage High alarm	10=High alarm	211	1	1	1	1	1
LD0.VMMXU1.HiWrn.stVal	VMMXU1.HIGH_WARN	Ph-Ph voltage High warning	10=High warning	211	2	1	1	1	1
LD0.VMMXU1.LoWrn.stVal	VMMXU1.LOW_WARN	Ph-Ph voltage Low warning	10=Low warning	211	3	1	1	1	1
LD0.VMMXU1.LoAlm.stVal	VMMXU1.LOW_ALARM	Ph-Ph voltage Low alarm	10=Low alarm	211	4	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
Circuit breaker condition monitoring									
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

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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
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

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IEC 61850 name	AFL-Common SA name	Description	DPI value	FUN	INF	InUse	ASDU	GI	Coding
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.ESSXWI2.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 REM615 variants M01-03 and MC51

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	Residual current	2.4	x	x	
5	LD0.VMMXU1.A.phsA.cVal.mag	Phase-to-ground voltage phase A	2.4	x	x	n.a in MC01
6	LD0.VMMXU1.A.phsB.cVal.mag	Phase-to-ground voltage phase B	2.4	x	x	n.a in MC01
7	LD0.VMMXU1.A.phsC.cVal.mag	Phase-to-ground voltage phase C	2.4	x	x	n.a in MC01
8	LD0.VMMXU1.A.phsAB.cVal.mag	Phase-to-phase voltage phase AB	2.4	x	x	n.a in MC01
9	LD0.VMMXU1.A.phsBC.cVal.mag	Phase-to-phase voltage phase BC	2.4	x	x	n.a in MC01
10	LD0.VMMXU1.A.phsCA.cVal.mag	Phase-to-phase voltage phase CA	2.4	x	x	n.a in MC01
11	LD0.RESVMMXU1.A.res.cVal.mag	Residual voltage	2.4	x	x	n.a in MC01,02
12	LD0.CSMSQI1.SeqA.c1.cVal.mag	Positive sequence current	2.4	x	x	
13	LD0.CSMSQI1.SeqA.c2.cVal.mag	Negative sequence current	2.4	x	x	
14	LD0.CSMSQI1.SeqA.c3.cVal.mag	Zero sequence current	2.4	x	x	
15	LD0.VSMSQI1.SeqA.c1.cVal.mag	Positive sequence voltage	2.4	x	x	n.a in MC01
16	LD0.VSMSQI1.SeqA.c2.cVal.mag	Negative sequence voltage	2.4	x	x	n.a in MC01
17	LD0.VSMSQI1.SeqA.c3.cVal.mag	Zero sequence voltage	2.4	x	x	n.a in MC01
18	LD0.PEMMXU1.TotW.instMag	Active power P	1000	x	x	n.a in MC01
19	LD0.PEMMXU1.TotVAr.instMag	Reactive power Q	1000	x	x	n.a in MC01
20	LD0.PEMMXU1.TotVA.instMag	Apparent power S	1000	x	x	n.a in MC01
21	LD0.PEMMXU1.TotPF.instMag	Power factor	1	x	x	n.a in MC01
22	LD0.MPTTR1.TmpRl.mag	Thermal level	1000	x	x	
23	LD0.FMMXU1.Hz.mag	Frequency measurement	100.0	x	x	n.a in MC01
24	LD0.CMSTA1.AvAmps1.mag	Phase current A -demand value	2.4		x	
25	LD0.CMSTA1.AvAmps2.mag	Phase current B -demand value	2.4		x	
26	LD0.CMSTA1.AvAmps3.mag	Phase current B -demand value	2.4		x	
unmapped	LD0.XRGGIO130.AnIn1.mag	RTD input 1	10000	-	-	optional MC01,02 only
unmapped	LD0.XRGGIO130.AnIn2.mag	RTD input 2	10000	-	-	optional MC01,02 only
unmapped	LD0.XRGGIO130.AnIn3.mag	RTD input 3	10000	-	-	optional MC01,02 only
unmapped	LD0.XRGGIO130.AnIn4.mag	RTD input 4	10000	-	-	optional MC01,02 only
unmapped	LD0.XRGGIO130.AnIn5.mag	RTD input 5	10000	-	-	optional MC01,02 only

Table continues on next page

Index	IEC 61850 name	Description	Default scale	Frame No6	Frame No7	Comment
unmapped	LD0.XRGGIO130.AnIn6.mag	RTD input 6	10000	-	-	optional MC01,02 only
unmapped	LD0.XRGGIO130.AnIn7.mag	RTD input 7	10000	-	-	optional MC01,02 only
unmapped	LD0.XRGGIO130.AnIn8.mag	RTD input 8	10000	-	-	optional MC01,02 only

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
CB	Circuit breaker
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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