



Relion® 615 series

Line Differential Protection and Control RED615 Modbus Point List Manual



Document ID: 1MRS756610
Issued: 2010-06-11
Revision: C
Product version: 3.0

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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 IED 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

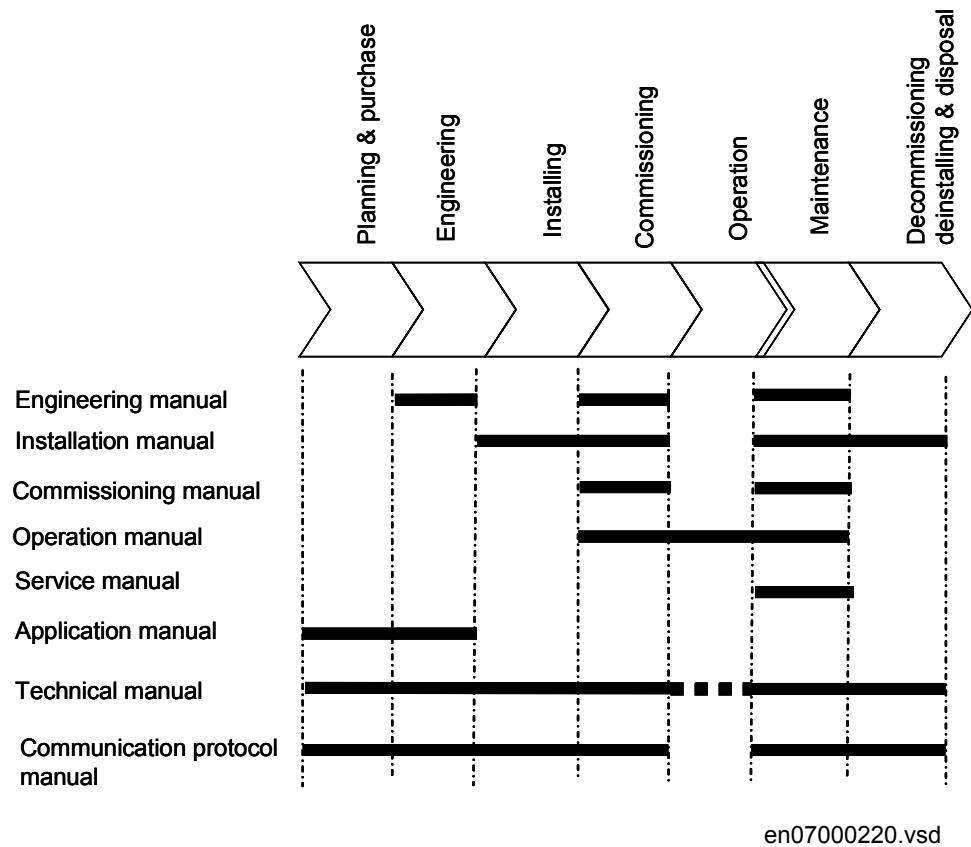


Figure 1: The intended use of manuals in different lifecycles

The engineering manual contains instructions on how to engineer the IEDs using the different tools in PCM600. The manual provides instructions on how to set up a PCM600 project and insert IEDs to the project structure. The manual also recommends a sequence for engineering of protection and control functions, LHMI functions as well as communication engineering for IEC 61850 and other supported protocols.

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

The commissioning manual contains instructions on how to commission the IED. The manual can also be used by system engineers and maintenance personnel for assistance during the testing phase. The manual provides procedures for checking of external circuitry and energizing the IED, parameter setting and configuration as

well as verifying settings by secondary injection. The manual describes the process of testing an IED in a substation which is not in service. The chapters are organized in chronological order in which the IED should be commissioned.

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

The service manual contains instructions on how to service and maintain the IED. The manual also provides procedures for de-energizing, de-commissioning and disposal of the IED.

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

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

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

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.



Some of the manuals are not available yet.

1.3.2

Document revision history

Document revision/date	Product version	History
A/2008-10-03	1.1	First release
B/2009-07-03	2.0	Content updated
C/2010-06-11	3.0	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
Modbus Communication Protocol Manual	1MRS756468

1.4 Symbols and conventions

1.4.1 Safety indication 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 to 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 should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

1.4.2 Manual conventions

Conventions used in IED manuals. A particular convention may not be used in this manual.

- Abbreviations and acronyms in this manual are spelled out in the glossary. The glossary also contains definitions of important terms.
- Push button navigation in the LHMI menu structure is presented by using the push button icons, for example:
To navigate between the options, use  and .
- HMI menu paths are presented in bold, for example:
Select **Main menu/Settings**.
- LHMI messages are shown in Courier font, for example:
To save the changes in non-volatile memory, select `Yes` and press .
- Parameter names are shown in italics, for example:
The function can be enabled and disabled with the *Operation* setting.
- Parameter values are indicated with quotation marks, for example:

The corresponding parameter values are "On" and "Off".

- IED input/output messages and monitored data names are shown in Courier font, for example:

When the function starts, the `START` output is set to `TRUE`.

1.4.3 Functions, codes and symbols

Table 1: *RED615 Functions, codes and symbols*

Function	IEC 61850	IEC 60617	IEC-ANSI
Protection			
Three-phase non-directional overcurrent protection, low stage, 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)
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)
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
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
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Residual overvoltage protection, instance 1	ROVPTOV1	U ₀ > (1)	59G (1)
Residual overvoltage protection, instance 2	ROVPTOV2	U ₀ > (2)	59G (2)
Residual overvoltage protection, instance 3	ROVPTOV3	U ₀ > (3)	59G (3)
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR1	3I _{th} >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>/I ₀ >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
Disconnecter position indication, instance 1	DCSXSUW1	I <-> O DC (1)	I <-> O DC (1)
Disconnecter position indication, instance 2	DCSXSUW2	I <-> O DC (2)	I <-> O DC (2)
Disconnecter position indication, instance 3	DCSXSUW3	I <-> O DC (3)	I <-> O DC (3)
Earthing switch indication	ESSXSUW1	I <-> O ES	I <-> O ES
Auto-reclosing	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)
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	CSMSQ1	I ₁ , I ₂ , I ₀	I ₁ , I ₂ , I ₀
Residual current measurement, instance 1	RESCMMXU1	I ₀	I _n
Residual voltage measurement	RESVMMXU1	U ₀	V _n

Section 2 Modbus data mappings

2.1 Overview

This document describes the Modbus data points and structures available in RED615 Ver. 3.0. The point lists describe a superset of all data available through the standard configurations A, B and C including the optional functionalities. The names of the standard configurations are DE01, DE02 and DE03 respectively.

The majority of the Modbus data points are valid for all standard configurations. Some data points are standard configuration or optional application dependent and thus not available in each IED. The unavailable, that means unused, data points always return value 0 when they are read. The configuration dependent and optional data do not overlap.

Point list table columns

0x addr	Coil (0X) PLC address, base address = 1
Addr.	Signal address
AFL-Common SA name	AFL name of the corresponding data signal
Bit addr	Bit (1X and 0X) PLC address, base address = 1
Ctrl bit	Control bit (0..15) within control structure
Ctrl struct	Control structure number
Description	Signal description
Ds	Object resides as default in some IEC 61850 data set (Y = yes, N = no)
Identification	IED's internal IEC 61850 signal name
IEC 61850 name	IEC 61850 signal description
Mode	Control object mode: unsecured or secured
Reg addr	Modbus register address (3X or 4X). PLC address, base address = 1
Reg.bit	Register PLC address (3X and 4X) and bit within register (0..15)
Scale	Scale factor, default setting
Type	Register type and value interpretation: signed or unsigned
Value range	Value range of the signal

2.2 Point list for RED615 Ver. 3.0 DE01-03

Table 2: Registers

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
1							
...							
127							
User definable registers							
128					Y	System status register SSR1	See Modbus CPM
129					Y	System status register SSR2	See Modbus CPM
130					Y	System status register SSR3	See Modbus CPM
131					Y	System status register SSR4	See Modbus CPM
132					Y	System status register SSR5	See Modbus CPM
133					Y	System status register SSR6	See Modbus CPM
System status registers							
Frequently updated measurands and counters							
134						(reserved)	0
135	i16	1	LD0.DARREC1.AutoRecSt.stVal	DARREC1.STATUS	Y	Autoreclosing status[stVal]	-2...4 (See documentation)
136	i16	1	LD0.DARREC1.ShotPntr.stVal	DARREC1.SHOT_PTR	Y	AR shot pointer value[stVal]	0...6
137	u16	1	LD0.DARREC1.OpCntRs.stVal	DARREC1.COUNTER	N	AR resettable operation counter (all shots)	0...2147483647
138	u16	1000	LD0.CMMXU1.A.phsA.instCVal.mag	CMMXU1.1_INST_A	Y	Phase current A magnitude	0.00 50.00 [xin]
139	u16	1000	LD0.CMMXU1.A.phsB.instCVal.mag	CMMXU1.1_INST_B	Y	Phase current B magnitude	0.00 50.00 [xin]
140	u16	1000	LD0.CMMXU1.A.phsC.instCVal.mag	CMMXU1.1_INST_C	Y	Phase current C magnitude	0.00 50.00 [xin]
141	u16	1000	LD0.RESCMMXU1.A.res.instCVal.mag	RESCMMXU1.10_INST	Y	Residual current magnitude	0.00 50.00 [xin]
Residual voltage only in variant DE02							
142	u16	1000	LD0.RESVMMXU1.PhV.res.instCVal.mag	RESCMMXU1.U0_INST	Y	Residual voltage magnitude	0.00 4.00 [xUn]
143	u16	1000	LD0.CSMSQ11.SeqA.c1.instCVal.mag	CMSQ1.11_INST	Y	Positive sequence of current magnitude	0.00 50.00 [xin]
144	u16	1000	LD0.CSMSQ11.SeqA.c2.instCVal.mag	CMSQ1.12_INST	Y	Negative sequence of current magnitude	0.00 50.00 [xin]
145	u16	1000	LD0.CSMSQ11.SeqA.c3.instCVal.mag	CMSQ1.13_INST	Y	Zero sequence of current magnitude	0.00 50.00 [xin]
146	i16	1	LD0.T1PTR11.Temp.mag	T1PTR1.TEMP	N	Temperature of the object	-100.00...9999.99 [Celsius]
147	i16	1	LD0.T1PTR11.TempRl.mag	T1PTR1.TEMP_RL	N	Calculated relative temperature	0.00...99.99 [Celsius]
148	i16	1	LD0.T1PTR11.TempUsed.mag	T1PTR1.TEMP_AMB	N	The ambient temperature used in the calculation	-99...999 [Celsius]
149	i16	0.001	LD0.T1PTR11.TmmsOp.stVal	T1PTR1.THERMLEV_S	N	Estimated time to operate	0...60000 [ms]
150	i16	0.001	LD0.T1PTR11.TmmsRecEna.stVal	T1PTR1.THERMLEV_E	N	Estimated time to deactivate BLK_CLOSE	0...60000 [ms]
151						(reserved)	0
...							
169						(reserved)	0
170						Indication bits mirrored and packed in registers 170 onwards	See 'Indications' table

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
...							
2000							
Phase current demand values (latest values)							
2001	u16	1000	LD0.CMSTA1.AvAmps1.mag	CMMXU1.I_DMD_A	N	Demand value of Phase A current	0.00 50.00 [xIn]
2002	u16	1000	LD0.CMSTA1.AvAmps2.mag	CMMXU1.I_DMD_B	N	Demand value of Phase B current	0.00 50.00 [xIn]
2003	u16	1000	LD0.CMSTA1.AvAmps3.mag	CMMXU1.I_DMD_C	N	Demand value of Phase C current	0.00 50.00 [xIn]
2004							Time structure (update time)
2005							
2006							
2007							
2008							
Maximum phase current demand values							
2009	u16	1000	LD0.CMSTA1.MaxAmps1.mag	CMMXU1.Max demand IL1	N	Max. demand value for Phase A current	0.00 50.00 [xIn]
2010							Time structure (update time)
2011							
2012							
2013							
2014							
2015	u16	1000	LD0.CMSTA1.MaxAmps2.mag	CMMXU1.Max demand IL2	N	Max. demand value for Phase B current	0.00 50.00 [xIn]
2016							Time structure (update time)
2017							
2018							
2019							
2020							
2021	u16	1000	LD0.CMSTA1.MaxAmps3.mag	CMMXU1.Max demand IL3	N	Max. demand value for Phase C current	0.00 50.00 [xIn]
2022							Time structure (update time)
2023							
2024							
2025							
2026							
Operation counters							
2027	u16	1	CTRL.CBCSW11.OpCntRs.stVal	CBXCBR1.Operation counter	N	Circuit breaker operation counter	0 ... 65535
2028						(reserved)	0

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
2029						(reserved)	0
2030						(reserved)	0
2031	u16	1	LD0.DARREC1.OpCnt1.stVal	DARREC1.CNT_SHOT1	N	Auto recloser operation counter (1st shot)	0...65535
2032	u16	1	LD0.DARREC1.OpCnt2.stVal	DARREC1.CNT_SHOT2	N	Auto recloser operation counter (2nd shot)	0...65535
2033	u16	1	LD0.DARREC1.OpCnt3.stVal	DARREC1.CNT_SHOT3	N	Auto recloser operation counter (3rd shot)	0...65535
2034	u16	1	LD0.DARREC1.OpCnt4.stVal	DARREC1.CNT_SHOT4	N	Auto recloser operation counter (4th shot)	0...65535
2035	u16	1	LD0.DARREC1.OpCnt5.stVal	DARREC1.CNT_SHOT5	N	Auto recloser operation counter (5th shot)	0...65535
2036	u16	1	LD0.DARREC1.FrqOpCnt.stVal	DARREC1.FRQ_OPR_CN T	N	Autorecloser frequent operation counter	0...65535
2037						(reserved)	0
2038						(reserved)	0
2039						(reserved)	0
Differential and bias current values							
2040	u16	1000	LD0.LNPDJF1.DifACIc.phsA.cVal.mag	-	N	Differential current phase A magnitude	0.00 80.00 [xin]
2041	u16	1000	LD0.LNPDJF1.DifACIc.phsB.cVal.mag	-	N	Differential current phase B magnitude	0.00 80.00 [xin]
2042	u16	1000	LD0.LNPDJF1.DifACIc.phsC.cVal.mag	-	N	Differential current phase C magnitude	0.00 80.00 [xin]
2043	u16	1000	LD0.LNPDJF1.RstA.phsA.cVal.mag	-	N	Bias current phase A magnitude	0.00 50.00 [xin]
2044	u16	1000	LD0.LNPDJF1.RstA.phsB.cVal.mag	-	N	Bias current phase B magnitude	0.00 50.00 [xin]
2045	u16	1000	LD0.LNPDJF1.RstA.phsC.cVal.mag	-	N	Bias current phase C magnitude	0.00 50.00 [xin]
2046						(reserved)	0
2047						(reserved)	0
2048						(reserved)	0
2049						(reserved)	0
Diagnostic values							
2050	u16	1	LD0.LPHD1.PhyHealth1.stVal	Warning	Y	Physical device Warning code (latest)	Codes: see documentation
2051	u16	1	LD0.LPHD1.PhyHealth2.stVal	Internal Fault	Y	Physical device Internal fault code (latest)	Codes: see documentation
2052	u16	1	DR.RDRE1.FIRNum.stVal	-	N	Number of disturbance recordings	0...65535
2053	u16	1	DR.RDRE1.MemUsed.stVal	-	N	Disturbance recorder memory used	0...100 [%]
2054	u16	1	LD0.LPHD1.NumPwrUp.stVal	-	N	Number of device power-ups	0...65535
2055	u16	1	LD0.LPHD1.WrmStr.stVal	-	N	Number of device warm-starts	0...65535
2056	u16	1	LD0.LPHD1.WacTrg.stVal	-	N	Number of watchdog device resets	0...65535
2057	u16	1	LD0.LPHD1.NumCmpChg.stVal	-	N	Number of composition changes	0...65535
2058						(reserved)	0
2059						(reserved)	0
Circuit breaker condition monitoring							
2060	u16	1	LD0.SSCBR1.InaTmdCnt.stVal	SSCBR1.INA_DAYS	N	Number of days CB has been inactive	0...9999
2061	u16	1	LD0.SSCBR1.TrmsOpn.mag	SSCBR1.T_TRV_OP	N	CB travel time opening	0...60000 [ms]
2062	u16	1	LD0.SSCBR1.TrmsClis.mag	SSCBR1.T_TRV_CL	N	CB travel time closing	0...60000 [ms]

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
2063	u16	100	LD0.SSCBR1.TmsSprCha.mag	SSCBR1.T_SPR_CHR	N	Charging time of the CB spring	0.00...99.99 [s]
2064	i16	1	LD0.SSCBR1.RmnL_ffPhA.stVal	SSCBR1.CB_LIFE_A	N	CB Remaining life phase A	-9999...9999
2065	i16	1	LD0.SSCBR1.RmnL_ffPhB.stVal	SSCBR1.CB_LIFE_B	N	CB Remaining life phase B	-9999...9999
2066	i16	1	LD0.SSCBR1.RmnL_ffPhC.stVal	SSCBR1.CB_LIFE_C	N	CB Remaining life phase C	-9999...9999
2067	u16	1	LD0.SSCBR1.AccAPwrPhA.mag	SSCBR1.IPOW_A	N	Accumulated currents power (Iy), phase A	0.00...1000000.00
2068	u16	1	LD0.SSCBR1.AccAPwrPhB.mag	SSCBR.IPOW_B	N	Accumulated currents power (Iy), phase B	0.00...1000000.00
2069	u16	1	LD0.SSCBR1.AccAPwrPhC.mag	SSCBR1.IPOW_C	N	Accumulated currents power (Iy), phase C	0.00...1000000.00
2070						(reserved)	0
...							
8000							
Control structure 1							
8001	u16		For information on control structure 1 bit definitions, see Modbus controls table.			Control Struct 1 - Execute register	Control structure (see Modbus CPM)
8002	u16					Control Struct 1 - Password 1	
8003	u16					Control Struct 1 - Password 2	
8004	u16					Control Struct 1 - Control register	
8005	u16					Control Struct 1 - Confirm register	
Control structure 2							
8006	u16		For information on control structure 2 bit definitions, see Modbus controls table.			Control Struct 2 - Execute register	Control structure (see Modbus CPM)
8007	u16					Control Struct 2 - Password 1	
8008	u16					Control Struct 2 - Password 2	
8009	u16					Control Struct 2 - Control register	
8010	u16					Control Struct 2 - Confirm register	
Control structure 3							
8011	u16		For information on control structure 3 bit definitions, see Modbus controls table.			Control Struct 3 - Execute register	Control structure (see Modbus CPM)
8012	u16					Control Struct 3 - Password 1	
8013	u16					Control Struct 3 - Password 2	
8014	u16					Control Struct 3 - Control register	
8015	u16					Control Struct 3 - Confirm register	
Control structure 4							
8016	u16		For information on control structure 4 bit definitions, see Modbus controls table.			Control Struct 4 - Execute register	Control structure (see Modbus CPM)
8017	u16					Control Struct 4 - Password 1	
8018	u16					Control Struct 4 - Password 2	
8019	u16					Control Struct 4 - Control register	
8020	u16					Control Struct 4 - Confirm register	
Control structure 5							

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
8021	u16		For information on control structure 5 bit definitions, see Modbus controls table.			Control Struct 5 - Execute register	Control structure (see Modbus CPM)
8022	u16					Control Struct 5 - Password 1	
8023	u16					Control Struct 5 - Password 2	
8024	u16					Control Struct 5 - Control register	
8025	u16					Control Struct 5 - Confirm register	
8026						(reserved)	0
...							
9000							
Device ID string							
9001						Max length of device ID string may be 128 registers	Device ID string (see Modbus CPM)
9002						(reserved)	0
...							
9128							
Device real-time clock in local time							
9201	u16					Real-time struct - Control register (0..2)	
9202	u16					Real-time struct - Year (2000..2999)	
9203	u16					Real-time struct - Month (1..12)	
9204	u16					Real-time struct - Day (1..31)	
9205	u16					Real-time struct - Hour (0..23)	
9206	u16					Real-time struct - Minute (0..59)	
9207	u16					Real-time struct - Seconds (0..59)	
9208	u16					Real-time struct - Milliseconds (0..999)	
9209						(reserved)	0
9210						(reserved)	0
Device real-time clock in UTC time							
9211	u16					Real-time struct UTC - Control register (0..2)	
9212	u16					Real-time struct UTC - Year (2000..2999)	
9213	u16					Real-time struct UTC - Month (1..12)	
9214	u16					Real-time struct UTC - Day (1..31)	
9215	u16					Real-time struct UTC - Hour (0..23)	
9216	u16					Real-time struct UTC - Minute (0..59)	
9217	u16					Real-time struct UTC - Seconds (0..59)	
9218	u16					Real-time struct UTC - Milliseconds (0..999)	
9219						(reserved)	0
9220						(reserved)	0
Timestamp of last device reset							
9221	u16					Reset time struct - Year (2000..2999)	

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
9222	u16					Reset time struct - Month (1..12)	
9223	u16					Reset time struct - Day (1..31)	
9224	u16					Reset time struct - Hour (0..23)	
9225	u16					Reset time struct - Minute (0..59)	
9226	u16					Reset time struct - Seconds (0..59)	
9227	u16					Reset time struct - Milliseconds (0..999)	
9228	u16					Reset time struct - Reason	1 = Cold reset 2 = Watchdog reset 3 = Warm reset
9229						(reserved)	0
9230						(reserved)	0
Active parameter setting group							
9231	u16		-	-		Setting group in use	1..6
...						(reserved)	0
9249							
Event record structure							
9250	u16	0	Event read selection	-		Number of events records in multiple event reading	1..10
9251	i16	0				Event read operation selection	-499...3
9252	u16	0	Event record 1 (11 registers)	-		Event record struct - Sequence number	Event record structure (see Modbus CPM)
9253	u16	0				Event record struct - Unread records left	
9254	u16	0				Event record struct - TimeStamp (Year,Month)	
9255	u16	0				Event record struct - TimeStamp (Day, Hour)	
9256	u16	0				Event record struct - TimeStamp (Min, Sec)	
9257	u16	0				Event record struct - TimeStamp (Milliseconds)	
9258	u16	0				Event record struct - Event identification	
9259	u16	0				Event record struct - Data object ID 1	
9260	u16	0				Event record struct - Data object ID 2	
9261	u16	0				Event record struct - Data value	
9262	u16	0				Event record struct - Data value	
9263...9273			Event record 2 (11 registers)	-		Event record structure	Event record structure (see Modbus CPM)
9274...9284			Event record 3 (11 registers)	-		Event record structure	Event record structure (see Modbus CPM)
9285...9295			Event record 4 (11 registers)	-		Event record structure	Event record structure (see Modbus CPM)
9296...9306			Event record 5 (11 registers)	-		Event record structure	Event record structure (see Modbus CPM)
9307...9317			Event record 6 (11 registers)	-		Event record structure	Event record structure (see Modbus CPM)

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
9318...9328			Event record 7 (11 registers)	-		Event record structure	Event record structure (see Modbus CPM)
9329...9339			Event record 8 (11 registers)	-		Event record structure	Event record structure (see Modbus CPM)
9340...9350			Event record 9 (11 registers)	-		Event record structure	Event record structure (see Modbus CPM)
9351...9361			Event record 10 (11 registers)	-		Event record structure	Event record structure (see Modbus CPM)
9362						(reserved)	0
...							
9400							
Fault record structure							
9401	i16	0	Fault record read selection	-		Fault record read operation selection	-99...3
9402	u16	0				Fault record struct - Sequence number	Header
9403	u16	0				Fault record struct - Unread records left	
9404	u16	0				Fault record struct - TimeStamp (Year,Month)	
9405	u16	0				Fault record struct - TimeStamp (Day, Hour)	
9406	u16	0				Fault record struct - TimeStamp (Min, Sec)	
9407	u16	0				Fault record struct - TimeStamp (Milliseconds)	
9408	u16	0				Fault record struct - TimeStamp (Time quality)	
Fault record data							
9409	u16	1	LD0.FL.TMSTA1.StrDur.mag	-		Maximum start duration of all stages during the fault	0.00 100.0 [%]
9410	u16	1	LD0.FL.TMSTA1.ActSG.stVal	-	Y	Active parameter setting group during the fault	1...6
9411						(reserved)	0
9412	u16	1000	LD0.FL.TMSTA1.MxRstACIcA.mag	-	Y	Max bias current in phase A during fault	0.00 50.00 [xin]
9413	u16	1000	LD0.FL.TMSTA1.MxRstACIcB.mag	-	Y	Max bias current in phase B during fault	0.00 50.00 [xin]
9414	u16	1000	LD0.FL.TMSTA1.MxRstACIcC.mag	-	Y	Max bias current in phase C during fault	0.00 50.00 [xin]
9415	u16	1000	LD0.FL.TMSTA1.DifAmpsA.mag	-	Y	Differential current in phase A at moment of trip	0.00 80.00 [xin]
9416	u16	1000	LD0.FL.TMSTA1.DifAmpsB.mag	-	Y	Differential current in phase B at moment of trip	0.00 80.00 [xin]
9417	u16	1000	LD0.FL.TMSTA1.DifAmpsC.mag	-	Y	Differential current in phase C at moment of trip	0.00 80.00 [xin]
9418	u16	1000	LD0.FL.TMSTA1.RstAmpsA.mag	-	Y	Bias current in phase A at moment of trip	0.00 50.00 [xin]
9419	u16	1000	LD0.FL.TMSTA1.RstAmpsB.mag	-	Y	Bias current in phase B at moment of trip	0.00 50.00 [xin]
9420	u16	1000	LD0.FL.TMSTA1.RstAmpsC.mag	-	Y	Bias current in phase C at moment of trip	0.00 50.00 [xin]
9421	u16	1000	LD0.FL.TMSTA1.MaxAmpsA.mag	-	Y	Max phase A current during fault	0.00 50.00 [xin]
9422	u16	1000	LD0.FL.TMSTA1.MaxAmpsB.mag	-	Y	Max phase B current during fault	0.00 50.00 [xin]
9423	u16	1000	LD0.FL.TMSTA1.MaxAmpsC.mag	-	Y	Max phase C current during fault	0.00 50.00 [xin]
9424	u16	1000	LD0.FL.TMSTA1.MaxAmpsN.mag	-	Y	Max residual current during fault	0.00 50.00 [xin]
9425	u16	1000	LD0.FL.TMSTA1.AmpsA.mag	-	Y	Phase A current at moment of trip	0.00 50.00 [xin]
9426	u16	1000	LD0.FL.TMSTA1.AmpsB.mag	-	Y	Phase B current at moment of trip	0.00 50.00 [xin]
9427	u16	1000	LD0.FL.TMSTA1.AmpsC.mag	-	Y	Phase C current at moment of trip	0.00 50.00 [xin]

Table continues on next page

Section 2 Modbus data mappings

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
9428	u16	1000	LD0.FLTMSTA1.AmpsN.mag	-	Y	Residual current at moment of trip	0.00 50.00 [xIn]
9429	u16	1000	LD0.FLTMSTA1.AmpsNCIc.mag	-	Y	Residual C1c current at moment of trip	0.00 50.00 [xIn]
9430	u16	1000	LD0.FLTMSTA1.AmpsPsSeq.mag	-	Y	Positive sequence current at moment of trip	0.00 50.00 [xIn]
9431	u16	1000	LD0.FLTMSTA1.AmpsNgSeq.mag	-	Y	Negative sequence current at moment of trip	0.00 50.00 [xIn]
9432	u16	1000	LD0.FLTMSTA1.VoltsN.mag	-	Y	Residual voltage at moment of trip	0...4.00 [xUn]
9433	u16	100	LD0.FLTMSTA1.MaxTmpRI.mag	-	Y	Max relative temperature	0.00...99.99 [degrees Celsius]
9434	u16	10	LD0.FLTMSTA1.PDNS1MxRat.mag	-	Y	Max ratio of PDNSPTOC1 stage	0...999.99 [%]
9445	i16	10	LD0.FLTMSTA1.DifNangN.mag	-	Y	Residual voltage-residual current angle	-180.0...180.0 [degrees]
9447							
9449							
9450							

Table 3: Indications

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2720	170.00	C.TRL.LLN0.Loc.stVal	-	Y	Local/Remote state - mom	0 = Local, 1=Remote
2721	170.01	C.TRL.LLN0.LocRem.stVal.Station	-	Y	Station - mom	0 = OFF, 1 =ON
2722	170.02	DR.RDRE1.RcdMade.stVal	-		Disturbance recorder file ready - mom	1 = DR file captured
2723	170.03	DR.RDRE1.RcdMade.stVal	-		Disturbance recorder file ready - MCD	
2724	170.04	LD0.DARREC1.AROn.stVal	DARREC1.AR_ON	Y	Autorecloser state	0=AR Off, 1=AR On
2725	170.05				(reserved)	0
2726	170.06	LD0.LLN0.SetSeid.stVal	-	Y	Parameter setting rights reserved - mom	1=Rights reserved
2727	170.07	LD0.LLN0.SetSeid.stVal	-		Parameter setting rights reserved - MCD	
2728	170.08	LD0.LLN0.SetChg.stVal	-	Y	Parameter settings changed - mom	1=Settings changed
2729	170.09	LD0.LLN0.SetChg.stVal	-		Parameter settings changed - MCD	
2730	170.10				(reserved)	0
...	...					
2735	170.15					
Global conditioning						
2736	171.00	LD0.LEDPTRC1.Str.general	-	Y	Start (.general)- mom	1 = Start (LEDPTRC)
2737	171.01	LD0.LEDPTRC1.Str.general	-		Start (.general) - MCD	
2738	171.02	LD0.LEDPTRC1.Op.general	-	Y	Operate (.general)- mom	1= Operate (LEDPTRC)
2739	171.03	LD0.LEDPTRC1.Op.general	-		Operate (.general) - MCD	
Protection trip conditioning (1)						
2740	171.04	LD0.TRPPTRC1.Op.general	-	Y	Input signal (.general)- mom	1=Input signal ON
2741	171.05	LD0.TRPPTRC1.Op.general	-		Input signal (.general)- MCD	
2742	171.06	LD0.TRPPTRC1.Tr.general	-	Y	Trip output signal (.general)- mom	1=Trip output signal ON
2743	171.07	LD0.TRPPTRC1.Tr.general	-		Trip output signal (.general)- MCD	
Protection trip conditioning (2)						
2744	171.08	LD0.TRPPTRC2.Op.general	-	Y	Input signal (.general)- mom	1=Input signal ON
2745	171.09	LD0.TRPPTRC2.Op.general	-		Input signal (.general)- MCD	
2746	171.10	LD0.TRPPTRC2.Tr.general	-	Y	Trip output signal (.general)- mom	1=Trip output signal ON
2747	171.11	LD0.TRPPTRC2.Tr.general	-		Trip output signal (.general)- MCD	
2748	171.12				(reserved)	0
2749	171.13				(reserved)	0
2750	171.14				(reserved)	0
2751	171.15				(reserved)	0
Phase current value limit supervision						
2752	172.00	LD0.CMMXU1.HiAlm.stVal	CMMXU1.HIGH_ALARM	Y	High alarm[.stVal] - mom	1=High alarm
2753	172.01	LD0.CMMXU1.HiAlm.stVal	-		High alarm[.stVal] - MCD	
2754	172.02	LD0.CMMXU1.HiWrn.stVal	CMMXU1.HIGH_WARN	Y	High warning[.stVal] - mom	1=High warning

Table continues on next page

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2755	172.03	LD0.CMMXU1.HiWrn.stVal			High warning[.stVal] - MCD	
2756	172.04	LD0.CMMXU1.LoWrn.stVal	CMMXU1.LOW_WARN	Y	Low alarm[.stVal] - mom	1=Low alarm
2757	172.05	LD0.CMMXU1.LoWrn.stVal			Low alarm[.stVal] - MCD	
2758	172.06	LD0.CMMXU1.LoAlm.stVal		Y	Low warning[.stVal] - mom	1=Low warning
2759	172.07	LD0.CMMXU1.LoAlm.stVal			Low warning[.stVal] - MCD	
Residual current value supervision						
2760	172.08	LD0.RESCMMXU1.HiAlm.stVal	RESCMMXU1.HIGH_ALARM	Y	High alarm[.stVal] - mom	1=High alarm
2761	172.09	LD0.RESCMMXU1.HiAlm.stVal			High alarm[.stVal] - MCD	
2762	172.10	LD0.RESCMMXU1.HiWrn.stVal	RESCMMXU1.HIGH_WARN	Y	High warning[.stVal] - mom	1=High warning
2763	172.11	LD0.RESCMMXU1.HiWrn.stVal			High warning[.stVal] - MCD	
Residual voltage value supervision, only in variant DE02						
2764	172.12	LD0.RESVMMXU1.HiAlm.stVal	RESVMMXU1.HIGH_ALARM	Y	High alarm[.stVal] - mom	1=High alarm
2765	172.13	LD0.RESVMMXU1.HiAlm.stVal			High alarm[.stVal] - MCD	
2766	172.14	LD0.RESVMMXU1.HiWrn.stVal	RESVMMXU1.HIGH_WARN	Y	High warning[.stVal] - mom	1=High warning
2767	172.15	LD0.RESVMMXU1.HiWrn.stVal			High warning[.stVal] - MCD	
Indication LED states						
2768	173.00	LD0.LEDGGIO1.SPCSO1.stVal	-	Y	LED 1[.stVal] - mom	1=LED ON
2769	173.01	LD0.LEDGGIO1.SPCSO2.stVal	-	Y	LED 2[.stVal] - mom	1=LED ON
2770	173.02	LD0.LEDGGIO1.SPCSO3.stVal	-	Y	LED 3[.stVal] - mom	1=LED ON
2771	173.03	LD0.LEDGGIO1.SPCSO4.stVal	-	Y	LED 4[.stVal] - mom	1=LED ON
2772	173.04	LD0.LEDGGIO1.SPCSO5.stVal	-	Y	LED 5[.stVal] - mom	1=LED ON
2773	173.05	LD0.LEDGGIO1.SPCSO6.stVal	-	Y	LED 6[.stVal] - mom	1=LED ON
2774	173.06	LD0.LEDGGIO1.SPCSO7.stVal	-	Y	LED 7[.stVal] - mom	1=LED ON
2775	173.07	LD0.LEDGGIO1.SPCSO8.stVal	-	Y	LED 8[.stVal] - mom	1=LED ON
2776	173.08	LD0.LEDGGIO1.SPCSO9.stVal	-	Y	LED 9[.stVal] - mom	1=LED ON
2777	173.09	LD0.LEDGGIO1.SPCSO10.stVal	-	Y	LED 10[.stVal] - mom	1=LED ON
2778	173.10	LD0.LEDGGIO1.SPCSO11.stVal	-	Y	LED 11[.stVal] - mom	1=LED ON
2779	173.11				(reserved)	0
Trip circuit supervision (1)						
2780	173.12	LD0.TCSCCBR1.CirAlm.stVal	TCSCCBR1.ALARM	Y	Alarm[.stVal] - mom	1=TCS1 Alarm
2781	173.13	LD0.TCSCCBR1.CirAlm.stVal			Alarm[.stVal] - MCD	
Trip circuit supervision (2)						
2782	173.14	LD0.TCSCCBR2.CirAlm.stVal	TCSCCBR2.ALARM	Y	Alarm[.stVal] - mom	1=TCS2 Alarm
2783	173.15	LD0.TCSCCBR2.CirAlm.stVal			Alarm[.stVal] - MCD	
Binary signal transfer supervision						
2784	174.00	LD0.BSTGGIO1.Alm1.stVal	BSTGGIO1.SEND_SIG_A	Y	Binary signal transfer sending alarm state - mom	1=Send alarm
2785	174.01	LD0.BSTGGIO1.Alm1.stVal			Binary signal transfer sending alarm state - MCD	
2786	174.02	LD0.BSTGGIO1.Alm2.stVal	BSTGGIO1.RECV_SIG_A	Y	Binary signal transfer receive alarm state - mom	1=Receive alarm
2787	174.03	LD0.BSTGGIO1.Alm2.stVal			Binary signal transfer receive alarm state - MCD	

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
Protection communication supervision						
2788	174.04	LD0.PCSRTPC1.HealthAlm.stVal	PCSRTPC1.ALARM	Y	Protection communication alarm - mom	1=Alarm
2789	174.05	LD0.PCSRTPC1.HealthAlm.stVal			Protection communication alarm - MCD (reserved)	0
2790	174.06				(reserved)	0
2791	174.07				(reserved)	0
Disconnecter (1) position						
2792	174.08	CTRL.DCSXSW11.Pos.stVal.Close	DCSXSWM1.POSITION	Y	close mom	1=Close
2793	174.09	CTRL.DCSXSW11.Pos.stVal.Open	-	Y	open mom	1=Open
2794	174.10	CTRL.DCSXSW11.Pos.stVal.Fault	-	Y	error position	1=Faulty or Intermediate
Disconnecter (2) position						
2795	174.11	CTRL.DCSXSW12.Pos.stVal.Close	DCSXSWM2.POSITION	Y	close mom	1=Close
2796	174.12	CTRL.DCSXSW12.Pos.stVal.Open	-	Y	open mom	1=Open
2797	174.13	CTRL.DCSXSW12.Pos.stVal.Fault	-	Y	error position	1=Faulty or Intermediate
Disconnecter (3) position						
2798	174.14	CTRL.DCSXSW13.Pos.stVal.Close	DCSXSWM3.POSITION	Y	close mom	1=Close
2799	174.15	CTRL.DCSXSW13.Pos.stVal.Open	-	Y	open mom	1=Open
2800	175.00	CTRL.DCSXSW13.Pos.stVal.Fault	-	Y	error position	1=Faulty or Intermediate
Earth disconnecter position						
2801	175.01	CTRL.ESSXSW11.Pos.stVal.Close	ESSXSWM1.POSITION	Y	close mom	1=Close
2802	175.02	CTRL.ESSXSW11.Pos.stVal.Open	-	Y	open mom	1=Open
2803	175.03	CTRL.ESSXSW11.Pos.stVal.Fault	-	Y	error position	1=Faulty or Intermediate
Circuit breaker position						
2804	175.04	CTRL.CBCSW11.Pos.stVal.Close	CBXGBR1.POSITION	Y	close mom	1=Close
2805	175.05	CTRL.CBCSW11.Pos.stVal.Open	-	Y	open mom	1=Open
2806	175.06	CTRL.CBCSW11.Pos.stVal.Fault	-	Y	error position	1=Faulty or Intermediate
2807	175.07				(reserved)	0
2808	175.08				(reserved)	0
2809	175.09				(reserved)	0
2810	175.10				(reserved)	0
2811	175.11				(reserved)	0
2812	175.12				(reserved)	0
2813	175.13				(reserved)	0
2814	175.14				(reserved)	0
2815	175.15				(reserved)	0
Circuit breaker position + momentary change detect						
2816	176.00	CTRL.CBCSW11.Pos.stVal	CBXGBR1.POSITION	Y	close mom	1=Close

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2817	176.01	CTRL.CBCSW11.Pos.stVal			close MCD	
2818	176.02	CTRL.CBCSW11.Pos.stVal	-		open mom	1=Open
2819	176.03	CTRL.CBCSW11.Pos.stVal		Y	open MCD	
2820	176.04				(reserved)	0
2821	176.05				(reserved)	0
Circuit breaker selected for control operation						
2822	176.06	CTRL.CBCSW11.Pos.stSeld	CBXCBR1.SELECTED	Y	Selected [.stSeld] - mom	1=Selected
2823	176.07	CTRL.CBCSW11.Pos.stSeld			Selected [.stSeld] - MCD	
Circuit breaker control enable signals						
2824	176.08	CTRL.CBCILO1.EnaOprn.stVal	CBXCBR1.ENA_OPEN	Y	Open enabled [.stVal] - mom	1=Open enabled
2825	176.09	CTRL.CBCILO1.EnaCls.stVal	CBXCBR1.ENA_CLOSE	Y	Close enabled [.stVal] - mom	1=Close enabled
2826	176.10				(reserved)	0
2827	176.11				(reserved)	0
Circuit breaker failure detection and -protection, variant DE02_03						
2828	176.12	CTRL.CCBRRBF1.Str.general	CCBRBF1.CB_FAULT_AL	Y	Start, timer running[.general] - mom	1=Start timer running
2829	176.13	CTRL.CCBRRBF1.Str.general			Start, timer running[.general] - MCD	
2830	176.14	CTRL.CCBRRBF1.OpEx.general	CCBRBF1.TRBU	Y	Failure, external trip [.general] - mom	1=Failure external trip
2831	176.15	CTRL.CCBRRBF1.OpEx.general			Failure, external trip [.general] - MCD	
2832	177.00	CTRL.CCBRRBF1.Opln.general	CCBRBF1.TRRET	Y	Operate, internal retrip (.general) - mom	1=Operate, internal re-trip
2833	177.01	CTRL.CCBRRBF1.Opln.general			Operate, internal retrip (.general) - MCD	
2834	177.02				(reserved)	0
2835	177.03				(reserved)	0
Circuit breaker control blocking signals						
2836	177.04	CTRL.CBXCBR1.BlkOprn.stVal	CBXCBR1.BLK_OPEN	Y	Open blocked [.stVal] - mom	1 = Open blocked
2837	177.05	CTRL.CBXCBR1.BlkOprn.stVal			Open blocked [.stVal] - MCD	
2838	177.06	CTRL.CBXCBR1.BlkCls.stVal	CBXCBR1.BLK_CLOSE	Y	Close blocked [.stVal] - mom	1 = Close blocked
2839	177.07	CTRL.CBXCBR1.BlkCls.stVal			Close blocked [.stVal] - MCD	
2840	177.08	CTRL.CBCILO1.ItlByPss.stVal	CBXCBR1.ITL_BYPASS	Y	Interlocking bypass [.stVal] - mom	1 = Interlocking bypass
2841	177.09	CTRL.CBCILO1.ItlByPss.stVal			Interlocking bypass [.stVal] - MCD	
2842	177.10				(reserved)	0
2843	177.11				(reserved)	0
2844	177.12				(reserved)	0
2845	177.13				(reserved)	0
2846	177.14				(reserved)	0
2847	177.15				(reserved)	0
Circuit breaker condition monitoring, variants DE02_03						
2848	178.00	LD0.SSCBR1.OprnAlm.stVal	SSCBR1.TRV_T_OP_ALM	Y	Open travel time exceeded (.stVal) - mom	1=Open travel time alarm

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2849	178.01	LD0.SSCBR1.CisAlm.stVal	SSCBR1.TRV_I_CL_ALM	Y	Close travel time exceeded (stVal) - mom	1=Close travel time alarm
2850	178.02	LD0.SSCBR1.SprChaAlm.stVal	SSCBR1.SPR_CHR_ALM	Y	Spring charging time exceeded (stVal)- mom	1=Spring charging time alarm
2851	178.03	LD0.SSCBR1.OpNumAlm.stVal	SSCBR1.OPR_ALM	Y	Num of CB operations alarm (stVal)- mom	1=CB operations alarm
2852	178.04	LD0.SSCBR1.OpNumLO.stVal	SSCBR1.OPR_LO	Y	Num of CB operations lockout limit (stVal) - mom	1=CB operations lockout alarm
2853	178.05	LD0.SSCBR1.LonTmAlm.stVal	SSCBR1.MON_ALM	Y	CB "not operated for long time"alarm (stVal)]- mom	1=CB unactive alarm
2854	178.06	LD0.SSCBR1.PresAlm.stVal	SSCBR1.PRES_ALM	Y	Pressure below alarm level[.stVal] - mom	1=Low pressure alarm
2855	178.07	LD0.SSCBR1.PresLO.stVal	SSCBR1.PRES_LO	Y	Pressure below lockout level[.stVal] - mom	1=Low pressure lockout alarm
2856	178.08	LD0.SSCBR1.APwrAlm.stVal	SSCBR1.IPOW_ALM	Y	Acc. currents power (ly),alarm limit[.stVal] - mom	1=lyt alarm
2857	178.09	LD0.SSCBR1.APwrLO.stVal	SSCBR1.IPOW_LO	Y	Acc. currents power (ly),lockout limit[.stVal] - mom	1=lyt lockout alarm
2858	178.10	LD0.SSCBR1.CBlifAlm.stVal	SSCBR1.CB_LIFE_ALM	Y	Remaining life of CB exceeded alarm limit[.stVal] - mom	1=CB life alarm
2859	178.11				(reserved)	0
2860	178.12				(reserved)	0
2861	178.13				(reserved)	0
2862	178.14				(reserved)	0
2863	178.15				(reserved)	0
Current circuit supervision						
2864	179.00	CTRL.CCRDIF1.Alm.stVal	CCRDIF1.FAIL	Y	Current circuit failure alarm - mom	1=Failure alarm
2865	179.01	CTRL.CCRDIF1.Alm.stVal			Current circuit failure alarm - MCD	
2866	179.02	CTRL.CCRDIF1.Op.general	CCRDIF1.ALARM	Y	Current circuit failure operate - mom	1=Failure operate
2867	179.03	CTRL.CCRDIF1.Op.general			Current circuit failure operate - MCD	
Line differential protection with stabilized and inst. Stages						
2868	179.04	LD0.LNPDIF1.Str.general	LNPDIF1.START	Y	Start, local or remote[.general] -mom	1=General start
2869	179.05	LD0.LNPDIF1.Str.general			Start, local or remote[.general] -MCD	
2870	179.06	LD0.LNPDIF1.Str.phsA	-	Y	Start[.phsA] - mom	1=Start phsA
2871	179.07	LD0.LNPDIF1.Str.phsA			Start[.phsA] - MCD	
2872	179.08	LD0.LNPDIF1.Str.phsB	-	Y	Start[.phsB] - mom	1=Start phsB
2873	179.09	LD0.LNPDIF1.Str.phsB			Start[.phsB] - MCD	
2874	179.10	LD0.LNPDIF1.Str.phsC	-	Y	Start[.phsC] - mom	1=Start phsC
2875	179.11	LD0.LNPDIF1.Str.phsC			Start[.phsC] - MCD	
2876	179.12	LD0.LNPDIF1.Op.general	LNPDIF1.OPERATE	Y	Operate, local or remote[.general] -mom	1=General operate
2877	179.13	LD0.LNPDIF1.Op.general			Operate, local or remote[.general] -MCD	
2878	179.14				(reserved)	0
2879	179.15				(reserved)	0
Phase overcurrent protection signals (3 stages)						
2880	180.00	LD0.PHLPTOC1.Str.general	PHLPTOC1.START	Y	Low stage Start[.general] - mom	1=Low stage start

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2881	180.01	LD0.PHLPTOC1.Str.general			Low stage Start[.general] - MCD	
2882	180.02	LD0.PHLPTOC1.Str.phsA	-	Y	Low stage Start[.phsA] - mom	1=Low stage phsA start
2883	180.03	LD0.PHLPTOC1.Str.phsA			Low stage Start[.phsA] - MCD	
2884	180.04	LD0.PHLPTOC1.Str.phsB	-	Y	Low stage Start[.phsB] - mom	1=Low stage phsB start
2885	180.05	LD0.PHLPTOC1.Str.phsB			Low stage Start[.phsB] - MCD	
2886	180.06	LD0.PHLPTOC1.Str.phsC	-	Y	Low stage Start[.phsC] - mom	1=Low stage phsC start
2887	180.07	LD0.PHLPTOC1.Str.phsC			Low stage Start[.phsC] - MCD	
2888	180.08	LD0.PHLPTOC1.Op.general	PHLPTOC1.OPERATE	Y	Low stage Operate[.general] - mom	1=Low stage operate
2889	180.09	LD0.PHLPTOC1.Op.general			Low stage Operate[.general] - MCD	
2890	180.10	LD0.PHHPTOC1.Str.general	PHHPPTOC1.START	Y	High(1) stage Start[.general] - mom	1=High(1) stage start
2891	180.11	LD0.PHHPTOC1.Str.general			High(1) stage Start[.general] - MCD	
2892	180.12	LD0.PHHPTOC1.Str.phsA	-	Y	High(1) stage Start[.phsA] - mom	1=High(1) stage phsA start
2893	180.13	LD0.PHHPTOC1.Str.phsA			High(1) stage Start[.phsA] - MCD	
2894	180.14	LD0.PHHPTOC1.Str.phsB	-	Y	High(1) stage Start[.phsB] - mom	1=High(1) stage phsB start
2895	180.15	LD0.PHHPTOC1.Str.phsB			High(1) stage Start[.phsB] - MCD	
2896	181.00	LD0.PHHPTOC1.Str.phsC	-	Y	High(1) stage Start[.phsC] - mom	1=High(1) stage phsC start
2897	181.01	LD0.PHHPTOC1.Str.phsC			High(1) stage Start[.phsC] - MCD	
2898	181.02	LD0.PHHPTOC1.Op.general	PHHPPTOC1.OPERATE	Y	High(1) stage Operate[.general] - mom	1=High(1) stage operate
2899	181.03	LD0.PHHPTOC1.Op.general			High(1) stage Operate[.general] - MCD	
2900	181.04	LD0.PHHPTOC2.Str.general	PHHPPTOC2.START	Y	High(2) stage Start[.general] - mom	1=High(2) stage start
2901	181.05	LD0.PHHPTOC2.Str.general			High(2) stage Start[.general] - MCD	
2902	181.06	LD0.PHHPTOC2.Str.phsA	-	Y	High(2) stage Start[.phsA] - mom	1=High(2) stage phsA start
2903	181.07	LD0.PHHPTOC2.Str.phsA			High(2) stage Start[.phsA] - MCD	
2904	181.08	LD0.PHHPTOC2.Str.phsB	-	Y	High(2) stage Start[.phsB] - mom	1=High(2) stage phsB start
2905	181.09	LD0.PHHPTOC2.Str.phsB			High(2) stage Start[.phsB] - MCD	
2906	181.10	LD0.PHHPTOC2.Str.phsC	-	Y	High(2) stage Start[.phsC] - mom	1=High(2) stage phsC start
2907	181.11	LD0.PHHPTOC2.Str.phsC			High(2) stage Start[.phsC] - MCD	
2908	181.12	LD0.PHHPTOC2.Op.general	PHHPPTOC2.OPERATE	Y	High(2) stage Operate[.general] - mom	1=High(2) stage operate
2909	181.13	LD0.PHHPTOC2.Op.general			High(2) stage Operate[.general] - MCD	
2910	181.14	LD0.PHIPTOC1.Str.general	PHIPTOC1.START	Y	Instantaneous stage Start[.general] - mom	1=Instantaneous stage start
2911	181.15	LD0.PHIPTOC1.Str.general			Instantaneous stage Start[.general] - MCD	

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2912	182.00	LD0.PHIPTOC1.Str.phsA	-	Y	Instantaneous stage Start[.phsA] - mom	1=Instantaneous stage phsA start
2913	182.01	LD0.PHIPTOC1.Str.phsA			Instantaneous stage Start[.phsA] - MCD	
2914	182.02	LD0.PHIPTOC1.Str.phsB	-	Y	Instantaneous stage Start[.phsB] - mom	1=Instantaneous stage phsB start
2915	182.03	LD0.PHIPTOC1.Str.phsB			Instantaneous stage Start[.phsB] - MCD	
2916	182.04	LD0.PHIPTOC1.Str.phsC	-	Y	Instantaneous stage Start[.phsC] - mom	1=Instantaneous stage phsC start
2917	182.05	LD0.PHIPTOC1.Str.phsC			Instantaneous stage Start[.phsC] - MCD	
2918	182.06	LD0.PHIPTOC1.Op.general	PHIPTOC1.OPERATE	Y	Instantaneous stage Operate[.general] - mom	1=Instantaneous stage operate
2919	182.07	LD0.PHIPTOC1.Op.general			Instantaneous stage Operate[.general] - MCD	
Directional earth-fault protection signals (3 stages), variant DE02						
2920	182.08	LD0.DEFLPTOC1.Str.general	DEFLPTOC1.START	Y	Low(1) stage Start[.general] - mom	1=Low(1) stage start
2921	182.09	LD0.DEFLPTOC1.Str.general			Low(1) stage Start[.general] - MCD	
2922	182.10	LD0.DEFLPTOC1.Op.general	DEFLPTOC1.OPERATE	Y	Low(1) stage Operate[.general] - mom	1=Low(1) stage operate
2923	182.11	LD0.DEFLPTOC1.Op.general			Low(1) stage Operate[.general] - MCD	
2924	182.12	LD0.DEFLPTOC2.Str.general	DEFLPTOC2.START	Y	Low(2) stage Start[.general] - mom	1=Low(2) stage start
2925	182.13	LD0.DEFLPTOC2.Str.general			Low(2) stage Start[.general] - MCD	
2926	182.14	LD0.DEFLPTOC2.Op.general	DEFLPTOC2.OPERATE	Y	Low(2) stage Operate[.general] - mom	1=Low(2) stage operate
2927	182.15	LD0.DEFLPTOC2.Op.general			Low(2) stage Operate[.general] - MCD	
2928	183.00	LD0.DEFHPTOC1.Str.general	DEFHPTOC1.START	Y	High stage Start[.general] - mom	1=High stage start
2929	183.01	LD0.DEFHPTOC1.Str.general			High stage Start[.general] - MCD	
2930	183.02	LD0.DEFHPTOC1.Op.general	DEFHPTOC1.OPERATE	Y	High stage Operate[.general] - mom	1=High stage operate
2931	183.03	LD0.DEFHPTOC1.Op.general			High stage Operate[.general] - MCD	
Non-directional earth-fault and sensitive earth-fault protection signals (4 stages), variant DE03. (EFHPTOC1 also in DE02)						
2932	183.04	LD0.EFLPTOC1.Str.general	EFLPTOC1.START	Y	Low(1) stage Start[.general] - mom	1=Low(1) stage start
2933	183.05	LD0.EFLPTOC1.Str.general			Low(1) stage Start[.general] - MCD	
2934	183.06	LD0.EFLPTOC1.Op.general	EFLPTOC1.OPERATE	Y	Low(1) stage Operate[.general] - mom	1=Low(1) stage operate
2935	183.07	LD0.EFLPTOC1.Op.general			Low(1) stage Operate[.general] - MCD	
2936	183.08	LD0.EFLPTOC2.Str.general	EFLPTOC2.START	Y	Low(2) stage Start[.general] - mom	1=Low(2) stage start
2937	183.09	LD0.EFLPTOC2.Str.general			Low(2) stage Start[.general] - MCD	
2938	183.10	LD0.EFLPTOC2.Op.general	EFLPTOC2.OPERATE	Y	Low(2) stage Operate[.general] - mom	1=Low(2) stage operate
2939	183.11	LD0.EFLPTOC2.Op.general			Low(2) stage Operate[.general] - MCD	
2940	183.12	LD0.EFHPTOC1.Str.general	EFHPTOC1.START	Y	High stage Start[.general] - mom	1=High stage start
2941	183.13	LD0.EFHPTOC1.Str.general			High stage Start[.general] - MCD	
2942	183.14	LD0.EFHPTOC1.Op.general	EFHPTOC1.OPERATE	Y	High stage Operate[.general] - mom	1=High stage operate
2943	183.15	LD0.EFHPTOC1.Op.general			High stage Operate[.general] - MCD	

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2944	184.00	LD0.EFIPTOC1.Str.general	EFIPTOC1.START	Y	Instantaneous stage Start[.general] - mom	1=Instantaneous stage start
2945	184.01	LD0.EFIPTOC1.Str.general			Instantaneous stage Start[.general] - MCD	
2946	184.02	LD0.EFIPTOC1.Op.general	EFIPTOC1.OPERATE	Y	Instantaneous stage Operate[.general] - mom	1=Instantaneous stage operate
2947	184.03	LD0.EFIPTOC1.Op.general			Instantaneous stage Operate[.general] - MCD	
Transient/Intermittent earth-fault protection signals (1 stage), variant DE02						
2948	184.04	LD0.INTRPTEF1.Str.general	INTRPTEF1.START	Y	Start[.general] - mom	1=Stage start
2949	184.05	LD0.INTRPTEF1.Str.general			Start[.general] - MCD	
2950	184.06	LD0.INTRPTEF1.Op.general	INTRPTEF1.OPERATE	Y	Operate[.general] - mom	1=Stage operate
2951	184.07	LD0.INTRPTEF1.Op.general			Operate[.general] - MCD	
Phase discontinuity protection, variants DE02,03						
2952	184.08	LD0.PDNSPTOC1.Str.general	PDNSPTOC1.START	Y	Start[.general] - mom	1=Stage start
2953	184.09	LD0.PDNSPTOC1.Str.general			Start[.general] - MCD	
2954	184.10	LD0.PDNSPTOC1.Op.general	PDNSPTOC1.OPERATE	Y	Operate[.general] - mom	1=Stage operate
2955	184.11	LD0.PDNSPTOC1.Op.general			Operate[.general] - MCD	
Negative sequence overcurrent protection signals (2 stages)						
2956	184.12	LD0.NSPTOC1.Str.general	NSPTOC1.START	Y	Stage1 Start[.general] - mom	1=Stage1 start
2957	184.13	LD0.NSPTOC1.Str.general			Stage1 Start[.general] - MCD	
2958	184.14	LD0.NSPTOC1.Op.general	NSPTOC1.OPERATE	Y	Stage1 Operate[.general] - mom	1=Stage1 operate
2959	184.15	LD0.NSPTOC1.Op.general			Stage1 Operate[.general] - MCD	
2960	185.00	LD0.NSPTOC2.Str.general	NSPTOC2.START	Y	Stage2 Start[.general] - mom	1=Stage2 start
2961	185.01	LD0.NSPTOC2.Str.general			Stage2 Start[.general] - MCD	
2962	185.02	LD0.NSPTOC2.Op.general	NSPTOC2.OPERATE	Y	Stage2 Operate[.general] - mom	1=Stage3 operate
2963	185.03	LD0.NSPTOC2.Op.general			Stage2 Operate[.general] - MCD	
2964	185.04				(reserved)	0
2965	185.05				(reserved)	0
2966	185.06				(reserved)	0
2967	185.07				(reserved)	0
2968	185.08				(reserved)	0
2969	185.09				(reserved)	0
2970	185.10				(reserved)	0
2971	185.11				(reserved)	0
Thermal overload protection, variants DE02,03						
2972	185.12	LD0.T1PTTR1.Str.general	T1PTTR1.START		Start[.general] - mom	1=Start
2973	185.13	LD0.T1PTTR1.Str.general			Start[.general] - MCD	
2974	185.14	LD0.T1PTTR1.Alm.Thm.general	T1PTTR1.ALARM		Thermal Alarm[.general] - mom	1=Thermal Alarm
2975	185.15	LD0.T1PTTR1.Alm.Thm.general			Thermal Alarm[.general] - MCD	
2976	186.00	LD0.T1PTTR1.Op.general	T1PTTR1.OPERATE		Operate[.general] - mom	1=Operate
2977	186.01	LD0.T1PTTR1.Op.general			Operate[.general] - MCD	

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2978	186.02				(reserved)	0
2979	186.03				(reserved)	0
Global conditioning, Phase information						
2980	186.04	LD0.LEDPTRC1.Str.phsA	-		Global conditioning - Start[phsA] - mom	1=Start phsA
2981	186.05	LD0.LEDPTRC1.Str.phsA			Global conditioning - Start[phsA] - MCD	
2982	186.06	LD0.LEDPTRC1.Str.phsB	-		Global conditioning - Start[phsB] - mom	1=Start phsB
2983	186.07	LD0.LEDPTRC1.Str.phsB			Global conditioning - Start[phsB] - MCD	
2984	186.08	LD0.LEDPTRC1.Str.phsC	-		Global conditioning - Start[phsC] - mom	1=Start phsC
2985	186.09	LD0.LEDPTRC1.Str.phsC			Global conditioning - Start[phsC] - MCD	
2986	186.10	LD0.LEDPTRC1.Op.phsA	-		Global conditioning - Operate[phsA] - mom	1=Operate phsA
2987	186.11	LD0.LEDPTRC1.Op.phsA			Global conditioning - Operate[phsA] - MCD	
2988	186.12	LD0.LEDPTRC1.Op.phsB	-		Global conditioning - Operate[phsB] - mom	1=Operate phsB
2989	186.13	LD0.LEDPTRC1.Op.phsB			Global conditioning - Operate[phsB] - MCD	
2990	186.14	LD0.LEDPTRC1.Op.phsC	-		Global conditioning - Operate[phsC] - mom	1=Operate phsC
2991	186.15	LD0.LEDPTRC1.Op.phsC			Global conditioning - Operate[phsC] - MCD	
Admittance based Earthfault protection - 3 stages (DE02)						
2992	187.00	LD0.EFPADM1.Str.general	EFPADM1_START		Stage1 start [general] - mom	1 = Stage1 start
2993	187.01	LD0.EFPADM1.Str.general			Stage1 start [general] - MCD	
2994	187.02	LD0.EFPADM1.Op.general	EFPADM1_OPERATE		Stage1 operate [general] - mom	1 = Stage1 operate
2995	187.03	LD0.EFPADM1.Op.general			Stage1 operate [general] - MCD	
2996	187.04	LD0.EFPADM2.Str.general	EFPADM2_START		Stage2 start [general] - mom	1 = Stage2 start
2997	187.05	LD0.EFPADM2.Str.general			Stage2 start [general] - MCD	
2998	187.06	LD0.EFPADM2.Op.general	EFPADM2_OPERATE		Stage2 operate [general] - mom	1 = Stage2 operate
2999	187.07	LD0.EFPADM2.Op.general			Stage2 operate [general] - MCD	
3000	187.08	LD0.EFPADM3.Str.general	EFPADM3_START		Stage3 start [general] - mom	1 = Stage3 start
3001	187.09	LD0.EFPADM3.Str.general			Stage3 start [general] - MCD	
3002	187.10	LD0.EFPADM3.Op.general	EFPADM3_OPERATE		Stage3 operate [general] - mom	1 = Stage3 operate
3003	187.11	LD0.EFPADM3.Op.general			Stage3 operate [general] - MCD	
3004	187.12				(reserved)	0
3005	187.13				(reserved)	0
3006	187.14				(reserved)	0
3007	187.15				(reserved)	0
Residual overvoltage protection - 3 stages (DE02)						
3008	188.00	LD0.ROVPTOV1.Str.general	ROVPTOV1_START		Stage1 start [general] - mom	1 = Stage1 start
3009	188.01	LD0.ROVPTOV1.Str.general			Stage1 start [general] - MCD	
3010	188.02	LD0.ROVPTOV1.Op.general	ROVPTOV1_OPERATE		Stage1 operate [general] - mom	1 = Stage1 operate
3011	188.03	LD0.ROVPTOV1.Op.general			Stage1 operate [general] - MCD	
3012	188.04	LD0.ROVPTOV2.Str.general	ROVPTOV2_START		Stage2 start [general] - mom	1 = Stage2 start
3013	188.05	LD0.ROVPTOV2.Str.general			Stage2 start [general] - MCD	

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
3014	188.06	LD0.ROVPTOV2.Op.general	ROVPTOV2_OPERATE		Stage2 operate [.general] - mom	1 = Stage2 operate
3015	188.07	LD0.ROVPTOV2.Op.general			Stage2 operate [.general] - MCD	
3016	188.08	LD0.ROVPTOV3.Str.general	ROVPTOV3_START		Stage3 start [.general] - mom	1 = Stage3 start
3017	188.09	LD0.ROVPTOV3.Str.general			Stage3 start [.general] - MCD	
3018	188.10	LD0.ROVPTOV3.Op.general	ROVPTOV3_OPERATE		Stage3 operate [.general] - mom	1 = Stage3 operate
3019	188.11	LD0.ROVPTOV3.Op.general			Stage3 operate [.general] - MCD	
...	...				(reserved)	0
3039	189.15				(reserved)	0
Autoreclosing signals (optional in all variants)						
3040	190.00	LD0.DARREC1.PrgRec.stVal	DARREC1.INPRO	Y	AR in progress [.stVal] - mom	1=In progress
3041	190.01	LD0.DARREC1.PrgRec.stVal			AR in progress [.stVal] - MCD	
3042	190.02	LD0.DARREC1.PrgRec1.stVal	DARREC1.INPRO_1	Y	AR in progress 1st reclose[.stVal] - mom	1=In progress
3043	190.03	LD0.DARREC1.PrgRec1.stVal			AR in progress 1st reclose[.stVal] - MCD	
3044	190.04	LD0.DARREC1.PrgRec2.stVal	DARREC1.INPRO_2	Y	AR in progress 2nd reclose[.stVal] - mom	1=In progress
3045	190.05	LD0.DARREC1.PrgRec2.stVal			AR in progress 2nd reclose[.stVal] - MCD	
3046	190.06	LD0.DARREC1.PrgRec3.stVal	DARREC1.INPRO_3	Y	AR in progress 3rd reclose[.stVal] - mom	1=In progress
3047	190.07	LD0.DARREC1.PrgRec3.stVal			AR in progress 3rd reclose[.stVal] - MCD	
3048	190.08	LD0.DARREC1.PrgRec4.stVal	DARREC1.INPRO_4	Y	AR in progress 4th reclose[.stVal] - mom	1=In progress
3049	190.09	LD0.DARREC1.PrgRec4.stVal			AR in progress 4th reclose[.stVal] - MCD	
3050	190.10	LD0.DARREC1.PrgRec5.stVal	DARREC1.INPRO_5	Y	AR in progress 5th reclose[.stVal] - mom	1=In progress
3051	190.11	LD0.DARREC1.PrgRec5.stVal			AR in progress 5th reclose[.stVal] - MCD	
3052	190.12	LD0.DARREC1.SucRec.stVal	DARREC1.SUC_RECL	Y	Successful reclose status[.stVal] - mom	1=Successful reclose
3053	190.13	LD0.DARREC1.SucRec.stVal			Successful reclose status[.stVal] - MCD	
3054	190.14	LD0.DARREC1.UnsRec.stVal	DARREC1.UNSUC_RECL	Y	Unsuccessful reclose status[.stVal] - mom	1=Unsuccessful reclose
3055	190.15	LD0.DARREC1.UnsRec.stVal			Unsuccessful reclose status[.stVal] - MCD	
3056	191.00				(reserved)	0
3057	191.01				(reserved)	0
3058	191.02				(reserved)	0
3059	191.03				(reserved)	0
3060	191.04	LD0.DARREC1.LO.stVal	DARREC1.LOCKED	Y	Lockout status[.stVal] - mom	1=Lockout
3061	191.05	LD0.DARREC1.LO.stVal			Lockout status[.stVal] - MCD	
3062	191.06	LD0.DARREC1.RdyRec.stVal	DARREC1.READY	Y	Ready reclose status[.stVal] - mom	1=Reclose ready
3063	191.07	LD0.DARREC1.RdyRec.stVal			Ready reclose status[.stVal] - MCD	
3064	191.08	LD0.DARREC1.ActRec.stVal	DAARREC1.ACTIVE	Y	Active reclose status[.stVal] - mom	1=Reclose active
3065	191.09	LD0.DARREC1.ActRec.stVal			Active reclose status[.stVal] - MCD	
3066	191.10	LD0.DARREC1.PrgDsr.stVal	DARREC1.DISCR_INPRO	Y	Discrimination time in progress[.stVal] - mom	1=Discr. time in progress
3067	191.11	LD0.DARREC1.PrgDsr.stVal			Discrimination time in progress[.stVal] - MCD	

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
3068	191.12	LD0.DARREC1.PrgCutOut.stVal	DARREC1.CUTOUT_INPRO	Y	Cutout time in progress[.stVal] - mom	1=Cutout time in progress
3069	191.13	LD0.DARREC1.PrgCutOut.stVal			Cutout time in progress[.stVal] - MCD	
3070	191.14	LD0.DARREC1.FrqOpAlm.stVal	DARREC1.FRQ_OP_ALM	Y	Frequent operation counter alarm[.stVal] - mom	1=Frequent operation alarm
3071	191.15	LD0.DARREC1.FrqOpAlm.stVal			Frequent operation counter alarm[.stVal] - MCD	
3072	192.00				(reserved)	0
3073	192.01				(reserved)	0
3074	192.02				(reserved)	0
3075	192.03				(reserved)	0
3076	192.04	LD0.DARREC1.CBManCls.stVal	DARREC1.MAN_CB_CL	Y	CB manually closed[.stVal] - mom	1=CB manually closed
3077	192.05	LD0.DARREC1.CBManCls.stVal			CB manually closed[.stVal] - MCD	
3078	192.06	LD0.DARREC1.Op.general	DARREC1.CLOSE_CB	Y	Operate (close command to XCBR)[.general] - mom	1=Close command to CB
3079	192.07	LD0.DARREC1.Op.general			Operate (close command to XCBR)[.general] - MCD	
3080	192.08	LD0.DARREC1.OpOpn.general	DARREC1.OPEN_CB	Y	Operate (open command to XCBR)[.general] - mom	1=Open command to CB
3081	192.09	LD0.DARREC1.OpOpn.general			Operate (open command to XCBR)[.general] - MCD	
3082	192.10	LD0.DARREC1.UnsCBCIs.stVal	DARREC1.UNSUC_CB	Y	Unsuccessful CB closing status[.stVal] - mom	1=Unsuccessful CB closing
3083	192.11	LD0.DARREC1.UnsCBCIs.stVal			Unsuccessful CB closing status[.stVal] - MCD	
3084	192.12	LD0.DARREC1.WIMstr.stVal	DARREC1.CMD_WAIT	Y	Master signal to follower[.stVal] - mom	1=Master signal to follower
3085	192.13	LD0.DARREC1.WIMstr.stVal			Master signal to follower[.stVal] - MCD	
3086	192.14				(reserved)	0
...	...				(reserved)	0
3183	198.15				(reserved)	0
Physical I/O signal states (BIO-card X130)						
3184	199.00	LD0.XGGIO130.Ind1.stVal	-		X130-Input 1[.stVal] - mom	1=ON, 0=OFF
3185	199.01	LD0.XGGIO130.Ind1.stVal			X130-Input 1[.stVal] - MCD	
3186	199.02	LD0.XGGIO130.Ind2.stVal	-		X130-Input 2[.stVal] - mom	1=ON, 0=OFF
3187	199.03	LD0.XGGIO130.Ind2.stVal			X130-Input 2[.stVal] - MCD	
3188	199.04	LD0.XGGIO130.Ind3.stVal	-		X130-Input 3[.stVal] - mom	1=ON, 0=OFF
3189	199.05	LD0.XGGIO130.Ind3.stVal			X130-Input 3[.stVal] - MCD	
3190	199.06	LD0.XGGIO130.Ind4.stVal	-		X130-Input 4[.stVal] - mom	1=ON, 0=OFF
3191	199.07	LD0.XGGIO130.Ind4.stVal			X130-Input 4[.stVal] - MCD	
3192	199.08	LD0.XGGIO130.Ind5.stVal	-		X130-Input 5[.stVal] - mom	1=ON, 0=OFF
3193	199.09	LD0.XGGIO130.Ind5.stVal			X130-Input 5[.stVal] - MCD	
3194	199.10	LD0.XGGIO130.Ind6.stVal	-		X130-Input 6[.stVal] - mom	1=ON, 0=OFF
3195	199.11	LD0.XGGIO130.Ind6.stVal			X130-Input 6[.stVal] - MCD	
3196	199.12				(reserved)	0

Table continues on next page

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
3197	199.13				(reserved)	0
3198	199.14				(reserved)	0
3199	199.15				(reserved)	0
Physical I/O signal states (AIM-card X120)						
3200	200.00	LD0.XGGIO120.ind1.stVal	-		X120-Input 1[.stVal] - mom	1=ON, 0=OFF
3201	200.01	LD0.XGGIO120.ind1.stVal			X120-Input 1[.stVal] - MCD	
3202	200.02	LD0.XGGIO120.ind2.stVal	-		X120-Input 2[.stVal] - mom	1=ON, 0=OFF
3203	200.03	LD0.XGGIO120.ind2.stVal			X120-Input 2[.stVal] - MCD	
3204	200.04	LD0.XGGIO120.ind3.stVal	-		X120-Input 3[.stVal] - mom	1=ON, 0=OFF
3205	200.05	LD0.XGGIO120.ind3.stVal			X120-Input 3[.stVal] - MCD	
3206	200.06	LD0.XGGIO120.ind4.stVal	-		X120-Input 4[.stVal] - mom	1=ON, 0=OFF
3207	200.07	LD0.XGGIO120.ind4.stVal			X120-Input 4[.stVal] - MCD	
3208	200.08				(reserved)	0
3209	200.09				(reserved)	0
3210	200.10				(reserved)	0
3211	200.11				(reserved)	0
3212	200.12				(reserved)	0
3213	200.13				(reserved)	0
3214	200.14				(reserved)	0
3215	200.15				(reserved)	0
Physical I/O signal states (BIO-card X110)						
3216	201.00	LD0.XGGIO110.ind1.stVal	-		X110-Input 1[.stVal] - mom	1=ON, 0=OFF
3217	201.01	LD0.XGGIO110.ind1.stVal			X110-Input 1[.stVal] - MCD	
3218	201.02	LD0.XGGIO110.ind2.stVal	-		X110-Input 2[.stVal] - mom	1=ON, 0=OFF
3219	201.03	LD0.XGGIO110.ind2.stVal			X110-Input 2[.stVal] - MCD	
3220	201.04	LD0.XGGIO110.ind3.stVal	-		X110-Input 3[.stVal] - mom	1=ON, 0=OFF
3221	201.05	LD0.XGGIO110.ind3.stVal			X110-Input 3[.stVal] - MCD	
3222	201.06	LD0.XGGIO110.ind4.stVal	-		X110-Input 4[.stVal] - mom	1=ON, 0=OFF
3223	201.07	LD0.XGGIO110.ind4.stVal			X110-Input 4[.stVal] - MCD	
3224	201.08	LD0.XGGIO110.ind5.stVal	-		X110-Input 5[.stVal] - mom	1=ON, 0=OFF
3225	201.09	LD0.XGGIO110.ind5.stVal			X110-Input 5[.stVal] - MCD	
3226	201.10	LD0.XGGIO110.ind6.stVal	-		X110-Input 6[.stVal] - mom	1=ON, 0=OFF
3227	201.11	LD0.XGGIO110.ind6.stVal			X110-Input 6[.stVal] - MCD	
3228	201.12	LD0.XGGIO110.ind7.stVal	-		X110-Input 7[.stVal] - mom	1=ON, 0=OFF
3229	201.13	LD0.XGGIO110.ind7.stVal			X110-Input 7[.stVal] - MCD	
3230	201.14	LD0.XGGIO110.ind8.stVal	-		X110-Input 8[.stVal] - mom	1=ON, 0=OFF
3231	201.15	LD0.XGGIO110.ind8.stVal			X110-Input 8[.stVal] - MCD	
3232	202.00	LD0.XGGIO110.SPCSO1.stVal	-		X110-Output 1[.stVal] - mom	1=ON, 0=OFF
3233	202.01	LD0.XGGIO110.SPCSO1.stVal			X110-Output 1[.stVal] - MCD	

Table continues on next page

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
3234	202.02	LD0.XGGIO110.SPCSO2.stVal	-		X110-Output 2[.stVal] - mom	1=ON, 0=OFF
3235	202.03	LD0.XGGIO110.SPCSO2.stVal			X110-Output 2[.stVal] - MCD	
3236	202.04	LD0.XGGIO110.SPCSO3.stVal	-		X110-Output 3[.stVal] - mom	1=ON, 0=OFF
3237	202.05	LD0.XGGIO110.SPCSO3.stVal			X110-Output 3[.stVal] - MCD	
3238	202.06	LD0.XGGIO110.SPCSO4.stVal	-		X110-Output 4[.stVal] - mom	1=ON, 0=OFF
3239	202.07	LD0.XGGIO110.SPCSO4.stVal			X110-Output 4[.stVal] - MCD	
3240	202.08				(reserved)	0
3241	202.09				(reserved)	0
3242	202.10				(reserved)	0
3243	202.11				(reserved)	0
3244	202.12				(reserved)	0
3245	202.13				(reserved)	0
3246	202.14				(reserved)	0
3247	202.15				(reserved)	0
Physical I/O signal states (PSM-card X100)						
3248	203.00	LD0.XGGIO100.SPCSO1.stVal	-		X100-Output 1[.stVal] - mom	1=ON, 0=OFF
3249	203.01	LD0.XGGIO100.SPCSO1.stVal			X100-Output 1[.stVal] - MCD	
3250	203.02	LD0.XGGIO100.SPCSO2.stVal	-		X100-Output 2[.stVal] - mom	1=ON, 0=OFF
3251	203.03	LD0.XGGIO100.SPCSO2.stVal			X100-Output 2[.stVal] - MCD	
3252	203.04	LD0.XGGIO100.SPCSO3.stVal	-		X100-Output 3[.stVal] - mom	1=ON, 0=OFF
3253	203.05	LD0.XGGIO100.SPCSO3.stVal			X100-Output 3[.stVal] - MCD	
3254	203.06	LD0.XGGIO100.SPCSO4.stVal	-		X100-Output 4[.stVal] - mom	1=ON, 0=OFF
3255	203.07	LD0.XGGIO100.SPCSO4.stVal			X100-Output 4[.stVal] - MCD	
3256	203.08	LD0.XGGIO100.SPCSO5.stVal	-		X100-Output 5[.stVal] - mom	1=ON, 0=OFF
3257	203.09	LD0.XGGIO100.SPCSO5.stVal			X100-Output 5[.stVal] - MCD	
3258	203.10	LD0.XGGIO100.SPCSO6.stVal	-		X100-Output 6[.stVal] - mom	1=ON, 0=OFF
3259	203.11	LD0.XGGIO100.SPCSO6.stVal			X100-Output 6[.stVal] - MCD	
3260	203.12				(reserved)	0
3261	203.13				(reserved)	0
3262	203.14				(reserved)	0
3263	203.15				(reserved)	0
Physical I/O signal states (BIO-card X130)						
3264	204.00	LD0.XGGIO130.SPCSO1.stVal	-		X130-Output 1[.stVal] - mom	1=ON, 0=OFF
3265	204.01	LD0.XGGIO130.SPCSO1.stVal			X130-Output 1[.stVal] - MCD	
3266	204.02	LD0.XGGIO130.SPCSO2.stVal	-		X130-Output 2[.stVal] - mom	1=ON, 0=OFF
3267	204.03	LD0.XGGIO130.SPCSO2.stVal			X130-Output 2[.stVal] - MCD	
3268	204.04	LD0.XGGIO130.SPCSO3.stVal	-		X130-Output 3[.stVal] - mom	1=ON, 0=OFF
3269	204.05	LD0.XGGIO130.SPCSO3.stVal			X130-Output 3[.stVal] - MCD	
Multipurpose indications (All variants)						
Table continues on next page						

Section 2 Modbus data mappings

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
3536	221.00	LD0.MVGAPC1.Q1.stVal	-		Input 1 [.stVal] - mom	0 = Input OFF, 1 = Input ON
3537	221.01	LD0.MVGAPC1.Q1.stVal	-		Input 1 [.stVal] - MCD	
3538	221.02	LD0.MVGAPC1.Q2.stVal	-		Input 2 [.stVal] - mom	0 = Input OFF, 1 = Input ON
3539	221.03	LD0.MVGAPC1.Q2.stVal	-		Input 2 [.stVal] - MCD	
3540	221.04	LD0.MVGAPC1.Q3.stVal	-		Input 3 [.stVal] - mom	0 = Input OFF, 1 = Input ON
3541	221.05	LD0.MVGAPC1.Q3.stVal	-		Input 3 [.stVal] - MCD	
3542	221.06	LD0.MVGAPC1.Q4.stVal	-		Input 4 [.stVal] - mom	0 = Input OFF, 1 = Input ON
3543	221.07	LD0.MVGAPC1.Q4.stVal	-		Input 4 [.stVal] - MCD	
3544	221.08	LD0.MVGAPC1.Q5.stVal	-		Input 5 [.stVal] - mom	0 = Input OFF, 1 = Input ON
3545	221.09	LD0.MVGAPC1.Q5.stVal	-		Input 5 [.stVal] - MCD	
3546	221.10	LD0.MVGAPC1.Q6.stVal	-		Input 6 [.stVal] - mom	0 = Input OFF, 1 = Input ON
3547	221.11	LD0.MVGAPC1.Q6.stVal	-		Input 6 [.stVal] - MCD	
3548	221.12	LD0.MVGAPC1.Q7.stVal	-		Input 7 [.stVal] - mom	0 = Input OFF, 1 = Input ON
3549	221.13	LD0.MVGAPC1.Q7.stVal	-		Input 7 [.stVal] - MCD	
3550	221.14	LD0.MVGAPC1.Q8.stVal	-		Input 8 [.stVal] - mom	0 = Input OFF, 1 = Input ON
3551	221.15	LD0.MVGAPC1.Q8.stVal	-		Input 8 [.stVal] - MCD	

Table 4: Controls

Ox addr	Ctrl struct	Ctrl bit	Mode	Identification	Description
2048	1	0	Uns	CTRL.CBCSWI1.Pos.ctlVal	CBXCBR1 - Switch, general - Open
2049		1	Uns		CBXCBR1 - Switch, general - Close
2050		2	Uns		CBXCBR1 - Switch, general - Cancel
2051		3	Uns		CBXCBR1 - Switch, general - Operate
2052		4	Uns		CBXCBR1 - Switch, general - Direct open
2053		5	Uns		CBXCBR1 - Switch, general - Direct close
2060	2	0	Uns	LD0.LLN0.LEDRs1.ctlVal	General - Indications and LEDs - 1=Activate
2061		1	Uns	LD0.LLN0.LEDRs2.ctlVal	General - Alarm LEDs - 1=Activate
2062		2	Uns	LD0.LLN0.RecRs.ctlVal	General - All data - 1=Activate
2063		3	Uns	LD0.DARREC1.RsRec.ctlVal	Reset reclosing - 1=Activate
2064		4	Uns	LD0.DARREC1.RsCnt.ctlVal	Reset reclosing counters - 1=Activate
2065		5	Uns	LD0.SSCBR1.RsAccAP.wr.ctlVal	Reset accumulation energy - 1=Activate
2066		6	Uns	LD0.SSCBR1.RsCBWear.ctlVal	Reset input for CB remaining life and operation counter - 1=Activate
2067		7	Uns	DR.RDRE1.RcdTrg.ctlVal	Disturbance recorder - Trig recording - 1=Activate
2068		8	Uns	DR.RDRE1.MemClr.ctlVal	Disturbance recorder - Disturbance records - 1=Activate
2069		9	Uns	LD0.CMSTA1.RecRs.ctlVal	CMMXU1 - CMMXU1 max.demands - 1=Reset
2070		10	Uns	LD0.PEMMXU1.SuDmdRs.ctlVal	Reset accumulated energy - 1=Reset
2071		11	Uns	LD0.SCCBR1.RsTrvTm.ctlVal	Reset travelling time alarm - 1=Reset
2072	12	Uns	LD0.SCCBR1.RsSprChaTm.ctlVal	Reset spring charge time alarm - 1=Reset	
2073				(reserved)	
2074				(reserved)	
2075				(reserved)	
2076				(reserved)	
2077				(reserved)	
2078				(reserved)	
2079				(reserved)	
2080	3	0	Uns	LD0.LPHD1.RsDev.ctlVal	Physical device - Reset device - 1=Activate
2096	4	0	Uns	LD0.SRGAPC1.Rs1.ctlVal	Reset SRGAPC1 flip-flop 1
2097		1	Uns	LD0.SRGAPC1.Rs2.ctlVal	Reset SRGAPC1 flip-flop 2
2098		2	Uns	LD0.SRGAPC1.Rs3.ctlVal	Reset SRGAPC1 flip-flop 3
2099		3	Uns	LD0.SRGAPC1.Rs4.ctlVal	Reset SRGAPC1 flip-flop 4
2100		4	Uns	LD0.SRGAPC1.Rs5.ctlVal	Reset SRGAPC1 flip-flop 5
2101		5	Uns	LD0.SRGAPC1.Rs6.ctlVal	Reset SRGAPC1 flip-flop 6
2102		6	Uns	LD0.SRGAPC1.Rs7.ctlVal	Reset SRGAPC1 flip-flop 7
2103		7	Uns	LD0.SRGAPC1.Rs8.ctlVal	Reset SRGAPC1 flip-flop 8

Section 3 Glossary

AFL	Application function block library
AR	Autoreclosing
BIO	Binary input and output
CB	Circuit breaker
DR	Disturbance recorder
EMC	Electromagnetic compatibility
HMI	Human-machine interface
I/O	Input/output
IEC	International Electrotechnical Commission
IEC 61850	International standard for substation communication and modelling
IED	Intelligent electronic device
LED	Light-emitting diode
LHMI	Local human-machine interface
MCD	Momentary change detect
Modbus	A serial communication protocol developed by the Modicon company in 1979. Originally used for communication in PLCs and RTU devices.
PCM600	Protection and Control IED Manager
PLC	Programmable logic controller
PSM	Power supply module
TCS	Trip-circuit supervision
UTC	Coordinated universal time

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