



Relion® 615 series

Transformer Protection and Control RET615 DNP3 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

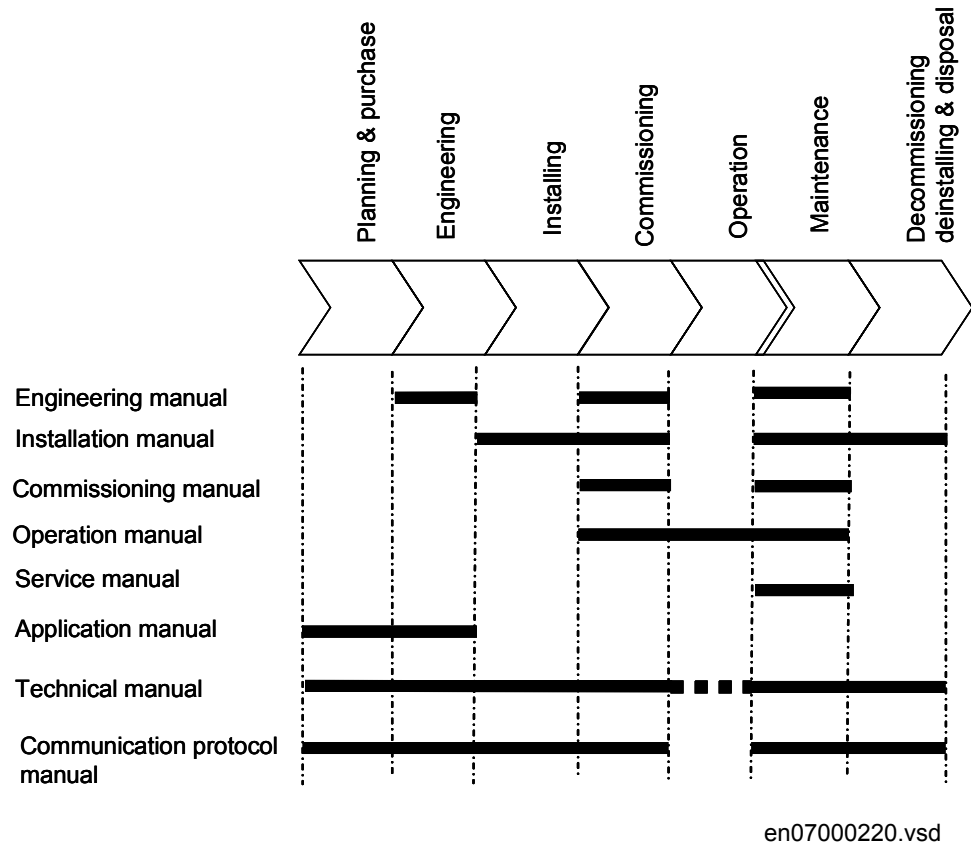


Figure 1: The intended use of manuals in different lifecycles

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
DNP3 Communication Protocol Manual	1MRS756709

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	SEQRUF1	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 DNP3 data mappings

2.1 Overview

This document describes the DNP3 data points and structures available in RET615 Ver. 3.0. The data points are unmapped as a default. 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 point tables show all the available DNP3 data points in this IED. The data objects in the point tables are listed in alphabetical order based on the objects' IEC61850 names. The DNP3 points can be freely added, removed, reorganized and reconfigured using PCM600.

As a default, the class assignments are Class 0 and Class 1 for binary inputs and Class 0 and Class 2 for analog inputs. Analog values are provided with default scalings. The scalings can be freely modified by the user.

This list represents the superset of DNP3 points. The actual set of available points is determined by the IED's ordercode.

2.2 Point list for RET615 Ver.3.0 TE01-08

Table 2: Binary inputs

IEC61850 name	AFL-Common SA name	IEC61850 LN desc, DO desc, DA name	Value
Arc protection			
LD0.ARCPTRC11.Op.general	ARCSARC1.OPERATE	ARCSARC1, Operate, general	1 = Operate
LD0.ARCPTRC21.Op.general	ARCSARC2.OPERATE	ARCSARC2, Operate, general	1 = Operate
LD0.ARCPTRC31.Op.general	ARCSARC3.OPERATE	ARCSARC3, Operate, general	1 = Operate
LD0.ARCSARC11.FADet.stVal	ARCSARC1.ARC_FLT_DET	ARCSARC1, Fault arc detected, stVal	1 = Fault arc detected
LD0.ARCSARC21.FADet.stVal	ARCSARC2.ARC_FLT_DET	ARCSARC2, Fault arc detected, stVal	1 = Fault arc detected
LD0.ARCSARC31.FADet.stVal	ARCSARC3.ARC_FLT_DET	ARCSARC3, Fault arc detected, stVal	1 = Fault arc detected
Circuit-breaker related signals (CB pos is found in AI)			
CTRL.CBCILO1.EnaCls.stVal	CBXCBBR1.ENA_OPEN	CBXCBBR1, ENA_CLOSE, stVal	1 = Close enabled
CTRL.CBCILO1.EnaOpn.stVal	CBXCBBR1.ENA_CLOSE	CBXCBBR1, ENA_OPEN, stVal	1 = Open enabled
CTRL.CBCILO1.IlibyPss.stVal	CBXCBBR1.ITL_BYPASS	CBXCBBR1, ITL_BYPASS, stVal	1 = Interlocking bypassed
CTRL.CBCSW11.Pos.stSeld	CBXCBBR1.SELECTED	CBXCBBR1, Switch, general, stSeld	1 = CB control selected
CTRL.CBXCBBR1.BkCls.stVal	CBXCBBR1.BLK_CLOSE	CBXCBBR1, Block closing, stVal	1 = Close blocked
CTRL.CBXCBBR1.BkOpn.stVal	CBXCBBR1.BLK_OPEN	CBXCBBR1, Block opening, stVal	1 = Open blocked
Circuit-breaker condition monitoring			
CTRL.CCBBRBF1.OpEx.general	CCBBRBF1.TRBU	CCBBRBF1, Breaker failure trip (external trip), general	1 = Breaker failure trip
CTRL.CCBBRBF1.OpIn.general	CCBBRBF1.TRRET	CCBBRBF1, Operate, retrip (internal trip), general	1 = Operate, re-trip
CTRL.CCBBRBF1.Str.general	CCBBRBF1.CB_FAULT_AL	CCBBRBF1, Delayed CB failure alarm, general	1 = Start, timer running
Three-phase current limit supervision, HV side			
LD0.CMMXU1.HiAlm.stVal	CMMXU1.HIGH_ALARM	CMMXU1, High alarm, stVal	1 = High alarm
LD0.CMMXU1.HiWrn.stVal	CMMXU1.HIGH_WARN	CMMXU1, High warning, stVal	1 = High warning
LD0.CMMXU1.LoAlm.stVal	CMMXU1.LOW_ALARM	CMMXU1, Low alarm, stVal	1 = Low alarm
LD0.CMMXU1.LoWrn.stVal	CMMXU1.LOW_WARN	CMMXU1, Low warning, stVal	1 = Low warning
Three-phase current limit supervision, LV side			
LD0.CMMXU2.HiAlm.stVal	CMMXU2.HIGH_ALARM	CMMXU2, High alarm, stVal	1 = High alarm
LD0.CMMXU2.HiWrn.stVal	CMMXU2.HIGH_WARN	CMMXU2, High warning, stVal	1 = High warning
LD0.CMMXU2.LoAlm.stVal	CMMXU2.LOW_ALARM	CMMXU2, Low alarm, stVal	1 = Low alarm
LD0.CMMXU2.LoWrn.stVal	CMMXU2.LOW_WARN	CMMXU2, Low warning, stVal	1 = Low warning
Non-directional earth-fault protection, 2 stages, HV side, variants TE01, TE03			
LD0.EFHPTOC1.Op.general	EFHPTOC1.OPERATE	EFHPTOC1, Operate, general	1 = Operate
LD0.EFHPTOC1.Str.general	EFHPTOC1.START	EFHPTOC1, Start, general	1 = Start
LD0.EFLPTOC1.Op.general	EFLPTOC1.OPERATE	EFLPTOC1, Operate, general	1 = Operate
LD0.EFLPTOC1.Str.general	EFLPTOC1.START	EFLPTOC1, Start, general	1 = Start
Non-directional earth-fault protection, 2 stages, LV side, variants TE02, TE04			
LD0.EFHPTOC2.Op.general	EFHPTOC2.OPERATE	EFHPTOC2, Operate, general	1 = Operate
LD0.EFHPTOC2.Str.general	EFHPTOC2.START	EFHPTOC2, Start, general	1 = Start
LD0.EFLPTOC2.Op.general	EFLPTOC2.OPERATE	EFLPTOC2, Operate, general	1 = Operate
LD0.EFLPTOC2.Str.general	EFLPTOC2.START	EFLPTOC2, Start, general	1 = Start

Table continues on next page

Section 2
DNP3 data mappings

IEC61850 name	AFL-Common SA name	IEC61850 LN desc, DO desc, DA name	Value
		Alarm LED states	
LD0.LEDGGIO1.SPCSO1.stVal	-	Alarm LEDs, LED 1, stVal	1 = LED On, 0 = LED Off
LD0.LEDGGIO1.SPCSO2.stVal	-	Alarm LEDs, LED 2, stVal	1 = LED On, 0 = LED Off
LD0.LEDGGIO1.SPCSO3.stVal	-	Alarm LEDs, LED 3, stVal	1 = LED On, 0 = LED Off
LD0.LEDGGIO1.SPCSO4.stVal	-	Alarm LEDs, LED 4, stVal	1 = LED On, 0 = LED Off
LD0.LEDGGIO1.SPCSO5.stVal	-	Alarm LEDs, LED 5, stVal	1 = LED On, 0 = LED Off
LD0.LEDGGIO1.SPCSO6.stVal	-	Alarm LEDs, LED 6, stVal	1 = LED On, 0 = LED Off
LD0.LEDGGIO1.SPCSO7.stVal	-	Alarm LEDs, LED 7, stVal	1 = LED On, 0 = LED Off
LD0.LEDGGIO1.SPCSO8.stVal	-	Alarm LEDs, LED 8, stVal	1 = LED On, 0 = LED Off
LD0.LEDGGIO1.SPCSO9.stVal	-	Alarm LEDs, LED 9, stVal	1 = LED On, 0 = LED Off
LD0.LEDGGIO1.SPCSO10.stVal	-	Alarm LEDs, LED 10, stVal	1 = LED On, 0 = LED Off
LD0.LEDGGIO1.SPCSO11.stVal	-	Alarm LEDs, LED 11, stVal	1 = LED On, 0 = LED Off
		Global conditioning signals	
LD0.LEDPTRC1.Op.general	-	Global conditioning, Operate, general	1 = Operate (general)
LD0.LEDPTRC1.Op.phsA	-	Global conditioning, Operate, phsA	1 = Operate (phsA)
LD0.LEDPTRC1.Op.phsB	-	Global conditioning, Operate, phsB	1 = Operate (phsB)
LD0.LEDPTRC1.Op.phsC	-	Global conditioning, Operate, phsC	1 = Operate (phsC)
LD0.LEDPTRC1.Str.general	-	Global conditioning, Start, general	1 = Start (general)
LD0.LEDPTRC1.Str.phsA	-	Global conditioning, Start, phsA	1 = Start (phsA)
LD0.LEDPTRC1.Str.phsB	-	Global conditioning, Start, phsB	1 = Start (phsB)
LD0.LEDPTRC1.Str.phsC	-	Global conditioning, Start, phsC	1 = Start (phsC)
		Local/remote (also present in IIN)	
CTRL.LLN0.Loc.stVal	-	Control LLN0, Local / remote, stVal	1 = Local
CTRL.LLN0.Loc1.stVal	-	Control LLN0, Local / Off, stVal	1 = Off
		Parameter settings supervision	
LD0.LLN0.SetChg.stVal	-	General, Settings change, stVal	1 = Settings changed
LD0.LLN0.SetSeld.stVal	-	General, Settings reservation, stVal	1 = Settings reserved
		Multipurpose analog protection functions (3 stages)	
LD0.MAPGAPC1.Op.general	-	MAPGAPC1, Operate, general	1 = Operate
LD0.MAPGAPC1.Str.general	-	MAPGAPC1, Start, general	1 = Start
LD0.MAPGAPC2.Op.general	-	MAPGAPC2, Operate, general	1 = Operate
LD0.MAPGAPC2.Str.general	-	MAPGAPC2, Start, general	1 = Start
LD0.MAPGAPC3.Op.general	-	MAPGAPC3, Operate, general	1 = Operate
LD0.MAPGAPC3.Str.general	-	MAPGAPC3, Start, general	1 = Start
		Generic operation time supervision for machines and devices	
LD0.MDSOPT1.Op.TmWm.stVal	MDSOPT1.WARNING	Accumulated operation time exceeds Warning value	1 = Warning
LD0.MDSOPT1.Op.TmAIm.stVal	MDSOPT1.ALARM	Accumulated operation time exceeds Alarm value	1 = Alarm
		High impedance restricted earth-fault protection, variants TE03.04	
LD0.HREFPDIF1.Op.general	HREFPDIF1.OPERATE	HREFPDIF1, Operate, general	1 = Operate

Table continues on next page

IEC61850 name	AFL-Common SA name	IEC61850 LN desc, DO desc, DA name	Value
LD0.HREFPDIF1.Str.general	HREFPDIF1.START	HREFPDIF1, Start, general	1 = Start
LD0.LREFPDIF1.Op.general	LREFPDIF1.OPERATE	Low impedance restricted earth-fault protection, variants TE01,02	1 = Operate
LD0.LREFPDIF1.Str.general	LREFPDIF1.START	LREFPDIF1, Start, general	1 = Start
Multipurpose inputs (All variants)			
LD0.MVGAPC1.Q1.stVal	-	MVGAPC1, Input 1 [stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q2.stVal	-	MVGAPC1, Input 2 [stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q3.stVal	-	MVGAPC1, Input 3 [stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q4.stVal	-	MVGAPC1, Input 4 [stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q5.stVal	-	MVGAPC1, Input 5 [stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q6.stVal	-	MVGAPC1, Input 6 [stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q7.stVal	-	MVGAPC1, Input 7 [stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q8.stVal	-	MVGAPC1, Input 8 [stVal]	0 = Input OFF, 1 = Input ON
Negative-sequence overcurrent protection signals, HV side			
LD0.NSPTOC1.Op.general	NSPTOC1.OPERATE	NSPTOC1, Operate, general	1 = Operate
LD0.NSPTOC1.Str.general	NSPTOC1.START	NSPTOC1, Start, general	1 = Start
Negative-sequence overcurrent protection signals, LV side			
LD0.NSPTOC2.Op.general	NSPTOC2.OPERATE	NSPTOC2, Operate, general	1 = Operate
LD0.NSPTOC2.Str.general	NSPTOC2.START	NSPTOC2, Start, general	1 = Start
Phase overcurrent protection signals HV side (3 stages)			
LD0.PHIPTOC1.Op.general	PHIPTOC1.OPERATE	PHIPTOC1, Operate, general	1 = Operate
LD0.PHIPTOC1.Str.general	PHIPTOC1.START	PHIPTOC1, Start, general	1 = Start
LD0.PHIPTOC1.Op.general	PHIPTOC1.OPERATE	PHIPTOC1, Operate, general	1 = Operate
LD0.PHIPTOC1.Str.general	PHIPTOC1.START	PHIPTOC1, Start, general	1 = Start
LD0.PHLPTOC1.Op.general	PHLPTOC1.OPERATE	PHLPTOC1, Operate, general	1 = Operate
LD0.PHLPTOC1.Str.general	PHLPTOC1.START	PHLPTOC1, Start, general	1 = Start
Phase overcurrent protection signals LV side (3 stages)			
LD0.PHIPTOC2.Op.general	PHIPTOC2.OPERATE	PHIPTOC2, Operate, general	1 = Operate
LD0.PHIPTOC2.Str.general	PHIPTOC2.START	PHIPTOC2, Start, general	1 = Start
LD0.PHIPTOC2.Op.general	PHIPTOC2.OPERATE	PHIPTOC2, Operate, general	1 = Operate
LD0.PHIPTOC2.Str.general	PHIPTOC2.START	PHIPTOC2, Start, general	1 = Start
LD0.PHLPTOC2.Op.general	PHLPTOC2.OPERATE	PHLPTOC2, Operate, general	1 = Operate
LD0.PHLPTOC2.Str.general	PHLPTOC2.START	PHLPTOC2, Start, general	1 = Start
Phase overvoltage and undervoltage protection			
LD0.PHPTOV1.Op.general	-	PHPTOV1, Operate, general	1 = Operate
LD0.PHPTOV1.Str.general	-	PHPTOV1, Start, general	1 = Start
LD0.PHPTOV2.Op.general	-	PHPTOV2, Operate, general	1 = Operate
LD0.PHPTOV2.Str.general	-	PHPTOV2, Start, general	1 = Start
LD0.PHPTUV1.Op.general	-	PHPTUV1, Operate, general	1 = Operate

Table continues on next page

IEC61850 name	AFL-Common SA name	IEC61850 LN desc, DO desc, DA name	Value
LD0.PHPTUV1.Str.general	-	PHPTUV1, Start, general	1 = Start
LD0.PHPTUV2.Op.general	-	PHPTUV2, Operate, general	1 = Operate
LD0.PHPTUV2.Str.general	-	PHPTUV2, Start, general	1 = Start
DR.RDRE1.RcdMade.stVal	-	Disturbance recorder	1 = Recording made
LD0.RESCMMXU1.HIAIm.stVal	RESCMMXU1.HIGH_ALARM	Disturbance recorder, Recording made, stVal	1 = High alarm
LD0.RESCMMXU1.HIWrm.stVal	RESCMMXU1.HIGH_WARN	Residual current limit supervision, HV side, variants TE01,TE03	1 = High warning
LD0.RESCMMXU2.HIAIm.stVal	RESCMMXU2.HIGH_ALARM	Residual current limit supervision, LV side, variants TE02,TE04	1 = High alarm
LD0.RESCMMXU2.HIWrm.stVal	RESCMMXU2.HIGH_WARN	Residual current limit supervision, LV side, variants TE02,TE04	1 = High warning
LD0.RESVMMXU1.HIAIm.stVal	RESVMMXU1.HIGH_ALARM	Residual voltage limit supervision, HV side	1 = Alarm
LD0.RESVMMXU1.HIWrm.stVal	RESVMMXU1.HIGH_WARN	Residual voltage limit supervision, HV side	1 = Warning
LD0.ROVPTOV1.Op.general	-	Residual overvoltage protection	1 = Operate
LD0.ROVPTOV1.Str.general	-	ROVPTOV1, Operate, general	1 = Start
LD0.ROVPTOV2.Op.general	-	ROVPTOV2, Operate, general	1 = Operate
LD0.ROVPTOV2.Str.general	-	ROVPTOV2, Start, general	1 = Start
LD0.SEQRUF1.Str.general	-	Fuse failure protection	1 = Start
LD0.SEQRUF1.Str3Ph.general	-	SEQRUF1, General start of function , general	1 = Start
		SEQRUF1, Three-phase start of function, general	1 = Start
		Circuit-breaker condition monitoring	
LD0.SSCBR1.APwrAlim.stVal	SSCBR1.IPOW_ALARM	SSCBR1, Accumulated currents power (lyt),exceeded alarm limit, stVal	1 = Iyt alarm limit
LD0.SSCBR1.APwrLO.stVal	SSCBR1.IPOW_LO	SSCBR1, Accumulated currents power (lyt),exceeded lockout limit, stVal	1 = Iyt lockout limit
LD0.SSCBR1.CB_LfAlim.stVal	SSCBR1.CB_LIFE_ALARM	SSCBR1, Remaining life of CB exceeded alarm limit, stVal	1 = Remaining life alarm
LD0.SSCBR1.ClsAlim.stVal	SSCBR1.TRV_T_CL_ALARM	SSCBR1, CB close travel time exceeded set value, stVal	1 = Close travel time alarm
LD0.SSCBR1.LonTmAlim.stVal	SSCBR1.MON_ALARM	SSCBR1, CB 'not operated for long time' alarm, stVal	1 = Not operated alarm
LD0.SSCBR1.OpnAlim.stVal	SSCBR1.TRV_T_OP_ALARM	SSCBR1, CB open travel time exceeded set value, stVal	1 = Open travel time alarm
LD0.SSCBR1.OpNumAlim.stVal	SSCBR1.OPR_ALARM	SSCBR1, Number of CB operations exceeds alarm limit, stVal	1 = CB operations alarm
LD0.SSCBR1.OpNumLO.stVal	SSCBR1.OPR_LO	SSCBR1, Number of CB operations exceeds lockout limit, stVal	1 = CB operations lockout
LD0.SSCBR1.PresAlim.stVal	SSCBR1.PRES_ALARM	SSCBR1, Pressure below alarm level, stVal	1 = Low pressure alarm
LD0.SSCBR1.PresLO.stVal	SSCBR1.PRES_LO	SSCBR1, Pressure below lockout level, stVal	1 = Low pressure lockout
LD0.SSCBR1.SprChaAlim.stVal	SSCBR1.SPR_CHR_ALARM	SSCBR1, Spring charging time has crossed the set value, stVal	1 = Spring charge alarm
		Thermal overload protection, HV side	
LD0.T2PTR1.AlmThm.general	T2PTR1.ALARM	T2PTR1, Thermal Alarm, general	1 = Alarm
LD0.T2PTR1.Op.general	T2PTR1.OPERATE	T2PTR1, Operate, general	1 = Operate
LD0.T2PTR1.Str.general	T2PTR1.START	T2PTR1, Start, general	1 = Start
		Trip circuit supervision	

Table continues on next page

IEC61850 name	AFL-Common SA name	IEC61850 LN desc, DO desc, DA name	Value
LD0.TCSSCBBR1.CirAlm.stVal	TCSSCBBR1.ALARM	TCSSCBBR1, Alarm, stVal	1 = Alarm
LD0.TCSSCBBR2.CirAlm.stVal	TCSSCBBR2.ALARM	TCSSCBBR2, Alarm, stVal	1 = Alarm
		Transformer differential protection	
LD0.TR2P2DIF1.Blk2HSI.general	TR2PTDF1.BLKD2H	2nd harmonic restraint blocking status, general	1 = Blocking
LD0.TR2P2DIF1.Op.general	TR2PTDF1.OPERATE	Operate signal, general	1 = Operate
		Global conditioning	
LD0.TRPPTRC1.Op.general	-	TRPPTRC1, Operate input signal, general	1 = Operate input
LD0.TRPPTRC1.Tr.general	-	TRPPTRC1, General trip output signal, general	1 = Operate output
LD0.TRPPTRC2.Op.general	-	TRPPTRC2, Operate input signal, general	1 = Operate input
LD0.TRPPTRC2.Tr.general	-	TRPPTRC2, General trip output signal, general	1 = Operate output
		Three-phase voltage limit supervision, HV side	
LD0.VMMXU1.HiAlm.stVal	VMMXU1.HIGH_ALARM	VMMXU1, High alarm, stVal	1 = Alarm
LD0.VMMXU1.HiWrn.stVal	VMMXU1.HIGH_WARN	VMMXU1, High warning, stVal	1 = Warning
LD0.VMMXU1.LoAlm.stVal	VMMXU1.LOW_ALARM	VMMXU1, Low alarm, stVal	1 = Alarm
LD0.VMMXU1.LoWrn.stVal	VMMXU1.LOW_WARN	VMMXU1, Low warning, stVal	1 = Warning
		Raw I/O signals	
LD0.XGGIO100.SPCSO1.stVal	-	X100 (PSM), X100-Output 1, stVal	1 = ON, 0 = OFF
LD0.XGGIO100.SPCSO2.stVal	-	X100 (PSM), X100-Output 2, stVal	1 = ON, 0 = OFF
LD0.XGGIO100.SPCSO3.stVal	-	X100 (PSM), X100-Output 3, stVal	1 = ON, 0 = OFF
LD0.XGGIO100.SPCSO4.stVal	-	X100 (PSM), X100-Output 4, stVal	1 = ON, 0 = OFF
LD0.XGGIO100.SPCSO5.stVal	-	X100 (PSM), X100-Output 5, stVal	1 = ON, 0 = OFF
LD0.XGGIO100.SPCSO6.stVal	-	X100 (PSM), X100-Output 6, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.Ind1.stVal	-	X110 (BIO), X110-Input 1, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.Ind2.stVal	-	X110 (BIO), X110-Input 2, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.Ind3.stVal	-	X110 (BIO), X110-Input 3, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.Ind4.stVal	-	X110 (BIO), X110-Input 4, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.Ind5.stVal	-	X110 (BIO), X110-Input 5, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.Ind6.stVal	-	X110 (BIO), X110-Input 6, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.Ind7.stVal	-	X110 (BIO), X110-Input 7, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.Ind8.stVal	-	X110 (BIO), X110-Input 8, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.SPCSO1.stVal	-	X110 (BIO), X110-Output 1, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.SPCSO2.stVal	-	X110 (BIO), X110-Output 2, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.SPCSO3.stVal	-	X110 (BIO), X110-Output 3, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.SPCSO4.stVal	-	X110 (BIO), X110-Output 4, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.Ind1.stVal	-	X130 (BIO), X130-Input 1, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.Ind2.stVal	-	X130 (BIO), X130-Input 2, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.Ind3.stVal	-	X130 (BIO), X130-Input 3, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.Ind4.stVal	-	X130 (BIO), X130-Input 4, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.Ind5.stVal	-	X130 (BIO), X130-Input 5, stVal	1 = ON, 0 = OFF

Table continues on next page

Section 2 DNP3 data mappings

IEC61850 name	AFL-Common SA name	IEC61850 LN desc, DO desc, DA name	Value
LD0.XGGIO130.Ind6.stVal	-	X130 (BIO), X130-Input 6, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.SPCSO1.stVal	-	X130 (BIO), X130-Output 1, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.SPCSO2.stVal	-	X130 (BIO), X130-Output 2, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.SPCSO3.stVal	-	X130 (BIO), X130-Output 3, stVal	1 = ON, 0 = OFF
		XRGGIO1 alarm/warning	
LD0.XRGGIO130.Alm.stVal	-	XRGGIO1, Alarm, stVal	1 = Alarm
LD0.XRGGIO130.Wrn.stVal	-	XRGGIO1, Warning, stVal	1 = Warning

Table 3: Binary outputs

IEC61850 name	AFL-Common SA name	IEC61850 LN desc, DO desc, DA name
Circuit breaker control		
CTRL.CBCSWI1.Pos.Oper.ctiVal	-	CBXCBR1_CB control
Reset current max. demand values		
LD0.CMSTA1.RecRs.Oper.ctiVal	-	CMMXU1.Reset CMMXU1 max.demands
LD0.CMSTA2.RecRs.Oper.ctiVal	-	CMMXU2.Reset CMMXU2 max.demands
Active parameter setting group control		
LD0.DNPGGIO1.ActSG1.ctiVal	-	Active parameter setting group 1
LD0.DNPGGIO1.ActSG2.ctiVal	-	Active parameter setting group 2
LD0.DNPGGIO1.ActSG3.ctiVal	-	Active parameter setting group 3
LD0.DNPGGIO1.ActSG4.ctiVal	-	Active parameter setting group 4
LD0.DNPGGIO1.ActSG5.ctiVal	-	Active parameter setting group 5
LD0.DNPGGIO1.ActSG6.ctiVal	-	Active parameter setting group 6
Clear Indications and LEDs		
LD0.LLN0.LEDRs1.Oper.ctiVal	-	General, Reset Indications and LEDs
LD0.LLN0.LEDRs2.Oper.ctiVal	-	General, Reset Alarm
LD0.LLN0.RecRs.Oper.ctiVal	-	General, Reset All data
LD0.LPHD1.RsDev.Oper.ctiVal	-	Physical device, Reset device
Disturbance recorder, clear memory and trig recording		
DR.RDRE1.MemClr.Oper.ctiVal	-	Disturbance recorder, Clear memory
LD0.RDRE1.RcdTrig.Oper.ctiVal	-	Disturbance recorder, Trig recording
SRGAPC1, flip-flop reset control (all variants)		
LD0.SRGAPC1.Rs1.ctiVal	-	Reset SRGAPC1 flip-flop 1
LD0.SRGAPC1.Rs2.ctiVal	-	Reset SRGAPC1 flip-flop 2
LD0.SRGAPC1.Rs3.ctiVal	-	Reset SRGAPC1 flip-flop 3
LD0.SRGAPC1.Rs4.ctiVal	-	Reset SRGAPC1 flip-flop 4
LD0.SRGAPC1.Rs5.ctiVal	-	Reset SRGAPC1 flip-flop 5
LD0.SRGAPC1.Rs6.ctiVal	-	Reset SRGAPC1 flip-flop 6
LD0.SRGAPC1.Rs7.ctiVal	-	Reset SRGAPC1 flip-flop 7
LD0.SRGAPC1.Rs8.ctiVal	-	Reset SRGAPC1 flip-flop 8
Reset signals of circuit breaker condition monitoring		
LD0.SSCBR1.RsAccAPwr.Oper.ctiVal	SSCBR1.RST_IPOW	SSCBR1, Reset accumulation energy
LD0.SSCBR1.RsCBWear.Oper.ctiVal	SSCBR1.RST_CB_WEAR	SSCBR1, Reset CB remaining life and operation counter
LD0.SSCBR1.RsSprChatIm.Oper.ctiVal	SSCBR1.RST_SPR_T	SSCBR1, Spring charge time alarm
LD0.SSCBR1.RsTrvIm.Oper.ctiVal	SSCBR1.RST_TRV_T	SSCBR1, Travel time alarm

Table 4: Analog inputs

IEC61850 name	AFL-Common SA name	Description	Scaling function	Argument 1 (min value)	Argument 2 (max value)	Argument 3	Argument 4
CB position							
CTRL.CBCSW1H.Pos.stVal	CBXCBR1.POSITION	CBXCBR1_Switch_general_stVal	Ratio	0	3	0	3
Phase current measurements (HV-side)							
LD0.CMMXU1.A.phsA.instCVal.mag.f	CMMXU1.I_INST_A	Phase currents, phsA.instCVal.mag.f	Ratio	0	40	0	4000
LD0.CMMXU1.A.phsB.instCVal.mag.f	CMMXU1.I_INST_B	Phase currents, phsB.instCVal.mag.f	Ratio	0	40	0	4000
LD0.CMMXU1.A.phsC.instCVal.mag.f	CMMXU1.I_INST_C	Phase currents, phsC.instCVal.mag.f	Ratio	0	40	0	4000
Phase current measurements (LV side)							
LD0.CMMXU2.A.phsA.instCVal.mag.f	CMMXU2.I_INST_A	Phase currents, phsA.instCVal.mag.f	Ratio	0	40	0	4000
LD0.CMMXU2.A.phsB.instCVal.mag.f	CMMXU2.I_INST_B	Phase currents, phsB.instCVal.mag.f	Ratio	0	40	0	4000
LD0.CMMXU2.A.phsC.instCVal.mag.f	CMMXU2.I_INST_C	Phase currents, phsC.instCVal.mag.f	Ratio	0	40	0	4000
Local remote							
CTRL.LLN0.LocRem.stVal	-	LR state monitoring	Ratio	0	4	0	4
Sequence of current measurements (HV side)							
LD0.CSMSQ1.SeqA.c1.instCVal.mag.f	CMSQ1.I1_INST	Positive Sequence Current, c1.instCVal.mag.f	Ratio	0	40	0	4000
LD0.CSMSQ1.SeqA.c2.instCVal.mag.f	CMSQ1.I2_INST	Negative Sequence Current, c2.instCVal.mag.f	Ratio	0	40	0	4000
LD0.CSMSQ1.SeqA.c3.instCVal.mag.f	CMSQ1.I3_INST	Zero Sequence Current, c3.instCVal.mag.f	Ratio	0	40	0	4000
Disconnecter positions							
CTRL.DCSXSW1.Pos.stVal	DCSXS1W1.POSITION	Disconnecter 1 position (4-pole), stVal	Ratio	0	3	0	3
CTRL.DCSXSW2.Pos.stVal	DCSXS2W2.POSITION	Disconnecter 2 position (4-pole), stVal	Ratio	0	3	0	3
CTRL.DCSXSW3.Pos.stVal	DCSXS3W3.POSITION	Disconnecter 3 position (4-pole), stVal	Ratio	0	3	0	3
CTRL.ESSXSW1.Pos.stVal	ESSXS1W1.POSITION	Earth switch position (4-pole), stVal	Ratio	0	3	0	3
Device diagnostics							
LD0.LPHD1.NumCmpChg.stVal	-	Number of composition changes, stVal	Ratio	0	65535	0	65535
LD0.LPHD1.NumPwrUp.stVal	-	Number of Power ups, stVal	Ratio	0	65535	0	65535
LD0.LPHD1.PhyHealth1.stVal	-	Latest Warning code, stVal	Ratio	0	65535	0	65535
LD0.LPHD1.PhyHealth2.stVal	-	Latest Fault code, stVal	Ratio	0	65535	0	65535
LD0.LPHD1.WacTrg.stVal	-	Number of watchdog device resets detected, stVal	Ratio	0	65535	0	65535
LD0.LPHD1.WrmStr.stVal	-	Number of Warm starts, stVal	Ratio	0	65535	0	65535
Power measurement and accumulated power values							
LD0.PEIMMTR1.DmdVArh.actVal	PEIMMXU1.ER_RV_ACM	Forward reactive energy	Ratio	0	999999999	0	999999999
LD0.PEIMMTR1.DmdWh.actVal	PEIMMXU1.EA_RV_ACM	Forward active energy	Ratio	0	999999999	0	999999999
LD0.PEIMMTR1.SupVArh.actVal	PEIMMXU1.ER_FWD_ACM	Reverse reactive energy	Ratio	0	999999999	0	999999999
LD0.PEIMMTR1.SupWh.actVal	PEIMMXU1.EA_FWD_ACM	Reverse active energy	Ratio	0	999999999	0	999999999
LD0.PEIMMXU1.ToPF.instMag.f	PEIMMXU1.PF_INST	Average power factor (Total PF)	Ratio	-1	1	-100	100
LD0.PEIMMXU1.ToTW.instMag.f	PEIMMXU1.P_INST	Total active power (Total P)	Ratio	0	999999	0	999999
LD0.PEIMMXU1.ToVA.instMag.f	PEIMMXU1.S_INST	Total apparent power (Total S)	Ratio	0	999999	0	999999
LD0.PEIMMXU1.ToVAr.instMag.f	PEIMMXU1.Q_INST	Total reactive power (Total Q)	Ratio	0	999999	0	999999

Table continues on next page

IEC61850 name	AFL-Common SA name	Description	Scaling function	Argument 1 (min value)	Argument 2 (max value)	Argument 3	Argument 4
		Disturbance recorder diagnostic					
DR.RDRE1.FitNum.stVal	-	Disturbance recorder, Number of recordings, stVal	Ratio	0	65535	0	65535
DR.RDRE1.MemUsed.stVal	-	Disturbance recorder, Rec. memory used, stVal	Ratio	0	100	0	100
		Residual current measurement (HV side), variants TE01, TE03					
LD0.RESCMMXU1.A.res.instCVal.mag.f	RESCMMXU1.I0_INST	Residual current, res.instCVal.mag.f	Ratio	0	40	0	4000
		Residual current measurement (LV side), variants TE02, TE04					
LD0.RESCMMXU2.A.res.instCVal.mag.f	RESCMMXU2.I0_INST	Residual current, res.instCVal.mag.f	Ratio	0	40	0	4000
		Residual voltage measurement					
LD0.RESVMMXU1.PhV.res.instCVal.mag.f	-	Residual voltage	Ratio	0	4	0	400
		Circuit-breaker condition monitoring values					
LD0.SSCBR1.OpCntr.stVal	SSCBR1.NO_OPR	Number of CB operation cycle	Ratio	0	99999	0	99999
		Thermal protection values (HV side)					
LD0.T2PTR1.Tmp.mag.f	T2PTR1.TEMP	T1PTR2, Temperature	Ratio	-100	9999.9	-1000	99999
LD0.T2PTR1.TmpRl.mag.f	T2PTR1.TEMP_RL	T1PTR2, Relative temperature	Ratio	0	99.9	0	999
		Tap changer position value					
LD0.TPOSSLTC1.TapPos.valWTr.posVal	TPOSSLTC1.TAP_POS	Tap changer position, valWTr.posVal	Ratio	-64	63	-64	63
		Voltage measurement phase-to-ground and phase-to-phase values					
LD0.VMMXU1.PhV.phsA.cVal.mag.f	-	Phase to ground voltage A	Ratio	0	4	0	400
LD0.VMMXU1.PhV.phsB.cVal.mag.f	-	Phase to ground voltage B	Ratio	0	4	0	400
LD0.VMMXU1.PhV.phsC.cVal.mag.f	-	Phase to ground voltage C	Ratio	0	4	0	400
LD0.VMMXU1.PPV.phsAB.instCVal.mag.f	-	Phase to phase voltage AB	Ratio	0	4	0	400
LD0.VMMXU1.PPV.phsBC.instCVal.mag.f	-	Phase to phase voltage BC	Ratio	0	4	0	400
LD0.VMMXU1.PPV.phsCA.instCVal.mag.f	-	Phase to phase voltage CA	Ratio	0	4	0	400
		Sequence of voltage measurement values					
LD0.VSMSQI1.SeqV.c1.instCVal.mag.f	-	Positive Sequence Voltage	Ratio	0	4	0	400
LD0.VSMSQI1.SeqV.c2.instCVal.mag.f	-	Negative Sequence Voltage	Ratio	0	4	0	400
LD0.VSMSQI1.SeqV.c3.instCVal.mag.f	-	Zero Sequence Voltage	Ratio	0	4	0	400
		RTD inputs					
LD0.XRGGIO130.AnIn1.instMag	-	XRGGIO130, RTD input 1, instMag	Ratio	-10000	10000	-10000	10000
LD0.XRGGIO130.AnIn2.instMag	-	XRGGIO130, RTD input 2, instMag	Ratio	-10000	10000	-10000	10000
LD0.XRGGIO130.AnIn3.instMag	-	XRGGIO130, RTD input 3, instMag	Ratio	-10000	10000	-10000	10000
LD0.XRGGIO130.AnIn4.instMag	-	XRGGIO130, RTD input 4, instMag	Ratio	-10000	10000	-10000	10000
LD0.XRGGIO130.AnIn5.instMag	-	XRGGIO130, RTD input 5, instMag	Ratio	-10000	10000	-10000	10000
LD0.XRGGIO130.AnIn6.instMag	-	XRGGIO130, RTD input 6, instMag	Ratio	-10000	10000	-10000	10000
LD0.XRGGIO130.AnIn7.instMag	-	XRGGIO130, RTD input 7, instMag	Ratio	-10000	10000	-10000	10000
LD0.XRGGIO130.AnIn8.instMag	-	XRGGIO130, RTD input 8, instMag	Ratio	-10000	10000	-10000	10000

Section 3 DNP3 protocol implementation

3.1 DNP3 device profile

The following table provides a device profile document in the standard format defined in the DNP3 Subset Definitions Document. In the DNP3 Subset Definitions Document it is referred to as a document, although it is in fact a table and only a component of a total interoperability guide. The table, in combination with the Implementation table and the point list tables, provides a complete configuration/interoperability guide for communicating with a device.

Table 5: *Device profile document*

DNP3 device profile document	
Vendor name:	ABB Oy
Device name:	RET615
Highest DNP level supported: For requests: Level 2+ For responses: Level 2+	Device function: <ul style="list-style-type: none"> <input type="radio"/> Master <input checked="" type="radio"/> Slave
Notable objects, functions, and/or qualifiers supported in addition to the highest DNP levels supported (the complete list is described in the attached table): For static (non-change-event) object requests, request qualifier codes 07 and 08 (limited quantity), and 17 and 28 (index) are supported. Static object requests sent with qualifiers 07, or 08, will be responded with qualifiers 00 or 01. 16-bit and 32-bit Analog Change Events with Time may be requested.	
Maximum data link frame size (octets): Transmitted: 292 Received: 292	Maximum application fragment size (octets): Transmitted: Configurable (256...2048) Received: 2048
Maximum data link re-tries: <ul style="list-style-type: none"> <input type="radio"/> None <input type="radio"/> Fixed <input checked="" type="radio"/> Configurable (0..65535) 	Maximum application layer re-tries: <ul style="list-style-type: none"> <input checked="" type="radio"/> None <input type="radio"/> Configurable
Requires data link layer confirmation: <ul style="list-style-type: none"> <input type="radio"/> Never <input type="radio"/> Always <input type="radio"/> Sometimes <input checked="" type="radio"/> Configurable as: "Never", "Only for multi-frame messages", or "Always" 	
Requires application layer confirmation: <ul style="list-style-type: none"> <input type="radio"/> Never <input type="radio"/> Always <input type="radio"/> When reporting event data (slave devices only) <input type="radio"/> When sending multi-fragment responses (slave devices only) 	
Table continues on next page	

DNP3 device profile document						
	○	Sometimes				
	●	Configurable as: "Only when reporting event data", or "When reporting event data or multi-fragment messages"				
Timeouts while waiting for:						
Data link confirm:	○	None	○	Fixed at ____	○	Variable
					●	Configurable
Complete appl. fragment:	●	None	○	Fixed at ____	○	Variable
					○	Configurable
Application confirm:	○	None	○	Fixed at ____	○	Variable
					●	Configurable
Complete appl. response:	●	None	○	Fixed at ____	○	Variable
					○	Configurable
Others:	Select/Operate Arm timeout, configurable in DNP setting parameters. Regardless of the select timeout in the HMI. Need time interval, configurable Unsolicited notification delay, configurable Unsolicited response retry delay, configurable Unsolicited offline Interval, configurable					
Sends/Executes Control Operations:						
WRITE binary outputs	●	Never	○	Always	○	Sometimes
					○	Configurable
SELECT/OPERATE	○	Never	○	Always	○	Sometimes
					●	Configurable
DIRECT OPERATE	○	Never	○	Always	○	Sometimes
					●	Configurable
DIRECT OPERATE - NO ACK	○	Never	○	Always	○	Sometimes
					●	Configurable
Count > 1 (Count > 1 is accepted but ignored)	●	Never	○	Always	○	Sometimes
					○	Configurable
Pulse on	●	Never	○	Always	○	Sometimes
					○	Configurable
Pulse off	●	Never	○	Always	○	Sometimes
					○	Configurable
Latch on	○	Never	●	Always	○	Sometimes
					○	Configurable
Latch off	○	Never	●	Always	○	Sometimes
					○	Configurable
Queue	●	Never	○	Always	○	Sometimes
					○	Configurable
Clear queue	●	Never	○	Always	○	Sometimes
					○	Configurable
The circuit breaker control model is configurable for either direct or SBO mode in the circuit breaker settings. If the operation mode does not match the CROB, the returned CROB status is hardware error (4). All other control points may be controlled by either direct or SBO controls.						
Reports binary input change events when no specific variation requested:			Reports time-tagged binary input change events when no specific variation requested:			
	○	Never		○	Never	
	○	Only when time-tagged		○	Binary input change with time	
	○	Only non-time-tagged		○	Binary input change with relative time	
	●	Configurable to send one or the other		●	Configurable	
Sends unsolicited responses:			Sends static data in unsolicited responses:			
	●	Never		●	Never	
Table continues on next page						

DNP3 device profile document																						
<ul style="list-style-type: none"> ○ Configurable ○ Only certain objects ○ Sometimes (attach explanation) ○ ENABLE/DISABLE UNSOLICITED function codes supported 	<ul style="list-style-type: none"> ○ When device restarts ○ When status flags change <p>No other options are permitted.</p>																					
<p>Default counter object/variation:</p> <ul style="list-style-type: none"> ● No counters reported ○ Configurable ○ Default object <p>Default variation:</p> <ul style="list-style-type: none"> ○ Point-by-point list attached 	<p>Counters roll over at:</p> <ul style="list-style-type: none"> ● No counters reported ○ Configurable (attach explanation) ○ 16 bits ○ 32 bits ○ Other value: _____ ○ Point-by-point list attached 																					
<p>Sends multi-fragment responses:</p> <ul style="list-style-type: none"> ● Yes ○ No ○ Configurable 																						
<p>Sequential file transfer support:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Append file mode</td> <td style="width: 10%; text-align: center;">○ Yes</td> <td style="width: 10%; text-align: center;">● No</td> </tr> <tr> <td>Custom status code strings</td> <td style="text-align: center;">○ Yes</td> <td style="text-align: center;">● No</td> </tr> <tr> <td>Permissions field</td> <td style="text-align: center;">○ Yes</td> <td style="text-align: center;">● No</td> </tr> <tr> <td>File events assigned to class</td> <td style="text-align: center;">○ Yes</td> <td style="text-align: center;">● No</td> </tr> <tr> <td>File events send immediately</td> <td style="text-align: center;">○ Yes</td> <td style="text-align: center;">● No</td> </tr> <tr> <td>Multiple blocks in a fragment</td> <td style="text-align: center;">○ Yes</td> <td style="text-align: center;">● No</td> </tr> <tr> <td>Max number of files open</td> <td style="text-align: center;">0</td> <td></td> </tr> </table>		Append file mode	○ Yes	● No	Custom status code strings	○ Yes	● No	Permissions field	○ Yes	● No	File events assigned to class	○ Yes	● No	File events send immediately	○ Yes	● No	Multiple blocks in a fragment	○ Yes	● No	Max number of files open	0	
Append file mode	○ Yes	● No																				
Custom status code strings	○ Yes	● No																				
Permissions field	○ Yes	● No																				
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File events send immediately	○ Yes	● No																				
Multiple blocks in a fragment	○ Yes	● No																				
Max number of files open	0																					
<p>● = Selected, ○ = Not selected</p>																						

3.2 DNP3 implementation table

The following table identifies which object variations, function codes and qualifiers the IED supports in both request messages and response messages. For static (non-change-event) objects, requests sent with qualifiers 00, 01, 06, 07 or 08 are responded with qualifiers 00 or 01. Requests sent with qualifiers 17 or 28 are responded with qualifiers 17 or 28. For change-event objects, qualifiers 17 or 28 are always responded.

Section 3 DNP3 protocol implementation

Table 6: Implementation table

OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
Object number	Variation number	Description	Function codes (dec)	Qualifier codes (hex)	Function codes (dec)	Qualifier codes (hex)
1	0	Binary input – any variation	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 28 (index)		
1	1 (default) ¹⁾	Binary input	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) ²⁾
1	2	Binary input with status	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) ²⁾
2	0	Binary input change – any variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
2	1	Binary input change without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
2	2 ¹⁾	Binary input change with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
2	3	Binary input change with relative time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
10	0	Binary output status – any variation	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 28 (index)		
10	1	Binary output	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) ²⁾
12	1	Control relay output block	3 (select) 4 (operate) 5 (direct op) 6 (dir. op, noack)	17, 28 (index)	129 (response)	echo of request
30	0	Analog input - any variation	1 (read) 22 (assign class)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 28 (index)		
30	1	32-bit analog input	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) ²⁾

Table continues on next page

OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
30	2 (default) ¹⁾	16-bit analog input	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) ²⁾
30	3	32-bit analog input without flag	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) ²⁾
30	4	16-bit analog input without flag	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07, 08 (limited qty) 17, 28 (index)	129 (response)	00, 01 (start-stop) 17, 28 (index) ²⁾
32	0	Analog change event – any variation	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
32	1	32-bit analog change event without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	2	16-bit analog change event without time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	3	32-bit analog change event with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
32	4 (default) ¹⁾	16-bit analog change event with time	1 (read)	06 (no range, or all) 07, 08 (limited qty)	129 (response) 130 (unsol. resp)	17, 28 (index)
50	0	Time and date				
50	1 (default) ¹⁾	Time and date	1 (read)	00, 01 (start-stop) 06 (no range, or all) 07 (limited qty = 1) 08 (limited qty)	129 (response)	00, 01 (start-stop) 17, 28 (index) ²⁾
			2 (write)	07 (limited qty = 1)		
50	3	Time and date last recorded time	2 (write)	07 (limited qty)		
51	1	Time and date CTO			129 (response) 130 (unsol. resp)	07 (limited qty) (qty = 1)
51	2	Unsynchronized time and date CTO			129 (response) 130 (unsol. resp)	07 (limited qty) (qty = 1)

Table continues on next page

Section 3 DNP3 protocol implementation

OBJECT			REQUEST (Library will parse)		RESPONSE (Library will respond with)	
52	2	Time delay fine			129 (response)	07 (limited qty) (qty = 1)
60	0	Not defined				
60	1	Class 0 data	1 (read)	06 (no range, or all)		
60	2	Class 1 data	1 (read)	06 (no range, or all)		
			20 (enbl. unsol.) 21 (dab. unsol.) 22 (assign class)	07, 08 (limited qty) 06 (no range, or all)		
60	3	Class 2 data	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
			20 (enbl. unsol.) 21 (dab. unsol.) 22 (assign class)	06 (no range, or all)		
60	4	Class 3 data	1 (read)	06 (no range, or all) 07, 08 (limited qty)		
			20 (enbl. unsol.) 21 (dab. unsol.) 22 (assign class)	06 (no range, or all)		
80	1	Internal indications	1 (read)	00, 01 (start-stop)		
			2 (write) ³⁾	00 (start-stop) index=7		
No object (function code only)			13 (cold restart)		4)	
No object (function code only)			14 (warm restart)		4)	
No object (function code only)			23 (delay meas.)			
No object (function code only)			24 (record current time)			

- 1) A default variation refers to the variation responded when variation 0 is requested and/or in class 0, 1, 2, or 3 scans. Default variations are configurable; however, default settings for the configuration parameters are indicated in the table above.
- 2) For static (non-change-event) objects, qualifiers 17 or 28 are only responded when a request is sent with qualifiers 17 or 28, respectively. Otherwise, static object requests sent with qualifiers 00, 01, 06, 07, or 08, will be responded with qualifiers 00 or 01. (For change-event objects, qualifiers 17 or 28 are always responded.)
- 3) Writes of internal indications are only supported for index 7 (Restart IIN1-7)
- 4) Cold and warm restarts return an application layer acknowledge, but no restart action is taken.

Section 4 Glossary

AFL	Application function block library
CB	Circuit breaker
CROB	Control relay output block
CTO	Common time of occurrence. The time and date CTO object is an information object that represents the absolute time of day.
DA	Data attribute
DNP3	A distributed network protocol originally developed by Westronic. The DNP3 Users Group has the ownership of the protocol and assumes responsibility for its evolution.
DO	Data object
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
LN	Logical node
LV	Low voltage
PCM600	Protection and Control IED Manager
SBO	Select-before-operate

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