



Relion® 615 series

Feeder Protection and Control REF615 DNP3 Point List Manual



Document ID: 1MRS756711
Issued: 2010-06-11
Revision: C
Product version: 3.0

© Copyright 2010 ABB. All rights reserved

Copyright

This document and parts thereof must not be reproduced or copied without written permission from ABB, and the contents thereof must not be imparted to a third party, nor used for any unauthorized purpose.

The software or hardware described in this document is furnished under a license and may be used, copied, or disclosed only in accordance with the terms of such license.

Trademarks

ABB and Relion are registered trademarks of ABB Group. All other brand or product names mentioned in this document may be trademarks or registered trademarks of their respective holders.

Warranty

Please inquire about the terms of warranty from your nearest ABB representative.

ABB Oy

Distribution Automation

P.O. Box 699

FI-65101 Vaasa, Finland

Telephone: +358 10 2211

Facsimile: +358 10 22 41094

<http://www.abb.com/substationautomation>

Disclaimer

The data, examples and diagrams in this manual are included solely for the concept or product description and are not to be deemed as a statement of guaranteed properties. All persons responsible for applying the equipment addressed in this manual must satisfy themselves that each intended application is suitable and acceptable, including that any applicable safety or other operational requirements are complied with. In particular, any risks in applications where a system failure and/or product failure would create a risk for harm to property or persons (including but not limited to personal injuries or death) shall be the sole responsibility of the person or entity applying the equipment, and those so responsible are hereby requested to ensure that all measures are taken to exclude or mitigate such risks.

This document has been carefully checked by ABB but deviations cannot be completely ruled out. In case any errors are detected, the reader is kindly requested to notify the manufacturer. Other than under explicit contractual commitments, in no event shall ABB be responsible or liable for any loss or damage resulting from the use of this manual or the application of the equipment.

Conformity

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.

Table of contents

Section 1	Introduction.....	3
	This manual.....	3
	Intended audience.....	3
	Product documentation.....	4
	Product documentation set.....	4
	Document revision history.....	5
	Related documentation.....	6
	Symbols and conventions.....	6
	Safety indication symbols.....	6
	Manual conventions.....	6
	Functions, codes and symbols.....	7
Section 2	DNP3 data mappings.....	11
	Overview.....	11
	Point list for REF615 Ver.3.0 FE01-08.....	12
Section 3	DNP3 protocol implementation.....	25
	DNP3 device profile.....	25
	DNP3 implementation table.....	27
Section 4	Glossary.....	31

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

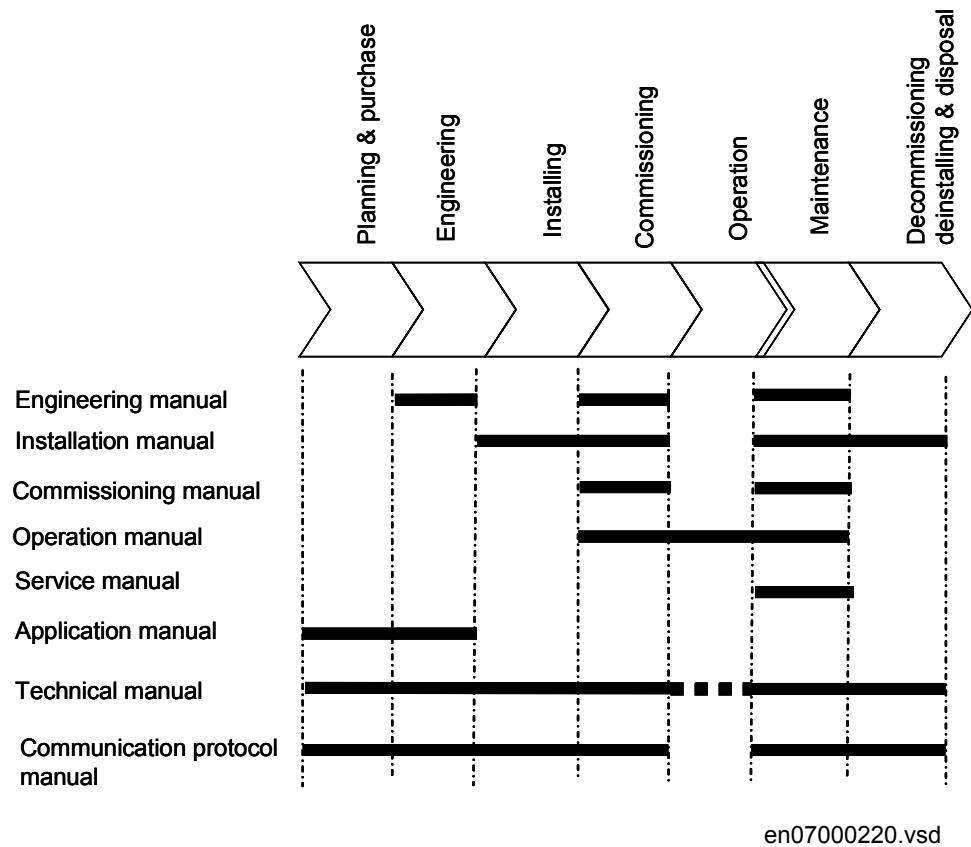


Figure 1: The intended use of manuals in different lifecycles

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/2009-03-04	2.0	First release
B/2009-07-03	2.0	Content updated
C/2010-06-11	3.0	Content updated to correspond to the product version



Download the latest documents from the ABB web site <http://www.abb.com/substationautomation>.

1.3.3 Related documentation

Name of the document	Document ID
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: REF615 Functions, codes and symbols

Function	IEC 61850	IEC 60617	IEC-ANSI
Protection			
Three-phase non-directional overcurrent protection, low stage, instance 1	PHLPTOC1	3I> (1)	51P-1 (1)
Three-phase non-directional overcurrent protection, high stage, instance 1	PHHPTOC1	3I>> (1)	51P-2 (1)
Three-phase non-directional overcurrent protection, high stage, instance 2	PHHPTOC2	3I>> (2)	51P-2 (2)
Three-phase non-directional overcurrent protection, instantaneous stage, instance 1	PHIPTOC1	3I>>> (1)	50P/51P (1)
Three-phase directional overcurrent protection, low stage, instance 1	DPHLPDOC1	3I> -> (1)	67-1 (1)
Three-phase directional overcurrent protection, low stage, instance 2	DPHLPDOC2	3I> -> (2)	67-1 (2)
Three-phase directional overcurrent protection, high stage	DPHHPDOC1	3I>> ->	67-2
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, instantaneous stage	EFIPTOC1	Io>>>	50N/51N
Directional earth-fault protection, low stage, instance 1	DEFLPDEF1	Io> -> (1)	67N-1 (1)
Directional earth-fault protection, low stage, instance 2	DEFLPDEF2	Io> -> (2)	67N-1 (2)
Directional earth-fault protection, high stage	DEFHPDEF1	Io>> ->	67N-2
Admittance based earth-fault protection, instance 1	EFPADM1	Yo> -> (1)	21YN (1)
Admittance based earth-fault protection, instance 2	EFPADM2	Yo> -> (2)	21YN (2)
Admittance based earth-fault protection, instance 3	EFPADM3	Yo> -> (3)	21YN (3)
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Transient / intermittent earth-fault protection	INTRPTEF1	lo> -> IEF	67NIEF
Non-directional (cross-country) earth fault protection, using calculated lo	EFHPTOC1	lo>> (1)	51N-2 (1)
Negative-sequence overcurrent protection, instance 1	NSPTOC1	I2> (1)	46 (1)
Negative-sequence overcurrent protection, instance 2	NSPTOC2	I2> (2)	46 (2)
Phase discontinuity protection	PDNSPTOC1	I2/I1>	46PD
Residual overvoltage protection, instance 1	ROVPTOV1	Uo> (1)	59G (1)
Residual overvoltage protection, instance 2	ROVPTOV2	Uo> (2)	59G (2)
Residual overvoltage protection, instance 3	ROVPTOV3	Uo> (3)	59G (3)
Three-phase undervoltage protection, instance 1	PHPTUV1	3U< (1)	27 (1)
Three-phase undervoltage protection, instance 2	PHPTUV2	3U< (2)	27 (2)
Three-phase undervoltage protection, instance 3	PHPTUV3	3U< (3)	27 (3)
Three-phase overvoltage protection, instance 1	PHPTOV1	3U> (1)	59 (1)
Three-phase overvoltage protection, instance 2	PHPTOV2	3U> (2)	59 (2)
Three-phase overvoltage protection, instance 3	PHPTOV3	3U> (3)	59 (3)
Positive-sequence undervoltage protection, instance 1	PSPTUV1	U1< (1)	47U+ (1)
Negative-sequence overvoltage protection, instance 1	NSPTOV1	U2> (1)	47O- (1)
Frequency protection, instance 1	FRPFRQ1	f>/f<,df/dt (1)	81 (1)
Frequency protection, instance 2	FRPFRQ2	f>/f<,df/dt (2)	81 (2)
Frequency protection, instance 3	FRPFRQ3	f>/f<,df/dt (3)	81 (3)
Three-phase thermal protection for feeders, cables and distribution transformers	T1PTTR1	3lth>F	49F
Circuit breaker failure protection	CCBRBRF1	3I>/lo>BF	51BF/51NBF
Three-phase inrush detector	INRPHAR1	3I2f>	68
Master trip, instance 1	TRPPTRC1	Master Trip (1)	94/86 (1)
Master trip, instance 2	TRPPTRC2	Master Trip (2)	94/86 (2)
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)
Control			
Circuit-breaker control	CBXCBR1	I <-> O CB	I <-> O CB
Table continues on next page			

Function	IEC 61850	IEC 60617	IEC-ANSI
Disconnecter position indication, instance 1	DCSXSW1	I <-> O DC (1)	I <-> O DC (1)
Disconnecter position indication, instance 2	DCSXSW2	I <-> O DC (2)	I <-> O DC (2)
Disconnecter position indication, instance 3	DCSXSW3	I <-> O DC (3)	I <-> O DC (3)
Earthing switch indication	ESSXSW1	I <-> O ES	I <-> O ES
Auto-reclosing	DARREC1	O -> I	79
Synchronism and energizing check	SECRSYN1	SYNC	25
Condition monitoring			
Circuit-breaker condition monitoring	SSCBR1	CBCM	CBCM
Trip circuit supervision, instance 1	TCSSCBR1	TCS (1)	TCM (1)
Trip circuit supervision, instance 2	TCSSCBR2	TCS (2)	TCM (2)
Current circuit supervision	CCRDI1	MCS 3I	MCS 3I
Fuse failure supervision	SEQRFUF1	FUSEF	60
Measurement			
Disturbance recorder	RDRE1	-	-
Three-phase current measurement, instance 1	CMMXU1	3I	3I
Sequence current measurement	CSMSQ1	I1, I2, I0	I1, I2, I0
Residual current measurement, instance 1	RESCMMXU1	Io	In
Three-phase voltage measurement	VMMXU1	3U	3U
Residual voltage measurement	RESVMMXU1	Uo	Vn
Sequence voltage measurement	VSMSQ1	U1, U2, U0	U1, U2, U0
Three-phase power and energy measurement, including power factor	PEMMXU1	P, E	P, E
Frequency measurement	FMMXU1	f	f

Section 2 DNP3 data mappings

2.1 Overview

This document describes the DNP3 data points and structures available in REF615 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 FE01, FE02, FE03, FE04, FE05, FE06, FE07 and FE08 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 REF615 Ver.3.0 FE01-08

Table 2: Binary inputs

IEC 61850 name	AFL-Common SA name	IEC 61850 LN desc, DO desc, DA name	Values
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.ARCSARC11.InRemFA.stVal	-	ARCSARC1, Remote 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.ARCSARC21.InRemFA.stVal	-	ARCSARC2, Remote 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
LD0.ARCSARC31.InRemFA.stVal	-	ARCSARC3, Remote fault arc detected, stVal	1 = Fault arc detected
Circuit breaker related signals (CB pos is found in AI)			
CTRL.CBCILO1.EnaCls.stVal	CBXCBR1.ENA_OPEN	CBXCBR1, ENA_CLOSE, stVal	1 = Close enabled
CTRL.CBCILO1.EnaOpn.stVal	CBXCBR1.ENA_CLOSE	CBXCBR1, ENA_OPEN, stVal	1 = Open enabled
CTRL.CBCSW1.Pos.stSeld	CBXCBR1.SELECTED	CBXCBR1, Switch, general, stSeld	1 = CB control selected
CTRL.CBXCBR1.BlkCls.stVal	CBXCBR1.BLK_CLOSE	CBXCBR1, Block closing, stVal	1 = Close blocked
CTRL.CBXCBR1.BlkOpn.stVal	CBXCBR1.BLK_OPEN	CBXCBR1, Block opening, stVal	1 = Open blocked
Circuit breaker failure protection			
CTRL.CCBBRBF1.InCBFit.stVal	-	CCBBRBF1, CB faulty and unable to trip, stVal	1 = CB faulty
CTRL.CCBBRBF1.InPosCls.stVal	-	CCBBRBF1, CB in closed position, stVal	1 = CB closed
CTRL.CCBBRBF1.InStr.stVal	-	CCBBRBF1, CBFP start command, stVal	1 = CBFP start
CTRL.CCBBRBF1.OpEx.general	CCBBRBF1.TRBUS	CCBBRBF1, Breaker failure trip (external trip), general	1 = Breaker failure trip
CTRL.CCBBRBF1.OpIn.general	CCBBRBF1.TRRET	CCBBRBF1, Operate, re-trip (internal trip), general	1 = Operate, re-trip
CTRL.CCBBRBF1.Str.general	CCBBRBF1.CB_FAULT_AL	CCBBRBF1, Start, timer running, general	1 = Start, timer running
Current circuit supervision			
CTRL.CCRDIF1.Alm.stVal	CCRDIF1.FAIL	CCRDIF1, Alarm, stVal	1 = Alarm
CTRL.CCRDIF1.Op.general	CCRDIF1.ALARM	CCRDIF1, Detection of current circuit failure, general	1 = Failure
Three-phase current limit supervision			
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
Autoreclosing signals			
LD0.DARREC1.ActRec.stVal	DAAREC1.ACTIVE	DARREC1, Active reclose status, stVal	1 = AR active
LD0.DARREC1.AROn.stVal	DARREC1.AR_ON	DARREC1, AR switched on, stVal	1 = AR switched ON
LD0.DARREC1.CBManCls.stVal	DARREC1.MAN_CB_CL	DARREC1, CB manually closed, stVal	1 = CB manually closed
LD0.DARREC1.FrqOpAlm.stVal	DARREC1.FRQ_OP_ALM	DARREC1, Frequent operation counter alarm, stVal	1 = Freq. operation alarm
LD0.DARREC1.InBlkThm.stVal	-	DARREC1, Thermal block (status), stVal	1 = Thermal block
LD0.DARREC1.InInhRec.stVal	-	DARREC1, Inhibit reclose (status), stVal	1 = Inhibit reclose

Table continues on next page

IEC 61850 name	AFL-Common SA name	IEC 61850 LN desc, DO desc, DA name	Values
LD0.DARREC1.LO.stVal	DARREC1.LOCKED	DARREC1, Lockout status, stVal	1 = Lockout status
LD0.DARREC1.Op.general	DARREC1.CLOSE_CB	DARREC1, Operate (close command to XCBR), general	1 = Operate, close CB
LD0.DARREC1.OpOpn.general	DARREC1.OPEN_CB	DARREC1, Operate (open command to XCBR), general	1 = Operate, open CB
LD0.DARREC1.PrgCutOut.stVal	DARREC1.CUTOUT_INPRO	DARREC1, Cutout time in progress, stVal	1 = Cutout time in progress
LD0.DARREC1.PrgDsr.stVal	DARREC1.DISCR_INPRO	DARREC1, Discrimination time in progress, stVal	1 = Discr time in progress
LD0.DARREC1.PrgRec.stVal	DARREC1.INPRO	DARREC1, In progress status, stVal	1 = AR in progress
LD0.DARREC1.PrgRec1.stVal	DARREC1.INPRO_1	DARREC1, In progress 1st reclose, stVal	1 = 1st reclose in progress
LD0.DARREC1.PrgRec2.stVal	DARREC1.INPRO_2	DARREC1, In progress 2nd reclose, stVal	1 = 2nd reclose in progress
LD0.DARREC1.PrgRec3.stVal	DARREC1.INPRO_3	DARREC1, In progress 3rd reclose, stVal	1 = 3rd reclose in progress
LD0.DARREC1.PrgRec4.stVal	DARREC1.INPRO_4	DARREC1, In progress 4th reclose, stVal	1 = 4th reclose in progress
LD0.DARREC1.PrgRec5.stVal	DARREC1.INPRO_5	DARREC1, In progress 5th reclose, stVal	1 = 5th reclose in progress
LD0.DARREC1.ProCrd.stVal	-	DARREC1, Protection coordination, stVal	1 = Prot coordination
LD0.DARREC1.ReClmStr.stVal	-	DARREC1, Reclaim time started, stVal	1 = Reclaim time started
LD0.DARREC1.RdyRec.stVal	DARREC1.READY	DARREC1, Ready reclose status, stVal	1 = Reclose ready
LD0.DARREC1.SucRec.stVal	DARREC1.SUC_RECL	DARREC1, Successful reclose status, stVal	1 = Successful reclose
LD0.DARREC1.UnsCBCls.stVal	DARREC1.UNSUC_CB	DARREC1, Unsuccessful CB closing status, stVal	1 = Unsuccessful CB closing
LD0.DARREC1.UnsRec.stVal	DARREC1.UNSUC_RECL	DARREC1, Unsuccessful reclose status, stVal	1 = Unsuccessful reclose
LD0.DARREC1.WMstr.stVal	DARREC1.CMD_WAIT	DARREC1, Master signal to follower, stVal	1 = Master signal to follower
Directional earth-fault protection			
LD0.DEFHPTOC1.Op.general	DEFHPTOC1.OPERATE	DEFHDEF1, Operate, general	1 = Operate
LD0.DEFHPTOC1.Str.general	DEFHPTOC1.START	DEFHDEF1, Start, general	1 = Start
LD0.DEFLPTOC1.Op.general	DEFLPTOC1.OPERATE	DEFLPDEF1, Operate, general	1 = Operate
LD0.DEFLPTOC1.Str.general	DEFLPTOC1.START	DEFLPDEF1, Start, general	1 = Start
LD0.DEFLPTOC2.Op.general	DEFLPTOC2.OPERATE	DEFLPDEF2, Operate, general	1 = Operate
LD0.DEFLPTOC2.Str.general	DEFLPTOC2.START	DEFLPDEF2, Start, general	1 = Start
LD0.DPHHPTOC1.Op.general	-	DPHPDOC1, Operate, general	1 = Operate
LD0.DPHHPTOC1.Str.general	-	DPHPDOC1, Start, general	1 = Start
Directional overcurrent protection			
LD0.DPHLPTOC1.Op.general	-	DPHLPDOC1, Operate, general	1 = Operate
LD0.DPHLPTOC1.Str.general	-	DPHLPDOC1, Start, general	1 = Start
LD0.DPHLPTOC2.Op.general	-	DPHLPDOC2, Operate, general	1 = Operate
LD0.DPHLPTOC2.Str.general	-	DPHLPDOC2, Start, general	1 = Start
Non-directional earth-fault and sensitive earth-fault protection			
LD0.EFHPTOC1.Op.general	EFHPTOC1.OPERATE	EFHPTOC1, Operate, general	1 = Operate
LD0.EFHPTOC1.Str.general	EFHPTOC1.START	EFHPTOC1, Start, general	1 = Start
LD0.EFIPTOC1.Op.general	EFIPTOC1.OPERATE	EFIPTOC1, Operate, general	1 = Operate
LD0.EFIPTOC1.Str.general	EFIPTOC1.START	EFIPTOC1, 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

Table continues on next page

IEC 61850 name	AFL-Common SA name	IEC 61850 LN desc, DO desc, DA name	Values
LD0.EFLPTOC2.Op.general	EFLPTOC2.OPERATE	EFLPTOC2, Operate, general	1 = Operate
LD0.EFLPTOC2.Str.general	EFLPTOC2.START	EFLPTOC2, Start, general	1 = Start
Admittance based earth-fault protection, 3 stages			
LD0.EFPADM1.Str.general	EFPADM1.START	EFPADM1, Stage1 start	1 = Start
LD0.EFPADM1.Op.general	EFPADM1.OPERATE	EFPADM1, Stage1 operate	1 = Operate
LD0.EFPADM2.Op.general	EFPADM2.OPERATE	EFPADM1, Stage2 operate	1 = Start
LD0.EFPADM2.Str.general	EFPADM2.START	EFPADM1, Stage2 start	1 = Operate
LD0.EFPADM3.Str.general	EFPADM3.START	EFPADM1, Stage3 start	1 = Start
LD0.EFPADM3.Op.general	EFPADM3.OPERATE	EFPADM1, Stage3 operate	1 = Operate
Frequency protection, 3 stages			
LD0.FRPFRC1.Str.general	FRPFRC1.START	FRPFRC1, Stage 1 start	1 = Start
LD0.FRPTOF1.Op.general	FRPTOF1.OPR_OFRQ	FRPFRC1, Operate 1 signal for overfrequency	1 = Operate
LD0.FRPTUF1.Op.general	FRPTUF1.OPR_UFRQ	FRPFRC1, Operate 1 signal for underfrequency	1 = Operate
LD0.FRPFRC1.Op.general	FRPFRC1.OPR_FRG	FRPFRC1, Operate 1 signal for frequency gradient	1 = Operate
LD0.FRPTRC2.Str.general	FRPTRC2.START	FRPFRC2, Stage 2 start	1 = Start
LD0.FRPTOF2.Op.general	FRPTOF2.OPR_OFRQ	FRPFRC2, Operate 2 signal for overfrequency	1 = Operate
LD0.FRPTUF2.Op.general	FRPTUF2.OPR_UFRQ	FRPFRC2, Operate 2 signal for underfrequency	1 = Operate
LD0.FRPFRC2.Op.general	FRPFRC2.OPR_FRG	FRPFRC2, Operate 2 signal for frequency gradient	1 = Operate
LD0.FRPTRC3.Str.general	FRPTRC3.START	FRPFRC3, Stage 3 start	1 = Start
LD0.FRPTOF3.Op.general	FRPTOF3.OPR_OFRQ	FRPFRC3, Operate 3 signal for overfrequency	1 = Operate
LD0.FRPTUF3.Op.general	FRPTUF3.OPR_UFRQ	FRPFRC3, Operate 3 signal for underfrequency	1 = Operate
LD0.FRPFRC3.Op.general	FRPFRC3.OPR_FRG	FRPFRC3, Operate 3 signal for frequency gradient	1 = Operate
Three-phase inrush detection			
LD0.INRP HAR1.Str.general	-	INRP HAR1, Start, general	1 = Start, general
LD0.INRP HAR1.Str.phsA	-	INRP HAR1, Start, phsA	1 = Start, phsA
LD0.INRP HAR1.Str.phsB	-	INRP HAR1, Start, phsB	1 = Start, phsB
LD0.INRP HAR1.Str.phsC	-	INRP HAR1, Start, phsC	1 = Start, phsC
Transient/intermittent earth-fault protection			
LD0.INTRPTEF1.Op.general	INTRPTEF1.OPERATE	INTRPTEF1, Operate, general	1 = Operate
LD0.INTRPTEF1.Str.general	INTRPTEF1.START	INTRPTEF1, Start, general	1 = Start
Alarm LED states			
LD0.LEDGGIO1.SPCSO1.stVal	-	Alarm LEDs, LED 1, stVal	1 = ON, 0 = OFF
LD0.LEDGGIO1.SPCSO2.stVal	-	Alarm LEDs, LED 2, stVal	1 = ON, 0 = OFF
LD0.LEDGGIO1.SPCSO3.stVal	-	Alarm LEDs, LED 3, stVal	1 = ON, 0 = OFF
LD0.LEDGGIO1.SPCSO4.stVal	-	Alarm LEDs, LED 4, stVal	1 = ON, 0 = OFF
LD0.LEDGGIO1.SPCSO5.stVal	-	Alarm LEDs, LED 5, stVal	1 = ON, 0 = OFF
LD0.LEDGGIO1.SPCSO6.stVal	-	Alarm LEDs, LED 6, stVal	1 = ON, 0 = OFF
LD0.LEDGGIO1.SPCSO7.stVal	-	Alarm LEDs, LED 7, stVal	1 = ON, 0 = OFF
LD0.LEDGGIO1.SPCSO8.stVal	-	Alarm LEDs, LED 8, stVal	1 = ON, 0 = OFF

Table continues on next page

IEC 61850 name	AFL-Common SA name	IEC 61850 LN desc, DO desc, DA name	Values
LD0.LEDGGIO1.SPCSO9.stVal	-	Alarm LEDs, LED 9, stVal	1 = ON, 0 = OFF
LD0.LEDGGIO1.SPCSO10.stVal	-	Alarm LEDs, LED 10, stVal	1 = ON, 0 = OFF
LD0.LEDGGIO1.SPCSO11.stVal	-	Alarm LEDs, LED 11, stVal	1 = ON, 0 = OFF
LD0.LEDPTRC1.Op.general	-	Global conditioning	
LD0.LEDPTRC1.Str.general	-	Global conditioning, Operate, general	1 = Operate
CTRL.LLN0.Loc.stVal	-	Local/remote (also present in IIN)	1 = Local
CTRL.LLN0.Loc1.stVal	-	Control LLN0, Local / remote, stVal	1 = Off
LD0.MVGAPC1.Q1.stVal	-	Multipurpose inputs (All variants)	
LD0.MVGAPC1.Q2.stVal	-	MVGAPC1, Input 1 [,stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q3.stVal	-	MVGAPC1, Input 2 [,stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q4.stVal	-	MVGAPC1, Input 3 [,stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q5.stVal	-	MVGAPC1, Input 4 [,stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q6.stVal	-	MVGAPC1, Input 5 [,stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q7.stVal	-	MVGAPC1, Input 6 [,stVal]	0 = Input OFF, 1 = Input ON
LD0.MVGAPC1.Q8.stVal	-	MVGAPC1, Input 7 [,stVal]	0 = Input OFF, 1 = Input ON
LD0.NSPTOC1.Op.general	NSPTOC1.OPERATE	Negative-sequence overcurrent protection	
LD0.NSPTOC1.Str.general	NSPTOC1.START	NSPTOC1, Operate, general	1 = Operate
LD0.NSPTOC2.Op.general	NSPTOC2.OPERATE	NSPTOC1, Start, general	1 = Start
LD0.NSPTOC2.Str.general	NSPTOC2.START	NSPTOC2, Operate, general	1 = Operate
LD0.NSPTOV1.Op.general	NSPTOV1.OPERATE	Negative-sequence overvoltage protection	
LD0.NSPTOV1.Str.general	NSPTOV1.START	NSPTOV1, Start, general	1 = Start
LD0.PDNSPTOC1.Op.general	PDNSPTOC1.OPERATE	Phase discontinuity protection	
LD0.PDNSPTOC1.Str.general	PDNSPTOC1.START	PDNSPTOC1, Start, general	1 = Start
LD0.PHHPTOC1.Op.general	PHHPTOC1.OPERATE	Phase overcurrent protection	
LD0.PHHPTOC1.Str.general	PHHPTOC1.START	PHHPTOC1, Operate, general	1 = Operate
LD0.PHHPTOC2.Op.general	PHHPTOC2.OPERATE	PHHPTOC1, Start, general	1 = Start
LD0.PHHPTOC2.Str.general	PHHPTOC2.START	PHHPTOC2, Operate, general	1 = Operate
LD0.PHIPTOC1.Op.general	PHIPTOC1.OPERATE	PHHPTOC2, Start, general	1 = Start
LD0.PHIPTOC1.Str.general	PHIPTOC1.START	PHIPTOC1, Operate, general	1 = Operate
LD0.PHLPTOC1.Op.general	PHLPTOC1.OPERATE	PHIPTOC1, Start, general	1 = Start
LD0.PHLPTOC1.Str.general	PHLPTOC1.START	PHLPTOC1, Operate, general	1 = Operate
		PHLPTOC1, Start, general	1 = Start

Table continues on next page

IEC 61850 name	AFL-Common SA name	IEC 61850 LN desc, DO desc, DA name	Values
LD0.PHPTOV1.Op.general	PHPTOV1.OPERATE	PHPTOV1, Operate, general	1 = Operate
LD0.PHPTOV1.Str.general	PHPTOV1.START	PHPTOV1, Start, general	1 = Start
LD0.PHPTOV2.Op.general	PHPTOV2.OPERATE	PHPTOV2, Operate, general	1 = Operate
LD0.PHPTOV2.Str.general	PHPTOV2.START	PHPTOV2, Start, general	1 = Start
LD0.PHPTOV3.Op.general	PHPTOV3.OPERATE	PHPTOV3, Operate, general	1 = Operate
LD0.PHPTOV3.Str.general	LD0.PHPTOV3.Str.general	PHPTOV3, Start, general	1 = Start
LD0.PHPTUV1.Op.general	PHPTUV1.OPERATE	PHPTUV1, Operate, general	1 = Operate
LD0.PHPTUV1.Str.general	PHPTUV1.START	PHPTUV1, Start, general	1 = Start
LD0.PHPTUV2.Op.general	PHPTUV2.OPERATE	PHPTUV2, Operate, general	1 = Operate
LD0.PHPTUV2.Str.general	PHPTUV2.START	PHPTUV2, Start, general	1 = Start
LD0.PHPTUV3.Op.general	PHPTUV3.OPERATE	PHPTUV3, Operate, general	1 = Operate
LD0.PHPTUV3.Str.general	LD0.PHPTUV3.Str.general	PHPTUV3, Start, general	1 = Start
LD0.PSPTUV1.Op.general	PSPTUV1.OPERATE	PSPTUV1, Operate, general	1 = Operate
LD0.PSPTUV1.Str.general	PSPTUV1.START	PSPTUV1, Start, general	1 = Start
Disturbance recorder			
DR.RDRE1.RcdMade.stVal	-	Disturbance recorder, recording made, stVal	1 = Recording made
Residual current limit supervision			
LD0.RESCMMXU1.HiAlm.stVal	RESCMMXU1.HIGH_ALARM	RESCMMXU1, High alarm, stVal	1 = High alarm
LD0.RESCMMXU1.HiWrn.stVal	RESCMMXU1.HIGH_WARN	RESCMMXU1, High warning, stVal	1 = High warning
Residual voltage limit supervision			
LD0.RESVMMXU1.HiAlm.stVal	RESVMMXU1.HIGH_ALARM	RESVMMXU1, High alarm, stVal	1 = High alarm
LD0.RESVMMXU1.HiWrn.stVal	RESVMMXU1.HIGH_WARN	RESVMMXU1, High warning, stVal	1 = High warning
Residual overvoltage protection			
LD0.ROVPTOV1.Op.general	ROVPTOV1.OPERATE	ROVPTOV1, Operate, general	1 = Operate
LD0.ROVPTOV1.Str.general	ROVPTOV1.START	ROVPTOV1, Start, general	1 = Start
LD0.ROVPTOV2.Op.general	ROVPTOV2.OPERATE	ROVPTOV2, Operate, general	1 = Operate
LD0.ROVPTOV2.Str.general	ROVPTOV2.START	ROVPTOV2, Start, general	1 = Start
LD0.ROVPTOV3.Op.general	ROVPTOV3.OPERATE	ROVPTOV3, Operate, general	1 = Operate
LD0.ROVPTOV3.Str.general	ROVPTOV3.START	ROVPTOV3, Start, general	1 = Start
Synchrocheck			
LD0.SECRSYN1.SynPrg.stVal	-	Synchronization in progress	1 = Synchronization in progress
LD0.SECRSYN1.FailCmd.stVal	-	CB closing request failed	1 = Closing request failed
LD0.SECRSYN1.FailSyn.stVal	-	CB closing command failed	1 = Closing command failed
Fuse failure protection			
LD0.SEQRUFUF1.Str.general	SEQRUFUF1.FUSEF_U	SEQRUFUF1, General start of function, general	1 = Start
LD0.SEQRUFUF1.Str3Ph.general	SEQRUFUF1.FUSEF_3PH	SEQRUFUF1, Three-phase start of function, general	1 = Start
Circuit breaker condition monitoring			
LD0.SSCBR1.APwrAlm.stVal	SSCBR1.IPOW_ALIM	SSCBR1, Accumulated currents power (lyt), exceeded alarm limit, stVal	1 = 1yt alarm limit
LD0.SSCBR1.APwrLO.stVal	LD0.SSCBR1.APwrLO.stVal	SSCBR1, Accumulated currents power (lyt), exceeded lockout limit, stVal	1 = 1yt lockout limit

Table continues on next page

IEC 61850 name	AFL-Common SA name	IEC 61850 LN desc, DO desc, DA name	Values
LD0.SSCBR1.CB_LfAlm.stVal	SSCBR1.CB_LIFE_ALM	SSCBR1, Remaining life of CB exceeded alarm limit, stVal	1 = Remaining life alarm
LD0.SSCBR1.CisAlm.stVal	SSCBR1.TRV_T_CL_ALM	SSCBR1, CB close travel time exceeded set value, stVal	1 = Close travel time alarm
LD0.SSCBR1.LonTmAlm.stVal	SSCBR1.MON_ALM	SSCBR1, CB 'not operated for long time' alarm, stVal	1 = Not operated alarm
LD0.SSCBR1.OperAlm.stVal	SSCBR1.TRV_T_OP_ALM	SSCBR1, CB open travel time exceeded set value, stVal	1 = Open travel time alarm
LD0.SSCBR1.OpNumAlm.stVal	SSCBR1.OPR_ALM	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.PresAlm.stVal	SSCBR1.PRES_ALM	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.SprChAlm.stVal	SSCBR1.SPR_CHR_ALM	SSCBR1, Spring charging time has crossed the set value, stVal	1 = Spring charge alarm
Thermal protection			
LD0.T1PTTR1.AlmThm.general	T1PTTR1.ALARM	T1PTTR1, Thermal alarm, general	1 = Alarm
LD0.T1PTTR1.Op.general	T1PTTR1.OPERATE	T1PTTR1, Operate, general	1 = Operate
LD0.T1PTTR1.Str.general	T1PTTR1.START	T1PTTR1, Start, general	1 = Start
Trip circuit supervision			
LD0.TC.SSCBR1.CirAlm.stVal	TCSSCBR1.ALARM	TCSSCBR1, Alarm, stVal	1 = Alarm
LD0.TC.SSCBR2.CirAlm.stVal	TCSSCBR2.ALARM	TCSSCBR2, Alarm, stVal	1 = Alarm
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 = Trip, output
LD0.TRPPTRC2.Op.general	-	TRPPTRC2, Operate input signal, general	1 = Operate, input
LD0.TRPPTRC2.Tr.general	-	TRPPTRC2, General trip output signal, general	1 = Trip, output
Three-phase voltage limit supervision			
LD0.VMMXU1.HiAlm.stVal	VMMXU1.HIGH_ALARM	VMMXU1, High alarm, stVal	1 = High alarm
LD0.VMMXU1.HiWrn.stVal	VMMXU1.HIGH_WARN	VMMXU1, High warning, stVal	1 = High warning
LD0.VMMXU1.LoAlm.stVal	VMMXU1.LOW_ALARM	VMMXU1, Low alarm, stVal	1 = Low alarm
LD0.VMMXU1.LoWrn.stVal	VMMXU1.LOW_WARN	VMMXU1, Low warning, stVal	1 = Low warning
Raw I/O signals			
LD0.XAGGIO130.Ind1.stVal	-	X130 (AIM), X130-Input 1, stVal	1 = ON, 0 = OFF
LD0.XAGGIO130.Ind2.stVal	-	X130 (AIM), X130-Input 2, stVal	1 = ON, 0 = OFF
LD0.XAGGIO130.Ind3.stVal	-	X130 (AIM), X130-Input 3, stVal	1 = ON, 0 = OFF
LD0.XAGGIO130.Ind4.stVal	-	X130 (AIM), X130-Input 4, stVal	1 = ON, 0 = OFF
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

Table continues on next page

IEC 61850 name	AFL-Common SA name	IEC 61850 LN desc, DO desc, DA name	Values
LD0.XGGIO110.lnd3.stVal	-	X110 (BIO), X110-Input 3, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.lnd4.stVal	-	X110 (BIO), X110-Input 4, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.lnd5.stVal	-	X110 (BIO), X110-Input 5, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.lnd6.stVal	-	X110 (BIO), X110-Input 6, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.lnd7.stVal	-	X110 (BIO), X110-Input 7, stVal	1 = ON, 0 = OFF
LD0.XGGIO110.lnd8.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.XGGIO120.lnd1.stVal	-	X120 (AIM), X120-Input 1, stVal	1 = ON, 0 = OFF
LD0.XGGIO120.lnd2.stVal	-	X120 (AIM), X120-Input 2, stVal	1 = ON, 0 = OFF
LD0.XGGIO120.lnd3.stVal	-	X120 (AIM), X120-Input 3, stVal	1 = ON, 0 = OFF
LD0.XGGIO120.lnd4.stVal	-	X120 (AIM), X120-Input 4, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.lnd1.stVal	-	X130 (BIO), X130-Input 1, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.lnd2.stVal	-	X130 (BIO), X130-Input 2, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.lnd3.stVal	-	X130 (BIO), X130-Input 3, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.lnd4.stVal	-	X130 (BIO), X130-Input 4, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.lnd5.stVal	-	X130 (BIO), X130-Input 5, stVal	1 = ON, 0 = OFF
LD0.XGGIO130.lnd6.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

Table 3: Binary outputs

IEC 61850 name	AFL-Common SA name	IEC 61850 LN desc, DO desc, DA ame
		Circuit breaker control
CTRL.CBCSW1.Pos.Oper.ctiVal	-	CBXCBR1, Switch, general, Oper.ctiVal
		Reset current max. demand values
CTRL.CMSTA1.RecRs.Oper.ctiVal	-	CMMXU1, CMMXU1 max.demands, Oper.ctiVal
		Autoreclosing reset signals
LD0.DARREC1.RsCnt.Oper.ctiVal	-	DARREC1, DARREC1 counters, Oper.ctiVal
LD0.DARREC1.RsRec.Oper.ctiVal	-	DARREC1, DARREC1 reset, Oper.ctiVal
		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, indications and LEDs, Oper.ctiVal
LD0.LLN0.LEDRs2.Oper.ctiVal	-	General, alarm LEDs, Oper.ctiVal
LD0.LLN0.RecRs.Oper.ctiVal	-	General, all data, Oper.ctiVal
		Reset accumulated energy values
LD0.PEMMXU1.SupDmdRs.Oper.ctiVal	PEMMXU1.RSTACM	PEMMXU1, Reset of accumulated energy, Oper.ctiVal
		Disturbance recorder, clear memory and trig recording
DR.RDRE1.MemCir.Oper.ctiVal	-	Disturbance recorder, disturbance records, Oper.ctiVal
DR.RDRE1.RcdTrg.Oper.ctiVal	-	Disturbance recorder, trig recording, Oper.ctiVal
		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, Oper.ctiVal
LD0.SSCBR1.RsCBWear.Oper.ctiVal	SSCBR1.RST_CB_WEAR	SSCBR1, Reset input for CB remaining life and operation counter, Oper.ctiVal
LD0.SSCBR1.RsSprChaTm.Oper.ctiVal	SSCBR1.RST_SPR_T	SSCBR1, SSCBR1 spring charge time alarm reset, Oper.ctiVal
LD0.SSCBR1.RsTrvTm.Oper.ctiVal	SSCBR1.RST_TRV_T	SSCBR1, SSCBR1 travel time alarm reset, Oper.ctiVal

Table 4: Analog inputs

IEC 61850 name	AFL-Common SA name	Description	Scaling function	Argument 1 (min value)	Argument 2 (min value)	Argument 3	Argument 4
Circuit breaker, operation counter and 4-pole (2 bit) position value							
CTRL.CBCSW11.OpCntRs.stVal	CBXCBR1.Operation counter	Operation counter	Ratio	0	65535	0	65535
CTRL.CBCSW11.Pos.stVal	CBXCBR1.POSITION	CB switch	Ratio	0	3	0	3
Phase current measurements							
LD0.CMMXU1.A.phsA.instCVal.mag.f	CMMXU1.I_INST_A	Phase current A	Ratio	0	40	0	4000
LD0.CMMXU1.A.phsB.instCVal.mag.f	CMMXU1.I_INST_B	Phase current B	Ratio	0	40	0	4000
LD0.CMMXU1.A.phsC.instCVal.mag.f	CMMXU1.I_INST_C	Phase current C	Ratio	0	40	0	4000
Phase currents demand values							
LD0.CMSTA1.AvAmps1.mag.f	-	Phase current A demand	Ratio	0	40	0	4000
LD0.CMSTA1.AvAmps2.mag.f	-	Phase current B demand	Ratio	0	40	0	4000
LD0.CMSTA1.AvAmps3.mag.f	-	Phase currents C demand	Ratio	0	40	0	4000
LD0.CMSTA1.MaxAmps1.mag.f	-	Maximum demand for phase A	Ratio	0	40	0	4000
LD0.CMSTA1.MaxAmps2.mag.f	-	Maximum demand for phase B	Ratio	0	40	0	4000
LD0.CMSTA1.MaxAmps3.mag.f	-	Maximum demand for phase C	Ratio	0	40	0	4000
Sequence of current measurement values							
LD0.CSMSQ11.SeqA.c1.instCVal.mag.f	CMSQ11.I1_INST	Positive Sequence Current	Ratio	0	40	0	4000
LD0.CSMSQ11.SeqA.c2.instCVal.mag.f	CMSQ11.I2_INST	Negative Sequence Current	Ratio	0	40	0	4000
LD0.CSMSQ11.SeqA.c3.instCVal.mag.f	CMSQ11.I3_INST	Zero Sequence Current	Ratio	0	40	0	4000
Autoreclosing values							
LD0.DARREC1.AutoRecSt.stVal	DARREC1.STATUS	Autoreclosing status	Ratio	-2	4	-2	4
LD0.DARREC1.FrqOpCnt.stVal	DARREC1.FREQ_OPR_CNT	Frequent operation counter	Ratio	0	65535	0	65535
LD0.DARREC1.OpCnt1.stVal	DARREC1.CNT_SHOT1	Operation counter (1st shot)	Ratio	0	65535	0	65535
LD0.DARREC1.OpCnt2.stVal	DARREC2.CNT_SHOT1	Operation counter (2nd shot)	Ratio	0	65535	0	65535
LD0.DARREC1.OpCnt3.stVal	DARREC3.CNT_SHOT1	Operation counter (3rd shot)	Ratio	0	65535	0	65535
LD0.DARREC1.OpCnt4.stVal	DARREC4.CNT_SHOT1	Operation counter (4th shot)	Ratio	0	65535	0	65535
LD0.DARREC1.OpCnt5.stVal	DARREC5.CNT_SHOT1	Operation counter (5th shot)	Ratio	0	65535	0	65535
LD0.DARREC1.OpCntRs.stVal	DARREC1.COUNTER	Resettable operation counter (all shots)	Ratio	0	65535	0	65535
LD0.DARREC1.ShotPtr.stVal	DARREC1.SHOT_PTR	Shot pointer value	Ratio	0	65535	0	65535
Disconnector 4-pole (2 bit) position values							
CTRL.DCSXSW11.Pos.stVal	DCSXSW11.POSITION	Disconnector switch 1 position	Ratio	0	3	0	3
CTRL.DCSXSW12.Pos.stVal	DCSXSW12.POSITION	Disconnector switch 2 position	Ratio	0	3	0	3
CTRL.DCSXSW13.Pos.stVal	DCSXSW13.POSITION	Disconnector switch 3 position	Ratio	0	3	0	3
Earth switch 4-pole (2 bit) position values							
CTRL.ESSXSW11.Pos.stVal	ESSXSW11.POSITION	Earth switch position	Ratio	0	3	0	3
Frequency measurement							
LD0.FMMXU1.Hz.mag	-	Frequency metering	Ratio	35	75	3500	7500
Device temperature, system values and counters							

Table continues on next page

IEC 61850 name	AFL-Common SA name	Description	Scaling function	Argument 1 (min value)	Argument 2 (min value)	Argument 3	Argument 4
LD0.LPHD1.NumPwrUp.stVal	-	Number of power ups	Ratio	0	65535	0	65535
LD0.LPHD1.PhyHealth1.stVal	Warning	Warning	Ratio	0	65535	0	65535
LD0.LPHD1.PhyHealth2.stVal	Internal Fault	Internal fault	Ratio	0	65535	0	65535
LD0.LPHD1.WacTrg.stVal	-	Number of watchdog device resets detected	Ratio	0	65535	0	65535
LD0.LPHD1.WrmStr.stVal	-	Number of warm starts	Ratio	0	65535	0	65535
Power measurement and accumulated power values							
LD0.PEMMTR1.DmdVArh.actVal	PEMMXU1.ER_RV_ACM	Forward reactive energy	Ratio	0	999999999	0	999999999
LD0.PEMMTR1.DmdWh.actVal	PEMMXU1.EA_RV_ACM	Forward active energy	Ratio	0	999999999	0	999999999
LD0.PEMMTR1.SupVArh.actVal	PEMMXU1.ER_FWD_ACM	Reverse reactive energy	Ratio	0	999999999	0	999999999
LD0.PEMMTR1.SupWh.actVal	PEMMXU1.EA_FWD_ACM	Energy unit Mult	Ratio	0	999999999	0	999999999
LD0.PEMMXU1.TotPF.instMag.f	PEMMXU1.PF_INST	Average power factor (Total PF)	Ratio	-1	1	-100	100
LD0.PEMMXU1.TotW.instMag.f	PEMMXU1.P_INST	Total active power (Total P)	Ratio	0	999999	0	999999
LD0.PEMMXU1.TotVA.instMag.f	PEMMXU1.S_INST	Total apparent power (Total S)	Ratio	0	999999	0	999999
LD0.PEMMXU1.TotVAr.instMag.f	PEMMXU1.Q_INST	Total reactive power (Total Q)	Ratio	0	999999	0	999999
Disturbance recorder values							
DR.RDRE1.FINum.stVal	-	Number of recordings	Ratio	0	65535	0	65535
DR.RDRE1.MemUsed.stVal	-	Rec. memory used	Ratio	0	100	0	100
Residual current and voltage							
LD0.RESCMMXU1.A.res.instCVal.mag.	-	Residual current	Ratio	0	40	0	4000
LD0.RESVMMXU1.PhV.res.instCVal.mag.f	-	Residual voltage	Ratio	0	4	0	400
Synchrocheck							
LD0.SECRSYN1.EnSt.stVal	-	Energization state of Line and Bus	Ratio	0	4	0	4
Circuit-breaker condition monitoring values							
LD0.SSCBR1.AccAPwrPhA.mag.f	-	Accumulated currents power (lyt), phase A	Ratio	0	1000000	0	1000000
LD0.SSCBR1.AccAPwrPhB.mag.f	-	Accumulated currents power (lyt), phase B	Ratio	0	1000000	0	1000000
LD0.SSCBR1.AccAPwrPhC.mag.f	-	Accumulated currents power (lyt), phase C	Ratio	0	1000000	0	1000000
LD0.SSCBR1.InaTmdCnt.stVal	SSCBR1.INA_DAYS	Number of days CB has been inactive	Ratio	0	9999	0	9999
LD0.SSCBR1.Rmnl.ifPhA.stVal	SSCBR1.CB_LIFE_A	CB Remaining life phase A	Ratio	-9999	9999	-9999	9999
LD0.SSCBR1.Rmnl.ifPhB.stVal	SSCBR1.CB_LIFE_B	CB Remaining life phase B	Ratio	-9999	9999	-9999	9999
LD0.SSCBR1.Rmnl.ifPhC.stVal	SSCBR1.CB_LIFE_C	CB Remaining life phase C	Ratio	-9999	9999	-9999	9999
LD0.SSCBR1.TmmsCls.mag.f	-	Travel time of the CB during closing operation	Ratio	0	60000	0	60000
LD0.SSCBR1.TmmsOpn.mag.f	-	Travel time of the CB during opening operation	Ratio	0	60000	0	60000
LD0.SSCBR1.TmsSprCha.mag.f	-	Charging time of the CB spring	Ratio	0	99.99	0	9999
Temperature protection values							
Table continues on next page							

IEC 61850 name	AFL-Common SA name	Description	Scaling function	Argument 1 (min value)	Argument 2 (min value)	Argument 3	Argument 4
LD0.T1PTTR1.TmmsOp.stVal	T1PTTR1.THERMLEV_S_T	Estimated time to operate	Ratio	0	600000	0	600
LD0.T1PTTR1.TmmsRecEna.stVal	T1PTTR1.THERMLEV_END	Estimated time to deactivate BLK_CLOSE	Ratio	0	600000	0	600
LD0.T1PTTR1.Tmp.mag.f	-	Protected object temperature	Ratio	-100	9999.9	-1000	99999
LD0.T1PTTR1.TmpRI.mag.f	-	Relative temperature	Ratio	0	99.9	0	999
LD0.T1PTTR1.TmpUsed.mag.f	-	The ambient temperature used in the calculation	Ratio	-99	999.99	-9900	99999
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

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:	REF615
Highest DNP level supported: For requests: Level 2+ For responses: Level 2+	Device function: ○ Master ● 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: ○ None ○ Fixed ● Configurable (0...65535)	Maximum application layer re-tries: ● None ○ Configurable
Requires data link layer confirmation: ○ Never ○ Always ○ Sometimes ● Configurable as: "Never", "Only for multi-frame messages", or "Always"	
Requires application layer confirmation: ○ Never ○ Always ○ When reporting event data (slave devices only) ○ When sending multi-fragment responses (slave devices only)	
Table continues on next page	

DNP3 device profile document						
	<ul style="list-style-type: none"> ○ Sometimes ● Configurable as: "Only when reporting event data", or "When reporting event data or multi-fragment messages" 					
Timeouts while waiting for:						
Data link confirm:	<ul style="list-style-type: none"> ○ None ○ Fixed at ____ ○ Variable ● Configurable 					
Complete appl. fragment:	<ul style="list-style-type: none"> ● None ○ Fixed at ____ ○ Variable ○ Configurable 					
Application confirm:	<ul style="list-style-type: none"> ○ None ○ Fixed at ____ ○ Variable ● Configurable 					
Complete appl. response:	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● Never ○ Always ○ Sometimes ○ Configurable 					
SELECT/ OPERATE	<ul style="list-style-type: none"> ○ Never ○ Always ○ Sometimes ● Configurable 					
DIRECT OPERATE	<ul style="list-style-type: none"> ○ Never ○ Always ○ Sometimes ● Configurable 					
DIRECT OPERATE - NO ACK	<ul style="list-style-type: none"> ○ Never ○ Always ○ Sometimes ● Configurable 					
Count > 1 (Count > 1 is accepted but ignored)	<ul style="list-style-type: none"> ● Never ○ Always ○ Sometimes ○ Configurable 					
Pulse on	<ul style="list-style-type: none"> ● Never ○ Always ○ Sometimes ○ Configurable 					
Pulse off	<ul style="list-style-type: none"> ● Never ○ Always ○ Sometimes ○ Configurable 					
Latch on	<ul style="list-style-type: none"> ○ Never ● Always ○ Sometimes ○ Configurable 					
Latch off	<ul style="list-style-type: none"> ○ Never ● Always ○ Sometimes ○ Configurable 					
Queue	<ul style="list-style-type: none"> ● Never ○ Always ○ Sometimes ○ Configurable 					
Clear queue	<ul style="list-style-type: none"> ● 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:			
<ul style="list-style-type: none"> ○ Never ○ Only when time-tagged ○ Only non-time-tagged ● Configurable to send one or the other 			<ul style="list-style-type: none"> ○ Never ○ Binary input change with time ○ Binary input change with relative time ● Configurable 			
Sends unsolicited responses:			Sends static data in unsolicited responses:			
<ul style="list-style-type: none"> ● Never 			<ul style="list-style-type: none"> ● 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: none;"> <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																				
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																					
<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	Unsyncronized 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
AR	Autoreclosing
CB	Circuit breaker
CBFP	Circuit-breaker failure protection
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
PCM600	Protection and Control IED Manager
SBO	Select-before-operate

Contact us

ABB Oy

Distribution Automation

P.O. Box 699

FI-65101 VAASA, Finland

Phone +358 10 22 11

Fax +358 10 22 41094

www.abb.com/substationautomation