



Relion® 615 series

Transformer Protection and Control RET615 Modbus 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 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

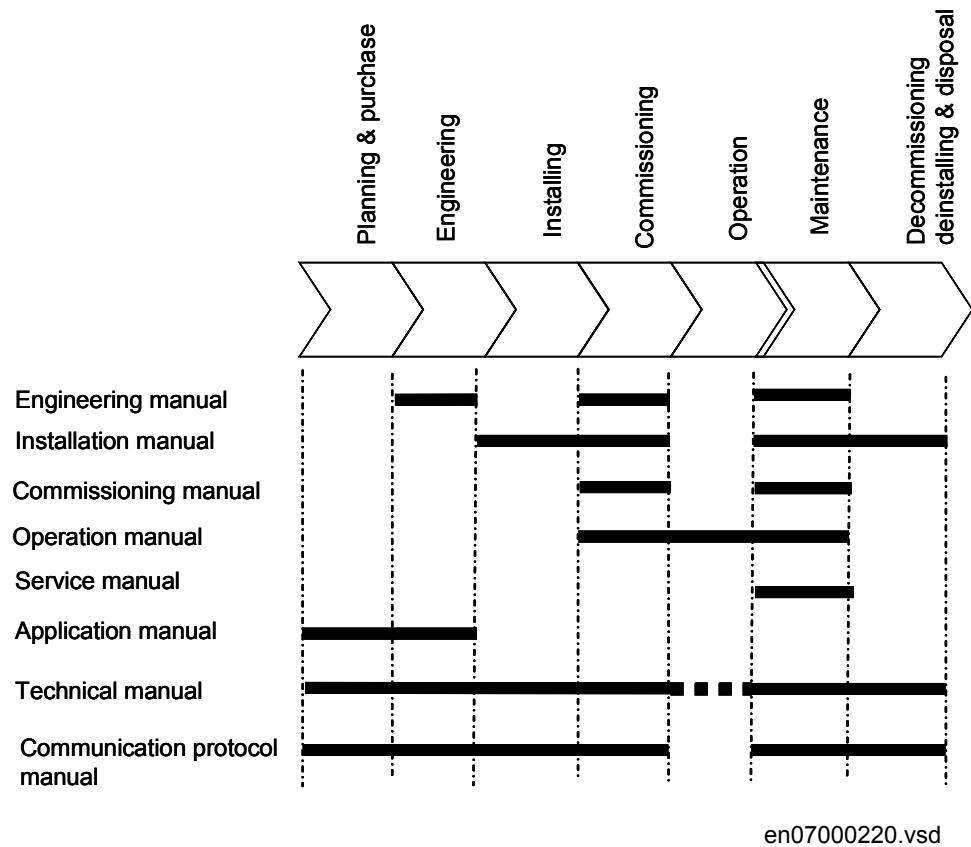


Figure 1: The intended use of manuals in different lifecycles

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/2009-07-03	2.0	First release
B/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
Table continues on next page	

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: *RET615 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, low stage, instance 2	PHLPTOC2	3I> (2)	51P-1 (2)
Three-phase non-directional overcurrent protection, high stage, instance 1	PHHPTOC1	3I>> (1)	51P-2 (1)
Three-phase non-directional overcurrent protection, high stage, instance 2	PHHPTOC2	3I>> (2)	51P-2 (2)
Three-phase non-directional overcurrent protection, instantaneous stage, instance 1	PHIPTOC1	3I>>> (1)	50P/51P (1)
Three-phase non-directional overcurrent protection, instantaneous stage, instance 2	PHIPTOC2	3I>>> (2)	50P/51P (2)
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, high stage, instance 2	EFHPTOC2	Io>> (2)	51N-2 (2)
Negative-sequence overcurrent protection, instance 1	NSPTOC1	I2> (1)	46 (1)
Negative-sequence overcurrent protection, instance 2	NSPTOC2	I2> (2)	46 (2)
Residual overvoltage protection, instance 1	ROVPTOV1	Uo> (1)	59G (1)
Residual overvoltage protection, instance 2	ROVPTOV2	Uo> (2)	59G (2)
Three-phase undervoltage protection, instance 1	PHPTUV1	3U< (1)	27 (1)
Three-phase undervoltage protection, instance 2	PHPTUV2	3U< (2)	27 (2)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Three-phase overvoltage protection, instance 1	PHPTOV1	3U> (1)	59 (1)
Three-phase overvoltage protection, instance 2	PHPTOV2	3U> (2)	59 (2)
Three-phase thermal overload protection for power transformers, two time constants	T2PTTR1	3lth>T	49T
Stabilized and instantaneous differential protection for 2W – transformers	TR2PTDF1	3dl>T	87T
Numerical stabilized low impedance restricted earth-fault protection	LREFPND1	dIoLo>	87NL
High impedance based restricted earth-fault protection	HREFPDIF1	dIoHi>	87NH
Circuit breaker failure protection	CCBRBRF1	3l>/Io>BF	51BF/51NBF
Master trip, instance 1	TRPPTRC1	Master Trip (1)	94/86 (1)
Master trip, instance 2	TRPPTRC2	Master Trip (2)	94/86 (2)
Arc protection, instance 1	ARCSARC1	ARC (1)	50L/50NL (1)
Arc protection, instance 2	ARCSARC2	ARC (2)	50L/50NL (2)
Arc protection, instance 3	ARCSARC3	ARC (3)	50L/50NL (3)
Multi-purpose protection, instance 1 ¹⁾	MAPGAPC1	MAP (1)	MAP (1)
Multi-purpose protection, instance 2 ¹⁾	MAPGAPC2	MAP (2)	MAP (2)
Multi-purpose protection, instance 3 ¹⁾	MAPGAPC3	MAP (3)	MAP (3)
Control			
Circuit-breaker control	CBXCBR1	I <-> O CB	I <-> O CB
Disconnecter position indication, instance 1	DCSXSW11	I <-> O DC (1)	I <-> O DC (1)
Disconnecter position indication, instance 2	DCSXSW12	I <-> O DC (2)	I <-> O DC (2)
Disconnecter position indication, instance 3	DCSXSW13	I <-> O DC (3)	I <-> O DC (3)
Earthing switch indication	ESSXSW11	I <-> O ES	I <-> O ES
Tap changer position indication	TPOSSLTC1	TPOSM	84M
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)
Fuse failure supervision	SEQRFUF1	FUSEF	60
Runtime counter for machines and devices	MDSOPT1	OPTS	OPTM
Measurement			
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Disturbance recorder	RDRE1	-	-
Three-phase current measurement, instance 1	CMMXU1	3I	3I
Three-phase current measurement, instance 2	CMMXU2	3I(B)	3I(B)
Sequence current measurement	CSMSQI1	I1, I2, I0	I1, I2, I0
Residual current measurement, instance 1	RESCMMXU1	I _o	I _n
Residual current measurement, instance 2	RESCMMXU2	I _o (B)	I _n (B)
Three-phase voltage measurement	VMMXU1	3U	3U
Residual voltage measurement	RESVMMXU1	U _o	V _n
Sequence voltage measurement	VSMSQI1	U1, U2, U0	U1, U2, U0
Three-phase power and energy measurement, including power factor	PEMMXU1	P, E	P, E
RTD/mA measurement	XRGGIO130	X130 (RTD)	X130 (RTD)

1) Multi-purpose protection is used for, for example, RTD/mA based protection.

Section 2 Modbus data mappings

2.1 Overview

This document describes the Modbus data points and structures available in RET615 Ver. 3.0. The point lists describe a superset of all data available through the standard configurations A, B, C, D, E, F, G and H including the optional functionalities. The names of the standard configurations are TE01, TE02, TE03, TE04, TE05, TE06, TE07 and TE08 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 RET615 Ver.3.0 TE01-08

Table 2: Registers

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)	
1				User definable registers				
...								
127								
System status 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	
Frequently updated measurands and counters								
Phase-to-ground voltages, Residual voltage (TE05,06,07,08)								
134	u16	1000	LD0.VMMXU1.phV.phsA.cVal.mag	VMMXU1.U_DB_A	Y	Phase-to-ground voltage A amplitude [phsA.cVal.mag]	0...4.00 [xUn]	
135	u16	1000	LD0.VMMXU1.phV.phsB.cVal.mag	VMMXU1.U_DB_B	Y	Phase-to-ground voltage B amplitude [phsB.cVal.mag]	0...4.00 [xUn]	
136	u16	1000	LD0.VMMXU1.phV.phsC.cVal.mag	VMMXU1.U_DB_B	Y	Phase-to-ground voltage C amplitude [phsB.cVal.mag]	0...4.00 [xUn]	
137	u16	1000	LD0.RESVMMXU1.PhV.res.instCVal.mag	RESVMMXU1.U0_INST	Y	Residual voltage amplitude [res.instCVal.mag]	0...4.00 [xUn]	
138	u16	1000	LD0.CMMXU1.A.phsA.instCVal.mag	CMMXU1.I_INST_A	Y	Phase current A magnitude (HV)	0.00 40.00 [xIn]	
139	u16	1000	LD0.CMMXU1.A.phsB.instCVal.mag	CMMXU1.I_INST_B	Y	Phase current B magnitude (HV)	0.00 40.00 [xIn]	
140	u16	1000	LD0.CMMXU1.A.phsC.instCVal.mag	CMMXU1.I_INST_C	Y	Phase current C magnitude (HV)	0.00 40.00 [xIn]	
141	u16	1000	LD0.RESCMMXU1.A.res.instCVal.mag	RESCMMXU1.I0_INST	Y	Residual current magnitude (HV)	0.00 40.00 [xIn]	
142	u16	1000	LD0.CSMSQI1.SeqA.c1.instCVal.mag	CMSQI1.I1_INST	Y	Positive sequence of current magnitude (HV)	0.00 40.00 [xIn]	
143	u16	1000	LD0.CSMSQI1.SeqA.c2.instCVal.mag	CMSQI1.I2_INST	Y	Negative sequence of current magnitude (HV)	0.00 40.00 [xIn]	
144	u16	1000	LD0.CSMSQI1.SeqA.c3.instCVal.mag	CMSQI1.I3_INST	Y	Zero sequence of current magnitude (HV)	0.00 40.00 [xIn]	
145						(reserved)	0	
146	i16	1	LD0.T2PTTR1.Tmp.mag	T2PTTR1.TEMP	N	Temperature of the object (HV)	-100.0...9999.9 [Celsius]	
147	i16	1	LD0.T2PTTR1.TmpR.mag	T2PTTR1.TEMP_RL	N	Calculated relative temperature (HV)	0.00...99.00 [Celsius]	
148	u16	1000	LD0.VSMSQI1.SeqA.c1.cVal.mag	VMSQI1.I1_DB	Y	Positive sequence voltage amplitude [c1.instCVal.mag]	0...4.00 [xUn]	
149	u16	1000	LD0.VSMSQI1.SeqA.c2.cVal.mag	VMSQI1.I2_DB	Y	Negative sequence voltage amplitude [c2.instCVal.mag]	0...4.00 [xUn]	
150	u16	1000	LD0.VSMSQI1.SeqA.c2.cVal.mag	VMSQI1.I3_DB	Y	Zero sequence voltage amplitude [c3.instCVal.mag]	0...4.00 [xUn]	
151	i16	1	LD0.TPOSSLTC1.TapPos.mag	TPOSSLTC1.TAP_POS	Y	Tap changer position	-64...63	
152	u16	1000	LD0.CMMXU2.A.phsA.instCVal.mag	CMMXU2.I_INST_A	Y	Phase current A magnitude (LV)	0.00 40.00 [xIn]	
153	u16	1000	LD0.CMMXU2.A.phsB.instCVal.mag	CMMXU2.I_INST_B	Y	Phase current B magnitude (LV)	0.00 40.00 [xIn]	
154	u16	1000	LD0.CMMXU2.A.phsC.instCVal.mag	CMMXU2.I_INST_C	Y	Phase current C magnitude (LV)	0.00 40.00 [xIn]	
155	u16	1000	LD0.RESCMMXU2.A.res.instCVal.mag	RESCMMXU2.I0_INST	Y	Residual current magnitude (LV)	0.00 40.00 [xIn]	
156						(reserved)	0	

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
157						(reserved)	0
158						(reserved)	0
159						(reserved)	0
Phase-to-phase voltages, sequence of voltages, power measurements (TE05,06,07,08)							
160	u16	1000	LD0.VMMXU1.PPV.phsAB.cVal.mag	VMMXU1.U_DB_AB	Y	Phase-to-phase voltage AB amplitude [phsAB.cVal.mag]	0...4.00 [xUn]
161	u16	1000	LD0.VMMXU1.PPV.phsBC.cVal.mag	VMMXU1.U_DB_BC	Y	Phase-to-phase voltage BC amplitude [phsBC.cVal.mag]	0...4.00 [xUn]
162	u16	1000	LD0.VMMXU1.PPV.phsCA.cVal.mag	VMMXU1.U_DB_CA	Y	Phase-to-phase voltage CA amplitude [phsCA.cVal.mag]	0...4.00 [xUn]
163	i32	1	LD0.PEMMXU1.TotW.instMag	PEMMXU1.P_INST	Y	Total active power P [.instMag] - High word	-99999...99999 (units = see documentation)
164					Y	Total active power P [.instMag] - Low word	
165	i32	1	LD0.PEMMXU1.TotVar.instMag	PEMMXU1.Q_INST	Y	Total reactive power Q [.instMag] - High word	-99999...99999 (units = see documentation)
166					Y	Total reactive power Q [.instMag] - Low word	
167	i32	1	LD0.PEMMXU1.TotVA.instMag	PEMMXU1.S_INST	Y	Total apparent power S [.instMag] - High word	-99999...99999 (units = see documentation)
168					Y	Total apparent power S [.instMag] - Low word	
169	u16	1000	LD0.PEMMXU1.TotPF.instMag	PEMMXU1.PF_INST	Y	Average power factor [.instMag]	-1...1
170						Indication bits mirrored and packed in registers 170 onwards	See 'Indications' table
...							
2000							
Phase current demand values (HV-latest values)							
2001	u16	1000	LD0.CMSTA1.AvAmps1.mag	CMMXU1.I_DMD_A	N	Demand value of Phase A current	0.00 40.00 [xIn]
2002	u16	1000	LD0.CMSTA1.AvAmps2.mag	CMMXU1.I_DMD_B	N	Demand value of Phase B current	0.00 40.00 [xIn]
2003	u16	1000	LD0.CMSTA1.AvAmps3.mag	CMMXU1.I_DMD_C	N	Demand value of Phase C current	0.00 40.00 [xIn]
2004							Time structure (update time)
2005							
2006							
2007							
2008							
Maximum phase current demand values (HV)							
2009	u16	1000	LD0.CMSTA1.MaxAmps1.mag	CMMXU1.Max demand IL1	N	Max. demand value for Phase A current	0.00 40.00 [xIn]
2010							Time structure (update time)
2011							
2012							
2013							

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
2014							
2015	u16	1000	LD0.CMSTA1.MaxAmps2.mag	CMMXU1.Max demand IL2	N	Max. demand value for Phase B current	0.00 40.00 [xIn] Time structure (update time)
2016							
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 40.00 [xIn] Time structure (update time)
2022							
2023							
2024							
2025							
2026							
Phase current demand values (LV-latest values)							
2027	u16	1000	LD0.CMSTA2.AvAmps1.mag	CMMXU2.I_DMD_A	N	Demand value of Phase A current	0.00 40.00 [xIn]
2028	u16	1000	LD0.CMSTA2.AvAmps2.mag	CMMXU2.I_DMD_B	N	Demand value of Phase B current	0.00 40.00 [xIn]
2029	u16	1000	LD0.CMSTA2.AvAmps3.mag	CMMXU2.I_DMD_C	N	Demand value of Phase C current	0.00 40.00 [xIn] Time structure (update time)
2030							
2031							
2032							
2033							
2034							
Maximum phase current demand values (LV)							
2035	u16	1000	LD0.CMSTA2.MaxAmps1.mag	CMMXU2.Max demand IL1	N	Max. demand value for Phase A current	0.00 40.00 [xIn] Time structure (update time)
2036							
2037							
2038							
2039							
2040							
2041	u16	1000	LD0.CMSTA2.MaxAmps2.mag	CMMXU2.Max demand IL2	N	Max. demand value for Phase B current	0.00 40.00 [xIn] Time structure (update time)
2042							
2043							
2044							
2045							
2046							

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
2047	u16	1000	LD0.CMSTA2.MaxAmps3.mag	CMMXU2.Max demand IL3	N	Max. demand value for Phase C current	0.00 40.00 [xIn]
2048							Time structure (update time)
2049							
2050							
2051							
2052							
Operation counters							
2053	u16	1	CTRL.CBCSW11.OpCntRs.stVal	CBXCBR1.Operation counter	N	Circuit breaker operation counter	0...65535
2054	u16	1	LD0.ARCSARC11.FACntRs.stVal	-	N	Fault arc counter 1	0...65535
2055	u16	1	LD0.ARCSARC21.FACntRs.stVal	-	N	Fault arc counter 2	0...65535
2056	u16	1	LD0.ARCSARC31.FACntRs.stVal	-	N	Fault arc counter 3	0...65535
2057	u32	1	LD0.MDSOPT1.OpTmWrm.stVal	MDSOPT1.OPR_TIME	N	Total operation time in hours [stVal] - High word	0...299999 [Hours]
2058					N	Total operation time in hours [stVal] - Low word (reserved)	0
2059							
2060	u16	1	LD0.LPHD1.PhyHealth1.stVal	Warning	Y	Physical device Warning code (latest)	Codes: see documentation
2061	u16	1	LD0.LPHD1.PhyHealth2.stVal	Internal Fault	Y	Physical device Internal fault code (latest)	Codes: see documentation
2062	u16	1	DR.RDRE1.FItNum.stVal	-	N	Number of disturbance recordings	0...65535
2063	u16	1	DR.RDRE1.MemUsed.stVal	-	N	Disturbance recorder memory used	0...100 [%]
2064	u16	1	LD0.LPHD1.NumPwrUp.stVal	-	N	Number of device power-ups	0...65535
2065	u16	1	LD0.LPHD1.WrmStr.stVal	-	N	Number of device warm-starts	0...65535
2066	u16	1	LD0.LPHD1.WacTrg.stVal	-	N	Number of watchdog device resets	0...65535
2067	u16	1	LD0.LPHD1.NumCmpChg.stVal	-	N	Number of composition changes	0...65535
2068	i16	1	LD0.T2PTTR1.TmsOp.stVal	T2PTTR1.THERMLEV_ST	N	Estimated time to operate (HV)	0..60000 [s]
2069	i16	1	LD0.T2PTTR1.TmsRecEna.stVal	T2PTTR1.THERMLEV_EN D	N	Estimated time to deactivate BLK_CLOSE (HV)	0..60000 [s]
Circuit breaker condition monitoring							
2070	u16	1	LD0.SSCBR1.InaTmdCnt.stVal	SSCBR1.INA_DAYS	N	Number of days CB has been inactive	0...9999
2071	u16	1	LD0.SSCBR1.TmmsOpn.mag	SSCBR1.T_TRV_OP	N	CB travel time opening	0...60000 [ms]
2072	u16	1	LD0.SSCBR1.TmmsCls.mag	SSCBR1.T_TRV_CL	N	CB travel time closing	0...60000 [ms]
2073	u16	100	LD0.SSCBR1.TmsSprCha.mag	SSCBR1.T_SPR_CHR	N	Charging time of the CB spring	0.00...99.99 [s]
2074	i16	1	LD0.SSCBR1.RmnLifPhA.stVal	SSCBR1.CB_LIFE_A	N	CB Remaining life phase A	-9999...9999
2075	i16	1	LD0.SSCBR1.RmnLifPhB.stVal	SSCBR1.CB_LIFE_B	N	CB Remaining life phase B	-9999...9999
2076	i16	1	LD0.SSCBR1.RmnLifPhC.stVal	SSCBR1.CB_LIFE_C	N	CB Remaining life phase C	-9999...9999
2077	u16	1	LD0.SSCBR1.AccAPwrPhA.mag	SSCBR1.IPOW_A	N	Accumulated currents power (Iyt), phase A	0.00...1000000.00
2078	u16	1	LD0.SSCBR1.AccAPwrPhB.mag	SSCBR1.IPOW_B	N	Accumulated currents power (Iyt), phase B	0.00...1000000.00
2079	u16	1	LD0.SSCBR1.AccAPwrPhC.mag	SSCBR1.IPOW_C	N	Accumulated currents power (Iyt), phase C	0.00...1000000.00

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
Differential- and bias current measurements							
2080	u16	1000	LD0.TR2PDIF1.DfACic.phsA.mag	-	N	Differential current phase A magnitude	0.00 40.00 [xIn]
2081	u16	1000	LD0.TR2PDIF1.DfACic.phsB.mag	-	N	Differential current phase B magnitude	0.00 40.00 [xIn]
2082	u16	1000	LD0.TR2PDIF1.DfACic.phsC.mag	-	N	Differential current phase C magnitude	0.00 40.00 [xIn]
2083	u16	1000	LD0.TR2PDIF1.RsIA.phsA.mag	-	N	Bias current phase A magnitude	0.00 40.00 [xIn]
2084	u16	1000	LD0.TR2PDIF1.RsIA.phsB.mag	-	N	Bias current phase B magnitude	0.00 40.00 [xIn]
2085	u16	1000	LD0.TR2PDIF1.RsIA.phsC.mag	-	N	Bias current phase C magnitude	0.00 40.00 [xIn]
2086						(reserved)	0
RTD inputs (optional in TE01..04)							
2091	i16	1	LD0.XRGGIO130.AnIn1.instMag	XRGGIO130.AL_VAL1	Y	RTD input 1	-10000.0...10000.0 [Ohms]
2092	i16	1	LD0.XRGGIO130.AnIn2.instMag	XRGGIO130.AL_VAL2	Y	RTD input 2	-10000.0...10000.0 [Ohms]
2093	i16	1	LD0.XRGGIO130.AnIn3.instMag	XRGGIO130.AL_VAL3	Y	RTD input 3	-10000.0...10000.0 [Ohms]
2094	i16	1	LD0.XRGGIO130.AnIn4.instMag	XRGGIO130.AL_VAL4	Y	RTD input 4	-10000.0...10000.0 [Ohms]
2095	i16	1	LD0.XRGGIO130.AnIn5.instMag	XRGGIO130.AL_VAL5	Y	RTD input 5	-10000.0...10000.0 [Ohms]
2096	i16	1	LD0.XRGGIO130.AnIn6.instMag	XRGGIO130.AL_VAL6	Y	RTD input 6	-10000.0...10000.0 [Ohms]
2097	i16	1	LD0.XRGGIO130.AnIn7.instMag	XRGGIO130.AL_VAL7	Y	RTD input 7	-10000.0...10000.0 [Ohms]
2098	i16	1	LD0.XRGGIO130.AnIn8.instMag	XRGGIO130.AL_VAL8	Y	RTD input 8	-10000.0...10000.0 [Ohms]
2099						(reserved)	0
Energy counters (TE05...08)							
2100	u32	1	LD0.PEMMTR1.SupWh.actVal	PEMMXU.EA_RV_ACM	N	Reverse active energy - high word	0...999999999 [kWh]
2101						Reverse active energy - low word	
2102	u32	1	LD0.PEMMTR1.SupVArh.actVal	PEMMXU.ER_RV_ACM	N	Reverse reactive energy - high word	0...999999999 [kVAr]
2103						Reverse reactive energy - low word	
2104	u32	1	LD0.PEMMTR1.DemWh.actVal	PEMMXU.EA_FWD_ACM	N	Forward active energy - high word	0...999999999 [kWh]
2105						Forward active energy - low word	
2106	u32	1	LD0.PEMMTR1.DemVArh.actVal	PEMMXU.ER_FWD_ACM	N	Forward reactive energy - high word	0...999999999 [kVAr]
2107						Forward reactive energy - low word	
...							
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	

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Section 2 Modbus data mappings

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
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							
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	0
...						(reserved)	
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							

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
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)	
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 4 = Warm reset
9229						(reserved)	0
9230						(reserved)	
Active parameter setting group							
9231	u16		-			Setting group in use	1..6
...						(reserved)	
9249							

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Section 2
Modbus data mappings

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
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)
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

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
...							
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	-	Y	Maximum start duration of all stages during the fault	0.0...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.MaxAmpsA.mag	-	Y	Max phase A current during fault (HV)	0.00 ... 50.00 [Xin]
9413	u16	1000	LD0.FL.TMSTA1.MaxAmpsB.mag	-	Y	Max phase B current during fault (HV)	0.00 ... 50.00 [Xin]
9414	u16	1000	LD0.FL.TMSTA1.MaxAmpsC.mag	-	Y	Max phase C current during fault (HV)	0.00 ... 50.00 [Xin]
9415	u16	1000	LD0.FL.TMSTA1.MaxAmpsN.mag	-	Y	Max residual current during fault (HV)	0.00 ... 50.00 [Xin]
9416	u16	1000	LD0.FL.TMSTA1.AmpsA.mag	-	Y	Phase A current at moment of trip (HV)	0.00 ... 50.00 [Xin]
9417	u16	1000	LD0.FL.TMSTA1.AmpsB.mag	-	Y	Phase B current at moment of trip (HV)	0.00 ... 50.00 [Xin]
9418	u16	1000	LD0.FL.TMSTA1.AmpsC.mag	-	Y	Phase C current at moment of trip (HV)	0.00 ... 50.00 [Xin]
9419	u16	1000	LD0.FL.TMSTA1.AmpsN.mag	-	Y	Residual current at moment of trip (HV)	0.00 ... 50.00 [Xin]
9420	u16	1000	LD0.FL.TMSTA1.AmpsNCIc.mag	-	Y	Residual CIc current at moment of trip (HV)	0.00 ... 50.00 [Xin]
9421	u16	1000	LD0.FL.TMSTA1.AmpsPsSeq.mag	-	Y	Positive sequence current at moment of trip (HV)	0.00 ... 50.00 [Xin]
9422	u16	1000	LD0.FL.TMSTA1.AmpsNgSeq.mag	-	Y	Negative sequence current at moment of trip (HV)	0.00 ... 50.00 [Xin]
9423	u16	1000	LD0.FL.TMSTA1.MaxAmpsAb.mag	-	Y	Max phase A current during fault (LV)	0.00 ... 50.00 [Xin]
9424	u16	1000	LD0.FL.TMSTA1.MaxAmpsBb.mag	-	Y	Max phase B current during fault (LV)	0.00 ... 50.00 [Xin]
9425	u16	1000	LD0.FL.TMSTA1.MaxAmpsCb.mag	-	Y	Max phase C current during fault (LV)	0.00 ... 50.00 [Xin]
9426	u16	1000	LD0.FL.TMSTA1.MaxAmpsNb.mag	-	Y	Max residual current during fault (LV)	0.00 ... 50.00 [Xin]
9427	u16	1000	LD0.FL.TMSTA1.AmpsAb.mag	-	Y	Phase A current at moment of trip (LV)	0.00 ... 50.00 [Xin]
9428	u16	1000	LD0.FL.TMSTA1.AmpsBb.mag	-	Y	Phase B current at moment of trip (LV)	0.00 ... 50.00 [Xin]
9429	u16	1000	LD0.FL.TMSTA1.AmpsCb.mag	-	Y	Phase C current at moment of trip (LV)	0.00 ... 50.00 [Xin]
9430	u16	1000	LD0.FL.TMSTA1.AmpsNb.mag	-	Y	Residual current at moment of trip (LV)	0.00 ... 50.00 [Xin]
9431	u16	1000	LD0.FL.TMSTA1.AmpsNCIcb.mag	-	Y	Residual CIc current at moment of trip (LV)	0.00 ... 50.00 [Xin]
9432	u16	1000	LD0.FL.TMSTA1.AmpsPsSeqb.mag	-	Y	Positive sequence current at moment of trip (LV)	0.00 ... 50.00 [Xin]
9433	u16	1000	LD0.FL.TMSTA1.AmpsNgSeqb.mag	-	Y	Negative sequence current at moment of trip (LV)	0.00 ... 50.00 [Xin]
9434	u16	1000	LD0.FL.TMSTA1.MxDIFACIcA.mag	-	Y	Max differential current in phase A during fault	0.00 ... 80.00 [Xin]
9435	u16	1000	LD0.FL.TMSTA1.MxDIFACIcB.mag	-	Y	Max differential current in phase B during fault	0.00 ... 80.00 [Xin]

Table continues on next page

Addr	Type	Scale	IEC 61850 name	AFL-Common SA name	Ds	Description	Value range (before scaling)
9436	u16	1000	LD0.FL.TMSTA1.MxDifACIcC.mag	-	Y	Max differential current in phase C during fault	0.00 ... 80.00 [xIn]
9437	u16	1000	LD0.FL.TMSTA1.MxRsACIcA.mag	-	Y	Max bias current in phase A during fault	0.00 ... 50.00 [xIn]
9438	u16	1000	LD0.FL.TMSTA1.MxRsACIcB.mag	-	Y	Max bias current in phase B during fault	0.00 ... 50.00 [xIn]
9439	u16	1000	LD0.FL.TMSTA1.MxRsACIcC.mag	-	Y	Max bias current in phase C during fault	0.00 ... 50.00 [xIn]
9440	u16	1000	LD0.FL.TMSTA1.DifAmpsA.mag	-	Y	Differential current in phase A at moment of trip	0.00 ... 80.00 [xIn]
9441	u16	1000	LD0.FL.TMSTA1.DifAmpsB.mag	-	Y	Differential current in phase B at moment of trip	0.00 ... 80.00 [xIn]
9442	u16	1000	LD0.FL.TMSTA1.DifAmpsC.mag	-	Y	Differential current in phase C at moment of trip	0.00 ... 80.00 [xIn]
9443	u16	1000	LD0.FL.TMSTA1.DifAmpsN.mag	-	Y	Differential residual current at moment of trip	0.00 ... 80.00 [xIn]
9444	u16	1000	LD0.FL.TMSTA1.RsAmpsA.mag	-	Y	Bias current in phase A at moment of trip	0.00 ... 50.00 [xIn]
9445	u16	1000	LD0.FL.TMSTA1.RsAmpsB.mag	-	Y	Bias current in phase B at moment of trip	0.00 ... 50.00 [xIn]
9446	u16	1000	LD0.FL.TMSTA1.RsAmpsC.mag	-	Y	Bias current in phase C at moment of trip	0.00 ... 50.00 [xIn]
9447	u16	1000	LD0.FL.TMSTA1.RsAmpsN.mag	-	Y	Bias residual current at moment of trip	0.00 ... 50.00 [xIn]
9448	u16	1000	LD0.FL.TMSTA1.VoltsA.mag	-	Y	Phase A voltage at moment of trip	0...4.00 [xUn]
9449	u16	1000	LD0.FL.TMSTA1.VoltsB.mag	-	Y	Phase B voltage at moment of trip	0...4.00 [xUn]
9450	u16	1000	LD0.FL.TMSTA1.VoltsC.mag	-	Y	Phase C voltage at moment of trip	0...4.00 [xUn]
9451	u16	1000	LD0.FL.TMSTA1.VoltsAB.mag	-	Y	Phase-to-phase voltage AB at moment of trip	0...4.00 [xUn]
9452	u16	1000	LD0.FL.TMSTA1.VoltsBC.mag	-	Y	Phase-to-phase voltage BC at moment of trip	0...4.00 [xUn]
9453	u16	1000	LD0.FL.TMSTA1.VoltsCA.mag	-	Y	Phase-to-phase voltage CA at moment of trip	0...4.00 [xUn]
9454	u16	1000	LD0.FL.TMSTA1.VoltsN.mag	-	Y	Residual voltage at moment of trip	0...4.00 [xUn]
9455	u16	1000	LD0.FL.TMSTA1.VZroSeq.mag	-	Y	Zero sequence voltage at moment of trip	0...4.00 [xUn]
9456	u16	1000	LD0.FL.TMSTA1.VPsSeq.mag	-	Y	Positive sequence voltage at moment of trip	0...4.00 [xUn]
9457	u16	1000	LD0.FL.TMSTA1.VNgSeq.mag	-	Y	Negative sequence voltage at moment of trip	0...4.00 [xUn]
9458	u16	100	LD0.FL.TMSTA1.MaxTmpRl.mag	-	Y	Max relative temperature (HV)	0.00...99.99 [degrees Celsius]
9459	i16	10	LD0.FL.TMSTA1.DifNangN.mag	-	Y	Angle residual voltage - residual current	-180.00...180.00 [degrees]
9460	i16	10	LD0.FL.TMSTA1.DifAangBC.mag	-	Y	Angle phase B to phase C voltage - phase A current	-180.00...180.00 [degrees]
9461	i16	10	LD0.FL.TMSTA1.DifBangCA.mag	-	Y	Angle phase C to phase A voltage - phase B current	-180.00...180.00 [degrees]
9462	i16	10	LD0.FL.TMSTA1.DifCangAB.mag	-	Y	Angle phase A to phase B voltage - phase C current	-180.00...180.00 [degrees]

Table 3: *Indications*

Bit addr	Reg bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2720	170.00	CTRL.LLN0.Loc.stVal	-	Y	Local/Remote state - mom	0 = Local, 1=Remote
2721	170.01	CTRL.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				(reserved)	0
2725	170.05				(reserved)	0
2726	170.06	LD0.LLN0.SetSeld.stVal	-	Y	Parameter setting rights reserved - mom	1=Rights reserved
2727	170.07	LD0.LLN0.SetSeld.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
2731	170.11				(reserved)	0
2732	170.12				(reserved)	0
2733	170.13				(reserved)	0
2734	170.14				(reserved)	0
2735	170.15				(reserved)	0
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	
Generic operation time supervision for machines and devices (All variants)						
2748	171.12	LD0.MDSOPT1.OpTmWm.stVal	MDSOPT1.WARNING		Accumulated operation time exceeds Warning value - mom	1 = Warning
2749	171.13	LD0.MDSOPT1.OpTmWm.stVal			Accumulated operation time exceeds Warning value - MCD	

Table continues on next page

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2750	171.14	LD0.MDSOPT1.OpTmAlm.stVal	MDSOPT1.ALARM		Accumulated operation time exceeds Alarm value - mom	1 = Alarm
2751	171.15	LD0.MDSOPT1.OpTmAlm.stVal			Accumulated operation time exceeds Alarm value - MCD	
Phase current value limit supervision (HV)						
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
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	CMMXU1.LOW_ALARM	Y	Low warning[.stVal] - mom	1=Low warning
2759	172.07	LD0.CMMXU1.LoAlm.stVal			Low warning[.stVal] - MCD	
Residual current value supervision (HV), variants TE01,03						
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	M		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 current value supervision (LV), variants TE02,04						
2764	172.12	LD0.RESCMMXU2.HiAlm.stVal	RESCMMXU2.HIGH_ALARM	Y	High alarm[.stVal] - mom	1=High alarm
2765	172.13	LD0.RESCMMXU2.HiAlm.stVal	M		High alarm[.stVal] - MCD	
2766	172.14	LD0.RESCMMXU2.HiWrn.stVal	RESCMMXU2.HIGH_WARN	Y	High warning[.stVal] - mom	1=High warning
2767	172.15	LD0.RESCMMXU2.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.TCSSCBR1.CirAlm.stVal	TCSSCBR1.ALARM	Y	Alarm[.stVal] - mom	1=TCS1 Alarm
2781	173.13	LD0.TCSSCBR1.CirAlm.stVal			Alarm[.stVal] - MCD	

Table continues on next page

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
Trip circuit supervision (2)						
2782	173.14	LD0.TCSSCBR2.CirAlm.stVal	TCSSCBR2.ALARM	Y	Alarm[.stVal] - mom	1=TCS2 Alarm
2783	173.15	LD0.TCSSCBR2.CirAlm.stVal			Alarm[.stVal] - MCD	
Phase current value limit supervision (LV)						
2784	174.00	LD0.CMMXU2.HiAlm.stVal	CMMXU2.HIGH_ALARM	Y	High alarm[.stVal] - mom	1=High alarm
2785	174.01	LD0.CMMXU2.HiAlm.stVal			High alarm[.stVal] - MCD	
2786	174.02	LD0.CMMXU2.HiWrn.stVal	CMMXU2.HIGH_WARN	Y	High warning[.stVal] - mom	1=High warning
2787	174.03	LD0.CMMXU2.HiWrn.stVal			High warning[.stVal] - MCD	
2788	174.04	LD0.CMMXU2.LoWrn.stVal	CMMXU2.LOW_WARN	Y	Low alarm[.stVal] - mom	1=Low alarm
2789	174.05	LD0.CMMXU2.LoWrn.stVal			Low alarm[.stVal] - MCD	
2790	174.06	LD0.CMMXU2.LoAlm.stVal	CMMXU2.LOW_ALARM	Y	Low warning[.stVal] - mom	1=Low warning
2791	174.07	LD0.CMMXU2.LoAlm.stVal			Low warning[.stVal] - MCD	
Disconnecter (1) position						
2792	174.08	CTRL.DCSXSW11.Pos.stVal.Close	DCSXSXW11.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	DCSXSXW12.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	DCSXSXW13.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	ESSXSXW11.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	CBXCBR1.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
...						
2815	175.15				(reserved)	0
Circuit breaker position + momentary change detect						
Table continues on next page						

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2816	176.00	CTRL.CBCSW1.Pos.stVal	CBXCBR1.POSITION	Y	close mom	1=Close
2817	176.01	CTRL.CBCSW1.Pos.stVal			close MCD	
2818	176.02	CTRL.CBCSW1.Pos.stVal	-		open mom	1=Open
2819	176.03	CTRL.CBCSW1.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.CBCSW1.Pos.stSeld	CBXCBR1.SELECTED	Y	Selected [.stSeld] - mom	1=Selected
2823	176.07	CTRL.CBCSW1.Pos.stSeld			Selected [.stSeld] - MCD	
Circuit breaker control enable signals						
2824	176.08	CTRL.CBCILO1.EnaOpn.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						
2828	176.12	CTRL.CCBRRBF1.Str.general	CCBRRBF1.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	CCBRRBF1.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.OpIn.general	CCBRRBF1.TRET	Y	Operate, internal retrip (.general) - mom	1=Operate, internal re-trip
2833	177.01	CTRL.CCBRRBF1.OpIn.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.CBXCBBR1.BlkOpn.stVal	CBXCBR1.BLK_OPEN	Y	Open blocked [.stVal] - mom	1 = Open blocked
2837	177.05	CTRL.CBXCBBR1.BlkOpn.stVal			Open blocked [.stVal] - MCD	
2838	177.06	CTRL.CBXCBBR1.BlkCls.stVal	CBXCBR1.BLK_CLOSE	Y	Close blocked [.stVal] - mom	1 = Close blocked
2839	177.07	CTRL.CBXCBBR1.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
...						
2847	177.15				(reserved)	0
Circuit breaker condition monitoring						
2848	178.00	LD0.SSCBR1.OpmAlm.stVal	SSCBR1.TRV_T_OP_ALM	Y	Open travel time exceeded (.stVal) - mom	1=Open travel time alarm
2849	178.01	LD0.SSCBR1.ClsAlm.stVal	SSCBR1.TRV_T_CL_ALM	Y	Close travel time exceeded (.stVal) - mom	1=Close travel time alarm

Table continues on next page

Bit addr	Reg bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
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 (lyt).alarm limit[.stVal] - mom	1=lyt alarm
2857	178.09	LD0.SSCBR1.APwrLO.stVal	SSCBR1.IPOW_LO	Y	Acc. currents power (lyt).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
Global conditioning, Phase information						
2864	179.00	LD0.LEDPTRC1.Str.phsA	-	Y	Global conditioning - Start[.phsA] - mom	1=Start phsA
2865	179.01	LD0.LEDPTRC1.Str.phsA	-	Y	Global conditioning - Start[.phsA] - MCD	
2866	179.02	LD0.LEDPTRC1.Str.phsB	-	Y	Global conditioning - Start[.phsB] - mom	1=Start phsB
2867	179.03	LD0.LEDPTRC1.Str.phsB	-	Y	Global conditioning - Start[.phsB] - MCD	
2868	179.04	LD0.LEDPTRC1.Str.phsC	-	Y	Global conditioning - Start[.phsC] - mom	1=Start phsC
2869	179.05	LD0.LEDPTRC1.Str.phsC	-	Y	Global conditioning - Start[.phsC] - MCD	
2870	179.06	LD0.LEDPTRC1.Op.phsA	-	Y	Global conditioning - Operate[.phsA] - mom	1=Operate phsA
2871	179.07	LD0.LEDPTRC1.Op.phsA	-	Y	Global conditioning - Operate[.phsA] - MCD	
2872	179.08	LD0.LEDPTRC1.Op.phsB	-	Y	Global conditioning - Operate[.phsB] - mom	1=Operate phsB
2873	179.09	LD0.LEDPTRC1.Op.phsB	-	Y	Global conditioning - Operate[.phsB] - MCD	
2874	179.10	LD0.LEDPTRC1.Op.phsC	-	Y	Global conditioning - Operate[.phsC] - mom	1=Operate phsC
2875	179.11	LD0.LEDPTRC1.Op.phsC	-	Y	Global conditioning - Operate[.phsC] - MCD	
2876	179.12				(reserved)	0
2877	179.13				(reserved)	0
2878	179.14				(reserved)	0
2879	179.15				(reserved)	0
Phase overcurrent protection signals HV-side (3 stages)						
2880	180.00	LD0.PHLPTOC1.Str.general	PHLPTOC1.START	Y	Low stage Start[.general] - mom	1=Low stage start
2881	180.01	LD0.PHLPTOC1.Str.general	-	Y	Low stage Start[.general] - MCD	
2882	180.02	LD0.PHLPTOC1.Str.phsA	-	Y	Low stage Start[.phsA] - mom	1=Low stage phsA start

Section 2
Modbus data mappings

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
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	PHHPTOC1.START	Y	High stage Start[.general] - mom	1=High stage start
2891	180.11	LD0.PHHPTOC1.Str.general			High stage Start[.general] - MCD	
2892	180.12	LD0.PHHPTOC1.Str.phsA	-	Y	High stage Start[.phsA] - mom	1=High stage phsA start
2893	180.13	LD0.PHHPTOC1.Str.phsA			High stage Start[.phsA] - MCD	
2894	180.14	LD0.PHHPTOC1.Str.phsB	-	Y	High stage Start[.phsB] - mom	1=High stage phsB start
2895	180.15	LD0.PHHPTOC1.Str.phsB			High stage Start[.phsB] - MCD	
2896	181.00	LD0.PHHPTOC1.Str.phsC	-	Y	High stage Start[.phsC] - mom	1=High stage phsC start
2897	181.01	LD0.PHHPTOC1.Str.phsC			High stage Start[.phsC] - MCD	
2898	181.02	LD0.PHHPTOC1.Op.general	PHHPTOC1.OPERATE	Y	High stage Operate[.general] - mom	1=High stage operate
2899	181.03	LD0.PHHPTOC1.Op.general			High stage Operate[.general] - MCD	
2900	181.04	LD0.PHIPTOC1.Str.general	PHIPTOC1.START	Y	Instantaneous stage Start[.general] - mom	1=Instantaneous stage start
2901	181.05	LD0.PHIPTOC1.Str.general			Instantaneous stage Start[.general] - MCD	
2902	181.06	LD0.PHIPTOC1.Str.phsA	-	Y	Instantaneous stage Start[.phsA] - mom	1=Instantaneous stage phsA start
2903	181.07	LD0.PHIPTOC1.Str.phsA			Instantaneous stage Start[.phsA] - MCD	
2904	181.08	LD0.PHIPTOC1.Str.phsB	-	Y	Instantaneous stage Start[.phsB] - mom	1=Instantaneous stage phsB start
2905	181.09	LD0.PHIPTOC1.Str.phsB			Instantaneous stage Start[.phsB] - MCD	
2906	181.10	LD0.PHIPTOC1.Str.phsC	-	Y	Instantaneous stage Start[.phsC] - mom	1=Instantaneous stage phsC start
2907	181.11	LD0.PHIPTOC1.Str.phsC			Instantaneous stage Start[.phsC] - MCD	
2908	181.12	LD0.PHIPTOC1.Op.general	PHIPTOC1.OPERATE	Y	Instantaneous stage Operate[.general] - mom	1=Instantaneous stage operate
2909	181.13	LD0.PHIPTOC1.Op.general			Instantaneous stage Operate[.general] - MCD	
Phase overcurrent protection signals LV-side (3 stages)						
2910	181.14	LD0.PHLPTOC2.Str.general	PHLPTOC2.START	Y	Low stage Start[.general] - mom	1=Low stage start
2911	181.15	LD0.PHLPTOC2.Str.general			Low stage Start[.general] - MCD	
2912	182.00	LD0.PHLPTOC2.Str.phsA	-	Y	Low stage Start[.phsA] - mom	1=Low stage phsA start
2913	182.01	LD0.PHLPTOC2.Str.phsA			Low stage Start[.phsA] - MCD	

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Bit addr	Reg bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2914	182.02	LD0.PHLPPTOC2.Str.phsB	-	Y	Low stage Start[.phsB] - mom	1=Low stage phsB start
2915	182.03	LD0.PHLPPTOC2.Str.phsB			Low stage Start[.phsB] - MCD	
2916	182.04	LD0.PHLPPTOC2.Str.phsC	-	Y	Low stage Start[.phsC] - mom	1=Low stage phsC start
2917	182.05	LD0.PHLPPTOC2.Str.phsC			Low stage Start[.phsC] - MCD	
2918	182.06	LD0.PHLPPTOC2.Op.general	PHLPTOC2.OPERATE	Y	Low stage Operate[.general] - mom	1=Low stage operate
2919	182.07	LD0.PHLPPTOC2.Op.general			Low stage Operate[.general] - MCD	
2920	182.08	LD0.PHHPTOC2.Str.general	PHHPTOC2.START	Y	High stage Start[.general] - mom	1=High stage start
2921	182.09	LD0.PHHPTOC2.Str.general			High stage Start[.general] - MCD	
2922	182.10	LD0.PHHPTOC2.Str.phsA	-	Y	High stage Start[.phsA] - mom	1=High stage phsA start
2923	182.11	LD0.PHHPTOC2.Str.phsA			High stage Start[.phsA] - MCD	
2924	182.12	LD0.PHHPTOC2.Str.phsB	-	Y	High stage Start[.phsB] - mom	1=High stage phsB start
2925	182.13	LD0.PHHPTOC2.Str.phsB			High stage Start[.phsB] - MCD	
2926	182.14	LD0.PHHPTOC2.Str.phsC	-	Y	High stage Start[.phsC] - mom	1=High stage phsC start
2927	182.15	LD0.PHHPTOC2.Str.phsC			High stage Start[.phsC] - MCD	
2928	183.00	LD0.PHHPTOC2.Op.general	PHHPTOC2.OPERATE	Y	High stage Operate[.general] - mom	1=High stage operate
2929	183.01	LD0.PHHPTOC2.Op.general			High stage Operate[.general] - MCD	
2930	183.02	LD0.PHIPTOC2.Str.general	PHIPTOC2.START	Y	Instantaneous stage Start[.general] - mom	1=Instantaneous stage start
2931	183.03	LD0.PHIPTOC2.Str.general			Instantaneous stage Start[.general] - MCD	
2932	183.04	LD0.PHIPTOC2.Str.phsA	-	Y	Instantaneous stage Start[.phsA] - mom	1=Instantaneous stage phsA start
2933	183.05	LD0.PHIPTOC2.Str.phsA			Instantaneous stage Start[.phsA] - MCD	
2934	183.06	LD0.PHIPTOC2.Str.phsB	-	Y	Instantaneous stage Start[.phsB] - mom	1=Instantaneous stage phsB start
2935	183.07	LD0.PHIPTOC2.Str.phsB			Instantaneous stage Start[.phsB] - MCD	
2936	183.08	LD0.PHIPTOC2.Str.phsC	-	Y	Instantaneous stage Start[.phsC] - mom	1=Instantaneous stage phsC start
2937	183.09	LD0.PHIPTOC2.Str.phsC			Instantaneous stage Start[.phsC] - MCD	
2938	183.10	LD0.PHIPTOC2.Op.general	PHIPTOC2.OPERATE	Y	Instantaneous stage Operate[.general] - mom	1=Instantaneous stage operate
2939	183.11	LD0.PHIPTOC2.Op.general			Instantaneous stage Operate[.general] - MCD	
Non-directional earthfault protection signals HV-side (2 stages), variants TE01,03						
2940	183.12	LD0.EFLPTOC1.Str.general	EFLPTOC1.START	Y	Low stage Start[.general] - mom	1=Low stage start
2941	183.13	LD0.EFLPTOC1.Str.general			Low stage Start[.general] - MCD	
2942	183.14	LD0.EFLPTOC1.Op.general	EFLPTOC1.OPERATE	Y	Low stage Operate[.general] - mom	1=Low stage operate
2943	183.15	LD0.EFLPTOC1.Op.general			Low stage Operate[.general] - MCD	
2944	184.00	LD0.EFHPTOC1.Str.general	EFHPTOC1.START	Y	High stage Start[.general] - mom	1=High stage start

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2945	184.01	LD0.EFHPTOC1.Str.general			High stage Start[.general] - MCD	
2946	184.02	LD0.EFHPTOC1.Op.general	EFHPTOC1.OPERATE	Y	High stage Operate[.general] - mom	1=High stage operate
2947	184.03	LD0.EFHPTOC1.Op.general			High stage Operate[.general] - MCD	
Non-directional earthfault protection signals LV-side (2 stages), variants TE02,04						
2948	184.04	LD0.EFLPTOC2.Str.general	EFLPTOC2.START	Y	Low stage Start[.general] - mom	1=Low stage start
2949	184.05	LD0.EFLPTOC2.Str.general			Low stage Start[.general] - MCD	
2950	184.06	LD0.EFLPTOC2.Op.general	EFLPTOC2.OPERATE	Y	Low stage Operate[.general] - mom	1=Low stage operate
2951	184.07	LD0.EFLPTOC2.Op.general			Low stage Operate[.general] - MCD	
2952	184.08	LD0.EFHPTOC2.Str.general	EFHPTOC2.START	Y	High stage Start[.general] - mom	1=High stage start
2953	184.09	LD0.EFHPTOC2.Str.general			High stage Start[.general] - MCD	
2954	184.10	LD0.EFHPTOC2.Op.general	EFHPTOC2.OPERATE	Y	High stage Operate[.general] - mom	1=High stage operate
2955	184.11	LD0.EFHPTOC2.Op.general			High stage Operate[.general] - MCD	
Negative sequence overcurrent protection signals (2 stages)						
2956	184.12	LD0.NSPTOC1.Str.general	NSPTOC1.START	Y	Stage1(HV) Start[.general] - mom	1=Stage1(HV) start
2957	184.13	LD0.NSPTOC1.Str.general			Stage1(HV) Start[.general] - MCD	
2958	184.14	LD0.NSPTOC1.Op.general	NSPTOC1.OPERATE	Y	Stage1(HV) Operate[.general] - mom	1=Stage1(HV) operate
2959	184.15	LD0.NSPTOC1.Op.general			Stage1(HV) Operate[.general] - MCD	
2960	185.00	LD0.NSPTOC2.Str.general	NSPTOC2.START	Y	Stage2(LV) Start[.general] - mom	1=Stage2(LV) start
2961	185.01	LD0.NSPTOC2.Str.general			Stage2(LV) Start[.general] - MCD	
2962	185.02	LD0.NSPTOC2.Op.general	NSPTOC2.OPERATE	Y	Stage2(LV) Operate[.general] - mom	1=Stage2(LV) operate
2963	185.03	LD0.NSPTOC2.Op.general			Stage2(LV) Operate[.general] - MCD	
Low impedance restricted earth fault protection, variants TE01,02						
2964	185.04	LD0.LREFPDIF1.Str.general	LREFPDIF1.START	Y	Start[.general] - mom	1=Stage start
2965	185.05	LD0.LREFPDIF1.Str.general			Start[.general] - MCD	
2966	185.06	LD0.LREFPDIF1.Op.general	LREFPDIF1.OPERATE	Y	Operate[.general] - mom	1=Stage operate
2967	185.07	LD0.LREFPDIF1.Op.general			Operate[.general] - MCD	
High impedance restricted earth fault protection, variants TE03,04						
2968	185.08	LD0.HREFPDIF1.Str.general	HREFPDIF1.START	Y	Start[.general] - mom	1=Stage start
2969	185.09	LD0.HREFPDIF1.Str.general			Start[.general] - MCD	
2970	185.10	LD0.HREFPDIF1.Op.general	HREFPDIF1.OPERATE	Y	Operate[.general] - mom	1=Stage operate
2971	185.11	LD0.HREFPDIF1.Op.general			Operate[.general] - MCD	
Thermal overload protection (HV-side)						
2972	185.12	LD0.T2PTTR1.Str.general	T2PTTR1.START		Start[.general] - mom	1=Start
2973	185.13	LD0.T2PTTR1.Str.general			Start[.general] - MCD	
2974	185.14	LD0.T2PTTR1.AlmThm.general	T2PTTR1.ALARM		Thermal Alarm[.general] - mom	1=Thermal Alarm
2975	185.15	LD0.T2PTTR1.AlmThm.general			Thermal Alarm[.general] - MCD	
2976	186.00	LD0.T2PTTR1.Op.general	T2PTTR1.OPERATE		Operate[.general] - mom	1=Operate
2977	186.01	LD0.T2PTTR1.Op.general			Operate[.general] - MCD	
ARC protection signals (3 stages), optional						

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Bit addr	Reg bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
2978	186.02	LD0.ARCSARC11.FADet.stVal	ARCSARC1.ARC_FLT_DET	Y	Stage1 Fault arc detected[,stVal] - mom	1=Stage1 arc detected
2979	186.03	LD0.ARCSARC11.FADet.stVal			Stage1 Fault arc detected[,stVal] - MCD	0
2980	186.04				(reserved)	0
2981	186.05				(reserved)	
2982	186.06	LD0.ARCPTRC11.Op.general	ARCSARC1.OPERATE	Y	Stage1 Operate[,general] - mom	1=Stage1 operate
2983	186.07	LD0.ARCPTRC11.Op.general			Stage1 Operate[,general] - MCD	
2984	186.08	LD0.ARCSARC21.FADet.stVal	ARCSARC2.ARC_FLT_DET	Y	Stage2 Fault arc detected[,stVal] - mom	1=Stage2 arc detected
2985	186.09	LD0.ARCSARC21.FADet.stVal			Stage2 Fault arc detected[,stVal] - MCD	0
2986	186.10				(reserved)	0
2987	186.11				(reserved)	
2988	186.12	LD0.ARCPTRC21.Op.general	ARCSARC2.OPERATE	Y	Stage2 Operate[,general] - mom	1=Stage2 operate
2989	186.13	LD0.ARCPTRC21.Op.general			Stage2 Operate[,general] - MCD	
2990	186.14	LD0.ARCSARC31.FADet.stVal	ARCSARC3.ARC_FLT_DET	Y	Stage3 Fault arc detected[,stVal] - mom	1=Stage3 arc detected
2991	186.15	LD0.ARCSARC31.FADet.stVal			Stage3 Fault arc detected[,stVal] - MCD	0
2992	187.00				(reserved)	0
2993	187.01				(reserved)	
2994	187.02	LD0.ARCPTRC31.Op.general	ARCSARC3.OPERATE	Y	Stage3 Operate[,general] - mom	1=Stage3 operate
2995	187.03	LD0.ARCPTRC31.Op.general			Stage3 Operate[,general] - MCD	
Fuse failure protection (1 stage), TE05.06.07.08						
2996	187.04	LD0.SEQRFUF1.Str.general	SEQRFUF1.FUSEF_U		Start[,general] - mom	1 = Start general
2997	187.05	LD0.SEQRFUF1.Str.general			Start[,general] - MCD	
2998	187.06	LD0.SEQRFUF1.Str3Ph.general	SEQRFUF1.FUSEF_3PH		Start[,general] - mom	1 = Start 3phase general
2999	187.07	LD0.SEQRFUF1.Str3Ph.general			Start[,general] - MCD	
Transformer differential protection signals						
3000	187.08	LD0.TR2PDIF1.Op.general	TR2PTDF1.OPERATE	Y	Operate [,general] - mom	1=ON, 0=OFF
3001	187.09	LD0.TR2PDIF1.Op.general			Operate [,general] - MCD	
3002	187.10	LD0.TR2PDIF1.Op.phsA	-	Y	Operate [,phsA] - mom	1=ON, 0=OFF
3003	187.11	LD0.TR2PDIF1.Op.phsA			Operate [,phsA] - MCD	
3004	187.12	LD0.TR2PDIF1.Op.phsB	-	Y	Operate [,phsB] - mom	1=ON, 0=OFF
3005	187.13	LD0.TR2PDIF1.Op.phsB			Operate [,phsB] - MCD	
3006	187.14	LD0.TR2PDIF1.Op.phsC	-	Y	Operate [,phsC] - mom	1=ON, 0=OFF
3007	187.15	LD0.TR2PDIF1.Op.phsC			Operate [,phsC] - MCD	
3008	188.00	LD0.TR2PDIF1.Blk2HSt.general	TR2PTDF1.BLKD2H	Y	2nd harmonic restraint blocking status - mom	1=Blocking
3009	188.01	LD0.TR2PDIF1.Blk2HSt.general			2nd harmonic restraint blocking status - MCD	
3010	188.02				(reserved)	0
3011	188.03				(reserved)	0
3012	188.04				(reserved)	0
3013	188.05				(reserved)	0
3014	188.06				(reserved)	0

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Section 2
Modbus data mappings

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
3015	188.07				(reserved)	0
Multipurpose analog protection functions (3 stages) (optional in TE01...04)						
3016	188.08	LD0.MAPGAPC1.Str.general	MAPGAPC1.START	Y	Stage 1 Start [.general] - mom	1 = Stage 1 start
3017	188.09	LD0.MAPGAPC1.Str.general			Stage 1 Start [.general] - MCD	
3018	188.10	LD0.MAPGAPC1.Op.general	MAPGAPC1.OPERATE	Y	Stage 1 Operate [.general] - mom	1 = Stage 1 operate
3019	188.11	LD0.MAPGAPC1.Op.general			Stage 1 Operate [.general] - MCD	
3020	188.12	LD0.MAPGAPC2.Str.general	MAPGAPC2.START	Y	Stage 2 Start [.general] - mom	1 = Stage 2 start
3021	188.13	LD0.MAPGAPC2.Str.general			Stage 2 Start [.general] - MCD	
3022	188.14	LD0.MAPGAPC2.Op.general	MAPGAPC2.OPERATE	Y	Stage 2 Operate [.general] - mom	1 = Stage 2 operate
3023	188.15	LD0.MAPGAPC2.Op.general			Stage 2 Operate [.general] - MCD	
3024	189.00	LD0.MAPGAPC3.Str.general	MAPGAPC3.START	Y	Stage 3 Start [.general] - mom	1 = Stage 3 start
3025	189.01	LD0.MAPGAPC3.Str.general			Stage 3 Start [.general] - MCD	
3026	189.02	LD0.MAPGAPC3.Op.general	MAPGAPC3.OPERATE	Y	Stage 3 Operate [.general] - mom	1 = Stage 3 operate
3027	189.03	LD0.MAPGAPC3.Op.general			Stage 3 Operate [.general] - MCD	
3028	189.04				(reserved)	0
3029	189.05				(reserved)	0
3030	189.06				(reserved)	0
3031	189.07				(reserved)	0
XRRGIO130 AlarmWarning (optional in TE01..04)						
3032	189.08	LD0.XRRGIO130.Alm.stVal	XRRGIO130.ALARM	Y	XRRGIO130 Alarm [.stVal] - mom	1 = Alarm
3033	189.09	LD0.XRRGIO130.Alm.stVal			XRRGIO130 Alarm [.stVal] - MCD	
3034	189.10	LD0.XRRGIO130.Wrn.stVal	XRRGIO130.WARNING	Y	XRRGIO130 Warning [.stVal] - mom	1 = Warning
3035	189.11	LD0.XRRGIO130.Wrn.stVal			XRRGIO130 Warning [.stVal] - MCD	
3036	189.12				(reserved)	0
3037	189.13				(reserved)	0
3038	189.14				(reserved)	0
3039	189.15				(reserved)	
Phase voltage limit supervision (TE05...08)						
3040	190.00	LD0.VMMXU1.HiAlm.stVal	VMMXU1.HIGH_ALARM	Y	High alarm [.stVal] - mom	1=High alarm
3041	190.01	LD0.VMMXU1.HiAlm.stVal			High alarm [.stVal] - MCD	
3042	190.02	LD0.VMMXU1.HiWrn.stVal	VMMXU1.HIGH_WARN	Y	High warning [.stVal] - mom	1=High warning
3043	190.03	LD0.VMMXU1.HiWrn.stVal			High warning [.stVal] - MCD	
3044	190.04	LD0.VMMXU1.LoWrn.stVal	VMMXU1.LOW_WARN	Y	Low warning [.stVal] - mom	1=Low warning
3045	190.05	LD0.VMMXU1.LoWrn.stVal			Low warning [.stVal] - MCD	
3046	190.06	LD0.VMMXU1.LoAlm.stVal	VMMXU1.LOW_ALARM	Y	Low alarm [.stVal] - mom	1=Low alarm
3047	190.07	LD0.VMMXU1.LoAlm.stVal			Low alarm [.stVal] - MCD	
Residual voltage limit supervision (TE05...08)						
3048	190.08	LD0.RESVMMXU1.HiAlm.stVal	RESVMMXU1.HIGH_ALARM	Y	High alarm [.stVal] - mom	1=High alarm
3049	190.09	LD0.RESVMMXU1.HiAlm.stVal			High alarm [.stVal] - MCD	

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Bit addr	Reg bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
3050	190.10	LD0.RESVMMXU1.HWrm.stVal	RESVMMXU1.HIGH_WARN	Y	High warning[.stVal] - mom	1=High warning
3051	190.11	LD0.RESVMMXU1.HWrm.stVal			High warning[.stVal] - MCD	
Phase overvoltage protection (2 stages), TE05,06,07,08						
3088	193.00	LD0.PHPTOV1.Str.general	PHPTOV1.START		Stage 1 Start[.general] - mom	1=Stage1 start
3089	193.01	LD0.PHPTOV1.Str.general			Stage 1 Start[.general] - MCD	
3090	193.02	LD0.PHPTOV1.Str.phsA	-		Stage 1 Start[.phsA] - mom	1=Stage1 phsA start
3091	193.03	LD0.PHPTOV1.Str.phsA			Stage 1 Start[.phsA] - MCD	
3092	193.04	LD0.PHPTOV1.Str.phsB			Stage 1 Start[.phsB] - mom	1=Stage1 phsB start
3093	193.05	LD0.PHPTOV1.Str.phsB			Stage 1 Start[.phsB] - MCD	
3094	193.06	LD0.PHPTOV1.Str.phsC	-		Stage 1 Start[.phsC] - mom	1=Stage1 phsB start
3095	193.07	LD0.PHPTOV1.Str.phsC			Stage 1 Start[.phsC] - MCD	
3096	193.08	LD0.PHPTOV1.Op.general	PHPTOV1.OPERATE		Stage 1 Operate[.general] - mom	1=Stage1 operate
3097	193.09	LD0.PHPTOV1.Op.general			Stage 1 Operate[.general] - MCD	
3098	193.10	LD0.PHPTOV2.Str.general	PHPTOV2.START		Stage 2 Start[.general] - mom	1=Stage2 start
3099	193.11	LD0.PHPTOV2.Str.general			Stage 2 Start[.general] - MCD	
3100	193.12	LD0.PHPTOV2.Str.phsA	-		Stage 2 Start[.phsA] - mom	1=Stage2 phsA start
3101	193.13	LD0.PHPTOV2.Str.phsA			Stage 2 Start[.phsA] - MCD	
3102	193.14	LD0.PHPTOV2.Str.phsB	-		Stage 2 Start[.phsB] - mom	1=Stage2 phsB start
3103	193.15	LD0.PHPTOV2.Str.phsB			Stage 2 Start[.phsB] - MCD	
3104	194.00	LD0.PHPTOV2.Str.phsC	-		Stage 2 Start[.phsC] - mom	1=Stage2 phsB start
3105	194.01	LD0.PHPTOV2.Str.phsC			Stage 2 Start[.phsC] - MCD	
3106	194.02	LD0.PHPTOV2.Op.general	PHPTOV2.OPERATE		Stage 2 Operate[.general] - mom	1=Stage2 operate
3107	194.03	LD0.PHPTOV2.Op.general			Stage 2 Operate[.general] - MCD	
Phase undervoltage protection (2 stages), TE05,06,07,08						
3138	196.02	LD0.PHPTUV1.Str.general	PHPTUV1.START		Stage 1 Start[.general] - mom	1=Stage1 start
3139	196.03	LD0.PHPTUV1.Str.general			Stage 1 Start[.general] - MCD	
3140	196.04	LD0.PHPTUV1.Str.phsA	-		Stage 1 Start[.phsA] - mom	1=Stage1 phsA start
3141	196.05	LD0.PHPTUV1.Str.phsA			Stage 1 Start[.phsA] - MCD	
3142	196.06	LD0.PHPTUV1.Str.phsB	-		Stage 1 Start[.phsB] - mom	1=Stage1 phsB start
3143	196.07	LD0.PHPTUV1.Str.phsB			Stage 1 Start[.phsB] - MCD	
3144	196.08	LD0.PHPTUV1.Str.phsC	-		Stage 1 Start[.phsC] - mom	1=Stage1 phsB start
3145	196.09	LD0.PHPTUV1.Str.phsC			Stage 1 Start[.phsC] - MCD	
3146	196.10	LD0.PHPTUV1.Op.general	PHPTUV1.OPERATE		Stage 1 Operate[.general] - mom	1=Stage1 operate
3147	196.11	LD0.PHPTUV1.Op.general			Stage 1 Operate[.general] - MCD	
3148	196.12	LD0.PHPTUV2.Str.general	PHPTUV2.START		Stage 2 Start[.general] - mom	1=Stage2 start
3149	196.13	LD0.PHPTUV2.Str.general			Stage 2 Start[.general] - MCD	
3150	196.14	LD0.PHPTUV2.Str.phsA	-		Stage 2 Start[.phsA] - mom	1=Stage2 phsA start
3151	196.15	LD0.PHPTUV2.Str.phsA			Stage 2 Start[.phsA] - MCD	
3152	197.00	LD0.PHPTUV2.Str.phsB	-		Stage 2 Start[.phsB] - mom	1=Stage2 phsB start

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Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
3153	197.01	LD0.PHPTUV2.Str.phsB			Stage 2 Start[.phsB] - MCD	
3154	197.02	LD0.PHPTUV2.Str.phsC	-		Stage 2 Start[.phsC] - mom	1=Stage2 phsB start
3155	197.03	LD0.PHPTUV2.Str.phsC			Stage 2 Start[.phsC] - MCD	
3156	197.04	LD0.PHPTUV2.Op.general	PHPTUV2.OPERATE		Stage 2 Operate[.general] - mom	1=Stage2 operate
3157	197.05	LD0.PHPTUV2.Op.general			Stage 2 Operate[.general] - MCD	
Residual overvoltage protection (2 stages), TE05.06.07.08						
3168	198.00	LD0.ROVPTOV1.Str.general	ROVPTOV1.START		Stage 1 Start[.general] - mom	1=Stage1 start
3169	198.01	LD0.ROVPTOV1.Str.general			Stage 1 Start[.general] - MCD	
3170	198.02	LD0.ROVPTOV1.Op.general	ROVPTOV1.OPERATE		Stage 1 Start[.phsA] - mom	1=Stage1 phsA start
3171	198.03	LD0.ROVPTOV1.Op.general			Stage 1 Start[.phsA] - MCD	
3172	198.04	LD0.ROVPTOV2.Str.general	ROVPTOV2.START		Stage 2 Start[.phsB] - mom	1=Stage1 phsB start
3173	198.05	LD0.ROVPTOV2.Str.general			Stage 2 Start[.phsB] - MCD	
3174	198.06	LD0.ROVPTOV2.Op.general	ROVPTOV2.OPERATE		Stage 2 Start[.phsC] - mom	1=Stage1 phsB start
3175	198.07	LD0.ROVPTOV2.Op.general			Stage 2 Start[.phsC] - MCD	
...	...					
3183	198.15				(reserved)	0
Physical I/O signal states (BIO-card X130)						
3184	199.00	LD0.XGGIO130.lnd1.stVal	-		X130-Input 1[.stVal] - mom	1=ON, 0=OFF
3185	199.01	LD0.XGGIO130.lnd1.stVal			X130-Input 1[.stVal] - MCD	
3186	199.02	LD0.XGGIO130.lnd2.stVal	-		X130-Input 2[.stVal] - mom	1=ON, 0=OFF
3187	199.03	LD0.XGGIO130.lnd2.stVal			X130-Input 2[.stVal] - MCD	
3188	199.04	LD0.XGGIO130.lnd3.stVal	-		X130-Input 3[.stVal] - mom	1=ON, 0=OFF
3189	199.05	LD0.XGGIO130.lnd3.stVal			X130-Input 3[.stVal] - MCD	
3190	199.06	LD0.XGGIO130.lnd4.stVal	-		X130-Input 4[.stVal] - mom	1=ON, 0=OFF
3191	199.07	LD0.XGGIO130.lnd4.stVal			X130-Input 4[.stVal] - MCD	
3192	199.08	LD0.XGGIO130.lnd5.stVal	-		X130-Input 5[.stVal] - mom	1=ON, 0=OFF
3193	199.09	LD0.XGGIO130.lnd5.stVal			X130-Input 5[.stVal] - MCD	
3194	199.10	LD0.XGGIO130.lnd6.stVal	-		X130-Input 6[.stVal] - mom	1=ON, 0=OFF
3195	199.11	LD0.XGGIO130.lnd6.stVal			X130-Input 6[.stVal] - MCD	
3196	199.12				(reserved)	0
3197	199.13				(reserved)	0
3198	199.14				(reserved)	0
3199	199.15				(reserved)	0
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

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Bit addr	Reg bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
3214	200.14				(reserved)	0
3215	200.15				(reserved)	0
Physical I/O signal states (BIO-card X110)						
3216	201.00	LD0.XGGIO110.lnd1.stVal	-		X110-Input 1[.stVal] - mom	1=ON, 0=OFF
3217	201.01	LD0.XGGIO110.lnd1.stVal	-		X110-Input 1[.stVal] - MCD	1=ON, 0=OFF
3218	201.02	LD0.XGGIO110.lnd2.stVal	-		X110-Input 2[.stVal] - mom	1=ON, 0=OFF
3219	201.03	LD0.XGGIO110.lnd2.stVal	-		X110-Input 2[.stVal] - MCD	1=ON, 0=OFF
3220	201.04	LD0.XGGIO110.lnd3.stVal	-		X110-Input 3[.stVal] - mom	1=ON, 0=OFF
3221	201.05	LD0.XGGIO110.lnd3.stVal	-		X110-Input 3[.stVal] - MCD	1=ON, 0=OFF
3222	201.06	LD0.XGGIO110.lnd4.stVal	-		X110-Input 4[.stVal] - mom	1=ON, 0=OFF
3223	201.07	LD0.XGGIO110.lnd4.stVal	-		X110-Input 4[.stVal] - MCD	1=ON, 0=OFF
3224	201.08	LD0.XGGIO110.lnd5.stVal	-		X110-Input 5[.stVal] - mom	1=ON, 0=OFF
3225	201.09	LD0.XGGIO110.lnd5.stVal	-		X110-Input 5[.stVal] - MCD	1=ON, 0=OFF
3226	201.10	LD0.XGGIO110.lnd6.stVal	-		X110-Input 6[.stVal] - mom	1=ON, 0=OFF
3227	201.11	LD0.XGGIO110.lnd6.stVal	-		X110-Input 6[.stVal] - MCD	1=ON, 0=OFF
3228	201.12	LD0.XGGIO110.lnd7.stVal	-		X110-Input 7[.stVal] - mom	1=ON, 0=OFF
3229	201.13	LD0.XGGIO110.lnd7.stVal	-		X110-Input 7[.stVal] - MCD	1=ON, 0=OFF
3230	201.14	LD0.XGGIO110.lnd8.stVal	-		X110-Input 8[.stVal] - mom	1=ON, 0=OFF
3231	201.15	LD0.XGGIO110.lnd8.stVal	-		X110-Input 8[.stVal] - MCD	1=ON, 0=OFF
3232	202.00	LD0.XGGIO110.SPSCO1.stVal	-		X110-Output 1[.stVal] - mom	1=ON, 0=OFF
3233	202.01	LD0.XGGIO110.SPSCO1.stVal	-		X110-Output 1[.stVal] - MCD	1=ON, 0=OFF
3234	202.02	LD0.XGGIO110.SPSCO2.stVal	-		X110-Output 2[.stVal] - mom	1=ON, 0=OFF
3235	202.03	LD0.XGGIO110.SPSCO2.stVal	-		X110-Output 2[.stVal] - MCD	1=ON, 0=OFF
3236	202.04	LD0.XGGIO110.SPSCO3.stVal	-		X110-Output 3[.stVal] - mom	1=ON, 0=OFF
3237	202.05	LD0.XGGIO110.SPSCO3.stVal	-		X110-Output 3[.stVal] - MCD	1=ON, 0=OFF
3238	202.06	LD0.XGGIO110.SPSCO4.stVal	-		X110-Output 4[.stVal] - mom	1=ON, 0=OFF
3239	202.07	LD0.XGGIO110.SPSCO4.stVal	-		X110-Output 4[.stVal] - MCD	1=ON, 0=OFF
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.SPSCO1.stVal	-		X100-Output 1[.stVal] - mom	1=ON, 0=OFF
3249	203.01	LD0.XGGIO100.SPSCO1.stVal	-		X100-Output 1[.stVal] - MCD	1=ON, 0=OFF
3250	203.02	LD0.XGGIO100.SPSCO2.stVal	-		X100-Output 2[.stVal] - mom	1=ON, 0=OFF

Table continues on next page

Bit addr	Reg.bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
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)						
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

Table continues on next page

Bit addr	Reg bit	IEC 61850 name	AFL-Common SA name	Ds	Description	Values
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.CBCSW11.Pos.ctlVal	CBXCBBR1 - Switch, general - Open
2049		1	Uns		CBXCBBR1 - Switch, general - Close
2050		2	Uns		CBXCBBR1 - Switch, general - Cancel
2051		3	Uns		CBXCBBR1 - Switch, general - Operate
2052		4	Uns		CBXCBBR1 - Switch, general - Direct open
2053		5	Uns		CBXCBBR1 - Switch, general - Direct close
2060		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					(reserved)
2064					(reserved)
2065	2	5	Uns	LD0.SSCBBR1.RsAccAPwr.ctlVal	Reset accumulation energy - 1=Activate
2066		6	Uns	LD0.SSCBBR1.RsCBWear.ctlVal	Reset input for CB remaining life and operation counter - 1=Activate
2067		7	Uns	DR.RDRE.1.RcdTrg.ctlVal	Disturbance recorder - Trig recording - 1=Activate
2068		8	Uns	DR.RDRE.1.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.SupDmdRs.ctlVal	Reset accumulated energy - 1=Reset
2071		11	Uns	LD0.SCCBBR1.RsTrvTm.ctlVal	Reset travelling time alarm - 1=Reset
2072		12	Uns	LD0.SCCBBR1.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
BIO	Binary input and output
CB	Circuit breaker
CPM	Communication protocol manual
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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